

INJURY RATES IN ACTIVE DUTY US NAVY FY 2012

Background

Injuries are currently the leading health problem for the US Military, resulting in over 2.1 million medical encounters among more than 592,000 service members in 2011 (Medical Surveillance Monthly Report [MSMR], 2012). Injuries (both battle and non-battle-related) result in the largest number of aero-medical evacuations from Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) (Harman 2005; Jones 2010). Jones, 2010, notes that historically, injuries have been a leading cause of deaths, disabilities, and medical encounters in the U.S. military. In addition to the morbidity, mortality and health care costs associated with injuries, a 2006 White Paper reported that injuries resulted in approximately 25,000,000 days of limited duty in 2005 (DMIPPWG 2006). Most published military injury surveillance data has focused on all service branches, with limited service-specific analyses existing to date (DMIPPWG 2006; MSMR 2011). The Navy and Marine Corps Public Health Center (NMCPHC) EpiData Center Department has completed the annual injury report for fiscal year (FY) 2012 in order to provide up-to-date information about the burden of injuries among active duty (AD) Navy service members.

Methods

Injury data were abstracted from standard inpatient and outpatient medical encounter records for fiscal year 2012 (01 October 2011 – 30 September 2012) for all AD Navy service members. Encounter records with injury diagnoses were identified by International Classification of Disease-9th Revision Clinical Modification (ICD-9) codes ranging from 800 to 995: injuries and poisonings excluding complications of surgical and medical care. Injuries were assigned Barell injury codes corresponding to their designated cell in the Barell matrix (Barell et al. 2002; CDC 2009), which classifies injuries according to injury type and anatomic location using ICD-9 codes (see Appendix 1 for description of injury types). Previous studies have used the Barell matrix as a standardized tool for describing injury types and locations (Clark and Ahmad 2006; Aharonson-Danielo et al. 2002).



Due to the chronic nature of injuries, individuals often had multiple follow-up medical encounters after their initial injury diagnosis. To avoid counting the same injury multiple times, medical encounters for an individual with the same Barell injury code occurring within 30 days were removed, which is consistent with DMIPPWG recommendations. Unique cases were identified using a 30 day gap-in-care rule based on encounter/admission dates. Records that occurred within 30 days of a previous record were treated as the same event, and records beyond this gap-in-care identified the next unique event for an individual. One alteration made to these methods however was in the case of an amputation. For the amputation injury type, only one record was included for each person for each different anatomic location assigned in the Barell matrix.

Initial diagnoses were identified by finding the first diagnosis for each injury for each person during FY2012 and looking back one month to eliminate injuries occurring in FY2011 for which follow-up visits occurred in FY2012.

All identified injury records were linked to the Defense Manpower Data Center (DMDC) database to determine the Unit Identification Code (UIC) that the service member was assigned to at the time of injury. The identified UICs were then matched to a listing of UICs by the Budget Submitting Office (BSO) to report injury rates by BSO. The injury rate is calculated by dividing the total number of injuries in each BSO by the average monthly population of the BSO.

Injury rates by month were calculated by dividing the total number of injuries identified by the total number of AD Navy service members for each month. Injury rates by type and location were calculated by dividing the number of injuries of a particular type or location by the total number of injuries occurring in that fiscal year. The number of AD Navy service members was obtained from DMDC and the DOD Statistical Information Analysis Division (SIAD) personnel records (SIAD 2012).

Results

There were 81,764 injuries identified in inpatient and outpatient records in FY2012. Figure 1 shows the total injury rate by month among AD Navy service members. September 2011 and October 2012 had the lowest injury rates at 16.8 and 19.7 injuries per 1,000 Sailors, respectively. July and January had the highest injury rates, with 23.1 and 23.2 injuries per 1,000 Sailors, respectively.



