

U.S. Army Center for Health Promotion and Preventive Medicine

INJURY PREVENTION REPORT NO. 12-HF-056Sc-08
CAUSES OF NONBATTLE INJURY FATALITIES
AMONG U.S. ARMY SOLDIERS
DURING OPERATION ENDURING FREEDOM
AND OPERATION IRAQI FREEDOM,
2001—2006



Approved for public release; distribution unlimited.

REPORT DOCUMENTATION PAGE			<i>Form Approved</i> OMB No. 0704-0188	
The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.				
1. REPORT DATE (DD-MM-YYYY) 28-07-2008		2. REPORT TYPE FINAL		3. DATES COVERED (From - To) October 2001 - December 2006
4. TITLE AND SUBTITLE Causes of Nonbattle Injury Fatalities among U.S. Army Soldiers during Operation Enduring Freedom and Operation Iraqi Freedom, October 2001 - December 2006			5a. CONTRACT NUMBER	
			5b. GRANT NUMBER	
			5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) Nakia S. Clemmons, Keith G. Hauret, Bonnie J. Taylor, Bruce H. Jones			5d. PROJECT NUMBER	
			5e. TASK NUMBER	
			5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) U.S. Army Center for Health Promotion and Preventive Medicine Aberdeen Proving Ground, MD			8. PERFORMING ORGANIZATION REPORT NUMBER 12-HF-056Sc-08	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) U.S. Army Center for Health Promotion and Preventive Medicine Aberdeen Proving Ground, MD			10. SPONSOR/MONITOR'S ACRONYM(S) USACHPPM	
			11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT				
13. SUPPLEMENTARY NOTES				
14. ABSTRACT As with previous military conflicts, nonbattle injuries (NBIs) are a major cause of mortality in Operations Enduring (OEF) and Iraqi Freedom (OIF). The purpose of this retrospective analysis was to 1) describe the incidence and rate of fatal NBIs in OEF and OIF from their beginning through December 2006, 2) describe the causes and circumstances of fatal NBIs, and 3) compare two Army data systems that report fatal NBI incidents. This analysis included all U.S. Army Soldiers who died from nonbattle injuries while deployed for OEF (October 2001 - December 2006) or OIF (March 2003 - December 2006). An NBI fatality case was defined as any Soldier (Regular Army, Army Reserve, or Army National Guard) who died due to a nonbattle injury sustained while in a deployed status for OEF or OIF, including while on midtour leave. This investigation included nonbattle injury fatalities resulting from 1) unintentional injury incidents, 2) intentional incidents (e.g., homicides, suicides), and 3) physical training. NBIs were responsible for 21 percent of all deaths in OEF and OIF. The leading causes of fatal injury were land transport vehicle accidents (41 percent), self-inflicted wounds (18 percent), and air transport-related accidents (18 percent). Measures have been taken to improve the rate of NBI fatalities during these deployments. More prevention strategies must be researched, implemented, and continually taught to Soldiers in theater to reduce these potentially avoidable deaths.				
15. SUBJECT TERMS Land transport accidents, nonhostile injuries, nonbattle injuries, OEF, OIF, DCIPS, ASMIS				
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES
a. REPORT Unclassified	b. ABSTRACT Unclassified	c. THIS PAGE Unclassified		
			19a. NAME OF RESONSIBLE PERSON Ms Nakia S. Clemmons/Mr Keith Hauret	
			19b. TELEPHONE NUMBER (include area code) 410-436-5486/5291	



DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

MCHB-TS-DI

EXECUTIVE SUMMARY
INJURY PREVENTION REPORT NO. 12-HF-056Sc-08
CAUSES OF NONBATTLE INJURY FATALITIES
AMONG U.S. ARMY SOLDIERS DURING OPERATION ENDURING FREEDOM
AND OPERATION IRAQI FREEDOM, 2001—2006

1. PURPOSE. The purpose of this analysis was to—

a. Describe the incidence and rate of fatal nonbattle injuries (NBIs) in Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) from the beginning of each operation through December 2006.

b. Describe the causes and circumstances of fatal NBIs.

c. Compare two Army data systems that report fatal NBI incidents.

2. CONCLUSIONS.

a. Nonbattle Injuries are an important cause of death in the current OEF and OIF deployments, accounting for 21 percent of all deaths.

b. The leading causes of NBI fatalities for OEF and OIF combined were land transport accidents (40 percent), self-inflicted injuries (18 percent), and air transport accidents (18 percent). Deaths from air transport accidents were significantly higher in OEF, while deaths from land transport accidents were significantly higher in OIF.

c. Overall, the annual NBI fatality rate for OEF was more than two times higher than for OIF (OEF: 155/100,000 Soldier-years; OIF: 72/100,000 Soldier-years). The OEF rate for aviation fatalities (80/100,000 Soldier-years) was 11 times higher than the OIF aviation rates (7/100,000 Soldier-years).

d. The three leading types of land transport accident types were (1) vehicle overturned, (2) vehicle ran off the road, and (3) collision with another vehicle. These three accident types accounted for 181 (91 percent) of the fatalities and 143 (90 percent) of the incidents. Approximately half (53 percent) of vehicles involved in fatal incidents were a type of high mobility multipurpose wheeled vehicle (HMMWV).

EXSUM, Injury Prevention Report No. 12-HF-056Sc-08, Causes of Nonbattle Injury Fatalities Among U.S. Army Soldiers During Operation Enduring Freedom and Operation Iraqi Freedom, 2001— 2006

e. A contributing cause of death was described for 73 (37 percent) of land transport fatalities. Drowning was the leading factor (70 percent of specified cases), followed by crushing (18 percent).

f. There were 27 air transport accidents involving a total of 121 Soldiers, of which 90 (74 percent) were fatally injured.

3. RECOMMENDATIONS.

a. Continue to emphasize integration of the Composite Risk Management Process into all missions, operations, activities and processes.

b. Re-evaluate current predeployment and deployment training provided to drivers of military vehicles. Develop strategies and techniques that will better train drivers of the new heavily armored military vehicles to negotiate the difficult road conditions encountered during military operations.

c. Identify and evaluate new and emerging safety technologies that may potentially reduce driving hazards in military vehicles or provide additional protection to vehicle occupants.

d. Identify and evaluate new and emerging technologies that may potentially reduce hazards encountered in flying helicopters in compromised environments, such as those encountered in the current deployments (i.e., darkness, wind, limited visibility, etc.).

e. Educate Soldiers frequently and regularly on the symptoms of a possible mental health crisis and on the steps to alert the appropriate chain of command.

Injury Prevention Report No. 12-HF-056Sc-08, Causes of Nonbattle Injury Fatalities Among U.S. Army Soldiers During Operation Enduring Freedom and Operation Iraqi Freedom, 2001—2006

Contents

1.	REFERENCES	1
2.	PURPOSE	1
3.	AUTHORITY	1
4.	BACKGROUND	1
5.	METHODS	2
6.	RESULTS	6
7.	DISCUSSION	20
8.	CONCLUSION	24
9.	RECOMMENDATIONS	24
10.	POINT OF CONTACT	25

Figures

1.	Fatalities and Incidents for Land Transport Vehicle Accident Types for OEF and OIF (combined), from the Start of Conflict through December 2006	12
2.	Contributing Causes of NBI Land Transport Vehicle Fatalities (n=73) by Accident Type for OEF and OIF (combined), from Start of Conflict through December 2006...	13
3.	Seatbelt Use Among Those Who Died in Land Transport Vehicle Accidents by Vehicle Type for OEF and OIF (combined), from theStart of Conflict Through December 2006	14
4.	Seatbelt Use among Those Who Died in Land Transport Vehicle Accidents by Accident Type for OEF and OIF (combined), from theStart of Conflict Through December 2006	15
5.	Helmet Use among Those Who Died in Land Transport Vehicle Accidents by Accident Type for OEF and OIF (combined), from theStart of Conflict Through December 2006	16
6.	Fatal Helicopter Incidents and Fatalities by Helicopter Type for OEF and OIF (combined), from theStart of Conflict Through December 2006	18

Injury Prevention Report No. 12-HF-056Sc-08, Causes of Nonbattle Injury Fatalities Among U.S. Army Soldiers During Operation Enduring Freedom and Operation Iraqi Freedom, 2001— 2006

Tables

1. Variables from DCIPS and ASMIS Included in the Analysis Database	4
2. Variables Used in Classifying Nonbattle Injury Fatalities	6
3. Distribution of Fatality Cases by Operation and Fatality Type for OEF and OIF, from the Start of Conflict Through December 2006	7
4. Frequency and Annual Rates of Nonbattle Injury Fatalities for OEF and OIF, from the Start of Conflict Through December 2006	7
5. Age, Gender, and Military Rank Distributions for Nonbattle Injury Fatalities from OEF and OIF, from the Start of Conflict Through December 2006	9
6. Distribution of Causes of Fatal Nonbattle Injuries for OEF and OIF, from the Start of Conflict Through December 2006	10
7. Fatal Land Transport Vehicle Incidents with One or More Fatalities and Injury Severity Level of All Vehicle Occupants for OEF and OIF (combined), from the Start of Conflict Through December 2006	11
8. Vehicles involved in Fatal Land Transport Vehicle Accidents for OEF and OIF (combined), from the Start of Conflict through December 2006	13
9. Seatbelt Use Among Those Who Died in Land Transport Vehicle Accidents by Vehicle Type for OEF and OIF (combined), from the Start of Conflict through December 2006	14
10. Seatbelt Use Among Those Who Died in Land Transport Vehicle Accidents by Accident Type for OEF and OIF (combined), from the Start of Conflict through December 2006	15
11. Helmet Use among Those Who Died in Land Transport Vehicle Accidents by Accident Type for OEF and OIF (combined), from the Start of Conflict Through December 2006	16
12. Fatal Air Transport Accidents and Injury Severity Level of All Occupants for OEF And OIF (combined), from the Start of Conflict through December 2006	17
13. Comparison of ASMIS and DCIPS as Sources of Nonbattle Injury Fatality Cases For OEF and OIF (combined), from the Start of Conflict through December 2006	19
14. Cases Reported Only in DCIPS, from the Start of Conflict through December 2006.....	19

Injury Prevention Report No. 12-HF-056Sc-08, Causes of Nonbattle Injury Fatalities Among U.S. Army Soldiers During Operation Enduring Freedom and Operation Iraqi Freedom, 2001— 2006

Appendices

A. REFERENCES A-1

B. TASKING MEMORANDUM FROM THE ASSISTANT SECRETARY
OF THE ARMY FOR INSTALLATIONS AND ENVIRONMENT B-1

C. MICROSOFT ACCESS DATA ENTRY INTERFACE C-1

INJURY PREVENTION REPORT NO. 12-HF-056Sc-08
CAUSES OF NONBATTLE INJURY FATALITIES
AMONG U.S. ARMY SOLDIERS DURING OPERATION ENDURING FREEDOM
AND OPERATION IRAQI FREEDOM, 2001—2006

