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Summary tables and figures

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Motorcycle Accidents, Active Component, U.S. Armed Forces, 1998-2008

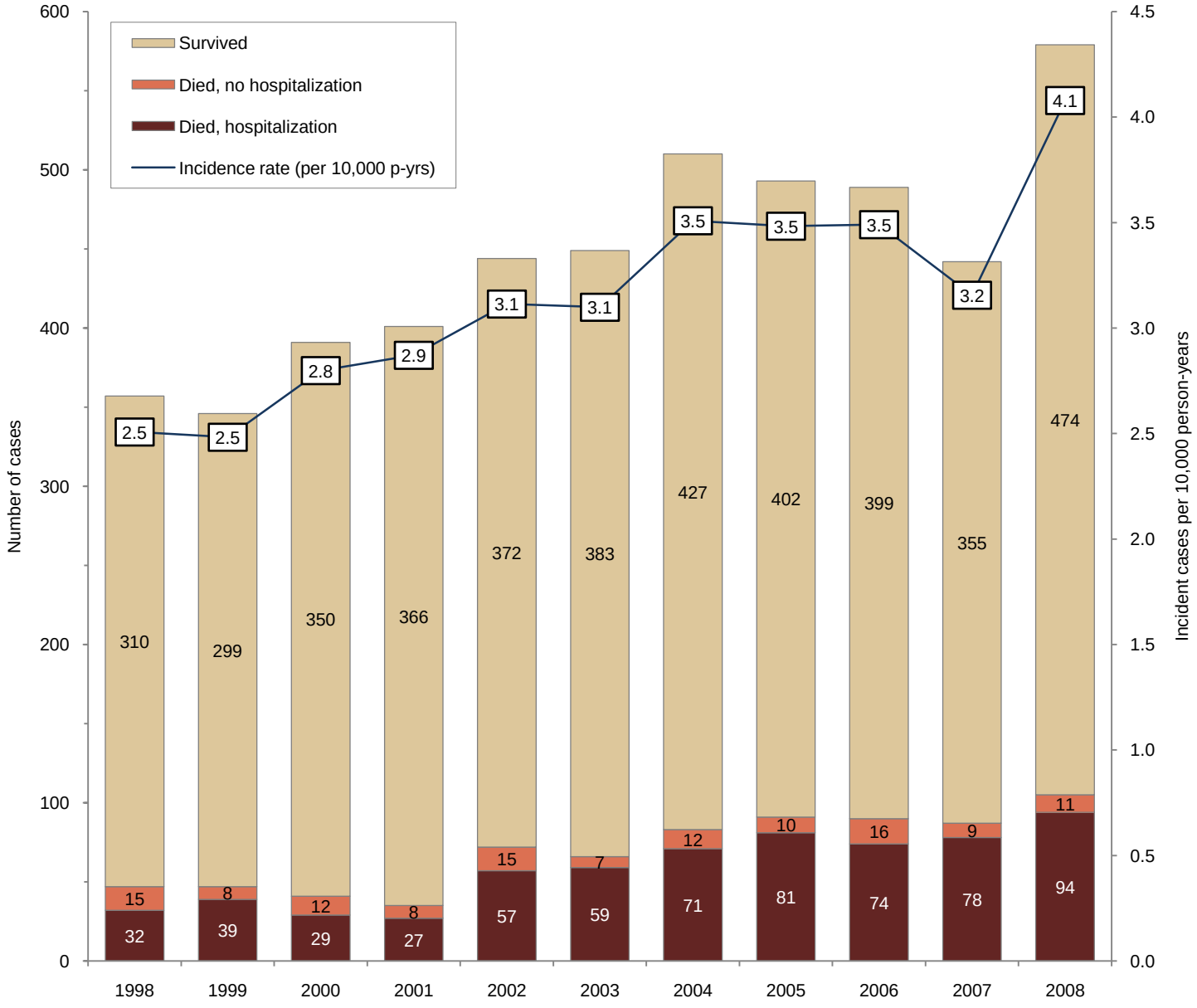
Transportation accidents are by far the leading underlying cause of deaths of U.S. service members. The May 2009 issue of the *MSMR* documented that since 1998, transportation accidents accounted for approximately one-third of all deaths of active duty service members and 40 percent of all deaths not related to war or legal interventions. [1] Eighteen percent of all transportation deaths were among motorcyclists.

In 2007 in the United States, motorcycle accidents accounted for 103,000 injuries and 5,154 deaths of motorcyclists. Between 1997 and 2006, the number of registered motorcycles in the United States increased by 75%; however, from 1997 to 2007, motorcycle accident-related injuries and deaths increased by 94% and 144%, respectively. The National Highway Traffic Safety Administration (NHTSA) estimates that per mile traveled, motorcyclists are approximately 35-times more likely than passenger car occupants to die in a traffic accident.[2]

Among men in the U.S. Army between 1990 and 1998, the self-reported behavior that was the strongest predictor of a fatal accident while in active service was motorcycle use.[3] More recently, the safety centers of the U.S. military services have documented sharp increases in numbers and rates of motorcycle fatalities among service members.[4,5]

This report documents numbers, rates, trends, and demographic and military characteristics of U.S. military

Figure 1. Motorcycle accident-related hospitalizations/deaths, by clinical outcome, active component, U.S. Armed Forces, 1998-2008



members who were hospitalized after or fatally injured during motorcycle accidents from 1998 through 2008.

Methods:

The surveillance period was 1 January 1998 to 31 December 2008. The surveillance population included all individuals who served in the active component of the U.S. Armed Forces any time during the surveillance period. All data were derived from records routinely maintained in the Defense Medical Surveillance System.

For this analysis, a "motorcycle accident" was defined by a hospitalization record with an external cause of injury code indicating that the injured person was a motorcyclist or motorcycle passenger **(Table 1)**; or by a death record in which the underlying cause was "motorcyclist involved in any accident except collision with railway train." If a service member had more than one motorcycle-related hospitalization, only the earliest was used for the analysis.

Table 1. External cause of injury codes used to define motorcycle accidents

E codes (ICD-9-CM):	E8102, E8112, E8122, E8132, E8142, E8152, E8162, E8172, E8182, E8192, E8103, E8113, E8123, E8133, E8143, E8153, E8163, E8173, E8183, E8193
NATO Standard Agreement (STANAG) codes:	106, 116, 126, 136

Results:

Between 1998 and 2008, there were 4,901 motorcycle accidents that resulted in hospitalizations and/or deaths of active component service members (overall incidence rate [IR]: 3.15 per 10,000 person-years [p-yrs]). During the 11-year period, the overall incidence rate generally increased, and the highest annual rate was in 2008 (IR: 4.08 per 10,000 p-yrs) **(Figure 1, Table 2)**. Of all motorcycle accident-related episodes included in this analysis, approximately one of six resulted in deaths (n=764, case fatality: 15.6%).

Across demographic and military subgroups, the highest crude rates were among Marines (4.02 per 10,000 p-yrs), 20-24 year-olds (4.03 per 10,000 p-yrs), service members in combat-specific occupations (3.64 per 10,000 p-yrs) and those with no post-high school educational attainment (3.65 per 10,000 p-yrs). Between 1998 and 2008, all Services except the Air Force experienced absolute increases in rates of more than 2.0 per 10,000 p-yrs **(Table 2)**.

During 4,137 hospitalizations following motorcycle accidents, the most frequent (62%) primary diagnoses were "fractures." Of fractures reported as primary diagnoses, the most frequent were those of the tibia and fibula (n=399), radius and ulna (n=379), ankle (n=220), clavicle (n=198) and vertebral column (n=181). The most frequent primary diagnoses (by 3-digit ICD-9 code) other than fractures were "open wound of knee, leg (except thigh) and ankle," "concussion," "traumatic pneumothorax and hemothorax," "sprains and strains of knee and leg," and "injury to spleen" **(Table 3)**.

Alcohol was reported as a factor in 8.6% of all motorcycle accident-related deaths (per death records). Of all motorcycle accident-related hospitalizations, 2.2% had concurrent diagnoses of "alcohol abuse", "alcohol dependence syndrome" or "excessive blood level of alcohol" (data not shown).

Motorcycle accident-related hospitalizations occurred at 140 U.S. military installations worldwide. In the United States, 21 locations had more than 50 hospitalizations each and accounted for two-thirds of the total **(Table 4)**. The facilities with the most motorcycle-related hospitalizations were tertiary care medical centers (Naval Medical Center [NMC] San Diego, CA, n=484; Tripler Army Medical Center/Fort Shafter, HI, n=351; NMC Portsmouth, VA, n=291) and hospitals on installations with large combat units (Fort Bragg, NC, n=248; Fort Hood, TX, n=154, Camp Pendleton, VA, n=140; Fort Campbell, n=114; Camp Lejeune, NC, n=99). Approximately 10% of the total motorcycle accident-related hospitalizations were in Europe or Japan **(Table 4)**.

The largest numbers of motorcycle accident-related hospitalizations and deaths occurred in May and July, respectively. More than one-half of all hospitalizations (52%) and deaths (54%) occurred between May and September **(Figure 2)**. Nearly one-half (47%) of all motorcycle deaths

Figure 2. Motorcycle accident-related hospitalizations/deaths, by month, active component, U.S. Armed Forces, 1998-2008

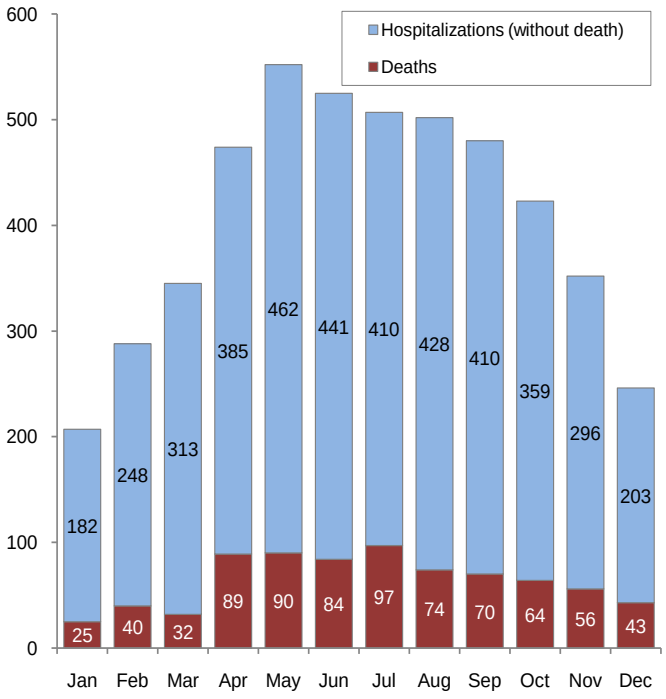


Table 2. Motorcycle accident-related hospitalizations/deaths, active component, U.S. Armed Forces, 1998-2008

	1998		1999		2000		2001		2002		2003		2004		2005		2006		2007		2008		Total 1998-2008	
	No.	Rate*	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
Total	357	2.5	346	2.5	391	2.8	401	2.9	444	3.1	449	3.1	510	3.5	493	3.5	489	3.5	442	3.2	579	4.1	4901	3.15
Service																								
Army	127	2.7	124	2.6	144	3.0	130	2.7	132	2.7	130	2.7	195	4.0	183	3.8	174	3.5	167	3.3	251	4.7	1757	3.27
Navy	95	2.5	85	2.3	103	2.8	120	3.3	137	3.6	123	3.3	150	4.0	132	3.7	142	4.1	102	3.1	150	4.6	1339	3.38
Air Force	82	2.2	78	2.2	74	2.1	91	2.6	108	3.0	107	2.9	98	2.6	81	2.3	95	2.8	87	2.6	69	2.1	970	2.50
Marine Corps	51	3.0	55	3.2	64	3.7	57	3.3	64	3.7	86	4.9	61	3.5	92	5.2	72	4.0	81	4.4	98	5.0	781	4.02
Coast Guard	2	0.6	4	1.2	6	1.7	3	0.9	3	0.8	3	0.8	6	1.5	5	1.3	6	1.5	5	1.2	11	2.7	54	1.31
Sex																								
Male	351	2.9	334	2.8	383	3.2	390	3.3	431	3.5	437	3.5	493	4.0	476	3.9	473	3.9	432	3.6	559	4.6	4759	3.57
Female	6	0.3	12	0.6	8	0.4	11	0.5	13	0.6	12	0.6	17	0.8	17	0.8	16	0.8	10	0.5	20	1.0	142	0.63
Race/ethnicity																								
White, non-Hispanic	244	2.9	241	2.8	291	3.3	282	3.2	314	3.5	301	3.3	345	3.8	331	3.7	316	3.6	267	3.0	391	4.3	3323	3.40
Black, non-Hispanic	33	1.2	43	1.6	47	1.7	58	2.1	70	2.6	76	2.8	93	3.6	85	3.5	76	3.2	87	3.8	81	3.5	749	2.64
Other	80	2.7	62	2.4	53	2.2	61	2.5	60	2.4	72	2.7	72	2.6	77	2.8	97	3.5	88	3.1	107	3.7	829	2.81
Age																								
<20	19	1.6	13	1.1	22	1.8	26	2.1	29	2.4	31	2.7	17	1.5	28	2.9	11	1.2	19	2.0	26	2.5	241	1.96
20-24	147	3.4	142	3.4	163	3.7	166	3.7	177	3.7	194	3.9	232	4.6	206	4.3	220	4.6	179	3.8	236	5.0	2062	4.03
25-29	88	2.9	91	3.2	91	3.3	95	3.5	98	3.6	94	3.3	110	3.7	121	4.0	108	3.5	103	3.3	150	4.6	1149	3.53
30-34	54	2.3	44	2.0	49	2.3	49	2.4	69	3.3	62	3.0	77	3.7	70	3.4	70	3.5	69	3.5	76	3.8	689	2.99
35-39	33	1.6	42	2.0	43	2.1	44	2.2	49	2.5	51	2.7	51	2.8	44	2.5	39	2.3	41	2.4	61	3.6	498	2.40
40+	16	1.2	14	1.0	23	1.7	21	1.5	22	1.5	17	1.1	23	1.5	24	1.6	41	2.7	31	2.1	30	2.1	262	1.64
Marital status																								
Single	176	3.2	142	2.5	195	3.3	226	3.7	229	3.6	206	3.2	257	4.1	238	4.0	211	3.7	179	3.2	246	4.3	2305	3.54
Married	170	2.1	183	2.4	175	2.3	158	2.2	186	2.5	216	2.8	230	3.0	229	3.0	250	3.2	239	3.1	297	3.8	2333	2.76
Other	11	2.0	21	3.9	21	3.8	17	3.2	29	5.2	27	5.1	23	4.4	26	4.9	28	5.1	24	4.2	36	5.9	263	4.35
Education																								
High school or less	254	2.9	238	2.8	285	3.3	341	3.3	362	3.5	379	3.6	422	4.0	412	4.0	407	4.0	365	3.6	477	4.7	3942	3.65
College 2+ yr	41	1.7	98	2.2	75	2.0	43	1.9	55	2.2	51	2.0	59	2.2	56	2.1	65	2.4	55	1.9	82	2.8	680	2.14
Post college	7	0.8	8	0.9	14	1.5	7	0.8	4	0.5	7	0.9	8	1.0	7	0.9	7	0.9	11	1.3	14	1.7	94	1.00
Unknown	55	2.4	2	1.2	17	3.1	10	2.0	23	3.5	12	1.8	21	3.6	18	4.8	10	2.5	11	4.4	6	2.4	185	2.78
Rank																								
E1-4	182	2.9	165	2.6	196	3.1	188	3.0	192	3.0	206	3.2	243	3.8	219	3.6	215	3.6	194	3.2	253	4.1	2253	3.29
E5-9	138	2.5	149	2.7	157	2.9	181	3.3	203	3.6	214	3.7	224	3.9	238	4.1	240	4.2	221	3.9	276	4.8	2241	3.61
O or W	37	1.6	32	1.4	38	1.7	32	1.4	49	2.2	29	1.2	43	1.8	36	1.5	34	1.5	27	1.2	50	2.2	407	1.61
Military occupation																								
Combat	88	3.1	93	3.3	89	3.2	94	3.4	92	3.3	104	3.6	110	3.8	112	3.7	115	4.0	116	4.0	143	4.8	1156	3.64
Health care	18	1.5	24	2.0	13	1.1	27	2.3	27	2.3	21	1.8	29	2.4	28	2.4	28	2.4	28	2.4	35	3.0	278	2.16
Other	251	2.5	229	2.3	289	2.9	280	2.8	325	3.2	324	3.1	371	3.6	353	3.5	346	3.5	298	3.0	401	4.0	3467	3.12

*Rate per 10,000

and 38% of all hospitalizations occurred on Saturdays or Sundays.

Editorial comment:

During the past 11 years, there has been an average of nearly 450 motorcycle accidents with severe injuries (including nearly 70 deaths) per year among active component members of the U.S. Armed Forces. During the period, there were sharp increases in both hospitalizations and deaths due to motorcycle accidents; there were more motorcycle accident-related hospitalizations and deaths by far in 2008 than in any prior year of the period.

