



APRIL 2017

Volume 24
Number 4

MISMR

MEDICAL SURVEILLANCE MONTHLY REPORT



Annual Summary Issue

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Absolute and Relative Morbidity Burdens Attributable to Various Illnesses and Injuries, Active Component, U.S. Armed Forces, 2016

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 impacts 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, and 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 determines 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 U.S. Armed Forces in 2016.

METHODS

The surveillance period was 1 January through 31 December 2016. The surveillance population included all individuals who served in the active component of the U.S. Army, Navy, Air Force, or Marine Corps anytime during the surveillance period. The Defense Medical Surveillance System (DMSS) maintains electronic records of all actively serving U.S. military members’ hospitalizations and ambulatory visits in U.S. military and civilian (contracted or purchased care through the Military Health System [MHS]) medical facilities worldwide. For this analysis, DMSS data for all inpatient and outpatient medical encounters of all active component members during 2016 were summarized according to the primary (first-listed) diagnosis (if reported with an International Classification of Diseases, Tenth Revision, Clinical Modification [ICD-10] code between A00 and T88, or codes beginning with Z37). 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 (GBD) Study.¹ In general, the GBD system groups diagnoses with common pathophysiologic or etiologic bases and/or significant international health policymaking importance. For this analysis, some diagnoses that are grouped into single categories in the GBD system (e.g., mental 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.

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 one encounter per

individual per condition per day), numbers of service members affected by each condition (i.e., individuals with at least one medical encounter for the condition during the year), and total bed days during hospitalizations for each condition.

RESULTS

Morbidity burden, by major category

In 2016, more service members (n=550,213) 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=2,755,387) than any other morbidity category and approximately one-quarter (24.8%) of all medical encounters overall.

Mental disorders accounted for more hospital bed days (n=154,853) than any other morbidity category and 43.8% of all hospital bed days overall (**Figures 1a, 1b**). Together, injury/poisoning and mental disorders accounted for more than half (56.2%) of all hospital bed days and more than two-fifths (41.8%) 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=54,856; 15.5%) but a much smaller proportion of medical encounters overall (n=176,124; 1.6%) (**Figures 1a, 1b**). Routine prenatal visits are not included in this summary.

Medical encounters, by condition

In 2016, the three 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 one-fourth (25.1%) of all illness- and injury-related medical encounters overall (**Figure 2**). Moreover, the nine conditions that accounted for the most medical encounters accounted for slightly more than half (53.1%) of all

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, 2016

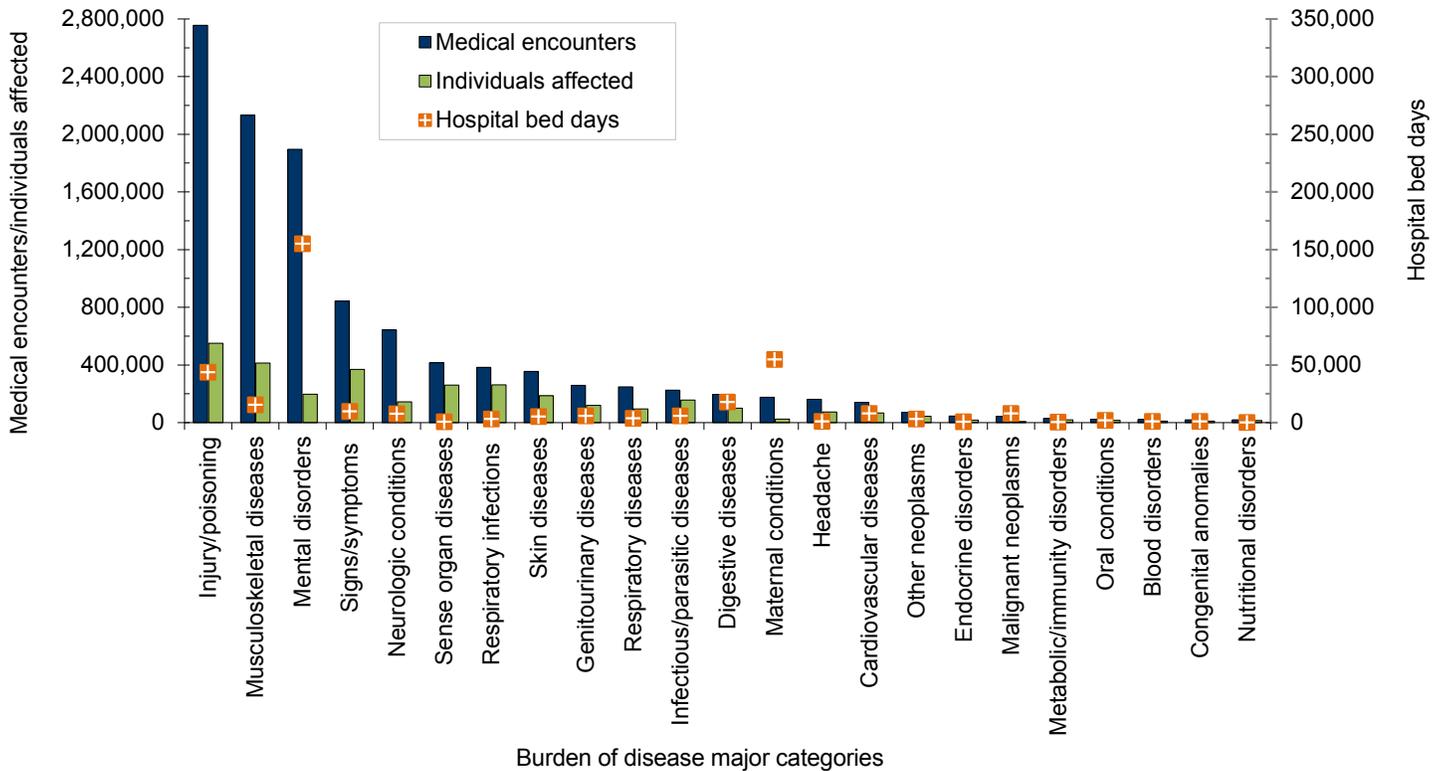
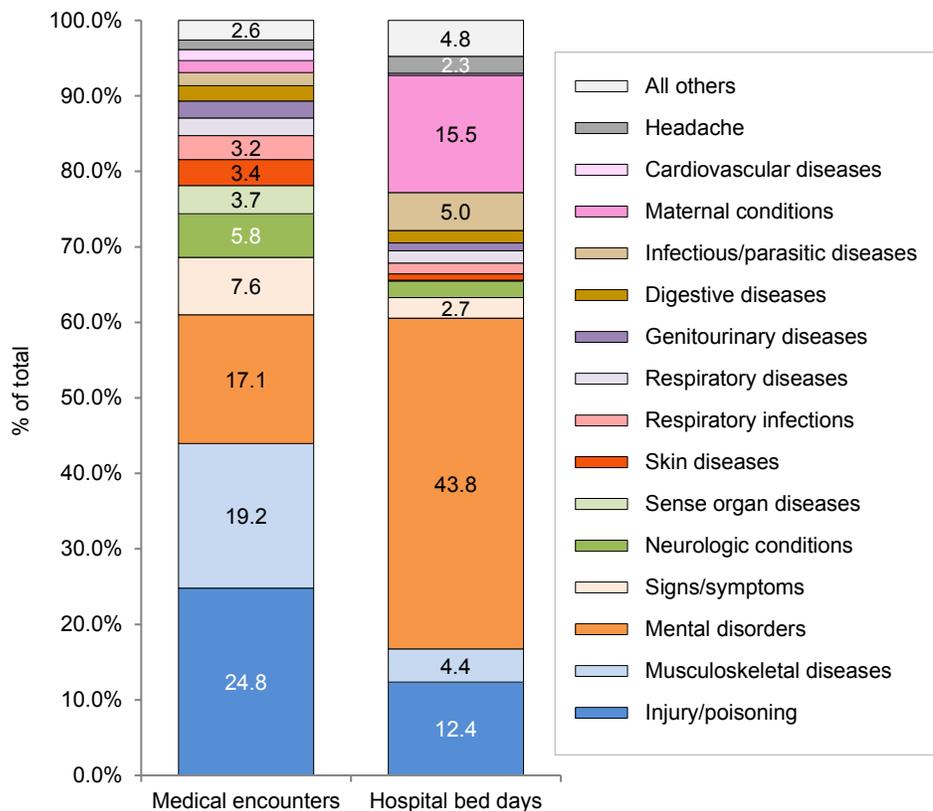


FIGURE 1b. Percentages of medical encounters^a and hospital bed days, by burden of disease major categories,^c active component, U.S. Armed Forces, 2016



^aMedical encounters: total hospitalizations and ambulatory visits for the condition (with no more than one encounter per individual per day per condition)

^bIndividuals with at least one hospitalization or ambulatory visit for the condition

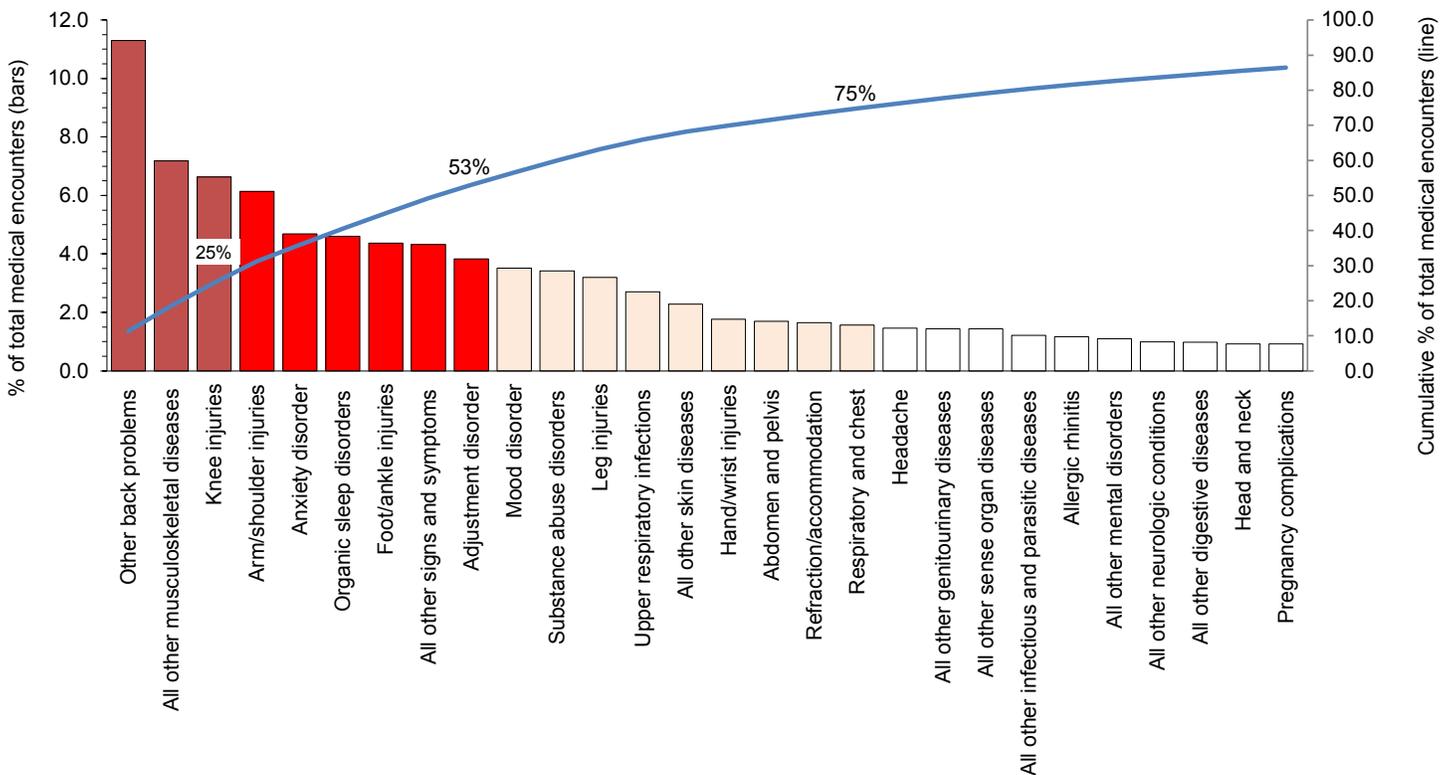
^cMajor categories and conditions defined in the Global Burden of Disease Study¹

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), injuries (e.g., knee, arm/shoulder, foot/ankle), and mental disorders (e.g., anxiety, adjustment disorders) (Table, Figure 2).

Individuals affected, by condition

In 2016, more service members received medical care for all other musculoskeletal diseases than for any other specific

FIGURE 2. Percentage and cumulative percentage distribution, burden "conditions" that accounted for the most medical encounters, active component, U.S. Armed Forces, 2016



condition (Table). Of the 10 conditions that affected the most service members, three were injuries, two were musculoskeletal diseases (all other musculoskeletal diseases and other back problems); two were signs and symptoms (all other signs and symptoms and abdomen and pelvis); one was respiratory infections (upper respiratory infections); one was a sense organ disease (refraction/accommodation); and one was skin diseases (all other skin diseases).

Hospital bed days, by condition

In 2016, mood disorders and substance abuse accounted for slightly more than one-quarter (25.9%) of all hospital days. Together, four mental disorders (mood, substance abuse disorders, adjustment, and anxiety) and two maternal conditions (pregnancy complications and delivery) accounted for more than half (53.6%) of all hospital bed days (Table, Figure 3). Approximately one-eighth (12.4%) 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

attributable to various conditions and the number of individuals affected by the conditions ($r=0.86$) (data not shown). For example, the three leading causes of medical encounters were among the five 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 ($r=0.21$) or medical encounters attributable to ($r=0.39$) the same conditions. 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 regarding morbidity and healthcare burdens among U.S. military members. In particular, the report documents that a majority of the morbidity and healthcare burden that affects U.S. military members

is attributable to just 6.3% of the 142 burden of disease-defining conditions considered in the analysis.

In 2016, as in prior years, musculoskeletal disorders (particularly of the back), injuries (particularly of the arm/shoulder, and knee), mental disorders (particularly substance abuse and disorders of mood, anxiety, and adjustment), and pregnancy- and delivery-related conditions accounted for relatively large proportions of the morbidity and healthcare burdens that affected U.S. military members. Nine burden of disease-defined conditions accounted for slightly more than half of all illness- and injury-related medical encounters of active component members and included two mental disorders (anxiety and adjustment disorders), three anatomic site-defined injuries (knee, arm/shoulder, and foot/ankle), two 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 2016 was based on the use of ICD-10 codes exclusively. This is the

TABLE. Healthcare burdens attributable to various diseases and injuries, active component, U.S. Armed Forces, 2016

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	736,591	(3)	157,304	(5)	1,243	(40)
Arm and shoulder	682,814	(4)	137,536	(9)	2,896	(24)
Foot and ankle	485,147	(7)	144,354	(7)	2,613	(26)
Leg	355,257	(12)	101,675	(13)	6,861	(12)
Hand and wrist	195,647	(15)	77,452	(18)	1,375	(39)
Head and neck	102,959	(27)	55,578	(22)	9,852	(7)
Back and abdomen	54,122	(34)	33,820	(31)	4,910	(18)
Other injury from external causes	43,620	(39)	18,213	(45)	498	(62)
Other complications NOS	36,121	(42)	19,683	(44)	8,625	(9)
Environmental	26,415	(46)	20,202	(43)	1,039	(44)
Unspecified injury	21,875	(52)	14,969	(48)	467	(65)
Poisoning, nondrug	5,408	(89)	3,628	(78)	360	(69)
All other injury	3,865	(98)	3,289	(82)	101	(94)
Poisoning, drugs	3,256	(101)	1,894	(94)	2,741	(25)
Other burns	1,270	(113)	622	(107)	153	(85)
Other superficial injury	983	(117)	782	(104)	2	(134)
Underdosing	37	(142)	37	(136)	2	(135)
Musculoskeletal diseases						
Other back problems	1,256,152	(1)	239,458	(2)	7,735	(10)
All other musculoskeletal diseases	797,738	(2)	246,426	(1)	5,553	(16)
Osteoarthritis	44,768	(37)	21,085	(40)	1,516	(36)
Other knee disorders	16,054	(61)	6,913	(66)	599	(57)
Other shoulder disorders	12,880	(69)	5,705	(71)	50	(107)
Rheumatoid arthritis	3,566	(99)	1,151	(99)	19	(117)
Mental disorders						
Anxiety	521,139	(5)	71,069	(20)	20,458	(6)
Adjustment	425,497	(9)	85,793	(17)	30,017	(3)
Mood	390,015	(10)	49,992	(23)	46,920	(1)
Substance abuse disorders	379,441	(11)	28,475	(36)	44,746	(2)
All other mental disorders	121,978	(24)	45,959	(24)	3,233	(22)
Psychotic	19,335	(56)	2,007	(92)	6,532	(13)
Personality	17,484	(57)	3,165	(83)	2,393	(28)
Tobacco dependence	11,617	(72)	7,209	(64)	2	(137)
Somatoform	8,650	(77)	2,092	(89)	552	(60)
Signs and symptoms						
All other signs and symptoms	479,748	(8)	229,211	(3)	6,981	(11)
Abdomen and pelvis	188,235	(16)	118,576	(10)	1,217	(41)
Respiratory and chest	173,730	(18)	105,819	(12)	1,377	(38)
Neurologic conditions						
Organic sleep disorders	511,536	(6)	116,631	(11)	492	(63)
All other neurologic conditions	109,966	(25)	32,778	(33)	6,019	(15)
Other mononeuritis - upper and lower limbs	13,395	(64)	6,770	(67)	65	(100)
Epilepsy	5,696	(86)	1,772	(95)	870	(50)
Multiple sclerosis	2,715	(105)	544	(110)	175	(83)
Parkinson disease	178	(135)	53	(132)	18	(119)
Sense organ diseases						
Refraction/accommodation	182,568	(17)	145,816	(6)	0	(142)
All other sense organ diseases	159,256	(21)	100,368	(14)	516	(61)
Hearing disorders	57,992	(31)	36,484	(29)	19	(118)
Glaucoma	13,108	(67)	8,342	(61)	4	(130)
Cataracts	1,429	(111)	788	(103)	2	(138)
Respiratory infections						
Upper respiratory infections	300,222	(13)	224,416	(4)	616	(56)
Lower respiratory infections	57,373	(32)	37,807	(28)	2,291	(29)
Otitis media	25,291	(49)	20,212	(42)	30	(111)
Skin diseases						
All other skin diseases	253,206	(14)	139,419	(8)	5,004	(17)
Sebaceous gland diseases	57,196	(33)	33,513	(32)	10	(126)
Contact dermatitis	44,237	(38)	31,652	(34)	65	(101)

TABLE. (cont.) Healthcare burdens attributable to various diseases and injuries, active component, U.S. Armed Forces, 2016