1. REFERENCES. Appendix A contains the scientific/technical references used in this report.
2. PURPOSE. The purpose of this analysis was to—
 - a. Describe the number and rate of fatal nonbattle injuries (NBIs) in Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) from the beginning of each operation through December 2006.
 - b. Describe the causes and circumstances of fatal NBIs.
 - c. Compare two Army data systems that report fatal NBI incidents.
3. AUTHORITY. Consistent with the mission of the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) described in Army Regulation (AR) 40-5, the USACHPPM Injury Prevention Program responded to a request from the Deputy Assistant Secretary of the Army for Environment, Safety, and Occupational Health in May 2005 to conduct surveillance of injuries to deployed U.S. Army Soldiers (Appendix B). The focus of this project was (1) to develop a system capable of identifying the types and potentially preventable causes of NBI requiring medical air evacuation from OEF and OIF and (2) to describe the relative magnitude of the NBI problem compared with battle injuries (BIs) and illness or other medical conditions.
4. BACKGROUND.
 - a. During peacetime, injuries are a leading cause of death among active duty personnel in the U.S. military services.⁽¹⁾ From 1980–1992, these peacetime non–battle-related injuries, which include unintentional injuries, suicides, and homicides, accounted for 81 percent of all military deaths, while illness/disease accounted for only 19 percent. Unintentional injuries accounted for nearly two-thirds (62 percent) of these peacetime deaths, followed by suicides (13 percent) and homicides (6 percent).⁽¹⁾ Although unintentional fatality rates in the military decreased substantially through the early 1990s, in 1994 unintentional injuries still accounted for almost half of all deaths, ranging from 47 percent to 57 percent.⁽²⁾ Motor vehicle-related accidents (land transport accidents) were the leading cause of fatal injuries, responsible for 30–40 percent of all NBI fatalities.⁽¹⁾

Use of trademarked name(s) does not imply endorsement by the U.S. Army but is intended only to assist in identification of a specific product.
--

Injury Prevention Report No. 12-HF-056Sc-08, Causes of Nonbattle Injury Fatalities Among U.S. Army Soldiers During Operation Enduring Freedom and Operation Iraqi Freedom, 2001—2006

b. The types and leading causes of injury fatalities among active duty, nondeployed service members were similar to those among civilian adults, ages 20 to 54 years.⁽³⁾ In the civilian population, during 2001, 56 percent of all fatal injuries resulted from unintentional injuries. Motor vehicle accidents were the leading cause of unintentional injury fatalities, comprising 51 percent of these deaths.⁽⁴⁾ Self-inflicted injuries were higher among the civilians, accounting for 23 percent of all fatal injuries, followed by assaults (18 percent), and unknown injury causes (4 percent).⁽³⁾

c. Of the military services, the Army had the highest NBI fatality rate in 1994 (91 per 100,000 Soldiers).⁽²⁾ The Army's leading causes of death were similar to those reported for the other military services, with unintentional injuries comprising nearly half (48 percent) of all deaths, followed by illness/disease (21 percent), suicides (18 percent), homicides (9 percent), and others (4 percent).⁽²⁾ Land transport vehicle accidents were the leading specific cause of NBI deaths for the Army (32 percent), followed by gunshot wounds that occurred from suicides, accidents, or homicides (21 percent).⁽¹⁾

d. The importance of NBIs during combat operations has steadily increased since World War I and, during the Vietnam War, became the leading casualty type.⁽⁵⁾ During the Persian Gulf War (August 1990—July 1991), unintentional NBIs were the leading cause of death, accounting for 49 percent of deaths compared with 40 percent for battle-related deaths, 8 percent for illness/disease-related deaths, and 3 percent for intentional NBI deaths (self-inflicted and homicides).⁽⁶⁾ The two leading causes of NBI fatalities were land transport vehicle accidents (34 percent) and aircraft accidents (26 percent). Overall, the combined NBI fatality rate for all unintentional trauma, suicides, and homicides was 73 per 100,000 Soldiers.⁽⁷⁾

e. Writer et al. compared NBI fatality rates of nondeployed and deployed military service members during the Persian Gulf War⁽⁸⁾. Causes of NBI deaths were split into five categories: unintentional injury, illness/disease, self-inflicted injury, homicide, and unknown. Although the unintentional death rate was higher for deployed Soldiers than for nondeployed Soldiers (69 deaths per 100,000 Soldier-years versus 41 deaths per 100,000 Soldiers-years, respectively), death rates for the other NBI categories were not significantly different.⁽⁷⁾

5. METHODS.

a. Subjects and Case Definition. This retrospective analysis included all U.S. Army Soldiers who died from NBIs while deployed for OEF or OIF from the beginning of each operation (October 2001 and March 2003, respectively), through December 2006. An NBI fatality case was defined as any Soldier (Regular Army, Army Reserve, or Army National Guard) who died due to an NBI sustained while in a deployed status for OEF or OIF, including

Injury Prevention Report No. 12-HF-056Sc-08, Causes of Nonbattle Injury Fatalities Among U.S. Army Soldiers During Operation Enduring Freedom and Operation Iraqi Freedom, 2001 — 2006

while on midtour leave. The NBI fatalities included in this investigation resulted from (1) unintentional injury incidents, (2) intentional injury incidents (such as, homicides, suicides), and (3) physical training.

b. Data Sources. The Defense Casualty Information Processing System (DCIPS) and the Army Safety Management Information System (ASMIS) were used to identify Soldiers who died from NBI incidents in OEF and OIF.

(1) The DCIPS is the official casualty reporting system for the Department of Defense (DOD), ensuring that all casualties are reported and documented. The DCIPS is managed by the Casualty and Mortuary Affairs Operation Center, U.S. Army Human Resource Command. The system's main functions include casualty reporting, casualty notification to next of kin, casualty assistance and the prompt settlement of claims and benefits. The DCIPS records reportable casualties' categories (according to AR 600-8-1). Generally, these include: (1) all hostile reportable battle-related casualties, (2) all active duty fatalities (BIs, NBIs, and illnesses), and (3) other nonbattle casualties. The DCIPS classifies casualties as non-seriously ill/injured, seriously ill/injured or very seriously ill/injured. A battle (hostile) casualty is defined as "a person who is the victim of a terrorist activity or who becomes a casualty as a direct result of combat or from an injury sustained going to or returning from a combat mission or hostile situation."⁽⁸⁾ A nonbattle casualty is defined as "a person who becomes a casualty due to circumstances not directly attributable to hostile action or terrorist activity." Casualties due to the elements, self-inflicted injuries, or combat fatigue are considered nonbattle casualties.⁽⁸⁾ Nonbattle casualties are further categorized in DCIPS as illnesses, accidents, homicides, or self-inflicted injuries. The DCIPS data used in this analysis included only those Soldiers who were identified as being deployed to OEF or OIF.

(2) The ASMIS is managed by the U.S. Army Combat Readiness Center (USACRC). The ASMIS records the results of accident investigations conducted by the USACRC. An accident is an unplanned event or series of events that results in the death, injury, or occupational illness of Army personnel or in damage to or loss of equipment or property.⁽⁹⁾ In the deployed setting, injuries and deaths from accidents (unintentional events) are referred to as "nonbattle injuries." The ASMIS also reports training-related deaths from accidents or natural causes, including physical training-related deaths. However, ASMIS does not report the following types of NBIs: (1) suicide, homicide, or other intentionally self-inflicted injuries, (2) injuries from altercations, attack, or assault, unless incurred in performance of duty, and (3) injury or death from the use of alcohol, drugs, or other substances.⁽⁹⁾ The ASMIS data provided by the USACRC for this analysis included only those Soldiers who were identified as being deployed for OEF or OIF when they were injured.

Injury Prevention Report No. 12-HF-056Sc-08, Causes of Nonbattle Injury Fatalities Among U.S. Army Soldiers During Operation Enduring Freedom and Operation Iraqi Freedom, 2001—2006

c. Linking Data Sources.

(1) Using coded variables in DCIPS and ASMIS, all fatality cases among Soldiers deployed for OEF and OIF were identified. The DCIPS and ASMIS records for these fatality cases were then imported into separate databases in Statistical Program for the Social Sciences (SPSS), version 15 (Chicago, IL). Of all the variables in DCIPS and ASMIS, only those that provided information useful for this fatality analysis were imported into the SPSS databases (see Table 1). Since the original DCIPS and ASMIS data were in a “vertical” record format, with each case having multiple rows of data, it was necessary to restructure the SPSS databases by transposing data fields from all records for a given fatality to a single row of data with all information about the fatal incident. Using personal identifiers (Social Security numbers (SSNs) and case numbers), data from DCIPS and ASMIS were then linked and merged to create the final fatality database in SPSS. Data from this combined fatality database were then imported into Microsoft (MS) Access.

Table 1. Variables from DCIPS and ASMIS Included in the Analysis Database

Variable Name	Data System	Brief Description
Case Number	ASMIS	Event Identifier
SSN	ASMIS/DCIPS	Personal Identifier
Last Name	ASMIS/DCIPS	Personal Identifier
Age	ASMIS/DCIPS	Age of Soldier at time of death
Gender	ASMIS/DCIPS	Gender of Soldier
Rank	ASMIS/DCIPS	Rank of Soldier
Casualty Category	DCIPS	Accident/homicide/self-inflicted/pending
Casualty Date	DCIPS	Date the incident occurred
Personnel Type	ASMIS/DCIPS	Casualty’s Army component (Regular, Guard, Reserve)
Operation	ASMIS/DCIPS	Operation where deployed (OIF or OEF)
Circumstance	DCIPS	Details of incident in a free text field
Accident Description	ASMIS	Details of incident in a free text field
Analysis	ASMIS	Details of aviation incident
Narrative	ASMIS	Details of ground incident
Overall Activity	ASMIS	Details of incident that led to casualty
Ground Model	ASMIS	Type of vehicle involved
Event Code	ASMIS	Aviation accident description
Environment	ASMIS	Environmental conditions during aviation incident

Injury Prevention Report No. 12-HF-056Sc-08, Causes of Nonbattle Injury Fatalities Among U.S. Army Soldiers During Operation Enduring Freedom and Operation Iraqi Freedom, 2001—2006

(2) An MS Access data entry form (see Appendix C) was developed for this project. Using this interface, each case was reviewed and classified as a BI fatality, NBI fatality, or illness-related fatality. For NBI fatalities, cause of injury and other important details of the injury incident were coded (categorized) within this MS Access interface using relevant data elements in DCIPS and ASMIS, many of which were in “free text” format.

d. Injury Cause Coding Scheme. Cause of injury for NBI fatality cases was coded using the coding scheme from the North Atlantic Treaty Organization (NATO) Standardization Agreement (STANAG) No. 2050, 5th Edition.⁽¹⁰⁾ The STANAG injury cause codes were developed in the 1950s by the NATO countries. This coding scheme was useful because it categorized causes of injuries that are of substantial importance to the armed forces, such as war-related injuries.⁽¹¹⁾ The STANAG codes are four-digit codes describing the intent/situation of the injury incident, injury cause, and where the injury occurred. The first digit is the trauma code, indicates the type of injury that occurred (such as, battle, intentional nonbattle, or accidental nonbattle). The second—fourth digits indicate the cause of injury, identifying the specific causative agent and in some cases, indicates where the injury occurred.⁽¹¹⁾

e. Additional Variables Developed for This Analysis. While the STANAG coding scheme is the most applicable cause coding method for this type of analysis, there were limitations to coding within this system. Additional variables were created in the MS Access interface that allowed coders to classify other important details of the NBI fatality incidents, such as type of aircraft or land transport vehicle involved, whether seat belts or helmets were being worn, and whether the person involved was the driver or a passenger in the vehicle.⁽¹²⁾ Brief descriptions of these variables are presented in Table 2.

f. Statistical Analysis. Descriptive statistics (frequencies and percentages) of fatality types (BI, NBI, or illness), demographics, fatal NBI causes, and other coded variables were evaluated using SPSS, version 15.0.

