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Counts of military deaths in Iraq are well publicized, but deaths alone do not indicate the risk for an individual. In order to assess the extent of individual risk, the number of deaths must be compared to the number of individuals exposed to the risk of death. These risks may vary from person to person depending on such factors as one's branch of service, rank, age, sex, race and ethnicity.

In this paper, we construct death rates for members of the military who have been deployed to Iraq. Two excellent and highly consistent websites, one of them maintained by the Department of Defense, provide data on deaths that have been incurred in Operation Iraqi Freedom. Data on the number and characteristics of troops deployed in Iraq (the denominators of death rates) were provided by the Department of Defense on their website, with supplementary tabulations supplied by the Defense Manpower Data Center (2006). [1]. The data permit an examination of how death risks among members of the military deployed to Iraq vary according to certain personal characteristics and aspects of armed service. Some of these differences mimic those in society at large, while others reflect the unique conditions of military service.

The Death Rate of Military Personnel in Iraq

Between March 21, 2003, when the first military death was recorded in Iraq, and March 31, 2006, a total of 2321 deaths occurred to troops in Iraq. This number includes deaths from all causes, whether combat-related or not, as well as deaths that were directly related to in-theatre operations in Iraq even though they occurred in another country. The conventional denominator for a death rate consists of an estimate of person-years lived during the period in which deaths are recorded (Preston, et al., 2001). We estimate person-years lived on the basis of counts of troop strength in Iraq that were made every three months beginning on March 31, 2003 and extending to December 31, 2005. [2] The result is an estimated total of 592,002 person-years lived between March 21, 2003 and March 31, 2006.

The ratio of deaths to person-years lived, .00392 or 3.92 per 1000, is the death rate of military personnel in Iraq. Thus, the chance of death is approximately one in 255 per year. How does this death rate compare to those in other populations? One obvious comparison is to the civilian population of the United States, a standard with which many are familiar. The death rate of the civilian population of the United States in 2003 was 8.42 per 1000 (National Center for Health Statistics, 2006a). Thus, the annual risk of death for a member of the military in Iraq is less than half of that for a randomly-chosen American citizen.

The comparison is imperfect because a much higher fraction of the American population is elderly and at high risk of death from age-related diseases. A more suitable comparison group is young men. The death rate for US men aged 18-39 in 2003 is 1.53 per 1000, about 40% of that of soldiers in Iraq (National Center for Health Statistics, 2006b). But it is not difficult to find conditions equivalent to combat in American cities. In Philadelphia, the death rate for black males aged 20-34 in 2002 was 4.37/1000, 11% higher than for troops in Iraq. A slight majority of the deaths were from homicide (Philadelphia Department of Public Health, n.d.)

The Department of Defense has classified deaths in Iraq into hostile and non-hostile. Based upon a description of the circumstances of death, we have further broken down the latter into violent deaths (e.g., non-hostile accidents, suicide, homicide) and deaths from disease. [3] Table 1 shows that 79% of deaths in Iraq are combat-related. We have compared Iraq death rates from disease and non-hostile violence to those of American male civilians aged 20 to 34. Table 1 shows that death rates among troops in Iraq are lower than those in the US population from these two causes. This difference may reflect the fact that military personnel are screened for good health upon enlistment and thereafter.

The death rate of troops in Iraq is much lower than that of troops serving in Vietnam during the Vietnam War. Between January 1, 1961 and December 31, 1972 there were 56,838 deaths among military personnel in Vietnam and a total of 2,608,650 person-years of exposure. [4] The resulting death rate of 21.79 per 1000 is 5.6 times higher than the death rate in Iraq. Part of the reduction in the death rate between Vietnam and Iraq is undoubtedly attributable to improvements in military medicine. Advances include the forward deployment of medical teams closer to combat positions and faster evacuation of the seriously wounded to hospitals abroad. The use of body armor to protect the torso has also reduced fatalities (Gawande, 2004; Nelson et al., 2006). These improvements are reflected in a reduction in the ratio of the number of deaths to the number wounded from 0.24 in Vietnam to 0.13 in Iraq through March 31, 2006 (Gawande, 2004; iCasualties website in footnote 1).

