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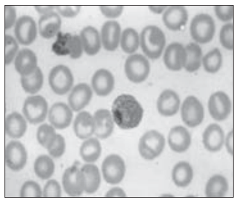

MEDICAL SURVEILLANCE MONTHLY REPORT

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Update: Heat Injuries Among U.S. Military Members, 2007

Throughout history, heat-related injuries have posed significant threats to the health and operational effectiveness of military members.[1] Decades of operational lessons learned and numerous research studies have resulted in doctrine, equipment, and training methods that significantly reduce the adverse effects of heat on U.S. military activities.[2] Still, physical exertion in hot environments causes hundreds of (occasionally fatal) injuries among U.S. service members[3]. This report summarizes heat injury-related medical events among members of active components during 2007 and compares them to recent years.

Methods:

The Defense Medical Surveillance System (DMSS) was searched to identify all medical encounters and notifiable medical event reports that included either primary (dx1) or secondary (dx2) diagnoses of "heat stroke" (ICD-9-CM: 992.0) or "heat exhaustion" (993.3-993.5). If more than one source documented a heat injury episode, information for summary purposes was derived from the hospitalization record (if one was available) or the reportable event record; ambulatory records were used when they were the only sources of information regarding particular episodes. This summary includes only incident cases, defined as one heat injury per service member per six months. Finally, as the DMSS is limited to data reported from fixed medical facilities, medical encounters for heat injuries that occurred during deployment are not included unless they resulted in medical evacuation to fixed medical facilities outside of theater.

Results:

In 2007, there were 329 incident cases of heat stroke and 1,853 incident cases of heat exhaustion among active service members. Overall crude incidence rates of heat stroke and heat exhaustion were 0.24 and 1.38 per 1,000 person-years (p-yrs), respectively **(Table 1)**.

The overall rate (unadjusted) of heat stroke in 2007 was slightly lower than any of the annual rates from 2003-2006 **(Figure 1)**. The overall rate (unadjusted) of heat exhaustion in 2007 was slightly lower than in 2006, but higher than in 2003-2005 **(Figure 2)**. There were fewer hospitalized cases of both heat stroke and heat exhaustion in 2007 than in any other year of the period.

In 2007, as in previous years, incident rates of heat stroke and heat exhaustion declined with increasing age and were higher in combat-related compared to other occupational groups **(Table 1)**. The heat stroke rate was nearly twice as high among males as compared with females, while the heat exhaustion rate was higher among females than males.

The Army and Marine Corps had the same rates of heat stroke, but heat exhaustion among Marines was approximately two-thirds higher than among soldiers. Relative to the Army and Marine Corps, the Air Force and Navy had much lower heat injury rates. The Air Force and Navy had similar rates of heat stroke, while airmen had higher rates of heat exhaustion than sailors. **(Table 1)**.

Table 1. Incident cases and rates of heat stroke and heat exhaustion, active components, U.S. Armed Forces, 2007

	Heat stroke ICD-9-CM: 992.0		Heat exhaustion ICD-9-CM: 992.3-5	
	No.	Incidence rate*	No.	Incidence rate*
Total	329	0.24	1,853	1.38
Sex				
Male	301	0.26	1,540	1.34
Female	28	0.14	313	1.62
Age group				
<20	49	0.51	470	4.85
20-24	152	0.33	773	1.70
25-29	64	0.21	304	1.02
30-34	28	0.15	164	0.86
35-39	22	0.13	100	0.61
>=40	14	0.10	42	0.31
Race/Ethnicity				
White	233	0.27	1,252	1.47
Black	54	0.24	294	1.30
Other	42	0.16	307	1.15
Service				
Army	214	0.43	915	1.82
Navy	25	0.08	157	0.47
Air Force	13	0.04	254	0.77
Marine Corps	77	0.43	527	2.96
Military status				
Enlisted	281	0.25	1,713	1.53
Officer	46	0.21	131	0.59
Military occupation				
Combat	121	0.43	463	1.64
Healthcare	8	0.07	107	0.98
Other	200	0.21	1,283	1.35

*per 1,000 person-years

Concurrent morbidity, per reports in the first two diagnostic positions (dx1 and dx2), were analyzed for incident heat injury cases treated in medical facilities in 2007. Among heat stroke-related medical visits (n=249), primary or secondary diagnoses of "rhabdomyolysis" and "acute kidney failure" were present in 6.8% and 6.0% of cases, respectively. Among heat exhaustion visits (n=1,391), "dehydration" was the primary or secondary diagnosis in 10.6% of cases. Of note, 4.4% of heat stroke and 2.8% of heat exhaustion cases treated in inpatient or outpatient settings had concurrent diagnoses of respiratory illness (principally pneumonia and acute upper respiratory infection). (Data not shown).

Editorial comment:

In the past 5 years, there has been no clear trend in heat

Figure 1. Numbers and rates* of heat stroke diagnoses, by source of report and year of diagnosis, active components, U.S. Armed Forces, 2003-2007

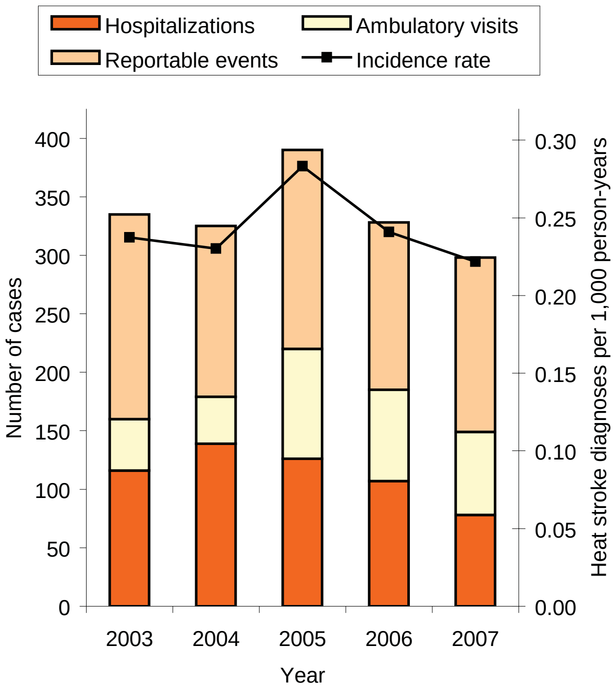
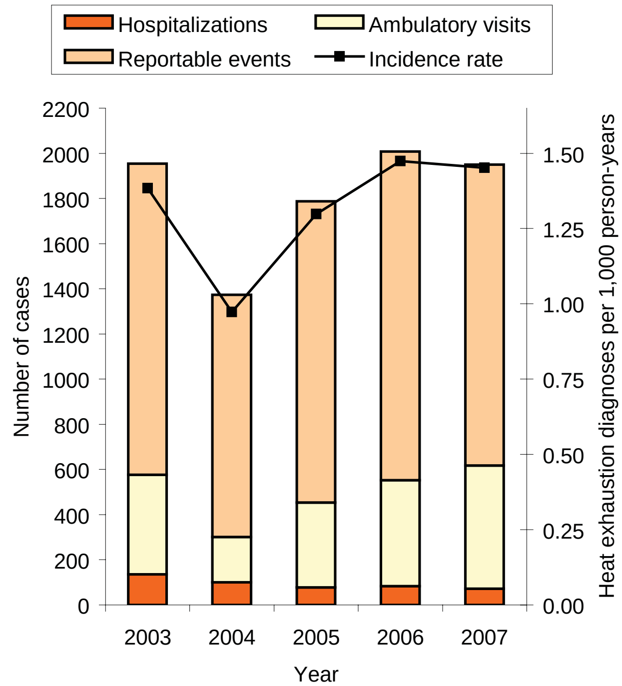


Figure 2. Number and rates* of heat exhaustion diagnoses, by source of report and year of diagnosis, active components, U.S. Armed Forces, 2003-2007



exhaustion incidence among service members, although during the past 2 years, there have been slight declines in reports of heat stroke. Hospitalizations for both heat stroke and heat exhaustion have generally declined and were lower in 2007 than in any of the preceding 5 years. Of note, the period's largest increase in episodes of heat exhaustion (from 1,374 cases in 2004 to 1,788 cases in 2005) was not accompanied by an increase in hospitalized cases. The general decline in the number of hospitalizations may suggest that heat injuries are being evacuated from field settings to fixed medical facilities more often and/or earlier in their clinical courses.

While previous heat injury analyses published in the *MSMR* included only primary (first-listed) diagnoses, this report includes both first-listed and second-listed diagnoses. This expanded case definition, as compared with the previous definition, resulted in 16 additional heat stroke cases (a 5.1% increase) and 139 additional heat exhaustion cases (a 7.7% increase) in 2007. The majority of these "additional cases" of heat injury had as a primary diagnosis either "dehydration" (26.4%) or "symptoms, signs and ill-defined conditions" (30.4%), such as "syncope and collapse" (16.2%).

As overall rates of heat injury have not changed substantially during the past five years, it remains clear that military activities in hot and humid environments are significant threats to the health and operational effectiveness of service members. Among all service members, the youngest and most inexperienced remain at highest risk, not only for heat stroke and heat exhaustion, but also for more serious heat-associated conditions such as exertional rhabdomyolysis (see related article, page 8). In 2007, a small proportion of heat-related injuries were associated with respiratory infections. In a review of heat stroke hospitalizations, Carter and colleagues suggested that acute local infections may increase service members' susceptibility to heat injury.[4]

Small unit leaders, training cadre, and supporting medical personnel, particularly at initial entry training centers, must ensure that service members whom they supervise and support are informed regarding risks, preventive countermeasures (e.g., water consumption), early signs and symptoms, and first responder actions related to heat injuries.[2] Leaders should also be aware of the upper limits of water intake, designed to prevent rare but life-threatening events of overhydration/hyponatremia (see related article, page 12).

Information related to heat injury prevention and treatment is available at: http://chppm-www.apgea.army.mil/heat/#PM.

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Update: Malaria among U.S. Service Members, 2007

Malaria is a mosquito-transmitted parasitic disease that is endemic throughout the tropics and in some temperate regions. Malaria accounts for as many as 300 million acute illnesses and more than 1 million deaths each year worldwide. Four *Plasmodium* species are capable of infecting humans and causing clinically significant illnesses: *Plasmodium falciparum* (the most deadly), *Plasmodium vivax* (the most common), *Plasmodium ovale*, and *Plasmodium malariae*.

For centuries, malaria has threatened the health and operational capabilities of military forces in malaria endemic areas.[1,2] Currently, U.S. service members are at risk of malaria when they train or conduct operations in endemic areas (e.g., Afghanistan); when they are permanently assigned in endemic areas (e.g., near the Demilitarized Zone in Korea[3-5]); or when they visit malarious areas during personal travels.

Since the mid-1990s, most malaria cases among U.S. service members were due to *P. vivax* infections that were acquired during summer-fall seasons in Korea.[3-5] More recently, *P. vivax* has threatened U.S. military forces that conduct/support operations in Afghanistan.[6,7] For example, in 2002, 38 U.S. Army Rangers acquired vivax malaria while operating in eastern Afghanistan.[7] Of note, malaria endemicity in Iraq is low,[8] and there have been no confirmed cases of Iraq-acquired malaria among U.S. service members.[9] This report summarizes the malaria experiences of U.S. service members during calendar year 2007 and compares it to recent experience.

Methods:

The Defense Medical Surveillance System was searched to identify inpatient medical encounters and reportable medical events that included primary (first-listed) diagnoses of malaria (ICD-9-CM: 084.0-084.9) among U.S. service members during calendar years 2002 through 2007. For this summary, only one episode of malaria per service member per year was included. When multiple records were available for a single case, the date of the earliest was considered the date of clinical onset, and the most specific diagnosis (typically from an inpatient record) was used to classify the species type.

Presumed locations of malaria acquisition were estimated using the following algorithm: (1) cases diagnosed in Korea were considered Korea-acquired; (2) cases among service members who had been assigned to Korea within 2 years prior to diagnosis were considered acquired in Korea; (3) cases among service members who had deployed to Afghanistan within 2 years prior to diagnosis were considered acquired in Afghanistan; (4) cases documented as reportable medical events that listed exposures to other malaria endemic locations were considered acquired in those locations; (5) all remaining cases were considered acquired in "unknown" areas.

Results:

In 2007, 86 U.S. military members were clinically diagnosed and/or were reported with malaria. The number of cases in 2007 was similar to the numbers in 2002, 2004, and 2005 but significantly fewer than in 2003 and 2006 **(Figure 1)**.

As in the past, most service members diagnosed with malaria in 2007 were males (94%), younger than 30 (83%), white non-Hispanic (73%), and in the active component (90%) **(Table 1)**.

In 2007, more than one-half (n=46; 53.5%) of all cases were attributed to *P. vivax* infections, and more than one-third (n=34; 39.5%) were reported as "unspecified" type **(Figure 1)**. Fewer cases of falciparum malaria were reported among U.S. service members in 2007 (n=6) than in any of the previous 5 years **(Table 1, Figure 1)**.

More than three-fourths of all malaria cases diagnosed/reported in 2007 were caused by infections that were considered acquired in Afghanistan (n=36; 41.9%) or Korea (n=31; 36.0%) **(Table 2)**. In 2007 compared to 2006, there were 48 fewer cases presumably acquired in Afghanistan and five more cases presumably acquired in Korea.

Figure 1. Malaria cases by plasmodium species and year, U.S. Armed Forces, 2002-2007

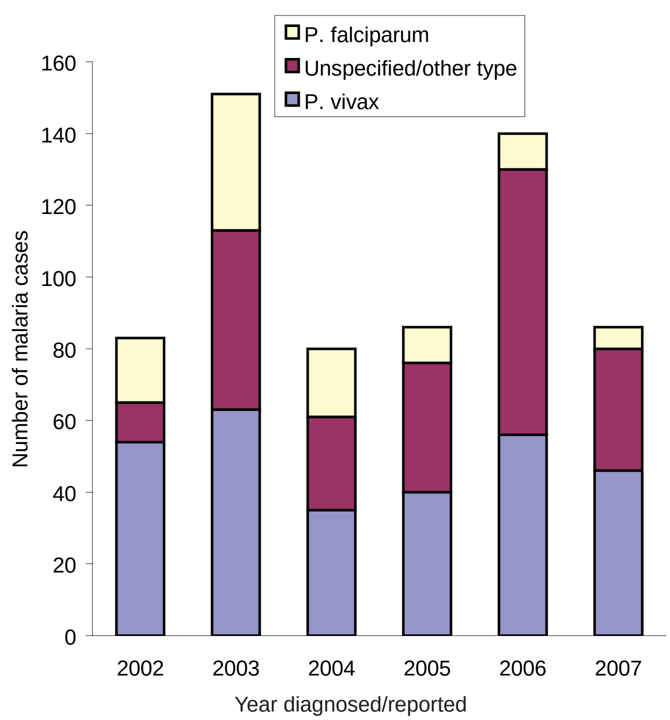


Table 1. Malaria cases by species type and selected demographic characteristics, active components, U.S. Armed Forces, 2007

	P. vivax	*P. falciparum*	Unspecified or other	Total	Percent of total
Total	46	6	34	86	100.0
Gender					
Male	44	4	33	81	94.2
Female	2	2	1	5	5.8
Age group					
<20	.	.	1	1	1.2
20-24	24	3	22	49	57.0
25-29	12	1	8	21	24.4
30-34	7	1	1	9	10.5
35-39	3	.	.	3	3.5
40+	.	1	2	3	3.5
Race/ethnicity					
White	34	3	26	63	73.3
Black	2	2	4	8	9.3
Hispanic	8	0	2	10	11.6
Other	2	1	2	5	5.8
Service					
Army	45	3	32	80	93.0
Navy	1	1	1	3	3.5
Air Force	.	.	.	.	0.0
Marine Corps	.	2	1	3	3.5
Component					
Active	44	4	29	77	89.5
Reserve	2	2	5	9	10.5

In 2007, all cases due to infections presumably acquired in Afghanistan and two-thirds of those presumably acquired in Korea were reported from medical facilities in the United States or Europe **(Table 2)**. During 2007, malaria cases were diagnosed and/or reported from 29 different medical facilities in the United States, Germany, Korea, and Japan; however, five Army facilities that treated/reported at least five cases each accounted for nearly 60% of the total: Bayne-Jones Army Community Hospital, Fort Polk, LA (n=16); Landstuhl Regional Medical Center, Germany (n=12); 121st General Hospital, Seoul, Korea (n=10); Womack Army Medical Center, Fort Bragg, NC (n=7); and Darnall Army Medical Center, Fort Hood, TX (n=5) **(Table 2)**.

In 2006 and 2007, malaria infections acquired in Afghanistan were clinically manifested and diagnosed throughout the year; however, there was a clear peak in Afghanistan-acquired cases in the summer of 2006 **(Figure 2)**. In contrast, during the past two years, all except two Korea-acquired cases were clinically expressed and diagnosed between May and September **(Figure 2)**.

Data analysis by Stephen B. Taubman, PhD.

