Absolute and Relative Morbidity Burdens Attributable to Various Illnesses and Injuries, U.S. Armed Forces, 2011

Perceptions of the relative "importance" of various conditions in military populations often determine the natures, extents, and priorities for resources for primary, secondary, and tertiary prevention activities. However, perceptions of the importance of conditions are inherently subjective; hence, they may have weak relationships with objective measures of their impacts on health, fitness, military operational effectiveness, health care 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 likely 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 that is 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 (slightly modified for use among U.S. military members) and several health care burden measures to quantify the impacts of various illnesses and injuries among members of the U.S. Armed Forces in 2011.

METHODS

The surveillance period was 1 January to 31 December 2011. The surveillance population included all individuals who served in the active component of the U.S. Army, Navy, Air Force, Marine Corps, or Coast Guard any time during the surveillance period. For this analysis, all inpatient and outpatient medical encounters of all active component members during 2011 were summarized according to the primary (first-listed) diagnosis (if reported with an ICD-9-CM code between 001 and 999).

For summary purposes, all illness and injury-specific diagnoses (as defined by the ICD-9-CM) were grouped into 139 burden of disease-related conditions and 25 categories based on a modified version of the classification system developed for the Global Burden of Disease (GBD) Study.[1] In general, the GBD system groups diagnoses with common pathophysiologic or etiologic bases and/or significant international health policymaking importance. For our purposes, we disaggregated some diagnoses that are grouped into single categories in the GBD system (e.g., mental disorders) to increase the military relevance of the results. We also categorized injuries by the affected anatomic sites rather than the causes 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 (with a limit of one encounter per individual per condition per day); total service members affected by each condition (i.e., individuals with at least one medical encounter for the condition during the year); total bed days during hospitalizations for each condition, and total number of lost duty days due to each condition. This fourth measure, added to the report this year, represents the days of work time lost due to hospitalizations plus one day for each "sick in quarters" disposition and one-half day for each "limited duty" disposition that resulted from ambulatory visits for the condition of interest.

The results of this year's summary differ from previous annual summaries of morbidity burdens published in the MSMR for several reasons. First, there were additional modifications made to the GBD classification system so that there are now distinct major categories for "blood disorders" and "metabolic and immunity disorders." Obesity has been reclassified to "nutritional disorders"; "endocrine disorders" now specifies some thyroid disorders. Several back disorders were reclassified from "injuries" to "musculoskeletal disorders." Newly promulgated ICD-9 codes were incorporated into the ascertainment of health care encounters. In conjunction with the reloading and modernization of the data in the Defense Medical Surveillance System, approximately 740,000 outpatient diagnoses of "other ill-defined conditions" (ICD-9-CM: 799.89) were removed from the analysis because that code has been used to document prescription refills rather than medical encounters for current illnesses or injuries.

RESULTS

Morbidity burden, by category:

In 2011, more service members (n=592,028) received medical care for injuries than any other morbidity-related category. In addition, injuries accounted for more medical encounters than any other morbidity category (n=2,154,169) and more than one-fifth (21.1%) of all medical encounters overall **(Figure 1)**.

Mental disorders accounted for more hospital bed days than any other morbidity category (n=174,005) and two-fifths (40.1%) of all hospital bed days. Together, injuries and mental disorders accounted

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
APR 2012		**00-00-2012 to 00-00-2012**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Absolute and Relative Morbidity Burdens Attributable to Various Illnesses and Injuries, U.S. Armed Forces, 2011	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Armed Forces Health Surveillance Center,11800 Tech Road, Suite 220,(MCAF-CS),Silver Spring,MD,20904**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