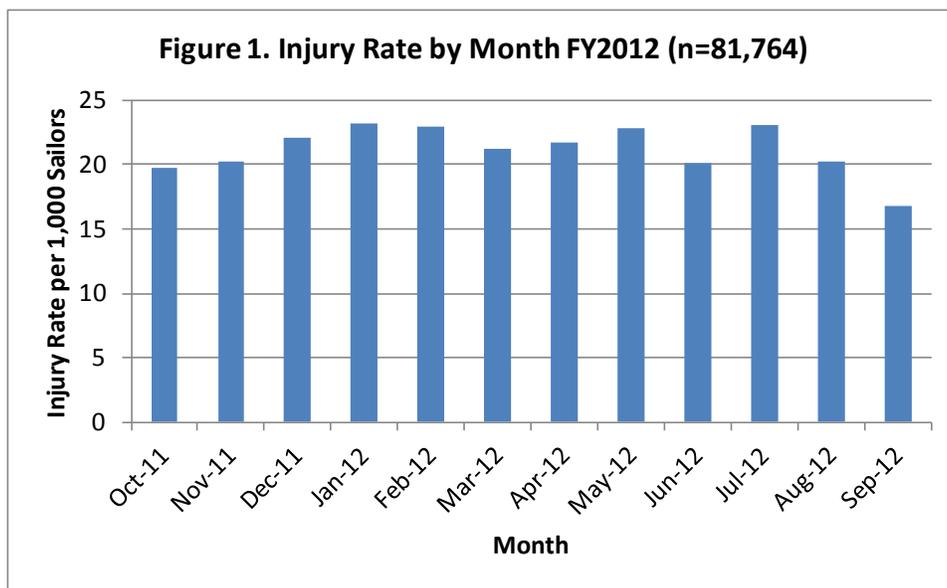


Figure 2 identifies the top ten injury locations. Most injuries occurred in the hand, with a rate of 138 per 1,000 injuries, followed by the shoulder and upper arm with 113 per 1,000 injuries, and injuries of the lower leg and ankle with 111 per 1,000 injuries.

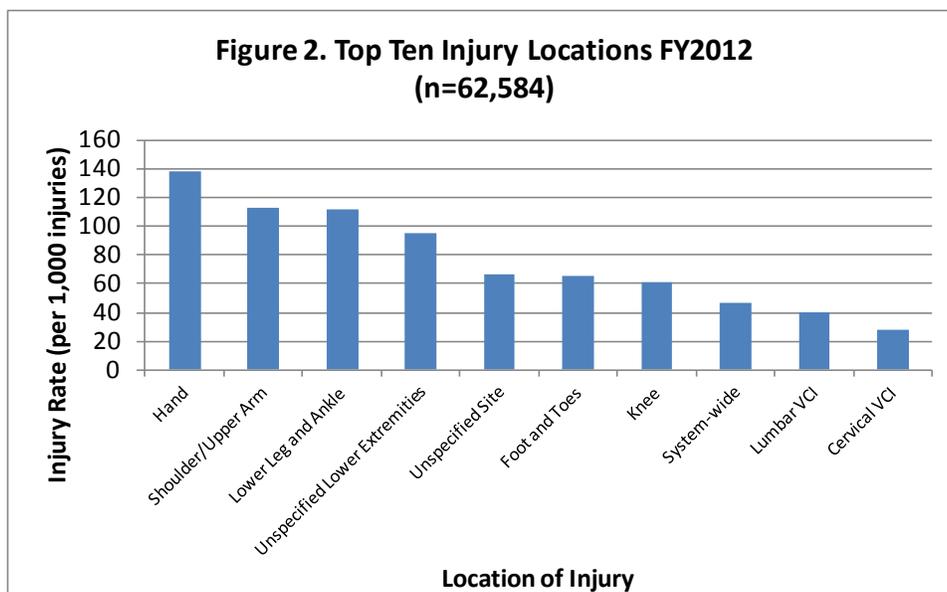
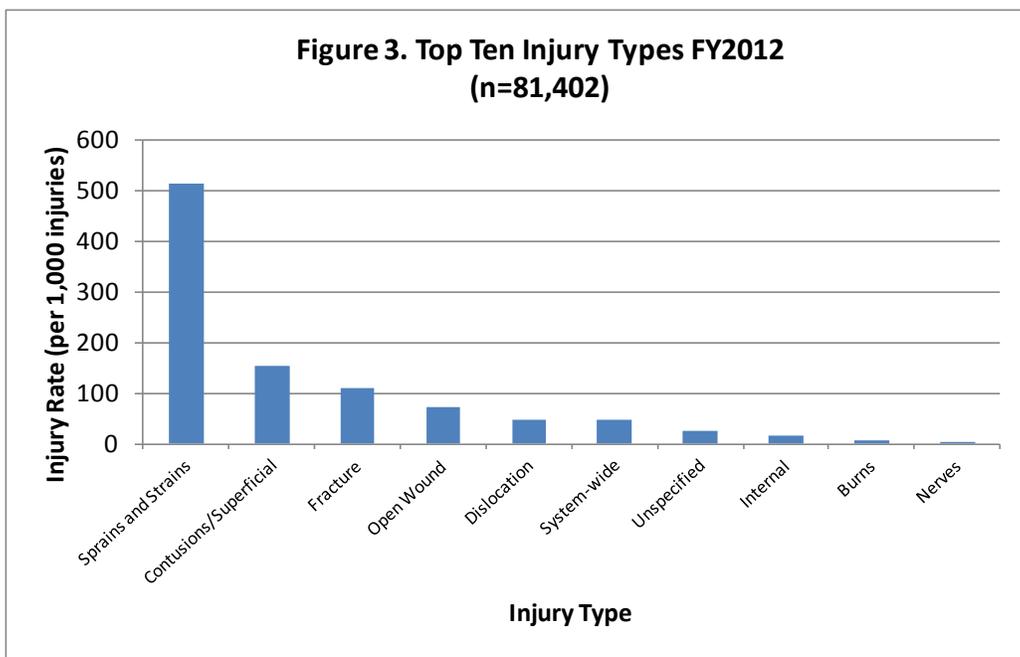
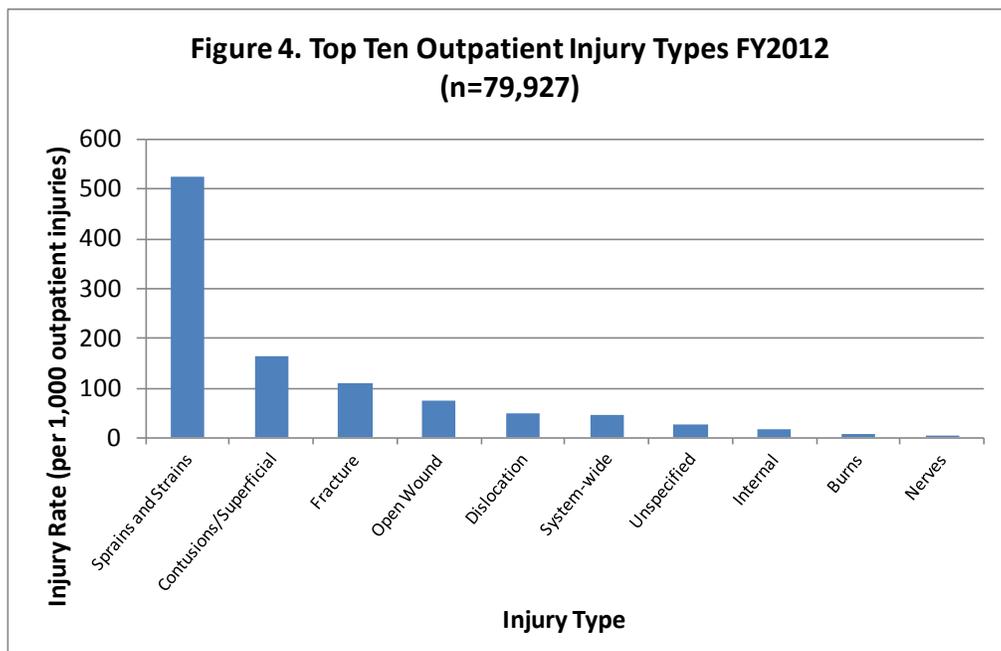


