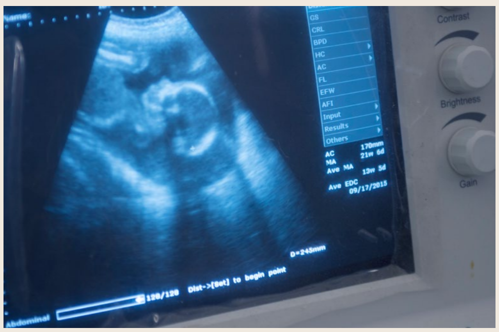
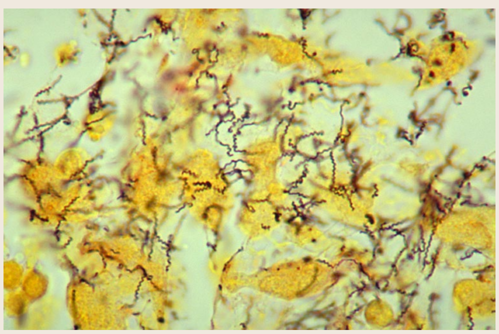
# MSMR

Medical Surveillance Monthly Report December 2024 | Vol. 31 | No. 12





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*A Publication of the Armed Forces Health Surveillance Division*

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# *Update*

## Diagnoses of Mental Health Disorders Among Active Component U.S. Armed Forces, 2019–2023

Mental health disorders have historically accounted for significant morbidity, health care provision, disability, and attrition from military service. From 2019 through 2023, a total of 541,672 active component service members of the U.S. Armed Forces were diagnosed with at least 1 mental health disorder. Crude annual incidence rates of at least 1 mental health disorder decreased from 2019 to 2020, but then increased continually from 2021 until 2023. Most incident mental health disorder diagnoses during the study period were attributable to adjustment disorders, anxiety disorders, depressive disorders, 'other' mental health disorders, and alcohol-related disorders. Efforts to assist and treat service members should continue to promote help-seeking behavior to improve their psychological and emotional well-being and reduce the burden of mental health disorders, especially as rates have been increasing since the COVID-19 pandemic.

**What are the new findings?**

Annual incidence rates for service members diagnosed with at least 1 mental health disorder increased from 2021 through 2023, coincident with the COVID-19 pandemic. Incidence rates for anxiety disorder and post-traumatic stress disorder increased substantially from 2019 to 2023, nearly doubling during that period.

**What is the impact on readiness and force health protection?**

As service members continue to experience increased rates of mental health disorders after the COVID-19 pandemic, help-seeking behaviors to address psychological as well as emotional well-being should be prioritized to maintain force readiness.

In 2023, mental health disorders accounted for the largest total number of hospital bed days and the second highest total number of medical encounters for members of the active component of the U.S. Armed Forces.[1] The most recent *MSMR* update on mental health disorders, from 2016 through 2020, found relatively stable incidence rates for all conditions evaluated, with the exception of adjustment disorders and depressive disorders.[2] In preceding periods, incident diagnoses of mental health disorders among active component service members (ACSMs) increased, by 65% from 2000 to 2011, largely attributable to diagnoses for adjustment disorders, depression, anxiety, and post-traumatic stress disorder (PTSD).[3] In general, crude incidence rates of mental health disorders have been observed to be highest among service members in the Army, females, and in younger age groups.[2-4]

This report summarizes the numbers, types, and rates of incident mental health disorder diagnoses among U.S. ACSMs over a 5-year surveillance period, from 2019 through 2023. This update separates 3 additional mental health disorders (acute stress disorder, eating disorders, and factitious disorders) that were previously combined in the 'other mental health disorders' category in prior *MSMR* articles. Additionally, data on the 'mental health problems' categories, which has been renamed 'non-medical factors influencing health', are no longer provided in this report, but will be reported in a separate *MSMR* article.[5]

## Methods

The surveillance period for this report ranged from January 1, 2019 through December 31, 2023. The surveillance population included all individuals who served in the active components of the U.S. Army, Navy, Air Force, Marine Corps, Coast Guard, and Space Force at any time during the surveillance period. Due to Space Force personnel data only available since 2023, Space Force members were combined with Air Force personnel for this analysis.

All data used to determine mental health diagnoses were derived from records routinely maintained in the Defense Medical Surveillance System (DMSS). These records document both ambulatory encounters and hospitalizations of active component members of the U.S. Armed Forces in fixed military and civilian (if reimbursed through the Military Health System [MHS]) hospitals and clinics. Diagnoses were also derived from records of medical encounters of deployed service members documented in the Theater Medical Data Store (TMDS) in DMSS.

For surveillance purposes, mental health disorders were ascertained from records of medical encounters that included mental health disorder-specific diagnoses (ICD-9: 290 – 319; ICD-10: F01 – F99) **(Table 1)** in the first or second diagnostic

**TABLE 1.** Mental Health Categories and ICD-9/ICD-10 Diagnostic Codes

| Diagnostic Category | ICD–9 Codes | ICD–10 Codes |
|---|---|---|
| Mental health disorders | | |
| Acute stress disorders | 308.* | F43.0 |
| Adjustment disorders | 309.** (excluding 309.81) | F43.2, F43.2*, F43.8, F43.9, F93.0, F94.8, F94.9 |
| Alcohol-related disorders | 291.0, 291.81, 303.9, 303.9*, 303.00, 303.0*, 305.00, 305.0* | F10.1*, F10.2* |
| Substance-related disorders | 304.*, 305.2*–305.9* | F11.2*, F12.2*, F13.2*, F14.2*, F15.2*, F16.2*, F18.2*, F19.2*, F11.1*, F12.1* F13.1*, F14.1*, F15.1*, F16.1*, F18.1*, F19.1* |
| Anxiety disorders | 300.0*, 300.2*, 300.3 | F40.*, F41.*, F42.* |
| PTSD | 309.81 | F43.1, F43.10–F43.12 |
| Depressive disorders | 296.2*, 296.3*, 296.82, 296.9*, 300.4, 311 | F32.*, F33.*, F34, F34.1, F34.8, F34.9, F39, F348.1, F34.89 |
| Eating disorders | 307.1, 307.51, 307.59, 307.50 | F500.*, F502, F508.*, F509 |
| Factitious disorders | 301.51, 300.16, 300.19 | F681.* |
| Bipolar disorder | 296.0*, 296.1*, 296.4*, 296.5*, 296.6*, 296.7, 296.8* (except 296.82), 301.13 | F30.*, F31.*, F34.0 |
| Personality disorders | 301.** (excluding 301.13, 301.50, 301.52) | F21, F60.* |
| Schizophrenia | 295** | F20*, F25* |
| Other psychoses | 293.81, 293.82, 297.0*, 298.0* | F06.0, F06.2, F22–F24, F28, F29 |
| Other mental health disorders | Any other code between 290–319 (excluding 299.*, 305.1, 310.2, 315.*, 317.*–319.*) | Any other code between F01–F99 (excluding F07.81, F70–F79, F17.*, F80.*–F82.*, F84.*, F88–F89) |

Abbreviations: ICD-9/ICD-10, International Classification of Diseases, 9th and 10th revisions; PTSD, post-traumatic stress disorder.
* Asterisk indicates that any subsequent digit or character is included.

position. Although the MHS transitioned to ICD-10 coding on October 1, 2015, ICD-9 codes were included in this analysis because some TMDS encounters still contain ICD-9 diagnoses, and the ICD-9 diagnoses were needed to identify and exclude prevalent cases documented in records preceding October 1, 2015. Diagnoses of pervasive developmental disorder (ICD-9: 299.*; ICD-10: F84.*), specific delays in development (ICD-9: 315.*; ICD-10: F80.*–F82.*, F88–F89), mental retardation (ICD-9: 317.*–319.*; ICD-10: F70–F79), tobacco use disorder and nicotine dependence (ICD-9: 305.1; ICD-10: F17.*), and post-concussion syndrome (ICD-9: 310.2; ICD-10: F07.81) were excluded from the analysis.

Each incident diagnosis of a mental health disorder was defined using the corresponding Armed Forces Health Surveillance Case Definition.[5] For most mental health disorders, a case was defined by a hospitalization with an indicator diagnosis in the first or second diagnostic position; or 2 outpatient or TMDS visits within 180 days documented with indicator diagnoses (from the same mental health disorder category) in the first or second diagnostic position; or a single outpatient visit in a psychiatric or mental health care specialty setting (defined by Medical Expense and Performance Reporting System [MEPRS] code beginning with 'BF') with an indicator diagnosis in the first or second diagnostic position.

The surveillance case definitions for schizophrenia, acute stress disorder, and eating disorders included some exceptions to the case parameters described. The case definition for schizophrenia required either a single hospitalization with a diagnosis of schizophrenia in the first or second diagnostic position, or 4 outpatient or TMDS encounters with a diagnosis of schizophrenia in the first or second diagnostic position. Schizophrenia cases who remained in the military for more than 2 years after becoming an incident case were excluded, as those cases were assumed to have been misdiagnosed. The case definition for the acute stress disorders required 1 encounter with an indicator diagnosis in any diagnostic position, due to its transient diagnosis. Eating disorder cases required 1 inpatient encounter with an indicator diagnosis in the first or second diagnostic position, or a single outpatient or TMDS encounter with an indicator diagnosis in the primary diagnostic position.

Service members who were diagnosed with 1 or more mental health disorders before the surveillance period (i.e., prevalent cases) were not considered at risk of incident diagnoses of the same conditions during the surveillance period. Service members who were diagnosed with more than 1 mental health disorder during the surveillance period were considered incident cases in each category in which they fulfilled case-defining criteria. Service members could be incident cases only once in each specific mental health disorder category.

## Results

During the 5-year surveillance period, 541,672 ACSMs were diagnosed with at least 1 mental health disorder; of those individuals, 255,108 (47.1%) were diagnosed with mental health disorders in more than 1 diagnostic category **(Table 2)**. Overall, 966,227 incident diagnoses of mental health disorders were recorded in all diagnostic categories. Annual numbers and rates of incident diagnoses of at least 1 mental health disorder decreased from 8,795 cases per 100,000 person-years (p-yrs) in 2019 to 8,391 cases per 100,000 p-yrs in 2020, and then increased from 2021 to 2023, with a peak incidence rate of 11,706 cases per 100,000 p-yrs in 2023 **(Table 2)**.

Over the entire period, 94.8% of all incident mental health disorder diagnoses were attributable to adjustment disorders (n=282,960, 29.3%), anxiety disorders (n=187,949, 19.5%), depressive disorders (n=168,519, 17.4%), 'other' mental health disorders (n=119,536, 12.4%); PTSD (n=86,216, 8.9%), and alcohol-related disorders (n=70,729, 7.3%) **(Table 2)**. In comparison, relatively few incident diagnoses were attributable to substance-related disorders (n=15,901, 1.6%), personality disorders (n=15,833, 1.6%), bipolar disorder (n=8,454, 0.9%), other psychoses (n=3,917, 0.4%), eating disorders (n=3,380, 0.3%), schizophrenia (n=1,506, 0.2%), acute stress disorders (n=1,220, 0.1%), and factitious disorders (n=107, 0.01%).

It was common for individuals with any mental health disorder to also experience an adjustment disorder diagnosis during the surveillance period. This co-occurrence ranged from 37.1% of substance-related disorder cases to 61.8% of personality disorder cases **(Table 3)**. Depressive disorders were also commonly diagnosed with all other mental health disorders, ranging from 26.9% of those with a substance-related disorder to 60.1% of those with a bipolar disorder. Incident cases of anxiety disorders were also frequently diagnosed among cases of bipolar disorder (46.1%), factitious disorders (43.9%), eating disorders (43.6%), depressive disorders (43.2%), personality disorders (40.2%), PTSD (40.1%), and schizophrenia (36.5%).

Crude annual rates of incident diagnoses of adjustment disorders, alcohol-related disorders, substance-related disorders, personality disorders, schizophrenia, other psychoses, acute stress disorders, eating disorders, and other mental health disorders followed a general pattern of decreasing or stabilizing from 2019 to 2020, increasing in 2021 and 2022, and then decreasing or stabilizing in 2023 **(Table 2)**. Over the 5-year surveillance period, the largest increase in annual incidence of mental health disorders was observed for anxiety disorders

**TABLE 2.** Incident Diagnoses and Rates of Mental Health Disorders, Active Component, U.S. Armed Forces, 2019–2023

| | Total, 2019-2023 | | 2019 | | 2020 | | 2021 | | 2022 | | 2023 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category[a] | No. | Rate[b] | No. | Rate[b] | No. | Rate[b] | No. | Rate[b] | No. | Rate[b] | No. | Rate[b] |
| Diagnoses | | | | | | | | | | | | |
| Adjustment disorders | 282,960 | 4,915 | 52,798 | 4,485 | 50,213 | 4,259 | 61,437 | 5,224 | 62,286 | 5,518 | 56,226 | 5,128 |
| Alcohol-related disorders | 70,729 | 1,105 | 14,800 | 1,150 | 13,182 | 1,016 | 14,285 | 1,095 | 14,869 | 1,173 | 13,593 | 1,096 |
| Substance-related disorders | 15,901 | 240 | 3,170 | 238 | 2,955 | 220 | 3,369 | 249 | 3,485 | 265 | 2,922 | 227 |
| Anxiety disorders | 187,949 | 3,071 | 27,672 | 2,218 | 28,055 | 2,239 | 37,845 | 3,022 | 45,437 | 3,774 | 48,940 | 4,210 |
| PTSD | 86,216 | 1,334 | 12,584 | 964 | 13,016 | 990 | 17,383 | 1,318 | 20,847 | 1,631 | 22,386 | 1,797 |
| Depressive disorders | 168,519 | 2,726 | 28,481 | 2,271 | 26,745 | 2,121 | 34,554 | 2,735 | 39,156 | 3,211 | 39,583 | 3,341 |
| Bipolar disorder | 8,454 | 127 | 1,366 | 102 | 1,486 | 110 | 1,834 | 136 | 1,959 | 149 | 1,809 | 140 |
| Personality disorders | 15,833 | 239 | 2,998 | 225 | 2,765 | 206 | 3,303 | 245 | 3,584 | 273 | 3,183 | 248 |
| Schizophrenia | 1,506 | 23 | 288 | 22 | 261 | 19 | 311 | 23 | 327 | 25 | 319 | 25 |
| Other psychoses | 3,917 | 59 | 759 | 57 | 732 | 54 | 844 | 62 | 816 | 62 | 766 | 59 |
| Acute stress disorders | 1,220 | 18 | 236 | 18 | 199 | 15 | 263 | 19 | 290 | 22 | 232 | 18 |
| Eating disorders | 3,380 | 51 | 509 | 38 | 497 | 37 | 709 | 52 | 882 | 67 | 783 | 61 |
| Factitious disorders | 107 | 2 | 32 | 2 | 17 | 1 | 16 | 1 | 24 | 2 | 18 | 1 |
| Other mental health disorders | 119,536 | 1,930 | 22,413 | 1,794 | 20,071 | 1,594 | 24,438 | 1,932 | 26,740 | 2,182 | 25,874 | 2,167 |
| Total | 966,227 | | 168,106 | | 160,194 | | 200,591 | | 220,702 | | 216,634 | |
| Individuals | | | | | | | | | | | | |
| >1 type of mental health diagnosis[c] | 255,108 | 3,834 | 35,648 | 2,665 | 33,625 | 2,494 | 43,663 | 3,219 | 48,858 | 3,702 | 47,934 | 3,710 |
| Any mental health diagnosis[d] | 541,672 | 8,141 | 117,654 | 8,795 | 113,116 | 8,391 | 139,611 | 10,292 | 152,817 | 11,580 | 151,228 | 11,706 |

Abbreviations: No., number; PTSD, post-traumatic stress disorder.
[a]An individual may be a case within a category only once per lifetime (censored person-time).
[b]Rate per 100,000 person-years.
[c]Rate per 100,000 person-years (individual continually at risk, uncensored person-time).
[d]Defined as a unique occurrence of any mental health diagnosis.