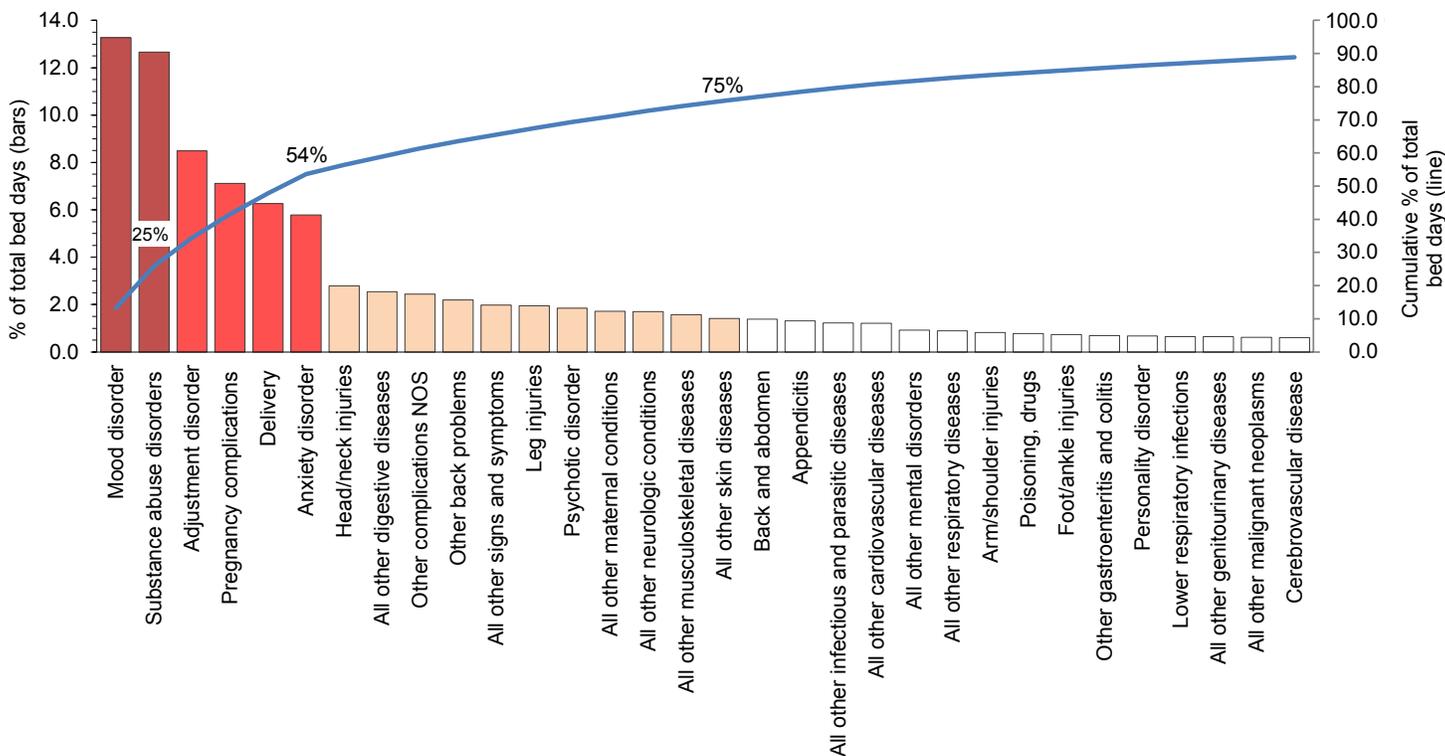
Major category condition ^a	Medical encounters ^b		Individuals affected ^c		Bed days	
	No.	Rank ^d	No.	Rank ^d	No.	Rank ^d
Genitourinary diseases						
All other genitourinary diseases	159,689	(20)	86,133	(16)	2,259	(30)
Female genital pain	26,231	(47)	14,057	(50)	122	(90)
Menstrual disorders	22,632	(51)	14,545	(49)	652	(55)
Other breast disorders	20,171	(55)	11,064	(55)	405	(67)
Kidney stones	16,674	(60)	6,931	(65)	726	(54)
Nephritis and nephrosis	10,640	(73)	3,975	(76)	1,499	(37)
Benign prostatic hypertrophy	3,192	(102)	2,095	(88)	50	(105)
Respiratory diseases						
Allergic rhinitis	129,426	(23)	44,052	(25)	3	(132)
All other respiratory diseases	66,200	(30)	37,928	(27)	3,145	(23)
Asthma	32,292	(45)	13,860	(51)	293	(73)
Chronic sinusitis	13,150	(66)	7,647	(63)	196	(79)
Chronic obstructive pulmonary disease	6,825	(82)	5,888	(70)	101	(95)
Infectious and parasitic diseases						
All other infectious and parasitic diseases	135,027	(22)	94,088	(15)	4,338	(20)
Diarrheal diseases	47,288	(36)	40,404	(26)	946	(46)
Unspecified viral infection	14,497	(63)	13,411	(53)	138	(88)
STDs	13,021	(68)	8,996	(59)	79	(99)
Chlamydia	9,068	(76)	7,923	(62)	10	(125)
Tuberculosis	4,721	(92)	2,044	(91)	49	(109)
Hepatitis B and C	1,520	(110)	757	(105)	23	(113)
Intestinal nematode infection	254	(129)	182	(125)	27	(112)
Malaria	208	(133)	75	(128)	84	(97)
Bacterial meningitis	158	(136)	48	(133)	83	(98)
Tropical cluster	82	(141)	32	(138)	0	(141)
Digestive diseases						
All other digestive diseases	108,965	(26)	62,087	(21)	9,004	(8)
Other gastroenteritis and colitis	33,345	(43)	21,421	(39)	2,460	(27)
Esophagus disease	32,795	(44)	20,460	(41)	812	(51)
Inguinal hernia	12,090	(70)	5,304	(72)	389	(68)
Appendicitis	5,751	(85)	2,817	(84)	4,616	(19)
Peptic ulcer disease	1,317	(112)	814	(102)	416	(66)
Cirrhosis of the liver	252	(130)	75	(129)	141	(87)
Maternal conditions						
Pregnancy complications	101,900	(28)	21,666	(38)	25,164	(4)
All other maternal disorders	39,930	(41)	9,906	(58)	6,081	(14)
Delivery	20,620	(54)	11,355	(54)	22,112	(5)
Ectopic/miscarriage/abortion	8,059	(78)	3,563	(79)	487	(64)
Puerperium complications	5,615	(87)	3,373	(80)	1,012	(45)
Headache						
Headache	162,748	(19)	73,752	(19)	919	(47)
Cardiovascular diseases						
All other cardiovascular diseases	70,781	(29)	35,794	(30)	4,285	(21)
Essential hypertension	52,586	(35)	29,612	(35)	151	(86)
Cerebrovascular disease	7,772	(79)	1,708	(96)	2,107	(32)
Ischemic heart disease	6,629	(83)	2,399	(87)	1,140	(42)
Inflammatory	2,221	(106)	1,302	(97)	297	(72)
Rheumatic heart disease	319	(125)	261	(121)	2	(133)
Other neoplasms						
All other neoplasms	40,606	(40)	27,749	(37)	1,932	(33)
Benign skin neoplasm	16,684	(59)	13,654	(52)	3	(131)
Lipoma	9,327	(75)	5,955	(69)	108	(92)
Uterine leiomyoma	4,121	(96)	1,993	(93)	890	(48)
Endocrine disorders						
All other endocrine disorders	23,667	(50)	8,934	(60)	239	(78)
Hypothyroidism	11,901	(71)	6,634	(68)	22	(114)
Other thyroid disorders	9,682	(74)	4,256	(74)	348	(71)

TABLE. (cont.) Healthcare burdens attributable to various diseases and injuries, active component, U.S. Armed Forces, 2016

Major category condition ^a	Medical encounters ^b		Individuals affected ^c		Bed days	
	No.	Rank ^d	No.	Rank ^d	No.	Rank ^d
Malignant neoplasms						
All other malignant neoplasms	7,309	(80)	1,048	(100)	2,163	(31)
Lymphoma and multiple myeloma	6,539	(84)	662	(106)	885	(49)
Leukemia	5,139	(91)	299	(117)	1,579	(35)
Melanoma and other skin cancers	4,233	(94)	2,046	(90)	176	(82)
Breast cancer	3,954	(97)	434	(114)	292	(74)
Testicular cancer	3,372	(100)	582	(108)	273	(75)
Brain	2,984	(103)	203	(124)	1,051	(43)
Thyroid	2,091	(107)	513	(111)	259	(76)
Colon and rectum cancers	1,985	(108)	238	(123)	557	(59)
Prostate cancer	1,171	(115)	267	(120)	95	(96)
Mouth and oropharynx cancers	1,004	(116)	143	(126)	62	(103)
Trachea, bronchus, and lung cancers	670	(120)	90	(127)	252	(77)
Cervix uteri cancer	655	(121)	383	(116)	22	(115)
Stomach cancer	276	(127)	40	(135)	48	(110)
Ovary cancer	275	(128)	65	(130)	56	(104)
Bladder cancer	222	(131)	59	(131)	2	(136)
Pancreas cancer	209	(132)	29	(139)	14	(121)
Liver cancer	204	(134)	23	(141)	134	(89)
Esophagus cancer	155	(137)	14	(142)	50	(106)
Corpus uteri cancer	94	(140)	25	(140)	11	(123)
Metabolic and immunity disorders						
Other metabolic disorders	25,528	(48)	17,650	(46)	355	(70)
Immunity disorders	2,743	(104)	1,225	(98)	105	(93)
Lipoid metabolism disorders	684	(119)	446	(112)	5	(129)
Oral conditions						
All other oral conditions	21,544	(53)	15,849	(47)	1,879	(34)
Dental caries	641	(122)	562	(109)	6	(128)
Periodontal disease	484	(124)	445	(113)	9	(127)
Blood disorders						
All other blood disorders	6,945	(81)	3,304	(81)	585	(58)
Iron-deficiency anemia	5,372	(90)	2,616	(85)	114	(91)
Other non-deficiency anemias	4,500	(93)	2,578	(86)	191	(80)
Hereditary anemias	4,194	(95)	3,728	(77)	49	(108)
Other deficiency anemias	543	(123)	295	(118)	10	(124)
Congenital anomalies						
All other congenital anomalies	17,037	(58)	10,160	(57)	731	(53)
Congenital heart disease	1,926	(109)	951	(101)	181	(81)
Other circulatory anomalies	1,181	(114)	432	(115)	170	(84)
Nutritional disorders						
Overweight, obesity	13,215	(65)	10,386	(56)	63	(102)
All other nutritional disorders	5,523	(88)	3,998	(75)	17	(120)
Protein-energy malnutrition	139	(139)	41	(134)	21	(116)
Diabetes mellitus						
Diabetes mellitus	15,915	(62)	4,456	(73)	768	(52)
Conditions arising during the perinatal period^e						
Low birth weight	970	(118)	285	(119)	0	(140)
All other perinatal anomalies	304	(126)	245	(122)	12	(122)
Birth asphyxia and birth trauma	150	(138)	36	(137)	0	(139)

^aMajor categories and conditions defined in the Global Burden of Disease Study¹^bMedical encounters: total hospitalizations and ambulatory visits for the condition (with no more than one encounter per individual per day per condition)^cIndividuals with at least one hospitalization or ambulatory visit for the condition^dRank based on 142 burden-related disease conditions^eConditions affecting newborns erroneously coded on service member medical records

FIGURE 3. Percentage and cumulative percentage distribution, burden "conditions" that accounted for the most hospital bed days, active component, U.S. Armed Forces, 2016



first *MSMR* burden report that did not use ICD-9 codes. Last year's summary for 2015 reflected 9 months of ICD-9 codes and 3 months of the ICD-10 codes, which were introduced into the medical record system of the MHS on October 1, 2015. Because of some of the differences between the two generations of coding (e.g., ICD-10 has more than four times as many codes, often allows for much greater specificity of diagnoses, and has added and deleted some specific diagnoses or terminology compared to ICD-9), direct comparisons of the counts for 2016 with those from earlier years should be interpreted with caution. Dramatic changes in counts and rankings for specific major 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 three. Several years of experience with ICD-10 and analyses of the resulting DMSS data will be needed to clarify the impact of the changeover from ICD-9 to ICD-10.

Throughout military history, mental disorders (including substance abuse disorders), injuries, and musculoskeletal disorders of the back have been leading causes of morbidity and lost work time among service members.³⁻⁷ As noted many times in the past, the prevention, treatment, and rehabilitation of back problems and joint injuries, and the detection, characterization, and management of mental 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 recent years, documents that a 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 burden should be high-priority targets for prevention research and resources.

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Hospitalizations, Active Component, U.S. Armed Forces, 2016

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 2016. 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 three characters of the International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10) used to report primary discharge diagnoses. Hospitalizations not routinely documented with standardized, automated records (e.g., field training exercises, shipboard) are not centrally available for health surveillance purposes and thus are not included in this report.

Frequencies, rates, and trends

In 2016, there were 68,189 records of hospitalizations of active component members of the U.S. Army, Navy, Air Force, and Marine Corps; 31% of the hospitalizations were in non-military facilities (**Table 1, data not shown**). The annual hospitalization rate (all causes) for 2016 was 52.9 per 1,000 service member person-years (p-yrs) and was the lowest rate reported within the last 10 years covered in this report (**Figure 1**).

Hospitalizations, by illness and injury categories

As in prior years, in 2016, three ICD-10 diagnostic categories accounted for more than half (56.5%) of all hospitalizations of active component members: mental disorders (24.3%), pregnancy- and delivery-related conditions (22.3%), and injuries and

poisonings (9.9%) (**Table 1**). Similar to 2012 and 2014, in 2016 there were more hospitalizations for mental disorders than for any other major diagnostic category (per the ICD-10). The last year in which the number of hospitalizations for pregnancy- and delivery-related conditions exceeded the number for mental disorders was 2008 (**data not shown**).

Comparing 2016 to 2012, numbers of hospitalizations decreased in all major categories of illnesses and injuries (**Table 1**). The largest percentage decrease in hospitalizations during 2012–2016 was for injuries and poisonings (hospitalization difference, 2012–2016: -3,932; -36.8%).

Hospitalizations, by gender

In 2016, the hospitalization rate (all causes) among females was more than

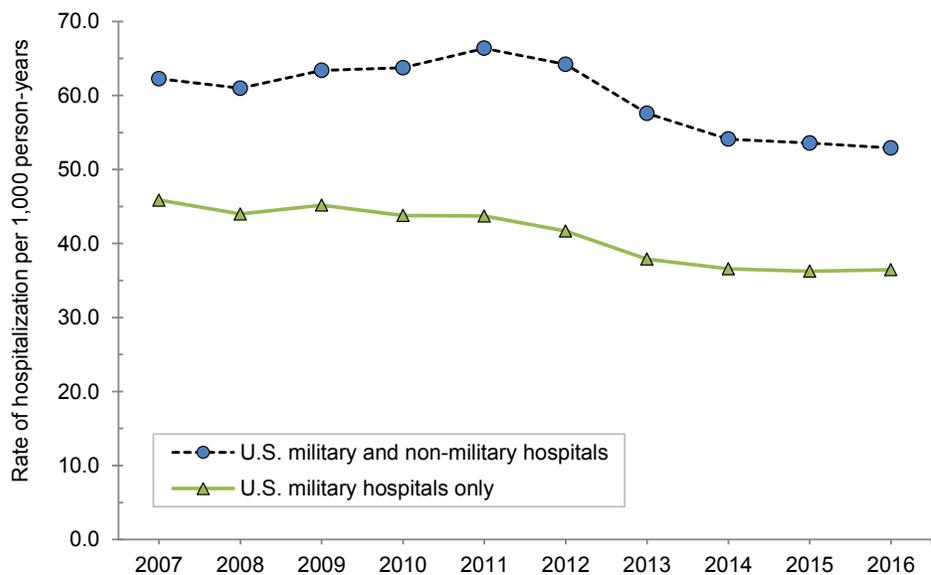
TABLE 1. Hospitalizations, ICD-10 diagnostic categories, active component, U.S. Armed Forces, 2012, 2014, and 2016

Major diagnostic category (ICD-10)	2012			2014			2016		
	No.	Rate ^a	Rank	No.	Rate ^a	Rank	No.	Rate ^a	Rank
Mental disorders (ICD-10: F01–F99)	20,690	14.9	(1)	15,931	11.9	(1)	16,563	12.9	(1)
Pregnancy and delivery (ICD-10: O00–O99, relevant Z-codes) ^b	17,277	12.4	(2)	15,554	11.6	(2)	15,219	11.8	(2)
Injury and poisoning (ICD-10: S00–T98)	10,684	7.7	(3)	7,415	5.5	(3)	6,752	5.2	(3)
Musculoskeletal system (ICD-10: M00–M99)	7,232	5.2	(5)	6,128	4.6	(5)	5,929	4.6	(4)
Digestive system (ICD-10: K00–K95)	7,907	5.7	(4)	6,540	4.9	(4)	5,677	4.4	(5)
Signs, symptoms, and ill-defined conditions (ICD-10: R00–R99)	4,550	3.3	(6)	3,298	2.5	(7)	3,241	2.5	(6)
Other (ICD-10: V00–V98, except pregnancy-related)	3,789	2.7	(7)	3,559	2.7	(6)	2,171	1.7	(7)
Genitourinary system (ICD-10: N00–N99)	2,632	1.9	(9)	2,216	1.7	(9)	2,041	1.6	(8)
Respiratory system (ICD-10: J00–J99)	2,521	1.8	(10)	1,862	1.4	(10)	1,972	1.5	(9)
Circulatory system (ICD-10: I00–I99)	2,743	2.0	(8)	2,295	1.7	(8)	1,852	1.4	(10)
Nervous system and sense organs (ICD-10: G00–H95)	2,222	1.6	(11)	1,745	1.3	(12)	1,729	1.3	(11)
Neoplasms (ICD-10: C00–D49)	2,102	1.5	(12)	1,803	1.3	(11)	1,655	1.3	(12)
Skin and subcutaneous tissue (ICD-10: L00–L99)	1,804	1.3	(13)	1,467	1.1	(13)	1,174	0.9	(13)
Infectious and parasitic diseases (ICD-10: A00–B99)	1,408	1.0	(14)	1,240	0.9	(14)	1,055	0.8	(14)
Endocrine, nutrition, immunity (ICD-10: E00–E89)	903	0.6	(15)	727	0.5	(15)	622	0.5	(15)
Congenital anomalies (ICD-10: Q00–Q99)	426	0.3	(16)	353	0.3	(16)	278	0.2	(16)
Hematologic disorders (ICD-10: D50–D89)	374	0.3	(17)	307	0.2	(17)	259	0.2	(17)
Total	89,264	64.2		72,440	54.1		68,189	52.9	

^aRates are based on 1,000 person-years.

^bRate of pregnancy and delivery-related hospitalizations among females only

FIGURE 1. Rates of hospitalization, by year, active component, U.S. Armed Forces, 2007–2016



three times that of males (hospitalization rate, overall: females: 130.9 per 1,000 p-yrs; males: 38.3 per 1,000 p-yrs). Excluding pregnancy and delivery, the rate of hospitalizations among females (56.1 per 1,000 p-yrs) was 46.7% higher than among males (data not shown).

Overall hospitalization rates were similar (i.e., the rate difference [RD] was less than 1.0 per 1,000 p-yrs) among males and females for injuries and poisonings (male:female [m:f], RD: 0.8 per 1,000 p-yrs, respectively). Hospitalization rates were higher among females than males for mental disorders (RD: 8.0 per 1,000 p-yrs); genitourinary disorders (RD: 4.1 per 1,000 p-yrs); neoplasms (RD: 2.2 per 1,000 p-yrs); signs, symptoms, and ill-defined conditions (RD: 1.3 per 1,000 p-yrs); and “other” conditions (RD: 1.0 per 1,000 p-yrs). Hospitalization rates were similar among males and females for the remaining 10 major disease-specific categories (data not shown).

Relationships between age and hospitalization rates varied significantly across illness- and injury-specific categories. For example, among both males and females, hospitalization rates increased with age for neoplasms, circulatory, genitourinary, and musculoskeletal system/connective tissue disorders; rates decreased with age for mental disorders; and rates were relatively

stable across age groups for injuries and poisonings, and skin and subcutaneous tissue. Rate differences between females and males changed for some categories with advancing age. For example, for service members aged 40 years or older, the rates for genitourinary disorders and neoplasms among females were notably higher than among males when compared to the differences in the younger age groups (Figure 2).

Most frequent diagnoses

In 2016, adjustment disorder was the most frequent discharge diagnosis among males (n=3,768) (Table 2). Alcohol dependence (n=1,656), major depressive disorder [single episode, unspecified] (n=1,308), acute appendicitis (n=1,091), and post-traumatic stress disorder (PTSD) (n=832), were the next four most frequent diagnoses in males (Table 2).

In 2016, pregnancy- and delivery-related conditions represented four of the top five leading causes of hospitalizations among females and accounted for 57.2% of all hospitalizations of females (Table 3). The top four discharge diagnoses in this condition category included first- and second-degree perineal laceration during delivery (n=1,254 and n=1,177, respectively), post-term (late) pregnancy (n=1,226), and

abnormality in fetal heart rate and rhythm (n=1,092). Other than pregnancy- and delivery-related diagnoses, leading causes of hospitalizations among females were adjustment disorder (n=1,158), major depressive disorder [single episode, unspecified] (n=471), PTSD (n=380), recurrent major depressive disorder without psychotic features (n=331), and acute appendicitis (n=203).

Injuries and poisonings

As in the past, in 2016, injuries and poisonings were the third leading cause of hospitalizations of U.S. military members (Table 1). Of all injuries and poisonings that resulted in hospitalizations in U.S. military medical facilities (n=4,015), approximately half (58.4%) had a missing or invalid NATO Standardization Agreement (STANAG) code. Of all “unintentional” injuries and poisonings that resulted in hospitalizations in U.S. military facilities (n=1,519), slightly less than one-third (31.3%) were considered caused by falls and miscellaneous (n=475), while complications of medical or surgical care (n=179) accounted for less than one in eight “unintentional” injuries (11.8%) (Table 4).

