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COMMANDER'S IMPACT ON PREVENTING DISEASE DURING MILITARY CONFLICTS

A thesis presented to the Faculty of the U.S. Army Command and General Staff College in partial fulfillment of the requirements for the degree

MASTER OF MILITARY ART AND SCIENCE

by

ROBERT J. THOMPSON, JR., MAJ, USA
B.S., Drexel University, Philadelphia, Pennsylvania, 1979
M.E., Manhattan College, Riverdale, New York, 1980

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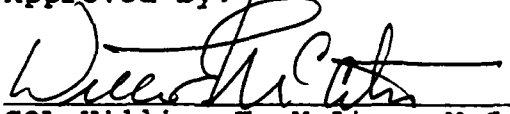

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The opinions and conclusions expressed herein are those of the student author and do not represent the views of the U.S. Army Command and General Staff College or any other governmental agency. (Reference to this study should include the foregoing statement.)

ABSTRACT

COMMANDER'S IMPACT ON PREVENTING DISEASE DURING MILITARY CONFLICTS by MAJ Robert J. Thompson, Jr., USA, 109 pages.

This study investigated the commander's impact on preventing disease during military conflicts. During the course of U.S. military history only 20 percent of all hospital admissions resulted from combat injuries, while the other 80 percent resulted from diseases and nonbattle injuries. There are numerous factors affecting wartime personnel losses resulting from disease. One of the more significant, yet often overlooked, factors is the commander's impact on preventing disease.

In this study the pivotal role played by commanders in preventing disease is evaluated through the use of statistical data and case studies. The case studies presented in this study addressed commanders from the American Revolutionary War to the Persian Gulf War, from General Washington to General Franks. A common thread emerged from the case studies. Commanders who took an active interest in the health of their command by emphasizing health discipline achieved a relatively high degree of success in preventing diseases. Conversely, commanders who did not emphasize health discipline were beset with a relatively high disease incidence rate.

Although medical technology is rapidly advancing, the commander's impact on preventing disease is as significant today as it was during the American Revolutionary War.

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TABLE OF CONTENTS

LIST OF TABLES

CHAPTER 1

INTRODUCTION

Significance of Disease During Military Conflicts

The Army faces special challenges as the nature of warfare evolves. One of the challenges which is always present, but often neglected is the human aspect of warfare. Specifically, maintaining the health of the soldier is critical. The success of a commander ultimately hinges on the ability of his soldiers to perform their mission. The capability of military units to hold or gain ground is degraded when their soldiers are weakened by disease.

The impact of casualties caused by disease has a devastating impact on the effectiveness of military units. From the beginning of recorded time through the recent past, armies encountered immense problems with heat, cold, and communicable disease.[1] In 425 A.D. the Huns stopped their otherwise unimpeded advance upon Constantinople because a plague of unknown nature decimated their forces. The Crusaders were turned back more effectively by epidemics than by the armed power of the Saracens.

> Disease and famine killed so many and in such a short time that the dead could not be buried . . .. When Jerusalem was taken, in 1099, only 60,000 of the original 300,000 were left, and these, by 1101, had melted to 20,000.[2]

Confronted with extremely cold weather and louse-borne typhus, Napoleon's elite Army was almost completely decimated in his retreat from Moscow in 1812. During World War II the United States Armed Forces lost over 16,000,000 man-days because of arthropod diseases alone.[3]

All units, no matter how elite, suffer from disease. In World War II Merrill's Marauders were rendered combat ineffective by disease.

> The medical threat faced by the Marauders in the jungles of Burma was great. Everyone was sick, but some had to stay and fight. Evacuation was limited to those with high fever and severe illness. One entire platoon cut the seats from their pants because severe diarrhea had to be relieved during gunfights. After a bold and successful attack on a major airfield, Merrill's Marauders were so decimated by disease that they were disbanded.[4]

Wartime manpower losses resulting from disease vary, depending on a variety of factors. These factors include but are not limited to: the commander's impact; the intensity of the conflict; the length of time the soldier spends in combat; the medical threat; degree of training and experience of the soldier; unit cohesion; and living conditions.

> Historically, in every conflict the U.S. has been involved in, only 20% of all hospital admissions have been from combat injuries. The other 80% have been from diseases and nonbattle injuries (DNBI).[5]

These figures indicate a large problem faced by commanders in attempting to prevent diseases from significantly attriting their forces. Additionally,

excluded from these figures are a significant number of soldiers with decreased combat effectiveness resulting from disease not serious enough for hospital admission (specific references are cited in Chapter 3 to support the non-hospitalized impact of disease). Therefore, the magnitude of the disease problem is even greater than it initially appears.

Based upon recent U.S. military experience, disease prevention is an area of possible failure in the future.[6] Current U.S. Army doctrine describes the nature of the modern battlefield as follows:

> . . . battlefields are likely to be chaotic, intense, and highly destructive . . .. Rapid movement will be complemented by the use of advanced highly lethal weapons throughout the battle area . . . deep reconnaissance, air mobility, long-range fires, and special operating forces (SOF) will blur the distinction between front and rear and will impose an all around defense and self-sufficiency on all units. . . . any battlefield employment of nuclear weapons would certainly magnify the destructiveness of operations and could sharply alter their tempo. Besides the effects of physical damages, the psychological stress on soldiers would be severe.[7]

Such an environment severely stresses the individual soldier physiologically as well as psychologically and stress is a primary contributing factor to disease. The nature of the future AirLand Operations battlefield could further increase the amount of stress and stress-induced disease casualties.

Problem Definition

The purpose of this study is to evaluate the commander's impact on preventing disease during military conflicts. Specifically, this study focuses on the following primary question: Is the commander's impact on disease prevention a significant issue for today's Army? To properly answer the primary question, this study addresses the following secondary questions:

1. Are diseases significant in warfare?
2. Do commanders significantly impact on disease prevention?
3. Are U.S. commanders properly informed of the significance of their impact on preventing disease?

Significance of the Study

> It is a well known fact that we cannot afford to waste man power in any future war; therefore, it behooves us to give serious study to the early formulation and adoption of Army-wide policies aimed at establishing these conservative measures.[8]

History is full of lessons learned on disease draining manpower assets during military conflicts. Unfortunately the nature of war and disease makes it unreasonable to expect the U.S. military to completely eliminate disease from the battlefield. But the study of disease prevention enhances the capability of the U.S. military to anticipate, plan, and control disease rates. Disease affects many

aspects of warfare to include medical resource requirements, personnel replacement needs, civilian-military affairs, and combat effectiveness of units.

This study is primarily intended for current and future commanders. Throughout the course of U.S. military history line commanders and medical planners have faced the challenges of planning for the prevention and treatment of disease. Presumably, in any future conflict, line commanders and medical planners will face them again.

Definitions

The very nature of this thesis requires the use of medical terms. The medical terms used in this thesis are defined in Dorland's Illustrated Medical Dictionary as follows:[9]

Diagnosis. The art of distinguishing one disease from another. The determination of the nature of a case of disease.

Disease. A definite morbid process having a characteristic train of symptoms; it may affect the whole body or any of its parts, and its etiology, pathology, and prognosis may be known or unknown.

Etiology. The study or theory of the factors that cause disease and the method of their introduction to the host; the sum of knowledge regarding causes.

Incidence. An expression of the rate at which a certain event occurs, as the number of new cases of a specific disease occurring during a certain period.

Morbidity. The condition of being diseased or morbid. The sick rate; the ratio of sick to well persons in a community.

Mortality. The quality of being mortal. The death rate.

Pathology. That branch of medicine which deals with the essential nature of disease, especially the structural and functional changes in tissues and organs of the body which cause or are caused by disease.

Physiology. The science which deals with the functions of the living organism and its parts, and the physical and chemical factors and processes involved.

Prevalence. The total number of cases of a disease in existence at a certain time in a designated area.

Preventive Medicine. That branch of study and practice which aims at the prevention of disease.

Prognosis. A forecast as to the probable outcome of an attack of disease; the prospect as to recovery from a disease as indicated by the nature and symptoms of the case.

Psychology. That branch of science which deals with the mind and mental processes, especially in relation to human and animal behavior.

Many types of diseases are mentioned in this study. The more historically significant diseases, to include

malaria, typhoid, plague, hepatitis, leishmaniasis, rabies, schistosomiasis, and dysentery, are described in Appendix B.

Diseases are often categorized by such factors as severity (fatal, non-fatal), duration (chronic, acute), and contagiousness (communicable, non-communicable). For the purpose of this study no such categorization is used because the focus of this study is on all diseases that affect a unit's combat effectiveness. While it is true that certain categories of disease may present more problems to a field commander than others, all categories of disease influence a unit's combat effectiveness. Additionally, historical data on disease during past conflicts includes any disease, regardless of its particular category, that required hospitalization and consequently affected a unit's combat readiness.

Limitations

This study is limited in scope to ensure a manageable thesis. Detailed research of historical aspects of disease is limited to a few leadership case studies. This study primarily concentrates on the military disease experiences from the American Revolutionary War to the Persian Gulf War. The commander's impact on disease occurrence for peacetime garrison troops is not specifically evaluated in this study because of the vast differences in the medical threat posed to peacetime garrison troops

versus wartime field troops. Additionally, the commander's impact on disease rates for wars of very short duration, such as Urgent Fury and Just Cause, is not evaluated because these wars are generally over before inadequate disease prevention measures have an opportunity to manifest themselves through disease outbreaks. The incubation period of many diseases exceeds the duration of wars lasting less than one month. Although soldiers can certainly contract diseases during a war but not manifest symptoms until after a war, from a commander's perspective soldier losses occurring after a war are not nearly as significant as those occurring during a war.

Structure of the Thesis

The remainder of this thesis is organized into four chapters. Chapter 2 presents the methodology followed throughout this study. Chapter 3 presents research information on the significance of disease and the role of commanders in minimizing the occurrence of disease. Chapter 4 evaluates the commander's impact on preventing disease against the null hypothesis and assesses lessons learned. Chapter 5 presents the conclusions of this study.

CHAPTER 1

ENDNOTES

[1]Headquarters, Department of the Army, Field Manual 21-10-1, Unit Field Sanitation Team (Washington, D.C.: U.S. Government Printing Office, 11 October 1989), p. 2-1.

[2]Hans Zinsser, Rats, Lice and History (Boston: Little, Brown and Company, 1963), pp. 154-155.

[3]Headquarters, Department of the Army, Field Manual 21-10-1, Unit Field Sanitation Team (Washington, D.C.: U.S. Government Printing Office, 11 October 1989), p. 2-1.

[4]Headquarters, Department of the Army, Field Manual 21-10, Field Hygiene and Sanitation (Washington, D.C.: U.S. Government Printing Office, 22 November 1988), p. 3.

[5]Ibid., p. 1.

[6]Ronald F. Bellamy and Craig H. Llewellyn, "Preventable Casualties: Rommel's Flaw, Slim's Edge," Army (May 1990): p. 56.

[7]Headquarters, Department of the Army, Field Manual 100-5, Operations (Washington, D.C.: U.S. Government Printing Office, 5 May 1986), pp. 2-3.

[8]U. P. Williams, "They May Not Die - But They Wither Fast," Military Review (July 1950): p. 23.

[9]Dorland's Illustrated Medical Dictionary, 25th Edition (Philadelphia, Pa: W.B. Saunders, 1974), pp. 435, 453, 550, 770, 922, 981, 982, 1148, 1194, 1255, 1262, and 1282.