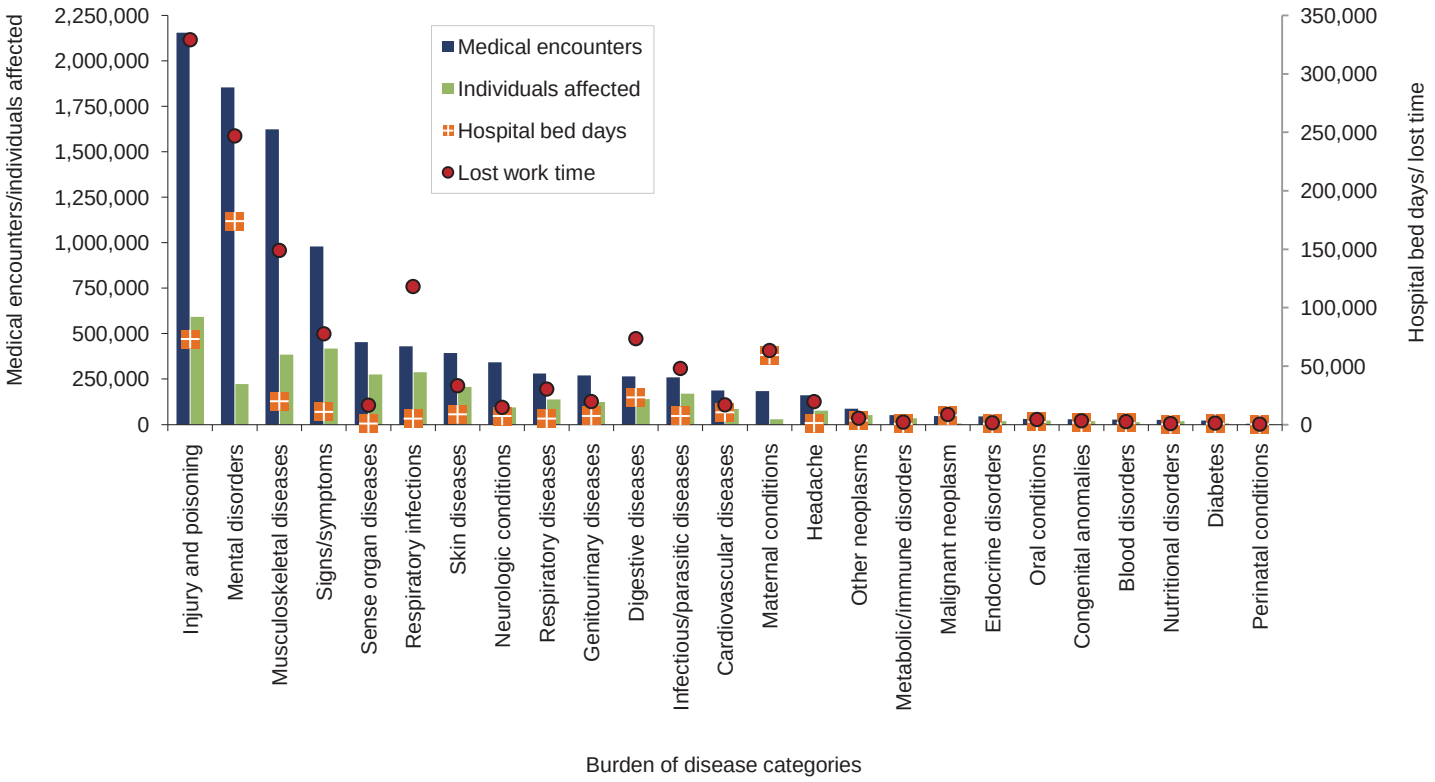
13. SUPPLEMENTARY NOTES
MSMR, April 2012, Vol. 19, No. 4, See also ADA 560908

14. ABSTRACT
perceptions of the relative ?importance? of various conditions in military populations oft en determine the natures, extents, and priorities for resources for primary, secondary, and tertiary prevention activities. However perceptions of the importance of conditions are inherently subjective; hence, they may have weak relationships with objective measures of their impacts on health fi tness, military operational eff ectiveness,health care costs, and so on.

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**	**Same as Report (SAR)**	**7**	

FIGURE 1. Medical encounters[a], individuals affected[b], hospital bed days[c], and lost work time[d], by burden of disease category, active component, U.S. Armed Forces, 2011



[a]Major categories and conditions defined in the Global Burden of Disease Study
[b]Medical encounters: total hospitalizations and ambulatory visits for the condition (with no more than one encounter per individual per day per condition)
[c]Individuals with at least one hospitalization or ambulatory visit for the condition
[d]A measure of lost work time due to bed days, convalescence, and one-half day for each ambulatory visit that resulted in limited duty

for more than half (57.0%) of all hospital bed days and nearly two-fifths (39.3%) of all medical encounters **(Figure 1)**.

Of note, maternal conditions (including pregnancy complications and delivery) accounted for a relatively large proportion of all hospital bed days (n=59,502; 13.7%) but relatively few (n=183,457; 1.8%) medical encounters overall **(Figure 1)**.