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

Durations of hospitalizations

During 2007–2016, the median duration of hospital stays (all causes) remained stable (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; signs, symptoms, and ill-defined conditions) to 6 days (i.e., mental disorders). For most diagnostic categories, less than 5% of hospitalizations exceeded 12

FIGURE 2. Rates (per 1,000 person-years) of hospitalization, by major diagnostic category, age, and sex, active component, U.S. Armed Forces, 2016

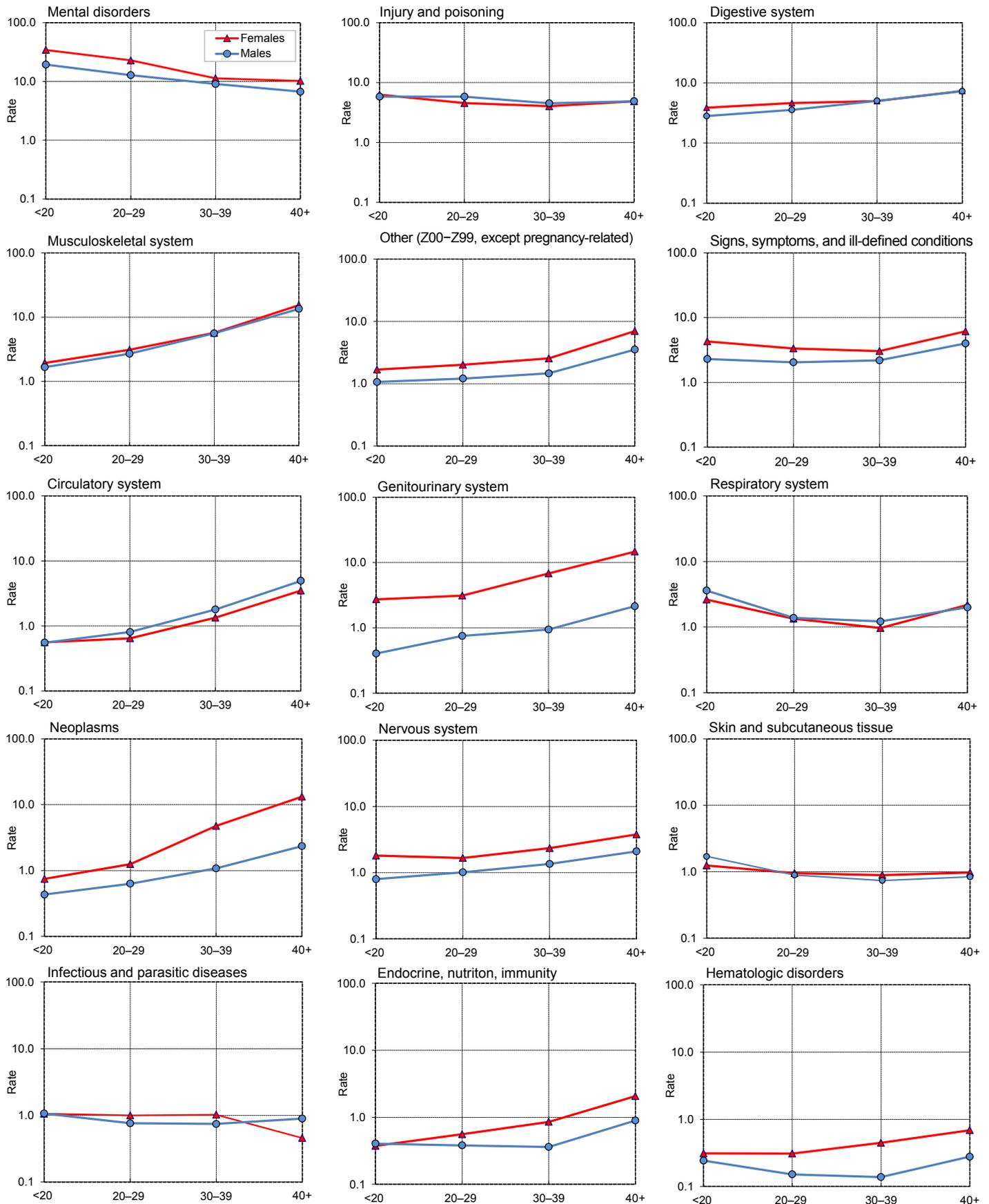


TABLE 2. Most frequent diagnoses during hospitalization with ICD-10 codes, by major diagnostic category, males, active component, U.S. Armed Forces, 2016

Diagnostic category (ICD-10 codes) ♂	No.	% ^a	Diagnostic category (ICD-10 codes) ♂	No.	% ^a
Mental disorders (ICD-10: F01–F99)	12,571		Respiratory system (ICD-10: J00–J99)	1,684	
Adjustment disorders	3,768	30.0	Pneumonia, unspecified organism	360	21.4
Alcohol dependence	1,656	13.2	Deviated nasal septum	118	7.0
Major depressive disorder, single episode, unspecified	1,308	10.4	Peritonsillar abscess	91	5.4
Post-traumatic stress disorder (PTSD)	832	6.6	Other pneumothorax and air leak	73	4.3
Major depressive disorder, recurrent severe without psychotic features	638	5.1	Other intraoperative and postprocedural complications and disorders of respiratory system, not elsewhere classified	73	4.3
Injury and poisoning (ICD-10: S00–T98)	5,822		Neoplasms (ICD-10: C00–D49)	1,009	
Infection following a procedure	268	4.6	Malignant neoplasm of thyroid gland	46	4.6
Concussion	187	3.2	Malignant neoplasm of prostate	34	3.4
Other fractures of lower leg	179	3.1	Malignant neoplasm of testis, unspecified whether descended or undescended	34	3.4
Fracture of shaft of tibia	131	2.3	Acute myeloblastic leukemia	31	3.1
Fracture of mandible	126	2.2	Diffuse large B-cell lymphoma	25	2.5
Digestive system (ICD-10: K00–K95)	4,684		Nervous system and sense organs (ICD-10: G00–H95)	1,314	
Other and unspecified acute appendicitis	1,091	23.3	Sleep apnea	149	11.3
Noninfective gastroenteritis and colitis, unspecified	218	4.7	Acute pain, not elsewhere classified	71	5.4
Acute appendicitis with localized peritonitis	168	3.6	Epilepsy, unspecified	70	5.3
Acute pancreatitis, unspecified	158	3.4	Nonpyogenic meningitis	50	3.8
Other and unspecified intestinal obstruction	153	3.3	Brachial plexus disorders	48	3.7
Musculoskeletal system (ICD-10: M00–M99)	4,967		Skin and subcutaneous tissue (ICD-10: L00–L99)	978	
Other specified disorders of muscle	545	11.0	Cellulitis and acute lymphangitis of other parts of limb	411	42.0
Thoracic, thoracolumbar and lumbosacral intervertebral disc disorders with radiculopathy	513	10.3	Cutaneous abscess, furuncle and carbuncle of limb	67	6.9
Cervical disc disorder with radiculopathy	292	5.9	Cellulitis and acute lymphangitis of finger and toe	56	5.7
Other spondylosis with radiculopathy	265	5.3	Pilonidal cyst and sinus with abscess	52	5.3
Major anomalies of jaw size	248	5.0	Pilonidal cyst and sinus without abscess	49	5.0
Other (ICD-10: V00–V98, except pregnancy-related)	1,651		Infectious and parasitic diseases (ICD-10: A00–B99)	859	
Encounter for antineoplastic chemotherapy and immunotherapy	295	17.9	Sepsis, unspecified organism	222	25.8
Encounter for other specified postprocedural aftercare	254	15.4	Infectious gastroenteritis and colitis, unspecified	70	8.1
Encounter for examination and observation for unspecified reason	216	13.1	Viral intestinal infection, unspecified	61	7.1
Encounter for other orthopedic aftercare	211	12.8	Viral meningitis, unspecified	52	6.1
Aftercare following joint replacement surgery	130	7.9	Viral infection, unspecified	39	4.5
Signs, symptoms, and ill-defined conditions (ICD-10: R00–R99)	2,511		Endocrine, nutrition, immunity (ICD-10: E00–E89)	469	
Other symptoms and signs involving emotional state	593	23.6	Dehydration	56	11.9
Other chest pain	320	12.7	Type 1 diabetes mellitus with ketoacidosis	54	11.5
Syncope and collapse	263	10.5	Other specified diabetes mellitus with ketoacidosis	50	10.7
Chest pain, unspecified	175	7.0	Type 2 diabetes mellitus with other specified complications	30	6.4
Unspecified convulsions	109	4.3	Thyrotoxicosis with diffuse goiter	22	4.7
Circulatory system (ICD-10: I00–I99)	1,635		Congenital anomalies (Q00–Q99)	211	
Pulmonary embolism without acute cor pulmonale	223	13.6	Atrial septal defect	15	7.1
Paroxysmal atrial fibrillation	87	5.3	Arteriovenous malformation of cerebral vessels	13	6.2
Non-ST elevation (NSTEMI) myocardial infarction	86	5.3	Congenital occlusion of ureter	12	5.7
Unspecified atrial fibrillation and atrial flutter	86	5.3	Pectus excavatum	12	5.7
Acute embolism and thrombosis of deep veins of lower extremity	63	3.9	Other congenital deformities of hip	11	5.2
Genitourinary system (ICD-10: N00–N99)	1,010		Hematologic disorders (ICD-10: D50–D89)	182	
Acute kidney failure, unspecified	203	20.1	Neutropenia, unspecified	29	15.9
Calculus of ureter	69	6.8	Anemia, unspecified	16	8.8
Hydronephrosis with renal and ureteral calculus obstruction	57	5.6	Other specified aplastic anemias and other bone marrow failure syndromes	15	8.2
Hypertrophy of breast	53	5.2	Iron deficiency anemia, unspecified	13	7.1
Calculus of kidney	51	5.0	Allergic purpura	10	5.5

^aPercentage of the total number of ambulatory visits within the diagnostic category

TABLE 3. Most frequent diagnoses during hospitalization with ICD-10 codes, by major diagnostic category, females, active component, U.S. Armed Forces, 2016

Diagnostic category (ICD-10 codes)	♀	No.	% ^a	Diagnostic category (ICD-10 codes)	♀	No.	% ^a
Mental disorders (ICD-10: F01–F99)		3,992		Genitourinary system (ICD-10: N00–N99)		1,031	
Adjustment disorders		1,158	29.0	Abnormal uterine and vaginal bleeding, unspecified		134	13.0
Major depressive disorder, single episode, unspecified		471	11.8	Other and unspecified ovarian cysts		77	7.5
Post-traumatic stress disorder (PTSD)		380	9.5	Hypertrophy of breast		69	6.7
Major depressive disorder, recurrent severe without psychotic features		331	8.3	Acute tubulo-interstitial nephritis		63	6.1
Alcohol dependence		189	4.7	Excessive and frequent menstruation with regular cycle		63	6.1
Pregnancy and delivery (ICD-10: O00–O99, relevant Z-codes)		15,219		Respiratory system (ICD-10: J00–J99)		288	
First degree perineal laceration during delivery		1,254	8.2	Pneumonia, unspecified organism		46	16.0
Post-term pregnancy		1,226	8.1	Peritonsillar abscess		26	9.0
Second degree perineal laceration during delivery		1,177	7.7	Acute tonsillitis, unspecified		23	8.0
Abnormality in fetal heart rate and rhythm complicating labor and delivery		1,092	7.2	Chronic tonsillitis and adenoiditis		18	6.3
Maternal care due to uterine scar from previous surgery		912	6.0	Other and unspecified asthma		18	6.3
Injury and poisoning (ICD-10: S00–T98)		930		Neoplasms (ICD-10: C00–D49)		646	
Infection following a procedure		59	6.3	Leiomyoma of uterus, unspecified		203	31.4
Other fractures of lower leg		37	4.0	Intramural leiomyoma of uterus		62	9.6
Poisoning by, adverse effect of and underdosing of 4-Aminophenol derivatives		28	3.0	Subserosal leiomyoma of uterus		42	6.5
Unspecified injury		26	2.8	Malignant neoplasm of breast of unspecified site		36	5.6
Poisoning by, adverse effect of and underdosing of other and unspecified antidepressants		25	2.7	Malignant neoplasm of thyroid gland		24	3.7
Digestive system (ICD-10: K00–K95)		993		Nervous system and sense organs (ICD-10: G00–H95)		415	
Other and unspecified acute appendicitis		203	20.4	Migraine, unspecified		40	9.6
Noninfective gastroenteritis and colitis, unspecified		55	5.5	Acute pain, not elsewhere classified		37	8.9
Acute pancreatitis, unspecified		48	4.8	Epilepsy, unspecified		26	6.3
Acute cholecystitis		40	4.0	Compression of brain		21	5.1
Calculus of gallbladder with acute cholecystitis		38	3.8	Nonpyogenic meningitis		17	4.1
Musculoskeletal system (ICD-10: M00–M99)		962		Skin and subcutaneous tissue (ICD-10: L00–L99)		196	
Major anomalies of jaw size		84	8.7	Cellulitis and acute lymphangitis of other parts of limb		37	18.9
Other specified disorders of muscle		79	8.2	Pilonidal cyst and sinus with abscess		17	8.7
Other spondylosis with radiculopathy		57	5.9	Cutaneous abscess, furuncle and carbuncle of limb		12	6.1
Cervical disc disorder with radiculopathy		50	5.2	Cellulitis and acute lymphangitis of face and neck		11	5.6
Thoracic, thoracolumbar and lumbosacral intervertebral disc disorders with radiculopathy		50	5.2	Pilonidal cyst and sinus without abscess		11	5.6
Other (ICD-10: V00–V98, except pregnancy-related)		520		Infectious and parasitic diseases (ICD-10: A00–B99)		196	
Encounter for examination and observation for unspecified reason		84	16.2	Sepsis, unspecified organism		47	24.0
Encounter for other specified postprocedural aftercare		74	14.2	Infectious gastroenteritis and colitis, unspecified		18	9.2
Encounter for other orthopedic aftercare		42	8.1	Viral intestinal infection, unspecified		14	7.1
Encounter for antineoplastic chemotherapy and immunotherapy		40	7.7	Enterocolitis due to <i>Clostridium difficile</i>		13	6.6
Encounter for routine postpartum follow-up		36	6.9	Infectious mononucleosis, unspecified		10	5.1
Signs, symptoms, and ill-defined conditions (ICD-10: R00–R99)		730		Endocrine, nutrition, immunity (ICD-10: E00–E89)		153	
Other symptoms and signs involving emotional state		128	17.5	Thyrotoxicosis with diffuse goiter		21	13.7
Syncope and collapse		87	11.9	Nontoxic multinodular goiter		15	9.8
Other chest pain		55	7.5	Localized adiposity		15	9.8
Unspecified abdominal pain		51	7.0	Nontoxic single thyroid nodule		14	9.2
Illness, unspecified		41	5.6	Dehydration		14	9.2
Circulatory system (ICD-10: I00–I99)		217		Hematologic disorders (ICD-10: D50–D89)		77	
Pulmonary embolism without acute cor pulmonale		39	18.0	Iron deficiency anemia, unspecified		14	18.2
Essential (primary) hypertension		15	6.9	Iron deficiency anemia secondary to blood loss (chronic)		7	9.1
Cerebral infarction, unspecified		11	5.1	Anemia, unspecified		7	9.1
Supraventricular tachycardia		10	4.6	Acute posthemorrhagic anemia		6	7.8
Cerebral aneurysm, nonruptured		8	3.7	Immune thrombocytopenic purpura		6	7.8

^aPercentage of the total number of ambulatory visits within the diagnostic category

TABLE 4. Injury hospitalizations,^a by causal agent,^b active component, U.S. Armed Forces, 2016

Cause	No.	%
Unintentional	1,519	37.8
Fall and miscellaneous	475	11.8
Land transport	344	8.6
Complications of medical/surgical	179	4.5
Poisons and fire	126	3.1
Athletics	116	2.9
Environmental	81	2.0
Machinery, tools	79	2.0
Guns, explosives (includes accidents during war)	57	1.4
Air transport	51	1.3
Water transport	11	0.3
Intentional	152	3.8
Self-inflicted	110	2.7
Battle casualty	28	0.7
Non-battle, inflicted by other (e.g., assault)	14	0.3
Missing/invalid code	2,344	58.4
Total	4,015	

^aHospitalizations in U.S. military medical facilities only
^bCausal agents were determined by codes per STANAG 2050.

days, but for four categories, 5% of hospitalizations had longer durations: nervous system/sense organs (16 days); injury and poisoning (20 days); neoplasms (25 days); mental disorders (31 days); and “other” or V-coded hospitalizations (primarily orthopedic aftercare and rehabilitation following a previous illness or injury) (33 days) (Figure 4).

Hospitalizations by service

Among 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 members of the Army and Marine Corps, mental disorders were the leading cause of hospitalizations (Table 5). The crude hospitalization rate for mental disorders in the Army (16.7 per 1,000 p-yrs) was higher than in all other Services.

FIGURE 3. Length of hospital stay, by year, active component, U.S. Armed Forces, 2007–2016

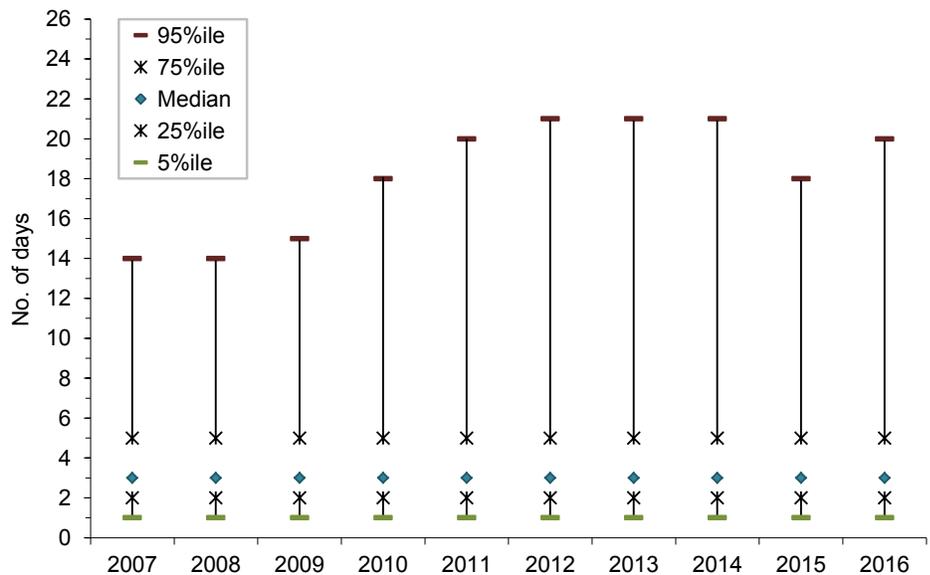
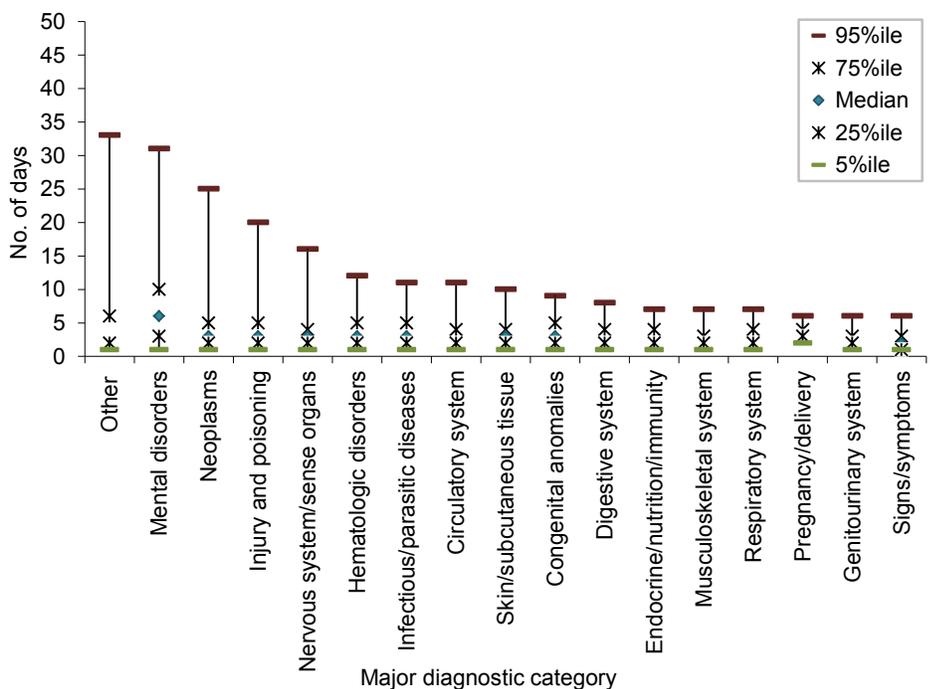


FIGURE 4. Length of hospital stay, by ICD-10 diagnostic category, active component, U.S. Armed Forces, 2007–2016



Injuries and poisonings were the third leading cause of hospitalizations in the Army, fourth in the Navy, fifth in the Air Force, and third in the Marine Corps (Table 5). The hospitalization rate for injuries and poisonings was 20.4% higher among soldiers (7.2 per 1,000 p-yrs) than Marines (6.0 per 1,000 p-yrs).

