DTIC FILE COPY

(2)

THE EFFECT OF COMBAT LEVEL ON DISEASE AND NON-BATTLE INJURY

AD-A224 754

W. M. PUGH

DTIC
ELECTE
AUG 02 1990
S D
E

REPORT NO. 90-9

Approved for public release; distribution unlimited.

NAVAL HEALTH RESEARCH CENTER
P.O. BOX 85122
SAN DIEGO, CALIFORNIA 92186-5122

NAVAL MEDICAL RESEARCH AND DEVELOPMENT COMMAND
BETHESDA, MARYLAND

90 08 02 065

THE EFFECT OF COMBAT LEVEL ON DISEASE AND NON-BATTLE INJURY

William M. Pugh

Medical Decisions Support Department
Naval Health Research Center
P.O. Box 85122
San Diego, CA 92186-5122

Accession For
NTIS GRA&I
DTIC TAB
Unannounced
Justification
By
Distribution/
Availability Codes
Dist | Avail and/or Special
A-1

QUALITY INSPECTED 4

Report 90 - 9, supported by the Naval Medical Research and Development Command, Department of the Navy, under work Unit No. M0095.005-6004. The views expressed in this article are those of the authors and do not reflect the official policy or position of the Department of Defense, nor the U.S. government. Approved for public release, distribution unlimited.

SUMMARY

Problem

Disease and Non-Battle Injury (DNBI) rates may differ between peacetime and wartime because of physiologic factors such as stress, and because of differences in patient handling. Therefore, peacetime DNBI rates may not be proper estimates of wartime DNBI rates.

Objective

The first goal was to assess the effect of combat level on DNBI rates. The second goal was to devise a method for combining the effect of combat information with information on peacetime DNBI rates to estimate wartime DNBI rates.

Approach

Navy and Marine Corps hospital admission data for the period from 1980 through 1984, and data gathered during 1989 on outpatients requiring bed rest for one or more days were used to determine peacetime DNBI rates. Vietnam data was used to establish combat rates for the Marine Corps, and World War II data was used to represent Navy and Marine Corps combat rates. Differences between the recent rates and the Vietnam and World War II rates was attributed to the effect of combat.

Results

Higher DNBI rates were found during combat than during peacetime. This difference was more pronounced for inpatient rates than for outpatient rates.

Conclusions

The results can be used to develop a matrix showing the relationship between outpatient rates, inpatient rates, and level of combat which can be used as a medical planning tool. In addition, these data provide a means for estimating wartime DNBI rates from peacetime information.

THE EFFECT OF COMBAT LEVEL ON DISEASE AND NON-BATTLE INJURY

Medical planners employ computer models to determine medical resource requirements by specifying the patient load expected for a wide range of combat scenarios. Clearly, accurate patient load information is needed to obtain reliable estimates from these models. For planning purposes, patient load is divided into Battle Injuries (BI), and Disease and Non-Battle Injuries (DNBI), because the former is a function of the action being planned while the latter is related to natural epidemiologic processes such as climate effects and the composition of the population.

Although battle injuries are a significant concern during wartime, Hoeffler and Melton[1] found that DNBI consistently accounted for more Navy and Marine Corps sick list admissions during World War I, World War II, the Korean conflict, and Vietnam. Similarly, Reister[2] shows that DNBI admissions accounted for a large majority of all admissions for Army personnel during both World Wars. Moreover, Hoeffler and Melton[1] pointed out that, "wartime morbidity and mortality are superimposed upon long-term secular changes." To establish baseline DNBI rates for individuals stationed in different geographic areas, analyses of illnesses and injuries for Navy enlisted personnel was conducted by Pugh, et. al[3] and a parallel study of the Marine Corps was performed by Hermansen et. al[4]. Both studies found some geographic variation, although the results differed somewhat between the Navy and Marine Corps populations. Navy personnel tended to have higher DNBI rates in Europe and Northeast Asia, and lower rates in Southwest Asia and the continental United States (CONUS). Marine Corps personnel differed because the DNBI rate found for Europe tended to be relatively low. Both populations had a similar distribution of hospital admissions across illness categories with Mental Disorders, Digestive Diseases, and Accident Poisoning and Violence consistently accounting for a greater portion of total admissions than the other categories.

