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Annual Summary Issue

Absolute and Relative Morbidity Burdens Attributable to Various Illnesses and Injuries, Active Component, U.S. Armed Forces, 2018

Perceptions of the relative importance of various health conditions in military populations often determine the natures, extents, and priorities for resources applied to primary, secondary, and tertiary prevention activities. However, these perceptions are inherently subjective and may not reflect objective measures of the relationship between the conditions and their impact on health, fitness, military operational effectiveness, healthcare costs, and so on.

Several classification systems and morbidity measures have been developed to quantify the "public health burdens" that are attributable to various illnesses and injuries in defined populations and settings.[1] Not surprisingly, different classification systems and morbidity measures lead to different rankings of illness- and injury-specific public health burdens.[2]

For example, in a given population and setting, the illnesses and injuries that account for the most hospitalizations are likely different from those that account for the most outpatient medical encounters. The illnesses and injuries that account for the most medical encounters overall may differ from those that affect the most individuals, have the most debilitating or long-lasting effects, and so on.[2] Thus, in a given population and setting, the classification system or measure used to quantify condition-specific morbidity burdens shapes to a large extent the conclusions that may be drawn regarding the relative importance of various conditions and, in turn, the resources that may be indicated to prevent or minimize their impacts.

This annual summary uses a standard disease classification system (modified for use among U.S. military members) and several healthcare burden measures to quantify the impacts of various illnesses and injuries among members of the active component of the U.S. Armed Forces in 2018.

METHODS

The surveillance period was 1 January through 31 December 2018. The surveillance population included all individuals who served in the active component of the U.S. Army, Navy, Air Force, or Marine Corps at any time during the surveillance period. All data used in this analysis 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 worldwide.

For this analysis, DMSS data for all inpatient and outpatient medical encounters of all active component members during 2018 were summarized according to the primary (first-listed) diagnosis (if reported with an International Classification of Diseases, 10th Revision, Clinical Modification [ICD-10-CM] code between A00 and T88, an ICD-10 code beginning with Z37, or Department of Defense [DoD] unique personal history codes DOD0101–DOD0105). For summary purposes, all illness- and injury-specific diagnoses (as defined by the ICD-10) were grouped into 142 burden of disease-related conditions and 25 categories based on a modified version of the classification system developed for the Global Burden of Disease (GBD) Study.[1] In general, the GBD system groups diagnoses with common pathophysiologic or etiologic bases and/or significant international health policymaking importance. In this analysis, some diagnoses that are grouped into single categories in the GBD system (e.g., mental health disorders) were disaggregated to increase the military relevance of the results. Also, injuries were categorized by affected anatomic site rather than by cause because external causes of injuries are incompletely reported in military outpatient records.

WHAT ARE THE NEW FINDINGS?

As in prior years, musculoskeletal disorders, injuries, mental health disorders, and pregnancy-related conditions accounted for relatively large proportions of the morbidity and healthcare burdens among active component service members. Injuries accounted for the largest percentage of medical encounters and individuals affected, and mental health disorders accounted for the largest number of hospital bed days.

WHAT IS THE IMPACT ON READINESS AND FORCE HEALTH PROTECTION?

Injuries, musculoskeletal disorders, and mental health disorders are major detractors from service members' individual readiness and deployability and can lead to early separation and disability. Reducing their impact on force readiness can be accomplished through enhanced measures to prevent and treat the occurrence of such disorders.

The "morbidity burdens" attributable to various "conditions" were estimated based on the total number of medical encounters attributable to each condition (i.e., total hospitalizations and ambulatory visits for the condition with a limit of 1 encounter per individual per condition per day), numbers of service members affected by each condition (i.e., individuals with at least 1 medical encounter for the condition during the year), and total bed days during hospitalizations for each condition.

The new electronic health record for the MHS, MHS GENESIS, was implemented at several military treatment facilities during 2017. Medical data from sites that are using MHS GENESIS are not available in DMSS. These sites include Naval Hospital Oak Harbor, Naval Hospital Bremerton, Air Force Medical Services Fairchild, and Madigan Army Medical Center. Therefore, medical encounters for individuals seeking care at any of these facilities during 2018 were not included in this analysis.

RESULTS

Morbidity burden, by category

In 2018, more service members (n=522,854) received medical care for injury/poisoning than any other morbidity-related category **(Figures 1a, 1b)**. In addition, injury/poisoning accounted for more medical encounters (n=2,703,799) than any other morbidity category and one-quarter (25.4%) of all medical encounters overall.

Mental health disorders accounted for more hospital bed days (n=163,652) than any other morbidity category and 48.9% of all hospital bed days overall **(Figures 1a, 1b)**. Together, injury/poisoning and mental health disorders accounted for nearly three-fifths (59.9%) of all hospital bed days and more than two-fifths (41.9%) of all medical encounters.

Of note, maternal conditions (including pregnancy complications and delivery) accounted for a relatively large proportion of all hospital bed days (n=52,939; 15.8%) but a much smaller proportion of medical encounters overall (n=174,185; 1.6%) **(Figures 1a, 1b)**. Routine prenatal visits are not included in this summary.

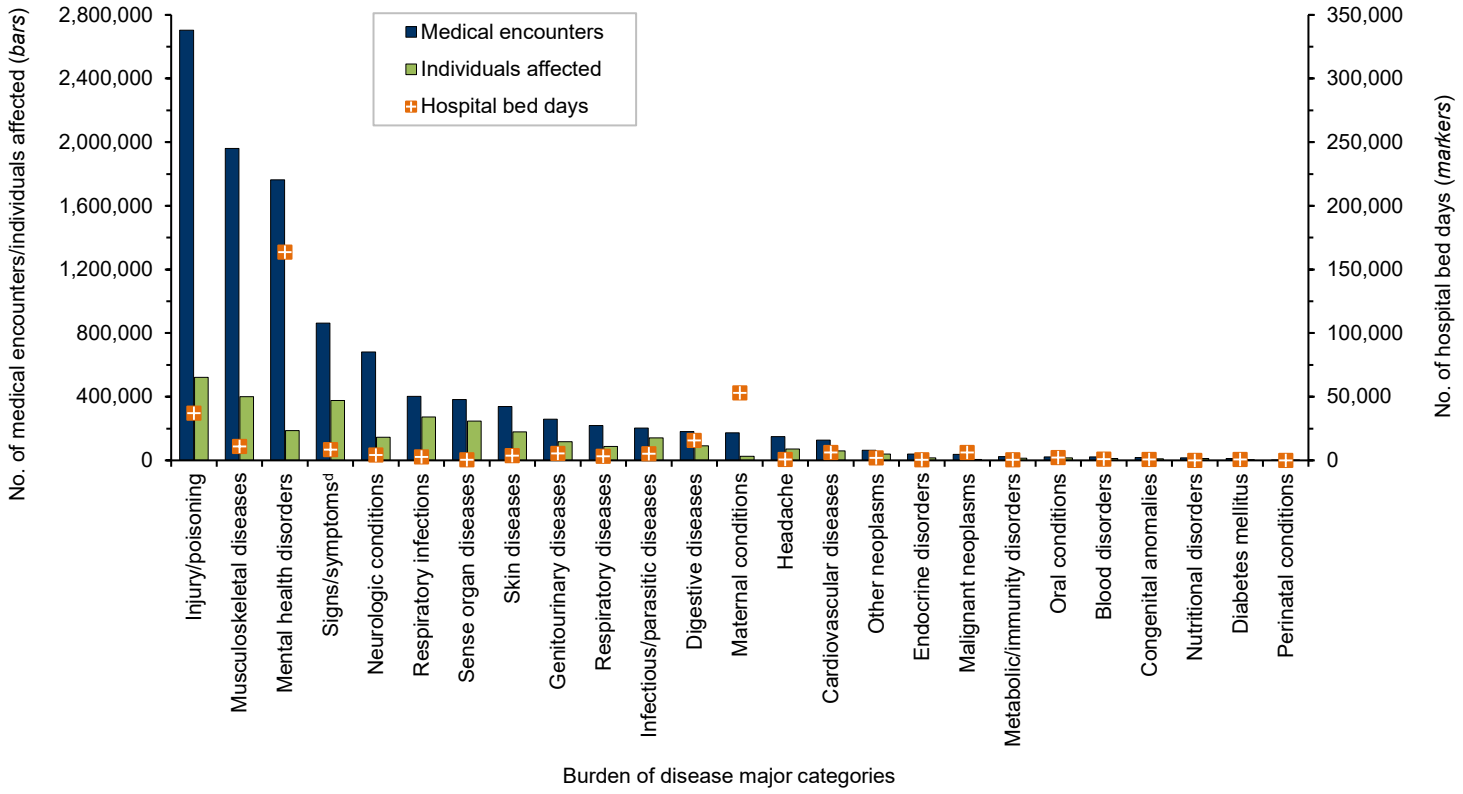
Medical encounters, by condition

In 2018, the 3 burden of disease-related conditions that accounted for the most medical encounters (i.e., other back problems, all other musculoskeletal diseases, and knee injuries) accounted for almost one-quarter (24.5%) of all illness- and injury-related medical encounters overall **(Figure 2)**. Moreover, the 9 conditions that accounted for the most medical encounters were responsible for more than half (53.0%) of all illness- and injury-related medical encounters overall. In general, the conditions that accounted for the most medical encounters were predominantly musculoskeletal disorders (e.g., back problems), anatomic site-defined injuries (e.g., injuries of the knee, arm/shoulder, or foot/ankle), and mental health disorders (e.g., adjustment disorders, anxiety disorders, or mood disorders) **(Table, Figure 2)**.

Individuals affected, by condition

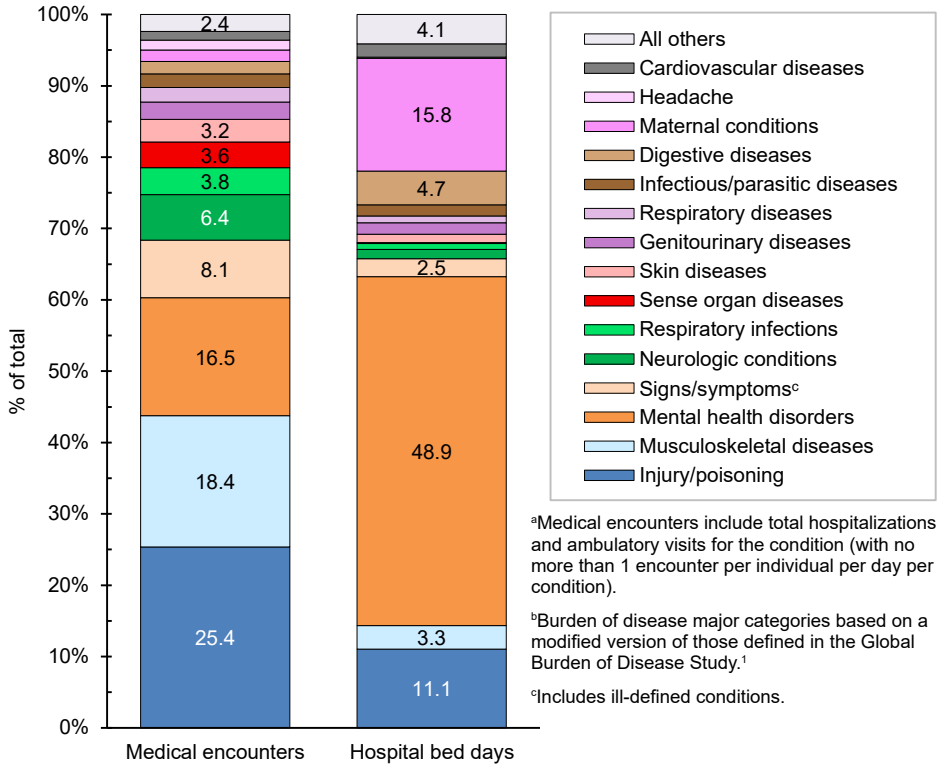
In 2018, more service members received medical care for "all other musculoskeletal diseases" than for any other specific condition **(Table)**. Of the 10 conditions that affected the most service members, 3 were anatomic site-defined injuries (injuries of the knee, foot/ankle, and arm/shoulder), 2 were musculoskeletal diseases (all other musculoskeletal diseases and other back problems), 2 were signs and symptoms (all other signs

FIGURE 1a. Numbers of medical encounters,[a] individuals affected,[b] and hospital bed days, by burden of disease major category,[c] active component, U.S. Armed Forces, 2018



[a]Medical encounters include total hospitalizations and ambulatory visits for the condition (with no more than 1 encounter per individual per day per condition).
[b]Individuals with at least 1 hospitalization or ambulatory visit for the condition.
[c]Burden of disease major categories based on a modified version of those defined in the Global Burden of Disease Study.[1]
[d]Includes ill-defined conditions.
No., number.

FIGURE 1b. Percentages of medical encounters[a] and hospital bed days, attributable to burden of disease major categories,[b] active component, U.S. Armed Forces, 2018



[a]Medical encounters include total hospitalizations and ambulatory visits for the condition (with no more than 1 encounter per individual per day per condition).

[b]Burden of disease major categories based on a modified version of those defined in the Global Burden of Disease Study.[1]

[c]Includes ill-defined conditions.

and symptoms and abdomen and pelvis), 1 was a respiratory infection-related condition (upper respiratory infections), 1 was a sense organ disease (refraction/accommodation), and 1 was a skin disease-related condition (all other skin diseases).

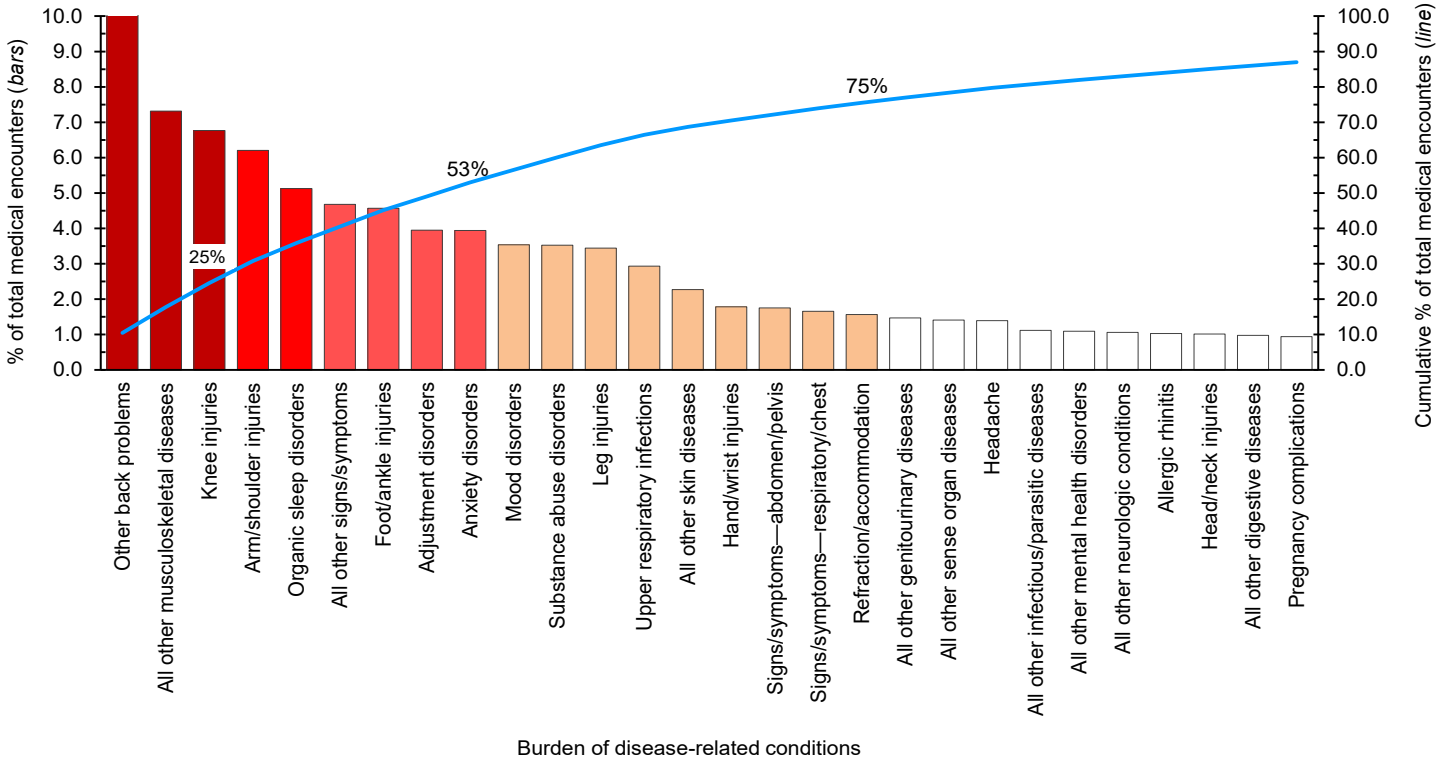
Hospital bed days, by condition

In 2018, mood and substance abuse disorders accounted for more than one-quarter (29.3%) of all hospital bed days. Together, 4 mental health disorders (mood, substance abuse, adjustment, and anxiety) and 2 maternal conditions (pregnancy complications and delivery) accounted for more than half (58.8%) of all hospital bed days **(Table, Figure 3)**. Approximately one-ninth (11.1%) of all hospital bed days were attributable to injuries and poisonings.

Relationships between healthcare burden indicators

There was a strong positive correlation between the number of medical encounters

FIGURE 2. Percentage and cumulative percentage distribution, burden of disease-related conditions[a] that accounted for the most medical encounters, active component, U.S. Armed Forces, 2018



[a]Burden of disease-related conditions based on a modified version of those defined in the Global Burden of Disease Study.[1]

TABLE. Healthcare burdens attributable to various diseases and injuries, U.S. Armed Forces, 2018

Major category condition[a]	Medical encounters[b]		Individuals affected[c]		Bed days	
	No.	Rank[d]	No.	Rank[d]	No.	Rank[d]
Injury and poisoning						
Knee injuries	721,412	(3)	150,477	(5)	1,137	(37)
Arm and shoulder injuries	661,439	(4)	129,885	(9)	2,638	(24)
Foot and ankle injuries	487,036	(7)	140,098	(6)	1,910	(30)
Leg injuries	367,002	(12)	97,037	(13)	5,248	(13)
Hand and wrist injuries	190,125	(15)	73,760	(18)	1,091	(39)
Head and neck injuries	108,123	(26)	52,064	(22)	9,911	(7)
Back and abdomen injuries	49,378	(34)	30,218	(33)	4,149	(17)
Other injury from external causes	31,443	(42)	15,450	(45)	381	(66)
Other complications NOS	30,809	(44)	17,489	(44)	5,706	(11)
Environmental	26,217	(48)	19,604	(40)	1,134	(38)
Unspecified injury	16,893	(56)	12,010	(52)	549	(55)
Poisoning, nondrug	4,783	(92)	3,491	(78)	324	(70)
Poisoning, drugs	3,565	(97)	2,006	(90)	2,624	(25)
All other injury	3,349	(99)	2,772	(85)	135	(85)
Other burns	1,381	(111)	648	(104)	101	(91)
Other superficial injury	823	(119)	626	(106)	0	(135)
Underdosing	21	(142)	18	(141)	0	(135)
Musculoskeletal diseases						
Other back problems	1,115,456	(1)	226,435	(4)	5,175	(14)
All other musculoskeletal diseases	779,825	(2)	242,952	(1)	4,248	(15)
Osteoarthritis	39,012	(39)	18,212	(43)	1,002	(43)
Other knee disorders	12,887	(61)	5,440	(68)	467	(62)
Other shoulder disorders	10,891	(67)	4,687	(71)	131	(87)
Rheumatoid arthritis	2,990	(101)	1,068	(98)	12	(122)
Mental health disorders						
Adjustment disorders	421,034	(8)	83,800	(16)	34,953	(3)
Anxiety disorders	420,138	(9)	62,190	(20)	17,761	(6)
Mood disorders	376,990	(10)	46,353	(23)	51,623	(1)
Substance abuse disorders	375,764	(11)	29,134	(35)	46,423	(2)
All other mental health disorders	116,518	(23)	41,933	(24)	3,559	(20)
Personality disorders	18,646	(54)	3,012	(83)	2,315	(26)
Psychotic disorders	17,948	(55)	1,864	(91)	6,473	(9)
Somatoform disorders	8,198	(76)	2,215	(89)	506	(57)
Tobacco dependence	7,924	(78)	5,429	(69)	39	(111)
Signs and symptoms						
All other signs and symptoms	498,826	(6)	240,132	(2)	6,452	(10)
Abdomen and pelvis	186,805	(16)	117,838	(10)	1,008	(41)
Respiratory and chest	176,605	(17)	108,304	(12)	1,047	(40)
Neurologic conditions						
Organic sleep disorders	546,433	(5)	114,336	(11)	289	(73)
All other neurologic conditions	113,050	(24)	39,433	(27)	3,046	(22)
Other mononeuritis—upper and lower limbs	12,699	(62)	6,531	(64)	14	(121)
Epilepsy	5,438	(89)	1,655	(95)	735	(48)
Multiple sclerosis	2,704	(103)	504	(111)	184	(76)
Parkinson disease	277	(130)	64	(129)	10	(123)

TABLE. (cont.) Healthcare burdens attributable to various diseases and injuries, U.S. Armed Forces, 2018

Major category condition[a]	Medical encounters[b]		Individuals affected[c]		Bed days	
	No.	Rank[d]	No.	Rank[d]	No.	Rank[d]
Respiratory infections						
Upper respiratory infections	312,664	(13)	231,797	(3)	536	(56)
Lower respiratory infections	63,339	(30)	41,900	(25)	2,222	(28)
Otitis media	26,518	(47)	20,964	(39)	38	(112)
Sense organ diseases						
Refraction/accommodation	166,841	(18)	138,905	(7)	0	(135)
All other sense organ diseases	150,205	(20)	94,426	(14)	492	(59)
Hearing disorders	53,160	(33)	33,731	(30)	17	(120)
Glaucoma	11,375	(65)	7,272	(62)	0	(135)
Cataracts	1,255	(112)	662	(103)	3	(129)
Skin diseases						
All other skin diseases	242,015	(14)	135,491	(8)	3,725	(19)
Sebaceous gland diseases	56,821	(32)	32,299	(32)	10	(123)
Contact dermatitis	40,144	(38)	29,525	(34)	61	(101)
Genitourinary diseases						
All other genitourinary diseases	156,621	(19)	84,590	(15)	2,102	(29)
Female genital pain	32,192	(41)	15,309	(46)	112	(88)
Menstrual disorders	22,466	(49)	14,788	(49)	560	(54)
Other breast disorders	18,725	(53)	10,460	(54)	364	(68)
Kidney stones	14,866	(59)	6,243	(65)	586	(53)
Nephritis and nephrosis	10,409	(71)	4,090	(75)	1,655	(32)
Benign prostatic hypertrophy	2,873	(102)	1,850	(92)	23	(116)
Respiratory diseases						
Allergic rhinitis	109,619	(25)	40,578	(26)	2	(130)
All other respiratory diseases	62,893	(31)	36,024	(29)	2,712	(23)
Asthma	29,022	(46)	12,615	(50)	306	(71)
Chronic sinusitis	11,521	(64)	6,556	(63)	96	(93)
Chronic obstructive pulmonary disease	5,367	(90)	4,611	(72)	110	(89)
Infectious and parasitic diseases						
All other infectious and parasitic diseases	119,128	(22)	82,493	(17)	4,075	(18)
Diarrheal diseases	44,569	(36)	37,596	(28)	757	(47)
Unspecified viral infection	16,213	(57)	15,003	(48)	109	(90)
STDs (excluding chlamydia)	10,894	(66)	7,765	(61)	61	(101)
Chlamydia	9,215	(74)	8,144	(59)	25	(115)
Tuberculosis	2,154	(106)	780	(102)	83	(95)
Hepatitis B and C	1,046	(117)	524	(109)	0	(135)
Intestinal nematode infection	259	(131)	235	(122)	0	(135)
Malaria	209	(132)	65	(128)	81	(96)
Tropical cluster	143	(137)	49	(132)	33	(113)
Bacterial meningitis	115	(140)	37	(135)	77	(97)
Digestive diseases						
All other digestive diseases	104,065	(27)	59,490	(21)	8,427	(8)
Esophagus disease	30,849	(43)	18,990	(41)	616	(51)
Other gastroenteritis and colitis	29,510	(45)	18,491	(42)	1,692	(31)
Inguinal hernia	10,137	(73)	4,424	(73)	330	(69)
Appendicitis	5,814	(85)	2,816	(84)	4,192	(16)

TABLE. (cont.) Healthcare burdens attributable to various diseases and injuries, U.S. Armed Forces, 2018

Major category condition[a]	Medical encounters[b]		Individuals affected[c]		Bed days	
	No.	Rank[d]	No.	Rank[d]	No.	Rank[d]
Digestive diseases (cont.)						
Peptic ulcer disease	1,194	(114)	782	(101)	428	(63)
Cirrhosis of the liver	188	(134)	73	(127)	47	(107)
Maternal conditions						
Pregnancy complications	100,262	(28)	21,203	(38)	28,117	(4)
All other maternal conditions	40,495	(37)	9,632	(55)	5,415	(12)
Delivery	19,409	(52)	10,700	(53)	17,909	(5)
Ectopic pregnancy/miscarriage/abortion	7,973	(77)	3,562	(77)	492	(59)
Puerperium complications	6,046	(84)	3,323	(80)	1,006	(42)
Headache						
Headache	148,440	(21)	70,958	(19)	606	(52)
Cardiovascular diseases						
All other cardiovascular diseases	63,784	(29)	32,396	(31)	3,254	(21)
Essential hypertension	46,913	(35)	26,288	(36)	171	(77)
Ischemic heart disease	6,962	(80)	2,490	(88)	865	(44)
Cerebrovascular disease	6,713	(81)	1,548	(96)	1,636	(33)
Inflammatory	2,241	(105)	1,203	(97)	275	(74)
Rheumatic heart disease	493	(123)	418	(114)	19	(118)
Other neoplasms						
All other neoplasms	36,389	(40)	24,783	(37)	1,248	(36)
Benign skin neoplasm	14,971	(58)	12,380	(51)	0	(135)
Lipoma	7,587	(79)	4,896	(70)	29	(114)
Uterine leiomyoma	3,743	(96)	1,846	(93)	666	(49)
Endocrine disorders						
All other endocrine disorders	19,733	(51)	8,111	(60)	168	(78)
Hypothyroidism	10,140	(72)	5,770	(67)	18	(119)
Other thyroid disorders	8,849	(75)	3,774	(76)	298	(72)
Malignant neoplasms						
Lymphoma and multiple myeloma	6,576	(82)	579	(107)	799	(45)
All other malignant neoplasms	5,736	(86)	919	(99)	1,346	(34)
Leukemia	4,632	(93)	276	(121)	1,345	(35)
Melanoma and other skin cancers	3,759	(95)	1,827	(94)	60	(103)
Breast cancer	3,459	(98)	398	(116)	142	(84)
Testicular cancer	3,042	(100)	537	(108)	400	(65)
Colon and rectum cancers	2,482	(104)	229	(123)	763	(46)
Brain cancer	1,863	(109)	165	(125)	423	(64)
Thyroid cancer	1,485	(110)	400	(115)	147	(81)
Prostate cancer	1,105	(116)	187	(124)	147	(81)
Mouth and oropharynx cancers	959	(118)	124	(126)	56	(105)
Cervix uteri cancer	703	(120)	330	(118)	43	(109)
Trachea, bronchus, and lung cancers	399	(125)	61	(130)	168	(78)
Stomach cancer	371	(127)	35	(137)	89	(94)
Pancreas cancer	332	(128)	29	(139)	48	(106)
Esophagus cancer	313	(129)	19	(140)	71	(98)
Corpus uteri cancer	202	(133)	18	(141)	23	(116)
Ovary cancer	172	(135)	49	(132)	46	(108)

TABLE. (cont.) Healthcare burdens attributable to various diseases and injuries, U.S. Armed Forces, 2018

Major category condition[a]	Medical encounters[b]		Individuals affected[c]		Bed days	
	No.	Rank[d]	No.	Rank[d]	No.	Rank[d]
Malignant neoplasms (cont.)						
Liver cancer	159	(136)	30	(138)	59	(104)
Bladder cancer	133	(139)	49	(132)	0	(135)
Metabolic and immunity disorders						
Other metabolic disorders	10,726	(69)	5,788	(66)	374	(67)
Lipoid metabolism disorders	10,590	(70)	8,566	(57)	5	(127)
Immunity disorders	1,991	(107)	639	(105)	70	(99)
Oral conditions						
All other oral conditions	20,871	(50)	15,198	(47)	2,237	(27)
Dental caries	602	(121)	511	(110)	1	(133)
Periodontal disease	447	(124)	419	(113)	4	(128)
Blood disorders						
All other blood disorders	6,477	(83)	3,029	(82)	474	(61)
Iron-deficiency anemia	5,595	(88)	2,572	(87)	146	(83)
Other non-deficiency anemias	4,880	(91)	2,734	(86)	194	(75)
Hereditary anemias	3,941	(94)	3,387	(79)	100	(92)
Other deficiency anemias	541	(122)	317	(119)	1	(133)
Congenital disorders						
All other congenital anomalies	14,627	(60)	8,603	(56)	498	(58)
Congenital heart disease	1,988	(108)	884	(100)	155	(80)
Other circulatory anomalies	1,218	(113)	432	(112)	135	(85)
Nutritional disorders						
Overweight, obesity	10,858	(68)	8,328	(58)	41	(110)
All other nutritional disorders	5,675	(87)	4,252	(74)	8	(125)
Protein-energy malnutrition	139	(138)	36	(136)	8	(125)
Diabetes mellitus						
Diabetes mellitus	12,502	(63)	3,257	(81)	661	(50)
Conditions arising during perinatal period[e]						
Low birth weight	1,145	(115)	341	(117)	2	(130)
All other perinatal anomalies	381	(126)	277	(120)	2	(130)
Birth asphyxia and birth trauma	95	(141)	55	(131)	68	(100)

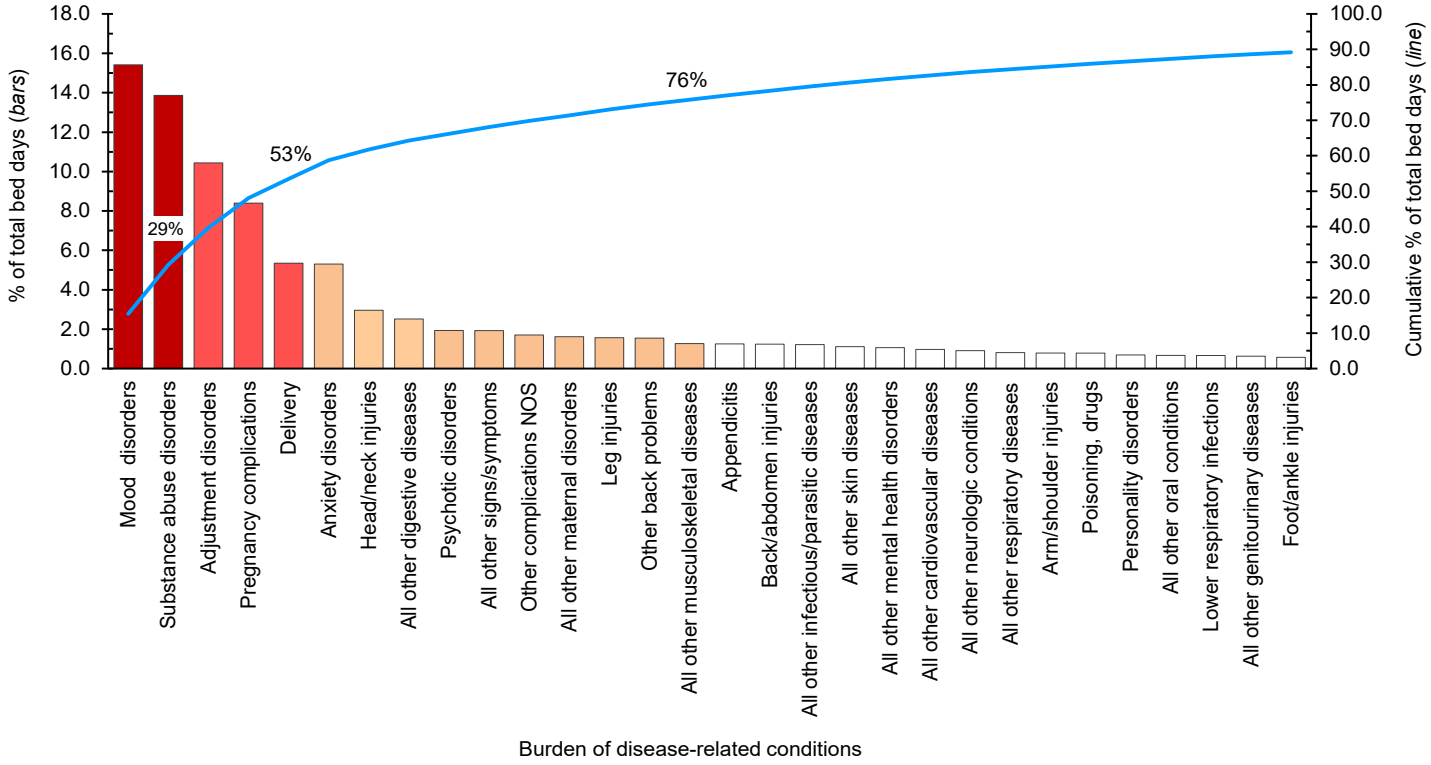
[a]Burden of disease major categories and burden of disease-related conditions based on a modified version of those defined in the Global Burden of Disease Study.[1]
[b]Medical encounters include total hospitalizations and ambulatory visits for the condition (with no more than 1 encounter per individual per day per condition).
[c]Individuals with at least 1 hospitalization or ambulatory visit for the condition.
[d]Rank based on 142 burden-related disease conditions; for individuals affected, 1 pair of tied values were given the same ranking, which resulted in a highest rank of 141; for hospital bed days, tied values were given the same ranking, which resulted in a highest rank of 135.
[e]Conditions affecting newborns erroneously coded on service member medical records.
No., number; NOS, not otherwise specified; STDs, sexually transmitted diseases.

attributable to various conditions and the number of individuals affected by the conditions (r=0.86) **(data not shown)**. For example, the 3 leading causes of medical encounters were among the 5 conditions that affected the most individuals **(Table)**. In contrast, there were weak to moderate positive relationships between the hospital bed days attributable to conditions and either the numbers of individuals affected by (r=0.17) or medical encounters attributable to (r=0.36) the same conditions **(data not shown)**. For example, labor and delivery and substance abuse disorders were among the top-ranking conditions in terms of proportion of total hospital bed days; however, these conditions affected relatively few service members.