EDITORIAL COMMENT

In 2016, the hospitalization rate for all causes among active component members was the lowest rate in the past decade. As in past years, in 2016, mental disorders, pregnancy- and delivery-related conditions, and

TABLE 5. Hospitalizations, by service and ICD-10 diagnostic category, active component, U.S. Armed Forces, 2016

Major diagnostic category (ICD-10)	Army		Navy		Air Force		Marine Corps	
	No.	Rate ^a	No.	Rate ^a	No.	Rate ^a	No.	Rate ^a
Mental disorders (ICD-10: F01–F99)	7,886	16.7	3,305	10.2	3,145	10.1	2,227	12.1
Pregnancy and delivery (ICD-10: O00–O99, relevant Z-codes)	5,695	12.1	4,336	13.4	4,066	13.1	1,122	6.1
Injury and poisoning (ICD-10: S00–T98)	3,382	7.2	1,272	3.9	1,002	3.2	1,096	6.0
Musculoskeletal system (ICD-10: M00–M99)	3,108	6.6	1,013	3.1	1,238	4.0	570	3.1
Digestive system (ICD-10: K00–K95)	2,692	5.7	1,315	4.1	1,089	3.5	581	3.2
Signs, symptoms, and ill-defined conditions (ICD-10: R00–R99)	2,021	4.3	487	1.5	507	1.6	226	1.2
Respiratory system (ICD-10: J00–J99)	1,089	2.3	283	0.9	303	1.0	297	1.6
Genitourinary system (ICD-10: N00–N99)	980	2.1	404	1.3	482	1.6	175	1.0
Circulatory system (ICD-10: I00–I99)	884	1.9	391	1.2	410	1.3	167	0.9
Other (ICD-10: V00–V98, except pregnancy-related)	834	1.8	450	1.4	561	1.8	326	1.8
Nervous system and sense organs (ICD-10: G00–H95)	832	1.8	374	1.2	350	1.1	173	0.9
Neoplasms (ICD-10: C00–D49)	756	1.6	361	1.1	436	1.4	102	0.6
Skin and subcutaneous tissue (ICD-10: L00–L99)	542	1.2	245	0.8	166	0.5	221	1.2
Infectious and parasitic diseases (ICD-10: A00–B99)	468	1.0	198	0.6	256	0.8	133	0.7
Endocrine, nutrition, immunity (ICD-10: E00–E89)	310	0.7	129	0.4	137	0.4	46	0.3
Congenital anomalies (ICD-10: Q00–Q99)	134	0.3	54	0.2	47	0.2	43	0.2
Hematologic disorders (ICD-10: D50–D89)	111	0.2	57	0.2	63	0.2	28	0.2
Total	31,724	67.4	14,674	45.4	14,258	47.2	7,533	41.0

^aRates are based on 1,000 person-years.

^bRates for pregnancy and delivery-related hospitalizations among females only (in parentheses)

injuries and poisonings accounted for more than half of all hospitalizations of active component members. Adjustment and mood disorders were among the leading causes of hospitalizations of 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 disorders—especially those related to long and repeated deployments and combat stress. Annual numbers of hospitalizations for mental disorders steadily decreased between 2010 and 2015, but the number in 2016 was more than a thousand greater than in 2015.

The reasons for the recent downturn in the trends for annual numbers of hospitalizations overall and for mental disorders 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,

the steady decline in the size of the forces in Afghanistan, and the change in the extent of combat engagements there. It is also conceivable that the concerted efforts in recent years to decrease stigmas and to remove barriers and enhance access to mental health care may have forestalled the need to hospitalize many service members because of early interventions in the outpatient setting. 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 Services. Many reserve component members were hospitalized for illnesses and injuries while serving on active duty in 2016; these hospitalizations are not accounted for in this report. Also, many injury- and poisoning-related hospitalizations occur in non-military hospitals;

in most cases, the “external causes” of such injuries and poisonings are not reported on standardized records. 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; 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. Even with these and other 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, 2016

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 2016. Ambulatory visits of U.S. service members in fixed military and non-military (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, at sea) are not included in this report.

For this report, all records of ambulatory visits of active component members of the Army, Navy, Air Force, and Marine Corps in 2016 were categorized according

to the first three characters of the diagnosis codes of the newly introduced Tenth Revision (ICD-10). As in previous such reports, the categorization of diagnoses was based on the codes entered in the first diagnostic position of the records of ambulatory visits.¹

Frequencies, rates, and trends

During 2016, there were 19,158,557 reported ambulatory visits of active

TABLE 1. Ambulatory visits, ICD-10 diagnostic categories, active component, U.S. Armed Forces, 2012, 2014, and 2016

Major diagnostic category (ICD-10)	2012			2014			2016		
	No.	No. per 1,000 person-years	Rank	No.	No. per 1,000 person-years	Rank	No.	No. per 1,000 person-years	Rank
Other (ICD-10: Z00–Z99, except pregnancy-related)	9,225,113	6,634.6	(1)	8,703,559	6,500.2	(1)	7,581,504	5,883.2	(1)
Musculoskeletal system (ICD-10: M00–M99)	3,015,130	2,168.4	(2)	2,997,705	2,238.8	(2)	4,198,896	3,258.3	(2)
Mental disorders (ICD-10: F01–F99)	2,090,696	1,503.6	(3)	1,911,115	1,427.3	(3)	1,939,607	1,505.1	(3)
Nervous system and sense organs (ICD-10: G00–H95)	1,008,065	725.0	(5)	1,040,011	776.7	(5)	1,245,823	966.8	(4)
Signs, symptoms, and ill-defined conditions (ICD-10: R00–R99)	1,105,764	795.3	(4)	1,049,197	783.6	(4)	1,022,359	793.3	(5)
Injury and poisoning (ICD-10: S00–T98)	926,945	666.6	(6)	808,497	603.8	(6)	841,242	652.8	(6)
Respiratory system (ICD-10: J00–J99)	614,099	441.7	(7)	560,689	418.7	(7)	603,044	468.0	(7)
Skin and subcutaneous tissue (ICD-10: L00–L99)	400,463	288.0	(8)	372,309	278.1	(8)	371,512	288.3	(8)
Pregnancy and delivery (ICD-10: O00–O9A, relevant Z-codes)	371,394	267.1	(9)	343,982	256.9	(9)	279,131	216.6	(9)
Genitourinary system (ICD-10: N00–N99)	289,674	208.3	(10)	267,410	199.7	(10)	243,732	189.1	(10)
Digestive system (ICD-10: K00–K95)	287,288	206.6	(11)	256,415	191.5	(11)	224,325	174.1	(11)
Infectious and parasitic diseases (ICD-10: A00–B99)	220,212	158.4	(12)	198,426	148.2	(12)	212,645	165.0	(12)
Circulatory system (ICD-10: I00–I99)	181,757	130.7	(13)	156,630	117.0	(13)	124,904	96.9	(13)
Neoplasms (ICD-10: C00–D49)	137,575	98.9	(15)	122,833	91.7	(15)	117,877	91.5	(14)
Endocrine, nutrition, immunity (ICD-10: E00–E89)	146,791	105.6	(14)	125,472	93.7	(14)	106,726	82.8	(15)
Hematologic disorders (ICD-10: D50–D89)	27,889	20.1	(16)	25,267	18.9	(17)	24,979	19.4	(16)
Congenital anomalies (ICD-10: Q00–Q99)	27,745	20.0	(17)	26,694	19.9	(16)	20,251	15.7	(17)
Total	20,076,600	14,438.9		18,966,211	14,164.8		19,158,557	14,867.0	

component service members. The crude annual rate (all causes) was 14,867 visits per 1,000 person-years (p-yrs) or 14.9 visits per person-year (p-yr); thus, on average, each service member had approximately 15 ambulatory encounters during the year (Table 1). The rate of documented ambulatory visits in 2016 was 5.0% higher than the rate in 2014 and 40.9% higher than in 2007 (Figure 1). Both the number of ambulatory visits (20,076,600) and the rate of such visits (14,438.9 visits per 1,000 p-yrs) had peaked in 2012, but the rate in 2016 was the highest of the 10-year period.

In 2016, 39.6% of ambulatory visits were classified into the “other” category (i.e., other contact with health services) (Table 1). This category (indicated by Z-codes of ICD-10) includes health care not related to a current illness or injury. Such care includes counseling, immunizations, deployment-related health assessments, routine and special medical examinations (e.g., periodic, occupational, retirement), and therapeutic and rehabilitative treatments for previously diagnosed illnesses or injuries (e.g., physical therapy).

Three diagnoses accounted for close to half (45.6%) of the visits in the “other” category: general medical examination (including deployment health assessments)

(24.9%), encounters for administrative examinations (10.8%), and encounters for immunization (9.9%) (Tables 2, 3).

In 2016, there were 11,577,053 documented ambulatory visits for illnesses and injuries (ICD-10: A00–T88, including relevant pregnancy Z-codes) (Table 1). “Illnesses and injuries” does not include diagnoses categorized as “other.” The crude annual rate of illness- and injury-related visits was approximately 9.0 visits per p-yr. The rate of ambulatory visits for illnesses and injuries in 2016 was higher than the rates in 2014 (7.7 visits per p-yr) and 2012 (7.8 visits per p-yr).

Ambulatory visits, by diagnostic category

In 2016, four major diagnostic categories accounted for 72.6% of all illness- and injury-related ambulatory visits among active component service members: musculoskeletal system/connective tissue disorders (36.3%), mental disorders (16.8%), disorders of the nervous system and sense organs (10.8%), and “signs, symptoms, and ill-defined conditions” (8.8%) (Table 1).

In a comparison of the years 2012 and 2016, there were increases in numbers of visits in two major diagnostic categories of illness and injury and decreases in 14

categories (Table 1). The largest percentage increases in ambulatory visits during 2012–2016 were for musculoskeletal system/connective tissue disorders (change: +1,183,766 visits; +39.3%) and disorders of the nervous system and sense organs (change: +237,758; +23.6%). The largest percentage decreases in visits during 2012–2016 were for disorders of the circulatory system (change: -56,853; -31.3%), for endocrine, nutrition, and immunity disorders (change: -40,065; -27.3%), congenital anomalies (change: -7,494; -27.0%), pregnancy and delivery (change: -92,263; -24.8%) and for disorders of the digestive system (change: -62,963; -21.9%). The largest decrease in numbers of visits was for mental disorders (change: -151,089; -7.2%).

Over the past 5 years, the relative distributions of ambulatory visits by diagnostic categories of the ICD-9 and ICD-10 remained fairly 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 2012, 2014, and 2016, the rank orders of four categories were exchanged: nervous system (5th to 4th), signs and symptoms (4th to 5th), neoplasms (15th to 14th), and disorders of endocrine, nutrition, and immunity (14th to 15th). Their relative rankings were most affected by the changes in the number of visits noted earlier.

Ambulatory visits, by gender

In 2016, males accounted for three-fourths (75.1%) of all illness- and injury-related visits; however, the annual crude rate among females (14.2 visits per p-yr) was 76.8% higher than that of males (8.0 visits per p-yr) (data not shown). Excluding pregnancy and delivery-related visits (which accounted for 9.7% of all non-Z-coded ambulatory visits among females), the illness and injury ambulatory visit rate among females was 12.8 visits per p-yr. As in the past, rates were higher among females than males for every illness- and injury-related category (Figure 2).

Among all illness- and injury-specific diagnoses, four of the five diagnoses with the largest numbers of ambulatory visits were the same for males and females. For all of the four most common diagnoses that males

FIGURE 1. Rates of ambulatory visits, by year, active component, U.S. Armed Forces, 2007–2016

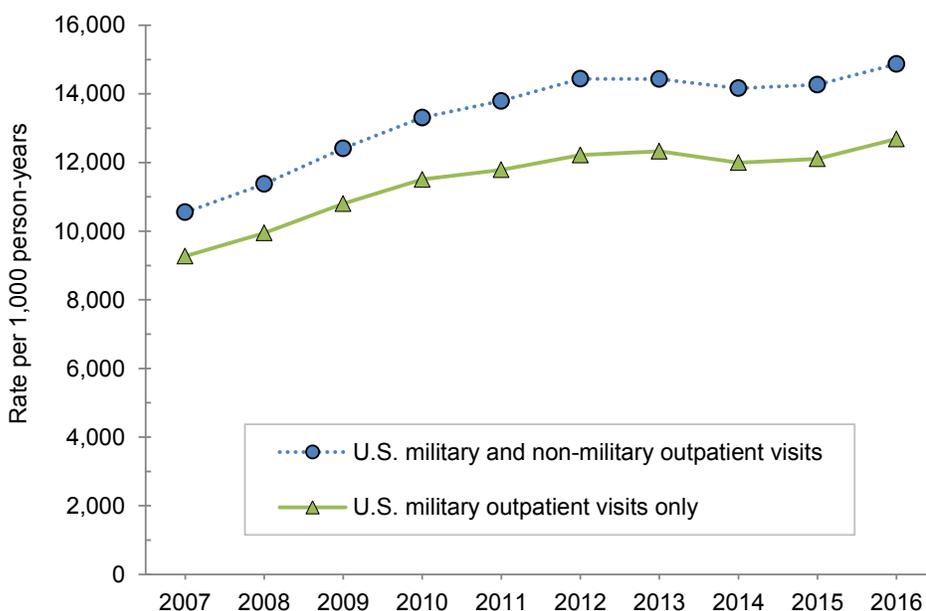


TABLE 2. Most frequent diagnoses during ambulatory visits with ICD-10 codes, by major diagnostic category, males, active component, U.S. Armed Forces, 2016

Diagnostic category (ICD-10 codes) ♂	No.	% ^a	Diagnostic category (ICD-10 codes) ♂	No.	% ^a
Infectious and parasitic diseases (ICD-10: A00–B99)	161,164		Digestive system (ICD-10: K00–K95)	176,182	
Viral intestinal infection, unspecified	18,995	11.8	Gastro-esophageal reflux disease without esophagitis	16,428	9.3
Infectious gastroenteritis and colitis, unspecified	11,157	6.9	Noninfective gastroenteritis and colitis, unspecified	14,034	8.0
Viral infection, unspecified	10,671	6.6	Unilateral inguinal hernia, without obstruction or gangrene	9,722	5.5
Other viral warts	9,310	5.8	Constipation	7,907	4.5
Plantar wart	8,459	5.2	Other hemorrhoids	6,088	3.5
Neoplasms (ICD-10: C00–D49)	88,449		Genitourinary system (ICD-10: N00–N99)	111,359	
Neoplasm of uncertain behavior of skin	12,439	14.1	Disorder of male genital organs, unspecified	12,306	11.1
Neoplasm of unspecified behavior of bone, soft tissue, and skin	3,406	3.9	Calculus of kidney	8,327	7.5
Other benign neoplasm of skin, unspecified	3,396	3.8	Other specified disorders of male genital organs	7,721	6.9
Melanocytic nevi of trunk	3,167	3.6	Hypertrophy of breast	7,177	6.4
Benign lipomatous neoplasm of skin and subcutaneous tissue of trunk	2,894	3.3	Epididymitis	5,904	5.3
Endocrine, nutrition, immunity (ICD-10: E00–E89)	79,826		Skin and subcutaneous tissue (ICD-10: L00–L99)	286,252	
Testicular hypofunction	15,246	19.1	Pseudofolliculitis barbae	39,271	13.7
Hyperlipidemia, unspecified	8,352	10.5	Cellulitis and acute lymphangitis of other parts of limb	15,652	5.5
Type 2 diabetes mellitus without complications	6,070	7.6	Ingrowing nail	15,596	5.4
Hypothyroidism, unspecified	4,902	6.1	Acne vulgaris	14,086	4.9
Dehydration	3,649	4.6	Dermatitis, unspecified	11,680	4.1
Hematologic disorders (ICD-10: D50–D89)	15,992		Musculoskeletal system (ICD-10: M00–M99)	3,281,366	
Anemia, unspecified	2,087	13.1	Pain in joint	1,204,927	36.7
Anemia due to glucose-6-phosphate dehydrogenase [G6PD] deficiency	1,587	9.9	Low back pain	626,488	19.1
Other specified disorders of white blood cells	1,452	9.1	Pain in limb, hand, foot, fingers, and toes	217,936	6.6
Iron deficiency anemia, unspecified	1,240	7.8	Cervicalgia	130,325	4.0
Sickle-cell trait	1,162	7.3	Radiculopathy	61,414	1.9
Mental disorders (ICD-10: F01–F99)	1,452,655		Congenital anomalies (ICD-10: Q00–Q99)	15,006	
Adjustment disorders	282,610	19.5	Congenital pes planus	2,596	17.3
Post-traumatic stress disorder (PTSD)	238,061	16.4	Congenital pes cavus	1,231	8.2
Alcohol dependence	219,260	15.1	Other congenital deformities of feet	776	5.2
Anxiety disorder, unspecified	98,861	6.8	Atrial septal defect	601	4.0
Alcohol abuse	69,581	4.8	Congenital insufficiency of aortic valve	490	3.3
Nervous system and sense organs (ICD-10: G00–H95)	1,025,188		Signs, symptoms, and ill-defined conditions (ICD-10: R00–R99)	748,762	
Sleep apnea	381,211	37.2	Headache	53,075	7.1
Myopia	87,689	8.6	Chest pain, unspecified	37,956	5.1
Insomnia	49,899	4.9	Other symptoms and signs involving cognitive functions and awareness	29,456	3.9
Chronic pain, not elsewhere classified	43,481	4.2	Unspecified abdominal pain	28,084	3.8
Astigmatism	22,107	2.2	Dyspnea	27,614	3.7
Circulatory system (ICD-10: I00–I99)	105,657		Injury and poisoning (ICD-10: S00–T98)	699,195	
Essential (primary) hypertension	46,203	43.7	Sprain of ankle	48,162	6.9
Scrotal varices	4,930	4.7	Sprain of shoulder joint	30,967	4.4
Atherosclerotic heart disease of native coronary artery	2,784	2.6	Sprain of cruciate ligament of knee	26,039	3.7
Nevus, non-neoplastic	2,372	2.2	History of TBI	17,378	2.5
Acute embolism and thrombosis of deep veins of lower extremity	2,337	2.2	Fracture of other and unspecified metacarpal bone	15,271	2.2
Respiratory system (ICD-10: J00–J99)	449,962		Other (ICD-10: Z00–Z99, except pregnancy-related)	5,971,393	
Acute upper respiratory infection, unspecified	89,040	19.8	General medical examination	1,587,992	26.6
Acute pharyngitis, unspecified	43,653	9.7	Encounter for other administrative examinations	660,043	11.1
Allergic rhinitis due to pollen	38,269	8.5	Encounter for immunization	616,633	10.3
Acute nasopharyngitis [common cold]	37,873	8.4	Encounter for examination of ears and hearing	404,585	6.8
Allergic rhinitis, unspecified	32,055	7.1	Encounter for other specified postprocedural aftercare	198,813	3.3

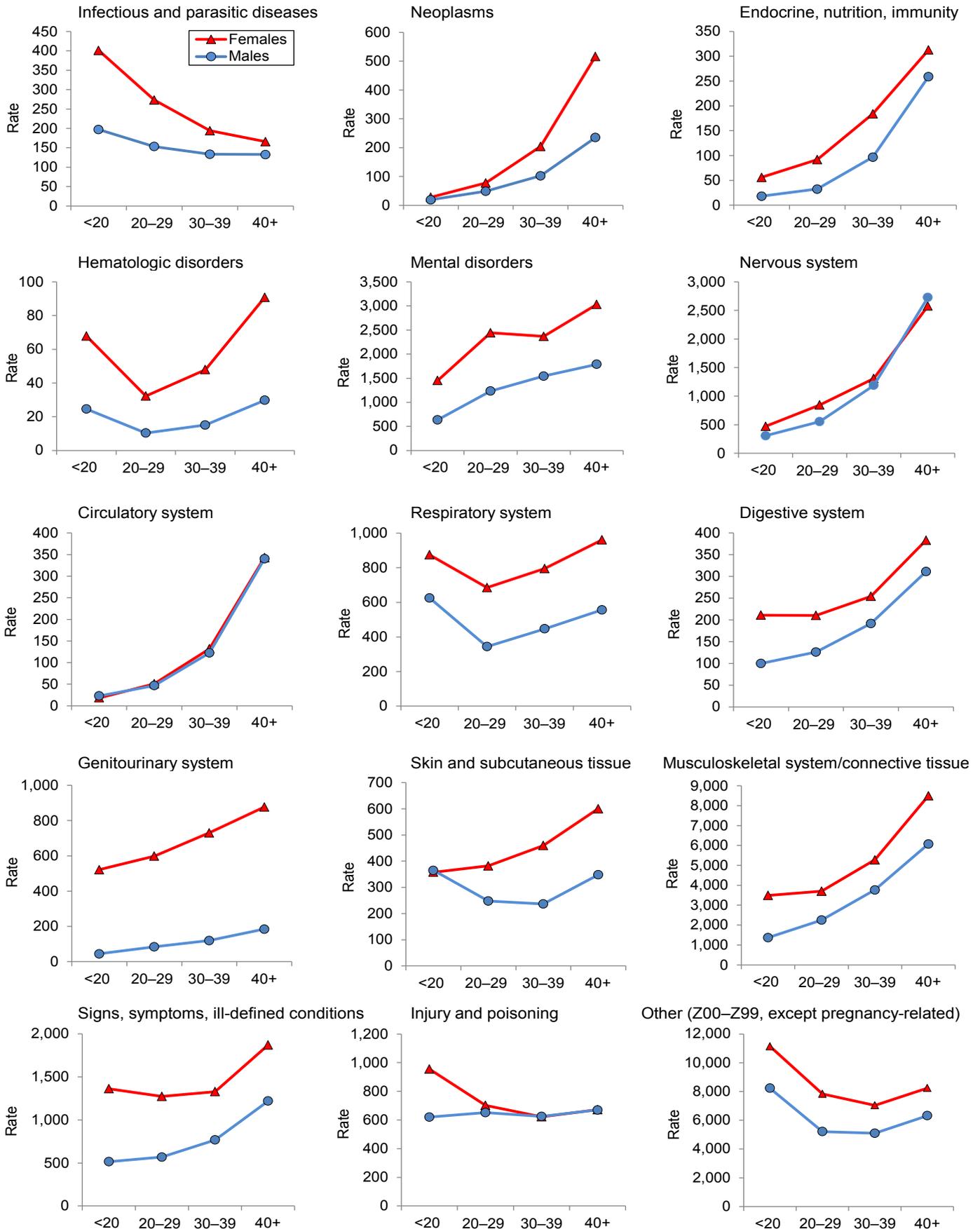
^aPercentage of the total number of ambulatory visits within the diagnostic category

