Medical Evacuations from Operation Iraqi Freedom/Operation New Dawn, Active and Reserve Components, U.S. Armed Forces, 2003-2011

From January 2003 to December 2011, over 50,000 service members were medically evacuated from the Operation Iraqi Freedom (OIF)/Operation New Dawn (OND) theater of combat operations to a medical treatment facility outside of theater. During the period, the numbers and underlying causes of medical evacuations sharply varied in relation to the numbers of deployed service members and the natures of ongoing military operations. There were nearly five times as many medical evacuations for disease and non-battle injuries than for battle-related conditions. The majority of medical evacuations (87%) occurred among males; the major causes of medical evacuations differed among male and female deployers. Based on these findings, force health protection policies and practices should be tailored to the characteristics of the deployed force and the nature of the military operation.

From March 2003 to December 2011, over 2 million U.S. service members deployed one or more times in support of military operations in southwest Asia. In Iraq, Operations Iraqi Freedom (OIF) and New Dawn (OND) occurred sequentially – from 19 March 2003 through 31 August 2010 and 1 September 2010 through 31 December 2011, respectively.

In wartime theaters of operations such as Iraq, most medical care is provided by deployed military medical personnel; however, some injuries and illnesses require medical management outside the operational theater. In such cases, affected individuals are usually transported by air to a fixed military medical facility in Europe or the United States. At the fixed facility, they receive the specialized, technically advanced, and/or prolonged diagnostic, therapeutic, and rehabilitation care required.

Medical air transports ("medical evacuations") are costly and generally indicative of serious medical conditions. Some serious medical conditions are directly related to participation in or support of combat operations (e.g., battle wounds); many others are unrelated to combat and may be preventable. The objectives of this report are to compare the natures, numbers, and trends of conditions for which male and female military members were medically evacuated from the OIF/OND theater during the entire campaign.

METHODS

The surveillance period was 1 January 2003 to 31 December 2011. The surveillance population included all members of the active and reserve components of the U.S. Army, Navy, Air Force, Marine Corps, and Coast Guard who were evacuated during the surveillance period from the OIF/OND theater of the U.S. Central Command (CENTCOM) area of responsibility (AOR) to a medical treatment facility outside the CENTCOM AOR. Evacuations were included in analyses if the affected service member had at least one inpatient or outpatient medical encounter in a permanent military medical facility in the U.S. or Europe within ten days after the evacuation date. Records of all medical evacuations conducted by the U.S. Transportation Command (TRANSCOM) are routinely provided for health surveillance purposes to the Armed Forces Health Surveillance Center (AFHSC) via the Office of the Assistant Secretary of Defense for Health Affairs.