CHAPTER 2

METHODOLOGY

This study uses primarily a historical methodology to review documentary sources and present case studies on the commander's impact on disease during military conflicts. The information is analyzed to determine the commander's impact on effectively controlling disease rates and thereby minimizing unnecessary combat degradation to his own forces. The importance of disease is reflected in the fact that until World War II, more fatalities occurred among U.S. troops from disease than from actual battle. Since World War II disease has continued to be a significant factor. During the Korean War and Vietnam War, as in previous wars, disease was the leading cause of military ineffectiveness. During the Vietnam War the ratio of disease hospital admissions to combat casualties was 2:1.[1]

Starting in the 19th century, medical professionals began to count and analyze the nature of military casualties, to include casualties resulting from disease.[2] Since that time a vast amount of information concerning disease has been compiled. Therefore, by necessity, this study is limited in the following ways:

1. This study contains no classified material.
2. Research of historical aspects of disease is limited primarily to preventive medicine experiences during the American Revolutionary War, Spanish American War, World War II, Vietnam War, and the Persian Gulf War.
3. This study does not address the medical treatment aspects of disease.
4. This study contains no research of military peacetime disease data.

After reviewing historical information, this study continues by subjectively evaluating the commander's impact on disease against the null hypothesis. The null hypothesis is the theory to be tested. The alternative hypothesis states the outcome that results if the null hypothesis is false.[3] In this study, the null hypothesis is that a commander does not significantly influence the occurrence of disease in his unit. The alternative hypothesis is that a commander does significantly influence the occurrence of disease in his unit. The criteria for the null hypothesis will be the incidence of disease and the overall combat degradation experienced by the commander's unit resulting from the commander's lack of emphasis on preventing disease.

The last step of the overall methodology evaluates the historical information and current training information for possible disease prevention trends, particularly with respect to the commander's impact. Such trends will then be

evaluated to determine if the commander's impact on disease prevention is a significant issue for today's army. Historically, in all wars, more soldiers were killed or disabled by disease than were killed or wounded by the enemy. Therefore, the commander who can successfully prevent disease may conserve his combat power to more effectively defeat his enemy.

CHAPTER 2

ENDNOTES

[1]J. P. Heggers, "Microbial Invasion: The Major Natural Ally of War (Natural Biological Warfare)," Military Medicine 143 (1978): pp. 391-393.

[2]L. H. Addington, Patterns of War Since the Eighteenth Century (Bloomington, IN: Indiana University Press, 1984), pp. 60-62.

[3]Eric A. Hanushek and John E. Jackson, Statistical Methods for Social Scientist (New York: Academic Press, Inc., 1977), p. 342.

CHAPTER 3

SUMMARY OF RESEARCH

Introduction

The purpose of this chapter is to present research information on the significance of disease and specifically the role of commanders in minimizing the occurrence of disease. This chapter begins with an overview of disease and its impact on combat. After describing the significance of disease, the role of commanders in minimizing disease during specific conflicts is presented. The emphasis is primarily on line commanders, but occasionally medical commanders are analyzed for their influence on line commanders. The conflicts addressed in this chapter are the American Revolutionary War, Spanish American War, World War II, Vietnam War, and the Persian Gulf War.

Importance of Disease as a Combat Multiplier

Battle versus Disease Attrition Rates

Historically, the major causes of manpower attrition (mortality and morbidity) in war are as follows:

1. Disease
2. Nonbattle injury
3. Battle wounds.

Military history establishes the fact that the nonbattle casualty is an enormous drain on military resources and operational effectiveness. Table 1 depicts the relative number of deaths attributable directly to battle versus disease and nonbattle injuries for the U.S. Army from the American Revolutionary War to the Vietnam War.

Table 1. U.S. Army Battle Deaths vs Deaths from Other Causes - Revolutionary War through Vietnam

War	Number Serving	Battle Deaths	Other Deaths	Battle Deaths to Other Deaths
Revolutionary War	NA*	4,044	NA*	NA*
War of 1812**	286,730	2,260	NA*	NA*
Mexican War**	78,718	1,721	11,550	0.15
Civil War (Union)**	2,128,948	138,154	221,374	0.62
Spanish American War**	280,564	369	2,061	0.18
World War I	4,057,101	50,510	55,860	0.90
World War II	11,260,000	234,874	83,400	2.82
Korean	2,834,000	27,704	9,429	2.94
Vietnam	4,368,000	30,593	7,146	4.28

*Data not available.
**Data based on incomplete records.
Source: United States Army Administration Center. Personnel Losses - Battle and Nonbattle Casualties. Fort Benjamin Harrison, IN.

World War II marks the first war in which battle deaths exceeded disease deaths. The relative ratio of battle versus disease fatalities increased with the Korean and Vietnam War.[1] However, morbidity, and not mortality, is the primary determinant of combat effectiveness and medical workload. The relative importance of disease to the overall morbidity rate is demonstrated by the fact that during the Vietnam War disease alone accounted for unheralded annual rates of 56 to 74 percent of all U.S. Army hospital admissions from 1965 to 1970.[2] During World War II 95 percent of U.S. Army hospital admissions resulted from disease.[3]

Combat Effectiveness

> Though the percentage actually on the sick list never got above twenty, there was less than 50 percent who were fit for any kind of work.[4]

This quote by then COL Theodore Roosevelt at the Battle of Santiago in 1898 indicates the impact of disease on combat effectiveness is greater than the historical statistics reveal. Disease data is usually based solely on hospital admissions. This method of collecting data ignores all of those disease patients either not reporting for treatment, reporting for treatment and not placed in an excused-from-duty status, or reporting and held-for-treatment without being hospitalized. The non-hospitalized disease patients account for a significant and important element of the

overall disease cases, particularly when assessing combat effectiveness.

American Revolutionary War

Impact of Disease

The impact of disease on the soldiers of the Continental Army during the American Revolutionary War is a gruesome picture. Although the data is incomplete, historians estimate that approximately ten Continental Army soldiers died of disease for every battle fatality.[5] Mortality rates for the Continental Army forces and the British forces are shown in Table 2.

Table 2. Colonial vs British Mortality Rates.

	Mortality Rates per 1,000 per Annum		
	Battle	Disease	Total
Colonial	20	180	200
British	18	100	118

Source: Bayne-Jones, Stanhope. The Evolution of Preventive Medicine in the United States Army, 1607-1939. Washington, D.C.: Office of the Surgeon General, 1968, p. 56.

Medical historians agree that the British soldiers experienced a lower disease rate than the American colonial soldiers. The reasons for this include the fact that the

British Army was characterized by seasoned, regular troops, fully-equipped, well- supplied, disciplined, well-organized, and possessing a relatively efficient medical system. In contrast, the Continental Army was characterized by inexperienced militia, poorly organized, partially disciplined, poorly fed, inadequately clothed, and possessing a relatively inefficient medical system. The American soldiers were usually from rural areas where they had no appreciable contact with communicable disease. Therefore, they were usually nonimmune and susceptible.[6]

During the American Revolutionary War the most severe diseases were typhus fever, smallpox, and dysentery. Other commonly encountered diseases were malaria, measles, meningitis, and pneumonia.[7]

Founding Fathers of U.S. Army Preventive Medicine

The American Revolutionary War began with the battles of Lexington and Concord on 19 April 1775. The Continental Army had a relatively strong militia, but no military medical department, or "hospital," as the whole medical service came to be called. However, on 27 July 1775, at the urging of George Washington, Congress voted for "the establishing of a 'hospital' for an army consisting of 20,000 men."[8] The "hospital" provided the mechanism for advancing preventive medicine within the Continental Army. This mechanism was valuable, but only when used and enforced by the Continental Army commanders.

During the American Revolutionary War, General George Washington, Major General Baron von Steuben, Dr. Benjamin Rush, and Dr. James Tilton stand out prominently for effectively using preventive medicine to preserve the health of their troops. These men were constantly striving to limit the occurrence and spread of disease by directing the actions of officers and their soldiers. They recognized and appreciated the importance of preventing disease and their actions significantly advanced the evolution of preventive medicine in the U.S. Army.[9]

The failures of the Continental Army in preventing disease are fairly well known. However, it is not known how much worse the disease rate would have been if men such as Washington, von Steuben, Rush, and Tilton had not actively sought to prevent disease.[10] Their actions helped to reduce the relatively high average annual disease rate experienced during the first several years of the war to significantly lower rates during the last several years of the war, as is illustrated in Table 3.

Table 3. Average Annual Disease Rate for the Continental Army, 1775-1783

Year	Percentage of Soldiers Who Were Sick
1775	13.1
1776	20.1
1777	23.6
1778	24.4
1779	10.5
1780	9.6
1781	10.8
1782	14.1
1783	10.9

Source: Richard L. Blanco, Physician of the American Revolution Jonathan Potts (NY: Garland Publishing, Inc., 1979), pp. 224-225.

As will be demonstrated later in this chapter, disease actually worked to favor the Continental Army during the pivotal Battle of Yorktown. The principles of preventing disease which were expounded by the leaders of the Continental Army are as significant today as they were during the founding of our nation. Consequently, people such as Washington, von Steuben, Rush, and Tilton could be considered the founding fathers of U.S. Army preventive medicine.

General George Washington

General George Washington had a personal interest in doing all he could to preserve the health of his soldiers. He frequently issued general orders stressing the importance of preserving the health of the soldier. On 4 July 1775, at his Headquarters in Cambridge, Massachusetts, he issued the following order:

> All officers are required and expected to pay diligent Attention to keep their Men neat and clean; to visit them often at their quarters, and inculcate upon them the necessity of cleanliness, as essential to their health and service. They are particularly to see, that they have Straw to lay on, if to be had, and to make it known if they are destitute of this article.[11]

Washington stressed the principle of cleanliness, to include both personal hygiene and environmental sanitation. Toward the end of the bitter winter of 1777-1778 at Valley Forge, Washington inspected the camp. He found the camp sanitarily unsatisfactory with dead horse carcasses and much offal in the streets. Following the inspection, Washington issued a general order to clean up the camp and abide by the regulations on cleanliness. At the recommendation of his medical advisors, Washington implemented inoculations for smallpox, sulfur ointment for scabies, and numerous military health and sanitation measures.[12]

Major General Baron von Steuben

Major General Baron von Steuben was a product of the rigorous military school of Frederick the Great. He served as the first Inspector General of the Army of the United States (1778-1784). During the winter of 1778-1779 at Valley Forge, Baron von Steuben wrote his Regulations for the Order and Discipline of the Troops of the United States.[13] Besides being a manual of arms and drill, the "Regulations" contained numerous measures for the prevention of disease and for the preservation of the health of the soldier. For example, he wrote the following:

> Instructions for the Commandant of a Regiment . . .. The preservation of the soldiers health should be his first and greatest care; and as that depends in great measure on their cleanliness and manner of living, he must have a watchful eye over the officers of companies, that they pay the necessary attention to their men in those respects.[14]

All the sanitary orders in the "Regulations" are directed to line officers, thereby indicating that the protection of the health of the soldier is a command responsibility. Medical personnel are only mentioned with respect to the treatment of sickness. Baron von Steuben's "Regulations" contributed to a vigor in arms as well as to a robustness in health. From 1779 to the end of the Revolutionary War, disease became less prevalent and mortality from sickness decreased.[15]

Dr. Benjamin Rush

Dr. Benjamin Rush was a highly respected physician, a signer of the Declaration of Independence, and Surgeon General of one of the regional medical departments in the Continental Army (1777-1778). He asserted that maintaining the health of soldiers was a command responsibility.

> . . . the munificence of the Congress, and the skill of Physicians and Surgeons, will avail but little in preventing mortality from sickness among our soldiers, without the concurrence of the officers of the army. Your authority, Gentlemen (line officers), is absolutely necessary to enforce the most salutary plans and precepts for preserving the health of the soldiers.[16]

Rush's command responsibility assertion is a basic principle of field preventive medicine, which is as applicable today as it was during the American Revolutionary War. Rush's Directions for Preserving the Health of Soldiers, describes the art of preserving the soldier's health in terms of dress, diet, cleanliness, encampments, and exercise. He urged commanders to minimize exposing their soldiers to wet, cold conditions which can cause cold injuries.[17]

Dr. James Tilton

Dr. James Tilton was a physician in the Continental Army. Tilton wrote Economical Observations on Military Hospitals; and the Prevention and Cure of Diseases Incident to an Army. In this book he emphasized that military hygiene is primarily a command responsibility.

