TWO FACES OF DEATH

fatalities from disease and combat in America's principal wars, 1775 to present

VINCENT J. CIRILLO

ABSTRACT Throughout America's first 145 years of war, far more of the country's military personnel perished from infectious diseases than from enemy action. This enduring feature of war was finally reversed in World War II, chiefly as a result of major medical advances in prevention (vaccines) and treatment (antibiotics). Safeguarding the health of a command is indispensable for the success of any campaign. Wars are lost by disease, which causes an enormous drain on the military's resources and affects both strategy and tactics. Disease and combat mortality data from America's principal wars (1775–present) fall into two clearly defined time periods: the Disease Era (1775–1918), during which infectious diseases were the major killer of America's armed forces, and the Trauma Era (1941–present), in which combat-related fatalities predominated. The trend established in World War II continues to the present day. Although there are currently more than 3,400 U.S. military fatalities in Iraq, the disease-death toll is so low that it is exceeded by the number of suicides.

Death is always and under all circumstances a tragedy.

—Theodore Roosevelt (1951)

1387 Joseph Street, North Brunswick, NJ 08902-1509.
E-mail: vjcirillo@optonline.com.

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IN THE ENORMOUS LITERATURE ON American war casualties, the number of disease fatalities is routinely concealed within such devitalizing categories as "nonbattle deaths," "nonhostile deaths," "unintentional deaths," and "other deaths in service." This is unfortunate, because it obscures the fact that all of America's wars fall into two clearly defined historical periods based on whether disease or combat trauma was the major killer of American servicemen.

This article analyzes death rates from disease within the U.S. military during its principal wars from 1775 to the present. Disease-death rates for wartime civilian populations and foreign armies during the relevant periods are beyond the scope of this study. Smallman-Raynor and Cliff (2004) have demonstrated that wars create the physical conditions (poverty, famine, destruction of public health infrastructure, population displacements, and ecological changes) that are conducive to spreading old and new diseases among civilians. They also have shown that America's medical disasters were not unique. Numerous military organizations made the same mistakes for the same reasons and suffered the same consequences. For example, armies repeatedly confined thousands of raw recruits from disparate epidemiological backgrounds in high-disease environments that supercharged epidemics.

Disease deaths/combat deaths ratios and disease mortality rates (expressed as the percentage of deaths among the people who served in the military during a given conflict) are appropriate measures to quantify the roles of disease and combat trauma in wartime. Based on these ratios and rates, America's principal wars from 1775 to the present can be separated into a Disease Era (1775–1918), during which infectious diseases were the major killer of military personnel, and a Trauma Era (1941–present), in which combat-related fatalities predominated (Table 1). Although the compilation of wartime disease morbidity and mortality data are subject to a number of limitations (misdiagnoses, imperfect records), the magnitudes of difference which support the key findings reported here are so large that even if the true numbers were off 50% or more, the conclusions would still hold. Leonard Bruce-Chwatt (1985) has put this issue into proper perspective: "Naturally, no statistics can be complete under war conditions, but the lessons that those data teach are of enormous value" (p. 85).

During the Disease Era (1775–1918), nearly all of the nonbattle deaths were attributable to infectious diseases. In the Mexican War, for example, 10,986 (96.8%) of the 11,347 nonbattle deaths were due to "camp diseases"—overwhelmingly dysentery (Scott 1864, p. 649). Volunteer troops had twice the disease mortality rate of U.S. Regulars, because the latter had a better grasp of the importance of personal hygiene and camp sanitation and had all the acquired immunities of men living in close contact. In the Civil War, disease mortality rates for the Union army declined over time, suggestive of a learning curve as raw recruits adjusted to military life (Grob 2002).

