VOL. 15 • NO. 8
OCTOBER 2008

# MSMR

A publication of the Armed Forces Health Surveillance Center


## MEDICAL SURVEILLANCE MONTHLY REPORT

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# Report Documentation Page

*Form Approved*
*OMB No. 0704-0188*



| 1. REPORT DATE | 2. REPORT TYPE | 3. DATES COVERED |
|---|---|---|
| **OCT 2008** | | **00-00-2008 to 00-00-2008** |

| 4. TITLE AND SUBTITLE | 5a. CONTRACT NUMBER |
|---|---|
| **Medical Surveillance Monthly Report (MSMR). Volume 15, Number 8, October 2008** | 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)<br>**U.S. Army Center for Health Promotion and Preventive Medicine,Armed Forces Health Surveillance Center (AFHSC),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)** | **28** | |

# Cold Weather-related Injuries, U.S. Armed Forces, July 2003-June 2008

Prolonged and/or intense exposures to cold can significantly impact the health, well-being and operational effectiveness of service members and their units.[1-4] Because U.S. military operations are conducted in diverse geographic and weather conditions, the U.S. military has developed extensive countermeasures against threats associated with training and operating in cold environments.[1-5]

In recent years, rates of hospitalization for cold weather-related injuries of U.S. military members have generally declined — at least in part, because of improvements in clothing, equipment, policies, and practices.[2] Still, cold injuries (many of them preventable) affect hundreds of service members each year. This report summarizes frequencies, rates, and correlates of risk of cold injuries among members of active and reserve components of the U.S. Armed Forces during the past five years.

## Methods:

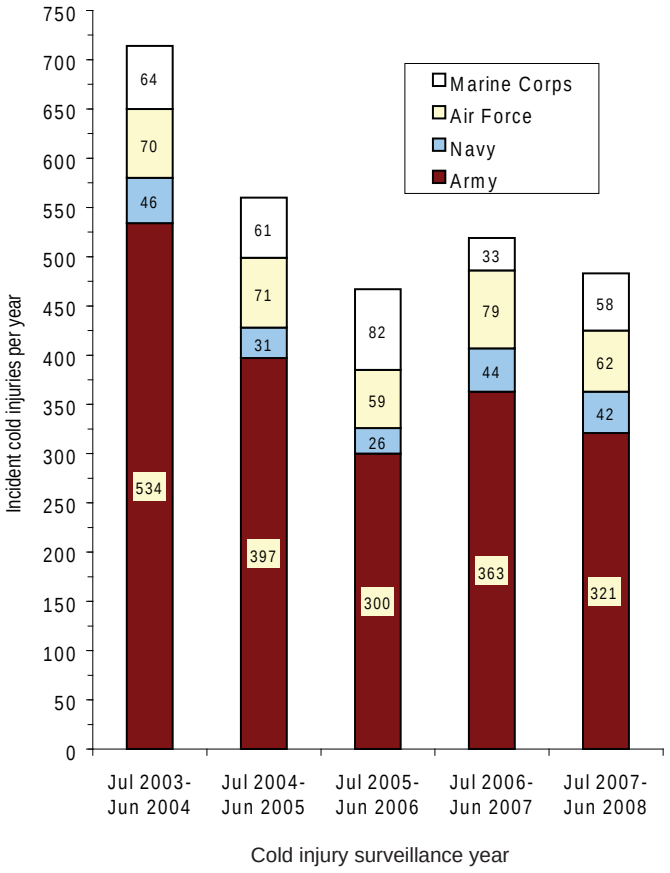
The surveillance period was 1 July 2003 to 30 June 2008. The surveillance population included all individuals who served in an active and/or reserve component of the U.S. Armed Forces any time during the surveillance period. For analysis purposes, years were divided into 1 July through 30 June intervals so that complete "cold weather seasons" could be represented in year-to-year summaries.

Inpatient, outpatient, and reportable medical event records in the Defense Medical Surveillance System (DMSS) were searched to identify all primary (first-listed) diagnoses of "frostbite" (ICD-9-CM codes: 991.0-991.3), "immersion foot" (ICD-9-CM: 991.4), "hypothermia"(ICD-9-CM: 991.6), and "other specified/unspecified effects of reduced temperature" (ICD-9-CM: 991.8-991.9). To exclude follow-up encounters for single cold injury episodes, only one of each type of cold injury per individual per year was included. If multiple medical encounters for cold injuries occurred on the same day, only one was used for analysis (hospitalizations were prioritized over ambulatory visits).

## Results:

From July 2007 through June 2008, 483 members of the U.S. Armed Forces had at least one medical encounter with a primary diagnosis of cold injury — approximately one-fifth (n=96) of all cases affected members of the Reserve component. The number of cold injuries in the past year was similar to the numbers each year from July 2005-June 2007 and fewer than the numbers each year from July 2003-June 2005 **(Figure 1).**

**Figure 1.** Cold injuries among members of active and reserve components, U.S. Armed Forces, by service and year, July 2003-June 2008




During the 2007-8 season, among all active component members, there were fewer incident cases of immersion foot, hypothermia, and cold injuries (all types) than during any other year of the 5-year surveillance period. Among the Services, the rate of cold injuries in the Army (44.8 per 100,000 person-years [p-yrs]) was approximately 50% higher than in the Marine Corps (29.6 per 100,000 p-yrs), 2.7-times higher than in the Air Force (16.6 per 100,000 p-yrs), and 3.8-times higher than in the Navy (11.7 per 1,000 p-yrs). During the year, soldiers accounted for nearly two-thirds (61.5%) of all cold injuries among active component members **(Tables 1a-d).**

During the past cold season, in each Service, the most frequently reported cold injury was frostbite. In the Army, rates of cold injuries overall — and of frostbite, immersion foot, and cold injuries (other/unspecified), specifically — were lower in 2007-8 than any other year of the period **(Table 1a).** In the Navy and Marine Corps, there were sharply fewer cases and lower rates of hypothermia in 2007-8 than in recent years **(Tables 1b,d).**

**Figure 2.** Annual number of cold injuries, 2007-8 and mean during 2003-7, at locations with at least 30 cold injuries during the surveillance period, active component members, U.S. Armed Forces, July 2003-June 2008

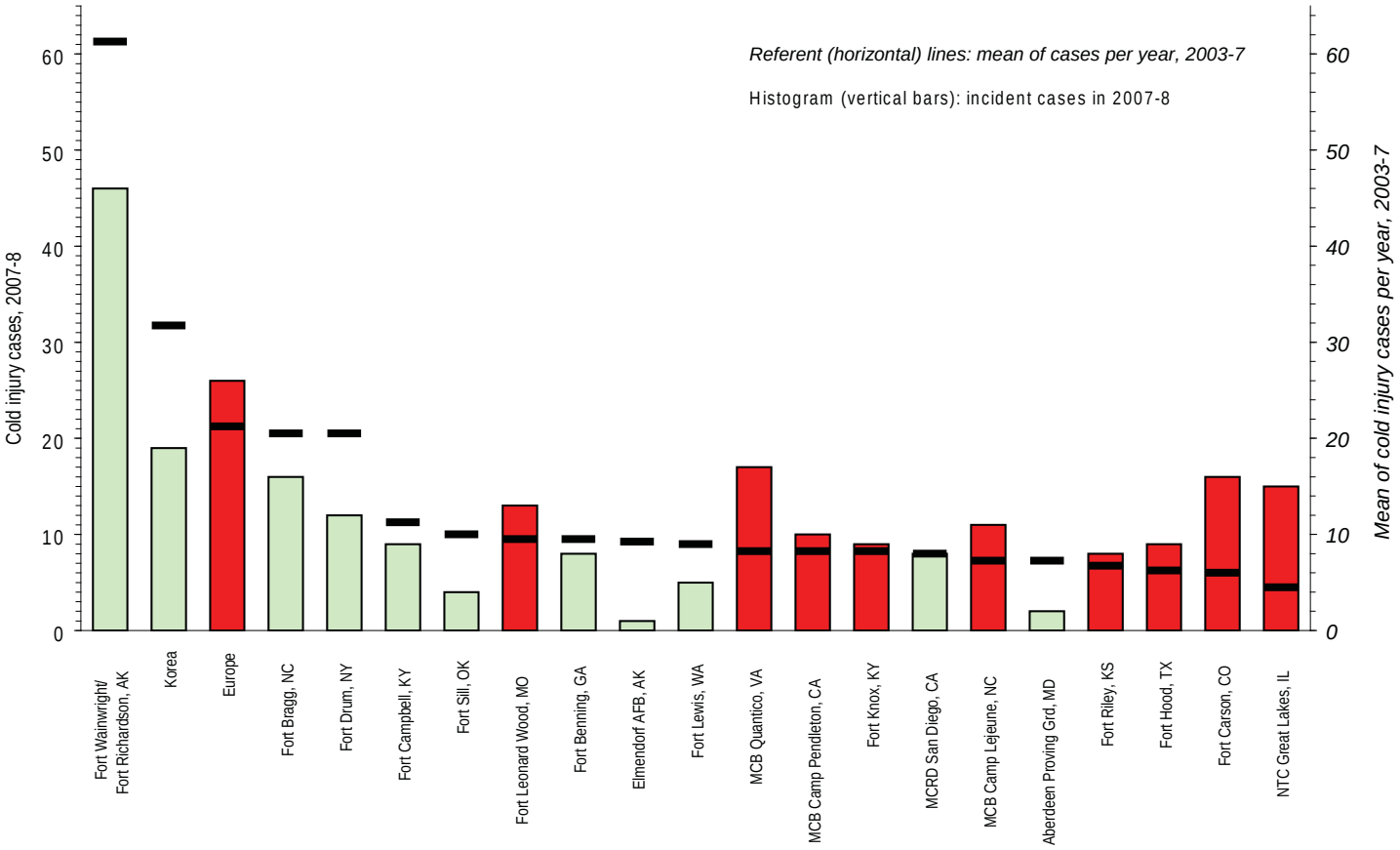



**Table 1a.** Incident diagnoses of cold injuries, by type, active component, U.S. Army, July 2003-June 2008

| | Frostbite | | Immersion Foot | | Hypothermia | | Unspecified | | All cold injuries | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Rate* | No. | Rate* | No. | Rate* | No. | Rate* | No. | Rate* |
| Total | 723 | 28.9 | 194 | 7.8 | 110 | 4.4 | 389 | 15.6 | 1,416 | 56.6 |
| *Sex* | | | | | | | | | | |
| Male | 531 | 24.7 | 163 | 7.6 | 96 | 4.5 | 244 | 11.4 | 1,034 | 48.2 |
| Female | 192 | 53.9 | 31 | 8.7 | 14 | 3.9 | 145 | 40.7 | 382 | 107.3 |
| *Race/ethnicity* | | | | | | | | | | |
| White, non-Hispanic | 291 | 19.2 | 130 | 8.6 | 68 | 4.5 | 157 | 10.3 | 646 | 42.5 |
| Black, non-Hispanic | 328 | 60.8 | 42 | 7.8 | 34 | 6.3 | 169 | 31.3 | 573 | 106.3 |
| Other | 104 | 23.4 | 22 | 5.0 | 8 | 1.8 | 63 | 14.2 | 197 | 44.4 |
| *Age* | | | | | | | | | | |
| <20 | 80 | 46.5 | 23 | 13.4 | 24 | 13.9 | 56 | 32.5 | 183 | 106.3 |
| 20-24 | 282 | 33.9 | 97 | 11.7 | 48 | 5.8 | 150 | 18.0 | 577 | 69.4 |
| 25-29 | 145 | 26.1 | 37 | 6.7 | 21 | 3.8 | 80 | 14.4 | 283 | 50.9 |
| 30-34 | 109 | 29.0 | 22 | 5.8 | 9 | 2.4 | 49 | 13.0 | 189 | 50.2 |
| 35-39 | 67 | 21.4 | 11 | 3.5 | 7 | 2.2 | 35 | 11.2 | 120 | 38.4 |
| 40-44 | 22 | 13.0 | 2 | 1.2 | 1 | 0.6 | 11 | 6.5 | 36 | 21.2 |
| 45+ | 18 | 21.8 | 2 | 2.4 | 0 | 0 | 8 | 9.7 | 28 | 33.9 |
| *Rank* | | | | | | | | | | |
| Enlisted | 678 | 32.4 | 163 | 7.8 | 102 | 4.9 | 359 | 17.2 | 1,302 | 62.3 |
| Officer | 45 | 10.9 | 31 | 7.5 | 8 | 1.9 | 30 | 7.3 | 114 | 27.7 |
| *Cold year (Jul-Jun)* | | | | | | | | | | |
| 2003-2004 | 174 | 35.3 | 49 | 9.9 | 27 | 5.5 | 74 | 15.0 | 324 | 65.8 |
| 2004-2005 | 166 | 33.9 | 43 | 8.8 | 18 | 3.7 | 85 | 17.4 | 312 | 63.7 |
| 2005-2006 | 110 | 22.7 | 39 | 8.0 | 15 | 3.1 | 72 | 14.8 | 236 | 48.6 |
| 2006-2007 | 154 | 30.6 | 37 | 7.4 | 27 | 5.4 | 88 | 17.5 | 306 | 60.8 |
| 2007-2008 | 119 | 22.4 | 26 | 4.9 | 23 | 4.3 | 70 | 13.2 | 238 | 44.8 |

* Rate per 100,000 person-years

**Table 1b.** Incident diagnoses of cold injuries, by type, active component, U.S. Navy, July 2003-June 2008

| | Frostbite | | Immersion Foot | | Hypothermia | | Unspecified | | All cold injuries | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Rate* | No. | Rate* | No. | Rate* | No. | Rate* | No. | Rate* |
| Total | 58 | 3.2 | 34 | 1.9 | 52 | 2.9 | 31 | 1.7 | 175 | 9.8 |
| *Sex* | | | | | | | | | | |
| Male | 50 | 3.3 | 32 | 2.1 | 45 | 2.9 | 24 | 1.6 | 151 | 9.8 |
| Female | 8 | 3.1 | 2 | 0.8 | 7 | 2.7 | 7 | 2.7 | 24 | 9.3 |
| *Race/ethnicity* | | | | | | | | | | |
| White, non-Hispanic | 29 | 2.8 | 24 | 2.3 | 31 | 3.0 | 17 | 1.7 | 101 | 9.8 |
| Black, non-Hispanic | 13 | 4.0 | 3 | 0.9 | 9 | 2.8 | 4 | 1.2 | 29 | 9.0 |
| Other | 16 | 3.7 | 7 | 1.6 | 12 | 2.7 | 10 | 2.3 | 45 | 10.3 |
| *Age* | | | | | | | | | | |
| <20 | 14 | 12.2 | 9 | 7.8 | 4 | 3.5 | 5 | 4.4 | 32 | 27.8 |
| 20-24 | 23 | 3.9 | 12 | 2.1 | 24 | 4.1 | 11 | 1.9 | 70 | 12.0 |
| 25-29 | 11 | 2.8 | 7 | 1.8 | 12 | 3.1 | 7 | 1.8 | 37 | 9.5 |
| 30-34 | 3 | 1.1 | 4 | 1.5 | 9 | 3.4 | 6 | 2.3 | 22 | 8.3 |
| 35-39 | 3 | 1.3 | 2 | 0.8 | 1 | 0.4 | 1 | 0.4 | 7 | 3.0 |
| 40-44 | 1 | 0.8 | 0 | 0 | 1 | 0.8 | 0 | 0 | 2 | 1.5 |
| 45+ | 3 | 4.4 | 0 | 0 | 1 | 1.5 | 1 | 1.5 | 5 | 7.3 |
| *Rank* | | | | | | | | | | |
| Enlisted | 53 | 3.5 | 31 | 2.1 | 45 | 3.0 | 28 | 1.9 | 157 | 10.4 |
| Officer | 5 | 1.8 | 3 | 1.1 | 7 | 2.5 | 3 | 1.1 | 18 | 6.5 |
| *Cold year (Jul-Jun)* | | | | | | | | | | |
| 2003-2004 | 14 | 3.7 | 10 | 2.7 | 8 | 2.1 | 7 | 1.9 | 39 | 10.4 |
| 2004-2005 | 5 | 1.4 | 3 | 0.8 | 16 | 4.4 | 4 | 1.1 | 28 | 7.7 |
| 2005-2006 | 4 | 1.1 | 5 | 1.4 | 8 | 2.3 | 7 | 2.0 | 24 | 6.8 |
| 2006-2007 | 15 | 4.3 | 7 | 2.0 | 17 | 4.9 | 4 | 1.2 | 43 | 12.3 |
| 2007-2008 | 20 | 5.7 | 9 | 2.6 | 3 | 0.9 | 9 | 2.6 | 41 | 11.7 |