Medical encounters, by condition:

In 2011, the four burden of disease-related conditions that accounted for the most medical encounters – "other back problems", "all other musculoskeletal diseases", "all other signs and symptoms" and injuries of the "arm and shoulder" – accounted for more than one-fourth (25.6%) of all illness and injury-related medical encounters overall. Moreover, the ten conditions that accounted for the most medical encounters accounted for one-half (50.0%) of all illness and injury-related medical encounters overall **(Figure 2)**. In general, the conditions that accounted for the most medical encounters were predominantly musculoskeletal disorders (e.g., back), injuries (e.g., arm/shoulder, knee, foot/ankle), and substance abuse and other mental disorders (e.g., anxiety, adjustment, mood disorders) **(Table 1, Figure 2)**.

Individuals affected, by condition:

In 2011, more service members received medical care for upper respiratory infections than for any other specific condition **(Table 1)**. Of the 10 conditions that affected the most service members, two were musculoskeletal disorders and three were injuries (arm/shoulder, knee, and foot/ankle). Of note, more individuals were affected by unspecified ("all other") musculoskeletal disorders (e.g., disorders of "other" joints, muscles, tendons, soft tissues) than by musculoskeletal conditions affecting the back **(Table 1)**.

Hospital bed days, by condition:

In 2011, substance abuse and mood disorders accounted for nearly one-quarter (24%) of all hospital days **(Table 1, Figure 3)**. Together, four mental disorders (substance abuse, mood, anxiety, adjustment reaction) and two pregnancy and delivery-related conditions (delivery, pregnancy complications) accounted for one-half (50.3%) of all hospital bed days **(Table 1, Figure 3)**. One-sixth (16.9%) of all hospital bed days were attributable to injuries and poisonings.

Lost duty days, by condition:

No single condition accounted for more than 7 percent of all lost duty days. Together, the four conditions with the most lost duty days (upper respiratory infections,

TABLE 1. Health care burdens attributable to various diseases and injuries, U.S. Armed Forces, 2011