Injury Prevention Report No. 12-HF-056Sc-08, Causes of Nonbattle Injury Fatalities Among U.S. Army Soldiers During Operation Enduring Freedom and Operation Iraqi Freedom, 2001—2006

Table 2. Variables Used in Classifying Nonbattle Injury Fatalities

Variable	Brief Description
Brief history	A free-text field that allows coders to enter a summary of the injury case and circumstance
STANAG trauma code	Classifies the type of injury that occurred: battle, intentional nonbattle, or accidental nonbattle
STANAG cause code	Classifies the specific causative agent for the injury death
Other STANAG code	Classifies a secondary injury cause code when a supplemental injury cause was described
Anatomical location of the injury	Classifies the injured body region, selected from a comprehensive list of single and multiple body regions
Vehicle type	Classifies the type of vehicle involved in incident
Occupant	Classifies the Soldier's position (role) in the vehicle
Collision group	Classifies the type of land transport vehicle accident: collision with object, with other vehicle, with pedestrian, overturned, ran off road
Data record source	Indicates in which system (ASMIS and/or DCIPS) the case was originally reported
Personal protective equipment	Indicates whether the Soldier was wearing the seatbelt or a helmet when the injury occurred

6. RESULTS. Between October 2001 and December 2006 during OEF and OIF, 2,327 Soldiers died (Table 3). Of these fatalities, 76 percent resulted from BIs, 21 percent from NBIs, and 3 percent from illness. The proportion of BI fatalities was greater in OIF than OEF ($p < 0.001$) and the proportion of NBI fatalities was greater in OEF ($p < 0.001$).

Injury Prevention Report No. 12-HF-056Sc-08, Causes of Nonbattle Injury Fatalities Among U.S. Army Soldiers During Operation Enduring Freedom and Operation Iraqi Freedom, 2001—2006

Table 3. Distribution of Fatality Cases by Operation and Fatality Type for OEF and OIF, from the Start of Conflict through December 2006

Fatality Type	Overall (n=2327)		OEF (n=264)		OIF (n=2063)	
	n	%	n	%	n	%
Battle Injury	1776	76.3	159	60.2	1617	78.4
Nonbattle Injury	492	21.1	98	37.1	394	19.1
Illness	59	2.5	7	2.7	52	2.5

a. Annual Nonbattle Injuries Fatality Rates.

(1) The number of NBI fatalities by year and the annual NBI fatality rates for OEF and OIF are shown in Table 4. Rates were calculated per 100,000 Soldiers. For OEF, NBI fatalities for 2001 and 2002 were combined because of the low number of Soldiers that were deployed during 2001.

Table 4. Annual Rate and Frequency of Nonbattle Injury Fatalities for OEF and OIF, from the Start of Conflict through December 2006

Year	Fatalities Overall		Aviation Fatalities		Nonaviation Fatalities	
	OEF rate ^a (n)	OIF rate ^a (n)	OEF rate ^a (n)	OIF rate ^a (n)	OEF rate ^a (n)	OIF rate ^a (n)
2001 + 2002 ^b	214 (18)	n/a	142 (12)	n/a	71 (6)	n/a
2003	158 (15)	101 (131)	95 (9)	8 (10)	63 (6)	93 (121)
2004	151 (20)	61 (88)	30 (4)	7 (10)	121 (16)	54 (78)
2005	157 (24)	81 (106)	85 (13)	5 (6)	72 (11)	77 (100)
2006	116 (21)	64 (69)	72 (13)	12 (13)	44 (8)	52 (56)
TOTAL	155 (98)	72 (394)	80 (51)	7 (39)	74 (47)	65 (355)

^a. Rate is annual fatalities per 100,000 Soldiers

^b. Years combined due to low number of Soldiers deployed in 2001

Injury Prevention Report No. 12-HF-056Sc-08, Causes of Nonbattle Injury Fatalities Among U.S. Army Soldiers During Operation Enduring Freedom and Operation Iraqi Freedom, 2001—2006

(2) Overall, the annual NBI fatality rate for OEF was more than two times higher than for OIF (OEF: 155/100,000 Soldier-years; OIF: 72/100,000 Soldier-years). To further evaluate this large difference, NBI fatalities were classified as aviation fatalities and nonaviation fatalities. Though the rate for nonaviation fatalities was somewhat higher for OEF (74/100,000 Soldier-years) compared with OIF (65/100,000 Soldier-years), the OEF rate for aviation fatalities (80/100,000 Soldier-years) was 11 times higher than for OIF (7/100,000 Soldier-years).

b. Demographics. The demographic characteristics of those who died in NBI incidents are presented in Table 5. Overall, 90 percent of NBI fatalities were less than 40 years of age, 95 percent were male, 81 percent were in ranks E1–E6, and 67 percent were Regular Army. The NBI fatalities in OIF were younger than those in OEF ($p=0.02$). There was no overall statistical difference ($p=0.20$) when the rank distributions for OEF and OIF were compared, but this finding was influenced by small frequencies in some rank categories affecting the statistical power. The proportion of NBI fatalities that were junior enlisted (E1–E4) was 9 percent higher in OIF and the proportion that were warrant officers was 6 percent higher in OEF.

c. Cause of Injury for Nonbattle Injuries Fatalities. Causes for fatal NBIs are presented in Table 6. Overall, the leading causes of death were land transport vehicle accidents (40 percent), self-inflicted injuries (18 percent) and air transport-related accidents (18 percent). The distribution of the leading causes differed between the two operations. For OEF, the top four causes of death were air transport accidents (52 percent), land transport accidents (16 percent), handling of weapons and explosives (13 percent), and self-inflicted injuries (12 percent). For OIF, the top four causes were land transport accidents (46 percent), self-inflicted injuries (20 percent), air transport accidents (10 percent), and handling of weapons and explosives (9 percent). However, the only significant differences in proportions between OEF and OIF were for land transport accidents ($p<0.001$) and air transport accidents ($p<0.001$).

d. Land Transport Accidents.

(1) Land Transport Vehicle Incidents with One or More Fatalities. There were 159 land transport vehicle incidents that resulted in 199 fatal injuries. Table 7 categorizes these 159 fatal incidents by the number of vehicle occupants when the incident occurred and the severity of the injuries to those occupants. Overall, of the 426 vehicle occupants, 199 (46.7 percent) incurred fatal injuries, 6 (1.4 percent) suffered permanent disability (total or partial), 103 (24.2 percent) had restricted or lost duty days, 55 (12.9 percent) required only first aid treatment, 60 (14.1 percent) were not injured, and for 3 (0.7 percent) the injury status was unknown.

Injury Prevention Report No. 12-HF-056Sc-08, Causes of Nonbattle Injury Fatalities Among U.S. Army Soldiers During Operation Enduring Freedom and Operation Iraqi Freedom, 2001—2006

Table 5. Age, Gender, and Military Rank Distributions for Nonbattle Injury Fatalities from OEF and OIF, from the Start of Conflicts through December 2006

Characteristic and Category	Overall (n=492)			OEF (n=98)		OIF (n=394)	
	n	%	p-value ^a	n	%	n	%
Age group (years)			0.02 ^b				
17–19	39	7.9		7	7.1	32	8.1
20–29	299	60.8		51	52.0	248	62.9
30–39	103	20.9		30	30.6	73	18.5
40–59	50	10.2		9	9.2	41	10.4
Unknown	1	0.2		1	1.0	0	0
Gender			0.20				
Female	20	4.1		2	2.0	18	4.6
Male	472	95.9		96	98.0	376	95.4
Military Rank			0.20				
Enlisted							
E1 – E4	267	54.3		46	46.9	221	56.1
E5 – E6	131	26.6		28	28.6	103	26.1
E7 – E8	19	3.9		4	4.1	15	3.8
Officers							
O1 – O3	31	6.3		5	5.1	26	6.6
O4 – O5	12	2.4		4	4.1	8	2.0
WO1 – WO5	32	6.5		11	11.2	21	5.3
Component			0.39				
Regular	330	67.1		65	66.3	265	67.3
Reserve	64	13.0		17	17.3	47	11.9
National Guard	90	18.3		14	14.3	76	19.3
Unknown	8	1.6		2	2.0	6	1.5

^a. p-value compares OEF to OIF, with a significance of 0.05

^b. p-value for age compared OEF and OIF fatalities in age groups 17-29 years and 30-59 years

Injury Prevention Report No. 12-HF-056Sc-08, Causes of Nonbattle Injury Fatalities Among U.S. Army Soldiers During Operation Enduring Freedom and Operation Iraqi Freedom, 2001— 2006

Table 6. Distribution of Causes of Fatal Nonbattle Injuries for OEF and OIF, from the Start of Conflict through December 2006

Causes	Overall (n=492)		OEF (n=98)		OIF (n=394)	
	n	%	n	%	n	%
Land Transport Vehicle Accidents	199	40.4	16	16.3	183	46.4
Self-Inflicted Injuries	90	18.3	12	12.2	78	19.8
Air Transport Accidents	90	18.3	51	52.0	39	9.9
Handling Weapons and Explosives	49	10.0	13	13.3	36	9.1
Sports and Physical Training	11	2.2	1	1.0	10	2.5
Machinery and Tools	11	2.2	1	1.0	10	2.5
Environmental Factors	10	2.0	1	1.0	9	2.3
Falls/Jumps	8	1.6	1	1.0	7	1.8
Homicide	6	1.2	0	0.0	6	1.5
Ingestion/Inhalation of Toxic Substances	4	0.8	1	1.0	3	0.8
Fire	4	0.8	0	0.0	4	1.0
Others	10	2.0	1	1.0	9	2.3

Injury Prevention Report No. 12-HF-056Sc-08, Causes of Nonbattle Injury Fatalities Among U.S. Army Soldiers During Operation Enduring Freedom and Operation Iraqi Freedom, 2001— 2006

Table 7. Fatal Land Transport Vehicle Incidents with One or More Fatalities and Injury Severity Level of All Vehicle Occupants for OEF and OIF (combined), from the Start of Conflict through December 2006

Number of Occupants in Fatal Incident	Number of Incidents (n=159)	Total Occupants ^a (n=426)	Injury Severity of Injured Land Transportation Occupants					
			Fatal (n=199)	Permanent Disability (n=6)	Restricted or Lost Duty Days (n=103)	First Aid (n=55)	Not Injured (n=60)	Injury Status Unknown (n=3)
1	62	62	62	0	0	0	0	0
2	32	64	37	0	14	6	7	0
3	30	90	41	2	22	17	7	1
4	12	48	21	1	14	1	9	2
5	7	35	9	0	12	3	11	0
6	5	30	8	0	6	3	13	0
7	3	21	6	2	4	3	6	0
8	2	16	6	1	6	2	1	0
9	2	18	2	0	8	5	3	0
10	2	20	2	0	8	9	1	0
11	2	22	5	0	9	6	2	0

Data source: ASMIS.

