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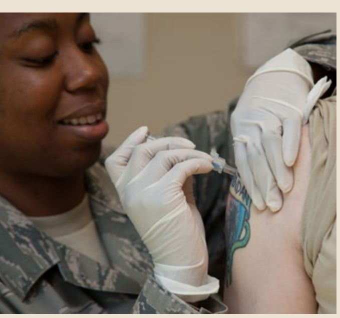

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Chikungunya Infection in DoD Healthcare Beneficiaries Following the 2013 Introduction of the Virus into the Western Hemisphere, 1 January 2014 to 28 February 2015

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The introduction and rapid spread of chikungunya virus (CHIKV) into the Western Hemisphere after December 2013 pose a potentially significant risk to Department of Defense (DoD) personnel, operations, and the military healthcare system. This report describes the DoD experience with CHIKV between January 2014 and February 2015 using case reports in the Defense Medical Surveillance System's (DMSS) Reportable Medical Events database and the Navy and Marine Corps Public Health Center's laboratory test results database. Case finding identified 157 confirmed cases; of these, 118 (75.2%) were either active or reserve component service members and 39 (24.8%) were other beneficiaries. Exposure locations were known for 117 (74.5%) of all cases, and of these, 113 (96.6%) reported likely exposures in the Western Hemisphere; 85 (75.2%) of those cases occurred in Puerto Rico. Although historical data on CHIKV in DoD populations are scant, introduction of CHIKV into the Western Hemisphere with ongoing transmission appears to have resulted in a significant increase in the number of cases among DoD healthcare beneficiary populations.

The rapid spread of chikungunya virus (CHIKV) in the Western Hemisphere since its introduction poses potentially significant risks to Department of Defense (DoD) personnel, operations, and the military healthcare system. The associated risks reflect the potential impacts of acute illnesses and short- and long-term sequelae associated with CHIKV infections. This report summarizes the DoD experience with CHIKV during a 14-month period after introduction of the virus into the Americas.

Chikungunya fever is caused by infection with the CHIKV, an alphavirus of the Togaviridae family. The virus is usually transmitted to humans via the bite of an infected mosquito of the genus *Aedes* (*A. aegypti* or *A. albopictus*). Acute disease is primarily characterized by sudden onset of high fever (102˚F or higher) and severe joint pain (often hands and feet). Other signs and symptoms commonly reported include rash, headache, diffuse back pain, myalgia, vomiting, and conjunctivitis. The acute phase lasts 3–10 days. Older adults and young children (especially infants) are at higher risk of severe and atypical disease. Encephalitis is possible, as well as other rare complications. Fatalities are uncommon in the absence of comorbidities. Long-lasting immunity seems to result after recovery from the infection.[1–3] There is no vaccine available to prevent illness due to CHIKV infection.

Several studies have reported persistent and chronic joint pains lasting months to years after the resolution of acute chikungunya fever. Surveys from La Réunion, a French protectorate in the Indian Ocean off the east coast of Africa, found that as many as 80%–93% of patients complained of persistent symptoms 3 months after disease onset; this proportion decreased to 57% at 15 months and to 47% at 2 years.[4] The most common persistent symptom was inflammatory arthralgia in the same joints that were affected during the acute stages.[5] Many patients went on to develop long-lasting rheumatism, fatigue, and depression resulting in an impaired quality of life for months to years.[6]

The virus was first identified in Tanzania in 1953, but epidemics of illnesses resembling chikungunya fever were reported at least as early as the 1770s. Through the 1990s, sporadic outbreaks were recognized in endemic areas of Africa and both Southwest and Southeast Asia.[7,8]

Since 2004, explosive outbreaks have been reported beyond the known endemic areas. From spring 2004 through summer 2006, an outbreak originating in Kenya spread to Comoros, La Réunion, and several other Indian Ocean islands, resulting in an estimated 500,000 cases.[2]

In 2006, the epidemic spread to India where large outbreaks occurred in 17 of the country's 28 states, resulting in more than 1.39 million cases.[9] A case from India was imported into Italy in 2007 and led to 337 cases before the outbreak was brought under control.[10] Since then, sporadic outbreaks have occurred throughout Africa and Asia.[2] Between 1995 and 2009, the U.S. recorded 109 travel-related cases; all but three were reported between 2006 and 2009 during and after the large Indian and Indian Ocean outbreaks.[11]

During the recent outbreaks in Asia and Africa, travel-related cases of chikungunya fever were detected in the Caribbean (Martinique) and French Guiana; however, there was no recognized local transmission in these locations.[12] In December 2013, the first recognized local transmission of the virus in the Americas was reported from the French territory of Saint Martin; the cases had occurred in October. As of 28 August 2015, 45 tropical and subtropical countries or territories in North, Central, and South America had recorded more than 1.7 million suspected, probable, or confirmed cases.[13–15] CDC's ArboNet recorded 3,061 travel-related cases in the U.S. between 1 January 2014 and 18 August 2015.[16,17] In 2014, four counties in South Florida recorded 11 autochthonous cases.[18]

During the Vietnam conflict, chikungunya fever, along with dengue and Japanese encephalitis, were considered significant arthropod-borne viral disease threats to U.S. forces. Limited laboratory diagnostics complicated specific diagnosis of the disease, especially in the early years of the conflict. Evidence of CHIKV infection was identified in two of five studies that tried to characterize the causes of fevers of unknown origin (FUO), a significant cause of morbidity, in U.S. service members in Vietnam. In one study, CHIKV was identified in 10 (9%) of 110 FUO cases.[19] In the second study, it was identified in 1 of 94 FUO cases.[20] The other three studies found no laboratory evidence for CHIKV infection among 688 FUO cases.[21,22]

Since the Vietnam conflict, the U.S. military has considered chikungunya to be a threat to U.S. personnel and operations, mainly because of the virus's potential for rapid epidemic spread among immunologically naïve populations, such as U.S. military members. However, surveillance of chikungunya in the U.S. military has been hindered by the lack of a specific diagnosis code for the illness in the International Classification of Diseases, 9th revision (ICD-9), the system that is used to document discharge diagnoses after hospitalizations and ambulatory visits of U.S. military members. The lack of a case-defining diagnosis code in electronic medical records of service members has made retrospective case finding difficult. In addition, until autochthonous transmission was established in the Western Hemisphere, chikungunya fever was not a reportable medical event (RME) in the Military Health System (MHS). Not surprisingly, there have been no published studies since 1969 of chikungunya fever epidemiology in U.S. military personnel.

METHODS

The DoD healthcare beneficiaries study population was all DoD health beneficiaries diagnosed with acute chikungunya fever between 1 January 2014 and 28 February 2015. Cases were identified through the Defense Medical Surveillance System's (DMSS) Reportable Medical Events (RME) database and the Navy and Marine Corps Public Health Center's laboratory test results database. During most of the study period (until 23 February 2015), chikungunya cases were recorded in the RME database as "Any Other Condition" with chikungunya noted in the comment field. Specific coding for "Chikungunya Fever" was added for reportable events after that date.

Each case-defining record in the RME dataset contains a comment field. The comment fields of all chikungunya case-defining records were reviewed to identify the likely locations of CHIKV exposures and the reasons for travel to areas of ongoing CHIKV transmission.

In general, a confirmed case had signs and symptoms consistent with chikungunya fever and at least one positive confirmatory laboratory test. A positive reverse transcriptase–polymerase chain reaction (RT-PCR), viral culture, IgM, IgG, or neutralizing antibody test, as defined by the U.S. Centers for Disease Control and Prevention (CDC), was needed to record the case as confirmed. The U.S. Army Medical Research Institute of Infectious Disease and the Navy Medical Research Center were able to perform diagnostic RT-PCR and viral culture. State or commercial laboratory results were used for serologic assays.

Once the confirmed RME and laboratory cases were identified, they were matched to personnel records to collect demographic data. Identification of possible cases of prolonged or chronic disease among chikungunya fever cases was done by identifying all in- and outpatient encounters with at least one of the ICD-9 codes listed in **Table 1**. Codes of interest could appear in any of the diagnosis fields on standardized records that document all ambulatory visits or hospitalizations of beneficiaries of the MHS. DMSS records were searched for in- and outpatient encounters with diagnoses of joint pain or malaise/fatigue occurring up to 1 year prior to the patient's CHIKV diagnosis and up to 90 days following diagnosis. The final analysis looked only at those chikungunya cases with at least 90 days post-diagnosis follow-up time available and compared encounters in that interval to encounters in the 90 days prior to the date of the chikungunya diagnoses. De-identified data were provided to the investigators who performed the analysis.

TABLE 1. ICD-9 codes searched to identify pre- and post-chikungunya diagnosis encounters for persistent disease

ICD-9 code	Description
711.X	Arthropathy associated with infections
713.X	Arthropathy associated with other disorders classified elsewhere
714.X	Rheumatoid arthritis and other inflammatory polyarthropathies
715.X	Osteoarthrosis and allied disorders
716.X	Other and unspecified arthropathies
719.X	Other and unspecified disorders of joint
780.6	Malaise and fatigue
V82.1	Screening for rheumatoid arthritis

This table displays a list of ICD-9 codes and their associated descriptions that were used to search the health care records of patients who were chikungunya cases. The codes identify types of joint disorders and other symptoms (malaise and fatigue) that might be used to describe the sequelae of chikungunya.

