American losses in World War I were modest compared to those of other belligerents, with 116,516 deaths and approximately 320,000 sick and wounded of the 4.7 million men who served. The USA lost more personnel to disease (63,114) than to combat (53,402), largely due to the influenza epidemic of 1918. Moreover, by applying knowledge that European physicians had acquired earlier in the war, Americans were able to mitigate losses from chemical weapons, shell shock, and infected gunshot and shrapnel wounds. The American response to war losses forged a new relationship between the government and military personnel and between the nation’s medical system and its military institutions.
1917, was slow to build a large army in France, and fought in only thirteen major battles. According to one study, the French, British and Germans lost thirty-four, sixteen, and thirty men per 1,000 respectively, compared to the American toll of one man per 1,000.[1] The American Expeditionary Force (AEF) spent only 200 days in combat, from 25 April 1918 to the armistice. Sadly, although the German military leader Erich von Ludendorff (1865-1937) reportedly realized on 9 August 1918 that Germany would lose the war, more than three-fourths of the American combat deaths occurred after that date.[2]

This article describes American losses to gunshot and artillery fire, chemical weapons, and diseases, as well as the care of the wounded. It also examines specific issues of shell shock, the impact of the influenza epidemic of 1918 on military forces, and government care for veterans in the decades after the war. The official response to war losses forged a new relationship between the federal government, military personnel, and American medical institutions.

For the combined Army, Navy and Marine forces of 4.7 million (Army of 4.1 million and a Navy of 600,000), the U.S. Department of Defense official figures for the period from 1 April 1917 to 31 December 1918 stand at 116,516 deaths.[3] This includes 479 soldiers and 675 members of the Navy and the Marine Corps lost at sea.[4] The U.S. Coast Guard lost an additional 192 men.[5] Fully two-thirds of all American deaths occurred in the last three months of the war - September, October, and November 1918 - due to the influenza pandemic of 1918 and the AEF’s greatest battle, the Meuse-Argonne (26 September 1918 – 11 November 1918). The United States was also unique in that - due largely to the epidemic - almost half of the losses occurred in training camps in the homeland rather than on the battlefields of Europe. The United States consequently lost more soldiers and sailors to disease than in combat, with 53,402 battle deaths and 63,114 non-combat deaths.[6]

Distance protected American civilians, holding losses at 128 Americans killed on the Lusitania and 629 members of the Merchant Marine.[7] The first American war death was Leon Thrasher, a thirty-one year-old mining engineer who died on 28 March 1915, when a German submarine torpedoed the cargo-passenger ship Falaba off the coast of England. The first American military death was Lieutenant William T. Fitzsimons, a twenty-eight-year-old medical officer serving in an American army hospital assigned to the British Expeditionary Forces who was killed on 4 September 1917 in a German air attack on Dannes-Camiers in Pas-de-Calais, France. The first American combat deaths were Corporal James B. Gresham, and Privates Thomas F. Enright and Merle D. Hay, killed on 2 November 1917 in a nighttime raid on their First Division Company. 260 members of the Army Nurse Corps also died in the war, 102 of them overseas with the AEF, but most of them from disease. Three nurses were wounded by enemy fire, but none were killed in action.[8]

After the AEF’s relatively brief military service on the battlefields of France, American losses continued to mount post-war as thousands of active and former military personnel developed diseases and disabilities from festering gunshot wounds and fractures, lung and skin ailments from
chemical weapons, nervous disorders such as shell shock (post-traumatic stress disorder), and degenerative diseases such as heart disease and tuberculosis which fed on the trauma of war.\textsuperscript{[9]} Government responsibility for World War I losses would continue for decades.

**Care of the Sick and Wounded**

As Americans contemplated declaring war on Germany, officials were mindful of the great cost to the state of pensions for sick and disabled veterans of the American Civil War (1861-65). By 1915 virtually all Civil War veterans (93 percent) were receiving a federal pension.\textsuperscript{[10]} To avoid a similar burden on the U.S. Treasury, the War Department engaged in an unprecedented examination of 10 million recruits to screen out medical liabilities and build the strongest and most fit Army, Navy, and Marine Corps. The medical toll was great nonetheless. American losses began before troops could even fight in France. As medical screening revealed men with serious problems requiring treatment, such as sexually transmitted diseases, malnourishment, respiratory diseases, or dental infections, trainees began to flood Army hospitals in the fall of 1917. Measles and mumps epidemics also appeared in several training camps, and some unfortunate men who developed lethal pneumonia from those diseases went home in caskets just weeks after enlistment. By the war’s end, the Army recorded more than 4 million hospital admissions. The vast majority (86.3 percent) were due to disease, with 5.5 percent from wounds received in combat, 0.9 percent from soldiers who were killed in action, and 7.3 percent admissions for non-combat injuries.\textsuperscript{[11]}

