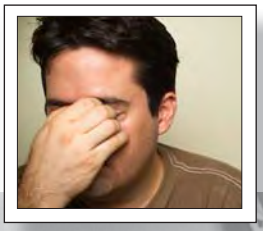
VOL. 16 • NO. 12
DECEMBER 2009

MSMR

A publication of the Armed Forces Health Surveillance Center





MEDICAL SURVEILLANCE MONTHLY REPORT

INSIDE THIS ISSUE:

Summary tables and figures

Read the MSMR online at: http://www.afhsc.mil

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
DEC 2009		**00-00-2009 to 00-00-2009**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Medical Surveillance Monthly Report (MSMR). Volume 16, Number 12, December 2009	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Armed Forces Health Surveillance Center (AFHSC),ATTN: MCHB-TS-EDM,2900 Linden Lane, Suite 200,Silver Spring,MD,20910**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

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

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

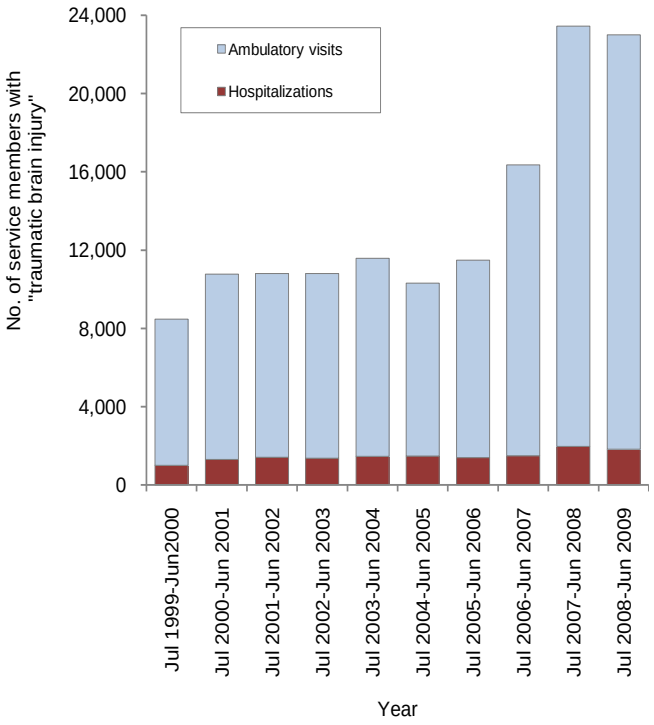
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**Same as Report (SAR)**	**24**	

Deriving Case Counts from Medical Encounter Data: Considerations when Interpreting Health Surveillance Reports

Military health surveillance involves the systematic collection, analysis, and interpretation of data that are informative regarding the status, trends, and determinants of the health, fitness, and military operational readiness of military members. For many health surveillance purposes, the Armed Forces Health Surveillance Center summarizes data reported in standardized records of medical encounters in U.S. military medical facilities and from reimbursed care provided in civilian facilities.

The accuracy of surveillance estimates of the numbers, rates, and trends of conditions of interest depend on many factors including, for example, the natures (e.g., type and severity of discomfort, disfiguration, disability) and natural histories (e.g., asymptomatic lead time; acute, relapsing, chronic clinical courses) of the conditions; the completeness and accuracy of reporting of relevant diagnoses, procedures, and treatments; care seeking behaviors of individuals affected by the conditions (including actual and perceived barriers to care); the frequency, timing, and accuracy of diagnostic and therapeutic procedures indicated for the condition; the specificity of clinical diagnoses and diagnostic codes (ICD-9-CM) used for reporting; the accuracy of determining and reporting appropriate diagnostic codes; and so on. These factors are carefully considered when designing analyses for surveillance reports that are published in the *MSMR*.

Figure 1. Incident diagnoses of "traumatic brain injury" (TBI) as ascertained by the standard surveillance case definition used by the Department of Defense, by clinical setting, active component, U.S. Armed Forces, July 1999-June 2009



Estimates of the numbers, rates, and trends of conditions targeted for surveillance rely on applications of "surveillance case definitions" to population-based data sets. Surveillance case definitions specify the criteria that are used to identify nominal "cases" of conditions of interest. Inevitably, all cases identified as "surveillance cases" will not be "true cases," and some true cases will not be ascertained as "surveillance cases" by all surveillance case definitions. Thus, surveillance case counts and trends can significantly differ from actual case counts and trends, depending, for example, on the natures of targeted conditions, specifications of the components of surveillance case definitions, and the completeness, accuracy, and timeliness of accessible and relevant data. Consumers of medical surveillance information should understand and account in their uses of such information for the uncertainty that is inherent in estimates of case counts, rates, and trends.

In recent years, there has been significant interest identifying U.S. military members with traumatic brain injury (TBI). The published estimate of the cumulative number of TBI cases in U.S. military members since 2000 is 161,025[1] (among members of both active and Reserve components of the Army, Navy, Air Force, and Marine Corps). The DoD's TBI case definition was formulated by subject matter experts from many disciplines and representing many medical, clinical, and public health organizations. The surveillance case definition of TBI was designed to be broad and sensitive in order to identify as many "true cases" among active and Reserve component U.S. military members as possible. Since September 2007, the *MSMR* has published summaries of estimated cases of TBI among recent participants in OEF/OIF (see "deployment-related conditions of special surveillance interest"). Beginning in this issue, the surveillance case definition of TBI used for the *MSMR*'s monthly summary will be consistent with the DoD's standard TBI case definition. Specifically, a TBI case is now defined in the monthly MSMR surveillance summary as a TBI-related diagnosis in any diagnostic position during a single hospitalization or ambulatory visit during or within 30 days after an OEF/OIF deployment (previously, two TBI-related ambulatory visits were necessary to define a case). The major effect of the change is to significantly increase the numbers of incident TBI cases among recent participants in OIF/OEF(see page 21).

The focus of this report is not estimation of TBI cases among U.S. service members. Rather, the report is

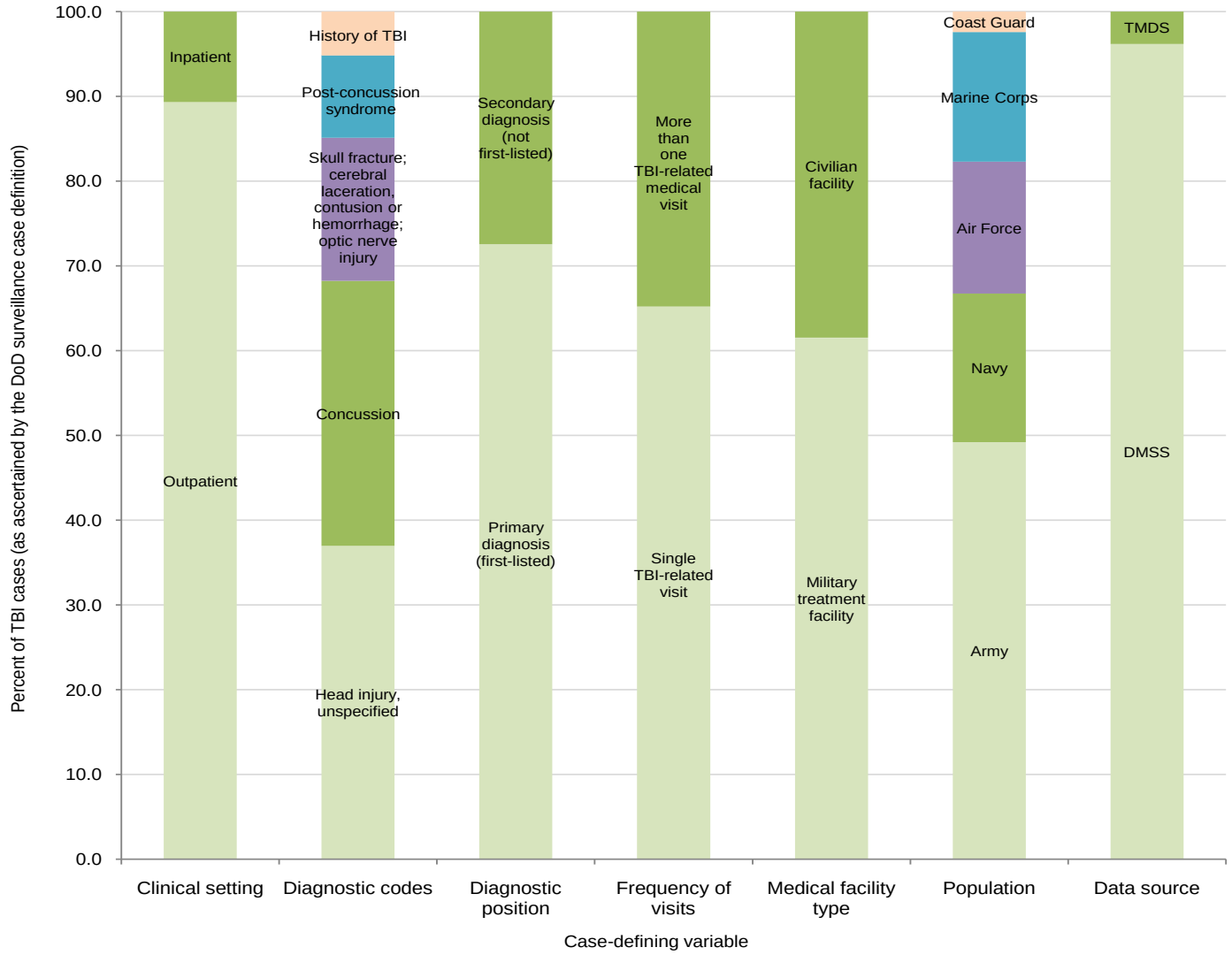
designed to increase awareness of the importance of case definitions in health surveillance applications, in general; and in turn, to improve understanding and enhance the uses of surveillance estimates of TBI and other conditions of surveillance interest. To this end, the report examines the variability in numbers, rates, and trends of TBI cases among active component members of the U.S. military in relation to elements of various surveillance case definitions, including the surveillance population and period, medical settings in which indicator diagnoses were made, diagnostic positions of indicator diagnoses (e.g., primary [first-listed] versus subsequent diagnoses), frequency and timing of relevant encounters, sources of surveillance data, and others. Of note, this analysis was based on TBI-related medical encounters of service members from the active components only of the Army, Navy, Air Force, Marine Corps, and Coast Guard. Hence, differences in case count estimates between the number of cases reported by the DoD and the numbers estimated in this report reflect differences in the populations among whom TBI-related medical encounters were analyzed.

Methods:

The surveillance period was 1 July 1999 through 30 June 2009. The surveillance period was divided into ten intervals of 12 months duration each (1 July through 30 June). The surveillance population included all individuals who served in the active component of the Army, Navy, Air Force, Marine Corps or Coast Guard any time during the surveillance period.

All medical encounters that included diagnostic codes indicative of traumatic brain injuries (TBI) were ascertained from electronic records of hospitalizations and ambulatory visits in U.S. military medical facilities and in civilian facilities (contracted/purchased care through the Military Health System); and from standardized records of in-theater medical encounters of deployed service members (Theater Medical Data Store [TMDS]). Because the military's surveillance of TBIs focuses on those with relatively recent onsets, service members with TBI-related medical encounters prior to the start of the surveillance period were excluded.

Figure 2. Proportions of incident cases of traumatic brain injury (TBI), as ascertained by the standard surveillance case definition, in relation to different case-defining variables, active component, U.S. Armed Forces, July 1999-June 2009



For surveillance purposes, each member of the surveillance population was included as an incident TBI case only once during the surveillance period. Service members who received more than one TBI diagnosis were considered "incident cases" on the date of the earliest medical encounter that met the criteria of the relevant surveillance case definition or case definition component.

For ongoing surveillance purposes, cases of TBI are ascertained using the DoD's standard surveillance case definition, which specifies a list of ICD-9-CM diagnostic codes that are considered indicators of TBI[2].

ICD-9-CM diagnostic code	Diagnosis
310.2	Post concussion syndrome
800	Fracture of vault of skull
801	Fracture of base of skull
803	Other and unqualified skull fractures
804	Multiple fractures involving skull or face with other bones
850	Concussion
851	Cerebral laceration and contusion
852	Subarachnoid, subdural, and extradural hemorrhage, following injury
853	Other and unspecified intracranial hemorrhage following injury
854	Intracranial injury of other and unspecified nature
950.1 - 950.3	Injury to optic chiasm/pathways or visual cortex
959.01	Head injury, unspecified
V15.5_1 thru V15.5_9, V15.5_A thru V15.5_F, V15.59_1_ thru V15.59_9, V15.59_A thru V15.59_F	Personal history of TBI[3]

Note: ICD-9-CM: 907.0 "Late effect of intracranial injury without mention of skull fracture" was added to the DoD's surveillance case definition of TBI in December 2008 and was not included in this analysis.

By the standard DoD surveillance case definition, a case of TBI is defined as a hospitalization or ambulatory visit with a TBI indicator diagnosis reported in any diagnostic position. For summary purposes, TBI-related hospitalizations are prioritized over ambulatory visits; and for each case, the earliest TBI-related encounter is considered the incident encounter.

For this report, incident cases of TBI ascertained by applying the DoD surveillance case definition in the routine manner were summarized in regard to selected components of the surveillance case definition (e.g., indicator diagnostic codes, clinical settings). Specifically, all "TBI cases" identified by the current standard surveillance method were characterized in relation to various case-defining attributes — overall and over time.

Finally, analyses were conducted to assess the importance of components of the surveillance case definition (e.g., clinical setting; number and timing of relevant medical encounters; positions of reported diagnoses) other than indicator diagnostic codes. For these analyses, six "comparison surveillance case definitions" were used to estimate TBI case counts and trends. The comparison case definitions used the same list of TBI indicator diagnostic codes as the DoD surveillance case definition; however, hospitalized and ambulatory cases were considered separately:

Ambulatory cases:

Case definition 1: ambulatory visit with a TBI-related diagnostic code ("TBI indicator code") in any diagnostic position (dx1-5).

Case definition 2: at least two ambulatory visits with a TBI indicator code in any diagnostic position (dx1-5).

Case definition 3: at least two ambulatory visits with TBI indicator codes as primary (first-listed) diagnoses.

Case definition 4: at least two ambulatory visits within a 90-day period with TBI indicator codes as primary (first-listed) diagnoses.

Hospitalized cases:

Case definition 5: hospitalization with a TBI-related diagnostic code in any diagnostic position (dx1-8).

Case definition 6: hospitalization with a TBI indicator code as the primary (first-listed) diagnosis.

