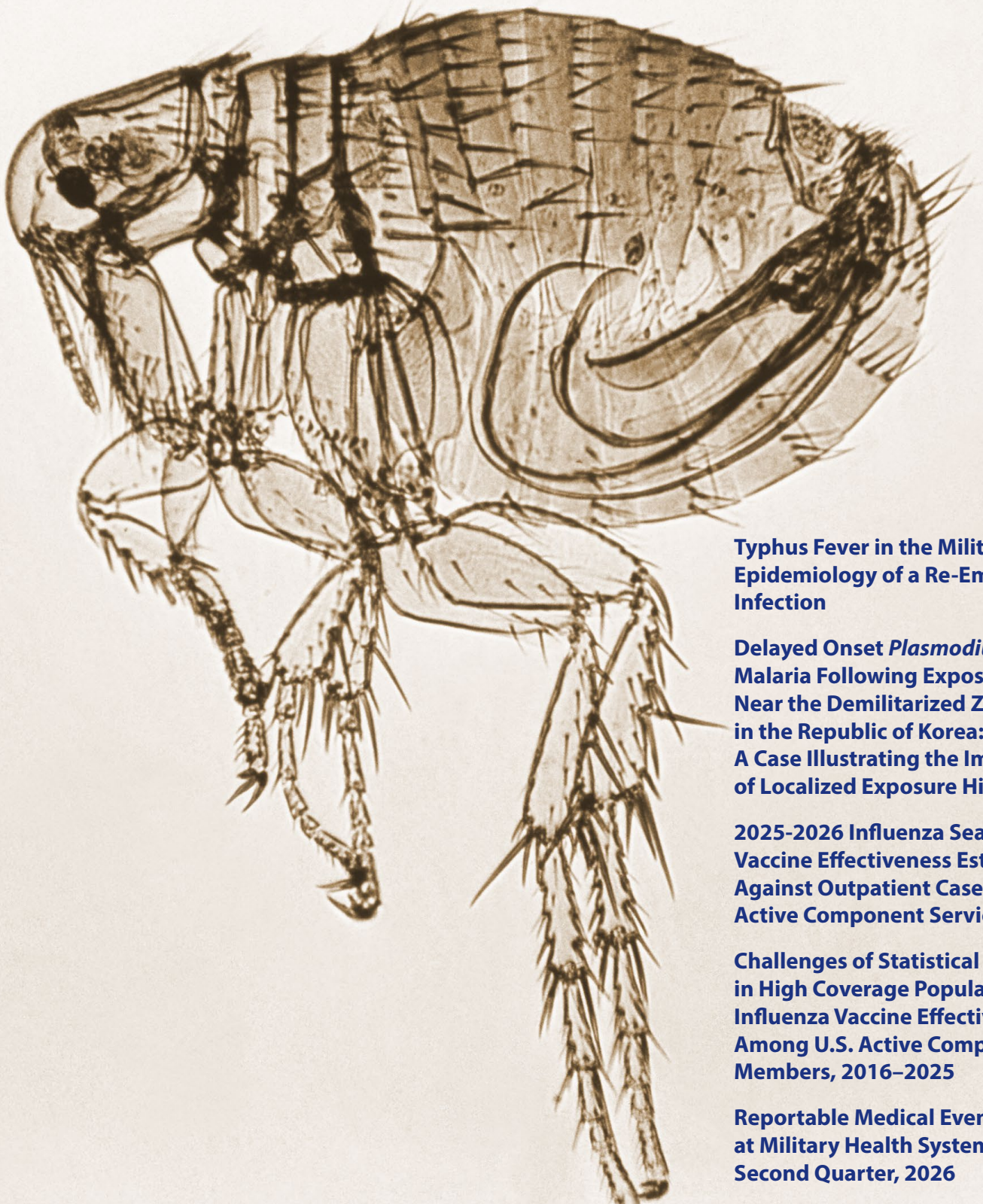


MSMR



Medical Surveillance Monthly Report

October 2026 | Vol. 33 | No. 10



**Typhus Fever in the Military:
Epidemiology of a Re-Emerging
Infection**

**Delayed Onset *Plasmodium vivax*
Malaria Following Exposure
Near the Demilitarized Zone
in the Republic of Korea:
A Case Illustrating the Importance
of Localized Exposure History**

**2025-2026 Influenza Season
Vaccine Effectiveness Estimates
Against Outpatient Cases Among U.S.
Active Component Service Members**

**Challenges of Statistical Power
in High Coverage Populations:
Influenza Vaccine Effectiveness Trends
Among U.S. Active Component Service
Members, 2016–2025**

**Reportable Medical Events
at Military Health System Facilities,
Second Quarter, 2026**

A Publication of the Armed Forces Health Surveillance Division

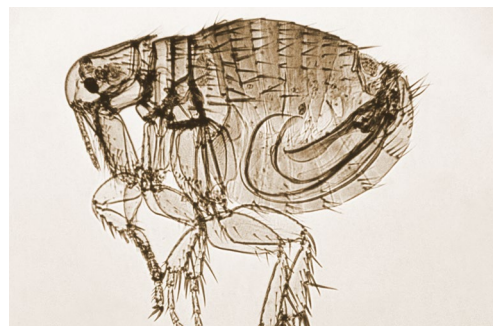
Medical Surveillance for Military Readiness

Table of Contents

3 [Typhus Fever in the Military: Epidemiology of a Re-Emerging Infection](#)

Lauren Sweet, MD; Elena Crouch, MD; John L. Kiley, MD

This study utilized Defense Medical Surveillance System data to evaluate the incidence and characteristics of flea-borne typhus diagnoses in the Military Health System from 1995 through 2024 among U.S. military service members, in addition to the geographic prevalence of flea-borne typhus in different periods.



9 [Case Report: Delayed Onset Plasmodium vivax Malaria Following Exposure Near the Demilitarized Zone in the Republic of Korea: A Case Illustrating the Importance of Localized Exposure History](#)

Carlie N. Skellington, MD, MPH; Leonie Joseph, DO; Marc-Eli M. Faldas, DO; Luke E. Mease, MD, MPH

This case report describes delayed onset *P. vivax* malaria in a U.S. service member whose non-specific symptom presentation prompted an extensive neurological and infectious disease evaluation before a detailed operational history revealed exposure near the demilitarized zone in the Republic of Korea.



12 [Brief Report: 2025-2026 Influenza Season Vaccine Effectiveness Estimates Against Outpatient Cases Among U.S. Active Component Service Members](#)

Angelia A. Eick-Cost, PhD, ScM; Zheng Hu, MS

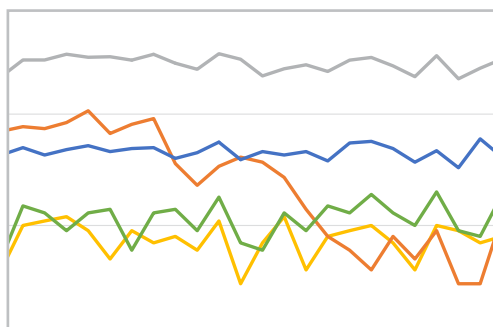
This brief report provides estimates of 2025-2026 influenza vaccine efficacy among U.S. active component service members.



15 [Surveillance Snapshot: Challenges of Statistical Power in High Coverage Populations: Influenza Vaccine Effectiveness Trends Among U.S. Active Component Service Members, 2016–2025](#)

David R. Sayers, MD, MTM&H; Angelia A. Eick-Cost, PhD, ScM

This brief report summarizes the challenges of accurate measuring of seasonal influenza vaccine efficacy in a population with historically high vaccination rates.



17 [Reportable Medical Events at Military Health System Facilities, Second Quarter, 2026](#)

Matthew W. R. Allman, MPH; Anthony R. Marquez, MPH; Katherine S. Kotas, MPH; Kiara Scatliffe-Carrion, MPH

MSMR publishes a quarterly report on reportable medical events among both active component service members as well as their beneficiaries who receive care through the Military Health System.

Typhus Fever in the Military: Epidemiology of a Re-Emerging Infection

Lauren Sweet, MD; Elena Crouch, MD; John L. Kiley, MD

Flea-borne, or endemic, typhus is a re-emerging disease in the U.S. that is only reported by selected states. Due to these limited surveillance efforts, the true burden of the disease has not been adequately assessed, and risk of infection for groups likely to be exposed to the vector, such as military personnel during field training, remains unclear. To better understand the geographic distribution of flea-borne typhus in the U.S. military, Defense Medical Surveillance System (DMSS) data from 1995 through 2024 were retrospectively analyzed, with laboratory data available from 2007 and afterwards. A total of 605 cases of 'typhus fever' were identified among service members of the U.S. military; flea-borne typhus cases were identified through International Classification of Diseases code filtering limited to a specified U.S. geographic area to exclude non-endemic typhus disease. The identification of cases was ultimately limited by reporting definitions stipulated in the *Armed Forces Reportable Medical Events Guidelines and Case Definitions*, constraints for stored variables within the DMSS, and potential concurrence between flea-based typhus and other rickettsioses. All possible screening was employed, however, to reduce this risk. Most cases occurred in men (82.0%), with a median age of 28 years, a reflection of military demographics. Almost half (46.8%) of cases were in a subset of military occupational categories with elevated field exposures, such as infantry and engineers. Among identified cases, pooled incidence in active duty personnel by person-years (p-yrs) increased to 3.5 from 2.1 cases per 100,000 p-yrs when comparing the 2018-2024 period with 2008-2013. Notable case clusters were observed in Missouri and North Carolina, with cases in active duty members per 100,000 p-yrs in those states exceeding 23.5 and 4.3, respectively. These findings may reveal a growing and under-recognized burden of flea-borne typhus within the U.S. military and highlight the need for enhanced arthropod control as well as reconsideration of national reporting strategies.

The burden of emerging tick- and flea-borne disease in the U.S. is increasing, but the true prevalence, including flea-borne typhus, remains undefined.¹ Until 1987, flea-borne, or endemic, typhus was a nationally reportable disease, but following the success of national pest control and sanitation programs, cases plummeted, and it was removed from the

list of nationally reportable diseases.²⁻⁴ Within the U.S. Department of War (DOW), flea-borne typhus has remained a reportable disease. To date, only a few state governments, including Texas, California, and Hawai'i, mandate reporting of this infection, and as a result of limited data sources, those 3 states are often considered endemic epicenters of this disease.^{3,5}

What are the new findings?

This study identified an increase in the pooled incidence rate of flea-borne typhus in U.S. military service members when comparing the 2008-2013 and 2018-2024 surveillance periods. Normalizing identified typhus cases against active duty strength in each U.S. state revealed previously unrecognized clusters of elevated disease activity in states without civilian reporting mandates, particularly Missouri and North Carolina, concentrated heavily among personnel in occupations with trainings requiring high field exposure.

What is the impact on readiness and force health protection?

Military personnel are exposed to a unique array of austere field conditions that put them at high risk for tick- and flea-borne diseases, including flea-borne typhus. Many military installations in the U.S. are located in regions with increasingly high incidences of these infections. It is unknown how geographic factors influence likelihood of exposure.

Because flea-borne typhus has variable clinical penetrance, the number of asymptomatic human cases is unknown, making true seroprevalence challenging to establish. This uncertainty makes prevention of flea bites a key public health measure. Direct exposure to a mammalian host is not required for transmission, and many cases often lack documented contact with a known amplifying host or reservoir.³ In urban settings, rats and rat fleas play a significant role in transmission, whereas in suburban environments, cat fleas and opossums are thought to be the primary drivers of the transmission cycle.^{3,6}

Due to the military's frequent requirements for field training, these infections present potential threats to force readiness. Military personnel (especially combat, infantry, artillery, and armor operators)

are exposed to a unique array of austere conditions, during both training and deployment, placing them at high risk for arthropod exposure and subsequent disease acquisition. Similarly, many military installations within the continental U.S. are in regions—the South, Midwest, and Northeast—with known high transmission rates of many of these diseases.^{7,8}

Studies evaluating the geographic range of flea-borne typhus beyond currently reporting states remain limited, largely due to inconsistent state reporting requirements and a deficiency of centralized public health reporting.^{5,6,9} The Defense Medical Surveillance System (DMSS) is a centrally maintained medical database of the DOW that contains current and historical data on diseases and medical events (e.g., hospitalizations, ambulatory care visits, reportable medical events), including flea-borne typhus, in addition to longitudinal data on personnel and deployment.¹⁰ In this study, the DMSS was employed to evaluate the incidence and characteristics of flea-borne typhus diagnoses from 1995 through 2024 within the Military Health System (MHS) among U.S. military service members, as well as the geographic prevalence of flea-borne typhus in different periods.

