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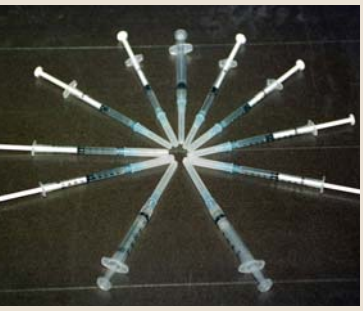

Suicides and Suicide Attempts Among Active Component Members of the U.S. Armed Forces, 2010–2012: Methods of Self-Harm Vary by Major Geographic Region of Assignment

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This report analyzed data from the Department of Defense Suicide Event Report program about suicide events (suicide attempts and suicides) among active component service members during 2010–2012. Most attempts (85.2%) and suicides (83.5%) occurred among service members stationed in the U.S. Drugs were identified as the method of self-harm in 54.8% of attempts but in only 3.6% of suicides. Firearms were the leading method of suicide in both the U.S. and combat zones (61.1% and 97.2%, respectively) but accounted for only 5.4% of suicides in those stationed in Europe/Asia. Hanging/asphyxiation (22.9% overall) was the second most common method in suicides. For suicides using firearms, the rates of suicide and the types of firearm used varied according to service members' geographically related access to firearms. Challenges to reducing the frequency of service member suicides by firearms are discussed.

Suicide was the third leading manner of death—after accidents and illness—among U.S. active duty service members from 1998 until 2003, when deaths due to war surpassed the number of deaths from illness and suicide.[1–3] From 2006 through 2011, deaths from suicide exceeded those associated with illness, and suicide was again the third leading manner of death. After the start of the drawdown in forces in Afghanistan in 2011, war-related deaths declined so much that suicide became the second leading manner of death category—after accidents—among active component service members in 2012 and 2013.[4]

In 2008, the Department of Defense Suicide Event Report (DoDSER) program was launched in support of the DoD suicide prevention initiatives.[5] The DoDSER program is a collaborative undertaking of the DoD's Suicide Prevention and Risk Reduction Committee, the Services' DoDSER program managers, and the National Center for Telehealth and Technology (T2). The program standardizes suicide surveillance efforts for the four Services to inform their suicide prevention programs. The standardized reports (DoDSERs) of suicide behaviors (i.e., suicides, suicide attempts, and other types of self-harm) are submitted via a secure web-based DoDSER application. Each DoDSER form contains approximately 250 data fields (e.g., demographics, military history) and must be completed for all suspected suicides and suicide attempts that result in hospitalization or evacuation. The T2 and the Defense Centers of Excellence for Psychological Health and Traumatic Brain Injury publish annual reports based on an analysis of the aggregated information from each year's DoDSERs.[5]

This study uses DoDSER data to analyze the rates of suicide events in three major geographic regions of duty assignment and assesses the differences in the methods of self-harm between those regions.

METHODS

The surveillance period was 1 January 2010 through 31 December 2012. The study population included all active component service members of the U.S. Army, Air Force, Marine Corps, and Navy. Suicide events (both suicides and non-fatal suicide attempts) were ascertained from T2's centralized records of the DoDSER program. No personally identifiable information or demographic data were provided by T2 and the data were aggregated for all 3 years of the period. For the calculation of rates, denominator data came from the Armed Forces Health Surveillance Center's Defense Medical Surveillance System, which utilizes personnel data from the Defense Manpower Data Center, including information on dates and locations of service members' entire periods of military service.

The principal data elements were suicides and non-fatal suicide attempts; each group was categorized according to the geographic locations where they occurred and the methods of self-harm used. The geographic information was used to create three mutually exclusive groups of suicide-related events: those that occurred in a combat zone (Iraq, Afghanistan, Kuwait, and Djibouti), those in the U.S., or those in Europe and Asia (exclusive of the combat zones). For the purposes of this analysis, the three suicide attempts in the Western Hemisphere outside the U.S. were grouped with those inside the U.S. Although all methods of self-harm were ascertained, the analysis focused on the more commonly used methods. **Table 1** lists the 15 methods of self-harm into which the DoDSER program categorizes suicide events.[5] The category "drugs" included illicit drugs, inhalants, prescription drugs, and over-the-counter medications. For the calculation of rates, numbers of suicides and suicide attempts were divided by the person-time associated with either the entire active component or the active component assigned to the geographic region of interest.

TABLE 1. Department of Defense Suicide Event Report (DoDSER) categories of methods of suicide attempts and suicides

Categories of methods of suicide attempts and suicides
Drugs
Alcohol
Gas, vehicle exhaust
Gas, utility (or other)
Chemicals
Hanging/asphyxiation
Drowning
Firearm, military issued
Firearm, not military issued
Fire/steam
Sharp/blunt object
Jumping from high place
Lying in front of a moving object
Crashing a motor vehicle
Other
Data unavailable

TABLE 2. Number, rates, and percent distribution of suicide attempts and suicides according to the geographic location of the event, active component service members, U.S. Armed Forces, 2010–2012

Suicide attempts				Suicides		
No.	Rate[a]	% of total		No.	Rate[a]	% of total
2,553	53.6	100.0	Total	812	17.1	100.0
			Region			
2,174	61.7	85.2	U.S.	678	19.2	83.5
241	29.1	9.4	Europe/Asia	37	4.5	4.6
73	17.8	2.9	Combat zones	71	17.3	8.7
65	-	2.5	Other/missing	26	-	3.2

[a]Rate per 100,000 person-years

RESULTS

The DoDSER program received reports of 2,553 suicide attempts and 812 suicides among active component service members during the 3-year surveillance period. Based on these reports, the overall rates were 53.6 suicide attempts per 100,000 person-years (p-yrs) and 17.1 suicides per 100,000 p-yrs. The numbers and rates of these events differed among the three geographic regions **(Table 2)**. The overwhelming majority of reported suicide attempts (85.2%) and suicides (83.5%) occurred in the U.S. group. Although the rate of reported suicide attempts in the combat zones (17.8 per 100,000 p-yrs) was less than one-third of the rate in the U.S. group (61.7 per 100,000 p-yrs), the rate of suicides in combat zones was only 9.9% lower than the rate in the U.S. group (17.3 vs. 19.2 per 100,000 p-yrs). The rate of suicides in Europe and Asia (4.5 per 100,000 p-yrs) was only about one-fourth the rates in the other two geographic regions **(Table 2)**. DoDSERs lacked sufficient information for 2.5% of attempts and 3.2% of suicides to associate them with any of the three geographic regions.

The most commonly reported method of self-harm was drugs, which were associated with 54.8% of suicide attempts but only 3.6% of suicides **(Table 3)**. The most common methods associated with suicide attempts were drugs, use of a sharp or blunt object, and hanging/asphyxiation **(Table 3)**. Suicides were most often associated with the use of a non-military firearm, hanging/asphyxiation, and the use of a military-issued or duty firearm. The seven most frequently reported methods were associated with 90.6% of all suicide attempts and 89.9% of all suicides.

The methods used for suicide attempts and suicides varied across geographic regions. **Table 4** presents the rates (per 100,000 p-yrs) for the seven most common methods of self-harm for each of the three geographic regions. Among reported suicide attempts, drugs were the most common method employed in all three regions. However, in the U.S. and Europe/Asia groups, sharp/blunt objects and hanging/asphyxiation were the next most common methods, while in combat zones, military-issued firearms were the second most used method of attempted suicides.

The methods used during suicides and attempted suicides varied markedly **(Table 4)**. Notably, drugs were used in more than half of suicide attempts but were the method of only 3.5% of suicides. Firearms were the leading method of suicide in both the U.S. and combat zones (61.1% and 97.2%, respectively) but accounted for only 5.4% of suicides in Europe/Asia. **Figure 1** depicts the rates of suicides by firearms, hanging/asphyxiation, and all other methods in the three regions. Hanging/asphyxiation was the most frequent method of suicide in the Europe/Asia group (67.6%) and the second most frequent method in the U.S. (22.1%) **(Table 4)**.

Of all firearm-related suicides in the U.S. group (n=414), relatively few (n=26, 6.3%) were associated with military-issued weapons **(Table 4)**. In contrast, 94.2% (n=65) of all firearm-related suicides in combat zones were attributed to military-issued weapons. The two firearm-associated suicides in the Europe/Asia group were attributable to military-issued weapons.

Although alcohol was reported as the method of self-harm for 3.3% of all suicide attempts, there were no suicides attributed to alcohol as the method. Moreover, there were no reports from combat zones of suicide attempts where alcohol was reported as the method. The only methods of suicide reported from combat zones were firearms (n=69), hanging (n=1), and other (n=1).

EDITORIAL COMMENT

This analysis of DoDSER data from 2010–2012 found an overall rate of suicides of 17.1 per 100,000 p-yrs among all active component service members. The suicide rate was much lower among those serving in Europe and Asia than in the U.S. and combat zones. The striking difference in rates of suicides overall in Europe/Asia compared to other regions reflects, to a large extent, marked differences in firearm-related suicides in Europe/Asia (n=2, 0.2 per 100,000 p-yrs) compared to the U.S. (n=414, 11.7 per 100,000 p-yrs) and combat zones (n=69, 16.9 per 100,000 p-yrs).

In general, U.S. military members have more limited access to firearms when serving in Europe/Asia than in other regions. Nearly all of the countries in Europe and Asia where U.S. service members are stationed have very restrictive weapons laws;[6] in turn, relatively

TABLE 3. Seven most common methods of suicide attempts and suicides, active component service members, U.S. Armed Forces, 2010–2012

Suicide attempts			Suicides	
No.	% of total		No.	% of total
94	3.7	Firearm/gun, other than military issue	397	48.9
232	9.1	Hanging/asphyxiation	186	22.9
40	1.6	Firearm/gun, military issued or duty weapon	95	11.7
1,400	54.8	Drugs	29	3.6
151	5.9	Other	16	2.0
311	12.2	Sharp or blunt object	7	0.9
84	3.3	Alcohol	0	0.0
241	9.4	All other methods (after top seven)	82	10.1
2,553	100.0	Total	812	100.0

TABLE 4. Numbers and rates of suicide attempts and suicides by geographic region and method, active component, U.S. Armed Forces, 2010–2012

	All active component		U.S.		Europe/Asia		Combat zones	
Suicide attempts	No.[a]	Rate[b]	No.	Rate[b]	No.	Rate[b]	No.	Rate[b]
Firearm, not military issue	94	2.0	93	2.6	0	0	0	0
Hanging/asphyxiation	232	4.9	203	5.8	21	2.5	5	1.2
Firearm, military issue	40	0.8	13	0.4	2	0.2	24	5.9
Drugs	1,400	29.4	1,222	34.7	121	14.6	37	9.0
Other	151	3.2	127	3.6	18	2.2	1	0.2
Sharp/blunt object	311	6.5	254	7.2	48	5.8	5	1.2
Alcohol	84	1.8	67	1.9	15	1.8	0	0.0
All other methods	241	5.1	195	5.5	16	1.9	1	0.2
Total of all attempts	2,553	53.6	2,174	61.7	241	29.1	73	17.8
	All active component		U.S.		Europe/Asia		Combat zones	
Suicides	No.[a]	Rate[b]	No.	Rate[b]	No.	Rate[b]	No.	Rate[b]
Firearm, not military issued	397	8.3	388	11.0	0	0.0	4	1.0
Hanging/asphyxiation	186	3.9	150	4.3	25	3.0	1	0.2
Firearm, military issue	95	2.0	26	0.7	2	0.2	65	15.9
Drugs	29	0.6	28	0.8	1	0.1	0	0.0
Other	16	0.3	14	0.4	1	0.1	1	0.2
Sharp/blunt object	7	0.1	5	0.1	2	0.2	0	0.0
Alcohol	0	0.0	0	0.0	0	0.0	0	0.0
All other methods	82	1.7	67	1.9	6	0.7	0	0.0
Total of all suicides	812	17.1	678	19.2	37	4.5	71	17.3

[a]Total for all active component does not equal sum of numbers for the three geographic regions because some Department of Defense Suicide Event Report data did not indicate the geographic location of the suicide event.
[b]Rate per 100,000 person-years

few service members have opportunities to acquire privately owned firearms legally while assigned in Europe/Asia. In addition, military regulations generally prohibit keeping a privately owned firearm (POF) in one's residence during overseas assignments; any POF brought to an overseas area must be stored in a secure military arms room or armory.[7] Given the restrictions on possession of firearms by U.S. military members while serving in Europe/Asia, it is not surprising that the only firearm-related suicide events in Europe and Asia during the 3-year period of interest were associated with military-issued weapons. Of note in this regard, most service members in Europe and Asia do not routinely have access to military-issued firearms.