It can be argued, however, that DNBI from data gathered during peacetime is not sufficient to estimate the occurrence of DNBI in combat zones. During World War II, for example, the rate of Non-Battle injuries was found to be considerably higher for Army troops outside the United

States than those in the continental United States[2]. Therefore, the current study was conducted to determine the effect of combat level on DNBI rates so that an appropriate adjustment to data gathered during peacetime could be performed, if necessary. To clarify how DNBI rates may be influenced by combat level, a conceptual model was developed. Then DNBI data from past conflicts was compared to the Navy and Marine Corps peacetime data to assess the difference in DNBI rates in peacetime versus wartime.

Conceptual Model

Injuries that result directly from combat are used to form the BI rate for a given conflict, but increased levels of combat intensity may have indirect effects that are reflected in DNBI rates. First, the level of combat may be perceived by an individual as stressful, and over time, may result in the manifestation of stress related disorders. Second, forces must be mobilized to engage the enemy, thus causing personnel to be exposed to new flora and fauna, and possibly subjecting them to a dramatic change in climate. In addition, the mobilization process may require individuals to work long hours in temporary accommodations causing them to lose sleep and forego optimal hygiene practices. Consequently, an indirect result of an increase in combat intensity may be a greater exposure to various disease and injury agents. Therefore, the combination of increased stress and increased exposure to disease and hazardous agents might lead to an increased occurrence of illness and injury.

In addition to a potential effect on morbidity, level of combat may affect patient handling. First, the level of combat may motivate a person to seek, or not seek, treatment for a physical disorder. For example, under high levels of combat a person may decide not to seek treatment of a minor problem such as a headache or an upset stomach. Also, in a combat environment the medical facilities may not be easily accessible, thereby decreasing the likelihood that a person would seek treatment. Once examined, patients must be hospitalized or treated on an outpatient basis; and the outpatients must either be returned to duty, or be given rest.