To care for these men and avoid a legacy of veterans’ pensions, Congress passed an unprecedented package of benefits for military personnel and their families. The War Risk Insurance Act of 1917 provided family allotments of soldiers’ pay to replace the loss of the breadwinner; automatic compensation for death and disability; additional, optional, government-subsidized life insurance of 10,000 dollars per soldier; and medical care in government hospitals.\textsuperscript{[12]} Congress authorized the American Red Cross to organize fifty base hospitals from leading universities and civilian hospitals and recruit nurses for the military. The American Medical Association helped recruit thousands of civilian physicians to serve, so that during the war almost 30 percent of American physicians were in the military. The Army Medical Department ultimately numbered 30,500 medical officers (including 350 African American physicians), 21,500 nurses (but no black nurses until December 1918), and 264,000 enlisted men. The Navy Bureau of Medicine and Surgery had some 3,000 medical officers, 1,700 nurses, and 11,000 enlisted men.\textsuperscript{[13]}

By the Armistice the Army Medical Department had increased its hospital capacity from 9,500 beds to 120,000 beds in the United States and to 300,000 beds in Europe with the AEF.\textsuperscript{[14]} The AEF developed three levels of hospital care, with mobile medical units near the front lines for triage and treatment of minor injuries, fixed hospitals and convalescent camps in the rear for more serious wounds and illnesses, and a third tier of general hospitals in the United States for longer-term care. Both the home front and AEF systems included specialized hospitals for orthopedic injuries, shell
shock, blinding injuries, gas victims, and soldiers who developed active tuberculosis.

The AEF’s 320,000 casualties included 16 percent killed, 20 percent gassed, and 64 percent wounded by a gunshot, including shrapnel rifle and machine gun fire. Many men received multiple wounds and fractures of the extremities, which sometimes led to death or long hospital stays. AEF surgeons, however, adopted the Allies’ hard-learned lessons on how to care for gangrenous wounds and employed the Carrel-Dakin procedure of debriding and cleansing wounds before closing them up. The injuries sustained by American troops therefore resulted in relatively few amputations – only 4,403 - with twenty-five double amputations and one triple amputation.

Chemical weapons and gas injuries generated 70,552 hospital admissions and 1,221 deaths for the AEF. The Army Medical Department devoted a whole volume of its fifteen-volume medical history of the war to gas warfare, reporting on clinical experiences with gas victims, clinical and laboratory research into chemical weapons, defensive and offensive measures, and various therapies. Treatment was largely palliative, though, involving washing the patient and providing warmth and nourishment. Many patients lingered for weeks before dying, and thousands of victims sustained lifelong injuries. One study showed that 60 percent of the 3.014 gas victims were receiving government compensation by 1920.

Shell Shock

Americans also benefitted from the lessons Europeans learned about the effects of trench warfare and the new horrors of chemical weapons, machine gun fire, and artillery barrages on the human psyche. British physicians first identified shell shock in 1915 as the result of the physical effects of explosions on the nervous system. Within weeks of declaring war, the U.S. War Department ordered Major Thomas W. Salmon (1876-1927), a U.S. Public Health Service psychologist, to Britain and France to study the matter. He found that war neuroses presented three medical military problems: the depletion of the fighting force through mental disabilities, the difficulty of distinguishing war neuroses from other neurological and mental illnesses, and the mystery of what caused war neuroses symptoms so they could be avoided in the future. Salmon explained that soldiers who grappled with fear, horror, and repulsion against “ghastly duties,” yet could not flee the battlefield due to duty, patriotism, honor, military training and discipline, could develop a range of nervous disorders. These included delirium, confusion, hallucinations, terrifying dreams, mutism, involuntary muscular functions, such as paralysis or tics and tremors, and even blindness. He concluded that “as every nation and race engaged is suffering severely from these disorders, it is apparent that new conditions of warfare are chiefly responsible for the prevalence.”