* Rate per 100,000 person-years

**Table 1c.** Incident diagnoses of cold injuries, by type, active component, U.S. Air Force, July 2003-June 2008

| | Frostbite | | Immersion Foot | | Hypothermia | | Unspecified | | All cold injuries | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Rate* | No. | Rate* | No. | Rate* | No. | Rate* | No. | Rate* |
| Total | 184 | 10.5 | 35 | 2.0 | 43 | 2.4 | 51 | 2.9 | 313 | 17.8 |
| *Sex* | | | | | | | | | | |
| Male | 148 | 10.5 | 30 | 2.1 | 36 | 2.5 | 39 | 2.8 | 253 | 17.9 |
| Female | 36 | 10.4 | 5 | 1.5 | 7 | 2.0 | 12 | 3.5 | 60 | 17.4 |
| *Race/ethnicity* | | | | | | | | | | |
| White, non-Hispanic | 120 | 9.6 | 26 | 2.1 | 32 | 2.6 | 29 | 2.3 | 207 | 16.6 |
| Black, non-Hispanic | 37 | 14.4 | 6 | 2.3 | 7 | 2.7 | 16 | 6.2 | 66 | 25.7 |
| Other | 27 | 10.5 | 3 | 1.2 | 4 | 1.6 | 6 | 2.3 | 40 | 15.5 |
| *Age* | | | | | | | | | | |
| <20 | 23 | 26.2 | 3 | 3.4 | 3 | 3.4 | 10 | 11.4 | 39 | 44.4 |
| 20-24 | 85 | 16.4 | 16 | 3.1 | 27 | 5.2 | 22 | 4.2 | 150 | 28.9 |
| 25-29 | 30 | 7.6 | 7 | 1.8 | 4 | 1.0 | 12 | 3.0 | 53 | 13.4 |
| 30-34 | 19 | 7.2 | 3 | 1.1 | 3 | 1.1 | 4 | 1.5 | 29 | 11.0 |
| 35-39 | 11 | 4.4 | 6 | 2.4 | 2 | 0.8 | 0 | 0 | 19 | 7.5 |
| 40-44 | 11 | 6.4 | 0 | 0 | 1 | 0.6 | 3 | 1.8 | 15 | 8.8 |
| 45+ | 5 | 7.4 | 0 | 0 | 3 | 4.5 | 0 | 0 | 8 | 11.9 |
| *Rank* | | | | | | | | | | |
| Enlisted | 162 | 11.6 | 33 | 2.4 | 39 | 2.8 | 44 | 3.1 | 278 | 19.8 |
| Officer | 22 | 6.2 | 2 | 0.6 | 4 | 1.1 | 7 | 2.0 | 35 | 9.8 |
| *Cold year (Jul-Jun)* | | | | | | | | | | |
| 2003-2004 | 44 | 11.8 | 5 | 1.3 | 9 | 2.4 | 6 | 1.6 | 64 | 17.1 |
| 2004-2005 | 45 | 12.3 | 8 | 2.2 | 6 | 1.7 | 11 | 3.0 | 70 | 19.2 |
| 2005-2006 | 19 | 5.5 | 9 | 2.6 | 12 | 3.5 | 14 | 4.0 | 54 | 15.5 |
| 2006-2007 | 43 | 12.6 | 7 | 2.1 | 10 | 2.9 | 10 | 2.9 | 70 | 20.5 |
| 2007-2008 | 33 | 10.0 | 6 | 1.8 | 6 | 1.8 | 10 | 3.0 | 55 | 16.6 |

* Rate per 100,000 person-years

**Table 1d.** Incident diagnoses of cold injuries, by type, active component, U.S. Marine Corps, July 2003-June 2008

| | Frostbite | | Immersion Foot | | Hypothermia | | Unspecified | | All cold injuries | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Rate* | No. | Rate* | No. | Rate* | No. | Rate* | No. | Rate* |
| Total | 76 | 8.4 | 85 | 9.4 | 84 | 9.3 | 37 | 4.1 | 282 | 31.2 |
| *Sex* | | | | | | | | | | |
| Male | 66 | 7.8 | 78 | 9.2 | 77 | 9.1 | 31 | 3.7 | 252 | 29.7 |
| Female | 10 | 18.1 | 7 | 12.7 | 7 | 12.7 | 6 | 10.8 | 30 | 54.2 |
| *Race/ethnicity* | | | | | | | | | | |
| White, non-Hispanic | 46 | 7.8 | 56 | 9.4 | 47 | 7.9 | 20 | 3.4 | 169 | 28.5 |
| Black, non-Hispanic | 15 | 14.9 | 10 | 9.9 | 12 | 11.9 | 9 | 9.0 | 46 | 45.7 |
| Other | 15 | 7.1 | 19 | 9.0 | 25 | 11.8 | 8 | 3.8 | 67 | 31.7 |
| *Age* | | | | | | | | | | |
| <20 | 21 | 16.4 | 38 | 29.7 | 30 | 23.4 | 9 | 7.0 | 98 | 76.5 |
| 20-24 | 37 | 8.6 | 38 | 8.8 | 40 | 9.3 | 22 | 5.1 | 137 | 31.9 |
| 25-29 | 7 | 4.4 | 8 | 5.1 | 9 | 5.7 | 5 | 3.2 | 29 | 18.4 |
| 30-34 | 8 | 9.2 | 1 | 1.2 | 4 | 4.6 | 1 | 1.2 | 14 | 16.1 |
| 35-39 | 2 | 3.3 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 3.3 |
| 40-44 | 0 | 0 | 0 | 0 | 1 | 3.5 | 0 | 0 | 1 | 3.5 |
| 45+ | 1 | 8.1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 8.1 |
| *Rank* | | | | | | | | | | |
| Enlisted | 52 | 6.4 | 83 | 10.3 | 79 | 9.8 | 32 | 4.0 | 246 | 30.4 |
| Officer | 24 | 25.0 | 2 | 2.1 | 5 | 5.2 | 5 | 5.2 | 36 | 37.5 |
| *Cold year (Jul-Jun)* | | | | | | | | | | |
| 2003-2004 | 11 | 6.2 | 19 | 10.7 | 22 | 12.4 | 4 | 2.3 | 56 | 31.6 |
| 2004-2005 | 11 | 6.2 | 19 | 10.7 | 22 | 12.4 | 4 | 2.3 | 56 | 31.6 |
| 2005-2006 | 15 | 8.5 | 20 | 11.3 | 25 | 14.1 | 19 | 10.7 | 79 | 44.6 |
| 2006-2007 | 7 | 3.9 | 9 | 5.1 | 11 | 6.2 | 0 | 0 | 27 | 15.2 |
| 2007-2008 | 26 | 14.5 | 17 | 9.5 | 5 | 2.8 | 5 | 2.8 | 53 | 29.6 |

* Rate per 100,000 person-years

During the past five years, in the Army and Marine Corps, rates of frostbite, cold injuries (other/unspecified), and cold injuries overall were sharply higher among females than males **(Tables 1a,d)**. Of note, in the Air Force and Navy, there were no clear relationships between gender and cold injury risk **(Tables 1b,c)**.

In the Army, Air Force, and Marine Corps, rates of cold injuries overall — and frostbite, in particular — were sharply higher among Black non-Hispanic than other racial-ethnic group members. In the Navy, there were no clear relationships between race-ethnicity and cold injury risk **(Table 1a-d)**.

In general, rates of cold injuries were higher among the youngest aged (<20 years old) and enlisted members relative to their respective counterparts. However, in the Navy and Air Force, rates of hypothermia were higher among 20-24 years olds than those younger or older; and in the Marine Corps, rates of frostbite were nearly 4-times higher among officers than enlisted **(Tables 1a-d)**.

During the five year surveillance period, 30 or more cold injuries occurred at each of 22 locations worldwide. Of these locations, 10 had more and 11 had fewer cold injuries in 2007-8 than the mean annual number of cases at the respective locations during the prior four years **(Figure 2)**. Among U.S. military installations in the past year, Fort Wainwright (n=23) and Fort Richardson in Alaska (n=23), Marine Corps Base Quantico, Virginia (n=17), Fort Bragg, North Carolina (n=16), and Fort Carson, Colorado (n=16) had the most cold injuries among active component members **(Figure 2)**. Only one installation reported more than five cold injuries among reserve component members during 2007-8 (Fort Leonard Wood, Missouri; n=9) (data not shown).

## Editorial comment:

In general, during the past cold season, numbers, rates, and types of cold injuries among U.S. service members were similar to those in recent years.

As in the past, the largest numbers and highest rates of cold injuries affect the Army. At least in part, this reflects differences in the natures, locations, and circumstances of the training and operations of the Services; it also may reflect differences in the ascertainment of cold injury cases (e.g., records of medical encounters during field exercises, deployment operations, and aboard Navy ships are not routinely available for health surveillance purposes).

In general, the youngest aged, female, enlisted, and Black non-Hispanic service members have the higher rates of cold injuries — particularly frostbite. Other reports have documented that African American soldiers and individuals with cold injuries in the past have increased susceptibilities to cold injuries during prolonged or intense cold exposures.[2,3] Special vigilance by individuals, line supervisors, commanders, and medical staffs is indicated to prevent cold injuries among those with known or suspected increased susceptibilities.

Commanders and supervisors at all levels should implement appropriate countermeasures to prevent cold injuries, including proper clothing and equipment, wind chill temperature monitoring and awareness training.[1,4] Service members who train in wet and freezing conditions should know the signs of cold injury, obtain adequate hydration, and avoid tobacco, caffeine and vasoconstrictive medications.[1,4,5] Up-to-date cold injury prevention materials (including posters, presentation outlines, policies, regulations, and technical bulletins) are available online: http://chppm-www.apgea.army.mil/coldinjury/ and http://www.usariem.army.mil/download.htm.

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## CORRECTION

Numbers and rates of syncope after immunization for male and female service members were incorrectly reported in the September 2008 issue of the *MSMR* (Table 1, page 3). The corrected numbers and rates appear below.

**Table 1.** Syncope after immunization, frequency and rate per 10,000 vaccination episodes, by year, U.S. Armed Forces, 1998-2007

| | 1998 | | 1999 | | 2000 | | 2001 | | 2002 | | 2003 | | 2004 | | 2005 | | 2006 | | 2007 | | Total (1998-2007) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Rate* | No. | Rate* | No. | Rate* | No. | Rate* | No. | Rate* | No. | Rate* | No. | Rate* | No. | Rate* | No. | Rate* | No. | Rate* | No. | Rate* | Rate ratio (unadjusted) |
| Total | 113 | 0.44 | 143 | 0.47 | 151 | 0.71 | 173 | 0.69 | 236 | 0.75 | 403 | 0.77 | 324 | 0.89 | 271 | 0.80 | 403 | 1.34 | 395 | 1.14 | 2,612 | 0.81 | |
| *Component* | | | | | | | | | | | | | | | | | | | | | | | |
| Active | 100 | 0.48 | 129 | 0.53 | 125 | 0.74 | 138 | 0.73 | 195 | 0.80 | 281 | 0.76 | 241 | 0.96 | 206 | 0.84 | 323 | 1.48 | 318 | 1.25 | 2,056 | 0.86 | 1.26 |
| Reserve | 13 | 0.29 | 14 | 0.23 | 26 | 0.60 | 35 | 0.56 | 41 | 0.57 | 122 | 0.79 | 83 | 0.74 | 65 | 0.71 | 80 | 0.98 | 77 | 0.82 | 556 | 0.68 | ref |
| ***Gender*** | | | | | | | | | | | | | | | | | | | | | | | |
| **Male** | **80** | **0.36** | **100** | **0.38** | **116** | **0.64** | **121** | **0.57** | **167** | **0.62** | **306** | **0.68** | **251** | **0.80** | **199** | **0.69** | **300** | **1.17** | **285** | **0.96** | **1,925** | **1.51** | **2.17** |
| **Female** | **33** | **0.96** | **43** | **1.06** | **35** | **1.12** | **52** | **1.36** | **69** | **1.48** | **97** | **1.33** | **73** | **1.53** | **72** | **1.52** | **103** | **2.35** | **110** | **2.14** | **687** | **0.70** | **ref** |
| *Age* | | | | | | | | | | | | | | | | | | | | | | | |
| <20 | 32 | 1.03 | 58 | 1.41 | 52 | 1.39 | 58 | 1.39 | 72 | 1.46 | 115 | 1.75 | 102 | 1.94 | 79 | 1.73 | 138 | 3.11 | 122 | 2.63 | 828 | 1.82 | 4.12 |
| 20-24 | 40 | 0.56 | 42 | 0.48 | 52 | 0.83 | 61 | 0.83 | 92 | 0.90 | 163 | 0.91 | 113 | 0.89 | 91 | 0.82 | 155 | 1.57 | 138 | 1.13 | 947 | 0.92 | 2.08 |
| 25-29 | 20 | 0.41 | 19 | 0.35 | 15 | 0.42 | 22 | 0.55 | 30 | 0.57 | 47 | 0.52 | 43 | 0.69 | 39 | 0.65 | 50 | 0.93 | 56 | 0.85 | 341 | 0.61 | 1.38 |
| 30-34 | 6 | 0.14 | 10 | 0.22 | 11 | 0.37 | 13 | 0.38 | 18 | 0.44 | 28 | 0.41 | 28 | 0.63 | 21 | 0.51 | 21 | 0.61 | 19 | 0.49 | 175 | 0.42 | 0.94 |
| 35-39 | 9 | 0.26 | 7 | 0.17 | 13 | 0.50 | 10 | 0.32 | 11 | 0.30 | 22 | 0.37 | 21 | 0.57 | 17 | 0.47 | 18 | 0.58 | 29 | 0.84 | 157 | 0.43 | 0.97 |
| 40+ | 6 | 0.23 | 7 | 0.21 | 8 | 0.37 | 9 | 0.30 | 13 | 0.37 | 28 | 0.45 | 17 | 0.42 | 24 | 0.56 | 21 | 0.56 | 31 | 0.76 | 164 | 0.44 | ref |
| *Race/ethnicity* | | | | | | | | | | | | | | | | | | | | | | | |
| White, non-Hispanic | 85 | 0.47 | 109 | 0.51 | 115 | 0.78 | 134 | 0.76 | 198 | 0.89 | 327 | 0.88 | 256 | 0.99 | 213 | 0.88 | 322 | 1.48 | 314 | 1.23 | 2,073 | 0.91 | 1.65 |
| Black, non-Hispanic | 15 | 0.33 | 20 | 0.37 | 24 | 0.63 | 22 | 0.50 | 27 | 0.49 | 50 | 0.55 | 36 | 0.61 | 42 | 0.80 | 43 | 0.93 | 47 | 0.87 | 326 | 0.61 | 1.10 |
| Other | 13 | 0.46 | 14 | 0.38 | 12 | 0.45 | 17 | 0.55 | 11 | 0.28 | 26 | 0.41 | 32 | 0.71 | 16 | 0.39 | 38 | 1.06 | 34 | 0.86 | 213 | 0.55 | ref |
| *Service* | | | | | | | | | | | | | | | | | | | | | | | |
| Army | 18 | 0.30 | 27 | 0.36 | 27 | 0.45 | 44 | 0.58 | 84 | 0.72 | 191 | 0.80 | 162 | 0.96 | 103 | 0.74 | 132 | 1.05 | 144 | 0.89 | 932 | 0.76 | ref |
| Navy | 17 | 0.30 | 24 | 0.37 | 19 | 0.46 | 26 | 0.60 | 32 | 0.60 | 42 | 0.46 | 40 | 0.60 | 27 | 0.43 | 45 | 0.71 | 56 | 0.90 | 328 | 0.54 | 0.71 |
| Air Force | 63 | 0.60 | 65 | 0.59 | 79 | 1.00 | 76 | 0.79 | 98 | 0.99 | 130 | 1.06 | 91 | 1.31 | 103 | 1.25 | 187 | 2.86 | 152 | 2.12 | 1,044 | 1.16 | 1.52 |
| Marine Corps | 15 | 0.45 | 27 | 0.51 | 26 | 0.86 | 26 | 0.78 | 21 | 0.47 | 35 | 0.54 | 30 | 0.57 | 30 | 0.66 | 29 | 0.75 | 25 | 0.56 | 264 | 0.60 | 0.79 |
| Coast Guard | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | 1 | 0.41 | 1 | 0.29 | 5 | 0.72 | 1 | 0.19 | 8 | 1.19 | 10 | 1.48 | 18 | 2.70 | 44 | 1.00 | 1.32 |
| *Grade* | | | | | | | | | | | | | | | | | | | | | | | |
| Enlisted | 102 | 0.47 | 134 | 0.51 | 136 | 0.74 | 148 | 0.68 | 205 | 0.74 | 373 | 0.82 | 296 | 0.92 | 244 | 0.83 | 357 | 1.37 | 356 | 1.18 | 2,351 | 0.84 | ref |
| Officer | 11 | 0.30 | 9 | 0.21 | 15 | 0.53 | 25 | 0.76 | 31 | 0.76 | 30 | 0.45 | 28 | 0.65 | 27 | 0.61 | 46 | 1.16 | 39 | 0.87 | 261 | 0.62 | 0.74 |
| *Military occupation* | | | | | | | | | | | | | | | | | | | | | | | |
| Combat | 12 | 0.26 | 16 | 0.28 | 15 | 0.37 | 22 | 0.47 | 35 | 0.54 | 54 | 0.49 | 45 | 0.56 | 61 | 0.73 | 78 | 0.94 | 67 | 0.80 | 405 | 0.58 | ref |
| Health care | 2 | 0.10 | 10 | 0.46 | 9 | 0.52 | 18 | 0.85 | 17 | 0.64 | 27 | 0.67 | 14 | 0.53 | 14 | 0.59 | 18 | 0.83 | 16 | 0.61 | 145 | 0.59 | 1.02 |
| Other | 99 | 0.53 | 117 | 0.52 | 127 | 0.82 | 133 | 0.73 | 184 | 0.82 | 322 | 0.86 | 265 | 1.04 | 196 | 0.86 | 307 | 1.57 | 312 | 1.31 | 2,062 | 0.91 | 1.57 |

