AUGUST 2021

Volume 28
Number 08

MSMR

MEDICAL SURVEILLANCE MONTHLY REPORT

Mental and Behavioral Health Issue

Update: Mental Health Disorders and Mental Health Problems, Active Component, U.S. Armed Forces, 2016–2020

Mental health disorders have historically accounted for significant morbidity, health care utilization, disability, and attrition from military service. From 2016 through 2020, a total of 456,293 active component service members were diagnosed with at least 1 mental health disorder and 84,815 were diagnosed with mental health problems related to family/support group problems, maltreatment, lifestyle problems, substance abuse counseling, or social environment problems. Crude annual incidence rates of at least 1 mental health disorder decreased between 2016 and 2018, then increased in 2019 and decreased again in 2020. Most of the incident mental health disorder diagnoses were attributable to adjustment disorders, anxiety disorders, depressive disorders, "other" mental health disorders, alcohol-related disorders, and post-traumatic stress disorder. Similar to the last *MSMR* update, rates of incident mental health disorders were generally higher among female service members and Army members and declined with increasing age. Ongoing efforts to assist and treat service members should continue to promote help-seeking behavior to improve the psychological and emotional well-being of service members and reduce the burden of mental health disorders.

WHAT ARE THE NEW FINDINGS?

Annual incidence rates of at least 1 mental health disorder decreased between 2016 and 2018, then increased in 2019 and decreased again in 2020. Patterns of incidence rates among demographic subgroups and the most commonly occurring types of mental health disorder diagnoses are similar to findings reported in previous *MSMR* reports.

WHAT IS THE IMPACT ON READINESS AND FORCE HEALTH PROTECTION?

Although the incidence of mental health disorders remained relatively stable in the past 5 years, mental health disorders continue to affect a large number of service members and account for a significant burden of medical care. Ongoing efforts are needed to promote help-seeking behavior to improve the psychological and emotional well-being of service members.

In 2020, 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] Prior *MSMR* reports have documented the increasing incidence of post-traumatic stress disorder (PTSD), anxiety disorders, depressive disorders, adjustment disorders, and other mental health disorders from 2003 through 2011, followed by decreasing incidence through 2016 most notably for alcohol- and substance-related disorders, personality disorders, and depressive disorders.[2,3] Between 2007 and 2016, the highest incidence rates of mental health disorders diagnosed among active component service members were for adjustment disorders, depressive disorders, anxiety disorders, "other" mental health disorders, and alcohol-related disorders, respectively.[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.[2,3]

Psychosocial and behavioral health problems related to difficult life circumstances (e.g., marital, family, other interpersonal relationships) are also important to consider for comprehensive surveillance of service members' mental health; these are often documented using International Classification of Diseases, 9th Revision (ICD-9) V-codes and Z-codes in ICD-10. For example, 1 study found that service members who received mental health care (documented with V-coded diagnoses) were at greater risk of attrition from military service than those treated for only physical health conditions but at less risk of attrition than those who received mental health disorder-specific diagnoses.[4] In addition, many studies have focused on the impact of mental health disorders such as PTSD among military-serving parents and their associations with increased problems in the family environment.[5] However, family problems can also have independent associations with adverse outcomes such as suicide or medical evacuation from overseas deployments.[6,7]

This report summarizes the numbers, natures, and rates of incident mental health disorder diagnoses among active component U.S. service members over a 5-year surveillance period. It also summarizes the numbers, natures, and rates of incident "mental health problems" (documented with mental health-related V- or Z-codes in ICD-9 or ICD-10, respectively) among active component service members during the same period.

METHODS

The surveillance period was 1 January 2016 through 31 December 2020. The surveillance population included all individuals who served in the active component of the Army, Navy, Air Force, or Marine Corps at any time during the surveillance period. All data used to determine incident mental health disorder-specific diagnoses and mental health problems 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]) treatment facilities. Diagnoses were also derived from records of medical encounters of deployed service members that were 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 position. It should be noted that although the MHS transitioned to ICD-10 on 1 October 2015, ICD-9 codes were included in this analysis because some TMDS encounters still contain ICD-9 diagnoses and ICD-9 diagnoses were needed to identify and exclude prevalent cases documented in records from before 1 October 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/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. Diagnoses of "mental health problems" were ascertained from records of health care encounters that included V- or Z-coded diagnoses indicative of psychosocial or behavioral health issues in the first or second diagnostic position **(Table 1)**. "Family/support group problems" included family disruption, health problems within the family, bereavement, and other family problems; "maltreatment" included counseling and other encounters for victims or perpetrators of abuse; "lifestyle problems" included lack of exercise, high-risk sexual behavior, sleep deprivation, and other psychological or physical stress; "substance abuse counseling" included counseling encounters for substance use and abuse; and "social environment problems" included social maladjustment, social exclusion and rejection, target of (perceived) adverse discrimination and abuse, problems of adjustment to life cycle transitions, and other problems related to social environment.

Each incident diagnosis of a mental health disorder or a mental health problem was defined by a hospitalization with an indicator diagnosis in the first or second

TABLE 1. Mental health categories and ICD-9/ICD-10 diagnostic codes

Diagnostic category	ICD–9 codes	ICD–10 codes
Mental health disorders		
Adjustment disorders	309.* (excluding 309.81)	F43.2*, F43.8, F43.9, F93.0, F94.8, F94.9
Alcohol-related disorders	291.0, 291.81, 303.0*, 303.9*, 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.*
Post-traumatic stress disorder	309.81	F43.1*
Depressive disorders	296.2*, 296.3* (excluding 296.34), 296.9*, 300.4, 311	F32.*, F33.*, F34, F34.1, F34.8, F34.9, F39, F348.1, F34.89
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*
Psychotic disorders (other psychoses)	293.81, 293.82, 297.0*, 298.0*	F06.0, F06.2, F22–F24, F28, F29
Other mental health disorder	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)
V- or Z-coded behavioral health disorder		
Family/support group problems	V61.0*, V61.3, V61.4*, V61.8, V61.9, V62.82	Z63.*
Maltreatment related	V61.11, V61.12, V61.21, V61.22, V62.83	Z69.*
Lifestyle problems	V49.85, V62.89, V69.*, V71.01, V71.02	Z72.*, Z73.*
Substance abuse counseling	V65.42	Z71.41, Z71.51, Z71.6
Social environment problems	V60.3, V62.4	Z60.*

[a]An asterisk (*) indicates that any subsequent digit/character is included.
ICD-9/ICD-10, International Classification of Diseases, 9th/10th revision.

diagnostic position; 2 outpatient or TMDS visits within 180 days documented with indicator diagnoses (from the same mental health disorder or mental health problem–specific category) in the first or second diagnostic positions; 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 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 incident cases were excluded as these cases were assumed to have been misdiagnosed.

Service members who were diagnosed with 1 or more mental health disorders prior to the surveillance period (i.e., prevalent cases) were not considered at risk of incident diagnoses of the same conditions during the 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 the case-defining criteria. Service members could be incident cases only once in each mental health disorder-specific category. Only service members with no incident mental health disorder-specific diagnoses (ICD-9: 290–319; ICD-10: F01–F99) diagnosed during or prior to the surveillance period were eligible for inclusion as cases of incident mental health problems (selected V- or Z-codes).

RESULTS

During the 5-year surveillance period, 456,293 active component service members were diagnosed with at least 1 mental health disorder; of these individuals, 199,945 (43.8%) were diagnosed with mental health disorders in more than 1 diagnostic category **(Table 2a)**. Overall, there were 785,229 incident diagnoses of mental health disorders in all diagnostic categories. Annual numbers and rates of incident diagnoses of at least 1 mental health disorder decreased from 856.1 cases per 10,000 person-years (p-yrs) in 2016 to 818.0 cases per 100,000 p-yrs in 2018, peaked at 885.3 cases per 100,000 p-yrs in 2019, and then decreased to 839.2 cases per 100,000 p-yrs in 2020.

Over the entire period, 94.7% of all incident mental health disorder diagnoses were attributable to adjustment disorders (n=242,068; 30.8%), anxiety disorders (n=131,153; 16.7%), depressive disorders (n=129,307; 16.5%), "other" mental health disorders (n=111,703; 14.2%); alcohol-related disorders (69,095; 8.8%), and PTSD (60,173; 7.7%) **(Table 2a)**. In comparison, relatively few incident diagnoses were attributable to substance-related disorders (n=15,733; 2.0%), personality disorders (14,307; 1.8%), bipolar disorder (6,674; 0.8%), psychotic disorders (3,619; 0.5%), and schizophrenia (1,397; 0.2%).

It was common for individuals who were diagnosed with alcohol- or substance-related disorders to also be diagnosed with other mental health disorders during the period. Among individuals who

TABLE 2a. Incident diagnoses and rates of mental health disorders, active component, U.S. Armed Forces, 2016–2020

	Total (2016–2020)		2016		2017		2018		2019		2020	
Category[a]	No.	Rate[b]	No.	Rate[b]	No.	Rate[b]	No.	Rate[b]	No.	Rate[b]	No.	Rate[b]
Adjustment disorders	242,068	426.8	46,934	415.3	47,221	421.1	46,829	414.1	51,857	454.1	49,227	429.1
Alcohol-related disorders	69,095	111.5	13,355	108.5	14,385	117.7	13,787	111.8	14,570	116.6	12,998	103.0
Substance-related disorders	15,733	24.5	3,115	24.5	3,517	27.8	3,058	24.0	3,130	24.2	2,913	22.3
Anxiety disorders	131,153	218.3	27,280	228.2	25,687	216.6	24,193	202.2	26,916	222.3	27,077	222.0
Post-traumatic stress disorder	60,173	95.8	12,901	103.6	11,639	94.0	10,776	86.2	12,259	96.8	12,598	98.5
Depressive disorders	129,307	214.2	25,423	212.3	25,623	215.3	24,485	203.6	27,799	228.3	25,977	211.6
Bipolar disorder	6,674	10.4	1,324	10.4	1,347	10.6	1,264	9.9	1,313	10.1	1,426	10.9
Personality disorders	14,307	22.3	3,070	24.1	2,978	23.6	2,559	20.1	2,970	23.0	2,730	20.9
Schizophrenia	1,397	2.2	269	2.1	265	2.1	289	2.3	296	2.3	278	2.1
Psychotic disorders	3,619	5.6	737	5.8	698	5.5	721	5.6	741	5.7	722	5.5
Other mental health disorders	111,703	185.9	23,591	197.6	24,043	203.0	21,893	183.2	22,292	184.1	19,884	162.5
No. of individuals												
>1 type of mental health disorder diagnosis	199,945	310.4	33,890	264.8	33,685	265.2	31,796	248.3	34,821	268.2	32,729	249.5
Any mental health disorder diagnosis[c]	456,293	708.4	109,552	856.1	109,446	861.6	104,768	818.0	114,921	885.3	110,094	839.2

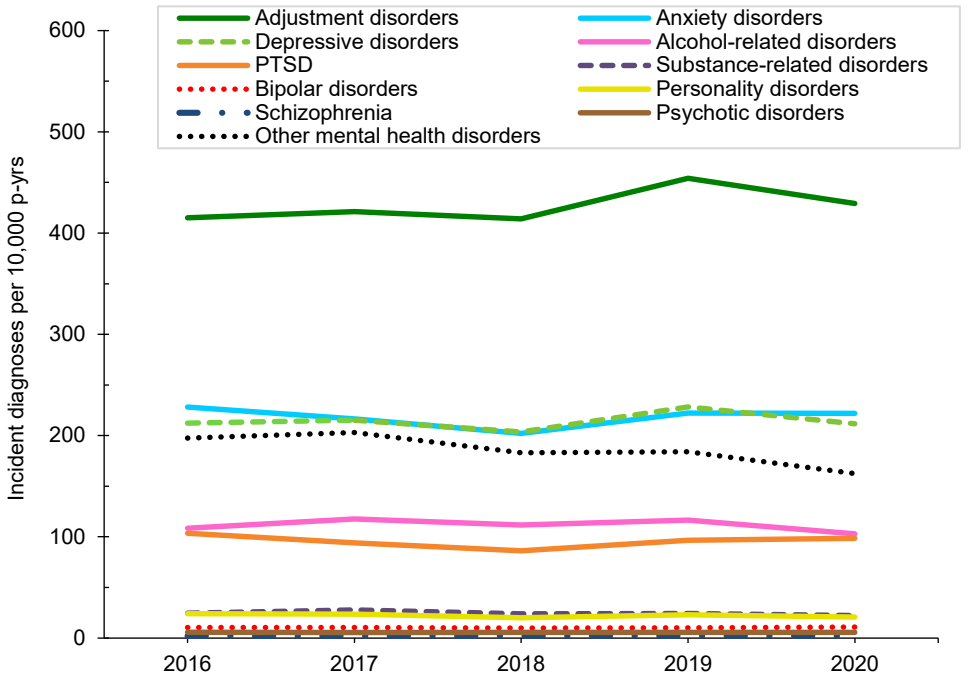
[a]An individual may be a case within a category only once per lifetime.
[b]Rate per 10,000 person-years.
[c]At least 1 recorded mental health disorder diagnosis.
No., number.

were diagnosed with alcohol-related disorders, 37.6% were also diagnosed with incident adjustment disorder and 27.6% with depressive disorder **(data not shown)**. Among those diagnosed with substance-related disorders, 50.2% were diagnosed with alcohol-related disorders and 38.9% were diagnosed with adjustment disorders **(data not shown)**. Adjustment disorders, depressive disorders, and personality disorders were also common co-occurring conditions. Among those diagnosed with personality disorders, 59.4% were also diagnosed with incident adjustment disorders and 51.9% were also diagnosed with incident depressive disorders **(data not shown)**.

Crude annual rates of incident diagnoses of adjustment disorders, anxiety disorders, and depressive disorders followed a general pattern of decreasing or remaining stable from 2016 through 2018, increasing in 2019, and then decreasing or remaining stable in 2020 **(Table 2a, Figure 1)**. Annual incidence of PTSD decreased during 2016 through 2018 but then increased through 2020. Rates of "other" mental health disorders decreased from 2017 through 2020. In contrast, crude annual incidence rates of diagnoses of alcohol-related disorders, substance-related disorders, personality disorders, bipolar disorders, psychotic disorders, and schizophrenia remained relatively stable through the surveillance period **(Table 2a, Figure 1)**.

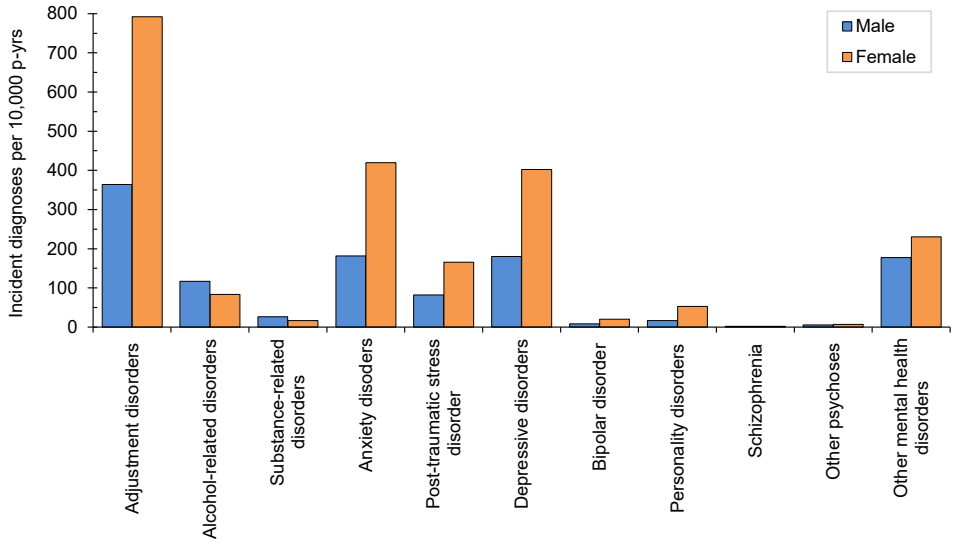
In general, overall rates of most incident mental health disorder diagnoses were higher among female than male service members. Exceptions were for schizophrenia, for which rates were similar between the sexes and alcohol- and substance-related disorders for which rates were higher among male service members **(Figure 2)**. Rates of most mental health disorder diagnoses declined with increasing age **(Figure 3)**. In particular, crude overall incidence rates of adjustment and psychotic disorders were higher among the youngest (less than 20 years old) service members, compared to any older age group. Rates of alcohol- and substance-related disorders, depressive disorders, bipolar disorders, personality disorders, and schizophrenia were highest among service members aged 20–24 years **(Figure 3)**. In contrast, the rates of PTSD, anxiety disorders, and "other" mental health disorders were highest among service members in their 40s and 50s.