**TABLE 3.** Comorbid Incident Mental Health Disorder Diagnoses,[a] Active Component, U.S. Armed Forces, 2019–2023

| | Adjustment Disorders | | Alcohol-related Disorder | | Substance-related Disorder | | Anxiety | | PTSD | | Depression | | Bipolar Disorder | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % |
| Adjustment disorders | 282,960 | - | 27,472 | 38.8 | 5,904 | 37.1 | 81,779 | 43.5 | 39,929 | 46.3 | 84,920 | 50.4 | 3,933 | 46.5 |
| Alcohol-related disorder | 27,472 | 9.7 | 70,729 | - | 7,533 | 47.4 | 16,888 | 9.0 | 9,380 | 10.9 | 21,739 | 12.9 | 1,518 | 18.0 |
| Substance-related disorder | 5,904 | 2.1 | 7,533 | 10.7 | 15,901 | - | 3,225 | 1.7 | 1,530 | 1.8 | 4,269 | 2.5 | 555 | 6.6 |
| Anxiety disorders | 81,779 | 28.9 | 16,888 | 23.9 | 3,225 | 20.3 | 187,949 | - | 34,607 | 40.1 | 72,801 | 43.2 | 3,901 | 46.1 |
| PTSD | 39,929 | 14.1 | 9,380 | 13.3 | 1,530 | 9.6 | 34,607 | 18.4 | 86,216 | - | 34,623 | 20.6 | 2,464 | 29.2 |
| Depressive disorders | 84,920 | 30.0 | 21,739 | 30.7 | 4,269 | 26.9 | 72,801 | 38.7 | 34,623 | 40.2 | 168,519 | - | 5,079 | 60.1 |
| Bipolar disorder | 3,933 | 1.4 | 1,518 | 2.2 | 555 | 3.5 | 3,901 | 2.1 | 2,464 | 2.9 | 5,079 | 3.0 | 8,454 | - |
| Personality disorders | 9,786 | 3.5 | 3,221 | 4.6 | 782 | 4.9 | 6,369 | 3.4 | 3,715 | 4.3 | 8,713 | 5.2 | 1,272 | 15.1 |
| Schizophrenia | 640 | 0.2 | 268 | 0.4 | 160 | 1.0 | 549 | 0.3 | 245 | 0.3 | 799 | 0.5 | 306 | 3.6 |
| Other psychoses | 1,892 | 0.7 | 736 | 1.0 | 474 | 3.0 | 1,363 | 0.7 | 681 | 0.8 | 1,965 | 1.2 | 759 | 9.0 |
| Acute stress disorders | 507 | 0.2 | 105 | 0.2 | 27 | 0.2 | 416 | 0.2 | 285 | 0.3 | 384 | 0.2 | 39 | 0.5 |
| Eating disorders | 1,569 | 0.6 | 426 | 0.6 | 62 | 0.4 | 1,475 | 0.8 | 886 | 1.0 | 1,624 | 1.0 | 163 | 1.9 |
| Factitious disorders | 56 | 0.0 | 10 | 0.0 | 2 | 0.0 | 47 | 0.0 | 18 | 0.0 | 48 | 0.0 | 7 | 0.1 |
| Total | 282,960 | | 70,729 | | 15,901 | | 187,949 | | 86,216 | | 168,519 | | 8,454 | |

| | Personality Disorders | | Schizophrenia | | Other Psychoses | | Acute Stress Disorder | | Eating Disorders | | Factitious Disorder | | Other | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % |
| Adjustment disorders | 9,786 | 61.8 | 640 | 42.5 | 1,892 | 48.3 | 507 | 41.6 | 1,569 | 46.4 | 56 | 52.3 | 43,941 | 36.8 |
| Alcohol-related disorder | 3,221 | 20.3 | 268 | 17.8 | 736 | 18.8 | 105 | 8.6 | 426 | 12.6 | 10 | 9.4 | 17,256 | 14.4 |
| Substance-related disorder | 782 | 4.9 | 160 | 10.6 | 474 | 12.1 | 27 | 2.2 | 62 | 1.8 | 2 | 1.9 | 5,878 | 4.9 |
| Anxiety disorders | 6,369 | 40.2 | 549 | 36.5 | 1,363 | 34.8 | 416 | 34.1 | 1,475 | 43.6 | 47 | 43.9 | 32,815 | 27.5 |
| PTSD | 3,715 | 23.5 | 245 | 16.3 | 681 | 17.4 | 285 | 23.4 | 886 | 26.2 | 18 | 16.8 | 16,900 | 14.1 |
| Depressive disorders | 8,713 | 55.0 | 799 | 53.1 | 1,965 | 50.2 | 384 | 31.5 | 1,624 | 48.1 | 48 | 44.9 | 30,633 | 25.6 |
| Bipolar disorder | 1,272 | 8.0 | 306 | 20.3 | 759 | 19.4 | 39 | 3.2 | 163 | 4.8 | 7 | 6.5 | 1,968 | 1.7 |
| Personality disorders | 15,833 | - | 217 | 14.4 | 612 | 15.6 | 48 | 3.9 | 357 | 10.6 | 23 | 21.5 | 3,991 | 3.3 |
| Schizophrenia | 217 | 1.4 | 1,506 | - | 981 | 25.0 | 7 | 0.6 | 17 | 0.5 | 3 | 2.8 | 411 | 0.3 |
| Other psychoses | 612 | 3.9 | 981 | 65.1 | 3,917 | - | 18 | 1.5 | 32 | 1.0 | 13 | 12.2 | 1,170 | 1.0 |
| Acute stress disorders | 48 | 0.3 | 7 | 0.5 | 18 | 0.5 | 1,220 | - | 9 | 0.3 | 0 | 0.0 | 342 | 0.3 |
| Eating disorders | 357 | 2.3 | 17 | 1.1 | 32 | 0.8 | 9 | 0.7 | 3,380 | - | 1 | 0.9 | 1,198 | 1.0 |
| Factitious disorders | 23 | 0.2 | 3 | 0.2 | 13 | 0.3 | 0 | 0.0 | 1 | 0.0 | 107 | - | 41 | 0.0 |
| Total | 15,833 | | 1,506 | | 3,917 | | 1,220 | | 3,380 | | 107 | | 119,536 | |

Abbreviations: No., number; PTSD, post-traumatic stress disorder.
[a] Mental health disorder diagnoses at any time during the surveillance period.

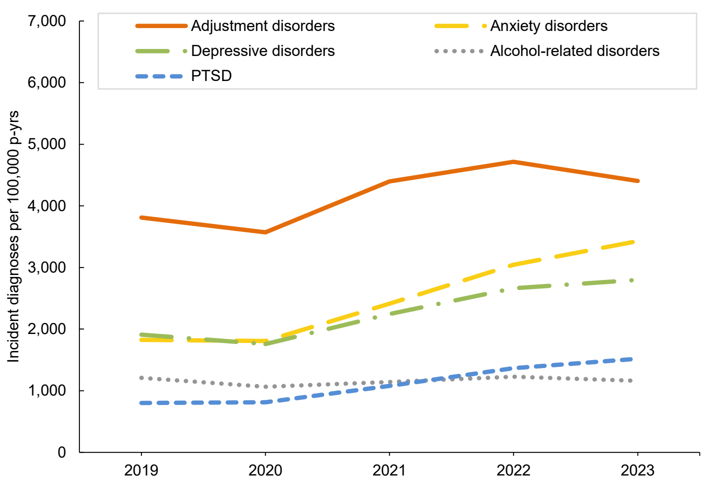
(89.8%) and PTSD (86.4%). Rates of bipolar disorders increased from 2019 to 2022 and then decreased slightly in 2023.

In general, overall rates of most incident mental health disorder diagnoses were higher among female service members, with exceptions for schizophrenia, for which rates were similar for both sexes, and alcohol- and substance-related disorders, for which rates were higher among male service members (**Figures 1a–2b**). Rates of most mental health disorder diagnoses declined with increasing age, from the 20-24-year age group and older (**Figure 3**). Adjustment disorder was the only condition for which the crude overall incidence rate was higher among the youngest (less than 20 years old) service members, compared to all other age groups. Rates of alcohol- and substance-related disorders, bipolar disorders, personality disorders, schizophrenia, and eating disorders were highest among service members aged 20-24 years (**Figure 3**). In contrast, the rates of PTSD increased with age, 'other' mental health disorders decreased with age, while crude incidence rates of anxiety disorders and depressive disorders fluctuated throughout the age groups.

Overall incidence rates of mental health disorders were highest in the Army, although the Navy accounted for the highest rates of depressive disorders, bipolar disorder, and personality disorders, while the Coast Guard accounted for the highest rates of acute stress disorders (**Figure 4**). Crude overall incidence rates of most mental health disorders were highest among ACSMs in health care occupations, although crude incidence rates of alcohol-related disorders, substance-related disorders, and factitious disorders were highest among those in combat-related occupations **(Figure 5)**. Service members in the motor transport occupations evinced the highest crude incidence rates of other psychoses and schizophrenia.

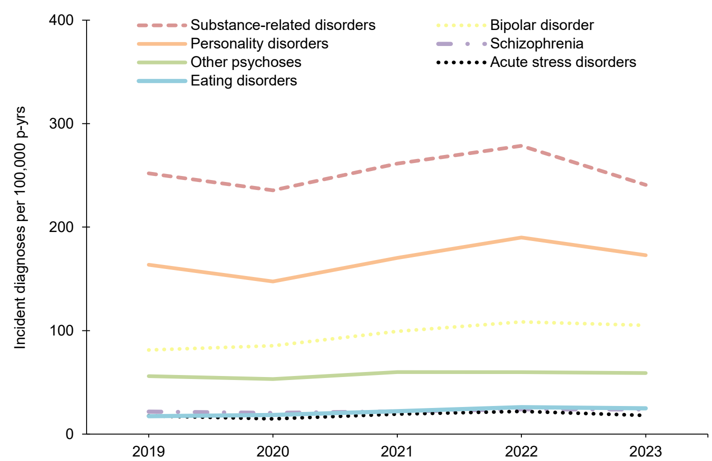
Rates of mental health disorder diagnoses increased by time in service until 36 months for most disorders, with rates of anxiety disorders and PTSD increasing after 36 months of service **(Figure 6)**. Rates of adjustment disorders, schizophrenia, other psychoses, and acute stress disorders were highest during the first 6 months of military service, however. Finally, overall rates of incident anxiety disorders, PTSD, acute stress disorders, and 'other' mental health disorders were higher among service members who had ever deployed to a U.S. Central Command (CENTCOM) area of responsibility (AOR) (data not shown).

**FIGURE 1a.** Annual Incidence Rates, Leading 5 Mental Health Disorder Diagnoses Among Male Active Component Service Members, U.S. Armed Forces, 2019–2023



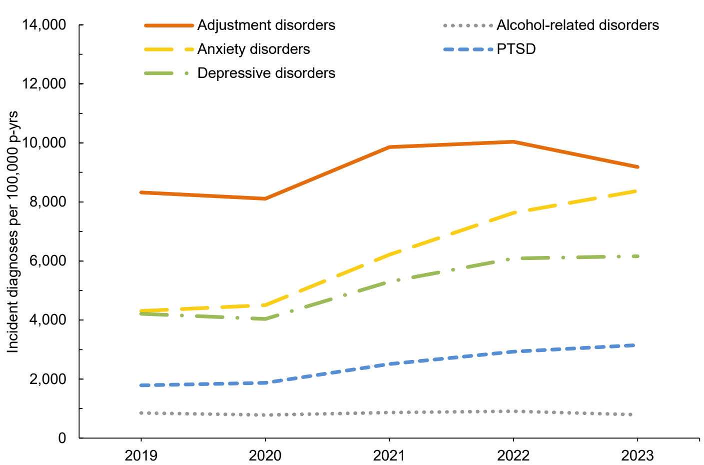

Abbreviations: PTSD, post-traumatic stress disorder; p-yrs, person-years.

**FIGURE 1b.** Annual Incidence Rates[a], Mental Health Diagnoses Following the Leading 5 Disorders, Male Active Component Service Members, U.S. Armed Forces, 2019–2023



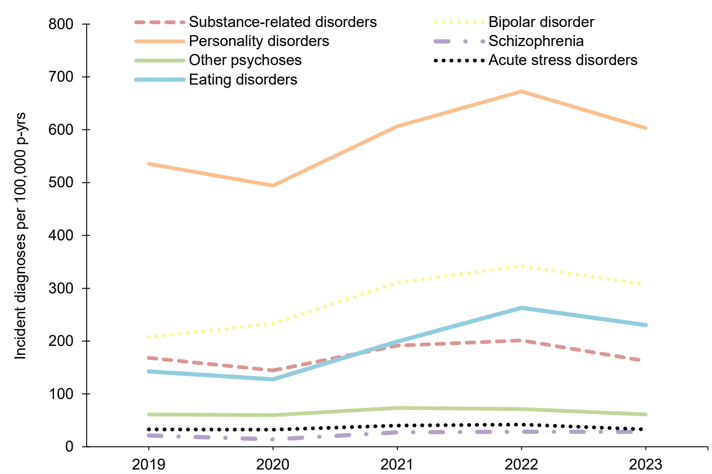

[a]Due to small rate sizes, factitious disorders are not represented.

**FIGURE 2a.** Annual Incidence Rates, Leading 5 Mental Health Disorder Diagnoses Among Female Active Component Service Members, U.S. Armed Forces, 2019–2024




Abbreviations: PTSD, post-traumatic stress disorder; p-yrs, person-years.

**FIGURE 2b.** Annual Incidence Rates[a], Mental Health Diagnoses Following the Leading 5 Disorders, Female Active Component Service Members, U.S. Armed Forces, 2019–2023



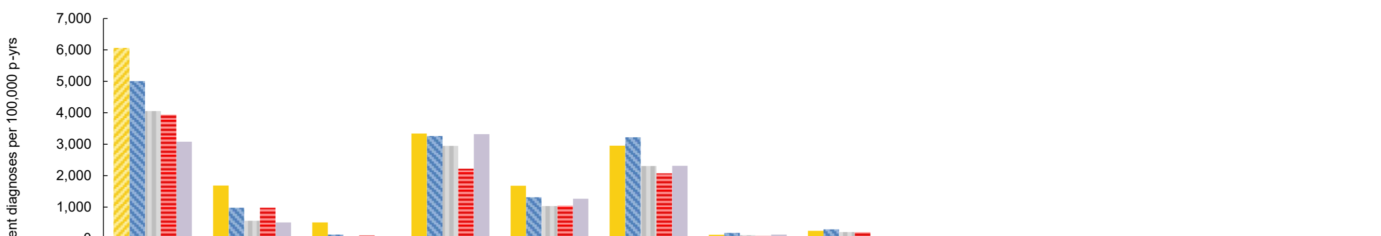

[a]Due to small rate sizes, factitious disorders are not represented.

**FIGURE 3.** Incidence Rates of Mental Health Disorder Diagnoses, by Category and Age Group, Active Component, U.S. Armed Forces, 2019–2023


| | Adjustment disorders | Alcohol-related disorders | Substance-related disorders | Anxiety disorders | PTSD | Depressive disorders | Bipolar disorder | Personality disorders | Schizophrenia | Other psychoses | Acute stress disorders | Eating disorders | Factitious disorders |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| <20 | 6,188.7 | 801.0 | 310.8 | 1,510.2 | 411.0 | 2,286.2 | 107.6 | 290.8 | 27.3 | 93.9 | 16.5 | 47.9 | 1.5 |
| 20–24 | 5,312.5 | 1,629.0 | 427.1 | 2,706.9 | 826.2 | 2,867.3 | 159.4 | 401.0 | 35.0 | 83.7 | 15.4 | 70.1 | 2.3 |
| 25–29 | 4,656.9 | 1,138.2 | 216.7 | 3,201.9 | 1,039.8 | 2,830.6 | 146.2 | 226.7 | 25.3 | 58.4 | 15.8 | 55.7 | 1.8 |
| 30–34 | 3,896.2 | 769.2 | 114.1 | 2,990.5 | 1,141.8 | 2,362.7 | 108.4 | 136.1 | 13.5 | 41.5 | 16.3 | 36.6 | 1.3 |
| 35–39 | 4,506.0 | 703.9 | 81.8 | 3,833.2 | 2,243.9 | 2,683.7 | 85.8 | 94.7 | 8.8 | 29.1 | 22.0 | 32.2 | 0.9 |
| 40–49 | 5,375.1 | 623.0 | 61.8 | 4,589.5 | 3,626.3 | 3,039.7 | 82.9 | 76.0 | 6.7 | 24.6 | 33.3 | 28.4 | 0.8 |
| 50+ | 4,932.5 | 438.9 | 51.3 | 3,778.2 | 3,740.8 | 2,616.6 | 51.3 | 50.0 | 6.6 | 21.0 | 35.5 | 24.9 | - |

Abbreviations: PTSD, post-traumatic stress disorder; p-yrs, person-years.

