

Deaths While on Active Duty in the U.S. Armed Forces, 1990-2011

Crude mortality rates are lower among U.S. military members than their civilian counterparts; service members must be healthy when they enter service and deaths from illnesses are relatively infrequent. From 1990 through 2011, there were 29,213 deaths of U.S. military members while on active duty (crude overall mortality rate: 71.5 per 100,000 person-years). The most deaths occurred in years when major combat operations were ongoing; from 2004 to 2007, war-related injuries accounted for approximately 40 percent of all deaths. From 2000 to 2011, two-thirds of all deaths unrelated to war were caused by transportation accidents (n=4,761; 37%), other accidents (n=1,358; 10%) and suicides (n=2,634; 20%). From 2005 to 2011, the proportion of deaths due to suicide increased sharply while the proportion due to transportation accidents generally decreased; as a result in 2010 and 2011, suicides accounted for more deaths of service members than transportation accidents. The current focuses of the Services on safety and mental health are clearly indicated to minimize the premature loss of lives of young men and women in military service.

Many military activities are physically and psychologically demanding; some are inherently dangerous. For this and other reasons, applicants for U.S. military service are screened to ensure that they are physically and psychologically healthy before they may enter.

While in active service, military members must be able to perform all duties required by their military occupations, ranks, and assignments. To maintain and enhance the health, fitness, and military occupational capabilities of its members, the Services conduct extensive physical fitness, health promotion, safety, and force health protection programs. In addition, service members receive “free” preventive, curative, and rehabilitation medical services.

Because military members are ostensibly healthy when they enter service and must maintain their health during service, deaths from illnesses (i.e., natural causes) are relatively infrequent. However, deaths from injuries (e.g., combat-related, motor vehicle accidents, self-inflicted) are not uncommon.¹⁻⁴ Many deaths of service members are preventable. In order to develop, target, and track the effects of

illness and injury prevention policies and practices, it is important to characterize the numbers, natures, risk factors, and causes of “preventable” deaths among active service members. This report is an overview of mortality among U.S. military members since 1990; it updates previous summaries of the numbers, rates, trends, and causes of deaths among members of the U.S. Armed Forces from 1990 through 2011.⁵

METHODS

The surveillance period was 1 January 1990 to 31 December 2011. The surveillance population included all individuals who served on active duty during the surveillance period as a member of the active or reserve component of the U.S. Army, Navy, Air Force, or Marine Corps. End-points of interest for this report were deaths of active or reserve component members while serving on active duty. Deaths of active duty service members were ascertained from records produced by service-specific casualty offices and maintained by the Armed Forces Medical Examiner in the DoD Medical Mortality Registry. For surveillance purposes, the records are

routinely provided to the Armed Forces Health Surveillance Center for integration in the Defense Medical Surveillance System (DMSS).

The Medical Mortality Registry classifies deaths by “manner” (i.e., natural, accident, homicide, suicide, undetermined) and underlying cause (using a classification system with 457 possible causes). For this report, the 201 underlying causes of service member deaths since 1990 were grouped into 21 categories of cause of death.

Summary measures for this analysis are numbers of deaths in the surveillance population overall (i.e., active and reserve component members on active duty) and mortality rates (calculated as deaths per 100,000 person-years of active military service) among members of the active component. Mortality rates were summarized in relation to person-years at risk (rather than individuals at risk) because the U.S. military is a dynamic cohort – every day, many individuals enter and many others leave service. Thus, in a given calendar year, there are many more individuals with any service than there are total person-years of active service; the latter was considered a more consistent measure of exposure to mortality risk across calendar years. Reserve component members were not included in rate calculations because the start and end dates of their active duty service periods were not available.

RESULTS

During the 22-year surveillance period, there were 29,213 deaths of U.S. military members while on active duty (**Table 1**). The mean number of deaths per year was 1,328; the range was 795 (in 1997) to 1,941 (in 2007). The numbers of deaths rose in years when major combat operations were ongoing (Operation Desert Storm, 1991; Operations Enduring Freedom, Iraqi Freedom, and New Dawn, 2001-2011) (**Figure 1**).