EDITORIAL COMMENT

This report reiterates the major findings of prior annual reports on morbidity and healthcare burdens among U.S. military members. In particular, this report documents that a majority of the morbidity and healthcare burdens that affect

FIGURE 3. Percentage and cumulative percentage distribution, burden of disease-related conditions[a] that accounted for the most hospital bed days, active component, U.S. Armed Forces, 2018



[a]Burden of disease-related conditions based on a modified version of those defined in the Global Burden of Disease Study.[1]
NOS, not otherwise specified.

active component U.S. military members are attributable to just 6.3% of the 142 burden of disease-defining conditions considered in the analysis.

In 2018, as in prior years, musculoskeletal disorders (particularly of the back), injuries (particularly of the knee and arm/shoulder), mental health disorders (particularly adjustment, anxiety, substance abuse, and mood disorders), and pregnancy- and delivery-related conditions accounted for relatively large proportions of the morbidity and healthcare burdens that affected active component service members. Nine burden of disease-related conditions accounted for slightly more than half of all illness- and injury-related medical encounters of active component members and included 2 mental health disorders (adjustment and anxiety disorders), 3 anatomic site-defined injuries (knee, arm/shoulder, and foot/ankle), 2 musculoskeletal conditions (other back problems and all other musculoskeletal diseases), organic sleep disorders, and all other signs and symptoms.

It should be noted that this annual summary for 2018 was based on the use of ICD-10 codes exclusively. This is the third *MSMR* burden report that did not use ICD-9 codes. Because of some of the differences between the 2 generations of coding (e.g., compared to ICD-9, ICD-10 has more than 4 times as many codes, often allows for much greater specificity of diagnoses, and has added and deleted some specific diagnoses or terminology), direct comparisons of the counts for 2018 with those from years before 2016 should be interpreted with caution. Dramatic changes in counts and rankings for specific categories or conditions may reflect changes in incidence or prevalence, the effects of a different coding system, the adjustment of healthcare providers to the new coding system, or combinations of all 3.

Mental health disorders (including substance abuse disorders), injuries, and musculoskeletal disorders of the back have been leading causes of morbidity and disability among service members throughout military history.[3–8] It is well recognized that the prevention, treatment, and rehabilitation of back problems and joint injuries, and the detection, characterization, and management of mental health disorders—including substance abuse and deployment stress-related disorders (e.g., post-traumatic stress disorder)—should be the highest priorities for military medical research, public health, and force health protection programs.

In summary, this analysis, like those of prior years, documents that relatively few illnesses and injuries account for most of the morbidity and healthcare burdens that affect U.S. military members. Illnesses and injuries that disproportionately contribute to morbidity and healthcare burdens should be high-priority targets for prevention research and resources.

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Hospitalizations, Active Component, U.S. Armed Forces, 2018

This report documents the frequencies, rates, trends, and distributions of hospitalizations of active component members of the U.S. Army, Navy, Air Force, and Marine Corps during calendar year 2018. Summaries are based on standardized records of hospitalizations at U.S. military and non-military (reimbursed care) medical facilities worldwide. For this report, primary (first-listed) discharge diagnoses are considered indicative of the primary reasons for hospitalizations; summaries are based on the first 3 digits of the International Classification of Diseases, 10th Revision, Clinical Modification (ICD-10-CM) codes used to report primary discharge diagnoses. The analysis depicts the distribution of diagnoses according to the 17 traditional categories of the ICD system. Hospitalizations not routinely documented with standardized, automated records (e.g., during field training exercises or while shipboard) are not centrally available for health surveillance purposes and thus are not included in this report.

Frequencies, rates, and trends

In 2018, there were 65,505 records of hospitalizations of active component members of the U.S. Army, Navy, Air Force, and Marine Corps **(Table 1)**; 32.0% of the hospitalizations were in non-military facilities **(data not shown)**. The annual hospitalization rate (all causes) for 2018 was 50.5 per 1,000 service member person-years (p-yrs) and was the lowest rate reported during 2009–2018, the years covered in this report **(Figure 1)**.

Hospitalizations, by illness and injury categories

As in prior years, in 2018, 3 diagnostic categories accounted for nearly three-fifths (59.8%) of all hospitalizations of active component members: mental health disorders (27.4%), pregnancy- and delivery-related

WHAT ARE THE NEW FINDINGS?

As in prior years, mental health disorders, pregnancy-related conditions, and injury/poisoning accounted for the majority (59.8%) of all hospitalizations among active component service members in 2018. However, the hospitalization rate for all causes was the lowest rate in the past 10 years.

WHAT IS THE IMPACT ON READINESS AND FORCE HEALTH PROTECTION?

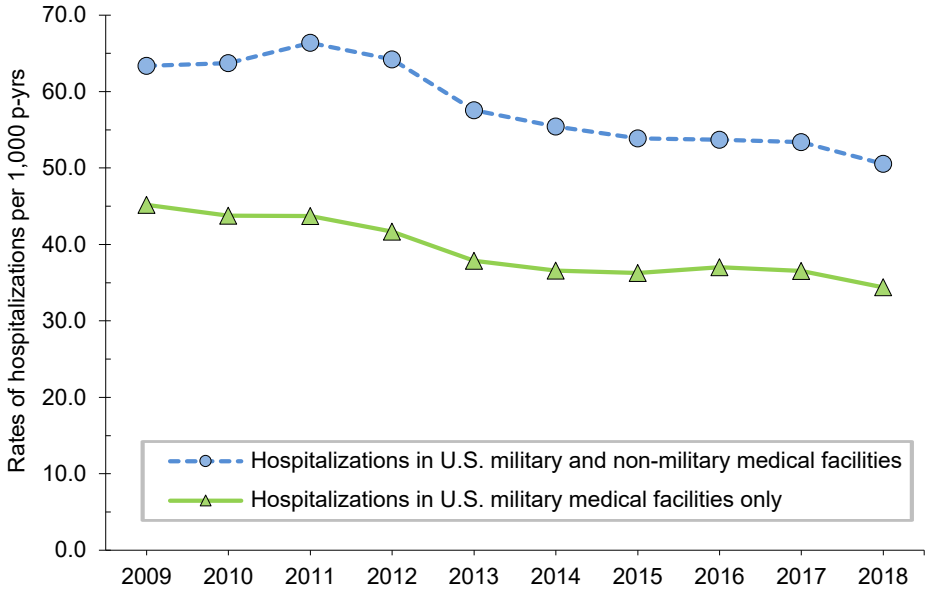
Hospitalizations for mental health disorders, particularly adjustment and mood disorders, reduce operational readiness. Even after discharge from the hospital, unresolved mental health disorders can result in limited and light duty, early attrition, and stress on the service member's unit.

TABLE 1. Hospitalizations, ICD-10 diagnostic categories, U.S. Armed Forces, 2014, 2016, and 2018

	2014			2016			2018		
Major diagnostic category (ICD-10 codes)	No.	Rate[a]	Rank	No.	Rate[a]	Rank	No.	Rate[a]	Rank
Mental health disorders (F01–F99)	16,514	12.3	(1)	16,770	13.0	(1)	17,954	13.9	(1)
Pregnancy and delivery (O00–O99, relevant Z-codes)[b]	15,857	78.6	(2)	15,476	76.1	(2)	14,848	69.7	(2)
Injury/poisoning (S00–T98, DOD0101–DOD0105)	7,605	5.7	(3)	6,895	5.3	(3)	6,351	4.9	(3)
Digestive system (K00–K95)	6,675	5.0	(4)	5,764	4.5	(5)	5,274	4.1	(4)
Musculoskeletal system (M00–M99)	6,274	4.7	(5)	5,992	4.6	(4)	4,822	3.7	(5)
Signs, symptoms, and ill-defined conditions (R00–R99)	3,357	2.5	(7)	3,290	2.6	(6)	3,006	2.3	(6)
Other (Z00–Z99, except pregnancy-related)[c]	3,591	2.7	(6)	2,175	1.7	(7)	2,033	1.6	(7)
Genitourinary system (N00–N99)	2,264	1.7	(9)	2,083	1.6	(8)	1,985	1.5	(8)
Respiratory system (J00–J99)	1,921	1.4	(10)	2,027	1.6	(9)	1,776	1.4	(9)
Circulatory system (I00–I99)	2,344	1.8	(8)	1,882	1.5	(10)	1,625	1.3	(10)
Nervous system and sense organs (G00–H95)	1,773	1.3	(12)	1,757	1.4	(11)	1,436	1.1	(11)
Neoplasms (C00–D49)	1,836	1.4	(11)	1,677	1.3	(12)	1,338	1.0	(12)
Skin and subcutaneous tissue (L00–L99)	1,492	1.1	(13)	1,199	0.9	(13)	1,051	0.8	(13)
Infectious and parasitic diseases (A00–B99)	1,282	1.0	(14)	1,071	0.8	(14)	996	0.8	(14)
Endocrine, nutrition, immunity (E00–E89)	732	0.5	(15)	626	0.5	(15)	521	0.4	(15)
Hematologic disorders (D50–D89)	320	0.2	(17)	262	0.2	(17)	274	0.2	(16)
Congenital anomalies (Q00–Q99)	367	0.3	(16)	283	0.2	(16)	215	0.2	(17)
Total	74,204	55.4		69,229	53.7		65,505	50.5	

[a]Rates are based on 1,000 person-years.
[b]Rate of pregnancy and delivery-related hospitalizations among females only.
[c]Other factors influencing health status and contact with health services (excluding pregnancy-related).
ICD, International Classification of Diseases; No., number.

FIGURE 1. Rates of hospitalization, by year, active component, U.S. Armed Forces, 2009–2018



P-yrs, person-years.

conditions (22.7%), and injury/poisoning (9.7%) **(Table 1)**. Similar to 2014 and 2016, in 2018 there were more hospitalizations for mental health disorders than for any other major diagnostic category (per ICD-10); 2008 was the last year in which the number of hospitalizations for pregnancy- and delivery-related conditions exceeded the number for mental health disorders **(data not shown)**.

Comparing 2018 to 2014, numbers of hospitalizations decreased in all major categories of illnesses and injuries except for mental health disorders, which increased 8.7% **(Table 1)**. The largest drop in the number of hospitalizations during 2014–2018 was seen in the category of "other factors influencing health status and contact with health services" (excluding pregnancy-related) (hospitalization difference, 2014–2018: -1,558; 43.4% decrease).

Hospitalizations, by sex

In 2018, the hospitalization rate (all causes) among females was more than 3 times that of males (121.1 per 1,000 p-yrs vs. 36.6 per 1,000 p-yrs, respectively). Excluding pregnancy and delivery, the rate of hospitalizations among females (51.4 per 1,000 p-yrs) was 40.3% higher than among males (36.6 per 1,000 p-yrs) **(data not shown)**.

Overall hospitalization rates were higher (i.e., the rate difference [RD] was greater than 1.0 per 1,000 p-yrs) among females than males for mental health disorders (female:male RD: 7.0 per 1,000 p-yrs); genitourinary disorders (RD: 4.0 per 1,000 p-yrs); neoplasms (RD: 1.7 per 1,000 p-yrs); and, signs, symptoms, and ill-defined conditions (RD: 1.0 per 1,000 p-yrs) **(data not shown)**. Hospitalization rates were higher among males than females for injury/poisoning (male:female RD: 1.1 per 1,000 p-yrs). Hospitalization rates were relatively similar among males and females for the remaining 11 major disease-specific categories **(data not shown)**.

Relationships between age and hospitalization rates varied considerably across illness- and injury-specific categories. For example, among both males and females, hospitalization rates generally increased with age for neoplasms, circulatory, genitourinary, digestive, nervous, endocrine/nutrition/immunity, and musculoskeletal system/connective tissue disorders **(Figure 2)**. Among service members aged 30 years or older, there was a pronounced difference by sex in the slopes of the rates of neoplasms, with the rates among females notably higher than among males in the same age groups. Rates decreased with age for mental health disorders but were relatively stable across age groups for injury/poisoning, skin and subcutaneous tissue, and infectious/parasitic diseases.

Most frequent diagnoses

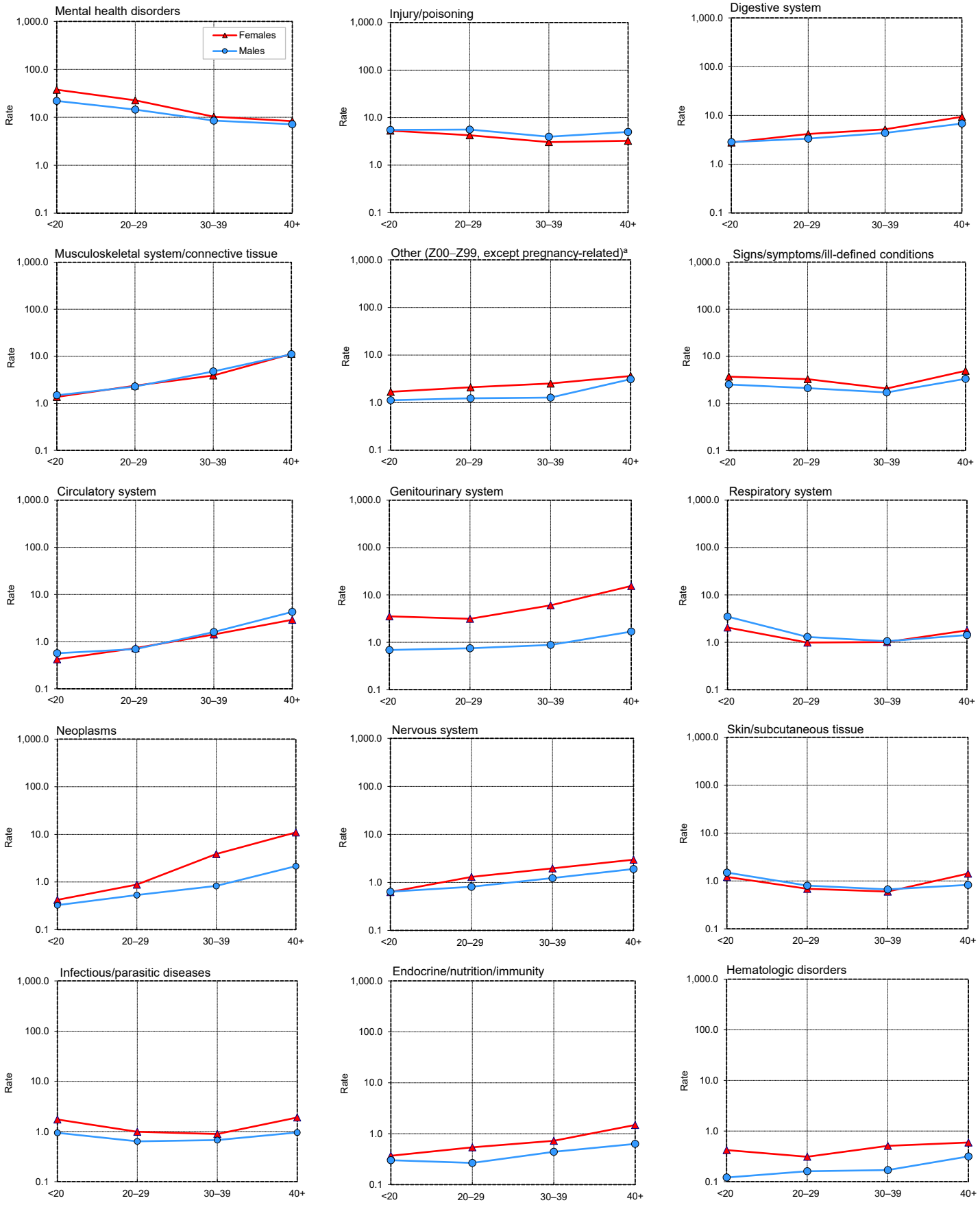
In 2018, adjustment disorder was the most frequent discharge diagnosis among males (n=4,379) **(Table 2)**. Alcohol dependence (n=2,068), major depressive disorder (single episode, unspecified) (n=1,247), acute appendicitis (n=1,097), major depressive disorder [recurrent, severe without psychotic features] (n=963), other symptoms and signs involving emotional state (n=628), and post-traumatic stress disorder (PTSD) (n=609) were the next 6 most frequent diagnoses in males **(Table 2)**.

In 2018, pregnancy- and delivery-related conditions represented 4 of the top 5 leading causes of hospitalizations among females, and this category alone accounted for 57.5% of all hospitalizations of females **(Table 3)**. The top 4 discharge diagnoses in this condition category included post-term (late) pregnancy (n=1,226), abnormality in fetal heart rate and rhythm (n=1,051), second-degree perineal laceration during delivery (n=884), and maternal care due to uterine scar from previous surgery (n=867). Other than pregnancy- and delivery-related diagnoses, leading causes of hospitalizations among females were adjustment disorder (n=1,246), recurrent major depressive disorder without psychotic features (n=416), major depressive disorder [single episode, unspecified] (n=396), PTSD (n=357), and alcohol dependence (n=256). Combined, mental health disorder diagnoses accounted for one-sixth (16.3%) of all hospitalizations of females.

Injury/poisoning

As in the past, in 2018, injury/poisoning was the third leading cause of hospitalizations of U.S. military members **(Table 1)**. Of all injury/poisoning-related hospitalizations in U.S. military medical facilities (n=3,873), more than three-fifths (61.3%) had a missing or invalid NATO Standardization Agreement (STANAG) code **(Table 4)**.

FIGURE 2. Rates of hospitalization, by major diagnostic category, age group, and sex, active component, U.S. Armed Forces, 2018



[a]Other factors influencing health status and contact with health services (excluding pregnancy-related).

TABLE 2. Most frequent diagnoses during hospitalization, by major diagnostic category, males, U.S. Armed Forces, 2018

Diagnostic category (ICD-10 codes) ♂	No.	%[a]
Mental health disorders (F01–F99)	**13,757**	
Adjustment disorders	4,379	31.8
Alcohol dependence	2,068	15.0
Major depressive disorder, single episode, unspecified	1,247	9.1
Major depressive disorder, recurrent severe without psychotic features	963	7.0
Post-traumatic stress disorder (PTSD)	609	4.4
Injury/poisoning (S00–T98, DOD0101–DOD0105)	**5,506**	
Infection following a procedure	197	3.6
Concussion	187	3.4
Other fractures of lower leg	155	2.8
Heatstroke and sunstroke	134	2.4
Fracture of mandible	115	2.1
Digestive system (K00–K95)	**4,268**	
Other and unspecified acute appendicitis	1,097	25.7
Acute appendicitis with localized peritonitis	201	4.7
Acute pancreatitis, unspecified	141	3.3
Noninfective gastroenteritis and colitis, unspecified	132	3.1
Other and unspecified intestinal obstruction	126	3.0
Musculoskeletal system (M00–M99)	**4,101**	
Other specified disorders of muscle	523	12.8
Thoracic, thoracolumbar, and lumbosacral intervertebral disc disorders with radiculopathy	360	8.8
Major anomalies of jaw size	247	6.0
Spinal stenosis	198	4.8
Other spondylosis with radiculopathy	189	4.6
Other (V00–V98, except pregnancy-related)[b]	**1,543**	
Encounter for examination and observation for unspecified reason	271	17.6
Encounter for antineoplastic chemotherapy and immunotherapy	271	17.6
Encounter for other specified postprocedural aftercare	212	13.7
Encounter for other orthopedic aftercare	176	11.4
Aftercare following joint replacement surgery	125	8.1
Signs, symptoms, and ill-defined conditions (R00–R99)	**2,337**	
Other symptoms and signs involving emotional state	628	26.9
Other chest pain	236	10.1
Syncope and collapse	220	9.4
Chest pain, unspecified	148	6.3
Unspecified convulsions	94	4.0
Circulatory system (I00–I99)	**1,401**	
Pulmonary embolism without acute cor pulmonale	159	11.3
Non-ST elevation (NSTEMI) myocardial infarction	75	5.4
Unspecified atrial fibrillation and atrial flutter	69	4.9
Atherosclerotic heart disease of native coronary artery	65	4.6
Paroxysmal atrial fibrillation	58	4.1
Genitourinary system (N00–N99)	**944**	
Acute kidney failure, unspecified	215	22.8
Hydronephrosis with renal and ureteral calculous obstruction	80	8.5
Calculus of kidney	62	6.6
Calculus of ureter	55	5.8
Hypertrophy of breast	51	5.4

Diagnostic category (ICD-10 codes) ♂	No.	%[a]
Respiratory system (J00–J99)	**1,530**	
Pneumonia, unspecified organism	289	18.9
Peritonsillar abscess	128	8.4
Deviated nasal septum	77	5.0
Other pneumothorax and air leak	67	4.4
Other intraoperative and postprocedural complications and disorders of respiratory system, not elsewhere classified	58	3.8
Neoplasms (C00–D49)	**824**	
Acute lymphoblastic leukemia (ALL)	44	5.3
Malignant neoplasm of thyroid gland	36	4.4
Malignant neoplasm of testis, unspecified whether descended or undescended	29	3.5
Malignant neoplasm of prostate	23	2.8
Benign neoplasm of pituitary gland	23	2.8
Nervous system and sense organs (G00–G99, H00–H95)	**1,107**	
Sleep apnea	91	8.2
Acute pain, not elsewhere classified	67	6.1
Epilepsy, unspecified	51	4.6
Nonpyogenic meningitis	37	3.3
Brachial plexus disorders	35	3.2
Skin and subcutaneous tissue (L00–L99)	**887**	
Cellulitis and acute lymphangitis of other parts of limb	347	39.1
Cutaneous abscess, furuncle and carbuncle of limb	52	5.9
Pilonidal cyst and sinus without abscess	51	5.7
Cellulitis and acute lymphangitis of face and neck	50	5.6
Cellulitis and acute lymphangitis of finger and toe	37	4.2
Infectious and parasitic diseases (A00–B99)	**761**	
Sepsis, unspecified organism	237	31.1
Infectious gastroenteritis and colitis, unspecified	49	6.4
Viral intestinal infection, unspecified	40	5.3
Enterocolitis due to *Clostridium difficile*	34	4.5
Viral infection, unspecified	30	3.9
Endocrine, nutrition, immunity (E00–E89)	**383**	
Type 1 diabetes mellitus with ketoacidosis	50	13.1
Dehydration	44	11.5
Other specified diabetes mellitus with ketoacidosis	32	8.4
Type 2 diabetes mellitus with other specified complications	27	7.0
Hypo-osmolality and hyponatremia	22	5.7
Congenital anomalies (Q00–Q99)	**156**	
Atrial septal defect	12	7.7
Arteriovenous malformation of cerebral vessels	11	7.1
Arteriovenous malformation (peripheral)	10	6.4
Other congenital deformities of hip	8	5.1
Malformation of coronary vessels	7	4.5
Hematologic and immune disorders (D50–D89)	**190**	
Neutropenia, unspecified	35	18.4
Agranulocytosis secondary to cancer chemotherapy	16	8.4
Anemia, unspecified	13	6.8
Immune thrombocytopenic purpura	12	6.3
Other specified aplastic anemias and other bone marrow failure syndromes	10	5.3

[a]Percentage of the total number of hospitalizations within the diagnostic category.
[b]Other factors influencing health status and contact with health services (excluding pregnancy-related).
ICD, International Classification of Diseases; No., number.

TABLE 3. Most frequent diagnoses during hospitalization, by major diagnostic category, females, U.S. Armed Forces, 2018

Diagnostic category (ICD-10 codes) ♀	No.	%[a]
Mental health disorders (F01–F99)	**4,197**	
Adjustment disorders	1,246	29.7
Major depressive disorder, recurrent severe without psychotic features	416	9.9
Major depressive disorder, single episode, unspecified	396	9.4
Post-traumatic stress disorder (PTSD)	357	8.5
Alcohol dependence	256	6.1
Pregnancy and delivery (O00–O99, relevant Z codes)	**14,848**	
Post-term pregnancy	1,226	8.3
Abnormality in fetal heart rate and rhythm complicating labor and delivery	1,051	7.1
Second degree perineal laceration during delivery	884	6.0
Maternal care due to uterine scar from previous surgery	867	5.8
First degree perineal laceration during delivery	836	5.6
Injury/poisoning (S00–T98, DOD0101–DOD0105)	**845**	
Poisoning by, adverse effect of, and underdosing of 4-Aminophenol derivatives	49	5.8
Infection following a procedure	37	4.4
Unspecified injury	35	4.1
Poisoning by, adverse effect of, and underdosing of other and unspecified antidepressants	34	4.0
Concussion	29	3.4
Digestive system (K00–K95)	**1,006**	
Other and unspecified acute appendicitis	187	18.6
Calculus of gallbladder with acute cholecystitis	48	4.8
Noninfective gastroenteritis and colitis, unspecified	44	4.4
Acute cholecystitis	37	3.7
Acute pancreatitis, unspecified	29	2.9
Musculoskeletal system (M00–M99)	**721**	
Major anomalies of jaw size	69	9.6
Other specified disorders of muscle	64	8.9
Thoracic, thoracolumbar, and lumbosacral intervertebral disc disorders with radiculopathy	50	6.9
Other spondylosis with radiculopathy	33	4.6
Anomalies of dental arch relationship	30	4.2
Other (V00–V98, except pregnancy-related)[b]	**490**	
Encounter for examination and observation for unspecified reason	103	21.0
Encounter for other specified postprocedural aftercare	74	15.1
Encounter for other administrative examinations	55	11.2
Encounter for other orthopedic aftercare	35	7.1
Encounter for antineoplastic chemotherapy and immunotherapy	35	7.1
Signs, symptoms, and ill-defined conditions (R00–R99)	**669**	
Other symptoms and signs involving emotional state	158	23.6
Syncope and collapse	61	9.1
Unspecified abdominal pain	48	7.2
Pain localized to other parts of lower abdomen	36	5.4
Other chest pain	29	4.3

Diagnostic category (ICD-10 codes) ♀	No.	%[a]
Circulatory system (I00–I99)	**224**	
Pulmonary embolism without acute cor pulmonale	43	19.2
Cerebral infarction, unspecified	17	7.6
Acute embolism and thrombosis of deep veins of lower extremity	11	4.9
Supraventricular tachycardia	9	4.0
Non-ST elevation (NSTEMI) myocardial infarction	7	3.1
Genitourinary system (N00–N99)	**1,041**	
Abnormal uterine and vaginal bleeding, unspecified	117	11.2
Acute tubulo-interstitial nephritis	73	7.0
Other and unspecified ovarian cysts	71	6.8
Hypertrophy of breast	67	6.4
Other specified abnormal uterine and vaginal bleeding	62	6.0
Respiratory system (J00–J99)	**246**	
Pneumonia, unspecified organism	32	13.0
Peritonsillar abscess	22	8.9
Other and unspecified asthma	19	7.7
Other intraoperative and postprocedural complications and disorders of respiratory system, not elsewhere classified	14	5.7
Acute tonsillitis, unspecified	13	5.3
Neoplasms (C00–D49)	**514**	
Leiomyoma of uterus, unspecified	148	28.8
Intramural leiomyoma of uterus	63	12.3
Subserosal leiomyoma of uterus	29	5.6
Malignant neoplasm of breast of unspecified site	27	5.3
Malignant neoplasm of thyroid gland	18	3.5
Nervous system and sense organs (G00–G99, H00–H95)	**329**	
Migraine, unspecified	26	7.9
Migraine with aura	24	7.3
Acute pain, not elsewhere classified	19	5.8
Epilepsy, unspecified	18	5.5
Multiple sclerosis	17	5.2
Skin and subcutaneous tissue (L00–L99)	**164**	
Cellulitis and acute lymphangitis of other parts of limb	43	26.2
Cutaneous abscess, furuncle and carbuncle of limb	11	6.7
Pilonidal cyst and sinus with abscess	11	6.7
Cutaneous abscess, furuncle and carbuncle of trunk	9	5.5
Cellulitis and acute lymphangitis of face and neck	9	5.5
Infectious and parasitic diseases (A00–B99)	**235**	
Sepsis, unspecified organism	79	33.6
Viral intestinal infection, unspecified	19	8.1
Infectious gastroenteritis and colitis, unspecified	18	7.7
Sepsis due to other Gram-negative organisms	14	6.0
Enterocolitis due to *Clostridium difficile*	12	5.1
Endocrine, nutrition, immunity (E00–E89)	**138**	
Thyrotoxicosis with diffuse goiter	27	19.6
Hypokalemia	14	10.1
Dehydration	13	9.4
Nontoxic single thyroid nodule	12	8.7
Obesity due to excess calories	6	4.3
Hematologic and immune disorders (D50–D89)	**84**	
Iron deficiency anemia secondary to blood loss (chronic)	18	21.4
Iron deficiency anemia, unspecified	15	17.9
Acute posthemorrhagic anemia	7	8.3
Anemia, unspecified	7	8.3
Neutropenia, unspecified	7	8.3

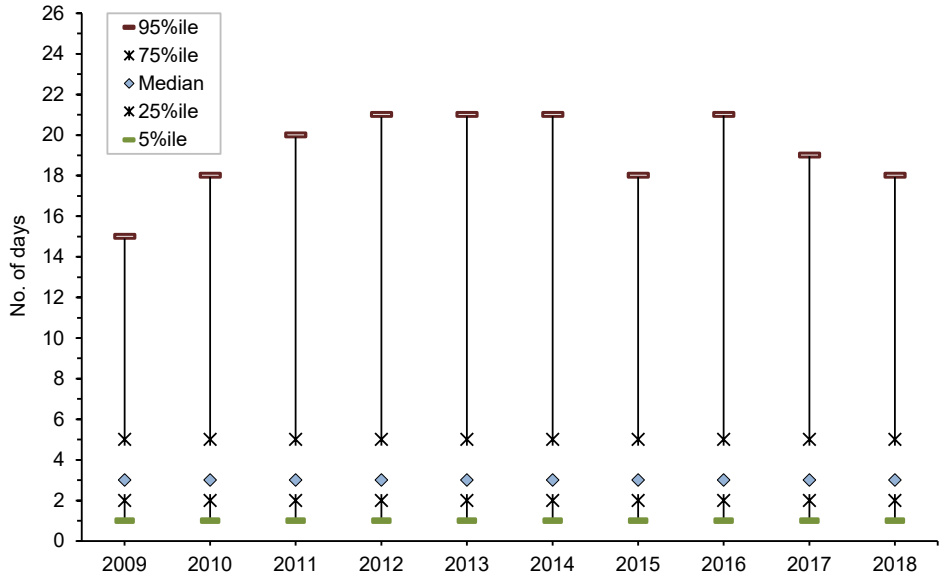
[a]Percentage of the total number of hospitalizations within the diagnostic category.
[b]Other factors influencing health status and contact with health services (excluding pregnancy-related).
ICD, International Classification of Diseases; No., number.