Methods

This report details a retrospective, descriptive study of epidemiological data on flea-borne typhus in the DMSS. The DMSS was queried for all confirmed and suspected cases of typhus fever from 1995 through 2024 in the U.S. active duty, Guard, and reserve component military populations in all 50 states. Disease definitions and reportable medical events (RMEs) are specified in the Defense Health Agency’s *Armed Forces Reportable Medical Events Guidelines and Case Definitions* (AFRME), which is periodically updated, most recently in 2022.¹¹

Confirmed cases were defined as 1 record of an RME confirmed for typhus fever or a laboratory test (polymerase chain reaction [PCR] or serology testing) positive for typhus fever. Suspected cases were defined as 1 inpatient or 2 outpatient

encounters within 60 days of each other with a diagnosis of typhus fever indicated by International Classification of Diseases, 9th and 10th revisions (ICD-9/ICD-10) codes in any diagnostic position (ICD-9: 080, 081, 081.0, 081.1, 081.2, 081.9; ICD-10: A75, A75.0, A75.1, A75.2, A75.3, A75.9); ICD-9 codes were utilized due to the older case data. Laboratory data were only available starting in 2007 and do not reliably specify laboratory test type (e.g., serology, PCR, etc.) or titers. For confirmed cases, the earliest date of the RME or laboratory test was used as the incident date. For suspected cases, the earliest date of the inpatient stay or outpatient encounter was used as the incident date. An individual could be an incident case once during the surveillance period. Cases were classified according to the state and military installation where diagnosed, unless otherwise specified.

The ‘typhus fever’ reporting category in the DMSS includes 3 distinct clinical syndromes caused by *Rickettsia typhi*, *Rickettsia prowazekii*, and *Orientia tsutsugamushi*; AFRME defines these 3 pathogens as having distinct clinical syndromes and assigns specific clinical descriptions and epidemiological risk factors.¹¹ Because included cases were exclusively from the 50 states, it was assumed that DMSS records for this study most likely represented cases of *R. typhi*, given the near-absence of *R. prowazekii* and *O. tsutsugamushi* in the U.S.^{12,13} Sporadic case reports of “syndromic typhus” caused by *R. prowazekii* have occurred in those with flying squirrel exposure, but it is of rare occurrence, with rare exposure.¹⁴ To further ensure the reliability of this *R. typhi* assumption, the data were filtered to remove any cases with ICD-9/ICD-10 codes specific to either epidemic (i.e., louse-borne, ICD-9 080 or ICD-10 A75.0) typhus or scrub (i.e., mite-borne, ICD-9 081.2 or ICD-10 A75.3) typhus.

Epidemiological characteristics, including prior deployment, time before and since last deployment, home of record, military occupation, age, sex, and race or ethnicity, were also documented and analyzed. Incidence analysis of cases was performed in 10-year increments. Occupational field or outdoor exposure risk was determined by agreement of 3 separate

military officers reviewing occupational codes, considering expected time outdoors to accomplish daily occupational responsibilities, degree of manual labor required in daily activities, and expected likelihood and frequency of outdoor exercises or training. **Table 1** details which occupations were designated as incurring high, moderate, or low field risk exposure.

To calculate overall incidence in U.S. states among active duty service members by person-years, the active duty population from each state was extracted from the Defense Manpower Data Center (DMDC) historical database in 4-6-year intervals, from 1996 through 2024: in 1996, 2000, 2004, 2008, 2013, 2018, 2024.¹⁵ Active duty census was determined based on DMDC service member records, in which the number of assigned personnel to each state is recorded at each data collection interval. The total number of person-years was tabulated using trapezoidal integration of each state’s total active duty population over time, divided into the total number of active duty cases per state for the same period. Due to potential under-reporting before laboratory data availability in 2007, only pooled incidence changes between 2008-2013 and 2018-2024 were calculated; data prior to 2007 were excluded from changing incidence rate (IR) calculations.

Results

In total, 610 cases of typhus fever were identified in U.S. active duty service members from 1995 through 2024. After filtering cases with codes for epidemic (louse-borne, ICD-9 080 or ICD-10 A75.0) typhus or scrub (mite-borne, ICD-9 081.2 or ICD-10 A75.3) typhus, 605 cases of flea-borne typhus were identified. Of those 605 flea-borne cases, 87.1% (n=527) met the criteria for confirmed disease via laboratory positivity (n=507, 83.8%) or RME (n=20, 3.3%), while the remainder (n=78, 12.9%) met suspected case definition criteria (**Table 2**).

Between 2007-2014 and 2015-2024, cases of flea-borne typhus among U.S. ACSMs increased from 24.8 cases per year to 39.5 cases per year (**Figure 1**).

TABLE 1. Flea-borne Typhus Cases by Military Occupation and Field Exposure Risk Designation, U.S. Armed Forces^a, 1995–2024

Military Occupation	Field Exposure Risk Designation	No.	%
Infantry, general	High	36	6.0
Combat engineering, general	High	28	4.6
Nuclear, biological and chemical warfare specialists	High	17	2.8
Special Forces	High	14	2.3
Ground, Naval arms	High	13	2.1
Combat operations control, general	High	11	1.8
Construction equipment operation	High	11	1.8
Explosive ordnance disposal, underwater demolition team	High	6	1.0
Ammunition repair	High	5	0.8
Forward area equipment support, general	High	6	1.0
Missile artillery, operating crew	High	3	0.5
Artillery, gunnery	High	3	0.5
Construction equipment	High	3	0.5
Rocket artillery	High	1	0.2
Not occupationally qualified, general	Medium	36	6.0
Students	Medium	28	4.6
Law enforcement, general	Medium	22	3.6
Construction, utilities	Medium	18	3.0
Operational intelligence	Medium	10	1.7
Police	Medium	8	1.3
Construction, general	Medium	4	0.7
Other ^b	N/A, Low	322	53.2
Total ^c		605	100.0

Abbreviation: No., number; %, percent; N/A, not applicable.

^aIncludes active duty, guard, reserve components.

^bAny occupation not included was otherwise assigned low field risk.

^c130 occupational codes represented in DMSS sample.

Utilizing laboratory data, from the initial (2008-2013) period when available and the later (2018-2024) period, pooled IRs for active duty-only individuals were calculated: 2.1 cases per 100,000 person-years (p-yrs) in 2008-2013 to 3.5 cases per 100,000 p-yrs in 2018-2024, with an absolute positive incidence change of 1.4 cases per 100,000 per p-yrs.

Table 2 shows that most cases were among young (median age 28 years, interquartile range [IQR] 23-35), non-Hispanic White, male, Army service members. A majority (n=352, 58.2%) of individuals with flea-borne typhus had never deployed (**Table 2**), and most cases in those with a history of deployment occurred at a median of 1,298 (IQR 585-2,628) days before any deployment start or end date (data not shown).

The greatest numbers of cases were in infantry members, those with a “general, not occupationally qualified” occupation signifier, combat engineers, and students. In addition, 25.9% (n=157) of cases occurred in occupations designated with high field activity requirements, and another 20.8% (n=126) occurred in occupations with moderate-to-potentially-high field activity requirements (e.g., students, construction, police) (**Table 1**).

The 5 states with the highest total case numbers together represented 62% (n=375) of all cases reported in the DMSS; Missouri, North Carolina, and Texas combined reported 49.6% (n=299) of all flea-borne typhus infections. **Figure 2** details the geographic distribution of DMSS-reported flea-borne typhus cases and the leading 10 reporting bases, led by Fort Leonard Wood

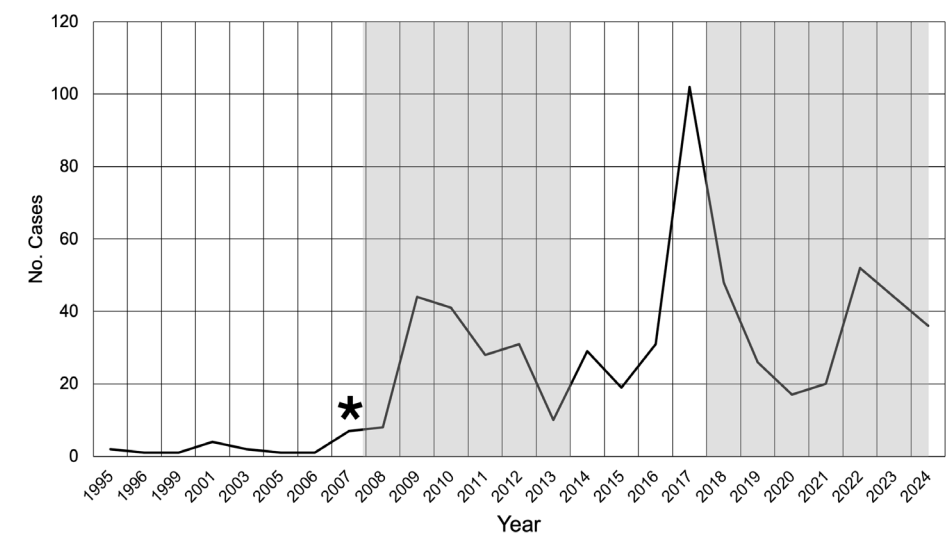
TABLE 2. Flea-borne Typhus Cases by Demographic Characteristics, U.S. Armed Forces^a, 1995–2024

	No.	%
Age, y (median, IQR)	28 (23-35)	
Sex		
Male	496	82.0
Female	109	18.0
Race, ethnicity		
White, non-Hispanic	387	64.0
Black, non-Hispanic	76	12.6
Asian	17	2.8
Hispanic	85	14.0
Other	40	6.6
Branch of service		
Army	366	60.5
Navy	45	7.4
Air Force	122	20.2
Marine Corps	66	10.9
Other	6	1.0
Rank		
Officer	120	19.8
Enlisted	485	80.2
Ever deployed		
Yes	253	41.8
No	352	58.2
Component		
Active duty	485	80.2
Guard	64	10.6
Reserve	56	9.3
Field risk		
High field risk	164	27.1
Moderate field risk, student	125	20.7
Low risk, other	347	57.4
Diagnosis		
Inpatient	24	4.0
Outpatient	54	8.9
Laboratory-based	507	83.8
RME	20	3.3

Abbreviations: No, number; %, percent; y, years; IQR, interquartile range; RME, reportable medical event.

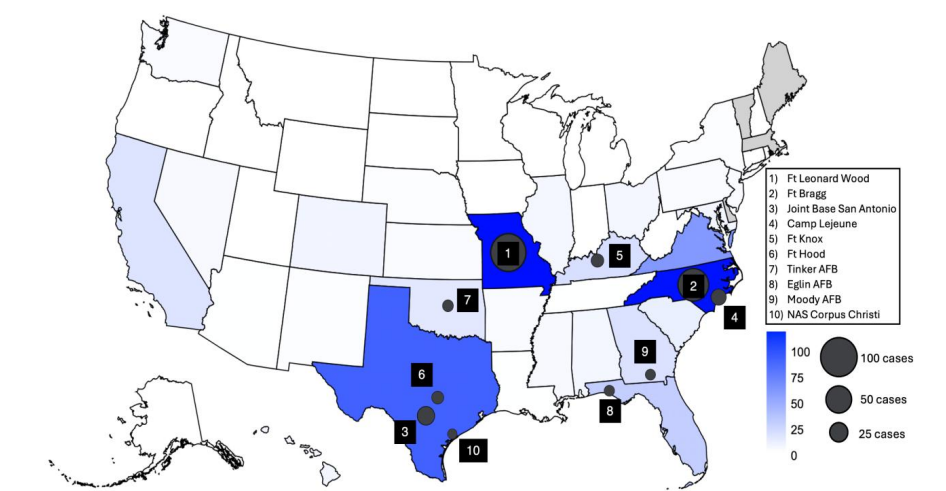
^aIncludes active duty, guard, reserve components.

FIGURE 1. Flea-borne Typhus Cases by Year, U.S. Armed Forces^a, 1995–2024



* Indicates year that laboratory data became available in DMSS; gray zones indicate periods used in incidence calculations.
Abbreviations: No., number; DMSS, Defense Medical Surveillance System.
^a Includes active duty, guard, reserve components.