TABLE 3. Most frequent diagnoses during ambulatory visits with ICD-10 codes, by major diagnostic category, females, active component, U.S. Armed Forces, 2016

Diagnostic category (ICD-10 codes) ♀	No.	% ^a	Diagnostic category (ICD-10 codes) ♀	No.	% ^a
Infectious and parasitic diseases (ICD-10: A00–B99)	51,481		Digestive system (ICD-10: K00–K95)	48,143	
Viral intestinal infection, unspecified	6,623	12.9	Constipation	7,658	15.9
Candidiasis of vulva and vagina	5,810	11.3	Noninfective gastroenteritis and colitis, unspecified	4,680	9.7
Viral infection, unspecified	3,783	7.3	Gastro-esophageal reflux disease without esophagitis	3,875	8.0
Infectious gastroenteritis and colitis, unspecified	3,589	7.0	Other hemorrhoids	1,603	3.3
Chlamydial infection of genitourinary tract, unspecified	1,938	3.8	Gastritis, unspecified	1,206	2.5
Neoplasms (ICD-10: C00–D49)	29,428		Genitourinary system (ICD-10: N00–N99)	132,373	
Neoplasm of uncertain behavior of skin	3,228	11.0	Urinary tract infection, site not specified	13,510	10.2
Leiomyoma of uterus, unspecified	3,167	10.8	Acute vaginitis	11,517	8.7
Malignant neoplasm of breast of unspecified site	2,370	8.1	Female infertility, unspecified	6,608	5.0
Other benign neoplasm of skin, unspecified	1,119	3.8	Other specified noninflammatory disorders of vagina	6,570	5.0
Melanocytic nevi of trunk	940	3.2	Abnormal uterine and vaginal bleeding, unspecified	5,721	4.3
Endocrine, nutrition, immunity (ICD-10: E00–E89)	26,900		Pregnancy and delivery (ICD-10: O00–O9A, relevant Z-codes)	279,131	
Hypothyroidism, unspecified	4,106	15.3	Encounter for supervision of normal first pregnancy	33,371	12.0
Polycystic ovarian syndrome	1,961	7.3	Encounter for supervision of other normal pregnancy	27,382	9.8
Overweight	1,958	7.3	Other specified diseases and conditions complicating pregnancy, childbirth and the puerperium	15,635	5.6
Obesity, unspecified	1,525	5.7	Encounter for supervision of normal pregnancy, unspecified	14,862	5.3
Dehydration	1,365	5.1	Other specified pregnancy related conditions	13,871	5.0
Hematologic disorders (ICD-10: D50–D89)	8,987		Skin and subcutaneous tissue (ICD-10: L00–L99)	85,260	
Iron deficiency anemia, unspecified	2,629	29.3	Acne vulgaris	11,709	13.7
Anemia, unspecified	1,317	14.7	Dermatitis, unspecified	4,019	4.7
Iron deficiency anemia secondary to blood loss (chronic)	679	7.6	Acne, unspecified	3,605	4.2
Sickle-cell trait	517	5.8	Ingrowing nail	2,737	3.2
Other specified disorders of white blood cells	461	5.1	Cellulitis and acute lymphangitis of other parts of limb	2,492	2.9
Mental disorders (ICD-10: F01–F99)	486,952		Musculoskeletal system (ICD-10: M00–M99)	917,530	
Adjustment disorders	121,754	25.0	Pain in joint	331,386	36.1
Post-traumatic stress disorder (PTSD)	70,762	14.5	Low back pain	160,387	17.5
Anxiety disorder, unspecified	40,370	8.3	Pain in limb, hand, foot, fingers, and toes	66,310	7.2
Alcohol dependence	29,169	6.0	Cervicalgia	49,199	5.4
Major depressive disorder, recurrent, moderate	23,672	4.9	Dorsalgia, unspecified	18,939	2.1
Nervous system and sense organs (ICD-10: G00–H95)	220,635		Signs, symptoms, and ill-defined conditions (ICD-10: R00–R99)	273,597	
Myopia	27,915	12.7	Headache	22,825	8.3
Sleep apnea	22,537	10.2	Unspecified abdominal pain	17,225	6.3
Chronic pain, not elsewhere classified	14,876	6.7	Pelvic and perineal pain	14,811	5.4
Insomnia	12,930	5.9	Nausea with vomiting, unspecified	11,902	4.4
Migraine without aura	9,556	4.3	Pain localized to other parts of lower abdomen	11,438	4.2
Circulatory system (ICD-10: I00–I99)	19,247		Injury and poisoning (ICD-10: S00–T98)	142,047	
Essential (primary) hypertension	6,341	32.9	Sprain of ankle	11,736	8.3
Varicose veins of lower extremities with other complications	1,056	5.5	Injury of unspecified muscle and tendon at lower leg level	5,262	3.7
Nevus, non-neoplastic	710	3.7	Sprain of cruciate ligament of knee	4,146	2.9
Lymphedema, not elsewhere classified	613	3.2	Sprain of hip	3,473	2.4
Venous insufficiency (chronic) (peripheral)	593	3.1	Sprain of shoulder joint	2,989	2.1
Respiratory system (ICD-10: J00–J99)	153,082		Other (ICD-10: Z00–Z99, except pregnancy-related)	1,610,111	
Acute upper respiratory infection, unspecified	31,228	20.4	General medical examination	300,750	18.7
Acute pharyngitis, unspecified	16,784	11.0	Encounter for other administrative examinations	158,055	9.8
Acute nasopharyngitis [common cold]	14,288	9.3	Encounter for immunization	134,410	8.3
Allergic rhinitis due to pollen	13,837	9.0	Other specified counseling	65,124	4.0
Allergic rhinitis, unspecified	12,773	8.3	Encounter for examination of ears and hearing	63,125	3.9

^aPercentage of the total number of ambulatory visits within the diagnostic category

FIGURE 2. Rates (per 1,000 person-years) of ambulatory visits, by major diagnostic category, age group, and gender, active component, U.S. Armed Forces, 2016



and females shared, the crude rate was at least 37% higher among females than males: pain in joint (rates [per 1,000 p-yrs], female: 1,630.0; male: 1,110.2; female:male rate ratio [RR]: 1.47); low back pain (rates, female: 788.9; male: 577.2; RR: 1.37); adjustment disorders (rates, female: 598.9; male: 260.4; RR: 2.30); and post-traumatic stress disorder (PTSD) (rates, female: 348.05; male: 219.3; RR: 1.59) (**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; cervicgia; anxiety disorder; and acute respiratory infection, unspecified. Of note, “sleep apnea” was the third most frequent illness- or injury-specific primary diagnosis during ambulatory visits of males, but it was not one of the 10 most common diagnoses among females. Among females, the 10th most common diagnosis was myopia, which was the 11th most common diagnosis among males (**Tables 2, 3**).

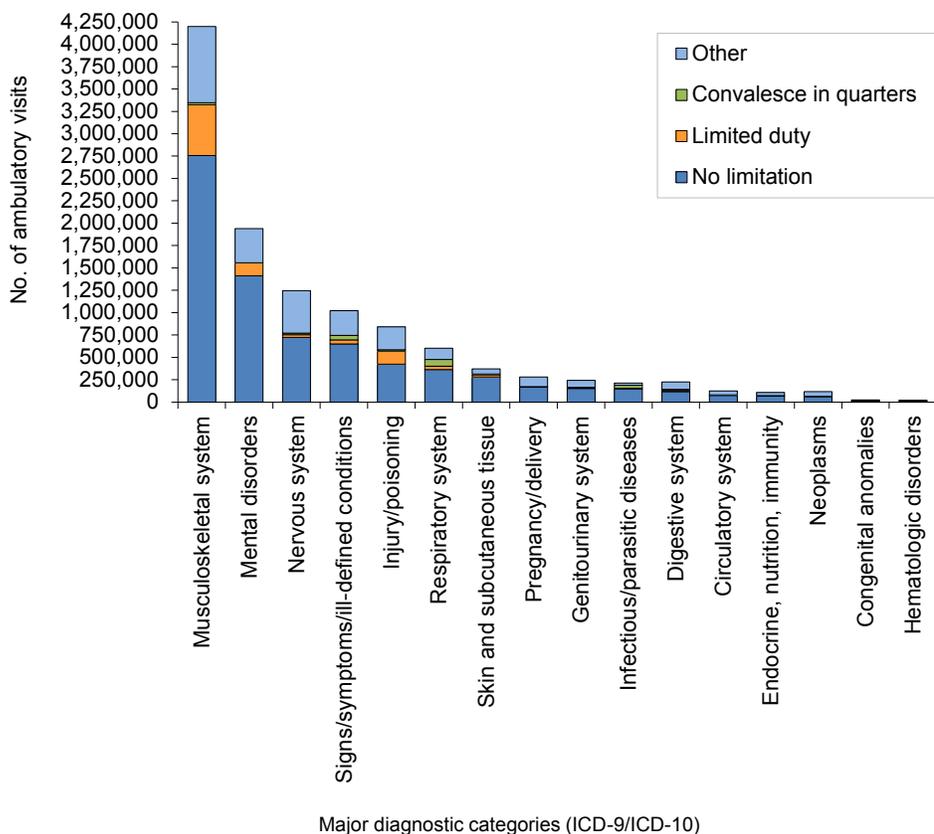
Across diagnostic categories, relationships between age and ambulatory visit rates were generally similar among males and females (**Figure 2**). For example, among both males and females, ambulatory visit rates for neoplasms and circulatory disorders among those aged 40 years or older were 10 or more 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, clinic visit rates for disorders of the endocrine system, nutrition, and immunity, of the nervous system, and of the musculoskeletal system were found to rise more steeply with advancing age than most other categories of illness or injury, for which rates were relatively stable or only modestly increased.

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 64.1% of all illness-and injury-related visits resulted in “no limitation” (i.e., duty without limitations) dispositions (**Figure 3**). Approximately one in 48 (2.1%) illness- and injury-related visits resulted in “convalescence in quarters” dispositions. The illness-and injury-related diagnostic categories with the highest proportions of “limited duty” dispositions were injuries and poisonings (17.3%) and musculoskeletal system disorders (13.5%). The illness-and injury-related diagnostic categories with the highest proportions of “convalescence in quarters” were infectious and parasitic diseases (15.3%) and diseases of the respiratory system (12.7%). Musculoskeletal system/connective tissue disorders (54.4%) accounted for over half of all “limited duty” dispositions, and injuries and poisonings (14.0%) and mental disorders (14.0%) together accounted for more than a quarter. Diseases of the respiratory system accounted for 31.6% of all “convalescence in quarters” dispositions—more than twice as many (n=76,576) as any other disease category, except signs and symptoms (20.8%) (**Figure 3**).

FIGURE 3. Ambulatory visits in relation to reported dispositions, by major diagnostic category, active component, U.S. Armed Forces, 2016



EDITORIAL COMMENT

In the past 5 years, the distribution of illness- and injury-related ambulatory visits in relation to their reported primary causes has remained fairly stable. In 2016, musculoskeletal system and mental disorders accounted for more than one-half (53.0%) of all illness- and injury-related diagnoses documented on standardized records of ambulatory encounters. The 2016 number of visits for musculoskeletal disorders (n=4,198,896) is the highest annual count in the past 13 years. In 2016 the 1,939,607 visits for mental disorders were higher than the counts of the previous 2 years but represented a decrease of 7.2% since the peak year of 2012. In 2016, only two major categories (musculoskeletal disorders and disorders of the nervous system and sense organs) showed increased numbers of visits compared to 2012. Four

additional categories (mental disorders, respiratory disorders, skin disorders, and infectious and parasitic diseases) showed slight rate increases, but not increases in visits, since 2012. Except as described, the annual numbers of visits and the rates for most (11 out of 17) of the major diagnostic categories of illness and injury have recently declined. This downward trend is likely due, in part, to the ongoing draw-down of military forces; for example, at the end of September 2016, there were 81,000 fewer active duty military personnel than at the same time in 2013.²

During 2012–2016, the relative ranking of injuries and poisonings (rank: 6) as primary causes of ambulatory visits has been stable. However, the numbers and rates of visits for injuries and poisonings have declined by 9% and 14%, respectively, since 2012. Nevertheless, the potential military operational impacts of various conditions cannot be assessed by numbers of attributable ambulatory visits alone. For example, in 2016, injuries and poisonings accounted for approximately one of every 23 ambulatory visits overall, but, of ambulatory visits occurring at MTFs, 17% (nearly 1 in 6) had limited duty dispositions. Of particular note in relation to injuries and musculoskeletal conditions, in 2016 as in the past, joint and back injuries and other disorders accounted for large numbers of ambulatory visits and lost duty time; 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 presented here using the major diagnostic categories of the ICD-10 system deserve more detailed 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). 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 (208,977) in annual visits for this category from 2012 to 2016 (described above) can be attributed almost entirely to a rise in diagnoses of organic sleep disorders from 269,540 in 2012 to 466,577 in 2016.³

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, Iraq, or at sea) may not be documented on standardized, automated records and thus not archived in the DMSS (the source of data for this report). 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 vary among those who are deployed and not deployed.

Also, this summary is based on primary (first-listed) diagnosis codes reported on ambulatory visit records. As a result, the summary discounts morbidity related to comorbid and complicating conditions that may have been documented in secondary diagnostic positions of the health-care 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 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.

Lastly, this report documents all ambulatory healthcare visits but does not provide estimates of the incidence rates of the diagnoses described. Illnesses and injuries that necessitate multiple ambulatory visits for evaluation, treatment, and rehabilitation are over-represented in this summary of the ambulatory burden of health care, in contrast to common, self-limited, and minor illnesses and injuries that require very little, if any, follow-up or continuing care.

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Surveillance Snapshot: Illness and Injury Burdens, Reserve Component, U.S. Armed Forces, 2016

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, 2016

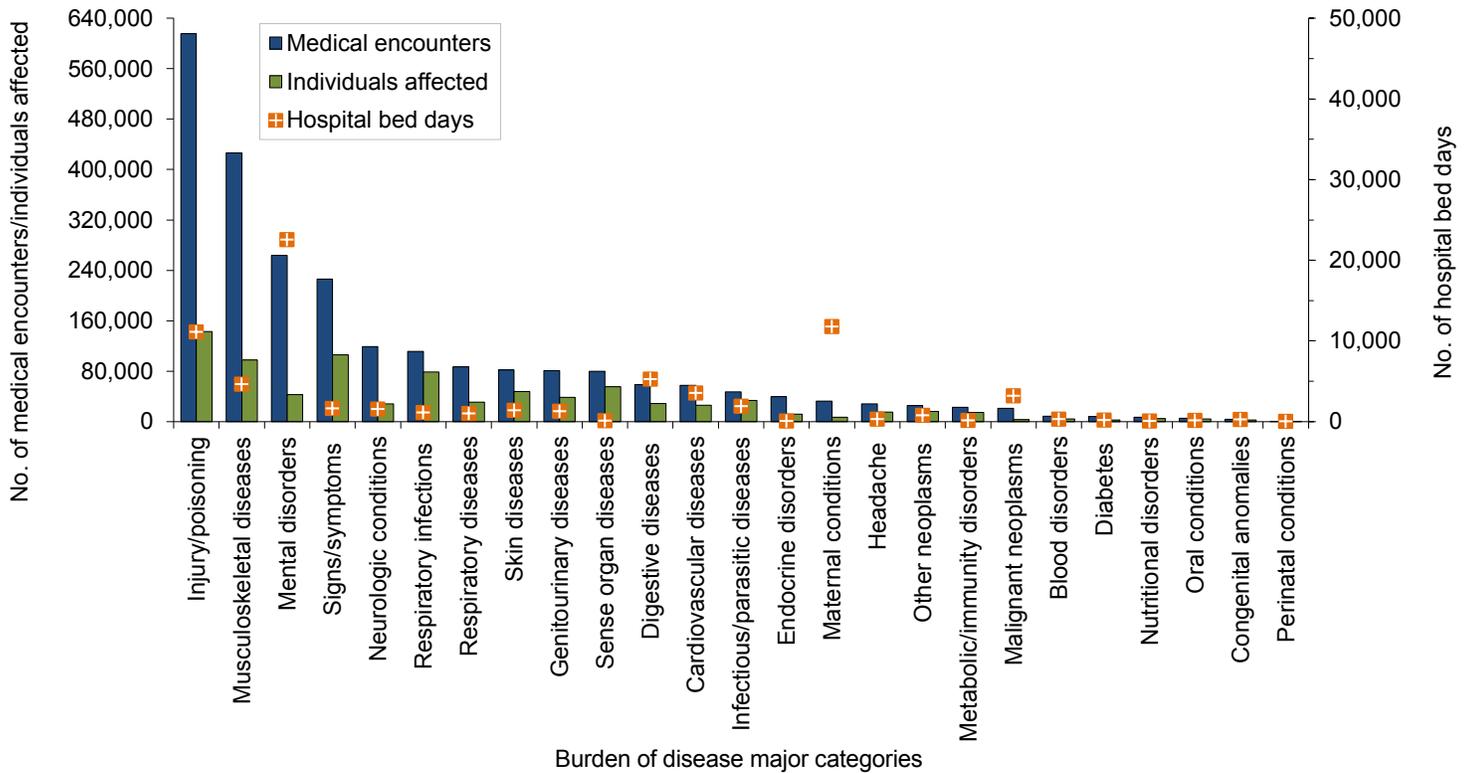
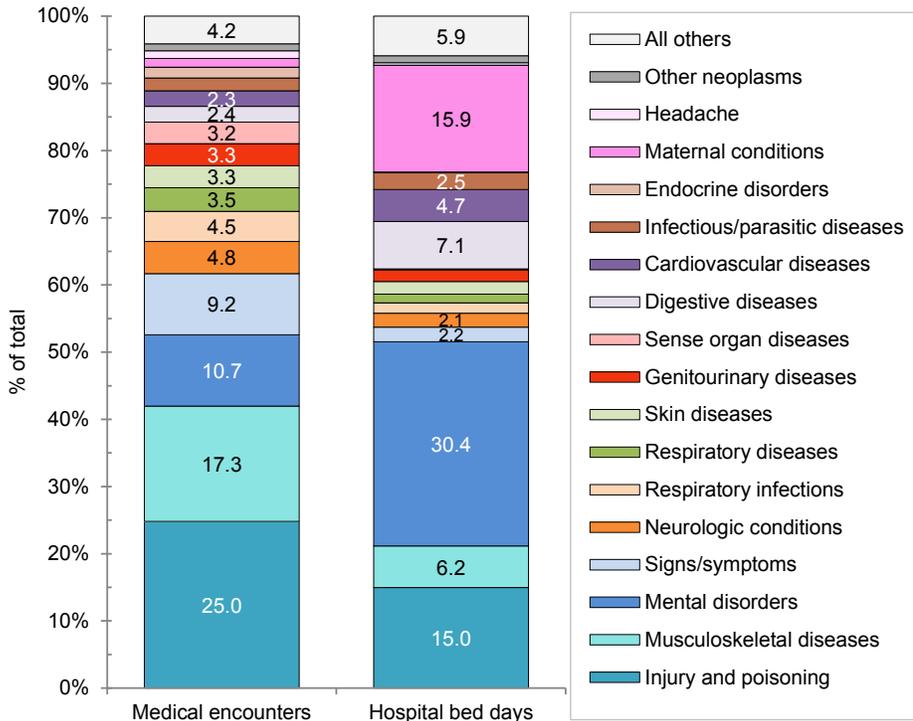


FIGURE 2. Percentages of medical encounters^a and hospital bed days, by burden of disease major category,^c reserve component,^d U.S. Armed Forces, 2016



^aMedical encounters: total hospitalizations and ambulatory visits for the condition (with no more than one encounter per individual per day per condition)

^bIndividuals with at least one hospitalization or ambulatory visit for the condition

^cBurden of disease major categories are the same as those used for analyses of morbidity burdens in the active component overall (see pp. 2–8).

^dThe reserve component comprises reserve and guard members of each service.