FIGURE 1. Annual incidence rates of mental health disorder diagnoses, active component, U.S. Armed Forces 2016–2020



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

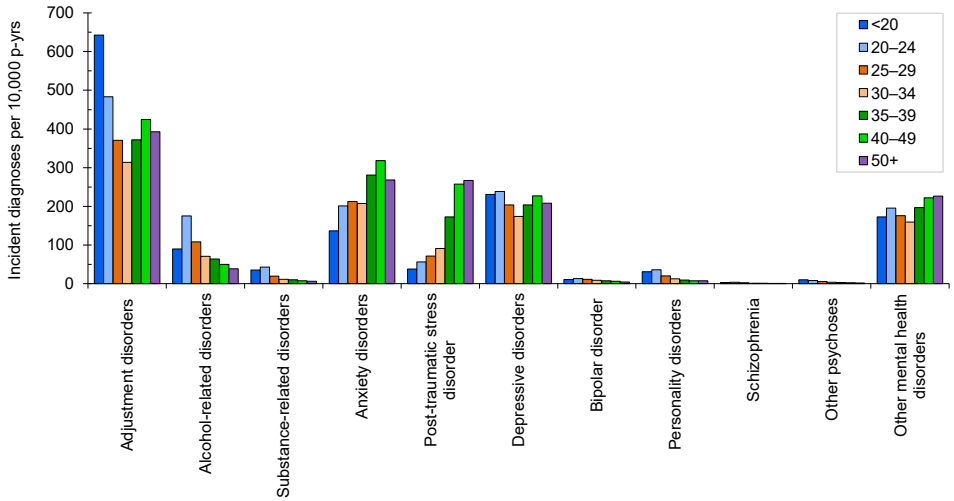
FIGURE 2. Incidence rates of mental health disorder diagnoses, by category and sex, active component, U.S. Armed Forces, 2016–2020



P-yrs, person-years.

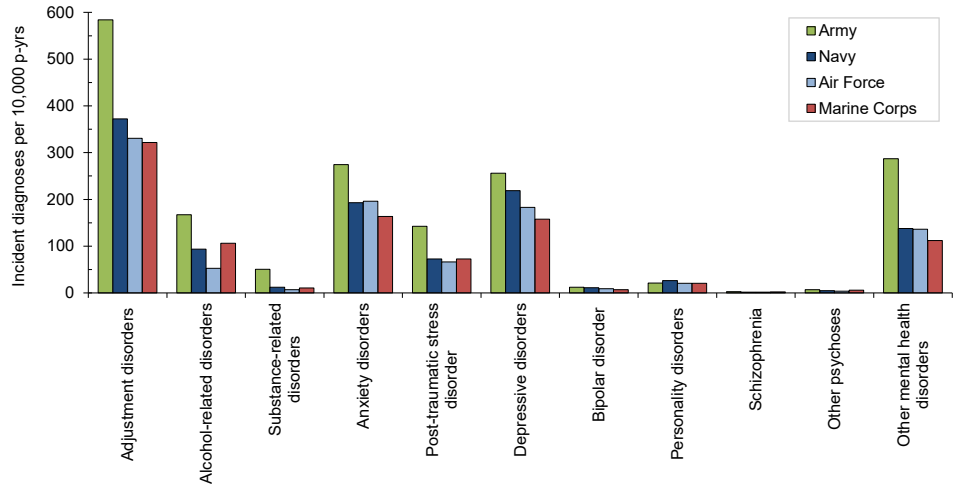
Overall incidence rates of all mental health disorders were higher in the Army than in any of the other services except for personality disorders, which were higher in the Navy **(Figure 4)**. Crude incidence rates for alcohol-related disorders, personality disorders, schizophrenia, and other psychotic disorders were higher among those in motor transport occupations than any other category of occupation **(Figure 5)**. In contrast, crude overall incidence rates of adjustment disorders, anxiety disorders, PTSD, depressive disorders, bipolar

FIGURE 3. Incidence rates of mental health disorder diagnoses, by category and age group, active component, U.S. Armed Forces, 2016–2020



P-yrs, person-years.

FIGURE 4. Incidence rates of mental health disorder diagnoses, by category and service, active component, U.S. Armed Forces, 2016–2020



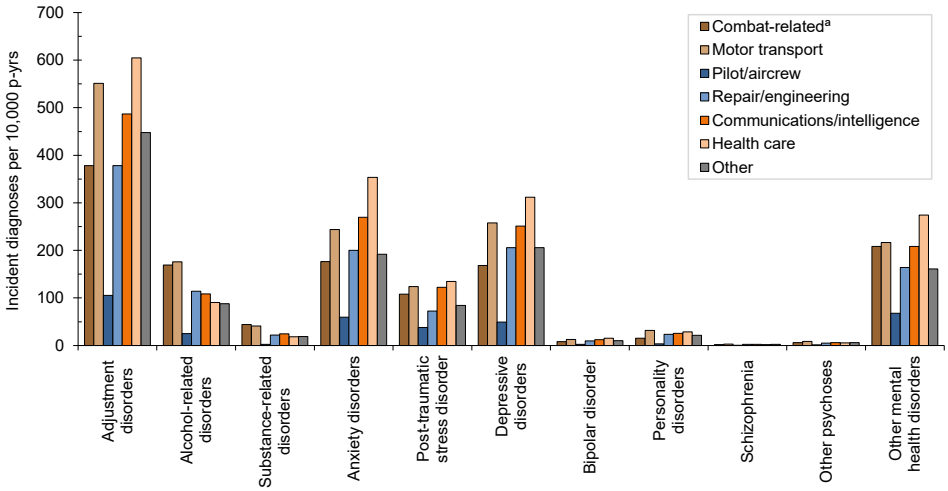
P-yrs, person-years.

disorders, and "other" mental health disorders were highest among those in health care occupations. There were some differences in rates of mental health disorder diagnoses by time in service. Rates of adjustment disorders, psychotic disorders, and bipolar disorders were highest during the first 6 months of military service, whereas rates of PTSD and anxiety disorders were highest among those with at least 36 months of service **(Figure 6)**. However, rates of all other mental health disorders were highest between 12 and 36 months of service. Finally, rates of incident anxiety disorders, PTSD, 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)**.

During the surveillance period, there were 91,432 records documenting mental health problems related to family/support group problems, maltreatment, lifestyle problems, or substance abuse counseling (documented with ICD-9 and ICD-10 V- and Z-codes, respectively) among 84,815 active component members who were never diagnosed with a mental health disorder (ICD-9: 290–319; ICD-10: F01–F99) **(Table 2b)**. During the period, one-third (33.7%) of all incident reports of these mental health problems were related to lifestyle problems; almost one-third (29.6%) were related to family/support group problems; slightly more than one-fifth (21.7%) were related to social environment problems; 11.3% were related to substance abuse counseling; and 3.7% were related to maltreatment (i.e., counseling and encounters for victims or perpetrators of abuse) **(Table 2b)**.

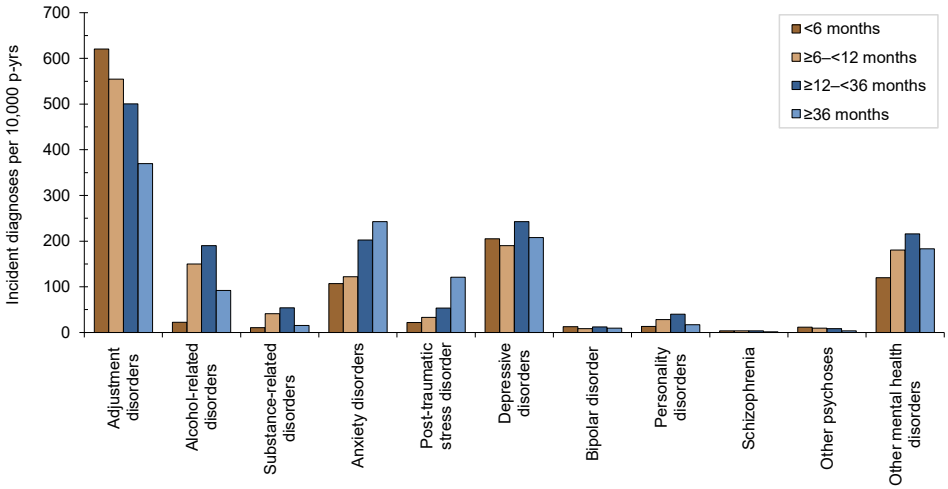
Crude annual rates of any V- or Z-coded mental health problems were relatively stable from 2016 through 2018, increased in 2019, and then decreased slightly in 2020 **(Figure 7)**. The increase between 2018 and 2019 was primarily driven by lifestyle problems and family/support group problems. Rates of substance abuse counseling decreased steadily from 2017 through 2020, whereas maltreatment-related problems decreased from 2016 to 2018 and then remained relatively stable in 2019 and 2020. Overall incidence of family/support group problems and maltreatment-related problems were higher among Army members, female service members, non-Hispanic Black service members, those aged 20–24 years, enlisted members, those in motor transport occupations, and those who were in service for 12–36 months **(data not shown)**. Overall incidence of lifestyle problems had similar demographic patterns with the exception that incidence was higher among males compared to females **(data not shown)**. Incidence of substance abuse counseling was highest among Air Force members, male service members, those aged 20–24 years, non-Hispanic Black service members, those in repair/engineering occupations, and those who were in service for 6–12 months **(data not shown)**. Finally, overall incidence of social environment problems was highest among Army members, female service members, non-Hispanic Black service members, those less than 20 years of age, those in motor transport occupations, and those who were in service for less than 6 months **(data not shown)**.

FIGURE 5. Incidence rates of mental health disorder diagnoses, by category and military occupation, active component, U.S. Armed Forces, 2016–2020



[a]Infantry/artillery/combat engineering.
P-yrs, person-years.

FIGURE 6. Incidence rates of mental health disorder diagnoses, by time in service, active component, U.S. Armed Forces, 2016–2020



P-yrs, person-years.

EDITORIAL COMMENT

This report provides an update on incident diagnoses for mental health disorders among active component service members of the U.S. Armed Forces. Similar to previous *MSMR* reports, rates of most incident mental health disorders were generally higher among female than male service members and among Army members, but rates declined with increasing age.[2,3] In addition, adjustment disorders were the most commonly diagnosed incident mental health disorder, and anxiety disorders, depressive disorders, alcohol-related disorders, and "other" mental health disorders were also relatively common.[2,3] The data presented here demonstrate a continuation of the trends in crude incidence of mental health disorders from 2007 to 2016, in which trends for many mental health disorder categories remained relatively stable during the 2016 to 2020 surveillance period. Of note, the drop in crude incidence of any mental health disorder diagnoses from 2019 through 2020 was a reversal of an increasing trend observed between 2018 and 2019.

The relative stability in rates of incident mental health disorder diagnoses observed during the surveillance period is likely related to reduced combat operations as well as prior and ongoing Department of Defense (DoD) anti-stigma campaigns. There was a significant reduction of U.S. Armed Forces in Iraq from 2011 through 2016, with an official end to combat operations in Afghanistan at the end of 2014. In this report and in several previous studies, mental health disorders such as anxiety and PTSD have been found to be significantly higher among service members with histories of deployment to a CENTCOM AOR, and the relative stability in mental health disorder diagnoses could be related to low and stable levels of deployment and combat exposure during this period.[8,9] DoD anti-stigma campaigns such as the "Real Warriors" campaign launched in 2009, seek to encourage individuals to seek treatment and link service members and their families to care and other confidential resources.[10]

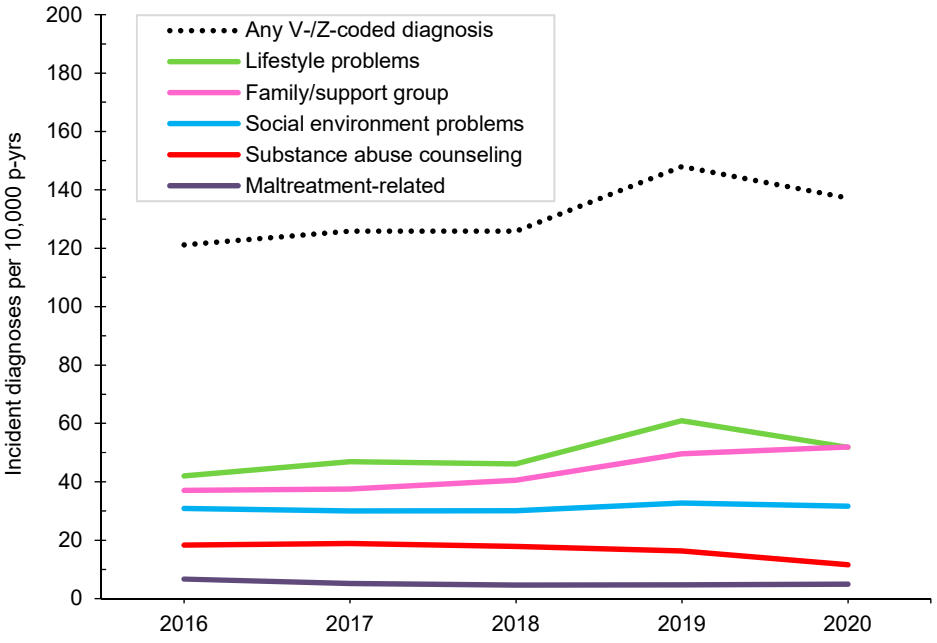
The decrease in incidence of mental health disorder diagnoses between 2019 and 2020 corresponds with the beginning of the coronavirus disease (COVID-19) pandemic, which was declared an international pandemic on 11 March 2020. This decreasing trend is somewhat unexpected, given that multiple studies reported negative mental health impacts of the pandemic, including the Centers for Disease Control and Prevention (CDC) reports of increases in adverse mental health conditions associated with COVID-19.[11,12] However, the decrease may instead be related to service members choosing to defer care due to the pandemic, which was a trend observed in the U.S. population.[13] This is of particular concern given that the number of active component suicide deaths have been increasing steadily over the past 5 years, and increased 10% between 2019 and 2020, from 350 to 385 deaths according to quarterly reports from the Defense Suicide Prevention Office.[14] Therefore, the trends observed in the present study warrant further investigation to determine whether they are related to a true decrease in mental health disorders or changes in health care seeking behavior,

TABLE 2b. Incident diagnoses and rates of V- or Z-coded mental health visits, among those without a mental health disorder diagnoses, active component, U.S. Armed Forces, 2016–2020

	Total (2016–2020)		2016		2017		2018		2019		2020	
Category[a]	No.	Rate[b]	No.	Rate[b]	No.	Rate[b]	No.	Rate[b]	No.	Rate[b]	No.	Rate[b]
Family/support group problems	27,054	43.4	4,554	37.0	4,612	37.6	5,040	40.6	6,241	49.6	6,607	51.9
Maltreatment-related	3,356	5.2	849	6.7	658	5.2	590	4.6	612	4.7	647	5.0
Lifestyle problems	30,790	49.6	5,144	42.0	5,731	46.9	5,707	46.2	7,644	60.9	6,564	51.8
Substance abuse counseling	10,370	16.6	2,267	18.3	2,322	18.8	2,231	17.9	2,068	16.3	1,482	11.6
Social environment problems	19,862	31.1	3,922	30.8	3,789	30.0	3,821	30.0	4,216	32.7	4,114	31.6
No. of individuals												
>1 type of V- or Z-coded diagnosis	81,339	126.3	1,160	9.1	1,072	8.4	1,205	9.4	1,492	11.5	1,358	10.4
Any V- or Z-coded diagnosis[c]	84,815	131.7	15,505	121.2	15,983	125.8	16,124	125.9	19,209	148.0	17,994	137.2

[a]An individual may be a case within a category only once per lifetime.
[b]Rate per 10,000 person-years.
[c]At least 1 reported mental health problem (V- or Z-coded diagnosis).
No., number.

FIGURE 7. Annual incidence rates of V- or Z-coded mental health diagnoses, active component, U.S. Armed Forces, 2016–2020



P-yrs, person-years.

and whether service members are receiving needed mental health care services particularly during the pandemic.

Incidence of any V- or Z-coded mental health problem followed the same general trend as incident mental health disorder diagnosis rates, remaining relatively stable but with an increase in 2019 followed by a decline in 2020. The reasons for this trend may be related to the factors previously described regarding trends in mental health disorder diagnoses. These mental health problems are important to monitor as they may serve as early indicators for mental health disorders and may also act as indicators for social determinants of mental health. In particular, the World Health Organization (WHO) has described social determinants of mental health as a framework that requires understanding risk and protective factors of mental health at different levels including the individual, family, community, and society.[15]

There are significant limitations to this report that should be considered when interpreting the results. For example, incident cases of mental health disorders and mental health problems were ascertained from ICD-9-/ICD-10-coded diagnoses that were reported on standardized administrative records of outpatient clinic visits and hospitalizations. Such records are not completely reliable indicators of the numbers and types of mental health disorders and mental health problems that actually affect military members. For example, the numbers reported here are underestimates to the extent that affected service members did not seek care or received care that is not routinely documented in records that were used for this analysis (e.g., private practitioner, counseling or advocacy support center, chaplains); that mental health disorders and mental health problems were not diagnosed or reported on standardized records of care; and/or that some indicator diagnoses were miscoded or incorrectly transcribed on the centrally transmitted records. On the other hand, some conditions may have been erroneously diagnosed or miscoded as mental health disorders or mental health problems (e.g., screening visits). The accuracy of estimates of the numbers, natures, and rates of

illnesses and injuries of surveillance interest depend to a great extent on specifications of the surveillance case definitions that are used to identify cases. If case definitions with different specifications were used to identify cases of nominally the same conditions, the resultant estimates of numbers, rates, and trends might vary from those reported here. In addition, the analyses reported here summarize the experiences of individuals while they were serving in an active component of the U.S. military; as such, the results 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 of the MHS.