> It may seem strange at first view, that I should call upon commanding officers to take care of the health of the men . . . and that the medical staff are only to be regarded as adjutants, in the recovery of the sick.[18]

Tilton listed the following means for commanders to prevent and alleviate ordinary sickness and distress:

1. Discipline
2. Avoidance of excessive heat.
3. Provision of well supervised play, amusement, and short marches.
4. Cleanliness
5. Clothing
6. Diet
7. Hardihood
8. Skin care.
9. Training the mind.[19]

Battle of Yorktown

At the Battle of Yorktown in October 1781 General Washington is given credit for defeating General Cornwallis. There are probably several factors which contributed to the success of Washington at Yorktown, but a critical factor was disease. Washington kept his soldiers relatively free of disease, while Cornwallis was unable to control disease among his soldiers.

In August 1781 Cornwallis and his soldiers had rode through tidewater marshes in Virginia, swatting mosquitoes, before setting up fortifications at Yorktown with approxi-

mately 8,000 prime scldiers. A month later, in September 1781, Washington, with 15,000 American and French soldiers, broke through Cornwallis' outer defenses. On 19 October 1781, Cornwallis surrendered.[20]

Although outnumbered at the moment, there were many factors in Cornwallis' favor to include: Cornwallis was probably the best British field general in the colonies; his soldiers were tough British and German professionals; they were fighting from behind fortifications; and they knew Sir Henry Clinton was en route with approximately 25 ships and 10 frigates carrying top British regiments.[21] Despite all these factors weighing in his favor, Cornwallis surrendered without a prolonged siege and lost the war. Cornwallis surrendered because approximately 2,000 of his men were ill. Thus, one-fourth of his army was ineffective because of disease. The culprit disease was probably malaria, conveniently carried by mosquitoes which were breeding in the marshy area occupied by Cornwallis.[22]

Spanish American War

Impact of Disease

The Spanish American War was fought in three geographical areas: Santiago, Cuba; Puerto Rico; and Manila Bay, Philippines. The war began on 21 April 1898 and hostilities ended on 12 August 1898. The Spanish American War was considered a short, decisive, and impressive victory

for the U.S. However, the euphoria of victory was soon overshadowed by the incompetent handling of medical issues, to include disease prevention. The problems encountered with weak commanders, tropical weather, inadequate facilities, shortage of trained medical personnel, and disease ridden environments significantly contributed to one of the largest scandals in U.S. medical history.

Approximately 200,000 volunteers were mobilized in April and May 1898, but only 35,000 were deployed to the war. The remaining 165,000 volunteers were placed in camps throughout the U.S. awaiting OCONUS deployment orders which never came.[23] Living conditions in the war zones, as well as in the U.S. camps, were miserable from a public health viewpoint. Disease ran rampant, with typhoid the most prevalent disease. Approximately 21,000 soldiers contracted typhoid, of which approximately 1,500 died. About 2500 soldiers died from disease during the short war, ten times the number killed in action.[24]

Medical personnel attempted to implement preventive medicine measures, but were usually unsuccessful because commanders paid little attention to their advise. Line officers scorned medical officers as "nobody but doctors." Surgeons had no power to enforce their preventive medicine recommendations and commanders frequently brushed aside their warnings and recommendations. Commanders belittled their medical personnel by referring to them as "fussy old women who tried to coddle the soldiers." General Brooke,

Camp Thomas Commander, complained that his camp surgeon bothered him by constantly "thrashing over old straw" with respect to the health of the camp. Camp Thomas, like most of the camps, experienced an appalling sick rate.[25]

Second Pennsylvania Volunteer Infantry Regiment

The Second Pennsylvania Volunteer Infantry Regiment was assigned to the Second Army Corps. The unit was mobilized in April 1898 and in May 1898 established two camps. The 1st Battalion of the Second Pennsylvania occupied a camp in Montchanin, Delaware from 19 May 1898 to 15 September 1898. The 2nd Battalion of the Second Pennsylvania occupied a camp in Pompton Lakes, New Jersey in May 1898 for one week and then established a camp in Penngrove, New Jersey until 6 September 1898, at which time 2nd Battalion was united with the 1st Battalion at Montchanin, Delaware. The Second Pennsylvania was demobilized on 15 September 1898.

While in a mobilized status, Second Pennsylvania incurred only five cases of typhoid. The virtual absence of typhoid in the 1st Battalion was rendered more remarkable by the fact that there was an epidemic of typhoid in Rising Sun, a small village located about one mile from their camp. Soldiers of the 1st Battalion often visited Rising Sun for off-duty entertainment needs.

There are several reasons for the excellent health record of the Second Pennsylvania. First, the commanders had a sincere and intelligent interest in the hygiene of the

camps. The suggestions made by the medical staff were investigated and endorsed by the commanders. Often the camp surgeon was indebted to the camp commander for timely and wise suggestions regarding the camp sanitation.

Secondly, the sanitary arrangements at both the Penngrove and Montchanin camps were practically perfect. The latrines were well designed, constructed, and maintained. The latrines were never placed within 300 feet of the kitchens or sleeping quarters. The medical personnel made a rigid inspection of all food issued to the camp. Both camps had excellent bathing facilities. The water supply at each camp was obtained from wells. Guards were posted at the wells to prevent anyone from wasting or polluting the water.

Another reason for the excellent health record of the Second Pennsylvania was the vigilant policing of the camps. The commanding officer of each camp continually stressed the necessity for absolute cleanliness to their company officers. All trash was immediately removed to a trash pile and burned in a fire which was kept constantly going. The trash pile was located a significant distance from the tents. On a weekly basis the tents were taken down, the floor boards removed, and the soil beneath the tents was turned over and exposed to the sun for drying purposes. Several times during their encampment the entire camp was slightly shifted.

Lastly, commanders conducted weekly health inspections of quarters. Every Sunday morning the commanding officer of the camp, accompanied by his staff, inspected every tent and all contents within the tents. The soldiers stood at attention between the tents. If the inspection team found the least evidence of a soldier's improper attention to the cleanliness of his tent or personal belongings, then the soldier was immediately counseled.[26]

First Division, Third Army Corps

The First Division of the Third Army Corps suffered from a significantly higher prevalence of typhoid than the Second Pennsylvania. Table 4 depicts the prevalence of typhoid within the First Division.

Table 4. Typhoid Cases in Regiments of the First Division, Third Army Corps

Regiment	Days Camped at Chicka-mauga Park	Strength on Arriving	Strength on Departing	Total Cases of Typhoid
Fourteenth NY	106	913	1277	233
First Missouri	106	1021	1275	216
Fifth Maryland	13	979	985	250
Second Nebraska	101	1020	1303	167
Second NY	11	1078	1014	161
Third Tennessee	104	997	1293	123
First Vermont	86	1026	996	278
Eighth NY	104	849	1301	425

Source: Walter Reed, Edward O. Shakespeare, and Victor C. Vaughan, Report on the Origin and Spread of Typhoid Fever in U.S. Military Camps During the Spanish War of 1898 (Washington, D.C.: U.S. Government Printing Office, 1904), pp. 161 and 207.

Once mobilized, the regiments of the First Division spent most of their time at Chickamauga Park, Georgia, with the first regiment arriving on 20 May 1898 and the last regiment leaving on 6 September 1898.[27] With respect to typhoid, the living conditions for the regiments at Chicka-mauga Park differed from those of the Second Pennsylvania in three ways. First, the regiments of the First Division used the Chickamauga Creek as their primary water source and the numerous large springs in the area as their secondary water source. Unfortunately, the medical authorities did not conduct a satisfactory bacteriological examination of the

various water sources while the camp was occupied. Second, the regiments of the First Division were more concentrated at Chickamauga Park than the Second Pennsylvania Regiment which had the luxury of spreading out in two separate camps. Third, the sanitary conditions at Chickamauga Park were significantly inferior to those at Penngrove, New Jersey and Montchanin, Delaware.

The first two differences in living conditions could not be controlled by the regiments of the First Division. However, the sanitary conditions certainly could be controlled. As previously mentioned, the Second Pennsylvania maintained practically perfect sanitary conditions. Conversely, the sanitary conditions maintained by the First Division were deplorable based upon the observations of MAJ Guy Edie, the division's sanitary inspector. The latrines and kitchen waste areas were filthy and contained myriads of flies. In the woods adjoining the camp, the ground was often covered with human feces. Most of the regiments never changed location within Chickamauga Park. Although an order was issued to boil drinking water, this order appears to have been weakly enforced. The sanitary inspector frequently observed soldiers drinking water which had not been boiled.[28] The drinking water was often stored in open barrels into which soldiers dipped their unclean cups and hands. At best, the camp commanders had but marginal interest in the hygiene of the camp.[29]

Within the First Division, there was a wide range of total cases of typhoid for each of the regiments. Total cases of typhoid ranged from a low of 123 in the Third Tennessee Voluntary Infantry Regiment to a high of 425 in the Eighth New York Voluntary Infantry Regiment. The Second Nebraska Voluntary Infantry Regiment had 167 total cases of typhoid, a relatively low prevalence for the First Division.[30] When comparing the Second Nebraska Regiment to the Eighth New York Regiment, official medical documents indicate a significant difference in the camp cleanliness.

Second Nebraska Volunteer Infantry Regiment

The Second Nebraska Volunteer Infantry Regiment was assigned to the Second Brigade, First Division, Third Army Corps. This regiment arrived at Chickamauga Park, Georgia on 22 May 1898 with a strength of 1020 soldiers and departed Chickamauga Park on 31 August 1898 with a strength of 1303 soldiers. The number of certain and probable cases of typhoid developed while stationed at Chickamauga Park was 167.

The monthly medical reports submitted by the regimental surgeon, MAJ Hoover, while stationed at Chickamauga Park states that the general medical condition of the camp was excellent and that the diseases present in the camp were attributable to changes in climate and water. Upon the arrival of the regiment at Chickamauga Park, orders were immediately issued to boil all water used for drinking. The

regiment's camp area was initially heavily laden with foliage and undergrowth, but was quickly cleared. During their stay at Chickamauga Park, the regiment thoroughly policed the camp.[31]

Eighth New York Volunteer Infantry Regiment

The Eighth New York Volunteer Infantry Regiment was also assigned to the First Division, Third Army Corps. The regiment arrived at Chickamauga Park, Georgia on 25 May 1898 with a strength of 849 soldiers and departed Chickamauga Park on 6 September 1898 with a strength of 1301. The number of certain and probable cases of typhoid developed while stationed at Chickamauga Park was 425.[32]

The Eighth New York Volunteer Infantry had a significantly greater prevalence of typhoid than the other regiments in the division. Since all the regiments in the division used the Chickamauga Creek as their primary water source, investigators have concluded that the higher prevalence of typhoid in the Eighth New York was due to a special local condition. A general statement was made to an investigating board of medical officers that the Eighth New York camp was especially filthy with respect to the other regiments in the division.[33]

World War II

Impact of Disease

During World War II, the problems of controlling and preventing diseases in the Army, and in the populations with which the Army was in contact, were extremely complex. The medical threat was global and included a myriad of diseases caused by bacteria, spirochetes, rickettsiae, viruses, fungi, protozoa, helminthes, ectoparasites, and toxins. The diseases were transmitted from man to man and from animals to man by a large variety of means and vectors. Despite the complexity of preventing diseases, the historical excess of deaths from disease over deaths from battle injury was strongly reversed by the U.S. Army in World War II. Of all deaths for U.S. soldiers in World War II, 75.2 percent were caused by battle injuries, 19.7 percent by nonbattle injury, and 5.1 percent by disease (Table 5).