In the Trauma Era (1941–present), on the other hand, accidental injuries accounted for most of the nonbattle deaths. The Vietnam War was typical, in that

TABLE 1 RATIOS OF DISEASE DEATHS TO COMBAT DEATHS (KILLED IN ACTION AND DIED OF WOUNDS) AND DISEASE MORTALITY RATES AMONG U.S. ARMED FORCES IN AMERICA'S PRINCIPAL WARS, 1775–PRESENT (99.98% CIs IN PARENTHESES)

War	*Total served*	*Disease deaths*	*Combat deaths*	*Disease to combat deaths (ratio)*	*Disease death rates (%)*
		DISEASE ERA			
Revolutionary (1775–83)	ca.290,000	ca.18,500[a]	7,174	2.6:1 (2.44, 2.73)	6.4 (6.20, 6.56)
War of 1812 (1812–15)	286,730	ca.17,000[a]	2,260	7.5:1 (6.90, 8.25)	5.9 (5.75, 6.10)
Mexican (1846–48)	78,718	10,986	1,548	7.1:1 (6.40, 7.94)	13.9 (13.47, 14.44)
Civil War[b] (1861–65)	2,213,363	224,586	110,070	2.0:1 (2.01, 2.07)	10.2 (10.07, 10.23)
Spanish-American[c] (1898)	280,564	2,565	345	7.4:1 (6.03, 9.54)	0.91[d] (0.84, 0.99)
Philippine (1899–1902)	127,068	2,748	1,037	2.7:1 (2.30, 3.08)	2.2 (2.00, 2.32)
World War I[c] (1917–18)	4,057,101	57,460	50,280	1.1:1 (1.12, 1.17)	1.4 (1.39, 1.44)
		TRAUMA ERA			
World War II[c] (1941–45)	11,260,000	14,904	229,823	0.06:1 (0.063, 0.067)	0.13 (0.128, 0.137)
Korean[c,e] (1950–53)	2,834,000	509	27,709	0.02:1 (0.015, 0.022)	0.02 (0.015, 0.021)
Vietnam (1964–73)	8,744,000	935[f]	47,322	0.02:1 (0.017, 0.022)	0.01 (0.009, 0.012)
Persian Gulf[g] (1990–91)	688,702	30[h]	147	0.2:1 (0.061, 0.391)	0.004 (0.001, 0.008)
Iraq[i] (2003–present)	NA	63	2,854	0.02:1 (0.011, 0.033)	NA

Notes: Statistical methods: Disease-to-combat mortality ratios were computed. Simultaneous confidence intervals (CIs) around the ratios were computed by normal approximation of the binomial distribution, application of Fieller's theorem to the ratio of those approximations, and Bonferroni-adjusted confidence levels. If the CIs for ratios from two wars do not overlap, then those two wars are considered to have statistically significantly different ratios. Simultaneous CIs for the mortality rates were computed similarly. CIs were computed for each ratio and rate. Since none of the CIs for the Disease Era overlaps any of the CIs from the Trauma Era, the two eras are statistically significantly different to the alpha level of <0.01. [a]Estimate includes an undetermined number of deaths by accident, drowning, homicide, suicide, and execution. [b]Union forces only; most of the Confederacy's official records were destroyed during the conflagration of Richmond on April 3, 1865. [c]U.S. Army only. [d]Of the 107,973 volunteers in the national assembly camps who never saw combat, 1,832 died from disease, a mortality rate of 1.6%. Typhoid fever accounted for 86.8% of the total disease deaths (Cirillo 2004b, p. 71). [e]The Army accounted for 2,452 (75.5%) of the 3,249 non-battle deaths that occurred among U.S. forces in the Korean theater. [f]Includes 312 deaths from heart disease and stroke. [g]Includes the mobilization phase (Operation Desert Shield, Aug. 1990–Jan. 1991) and the combat phase (Operation Desert Storm, Jan.–Mar. 1991). [h]Includes 17 deaths from cardiovascular diseases, and only one from infectious disease. [i]As of June 2, 2007.