This report summarizes motorcycle accidents with severe clinical consequences in relation to demographic and military characteristics and geographic locations. The analysis does not account for effects of potentially important factors such as temporal changes in numbers of military motorcyclists and miles traveled; licensure, training, and experience; availability and use of safety clothing and equipment; recent deployment and combat experiences; medical histories and psychological status; alcohol and drug use (illicit/medically prescribed); weather and road conditions; natures and circumstances of accidents and driver culpabilities; and so on. Without detailed information regarding such factors, novel insights that could lead to more effective accident prevention or personal protection measures are not possible.

Still, the findings of this report are potentially useful to sharpen awareness of the increasing magnitudes and clinical impacts of motorcycle accidents among active service members. Increased awareness may enhance enforcement of and compliance with current safety guidelines. It may also prompt investigation into how safety guidelines could be strengthened.

Currently, service members who ride motorcycles are required to wear a certified helmet, gloves of abrasion-resistant material, a long-sleeved shirt and sturdy, over-the-ankle footwear. Use of a jacket with "armor" or padding is encouraged but not required; cloth athletic shoes (e.g., high-top sneakers) are permitted.[5] The expansion of personal

Table 3. Most frequent primary diagnoses during motorcycle accident-related hospitalizations, by 3 digit ICD-9 code, 1998-2008

Primary diagnosis	No. of hospitalized service members
Fracture of tibia and fibula	399
Fracture of radius and ulna	379
Fracture of ankle	220
Fracture of clavicle	189
Fracture of vertebral column w/o spinal cord injury	181
Fracture of other and unspecified parts of femur	170
Injury other and unspecified	141
Fracture of one or more tarsal/metatarsal bones	134
Fracture of pelvis	125
Open wound of knee,leg (except thigh),ankle	115
Fracture of humerus	102
Concussion	101
Fracture of rib(s) sternum larynx and trachea	77
Traumatic pneumothorax and hemothorax	72
Fracture of face bones	71
Fracture of carpal bone(s)	68
Fracture of scapula	67
Sprains and strains of knee and leg	63
Injury to spleen	61
Fracture of metacarpal bone(s)	59

protective equipment (PPE) requirements to include certified motorcycle boots may reduce the frequency of tibia/fibula and ankle fractures—the first and third most frequent primary diagnoses during motorcycle-related hospitalizations of U.S. service members. Additionally, use of a certified motorcycle jacket with padded sleeves, shoulders and spine could prevent or reduce the severity of trunk injuries and other relatively frequent motorcycle-related fractures (e.g., radius, ulna, clavicle). Padded PPEs have been shown to reduce the risk of fractures in Europe,[6] where certified motorcycle boots and jacket are mandatory for riders.

In recent months, Service safety centers and leaders at the highest levels of the Services have focused significant attention on motorcycle safety programs and activities. Experimental programs to reduce accidents include advanced sportbike training courses and "track day" events during which service members can ride their motorcycles at high speeds in safe environments.[7]

Potentially useful information regarding motorcycle safety is available from Service safety centers at:

- Naval Safety Center: http://safetycenter.navy.mil/toolbox/traffic/motorcycles/default.htm
- Air Force Safety Center: http://www.afsc.af.mil/
- Army Safety Center: https://safety.army.mil/povmotorcyclesafety/

Analysis and report by Scott Cherry, CPT, MC, U.S. Army; data summaries conducted by Stephen Taubman, PhD, Data Analysis Group, Armed Forces Health Surveillance Center.

Table 4. Motorcycle accident-related hospitalizations, by location of treatment facility, active component, U.S. Armed Forces, 1998-2008

Location	No. of hospitalizations	% of total
NMC San Diego, CA	484	11.7
Fort Shafter/Tripler AMC, HI	351	8.5
NMC Portsmouth, VA	291	7.0
Fort Bragg, NC	248	6.0
Fort Hood, TX	154	3.7
Germany	153	3.7
Camp Pendleton, CA	140	3.4
Japan	132	3.2
Fort Campbell, KY	114	2.8
Europe (except Germany)	109	2.6
Camp Lejeune, NC	99	2.4
Washington, DC/NNMC Bethesda	94	2.3
Fort Bliss, TX	89	2.2
Fort Sam Houston, TX	88	2.1
Fort Lewis, WA	79	1.9
Fort Carson, CO	67	1.6
Fort Stewart, GA	66	1.6
Fort Benning, GA	61	1.5
Jacksonville, FL	59	1.4
Travis AFB, CA	58	1.4
Lackland AFB, TX	57	1.4
Fort Gordon, GA	55	1.3
Fort Wainwright, AK	53	1.3
Eglin AFB, FL	52	1.3
Other installations (n=96)	*984*	23.8
Total	*4137*	100.0

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Lightning Strike Injuries, Active Component, U.S. Armed Forces, 1999-2008

Each year in the United States, an average of 265 people are reported as injured by and approximately 40 people die from effects of lightning.[1] The National Weather Service estimates that as many as 200 lighting strike injuries per year are unreported and that approximately 10% of lightning injuries are fatal.[2]

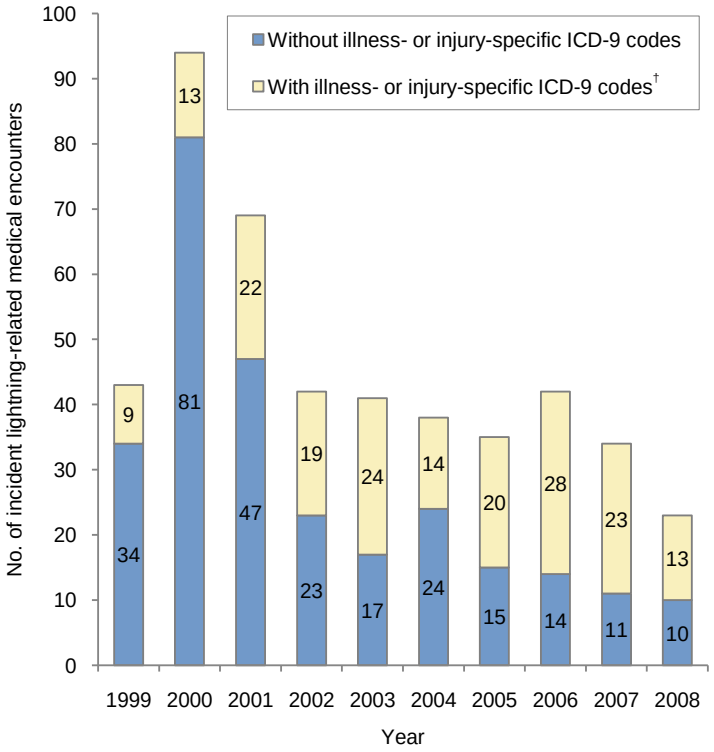
In non-military populations and settings in the United States, lightning injuries occur most often during summer among people who are outdoors during afternoon and early evening hours. Activities commonly associated with lighting injuries include waiting under trees, camping, jogging, golf, baseball, water-related activities (swimming, boating), working on construction or electrical equipment and using landline telephones. Less than one-third of lightning injuries in the United States are work-related[3] and the most common days of lighting injury are Saturday and Sunday.[4]

Lightning-associated injuries result from electrical current, heat and concussive force.[5] Lightning injuries are usually neurological with manifestations ranging from temporary confusion to cardio-pulmonary arrest. Blunt force injures can result from falling heavy objects (e.g., trees) after direct strikes or explosive blasts from nearby strikes. Direct lighting strikes to individuals are infrequent. More often, the energy of a lighting strike is transmitted to individuals from the ground, a tree or other objects.[3] In approximately one-fifth of lighting injury incidences, there are two or more victims.[4]

News reports of episodes of multiple casualties from single lightning strikes reported in newspapers provide insights into the nature and scope of the risk in military settings. For example, on 16 August 2005, a single lightning strike injured 19 soldiers during a field exercise at Fort Benning, GA. Four of the soldiers were hospitalized overnight for observation; the others were treated and released. On 10 June 2006, four soldiers were struck—one fatally—at Gwangju Air Base in Seoul, Korea while attempting to right a tent that had been blown over. On 7 August 2006, three soldiers were hospitalized when lightning struck a nearby tree at Camp Mackall, NC. On the afternoon of 7 August 2008, two soldiers at Fort Drum, NY were injured by a lightning strike (50-75 feet away) while walking in a parking lot. Both soldiers complained of tingling and numbness.

Military members work, train, conduct operations, and recreate outdoors—year round and in all weather conditions. In turn, they often confront thunderstorms and lightning. This

Figure 1. Incident lightning-related medical encounters*, by year, active component, U.S. Armed Forces, 1999-2008



*Inpatient or outpatient encounter with ICD-9-CM: 994.0 "effects of lightning" or E907 "accident caused by lightning" in any diagnostic position

†Medical encounters with at least one diagnosis other than the following: ICD-9-CM: 994.0 "effects of lightning", 994.9 "other effects of external causes", mental health diagnoses (290-319), E and V codes.

Table 1. Lightning-associated injuries*, active components, U.S. Armed Forces, 1999-2008

	Total 1999-2008	
	No.	%
Total	185	100.0
Service		
Army	103	55.7
Navy	25	13.5
Air Force	33	17.8
Marine Corps	18	9.7
Coast Guard	6	3.2
Sex		
Male	170	91.9
Female	15	8.1
Race/ethnicity		
White non-Hispanic	141	76.2
Black non-Hispanic	18	9.7
Other	26	14.1
Age		
<20	20	10.8
20-24	65	35.1
25-29	41	22.2
30-34	27	14.6
35-39	24	13.0
40+	8	4.3
Military occupation		
Combat	66	35.7
Health care	7	3.8
Other	112	60.5

*Inpatient or outpatient encounter with ICD-9-CM: 994.0 "effects of lightning" or E907 "accident caused by lightning" and at least one diagnostic code other than V codes, E codes, mental disorders or "other effects of external causes"

Table 2. Numbers and rates* of lightning-related medical encounters, by Service and year, active component, U.S. Armed Forces, 1999-2008

	All active component service members		Army		Navy		Air Force		Marine Corps		Coast Guard	
	No.	Rate*	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
Total 1999-2008	*185*	*1.31*	*103*	*2.10*	*25*	*0.70*	*33*	*0.94*	*18*	*1.02*	*6*	*1.58*
1999	9	0.65	5	1.07	0	0.00	3	0.84	1	0.58	0	0.00
2000	13	0.93	5	1.06	3	0.82	4	1.14	0	0.00	1	2.88
2001	22	1.57	9	1.90	3	0.81	5	1.44	5	2.91	0	0.00
2002	19	1.33	14	2.91	1	0.27	4	1.11	0	0.00	0	0.00
2003	24	1.66	12	2.45	3	0.80	7	1.91	2	1.13	0	0.00
2004	14	0.96	7	1.42	3	0.81	3	0.80	0	0.00	1	2.56
2005	20	1.41	10	2.06	5	1.39	1	0.28	2	1.12	2	5.07
2006	28	2.00	20	4.06	4	1.16	1	0.29	3	1.68	0	0.00
2007	23	1.64	16	3.14	2	0.60	3	0.90	1	0.55	1	2.47
2008	13	0.92	5	0.94	1	0.31	2	0.62	4	2.06	1	2.42

*Rate per 100,000 person-years

report documents frequencies, rates, trends, and correlates of risk of lightning injuries of U.S. service members during the past 10 years. Unlike previous summaries of lighting-strike events among service members,[5] this analysis characterizes the minority of incident lightning-related medical encounters during which specific injuries or illnesses were reported (i.e., diagnoses other than the non-specific diagnosis of "effects of lighting"). Mental and behavioral sequelae, which are known consequences of lightning injury,[6] were not analyzed for this report.

Methods:

The surveillance period was January 1999-December 2008. The population base included all service in the active component of the U.S. Armed Forces during the surveillance period. Electronic records of all active component U.S. service members were searched to identify hospitalizations and ambulatory encounters that included diagnosis codes (in any diagnostic position) indicative of lightning injuries (ICD-9-CM: 994.0 "effects of lightning"; ICD-9-CM: E907 "accident caused by lightning"). For analysis purposes, cases of "lightning-associated injuries/illnesses" were defined by medical encounters that included a diagnosis code indicative of a lightning injury *plus* one or more injury- or illness-specific diagnosis codes (excluding "mental disorders").

Medical encounters were not case defining as "lightning-associated injuries/illnesses" if (a) the primary (first-listed) diagnosis was a V-code or E-code (i.e., the primary reason for the encounter was not a current illness or injury); or (b) there were no diagnoses other than lightning indicator diagnoses, V-codes, E-codes, mental disorders (ICD-9-CM: 290-319) or "other effects of external causes" (ICD-9-CM: 994.9). If an individual had case-defining inpatient and outpatient records, information from the hospitalization record was used for the analysis. Each individual was included as a case only once during the surveillance period.

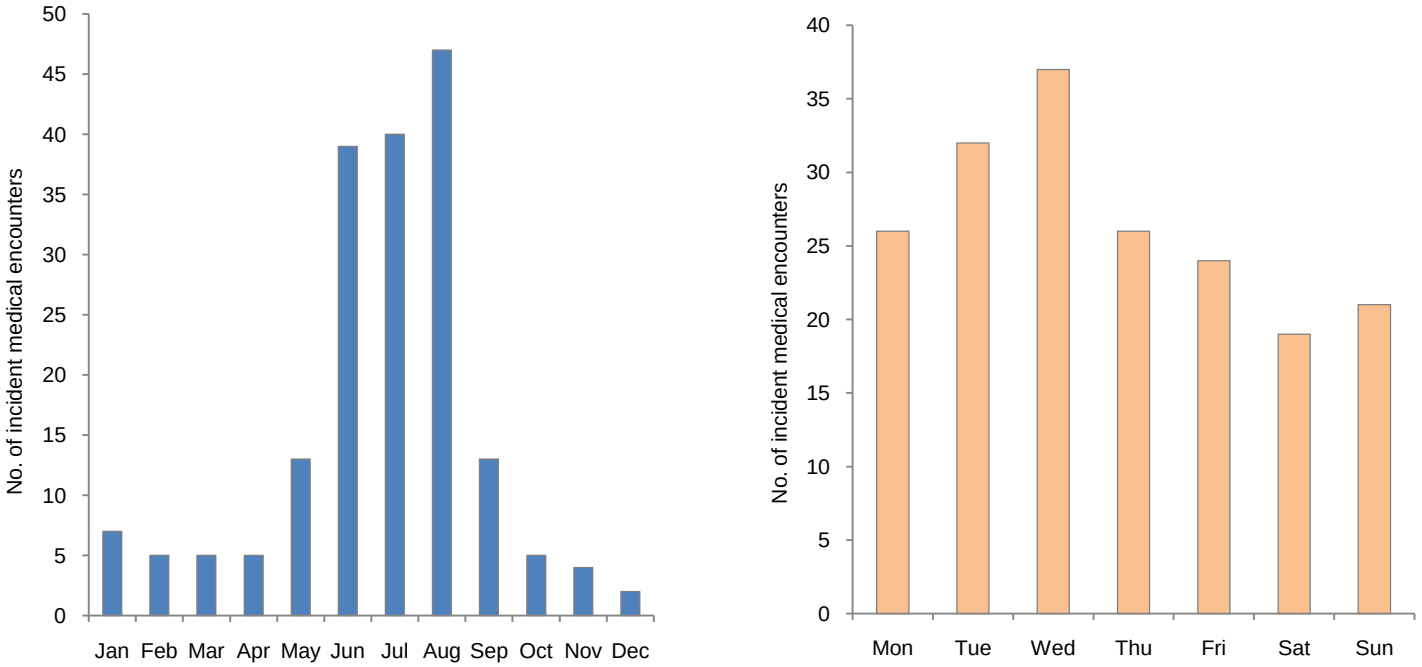
Results:

Between 1999 and 2008, 461 service members had incident lighting-related medical encounters; of these, 185 (40%) had ICD-9-CM codes that documented specific "lightning-associated injuries/illnesses" **(Figure 1).** Of the 185 service members with lightning-associated injuries/illnesses, most were males (92%), in their 20s (57%), in the Army (56%) or Air Force (18%), and in military occupations (61%) other than combat-specific or health care **(Table 1).**

During the ten-year period, the overall rate of episodes of lightning-associated injuries/illnesses was 1.31 per 100,000 person-years (p-yrs) **(Table 2).** Service-specific rates were highest in the Army (2.10 per 100,000 p-yrs) and Coast Guard (1.58 per 100,000 p-yrs) and lowest in the Navy (0.70 per 100,000 p-yrs). During the period, annual numbers (and rates) of episodes of lightning-associated injuries/illnesses ranged from 9 (0.65 per 100,000 p-yrs) in 1999 to 28 (2.00 per 100,000 p-yrs) in 2006; in general, however, overall numbers and rates varied from year to year with no apparent trend **(Table 2).**

Service members in enlisted occupations accounted for 85% (n=158) of those diagnosed with lightning-associated injuries/illnesses. The enlisted occupational groups most affected by lightning-associated injuries/illnesses were "combat" (n=54) and "electrical/mechanical equipment repair" (n=25, 13.5%); of the latter, nearly half were related to aircraft repair (n=12, 6.5%). Of note, "communications specialists" and "electronic equipment repairers" — all of whom work with radio, radar, and other electromagnetic transmission equipment — together accounted for more than one-seventh (n=28, 15.1%) of all lightning-associated injuries/illnesses during the period. Among the 27 officers

Figure 2. Lightning injuries, by month and by day of the week, active component, U.S. Armed Forces, 1999-2008



who were affected, nearly one-half (n=12) were "tactical operations officers" (e.g., ground and naval combat arms officers, fixed wing and helicopter pilots, air crewmen, operations staff officers) **(Table 3)**.