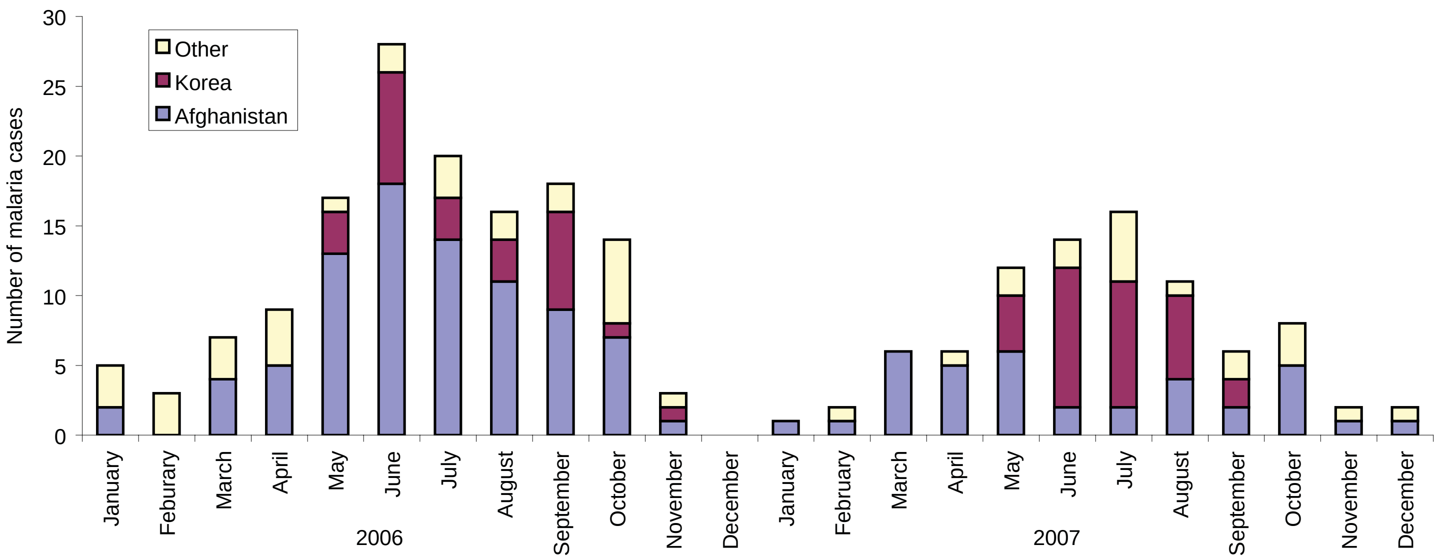
Editorial comment:

The number of malaria cases diagnosed/reported among U.S. service members in 2007 was similar to the numbers in

Table 2. Number of malaria cases by geographical locations of diagnosis or report and presumed location of acquisition, U.S. Armed Forces, 2007

Location of diagnosis/report	Number of cases	Percent of total	Presumed location of infection acquisition				
			Afghanistan	Korea	Africa	Central/ S. America	Other/ Unknown
United States							
Ft. Polk, LA	16	18.6	14	1	0	0	1
Ft. Bragg, NC	7	8.1	1	4	0	1	1
Ft. Hood, TX	5	5.8	0	4	0	0	1
Washington, DC	4	4.7	2	2	0	0	0
Ft. Bliss, TX	3	3.5	0	3	0	0	0
Ft. Carson, CO	2	2.3	1	1	0	0	0
Ft. Riley, KS	2	2.3	1	0	0	0	1
Ft. Drum, NY	2	2.3	2	0	0	0	0
San Diego, CA	1	1.2	0	1	0	0	0
Ft. Shafter, HI	1	1.2	1	0	0	0	0
Ft. Knox, KY	1	1.2	0	1	0	0	0
Ft. Leonard Wood, MO	1	1.2	0	0	0	1	0
Ft. Monmouth, NJ	1	1.2	1	0	0	0	0
Camp Lejeune, NC	1	1.2	0	0	1	0	0
Ft. Sill, OK	1	1.2	0	1	0	0	0
Beaufort, SC	1	1.2	0	0	0	0	1
Ft. Lewis, WA	1	1.2	0	1	0	0	0
Other U.S. locations	10	11.6	6	0	0	1	3
Outside of U.S.							
Landstuhl, Germany	12	14.0	6	1	1	0	4
Seoul, Korea	10	11.6	0	10	0	0	0
Heidelberg, Germany	2	2.3	1	1	0	0	0
Wuerzburg, Germany	1	1.2	0	0	1	0	0
Okinawa, Japan	1	1.2	0	0	0	0	1
Total	86	100.0	36	31	3	3	13

Figure 2. Diagnoses/reported cases of malaria, by location of acquisition of infection, by month of clinical presentation/diagnosis, U.S. Armed Forces, 2006-2007



three of the previous five years – and significantly fewer than in the other two years. From the mid-1990s through 2004, most cases of malaria among U.S. military members were due to *P. vivax* infections presumably acquired near the demilitarized zone in Korea.[3-5,10] However, since the beginning of the global war on terrorism, U.S. service members have also been at risk while conducting operations in endemic areas of Afghanistan. Since 2004, Korea-associated cases have declined likely due to the prevention policies and practices of U.S. forces and the directed malaria control program of the Republic of Korea.[10] In turn, in 2006 and 2007, more malaria cases among U.S. military members were likely due to infections acquired in Afghanistan than Korea. Of note in this regard, from 2006 to 2007, Afghanistan-associated cases sharply declined while Korea-associated cases slightly increased **(Figure 2)**.

The findings of this report should be interpreted with consideration of its limitations. In particular, there are significant difficulties in ascertaining and tracking not only the numbers and types of clinical cases of malaria but also the times when and the locations where the underlying infections were acquired.[11] For example, for several reasons, most cases of malaria among U.S. service members in 2007 were diagnosed/reported at medical facilities outside of the areas where – and long after – the infections were acquired.[11] Of note in this regard, the clinical manifestations of *P. vivax* infections acquired in Afghanistan may be suppressed until the chemoprophylaxis that is taken routinely while deployed is terminated following deployment – usually in a different geographic area.[7,11]

Also, the malaria parasites endemic in temperate climate regions often have long latency periods.[12] In turn, *P. vivax* infections acquired in Afghanistan and Korea may be clinically expressed outside of the areas where the infections were acquired.[5,11,13,14] For example, 17 of the 31 Korea-associated cases reported in 2007 were presumably due to *P. vivax* infections acquired in the summer-fall of 2006.[5]

In addition, malaria cases diagnosed in deployed settings (such as in Afghanistan) are unlikely to be ascertained for surveillance purposes unless they are treated at/reported from a fixed medical facility out of the operational theater. In 2007, malaria cases among U.S. military members were diagnosed at/reported from 29 locations in the United States, Germany, Korea, and Japan.

In recent years, many U.S. military members have presented with malaria after sequential assignments in different malaria endemic areas.[11] In such cases, it is often difficult to determine where and when the underlying infections were acquired. Clearly, providers of medical care to U.S. service members—during all seasons and in all locations—should be alert for service members who present with clinical syndromes consistent with malaria and who traveled to or were assigned/deployed to malaria-endemic areas during the past 2 years.

Finally, all soldiers at risk of malaria (and other arthropod-transmitted infections) should be informed of the nature of the risk; trained, equipped, and supplied to conduct indicated countermeasures; and monitored to ensure compliance. Personal protective measures against malaria include the proper wear of permethrin-impregnated uniforms; the use of bed nets and military-issued DEET-containing insect repellent; and compliance with prescribed chemoprophylactic drugs before, during, and after times of exposure in malarious areas.

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Exertional Rhabdomyolysis among U.S. Military Members, 2004-2007

Rhabdomyolysis literally means the breakdown of striated muscle cells.[1-3] The life threatening consequences of rhabdomyolysis result from the release into the bloodstream of potentially toxic cellular contents (e.g., myoglobin).[1-3] In high enough concentrations, the contents of skeletal muscle cells can cause organ and systemic dysfunction, including disseminated intravascular coagulation (DIC), disturbances of fluid, electrolyte, and acid-base balance, compartment syndrome, and renal failure.[1-3]

In the United States, case fatality with rhabdomyolysis is less than 5% and depends on the nature of the precipitating cause, the severity and clinical effects of comorbid conditions, and the prior state of health of affected individuals. Most otherwise healthy individuals recover with aggressive hydration and management of metabolic, renal, and systemic complications.[1,3]

There are numerous and diverse causes of rhabdomyolysis, including acute traumatic injury – particularly, soft tissue compression ("crush") injuries; electrocution; infections and immune disorders that cause inflammation of skeletal muscle; toxic effects of prescribed, over-the counter, recreational (e.g., alcohol), and illicit drugs; ischemia; invasive and toxigenic infections; sepsis; and seizures.[1,2] In healthy, physically active young adults (such as military members), rhabdomyolysis is a significant threat during physical exertion ("exertional rhabdomyolysis"), particularly under heat stress.[1-3] Militarily-relevant risk factors for exertional rhabdomyolysis – particularly among recruits – include rapid increase in physical activity, high heat and humidity, inadequate hydration, concurrent heat injury, and ongoing/recent acute infectious illness.[1-3]

For the purpose of estimating recent experience with "exertional rhabdomyolysis," we identified all incident medical encounters of U.S. service members for "rhabdomyolysis" and excluded those with concurrent diagnoses of injuries (other than sprains and strains), poisonings, and/or toxic effects. For this report, all incident cases of presumed exertional rhabdomyolysis from 2004 to 2007 were summarized in relation to the seasons and geographic locations of their occurrence and the military and demographic characteristics of affected service members.

Methods:

In 2004, a diagnostic code specific for "rhabdomyolysis" was added to the International Classification of Diseases, 9th revision, clinical modifications [ICD-9-CM]. For this reason, the surveillance period was defined as 1 January 2004 to 31 December 2007. The surveillance population included all individuals who served in an active component of the U.S. Armed Forces any time during the surveillance period.

For surveillance purposes, a case of "exertional rhabdomyolysis" was defined as a hospitalization or ambulatory visit with a discharge diagnosis in any position of ICD-9-CM: 728.88: "rhabdomyolysis" and/or ICD-9-CM: 791.3 "myoglobinuria"; plus a diagnosis in any position of ICD-9-CM: 276.5 "volume depletion (dehydration)" and/or ICD-9-CM: 992.0-992.9 "effects of heat" and/or ICD-9-CM: 994.3-994.5 "effects of thirst (deprivation of water)", "exhaustion due to exposure" and "exhaustion due to excessive exertion (overexertion)."

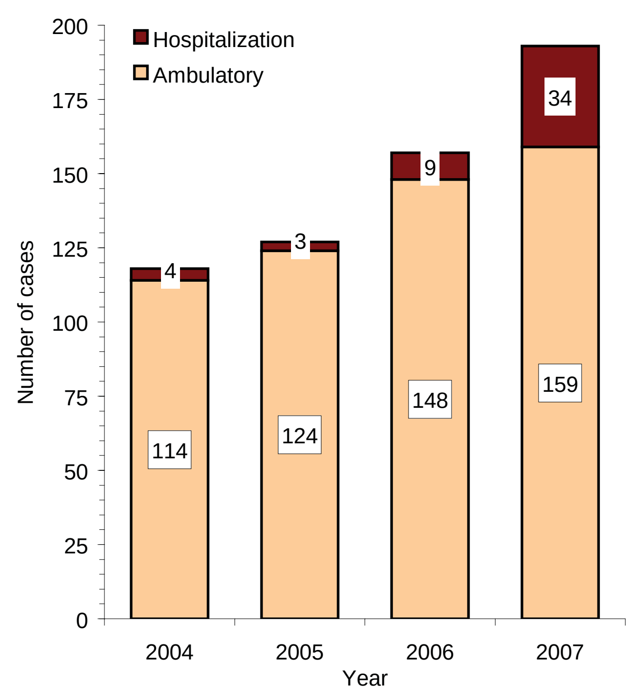
To exclude cases of rhabdomyolysis that were secondary to traumatic injuries, intoxications, or adverse drug reactions, medical encounters with diagnoses in any position of ICD-9-CM: 800-999 "injury, poisoning, toxic effects" (except ICD-9-CM: 992.0-992.9, 994.3-994.5, and 840-848 "sprains and strains of joints and adjacent muscles") were excluded from consideration as "exertional rhabdomyolysis" case defining encounters.

Each individual was included as a case only once per calendar year.

Results:

During the period, there were 595 incident diagnoses of rhabdomyolysis likely due to physical exertion and/or heat stress ("presumed exertional rhabdomyolysis"). The number of cases increased each year from 2004 (n=118) to 2007 (n=193) **(Table1, Figure 1).**

Figure 1. Incident diagnoses of presumed exertional rhabdomyolysis among U.S. military members, by type of medical encounter, 2004-2007



From 2004 to 2006, more than 94% of all cases were diagnosed in ambulatory settings only. In 2007, nearly 18% of incident cases were diagnosed during hospitalizations.

Most service members diagnosed with presumed exertional rhabdomyolysis were males (93.8%), in the Army (46.2%) or Marine Corps (30.9%), enlisted (89.6%), and younger than 25 years old (63.2%) **(Table 1)**. Compared to the racial/ethnic composition of U.S. service members overall, those diagnosed with exertional rhabdomyolysis were more likely to be black non-Hispanic (25.7%) or "other" (16.1%) race/ethnicities **(Table 1)**.

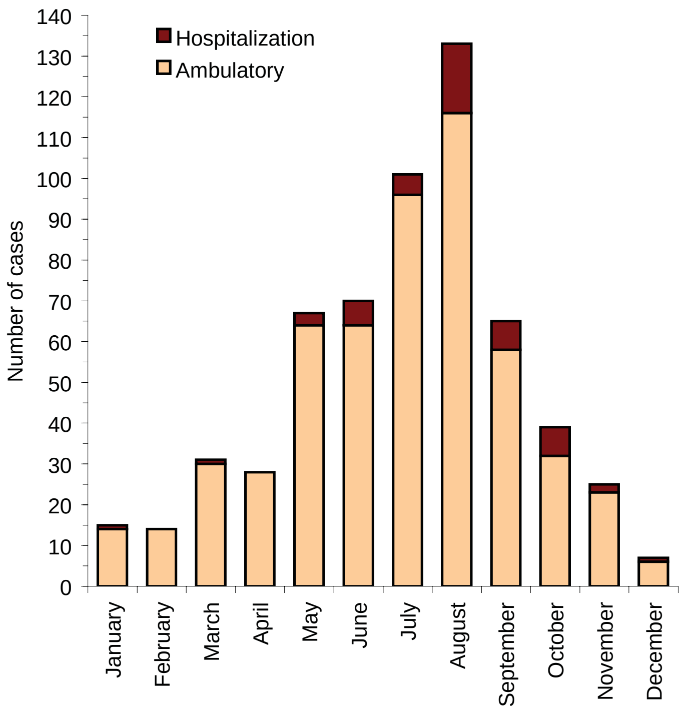
In general, case incidence increased beginning in March, rose through the spring and summer to a sharp peak in August, and then continuously declined through December **(Tables 1, Figure 2)**. Nearly one-fourth of all cases – and nearly one-third of all hospitalized cases – occurred in August; and nearly three-fourths of all cases were diagnosed between May and September **(Table 1, Figure 2)**.

During the period, 20 medical treatment facilities reported at least 8 cases each of presumed exertional rhabdomyolysis; of these, nine provided medical support for recruit/basic combat training installations. The medical facilities at 10 installations – six Army, three Navy/Marine Corps, and one Air Force – accounted for nearly one-half of all incident diagnoses of exertional rhabdomyolysis. Approximately one-ninth (n=65) of all cases were diagnosed at the Naval Hospital, Beaufort, SC, or its associated clinics which support the Marine Corps Recruit Depot, Parris Island, and the

Table 1. Incident diagnoses of exertional rhabdomyolysis, active components, U.S. Armed Forces, January 2004-December 2007

	Overall						By calendar year			
	Hospitalized		Ambulatory		Total		2004	2005	2006	2007
	No.	column %	No.	column %	No.	% of total	No.	No.	No.	No.
Total	50	100.0	545	100.0	595	100.0	118	127	157	193
Service										
Army	17	34.0	258	47.3	275	46.2	61	54	67	93
Navy	7	14.0	70	12.8	77	12.9	15	18	23	21
Air Force	6	12.0	53	9.7	59	9.9	10	11	14	24
Marine Corps	20	40.0	164	30.1	184	30.9	32	44	53	55
Sex										
Male	49	98.0	509	93.4	558	93.8	107	121	152	178
Female	1	2.0	36	6.6	37	6.2	11	6	5	15
Race/ethnicity										
White, non-Hispanic	30	60.0	316	58.0	346	58.2	71	76	89	110
Black, non-Hispanic	15	30.0	138	25.3	153	25.7	27	26	47	53
Other	5	10.0	91	16.7	96	16.1	20	25	21	30
Age										
<20	16	32.0	116	21.3	132	22.2	27	31	35	39
20-24	15	30.0	229	42.0	244	41.0	45	50	74	75
25-29	7	14.0	92	16.9	99	16.6	20	21	24	34
30-34	6	12.0	46	8.4	52	8.7	11	13	11	17
35-39	4	8.0	37	6.8	41	6.9	10	10	6	15
40+	2	4.0	25	4.6	27	4.5	5	2	7	13
Rank										
Enlisted	48	96.0	485	89.0	533	89.6	99	115	145	174
Officer	2	4.0	60	11.0	62	10.4	19	12	12	19
Military occupation										
Combat	18	36.0	149	27.3	167	28.1	26	38	49	54
Health care	1	2.0	38	7.0	39	6.6	8	8	14	9
Other	31	62.0	358	65.7	389	65.4	84	81	94	130
Month of dx										
January	1	2.0	14	2.6	15	2.5	0	4	3	8
February	0	.	14	2.6	14	2.4	4	1	6	3
March	1	2.0	30	5.5	31	5.2	9	5	8	9
April	0	.	28	5.1	28	4.7	8	4	6	10
May	3	6.0	64	11.7	67	11.3	18	10	18	21
June	6	12.0	64	11.7	70	11.8	12	15	21	22
July	5	10.0	96	17.6	101	17.0	21	30	28	22
August	17	34.0	116	21.3	133	22.4	22	30	30	51
September	7	14.0	58	10.6	65	10.9	14	12	17	22
October	7	14.0	32	5.9	39	6.6	6	9	9	15
November	2	4.0	23	4.2	25	4.2	4	7	7	7
December	1	2.0	6	1.1	7	1.2	0	0	0	0

Figure 2. Incident diagnoses of presumed exertional rhabdomyolysis among U.S. military members, by type of medical encounter and calendar month, 2004-2007



Marine Corps Air Station, Beaufort. Together, the medical facilities at Fort Bragg, NC (n=44), Camp Pendleton, CA (n= 35), and Fort Benning, GA (n=35) accounted for nearly one-fifth of all exertional rhabdomyolysis diagnoses during the period **(Table 2)**.