^a It is possible that some incidents could have had more, uninjured occupants who were not listed in ASMIS.

(2) Accident Types for Land Transport Incidents with One or More Fatalities. Fatal land transport vehicle incidents were classified into 6 accident types. The number of incidents and fatalities for each accident type are shown in Figure 1. The three leading accident types, overturned, ran off the road, and collision with another vehicle, accounted for 181 (91 percent) of the fatalities and 143 (90 percent) of the incidents. For each accident type, the fatality-incident ratio (F:I ratio) was calculated using the following formula:

$$\text{F:I ratio} = \text{total number of fatalities} / \text{number of incidents}$$

The overall fatality-incident ratio was 1.25 (199/159). The ratio was lowest for falling from a moving vehicle (2 incidents, 2 fatalities, F:I ratio=1) and collisions with pedestrians (8 incidents, 9 fatalities, F:I ratio=1.13), and highest for vehicles running off the road (51 incidents, 66 fatalities, F:I ratio=1.29) and vehicles overturning (56 incidents, 71 fatalities, F:I ratio=1.27).

Injury Prevention Report No. 12-HF-056Sc-08, Causes of Nonbattle Injury Fatalities Among U.S. Army Soldiers During Operation Enduring Freedom and Operation Iraqi Freedom, 2001—2006

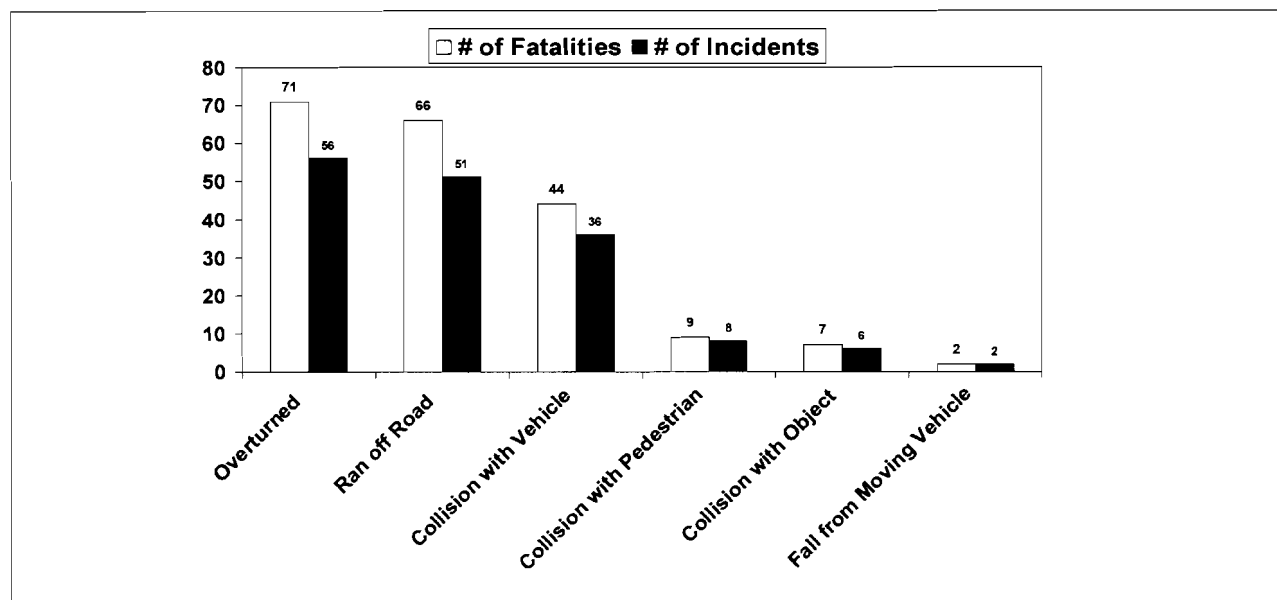


Figure 1. Fatalities and Incidents for Land Transport Vehicle Accident Types for OEF and OIF (combined), from the Start of Conflict through December 2006

(3) Contributing Causes of Land Transport Vehicle Fatalities. A contributing cause of death was described for 73 (37 percent) of land transport fatalities. When specified, drowning was the leading factor (70 percent of specified cases), followed by crushing (18 percent), and other causes (14 percent). Drowning was the cause of death for 42 percent of the fatalities that occurred when vehicles ran off the road and 30 percent of the fatalities when vehicles overturned (Figure 2).

(4) Land Transport Vehicle Accidents and Vehicles Involved. Table 8 further describes fatal land transport vehicle accidents, categorizing them by accident type and type of vehicle involved. Approximately half (53 percent) of vehicles involved in fatal incidents were a type of high mobility multipurpose wheeled vehicle (HMMWV). The family of medium tactical vehicles (FMTV), the second largest category, was involved in only 11 percent of the fatal incidents. According to data received from the Joint Staff, Readiness Division, DOD,⁽¹³⁾ HMMWVs accounted for 70 percent of all vehicles in OEF and OIF, while FMTVs made up 6 percent and Strykers 3 percent. The distribution of fatal incidents by vehicle type, therefore, was similar to the distribution of these vehicles in the theaters of operation.

Injury Prevention Report No. 12-HF-056Sc-08, Causes of Nonbattle Injury Fatalities Among U.S. Army Soldiers During Operation Enduring Freedom and Operation Iraqi Freedom, 2001— 2006

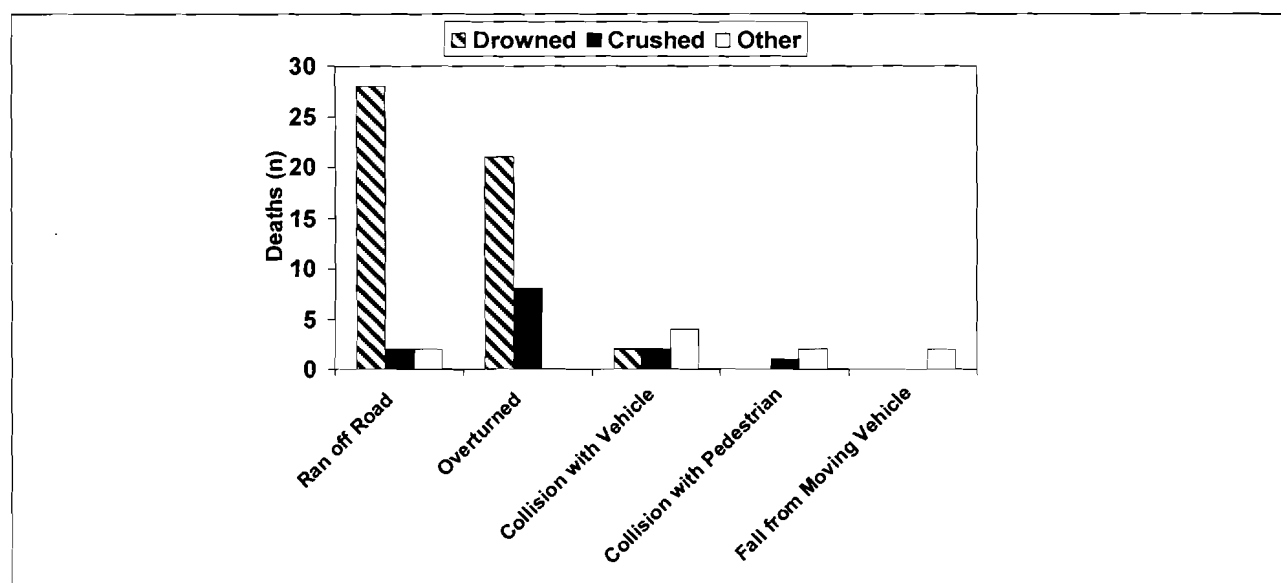


Figure 2. Contributing Causes of NBI Land Transport Vehicle Fatalities (n=73) by Accident Type for OEF and OIF (combined), from the Start of Conflict through December 2006

Table 8. Vehicles Involved in Fatal Land Transport Vehicle Accidents^a for OEF and OIF (combined), from the Start of Conflict through December 2006

Land Transport Vehicle	Accident Type													
	Overturned (n=57)		Ran Off Road (n=50)		Collision with Vehicle (n=36)		Collision with Object (n=7)		Collision with Pedestrian (n=7)		Fall from Moving Vehicle (n=2)		Total (n=159)	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
HMMWV	33	57.9	25	50.0	19	52.8	6	85.7	1	14.3	1	50.0	85	53.5
FMTV	7	12.3	8	16.0	2	5.6	0	0.0	0	0.0	1	50.0	18	11.3
Other Truck	2	3.5	5	10.0	5	13.9	1	14.3	2	28.6	0	0.0	15	9.4
Car/SUV	4	7.0	2	4.0	2	5.6	0	0.0	3	42.9	0	0.0	11	6.9
Tank	1	1.8	3	6.0	2	5.6	0	0.0	0	0.0	0	0.0	7	4.4
Bradley	4	7.0	2	4.0	0	0.0	0	0.0	0	0.0	0	0.0	6	3.8
Stryker	1	1.8	3	6.0	0	0.0	0	0.0	0	0.0	0	0.0	4	2.5
Other Specified	4	7.0	28	4.0	6	16.7	0	0.0	1	14.3	0	0.0	13	8.2

^a Total incidents, not total fatalities

(5) Seatbelt Usage. Table 9 and Figure 3 describe seatbelt use among those who died in land transport accidents and the type of vehicle involved. For those Soldiers whose seatbelt usage data were available in ASMIS (n= 84), 65 percent were not wearing seatbelts (n=55). For 7 percent who had seatbelts available for use it was unknown whether they were wearing them at the time of injury. The HMMWVs had the highest number of Soldiers who were not wearing seatbelts at the time of injury (n=30; 55 percent).