Approximately 15% (n=27) of all incident medical encounters for lightning-associated injuries/illnesses were hospitalizations. The most frequent diagnoses during medical encounters for lightning-associated injuries/illnesses were "disturbance of skin sensation" (n=25, 13.5%) and burns (n=18, 9.7%). Cardiac dysrhythmias/conduction disorders (n=14) and "sprains and strains" (n=14) each affected approximately one of every 13 (7.6%) lightning-injured service members. "Chest symptoms" and "myalgia and myositis unspecified" affected six service members each (data not shown).

More than two-thirds (68%) of all lightning-associated injuries/illnesses (and all 3 deaths) occurred in June (n=39), July (n=40), or August (n=47). Significantly fewer episodes occurred in May (n=13) and September (n=13); only 2 to 7 episodes occurred each month from October through April **(Figure 2)**. More than three-fourths (n=145, 78%) of all lightning injury episodes occurred during days of the usual work week. The most episodes were on Wednesdays (n=37) and the fewest on Saturdays (n=19) and Sundays (n=21) **(Figure 2)**.

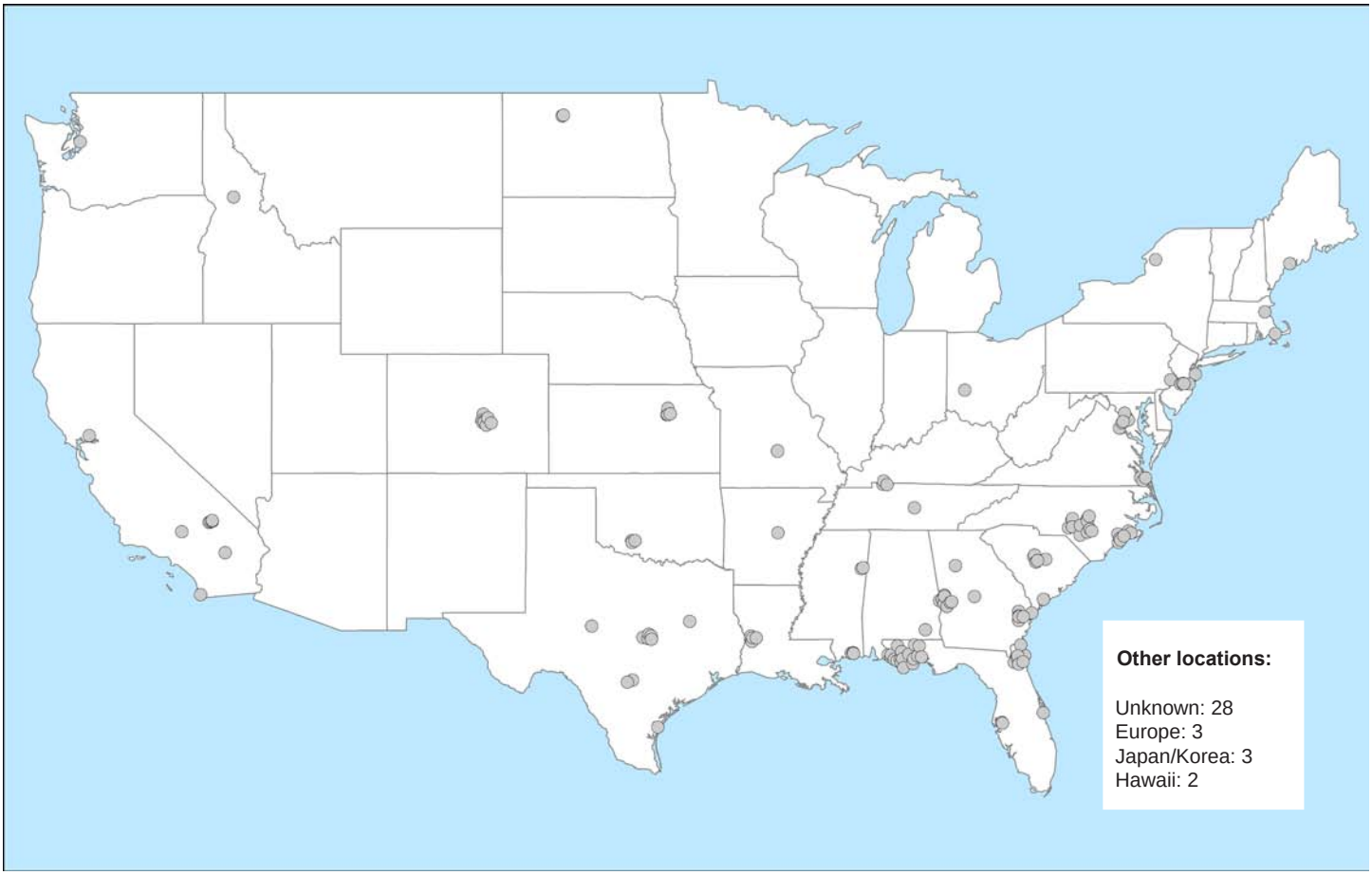
Lightning-associated injuries/illnesses occurred at more than 65 U.S. military installations worldwide. However, ten locations had at least 5 cases each; together they accounted for more than two-fifths (43%) of the total **(Table 4)**. Installations with the most cases tended to be in the southeastern United States; located along the Gulf (Eglin Air Force Base/Naval Hospital Pensacola, FL, n=19) or Atlantic (Naval Air Station/Naval Hospital Jacksonville, FL, n=6) coasts of Florida; hosted large ground combat units (Fort Bragg, NC, n=13; Fort Carson, CO, n=7; Fort Hood, TX, n=6; Camp Lejeune, NC, n=5; Fort Campbell, KY, n=5; Fort Stewart, GA, n=5); and/or served large trainee populations (Fort Benning, GA, n=8; Fort Jackson, SC, n=5) **(Table 4, Figure 3)**.

During the 10-year period, there were 16 spatial-temporal clusters (two or more service members treated for lighting-associated injuries on the same day at the same location). Clusters affected two to six service members each and 48 overall. All of the clusters occurred between late May and early September. The two largest clusters were at Eglin Air Force Base, Florida — on 27 June 2007, 6 airmen were injured (one hospitalized for "effects of lightning"); and on 9 August 2006, 5 airmen were injured (four hospitalized with third degree burns, alteration of consciousness, and/or "effects of lightning"). Of all lightning-associated injuries/illnesses during the period, approximately one-fourth (n=48, 26%) were part of clusters. If each cluster was caused by a single lightning strike, then nearly one of nine (10.5%) injury-producing strikes produced clusters.

Editorial Comment:

This report summarizes records of lightning-associated medical encounters that included diagnoses specific for injuries or illnesses. The summary did not include medical encounters with the nonspecific diagnosis "effects of lightning" and no more specific diagnoses because the non-specific diagnosis is not informative regarding the nature or severity of the "effects." Of course, the use of a restrictive

Figure 3. Locations of lightning-associated injuries/illnesses, active component, U.S. Armed Forces, 1999-2008



case definition produces an incomplete ascertainment of the total number of service members with *any* effects of lightning – no matter how clinically mild or transient. In addition, because the analysis was based on electronic medical records, it did not ascertain cases that occurred in settings where medical encounters are not documented electronically (e.g., deployments, field training exercises). Also, service members who received medical care for lightning-associated injuries were not included as cases if the diagnostic codes indicative of lightning exposure were not reported on the electronic medical record. However, the purpose of this analysis was not to completely enumerate all lightning affected service members; rather, it aimed to describe the spectrum of clinically significant effects of lightning-associated injuries. It also aimed to extend and update epidemiologic findings from previous military and civilian studies.

Some findings of this analysis are relevant and useful for prevention. For example, in the general population of the U.S., most lightning injuries occur on weekends, presumably during recreational activities. In contrast, among U.S. military members, most lightning injuries occur on weekdays, presumably during military training or operational activities. In both civilian and military populations, most lightning injuries occur in the summer (and in civilian settings, approximately two-thirds of lightning injuries

Table 3. Lightning injuries, by military occupation*, active component, U.S. Armed Forces, 1999-2008

	No.	% (N=185)
Enlisted occupations		
Combat (infantry, gun crew, seamanship)	54	29.2
Electrical/mechanical equipment repairer (aircraft, automotive)	25	13.5
Communications/intelligence specialist (radio,radar, sonar)	18	9.7
Service and supply handler	12	6.5
Functional support and administration	12	6.5
Electronic equipment repairer (radio, radar, navigation)	10	5.4
Craftsworker	10	5.4
Health care specialist	5	2.7
Other technical and allied specialist	5	2.7
Non-occupational/other	7	3.8
Officer occupations		
Tactical operations officer (pilots, crew, operations staff)	12	6.5
All other officer occupations	15	8.1
Total	*185*	*100.0*

*DoD Occupational Conversion Index, March 2001

Table 4. Episodes of medical care for lightning-strike injuries, by location, active component, U.S. Armed Forces, 1999-2008

Location	No.	% (N=185)
Eglin AFB/Pensacola, FL	19	10.3
Fort Bragg, NC	13	7.0
Fort Benning, GA	8	4.3
Fort Carson, CO	7	3.8
Camp Lejeune/Cherry Point, NC	7	3.8
Jacksonville, FL	6	3.2
Fort Hood, TX	5	2.7
Fort Stewart, GA	5	2.7
Fort Jackson, LA	5	2.7
Fort Campbell, KY	5	2.7
Other known locations	*80*	*43.2*
Unknown locations	*25*	*13.5*
Total	185	100.0

occur in the afternoon). Among U.S. military members, more than two-fifths (43%) of all lightning injuries occurred at installations in Florida, Georgia, or North Carolina; however, the risk is ubiquitous. In the past ten years, lightning injuries have occurred at more than 65 installations worldwide.

Many lighting injuries can be prevented by simple measures such as avoiding working and training outside during thunderstorms and seeking appropriate shelter when storms are imminent. The dangers of lightning are not always apparent to ground observers. Lightning may strike as far as 10 miles ahead of approaching thunderstorms, before rain starts, and while the sky is still clear.[3]

The most dangerous places during thunderstorms are in open fields, under trees and on the water. According to the National Weather Service, the safest place to be during a thunderstorm is inside a substantial building (tents and open shelters are not safe). Alternatively, a closed, metal-topped vehicle or boat cabin can provide some protection (the energy of the strike is conducted by the metal vehicle body). Metal objects do not "attract" lighting; however, they are good conductors of electric current. As such, they increase the risk of injury if one is struck (of note, rubber tires provide no protection from lightning).

Lightning injury experts advise that lightning safety is primarily an individual responsibility. Service members who routinely train and work outdoors (e.g., tactical communications specialists, tactical vehicle and aircraft maintenance crews, ground combat forces, recruit trainees) should be particularly knowledgable of and vigilant regarding the dangers of lightning—particularly in field settings during summer months. In addition, during military training and operational activities, leaders are responsible and accountable for protecting their subordinates from injury. The recommendations in Table 5 may be useful to commanders, training staffs and supervisors at all levels to reduce risks associated with lightning.

Table 5. Lightning Protection*

- Prepare for lightning by checking weather forecasts and watching for signs of approaching storms. Most strikes occur June through August between 1200 and 1800 hours local time.
- In the event of a thunderstorm, cease all outdoor training.
- Move personnel into a building if possible. Tents and open shelters are not safe.
- If no building is available, move personnel into a closed metal-topped vehicle or boat cabin; dense woods; a low area, ditch or ravine; or the foot of a hill or cliff.
- Keep personnel from fences, electrical wiring, vehicles, heavy equipment or other possible conductors of electricity.
- When marching in formation, increase the minimum distance and interval to twice that normally maintained.
- Do not use radios or associated equipment; move away from TV antennas, relay antennas, or vehicles with whip antennas.
- Move a safe distance away from metal machinery, approximately 100 feet.
- Do not group together under a tree; do not huddle together if caught in an open area.
- Avoid high places, hilltops, lone trees, flagpoles, open spaces, lakes or deep standing water, tents, small, unprotected buildings in the open and canvas top vehicles.
- When indoors, stay away from possible conductors of electricity such as electrical wiring, plumbing and landline phones. Cell phones are safe to use.
- Do not use personal plug-in appliances such as hair dryers, toothbrushes, or razors.
- Do not handle flammable liquids in open containers.

*Reprinted from *Medical Surveillance Monthly Report (MSMR)*. 2001 Aug;7(7):4.

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Accidental drownings, active component, U.S. Armed Forces, 2004-2008

Many military activities—particularly of the Navy, Coast Guard, and Marine Corps—occur on or near water. Particularly during summer months, many service members and their families engage in recreational activities in or near water (e.g., fishing, swimming, boating, camping in/near rivers, lakes, oceans, swimming pools). Water-related military and recreational activities are potentially dangerous— particularly to non-swimmers and weak swimmers, in hazardous conditions and settings (e.g., storms, currents, riptides), and when safety measures are not observed.

In 2005 in the United States, unintentional water immersion ("drowning") and boating accidents accounted for 3,582 and 710 deaths, respectively. Males and members of racial-ethnic minorities were overrepresented among fatal drowning victims. Alcohol use was involved in approximately one-half of water recreation-related fatalities and one-fifth of boating fatalities.[1]

In 2001, Bell and colleagues reviewed 352 fatal drownings of U.S. Army soldiers from 1980-1997. The analysis revealed increased risk among soldiers who were relatively young, black, and unmarried. Most deaths occurred during off-duty activities; alcohol use was involved in approximately one-third of the cases.

This analysis extends and updates the findings of Bell and colleagues. Specifically, it summarizes numbers, rates, and correlates of risk of medical encounters and deaths related to accidental drownings among U.S. military members from 2004 to 2008.

Methods:

The surveillance period was 1 January 2004 to 31 December 2008. The surveillance population included all individuals who served in an active component of the U.S. Armed Forces any time during the surveillance period.

The World Health Organization defines drowning as the process of experiencing respiratory impairment from submersion/immersion in liquid. Drowning does not inevitably lead to death. For this analysis, a "drowning-related episode" was defined by a record of a hospitalization or

Table 1. Incident episodes and rates of accidental drownings, active components, U.S. Armed Forces, 2004-2008

	2004		2005		2006		2007		2008		Total	
	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
Gender												
Male	147	11.9	108	8.9	154	12.8	131	10.9	102	8.4	642	10.6
Female	15	7.0	15	7.3	8	4.0	9	4.5	13	6.5	60	5.9
Age group												
<20 years	19	17.0	13	13.3	6	6.3	13	13.3	6	5.8	57	11.3
20-24	70	14.0	46	9.6	64	13.5	58	12.3	50	10.5	288	12.0
25-29	31	10.3	31	10.2	42	13.5	33	10.4	24	7.4	161	10.3
30-34	18	8.7	13	6.4	26	13.1	16	8.0	13	6.5	86	8.5
35-39	15	8.3	9	5.2	12	7.0	10	5.8	15	8.8	61	7.0
>=40 years	9	5.8	11	7.2	12	8.0	10	6.8	7	4.9	49	6.6
Marital status												
Married	63	8.2	47	6.1	84	10.8	73	9.4	56	7.1	323	8.3
Not married	99	14.5	76	11.8	78	12.4	67	10.8	59	9.3	379	11.8
Racial-ethnic identity												
Asian, Pacific Island	12	18.4	6	9.1	7	10.5	4	5.9	7	10.2	36	10.8
Black, non-Hispanic	16	6.1	11	4.5	16	6.8	11	4.8	16	6.9	70	5.8
Hispanic	19	13.2	17	11.8	10	6.9	11	7.5	12	8.0	69	9.5
Native American/Alaskan	3	12.5	3	12.2	6	23.7	5	19.6	0	0.0	17	13.6
White non-Hispanic	110	12.0	81	9.1	115	13.0	104	11.7	76	8.4	486	10.8
Others/unknown	2	4.6	5	11.9	8	19.1	5	11.9	4	9.5	24	11.4
Service												
Army	36	7.3	33	6.8	38	7.7	37	7.3	43	8.1	187	7.4
Navy	53	14.3	39	10.9	53	15.3	44	13.2	27	8.2	216	12.4
Air Force	28	7.5	30	8.5	38	11.0	31	9.3	27	8.3	154	8.9
Marine Corps	39	22.1	14	7.8	25	14.0	24	13.1	11	5.7	113	12.4
Coast Guard	6	15.4	7	17.8	8	20.1	4	9.9	7	16.9	32	16.0
Military occupational group												
Combat-specific	31	10.6	33	11.0	42	14.4	34	11.6	34	11.4	174	11.8
Health	10	8.4	8	6.9	10	8.6	7	6.1	5	4.3	40	6.9
Other	121	11.6	82	8.2	110	11.1	99	10.0	76	7.6	488	9.7
Military status/grade												
Junior enlisted, E1-E4	97	15.1	63	10.4	77	12.9	80	13.3	55	9.0	372	12.2
Senior enlisted, E5-E9	40	6.9	40	7.0	54	9.4	44	7.7	43	7.5	221	7.7
Officer, commissioned/warrant	25	10.6	20	8.6	31	13.4	16	6.9	17	7.3	109	9.4

outpatient encounter that included an ICD-9-CM discharge diagnosis code (in any diagnostic position), an ICD-9-CM external cause of injury code, or a NATO standardization agreement (STANAG) cause of injury code that indicated a drowning or submersion injury that was not intentionally inflicted; or by a record in the DoD Medical Mortality Registry with an underlying cause of death of "accidental drowning and submersion."