Data analysis by Gi-Taik Oh, MS, MA.

Editorial comment:

For several reasons, the findings of this report are difficult to interpret. For example, because there was not a diagnostic code specific for "rhabdomyolysis" prior to 2004, a reliable record of past experience is not available for assessing recent experience. Because of the recency of implementation of a specific diagnostic code, it is difficult to determine if the increase in reported cases of "rhabdomyolysis" from 2004 through 2007 reflects increasing awareness and use of the code in standardized reporting, the continuation of a trend of increasing incidence, or a recent increase in case incidence. Also, the diagnosis of "rhabdomyolysis" does not indicate the cause; in turn, it is difficult to discern cases that are "exertional" and/or heat-related from those with other precipitating causes.

Still, the findings of this analysis are informative and potential useful for prevention. They confirm that, in U.S. service members, most cases of exertional rhabdomyolysis occur in mid-to-late summer at basic combat/recruit training installations and at home bases of major Army and Marine Corps combat units. They also suggest that service members who represent black and "other" non-white race/ethnic groups have relatively increased risks of exertional rhabdomyolysis during military service.

Individuals who suddenly increase overall levels of physical activity and/or increase stress on weight bearing muscles – particularly in high heat and humidity – are at increased risk of exertional rhabdomyolysis. Recruits who are not physically fit when they begin training have relatively high risks of training-related (including exertional heat)

Table 2. Exertional rhabdomyolysis, by installation (at least 8 cases during the period), active components, U.S. Armed Forces, January 2004-December 2007

Location	2004		2005		2006		2007		Total	
	No.	% of total cases	No.	% of total cases	No.	% of total cases	No.	% of total cases	No.	% of total cases
Beaufort, SC	7	5.9	14	11.0	21	13.4	23	12.0	65	10.9
Fort Bragg, NC	6	5.1	10	7.9	10	6.4	18	9.4	44	7.4
Camp Pendleton, CA	8	6.8	11	8.7	10	6.4	6	3.1	35	5.9
Fort Benning, GA	12	10.2	11	8.7	6	3.8	6	3.1	35	5.9
Fort Knox, KY	3	2.5	10	7.9	6	3.8	5	2.6	24	4.0
Fort Shafter, HI	2	1.7	7	5.5	6	3.8	5	2.6	20	3.4
Fort Campbell, CA	8	6.8	3	2.4	2	1.3	7	3.6	20	3.4
San Diego, CA	7	5.9	5	3.9	1	0.6	6	3.1	19	3.2
Lackland AFB, TX	.	.	1	0.8	2	1.3	11	5.7	14	2.4
Fort Jackson, SC	4	3.4	.	.	2	1.3	7	3.6	13	2.2
Okinawa, Japan	3	2.5	2	1.6	2	1.3	5	2.6	12	2.0
Fort Leonard Wood, MO	3	2.5	5	3.9	1	0.6	3	1.6	12	2.0
Camp Lejeune, NC	.	.	6	4.7	2	1.3	4	2.1	12	2.0
Portsmouth, VA	4	3.4	2	1.6	2	1.3	3	1.6	11	1.9
Presidio of San Francisco, CA	3	2.5	2	1.6	3	1.9	2	1.0	10	1.7
Great Lakes, IL	1	0.8	3	2.4	5	3.2	1	0.5	10	1.7
Quantico, VA	4	3.4	1	0.8	4	2.5	.	.	9	1.5
Twenty-nine Palms, CA	1	0.8	1	0.8	4	2.5	2	1.0	8	1.3
Washington, DC	3	2.5	1	0.8	.	.	4	2.1	8	1.3
Fort Sill, OK	.	.	1	0.8	4	2.5	3	1.6	8	1.3

injuries, in general. Also, recruits from relatively cool and dry climates may not be acclimated to the high heat and humidity at training camps in mid-late summer. Finally, soldiers and Marines in combat units often conduct rigorous unit physical training, personal fitness training, and field training exercises regardless of weather conditions. It is not surprising, therefore, that recruit camps and installations with large combat units account for most exertional rhabdomyolysis cases.

The finding that black and "other" non-white racial/ethnic subgroup members were overrepresented among exertional rhabdomyolysis cases may reflect, at least in part, increased risk of exertional rhabdomyolysis among individuals with sickle cell trait.[4,5] Supervisors at all levels should assure that guidelines to prevent heat injuries are enforced for all service members. They should be vigilant for early signs of exertional heat injuries including rhabdomyolysis among all (particularly, non-white) service members.

The measures that are effective at preventing exertional heat injuries in general are indicated for preventing exertional rhabdomyolysis. Work-rest cycles should be adapted not only to ambient weather conditions but also the fitness levels of participants in strenuous activities. Of particular note, the strenuous physical activities of overweight and/or previously sedentary new recruits – particularly in hot, humid weather – should increase gradually and be closely monitored. Water intake should comply with current guidelines and be closely supervised. Strenuous activities during relatively cool mornings following days of high heat stress should be particularly closely monitored; in the past, such situations have been associated with increased risk of exertional heat injuries (including rhabdomyolysis).[6] Commanders and supervisors at all levels should be aware of and alert for early signs of exertional heat injuries – including rhabdomyolysis – and should aggressively intervene when dangerous conditions, activities, or suspicious illnesses are detected.

Finally, medical care providers should consider exertional rhabdomyolysis in the differential diagnosis when service members – particularly recruits – present with muscular pain, swelling, and limited range of motion after strenuous physical activity, particularly in hot, humid weather. Brown colored urine from increased concentrations of myoglobin in urine is a distinctive clinical sign of rhabdomyolysis.

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Exercise-associated Hyponatremia Due to Excessive Water Consumption, U.S. Military Members, 1999-2007

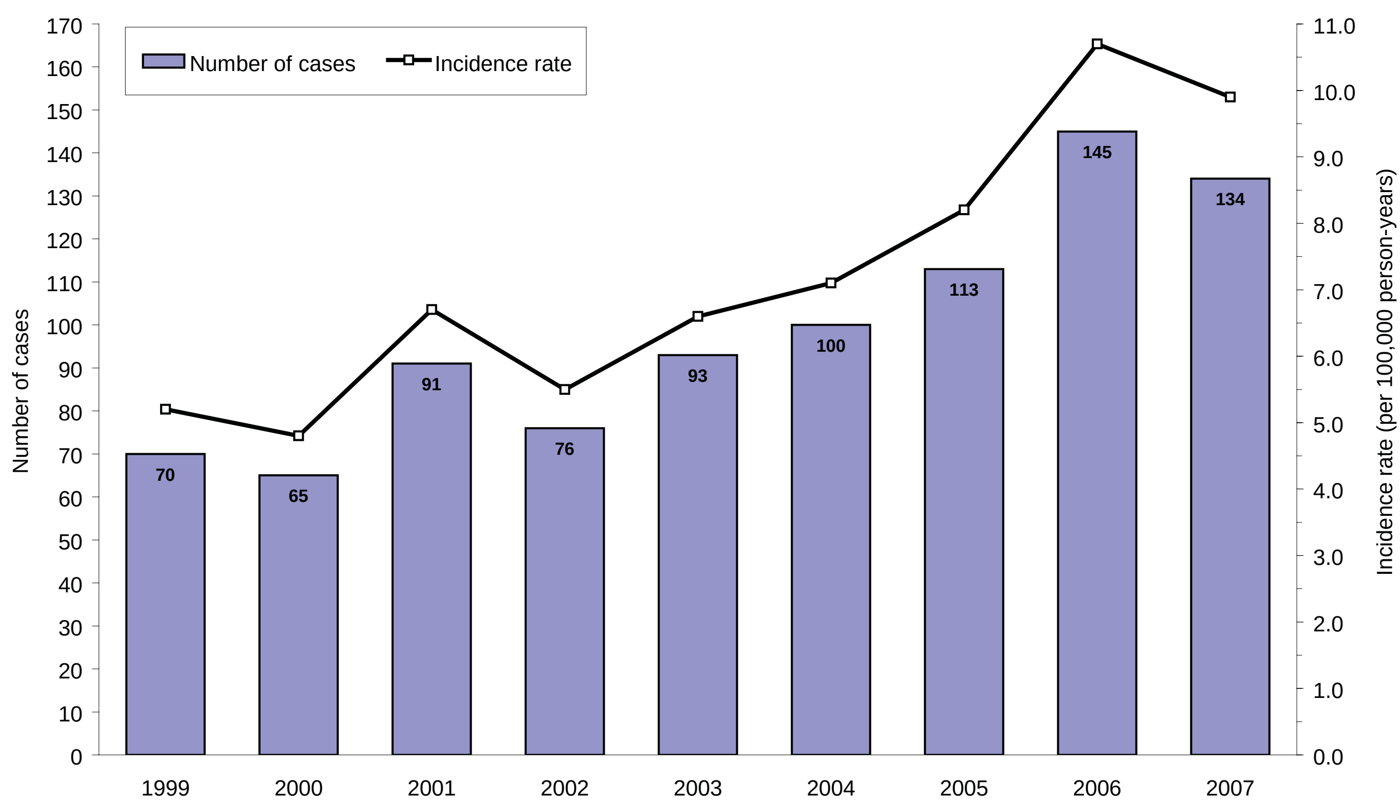
Hyponatremia is defined as abnormally low concentrations of sodium in the blood (serum sodium concentration <135 mEq/L).[1,2] In otherwise healthy young adults, hyponatremia can result from excessive sodium losses in sweat and/or excessive water consumption during prolonged exercise.[1] Although symptomatic hyponatremia occurs infrequently, when it does occur, it is potentially life threatening.[1-3]

Acute hyponatremia creates an osmotic imbalance between fluid outside and inside of cells. In response to the osmotic gradient, water flows from outside to inside the cells of various organs, including the lungs ("pulmonary edema") and brain ("cerebral edema"). Swelling of the brain increases intracranial pressure which can decrease cerebral blood flow and disrupt brain function (e.g., hypotonic encephalopathy, seizures, coma). Without rapid and definitive treatment to relieve increasing intracranial pressure, the brain stem can herniate through the base of the skull which can compromise life sustaining functions controlled by the cardio-respiratory centers of the brain stem.[1-3]

There are many potential causes of hyponatremia, including endocrine, kidney, and neuropsychiatric conditions; prescribed, over the counter, and recreational drugs; and medical errors.[3] However, in otherwise healthy, physically active young adults (e.g., long distance runners, military service members), hyponatremia is a threat from excessive water consumption during prolonged physical exertion ("exercise-associated hyponatremia"), particularly during heat stress.[1-3]

In the summer of 1997, multiple hospitalizations of soldiers for hyponatremia secondary to excessive water consumption during rigorous physical training in hot, humid weather were reported from Army training centers — one case was fatal and several others required intensive medical care.[4] In April 1998, the U.S. Army Research Institute of Environmental Medicine (USARIEM), Natick, Massachusetts, published new guidelines for fluid replacement during military training in heat. The new guidelines were designed to protect service members not only from heat injury but also from hyponatremia due to excessive water consumption; of note, the guidelines limited fluid intake regardless of heat category or work level to no more than 1½ quarts hourly and 12 quarts daily.[5] There were fewer hospitalizations of soldiers for hyponatremia due to excessive water consumption during the year after compared to before implementation of the new guidelines.[5]

Figure 1. Incident diagnoses of hyponatremia (presumably caused by excessive water consumption during physical exertion/heat stress), U.S. service members, 1999-2007



For this analysis, we identified all service members who were diagnosed with "hyposmolality and/or hyponatremia" during a hospitalization or ambulatory encounter from 1999 through 2007. To focus on cases that were likely exercise-associated, we excluded cases with concurrent diagnoses of medical, psychiatric, or other major disorders (e.g., acute traumatic injuries) that could cause or increase risk of hyponatremia.

Methods:

The surveillance period was 1 January 1999 to 31 December 2007. The surveillance population included all individuals who served in an active component of the U.S. Armed Forces any time during the surveillance period.

For surveillance purposes, a possible case of exercise-associated hyponatremia was defined as a hospitalization or ambulatory visit with a discharge diagnosis in any position of ICD-9-CM: 276.1 "hyposmolality and/or hyponatremia." Records of all medical encounters that defined possible cases were reviewed for evidence of primary or contributory causes of hyponatremia other than excessive water consumption during physical exertion. To this end, after possible cases were identified, all other diagnoses and procedure codes on the standardized records of the index medical encounters were examined. Possible cases were excluded from final analysis if they included complicating diagnoses such as alcohol/illicit drug abuse; psychosis, depression, other major mental disorders; endocrine (e.g., pituitary, adrenal) disorders; kidney diseases; cancers; major traumatic injuries; and complications of medical care.

Each individual was included as a case only once per calendar year. All data were derived from records routinely maintained in the Defense Medical Surveillance System (DMSS).

Results:

During the 9-year surveillance period, there were 887 incident diagnoses (incidence rate: 7.2 per 100,000 person-years [p-yrs]) of presumably exercise-associated hyponatremia. The number of cases and incidence rates increased each year, and nearly doubled overall, from 2002 to 2006 – and then slightly declined in 2007 **(Table 1, Figure 1).**

Each year from 2000 to 2007, the highest rate among the Services was in the Marine Corps **(Table 1).** For the entire period, the incidence rate was highest in the Marine Corps (12.7 per 100,000 p-yrs), lowest in the Navy (3.9 per 100,000 p-yrs), and intermediate in the Army (7.5 per 100,000 p-yrs) and Air Force (7.3 per 100,000 p-yrs).

More than three-fourths of all cases were diagnosed among males; however, the incidence rate was consistently

Table 1. Incident cases and rates* of hyponatremia/overhydration, active components, U.S. Armed Forces, January 1999-December 2007

	1999		2000		2001		2002		2003		2004		2005		2006		2007		Total 1999-2007	
	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate*
Total	70	5.2	65	4.8	91	6.7	76	5.5	93	6.6	100	7.1	113	8.2	145	10.7	134	9.9	887	7.2
Service																				
Army	29	6.2	26	5.5	43	9.1	26	5.4	30	6.1	37	7.5	32	6.6	59	12.0	46	9.0	328	7.5
Navy	5	1.4	6	1.6	8	2.2	15	4.0	17	4.5	18	4.8	20	5.6	22	6.4	16	4.8	127	3.9
Air Force	25	7.0	18	5.1	11	3.2	21	5.8	31	8.4	24	6.4	32	9.1	37	10.7	33	9.9	232	7.3
Marine Corps	11	6.4	15	8.7	29	16.9	14	8.1	15	8.5	21	11.9	29	16.3	27	15.2	39	21.4	200	12.7
Sex																				
Male	53	4.5	51	4.4	67	5.8	58	4.9	70	5.8	75	6.2	91	7.7	116	10.0	104	8.9	685	6.5
Female	17	8.8	14	7.1	24	11.9	18	8.7	23	10.9	25	11.9	22	10.9	29	14.7	30	15.3	202	11.1
Race/ethnicity																				
White, non-Hispanic	43	5.1	39	4.6	60	7.0	49	5.6	59	6.7	73	8.2	79	9.1	103	12.0	95	11.0	600	7.7
Black, non-Hispanic	7	2.6	8	2.9	12	4.4	13	4.8	21	7.8	10	3.9	21	8.6	22	9.4	17	7.5	131	5.7
Other	20	8.0	18	7.7	19	8.1	14	5.7	13	5.0	17	6.4	13	4.9	20	7.4	22	8.2	156	6.8
Age																				
<20	16	13.9	12	9.7	24	19.3	10	8.3	19	16.8	19	17.3	14	14.4	17	17.9	13	13.1	144	14.4
20-24	15	3.6	19	4.4	21	4.7	25	5.4	27	5.6	30	6.1	38	8.1	44	9.5	56	12.1	275	6.7
25-29	15	5.3	14	5.2	17	6.5	11	4.1	10	3.6	15	5.2	13	4.4	28	9.3	21	6.9	144	5.6
30-34	9	4.2	6	2.9	13	6.4	10	5.0	8	4.0	11	5.5	13	6.6	18	9.3	12	6.3	100	5.5
35-39	9	4.4	3	1.5	8	4.1	10	5.3	15	8.2	15	8.5	19	11.2	15	9.0	11	6.6	105	6.4
40+	6	4.5	11	8.3	8	5.8	10	7.0	14	9.6	10	6.8	16	10.9	23	16.2	21	15.3	119	9.4
Military occupation																				
Combat	15	5.5	23	8.4	22	8.1	18	6.6	14	5.0	21	7.4	23	8.0	26	8.6	28	9.8	190	7.5
Health Care	8	6.9	3	2.6	8	6.9	10	8.6	13	11.1	9	7.7	10	8.8	15	13.4	12	10.9	88	8.5
Other	47	4.9	39	4.0	61	6.3	48	4.8	66	6.5	70	6.9	80	8.2	104	11.0	94	9.8	609	6.9

*Rate per 100,000 person-years

higher among females (overall, female-to-male incidence rate ratio: 1.72) **(Table 1)**. Each year from 2004 to 2007 and overall, incidence rates were higher among white non-Hispanic than black non-Hispanic or other racial/ethnic subgroup members **(Table 1)**.