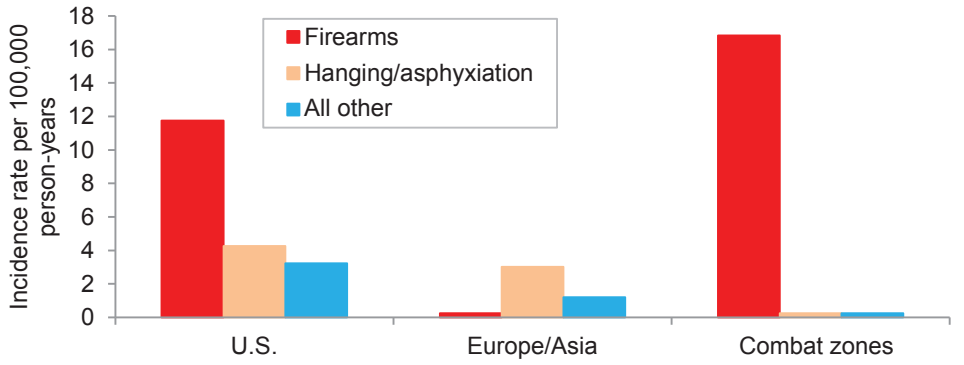
At the other extreme of the access to firearms spectrum, nearly all service members in combat zones are issued firearms and ammunition which must remain under the individual's control at all times.[8] The suicide rate from firearms in combat zones was higher than in the other geographic regions, and only two of the 71 suicides in combat zones were not attributed to firearms.

In the U.S. group, most suicides (61.1%) were associated with firearms, and 93.7% of all firearm-related deaths were linked to non-military-issued weapons. As is the case in Europe and Asia, most service members' duties in the U.S. do not require them to carry military-issued firearms on a regular or routine basis. Although laws and regulations governing gun ownership vary from state to state, most citizens in the U.S. may legally own POFs and many service members do.[9]

Almost all deaths of active component service members are subject to close scrutiny by the Armed Forces Medical Examiner; documentation of the manner and underlying cause of death is thorough. When a death is determined to be the result of suicide, that categorization is required to be recorded in a DoDSER. Accordingly, the identification and characterization of service member suicides are fairly complete and the corresponding data from the DoDSER records are useful in documenting trends in suicides and associated factors.

A limitation of this analysis is that suicide attempts are not investigated or reported as completely as are deaths. In this report, suicide attempts were ascertained via DoDSERs only. The DoDSER defines a suicide attempt as "a non-fatal, self-directed, potentially injurious behavior with any intent to die

FIGURE 1. Incidence rate of suicide according to principal methods and geographic location of event, active component, U.S. Armed Forces, 2010–2012



as a result of the behavior." A suicide attempt may or may not result in injury. For example, if someone seizes a gun from a service member who was holding it to his head, the event should be classified as a suicide attempt even though there were no injuries. In addition, DoDSERs are required only when the event results in a hospitalization or an evacuation from theater. Other types of attempts may result in physical injuries that were relatively minor, were not detected by others, or were attributed to accidents. Unless such events result in the submission of a DoDSER, they were not included in the data provided for this report. Because some suicide attempts likely were not reported, the suicide attempts enumerated in this analysis must be regarded as underestimates of the incidence of such events.[10]

From the perspectives of both public health and clinical care, the prevention of suicide is a formidable challenge. The DoD's efforts to reduce the incidence of suicides and suicide attempts have included initiatives to educate military leaders, service members, and family members about the risk factors for self-harm; to increase the availability of, and access to, mental health resources to help individuals deal with suicidal ideation and other psychological distress; and to destigmatize seeking help for mental health problems. In recent years, the DoD has greatly increased the level of mental health resources to assist with achieving such objectives, but the toll of suicide remains high. It remains to be seen whether or not the recently reduced level of combat operations will be followed by a reduction in suicide incidence.

The majority of suicides in both the U.S. civilian population and in the U.S. Armed Forces have been due to self-harm with firearms. A RAND study commissioned by the DoD recommended consideration of restrictions on access to lethal means of self-harm.[10] The results of the analysis in this report document that, among the seven most common methods of lethal self-harm, the only means of suicide that are not commonplace in every service member's daily life are drugs and firearms. Restricting access to these risk factors presents complex challenges. Medications to treat illnesses are valuable measures to enhance the quality and duration of life. Similarly, in the Armed Forces, firearms are important, often essential, and commonly employed tools for security, protection of life, and achievement of the mission. DoDSER annual analyses have noted that firearms were present in the homes or immediate environments of about half of suicide decedents.[11,12] Meeting the challenge involved in restricting access to these potential instruments of self-harm depends on methods of identifying those distressed individuals whose access should be constrained—and then actually controlling access. Impediments to accomplishing such a task include the realities that many individuals with suicidal thoughts choose not to make known to others their distress, that the Services can control access to only military-issued firearms, and that access to non-military-issued firearms and drugs is not readily amenable to limitation by official military controls, particularly in the U.S.

It is important to note that this analysis suggests an association between access to firearms and suicide rates, particularly those suicides due to firearms, but it does not demonstrate a clear cause-and-effect relationship. In particular, the results of this analysis should not be interpreted as proof that restricting access to firearms would reduce suicide rates. It is possible that other factors played an important role in the differences in suicide rates among the geographic regions studied.

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Risk of Type II Diabetes and Hypertension Associated with Chronic Insomnia Among Active Component, U.S. Armed Forces, 1998–2013

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Chronic insomnia is a common clinical complaint and its incidence in both U.S. military and civilian populations has increased. Several studies have evaluated the association between chronic insomnia and the development of other chronic diseases. This study estimates the incidence of chronic insomnia. In addition, this report examines the association between both hypertension and type II diabetes and chronic insomnia in active component military members. The Defense Medical Surveillance System was used to identify a cohort of individuals with chronic insomnia between 1998 and 2013 and to match them by age and gender with a cohort without insomnia. During 1998–2013, there were 205,740 incident cases of chronic insomnia among active component service members with an overall rate of 90.3 per 10,000 person-years. Individuals in the chronic insomnia cohort were at higher risk for type II diabetes (adjusted hazard ratio [HR], 2.17 [95% CI, 1.75–2.69]) and hypertension (adjusted HR, 2.00 [95% CI, 1.85–2.16]). Sleep hygiene education along with evaluation and treatment of persistent symptoms are of public health importance in active duty service members.

Insomnia is characterized by impaired daytime function as a result of difficulty initiating or maintaining sleep or waking up early in the morning without the ability to return to sleep despite adequate opportunity and circumstances for sleep. Although many individuals experience intermittent or short-term insomnia, chronic insomnia is diagnosed when symptoms occur at least three times per week for 3 months or more.[1] Insomnia is a clinical diagnosis, with a sleep history as the only diagnostic evaluation required. Treatment consists of sleep hygiene education progressing to medication management when necessary.

Prevalence estimates of chronic insomnia are as high as 19% in the U.S. population, and a survey of primary care patients found that 69% had occasional or chronic insomnia.[2] Insomnia increases with age, with only 12% of elderly individuals reporting normal sleep.[3] Other demographic factors associated with the development of insomnia include female gender, employment status, marital status, and socioeconomic status.[4]

Insomnia is a common complaint in active duty service members. Of those returning from deployment in Iraq and Afghanistan, 41% reported problems sleeping.[5] A 10-year study of active component service members found an overall incidence rate of 48 cases of chronic insomnia per 10,000 person-years (p-yrs). Insomnia was diagnosed at a rate 57% higher among females (70.0 cases per 10,000 p-yrs) than males (44.7 cases per 10,000 p-yrs) and Army personnel had the highest incidence rate of the Services (79.2 cases per 10,000 p-yrs).[6]

Insomnia affects work performance, social functioning, and quality of life. It is also a significant factor in work-related and motor vehicle accidents.[7] Individuals with insomnia have an increased risk of developing depression, anxiety, and drug abuse.[8] Those with pulmonary disease, heart failure, or chronic pain are also known to commonly suffer from insomnia.[9,10] Recent studies have investigated the idea that insomnia may be a predisposing factor for common chronic diseases such as diabetes, hypertension, obesity, and coronary artery disease.[11–14]

Military personnel are at high risk for insomnia due to stressors such as frequent moves, deployments, and rotating shifts or night shift work.[15,16] In a military setting, the consequences of work-related accidents can be magnified, given the nature and demands of military operations (e.g., fatigue is cited as the primary cause of military aviation mishaps).[6] Type II diabetes and hypertension are chronic conditions that lead to lifelong disability at potentially significant cost to the Department of Defense. An updated report on insomnia incidence and an evaluation of its potential impact on these chronic conditions in an active duty population have significant military relevance.

METHODS

The surveillance period was 1 January 1998 through 31 December 2013. The surveillance population included all individuals who served at any time in the active component of the Army, Navy, Air Force, Marine Corps, or Coast Guard.

All data used to determine incident diagnoses of chronic insomnia, hypertension, or type II diabetes were derived from records routinely maintained in the Defense Medical Surveillance System (DMSS). These records document both ambulatory encounters and hospitalizations of active component members of the

TABLE 1. ICD-9 codes for type II diabetes, hypertension, and insomnia

Type II diabetes	ICD-9 codes
Diabetes mellitus without mention of complication	250.00 or 250.02
Diabetes with ketoacidosis	250.10 or 250.12
Diabetes with hyperosmolarity	250.20 or 250.22
Diabetes with other coma	250.30 or 250.32
Diabetes with renal manifestations	250.40 or 250.42
Diabetes with ophthalmic manifestations	250.50 or 250.52
Diabetes with neurological manifestations	250.60 or 250.62
Diabetes with peripheral circulatory disorders	250.70 or 250.72
Diabetes with other specified manifestations	250.80 or 250.82
Diabetes with unspecified complications	250.90 or 250.92
Hypertension	**ICD-9 codes**
Malignant essential hypertension	401
Benign essential hypertension	401.1
Unspecified essential hypertension	401.9
Insomnia	**ICD-9 codes**
Transient insomnia	307.41
Persistent insomnia	307.42
Organic insomnias	327.00–327.02
Other organic insomnias	327.09
Insomnia, unspecified	780.52

U.S. Armed Forces in fixed military and civilian (if reimbursed through the Military Health System) treatment facilities.

The study design was a retrospective cohort study with a dynamic cohort (i.e., incident cases of chronic insomnia at any time during the surveillance period were included in the analysis). An incident case of chronic insomnia was defined by records of two or more ambulatory visits within 90 days of each other or a hospitalization with a diagnosis of insomnia in any diagnostic position.[6] The ICD-9 codes used to define a case of chronic insomnia are listed in **Table 1**. Each individual could be an incident case once during the surveillance period. Any individuals with a chronic insomnia diagnosis prior to 1 January 1998 were excluded.

Incidence rates of hypertension and type II diabetes were compared between two groups of active component service members. The *chronic insomnia cohort* comprised service members who met the surveillance case definition for chronic insomnia as described in the preceding paragraph. Service members with a diagnosis of sleep apnea at any time during their military service were excluded from the cohort. The *control cohort* consisted of service members who were not documented as having chronic insomnia. One control was selected for each case from a random sample of 25% of eligible controls. Each control was matched on gender and age (within 1 year of the matched case). A control must have been in service at the time of the incident date of insomnia diagnosis of their matched case. Service members with a diagnosis of sleep apnea at any time during their military service were excluded from the cohort.

The insomnia cohort and the control cohort were then followed from the date of incident insomnia diagnosis until onset of hypertension or type II diabetes, separation from the military, death, or until 31 December 2013. The beginning of a control's follow-up period began on the same date as the incident insomnia diagnosis of the matched case.

Incident cases of hypertension or type II diabetes were defined as two or more ambulatory visits within 90 days of each other or a hospitalization with any of the ICD-9 codes listed **(Table 1)**. Any cases of hypertension or type II diabetes that occurred within 1 year of a diagnosis of insomnia were excluded from both groups.

The two cohorts were compared for differences in race and obesity status using the chi-square test. An incidence rate was calculated by using the number of cases and the number of person-years of follow-up for each cohort. Cox proportional hazards regression models were developed to assess the influence of chronic insomnia on the risk of developing hypertension or type II diabetes during the follow-up period. Hazard ratios (HRs) were adjusted for age and gender (to obtain stratified estimates) as well as race/ethnicity and obesity. Individuals were classified as obese if they had received any of the following ICD-9 diagnoses in any diagnostic position in any medical encounter during the study period: 278.00, 278.01, V85.3x, or V85.4x (i.e., "obesity, unspecified," "morbid obesity," "body mass index between 30–39, adult," "body mass index 40 and over, adult"). All analyses were performed using SAS System for Windows, version 9.2.

RESULTS

During 1998–2013, there were 205,740 incident cases of chronic insomnia among active component service members with an overall crude incidence rate of 90.3 cases per 10,000 p-yrs. The highest annual overall rate was in 2012 with 252.3 cases per 10,000 p-yrs **(Figure, Table 2)**.

Since 2005, the Army has consistently had the highest rate of chronic insomnia among the Services, peaking at 432.8 cases per 10,000 p-yrs in 2012. This rate was more than 2.5 times the rate of any of the other Services that same year. A sevenfold increase in the rate among men and a five-fold increase in the rate among women occurred during the same period (2005–2013). The rate increase was seen across all age categories and all military occupations. The largest rate increase was among those in the occupational categories of infantry/artillery and armor/motor transport, from 33 per 10,000 p-yrs in 2005 to more than 300 per 10,000 p-yrs in 2012 **(Table 2)**.