TABLE 4. Injury hospitalizations,[a] by causal agent,[b] U.S. Armed Forces, 2018

Cause	No.	%
Unintentional	1,371	35.4
Fall and miscellaneous	454	11.7
Land transport	305	7.9
Athletics	124	3.2
Poisons and fire	107	2.8
Complications of medical/surgical	98	2.5
Environmental	96	2.5
Guns, explosives (includes accidents during war)	67	1.7
Machinery, tools	67	1.7
Air transport	46	1.2
Water transport	7	0.2
Intentional	128	3.3
Self-inflicted	92	2.4
Battle casualty	28	0.7
Non-battle, inflicted by other (e.g., assault)	8	0.2
Missing/invalid code	2,374	61.3
Total	3,873	

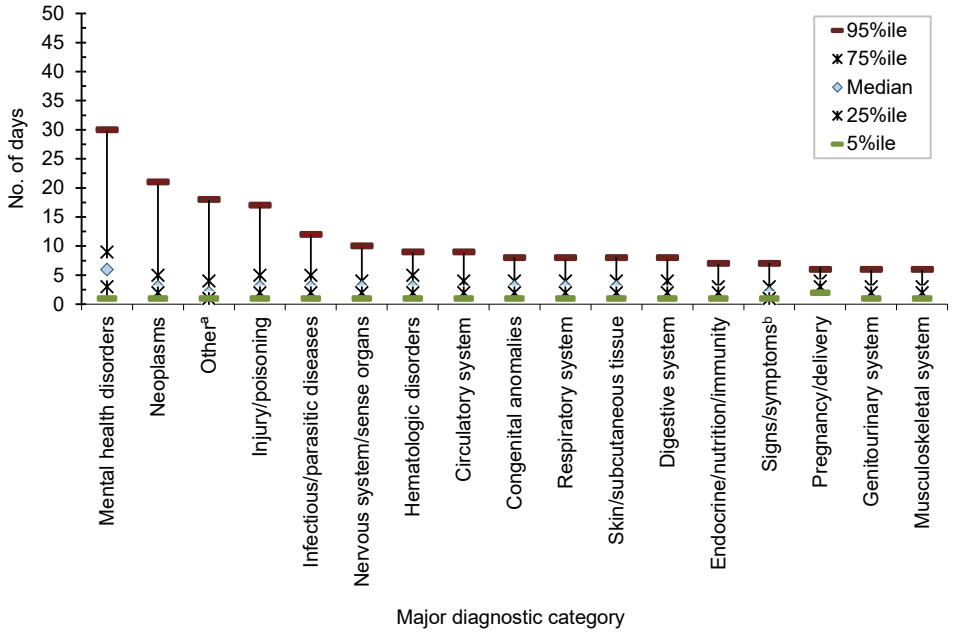
[a]Hospitalizations in U.S. military medical facilities only.
[b]Causal agents were determined by codes per NATO Standardization Agreement (STANAG) 2050.
No., number.

FIGURE 3. Length of hospital stay, by year, active component, U.S. Armed Forces, 2009–2018



No., number.

FIGURE 4. Length of hospital stay, by major diagnostic category, active component, U.S. Armed Forces, 2009–2018



[a]Other factors influencing health status and contact with health services (excluding pregnancy-related).
[b]Includes ill-defined conditions.
No., number.

Nearly one-third (33.1%) of all "unintentional" injury/poisoning-related hospitalizations in U.S. military facilities (n=1,371) were considered caused by falls and miscellaneous (n=454), while land transport (n=305) accounted for 22.2% of "unintentional" injury/poisoning-related hospitalizations **(Table 4)**.

Among males, injury/poisoning-related hospitalizations were most often related to infection following a procedure, concussion, or other fractures of the lower leg **(Table 2)**. Among females, injury/poisoning-related hospitalizations were most often related to poisoning by/adverse effect of acetaminophen derivatives, infection following a procedure, unspecified injuries, or poisoning by/adverse effect of/underdosing of other and unspecified antidepressants **(Table 3)**.

Durations of hospitalizations

During 2009–2018, the median duration of hospital stays (all causes) remained stable at 3 days **(Figure 3)**. As in previous years, medians and ranges of durations of hospitalizations varied considerably across major diagnostic categories. For example, median lengths of hospitalizations varied from 2 days (e.g., musculoskeletal system disorders; genitourinary system disorders; signs, symptoms, and ill-defined conditions) to 6 days (mental health disorders). For most diagnostic categories, less than 5% of hospitalizations exceeded 12 days, but for 4 categories, 5% of hospitalizations had longer durations: injury/poisoning (17 days), other non-pregnancy-related factors

TABLE 5. Hospitalizations, by service and ICD-10 diagnostic category, U.S. Armed Forces, 2018

	Army		Navy		Air Force		Marine Corps	
Major diagnostic category (ICD-10-CM)	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]
Mental health disorders (F01–F99)	8,284	17.7	3,537	10.9	3,901	12.2	2,232	12.1
Pregnancy and delivery (O00–O99, relevant Z-codes)[b]	5,169	11.1	4,225	13.0	4,293	13.4	1,161	6.3
Injury/poisoning (S00–T98, DOD0101–DOD0105)	3,086	6.6	1,155	3.6	978	3.1	1,132	6.1
Digestive system (K00–K95)	2,305	4.9	1,219	3.8	1,088	3.4	662	3.6
Musculoskeletal system (M00–M99)	2,213	4.7	893	2.8	1,037	3.2	679	3.7
Signs, symptoms, and ill-defined conditions (R00–R99)	1,843	3.9	422	1.3	510	1.6	231	1.2
Other (Z00–Z99, except pregnancy-related)[c]	884	1.9	407	1.3	470	1.5	272	1.5
Genitourinary system (N00–N99)	873	1.9	432	1.3	454	1.4	226	1.2
Respiratory system (J00–J99)	773	1.7	293	0.9	303	0.9	407	2.2
Circulatory system (I00–I99)	667	1.4	427	1.3	357	1.1	174	0.9
Neoplasms (C00–D49)	595	1.3	309	1.0	317	1.0	117	0.6
Nervous system and sense organs (G00–G99, H00–H95)	577	1.2	358	1.1	340	1.1	161	0.9
Skin and subcutaneous tissue (L00–L99)	448	1.0	225	0.7	166	0.5	212	1.1
Infectious and parasitic diseases (A00–B99)	407	0.9	236	0.7	242	0.8	111	0.6
Endocrine, nutrition, immunity (E00–E89)	228	0.5	135	0.4	103	0.3	55	0.3
Hematologic and immune disorders (D50–D89)	121	0.3	77	0.2	52	0.2	24	0.1
Congenital anomalies (Q00–Q99)	79	0.2	51	0.2	62	0.2	23	0.1
Total	28,552	61.1	14,401	44.4	14,673	44.9	7,879	42.6

[a]Rates are based on 1,000 person-years.
[b]Rates for pregnancy and delivery-related hospitalizations among females only.
[c]Other factors influencing health status and contact with health services (excluding pregnancy-related).
ICD, International Classification of Diseases; No., number.

influencing health status and contact with health services (primarily orthopedic aftercare and rehabilitation following a previous illness or injury) (18 days), neoplasms (21 days), and mental health disorders (30 days) **(Figure 4)**.

Hospitalizations, by service

Among active component members of the Navy and Air Force, pregnancy- and delivery-related conditions accounted for more hospitalizations than any other category of illnesses or injuries; however, among active component members of the Army and Marine Corps, mental health disorders were the leading cause of hospitalizations **(Table 5)**. The crude hospitalization rate for mental health disorders among active component Army members (17.7 per 1,000 p-yrs) was higher than among members of all other services.

Injury/poisoning was the third leading cause of hospitalizations in the Army and the Marine Corps, fourth in the Navy, and fifth in the Air Force **(Table 5)**. The hospitalization rate for injury/poisoning was slightly higher among soldiers (6.6 per 1,000 p-yrs) than Marines (6.1 per 1,000 p-yrs).

EDITORIAL COMMENT

In 2018, the hospitalization rate for all causes among active component members was the lowest rate seen in the past 10 years. As in past years, in 2018, mental health disorders, pregnancy- and delivery-related conditions, and injury/poisoning accounted for more than half of all hospitalizations of active component members. Adjustment and mood disorders were among the leading causes of hospitalizations among both male and female service members. In recent years, attention at the highest levels of the U.S. military and significant resources have focused on detecting, diagnosing, and treating mental health disorders—especially those related to long and repeated deployments and combat stress. Annual numbers and crude rates of hospitalizations for mental health disorders increased between 2014 and 2018; the number of mental health disorder-related hospitalizations in 2018 was more than a thousand greater than in 2016 and the crude rate was 6.4% higher.

The reasons for the recent downturn in the trends for annual numbers of hospitalizations overall and for the slight increase in mental health disorder-related hospitalizations in particular are not clear. It is conceivable that there has been a decline in the impact of combat and peacekeeping operations on overall morbidity among service members since the withdrawal of U.S. forces from Iraq and the official end to combat operations in Afghanistan. Continued monitoring of hospitalizations and all other healthcare encounters over time may permit elucidation of the possible reasons for the recent trends in hospitalization.

This summary has certain limitations that should be considered when interpreting the results. For example, the scope of this report is limited to members of the active components of the U.S. Armed Forces. Many reserve component members were hospitalized for illnesses and injuries while serving on active duty in 2018; however, these hospitalizations are not accounted for in this report. In addition, many injury/poisoning-related hospitalizations occur in non-military hospitals. If there are significant differences between the causes of injuries and poisonings that resulted in hospitalizations in U.S. military and non-military hospitals, the summary of external causes of injuries requiring hospital treatment reported here **(Table 4)** could be misleading. Also, this summary is based on primary (first-listed) discharge diagnoses only; however, in many hospitalized cases, there are multiple underlying conditions. For example, military members who are wounded in combat or injured in motor vehicle accidents may have multiple injuries and complex medical and psychological complications. In such cases, only the first-listed discharge diagnosis would be accounted for in this report. Finally, the new electronic health record for the Military Health System, MHS GENESIS, was implemented at several military treatment facilities during 2017. Medical data from sites using MHS GENESIS are not available in the Defense Medical Surveillance System. These sites include Naval Hospital Oak Harbor, Naval Hospital Bremerton, Air Force Medical Services Fairchild, and Madigan Army Medical Center. Therefore, medical encounter data for individuals who were hospitalized at any of these facilities during 2018 were not included in this analysis. Even with these limitations, this report provides useful and informative insights regarding the natures, rates, and distributions of the most serious illnesses and injuries that affect active component military members.

Ambulatory Visits, Active Component, U.S. Armed Forces, 2018

This report documents the frequencies, rates, trends, and characteristics of ambulatory healthcare visits of active component members of the U.S. Army, Navy, Air Force, and Marine Corps during 2018. Ambulatory visits of U.S. service members in fixed military and nonmilitary (reimbursed through the Military Health System [MHS]) medical treatment facilities are documented with standardized, automated records. These records are routinely archived for health surveillance purposes in the Defense Medical Surveillance System (DMSS), which is the source of data for this report. Ambulatory visits that are not routinely and completely documented with standardized electronic records (e.g., during deployments, field training exercises, or at sea) are not included in this analysis. As in previous *MSMR* reports, all records of ambulatory visits of active component service members were categorized according to the first 4 characters of the International Classification of Diseases, 10th Revision, Clinical Modification (ICD-10-CM) codes entered in the primary (first-listed) diagnostic position of the visit records.[1] The analysis depicts the distribution of diagnoses according to the 17 traditional categories of the ICD system.

Frequencies, rates, and trends

During 2018, there were 16,274,417 reported ambulatory visits of active component service members. The crude annual rate (all causes) was 12,554.7 visits per 1,000 person-years (p-yrs) or 12.6 visits per p-yr; thus, on average, each service member had approximately 13 ambulatory encounters during the year **(Table 1)**. The rate of documented ambulatory visits in 2018 (12,554.69 per 1,000 p-yrs) was 6.1% lower than the rate in 2016 (13,366.8 visits per 1,000 p-yrs) and 13.0% lower than the peak in 2012 (14,438.9

WHAT ARE THE NEW FINDINGS?

Musculoskeletal disorders and mental health disorders accounted for more than half (52.6%) of all illness- and injury-related ambulatory encounters among active component service members in 2018. Since 2014, the number of ambulatory visits for mental health disorders has decreased, while the numbers of ambulatory visits for musculoskeletal system/connective tissue disorders, nervous system and sense organ disorders, and respiratory system disorders have increased.

WHAT IS THE IMPACT ON READINESS AND FORCE HEALTH PROTECTION?

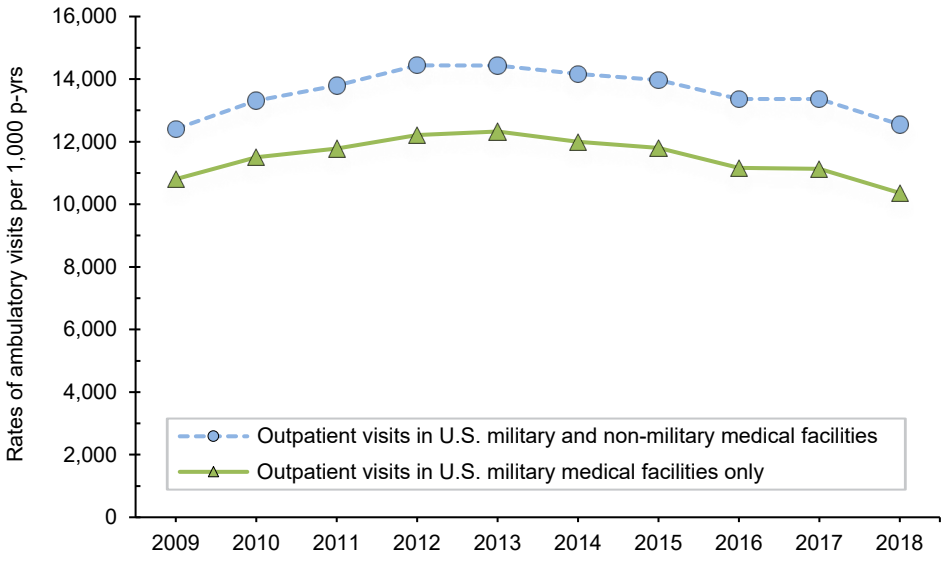
Ambulatory visits for injury/poisoning and musculoskeletal system disorders resulted in the largest percentages of limited duty dispositions among service members diagnosed in military treatment facilities. Duty limitations adversely affect the readiness of affected service members' units. Prevention and treatment of the most common causes of duty limitations will help preserve units' readiness.

TABLE 1. Ambulatory visits, ICD-10 diagnostic categories, U.S. Armed Forces, 2014, 2016, and 2018

	2014			2016			2018		
Major diagnostic category (ICD-10-CM)	No.	Rate[a]	Rank	No.	Rate[a]	Rank	No.	Rate[a]	Rank
Other (Z00–Z99, except pregnancy-related)[b]	8,703,559	6,500.2	(1)	5,620,783	4,361.0	(1)	5,153,268	3,975.4	(1)
Musculoskeletal system (M00–M99)	2,997,705	2,238.8	(2)	4,208,980	3,265.6	(2)	4,043,817	3,119.6	(2)
Mental health disorders (F01–F99)	1,911,115	1,427.3	(3)	1,943,707	1,508.1	(3)	1,801,010	1,389.4	(3)
Nervous system and sense organs (G00–H95)	1,040,011	776.7	(5)	1,246,832	967.4	(4)	1,240,178	956.7	(4)
Signs, symptoms, and ill-defined conditions (R00–R99)	1,049,197	783.6	(4)	1,023,451	794.1	(5)	1,043,800	805.2	(5)
Injury/poisoning (S00–T98)	808,497	603.8	(6)	828,937	643.2	(6)	738,768	569.9	(6)
Respiratory system (J00–J99)	560,689	418.8	(7)	602,043	467.1	(7)	592,749	457.3	(7)
Skin and subcutaneous tissue (L00–L99)	372,309	278.1	(8)	370,585	287.5	(8)	355,404	274.2	(8)
Pregnancy and delivery (O00–O99, relevant Z-codes)[c]	343,977	1,703.8	(9)	310,578	1,527.3	(9)	315,215	1,478.9	(9)
Genitourinary system (N00–N99)	267,410	199.7	(10)	243,622	189.0	(10)	237,909	183.5	(10)
Digestive system (K00–K95)	256,415	191.5	(11)	224,554	174.2	(11)	210,962	162.7	(11)
Infectious and parasitic diseases (A00–B99)	198,426	148.2	(12)	212,730	165.1	(12)	191,439	147.7	(12)
Circulatory system (I00–I99)	156,630	117.0	(13)	123,705	96.0	(13)	113,610	87.6	(13)
Neoplasms (C00–D49)	122,833	91.7	(15)	117,414	91.1	(14)	104,663	80.7	(14)
Endocrine, nutrition, immunity (E00–E89)	124,617	93.1	(14)	104,866	81.4	(15)	89,570	69.1	(15)
Hematologic disorders (D50–D89)	26,122	19.5	(17)	24,812	19.3	(16)	24,073	18.6	(16)
Congenital anomalies (Q00–Q99)	26,694	19.9	(16)	20,381	15.8	(17)	17,982	13.9	(17)
Total	18,966,206	14,164.9		17,227,980	13,366.8		16,274,417	12,554.7	

[a]Rates are based on 1,000 person-years.
[b]Other factors influencing health status and contact with health services (excluding pregnancy-related).
[c]Rates for pregnancy- and delivery-related ambulatory visits among females only.
ICD, International Classification of Diseases; No., number.

FIGURE 1. Rates of ambulatory visits, by year, active component, U.S. Armed Forces, 2009–2018



P-yrs, person-years.

visits per 1,000 p-yrs) but 1.2% higher than in 2009 (12,411.3 per 1,000 p-yrs) **(Figure 1)**. In 2018, 31.7% of ambulatory visits were classified into the "other" category (i.e., other factors influencing health status and contact with health services, excluding pregnancy-related), which includes health care not related to a current illness or injury **(Table 1)**. Such care includes counseling, immunizations, deployment-related health assessments, routine and special medical examinations (e.g., periodic, occupational, or retirement), and therapeutic and rehabilitative treatments for previously diagnosed illnesses or injuries (e.g., physical therapy).

In 2018, there were 11,121,149 documented ambulatory visits for illnesses and injuries (ICD-10: A00–T88, including relevant pregnancy Z-codes), not including diagnoses classified as "other" **(Table 1)**. The crude annual rate of illness- and injury-related visits was approximately 8.6 visits per p-yr. The rate of ambulatory visits for illnesses and injuries in 2018 (8.6 visits per p-yr) was similar to the rate in 2016 (9.0 visits per p-yr) but slightly higher than the rate in 2014 (7.7 visits per p-yr).

Ambulatory visits, by diagnostic categories

In 2018, 4 major diagnostic categories accounted for 73.1% of all illness- and injury-related ambulatory visits among active component service members: musculoskeletal system/connective tissue disorders (36.4%); mental health disorders (16.2%); disorders of the nervous system and sense organs (11.2%); and signs, symptoms, and ill-defined conditions (9.4%) **(Table 1)**.

Between 2014 and 2018, there were increases in the numbers of visits in 3 major diagnostic categories of illness and injury and decreases in 13 categories **(Table 1)**. The largest percentage increases in ambulatory visits during 2014–2018 were for musculoskeletal system/connective tissue disorders (change: +1,046,112 visits; +34.9%) and disorders of the nervous system and sense organs (change: +200,167; +19.2%). The largest decrease in numbers of visits between 2014 and 2018 was for mental health disorders (change: -110,105; -5.8%). The largest percentage decreases in ambulatory visits during 2014–2018 were for congenital anomalies (change: -8,712; -32.6%); endocrine, nutrition, and immunity disorders (change: 35,047; -28.1%); disorders of the circulatory system (change: -43,020; -27.5%); and disorders of the digestive system (change: -45,453; -17.7%). Moreover, the rates of ambulatory visits for illnesses and injuries in these categories showed consistent decreases during the 5-year period.

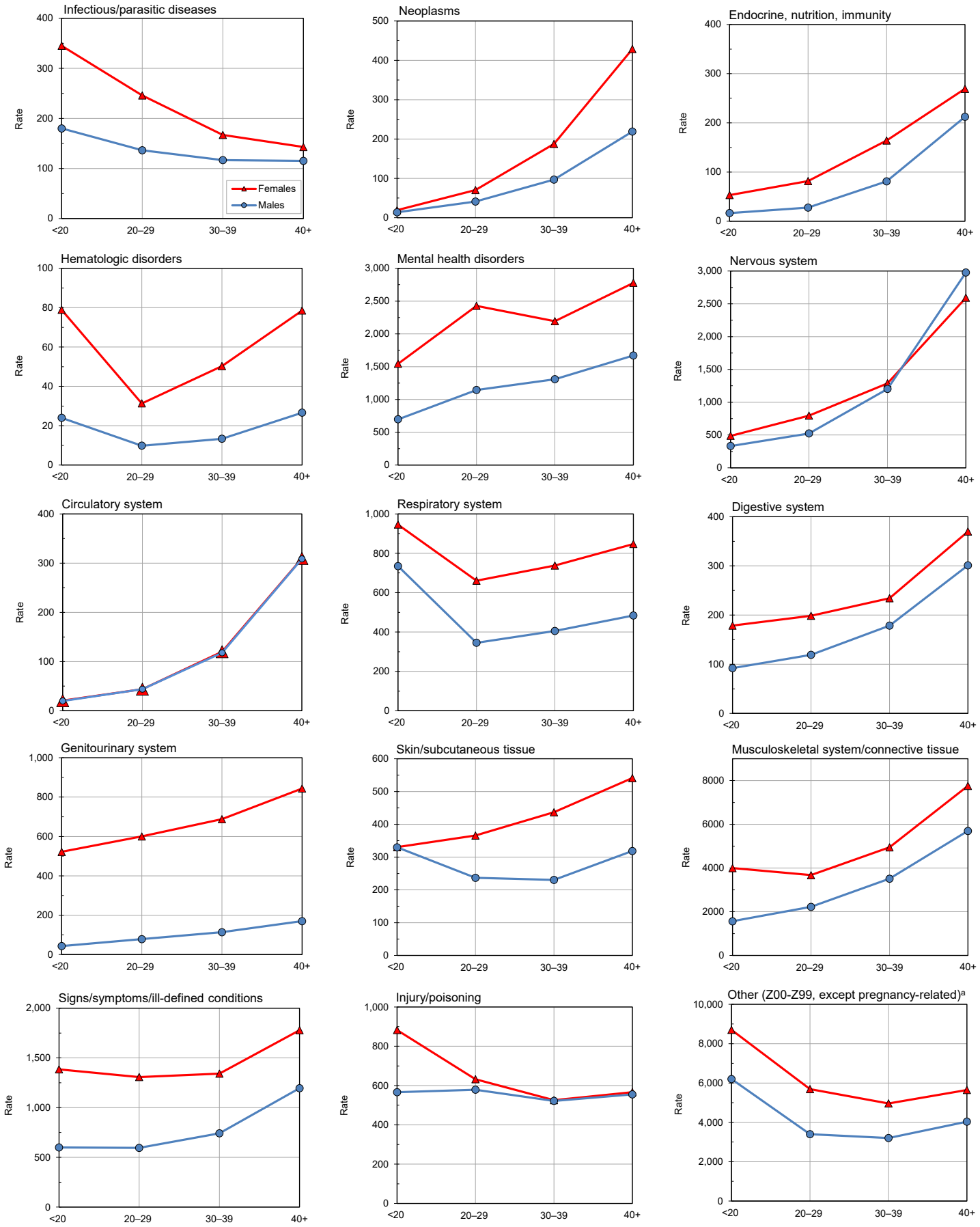
Over 5-year surveillance period, the relative distributions of ambulatory visits by the ICD-10 diagnostic categories remained stable with a few exceptions **(Table 1)**. In a comparison of the numbers and rates of visits attributable to each of the 17 major diagnostic categories in the years 2014 and 2018, the rank orders of 3 pairs of categories were exchanged: disorders of the nervous system and sense organs (5th to 4th) and signs, symptoms, and ill-defined conditions (4th to 5th); neoplasms (15th to 14th) and endocrine, nutrition, and immunity disorders (14th to 15th); and hematologic and immune system disorders (17th to 16th) and congenital anomalies (16th to 17th). The rank orders of the major diagnostic categories (including "other") were the same in 2016 and 2018.

Ambulatory visits, by sex

In 2018, males accounted for nearly three-fourths (73.6%) of all illness- and injury-related visits; however, the annual crude rate among females (13.8 visits per p-yr) was 81.9% higher than that among males (7.6 visits per p-yr) **(data not shown)**. Excluding pregnancy- and delivery-related visits (which accounted for 10.8% of all non-Z-coded ambulatory visits among females), the illness and injury ambulatory visit rate among females was 12.3 visits per p-yr. As in the past, rates were higher among females than males for every illness- and injury-related category except circulatory disorders **(Figure 2)**.

Among all illness- and injury-specific diagnoses, 3 of the 5 diagnoses with the largest numbers of ambulatory visits were the same for males and females. However, the crude rate (per 1,000 p-yrs) was at least 41% higher among females than males for these 3 common diagnoses: pain in joint (female: 1,712.2; male: 1,148.4; female:male rate ratio [RR]: 1.49), low back pain (female: 731.3; male: 518.1; RR: 1.41), and adjustment disorders (female: 575.3; male: 245.9; RR: 2.34) **(data not shown)**. Five other diagnoses were among the 10 most common diagnoses for both males and females: alcohol dependence; pain in limb, hand, foot, fingers, and toes; post-traumatic stress disorder (PTSD); cervicalgia; and acute respiratory infection, unspecified. Of note, sleep apnea was the

FIGURE 2. Rates of ambulatory visits, by major diagnostic category, age group, and sex, active component, U.S. Armed Forces, 2018



[a]Other factors influencing health status and contact with health services (excluding pregnancy-related).

TABLE 2. Most frequent diagnoses during ambulatory visits, by major diagnostic category, males, U.S. Armed Forces, 2018

Diagnostic category (ICD-10 codes) ♂	No.	%[a]
Infectious and parasitic diseases (A00–B99)	**143,199**	
Viral intestinal infection, unspecified	18,014	12.6
Viral infection, unspecified	11,604	8.1
Infectious gastroenteritis and colitis, unspecified	10,329	7.2
Other viral warts	7,921	5.5
Plantar wart	7,421	5.2
Neoplasms (C00-D49)	**78,196**	
Neoplasm of uncertain behavior of skin	10,983	14.0
Melanocytic nevi of trunk	3,226	4.1
Neoplasm of unspecified behavior of bone, soft tissue, and skin	2,859	3.7
Other benign neoplasm of skin, unspecified	2,506	3.2
Benign lipomatous neoplasm of skin and subcutaneous tissue of trunk	2,434	3.1
Endocrine, nutrition, immunity (E00-E89)	**64,992**	
Testicular hypofunction	12,207	18.8
Hyperlipidemia, unspecified	5,579	8.6
Type 2 diabetes mellitus without complications	4,105	6.3
Hypothyroidism, unspecified	3,975	6.1
Dehydration	3,427	5.3
Hematologic and immune disorders (D50-D89)	**14,655**	
Anemia, unspecified	1,872	12.8
Anemia due to glucose-6-phosphate dehydrogenase (G6PD) deficiency	1,479	10.1
Other specified disorders of white blood cells	1,381	9.4
Iron deficiency anemia, unspecified	1,314	9.0
Sickle-cell trait	1,067	7.3
Mental disorders (ICD-10: F01-F99)	**1,307,260**	
Adjustment disorders	266,297	20.4
Alcohol dependence	220,984	16.9
Post-traumatic stress disorder (PTSD)	168,691	12.9
Anxiety disorder, unspecified	73,910	5.7
Alcohol abuse	62,001	4.7
Nervous system and sense organs (G00-G99, H00-H95)	**1,019,099**	
Sleep apnea	418,678	41.1
Myopia	80,367	7.9
Chronic pain, not elsewhere classified	47,917	4.7
Insomnia	43,573	4.3
Astigmatism	21,001	2.1
Circulatory system (I00-I99)	**96,071**	
Essential (primary) hypertension	41,094	42.8
Scrotal varices	4,342	4.5
Atherosclerotic heart disease of native coronary artery	2,860	3.0
Varicose veins of lower extremities with other complications	2,092	2.2
Acute embolism and thrombosis of deep veins of lower extremity	2,038	2.1
Respiratory system (J00-J99)	**439,115**	
Acute upper respiratory infection, unspecified	87,336	19.9
Acute pharyngitis, unspecified	46,454	10.6
Acute nasopharyngitis (common cold)	45,536	10.4
Allergic rhinitis due to pollen	35,951	8.2
Other allergic rhinitis	19,276	4.4
Digestive system (K00–K95)	**164,169**	
Gastro-esophageal reflux disease without esophagitis	15,378	9.4
Noninfective gastroenteritis and colitis, unspecified	12,232	7.5
Unilateral inguinal hernia, without obstruction or gangrene	8,041	4.9
Constipation	7,443	4.5
Hemorrhage of anus and rectum	7,291	4.4
Genitourinary system (N00-N99)	**102,495**	
Other specified disorders of male genital organs	20,850	20.3
Calculus of kidney	7,153	7.0
Hypertrophy of breast	6,051	5.9
Epididymitis	4,428	4.3
Male erectile dysfunction, unspecified	4,176	4.1
Skin and subcutaneous tissue (L00-L99)	**271,221**	
Pseudofolliculitis barbae	40,301	14.9
Acne vulgaris	15,591	5.7
Ingrowing nail	15,460	5.7
Cellulitis and acute lymphangitis of other parts of limb	14,177	5.2
Dermatitis, unspecified	9,859	3.6
Musculoskeletal system (M00-M99)	**3,115,478**	
Pain in joint	1,243,925	39.9
Low back pain	561,777	18.0
Pain in limb, hand, foot, fingers, and toes	226,132	7.3
Cervicalgia	123,676	4.0
Segmental and somatic dysfunction	55,572	1.8
Congenital anomalies (Q00-Q99)	**13,356**	
Congenital pes planus	2,163	16.2
Congenital pes cavus	973	7.3
Other congenital deformities of feet	675	5.1
Atrial septal defect	623	4.7
Congenital insufficiency of aortic valve	582	4.4
Signs, symptoms, and ill-defined conditions (R00-R99)	**753,774**	
Headache	46,115	6.1
Chest pain, unspecified	38,295	5.1
Other symptoms and signs involving emotional state	37,653	5.0
Cough	28,261	3.7
Other symptoms and signs involving cognitive functions and awareness	27,470	3.6
Injury/poisoning (S00-T98, DOD0101-DOD0105)	**606,200**	
Sprain of ankle	40,682	6.7
Sprain of shoulder joint	23,918	3.9
Sprain of cruciate ligament of knee	22,427	3.7
Concussion	15,500	2.6
Fracture of other and unspecified metacarpal bone	14,984	2.5
Other (Z00–Z99, except pregnancy-related)[b]	**3,923,786**	
Encounter for immunization	683,004	17.4
Encounter for other administrative examinations	563,302	14.4
Encounter for examination of ears and hearing	380,898	9.7
Other specified counseling	182,944	4.7
Encounter for issue of medical certificate	141,939	3.6

[a]Percentage of the total number of ambulatory within the diagnostic category.
[b]Other factors influencing health status and contact with health services (excluding pregnancy-related).
ICD, International Classification of Diseases; No., number.