Throughout the period, the highest rates were among the youngest (incidence rate, <20 years old: 14.4 per 100,000 p-yrs) and oldest (incidence rate, >39 years old: 9.4 per 100,000 p-yrs) service members **(Table 1)**. There were not sharp differences in rates across military occupational subgroups. However, during each year from 2002 to 2007 and overall, incidence rates were higher among service members with health care-related compared to combat-specific or other occupations **(Table 1)**.

During the 9-year period, cases were diagnosed at more than 200 medical facilities. However, only 29 facilities reported at least 8 cases each (accounting for more than one-half of the total); and 4 locations reported more than 20 cases each (accounting for more than one-fifth of the total). The four locations with the most cases overall were Parris Island/Beaufort, SC (n=78), Fort Benning, GA (n=52), Lackland AFB, TX (n=30), and Fort Bragg, NC (n=24).

Data analysis by Vicki Jeffries.

Editorial comment:

The results of this analysis suggest that the incidence of exercise-associated hyponatremia among U.S. service members generally increased from 2002 through 2006 (and slightly declined in 2007). However, the results must be interpreted with consideration of the limitations. For example, there is not a diagnostic code specific for "exercise-associated hyponatremia." Thus, for surveillance purposes, we identified all medical encounters with a diagnosis of "hyposmolality and/or hyponatremia" and then excluded those with concurrent diagnoses indicative of conditions that may have caused or increased risk of hyponatremia. Clearly, the results presented here should be considered fairly rough estimates of the true incidence of symptomatic exercise-associated hyponatremia from excessive water consumption among U.S. service members. In light of that, relationships across military and demographic subgroups and trends over time are likely informative and potentially useful for assessing the effectiveness of current policies and practices regarding heat injury and exercise-associated hyponatremia prevention.

Of note, in this analysis, incidence rates of hyponatremia were consistently higher among females than males (the increased risk among females may account, at least in part, for the higher rates among service members in health care professions). In a recent review of clinical aspects of hyponatremia, Lien and Shapiro reported that, at similar levels of hyponatremia, women may be more likely than men to develop clinically significant hyponatremic injury (e.g., cerebral/pulmonary edema, encephalopathy, permanent brain injury).[3] The authors suggest that female sex hormones may be determinants of the increased risk.[3]

In the past, concerns regarding hyponatremia from excessive water consumption were focused at training – particularly basic combat training – installations. Not surprisingly, in this analysis, the highest rates were among the youngest – hence, the most junior – service members; and the most cases were diagnosed at medical facilities in the south-east and south-central United States that support Army (Fort Benning, GA), Marine Corps (Parris Island, SC), and Air Force (Lackland AFB, TX) recruit training; Army airborne and Ranger training (Fort Benning, GA), and Army special operations training (Fort Bragg, NC). In many circumstances (e.g., recruit training, Ranger School), military trainees conduct the activities prescribed by their training schedules regardless of the weather conditions. In hot, humid weather, commanders, supervisors, instructors, and medical support staffs must be aware of and enforce guidelines for work-rest cycles and water consumption.

In regard to hyponatremia, service members and their supervisors must be knowledgeable of the dangers of excessive water consumption and the prescribed limits for water intake during prolonged physical activity in hot, humid weather – during military activities, personal fitness training, and recreational activities. Service members (particularly trainees) and their supervisors must be vigilant for early signs of heat-related illnesses and immediately and appropriately – not excessively – intervene in such cases.

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Update: Deployment Health Assessments, U.S. Armed Forces, January 2003-February 2008

The health protection strategy of the U.S. Armed Forces is designed to deploy healthy, fit, and medically ready forces, to minimize illnesses and injuries during deployments, and to evaluate and treat physical and psychological problems (and deployment-related health concerns) following deployment.

In 1998, the Department of Defense initiated health assessments of all deployers prior to and after serving in major operations outside of the United States.[1] In March 2005, the Post-Deployment Health Reassessment (PDHRA) program was begun to identify and respond to health concerns that persisted for or emerged within three to six months after return from deployment.[2]

This report summarizes responses to selected questions on deployment health assessments completed since 2003. In addition, it documents the natures and frequencies of changes in responses from before to after deployments.

Methods:

Completed deployment health assessment forms are transmitted to the Armed Forces Health Surveillance Center (AFHSC) where they are incorporated into the Defense Medical Surveillance System (DMSS).[3] In the DMSS, data recorded on health assessment forms are integrated with data that document demographic and military characteristics and medical encounters (e.g., hospitalizations, ambulatory visits) at fixed military and other (contracted care) medical facilities of the Military Health System. For this analysis, DMSS was searched to identify all pre (DD2795) and post (DD2796) deployment health assessment forms completed since 1 January 2003 and all post-deployment health reassessment (DD2900) forms completed since 1 August 2005.

Results:

Since January 2003, 1,892,754 pre-deployment health assessment forms, 1,904,849 post-deployment health assessment forms, and 486,117 post-deployment health reassessment forms were completed at field sites, transmitted to the AFHSC, and integrated into the DMSS **(Figure 1)**. Throughout the period, there were intervals of approximately 2-4 months between peaks of pre-deployment and post-deployment health assessments (that were completed by different cohorts of deployers) **(Figure 1)**. Post-deployment health reassessments rapidly increased between February and May 2006 **(Figure 1)**. Since then, numbers of reassessment forms per month have been relatively stable (reassessment forms per month, March 2007-February 2008: mean: 23,589; range: 16,709-36,383) **(Figure 1, Table 1)**.

Between March 2007 and February 2008, nearly three-fourths (73.0%) of deployers rated their "health in general" as "excellent" or "very good" during pre-deployment health assessments **(Figure 2)**. During the same period, only 59.4% and 52.6% of redeployers rated their general health as "excellent" or "very good" during post-deployment assessments and post-deployment reassessments, respectively **(Figure 2)**.

From pre-deployment to post-deployment to post-deployment reassessments, there were sharp increases in the proportions of deployers who rated their health as "fair" or "poor" **(Figure 2)**. For example, prior to deployment, approximately one of 40 (2.7%) deployers rated their health

Figure 1. Total deployment health assessment and reassessment forms, by month, U.S. Armed Forces, March 2007-February 2008

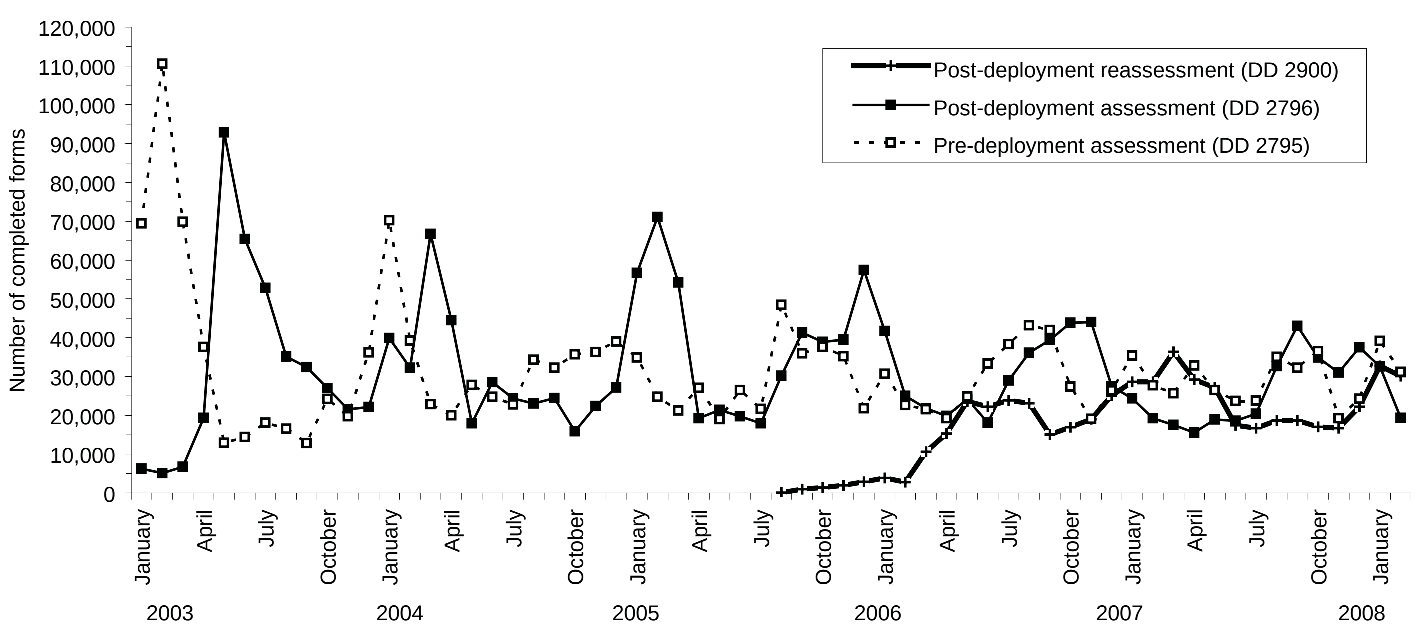


Table 1. Deployment-related health assessment forms, by month, U.S. Armed Forces, March 2007-February 2008

	Pre-deployment assessment DD2795		Post-deployment assessment DD2796		Post-deployment reassessment DD2900	
	No.	%	No.	%	No.	%
Total	350,033	100	321,903	100	283,068	100
2007						
March	25,694	7.3	17,558	5.5	36,383	12.9
April	32,818	9.4	15,546	4.8	29,232	10.3
May	26,443	7.6	18,893	5.9	27,160	9.6
June	23,649	6.8	18,594	5.8	17,448	6.2
July	23,741	6.8	20,393	6.3	16,709	5.9
August	35,043	10.0	32,692	10.2	18,674	6.6
September	32,243	9.2	43,024	13.4	18,679	6.6
October	36,555	10.4	34,867	10.8	17,051	6.0
November	19,241	5.5	31,010	9.6	16,736	5.9
December	24,290	6.9	37,474	11.6	22,206	7.8
2008						
January	39,113	11.2	32,544	10.1	32,720	11.6
February	31,203	8.9	19,308	6.0	30,070	10.6

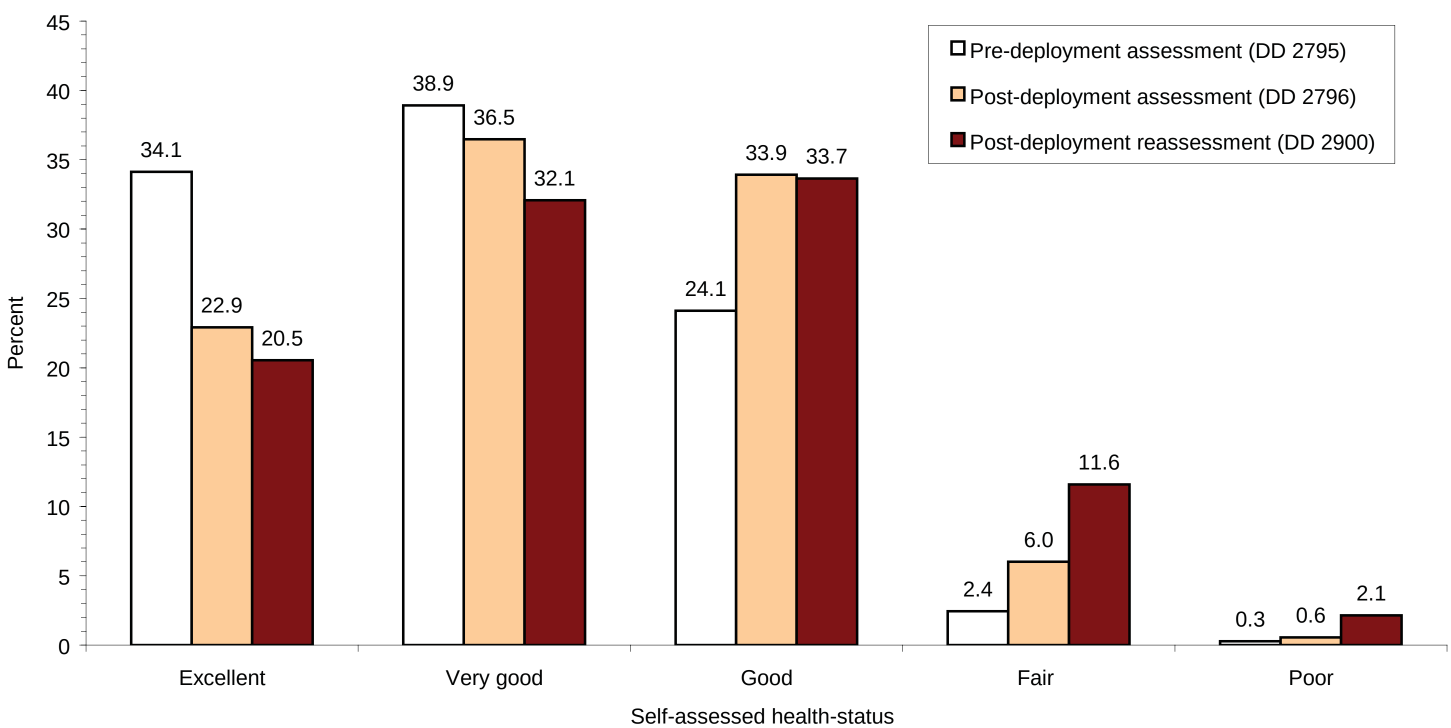
as "fair" or "poor"; however, 3-6 months after returning from deployment (during post-deployment reassessments), approximately one of seven (13.7%) respondents rated their health as "fair" or "poor" **(Figure 2)**.

From March 2007 through February 2008, the proportion of deployers who assessed their general health as "fair" or "poor" before deploying remained consistently low (% "fair" or "poor" "health in general," pre-deployment health assessments, January 2003-February 2008, by month: mean: 2.7% [range: 1.8-3.4%]) **(Figure 3)**. During the same period, the proportion of redeployers who assessed their general health as "fair" or "poor" around times of return from deployment was consistently and clearly higher than before deploying (% "fair" or "poor" "health in general," post-deployment health assessments, January 2003-February 2008, by month: mean: 6.4% [range: 4.2-7.7%]) **(Figure 3)**. Finally, from January 2006 through February 2008, the proportion of redeployers who assessed their general health as "fair" or "poor" 3-6 months after redeploying was sharply higher than at redeployment (% "fair" or "poor" "health in general," post-deployment health reassessments, January 2006-December 2007, by month: mean: 13.2% [range: 11.3-15.9%]) **(Figure 3)**.

More than half of service members who rated their overall health before deployment chose a different descriptor after deploying, but usually by a single category (on a five category scale). The proportions of deployers whose self-rated health improved by more than one category from pre-deployment to reassessment remained relatively stable between March 2007 and February 2008 (mean: 1.3%, range:1.0-1.6%) **(Figure 4)**. The proportions of service members whose self-assessed health declined by more than one category was relatively stable between January and March 2007, declined between March and September 2007, and has generally increased since September 2007 (mean: 16.1, range 13.6-19.1%) **(Figure 4)**.

In general, on post-deployment assessments and reassessments, members of Reserve components and members of the Army were much more likely than their respective counterparts to report mental health-related symptoms and health and exposure-related concerns – and in turn, to have indications for medical and mental health follow-ups ("referrals") **(Table 2)**.

Figure 2. Percent distributions of self-assessed health status as reported on deployment health assesment forms, U.S. Armed Forces, March 2007-February 2008



Among Reserve versus active component members, relative excesses of health-related concerns and provider-indicated referrals were much greater 3-6 months after redeployment (DD2900) than either before deploying (DD2795) or at redeployment (DD2796) **(Table 2, Figures 5,6)**. For example, among both active and Reserve component members of all Services, mental or behavioral health referrals were more common after deployment than before **(Figure 5)**. However, from the time of redeployment to 3-6 months later, mental health referrals sharply increased among Reserve component members of the Army, Navy, and Marine Corps (but not Air Force) **(Table 2, Figure 5)**. Of note in this regard, the largest absolute increase in mental health referrals from redeployment to 3-6 months later was for Reserve component members of the Army (post-deployment: 5.0%; reassessment: 11.7%) **(Table 2, Figure 5)**.