In general, the most deaths were among members of military and demographic subgroups with the largest representations in

TABLE 1. Demographic and military characteristics of individuals who died in active service, active and reserve components, U.S. Armed Forces, 1990-2011

	Active/ reserve components	Active component	Rate ^a
	No.	No.	
Total	29,213	24,788	75.1
Service			
Army	14,341	11,269	95.8
Navy	5,775	5,385	60.9
Air Force	4,628	3,972	47.4
Marine Corps	4,469	4,162	103.8
Sex			
Male	27,393	23,308	81.6
Female	1,820	1,480	33.4
Race/ethnicity			
White, non-Hispanic	20,002	16,814	78.4
Black, non-Hispanic	4,907	4,309	70.2
Other	4,304	3,665	67.7
Age			
<20	2,122	1,958	79.4
20-24	10,748	9,900	92.0
25-29	5,688	5,098	70.8
30-34	3,499	3,009	58.0
35-39	3,037	2,450	57.6
40+	4,119	2,373	75.6
Military occupation			
Health	1,459	1,308	54.8
Combat	8,655	7,731	128.5
Other	19,099	15,749	64.0

^aDeath rate per 100,000 person-years of service; for active component only

the military overall. For example, of service members who died while on active duty, most by far (94%) were males, more than two-thirds (68%) were white, non-Hispanic, and more than one-half (56%) were in their twenties. Service members with combat-specific occupations accounted for 30 percent of all deaths but approximately 18 percent of all service members (Table 1).

From 2000 to 2011, three-fourths of all deaths were caused by accidents, war/legal interventions, or suicides (Figure 2). From 2004 to 2007, war-related injuries accounted for approximately 40 percent of all deaths; and from 2000 to 2011, two-thirds of all deaths unrelated to war/

legal interventions were caused by transportation accidents (n=4,761; 37%), other accidents (n=1,358; 10%) and suicides (n=2,634; 20%) (Figure 3). From 2008 to 2011, suicides accounted for approximately 26 percent of all non-war-related deaths of U.S. service members. (At the time of this analysis, final determinations of underlying causes were pending for approximately 11 percent of all deaths in 2011; as a result, relatively more deaths in 2011 than in prior years are attributed to “all other” causes).

From 2005 to 2011, the proportion of deaths due to suicide increased sharply while the proportion due to transportation accidents generally decreased; as a result in 2010 and 2011, suicides accounted for more deaths of service members than transportation accidents. The proportions of deaths due to other non-war-related causes were relatively stable during the past 12 years (Figures 3,4).

From 1990 to 2011 among active component members, the crude overall mortality rate was 75.1 per 100,000 person-years (p-yrs). The highest crude overall

subgroup-specific mortality rates affected members who were in combat-specific occupations (128.5 per 100,000 p-yrs), in the Marine Corps (103.8 per 100,000 p-yrs) or Army (95.8 per 100,000 p-yrs), 20-24 years old (92.0 per 100,000 p-yrs), and male (81.6 per 100,000 p-yrs). The lowest crude overall subgroup-specific mortality rates affected members who were female (33.4 per 100,000 p-yrs), in the Air Force (47.4 per 100,000 p-yrs), in health-related occupations (54.8 per 100,000 p-yrs), and in their thirties (57.8 per 100,000 p-yrs) (Table 1).

The highest annual subgroup-specific mortality rates (unadjusted) affected service members in the Marine Corps in 2004 (232.7 per 100,000 p-yrs), in the Army in 2007 (212.9 per 100,000 p-yrs) and in combat-specific occupations from 2004 to 2007 (range, annual rates, 2004-2007: 218.1-262.5 per 100,000 p-yrs) (data not shown).