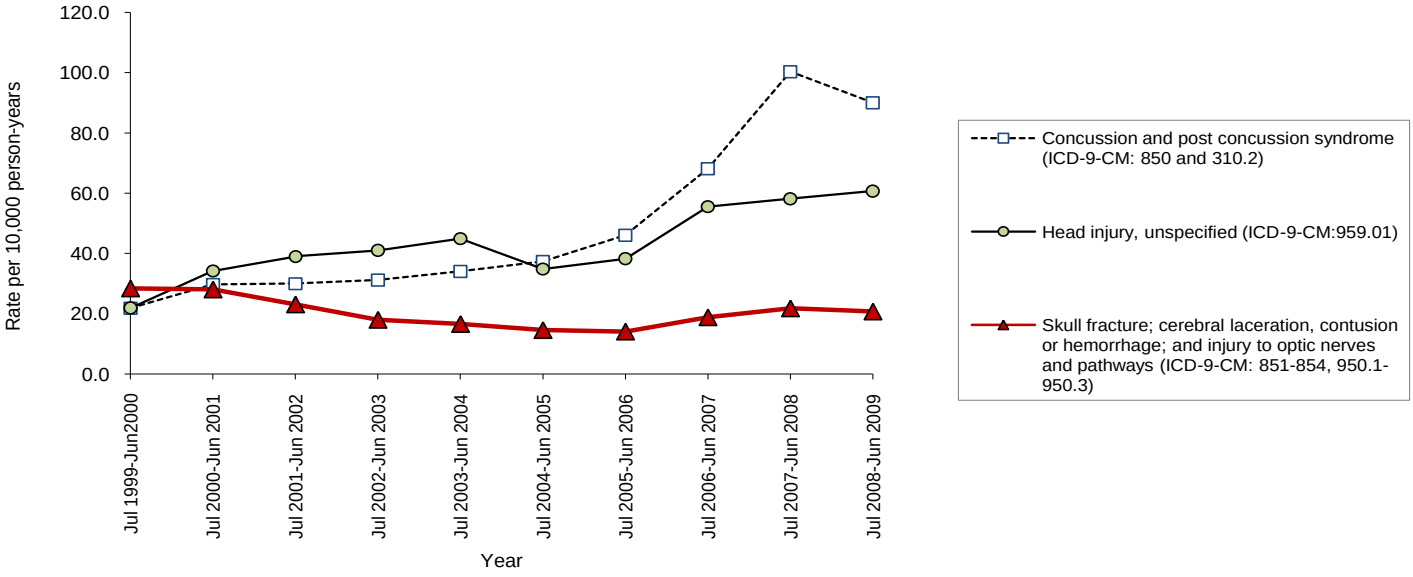
Results:

During the 10-year period, 137,029 active component members of the Army, Navy, Air Force, Marine Corps, and Coast Guard met the DoD surveillance case definition for traumatic brain injury. From the first to the second year of the surveillance period, incident TBI cases increased by approximately 25%; over the next five years, incident TBI cases per year remained relatively stable (range, incident cases per 12-month period, July 1999-June 2006: 10,292-11,563). Beginning in 2006, the numbers of incident TBI cases (as ascertained by the DoD surveillance case definition) sharply increased. Specifically, from 2005-6 to 2006-7 (n=16,354), incident TBI cases increased by 43%; and from 2006-7 to 2007-8 (n=23,512), incident cases increased by another 44%. During the most recent 12-month period, the number of incident TBI cases slightly declined (2008-9, n=23,047) **(Figure 1).**

Approximately one of nine (11%) service members identified as "TBI cases" (per the DoD case definition) were ever hospitalized with a TBI-related diagnosis during the period **(Figure 1, Figure 2).** In more than two-thirds of all incident "TBI cases", the diagnosis during the case-defining medical encounter was "head injury, unspecified" (37.0%) or "concussion" (31.3%). More than one-fourth (27.4%) of all "TBI cases" never had a TBI indicator code as a primary (first-listed) diagnosis.

Approximately two-thirds (65.2%) of all service members identified as "TBI cases" by the DoD case definition had only

Figure 3. Incidence rates for selected categories of traumatic brain injury (TBI) indicator codes, active component, U.S. Armed Forces, July 1999-June 2009



one TBI-related medical encounter during the period **(Figure 2).** Of all TBI cases (per the DoD case definition), nearly one-half were from the Army (49.2%), approximately one-sixth each were from the Navy (17.5%), Air Force (15.5%), and Marine Corps (15.3%), and the relatively few others were from the Coast Guard (2.4%) **(Figure 2).** Finally, of all TBI cases, only approximately one of 25 (3.8%) were documented with records of medical encounters in a military operational theater (e.g., Iraq, Afghanistan); thus, most cases by far were documented through records of medical encounters in fixed medical facilities outside of combat theaters **(Figure 2).**

Of note, there is significant variability in the numbers, rates and trends of various indicators of the occurrence, clinical setting, and possible sequelae of TBIs. For example, in regard to clinical setting, the number of active component service members hospitalized with a TBI diagnosis increased by 24% from June 2005 through June 2009; during the same period, the number of individuals with TBI-related ambulatory visits increased by 139% **(Figure 1).**

In regard to TBI indicator diagnostic codes, during the first year of the surveillance period, there were similar rates of incident diagnoses of "concussion/post-concussion syndrome" and "head injury, unspecified"; and compared to each of these, there were higher incidence rates of "other" TBI indicator codes (i.e., skull fractures; cerebral lacerations, contusions and hemorrhages; injury to optic nerve and pathway) **(Figure 3).** However, by the end of the period, there were far higher incidence rates of "concussion/post concussion syndrome" than "head injury, unspecified"; and far higher rates of each of these than of "other" TBI indicator diagnoses **(Figure 3).**

There were also varying trends of TBI incidence rates (per the DoD case definition) across the Services **(Figure 4).** For example, during the first six years of the surveillance period, TBI incidence rates were higher in the Marine Corps (annual incidence rate, range: 85.8 to 106.6 per 10,000 p-yrs) than the other services. From approximately 2006 through 2008, TBI case incidence rates increased in all the Services, but most sharply in the Army; and by 2008-9, the incidence rate in the Army (280.0 per 10,000 p-yrs) was approximately two-thirds higher than in the Marine Corps (172.1 per 10,000

Figure 4. Incident rates of "traumatic brain injury", as ascertained by the DoD surveillance case definition, by Service, active component, U.S. Armed Forces, July 1999-June 2009

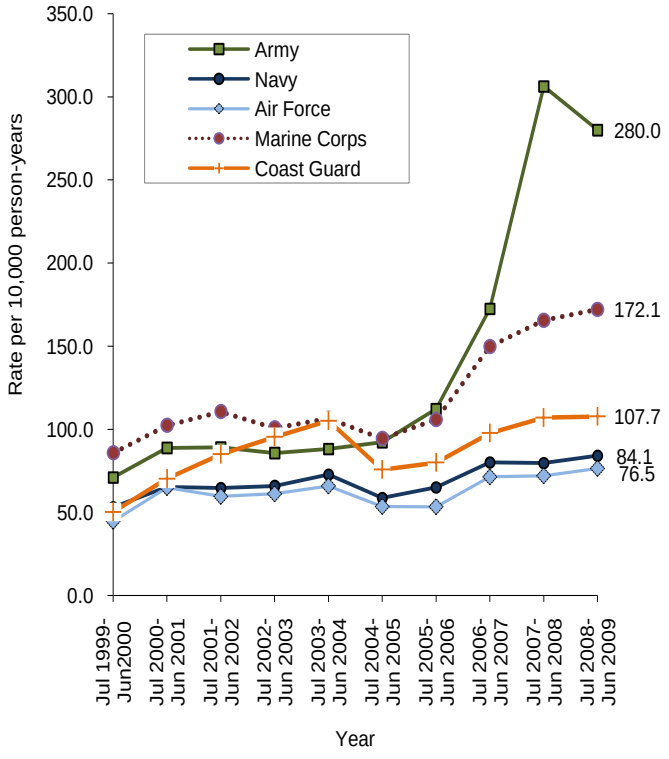


Figure 5. Incident diagnoses of "traumatic brain injury", by type of medical facility reporting the encounters, U.S. Armed Forces, July 1999- June 2009

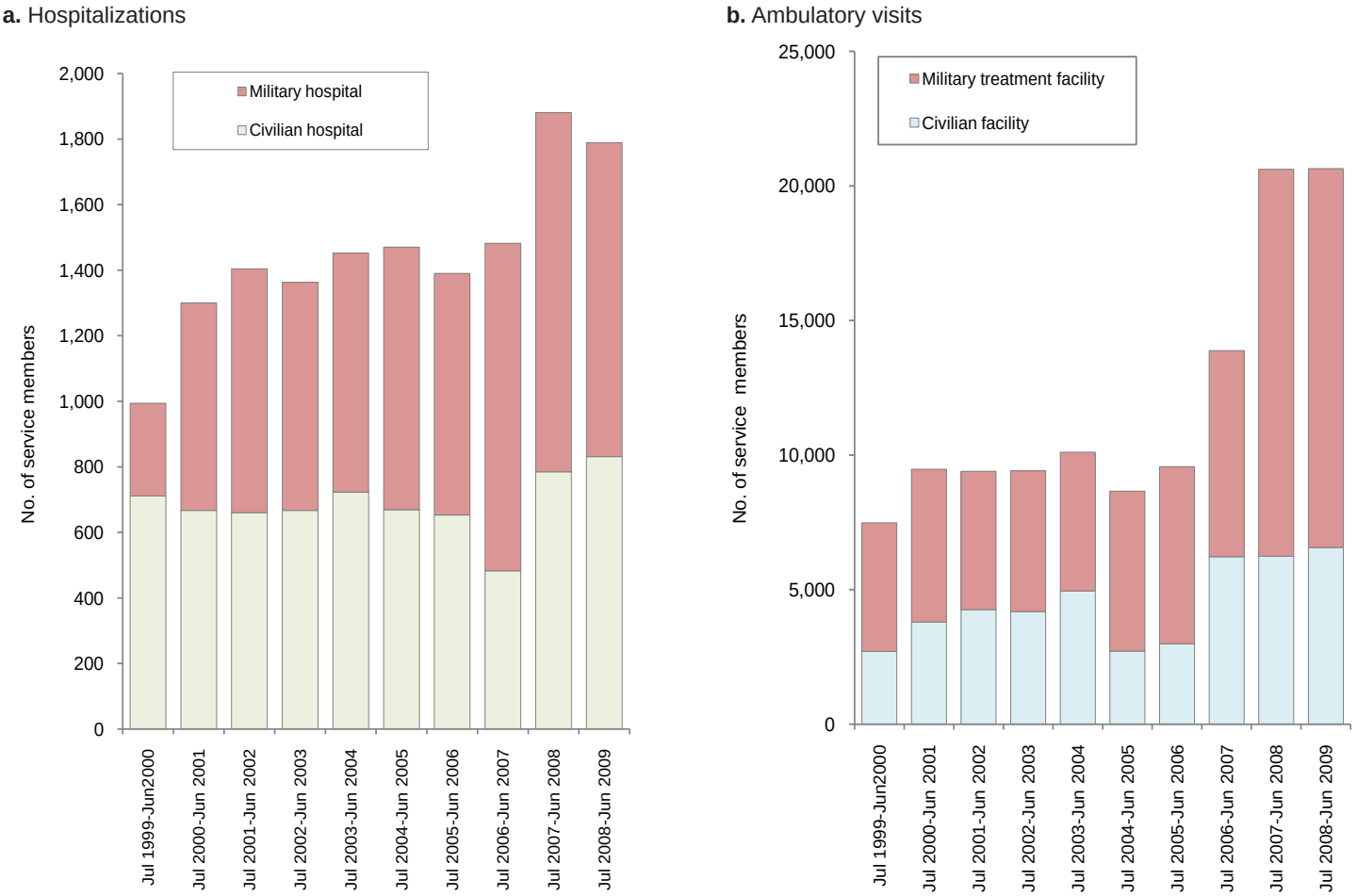


Figure 6. Incident diagnoses of "traumatic brain injury", as ascertained by applications of different surveillance case definitions (and percent of total cases ascertained by the DoD case definition), active component, U.S. Armed Forces, July 1999-June 2009

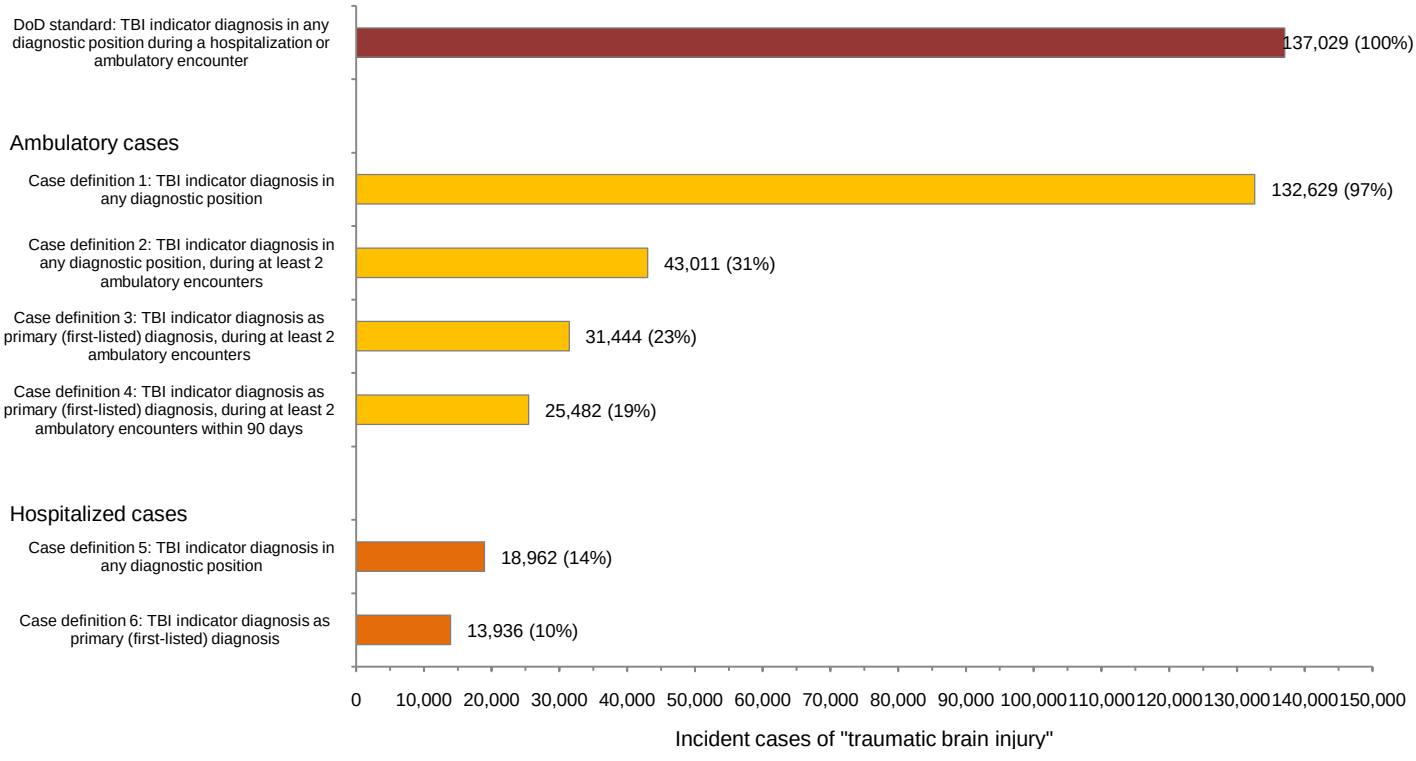
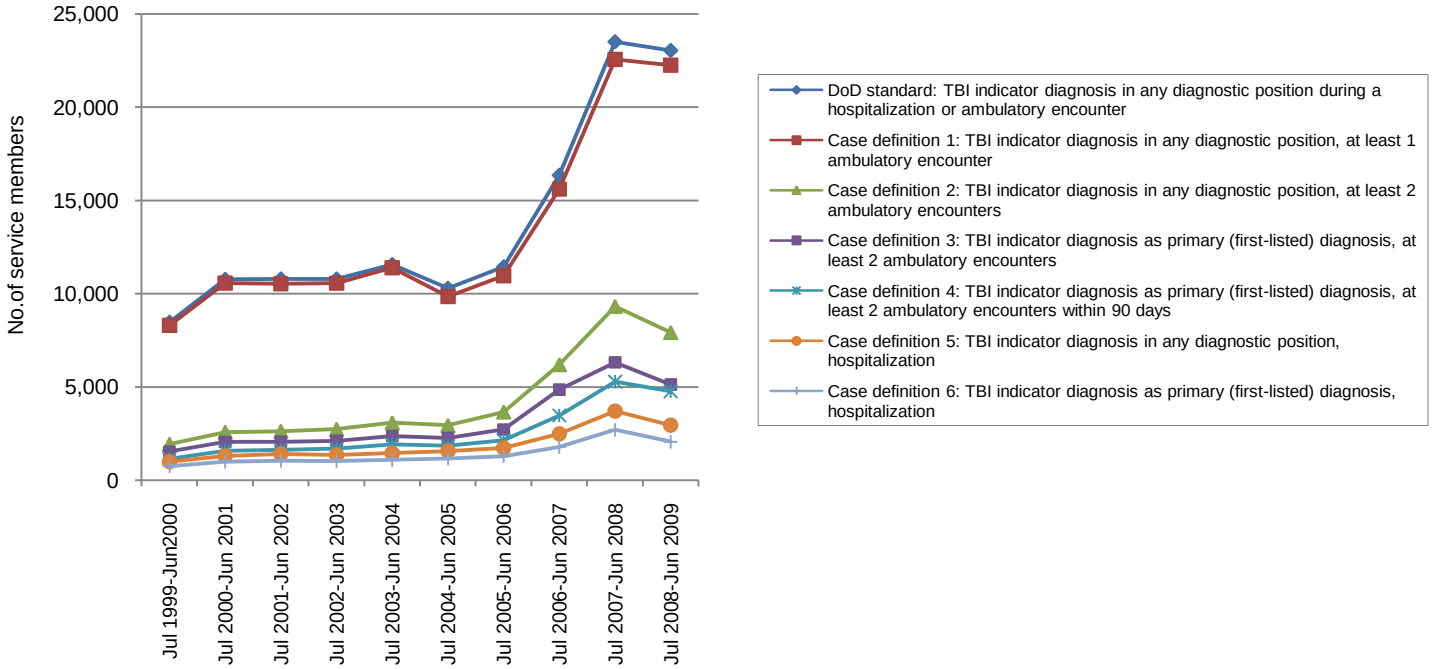