Sources: Brooks (1966); Byerly (2005); Chambers (1999); Cirillo (2004b); Hickey (1995); Moïse (2001); Peckham (1974); Reister (1973, 1975); Scott (1864); Tucker (2000); U.S. Dept. of Defense (1994, 2007); U.S. War Dept. (1903); Writer, DeFraites, and Brundage (1996).

only 935 (8.7%) of the 10,700 nonbattle deaths were due to disease, whereas aircraft and vehicular crashes accounted for 4,351 (40.7%) deaths (Moïse 2001, pp. 75–76).

THE DISEASE ERA (1775–1918)

The success or failure of a war depends, not upon the outcome of its battles, but upon the appearance or non-appearance of pestilence.

—F. Prinzing (1916)

Throughout the nation's first 145 years of war, infectious diseases claimed the lives of more U.S. soldiers, sailors, and marines than did battle injuries. Even in minor conflicts microbes proved more deadly than bullets. In the Second Seminole War (1835–42), for example, 75% of deaths were due to disease—chiefly malaria (Smith 1994).

The disease deaths/combat deaths ratios increased from the Revolutionary War through the Spanish-American War and then declined toward unity at the beginning of the 20th century (Table 1). Although the low ratio for the Civil War (2:1) appears to be an exception, it has less to do with the prevalence of disease and more to do with the frightful casualty rates of Civil War battles. Indeed, the 2,108 Union soldiers killed in action in a single day at Antietam (Livermore 1900, p. 92) exceeded the total number of combat deaths in the Mexican War, the Spanish-American War, and the Persian Gulf War *combined.* In the case of the Civil War, the disease mortality rate (10.2%) is a better indicator of the impact of disease on the Union forces. Furthermore, a large proportion of Civil War combatants listed as dying of wounds actually perished from wound infections after reaching medical care. Penetrating gunshot wounds were often infected by germs from dirt, wadding, and bits of clothing driven into the body by low-velocity projectiles fired from smoothbore and rifled muskets. An added complication, prior to the use of X-rays in the Spanish-American War, was that army surgeons explored gunshot wounds with unwashed fingers and unsterilized probes—both of which had pernicious consequences.

With the exception of the low disease mortality rate in the Spanish-American War (0.91%, the lowest rate in the Disease Era), disease mortality rates declined successively from the Mexican War to World War I. Notwithstanding, the disease mortality rate in the Spanish-American War is significantly higher than the highest rate in the Trauma Era (World War II, 0.13%).

Medical officers were powerless against invisible microbial foes that proved far more lethal than enemy bullets and bayonets. Two events of this era were powerful stimuli for military reform: the typhoid fever outbreak during the Spanish-American War and the influenza epidemic in World War I (Byerly 2005; Cirillo 2004b). The typhoid epidemic exposed the culpability of line officers and revealed the importance of preventive medicine to preserving the fighting strength of the army, while the influenza epidemic exploded the unrealistic confidence

20th-century army doctors had in their ability to keep soldiers healthy. Far from being aberrations, both medical disasters were fueled by rapid mobilization, overcrowding, and abysmal camp and field sanitation. Improper disposal of human and animal wastes and of kitchen refuse led to the rapid proliferation of houseflies, which were potent agents in the spread of bacterial and viral pathogens (Cirillo 2006). As noted above for the Mexican War, unseasoned volunteers were especially vulnerable to new pathogens lurking in the unhealthy camps. Nearly three-quarters of the deaths from disease in the Spanish-American War occurred among raw volunteer units in the assembly camps within the continental United States (Cirillo 2004b, p. 33).