Annual mortality rates from deaths unrelated to war were higher during the first two years (1990-1, mean annual rate: 67.3 per 100,000 p-yrs) and the last seven

FIGURE 1. Deaths per year among individuals on active duty, by service, active and reserve components, U.S. Armed Forces, 1990-2011

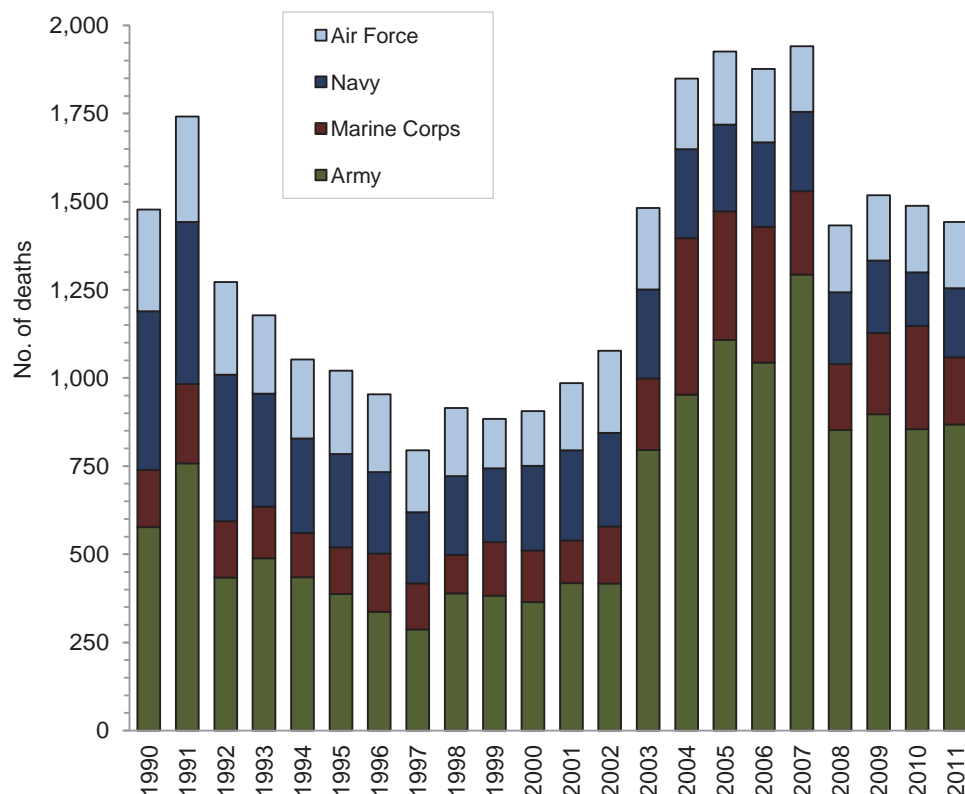


FIGURE 2. Deaths of individuals on active duty, by proportions attributable to various categories of underlying causes, active and reserve components, U.S. Armed Forces, 2000-2011