# Clinically Significant Carbon Monoxide Poisoning, Active and Reserve Components, U.S. Armed Forces, July 1998 - June 2008

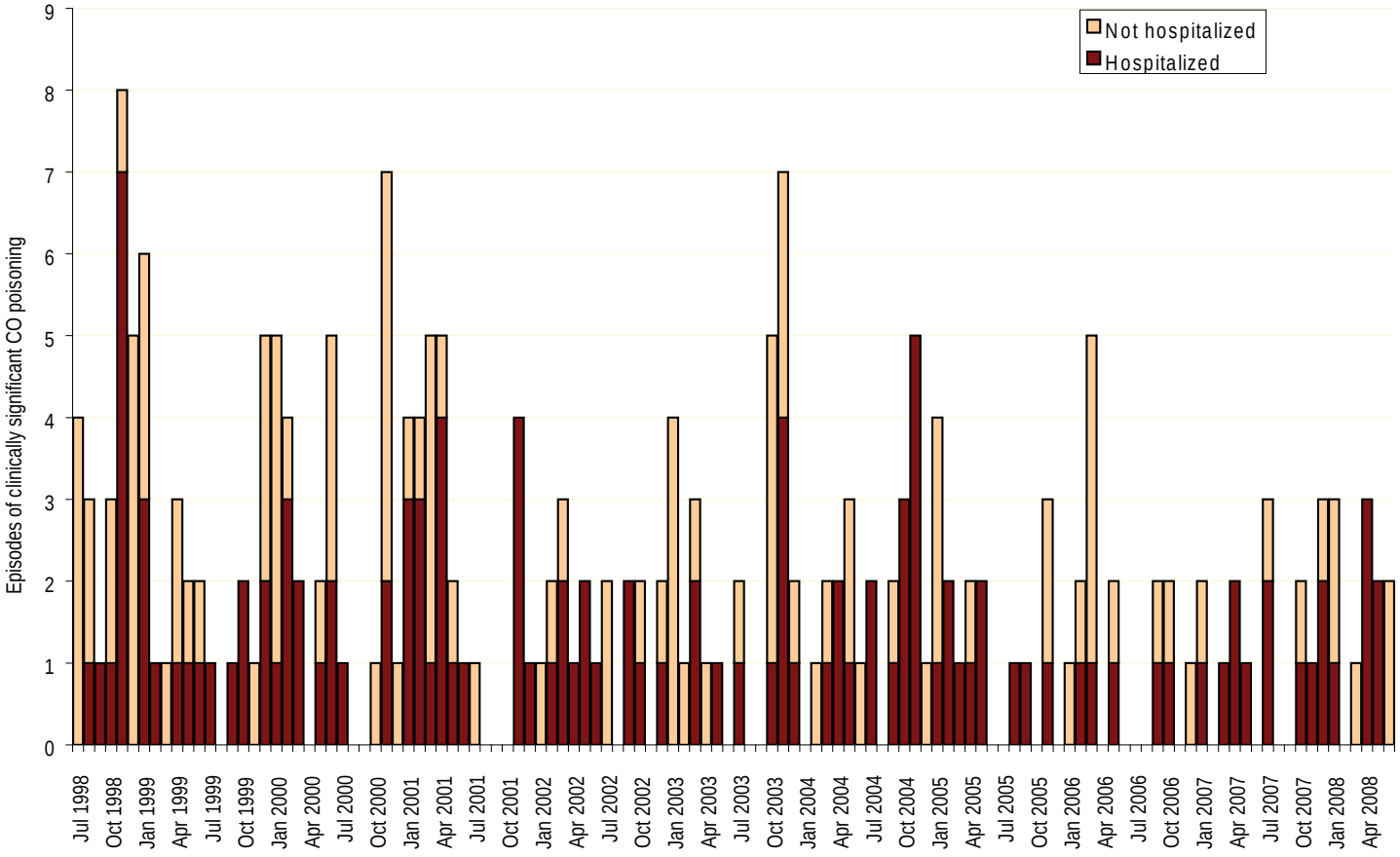
In the United States, there are more than 400 deaths each year due to unintentional carbon monoxide (CO) poisoning[1] – approximately 7% of these are attributable to occupational inhalations.[2,3] For each unintentional death from CO poisoning, there are more than two CO-related suicides.[4] Poisonings with CO are most often related to motor vehicles (e.g., automobiles, trucks, tractors, fork lifts, motorboats), malfunctioning and/or inadequately ventilated heating or cooking devices (e.g., furnaces, fireplaces, stoves, barbecues, water heaters), and gasoline-powered tools (e.g., pumps, compressors, power generators).[4,6] By their natures, many military activities, materials, and settings[7-9] pose CO hazards. In recent years, CO intoxication has been a reportable medical event in the U.S. Military Health System.

This report updates previous reports in the MSMR regarding episodes of CO intoxication among members of the U.S. Armed Forces.[10-14] For this analysis, intentional and unintentional CO intoxication episodes that resulted in hospitalizations, lost duty time (e.g., limited duty or convalescence in quarters dispositions), and/or were reported as notifiable medical events among active and Reserve component members were ascertained from records routinely maintained in the Defense Medical Surveillance System.

## Methods:

The surveillance period was 1 July 1998 to 30 June 2008. The surveillance population included all individuals who served in the U.S. Armed Forces any time during the surveillance period. For analysis purposes, a case was defined as a hospitalization, ambulatory visit, or reportable medical event case report that included a diagnosis of "toxic effect of carbon monoxide" (ICD-9 code 986) among the first four diagnoses listed. Cases were excluded if the primary (first-listed) diagnosis was not a condition directly related to or likely caused by acute CO intoxication (e.g., headache, syncope). To separate true CO intoxication cases from evaluations following possible CO exposures, ambulatory visits with dispositions of "released without limitations" were excluded. To exclude follow-up encounters for single CO

**Figure 1** Episodes of clinically significant carbon monoxide poisoning*, by month, U.S. Armed Forces, July 1998-June 2008




*Includes hospitalizations, ambulatory visits with limited duty or confinement to quarters dispositions, and/or reportable medical events.

intoxication episodes, only one episode per individual per year was included. As CO poisonings are more frequent in the fall and winter, a surveillance year was defined as 1 July through 30 June for analysis purposes.

## Results:

During the surveillance period, 227 service members were either reported with, hospitalized for, or placed on limited duty due to carbon monoxide intoxication. More than one-half (n=121, 53%) of all cases were hospitalized, and 9 cases (4.0%) were reported as fatal. The number of cases per year generally declined during the period — from 39 in 1998-1999 to 20 in 2007-2008 **(Figure 1).** In regard to season, case counts generally increased from late summer through early fall, were highest in late fall and early winter, decreased from late winter through early spring, and were lowest in late spring and early summer **(Figures 1, 2).**

Service members affected by CO intoxication generally reflected the demographic composition of U.S. military members in general. Of note, service members with combat and health care occupations accounted for less than one-third (30.4%) of CO intoxication cases overall. Fifteen percent of cases were among members of The Reserve or National Guard **(Table 1).**

**Table 1.** Episodes of clinically significant carbon monoxide poisoning, U.S. Armed Forces, July 1998-June 2008

| | No. | % |
|---|---|---|
| Total | 227 | 100.0 |
| *Component* | | |
| Active | 193 | 85.0 |
| Reserve/Guard | 34 | 15.0 |
| *Service* | | |
| Army | 127 | 56.0 |
| Navy | 32 | 14.1 |
| Air Force | 54 | 23.8 |
| Marine Corps | 14 | 6.2 |
| *Sex* | | |
| Male | 185 | 81.5 |
| Female | 42 | 18.5 |
| *Race ethnicity* | | |
| Black, non-hispanic | 39 | 17.2 |
| Hispanic | 20 | 8.8 |
| Other | 18 | 7.9 |
| White, non-hispanic | 150 | 66.1 |
| *Age* | | |
| < 20 | 9 | 4.0 |
| 20-24 | 90 | 39.7 |
| 25-29 | 61 | 26.9 |
| 30-34 | 33 | 14.5 |
| 35-39 | 21 | 9.3 |
| >=40 | 13 | 5.7 |
| *Military occupation* | | |
| Combat | 51 | 22.5 |
| Health care | 18 | 7.9 |
| Other | 158 | 69.6 |

CO poisoning cases were widely distributed among units and installations in the United States and overseas. Two large Army installations — Fort Hood, Texas (13 cases) and Fort Lewis, Washington (12 cases) — accounted for more than 5% each of all clinically significant CO intoxication cases **(Table 2).** One-fifth (n=46, 20.3%) of all cases affected service members assigned outside the United States (data not shown).

NATO Standardized Agreement (STANAG) cause-of-injury codes were reported in relation to nearly two-thirds (n=77) of all hospitalized cases. Of those, 33 (42.9%) were reported as "intentionally self-inflicted." Of 26 outpatient cases with external cause of injury codes, approximately one-fifth (n=5, 19.2%) indicated that the intoxication was intentionally self-inflicted.

## Editorial comment:

During the ten-year surveillance period, there were more than 1,000 medical encounters with "toxic effect of carbon monoxide" as a diagnosis. For most of these cases, the affected service members were returned to duty without limitations. Because such cases likely include "rule outs" of potential/suspected intoxications and otherwise clinically insignificant exposures to CO, they were not counted as cases for this analysis.

**Figure 2.** Episodes of clinically significant carbon monoxide poisoning, by month, U.S. Armed Forces, July 1998-June 2008

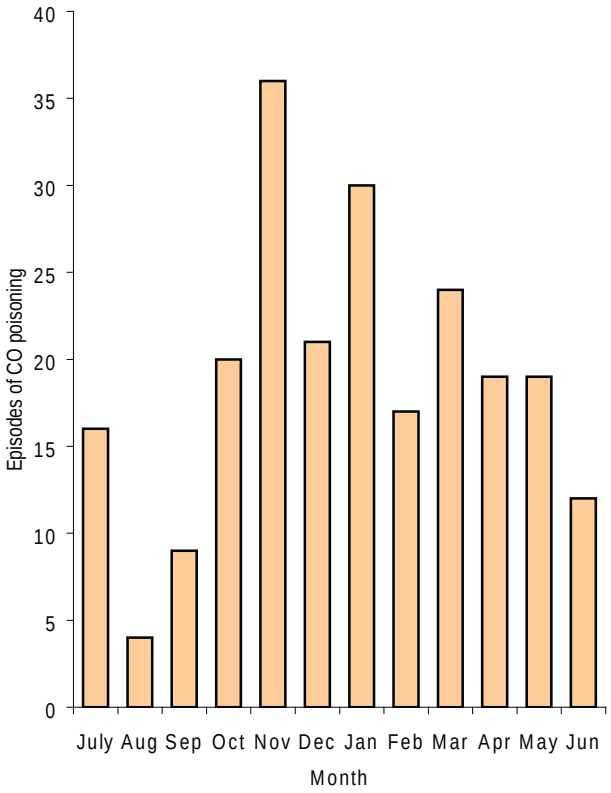


**Table 2.** Episodes of clinically significant carbon monoxide poisoning, by location, U.S. Armed Forces, 1998-2008

| Installation | Jul 1998-Jun 1999 | Jul 1999-Jun 2000 | Jul 2000-Jun 2001 | Jul 2001-Jun 2002 | Jul 2002-Jun 2003 | Jul 2003-Jun 2004 | Jul 2004-Jun 2005 | Jul 2005-Jun 2006 | Jul 2006-Jun 2007 | Jul 2007-Jun 2008 | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | No. | No. | No. | No. | No. | No. | No. | No. | No. | No. | % |
| Fort Hood, TX | 2 | 3 | 1 | 1 | . | 1 | 1 | 1 | 2 | 1 | 13 | 5.7 |
| Fort Lewis, WA | 1 | . | 3 | . | 2 | 1 | . | 2 | 2 | 1 | 12 | 5.3 |
| Fort Carson, CO | 2 | 2 | 1 | . | 1 | 1 | . | . | . | . | 7 | 3.1 |
| Fort Sill, OK | 1 | . | 3 | . | . | . | 3 | . | . | . | 7 | 3.1 |
| Fort Bliss, TX | . | 1 | . | 1 | . | 1 | . | 1 | 1 | 2 | 7 | 3.1 |
| Fort Bragg, NC | . | 2 | 2 | . | 1 | . | 2 | . | . | . | 7 | 3.1 |
| Spangdahlem AB, Germany | . | . | . | . | . | 3 | 1 | 1 | . | 1 | 6 | 2.6 |
| Holloman AFB, NM | 3 | 2 | . | . | 1 | . | . | . | . | . | 6 | 2.6 |
| Other | 30 | 18 | 21 | 14 | 13 | 18 | 17 | 10 | 6 | 15 | 162 | 71.4 |
| **Total** | **39** | **28** | **31** | **16** | **18** | **25** | **24** | **15** | **11** | **20** | **227** | **100.0** |

This report included cases that were reported during hospitalizations, ambulatory visits with limited duty or confinement to quarters dispositions, and/or as reportable medical events. In the past ten years, there have been 227 clinically significant carbon monoxide intoxications — an average of 23 per year — among U.S. service members. The number of cases per year has generally declined.

This report also documents that CO-related risks increase through the late summer and early fall and are highest during the late fall and early winter. This seasonal pattern generally corresponds with trends in ambient outdoor temperatures and uses of indoor heating. The Consumer Products Safety Commission has published prevention guidelines that address, for example, hazards associated with furnaces and other heating devices.[15]

As usual, the results of this analysis should be interpreted with consideration of some inherent shortcomings. For example, cases for this report were ascertained from standardized clinical records and notifiable medical event reports that are routinely submitted from fixed medical treatment facilities. Thus, cases diagnosed and treated in deployed settings (e.g., field hospitals, Navy ships) and fatal cases that did not present premortem to the Military Health System are not included. Also, cases among Reserve and National Guard members that were diagnosed in their civilian communities outside of the Military Health System were not included.

In summary, service members, unit leaders, and supervisors at all levels should be aware of and responsive to the dangers of CO poisoning; CO hazards related to residential, recreational, occupational, and military operational circumstances, equipment, and activities; and appropriate preventive measures. This is especially important for service members who repair or maintain their own and/or military vehicles.[3] Finally, primary medical care providers (including unit medics and emergency medical technicians) should be knowledgeable of and sensitive to the early clinical manifestations of CO intoxication.

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# Variation across Evaluation Sites in Clinical Referrals of Service Members after Returning from Deployment, Active Component, U.S. Armed Forces, 2005-2007

In March 2005, the Department of Defense launched the Post-Deployment Health Reassessment (PDHRA) program to identify and respond to health concerns — with a specific emphasis on mental health — that persisted for or emerged within three to six months after service members returned from deployments.[1]

The PDHRA program mandates that all service members who have returned from operational deployments complete an electronic or web-enabled version of the Post-Deployment Health Reassessment (DD Form 2900), ideally within three to four months (but up to 180 days) of return. After completing the form, the service member visits a healthcare provider who reviews information on the form and conducts a brief behavioral risk assessment. The care provider may refer the service member to healthcare or community-based services for further evaluation or treatment.

The objective of this analysis was to document the variability and determinants of differences across military treatment facilities (MTFs) – while simultaneously accounting for individual differences – in the percentages of returning deployers who received clinical referrals after PDHRAs.

## Methods:

The DMSS was searched to identify all PDHRA forms that were completed between 1 January 2005 and 31 December 2007 by members of the active components of the Army, Navy, Air Force and Marine Corps. The proportions of forms that indicated recommendations for referrals to a clinic or specialty provider were calculated overall and for each screening site (estimated based on the medical treatment facilities where respondents received medical care around the time of their PDHRAs).

Analyses were designed to estimate the effects of individual and MTF-specific characteristics on the likelihood of clinical referral. First, the distribution of the percentages of referrals across all MTF screening sites was assessed. Next, the overall variance in clinical referrals due to medical site was assessed in a multivariate model (model 1). A second multivariate model (model 2) was used to estimate the variance in clinical referrals due to medical site while controlling for individual characteristics (including responses to PTSD screening questions). A final two-level model (model 3) estimated the variance due to medical site after accounting for individual characteristics to assess whether factors such as PTSD score and Service were considered similarly during evaluations across sites. Analyses were conducted using PROC LOGISTIC and PROC GLIMMIX provided by version 9.1 SAS/STAT®.