FIGURE 2. Geographic Distribution of Flea-borne Typhus Cases by State and Leading 10 Reporting Military Installations, U.S. Armed Forces^a, 1995–2024



Abbreviations: AFB, Air Force Base; Ft, Fort; NAS, Naval Air Station.
^a Includes active duty, guard, and reserve components.

(Missouri), Fort Bragg (North Carolina), and Joint Base San Antonio (Texas). **Table 3** demonstrates that the overall highest IRs, when normalizing against total active duty person-years remain in Missouri and North Carolina, with Missouri's IR (23.5 cases per 100,000 p-yrs) about 6 times higher than the state with the next highest IR, North Carolina.

Discussion

The DMSS data described in this study suggest an under-recognized and increasing burden of flea-borne typhus within the U.S. military population. These findings also imply under-appreciated exposure risks in U.S. states not typically associated with the disease, with greater than expected burdens evidenced in states such as North Carolina

or Missouri. These data further corroborate trends observed in the U.S. states with flea-borne typhus reporting criteria: Incidence of flea-borne typhus appears to be increasing annually.⁵ These findings must be interpreted with caution, however, as they rely heavily on pre-defined classifications in the AFRME Guidance, which carries significant assumptions regarding diagnostic specificity.

While incidence of flea-borne typhus between the initial period (2008–2013) after laboratory data availability and the more recent period (2018–2024) demonstrates a modest upward trend consistent with typhus reporting from states such as Texas and California,⁵ annual fluctuations remain difficult to interpret. The cause of the 2017 spike in cases is unclear; however, it mirrors similar trends in above-average arthropod (i.e., tick bite) exposures reported to the U.S. Centers for Disease Control and Prevention that year.¹⁶ The subsequent decline in reported cases in 2020–2021 likely reflects national patterns in arthropod-borne disease surveillance observed during the COVID-19 pandemic.^{17–19}

While Texas is often considered an epicenter of flea-borne typhus infections,^{1,3,5} the data in DMSS provide potential evidence of a high degree of exposure among military members stationed in other states, most prominently Missouri. The cases in Missouri occurred almost exclusively at Fort Leonard Wood, a training site for Army infantry, engineers, military police, along with chemical, biological, radiological and nuclear units. These teams typically spend extended durations in the field and outdoors, which may predispose individuals to increased arthropod exposures in rural and peri-urban settings. This predominance of cases was not explained by size-biased sampling from an area of high military personnel concentration, as demonstrated by the IRs per 100,000 p-yrs. States such as Missouri, North Carolina, and Texas continue to have higher rates despite normalization by active duty census.

One major limitation of this study is that the details of tests indicating positive cases are not available within the DMSS: Whether the disease was confirmed via PCR, or serology (e.g., IFA or ELISA), cycle thresholds, and titers were not available

TABLE 3. Rate of Flea-borne Typhus Cases (per 100,000 person-years) by State, Active Duty Service Members, U.S. Armed Forces, 1995–2024

Rank by Cases per 100,000 Person-Years	State	Total Person-Years per State ^a	Cases	Cases per 100,000 Person-Years
1	Missouri	455,393.0	107	23.5
2	North Carolina	2,486,284.0	106	4.3
3	Arkansas	147,982.0	4	2.7
4	Oklahoma	590,261.0	13	2.2
5	Montana	96,987.0	2	2.1
6	Kentucky	826,464.0	17	2.1
7	Texas	2,951,411.0	53	1.8
8	Alabama	303,332.5	5	1.6
9	Nebraska	184,790.0	3	1.6
10	Virginia	2,783,731.0	40	1.4
11	New Jersey	228,012.5	3	1.3
12	Maryland	763,877.0	10	1.3
13	Michigan	81,624.0	1	1.2
14	Florida	1,573,762.5	18	1.1
15	Mississippi	365,165.0	4	1.1
16	Kansas	493,714.5	5	1.0
17	New Mexico	302,184.0	3	1.0
18	South Carolina	1,008,778.0	10	1.0
19	Georgia	1,716,379.5	17	1.0
20	Colorado	781,282.5	7	0.9
21	Ohio	246,089.0	2	0.8
22	Nevada	261,178.0	2	0.8
23	Pennsylvania	146,588.0	1	0.7
24	North Dakota	193,419.0	1	0.5
25	Louisiana	431,528.5	2	0.5
26	Illinois	691,088.5	3	0.4
27	Hawaii	1,017,497.5	4	0.4
28	New York	603,672.5	2	0.3
29	California	3,626,405.0	9	0.2
30	Washington	1,264,085.5	3	0.2
31	Alaska	469,679.5	1	0.2
32	Arizona	549,140.0	1	0.2
33	Connecticut	162,096.5	0	0
34	Delaware	103,850.5	0	0
35	Idaho	108,406.0	0	0
36	Indiana	70,613.0	0	0
37	Iowa	38,001.0	0	0
38	Maine	50,100.0	0	0
39	Massachusetts	121,478.5	0	0
40	Minnesota	65,014.0	0	0
41	New Hampshire	32,012.0	0	0
42	Oregon	54,177.5	0	0
43	Rhode Island	89,404.0	0	0
44	South Dakota	94,029.5	0	0
45	Tennessee	115,844.0	0	0
46	Utah	147,977.0	0	0
47	Vermont	11,551.5	0	0
48	West Virginia	32,657.0	0	0
49	Wisconsin	55,314.5	0	0
50	Wyoming	88,339.5	0	0

^a Person-year data derived from active duty population data from Defense Manpower Data Center at time points 1996, 2000, 2004, 2008, 2013, 2018, 2024.

reliably in the DMSS. Furthermore, information on what constituted a positive test, and whether a positive titer was taken during acute infection or convalesce, are unknown. This limitation is compounded by the fact that many of the rickettsia serological laboratory specimens are known to cross-react, notably with the spotted fever group rickettsiae.^{20,21} The possibility of cross-reactivity is impossible to discount without knowledge of the titers of any additional paired tests, which was not available. Cross-reactivity is especially relevant in states such as North Carolina, where an elevated number of flea-borne typhus cases were observed, but where a strong association with Rocky Mountain Spotted Fever (RMSF) exists.^{22,23}

This study assumed that cases entered in the DMSS under the established surveillance definitions represent true infections of flea-borne typhus, even though diagnosis ultimately relies on provider clinical judgment. Notably, the AFRME guidelines specify that when serologies are positive for both the spotted fever and typhus groups, the event must be classified under the disease most consistent with the patient's clinical presentation, exposure history, and travel history.¹¹ The emergence of novel conditions, such as flea-borne spotted fever, may further confound case counts due to diagnostic overlap and low assay specificity.²⁴

An additional limitation is the inability to account for temporary duty (TDY) status at time of diagnosis. Cases are attributed to the location where a diagnosis is made, so personnel who become ill while temporarily assigned elsewhere—such as for training—are recorded at the TDY rather than permanent duty station. Because denominator data are based on permanently assigned active duty personnel, this misclassification may distort state incidence estimates. Despite this constraint, these findings continue to suggest an elevated exposure risk in certain states, including Missouri.

DMSS data provide a centralized database for exploring the increasing burden of flea-borne typhus. Collectively, these data suggest the possibility of a nationally under-reported burden, due to states that do not currently report this infection publicly—such as Missouri—but with high numbers of infections recorded in the DMSS.

These data indicate that increased surveillance with strict diagnostic parameters and heightened clinical suspicion of this disease may be useful in determining the true burden. DMSS data suggest that individuals stationed in certain areas may benefit from stricter arthropod protection and flea control measures based on potential increased exposure risk. This is especially relevant due to the historical ban against re-application of permethrin to field uniforms.²⁵

Given that standard serology cannot reliably distinguish *R. typhi* from other rickettsioses, it is possible that a proportion of coded typhus cases represent misclassified rickettsial infections. Attributing observed trends exclusively to *R. typhi* without confirmatory, pathogen-specific diagnostics risks misdirecting surveillance and management efforts. These data argue for more intensive review of local incidence patterns and underscore the need for greater rickettsiosis-focused laboratory diagnostic specificity within the MHS, as well as targeted vector and reservoir biosurveillance, to better characterize the true etiology and epidemiology of typhus-coded cases in the military population.

Author Affiliations

Infectious Diseases Service, Department of Medicine, Brooke Army Medical Center, Fort Sam Houston, TX: Maj Sweet, LTC Kiley, Capt Crouch; Uniformed Services University, Department of Medicine, Bethesda, MD: Maj Sweet, LTC Kiley, Capt Crouch

Acknowledgment

The authors thank Dr. Angelia Eick-Cost, who assisted with DMSS data capture.

Disclaimers

The views expressed in this report reflect the results of research conducted by the authors and do not necessarily reflect official policy nor position of the Defense Health Agency, Department of War, or the U.S. Government.

The authors are military service members. This work was prepared as part of official duties. Title 17, U.S. Code Section 105 provides that copyright protection under this title is not available for any work of the U.S. Government.

Title 17, U.S. Code Section 101 defines a

U.S. Government work as a work prepared by a military service member or employee of the U.S. Government as part of that person's official duties.

References

- Blanton LS. Murine typhus: a review of a re-emerging flea-borne rickettsiosis with potential for neurologic manifestations and sequelae. *Infect Dis Rep*. 2023;15(6):6. doi:10.3390/idr15060063
- Blanton LS, Vohra RF, Bouyer DH, Walker DH. Reemergence of murine typhus in Galveston, Texas, USA, 2013. *Emerg Infect Dis*. 2015;21(3):484-486. doi:10.3201/eid2103.140716
- Anstead GM. A one health perspective on the resurgence of flea-borne typhus in Texas in the 21st century: part 1: the bacteria, the cat flea, urbanization, and climate change. *Pathogens*. 2025;14(2):2. doi:10.3390/pathogens14020154
- Anstead GM. History, rats, fleas, and opossums. ii. the decline and resurgence of flea-borne typhus in the United States, 1945–2019. *Trop Med Infect Dis*. 2020;6(1):2. doi:10.3390/tropicalmed6010002
- Salzer J, Blanton LS, Paddock CD. CDC Clinical Outreach Call: Murine Typhus: A Re-emerging Threat in the United States. Mar. 27, 2025. Accessed Apr. 13, 2025. <https://www.cdc.gov/coca/hcp/trainings/murine-typhus.html>
- Civen R, Ngo V. Murine typhus: an unrecognized suburban vectorborne disease. *Clin Infect Dis Off Publ Infect Dis Soc Am*. 2008;46(6):913-918. doi:10.1086/527443
- Madison-Antenucci S, Kramer LD, Gebhardt LL, Kauffman E. Emerging tick-borne diseases. *Clin Microbiol Rev*. 2020;33(2):10.1128/cmr.00083-18. doi:10.1128/cmr.00083-18
- Marx GE, Spillane M, Beck A, et al. Emergency department visits for tick bites: United States, January 2017–December 2019. *MMWR Morb Mortal Wkly Rep*. 2021;70(17):612-616. doi:10.15585/mmwr.mm7017a2
- Afzal Z, Kallumadanda S, Wang F, Hemmige V, Musher D. Acute febrile illness and complications due to murine typhus, Texas, USA. *Emerg Infect Dis*. 2017;23(8):1268-1273. doi:10.3201/eid2308.161861
- Rubertone MV, Brundage JF. The Defense Medical Surveillance System and the Department of Defense Serum Repository: glimpses of the future of public health surveillance. *Am J Public Health*. 2002;92(12):1900-1904. doi:10.2105/ajph.92.12.1900
- Armed Forces Health Surveillance Branch. *Armed Forces Reportable Medical Events: Guidelines and Case Definitions*. Defense Health Agency, U.S. Dept. of War. 2022. Accessed Sep. 8, 2026. <https://www.health.mil/reference-center/publications/2022/11/01/armed-forces-reportable-medical-events-guidelines>
- Cherry CC, Binder AM. Trends in clinical diagnoses of typhus group rickettsioses among a large U.S. insurance claims database. *Zoonoses Public Health*. 2020;67(3):291-299. doi:10.1111/zph.12687
- Wang Q, Ma T, Ding F, et al. Global and regional seroprevalence, incidence, mortality of, and risk factors for scrub typhus: a systematic review and meta-analysis. *Int J Infect Dis*. 2024;146. doi:10.1016/j.ijid.2024.107151
- Chapman AS, Swerdlow DL, Dato VM, et al. Cluster of sylvatic epidemic typhus cases associated with flying squirrels, 2004–2006. *Emerg Infect Dis*. 2009;15(7):1005-1011. doi:10.3201/eid1507.081305
- Defense Manpower Data Center. DoD Personnel, Workforce Reports & Publications: Military and Civilian Personnel by Service/Agency by State/Country. U.S. Dept. of War. Accessed Jun. 22, 2026. <https://dwp.dmdc.osd.mil/dwp/app/dod-data-reports/workforce-reports>
- Centers for Disease Control and Prevention. Tick Bite Data Tracker. Ticks. U.S. Dept. of Health and Human Services. Jul. 11, 2024. Accessed Jun. 23, 2026. <https://www.cdc.gov/ticks/data-research/facts-stats/tick-bite-data-tracker.html>
- Centers for Disease Control and Prevention. Ehrlichiosis Epidemiology and Statistics. Ehrlichiosis. U.S. Dept. of Health and Human Services. Jun. 25, 2025. Accessed Jun. 23, 2026. <https://www.cdc.gov/ehrlichiosis/data-research/facts-stats/index.html>
- Centers for Disease Control and Prevention. Clinical Overview of Transmission and Epidemiology. Rocky Mountain Spotted Fever (RMSF). U.S. Dept. of Health and Human Services. May 20, 2024. Accessed Sept. 18, 2024. <https://www.cdc.gov/rocky-mountain-spotted-fever/hcp/clinical-overview/index.html>
- McCormick DW, Kugeler KJ, Marx GE, et al. Effects of COVID-19 pandemic on reported Lyme disease, United States, 2020. *Emerg Infect Dis*. 2021;27(10):2715-2717. doi:10.3201/eid2710.210903
- Aita T, Sando E, Katoh S, et al. Serological cross-reactivity between spotted fever and typhus groups of rickettsia infection in Japan. *Int J Infect Dis*. 2023;130:178-181. doi:10.1016/j.ijid.2023.03.012
- La Scola B, Rydkina L, Ndihokubwayo JB, Vene S, Raoult D. Serological differentiation of murine typhus and epidemic typhus using cross-adsorption and western blotting. *Clin Diagn Lab Immunol*. 2000;7(4):612-616. doi:10.1128/cdli.7.4.612-616.2000
- Brown Marusiak A, Giandomenico DA, Hollingsworth BD, et al. Spatial and clinical epidemiology of spotted fever rickettsioses and ehrlichiosis, North Carolina, 2010–2019. *PLoS Negl Trop Dis*. 2025;19(8):e0013406. doi:10.1371/journal.pntd.0013406
- Urserly L, Mansour O, Abernathy H, et al. Enhanced surveillance for tick-borne rickettsiosis and ehrlichiosis in North Carolina: protocol and preliminary results. *PLoS One*. 2025;20(5):e0320361. doi:10.1371/journal.pone.0320361
- Stidham RA, Lenhart PA, Roachell W, et al. Rickettsia felis case cluster in a military family. *Mil Med*. 2025;190(11-12):e2643-e2647. doi:10.1093/milmed/usaf104
- Armed Forces Pest Management Board. Re-Treatment of Uniforms with Permethrin: New Guidance. Acquisition and Sustainment, U.S. Dept. of War. Apr. 17, 2020. Accessed Sep. 8, 2026. https://www.acq.osd.mil/eie/afpmb/docs/contingency/Re-treatment_of_uniforms_with_permethrin_New_Guidance.pdf