RESULTS

From January 2014 through February 2015, a total of 157 confirmed chikungunya cases among beneficiaries of the MHS were recorded in RME and laboratory surveillance data systems. Sixty-four cases (40.8%) appeared in both RME and laboratory reports; 57 (36.3%) cases were reported only in the RME database and 36 (22.9%) cases were identified only in the laboratory database. For the 121 cases identified by RME reports, providers completed the comments section for 120 of them.

Service members (active and reserve components) accounted for 118 cases (75.2%); 50 (42.4%) of those cases were in the active component and 68 (57.6%) were members of the Reserve or National Guard. The remaining cases were family members (n=15, 9.6%), retirees (n=4, 2.5%) or had "other/unknown" beneficiary statuses (n=20, 12.7%).

Table 2 summarizes the demographic profile of the cases. As would be expected in a population that was three-quarters service members, the cases were mostly male (n=114, 72.6%) and between 26 and 45 years old (n=106, 67.5%).

Among affected military members, approximately two-thirds (66.9%) were in the Army and nearly one-fifth in the Coast Guard; the other services accounted for the remaining 15.2% **(Table 3)**. By comparison, as of March 2015, the population of all active and reserve component service members was distributed as follows: Army (47.8%), Air Force (22.2%), Navy (17.6%), Marine Corps (10.2%), and Coast Guard (2.3%).

The first case attributed to travel in the Caribbean region was reported in the RME data base in May 2014. Cases were reported each month thereafter through the end of the study period in February 2015. Most cases (n=128, 81.5%) were diagnosed between August and November 2014, and nearly one-third of all cases were reported in September 2014 (n=50, 31.8%) **(Figure)**.

For 117 cases, information regarding likely exposure locations was abstracted from the comment fields in related RME records; four records contained no information on likely exposure locations **(Table 4)**. Information in comment fields suggested that a large majority of cases were likely exposed in Puerto Rico (n=85, 72.6%); the next most frequently reported likely exposure location was Jamaica (n=7, 6.0%). Five cases (4.3%) were diagnosed in service members while they were deployed to Curacao. These cases were described in a previous *MSMR* report.[23]

For 95 cases, their travel statuses (deployed, garrison, leave, resident) when they were likely infected were reported: of these, 77 (81.1%) were in garrison in Puerto Rico; 9 (9.5%) were on leave; 6 (6.3%) were deployed (including one to West Africa); and 3 (3.2%) were residents of chikungunya endemic countries or territories **(data not shown)**.

There were no inpatient encounters identified among the chikungunya fever cases. Outpatient records were examined to identify possible relationships between chikungunya fever diagnoses and subsequent healthcare encounters for persistent or chronic joint pains or malaise/fatigue. Eighty cases met the criterion of having at least 90 days of post-diagnosis follow-up time available. These cases had 298 outpatient encounters in the 90 days following their diagnosis (mean=3.7 encounters per case). In comparison, in the 90-day pre-diagnosis period 67 cases had 203 encounters (mean=3.0 encounters per patient). This difference in mean number of encounters was not statistically significant.

EDITORIAL COMMENT

Although historical data on acute chikungunya fever in MHS beneficiaries are scant, the number of cases reported since the beginning of 2014 in this study appears to demonstrate a significant increase in the number of cases among DoD populations. The small number of cases reported from outside the Western Hemisphere during the study period, when there was heightened awareness and specific reporting guidance, suggests that chikungunya fever has been an infrequent occurrence among MHS beneficiaries.

In June 2014, the Armed Forces Health Surveillance Center published guidelines for the detection and reporting of chikungunya fever cases (revised on 9 July 2015), and in February 2015 the disease was added to the list of RMEs.[24] Despite the increased DoD emphasis on detecting and reporting

TABLE 2. Age and sex distribution of all DoD chikungunya cases among service members and other Department of Defense beneficiaries identified between 1 January 2014 and 28 February 2015

	Service members			
	Active component	Reserve component	Other beneficiaries	Total
Age				
0–20	0	0	7	7
21–25	5	2	3	10
26–30	12	11	1	24
31–35	14	12	7	33
36–40	10	14	3	27
41–45	8	11	3	22
46–50	1	7	4	12
51+	0	11	11	22
Sex				
Female	5	18	20	43
Male	45	50	19	114

The table depicts the age and sex distribution of all DoD chikungunya cases identified among Service Members and other DoD beneficiaries for the period 1 January 2014 — 28 February 2015. Within the Service Member category, the numbers of cases in the active and reserve components are displayed separately.

TABLE 3. Military service and pay grade (rank) of service member chikungunya cases identified between 1 January 2014 and 28 February 2015

	Active component	Reserve component	Total
Service			
Army	13	66	79
Coast Guard	21	0	21
Air Force	10	2	12
Marines	3	0	3
Navy	3	0	3
Total	50	68	118
Rank			
Enlisted, E1–E4	11	10	21
Enlisted, E5–E9	30	51	81
Officers, W1–W5, O1–O10	9	7	16
Total	50	68	118

The table shows the distribution of service member cases of chikungunya according to their military service (Army, Navy, etc.), component (active or reserve), and pay grade (rank) for the period 1 January 2014 — 28 February 2015.

FIGURE. Month of diagnosis for all DoD chikungunya cases among service members and other DoD beneficiaries identified between 1 January 2014 and 28 February 2015

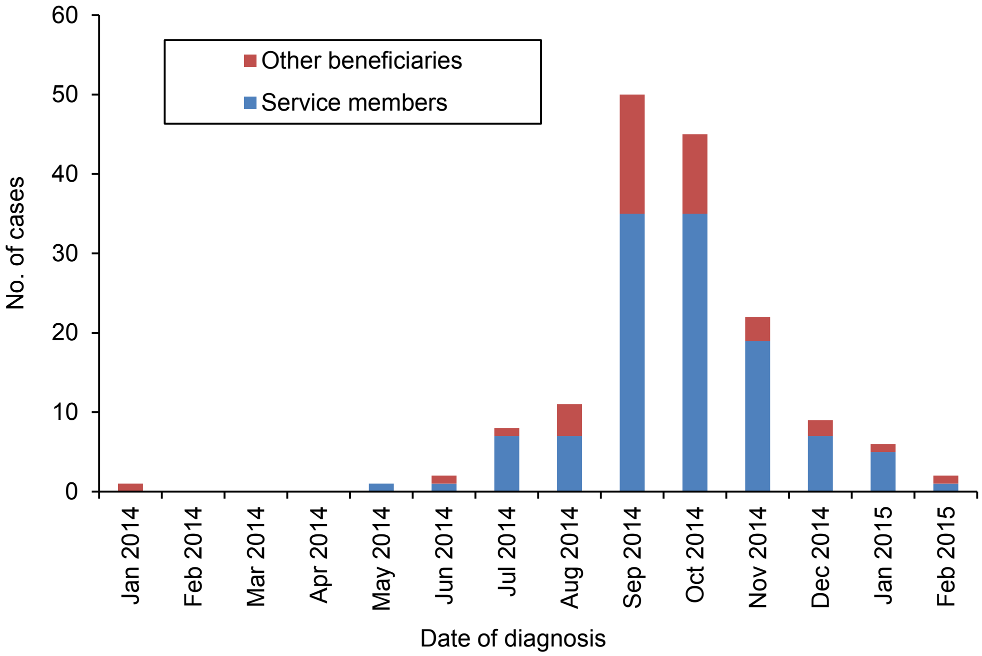

TABLE 4. Reported exposure location of all DoD chikungunya cases among service members and other DoD beneficiaries identified between 1 January 2014 and 28 February 2015

		Service members[a]	Other beneficiaries[b]	Total
Caribbean exposure	Location			
	Barbados[c]	0	3	3
	Caribbean NOS	1	0	1
	Curaçao	5	0	5
	Dominica[c]	1	0	1
	Dominican Republic	1	3	4
	El Salvador	2	1	3
	Guatemala	0	1	1
	Guyana	1	0	1
	Haiti	1	0	1
	Jamaica	2	6	8
	Puerto Rico	76	9	85
	Total	90	23	113
Other exposure	Location			
	American Samoa	1	0	1
	Guam	0	1	1
	Samoa	0	1	1
	West Africa	1	0	1
	Total	2	2	4

[a]Active and reserve components

[b]Dependents, retirees, other, and unknown

[c]One case reported recent travel to both Barbados and Dominica.

The table displays the reported exposure locations of 117 DoD chikungunya cases among Service Members and other DoD beneficiaries identified for the period 1 January 2014 — 28 February 2015. Most (113) were exposed to the virus in the Caribbean Basin and 1 each was exposed in West Africa, Samoa, Guam, and American Samoa. The three locations in the Caribbean most associated with cases were Puerto Rico (85 cases), Jamaica (8), and Curaçao (5).

chikungunya fever cases there was likely some underreporting. This analysis attempted to overcome underreporting by searching both the RME database and the laboratory database for cases. If only cases in the RME database had been counted, 36 (22.9%) of the cases described in this study would not have been identified. It is not known how many other cases were diagnosed but not reported. In addition, there may have been additional unidentified cases among DoD beneficiaries that went undiagnosed by a healthcare provider or did not result in a visit to a provider.