## Results:

During the three-year period, 322,510 post-deployment health reassessments were completed at 238 MTF screening sites. Across sites, there was significant variation in the proportions of PDHRA forms that included indications for referrals (% with referrals, by site: median: 16.5%; range: 3%-88%) **(Figure 1).**

There were significant differences in the likelihood of referral based on the Service, race, age, and military occupation of respondents as well as their responses to PTSD screening questions. However, the variation in percentages of referrals across screening sites was not entirely attributable to differences in individual characteristics of respondents. A multivariate model (model 2) suggested that approximately 10% of the total variability in referrals was attributable to the medical screening site (estimated variability due to screening site: 0.367; overall variability in referral patterns: 3.287) **(Table 1).**

A final model (model 3) assessed whether responses to PTSD screening questions and Service assignment were

**Table 1.** Relationships between individual and screening site (MTF)-specific characteristics and the likelihood of referral after completing a post-deployment health reassessment (DD2900), among active component members who return from deployment, U.S. Armed Forces, 2005-2007 (model 2)

| | *Odds ratio* |
|---|---|
| *Age group* | |
| Age | 0.99 |
| *Service* | |
| Army | 3.25* |
| Marine Corps/Navy | 1.98* |
| Air Force | Referent |
| *Occupational group* | |
| Combat | 0.87* |
| Health care | 0.99* |
| Other | Referent |
| *PTSD screen* | |
| Age * PTSD | 1.01 |
| PTSD score: screen negative | 0.15* |
| *Race* | |
| White | 0.86* |
| Black | 1.04* |
| Other | Referent |
| *Deployment experience* | |
| Multiple deployments | 1.15* |
| | *Variance estimate* |
| *Across MTF screening sites* | |
| Between locations | 0.367* |

*p<.01
Overall variance, standard logistic distribution: 3.287

considered similarly during evaluations across sites. The results suggest that assignment in the Army accounted for approximately 23% and PTSD score approximately 12% of the overall variation in referral patterns across sites (results not shown).

In general, the analyses indicate that assignment in the Army and endorsement of two or more PTSD screening questions were strong independent predictors of clinical referral after PDHRA. However, the strengths of the associations between these factors and the likelihood of referral differed across sites. Thus, for example, the PTSD score was a significant predictor of clinical referral in general; however, the PTSD score was considered differently relative to other factors during evaluations at different sites. Of note, no MTF screening site-specific characteristics (e.g., region of the U.S., number of assessments conducted) were significant independent predictors of clinical referral (results not shown).

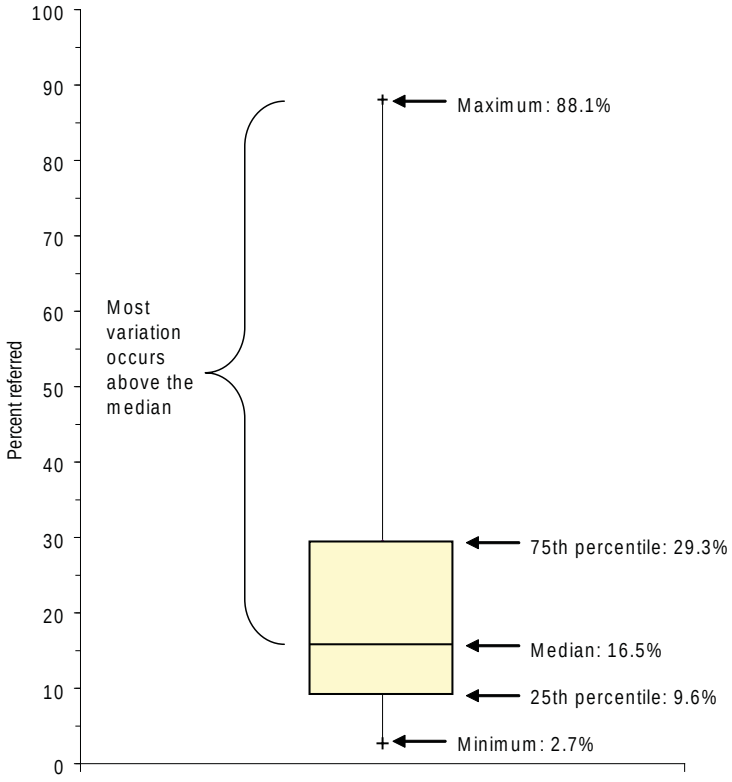
## Editorial comment:

This report documents that the proportion of service members who were referred for further evaluations at the time of their post-deployment heath reassessments varied in relation to the medical sites at which they were assessed. After accounting for the effects of individual characteristics, the assessment site still accounted for approximately 10% of the total variation in referral probability. Of particular note, the strengths of the associations between Army service and PTSD score and the likelihood of referral significantly varied across sites.

Variation in the percentages of referrals across sites may reflect different types and/or degrees of deployment-related experiences, health concerns, injuries, and illnesses in different Army units. It may also reflect differences in assessment and documentation methods and/or referral criteria of healthcare providers at various sites. For example, the natures of deployment missions and in-theater locations significantly vary across units; thus, the probability of actual or perceived health problems would be expected to vary across returning units — and in turn, the installations where they are permanently garrisoned. Likewise, providers become familiar with the prevailing health concerns and clinical problems of service members at their installations; also, the clinical experiences of providers with service members who returned from deployments in the past can influence their judgments regarding clinical referral of recently returning deployers. Finally, differences in the kinds of information (both official and unofficial) that are prevalent among units and across garrisons may influence responses of service members and assessments of providers during post-deployment health reassessments.

The many factors that determine thresholds for clinical referrals at various sites underlie the differences across sites in referrals of Army relative to other Service members and among those with similar PTSD scores. Analyses of the experiences of service members who endorsed PTSD screening questions — whether or not referred — could illuminate differences in referral thresholds across units and deployment periods (with control of the effects of other factors independently associated with referral), compliance with clinical referrals among those who received them, and the clinical courses of returned deployers subsequent to PDHRA administration.

**Figure 1.** Distribution of percentages of post-deployment health reassessment forms (DD2900) with indications for clinical referrals/follow-ups, across military treatment facility screening sites, among active component members who return from deployment, U.S. Armed Forces, January 2005-December 2007




*Analysis and report by Pablo Aliaga, MPH; Bruno Petruccelli, MD, MPH; and Lt. Col. Sean Moore, MD, MS, USAF, Armed Forces Health Surveillance Center.*

## References:

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Washington, DC. Accessed 14 October 2008 at: http://www.health.mil/Content/docs/pdfs/policies/2005/05-011.pdf.

# Update: Deployment Health Assessments, U.S. Armed Forces, September 2008

The force 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 until or emerged within three to six months after returning 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 predeployment to postdeployment.

## 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:

During the 12-month period from October 2007 to September 2008, there were 397,538 pre-deployment health assessments, 350,988 post-deployment health assessments, and 295,144 post-deployment health reassessments completed at field sites, forwarded to the Armed Forces Health Surveillance Center, and archived in the Defense Medical Surveillance System **(Table 1)**.

Between January 2003 and September 2008, there were peaks and troughs in the numbers of pre-deployment and post-deployment health assessments that generally corresponded to times of departure and return of large numbers of deployers **(Figure 1)**. Since April 2006, the numbers of post-deployment health reassessments (PDHRA) completed per month have fluctuated in a range between approximately 17,000 and 37,000 **(Figure 1, Table 1)**.

From October 2007 to September 2008, nearly three-fourths (72.9%) of deployers rated their "health in general" as "excellent" or "very good" during pre-deployment health assessments. Smaller proportions of returned deployers rated their health as "excellent" or "very good" during post-deployment assessments (58.1%) and post-deployment reassessments (52.6%). There were increases in the proportions of deployers who rated their health as "fair" or "poor" from pre-deployment to post-deployment and from

**Figure 1.** Total deployment health assessment and reassessment forms, by month, U.S. Armed Forces, January 2003-September 2008

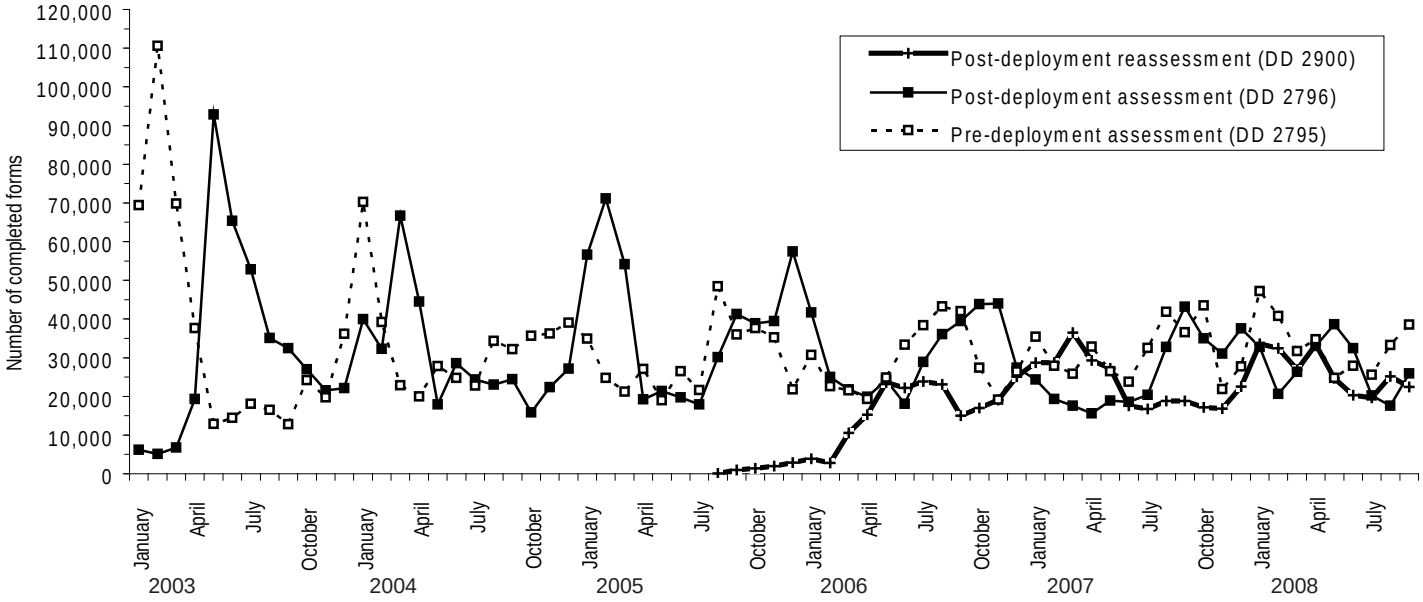


**Table 1.** Deployment-related health assessment forms, by month, U.S. Armed Forces, October 2007-September 2008

| | Pre-deployment assessment DD2795 | | Post-deployment assessment DD2796 | | Post-deployment reassessment DD2900 | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| **Total** | **397,538** | **100** | **350,988** | **100** | **295,144** | **100** |
| *2007* | | | | | | |
| October | 43,454 | 10.9 | 34,952 | 10.0 | 17,169 | 5.8 |
| November | 21,893 | 5.5 | 31,029 | 8.8 | 16,865 | 5.7 |
| December | 27,764 | 7.0 | 37,559 | 10.7 | 22,504 | 7.6 |
| *2008* | | | | | | |
| January | 47,203 | 11.9 | 32,740 | 9.3 | 33,550 | 11.4 |
| February | 40,745 | 10.2 | 20,641 | 5.9 | 32,466 | 11.0 |
| March | 31,664 | 8.0 | 26,300 | 7.5 | 26,876 | 9.1 |
| April | 34,763 | 8.7 | 33,000 | 9.4 | 33,465 | 11.3 |
| May | 24,772 | 6.2 | 38,641 | 11.0 | 24,690 | 8.4 |
| June | 27,865 | 7.0 | 32,402 | 9.2 | 20,321 | 6.9 |
| July | 25,616 | 6.4 | 20,217 | 5.8 | 19,652 | 6.7 |
| August | 33,236 | 8.4 | 17,559 | 5.0 | 25,174 | 8.5 |
| September | 38,563 | 9.7 | 25,948 | 7.4 | 22,412 | 7.6 |

immediate post-deployment to 3-6 months after returning. For example, prior to deploying, less than one of 40 (2.6%) deployers rated their health as "fair" or "poor"; upon returning from deployment, one of 14 (7.5%) deployers rated their health as "fair" or "poor"; and 3-6 months after returning, one of 7 (13.8%) deployers rated their health as "fair" or "poor" **(Figure 2).**

In the past 12 months, the proportion of deployers who assessed their general health as "fair" or "poor" was consistently low before deployment (mean, by month: 2.6%), higher at return from deployment (mean, by month: 7.5%), and highest 3-6 months after return from deployment (mean, by month: 13.6%) **(Figure 3).** From month to month, there was relatively little variability in the proportions of deployers who rated their health as "fair" or "poor" on predeployment, post-deployment, and post-deployment reassessment questionnaires **(Figure 3).** Of deployers who completed health assessments prior to and 3-6 months after returning from deployment, approximately one of 6 (16.4%) indicated significant declines (i.e., change of 2 or more categories on a 5-category scale) in their perceived general health states between the assessments **(Figure 4).**

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. Among Reserve component members of the Army and Marine Corps, health and exposure-related concerns and indications for referrals were much greater 3-6 months after return from deployment (DD2900) than at the time of return deployment (DD2796). Of note, at the time of return, active component soldiers were the most likely of all deployers to receive mental health referrals; however, 3-6 months after returning, Reserve component members of the Army and Marine Corps were the most likely of all deployers to receive mental health referrals **(Table 2, Figures 5,6).**

Finally, in general, soldiers and Reserve component members were more likely than their respective counterparts

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

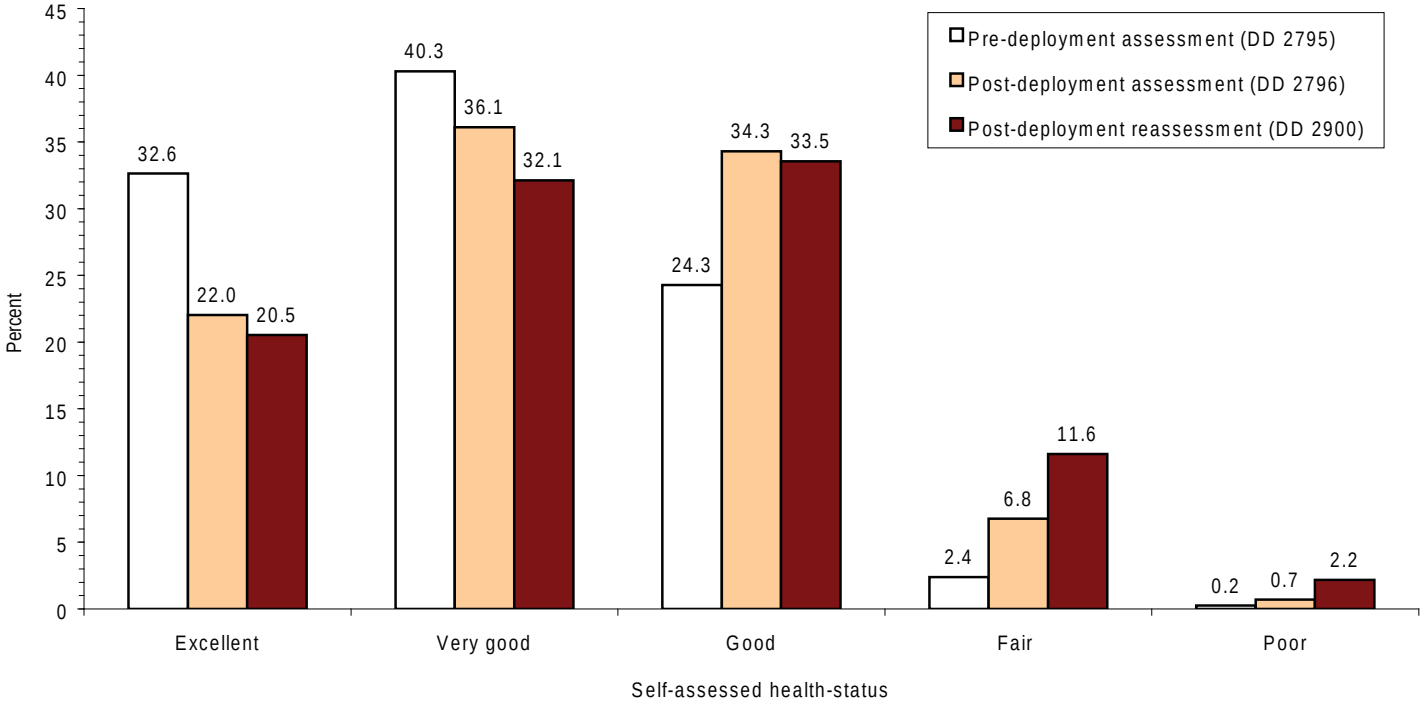
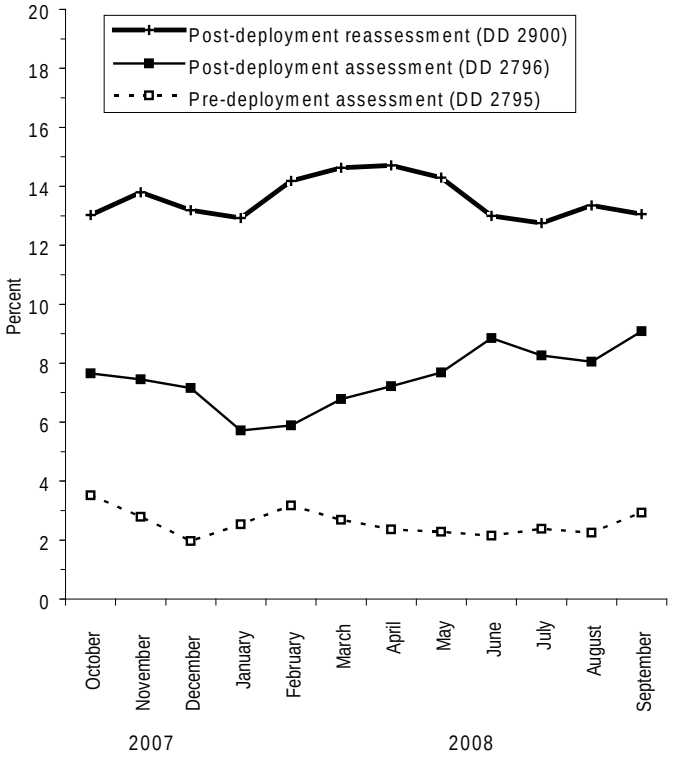


**Figure 3.** Proportion of deployment health assessment forms with self-assessed health status as "fair" or "poor", U.S. Armed Forces, October 2007-September 2008




to report "exposure concerns"; and both active and Reserve component members were more likely to report "exposure concerns" 3-6 months after compared to the time of return from deployment **(Table 2, Figures 6,7).**

## Editorial comment:

A consistent finding of deployment-related health assessments is that deployers rate their general health worse when they return from deployment compared to before deploying, regardless of the Service or component. Deployments are inherently physically and psychologically demanding; and there are more – and more significant – threats to the physical and mental health of service members when they are conducting 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).