The ICD-9-CM diagnosis/external cause of injury codes that defined cases for this analysis were 994.1: "drowning and nonfatal submersion"; E830 "accident to watercraft causing submersion"; E832 "other accidental submersion or drowning in water transport accident"; E910 "accidental drowning and submersion"; and E984 "submersion [drowning], undetermined whether accidentally or purposely inflicted." The NATO STANAG cause of injury codes that defined cases were 150 "water transport accident, involving submersion in boarding and alighting"; 151 "water transport accident, involving submersion of occupant of small boat"; 159 "water transport accident, involving submersion, other"; and 860-869 "drowning or submersion, not elsewhere classified."

Cause of injury codes that excluded medical encounters from consideration as cases were ICD-9-CM E964 "assault by submersion [drowning]"; ICD-9-CM E954 "suicide and self-inflicted injury by submersion [drowning]"; and NATO STANAG "general class of trauma" codes 3 "assault, or intentionally inflicted by another person" and 4 "intentionally self-inflicted."

If an individual had case-defining medical encounters in both inpatient and ambulatory settings, information on the hospitalization record was used for the analysis. Individuals could be counted as cases once per calendar year.

Results:

During the 5-year surveillance period, there were 702 incident episodes of "accidental drowning" (overall incidence rate: 9.9 per 100,000 person-years [p-yrs]); approximately one of seven drowning episodes resulted in deaths (n=102, case fatality: 14.5%). In the past five years, the fewest cases and deaths were in 2008; overall, there were no clear trends of case incidence or case fatality **(Figure 1)**.

Of service members affected by accidental drowning, most by far were males (91%), more than two-thirds were White (69%), nearly two-thirds were in their twenties (64%), and nearly one-third were in the Navy (31%).

Incidence rates (unadjusted) were relatively high among service members who were in the Coast Guard (16.0 per 100,000 p-yrs), Navy (12.4 per 100,000 p-yrs), or Marine Corps (12.4 per 100,000 p-yrs); race-ethnicity other than Black, White, or Hispanic (12.6 per 100,000 p-yrs); in junior enlisted grades (12.2 per 100,000 p-yrs); younger than 25 years (11.9 per 100,000 p-yrs); not married (11.8 per 100,000 p-yrs); in a combat-specific military occupation (11.8 per 100,000 p-yrs); or male (10.6 per 100,000

Figure 1. Accidental drownings, by clinical outcome, active components, U.S. Armed Forces, 2004-2008

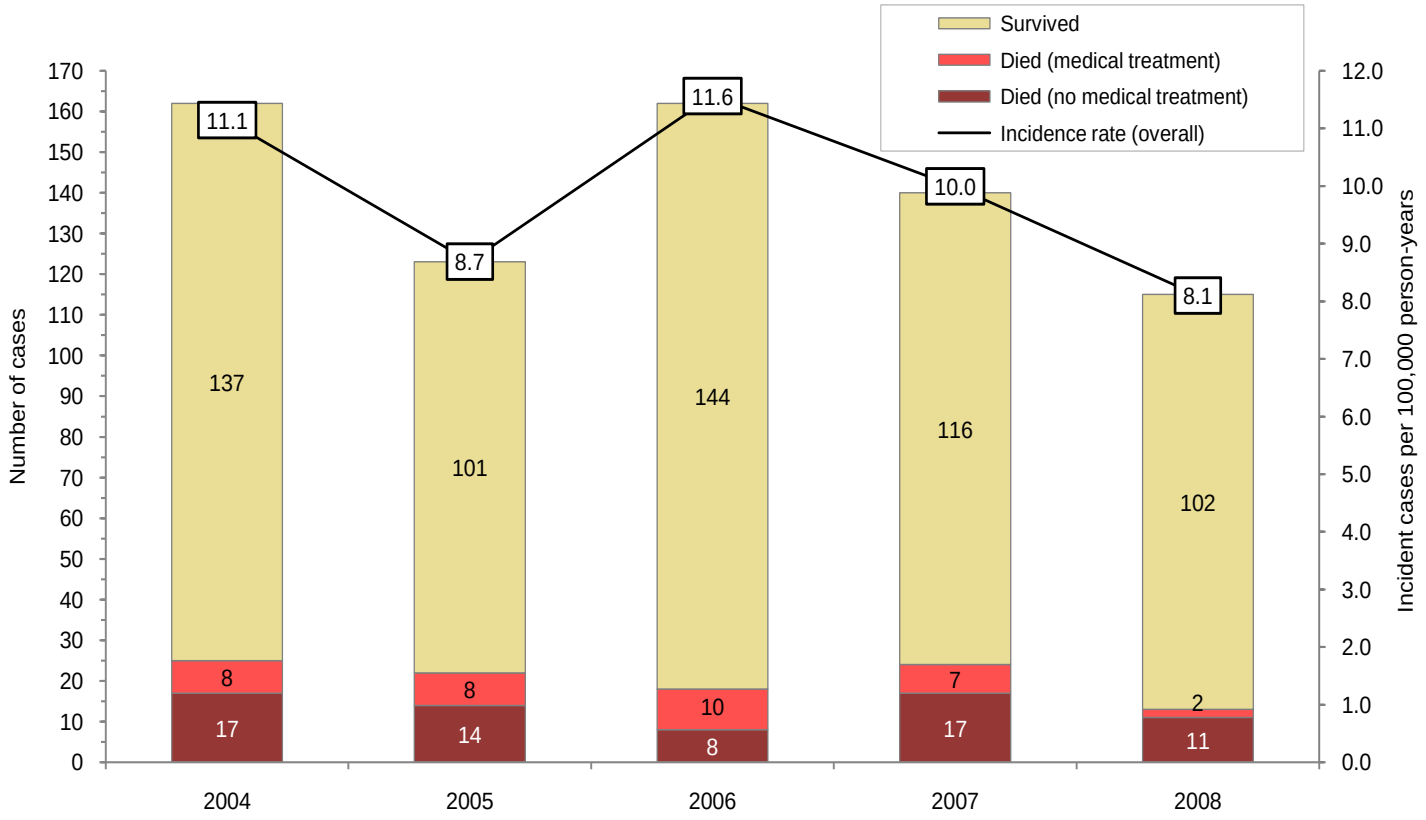
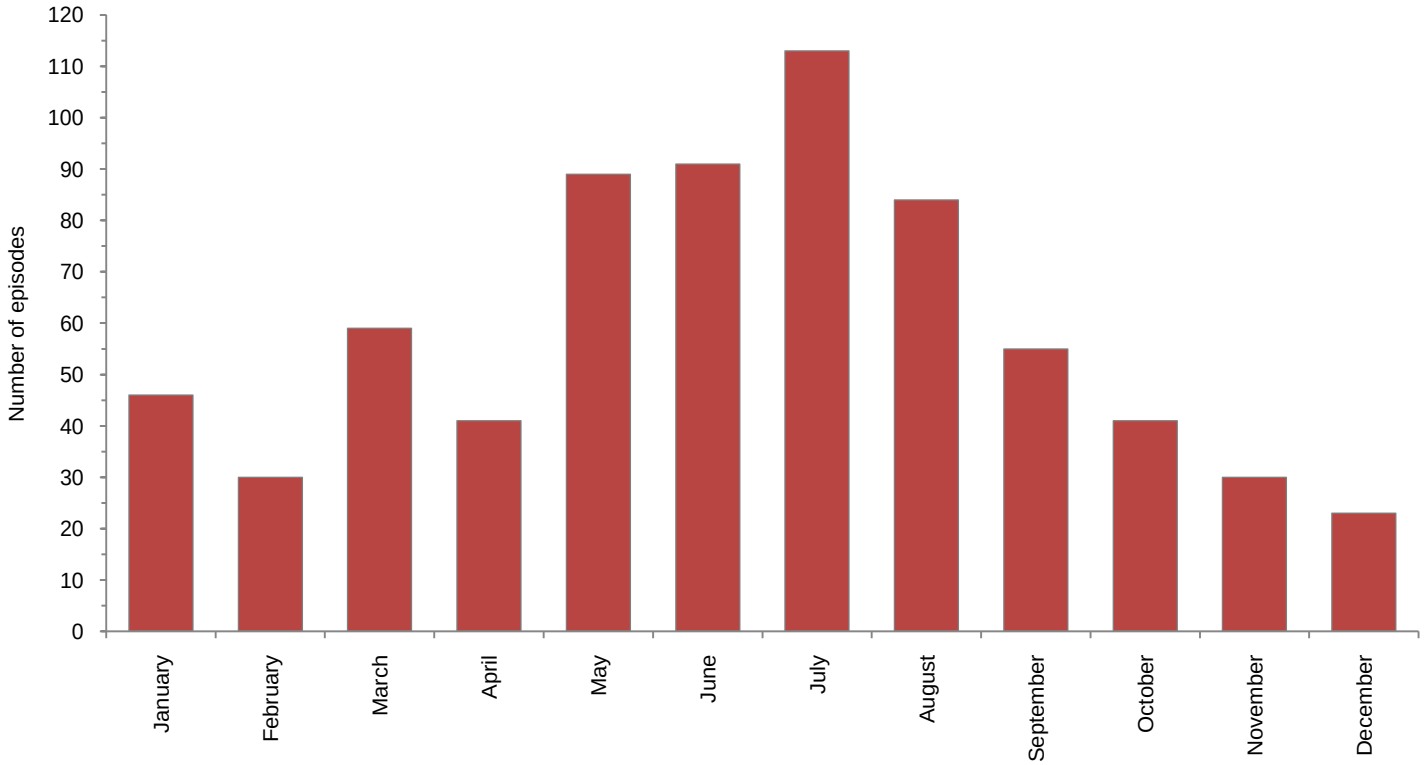


Figure 2. Accidental drownings, by calendar month, active components, U.S. Armed Forces, 2004-2008



p-yrs). Incidence rates (unadjusted) were relatively low among service members who were Black non-Hispanic (5.8 per 100,000 p-yrs), female (5.9 per 100,000 p-yrs), older than 39 years (6.6 per 100,000 p-yrs), or in a health-related military occupation (6.9 per 100,000 p-yrs). Among Black non-Hispanic service members compared to those of other race-ethnicities, the overall incidence rate was lower but the case fatality percentage was higher (case fatality, overall: Black non-Hispanic: 26%; White non-Hispanic: 13%; all other race-ethnicities: 16%) **(Table 1).**

More accidental drownings occurred in July (n=113) than any other month; slightly more than one-half (54%) of all accidental drownings occurred from May through August **(Figure 2).**

Data summaries by Stephen B. Taubman, PhD, Data Analysis Group, Armed Forces Health Surveillance Center.

Editorial Comment:

This report documents an average of 140 accidental drowning episodes and 20 deaths per year among active component members of the U.S. Armed Forces.

In this analysis, the highest rates of drowning-related episodes affected members of the Coast Guard, Navy, and Marine Corps— perhaps due to geographic proximity and more frequent, more prolonged exposures to potentially dangerous water environments (on and off duty). Of interest, in the Navy, Marine Corps, and Coast Guard, swimming and water survival proficiencies are required for graduation from recruit training. In Army and Air Force recruit training, swimming proficiency is not required and water survival training is not routinely conducted.

Consistent with the findings of an earlier study of fatal drownings among U.S. soldiers, in this analysis, relatively high rates (unadjusted) of drowning-related episodes affected service members who were young, unmarried, male, and in combat occupations. In contrast to the findings of the earlier study, however, this analysis documented relatively low rates of drowning-related episodes among Black non-Hispanic service members. The apparently conflicting findings reflect the fact that Black non-Hispanic service members have relatively low rates of drowning-related episodes overall but relatively high mortality incidence when drowning episodes occur (e.g., among Black non-Hispanic soldiers, case fatality incidence: 33% [data not shown]).

This analysis has limitations that should be considered when interpreting the results. For example, drowning-related medical encounters were identified from drowning-specific diagnosis and cause-of-injury codes that were reported on standardized electronic medical records. The completeness and accuracy of case ascertainment by these methods are not known; it is possible that many medical encounters for conditions related to water submersion ("near drowning") were not documented with the case indicator codes used for this report.

This analysis summarized drowning-related episodes in relation to demographic and military characteristics. As such, the findings do not account for factors such as

swimming proficiency, nature and setting of the drowning episode, frequency and duration of exposure to drowning risk, adherence to routine safety measures, alcohol use, and so on. Absent information related to these factors, novel specific recommendations aimed at prevention are not appropriate. However, the results of this report may be useful to increase awareness regarding the ongoing risks and effects of drowning-related episodes among U.S. service members. In addition, the information may be useful to enforce current water safety guidelines (such as those published by the U.S. Naval Safety Center **[Table 2]**[3]).

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3. Naval Safety Center. Swimming safety brief. Viewed on 23 June 2009 at: http://safetycenter.navy.mil/ashore/recreation/safetybriefs/swimmingBrief.htm

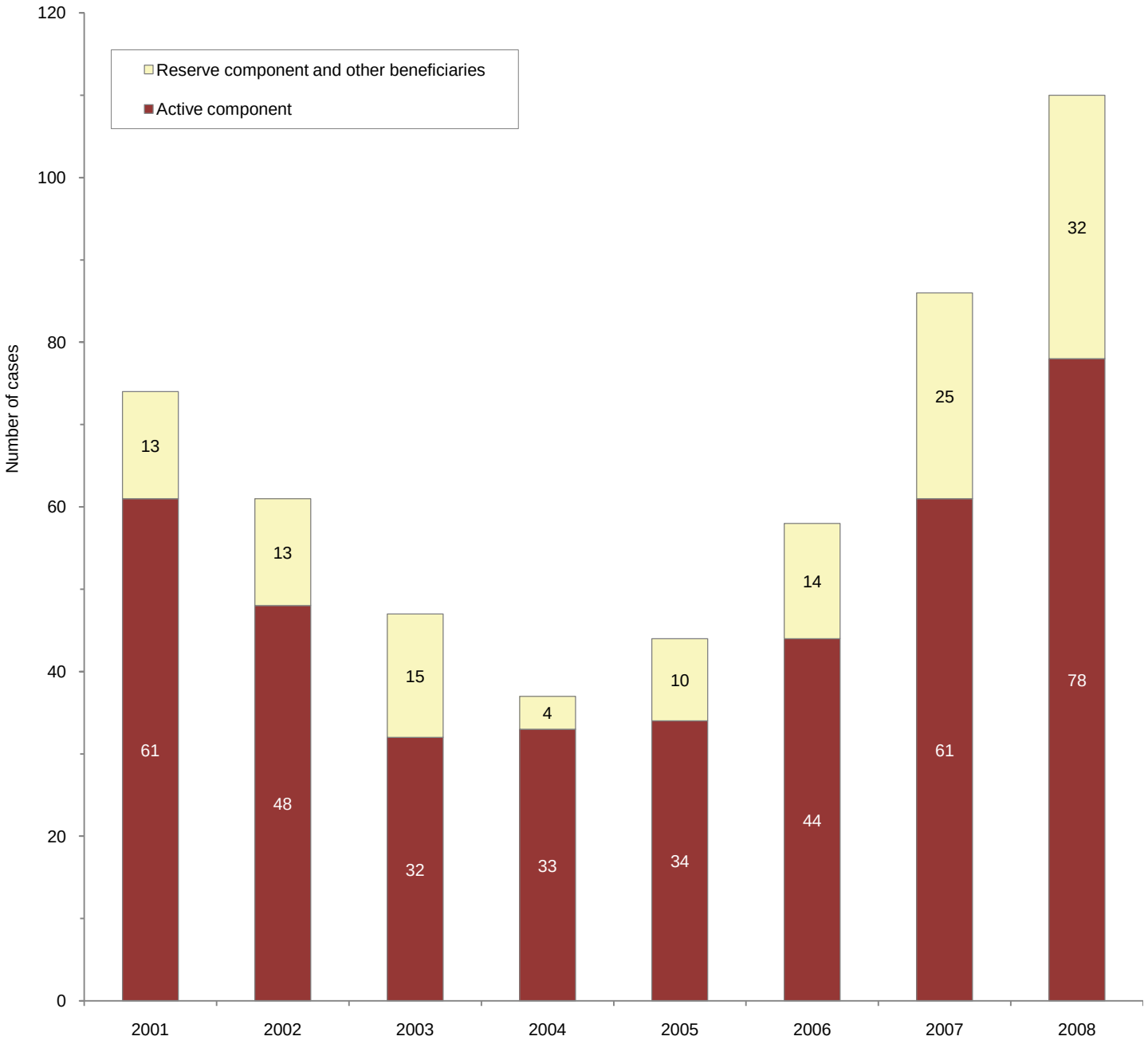
Table 2. Swimming Safety Brief, Recommendations[3]

Assessing the risks along with making risk decisions and implementing controls to eliminate swimming mishaps are as follows:

- Learn to swim well enough to survive an emergency.
- Always swim with a buddy who has the ability to help you in an emergency.
- Swim only in supervised areas.
- Follow the safety rules for the particular pool or beach area. Pay attention to warnings about local hazards such as currents.
- Know your limitations and don't overestimate your ability.
- Stay out of the water when overheated, immediately after eating, and during an electrical storm.
- Check the water depth before diving into the water.
- Keep a safe distance from diving boards and platforms.
- Don't substitute inflated tubes, air mattresses or other artificial supports for swimming ability. If a flotation device is needed as a safety aid, use a U.S. Coast Guard approved personal flotation device.
- Learn the simple and safe reaching-rescue techniques. Only certified lifeguards should dive in to rescue a drowning victim. The American Red Cross offers courses in water rescue.
- Avoid overexposure to the sun. Use plenty of sunscreen lotion.