Although the incidence of mental health disorders has remained relatively stable in the past 5 years, mental health disorders continue to affect a large number of service members and account for a significant burden of medical care. Ongoing efforts to assist and treat service members should continue to promote help-seeking behavior to improve the psychological and emotional well-being of service members in the U.S. Armed Forces.

REFERENCES

1. Armed Forces Health Surveillance Division. Absolute and relative morbidity burdens attributable to various illnesses and injuries, active component, U.S. Armed Forces, 2020. *MSMR*. 2021;28(6):2–9.
2. 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.
3. Stahlman, S and Oetting AA. Mental health disorders and mental health problems, active component, U.S. Armed Forces, 2007–2016. *MSMR*. 2018;25(3):2–11.
4. Garvey Wilson A, Messer S, Hoge C. U.S. military mental health care utilization and attrition prior to the wars in Iraq and Afghanistan. *Soc Psychiatry Psychiatr Epidemiol*. 2009;44(6):473–481.
5. Kritikos TK, Comer JS, He M, et al. Combat experience and posttraumatic stress symptoms among military-serving parents: a meta-analytic examination of associated offspring and family outcomes. *J Abnorm Child Psychol*. 2019;47(1):131–148.
6. Skopp N, Trofimovich L, Grimes J, et al. Relations between suicide and traumatic brain injury, psychiatric diagnoses, and relationship problems, active component, U.S. Armed Forces, 2001–2009. *MSMR*. 2012; 19(2):7–11.
7. Rupp BL, Ying S, and Stahlman S. Psychiatric medical evacuations in individuals with diagnosed pre-deployment family problems, active component, U.S. Armed Forces, 2002–2014. *MSMR*. 2018; 25(10):9–15.
8. Vasterling JJ, Proctor SP, Friedman MJ, et al. PTSD symptom increases in Iraq-deployed soldiers: Comparison with nondeployed soldiers and associations with baseline symptoms, deployment experiences, and postdeployment stress. *J Traum Stress*. 2010;23(1):41–51.
9. Hoge CW, Auchterlonie JL, Milliken CS. Mental health problems, use of mental health services, and attrition from military service after returning from deployment to Iraq or Afghanistan. *JAMA*. 2006;295(9):1023–1032.
10. Real Warriors Campaign. Accessed 31 July 2021. https://www.health.mil/Military-Health-Topics/Centers-of-Excellence/Psychological-Health-Center-of-Excellence/Real-Warriors-Campaign
11. 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.
12. Czeisler MÉ, 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.
13. Czeisler MÉ, 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.
14. Department of Defense (DoD) Quarterly Suicide Report (QSR) 1st Quarter, CY 2021. Accessed 31 July 2021. https://www.dspo.mil/QSR/
15. World Health Organization and Calouste Gulbenkian Foundation. Social determinants of mental health. Geneva, World Health Organization, 2014.

Brief Report

Prevalence of Screening Positive for Post-Traumatic Stress Disorder Among Service Members Following Combat-Related Injury

Andrew J. MacGregor, PhD; Katheryne G. Perez, MPH; Cameron T. McCabe, PhD; Amber L. Dougherty, MPH; Sarah M. Jurick, PhD; Michael R. Galarneau, MS

The post-9/11 conflicts in Iraq and Afghanistan resulted in the most U.S. military casualties since Vietnam.[1] Asymmetric warfare dominated the battlefield, commonly in the form of improvised explosive devices and other blast weaponry, which placed infantry and combat support personnel at risk of injury.[2] As casualty numbers increased during these conflicts, so too did the survivability rate relative to previous wars, most notably due to advances in personal protective equipment and field medical care.[3] This led to a shift in resources towards long-term rehabilitation of wounded service members to ameliorate physical and mental health sequelae.[2,4]

Post-traumatic stress disorder (PTSD) is frequently reported among military personnel, particularly those with combat-related injury.[5,6] Koren et al.[5] hypothesized multiple etiologies for the relationship between combat-related injury and PTSD, including increased levels of perceived threat to life and peritraumatic dissociation (i.e., feeling emotionally numb or separated from a traumatic event) among injured relative to non-injured personnel. An increased incidence of PTSD is associated with physical problems and chronic health conditions after combat-related injury.[7,8] Moreover, assessment of PTSD following combat-related injury is essential for planning appropriate treatment protocols and improving long-term well-being.[4,9]

This report describes the prevalence of screening positive for PTSD and the association with injury severity and time since injury among U.S. military personnel injured during combat operations.

METHODS

Data were collected from the Wounded Warrior Recovery Project (WWRP), a longitudinal examination of patient-reported outcomes among service members injured on deployment in post-9/11 conflicts.[10] Participants in the WWRP are identified from the Expeditionary Medical Encounter Database (EMED), a deployment health repository maintained by the Naval Health Research Center that includes clinical records of service members injured during overseas contingency operations since 2001. Records are collected throughout the continuum of care (i.e., from point of injury through rehabilitation).[11] Individuals who sustained an injury during combat operations after 1 September 2001 are eligible for the WWRP and approached via postal mail and email to provide informed consent to complete biannual assessments for 15 years. Recruitment for the WWRP began in November 2012 and is ongoing.

The present study utilized cross-sectional data for 3,847 WWRP participants collected between September 2018 and April 2020. WWRP measures and procedures were updated in late 2018 to remain consistent with current standards of measurement. Specifically, the PTSD screening instrument was updated to the PTSD Checklist for the DSM-5 (PCL-5).[12] The PCL-5 shows good psychometric properties and has been used with military samples.[13,14] Scores on the PCL-5 were summed to create a total symptom severity score. A standard cutoff of 33 indicated a positive screen for PTSD. Injury dates, Injury Severity Scores (ISS), and demographics for this study were obtained from the EMED. The ISS is a composite measure of overall injury severity that accounts for multiple injuries to different body regions.[15] Prevalence of screening positive for PTSD was calculated and stratified by ISS (mild [ISS 1–3], moderate [ISS 4–8], or serious/severe [ISS 9+]) and time between injury and WWRP assessment in quartiles (0.4–7.3, 7.4–10.7, 10.8–13.0, or 13.1–17.8 years). Chi-square tests assessed differences by PTSD screening status. An alpha level of 0.05 was considered statistically significant. Analyses were performed in SAS/STAT software, version 9.4 (SAS Institute, Cary, NC).

RESULTS

The study population consisted mostly of young (<30 years old), non-Hispanic White, and male service members in the Army with mild ISSs **(Table)**. Missing data were observed for sex (n = 4), race/ethnicity group (n = 325), and rank (n = 21). Approximately half completed a WWRP assessment more than 10.8 years after injury, and 38.7% screened positive for PTSD. Service members who screened positive for PTSD were more likely to be non-White (p <.001), non-Army (p <.001), and lower- to midlevel-enlisted (E1–E6; p <.001) with mild or moderate ISSs (p =.001)

Overall, the proportion of service members who screened positive for PTSD increased by time since injury quartile **(Figure)**; 35.9% of participants who completed an assessment 0.4–7.3 years after injury screened positive for PTSD, compared with 41.4% who completed the assessment 13.1–17.8 years after injury. Participants with serious/severe injuries had the lowest prevalence of screening positive for PTSD in all time since injury quartiles (30.8–38.0%), while those with moderate injuries had the highest prevalence in the final 2 quartiles (44.5%).

TABLE. Demographic, military, and injury characteristics of Wounded Warrior Recovery Project participants, by post-traumatic stress disorder (PTSD) screening outcome,[a] September 2018–April 2020

	PTSD positive		PTSD negative		Total		p-value
	No.	%	No.	%	No.	%	
Total	1,490	100.0	2,357	100.0	3,847	100.0	
Sex[b]							
Male	1,422	95.6	2,250	95.5	3,672	95.6	.973
Female	66	4.4	105	4.5	171	4.5	
Age group (years)							
≤21	181	12.2	274	11.6	455	11.8	.844
21–24	507	34.0	790	33.5	1,297	33.7	
25–29	376	25.2	609	25.8	985	25.6	
30–34	213	14.3	324	13.8	537	14.0	
35–39	115	7.7	180	7.6	295	7.7	
40+	98	6.6	180	7.6	278	7.2	
Race/ethnicity group[b]							
Non-Hispanic White	985	73.2	1,762	81.0	2,747	78.0	<.001
Hispanic	156	11.6	176	8.1	332	9.4	
Non-Hispanic Black	108	8.0	111	5.1	219	6.2	
Asian/Pacific Islander	66	4.9	90	4.1	156	4.4	
American Indian/Alaska Native	31	2.3	37	1.7	68	1.9	
Service							
Army	1,022	68.6	1,690	71.7	2,712	70.5	<.001
Marine Corps	410	27.5	560	23.8	970	25.2	
Navy	45	3.0	56	2.4	101	2.6	
Air Force	13	0.9	51	2.2	64	1.7	
Rank[b]							
E1–E3	390	26.3	499	21.3	889	23.2	<.001
E4–E6	906	61.2	1,291	55.1	2,197	57.4	
E7–E9	114	7.7	180	7.7	294	7.7	
Officer/warrant officer	71	4.8	375	16.0	446	11.7	
Injury Severity Score							
Mild (1–3)	800	53.7	1,237	52.5	2,037	53.0	.001
Moderate (4–8)	398	26.7	549	23.3	947	24.6	
Serious/severe (9+)	292	19.6	571	24.2	863	22.4	
Time since injury quartile (years)							
0.4–7.3	347	23.3	620	26.3	967	25.1	.069
7.4–10.7	360	24.2	592	25.1	952	24.7	
10.8–13.0	388	26.0	587	24.9	975	25.3	
13.1–17.8	395	26.5	558	23.7	953	24.8	

[a]PTSD positive was defined as a total score of 33 or higher on the PTSD Checklist for the DSM-5 (PCL-5).
[b]Missing data observed among some study participants for sex (n = 4), race/ethnicity group (n = 325) and rank (n = 21).
PTSD, post-traumatic stress disorder.

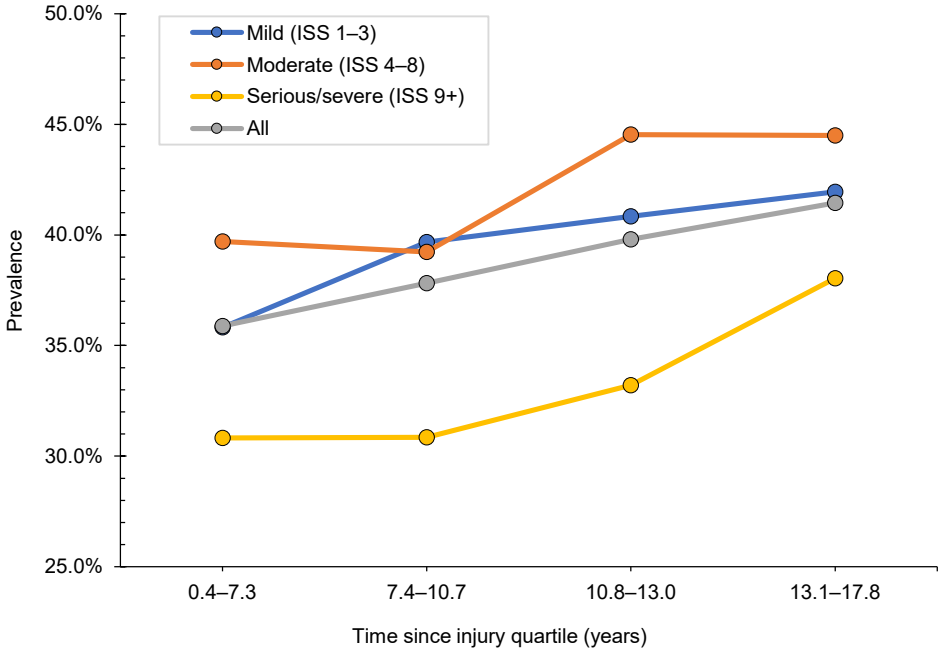
EDITORIAL COMMENT

Approximately 39% of WWRP participants screened positive for PTSD, which is higher than the 28% identified in a previous study using the same instrument among military personnel with high combat exposure.[14] Another study among Marines and Soldiers returning from deployment identified 12–13% PTSD positive using a 4-item PTSD screening instrument.[16] In the present study, all service members had at least 1 potentially traumatic event (i.e., combat-related injury), which could explain the higher prevalence of participants who screened positive for PTSD relative to other studies.

The finding of increasing prevalence by time since injury suggests that PTSD may develop or persist several years after combat-related injury, and underscores the need for continual assessment. The higher prevalence of screening positive for PTSD in participants with mild or moderate combat-related injuries suggests that PTSD symptoms in these individuals may not have been as promptly or readily identified and treated as in those with serious/severe injuries. Further, service members with serious/severe injuries likely received more extensive care for physical ailments and may have been regularly assessed for mental health symptoms leading to earlier identification, treatment, and resolution. Other aspects of serious/severe combat-related injuries, such as medications received during treatment in-theater, could also explain lower PTSD prevalence in this group.[17]

The results of this study highlight the importance of screening for PTSD after combat-related injury even after long periods of time. Both the Post-Deployment Health Assessment and Periodic Health Assessment should continue to be used to identify and refer individuals at risk for PTSD. Given that service members may be averse to reporting mental health symptoms due to non-anonymity of these assessments,[18] programs aimed at reducing the stigma associated with mental health care in the military should be prioritized.[19] In addition, medical providers who treat combat-related injuries should routinely screen service members for mental

FIGURE. Prevalence of screening positive for post-traumatic stress disorder (PTSD)[a] by Injury Severity Score (ISS) and time since injury, Wounded Warrior Recovery Project participants, September 2018–April 2020



[a]PTSD positive was defined as a total score of 33 or higher on the PTSD Checklist for the DSM-5 (PCL-5).

health concerns, as individuals presenting for physical health complaints may be simultaneously experiencing psychological symptoms.[20]

There are some limitations that should be considered when interpreting the results of this study. This analysis examined time since injury in mutually exclusive groups, rather than repeated measures within individuals, and thus trajectory of PTSD over time could not be elucidated. Similarly, the WWRP does not collect information related to history of PTSD prior to injury. Further, the specific role of injury on the development of PTSD cannot be clarified without a detailed accounting of other factors (e.g., physical health, comorbidities, and life stressors) following combat-related injury.

In conclusion, service members and veterans with combat-related injuries are at risk of screening positive for PTSD even more than a decade after injury. This warrants future research to explore the role of injury severity and factors associated with resiliency, persistence, and recovery. Resources should be prioritized for early intervention and mitigation in this population during active service and post-military discharge.

Author Affiliations: Naval Health Research Center, San Diego, CA (Dr. MacGregor, Ms. Perez, Dr. McCabe, Ms. Dougherty, Dr. Jurick, and Mr. Galarneau); Axiom Resource Management Inc., San Diego, CA (Dr. MacGregor); Leidos, Inc., San Diego, CA (Ms. Perez, Dr. McCabe, Ms. Dougherty, Dr. Jurick).

 This report was supported by the U.S. Navy Bureau of Medicine and Surgery under work unit no. 60808. The views expressed in this article are those of the authors and do not necessarily reflect the official policy or position of the Department of the Navy, Department of Defense, nor the U.S. Government. The study protocol was approved by the Naval Health Research Center Institutional Review Board in compliance with all applicable Federal regulations governing the protection of human subjects. Research data were derived from an approved Naval Health Research Center Institutional Review Board protocol, number NHRC.2009.0014.

REFERENCES

1. DeBruyne NF, Leland A; Congressional Research Service. American war and military operations casualties: lists and statistics. Accessed 1 June 2021. https://fas.org/sgp/crs/natsec/RL32492.pdf
2. Greer N, Sayer N, Kramer M, Koeller E, Velasquez T. Prevalence and epidemiology of combat blast injuries from the military cohort 2001–2014. Washington, DC: Department of Veterans Affairs; 2016.
3. Cannon JW, Holena DN, Geng Z, et al. Comprehensive analysis of combat casualty outcomes in US service members from the beginning of World War II to the end of Operation Enduring Freedom. *J Trauma Acute Care Surg.* 2020;89(Suppl 2):S8–S15.
4. Sayer NA, Cifu DX, McNamee S, et al. Rehabilitation needs of combat-injured service members admitted to the VA Polytrauma Rehabilitation Centers: the role of PM&R in the care of wounded warriors. *PM R.* 2009;1(1):23–28.
5. Koren D, Norman D, Cohen A, Berman J, Klein EM. Increased PTSD risk with combat-related injury: a matched comparison study of injured and uninjured soldiers experiencing the same combat events. *Am J Psychiatry.* 2005;162(2):276–282.
6. Walker LE, Watrous J, Poltavskiy E, et al. Longitudinal mental health outcomes of combat-injured service members. *Brain Behav.* 2021;11(5):e02088.
7. Grieger TA, Cozza SJ, Ursano RJ, et al. Posttraumatic stress disorder and depression in battle-injured soldiers. *Am J Psychiatry.* 2006;163(10):1777–1783.
8. Watrous JR, McCabe CT, Jones G, et al. Low back pain, mental health symptoms, and quality of life among injured service members. *Health Psychol.* 2020;39(7):549–557.
9. Woodruff SI, Galarneau MR, McCabe CT, Sack DI, Clouser MC. Health-related quality of life among US military personnel injured in combat: findings from the Wounded Warrior Recovery Project. *Qual Life Res.* 2018;27(5):1393–1402.
10. Watrous JR, Dougherty AL, McCabe CT, Sack DI, Galarneau MR. The Wounded Warrior Recovery Project: a longitudinal examination of patient-reported outcomes among deployment-injured military personnel. *Mil Med.* 2019;184(3–4):84–89.
11. Galarneau MR, Hancock WC, Konoske P, et al.