Analyses evaluating the development of type II diabetes

Of the 205,740 total cases of incident insomnia, 105,246 were excluded due to a co-morbid diagnosis of sleep apnea or

TABLE 2. Numbers and rates of incident diagnoses of insomnia (one case per individual in surveillance period), active component, U.S. Armed Forces, January 1998–December 2013

	Total 1998–2013		1998		1999		2000		2001		2002		2003		2004		2005	
	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]
All	205,740	90.3	486	3.4	619	4.4	951	6.8	1,299	9.3	1,573	11.0	2,122	14.6	2,843	19.6	4,924	34.8
Service																		
Army	130,486	160.6	170	3.6	201	4.3	319	6.7	477	10.1	537	11.2	794	16.2	1,232	25.1	2,480	51.0
Navy	19,122	34.3	71	1.9	84	2.3	135	3.7	229	6.2	252	6.7	319	8.5	418	11.3	650	18.1
Air Force	38,187	69.1	223	6.1	303	8.5	446	12.7	501	14.4	672	18.6	881	23.9	1,026	27.5	1,467	41.5
Marine Corps	15,240	51.8	17	1.0	19	1.1	37	2.2	60	3.5	80	4.7	61	3.5	86	4.9	192	10.8
Coast Guard	2,705	43.5	5	1.5	12	3.5	14	4.0	32	9.2	32	8.8	67	17.5	81	20.8	135	34.2
Sex																		
Male	164,203	84.2	372	3.0	465	3.9	729	6.1	961	8.1	1,173	9.7	1,518	12.3	2,053	16.6	3,722	30.8
Female	41,537	126.0	114	5.8	154	7.8	222	11.1	338	16.4	400	18.9	604	28.0	790	36.8	1,202	58.4
Race/ethnicity																		
White, non-Hispanic	142,110	90.7	351	3.6	432	4.6	694	7.4	921	9.9	1,086	11.4	1,497	15.2	2,035	20.5	3,515	36.0
Black, non-Hispanic	39,722	97.6	84	3.0	113	4.2	153	5.6	218	7.9	258	9.4	390	14.2	490	18.5	826	32.9
Other	23,908	78.2	51	2.9	74	4.1	104	5.6	160	8.4	229	11.6	235	12.4	318	16.8	583	30.9
Age																		
<20	7,181	41.4	50	4.1	64	5.1	118	8.8	160	11.8	151	11.7	202	16.4	211	18.1	305	29.6
20–24	60,202	81.5	155	3.6	243	5.8	349	8.1	458	10.1	596	12.6	747	15.1	1,042	20.9	1,676	34.9
25–29	49,610	99.2	87	2.9	99	3.5	151	5.5	218	8.2	230	8.4	387	13.5	555	18.7	1,022	33.7
30–24	30,297	88.9	55	2.3	60	2.7	90	4.3	125	6.0	166	8.0	225	10.8	328	15.8	598	29.3
35–39	26,940	93.1	76	3.7	74	3.6	125	6.1	160	8.1	204	10.5	257	13.7	293	16.4	621	36.0
40+	31,510	133.2	63	4.7	79	5.9	118	8.7	178	12.8	226	15.2	304	20.0	414	26.9	702	46.0
Rank																		
E1–E4	95,044	95.0	274	4.3	391	6.3	562	8.9	739	11.8	869	13.7	1,172	18.2	1,538	24.1	2,433	40.1
E5–E9	90,023	99.6	164	2.9	164	3.0	295	5.4	417	7.6	543	9.6	719	12.5	1,027	17.8	2,008	34.9
O1–O4	13,102	47.2	32	1.9	41	2.5	65	3.9	103	6.2	104	6.1	154	8.8	181	10.3	314	18.0
O5–O10	4,394	65.0	14	3.3	16	3.8	22	5.3	31	7.6	46	11.1	59	14.0	76	18.0	115	27.4
W1–W5	3,177	107.6	2	1.2	7	4.2	7	4.3	9	5.5	11	6.6	18	10.5	21	12.2	54	31.3
Marital status																		
Married	124,138	99.3	244	3.0	276	3.6	404	5.4	564	7.7	719	9.8	1,043	13.7	1,414	18.4	2,606	33.7
Single	65,213	69.7	214	3.9	310	5.5	481	8.2	656	10.7	742	11.7	940	14.8	1,255	19.9	1,967	33.3
Other	16,389	175.1	28	5.1	33	6.1	66	12.0	79	15.1	112	20.2	139	26.2	174	33.2	351	65.8
Education																		
High school or less	149,145	94.5	262	3.0	283	3.3	515	5.9	994	9.7	1,186	11.5	1,560	14.9	2,149	20.5	3,688	36.0
Some college	24,770	103.4	160	5.5	261	8.9	294	12.5	92	10.5	125	13.5	172	17.8	223	22.0	465	43.3
College	17,040	66.9	31	2.0	38	2.6	60	4.2	94	6.7	116	7.6	169	10.7	201	12.4	398	24.2
Advanced degree	10,289	72.1	31	3.3	32	3.5	51	5.6	73	8.1	82	10.1	113	13.9	143	17.5	220	27.2
Unknown	4,496	71.1	2	1.1	5	3.1	31	5.7	46	9.0	64	9.6	108	16.1	127	22.1	153	40.5
Military occupation																		
Infantry/artillery	34,718	122.6	31	1.9	31	2.0	55	3.5	71	4.6	92	5.8	125	7.7	222	13.4	552	33.1
Armor/motor transport	11,703	117.7	16	2.4	24	3.3	39	5.4	63	9.1	59	9.6	70	11.6	81	13.1	200	33.1
Pilot/aircrew	2,028	23.8	6	1.1	15	2.8	16	3.0	22	4.3	19	3.5	30	5.4	45	7.9	74	13.2
Repair/engineering	48,877	73.0	142	3.3	190	4.8	267	6.6	344	8.5	462	10.5	647	14.5	819	18.5	1,348	31.3
Comm/intel	49,148	95.5	120	3.7	153	4.6	266	8.1	347	10.6	435	13.2	567	17.0	764	23.0	1,260	38.9
Health care	25,688	137.3	81	6.7	94	8.3	127	11.5	196	18.2	242	20.7	350	29.8	439	37.1	714	61.1
Other	33,578	76.4	90	3.3	112	4.1	181	6.6	256	9.0	264	9.8	333	12.2	473	17.3	776	29.8

[a]Rate per 10,000 person-years

TABLE 2 (cont.) Numbers and rates of incident diagnoses of insomnia (one case per individual in surveillance period), active component, U.S. Armed Forces, January 1998–December 2013

	2006		2007		2008		2009		2010		2011		2012		2013	
	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate*
All	8,620	61.3	13,284	94.8	18,723	132.2	22,963	158.9	23,700	162.4	32,468	222.8	36,133	252.3	35,032	248.3
Service																
Army	4,981	100.7	8,097	158.8	12,179	229.8	15,089	276.1	16,074	287.0	21,993	390.1	23,743	432.8	22,120	417.2
Navy	945	27.2	1,240	37.1	1,518	46.4	1,875	57.5	1,942	60.0	2,715	84.5	3,257	103.2	3,472	109.5
Air Force	2,098	60.7	2,968	89.0	3,562	109.9	4,291	130.9	3,881	117.3	4,792	145.5	5,405	164.4	5,671	172.6
Marine Corps	389	21.8	722	39.5	1,175	60.7	1,416	69.9	1,560	77.0	2,658	132.2	3,370	170.7	3,398	174.5
Coast Guard	207	52.0	257	63.5	289	70.1	292	69.3	243	58.0	310	74.1	358	85.3	371	91.1
Sex																
Male	6,548	54.4	10,332	86.1	15,087	124.2	18,466	149.0	19,147	153.2	26,162	209.8	29,247	239.0	28,221	234.8
Female	2,072	102.0	2,952	147.2	3,636	180.9	4,497	218.8	4,553	217.7	6,306	299.3	6,886	329.6	6,811	325.6
Race/ethnicity																
White, non-Hispanic	6,107	62.7	9,490	97.3	13,328	134.8	16,197	160.2	16,470	161.5	22,247	218.7	24,711	247.5	23,029	234.9
Black, non-Hispanic	1,471	60.7	2,257	95.5	3,243	137.1	4,182	174.3	4,555	188.5	6,575	273.1	7,255	307.6	7,652	326.9
Other	1,042	55.0	1,537	81.2	2,152	113.0	2,584	133.0	2,675	135.0	3,646	182.6	4,167	210.4	4,351	221.2
Age																
<20	484	47.5	700	68.9	745	72.4	830	87.0	713	81.6	823	100.0	812	97.5	813	88.2
20–24	2,868	60.5	4,439	95.1	6,122	130.8	6,997	147.0	7,040	147.9	9,305	200.0	9,566	215.0	8,599	197.6
25–29	1,893	61.2	2,923	92.9	4,555	139.9	5,608	164.0	5,773	163.0	8,176	225.4	9,368	262.2	8,565	249.3
30–24	1,119	56.2	1,705	85.9	2,413	120.1	3,170	151.8	3,420	157.6	4,905	218.3	5,819	254.8	6,099	267.1
35–39	1,019	59.3	1,625	94.6	2,440	142.3	3,104	180.6	3,051	179.7	4,161	251.3	4,802	295.2	4,928	309.9
40+	1,237	82.3	1,892	128.2	2,448	166.3	3,254	215.2	3,703	239.0	5,098	325.1	5,766	369.8	6,028	394.5
Rank																
E1–E4	4,095	68.2	6,409	106.6	8,979	146.6	10,846	171.6	11,003	171.7	15,163	236.1	16,281	261.2	14,290	235.0
E5–E9	3,632	63.4	5,604	98.5	7,995	139.6	9,891	171.5	9,917	172.0	13,991	245.6	16,427	292.1	17,229	309.8
O1–O4	590	34.2	833	49.0	1,133	66.9	1,409	81.4	1,782	100.2	2,104	116.2	2,104	115.6	2,153	117.9
O5–O10	185	44.2	280	66.9	346	82.0	475	111.0	552	127.1	676	155.8	746	171.9	755	174.9
W1–W5	118	66.6	158	84.4	270	137.6	342	168.0	446	214.3	534	251.8	575	269.6	605	287.2
Marital status																
Married	4,806	61.9	7,594	97.7	10,958	139.5	13,774	171.3	14,542	177.0	20,226	245.1	22,874	282.7	22,094	280.9
Single	3,199	55.6	4,756	84.1	6,354	111.5	7,384	128.0	7,294	127.7	9,544	169.2	10,278	185.1	9,839	175.9
Other	615	111.6	934	162.9	1,411	232.5	1,805	281.7	1,864	279.5	2,698	395.4	2,981	438.2	3,099	474.4
Education																
High school or less	6,496	64.2	9,991	99.2	14,210	139.7	17,148	166.0	17,289	167.6	23,965	235.3	25,741	266.3	23,668	254.8
Some college	793	71.6	1,326	111.8	1,861	150.4	2,361	180.9	2,412	180.2	3,494	251.8	4,957	307.9	5,774	335.6
College	709	44.3	1,108	66.1	1,507	90.1	1,884	111.9	2,016	125.4	2,691	164.2	2,891	173.0	3,127	183.2
Advanced degree	415	50.7	593	71.9	754	90.9	1,058	122.8	1,397	146.4	1,642	166.3	1,819	178.0	1,866	176.7
Unknown	207	50.4	266	106.1	391	157.9	512	188.5	586	154.8	676	180.2	725	204.1	597	175.6
Military occupation																
Infantry/artillery	1,124	64.8	2,044	112.1	3,322	173.7	3,945	198.0	4,273	208.5	5,971	290.5	6,727	333.4	6,133	321.3
Armor/motor transport	459	77.7	762	127.8	1,185	195.2	1,326	211.6	1,332	215.9	1,995	337.1	2,164	395.5	1,928	356.9
Pilot/aircrew	107	19.9	124	24.1	172	34.5	228	44.6	249	47.7	257	48.8	343	64.7	321	61.1
Repair/engineering	2,129	50.6	3,150	76.5	4,258	105.0	5,463	133.0	5,622	133.7	7,592	180.8	8,282	203.2	8,162	199.5
Comm/intel	2,127	67.0	3,218	102.4	4,358	138.3	5,445	171.4	5,445	172.5	7,537	238.3	8,530	271.7	8,576	280.2
Health care	1,284	110.6	1,826	158.3	2,339	203.8	2,845	244.1	2,919	241.6	3,711	309.3	4,233	347.2	4,288	348.4
Other	1,390	52.4	2,160	81.2	3,089	110.7	3,711	129.2	3,860	136.1	5,405	190.3	5,854	209.5	5,624	204.2

[a]Rate per 10,000 person-years

pre-existing type II diabetes. The remaining 100,494 made up the study cohort and the control cohort comprised an equal number of matched individuals. Characteristics of the study and comparison cohorts are shown in **Table 3**. The average follow-up time was 3.09 years in the study cohort and 3.42 years in the control cohort. Individuals in the study cohort were more likely to be black, non-Hispanic (18.9%) or obese (12.4%) than in the control cohort (16.5% and 5.9%, respectively) **(Table 3)**.