Figure 7. Number of service members with "traumatic brain injury", as ascertained by applications of different surveillance case definitions, by year, active component, U.S. Armed Forces, July 1999-June 2009



p-yrs) and more than 3-times higher than in the Navy or Air Force **(Figure 4).**

Numbers and trends of TBI case-defining diagnoses also differed by the natures of the medical facilities that provided the care **(Figure 5a-b).** For example, during the first five years of the period, more hospitalized cases were treated in civilian (contracted/purchased care) than in military hospitals; however, during the next five years, there were approximately one-third more hospitalized cases treated in military than in civilian hospitals **(Figure 5a).** During the first five years of the surveillance period, there were approximately one-third more incident diagnoses of TBI reported from military than civilian ambulatory facilities; however, during the next five years, there were nearly twice as many incident diagnoses of TBI reported from military than civilian ambulatory facilities **(Figure 5b).**

Comparison surveillance case definition 1 requires a TBI indicator diagnosis in any diagnostic position during at least one outpatient encounter. The number of cases ascertained when case definition 1 was applied (n=132,629) was similar to the number estimated under the DoD case definition **(Table 1, Figure 6).**

Case definition 2 requires TBI indicator diagnoses (in any diagnostic positions) during at least two outpatient visits. Compared to the cases estimated when the DoD definition or definition 1 was applied, there were approximately two-thirds fewer cases when surveillance case definition 2 was used (estimated cases, case definition 2, n=43,011).

Case definition 3 requires TBI indicator diagnoses as primary (first-listed) diagnoses during at least two outpatient visits. Compared to the number of cases estimated when the DoD case definition was applied, there were only approximately one-fourth as many cases when surveillance case definition 3 was used (estimated cases, case definition 3, n=31,444).

Case definition 4 requires TBI indicator diagnoses as primary (first-listed) diagnoses during at least two medical encounters within 90 days. Compared to the number of cases estimated when the DoD case definition was applied, there were fewer than one-fifth as many cases when surveillance case definition 4 was used (estimated cases, case definition 3, n=25,482).

Of all TBI cases (per the DoD surveillance definition), approximately one of ten had a hospitalization with a TBI-specific primary (first-listed) diagnosis (n=13,936, 10%); an additional 5,026 TBI cases were hospitalized with TBI indicator diagnoses as secondary (but not primary) diagnoses (n= 18,962, 14%) **(Table 1, Figure 6).**

The DoD definition and the least restrictive other definition used for this report (definition 1: one ambulatory visit with a TBI-related diagnosis in any diagnostic position) estimated similar numbers of TBI cases throughout the period. Both definitions identified fewer than 9,000 cases in 1999-2000, between 10,000 and 12,000 cases from 2000 through 2006, and sharply increasing numbers through 2008 **(Table 1, Figure 7).** Trends of incident TBI cases were generally similar when using case definitions that required a TBI-related hospitalization or at least two TBI-related ambulatory visits. Regardless of the surveillance case definition, however, incident TBI cases declined slightly during the last year of the period **(Table 1, Figure 7).**

Data summaries conducted by Gi-Taik Oh, Data Analysis Group, Armed Forces Health Surveillance Center (AFHSC).

Editorial comment:

Case counts that are reported in the *MSMR* (as are case counts reported in other health surveillance reports) are estimates of actual numbers of cases of conditions of surveillance interest. Because surveillance case counts are estimates, however, they are subject to numerous sources of estimation error. For this reason, health surveillance findings should always be interpreted with an understanding of the estimation methods, their limitations, and the likely and potential effects of the limitations.

In general, consumers of health surveillance information are interested in the numbers of individuals that have been affected by conditions ("cumulative incidence"), the number of individuals currently affected ("prevalence"), the current rate at which new cases are occurring ("incidence rate"), whether the rate is increasing or decreasing over time ("incidence trend"), and characteristics of those affected ("risk factors") in various populations (e.g., combat service veterans) and settings (e.g., occupational groups). The completeness and accuracy of case ascertainment for surveillance purposes depend not only on the diagnostic codes used to "find" cases from relevant records ("indicator diagnoses") but also on other critical components of the "surveillance case definition." This report illuminates the importance of components of the "surveillance case definition" other than indicator diagnoses in the estimation of numbers, rates, and trends of traumatic brain injury. It is clear, for example, that estimated numbers, rates and trends of TBI can significantly vary depending on where, when, and by whom indicator diagnoses were made and reported; and by judgments regarding the likelihood that a single or multiple reports of various indicator diagnoses reflect "true" TBI cases.

During health surveillance in general, factors (not assessed in this report) that may modify the "positive predictive values" of various indicator diagnoses include length of hospitalization; disposition after hospitalization or ambulatory visit (e.g., medical disability retirement; convalescent leave; limited duty; duty without limitation); the medical service, clinic, or ward that reports a case defining diagnosis (e.g., general medicine clinic; emergency room; neurology, neurosurgery, physical medicine/rehabilitation clinic or ward); the cause of the underlying injury (e.g., motor vehicle accident, blast injury in combat, assault, fall), and so on. Consideration or not of such factors in health surveillance analyses may significantly affect the reliability of the findings of health surveillance reports. Informed readers of such reports should consider the limitations (and likely effects) of the methods used to detect and confirm cases when they interpret the "results." The editorial comments that append most *MSMR* reports often highlight limitations of the subject analyses and the likely or potential effects of the limitations on the main findings.

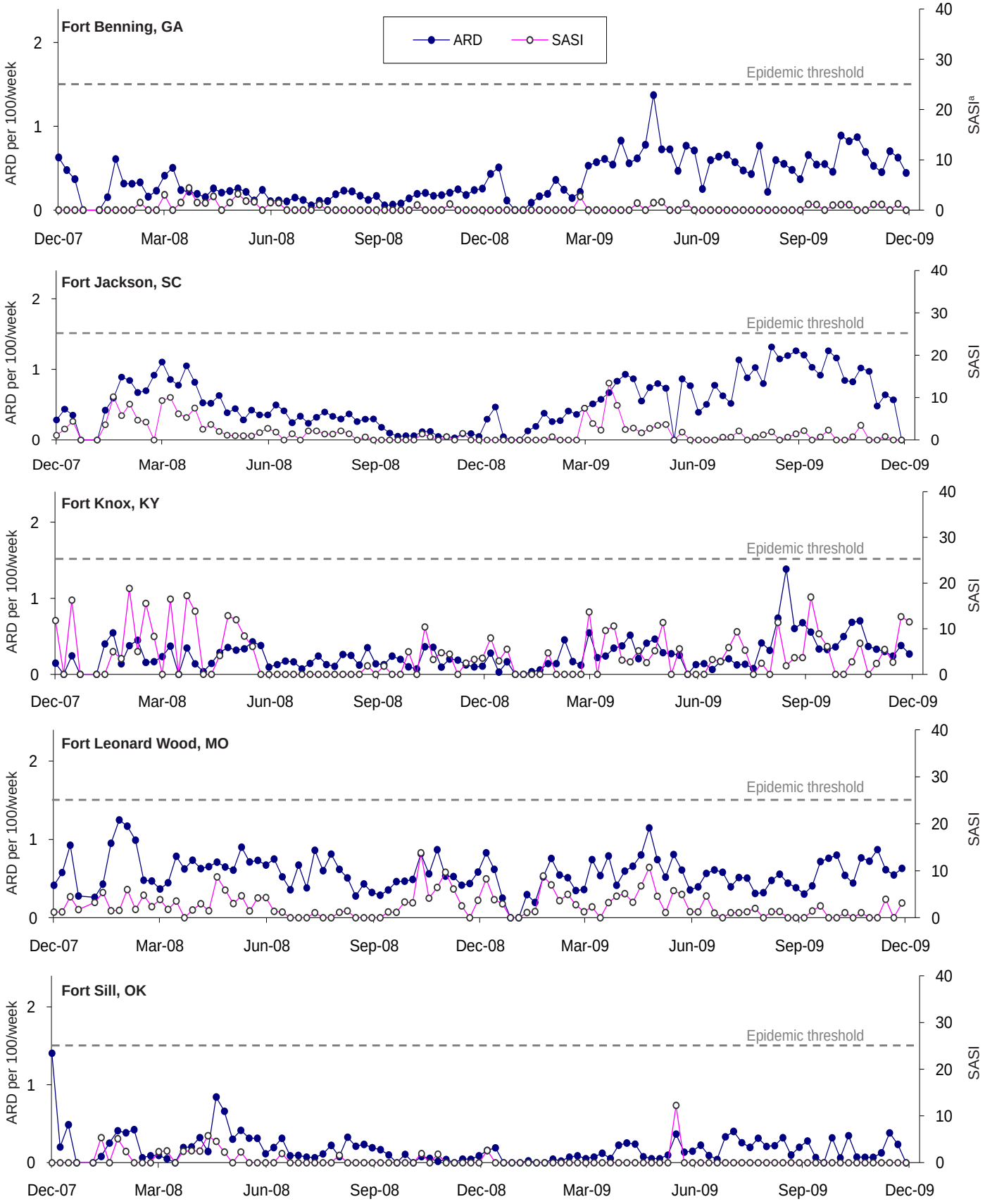
Health surveillance findings related to temporal trends should be interpreted with particular caution. Factors such as changes in diagnostic procedures, clinical practice guidelines, medical coding practices, and institutional awareness and concern can suddenly and significantly change the numbers and meaning of reported diagnoses of various conditions. This report, for example, documented a sharp increase in the numbers of service members with TBI indicator diagnoses from 2006 through 2008; the increase was largely attributable to outpatient diagnoses (in U.S. military medical treatment facilities outside of combat operational theaters) of "concussion" and "head injury, unspecified" among members of the U.S. Army and Marine Corps. Factors likely associated with the apparent increase include the implementation of post-deployment screening for "mild TBI" at several large Army and Marine Corps combat installations (since 2005);[3] the addition to DoD coding guidelines of a diagnostic code for "history of TBI" (in 2007); and the availability for health surveillance purposes of reports of in-theater medical encounters (since 2007).

In conclusion, this report documents that numbers, rates and trends of conditions of military medical significance vary not only by the clinical criteria (indicator diagnostic codes) used to ascertain cases, but also by other case finding and case confirmation factors such as clinical setting, diagnostic position, frequency and timing of medical encounters, source of the surveillance data, and population under surveillance. Consideration of these and other case-defining components are necessary to understand, appropriately interpret, and efficiently and effectively apply the results of health surveillance analyses. In the case of TBI among U.S. military members, long and careful deliberations by subject matter experts from many disciplines produced the case definition that is used to track numbers, rates, and trends. Such careful and thoughtful planning should be included in designing and interpreting results of surveillance of other conditions of interest.

References:

1. U.S. Department of Defense, Military Health System. Department of Defense Numbers for Traumatic Brain Injury. http://www.health.mil/Pages/Page.aspx?ID=49. Updated 7 Oct 2009. Accessed 8 Jan 2009.
2. Armed Forces Health Surveillance Center. Notice to readers: New surveillance case definition for traumatic brain injury (TBI). *MSMR. 2008 Oct;15(8):24.*
3. Bradshaw D, et al. Report to the Surgeon General: Traumatic Brain Injury Task Force, dated 15 May 2007. The Surgeon General, Department of the Army. Washington, DC. Accessed on-line on 28 October 2008 at: http://www.armymedicine.army.mil/reports/tbi/TBITaskForceReportJanuary2008.pdf

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



[a]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

Risk Factors for Migraine after OEF/OIF Deployment, Active Component, U.S. Armed Forces

Migraine is a leading cause of medical encounters and lost duty time among military members.[1] During migraine attacks, the military operational capabilities of those affected are sharply reduced.

In the U.S. military, as in the general population, migraine is much more common among females than males.[1-3] Of recent concern, among females who have served in Operations Enduring Freedom or Iraqi Freedom (OEF/OIF), migraine is much more common after OEF/OIF service than before; also, migraine is much more common among female than male OEF/OIF veterans.[2]

Migraine has been associated with several mental disorders, including depression and post-traumatic stress disorder (PTSD). Depression and PTSD have been associated with traumatic brain injury (TBI); it is likely that some episodes of migraine among OEF/OIF veterans are related to TBI or PTSD.[3-6]

Analyses for this report were designed to compare the incidence of migraine diagnoses among male and female OEF/OIF deployers, before and after OEF/OIF service, and in relation to several hypothesized deployment-related comorbid conditions (i.e., concussion [an indicator of TBI], anxiety disorders [including PTSD], and depression).