Shell shock accounted for nearly 20 percent of the hospital admissions during the fighting at Château-Thierry in May-June 1918. As the first major U.S. military engagement involving several thousand men, the unprepared medical staff discharged many soldiers from service. Wanting to
avoid many such disability discharges, Salmon proposed a system of forward clearing stations to triage war neuroses cases and designated the AEF Base Hospital 117 at La Fache as the center where psychiatrists could diagnose war neuroses as compared to physical neurological disorders or diseases. The goal was to identify patients within forty-eight hours of their traumatic incident (to avoid reinforcing the trauma), begin treatment, and cure the soldier, returning him to the front lines or military support units. Evacuation back to the United States would be a last resort.

Hospital stays averaged three weeks, and staff maintained a “return to duty” attitude for each man, helping soldiers process their experiences. Medical personnel were sympathetic to the patient’s complaints, yet also sought “to counteract their worries and anxieties with firmness and decision.”[23] The hospital provided a quiet place to rest, and patients were encouraged to talk about or sketch their war experiences to provide some relief. Staff used work as a curative agent, and when the facility first opened, patients broke up stones for a macadam road to link the hospital to the French road. The hospital also provided a workshop with weaving, sketching and printing to help retrain patients with paralyses, tremors, and other symptoms.[24] Although exact figures are difficult to derive, from 1 April 1917 to 31 December 1919, one-third of the almost 98,000 neuropsychiatric hospital admissions were due to war neuroses, with diagnoses including neurasthenia, hysteria, shell shock, anxiety, and exhaustion. The caseload increased rather than decreased after the war, and by 1920 mental cases accounted for more than one-third of veterans hospitalized in the United States.

### Disease

A generation after the development of germ theory and modern bacteriology, the Army Medical Department was able to control several diseases that had historically plagued armies. It vanquished typhoid with a modern system of water testing and purification and a vaccine pioneered in 1909, reducing rates to fewer than one case per 1,000 men, compared to thousands of cases and deaths during previous wars.[25] Clean water also reduced deaths from dysentery and diarrhea. Anti-toxin tetanus injections for the wounded kept tetanus at bay, and the identification of the louse vector for typhus and rigorous disinfection programs held cases of this disease to only forty-two.

Other diseases were less tractable. Childhood infections such as measles and mumps and to a lesser extent diphtheria and scarlet fever ran through training camps. In the pre-antibiotic era, sexually transmitted diseases, primarily syphilis and gonorrhea, accounted for almost 400,000, or 10 percent of Army hospital admissions during the war. Such rates rendered thousands of troops non-effective. In response officials took stringent surveillance and disciplinary measures, such as mandating sex education lectures, closing down red-light districts near training camps, requiring harsh mercury treatments for soldiers who had had sexual intercourse, and even court martialed men who contracted syphilis or gonorrhea. Sexually transmitted infections nonetheless ranked fourth among diseases behind tuberculosis, heart disease, and mental illness as a cause of permanent disability, requiring discharge from the service.[26]
One unlikely war disease, tuberculosis, was especially costly. The Medical Department identified more than 23,000 cases of tuberculosis during the war, about 18,500 from training camps in the United States and 3,500 from Europe.[27] Tuberculosis patients consumed a disproportionate amount of Medical Department resources because they required longer periods of treatment than many other sick and wounded. The Department calculated that during 1918 alone tuberculosis stood third in loss of days for officers (50,341 days) and seventh for enlisted men (1,255,009 days).[28]

Influenza Epidemic

Despite the unprecedented carnage of industrial warfare, the influenza epidemic dwarfed combat losses, killing perhaps 50 million people worldwide in just eighteen months. The epidemic of 1918 struck all war participants, but had a unique impact on the United States because it attacked during the AEF’s greatest campaign of the war, the fall 1918 Battle of Meuse-Argonne. By the War Department’s most conservative count, influenza sickened 26 percent of the Army - more than 1 million men - and killed almost 30,000 trainees before they even got to France.[29] On both sides of the Atlantic the Army lost a staggering 8,743,102 days a soldier was able to serve due to influenza among enlisted men in 1918.[30] The Navy recorded 5,027 influenza and pneumonia deaths and more than 106,000 hospital admissions or about 16 percent of the 600,000 troops. Given the large number of mild cases that were never recorded, however, Navy Surgeon General William C. Braisted (1864-1941) put the sickness rate closer to 40 percent.[31]