Overall, the crude incidence rate of type II diabetes was 15.4 cases per 10,000 p-yrs in the study cohort and 6.2 cases per 10,000 p-yrs in the control cohort **(Table 4)**. Those in the insomnia cohort were at higher risk of developing type II diabetes (adjusted HR, 2.17 [95% CI, 1.75–2.69]). The elevated risk of type II diabetes in the insomnia cohort was significant among both those younger than 30 years of age (adjusted HR, 2.53 [95% CI, 1.81–3.54]) and those aged 30 years or older (adjusted HR, 2.12 [95% C, 1.76–2.55]. The risk of type II diabetes among those with insomnia compared to those without insomnia was elevated in all race categories and in those with and without diagnoses of obesity. **(Table 4)**.

FIGURE. Annual incidence rates of diagnoses of chronic insomnia, active component, U.S. Armed Forces, January 1998–December 2013

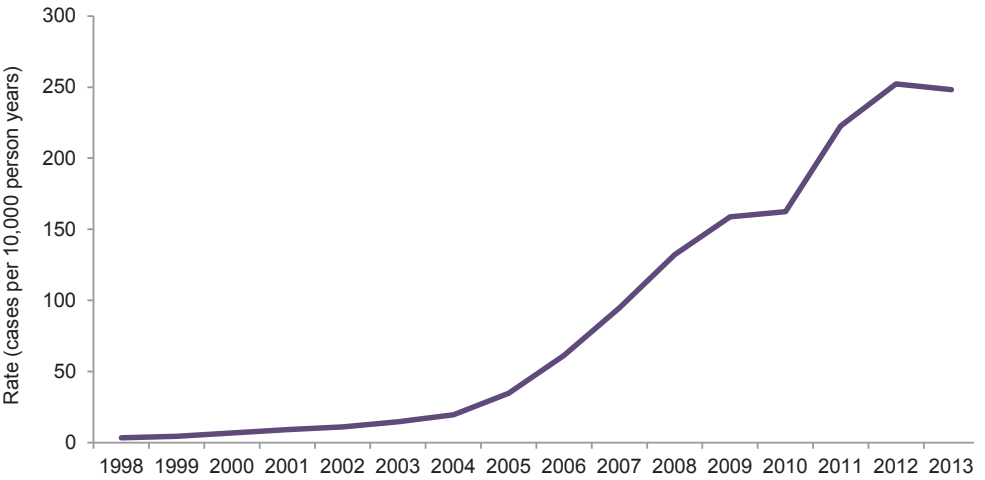

TABLE 3. Type II diabetes study: demographics and comorbidities comparing patients with and without chronic insomnia

	Insomnia				
	Yes		No		
	No.	%	No.	%	P value
Total	100,494	100.0	100,494	100.0	
Age					
<30	58,650	58.4	58,662	58.4	0.96
≥30	41,844	41.6	41,832	41.6	
Sex					
Male	79,437	79.0	79,437	79.0	1
Female	21,057	21.0	21,057	21.0	
Race					
White, non-Hispanic	69,395	69.1	69,810	69.5	<0.0001
Black, non-Hispanic	18,968	18.9	16,612	16.5	
Other	12,131	12.1	14,072	14.0	
Obesity					
No	88,003	87.6	94,528	94.1	<0.0001
Yes	12,491	12.4	5,966	5.9	

Analyses evaluating the development of hypertension

The study cohort for this analysis included 94,162 service members; 111,578 individuals were excluded from the cohort of those with chronic insomnia due to a co-morbid diagnosis of sleep apnea or pre-existing hypertension. The average follow-up times were 3.06 years and 3.42 years for the study and control groups, respectively. Higher proportions of the insomnia cohort were black, non-Hispanic or obese. **(Table 5)**

The crude incidence rate of hypertension was 95.6 cases per 10,000 p-yrs in the insomnia cohort and 46.2 per 10,000 p-yrs in the control cohort, with an overall adjusted HR of 2.00 (95% CI, 1.85–2.16) **(Table 6)**. The association of chronic insomnia with hypertension was seen both in those younger than 30 years of age and in those aged 30 years or older, with adjusted HRs of 2.32 (95% CI, 2.08–2.59) and 1.94 (95% CI, 1.79–2.10), respectively. Stratification by gender demonstrated that chronic insomnia had a stronger association with hypertension in men (adjusted HR, 2.17 [95% CI, 2.03–2.33]) than in women (adjusted HR, 1.59 [95% CI, 1.37–1.86]). The HR was also greater for whites (adjusted HR, 2.26 [95% CI, 2.08–2.46]) than for black, non-Hispanics (adjusted HR, 1.72 [95% CI 1.52–1.93]). Finally, both obese subjects and non-obese subjects had a significantly increased risk of hypertension related to insomnia with adjusted HRs of 2.09 (95% CI, 1.96–2.24) and 1.86 (95% CI, 1.55–2.23), respectively.

Mental health diagnoses were evaluated as possible confounders of the association between insomnia and hypertension. Previously published case definitions of four mental health disorders (post-traumatic stress disorder [PTSD], depression, anxiety, or alcohol abuse or dependence) were used to classify individuals into categories indicating the presence or absence of these conditions.[17] These variables were included in multivariate analyses to evaluate whether they were significant independent predictors of the development of hypertension or if they modified the relationship between insomnia and development of

TABLE 4. Type II diabetes risk associated with insomnia

Variables	Insomnia						Hazard ratios			
	Yes			No			Chronic insomnia vs. those without chronic insomnia			
	Case	P-Y[a]	IR[a]	Case	P-Y	IR[a]	Crude HR	CI	Adj HR[b]	CI
Overall	477	310,319	15.4	214	343,557	6.2	2.42	(1.99–2.94)	2.17	(1.75–2.69)
Age										
<30	112	180,059	6.2	50	201,568	2.5	2.63	(1.88–3.67)	2.53	(1.81–3.54)
≥30	365	130,259	28.0	164	141,990	11.6	2.52	(2.09–3.03)	2.12	(1.76–2.55)
Sex										
Male	382	241,620	15.8	177	272,430	6.5	2.56	(2.14–3.06)	2.20	(1.83–2.63)
Female	95	68,699	13.8	37	71,128	5.2	2.70	(1.85–3.95)	2.34	(1.59–3.43)
Race										
White, non-Hispanic	227	212,862	10.7	108	236,975	4.6	2.44	(1.94–3.07)	2.23	(1.77–2.81)
Black, non-Hispanic	153	58,389	26.2	61	57,909	10.5	2.64	(1.96–3.55)	2.13	(1.58–2.88)
Other	97	39,067	24.8	45	48,673	9.2	2.76	(1.94–3.93)	2.32	(1.62–3.32)
Obesity										
No	112	180,059	6.2	50	201,568	2.4	2.39	(1.99–2.87)	2.35	(1.95–2.82)
Yes	365	130,259	28.0	164	141,990	11.6	1.90	(1.34–2.69)	1.85	(1.31–2.62)

[a]Rate per 10,000 person-years

[b]Adjusted for age, sex, race, obesity

P-Y=person-years; IR=incidence rate; CI=confidence interval

hypertension. Inclusion of variables indicating the presence/absence of depression, anxiety, PTSD, or alcohol dependence/abuse in the model resulted in an overall adjusted HR of 1.91 (95% CI, 1.75–2.08), a value essentially unchanged from the crude HR.

TABLE 5. Hypertension study: demographics and comorbidities comparing patients with and without chronic insomnia

	Insomnia				
	Yes		No		
	No.	%	No.	%	P value
Total	94,162	100.0	94,162	100.0	
Age					
<30	57,203	60.8	57,218	60.8	0.94
≥30	36,959	39.2	36,944	39.2	
Sex					
Male	74,003	78.6	74,003	78.6	0.99
Female	20,159	21.4	20,159	21.4	
Race					
White, non-Hispanic	66,007	70.1	65,706	69.8	<0.0001
Black, non-Hispanic	16,777	17.8	15,271	16.2	
Other	11,378	12.1	13,185	14.0	
Obesity					
No	83,311	88.5	88,891	94.4	<0.001
Yes	10,851	11.5	5,271	5.6	

EDITORIAL COMMENT

This report examines the incidence of chronic insomnia in active component military members and its association with subsequent diagnoses of hypertension and type II diabetes. Chronic insomnia incidence rose sharply from 2004 through 2012, with a peak crude incidence rate of 252 cases per 10,000 p-yrs. After years of steady increase, the rate leveled out in 2013 (IR: 248 cases per 10,000 p-yrs).

Several possible mechanisms of action have been proposed to explain why insomnia might increase the risk of developing hypertension or type II diabetes. Patients with insomnia have dysregulation of the hypothalamic–pituitary–adrenal axis resulting in hypercortisolemia.[18–20] High levels of serum cortisol increase the risk of many chronic diseases including hypertension and metabolic syndrome. By extension, metabolic syndrome is a known precursor to type II diabetes. In addition, sleep loss may impact the neuroendocrine control of appetite, causing individuals to overeat and resulting in an increased risk of metabolic syndrome and type II diabetes.[21]

Chronic insomnia was associated with a two-fold increased risk of hypertension and type II diabetes (p<0.0001). Previous studies on this topic have provided conflicting results, with some demonstrating a strong association[11,22,23] and others finding minimal to no association.[13,24–26] There are several reasons why the findings of this study may not be directly comparable to studies in civilian populations. Military members are generally younger and

TABLE 6. Hypertension risk associated with insomnia

Variables	Insomnia						Hazard ratios			
	Yes			No			Chronic insomnia vs. those without chronic insomnia			
	Case	P-Y	IR[a]	Case	P-Y	IR	Crude HR	CI	Adj HR[b]	CI
Overall	2,757	288,494	95.6	1,486	321,873	46.2	2.08	(1.93–2.24)	2.00	(1.85–2.16)
Age										
<30	963	174,571	55.2	486	196,127	24.8	2.34	(2.10–2.62)	2.32	(2.08–2.59)
≥30	1,794	113,923	157.5	1,000	125,747	79.5	2.07	(1.92–2.24)	1.94	(1.79–2.10)
Sex										
Male	2,320	223,105	104.0	1,218	253,621	48.0	2.30	(2.14–2.46)	2.17	(2.03–2.33)
Female	437	65,389	66.8	268	68,252	39.3	1.74	(1.49–2.02)	1.59	(1.37–1.86)
Race										
White, non-Hispanic	1,652	200,907	82.2	848	222,613	38.1	2.26	(2.08–2.46)	2.26	(2.08–2.46)
Black, non-Hispanic	760	51,141	148.6	440	53,456	82.3	1.93	(1.71–2.17)	1.72	(1.52–1.93)
Other	345	36,446	94.7	198	45,805	43.2	2.27	(1.90–2.70)	2.00	(1.68–2.39)
Obesity										
No	2,253	257,417	87.5	1,334	304,902	43.8	2.10	(1.96–2.24)	2.09	(1.96–2.24)
Yes	504	31,077	162.2	152	16,972	89.6	1.92	(1.60–2.30)	1.86	(1.55–2.23)

[a]Rate per 10,000 person-years
[b]Adjusted for age, sex, race, obesity
P-Y=person-years

have fewer comorbidities than their civilian counterparts. Although this inquiry employed a longitudinal study design that allowed for follow-up of individuals over time, many previous studies evaluating these associations employed cross-sectional designs which do not allow for the evaluation of a temporal relationship between an exposure (i.e., insomnia) and an outcome (i.e., hypertension, diabetes). In addition, insomnia symptoms (rather than physician-assigned diagnoses) were used to define exposure in many of these studies; such a variation in approach may introduce differences in severity of symptoms. These methodologic differences might partially explain the increased risks of hypertension and diabetes associated with chronic insomnia seen in this study but not seen in some other studies.

There are several limitations to this report that should be considered when interpreting the results. First, despite adjusting for confounding factors there is the potential for bias resulting from unmeasured or unknown confounding factors. Detailed patient data are not available in DMSS for smoking status, height, weight, diet, physical activity, cholesterol level, alcohol use, blood pressure, supplement use, or family history of diabetes. Second, because the endpoints of analysis were ICD-9 diagnostic codes, there is the potential for miscoding and misclassification, which also may result in bias. Patient surveys or evidence from sleep studies were not obtained to verify the diagnostic coding by physicians. Nevertheless, the strength of the study is its large population-based cohort with a long follow-up period demonstrating the association between chronic insomnia and the development of type II diabetes and hypertension.

In summary, the findings of this report suggest that the incidence of diagnoses of chronic insomnia in active component service members has been on the rise from 2004 through 2012, with a trend toward leveling off in 2013. A diagnosis of chronic insomnia was a strong predictor for subsequent incidence of type II diabetes and hypertension, and further study is warranted to determine the long-term impact of chronic insomnia on service members' health. These findings highlight the importance of sleep hygiene education for active duty members and their supervisors, with referral for treatment if symptoms do not improve after 2 weeks.

Disclaimer: The views expressed are those of the authors and do not necessarily reflect the official views of the Uniformed Services University of the Health Sciences, U.S. Air Force, or Department of Defense.