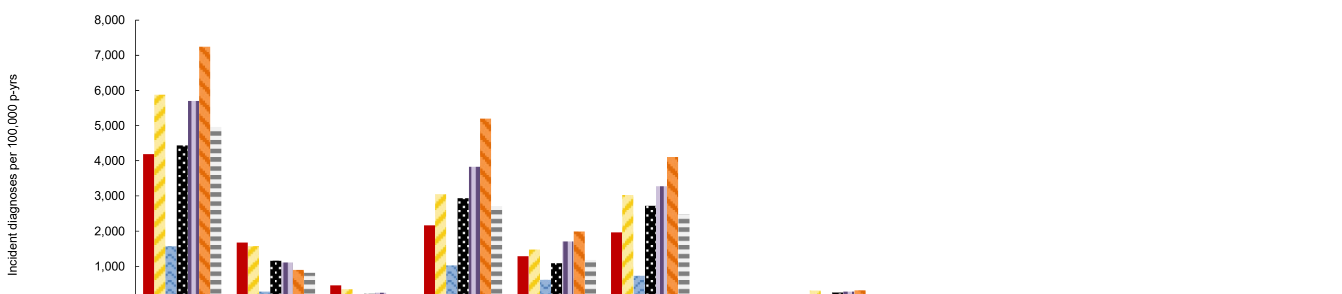
**FIGURE 4.** Incidence Rates of Mental Health Disorder Diagnoses, by Category and Service, Active Component, U.S. Armed Forces, 2019–2023




| | Adjustment disorders | Alcohol-related disorders | Substance-related disorders | Anxiety disorders | PTSD | Depressive disorders | Bipolar disorder | Personality disorders | Schizophrenia | Other psychoses | Acute stress disorders | Eating disorders | Factitious disorders |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Army | 6,054.3 | 1,685.3 | 516.0 | 3,342.7 | 1,680.3 | 2,956.5 | 121.0 | 249.1 | 26.7 | 72.1 | 21.3 | 60.3 | 2.8 |
| Navy | 5,008.2 | 978.1 | 124.6 | 3,259.2 | 1,313.6 | 3,220.1 | 179.1 | 296.7 | 21.8 | 60.1 | 21.2 | 50.7 | 0.8 |
| Air Force | 4,058.1 | 565.0 | 64.2 | 2,949.8 | 1,034.1 | 2,310.5 | 106.5 | 209.4 | 18.8 | 41.1 | 13.0 | 41.9 | 1.2 |
| Marine Corps | 3,941.9 | 983.5 | 98.4 | 2,219.1 | 1,045.1 | 2,075.8 | 85.3 | 199.1 | 22.4 | 61.9 | 12.7 | 47.6 | 0.9 |
| Coast Guard | 3,079.1 | 515.2 | 72.3 | 3,319.6 | 1,269.7 | 2,317.6 | 127.2 | 62.5 | 14.3 | 27.1 | 29.2 | 29.7 | 0.5 |

Abbreviations: PTSD, post-traumatic stress disorder; p-yrs, person-years.

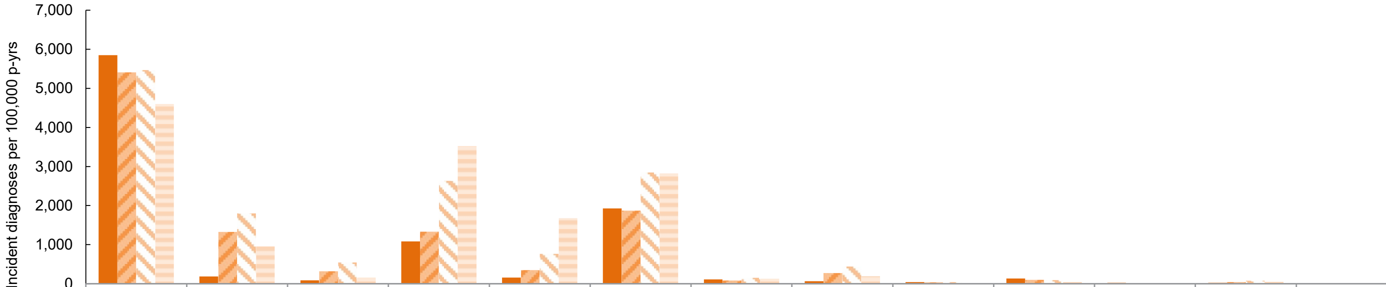
**FIGURE 5.** Incidence Rates of Mental Health Disorder Diagnoses, by Category and Military Occupation, Active Component, U.S. Armed Forces, 2019–2023




| | Adjustment disorders | Alcohol-related disorders | Substance-related disorders | Anxiety disorders | PTSD | Depressive disorders | Bipolar disorder | Personality disorders | Schizophrenia | Other psychoses | Acute stress disorders | Eating disorders | Factitious disorders |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Combat-related[a] | 4,185.5 | 1,676.1 | 460.0 | 2,164.3 | 1,289.2 | 1,966.5 | 79.7 | 187.2 | 20.0 | 58.1 | 13.1 | 30.6 | 2.2 |
| Motor transport | 5,881.1 | 1,574.3 | 349.9 | 3,049.1 | 1,476.5 | 3,034.5 | 154.2 | 311.7 | 35.7 | 85.4 | 16.7 | 49.2 | 0.9 |
| Pilot / air crew | 1,571.5 | 281.7 | 22.5 | 1,023.6 | 614.7 | 733.2 | 29.9 | 42.5 | 3.5 | 15.2 | 9.1 | 11.7 | - |
| Repair / engineering | 4,437.0 | 1,163.7 | 216.7 | 2,933.2 | 1,086.3 | 2,721.7 | 133.7 | 253.6 | 22.4 | 56.3 | 15.3 | 37.7 | 1.6 |
| Communications / intelligence | 5,700.7 | 1,108.2 | 251.9 | 3,833.4 | 1,709.1 | 3,275.0 | 147.1 | 280.5 | 24.2 | 61.1 | 21.6 | 70.4 | 1.7 |
| Health care | 7,245.7 | 900.9 | 168.9 | 5,203.5 | 1,988.9 | 4,112.8 | 199.6 | 320.3 | 17.8 | 50.0 | 30.3 | 109.9 | 1.5 |
| Other | 4,963.7 | 818.0 | 169.5 | 2,706.9 | 1,185.8 | 2,477.5 | 112.4 | 199.9 | 26.2 | 67.7 | 19.9 | 46.1 | 1.6 |

Abbreviations: PTSD, post-traumatic stress disorder; p-yrs, person-years.
[a]Infantry/artillery/combat engineering.

**FIGURE 6.** Incidence Rates of Mental Health Disorder Diagnoses, by Time in Service, Active Component, U.S. Armed Forces, 2019–2023




| | Adjustment disorders | Alcohol-related disorders | Substance-related disorders | Anxiety disorders | PTSD | Depressive disorders | Bipolar disorder | Personality disorders | Schizophrenia | Other psychoses | Acute stress disorders | Eating disorders | Factitious disorders |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| <6 months | 5,848.2 | 183.0 | 88.9 | 1,079.4 | 153.6 | 1,927.3 | 111.0 | 66.4 | 39.3 | 131.8 | 23.0 | 23.3 | 0.3 |
| 6–<12 months | 5,411.0 | 1,327.0 | 316.1 | 1,332.5 | 348.1 | 1,871.7 | 82.9 | 271.9 | 36.0 | 96.5 | 10.2 | 41.6 | 1.6 |
| 12–<36 months | 5,468.0 | 1,800.4 | 541.9 | 2,629.9 | 761.1 | 2,847.7 | 148.6 | 439.2 | 39.0 | 92.2 | 15.8 | 73.2 | 3.6 |
| ≥36 months | 4,602.0 | 954.6 | 157.8 | 3,522.8 | 1,675.2 | 2,821.6 | 125.5 | 191.6 | 15.6 | 40.8 | 19.3 | 47.1 | 1.1 |

Abbreviations: PTSD, post-traumatic stress disorder; p-yrs, person-years.

## Discussion

This report provides an update on incident diagnoses for mental health disorders among ACSMs of the U.S. Armed Forces from 2019 through 2023. These trends demonstrate a growing need for mental health services among U.S. military members, as the incidence rate of any mental health diagnosis increased by almost 40% between 2019 and 2023. Disorders related to adjustment, anxiety, and depression remain the most common mental health diagnoses, as documented in previous *MSMR* reports.[2,3] Notably, incidence rates for anxiety disorders and PTSD increased substantially, almost doubling from 2019 to 2023.

A temporary decline in the incidence of most mental health disorders was observed between 2019 and 2020, corresponding with the beginning of the coronavirus disease (COVID-19) pandemic. This decreasing trend does not reflect reports from the Centers for Disease Control and Prevention (CDC), which documented an increase in adverse mental health conditions associated with effects of the COVID-19 pandemic.[6,7] This decrease may, instead, be related to service members choosing to defer care due to the pandemic, similar to temporary disruptions in routine and non-emergency medical care observed in the general U.S. population.[8] Consequently, the temporary decline observed in this study may be related to changes to access and provision of mental health care services during the pandemic.

From 2019 to 2022, the percentage of general U.S. adults with anxiety (from 15.6% to 18.2%) and depression (from 18.5% to 21.4%) symptoms increased significantly.[9] Subsequent increases in anxiety and depressive disorders following the COVID-19 pandemic were also observed among male and female ACSMs. Prior *MSMR* reports indicate that approximately one-third of anxiety disorder cases between 2000 to 2011 had co-occurring diagnoses of either adjustment or depressive disorder.[10] Co-occurring diagnoses persist in the current report, which documents both adjustment disorders (43.5%) and depressive disorders (38.7%) as the leading 2 co-occurring diagnoses from 2019 to 2023 for ACSMs with incident anxiety disorder diagnoses. Comparable to *MSMR* reports from the last 2 decades, incidence rates of anxiety disorders remain highest among female service members and health care occupations.[3]

The rate of PTSD among ACSMs increased nearly six-fold from 2003 to 2008, likely reflecting the psychological effects among participants in Operations Iraqi Freedom and Enduring Freedom.[3] While this report also documents a subsequent peacetime operation increase in PTSD rates, the demographic distributions differ from prior reports. From 2000 to 2011, incidence rates of PTSD were higher among men and decreased with age.[3] In contrast, from 2019 to 2023 the incidence of PTSD in female ACSMs was consistently twice the rate of male counterparts, while also increasing with age. These findings likely reflect the changing demographics of the force, now representing increasing numbers of women,[11] and may also be related to sex-specific differences in comorbid mental health disorders that can predispose ACSMs to higher PTSD rates.[12] Congruent with prior reports, service members in health care occupations continued to represent high rates of PTSD, potentially reflecting the psychological stresses inherent to many health care roles in both peace and wartime operations.

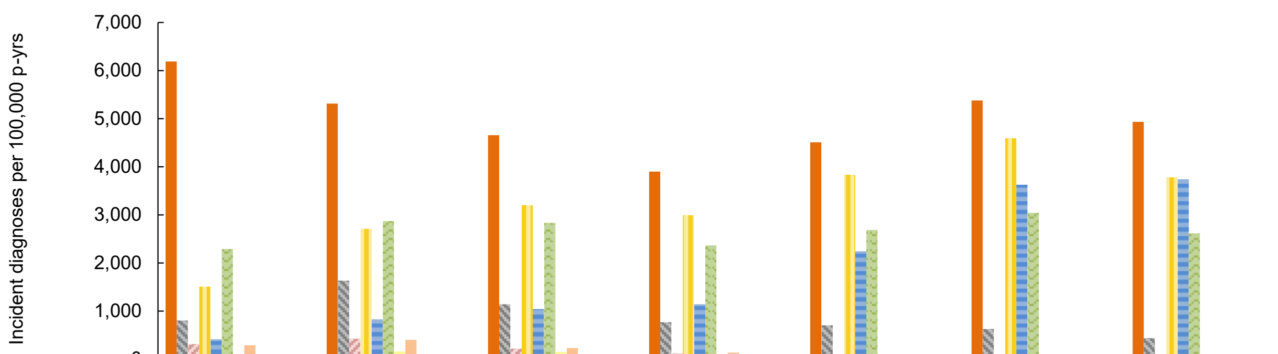
The 2018 Health Risk Behavior Survey (HRBS) indicates that approximately 7% of service members reported needing—but not receiving—mental health services in the past 12 months. Furthermore, over one-third of all active component HRBS respondents suggested that seeking mental health services damages one's military career.[13] These findings underscore the limitations of interpreting these results, which are based on standardized administrative records and may not be reliable indicators for the true burden of mental health disorders among military service members. This report may underestimate mental health disorder incidence if service members do not seek care or receive care not routinely documented as ICD-9/10-coded diagnoses (e.g., private practitioner, counseling or advocacy support center, chaplains); if mental health disorders were not diagnosed nor reported on standardized records of care; or if diagnoses were miscoded or incorrectly transcribed on the centrally transmitted records. Conversely, some conditions may have been erroneously diagnosed or miscoded as mental health disorders (e.g., screening visits), which may contribute to an over-estimation of the true burden of disease.

This report documents recent changes to the case surveillance definitions for mental health disorders, maintained by the Armed Forces Health Surveillance Division. This update presents results for 3 new case categories, including acute stress disorder, eating disorders, and factitious disorders; diagnoses under these categories were previously combined in the 'other mental health disorders' categories presented in prior *MSMR* articles.[2-4] Additionally, prior reports present data for a generalized "mental health problems" category, which included Z-code diagnosis codes related to factors influencing the health status of an individual warranting clinical attention. While those 'Z' codes are no longer presented in this report, a separate report will summarize a new case classification for the Z codes related to mental health disorders as "non-medical factors influencing health." The estimates of the numbers, natures, and rates of illnesses and injuries of surveillance interest depend on specifications of the surveillance case definitions; thus, changes to case definitions should be considered when comparing this report to prior data. In addition, the analyses reported herein summarize the experiences of individuals while serving in an active component of the U.S. military and do not include mental health disorders and mental health problems that affected members of reserve components or veterans of recent military service who received care outside the MHS.

In 2023, mental health disorders accounted for more hospital bed days than any other morbidity-related diagnostic category, contributing to over half (54.8%) of all hospital bed days among ACSMs.[1] A substantial proportion of those bed days occurred in non-military medical facilities. Policy implications from the published HRBS call for additional research to identify the reasons service members seek mental health care outside the MHS.

In September 2024, the Department of Defense revised Instruction 6490.08 and established a Department policy to promote health-seeking behaviors for mental health services. This policy emphasizes unrestricted, non-stigmatizing access to mental health care services, including voluntary substance misuse education, as essential for maintaining the health and readiness of the total force.[14] As the burden of mental health disorders continues to increase during a period of policy change, ongoing surveillance and further analyses are warranted to better understand the true burden of disease, along with related health care access and use. The results from this report underscore the need for mental health services to address a range of mental health comorbidities within the active component of the U.S. Armed Forces.