Surveillance Snapshot: Illness and Injury Burdens, Recruit Trainees, Active Component, U.S. Armed Forces, 2016

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, 2016

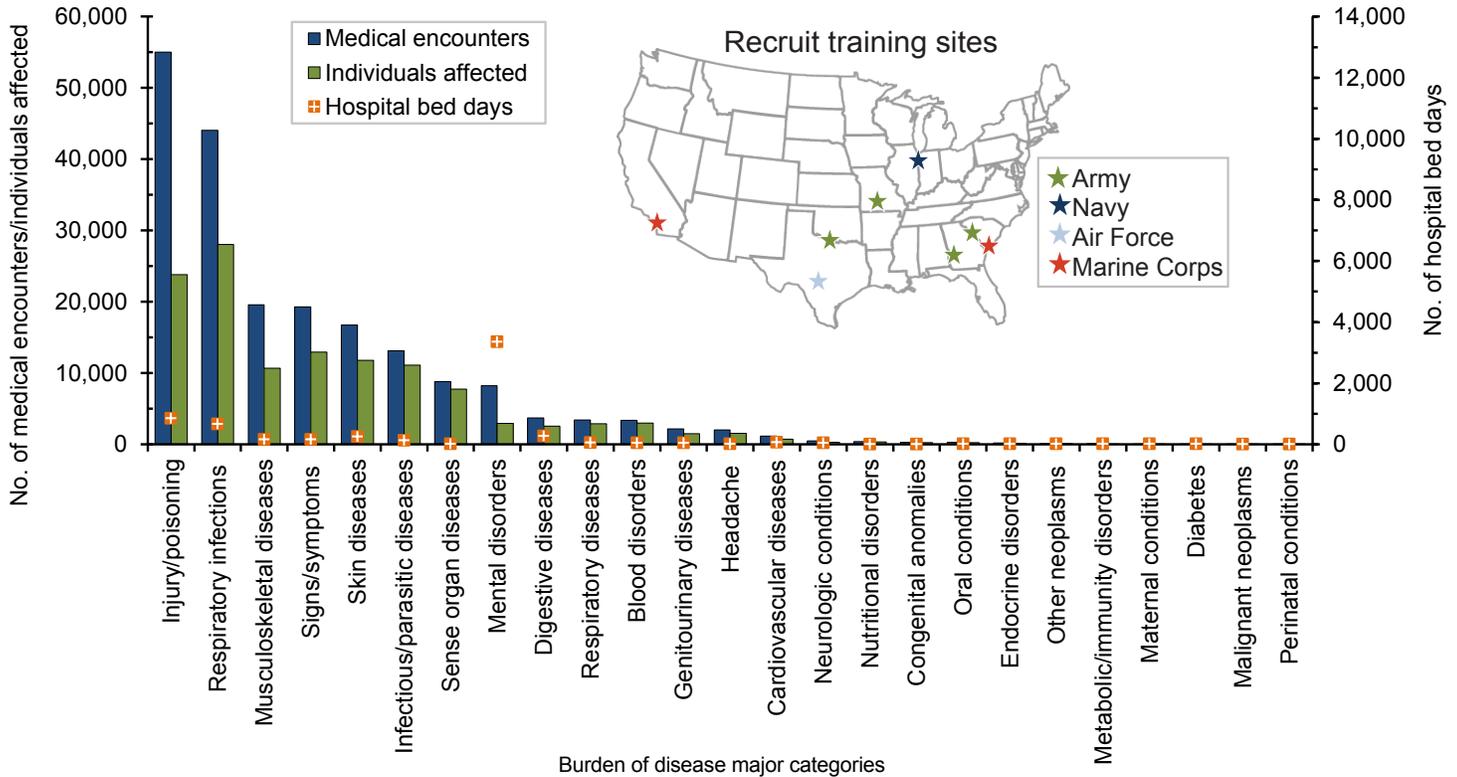
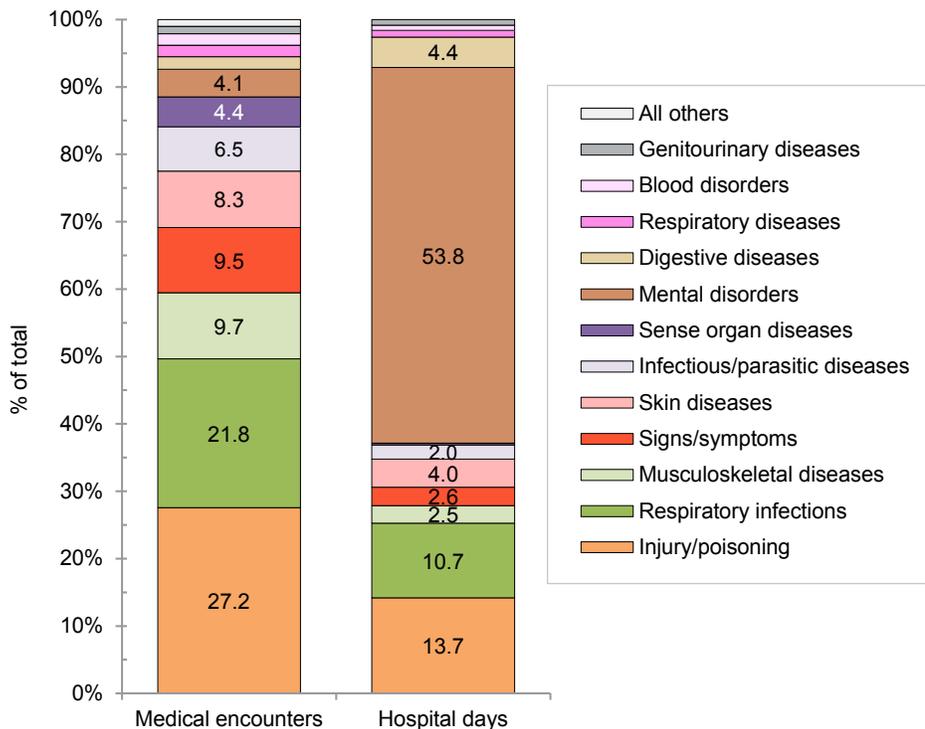


FIGURE 2. Percentages of medical encounters^a and hospital bed days, by burden of disease major category,^c recruit trainees,^d active component, U.S. Armed Forces, 2016



^aMedical encounters: total hospitalizations and ambulatory visits for the condition (with no more than one encounter per individual per day per condition)

^bIndividuals with at least one hospitalization or ambulatory visit for the condition

^cBurden of disease major categories are the same as those used for analyses of morbidity burdens in the active component overall (see pp. 2–8).

^dRecruit 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 one of the eight 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. 2–8.

Absolute and Relative Morbidity Burdens Attributable to Various Illnesses and Injuries, Non-service Member Beneficiaries of the Military Health System, 2016

Individuals who are eligible for care through the Military Health System (MHS) (“beneficiaries”) include family members of active component service members, family members of National Guard and Reserve service members, and retirees and eligible family members of retirees. In 2016, there were approximately 9.4 million beneficiaries eligible for health care in the MHS: 1.5 million active duty and activated reserve component service members; 1.8 million active component family members; 710,000 Guard/Reserve family members; and 5.4 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., if they use insurance through their own employment); also, 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 2016, approximately 6.5 million individuals utilized inpatient or outpatient services provided by the MHS (data source: the Defense Medical Surveillance System). In the population of MHS care recipients in 2016, there were more females (57.3%) than males (42.7%) and more infants, children, and adolescents (younger than 20 years old: n=1.8 million; 26.9%) and more seniors (aged 65 years or older: n=2.0 million; 30.0%) than younger (aged 20–44 years: n=1.3 million; 19.5%) or older (aged 45–64 years: n=1.5 million; 23.6%) 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 major ICD-9/ICD-10 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 major categories of health care. Since then, the annual “burden” issue of the *MSMR* has contained three reports on hospital care, ambulatory care, and the overall burden of care for active component service members. In 2014, for the first time and using similar methodology, the *MSMR* published a report that quantified the health care 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 2016. Healthcare burden estimates are stratified by direct versus outsourced care and across four age groups of healthcare recipients.

METHODS

The surveillance period was 1 January through 31 December 2016. The surveillance population included all non-service member beneficiaries of the MHS who had at least one hospitalization or outpatient medical encounter during 2016 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, Tenth Revision, Clinical Modification (ICD-10) 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 were codes for “Z-codes” (care other than for a current illness or injury, e.g., general medical examinations, after care, vaccinations) or

“V/X/Y-codes” (indicators of the external causes but not the natures of injuries) were excluded from analyses; however, encounters with primary diagnosis codes beginning with Z37 were included.

For summary purposes, all illness- and injury-specific diagnoses (as defined by the ICD-9/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*.

RESULTS

In 2016, a total of 6,589,843 non-service member beneficiaries of the MHS had 86,486,080 medical encounters (Table). Thus, on average, each individual who accessed care from the MHS had 13.1 medical encounters over the course of the year. The top three morbidity-related major categories, which accounted for a little more than one-third (34.5%) of all medical encounters, were musculoskeletal diseases (12.2%); “signs, symptoms, and ill-defined conditions” (11.9%); and injuries and poisonings (10.5%) (Figures 1a, 1b). Signs, symptoms, and ill-defined conditions, injuries and poisonings, and disorders of the sense organs were the illness/injury categories that affected the most individuals (44.9%, 34.7%, and 30.3% of all beneficiaries who received any care, respectively).

Cardiovascular diseases accounted for more hospital bed days (n=1,205,961) than any other illness/injury category and 16.5% of all hospital bed days overall (Figures 1a, 1b). An additional 37.5% of all bed days were attributable to injuries and poisonings (15.0%), mental disorders (8.9%), musculoskeletal diseases (6.9%), and digestive diseases (6.7%).

TABLE. Numbers of medical encounters, individuals affected, and hospital bed days, by source and age group, non-service member beneficiaries, 2016

	Medical encounters		Individuals affected		Hospital bed days		Medical encounters per individual affected
	No.	% total	No.	% total	No.	% total	
All non-service member beneficiaries	86,486,080	-	6,589,843	-	7,301,052	-	13.1
Source							
Direct care only	9,441,807	10.9	880,254	13.4	562,206	7.7	n/a
Outsourced care only	77,044,273	89.1	4,547,116	69.0	6,738,846	92.3	n/a
Direct and outsourced	n/a	n/a	1,162,473	17.6	n/a	n/a	n/a
Age group							
0-17 years	12,004,546	13.9	1,610,336	24.4	503,018	6.9	7.5
18-44 years	12,137,796	14.0	1,449,440	22.0	815,817	11.2	8.4
45-64 years	19,249,218	22.3	1,552,477	23.6	1,157,808	15.9	12.4
65 years or older	43,094,520	49.8	1,977,590	30.0	4,824,409	66.1	21.8

FIGURE 1b. Percentages of medical encounters and hospital bed days, by burden of disease major category, non-service member beneficiaries, 2016

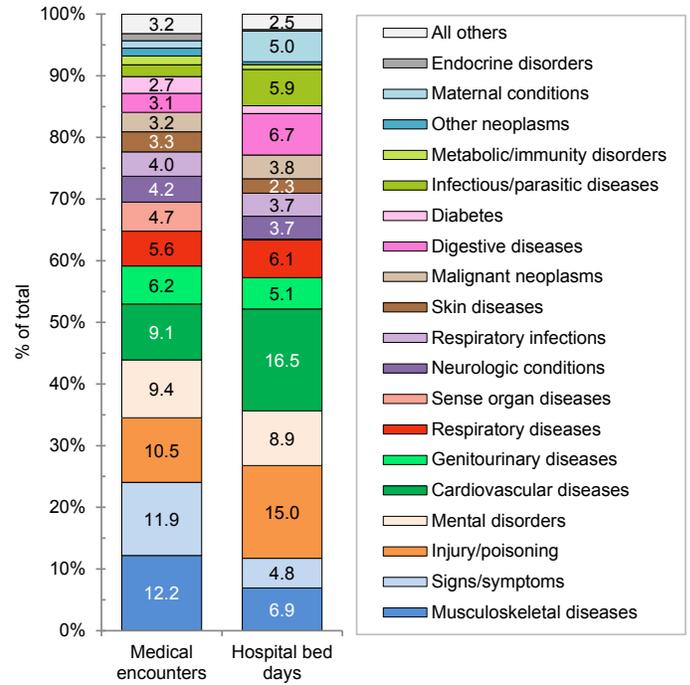


FIGURE 1a. Numbers of medical encounters, individuals affected, and hospital bed days, by burden of disease major category, non-service member beneficiaries, 2016

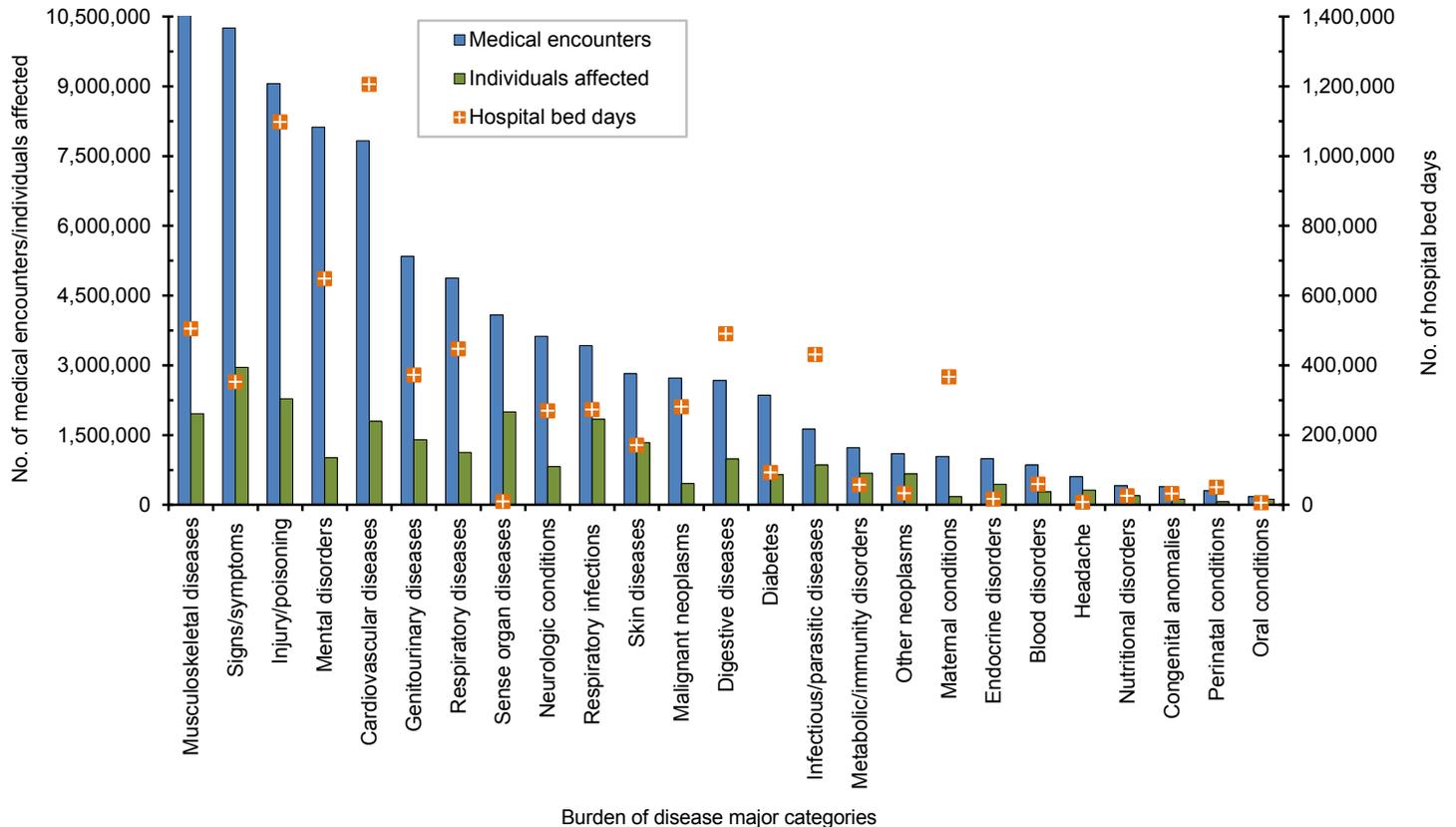
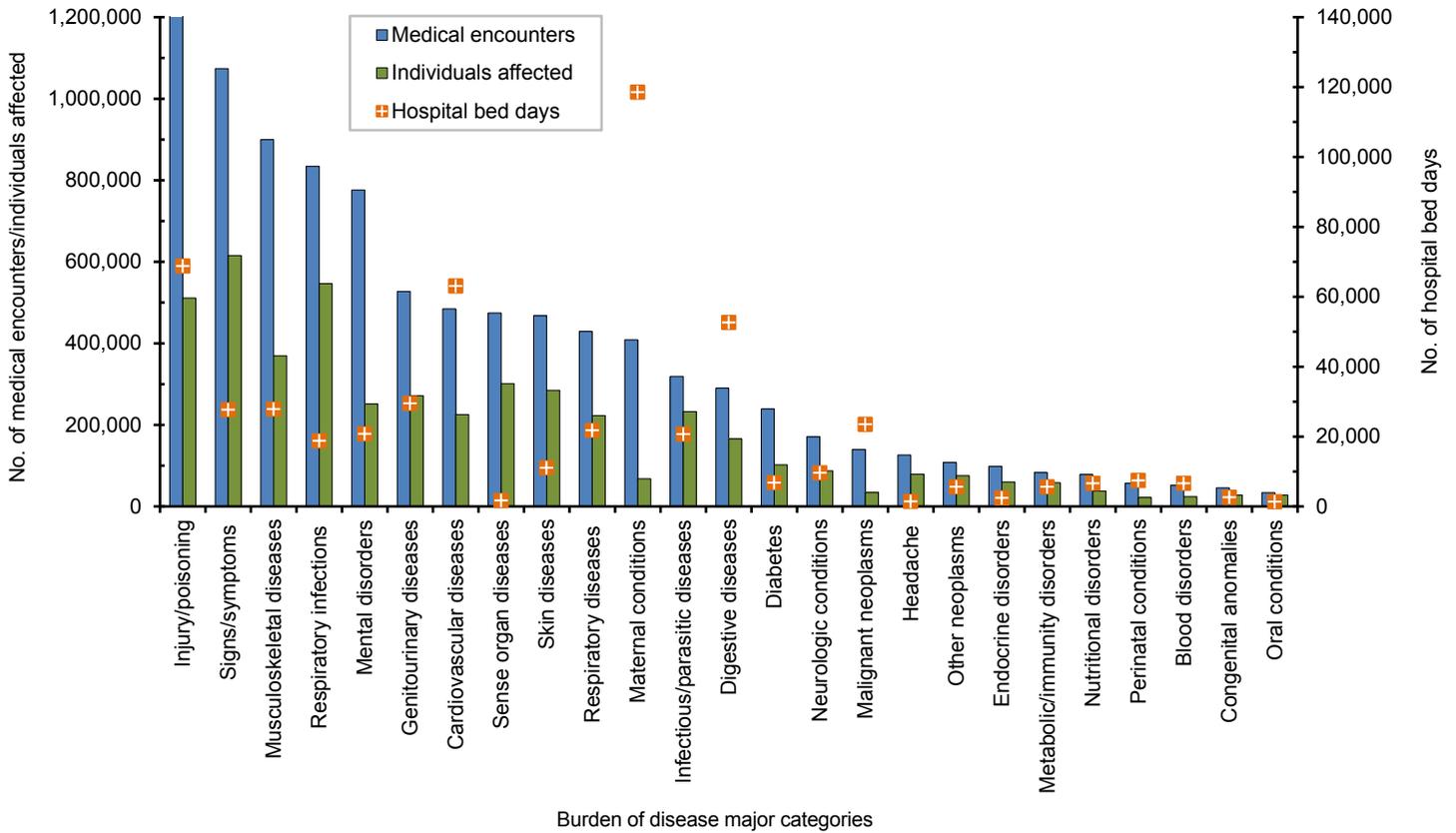


FIGURE 2a. Numbers of medical encounters, individuals affected, and hospital bed days, by burden of disease major category, non-service member beneficiaries, direct care only, 2016



Of note, maternal conditions (including pregnancy complications and delivery) accounted for relatively more hospital bed days ($n=366,376$; 5.0%) than individuals affected ($n=176,210$; 2.7% of all beneficiaries) (Figure 1a).

Direct care vs. outsourced care

In 2016, among non-service member beneficiaries, most medical encounters (89.1%) were in non-military medical facilities (“outsourced care”) (Table 1). Of all beneficiaries with any illness or injury-related encounters during the year, many more received exclusively outsourced care ($n=4,547,116$; 69.0%) than either military medical (direct) care only ($n=880,254$; 13.4%) or both outsourced and direct care ($n=1,162,473$; 17.6%). By far, most inpatient care (92.3% of all bed days) was received in non-military facilities (outsourced).

The proportions of medical encounters by morbidity-related major categories were broadly similar for direct and outsourced care (Figures 2a, 2b, 3a, 3b). However, encounters for respiratory infections and injuries and poisonings were relatively more common during direct (8.8% and 12.9%, respectively) than outsourced (3.4% and 10.2%, respectively) care encounters. Musculoskeletal diseases, cardiovascular diseases, neurologic disorders, and malignant neoplasms were relatively more common during outsourced (12.5%, 9.5%, 4.5%, and 3.4%, respectively) than direct (9.5%, 5.1%, 1.8%, and 1.5%, respectively) care encounters.