With only 14 months of documented experience regarding this newly introduced disease in the Western Hemisphere, it is difficult to predict the future incidence and impacts of the disease among service members. Historically, new introductions of chikungunya fever into highly susceptible populations can cause explosive outbreaks until levels of acquired immunity to the virus increase in the population. To date in 2015 (11 September), transmission patterns among the general population of the Western Hemisphere appear to have changed from 2014. The most intense transmission in 2015 was being reported in parts of South and Central America with few cases being reported in the Caribbean. Puerto Rico reported an 86% drop in cases during January–August 2015, compared to the same time period in 2014.[25]

Based on the aftermath of the Indian Ocean outbreak, a more significant legacy of the introduction of chikungunya virus into the Western Hemisphere may be the persistent and sometimes debilitating polyarthralgias that follow the acute disease. The potential impact on individual quality of life, service member health, and the DoD healthcare system is yet to be determined. This study attempted to examine changes in healthcare utilization among chikungunya fever cases but showed no significant increase in outpatient encounters after infection. However, this exploratory analysis was limited by both a short follow-up period and non-specific case-finding methods. Continued monitoring of numbers, rates, and impacts of chikungunya-related illnesses among military members and other beneficiaries of the MHS is warranted.

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MSMR's Invitation to Readers

The *Medical Surveillance Monthly Report (MSMR)* invites readers to submit topics for consideration as the basis for future *MSMR* reports. The *MSMR* editorial staff will review suggested topics for feasibility and compatibility with the journal's health surveillance goals. As is the case with most of the analyses and reports produced by Armed Forces Health Surveillance Branch staff, studies that would take advantage of the healthcare and personnel data contained in the Defense Medical Surveillance System would be the most plausible types. For each promising topic, Armed Forces Health Surveillance Branch staff members will design and carry out the data analysis, interpret the results, and write a manuscript to report on the study. This invitation represents a willingness to consider good ideas from anyone who shares the *MSMR*'s objective to publish evidence-based reports on subjects relevant to the health, safety, and well-being of military service members and other beneficiaries of the Military Health System (MHS).

In addition, the *MSMR* encourages the submission for publication of reports on evidence-based estimates of the incidence, distribution, impact, or trends of illness and injuries among members of the U.S. Armed Forces and other beneficiaries of the MHS. Instructions for authors can be found on the *MSMR* page of the Armed Forces Health Surveillance Branch website: www.afhsc.mil/msmr/Instructions.

Please email your article ideas and suggestions to the *MSMR* editorial staff at: usarmy.ncr.medcom-afhsc.mbx.msmr@mail.mil.

Update: Cold Weather Injuries, Active and Reserve Components, U.S. Armed Forces, July 2010–June 2015

Sumitha Nagarajan, MPH

From July 2014 through June 2015, the number of active and reserve component service members treated for cold injuries (n=603) was much lower than the 719 cases diagnosed during the previous, unusually cold winter of 2013–2014. Army personnel accounted for the majority (51%) of cold injuries. Frostbite was the most common type of cold injury in each of the services except the Marine Corps for which immersion foot was unusually common. Consistent with trends from previous cold seasons, service members who were female, younger than 20 years old, or of black, non-Hispanic race/ethnicity tended to have higher cold injury rates than their respective counterparts. Numbers of cases in the combat zone have decreased in the past 3 years, most likely the result of declining numbers of personnel exposed and the changing nature of operations. It is important that awareness, policies, and procedures continue to be emphasized to reduce the toll of cold injuries among U.S. service members.

U.S. military members are often assigned to, and perform duties in, cold weather climates where they may be exposed to cold and wet environments. Such conditions pose the threat of hypothermia, frostbite, and non-freezing cold injury such as immersion foot. The human physiologic responses to cold exposure preserve core body temperature, but those responses may not be sufficient to prevent hypothermia if heat loss is prolonged. Moreover, those responses include constriction of the peripheral (superficial) vascular system, which may result in non-freezing injuries or hasten the onset of actual freezing of tissues (frostbite). Traditional measures to counter the dangers associated with cold environments include minimizing loss of body heat and protecting superficial tissues through such means as protective clothing, shelter, physical activity, and nutrition.

Military training or mission requirements in cold and wet weather may place service members in situations where they may be unable to be physically active, find warm shelter, or change wet or damp clothing.[1,2] Military history has well documented the toll of cold weather injuries, and for many years the U.S. Armed Forces have developed and improved robust training, doctrine, procedures, and protective equipment and clothing to counter the threat from cold environments.[1,3,4] Although these measures are highly effective, cold injuries continue to affect hundreds of service members each year.[5] Continuous surveillance of these injuries is essential to inform additional steps needed to reduce the impact of cold weather on service members' health and their mission accomplishment.

This update 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 5 years.

METHODS

The surveillance period was 1 July 2010 through 30 June 2015. The surveillance population included all individuals who served in an active or reserve component of the U.S. Armed Forces at any time during the surveillance period. For analysis purposes, "cold years" or "cold seasons" were defined by 1 July through 30 June intervals so that complete cold weather seasons could be represented in year-to-year summaries and comparisons.

For this analysis, inpatient, outpatient, and reportable medical event records in the Defense Medical Surveillance System (DMSS) and in the Theater Medical Data Store (which maintains records of medical encounters of service members deployed to Southwest Asia and the Middle East) were searched to identify all primary (first-listed) diagnoses of frostbite (ICD-9 codes 991.0–991.3), immersion foot (ICD-9: 991.4), hypothermia (ICD-9: 991.6), and "other specified/unspecified effects of reduced temperature" (ICD-9: 991.8–991.9).

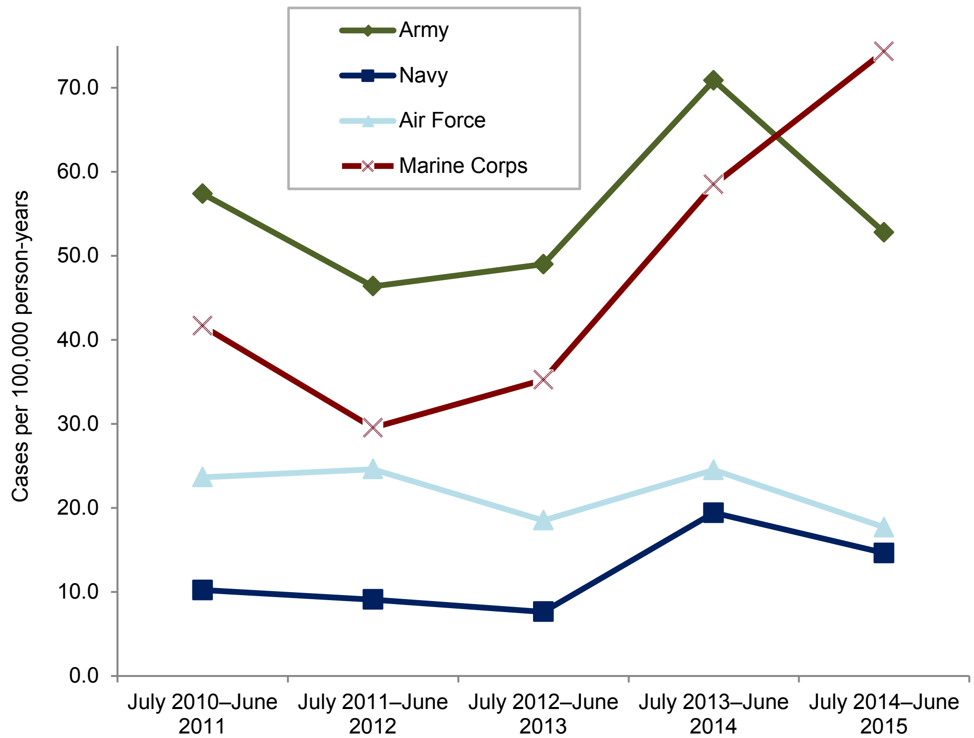
To estimate the number of unique individuals who suffered a cold injury each cold season and to avoid counting follow-up healthcare encounters after single episodes of cold injury, only one cold injury per individual per cold season was included. In summaries of the incidence of the different types of cold injury diagnoses, one of each type of cold injury per individual per cold season was included. For example, if an individual was diagnosed with more than one type of cold injury in a single cold season, each of those injuries would be counted in the tally of injuries. If a service member had multiple medical encounters for cold injuries on the same day, only one was used for analysis (hospitalizations were prioritized over ambulatory visits). Annual incidence rates of cold injuries (per 100,000 person-years [p-yrs] of service) were estimated only for the active component because the start and end dates of all active duty service periods of reserve component members were not available.