Variations in Risk of Death

Branch of Service

Differences in death rates according to the branch of service overwhelmingly reflect differences in exposure to combat. Table 2 and Figure 1 show that the rate of death for Marines is more than double that of any other branch of service. It is 10 times higher than the death rate in the Navy and 20 times higher than the death rate in the Air Force. In fact, Naval and Air Force personnel in Iraq have a much lower death rate than young men in the civilian population (cf. Table 1). Army troops are intermediate; their death rate is virtually identical to that of all service personnel in Iraq combined.

To describe mortality variation according to other characteristics, we use data supplied to us by the Defense Manpower Data Center on the number of deployments of persons with particular characteristics to Iraq through April 30, 2006. Accordingly, our mortality measures include deaths through April 30, 2006 and are in the form of deaths per deployment. [5]

Component of Service

Table 3 shows that members in the active Army forces have a risk of death that is more than three times greater than that of Army reservists called to Iraq. [6] This difference almost certainly reflects the fact that most members of the active Army are in Combat forces while reservists are predominantly in Combat Support and Combat Service Support. The Army National Guard structure is intermediate, consisting of a mixture of Combat, Combat Support, and Combat Service Support units (<http://www.1800goguard.com/info/active.html>). This mixture is reflected in the National Guard's intermediate mortality risk. Marines are at very high risk regardless of whether they are active members or reserves.

Rank in Service

One of the oldest observations in the social sciences is that lower-ranking individuals experience a greater risk of death than higher-ranking individuals. That phenomenon is virtually universal through time and space and persists whether rank is measured by income, education, or occupational prestige (Marmot, 2004). US military deaths in Iraq present a clear example of this relationship. Table 4 displays the relative mortality risks by rank within different branches of the military. In the Army, those in the rank of Private First Class have a death risk that is 3.45 times greater than the combined category of Major, Colonel, and General (see also Figure 2). In the Marines, Lance Corporals have a death risk that is 4.81 times greater than that of Major/Colonel/General (Figure 3).

In the Army, enlisted men have 40% higher mortality than officers; in the Marines, the differential is 36%. The excess mortality of enlisted men is diminished by the high mortality of the lowest-ranking officers, Lieutenants, who are typically the leaders of combat patrols. Army Lieutenants have the highest mortality of any rank in the Army, 19% higher mortality than all Army troops combined. Marine Lieutenants have 11% higher mortality than all Marines. But the single highest mortality group in any service consists of Lance Corporals in the Marines, whose death risk is 3.3 times that of all troops in Iraq.

Age and Sex

Women deployed to Iraq, who are not permitted to hold primary combat positions, have a much lower death risk than men. The male risk is 5.5 times that of females (Table 5). What may be more surprising is the exceptionally large mortality differences by age. In contrast to the civilian population, mortality rates decline precipitously with age. Troops aged 17-19 have a death risk that is 4.6 times that of those aged 50 or higher (Figure 4). One contributing factor to this gradient is doubtless the distribution of rank by age. Another contributor, perhaps less obvious, is the distribution of service affiliation by age. According to the data supplied by the Defense Manpower Data Center (2006), 64.7% of Marine deployments to Iraq were of persons aged 24 or younger, compared to only 39.5% of Army deployments. Marines bear the greatest risk, and they are disproportionately very young. Inexperience within a rank and branch of service may also contribute to the high death rate of young troops.

Since young people have a higher life expectancy than older people, the sharp age-gradient in mortality suggests that the loss of potential years of life in Iraq is much greater than if there were no mortality differences by age.

Race and Ethnicity

Relative mortality levels by race and ethnicity are less reliable than others that we have developed. In its death statistics, the Department of Defense uses a one-dimensional classification of race and ethnicity, so that “white” “black” and “Hispanic” are alternative categories. But in its deployment statistics, the Department of Defense, like the Bureau of the Census, assumes that race and ethnicity are two separate dimensions and offers two separate classifications. We have tried a variety of means to adjust for the inconsistencies that the alternative systems create. All of them indicate that Hispanics have somewhat higher mortality in Iraq than non-Hispanics and that blacks have substantially lower mortality.