IN THE NEXT MSMR:
Lyme disease

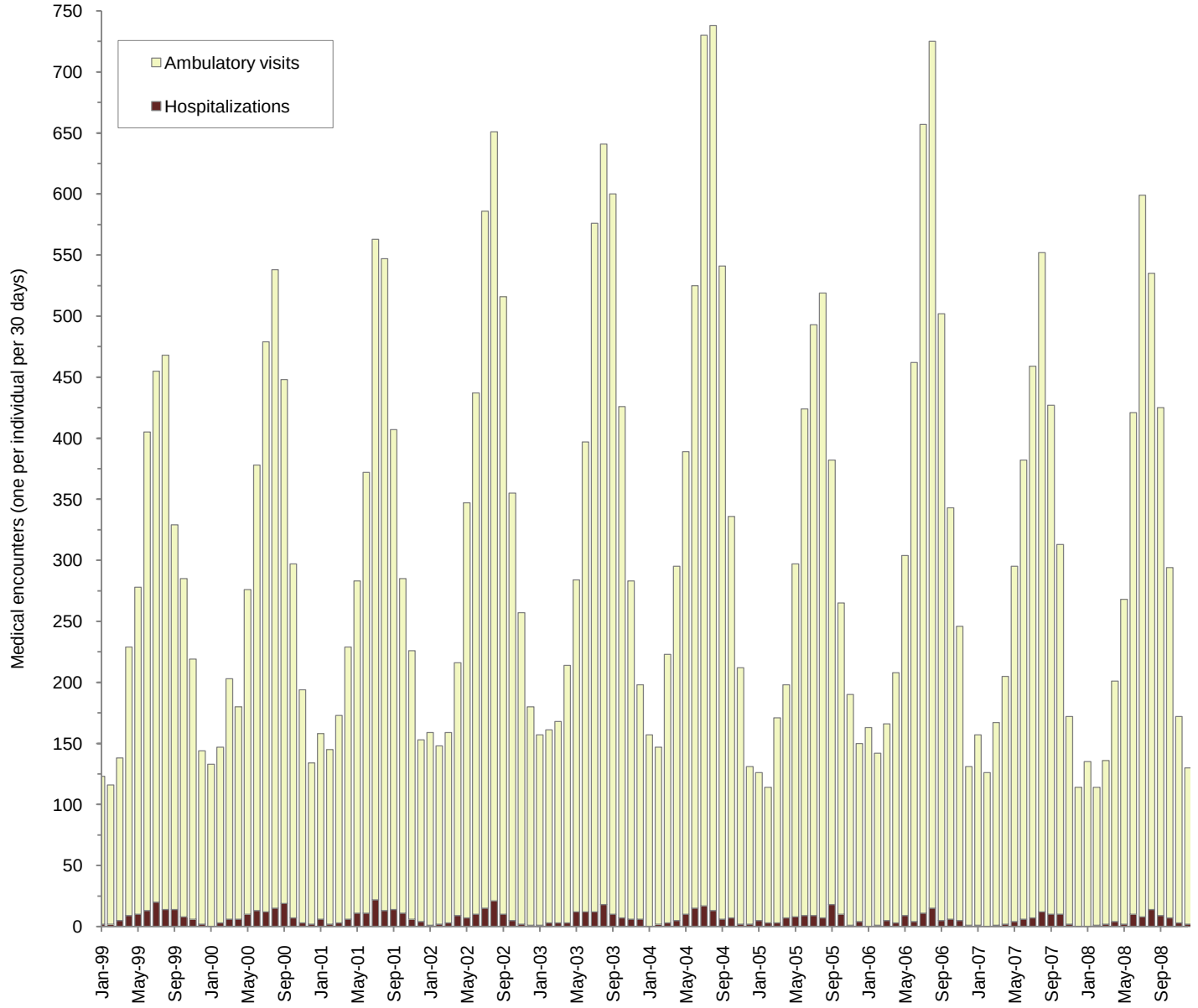
Confirmed cases* of Lyme disease, among service members and other beneficiaries of the U.S. Military Health System, 2001-2008



* "Confirmed cases" are defined as hospitalizations, notifiable medical event reports, or at least three ambulatory visits (separated by at least 7 days) with the primary diagnosis of "Lyme disease" (ICD-9-CM: 088.81)

SURVEILLANCE SNAPSHOT:
Envenomations, active component service members, 1999-2008

Diagnoses of envenomations*, by month and year, active component service members, January 1999-December 2008

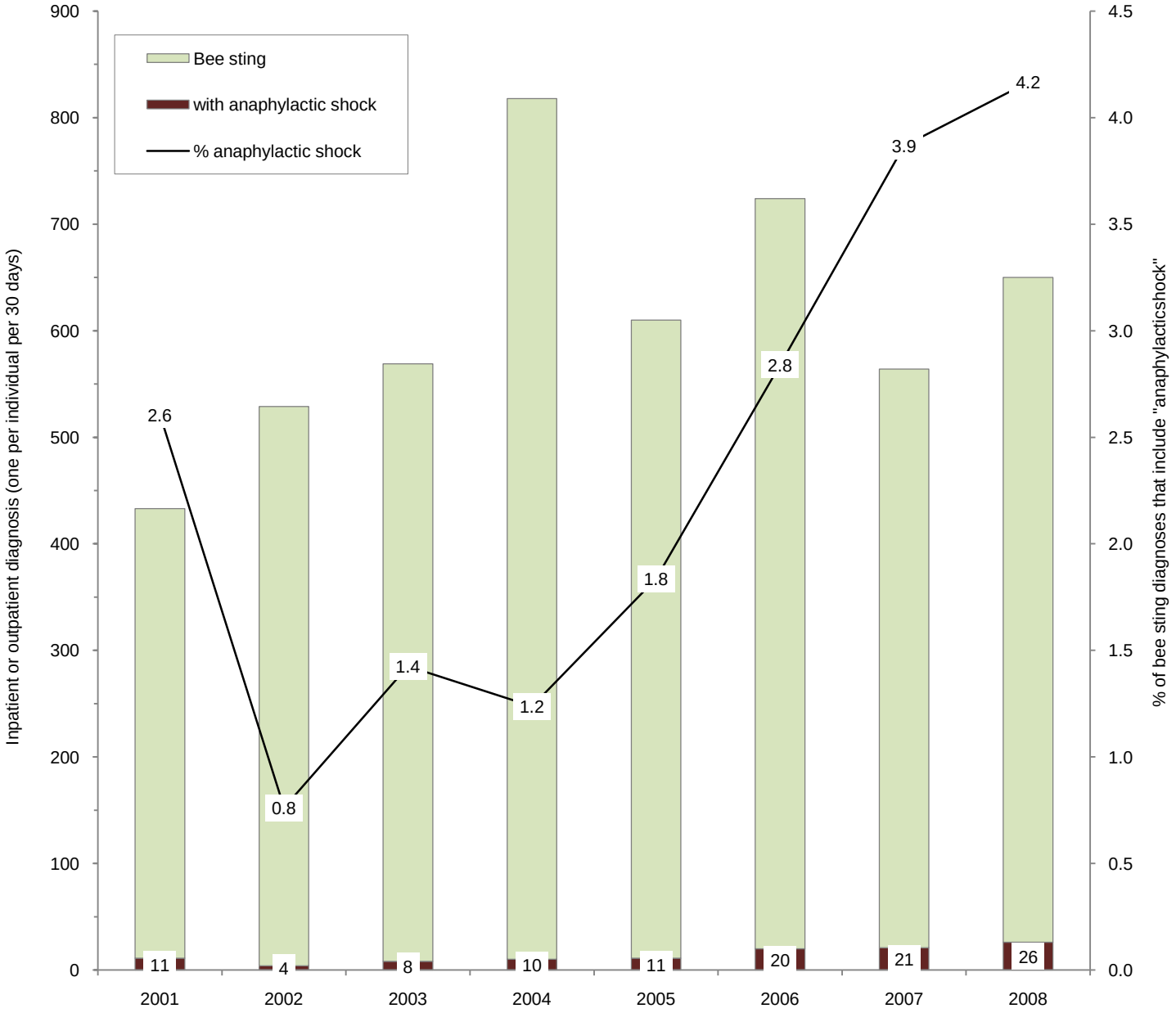


*Inpatient and outpatient encounters with ICD-9-CM:989.5 (Venom, bites of venomous snakes, lizards and spiders) or E905 (Venomous animals and plants as the cause of poisoning and toxic reactions, including snakes, lizards, spiders, scorpion, bees, sea urchin, jellyfish, etc.). One inpatient or outpatient diagnosis per individual per 30 days.

From January 1999 through December 2008, there were 36,854 medical encounters for "envenomations." There was more than a six-fold difference between the most (n=738, August 2004) and fewest (n=114, February 2005) cases in any month. During each year of the period, the most cases were in July or August and the fewest in December, January, or February. Approximately one of 40 (2.3%) envenomations received in-hospital treatment.

SURVEILLANCE SNAPSHOT:
Envenomations, active component service members, 1999-2008

Diagnoses of bee sting (ICD-9-CM E905.3) and bee sting with anaphylactic shock (ICD-9-CM: E905.3 plus 995.0), by year, active component service members, 2001-2008



From 2001 to 2008, there were 4,786 medical encounters for "envenomations" related to "bee stings." For the past seven years, annual encounters for bee sting-related envenomations have been fairly stable. From 2001 to 2008, approximately one of 40 (n=111, 2.3%) bee sting-related envenomations were complicated by "anaphylactic shock." Numbers and proportions of bee sting-related envenomations with anaphylactic shock increased from 2004 (n=10, 1.2%) to 2008 (n=26, 4.2%). Differences in reporting (e.g., completeness, specificity) may account for some of the increase in anaphylactic shock incidence during the period.

Update: Deployment Health Assessments, U.S. Armed Forces, May 2009

Since January 2003, peaks and troughs in the numbers of pre- and post-deployment health assessment forms transmitted to the Armed Forces Health Surveillance Center generally corresponded to times of departure and return of large numbers of deployers. Since April 2006, numbers of post-deployment health reassessments (PDHRA) transmitted per month have ranged from 17,000 to 36,000 **(Table 1, Figure 1).**

During the past 12 months, the proportions of returned deployers who rated their health as "fair" or "poor" were 8-11% on post-deployment health assessment questionnaires and 9-14% on PDHRA questionnaires **(Figure 2).**

In general, on post-deployment assessments and reassessments, deployers in the Army and in reserve components were more likely than their respective counterparts to report health and exposure-related concerns **(Table 2, Figure 2)**. Both active and reserve component members were more likely to report exposure concerns three to six months after compared to the time of return from deployment **(Figure 3).**

At the time of return from deployment, soldiers serving in the active component were the most likely of all deployers to receive mental health referrals; however, three to six months after returning, active component soldiers were less likely than Army and Marine Corps Reservists to receive mental health referrals **(Table 2).**

Finally, during the past three years, reserve component members have been more likely than active to report "exposure concerns" on post-deployment assessments and reassessments **(Figure 3).**

Table 1. Deployment-related health assessment forms, by month, U.S. Armed Forces, June 2008-May 2009

	Pre-deployment assessment DD2795		Post-deployment assessment DD2796		Post-deployment reassessment DD2900	
	No.	%	No.	%	No.	%
Total	**422,853**	**100**	**361,325**	**100**	**305,394**	**100**
2008						
June	28,176	6.7	34,389	9.5	21,174	6.9
July	26,193	6.2	25,507	7.1	21,453	7.0
August	33,828	8.0	22,801	6.3	30,100	9.9
September	39,276	9.3	33,492	9.3	25,862	8.5
October	38,657	9.1	38,042	10.5	26,295	8.6
November	28,411	6.7	37,800	10.5	23,402	7.7
December	36,730	8.7	40,313	11.2	21,418	7.0
2009						
January	42,862	10.1	31,693	8.8	25,544	8.4
February	36,362	8.6	28,242	7.8	27,486	9.0
March	37,849	9.0	23,584	6.5	30,309	9.9
April	40,938	9.7	18,311	5.1	29,378	9.6
May	33,571	7.9	27,151	7.5	22,973	7.5

Figure 2. Proportion of deployment health assessment forms with self-assessed health status as "fair" or "poor", U.S. Armed Forces, June 2008-May 2009

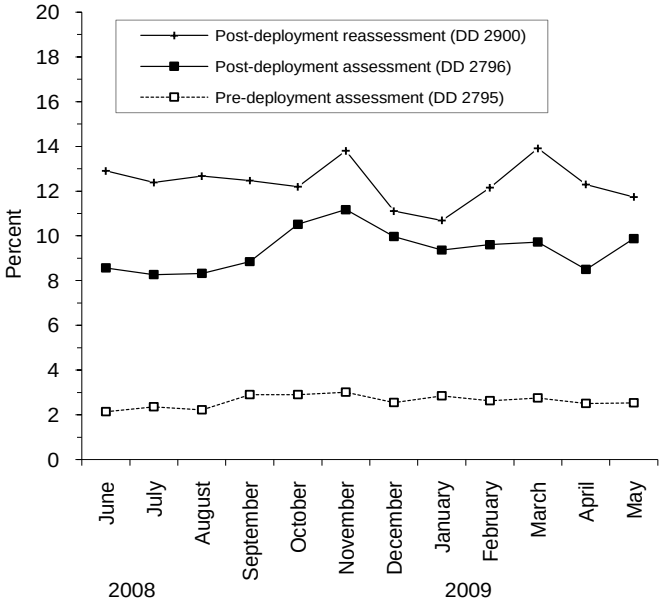


Figure 1. Total deployment health assessment and reassessment forms, by month, U.S. Armed Forces, January 2003-May 2009