The Navy-Marine Corps Combat Trauma Registry. *Mil Med.* 2006;171(8):691–697.
12. Weathers FW, Litz BT, Keane TM, Palmieri PA, Marx BP, Schnurr PP. The PTSD Checklist for DSM-5 (PCL-5) – Standard [Measurement instrument]. National Center for PTSD Web site. Accessed 1 June 2021. https://www.ptsd.va.gov/professional/assessment/documents/PCL5_Standard_form.PDF
13. Blevins CA, Weathers FW, Davis MT, Witte TK, Domino JL. The posttraumatic stress disorder checklist for DSM-5 (PCL-5): development and initial psychometric evaluation. *J Trauma Stress.* 2015;28(6):489–498.
14. Hoge CW, Riviere LA, Wilk JE, Herrell RK, Weathers FW. The prevalence of post-traumatic stress disorder (PTSD) in US combat soldiers: a head-to-head comparison of DSM-5 versus DSM-IV-TR symptom criteria with the PTSD checklist. *Lancet Psychiatry.* 2014;1(4):269–277.
15. Baker SP, O'Neill B, Haddon W Jr, Long WB. The injury severity score: a method for describing patients with multiple injuries and evaluating emergency care. *J Trauma*. 1974;14:187–96.
16. Mustillo SA, Kysar-Moon A, Douglas SR, et al. Overview of depression, post-traumatic stress disorder, and alcohol misuse among active duty service members returning from Iraq and Afghanistan, self-report and diagnosis. *Mil Med.* 2015;180(4):419–27.
17. Holbrook TL, Galarneau MR, Dye JL, Quinn K, Dougherty AL. Morphine use after combat injury in Iraq and post-traumatic stress disorder. *N Engl J Med.* 2010;362(2):110–117.
18. Warner CH, Appenzeller GN, Grieger T, et al. Importance of anonymity to encourage honest reporting in mental health screening after combat deployment. *Arch Gen Psychiatry.* 2011;68(10):1065–1071.
19. Ben-Zeev D, Corrigan PW, Britt TW, Langford L. Stigma of mental illness and service use in the military. *J Ment Health.* 2012;21(3):264–273.
20. MacGregor AJ, Zouris JM, Watrous JR, et al. Multimorbidity and quality of life after blast-related injury among US military personnel: a cluster analysis of retrospective data. *BMC Public Health.* 2020;20(1):578.

Mental Health Disorders, Behavioral Health Problems, Fatigue and Sleep Outcomes in Remotely Piloted Aircraft/Manned Aircraft Pilots, and Remotely Piloted Aircraft Crew, U.S. Air Force, 1 October 2003–30 June 2019

John W. Kieffer, MD (Maj, USAF); Shauna Stahlman, PhD, MPH

U.S. Air Force (USAF) manned aircraft (MA) pilots and remotely piloted aircraft (RPA) pilots and their non-pilot crew form part of the forward-most contingent of airpower. Limited information exists on the incidence of mental health (MH) disorders, behavioral health (BH) problems, sleep disorders, and fatigue among these groups. Incidence rates and incidence rate ratios of these conditions were calculated among all active component USAF members during the period from 1 October 2003 to 30 June 2019. Compared to those in all other USAF occupations, RPA and MA pilots had statistically significantly lower risk of MH and BH outcomes while RPA crew shared a risk similar to other USAF members, although with higher risk of post-traumatic stress disorder and lower risk of substance- and alcohol-related disorders. This pattern was similar for fatigue outcomes except RPA crew had slightly higher risk. All 3 occupational groups had elevated risk for sleep disorders, and RPA pilots had 32% higher risk compared to those in all other USAF occupations. This study highlights that pilots have lower risk and/or reporting tendency for MH disorders, BH problems, and fatigue, while sleep disorders are common among service members in all of these (RPA/MA pilot, RPA crew) occupations.

WHAT ARE THE NEW FINDINGS?

Adjusted incidence rate ratios of MH disorders, BH problems and fatigue were lower among RPA pilots and MA pilots, while fatigue was higher among RPA crew compared to other USAF occupations. All 3 groups had higher risk for sleep disorders compared to other USAF occupations.

WHAT IS THE IMPACT ON READINESS AND FORCE HEALTH PROTECTION?

Understanding the burden of these outcomes is important for gauging the health of operational USAF members and to help direct actions to reduce and/or prevent the highest risk health concerns. This study can inform leadership's prioritization of resources to maximize pilot and air crew health and readiness.

In the Department of Defense (DoD), the years from 2002 through 2010 saw an increase of nearly 45-fold (167 to 7,500) in the quantity of unmanned aerial vehicles (UAVs).[1] U.S. Air Force (USAF) remotely piloted aircraft (RPA) have increased from 21 in 2005 to a projected 318 in 2020.[2] Operational USAF members, like unmanned aerial vehicle (UAV) pilots and their crew members, face dynamic challenges unique to their occupations including mental and social stressors. Recent wars in Iraq and Afghanistan have precipitated a large burden of mental and behavioral health (MH/BH) conditions among U.S. military service members. Although the incidence of MH/BH conditions have decreased slightly since 2007 among all active component service members,[3] it is important to conduct surveillance of trends of MH/BH conditions in specific occupational groups which may be at greater risk of these conditions due to operational demands and stressors associated with those occupations.[4]

The overall decreasing trend in MH/BH conditions among U.S. military personnel may not apply to the RPA community (pilots and the crew [sensor operator and mission intelligence coordinator]). The observed small overall decline in incidence rates of MH/BH conditions may be partially due to decreased deployment activity in Iraq (Operation Iraqi Freedom/OIF, Operation New Dawn/OND) and Afghanistan (Operation Enduring Freedom/OEF) in 2010 and 2014, respectively. However, such decreases in conventional deployed operations may not apply to those RPA pilots and crew who work within a "deployed-in-garrison" setting that involves long hours, shift work, and exposure to traumatic real-time events.[5] In fact, the main mission of RPA teams, Combat Air Patrols (CAPs), has increased from 5 CAPs in 2004 to 65 in 2014 and have remained at high levels.[6] These CAP missions can and often do operate 24 hours a day every day of the year. Furthermore, beyond elevated rates of MH disorder diagnoses, given their unique occupational setting, RPA teams may also be at greater risk of insomnia, fatigue, and occupational burnout.[7] Over 6% of U.S. RPA pilots were noted to meet post-traumatic stress disorder (PTSD) symptom criteria.[8] Other studies indicate that, in U.K. RPA pilots, the shift-work features of this occupation are among the greatest sources of stress and diminished functional ability.[9]

Like RPA pilots and crew, manned aircraft (MA) pilots are in a unique occupation compared to many other USAF service members. MA pilots constitute only a fraction of the total USAF but perform a critical mission on the forefront of the operational force. Frequent deployment demands, sometimes reaching a 1:1 combat-to-dwell

ratio (the ratio of time deployed to time at home), may pose formidable demands on the MH of these aviators. Related conditions such as fatigue and sleep disorders are also historically common concerns among MA pilots.[10]

Studies on the incidence of MH/BH and fatigue-related conditions in USAF pilots and crew are limited. In a relevant prior study, Otto and Webber investigated rates of incident MH disorder diagnoses and BH outcomes among MA and RPA pilots in the USAF between 1 October 2003 and 31 December 2011.[11] Their findings indicated similar rates of MH disorder diagnoses among MA pilots and their RPA pilot counterparts, both of whom had lower rates than those in other USAF occupations (as designated by Air Force Specialty Code [AFSC]). Changes in the nature of USAF missions since the Otto and Webber study and the ability to include other diagnoses and outcomes (i.e., sleep disorders and fatigue) make the current study a more inclusive characterization of the health risks of this population.

This study describes the demographic and military characteristics of RPA pilots, RPA crew, and MA pilots as well as the incidence rates and rate ratios of MH/BH conditions, sleep disorders, and fatigue among these 3 groups of pilots and crew compared to service members in all other USAF occupations during the surveillance period.

METHODS

The surveillance period was 1 October 2003 (the inception date for the RPA pilot AFSC) through 30 June 2019. The surveillance population included all active component (AC) Air Force members serving at any time from 1 October 2003 through 31 December 2018. Diagnoses were ascertained from administrative medical records maintained in the Defense Medical Surveillance System (DMSS) that document outpatient and inpatient encounters of active component service members. Such records reflect care in fixed military treatment facilities of the Military Health System (MHS) and in civilian health care settings where care is paid for by the MHS. Health care encounters of deployed service members were obtained from the Theater Medical Data Store (TMDS).

This analysis included service members in 1 of 4 occupational groups (categorized by AFSC): RPA pilots, MA pilots, RPA crew, and all other USAF occupations **(Table 1)**. If service members served in multiple AFSCs during their military career, they were assigned to the highest AFSC they had held, as designated by a ranking of the 4 AFSC groups (highest to lowest): RPA pilot, MA pilot, RPA crew, all other USAF. For example, if a service member had served as an RPA crew member, other USAF occupation, and an RPA pilot during the course of his/her career, then that person was designated as an RPA pilot for the purposes of this study. Only MA pilots with a history of having deployed for at least 30 days to OEF, OIF, or OND were included in the analysis.

The follow-up period for RPA/MA pilots, RPA crew, or other USAF members began after completion of 30 days of service (person-time began at this point). They were censored from observation at separation from active duty or at the end of the surveillance period. Prevalent cases were excluded but an incident case in one outcome category did not preclude persons from being incident cases in another outcome category. For example, an incident case of PTSD would not preclude that same person from being counted as an incident case of depression.

There were 4 main categories of outcomes: MH disorders (acute stress disorder, adjustment disorders, alcohol-related disorders, anxiety disorders, depressive disorders, PTSD, sexual dysfunction not due to substance/physiologic condition, and substance-related disorders), behavioral health problems (suicidal/homicidal ideation, family/support group problems, maltreatment-related, lifestyle problems, and substance abuse counseling), sleep disorders (excluding sleep apnea and other physiologic etiologies), and fatigue. To meet the case definition for a MH disorder, a person must have had either 1 hospitalization with a defining International Classification of Diseases, 9th Revision (ICD-9)/International Classification of Diseases, 10th Revision (ICD-10) diagnosis code **(Table 2)** in the first or second diagnostic position or 2 or more outpatient or TMDS encounters occurring within 180 days (not on same day) or 1 outpatient encounter in a psychiatric or mental health care specialty

TABLE 1. Air Force Specialty Codes (AFSCs) used in categorizing service members into occupational groups[a]

	AFSC
RPA pilots	11U (RPA pilot-former MA pilot) 12U (RPA pilot-former CSO field) 18A (attack RPA pilot) 18G (generalist RPA pilot) 18R (reconnaissance RPA pilot) 1U1 (enlisted RPA pilot)
MA pilots[b]	11B (bomber pilot) 11F (fighter pilot) 11G (generalist pilot) 11H (rescue pilot) 11M (mobility pilot) 11R (reconnaissance/surveillance/electronic warfare pilot) 11S (special operations pilot)
RPA crew	1U0X (Sensor Operator) 1N1X (Geospatial Intelligence) 1N8X (Targeting Analyst)
All other USAF occupations	All other AFSCs

[a]If service members served in multiple AFSCs during their military career, they were assigned to the highest AFSC they had held, as designated by a ranking of the 4 AFSC groups (highest to lowest): RPA pilot–MA pilot–RPA crew–all other USAF.
[b]MA pilots were those with a history of having deployed for at least 30 days to OEF, OIF or OND and also held one of these AFSCs.
RPA, remotely piloted aircreaft; MA, manned aircraft; USAF, U.S. Air Force.

setting defined by Medical Expense and Performance Reporting System (MEPRS) code starting with "BF", with a case-defining diagnosis in the first or second diagnostic position. To meet the case definitions for a BH problem, sleep disorder, or fatigue, 1 encounter (inpatient or outpatient/TMDS) with the defining diagnosis in any diagnostic position was required. The case definitions used in this analysis are generally consistent with the AFHSD surveillance case definitions for mental heath conditions; however, a notable difference is the exclusion of ICD-10 code F10.11 which represents alcohol use disorders in remission.

Incidence rates (IRs) per 1,000 person-years (p-yrs) and adjusted incidence rate ratios (AIRRs) with their 95% confidence intervals (CIs) were calculated using all other USAF occupations as the reference group. For the purposes of examining IRs over time, the IRs of MH disorders and BH problems were combined as 1 outcome and also broken down into specific categories. IRRs were calculated using a multivariable Poisson regression model that adjusted for age group, sex, race/ethnicity group, and number of deployments. Data analysis was carried out using SAS/STAT software, version 9.4 (2014, SAS Institute, Cary, NC) and R, version 3.6.2 (2019, R Core Team).

RESULTS

USAF members in service during the surveillance period included 2,687 RPA pilots, 13,384 MA pilots (with at least 1 deployment), 6,793 RPA crew, and 840,812 service members in other occupations **(Table 3)**. Several differences in demographic and military characteristics were apparent between these occupational groups. Both RPA and MA pilots were predominately male (94.0% and 94.5%, respectively) while RPA crew and other USAF were less so (71.5% and 78.7%, respectively). RPA pilots tended to be older (46.7% aged 30 years or older) than other occupational groups: MA pilots (26.5%); RPA crew (12.6%); and other USAF (19.1%). RPA and MA pilots were predominantly non-Hispanic White (82.7% and 86.6%, respectively) and RPA crew and other USAF less so (69.8% and 66.8%, respectively). More than one-third (35.3%) of MA pilots had 3 or more deployments followed by RPA pilots (18.8%), other USAF (4.5%), and RPA crew (2.6%).

Over the course of the surveillance period, crude (unadjusted) annual rates of

TABLE 2. Mental and behavioral health, sleep disorders and fatigue outcome categories ICD-9 and ICD-10 diagnostic codes

Outcome categories	ICD-9[a]	ICD-10[a]
Mental health disorders		
Acute stress disorder	308.*	F43.0
Adjustment disorders	309.* (except 309.81)	F43.2*, F43.8, F43.9, F93.0, F94.8, F94.9
Anxiety disorders	300.0*, 300.2*, 300.3	F40*, F41*, F42*
Depressive disorders	296.2*, 296.3* (excluding 296.34), 296.9*, 300.4, 311	F32.*, F33.*, F34, F34.1, F34.8, F34.9, F39, F34.81, F34.89
Post-traumatic stress disorder	309.81	F43.1*
Sexual dysfunction not due to a substance or known physiological condition	302.7*	F52.*
Alcohol-related disorders	291.0 , 291.81, 303.0*, 305.0*, 303.9*	F10.1* (except F10.11), 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*
Psychogenic asthenia	300.5	F48.8
Behavioral health problems		
Homicidal and suicidal ideations	V628.5, V628.4	R45.85*
V- or Z-coded behavioral health problems (family/support groups, maltreatment-related, lifestyle, substance abuse counseling)	V610*, V69*, V613, V6141, V6142, V6149, V618, V619, V6282, V6111, V6112, V6121, V6122, V6283, V4985, V624, V6289, V7101, V7102, V6542	Z63*, Z69*, Z72*, Z73*, Z714*, Z715*, Z716
Fatigue/Sleep disorders		
Fatigue	780.71, 780.79, 780.52, 327.09, 327.10, 780.54,	R53.8*
Sleep disorders	307.41–307.44, 307.46, 307.47, 307.49, 327.09, 327.10–327.15, 327.3*, 327.02, 780.50, 780.52, 780.54, 780.59	G47.00, G47.09, G47.10–G47.13, G47.19, G47.20–G47.29, G47.8, G47.9, F51, F51.0*, F51.1*, F51.3, F51.4, F51.5, F51.8, F51.9

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

TABLE 3. Demographic and military characteristics, active component Air Force service members, by study group, October 2003–30 June 2019