RESULTS

2014–2015 cold season

From July 2014 through June 2015, a total of 603 members of the active (n=512) and reserve (n=91) components had at least one medical encounter with a primary diagnosis of cold injury. This total number of affected individuals was lower than in the previous 2013–2014 cold season. By using only one cold injury diagnosis per individual during the cold season, the overall incidence rate for all active component service members in 2014–2015 (38.9.per 100,000 p-yrs) was 16% lower than the rate (46.5 per 100,000 p-yrs) of the 2013–2014 cold season. In 2014–2015, the service-specific incidence rates for Army, Navy, and Air Force were lower than the rates of the previous 2013–2014 cold season. However, the service-specific incidence rate for Marine Corps (74.3 per 100,000 p-yrs) increased by 27.1% compared to the previous 2013–2014 cold season rate (58.5 per 100,000 p-yrs) and was the highest of the 5-year surveillance period. **(Table 1, Figure 1).**

FIGURE 1. Annual incidence rates of cold injuries, by service, active component, U.S. Armed Forces, July 2010–June 2015



Note: Rates not displayed for Coast Guard due to unavailability of person-time for July 2014–June 2015.

TABLE 1. Numbers and rates of any cold injury (one per person per year), by service and component, U.S. Armed Forces, July 2010–June 2015

	Army		Navy		Air Force		Marine Corps		Coast Guard		All services	
Active component	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a,c]	No.	Rate[a]
All years (2010–2015)	1,478	55.2	195	12.2	355	21.8	463	47.4	37	20.0	2,528	36.8
July 2010–June 2011	324	57.4	33	10.2	78	23.6	84	41.7	8	19.2	527	37.1
July 2011–June 2012	259	46.4	29	9.1	81	24.6	59	29.5	6	14.2	434	30.9
July 2012–June 2013	264	49.0	24	7.6	61	18.5	69	35.3	5	12.1	423	30.7
July 2013–June 2014	369	70.9	62	19.4	80	24.5	113	58.5	8	20.0	632	46.5
July 2014–June 2015	262	52.8	47	14.6	55	17.7	138	74.3	10		512	38.9
Reserve component[b]												
All years (2010–2015)	339		12		54		60		1		466	
July 2010–June 2011	99		0		17		8		1		125	
July 2011–June 2012	53		4		6		8		0		71	
July 2012–June 2013	47		1		11		15		0		74	
July 2013–June 2014	80		4		7		14		0		105	
July 2014–June 2015	60		3		13		15		0		91	
Overall, active and reserve[b]												
All years (2010–2015)	1,817		207		409		523		38		2,994	
July 2010–June 2011	423		33		95		92		9		652	
July 2011–June 2012	312		33		87		67		6		505	
July 2012–June 2013	311		25		72		84		5		497	
July 2013–June 2014	449		66		87		127		8		737	
July 2014–June 2015	322		50		68		153		10		603	

[a]Rate per 100,000 person-years
[b]Rate is not calculated for reserve component due to unavailability of person-time.
[c]Rate is not calculated for Coast Guard for July 2014 through June 2015 due to unavailability of person-time.
This table displays the numbers of service members who were diagnosed with any cold injury during each of the five most recent cold seasons from July 2010 through June 2015. Separate columns show the numbers of cases for each of the five services and for all services combined. This type of display is presented for separate sections that cover the active component only, the reserve component only, and all components combined. For the active component only, incidence rates are shown for each service by cold season except for the Coast Guard during the most recent cold season.

TABLE 2a. Numbers and rates of diagnoses of cold injuries (one per type per person per year), active component, U.S. Army, July 2010–June 2015

	Frostbite		Immersion foot		Hypothermia		Unspecified		All cold injuries	
	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]
Total	775	28.9	167	6.2	211	7.9	385	14.4	1,538	57.4
Sex										
Male	627	27.1	151	6.5	187	8.1	278	12.0	1,243	53.7
Female	148	40.5	16	4.4	24	6.6	107	29.3	295	80.8
Race/ethnicity										
White, non-Hispanic	329	20.3	91	5.6	123	7.6	178	11.0	721	44.5
Black, non-Hispanic	330	60.5	43	7.9	42	7.7	149	27.3	564	103.4
Other	116	22.6	33	6.4	46	9.0	58	11.3	253	49.4
Age										
<20	68	48.1	18	12.7	25	17.7	60	42.4	171	120.9
20–24	323	41.3	72	9.2	96	12.3	158	20.2	649	83.1
25–29	178	27.1	40	6.1	54	8.2	80	12.2	352	53.6
30–34	97	21.8	23	5.2	24	5.4	47	10.5	191	42.9
35–39	61	19.2	9	2.8	7	2.2	21	6.6	98	30.8
40–44	29	13.5	4	1.9	3	1.4	14	6.5	50	23.4
45+	19	15.6	1	0.8	2	1.6	5	4.1	27	22.2
Rank										
Enlisted	707	32.3	137	6.3	180	8.2	350	16.0	1,374	62.7
Officer	68	13.9	30	6.2	31	6.4	35	7.2	164	33.6
Occupation										
Infantry/artillery/ combat engineer	299	43.7	82	12.0	104	15.2	111	16.2	596	87.1
Motor transport	30	33.7	1	1.1	3	3.4	9	10.1	43	48.2
Repair/engineering	130	23.6	26	4.7	37	6.7	70	12.7	263	47.7
Communications/ intelligence	181	27.9	35	5.4	35	5.4	109	16.8	360	55.4
Health care	46	17.4	4	1.5	8	3.0	29	11.0	87	32.9
Other	89	20.2	19	4.3	24	5.4	57	12.9	189	42.9
Cold year (July–June)										
2010–2011	176	31.2	32	5.7	43	7.6	89	15.8	340	60.2
2011–2012	145	26.0	24	4.3	31	5.6	72	12.9	272	48.7
2012–2013	145	26.9	46	8.5	29	5.4	52	9.7	272	50.5
2013–2014	183	35.2	48	9.2	53	10.2	97	18.6	381	73.2
2014–2015	126	25.4	17	3.4	55	11.1	75	15.1	273	55.0

[a]Rate per 100,000 person-years

This table covers only active component members of the Army. Separate columns show the numbers and incidence rates for all cold injuries combined and for specific types (i.e., frostbite, immersion foot, hypothermia, and unspecified). The data summarize cold injuries for the five cold seasons during July 2010–June 2015. Within each of the columns, distinct rows show the distribution of cold injuries by sex, race/ethnicity, age group, rank, occupation, and for each of the five cold seasons.

The 262 active component Army service members who received at least one diagnosis of a cold injury (rate: 52.8 per 100,000 p-yrs) during the 2014–2015 cold season accounted for 51.2% of active component members affected among all services. The 138 members of the Marine Corps diagnosed with a cold injury represented 27.0 % of all affected service members. Navy service members (n=47) had the lowest service-specific rate of cold injuries during the 2014–2015 cold season (rate: 14.6 per 100,000 p-yrs) **(Table 1, Figure 1).**

When all injuries were considered—not just the numbers of individuals affected—frostbite was the most common type of cold injury (n=207 or 39.1 % of all cold injuries) among active component service members in 2014–2015. In both the Air Force and Coast Guard, at least 70% of all cold injuries were frostbite, while in the other services the proportions of cases of frostbite ranged from 46.2% in the Army to 12.1% in the Marine Corps **(Tables 2a–2d)**. Although the number of frostbite cases in the Marine Corps decreased by 68% from the anomalously high count of the 2013–2014 cold season, immersion foot cases among Marines increased from 17 (rate: 8.8 per 100,000 p-yrs) to 76 (rate: 40.9 per 100,000 p-yrs) in 2014–2015 **(Table 2d)**. (Detailed data for the Coast Guard are not shown because there were only 38 cold injuries over the 5-year surveillance period.) Among the non-frostbite cold injuries, rates by type were the highest in the past 5 years for hypothermia in the Army and for immersion foot in the Navy and Marine Corps **(Tables 2a–2d)**.

Five cold seasons: July 2010–June 2015

During the 5-year surveillance period, overall rates for cold injuries were higher in females than in males. The Army had the most striking rate difference between female (rate: 80.8 per 100,000 p-yrs) and male (rate: 53.7 per 100,000 p-yrs) service members. Within all services, females tended to have higher rates for frostbite and "unspecified" cold injuries. Females also had higher rates for hypothermia in the Marine Corps **(Tables 2a–2d).**

In all of the services, overall rates for cold injuries were higher among black, non-Hispanic service members than among those of other race/ethnicity groups. In particular, within the Army and Marine Corps, rates of cold injuries were more than twice as high in black, non-Hispanic service members as in white, non-Hispanic or "other" race/ethnicity groups **(Tables 2a–2d)**. Additionally, black, non-Hispanic service members had at least twice the rate of cold injuries as the service members of other race/ethnicity groups in nearly every military occupational category during 2010–2015 **(data not shown)**.

Rates of cold injuries were higher among the youngest service members (less than 20 years old) and generally declined with each succeeding older age group. Enlisted members of the Army, Navy, and Air Force had higher rates than officers, but the opposite was true in the Marine Corps **(Tables 2a–d)**. In the Army and Air Force, rates were highest among service members in infantry/artillery/combat engineering–related occupations **(Tables 2a, 2c)**.

During the 5-year surveillance period, the 2,994 service members affected by any cold injury included 2,528 from the active component and 466 from the reserve component. Of all affected reserve component members, 72.7% (n=339) were members of the Army **(Table 1)**. Overall, soldiers accounted for the majority of all cold injuries affecting active and reserve component service members **(Figure 2)**.