Table 5. U.S. Army Deaths during World War II

	Deaths	
Category	Number	Percent of Total
Disease	15,779	5.1
Battle Casualties	234,874	75.2
Nonbattle Injuries	61,640	19.7
Total	312,293	100.0

Source: Medical Department, United States Army. Preventive Medicine in World War II, Volume IV, Communicable Diseases. Washington, D.C.: Office of the Surgeon General, 1958, p. 8.

However, the death rates do not depict the big picture. During World War II, disease was the major cause of disability in the Army. The number of hospital admissions for disease was more than five times greater than that for battle casualties and nonbattle injuries (Table 6).

Table 6. U.S. Army Hospital Admissions during World War II

Category	Admissions Number	Percent of Total
Disease	14,969,028	85.2
Battle Casualties	592,170	3.4
Nonbattle Injuries	1,995,398	11.4
Total	17,556,596	100.0

Source: Medical Department, United States Army. Preventive Medicine in World War II, Volume IV, Communicable Diseases. Washington, D.C.: Office of the Surgeon General, 1958, p. 8.

Disease was also the major contributor to the noneffective rate. Approximately 70 percent of the total U.S. Army man-days lost during World War II was attributed to disease (Table 7).

Table 7. U.S. Army Man-Days Lost during World War II

Category	Number of Man-days Lost	Percent of Total
Disease	285,918,000	68.5
Battle Casualties	72,000,000	17.2
Nonbattle Injuries	59,863,000	14.3
Total	417,781,000	100.0

Source: Medical Department, United States Army. Preventive Medicine in World War II, Volume IV, Communicable Diseases. Washington, D.C.: Office of the Surgeon General, 1958, p. 14.

The cited statistics on morbidity and noneffective rates indicate that disease was a significant drain on the operating efficiency of the U.S. Army. World War II commanders varied greatly in their ability to recognize and deal with diseases. Lieutenant General Sir William J. Slim superbly controlled diseases while Field Marshall Erwin Rommel and Brigadier General Frank D. Merrill allowed disease to control them.

Rommel

The tactical brilliance, energy of execution, and inspiring leadership displayed by Field Marshal Erwin Rommel in the Western African Desert in 1941-1942 were unquestionably superb. Many military scholars view Rommel as the ultimate armor commander and a role model in tactical and operational skills. "Beyond these acknowledged areas of excellence, however, Rommel's performance as a commander showed deficiencies bordering on negligence."[34]

After numerous spectacular successes, Rommel was ultimately defeated in the western desert of North Africa. His defeat is often attributed solely to the overwhelming personnel and materiel superiority of the Allies. However, most people are unaware of the extent to which his own actions contributed to the numerical inferiority of his army.

Between October 1941 and December 1942 Rommel fought many famous battles, to include: the British Crusader

offensive; the German retreat and subsequent counteroffensive in January 1942; the German offensive in May 1942 resulting in the capture of Tobruk; the first battle of El Alamein; the German defeat at Alam Halfa in August 1942; and Germany's decisive defeat during the second battle of El Alamein in October and November 1942.

During this same time period, disease accounted for approximately 75 percent of Rommel's manpower losses. Medical data indicates that of the 40,867 German troops medically evacuated from North Africa in 1942, disease accounted for 28,488 cases. "Through sickness, Rommel lost temporarily or permanently a force equal to twice his average strength."[35] Disease was second only to being taken prisoner as a source of German manpower loss during the decisive second battle of El Alamein. Dysentery, hepatitis, malaria, and skin disease were the primary diseases among Rommel's soldiers. The official disease casualty records only account for those soldiers who were hospitalized. However, many soldiers who were inflicted with disease were not hospitalized and therefore not included in the official disease casualty records. Both the nonhospitalized soldiers and the return to duty soldiers functioned with reduced combat effectiveness. Many soldiers suffered relapses leading to long term hospital care.

The concurrent British experience in the Western African Desert indicates that Rommel could have significantly reduced the German military manpower attrition

caused by disease. When comparing the disease rate of Rommel's Panzerarmee Afrika to the British 8th Army from October 1941 to December 1942, the data indicates that a German soldier was 2.6 times as likely to become medically ineffective as his British counterpart. In the two months preceding the second battle of El Alamein, more than one in every five Germans had become ill. German elite units were terribly understrength. For example, the 15th Panzer Division had a TOE manpower strength of more than 10,000, but its personnel strength had been attrited down to 3,840.[36]

The British and Germans were fighting in the same hostile desert environment, yet the Germans were obviously more profoundly affected by disease. The medical conditions that disproportionately weakened Rommel's army were preventable by well understood and usually simple measures. British official records indicate that the British Army and its medical services were clearly aware of the significance of preventive medicine in hostile environments. Rommel's command failed to demonstrate a similar degree of awareness. Paradoxically, the otherwise exceptionally well disciplined Afrika Korps displayed poor field sanitation discipline, resulting in excessively high rates of intestinal diseases.[37] Rommel's neglect of basic disease prevention measures is illustrated in the following report by COL H. S. Gear, the British assistant director of hygiene in the Middle East:

> Enemy defensive localities are obvious from the amount of faeces lying on the surface of the ground . . . . This contempt for hygiene became such a menace to the enemy as to affect from 40 to 50 percent of his front-line troops, as interrogation of captured medical officers revealed . . . the enemy appears to have no conception of the most elementary sanitary measures, and has a dysentery rate so very much higher than ours that [it] is believed that the poor physical condition of these troops played a great part in the recent victory at El Alamein.[38]

Rommel's behavior in the Western African Desert is difficult to understand. While Rommel was running about the battlefield performing the exploits for which he is now famous, his army was literally rotting away. Since the attrition data was available, either his senior medical officers or personnel officers should have alerted him to the disease prevalence problem. Unfortunately, Rommel demonstrated only a vague awareness of the disease and sanitation disaster inflicting his forces. Rommel's diary contains only two references to the magnitude of his disease problem. On 2 August 1942, he wrote "A lot of sickness . . . .." In September 1942 Rommel wrote, "On my visits to the front I was continually hearing of growing sick parades caused by bad rations."[39] Rommel should have been acutely aware of the disease problem since he himself was twice evacuated to Germany because of hepatitis. He also lost numerous members of his staff for medical reasons.[40]

Rommel either never learned to effectively employ his medical staff or was uninterested in the medical aspects of protecting his soldiers. There is no evidence to

illustrate Rommel's recognition of the commander's responsibility for the health and welfare of his soldiers, and the ability of military medicine to maintain the health of the command.

> At a minimum, a commander of Rommel's experience and expertise should have recognized the tactical military significance of his temporary and permanent troop losses resulting from disease.[41]

Slim

General Slim, an outstanding British field commander, took command of the Fourteenth Army in October 1943. The Fourteenth Army was deployed along an approximately seven hundred mile front on the Indo-Burmese border. This area was characterized as disease-infested, sparsely populated with extremely restrictive terrain and poor climate. For six months of the year during the monsoon rains the area was virtually trackless. "It could fairly be described as some of the world's worst country, breeding the world's worst diseases, and having for half the year at least the world's worst climate." No serious defense measures had ever been taken on India's eastern frontier because the indigenous armies considered it impossible to supply, move, and fight armies in the mass of jungled hills along the Indo-Burmese borders.[42]

Immediately upon taking command of the Fourteenth Army General Slim recognized that he was confronted with a health problem. In 1943, the Fourteenth Army had one

hundred and twenty soldiers evacuated sick for every soldier evacuated with wounds. Malaria was the most prevalent disease to inflict soldiers, followed in order of prevalence by dysentery, skin diseases, and jungle typhus. In October 1943, the sick rate of soldiers evacuated from their units increased to over twelve per thousand per day.[43] General Slim realized that at this rate his army would simply melt away in a matter of months.

General Slim immediately consulted with his senior medical officers and reviewed the resources of the Fourteenth Army. He found that his medical assets were significantly less than those of other British armies in Africa or Europe. The Fourteenth Army was short of units, doctors, nurses, and equipment. Despite General Slim's demands for more medical assets, particularly nurses, little assistance was provided. Therefore, General Slim decided to solve his problem through the use of preventive medicine, believing that prevention was always better than cure. If he could not increase his medical treatment capability, then he would devise a plan to stop his soldiers from getting sick, or if they got sick, from staying sick. General Slim approached his medical problem using the following four part program:

1. The practical application of the latest medical research.
2. The use of Malaria Forward Treatment Units (MFTUs).

3. The air evacuation of serious casualties.

4. The establishment of good morale and discipline.

The prevention of tropical disease advanced immensely during this time. British medical researchers were sent to South-East Asia to study the etiology of diseases prevalent in the area. Working closely with the medical officers assigned to the Fourteenth Army, the medical researchers introduced new techniques, drugs, and methods of treatment to include sulphonamide compounds, penicillin, mepacrine, and dichloro-diphenyl-trichloro-ethane (DDT). General Slim firmly believed that without this medical research and its results his army would not have survived.

The second part of General Slim's medical improvement program was the forward treatment of casualties, particularly malaria stricken casualties. Up until 1943 of the Burma Campaign when a soldier contracted malaria he was evacuated hundreds of miles by road, rail, and boat to a hospital in India. The malaria stricken soldier would not return to his unit for at least five months and often he never returned. MFTUs were organized to increase the return to duty rate of malaria stricken soldiers. MFTUs were field hospitals located a few miles behind the fighting lines. Within twenty-four hours of a malaria attack, a soldier was placed in a MFTU and remained there for approximately three weeks it took to cure him. The soldier was returned to his unit in weeks instead of months or never. MFTUs also

contributed to reducing the incidence of malaria. When unit morale was low, some soldiers welcomed malaria and took no precautions to avoid it, reasoning that a bout of malaria was a cheap price to pay for getting away from the Burma front. If malaria only took soldiers half a dozen miles from the front and then brought them quickly back to the front it was not so attractive.

General Slim also established forward surgical teams to treat the wounded. These teams performed major operations within a few hours of a soldier being wounded. Although the work of these teams was brilliant, General Slim always remembered that while the surgeon saved the individual life, the preventive medicine physician, less dramatically, saved hundreds.

The third part of General Slim's medical improvement program was the air evacuation of the wounded and sick soldiers. In November 1943, the Fourteenth Army had for all transport purposes about one hundred and twenty sorties a month, but the number grew rapidly and with it the Fourteenth Army's technique of air evacuation. Eventually, casualties within the Fourteenth Army went almost directly from the battlefield to the hospital. From 1944 to 1945 one hospital took in over eleven thousand casualties straight from the front line of the battlefield and saved all but twenty-three.[44]

The fourth part of General Slim's medical improvement program was the establishment of good morale and discipline. Slim stated that:

> Good doctors are no use without good discipline. More than half the battle against disease is fought, not by doctors, but by the regimental officers. It is they who see that the daily dose of mepacrine is taken, that shorts are never worn, that shirts are put on and sleeves turned down before sunset, that minor abrasions are treated before, not after, they go septic, that bodily cleanliness is enforced.[45]

When mepacrine, an anti-malarial drug, was first introduced, many soldiers would not swallow the tablet because rumors were circulating that among other side-effects mepacrine resulted in impotency. An individual medical test was available to determine whether a soldier had taken mepacrine. Therefore, General Slim had unannounced checks of entire units, every soldier being examined. If the overall result was less than 95 percent positive, then General Slim fired the commanding officer. "I only had to sack three; by then the rest had got my meaning."[46]

As the commanders, doctors, staff officers, and NCOs united in their campaign against disease, impressive results began to appear. The medical charts which General Slim had posted in his office depicted an ever-decreasing rate of admissions to hospitals and MFTUs. From 1943 to 1945, the sickness rate for Fourteenth Army decreased from twelve to one per thousand per day.[47]

Merrill

The 5307th Composite Unit (Provisional), as the Marauders were officially designated, was organized in September 1943 and placed directly under General Joseph Stillwell. General Stillwell, Commanding General, U.S. Army Forces, China-Burma-India Theater, was to use the Marauders in a drive from upper Assam Province, India, into northern Burma. Brigadier General Frank D. Merrill was selected to command the Marauders. The Marauders were entirely a volunteer regiment designed for long-range penetration tactics in jungle and mountain terrain. From November to December 1943 the Marauders underwent extensive training in the Bengal Province of India. From the end of February 1944 until the beginning of June 1944, the Marauders engaged in essentially continuous manuevers which are typically divided into the following three phases.