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10 Effective Sleep Habits for Adults

Sleep is vital for health, performance, and wellbeing. That is why healthy sleep habits, that promote optimal sleep duration and quality, are important for everyone.

- **1. Create a quiet, dark, comfortable sleeping environment.** Cover windows with darkening drapes or shades or wear a sleep mask to block light. If you can, adjust the room temperature to suit you. Use the room fan to muffle noise AND keep you cool.
- **2. Remove distractions from the bedroom.** Make sure your bed is comfortable and use it only for sleeping. Don't read, watch TV, or listen to music in bed. Remove all TVs, computers, and other "gadgets" from the bedroom. Don't dwell on, or bring your problems or emotionally upsetting arguments to bed.
- **3. Stop caffeine at least 6 hours before bedtime.** Caffeine promotes wakefulness and disrupts sleep.
- **4. Don't drink alcohol before bed.** Alcohol reduces the recuperative value of sleep. If you need help to stop drinking see your healthcare provider for options.
- **5. Get your exercise in by early evening.** If you experience difficulty initiating or maintaining sleep after nighttime exercise, try exercising at least 3 hours before bedtime.
- **6. Do not go to bed hungry.** A light bedtime snack (for example, milk and crackers) can be helpful, but do not eat a large meal close to bedtime. Also, empty your bladder before you go to bed, so that the urge to urinate does not disrupt your sleep.

The following sleep hygiene tips are especially critical for those experiencing sleep problems:

- **7. Maintain a consistent, regular routine that starts with a fixed wake-up time.** Start by setting a fixed time to wake up, get out of bed, and get exposure to light each day. Pick a time that you can maintain during the week AND on weekends. Adjust your bedtime so that you target 7—8 hours of sleep.
- **8. Get out of bed if you can't sleep.** Do not try to force yourself to fall asleep – it will tend to make you more awake. If you wake up in the middle of the night, give yourself about 20 minutes to return to sleep. Do not return to bed until you feel sleepy.
- **9. Nap wisely.** Naps longer than 1 hour and/or if they are taken late in the day (after 3 PM), can cause problems falling asleep or staying asleep at night. If you need to nap for safety reasons (e.g., driving), try to take a 30-60 minute nap in the late morning or early afternoon, just enough to take the edge off your sleepiness.
- **10. Move the bedroom clock to where you cannot see it.** If you tend to check the clock two or more times during the night, cover the clock face or turn it around so that you can't see it.

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Update: Cold Weather Injuries, Active and Reserve Components, U.S. Armed Forces, July 2009–June 2014

Ricardford R. Connor, MPH

From July 2013 through June 2014, the number of active and reserve component service members treated for cold injuries (n=719) was the highest of the past five cold seasons (2009–2014). The rate of cold injury among active component personnel was also the highest of the 5-year period. Army personnel accounted for the majority (62%) of cold injuries. Frostbite was the most common type of cold injury in each of the services. 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 2 years, presumably as a result of declining numbers of personnel exposed and the changing nature of operations. The increase in numbers and the geographic distribution of cold injuries in the previous cold season are compatible with the unusual pattern of cold weather that marked Winter 2013–2014.

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 the U.S. Armed Forces have for many years 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 2009 through 30 June 2014. 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–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-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 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.

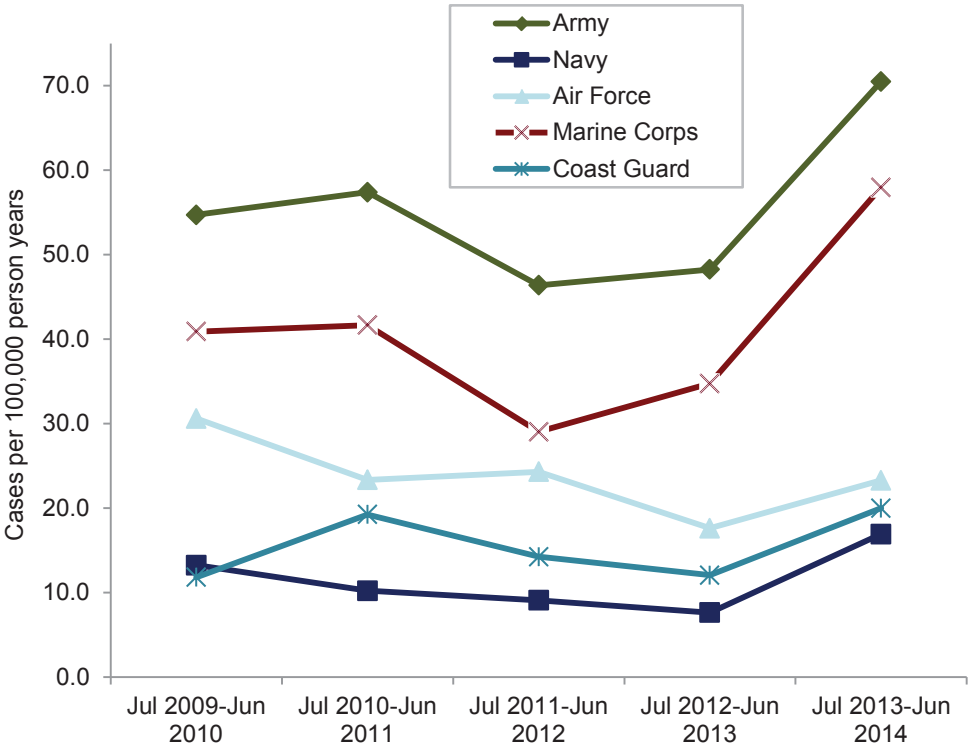
RESULTS

2013–2014 cold season

From July 2013 through June 2014, a total of 719 members of the active (n=617) and reserve (n=102) components had at least one medical encounter with a primary diagnosis of cold injury. This total number of affected individuals was the highest of the past five cold seasons. By using only one cold injury diagnosis per individual during the cold season, the overall incidence rate for all active component service members in 2013–2014 (45.4 per 100,000 p-yrs) was 51% higher than the rate (30.1 per 100,000 p-yrs) of the 2012–2013 cold season. In 2013–2014, the overall incidence rate and the rates for each of the individual military services, with the exception of the Air Force, were higher than the rates for any of the previous four cold seasons. **(Table 1, Figure 1).**

The 367 active component Army service members who received at least one

FIGURE 1. Rates of cold injury[a] by service and cold year, active component, U.S. Armed Forces, July 2009–June 2014



[a]One cold injury per individual per year

TABLE 1. Numbers and rates of any cold injury (one per person per year), by service and component, U.S. Armed Forces, July 2009–June 2014

	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]	No.	Rate[a]
All years (2009–2014)	1,512	55.3	183	11.4	392	23.8	405	40.8	32	15.4	2,524	36.2
Jul 2009–Jun 2010	302	54.7	43	13.2	101	30.6	83	40.9	5	11.8	534	37.9
Jul 2010–Jun 2011	324	57.4	33	10.2	77	23.3	84	41.7	8	19.2	526	37.1
Jul 2011–Jun 2012	259	46.4	29	9.1	80	24.3	58	29.0	6	14.2	432	30.7
Jul 2012–Jun 2013	260	48.3	24	7.6	58	17.6	68	34.7	5	12.1	415	30.1
Jul 2013–Jun 2014	367	70.5	54	16.9	76	23.3	112	58.0	8	20.0	617	45.4
Reserve component[b]												
All years (2009–2014)	366		15		50		52		1		484	
Jul 2009–Jun 2010	91		5		9		7		0		112	
Jul 2010–Jun 2011	99		0		17		8		1		125	
Jul 2011–Jun 2012	53		4		6		8		0		71	
Jul 2012–Jun 2013	46		2		11		15		0		74	
Jul 2013–Jun 2014	77		4		7		14		0		102	
Overall, active and reserve[b]												
All years (2009–2014)	1,878		198		442		457		33		3,008	
Jul 2009–Jun 2010	393		48		110		90		5		646	
Jul 2010–Jun 2011	423		33		94		92		9		651	
Jul 2011–Jun 2012	312		33		86		66		6		503	
Jul 2012–Jun 2013	306		26		69		83		5		489	
Jul 2013–Jun 2014	444		58		83		126		8		719	

[a]Rate per 100,000 person-years

[b]Rate is not calculated for reserve component due to unavailability of person-time.

TABLE 2a. Numbers and rates of diagnoses of cold injuries (one per type per person per year), active component, U.S. Army, July 2009–June 2014

	Frostbite		Immersion foot		Hypothermia		Unspecified		All cold injuries	
	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]
Total	797	29.1	193	7.1	193	7.1	401	14.7	1,584	57.9
Sex										
Male	641	27.1	177	7.5	169	7.1	281	11.9	1,268	53.6
Female	156	42.2	16	4.3	24	6.5	120	32.4	316	85.4
Race/ethnicity										
White, non-Hispanic	358	21.4	117	7.0	118	7.0	177	10.6	770	46.0
Black, non-Hispanic	327	59.5	50	9.1	40	7.3	168	30.6	585	106.5
Other	112	21.9	26	5.1	35	6.9	56	11.0	229	44.8
Age										
<20	74	52.2	18	12.7	26	18.4	60	42.4	178	125.7
20–24	321	39.8	87	10.8	94	11.7	162	20.1	664	82.4
25–29	194	28.5	45	6.6	39	5.7	88	12.9	366	53.7
30–34	86	19.3	26	5.8	23	5.2	46	10.3	181	40.6
35–39	63	19.3	10	3.1	6	1.8	23	7.0	102	31.2
40–44	39	18.1	5	2.3	4	1.9	16	7.4	64	29.8
45+	20	17.0	2	1.7	1	0.8	6	5.1	29	24.6
Rank										
Enlisted	719	31.9	159	7.1	169	7.5	368	16.3	1,415	62.8
Officer	78	16.2	34	7.0	24	5.0	33	6.8	169	35.0
Occupation										
Infantry/artillery/ combat engineering	293	44.7	87	13.3	84	12.8	93	14.2	557	84.9
Armor/motor transport	39	28.6	9	6.6	5	3.7	14	10.3	67	49.2
Repair/engineering	121	21.4	28	5.0	39	6.9	79	14.0	267	47.3
Comm/intel	184	28.1	38	5.8	30	4.6	112	17.1	364	55.5
Health care	54	20.2	4	1.5	8	3.0	32	12.0	98	36.7
Other	106	23.3	27	5.9	27	5.9	71	15.6	231	50.8
Cold year (Jul–Jun)										
2009–2010	150	27.2	44	8.0	37	6.7	95	17.2	326	59.1
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	142	26.4	46	8.5	29	5.4	51	9.5	268	49.7
2013–2014	184	35.3	47	9.0	53	10.2	94	18.1	378	72.6

[a]Rate per 100,000 person-years

diagnosis of a cold injury (rate: 70.5 per 100,000 p-yrs) during the 2013–2014 cold season accounted for 59.5% of active component members affected among all services. The Marine Corps had 112 individuals diagnosed with a cold injury (rate: 58.0 per 100,000 p-yrs); they represented 18.2% of all affected service members. Navy service members (n=54) had the lowest service-specific rate of cold injuries during the 2013–2014 cold season (rate: 16.9 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=321 or 50.9% of all cold injuries) among active component service members in 2013–2014. In both the Air Force and Coast Guard, more than 60% of all cold injuries were frostbite, while in the other services the proportions of cases of frostbite ranged from 46.4% to 52.6% **(Tables 2a–d)**. (Detailed data for the Coast Guard are not shown because there were only 33 cold injuries over the 5-year surveillance period.) In all five Services, the 2013–2014 incidence rates of frostbite among active component service members were the highest of the past five cold seasons. In addition to frostbite, rates by type of cold injury were the highest in the past 5 years for hypothermia in the Army and Navy and for immersion foot in the Army **(Tables 2a–d)**.

Five cold seasons: July 2009–June 2014

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: 85.4 per 100,000 p-yrs) and male (rate: 53.6 per 100,000 p-yrs) service members. Within all services, females had higher rates for frostbite and "unspecified" cold injuries. Females also had higher rates for hypothermia in the Marine Corps **(Tables 2a–d)**.

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–d)**. 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 2009–2014 **(data not shown)**.

Rates of cold injuries were higher among the youngest service members (<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 and Coast Guard **(Tables 2a–d)**. In the Army, Air Force, and Marine Corps, rates were highest among service members in infantry/artillery/combat engineering–related occupations **(Tables 2a, 2c, 2d)**.