Major category condition[a]	Medical encounters[b]		Individuals affected[c]		Bed days	
	No.	Rank	No.	Rank	No.	Rank
Injury and poisoning						
Arm and shoulder	490,357	(4)	148,339	(9)	5,910	(18)
Knee	485,954	(5)	149,008	(8)	2,336	(31)
Foot and ankle	376,982	(10)	149,457	(7)	6,850	(16)
Leg	176,638	(18)	69,559	(19)	11,440	(10)
Unspecified injury	161,125	(21)	100,937	(14)	1,223	(45)
Hand and wrist	142,426	(24)	72,563	(18)	2,150	(33)
Head and neck	105,936	(27)	64,130	(21)	13,716	(8)
Back and abdomen	94,971	(29)	57,714	(26)	7,474	(15)
Other complications	43,543	(43)	22,291	(47)	13,265	(9)
Environmental	30,135	(51)	23,115	(46)	1,436	(38)
All other injury	19,207	(63)	11,956	(60)	2,549	(29)
Other injury	17,123	(67)	11,146	(61)	267	(84)
Poisoning, drugs	5,263	(89)	3,379	(82)	4,038	(25)
Poisoning, nondrug	4,509	(93)	3,191	(83)	503	(68)
Mental disorders						
Anxiety	475,546	(6)	68,672	(20)	28,738	(4)
Substance abuse dis	395,021	(7)	36,276	(36)	53,589	(1)
Adjustment	385,122	(8)	89,563	(15)	26,456	(5)
Mood	377,334	(9)	61,996	(23)	51,694	(2)
Other mental dis	146,775	(23)	57,021	(27)	2,915	(28)
Tobacco dependence	33,575	(49)	21,178	(48)	0	(139)
Psychotic	23,234	(58)	3,007	(84)	9,128	(11)
Personality	11,609	(75)	3,410	(80)	1,076	(47)
Somatoform	6,191	(87)	1,880	(94)	409	(75)
Musculoskeletal diseases						
Other back problems	837,471	(1)	201,190	(4)	8,271	(14)
Other musculoskel dis	712,298	(2)	243,638	(3)	8,926	(12)
Other knee dis	37,133	(47)	15,728	(57)	1,722	(36)
Other shoulder dis	17,621	(65)	8,576	(64)	241	(87)
Osteoarthritis	15,284	(69)	8,529	(65)	742	(59)
Rheumatoid arthritis	3,705	(97)	1,167	(98)	37	(118)
Signs and symptoms						
Other signs/symptoms	575,183	(3)	281,678	(1)	5,418	(20)
Abdomen and pelvis	222,643	(14)	131,931	(10)	2,347	(30)
Respiratory and chest	180,969	(16)	105,995	(12)	3,089	(27)
Sense organ diseases						
Refraction/accom	196,430	(15)	149,972	(6)	2	(137)
Other sense organ dis	179,003	(17)	111,422	(11)	802	(56)
Hearing disorders	61,504	(36)	36,679	(35)	23	(122)
Glaucoma	14,285	(70)	8,495	(66)	18	(126)
Cataracts	1,694	(112)	888	(103)	5	(134)
Respiratory infections						
Upper resp infections	331,253	(11)	243,773	(2)	794	(57)
Lower resp infections	64,416	(35)	40,122	(32)	4,206	(23)
Otitis media	34,858	(48)	26,771	(42)	75	(109)
Skin diseases						
Other skin diseases	282,867	(12)	152,641	(5)	8,682	(13)
Contact dermatitis	56,612	(38)	41,666	(31)	71	(111)
Sebaceous gland dis	54,509	(39)	32,872	(39)	26	(120)
Neurologic conditions						
Organic sleep dis	231,805	(13)	61,350	(24)	617	(62)
Other neurologic cond	81,274	(31)	30,249	(40)	5,114	(21)
Mononeuritis, limbs	16,390	(68)	7,809	(67)	271	(83)
Epilepsy	8,597	(83)	2,607	(87)	827	(54)
Multiple sclerosis	3,670	(98)	662	(106)	478	(71)
Parkinson disease	293	(133)	65	(131)	2	(136)
Respiratory diseases						
Allergic rhinitis	98,351	(28)	46,658	(28)	46	(114)
Other respiratory dis	67,131	(34)	37,379	(34)	4,119	(24)
Chronic sinusitis	45,112	(42)	34,108	(37)	277	(81)
Asthma	39,359	(45)	17,783	(52)	439	(74)
COPD	31,394	(50)	25,453	(44)	221	(94)
Genitourinary diseases						
Other genitourinary dis	162,160	(19)	88,736	(16)	3,633	(26)
Female genital pain	28,479	(53)	16,262	(56)	399	(76)
Kidney stones	24,061	(56)	8,892	(63)	1,228	(44)
Menstrual disorders	23,248	(57)	14,613	(59)	591	(66)
Other breast disorders	20,227	(62)	10,562	(62)	454	(72)
Nephritis/nephrosis	8,250	(85)	2,267	(89)	1,021	(49)
Benign prostatic hyper	3,262	(101)	2,218	(91)	40	(115)
Digestive diseases						
Other digestive dis	125,508	(25)	62,670	(22)	14,166	(7)
Other gastroent/colitis	75,161	(33)	60,595	(25)	940	(51)
Esophagus disease	40,129	(44)	25,739	(43)	1,073	(48)
Inguinal hernia	14,078	(72)	6,096	(73)	616	(63)
Appendicitis	6,188	(88)	3,381	(81)	5,906	(19)
Cirrhosis of the liver	2,072	(109)	1,379	(97)	78	(106)
Peptic ulcer disease	1,752	(111)	1,053	(102)	507	(67)
Infectious and parasitic diseases						
Other infect/para dis	158,815	(22)	103,911	(13)	4,635	(22)
Unspec viral infection	45,233	(41)	38,915	(33)	274	(82)
STDs	24,465	(55)	17,931	(51)	668	(60)
Diarrheal diseases	17,728	(64)	15,366	(58)	1,239	(43)
Chlamydia	8,953	(80)	7,534	(68)	14	(129)
Hepatitis B and C	3,173	(102)	1,065	(101)	28	(119)
Tuberculosis	753	(118)	378	(115)	76	(108)
Malaria	420	(126)	133	(125)	240	(90)
Bacterial meningitis	228	(135)	73	(129)	100	(104)
Intest nematode infect	226	(136)	185	(122)	17	(127)
Tropical cluster	191	(137)	64	(132)	38	(117)
Cardiovascular diseases						
Other cardiovasc dis	87,974	(30)	43,841	(29)	6,338	(17)
Essential hypertension	79,667	(32)	42,301	(30)	240	(88)
Ischemic heart disease	8,936	(81)	3,437	(79)	1,464	(37)
Cerebrovascular dis	8,581	(84)	2,224	(90)	1,786	(35)
Inflammatory	1,199	(115)	472	(110)	595	(65)
Rheumatic heart dis	519	(123)	391	(112)	38	(116)