1. Long range penetration and road block actions at Walawbum, Shaduzup, and Inkangahtawng (24 February 1944 to 28 March 1944).
2. Defense of the force of Nhpum Ga (28 March 1944 to 9 April 1944), followed by two weeks of rest.
3. The Myitkyina operation (28 April 1944 to 3 June 1944).[48]

During the first and second phases Merrill's Marauders was a relatively small infantry outfit with a big reputation. However, by the end of the third phase, the

Marauders' fame was tarnished. By the third of June the entire regiment was evacuated to medical installations for treatment and rest, thus ingloriously ending the third phase of the Marauders' campaign. Although some of the Marauders were later assigned to the 5332d Infantry Brigade, the 5307th was retired and never again saw action.

Disease was the major factor contributing to the demise of the Marauders. Before the campaign started U.S. planners recognized the severe medical threat posed by the Marauders' area of operations. General Stillwell's staff estimated that 85 percent of the Marauders would be lost before it finished its mission, with 35 percent killed and wounded and 50 percent evacuated with disease. Actual casualty statistics indicate that the Marauders lost only 14 percent killed and wounded but 66 percent to disease.[49] Merrill and his commanders ineffectively enforced the advice of the medical officers assigned to the Marauders. The Marauders began training in November 1943 with approximately 2830 soldiers.[50] By 3 June 1944 there were 424 Marauders killed, wounded, and missing in action. From November 1943 to June 1944 malaria, amoebic dysentery, scrub typhus, psychoneuroses, and miscellaneous diseases removed 1970 soldiers from the regiment, and impacted to varying degrees most of the remaining soldiers.[51]

Throughout their existence the Marauders experienced a high disease rate. While on ship to India, malaria, dysentery, and respiratory infections were excessive.

Malaria and dysentery became so common during the preparatory period in India that the regiment was forced to interrupt training to treat the diseases.[52] Besides inhibiting troop activity, such conditions were indicative of poor health in the past and unsatisfactory sanitary discipline in the present.

Merrill and his commanders did little to prevent the occurrence and recurrence of dysentery among the Marauders. To prevent dysentery requires careful attention to sanitation. While the 5307th conducted training in India the sanitary facilities were deplorable and food supplies from local sources were medically unacceptable. By the time commanders expressed concern about the unsanitary conditions, the damage had been done. Marauders lost training opportunities, did not store up strength for their campaign, and carried with them the nagging burden of dysentery.[53] During the first phase of their campaign, as the Marauders neared Hsamsingyang, a third of the regiment had dysentery and were only dragging along. During the second phase of their campaign, Marauders began to pass fellow soldiers fallen out beside the trail. These soldiers were not simply complying with the demands of dysentery, but were sitting bent over their weapons, waiting for enough strength to return to take them another mile.[54] By the time the Marauders reached Myitkyina, dysentery was so rampant that "one platoon had cut open the seats of its trousers so as to

be handicapped as little as possible by dysentery in any combat emergency."[55]

Malaria was the other principle cause of illness among the Marauders. As with dysentery, attempts by Merrill and his commanders to prevent infection were unimpressive. Within the theater little had been done to establish environmental controls over mosquito carriers. Repellents and mosquito bars were unpopular and commanders did not enforce their use. The primary measure of controlling malaria was to rely on atabrine suppressive discipline. However, atabrine discipline was neglected until malaria brought training to a standstill. Only after allowing malaria to devastate their soldiers' training did the commanders finally give proper emphasis to atabrine discipline. During the first and second phases of the campaign the Marauders observed atabrine discipline fairly well. However, by the time the battle of Nhpum Ga ended and the Myitkyina operation began, commanders had once again allowed their emphasis on medical discipline to diminish. Consequently, atabrine discipline deteriorated very rapidly. As the Marauders reached Myitkyina, malaria cases were increasingly numerous.[56]

Knowing the suppression of malaria by atabrine was a matter of discipline, commanders attempted to force the Marauders back into line by stopping the medical evacuation of malaria casualties. Such Spartan tactics were ill-timed. Outraged by restrictions on evacuation and the mounting

pressure to continue the operation, genuinely dazed with fatigue and suffering from other miscellaneous diseases, more and more Marauders refused atabrine which then set in motion a circuitous chain reaction. As their degree of sickness increased, their morale rapidly decreased, which in turn reduced any hope of restoring atabrine discipline and curbing malaria.[57]

In fairness to Merrill and his commanders, malaria infection was difficult to control during the campaign. Burma had an extremely high incidence of the disease. The Marauders were in the open every night and were pushed to their physical and mental limits. The slightest carelessness with using protective clothing, repellents, and netting meant almost certain exposure to infection. However, malaria could have been suppressed provided a high level of morale and discipline was maintained.

The Marauders inflicted on the enemy ten times the number of battle casualties they received. "But in the end, amoebae and plasmodia, bacteria and rickettsia, rather than Japanese soldiers, vanquished Merrill's Marauders."[58] The demise of the 5307th was medically attributable to the following: command ineptness in supporting their medical advisors; loose sanitary practices; and defiance of atabrine suppressive discipline.

Vietnam War

Impact of Disease

In Vietnam, as in Korea, the Pacific, and Asiatic theaters during World War II, the cumulative effect of disease was the greatest drain on U.S. combat effectiveness. Significant diseases included malaria, viral hepatitis, diarrheal diseases, skin diseases, venereal diseases, and fever of undetermined origin (FUO). Disease admission accounted for approximately 70 percent of the hospital admissions in Vietnam during the period 1965-1969. Conversely, battle injuries and wounds were responsible for approximately 30 percent of the hospital admissions during this period.[59]

Although indicative of the theater's greatest cause of morbidity, disease rates for Vietnam revealed encouraging trends when compared to rates experienced in Korea and the disease-stricken World War II theaters of China-Burma-India and Southwest Pacific. Table 8 indicates that the average annual disease admission rate for Vietnam (1965-1969) was approximately 33 percent that for the Southwest Pacific and China-Burma-India theaters in World War II, and greater than 40 percent that for the Korean War.

Table 8. Hospital Admissions for all Causes, U.S. Army: World War II, Korea, and Vietnam (Rate expressed as number of admissions per annum per 1000 average strength)

War	Year	All Causes	Non Battle Injury	Battle Injury and Wounds	Dis-ease	% Dis-ease
World War II						
China-	1942	1130	81	3	1046	92
Burma-	1943	1081	84	6	991	92
India	1944	1191	96	18	1077	90
	1945	745	80	4	661	90
Southwest	1942	1035	178	25	832	80
Pacific	1943	1229	171	12	1046	84
	1944	1013	139	34	840	83
	1945	990	99	48	843	85
Korea	1950	1526	242	460	824	61
	1951	897	151	170	576	64
	1952	592	102	57	433	75
Vietnam	1965	484	67	62	355	73
	1966	547	76	75	396	72
	1967	515	69	84	362	70
	1968	523	70	120	333	64
	1969	459	63	87	309	67

Source: Major General Spurgeon Neel. Medical Support of the U.S. Army in Vietnam 1965-1970. Washington, D.C.: Department of the Army, 1973, p. 33.

The cumulative effect of disease was probably much greater than the hospital admission statistics indicate. High incidence, short duration diseases, such as diarrheal and skin diseases, were often treated on an outpatient basis. For example, in 1968 the Ninth Infantry Division surgeon reported that , after spending five days in the rice paddies, one of the battalion's strength was reduced by approximately 33 percent by skin disease. Although the

soldiers were not fully fit for duty, most of these men were treated as outpatients.[60]

A significant achievement of military medicine in Vietnam was the quickness with which an effective preventive medicine program was established to control the impact of disease on combat operations. During World War II, preventive medicine programs in the Far East did not show significant results until 1945 as the war was ending. During the Korean War the delay was less but nevertheless considerable. In Vietnam an effective disease control program was introduced at the very beginning of the conflict. The disease control program, when properly influenced by commanders, had two benefits. First, the incidence of disease was greatly minimized. Secondly, the incidence of disease could be forecasted with increased accuracy while planning combat operations.[61] Unfortunately not all field commanders actively supported the disease control program.

Malaria Study - 1st Cavalry Division

This case study is based on a malaria chemoprophylaxis study conducted in Vietnam by a U.S. Army medical research team from the Walter Reed Army Institute of Research (WRAIR). The primary objective of their study was to evaluate the effectiveness of DDS (di-amino, di-phenyl sulfone) in 25 milligram daily doses, coupled with the usual

weekly C-P (chloroquine-primaquine) tablet, as a chemoprophylactic drug against falciparum malaria in Vietnam.

The 1st Brigade of the 1st Cavalry Division agreed to participate in the malaria chemoprophylaxis field study. The field study began on 25 March 1966 and ended on 26 April 1966. Daily DDS tablets, coupled with weekly C-P tablets, were administered to Companies A and C of the 1/8, 2/8, 1/12 Infantry Battalions. Daily glucose placebo tablets, plus the weekly C-P tablets, were administered to Companies B and D of these battalions.[62]

After action reports for the 1/8, 2/8, and 1/12 Battalions were analyzed by company to determine actual time spent in combat or on combat patrols during the malaria chemoprophylaxis field study. This data was then combined with malaria cases occurring during the same time period. Table 9 presents the malaria rates per 1000 man-combat days.

Table 9. First Cavalry Division Malaria Cases per 1000 Man-Combat Days

Company	Battalion 1/8	2/8	1/12
A*	4.52	2.68	0.69
B	9.63	10.02	9.13
C*	4.08	1.25	8.75
D	6.15	5.24	2.94

* = Company on DDS Chemoprophylaxis

Source: LTC Robert J. T. Joy, "Malaria Chemoprophylaxis with Di-Amino, Di-Phenyl Sulfone; I: Field Trial with the 1st Brigade 1st Cavalry Division (AM)," United States Army Medical Research Team (WRAIR) Vietnam, Annual Progress Report, 1 September 1965 - 31 August 1966 (1966): p. 35.