TABLE 3. Most frequent diagnoses during ambulatory visits, by major diagnostic category, females, U.S. Armed Forces, 2018

Diagnostic category (ICD-10 codes) ♀	No.	%[a]
Infectious and parasitic diseases (A00–B99)	**48,240**	
Viral intestinal infection, unspecified	6,113	12.7
Candidiasis of vulva and vagina	5,852	12.1
Viral infection, unspecified	4,590	9.5
Infectious gastroenteritis and colitis, unspecified	3,497	7.2
Chlamydial infection of genitourinary tract, unspecified	1,925	4.0
Neoplasms (C00-D49)	**26,467**	
Neoplasm of uncertain behavior of skin	2,930	11.1
Leiomyoma of uterus, unspecified	2,729	10.3
Malignant neoplasm of breast of unspecified site	1,636	6.2
Other benign neoplasm of skin, unspecified	845	3.2
Neoplasm of unspecified behavior of bone, soft tissue, and skin	808	3.1
Endocrine, nutrition, immunity (E00-E89)	**24,578**	
Hypothyroidism, unspecified	3,421	13.9
Polycystic ovarian syndrome	1,988	8.1
Obesity, unspecified	1,563	6.4
Dehydration	1,305	5.3
Overweight	1,256	5.1
Hematologic and immune disorders (D50-D89)	**9,418**	
Iron deficiency anemia, unspecified	2,665	28.3
Anemia, unspecified	1,868	19.8
Iron deficiency anemia secondary to blood loss (chronic)	690	7.3
Sickle-cell trait	560	5.9
Other iron deficiency anemias	414	4.4
Mental disorders (F01-F99)	**493,750**	
Adjustment disorders	122,627	24.8
Post-traumatic stress disorder (PTSD)	66,402	13.4
Anxiety disorder, unspecified	35,385	7.2
Alcohol dependence	32,983	6.7
Major depressive disorder, recurrent, moderate	24,463	5.0
Nervous system and sense organs (G00-G99, H00-H95)	**221,079**	
Sleep apnea	28,464	12.9
Myopia	26,868	12.2
Chronic pain, not elsewhere classified	16,538	7.5
Insomnia	11,731	5.3
Migraine without aura	8,555	3.9
Circulatory system (I00-I99)	**17,539**	
Essential (primary) hypertension	5,551	31.6
Varicose veins of lower extremities with other complications	1,051	6.0
Venous insufficiency (chronic) (peripheral)	598	3.4
Nevus, non-neoplastic	595	3.4
Supraventricular tachycardia	540	3.1
Respiratory system (J00-J99)	**153,634**	
Acute upper respiratory infection, unspecified	30,105	19.6
Acute pharyngitis, unspecified	18,625	12.1
Acute nasopharyngitis (common cold)	17,977	11.7
Allergic rhinitis due to pollen	13,816	9.0
Other allergic rhinitis	7,780	5.1

Diagnostic category (ICD-10 codes) ♀	No.	%[a]
Digestive system (K00–K95)	**46,793**	
Constipation	7,169	15.3
Noninfective gastroenteritis and colitis, unspecified	4,315	9.2
Gastro-esophageal reflux disease without esophagitis	3,705	7.9
Hemorrhage of anus and rectum	1,591	3.4
Other hemorrhoids	1,246	2.7
Genitourinary system (N00-N99)	**135,414**	
Acute vaginitis	14,596	10.8
Urinary tract infection, site not specified	12,598	9.3
Other specified noninflammatory disorders of vagina	6,642	4.9
Abnormal uterine and vaginal bleeding, unspecified	6,332	4.7
Acute cystitis	6,254	4.6
Pregnancy and childbirth (O00-O99, relevant Z codes)	**315,215**	
Encounter for supervision of normal first pregnancy	34,035	10.8
Encounter for care and examination of lactating mother	28,499	9.0
Encounter for supervision of other normal pregnancy	26,526	8.4
Encounter for routine postpartum follow-up	15,156	4.8
Other specified diseases and conditions complicating pregnancy, childbirth and the puerperium	14,535	4.6
Skin and subcutaneous tissue (L00-L99)	**84,183**	
Acne vulgaris	12,857	15.3
Dermatitis, unspecified	3,710	4.4
Acne, unspecified	3,166	3.8
Ingrowing nail	2,556	3.0
Cellulitis and acute lymphangitis of other parts of limb	2,416	2.9
Musculoskeletal system (M00-M99)	**928,339**	
Pain in joint	364,948	39.3
Low back pain	155,871	16.8
Pain in limb, hand, foot, fingers, and toes	69,943	7.5
Cervicalgia	47,156	5.1
Segmental and somatic dysfunction	20,278	2.2
Signs, symptoms, and ill-defined conditions (R00-R99)	**290,026**	
Headache	22,490	7.8
Pelvic and perineal pain	20,302	7.0
Unspecified abdominal pain	16,059	5.5
Nausea with vomiting, unspecified	12,935	4.5
Pain localized to other parts of lower abdomen	11,906	4.1
Injury/poisoning (S00-T98, DOD0101-DOD0105)	**132,568**	
Sprain of ankle	11,456	8.6
Sprain of cruciate ligament of knee	4,669	3.5
Concussion	3,520	2.7
Injury of other muscles and tendons at lower leg level	3,000	2.3
Injury of muscle, fascia and tendon of abdomen, lower back and pelvis	2,841	2.1
Other (Z00–Z99, except pregnancy-related)[b]	**1,229,482**	
Encounter for immunization	149,587	12.2
Encounter for other administrative examinations	149,198	12.1
Other specified counseling	74,836	6.1
Encounter for examination of ears and hearing	67,103	5.5
Encounter for surveillance of contraceptives	41,978	3.4

[a]Percentage of the total number of ambulatory within the diagnostic category.
[b]Other factors influencing health status and contact with health services (excluding pregnancy-related).
ICD, International Classification of Diseases; No., number.

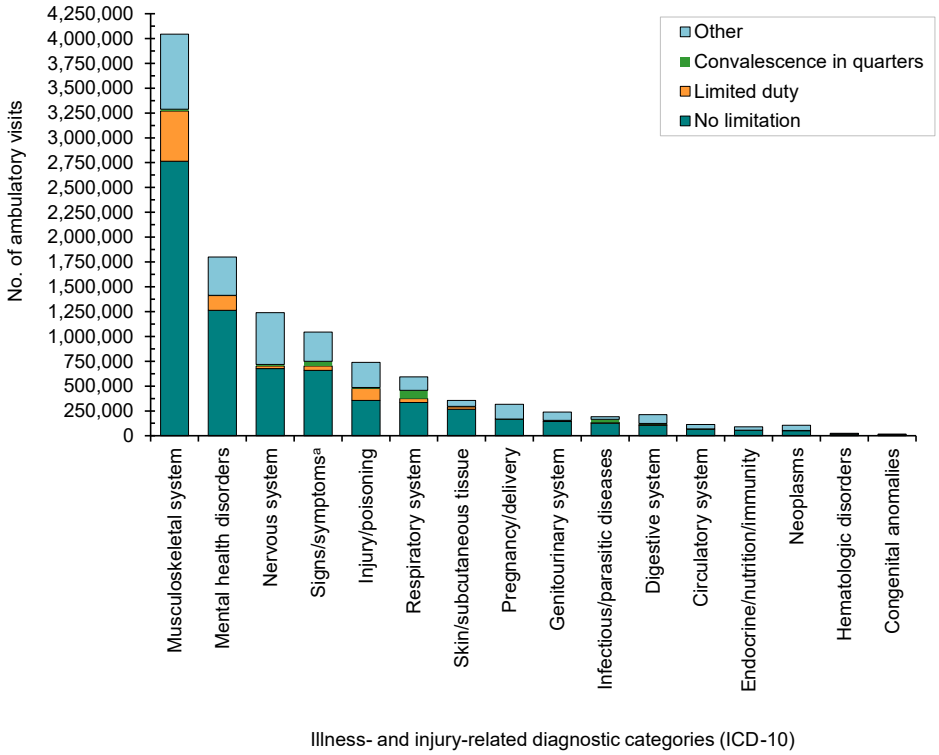
3rd most frequent illness- or injury-specific primary diagnosis during ambulatory visits of males, but it ranked as the 12th most common diagnosis among females. Among females, the 7th most common diagnosis was anxiety disorder, unspecified, which was the 11th most common diagnosis among males **(Tables 2, 3)**.

Across diagnostic categories, relationships between age group and ambulatory visit rates were broadly similar among males and females **(Figure 2)**. For example, among both males and females, ambulatory visit rates for neoplasms and circulatory disorders among those aged 40 years or older were 15 or more times the rates among those younger than 20 years old; in contrast, clinic visit rates for infectious and parasitic diseases were lower among the oldest compared to the youngest service members. As in the past, ambulatory visit rates for disorders of the nervous system; digestive system; endocrine, nutrition, and immunity system; and musculoskeletal system rose more steeply with advancing age than most other categories of illness or injury (for which rates were relatively stable or only modestly increased) **(Figure 2)**.

Dispositions after ambulatory visits

Because disposition codes are assigned to ambulatory medical encounters that occur only at military treatment facilities (MTFs), the following metrics do not include outsourced care. Approximately 63.4% of all illness- and injury-related visits resulted in "no limitation" (i.e., duty without limitations) dispositions **(data not shown)**. Approximately 1 in 48 (2.1%) illness- and injury-related visits resulted in "convalescence in quarters" dispositions **(data not shown)**. The illness- and injury-related diagnostic categories with the highest proportions of "limited duty" dispositions were injury/poisoning (16.3%) and musculoskeletal system disorders (12.5%) **(Figure 3)**. The illness- and injury-related diagnostic categories with the highest proportions of "convalescence in quarters" were infectious/parasitic diseases (16.2%) and diseases of the respiratory system (13.8%). Musculoskeletal system/connective tissue disorders (53.4%) accounted for more than half of all "limited duty" dispositions, and mental health disorders (15.8%) and injury/poisoning (12.7%) together accounted for more than one-quarter (28.5%) **(Figure 4)**. Diseases of the respiratory system accounted for more than one-third (35.8%) of all "convalescence in quarters" dispositions—more than twice as many (n=81,556) as any other disease category, except signs and symptoms (21.0%).

FIGURE 3. Ambulatory visits in relation to reported dispositions, by illness- and injury-related diagnostic category, active component, U.S. Armed Forces, 2018



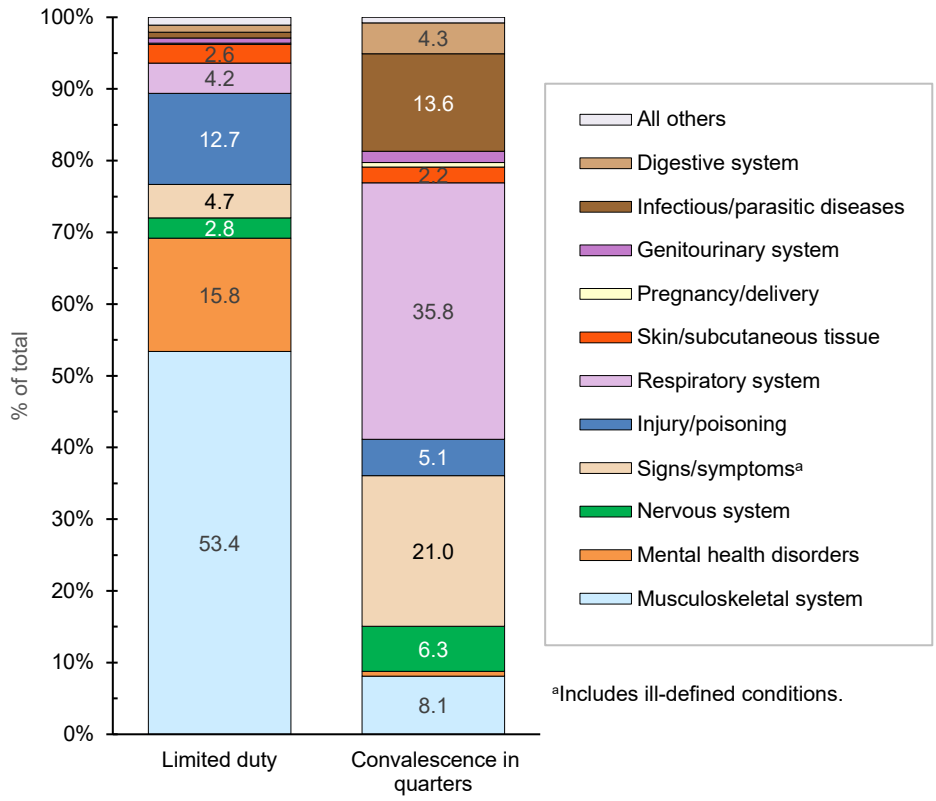
[a]Includes ill-defined conditions.
No., number; ICD, International Classification of Diseases.

EDITORIAL COMMENT

Over the 5-year surveillance period, the distribution of illness- and injury-related ambulatory visits in relation to their reported primary causes has remained fairly stable. In 2018, musculoskeletal system and mental health disorders accounted for more than one-half (52.6%) of all illness- and injury-related diagnoses documented on standardized records of ambulatory encounters. In 2018, the annual count of 1,801,010 visits for mental health disorders represented a decrease of 5.8% from 2014 and a 7.3% decrease from 2016. Three major illness- and injury-related categories (musculoskeletal system/connective tissue disorders, disorders of the nervous system and sense organs, and respiratory system disorders) showed increased numbers of visits and rates in 2018 compared to 2014. Except as described, the annual numbers of visits and the rates for most (14 of 17) of the major diagnostic categories have recently declined. This downward trend is likely due, in part, to the ongoing drawdown of military forces; for example, at the end of September 2018, there were approximately 21,000 fewer active duty military personnel than at the same time in 2014.[2]

During 2014–2018, the relative ranking of injury/poisoning (rank: 6) as a primary cause of ambulatory visits has been stable. However, the numbers and rates of visits for injury/poisoning have declined by 8.6% and 5.6%, respectively, since 2014. Nevertheless, the potential military operational impacts of various conditions cannot be assessed

FIGURE 4. Percentages of ambulatory visit-related limited duty and convalescence in quarters dispositions, attributable to illness- and injury-related diagnostic categories, active component, U.S. Armed Forces, 2018



[a]Includes ill-defined conditions.

by numbers of attributable ambulatory visits alone. For example, in 2018, injuries and poisonings accounted for approximately 1 of every 22 ambulatory visits overall; however, of ambulatory visits occurring at MTFs, 17.9% (slightly more than 1 in 6) had limited duty dispositions. Of particular note, in relation to injuries and musculoskeletal conditions, in 2018 (as in the past), joint and back injuries and other disorders accounted for large numbers of ambulatory visits; resources should continue to be focused on preventing, treating, and rehabilitating back pain and injuries among active component members.

It should be noted that the summary data using the major diagnostic categories of the ICD-10 system presented here deserve as detailed an examination as presented in Tables 2 and 3. For example, the general category identified as "nervous system" encompasses diseases of the nervous system and the sense organs (eyes and ears). Results presented in Tables 2 and 3 indicate that the more common diagnoses in this category refer to sleep disorders, disorders of refraction and accommodation, and pain disorders. Closer scrutiny reveals that the overall increase (n=200,167) in annual visits for this category from 2014 to 2018 (described earlier) can be attributed mostly to a rise in diagnoses of organic sleep disorders from 359,675 in 2014 to 502,446 in 2018.[3]

Several limitations should be considered when interpreting the findings of this report. For example, ambulatory care that is delivered by unit medics and at deployed medical treatment facilities (such as in Afghanistan or Iraq or at sea) may not be documented on standardized, automated records and thus not archived in the DMSS. In turn, this summary does not reflect the experience of active component military members overall, to the extent that the natures and rates of illnesses and injuries may vary between those who are deployed and those who are not deployed.

In addition, this summary is based on primary (first-listed) diagnosis codes reported on ambulatory visit records. As a result, the current summary discounts morbidity related to comorbid and complicating conditions that may have been documented in secondary diagnostic positions of the healthcare records. Furthermore, the accuracy of reported diagnoses likely varies across conditions, care providers, treatment facilities, and clinical settings. Although some specific diagnoses made during individual encounters may not be definitive, final, or even correct, summaries of the frequencies, natures, and trends of ambulatory encounters among active component members are informative and potentially useful. For example, the relatively large numbers of ambulatory visits for mental health disorders in general and the large numbers of visits for organic sleep disorders among males reflect patterns of responses by the MHS to the effects of combat- and deployment-related stresses on active component service members.

Also, this report documents all ambulatory healthcare visits but does not provide estimates of the incidence rates of the diagnoses described. In contrast to common, self-limited, and minor illnesses and injuries that require very little, if any, follow-up or continuing care, illnesses and injuries that necessitate multiple ambulatory visits for evaluation, treatment, and rehabilitation are overrepresented in this summary of the ambulatory burden of health care. Finally, the new electronic health record, MHS GENESIS, was implemented at several MTFs during 2017. Medical data from sites using MHS GENESIS are not available in the DMSS. These sites include Naval Hospital Oak Harbor, Naval Hospital Bremerton, Air Force Medical Services Fairchild, and Madigan Army Medical Center. Therefore, medical encounter data for individuals who received outpatient care at any of these facilities during 2018 were not included in this analysis.

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Surveillance Snapshot: Illness and Injury Burdens, Reserve Component, U.S. Armed Forces, 2018

FIGURE 1. Numbers of medical encounters,[a] individuals affected,[b] and hospital bed days, by burden of disease major category,[c] reserve component,[d] U.S. Armed Forces, 2018

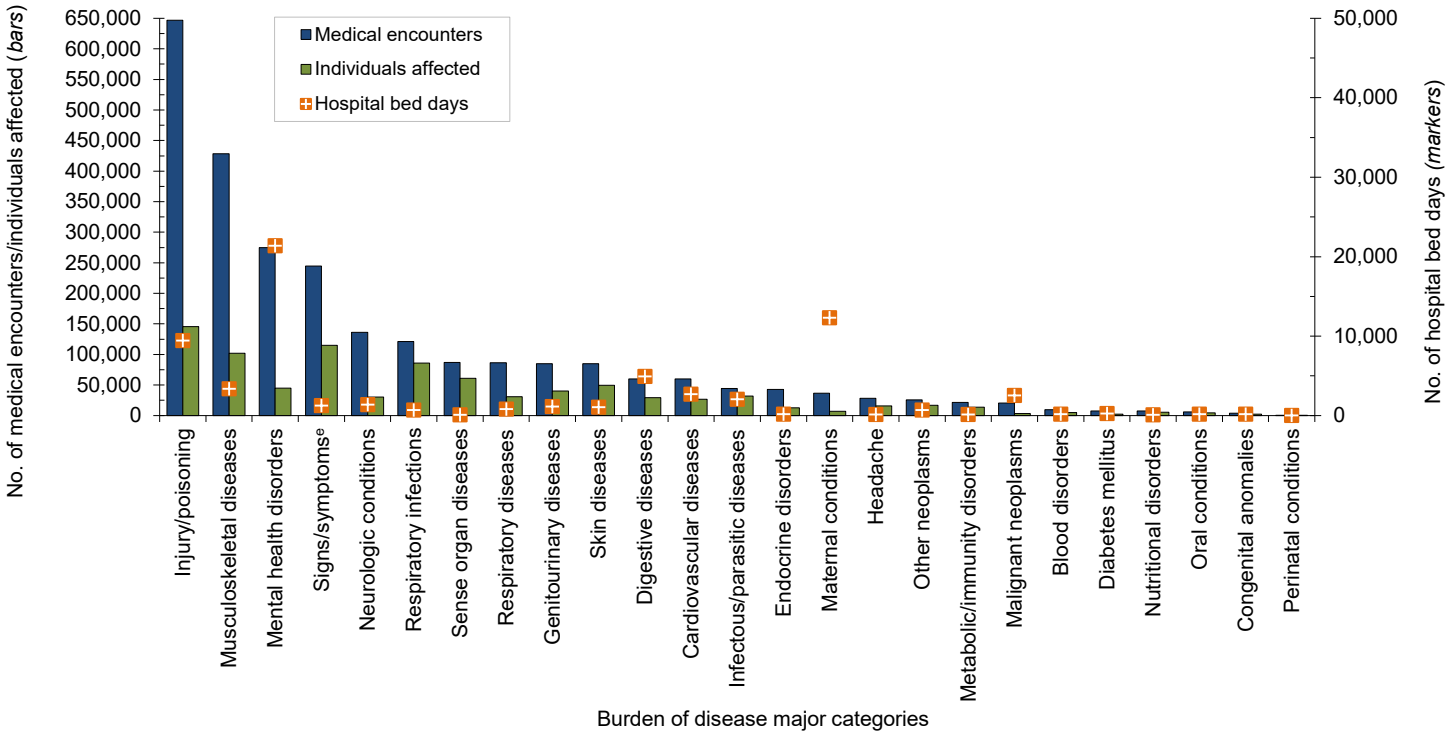
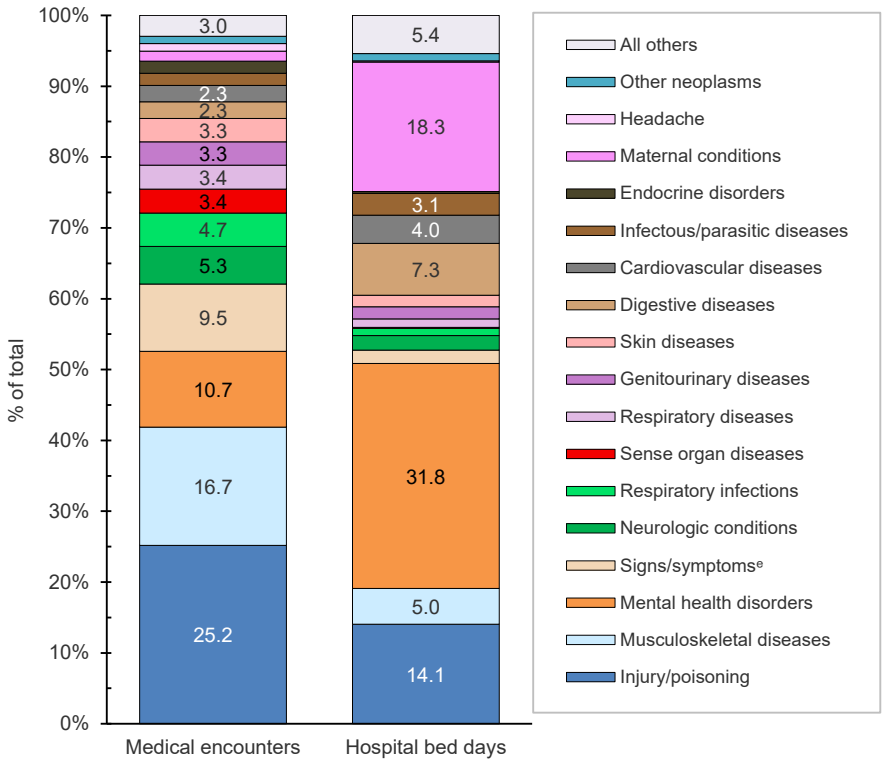


FIGURE 2. Percentages of medical encounters[a] and hospital bed days, by burden of disease category,[c] reserve component,[d] U.S. Armed Forces, 2018



[a]Medical encounters include total hospitalizations and ambulatory visits for the condition (with no more than 1 encounter per individual per day per condition).

[b]Individuals with at least 1 hospitalization or ambulatory visit for the condition.

[c]Burden of disease categories are the same as those used for analyses of morbidity burdens in the active component overall (see pp. 2–9).

[d]The reserve component comprises reserve and guard members of each service. Data reflect healthcare encounters and bed days occuring during active duty service.

[e]Includes ill-defined conditions.

Surveillance Snapshot: Illness and Injury Burdens, Recruit Trainees, Active Component, U.S. Armed Forces, 2018

FIGURE 1. Numbers of medical encounters,[a] individuals affected,[b] and hospital bed days, by burden of disease major category,[c] recruit trainees,[d] active component, U.S. Armed Forces, 2018

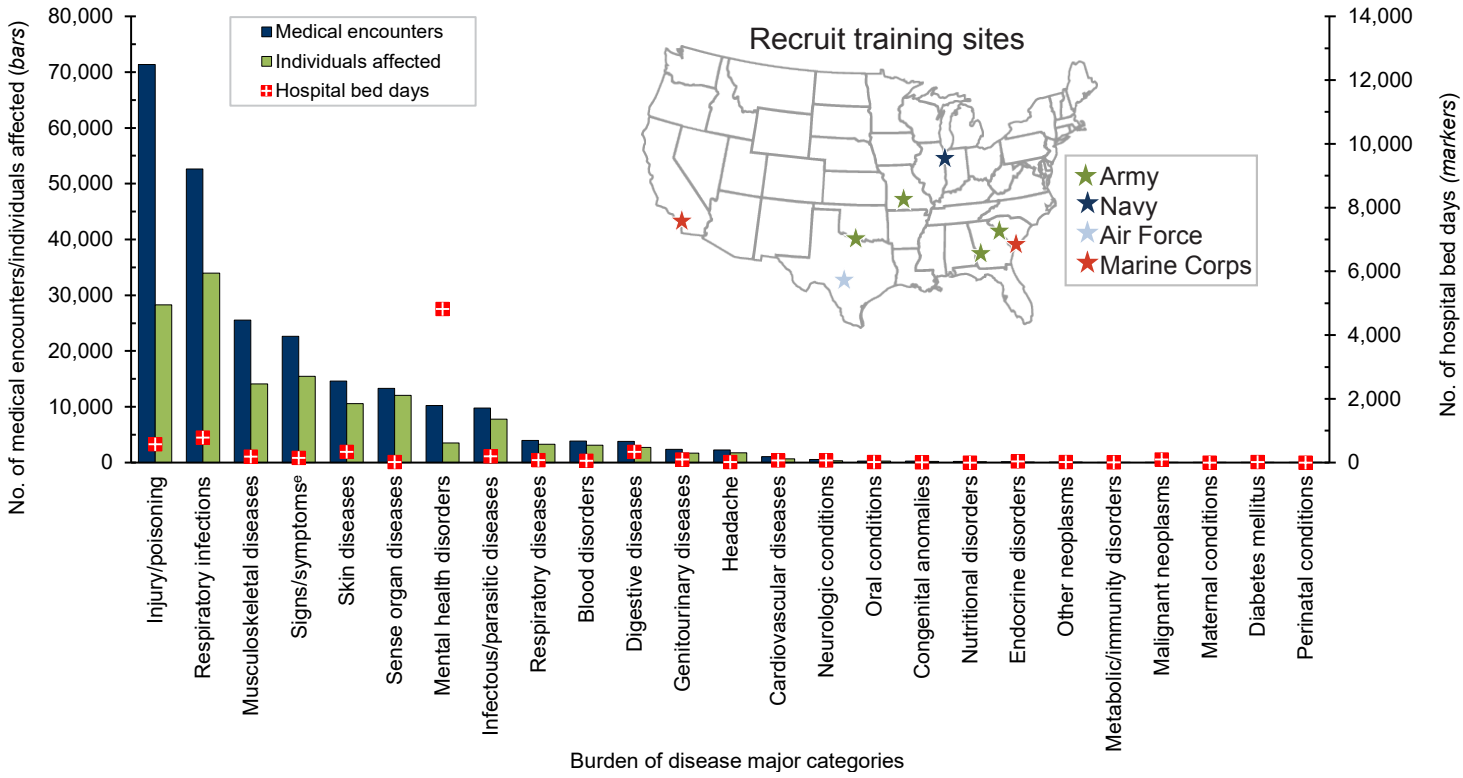
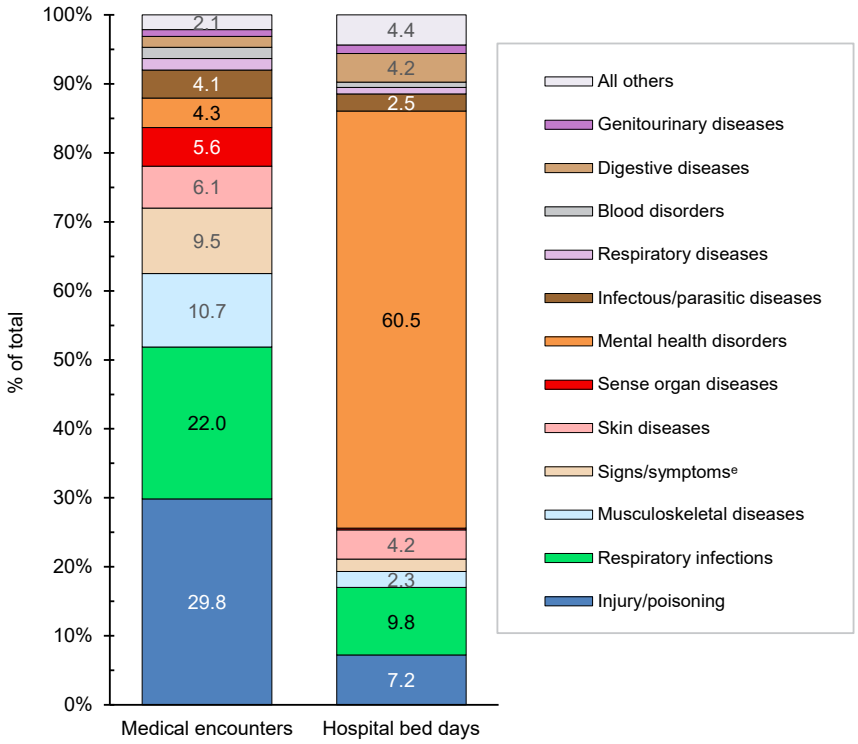


FIGURE 2. Percentages of medical encounters[a] and hospital bed days, by burden of disease major category,[c] recruit trainees,[d] active component, U.S. Armed Forces, 2018



[a]Medical encounters include total hospitalizations and ambulatory visits for the condition (with no more than 1 encounter per individual per day per condition).

[b]Individuals with at least 1 hospitalization or ambulatory visit for the condition.

[c]Burden of disease categories are the same as those used for analyses of mobidity burdens in the active component overall (see pp. 2–9).

[d]Recruit trainees are defined as active component members of the Army, Navy, Air Force, or Marine Corps with a rank of E1–E4 who served at 1 of the 8 basic training locations (**Figure 1, map inset**) during a service-specific training period following a first-ever personnel record. The data shown here are a subset of the active component data found on pp. 2–9.

[e]Includes ill-defined conditions.

Medical Evacuations out of the U.S. Central Command, Active and Reserve Components, U.S. Armed Forces, 2018

Although there have been substantial reductions in combat operations taking place in the U.S. Central Command (CENTCOM) area of responsibility (AOR) in Southwest Asia,[1–5] the number of service members deployed to the CENTCOM AOR is still significant. Reports indicate that there are currently about 14,000 to 15,000 service members in Afghanistan for Operation Resolute Support and another 2,000 reinforcing the Syrian Democratic Forces.[6–8] In theaters of operations such as Afghanistan, most medical care is provided by deployed military medical personnel; however, some injuries and illnesses require medical management outside the operational theater. In these cases, the affected individuals are usually transported by air to a fixed military medical facility in Europe or the U.S. where the service members receive the specialized, technically advanced, and/or prolonged diagnostic, therapeutic, and rehabilitative care required.

Medical air transports, or medical evacuations, are costly and generally indicative of serious medical conditions. Some serious conditions are directly related to participation in or support of combat operations (e.g., battle wounds); however, many others are unrelated to combat and may be preventable. This report summarizes the natures, numbers, and trends of conditions for which male and female military members were medically evacuated from CENTCOM AOR operations during 2018 and compares them to the previous 4 years.

METHODS

The surveillance period was 1 January 2014 through 31 December 2018. The surveillance population included all members of the active and reserve components of the U.S. Army, Navy, Air Force, and Marine Corps who were deployed to the CENTCOM AOR during the period. The outcome of interest in this analysis was medical evacuations during the surveillance period from the CENTCOM AOR (e.g., Afghanistan or Iraq) to a medical treatment facility outside the CENTCOM AOR. Records of all medical evacuations conducted by the U.S. Transportation Command (TRANSCOM) maintained in the TRANSCOM Regulating and Command & Control Evacuation System (TRAC2ES) were utilized. Evacuations were included in the analyses if the affected service member had at least 1 inpatient or outpatient medical encounter in a permanent military medical facility in the U.S. or Europe during a time interval extending from 5 days before to 10 days after the reported evacuation date.