[a]Major categories and conditions defined in the Global Burden of Disease study[1]
[b]Medical encounters: total hospitalizations and ambulatory visits for the condition (with no more than one encounter per individual per day per condition)
[c]Individuals with at least one hospitalization or ambulatory visit for the condition

TABLE 1. Health care burdens attributable to various diseases and injuries, U.S. Armed Forces, 2011

Major category condition[a]	Medical encounters[b]		Individuals affected[c]		Bed days	
	No.	Rank	No.	Rank	No.	Rank
Maternal conditions						
Pregnancy compl	112,531	(26)	24,387	(45)	18,759	(6)
Delivery	59,012	(37)	18,977	(50)	39,169	(3)
Ectopic/miscarriage/ abortion	9,120	(78)	4,090	(78)	826	(55)
Puerperium compl	2,723	(105)	1,795	(95)	667	(61)
Other maternal dis	71	(138)	36	(136)	81	(105)
Headache						
Headache	161,322	(20)	76,362	(17)	1,312	(41)
Other neoplasms						
Other neoplasms	51,013	(40)	32,954	(38)	2,124	(34)
Benign skin neoplasm	20,984	(60)	16,784	(53)	10	(133)
Lipoma	9,883	(76)	6,282	(72)	77	(107)
Uterine leiomyoma	4,827	(91)	2,195	(92)	1,320	(40)
Metabolic and immunity disorders						
Lipoid metabolism dis	38,209	(46)	28,624	(41)	20	(125)
Other metabolic dis	12,965	(73)	6,944	(71)	503	(69)
Immunity disorders	1,007	(117)	249	(120)	136	(100)
Malignant neoplasms						
Lymphoma/myeloma	8,969	(79)	777	(104)	1,016	(50)
Other mal neoplasms	6,722	(86)	1,138	(100)	1,398	(39)
Melanoma/skin cancer	5,022	(90)	2,286	(88)	169	(96)
Leukemia	4,360	(94)	233	(121)	1,257	(42)
Testicular cancer	3,887	(96)	730	(105)	293	(80)
Breast cancer	3,506	(99)	387	(113)	108	(102)
Colon/rectum cancers	3,020	(103)	276	(117)	887	(52)
Brain	2,980	(104)	261	(119)	602	(64)
Thyroid	2,198	(108)	540	(109)	375	(78)
Prostate cancer	1,857	(110)	347	(116)	241	(86)
Mouth/oropharynx	1,523	(113)	180	(123)	167	(97)
Trachea,bronchus,lung	733	(119)	91	(128)	222	(93)
Pancreas cancer	528	(122)	33	(137)	443	(73)
Bladder cancer	374	(127)	106	(126)	49	(112)
Cervix uteri cancer	370	(128)	37	(135)	10	(132)
Liver cancer	359	(129)	44	(133)	158	(98)
Ovary cancer	345	(131)	70	(130)	104	(103)
Stomach cancer	304	(132)	42	(134)	375	(77)
Esophagus cancer	285	(134)	13	(139)	144	(99)
Corpus uteri cancer	25	(139)	13	(138)	12	(131)
Endocrine disorders						
Other endocrine dis	17,565	(66)	7,362	(70)	240	(89)
Hypothyroidism	14,147	(71)	7,521	(69)	20	(124)
Other thyroid disorders	12,956	(74)	5,268	(75)	502	(70)
Oral conditions						
Other oral conditions	29,170	(52)	21,042	(49)	2,260	(32)
Dental caries	700	(120)	618	(108)	14	(130)
Periodontal disease	691	(121)	638	(107)	16	(128)
Congenital anomalies						
Other congenital anomalies	26,341	(54)	16,519	(54)	1,210	(46)
Congenital heart dis	2,300	(107)	1,144	(99)	234	(91)
Other circulatory anomalies	1,140	(116)	413	(111)	229	(92)
Blood disorders						
Other blood disorders	9,764	(77)	4,605	(77)	874	(53)
Other non-deficiency anemias	8,845	(82)	5,096	(76)	331	(79)
Iron-deficiency anemia	4,310	(95)	2,193	(93)	123	(101)
Hereditary anemias	3,429	(100)	2,858	(85)	47	(113)
Other deficiency anemias	462	(124)	263	(118)	0	(138)
Nutritional disorders						
Overweight, obesity	20,980	(61)	16,433	(55)	245	(85)
Other nutritional dis	4,528	(92)	2,835	(86)	4	(135)
Protein-energy malnutrition	359	(130)	92	(127)	22	(123)
Diabetes mellitus						
Diabetes mellitus	21,516	(59)	5,708	(74)	790	(58)
Conditions arising during the perinatal period[d]						
Other perinatal anom	2,346	(106)	1,413	(96)	74	(110)
Low birth weight	1,408	(114)	383	(114)	23	(121)
Birth asphyxia/trauma	450	(125)	176	(124)	183	(95)