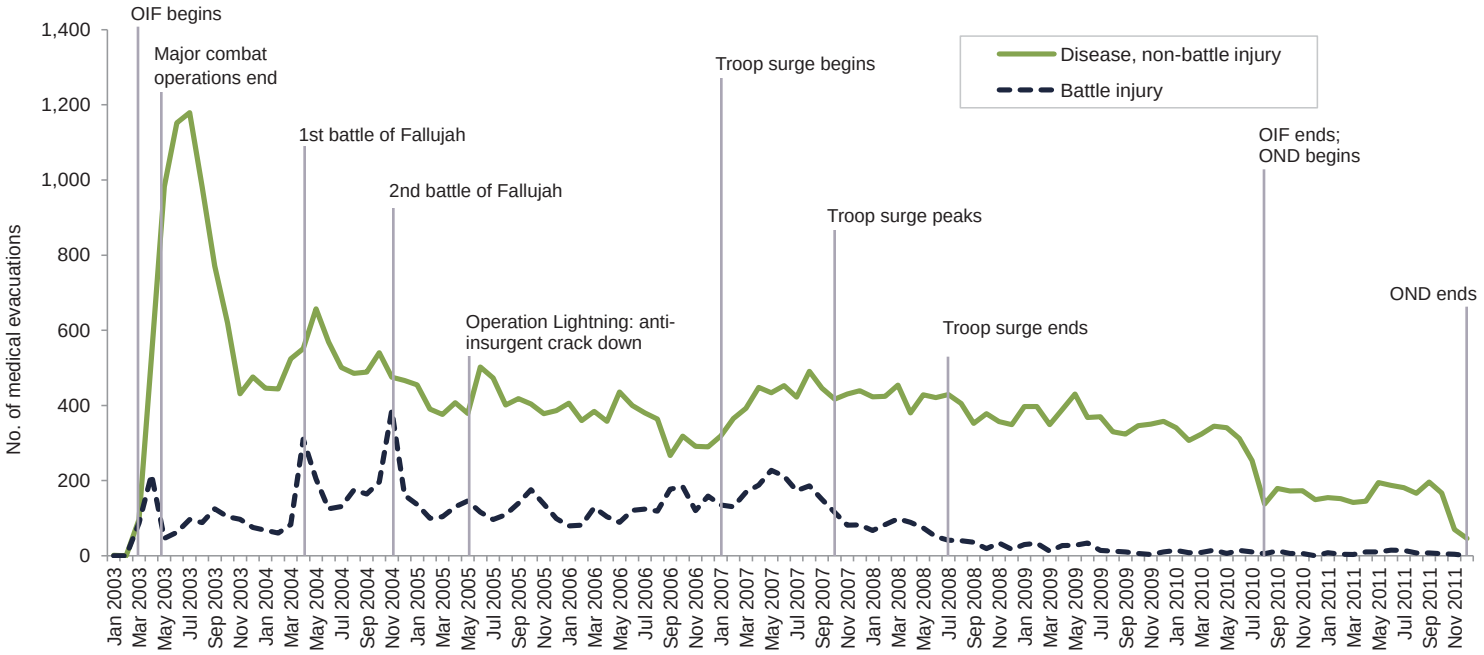
Medical evacuations included in the analyses were classified by the causes and natures of the precipitating medical conditions (based on information reported in relevant evacuation and medical encounter records). First, all medical conditions that resulted in evacuations were classified as "battle injuries" or "non-battle injuries and illnesses" (based on entries in an indicator field of the TRANSCOM evacuation record). Evacuations due to non-battle injuries and illnesses were sub-classified into 18 illness/injury categories based on International Classification of Diseases (ICD-9-CM) diagnostic codes reported on records of medical encounters after evacuation. For this purpose, all records of hospitalizations and ambulatory visits from five days prior to ten days after the reported date of each medical evacuation were identified. In most cases, the primary (first-listed) diagnosis for either a hospitalization (if one occurred) or the earliest ambulatory visit after evacuation was considered indicative of the condition responsible for the evacuation. However, if the first-listed diagnostic code specified the external cause (rather that the nature) of an injury (ICD-9-CM E-code) or an encounter for something other than a current illness or injury (e.g., observation, medical examination, vaccination [V-code]), then secondary diagnoses that specified illnesses and injuries (ICD-9-CM 001-999) were considered the likely reasons for the subject evacuations.

RESULTS

During the nearly nine-year period of the OIF/OND campaign, 50,634 medical evacuations of service members from OIF/OND were followed by at least one medical encounter in a fixed medical facility outside the operational theater. Overall, nearly seven times more males (n=44,258) than females (n=6,376) were medically evacuated **(Table 1)**.

Of all medical evacuations, 17.7 percent were considered battle injury-related

FIGURE 1. Medical evacuations of U.S.service members from OIF/OND, by month, January 2003- December 2011



(Table 1). Not surprisingly, the numbers of evacuations for battle injuries varied in relation to the number of deployed service members (e.g., during troop surges compared to other periods) and the natures, locations, and intensities of ongoing combat operations **(Figure 1)**. For example, there were spikes in battle-related evacuations from OIF/OND in April 2003, April 2004, and November 2004 and another rise in April-May 2007 **(Figure 1)**.

During every month of the nine year period, there were more medical evacuations for disease and non-battle injuries than for battle-related injuries; overall during the period, there were nearly five times as many medical evacuations for non-battle as for battle-related conditions **(Table 1, Figure 1)**.