Originating in U.S. training camps in the spring 1918, influenza sickened but did not kill trainees and then traveled with troops across the Atlantic. The virus moved through armies on both sides of the Western Front during the summer, and in late August exploded with a virulent strain that could induce deadly pneumonia. This swept the globe. Surgeon General Braisted pinpointed the arrival of the lethal flu virus in the United States to 27 August 1918 at Commonwealth Pier in Boston, when three cases of influenza appeared on the sick list. Eight cases emerged the next day, and fifty-eight the next, fifteen of whom were so ill they were transferred to the U.S. Naval Hospital in Chelsea.[32] Influenza soon reached Boston and on 8 September arrived at the Army’s Camp Devens outside of the city. Within ten days thousands of feverish patients overwhelmed the camps’ hospitals and infirmaries.[33]

The epidemic traveled west and south across the country, lasting about four weeks in individual camps and running its course in the Army in eight weeks, roughly from 15 September to 15 November 1918. The high-water mark for deaths in the United States came the week of 4 October; within the AEF the week of 11 October was the most deadly.[34] Sickness rates in U.S. camps ultimately ranged from 10 percent at Camp Lewis, Washington, to 63 percent at Camp Beauregard, Louisiana, averaging between 25 to 40 percent; death rates ranged from less than 1 percent at many camps to 3.3 percent at Camp Sherman, Ohio.[35] The epidemic struck during the climax of the American military effort, compromising the AEF’s performance in the Meuse-Argonne Offensive, which began on 26 September.
The influenza virus sickened and killed thousands of soldiers, depleted and demoralized military units, choked hospitals, and flooded the medical evacuation system, diverting military and political leaders from fighting the war to combating disease. On 18 October the AEF chief surgeon reported that “influenza and pneumonia continue to prevail in all parts of the A.E.F.”[36] Influenza cases outnumbered combat casualties. According to one tally, 227,000 soldiers were hospitalized for battle wounds in 1918, but half again as many AEF soldiers, 340,000, were hospitalized for influenza and pneumonia.[37] The epidemic subsided as the war ended, but in early 1919 a third wave resurged among U.S. occupation troops in Germany and elsewhere, again sweeping the globe until it finally burned out.

Ironically, in a war fought in the name of democracy, increased hospital admissions due to disease epidemics enabled military hospitals to re-segregate wards by race as early as the fall of 1917, a practice that had been impractical during peacetime due to small patient numbers. Some medical officers also attributed African American soldiers’ higher mortality rates during the influenza epidemic to racial inferiority. In the training camps the October 1918 hospital admission rates for influenza were 198 percent for whites and 158 percent for blacks, while death rates were 9.5 percent and 11.1 percent, respectively. In the AEF the same month, white and black admissions were virtually the same, 39 to 40 percent, but whites had a lower death rate than blacks, 3.3 percent to 5.0 percent. These differential rates are best explained by racial discrimination in the segregated Army, which often afforded black personnel inferior living conditions and second-class health care. African American units in the training camps and in France were often the last to receive warm clothing and bedding, assigned the less desirable living quarters, and were even served rations with fewer calories than white troops. African American personnel were also often reluctant to go to sick call or consult an all-white medical staff and therefore did not get the prompt and proper medical attention and nursing care required to stave off deadly influenzal pneumonia.[38]

Care for Veterans

The Armistice stopped the battlefield killing but hospitalizations continued as almost 300,000 soldiers returned home with debilitating physical and mental conditions. Despite a precipitous American demobilization effort, the Army Medical Department retained personnel to care for this increasing patient load. In March 1919 Congress instructed the Public Health Service (PHS), “to provide hospital and sanatorium facilities for discharged sick and disabled soldiers, sailors, and marines; Army and Navy nurses, male and female; patients of the War Risk Insurance Bureau; and other legal beneficiaries of the Public Health Service.”[39] In the next three years the PHS admitted 264,000 veterans for more than 14 million hospital days.[40] In the decade following the war, Congress amended veterans’ benefits laws at least nineteen times in response to demands from veterans and their advocates. To relieve the overwhelmed PHS and simplify a patchwork of government benefits Congress created the Veterans’ Bureau in 1921, which enabled the PHS to transfer fifty-seven
hospitals with 17,000 beds, 13,000 patients, 1,400 nurses, and 900 physicians and dentists to the new agency.\[41\] The World War Veterans’ Act of June 1924 further expanded veterans’ benefits with a "presumption of service origin" provision stating that veterans who developed tuberculosis, neuropsychiatric diseases, paralysis, encephalitis, or amoebic dysentery from 6 April 1917 to 1 January 1925 were presumed to have contracted it during their military service and were eligible for government hospital and disability benefits.\[42\] The measure added about 100,000 new beneficiaries between 1926 and 1932, bestowing benefits, by one count, on a total of 328,658 veterans.\[43\]