[a]Major categories and conditions defined in the Global Burden of Disease study[1]
[b]Medical encounters: total hospitalizations and ambulatory visits for the condition (with no more than one encounter per individual per day per condition)
[c]Individuals with at least one hospitalization or ambulatory visit for the condition
[d]Conditions affecting newborns erroneously coded on service members medical records

substance abuse disorders, other back problems and mood disorders) accounted for 24 percent all lost duty days **(Table 1, Figure 4)**.

Relationships between health care burden indicators:

There was a strong correlation between the number of medical encounters attributable to various conditions and the number of individuals affected by the conditions (r=0.88). For example, the three leading causes of medical encounters were among the four conditions that affected the most individuals **(Table 1)**. There was also a strong relationship between lost duty days attributable to conditions and medical encounters attributable to (r=0.85) the same conditions. For example, of the 10 conditions that resulted in the most lost duty, seven were among the top ten leading causes of medical encounters. In contrast, there were not strong relationships between the hospital bed days attributable to conditions and either the numbers of individuals affected by (r=0.23) or medical encounters attributable to (r=0.48) the same conditions. For example, delivery and substance abuse disorders were among the top three sources of hospital bed days; however, these conditions affected relatively few service members **(Table 1)**.

Finally, four conditions were among the top 15 in relation to all four burden measures: adjustment disorder, "all other musculoskeletal diseases", "other back problems" and "all other skin diseases." Another five conditions were among the top 20 in relation to all burden measures: three injuries (arm/shoulder, foot/ankle,

FIGURE 2. Percentage and cumulative percentage distribution, burden categories that accounted for the most medical encounters among U.S. service members, 2011