Table 6 presents the results of the analysis that we consider most reliable. The number of deaths to Hispanics in death statistics is divided by the number of Hispanics identified on the ethnicity question in deployment statistics. Hispanics are shown to have a death risk that is 21% higher than that of non-Hispanics. Since some Hispanics may have reported another category in deployment statistics if they were only given a choice between racial and ethnic categories, their death risk shown in Table 6 is probably biased downwards.

To approach racial comparability between deaths and populations at risk, we have allocated deaths identified as Hispanic to the three racial groups based upon the 2000 US Census tabulation of the racial classification of persons reporting Hispanic ethnicity. [7] In this fashion, all deaths are assigned a racial classification. Table 6 shows that “Other races” have the highest death risk, whites an intermediate risk, and blacks by far the lowest risk.[8] The low death rate for blacks may be surprising in light of many reports of excess mortality among blacks who served in Vietnam, an impression that became “conventional wisdom” despite its dubious accuracy (Gartner and Segura, 2000). These reports usually compounded the probability of serving in Vietnam with the probability of death once deployed to Vietnam; we are only examining this latter probability in Iraq.

It is likely that the low relative risk of death for blacks in Iraq reflects relatively low exposure to combat, a factor that has been noted by sociologists (Gifford, 2005) and by black leaders. [9] The ratio of combat to non-combat deaths for blacks in Iraq is 2.53, whereas the ratio for non-blacks is 3.86. We have no data on the distribution of blacks by age or rank that could help account for their relatively low frequency of combat deaths. But we do have data on their distribution by sex and by branch of service. In both cases, blacks are over-represented in lower-risk categories. 18.9% of blacks in Iraq are women, compared to 9.1% of non-blacks. Likewise, 7.2% of blacks in Iraq are Marines, compared to 12.5% of non-blacks.

Conclusion

The death rate among US military personnel in Iraq is less than half of that in the American population as a whole, and less than a fifth of the rate of American troops during the Vietnam War. On the other hand, it is roughly 2.5 times higher than that of young men in the United States today. 79% of deaths among troops in Iraq are combat-related.

The risk of death in Iraq shows considerable variability. It is highest in the Marine Corps and lowest in the Air Force and higher among enlisted troops than among officers. The death risk is much higher for men than for women and declines sharply with age. Hispanics have a higher death rate than non-Hispanics, but African Americans have unusually low mortality in Iraq.

Death is only one of the possible adverse outcomes for troops serving in Iraq. The reduction in the fatality rate from war wounds means that death data capture less of the casualty picture in Iraq than they did in earlier wars. The number of wounded in Iraq through March 31, 2006 is 7.5 times the number of dead; the rate at which wounds are incurred in Iraq is 1-per-33 troops per year. We do not have the same information about the characteristics of those wounded as we have about those killed. But given the overwhelming importance of hostile encounters in both wounds and deaths, it is likely that variations in the risk of being wounded are quite similar to those presented in this paper.

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Endnotes

[1] We refer to three websites providing data on deaths among military personnel in Iraq: iCasualties – <http://icasualties.org/oif/Details.aspx>

DoD list of deaths by date –

http://siadapp.dior.whs.mil/personnel/CASUALTY/oif_date_of_death_list.pdf

DoD press releases –

<http://defenselink.mil/releases> accessed from http://icasualties.org/oif/BY_DOD.aspx

To investigate the consistency of the first two sources, we drew a simple random sample of 50 Iraq War deaths from the DOD list of deaths using a random number generator. Information on the individual's name, date of death, military branch, military rank, age, and cause of death was gathered from both the iCasualties database and the DoD list of deaths. In the sample of 50 deaths, iCasualties and the DoD agreed on all of the above variables in 40 cases. For the other 10 instances where there was a discrepancy (most often in military rank, age at death, or date of death), DoD press releases were accessed to establish whether the error was in the iCasualties database or in the DoD list. In all but one case, the DoD list contained the error. We concluded that the iCasualties list was more accurate with respect to the DoD press releases and used the iCasualties site whenever possible.