Table 9. Seatbelt Use Among Those Who Died in Land Transport Vehicle Accidents by Vehicle Type for OEF and OIF (combined), from the Start of Conflict through December 2006

Vehicle Type	Seatbelt (n=29)		No Seatbelt (n=55)		Total (n=84)	
	n	%	n	%	n	%
HMMWV	16	55.1	30	54.5	46	54.8
FMTV	4	13.8	6	10.9	10	11.9
Bradley	1	3.4	6	10.9	7	8.3
Stryker	1	3.4	5	9.1	6	7.1
Car/SUV	1	3.4	1	1.8	2	2.4
Tank	0	0.0	1	1.8	1	1.2
Other Truck	4	13.8	5	9.1	9	10.7
Other Specified	2	6.9	1	1.8	3	3.6

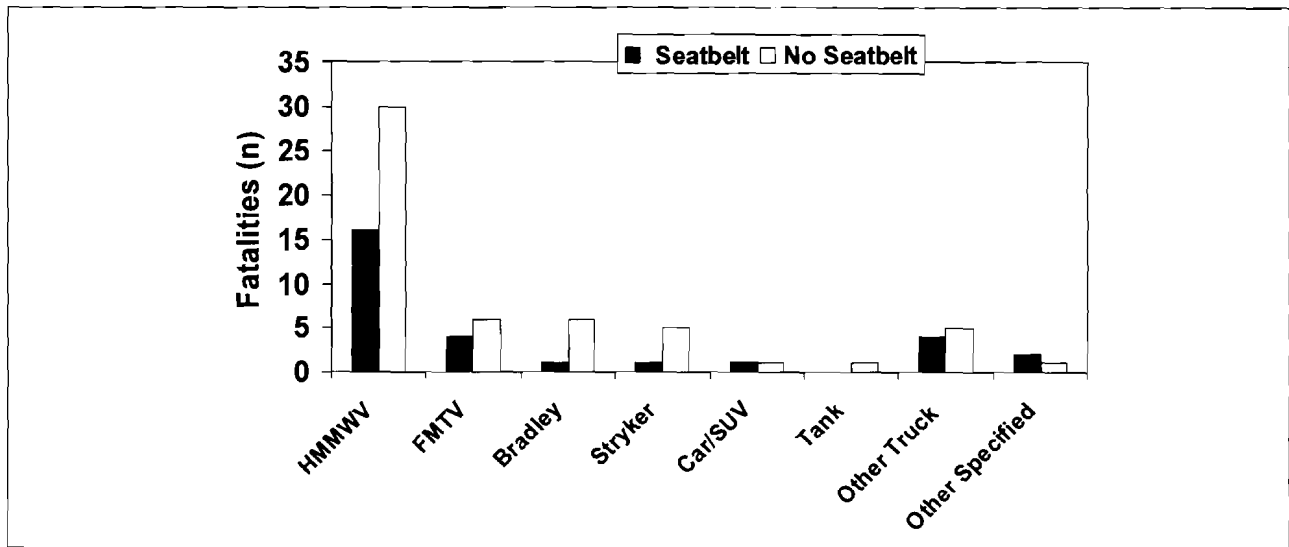


Figure 3. Seatbelt Use Among Those Who Died in Land Transport Vehicle Accidents by Vehicle Type for OEF and OIF (combined), from the Start of Conflict through December 2006

Injury Prevention Report No. 12-HF-056Sc-08, Causes of Nonbattle Injury Fatalities Among U.S. Army Soldiers During Operation Enduring Freedom and Operation Iraqi Freedom, 2001— 2006

(6) Seatbelt Usage by Accident Type. Table 10 and Figure 4 present seatbelt usage by accident type among those who died in land transport vehicle accidents. Most Soldiers who were injured and not wearing seatbelts were involved in accidents where their vehicle ran off the road (49 percent), followed by those whose vehicles overturned (26 percent), and those who collided with another vehicle (18 percent).

Table 10. Seatbelt Use Among Those Who Died in Land Transport Vehicle Accidents by Accident Type for OEF and OIF (combined), from the Start of Conflict through December 2006

Accident Type	Seatbelt (n=29)		No Seatbelt (n=55)		Total (n=84)	
	n	%	n	%	n	%
Overtuned	9	31.0	14	25.5	23	27.4
Ran Off Road	12	41.4	27	49.1	39	46.4
Collision w/Vehicle	7	24.1	10	18.2	17	20.2
Collision w/Object	1	3.4	3	5.5	4	4.8
Fall from Moving Vehicle	0	0.0	1	1.8	1	1.2

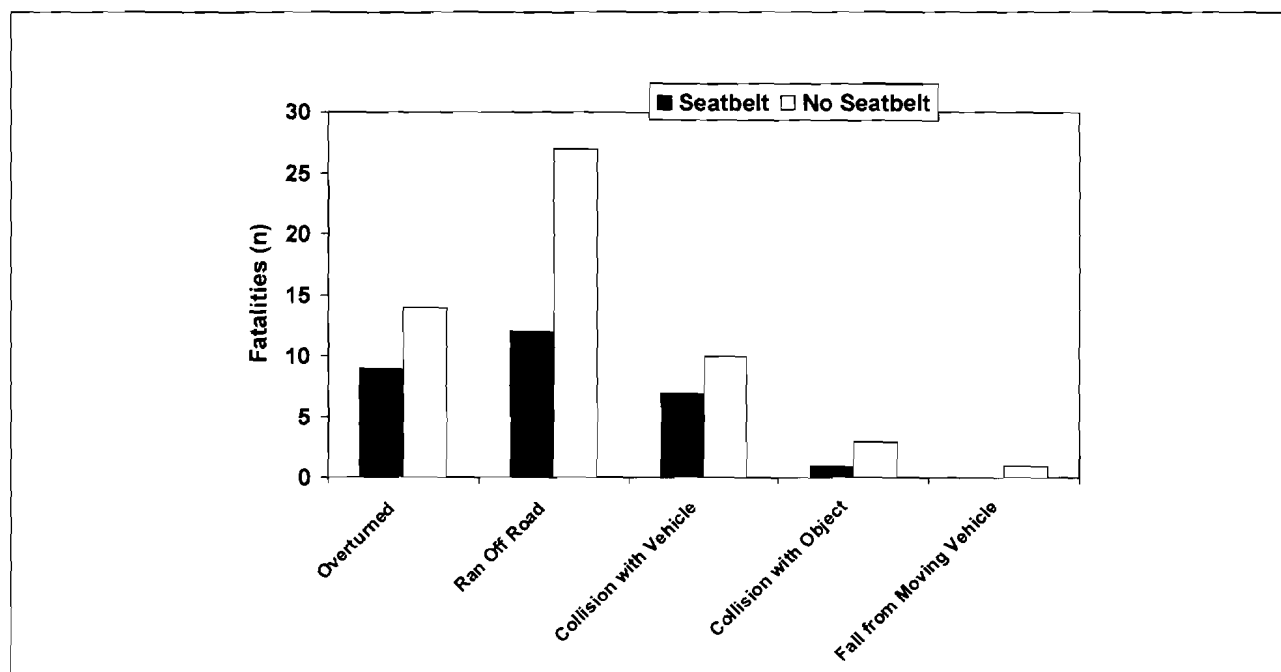


Figure 4. Seatbelt Use Among Those Who Died in Land Transport Vehicle Accidents by Accident Type for OEF and OIF (combined), from the Start of Conflict through December 2006

(7) **Helmet Usage.** Information about helmet usage was available for 59 percent of fatalities from land transport vehicle accidents (Table 11 and Figure 5). Of these 118 Soldiers, 95 percent were wearing helmets at the time of injury. Of those Soldiers not wearing a helmet at the time of injury, three were in vehicles that ran off the road, one in a vehicle that collided with another vehicle, one in a vehicle that overturned, and one fell out of a vehicle. It was unknown whether 5 percent of those who had helmets available for use wore them at the time of injury.

Table 11. Helmet Use Among Those Who Died in Land Transport Vehicle Accidents by Accident Type for OEF and OIF (combined), from the Start of Conflict through December 2006

Accident Type	Helmet (n=112)		No Helmet (n=6)		Total (n=118)	
	n	%	n	%	n	%
Overturned	46	41.0	3	50.0	49	41.5
Ran off Road	33	29.5	1	16.7	34	28.8
Collision w/Vehicle	26	23.2	1	16.7	27	22.9
Collision w/Object	6	5.4	0	0.0	6	5.1
Collision w/Pedestrian	1	0.9	0	0.0	1	0.8
Fall from Moving Vehicle	0	0.0	1	16.7	1	0.8

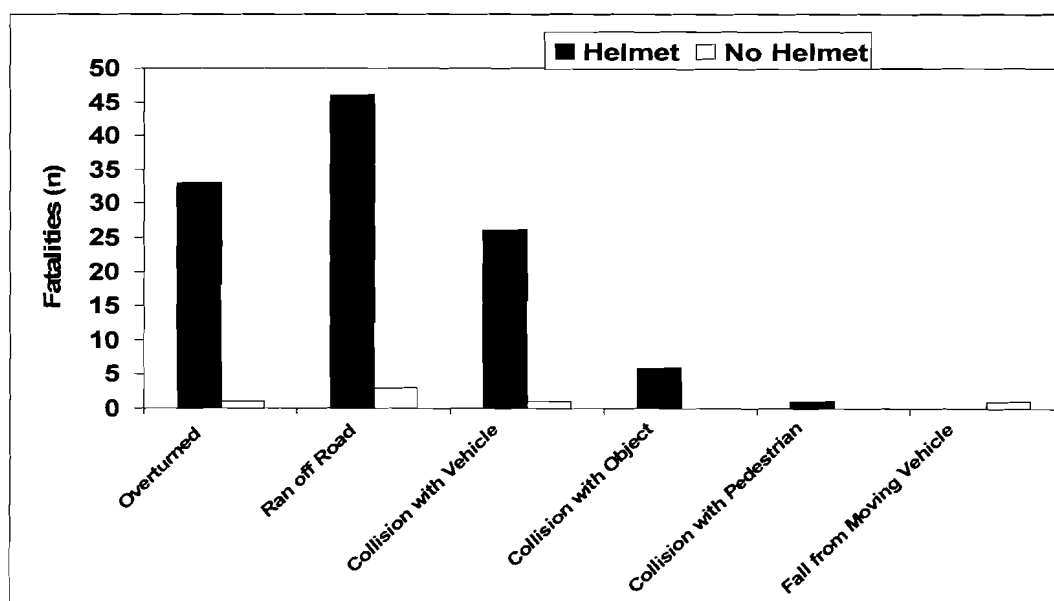


Figure 5. Helmet Use Among Those Who Died in Land Transport Vehicle Accidents by Accident Type for OEF and OIF (combined), from the Start of Conflict through December 2006

Injury Prevention Report No. 12-HF-056Sc-08, Causes of Nonbattle Injury Fatalities Among U.S. Army Soldiers During Operation Enduring Freedom and Operation Iraqi Freedom, 2001—2006

e. Air Transport Incidents. There were 27 air transport accidents involving a total of 121 Soldiers. Table 12 summarizes the air transport accidents according to the total number of occupants in the aircraft and their injury severity. Overall, 90 occupants (74 percent) suffered fatal injuries, 3 (2.4 percent) had permanent disability (total or partial), 12 (9.9 percent) had restricted or lost workdays, 3 (2.4 percent) required only first aid, and 13 (10.7 percent) had no injury listed in ASMIS. More than one-third of the fatalities (n=33) resulted from only three incidents: two of the aircraft had 10 occupants each with 18 total fatalities and one aircraft had 15 occupants, all of whom died.