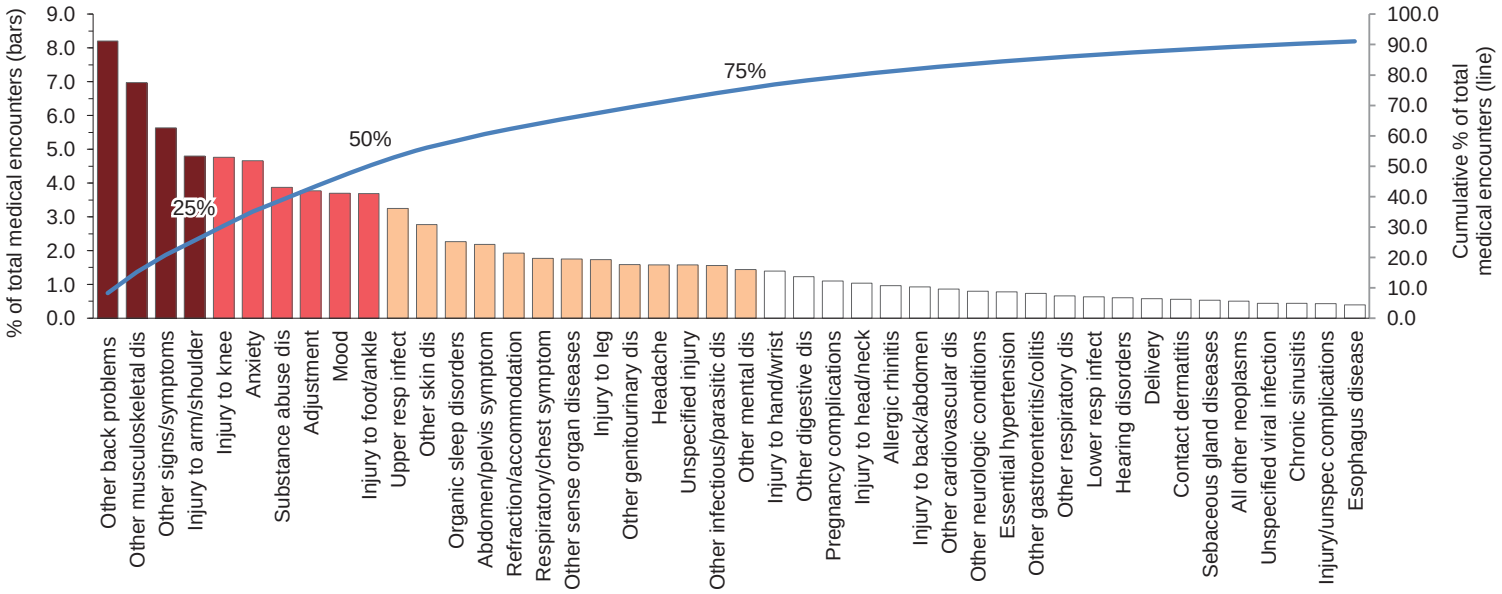
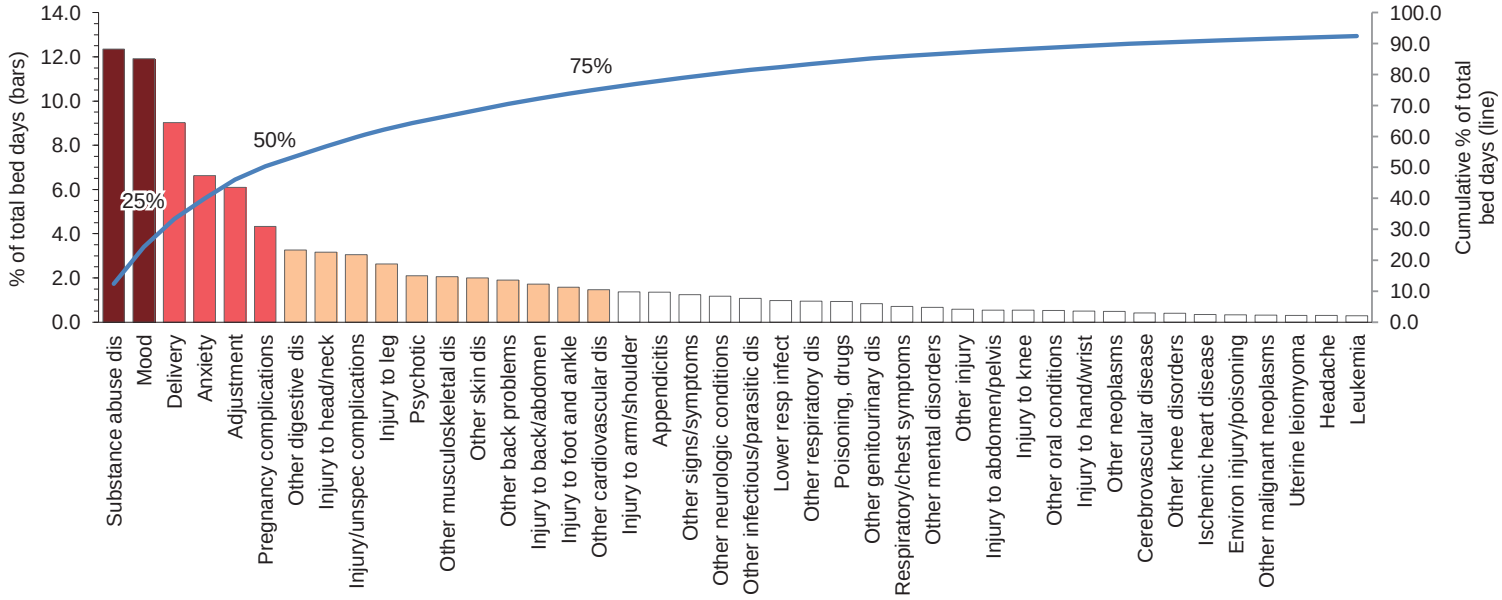


FIGURE 3. Percentage and cumulative percentage distribution, burden categories that accounted for the most hospital bed days among U.S. service members, 2011