The aggregate counts of deaths and cause-of death assignments are highly consistent in the two sources. According to iCasualties, there were 2397 deaths to American troops between 3/21/03 and 4/30/06. Of these deaths, 1891 were combat-related ("hostile"). Similarly, the Department of Defense also records 2397 deaths in the same time span, with 1895 attributed to hostile causes.

The Department of Defense website for troop strength by service and date is <http://siadapp.dior.whs.mil/personnel/MILITARY/Miltop.html>.

[2] The number of troops was assumed to change linearly during the three-month period between observations. Between March 21 and March 31, 2003, the number of troops was assumed to rise linearly from zero to 269,263 (the count on March 31). The number of

military personnel in Iraq was assumed not to change during the three months following December 31, 2005.

[3] Causes of death were drawn from the iCasualties website. Hostile deaths and combat deaths are treated interchangeably. When assigning non-hostile deaths to violence or diseases, all ambiguous cases (“non-hostile”, “illness”, “non-hostile not reported”, and “non-hostile unspecified cause”) were assigned to disease. “Unspecified accident” and “unspecified injury” were assigned to violence.

[4] The sources of deaths and troop strength in Vietnam are <http://www.archives.gov/research/vietnam-war/casualty-statistics.html> and <http://siadapp.dior.whs.mil/personnel/M01/fy04/M01FY04.pdf>.

[5] Deaths per person-year and deaths per deployment would give the same relative measures of mortality if all deployments were of equal length. However, Army deployments are generally longer than Marine deployments (<http://usmilitary.about.com/cs/terrorism/a/iraqdeployment2.html>). Accordingly, the Army-to-Marine relative mortality risk is higher when measured per deployment than when measured per person-year, as shown by a comparison of Tables 2 and 3. Relative measures of death risk per deployment could be misleading if there were sharp differences in the time-pattern of deployments across characteristics, but we are not aware of any such differences. In all calculations involving deployments, persons in an “unknown” category were prorated among the remaining categories.

[6] The number of reservists and National Guard units in the Navy and Air Force is insufficient to allow them to be compared meaningfully to other groups.

[7] The racial distribution of Hispanics of all ages and both sexes combined was used to perform this allocation. Source: <http://factfinder.census.gov>. The categories “other race” and “two or more races” were prorated to the three racial categories recognized in this analysis after the initial allocation was made.

[8] The rank order remains the same, and relative risks are little changed, if Hispanics are ignored altogether in death statistics. In a more extreme trial, we placed all deaths of persons reported as having “two or more races” in the “black” category, along with all deaths among Hispanics allocated to “two or more races”. This allocation still left black mortality well below that of whites but raised the ratio of black mortality to white mortality to 0.68. The inclusion of the multiracial category in the “other race” group in Table 6 is responsible for the above-average mortality of this group.

[9] As National Chairman of the NAACP, Julian Bond was reported to have said in reference to deaths among American troops in Iraq, “I knew that black soldiers were concentrated in the non-combat positions of the military.” Scripps Howard News Service release published in the Naples Daily News. April 12, 2003.

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Table 1. Comparison of Death Rates by Cause Among Troops in Iraq to U.S. Male Population

| | Annual Death Rate per 1000 | | | Total |
|--|----------------------------|---------------------------|---------------------|-------|
| | Combat Deaths | Non-Combat Violent Deaths | Deaths from Disease | |
| Death Rate Among Troops in Iraq, 2003-2006 | 3.08 | 0.70 | 0.14 | 3.92 |
| Death Rate, U.S. Males Aged 20-34, 2003 | – | 0.98 | 0.43 | 1.41 |

Table 2. Death Rate by Military Branch, Operation Iraqi Freedom, 3/21/03-3/31/06

| | Death Rate Per 1000 | Ratio, Death Rate To Total Death Rate |
|---------------------|---------------------|---------------------------------------|
| Army | 3.94 | 1.005 |
| Marine Corps | 8.48 | 2.164 |
| Navy | 0.83 | 0.211 |
| Air Force | 0.40 | 0.103 |
| Total | 3.92 | 1.000 |