Figure 3 shows that sprains and strains accounted for the majority of injuries with a rate of 512 per 1,000 injuries, followed by contusions/superficial injuries at 153 per 1,000 injuries, fractures at 109 per 1,000 injuries, and open wounds accounting for 72 per 1,000 injuries.

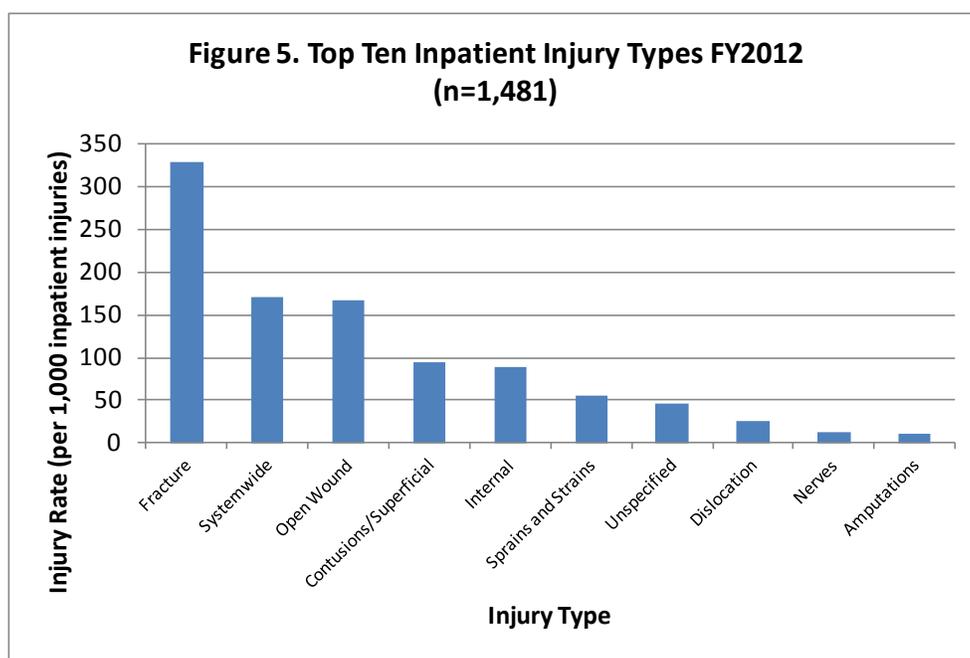




There were 75,883 outpatient injuries in FY2012. The ten most common outpatient injury types are shown in Figure 4. Sprains and strains accounted for 523 per 1,000 outpatient injuries, followed by contusions/superficial at 163 per 1,000 outpatient injuries, fractures at 111 per 1,000 outpatient injuries, and open wounds at 75 per 1,000 outpatient injuries.