	Total		Cohort							
			RPA pilots		Deployed MA pilots		RPA crew		All other USAF	
	No.	%	No.	%	No.	%	No.	%	No.	%
Total	863,676	100.0	2,687	100.0	13,384	100.0	6,793	100.0	840,812	100.0
Sex										
Male	681,771	78.9	2,525	94.0	12,644	94.5	4,856	71.5	661,746	78.7
Female	181,905	21.1	162	6.0	740	5.5	1,937	28.5	179,066	21.3
Age group (years)										
18–19	261,291	30.3	0	0.0	0	0.0	2,021	29.8	259,270	30.8
20–24	320,012	37.1	367	13.7	2,547	19.0	2,644	38.9	314,454	37.4
25–29	115,953	13.4	1,066	39.7	7,288	54.5	1,274	18.8	106,325	12.7
30–34	61,018	7.1	737	27.4	1,724	12.9	496	7.3	58,061	6.9
35–39	60,009	7.0	303	11.3	820	6.1	279	4.1	58,607	7.0
40+	45,393	5.3	214	8.0	1,005	7.5	79	1.2	44,095	5.2
Race/ethnicity group										
Non-Hispanic White	580,164	67.2	2,222	82.7	11,591	86.6	4,742	69.8	561,609	66.8
Non-Hispanic Black	121,870	14.1	77	2.9	260	1.9	632	9.3	120,901	14.4
Hispanic	81,382	9.4	184	6.9	559	4.2	701	10.3	79,938	9.5
Other/unknown	80,260	9	204	8	974	7	718	11	78,364	9
Marital status										
Single, never married	557,754	64.6	884	32.9	5,657	42.3	4,615	67.9	546,598	65.0
Married	278,106	32.2	1,709	63.6	7,479	55.9	1,979	29.1	266,939	31.8
Other/unknown	27,816	3.2	94	3.5	248	1.9	199	2.9	27,275	3.2
Education level										
High school or less	632,776	73.3	28	1.0	247	1.9	5,380	79.2	627,121	74.6
Some College	46,050	5.3	13	0.5	12	0.1	734	10.8	45,291	5.4
College or more	117,121	13.6	2,549	94.9	12,643	94.5	375	5.5	101,554	12.1
Unknown	67,729	7.8	97	3.6	482	3.6	304	4.5	66,846	8.0
Rank/grade										
Junior enlisted (E1–E4)	565,696	65.5	0	0.0	0	0.0	5,049	74.3	560,647	66.7
Senior enlisted (E5–E9)	167,763	19.4	22	0.8	0	0.0	1,744	25.7	165,997	19.7
Junior officer (O1–O3)	97,109	11.2	2,127	79.2	11,272	84.2	0	0.0	83,710	10.0
Senior officer (O4–O10)	33,108	3.8	538	20.0	2,112	15.8	0	0.0	30,458	3.6
# of deployments										
0	608,143	70.4	1,126	41.9	0	0.0	5,035	74.1	601,982	71.6
1	140,307	16.3	612	22.8	5,034	37.6	1,142	16.8	133,519	15.9
2	71,800	8.3	443	16.5	3,624	27.1	443	6.5	67,290	8.0
3+	43,426	5.0	506	18.8	4,726	35.3	173	2.6	38,021	4.5
Deployment length (months)										
None	608,143	70.4	1,126	41.9	0	0.0	5,035	74.1	601,982	71.6
<6	79,312	9.2	488	18.2	4,235	31.6	611	9.0	73,978	8.8
6–12	109,242	12.7	598	22.3	4,918	36.8	795	11.7	102,931	12.2
13–18	42,609	4.9	313	11.7	2,529	18.9	242	3.6	39,525	4.7
19+	24,370	2.8	162	6.0	1,702	12.7	110	1.6	22,396	2.7
Time in occupation (years)										
<1	97,745	11.3	159	5.9	182	1.4	413	6.1	96,991	11.5
1–5	353,623	40.9	1,423	53.0	2,877	21.5	3,120	45.9	346,203	41.2
6–10	236,497	27.4	893	33.2	6,148	45.9	2,526	37.2	226,930	27.0
11+	175,811	20.4	212	7.9	4,177	31.2	734	10.8	170,688	20.3

RPA, remotely piloted aircraft; MA, manned aircraft; USAF, U.S. Air Force.

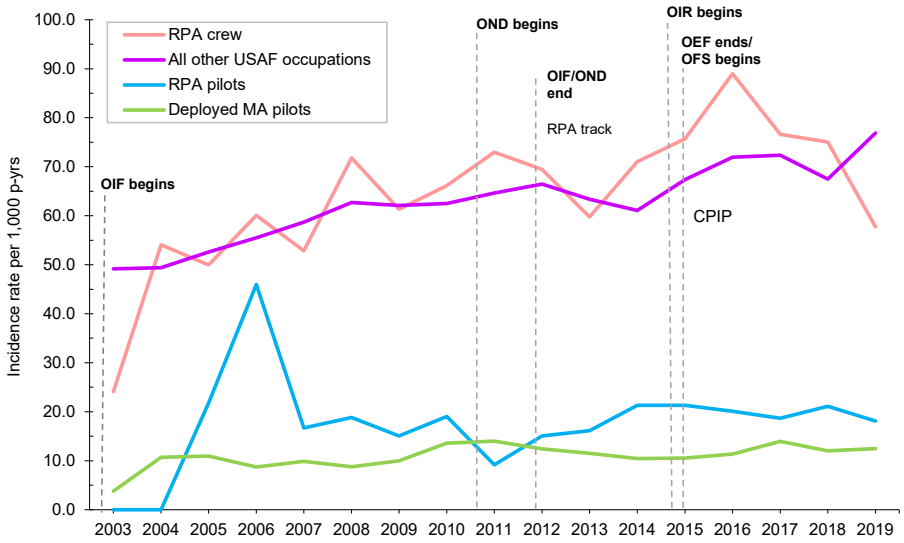
incident MH disorder and BH problem diagnoses were consistently higher among service members working as RPA crew and those in all other USAF occupations compared to RPA and MA pilots **(Figure 1)**. Incidence rates of MH disorder and BH problem diagnoses among all other USAF occupations showed a pronounced and relatively steady increase over time from 49.2 per 1,000 p-yrs in 2003 to 76.9 per 1,000 p-yrs in 2019. Rates for RPA crew also increased over time, but with greater year-to-year fluctuations. Compared to all other USAF occupations and RPA crew, rates among MA pilots remained relatively low and the absolute increase in rates was relatively small over the period (3.8 per 1,000 p-yrs in 2003 to 12.5 per 1,000 p-yrs in 2019).

Patterns of rates of incident fatigue diagnoses over time were similar to those observed for MH disorder and BH problem diagnoses in that rates were consistently higher among RPA crew and those in all other USAF occupations compared to RPA and MA pilots **(Figure 2)**. All occupational groups showed steady increases in fatigue incidence over the surveillance period. Crude annual rates of incident sleep disorder diagnoses showed a different pattern by occupational group in which RPA crew and other USAF occupations demonstrated slight increases over the course of the surveillance period **(Figure 3)**. In contrast, there were marked increases in the rates of sleep disorder diagnoses in both pilot groups beginning in 2010. Rates in these groups peaked in 2013 and again more dramatically in 2017 followed by declines through 2019.

Multivariable regression analysis using all other USAF occupations as the reference group revealed that AIRRs for MH disorder or BH problem diagnoses were lowest among MA pilots (AIRR=0.31; 95% CI: 0.29–0.33) followed by RPA pilots (AIRR=0.44; 95% CI=0.38–0.50) **(Figure 4)**. The adjusted incidence rate of this outcome category among RPA crew showed no difference compared to the rate for those in all other USAF occupations (AIRR=0.97; 95% CI: 0.93–1.02). Fatigue diagnoses followed a similar pattern with MA pilots (AIRR=0.52; 95% CI: 0.49–0.56) and RPA pilots having lower risk (AIRR=0.61; 95% CI: 0.52–0.72) compared to those in all other USAF occupations, and RPA crew showing mildly elevated risk (AIRR=1.10; 95% CI: 1.02–1.18). Sleep disorders demonstrated a different pattern in which all groups showed elevated risk compared to those in all other USAF occupations, with RPA pilots at highest risk: RPA pilots (AIRR=1.32; 95% CI: 1.21–1.43); MA pilots (1.20; 95% CI: 1.16–1.24); and RPA crew (1.10; 95% CI: 1.04–1.16).

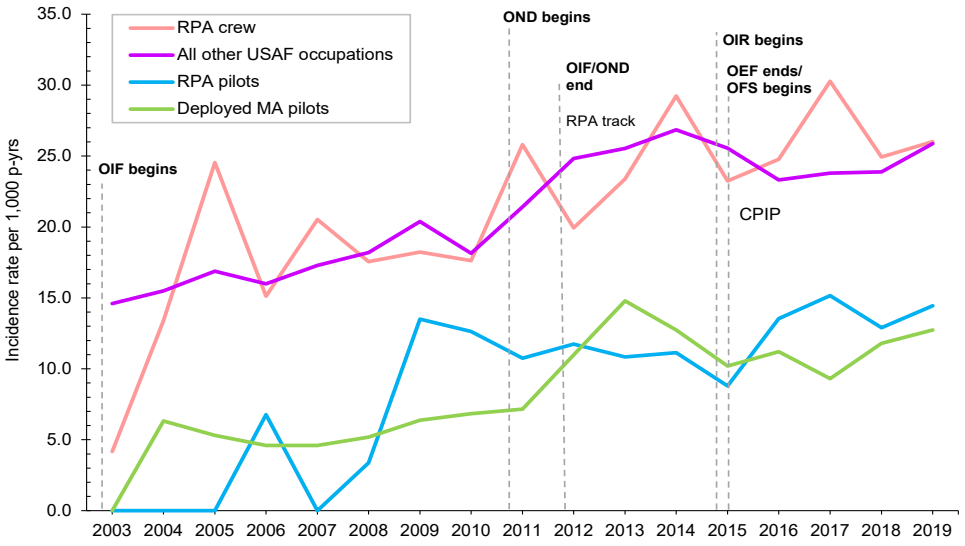
Analysis of AIRRs for specific MH disorder and BH problem diagnoses by occupational group yielded patterns broadly similar to those observed for the overall outcome categories **(Figure 5)**. Compared

FIGURE 1. Unadjusted annual incidence rates of MH disorder or BH problem diagnoses, by occupational group, active component U.S. Air Force service members, 1 October 2003–30 June 2019



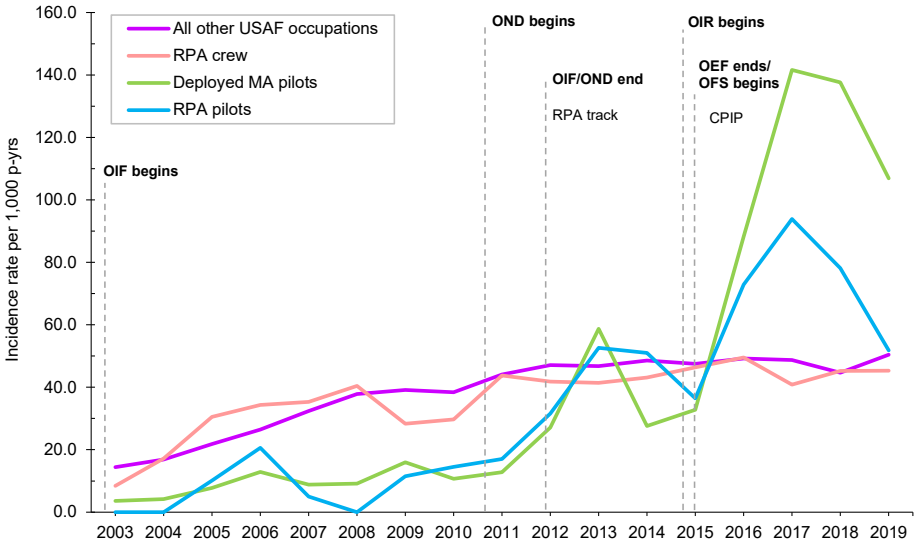
MH, mental health; BH, behavioral health; p-yrs, person-years; OIF, Operation Iraqi Freedom; OND, Operation New Dawn; OEF, Operation Enduring Freedom; OIR, Operation Inherent Resolve; OFS, Operation Freedom's Sentinel; RPA, remotely piloted aircraft; CPIP, Culture and Process Improvement Plan.

FIGURE 2. Unadjusted annual incidence rates of fatigue diagnoses, by occupational group, active component U.S. Air Force service members, 1 October 2003–30 June 2019



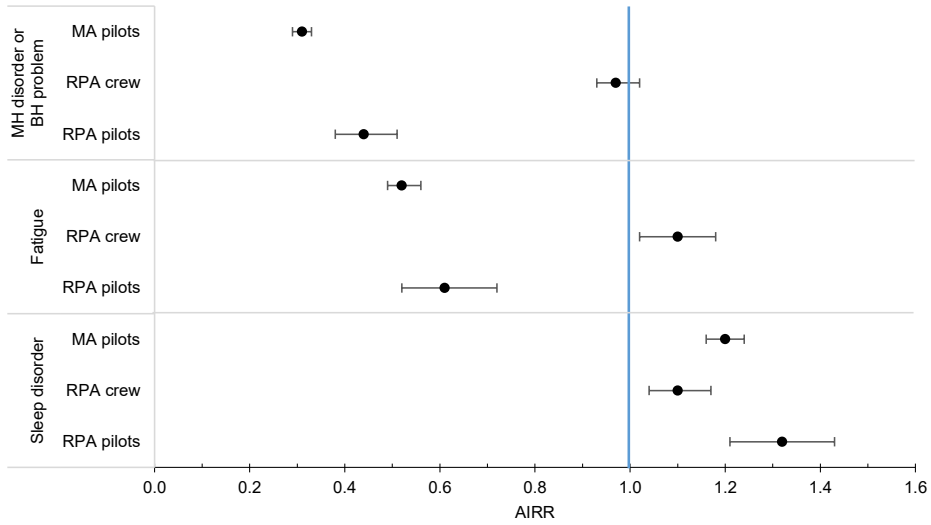
MH, mental health; BH, behavioral health; p-yrs, person-years; OIF, Operation Iraqi Freedom; OND, Operation New Dawn; OEF, Operation Enduring Freedom; OIR, Operation Inherent Resolve; OFS, Operation Freedom's Sentinel; RPA, remotely piloted aircraft; CPIP, Culture and Process Improvement Plan.

FIGURE 3. Unadjusted annual incidence rates of sleep disorder diagnoses, by occupational group, active component U.S. Air Force service members, 1 October 2003–30 June 2019



MH, mental health; BH, behavioral health; p-yrs, person-years; OIF, Operation Iraqi Freedom; OND, Operation New Dawn; OEF, Operation Enduring Freedom; OIR, Operation Inherent Resolve; OFS, Operation Freedom's Sentinel; RPA, remotely piloted aircraft; CPIP, Culture and Process Improvement Plan.

FIGURE 4. Adjusted incidence rate ratios[a] of mental health disorder or behavioral health problem, fatigue, and sleep disorder diagnoses, by occupational group, active component U.S. Air Force service members, 1 October 2003–30 June 2019



MH, mental health; BH, behavioral health; MA, manned aircraft; RPA, remotely piloted aircraft; AIRR, adjusted incidence rate ratio.

[a]IRRs were adjusted for age group, sex, race/ethnicity group, and number of deployments. All other USAF occupations was the reference group.

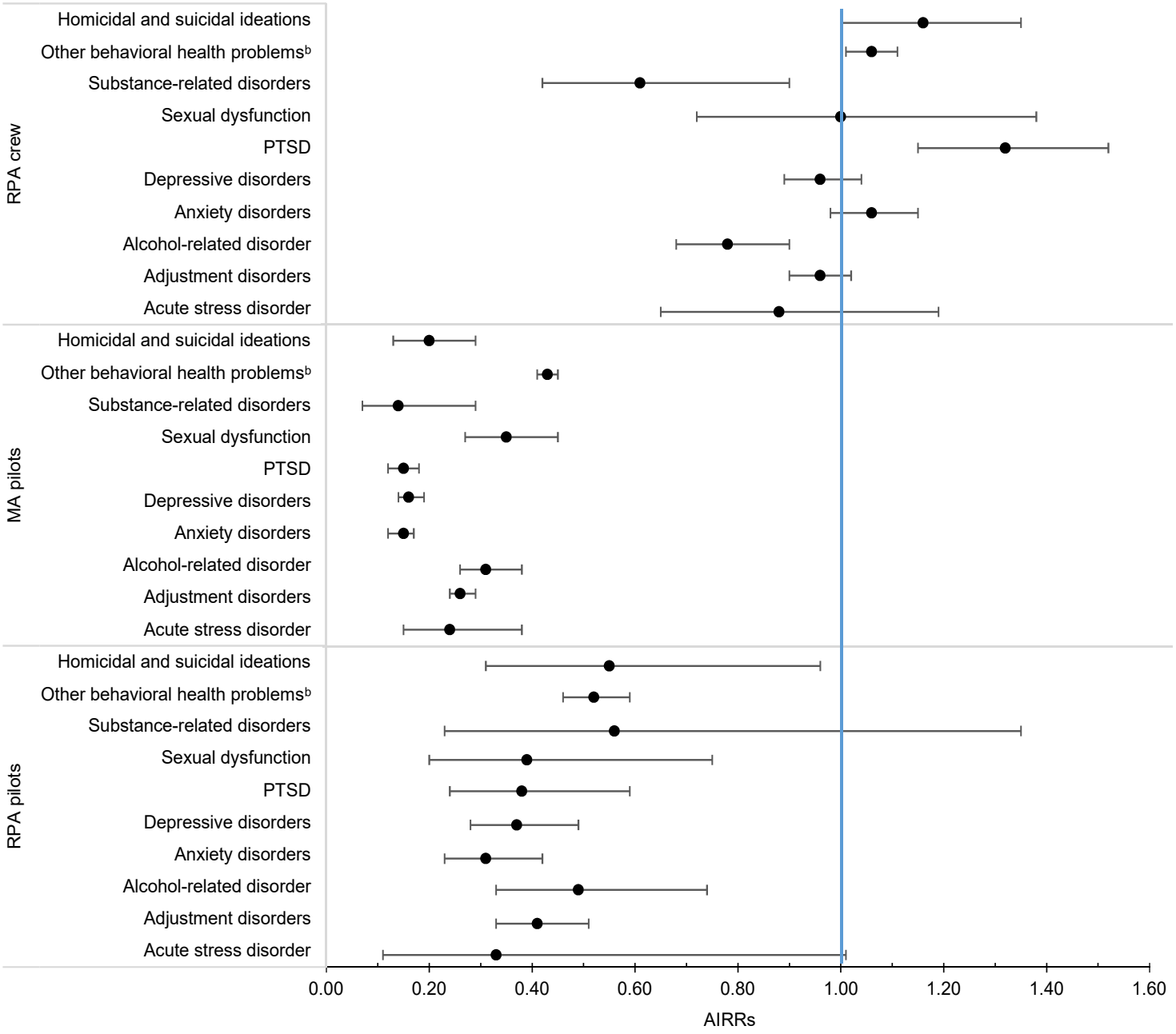
to those in all other USAF occupations, RPA and MA pilots were at lower risk of all of the specific conditions examined. Patterns of specific MH and BH conditions among RPA crew were more varied, however, with RPA crew having significantly higher risk of PTSD (AIRR=1.32; 95% CI: 1.15–1.52), and other behavioral health problems (AIRR=1.06; 95% CI: 1.01–1.11) compared to those in all other USAF occupations, and significantly lower risk of alcohol- (AIRR=0.78; 95% CI=0.68–0.90) and substance-related disorders (AIRR=0.61; 95% CI=0.42–0.90).