Case Report

Delayed Onset *Plasmodium vivax* Malaria Following Exposure Near the Demilitarized Zone in the Republic of Korea: A Case Illustrating the Importance of Localized Exposure History

Carlie N. Skellington, MD, MPH; Leonie Joseph, DO; Marc-Eli M. Faldas, DO; Luke E. Mease, MD, MPH

P*lasmodium vivax* malaria was eliminated in the Republic of Korea (ROK) in 1979 but re-emerged in 1993 and remains endemic.¹⁻³ Although malaria incidence in the ROK is relatively low overall, transmission is geographically concentrated in areas near the demilitarized zone (DMZ), where U.S. military personnel may conduct training and field operations.⁴ Recognition of malaria may also be complicated by the prolonged latency of *P. vivax*, as clinical illness can occur months after exposure.⁵⁻⁷ This report describes a case of delayed onset *P. vivax* malaria in a service member who presented approximately 5 months after returning from the ROK. His non-specific symptoms initially prompted an extensive neurological and infectious disease evaluation before a detailed operational history identified field exposure near the DMZ. This case demonstrates the diagnostic value of geographically-specific operational exposure histories when evaluating returning service members.

Case Presentation

An active duty male service member aged 23 years presented to a continental U.S. military medical facility with 5 days of subjective fever, headache, and non-bloody diarrhea, followed by 1 day of neck stiffness (**Table**). His headache progressively worsened and was accompanied by intermittent fevers and chills. Initial history was negative for chronic medical conditions, recent domestic travel, sick contacts, intravenous drug use, wildlife exposure, or recent airborne operations. Sexual history was notable for inconsistent condom use.

Upon admission, the service member was febrile to 39.5°C. Physical examination was otherwise largely unremarkable, including negative Kernig and Brudzinski signs. Meningitis, however, remained a concern, given his worsening headache and newly reported neck stiffness. Initial laboratory studies demonstrated thrombocytopenia ($87 \times 10^3/\mu\text{L}$), mild hyperbilirubinemia, and elevated procalcitonin (2.55 ng/mL) without leukocytosis or anemia. Respiratory pathogen polymerase chain reaction testing, HIV testing, syphilis screening, heterophile antibody testing, and hepatitis serologies were negative. Non-contrast head computed tomography was normal. After blood cultures were obtained, empiric ceftriaxone and vancomycin were initiated. Lumbar puncture was subsequently performed and demonstrated unremarkable cerebrospinal fluid findings. The patient met systemic inflammatory response syndrome criteria and was admitted for further evaluation of worsening headache in the context of an undifferentiated febrile illness.

Additional history obtained after admission revealed leisure travel to Puerto Rico and a 6-month deployment to the ROK and Japan, with return to the U.S. approximately 5 months before presentation. Infectious disease consultation further identified field exposure near the DMZ without malaria chemoprophylaxis. BinaxNOW malaria testing was positive, and peripheral thin blood smear confirmed uncomplicated *P. vivax* malaria with parasitemia less than 1%.

The patient was treated with atovaquone-proguanil (250 mg/100 mg, 4 tablets daily) for 3 days and a concurrent 14-day

course of primaquine 30 mg daily for anti-relapse therapy following confirmation of normal glucose-6-phosphate dehydrogenase activity. At follow-up, thrombocytopenia had resolved, repeat BinaxNOW malaria testing and peripheral thin blood smear were negative, and the patient recovered fully without complication.

Discussion

Both geographic specificity and time since exposure complicated recognition of *P. vivax* malaria in this returning service member. Although the patient had returned from the ROK approximately 5 months before presentation, his field exposure near the DMZ remained clinically relevant because malaria transmission in the ROK is geographically concentrated, and *P. vivax* may present after prolonged latency. His initial symptoms prompted evaluation for neurological and infectious causes before a detailed operational history identified the relevant exposure. The case emphasizes the value of determining not only where a service member was stationed or deployed but also where specific training and field activities occurred.

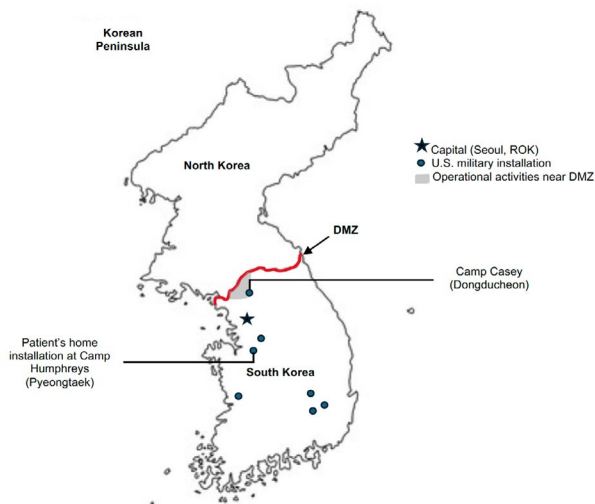
Malaria risk is not uniform within the ROK. *P. vivax* transmission is concentrated near the DMZ and is substantially lower in most urban areas and at established U.S. military installations.⁸ Personnel conducting training in northern areas closer to the DMZ, including near Camp Casey in Dongducheon-si, may therefore experience greater vector exposure than those stationed at southern installations, such as U.S. Army Garrison Humphreys

TABLE. Clinical Timeline of Delayed Onset *Plasmodium vivax* Malaria Case Following Military Assignment in the Republic of Korea

Medical Event	Time in Relation to ED Arrival	Details of Exposure, Symptom, Diagnosis and Treatment
Exposure	– 5 months	History of exposure near DMZ during military assignment
Symptom onset	– 5 days	Fever, headache, diarrhea
Symptom progression	– 1 day	Worsening headache with new-onset neck stiffness
Presentation	Arrival at ED	Presentation for evaluation at ED
Initial evaluation	+ 5 hours	Laboratory studies notable for thrombocytopenia; non-contrast head CT unremarkable
Initial management	+ 6 hours	Empiric ceftriaxone and vancomycin administered after blood cultures obtained
Diagnostic evaluation	+ 7 hours	Lumbar puncture performed; CSF studies unremarkable
Admission	+ 10 hours	Admitted for inpatient service
Specialist evaluation	+ 17 hours	Infectious Disease consultation
Diagnosis	+ 19 hours	BinaxNOW malaria test positive; peripheral thin blood smear confirmed <i>P. vivax</i> (<1% parasitemia)
Treatment initiation	+ 22 hours	Dual regimen antimalarial therapy initiated
Discharge	+ 45 hours	Discharged in stable condition with ongoing treatment course
Follow-up	+ 7 days	Repeat BinaxNOW malaria test and peripheral thin blood smear negative; thrombocytopenia resolved

Abbreviations: ED, emergency department; DMZ, demilitarized zone; CT, computed tomography; CSF, cerebrospinal fluid; *P.*, *Plasmodium*.

in Pyeongtaek (**Figure**).⁹ A 2018 cluster of *P. vivax* malaria among U.S. soldiers training near the DMZ further demonstrates this geographically concentrated risk.¹⁰ More recent data show that 80% of *P. vivax* malaria cases among U.S. service members in 2025 were acquired in Korea.¹¹

FIGURE. Map of the Republic of Korea, with U.S. Military Installations Located in Relation to Demilitarized Zone

Abbreviations: ROK, Republic of Korea; DMZ, Demilitarized Zone.

The prolonged latency of *P. vivax* can further obscure the relationship between exposure and clinical presentation. A Korean study of 897 individuals with *P. vivax* malaria reported mean short- and long-incubation periods of 25.5 and 329.4 days, respectively.⁵ Among the U.S. soldiers in the 2018 cluster described earlier, 9 of 11 cases (82%) were diagnosed 8–11 months after return to the U.S.¹⁰ In temperate regions such as the ROK, *P. vivax* may exhibit a bimodal pattern of primary presentation, with some infections becoming symptomatic within approximately 1 month and others presenting many months after infection.⁵ This delayed presentation is associated with dormant hepatic hypnozoites that persist during latent liver-stage infection.⁷

U.S. Forces Korea Instruction 4200.02 generally does not require malaria

chemoprophylaxis for deployments or field operations in the ROK because of low overall malaria attack rates. Chemoprophylaxis may be recommended, however, when increased malaria risk exists, particularly for operations in close proximity to the Military Demarcation Line or within northern boundary training areas.¹² Although this patient reported field exposure near the DMZ, he did not receive malaria chemoprophylaxis. Available information does not establish whether chemoprophylaxis was considered or recommended as part of a mission-specific risk assessment. The absence of chemoprophylaxis in this patient cannot therefore be attributed to individual non-adherence, an operational decision based on assessed risk, or a gap in implementation of existing guidance.

Malaria risk is also influenced by seasonality, making timing as well as location of field exposure relevant to operational risk assessment.¹¹ Force health protection measures should continue to emphasize adherence to theater-specific chemoprophylaxis guidance and Department of War Insect Repellent System implementation,

including use of permethrin-treated uniforms and DEET (diethyltoluamide)- or picaridin-based repellents, along with appropriate environmental vector control measures.^{13,14} The effectiveness of these preventive measures may also be influenced by insecticide resistance among local mosquito populations.¹⁵

This case has important implications for both force health protection and clinical practice. Commanders, operational planners, and medical personnel should ensure that malaria risk assessments account for specific training and operational locations and are translated into appropriate preventive measures, including chemoprophylaxis when indicated by theater guidance. Clinicians evaluating service members after return from the ROK should likewise obtain detailed operational and geographic exposure histories. Recognition of prior exposure near the DMZ may facilitate timely diagnosis of *P. vivax* malaria even months after return to the U.S.