Methods:

The surveillance population included all members of the active component of the U.S. Armed Forces who completed at least one Operation Enduring Freedom (OEF) or Operation Iraqi Freedom (OIF) deployment prior to 31 December 2008.

The endpoint of analyses was a hospitalization or ambulatory visit with a primary (first-listed) diagnosis of "migraine" (ICD-9-CM: 346). Follow-up of each surveillance cohort member was divided into "predeployment" and "postdeployment" periods: the predeployment period consisted of all active service prior to the start date of each cohort member's first OEF or OIF deployment; the postdeployment period consisted of all active service following the start date of each service member's first OEF or OIF deployment.

The summary measure of migraine incidence was the cumulative incidence percent. The cumulative incidence percent was calculated as the percentage of all cohort members who had at least one medical encounter for migraine during each deployment-related followup period.

To assess relationships between comorbid conditions of interest and migraine, all medical encounters of each cohort member before and after their first OEF/OIF deployments were reviewed to identify all hospitalizations and ambulatory visits for the following conditions (ICD-9-CM diagnoses and codes): "concussion" (concussion: 850.0-850.9; postconcussion syndrome: 310.2); "anxiety disorder" (anxiety states: 300.00-300.09; phobic disorders: 300.20-300.39; acute reaction to stress: 308.0-308.9; adjustment disorder with anxiety: 309.24; post-traumatic stress disorder: 309.81); and "depression" (major depressive disorder: 296.20-296.39; bipolar disorder, most recently/currently depressed: 296.50-296.55; unspecified episodic mood disorder: 296.90; dysthymic disorder: 300.40-300.49; adjustment disorder with depressed mood: 309.0; prolonged depressive reaction: 309.1; depressive disorder, not elsewhere classified: 311). During each deployment-related period, deployers to OEF/OIF were considered "exposed" to each migraine-associated condition if they had at least one medical encounter for the condition during the period.

Table 1. Number and percent with "migraine" prior to deployment, in relation to diagnoses of "concussion," "anxiety disorder," and "depression" prior to deployment, among male and female deployers to OEF/OIF

	Male OEF/OIF deployers				Female OEF/OIF deployers				
Comorbidity status, before deployment	Migraine before deployment	No migraine before deployment	% with migraine before deployment	Relative % with migraine before deployment, by comorbidity status	Migraine before deployment	No migraine before deployment	% with migraine before deployment	Relative % with migraine before deployment, by comorbidity status	Female-to-male ratio, % with migraine before deployment
No concussion	18,276	1,078,805	1.67	ref	10,929	130,445	7.73	ref	4.64
Concussion	542	9,500	5.40	3.24	216	911	19.17	2.48	3.55
No anxiety disorder	17,354	1,065,565	1.60	ref	9,577	124,162	7.16	ref	4.47
Anxiety disorder	1,464	22,740	6.05	3.77	1,568	7,194	17.90	2.50	2.96
No depression	16,737	1,054,318	1.56	ref	8,585	119,909	6.68	ref	4.28
Depression	2,081	33,987	5.77	3.69	2,560	11,447	18.28	2.74	3.17
Totals	*18,818*	*1,088,305*	*1.70*		*11,145*	*131,356*	*7.82*		*4.60*

Table 2. Number and percent with "migraine" after OEF/OIF deployment, in relation to predeployment history of migraine and pre- and post-deployment histories of "concussion," "anxiety disorder," and "depression," among male and female deployers to OEF/OIF

	Male OEF/OIF deployers				Female OEF/OIF deployers				
Migraine history and comorbidity status	Migraine after deployment	No migraine after deployment	% with migraine after deployment	Relative % with migraine after deployment, by comorbidity status	Migraine after deployment	No migraine after deployment	% with migraine after deployment	Relative % with migraine after deployment, by comorbidity status	Female-to-male ratio, % with migraine after deployment
No migraine before OEF/OIF deployment									
No concussion	20,238	1,033,417	1.92	ref	10,535	118,527	8.16	ref	4.25
Concussion (before deployment)	368	9,132	3.87	2.02	112	799	12.29	1.51	3.17
Concussion (after deployment)	2,652	23,080	10.31	5.37	290	1,123	20.52	2.51	1.99
No anxiety disorder	16,574	967,918	1.68	ref	8,087	104,275	7.20	ref	4.28
Anxiety disorder (before deployment)	898	21,842	3.95	2.35	855	6,339	11.88	1.65	3.01
Anxiety disorder (after deployment)	6,105	80,547	7.05	4.18	2,320	11,337	16.99	2.36	2.41
No depression	17,691	970,116	1.79	ref	7,261	97,775	6.91	ref	3.86
Depression (before deployment)	1,241	32,746	3.65	2.04	1,335	10,112	11.66	1.69	3.19
Depression (after deployment)	4,747	69,677	6.38	3.56	3,027	15,773	16.10	2.33	2.52
Migraine before OEF/OIF deployment									
No concussion	3,651	14,125	20.54	ref	4,049	6,715	37.62	ref	1.83
Concussion (before deployment)	118	424	21.77	1.06	85	131	39.35	1.05	1.81
Concussion (after deployment)	205	340	37.61	1.83	100	74	57.47	1.53	1.53
No anxiety disorder	2,981	12,293	19.52	ref	2,876	5,331	35.04	ref	1.80
Anxiety disorder (before deployment)	325	1,139	22.20	1.14	632	936	40.31	1.15	1.82
Anxiety disorder (after deployment)	795	1,740	31.36	1.61	948	888	51.63	1.47	1.65
No depression	2,925	12,104	19.46	ref	2,445	4,742	34.02	ref	1.75
Depression (before deployment)	495	1,586	23.79	1.22	1,043	1,517	40.74	1.20	1.71
Depression (after deployment)	732	1,574	31.74	1.63	1,234	1,166	51.42	1.51	1.62

All data used for analyses were derived from records maintained in the Defense Medical Surveillance System.

Results:

During the surveillance period, 1,249,624 active component members completed at least one assignment to OEF/OIF; 2.4% of all OEF/OIF deployers had at least one medical encounter for migraine before deployment **(Table 1).**

Prior to OEF/OIF deployment, females were 4.6-times more likely than their male counterparts to have had a medical encounter for migraine (% with migraine prior to deployment: females: 7.8%, males: 1.7%) **(Table 1).** Before OEF/OIF deployment, service members with concussion, anxiety disorder, or depression ("comorbid conditions") were 2.5- to 3.8-times more likely than their respective counterparts to have a medical encounter for migraine; the relative increases in migraine among those with comorbid conditions were larger among males than females (range, relative increases in % with migraine, by comorbid condition: males: 3.2-3.8; females: 2.5-2.7). Before deployment, among males, the highest cumulative incidence (6.1%) of and the largest relative increase (3.8) in migraine affected those with anxiety disorders; in contrast, among females, the highest cumulative incidence of migraine affected those with concussion (19.2%), while the largest relative increase in migraine was associated with depression (2.7) **(Table 1).**

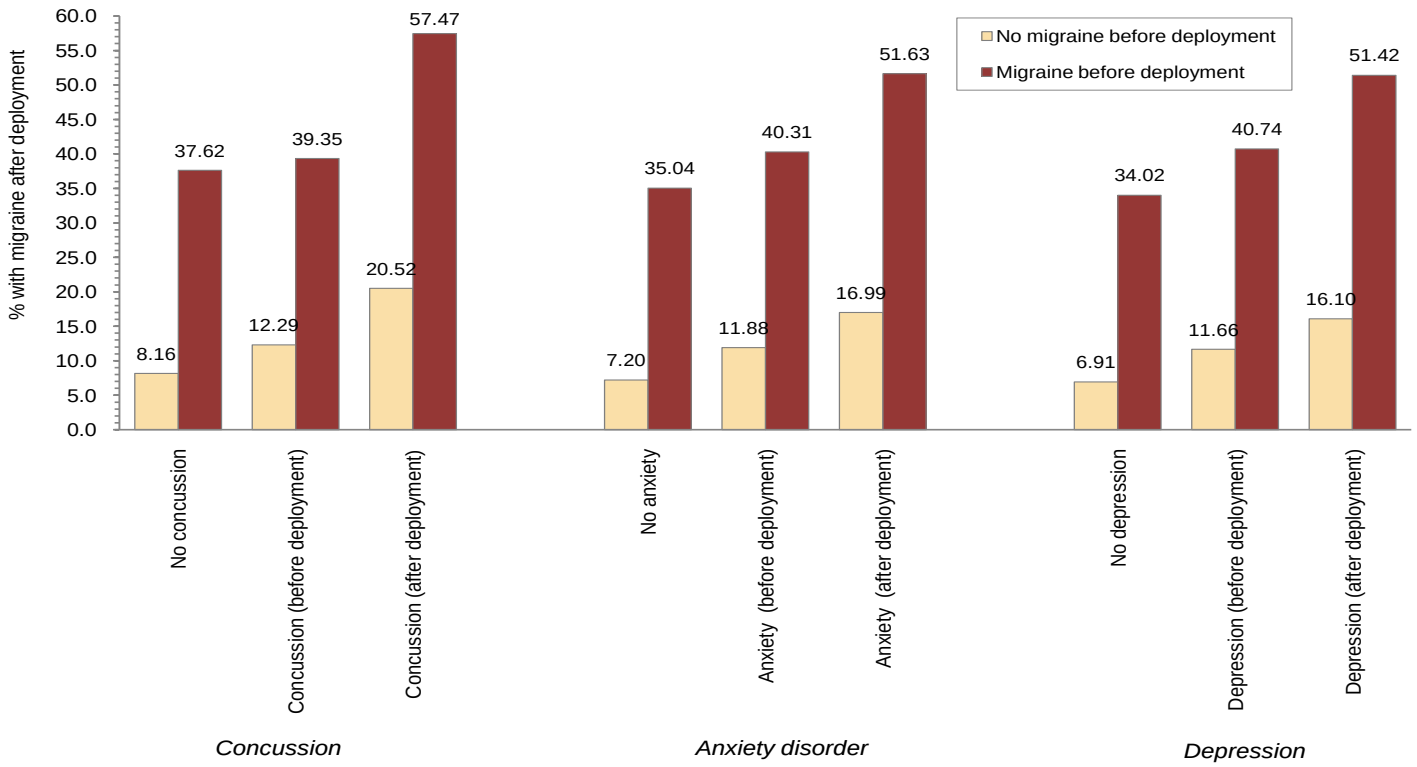
Among OEF/OIF deployers overall, the cumulative incidence of migraine was approximately 40% higher after (3.3%) than before (2.4%) deployment **(Tables 1,2).** After deployment (as before deployment), females were more than 4-times more likely than males to have a medical encounter for migraine (% with migraine after deployment: females: 10.6%, males: 2.5%). Notably, deployers with migraine before deployment were nearly 10-times more likely than others to have at least one migraine after deployment (% with migraine after deployment, by migraine history: predeployment migraine: 27.7%; no predeployment migraine: 2.8%) **(Table 2, Figures 1a,b).**

After deployment, service members with concussion, anxiety disorder, or depression were 1.1- to 5.4-times more likely than their respective counterparts to have migraine. In general, comorbid conditions had relatively larger effects on postdeployment migraine incidence among deployers with no predeployment migraine diagnoses. For example, among males with no migraines prior to deployment, migraines were 5.4-, 4.2-, and 3.6-times more common after deployment among those with concussion, anxiety disorders, and/or depression, respectively. In contrast, among males with migraines prior to deployment, migraines were 1.6 to 1.8-times more common after deployment among those with postdeployment comorbid conditions **(Table 2, Figures 1a,b).**

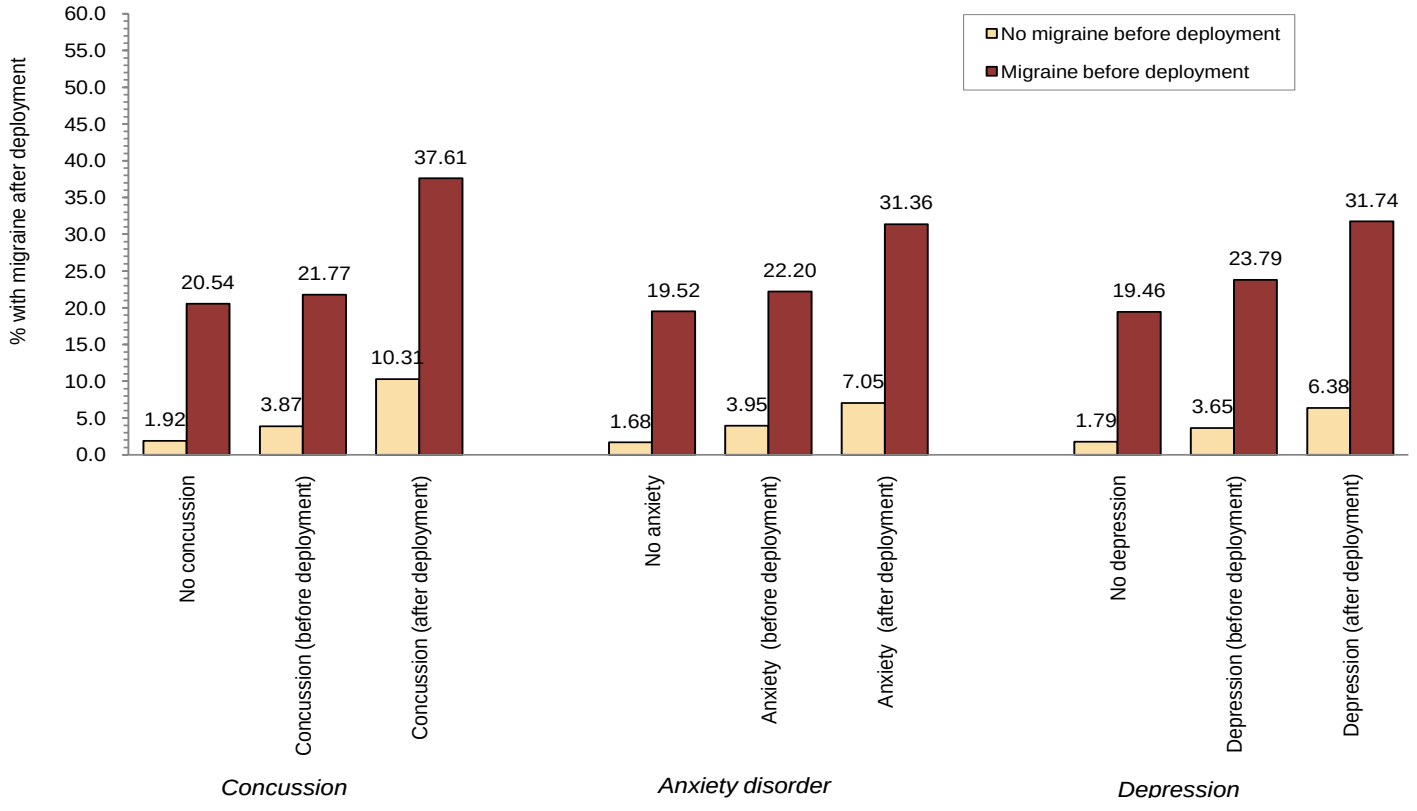
Finally, among both male and female deployers, the highest cumulative incidence rates of migraine after deployment were

Figure 1. Percent of OEF/OIF deployers with at least one diagnosis of migraine after deployment, by history of migraine before deployment and comorbidity status, active component, U.S. Armed Forces

a. Among female deployers



b. Among male deployers



among those with predeployment diagnoses of migraine and post-deployment diagnoses of concussion (males: 37.6%; females: 57.5%) **(Table 2, Figures 1a,b).**

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

Editorial Comment:

After deployment to OEF/OIF, migraines are much more common among females, those treated for migraine before deployment, and those diagnosed with concussion, anxiety disorder (including PTSD), and/or depression after deployment. There is extreme variability in postdeployment migraine incidence in relation to these factors. For example, among U.S. deployers to OEF/OIF, migraine has affected fewer than 2% of all males with no predeployment migraine and no postdeployment concussion, anxiety disorder, or depression; however, migraine has affected nearly 60% of all females with predeployment migraine and postdeployment concussion diagnoses.