EDITORIAL COMMENT

This study found that MA pilots and RPA pilots had lower adjusted incidence rates of MH disorder and BH problem diagnoses compared to those of other USAF service members, and RPA crew did not have a statistically significantly different adjusted incidence of these outcomes compared to USAF service members in other occupations. MA and RPA pilots had lower adjusted incidence rates of fatigue diagnoses while RPA crew had higher incidence than other USAF members. Interestingly, with regard to sleep disorder diagnoses, pilots of both types and RPA crew had higher adjusted incidence rates compared to those in all other USAF occupations.

Findings of lower incidence rates of MH/BH conditions among pilots compared to all other USAF members were not entirely unexpected; a previous study also reported a lower risk of MH/BH outcomes among USAF pilots compared to USAF members overall.[11] Several explanations for these lower rates are conceivable. Flying duty, unsurprisingly, is the defining feature of the pilot occupation and is centrally important to pilots and their careers. Diagnosis of a MH disorder results in revocation of a pilot's flying status until they are able to receive a waiver after successful treatment and resolution of the condition. However, even if a waiver is granted, there is often a period ranging from 3 months to 1 year during which the pilot is not allowed to perform flying duties.[12] This threat of losing flying status and the potential harm to career may make seeking help for MH conditions less common among pilots and may partially explain these results. Another factor, the so-called healthy flyer effect, may also contribute to the lower rates of incident mental health disorder diagnoses and behavioral health problems observed in pilots. Mental and physical requirements to become a pilot are more stringent than for other USAF occupations which may screen out potential pilot candidates at higher risk of these outcomes. Since the creation of the RPA pilot AFSC in 2003, 2 notable changes have occurred within the pilot career field. In 2010, the USAF created an independent AFSC for RPA pilots. Additionally, the first enlisted RPA pilots also came into the USAF for the 2017–2018 fiscal year. In the context of these recent changes, this study's

FIGURE 5. Adjusted incidence rate ratios[a] for specified mental health disorder and behavioral health problem diagnoses, by occupational group, active component U.S. Air Force members, 1 October 2003–30 June 2019



RPA, remotely piloted aircraft; PTSD, post-traumatic stress disorder; MA, manned aircraft; AIRR, adjusted incidence rate ratio.

[a]IRRs were adjusted for age group, sex, race/ethnicity group, and number of deployments. All other USAF occupations was the reference group.

[b]Other behavioral health problems include V- or Z-coded behavioral health problems.

results were consistent with the previous study of pilots in 2013.[11]

RPA crew had similar incidence rates of MH/BH outcomes compared with other USAF personnel. This finding persisted even after adjusting for age group, sex, race/ethnicity group, and number of deployments. The persistence of this finding is not entirely unexpected given similar demographic characteristics between RPA crew and the rest of the non-pilot USAF. However, for several specific MH/BH outcomes, RPA crew did demonstrate a significant difference in incidence rates compared to those in all other USAF occupations. RPA crew had lower adjusted incidence rates of substance- and alcohol-related disorder diagnoses but higher rates of PTSD and BH problems which is consistent with a study of RPA intelligence personnel between 2006 and 2010.[13] It may be that interventions targeted for the RPA crew occupational field could help reduce their elevated incidence of these 2 conditions.

Notably, all groups had elevated risk for sleep disorders compared to those in other USAF occupations. One possible explanation for the elevated incidence of sleep disorders among pilots may be that they feel more at ease reporting to medical professionals for a sleep-related complaint than for a potential underlying MH disorders or BH problems. This elevated risk of sleep disorders among RPA pilots, MA pilots, and RPA crew may be an accurate reflection of increased sleep-related complaints in pilots and crew compared to those in other USAF occupations. This elevated risk may be partly attributable to deployment and/or shift work which can disrupt normal sleep cycles. Sleep complaints could also be a proxy for MH disorders or BH problems. RPA pilot, MA pilot, and RPA crew occupations have features which elevate risk of related concerns such as burnout and exhaustion. This finding is consistent with prior studies of RPA and MA pilots and RPA crews.[7,8,14]

The higher risk of sleep disorders in pilots highlights the potential for adverse long-term outcomes such as burnout, early attrition, and poorer operational performance.[14] Work is already underway to improve USAF service member sleep and reduce fatigue by the Air Force Research Laboratory 711th Human Performance Wing, where researchers are studying sleep with a focus on aircrew.[15]

The current study may inform other efforts such as the Culture and Process Improvement Plan (CPIP) which was developed by USAF leadership in 2015 to improve morale among the RPA community. Heavy workloads combined with manning challenges spurred this effort along with the finding that the top concern among the RPA community was insufficient time outside of work duties.[16] CPIP may have played a role in some of the trends observed in this study by encouraging service members to seek help for these conditions. Unadjusted incidence rates of fatigue in 2015 increased by over 60% among RPA pilots and rates of sleep disorders jumped by 100% in RPA pilots and by nearly 170% in MA pilots. Sleep disorder incidence rates continued to increase until 2018 when they began to fall back towards previous levels.

Several limitations are present in this study. First, the choice to only include MA pilots who have been deployed means that some MA pilots were excluded from the analysis and not considered for the outcomes of interest. The number of MA pilots who have never deployed is likely to be small, but there should be further investigation into the extent of never-deployed pilots and whether they differ in these outcomes. A second limitation of this analysis is related to the classification of exposure. Individuals were only allowed to contribute person-time (and outcomes) towards a single exposure group (RPA pilot, MA pilot, or RPA crew) regardless of whether they served in other groups. Choosing this method aims to most closely represent the final career path of the member to reflect that RPA pilot and MA pilot are more likely to be the most recent AFSC category. This approach was taken given the difficulty of assigning outcomes occurring at different times in a member serving in more than 1 AFSC category. This choice would tend to result in bias towards increased incidence of outcomes assigned to RPA pilots and slightly less so MA pilots. However, except in the sleep outcome, the opposite trend was seen with MA and RPA pilots demonstrating lower incidence than other groups. Therefore, these findings may be slight overestimates of actual incidence. Finally, the low annual case counts for some occupational groups, particularly during the first years of the surveillance period, likely contributed to the pronounced fluctuations in IR estimates observed.

In conclusion, this study provides a longitudinal perspective on an expanded set of operationally-relevant outcomes among RPA/MA pilots and RPA crew. Future operational health studies may explore whether under-reporting of MH/BH outcomes among pilots is a significant concern and may be able to examine methods of reducing sleep disorders among all air crew.

Author Affiliations: Uniformed Services University of the Health Sciences, Bethesda, MD (Maj Kieffer); Armed Forces Health Surveillance Division (Dr. Stahlman).

Acknowledgements: Dr. Clara Ziadeh and Ms. Zheng Hu (Armed Forces Health Surveillance Division) were instrumental in performing data abstraction and statistical analysis.

Disclaimer: The contents, views or opinions expressed in this publication or presentation are those of the author(s) and do not necessarily reflect official policy or position of Uniformed Services University of the Health Sciences, the Department of Defense (DoD), or Departments of the Army, Navy, or Air Force. Mention of trade names, commercial products, or organizations does not imply endorsement by the U.S. Government.

REFERENCES

1. Weatherington D. Current and Future Potential for Unmanned Aircraft Systems. 2010.
2. Cancian M. U.S. Military Forces in FY 2020: Air Force. *Cent Strateg Int Stud*. 2019. Accessed 31 March 2020. https://www.csis.org/analysis/us-military-forces-fy-2020-air-force
3. 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.
4. Armed Forces Health Surveillance Branch. Absolute and relative morbidity burdens attributable to various illnesses and injuries, active component, U.S. Armed Forces, 2018. *MSMR*. 2019;26(5):2–10.
5. Bryan C, Goodman T, Chappelle W, Thompson W, Prince L. Occupational Stressors, Burnout, and Predictors of Suicide Ideation Among U.S. Air Force Remote Warriors. *Mil Behav Heal*. 2018;6(1):3–12.
6. Hardison, Chaitra M., Aharoni E, Larson C, Trochlil S, Hou AC. *Stress and Dissatisfaction in the Air Force's Remotely Piloted Aircraft Community*. Santa Monica, CA; 2017.
7. Armour C, Ross J. The Health and Well-Being of Military Drone Operators and Intelligence Analysts: A Systematic Review. *Mil Psychol*. 2017;29(2):83–98.
8. Chappelle W, Goodman T, Reardon L, Prince L. Combat and operational risk factors for post-traumatic stress disorder symptom criteria among U.S. Air Force remotely piloted aircraft "Drone" warfighters. *J Anxiety Disord*. 2019;62:86–93.
9. Phillips A, Sherwood D, Greenberg N, Jones N. Occupational stress in Remotely Piloted Aircraft System operators. *Occup Med (Lond)*. 2019;69(4):244–250.
10. Neville KJ, Bisson RU, French J, Boll PA, Storm WF. Subjective Fatigue of C-141 Aircrews during Operation Desert Storm. *Hum Factors J Hum Factors Ergon Soc*. 1994;36(2):339–349.
11. Otto JL, Webber BJ. Mental health diagnoses and counseling among pilots of remotely piloted aircraft in the U.S. Air Force. *MSMR*. 2013;20(3):3–8.
12. Department of the Air Force. USAF Medical Service. Aerospace Medicine Waiver Guide. Air Force Waiver Guide. 2 Dec 2020. Accessed 31 March 2020. https://www.afrl.af.mil/Portals/90/Documents/711/USAFSAM/USAF-waiver-guide-201202.pdf?ver=CfL6CVKyrAbqyXS7A-OX_A%3D%3D
13. Ostrowski, Kris Anthony, Psychological Health Outcomes Within USAF Remotely Piloted Aircraft Support Career Fields. *Scholarly Commons*. 2016; PhD Dissertations and Master's Theses. 203.
14. Chappelle W, McDonald K, Prince L, Goodman T, Ray-Sannerud BN, Thompson W. Assessment of Occupational Burnout in U.S. Air Force Predator/Reaper "Drone" Operators. *Mil Psychol*. 2014;26(5–6):376–385.
15. Bedi S. Air Force studies fatigue, sleep to enhance readiness. Air Force Surgeon General Public Affairs. Accessed 31 March 2020. https://www.af.mil/News/Article-Display/Article/2047256/air-force-studies-fatigue-sleep-to-enhance-readiness/
16. Everstine BW. Don't Fear the Reaper. *Air Force Mag*. 2016. Accessed 31 March 2020. https://www.airforcemag.com/article/dont-fear-the-reaper/.

Surveillance of Mental and Behavioral Health Care Utilization and Use of Telehealth, Active Component, U.S. Armed Forces, 1 January 2019–30 September 2020

Leslie Clark, PhD, MS; Michael Fan, PhD; Shauna Stahlman, PhD, MPH

This analysis of population-level health care utilization data evaluates changes in monthly counts and rates of medical encounters for mental and behavioral health (MH/BH) conditions and the proportion of care delivered via telehealth among active component military members of the U.S. Armed Forces during the first 6 months (March–September 2020) of the COVID-19 pandemic. Comparisons are also made to the same time period in the previous year (2019). Telehealth usage increased during the early pandemic and was on average 25% higher during March–September 2020 as compared to the previous year. In contrast, MH/BH outpatient visit rates declined modestly between March and May 2020 before rebounding in June and remaining stable through September 2020. The number of bed days attributable to MH/BH conditions also declined during March and April 2020 and was on average 30% lower during March–September 2020 as compared to the same period in the prior year. Continued surveillance is warranted to track MH/BH health care utilization during the later months of the pandemic to ensure that sufficient resources continue to be directed towards MH/BH care to support the health and readiness of active component service members.

WHAT ARE THE NEW FINDINGS?

During the first 6 months of the COVID-19 pandemic, health care utilization for mental and behavioral health generally declined during March and April but rebounded by June 2020. During the same period, telehealth usage increased during the early pandemic and was on average 25% higher during the period between March and September 2020 as compared to the previous year.

WHAT IS THE IMPACT ON READINESS AND FORCE HEALTH PROTECTION?

The finding that telehealth usage for MH/BH conditions increased (albeit modestly) during the early period of the pandemic, as well as its usage prior to the pandemic, demonstrates that the Military Health System (MHS) was prepared to deliver mental health services via telehealth and increase telehealth services to meet the needs of active component service members.

The World Health Organization declared the spread of coronavirus disease (COVID-19) an international pandemic on March 11, 2020. Subsequently, 2 national emergency declarations related to the pandemic were issued in the U.S. on March 13. Between 1 March and 31 May 2020, 42 U.S. states and territories issued mandatory stay-at-home orders as a mitigation strategy to reduce the spread of COVID-19.[1] The resulting unprecedented and multi-dimensional disruptions to daily life contributed to social isolation, fear and worry about being infected with COVID-19, economic stress, and other factors which can affect mental and behavioral health (MH/BH).

Multiple studies have reported on the negative MH impacts of the pandemic. A systematic review revealed elevated rates of stressors and symptoms of anxiety and depression across 8 countries during the pandemic as compared to the prior year.[2] In the U.S., the Centers for Disease Control and Prevention (CDC) reported considerable increases in symptoms of anxiety and depressive disorders between April and June of 2020[3,4] and elevated rates of suicidal ideation, substance abuse, and other adverse mental health conditions in June 2020[5] when compared to the previous year.

Concomitant with these negative consequences, the COVID-19 pandemic forced many health care institutions to embrace the use of telehealth to efficiently provide quality care to patients. Several large health care systems in the U.S. reported dramatic increases in the use of telehealth with commensurate declines for in-person medical care.[6–8] In addition to the overall shift from in-person to telehealth medical services, health care systems reported increased use of telehealth specifically for mental health care. For example, the U.S. Department of Veterans Affairs experienced an increase of over 500% in telehealth visits for mental and behavioral health care between 11 March and 22 April 2020.[9] Similar patterns for MH/BH visits and telehealth were observed among TRICARE beneficiaries during the COVID-19 pandemic as compared to the same time period in 2019.[10]

However, estimates of the magnitude of change in the utilization of MH/BH health care and telehealth use by active component members of the U.S. Armed Forces have not been published. This surveillance analysis of population-level health care utilization data evaluates changes in monthly counts and rates of medical encounters for MH/BH conditions among active component military members of the U.S. Armed Forces during the first 6 months (March–September 2020) of the COVID-19 pandemic. This analysis also assesses and reports the proportion of MH/BH encounters delivered via telehealth during the surveillance period. Finally, counts and rates of MH/BH encounters during the first 6 months of the pandemic are compared to the same time period in the previous year (2019).

METHODS

The surveillance period for this analysis was 1 January 2019 through 30 September 2020. This retrospective surveillance analysis evaluated health care utilization for MH/BH conditions including outpatient encounters, hospitalizations, and telehealth usage for all active component service members in the U.S. Army, Navy, Air Force, and Marine Corps during the surveillance period. The data used in this analysis were derived from administrative medical records routinely maintained in the Defense Medical Surveillance System (DMSS) consisting of encounters rendered at military treatment facilities (MTFs) and civilian facilities if reimbursed through the Military Health System (MHS) worldwide.

For the surveillance period, monthly summaries of health care utilization for specific MH/BH conditions were quantified using methods consistent with those used in the annual *Medical Surveillance Monthly Report* (*MSMR*) burden analysis.[11] Standard surveillance case definitions developed by the Armed Forces Health Surveillance Division were used to identify International Classification of Diseases, 10th Revision (ICD-10) codes corresponding to the MH/BH conditions of interest **(Table 1)**. All medical encounters for active component service members with an ICD-10 code for a MH/BH condition of interest in the primary (first-listed) diagnostic position were identified. The specific MH/BH conditions evaluated for this analysis included the following: adjustment disorders, alcohol-related disorders, anxiety disorders, depressive disorders, substance-related disorders, suicidal ideation, psychosocial circumstances (e.g., problems related to family circumstances; problems related to other psychosocial circumstances), and insomnia. ICD-10 code F10.11 was not included because this code represents alcohol abuse in remission. Although not specifically a MH/BH diagnosis, insomnia was included in this analysis as it is a common comorbidity with other MH/BH conditions and increases in the frequency of sleep problems have been reported during the COVID-19 pandemic.[12]

TABLE 1. Diagnostic ICD-10 codes used to identify medical encounters for mental and behavioral health disorders

Diagnostic category	ICD-10 codes
Mental or Behavioral Health Disorder	
Adjustment disorders	F43.2*, F43.8, F43.9, F93.0, F94.8, F94.9
Alcohol-related disorders	F10.1* (excludes F10.11), F10.2*
Anxiety disorders	F40.*, F41.*, F42*
Depressive disorders	F32.*, F33.*, F34, F34.1, F34.8, F34.9, F39, F34.81, F34.89
Insomnia	F51.0*, G47.0*
Psychosocial Circumstances	Z63*, Z65*
Substance-related disorder	F11.2*, F12.2*, F13.2*, F14.2*, F15.2*, F16.2*, F18.2*, F19.2*, F11.1*, F13.1*, F14.1*, F15.1*, F16.1*, F18.1*, F19.1*
Suicidal ideation	R45.851

An asterisk (*) indicates that any subsequent digit/character is included.
ICD-10, International Classification of Disease, 10th Revision.