Medical evacuations included in the analyses were classified by the causes and natures of the precipitating medical conditions (based on information reported in relevant evacuation and medical encounter records). First, all medical conditions that resulted in evacuations were classified as "battle injuries" or "non-battle injuries and illnesses" (based on entries in an indicator field of the TRAC2ES evacuation record). Evacuations due to non-battle injuries and illnesses were subclassified into 17 illness/injury categories based on International Classification of Diseases, 9th/10th Revision, Clinical Modification (ICD-9-CM/ICD-10-CM) diagnostic codes reported on records of medical encounters after evacuation. For the purposes of this report, all records of hospitalizations and ambulatory visits from 5 days before to 10 days after the reported date of each medical evacuation were identified. In most cases, the primary (first-listed) diagnosis for either a hospitalization (if any occurred) or the earliest ambulatory visit after evacuation was considered indicative of the condition responsible for the evacuation. However, if the first-listed diagnostic code specified the external cause (rather than the nature) of an injury (ICD-9 E-code/ICD-10 V-, W-, X-, or Y-code) or an encounter for something other than a current illness or injury (e.g., observation, medical examination, or vaccination [ICD-9 V-codes/ICD-10 Z-codes other than those related to pregnancy]), then secondary diagnoses that specified illnesses and injuries (ICD-9 codes 001–999; ICD-10 codes A00–T88) were considered the likely reasons for the subject evacuations. If there was no secondary diagnosis or if the secondary diagnosis also was an external cause code, the first-listed diagnostic code of a subsequent encounter was used.

Deployment data were no longer available in the Defense Medical Surveillance System (DMSS) beginning in 2018; therefore, rates of medical evacuations per deployed person-time were not calculated. The disposition after each medical evacuation was determined by using the disposition code associated with the medical encounter that was used for documenting the category of the medical evacuation.

WHAT ARE THE NEW FINDINGS?

The number of medical evacuations for battle injuries has decreased considerably since 2014. Most medical evacuations in 2018 were attributed to mental health disorders, followed by non-battle injury/poisoning; signs, symptoms, and ill-defined conditions; musculoskeletal disorders; and digestive system disorders.

WHAT IS THE IMPACT ON READINESS AND FORCE HEALTH PROTECTION?

Medical evacuations have a significant impact on military readiness because of loss of personnel and the resultant effects on unit cohesion and mission effectiveness. In addition, the costs of medical evacuations related to non-battle injuries are considerable. Military medical providers should continue to apply pre-deployment screening processes to optimize service members' medical and psychological fitness to deploy.

Inpatient disposition categories were returned to duty (code 01), transferred/discharged to other facility (codes 02–04, 09, 21–28, 43, or 61–66), died (codes 20, 30, 40–42, 50, or 51), separated from service (codes 10–15), and other/unknown. Outpatient disposition categories were released without limitation (code 1), released with work/duty limitation (code 2), immediate referral (code 4), sick at home/quarters (codes 3 or S), admitted/transferred to civilian hospital (codes 7, 9, A–D, or U), died (codes 8 or G), discharged home (code F), and other/unknown.

RESULTS

In 2018, a total of 1,264 medical evacuations of service members from the CENTCOM AOR were followed by at least 1 medical encounter in a fixed medical facility outside the operational theater **(Table 1)**. Overall, there were more medical evacuations for mental health disorders (n=356; 28.2%) than for any other single category of illnesses or injuries **(Table 1)**. In addition, the numbers of evacuations for non-battle injuries and poisonings (n=309; 24.5%); signs, symptoms, and ill-defined conditions (n=142; 11.2%); musculoskeletal system disorders (n=116; 9.2%); and disorders of the digestive system (n=91; 7.2%) were all higher than the number of evacuations for battle injuries (n=56; 4.4%). The top 3 categories—mental health disorders (most frequently adjustment and depressive disorders); non-battle injuries (primarily fractures of extremities, strains, and sprains); and signs, symptoms, and ill-defined conditions (primarily pain and swelling)—accounted for more than half (63.8%) of all evacuations **(Table 1)**.

During 2014–2018, the annual number of medical evacuations attributable to battle injuries peaked in 2014 (n=126) then decreased in 2015 (n=35) and remained relatively low in 2016 (n=42) before increasing in 2017 (n=71) and decreasing again in 2018 (n=56) **(data not shown)**. Over the 5-year period, the annual number of battle injury-related evacuations declined 55.6% from the peak year of 2014 through the most recent year, 2018. The annual number of medical evacuations attributable to non-battle injuries and diseases peaked in 2014 (n=1,807) and then decreased to relatively low levels in 2015 (n=1,050), 2016 (n=1,010), and 2017 (n=1,024) before increasing again in 2018 (n=1,208). In general, the annual numbers of medical evacuations over the course of the 5-year period varied in relation to the numbers of deployed service members, with the highest yearly count of medical evacuations occurring during the final year (2014) of Operation Enduring Freedom (OEF). The monthly numbers of medical evacuations decreased considerably in the later months of 2014 leading up to 1 January 2015, when U.S. Forces-Afghanistan formally ended OEF and began Operation Freedom's Sentinel (OFS) **(Figure)**.

Demographic and military characteristics

The number of medical evacuations in 2018 was higher among males (n=1,038) than females (n=226) **(Table 1, 2)**. The most frequent causes of medical evacuations among male service members were mental health disorders (n=278; 26.8%); non-battle injury and poisoning (n=273; 26.3%); signs, symptoms, and ill-defined conditions (n=118; 11.4%); and musculoskeletal disorders (n=102; 9.8%) **(Table 1)**. Among female service members, the most frequent causes of medical evacuations were mental health disorders (n=78; 34.5%); non-battle injury and poisoning (n=36; 15.9%); signs, symptoms, and ill-defined conditions (n=24; 10.6%); and genitourinary system disorders (n=19; 8.4%).

Compared to males, females had higher percentages of evacuations for about half of all illness and injury categories. Female service members had notably higher percentages of medical evacuations for mental health disorders and genitourinary system disorders compared to males **(Table 1)**. In contrast, male service members had higher percentages of evacuation for injuries (both battle and non-battle related) and for musculoskeletal disorders. There were no medical evacuations of a female service member during 2018 for a battle injury.

Within the various demographic and military characteristics of those service members who were evacuated, the largest numbers and proportions of evacuees were among non-Hispanic white service members, those aged 20–24 years, members of the Army, junior and senior enlisted personnel, and those in repair/engineering occupations **(Table 2)**.

Most medical evacuations (86.2%) were characterized as having routine precedence. The remainder had priority (11.3%) or urgent (2.5%) precedence. All but 25 (2.0%) of the medical evacuations were accomplished through military transport **(Table 2)**.

Most frequent specific diagnoses

Among both males and females in 2018, "reaction to severe stress, and adjustment disorders" was the most frequent specific diagnosis (3-digit ICD-10 diagnosis code: F43) during initial medical encounters after evacuations **(Table 3)**. The remaining 5 most common 3-digit diagnoses associated with evacuations of males were musculoskeletal disorders ("dorsalgia"), injuries ("fracture at wrist and hand level" and "dislocation and sprain of joints and ligaments of knee"), mental health disorders ("major depressive disorder, single episode"), and digestive system diseases ("inguinal hernia") **(Table 3)**.

Of the top 6 diagnoses most frequently associated with evacuations of female service members, 1 was a mental health disorder ("reaction to severe stress, and adjustment disorders"); 1 was a condition that primarily affects women ("unspecified lump in breast"); 2 were musculoskeletal disorders ("other joint disorder, not elsewhere classified" and "dorsalgia"); 1 was a sign, symptom, and ill-defined condition ("abdominal and pelvic pain"); and 1 was a potential health hazard related to socioeconomic and psychosocial circumstances ("problems related to employment and unemployment") **(Table 3)**.

Disposition

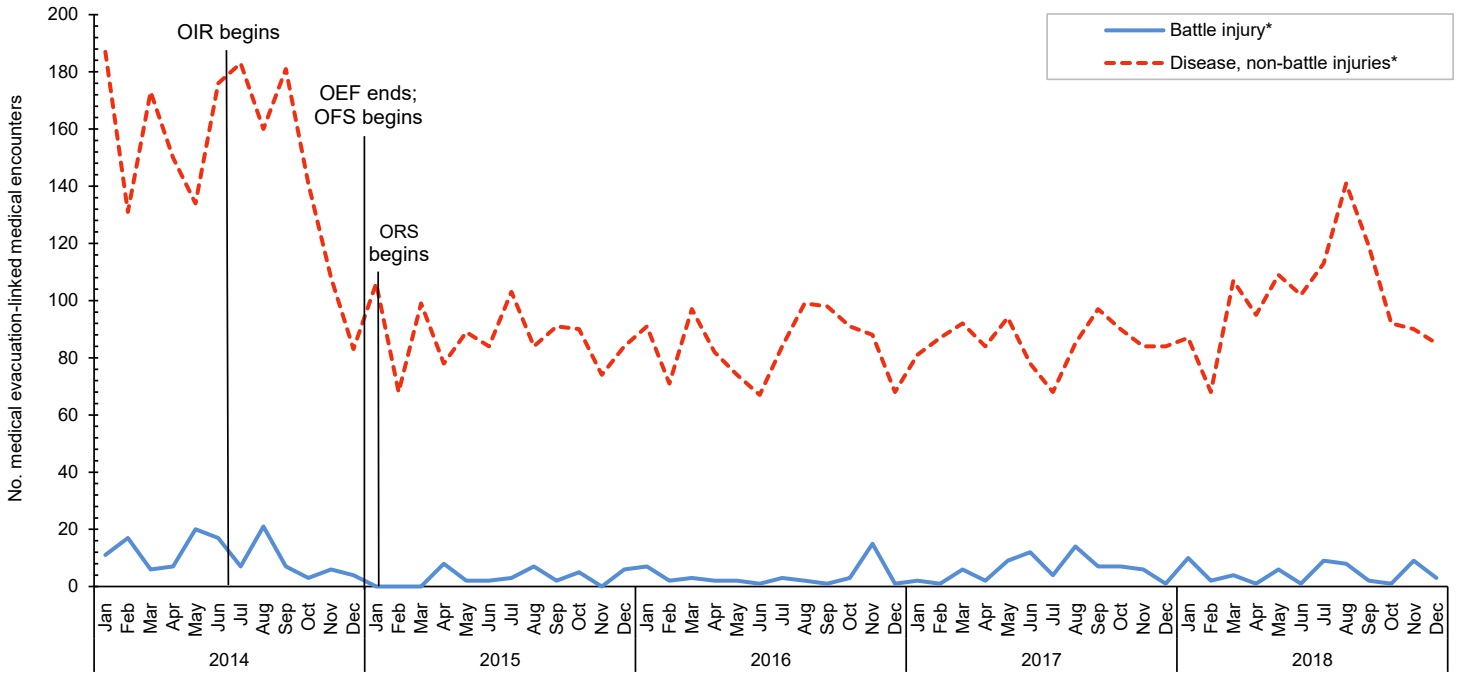
Of the 1,264 medical evacuations reported in 2018, a total of 451 (35.7%) resulted in inpatient encounters. More than two-thirds (69.0%) of all service members who were hospitalized after medical

TABLE 1. Numbers and percentages of medical encounters following medical evacuation from theater, by ICD-9/ICD-10 diagnostic category, U.S. Armed Forces, 2018

	Total		Males		Females	
Diagnostic category (ICD-9-CM; ICD-10-CM)	No.	%	No.	%	No.	%
Mental health disorders (ICD-9: 290–319; ICD-10: F01–F99)	356	28.16	278	26.78	78	34.51
Non-battle injury and poisoning (ICD-9: 800–999; ICD-10: S00–T88, DOD0101–DOD0105)	309	24.45	273	26.30	36	15.93
Signs, symptoms, and ill-defined conditions (ICD-9: 780–799; ICD-10: R00–R99)	142	11.23	118	11.37	24	10.62
Musculoskeletal system (ICD-9: 710–739; ICD-10: M00–M99)	116	9.18	102	9.83	14	6.19
Digestive system (ICD-9: 520–579; ICD-10: K00–K95)	91	7.20	79	7.61	12	5.31
Battle injury (from TRAC2ES records)	56	4.43	56	5.39	0	0.00
Nervous system and sense organs (ICD-9: 320–389; ICD-10: G00–G99, H00–H95)	44	3.48	35	3.37	9	3.98
Genitourinary system (ICD-9: 580–629; ICD-10: N00–N99)	32	2.53	13	1.25	19	8.41
Circulatory system (ICD-9: 390–459; ICD-10: I00–I99)	31	2.45	24	2.31	7	3.10
Other (ICD-9: V01–V99, except pregnancy related; ICD-10: Z00–Z99, except pregnancy related)	18	1.42	10	0.96	8	3.54
Neoplasms (ICD-9: 140–239; ICD-10: C00–D49)	17	1.34	16	1.54	1	0.44
Skin and subcutaneous tissue (ICD-9: 680–709; ICD-10: L00–L99)	12	0.95	8	0.77	4	1.77
Endocrine, nutrition, immunity (ICD-9: 240–279; ICD-10: E00–E89)	11	0.87	9	0.87	2	0.88
Respiratory system (ICD-9: 460–519; ICD-10: J00–J99)	10	0.79	9	0.87	1	0.44
Infectious and parasitic diseases (ICD-9: 001–139; ICD-10: A00–B99)	9	0.71	6	0.58	3	1.33
Pregnancy and childbirth (ICD-9: 630–679, relevant V codes; ICD-10: O00–O99, relevant Z codes)	6	0.47	--	--	6	2.65
Hematologic disorders (ICD-9: 279–289; ICD-10: D50–D89)	3	0.24	1	0.10	2	0.88
Congenital anomalies (ICD-9: 740–759; ICD-10: Q00–Q99)	1	0.08	1	0.10	0	0.00
Total	1,264	100.00	1,038	100.00	226	100.00

ICD, International Classification of Diseases; No., number; TRAC2ES, U.S. Transportation Command (TRANSCOM) Regulating and Command & Control Evacuation System.

FIGURE. Numbers of battle injury and disease vs. non-battle injury medical evacuations of U.S. service members, by month, 2014–2018



*These classifications are based on the casual event of medical evacuation medical encounters.
No., number; OIR, Operation Inherent Resolve; OEF, Operation Enduring Freedom; OFS, Operation Freedom's Sentinel; ORS, Operation Resolute Support.

evacuations were discharged back to duty. About one-quarter (25.5%) of service members who were hospitalized after medical evacuations were transferred or discharged to other facilities **(Table 4)**.

Return to duty dispositions were much more likely after hospitalizations for non-battle injuries (65.1%) than for battle injuries (15.9%). The majority (81.8%) of battle injury-related hospitalizations and a little more than one-quarter (27.9%) of non-battle injury-related hospitalizations resulted in transfers/discharges to other facilities **(Table 4)**.

Slightly more than two-thirds (n=813; 64.3%) of all medical evacuations reported resulted in outpatient encounters only. Of the service members who were treated exclusively in outpatient settings after evacuations, the majority (76.8%) were discharged back to duty without work/duty limitations, 18.5% were released with work/duty limitations, and less than 1% each were admitted/transferred to a civilian hospital, immediately referred, or discharged to "home sick" for recuperation. Service members treated as outpatients after battle injury-related evacuations were more likely to be released without limitations (n=12; 100.0%) than medical evacuees treated as outpatients for non-battle injuries (n=121; 54.3%) **(Table 4)**.

EDITORIAL COMMENT

This report documented that only 4.4% of all medical evacuations during 2018 were associated with battle injuries. Counts of evacuations for battle injuries were considerably lower (55.6%) in 2018 than in 2014, which is likely a reflection of both the reduction in troop levels that took place during this period and the change in mission away from direct combat. Most evacuations in 2018 were attributed to mental health disorders, followed by non-battle injuries and poisonings; signs, symptoms, and ill-defined conditions; musculoskeletal disorders; and digestive system disorders. Evacuations during the 5-year surveillance period followed a similar but slightly different pattern, with mental health disorders being the most frequent, followed by non-battle injuries, musculoskeletal disorders, signs and symptoms, and digestive system syndromes. Of the major diagnostic categories for which there was more than 1 medical evacuation for both men and women, only percentages of evacuations for injuries (battle and non-battle) and musculoskeletal disorders were noticeably higher among males compared to females. As in previous years, the majority of service members who were evacuated were returned to normal duty status following their post-evacuation hospitalizations or outpatient encounters. However, only about one-third of those evacuated for battle injuries were returned to duty immediately after their initial healthcare encounters.

Overall, the changes in numbers of medical evacuations over the course of the surveillance period reflect the drawdown of U.S. troops from Afghanistan leading up to the end of OEF.[9] As OFS began, U.S. troop withdrawal slowed and began to level off in 2015.[9] The relatively low percentage of medical evacuations in 2018 suggests that most deployers were sufficiently healthy and ready for their deployments and received the medical care in theater necessary to complete their assignments without having to be evacuated. Moreover, the fact that very few medical evacuations were conducted for chronic conditions such as hematologic disorders and congenital anomalies supports the idea that most deployers were sufficiently healthy for deployment. However, deployed service members are not immune to such conditions. For example, there was 1 medical evacuation for congenital anomalies in 2018 that was due to an arteriovenous malformation of cerebral vessels **(data not shown)**. Because congenital anomalies may not be identified and diagnosed until later in life,[10] such diagnoses should not be ruled out.

The proportion of medical evacuations attributed to mental health disorders (28.2%) was slightly higher than the proportion reported in a recent *MSMR* analysis of medical evacuations in 2017 (23.6%)[5] but considerably higher than the proportion (11.6%) reported in an earlier *MSMR* report examining evacuations from Iraq

TABLE 2. Numbers of medical encounters following medical evacuation, by demographic and military characteristics, U.S. Armed Forces, 2018

	No.	% total
Totals	1,264	100.0
Sex		
Male	1,038	82.1
Female	226	17.9
Race/ethnicity		
Non-Hispanic white	739	58.5
Non-Hispanic black	253	20.0
Hispanic	155	12.3
Asian/Pacific Islander	47	3.7
Other/unknown	70	5.5
Age group (years)		
<20	42	3.3
20–24	401	31.7
25–29	304	24.1
30–34	198	15.7
35–39	147	11.6
40–44	67	5.3
45+	105	8.3
Service		
Army	842	66.6
Navy	123	9.7
Air Force	255	20.2
Marine Corps	44	3.5
Component		
Active	873	69.1
Reserve/Guard	391	30.9
Rank		
Junior enlisted (E1–E4)	548	43.4
Senior enlisted (E5–E9)	532	42.1
Junior officer (O1–O3, W1–W3)	127	10.0
Senior officer (O4–O10, W4–W5)	57	4.5
Occupation		
Combat-specific[a]	281	22.2
Motor transport	34	2.7
Repair/engineering	343	27.1
Communications/intelligence	284	22.5
Healthcare	67	5.3
Other/unknown	255	20.2
Marital status		
Married	676	53.5
Single, never married	490	38.8
Other/unknown	98	7.8
Education level		
High school or less	757	59.9
Some college	236	18.7
College	231	18.3
Other/unknown	40	3.2
Precedence[b]		
Routine	1,089	86.2
Priority	143	11.3
Urgent	32	2.5
Transport_mode_num[b]		
Military	1,239	98.0
Commercial	22	1.7
Other/unknown	3	0.2

[a]Infantry/artillery/combat engineering/armor.
[b]Data field within U.S. Transportation Command (TRANSCOM) Regulating and Command & Control Evacuation System (TRAC2ES).
No., number.

TABLE 3. Most frequent 3-digit ICD-10 diagnoses from medical evacuations, by sex, U.S. Armed Forces, 2018

Males			Females		
3-digit ICD-10	ICD-10 code description	No.	3-digit ICD-10	ICD-10 code description	No.
F43	Reaction to severe stress, and adjustment disorders	201	F43	Reaction to severe stress, and adjustment disorders	61
M54	Dorsalgia	33	M25	Other joint disorder, not elsewhere classified	6
S62	Fracture at wrist and hand level	28	N63	Unspecified lump in breast	6
S83	Dislocation and sprain of joints and ligaments of knee	25	Z56	Problems related to employment and unemployment	5
F32	Major depressive disorder, single episode	23	M54	Dorsalgia	4
K40	Inguinal hernia	20	R10	Abdominal and pelvic pain	4

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

during a 9-year period between 2003 and 2011.[1] However, that article also reported that during the last 4 years of the surveillance period (2008–2011), as the proportion of evacuations for battle injuries fell sharply, the proportions of evacuations for mental disorders increased dramatically for both males (peak of 20.9% in 2010) and females (peak of 26.6% in 2010). Although some studies have indicated improved access to mental health care in deployed settings, the results from the current analysis indicate that mental health diagnoses still represent the single most common basis for medical evacuations out of the CENTCOM AOR.[11] This could be due, at least in part, to variations in the availability of mental health care in deployed settings. In these settings, the distribution of providers and clinics that deliver such services is uneven and varies according to factors such as the number of deployed personnel and the assessed needs of the particular unit.[11] It is also likely that some service members with mental health diagnoses may be evacuated because their estimated recovery times are too long. In addition, although the number of mental healthcare providers in Afghanistan increased from 2005 through 2010, this number decreased after 2013 as part of the overall drawdown of U.S. troops from the region.[11]

Several important limitations should be considered when interpreting the results of this analysis. Because deployment data are no longer available in the DMSS, rates of medical evacuations per deployed person-time were not able to be calculated, precluding comparisons with recent *MSMR* analyses. In addition, direct comparisons of numbers and percentages of medical evacuations by cause, as between males and females, can be misleading; for example, such comparisons do not account for differences between the groups in other characteristics (e.g., age, grade, military occupation, locations, and activities while deployed) that are significant determinants of medical evacuation risk. Moreover, because data about the characteristics of the entire deployed population of service members were not available, it was not possible to determine if the members of demographic and military groups listed above were over- or underrepresented among the evacuees. Also, for this report, most causes of medical evacuations were estimated from

TABLE 4. Dispositions after inpatient or outpatient encounters following medical evacuation, U.S. Armed Forces, 2018

Disposition	Total		Battle injury		Non-battle injury and poisoning	
	No.	%	No.	%	No.	%
Inpatient	451		44		86	
Returned to duty	311	69.0	7	15.9	56	65.1
Transferred/discharged to other facility	115	25.5	36	81.8	24	27.9
Discharged home	1	0.2	0	0.0	0	0.0
Separated	0	0.0	0	0.0	0	0.0
Died	2	0.4	1	2.3	0	0.0
Other/unknown	22	4.9	0	0.0	6	7.0
Outpatient	813		12		223	
Released without limitation	624	76.8	12	100.0	121	54.3
Released with work/duty limitation	150	18.5	0	0.0	83	37.2
Sick at home/quarters	1	0.1	0	0.0	1	0.4
Immediate referral	9	1.1	0	0.0	7	3.1
Admitted/transferred to civilian hospital	1	0.1	0	0.0	0	0.0
Died	0	0.0	0	0.0	0	0.0
Discharged home	0	0.0	0	0.0	0	0.0
Other/unknown	28	3.4	0	0.0	11	4.9

No., number.

primary (first-listed) diagnoses that were recorded during hospitalizations or initial outpatient encounters after evacuation. In some cases, clinical evaluations in fixed medical treatment facilities after medical evacuations may have ruled out serious conditions that were clinically suspected in the theater. For this analysis, the causes of such evacuations reflect diagnoses that were determined after evaluations outside of the theater rather than diagnoses—perhaps of severe disease—that were clinically suspected in the theater. To the extent that this occurred, the causes of some medical evacuations may seem surprisingly minor.

Overall, the results highlight the continued need to tailor force health protection policies, training, supplies, equipment, and practices based on characteristics of the deployed force (e.g., combat vs. support; male vs. female) and the nature of the military operations (e.g., combat vs. humanitarian assistance).

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Morbidity Burdens Attributable to Various Illnesses and Injuries, Deployed Active and Reserve Component Service Members, U.S. Armed Forces, 2018

Every year, the *MSMR* estimates illness- and injury-related morbidity and healthcare burdens on the U.S. Armed Forces and the Military Health System (MHS) using electronic records of medical encounters from the Defense Medical Surveillance System (DMSS). These records document health care delivered in the fixed medical facilities of the MHS and in civilian medical facilities when care is paid for by the MHS. Healthcare encounters of deployed service members are documented in records that are maintained in the Theater Medical Data Store (TMDS), which is incorporated into the DMSS. Last year for the first time, TMDS morbidity burden analyses were included in the annual *MSMR* burden issue.[1] This report examines the distributions of illnesses and injuries that accounted for medical encounters ("morbidity burdens") of active component members in deployed settings in the U.S. Central Command (CENTCOM) and the U.S. Africa Command (AFRICOM) areas of operations during the 2018 calendar year.

METHODS

The surveillance population included all individuals who served in the active or reserve components of the U.S. Army, Navy, Air Force, or Marine Corps and who had records of healthcare encounters captured in the TMDS during the surveillance period. The analysis was restricted to encounters where the theater of care specified was CENTCOM or AFRICOM. By default, this excluded encounters in the U.S. Northern Command, U.S. European Command, U.S. Indo-Pacific Command, or U.S. Southern Command theater of operations. Encounters where the theater of operation was missing were included, as most of these were assumed to be from CENTCOM. TMDS-recorded medical encounters where the data source was identified as Shipboard Automated Medical System (e.g., SAMS, SAMS8, SAMS9) or where the military treatment facility descriptor indicated care was provided aboard a ship (e.g., *USS George H.W. Bush* or *USS Dwight D. Eisenhower*) were excluded from this analysis. Encounters from aeromedical staging facilities outside of CENTCOM or AFRICOM (e.g., the 779th Medical Group Aeromedical Staging Facility or the 86th Contingency Aeromedical Staging Facility) were also excluded. Inpatient and outpatient medical encounters were summarized according to the primary (first-listed) diagnoses (if reported with an International Classification of Diseases, 9th Revision, Clinical Modification [ICD-9-CM] code between 001 and 999 or beginning with V27 or with an International Classification of Diseases, 10th Revision, Clinical Modification [ICD-10-CM] code between A00 and T88 or beginning with Z37). Primary diagnoses that did not correspond to an ICD-9 or ICD-10 code (e.g., 1XXXX or 4XXXX) were not reported in this burden analysis.

In tandem with the methodology described on page 2 of this issue of the *MSMR*, all illness- and injury-specific diagnoses were grouped into 142 burden of disease-related conditions and 25 major categories based on a modified version of the classification system developed for the Global Burden of Disease (GBD) study.[2] The morbidity burdens attributable to various conditions were estimated on the basis of the total number of medical encounters attributable to each condition (i.e., total hospitalizations and ambulatory visits for the condition with a limit of 1 encounter per individual per condition per day) and the numbers of service members affected by the conditions. In general, the GBD system groups diagnoses with common pathophysiologic or etiologic bases and/or significant international health policy-making importance. For this analysis, some diagnoses that are grouped into single categories in the GBD system (e.g., mental health disorders) were disaggregated. Also, injuries were categorized by the affected anatomic sites rather than by causes because external causes of injuries are not completely reported in TMDS records. It is important to note that because the TMDS has not fully transitioned to ICD-10 codes, ICD-9 codes appear in this analysis. In addition to the examination of the distribution of diagnoses by the 142 conditions and the 25 major categories of disease burden, a third analysis depicts the distribution of diagnoses according to the 17 traditional categories of the ICD system.

WHAT ARE THE NEW FINDINGS?

Among service members deployed during 2018, injury/poisoning, musculoskeletal diseases, and signs/symptoms accounted for more than half of the total healthcare burden while deployed. Compared to the distribution of major burden of disease categories documented in garrison, a relatively greater proportion of in-theater medical encounters due to respiratory infections, skin diseases, infectious/parasitic diseases, and digestive diseases was documented.

WHAT IS THE IMPACT ON READINESS AND FORCE HEALTH PROTECTION?

Injuries and musculoskeletal diseases account for a significant proportion of illness- and injury-related medical care in both deployed and non-deployed settings. However, while deployed, readiness may also be impacted by some infectious conditions associated with austere environmental and sanitary conditions.

RESULTS

In 2018, a total of 180,940 medical encounters occurred among 66,627 individuals while deployed to Southwest Asia/

Middle East and Africa. Of the total medical encounters, only 56 (0.03%) were indicated to be hospitalizations **(data not shown)**. A majority of the medical encounters (77.4%), individuals affected (82.4%), and hospitalizations (89.3%) occurred among males **(Figures 1a, 1b)**.

Medical encounters/individuals affected by burden of disease categories

During 2018, the percentages of total medical encounters by burden of disease categories in deployed men and women were generally similar; in both sexes, more encounters were attributable to injury/poisoning, musculoskeletal diseases, and signs/symptoms (including ill-defined conditions) than any other categories **(Figures 1a, 1b, 2a, 2b)**. Of note, females had a greater proportion of medical encounters for genitourinary diseases (5.7%) compared to males (1.2%). Females also had a slightly higher proportion of medical encounters for mental health disorders (7.9%) compared to males (5.2%).

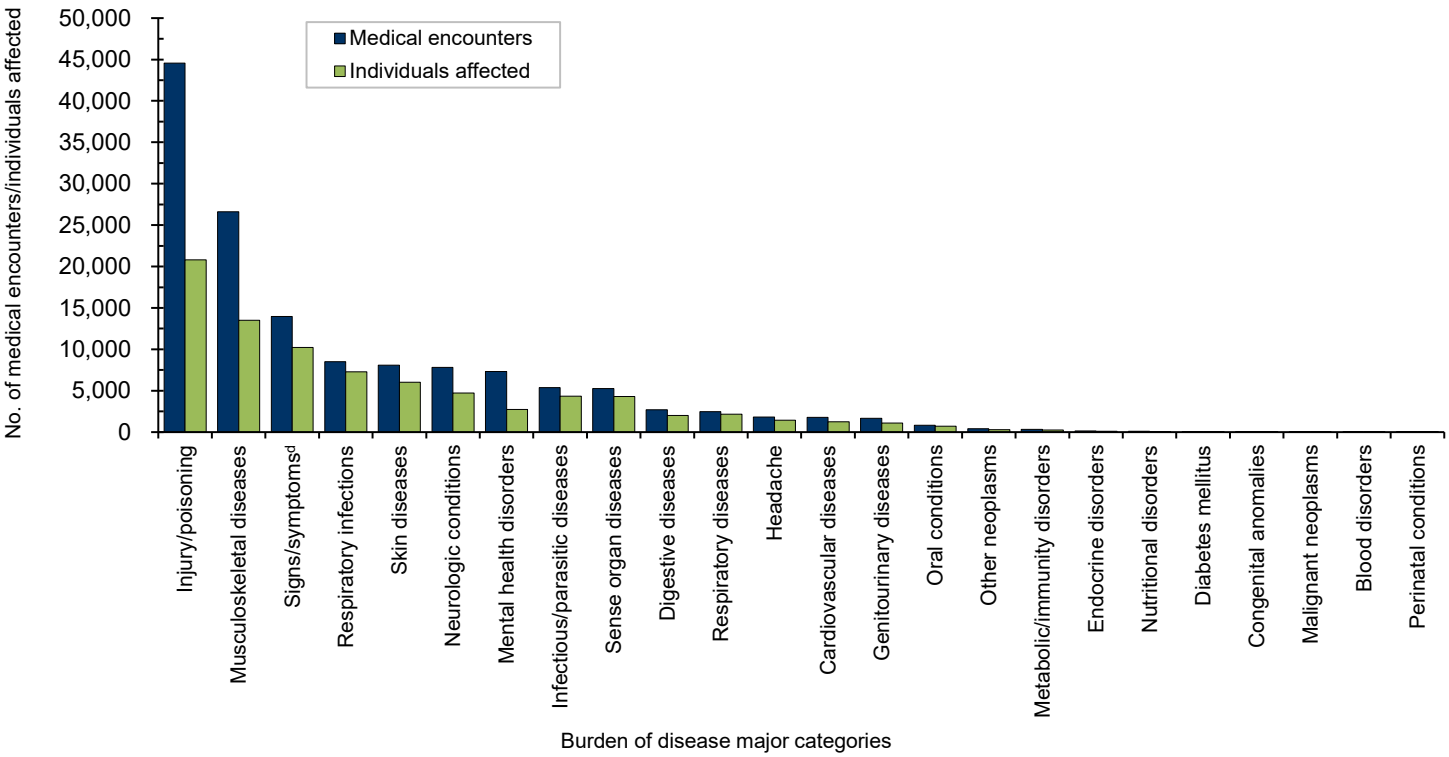
Among both males and females, 4 burden conditions (other back problems, all other musculoskeletal diseases, knee injuries, and foot and ankle injuries) were among the top 5 burden conditions that accounted for the most medical encounters in 2018 **(Figures 3a, 3b)**. The remaining burden conditions among males and females were arm and shoulder injuries and upper respiratory infections, respectively.