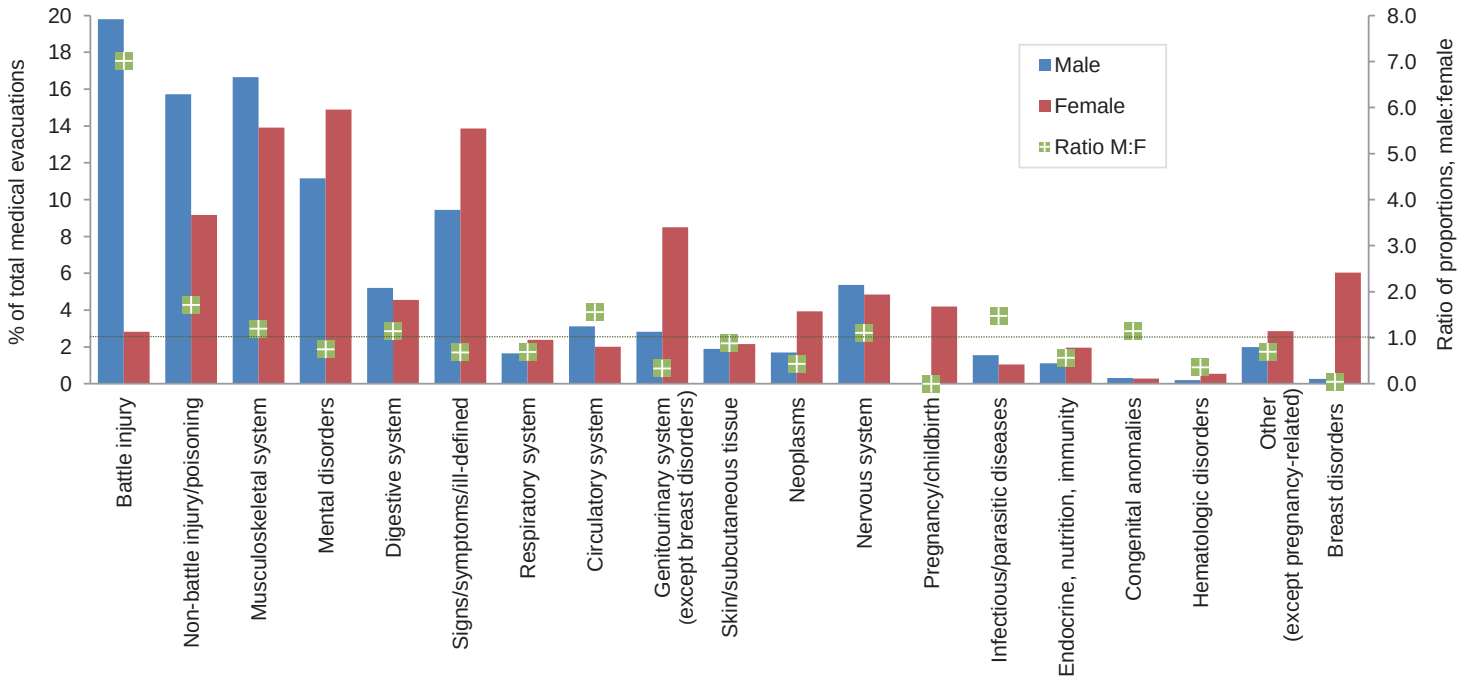
During the surveillance period, four categories of illnesses and non-battle injuries accounted for a majority (52.8%) of all evacuations. Musculoskeletal disorders, primarily affecting the back and knee, accounted for approximately one of every six (16.3%) evacuations; non-battle injuries, primarily sprains and fractures of extremities, accounted for approximately one of seven (14.9%) evacuations; mental disorders, most frequently adjustment reactions, mood disorders, anxiety disorders, and post-traumatic stress disorder (PTSD), accounted for approximately one of nine (11.6%) evacuations; and "signs, symptoms and ill-defined conditions" (more than one-fourth related to the respiratory system) accounted for one of ten (10.0%) evacuations **(Table 1)**.