There are limitations to this analysis that should be considered when interpreting the results. For example, the surveillance population included only active component members. As such, the results may not be generalizable to Reserve component deployers to OEF/OIF. In addition, followup after OEF/OIF deployment was limited to time in active military service. As such, some occurrences of migraine and comorbid conditions after deployment were not accounted for in the results; in turn, the cumulative incidence percentages of migraine and comorbid conditions after deployment are underestimated. Also, the summary measure of migraine incidence used in the report was cumulative incidence; the denominator for calculation of cumulative incidence was individuals, not person-years. As a result, all individuals were considered at similar risk regardless of the extents of their active military service (i.e., follow-up times) during pre- and postdeployment-related periods. If total time at risk of migraine significantly varied between the predeployment and postdeployment periods, comparisons of cumulative incidence rates of migraine between the periods would be biased. Also, for this analysis, OEF/OIF deployers were considered "postdeployment" from the first day of their first OEF/OIF assignments. If, for example, migraine risk varies in relation to the numbers or durations of OEF/OIF deployments, the effects would not be detectable through the analyses conducted for this report.

Finally, temporal relationships between incident diagnoses of migraine and concussion, anxiety disorders, and depression were not assessed. For example, associations between migraine and comorbid conditions did not consider the sequencing or timing of incident diagnoses of the respective conditions. In a separate analysis (results not shown), fewer than 3% of incident diagnoses of migraine before deployment occurred within 30 days of an incident diagnosis of a comorbid condition; among deployers with migraine before deployment, fewer than 6% of incident migraine diagnoses after deployment occurred within 30 days of an incident diagnosis of a comorbid condition; and among deployers with no migraine before deployment, from 0.5% (females with concussion) to 9.4% (males with anxiety disorder) of incident migraine diagnoses after deployment occurred within 30 days of an incident diagnosis of a comorbid condition. These results suggest that most incident episodes of migraine, both before and after deployment, were not closely temporally related to incident diagnoses of a comorbid condition. However, because these results are based on times of incident diagnoses, not actual clinical courses, of conditions of interest, they are not particularly informative regarding possible pathophysiologic relationships between migraine and concussion, anxiety disorders (including PTSD), depression, and traumatic brain injury. Much more detailed analyses than are possible using routinely collected surveillance data are necessary to discern the natures and strengths of such relationships.

Of the factors examined in this report, by far the strongest predictor of migraine after deployment was history of migraine before deployment. The finding suggests that, prior to OEF/OIF deployment, those with histories of migraine should be assessed regarding their current clinical states, treatment regimens, military operational limitations, and migraine management plans while deployed. All OEF/OIF deployers should have updated prescriptions and sufficient medication to expeditiously treat migraine episodes that may occur during deployment. Finally, more detailed clinical and epidemiologic research are indicated to define and characterize the natures and strengths of relationships between migraine, war-related comorbid conditions (e.g., PTSD, TBI), and other potentially modifiable risk factors for migraine.

References:

1. Armed Forces Health Surveillance Center. Migraine and other headaches, active components, U.S. Armed Forces, 2001-2007. *Medical Surveillance Monthly Report (MSMR).* 2008 May;15(4):6-10.
2. Armed Forces Health Surveillance Center. Health of women after deployment in support of Operation Enduring Freedom/Operation Iraqi Freedom, active component, U.S. Armed Forces. *Medical Surveillance Monthly Report (MSMR).* 2009 Oct;16(10):2-9.
3. Bigal ME, Lipton RB. The epidemiology, burden, and comorbidities of migraine. *Neurol Clin*. 2009 May;27(2):321-34.
4. Peterlin BL, Tietjen GE, Brandes JL, et al. Posttraumatic stress disorder in migraine. *Headache*. 2009 Apr;49(4):541-51.
5. Peterlin BL, Ward TN. Neuropsychiatric aspects of migraine. *Curr Psychiatry Rep*. 2005 Oct;7(5):371-5.
6. Victor TW, Hu X, Campbell J, et al. Association between migraine, anxiety and depression. *Cephalalgia*. 2009 Jul 9. [Published online ahead of print] doi:10.1111/j.1468-2982.2009.01944.x

Update: Deployment Health Assessments, U.S. Armed Forces, November 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 43,000 **(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 10-14% 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, December 2008-November 2009

	Pre-deployment assessment DD2795		Post-deployment assessment DD2796		Post-deployment reassessment DD2900	
	No.	%	No.	%	No.	%
Total	**455,810**	**100**	**366,108**	**100**	**303,768**	**100**
2008						
December	37,358	8.2	40,415	11.0	21,686	7.1
2009						
January	43,206	9.5	31,793	8.7	26,076	8.6
February	36,891	8.1	28,375	7.8	28,474	9.4
March	40,578	8.9	23,850	6.5	32,100	10.6
April	43,422	9.5	18,825	5.1	31,290	10.3
May	36,215	7.9	28,133	7.7	24,958	8.2
June	44,370	9.7	28,323	7.7	26,858	8.8
July	39,804	8.7	25,828	7.1	22,570	7.4
August	38,929	8.5	43,727	11.9	21,561	7.1
September	30,310	6.6	37,530	10.3	25,980	8.6
October	35,761	7.8	30,794	8.4	23,596	7.8
November	28,966	6.4	28,515	7.8	18,619	6.1

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

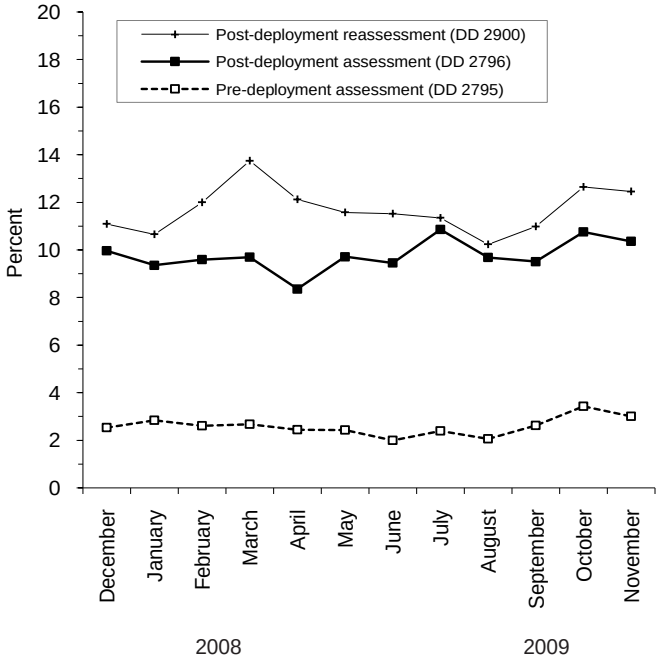


Figure 1. Total deployment health assessment and reassessment forms, by month, U.S. Armed Forces, January 2003-November 2009

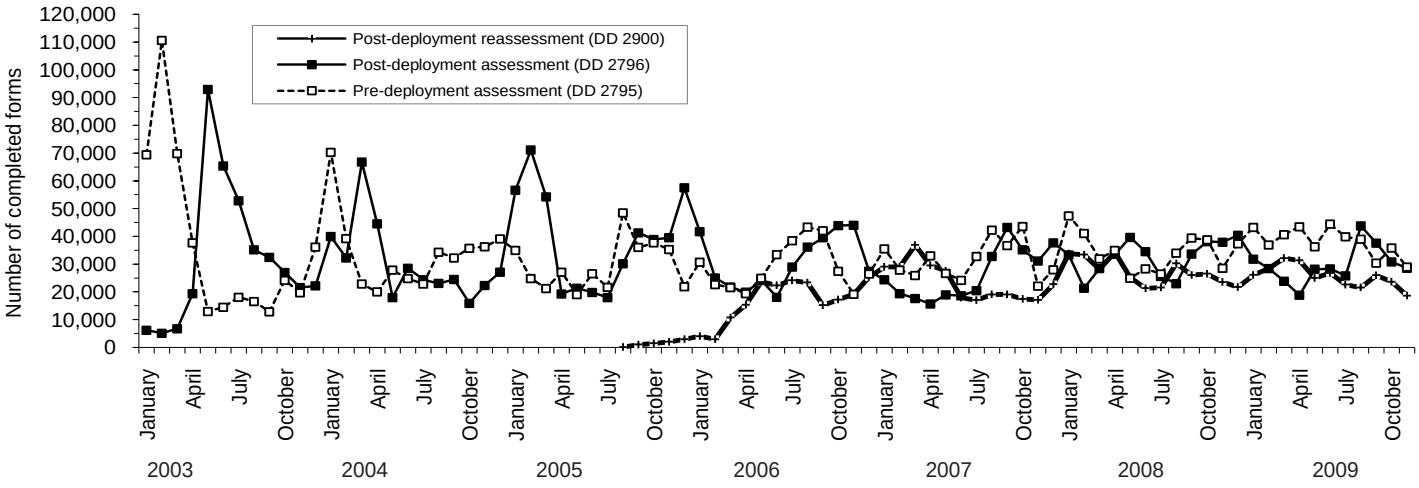


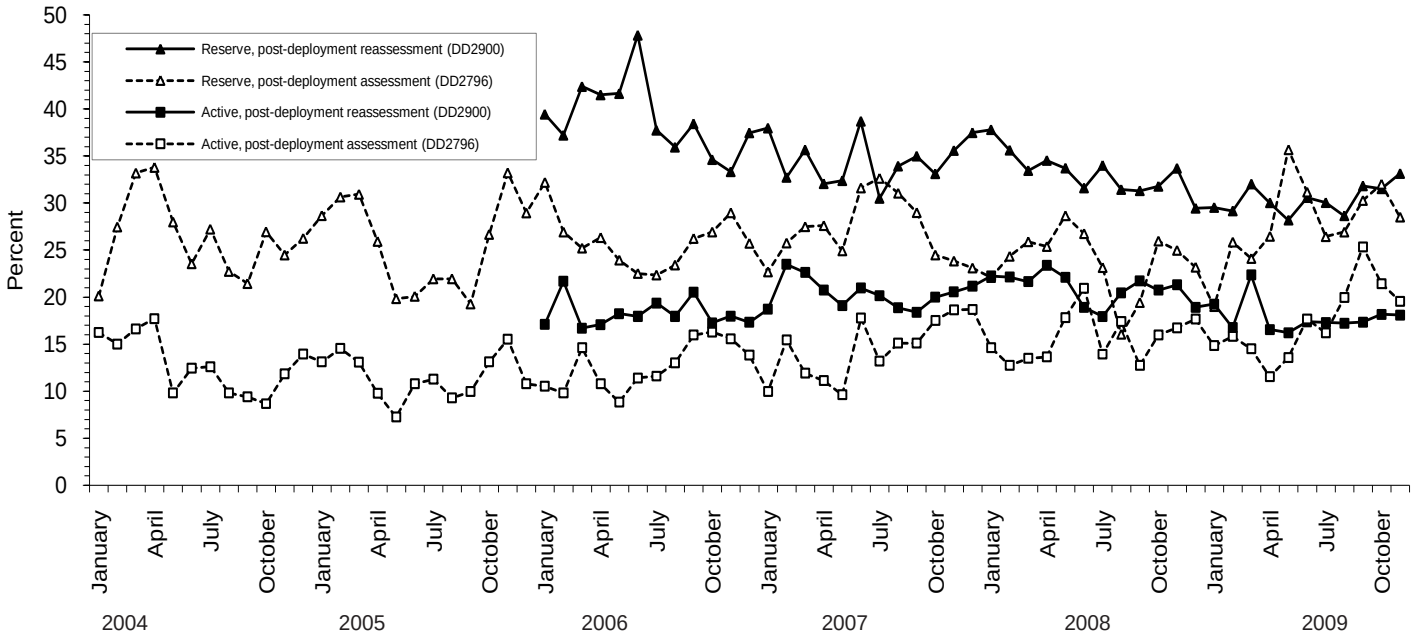
Table 2. Percentage of service members who endorsed selected questions/received referrals on health assessment forms, U.S. Armed Forces, December 2008-November 2009

	Army			Navy			Air Force			Marine Corps			All service members		
Active component	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
	n= 155,714	n= 139,419	n= 116,057	n= 18,395	n= 9,026	n= 15,966	n= 59,562	n= 52,787	n= 52,811	n= 33,353	n= 15,279	n= 35,613	n= 267,024	n= 216,511	n= 220,447
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
General health "fair" or "poor"	4.1	10.8	14.7	1.3	4.3	6.1	0.5	3.8	4.1	1.8	6.8	9.3	2.8	8.5	10.7
Health concerns, not wound or injury	20.7	25.8	24.0	3.7	12.5	13.4	1.4	5.7	10.6	3.3	12.5	17.5	13.1	19.4	19.0
Health worse now than before deployed	na	23.6	26.2	na	11.9	13.3	na	8.8	8.7	na	15.2	18.3	na	18.9	19.8
Exposure concerns	na	18.4	18.8	na	17.5	17.6	na	11.5	14.8	na	18.1	20.5	na	16.7	18.0
PTSD symptoms (2 or more)	na	9.5	12.6	na	3.9	6.4	na	2.1	2.4	na	4.5	8.4	na	7.1	9.0
Depression symptoms (any)	na	32.2	32.8	na	19.5	23.0	na	13.2	13.8	na	26.6	29.7	na	26.7	27.0
Referral indicated by provider (any)	5.0	33.9	20.1	5.3	21.6	15.3	1.7	10.3	6.7	3.6	21.2	24.2	4.1	26.7	17.2
Mental health referral indicated*	1.0	7.3	6.1	0.7	3.3	5.7	0.5	1.2	1.8	0.3	2.2	4.8	0.8	5.3	4.8
Medical visit following referral†	97.9	99.5	97.4	91.4	86.0	92.0	80.7	96.6	98.6	62.3	74.5	87.9	91.7	96.5	95.3

	Army			Navy			Air Force			Marine Corps			All service members		
Reserve component	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
	n= 80,347	n= 64,471	n= 49,677	n= 5,468	n= 2,058	n= 6,520	n= 15,867	n= 14,922	n= 17,531	n= 4,428	n= 1,054	n= 6,172	n= 106,110	n= 82,505	n= 79,900
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
General health "fair" or "poor"	1.6	11.8	18.0	0.5	9.4	7.9	0.3	5.5	4.8	1.2	10.0	9.9	1.3	10.6	13.6
Health concerns, not wound or injury	16.4	34.4	44.9	1.8	36.0	29.2	0.6	9.0	15.1	3.6	21.6	34.8	12.7	29.7	36.3
Health worse now than before deployed	na	26.2	34.0	na	22.4	20.8	na	13.7	11.2	na	22.0	26.2	na	23.8	27.3
Exposure concerns	na	27.8	33.2	na	34.6	29.8	na	22.2	22.7	na	21.0	29.6	na	26.9	30.3
PTSD symptoms (2 or more)	na	8.8	20.9	na	5.9	10.1	na	2.2	3.0	na	5.0	13.4	na	7.5	15.5
Depression symptoms (any)	na	31.0	36.4	na	25.2	24.0	na	14.2	13.9	na	31.1	28.0	na	27.8	29.8
Referral indicated by provider (any)	3.7	37.8	33.4	3.4	30.7	17.2	0.4	13.3	5.6	3.8	31.9	27.0	3.2	33.1	25.5
Mental health referral indicated*	0.4	4.8	12.5	0.3	3.3	4.5	0.0	0.8	0.8	0.3	2.9	8.3	0.3	4.0	8.9
Medical visit following referral†	95.9	98.3	35.4	90.6	96.6	40.8	54.5	63.3	43.3	34.1	69.0	29.2	93.5	94.6	35.5

[a]Includes behavioral health, combat stress and substance abuse referrals.
[b]Record of inpatient or outpatient visit within 6 months after referral.