Death tolls understate the full impact of disease on warfare. The health of a command is crucial for combat readiness. Wars are won by able-bodied combatants and, in the words of military hygienist Alfred A. Woodhull (1909): "the sick are for the time as ineffective as the dead" (see also Cirillo 2004a). Disease is the enemy's ally, because it causes an enormous drain on the military's resources and affects both strategy and tactics. This point was appreciated by both sides in the Revolutionary War and exploited to sinister effect. The British were suspected of intentionally introducing smallpox among the colonists to impede the Continental Army's campaigns (Becker 2004), and a British surgeon who attended the casualties from the Battle of Breed's Hill (1775) reported that Americans loaded their muskets with shrapnel, and deliberately fired at the legs of redcoats so as not to kill but to cripple them, "to leave them as burdens on us, to exhaust our provisions and to engage our attention" (Frey 1981, p. 47).

In the 18th and 19th centuries, America's foes also suffered from the ravages of the so-called war pestilences, "those infectious diseases which . . . usually followed at the heels of belligerent armies," such as chronic diarrhea, dysentery, cholera, typhus, typhoid, smallpox, and measles (Prinzing 1916, p. 4). Poor personal hygiene, overcrowded and unsanitary living conditions, recycling the clothing of soldiers dead from disease, lack of bathing facilities, and inadequate rations—all contributed to the spread of communicable diseases. Although there are no comprehensive disease mortality statistics for the Royal Army for the entire period of the Revolutionary War, Cantlie (1974, p. 156) estimates the total number sick from 1775 to 1780 at 23,500, with 6,100 deaths (mortality rate = 25.9%). The disease mortality rate for Great Britain's six German auxiliary corps—known collectively as the Hessians—was 20.1%. Although the Hessians' disease deaths/combat deaths ratio (3.3:1) was similar to that of their American adversaries (2.6:1), the Americans' disease mortality rate was significantly lower, at 6.4%.

Smallpox was a serious health problem for the Continental Army, especially during the first two years of the war (Glynn and Glynn 2004). The American invasion of Canada in 1775 failed because of a smallpox epidemic. His Majesty's troops did not suffer from this epidemic, because they either had survived smallpox in childhood or had been inoculated when they joined the military. The

degree of exposure to disease prior to enlistment has been shown to be the main determinant of wartime mortality; that is, exposure to certain contagious diseases, such as smallpox and typhoid fever, would confer immunity and thereby reduce the risk of a recruit contracting and dying from those diseases while in the army (Lee 2003). Since most colonists came from sparsely populated rural areas, they had little exposure to the variola virus before the war, and were not immunized until 1777 when General Washington made smallpox inoculation compulsory in the Continental Army. Having survived a bout of the dreaded disease as a young man, Washington fully appreciated its dangers. On April 13, 1777, he wrote to Gov. Patrick Henry urging inoculation of all of Virginia's enlistees, adding that smallpox "is more destructive to an Army in the Natural way, than the Enemy's sword" (Gillett 1981, p. 75). Mandatory inoculation was the most significant medical success of the Revolutionary War, and it contributed substantially to America's victory.

Intestinal disorders were the bane of Civil War combatants. Diarrhea and dysentery caused more disability and death among Union and Confederate soldiers than any other diseases. Union army medical statistics show 1,451,613 cases of acute and chronic diarrhea with an estimated 57,000 deaths (mortality rate = 3.9%), and 287,522 cases of dysentery with 9,431 deaths (mortality rate = 3.3%; Adams 1952, pp. 241–42). Although Confederate medical records are fragmentary, the following data give some indication of their plight: of the 848,555 cases of disease found in Confederate field reports, 226,828 (26.7%) were listed as diarrhea or dysentery. Also, of the 50,350 admissions to Chimborazo Hospital in Richmond, Virginia—the Confederacy's largest military hospital—10,503 (20.9%) were diagnosed with one of these ailments (Cunningham 1970, p. 185). Bowel complaints were so universal that their debilitating, and sometimes humorous, aspects found their way into popular music ("The Tennessee Quickstep") and novels about the Lost Cause. In *Gone with the Wind*, Mammy lamented: "Dey ain' a soun' set of bowels in de whole Confedrut ahmy. It's mah notion dat 'twarn't de Yankees whut beat our gempmum. 'Twuz dey own innards. Kain no gempmum fight wid his bowels tuhnin' ter water" (Mitchell 1936, p. 501).