Another consistent finding of deployment-related health surveillance is that, as a group, returned service members rate their general health worse and are more likely to report exposure concerns 3-6 months after returning from deployment compared to the time of return. Symptoms of post deployment 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 return from deployment.[4] Among British veterans of the Iraq war, Reservists reported more "ill health" than their active counterparts. Roles, traumatic experiences, and unit cohesion while deployed were 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]

## References:

1. Undersecretary of Defense for Personnel and Readiness. Department of Defense Instruction (DODI) No. 6490.3, subject: Deployment health, dated 11 August 2006. Washington, DC.
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.
3. Rubertone MV, Brundage JF. 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):1900-4.
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 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, October 2007-September 2008

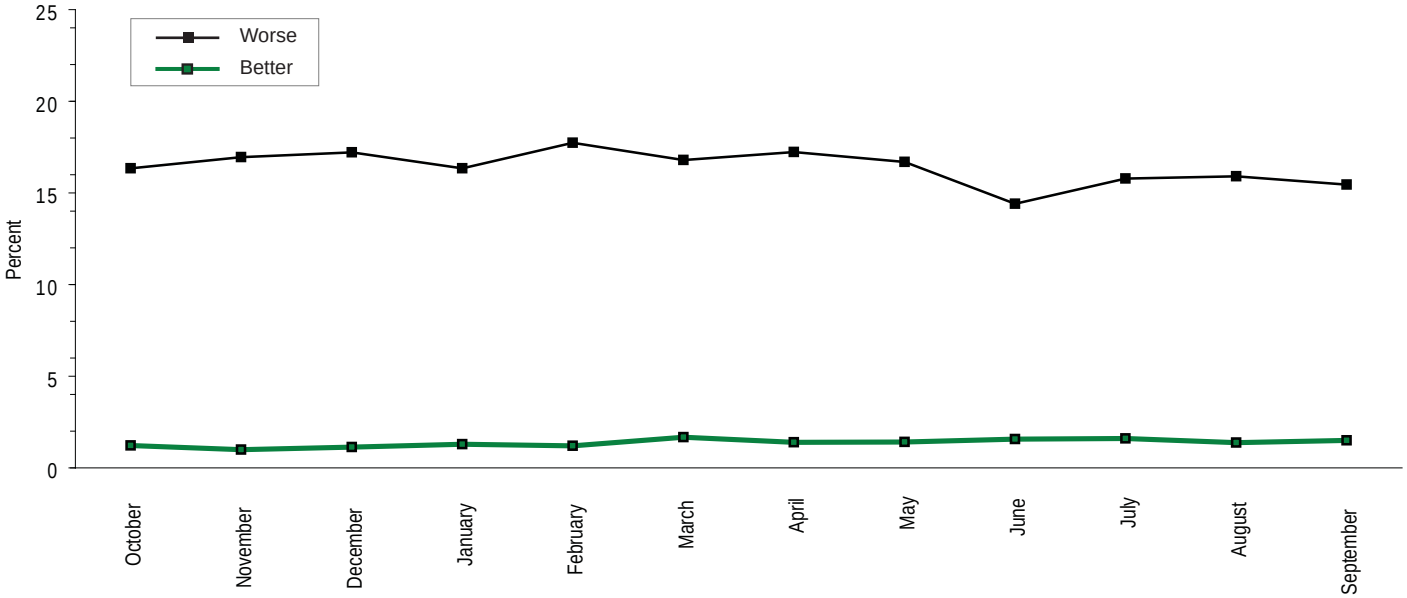



**Figure 5.** Percent of deployers with mental or behavioral health referrals, by Service and component, by timing of health assessment, U.S. Armed Forces, October 2007-September 2008

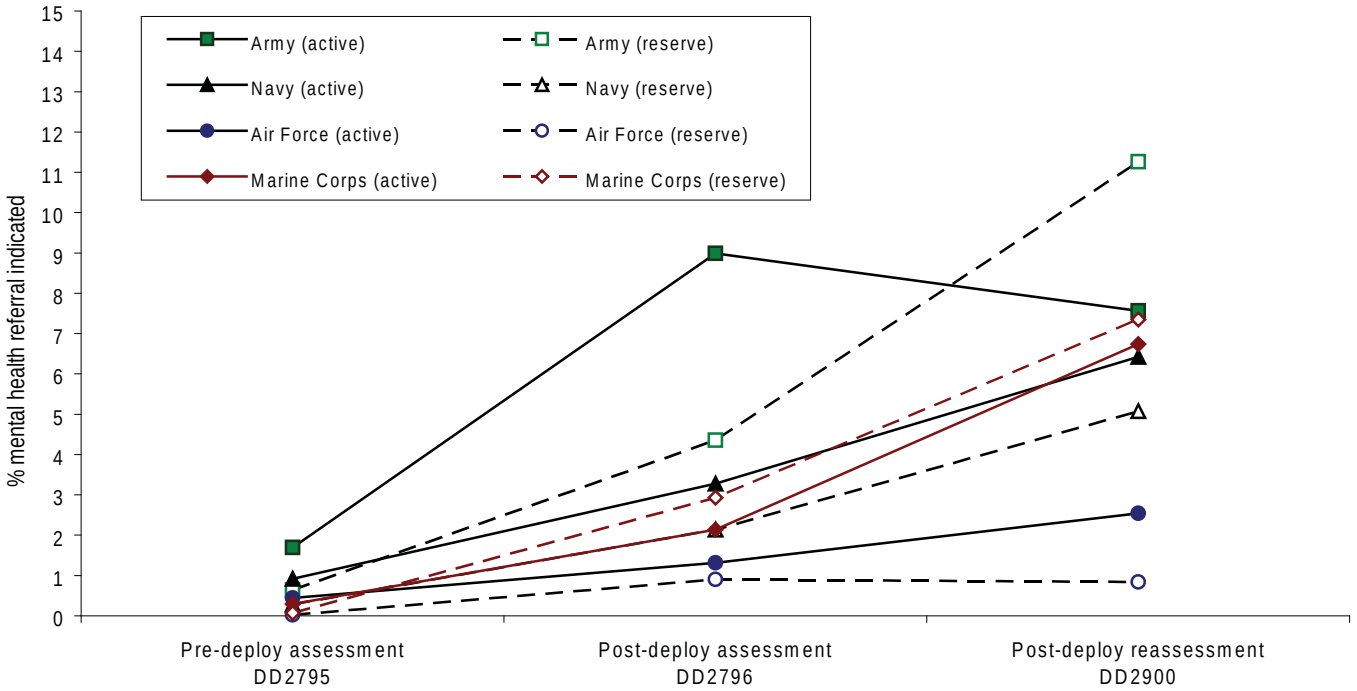


**Table 2.** Percentage of service members who endorsed selected questions/received referrals on health assessment forms, U.S. Armed Forces, October 2007-September 2008

| | 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=134,919 | n=124,776 | n=94,595 | n=16,043 | n=11,914 | n=8,285 | n=58,589 | n=51,268 | n=50,759 | n=30,930 | n=27,307 | n=40,743 | n=240,481 | n=215,265 | n=194,382 |
| | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % |
| General health “fair” or “poor” | 4.2 | 9.0 | 17.2 | 1.6 | 4.2 | 6.9 | 0.5 | 2.8 | 4.5 | 1.9 | 3.3 | 10.3 | 2.8 | 6.6 | 12.0 |
| Health concerns, not wound or injury | 12.1 | 28.7 | 37.4 | 5.1 | 9.5 | 20.8 | 2.9 | 10.7 | 15.0 | 3.8 | 7.8 | 27.8 | 8.3 | 20.7 | 28.8 |
| Health worse now than before deployed | na | 16.3 | 29.1 | na | 4.5 | 14.5 | na | 4.8 | 9.7 | na | 4.9 | 20.3 | 0.0 | 11.5 | 21.6 |
| Exposure concerns | na | 22.1 | 25.0 | na | 10.3 | 16.2 | na | 8.4 | 15.2 | na | 6.7 | 22.0 | 0.0 | 16.3 | 21.4 |
| PTSD symptoms (2 or more) | na | 15.3 | 18.8 | na | 3.4 | 9.3 | na | 2.9 | 3.4 | na | 3.4 | 11.6 | 0.0 | 10.2 | 12.9 |
| Depression symptoms (any) | na | 22.6 | 37.7 | na | 7.8 | 27.5 | na | 5.3 | 15.5 | na | 9.9 | 34.0 | 0.0 | 16.1 | 30.7 |
| Referral indicated by provider (any) | 6.4 | 33.4 | 24.7 | 5.8 | 17.3 | 21.7 | 1.6 | 11.7 | 9.5 | 5.6 | 12.8 | 28.8 | 5.1 | 24.7 | 21.4 |
| Mental health referral indicated* | 1.7 | 9.0 | 7.6 | 0.9 | 3.3 | 6.4 | 0.4 | 1.3 | 2.5 | 0.3 | 2.1 | 6.7 | 1.2 | 6.0 | 6.0 |
| Medical visit following referral† | 98.6 | 99.0 | 97.4 | 88.4 | 89.3 | 92.7 | 78.2 | 95.0 | 96.2 | 72.9 | 74.2 | 72.9 | 91.2 | 96.6 | 87.2 |
| | **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 |
| **Reserve component** | n=67,781 | n=50,870 | n=75,284 | n=3,836 | n=3,980 | n=4,724 | n=15,113 | n=14,152 | n=14,003 | n=2,731 | n=3,137 | n=3,155 | n=89,461 | n=72,139 | n=97,166 |
| | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % |
| General health “fair” or “poor” | 2.3 | 10.0 | 19.5 | 0.6 | 4.1 | 9.6 | 0.3 | 3.2 | 4.6 | 1.3 | 5.3 | 10.4 | 1.9 | 8.1 | 16.5 |
| Health concerns, not wound or injury | 13.3 | 39.1 | 54.2 | 3.5 | 17.3 | 34.8 | 1.4 | 16.2 | 15.2 | 3.9 | 23.8 | 40.0 | 10.6 | 32.7 | 47.2 |
| Health worse now than before deployed | na | 21.8 | 38.0 | na | 10.0 | 23.5 | na | 6.9 | 10.2 | na | 6.7 | 25.6 | 0.0 | 17.6 | 32.9 |
| Exposure concerns | na | 28.2 | 37.7 | na | 22.1 | 29.0 | na | 12.0 | 19.4 | na | 15.5 | 30.6 | 0.0 | 24.1 | 34.4 |
| PTSD symptoms (2 or more) | na | 12.1 | 24.8 | na | 3.2 | 12.8 | na | 1.8 | 2.7 | na | 3.1 | 16.6 | 0.0 | 9.2 | 20.8 |
| Depression symptoms (any) | na | 21.0 | 40.1 | na | 8.8 | 26.9 | na | 4.3 | 13.7 | na | 10.6 | 30.9 | 0.0 | 16.6 | 35.4 |
| Referral indicated by provider (any) | 5.4 | 28.3 | 34.5 | 3.5 | 17.2 | 18.7 | 0.8 | 13.1 | 6.1 | 6.1 | 28.0 | 29.2 | 4.6 | 24.7 | 29.5 |
| Mental health referral indicated* | 0.6 | 4.4 | 11.3 | 0.3 | 2.1 | 5.1 | 0.0 | 0.9 | 0.8 | 0.1 | 2.9 | 7.4 | 0.5 | 3.5 | 9.3 |
| Medical visit following referral† | 95.3 | 97.2 | 32.5 | 78.9 | 74.9 | 32.2 | 51.4 | 61.4 | 31.0 | 78.3 | 61.9 | 28.0 | 92.5 | 89.3 | 32.3 |

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

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

**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, October 2007-September 2008

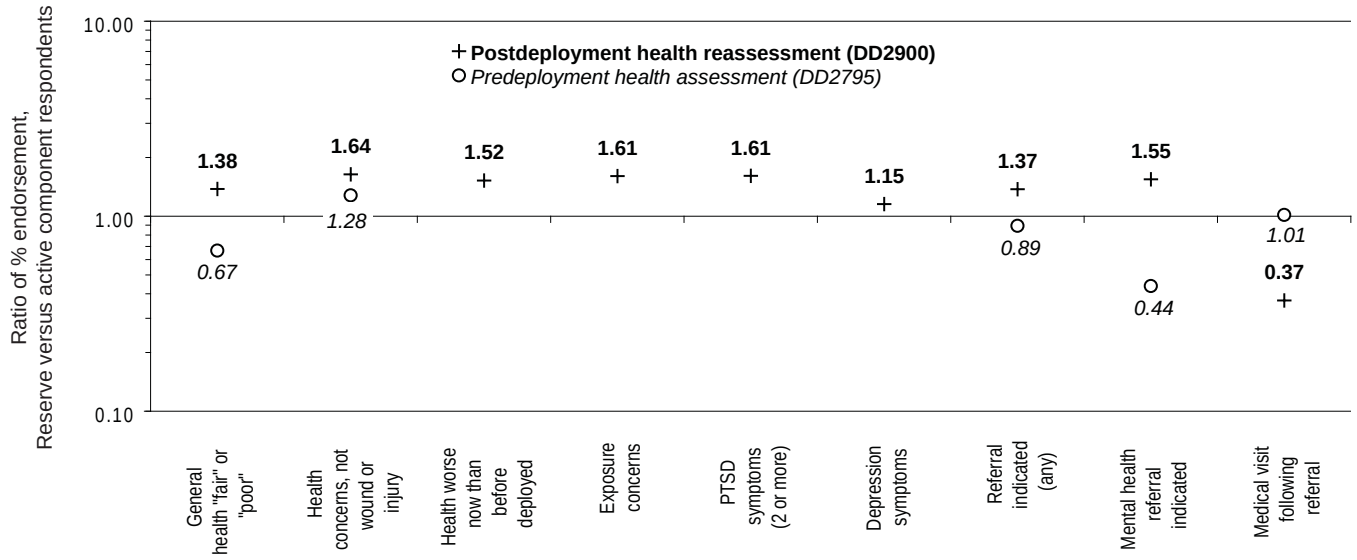
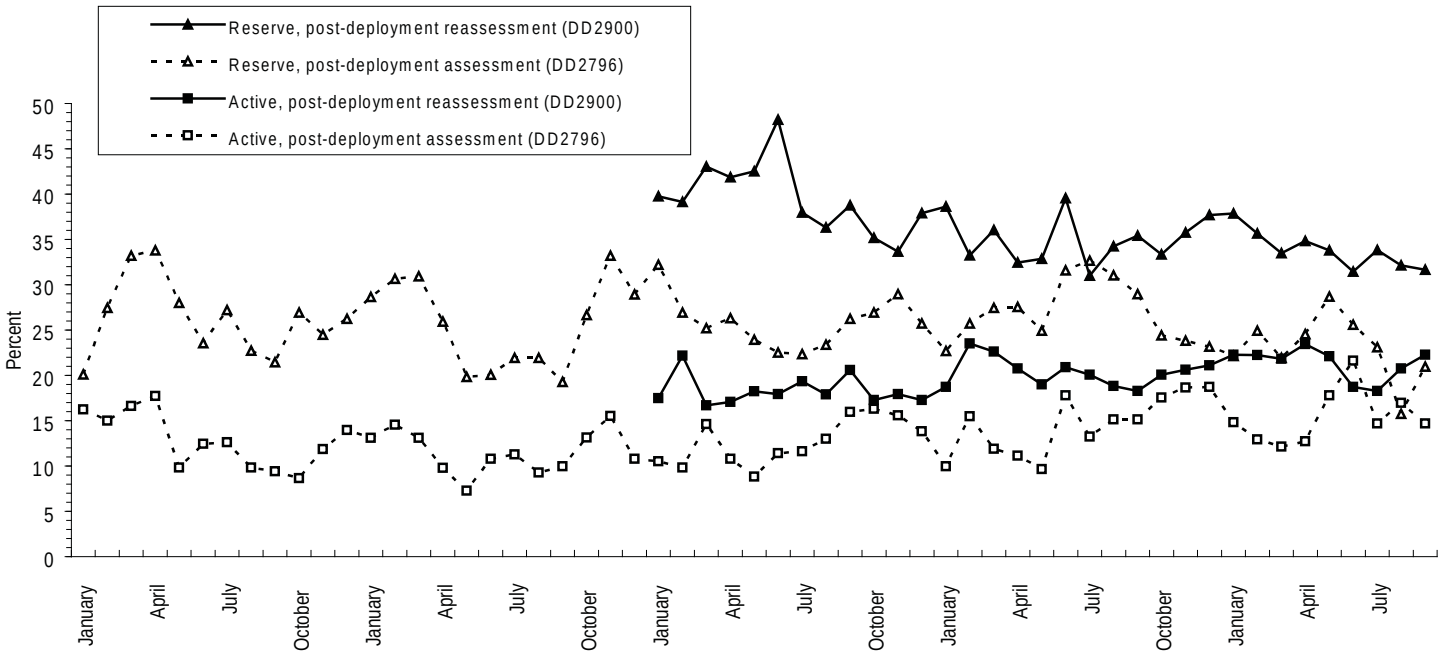