Author Affiliations

Department of Preventive Medicine, Madigan Army Medical Center, Joint Base Lewis-McChord, WA: CPT Skellington, COL Mease; Department of Family Medicine, Madigan Army Medical Center: CPT Joseph; 210th Field Artillery Brigade, Camp Casey, Dongducheon-si, Gyeonggi-do, Republic of Korea: CPT Faldas

Acknowledgment

The authors acknowledge the inpatient care team involved in this case.

Disclaimers

The clinical aspects of this case were presented as an oral poster at the 2026 Uniformed Services Academy of Family Physicians (USAFP) Annual Meeting and Exposition, March 10-11, 2026, San Diego, CA.

The contents of this article are the sole responsibility of the authors and do not necessarily reflect the views, opinions, nor policies of the U.S. Government, Department of War, U.S. Army Medical Department, U.S. Army Office of the Surgeon General, Madigan Army Medical Center, or Camp Casey.

Mention of trade names, commercial products, or organizations does not imply endorsement by the U.S. Government. Investigators followed human subject protection 45CFR46 policies.

References

1. Chai JY. History and current status of malaria in Korea. *Infect Chemother*. 2020;52(3):441-452. doi:10.3947/ic.2020.52.3.441
2. Bahk YY, Lee HW, Na BK, et al. Epidemiological characteristics of re-emerging *vivax* malaria in the Republic of Korea (1993–2017). *Korean J Parasitol*. 2018;56(6):531-543. doi:10.3347/kjp.2018.56.6.531
3. Kim JH, Lim AY, Cheong HK. Malaria incidence of the regions adjacent to the Demilitarized Zone in the Democratic People's Republic of Korea, 2004–2016. *J Korean Med Sci*. 2019;34(36):e227. doi:10.3346/jkms.2019.34.e227
4. Kim B, Kim JH, Lee J, Yeom JS. A region-structured model for early warning of *Plasmodium vivax* malaria transmission risk in the Republic of Korea. *J Infect Public Health*. 2025;18(3):102665. doi:10.1016/j.jiph.2025.102665
5. Kim Sun-Ja, Kim Si-Heon, Jo S, et al. The long and short incubation periods of *Plasmodium vivax* malaria in Korea: the characteristics and relating factors. *Infect Chemother*. 2013;45(2):184-193. doi:10.3947/ic.2013.45.2.184
6. Fikadu M, Ashenafi E. Malaria: an overview. *Infect Drug Resist*. 2023;16:3339-3347. doi:10.2147/idr.s405668
7. Flannery EL, Kangwanransan N, Chuenchob V, et al. *Plasmodium vivax* latent liver infection is characterized by persistent hypnozoites, hypnozoite-derived schizonts, and time-dependent efficacy of primaquine. *Mol Ther Methods Clin Dev*. 2022;26:427-440. doi:10.1016/j.omtm.2022.07.016
8. Yeom JS. To eradicate malaria on the Korean Peninsula, accurate Democratic People's Republic of Korea malaria statistics are needed. *J Korean Med Sci*. 2019;34(36):e249. doi:10.3346/jkms.2019.34.e249
9. HyunJung K, Lee S, Shin N, et al. Status of malaria and diagnosis rate in the Republic of Korea, 2018–2022. *Public Health Wkly Rep*. 2023;16(26):852-866. doi:10.56786/phwr.2023.16.26.3
10. Klein TA, Seyoum B, Forshey BM, et al. Cluster of *vivax* malaria in U.S. soldiers training near the demilitarized zone, Republic of Korea during 2015. *MSMR*. 2018;25(11):4-9. Accessed Sep. 14, 2026. <https://www.health.mil/reference-center/reports/2018/01/01/medical-surveillance-monthly-report-volume-25-number-11>
11. Armed Forces Health Surveillance Division. Malaria among members of the U.S. Armed Forces, 2025. *MSMR*. 2026;33(5):22-28. Accessed Sep. 14, 2026. <https://www.health.mil/news/articles/2026/05/01/msmr-malaria-2026>
12. U.S. Forces Korea Headquarters. U.S. Forces Korea Regulation 40-9: Force Health Protection (FHP) Requirements for the Korean Theater. Feb. 8, 2018. Accessed Jun. 12, 2026. <https://www.usfk.mil/portals/105/documents/publications/regulations/usfk-reg-40-9-fhp-requirements-kn.pdf>
13. Agudelo Higuaita NI, White BP, Franco-Paredes C, McGhee MA. An update on prevention of malaria in travelers. *Ther Adv Infect Dis*. 2021;8:20499361211040690. doi:10.1177/20499361211040690
14. U.S. Forces Korea Headquarters. U.S. Forces Korea Regulation 40-9: Force Health Protection (FHP) Requirements for the Korean Theater. Feb. 8, 2018. Accessed Jun. 12, 2026. <https://www.usfk.mil/portals/105/documents/publications/regulations/usfk-reg-40-9-fhp-requirements-kn.pdf>
15. Jeon J, Kim HC, Klein TA, Jun H, Choi KS. Insecticide resistance mutations of *Anopheles* species in the Republic of Korea. *PLoS Negl Trop Dis*. 2025;19(1):e0012748. doi:10.1371/journal.pntd.0012748

2025-2026 Influenza Season Vaccine Effectiveness Estimates Against Outpatient Cases Among U.S. Active Component Service Members

Angelia A. Eick-Cost, PhD, ScM; Zheng Hu, MS

Seasonal changes in circulating influenza virus strains are well known and require annual updates to influenza vaccine formulations to effectively prevent or reduce the impacts of influenza infections.¹ The U.S. Food and Drug Administration's Vaccine and Related Biological Products Advisory Committee (VRBPAC) reviews and evaluates data on the safety, effectiveness, and use of vaccines, including influenza vaccines. Seasonal influenza vaccine effectiveness (VE) estimates and epidemiological, genetic, and antigenic characteristics of circulating influenza virus data are necessary to inform influenza policy-makers on the past season's influenza characteristics and effectiveness of vaccines, to guide policy decisions for the next season.² The most accurate data, from a variety of populations within the U.S., are essential for developing vaccines that are antigenically well-matched to circulating viruses and effective at preventing or minimizing clinical symptoms from influenza infections.

The U.S. military required annual influenza vaccinations from the 1950s through the 2025-2026 influenza season.³ This analysis was conducted to provide military leadership with timely data on influenza VE among U.S. active component service members (ACSMs) for the 2025-2026 influenza season. This analysis and evaluation is essential due to annually evolving influenza strains and vaccines.⁴⁻¹²

Methods

A case test-negative design was used to estimate influenza VE against outpatient cases of influenza for the 2025-2026 season. Demographic and vaccination data from

the Defense Medical Surveillance System and standardized laboratory data provided by the Defense Centers for Public Health—Portsmouth were used for this analysis.^{13,14} The study population included all ACSMs tested for influenza from December 1, 2025 through March 31, 2026—peak influenza activity months—who had no indications of hospitalization in the laboratory data.

Cases of influenza were defined as individuals with a positive influenza result from a rapid antigen, reverse transcription polymerase chain reaction (RT-PCR), or culture influenza assay. Test-negative controls (TNCs) were individuals with a negative influenza result from a RT-PCR or culture influenza assay. Individuals with negative rapid antigen tests were excluded from the analysis due to the high false-positivity rate of those tests.¹⁵

Influenza vaccination status was determined using CVX codes for any northern hemisphere seasonal influenza vaccine (CVX codes 15, 88, 111, 135, 140, 141, 144, 149, 150, 151, 153, 155, 158, 161, 166, 168, 171, 185, 186, 197, 205, 320, 333). Service members were excluded from analysis if they had received a southern hemisphere influenza vaccine (CVX codes 194, 200, 201, 202, 231, or 331) during the surveillance period, as the study only evaluated the Northern Hemisphere formulation. Individuals who had received an influenza vaccine at least 14 days prior to the specimen collection date were considered vaccinated; otherwise they were classified as unvaccinated.

Unadjusted odds ratios (ORs) were calculated, and a multivariate logistic regression was used to calculate adjusted ORs and 95% confidence intervals (CIs). The model was adjusted for sex, age group, prior vaccination (any influenza vaccine in previous

5 years, the most suitable timeframe for this variable based on prior evaluations), and month of diagnosis. Estimates of VE were defined as $(1 - OR)$ multiplied by $(x) 100$. Analyses were conducted using SAS Enterprise Guide version 8.6.

Results

Evaluation of the data revealed 7,954 laboratory-confirmed outpatient influenza cases and 21,628 outpatient TNCs during the surveillance period. Cases were mostly influenza type A (6,221) with the remainder type B (1,706) or A and B co-infections (27). Only 14% of influenza A cases had subtype data available, of which 819 were A(H3N2) and 71 were A(H1N1)pdm09. The vaccine types administered were mostly inactivated, 79.9%, followed by cell-based (13.7%), with the remainder either 'other' or unknown (data not shown). Compared to TNCs, outpatient influenza cases had a statistically significantly higher odds of being male, ages 25-29 years, serving in the Coast Guard, assigned outside the U.S., and with no documented influenza vaccination in the past 5 years (**Table 1**).

Unadjusted and adjusted VE estimates are provided in **Table 2**. Overall, 80% of outpatient cases were vaccinated compared to 86% of TNCs, resulting in a crude VE of 34% (95% CI 29, 38). After adjustment, the VE was 30% (95% CI 25, 35). As most cases were type A, a similar adjusted VE was found for type A overall, at 35% (95% CI 29, 40). A higher adjusted VE was seen for A(H3N2), at 52% (95% CI 43, 59). Non-significant adjusted VE estimates were found for A(H1N1)pdm09, at 26% (95% CI -44, 62), and influenza B, at 6% (95% CI -10, 19).

Discussion

This study found moderate influenza VE during the 2025-2026 influenza season against outpatient cases of influenza A among U.S. ACSMs, with the highest adjusted VE against cases of influenza A(H3N2). No statistically significant VE was seen against influenza B or A(H1N1)pdm09. These results are similar to the mid-season estimates reported by the U.S. Centers for Disease Control and Prevention (CDC) for adults ages 18-64 years in the general U.S. population for outpatient influenza A.¹⁶ The Virtual SARS-CoV-2, Influenza, and Other respiratory viruses Network (VISION) reported a 35% (95% CI 30, 39) VE against outpatient influenza A. The ACSM VE against influenza B was much lower than the VISION VE estimates (66%, 95% CI 50, 78). The difference in estimates between this study and the CDC data have been reported previously and may be affected by differences in influenza vaccine coverage (80–86% among ACSMs, 18–32% in the general U.S. population), study sample sizes, and population characteristics.⁷

Interpretation of these findings should be limited to the population under surveillance. This study only evaluated influenza VE against cases seeking outpatient care, and the results, therefore, do not reflect VE against more severe infections (i.e., hospitalizations) as well as less severe cases (i.e., non-medically attended). Military influenza vaccine mandates resulted in a highly vaccinated population, not only for the current season, but for past seasons as well. This may affect VE due to issues with statistical power to detect significant findings and immune responses due to repeated vaccinations.¹⁷ Vaccine data are typically only available while a member of the military is in service, so there may be misclassification of the prior vaccination variable for those who joined service less than 5 years before the season. Additionally, the reason for lack of influenza vaccination is not always documented but may include adverse reactions to prior vaccinations or temporary medical exceptions; these exceptions may introduce unmeasured confounders that were not accounted for in the analysis.