Specialized hospitals or wards in general hospitals were designated for orthopedic and surgical patients, war neuroses patients, the blind, the tuberculous, and the hearing impaired, and thousands of these patients remained in government hospitals for months and years. Congress also created the Federal Bureau of Vocational Education in 1917 to provide rehabilitation training and payments to disabled soldiers, and in subsequent amendments authorized up to four years of physical therapy and training. Approximately 180,000 veterans entered training, and by 1928 when the program ended 129,000 had successfully completed their training courses at a cost of about 645 million dollars.\[44\]

The two greatest claims on veterans’ disability benefits were tuberculosis and neuropsychiatric diseases such as shell shock. Indeed, from July 1918 to June 1919, 37 percent of the 8,000 hospital admissions for Bureau of War Risk insurance beneficiaries were for tuberculosis and 22 percent for neuropsychiatric diseases.\[45\] The ratio reversed over the years as tuberculosis patients died; in 1932 tuberculosis was the greatest cause of Veterans Administration deaths, but accounted for 15 percent of hospital admissions compared to 47 percent of admissions for neuropsychiatric patients.\[46\] Tuberculosis nevertheless remained a costly disease. The World War Veterans’ Act of June 1924 more than tripled the number of tuberculous veterans covered from 12,019 in 1926 to 38,701 two years later, and increased the average payment from less than seventeen dollars a month to nearly fifty dollars a month.\[47\] One observer calculated that from 1919 to 1940 Veterans Administration hospitals admitted 293,761 tuberculosis patients who received government care and benefits for more than 1 million patient-years at a cost of 1.1 billion dollars.\[48\]

Although African American veterans had more access to medical care than many civilians, they often encountered unfair treatment in realizing the benefits for which they were eligible. All-white disability rating boards often ruled against or downgraded ratings for blacks, and some veterans’ hospitals turned them away or provided care in segregated wards. The Army tuberculosis hospital in Oteen, New York, for example, ran segregated education and rehabilitation programs, instructing black patients in their segregated wards rather than proper classrooms to avoid racial integration.\[49\] Facing such discrimination, African American physicians and other advocates campaigned for an all-black veterans hospital in Tuskegee, Alabama, staffed with black medical personnel. Established in 1923, over the next decade this hospital cared for 50 percent of hospitalized black veterans and employed all of the black physicians in the Veterans Bureau.\[50\]
Conclusion

Federal support for World War I veterans continued into the 21st century when the last veteran, Frank W. Buckles (1901-2011), died at the age of 110 on 27 February 2011 and was buried in Arlington Cemetery. American losses in the war may have been fewer than European losses, but the legacy of increased governmental responsibility for its soldiers, sailors, marines, and veterans forged a new relationship between the government and its military personnel and between the nation’s civilian medical system and its military institutions. As the nation demanded military service from millions of young men, they and their families and advocates negotiated with the government for new agencies and benefits to care for and compensate them for their service and sacrifice. This negotiation continued in the post-war years as veterans contended with disability and diseases stemming from their service, leaving a legacy of increased expectations regarding government support for future active duty personnel and veterans. Any analysis of war losses, therefore, given the continued disability and suffering as well as the public policy efforts to compensate that suffering, must extend beyond wartime to succeeding generations.

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Notes


17. Medical Department in the World War, vol. 14, Table 3, p. 274.


25. Medical Department in the World War, vol. 9, p. 17.

26. Medical Department in the World War, vol. 9, p. 263.

27. Medical Department in the World War, vol. 9, p. 68; and Byerly, Carol R.: Good Tuberculosis Men. The Army Medical Department’s Struggle with Tuberculosis, Fort Sam Houston 2013.


34. War Department, Annual Report, 1919, p. 2755.

35. Medical Department in the World War. vol. 9, p. 138.


41. ↑ Byerly, Good Tuberculosis Men 2013, Chapter 5.

42. ↑ Medical Department in the World War, vol. 9, p. 200.


47. ↑ Dillingham, Federal Aid to Veterans 2009, p. 50.


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