Table 3. Relative Mortality Levels by Branch of Service and Component, Operation Iraqi Freedom, 3/21/03-4/30/06

| | Number of Deaths | Relative Risk of Death (All Military Personnel = 1.00) |
|------------------------|-------------------------|---|
| Army | 1633 | 1.399 |
| Active | 1192 | 1.689 |
| National Guard | 348 | 1.190 |
| Reserve | 93 | 0.551 |
| Marines | 695 | 2.393 |
| Active | 609 | 2.383 |
| Reserve | 86 | 2.468 |
| Navy | 45 | 0.100 |
| Air Force | 23 | 0.047 |
| All¹ | 2397 | 1.000 |

¹Includes one Coast Guard death

**Table 4. Relative Mortality Levels by Branch of Service and Rank,
Operation Iraqi Freedom, 3/21/03-4/30/06**

| | Number of Deaths | Relative Risk of Death (All Military Personnel = 1.00) |
|---|-------------------------|---|
| Army (Active, Guard, Reserve) | 1633 | 1.399 |
| Enlisted | 1451 | 1.441 |
| Private, Private E-2 | 55 | 0.995 |
| Private First Class | 225 | 1.586 |
| Corporal/Specialist | 546 | 1.505 |
| Sergeant ¹ | 625 | 1.398 |
| Officer | 140 | 1.031 |
| Second Lieutenant, First Lieutenant | 64 | 1.660 |
| Captain | 53 | 1.122 |
| Major, Colonel, General ² | 23 | 0.460 |
| Warrant Officer | 42 | 1.731 |
| Marines (Active, Reserve) | 695 ³ | 2.393 |
| Enlisted | 646 | 2.468 |
| Private, Private First Class | 59 | 2.538 |
| Lance Corporal | 313 | 3.286 |
| Corporal | 161 | 2.191 |
| Sergeant ⁴ | 113 | 1.619 |
| Officer | 46 | 1.759 |
| Second Lieutenant, First Lieutenant | 20 | 2.663 |
| Captain | 19 | 2.265 |
| Major, Colonel, General ⁵ | 7 | 0.683 |
| Navy (Active, Reserve) | 45 | 0.100 |
| Air Force (Active, Guard, Reserve) | 23 | 0.047 |
| All⁶ | 2397 | 1.000 |

¹Includes Sergeant, Staff Sergeant, Sergeant First Class, Master Sergeant, and Sergeant Major

²Includes Major, Lieutenant Colonel, Colonel, Brigadier General, Major General, Lieutenant General, and General

³Includes 3 Warrant Officer deaths

⁴Includes Sergeant, Staff Sergeant, Gunnery Sergeant, Master Sergeant, and Sergeant Major

⁵Includes Major, Lieutenant Colonel, Colonel, Brigadier General, Major General, Lieutenant General, and General

⁶Includes one Coast Guard death

Table 5. Relative Mortality Levels by Gender and Age, Operation Iraqi Freedom, 3/21/03-4/30/06

| | Number of Deaths | Relative Risk of Death (All Military Personnel = 1.00) |
|---------------|-------------------------|---|
| Gender | | |
| Male | 2345 | 1.098 |
| Female | 52 | 0.199 |
| Age | | |
| 17-19 | 163 | 1.410 |
| 20-24 | 1109 | 1.256 |
| 25-29 | 518 | 1.098 |
| 30-34 | 281 | 0.848 |
| 35-39 | 181 | 0.617 |
| 40-44 | 92 | 0.513 |
| 45-49 | 38 | 0.515 |
| 50 and over | 15 | 0.307 |
| Total | 2397 | 1.000 |

Table 6. Relative Mortality Levels by Race and Hispanic Origin, Operation Iraqi Freedom, 3/21/03-4/30/06

| | Number of Deaths | Relative Risk of Death (All Military Personnel = 1.00) |
|------------------------|-------------------------|---|
| Race | | |
| White | 2014.9 | 1.086 |
| Black | 250.6 | 0.568 |
| Other ¹ | 131.5 | 1.319 |
| Hispanic Origin | | |
| Hispanic | 271 | 1.183 |
| Non-Hispanic | 2126 | 0.981 |
| All | 2397 | 1.000 |