**Figure 7.** Proportion of service members who endorse exposure concerns on post-deployment health assessments, U.S. Armed Forces, January 2004-September 2008



# Sentinel reportable events for service members and beneficiaries at U.S. Army medical facilities, cumulative numbers* for calendar years through 30 September 2007 and 30 September 2008

Army

| 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 |
| **NORTH ATLANTIC** | | | | | | | | | | | | | | | | |
| Washington, DC area | 226 | 269 | . | 2 | 3 | 4 | 6 | 1 | 1 | 1 | . | . | 6 | 2 | 1 | 6 |
| Aberdeen, MD | 19 | 76 | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . |
| FT Belvoir, VA | 197 | 210 | 8 | 7 | 2 | . | 5 | 12 | 3 | 3 | . | . | . | . | 1 | . |
| FT Bragg, NC | 1,006 | 1,243 | 2 | . | . | . | 18 | 14 | 2 | . | . | . | . | . | . | . |
| FT Drum, NY | 185 | 217 | . | . | . | . | . | . | . | . | . | . | 2 | . | . | . |
| FT Eustis, VA | 156 | 480 | . | 1 | . | . | . | 1 | . | . | . | . | . | . | . | 1 |
| FT Knox, KY | 208 | 465 | 2 | 2 | . | . | 2 | 1 | 1 | . | . | . | 2 | . | . | . |
| FT Lee, VA | 287 | 259 | . | . | 1 | . | 1 | . | 1 | . | . | . | 2 | 4 | 1 | 1 |
| FT Meade, MD | 66 | 213 | . | . | . | 1 | 1 | . | . | 1 | . | . | . | . | . | . |
| West Point, NY | 31 | 85 | . | . | . | . | . | . | . | . | . | . | 3 | 1 | . | . |
| **GREAT PLAINS** | | | | | | | | | | | | | | | | |
| FT Sam Houston, TX | 442 | 612 | . | . | 1 | 1 | 4 | 8 | . | 12 | . | . | 4 | . | 6 | . |
| FT Bliss, TX | 132 | 425 | . | . | . | . | . | 11 | . | . | . | . | . | . | . | . |
| FT Carson, CO | 520 | 659 | 3 | 3 | 3 | 4 | 1 | 3 | . | . | . | . | . | 1 | . | . |
| FT Hood, TX | 1,682 | 1,795 | 10 | 6 | 3 | 3 | 9 | 30 | 9 | 5 | . | . | . | . | 1 | 2 |
| FT Huachuca, AZ | 87 | 81 | 1 | . | . | . | 6 | 1 | . | 2 | . | . | . | 1 | . | . |
| FT Leavenworth, KS | 45 | 40 | 1 | . | . | . | . | . | 2 | . | . | . | . | . | . | . |
| FT Leonard Wood, MO | 310 | 410 | . | 2 | 1 | 2 | 1 | 1 | 1 | 1 | . | . | . | 1 | 11 | 1 |
| FT Polk, LA | 191 | 149 | . | 1 | 3 | . | 5 | . | . | 1 | . | . | . | . | 1 | 1 |
| FT Riley, KS | 285 | 440 | 2 | 3 | . | 1 | 5 | 2 | . | . | . | . | . | 2 | 2 | . |
| FT Sill, OK | 150 | 177 | . | . | . | . | 2 | . | . | . | . | . | . | . | 1 | . |
| **SOUTHEAST** | | | | | | | | | | | | | | | | |
| FT Gordon, GA | 555 | 716 | . | 1 | . | . | 5 | 13 | . | 14 | . | . | 1 | 1 | . | 2 |
| FT Benning, GA | 324 | 328 | 1 | 2 | 1 | 1 | 3 | 5 | 1 | 1 | . | . | 1 | . | 1 | . |
| FT Campbell, KY | 587 | 256 | 1 | 1 | . | . | . | . | 2 | 2 | . | . | . | . | . | . |
| FT Jackson, SC | 265 | 274 | . | . | . | . | . | . | . | . | . | . | 1 | 1 | . | . |
| FT Rucker, AL | 74 | 68 | . | 1 | . | 2 | 1 | 4 | 13 | . | . | . | 1 | . | . | . |
| FT Stewart, GA | 832 | 688 | 2 | 3 | . | 1 | 19 | 22 | 9 | 1 | . | . | 2 | 7 | 2 | . |
| **WESTERN** | | | | | | | | | | | | | | | | |
| FT Lewis, WA | 598 | 952 | 3 | 9 | 4 | . | 1 | 3 | 1 | 2 | . | . | . | . | 1 | . |
| FT Irwin, CA | 77 | 67 | 1 | . | . | . | 2 | 3 | 1 | 1 | . | . | . | . | . | . |
| FT Wainwright, AK | 181 | 298 | . | 4 | . | . | 1 | 1 | . | . | . | . | . | . | . | . |
| **OTHER LOCATIONS** | | | | | | | | | | | | | | | | |
| Hawaii | 585 | 713 | 22 | 32 | 2 | 3 | 12 | 14 | . | 3 | . | . | 1 | 4 | . | . |
| Germany | 662 | 988 | 6 | 9 | 1 | 2 | 7 | 20 | 8 | 5 | . | . | . | 5 | 1 | 2 |
| Korea | 497 | 614 | . | . | . | . | . | 1 | . | . | . | . | . | . | 2 | 1 |
| Other | 0 | 0 | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| **Total** | **11,462** | **14,267** | **65** | **89** | **26** | **25** | **117** | **171** | **55** | **55** | **0** | **0** | **26** | **30** | **32** | **17** |

*Events reported by October 7, 2007 and 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* for calendar years through 30 September 2007 and 30 September 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 | 11 | 16 | 4 | 1 | 126 | 111 | 19 | 23 | 5 | 6 | . | . | . | . | . | 15 |
| Aberdeen, MD | . | 3 | . | . | 10 | 11 | 3 | 3 | . | . | . | . | . | . | . | . |
| FT Belvoir, VA | 1 | . | 1 | . | 139 | 122 | 20 | 10 | 2 | . | . | . | . | . | . | . |
| FT Bragg, NC | 1 | 1 | 4 | 9 | 675 | 798 | 116 | 168 | 2 | 1 | 59 | 60 | 1 | . | 122 | 100 |
| FT Drum, NY | 2 | 3 | 2 | . | 124 | 159 | 24 | 14 | . | . | . | . | . | . | . | . |
| FT Eustis, VA | 1 | . | . | . | 127 | 160 | 8 | 26 | . | 4 | . | . | . | . | 10 | 1 |
| FT Knox, KY | 1 | 2 | 1 | . | 165 | 163 | 25 | 37 | . | 2 | . | . | . | . | 2 | 2 |
| FT Lee, VA | 3 | 2 | . | 1 | 221 | 171 | 28 | 62 | 2 | 2 | . | . | 1 | . | 12 | 5 |
| FT Meade, MD | 1 | 1 | . | . | 53 | 46 | 8 | 4 | 1 | . | 1 | . | 1 | . | . | . |
| West Point, NY | 14 | 31 | . | . | 11 | 25 | . | . | . | . | . | . | . | . | . | . |
| **GREAT PLAINS** | | | | | | | | | | | | | | | | |
| FT Sam Houston, TX | 1 | . | . | 2 | 233 | 276 | 48 | 66 | 3 | 18 | . | . | . | 1 | 4 | 5 |
| FT Bliss, TX | . | . | . | . | 101 | 296 | 23 | 58 | 1 | 6 | . | . | . | . | . | . |
| FT Carson, CO | . | . | 1 | . | 363 | 475 | 51 | 47 | 1 | . | 10 | 13 | 1 | . | . | . |
| FT Hood, TX | 2 | 1 | 5 | 1 | 1,235 | 1,277 | 224 | 282 | 2 | 1 | 75 | 64 | . | . | 27 | . |
| FT Huachuca, AZ | . | 1 | . | . | 63 | 61 | 16 | 10 | 1 | . | . | . | . | 1 | . | 3 |
| FT Leavenworth, KS | 1 | 1 | . | . | 36 | 35 | 5 | 4 | . | . | . | . | . | . | . | . |
| FT Leonard Wood, MO | . | . | . | . | 208 | 150 | 31 | 17 | 1 | . | . | . | 2 | 3 | 20 | 7 |
| FT Polk, LA | . | . | 15 | . | 92 | 93 | 29 | 30 | 1 | 2 | . | . | . | . | 43 | 20 |
| FT Riley, KS | . | 4 | . | 1 | 204 | 267 | 19 | 30 | . | 1 | . | 1 | . | 1 | 19 | 8 |
| FT Sill, OK | . | . | 1 | . | 78 | 62 | 19 | 12 | 2 | . | . | . | 1 | . | 34 | 9 |
| **SOUTHEAST** | | | | | | | | | | | | | | | | |
| FT Gordon, GA | 1 | . | . | . | 401 | 388 | 75 | 87 | 4 | . | . | . | . | . | 6 | 1 |
| FT Benning, GA | . | . | 2 | . | 199 | 203 | 56 | 68 | . | 1 | . | . | 1 | . | 42 | 20 |
| FT Campbell, KY | . | 1 | . | . | 440 | 141 | 66 | 11 | . | 1 | . | . | . | . | 15 | 6 |
| FT Jackson, SC | . | . | . | . | 136 | 216 | 37 | 34 | 2 | 1 | . | 1 | . | . | 87 | 20 |
| FT Rucker, AL | . | 2 | . | . | 48 | 44 | 2 | 9 | 1 | 2 | . | . | . | . | 5 | 2 |
| FT Stewart, GA | . | 2 | . | 2 | 579 | 493 | 106 | 94 | 3 | 2 | 1 | . | . | . | 63 | 39 |
| **WESTERN** | | | | | | | | | | | | | | | | |
| FT Lewis, WA | . | . | 3 | 5 | 512 | 769 | 60 | 80 | . | 1 | 8 | 14 | . | . | . | . |
| FT Irwin, CA | 1 | . | 1 | . | 45 | 43 | 5 | 9 | . | . | . | . | . | . | 18 | 11 |
| FT Wainwright, AK | . | 1 | . | . | 146 | 210 | 9 | 27 | . | 1 | . | . | 10 | 12 | . | 1 |
| **OTHER LOCATIONS** | | | | | | | | | | | | | | | | |
| Hawaii | 1 | . | . | 1 | 443 | 531 | 44 | 59 | . | . | . | 1 | . | . | 3 | 2 |
| Germany | 19 | 30 | 7 | 14 | 398 | 571 | 128 | 119 | 2 | 7 | 3 | . | . | 8 | 34 | 18 |
| Korea | . | . | 11 | . | 407 | 529 | 47 | 65 | 1 | 4 | 1 | . | 20 | . | 8 | 4 |
| Other | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| **Total** | **61** | **102** | **58** | **37** | **8,018** | **8,896** | **1,351** | **1,565** | **37** | **63** | **158** | **154** | **38** | **26** | **574** | **299** |

‡Primary and secondary.

§Urethritis, non-gonococcal (NGU).

# Sentinel reportable events for service members and beneficiaries at U.S. Navy medical facilities, cumulative numbers* for calendar years through 30 September 2007 and 30 September 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 | 31 | . | 1 | . | . | . | 1 | . | . | . | . | . | . | . | . |
| Bethesda, MD | 36 | 91 | 1 | 2 | . | 1 | 2 | 8 | . | . | . | . | 1 | 1 | . | . |
| Patuxent River, MD | 14 | 19 | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| **NAVY MEDICINE EAST** | | | | | | | | | | | | | | | | |
| Albany, GA | 0 | 3 | . | . | . | . | . | . | . | . | . | . | . | 2 | . | . |
| Atlanta, GA | 3 | 5 | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| Beaufort, SC | 262 | 81 | . | . | . | . | . | 1 | 1 | . | . | . | . | . | . | . |
| Camp Lejeune, NC | 293 | 329 | . | . | . | . | 5 | 11 | . | . | . | . | . | . | . | . |
| Cherry Point, NC | 135 | 145 | . | . | . | . | 2 | 4 | . | . | . | . | . | . | 3 | . |
| Great Lakes, IL | 170 | 476 | . | . | 1 | . | 3 | . | . | . | . | . | . | 7 | . | 1 |
| Jacksonville, FL | 201 | 116 | 1 | . | . | . | 13 | 20 | 5 | 1 | . | . | . | 1 | . | 2 |
| Mayport, FL | 24 | 66 | 1 | . | . | . | 4 | 12 | . | 2 | . | . | . | . | . | . |
| NABLC Norfolk, VA | 64 | 111 | . | . | . | . | . | . | . | 2 | . | . | . | . | . | . |
| NBMC Norfolk, VA | 346 | 275 | . | . | . | . | . | . | . | . | . | . | . | 1 | . | . |
| NEHC Norfolk, VA | 4 | 0 | . | . | . | . | . | . | . | . | . | . | . | . | 2 | . |
| North Charleston, SC | 3 | 36 | . | . | . | . | . | 1 | . | 1 | . | . | . | . | . | . |
| Pensacola, FL | 84 | 90 | . | 1 | 3 | . | 5 | 4 | 3 | 1 | . | . | . | . | 5 | . |
| Portsmouth, VA | 0 | 43 | . | . | . | . | . | . | . | . | . | . | . | 2 | . | . |
| Washington, DC | 6 | 9 | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . |
| Guantanamo Bay, Cuba | 4 | 8 | . | . | . | 1 | 1 | . | . | . | . | . | . | . | . | . |
| Europe | 22 | 69 | . | 5 | . | . | . | 3 | . | . | . | . | . | 1 | . | . |
| **NAVY MEDICINE WEST** | | | | | | | | | | | | | | | | |
| Camp Pendleton, CA | 13 | 167 | . | 2 | . | 1 | 1 | 3 | . | 1 | . | . | . | . | . | . |
| Corpus Christi, TX | 4 | 3 | . | . | . | . | . | . | . | 1 | . | . | . | . | . | . |
| Fallon, NV | 0 | 8 | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| Ingleside, TX | 4 | 2 | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| Lemoore, CA | 1 | 27 | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| Pearl Harbor, HI | 0 | 88 | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| San Diego, CA | 335 | 340 | 3 | . | 2 | . | 3 | 2 | 2 | 1 | . | . | 28 | 14 | . | 1 |
| Guam | 31 | 61 | . | . | . | . | 1 | . | . | . | . | . | . | . | . | 2 |
| Japan | 72 | 116 | . | . | . | 1 | . | . | . | . | . | . | . | 2 | 1 | . |
| **NAVAL SHIPS** | | | | | | | | | | | | | | | | |
| COMNAVAIRLANT/CINCLANTFLEET | 10 | 2 | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| COMNAVSURFPAC/CINCPACFLEET | 29 | 45 | . | . | . | . | . | 2 | . | . | . | . | . | . | 1 | . |
| **OTHER LOCATIONS** | | | | | | | | | | | | | | | | |
| Other | 29 | 462 | . | 1 | . | . | 4 | 6 | . | . | . | . | . | 1 | . | 2 |
| **Total** | **2,199** | **3,324** | **6** | **12** | **6** | **5** | **44** | **78** | **11** | **10** | **0** | **0** | **29** | **32** | **12** | **8** |