There were 1,481 inpatient injury discharges recorded in FY2012. The ten most common inpatient injury types are shown in Figure 5. Most frequently these were fractures, with a rate of 329 per 1,000 inpatient injuries, followed by system-wide injuries at 171 per 1,000 inpatient injuries, open wound at 166 per 1,000 inpatient injuries, and contusions/superficial injuries at 94 per 1,000 inpatient injuries.

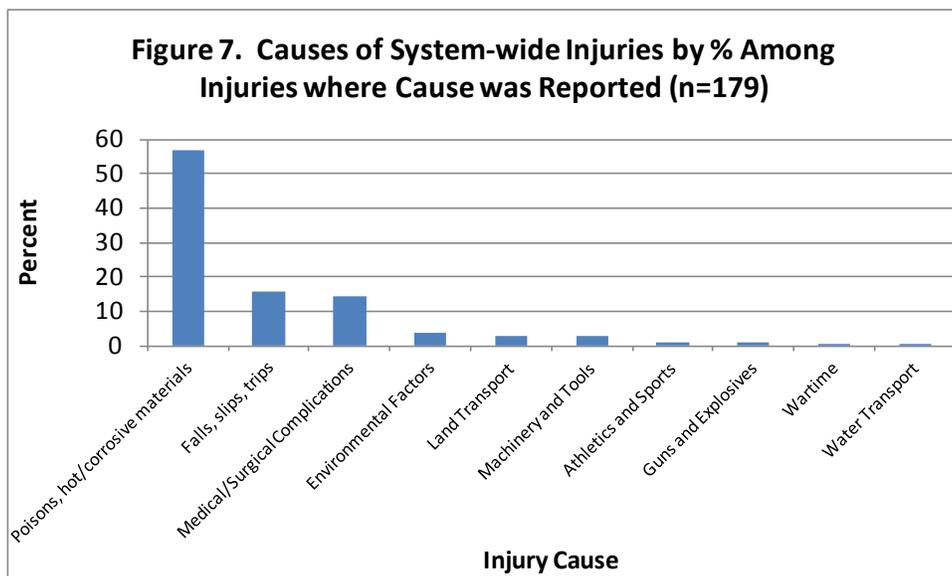
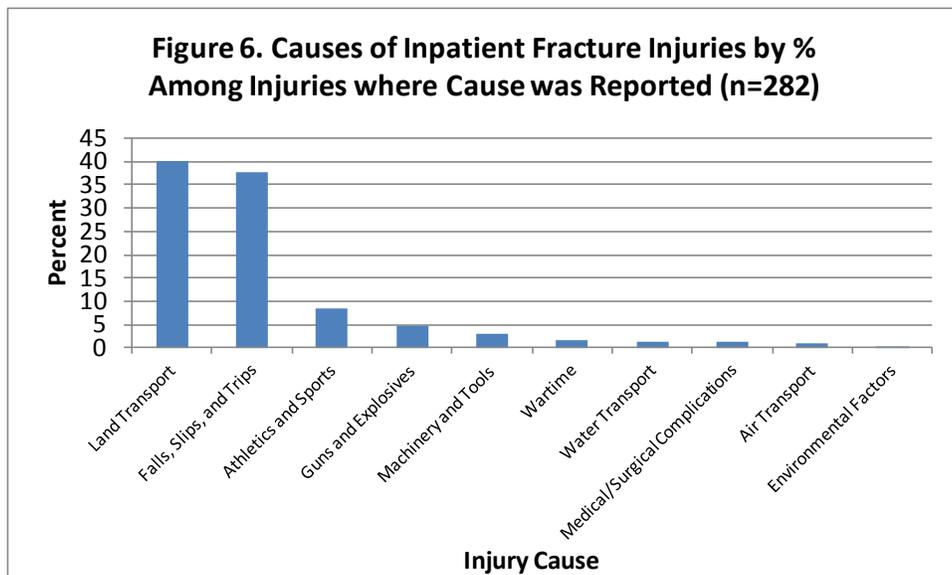