¹Includes American Indian, Alaska Native, Asian, Pacific Islander, Native Hawaiian, and Multi Race

Figure 1. Relative Risk of Death Per Year in Iraq (All Troops = 1.000)

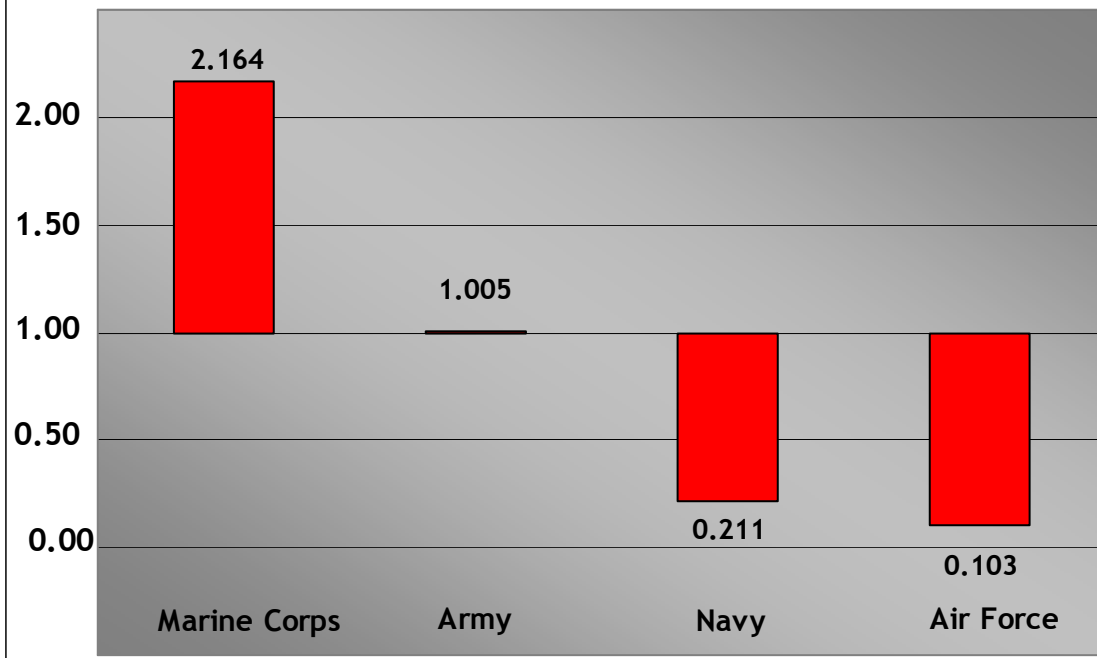


Figure 2. Relative Risk of Death Per Deployment by Army Rank (All Troops = 1.000)