Camp fevers—typhoid fever, typhomalarial fever, and malarial remittent fever—also played a significant role in the morbidity and mortality of Civil War soldiers. The Union army experienced a total of 453,997 cases and 39,551 deaths (mortality rate = 8.7%) from the principal camp fevers (Cirillo 2004b, p. 61). Yellow fever and typhus were relatively rare. Union forces were fortunate that a "considerable dissimilarity exists between the chief diseases observed among troops on this continent and those which have decimated the combatants in European wars" (Woodward 1863, p. vii). Indeed, louse-borne typhus had recently killed more than 17,500 French soldiers during the Crimean War of 1854–1856 (Major 1943, p. 89).

Union army surgeon Joseph Janvier Woodward (1863) introduced the concept of typhomalarial fever into military medicine. He envisioned this form of

camp fever, a mixed bag of malarial and typhoid elements, as a disease sui generis (Smith 1982, pp. 216–18), but Walter Reed and his colleagues on the U.S. Army Typhoid Board later established that typhomalarial fever "was none other than typhoid fever" (Reed, Vaughan, and Shakespeare 1900, p. 167). Notwithstanding, the category "typhomalarial fever" had served a useful nosological purpose in the Civil War, because a large number of typhoid cases included under this heading would otherwise have been lost by being designated "malarial remittent fever" (Sternberg 1912, pp. 25–26).

The World War I U.S. Army disease deaths/combat deaths ratio (1.1:1) was worse than that of the other belligerents. In addition to influenza and pneumonia, 12 to 15% of American wounded died from infection. The German army's ratio was only 0.10:1. As with Union army losses in the Civil War, this low ratio had more to do with staggering battlefield losses—in this case from machine gun and artillery fire—than a lower prevalence of disease (Byerly 2005, p. 132).

The Plains Indian Wars (1866–1890), fought by Native Americans to contest the westward expansion of whites, were not wars in the conventional sense. Rather, they were a conglomerate of more than 1,000 clashes (skirmishes, sieges, sorties, and ambushes) between the U.S. Army and the nomadic tribes of the northern (Lakota Sioux, Cheyenne, and Arapaho) and southern (Cheyenne, Arapaho, Comanche, and Kiowa) Great Plains. Because Indian warriors employed hit-and-run tactics and avoided open combat, casualties were low on both sides (Utley 1973). The frontier army reported a total of 919 combat deaths out of 106,000 men who served during the 25 years of intermittent warfare. The Adjutant General's Office listed 4,371 battle fatalities (many were noncombatants) among the warring tribes during the same time period (Chambers 1999, p. 849; U.S. War Department 1891, pp. 1–65).

That diseases of whites—especially smallpox and tuberculosis—decimated many indigenous tribes is indisputable. However, accurate statistics on disease deaths among Native Americans during the Plains Indian Wars do not exist. The U.S. Army's winter campaigns were especially successful against the Indians. Contrary to popular belief, these victories were not due to an increased incidence of disease in the Indian villages during the bitter weather, but to starvation, exposure, short rations, scarcity of grass for their horses, and heavy snowfalls—all of which nullified the superb horsemanship and guerrilla tactics that made Indian fighters superior to the bluecoats. Winter clothing and plentiful supplies were additional factors in turning the harsh environment to the Army's advantage (Utley 1973; Weigley 1967).

THE TRAUMA ERA (1941–PRESENT)

Science is the best friend war has ever had; it has made slaughter possible on a scale never dreamt of before.