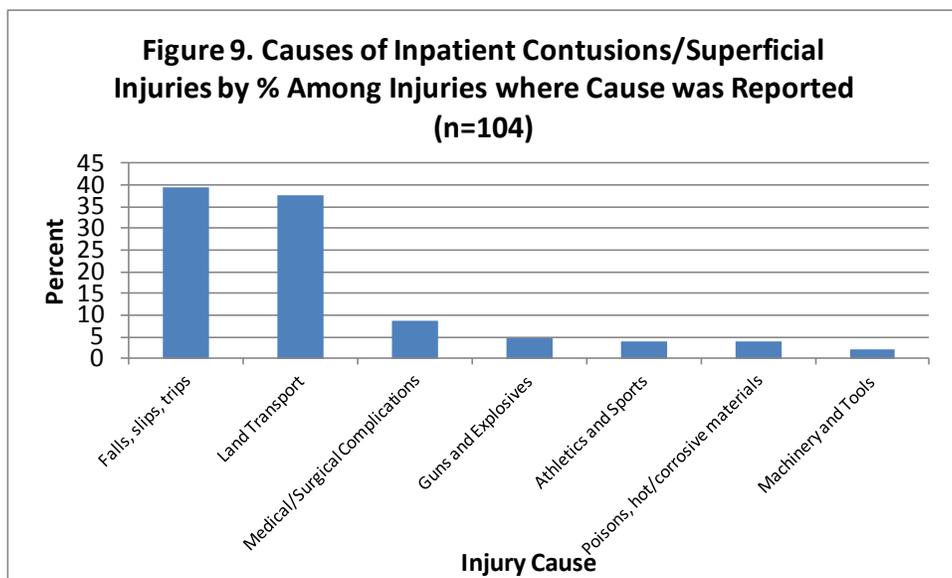
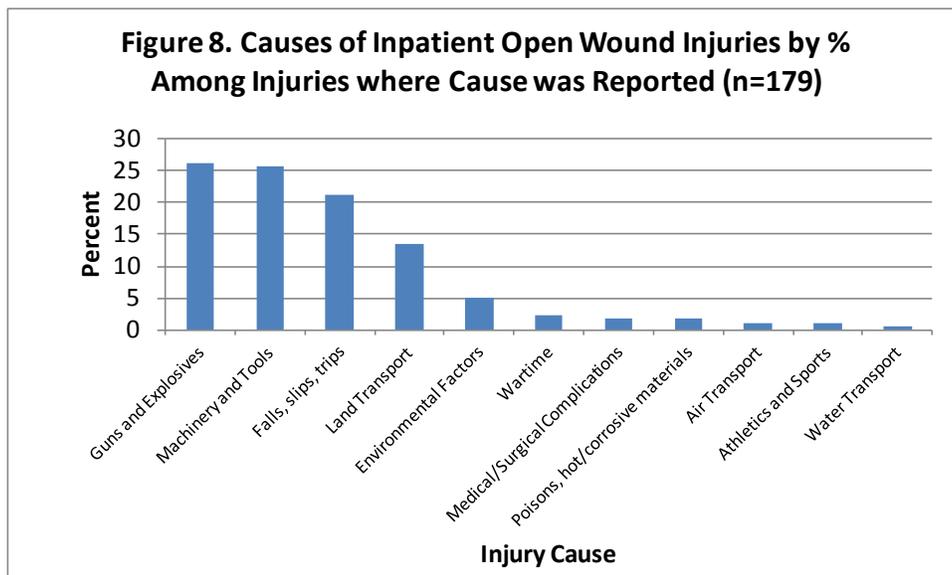
Inpatient injury records contain an injury cause field (STANAG code) that classifies injuries according to their causative events. Only 65% of inpatient injuries contained valid entries for STANAG codes; however, this information may still be of use in identifying the common causative factors that lead to injuries serious enough to result in hospitalization. Strengths and limitations of STANAG codes are outlined in the aforementioned 2006 DMIPPWG White Paper (DMIPPWG 2006).

Figures 6-10 illustrate the distribution of injury cause for the five most common inpatient injuries. Injury cause distributions were drawn from the 985 injuries for which cause was reported. The two most common causes of inpatient fractures, contusion/superficial injuries, and internal injuries were land transport and falls, slips and trips (Figures 6, 9, 10). The two most common causes of inpatient system-wide injuries were poison, fire, and hot/corrosive materials and falls, slips and trips (Figure 7). The two most common causes of inpatient open wounds were guns and explosives and machinery and tools (Figure 8). It is important to note that injuries



that occurred as a result of guns and explosives were unintentional, and the weapon was not used as an instrumentality of war.