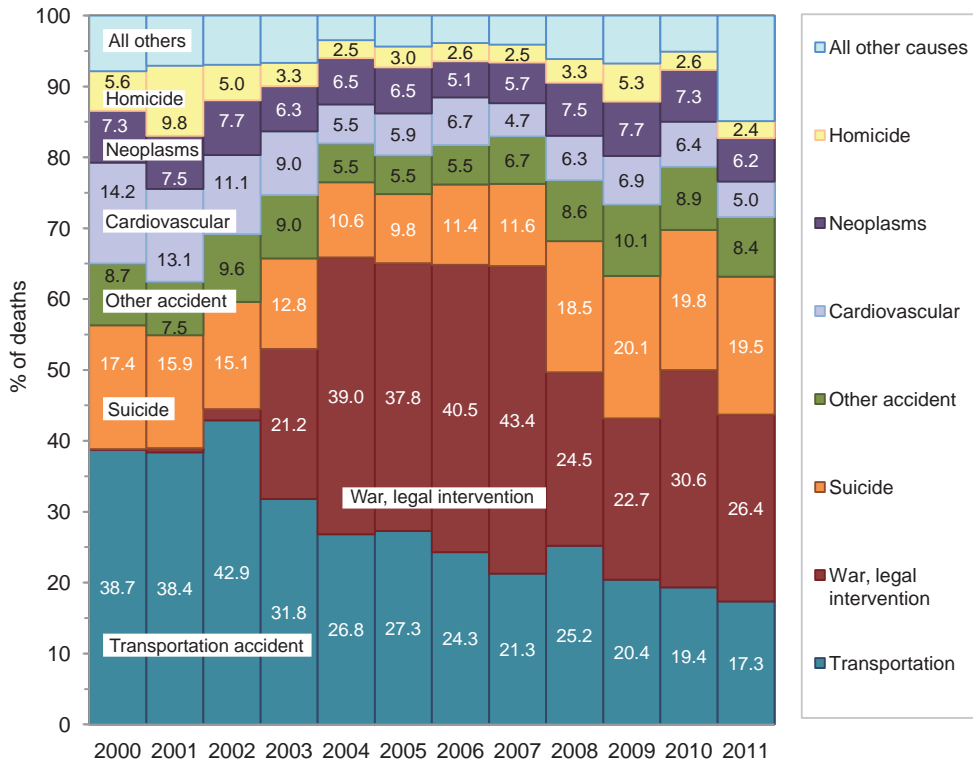
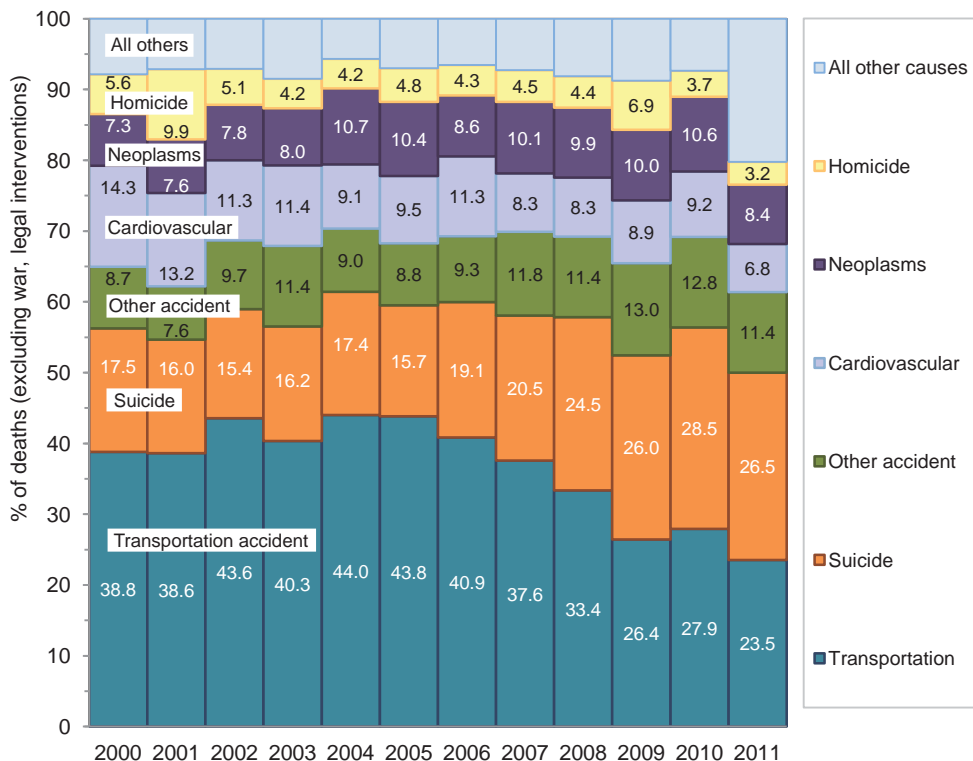


FIGURE 3. Deaths not related to war/legal interventions, among individuals on active duty, by proportions attributable to various categories of underlying causes, active and reserve components, U.S. Armed Forces, 2000-2011



years (2005-11, mean annual rate: 65.5 per 100,000 p-yrs) than the intervening thirteen years (1992-2001, mean annual rate: 58.7 per 100,000 p-yrs) of the overall period. In general, however, there was no clear long-term trend in mortality from deaths unrelated to war (Figure 4).