The 4-digit ICD-10 code with the most medical encounters in the other back problems category during 2018 was lumbago/low back pain **(data not shown)**. Among both men and women, for all other musculoskeletal diseases, the most common 4-digit ICD codes were for pain in limb and cervicalgia. The most common 4-digit ICD-10 code for arm and shoulder injuries among males and for foot and ankle injuries among females was for pain in joint **(data not shown)**.

Of note, among males, less than 0.3% of all medical encounters during deployment were associated with any of the following major morbidity categories: metabolic/immunity disorders, endocrine disorders, nutritional disorders, diabetes mellitus, congenital anomalies, malignant neoplasms, blood disorders, and perinatal conditions **(Figure 1a)**. Among females, less than 0.3% of all medical encounters during deployment were associated with maternal conditions, blood disorders, nutritional disorders, congenital anomalies, metabolic/immunity disorders, malignant neoplasms, diabetes mellitus, and perinatal conditions **(Figure 1b)**.

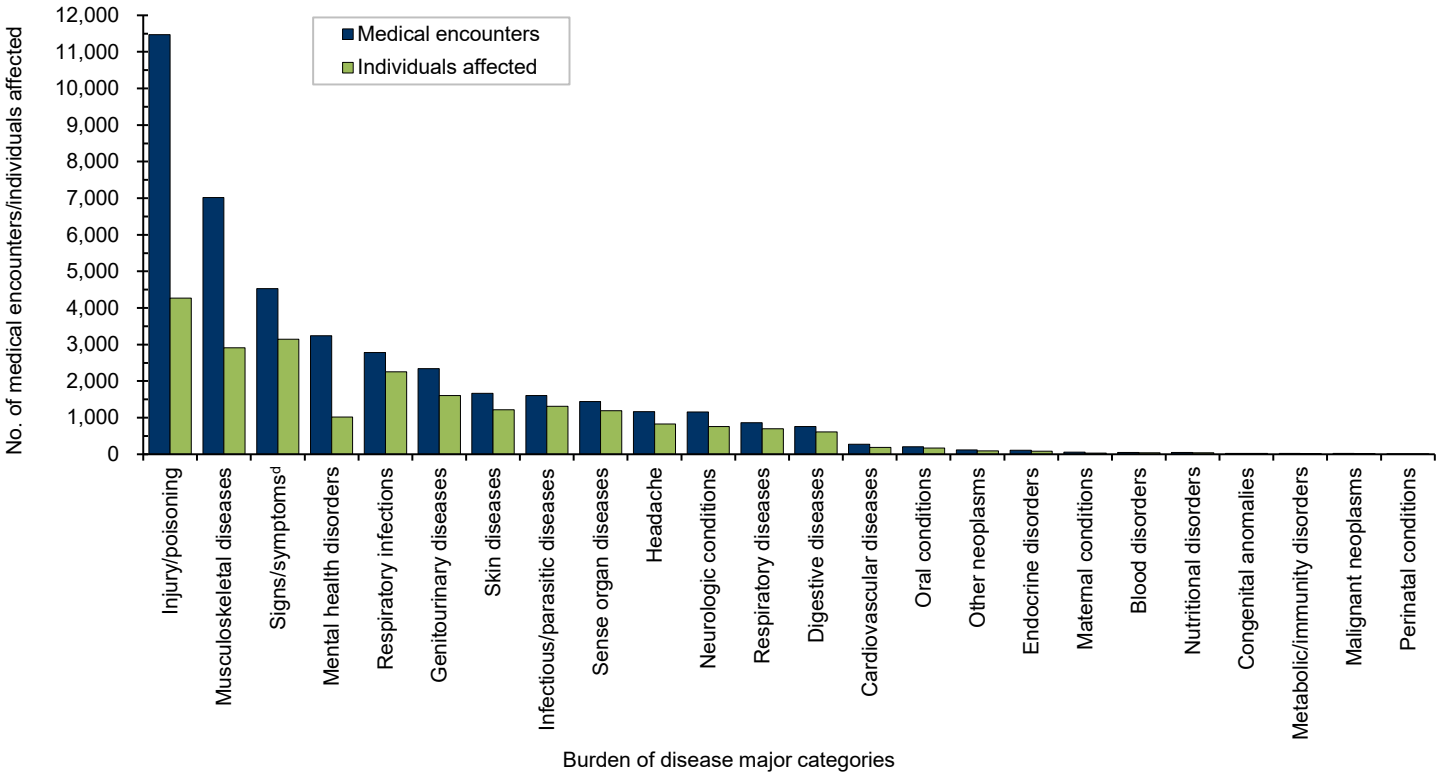
Among both sexes in 2018, injury/poisoning, musculoskeletal diseases, and signs/symptoms were the top 3 categories that affected the most individuals; musculoskeletal diseases ranked second among males and third among females **(Figures 1a, 1b)**.

FIGURE 1a. Medical encounters[a] and individuals affected,[b] by burden of disease major category,[c] deployed male service members, U.S. Armed Forces, 2018



[a]Medical encounters include total hospitalizations and ambulatory visits for the condition (with no more than 1 encounter per individual per day per condition).
[b]Individuals with at least 1 hospitalization or ambulatory visit for the condition.
[c]Burden of disease major categories based on a modified version of those defined in the Global Burden of Disease study.[2]
[d]Includes ill-defined conditions.

FIGURE 1b. Medical encounters[a] and individuals affected,[b] by burden of disease major category,[c] deployed female service members, U.S. Armed Forces, 2018



[a]Medical encounters include total hospitalizations and ambulatory visits for the condition (with no more than 1 encounter per individual per day per condition).
[b]Individuals with at least 1 hospitalization or ambulatory visit for the condition.
[c]Burden of disease major categories based on a modified version of those defined in the Global Burden of Disease study.[2]
[d]Includes ill-defined conditions.

Medical encounters by major ICD-9/ICD-10 diagnostic category

In 2018, among the 17 major ICD-9/ICD-10 diagnostic categories, the largest percentages of medical encounters were attributable to musculoskeletal system and "other" (includes factors influencing health status and contact with health services as well as external causes of morbidity) **(Figure 4)**. The percentage of medical encounters attributable to musculoskeletal system conditions increased from 2014 through 2018 and the percentage attributable to "other" decreased during the same period. Of note, the percentages of medical encounters attributable to injury/poisoning and mental health disorders decreased slightly from 9.5% in 2014 to 8.2% in 2018 for injury/poisoning and from 6.2% to 4.4% for mental health disorders. However, the percentage of medical encounters attributable to disorders of the nervous system and sense organs doubled from 3.6% in 2014 to 7.3% in 2018. The percentages of medical encounters attributable to other major ICD-9/ICD-10 diagnostic categories were relatively similar during the years 2014, 2016, and 2018.

EDITORIAL COMMENT

This report documents the morbidity and healthcare burden among U.S. military members while deployed to Southwest Asia/Middle East and Africa during 2018. Similar to results from earlier surveillance periods,[1,3] 3 burden categories—injury/poisoning, musculoskeletal diseases, and signs/symptoms—together accounted for 50% or more of the total healthcare burden among both male and female deployers. However, the 2018 percentages of encounters due to mental health disorders among males and females (5.2% and 7.9%, respectively) were much smaller than the corresponding percentages during 2008–2014 (13.1% and 13.8%, respectively).[3]

Compared to the distribution of major burden of disease categories documented in garrison, this report demonstrates a relatively greater proportion of in-theater medical encounters due to respiratory infections, skin diseases, infectious and parasitic diseases, and digestive diseases.[4] The lack of certain amenities and greater exposure to austere environmental conditions may have compromised hygienic practices and contributed to this finding. However, 4 of the top 5 major burden of disease categories in-theater—injury/poisoning, musculoskeletal diseases, signs/symptoms, and mental health disorders—were the same as those reported in non-deployed settings.[4] Injury and musculoskeletal diseases ranked first and second, respectively, in both settings. In garrison

FIGURE 2a. Percentages of medical encounters,[a] by burden of disease major category,[b] deployed male service members, U.S. Armed Forces, 2018

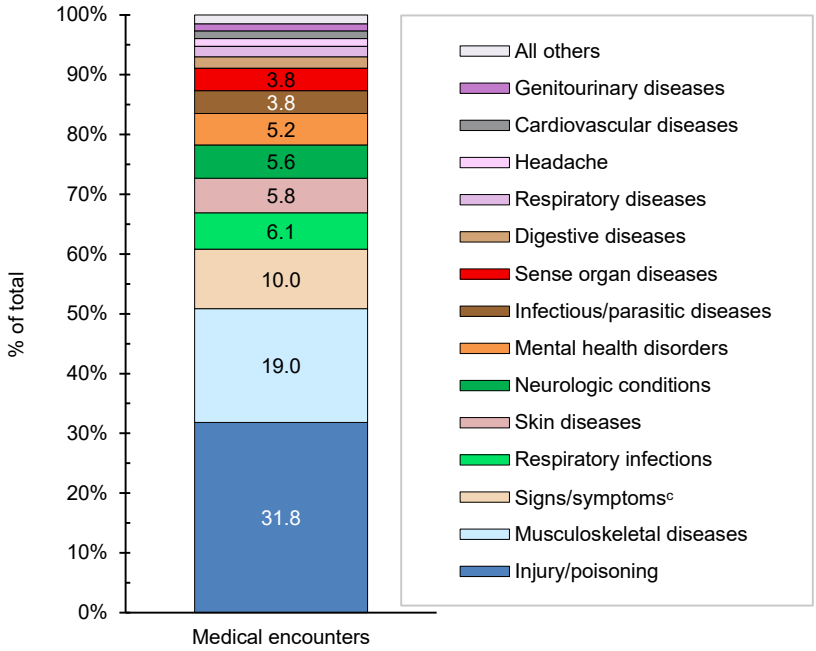
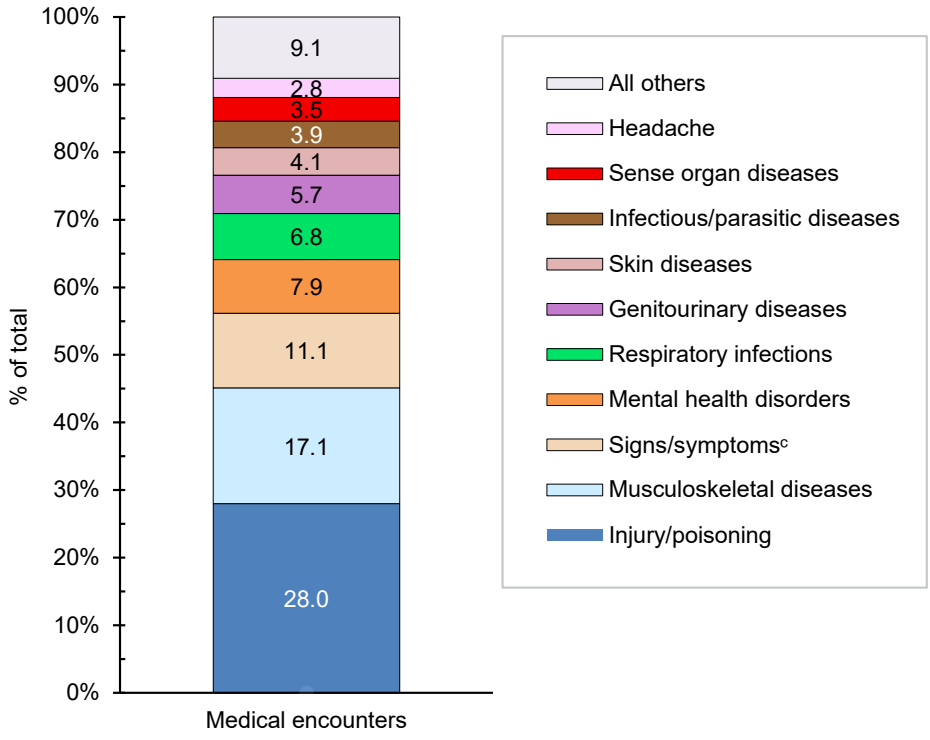


FIGURE 2b. Percentages of medical encounters,[a] by burden of disease major category,[b] deployed female service members, U.S. Armed Forces, 2018



[a]Medical encounters include total hospitalizations and ambulatory visits for the condition (with no more than 1 encounter per individual per day per condition).
[b]Burden of disease major categories based on a modified version of those defined in the Global Burden of Disease study.[2]
[c]Includes ill-defined conditions.

settings, mental health disorders, signs/symptoms, and neurologic conditions ranked third through fifth.[4] In contrast, sign/symptoms, respiratory infections, and mental health disorders ranked third through fifth in deployed settings. The similarity in these top conditions is likely attributable to the fact that both deployed and non-deployed populations generally comprise young and healthy individuals undergoing strenuous physical and mental tasks. Some of the similarity in the top conditions could also be attributed to service members receiving follow-up care once out of theater. For example, a service member medically evacuated out of theater for an injury could have encounters for injury recorded in both deployed and non-deployed (hospital or ambulatory care) settings.

Encounters for certain conditions are not expected to occur often in deployment settings. For example, the presence of some conditions (e.g., diabetes mellitus, pregnancy, or congenital anomalies) makes the affected service members ineligible for deployment. As a result of this selection process, deployed service members are generally healthier than their non-deployed counterparts and, specifically, less likely to require medical care for conditions that preclude deployment. The overall result of such predeployment medical screening is diminished healthcare burdens (as documented in the TMDS) related to certain disease categories.

Interpretation of the data in this report should be done with consideration of some limitations. Not all medical encounters in theaters of operation are captured in the TMDS. Some care is rendered by medical personnel at small, remote, or austere forward locations where electronic documentation of diagnoses and treatment is not feasible. As a result, the data described in this report likely underestimate the total burden of health care actually provided in the areas of operation examined. In particular, some emergency medical care provided to stabilize combat-injured service members before evacuation may not be routinely captured in the TMDS. Another limitation derives from the potential for misclassification of diagnoses due to errors in the coding of diagnoses

FIGURE 3a. Percentage and cumulative percentage distribution, burden of disease-related conditions[a] that accounted for the most medical encounters among deployed male service members, U.S. Armed Forces, 2018

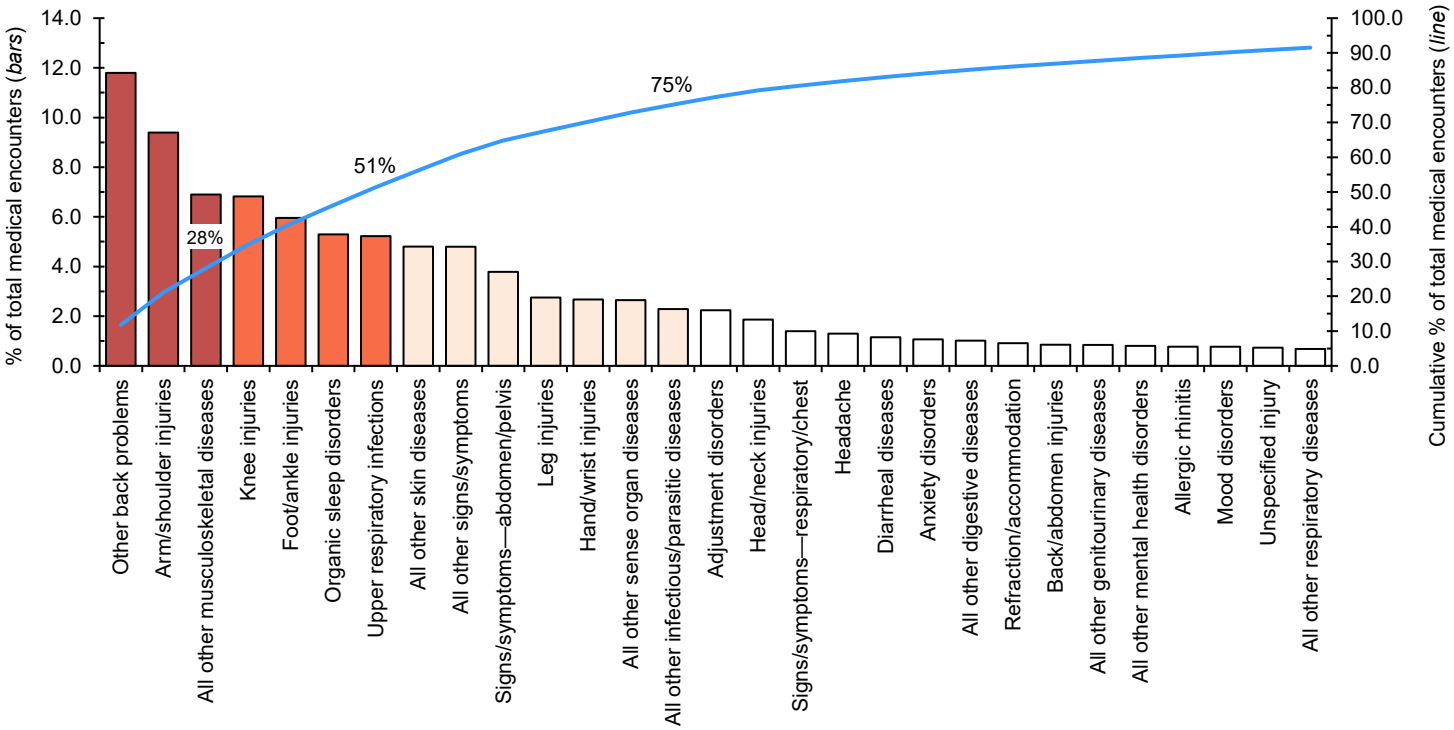
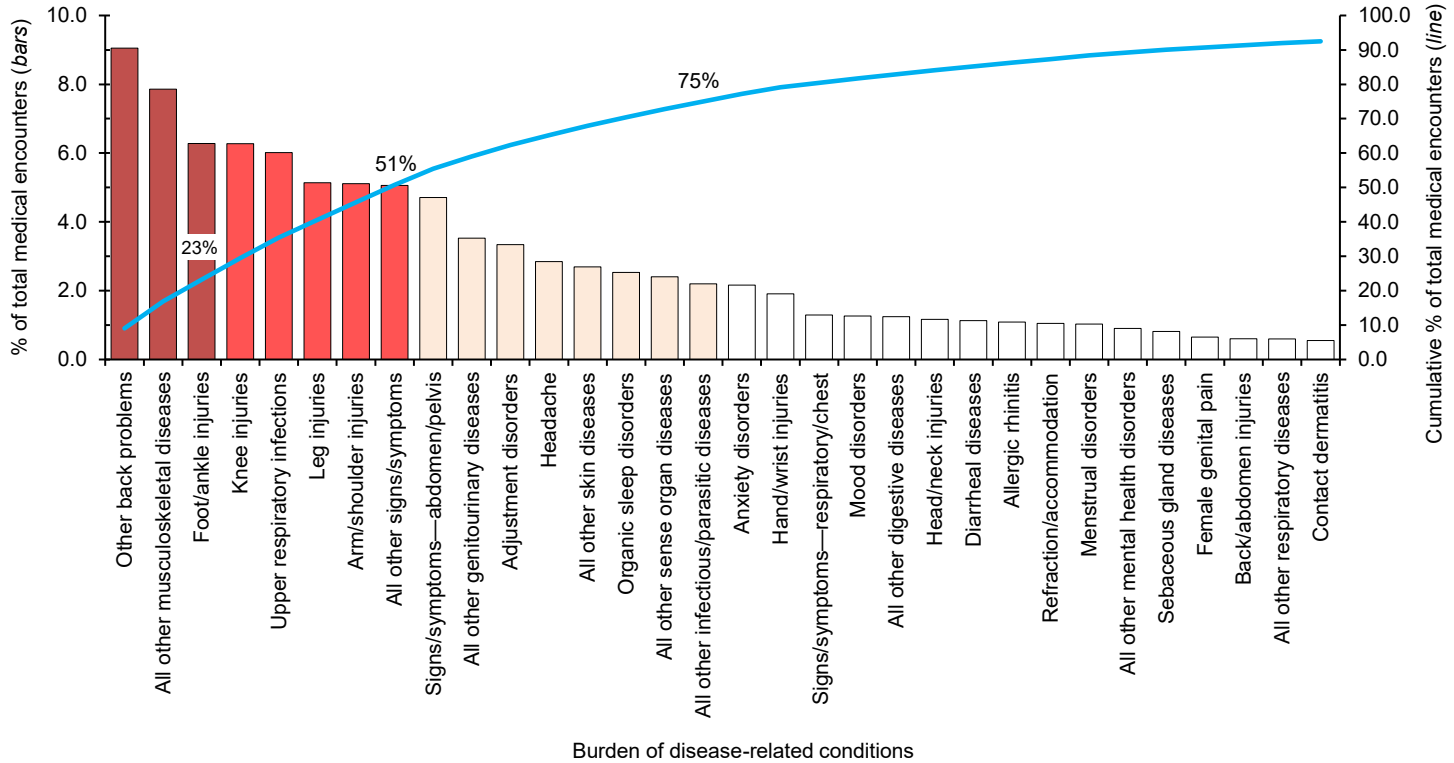
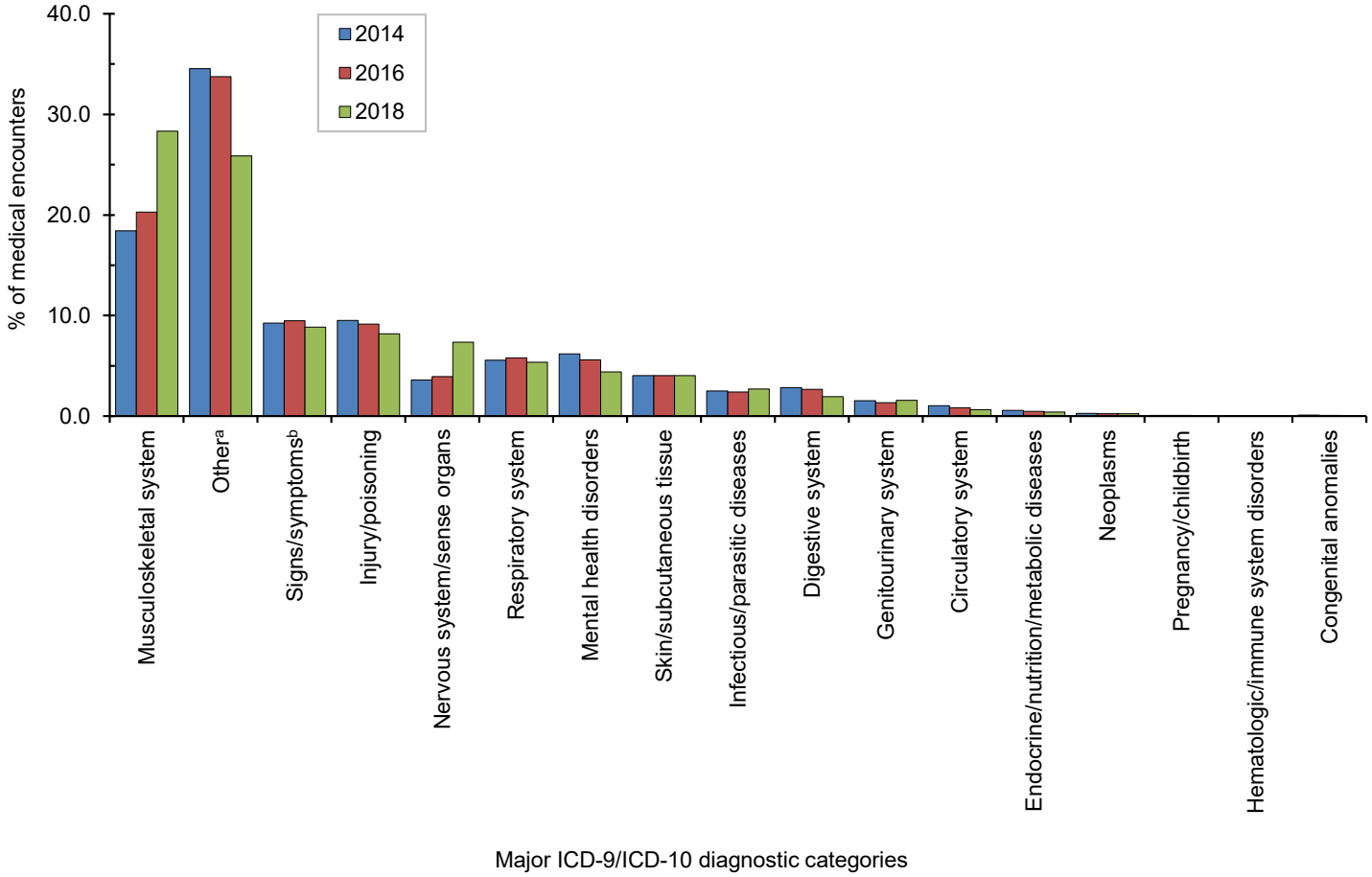


FIGURE 3b. Percentage and cumulative percentage distribution, burden of disease-related conditions[a] that accounted for the most medical encounters among deployed female service members, U.S. Armed Forces, 2018



[a]Burden of disease-related conditions based on a modified version of those defined in the Global Burden of Disease study.[2]

FIGURE 4. ICD-9/ICD-10 diagnostic categories of in-theater medical encounters, active component, U.S. Armed Forces, 2014, 2016, and 2018



[a]Other factors influencing health status and contact with health services (excluding pregnancy-related).
[b] Includes ill-defined conditions.
ICD, International Classification of Diseases.

entered into the electronic health record. Although the aggregated distributions of illnesses and injuries found in this study are compatible with expectations derived from other examinations of morbidity in military populations (both deployed and non-deployed), instances of incorrect diagnostic codes (e.g., coding a spinal cord injury using a code that denotes the injury was suffered as a birth trauma rather than using a code indicating injury in an adult) warrant care in the interpretation of some findings. Although such coding errors are not common, their presence serves as a reminder of the extent to which this study depends on the capture of accurate information in the sometimes austere deployment environment in which healthcare encounters occur.

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Absolute and Relative Morbidity Burdens Attributable to Various Illnesses and Injuries, Non-service Member Beneficiaries of the Military Health System, 2018

Individuals who are eligible for care through the Military Health System (MHS) ("beneficiaries") include active component service members and their eligible family members, activated National Guard and Reserve service members and their eligible family members, and retirees and their eligible family members. In 2018, there were approximately 9.51 million beneficiaries eligible for health care in the MHS: 1.38 million active duty and activated reserve component service members, 1.68 million active component family members, 190,000 Guard/Reserve members, 780,000 Guard/Reserve family members, and 5.49 million retirees and their family members.[1] Some beneficiaries of MHS care do not enroll in the healthcare plans provided by the MHS (e.g., they use insurance through their own employment), and some of those who are enrolled do not seek care through the MHS.

MHS beneficiaries may receive care from resources provided directly by the Uniformed Services (i.e., military medical treatment facilities [MTFs]) or from civilian healthcare resources (i.e., outsourced [purchased] care) that supplement direct military medical care.[1] In 2018, approximately 6.5 million non-service member beneficiaries utilized inpatient or outpatient services provided by the MHS (data source: the Defense Medical Surveillance System [DMSS]). In the population of non-service member MHS care recipients in 2018, there were more females (57.1%) than males (42.9%) and more infants, children, and adolescents (those younger than 20 years old: n=1.66 million; 25.4%) and more seniors (those aged 65 years or older: n=2.07 million; 31.6%) than younger (aged 20–44 years: n=1.29 million; 19.7%) or older (aged 45–64 years: n=1.52 million; 23.3%) adults.

Since 1998, the *MSMR* has published annual summaries of the numbers and rates of hospitalizations and outpatient medical encounters to assess the healthcare burdens of 16 categories of illnesses and injuries among active component military members. Beginning in 2001, the *MSMR* complemented those summaries with annual reports on the combined healthcare burden of both inpatient and outpatient care for 25 categories of health care. Since then, the *MSMR*'s annual burden issue has contained a report on hospital care, ambulatory care, and the overall burden of care each for active component service members. In 2014, for the first time and using similar methodology, the *MSMR* published a report that quantified the healthcare burden for illnesses and injuries among non-service members in 2013.[2] The current report represents an update and provides a summary of care provided to non-service members in the MHS during calendar year 2018. Healthcare burden estimates are stratified by direct versus outsourced care and across 4 age groups of healthcare recipients.

WHAT ARE THE NEW FINDINGS?

In 2018, mental health disorders accounted for the largest proportions of the morbidity and healthcare burdens that affected the pediatric and younger adult beneficiary age groups. Among adults aged 45–64 years, musculoskeletal diseases accounted for the most morbidity and healthcare burdens, and among adults aged 65 years or older, cardiovascular diseases accounted for the most.

WHAT IS THE IMPACT ON READINESS AND FORCE HEALTH PROTECTION?

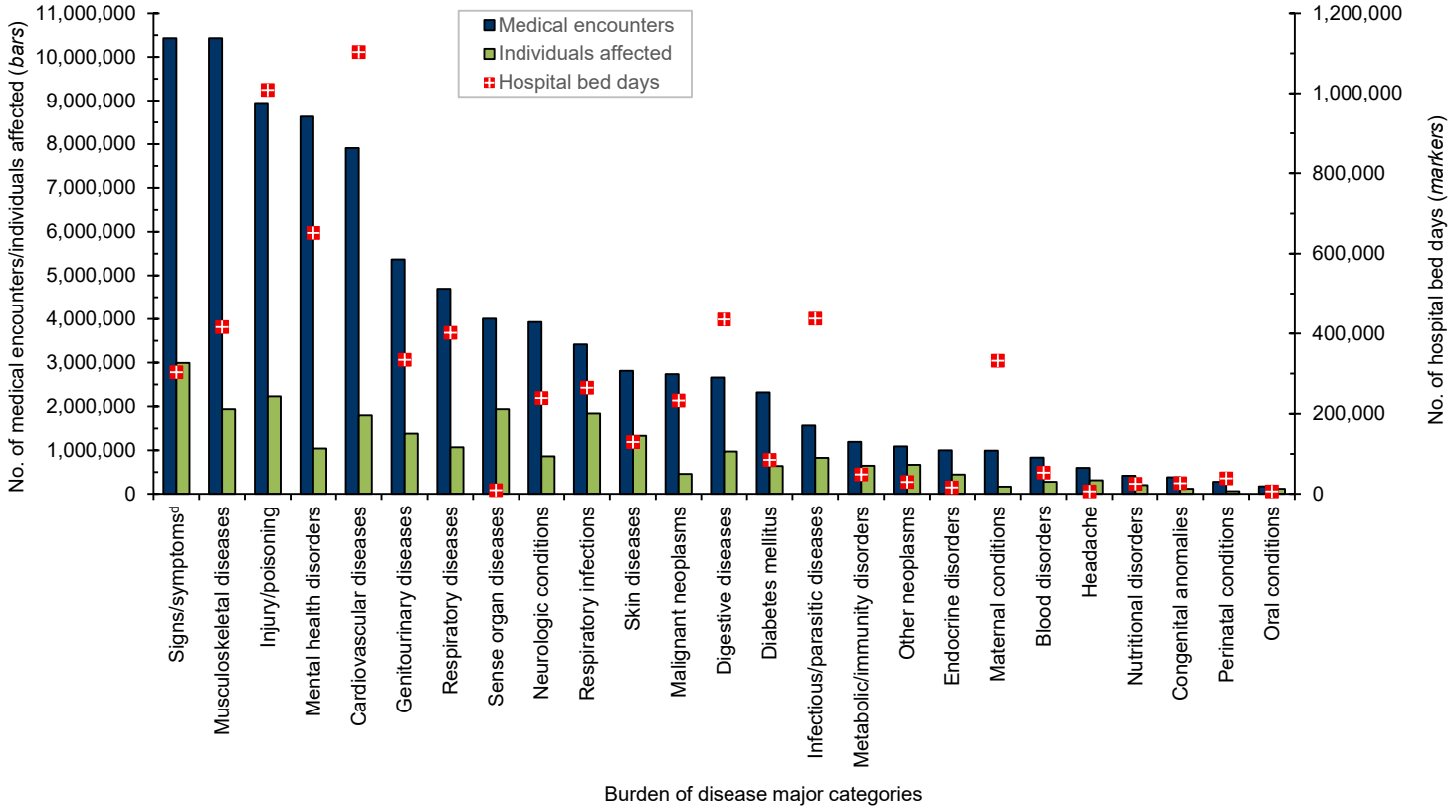
Mental health disorders among military family member dependents may affect service members' readiness and their focus on the mission by contributing to stress or by affecting the mental health status of the service member. It is important to connect families to social support services to improve military family readiness, which can impact the overall readiness of the force.