Based upon the data in Table 9, the total combined malaria rate per 1000 man-combat days for the DDS companies was 3.45 versus 7.38 for the placebo companies. The rate of malaria in the placebo companies was approximately twice that of the DDS companies. Therefore, when DDS and C-P are properly administered, the malaria rate for a combat company deployed in Vietnam could be reduced by approximately 50 percent.[63]

The usefulness of DDS is affected by personal protective measures. Therefore, during the field study interview information was routinely collected on the following areas of personal protective measures: mosquito net use; chemoprophylaxis use; and sleeve discipline and

insect repellent use. For all but one of the companies participating in the field trial, the use of mosquito netting during operations was a rare and random occurrence. Chemoprophylaxis use with respect to C-P tablet discipline was good with an average compliance rate for those interviewed of approximately 92 percent. However, DDS and placebo tablet discipline was poor with an average compliance rate of approximately 62 percent. Sleeve discipline and insect repellent use was poorly enforced with an approximately 25 percent failure rate among the soldiers interviewed. Approximately 25 percent of the soldiers who did roll down their sleeves at night did so to keep warm or protect themselves from scratches. They were unaware of the mosquito protection aspects of sleeve discipline.[64]

Malaria Study - 1st Cavalry Division and 25th Infantry Division

As a follow-up to the March-April field study with the 1st Cavalry Division, WRAIR conducted another field study using the 1/14, 1/35, and 2/35 Infantry Battalions of the 3rd Brigade, 25th Infantry Division and the 2/5 and 2/12 Infantry Battalions of the 1st Cavalry Division. The study lasted from 10 May 1966 to 25 June 1966. The battalions of the 3rd Brigade were placed on daily DDS chemoprophylaxis plus the weekly C-P tablets. The 1/14, 1/35, and 2/35 Battalions operated in the highly endemic areas of Ia Drang and Ya Lop river valleys and the Plei Me - Due Co - Plei

Djereng - Cambodian border area. During one period of the study, 30 May to 10 June 1966, the 2/5 and 2/12 Infantry Battalions of the 1st Cavalry Division operated in the same general area as the 3rd Brigade and were under the operational control of the 3rd Brigade. Both battalions had been in staging areas for at least seven days prior to attachment to 3rd Brigade and neither battalion was taking DDS. Table 10 depicts the compiled data for the three battalions of 3rd Brigade plus the two battalions of the 1st Cavalry Division resulting from exposures while attached to the 3rd Brigade.[65]

Table 10. Malaria Cases Within Battalions of the 25th Infantry Division and the 1st Cavalry Division

Battalion	Cases Per 1000 Man-Combat Days
1/14, 25th Div	2.0
1/35, 25th Div	1.3
2/35, 25th Div	1.1
2/5, 1st Cav	16.6
2/12, 1st Cav	12.5

Source: LTC Robert J. T. Joy and CPT William R. Gardner, "Malaria Chemoprophylaxis Using Di-Amino, Di-Phenyl Sulfone; II: Field Trial with the 3rd Brigade, 25th Infantry Division," United States Army Medical Research Team (WRAIR) Vietnam, Annual Progress Report, 1 September 1965 - 31 August 1966 (1966): p. 45.

During the study the 2/12 (1st Cav) and 1/14 (25th Div) Battalions operated together for only a few days near Plei M'nang. However, the 2/5 (1st Cav) and the 1/35 (25th Div) Battalions operated together for nine days in an area southwest of Plei Djereng. The malaria cases per 1000 man-combat days for the three rifle companies of 2/5 and 1/35 was 18.7 and 1.8 respectively.[66]

An analysis of the data indicates a tenfold difference in the malaria attack rate between the rifle companies of the 2/5 Battalion (1st Cav) and the 1/35 Battalion (25th Div). There was also a tenfold difference in the collective average malaria attack rate between the 2/5 and 2/12 1st Cavalry Battalions (14.2 cases per 1000 man-combat days) and the three 25th Division battalions (1.4 cases per 1000 man-combat days). The initial DDS chemoprophylaxis study conducted during March-April 1966 in the 1st Cavalry Division indicated that daily consumption of DDS would reduce the malaria attack rate by approximately 50 percent. Therefore, the tenfold difference in the May-June 1966 study suggests a significant decrease in cases attributable to DDS chemoprophylaxis plus some other factor.

The other factor was malaria discipline. Malaria discipline in the battalions of the 1st Cavalry Division which participated in the March-April study was documented to be poor. Study observers from the May-June study stated that malaria discipline in the 3rd Brigade, 25th Division was excellent, but there was no interview data to

substantiate malaria discipline in the 25th Infantry Division nor the 1st Cavalry Division. However, the May-June study contains data on the distribution of malaria cases by rank. Using this type of data one could reasonably hypothesize that if malaria discipline is being practiced by anyone, then officers and senior NCOs would be most likely to practice personal protective measures and thus be less likely to contract malaria. Using such a hypothesis the data depicted in Table 11 suggest that malaria discipline in the three battalions (1/14, 1/35, and 2/35) of the 25th Infantry Division was good, while malaria discipline in the two battalions (2/5 and 2/12) of the 1st Cavalry Division was poor.[67]

Table 11. Malaria Cases by Rank

Rank	Battalions 2/5	2/12	1/14	1/35	2/35
O-3	1	1	0	0	0
O-2	3	2	0	0	0
O-1	0	1	0	0	0
E-9	0	0	0	0	0
E-8	2	2	0	0	0
E-7	2	1	1	0	0
E-5 and E-6	39	16	10	7	9
E-3 and E-4	79	103	29	26	12
Total	126	126	40	33	21

Source: LTC Robert J. T. Joy and CPT William R. Gardner, "Malaria Chemoprophylaxis Using Di-Amino, Di-Phenyl Sulfone; II: Field Trial with the 3rd Brigade, 25th Infantry Division," United States Army Medical Research Team (WRAIR) Vietnam, Annual Progress Report, 1 September 1965 - 31 August 1966 (1966): p. 49.

The studies conducted by the WRAIR medical research team within the 1st Cavalry Division and the 25th Infantry Division in 1966 demonstrated that an infantry unit with good malaria discipline and taking DDS chemoprophylaxis would experience approximately one-tenth the malaria cases of a similar unit with weak discipline and not taking DDS chemoprophylaxis. The studies further suggested that in two units exposed to the same malaria threat and taking DDS chemoprophylaxis, the unit with good malaria discipline would experience approximately 40 percent fewer malaria

cases. "In rule-of-thumb terms, DDS (in conjunction with the weekly chloroquine-primaquine tablet) will reduce a malaria rate by half, and good malaria discipline will reduce it by more than half again."[68]

Persian Gulf War

Impact of Disease

The Persian Gulf War, code named Operation Desert Shield and Desert Storm (ODS), lasted half a year, commencing on 7 August 1990 and terminating on 28 February 1991. The campaign was well orchestrated and remarkably successful. Contributing to the success of ODS was the extremely low incidence of disease. ARCENT medical data reflects an ODS disease rate which was 40 percent lower than that of the Vietnam War and 85 percent lower than the HQDA planning factor.[69] Despite our general success in preventing disease during ODS, sporadic outbreaks occurred when preventive medicine principles were ignored. For example, early in the ODS deployment over 50 percent of the units in a division-size force suffered from a diarrhea epidemic. The primary source of the problem was traced to non-approved, locally procured foods.[70]

VII Corps

When President Bush decided on 8 November 1990 to expand the range of options beyond the defense of Saudi

Arabia and to develop an offensive capability, VII Corps was ordered to deploy from Europe to the Kuwaiti Theater of Operations (KTO). From their initial deployment to their redeployment, VII Corps was an extremely healthy command with respect to the incidence of disease. From a commanders perspective there were two primary factors contributing to the ability of VII Corps to remain relatively disease free.

The first factor was the personal sensitivity of key leaders to the rigors of war and the significant role of military medicine. The VII Corps Commander, LTG Frederick Franks was wounded in Vietnam and subsequently underwent a below-the-knee amputation of his left leg. The VII Corps Operations Officer, COL Stanley Cherrie, suffered a similar injury during the Vietnam War. The VII Corps Surgeon, COL Robert Griffin, was unique in his first hand knowledge of the rigors of war, having served as an infantry commander in Vietnam before completing his medical schooling.[71] The experiences of these men were invaluable in recognizing the significance of military medicine during war.

The second factor was the command emphasis placed on the prevention of disease. General Franks clearly communicated his paramount concern for the care of his soldiers. He implemented a detailed tracking system to ensure all his soldiers were educated on the medical threat of the KTO. The medical threat briefings covered the perils of desert living, the need for enforced water discipline, the possibilities of infectious diseases resulting from

undisciplined hygiene practices, and medical precautions against chemical and biological agents. General Franks also actively supported the immunization program conducted by his preventive medicine teams.[72]

The benefits of VII Corps command emphasis on disease prevention were not reflected in drastic before and after disease incidence rates because of the proactive nature of the command. When a command emphasizes disease prevention from the conception of a campaign plan to its final execution, there are no impressive changes in the disease incidence rates. VII Corps intelligently conducted their disease prevention program by placing early emphasis on disease prevention and by the emphasis starting at the top with the Corps Commander, General Franks.

CHAPTER 3

ENDNOTES

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CHAPTER 4

DISCUSSION

Introduction

The purpose of this chapter is to analyze the research information presented in Chapter 3 against the null hypothesis and to evaluate disease prevention trends. In this study the null hypothesis is that a commander does not significantly influence the occurrence of disease in his unit. The criteria for the null hypothesis are the relative incidence of disease and the overall combat degradation resulting from a commander's inattentive attitude towards preventing disease.

Null Hypothesis Assessment

American Revolutionary War

During the American Revolutionary War the foundation for disease prevention was laid by leaders such as General George Washington, Major General Baron von Steuben, Dr. Benjamin Rush, and Dr. James Tilton. Although these men did not understand the science of disease transmission, they did recognize that there was a direct correlation between cleanliness/sanitation and disease transmission. Generally the greater the degree of cleanliness/sanitation the lower

the incidence of disease. Although the medical sciences have exponentially advanced since the American Revolutionary War, the relationship between cleanliness/sanitation and disease is still valid today and important to the effective control of diseases.

By today's standard, the Continental Army was not very successful in preventing diseases, as historians estimate that approximately ten Continental Army soldiers died of disease for every battle fatality.[1] However, the leadership efforts of such men as Washington, von Steuben, Rush, and Tilton helped to reduce by approximately 50 percent the relatively high average annual disease rate reported in the first half of the war (1775-1778) versus the second half of the war (1779-1783).[2] In the Battle of Yorktown, the culminating battle of the war, Washington kept his soldiers relatively free of disease, while Cornwallis and his British troops experienced a 25 percent casualty rate attributable to disease alone.[3]

Spanish American War

The Spanish American War was considered an impressive victory for the United States, but from a disease prevention perspective, this war was a disaster. Approximately ten times more soldiers died from diseases than from battle injuries.[4] In analyzing the medical disaster of this war, the case studies of the U.S. camps tend to subjectively disprove the null hypothesis of this study.

During the Spanish American War, typhoid was the primary disease affecting units placed in camps throughout the U.S. Some units, such as the Second Pennsylvania Volunteer Infantry Regiment, experienced very low typhoid rates. The commanders in the Second Pennsylvania Regiment had a sincere and active interest in the hygiene of the camps. In contrast to the commanders of the Second Pennsylvania Regiment were the commanders of the First Division, Third Army Corps, who generally displayed marginal interest in the hygiene of the camps. Unfortunately, the First Division suffered from a significantly higher incidence of typhoid than the Second Pennsylvania Regiment. This difference in the incidence of typhoid was largely attributable to the low level of interest displayed by most of the First Division commanders towards cleanliness and disease prevention.

Within the First Division there was a wide range of total cases of typhoid, as well as a wide range of commander's attention to disease prevention. Units such as the Second Nebraska Volunteer Infantry Regiment, which was led by commanders sensitized to the significance of disease prevention, had relatively few cases of typhoid (167 cases). Conversely, units such as the Eighth New York Volunteer Infantry Regiment which were led by commanders with at best marginal interest in disease prevention had relatively high cases of typhoid (425 cases).[5] The conditions existing within the Second Nebraska and Eighth New York Regiments

were practically identical with respect to camp location, time period spent in camp, and size of unit. The primary difference between the two regiments was the sensitivity of their commanders to the significance of disease prevention.