—William Osler (1915)

The horrific killing power of 20th- and 21st-century weaponry gives deadly meaning to Russian military surgeon Nikolai Pirogov's (1810–1881) definition of war as an epidemic of trauma (Garrison 1929; Halperin 1956). Indeed, Pirogov's interpretation is well supported by the Trauma Era data (Table 1): for every American soldier who died of an infectious, parasitic, or other disease in World War II, 15 of his comrades succumbed to enemy action (Reister 1975, p. 11).

From a medical standpoint, science has also benefited humanity in wartime. Improvements in the proper disposal of human, animal, and kitchen wastes, and fly control in camps and bivouacs in the pre–World War II years were a step in the right direction (Dunham 1940). These new technologies reduced camp pollution, which had previously been accepted by line officers and enlisted men as inseparable from army life (Cirillo 2000). The hegemony of disease was finally ended, chiefly as a result of significant medical advances in prevention (vaccines) and treatment (antibiotics).

Entering World War II, U.S. troops were immunized against smallpox, typhoid fever, cholera, plague, tetanus, yellow fever, and typhus. Brig. Gen. Elliott Carr Cutler (1888–1947), chief surgical consultant in the European theater, was impressed by the striking protection afforded the troops by mass inoculations, especially the near eradication of tetanus from military surgery. Tetanus, which had exacted a dreadful toll (mortality rate = 20–58%) in World War I, accounted for only 11 cases and four deaths among 11 million GIs serving in World War II (Fulton 1953; Shepard and Rich 1972).

Although his interests centered on surgery, Cutler would have been equally impressed by the medical success of the yellow fever vaccine that had been developed just prior to World War II. After the isolation of the yellow fever virus in 1927, researchers at Harvard University and the Rockefeller Foundation Yellow Fever Laboratory in New York City collaborated on developing a live, attenuated vaccine. By 1940, the clinical results with the experimental vaccine were so promising that the National Research Council recommended that all U.S. servicemen traveling to the tropics be immunized against yellow fever. By April 1942, the Rockefeller laboratory had produced 7 million doses of the vaccine. Although 84 deaths were linked to the vaccine itself (due to hepatitis-contaminated human serum used in the vaccine's manufacture), not a single U.S. serviceman contracted yellow fever during World War II (Pierce and Writer 2005, pp. 232–37).

The introduction of penicillin, which was undoubtedly the most significant medical development of World War II, revolutionized wound care and the management of bacterial infections. Penicillin, a laboratory curiosity at the start of

the war, was transformed by the U.S. pharmaceutical industry—in concert with the military and government—into a therapeutic reality. By D-Day (June 6, 1944), 100 billion units of penicillin per month—enough to treat 40,000 men—were being manufactured in the United States. From that point onward to the unconditional surrender of Nazi Germany on V-E Day (May 8, 1945), U.S. military deaths from infection approximated zero (Helfand et al. 1980; Neushul 1998). For the first time in American military history, battle fatalities exceeded disease fatalities during wartime. The trend established in World War II has continued through the current conflict in Iraq.

DISEASE IN THE TRAUMA ERA

This will be a long war if for every division I have facing the enemy I must count a second division in the hospital with malaria and a third division convalescing from this debilitating disease.

—Douglas MacArthur (Beadle and Hoffman 1993)

Even though the number of disease fatalities paled in relation to the number of combat deaths throughout the latter half of the 20th century, disease still inflicted enormous losses on U.S. troops. In addition to the loss of manpower, debilitating illnesses and relapses increased the drain on the military's health support system and lowered unit morale.

Malaria plagued the U.S. Army in World War II: between 1942 and 1945, there were 492,299 cases of the disease and 302 deaths among U.S. troops. The majority of cases (65%) were due to *Plasmodium vivax*. The highest incidence of malarial attacks occurred in the India-Burma-China theater. All told, U.S. forces lost an astounding 9 million man-days during that period (Bruce-Chwatt 1985).