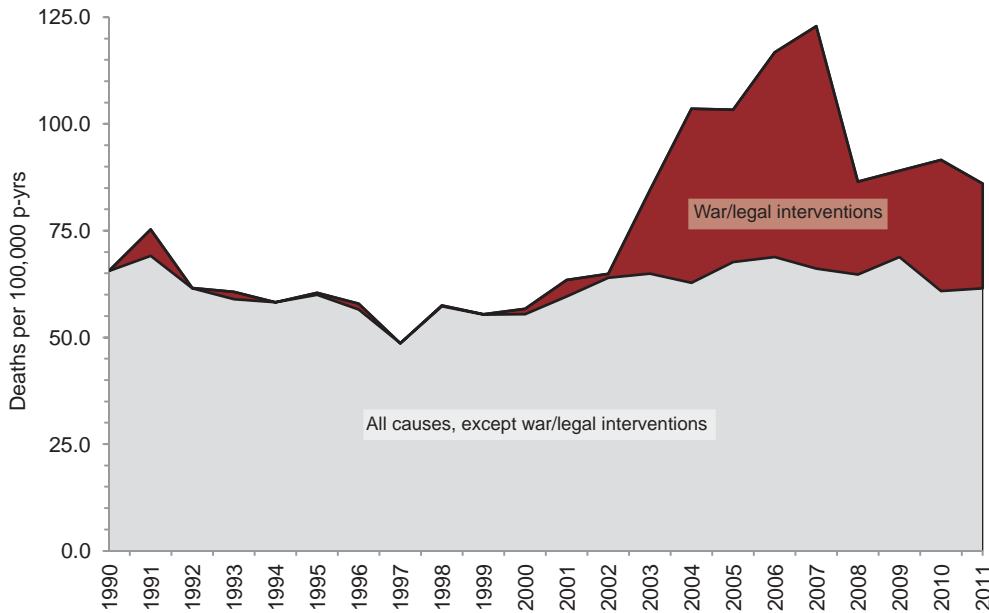
EDITORIAL COMMENT

In the past two decades (which include two periods of intense combat operations), the crude overall mortality rate among U.S. service members was 71.5 per 100,000 p-yrs. In 2005, in the general U.S. population, the crude overall mortality rate among 15-44 year olds was 127.5 per 100,000 p-yrs.⁶ If the age-specific mortality rates that affected the U.S. general population in 2005 had affected the respective age-groups of active component military members throughout the period of interest for this report, there would have been approximately 13,198 (53%) more deaths among military members overall (calculations not shown).

Because many military activities are dangerous and some are life threatening (e.g., combat operations), many military members die from military activity-specific causes – particularly during wartime. It is not surprising, therefore, that while crude mortality rates are generally lower among military members overall than similarly aged civilians, in recent years because of war-related injuries, mortality rates have been higher among military members younger than 25 years than among their civilian counterparts. Of note, in both military and civilian populations, accidents and suicides are leading causes of death among individuals in their late teens and early twenties.^{5,6} Since 1998 in the military, suicide has been the second leading cause of deaths unrelated to war.

Among U.S. civilians 25 to 44 years old, malignant neoplasms and diseases of the heart are the second and third leading causes of death (after accidents); in contrast, there are relatively few disease-related deaths among military members in active service.⁶ The finding is not surprising because young adults with life-threatening

FIGURE 4. Crude annual mortality rate, by relationship to war/legal interventions, active component, U.S. Armed Force, 1990-2011



medical conditions are relatively unlikely to apply for and are medically disqualified from entering military service. Also, active military members who develop life-threatening medical conditions while in service generally leave (e.g., medical disability) prior to the terminal clinical stages of their illnesses. As a result, rates of disease related deaths are much lower among actively serving military members than similarly aged civilians.

In summary, war-related injuries have been the leading cause of deaths of active

service members in each year since 2004. Excluding war-related deaths, accidents and suicides account for approximately two-thirds of all deaths of active military members. Since 2005, the proportion of service members' deaths due to suicide has been increasing; and in 2010 and 2011, there were more deaths from suicide than from transportation accidents. The current focuses of the Services on safety and mental health are clearly indicated not only to decrease morbidity, disability, and costs and to enhance individual and unit

operational effectiveness but also to minimize the premature loss of lives of young men and women in military service.^{7,8}

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