*Events reported by October 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* for calendar years through 30 September 2007 and 30 September 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 | . | 6 | . | . | . | 16 | . | 1 | . | . | . | . | . | . | . | 1 |
| Bethesda, MD | 4 | 8 | . | 2 | 21 | 49 | 2 | 6 | 1 | 1 | . | . | . | . | . | . |
| Patuxent River, MD | . | 3 | . | . | 13 | 13 | . | 1 | . | . | . | . | . | . | . | . |
| **NAVY MEDICINE EAST** | | | | | | | | | | | | | | | | |
| Albany, GA | . | . | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . |
| Atlanta, GA | . | . | . | . | 1 | 4 | 1 | 1 | 1 | . | . | . | . | . | . | . |
| Beaufort, SC | . | 1 | . | . | 177 | 10 | 18 | . | 2 | . | . | . | . | . | 57 | 67 |
| Camp Lejeune, NC | 12 | . | 1 | . | 226 | 167 | 30 | 47 | . | . | . | 38 | . | . | 17 | 63 |
| Cherry Point, NC | . | 1 | . | . | 112 | 98 | 7 | 19 | 1 | . | . | . | . | . | 3 | 4 |
| Great Lakes, IL | . | . | . | . | 143 | 425 | 16 | 38 | . | 2 | . | . | . | . | . | . |
| Jacksonville, FL | . | . | . | . | 135 | 62 | 22 | 4 | 2 | 2 | . | . | . | . | 8 | . |
| Mayport, FL | . | . | . | . | 16 | 39 | . | 5 | 1 | . | . | . | . | . | . | . |
| NABLC Norfolk, VA | . | . | . | 1 | 56 | 87 | 8 | 21 | . | . | . | . | . | . | . | . |
| NBMC Norfolk, VA | . | 1 | . | . | 285 | 223 | 59 | 43 | . | 1 | . | . | . | . | . | . |
| NEHC Norfolk, VA | . | . | . | . | 2 | . | . | . | . | . | . | . | . | . | . | . |
| North Charleston, SC | . | 1 | . | . | 3 | 25 | . | 3 | . | 1 | . | . | . | . | . | 1 |
| Pensacola, FL | . | . | . | . | 47 | 60 | 5 | 6 | . | . | . | . | . | . | 12 | 10 |
| Portsmouth, VA | . | . | . | . | . | 26 | . | 11 | . | 1 | . | . | . | . | . | . |
| Washington, DC | . | 1 | . | . | 5 | 7 | . | . | 1 | . | . | . | . | . | . | . |
| Guantanamo Bay, Cuba | . | . | . | . | 3 | 7 | . | . | . | . | . | . | . | . | . | . |
| Europe | . | . | . | 1 | 21 | 56 | 1 | 3 | . | . | . | . | . | . | . | . |
| **NAVY MEDICINE WEST** | | | | | | | | | | | | | | | | |
| Camp Pendleton, CA | . | . | . | . | 10 | 136 | 1 | 18 | 1 | . | . | . | . | . | . | . |
| Corpus Christi, TX | . | . | . | . | 3 | . | 1 | 2 | . | . | . | . | . | . | . | . |
| Fallon, NV | . | . | . | . | . | 8 | . | . | . | . | . | . | . | . | . | . |
| Ingleside, TX | . | . | . | . | 4 | 2 | . | . | . | . | . | . | . | . | . | . |
| Lemoore, CA | . | 2 | . | . | . | 16 | . | . | . | . | . | . | . | . | . | . |
| Pearl Harbor, HI | . | . | . | . | . | 81 | . | 3 | . | 1 | . | . | . | . | . | . |
| San Diego, CA | 1 | 3 | . | 1 | 217 | 259 | 36 | 28 | 5 | 3 | . | . | . | . | . | 1 |
| Guam | . | . | . | 3 | 25 | 41 | 4 | 13 | . | . | . | . | . | . | . | . |
| Japan | . | . | . | 1 | 52 | 87 | 10 | 15 | . | . | . | . | . | . | 6 | 5 |
| **NAVAL SHIPS** | . | | | | | | | | | | | | | | | |
| COMNAVAIRLANT/CINCLANTFLEET | . | . | . | . | 8 | 2 | 2 | . | . | . | . | . | . | . | . | . |
| COMNAVSURFPAC/CINCPACFLEET | . | . | . | . | 18 | 27 | 9 | 9 | . | . | . | 7 | . | . | 1 | . |
| **OTHER LOCATIONS** | | | | | | | | | | | | | | | | |
| Other | 1 | 26 | 1 | 3 | 17 | 306 | 5 | 33 | 1 | 4 | . | . | . | 1 | . | 53 |
| **Total** | **18** | **53** | **2** | **12** | **1,620** | **2,340** | **237** | **330** | **16** | **16** | **0** | **45** | **0** | **1** | **104** | **205** |

‡Primary and secondary.

§Urethritis, non-gonococcal (NGU).

# Sentinel reportable events for service members and beneficiaries at U.S. Air Force medical facilities, cumulative numbers* for calendar years through 30 September 2007 and 30 September 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 | 1,234 | 1,297 | 2 | 2 | 2 | 3 | 7 | 13 | . | 4 | . | . | 9 | 28 | 6 | 3 |
| Air Education & Training Cmd | 585 | 737 | 1 | 1 | 1 | 5 | 14 | 9 | 5 | 1 | . | . | 4 | 1 | 9 | 7 |
| Lackland, TX | 0 | 0 | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| USAF Academy, CO | 42 | 31 | . | 1 | . | . | 2 | . | . | . | . | . | . | . | . | . |
| Air Force Dist. of Washington | 26 | 23 | . | . | . | . | . | . | 1 | . | . | . | 1 | . | . | . |
| Air Force Materiel Cmd | 447 | 571 | . | 2 | 2 | 1 | 17 | 7 | 2 | 8 | . | . | . | . | 2 | . |
| Air Force Special Ops Cmd | 138 | 211 | . | . | . | . | . | 3 | 1 | . | . | . | . | 3 | . | . |
| Air Force Space Cmd | 295 | 362 | 2 | 1 | 2 | 2 | 7 | 6 | 1 | 1 | . | . | 2 | 2 | 1 | 1 |
| Air Mobility Cmd | 570 | 828 | 1 | 1 | 1 | 2 | 10 | 7 | 2 | 2 | . | . | 4 | 7 | 2 | 8 |
| Pacific Air Forces | 433 | 457 | 1 | 7 | 2 | 4 | 4 | 4 | 1 | . | . | . | 5 | 8 | 10 | 3 |
| PACAF Korea | 116 | 161 | . | . | . | . | . | . | . | . | . | . | 6 | 1 | 1 | . |
| U.S. Air Forces in Europe | 215 | 341 | 3 | 1 | . | . | . | 7 | 1 | . | . | . | 1 | 3 | . | 1 |
| Other | 633 | 731 | 4 | 4 | 2 | 5 | 9 | 14 | . | 8 | . | . | 2 | 1 | 1 | 1 |
| **Total** | **4,734** | **5,750** | **14** | **20** | **12** | **22** | **70** | **70** | **14** | **24** | **0** | **0** | **34** | **54** | **32** | **24** |

*Events reported by October 7, 2008

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

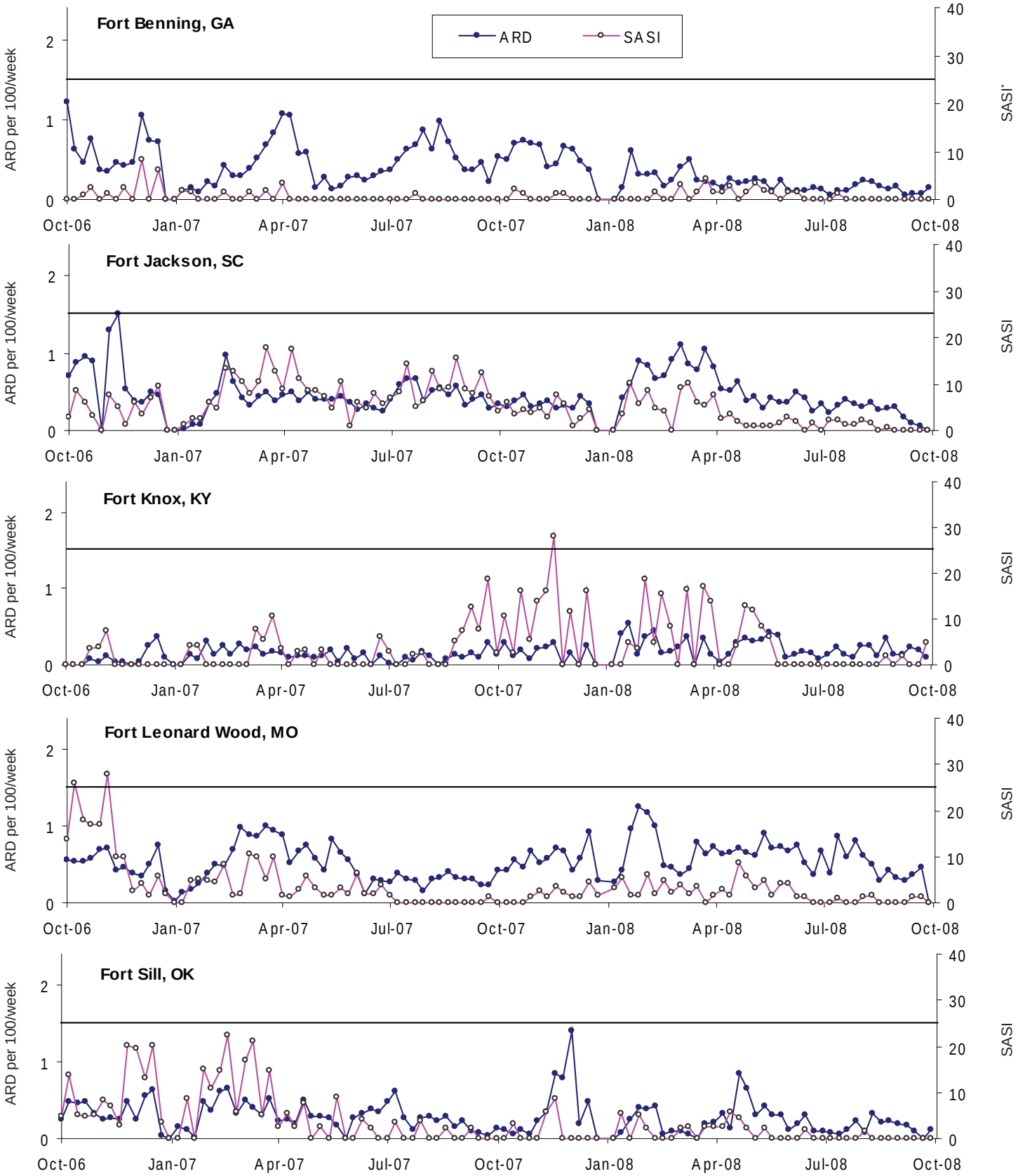
Note: Completeness and timeliness of reporting vary by facility

| 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 | 10 | 3 | . | . | 813 | 788 | 66 | 65 | 2 | 2 | 3 | 3 | . | 4 | 6 | . |
| Air Education & Training Cmd | 2 | 4 | . | . | 451 | 454 | 59 | 41 | . | 5 | . | . | 1 | 1 | 1 | 3 |
| Lackland, TX | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| USAF Academy, CO | . | . | . | . | 35 | 28 | 3 | . | . | . | . | . | . | 1 | . | . |
| Air Force Dist. of Washington | . | 1 | . | . | 23 | 15 | 1 | 1 | . | . | . | . | . | . | . | . |
| Air Force Materiel Cmd | 7 | 9 | 1 | 1 | 352 | 358 | 46 | 51 | 1 | 3 | . | . | . | . | . | . |
| Air Force Special Ops Cmd | . | 1 | . | 1 | 109 | 165 | 16 | 27 | . | 1 | . | . | . | . | 12 | . |
| Air Force Space Cmd | 1 | 5 | . | . | 251 | 256 | 20 | 14 | 1 | . | . | . | . | . | . | . |
| Air Mobility Cmd | 6 | 7 | . | . | 477 | 570 | 34 | 64 | 3 | 4 | . | . | . | 4 | 3 | 7 |
| Pacific Air Forces | 2 | . | 1 | . | 358 | 369 | 24 | 23 | . | 1 | . | . | 1 | 1 | . | . |
| PACAF Korea | . | . | . | . | 84 | 132 | 5 | 4 | 4 | . | . | . | 2 | . | 1 | . |
| U.S. Air Forces in Europe | 3 | 10 | . | 2 | 165 | 256 | 13 | 28 | . | . | . | . | . | . | . | . |
| Other | 2 | 6 | . | . | 554 | 587 | 35 | 39 | 2 | 1 | . | . | . | . | . | 8 |
| **Total** | **33** | **46** | **2** | **4** | **3,672** | **3,978** | **322** | **357** | **13** | **17** | **3** | **3** | **4** | **11** | **23** | **18** |

‡Primary and secondary.

§Urethritis, non-gonococcal (NGU).

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




* 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

NOTICE TO READERS

# New Surveillance Case Definitions for Traumatic Brain Injury (TBI)

In each issue of the *MSMR*, numbers of cases of selected deployment-related conditions of special surveillance interest are summarized, by month and Service, in a series of histograms. Since August 2007, traumatic brain injury (TBI) has been included as a condition of special interest for the *MSMR*.

In recent months, there has been increasing interest and concern — including in the Departments of Defense, Veterans Affairs, and Health and Human Services — regarding "traumatic brain injury" among U.S. service members who have served in Afghanistan and Iraq.[1] Collaborations among policy makers and medical experts from all Services and various agencies — most notably, the Defense and Veterans Brain Injury Center Working Group, the Traumatic Brain Injury Task Force, and the Defense Centers of Excellence for Psychological Health and Traumatic Brain Injury — have resulted in a standardized case definition for surveillance of TBI. The "new" surveillance case definition differs from the definition that has been used for tracking TBI in the MSMR. The differences in case defining diagnosis (ICD-9-CM) codes between the "new" and "old" definitions are shown in the table below.

| ICD-9-CM code | Description | Old definition | New definition |
|---|---|---|---|
| 310.2 | Postconcussion syndrome | | x |
| 800-801 | Fracture, vault or base of skull | x | x |
| 802 | Fracture of face bones | x | |
| 803-804 | Other/multiple fractures of skull | x | x |
| 850-854 | Intracranial injury w/o with skull fracture | x | x |
| 950.1-950.3 | Injury to optic chiasm, optic pathways, visual cortex | | x |
| 959.01 | Head injury, unspecified | x | x |
| V15.5_1-9, V15.5_A-F | Personal history of TBI | | x |

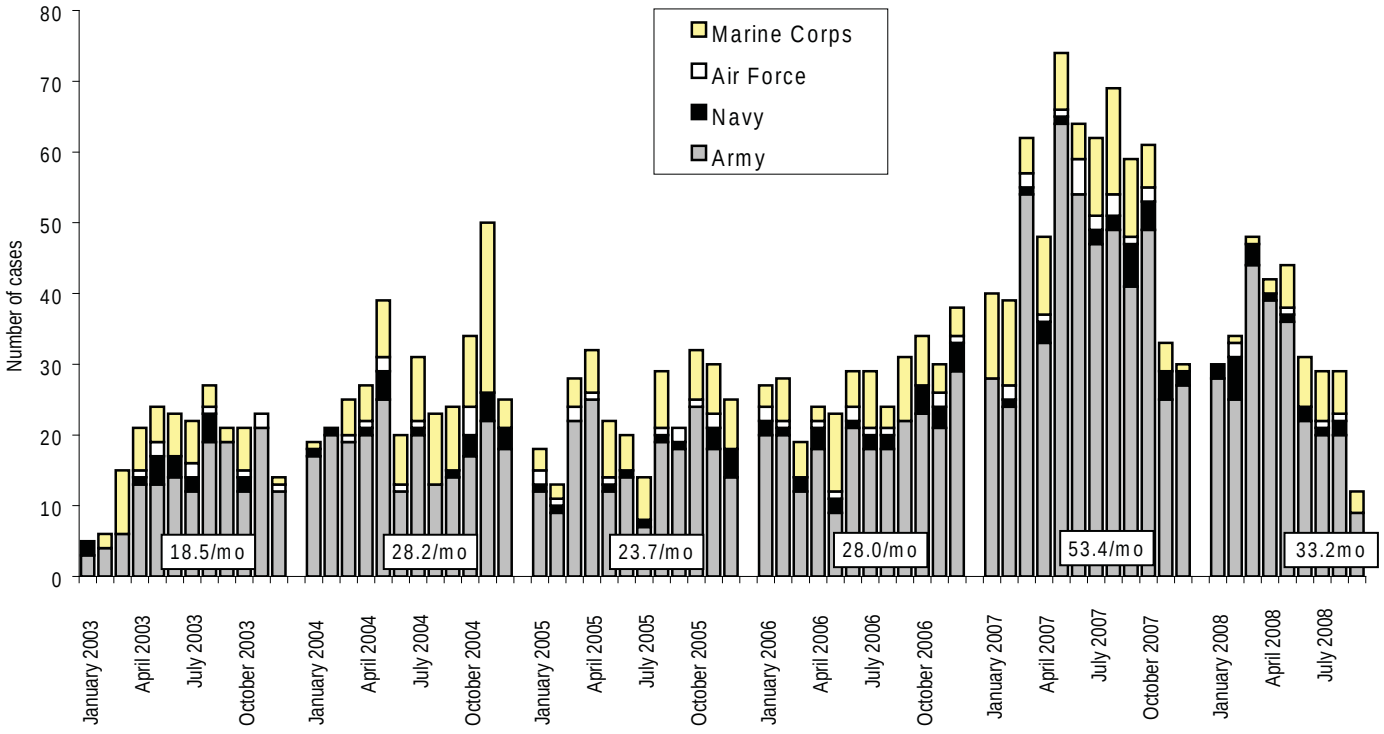
The most significant differences between the "old" and "new" surveillance case definitions are a) the new definition does not include ICD-9-CM: 802 "fracture of face bones"; and b) the old definition did not include ICD-9-CM: V15.5 "history of injury." Compared to the "old" definition, the "new" surveillance case definition significantly increases the numbers of TBI cases ascertained for routine surveillance. The figures in the following section are based on the "new" surveillance case definition of TBI.