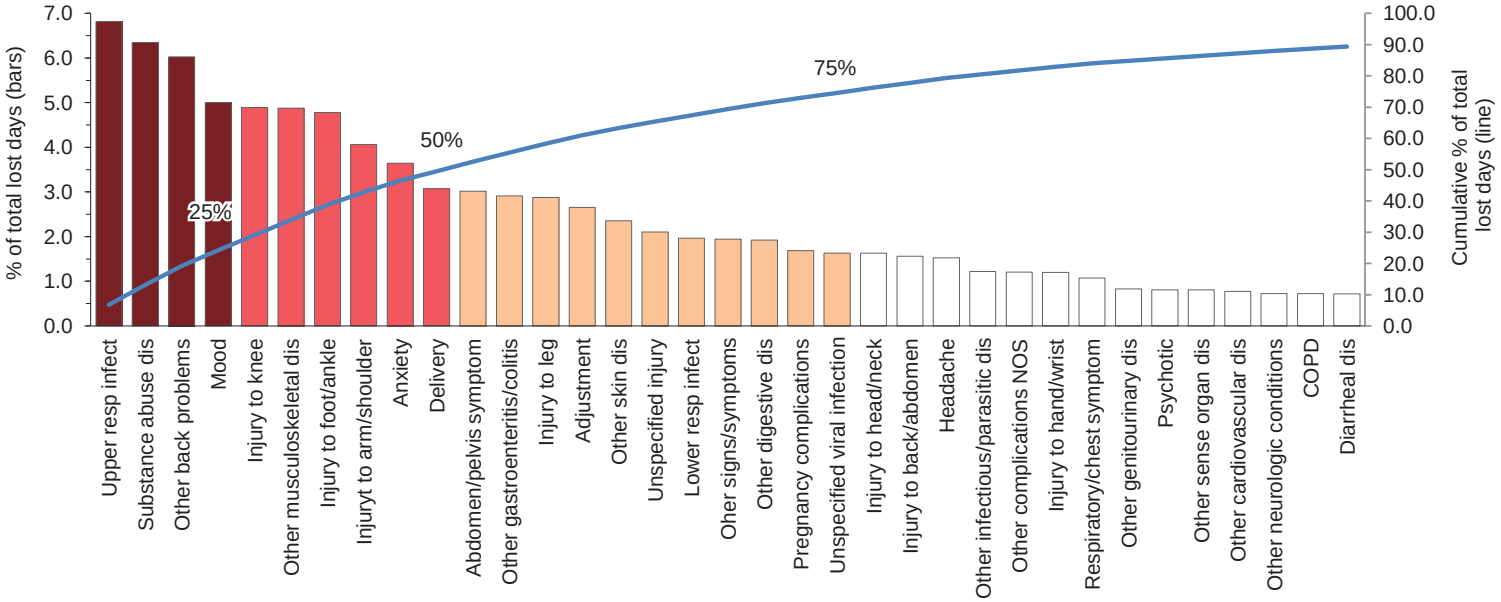
and leg), anxiety disorder, and "all other signs and symptoms" **(Table 1)**.

EDITORIAL COMMENT

This report reiterates the major findings of prior annual reports regarding morbidity and health care burdens among U.S. military members. In particular, the report documents that a majority of the morbidity and health care burden that affects U.S. military members is attributable to remarkably few (i.e., less than 8%) of the 139 burden of disease-defining conditions considered in the analysis.

In 2011 as in prior years, musculoskeletal disorders (particularly of the back), injuries (particularly of the shoulder, knee and ankle), 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 health care burdens that affected U.S. military members. For example, in 2011, substance abuse, mood, anxiety, and

FIGURE 4. Percentage and cumulative percentage distribution, burden categories that accounted for the most lost days among U.S. service members, 2011



adjustment disorders accounted for 622 person-years of lost duty due to hospitalization, convalescence, and limited duty dispositions; together, these four mental disorders and two pregnancy/delivery-related conditions accounted for more than one-half of all hospital bed days among active component members. Of note in this regard, since 2005, there has been a steep increase in hospital bed days due to mental disorders; in sharp contrast, bed days related to pregnancy and delivery have been remarkably stable since 2001.

Also, in 2011, ten burden of disease-defined conditions accounted for more than one-half of all illness and injury-related medical encounters of active component members. The ten conditions that accounted for the most medical encounters overall included four mental disorders (anxiety. substance abuse, adjustment, and mood), three anatomic site-defined injuries (arm/shoulder; knee, and foot/ankle), and two musculoskeletal disorders (back and disorders of "other" joints, muscles, tendons, soft tissues).

Throughout military history, mental disorders (including substance abuse disorders), injuries and musculoskeletal disorders of the back have been leading causes of morbidity and lost duty 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., PTSD – should have 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 health care burdens that affect U.S. military members. Illnesses and injuries that account for disproportionately large morbidity and health care burdens should be targeted to determine their susceptibilities to primary, secondary, and tertiary prevention efforts and given high priorities for prevention resources.

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