TABLE 1. Peak Season Demographics of Influenza Cases and Test-Negative Controls, Active Component, U.S. Armed Forces, 2025–2026^a

Demographics	Cases		Test-Negative Controls		Unadjusted Odds Ratio	
	No.	%	No.	%	%	95% CI
Total	7,954	100	21,628	100		
Sex						
Female	1,975	24.8	6,560	30.3	Reference	
Male	5,979	75.2	15,068	69.7	1.32	1.24, 1.40
Age, y						
18–24	3,072	38.6	8,551	39.5	Reference	
25–29	2,180	27.4	5,416	25.0	1.12	1.05, 1.20
30–39	2,023	25.4	5,680	26.3	0.99	0.93, 1.06
40+	679	8.5	1,981	9.2	0.95	0.87, 1.05
Race and ethnicity						
White, non-Hispanic	3,538	44.5	9,381	43.4	Reference	
Black, non-Hispanic	1,438	18.1	4,582	21.2	0.83	0.78, 0.89
Hispanic	1,913	24.1	4,940	22.8	1.03	0.96, 1.10
Other, unknown	1,065	13.4	2,725	12.6	1.04	0.96, 1.12
Branch of service						
Army	3,219	40.5	7,782	36.0	Reference	
Navy	1,522	19.1	4,718	21.8	0.78	0.73, 0.84
Air Force	2,108	26.5	6,573	30.4	0.78	0.73, 0.83
Marine Corps	891	11.2	2,085	9.6	1.03	0.95, 1.13
Coast Guard	156	2.0	212	1.0	1.78	1.44, 2.20
Space Force	58	0.7	258	1.2	0.54	0.41, 0.73
Geographic location						
U.S.	7,052	88.7	19,695	91.1	Reference	
Outside U.S.	902	11.3	1,933	8.9	1.3	1.20, 1.42
Prior vaccine for influenza						
No	1,744	21.9	4,434	20.5	Reference	
Yes	6,210	78.1	17,194	79.5	0.86	0.86, 0.98
Month of diagnosis						
December	2,379	29.9	5,374	24.9	0.97	0.91, 1.04
January	2,805	35.3	6,159	28.5	Reference	
February	1,803	22.7	5,342	24.7	0.74	0.69, 0.79
March	967	12.2	4,753	22.0	0.45	0.41, 0.49

Abbreviations: No., number; CI, confidence interval; y, years.

^a Peak season surveillance period defined as Dec. 1, 2025–Mar. 31, 2026.

Differences in VE estimates between populations and characteristics of those populations emphasize the need for continued reporting of VE estimates among ACSMs. Seasonal changes in circulating influenza virus strains necessitate mid- and post-season assessments of influenza VE to inform both military and national

public health leaders and policy-makers on the impacts, as well as changing needs, of vaccine formulations. These estimates provide valuable data on influenza infections among ACSMs and assess the vaccine's ability to protect the health and readiness of service members.

TABLE 2. Peak Season Influenza Vaccine Effectiveness Against Outpatient Laboratory-Confirmed Influenza, Active Component, U.S. Armed Forces, 2025–2026^a

Type of Influenza	Cases		Test-Negative Controls		Unadjusted VE		Adjusted VE	
	No.	% Vaccinated	No.	% Vaccinated	%	95% CI	%	95% CI ^b
Overall	7,954	80	21,628	86	34	29, 38	30	25, 35
A, any subtype ^c	6,248	78	21,628	86	42	37, 46	35	29, 40
A(H1N1)pdm09	71	85	21,628	86	11	-70, 53	26	-44, 62
A(H3N2)	819	69	21,628	86	63	57, 68	52	43, 59
B ^c	1,733	88	21,628	86	-15	-33, 1	6	-10, 19

Abbreviations: VE, vaccine effectiveness; No., number; CI, confidence interval.

^aPeak season surveillance period defined as Dec. 1, 2025–Mar. 31, 2026.

^bAdjusted for sex, age category, prior vaccination (any influenza vaccine in previous 5 years), and month of diagnosis.

^cInfluenza type A (any subtype) and B include 27 cases positive for both influenza A and B.

Authors' Affiliation

Epidemiology and Analysis Branch, Armed Forces Health Surveillance Division, Public Health Directorate, Defense Health Agency, Silver Spring, MD: Dr. Eick-Cost, Ms. Hu

References

1. Trombetta CM, Kistner O, Montomoli E, Viviani S, Marchi S. Influenza viruses and vaccines: the role of vaccine effectiveness studies for evaluation of the benefits of influenza vaccines. *Vaccines (Basel)*. 2022;10(5):714. doi:10.3390/vaccines10050714
2. U.S. Food and Drug Administration. Influenza Vaccine Composition for the 2026–2027 U.S. Influenza Season. U.S. Dept. of Health and Human Services. Aug. 11, 2026. Accessed Mar. 26, 2026. <https://www.fda.gov/vaccines-blood-biologics/vaccines/influenza-vaccine-composition-2026-2027-us-influenza-season>
3. Grabenstein JD, Pittman PR, Greenwood JT, Engler RJM. Immunization to protect the US Armed Forces: heritage, current practice, and prospects. *Epidemiol Rev*. 2006;28(1):3–26. doi:10.1093/epirev/mxj003
4. Eick-Cost AA, Hu Z. 2023–2024 mid-season influenza vaccine effectiveness against laboratory-confirmed ambulatory influenza: U.S. active component service members. *MSMR*. 2024; 31(3):22. Accessed Mar. 27, 2026. <https://www.health.mil/news/articles/2024/03/01/msmr-flu-vaccines-hospitalizations>
5. Thervil JW, DeMarcus LS, Eick-Cost A, et al. Department of Defense mid-season vaccine effectiveness estimates for the 2019–2020 influenza season. *MSMR*. 2021;28(6):16–19. Accessed Aug. 11, 2026. <https://www.health.mil/reference-center/reports/2021/06/01/medical-surveillance-monthly-report-volume-28-number-06>
6. Lynch LC, Colemand R, DeMarcus L, et al. Department of Defense midseason estimates of vaccine effectiveness for the 2018–2019 influenza season. *MSMR*. 2019;26(7):24–27. Accessed Aug. 11, 2026. <https://www.health.mil/reference-center/reports/2019/07/01/medical-surveillance-monthly-report-volume-26-number-7>
7. Coleman R, Eick-Cost AA, Hawksworth AW, et al. Department of Defense end-of-season influenza vaccine effectiveness estimates for the 2017–2018 season. *MSMR*. 2018;25(10):16–20. Accessed Aug. 11, 2026. <https://www.health.mil/reference-center/reports/2018/01/01/medical-surveillance-monthly-report-volume-25-number-10>
8. Shoubaki L, Eick-Cost AA, Hawksworth A, et al. Department of Defense midseason vaccine effectiveness estimates for the 2017–2018 influenza season. *MSMR*. 2018;25(6):26–28. Accessed Aug. 11, 2026. <https://www.health.mil/reference-center/reports/2018/01/01/medical-surveillance-monthly-report-volume-25-number-6>
9. Toure E, Eick-Cost AA, Hawksworth A, et al. Mid-season influenza vaccine effectiveness estimates for the 2016–2017 influenza season. *MSMR*. 2017;24(8):17–19. Accessed Aug. 11, 2026. <https://www.health.mil/reference-center/reports/2017/01/01/medical-surveillance-monthly-report-volume-24-number-8>
10. Cost AA, Hiser MJ, Hu Z, et al. Mid-season influenza vaccine effectiveness estimates for the 2013–2014 influenza season. *MSMR*. 2014;21(6):15–17. Accessed Aug. 11, 2026. <https://www.health.mil/reference-center/reports/2014/01/01/medical-surveillance-monthly-report-volume-21-number-6>
11. Eick-Cost AA, Hu Z, Cooper MJ, et al. Mid-season influenza vaccine effectiveness for the 2012–2013 influenza season. *MSMR*. 2013;20(3):15–6. Accessed Aug. 11, 2026. <https://www.health.mil/reference-center/reports/2013/01/01/medical-surveillance-monthly-report-volume-20-number-3>
12. Eick-Cost AA, Tastad KJ, Guerrero AC, et al. Effectiveness of seasonal influenza vaccines against influenza-associated illnesses among US military personnel in 2010–11: a case-control approach. *PLoS One*. 2012;7(7):e41435. doi:10.1371/journal.pone.0041435
13. Rubertone MV, Brundage JF. The Defense Medical Surveillance System and the Department of Defense serum repository: glimpses of the future of public health surveillance. *Am J Public Health*. 2002;92(12):1900–1904. doi:10.2105/ajph.92.12.1900
14. Navy Medicine. Respiratory Surveillance. Department of the Navy, U.S. Dept. of War. Accessed Aug. 11, 2026. <https://www.med.navy.mil/navy-medicine-research-and-development-command/r-d-commands/naval-health-research-center/core-research/operational-infectious-diseases/respiratory-surveillance>
15. Centers for Disease Control and Prevention. Information for Clinicians on Rapid Diagnostic Testing for Influenza. U.S. Dept. of Health and Human Services. Jan. 5, 2026. Accessed Apr. 24, 2026. <https://www.cdc.gov/flu/hcp/testing-methods/rapid-clin.html>
16. Centers for Disease Control and Prevention. Preliminary Flu Vaccine Effectiveness (VE) Data for 2025–2026. U.S. Dept. of Health and Human Services. Mar. 16, 2026. Accessed Aug. 11, 2026. <https://www.cdc.gov/flu-vaccines-work/php/effectiveness-studies/2025-2026.html>
17. Jones-Gray E, Robinson EJ, Kucharski AJ, Fox A, Sullivan SG. Does repeated influenza vaccination attenuate effectiveness? A systematic review and meta-analysis. *Lancet Respir Med*. 2023;11(1):27–44. doi:10.1016/S2213-2600(22)00266-1

Challenges of Statistical Power in High Coverage Populations: Influenza Vaccine Effectiveness Trends Among U.S. Active Component Service Members, 2016–2025

David R. Sayers, MD, MTM&H; Angelia A. Eick-Cost, PhD, ScM

TABLE. Influenza Vaccine Effectiveness Against Laboratory-Confirmed Influenza and Case-to-Control Ratio, Active Component, U.S. Armed Forces, 2016–2025

Mid-Season Vaccine Effectiveness, U.S. Department of War							
Influenza Season	Cases ^a		Controls ^b		Case: Control Ratio ^c	Adjusted ^d VE	
	No.	% Vaccinated	No.	% Vaccinated		Point Est.	95% CI
2016–2017	1,031	90	1,299	89	1:1.3	-7	-42, 19
2017–2018	2,926	89	2,557	90	1.2:1	19	3, 33
2018–2019	1,594	92	2,548	91	1:1.6	13	-11, 32
2019–2020	3,999	86	3,682	85	1:1	10	-3, 21
2020–2021	375	38	12,481	56	1:33	29	9, 44
2021–2022	1,459	65	48,813	69	1:33.4	36	28, 44
2022–2023	4,899	47	23,433	54	1:4.8	34	29, 39
2023–2024	3,540	82	16,411	85	1:4.6	21	13, 29
2024–2025	4,677	83	12,787	82	1:2.7	15	7, 23

Full Season Vaccine Effectiveness, U.S. Department of War								CDC	
Influenza Season	Cases ^a		Controls ^b		Case: Control Ratio ^c	Adjusted ^d VE		Adjusted ^e VE	
	No.	% Vaccinated	No.	% Vaccinated		Point Est.	95% CI	Point Est.	95% CI
2016–2017	1,778	92	2,378	92	1:1.3	5	-19, 25	40	32, 46
2017–2018	4,096	91	5,274	93	1:1.3	18	4, 30	38	31, 43
2018–2019	3,758	93	4,521	93	1:1.2	15	-2, 29	29	21, 35
2019–2020	Not Available							39	32, 44
2020–2021	Not Available							Insufficient Data	
2021–2022	3,977	86	56,881	85	1:14.3	26	19, 33	36	21, 48
2022–2023	6,355	54	44,560	70	1:7.0	35	30, 39	30	-9, 54
2023–2024	5,126	86	24,458	88	1:4.8	12	4, 20	44	36, 51
2024–2025	8,201	78	23,226	81	1:2.8	17	10, 23	56	54, 58

Abbreviations: VE, vaccine effectiveness; No., number; %, percent; Est., estimate; CI, confidence interval; CDC, Centers for Disease Control and Prevention.

^a Cases were defined as individuals with a positive influenza result from a rapid antigen, reverse transcription polymerase chain reaction (RT-PCR), or culture influenza assay.

^b Controls (test-negative) were defined as individuals with a negative influenza result from a RT-PCR or culture influenza assay.

^c Case: control ratio was defined as the ratio of cases to controls at mid-season and full season vaccine effectiveness calculations.

^d Adjusted for sex, age category, prior vaccination (any influenza vaccine in previous 5 years), and month of diagnosis.

^e Adjusted for study site, age, sex, underlying medical conditions, and days from illness onset to enrollment.