Of all active component service members who were diagnosed with a cold

TABLE 2b. Numbers and rates of diagnoses of cold injuries (one per type per person per year), active component, U.S. Navy, July 2010–June 2015

	Frostbite		Immersion foot		Hypothermia		Unspecified		All cold injuries	
	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]
Total	80	5.0	42	2.6	47	2.9	32	2.0	201	12.6
Sex										
Male	56	4.2	38	2.9	43	3.2	27	2.0	164	12.4
Female	24	8.8	4	1.5	4	1.5	5	1.8	37	13.6
Race/ethnicity										
White, non-Hispanic	40	4.9	18	2.2	25	3.0	14	1.7	97	11.8
Black, non-Hispanic	22	9.0	3	1.2	11	4.5	8	3.3	44	18.0
Other	18	3.4	21	4.0	11	2.1	10	1.9	60	11.3
Age										
<20	19	23.0	3	3.6	3	3.6	3	3.6	28	33.9
20–24	21	4.2	26	5.1	21	4.2	15	3.0	83	16.4
25–29	20	5.0	9	2.3	17	4.3	5	1.3	51	12.8
30–34	10	3.9	4	1.6	2	0.8	2	0.8	18	7.1
35–39	5	2.7	0	0.0	3	1.6	4	2.1	12	6.4
40–44	4	3.8	0	0.0	0	0.0	3	2.8	7	6.6
45+	1	1.6	0	0.0	1	1.6	0	0.0	2	3.2
Rank										
Enlisted	71	5.3	41	3.1	42	3.2	29	2.2	183	13.8
Officer	9	3.4	1	0.4	5	1.9	3	1.1	18	6.7
Occupation										
Infantry/artillery/ combat engineer	4	3.6	1	0.9	4	3.6	2	1.8	11	10.0
Motor transport	5	8.5	5	8.5	7	11.9	1	1.7	18	30.7
Repair/engineering	22	3.3	20	3.0	17	2.5	12	1.8	71	10.6
Communications/ intelligence	11	4.1	4	1.5	3	1.1	3	1.1	21	7.8
Health care	7	3.9	3	1.7	5	2.8	6	3.3	21	11.6
Other	31	10.0	9	2.9	11	3.5	8	2.6	59	19.0
Cold year (July–June)										
2010–2011	14	4.3	6	1.9	11	3.4	3	0.9	34	10.5
2011–2012	10	3.1	10	3.1	5	1.6	4	1.3	29	9.1
2012–2013	7	2.2	7	2.2	7	2.2	4	1.3	25	8.0
2013–2014	34	10.7	6	1.9	17	5.3	8	2.5	65	20.4
2014–2015	15	4.7	13	4.0	7	2.2	13	4.0	48	14.9

[a]Rate per 100,000 person-years

This table covers only active component members of the Navy. The numbers and incidence rates of cold injuries are displayed in a manner identical to that of TABLE 2a. (See description of TABLE 2a. for details.)

injury (n=2,528), 228 (9.0% of the total) were affected during basic training. The Army (n=133) and Marine Corps (n=88) accounted for 96.9% of all basic trainees who suffered a cold injury **(data not shown)**. Additionally, during the surveillance period, 72 service members affected with cold injuries (2.8% of the total) were hospitalized, and most of the hospitalized cases were members of either the Army (n=48) or Marine Corps (n=20) **(data not shown)**.

Cold injuries in Iraq and Afghanistan

During the 5-year surveillance period, 268 cold injuries were diagnosed and treated in Iraq and Afghanistan. Of these, half (n=134) were frostbite; 60 (22%) were immersion foot; 28 (10%) were hypothermia; and 46 (17%) were "unspecified" cold injuries. Cold injuries most often occurred in deployed service members who were male (n=231; 86%); white, non-Hispanic (n=147; 54%); aged 20–24 years (n=132; 49%); in the Army (n=193; 72%); enlisted grade (n=249; 93%); and in infantry/artillery/combat engineering–related occupations (n=108; 40%). Of all 268 cold injuries during the surveillance period, 82% occurred in the first 3 years. During July 2013 through June 2014, there were 35 cold injuries and only 13 during July 2014 through June 2015 **(data not shown)**.

Cold injuries by location

There were 20 military installations that were associated with at least 30 cold injuries among active and reserve component service members during the 5-year surveillance period. Fort Bragg, NC (n=109) and Fort Wainwright, AK (n=106) had the highest 5-year total numbers of incident cold injury events. During the 2014–2015 cold season, incident cases of cold injuries were higher at five of those 20 installations compared to the previous 2013–2014 cold season. Among the five installations, three (Fort Drum, NY; Marine Corps Recruit Depot [MCRD], Parris Island, SC; and Fort Leonard Wood, MO) installations had the highest service-specific incident rates for 2014–2015 when compared to their respective service-specific rates for the previous reported cold seasons **(data not shown). Figure 3** shows the numbers of cold injuries during 2014–2015 and the median numbers of cases for the previous 4 years for those installations that had at least 30 cases during the past 5 years. There were 67 cases of cold injuries at MCRD Parris Island, SC, for

FIGURE 2. Numbers of cold injuries, by service and cold season, active and reserve components, U.S. Armed Forces, July 2010–June 2015

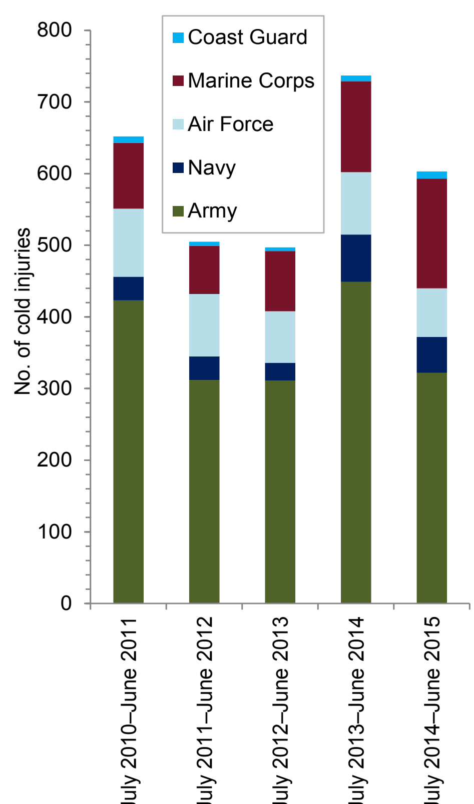


TABLE 2c. Numbers and rates of diagnoses of cold injuries (one per type per person per year), active component, U.S. Air Force, July 2010–June 2015

	Frostbite		Immersion foot		Hypothermia		Unspecified		All cold injuries	
	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]
Total	221	13.6	45	2.8	45	2.8	54	3.3	365	22.5
Sex										
Male	177	13.4	42	3.2	37	2.8	37	2.8	293	22.2
Female	44	14.3	3	1.0	8	2.6	17	5.5	72	23.3
Race/ethnicity										
White, non-Hispanic	134	11.7	37	3.2	32	2.8	39	3.4	242	21.1
Black, non-Hispanic	45	19.9	4	1.8	7	3.1	10	4.4	66	29.2
Other	42	16.5	4	1.6	6	2.4	5	2.0	57	22.4
Age										
<20	17	25.6	10	15.1	1	1.5	4	6.0	32	48.2
20–24	108	23.7	19	4.2	17	3.7	24	5.3	168	36.9
25–29	58	13.6	10	2.3	14	3.3	12	2.8	94	22.1
30–34	15	5.2	1	0.3	6	2.1	6	2.1	28	9.7
35–39	13	6.2	3	1.4	4	1.9	5	2.4	25	12.0
40–44	8	6.4	2	1.6	0	0.0	2	1.6	12	9.7
45+	2	3.5	0	0.0	3	5.3	1	1.8	6	10.5
Rank										
Enlisted	190	14.6	41	3.1	37	2.8	47	3.6	315	24.2
Officer	31	9.6	4	1.2	8	2.5	7	2.2	50	15.6
Occupation										
Infantry/artillery/ combat engineer	8	77.9	0	0.0	0	0.0	1	9.7	9	87.7
Motor transport	2	16.5	0	0.0	1	8.3	0	0.0	3	24.8
Repair/engineering	79	14.9	16	3.0	15	2.8	15	2.8	125	23.5
Communications/ intelligence	41	11.0	5	1.3	7	1.9	10	2.7	63	16.8
Healthcare	10	6.4	0	0.0	5	3.2	2	1.3	17	10.8
Other	81	15.0	24	4.4	17	3.1	26	4.8	148	27.4
Cold year (July–June)										
2010–2011	47	14.2	13	3.9	10	3.0	10	3.0	80	24.3
2011–2012	46	14.0	11	3.3	14	4.3	11	3.3	82	24.9
2012–2013	34	10.3	8	2.4	9	2.7	13	3.9	64	19.4
2013–2014	52	15.9	9	2.8	8	2.5	12	3.7	81	24.8
2014–2015	42	13.5	4	1.3	4	1.3	8	2.6	58	18.7

[a]Rate per 100,000 person-years

This table covers only active component members of the Air Force. The numbers and incidence rates of cold injuries are displayed in a manner identical to that of TABLE 2a. (See description of TABLE 2a. for details.)

the 2014–2015 cold season compared to the median of 2 for the previous four seasons **(Figure 3)**. Additionally, cold injuries at Grafenwoehr, Germany, more than doubled for the 2014–2015 cold season (n=38) compared to the previous 2013–2014 cold season (n=14) **(data not shown)**. During the 2014–2015 cold season, cold injury cases at Marine Corps Base Quantico, VA, decreased by 24 from the previous cold season; this decline was the largest 1-year decrease in cases among all 20 military installations **(data not shown)**.