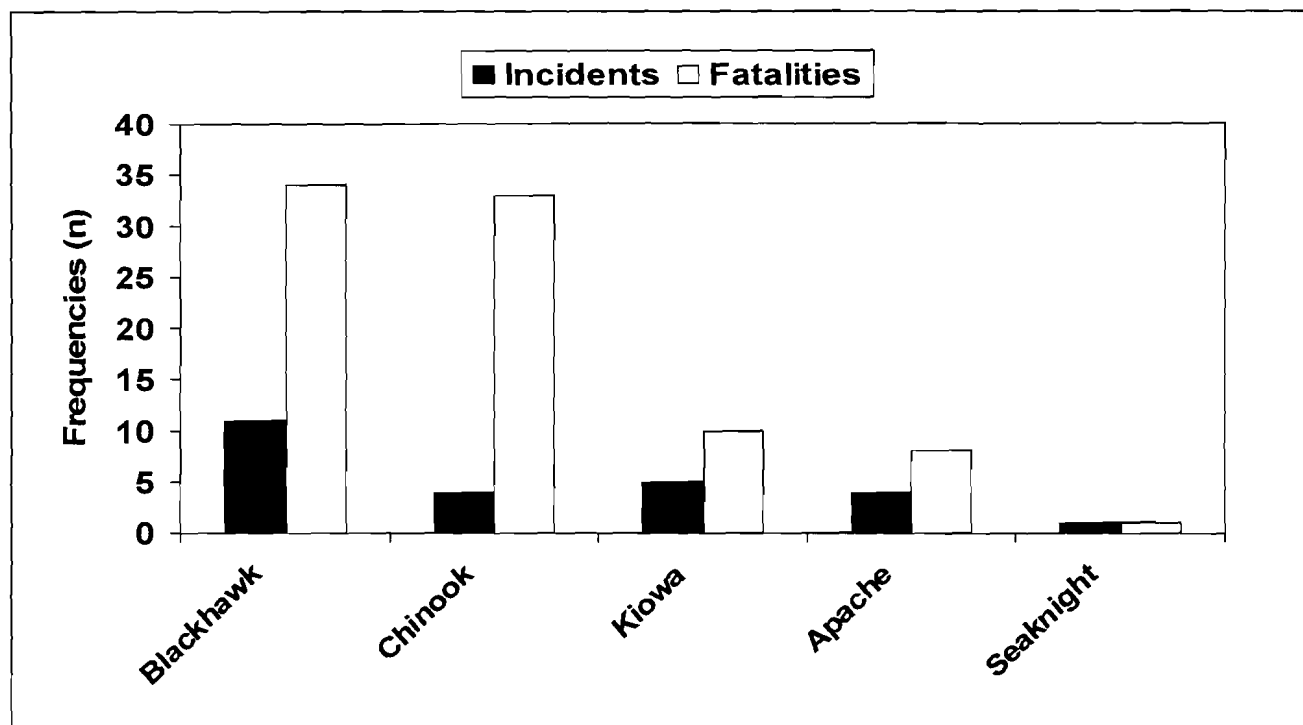
Table 12. Fatal Air Transport Accidents and Injury Severity Level of All Occupants for OEF and OIF (combined), from the Start of Conflict through December 2006

Number of Occupants in Fatal Incidents	Number of Incidents (n= 27)	Total Occupants ^a (n=121)	Injury Severity of Injured Air Transportation Occupants				
			Fatal (n= 90)	Permanent Disability (n= 3)	Restricted or Lost Workdays (n= 12)	First Aid (n=3)	Unknown Injury Status (n=13)
1	5	5	5	0	0	0	0
2	5	10	9	1	0	0	0
3	3	9	6	0	0	0	3
4	5	20	12	1	2	1	4
6	3	18	13	1	4	0	0
7	1	7	2	0	1	0	4
8	1	8	8	0	0	0	0
9	1	9	2	0	5	2	0
10	2	20	18	0	0	0	2
15	1	15	15	0	0	0	0

Data source: ASMIS and DCIPS

^a It is possible that some incidents could have had more uninjured occupants who were not listed in ASMIS or DCIPS.

f. Helicopter Mishaps. Helicopters were involved in 25 of the 27 fatal air transport accidents and accounted for 86 fatalities. Most of these fatalities were caused by air-to-ground or air-to-water crashes (n=11) and by other incidents that involved hovering or taxiing (n=2). Figure 6 shows the number of fatal incidents and the number of fatalities by helicopter type involved. Blackhawk helicopters were involved in the largest proportion of incidents (n= 11; 44 percent).



Note: Includes one Soldier who was missing and is presumed dead

Figure 6. Fatal Helicopter Incidents and Fatalities by Helicopter Type for OEF and OIF (combined), from the Start of Conflict through December 2006

g. Comparison of Data Systems.

(1) Table 13 demonstrates the differences in fatal NBI reporting between the DCIPS and ASMIS. Of the 492 NBI fatality cases identified (October 2001 – December 2006), 368 cases were reported in both systems, while 124 were reported only in DCIPS. Most of the differences in reporting were related to the type of injury that caused the fatality. Of the 381 fatalities from unintentional injuries, 91% were recorded in both systems. All of the physical training-related fatalities (n=11) were recorded in both systems. The ASMIS recorded only a small proportion of fatalities that resulted from intentional causes (8%) or ingestion/inhalation of toxic substances (25%).

Injury Prevention Report No. 12-HF-056Sc-08, Causes of Nonbattle Injury Fatalities Among U.S. Army Soldiers During Operation Enduring Freedom and Operation Iraqi Freedom, 2001—2006

Table 13. Comparison of ASMIS and DCIPS as Sources of Nonbattle Injury Fatality Cases for OEF and OIF (combined), from the Start of Conflict through December 2006

Reporting Source for NBI Fatalities	Type of Fatal Injury/Incident									
	TOTAL (n=492)		Unintentional (n=381)		Physical Training-Related (n= 11)		Intentional (n=96)		Ingestion/Inhalation of Toxic Substances (n=4)	
	n	%	n	%	n	%	n	%	n	%
Cases reported in DCIPS ^a & ASMIS ^b	368	74.8	348	91.3	11	100	8	8.3	1	25
Cases reported only in DCIPS ^a	124	25.2	33	8.7	0	0	88	91.7	3	75

^a According to DOD 1300.18, all unintentional, intentional and physical-training related injuries should be included in DCIPS.

^b According to AR 385-10, only unintentional injuries and physical training-related injuries should be included in ASMIS.

(2) Table 14 provides a brief description of the unintentional injury causes that were reported only in DCIPS (n=33), but not in ASMIS. The largest categories were accidents in handling weapons or explosives, air transport accidents, and land transport accidents. Thirty-three cases that the Injury Prevention Program determined to be unintentional NBIs were not included in ASMIS. These cases were sent to the USACRC for investigation and validation. The USACRC determined that the three land transport accidents were, indeed, missing from ASMIS, and added these cases for future reference. The USACRC confirmed that the other 30 cases were appropriately not in ASMIS since they did not fit the USACRC case definition of an “accident.”

Table 14. Cases Reported Only in DCIPS, from the Start of Conflict through December 2006

Fatal Unintentional Injury Cause	Cases Recorded Only in DCIPS (n=33)
Handling weapons and ammunition	18
Air Transport Accidents	8
Land Transport Accidents	3
Heat stroke	1
Choking (unintentional)	1
Cardiac arrest while lifting heavy boxes	1
Fall	1

7. DISCUSSION.

a. From the beginning of OEF and OIF through December 2006, there were 98 and 394 NBI fatalities, respectively. Overall, 90 percent of these fatalities were less than 40 years of age, 95 percent were male, 81 percent were in ranks E1–E6, and 67 percent were Regular Army. The leading causes of NBI fatalities (OEF and OIF combined) were land transport accidents (41 percent), self-inflicted injuries (18 percent), and air transport accidents (18 percent).

b. Nonbattle injuries have been an important cause of mortality during past combat operations.^(6,7) For the on-going OEF and OIF deployments, the annual NBI fatality rates were 155/100,000 per Soldier-years and 72/100,000 per Soldier-years, respectively. With further classification of fatalities as aviation fatalities and nonaviation fatalities, it became evident that the higher OEF rate was influenced primarily by its much higher aviation fatality rate (11 times higher than for OIF). The OIF rate is nearly the same as the NBI fatality rate for the Persian Gulf War (73/100,000),⁽⁷⁾ while the OEF rate is more than twice as high as the Persian Gulf War and OIF rates.

c. During OEF and OIF, NBI fatalities accounted for 37 percent and 19 percent, respectively, of all deaths and BI fatalities accounted for 60 percent and 78 percent, respectively. These fatality proportions, however, are much different than those reported for the Persian Gulf War for which NBI was 49 percent and BI was 40 percent of the total deaths.⁽⁷⁾ The use of covert weapons such as improvised explosive devices (IEDs), the long duration of the insurgency, and the sustained combat intensity are most likely responsible for the higher proportions of BI fatalities and lower proportions of NBI fatalities thus far in OEF and OIF.

d. The leading causes of NBI fatalities for OEF and OIF combined were land transport accidents (40 percent), self-inflicted injuries (18 percent), and air transport accidents (18 percent). When examined separately, however, the distribution of leading causes differed distinctively across the operations. For OEF, the leading causes were air transport accidents (52 percent), land transport accidents (16 percent), handling of weapons and explosives (13 percent), and self-inflicted injuries (12 percent), while for OIF the leading causes were land transport accidents (46 percent), self-inflicted injuries (20 percent), air transport accidents (10 percent), and handling of weapons and explosives (9 percent). Some of the factors that may account for these differences between operations include differences in the tempo and types of military operations, weather, and terrain.