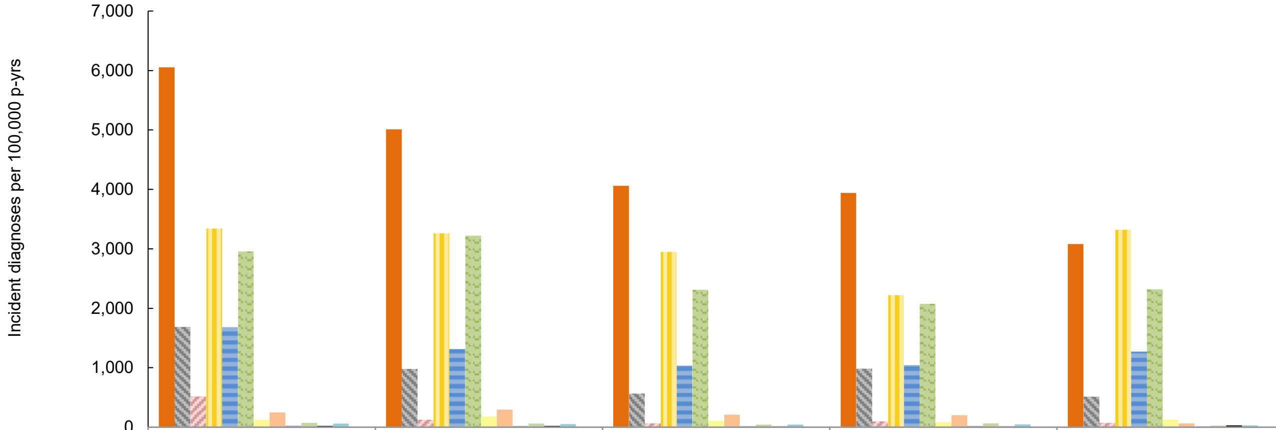
**FIGURE 3 SUPPLEMENT**. Incidence Rates of Mental Health Disorder Diagnoses, by Age Group and Diagnostic Category, Active Component, U.S. Armed Forces, 2019–2023




| | <20 | 20–24 | 25–29 | 30–34 | 35–39 | 40–49 | 50+ |
|---|---|---|---|---|---|---|---|
| Adjustment disorders | 6188.71 | 5312.48 | 4656.91 | 3896.24 | 4505.98 | 5375.13 | 4932.51 |
| Alcohol-related disorders | 800.95 | 1628.97 | 1138.2 | 769.17 | 703.89 | 622.99 | 438.9 |
| Substance-related disorders | 310.77 | 427.11 | 216.73 | 114.14 | 81.81 | 61.75 | 51.27 |
| Anxiety disorders | 1510.18 | 2706.86 | 3201.94 | 2990.54 | 3833.15 | 4589.52 | 3778.24 |
| Post-traumatic stress disorder | 410.97 | 826.16 | 1039.79 | 1141.83 | 2243.92 | 3626.27 | 3740.76 |
| Depressive disorders | 2286.17 | 2867.31 | 2830.64 | 2362.65 | 2683.67 | 3039.73 | 2616.58 |
| Bipolar disorder | 107.55 | 159.38 | 146.2 | 108.44 | 85.78 | 82.9 | 51.26 |
| Personality disorders | 290.75 | 400.96 | 226.73 | 136.13 | 94.74 | 76.04 | 50.02 |
| Schizophrenia | 27.27 | 35.01 | 25.27 | 13.52 | 8.84 | 6.74 | 6.55 |
| Other psychoses | 93.91 | 83.67 | 58.42 | 41.54 | 29.1 | 24.64 | 20.97 |
| Acute stress disorders | 16.49 | 15.44 | 15.75 | 16.31 | 21.95 | 33.27 | 35.46 |
| Eating disorders | 47.94 | 70.07 | 55.73 | 36.64 | 32.15 | 28.36 | 24.91 |
| Factitious disorders | 1.54 | 2.26 | 1.75 | 1.3 | 0.85 | 0.84 | 0 |

Abbreviations: PTSD, post-traumatic stress disorder; p-yrs, person-years.

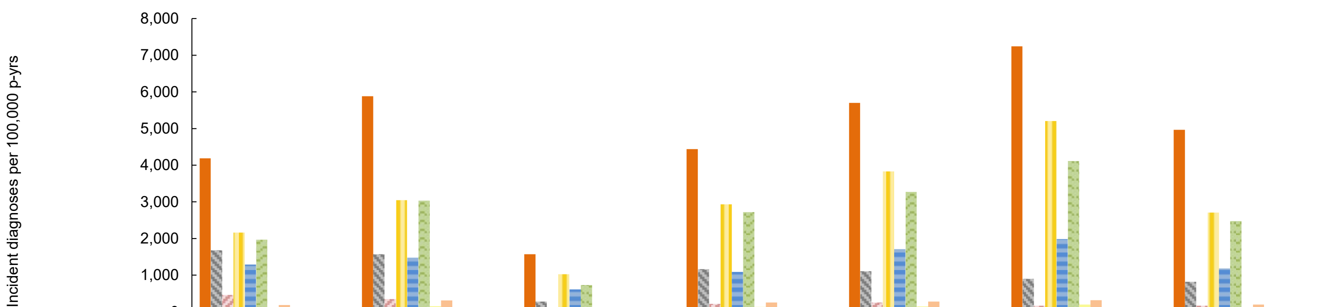
**FIGURE 4 SUPPLEMENT.** Incidence Rates of Mental Health Disorder Diagnoses, by Service and Diagnostic Category, Active Component, U.S. Armed Forces, 2019–2023




| | Army | Navy | Air Force | Marine Corps | Coast Guard |
|---|---|---|---|---|---|
| Adjustment disorders | 6054.28 | 5008.22 | 4058.07 | 3941.88 | 3079.14 |
| Alcohol-related disorders | 1685.25 | 978.09 | 564.98 | 983.45 | 515.18 |
| Substance-related disorders | 516.04 | 124.63 | 64.24 | 98.44 | 72.27 |
| Anxiety disorders | 3342.72 | 3259.19 | 2949.84 | 2219.13 | 3319.64 |
| Post-traumatic stress disorder | 1680.33 | 1313.61 | 1034.11 | 1045.13 | 1269.7 |
| Depressive disorders | 2956.45 | 3220.09 | 2310.54 | 2075.78 | 2317.59 |
| Bipolar disorder | 120.96 | 179.08 | 106.53 | 85.25 | 127.22 |
| Personality disorders | 249.11 | 296.71 | 209.35 | 199.14 | 62.54 |
| Schizophrenia | 26.73 | 21.8 | 18.77 | 22.41 | 14.32 |
| Other psychoses | 72.09 | 60.09 | 41.11 | 61.87 | 27.12 |
| Acute stress disorders | 21.28 | 21.21 | 13 | 12.73 | 29.17 |
| Eating disorders | 60.34 | 50.67 | 41.88 | 47.57 | 29.7 |
| Factitious disorders | 2.82 | 0.79 | 1.24 | 0.9 | 0.51 |

Abbreviations: PTSD, post-traumatic stress disorder; p-yrs, person-years.

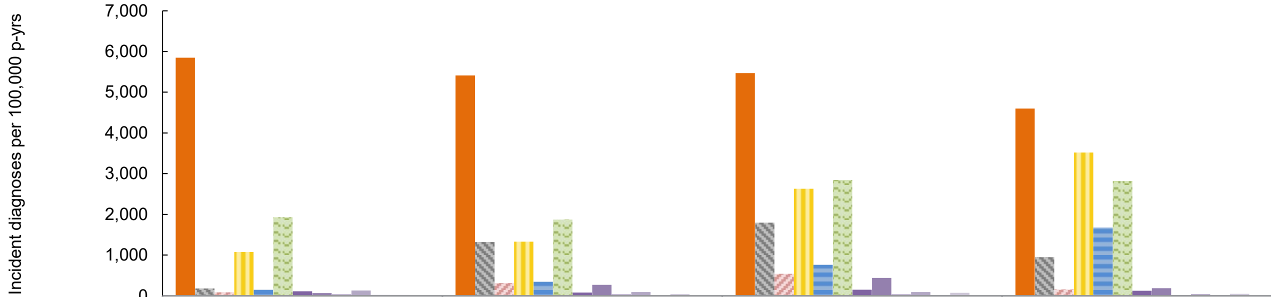
**FIGURE 5 SUPPLEMENT.** Incidence Rates of Mental Health Disorder Diagnoses, by Military Occupation and Diagnostic Category, Active Component, U.S. Armed Forces, 2019–2023




| | Combat-related[a] | Motor transport | Pilot/aircrew | Repair/engineering | Communications/intelligence | Health care | Other |
|---|---|---|---|---|---|---|---|
| Adjustment disorders | 4185.5 | 5881.07 | 1571.47 | 4437 | 5700.69 | 7245.73 | 4963.74 |
| Alcohol-related disorders | 1676.07 | 1574.33 | 281.71 | 1163.73 | 1108.22 | 900.88 | 817.99 |
| Substance-related disorders | 460 | 349.89 | 22.53 | 216.72 | 251.86 | 168.94 | 169.47 |
| Anxiety disorders | 2164.32 | 3049.09 | 1023.58 | 2933.15 | 3833.4 | 5203.53 | 2706.87 |
| Post-traumatic stress disorder | 1289.21 | 1476.51 | 614.74 | 1086.31 | 1709.07 | 1988.89 | 1185.84 |
| Depressive disorders | 1966.45 | 3034.48 | 733.21 | 2721.68 | 3274.95 | 4112.81 | 2477.45 |
| Bipolar disorder | 79.69 | 154.2 | 29.88 | 133.69 | 147.05 | 199.59 | 112.4 |
| Personality disorders | 187.19 | 311.71 | 42.46 | 253.61 | 280.5 | 320.25 | 199.88 |
| Schizophrenia | 19.98 | 35.69 | 3.46 | 22.39 | 24.17 | 17.76 | 26.15 |
| Other psychoses | 58.06 | 85.35 | 15.16 | 56.25 | 61.05 | 50.03 | 67.67 |
| Acute stress disorders | 13.06 | 16.69 | 9.09 | 15.26 | 21.57 | 30.25 | 19.89 |
| Eating disorders | 30.56 | 49.17 | 11.69 | 37.72 | 70.44 | 109.85 | 46.08 |
| Factitious disorders | 2.16 | 0.93 | 0 | 1.63 | 1.7 | 1.46 | 1.57 |

Abbreviations: PTSD, post-traumatic stress disorder; p-yrs, person-years.
[a] Infantry/artillery/combat engineering.

**FIGURE 6 SUPPLEMENT.** Incidence Rates of Mental Health Disorder Diagnoses, by Time in Service and Diagnostic Category, Active Component, U.S. Armed Forces, 2019–2023




| | <6 months | 6–<12 months | 12–<36 months | ≥36 months |
|---|---|---|---|---|
| Adjustment disorders | 5848.15 | 5410.97 | 5467.99 | 4601.96 |
| Alcohol-related disorders | 182.99 | 1327.03 | 1800.41 | 954.6 |
| Substance-related disorders | 88.86 | 316.06 | 541.87 | 157.78 |
| Anxiety disorders | 1079.38 | 1332.52 | 2629.93 | 3522.8 |
| Post-traumatic stress disorder | 153.64 | 348.1 | 761.09 | 1675.17 |
| Depressive disorders | 1927.28 | 1871.72 | 2847.65 | 2821.6 |
| Bipolar disorder | 111 | 82.86 | 148.64 | 125.47 |
| Personality disorders | 66.43 | 271.94 | 439.24 | 191.55 |
| Schizophrenia | 39.31 | 35.99 | 38.99 | 15.6 |
| Other psychoses | 131.77 | 96.52 | 92.21 | 40.82 |
| Acute stress disorders | 22.97 | 10.24 | 15.8 | 19.3 |
| Eating disorders | 23.25 | 41.58 | 73.22 | 47.11 |
| Factitious disorders | 0.28 | 1.55 | 3.62 | 1.13 |

Abbreviations: PTSD, post-traumatic stress disorder; p-yrs, person-years.

## References


1. Armed Forces Health Surveillance Division. Absolute and relative morbidity burdens attributable to various illnesses and injuries among active component members of the U.S. Armed Forces, 2023. *MSMR.* 2024;31(6):2-10.
2. Armed Forces Health Surveillance Division. Update: mental health disorders and mental health problems, active component, U.S. Armed Forces, 2016-2020. *MSMR.* 2021;28(8):2-9.
3. Armed Forces Health Surveillance Center. Mental disorders and mental health problems, active component, U.S. Armed Forces, 2000–2011. *MSMR.* 2012;19(6):11-17.
4. Stahlman S, Oetting AA. Mental health disorders and mental health problems, active component, U.S. Armed Forces, 2007–2016. *MSMR.* 2018;25(3):2-11.
5. Armed Forces Health Surveillance Division. Surveillance Case Definitions. Defense Health Agency, U.S. Dept. of Defense. Accessed Oct. 25, 2024. https://www.health.mil/Military-Health-Topics/Health-Readiness/AFHSD/Epidemiology-and-Analysis/Surveillance-Case-Definitions
6. Xiong J, Lipsitz O, Nasri F, et al. Impact of COVID-19 pandemic on mental health in the general population: a systematic review. *J Affect Disord.* 2020;277:55-64. doi:10.1016/j.jad.2020.08.001
7. Czeisler ME, Lane RI, Petrosky E, et al. Mental health, substance use, and suicidal ideation during the COVID-19 pandemic, United States, June 24-30, 2020. *MMWR Morb Mortal Wkly Rep.* 2020;69(32):1049-1057. doi:10.15585/mmwr.mm6932a1
8. Czeisler ME, Marynak K, Clarke KEN, et al. Delay or avoidance of medical care because of COVID-19-related concerns, United States, June 2020. *MMWR Morb Mortal Wkly Rep.* 2020;69(36):1250-1257. doi:10.15585/mmwr.mm6936a4
9. Terlizzi EP, Zablotsky B. Symptoms of anxiety and depression among adults: United States, 2019 and 2022. National Health Statistics Reports; no 213. Centers for Disease Control and Prevention, U.S. Dept. of Health and Human Services. Nov. 7, 2024. Accessed Nov. 12, 2024. https://www.cdc.gov/nchs/data/nhsr/nhsr213.pdf
10. Armed Forces Health Surveillance Center. Anxiety disorders, active component, U.S. Armed Forces, 2000–2012. *MSMR.* 2013;20(10):2-6.
11. Department of Defense Releases Annual Demographics Report–Upward Trend in Number of Women Serving Continues. News release. U.S. Dept. of Defense. Dec. 14, 2022. Accessed Nov. 12, 2024. https://www.defense.gov/News/Releases/Release/Article/3246268/department-of-defense-releases-annual-demographics-report-upward-trend-in-numbe
12. Obubi-Donkor G, Oluwasina F, Nire N, Agyopong V. A scoping review on the prevalence and determinants of post-traumatic stress disorder among military personnel and firefighters: implications for public policy and practice. *Int J Environ Res Public Health.* 2022;19(3). doi:10.3390/ijerph19031565
13. Meadows SO, Engel CC, Collins RL, et al. Research Brief: 2018 Health Related Behaviors Survey Summary Findings and Policy Implications for the Active Component. RAND Corporation. Apr. 28, 2021. Accessed Nov. 12, 2024. https://www.rand.org/pubs/research_briefs/RB10116z1.html
14. Aker JA, MHS Communications. Department of Defense works to dispel stigma of seeking mental health care. Defense Health Agency, U.S. Dept. of Defense. Dec. 4, 2023. Accessed Nov. 12, 2024. https://health.mil/News/Dvids-Articles/2023/12/04/news458878

# Syphilis Cases Among Pregnant Women and Newborns in the Military Health System, 2012–2022

*Katherine S. Kotas, MPH; Shauna L. Stahlman, PhD, MPH; Saixia Ying, PhD; David H. Yun, MD, MPH; Charles E. McCannon, MD, MBA, MPH, JD, FACPM; John F. Ambrose, PhD, MPH, CHES*

This report presents the rates of maternal syphilis among pregnant women and congenital syphilis among newborns in the Military Health System (MHS) beneficiary population from 2012 to 2022. Medical encounter data from military hospitals and clinics as well as civilian health care facilities were obtained from the Defense Medical Surveillance System (DMSS) to determine pregnancies, live births, and confirmed diagnoses of maternal and congenital syphilis. The rate of maternal syphilis in female MHS beneficiaries increased by 233% between 2012 (n=123, 66.0 per 100,000 births) and 2022 (n=169, 219.8 per 100,000 births), while the rate of congenital syphilis in newborn MHS beneficiaries increased by 355% (n=9 to n=32, 6.8 to 30.8 per 100,000 live births). Pregnant active component service members generally evinced higher rates of maternal syphilis than pregnant non-service member MHS beneficiaries during the reporting period. Additionally, the positive predictive value of maternal syphilis cases in the MHS was found to be low (59%). Future studies could focus on potential misclassification of maternal syphilis cases as well as syphilis screening compliance and treatment during pregnancy for all pregnant MHS beneficiaries.