Influenza vaccines have been used by the U.S. military since the 1940s, and were required annually from the 1950s until 2026 for active component service members (ACSMs),¹ but annual estimates of military influenza program vaccine effectiveness (VE), through traditional observational test-negative case control studies, typically demonstrate lower VE among ACSMs when compared to national data. Multiple factors may influence this disparity, including diminished antibody response to multiple vaccinations, waning immunity during the influenza season, and study design limitations including adequate statistical power.² This Surveillance Snapshot summarizes seasonal influenza VE among ACSMs from 2016 through 2025 compared to U.S. Centers for Disease Control national estimates and describes statistical power challenges in calculating VE in the highly vaccinated U.S. military population.

The Armed Forces Health Surveillance Division (AFHSD) utilizes Defense Medical Surveillance System data to generate seasonal influenza VE estimates for ACSMs. Each season, a test-negative observational case-control design, previously reported,³ is used to calculate influenza VE in the U.S. military. The frequent use of this design is due to key methodological advantages: It simplifies execution by identifying cases and controls concurrently and draws sample cases from a population with similar health care-seeking behaviors (i.e., minimizes confounding). Historically, these strengths have made the test-negative design the preferred method for calculating the seasonal VE for influenza, both within the military and nationally.² Each year, however, this VE analysis is subject to variance in influenza severity (i.e., case volume) and testing frequency (i.e., number of controls).

'Power' is the probability a statistical test will correctly reject a false null hypothesis (e.g., vaccine has no effect). In general, power increases with a larger sample size and more controls matched to cases. A ratio of 1-to-4 (case[s]-to-controls) is generally considered the threshold ratio, when adding more controls provides little additional power, but higher ratios may be beneficial in large studies with small significance levels.⁴ Sample sizes necessary for adequate power to detect significant VE in highly vaccinated populations can be estimated: For example, the World Health Organization sample size calculator indicates that a VE evaluation employing a case-control test-negative study design with a 1:4 case-to-control ratio, predicted VE of 40%, confidence interval length of 10%, expected vaccine coverage of 90%, and power of 80% requires a sample size of over 5,700 cases and 22,900 controls.⁵

Table 1 summarizes AFHSD annual (when available) and mid-season influenza adjusted VE estimates from 2016 through 2025 for ACSMs with numbers of cases and controls, percentages vaccinated, and ratios of cases to controls.⁶⁻¹³ Seasonal comparisons demonstrate that years with increased sample sizes, higher case-to-control ratios, and lower vaccination coverage produced VE estimates consistent with the general population (2021-2022, 2022-2023 seasons),¹⁴ indicating that this case-control test-negative study design is often under-powered, due to the typically high vaccination coverage of the ACSM population as a result of the historical annual goal of greater than 90% immunization. When interpreting annual VE estimates in a highly immunized population, considering the statistical power and sample size required is important for contextualizing the results and detecting significant VE.

Author Affiliations

Department of Preventive Medicine and Biostatistics, Uniformed Services University of the Health Sciences, Bethesda, MD: Lt Col Sayers; Epidemiology and Analysis Branch, Armed Forces Health Surveillance Division, Public Health Directorate, Defense Health Agency, Silver Spring, MD: Dr. Eick-Cost

Disclaimers

The opinions and assertions expressed herein are those of the authors and do not reflect official policy nor position of the Uniformed Services University of the Health Sciences or the U.S. Department of War. This work was prepared by military and contract employees of the U.S. Government as part of official duties and therefore is in the public domain and does not possess copyright protection. Public domain information may be freely distributed and copied; as a courtesy, it is requested that the Uniformed Services University and authors are appropriately acknowledged.

The authors have no conflicts of interest to declare.

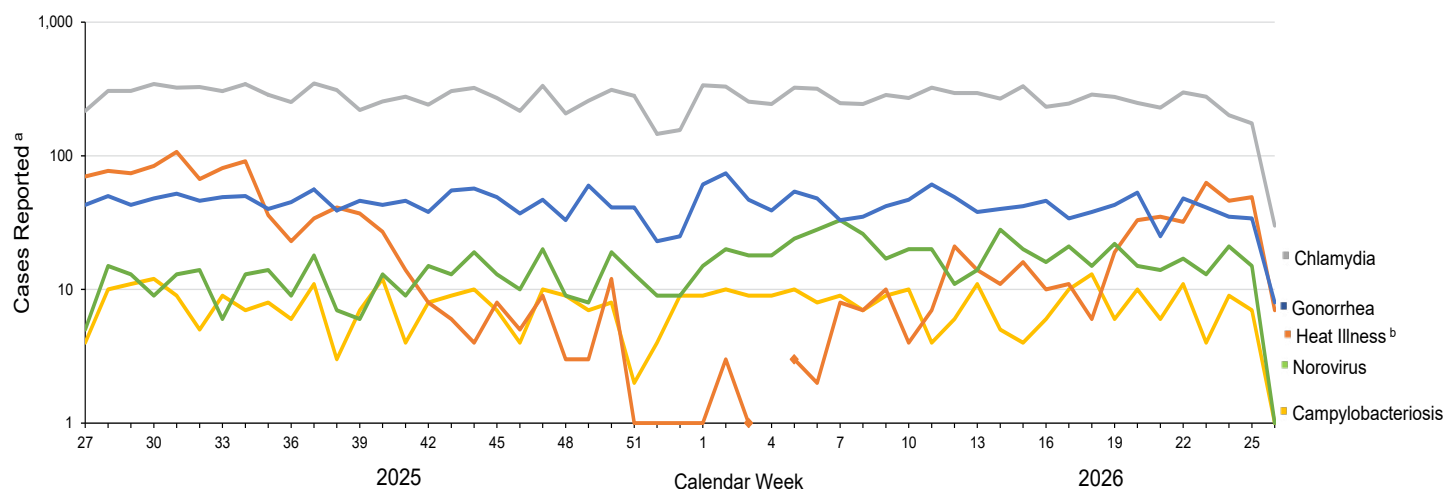
REFERENCES

1. Grabenstein JD, Pittman PR, Greenwood JT, Engler RJM. Immunization to protect the US Armed Forces: heritage, current practice, and prospects. *Epidemiol Rev.* 2006;28(1):3-26. doi:10.1093/epirev/mxj003
2. Sayers DR, Iskander JK. Influenza vaccine effectiveness and test-negative study design within the Department of Defense. *Mil Med.* 2023;188(11-12):289-291. doi:10.1093/milmed/usac436
3. Eick-Cost AA, Hu Z. Mid-season influenza vaccine effectiveness against laboratory-confirmed ambulatory influenza among U.S. active component service members, December 1, 2024–February 8, 2025. *MSMR.* 2025;32(3):20. Accessed May 18, 2026. <https://www.health.mil/news/articles/2025/03/01/msmr-flu-vaccine-effectiveness>
4. Iwagami M, Shinozaki T. Introduction to matching in case-control and cohort studies. *Ann Clin Epidemiol.* 2022;4(2):33-40. doi:10.37737/ace.22005
5. World Health Organization. Sample Size Calculator for Evaluation of COVID-19 Vaccine Effectiveness (Excel). Mar. 17, 2021. Accessed Feb. 3, 2026. https://www.who.int/publications/i/item/WHO-2019-nCoV-vaccine_effectiveness-measurement_tool-2021.1
6. Toure E, Eick-Cost AA, Hawksworth, W, et al. Mid-season influenza vaccine effectiveness estimates for the 2016-2017 influenza season. *MSMR.* 2017;24(8):17-19. Accessed Feb. 3, 2026. <https://www.health.mil/reference-center/reports/2017/01/01/medical-surveillance-monthly-report-volume-24-number-8>
7. Coleman R, Mancuso JD. Department of Defense end-of-season influenza vaccine effectiveness estimates for the 2017-2018 season. *MSMR.* 2018;25(10):16-20. Accessed Feb. 3, 2026. <https://www.health.mil/reference-center/reports/2018/01/01/medical-surveillance-monthly-report-volume-25-number-10>
8. Lynch LC, Coleman R, DeMarcus L, et al. Department of Defense midseason estimates of vaccine effectiveness for the 2018-2019 influenza season. *MSMR.* 2019;26(7):24-27. Accessed Feb. 3, 2026. <https://www.health.mil/reference-center/reports/2019/07/01/medical-surveillance-monthly-report-volume-26-number-7>
9. Thervil JW, Williams VF, Coleman R, et al. Department of Defense mid-season vaccine effectiveness estimates for the 2019-2020 influenza season. *MSMR.* 2021;28(6):16-19. Accessed Feb. 3, 2026. <https://www.health.mil/reference-center/reports/2021/06/01/medical-surveillance-monthly-report-volume-28-number-06>
10. U.S. Food and Drug Administration. Vaccines and Related Biological Products Advisory Committee March 3, 2022 Meeting Announcement. U.S. Dept. of Health and Human Services. Mar. 3, 2022. Accessed Feb. 3, 2026. <https://www.fda.gov/advisory-committees/advisory-committee-calendar/vaccines-and-related-biological-products-advisory-committee-march-3-2022-meeting-announcement>
11. U.S. Food and Drug Administration. Vaccines and Related Biological Products Advisory Committee Mar. 7, 2023 Meeting Announcement. U.S. Dept. of Health and Human Services. Feb. 23, 2023. Accessed Feb. 3, 2026. <https://www.fda.gov/advisory-committees/advisory-committee-calendar/vaccines-and-related-biological-products-advisory-committee-march-7-2023-meeting-announcement>
12. Eick-Cost AA, Hu Z. 2023-2024 mid-season influenza vaccine effectiveness against laboratory-confirmed ambulatory influenza: U.S. active component service members. *MSMR.* 2024;31(3):22. Accessed Feb. 3, 2026. <https://www.health.mil/reference-center/reports/2024/03/01/msmr-march-2024-volume-31-number-3>
13. Eick-Cost AA, Hu Z. Mid-season influenza vaccine effectiveness against laboratory-confirmed ambulatory influenza among U.S. active component service members, December 1, 2024–February 8, 2025. *MSMR.* 2025;32(3):20. Accessed Feb. 3, 2026. <https://www.health.mil/news/articles/2025/03/01/msmr-flu-vaccine-effectiveness>
14. Centers for Disease Control and Prevention. How Flu Vaccine Effectiveness and Efficacy Are Measured. U.S. Dept. of Health and Human Services. May 30, 2025. Accessed Feb. 3, 2026. <https://www.cdc.gov/flu-vaccines-work/php/effectiveness-studies/index.html>

Reportable Medical Events at Military Health System Facilities, Second Quarter, 2026

Matthew W.R. Allman, MPH; Anthony R. Marquez, MPH; Katherine S. Kotas, MPH; Kiara Scatliffe-Carrion, MPH

FIGURE 1. Leading Five Reportable Medical Events by Calendar Week, Active Component, U.S. Armed Forces, June 29, 2025–June 30, 2026



Abbreviation: RMEs, reportable medical events.