Telehealth encounters were defined as outpatient encounters that contained a Current Procedural Terminology (CPT) code for a telehealth encounter (i.e., health care delivered via telephone or video) or that were coded as a telehealth encounter in a DMSS variable identifying appointment type.

All medical encounters identified using the criteria specified above were included in this analysis and no sampling strategy was utilized. Because this analysis represents population-level data and the goal of the analysis was not to generalize these findings to other populations or time periods, no inferential statistics were employed.[13]

Counts of outpatient medical encounters, the number of unique individuals receiving care, and the numbers of bed days were calculated and reported for each month of the surveillance period for MH/BH conditions overall and for each specific MH/BH condition assessed. Monthly MH/BH outpatient encounter rates were calculated by dividing the number of outpatient encounters (including telehealth encounters) in a given month by the number of service members serving at least 1 day during that month and reported as the number of encounters per 100 service members. The number of bed days attributable to insomnia and psychological circumstances were not reported because there were few hospitalizations for these conditions.

RESULTS

During January and February 2020 (the months prior to the declaration of the pandemic), the MH/BH outpatient visit rate and the number of bed days attributable to MH/BH conditions averaged 12 and 13% higher, respectively, than in the same period in the previous year. **(Table 2, Figures 1a, 1b)**. In contrast, telehealth usage during this period was similar (approximately 1% lower) to the same period in 2019 **(Table 2, Figure 1c)**. During March 2020, the MH/BH outpatient visit rate remained 6% higher than in 2019 **(Table 2, Figure 1a).** However, the number of bed days attributable to MH/BH conditions during March 2020 (n=10,842) represented a 19% decrease from February 2020 and an 11% decrease compared to February 2019 **(Table 2).**

Between March and April 2020, the outpatient visit rate for MH/BH encounters declined by 15% to 10.6 visits per 100 service members; this outpatient visit rate was stable through May **(Table 2, Figure 2)**. During this same period, the percentage of outpatient encounters delivered via telehealth increased an additional 22%, after increasing 48% between February and March 2020**.**

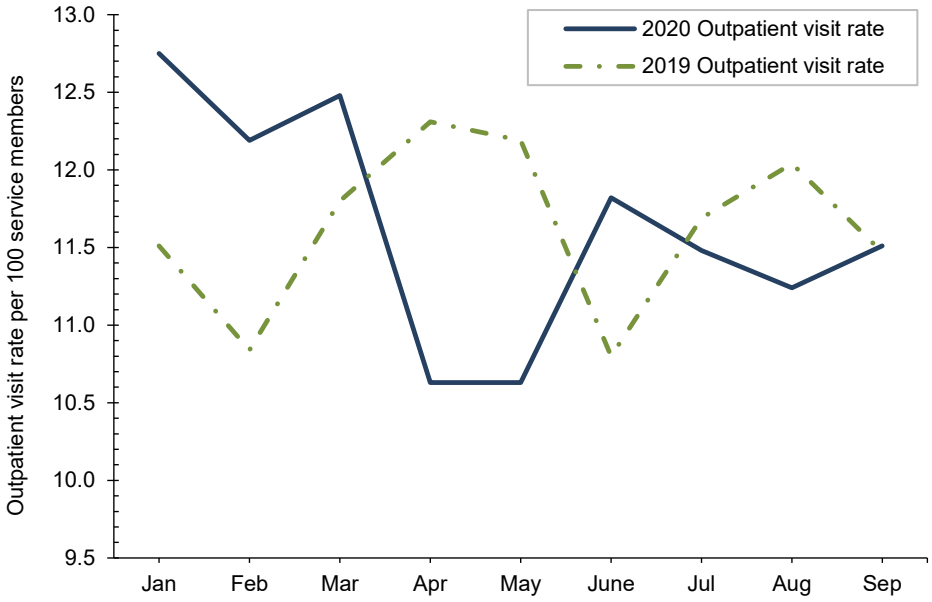
By June 2020, the declining trend in health care utilization for MH/BH conditions reversed with an 11% increase in the

TABLE 2. Healthcare utilization attributable to all mental and behavioral health conditions, U.S. Armed Forces, January 2019–September 2020

	No. outpatient encounters		Outpatient visit rate[a]		% telehealth		Individuals affected		Bed days	
Year	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
Month										
Jan	150,012	168,826	11.5	12.8	5.7	5.7	55,291	64,295	13,185	13,969
Feb	141,391	161,398	10.8	12.2	5.3	5.3	53,729	62,311	11,303	13,444
Mar	153,881	165,123	11.8	12.5	5.4	7.8	56,347	62,321	12,217	10,842
Apr	160,530	140,016	12.3	10.6	5.5	9.5	57,544	51,872	12,518	8,399
May	159,596	135,686	12.2	10.6	5.5	7.8	57,610	50,979	11,300	9,445
Jun	141,927	156,138	10.8	11.8	5.5	6.7	54,357	56,384	11,438	11,067
Jul	154,214	151,556	11.7	11.5	5.3	6.6	56,506	56,221	11,904	10,809
Aug	159,563	149,871	12.0	11.2	5.3	6.4	57,713	57,135	13,791	10,094
Sep	152,135	153,479	11.5	11.5	5.4	6.7	56,985	59,262	13,317	7,166
Oct	183,154		13.8		5.4		64,611		13,796	
Nov	150,752		11.4		5.6		59,033		11,959	
Dec	144,252		10.9		5.8		58,961		10,794	

[a]Outpatient visit rate is calculated as the number of encounters per 100 service members.

FIGURE 1a. Mental and behavioral health outpatient visit rates: 2019 vs 2020



outpatient visit rate to 11.8 encounters per 100 service members **(Table 2, Figure 2)**. Similarly, the number of bed days attributable to MH/BH conditions increased by 17% in June as compared to the prior month **(Table 2)**. In contrast, from May through June 2020, telehealth usage declined by 14%.

During the remainder of the surveillance period (July–September 2020), the outpatient visit rate was relatively stable and varied by 3% or less while the number of bed days attributable to MH/BH conditions declined in each remaining month of the surveillance period **(Table 2, Figure 2)**. Overall, the number of bed days attributable to all MH/BH conditions in September was 29% lower than in August and 46% lower than in September of the prior year.

Telehealth use for MH/BH conditions peaked in April 2020. Subsequently, telehealth use declined during May–August 2020 although telehealth use remained consistently higher every month between March and September 2020 than during the same period in the prior year (2019) **(Figure 1c)**.

Generally, patterns of health care utilization for specific MH/BH conditions (e.g., adjustment disorders, anxiety disorders, depressive disorders) were similar to patterns identified in the summary of conditions overall **(Tables 3–10 [See Appendix])**. For example, all conditions included in this analysis except insomnia, psychosocial circumstances, and suicidal ideation exhibited the same declines in outpatient visit rates during April and May 2020 and a rebound, or increase in outpatient visit rates, in June 2020. The 3 conditions that did not follow this pattern still showed a decline in outpatient visit rates in April but demonstrated an earlier rebound in outpatient visit rates in May instead of June 2020.

Similarly, while most specific MH/BH conditions demonstrated generally lower outpatient visit rates during June–September 2020 as compared to the previous year, 3 conditions (adjustment disorders, anxiety disorders, psychosocial circumstances) had, on average, higher outpatient visit rates than

FIGURE 1b. The number of bed days attributable to mental and behavioral healthcare: 2019 vs 2020

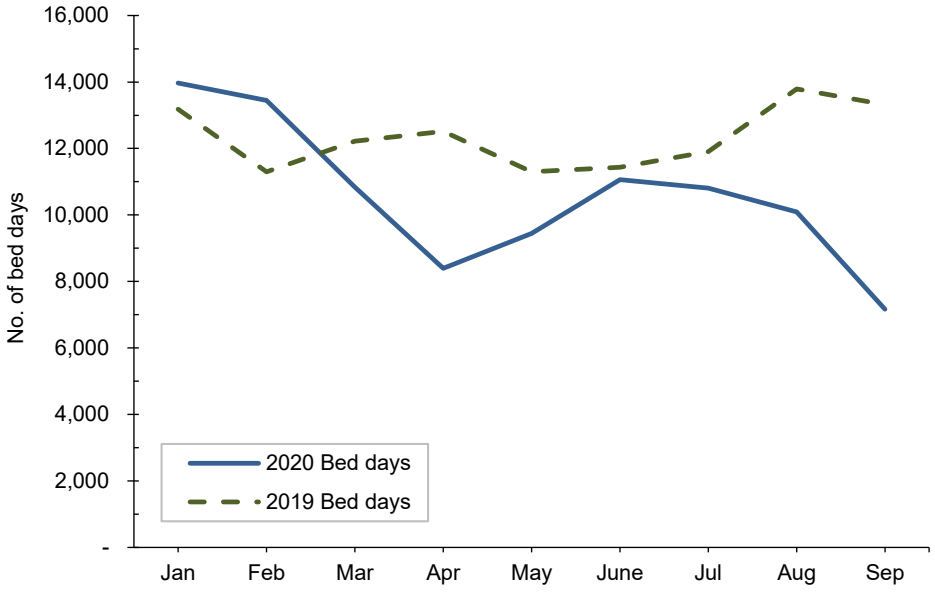
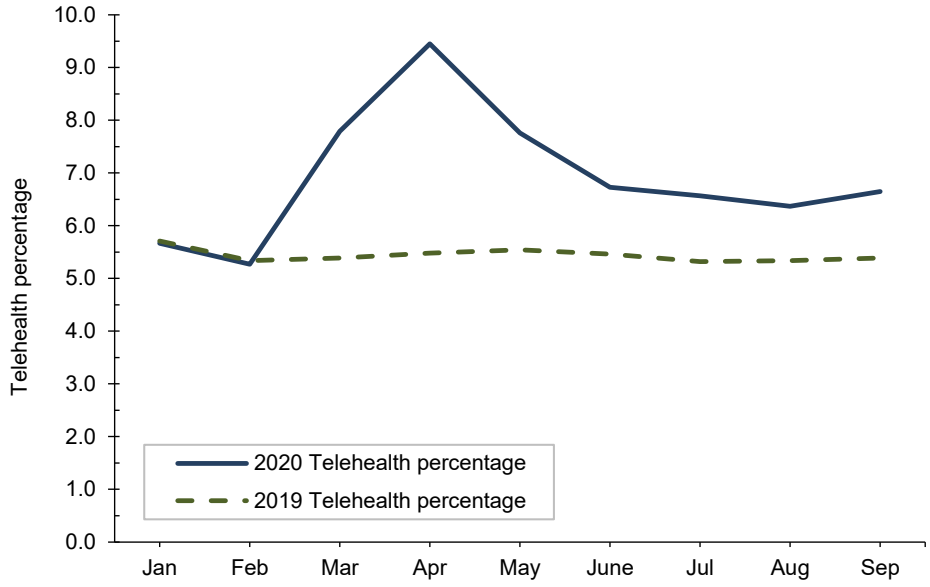


FIGURE 1c. Percentages of mental and behavioral outpatient care delivered by telehealth: 2019 vs 2020



the same period in 2019. Average visit rates were slightly elevated for adjustment disorders (5% higher) and psychosocial circumstances (2% higher), while outpatient visit rates for anxiety disorders averaged 13% higher from June through September 2020 as compared to the same time period in 2019 **(Tables 3, 5, 8)**.

Telehealth usage for 8 out of 10 specific MH/BH conditions also followed a pattern in which the percentage of outpatient care delivered via telehealth increased in March and April 2020 but declined in May 2020. Exceptions to this trend were seen for anxiety disorders and suicidal ideation **(Tables 5, 10)**. In March 2020, the percentage of outpatient care delivered by telehealth related to anxiety disorders increased by 53%, but declined over the remainder of the surveillance period while telehealth use for suicidal ideation spiked in April 2020 and subsequently declined through September 2020.

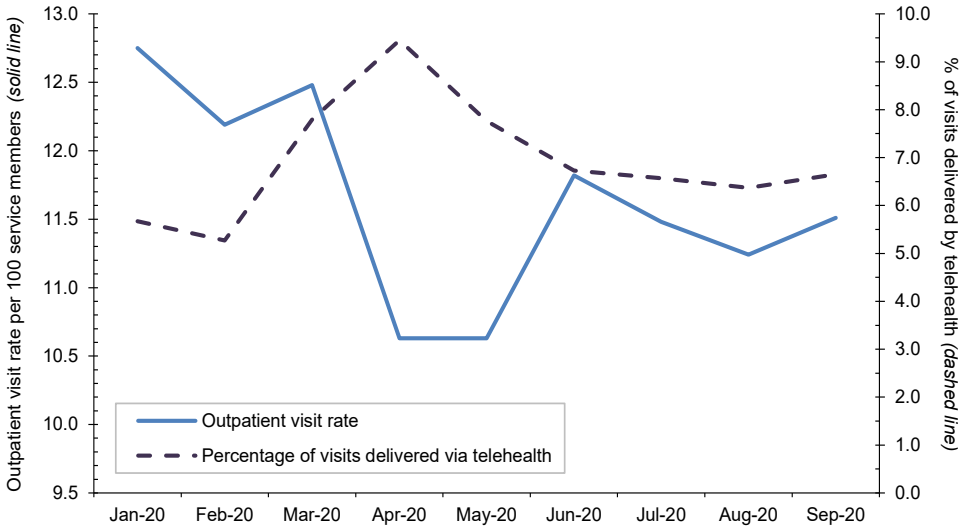
EDITORIAL COMMENT

In this analysis of MH/BH health care utilization prior to and during the first 6 months of the pandemic, telehealth usage increased during the early pandemic and was on average 25% higher during March–September 2020 as compared to the previous year. In contrast, MH/BH outpatient visit rates declined modestly between March and May 2020 before rebounding in June and remaining stable for the remainder of the surveillance period. The number of bed days attributable to MH/BH conditions also declined during March and April 2020 and was on average 30% lower during March–September 2020 as compared to the same period in the prior year. The pattern of decreased health care utilization and increased telehealth usage was almost universal across all conditions surveyed during March and April 2020, although for most MH/BH conditions, health care utilization had rebounded by June of that year.

Notably, even after health care utilization for mental and behavioral health conditions had begun to rebound in June 2020, outpatient visit rates for anxiety disorders, adjustment disorders, and psychosocial circumstances were higher than rates during the previous year.

There are few published studies of population-level health care utilization data with which to compare these findings. Patel et al. reported similar trends in outpatient care delivery and telehealth usage in a large, commercially insured population and, like this *MSMR* analysis, also demonstrated pronounced declines in the rate of in-person outpatient visits beginning in March 2020.[14] Patel et al. also documented increases in telehealth usage during the same period with marked increases in the rate of telehealth usage beginning during the week of March 17 (coinciding with

FIGURE 2. Monthly outpatient visit rates and the percentage of visits delivered via telehealth for all mental and behavioral health conditions, active component, U.S. Armed Forces, January–September 2020



the expansion of Medicare reimbursement for telehealth during the COVID-19 pandemic).[14]

Data from the CDC's National Syndromic Surveillance System Program (which represents approximately 70% of U.S. emergency department [ED] visits) were used in a cross-sectional study of ED visits for mental health before and during the pandemic.[13] This study reported declines in overall ED visit volume after the implementation of stay-at-home orders in March which persisted through October 2020. However, visit rates for mental health, suicide attempts, drug overdoses, intimate partner violence and child abuse were higher in mid-March-October 2020 as compared to the same period during the prior year.[13]

The finding that telehealth usage for MH/BH conditions increased (albeit modestly) during the early period of the pandemic, as well as its usage prior to the pandemic, demonstrates that the Military Health System (MHS) was prepared to deliver mental health services via telehealth and to increase telehealth services when needed. In fact, a recent analysis of telehealth usage for all ambulatory encounters in 2020 reported telehealth accounted for 19.2% of ambulatory encounters in active component service members.[16] This is likely a reflection of the Defense Health Agency's (DHA's) ongoing expansion and standardization of telehealth service capabilities.[17] The TRICARE Health Plan already covered most mental health care when provided via telehealth prior to the pandemic. Regional contractors for TRICARE had also established a network of telemental health service providers.[18] In response to COVID-19, TRICARE also began reimbursement for audio-only care, loosened cross-state licensure requirements, and began waiving copays and cost shares for telehealth services for the duration of the public health emergency.[10] TRICARE also began allowing more providers to offer telemedicine services.[18] In addition the MHS developed Health Protection Condition-linked guidance to standardize behavioral health operations during the COVID-19 response including support services for active component service members and their families.[10]

While many studies have reported increased levels of anxiety, depression, alcohol and substance misuse, and suicidal ideation in response to the pandemic, many of these studies relied on self-report data collected via survey.[3–5] In contrast, this analysis used health care claims data to quantify health care utilization for specific MH/BH conditions which were identified via ICD-10 codes listed in the primary diagnostic position. To be included in this analysis, a service member would have to seek medical care and have that medical care documented in the electronic health record by a medical provider. Mental or behavioral health symptoms which did not result in a health care encounter would not be captured in this analysis and is a limitation of this analysis.