During the 5-year surveillance period, there were 3,008 active and reserve component service members affected by any cold injury. Of those, 484 were reservists and 2,524 were active component service members. Of all reserve component members (n=484) who suffered a cold injury during the 5-year surveillance period, 76% (n=366) were members of the Army **(data not shown)**. Overall, soldiers accounted

TABLE 2b. Numbers and rates of diagnoses of cold injuries (one per type per person per year), active component, U.S. Navy, July 2009–June 2014

	Frostbite		Immersion foot		Hypothermia		Unspecified		All cold injuries	
	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]
Total	72	4.5	39	2.4	52	3.2	26	1.6	189	11.8
Sex										
Male	52	3.9	35	2.6	47	3.5	20	1.5	154	11.5
Female	20	7.6	4	1.5	5	1.9	6	2.3	35	13.3
Race/ethnicity										
White, non-Hispanic	39	4.7	19	2.3	30	3.6	8	1.0	96	11.6
Black, non-Hispanic	20	8.0	4	1.6	10	4.0	10	4.0	44	17.7
Other	13	2.5	16	3.1	12	2.3	8	1.5	49	9.4
Age										
<20	13	15.9	2	2.5	3	3.7	1	1.2	19	23.3
20–24	21	4.1	23	4.5	25	4.9	12	2.4	81	15.9
25–29	18	4.6	8	2.0	17	4.3	2	0.5	45	11.4
30–34	10	4.0	5	2.0	3	1.2	4	1.6	22	8.8
35–39	4	2.1	1	0.5	2	1.0	3	1.6	10	5.2
40–44	5	4.7	0	0.0	0	0.0	4	3.7	9	8.4
45+	1	1.6	0	0.0	2	3.1	0	0.0	3	4.7
Rank										
Enlisted	60	4.5	37	2.8	45	3.4	22	1.6	164	12.3
Officer	12	4.5	2	0.8	7	2.6	4	1.5	25	9.4
Occupation										
Infantry/artillery/ combat engineering	2	1.7	3	2.6	5	4.4	1	0.9	11	9.6
Armor/motor transport	3	5.2	4	7.0	6	10.5	0	0.0	13	22.7
Repair/engineering	17	2.6	17	2.6	20	3.0	10	1.5	64	9.7
Comm/intel	10	3.6	4	1.4	4	1.4	2	0.7	20	7.2
Health care	7	4.0	1	0.6	4	2.3	6	3.4	18	10.2
Other	33	10.4	10	3.2	13	4.1	7	2.2	63	19.9
Cold year (Jul–Jun)										
2009–2010	11	3.4	13	4.0	12	3.7	8	2.5	44	13.6
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	30	9.4	3	0.9	17	5.3	7	2.2	57	17.9

[a]Rate per 100,000 person-years

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 injury (n=2,524), 57 (2.3% of the total) were affected during basic training. The Army (n=37) and Marine Corps (n=16) accounted for 93% of all basic trainees who suffered a cold injury **(data not shown)**. Additionally, during the surveillance period, 64 service members affected with cold injuries (2.5% of the total) were hospitalized, and most of the hospitalized cases were members of either the Army (n=38) or Marine Corps (n=18) **(data not shown)**.

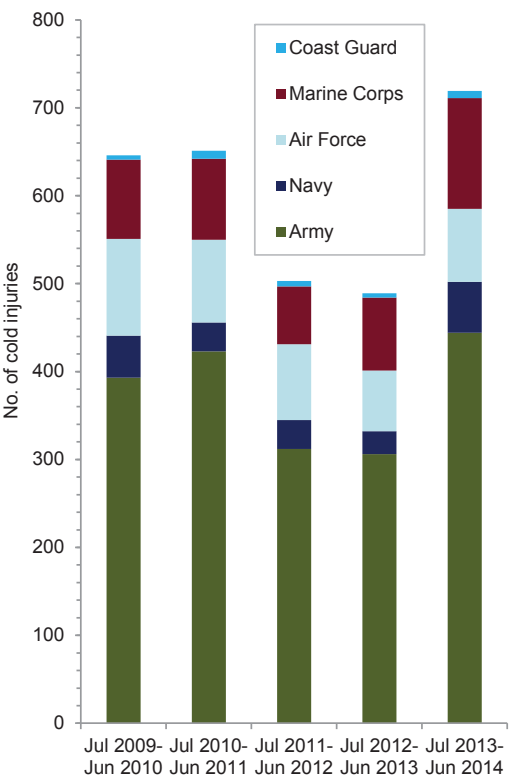
Cold injuries in Iraq and Afghanistan

During the 5-year surveillance period, 285 cold injuries were diagnosed and treated in Iraq and Afghanistan. Of these, nearly half (n=141, 49%) were frostbite; 60 (21%) were immersion foot; 35 (12%) were hypothermia; and 49 (17%) were "unspecified" cold injuries. Cold injuries most often occurred in deployed service members who were male (n=246; 86%); white, non-Hispanic (n=158; 54%); aged 20–24 years (n=144; 51%); in the Army (n=214; 75%); enlisted grade (n=265; 93%); and in infantry/artillery/combat engineering–related occupations (n=119; 42%). Of all 285 cold injuries during the surveillance period, 82% occurred in the first 3 years and only 24 and 26 were diagnosed in the past two cold seasons, respectively **(data not shown)**.

Cold injuries by location

There were 20 military installations that reported at least 30 cold injuries among active and reserve component service members during the 5-year surveillance period. Fort Bragg, NC (n=118) and Fort Wainwright, AK (n=116) had the highest 5-year total numbers of incident cold injury events. During the 2013–2014 cold season, incident cases of cold injuries were the highest in the past 5 years at 10 of those 20 installations; all 10 are located in the contiguous 48 states. Interestingly, three of the five installations that had fewer cold injuries during 2013–2014 than in the previous cold season were located in Alaska. **(data not shown)**. **Figure 3** shows the numbers of cold injuries during 2013–2014 and the median numbers of cases for

FIGURE 2. Cold injuries[a] by cold year and service, active and reserve components, U.S. Armed Forces, July 2009–June 2014



[a]One cold injury per individual per year

TABLE 2c. Numbers and rates of diagnoses of cold injuries (one per type per person per year), active component, U.S. Air Force, July 2009–June 2014

	Frostbite		Immersion foot		Hypothermia		Unspecified		All cold injuries	
	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]
Total	224	13.6	55	3.3	51	3.1	68	4.1	398	24.2
Sex										
Male	179	13.4	49	3.7	43	3.2	49	3.7	320	24.0
Female	45	14.3	6	1.9	8	2.6	19	6.1	78	24.9
Race/ethnicity										
White, non–Hispanic	133	11.5	46	4.0	37	3.2	49	4.2	265	22.9
Black, non–Hispanic	50	21.8	6	2.6	8	3.5	12	5.2	76	33.1
Other	41	16.1	3	1.2	6	2.3	7	2.7	57	22.3
Age										
<20	18	25.9	9	13.0	3	4.3	8	11.5	38	54.7
20–24	116	25.0	23	5.0	19	4.1	31	6.7	189	40.8
25–29	52	12.2	11	2.6	17	4.0	13	3.1	93	21.8
30–34	16	5.7	2	0.7	5	1.8	7	2.5	30	10.6
35–39	12	5.7	4	1.9	4	1.9	4	1.9	24	11.3
40–44	8	6.1	6	4.6	0	0.0	2	1.5	16	12.2
45+	2	3.3	0	0.0	3	5.0	3	5.0	8	13.2
Rank										
Enlisted	196	14.9	51	3.9	42	3.2	59	4.5	348	26.4
Officer	28	8.6	4	1.2	9	2.8	9	2.8	50	15.4
Occupation										
Infantry/artillery/ combat engineering	6	60.4	3	30.2	0	0.0	1	10.1	10	100.7
Armor/motor transport	2	16.0	0	0.0	1	8.0	0	0.0	3	24.0
Repair/engineering	80	14.9	19	3.5	15	2.8	20	3.7	134	24.9
Comm/intel	39	10.3	6	1.6	11	2.9	12	3.2	68	18.0
Health care	13	8.2	1	0.6	5	3.2	3	1.9	22	13.9
Other	84	15.3	26	4.7	19	3.5	32	5.8	161	29.3
Cold year (Jul–Jun)										
2009–2010	48	14.5	17	5.2	12	3.6	24	7.3	101	30.6
2010–2011	47	14.2	12	3.6	10	3.0	10	3.0	79	24.0
2011–2012	46	14.0	10	3.0	14	4.3	11	3.3	81	24.6
2012–2013	33	10.0	8	2.4	9	2.7	11	3.3	61	18.5
2013–2014	50	15.3	8	2.5	6	1.8	12	3.7	76	23.3

[a]Rate per 100,000 person-years

the previous 4 years for those installations that had at least 30 cases during the past 5 years. The four installations in Alaska had 52 fewer cold injuries during 2013–2014 than in the previous cold season, but the 16 installations in the lower 48 states had 171 more cold injuries **(data not shown)**.

EDITORIAL COMMENT

The overall rate of cold injuries among active component service members during the 2013–2014 cold season was higher than any of the rates of the previous 4 years. Although last winter's rates increased for all of the services, the Army and Marine Corps accounted for most of the increase in cold injuries from the year before. The eight locations that recorded the largest increases in numbers of cold injuries from the previous cold season were the eight installations with the greatest numbers of cases in **Figure 3.** Winter 2013–2014 was marked by a weakening of the polar vortex that brought dramatically colder-than-average weather to much of the U.S. east of the Rocky Mountains. Two distinct waves of such weather began on 6 December 2013 and 2 January 2014.[6] Interestingly, Alaska and the westernmost part of the lower 48 states experienced winters that were warmer than usual.[7] This analysis did not examine a temporal correlation between the occurrence of cold injuries and the timing of the unusual cold weather.

FIGURE 3. Numbers of cold injuries, 2013−2014 cold season, and median number for 2009−2013 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 2009−June 2014

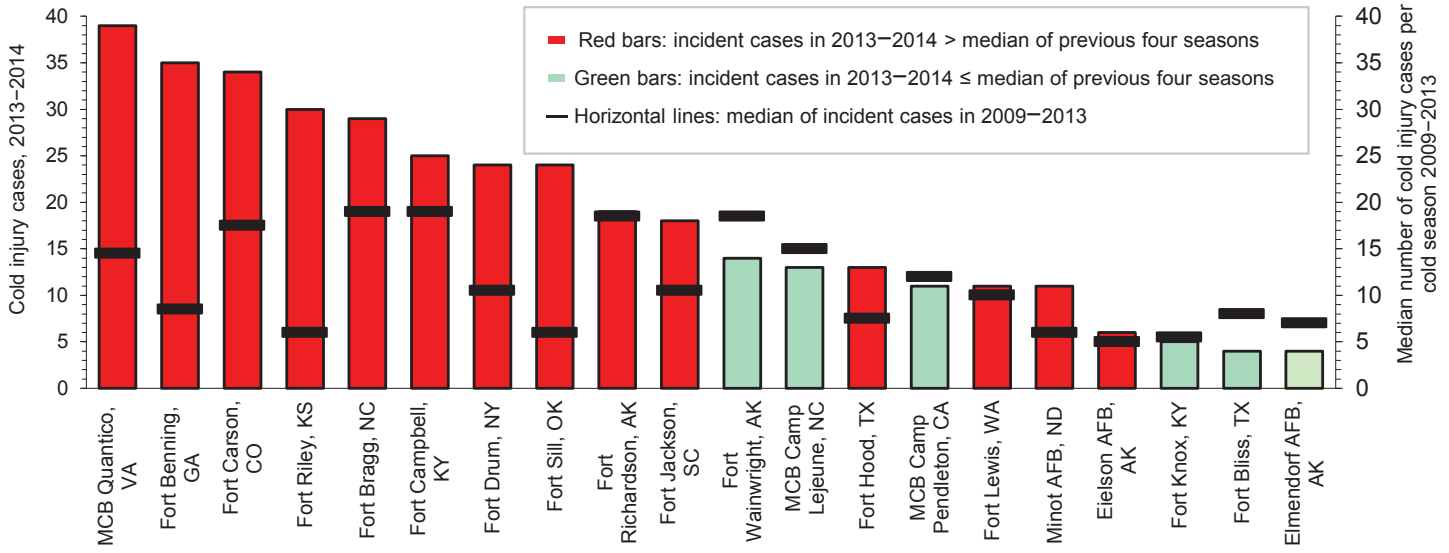


TABLE 2d. Numbers and rates of diagnoses of cold injuries (one per type per person per year), active component, U.S. Marine Corps, July 2009–June 2014

	Frostbite		Immersion foot		Hypothermia		Unspecified		All cold injuries	
	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]
Total	133	13.4	93	9.4	119	12.0	69	6.9	414	41.7
Sex										
Male	116	12.5	90	9.7	106	11.5	63	6.8	375	40.6
Female	17	24.8	3	4.4	13	19.0	6	8.8	39	56.9
Race/ethnicity										
White, non–Hispanic	62	9.4	67	10.1	64	9.7	43	6.5	236	35.6
Black, non–Hispanic	48	49.2	5	5.1	20	20.5	18	18.4	91	93.2
Other	23	9.9	21	9.0	35	15.0	8	3.4	87	37.3
Age										
<20	22	18.4	30	25.1	32	26.8	6	5.0	90	75.3
20–24	62	13.6	52	11.4	61	13.4	36	7.9	211	46.3
25–29	29	14.0	8	3.9	20	9.6	16	7.7	73	35.2
30–34	15	15.2	2	2.0	4	4.0	9	9.1	30	30.4
35–39	4	6.1	1	1.5	0	0.0	1	1.5	6	9.1
40–44	1	3.0	0	0.0	2	6.1	0	0.0	3	9.1
45+	0	0.0	0	0.0	0	0.0	1	7.6	1	7.6
Rank										
Enlisted	101	11.4	81	9.2	113	12.8	48	5.4	343	38.8
Officer	32	29.5	12	11.1	6	5.5	21	19.4	71	65.5
Occupation										
Infantry/artillery/ combat engineering	34	15.8	12	5.6	22	10.2	15	7.0	83	38.5
Armor/motor transport	3	5.3	1	1.8	2	3.6	5	8.9	11	19.5
Repair/engineering	11	4.6	10	4.1	11	4.6	7	2.9	39	16.2
Comm/intel	29	13.2	3	1.4	9	4.1	16	7.3	57	26.0
Health care	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Other	56	21.5	67	25.7	75	28.8	26	10.0	224	85.9
Cold year (Jul–Jun)										
2009–2010	28	13.8	14	6.9	34	16.7	10	4.9	86	42.4
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	22	11.0	9	4.5	58	29.0
2012–2013	18	9.2	20	10.2	15	7.7	20	10.2	73	37.3
2013–2014	52	26.9	17	8.8	20	10.4	23	11.9	112	58.0