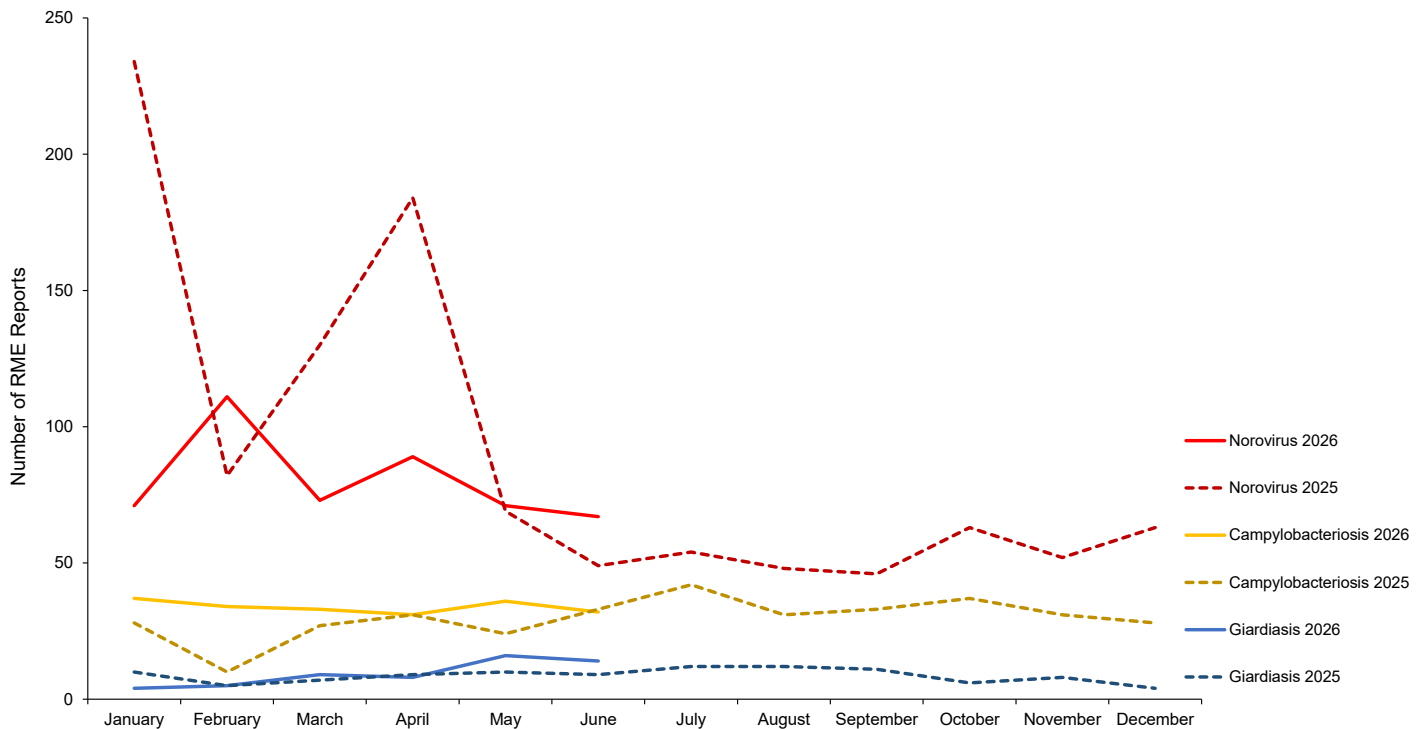
^aCases shown on a logarithmic scale.

^bThere were 0 reported heat illness cases during week 4 of 2026.

Reportable Medical Events (RMEs) are documented in the Disease Reporting System internet (DRSi) by health care providers and public health officials throughout the Military Health System (MHS) for monitoring, controlling, and preventing the occurrence and spread of diseases of public health interest or readiness importance. These reports are reviewed by a team of validators from Defense Centers for Public Health (DCPH). The DRSi collects reports on over 70 different RMEs, including infectious and non-infectious conditions, outbreak reports, sexually transmitted infection (STI) risk surveys, and tuberculosis contact investigation reports. A complete list of RMEs is available in the 2022 *Armed Forces Reportable Medical Events Guidelines and Case Definitions*.¹ Data reported in these tables are considered provisional and do not represent conclusive evidence until case reports are fully validated.

Total cases among active component service members (ACSMs) reported per week are displayed in the graph for the 5 RMEs for the prior year, or preceding 52 weeks. Each quarter, the graph is updated and presented with the quarter's (Q2, 2026) 5 most frequently reported RMEs, which may differ from previous quarters.

FIGURE 2. Selected Reportable Medical Events by Month, Active Component, U.S. Armed Forces, January 1, 2025–June 30, 2026



Abbreviation: RME, reportable medical events.

The DRSi requires the reporting of numerous gastrointestinal (GI) illnesses.¹ In Q2 2026, the most frequently reported GI illnesses among U.S. ACSMs were norovirus, campylobacteriosis, and giardiasis. This is a change from the previous quarter, which involved a large cryptosporidiosis outbreak.

The number of reports for norovirus in DRSi were lower during April and May of 2026 than in their respective months in 2025, while the number of norovirus reports in June 2026 was slightly higher than June 2025. One norovirus outbreak report was submitted in June 2026 that included ACSMs. Additionally, campylobacteriosis and giardiasis reports in DRSi during Q2 2026 remained similar to the numbers of reports in the months of Q2 2025. One outbreak of campylobacteriosis was reported in May 2026 that affected ACSMs.

DCPH-A developed the Communicable Disease Toolkit to provide guidance for reporting RME cases and outbreaks to DRSi.² Tools like investigation worksheets and case definition flowcharts are available in the Communicable Disease Toolkit for all RMEs, including reportable GI illnesses.

For questions about this report, please contact the Disease Epidemiology Branch at DCPH–Aberdeen. Email: dha.apg.pub-health-a.mbx.disease-epidemiologyprogram13@health.mil

References

1. Armed Forces Health Surveillance Division. Armed Forces Reportable Medical Events. Accessed Aug. 26, 2026. <https://health.mil/reference-center/publications/2022/11/01/armed-forces-reportable-medical-events-guidelines>
2. Defense Health Agency–Public Health. Communicable Disease Toolkit. Accessed Aug. 26, 2026. <https://ph.health.mil/topics/healthsurv/de/Pages/cdt.aspx>

TABLE. Reportable Medical Events, Military Health System Facilities, Second Quarter, 2026^a

Reportable Medical Event ^b	Active Component ^c				MHS Beneficiaries ^d	
	Q2 2026 ^e	YTD 2026 ^e	Q2 2025 ^e	YTD 2025 ^e	Total 2025	Q2 2026
	No.	No.	No.	No.	No.	No.
Amebiasis	7	12	5	12	15	1
Arboviral diseases, neuroinvasive, non-neuroinvasive	1	1	1	1	4	0
Babesiosis	0	0	0	0	1	0
Botulism	0	0	0	0	0	2
COVID-19-associated hospitalization, death	4	6	5	20	33	9
Campylobacteriosis	99	203	88	153	355	71
<i>Chlamydia trachomatis</i> infection	3,301	6,866	3,824	7,460	14,880	369
Cholera toxin-producing <i>Vibrio cholerae</i> O1, O139	0	0	0	0	0	1
Coccidioidomycosis	6	10	6	11	24	9
Cold weather injury ^f	18	309	49	280	446	N/A
Cryptosporidiosis ^g	12	680	20	37	75	6
Cyclosporiasis	3	3	6	7	22	2
Dengue virus infection	1	3	3	6	9	1
<i>E. coli</i> , Shiga toxin-producing	24	34	22	28	58	13
Ehrlichiosis, anaplasmosis	1	1	1	1	1	2
Filarial infection	0	0	0	0	0	1
Giardiasis	38	56	28	50	103	7
Gonorrhea	512	1,115	584	1,138	2,340	41
<i>H. influenzae</i> , invasive	2	2	1	2	2	0
Hantavirus disease	1	1	0	0	0	0
Heat illness ^f	348	419	470	506	1,413	N/A
Hepatitis A	0	0	1	1	2	0
Hepatitis B, acute, chronic	11	24	25	44	83	11
Hepatitis C, acute, chronic	11	15	7	14	28	7
Influenza-associated hospitalization ^h	7	30	9	48	68	7
Lead poisoning, pediatric ⁱ	N/A	N/A	N/A	N/A	N/A	10
Legionellosis	0	1	1	1	2	1
Leishmaniasis	0	1	0	0	1	0
Leptospirosis	0	1	0	0	0	0
Listeriosis	0	0	0	1	1	0
Lyme disease	9	18	29	35	74	22
Malaria	4	12	5	6	29	0
Meningococcal disease	0	0	1	1	2	1
Mpox	0	1	1	3	11	1
Mumps	0	0	0	1	1	0
Norovirus infection	227	482	302	748	1,074	200
Pertussis	3	10	13	27	42	9
Q fever	1	1	1	1	2	0
Rabies post-exposure prophylaxis (PEP)	160	288	169	297	649	146
Salmonellosis	30	50	51	71	164	42
Shigellosis	8	17	9	15	25	0
Spotted fever rickettsiosis	2	5	10	13	33	3
Syphilis	79	190	130	242	466	17
Toxic shock syndrome	0	0	0	0	1	0
Trypanosomiasis	1	1	1	1	2	0
Tuberculosis	2	2	1	1	8	1
Tularemia	0	0	0	0	2	0
Typhus fever	0	0	1	1	10	0
Varicella	3	3	2	2	15	13
Zika virus infection	1	1	0	0	0	0
Total case counts	4,937	10,874	5,882	11,286	22,576	1,026

Abbreviations: MHS, Military Health System; Q2, second quarter; YTD, year-to-date; No., number; N/A, not applicable; *E. Escherichia*; *H. Haemophilus*; PEP, post-exposure prophylaxis; DRISi, Disease Reporting System internet; Q1, first quarter.

^aRMEs submitted to DRISi as of Aug. 19, 2026. RMEs were classified by date of diagnosis or, where unavailable, date of onset. Q2 comparisons displayed for the period Apr. 1, 2026–Jun. 30, 2026 (current year) and Apr. 1, 2025–Jun. 30, 2025 (previous year). YTD comparisons are displayed for the period Jan. 1, 2026–Jun. 30, 2026 (current year) and Jan. 1, 2025–Jun. 30, 2025. Total 2025 count comprises the period Jan. 1, 2025–Dec. 31, 2025. All displayed counts are for MHS facilities and include cases classified as confirmed or probable (suspect classified cases excluded from this analysis).

^bRME categories with 0 reported cases among active component service members and MHS beneficiaries for the periods included are not detailed in this report.

^cServices included in this report: Army, Navy, Air Force, Marine Corps, Coast Guard, and Space Force, including personnel classified as active duty, cadet, midshipman, or recruit in DRISi.

^dBeneficiaries comprise individuals classified as retired and family members (including spouse, child, 'other', unknown). National Guard, reservists, civilians, contractors, and foreign nationals are excluded from these counts.

^eQ1 and YTD counts will be the same for the first quarterly report of each year; otherwise, quarter and YTD counts will vary.

^fOnly reportable for service members.

^gLarge number of cryptosporidiosis cases reported in 2026 due to outbreak in Jan-Feb 2026 in Republic of Korea.

^hInfluenza-associated hospitalization is reportable only for individuals younger than age 65 years.

ⁱPediatric lead poisoning is reportable only for children ages 6 years or younger.

The **Medical Surveillance Monthly Report (MSMR)**, in continuous publication since 1995, is produced by the Armed Forces Health Surveillance Division (AFHSD) of the Defense Health Agency (DHA) Public Health Directorate. AFHSD is a designated public health authority within the Defense Health Agency. *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 *MSMR* are based on summaries of medical administrative data routinely provided to AFHSD and integrated within the Defense Medical Surveillance System for health surveillance purposes.

- *Archive*: Past issues of *MSMR* are available as downloadable PDF files at www.health.mil/MSMRArchives.
- *Online Subscriptions*: Submit subscription requests at www.health.mil/MSMRSubscribe.
- *Editorial Inquiries*: Call (301) 319-3240 or email dha.ncr.health-surv.mbx.msmr@health.mil.
- *Instructions for Authors*: Information about article submissions is provided at www.health.mil/MSMRInstructions.

All material in *MSMR* is in the public domain and may be used and reprinted without permission. Citation formats are available at www.health.mil/MSMR.

Opinions and assertions expressed in *MSMR* should not be construed as reflecting official views, policies, nor positions of the Department of War or the United States Government. The use of the name of any specific manufacturer, commercial product, commodity, or service in this publication does not imply endorsement by the Armed Forces Health Surveillance Division, the Defense Health Agency, nor the Department of War.

Editor-in-Chief

Robert Johnson, MD, MPH, MBA, FACPM, FAsMA

Contributing Editor

Kristen R. Rossi, MPH

Senior Technical Writer and Editor

HyounKyoung Grace Park, PhD, MPH, BSN

Writer and Editor

Carol H. Bennett

Managing and Production Editor

Robert Pursley, MA

Consulting Editor

Angelia A. Eick-Cost, PhD

Editor Emeritus

John F. Brundage, MD, MPH
Mark V. Rubertone, MD, MPH

Layout and Design

Darrell Olson

Director, Defense Health Agency Public Health

RDML Sara B. Newman, DrPH, MCP (USPHS)

Chief, Armed Forces Health Surveillance Division

CAPT Richard S. Langton, MD, MPH (USN)

Editorial Oversight

Col Cecilia K. Sessions, MD, MPH (USAF)
CAPT Carlos D. Williams, MD, MPH, MBA (USN)

Follow us:

 Facebook: <https://www.facebook.com/AFHSDPAGE>

 X: <https://x.com/AFHSDPAGE>

ISSN 2158-0111 (print)

ISSN 2152-8217 (online)

Medical Surveillance Monthly Report (MSMR)

Defense Health Agency—Public Health
Armed Forces Health Surveillance Division
11800 Tech Road, Suite 220
Silver Spring, MD 20904