## References:

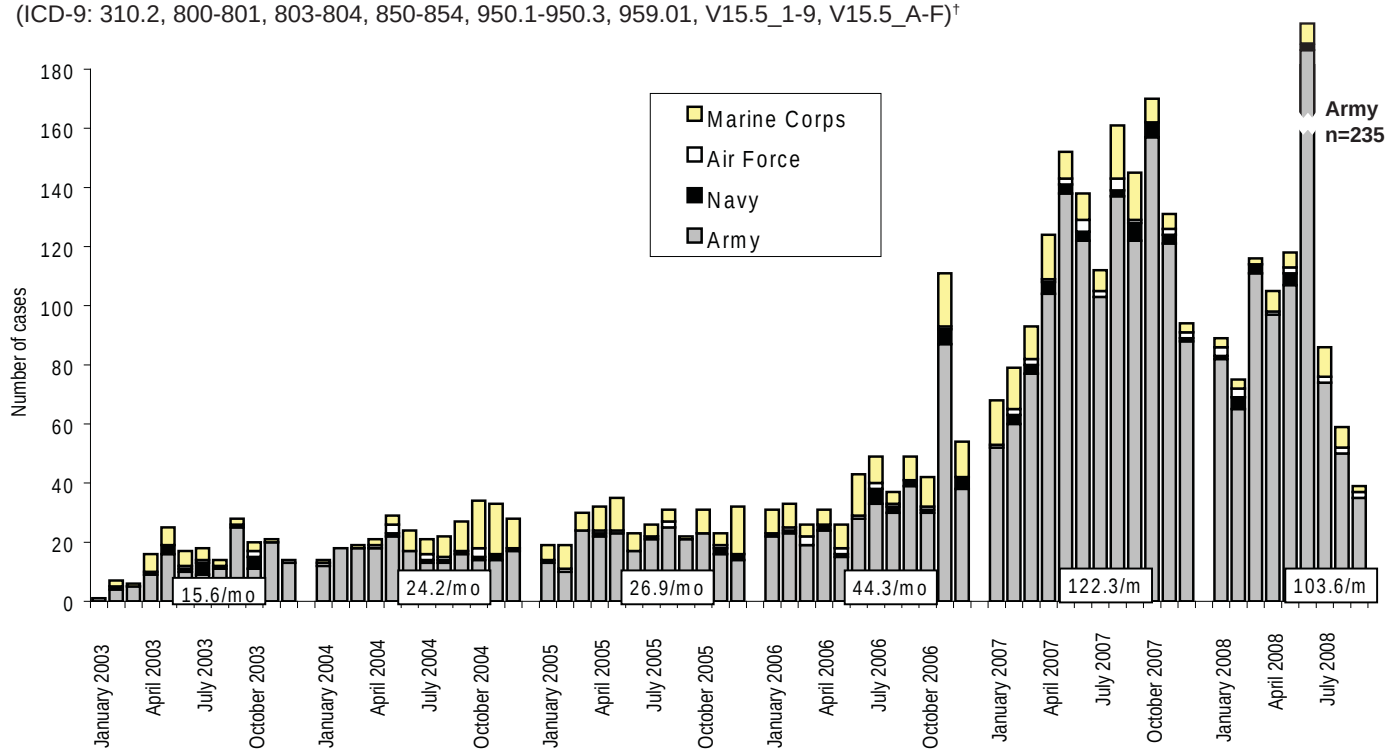
1. Bradshaw D, et al. Report to the Surgeon General: Traumatic Brain Injury Task Force, dated 15 May 2007. The Surgeon General, Department of the Army. Washington, Dc. Accessed on-line on 28 October 2008 at: http://www.armymedicine.army.mil/reports/tbi/TBITaskForceReportJanuary2008.pdf

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

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




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



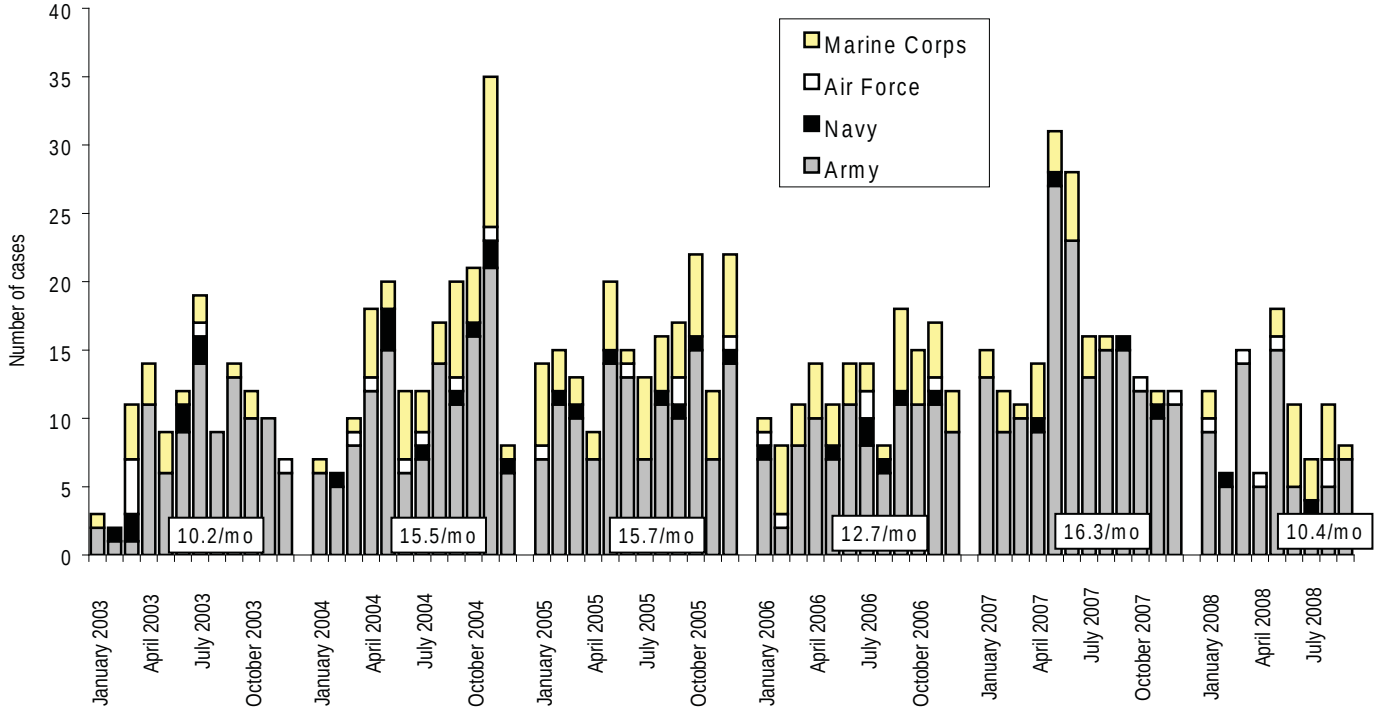

Reference: Army Medical Surveillance Activity. Traumatic brain injury among members of active components, U.S. Armed Forces, 2002-2007. *MSMR*. Aug 2007; 14(5):2-6.

*Indicator diagnosis (one per individual) during a hospitalization while deployed to/within 30 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.

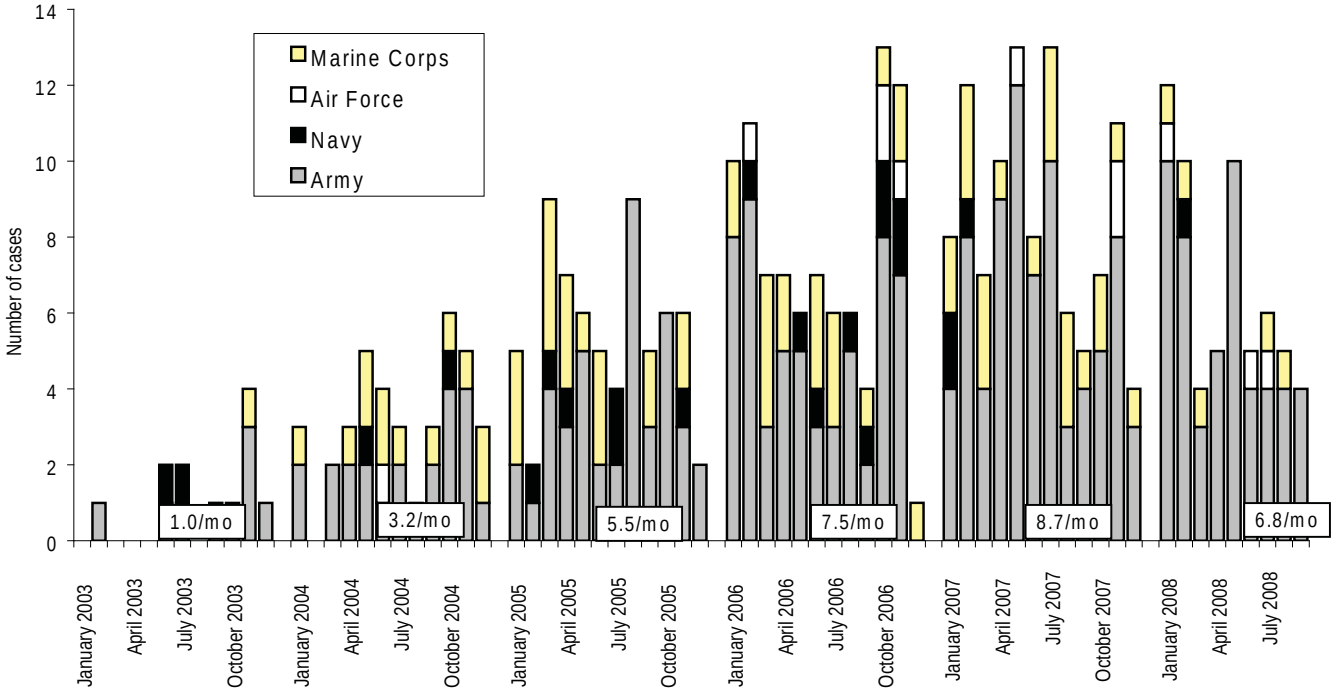
# Deployment-related conditions of special surveillance interest, U.S. Armed Forces, by month and service, January 2003 - September 2008

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




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.

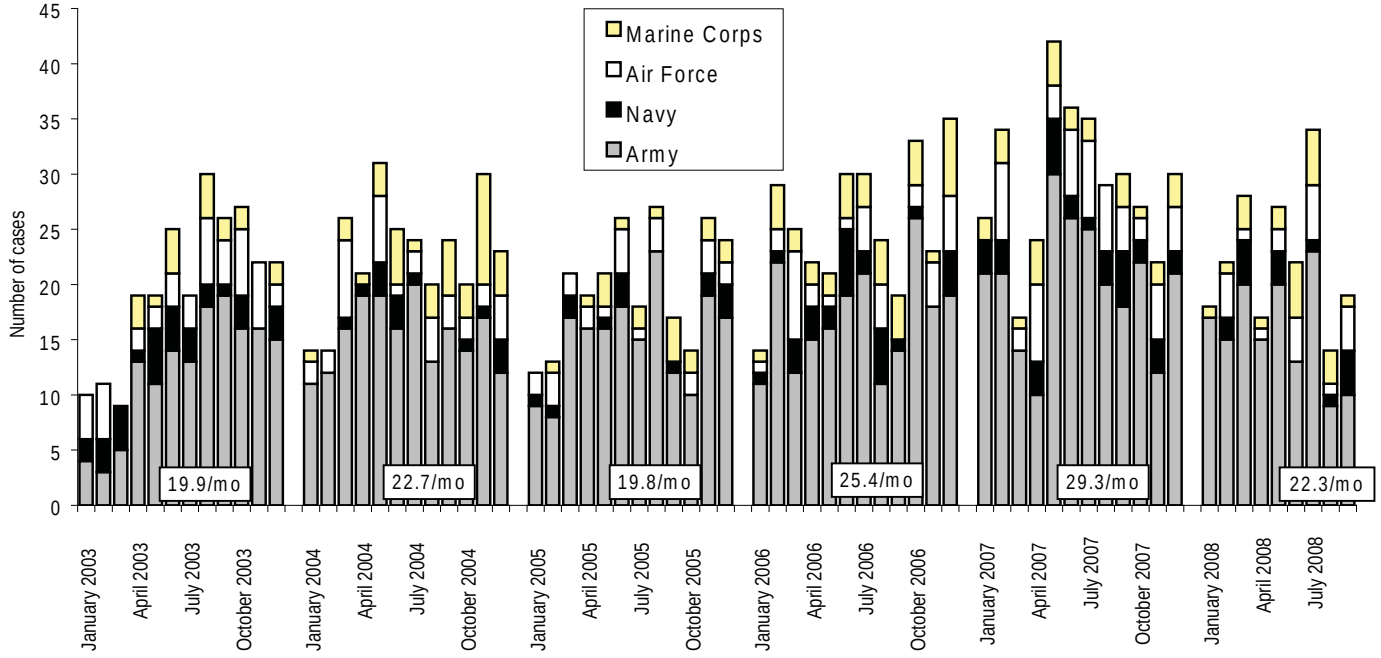
Heterotopic ossification (ICD-9: 728.12, 728.13, 728.19)†




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.

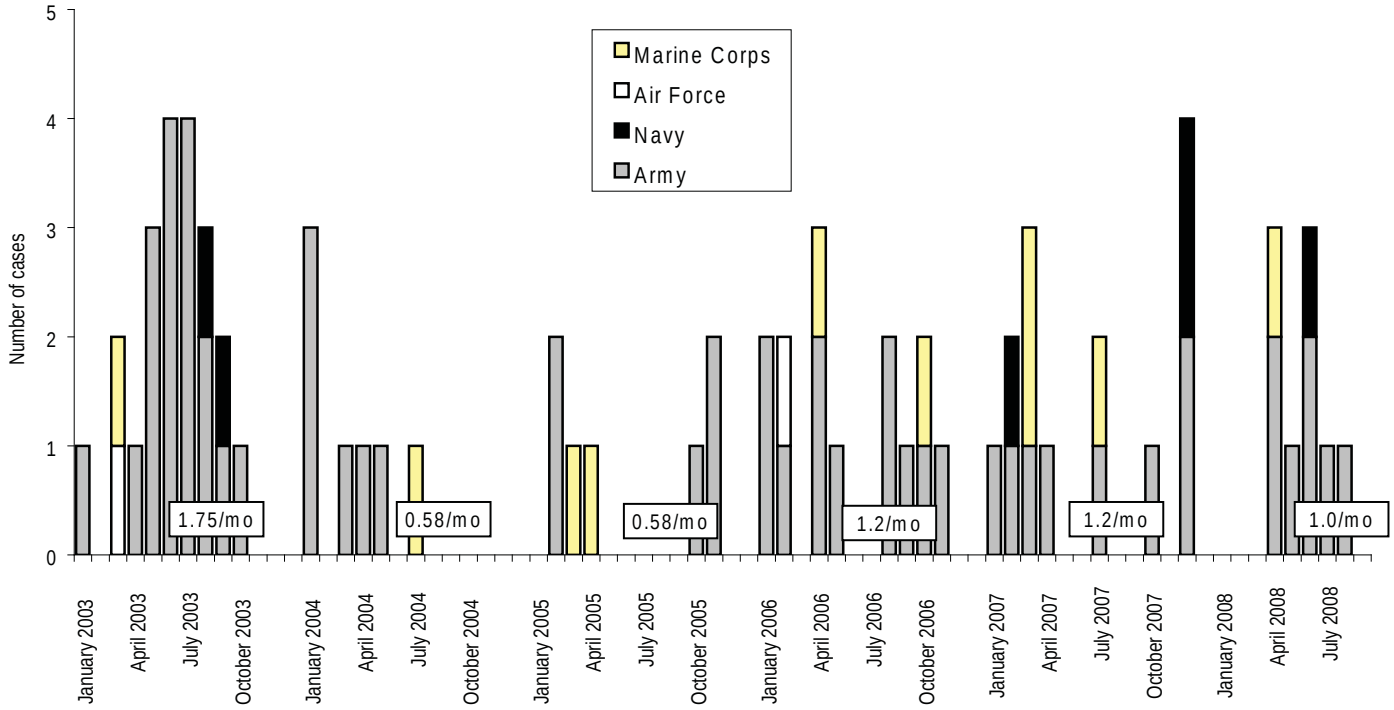
# Deployment-related conditions of special surveillance interest, U.S. Armed Forces, by month and service, January 2003 - September 2008

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.

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

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