World War II

By World War II, medical technology was rapidly advancing, but diseases continued to play a significant role in combat effectiveness. Through the application of medical technology the historical excess of deaths from disease over deaths from battle injury was strongly reversed by the U.S. Army in World War II. For the first time in U.S. history, deaths due to battle injuries exceeded deaths due to diseases. However, disease continued to be the major cause of disability in the U.S. Army. The number of hospital admissions for disease was more than five times greater than that for battle casualties and nonbattle injuries.[6]

World War II commanders varied greatly in their ability to recognize and deal with the significance of disease. In this study three case studies were used to clearly demonstrate the significant role of a commander in protecting the health of his soldiers. The first case study focused on the leadership of Field Marshall Rommel during his North African Campaign. There is a general consensus that Rommel was a tactically brilliant commander. However, he demonstrated a poor ability to protect the health of his soldiers. His inattention to the health of his command led

to massive attrition of irreplaceable seasoned veteran troops and contributed significantly to his ultimate defeat. Although the British and Germans were fighting in the same hostile desert environment, a German soldier was 2.6 times as likely to become medically ineffective as was his British counterpart.[7] The medical conditions that disproportionately weakened Rommel's army were preventable by well understood and usually simple measures; measures which the British Army implemented. There was no evidence to illustrate Rommel's recognition of the commander's responsibility for the health and welfare of his soldiers, and the capability of military medicine to maintain the health of the command. In hindsight, Rommel believed that disease contributed more to his defeat in North Africa than the British Army.[8]

The second case study focused on the leadership of General Slim during his Burma Campaign. Slim was credited with reversing the longest and most humiliating retreat in the history of the British Army, and ultimately inflicting upon the Japanese Army one of its worst defeats. His achievements reinforce the significance of a knowledge of military medicine for the combat commander. Upon taking command, Slim recognized that he had to personally take action to prevent further erosion of his manpower strength caused by an excessively high disease rate. He actually fired commanders who he considered incompetent to command because they had needlessly allowed diseases to render their

unit ineffective. Slim's sensitivity to the significance of disease prevention resulted in a twelvefold decrease over a two year period in the disease rate in his command.[9]

The third case study focused on Brigadier General Merrill and his Marauders. Throughout their brief existence the Marauders experienced a high disease rate which was primarily attributable to the severe environment and Merrill's lack of emphasis on health discipline. The Marauders performed splendidly on the battlefield, inflicting on the enemy ten times the number of battle casualties they received.[10] However their poor health discipline eventually resulted in the inglorious demise of the Marauders as 66 percent of the unit became disease casualties.[11] Merrill and his subordinate commanders failed to heed the advice of their medical advisors and failed to enforce health discipline.

Vietnam War

In Vietnam the cumulative effect of disease was once again the greatest drain on U.S. combat effectiveness.[12] To combat the prevalent diseases of the area, a comprehensive preventive medicine program was developed which built upon lessons learned from previous conflicts and continuing advances in the medical sciences. Unfortunately not all field commanders effectively supported the preventive medicine program.

The significance of a commander's sensitivity to disease prevention was demonstrated in the case study of the 1st Cavalry Division versus the 25th Infantry Division. This case study was based on a malaria chemoprophylaxis study conducted by WRAIR from March to June 1966. An unintended result of the study involved health discipline. The health discipline enforced by the commanders of the 1st Cavalry Division was documented to be poor. Conversely, the health discipline enforced by the commanders of the 25th Infantry Division was documented to be excellent. The 25th Infantry Division had one-tenth the malaria cases of the 1st Cavalry Division. The study suggested that the excellent health discipline displayed by the 25th Infantry Division accounted for approximately 40 percent of the difference in malaria rates between the two units.[13]

Persian Gulf War

The U.S. Army experienced an extremely low incidence of disease during the Persian Gulf War. A detailed analysis of the commander's impact on preventing diseases during this conflict is currently difficult to perform because much of the data is still classified and the professional analysts are still accumulating and assessing the raw data. However, a brief review of information available at CGSC on VII Corps indicated that there was a strong emphasis placed on disease prevention by the Corps Commander, General Franks.

VII Corps benefitted from a commander who was sensitized to the significant role of military medicine and knowledgeable on the need to be proactive on health matters. By visibly caring for his soldiers, General Franks reaped many dividends. The support he gave his soldiers and his medical staff reflected itself in an extremely low disease incidence rate and ultimately the ability to effectively fight in a hostile desert environment. If ODS had become a protracted conflict, VII Corps probably would have remained healthy because of General Franks emphasis on preventing disease.

Trends

Medical Technology

The data presented throughout this study reflects a declining incidence of disease as one progresses through the military history of our nation. The reduced incidence of disease is attributable primarily to the tremendous advancements in the medical sciences. Because of the rapid advancements in the field of military medicine, there is a tendency to question the relevancy of 18th and 19th century wars to today's Army. On the surface the nexus does appear to be weak at best. When our nation was founded physicians could not identify the causative agents of disease. Today not only can physicians identify the causative agents, but they have developed medications and vaccinations that offer protection from many of the diseases which have plagued

armies throughout history. Consequently, people are tempted to ignore the relevancy of previous lessons learned on disease prevention, believing that medical technology has substantially eliminated the future disease threat.

Such an attitude is dangerous for several reasons. First, medical technology is a tool that is useless unless properly used and enforced by the commander. Medical technology does not in and of itself guarantee success against disease. Second, health discipline is as important today as it was during the American Revolutionary War with respect to preventing disease. Personal hygiene and sanitation are still key factors in deterring the occurrence and spread of disease. Third, new diseases are periodically identified (i.e., Legionaires Disease and AIDS) and more resistant strains of old diseases (i.e., malaria) are evolving for which medical technology cannot be relied upon to offer adequate protection.

Study of the Significance of Disease

During my research of our nation's military history I observed that documentation on the successes and failures of disease prevention was provided almost exclusively by medical personnel. Line commanders rarely document their lessons learned on disease prevention, with General Slim being a notable exception. Paradoxically, line commanders play the pivotal role in preventing diseases because they are responsible for the health of their soldiers. The

reluctance of line commanders to study disease prevention is probably due to the unglamorous nature of disease prevention and the perception that disease prevention is a medical issue.

When medical personnel document their experiences in disease prevention there is a general reluctance to identify the involved commanders by name. For example, the names of the line commanders in my Spanish American War and Vietnam War case studies were not readily available. The names of these line commanders are important, not to fix the blame or credit on a single individual, but rather to further the study of why the commander was or was not sensitized to the significance of disease prevention.

Conflicts of the 80's and 90's

During the 1980's and thus far in the 1990's our nation has fought in three mid-intensity conflicts: Urgent Fury in Granada; Just Cause in Panama; and Desert Shield/Desert Storm in the Persian Gulf. These conflicts can potentially lull us into a false sense of security with respect to the significance of disease prevention. During these three conflicts disease did not significantly affect our combat efficiency. This was primarily because of our overwhelming relative combat strength which resulted in a very short duration conflict. During short duration conflicts, commanders have a relatively easy time maintaining a high level of discipline and motivation among their sol-

diers. In a short duration war soldiers generally want to stay healthy and fight along side their fellow soldiers. As a conflict drags on, soldiers become more exposed and less inclined to maintain their personal hygiene, and thereby become more susceptible to disease. Commanders experience a greater degree of difficulty in maintaining discipline, to include health discipline, as a war lengthens in duration.

Although a nation often enters a war hoping that it can quickly achieve its objective, such is not always the case as history has often recorded. Therefore, a prudent commander will not count on a short war, but will remain sensitized to the challenges of disease prevention which become more pronounced during protracted conflicts. The value of each individual soldier is increasing because of the following factors: technology is increasing the lethality of weapons; and automation and congressional pressure are decreasing the size of our Army. Thus, future commanders can ill afford to lose their soldiers to diseases that could have been prevented with proper command emphasis.

Commander's Training on Disease Prevention

It goes without saying that an army will fight as it has been trained. Unfortunately, today's commander receives virtually no formal indoctrination on the significance of disease prevention. There are currently no core courses offered in disease prevention at the army military academy, staff college, or war college.[14]

The Office of the Surgeon General (OTSG) Professional Services Directorate sponsored a Desert Shield/Desert Storm After Action Review in June and July of 1991. One of their recommendations was to include disease prevention instruction as part of the CGSC core curriculum.[15] The CGSC academic staff recently introduced a course entitled "Commander's Influence on Health Services During War," but unfortunately the course is an elective which has thus far attracted more Army Medical Department (AMEDD) officers than line officers.

The POI for the CGSC Brigade and Battalion Pre-Command Course (2G-F22), dated 14 February 1990, contains no instruction on disease prevention. The POIs for the various branch school Brigade and Battalion Pre-Command Course also contain no instruction on disease prevention, with the exception of the AMEDD. The AMEDD has a two hour block of instruction on disease prevention entitled, "The Medical Threat to Field Forces and Preventive Medicine Measures."

Instruction on disease prevention for line officers would not require a significant portion of curriculum time. Line officers primarily need instruction on the broad concepts of disease prevention, to include the following:

1. The commander's responsibility for the health of his command.
2. Information the commander needs to know to assess the health of his command.

3. Responsibilities of the medical staff and supporting medical units.
4. Sources of manpower attrition during war and the spectrum of the medical threat.
5. A basic knowledge of field sanitation.
6. The commander's role in countering the principal medical threats to military operations and personnel.[16]

Such instruction would provide commanders with an understanding of why they need to be as involved in the health of their command as they are in the signal or maintenance support.

The Military Qualification Standards (MQS) recognizes the significance of preventing disease. Such recognition serves to further support the desirability for formal instruction on preventing disease. At the company grade level, MQS II, Manual of Common Tasks, contains a task entitled "Supervise Unit Preventive Medicine and Field Sanitation Procedures."[17] The MQS III Leader Development Manual, currently in draft form, lists command influence on health services as an area of knowledge for majors, but not for lieutenant colonels. This area of knowledge is most directly applicable to lieutenant colonels because they and not majors normally fill commander positions. The MQS III reading list contains some books which touch upon the significance of preventing disease, most notably Defeat Into

Victory by Slim.[18] Although the reading list contains only books, journal articles are also great concise sources of knowledge. For example, "Preventable Casualties: Rommel's Flaw, Slim's Edge," by Ronald Bellamy and Craig Llewellyn (appeared in the May 1990 edition of Army) would be a valuable addition to the MQS III reading list.

CHAPTER 4

ENDNOTES

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CHAPTER 5

CONCLUSIONS

Introduction

Throughout our nation's military history disease has caused significant problems for field commanders. Strategic, operational, and tactical brilliance are of marginal value if a commander has few men fit to fight. The purpose of this chapter is to present conclusions, based upon the information presented in the previous chapters of this study, on the commander's impact on preventing disease during military conflicts.

Problem Definition

The purpose of this study was to evaluate the commander's impact on preventing disease during military conflicts. Specifically, this study focused on the following primary question: Is the commander's impact on disease prevention a significant issue for today's Army? To address the primary question this study presented both statistical data and antidotal information in the form of case studies.

Conclusions

Disease Threat

The disease threat confronting military forces hasn't diminished with the passage of time. When soldiers leave the relative comforts of peacetime garrison installations and deploy for combat, their vulnerability to disease increases dramatically because of three primary reasons. First, the combat mission often requires them to fight and live in places which would ordinarily be avoided because of endemic diseases, insect infestations, or inclement weather. Second, once soldiers arrive in such places, they must exist under spartan conditions. Third, the soldier's natural bodily defenses against disease are greatly reduced by the following stress inducing experiences: physical exertion; irregular meals; irregular sleep; psychological anxiety; and environmental discomforts.

Military forces throughout history have had to confront this disease threat. The case studies presented in this study demonstrate that commanders who are sensitized to the significance of preventing disease experience a greater degree of success in maintaining combat effectiveness.