There are likely active component members who experienced symptoms of anxiety, depression or other mental and behavioral health issues who are not represented in this analysis because they chose not to seek care related to these symptoms. Service members may have been able to cope with their symptoms using resources other than medical care (e.g., chaplain, family, community, or command support). Service members may also have chosen to defer care due to the pandemic. An estimated 40.9% of adults in the U.S. have avoided medical care during the pandemic with 31.5% forgoing routine care.[6]

A significant strength of this study is the ability to include the entire population of interest in the analysis. The DMSS captures virtually 100% of health care encounters for active component service members and includes both direct care (provided at military treatment facilities) and outsourced care (paid for by TRICARE).

MH/BH conditions can negatively affect service member readiness. Offering alternative methods to in-person care for these conditions, such as telehealth, facilitates access to care which can help mitigate adverse impacts to health, well being, and readiness. Continued surveillance is warranted to track MH/BH health care utilization during the later months of the pandemic to ensure that sufficient resources continue to be directed towards MH/BH care to support the health and readiness of active component service members.

Acknowledgements: The authors thank Maisha Toussaint, PhD (U.S. Army Public Health Center) for contributions including conceptual contributions during initial study design and critical review and feedback on the manuscript.

Disclaimer: The contents, views or opinions expressed in this publication or presentation are those of the author(s) and do not necessarily reflect official policy or position of the Defense Health Agency, the Department of Defense (DOD), or Departments of the Army, Navy, or Air Force. The mention of any non-federal entity and/or its products is not to be construed or interpreted, in any manner, as federal endorsement of that non-federal entity or its products.

REFERENCES

1. Moreland A, Herlihy C, Tynan MA, et al. Timing of state and territorial COVID-19 stay-at-home orders and changes in population movement – United States, March 1–May 31, 2020. *MMWR Morb Mortal Wkly Rep*. 2020; 69(35): 1198–1203.
2. 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 Dec 1;277:55–64.
3. CDC, National Center for Health Statistics. Indicators of anxiety or depression based on reported frequency of symptoms during the last 7 days. Household Pulse Survey. Atlanta, GA: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2020. https://www.cdc.gov/nchs/covid19/pulse/mental-health.htm
4. CDC, National Center for Health Statistics. Early release of selected mental health estimates based on data from the January–June 2019 National Health Interview Survey. Atlanta, GA: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2020. https://www.cdc.gov/nchs/data/nhis/earlyrelease/ERmentalhealth-508.pdf
5. Czeisler MÉ, 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 Aug 14;69(32):1049–1057.
6. Czeisler MÉ, 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 Sep 11;69(36):1250–1257.
7. Hoyer C, Ebert A, Szabo K, Platten M, Meyer-Lindenberg A, Kranaster L. Decreased utilization of mental health emergency service during the COVID-19 pandemic. *Eur Arch Psychiatry Clin Neurosci*. 2020 Jun 9:1–3.
8. Verma S. Early Impact of CMS Expansion of medicare telehealth during COVID-19. *Health Affairs Blog*. Published July 15, 2020. Accessed May 10, 2021. https://www.healthaffairs.org/do/10.1377/hblog20200715.454789/full
9. Connolly SL, Stolzmann KL, Heyworth L, Weaver KR, Bauer MS, Miller CJ. Rapid increase in telemental health within the Department of Veterans Affairs during the COVID-19 pandemic [published online ahead of print, 2020 Sep 14]. *Telemed J E Health*. 2020;10.
10. Bradford C. Department of Defense (DoD) mental health response to the COVID-19 pandemic. Oral presentation at: AMSUS The Society of Federal Health Professionals Annual Meeting; December, 2020; Virtual.
11. Armed Forces Health Surveillance Division. Absolute and relative morbidity burdens attributable to various illnesses and injuries, active component, U.S. Armed Forces, 2020. *MSMR*. 2021; 28(5): 2–9.
12. Mandelkorn U, Genzer S, Choshen-Hillel S, et al. Escalation of sleep disturbances amid the COVID-19 pandemic: a cross-sectional international study. *J Clin Sleep Med*. 2021;17(1):45–53.
13. Alexander N. What's more general than a whole population? *Emerg Themes Epidemiol*. 2015;12:11.
14. Patel SY, Mehrotra A, Huskamp HA, Uscher-Pines L, Ganguli I, Barnett ML. Trends in outpatient care delivery and telemedicine during the COVID-19 pandemic in the US. *JAMA Intern Med*. 2021;181(3):388–391.
15. Holland KM, Jones C, Vivolo-Kantor AM, et al. Trends in US Emergency Department visits for mental health, overdose, and violence outcomes before and during the COVID-19 pandemic. *JAMA Psychiatry*. 2021;78(4):372–379.
16. Armed Forces Health Surveillance Division. Ambulatory visits, active component, U.S. Armed Forces, 2020. *MSMR*. 2021; 28(5): 18–25.
17. Defense Health Board. Modernization of the TRICARE benefit. Published 2020. Accessed Aug. 13, 2021. https://health.mil/Reference-Center/Reports/2020/11/05/Modernization-of-the-TRICARE-Benefit
18. Telemental Health Services. Accessed August 13, 2021. Updated 6/18/2020. https://tricare.mil/CoveredServices/IsItCovered/TelementalHealth

TABLE 3. Healthcare utilization attributable to adjustment disorder, U.S. Armed Forces, January 2019–September 2020

	No. outpatient encounters		Outpatient visit rate[a]		% telehealth		Individuals affected		Bed days	
Year	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
Month										
Jan	40,561	47,246	3.1	3.6	4.4	4.6	20,089	24,164	2,965	4,149
Feb	38,285	45,045	2.9	3.4	4.2	4.4	19,542	23,280	2,519	3,444
Mar	41,447	46,798	3.2	3.5	4.3	6.5	20,575	23,294	2,869	2,950
Apr	43,175	39,990	3.3	3.0	4.3	8.0	20,966	19,140	3,005	1,885
May	42,411	37,901	3.2	2.9	4.4	6.4	20,879	18,645	2,906	2,421
Jun	38,042	44,214	2.9	3.4	4.3	5.5	19,669	20,914	2,927	2,840
Jul	41,823	43,802	3.2	3.3	4.2	5.4	20,727	21,022	3,055	2,994
Aug	43,937	42,885	3.3	3.2	4.4	5.2	21,426	21,262	3,901	2,857
Sep	42,627	44,355	3.2	3.3	4.4	5.6	21,215	22,002	3,548	2,881
Oct	51,480		3.9		4.4		24,328		3,989	
Nov	41,645		3.1		4.7		21,860		3,062	
Dec	39,565		3.0		5.0		21,812		2,589	

[a]Outpatient visit rate is calculated as the number of outpatient visits per 100 service members.

TABLE 4. Healthcare utilization attributable to alcohol use disorders, U.S. Armed Forces, January 2019–September 2020

	No. outpatient encounters		Outpatient visit rate[a]		% telehealth		Individuals affected		Bed days	
Year	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
Month										
Jan	28,981	31,028	2.2	2.3	4.5	5.0	6,838	7,680	4,246	3,320
Feb	28,176	30,770	2.2	2.3	3.9	4.0	6,754	7,491	3,497	3,903
Mar	30,989	31,096	2.4	2.4	4.0	7.6	7,114	7,612	3,951	2,946
Apr	32,680	26,682	2.5	2.0	4.4	10.2	7,239	6,853	4,033	2,876
May	33,005	26,638	2.5	2.0	4.4	8.1	7,444	6,828	3,435	3,575
Jun	28,856	29,571	2.2	2.2	4.2	6.4	7,078	7,054	3,103	3,097
Jul	30,854	28,494	2.3	2.2	4.0	6.4	7,112	6,853	3,357	3,026
Aug	31,157	27,554	2.4	2.1	4.2	6.1	7,180	6,803	3,133	2,816
Sep	28,839	28,005	2.2	2.1	4.2	6.3	7,045	6,963	3,320	1,339
Oct	34,982		2.6		4.3		7,675		3,865	
Nov	28,959		2.2		4.2		7,253		3,527	
Dec	27,864		2.1		4.6		7,249		3,750	

[a]Outpatient visit rate is calculated as the number of visits per 100 service members.

TABLE 5. Healthcare utilization attributable to anxiety disorders, U.S. Armed Forces, January 2019–September 2020

	No. outpatient encounters		Outpatient visit rate[a]		% telehealth		Individuals affected		Bed days	
Year	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
Month										
Jan	18,837	20,803	1.5	1.6	6.3	5.7	10,873	12,538	353	385
Feb	17,310	19,544	1.3	1.5	6.1	5.3	10,407	12,014	323	405
Mar	18,627	20,224	1.4	1.5	6.2	8.0	10,904	12,193	260	250
Apr	19,319	18,158	1.5	1.4	6.2	7.9	11,226	10,185	543	182
May	19,248	17,584	1.5	1.3	6.1	6.8	11,095	10,000	250	248
Jun	16,946	20,406	1.3	1.6	6.4	6.1	10,409	11,326	212	311
Jul	18,053	19,811	1.4	1.5	6.2	6.0	10,865	11,249	285	333
Aug	18,630	19,876	1.4	1.5	5.9	6.0	11,094	11,522	320	262
Sep	17,834	20,736	1.3	1.6	6.5	5.8	10,911	12,198	203	211
Oct	21,692		1.6		6.0		12,632		291	
Nov	18,161		1.4		6.1		11,342		228	
Dec	17,634		1.3		6.3		11,230		278	

[a]Outpatient visit rate is calculated as the number of visits per 100 service members.

TABLE 6. Healthcare utilization attributable to depressive disorders, active component, U.S. Armed Forces, January 2019–September 2020

	No. outpatient encounters		Outpatient visit rate[a]		% telehealth		Individuals affected		Bed days	
Year	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
Month										
Jan	34,832	40,439	2.7	3.1	4.6	4.1	12,853	14,844	4,711	5,701
Feb	32,985	38,363	2.5	2.9	4.1	3.9	12,374	14,235	4,231	5,080
Mar	35,873	39,721	2.8	3.0	4.0	5.6	12,882	14,373	4,389	4,289
Apr	36,955	33,657	2.8	2.6	4.0	6.5	13,105	12,241	4,076	2,925
May	36,506	31,772	2.8	2.4	4.0	5.2	13,077	11,856	4,173	2,684
Jun	33,516	35,901	2.6	2.7	4.1	4.3	12,445	12,785	4,594	4,381
Jul	36,793	34,219	2.8	2.6	4.1	4.5	13,083	12,622	4,446	4,157
Aug	37,603	33,833	2.8	2.5	3.8	4.4	13,225	12,818	5,720	3,772
Sep	36,558	33,507	2.8	2.5	4.0	4.6	12,944	13,045	5,548	2,482
Oct	43,140		3.3		4.2		14,809		5,113	
Nov	36,297		2.7		4.5		13,565		4,667	
Dec	34,442		2.6		4.5		13,445		3,589	

[a]Outpatient visit rate is calculated as the number of visits per 100 service members.

TABLE 7. Heathcare utilization attributable to insomnia, active component, U.S. Armed Forces, January 2019–September 2020

	No. outpatient encounters		Outpatient visit rate[a]		% telehealth		Individuals affected	
Year	2019	2020	2019	2020	2019	2020	2019	2020
Month								
Jan	6,121	6,507	0.5	0.5	9.9	8.1	4,687	4,968
Feb	5,546	6,038	0.4	0.5	9.6	8.0	4,320	4,743
Mar	5,877	5,942	0.5	0.5	9.2	10.5	4,619	4,573
Apr	6,047	3,850	0.5	0.3	8.7	16.1	4,693	3,039
May	5,683	3,969	0.4	0.3	9.8	14.0	4,544	3,095
Jun	4,851	4,925	0.4	0.4	9.1	11.2	3,853	3,743
Jul	5,504	5,107	0.4	0.4	9.0	10.3	4,306	3,958
Aug	5,889	5,099	0.4	0.4	7.7	9.9	4,422	3,937
Sep	5,419	5,505	0.4	0.4	8.2	10.5	4,231	4,299
Oct	6,786		0.5		7.4		5,202	
Nov	5,515		0.4		8.3		4,382	
Dec	5,178		0.4		8.4		4,126	

[a]Outpatient visit rate is calculated as the number of visits per 100 service members.

TABLE 8. Healthcare utilization attributable to psychosocial circumstances, active component, U.S. Armed Forces, January 2019–September 2020

	No. outpatient encounters		Outpatient visit rate[a]		% telehealth		Individuals affected	
Year	2019	2020	2019	2020	2019	2020	2019	2020
Month								
Jan	15,694	17,915	1.2	1.4	11.7	12.2	9,006	10,442
Feb	14,482	16,928	1.1	1.3	11.9	12.0	8,549	9,922
Mar	15,718	16,723	1.2	1.3	12.0	16.2	9,126	9,904
Apr	16,829	14,059	1.3	1.1	12.1	19.8	9,610	7,758
May	17,602	13,955	1.3	1.1	11.8	16.5	9,916	7,829
Jun	15,198	16,964	1.2	1.3	11.9	15.2	9,019	9,087
Jul	16,302	15,939	1.2	1.2	11.5	14.4	9,300	8,997
Aug	17,140	16,175	1.3	1.2	12.3	13.7	9,608	9,323
Sep	15,837	17,105	1.2	1.3	11.7	13.7	9,404	9,646
Oct	19,494		1.5		11.3		10,863	
Nov	15,813		1.2		11.7		9,518	
Dec	15,481		1.2		12.0		9,463	

[a]Outpatient visit rate is calculated as the number of visits per 100 service members.

TABLE 9. Healthcare utilization attributable to substance use disorders, active component, U.S. Armed Forces, January 2019–September 2020

	No. outpatient encounters		Outpatient visit rate[a]		% telehealth		Individuals affected		Bed days	
Year	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
Month										
Jan	2,210	1,903	0.2	0.1	6.2	6.9	583	522	548	237
Feb	2,087	1,729	0.2	0.1	6.0	6.4	550	524	513	320
Mar	2,517	1,835	0.2	0.1	6.2	8.0	640	554	577	195
Apr	2,747	1,586	0.2	0.1	6.3	9.8	654	457	498	389
May	2,553	1,691	0.2	0.1	6.2	7.3	641	488	314	189
Jun	2,033	1,667	0.2	0.1	5.7	8.2	591	499	425	215
Jul	2,187	1,443	0.2	0.1	6.0	7.8	585	451	546	140
Aug	2,269	1,478	0.2	0.1	5.2	7.1	552	432	551	203
Sep	1,970	1,341	0.2	0.1	5.8	10.1	506	443	500	75
Oct	2,220		0.2		5.5		558		389	
Nov	1,768		0.1		4.3		501		337	
Dec	1,706		0.1		5.3		500		463	

[a]Outpatient visit rate is calculated as the number of visits per 100 service members.

TABLE 10. Healthcare utilization attributable to suicidal ideation, active component, U.S Armed Forces, January 2019–September 2020

	No. outpatient encounters		Outpatient visit rate[a]		% telehealth		Individuals affected		Bed days	
Year	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
Month										
Jan	2,073	2,167	0.2	0.2	3.5	5.4	1,371	1,545	336	129
Feb	1,882	2,203	0.1	0.2	2.3	4.5	1,236	1,531	200	262
Mar	2,107	1,973	0.2	0.2	2.8	4.2	1,383	1,423	138	173
Apr	2,115	1,325	0.2	0.1	2.5	7.1	1,347	897	312	101
May	1,916	1,570	0.2	0.1	4.1	5.7	1,258	1,050	194	275
Jun	1,812	1,639	0.1	0.1	3.5	4.6	1,206	1,157	138	207
Jul	1,997	1,842	0.2	0.1	4.0	5.3	1,360	1,318	178	133
Aug	2,127	2,068	0.2	0.2	3.7	5.2	1,496	1,392	131	142
Sep	2,216	2,068	0.2	0.2	2.7	4.6	1,582	1,425	164	149
Oct	2,409		0.2		4.4		1,666		122	
Nov	1,920		0.1		4.5		1,333		109	
Dec	1,672		0.1		4.6		1,180		96	

[a]Outpatient visit rate is calculated as the number of visits per 100 service members.

Medical Surveillance Monthly Report (MSMR)
Armed Forces Health Surveillance Division
11800 Tech Road, Suite 220
Silver Spring, MD 20904

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

Archive: Past issues of the *MSMR* are available as downloadable PDF files at www.health.mil/MSMRArchives.

Online Subscriptions: Submit subscription requests at www.health.mil/MSMRSubscribe.

Editorial Inquiries: Call (301) 319-3240 or email dha.ncr.health-surv.mbx.msmr@mail.mil.

Instructions for Authors: Information about article submissions is provided at www.health.mil/MSMRInstructions.

Follow us:
www.facebook.com/AFHSDPAGE
http://twitter.com/AFHSDPAGE

ISSN 2158-0111 (print)
ISSN 2152-8217 (online)