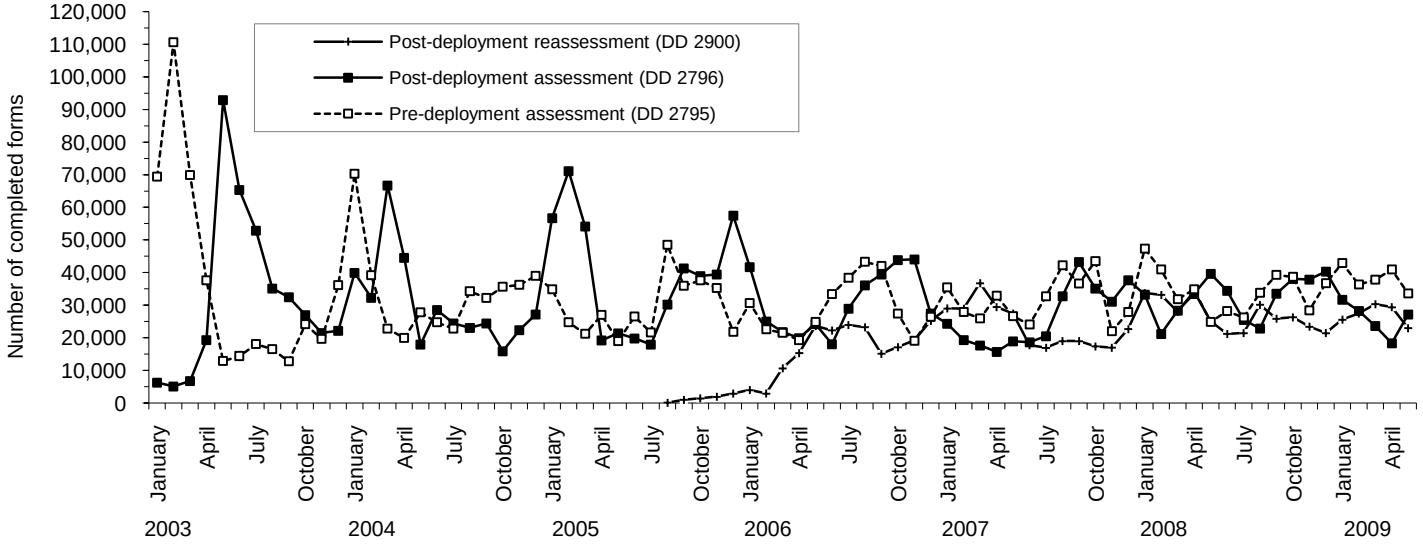


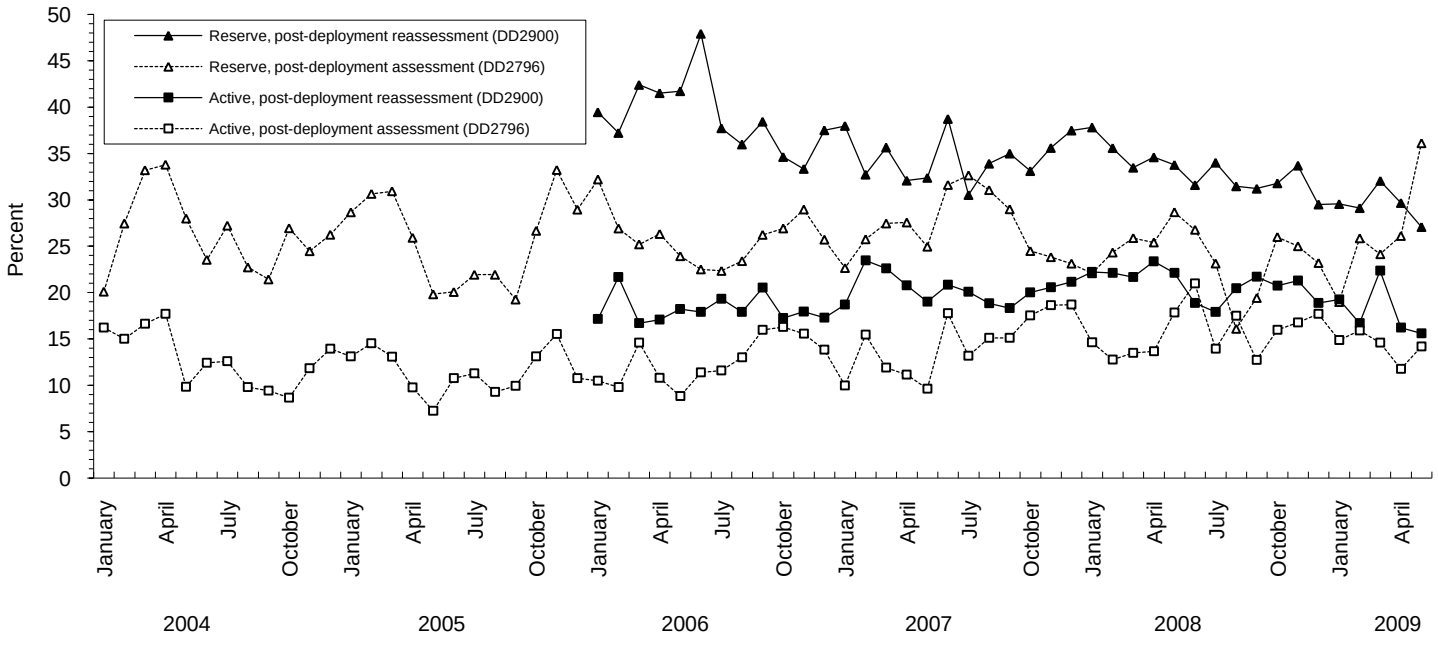
Table 2. Percentage of service members who endorsed selected questions/received referrals on health assessment forms, U.S. Armed Forces, June 2008-May 2009

	Army			Navy			Air Force			Marine Corps			All service members		
	Pre-deploy DD2795	Post-deploy DD2796	Reassess DD2900	Pre-deploy DD2795	Post-deploy DD2796	Reassess DD2900	Pre-deploy DD2795	Post-deploy DD2796	Reassess DD2900	Pre-deploy DD2795	Post-deploy DD2796	Reassess DD2900	Pre-deploy DD2795	Post-deploy DD2796	Reassess DD2900
Active component	n= 148,417	n= 131,306	n= 113,303	n= 11,939	n= 16,420	n= 14,257	n= 56,830	n= 49,482	n= 51,214	n= 24,054	n= 33,402	n= 33,866	n= 241,240	n= 230,610	n= 212,640
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
General health "fair" or "poor"	4.1	11.2	14.9	1.3	4.8	6.1	0.5	3.7	4.3	1.8	6.3	9.1	2.9	8.4	10.8
Health concerns, not wound or injury	15.8	25.7	25.5	3.9	14.3	14.1	1.4	5.9	11.1	3.3	13.5	17.8	10.6	18.9	20.0
Health worse now than before deployed	na	1.9	26.6	na	0.0	13.9	na	0.1	9.1	na	0.0	18.2	na	1.1	20.2
Exposure concerns	na	17.4	21.4	na	16.7	16.2	na	10.7	14.9	na	14.1	18.7	na	15.4	19.1
PTSD symptoms (2 or more)	na	11.0	14.2	na	4.4	7.3	na	2.2	2.7	na	4.3	8.7	na	7.7	10.1
Depression symptoms (any)	na	2.5	35.0	na	0.0	24.9	na	0.1	14.7	na	0.2	31.2	na	1.4	28.8
Referral indicated by provider (any)	5.5	35.5	20.5	5.2	23.9	15.3	1.7	10.9	6.8	3.1	21.0	20.6	4.4	27.3	16.9
Mental health referral indicated*	1.1	8.3	6.4	0.5	4.2	5.7	0.5	1.1	2.1	0.3	2.5	4.5	0.9	5.6	5.0
Medical visit following referral†	93.3	98.3	95.5	90.7	79.4	90.8	78.6	96.0	97.3	61.7	71.7	74.8	89.3	92.8	91.1
	Army			Navy			Air Force			Marine Corps			All service members		
	Pre-deploy DD2795	Post-deploy DD2796	Reassess DD2900	Pre-deploy DD2795	Post-deploy DD2796	Reassess DD2900	Pre-deploy DD2795	Post-deploy DD2796	Reassess DD2900	Pre-deploy DD2795	Post-deploy DD2796	Reassess DD2900	Pre-deploy DD2795	Post-deploy DD2796	Reassess DD2900
Reserve component	n= 82,661	n= 56,199	n= 61,000	n= 3,335	n= 3,698	n= 6,084	n= 15,835	n= 15,116	n= 16,633	n= 2,038	n= 3,234	n= 5,323	n= 103,869	n= 78,247	n= 89,040
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
General health "fair" or "poor"	2.0	11.8	18.9	0.6	8.9	9.1	0.3	5.2	4.8	1.3	8.9	9.5	1.7	10.3	15.1
Health concerns, not wound or injury	13.4	35.1	47.6	2.8	28.2	29.4	0.6	9.1	13.5	3.3	29.5	32.7	10.9	29.5	39.1
Health worse now than before deployed	na	2.9	36.4	na	0.2	22.7	na	0.1	10.5	na	0.2	24.8	na	2.1	29.9
Exposure concerns	na	25.1	34.5	na	32.7	27.3	na	18.8	20.9	na	21.6	26.9	na	24.1	31.0
PTSD symptoms (2 or more)	na	9.9	23.6	na	5.7	10.4	na	1.9	2.7	na	5.3	12.7	na	8.0	18.1
Depression symptoms (any)	na	3.1	39.2	na	0.2	25.6	na	0.0	14.1	na	0.3	31.2	na	2.3	33.1
Referral indicated by provider (any)	4.1	37.3	34.9	4.0	30.6	18.3	0.7	13.0	5.6	3.9	32.9	29.7	3.6	32.1	28.0
Mental health referral indicated*	0.5	5.1	13.1	0.4	3.4	4.7	0.0	0.6	0.9	0.4	3.2	9.6	0.4	4.1	10.1
Medical visit following referral†	95.1	97.3	31.4	93.2	89.0	39.8	39.5	66.4	37.8	67.5	58.0	22.2	91.7	91.5	31.4

*Includes behavioral health, combat stress and substance abuse referrals.

†Record of inpatient or outpatient visit within 6 months after referral.

Figure 3. Proportion of service members who endorse exposure concerns on post-deployment health assessments, U.S. Armed Forces, January 2004-May 2009



Sentinel reportable events for service members and beneficiaries at U.S. Army medical facilities, cumulative numbers* for calendar years through 31 May 2008 and 31 May 2009

Army

Reporting locations	Number of reports all events†		Food-borne								Vaccine preventable					
			Campylo-bacter		Giardia		Salmonella		Shigella		Hepatitis A		Hepatitis B		Varicella	
	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
NORTH ATLANTIC																
Washington, DC Area	159	204	1	1	2	1	1	.	.	.	1	.	1	1	6	1
Aberdeen, MD	0	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FT Belvoir, VA	125	113	2	4	.	.	1	2	.	.	.	.	.	.	.	.
FT Bragg, NC	657	767	.	2	.	.	7	5	.	.	.	.	.	2	.	.
FT Drum, NY	201	27	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FT Eustis, VA	401	105	.	.	.	1	.	.	.	.	.	.	.	.	.	.
FT Knox, KY	355	93	2	.	.	.	.	.	.	.	.	.	.	.	.	.
FT Lee, VA	151	255	.	.	.	.	.	.	.	.	.	.	1	.	1	.
FT Meade, MD	190	37	.	.	1	.	.	.	.	.	.	.	.	.	.	.
West Point, NY	44	66	.	1	.	.	.	.	.	.	.	.	.	1	.	.
GREAT PLAINS																
FT Sam Houston, TX	398	344	.	1	.	3	4	2	8	.	.	.	.	.	.	.
FT Bliss, TX	229	310	.	.	.	.	1	1	.	1	.	1	.	6	.	.
FT Carson, CO	412	425	1	1	.	.	2	.	.	.	.	.	.	.	.	.
FT Hood, TX	966	975	2	6	.	.	9	9	5	4	.	.	.	.	1	.
FT Huachuca, AZ	43	52	.	.	.	.	1	.	1	.	.	.	.	.	.	.
FT Leavenworth, KS	19	22	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FT Leonard Wood, MO	322	249	.	.	2	.	1	.	.	.	.	1	1	.	.	1
FT Polk, LA	76	205	.	.	.	2	.	.	1	.	.	.	.	.	1	.
FT Riley, KS	288	314	.	.	.	.	1	2	.	.	.	.	1	.	.	.
FT Sill, OK	146	142	.	.	.	.	.	.	.	2	.	.	.	.	.	.
SOUTHEAST																
FT Gordon, GA	506	414	.	.	.	.	7	3	9	1	.	.	.	.	1	1
FT Benning, GA	181	100	.	.	.	.	.	.	.	1	.	.	.	.	.	.
FT Campbell, KY	144	128	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FT Jackson, SC	111	143	.	.	.	.	.	.	.	.	.	.	1	.	.	.
FT Rucker, AL	37	39	.	7	.	.	1	1	.	.	.	.	.	.	.	.
FT Stewart, GA	331	500	1	.	1	.	6	4	.	7	1	.	6	.	.	.
WESTERN																
FT Lewis, WA	509	680	2	1	.	.	.	2	1	.	.	.	.	.	.	.
FT Irwin, CA	10	66	.	.	.	.	.	.	1	1	.	.	.	.	.	.
FT Wainwright, AK	188	107	4	.	.	.	.	.	.	.	.	.	.	.	.	.
PACIFIC																
Hawaii	352	365	15	12	1	.	7	6	3	.	1	.	3	1	.	.
Japan	30	3	1	.	.	.	.	.	.	.	.	.	.	.	.	.
Korea	309	390	.	.	.	.	.	.	.	.	.	.	.	.	1	.
OTHER LOCATIONS																
Germany	583	855	6	9	2	1	2	5	1	.	1	.	2	1	.	1
Unknown	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Total	**8,473**	**8,498**	**37**	**45**	**9**	**8**	**51**	**42**	**30**	**17**	**4**	**2**	**16**	**12**	**11**	**4**

‡Primary and secondary.
§Urethritis, non-gonococcal (NGU).

Sentinel reportable events for service members and beneficiaries at U.S. Army medical facilities, cumulative numbers* for calendar years through 31 May 2008 and 31 May 2009

Army

Reporting location	Arthropod-borne				Sexually transmitted								Environmental			
	Lyme disease		Malaria		Chlamydia		Gonorrhea		Syphilis‡		Urethritis§		Cold		Heat	
	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
NORTH ATLANTIC																
Washington, DC Area	2	9	.	.	46	76	15	8	5	10	.	1	.	.	.	.
Aberdeen, MD	.	.	.	.	.	2	.	1	.	.	.	.	.	.	.	.
FT Belvoir, VA	.	.	.	.	67	90	1	11	.	.	.	.	.	.	.	.
FT Bragg, NC	.	.	3	.	428	596	81	102	1	2	32	16	.	1	8	11
FT Drum, NY	3	.	.	.	143	19	14	3	.	.	.	.	.	.	.	.
FT Eustis, VA	.	.	.	.	101	88	13	15	3	.	.	.	.	.	.	.
FT Knox, KY	.	1	.	.	70	67	17	11	1	.	.	.	.	.	.	.
FT Lee, VA	1	1	.	.	99	228	39	24	.	2	.	.	.	.	.	.
FT Meade, MD	1	.	.	.	28	24	1	.	.	.	.	.	.	.	.	.
West Point, NY	5	6	.	.	10	23	.	1	.	.	.	.	.	.	.	.
GREAT PLAINS																
FT Sam Houston, TX	.	.	.	.	124	210	31	37	11	8	.	.	1	.	.	4
FT Bliss, TX	.	.	.	.	147	175	31	29	3	5	.	.	.	.	.	.
FT Carson, CO	.	.	.	.	260	286	25	31	.	.	12	.	.	1	.	.
FT Hood, TX	.	.	.	.	678	621	121	146	.	3	36	88	.	.	.	.
FT Huachuca, AZ	.	.	.	.	35	34	5	2	.	.	.	.	.	.	.	.
FT Leavenworth, KS	.	.	.	.	19	17	.	3	.	1	.	.	.	.	.	1
FT Leonard Wood, MO	.	.	.	.	83	161	11	17	.	.	.	.	3	1	.	.
FT Polk, LA	.	.	.	.	49	171	18	19	.	1	.	.	.	.	6	6
FT Riley, KS	2	.	1	.	149	179	12	32	.	.	.	1	1	1	.	.
FT Sill, OK	.	.	.	.	41	93	10	14	.	.	.	.	.	.	4	.
SOUTHEAST																
FT Gordon, GA	.	.	.	.	222	256	60	43	.	.	.	.	.	.	.	1
FT Benning, GA	.	.	.	5	113	68	33	18	1	1	.	.	.	.	8	.
FT Campbell, KY	.	4	.	.	51	91	2	18	1	1	.	.	.	.	.	8
FT Jackson, SC	.	.	.	.	94	102	16	19	.	.	.	.	.	.	.	22
FT Rucker, AL	1	.	.	.	26	28	7	2	1	.	.	.	.	.	.	.
FT Stewart, GA	.	.	1	.	258	391	45	71	2	4	.	.	.	.	.	6
WESTERN																
FT Lewis, WA	.	.	.	.	389	437	39	45	1	1	8	4	.	.	.	.
FT Irwin, CA	.	.	.	.	8	50	.	1	.	.	.	.	.	.	1	.
FT Wainwright, AK	1	.	.	.	120	83	14	6	.	.	.	.	11	1	.	.
PACIFIC																
Hawaii	.	.	1	.	247	245	33	27	.	1	.	.	.	.	.	.
Japan	.	.	.	.	16	3	2	.	.	.	.	.	.	.	.	.
Korea	.	.	.	.	260	369	30	16	4	2	.	.	.	1	3	1
OTHER LOCATIONS																
Germany	14	17	5	4	308	531	79	57	4	8	.	.	8	1	4	3
Unknown	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Total	**30**	**38**	**11**	**9**	**4,689**	**5,814**	**805**	**829**	**38**	**50**	**88**	**110**	**24**	**7**	**34**	**63**

*Events reported by June 7, 2008 and 2009

†Seventy medical events/conditions specified by Tri-Service Reportable Events Guidelines and Case Definitions, May 2004.

Note: Completeness and timeliness of reporting vary by facility.