Figure 3. Proportion of service members who endorsed exposure concerns on post-deployment health assessments, U.S. Armed Forces, January 2004-November2009



Sentinel reportable events among service members and beneficiaries at U.S. Army medical facilities, cumulative numbers[a] for calendar years through 30 November 2008 and 30 November 2009

Army

Reporting locations	Number of reports all events[b]		Food-borne						Vaccine preventable					
			Campylo-bacter		Salmonella		Shigella		Hepatitis A		Hepatitis B		Varicella[c]	
	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
NORTHERN														
Aberdeen Proving Ground, MD	27	45	.	.	.	.	.	.	.	1	.	.	.	.
Fort Belvoir, VA	207	247	8	9	14	4	4	.	.	.	.	.	.	.
Fort Bragg, NC	1,345	1,589	.	6	19	20	2	.	.	.	.	3	.	.
Fort Dix, NJ	0	0	.	.	.	.	.	.	.	.	.	.	.	.
Fort Drum, NY	213	54	.	.	.	.	.	.	.	.	.	.	.	.
Fort Eustis, VA	242	240	1	.	2	3	.	.	.	.	.	.	1	.
Fort George G Meade, MD	64	38	.	1	.	1	1	.	.	.	.	.	.	.
Fort Knox, TN	260	207	2	.	1	.	.	.	.	.	.	.	.	.
Fort Lee, VA	292	549	.	.	.	.	.	.	.	.	4	.	2	.
Fort Monmouth, NJ	24	48	.	.	.	.	.	.	.	.	.	4	1	.
Walter Reed AMC, DC	195	162	2	1	1	.	1	.	1	.	3	1	5	1
West Point Military Reservation, NY	63	108	.	1	.	.	.	.	.	.	1	1	.	.
SOUTHERN														
Fort Benning, GA	299	408	2	1	5	.	1	1	.	1	.	.	.	.
Fort Campbell, KY	185	372	1	.	.	.	2	.	.	.	.	.	.	1
Fort Gordon, GA	610	645	1	3	14	18	19	3	.	.	1	4	2	1
Fort Hood, TX	1,974	1,896	6	8	37	21	6	17	.	.	.	3	2	.
Fort Jackson, SC	368	582	.	.	.	.	.	.	.	.	1	2	.	.
Fort Polk, LA	164	589	1	.	1	2	1	3	.	.	.	.	1	.
Fort Rucker, AL	79	79	2	8	4	5	.	.	.	.	1	1	.	.
Fort Sam Houston, TX	502	559	.	1	13	7	12	2	.	.	.	1	.	1
Fort Sill, OK	114	621	.	.	3	.	.	4	.	.	1	.	.	.
Fort Stewart, GA	841	1,103	6	.	25	34	3	15	1	.	8	1	.	.
WESTERN														
Fort Bliss, TX	497	262	.	.	14	1	1	1	.	1	.	5	.	.
Fort Carson, CO	632	686	4	5	3	3	.	.	1	1	1	.	.	.
Fort Huachuca, AZ	101	78	.	1	2	.	2	.	.	.	1	.	.	.
Fort Leavenworth, KS	49	61	.	.	.	1	.	.	.	.	.	.	.	.
Fort Leonard Wood, MO	237	344	2	2	1	.	1	.	2	1	1	.	1	1
Fort Lewis, WA	1,079	1,012	11	6	4	8	3	1	.	.	.	.	.	.
Fort Riley, KS	411	359	3	1	3	3	.	.	.	.	2	.	.	.
Fort Wainwright, AK	278	197	5	.	2	.	.	.	2	.	.	.	.	.
NTC and Fort Irwin, CA	69	125	.	.	2	1	1	1	.	.	.	.	.	.
PACIFIC														
Hawaii	740	772	35	33	16	16	3	5	1	.	5	3	.	.
Japan	29	3	1	.	.	.	.	.	.	.	.	.	.	.
Korea	429	529	.	.	1	.	.	.	.	.	.	.	1	.
EUROPEAN														
Heidelberg	245	184	9	13	9	6	1	.	.	1	2	.	1	.
Landstuhl	347	826	1	4	6	3	4	2	.	1	.	1	1	1
Bavaria	393	419	.	6	9	8	.	.	1	.	1	.	.	.
OTHER LOCATIONS														
OTHER	0	0	.	.	.	.	.	.	.	.	.	.	.	.
Total	**13,604**	**15,998**	**103**	**110**	**211**	**165**	**68**	**55**	**9**	**7**	**33**	**30**	**18**	**6**

[a]Events reported by Jan 5, 2009 and 2010
[b]Sixty-seven medical events/conditions specified by Tri-Service Reportable Events Guidelines and Case Definitions, June 2009.
[c]Service member cases only.
Note: Completeness and timeliness of reporting vary by facility.

Sentinel reportable events among service members and beneficiaries at U.S. Army medical facilities, cumulative numbers[a] for calendar years through 30 November 2008 and 30 November 2009

Army

Reporting location	Arthropod-borne				Sexually transmitted						Environmental				Travel associated			
	Lyme disease		Malaria		Chlamydia		Gonorrhea		Syphilis		Cold[c]		Heat[c]		Q Fever		Tuberculosis	
	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
NORTHERN																		
Aberdeen Proving Ground, MD	3	.	.	.	20	37	4	5	.	2	.	.	.	.	.	.	.	.
Fort Belvoir, VA	.	.	.	.	166	216	13	18	2	.	.	.	.	.	.	.	.	.
Fort Bragg, NC	1	.	10	.	976	1,217	197	237	1	4	.	1	137	101	.	.	2	.
Fort Dix, NJ	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Fort Drum, NY	4	.	.	.	190	51	19	3	.	.	.	.	.	.	.	.	.	.
Fort Eustis, VA	.	.	.	.	200	204	33	33	4	.	.	.	1	.	.	.	.	.
Fort George G Meade, MD	1	1	.	.	57	35	5	.	.	.	.	.	.	.	.	.	.	.
Fort Knox, TN	2	1	.	2	205	181	44	23	3	.	.	.	2	.	1	.	.	.
Fort Lee, VA	2	1	1	.	210	496	67	50	1	2	.	.	5	.	.	.	.	.
Fort Monmouth, NJ	.	16	.	.	6	25	3	2	.	1	.	.	14	.	.	.	.	.
Walter Reed AMC, DC	17	10	1	.	129	120	22	17	9	11	.	.	.	.	3	.	1	1
West Point Military Reservation, NY	33	33	.	.	27	69	2	4	.	.	.	.	.	.	.	.	.	.
SOUTHERN																		
Fort Benning, GA	.	.	.	6	202	289	69	68	1	2	.	.	19	39	.	.	.	1
Fort Campbell, KY	1	5	.	1	162	254	14	64	1	1	.	.	4	46	.	.	.	.
Fort Gordon, GA	.	.	.	.	472	521	99	87	.	.	.	.	1	8	.	.	1	.
Fort Hood, TX	1	.	1	.	1,565	1,476	354	340	1	11	.	.	.	19	1	.	.	1
Fort Jackson, SC	.	.	.	.	307	321	40	50	1	2	.	.	19	207	.	.	.	.
Fort Polk, LA	.	.	.	.	108	384	31	63	2	1	.	.	19	136	.	.	.	.
Fort Rucker, AL	2	.	.	.	55	61	10	4	2	.	.	.	2	.	.	.	1	.
Fort Sam Houston, TX	.	.	2	.	368	434	83	84	19	11	1	.	4	17	.	.	.	1
Fort Sill, OK	.	.	.	.	83	551	18	44	.	1	.	.	9	21	.	.	.	.
Fort Stewart, GA	2	.	3	1	645	828	115	128	4	7	.	.	28	82	1	6	.	1
WESTERN																		
Fort Bliss, TX	.	.	.	.	395	215	79	33	7	5	.	.	.	.	.	.	1	1
Fort Carson, CO	.	.	.	2	565	612	57	63	.	.	.	.	.	.	1	.	.	.
Fort Huachuca, AZ	1	.	.	.	78	71	14	4	.	1	1	.	2	1	.	.	.	.
Fort Leavenworth, KS	1	4	.	.	44	50	4	3	.	2	.	.	.	1	.	.	.	.
Fort Leonard Wood, MO	.	.	.	.	191	299	25	31	1	.	3	1	7	8	.	.	2	1
Fort Lewis, WA	.	.	5	.	963	913	91	79	1	2	.	.	.	1	.	.	1	2
Fort Riley, KS	6	1	1	1	338	304	48	45	1	1	1	1	8	2	.	.	.	.
Fort Wainwright, AK	1	.	.	.	226	175	29	17	1	.	10	2	1	1	.	1	1	1
NTC and Fort Irwin, CA	.	.	.	.	46	110	9	6	.	2	.	.	11	5	.	.	.	.
PACIFIC																		
Hawaii	.	.	1	1	604	630	65	68	.	6	.	.	2	3	.	1	8	6
Japan	.	.	.	.	24	3	4	.	.	.	.	.	.	.	.	.	.	.
Korea	.	.	.	.	377	500	45	21	3	2	.	1	2	5	.	.	.	.
EUROPEAN																		
Heidelberg	17	11	.	.	169	134	36	18	1	.	.	.	.	.	.	.	.	1
Landstuhl	9	25	11	3	220	658	36	83	5	9	8	.	18	30	25	2	3	4
Bavaria	16	16	5	4	297	343	63	38	1	2	.	1	.	1	.	.	.	.
OTHER LOCATIONS																		
Other	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Total	**120**	**124**	**41**	**21**	**10,690**	**12,787**	**1,847**	**1,833**	**72**	**88**	**24**	**7**	**315**	**734**	**32**	**10**	**21**	**21**

Sentinel reportable events among service members and beneficiaries at U.S. Navy medical facilities, cumulative numbers[a] for calendar years through 30 November 2008 and 30 November 2009

Navy

Reporting locations	Number of reports all events[b]		Food-borne						Vaccine preventable					
			Campylo-bacter		Salmonella		Shigella		Hepatitis A		Hepatitis B		Varicella[c]	
	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
NATIONAL CAPITOL AREA														
NNMC Bethesda, MD	248	160	4	3	15	2	2	.	.	3	6	5	.	.
NHC Annapolis, MD	32	8	1	.	1	.	.	.	.	.	.	.	.	.
NHC Patuxent River, MD	41	28	.	.	.	.	.	.	.	.	.	.	.	.
NHC Quantico, VA	204	103	.	1	.	1	.	3	.	.	3	.	.	.
NAVY MEDICINE EAST														
NH Beaufort, SC	181	392	.	.	1	.	1	.	.	1	.	5	.	.
NH Camp Lejeune, NC	989	553	2	1	29	14	.	1	.	.	.	.	.	.
NH Charleston, SC	37	3	.	.	1	.	1	.	.	.	.	.	.	.
NH Cherry Point, NC	160	3	.	.	8	.	.	.	.	.	.	.	.	.
NH Corpus Christi, TX	17	3	.	.	.	.	2	.	1	.	.	.	.	.
NHC Great Lakes, IL	682	434	.	.	.	1	.	.	.	1	7	12	2	.
NH Guantanamo Bay, Cuba	9	0	.	.	.	.	.	.	.	.	.	.	.	.
NH Jacksonville, FL	541	244	.	.	86	17	7	1	.	.	5	.	2	.
NH Naples, Italy	62	1	2	.	.	.	.	.	2	.	2	.	.	.
NHC New England, RI	36	0	1	.	1	.	.	.	.	.	.	.	1	.
NH Pensacola, FL	362	229	2	1	12	8	3	2	.	.	.	.	.	.
NMC Portsmouth, VA	583	185	.	.	1	.	2	.	.	.	5	1	.	.
NH Rota, Spain	27	0	5	.	3	.	.	.	.	.	.	.	.	.
NH Sigonella, Italy	54	1	.	.	1	.	.	.	.	.	.	.	1	1
NAVY MEDICINE WEST														
NH Bremerton, WA	76	6	1	.	1	.	.	.	.	.	.	.	.	.
NH Camp Pendleton, CA	213	6	3	.	3	.	1	.	.	.	.	.	.	.
NH Guam-Agana, Guam	146	31	.	.	.	3	.	.	.	.	.	.	6	.
NHC Hawaii, HI	168	20	.	.	2	.	.	.	.	.	1	.	.	.
NH Lemoore, CA	62	48	.	.	.	.	.	.	.	.	.	.	.	.
NH Oak Harbor, WA	151	104	.	3	4	2	1	1	.	.	4	4	.	1
NH Okinawa, Japan	47	39	.	.	.	.	.	.	.	.	.	.	.	.
NMC San Diego, CA	1,280	808	1	8	6	12	2	1	1	.	57	61	2	1
NH Twentynine Palms, CA	10	1	.	.	.	.	.	.	.	.	.	.	.	.
NH Yokosuka, Japan	229	35	.	.	.	.	.	.	.	.	11	3	.	.
NAVAL SHIPS														
COMNAVAIRLANT/CINCLANTFLEET	62	22	.	.	.	.	.	.	.	.	.	.	.	.
COMNAVSURFPAC/CINCPACFLEET	130	75	.	.	4	.	.	.	.	.	.	.	.	.
OTHER LOCATIONS														
OTHER	3,607	3,363	16	17	31	23	7	5	.	1	18	12	8	2
Total	**10,446**	**6,905**	**38**	**34**	**210**	**83**	**29**	**14**	**4**	**6**	**119**	**103**	**22**	**5**

[a]Events reported by Jan 5, 2010
[b]Sixty-seven medical events/conditions specified by Tri-Service Reportable Events Guidelines and Case Definitions, June 2009.
[c]Service member cases only.
Note: Completeness and timeliness of reporting vary by facility.