**What are the new findings?**

Rates of maternal and congenital syphilis increased from 2012 through 2022 within the Military Health System population. The rate of diagnosed maternal syphilis among pregnant female active component service members exceeded previously reported rates of syphilis among all female active component service members annually between 2015 and 2022, likely due to increased screening.

**What is the impact on readiness and force health protection?**

Maternal and congenital syphilis affect the quality of life of service members and their families, as syphilis can lead to miscarriage and stillbirth in pregnant women and serious health conditions, even death, in newborns. Additionally, maternal, and congenital syphilis can increase Military Health System costs for short- and long-term treatments, and active component service members may experience increased lost duty days while managing their own or their beneficiary's condition.

Syphilis is a sexually transmitted infection (STI) that can be spread by mother to fetus, which is called congenital syphilis, that can cause premature birth, low birth weight, miscarriage, stillbirth, and death of the newborn after birth.[1-3] Congenital syphilis can also cause health problems in newborns such as deformed bones, anemia, enlarged liver and spleen, jaundice, nervous system complications, and meningitis.[1]

Congenital syphilis can be prevented through maternal syphilis detection from screening women during pregnancy.[1,2] In 1996, the U.S. Preventive Services Task Force (USPSTF) began recommending routine screening for syphilis infection in all pregnant women.[4] Since then, screening for syphilis during an initial pregnancy visit has been a well-established standard of care endorsed by the American College of Obstetricians and Gynecologists (ACOG), American Academy of Pediatrics (AAP), and American Academy of Family Physicians (AAFP).[5-8] Additionally, the Department of Veterans Affairs (VA)/Department of Defense (DOD) clinical practice guideline also includes syphilis screening as a prenatal laboratory test recommended for routine pregnancy care.[9] As of November 2023, syphilis screening during the first pregnancy visit was required by law in every state except Wisconsin, North Dakota, New Hampshire, Minnesota, Maine, Iowa, and Hawaii.[10]

In April 2024, the ACOG updated its recommendation to include serological screening of all pregnant individuals for syphilis at the first prenatal care visit, followed by universal re-screening during the third trimester and again at birth.[6] Previous ACOG guidance had recommended risk-based testing in the third trimester only, for individuals living in communities with high rates of syphilis and those at risk of syphilis acquisition during pregnancy.[5]

Despite robust guidance for syphilis screening, in November 2023 the Centers for Disease Control and Prevention (CDC) published a *Morbidity and Mortality Weekly Report (MMWR)* about the increase in congenital syphilis cases in the U.S. between 2012 and 2022.[11] Using its Notifiable Diseases Surveillance System (NNDSS), the CDC identified 3,761 cases of congenial syphilis in 2022—and determined that the number of congenital syphilis cases in the U.S. increased by 755% between 2012 and 2021.[11] Along with this increase in congenital syphilis cases during this period, the CDC also found increased rates of primary and secondary syphilis in women 15-44 years of age between 2012 (2.1 per 100,000 population) and 2022 (19.1 cases per 100,000 population).[11]

In recent years, the rate of syphilis has increased among female active component service members (ACSMs). The June 2024 issue of *MSMR* reported on the incidence rate of syphilis between 2015 and 2023.[12] The Armed Forces Health Surveillance Division (AFHSD) found the rate of syphilis in female ACSMs increased from 30.0 per 100,000 in 2015 to 80.4 per 100,000 in 2023, an increase of over 160% in 9 years.[12] That report did not, however, address cases of maternal or congenital syphilis, and due to that knowledge gap, this report aimed to find the rate of maternal syphilis and congenital syphilis in Military Health System (MHS) beneficiaries receiving direct care through military hospitals and clinics or the private sector care between 2012 and 2022.

## Methods

Data for this study were derived from the Defense Medical Surveillance System (DMSS), a longitudinal database that includes records of both direct and privately sourced ambulatory health care encounters and hospitalizations of MHS beneficiaries in military hospitals and clinics as well as civilian (if reimbursed through MHS) treatment facilities worldwide. DMSS also includes records of reportable medical events (RMEs) from the Disease Reporting System internet (DRSi). The surveillance period was from January 1, 2012 through December 31, 2022.

The analysis was segmented in 2 categories: maternal syphilis and congenital syphilis. Maternal cases of syphilis were identified among MHS beneficiaries who had a live or stillbirth delivery from 2012 through 2022. Deliveries were identified by an inpatient or outpatient encounter for infant delivery recorded with an International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) or 10th Revision, Clinical Modification (ICD-10-CM) code in any diagnostic position of the medical encounter **(Table)**. A 280-day incidence rule was applied to identify separate delivery events; this methodology has been used as an estimate of gestational periods in previous analyses both in and outside the MHS.[14-17] Age, beneficiary type, and race or ethnicity were identified at time of delivery. Maternal cases of syphilis were defined by a confirmed RME for syphilis or an inpatient or outpatient encounter with a syphilis diagnosis in any diagnostic position **(Table)**. Diagnoses for early syphilis, late syphilis, and other and unspecified syphilis were included, as well as diagnoses for syphilis complicating pregnancy and childbirth. The syphilis diagnosis or RME was required to occur within 280 days on or prior to the delivery event to capture diagnoses during a pregnancy. Rates of maternal syphilis were calculated per 100,000 births.

The second part of this analysis evaluated rates of congenital syphilis. Cases of congenital syphilis were identified by a confirmed RME record for congenital syphilis or an inpatient or outpatient encounter with a congenital syphilis diagnosis in any diagnostic position **(Table)**. These diagnoses were listed in the newborn's medical record, and not linked to delivery events. The encounter had to occur in a neonate less than 28 days old, however. Live births from 2012 through 2022 were used as the denominator in rate calculations. Deliveries were excluded if a delivery encounter contained a diagnosis specific to stillbirth (ICD-9-CM: V27.1, V27.4, V27.7; ICD-10-CM: Z37.1, Z37.4, Z37.7). Rates of congenital syphilis were calculated per 100,000 live births.

Due to concerns that maternal and congenital syphilis cases could be overestimated by the methodology employed for this report, because of possible medical encounter coding of previous syphilis cases as if they were new cases, a random sample of 25 (2%) maternal syphilis cases and 20 (10%) congenital syphilis cases were retrieved for medical chart reviews. The sample sizes were chosen in accordance with the feasibility of the authors' completion of the selected number of chart reviews. Cases in the sample were required to have been identified by ICD-9-CM or ICD-10-CM codes, and the care for the case had to be in an MHS hospital or clinic. Of those cases, medical charts could only be retrieved for 17 maternal and 11 congenital cases. Authors with clinical backgrounds conducted the chart reviews to confirm maternal and congenital syphilis diagnoses, looking to confirm that laboratory testing was positive for syphilis, maternal and congenital cases, and that maternal cases did not have a history of syphilis prior to pregnancy. These cases were used to calculate the positive predictive value (PPV) of the maternal and congenital syphilis case definitions. The PPV is the proportion of syphilis cases identified by the case definition employed by this report that were validated as true positive syphilis cases through medical chart review.

**TABLE.** ICD-9-CM and ICD-10-CM Diagnoses for Newborn Deliveries and Syphilis

| Description | ICD-9-CM | ICD-10-CM |
|---|---|---|
| Newborn diagnoses | | |
| Outcome of delivery | V27[a] | Z37[a] |
| Normal delivery | 650[a] | O80 |
| Cesarean delivery without mention of indication | 669.7[a] | O82 |
| Syphilis diagnoses | | |
| Maternal syphilis | 091[a] - 097[a], 647.00 - 647.03 | A51[ab] - A53[a], O98.11[a], O98.12 |
| Congenital syphilis | 090[a] | A50[a] |

Abbreviations: ICD-9-CM, International Classification of Diseases, 9th Revision, Clinical Modification; ICD-10-CM, International Classification of Diseases, 10th Revision, Clinical Modification.
[a] Indicates that subsequent digits/characters are included.
[b] ICD-10-CM code A51.31 (condyloma latum) was excluded due to previously documented evidence of incorrect use of this code to diagnosis condyloma acuminata.[13]

## Results

### Rates of maternal syphilis in the MHS

The rate of maternal syphilis during pregnancy generally increased between 2012 and 2022 among female MHS beneficiaries, with an overall rate of 94.0 cases per 100,000 births (n=1,198). While the number of births among female MHS beneficiaries decreased steadily from 2012 (n=133,590) to 2022 (n=104,475), the number of maternal syphilis cases increased (n=123 to n=169). Although the rate decreased from 2012 until 2015, it increased after 2015 and continued to rise annually through 2022 **(Figure 1)**. Since 2015, the rate of maternal syphilis increased by 159%. In addition, the rate of maternal syphilis in female MHS beneficiaries increased by 30.1% between 2021 and 2022 alone. Between 2012 and 2022, maternal syphilis rates were highest among beneficiaries under 20 years of age (140.1 per 100,000 births) and among non-Hispanic Black or African Americans (182.5 per 100,000 births) (data not shown).

When the rate of maternal syphilis during pregnancy was calculated for female ACSMs only, the rate for ACSMs was higher than the rate for all female MHS beneficiaries during all but 3 years during the analysis period (2012, 2018, 2021) **(Figure 1)**. Unlike the decrease seen in births among all female MHS beneficiaries between 2012 and 2022, births among female ACSMs remained stable during the study period (range 13,833–15,470 births) (data not shown).

### Rates of congenital syphilis in newborns in the MHS

The number of live births in the MHS population decreased between 2012 (n=132,900) and 2022 (n=103,753), while the number of congenital syphilis cases increased (n=9 to n=32). Those trends translate to an increasing rate of congenital syphilis in newborns in the MHS between 2012 and 2022, from 6.8 to 30.8 cases per 100,000 live births **(Figure 2)**. Since 2017, the rate of congenital syphilis increased by 187%. Between 2021 and 2022 alone, the rate of congenital syphilis in newborn MHS beneficiaries increased by 30.1%; this is the same percentage increase seen in maternal syphilis among female MHS beneficiaries between 2021 and 2022.

### Positive predictive values of maternal and congenital syphilis

The PPVs of syphilis differed in the maternal and congenital samples. Of the 17 maternal syphilis cases receiving a medical chart review, 10 cases were validated as true positive cases of incident syphilis diagnosed during pregnancy, per laboratory test results for syphilis and the additional criteria set forth in this study: a PPV of 59%. By contrast, of the 11 congenital syphilis cases receiving a medical chart review, 10 were validated as true positive cases of syphilis, per laboratory test results: a PPV of 91% (data not shown). A lower PPV suggests more false positive syphilis cases were found from the case definitions used to determine the maternal and congenital syphilis rates in this report.

**FIGURE 1.** Cases and Rates of Maternal Syphilis During Pregnancy Among Female MHS Beneficiaries and Female ACSMs, 2012–2022

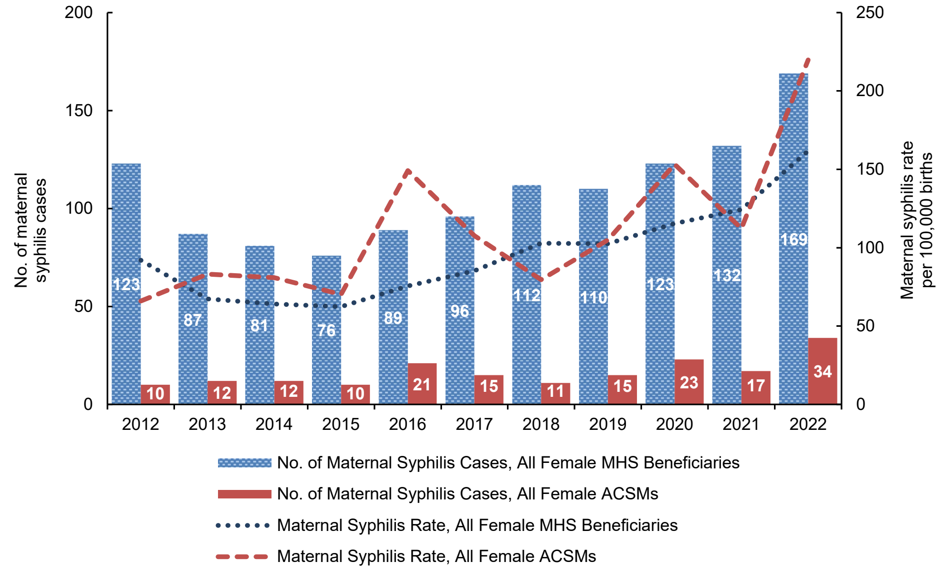
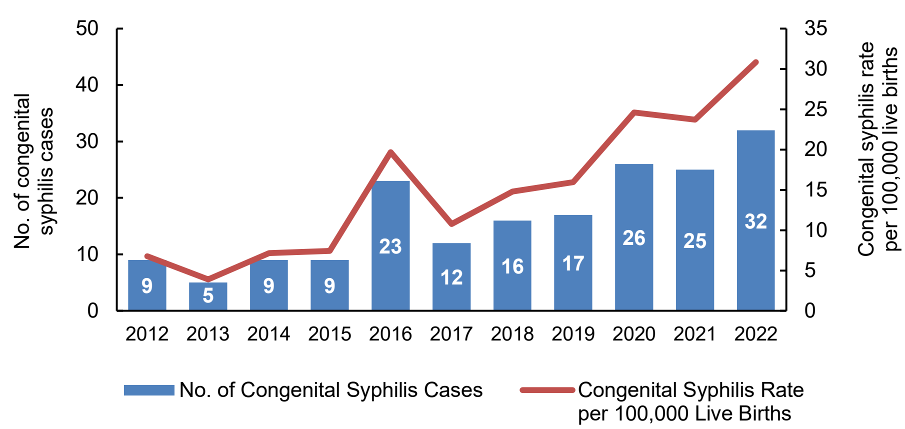



**FIGURE 2.** Cases and Rates of Congenital Syphilis Among Newborn MHS Beneficiaries, 2012–2022



## Discussion

Based on the data from the CDC and AFHSD, maternal and congenital syphilis is increasing in both the general U.S. and MHS populations. This new analysis adds to the Defense Health Agency's knowledge on the rates of maternal and congenital syphilis, which were previously not reported separately from syphilis rates among female ACSMs.

While the CDC did not report on maternal syphilis rates specifically, they have reported increases from 2012 to 2021of primary and secondary syphilis among U.S. women ages 15-44 years; rates of syphilis increased by 676% during that period.[11] Within the MHS, maternal syphilis rates increased by 233% from 2012 through 2022 for pregnant, female MHS beneficiaries. Additionally, the rate of maternal syphilis among pregnant, female ACSMs exceeded the rate of syphilis among all female ACSMs annually between 2015 and 2022, as reported in the June 2024 *MSMR*.[12] This difference was likely due to the additional syphilis screening pregnant women must undergo per ACOG, AAP, and AAFP guidance.

The CDC reported an increase of 31.7% in congenital syphilis cases in newborns in the U.S. between 2021 and 2022,[11] while this analysis found a similar increase of 30.1% in rates of congenital syphilis in newborns within the MHS between 2021 and 2022. Additionally, the CDC reported an increase of 755% in congenital syphilis cases between 2012 and 2021,[11] while this analysis found a smaller, yet significant, increase in congenital syphilis rates among newborns in the MHS at 355% between 2012 and 2022.

Due to concerns about potential misclassification of maternal and congenital syphilis cases using ICD-9-CM and ICD-10-CM codes, chart reviews were completed for a sample of 17 maternal and 11 congenital syphilis cases across the study period to assess case definition validity. The chart reviews of available medical records revealed that most cases of syphilis in newborns seen at military hospitals and clinics identified by the case definition (PPV 91%) were true cases of syphilis. Chart reviews also revealed that 82% (n=9) of the pregnant mothers of those congenital syphilis cases were screened, and 64% (n=7) were treated for syphilis during the pregnancy. This review suggests that the subsequent congenital syphilis diagnoses were due to either a treatment failure or were treated out of abundance of caution rather than a failure to screen and offer treatment to a pregnant mother. In cases when a pregnant mother was not treated before delivery, it was a result of no prenatal care, a loss to follow-up, or the mother declining treatment.

Conversely, only 59% of the syphilis cases identified in pregnant female MHS beneficiaries were true cases, which suggests that the maternal syphilis incidence data presented herein should be interpreted with caution, as they overestimate the true number of cases. This may be due, in part, to women's incident diagnoses occurring prior to pregnancy, or false positive test results. The screening and confirmation of syphilis cases is complicated and can easily be misinterpreted through diagnostic codes alone. There is still an increasing trend over time, as the chart review did not suggest that case misclassification became better or worse over time.