Finally, over the past three years, Reserve component members have been approximately twice as likely as active to report "exposure concerns" on post-deployment health assessments (DD2796) (% "exposure concerns," post-deployment assessments, by month, March 2007-February 2008: Reserve: mean: 27.0%, range: 22.2-32.6%; active: mean: 14.6%; range: 9.6-18.8%) **(Table 2, Figures 6,7)**. Sharply higher proportions of both Reserve and active component members endorsed exposure concerns 3-6 months after (DD2900) compared to around times (DD2796) of redeployment (% "exposure concerns," post-deployment reassessments, by month, March 2007-February 2008: Reserve: mean: 35.3%, range: 31.0-39.6%; active: mean: 20.5%; range: 18.2-22.6%) **(Figure 7)**.

Editorial comment:

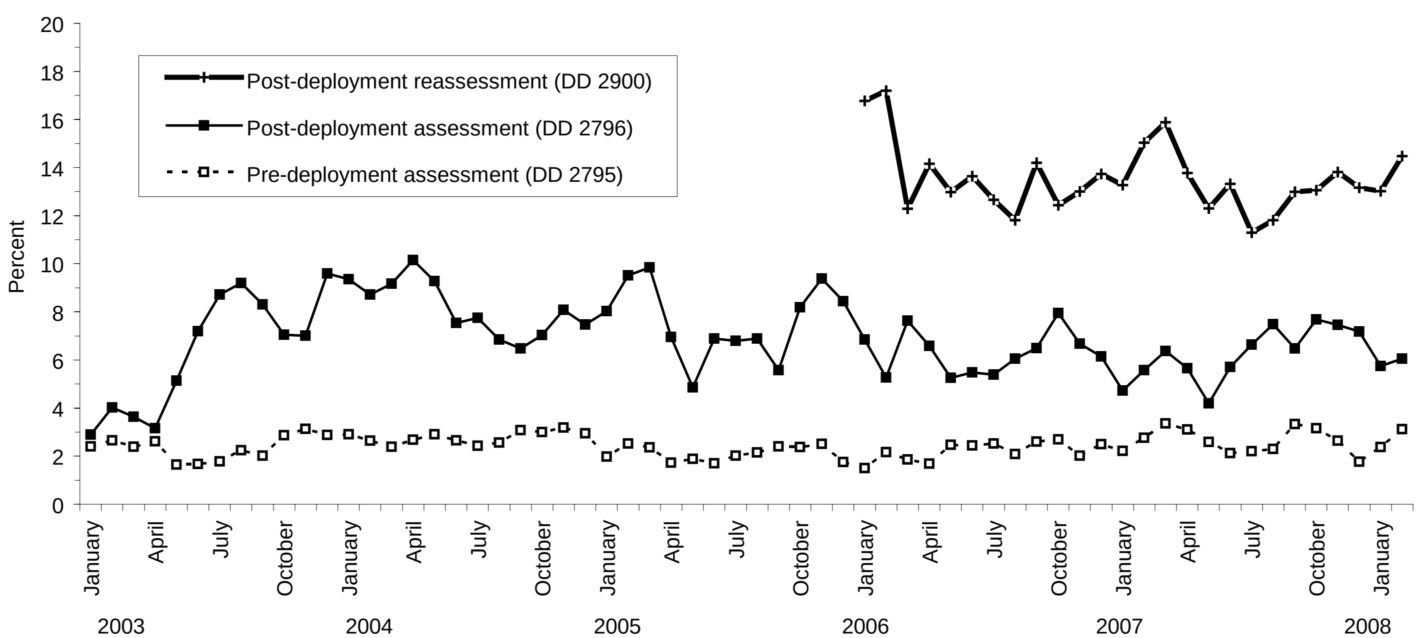
In general, since 2003, proportions of U.S. deployers to Iraq and Afghanistan who report medical or mental health-related symptoms (or have indications for medical or mental health referrals) on deployment-related health assessments increased from pre-deployment to post-deployment to 3-6 months post-deployment, are higher among members of the Army than the other Services, and are higher among Reserve than the active component members.

Regardless of the Service or component, deployers often rate their general health worse when they return compared to before deploying. This is not surprising because deployments are inherently physically and psychologically demanding. Clearly, there are many more – and more significant – threats to the physical and mental health of service members when they are conducting or supporting combat operations away from their families in hostile environments compared to when serving at their permanent duty stations (active component) or when living in their civilian communities (Reserve component).

However, many redeployed service members rate their general health worse 3-6 months after returning from deployment compared to earlier. This finding may be less intuitively understandable. Symptoms of post-traumatic stress disorder (PTSD) may emerge or worsen within several months after a life threatening experience (such as military service in a war zone). PTSD among U.S. veterans of combat duty in Iraq has been associated with higher rates of physical health problems after redeployment.[4] The post-deployment health reassessment at 3-6 months post-deployment is designed to detect service members with symptoms not only of PTSD but also persistent or emerging deployment-related medical and mental health problems.

Among British veterans of the Iraq war, Reservists reported traumatic experiences, and unit cohesion while deployed were

Figure 3. Proportion of deployment health assessment forms with self-assessed health status as "fair" or "poor", U.S. Armed Forces, March 2007-February 2008



associated with medical outcomes after returning; however, PTSD symptoms were more associated with problems at home (e.g, reintegration into family, work, and other aspects of civilian life) than with events in Iraq.[5] The finding may explain, at least in part, the large differences in prevalences of mental health symptoms, medical complaints, and provider-indicated mental health referrals among Reserve compared to active members — particularly in the Army and Navy — 3-6 months after returning from deployment compared to earlier.

Post-deployment health assessments may be more reliable several months after redeployment compared to earlier. Commanders, supervisors, family members, peers, and providers of health care to redeployed service members should be alert to emerging or worsening symptoms of physical and psychological problems for several months, at least, after returning from deployment.

Figure 4. Proportion of service members whose self-assessed health status improved ("better") or declined ("worse") (by 2 or more categories on 5-category scale) from pre-deployment to reassessment, by month, U.S. Armed Forces, March 2007-February 2008

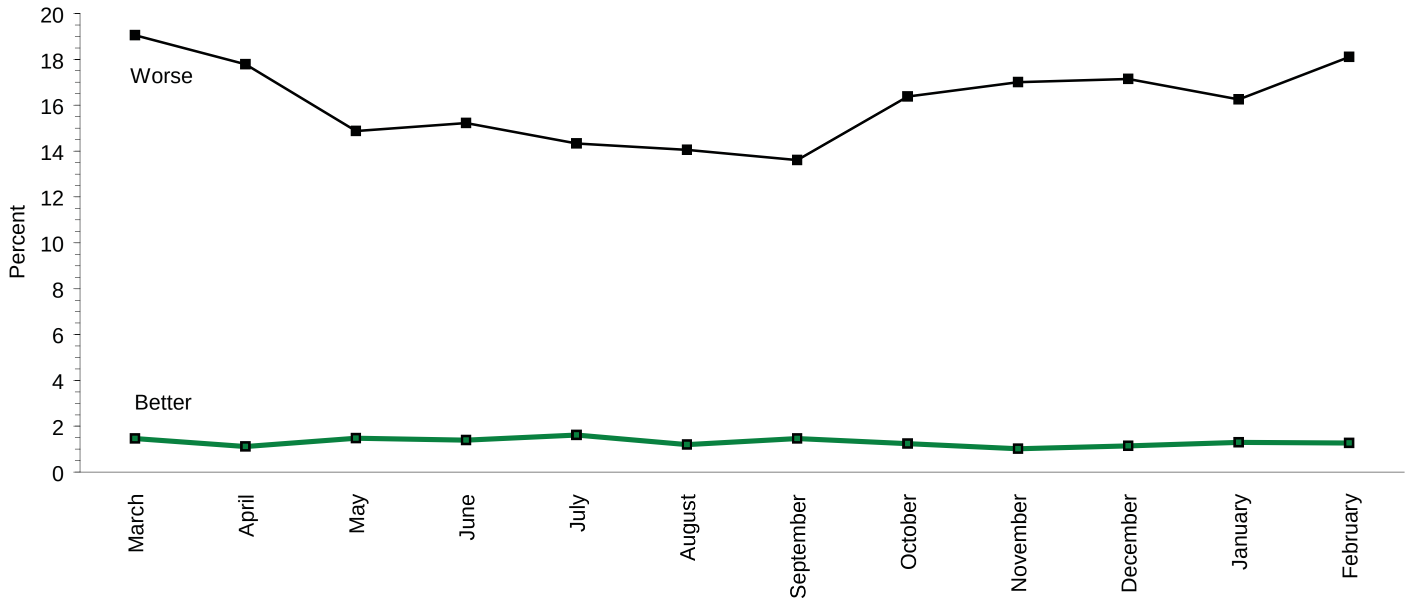


Figure 5. Percent of deployers with mental or behavioral health referrals, by Service and component, by timing of health assessment, U.S. Armed Forces, March 2007-February 2008

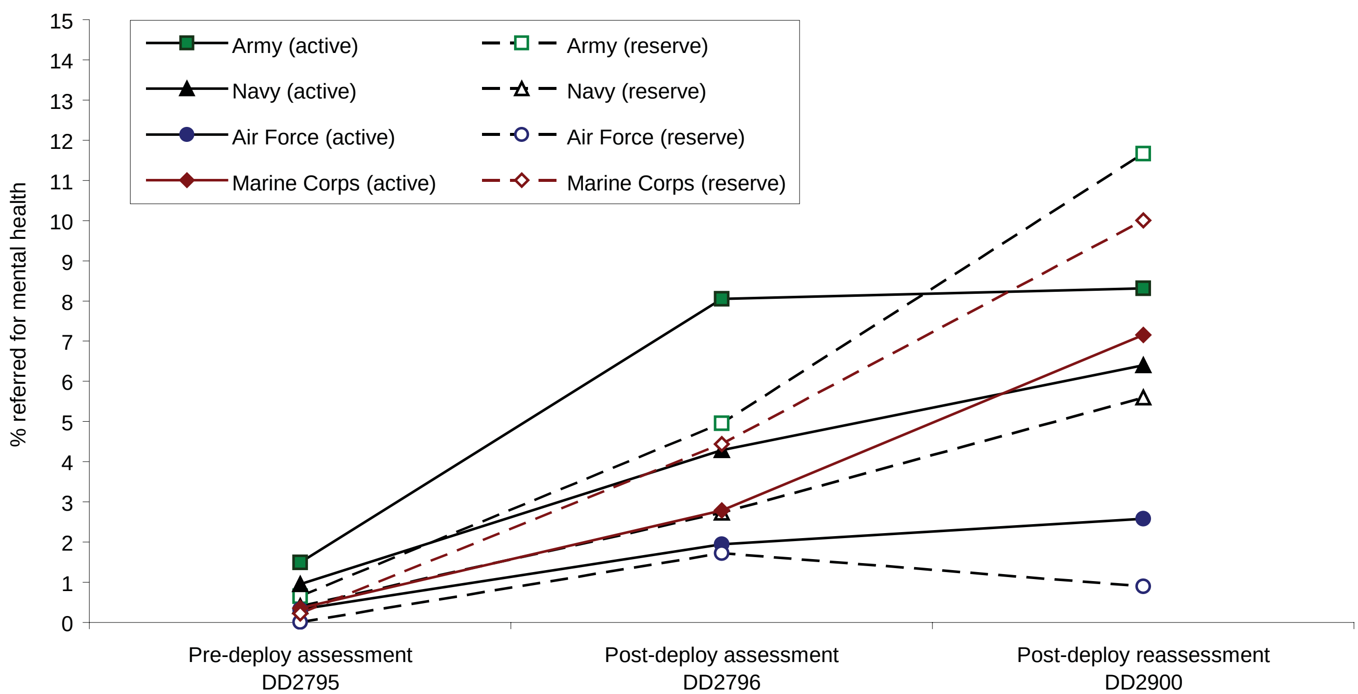


Table 2. Percentage of service members who endorsed selected questions/received referrals on health assessment forms, U.S. Armed Forces, March 2007-February 2008

	Army			Navy			Air Force			Marine Corps			All service members		
	Pre-deploy DD2795	Post-deploy DD2796	Reassessmt DD2900	Pre-deploy DD2795	Post-deploy DD2796	Reassessmt DD2900	Pre-deploy DD2795	Post-deploy DD2796	Reassessmt DD2900	Pre-deploy DD2795	Post-deploy DD2796	Reassessmt DD2900	Pre-deploy DD2795	Post-deploy DD2796	Reassessmt DD2900
Active component	n=145,047	n=140,256	n=80,214	n=16,068	n=11,517	n=8,409	n=62,501	n=56,089	n=53,497	n=35,259	n=29,964	n=34,955	n=258,875	n=237,826	n=177,075
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
General health "fair" or "poor"	4.5	8.2	17.8	1.8	3.7	7.2	0.5	2.1	4.9	2.0	3.1	10.3	3.1	5.9	11.9
Health concerns, not wound or injury	13.7	28.0	41.4	5.7	11.6	24.1	4.8	15.5	16.9	4.1	8.9	30.0	9.7	21.8	30.9
Health worse now than before deployed	0.0	23.0	28.4	0.0	10.0	15.6	0.0	8.2	10.2	0.0	11.2	20.6	0.0	17.4	20.8
Exposure concerns	0.0	21.3	25.8	0.0	11.7	15.1	0.0	6.6	13.5	0.0	7.7	21.8	0.0	15.7	20.8
PTSD symptoms (2 or more)	0.0	17.8	18.5	0.0	5.6	10.2	0.0	2.8	3.4	0.0	6.6	12.9	0.0	12.3	12.4
Depression symptoms	0.0	33.3	10.6	0.0	19.4	7.4	0.0	9.2	2.8	0.0	24.4	9.8	0.0	25.8	7.9
Referral indicated by provider (any)	7.2	31.7	26.0	7.3	21.4	24.1	1.7	11.6	9.3	4.2	14.9	28.3	5.5	24.3	21.3
Mental health referral indicated*	1.5	8.1	8.3	1.0	4.3	6.4	0.3	1.9	2.6	0.4	2.8	7.2	1.0	5.8	6.3
Medical visit following referral†	94.8	99.3	98.8	85.0	87.7	93.9	77.4	93.9	95.9	70.9	72.3	90.5	91.5	93.1	97.2
	Pre-deploy DD2795	Post-deploy DD2796	Reassessmt DD2900	Pre-deploy DD2795	Post-deploy DD2796	Reassessmt DD2900	Pre-deploy DD2795	Post-deploy DD2796	Reassessmt DD2900	Pre-deploy DD2795	Post-deploy DD2796	Reassessmt DD2900	Pre-deploy DD2795	Post-deploy DD2796	Reassessmt DD2900
Reserve component	n=65,293	n=62,970	n=78,305	n=4,652	n=3,953	n=7,018	n=17,562	n=15,057	n=16,482	n=3,651	n=2,097	n=4,188	n=91,158	n=84,077	n=105,993
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
General health "fair" or "poor"	2.1	10.4	19.2	0.7	4.6	8.8	0.3	2.1	4.6	2.1	5.1	12.9	1.7	8.5	16.0
Health concerns, not wound or injury	16.3	38.5	56.5	3.0	24.1	39.7	2.0	22.9	19.0	4.5	20.4	45.5	12.4	34.6	49.2
Health worse now than before deployed	0.0	29.4	37.8	0.0	18.8	24.2	0.0	11.7	11.1	0.0	22.4	28.6	0.0	25.5	32.4
Exposure concerns	0.0	32.5	39.8	0.0	31.3	29.5	0.0	9.4	19.3	0.0	18.7	29.1	0.0	28.0	35.5
PTSD symptoms (2 or more)	0.0	14.5	23.9	0.0	5.3	12.6	0.0	2.0	3.3	0.0	8.2	21.7	0.0	11.7	19.9
Depression symptoms	0.0	28.5	12.5	0.0	18.2	7.9	0.0	8.0	2.7	0.0	33.0	10.3	0.0	24.5	10.6
Referral indicated by provider (any)	9.4	30.6	43.1	5.4	20.6	30.0	0.3	11.7	19.1	5.3	31.0	41.9	7.3	26.8	38.4
Mental health referral indicated*	0.7	5.0	11.7	0.4	2.7	5.6	0.0	1.7	0.9	0.2	4.4	10.0	0.5	4.3	9.5
Medical visit following referral†	96.8	96.3	28.8	94.1	90.8	30.0	52.6	56.3	25.1	41.9	67.7	24.3	94.9	92.3	28.2

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1. Undersecretary of Defense for Personnel and Readiness. Department of Defense Instruction (DODI) Number 6490.3. Subject: Deployment health, dated 11 August 2006. Accessed on 19 March 2007 at: http://www.dtic.mil/whs/directives/corres/pdf/649003p.pdf.
2. Assistant Secretary of Defense (Health Affairs). Memorandum for the Assistant Secretaries of the Army (M&RA), Navy (M&RA), and Air Force (M&RA), subject: Post-deployment health reassessment (HA policy: 05-011), dated 10 March 2005. Washington, DC. http://www.ha.osd.mil/policies/2005/05-011.pdf. Accessed 18 October 2006.
3. Rubertone MV, Brundage JG. The Defense Medical Surveillance System and the Department of Defense Serum Repository: Glimpses of the Future of Public Health Surveillance. *Am J Public Health* 2002 Dec;92,(12):1900-04.
4. Hoge CW, Terhakopian A, Castro CA, Messer SC, Engel CC. Association of posttraumatic stress disorder with somatic symptoms, health care visits, and absenteeism among Iraq war veterans. *Am J Psychiatry*. 2007 Jan;164(1):150-3.
5. Browne T, Hull L, Horn O, et al. Explanations for the increase in mental health problems in UK reserve forces who have served in Iraq. *Br J Psychiatry*. 2007 Jun;190:484-489.