EDITORIAL COMMENT

Overall rates of cold injuries in U.S. service members declined last winter after having peaked in winter 2013–2014 when much of the eastern U.S. experienced much colder-than-average weather attributed to a weakening of the polar vortex.[6] Rates of all cold injuries together declined during winter 2014–2015 for all of the services except the Marine Corps. The overall rate among Marines was higher than the year before solely because of a sharp leap in the numbers and rate of cases of immersion foot associated with a cluster of 59 cases among trainees at MCRD Parris Island in December 2014.

Supplementary information obtained from the medical staff on site revealed that these diagnoses were recorded for Marines who had been training during rainy conditions but mild temperatures (58–72˚F). Because so many trainees developed wet, cool, and tender feet, they were referred for

FIGURE 3. Numbers of cold injuries, 2014–2015 cold season, and median number for 2010–2014 cold seasons, at locations with at least 30 cold injuries during the 5-year surveillance period, active and reserve component service members, U.S. Armed Forces, July 2010–June 2015

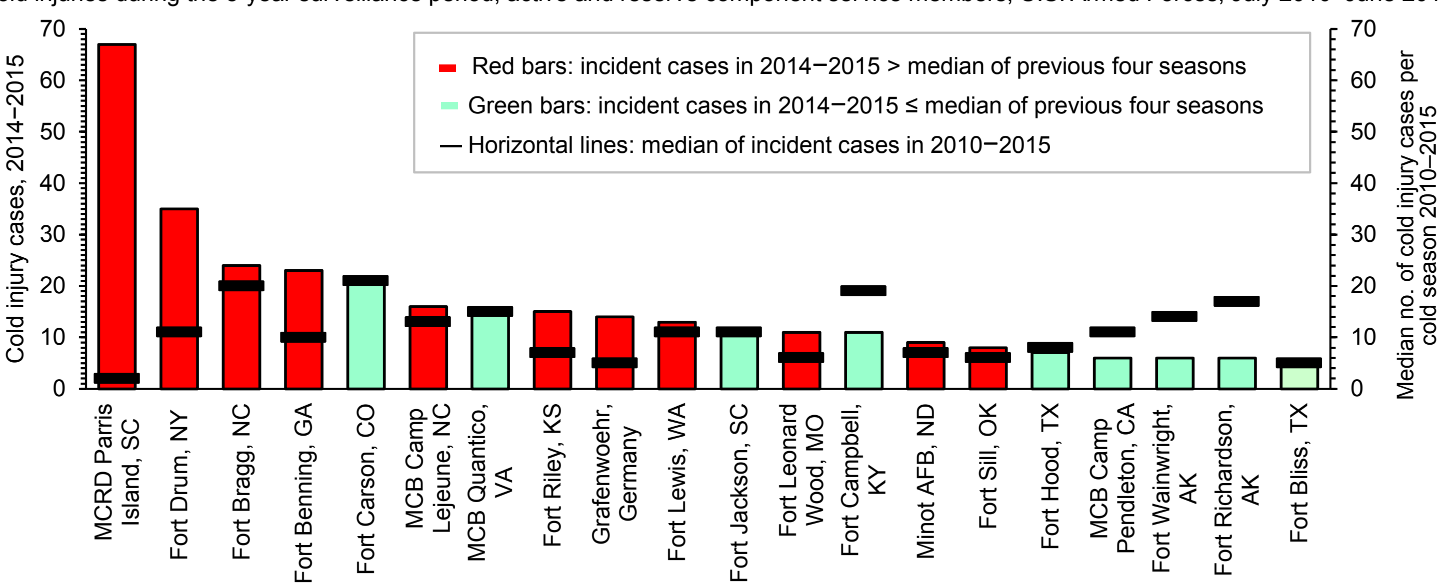


TABLE 2d. Numbers and rates of diagnoses of cold injuries (one per type per person per year), active component, U.S. Marine Corps, July 2010–June 2015

	Frostbite		Immersion foot		Hypothermia		Unspecified		All cold injuries	
	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]
Total	124	12.7	155	15.9	109	11.2	85	8.7	473	48.5
Sex										
Male	104	11.5	152	16.8	98	10.8	78	8.6	432	47.7
Female	20	28.7	3	4.3	11	15.8	7	10.1	41	58.9
Race/ethnicity										
White, non-Hispanic	55	8.6	116	18.0	60	9.3	53	8.2	284	44.2
Black, non-Hispanic	47	48.8	10	10.4	21	21.8	18	18.7	96	99.6
Other	22	9.3	29	12.3	28	11.8	14	5.9	93	39.3
Age										
<20	20	16.8	65	54.5	28	23.5	17	14.2	130	108.9
20–24	61	13.8	79	17.8	56	12.6	42	9.5	238	53.7
25–29	25	12.4	8	4.0	20	9.9	15	7.4	68	33.7
30–34	14	14.1	1	1.0	3	3.0	9	9.1	27	27.3
35–39	3	4.6	2	3.1	1	1.5	1	1.5	7	10.7
40–44	1	3.0	0	0.0	1	3.0	0	0.0	2	5.9
45+	0	0.0	0	0.0	0	0.0	1	7.5	1	7.5
Rank										
Enlisted	94	10.8	143	16.5	104	12.0	66	7.6	407	46.9
Officer	30	27.7	12	11.1	5	4.6	19	17.6	66	61.0
Occupation										
Infantry/artillery/ combat engineer	33	15.0	11	5.0	19	8.6	16	7.3	79	35.8
Motor transport	2	4.8	1	2.4	1	2.4	4	9.6	8	19.3
Repair/engineering	9	3.7	12	5.0	13	5.4	7	2.9	41	17.0
Communications/ intelligence	28	12.9	2	0.9	8	3.7	16	7.4	54	25.0
Healthcare	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Other	52	20.3	129	50.3	68	26.5	42	16.4	291	113.4
Cold year (July–June)										
2010–2011	26	12.9	24	11.9	28	13.9	7	3.5	85	42.2
2011–2012	9	4.5	18	9.0	23	11.5	9	4.5	59	29.5
2012–2013	19	9.7	20	10.2	15	7.7	20	10.2	74	37.8
2013–2014	53	27.4	17	8.8	20	10.4	24	12.4	114	59.0
2014–2015	17	9.2	76	40.9	23	12.4	25	13.5	141	76.0

[a]Rate per 100,000 person-years

This table covers only active component members of the Marine Corps. The numbers and incidence rates of cold injuries are displayed in a manner identical to that of TABLE 2a. (See description of TABLE 2a. for details.)

prompt evaluation. These assessments found that none of the trainees suffered nerve or vascular injury or sequelae. All were returned to their training program following this appropriate and early medical assessment (C. Butler, Naval Hospital, Beaufort, SC; personal communication, 21 October 2015).

Factors associated with increased risk of cold injury in previous years were again noted during the most recent cold season. Frostbite was the most common cold injury for each service, except the Marine Corps for which immersion foot was the most common type of injury due to the cluster of cases identified at MCRD Parris Island in December 2014. Rates of cold injuries were higher among service members who were the youngest (less than 20 years old), female, enlisted, and of black, non-Hispanic race/ethnicity. Increased rates of cold injuries affected all enlisted and most officer occupations among black, non-Hispanic service members. The *MSMR* has previously noted that this latter pattern suggests that other factors such as physiologic differences or previous cold weather experience are possible explanations for increased susceptibility.[5]

The numbers of cold injuries associated with service in Iraq and Afghanistan have fallen precipitously in the past three cold seasons. This reduction in the number of cases is almost certainly a byproduct of the dramatic decline in the numbers of service members in that region and changes in the nature of military operations there.

Policies and procedures are in place to protect service members against cold-weather injuries. Modern cold weather uniforms and equipment provide excellent protection against the cold when used correctly. However, in spite of these safeguards, a significant number of individuals within all military services continue to be affected by cold weather injuries each year. It is important that awareness, policies, and procedures continue to be emphasized to reduce the toll of such injuries. In addition, enhancements in protective technologies deserve continued research. It should be noted that this analysis of cold injuries was unable to distinguish between injuries sustained during official military duties (training or operations) and injuries associated with personal activities not related to official duties. To provide for all circumstances that pose the threat of cold weather injury, service members should know well the signs of cold injury and how to protect themselves against such injuries whether they are training, operating, fighting, or recreating under wet and freezing conditions.