Furthermore, the chart reviews found that pregnant women and newborns were generally appropriately diagnosed and treated for syphilis with antibiotics based on maternal and newborn history, physical examination, laboratory test results, and newborn radiography, when clinically indicated. Providers appear to have been using an abundance of caution in treating pregnant women and newborns for any possible syphilis infection when there was uncertainty, including using syphilis diagnostic codes when there was a history of syphilis prior to pregnancy. Providers' continued adherence to DOD, ACOG, AAP, and AAFP guidance to properly screen, detect, and treat cases of syphilis supports the health and well-being of pregnant women and newborns. Additional chart reviews in future studies could more accurately calculate the potential overcounting of syphilis per the surveillance case definition.

The exact reasons for the increase in maternal and congenital syphilis from 2012 to 2022 among MHS beneficiaries cannot be determined by this analysis alone. Factors cited for the increase in the U.S. population include lack of adequate and timely testing and treatment, social and economic factors, and lack of awareness about the disease.[2,3,11] Further analyses would be required to understand which, if any, of those factors are limitations shared in the MHS.

It is presumed that most, if not all, providers caring for pregnant patients in military hospitals and clinics are meeting the standard of care by screening for syphilis during the initial pregnancy visit. Increased compliance with syphilis screening guidelines may be a contributing factor to the increased numbers of maternal and congenital syphilis cases identified in this report. Additional analysis of syphilis screening compliance, as well as treatment administration and adherence, is warranted, however, to determine how these factors may have contributed to the increased rates of maternal and congenital syphilis. Additionally, a larger sample of case reviews could provide useful information on potential misclassification of maternal and congenital syphilis cases. Continued surveillance of syphilis cases in pregnant women and newborns and associated research on the impact of syphilis to military readiness is essential for understanding the true cost and burden to individuals in addition to the MHS, including increased medical resources and time military beneficiaries may have to interrupt their duties to attend appointments or care for affected family members.

*Author Affiliations*
*Defense Centers for Public Health–Aberdeen, Armed Forces Health Surveillance Division, Defense Health Agency, Aberdeen, MD: Ms. Kotas, LTC Yun, Dr. McCannon, Dr. Ambrose; Epidemiology and Analysis Branch, Armed Forces Health Surveillance Division, Silver Spring, MD: Dr. Stahlman; Defense Centers for Public Health–Falls Church, Armed Forces Health Surveillance Division, Falls Church, VA: Dr. Ying*

## References


1. Centers for Disease Control and Prevention. About Congenital Syphilis. U.S. Dept. of Health and Human Services. Accessed Aug. 22, 2024. https://www.cdc.gov/syphilis/about/about-congenital-syphilis.html
2. Centers for Disease Control and Prevention. Syphilis in Babies Reflects Health System Failures: Tailored Strategies Can Address Missed Prevention Opportunities During Pregnancy. U.S. Dept. of Health and Human Services. Accessed Aug. 26, 2024. https://www.cdc.gov/vitalsigns/newborn-syphilis/index.html#:~:text=of%20reproductive%20age.-,people%20can%20experience%20illness%20and%20pass%20syphilis%20to%20their%20babies,treated%20early%20enough%20during%20pregnancy
3. Centers for Disease Control and Prevention. U.S. Syphilis Cases in Newborns Continue to Increase: A 10-Times Increase Over a Decade. U.S. Dept. of Health and Human Services. Accessed Aug. 26, 2024. https://www.cdc.gov/media/releases/2023/s1107-newborn-syphilis.html#:~:text=newborn%20syphilis%20occurs%20when%20mothers,download%20image%5bpng%5d
4. Calonge N, U.S. Preventive Services Task Force. Screening for syphilis infection: recommendation statement [correction in *Ann Fam Med*. 2004;2(5):517]. *Ann Fam Med*. 2004;2(4):362-365. doi:10.1370/afm.215
5. Kilpatrick SJ, Papile LA, Macones GA (eds). *Guidelines for Perinatal Care (8th ed.)*. American Academy of Pediatrics, American College of Obstetricians and Gynecologists;2017.
6. American College of Obstetricians and Gynecologists. Screening for Syphilis in Pregnancy: Practice Advisory April 2024. Accessed Aug. 26, 2024. https://www.acog.org/clinical/clinical-guidance/practice-advisory/articles/2024/04/screening-for-syphilis-in-pregnancy
7. American Academy of Family Physicians. Clinical Preventive Service Recommendation. Accessed Feb. 15, 2024. https://www.aafp.org/family-physician/patient-care/clinical-recommendations/all-clinical-recommendations/syphilis.html
8. USPSTF, Curry SJ, Krist AH, Owens DK, et al. Screening for syphilis infection in pregnant women: US Preventive Services Task Force reaffirmation recommendation statement. *JAMA*. 2018;320(9):911-917. doi:10.1001/jama.2018.11785
9. Management of Pregnancy Work Group. *VA/DoD Clinical Practice Guideline*. Veterans Health Administration Office of Quality and Patient Safety, Defense Health Agency Clinical Quality Improvement Program;2023. Accessed Feb. 1, 2024. https://www.healthquality.va.gov/guidelines/wh/up/va-dod-cpg-pregnancy-full-cpg_508.pdf
10. Centers for Disease Control and Prevention. State Statutory and Regulatory Language Regarding Prenatal Syphilis Screening in the United States. U.S. Dept. of Health and Human Services. Accessed Aug. 22, 2024. https://www.cdc.gov/syphilis/media/pdfs/2024/07/prenatal-syphilis-screening-laws-web-document-25-july-2024-final.pdf
11. McDonald R, O'Callaghan K, Torrone E, et al. Vital signs: missed opportunities for preventing congenital syphilis–United States, 2022. *MMWR Morb Mortal Wkly Rep*. 2023;72(46):1269-1274. doi:10.15585/mmwr.mm7246e1
12. Armed Forces Health Surveillance Division. Sexually transmitted infections among active component service members, U.S. Armed Forces, 2015–2023. *MSMR*. 2024;31(6):34-42.
13. Stahlman S. Brief report: use of ICD-10 code A51.31 (condyloma latum) for identifying cases of secondary syphilis. *MSMR*. 2017;24(9):23.
14. Stahlman S, Witkop CT, Clark LL, Taubman SB. Pregnancies and live births, active component service women, U.S. Armed Forces, 2012–2016. *MSMR*. 2017;24(11):2-9.
15. Bennett WL, Chang HY, Levine DM, et al. Utilization of primary and obstetric care after medically complicated pregnancies: an analysis of medical claims data. *J Gen Intern Med*. 2014;29(4):636-645. doi:10.1007/s11606-013-2744-2
16. Dumas SA, Chu S, Horswell R. analysis of pregnancy and birth rates among black and white medicaid-enrolled teens. *J Adolesc Health*. 2020;67(3):409-415. doi:10.1016/j.jadohealth.2020.04.026
17. Margulis AV, Setoguchi S, Mittleman MA, et al. Algorithms to estimate the beginning of pregnancy in administrative databases. *Pharmacoepidemiol Drug Saf*. 2013;22(1):16-24. doi:10.1002/pds.3284

# Post-Acute Sequelae of SARS-CoV-2 and Kidney Events in U.S. Active Component Service Members, March 1, 2020–September 30, 2022

*Kayli Hiban, MPH; Sithembile L. Mabila, PhD; Jessica H. Murray, MPH; Alexis A. McQuistan, MPH; Natalie Y. Wells, MD, MPH*

Early evidence suggests that COVID-19 is linked to kidney-related events in older and hospitalized patients. This link has not, however, been explored among a younger, healthy population such as U.S. active component service members (ACSMs). This retrospective cohort study assessed the incidence of post-acute sequelae of SARS-CoV-2 (PASC) and kidney events between March 1, 2020 and September 30, 2022 in ACSMs with no prior history of kidney events. Among the study population (n=831,780), 1,975 (0.2%) kidney events were reported between 31 days and 6 months after COVID-19 test dates. The incidence rate of any kidney event was slightly higher among ACSMs who tested negative for COVID-19 (10.6 per 10,000 person-years) compared to ACSMs who tested positive (9.8 per 10,000 person-years). In adjusted models of incidence rate ratios (IRRs), older ACSMs evinced significantly higher rates of kidney events compared to younger ACSMs, and COVID-19 vaccination had a protective effect; this was true in both the COVID-19-positive and -negative groups, although the IRR magnitude was stronger in the COVID-19-positive group. PASC did not lead to an increased incidence of kidney events compared to the COVID-19-negative group among ACSMs, an overall young and healthy population.

**What are the new findings?**

PASC-related kidney events were rare among a young, healthy population of ACSMs without prior history of kidney events. The incidence of kidney events among ACSMs was not higher in the COVID-positive group compared to the group that tested negative for COVID.

**What is the impact on readiness and force health protection?**

The detection and management of PASC in ACSMs is essential to prevent morbidity and ensure optimal health of the force, particularly among ACSMs of older age and at higher risk of PASC-related outcomes.

Severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), the virus that causes coronavirus disease 2019 (COVID-19), infected nearly 190,000 U.S. service members between January 1, 2020 and August 31, 2021. Of those cases, 1,760 resulted in hospitalizations and 45 resulted in deaths.[1] While individuals who are older or have a comorbidity are more at risk for severe illness from the virus,[2-4] COVID-19 also poses health risks to young and healthy individuals, including active component service members (ACSMs).

The most common health consequences of COVID-19 occur in the acute illness stage, including influenza-like symptoms, loss of taste or smell, nausea, and diarrhea.[5] Growing evidence suggests, however, that COVID-19 is a multi-organ disease, sometimes causing persistent symptoms after recovery. The U.S. Centers for Disease Control and Prevention defines long COVID as new, returning, or ongoing health problems occurring at least 4 weeks after COVID-19 infection.[6] Long COVID has also been referred to as long haul COVID, post-COVID-19 conditions, chronic COVID, or post-acute sequelae of SARS-CoV-2 (PASC). Each of these terms is associated with a specific timeline for persistence of symptoms after COVID-19 infection; for example, PASC refers to the onset or persistence of symptoms more than 4 weeks after infection, and long haul COVID refers to symptom persistence more than 100 days after infection.[7] For the purposes of this study, PASC refers to long COVID. PASC can adversely affect a variety of organ systems, including the respiratory, cardiovascular, neurological, and genitourinary systems, regardless of severity of COVID-19 illness.[8]

Early evidence suggests that COVID-19 is linked to kidney-related events, leading to more severe disease and increased hospital mortality.[9] In the acute stage of infection, nearly one-third of patients hospitalized with COVID-19 were diagnosed with acute kidney injury (AKI).[10] Patients hospitalized for COVID-19 more frequently experienced AKI, hematuria, and proteinuria and were less likely to have kidney function recovery than those hospitalized for influenza.[11,12] Similarly, kidney diseases are common following COVID-19 recovery, even among patients without kidney damage in the acute stage. Several studies of U.S. military veterans showed a significantly increased risk and burden of kidney diseases among 30-day COVID-19 survivors; this risk increased with severity of COVID-19 infection, but was present even for mild cases.[13-15]

Evidence for the association between PASC and kidney events is growing, but current research has focused largely on hospitalized patients and older populations.

To evaluate its full burden, it is important to study PASC kidney events among a younger population such as ACSMs. The objectives of this study were to determine the incidence and incidence rate ratio (IRR) of selected kidney events in ACSMs occurring 31 days to 6 months after a COVID-19 test date, and by COVID-19 test status.

## Methods

This retrospective cohort study assessed PASC and kidney events among ACSMs from March 1, 2020 through September 30, 2022. Incidence of selected kidney events among those who tested positive for COVID-19 was determined through reverse transcription-polymerase chain reaction (RT-PCR) in comparison to those who tested negative. A total of 888,588 ACSMs with PCR COVID-19 tests were identified from March 1, 2020 until March 31, 2022. COVID-19-positive individuals were identified by positive PCR COVID-19 tests, and COVID-19-negative individuals were identified by negative PCR COVID-19 tests. Individuals without a PCR test but who were tested with antigen or unknown test types were not included in either group. Only service members who never tested positive by PCR for COVID-19 during the surveillance period were included in the COVID-19-negative group. Individuals with only negative PCR test results but positive or suspect results to antigen or unknown test types (n=38,712) were excluded from the negative group **(Figure)**. The first negative test result was used as the incident date for the COVID-19-negative group. ACSMs with multiple COVID-19-positive tests (n=1,008) during the study were excluded, as it was not possible to ascertain if a kidney event was due to PASC or a subsequent COVID-19 infection during the acute stage **(Figure)**. ACSMs with histories of kidney events prior to a COVID-19 test (n=17,086) were excluded from the study, but those who experienced kidney events within 30 days after their COVID-19 tests were not excluded. The final cohort comprised 104,422 ACSMs with 1 positive PCR test and 727,358 with only negative PCR tests during the surveillance period **(Figure)**.

The Defense Medical Surveillance System (DMSS) was utilized to capture selected kidney-related encounters with International Classification of Diseases, 10th Revision (ICD-10) codes, for AKI, chronic kidney disease, proteinuria, nephrosis, nephritis, renal sclerosis, or other kidney events, in the first or second diagnostic position **(Table 1)** through September 30, 2022, to allow 6 months of follow-up. Six months of follow-up was necessary because PASC-related symptoms can persist 24 weeks or more after COVID-19 infection.[7,16] Kidney events within 30 days following a COVID-19 test were considered complications of acute COVID-19 infection, while kidney events more than 30 days, until 6 months, after a COVID-19 test date were considered PASC. Similar methods were used to evaluate the PASC burden among U.S. veterans.[15] An individual was counted once per kidney event type within the follow-up period. Encounters with kidney-related ICD-9/10 codes in the first or second diagnostic position were also used to determine prior history of kidney events for exclusion. For COVID-19 vaccination status, fully vaccinated was defined as the completion of a vaccination series at least 14 days prior to COVID-19 testing.

Person-time contributions for each ACSM were obtained for March 1, 2020 until September 30, 2022. Person-time was censored when a service member left the active component, at the conclusion of 6-month follow-up, or at the end of the surveillance period, whichever occurred first. Crude and multivariable Poisson regression models (adjusted for sex, age category, race and ethnicity, military service, and COVID-19 vaccination status) assessed the IRR of kidney events per 10,000 person-years (p-yrs), from 31 days to 6 months following COVID-19 testing, by test status.