e. When vehicles were involved in accidents resulting in fatalities, almost half of all Soldiers in the vehicles died. Other Soldiers suffered nonfatal injuries in these accidents, requiring medical care and limited duty, further reducing their unit's combat readiness. Approximately 70 percent of land transport vehicles in OEF and OIF are HMMWVs, which

accounted for half of all fatal land transport accidents in these deployments.⁽¹³⁾ Army leaders have determined that modifications must be made to the HMMWV to decrease the number of injuries that occur while operating this vehicle. New HMMWVs are being produced with enhanced safety features. The Combatant Forces Land Component Commander in Kuwait is now responsible for making sure that these same safety enhancements are made to HMMWVs currently being used in theater.⁽¹⁴⁾ These enhancements include elongated seatbelts for use while wearing full body armor, a radio system for communication between crew members, and a fire suppression system within the HMMWV.⁽¹⁵⁾ A new type of windshield has also been developed. The Vehicle Emergency Escape (VEE) Window kits allow Soldiers to remove the windshield of the HMMWV in less than five seconds in order to exit the vehicle in an emergency.⁽¹⁶⁾

f. Rollover accidents were responsible for a large portion of land transport accidents in OEF and OIF. In this investigation, incidents in which vehicles ran off the road or overturned were considered “rollover” events. In a prior report of HMMWV accidents in OIF and OEF, rollover accidents were 70 percent more likely to result in a fatal injury than nonrollover accidents.⁽¹⁷⁾ This is consistent with the current results that 67 percent of all fatal land transport vehicle incidents involved vehicles that either overturned or ran off the road. In response to these rollover events, the HMMWV Egress Assistance Trainer (HEAT) is now being used to train Soldiers to safely escape from an overturned vehicle and to reinforce safety measures such as proper seatbelt use.⁽¹⁴⁾ As of October 2007, this training is required for all Army personnel deploying to Afghanistan or Iraq.⁽¹⁸⁾

g. The high number of drownings that occurred during land transport vehicle incidents where the vehicle rolled into a canal or ditch is noteworthy. Drowning was listed as a cause or factor of death for 42 percent of Soldiers whose vehicles ran off the road and 30 percent of Soldiers whose vehicles overturned. The proportion of drowning deaths resulting from land transport vehicles incidents during these deployments is much higher than those reported in civilian settings.⁽¹⁹⁾ Possible reasons may include inadequate road infrastructure and bridges over bodies of water (canals and ditches). Hammett reported that 52 percent of military personnel who were involved in land transport vehicle drowning incidents in OEF and OIF did not have injuries severe enough to prevent them from exiting the vehicle, yet they were unable to escape for various reasons, including inability to open the doors.⁽¹⁹⁾ The DOD has directed changes that should lower the mortality rate of these accidents. These include changes to vehicle operating procedures near water, equipment modifications such as improving the seat restraint and vehicle lock systems so that it is easier to get out of the vehicle, and implementation of an in-depth water egression training program.⁽¹⁹⁾

Injury Prevention Report No. 12-HF-056Sc-08, Causes of Nonbattle Injury Fatalities Among U.S. Army Soldiers During Operation Enduring Freedom and Operation Iraqi Freedom, 2001—2006

h. As in any population, seatbelt use is an issue requiring continued attention. The Army, however, has a unique situation that must be taken into account. The seatbelt must be able to be comfortably worn while wearing personal protective equipment (body armor) and combat loads and it must be an effective restraint during a crash, yet quick and easy to remove during combat operations. In this analysis, 42 percent of Soldiers killed in land transport vehicle accidents had seatbelt use annotated. Of these cases, 65 percent had access to a seatbelt but were not wearing it when the accident occurred. The HMMWVs had the highest number of fatalities where soldiers were not wearing seatbelts. In an earlier evaluation for OEF and OIF, the risk of a fatal injury in a HMMWV accident was six times greater for Soldiers not wearing seatbelts than for those who were.⁽¹⁷⁾ However, depending on a Soldier's position in the vehicle, seatbelt usage may not be available or, if available, feasible to use at that time (such as, gunners and/or Soldiers providing rear security). Recently, gunner restraint systems have been put in place to keep the gunner inside the hatch during a rollover accident.⁽¹⁵⁾ More research needs to be done to determine how to provide better protection and restraint for those Soldiers who are not able to wear conventional seatbelts.

i. Air transport accidents were the leading cause of NBI fatalities in OEF, accounting for half of the deaths. Crashes and hovering/taxiing incidents were responsible for most fatalities. There are many factors involved in these incidents. Helicopters such as the Blackhawk, Chinook, and Apache are being flown three times more than their normal operation levels in both OEF and OIF.⁽²⁰⁾ In addition to impairing pilots' vision, sand and dust are taking a toll on the aircraft, reducing the life of components.⁽²⁰⁾ In response to these issues, many improvements have been made to aircraft in theater. Improved survivability equipment is being installed. Since data show that almost 75 percent of all accidents are a result of brown-out conditions that occur during take-off or landing, hover cues and heads-up displays are being installed in the Blackhawk and Chinook aircraft.⁽²⁰⁾ Training, such as aircrew coordination, has also been enhanced and is being given to pilots and crew to improve survivability.⁽¹⁴⁾

j. Within the military, rates of fatal self-inflicted injury have been lower than those of a similar civilian population.⁽²¹⁾ However, fatal self-inflicted injuries in OEF (fourth leading cause of NBI death) and OIF (second leading cause of NBI death) have garnered much attention lately. In the deployed setting, it may be difficult to assess and predict who is at risk to intentionally harm him/herself. In addition to high levels of combat stress, many deployed Soldiers also experience high levels of stress associated with being away from home (such as, troubled interpersonal relationships, family problems, financial concerns, and illness/death of family members or friends). These deployment and personal stressors can result in serious mental health issues that were not present prior to deployment and were, therefore, not identified during predeployment mental health screening. It is imperative that Soldiers experiencing serious mental health issues be identified early by their fellow Soldiers and leaders and referred to mental health providers available in the deployed setting.⁽²¹⁾ In response to the increasing

number of suicides among deployed Soldiers, the Multi-National Forces–Iraq (MNF-I) coalition created a Suicide Prevention Committee chaired by the Command Surgeon. This committee reviews all suicide policies and procedures, analyzes trends in suicides and suicidal behaviors, and advises leaders in theater on suicide prevention training and education.⁽²²⁾ Treatment options may range from talking to a chaplain or mental health provider to the removal of the Soldier's weapon and ammunition or supervision by his/her unit.⁽²¹⁾ If deemed necessary, Soldiers are evacuated for further treatment.

k. After reviewing the NBI fatalities reported in DCIPS and ASMIS, it was found that both systems report cases that are consistent with their primary purposes, DCIPS as a casualty reporting system and ASMIS as an accident reporting system. Overall, 75% of NBI fatality cases were reported in both data systems. When this occurred, DCIPS and ASMIS complemented each other and together provided greater detail about the types and causes of the fatal incidents. Differences in the types of cases reported between DCIPS and ASMIS were mostly due to the differences in their primary purposes.

l. When comparison was limited to fatal unintentional injuries, the proportion of cases reported in both systems was much higher (91%). Thirty-three cases that the Injury Prevention Program determined to be unintentional NBIs, were not included in ASMIS. These cases were sent to the USACRC for investigation and validation. The USACRC determined that the three land transport accidents were, indeed, missing from ASMIS, and added these cases for future reference. The USACRC confirmed that the other 30 cases were appropriately not in ASMIS since they did not fit the USACRC case definition of an “accident.”

m. The total impact of NBI fatalities is immeasurable. These deaths affect not only those involved in the incident but also their fellow Soldiers and units. The unit's combat readiness is also affected, possibly hindering mission progress or putting other lives in danger due to the shortage. In land and air transport accidents, equipment is often damaged so badly that it cannot be salvaged, costing millions of dollars for replacements.

n. Nonbattle fatalities are tragic but often preventable. Although these incidents are possible in any setting, the deployment setting poses unique risks of NBIs. Soldiers are working in unfamiliar surroundings, physically and mentally fatigued, and may be performing activities they are not accustomed to. These factors can be stressful and may lead to less adherence to safety rules and procedures.⁽⁷⁾ Deployment injury surveillance systems are capturing the causes of NBIs in OEF and OIF.^(12,23) Prevention strategies and countermeasures specific to the deployment setting must be researched, implemented, and regularly and frequently taught to Soldiers in theater to reduce these potentially avoidable deaths.

8. CONCLUSIONS.

a. The NBIs are an important cause of death in the current OEF and OIF deployments, accounting for 21 percent of all deaths.

b. The leading causes of NBI fatalities for OEF and OIF combined were land transport accidents (40 percent), self-inflicted injuries (18 percent), and air transport accidents (18 percent). Deaths from air transport accidents were significantly higher in OEF, while deaths from land transport accidents were significantly higher in OIF.

c. Overall, the annual NBI fatality rate for OEF was more than two times higher than for OIF (OEF: 155/100,000 Soldier-years; OIF: 72/100,000 Soldier-years). The OEF rate for aviation fatalities (80/100,000 Soldier-years) was 11 times higher than for OIF aviation rates (7/100,000 Soldier-years).

d. The three leading types of land transport accident types were (1) vehicle overturned, (2) vehicle ran off the road, and (3) collision with another vehicle. These three accident types accounted for 181 (91 percent) of the fatalities and 143 (90 percent) of the incidents. Approximately half (53 percent) of vehicles involved in fatal incidents were a type of HMMWV.

e. A contributing cause of death was described for 73 (37 percent) of land transport fatalities. Drowning was the leading factor (70 percent of specified cases), followed by crushing (18 percent).

f. There were 27 air transport accidents involving a total of 121 Soldiers, of which 90 (74 percent) were fatal.

9. RECOMMENDATIONS.

a. Continue to emphasize integration of the Composite Risk Management Process into all missions, operations, activities, and processes.⁽²⁴⁾

b. Re-evaluate current predeployment and deployment training provided to drivers of military vehicles. Develop strategies and techniques that will better train drivers of the new heavily armored military vehicles to negotiate the difficult road conditions encountered during military operations.

c. Identify and evaluate new and emerging safety technologies that may potentially reduce driving hazards in military vehicles or provide additional protection to vehicle occupants.

Injury Prevention Report No. 12-HF-056Sc-08, Causes of Nonbattle Injury Fatalities Among U.S. Army Soldiers During Operation Enduring Freedom and Operation Iraqi Freedom, 2001— 2006

d. Identify and evaluate new and emerging technologies that may potentially reduce hazards encountered in flying helicopters in compromised environments, such as those encountered in the current deployments (such as, darkness, wind, limited visibility, etc.).

e. Educate Soldiers frequently and regularly on the symptoms of a possible mental health crisis and on the steps to alert the appropriate chain of command.