TABLE. Medical encounters,[a] individuals affected,[b] and hospital bed days, by source and age group, non-service member beneficiaries, 2018

	Medical encounters		Individuals affected		Hospital bed days		Medical encounters per individual affected
	No.	% total	No.	% total	No.	% total	
All non-service member beneficiaries	86,788,454	---	6,537,135	---	6,629,324	---	13.3
Source							
Direct care only	8,189,228	9.4	708,585	10.8	473,850	7.1	n/a
Outsourced care only	78,599,226	90.6	4,728,130	72.3	6,155,474	92.9	n/a
Direct and outsourced	n/a	n/a	1,100,420	16.8	n/a	n/a	n/a
Age group[c]							
0–17 years	12,058,173	13.9	1,503,412	23.0	496,877	7.5	8.0
18–44 years	11,837,374	13.6	1,446,756	22.1	740,393	11.2	8.2
45–64 years	18,284,707	21.1	1,520,024	23.3	918,515	13.9	12.0
65 years or older	44,608,190	51.4	2,066,942	31.6	4,473,539	67.5	21.6

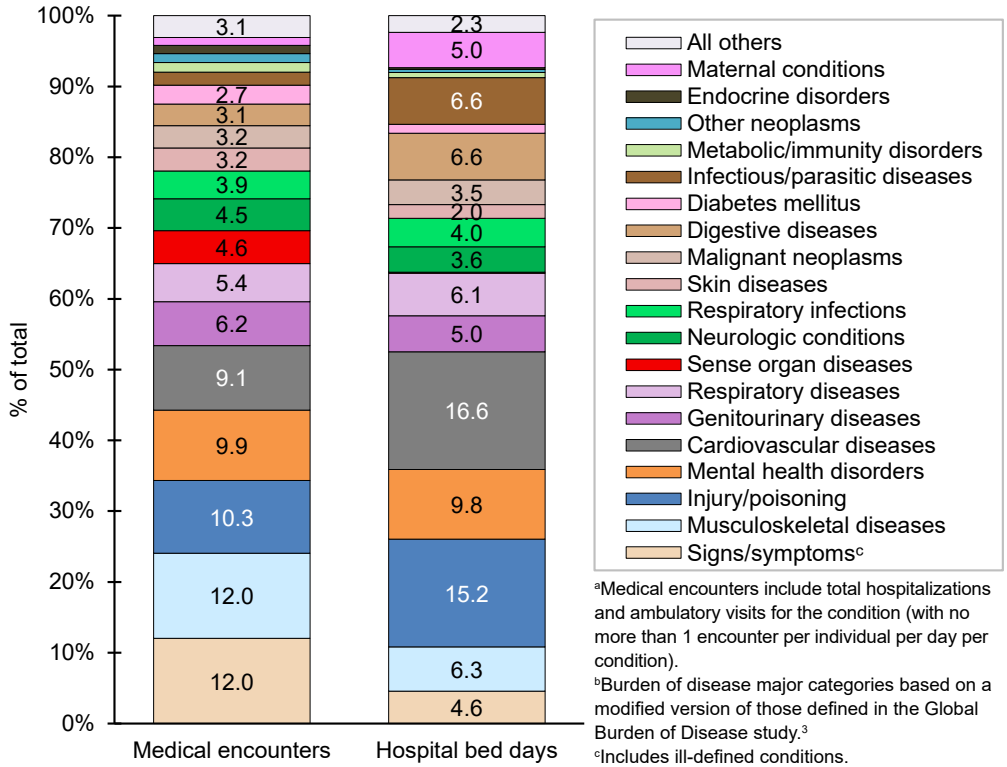
[a]Medical encounters include total hospitalizations and ambulatory visits for the condition (with no more than 1 encounter per individual per day per condition).
[b]Individuals with at least 1 hospitalization or ambulatory visit for the condition.
[c]Information on age was missing for 1 individual.
No., number.

FIGURE 1a. Numbers of medical encounters,[a] individuals affected,[b] and hospital bed days, by burden of disease major category,[c] non-service member beneficiaries, 2018



[a]Medical encounters include total hospitalizations and ambulatory visits for the condition (with no more than 1 encounter per individual per day per condition).
[b]Individuals with at least 1 hospitalization or ambulatory visit for the condition.
[c]Burden of disease major categories based on a modified version of those defined in the Global Burden of Disease study.[3]
[d]Includes ill-defined conditions.
No., number.

FIGURE 1b. Percentages of medical encounters[a] and hospital bed days, by burden of disease major category,[b] non-service member beneficiaries, 2018

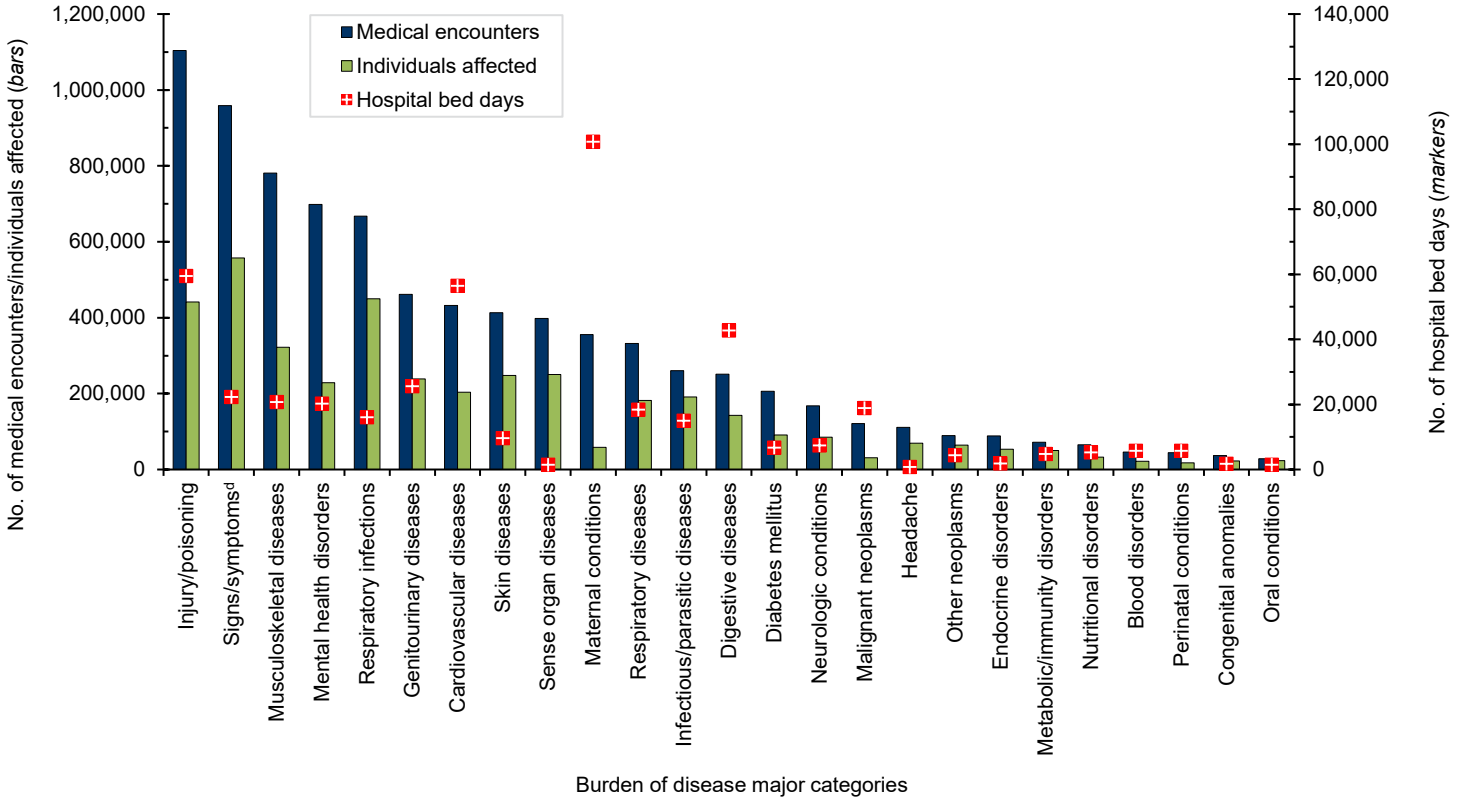


[a]Medical encounters include total hospitalizations and ambulatory visits for the condition (with no more than 1 encounter per individual per day per condition).
[b]Burden of disease major categories based on a modified version of those defined in the Global Burden of Disease study.[3]
[c]Includes ill-defined conditions.

METHODS

The surveillance period was 1 January through 31 December 2018. The surveillance population included all non-service member beneficiaries of the MHS who had at least 1 hospitalization or outpatient medical encounter during 2018 either through a military medical facility/provider or a civilian facility/provider (if paid for by the MHS). For this analysis, all inpatient and outpatient medical encounters were summarized according to the primary (first-listed) diagnoses documented on administrative records of the encounters if the diagnoses were reported with International Classification of Diseases, 10th Revision, Clinical Modification (ICD-10-CM) codes that indicate the natures of illnesses or injuries (i.e., ICD-10 codes A00–T88). Nearly all records of encounters with first-listed diagnoses that

FIGURE 2a. Numbers of medical encounters,[a] individuals affected,[b] and hospital bed days, by burden of disease major category,[c] non-service member beneficiaries, direct care only, 2018



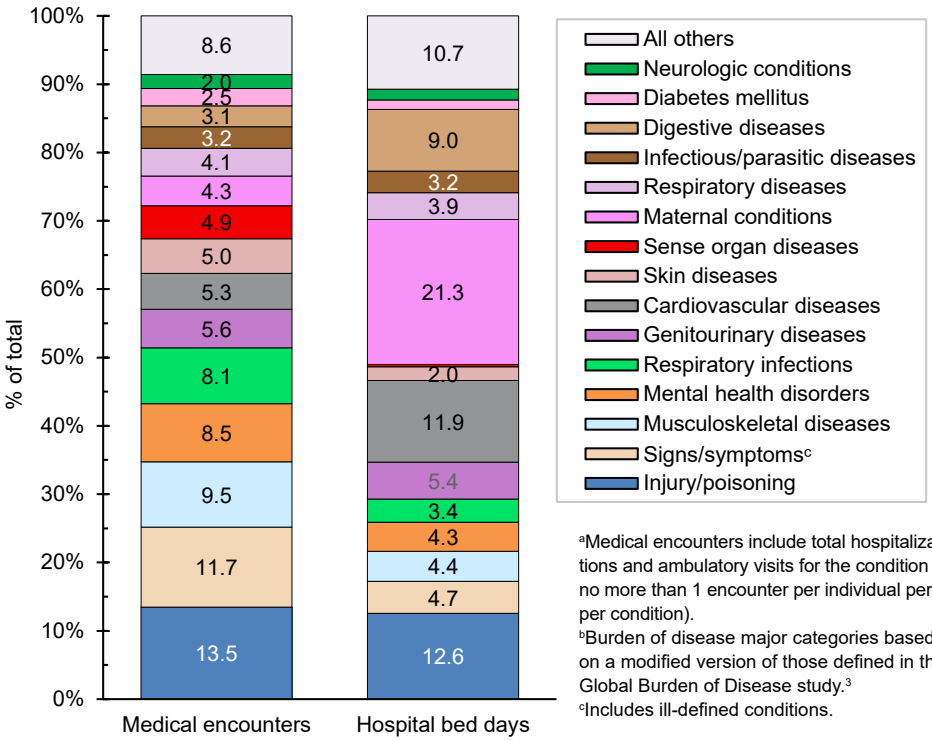
[a]Medical encounters include total hospitalizations and ambulatory visits for the condition (with no more than 1 encounter per individual per day per condition).
[b]Individuals with at least 1 hospitalization or ambulatory visit for the condition.
[c]Burden of disease major categories based on a modified version of those defined in the Global Burden of Disease study.[3]
[d]Includes ill-defined conditions.
No., number.

were Z-codes (care other than for a current illness or injury—e.g., general medical examinations, after care, vaccinations) or V-, W-, X-, or Y-codes (indicators of the external causes but not the natures of injuries) were excluded from the analysis; however, encounters with primary diagnoses of Z37 ("outcome of delivery, single liveborn") were retained.

For summary purposes, all illness- and injury-specific diagnoses (as defined by the ICD-10) were grouped into 142 burden of disease-related conditions and 25 major categories based on a modified version of the classification system developed for the Global Burden of Disease Study.[3] The methodology for summarizing absolute and relative morbidity burdens is described on page 2 of this issue of the *MSMR*.

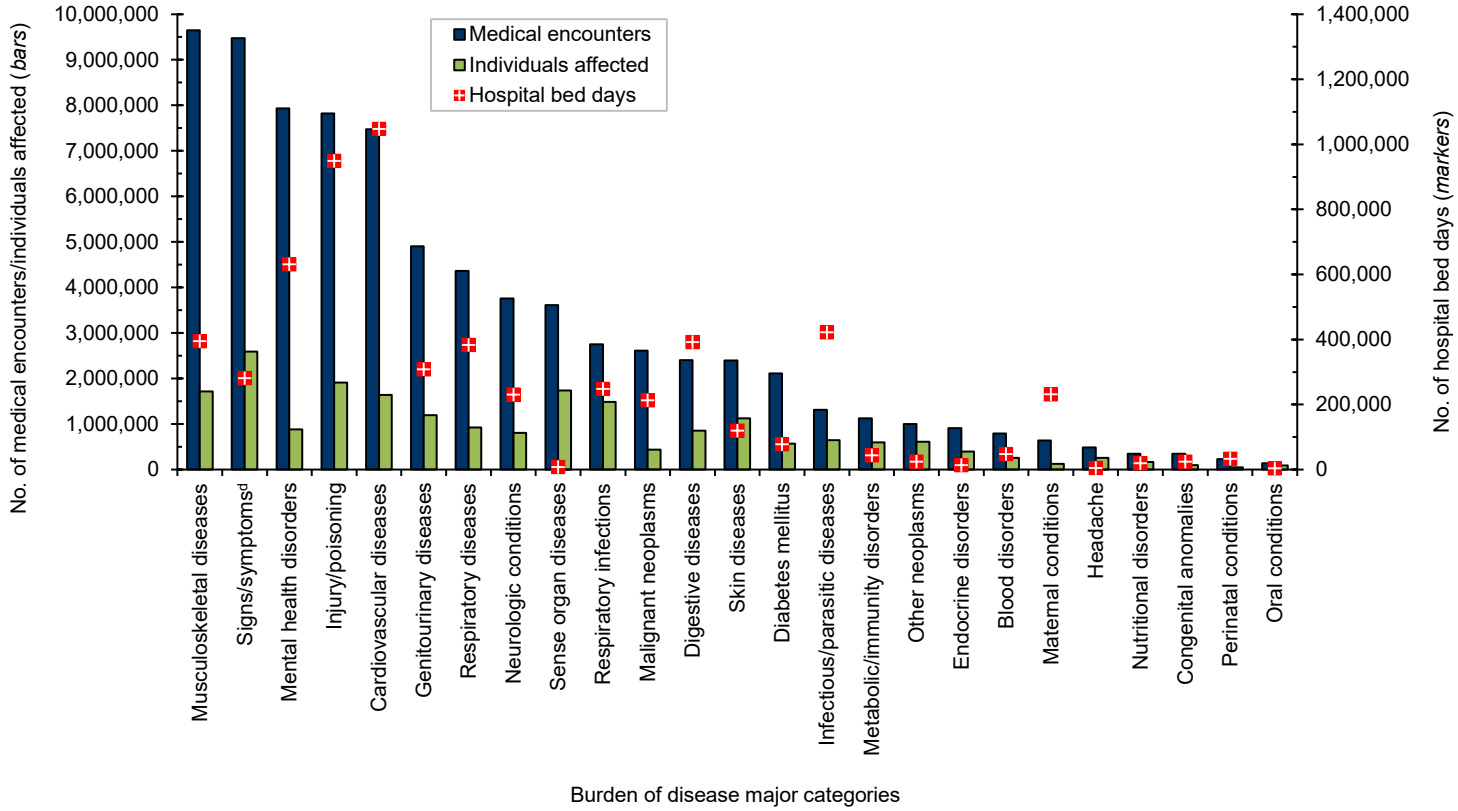
The new electronic health record for the MHS, MHS GENESIS, was implemented at several military treatment

FIGURE 2b. Percentages of medical encounters[a] and hospital bed days, by burden of disease major category,[b] non-service member beneficiaries, direct care only, 2018



[a]Medical encounters include total hospitalizations and ambulatory visits for the condition (with no more than 1 encounter per individual per day per condition).
[b]Burden of disease major categories based on a modified version of those defined in the Global Burden of Disease study.[3]
[c]Includes ill-defined conditions.

FIGURE 3a. Numbers of medical encounters,[a] individuals affected,[b] and hospital bed days, by burden of disease major category[c] non-service member beneficiaries, outsourced care only, 2018



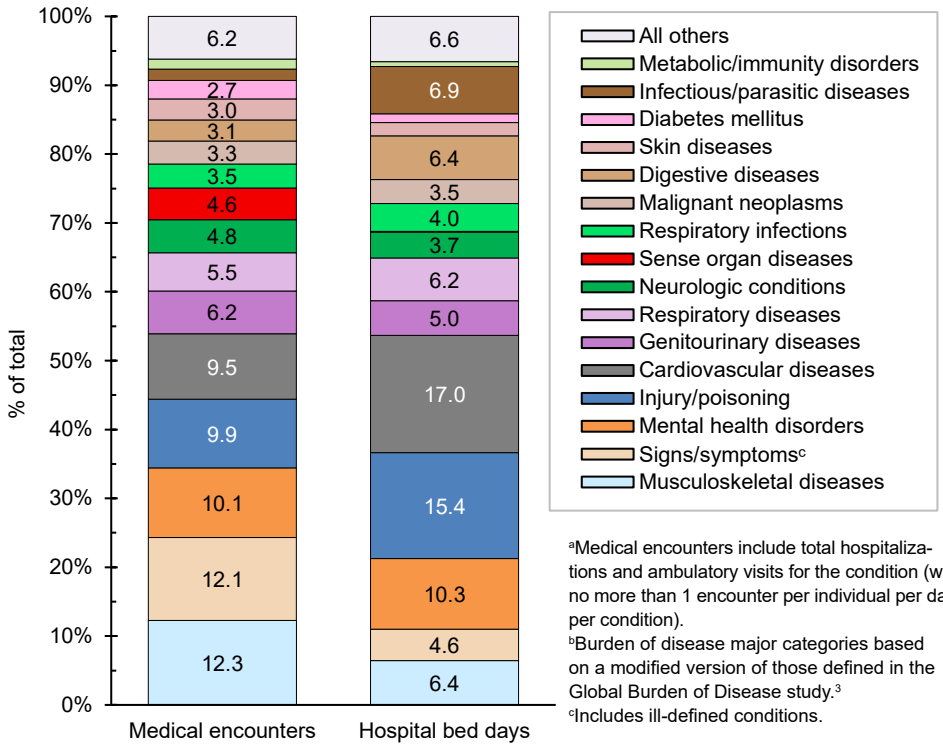
[a]Medical encounters include total hospitalizations and ambulatory visits for the condition (with no more than 1 encounter per individual per day per condition).
[b]Individuals with at least 1 hospitalization or ambulatory visit for the condition.
[c]Burden of disease major categories based on a modified version of those defined in the Global Burden of Disease study.[3]
[d]Includes ill-defined conditions.
No., number.

facilities during 2017. Medical data from sites that are using MHS GENESIS are not available in the DMSS. These sites include Naval Hospital Oak Harbor, Naval Hospital Bremerton, Air Force Medical Services Fairchild, and Madigan Army Medical Center. Therefore, medical encounter data for individuals seeking care at any of these facilities during 2018 were not included in this analysis.

RESULTS

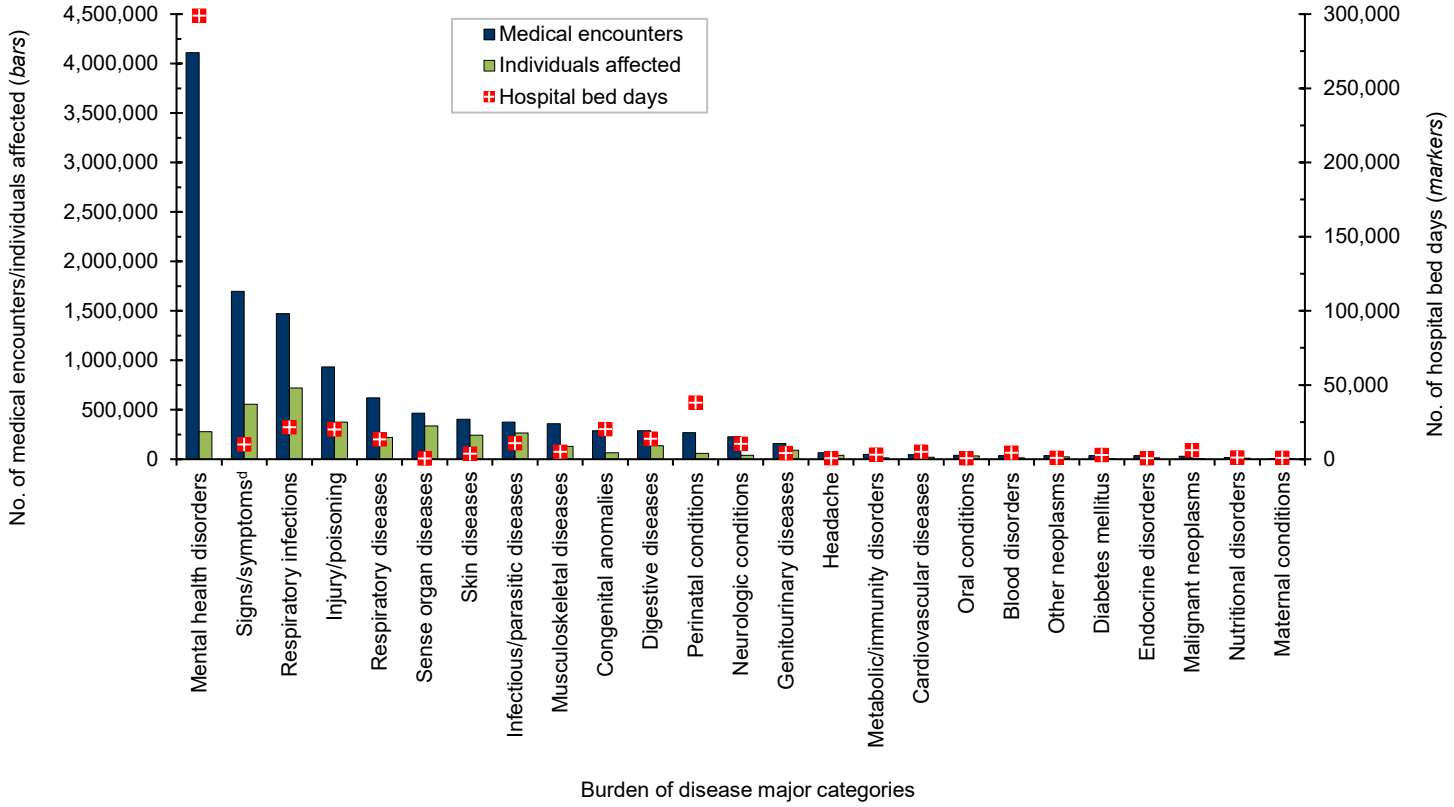
In 2018, a total of 6,537,135 non-service member beneficiaries of the MHS had 86,788,454 medical encounters **(Table)**. Thus, on average, each individual who accessed care from the MHS had 13.3 medical encounters over the course of the year. The top 3 morbidity-related categories, which accounted for a little more than one-third (34.3%) of all medical encounters,

FIGURE 3b. Percentages of medical encounters[a] and hospital bed days, by burden of disease major category,[b] non-service member beneficiaries, outsourced care only, 2018



[a]Medical encounters include total hospitalizations and ambulatory visits for the condition (with no more than 1 encounter per individual per day per condition).
[b]Burden of disease major categories based on a modified version of those defined in the Global Burden of Disease study.[3]
[c]Includes ill-defined conditions.

FIGURE 4a. Medical encounters,[a] individuals affected,[b] and hospital bed days, by burden of disease major category[c] non-service member beneficiaries, pediatric non-service member beneficiaries, aged 0–17 years, 2018



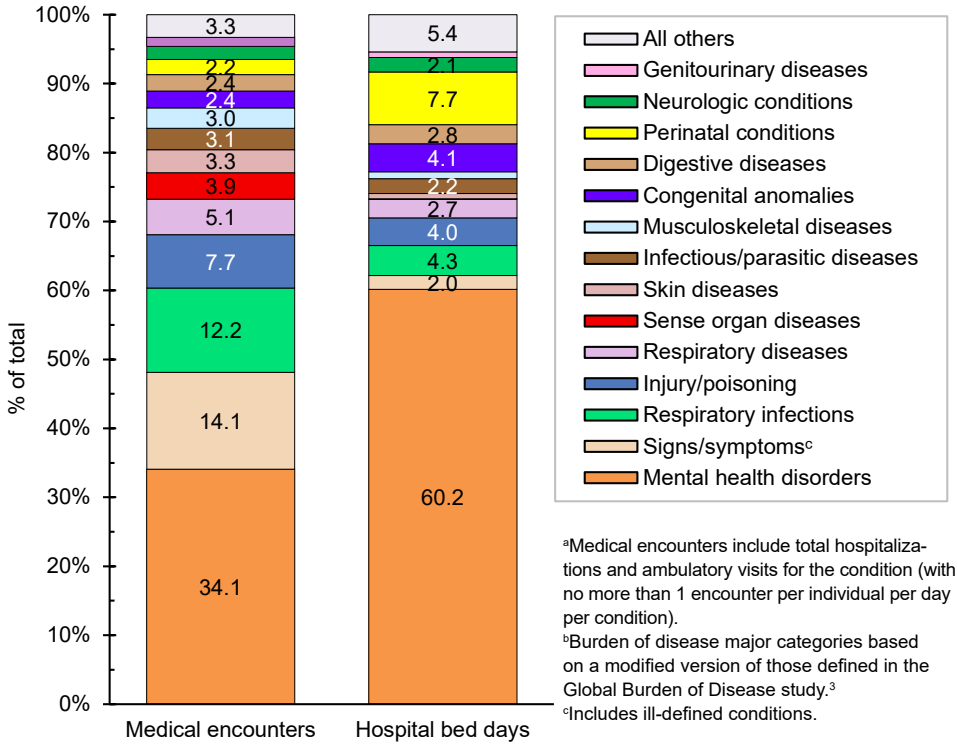
[a]Medical encounters include total hospitalizations and ambulatory visits for the condition (with no more than 1 encounter per individual per day per condition).
[b]Individuals with at least 1 hospitalization or ambulatory visit for the condition.
[c]Burden of disease major categories based on a modified version of those defined in the Global Burden of Disease study.[3]
[d]Includes ill-defined conditions.
No., number.

were signs, symptoms, and ill-defined conditions (12.0%); musculoskeletal diseases (12.0%); and injury/poisoning (10.3%) **(Figures 1a, 1b)**. The illness/injury categories that affected the most beneficiaries who received any care were signs, symptoms, and ill-defined conditions (45.8%); injury/poisoning (34.1%); and sense organ diseases (29.6%).

Cardiovascular diseases accounted for more hospital bed days (n=1,103,494) than any other illness/injury category and 16.6% of all hospital bed days overall **(Figures 1a, 1b)**. An additional 38.2% of all bed days were attributable to injury/poisoning (15.2%), mental health disorders (9.8%), infectious/parasitic diseases (6.6%), and digestive diseases (6.6%).

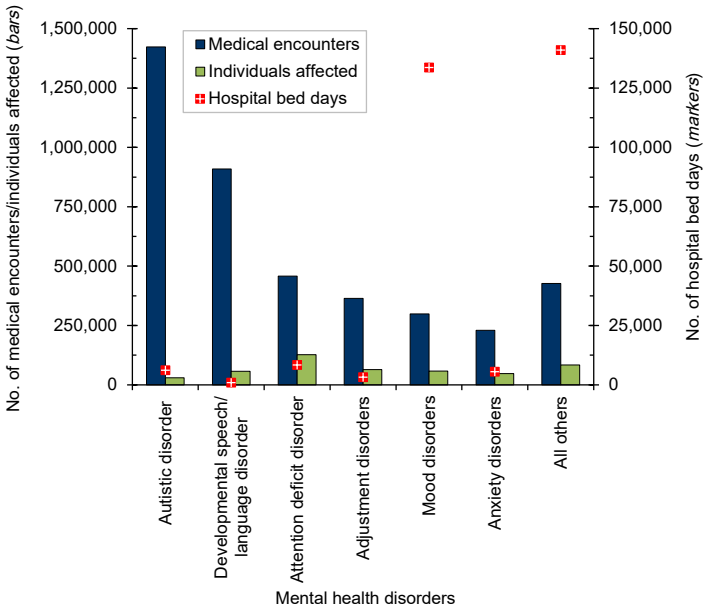
Of note, among all beneficiaries, maternal conditions (including pregnancy complications and delivery) accounted for relatively more hospital bed days (n=331,973; 5.0%) than individuals affected (n=163,349; 2.5%) **(Figure 1a)**.

FIGURE 4b. Percentages of medical encounters[a] and hospital bed days, by burden of disease category,[b] pediatric non-service member beneficiaries, aged 0–17 years, 2018



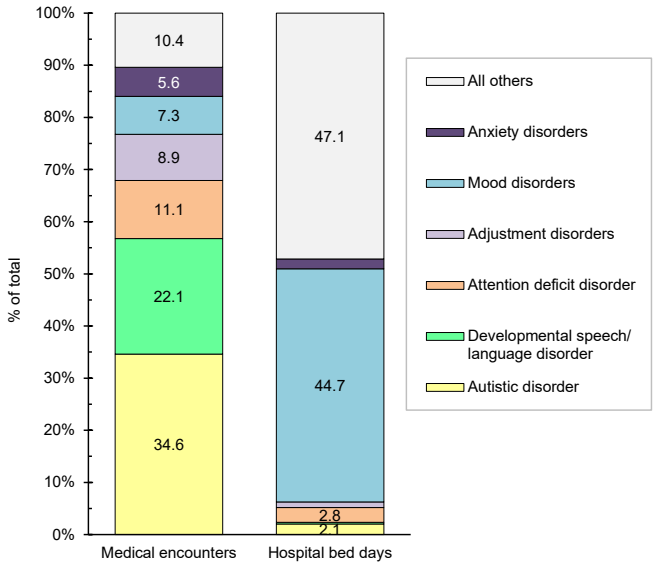
[a]Medical encounters include total hospitalizations and ambulatory visits for the condition (with no more than 1 encounter per individual per day per condition).
[b]Burden of disease major categories based on a modified version of those defined in the Global Burden of Disease study.[3]
[c]Includes ill-defined conditions.

FIGURE 4c. Medical encounters,[a] individuals affected,[b] and hospital bed days, by the mental health disorders accounting for the most morbidity burden, pediatric non-service member beneficiaries, aged 0–17 years, 2018



[a]Medical encounters include total hospitalizations and ambulatory visits for the condition (with no more than 1 encounter per individual per day per condition).
[b]Individuals with at least 1 hospitalization or ambulatory visit for the condition.
No., number.

FIGURE 4d. Percentages of medical encounters[a] and hospital bed days for mental health disorders, by the conditons accounting for the most morbidity burden, pediatric non-service member beneficiaries, aged 0–17 years, 2018



[a]Medical encounters include total hospitalizations and ambulatory visits for the condition (with no more than 1 encounter per individual per day per condition).