Sentinel reportable events for service members and beneficiaries at U.S. Air Force medical facilities, cumulative numbers* for calendar years through 31 May 2008 and 31 May 2009

Air Force

Reporting locations	Number of reports all events†		Food-borne								Vaccine preventable					
			Campylo-bacter		Giardia		Salmonella		Shigella		Hepatitis A		Hepatitis B		Varicella	
	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
Air Combat Cmd	1,074	740	3	1	4	4	4	3	3	1	4	.	27	.	4	1
Air Education & Training Cmd	422	838	.	3	3	1	3	11	1	2	3	3	3	3	4	3
Air Force Dist. of Washington	119	95	.	.	.	.	1	1	.	.	.	.	1	1	.	.
Air Force Materiel Cmd	355	263	1	.	1	1	2	1	2	.	1	.	.	3	.	2
Air Force Special Ops Cmd	100	82	.	1	.	.	.	1	.	.	.	.	2	.	.	.
Air Force Space Cmd	207	139	.	1	.	1	4	4	.	.	.	1	1	.	1	2
Air Mobility Cmd	525	406	1	3	2	2	1	3	1	2	.	.	1	2	4	2
Pacific Air Forces	410	364	5	.	4	1	1	1	.	.	3	.	7	3	2	3
U.S. Air Forces in Europe	258	292	1	2	.	.	1	1	.	.	.	.	1	3	1	3
U.S. Air Force Academy	11	33	.	.	.	2	.	1	.	.	.	.	.	.	.	.
Other	269	78	1	1	2	1	2	1	3	.	1	.	.	.	.	1
Total	**3,750**	**3,330**	**12**	**12**	**16**	**13**	**19**	**28**	**10**	**5**	**12**	**4**	**43**	**15**	**16**	**17**

*Events reported by June 7, 2009

†Seventy medical events/conditions specified by Tri-Service Reportable Events Guidelines and Case Definitions, May 2004.

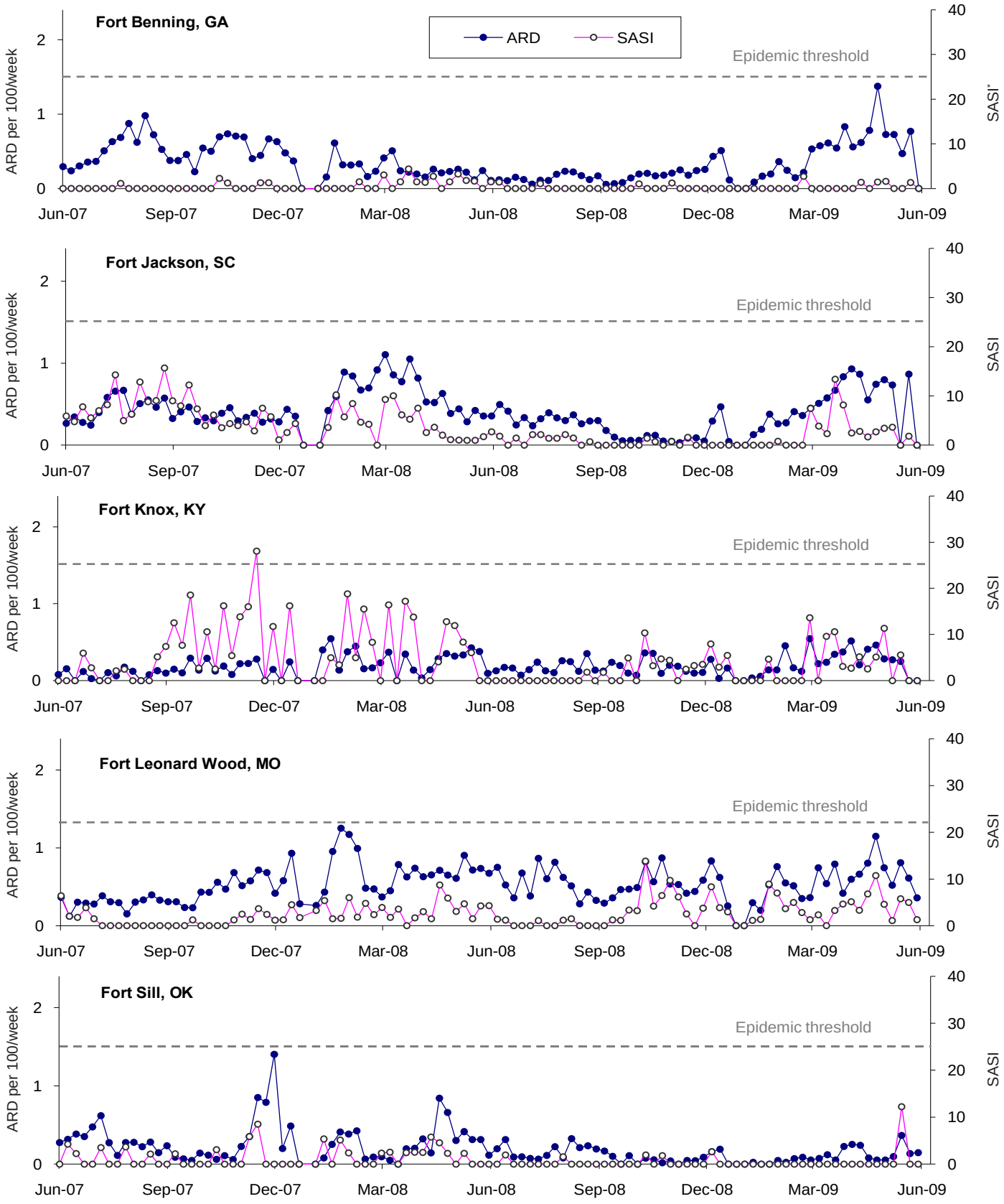
Note: Completeness and timeliness of reporting vary by facility

Reporting location	Arthropod-borne				Sexually transmitted								Environmental			
	Lyme disease		Malaria		Chlamydia		Gonorrhea		Syphilis‡		Urethritis§		Cold		Heat	
	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
Air Combat Cmd	4	4	.	.	572	490	64	39	2	3	1	.	4	4	.	1
Air Education & Training Cmd	2	.	.	.	225	471	19	51	.	3	.	.	.	.	.	1
Air Force Dist. of Washington	1	2	.	.	70	67	8	4	1	.	.	.	.	.	.	.
Air Force Materiel Cmd	4	2	1	.	192	176	18	18	2	1	.	.	.	1	.	.
Air Force Special Ops Cmd	.	1	1	.	83	67	7	1	.	1	.	.	.	1	.	.
Air Force Space Cmd	1	.	.	.	121	104	8	4	.	.	.	.	.	.	.	.
Air Mobility Cmd	6	7	.	.	316	271	31	26	.	1	.	.	2	9	4	.
Pacific Air Forces	.	.	.	.	323	153	13	16	1	1	.	.	.	9	.	.
U.S. Air Forces in Europe	.	1	2	1	204	201	14	14	.	1	.	.	.	2	.	.
U.S. Air Force Academy	1	.	.	.	10	20	.	1	.	.	.	.	.	.	.	.
Other	3	.	.	1	215	16	10	5	1	.	.	.	.	.	.	6
Total	**22**	**17**	**4**	**2**	**2,331**	**2,036**	**192**	**179**	**7**	**11**	**1**	**0**	**6**	**26**	**4**	**8**

‡Primary and secondary.

§Urethritis, non-gonococcal (NGU).

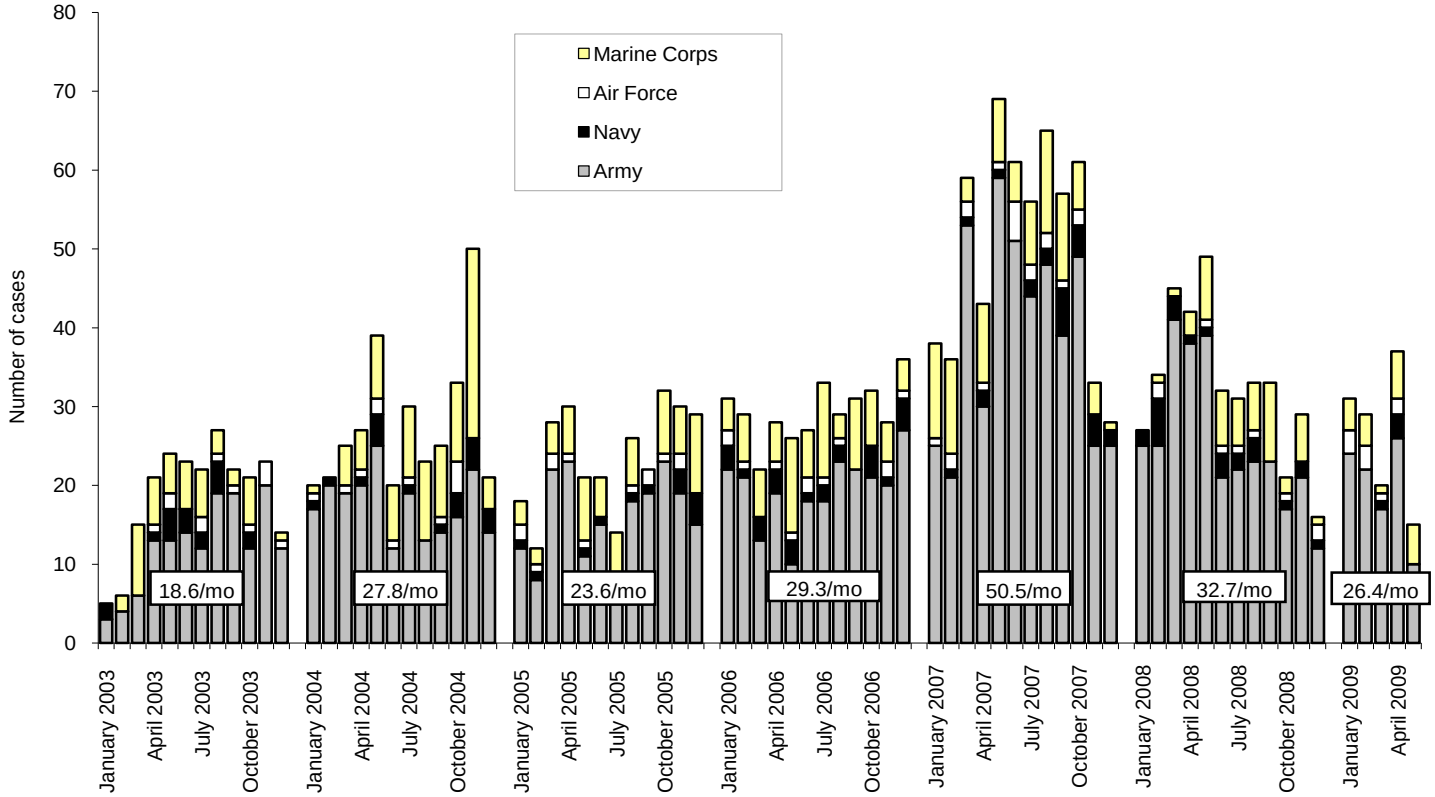
Acute respiratory disease (ARD) and streptococcal pharyngitis rates (SASI*), basic combat training centers, U.S. Army, by week, June 2007-June 2009



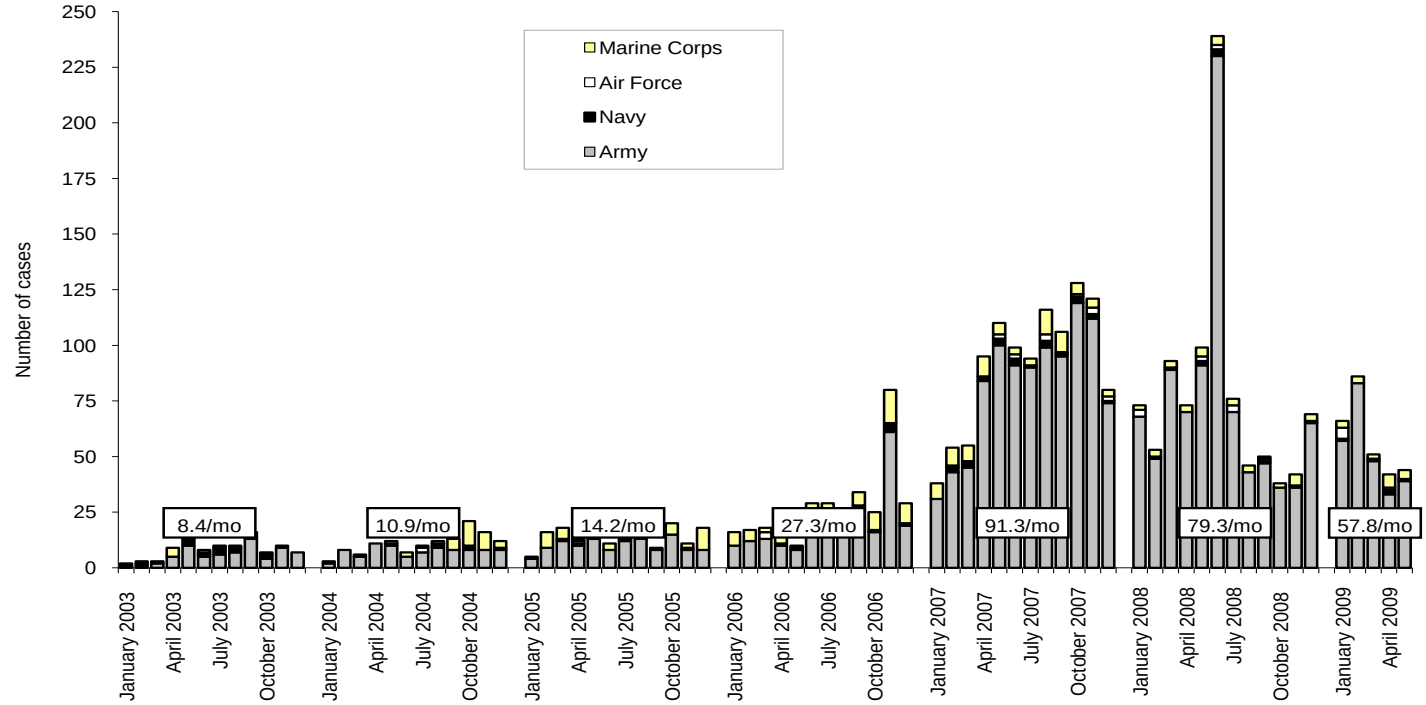
* Streptococcal-ARD surveillance index (SASI) = ARD rate x % positive culture for group A streptococcus
ARD rate = cases per 100 trainees per week
ARD rate > 1.5 or SASI > 25.0 for 2 consecutive weeks are surveillance indicators of epidemics

Deployment-related conditions of special surveillance interest, U.S. Armed Forces, by month and service, January 2003 - May 2009 (data as of 24 June 2009)

Traumatic brain injury, hospitalizations (ICD-9: 310.2, 800-801, 803-804, 850-854, 950.1-950.3, 959.01, V15.5_1-9, V15.5_A-F)*



Traumatic brain injury, multiple ambulatory visits (without hospitalization),
(ICD-9: 310.2, 800-801, 803-804, 850-854, 950.1-950.3, 959.01, V15.5_1-9, V15.5_A-F)†



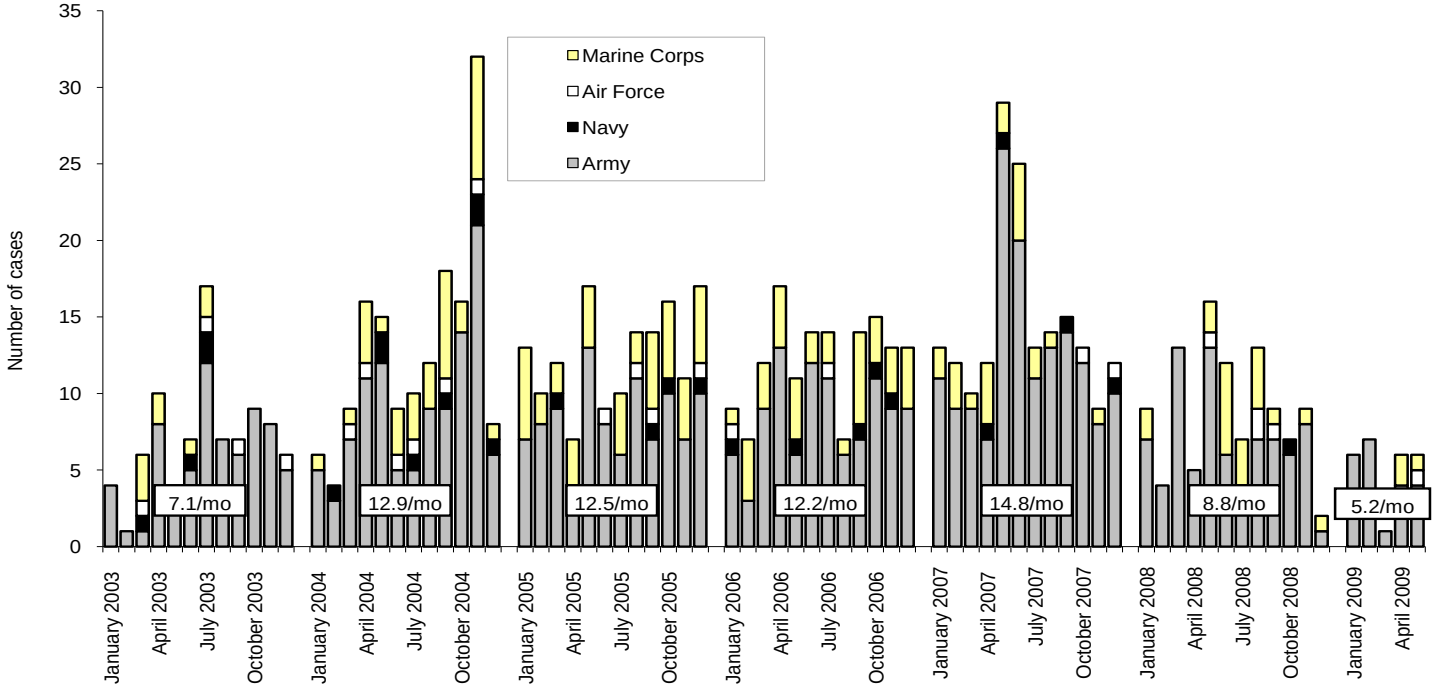
Reference: Armed Forces Health Surveillance Center. Frequencies, rates and trends of use of diagnostic codes indicative of traumatic brain injury (TBI), July 1999-June 2008. MSMR. Dec 2008; 15(10):2-9.