Sentinel reportable events among service members and beneficiaries at U.S. Navy medical facilities, cumulative numbers[a] for calendar years through 30 November 2008 and 30 November 2009

Navy

Reporting location	Arthropod-borne				Sexually transmitted						Environmental				Travel associated			
	Lyme disease		Malaria		Chlamydia		Gonorrhea		Syphilis		Cold[c]		Heat[c]		Q Fever		Tuberculosis	
	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
NATIONAL CAPITOL AREA																		
NNMC Bethesda, MD	22	12	5	.	175	125	14	9	3	1	.	.	.	.	.	.	2	.
NHC Annapolis, MD	6	.	.	.	21	7	1	.	1	1	.	.	1	.	.	.	.	.
NHC Patuxent River, MD	6	6	.	.	33	18	2	3	.	1	.	.	.	.	.	.	.	.
NHC Quantico, VA	4	1	2	.	132	77	19	10	.	.	.	.	44	10	.	.	.	.
NAVY MEDICINE EAST																		
NH Beaufort, SC	1	.	.	.	68	367	5	18	2	1	.	.	103	.	.	.	.	.
NH Camp Lejeune, NC	3	4	.	2	673	380	147	85	2	.	.	1	131	62	2	2	.	1
NH Charleston, SC	1	.	.	.	28	2	3	1	2	.	.	.	1	.	.	.	.	.
NH Cherry Point, NC	1	.	.	.	126	3	22	.	.	.	.	.	3	.	.	.	.	.
NH Corpus Christi, TX	1	.	.	.	6	3	7	.	.	.	.	.	.	.	.	.	.	.
NHC Great Lakes, IL	.	1	.	.	626	386	44	29	3	.	.	.	.	3	.	.	.	1
NH Guantanamo Bay, Cuba	.	.	.	.	8	.	1	.	.	.	.	.	.	.	.	.	.	.
NH Jacksonville, FL	.	1	.	1	396	204	39	20	6	.	.	.	.	.	.	.	.	.
NH Naples, Italy	.	.	.	.	52	1	4	.	.	.	.	.	.	.	.	.	.	.
NHC New England, RI	7	.	.	.	23	.	3	.	.	.	.	.	.	.	.	.	.	.
NH Pensacola, FL	3	.	.	.	259	176	31	24	9	1	.	.	42	14	.	2	1	1
NMC Portsmouth, VA	2	.	1	4	467	142	100	32	4	4	.	.	.	.	1	.	.	2
NH Rota, Spain	.	.	.	.	18	.	1	.	.	.	.	.	.	.	.	.	.	.
NH Sigonella, Italy	.	.	1	.	41	.	5	.	1	.	.	.	4	.	.	.	.	.
NAVY MEDICINE WEST																		
NH Bremerton, WA	.	.	1	.	69	6	4	.	.	.	.	.	.	.	.	.	.	.
NH Camp Pendleton, CA	.	.	2	.	177	6	24	.	1	.	.	.	.	.	1	.	1	.
NH Guam-Agana, Guam	.	.	6	.	106	24	28	3	.	.	.	.	.	.	.	.	.	1
NHC Hawaii, HI	.	.	.	.	156	19	8	1	1	.	.	.	.	.	.	.	.	.
NH Lemoore, CA	4	1	.	.	57	42	1	5	.	.	.	.	.	.	.	.	.	.
NH Oak Harbor, WA	.	1	.	.	130	90	9	2	3	.	.	.	.	.	.	.	.	.
NH Okinawa, Japan	.	.	1	.	33	39	8	.	.	.	.	.	5	.	.	.	.	.
NMC San Diego, CA	11	3	2	3	1,066	587	109	87	15	18	.	.	5	21	2	2	1	4
NH Twentynine Palms, CA	.	.	.	.	7	.	.	.	.	1	.	.	3	.	.	.	.	.
NH Yokosuka, Japan	.	1	.	.	188	31	27	.	1	.	.	.	.	.	.	.	2	.
NAVAL SHIPS																		
COMNAVAIRLANT/CINCLANTFLEET	.	.	.	1	51	21	10	.	1	.	.	.	.	.	.	.	.	.
COMNAVSURFPAC/CINCPACFLEET	.	.	.	.	100	64	26	10	.	1	.	.	.	.	.	.	.	.
OTHER LOCATIONS																		
Other	81	28	6	8	2,946	2,742	335	345	21	11	.	9	136	155	1	.	1	5
Total	**153**	**59**	**27**	**19**	**8,238**	**5,562**	**1,037**	**684**	**76**	**40**	**0**	**10**	**478**	**265**	**7**	**6**	**8**	**15**

Sentinel reportable events among service members and beneficiaries at U.S. Air Force medical facilities, cumulative numbers[a] for calendar years through 30 November 2008 and 30 November 2009

Air Force

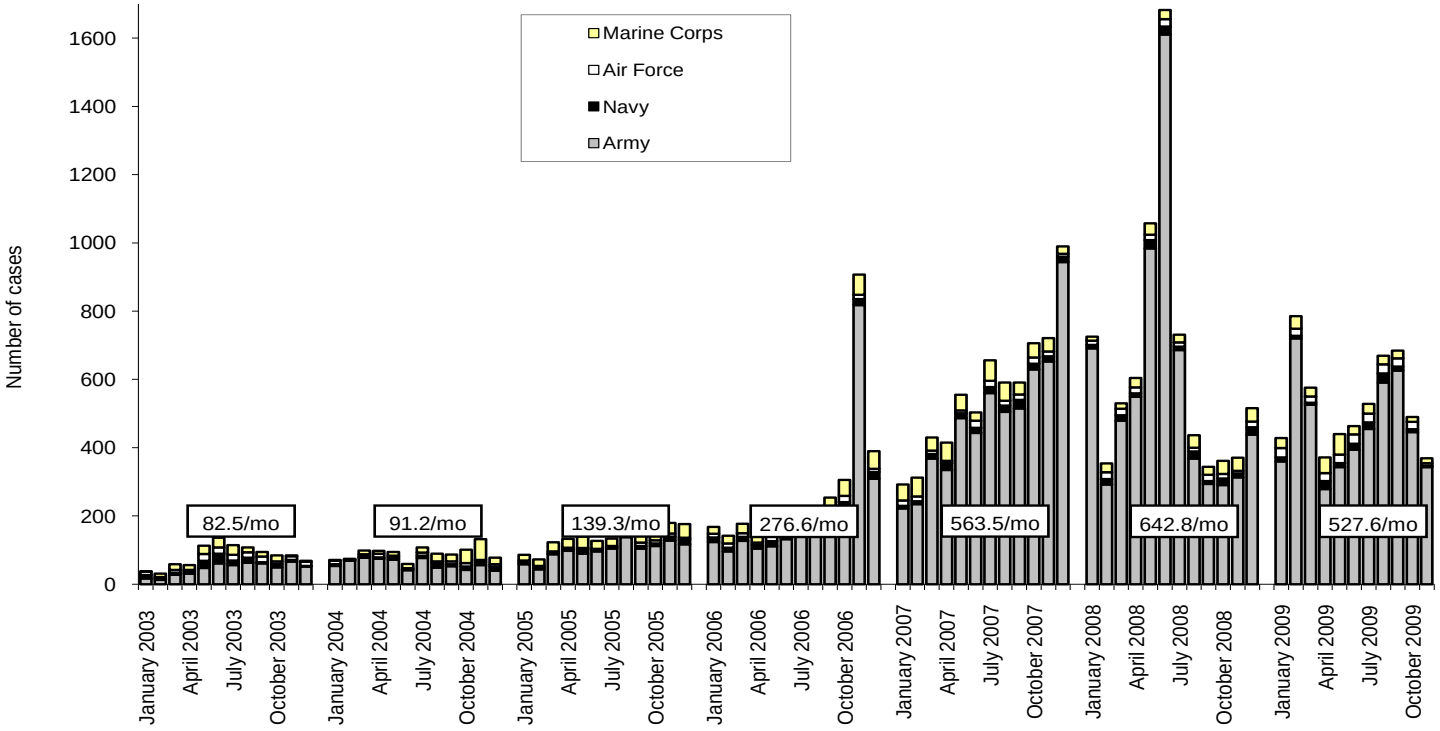
Reporting locations	Number of reports all events[b]		Food-borne						Vaccine preventable					
			Campylo-bacter		Salmonella		Shigella		Hepatitis A		Hepatitis B		Varicella[c]	
	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
Air Combat Cmd	1,392	1,311	5	5	23	16	5	2	6	2	33	4	2	2
Air Education & Training Cmd	795	1,451	2	5	16	22	7	7	3	3	4	12	.	.
Air Force Dist. of Washington	193	165	.	.	2	1	.	.	1	.	3	3	.	.
Air Force Materiel Cmd	569	527	4	2	7	15	10	.	2	1	1	7	.	.
Air Force Special Ops Cmd	186	168	.	1	4	12	.	.	.	.	3	.	.	.
Air Force Space Cmd	264	322	1	2	6	8	1	.	.	1	3	2	.	.
Air Mobility Cmd	758	699	1	4	13	9	2	5	.	1	9	5	1	1
Pacific Air Forces	654	504	9	3	7	6	.	.	3	.	10	5	.	2
U.S. Air Forces in Europe	506	543	2	4	10	6	.	.	.	.	4	4	3	1
U.S. Air Force Academy	48	65	1	1	.	3	.	.	.	.	.	.	.	.
Other	582	83	4	1	16	4	7	.	1	.	2	.	.	.
Total	**5,947**	**5,838**	**29**	**28**	**104**	**102**	**32**	**14**	**16**	**8**	**72**	**42**	**6**	**6**

[a]Events reported by Jan 5, 2010
[b]Sixty-seven medical events/conditions specified by Tri-Service Reportable Events Guidelines and Case Definitions, June 2009.
[c]Service member cases only.
Note: Completeness and timeliness of reporting vary by facility.

Reporting location	Arthropod-borne				Sexually transmitted						Environmental				Travel associated			
	Lyme disease		Malaria		Chlamydia		Gonorrhea		Syphilis		Cold[c]		Heat[c]		Q Fever		Tuberculosis	
	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
Air Combat Cmd	4	11	1	.	1,198	1,154	107	98	3	6	4	5	1	5	.	.	.	1
Air Education & Training Cmd	5	7	.	4	687	1,244	60	132	6	7	1	.	4	8	.	.	.	.
Air Force Dist. of Washington	3	5	.	.	160	146	23	10	1	.	.	.	.	.	.	.	.	.
Air Force Materiel Cmd	12	9	1	.	467	451	60	40	3	2	.	.	.	.	1	.	1	.
Air Force Special Ops Cmd	.	1	1	.	166	142	11	10	.	1	.	1	.	.	1	.	.	.
Air Force Space Cmd	1	.	.	.	236	292	15	14	.	1	.	.	1	1	.	.	.	1
Air Mobility Cmd	19	18	1	1	631	596	65	49	3	1	6	6	5	1	1	1	1	1
Pacific Air Forces	.	1	.	1	589	423	32	44	1	4	2	9	.	6	.	.	1	.
U.S. Air Forces in Europe	21	19	3	2	427	461	35	41	1	2	.	1	.	.	.	.	.	2
U.S. Air Force Academy	1	1	.	1	44	56	1	3	.	.	1	.	.	.	.	.	.	.
Other	6	.	2	5	505	40	29	7	2	.	.	1	5	23	3	1	.	1
Total	**72**	**72**	**9**	**14**	**5,110**	**5,005**	**438**	**448**	**20**	**24**	**14**	**23**	**16**	**44**	**6**	**2**	**3**	**6**

Deployment-related conditions of special surveillance interest, U.S. Armed Forces, by month and service, January 2003 - November 2009 (data as of 8 January 2010)

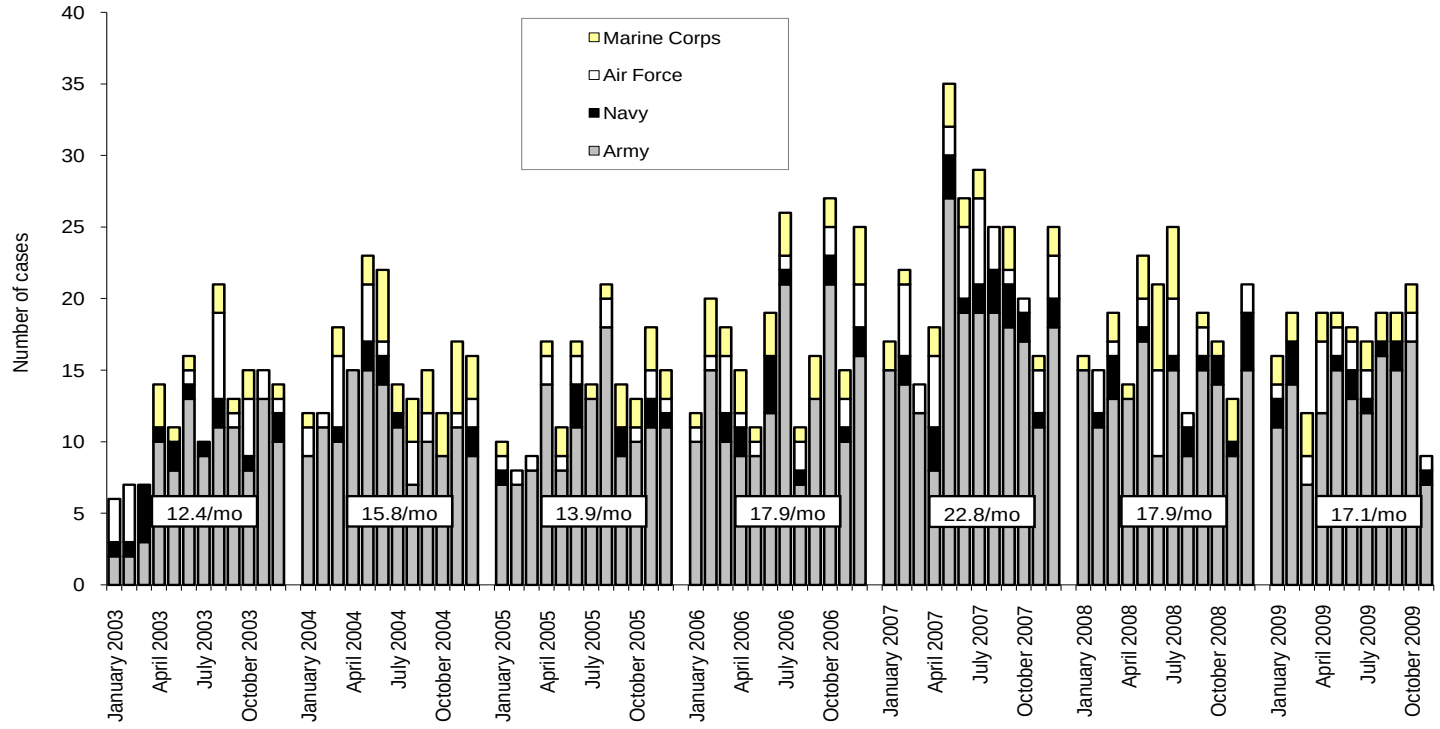
Traumatic brain injury, incident diagnoses (ICD-9: 310.2, 800-801, 803-804, 850-854, 907.0, 950.1-950.3, 959.01, V15.5_1-9, V15.5_A-F)[a]



Reference: Armed Forces Health Surveillance Center. Deriving case counts from medical encounter data: considerations when interpreting health surveillance reports. *MSMR*. Dec 2009; 16(12):2-8.