There were differences in the conditions that resulted in medical evacuations of male and female deployers. Of all medical evacuations of males throughout the period (n=44,258), the most frequent causes were battle injuries (19.8%), musculoskeletal disorders (16.7%), non-battle injuries (15.7%), and mental disorders (11.2%). In contrast, the most frequent

TABLE 1. Numbers and proportions of medical evacuations from OIF/OND by major categories of illnesses and injuries, January 2003-December 2011

	Total		Total male		Total female	
Diagnostic category (ICD-9-CM)	No.	%	No.	%	No.	%
Battle injury (from TRAC2ES records)	8,944	17.7	8,764	19.8	180	2.8
Musculoskeletal system (710-739)	8,257	16.3	7,370	16.7	887	13.9
Non-battle injury and poisoning (800-999)	7,542	14.9	6,957	15.7	585	9.2
Mental disorders (290-319)	5,892	11.6	4,942	11.2	950	14.9
Signs, symptoms, ill-defined conditions (780-799)	5,065	10.0	4,181	9.4	884	13.9
Nervous system (320-389)	2,684	5.3	2,375	5.4	309	4.8
Digestive system (520-579)	2,592	5.1	2,302	5.2	290	4.5
Genitourinary system (580-629, except breast)	1,794	3.5	1,252	2.8	542	8.5
Circulatory system (390-459)	1,512	3.0	1,384	3.1	128	2.0
Other (V01-V82, except pregnancy-related)	1,062	2.1	880	2.0	182	2.9
Neoplasms (140-239)	1,006	2.0	755	1.7	251	3.9
Skin and subcutaneous tissue (680-709)	980	1.9	842	1.9	138	2.2
Respiratory system (460-519)	882	1.7	730	1.6	152	2.4
Infectious and parasitic diseases (001-139)	753	1.5	686	1.6	67	1.1
Endocrine, nutrition, immunity (240-279)	616	1.2	491	1.1	125	2.0
Breast disorders (610-611)	502	1.0	117	0.3	385	6.0
Pregnancy and childbirth (630-679, relevant V codes)	268	0.5	0	0.0	268	4.2
Congenital anomalies (740-759)	161	0.3	143	0.3	18	0.3
Hematologic disorders (280-289)	122	0.2	87	0.2	35	0.5
Totals	50,634		44,258		6,376	

FIGURE 2. Proportions of medical evacuations, by major categories of illness/injury (ICD-9-CM), by gender, OIF/OND, U.S. Armed Forces, January 2003- December 2011



causes of medical evacuations of females during the period (n=6,376) were mental disorders (14.9%), musculoskeletal disorders (13.9%), "signs, symptoms, and ill-defined conditions" (13.9%), and non-battle injuries (9.2%) **(Table 1, Figure 2)**.

Among both males and females, "adjustment reaction" was the most frequent specific diagnosis (3-digit diagnosis code of ICD-9-CM) during initial medical encounters after evacuations. "Adjustment reactions" accounted for relatively more of the total evacuations of females (n=370; 5.8%) than males (n=2,000; 4.5%). Among males, back and joint-related conditions – specifically, "intervertebral disc disorders" (n=1,609; 3.6%), "other and unspecified disorders of joint" (e.g., knee problems) (n=1,524; 3.4%), and "other and unspecified disorders of back" (n=1,196; 2.7%) – were the second, third, and fourth most frequent diagnoses among medical evacuees. The fifth most frequent diagnosis among males was "symptoms involving the respiratory system and other chest symptoms" (n=1,167; 2.6%) **(data not shown)**.

Among females, "other disorders of the breast" (n=340, 5.3%), "other and unspecified disorders of joints" (e.g., knee problems) (n=236, 3.7%), "episodic mood disorders" (n=233, 3.7%), and "other symptoms involving the abdomen and pelvis" (n=195, 3.1%) were the next most frequent diagnoses among medical evacuees **(data not shown)**.

Among OIF/OND male participants, the proportion of medical evacuations attributable to battle injuries declined from approximately 29 percent in 2006 and 2007 to 5 percent in 2011 **(Figure 3)**. In contrast, the proportion of medical evacuations attributable to mental disorders sharply increased from 7.1 percent in 2003 to 20.9 percent in 2010 then declined slightly to 17.6 percent in 2011 **(Figure 3)**.