FIGURE 2b. Percentages of medical encounters and hospital bed days, by burden of disease major category, non-service member beneficiaries, direct care only, 2016

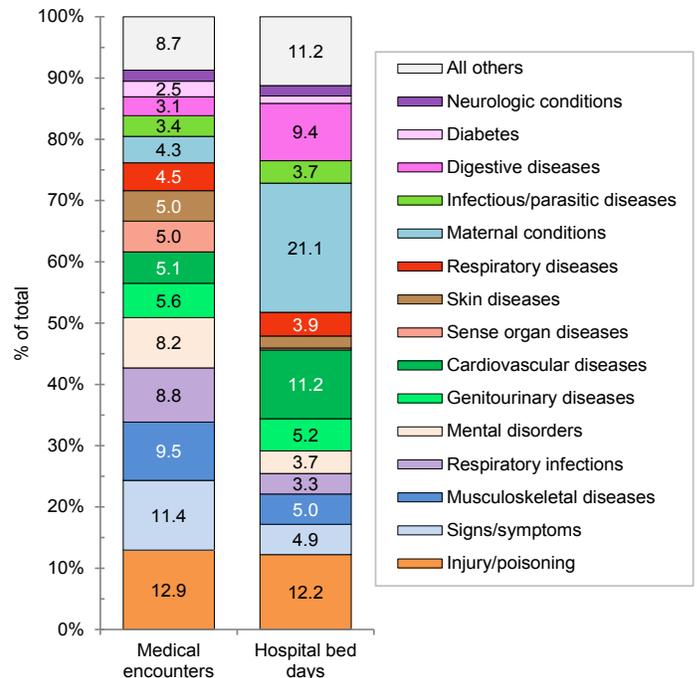
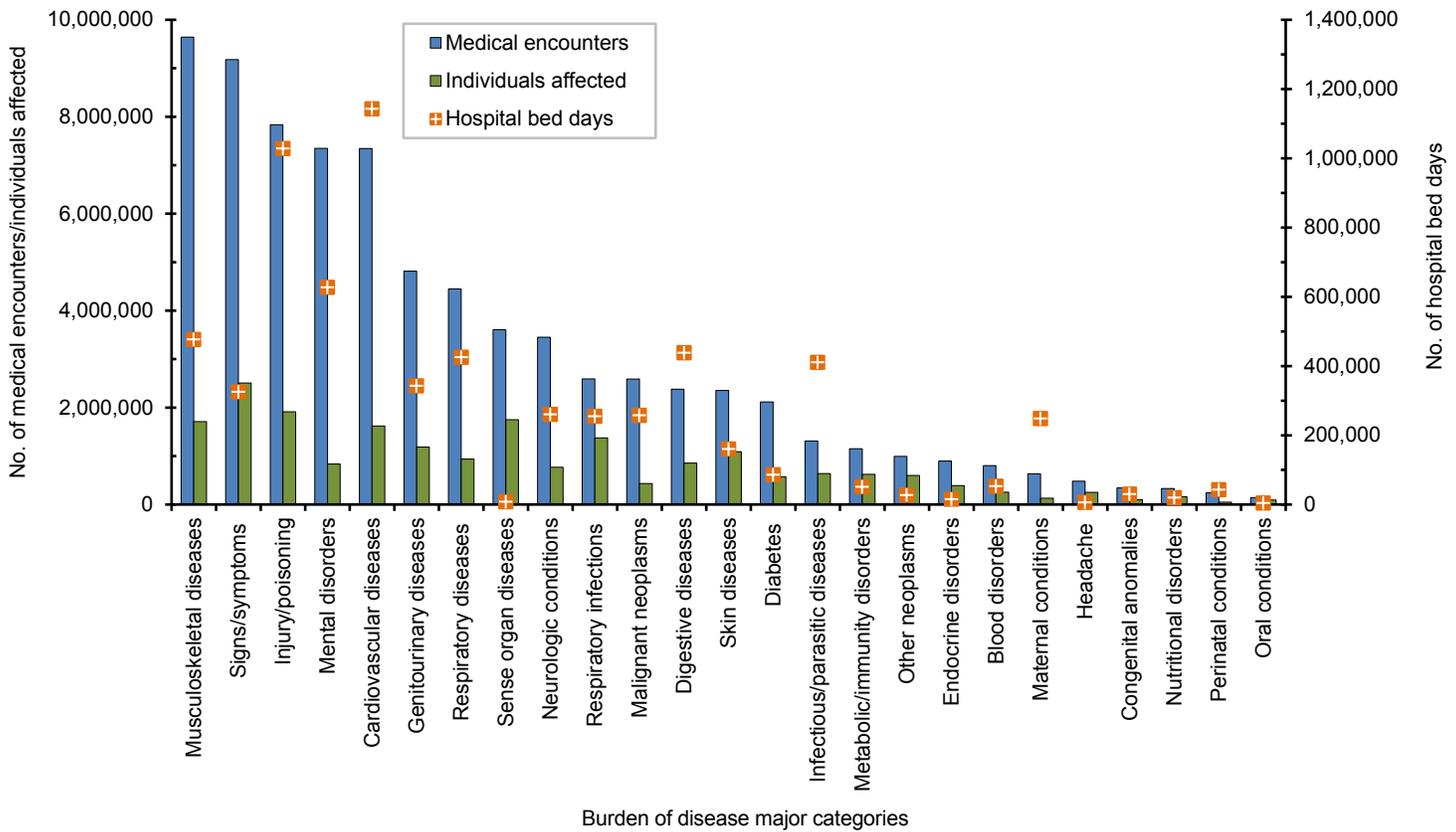


FIGURE 3a. Numbers of medical encounters, individuals affected, and hospital bed days, by burden of disease major category, non-service member beneficiaries, outsourced care only, 2016



Maternal conditions accounted for 21.1% of all direct care bed days but only 3.7% of all outsourced care bed days (Figures 2a, 2b, 3a, 3b). On the other hand, cardiovascular disorders, mental 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. 11.2%; mental, 9.3% vs. 3.7%; musculoskeletal, 7.1% vs. 5.0%).

Pediatric beneficiaries (aged 0–17 years)

In 2016, pediatric beneficiaries accounted for 13.9% of all medical encounters, 24.4% of all individuals affected, and 6.9% of all hospital bed days (Table 1). On average, each affected individual had 7.5 medical encounters during the year.

Mental disorders accounted for 31.5% (n=3,781,278) of all medical encounters and 53.2% of all hospital bed days (n=267,388) among pediatric beneficiaries (Figures 4a, 4b). On average, each pediatric beneficiary who was affected by a mental disorder had 13.8 mental disorder-related encounters during the year. More than two-thirds (67.8%) of all medical encounters for mental disorders among pediatric beneficiaries were for autistic disorder (32.9%), developmental speech/language disorders (22.5%), or attention deficit disorders (12.5%) (Figures 4c, 4d). On average, there were 45.5 autism-related encounters per individual affected with an autistic disorder and 15.3

FIGURE 3b. Percentages of medical encounters and hospital bed days, by burden of disease major category, non-service member beneficiaries, outsourced care only, 2016

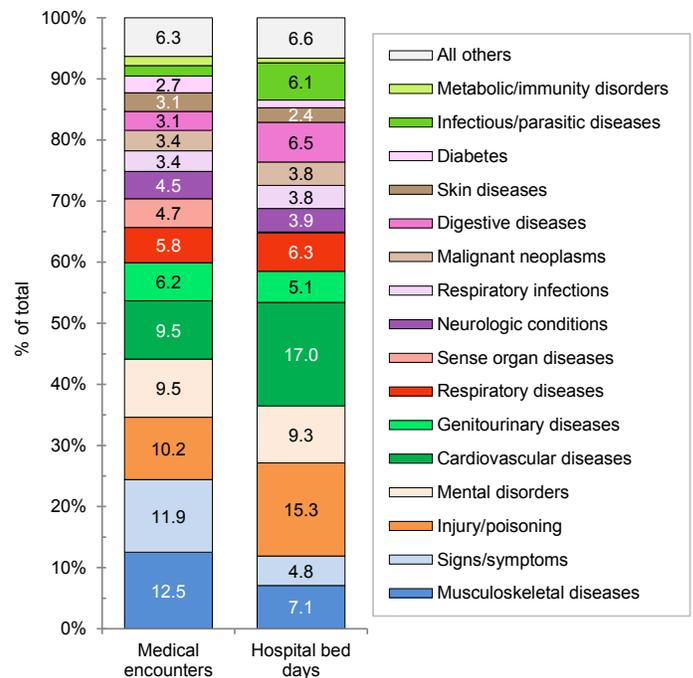
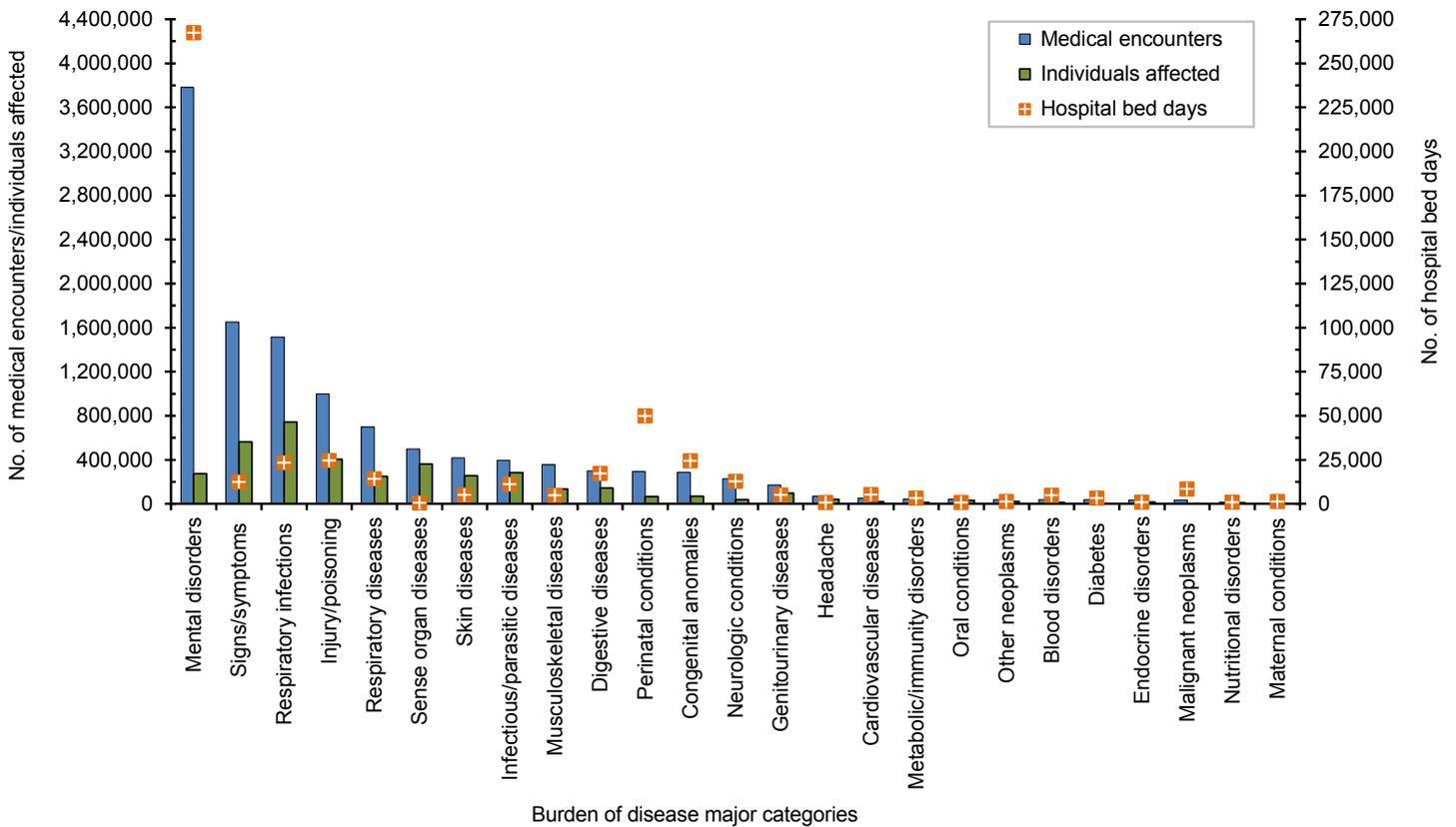


FIGURE 4a. Numbers of medical encounters, individuals affected, and hospital bed days, by burden of disease major category, pediatric non-service member beneficiaries, aged 0–17 years, 2016



encounters for developmental speech/language disorders per individual affected with those specific disorders. Despite the high numbers of encounters overall associated with these three types of mental disorders, more than two-fifths of mental disorder-related bed days were attributable to depressive disorders (43.9%), and 9.0% of all depression-related bed days were attributable to “affective psychosis, unspecified” (data not shown).

Among pediatric beneficiaries overall, “conditions arising during the perinatal period” (i.e., perinatal category) accounted for the second most hospital bed days (n=49,874, 9.9%) (Figures 4a, 4b). Of note, among pediatric beneficiaries with at least one illness or injury-related diagnosis, those with malignant neoplasms had the second highest number of related encounters per affected individual (13.3). The highest numbers of malignant neoplasm-related encounters and bed days were attributable to leukemias, “all other malignant neoplasms,” and brain 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 (12.6% and 4.6%, respectively), compared to any older age group of beneficiaries (with the exception of beneficiaries aged 65 years or older in whom respiratory infections also accounted for 4.6% of total bed days) (data not shown).

FIGURE 4b. Percentages of medical encounters and hospital bed days, by burden of disease major category, pediatric non-service member beneficiaries, aged 0–17 years, 2016

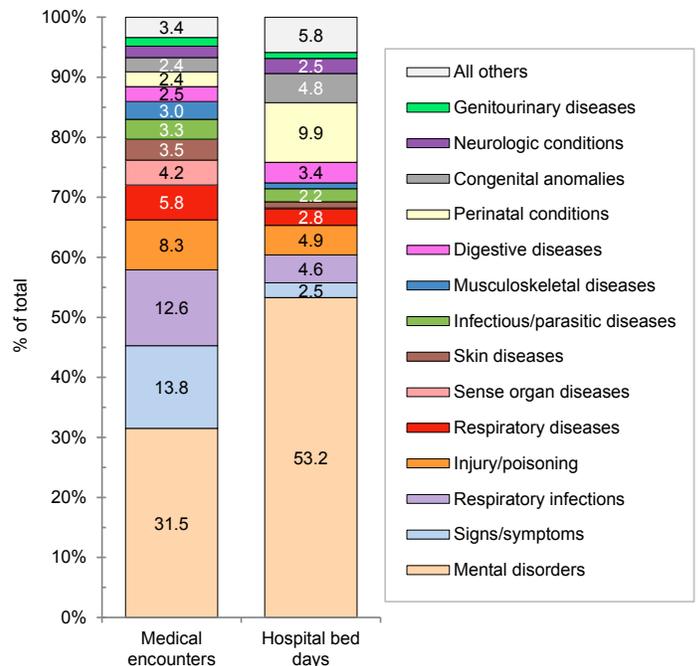


FIGURE 4c. Medical encounters, individuals affected, and hospital bed days, by mental disorders accounting for the most morbidity burden, pediatric non-service member beneficiaries, aged 0–17 years, 2016

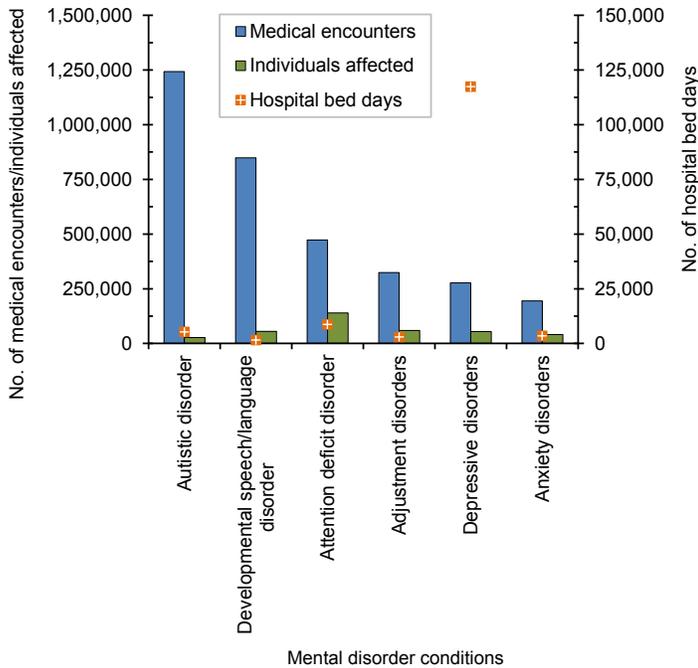
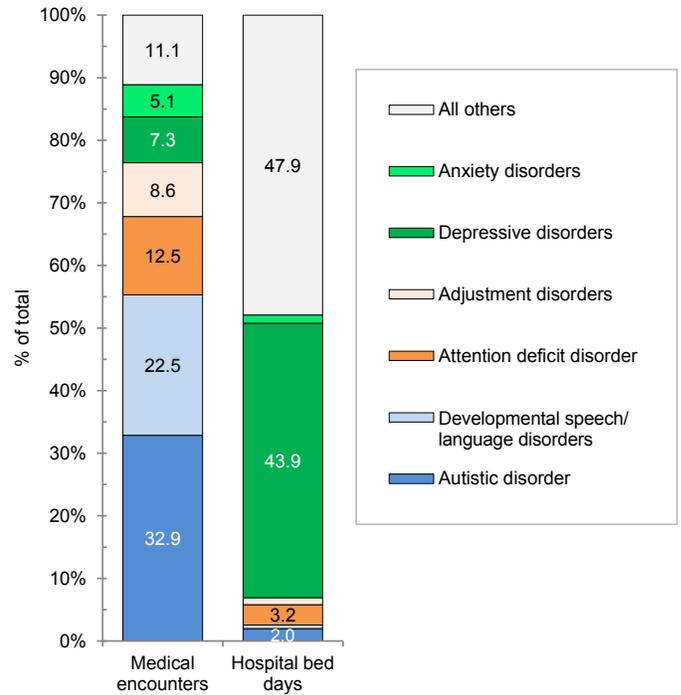


FIGURE 4d. Percentage of total mental disorders, by specific diagnosis, pediatric non-service member beneficiaries, aged 0–17 years, 2016



Beneficiaries (aged 18–44 years)

In 2016, non-service member beneficiaries aged 18–44 years accounted for 14.0% of all medical encounters, 22.0% of all individuals affected, and 11.2% of hospital bed days (Table 1). On average, each individual affected with an illness or injury (any cause) had 8.4 medical encounters during the year.

Among beneficiaries aged 18–44 years, the morbidity-related major category that accounted for the most medical encounters was mental disorders (n=2,017,097; 16.6% of all encounters) (Figures 5a, 5b). Among these adult beneficiaries, mental disorders accounted for 19.1% of all bed days, and on average, each adult affected by a mental disorder had 6.4 mental disorder-related encounters during the year. Mood disorders (34.6%), anxiety disorders (27.6%), and adjustment disorders (16.6%) accounted for close to four-fifths (78.8%) of all mental disorder-related medical encounters among beneficiaries aged 18–44 years (data not shown).

Among adults aged 18–44 years, maternal conditions accounted for close to half (44.6%) of all bed days and, on average, 5.9 medical encounters per affected individual (Figures 5a, 5b). Deliveries accounted for 12.1% of maternal condition-related medical encounters (data not shown). Adults aged 18–44 years accounted for nearly all (99.3%) maternal condition-related bed days among beneficiaries not in military service. If morbidity burdens associated with maternal conditions were excluded from the overall analysis, 18- to 44-year-olds and pediatric beneficiaries would account for similar percentages of total medical encounters (14.0% and 13.9%, respectively) and total hospital bed days (22.0% and 24.4%, respectively) (data not shown).