Direct care vs. outsourced care

In 2018, among non-service member beneficiaries, most medical encounters (90.6%) were in non-military medical facilities (outsourced care) **(Table)**. Of all beneficiaries with any illness or injury-related encounters during the year, many more received exclusively outsourced care (n=4,728,130; 72.3%) than either military medical (direct) care only (n=708,585; 10.8%) or both outsourced and direct care (n=1,100,420; 16.8%). By far, most inpatient care (92.9% of all bed days) was received in non-military facilities (outsourced).

The proportions of medical encounters by morbidity-related categories were broadly similar for direct and outsourced care **(Figures 2a, 2b, 3a, 3b)**. However, encounters for injury/poisoning and respiratory infections were relatively more common in direct (13.5% and 8.1%, respectively) compared to outsourced (9.9% and 3.5%, respectively) care. Musculoskeletal diseases, cardiovascular diseases, neurologic conditions, and malignant neoplasms were relatively more common in outsourced (12.3%, 9.5%, 4.8%, and 3.3%, respectively) compared to direct (9.5%, 5.3%, 2.0%, and 1.5%, respectively) care.

Maternal conditions accounted for 21.3% of all direct care bed days but only 3.8% of all outsourced care bed days **(Figures 2a, 2b, 3a, 3b)**. However, cardiovascular diseases, mental health disorders, and musculoskeletal diseases accounted for relatively more of all outsourced than direct care bed days (% of outsourced vs. % of direct care bed days: cardiovascular, 17.0% vs. 11.9%; mental health, 10.3% vs. 4.3%; musculoskeletal, 6.4% vs. 4.4%).

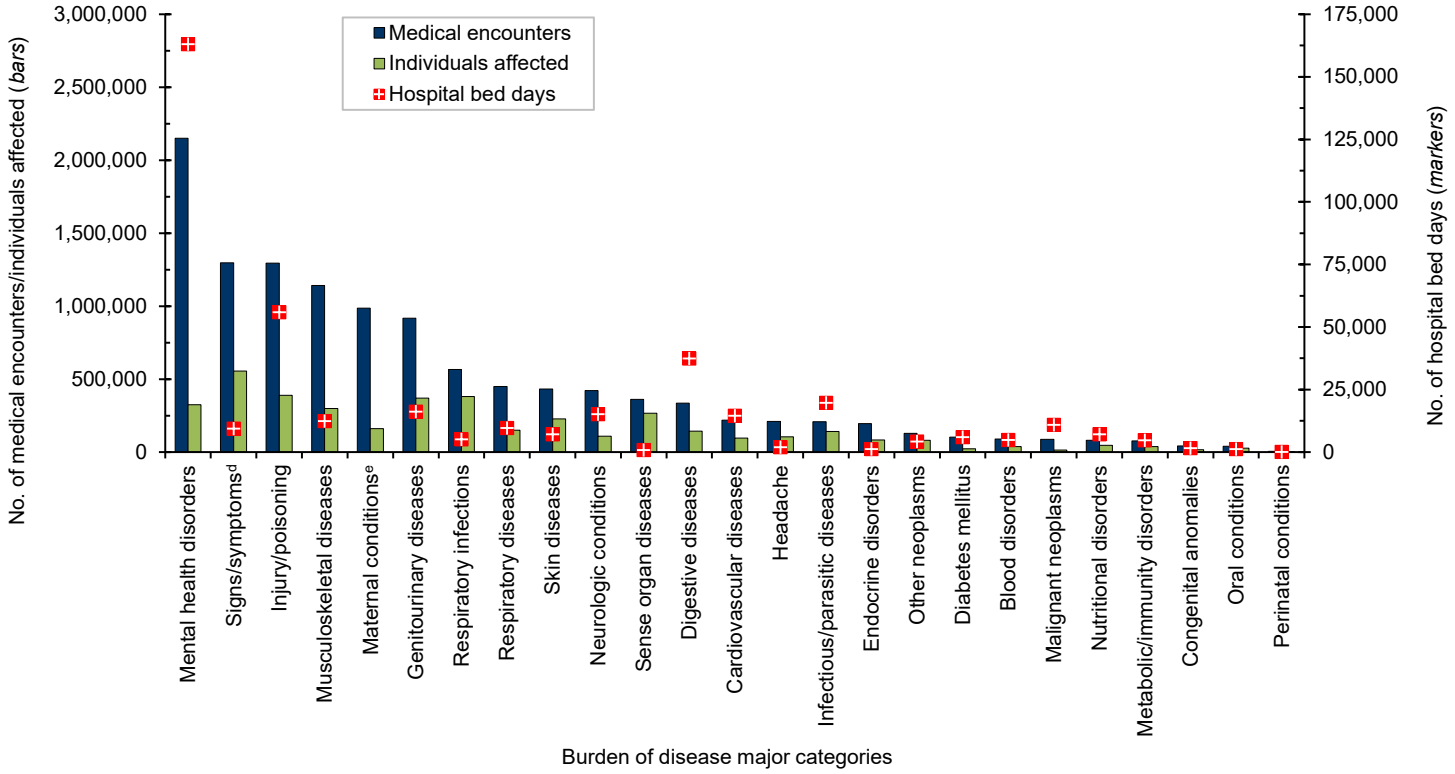
Pediatric beneficiaries (aged 0–17 years)

In 2018, pediatric beneficiaries accounted for 13.9% of all medical encounters, 23.0% of all individuals affected, and 7.5% of all hospital bed days **(Table)**. On average, each affected individual had 8.0 medical encounters during the year.

Mental health disorders accounted for slightly more than one-third (34.1%; n=4,108,901) of all medical encounters and 60.2% of all hospital bed days (n=298,975) among pediatric beneficiaries **(Figures 4a, 4b)**. On average, each pediatric beneficiary who was affected by a mental health disorder had 14.7 mental health disorder-related encounters during the year. More than two-thirds (67.9%) of all medical encounters for mental health disorders among pediatric beneficiaries were for autistic disorders (34.6%), followed by developmental speech/language disorders (22.1%), and attention deficit disorders (11.1%) **(Figures 4c, 4d)**. On average, there were 48.3 autism-related encounters per individual affected with an autistic disorder and 12.2 encounters for developmental speech/language disorder per individual affected with those specific disorders **(data not shown)**. Despite the high numbers of encounters associated with these 3 categories of mental health disorders, 44.7% of mental health disorder-related bed days were attributable to mood disorders, and 37.4% of mood-related bed days were attributable to "major depressive disorder, recurrent severe without psychotic features" **(data not shown)**.

Among pediatric beneficiaries overall, "conditions arising during the

FIGURE 5a. Medical encounters,[a] individuals affected,[b] and hospital bed days, by burden of disease major category[c] non-service member beneficiaries, aged 18–44 years, 2018

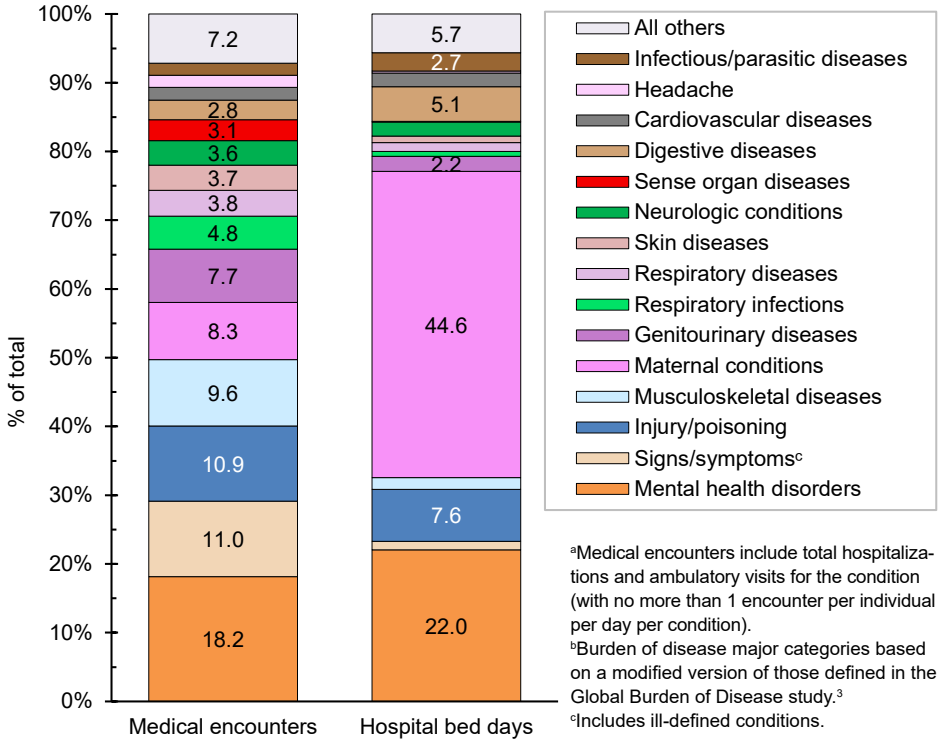


[a]Medical encounters include total hospitalizations and ambulatory visits for the condition (with no more than 1 encounter per individual per day per condition).
[b]Individuals with at least 1 hospitalization or ambulatory visit for the condition.
[c]Burden of disease major categories based on a modified version of those defined in the Global Burden of Disease study.[3]
[d]Includes ill-defined conditions.
[e]Maternal conditions accounted for 330,075 hospital bed days in 2018 (not shown in figure).
No., number.

perinatal period" (i.e., perinatal conditions) accounted for the second most hospital bed days (n=38,034; 7.7%) **(Figures 4a, 4b)**. Of note, among pediatric beneficiaries with at least 1 illness or injury-related diagnosis, those with malignant neoplasms had the second highest number of related encounters per affected individual (12.6). The highest numbers of malignant neoplasm-related encounters were attributable to leukemias, "all other malignant neoplasms," and brain neoplasms, while the highest numbers of bed days were attributable to leukemias, brain neoplasms, and "all other malignant neoplasms" **(data not shown)**.

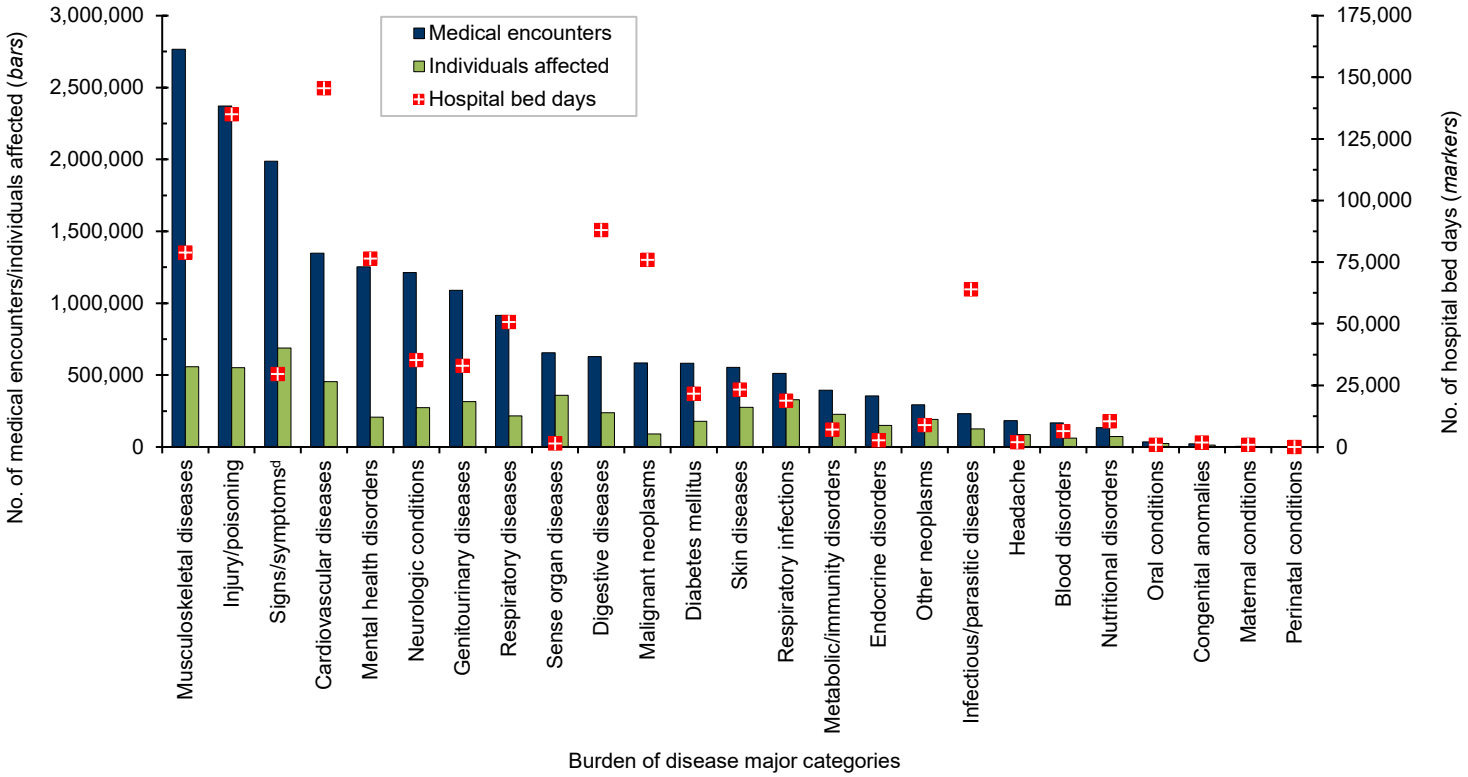
Finally, respiratory infections (including upper and lower respiratory infections and otitis media) accounted for relatively more medical encounters and bed days among pediatric beneficiaries (12.2% and 4.3%, respectively) when compared to any older age group of beneficiaries (with the exception of beneficiaries aged 65 years or older among whom respiratory infections

FIGURE 5b. Percentages of medical encounters[a] and hospital bed days, by burden of disease major category,[b] non-service member beneficiaries, aged 18–44 years, 2018



[a]Medical encounters include total hospitalizations and ambulatory visits for the condition (with no more than 1 encounter per individual per day per condition).
[b]Burden of disease major categories based on a modified version of those defined in the Global Burden of Disease study.[3]
[c]Includes ill-defined conditions.

FIGURE 6a. Medical encounters,[a] individuals affected,[b] and hospital bed days, by burden of disease major category[c] non-service member beneficiaries, aged 45–64 years, 2018



[a]Medical encounters include total hospitalizations and ambulatory visits for the condition (with no more than 1 encounter per individual per day per condition).
[b]Individuals with at least 1 hospitalization or ambulatory visit for the condition.
[c]Burden of disease major categories based on a modified version of those defined in the Global Burden of Disease study.[3]
[d]Includes ill-defined conditions.
No., number.

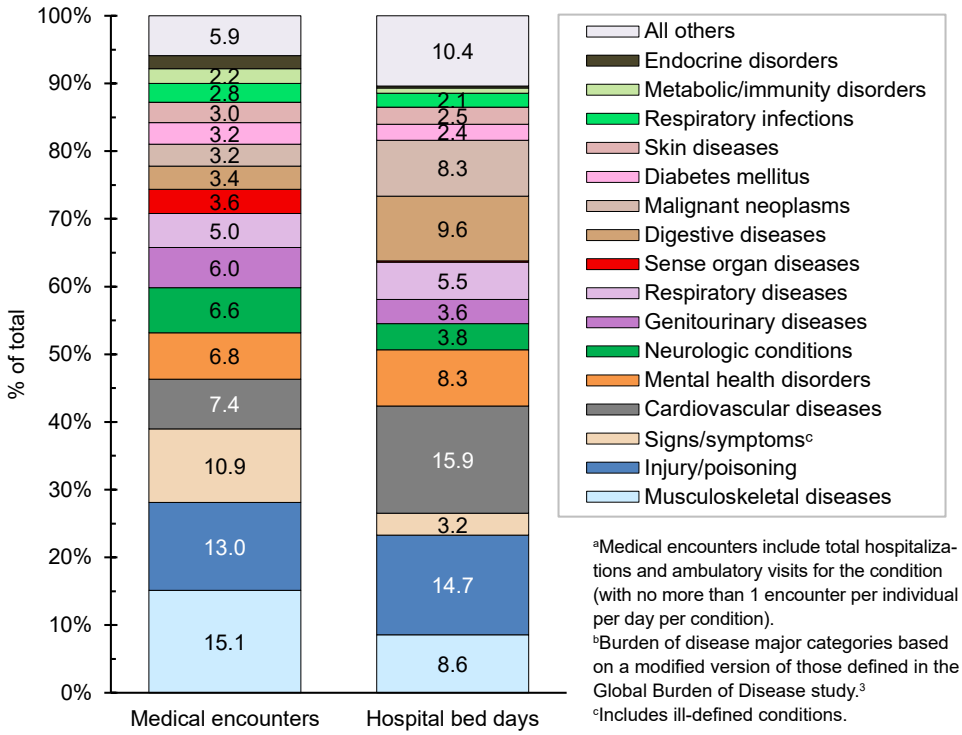
accounted for 4.9% of total bed days) **(Figures 4b, 5b, 6b, and 7b)**.

Beneficiaries (aged 18–44 years)

In 2018, non-service member beneficiaries aged 18–44 years accounted for 13.6% of all medical encounters, 22.1% of all individuals affected, and 11.2% of hospital bed days **(Table)**. On average, each individual affected with an illness or injury (any cause) had 8.2 medical encounters during the year.

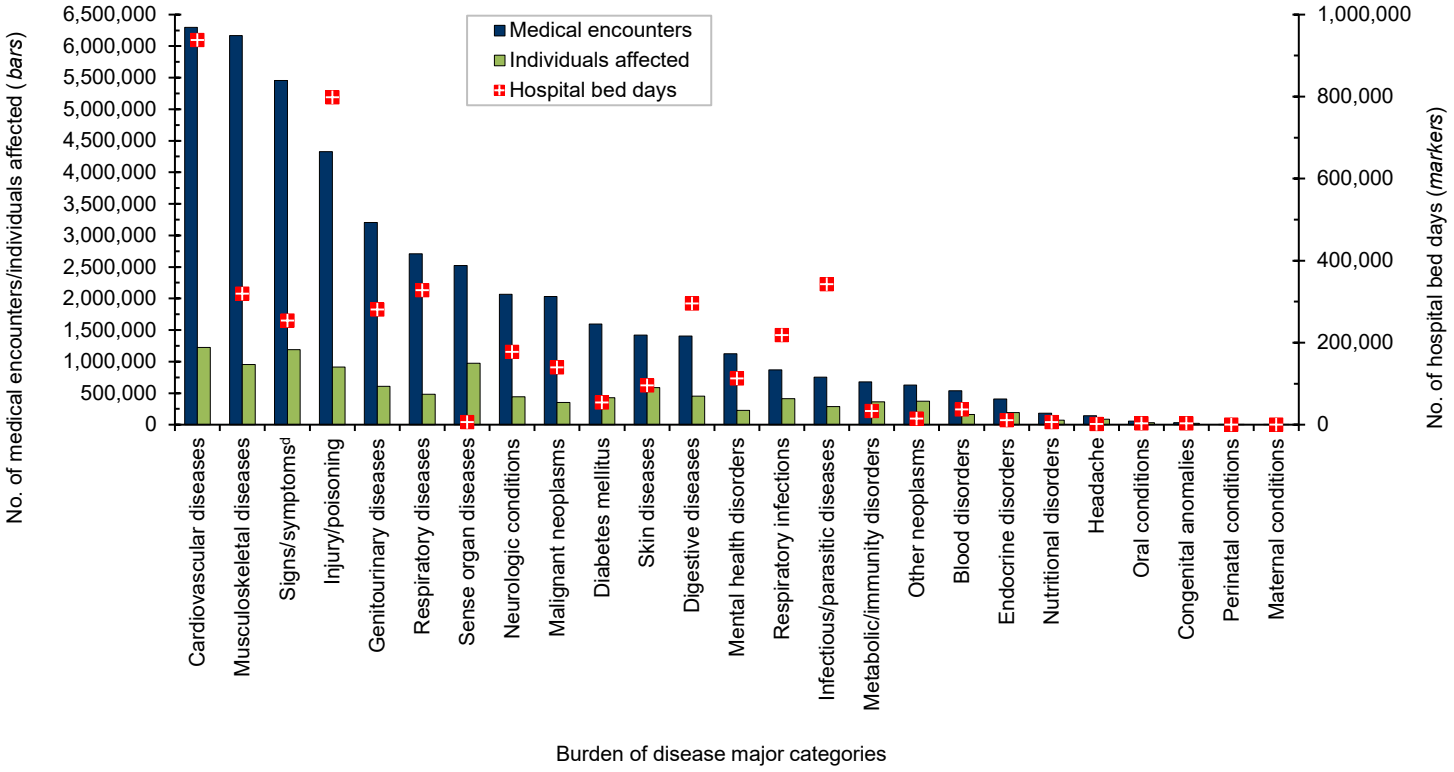
Among beneficiaries aged 18–44 years, the morbidity-related category that accounted for the most medical encounters was mental health disorders (n=2,151,074; 18.2% of all encounters) **(Figures 5a, 5b)**. Among these adult beneficiaries, mental health disorders accounted for 22.0% of all bed days, and, on average, each adult affected by a mental health disorder had 6.6 mental health disorder-related encounters during the year. Mood disorders (33.4%),

FIGURE 6b. Percentages of medical encounters[a] and hospital bed days, by burden of disease major category,[b] non-service member beneficiaries, aged 45–64 years, 2018



[a]Medical encounters include total hospitalizations and ambulatory visits for the condition (with no more than 1 encounter per individual per day per condition).
[b]Burden of disease major categories based on a modified version of those defined in the Global Burden of Disease study.[3]
[c]Includes ill-defined conditions.

FIGURE 7a. Medical encounters,[a] individuals affected,[b] and hospital bed days, by burden of disease major category[c] non-service member beneficiaries, aged 65 years or older, 2018

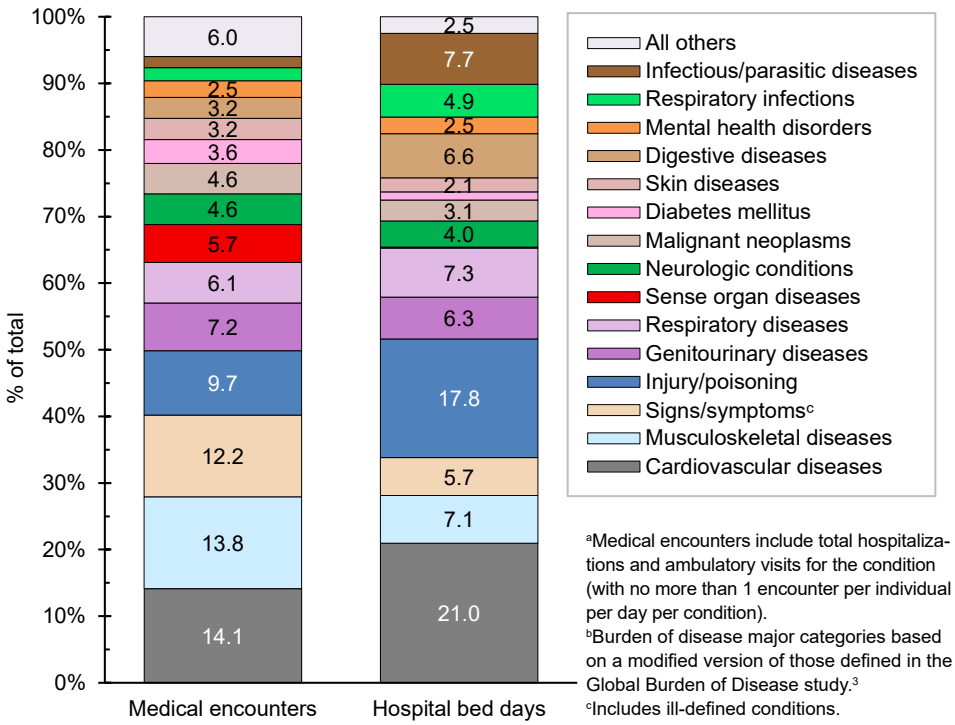


[a]Medical encounters include total hospitalizations and ambulatory visits for the condition (with no more than 1 encounter per individual per day per condition).
[b]Individuals with at least 1 hospitalization or ambulatory visit for the condition.
[c]Burden of disease major categories based on a modified version of those defined in the Global Burden of Disease study.[3]
[d]Includes ill-defined conditions.
No., number.

anxiety disorders (28.2%), and adjustment disorders (16.7%) accounted for nearly four-fifths (78.3%) of all mental health disorder-related medical encounters among beneficiaries aged 18–44 years **(data not shown)**.

Among adults aged 18–44 years, maternal conditions accounted for more than two-fifths (44.6%) of all bed days and, on average, 6.1 medical encounters per affected individual **(Figures 5a, 5b)**. Normal deliveries accounted for 11.1% of maternal condition-related medical encounters **(data not shown)**. Adults aged 18–44 years accounted for nearly all (99.2%) maternal condition-related bed days among beneficiaries not in military service. Although adults aged 18–44 years had the lowest percentage of total medical encounters (13.6%), if morbidity burdens associated with maternal conditions were excluded from the overall analysis, this age group would account for even lower percentages of total medical encounters (12.5%) and the

FIGURE 7b. Percentages of medical encounters[a] and hospital bed days, by burden of disease major category,[b] non-service member beneficiaries, aged 65 years or older, 2018



[a]Medical encounters include total hospitalizations and ambulatory visits for the condition (with no more than 1 encounter per individual per day per condition).
[b]Burden of disease major categories based on a modified version of those defined in the Global Burden of Disease study.[3]
[c]Includes ill-defined conditions.

lowest percentage of total hospital bed days (6.2%) when compared to any other age group **(data not shown)**.

Among beneficiaries aged 18–44 years with at least 1 illness or injury-related diagnosis, those with malignant neoplasms had the second most (along with maternal conditions) category-specific encounters per affected individual (6.1). Of all malignant neoplasms, breast cancer accounted for the most malignant neoplasm-related encounters (27.8% of the total) **(data not shown)**.

Beneficiaries (aged 45–64 years)

In 2018, non-service member beneficiaries aged 45–64 years accounted for 21.1% of all medical encounters, 23.3% of all individuals affected, and 13.9% of hospital bed days **(Table)**. On average, each affected individual had 12.0 medical encounters during the year.

Of all morbidity-related categories, musculoskeletal diseases accounted for the most medical encounters (n=2,766,188; 15.1%) among older adult beneficiaries **(Figures 6a, 6b)**. In addition, in this age group, back problems accounted for 44.9% of all musculoskeletal disease-related encounters **(data not shown)**. Cardiovascular diseases accounted for more hospital bed days (15.9% of the total) than any other category of illnesses or injuries, and cerebrovascular disease and ischemic heart disease accounted for 33.3% and 18.9%, respectively, of all cardiovascular disease-related bed days **(data not shown)**. Digestive diseases accounted for a larger percentage (9.6%) of total hospital bed days among beneficiaries in this age group when compared to those in the other age groups.

The most medical encounters per affected individual were associated with malignant neoplasms (6.5), mental health disorders (6.0), musculoskeletal diseases (5.0), maternal conditions (4.9), neurologic conditions (4.4), injury/poisoning (4.3), and respiratory diseases (4.2) **(Figures 6a, 6b)**. Malignant neoplasms (8.3%) accounted for a larger proportion of total bed days among beneficiaries aged 45–64 years than the other age groups of beneficiaries. Breast cancer accounted for nearly one-fourth (23.9%) of all malignant neoplasm-related encounters among older adult beneficiaries **(data not shown)**.

Beneficiaries (aged 65 years or older)

In 2018, non-service member beneficiaries aged 65 years or older accounted for slightly more than half (51.4%) of all medical encounters, nearly one-third (31.6%) of all individuals affected, and slightly more than two-thirds (67.5%) of hospital bed days **(Table 1)**. On average, each affected individual had 21.6 medical encounters during the year.

Of all morbidity-related categories, cardiovascular diseases accounted for the most medical encounters (n=6,297,744; 14.1%) and bed days (n=938,343; 21.0%) **(Figures 7a, 7b)**. Essential hypertension (26.6%), ischemic heart disease (14.5%), and cerebrovascular disease (9.7%) accounted for slightly more than half (50.8%) of all cardiovascular disease-related medical encounters, and cerebrovascular disease accounted for over one-quarter (29.1%) of all cardiovascular disease-related bed days **(data not shown)**.

Among the oldest age group of beneficiaries, the most medical encounters per affected individual were associated with musculoskeletal diseases (6.5), malignant neoplasms (5.8), respiratory diseases (5.6), diseases of the genitourinary system (5.3), cardiovascular diseases (5.1), and mental health disorders (5.0). In this age group, back problems accounted for more than one-third (36.2%) of all musculoskeletal disease-related encounters. Together, melanomas and other skin cancers (19.9%); prostate cancer (14.4%); breast cancer (12.3%); and trachea, bronchus, and lung cancers (10.7%) accounted for more than half (57.4%) of all malignant neoplasm-related encounters **(data not shown)**. Chronic obstructive pulmonary disease accounted for more than two-fifths of all medical encounters (42.3%) and approximately three-eighths of all bed days (37.1%) attributable to respiratory diseases **(data not shown)**.

Infectious and parasitic diseases (7.7%) accounted for a larger proportion of total bed days among the oldest age group compared to the other age groups of beneficiaries **(Figures 7a, 7b)**. In contrast, mental health disorders accounted for smaller percentages of medical encounters (2.5%) and bed days (2.5%) among the oldest age group compared to the younger age groups.

EDITORIAL COMMENT

This report describes the sixth estimate of overall morbidity burdens among non-service member beneficiaries of the MHS. The report notes that a large majority of the healthcare services for current illness and injury (excluding encounters with diagnoses identified by Z-codes) that are provided through the MHS to non-service member beneficiaries are delivered in non-military medical facilities (i.e., outsourced [purchased] care). The report also documents that there are pronounced differences in the types of morbidity and the natures of the care provided for evaluation and treatment across age groups of beneficiaries. Of particular note, individuals aged 65 years or older account for slightly more than half of all medical encounters (51.4%) and a majority (67.5%) of all hospital bed days delivered to beneficiaries not currently in military service.

In 2018, mental health disorders accounted for the largest proportions of the morbidity and healthcare burdens that affected the pediatric (aged 0–17 years) and younger adult (aged 18–44 years) beneficiary age groups. Among pediatric beneficiaries, 67.9% of medical encounters for mental health disorders were attributable to autistic disorders, developmental speech/language disorders, or attention deficit disorders. Of particular note, children affected by autistic disorders had, on average, 48.3 autism-related encounters each during the 1-year surveillance period.

Although mental health disorders also accounted for more medical encounters among young adult (18–44 years) beneficiaries than any other major category of illnesses or injuries, the proportion of all encounters attributable to mental health disorders was markedly less among young adult (18.2%) than pediatric (34.1%) beneficiaries. Also, as expected, the mental health disorders that accounted for the largest healthcare burdens among younger

adults (18–44 years)—mood, anxiety, and adjustment disorders—differed from those that most affected the pediatric age group.

It is not surprising that the highest numbers and proportions of hospital bed days among adults aged 18–44 years were for maternal conditions because this age group encompasses nearly all women of childbearing age. Among older adults (aged 45–64 years), musculoskeletal diseases were the greatest contributors to morbidity and healthcare burdens, and among adults aged 65 years or older, cardiovascular diseases were the greatest contributors to morbidity and healthcare burdens.

Of musculoskeletal diseases, back problems were a major source of healthcare burden; of cardiovascular diseases, cerebrovascular disease, ischemic heart disease, and essential hypertension accounted for the largest healthcare burdens. These findings are not surprising and reflect the inevitable effects of aging on the health and healthcare needs of the older segment of the MHS beneficiary population. However, many of the health conditions associated with the largest morbidity and healthcare burdens among beneficiaries in older age groups are also associated with unhealthy lifestyles (e.g., unhealthy diet, inadequate exercise, or tobacco use). As such, to varying extents, the most costly health conditions may be preventable and their disabling or life-threatening long-term consequences may be avoidable. Illnesses and injuries that disproportionately contribute to morbidity and healthcare burdens in various age groups of MHS beneficiaries should be targeted for early detection and treatment by comprehensive prevention and research programs.

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