**TABLE 1.** ICD-9 and ICD-10 Codes for Selected Kidney Events

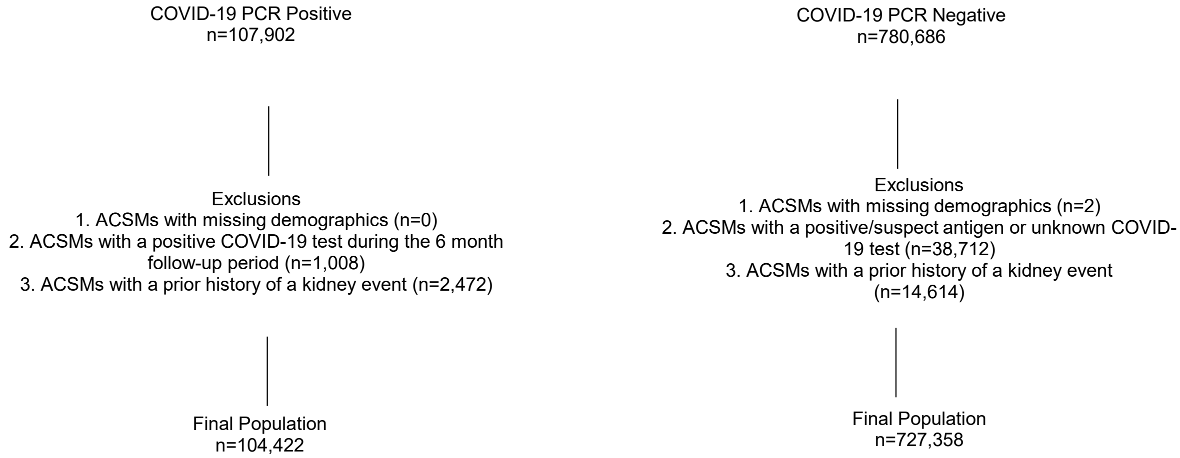
| Kidney Event | ICD-10[a] | ICD-9[a] |
|---|---|---|
| Acute kidney injury | N17.0, N17.1, N17.2, N17.8, N17.9 | 584.5, 584.6, 584.7, 584.8, 584.9, 586 |
| Chronic kidney disease | I12.0, I12.9, I13.10, I13.11, I13.2, N18.1, N18.2, N18.3, N18.30, N18.31, N18.32, N18.4, N18.5, N18.9 | 403.01, 403.11, 403.91, 404.00, 404.10, 404.90, 404.02, 404.12, 404.92, 585* |
| Proteinuria | N06*, R80.0, R80.1, R80.8, R80.9 | 791, 593.6 |
| Nephrosis, nephritis, and renal sclerosis | N00*, N01*, N03*, N04*, N05*, N14.4, N15.8, N15.9, N26.9 | 580.0, 580.4, 580.81, 580.89, 580.9, 582.0-582.2, 582.4, 582.81, 582.89, 582.9, 581.0-581.3, 581.81, 581.9, 583.0-583.2, 583.4, 583.6, 583.7, 583.81, 583.89, 583.9, 587 |
| Other diseases of kidney | N13.0, N13.1, N13.2, N13.30, N13.39, N26.1, N28.0, N28.1, N28.81, N19 | 591, 588.1, 593, 593.71-593.73, 593.2, 593.1 |

Abbreviations: ICD-9, International Classification of Diseases, 9th Revision; ICD-10, International Classification of Diseases, 10th Revision; ICD-9-CM, International Classification of Diseases, 9th Revision, Clinical Modification; ICD-10-CM, International Classification of Diseases, 10th Revision, Clinical Modification.

[a]ICD codes for kidney events were chosen from the Clinical Classifications Software Refined (CCSR) for ICD-10-CM (and ICD-9-CM) Diagnoses (a family of databases developed as part of the Healthcare Cost and Utilization Project).

*Asterisk indicates that any ICD code that begins with the specified value is included.

**FIGURE.** Study Population, March 1, 2020–March 31, 2022




Abbreviations: ACSMs, active compononet service member; n, number.

**TABLE 2.** Incidence Rates of Kidney Events Among Active Component Service Members by COVID-19 PCR Test Result, March 1, 2020–September 30, 2022

| | COVID-19-Positive | | | COVID-19-Negative | | |
|---|---|---|---|---|---|---|
| | Individuals with a Kidney Event | Person-Time | Rate[a] | Individuals with a Kidney Event | Person-Time | Rate[a] |
| Overall | 244 | 247,903.5 | 9.8 | 1,731 | 1,632,132.3 | 10.61 |
| Sex | | | | | | |
| Male | 202 | 200,813.5 | 10.1 | 1,417 | 1,340,074.7 | 10.6 |
| Female | 42 | 47,090.1 | 8.9 | 314 | 292,057.6 | 10.8 |
| Age group, y | | | | | | |
| <20 | 13 | 14,622.0 | 8.9 | 120 | 117,367.8 | 10.2 |
| 20-24 | 69 | 85,431.2 | 8.1 | 482 | 554,343.3 | 8.7 |
| 25-29 | 43 | 60,726.9 | 7.1 | 336 | 379,318.8 | 8.9 |
| 30-34 | 39 | 40,137.0 | 9.7 | 252 | 253,048.5 | 10.0 |
| 35-39 | 35 | 28,276.6 | 12.4 | 254 | 182,905.7 | 13.9 |
| 40-44 | 27 | 12,629.0 | 21.4 | 151 | 90,829.6 | 16.6 |
| ≥45 | 18 | 6,080.9 | 29.6 | 136 | 54,318.7 | 25.0 |
| Race and ethnicity | | | | | | |
| White, non-Hispanic | 116 | 125,680.7 | 9.2 | 885 | 890,533.5 | 10.0 |
| Black, non-Hispanic | 61 | 45,317.5 | 13.5 | 393 | 262,063.1 | 15.0 |
| Hispanic | 49 | 49,836.5 | 9.8 | 268 | 288,539.1 | 9.3 |
| Other/unknown | 18 | 27,068.9 | 6.7 | 185 | 190,996.6 | 9.7 |
| Service branch | | | | | | |
| Army | 109 | 96,894.5 | 11.3 | 774 | 593,356.2 | 13.0 |
| Navy | 65 | 61,942.6 | 10.5 | 398 | 419,354.1 | 9.5 |
| Air Force | 56 | 54,758.4 | 10.2 | 359 | 385,078.6 | 9.3 |
| Marine Corps | 14 | 31,924.2 | 4.4 | 182 | 218,789.8 | 8.3 |
| Coast Guard | 0 | 2,383.9 | 0.0 | 18 | 15,553.6 | 11.6 |
| Education | | | | | | |
| High School or less | 154 | 166,474.9 | 9.3 | 1,077 | 1,066,718.0 | 10.1 |
| Some college | 39 | 29,884.3 | 13.1 | 237 | 185,556.3 | 12.8 |
| Bachelors or advanced degree | 50 | 47,196.1 | 10.6 | 382 | 350,906.2 | 10.9 |
| Other/unknown | 1 | 4,348.2 | 2.3 | 35 | 28,951.8 | 12.1 |
| Vaccination status prior to COVID-19 test | | | | | | |
| Fully vaccinated | 113 | 149,220.7 | 7.6 | 387 | 390,442.4 | 9.9 |
| Not vaccinated | 131 | 98,682.8 | 13.3 | 1,344 | 1,241,689.9 | 10.8 |
| Kidney events[b] | | | | | | |
| Acute kidney injury | 56 | 247,903.5 | 2.3 | 457 | 1,632,132.3 | 2.8 |
| Chronic kidney disease | 24 | 247,903.5 | 1.0 | 189 | 1,632,132.3 | 1.2 |
| Proteinuria | 42 | 247,903.5 | 1.7 | 321 | 1,632,132.3 | 2.0 |
| Nephrosis, nephritis, renal sclerosis | 4 | 247,903.5 | 0.2 | 25 | 1,632,132.3 | 0.2 |
| Other | 118 | 247,903.5 | 4.8 | 739 | 1,632,132.3 | 4.5 |
| Any kidney event | 244 | 247,903.5 | 9.8 | 1,731 | 1,632,132.3 | 10.6 |

Abbreviations: COVID-19, coronavirus disease 2019; y, years.
[a] Rate per 10,000 person-years.
[b] Each kidney event counted once per person.

## Results

There were 104,422 ACSMs who tested positive for COVID-19 and 727,358 who tested negative among the study population **(Figure)**. The average age at COVID-19 test date was 27 years. There were 694 (0.7%) COVID-19 hospitalizations reported among those who tested positive. There were 1,975 kidney events reported between 31 days and 6 months after COVID-19 test date among the cohort: 244 (0.2%) in the COVID-19-positive group and 1,731 (0.2%) in the COVID-19-negative group. The proportions of each of the kidney events were relatively similar among the COVID-19-negative and the COVID-19-positive group (data not shown). Kidney-related hospitalizations were very low (n=87) in this study, with 11 among the COVID-positive group and 76 among the negative group. Overall, the incidence rate of PASC-related kidney events was lower among ACSMs who tested positive for COVID-19 (9.8 per 10,000 p-yrs) compared to kidney events among the COVID-19-negative group (10.6 per 10,000 p-yrs) **(Table 2)**. The 3 leading kidney events among both groups were 'other' kidney events, acute kidney injury, and proteinuria **(Table 2)**. Among both groups, the incidence rate of kidney events increased with age and was highest among non-Hispanic Black ACSMs and Army service members **(Table 2)**. The incidence rate of kidney events was higher among the COVID-19-positive group than the negative group among those 40 years and older and those unvaccinated prior to testing. PASC-related kidney events in the COVID-19-positive group were also higher among those unvaccinated prior to their COVID-19 test compared to those vaccinated (13.3 vs. 7.6 per 10,000 p-yrs) **(Table 2)**. Moreover, the incidence rate of kidney events was higher among men compared to women (10.1 vs. 8.9 per 10,000 p-yrs) within the COVID-19-positive group, while the rate was similar for both sexes within the COVID-19-negative group (females: 10.8 per 10,000 p-yrs vs. males: 10.6 per 10,000 p-yrs) **(Table 2)**.

Among both groups, the IRR of kidney events increased significantly with age in the older than 40 years age groups compared to the under-20-year age group. In the 40-44-year and 45-year and older groups, the magnitude of the IRR was higher in the COVID-positive group (aIRR 2.5 [95% CI, 1.3-4.8]; aIRR 3.4 [95% CI, 1.7-7.0]) compared to the negative group (aIRR 1.7 [95% CI, 1.3-2.1]; aIRR 2.5 [95% CI, 1.9-3.2]) **(Table 3)**. COVID-19 vaccination had a significant protective effect against kidney events in both groups, although the effect was stronger among the COVID-positive group (aIRR 0.5; 95% CI, 0.4-0.7) compared to the negative group (aIRR 0.9; 95% CI, 0.8-1.0) **(Table 3)**.

## Discussion

This study did not identify an overall increased incidence of kidney events in ACSMs who tested positive during the surveillance period for COVID-19 compared to those who tested negative. This finding is likely due to the demographic characteristics of the ACSM population in the study; COVID-19 hospitalizations were low (0.7%) meaning a majority of the COVID-19 cases were mild, and the average age (27 years) was low. Both of these factors have been linked with a lower risk of PASC in the existing literature. First, studies have shown that the risk of PASC-related kidney outcomes increases with the severity of acute COVID-19 infection and is lowest among non-hospitalized patients.[13-15] Second, PASC is more common among older patients than younger patients.[17,18]

The results of the current study align with the findings of other studies on PASC and kidney events in older populations, in that the risk of kidney events increases with age. An analysis of Veterans Health Administration data showed a 47% increased risk of AKI (hazard ratio [HR] 1.5; 95% CI, 1.0-2.2) and a 15% increased risk of chronic kidney disease (HR 1.2; 95% CI, 1.1-1.3) among non-hospitalized 30-day COVID-19 survivors.[13] In a similar study of veterans, PASC was associated with a 41% increased risk of AKI (HR 1.4; 95% CI, 1.3-1.5) and an 18% increased risk of chronic kidney disease (HR 1.2; 95% CI, 1.1-1.2). The burden of PASC-related AKI increased with older age.[15] A third study of veterans found that PASC almost doubled risk of AKI in 30-day COVID-19 survivors (aHR 1.9; 95% CI, 1.9-2.0).[14] Previous studies have focused on hospitalized patients[9-12] and veterans with an average age of late 50s or 60s,[11-15] while this population has an average age of 27 years and few hospitalizations. In this study, the rate of kidney events was similar among COVID-positive and -negative ACSMs for all age groups except for ages 40-44 years and 45 and older, where the rate was higher in the COVID-positive group. These findings add to the literature that PASC may increase the risk of kidney events in older populations, but in a younger population such as ACSMs without a history of kidney events, the overall incidence rate was not higher in COVID-positive individuals.

This study found a higher incidence of kidney events among non-Hispanic Black ACSMs, which is a disparity supported in the existing literature. In a study of U.S. veterans, the 6-month burden of PASC-related acute kidney injury was higher among Black patients compared to White patients,[15] and a meta-analysis found that Black COVID-19 patients were at highest risk of AKI.[17] Additionally, in this study COVID-19 vaccination had a protective effect on the incidence of PASC-related kidney events among COVID-positive ACSMs. COVID-19 vaccination has been linked to a significantly lower risk of PASC-related kidney diseases following COVID-19, which supports these findings.[19,20]

There were numerous limitations in this study. First, this study relied on PCR testing to determine COVID-19 test status. With the increasing use of at-home COVID-19 tests, ACSMs who tested positive may have been misclassified as COVID-negative, potentially understating the difference in incidence of PASC and kidney events compared to the COVID-19-negative group. The results were not adjusted for co-morbidities or medications, including nephrotoxic agents or medications prescribed during COVID-19 treatment, that may have affected ACSMs' rates of kidney events. ACSMs are generally in good health, however, so the prevalence of disease and health conditions in this population tends to be low. Medical encounters for genitourinary diseases in 2021,

**TABLE 3.** Adjusted Incidence Rate Ratios for Any Kidney Event[a] Among COVID-19 PCR Positive and COVID-19 PCR Negative Active Component Service Members, March 1, 2020–September 30, 2022

| | COVID-19-Positive | COVID-19-Negative |
|---|---|---|
| | Adjusted IRR[b] (95% CI) | Adjusted IRR[b] (95% CI) |
| Sex | | |
| Male | Reference | Reference |
| Female | 0.9 (0.6-1.2) | 1.0 (0.9-1.1) |
| Age group, y | | |
| <20 | Reference | Reference |
| 20-24 | 0.9 (0.5-1.6) | 0.9 (0.7-1.1) |
| 25-29 | 0.8 (0.4-1.4) | 0.9 (0.7-1.1) |
| 30-34 | 1.1 (0.6-2.0) | 1.0 (0.8-1.2) |
| 35-39 | 1.4 (0.8-2.7) | 1.4 (1.1-1.7) |
| 40-44 | 2.5 (1.3-4.8) | 1.7 (1.3-2.1) |
| >45 | 3.4 (1.7-7.0) | 2.5 (1.9-3.2) |
| Race and ethnicity | | |
| White, non-Hispanic | Reference | Reference |
| Black, non-Hispanic | 1.4 (1.1-2.0) | 1.5 (1.3-1.7) |
| Hispanic | 1.2 (0.8-1.6) | 1.0 (0.9-1.1) |
| Other/unknown | 0.7 (0.5-1.2) | 1.0 (0.9-1.2) |
| Service branch | | |
| Army | Reference | Reference |
| Navy | 0.9 (0.7-1.2) | 0.7 (0.7-0.8) |
| Air Force | 1.0 (0.7-1.3) | 0.8 (0.7-0.9) |
| Marine Corps | 0.4 (0.2-0.7) | 0.7 (0.6-0.9) |
| Coast Guard | 0.0 (0.0-0.0) | 0.9 (0.5-1.4) |
| Vaccination status prior to COVID-19 test | | |
| Fully vaccinated | 0.5 (0.4-0.7) | 0.9 (0.8-1.0) |
| Not vaccinated | Reference | Reference |

Abbreviations: COVID-19, coronavirus disease 2019; IRR, Incidence rate ratio; CI, confidence interval; y, years.
[a]Kidney events were counted from period of 31 days to 6 months following COVID-19 test date.
[b]Adjusted for sex, age, race and ethnicity, service, and COVID-19 vaccination status.

for instance, accounted for only 2.8% of military member encounters overall.[21] Additionally, this study found low hospitalizations for COVID-19 and kidney events. Moreover, this study did not utilize laboratory data to assess how many patients required kidney function follow-up after COVID-19 testing; intensity of follow-up for the COVID-positive and -negative groups is important in determining true incidence of PASC-related kidney events. Lastly, this study did not account for the dominant circulating COVID-19 variant, which affects risk of PASC, throughout the surveillance period. A study of veterans found that risk of PASC decreased over the course of the pandemic,[22] which may have affected the findings of the current study. Future studies should account for increasing use of at-home COVID-19 tests, adjust for co-morbidities and medications, incorporate laboratory data, and consider COVID-19 variants.

Overall, kidney events were rare among U.S. ACSMs, and kidney event incidence was not higher among COVID-19-positive individuals compared those who were negative. The rate of kidney events increased significantly with age, however, which supports the findings of studies of older, hospitalized populations, in which PASC is associated with increased kidney event risk.