[a]Indicator diagnosis (one per individual) during a hospitalization or ambulatory visit while deployed to/within 30 days of returning from OEF/OIF. Includes in-theater medical encounters from the Theater Medical Data Store (TMDS).

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)[b]

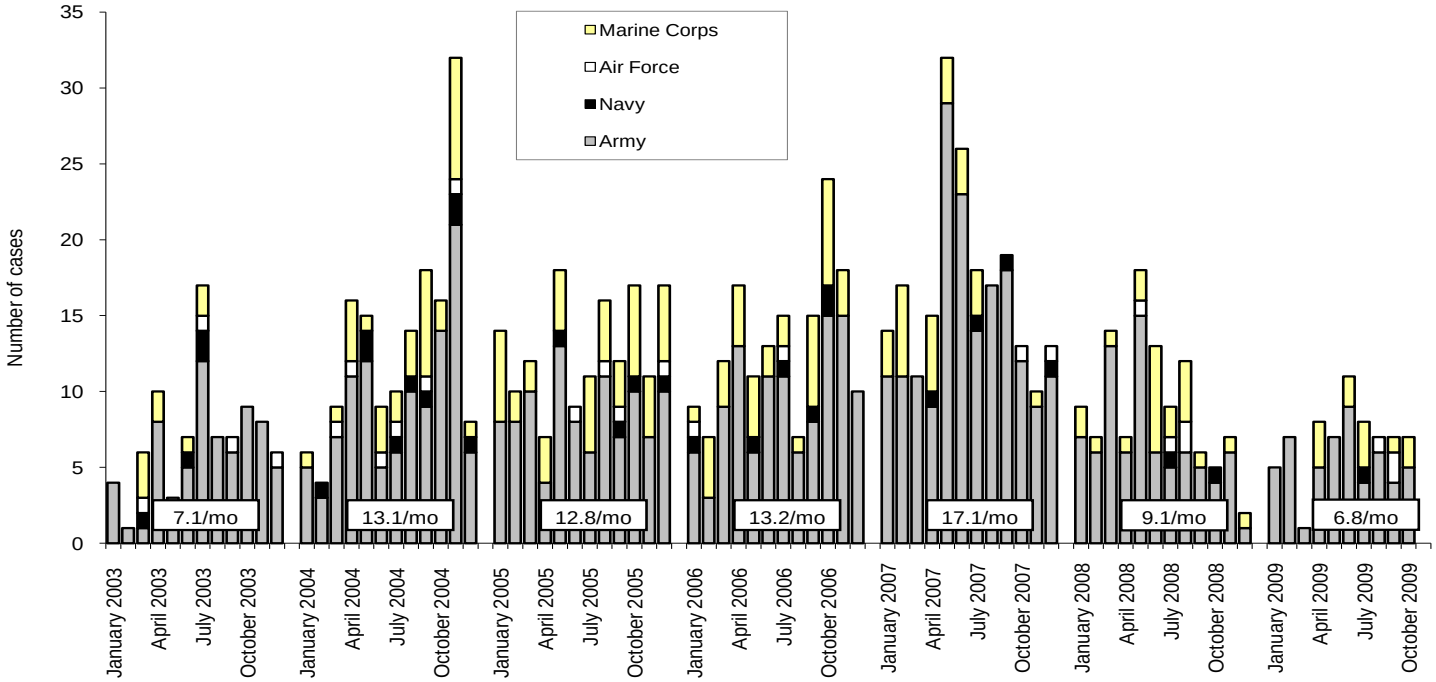


Reference: Isenbarger DW, Atwood JE, Scott PT, et al. Venous thromboembolism among United States soldiers deployed to Southwest Asia. *Thromb Res*. 2006;117(4):379-83.

[b]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.

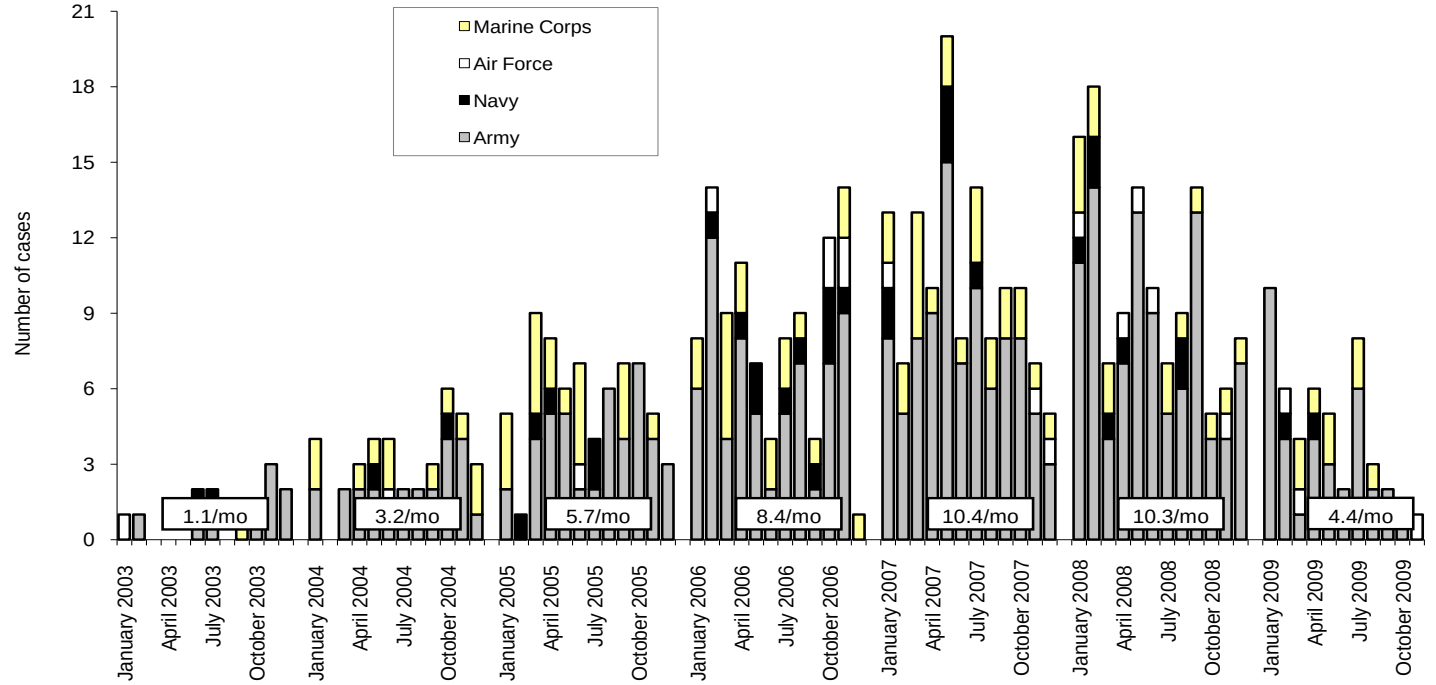
Deployment-related conditions of special surveillance interest, U.S. Armed Forces, by month and service, January 2003 - November 2009 (data as of 8 January 2010)

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)[a]



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.
[a]Indicator diagnosis (one per individual) during a hospitalization while deployed to/within 365 days of returning from OEF/OIF.

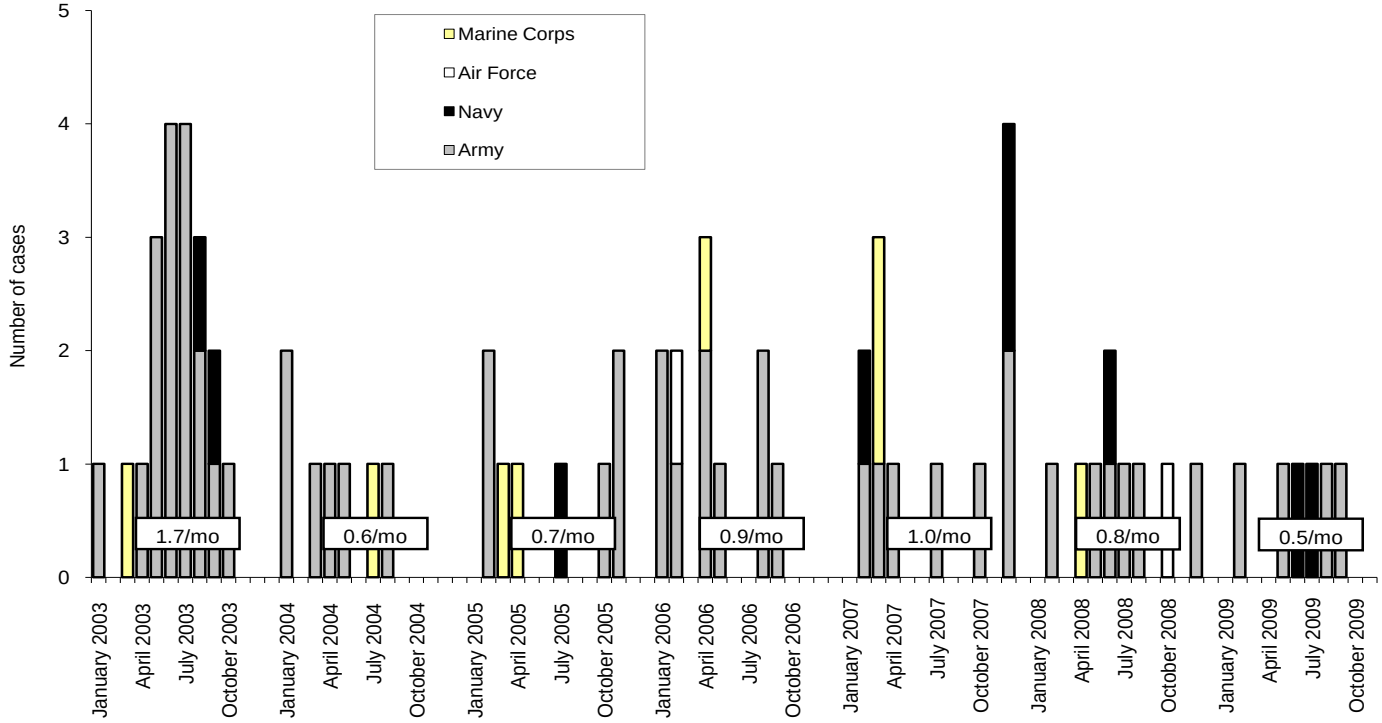
Heterotopic ossification (ICD-9: 728.12, 728.13, 728.19)[b]



Reference: Army Medical Surveillance Activity. Heterotopic ossification, active components, U.S. Armed Forces, 2002-2007. *MSMR*. Aug 2007; 14(5):7-9.
[b]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 - October 2009 (data as of 8 January 2010)

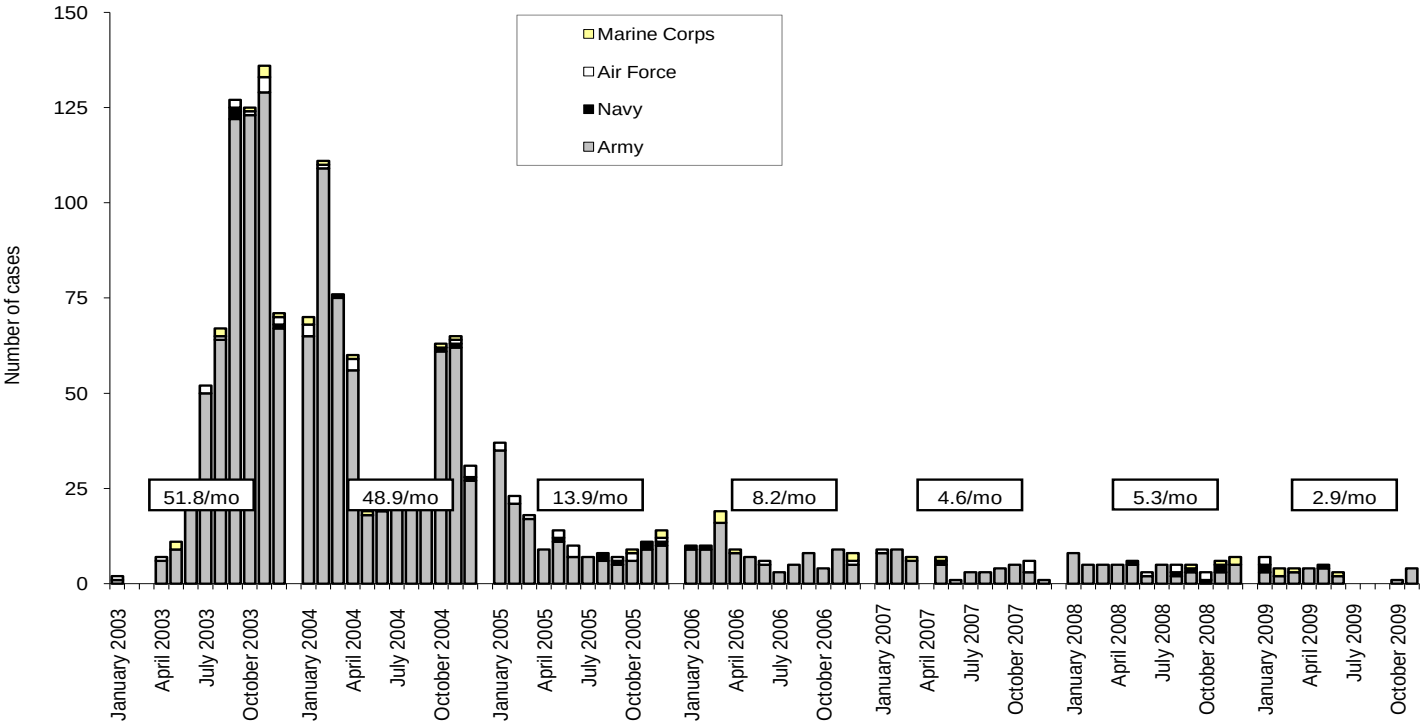
Severe acute pneumonia (ICD-9: 518.81, 518.82, 480-487, 786.09)[a]



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.

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

Leishmaniasis (ICD-9: 085.0 to 085.9)[b]



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.

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

Commander
U.S. Army Public Health Command (Provisional)
ATTN: MCHB-TS-EDM
5158 Blackhawk Road
Aberdeen Proving Ground, MD 21010-5422

STANDARD
U.S. POSTAGE
PAID
APG, MD
PERMIT NO. 1

OFFICIAL BUSINESS

The *Medical Surveillance Monthly Report* (MSMR) is prepared by the Armed Forces Health Surveillance Center (AFHSC).

Data in the MSMR are provisional, based on reports and other sources of data available to AFHSC.

Inquiries regarding content or material to be considered for publication should be directed to: Editor, Armed Forces Health Surveillance Center, 2900 Linden Lane, Suite 200 (Attn: MCHB-TS-EDM), Silver Spring, MD 20910. E-mail: msmr.afhsc@amedd.army.mil

Subscriptions may be requested online at www.afhsc.army.mil or by contacting the Armed Forces Health Surveillance Center at (301) 319-3240. E-mail: msmr.afhsc@amedd.army.mil