Among female participants, the proportion of medical evacuations attributable to battle injuries remained low compared to males with a peak at 5.5 percent in 2004 followed by a decrease to under 2 percent from 2008 to 2011 **(Figure 4)**. The relative proportion of medical evacuations due to mental disorders among females increased sharply from 7.4 percent in 2003 to 26.6 percent in 2010 **(Figure 4)**.

EDITORIAL COMMENT

A previous *MSMR* report estimated that during a 12-month deployment to combat operations in Iraq and Afghanistan, approximately four percent of Army, two percent of Marine Corps, and one percent of the other services' members were medically evacuated for any reason.[1] The relatively low likelihood of medical evacuation suggests that most deployers were sufficiently healthy and fit, and received the medical care in theater necessary, to successfully complete their OIF/OND assignments.

This analysis extends the findings of previous reports on medical evacuations from OIF/OND. It documents that the numbers and underlying causes of medical evacuations from OIF/OND sharply varied in relation to the numbers of deployed service members and the natures of ongoing military operations. The report also documents differences in the predominant causes of medical evacuations among male and female deployers.

The findings enforce the need to tailor force health protection policies, training, supplies, equipment, and practices based on characteristics of the deployed force (e.g., combat versus support; male versus female) and the nature of the military operations (e.g., combat versus humanitarian assistance).

There are limitations to the analysis reported here that should be considered

FIGURE 3. Proportions of medical evacuations for selected diagnostic categories among males, OIF/OND, U.S. Armed Forces, January 2003-December 2011

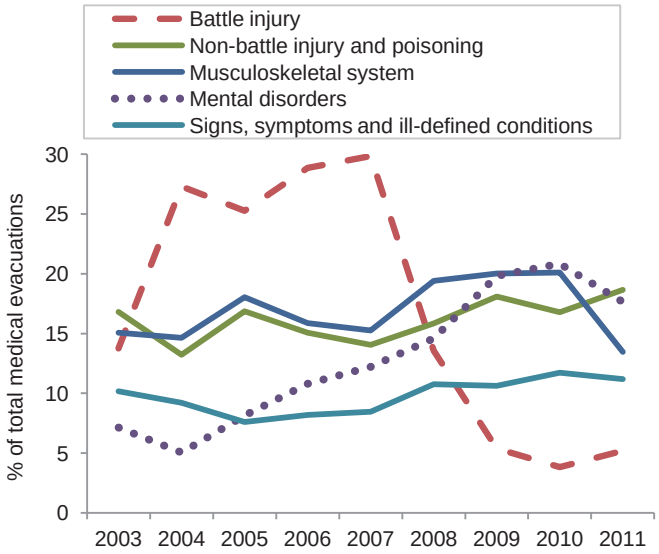
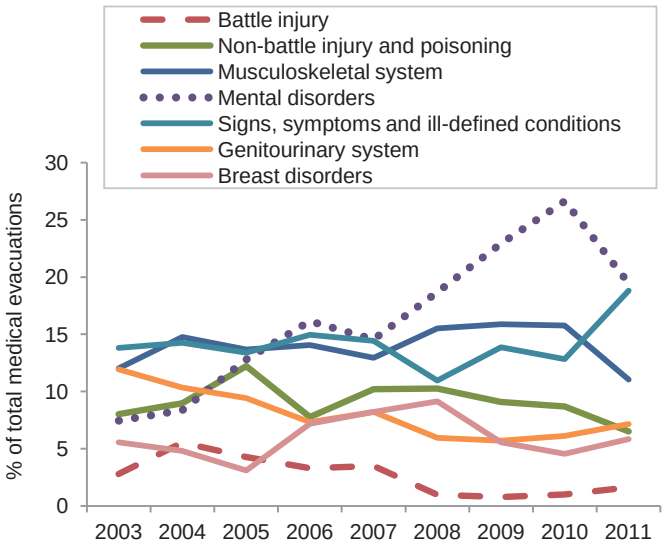


FIGURE 4. Proportions of medical evacuations for selected diagnostic categories among females, OIF/OND, U.S. Armed Forces, January 2003-December 2011



when interpreting the results. For example, assessments of trends were based on numbers of medical evacuations per month or year; as such, variations in the numbers of deployed troops (i.e., the population at risk of medical evacuation) over time were not factored in the analysis. Because the numbers of service members deployed to OIF/OND significantly varied during the period, trends of numbers of medical evacuations do not directly reflect changes in other risk factors for medical evacuation over time.