The most current cold injury prevention materials are available at: http://phc.amedd.army.mil/topics/discond/cip/Pages/default.aspx

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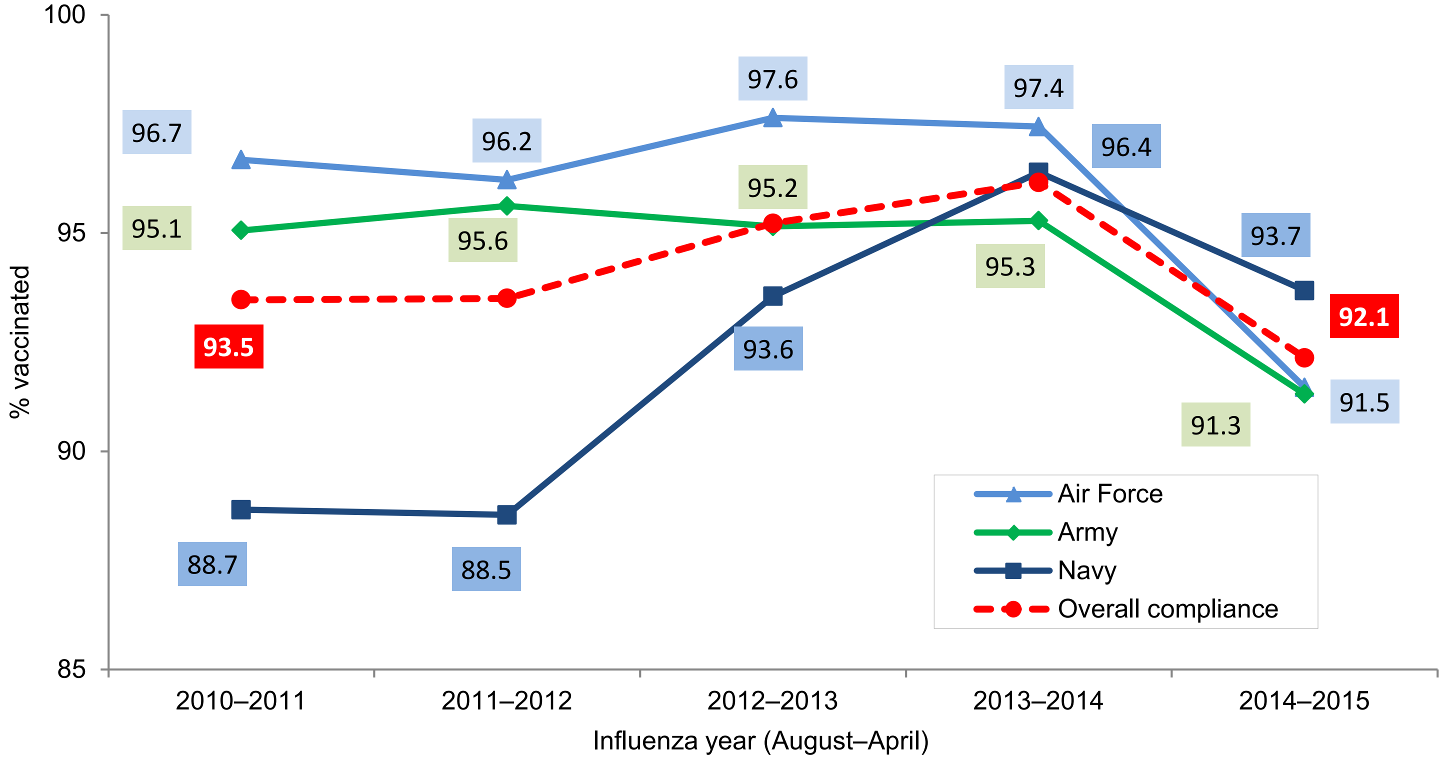
Surveillance Snapshot: Influenza Immunization Among U.S. Armed Forces Healthcare Workers, August 2010–April 2015

FIGURE. Percentage of healthcare specialists and officers (excluding veterinary) with records of influenza vaccination by influenza year (1 August through 30 April) and service, active component, U.S. Armed Forces, August 2010–April 2015



The U.S. Advisory Committee on Immunization Practices recommends that all healthcare personnel be vaccinated against influenza to protect themselves and their patients.[1] The Joint Commission's standard on infection control emphasizes that individuals who are infected with influenza virus are contagious to others before any signs or symptoms appear. The Joint Commission requires that healthcare organizations have influenza vaccination programs for practitioners and staff, and that they work toward the goal of 90% receipt of influenza vaccine. Within the Department of Defense, seasonal influenza immunization is mandatory for all uniformed personnel and for healthcare personnel who provide direct patient care, and is recommended for all others (excluding those who are medically exempt).[2–4] This snapshot covers a 5-year surveillance period (August 2010–April 2015) and depicts the documented percentage compliance with the influenza immunization requirement among active component healthcare personnel of the Army, Navy, and Air Force. During the 2014–2015 influenza season, each of the three services attained greater than 90% compliance among healthcare personnel **(Figure)**. For all services together, the compliance rate was 92.1%. This rate represents a slight decline from the previous year, when the overall compliance rate was the highest ever documented.

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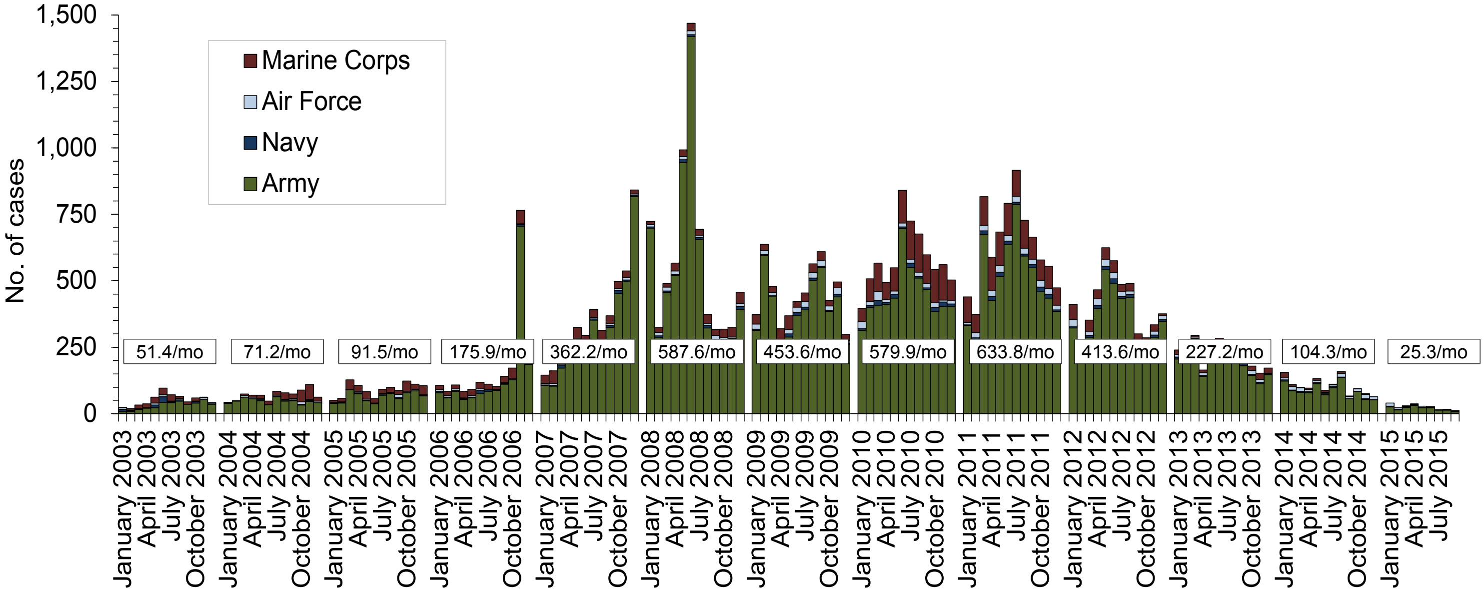
Deployment-Related Conditions of Special Surveillance Interest, U.S. Armed Forces, by Month and Service, January 2003–September 2015 (data as of 19 October 2015)