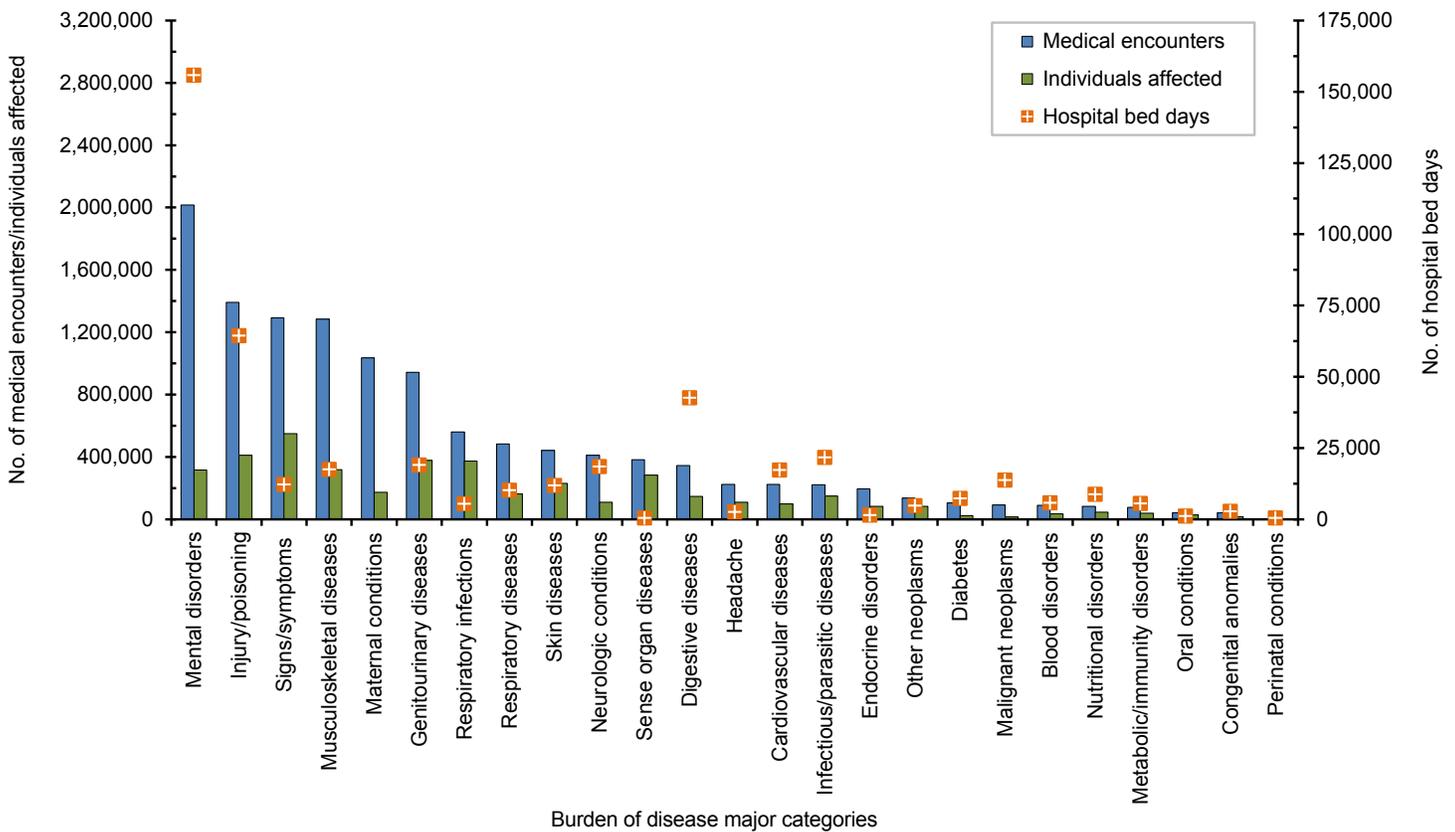
Among beneficiaries aged 18–44 years with at least one illness or injury-related diagnosis, those with malignant neoplasms had the most category-specific encounters per affected individual (6.0). Of all malignant neoplasms, breast cancer accounted for the most malignant neoplasm-related encounters (25.8% of the total) (data not shown).

Beneficiaries (aged 45–64 years)

In 2016, non-service member beneficiaries aged 45–64 years accounted for 22.3% of all medical encounters, 23.6% of all individuals affected, and 15.9% of hospital bed days (Table 1). On average, each affected individual had 12.4 medical encounters during the year.

Of all morbidity-related major categories, musculoskeletal diseases accounted for the most medical encounters (n=3,002,392; 15.7%) among older adult beneficiaries (Figures 6a, 6b). In addition, in this age group, back problems accounted for 45.2% of all musculoskeletal disease-related encounters (data not shown). Cardiovascular diseases accounted for more hospital bed days (15.4% of the total) than any other major category of illnesses or injuries; and cerebrovascular disease and ischemic heart disease accounted for 32.4% and 18.4%, respectively, of all cardiovascular disease-related bed days (data not shown). Digestive diseases accounted for a larger percentage

FIGURE 5a. Numbers of medical encounters, individuals affected, and hospital bed days,^a by burden of disease major category, non-service member beneficiaries, aged 18–44 years, 2016



^aMaternal conditions accounted for 363,698 hospital bed days in 2016.

(9.5%) of total hospital bed days among this age group compared to the other age groups of beneficiaries.

The most medical encounters per affected individual were associated with malignant neoplasms (6.4), mental disorders (6.1), musculoskeletal diseases (5.2), injury/poisoning (4.4), neurologic conditions (4.3), maternal conditions (4.2), and respiratory diseases (4.2) (Figures 6a, 6b). Malignant neoplasms (8.5%) 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 2016, non-service member beneficiaries aged 65 years or older accounted for 49.8% of all medical encounters, 30.0% of all individuals affected, and 66.1% of hospital bed days (Table 1). On average, each affected individual had 21.8 medical encounters during the year.

Of all morbidity-related major categories, cardiovascular diseases accounted for the most medical encounters (n=6,126,423; 14.2%) and bed days (n=1,005,498; 20.8%) (Figures 7a, 7b). Essential hypertension (26.4%), ischemic heart disease (15.2%), and cerebrovascular disease (9.9%) accounted for a little more than half (51.5%) of all

FIGURE 5b. Percentages of medical encounters and hospital bed days, by burden of disease major category, non-service member beneficiaries, aged 18–44 years, 2016

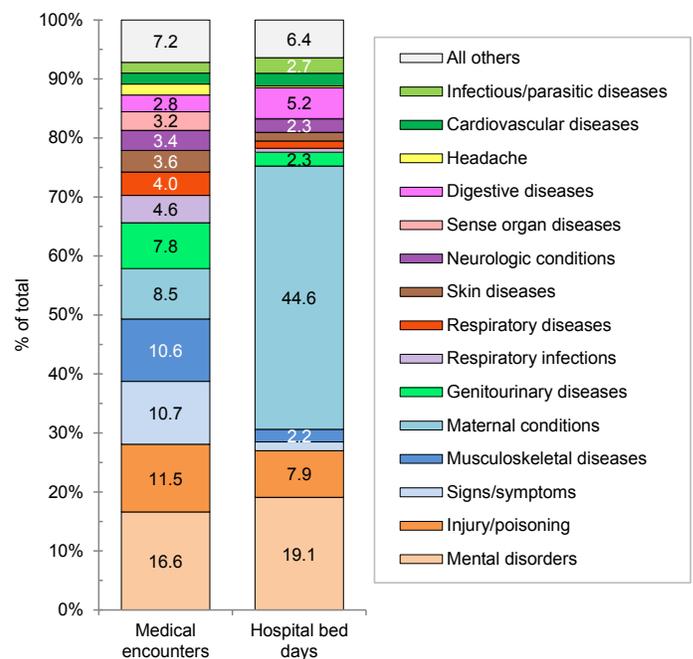
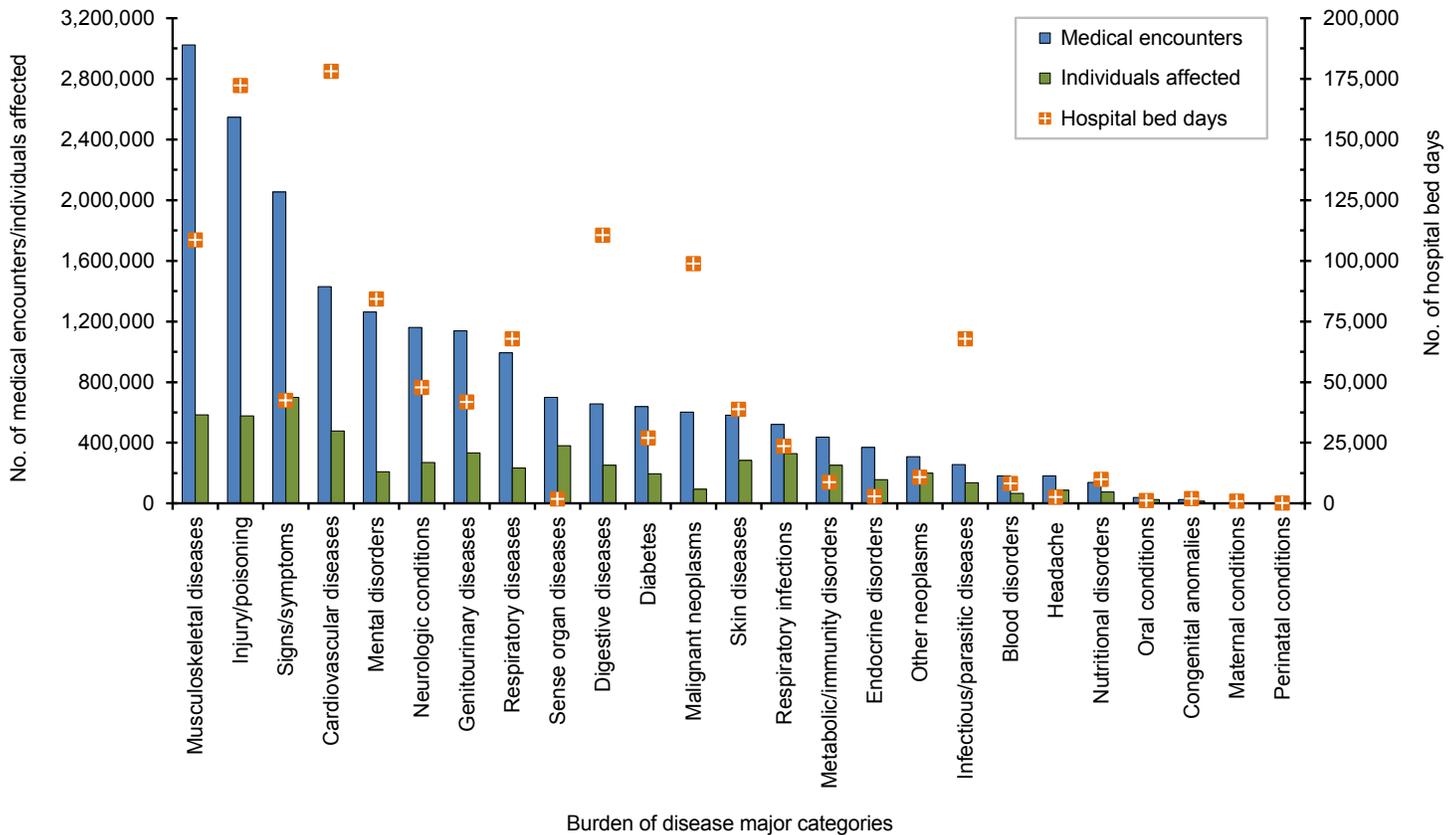


FIGURE 6a. Numbers of medical encounters, individuals affected, and hospital bed days, by burden of disease major category, non-service member beneficiaries, aged 45–64 years, 2016



cardiovascular disease–related medical encounters; and cerebrovascular disease accounted for more than one-quarter (30.3%) 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 (6.4), malignant neoplasms (5.8), respiratory diseases (5.6), diseases of the genitourinary system (5.2), cardiovascular diseases (5.1), and mental 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 (19.4%), prostate cancer (14.0%), breast cancer (12.5%), and “trachea, bronchus, and lung” cancers (11.0%) accounted for more than half (56.9%) of all malignant neoplasm–related encounters (**data not shown**).

Chronic obstructive pulmonary disease accounted for more than two-fifths of all medical encounters (44.5%) and bed days (41.2%) attributable to respiratory diseases (**data not shown**).

Infectious and parasitic diseases (6.9%) accounted for a larger proportion of total bed days among the oldest compared to the other age groups of beneficiaries (**Figures 7a, 7b**). In contrast, mental disorders accounted for smaller percentages of medical encounters (2.5%) and bed days (2.9%) among the oldest compared to the younger age groups.

FIGURE 6b. Percentages of medical encounters and hospital bed days, by burden of disease major category, non-service member beneficiaries, aged 45–64 years, 2016

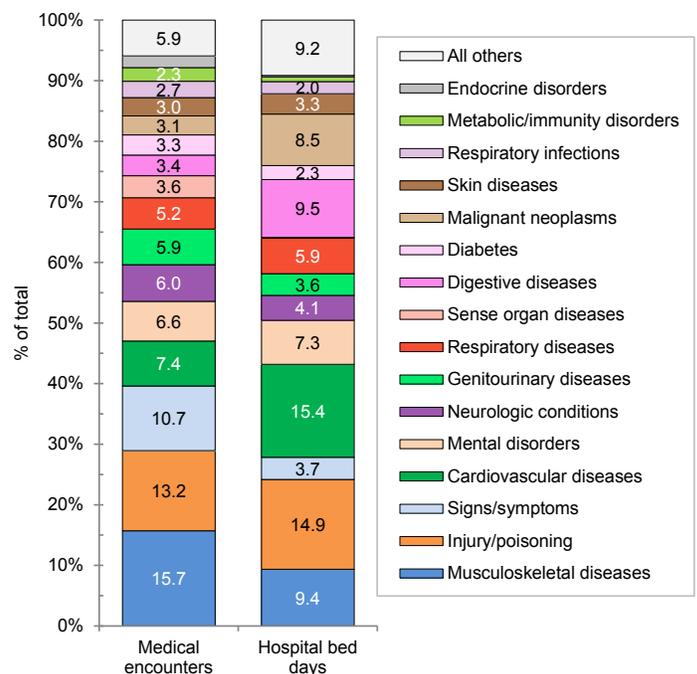
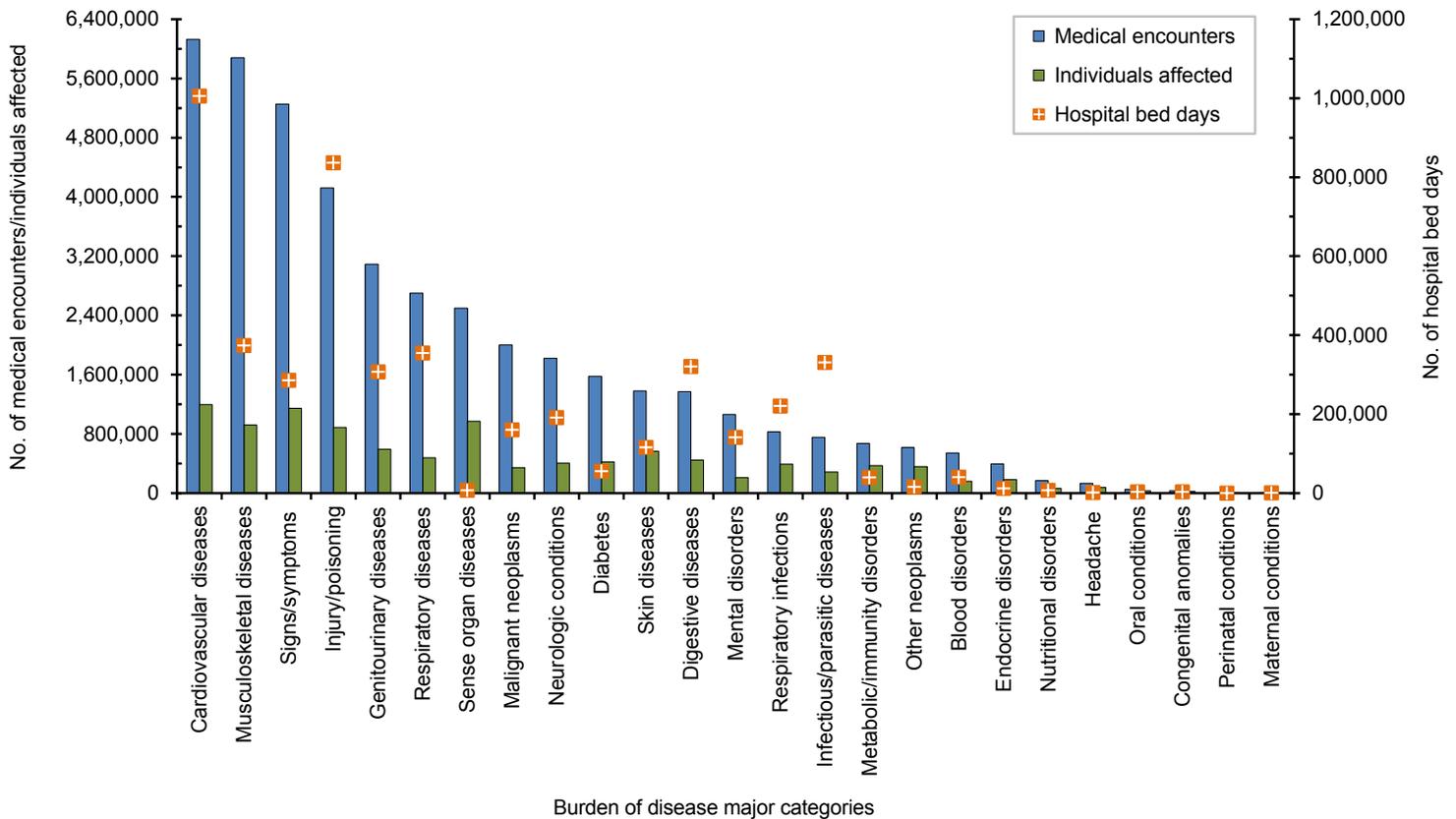


FIGURE 7a. Numbers of medical encounters, individuals affected, and hospital bed days, by burden of disease major category, non-service member beneficiaries, aged 65 years or older, 2016

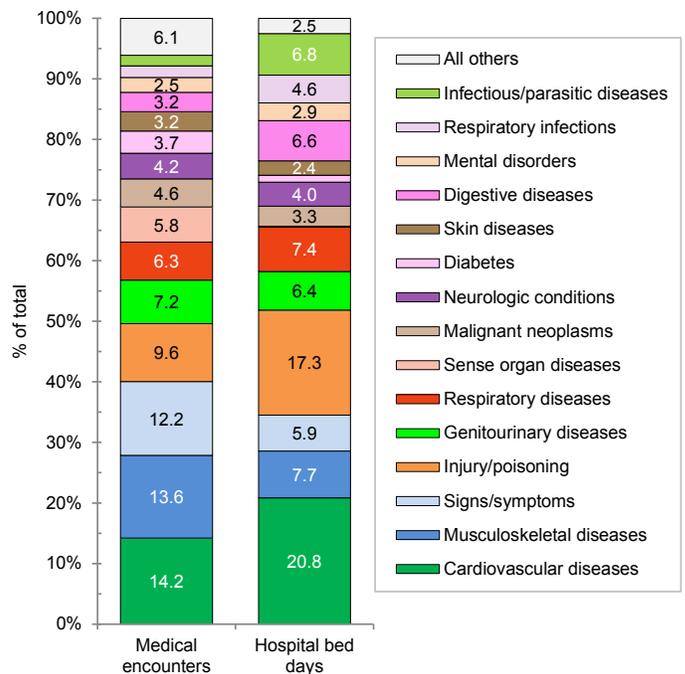


EDITORIAL COMMENT

This report describes the fourth 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 the types of morbidity and the natures of the care provided for evaluation and treatment sharply differ across age groups of beneficiaries. Of particular note, individuals aged 65 years or older account for nearly half of all medical encounters (49.8%) and a majority (66.1%) of all hospital bed days delivered to beneficiaries not currently in military service.

In 2016, mental disorders accounted for the largest proportions of the morbidity and healthcare burdens that affected the pediatric (aged 0–17 years) and young adult (aged 18–44 years) beneficiary age groups. Among pediatric beneficiaries, 67.8% of medical encounters for mental disorders were attributable to autistic disorder, attention deficit disorders, and developmental speech/language disorders. Of particular note, children affected by autistic disorders had, on average, 45.5 autism-related encounters each during the 1-year surveillance period.

FIGURE 7b. Percentages of medical encounters and hospital bed days, by burden of disease major category, non-service member beneficiaries, aged 65 years or older, 2016



As among pediatric beneficiaries, among young adults (18–44 years), mental disorders accounted for more medical encounters than any other major category of illnesses or injuries. However, the proportion of all encounters attributable to mental disorders was markedly less among adults (18–44 years) (16.6%) compared to pediatric (31.5%) beneficiaries. Also, as expected, the mental disorders that accounted for the largest healthcare burdens among 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 proportion of hospital bed days among 18- to 44-year-olds were for maternal conditions because this age group encompasses nearly all women of childbearing age.

Among older adults (aged 44–64 years), musculoskeletal diseases were the greatest contributors to morbidity and healthcare

burdens; and among adults aged 65 years or older, cardiovascular diseases accounted for the most morbidity and healthcare burdens.

Of musculoskeletal diseases, back problems were the major source of healthcare burden; and of cardiovascular diseases, essential hypertension, cerebrovascular disease, and ischemic heart disease accounted for the largest healthcare burdens. The 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 in older age groups of beneficiaries are also associated with unhealthy lifestyles (e.g., unhealthy diet, inadequate exercise, 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 and by comprehensive prevention and research programs.

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Erratum: Armed Forces Health Surveillance Branch. Absolute and relative morbidity burdens attributable to various illnesses and injuries, non-service member beneficiaries of the Military Health System, 2015. *MSMR*. 2016;23(4):28–35.

The 2015 annual MSMR morbidity burden summary for the non-service member beneficiaries of the Military Health System states that ICD-10 codes were used in the analyses. However, it has come to our attention that those codes were not included in the data analyses and thus were not represented in the results. Given this, direct comparisons of counts for 2015 with those from 2016 or earlier years are not valid.

–The MSMR Editors



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Medical Surveillance Monthly Report (MSMR)

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Silver Spring, MD 20904

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ISSN 2158-0111 (print)

ISSN 2152-8217 (online)