[a]Rate per 100,000 person-years

Factors associated with increased risk of cold injury in previous years were again noted during the most recent cold season. Frostbite was by far the most common cold injury overall and in each of the services. Rates of cold injuries were higher among service members who were the youngest (<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]

Unlike the experience at U.S locations, the number of cold injuries associated with service in Iraq and Afghanistan has declined in the past two cold seasons after having steadily risen in the previous 3 years. This reduction in the number of cases is likely the result of both a dramatic decline in the numbers of service members in that region and a change 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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2. Castellani JW, O'Brien C, Baker-Fulco C, Sawka MN, Young AJ. Sustaining health and performance in cold weather operations. Technical Note No. TN/02-2. U.S. Army Research Institute of Environmental Medicine, Natick, MA. October 2001.
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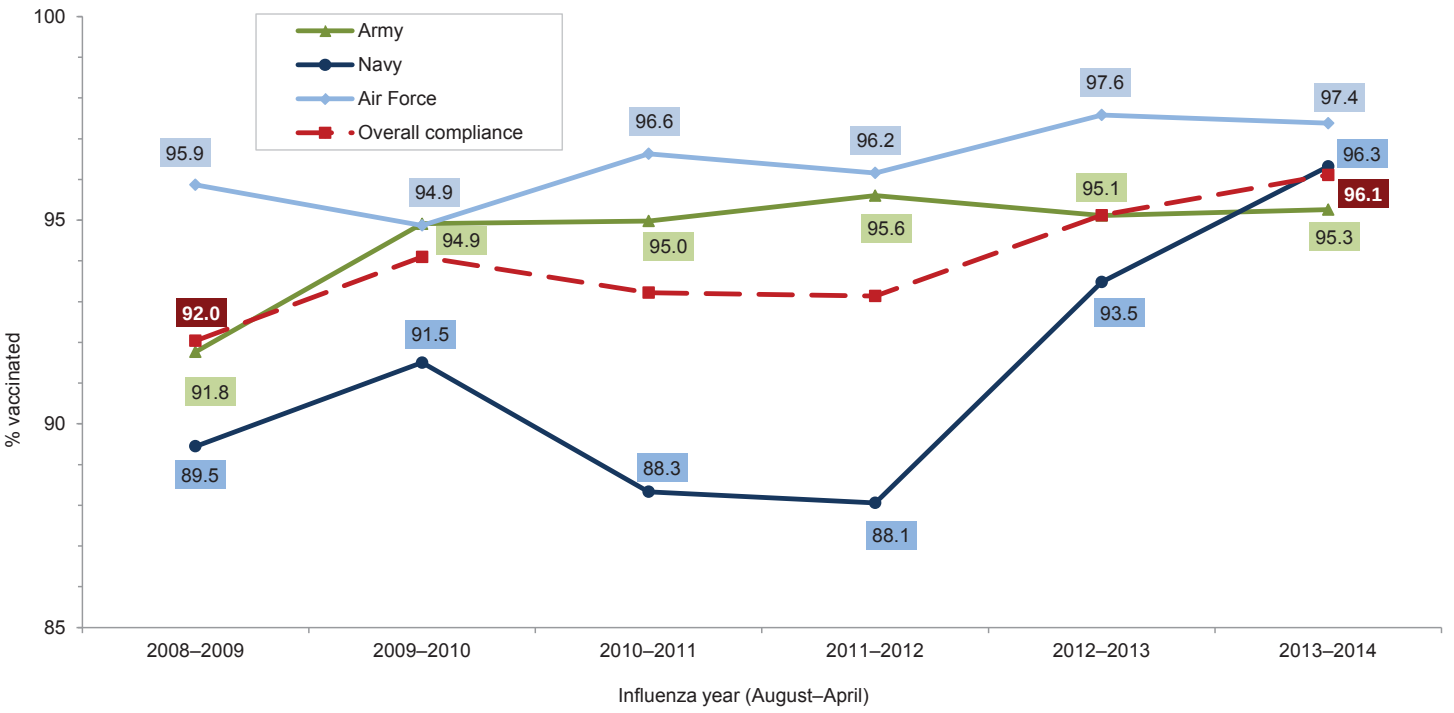
7. Koronowski R. Hot Alaska, Cold Georgia: How The Shifted Polar Vortex Turned Winter Upside-Down. Climate Progress. 8 February 2014. Avalable at: http://thinkprogress.org/climate/2014/02/08/3266731/hot-alaska-cold-georgia-polar-vortex/ Accessed on 21 October 2014.

Surveillance Snapshot: Influenza Immunization Among U.S. Armed Forces Healthcare Workers, August 2008–April 2014

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 2008–April 2014



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 6-year surveillance period (August 2008–April 2014) 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 2013–2014 influenza season, each of the three Services attained greater than 95% compliance among healthcare personnel **(Figure)**. For all Services together, the compliance rate was 96.1%; this represents the highest reported overall compliance rate since the *MSMR* began reporting this metric.

1. CDC. Immunization of health-care personnel: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR Recomm Rep.* 2011 Nov 25;60 (RR-7): 1–45.
2. Army Regulation 40-562; BUMEDINST 6230.15B; AFJI 48-110_IP; CG COMDTINST M6230.4G. Medical Services, Immunizations and Chemoprophylaxis for the Prevention of Infectious Diseases. 7 October 2013.
3. Assistant Secretary of Defense (Health Affairs). Policy for Mandatory Seasonal Influenza Immunization for Civilian Healthcare Personnel Who Provide Direct Patient Care in Department of Defense Military Treatment Facilities. Health Affairs Policy 08-005, 4 April 2008.
4. Assistant Secretary of Defense (Health Affairs). Addition of Pandemic Influenza Vaccine or Novel Influenza Vaccine to the Policy for Mandatory Seasonal Influenza Immunization for Civilian Healthcare Personnel Who Provide Direct Patient Care in Department of Defense Military Treatment Facilities. Health Affairs Policy Memorandum 11-010, 28 July 2011.

Surveillance Snapshot: Manner and Cause of Death, Active Component, U.S. Armed Forces, 1998–2013

FIGURE 1. Deaths of individuals, by proportions attributable to various "manners" of death, active component, U.S. Armed Forces, 1998–2013

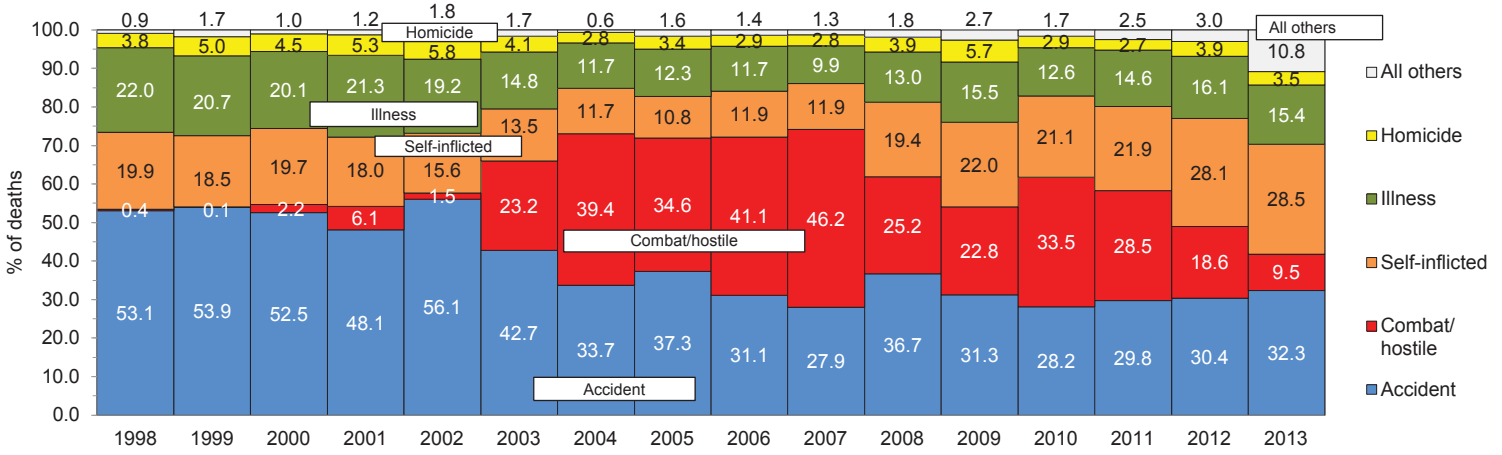
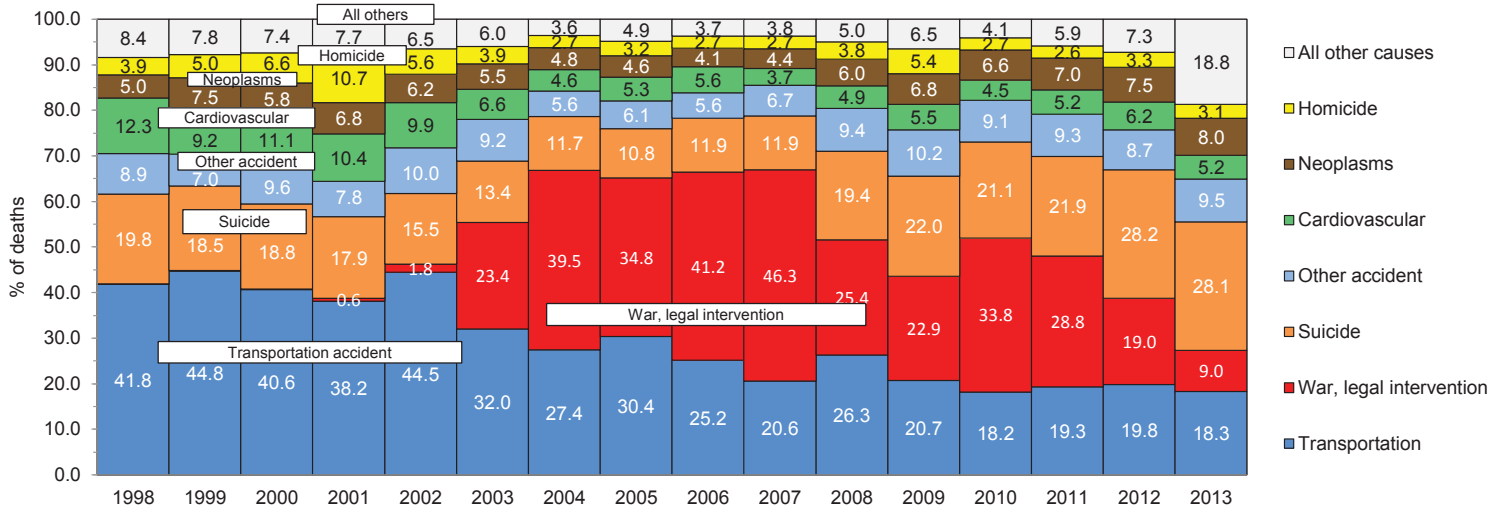


FIGURE 2. Deaths of individuals by proportions attributable to various categories of underlying causes, active component, U.S. Armed Forces, 1998–2013