*Indicator diagnosis (one per individual) during a hospitalization while deployed to/within 30 days of returning from OEF/OIF.

†Two or more ambulatory visits at least 7 days apart (one case per individual) while deployed to/within 30 days of returning from OEF/OIF.

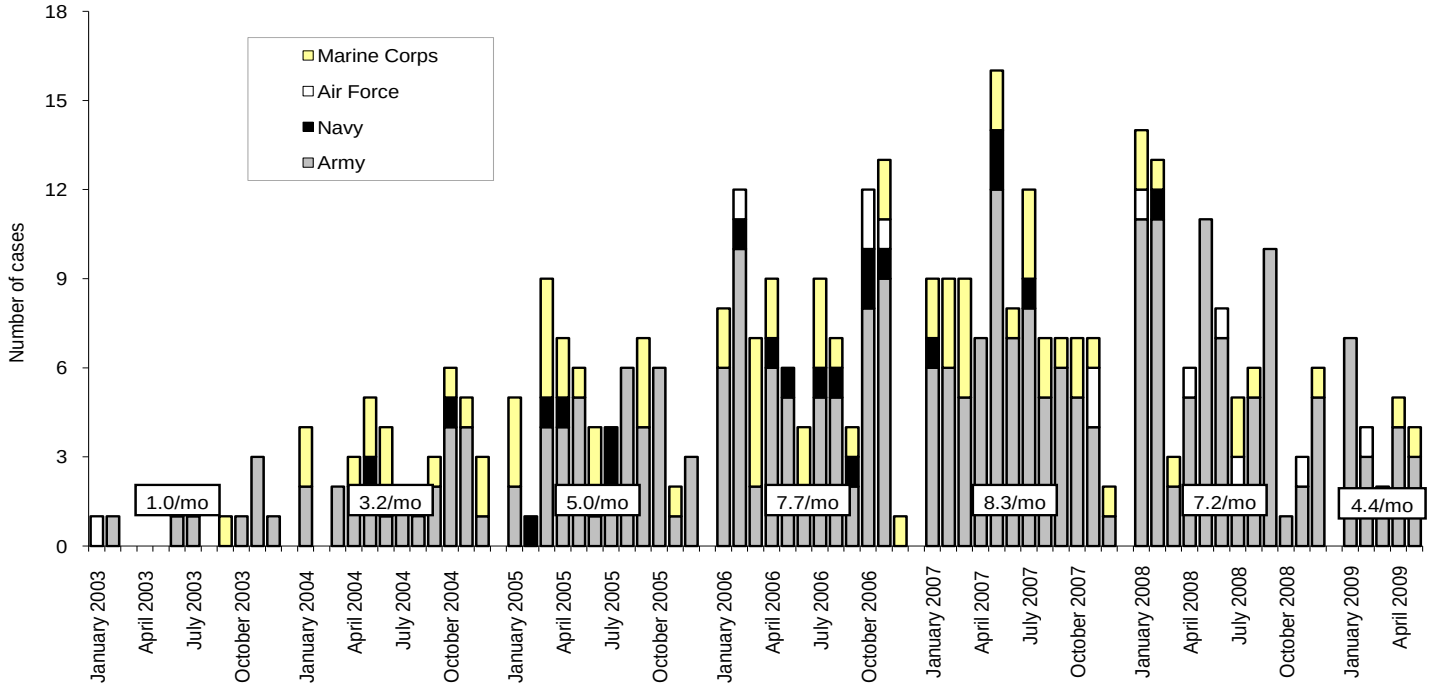
Deployment-related conditions of special surveillance interest, U.S. Armed Forces, by month and service, January 2003 - May 2009 (data as of 24 June 2009)

Amputations (ICD-9: 887, 896, 897, V49.6 except V49.61-V49.62, V49.7 except V49.71-V49.72, PR 84.0-PR 84.1, except PR 84.01-PR 84.02 and PR 84.11)*



Reference: Army Medical Surveillance Activity. Deployment-related condition of special surveillance interest: amputations. Amputations of lower and upper extremities, U.S. Armed Forces, 1990-2004. MSMR. Jan 2005;11(1):2-6.
*Indicator diagnosis (one per individual) during a hospitalization while deployed to/within 365 days of returning from OEF/OIF.

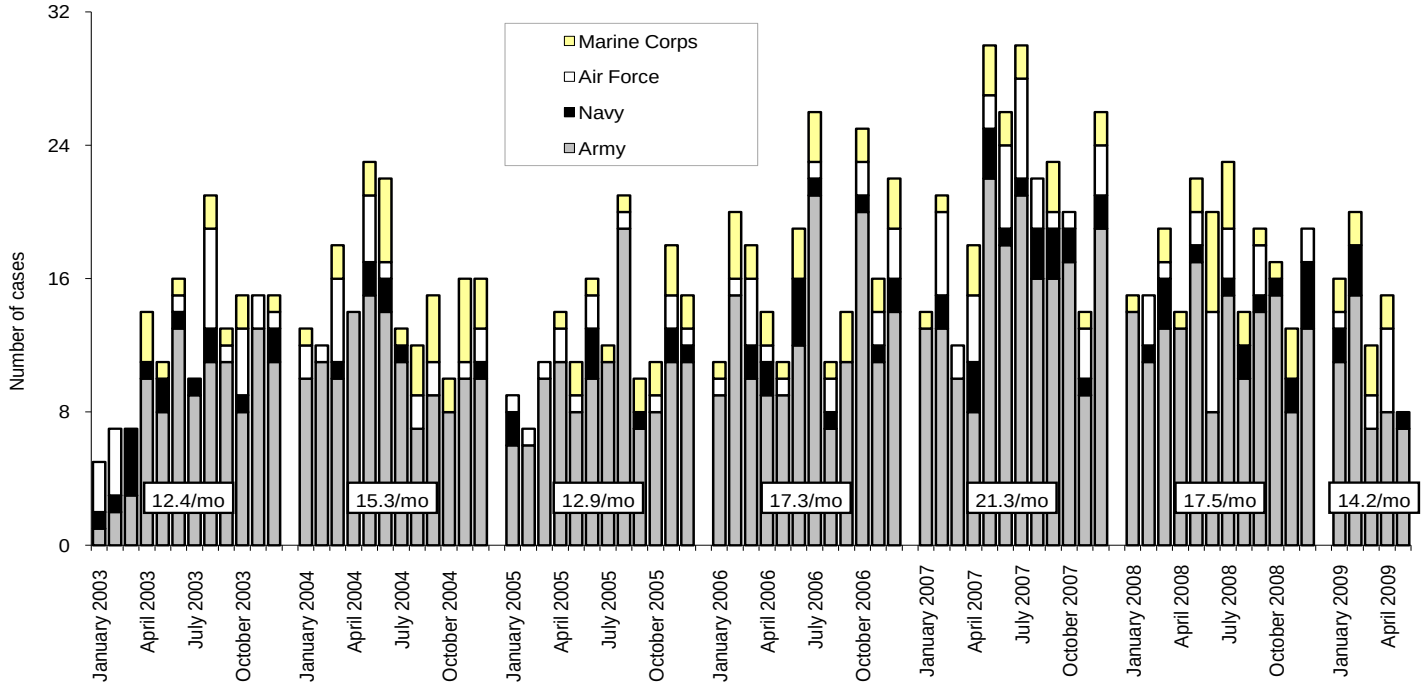
Heterotopic ossification (ICD-9: 728.12, 728.13, 728.19)†



Reference: Army Medical Surveillance Activity. Heterotopic ossification, active components, U.S. Armed Forces, 2002-2007. MSMR. Aug 2007; 14(5):7-9.
†One diagnosis during a hospitalization or two or more ambulatory visits at least 7 days apart (one case per individual) while deployed to/within 365 days of returning from OEF/OIF.

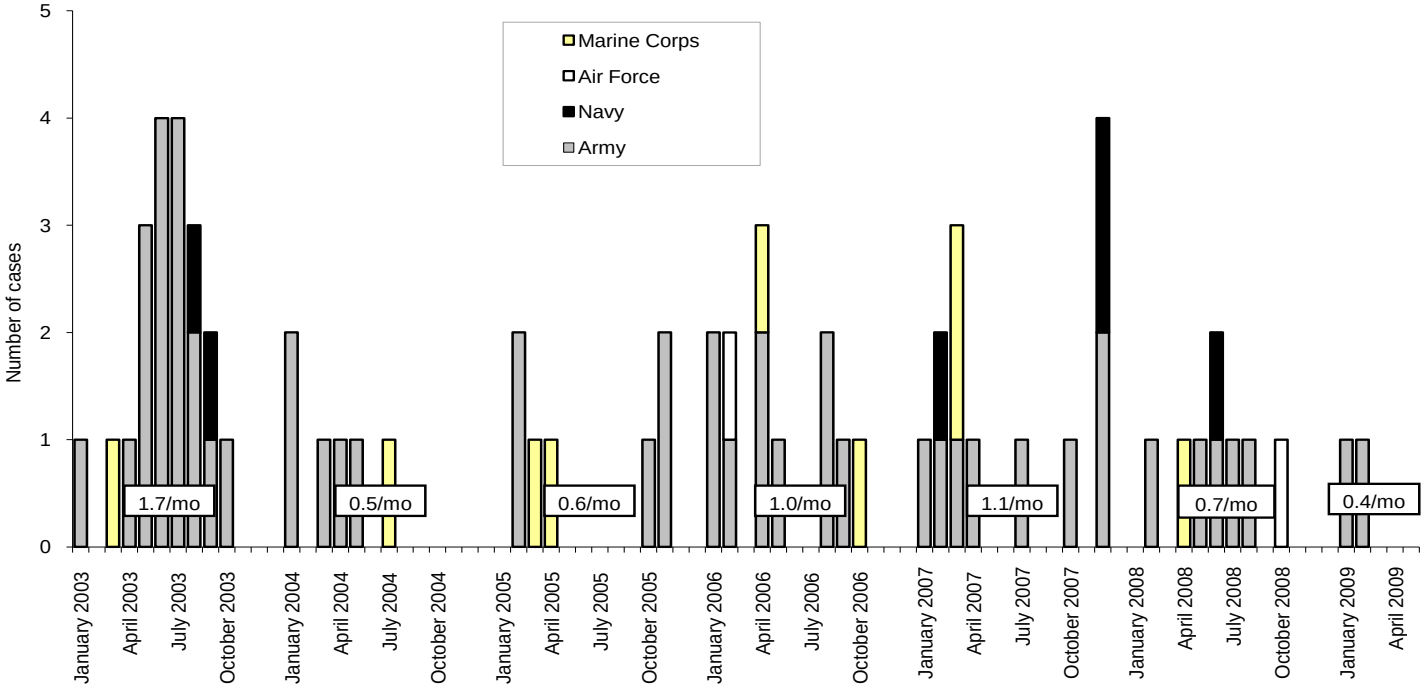
Deployment-related conditions of special surveillance interest, U.S. Armed Forces, by month and service, January 2003 - April 2009 (data as of 24 June 2009)

Deep vein thrombophlebitis/pulmonary embolus (ICD-9: 415.1, 451.1, 451.81, 451.83, 451.89, 453.2, 453.40 - 453.42 and 453.8)*



Reference: Isenbarger DW, Atwood JE, Scott PT, et al. Venous thromboembolism among United States soldiers deployed to Southwest Asia. Thromb Res. 2006;117(4):379-83.
*One diagnosis during a hospitalization or two or more ambulatory visits at least 7 days apart (one case per individual) while deployed to/within 90 days of returning from OEF/OIF.

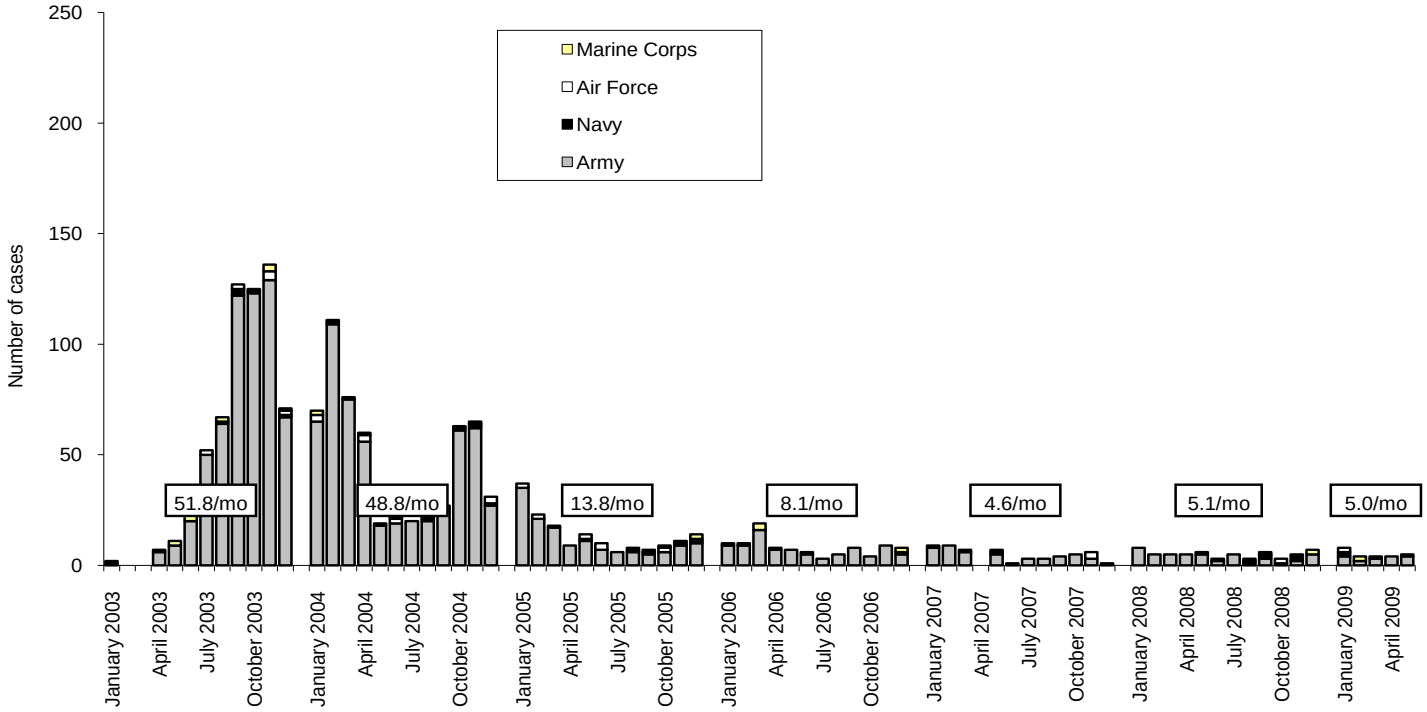
Severe acute pneumonia (ICD-9: 518.81, 518.82, 480-487, 786.09)†



Reference: Army Medical Surveillance Activity. Deployment-related condition of special surveillance interest: severe acute pneumonia. Hospitalizations for acute respiratory failure (ARF)/acute respiratory distress syndrome (ARDS) among participants in Operation Enduring Freedom/Operation Iraqi Freedom, active components, U.S. Armed Forces, January 2003-November 2004. MSMR. Nov/Dec 2004;10(6):6-7.
†Indicator diagnosis (one per individual) during a hospitalization while deployed to/within 30 days of returning from OEF/OIF.

Deployment-related conditions of special surveillance interest, U.S. Armed Forces, by month and service, January 2003 - April 2009 (data as of 24 June 2009)

Leishmaniasis (ICD-9: 085.0 to 085.9)*



Reference: Army Medical Surveillance Activity. Deployment-related condition of special surveillance interest: leishmaniasis. Leishmaniasis among U.S. Armed Forces, January 2003-November 2004. MSMR. Nov/Dec 2004;10(6):2-4.
*Indicator diagnosis (one per individual) during a hospitalization, ambulatory visit, and/or from a notifiable medical event during/after service in OEF/OIF.

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