10. POINT OF CONTACT. Refer questions pertaining to this report to Nakia Clemmons, Injury Prevention Program, Directorate of Epidemiology and Disease Surveillance, at (410) 436-5486/5291, DSN 584-5486/5291, or email to nakia.clemmons@us.army.mil.

NAKIA S. CLEMMONS
Injury Prevention Program

BRUCE H JONES
Manager, Injury Prevention Program

Injury Prevention Report No. 12-HF-056Sc-08, Causes of Nonbattle Injury Fatalities Among U.S. Army Soldiers During Operation Enduring Freedom and Operation Iraqi Freedom, 2001—2006

APPENDIX A

REFERENCES

1. Powell KE, Fingerhut LA, Branche CM, Perrotta DM. 2000. Deaths due to injury in the military. *Am J Prev Med.*; 18(3S):26–32.
2. Jones BH, Perrotta DM, Canham-Chervak ML, Nee MA, Brundage JF. 2000. Injuries in the military: a review and commentary focused on prevention. *Am J Prev Med.*; 18(3S):71–84.
3. Vyrostek SB, Annest JL, Ryan GW. 2004. Surveillance for fatal and nonfatal injuries—United States, 2001. *MMWR Surveillance Summaries.* 03 September 2004; 53(SS07):1–57.
4. National Center for Injury Prevention and Control. 2005. Web-based Injury Statistics Query and Reporting System (WISQARS) [online]. The Centers for Disease Control and Prevention. Available at <http://www.cdc.gov/ncipc/wisqars>. Accessed 18 January 2008.
5. Palinkas JA, Coben P. Disease and nonbattle injuries among U.S. Marines in Vietnam. 1988. *Mil Med.*; 153:150–155.
6. Writer JV, DeFraites RF, Keep LW. 2000. Nonbattle injury casualties during the Persian Gulf War and other deployments. *Am J Prev Med.*, 18(3S):64–70.
7. Writer JV, DeFraites, Brundage JF. Comparative mortality among U.S. military personnel in the Persian Gulf region and worldwide during Operations Desert Shield and Desert Storm. *JAMA.* 1996; 275(2):118–121.
8. Department of Defense Instruction 1300.18, Military Personnel Casualty Matters, Policies, and Procedures, 18 December 2000.
9. Army Regulation 385-10, The Army Safety Program, 23 August 2007.
10. Military Agency for Standardization, North Atlantic Treaty Organization. Standardized Classification of Diseases, Injuries, and Causes of Death. 1989. STANAG 2050 MED 5th Edition. 2 March 1989.
11. Amoroso PJ, Bell NS, Smith GS, Senier L, Pickett D. Viewpoint: A Comparison of Cause-of-Injury Coding in U.S. Military and Civilian Hospitals. 2000. *Am J Prev Med.*; 18(3S):164–173.

Injury Prevention Report No. 12-HF-056Sc-08, Causes of Nonbattle Injury Fatalities Among U.S. Army Soldiers During Operation Enduring Freedom and Operation Iraqi Freedom, 2001—2006

12. Hauret KG, Clemmons NS, Jones BH, Hadley J. Development of a Deployment Injury Surveillance System Using Medical Air Evacuation Data. Technical Report No. 12-HF-056S-07. Aberdeen Proving Ground, MD: U.S. Army Center for Health Promotion and Preventive Medicine. 2007.

13. Rice A. "Re: Motor Vehicles in OEF/OIF." Email to the authors 17 October 2007.

14. U.S. Army Combat Readiness/Safety Center. Fiscal Year 2006 Army safety performance report. Available at <https://crc.army.mil/Report/Fy06yearend.doc>. Accessed 9 January 2008.

15. Best RD. Up-Armored Humvees (UAHs) Get New Safety Enhancements. Army AL&T Online Monthly. January 2007. Available at http://www.usaasc.info/alt_online/article.cfm?iID=0701&aid=06. Accessed 13 February 2008.

16. BAE Systems. BAE Systems Receives \$12.5 Million Contract to Provide Emergency Escape Windows to U.S. Army. 29 August 2007. News Release. Available at http://www.baesystems.com/Newsroom/NewsReleases/autoGen_107729125349.html. Accessed 13 February 2008.

17. Canham-Chervak M, Canada S, Hauret K, Hadley J, Jones B. Risk factors for high mobility multi-purpose wheeled vehicle (HMMWV) accidents and other important injuries during Operations Iraqi Freedom and Enduring Freedom, Calendar Years 2003–2004. Technical Report No. 12-MA-03Z8-05. Aberdeen Proving Ground, MD: U.S. Army Center for Health Promotion and Preventive Medicine. 2005.

18. U.S. Army Combat/Safety Readiness Center. Current status of the Army HMMWV egress assistance trainer (HEAT). Information Paper CSSC-ZT. 16 October 2007. Available at (https://crcapps2.crc.army.mil/ako_auth/heat.html.) Accessed 3 February 2008.

19. Hammett M, Pearse L, Naito N, Watts D, Hooper T. Drowning Deaths of U.S. Service Personnel Associated with Motor Vehicle Accidents Occurring in Operation Iraqi Freedom and Operation Enduring Freedom, 2003–2005. *Mil Med.* 2007; 172:875–878.

20. Bergantz, JL. Army aviation transformation. Army Magazine. 1 January 2004. Available at (<http://www.ausa.org/webint/DeptArmyMagazine.nsf/byid/CCRN-6CCSBM>.) Accessed 18 January 2008.

21. Allen JP, Cross G, Swanner J. Suicide in the Army. a Review of Current Information. *Mil Med.* 2005; 170:580–584.

Injury Prevention Report No. 12-HF-056Sc-08, Causes of Nonbattle Injury Fatalities Among U.S. Army Soldiers During Operation Enduring Freedom and Operation Iraqi Freedom, 2001—2006

22. Castro CA, McGurk D. Suicide Prevention Down Range: A Program Assessment. *Traumatology*. 2007; 13:32–36.

23. Deployment-related conditions of special surveillance interest, U.S. Armed Forces by month and service, January 2003–May 2007. *Medical Surveillance Monthly Report (MSMR)*. 2007; May 14(3):18.

24. U.S. Army Combat/Safety Readiness Center. Graphic training aids(GTAS): GTA 05-08-012 Individual safety card. Available at <https://crc.army.mil/Guidance/cat.asp?iCat=632&iChannel=15&nChannel=Guidance>. Accessed 23 July 2008.

Injury Prevention Report No. 12-HF-056Sc-08, Causes of Nonbattle Injury Fatalities Among U.S. Army Soldiers During Operation Enduring Freedom and Operation Iraqi Freedom, 2001—2006

APPENDIX B
TASKING MEMORANDUM



DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY OF THE ARMY
INSTALLATIONS AND ENVIRONMENT
110 ARMY PENTAGON
WASHINGTON DC 20310-0110

MAY 02 2005

MEMORANDUM FOR COMMANDER, US ARMY MEDICAL COMMAND/THE SURGEON
GENERAL, 5109 LEESBURG PIKE, FALLS CHURCH, VA 22041
(ATTN: MS. SIL FINAMORE, DASG-ZXA)

SUBJECT: Request for USACHPPM Analyses of CENTCOM AOR Non-Battle Injuries

1. Non-battle injuries have been a major cause of morbidity and mortality during past combat operations. Preliminary analysis using medical evacuation data (TRAC2ES) in January 2004 by the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) showed that non-battle injuries accounted for 39% of air evacuations from the CENTCOM AOR for Operations Iraqi Freedom (OIF) and Enduring Freedom (OEF). Many injuries within the three leading causes of non-battle injuries (falls, motor vehicle-related mishaps, and sports/physical training) may be preventable.

2. I request the assistance of the USACHPPM to provide on-going analyses of non-battle injuries that require air evacuation from the CENTCOM AOR and to identify potentially preventable causes of non-battle injuries. Specifically, it is requested that the USACHPPM identify and link medical, safety, and personnel data sources that document battle injuries, non-battle injuries, and diseases during deployments, such as OIF and OEF to:

- a. Describe the distribution of diagnoses (ICD-9 codes) for Soldiers hospitalized in, or air evacuated from, the CENTCOM AOR.
- b. Describe the relative impact and rates of non-battle injuries compared to battle-injuries and to other medical conditions and illnesses that required air evacuation, hospitalization, or other health care.
- c. Identify causes of NBI that may be preventable.
- d. Validate the diagnoses and causes of injuries from the medical evacuation data against other medical and safety data sources.

3. I thank you for your assistance with this. I am confident that this analysis will provide the Army with critical information for reducing Soldier injuries and enhancing readiness, combat effectiveness, well-being and morale. My point of contact is Mr. Jim Patton, 703-697-3123.


Raymond J. Fatz

Deputy Assistant Secretary of the Army
(Environment, Safety and Occupational Health)
OASA(I&E)

Printed on  Recycled Paper

Injury Prevention Report No. 12-HF-056Sc-08, Causes of Nonbattle Injury Fatalities Among U.S. Army Soldiers During Operation Enduring Freedom and Operation Iraqi Freedom, 2001— 2006

APPENDIX C MS ACCESS DATA ENTRY FORM

Microsoft Access - [frmTrac2esNew]

File Edit View Format Records Tools Window Help

CODER: QUESTION: Injury or illness: Gender: Data Loc Indicator:
 SSN: Body part: Rank: PERIOD_OF_DAY: COMBAT_crc:
 Personnel Type:

BRIEF HISTORY: DUTY STATUS: CAS_CTRY_CD: YEAR:
 CRC: LOST CONTROL OF VEHICLE WHILE TURNING, TC EJECTED COUNTRY_CRC: DATE_OF_ACCIDENT:
 Casualty Date: Event Type:

Next person This evacuation was... Trauma code: Instruments of War (primary)
 If pre-existing ... Cause code: Instruments of War (secondary)
 Trauma: Other STANAG: Injured by own IOW
 Cause:

Jumping/Not vehicle	Falling/Not vehicle	Sports/PT	Poisons/Fire/Corrosives
Jumping from vehicle	Falling from vehicle	Twist, slip, trip (no fall cited)	Machinery, tools and selected agents
Boarding vehicle	MVA	Other cause	Environmental factors
Exiting Vehicle	MVA - Pedestrian		

Circumstances:

Cause:

Diagnosis:

Vehicle Ownership:
 Vehicle Role:
 ACTIVITY_CODE_crfw:
 Overall_Activity_crd: 313
 ACCIDENT_DESCRIPTION_crc:
 Soldiers were transporting barriers on a PLS. Driver was making right turn and lost control of the vehicle. The TC was partially ejected from the vehicle and was fatally injured.

Avn. Accid. Descrip	Avn_Weather_Event Info	Body Parts	Grd Accident	Enviro Conditions
Activity Codes	Grd. Veh Info	Mistakes Made?	Type_Cause Injury	