Malaria reemerged as the outstanding medico-military problem in Vietnam; in Vietnam, however, *P. falciparum* was the etiologic agent in the majority of cases (85%; Bruce-Chwatt 1985). The chief factors contributing to the high incidence of the disease in the Asia-Pacific region were the failure of line officers to enforce chemoprophylaxis regimens (CP tablets containing chloroquine and primaquine) and other preventive measures in malarious areas, and the emergence of chloroquine-resistant strains of *P. falciparum*. Drug-resistant parasites were acquired by U.S. Army combat units in contact with the Vietcong (the principal reservoir of the disease) in the Central Highlands of Vietnam (Neel 1973). U.S. Navy and Marine Corps operations were also disrupted by malaria. Naval morbidity and mortality data, when combined with the Army's, yielded a total of 65,053 cases of malaria, and 124 deaths due to malaria. Importantly, effective fighting strength was seriously compromised by 1,186,465 man-days lost from duty (Beadle and Hoffman 1993).

The U.S. military's experience in Vietnam awakened authorities to a greater appreciation of the medical threat posed by arthropod-borne diseases, especially malaria. Resulting reforms included use of Permethrin-impregnated battle uniforms, application of insect repellent to exposed skin, reduced unit exposure

during peak anopheline mosquito biting times (dusk to dawn), head nets and bed nets in the field, tent screens, and destruction of vector breeding sites. Most importantly, malaria prevention and control became a command responsibility. Commanders and unit leaders were required to work closely with their medical officers to eliminate the medical threat (Robert 2001).

Infectious diarrheal diseases affected more than half of the U. S. troops initially deployed in northeastern Saudi Arabia during the mobilization phase (Operation Desert Shield, August 1990–January 1991) of the Persian Gulf War. Disabling diarrhea, abdominal cramps, vomiting, and hematochezia hampered deployment during the early months of August and September. The causative agents in nearly 50% of the gastroenteritis cases were identified as enterotoxigenic *Escherichia coli* and *Shigella sonnei*; there were no confirmed cases of cholera, typhoid fever, amoebic dysentery, or giardiasis. The enteropathogens were spread by personal contact, contaminated communal latrines, and desert filth flies (Hyams et al. 1995). After the purchase of locally supplied fresh produce was stopped in October, the rate of gastrointestinal complaints declined dramatically. *Plus ça change, plus c'est la même chose.*

ENVOI

Between Lexington and the 1918 Armistice, disease reigned uncontested as the number one killer of American troops. This enduring feature of war was finally ended in World War II as a result of significant medical advances in prevention and treatment. Since then, fatalities from trauma sustained in battle have been predominant, while disease has become responsible for an ever-decreasing percentage of nonbattle deaths. Moreover, the types of fatal diseases have changed too, as infectious diseases, the leading cause of mortality during the Disease Era, have been replaced in the Trauma Era by cardiovascular, neoplastic, and other noninfectious diseases.

Although there are presently 3,480 U.S. military fatalities in the Iraq War (2,854 combat, 626 nonbattle, as of June 2, 2007), the disease-death toll of 63 is so low as to be eclipsed by the 113 suicides (U.S. Department of Defense 2007). This is a new phenomenon. In the Vietnam War, there were 382 suicides, substantially fewer than the 935 disease deaths. Likewise, in the Persian Gulf War, there were 10 deaths by self-inflicted gunshot wounds and 30 fatalities due to disease (Moïse 2001, p. 76; Writer, DeFraites, and Brundage 1996, p. 119). U.S. Army personnel in Iraq spend more time in continuous combat than their comrades in arms did in Vietnam (Zoroya 2007). The high suicide rate among U.S. servicemen in Iraq—the Army leads the other branches with 96—may be related to the mental stresses the ground forces face in fighting an unconventional enemy that strikes and then dissolves into the civilian population, the psychological terror of improvised explosive devices (responsible for 80% of U.S. Army casualties), the insufficient rest and rehabilitation time, and the sheer physical

exhaustion of having to serve longer tours of duty and multiple tours without sufficient down time.

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