Disease Incidence

This study presented statistical disease incidence data. The data reflected the significance of disease during military conflicts. Although World War II marked the first war in which battle deaths exceeded disease deaths,

morbidity, and not mortality, is the primary determinant of combat effectiveness and medical workload. The relative importance of disease to the overall morbidity rate is demonstrated by the fact that during the Vietnam War disease alone accounted for unheralded annual rates of 56 to 74 percent of all U.S. Army hospital admissions from 1965 to 1969.[1] Additionally, the affect of disease on combat effectiveness is greater than the historical statistics reveal because such statistics are exclusive of the non-hospitalized disease inflicted soldiers.[2]

Commander's Impact

The case studies presented in this study addressed commanders from the American Revolutionary War to the Persian Gulf War, from General George Washington to General Frederick Franks. A common thread emerged from the case studies. Commanders who took an active interest in the health of their command by emphasizing health discipline achieved a relatively high degree of success in preventing diseases. Conversely, commanders who didn't emphasize health discipline were beset with a relatively high disease incidence rate. General Patton stated that "Officers are responsible, not only for the conduct of their men in battle, but also for their health . . . ."[3] Unfortunately, this responsibility is not always fulfilled by field commanders.

Medical Technology

During the American Revolutionary War commanders knew only simple rules for preventing diseases, such as camp on high ground, bury wastes, and move often. To be effective, these rules required commanders to enforce health discipline. Today, medical science and technology provides us with an understanding of pathogens and their life cycles. Upon such a knowledge base, researchers develop vaccines and prophylactic medications to reduce susceptibility to diseases, and chemicals to inhibit or kill insect vectors. Like the simple disease prevention rules of the American Revolutionary War, modern medical science and technology are only effective when commanders enforce health discipline.

Study of the Significance of Disease

Historical lessons learned on the significant role of commanders in preventing disease are usually not well documented. The medical community focuses on the technical aspects of disease prevention and only rarely addresses the impact of commanders. Line commanders focus on the strategic, operational, and tactical aspects of warfare. Consequently, the pivotal role played by commanders in preventing disease is usually not captured in historical reports.

Conflicts of the 80's and 90's

The success enjoyed by U.S. military forces in preventing diseases during the extremely short duration

conflicts of the past ten years will not guarantee success in all the possibilities of future conflicts. Such success may actually hinder future successes if analyst use the extremely low disease incidence rates as rationale to deemphasize the significance of disease prevention. In the future the U.S. may be involved in a large scale, protracted war in an environmentally hostile area. The disease challenges facing military forces in this type of war far exceed those of short duration conflicts. Additionally, such a war would involve a new set of commanders who may not be as sensitized to the significance of disease prevention as were the VII Corps commanders during ODS.

The most recent conflict, ODS, has been referred to as the mother of all military anomalies.[4] Indeed every war is unique. Therefore the conflicts of the 80's and 90's should not be used as the only model for future conflicts upon which to base the future significance of disease prevention.

Commander's Training on Disease Prevention

The Army Command and General Staff College, Pre-Command Course, and Army War College currently do not indoctrinate commanders on the significance of disease prevention and their pivotal role in maintaining healthy soldiers. Without full command support, most disease prevention efforts will fail. Thus, the Army needs to encourage commanders to have the same degree of sensitivity

about disease prevention as they do about their other areas of responsibility.

Significance of Study

The U.S. Army can expect to fight some difficult conflicts in the future. Soldiers will become inflicted with disease in these conflicts. Commanders will significantly impact on the disease incidence rate through their command emphasis on preventive medicine. Thus, commanders could gain a relative advantage over enemy commanders who fail to emphasize disease prevention. As the future Army decreases in size, commanders must increase efforts to conserve their fighting forces.

Future Research

This study has raised additional issues and areas that lend themselves to additional in-depth research. These areas, which went beyond the scope of this study, are listed below.

1. Why do some commanders emphasize disease prevention more than other commanders? Is it because of their educational background, personal experiences with diseases, individual character traits, or influence of family members and close friends?

2. With the multitude of factors affecting combat disease rates, how can medical planners best predict the disease incidence rate for future conflicts?
3. What are the Persian Gulf War lessons learned on disease prevention and how can they best be applied to 21st century warfare?
4. Will the threat of artificially induced diseases through the use of biological warfare exceed the threat of naturally induced diseases during the 21st century? If so, are we prepared to meet this new type of disease threat?

CHAPTER 5

ENDNOTES

[1]Timothy Dickens, "Bugs and Battlefields," Defense (September/October 1990): p. 29.

[2]Alfred M. Allen, Internal Medicine in Vietnam, Volume I, Skin Diseases in Vietnam, 1965-72 (Washington, D.C.: Office of the Surgeon General and Center of Military History, 1977), pp. 44-45.

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[4]David H. Hackworth, "The Lessons of the Gulf War," Newsweek (24 June 1991): p. 22.

APPENDIX A

APPENDIX A

GLOSSARY OF ABBREVIATIONS AND ACRONYMS

AIDS	- Acquired Immunodeficiency Syndrome
AMEDD	- Army Medical Department
CGSC	- Command and General Staff College
C-P	- Chloroquine-Primaquine
DDS	- Di-Amino, Di-Phenyl Sulfone
DDT	- Dichloro-Diphenyl-Trichloro-Ethane
DNBI	- Disease and Nonbattle Injuries
FUO	- Fever of Undetermined Origin
KTO	- Kuwaiti Theater of Operations
MFTU	- Malaria Forward Treatment Unit
MQS	- Military Qualification Standards
ODS	- Operation Desert Shield and Desert Storm
OTSG	- Office of the Surgeon General
POI	- Program of Instruction
SOF	- Special Operation Forces
WRAIR	- Walter Reed Army Institute of Research

APPENDIX B

APPENDIX B

DISEASE DESCRIPTIONS

Dysentery

Dysentery is caused by microorganisms that thrive within the intestines of infected individuals. The most common types of dysentery are amoebic dysentery, caused by amoebae, and bacillary dysentery, caused by bacteria. Dysentery is characterized by diarrhea with blood and puss in the stools, abdominal cramps, and fever. The infections are spread from individual to individual through excrement that contaminates food and/or water. Houseflies are often responsible for spreading dysentery as they feed on infected fecal matter. Dysentery should be treated early with antibiotic drugs to avoid erosion of the intestinal wall.[1]

Hepatitis

Hepatitis is a viral disease which causes an inflammation of the liver. There are numerous types of hepatitis which can be categorized as either infectious (i.e. hepatitis A) or serum (i.e. hepatitis B) hepatitis. Infectious hepatitis is usually transmitted by food and water contaminated by feces from an infected person. Serum hepatitis is usually spread by blood transfusions or by

infected needles. The incubation period of infectious hepatitis ranges from 15 to 45 days. Serum hepatitis has an incubation period ranging from 15 to 180 days. Both forms of hepatitis are characterized by fever with headache, loss of appetite, and gastrointestinal distress. As the disease progresses, the liver becomes enlarged and the patient jaundiced. There is no specific treatment for hepatitis, but rest is essential.[2]

Leishmaniasis

Leishmaniasis is a parasitic disease found in rural tropical and subtropical areas of the world. It is transmitted by the bite of some species of sandflies. Leishmaniasis usually presents itself in either a cutaneous (skin) or a visceral (internal organ) form. Cutaneous leishmaniasis is characterized by one or more skin sores, which can be either open or closed. The symptoms of visceral leishmaniasis include fever, enlargement of the liver and spleen, and anemia. Cutaneous leishmaniasis has an incubation period of normally 2 to 8 weeks. The incubation period for visceral leishmaniasis is usually 3 to 8 months. Cutaneous leishmaniasis does not necessarily require treatment. However, visceral leishmaniasis is a life threatening disease requiring drug treatment.[3]

Malaria

Malaria in humans is caused by one of four protozoan species of the genus Plasmodium. The disease is transmitted by the bite of an infected female Anopheles mosquito. Because of the nocturnal feeding habits of Anopheles mosquitoes, malaria transmission occurs primarily between dusk and dawn.[4] Usually the first symptoms of malaria develop in ten days to six weeks following an infected Anopheles mosquito bite. The symptoms of malaria differ among various patients because the four known types of plasmodia that cause the infection do not produce the same specific effects. However, malaria is generally characterized by fever and flu-like symptoms including chills, headache, myalgias, and malaise, which may occur at intervals. Malaria may be associated with anemia and jaundice, and P. falciparum infections may cause kidney failure, coma, and death. However, deaths resulting from malaria are preventable through the use of antimalarial drugs.[5]

Plague

Plague is one of the great disease menaces of past centuries. The most notorious plague epidemic was the Black Death of the 14th century when the disease killed at least 50 million people. There are three types of plague: bubonic, primary septicemic, and pneumonic. The disease is usually transmitted from animals to man by the bite of fleas

living on rats, squirrels, and rabbits. The hallmark symptom of bubonic plague is buboes, which are enlarged lymph nodes normally in the leg and groin area. Septicemic plague is characterized by high fever, but without buboes. Symptoms of pneumonic plague include chest pain, bloody sputum, progressive respiratory insufficiency, and toxemia. Plague can be effectively treated with antibodies. Untreated bubonic plague has a case-fatality rate of about 50 percent, while untreated primary septicemic and pneumonic plague are invariably fatal.[6]

Rabies

Rabies is an acute viral disease of the central nervous system transmitted to humans by the bite or saliva of an infected animal, such as a dog, bat, squirrel, fox, or skunk. The incubation period is normally 14 to 60 days. Rabies is characterized by pain at the site of infection, extreme sensitivity of the skin to temperature changes, and painful spasms of the larynx that makes it almost impossible to drink. Saliva thickens and the patient becomes restless and easily excitable. By the time symptoms develop, death may be imminent. There is no specific treatment for rabies. Therefore, treatment is directed solely at supportive care.[7]

Schistosomiasis

An estimated 200 million people worldwide are infected with schistosomiasis. This disease is caused by flukes whose complex life cycles use specific fresh water snail species as intermediate hosts. Infected snails release large numbers of minute free-swimming larvae which can penetrate the unbroken skin of the human host. Even brief exposures to contaminated water can cause an infection. People at greatest risk are those who engage in wading or swimming in fresh water in rural areas where poor sanitation and appropriate snail hosts are present. Humans cannot acquire schistosomiasis by wading or swimming in salt water. The incubation period is usually 1 to 3 months. The most common acute symptoms are fever, lack of appetite, abdominal pain, diarrhea, headaches, nausea, and cough. Drugs are available for treating schistosomiasis.[8]

Typhoid

Typhoid, also known as enteric fever, is an acute, highly communicable disease caused by a bacterial organism. Typhoid often occurs in locations where unsanitary living conditions predominate. Flies can transmit the disease, as can shellfish that live in typhoid-infested waters. Usually the first symptoms of typhoid develop ten days after infection with the bacteria. Typhoid is characterized by general bodily discomfort, fever, headache, nausea, vomiting, and abdominal pain. If untreated, typhoid

patients die within 21 days of the onset of the disease. Destruction of the bacilli is achieved by antibiotic therapy.[9]

APPENDIX B

ENDNOTES

[1]Richard J. Wagman, The New Complete Medical and Health Encyclopedia (Chicago: J. G. Ferguson Publishing Company, 1977), pp. 852-853.

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[3]Ibid., pp. 990-992.

[4]Centers for Disease Control, Health Information for International Travel, 1991 (Washington, D.C.: U.S. Government Printing Office, June 1991), pp. 96-99.

[5]Richard J. Wagman, The New Complete Medical and Health Encyclopedia (Chicago: J. G. Ferguson Publishing Company, 1977), pp. 986-989.

[6]Ibid., pp. 980-983.

[7]Ibid., pp. 1089-1090.

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