Figure 6. Ratio of percents of deployers who endorse selected questions, Reserve versus active component, on pre-deployment health assessments (DD2795) and post-deployment health reassessments (DD2900), U.S. Armed Forces, March 2007-February 2008

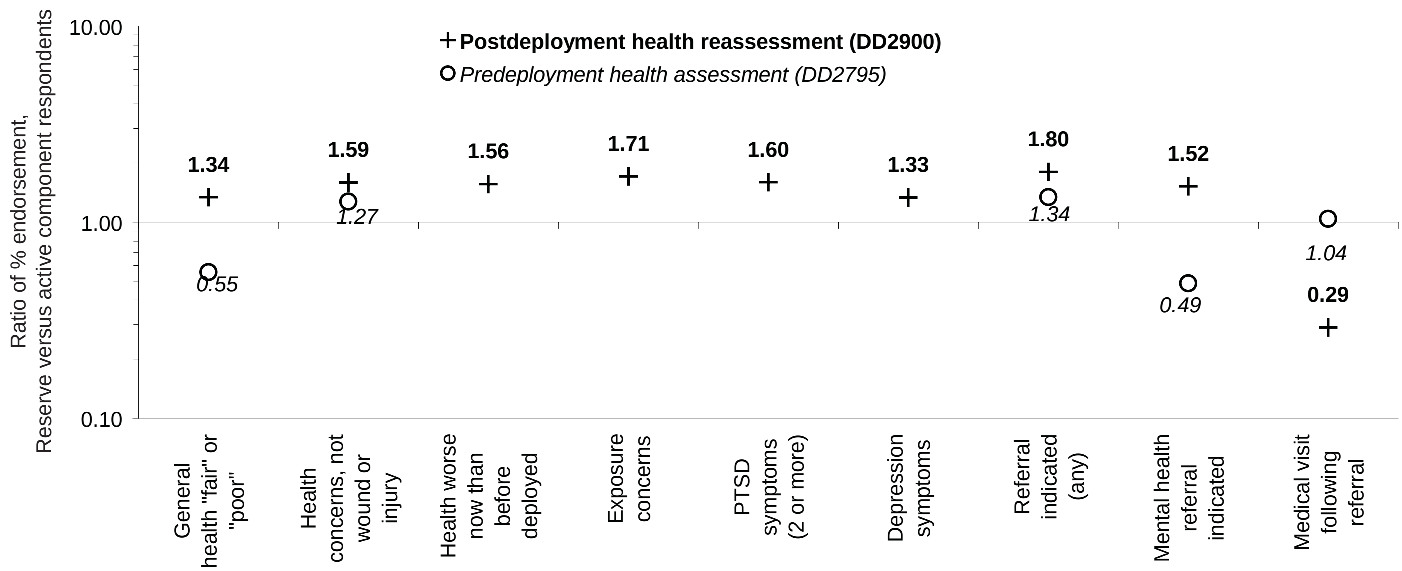
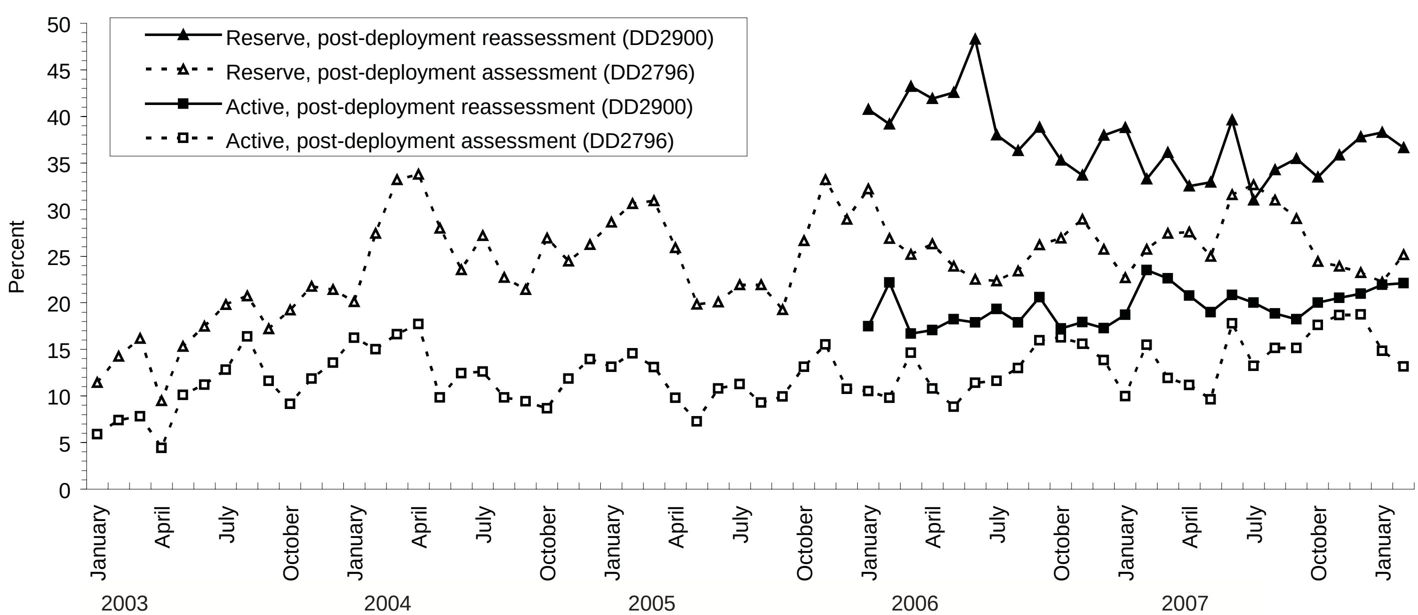
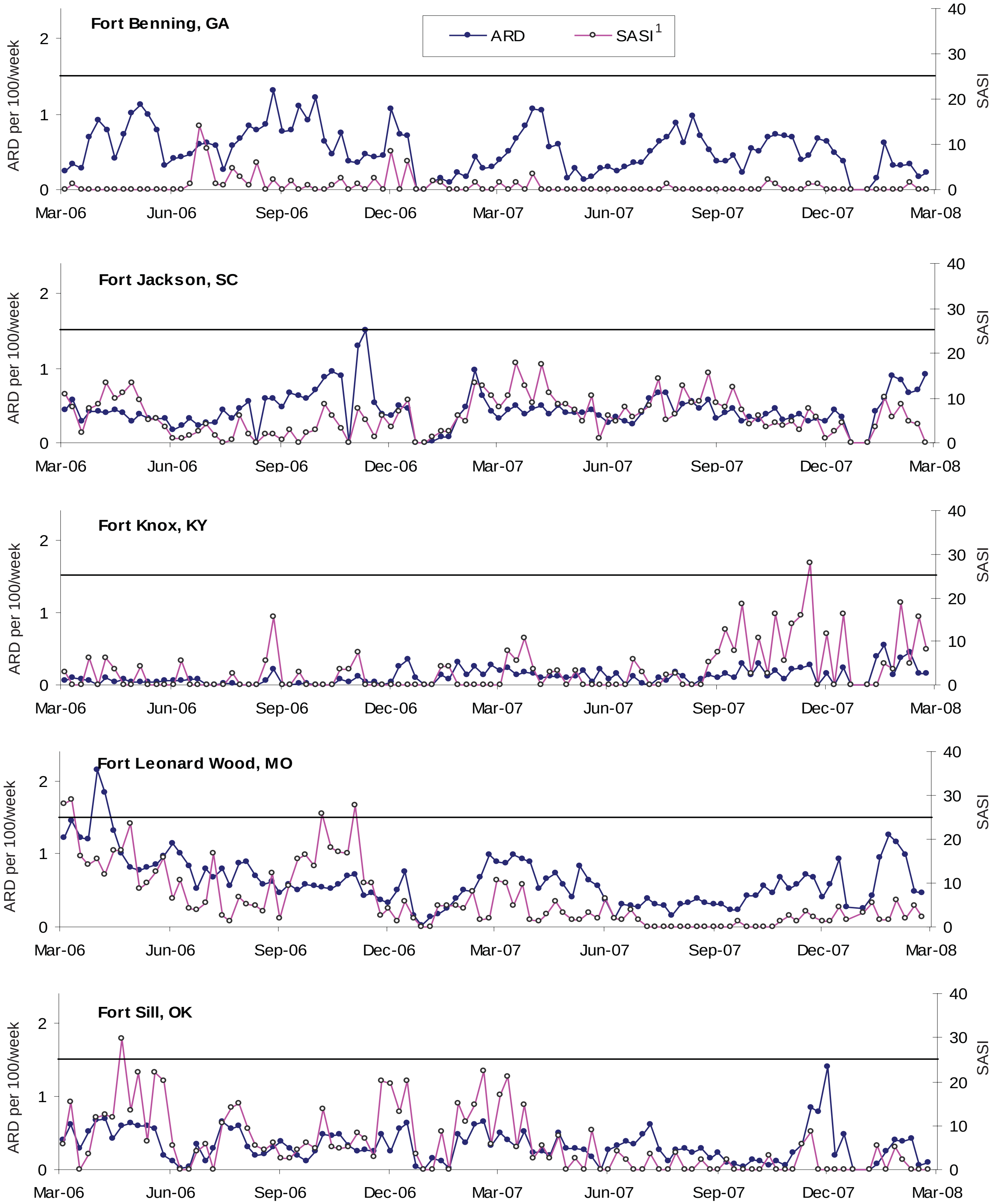


Figure 7. Proportion of service members who endorse exposure concerns on post-deployment health assessments, U.S. Armed Forces, January 2003-February 2008



Acute respiratory disease (ARD) and streptococcal pharyngitis rates (SASI*), basic combat training centers, U.S. Army, by week, March 2006-March 2008



1 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

Sentinel reportable events for service members and beneficiaries at U.S. Army medical facilities, cumulative numbers* through February 2007 and February 2008

Army

Reporting locations	Number of reports all events†		Food-borne								Vaccine preventable					
			Campylobacter		Giardia		Salmonella		Shigella		Hepatitis A		Hepatitis B		Varicella	
	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008
NORTH ATLANTIC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Washington, DC Area	49	91	.	.	2	1	.	.	.	.	.	.	1	.	1	4
Aberdeen, MD	2	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FT Belvoir, VA	40	43	2	.	.	.	.	.	.	.	.	.	.	.	.	.
FT Bragg, NC	214	304	1	.	.	.	2	2	.	.	.	.	.	.	.	.
FT Drum, NY	54	73	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FT Eustis, VA	31	270	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FT Knox, KY	50	241	.	1	.	.	1	.	.	.	.	.	1	.	.	.
FT Lee, VA	87	72	.	.	.	.	.	.	.	.	.	.	1	.	.	.
FT Meade, MD	4	123	.	.	.	.	.	.	.	.	.	.	.	.	.	.
West Point, NY	7	9	.	.	.	.	.	.	.	.	.	.	3	.	.	.
GREAT PLAINS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FT Sam Houston, TX	136	241	.	.	.	.	.	1	.	1	.	.	.	.	.	.
FT Bliss, TX	0	104	.	.	.	.	.	1	.	.	.	.	.	.	.	.
FT Carson, CO	159	194	.	.	2	.	.	1	.	.	.	.	.	.	.	.
FT Hood, TX	285	220	2	.	.	.	.	3	2	1	.	.	.	.	.	.
FT Huachuca, AZ	23	10	.	.	.	.	5	.	.	.	.	.	.	.	.	.
FT Leavenworth, KS	1	7	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FT Leonard Wood, MO	77	232	.	.	.	1	.	1	.	.	.	.	.	1	2	.
FT Polk, LA	31	28	.	.	1	.	1	.	.	.	.	.	.	.	.	1
FT Riley, KS	75	165	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FT Sill, OK	34	77	.	.	.	.	1	.	.	.	.	.	.	.	1	.
SOUTHEAST	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FT Gordon, GA	142	251	.	.	.	.	.	1	.	.	.	.	.	.	.	.
FT Benning, GA	90	71	.	.	1	.	.	.	.	.	.	.	1	.	1	.
FT Campbell, KY	127	74	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FT Jackson, SC	25	30	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FT Rucker, AL	6	12	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FT Stewart, GA	172	144	1	.	.	1	1	2	3	.	.	.	1	2	1	.
WESTERN	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FT Lewis, WA	84	191	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FT Irwin, CA	14	7	1	.	.	.	1	1	.	.	.	.	.	.	.	.
FT Wainwright, AK	29	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
OTHER LOCATIONS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Hawaii	118	154	2	4	.	1	2	3	.	.	.	.	.	.	.	.
Germany	88	333	3	3	1	1	2	1	.	.	.	.	.	4	1	.
Korea	98	98	.	.	.	.	.	.	.	.	.	.	.	.	2	1
Total	**2,352**	**3,869**	**12**	**8**	**7**	**5**	**16**	**17**	**5**	**2**	**0**	**0**	**8**	**7**	**9**	**6**

*Events reported by March 7, 2007 and March 7, 2008

†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. Army medical facilities, cumulative numbers* through February 2007 and February 2008

Army

Reporting location	Arthropod-borne				Sexually transmitted								Environmental			
	Lyme disease		Malaria		Chlamydia		Gonorrhea		Syphilis‡		Urethritis§		Cold		Heat	
	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008
NORTH ATLANTIC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Washington, DC Area	.	1	.	.	29	24	2	7	2	2	.	.	.	.	.	.
Aberdeen, MD	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.
FT Belvoir, VA	.	.	.	.	20	16	5	.	2	.	.	.	.	.	.	.
FT Bragg, NC	.	.	.	.	163	174	23	42	.	1	19	13	1	.	4	.
FT Drum, NY	.	3	.	.	36	40	5	8	.	.	.	.	.	.	.	.
FT Eustis, VA	.	.	.	.	23	57	1	2	.	.	.	.	.	.	.	.
FT Knox, KY	.	.	.	.	44	30	4	9	.	.	.	.	.	.	.	.
FT Lee, VA	.	.	.	.	72	40	9	24	.	1	.	.	1	.	1	.
FT Meade, MD	.	.	.	.	2	7	1	.	.	.	.	.	1	.	.	.
West Point, NY	2	3	.	.	2	6	.	.	.	.	.	.	.	.	.	.
GREAT PLAINS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FT Sam Houston, TX	.	.	.	.	56	38	6	9	1	2	.	.	.	1	.	.
FT Bliss, TX	.	.	.	.	.	47	.	12	.	.	.	.	.	.	.	.
FT Carson, CO	.	.	.	.	85	77	18	10	1	.	3	7	.	.	.	.
FT Hood, TX	.	.	.	.	186	112	23	25	.	.	23	5	.	.	.	.
FT Huachuca, AZ	.	.	.	.	18	8	.	2	.	.	.	.	.	.	.	.
FT Leavenworth, KS	.	.	.	.	.	7	1	.	.	.	.	.	.	.	.	.
FT Leonard Wood, MO	.	.	.	.	48	45	8	4	.	.	.	.	2	2	.	.
FT Polk, LA	.	.	1	.	23	17	4	10	.	.	.	.	.	.	.	.
FT Riley, KS	.	.	.	1	48	65	2	4	.	.	.	.	.	1	.	.
FT Sill, OK	.	.	.	.	20	10	7	3	.	.	.	.	1	.	.	.
SOUTHEAST	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FT Gordon, GA	.	.	.	.	92	88	11	41	1	.	.	.	.	.	.	.
FT Benning, GA	.	.	1	.	48	48	23	14	.	.	.	.	.	.	.	.
FT Campbell, KY	.	.	.	.	77	6	13	.	.	.	.	.	.	.	.	.
FT Jackson, SC	.	.	.	.	23	24	2	6	.	.	.	.	.	.	.	.
FT Rucker, AL	.	1	.	.	6	8	.	3	.	.	.	.	.	.	.	.
FT Stewart, GA	.	.	.	.	124	117	25	17	.	.	.	.	.	.	.	.
WESTERN	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FT Lewis, WA	.	.	.	.	72	153	11	14	.	.	1	4	.	.	.	.
FT Irwin, CA	.	.	.	.	11	5	1	1	.	.	.	.	.	.	.	.
FT Wainwright, AK	.	.	.	.	10	.	1	.	.	.	.	.	7	.	.	.
OTHER LOCATIONS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Hawaii	.	.	.	.	94	108	7	6	.	.	.	.	.	.	1	.
Germany	2	4	2	2	52	174	17	33	.	2	1	.	.	8	.	.
Korea	.	.	.	.	82	82	8	9	.	.	1	.	5	.	.	.
Total	**4**	**12**	**4**	**3**			**238**	**315**	**7**	**8**	**48**	**29**	**18**	**12**	**6**	**0**

‡Primary and secondary.

§Urethritis, non-gonococcal (NGU).