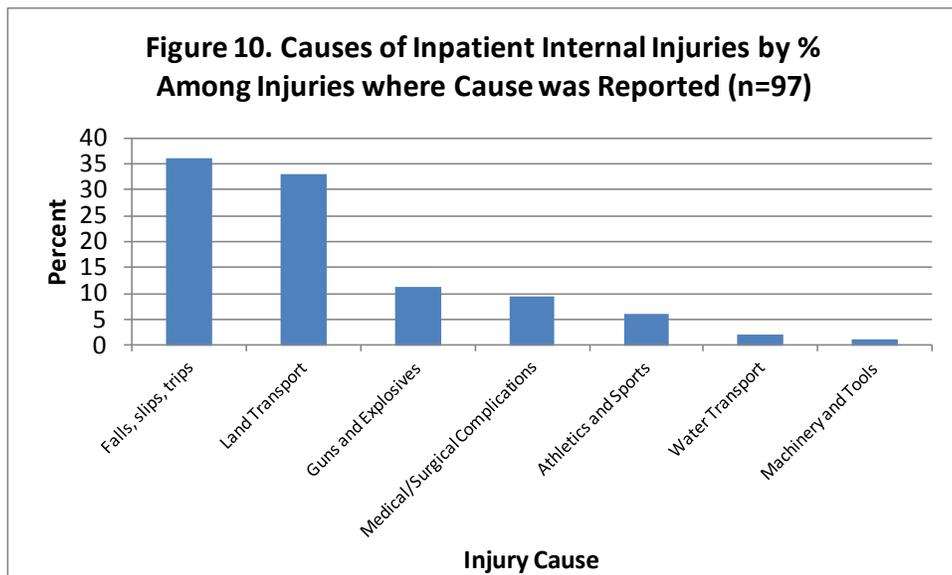
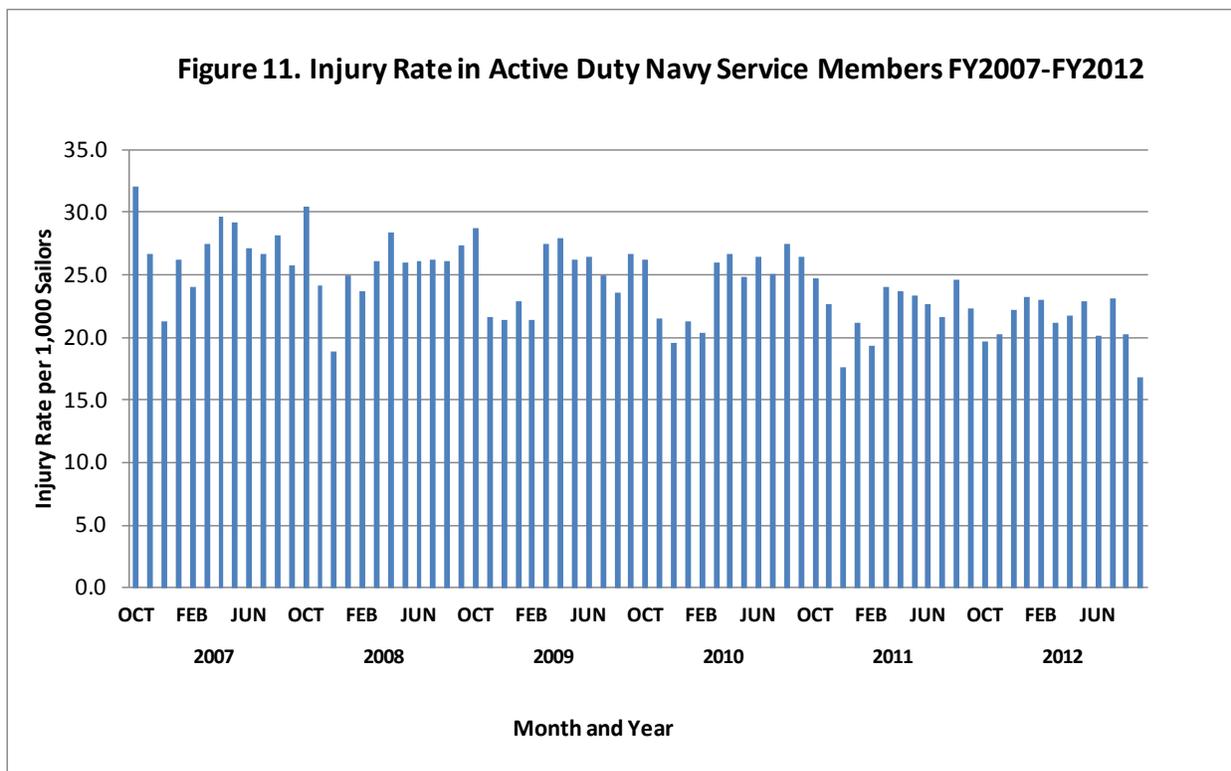
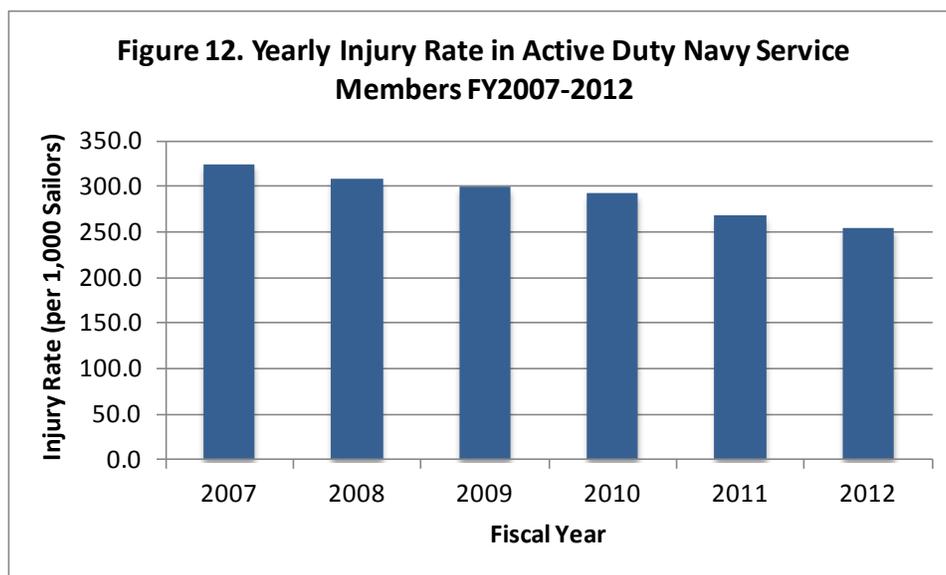