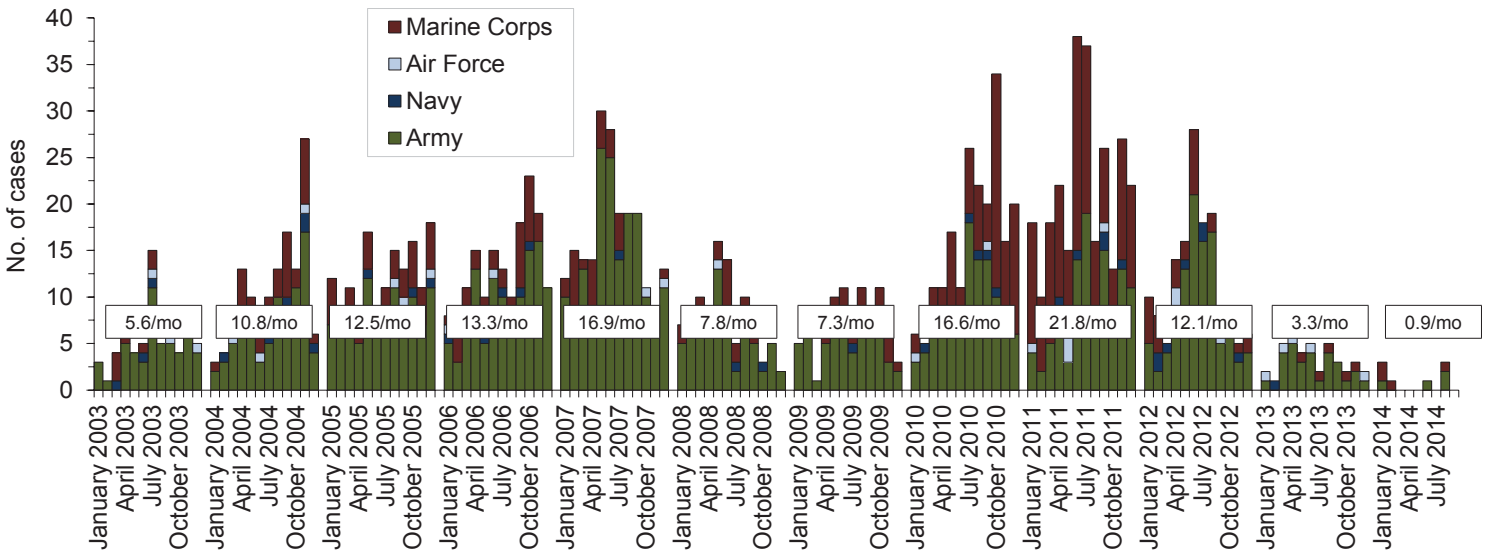
The Armed Forces Medical Examiner System, Mortality Surveillance Division, classifies deaths by "manner" (e.g., natural, accident, homicide, suicide, undetermined) and by underlying cause (using a classification system with more than 450 possible causes). The *MSMR* has previously reported on the relative proportions of deaths by manner and cause in active component service members through 2011.[1] **Figures 1** and **2** show the relative proportions of death by manner and by cause in active component service members of the U.S Army, Navy, Air Force, and Marine Corps who died during 1998–2013.

The manner of death comprising the greatest proportion of deaths throughout the entire surveillance period was accidental deaths; suicide (i.e., self-inflicted death) has become the second most frequent manner of death in the last 2 years of the surveillance period as deaths due to combat have declined. However, when looking at proportion of deaths by underlying cause, suicide appears to account for a greater proportion of deaths than accidents. One reason for this apparent disparity is that accidental deaths are broken out into "transportation accidents" and "other accident" categories in the underlying cause-of-death figure **(Figure 2)**. This figure illustrates some other notable trends in the relative proportion of deaths by cause: transportation (e.g., motor vehicle-related) deaths have steadily declined during the surveillance period[2] and combat-related deaths have substantially declined during the last 2 years of the surveillance period, as would be expected with the drawdown of forces in Afghanistan.

1. Armed Forces Health Surveillance Center. Deaths while on active duty in the U.S. Armed Forces, 1990–2011. *MSMR*. 2012; 19(5): 2–5.
2. Armed Forces Health Surveillance Center. Update: motor vehicle-related deaths, active and reserve components, U.S. Armed Forces, 1999–2012. *MSMR*. 2013; 20(11): 10–14.

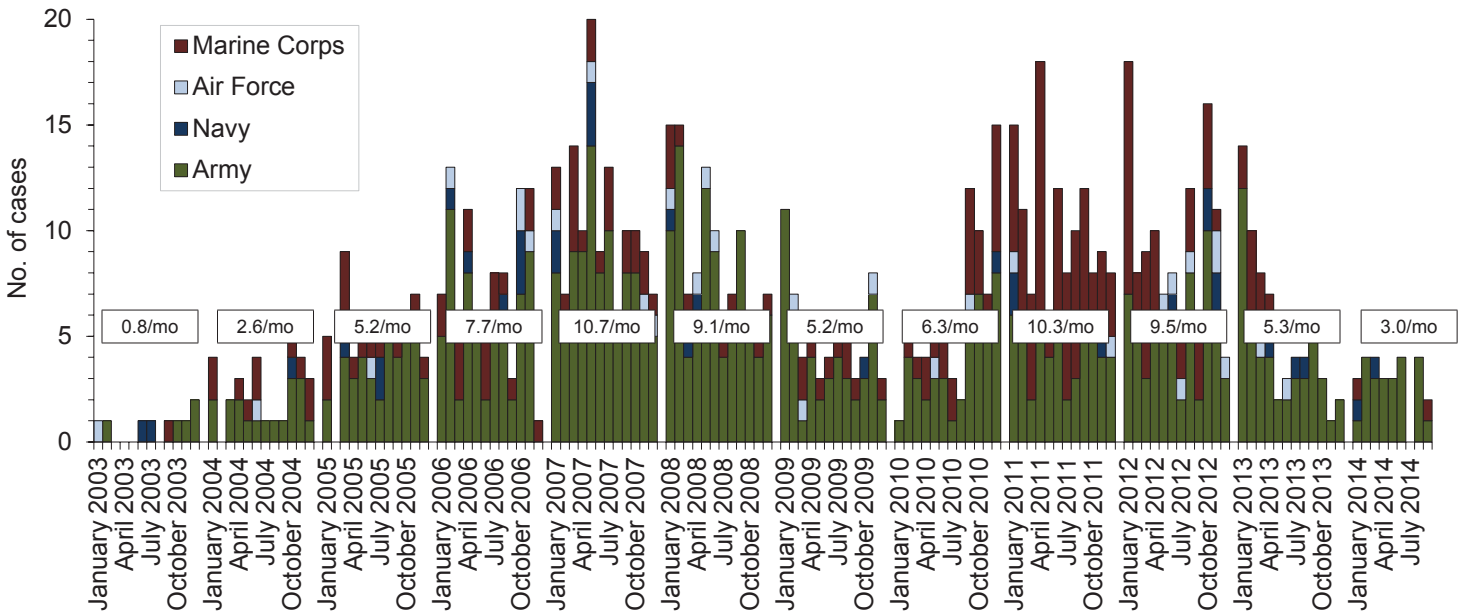
Deployment-related Conditions of Special Surveillance Interest, U.S. Armed Forces, by Month and Service, January 2003–September 2014 (data as of 20 October 2014)

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*. Jan 2005;11(1):2–6.
[a]Indicator diagnosis (one per individual) during a hospitalization while deployed to/within 365 days of returning from deployment.

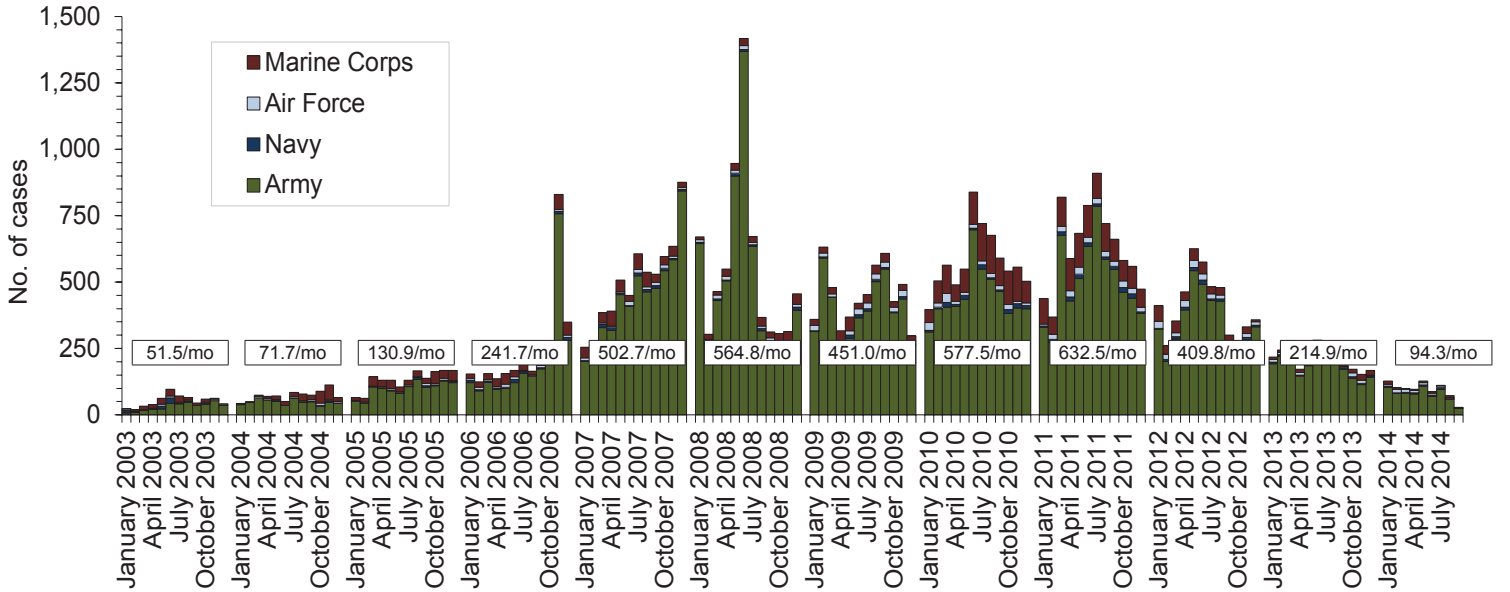
Heterotopic ossification (ICD-9: 728.12, 728.13, 728.19)[b]



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

Deployment-related Conditions of Special Surveillance Interest, U.S. Armed Forces, by Month and Service, January 2003–September 2014 (data as of 20 October 2014)

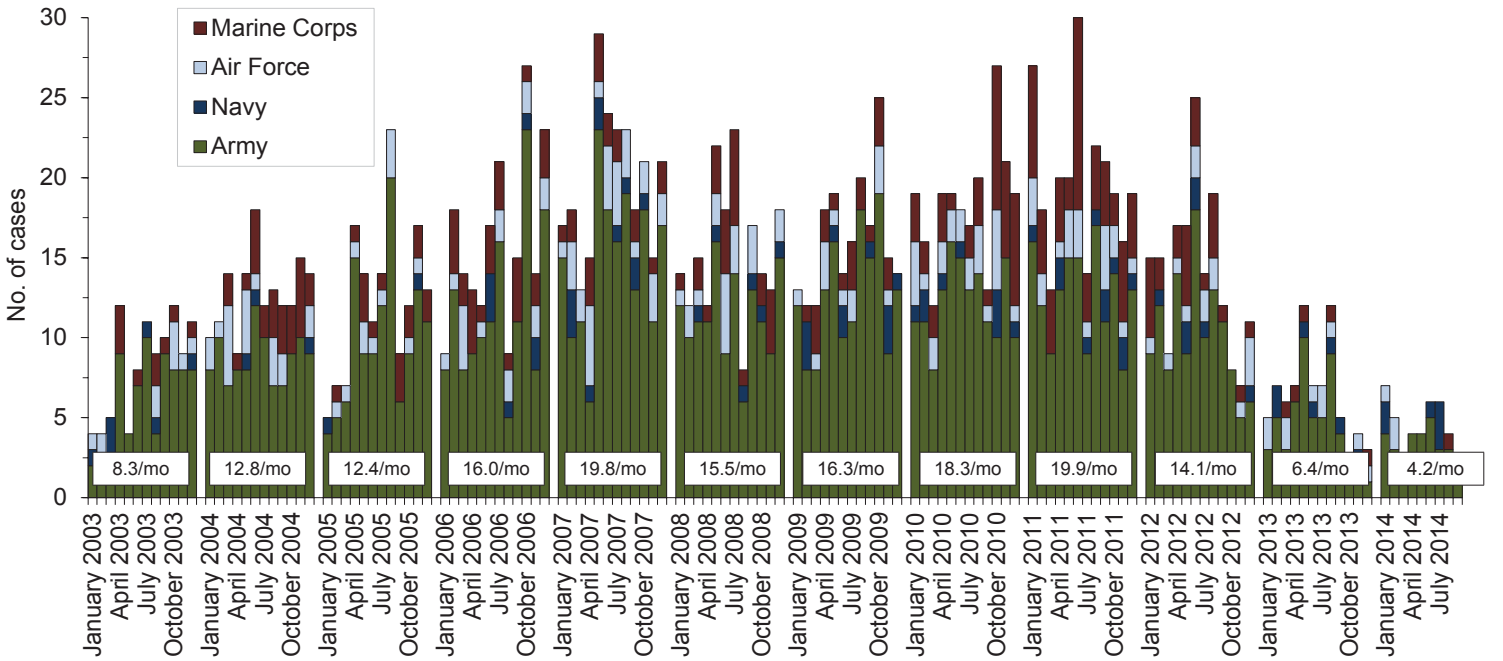
Traumatic brain injury (TBI) (ICD-9: 310.2, 800–801, 803-804, 850–854, 907.0, 950.1–950.3, 959.01, V15.5_1–9, V15.5_A–F, V15.52_0–9, V15.52_A–F, V15.59_1–9, V15.59_A–F)[a]



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 4,586 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.

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