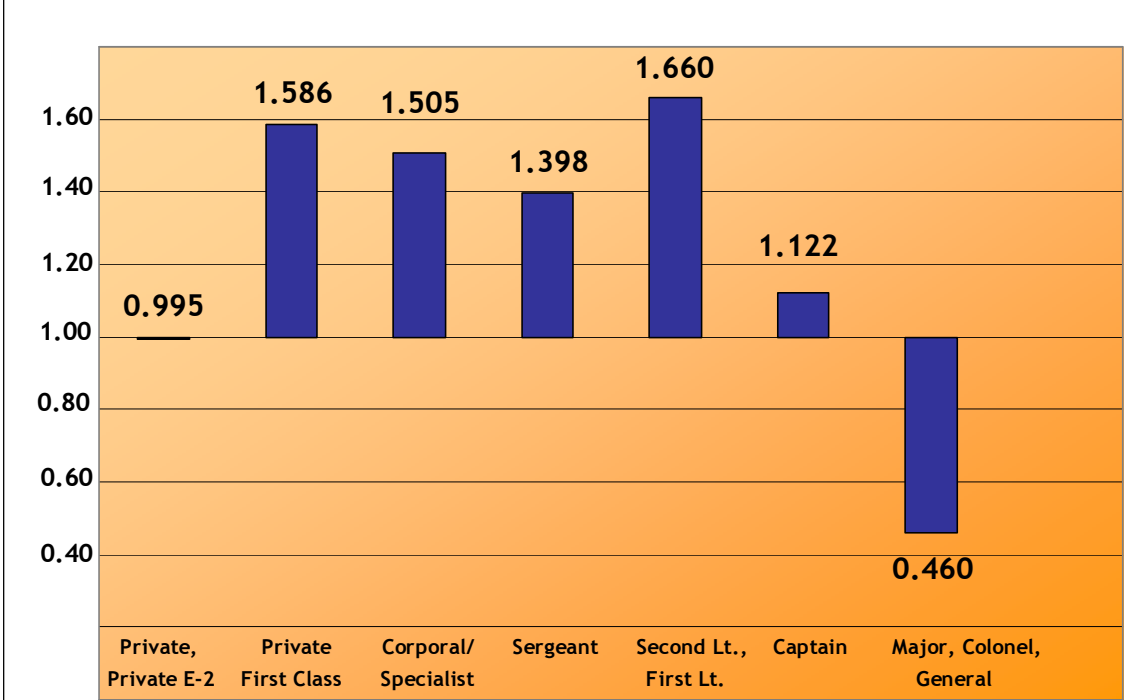


Figure 3. Relative Risk of Death Per Deployment by Marine Corps Rank (All Troops = 1.000)

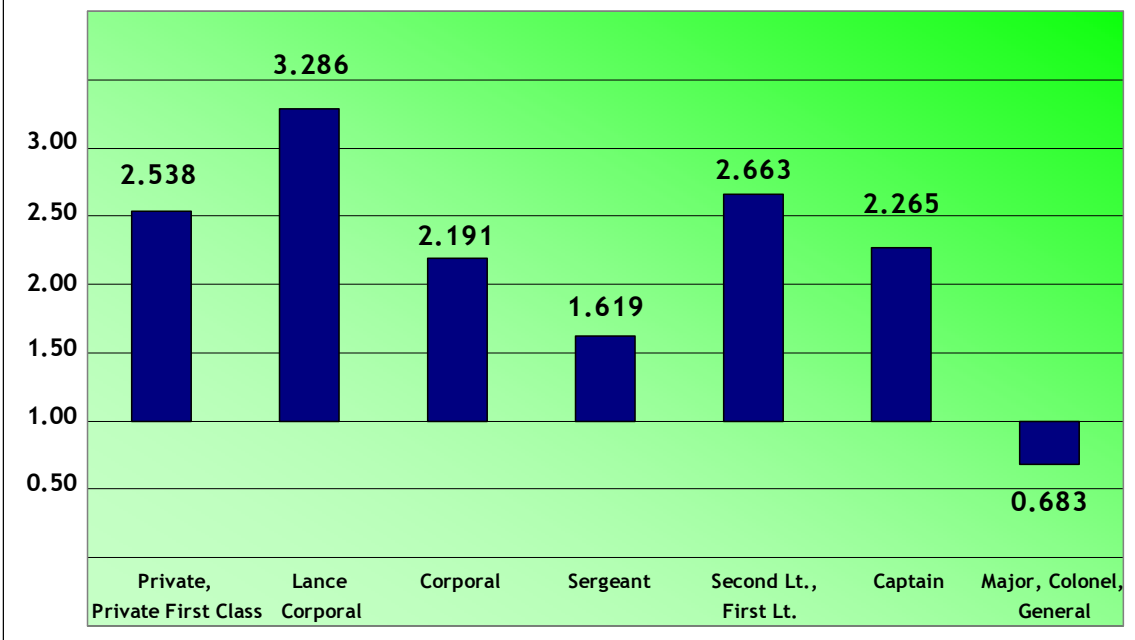


Figure 4. Relative Risk of Death Per Deployment by Age (All Troops = 1.000)