Sentinel reportable events for service members and beneficiaries at U.S. Navy medical facilities, cumulative numbers* through February 2007 and February 2008

Navy

Reporting locations	Number of reports all events†		Food-borne								Vaccine preventable					
			Campylo-bacter		Giardia		Salmonella		Shigella		Hepatitis A		Hepatitis B		Varicella	
	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008
NATIONAL CAPITOL AREA	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Annapolis, MD	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Bethesda, MD	1	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Patuxent River, MD	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
NAVY MEDICINE EAST	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Albany, GA	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Atlanta, GA	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Beaufort, SC	21	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Camp Lejeune, NC	24	6	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cherry Point, NC	16	13	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Great Lakes, IL	34	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Jacksonville, FL	13	2	.	.	.	.	.	2	.	.	.	.	.	.	.	.
Mayport, FL	3	9	.	.	.	.	1	2	.	.	.	.	.	.	.	.
NABLC Norfolk, VA	17	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.
NBMC Norfolk, VA	0	63	.	.	.	.	.	.	.	.	.	.	.	.	.	.
NEHC Norfolk, VA	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
North Charleston, SC	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Pensacola, FL	5	0	.	.	.	.	1	.	.	.	.	.	.	.	1	.
Portsmouth, VA	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Washington, DC	0	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Guantanamo Bay, Cuba	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Europe	4	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
NAVY MEDICINE WEST	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Camp Pendleton, CA	4	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Corpus Christi, TX	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Fallon, NV	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ingleside, TX	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lemoore, CA	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Pearl Harbor, HI	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
San Diego, CA	108	0	.	.	.	.	1	.	.	.	.	.	11	.	.	.
Guam	4	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Japan	1	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
NAVAL SHIPS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
COMNAVAIRLANT/CINCLANTFLEET	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
COMNAVSURFPAC/CINCPACFLEET	11	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Total	**266**	**99**	**0**	**0**	**0**	**0**	**3**	**4**	**0**	**0**	**0**	**0**	**11**	**0**	**1**	**0**

*Events reported by March 7, 2008

†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. Navy medical facilities, cumulative numbers* through February 2007 and February 2008

Navy

Reporting location	Arthropod-borne				Sexually transmitted								Environmental			
	Lyme disease		Malaria		Chlamydia		Gonorrhea		Syphilis‡		Urethritis§		Cold		Heat	
	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008
NATIONAL CAPITOL AREA	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Annapolis, MD	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Bethesda, MD	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.
Patuxent River, MD	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
NAVY MEDICINE EAST	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Albany, GA	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Atlanta, GA	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Beaufort, SC	.	.	.	.	18	.	1	.	.	.	.	.	.	.	.	.
Camp Lejeune, NC	1	.	.	.	22	4	1	2	.	.	.	.	.	.	.	.
Cherry Point, NC	.	.	.	.	15	12	.	1	.	.	.	.	.	.	.	.
Great Lakes, IL	.	.	.	.	28	.	5	.	.	.	.	.	.	.	.	.
Jacksonville, FL	.	.	.	.	10	.	2	.	.	.	.	.	.	.	.	.
Mayport, FL	.	.	.	.	2	4	.	2	.	.	.	.	.	.	.	.
NABLC Norfolk, VA	.	.	.	.	16	3	1	.	.	.	.	.	.	.	.	.
NBMC Norfolk, VA	.	.	.	.	.	54	.	8	.	.	.	.	.	.	.	.
NEHC Norfolk, VA	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
North Charleston, SC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Pensacola, FL	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.
Portsmouth, VA	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Washington, DC	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.
Guantanamo Bay, Cuba	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Europe	.	.	.	.	4	.	.	.	.	.	.	.	.	.	.	.
NAVY MEDICINE WEST	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Camp Pendleton, CA	.	.	.	.	4	1	.	.	.	.	.	.	.	.	.	.
Corpus Christi, TX	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Fallon, NV	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ingleside, TX	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lemoore, CA	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Pearl Harbor, HI	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
San Diego, CA	.	.	.	.	76	.	8	.	2	.	.	.	.	.	.	.
Guam	.	.	.	.	3	.	1	.	.	.	.	.	.	.	.	.
Japan	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.
NAVAL SHIPS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
COMNAVAIRLANT/CINCLANTFLEET	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
COMNAVSURFPAC/CINCPACFLEET	.	.	.	.	7	.	4	.	.	.	.	.	.	.	.	.
Total	**1**	**0**	**0**	**0**	**209**	**80**	**23**	**13**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

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

Sentinel reportable events for service members and beneficiaries at U.S. Air Force medical facilities, cumulative numbers* through February 2007 and February 2008

Air Force

Reporting locations	Number of reports all events†		Food-borne								Vaccine preventable					
			Campylo-bacter		Giardia		Salmonella		Shigella		Hepatitis A		Hepatitis B		Varicella	
	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008
Air Combat Cmd	193	261	1	1	.	1	.	1	.	3	.	.	2	3	3	.
Air Education & Training Cmd	48	181	.	.	.	.	2	.	.	.	.	.	.	.	.	.
Lackland, TX	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
USAF Academy, CO	8	3	.	.	.	.	1	.	.	.	.	.	.	.	.	.
Air Force Dist. of Washington	3	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Air Force Materiel Cmd	67	91	.	1	.	.	3	.	.	1	.	.	.	.	.	.
Air Force Special Ops Cmd	8	18	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Air Force Space Cmd	27	51	.	.	1	.	2	.	.	.	.	.	.	.	.	.
Air Mobility Cmd	71	135	.	.	.	.	.	.	2	.	.	.	.	2	.	.
Pacific Air Forces	59	61	.	1	.	1	.	1	.	.	.	.	1	1	1	.
PACAF Korea	30	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.
U.S. Air Forces in Europe	47	66	.	1	.	.	.	.	.	.	.	.	.	.	.	1
Total	**561**	**875**	**1**	**4**	**1**	**2**	**8**	**2**	**2**	**4**	**0**	**0**	**3**	**6**	**4**	**1**

*Events reported by March 7, 2008

†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.

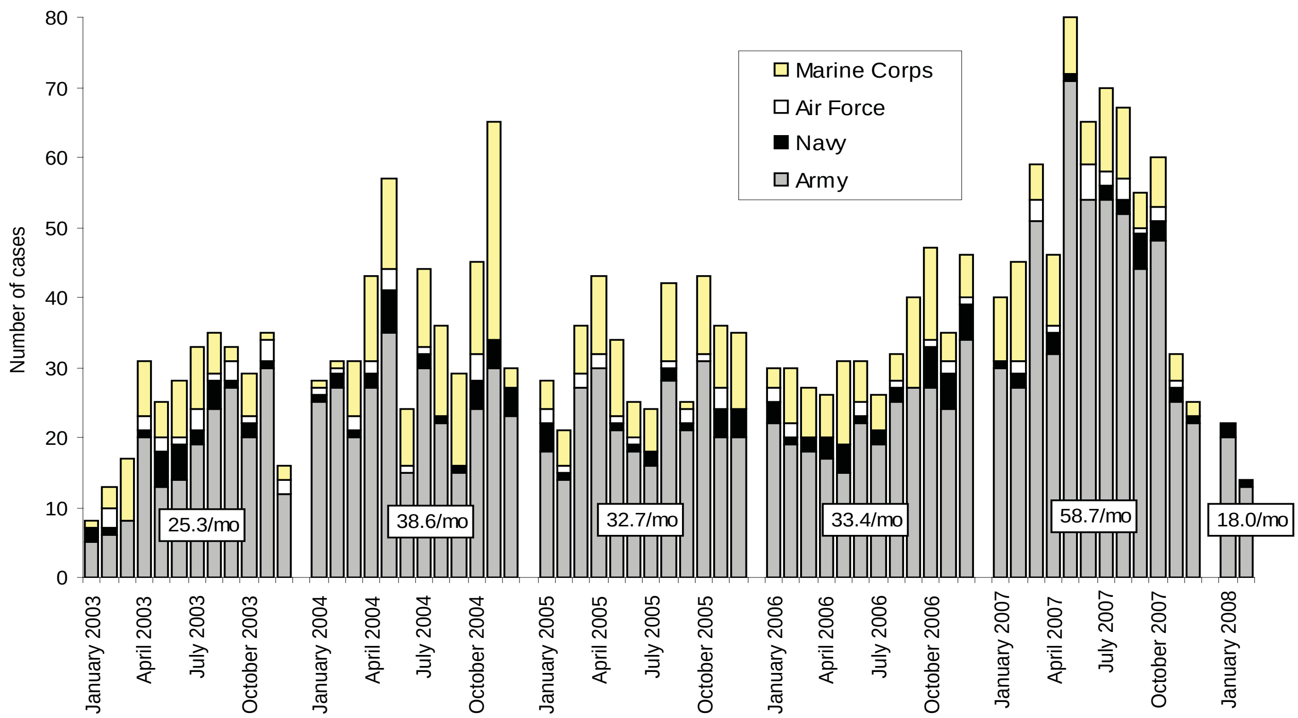
Reporting location	Arthropod-borne				Sexually transmitted								Environmental			
	Lyme disease		Malaria		Chlamydia		Gonorrhea		Syphilis‡		Urethritis§		Cold		Heat	
	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008
Air Combat Cmd	.	.	.	.	125	105	6	8	.	.	.	1	.	1	.	.
Air Education & Training Cmd	.	1	.	.	29	53	4	4	.	.	.	.	.	.	.	.
Lackland, TX	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
USAF Academy, CO	.	.	.	.	7	3	.	.	.	.	.	.	.	.	.	.
Air Force Dist. of Washington	.	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.
Air Force Materiel Cmd	.	1	.	.	52	40	4	5	.	1	.	.	.	.	.	.
Air Force Special Ops Cmd	.	1	.	.	7	14	1	2	.	.	.	.	.	.	.	.
Air Force Space Cmd	.	.	.	.	22	26	2	3	.	.	.	.	.	.	.	.
Air Mobility Cmd	1	.	.	.	60	99	3	10	.	1	.	.	.	2	.	.
Pacific Air Forces	.	.	.	.	45	40	1	1	.	.	.	.	1	.	.	.
PACAF Korea	.	.	.	.	22	4	.	.	.	.	.	.	.	.	.	.
U.S. Air Forces in Europe	.	.	.	.	20	38	3	6	.	.	.	.	.	.	.	.
Total	**1**	**3**	**0**	**0**	**392**	**422**	**24**	**39**	**0**	**2**	**0**	**1**	**1**	**3**	**0**	**0**

‡Primary and secondary.

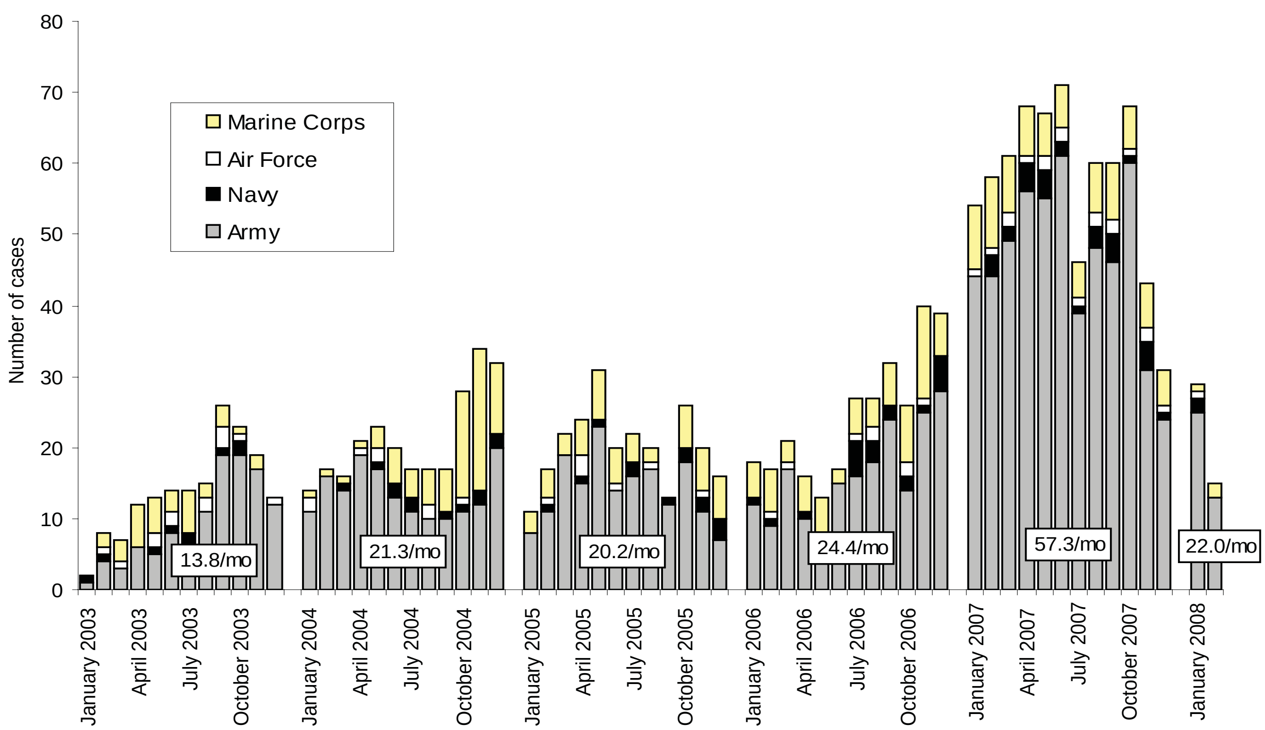
§Urethritis, non-gonococcal (NGU).

Deployment-related conditions of special surveillance interest, U.S. Armed Forces, by month and service, January 2003-February 2008

Traumatic brain injury, hospitalizations (ICD-9: 800-804, 850-854, 959.01)*



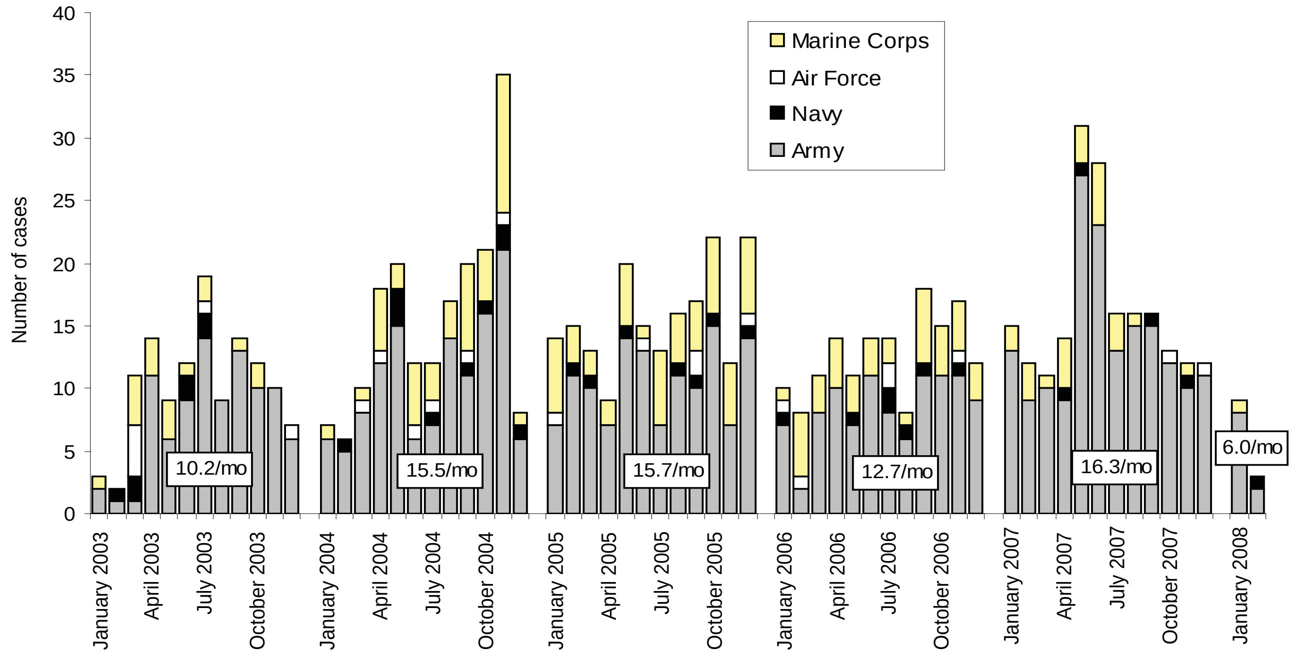
Traumatic brain injury, multiple ambulatory visits (without hospitalization), (ICD-9: 800-804, 850-854, 959.01)†



Reference: Army Medical Surveillance Activity. Traumatic brain injury among members of active components, U.S. Armed Forces, 2002-2007. *MSMR*. Aug 2007; 14(5):2-6.
*Indicator diagnosis (one per individual) during a hospitalization while deployed to/within 365 days of returning from OEF/OIF.
†Two or more ambulatory visits at least 7 days apart while deployed to/within 365 days of returning from OEF/OIF.