Figure 11 shows monthly injury rates for six years (FY 2007-2012). The pattern of injury rates is seasonal, as seen in the figure, with the most injuries occurring in the spring and summer months.



The yearly injury rates for the six years decreased by 22% (from 324.4 injuries per 1,000 Sailors in 2007 to 254.4 injuries per 1,000 Sailors in 2012, Figure 12).



Of 86,556 total injury medical encounters, 81,764 (94%) matched to the DMDC AD database. The UICs identified in DMDC were then matched to a corresponding Budget Submitting Office (BSO). Of the 81,764 injuries with an identified UIC, 77,507 injuries (95%) matched to a BSO. Appendix 2 includes the number of injuries occurring in each BSO, the average monthly number of people in each BSO, and the injury rate for each BSO per 1,000 Sailors.

Limitations

The Defense Manpower Data Center (DMDC) provides monthly snapshots of each active duty, reserve component, and deployed Navy and Marine Corps service members' personnel record. Data are provided to DMDC by the service and analyses are dependent on the quality and completeness of these data. Any changes in service member status after the monthly data are extracted will not be captured until the following month. Active duty and reserve personnel records are maintained in separate databases, but activated reservists may be captured in the active duty DMDC file rather than the reserve DMDC file.

Encounter data maintained at the EpiData Center Department (EDC) are routinely generated within the Composite Health Care System (CHCS) at fixed-military treatment facilities (MTFs).



Encounter data consist of ambulatory clinical encounters and inpatient discharges. These data do not include records from shipboard facilities, battalion aid stations, or in-theater facilities. Purchased care records are only available for active duty personnel with inpatient admissions. Due to data source changes, ambulatory data before 1 January 2012 have four diagnosis fields, and data after this date have 10 diagnosis fields. The number of cases for a particular condition will likely appear to increase after 1 January 2012 even if the actual number of individuals with the condition did not. This change will affect case counts over years and may make comparisons more difficult to interpret. Inpatient records are created at discharge or transfer and have 20 diagnosis fields.

Diagnoses in medical encounters depend on correct International Classification of Diseases, 9th Revision (ICD-9) coding practices. Data for medical surveillance are considered provisional and medical case counts may change if the record is updated after the report is generated. Additionally, because records are submitted into the system at different times, there may be patients who had an inpatient or outpatient encounter but were not captured in the current data.

Although this data did not capture in-theatre or shipboard injuries, it is likely that injuries serious enough to result in medical evacuation (MEDEVAC) of deployed personnel lead to inpatient and/or outpatient visits at fixed MTFs after evacuation. Less serious in-theatre or shipboard injuries are more likely to occur and are usually treated locally, resulting in return to normal duty. These occurrences may be under-represented in this report.

Discussion

The trend over the past five years shows that the injury rate is decreasing in the AD Navy population. However, it is important to note that the proportions of total injuries of the various injury types are similar from FY 2007-2012. This indicates that injury prevention strategies are having the same effect on all injury types, not just for a particular type. There were more injuries in the warmer months of fiscal years 2007-2012, when more people engage in outdoor activities. If efforts could be focused on safety outside of work, during leisure-time activities, a greater reduction in injury rates may be seen. Also important is to continue to emphasize the importance of physical training safety that could reduce sprains and strains, the most common injury type. The most common causes of inpatient injuries were land transport and falls, slips, and trips. It cannot be determined whether the causative events are work-related; however, interventions applied at work provide the most control to reduce slips and trips and increase driver safety, which may reduce the injury rate.