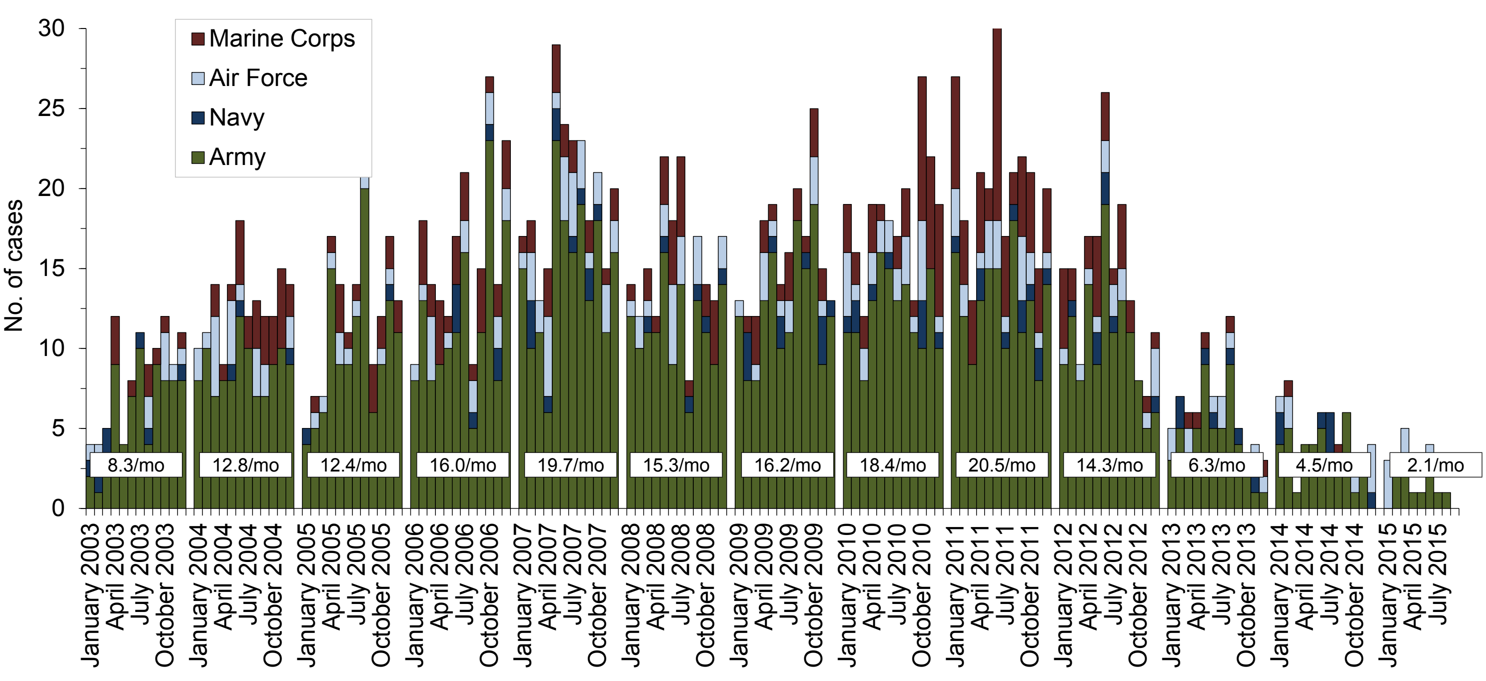
Traumatic brain injury (TBI) (ICD-9: 310.2, 800–801, 803-804, 850–854, 907.0, 950.1–950.3, 959.01, V15.5_1–9, V15.5_A–F, V15.52_0–9, V15.52_A–F, V15.59_1–9, V15.59_A–F)[a]



Reference: Armed Forces Health Surveillance Center. Deriving case counts from medical encounter data: considerations when interpreting health surveillance reports. *MSMR*. 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 deployment (includes in-theater medical encounters from the Theater Medical Data Store [TMDS] and excludes 4,630 deployers who had at least one TBI-related medical encounter any time prior to deployment).

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]

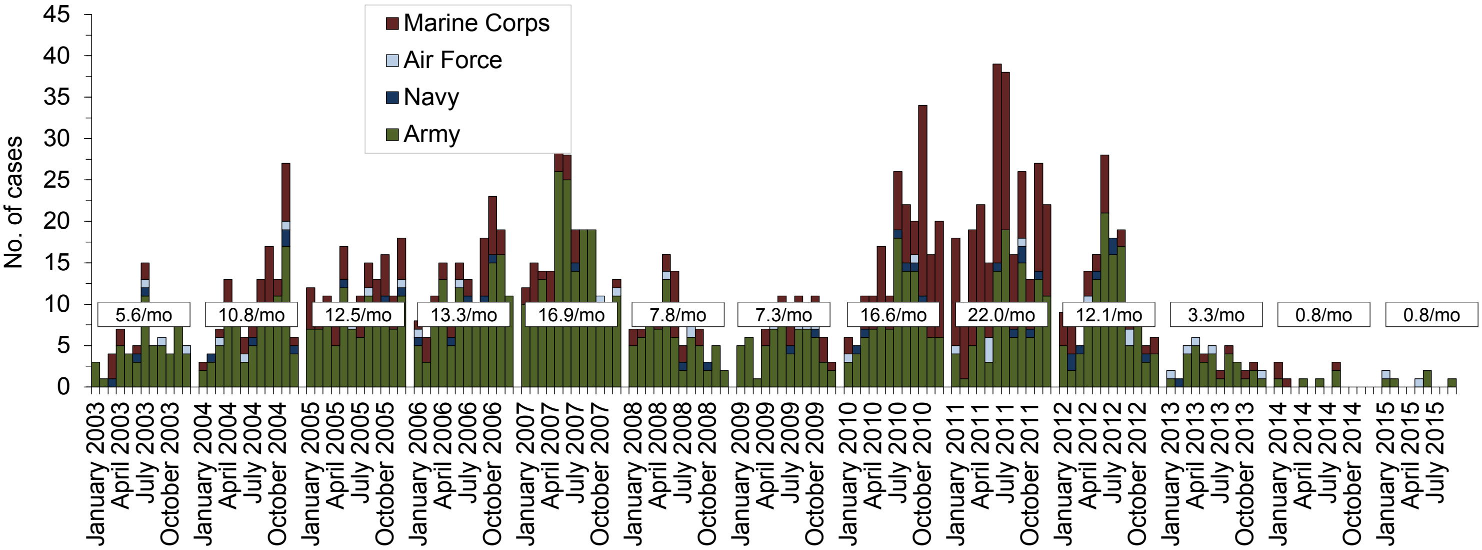


Reference: Isenbarger DW, Atwood JE, Scott PT, et al. Venous thromboembolism among United States soldiers deployed to Southwest Asia. *Thromb Res*. 2006;117(4):379–383.

[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 deployment.

Deployment-Related Conditions of Special Surveillance Interest, U.S. Armed Forces, by Month and Service, January 2003–September 2015 (data as of 19 October 2015)

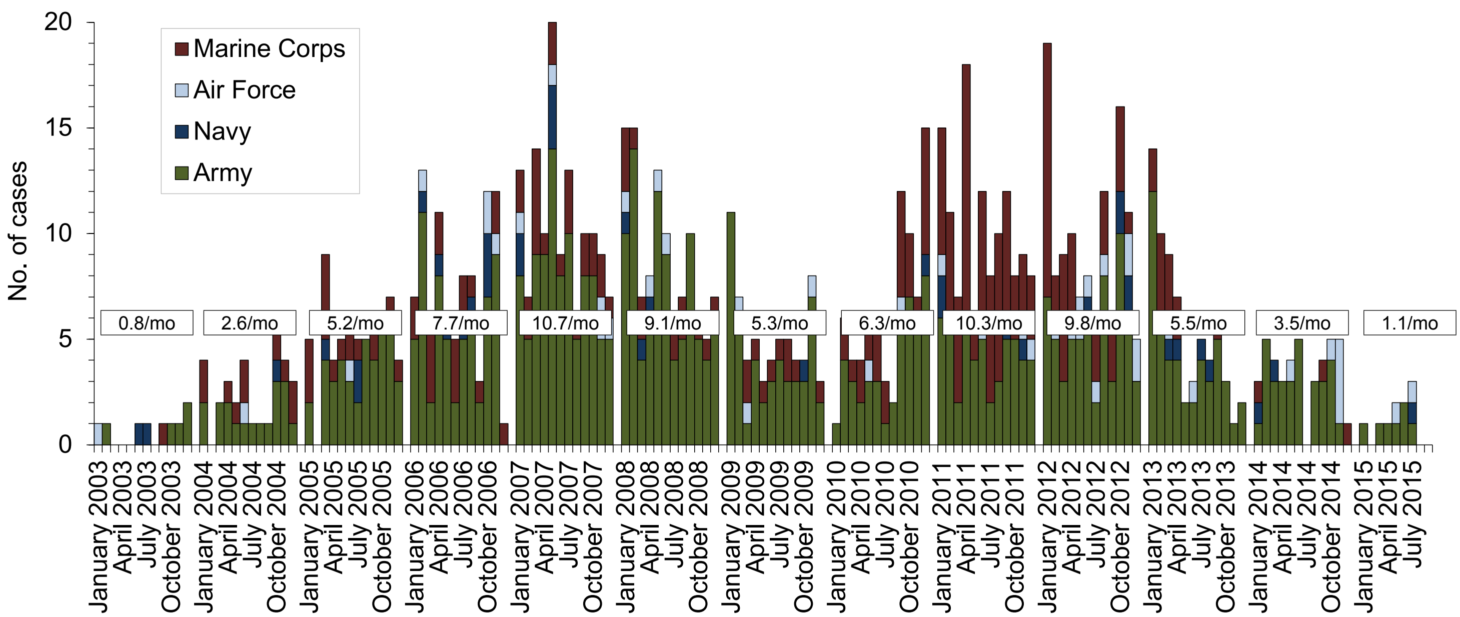
Amputations (ICD-9-CM: 887, 896, 897, V49.6 except V49.61–V49.62, V49.7 except V49.71–V49.72, PR 84.0–PR 84.1, except PR 84.01–PR 84.02 and PR 84.11)[a]



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*. 2005;11(1):2–6.

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

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*. 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 deployment

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