Also, direct comparisons of numbers and proportions of medical evacuations by cause, as between operational theaters or between males and females, can be misleading; for example, such comparisons do not account for differences between the groups in other characteristics (e.g., age, grade, military occupation, locations, and activities while deployed) that are significant determinants of medical evacuation risk. Also, for this report, most "causes" of medical evacuations were estimated from primary (first-listed) diagnoses that were recorded during hospitalizations or initial outpatient encounters after evacuation. In some cases, clinical evaluations in fixed medical treatment facilities after medical evacuations may have "ruled out" serious conditions that were clinically suspected in the theater. For this analysis, the "causes" of such evacuations reflect diagnoses that were determined after evaluations outside of the theater rather than diagnoses – perhaps of severe disease – that were clinically suspected in the theater. To the extent that this occurred, the "causes" of some medical evacuations may seem surprisingly minor.

This reports documents that, throughout OIF/OND (even during periods of the most intense combat), most medical evacuations were not directly related to battle injuries. Overall, approximately four of every five medical evacuations were due to illnesses and non-battle injuries; and of these, more than one-half were due to musculoskeletal disorders (16.3%), non-battle injuries (14.9%), mental disorders (11.6%), and "signs, symptoms, and ill-defined conditions" (10.0%).

In addition, this report documents that the proportions of medical evacuations due to mental disorders and battle injuries were not closely temporally related. For example, since 2007 among both male and female participants, the proportion of medical evacuations due to battle injuries sharply decreased while the proportion due to mental disorders increased **(Figures 3, 4)**. The recent increase in mental disorder-related evacuations from Iraq may reflect, at least in part, increased awareness of, concern regarding, and health care resources dedicated to detecting and clinically managing psychological, stress-related disorders (e.g., PTSD, depression, suicide ideation) among deployers.