*Authors' Affiliation*
*Epidemiology and Analysis Branch, Armed Forces Health Surveillance Division, Public Health Directorate, Defense Health Agency, Silver Spring, MD: Ms. Hiban, Dr. Mabila, Ms. Murray, Ms. McQuistan, Dr. Wells*

## References

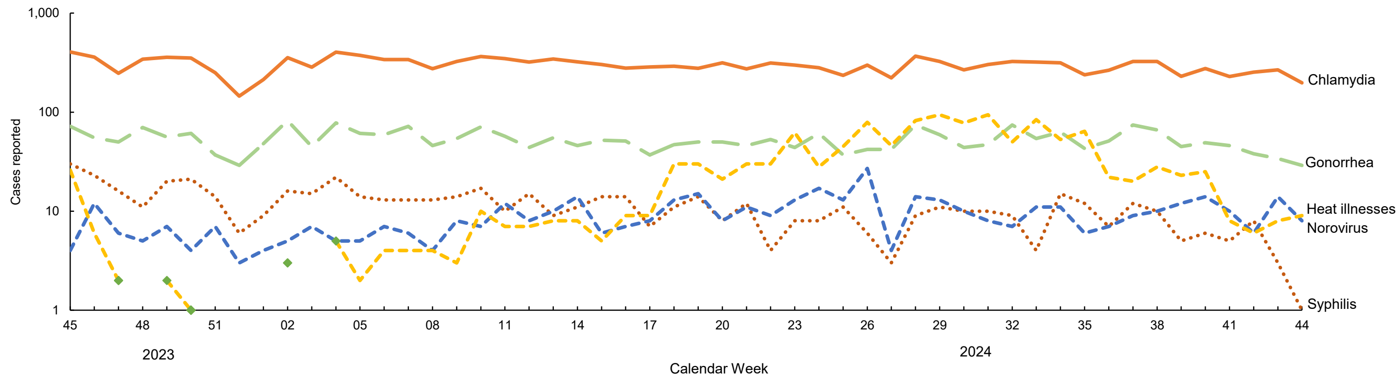
1. Stahlman S, Hiban K, Mahaney H, Ford S. Incident COVID-19 infections, active and reserve components, 1 January 2020-31 August 2021. *MSMR*. 2021;28(12):14-21.
2. Biswas M, Rahaman S, Biswas TK, Haque Z, Ibrahim B. Association of sex, age, and comorbidities with mortality in COVID-19 patients: a systematic review and meta-analysis. *Intervirology*. 2020:1-12. doi:10.1159/000512592
3. Centers for Disease Control and Prevention. Cases, Data, and Surveillance: February 11, 2020. U.S. Dept. of Health and Human Services. Accessed Jul. 6, 2022. https://www.cdc.gov/coronavirus/2019-ncov/covid-data/investigations-discovery/hospitalization-death-by-age.html
4. Kompaniyets L, Pennington AF, Goodman AB, et al. Underlying medical conditions and severe illness among 540,667 adults hospitalized with COVID-19, March 2020-March 2021. *Prev Chronic Dis*. 2021;18:210123. doi:10.5888/pcd18.210123
5. Centers for Disease Control and Prevention. Coronavirus Disease 2019 (COVID-19): Symptoms. U.S. Dept. of Health and Human Services. Mar. 22, 2022. Accessed Jul. 6, 2024. https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html
6. Centers for Disease Control and Prevention. Long COVID or Post-COVID Conditions. U.S. Dept. of Health and Human Services. Jul. 20, 2023. Accessed Jul. 6, 2024. https://www.cdc.gov/coronavirus/2019-ncov/long-term-effects
7. Gheorghita R, Soldanescu I, Lobiuc A, et al. The knowns and unknowns of long COVID-19: from mechanisms to therapeutical approaches. *Front Immunol*. 2024;15:1344086. doi:10.3389/fimmu.2024.1344086
8. Crook H, Raza S, Nowell J, Young M, Edison P. Long COVID: mechanisms, risk factors, and management. *BMJ*. 2021:n1648. doi:10.1136/bmj.n1648
9. Kanbay M, Medetalibeyoglu A, Kanbay A, et al. Acute kidney injury in hospitalized COVID-19 patients. *Int Urol Nephrol*. 2022;54(5):1097-1104. doi:10.1007/s11255-021-02972-x
10. Silver SA, Beaubien-Souligny W, Shah PS, et al. The prevalence of acute kidney injury in patients hospitalized with COVID-19 infection: a systematic review and meta-analysis. *Kidney Med*. 2021;3(1):83-98.e1. doi:10.1016/j.xkme.2020.11.008
11. Birkelo BC, Parr SK, Perkins AM, et al. Comparison of COVID-19 versus influenza on the incidence, features, and recovery from acute kidney injury in hospitalized United States veterans. *Kidney Int*. 2021;100(4):894-905. doi:10.1016/j.kint.2021.05.029
12. Xie Y, Bowe B, Maddukuri G, Al-Aly Z. Com-

parative evaluation of clinical manifestations and risk of death in patients admitted to hospital with COVID-19 and seasonal influenza: cohort study. *BMJ*. 2020;371:m4677. doi:10.1136/bmj.m4677
13. Al-Aly Z, Xie Y, Bowe B. High-dimensional characterization of post-acute sequelae of COVID-19. *Nature*. 2021;594(7862):259-264. doi:10.1038/s41586-021-03553-9
14. Bowe B, Xie Y, Xu E, Al-Aly Z. Kidney outcomes in long COVID. *JASN*. 2021;32(11):2851-2862. doi:10.1681/asn.2021060734
15. Xie Y, Bowe B, Al-Aly Z. Burdens of post-acute sequelae of COVID-19 by severity of acute infection, demographics and health status. *Nat Commun*. 2021;12(1):6571. doi:10.1038/s41467-021-26513-3
16. Venkatesan P. NICE guideline on long COVID. *Lancet Respir Med*. 2021;9(2):129. doi:10.1016/s2213-2600(21)00031-x
17. Jiang DH, Roy DJ, Gu BJ, Hassett LC, McCoy RG. Postacute sequelae of severe acute respiratory syndrome coronavirus 2 infection. *JACC:BTS*. 2021;6(9-10):796-811. doi:10.1016/j.jacbts.2021.07.002
18. Hill EL, Mehta HB, Sharma S, et al. Risk factors associated with post-acute sequelae of SARS-CoV-2: an N3C and NIH RECOVER study. *BMC Public Health*. 2023;23(1):2103. doi:10.1186/s12889-023-16916-w
19. Gao P, Liu J, Liu M. Effect of COVID-19 vaccines on reducing the risk of long COVID in the real world: a systematic review and meta-analysis. *IJERPH*. 2022;19(19):12422. doi:10.3390/ijerph191912422
20. Al-Aly Z, Bowe B, Xie Y. Long COVID after breakthrough SARS-CoV-2 infection. *Nat Med*. 2022;28:1461-1467. doi:10.1038/s41591-022-01840-0
21. Armed Forces Health Surveillance Division. Absolute and relative morbidity burdens attributable to various illnesses and injuries, active component, U.S. Armed Forces, 2021. *MSMR*. 2022;29(6):2-9.
22. Xie Y, Choi T, Al-Aly Z. Postacute sequelae of SARS-CoV-2 infection in the pre-Delta, Delta, and Omicron eras. *NEJM*. 2024;391(6):515-525. doi:10.1056/nejmoa2403211

# Reportable Medical Events at Military Health System Facilities Through Week 44, Ending November 2, 2024

*Matthew W. R. Allman, MPH; Anthony R. Marquez, MPH; Katherine S. Kotas, MPH; Idalia Aguirre, MPH*

**TOP 5 REPORTABLE MEDICAL EVENTS BY CALENDAR WEEK, ACTIVE COMPONENT (OCTOBER 1, 2023 - NOVEMBER 2, 2024)**




Abbreviation: RMEs, reportable medical events.

[a]Cases are shown on a logarithmic scale.

Note: There were 0 heat illness cases in the following weeks in 2023: 48, 51-52, and weeks 1 and 3 in 2024. Markers added to represent instances of heat illnesses that were not visible on the logarithmic scale graph.

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 each service's public health surveillance hub. The DRSi collects reports on over 70 different RMEs, including infectious and non-infectious conditions, outbreak reports, 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 active component cases reported per week are displayed for the top 5 RMEs for the previous year. Each month, the graph is updated with the top 5 RMEs, and is presented with the current month's (October 2024) top 5 RMEs, which may differ from previous months. COVID-19 is excluded from these graphs due to changes in reporting and case definition updates in 2023.

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

*Authors' Affiliation: Defense Health Agency, Disease Epidemiology Branch, Defense Centers for Public Health–Aberdeen*

## References

1. Armed Forces Health Surveillance Division. Armed Forces Reportable Medical Events. Accessed Feb. 28, 2024. https://health.mil/reference-center/publications/2022/11/01/armed-forces-reportable-medical-events-guidelines
2. Defense Manpower Data Center. Department of Defense Active Duty Military Personnel by Rank/Grade of Service. Accessed Feb. 28, 2024. https://dwp.dmdc.osd.mil/dwp/app/dod-data-reports/workforce-reports
3. Defense Manpower Data Center. Armed Forces Strength Figures for January 31, 2023. Accessed Feb. 28, 2024. https://dwp.dmdc.osd.mil/dwp/app/dod-data-reports/workforce-reports
4. Navy Medicine. Surveillance and Reporting Tools–DRSI: Disease Reporting System Internet. Accessed Feb. 28, 2024. https://www.med.navy.mil/navy-marine-corps-public-health-center/preventive-medicine/program-and-policy-support/disease-surveillance/drsl

**TABLE.** Reportable Medical Events, Military Health System Facilities, Week Ending November 2, 2024 (Week 44)[a]

| Reportable Medical Event[b] | Active Component[c] | | | | | MHS Beneficiaries[d] |
|---|---|---|---|---|---|---|
| | September 2024 | October 2024 | YTD 2024 | YTD 2023 | Total 2023 | October 2024 |
| | No. | No. | No. | No. | No. | No. |
| Amebiasis | 1 | 1 | 10 | 13 | 15 | 1 |
| Arboviral diseases, neuroinvasive and non-neuroinvasive | 1 | 0 | 3 | 2 | 2 | 0 |
| Babesiosis | 0 | 0 | 0 | 0 | 0 | 1 |
| Brucellosis | 0 | 0 | 1 | 0 | 0 | 0 |
| COVID-19-associated hospitalization and death[e] | 3 | 0 | 39 | 94 | 113 | 28 |
| Campylobacteriosis | 29 | 13 | 270 | 238 | 270 | 10 |
| Chikungunya virus disease | 0 | 0 | 0 | 2 | 2 | 0 |
| *Chlamydia trachomatis* | 1,204 | 1,135 | 13,073 | 14,871 | 17,510 | 149 |
| Cholera | 0 | 1 | 3 | 4 | 4 | 0 |
| Coccidioidomycosis | 0 | 0 | 46 | 23 | 36 | 0 |
| Cold weather injury[f] | 1 | 3 | 138 | 112 | 152 | N/A |
| Cryptosporidiosis | 8 | 8 | 78 | 60 | 67 | 5 |
| Cyclosporiasis | 2 | 1 | 11 | 15 | 15 | 0 |
| Dengue virus infection | 0 | 0 | 11 | 7 | 7 | 0 |
| *E. coli*, Shiga toxin-producing | 5 | 3 | 67 | 61 | 69 | 1 |
| Ehrlichiosis/anaplasmosis | 0 | 0 | 2 | 28 | 28 | 0 |
| Giardiasis | 10 | 11 | 90 | 67 | 78 | 1 |
| Gonorrhea | 247 | 179 | 2,314 | 2,308 | 2,763 | 24 |
| *Haemophilus influenzae,* invasive | 0 | 0 | 3 | 1 | 1 | 1 |
| Hantavirus disease | 0 | 0 | 0 | 1 | 2 | 0 |
| Heat illness[f] | 95 | 53 | 1,236 | 1,215 | 1,254 | N/A |
| Hepatitis A | 0 | 1 | 6 | 6 | 7 | 0 |
| Hepatitis B, acute and chronic | 7 | 2 | 88 | 125 | 155 | 5 |
| Hepatitis C, acute and chronic | 3 | 0 | 27 | 43 | 52 | 3 |
| Influenza-associated hospitalization[g] | 2 | 5 | 45 | 17 | 29 | 1 |
| Lead poisoning, pediatric[h] | N/A | N/A | N/A | N/A | N/A | 7 |
| Legionellosis | 0 | 0 | 4 | 4 | 5 | 0 |
| Leishmaniasis | 0 | 0 | 0 | 1 | 1 | 0 |
| Leprosy | 0 | 0 | 0 | 2 | 2 | 0 |
| Leptospirosis | 0 | 0 | 0 | 4 | 4 | 0 |
| Lyme disease | 10 | 6 | 91 | 64 | 70 | 6 |
| Malaria | 4 | 1 | 17 | 21 | 28 | 0 |
| Meningococcal disease | 0 | 1 | 1 | 2 | 4 | 0 |
| Mpox | 1 | 1 | 12 | 2 | 5 | 0 |
| Norovirus | 44 | 45 | 422 | 368 | 420 | 45 |
| Pertussis | 2 | 2 | 22 | 10 | 15 | 10 |
| Post-exposure prophylaxis against Rabies | 49 | 32 | 496 | 513 | 598 | 34 |
| Q fever | 2 | 0 | 2 | 2 | 2 | 0 |
| Rubella | 0 | 0 | 0 | 2 | 2 | 0 |
| Salmonellosis | 16 | 18 | 128 | 111 | 129 | 17 |
| Schistosomiasis | 0 | 0 | 1 | 0 | 0 | 0 |
| Shigellosis | 5 | 3 | 45 | 57 | 59 | 4 |
| Spotted fever rickettsiosis | 2 | 1 | 20 | 30 | 31 | 0 |
| Syphilis (all)[i] | 35 | 22 | 448 | 787 | 939 | 2 |
| Toxic shock syndrome | 0 | 0 | 2 | 1 | 2 | 0 |
| Trypanosomiasis | 0 | 0 | 2 | 1 | 1 | 0 |
| Tuberculosis | 0 | 0 | 2 | 11 | 11 | 0 |
| Tularemia | 0 | 0 | 1 | 1 | 1 | 0 |
| Typhoid fever | 0 | 0 | 1 | 2 | 2 | 0 |
| Typhus fever | 0 | 0 | 1 | 3 | 3 | 0 |
| Varicella | 0 | 0 | 12 | 10 | 13 | 5 |
| Zika virus infection | 0 | 0 | 1 | 0 | 0 | 0 |
| Total case counts | 1,788 | 1,548 | 19,292 | 21,322 | 24,978 | 360 |

Abbreviations: MHS, Military Health System; YTD, year-to-date; no., number; *E., Escherichia*; N/A, not applicable.

[a] RMEs reported through the DRSi as of Nov. 7, 2024 are included in this report. RMEs were classified by date of diagnosis or, where unavailable, date of onset. Monthly comparisons are displayed for the period of Sep. 1, 2024–Sep. 30, 2024 and Oct. 1, 2024–Oct. 31, 2024. YTD comparison is displayed for the period of Jan. 1, 2024–Oct. 31, 2024 for MHS facilities. Previous year counts are provided as the following: previous YTD, Jan. 1, 2023-Oct. 31, 2023; total 2023, Jan. 1, 2023–Dec. 31, 2023.

[b] RME categories with 0 reported cases among active component service members and MHS beneficiaries for the time periods covered were not included in this report.

[c] Services included in this report include the Army, Navy, Air Force, Marine Corps, Coast Guard, and Space Force, including personnel classified as FMP 20 with duty status of Active Duty, Recruit, or Cadet in DRSi.

[d] Beneficiaries included the following: individuals classified as FMP 20 with duty status of Retired and individuals with all other FMPs except 98 and 99. Civilians, contractors, and foreign nationals were excluded from these counts.

[e] Only cases reported after case definition update on May 4, 2023. Includes only cases resulting in hospitalization or death. Does not include cases of hospitalization or death reported under the previous COVID-19 case definition.

[f] Only reportable for service members.

[g] Influenza-associated hospitalization is reportable only for individuals under 65 years of age.

[h] Pediatric lead poisoning is reportable only for children aged 6 years or younger.

[i] The observed drop in syphilis cases from 2023 to 2024 may be due, in part, to an updated case validation process that began Jan. 2024.

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The Editor-in-Chief of *MSMR*, its contributing editors, and production staff would each like to extend their appreciation and gratitude to the subject matter experts who served as peer reviewers of manuscripts published in *MSMR* during 2024. Our external reviewers commit valuable time and effort sincerely appreciated by the *MSMR* team. Their informed insight, careful analysis, and thoughtful critique supported the continuance of the *MSMR* mission: to provide monthly, evidence-based estimates of the incidence, distribution, impact, and trends of health-related conditions among service members.

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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