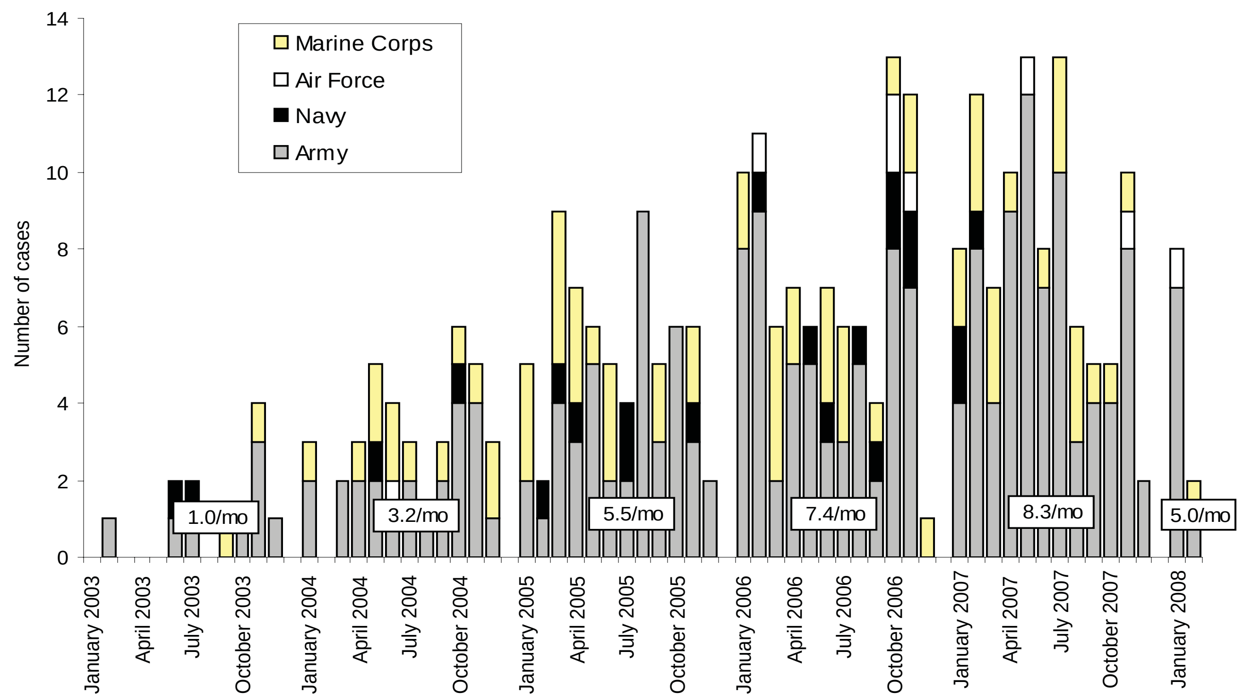
Deployment-related conditions of special surveillance interest, U.S. Armed Forces, by month and service, January 2003-February 2008

Amputations (ICD-9: 887, 896, 897, V49.6 to V49.7, PR 84.0 to PR 84.1)*



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 or ambulatory visit while deployed to/within 365 days of returning from OEF/OIF.

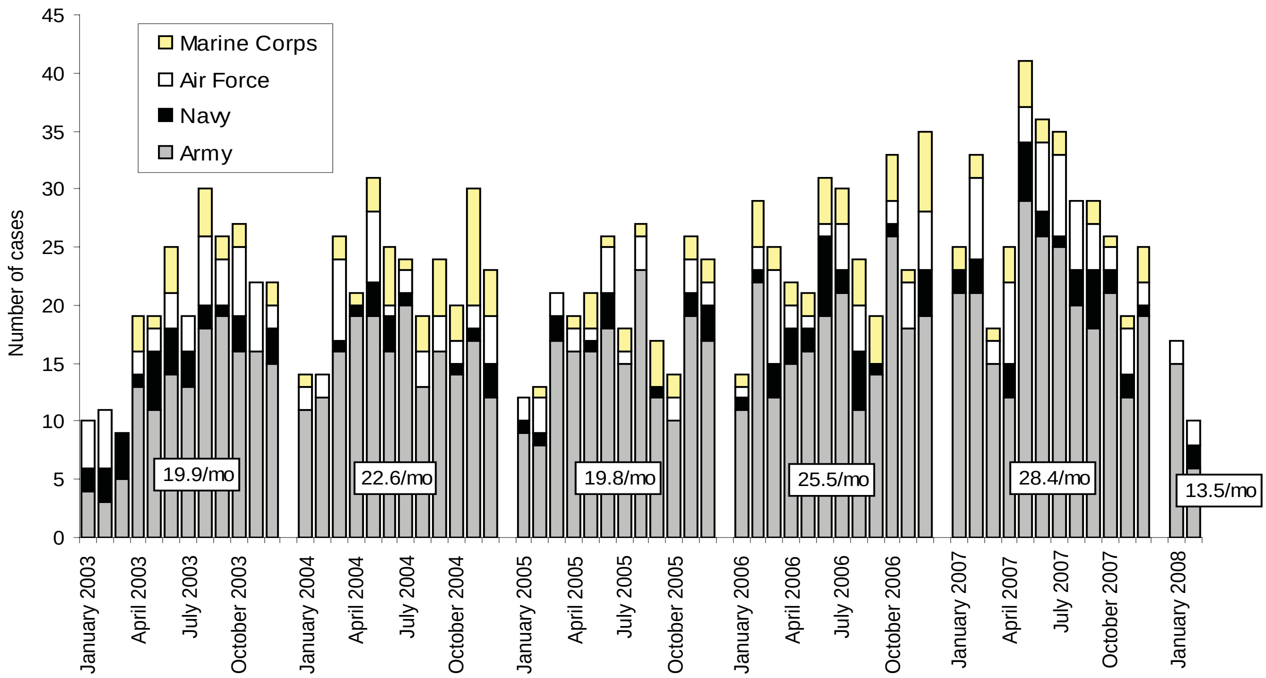
Heterotopic ossification (ICD-9: 728.12, 728.13, 728.19)†



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 while deployed to/within 365 days of returning from OEF/OIF.

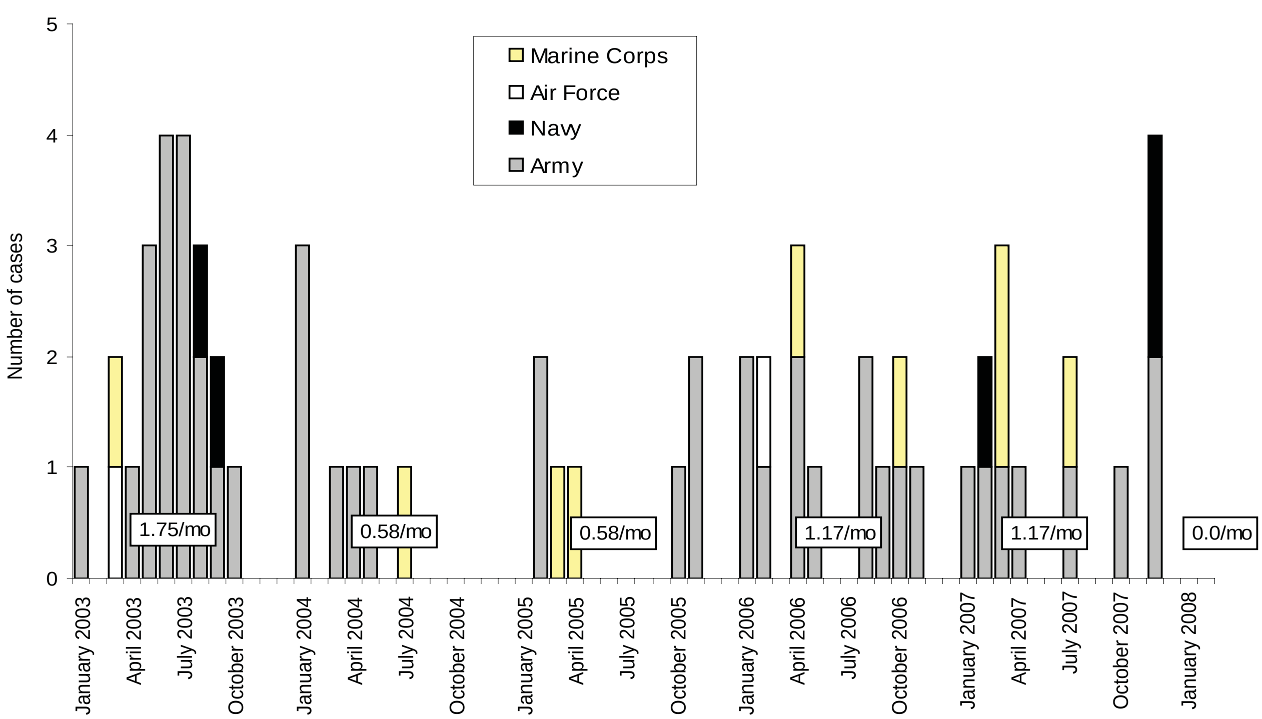
Deployment-related conditions of special surveillance interest, U.S. Armed Forces, by month and service, January 2003-February 2008

Deep vein thrombophlebitis/pulmonary embolus (ICD-9: 415.1, 451.1, 451.81, 451.83, 451.89, 453.2, 453.40 to 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.
*Indicator diagnosis (one per individual) during a hospitalization while deployed to/within 90 days of returning from OEF/OIF.

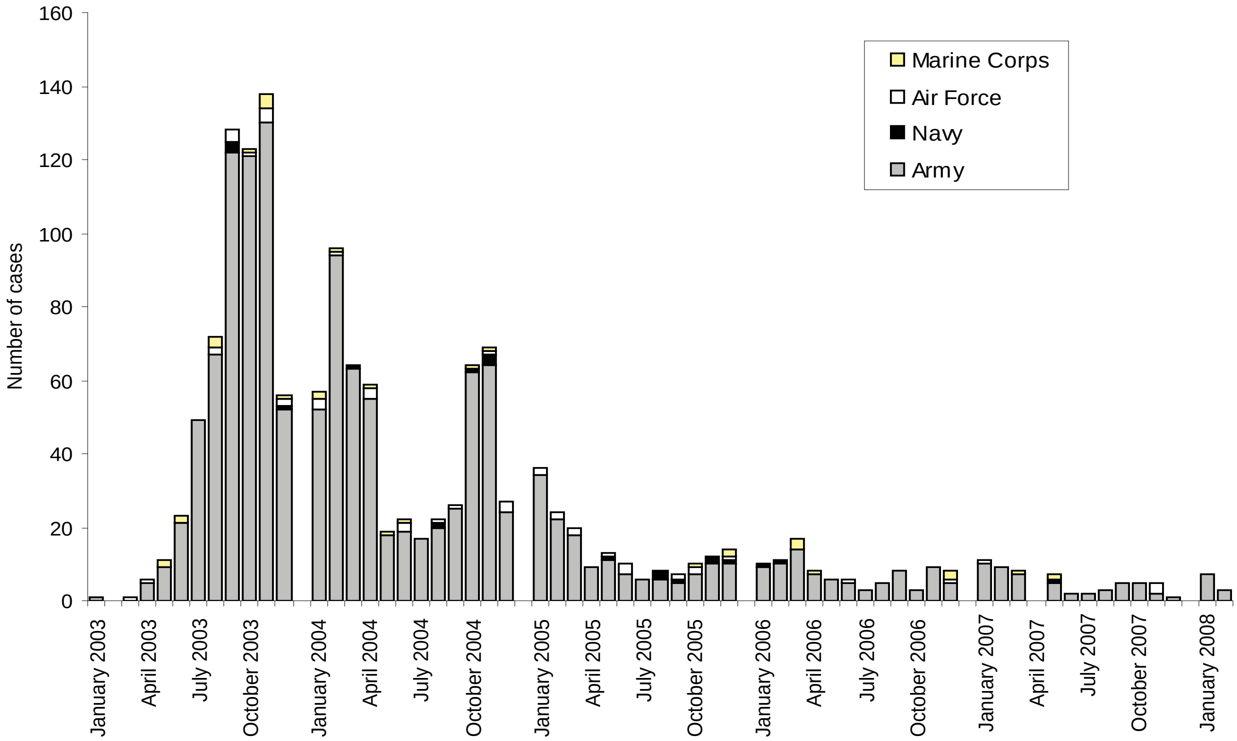
Severe acute pneumonia (ICD-9: 518.81, 518.82, 518.3, 480-487, 786.09)†



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 or ambulatory visit 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-February 2008

Leishmaniasis (ICD-9: 085.0 to 085.9)*

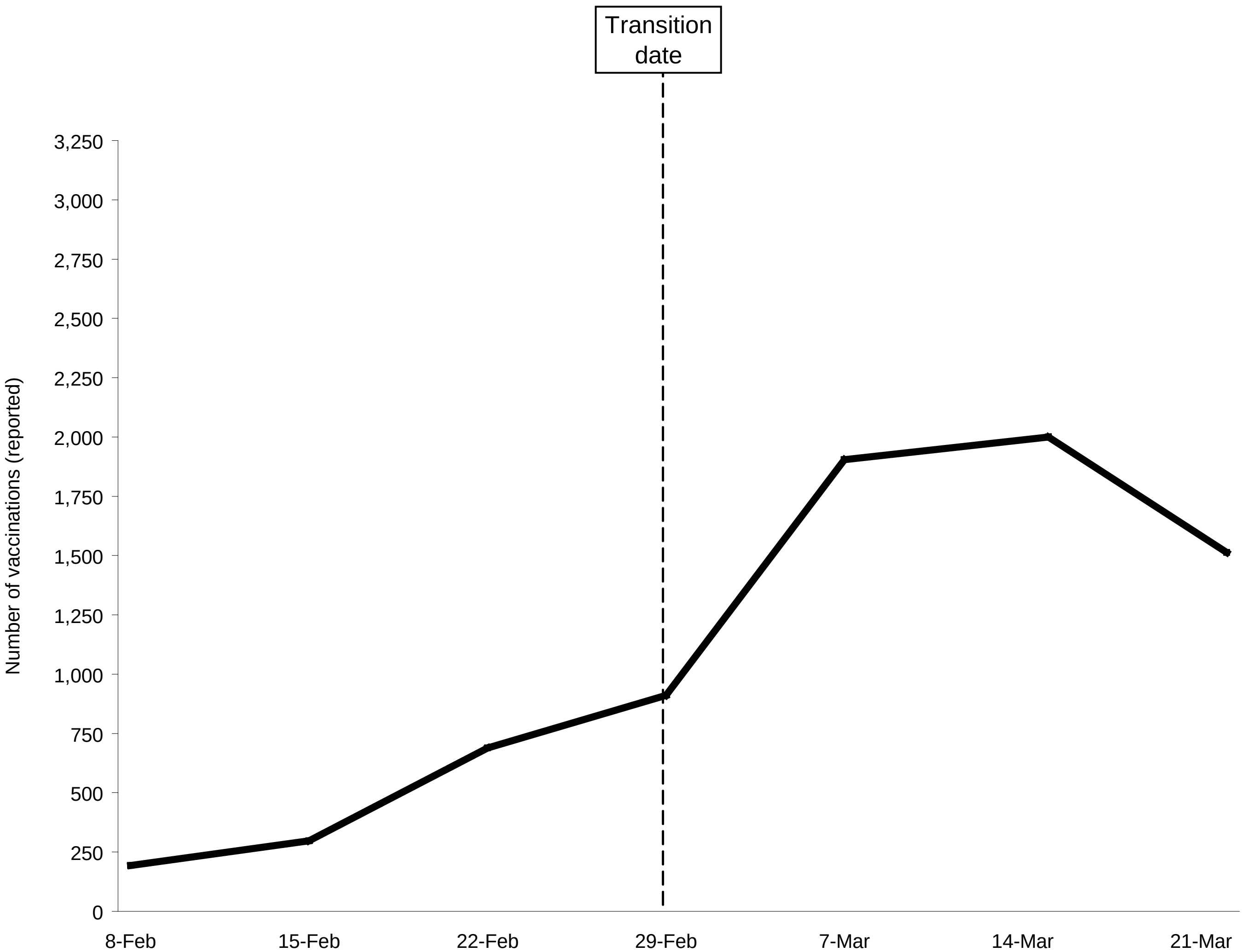


Reference: Army Medical Surveillance Activity. Deployment-related condition of special surveillance interest: leishmaniasis. Leishmaniasis among U.S. Armed Forces, January 2003-November 2004. *MSMR*. Nov/Dec 2004;10(6):2-4.

*Indicator diagnosis (one per individual) during a hospitalization, ambulatory visit, and/or from a notifiable medical event during/after service in OEF/OIF.

SURVEILLANCE SNAPSHOT:
Transition to new smallpox vaccine (ACAM2000™)

Reported uses of the new smallpox vaccine (ACAM2000™) among U.S. service members, by week, 8 February-21 March 2008



In humans, smallpox is caused by infection with variola virus. Throughout history, smallpox was a significant cause of death and a significant threat to military operations. A campaign to eliminate the natural occurrence of smallpox ended successfully in 1977. Vaccination with a live, attenuated vaccinia (cowpox) virus was a major component of the elimination strategy.

In the United States, the last case of smallpox was recorded in 1949. Routine vaccinations ceased in children by 1972, in hospital workers by 1976, and in military members in 1989. Routine vaccination of military members resumed in 2002 in response to the threat of the use of smallpox as a biological warfare or terrorist weapon.

In November of 2001, Acambis was awarded a contract to develop and manufacture a second-generation smallpox vaccine using modern methodology and quality controls. On 31 August 2007, the Food and Drug Administration approved licensure of a new smallpox vaccine, ACAM2000™. The vaccine is derived from the only other FDA licensed smallpox vaccine, Dryvax®, which was in short supply and no longer manufactured.

As of 29 February 2008, DoD clinics should have quarantined all Dryvax® vaccine and should be completely transitioned to ACAM2000™ for smallpox vaccinations. By 31 March 2008, all DoD Dryvax® vaccine should have been destroyed. The transition of the smallpox vaccine brand does not affect other aspects of DoD smallpox vaccination policy.

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