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Appendix I. Description of Injury Types

Type of Injury	Description
Fracture	A break in a bone (closed and open)
Sprains and Strains	Avulsion, hemarthrosis, laceration rupture, sprain, strain and tear of the joint capsule, ligament, muscle or tendon.
Dislocation	Complete displacement or subluxation of joint surfaces
Internal	Concussions, blast injuries, blunt trauma, bruise, crushing, hematoma, laceration, puncture, tear and traumatic rupture of internal organs. Spinal cord injury without evidence of spinal bone injury and shaken infant syndrome.
Open Wound	Includes animal bite, avulsion, cut, laceration and puncture wound
Amputations	Traumatic amputations.
Blood Vessels	Arterial hematoma, avulsion, cut, laceration, rupture, traumatic aneurysm or fistula (arteriovenous) of the blood vessel, secondary to other injuries.
Contusion/Superficial	Includes superficial injuries and bruise/hematoma without fracture or open wound.
Crush	Crushing injury that excludes concussion, fractures and injuries to internal organs.
Burns	Burns from electrical heating appliance, electricity, flame, hot object, lightning, radiation, chemical burns (external and internal), scalds. Excludes friction burns and sunburn
Nerves	Injury to nerves and spinal cord including division of nerve, lesion in continuity, traumatic neuroma, traumatic transient paralysis.
Unspecified	Other and unspecified injuries including NOS.
Systemwide and late effects	Foreign bodies entering through orifice, early complications of trauma, late effects of injuries, poisoning and toxic effects of substances, and other and unspecified effects of substances, and other and unspecified effects of external causes.



Appendix II. Injuries by Budget Submitting Office

Budget Submitting Office	Total Number of Injuries	Average Monthly Population	Injury Rate (per 1000 Sailors)
02 Central Operating Authority (COA)	501	2,070	242.03
11 Chief of Naval Operations (09BF) (CNO)	1,172	3,965	295.59
12 DONSO Under SECNAV (AAUSNSECNAV)	270	918	294.12
14 Chief of Naval Research (CNR)	34	114	298.25
15 Office of Naval Intel (ONI)	230	635	362.20
18 Bureau of Naval Medicine (BUMED)	11,374	27,623	411.76
19 Naval Air Systems Cmd (NAVAIRSYSCOM)	330	1,360	242.65
20 Defense Finance Accounting Service (DFAS)	1	15	66.67
22 Bureau of Navy Personnel (CHNAVPERS)	1,159	7,170	161.65
23 Naval Supply Systems Cmd (NAVSUPSYSCOM)	574	1,558	368.42
24 Naval Sea Systems Cmd (NAVSEASYSYSCOM)	255	955	267.02
25 Naval Facilities Eng Cmd (NAVFACENGCOM)	526	1,259	417.79
27 Cmdant Marine Corps (CMC)	1,790	7,333	244.10
28 Joint Chief of Staff (JCS)	408	1,360	300.00
29 Office of Secretary of Defense (OSD)	91	340	267.65
30 Strategic Systems Programs (SSP)	428	1,387	308.58
33 Military Sealift Cmd (MSC)	80	332	240.96
34 Defense Technology Security Admin (DTSA)	1	2	500.00
35 Department of Agriculture (MDA)	6	27	222.22
39 Space and Naval Warfare Cmd (SPAWARSCOM)	213	532	400.38
40 Defense Contract Mgt Agency (DCMA)	7	81	86.42
42 Defense Threat Reduction Agency (DTRA)	23	110	209.09
43 Defense Information Systems Agency (DISA)	76	244	311.48
44 Defense Intel Agency (DIA)	98	499	196.39
45 National Security Agency (NSA)	266	875	304.00
47 Defense Inspector General (IG)	1	6	166.67
48 National Geospatial-Intel Agency (NGA)	16	66	242.42
51 Defense Logistics Agency (DLA)	53	169	313.61
52 Cmdr Navy Installations Cmd (CNIC)	7,111	16,807	423.10
60 Fleet Forces Cmd (USFF)	20,151	86,181	233.82
70 Pacific Fleet (PACFLT)	18,972	88,275	214.92
72 Navy Reserve Force (COMNAVRESFOR)	210	910	230.77
75 US Transportation Cmd (USTRANSCOM)	26	129	201.55
76 Navy Education and Training (NETC)	9,492	38,511	246.48
88 Special Warfare Cmd (SPECWARCOM)	1,562	7,785	200.64
Missing	4,257	17,742	239.94