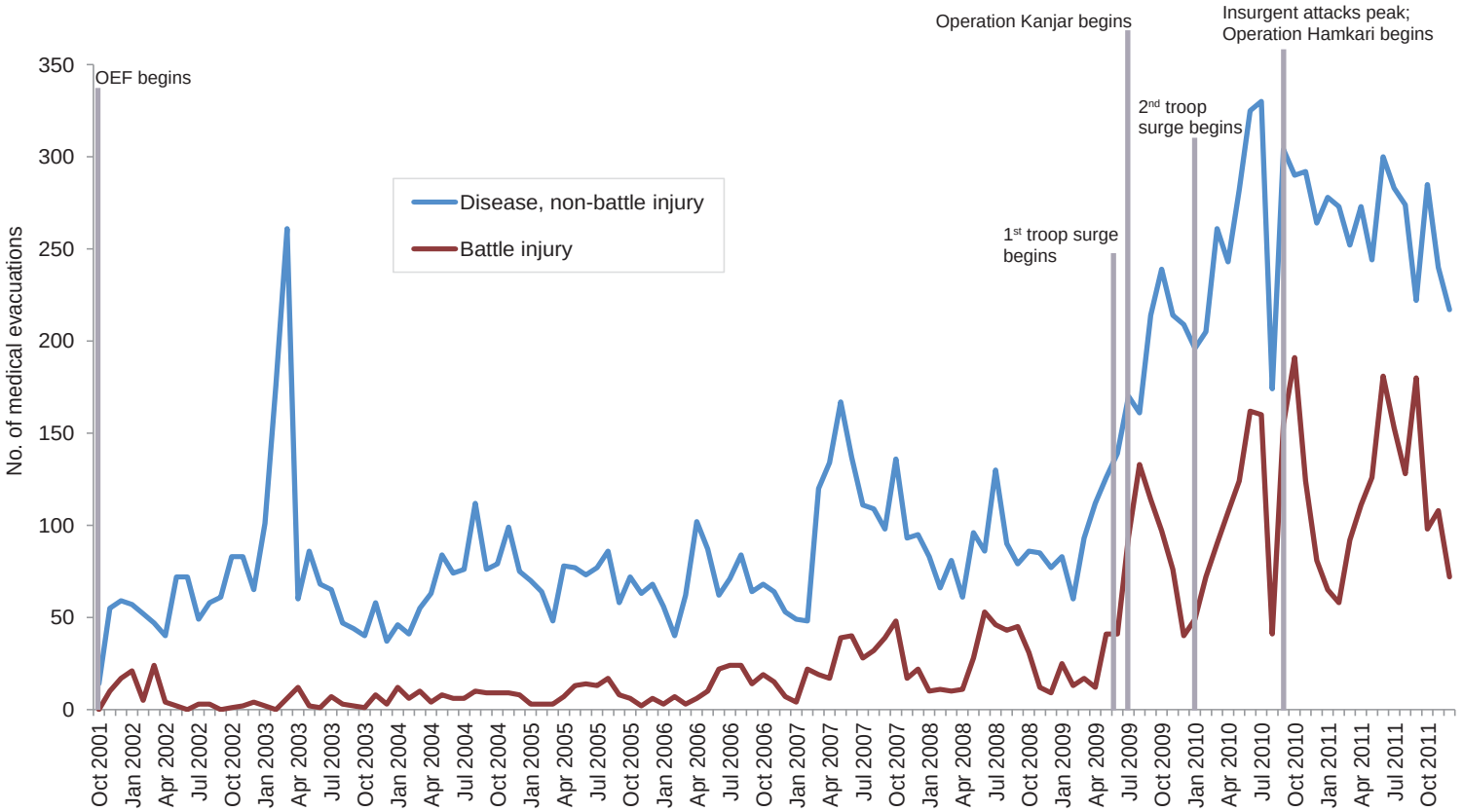
In summary, during the entirety of the campaign in Iraq, more than 50,000 U.S. service members were medically evacuated. Throughout the period, there were many more medical evacuations for illnesses and non-battle injuries than for battle injuries; also, the major causes of medical evacuations differed among male and female deployers. Previous reports have documented that relatively large proportions of service members who are evacuated for illnesses (including musculoskeletal and mental disorders) during deployments had medical encounters for the same or closely related conditions shortly before deploying.[1] Further analyses should identify conditions among male and female service members that are most likely to recur or worsen during, and require medical evacuation from, combat-related deployments.

REFERENCES

1. Armed Forces Health Surveillance Center. Medical evacuations from Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF), active and reserve components, U.S. Armed Forces, October 2001-September 2009. *Medical Surveillance Monthly Report* (*MSMR*).17(2):2-7.

Surveillance Snapshot: Medical Evacuations from Operation Enduring Freedom (OEF), Active and Reserve Components, U.S. Armed Forces, October 2001-December 2011

Medical evacuations[a] of U.S.service members from OEF (Afghanistan), by month, October 2001- December 2011



[a]Methodology is the same as used for the medical evacuations from OIF/OND found on page 18.

From October 2001 to December 2011, there were 19,437 medical evacuations of service members from Operation Enduring Freedom (OEF) that were followed by at least one medical encounter in a fixed medical facility outside the operational theater. During every month of the period, there were more medical evacuations for conditions not directly related to battle than for battle-related injuries; overall, 23.4 percent of evacuations were considered battle injury-related. Total medical evacuations increased in 2009 following the surge in the number of service members deployed to Afghanistan. Since then, the numbers of evacuations per month have remained higher than pre-surge numbers, particularly in non-battle-related evacuations. Battle-injury evacuations tended to increase during the warmer months, presumably due to the impact of weather conditions on the natures, locations, and intensity of ongoing combat operations. For example, there were spikes in battle-related evacuations from OEF in August 2009, June through October 2010, and June through September 2011.