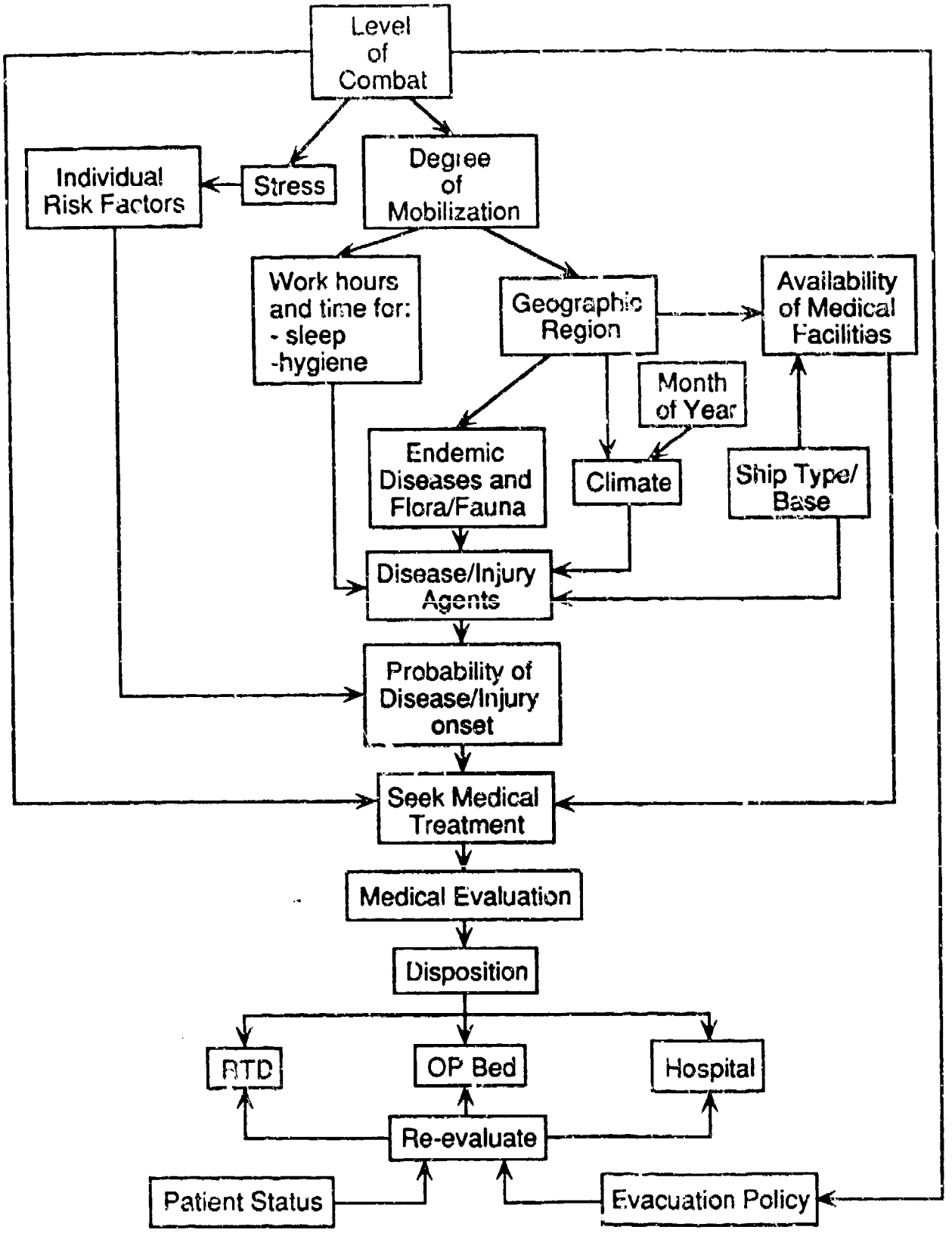

Figure 1. Flowchart of factors potentially affecting DNBI rates

This latter group, then, must be monitored and eventually hospitalized or returned to duty. This monitoring is not only a function of the patient's recuperation, but during combat, it is also a function of the need for beds and medical resources to treat combat casualties.

These factors and their inter-relationship are depicted in Figure 1. The upper portion of this figure shows those factors affecting the onset of disease or injury, and the lower portion outlines the various outcome possibilities. It is important to notice that illness and injury rates can be computed from information gathered at different stages of the patient handling process. The number of people seeking medical treatment is used to determine a sick call rate, and those people seeking treatment who require one or more days rest but are not admitted to a hospital are counted as outpatients. Those individuals requiring hospitalization are counted as inpatients, and the combination of the outpatients and inpatients is used to compute illness incidence.

Data

Medical records of past military conflicts were compared to peacetime data to assess the effect of combat on DNBI rates and allow an appropriate method for translating peacetime rates to wartime rates to be formulated. The peacetime data used in these comparisons was the information reported by Pugh et. al[3] and Hermansen, et. al[4] and is reproduced in Table 1.

When reviewing past military conflicts, Vietnam was considered first because it was the last major action by the United States, and because medical information on personnel in Vietnam can be drawn from the same sources[3,4] used to determine peacetime DNBI rates. To obtain hospital admission DNBI rates for Vietnam for the period between July 1965 and June 1971, data on U.S. Marine Corps personnel reported by Blood, et.al[5] are summarized in Table 2. These data indicate that during the Vietnam conflict Marines sustained DNBI at a rate of 0.852 per 1,000 per day.

Table 1

PEACETIME DNBI RATES
(Patients per 1,000 personnel per day)

SERVICE	PATIENT TYPE	SUB POPULATION	WORLD REGION: EUROPE	NORTHEAST ASIA	SOUTHWEST ASIA	CONTINENTAL UNITED STATES
NAVY [a]						
	Inpatient					
		Aflcat	0.224	0.297	0.190	0.179
		Ashore	0.412	0.292	0.125	0.188
	Outpatient					
		Carrier	0.334	0.367	0.217	---
		Non-Carrier	0.819	0.883	0.333	---
MARINE CORPS [b]						
	Inpatient		0.106	0.123	---	0.122
	Outpatient		0.480	0.423	0.276	---

[a] Data from Pugh et.al[3]
[b] Data from Hermansen et.al[4]

Table 2

HOSPITAL ADMISSION RATES FOR MARINES IN VIETNAM
BETWEEN JULY 1965 AND JUNE 1971
(Patients per 1,000 personnel per day)

ICD-9 Category	RATE
Infective & Parasitic	0.195
Neoplasms	0.011
Endocrine, Nutritional & Metabolic	0.005
Blood & Blood Forming Organs	0.004
Mental Disorders	0.046
Nervous Sys & Sense Organs	0.040
Diseases of Circulatory Sys	0.016
Diseases of Respiratory Sys	0.042
Diseases of Digestive Sys	0.056
Diseases of Genitourinary Sys	0.026
Complications of Pregnancy	0.000
Diseases of the Skin	0.077
Diseases of the Musculoskeletal Sys	0.034
Congenital Anomalies	0.002
Perinatal Morbidity & Mortality	0.000
Symptoms & Ill-Defined conditions	0.128
Accidents Poisonings & Violence	0.169
Total	0.852

Vietnam information was not used to determine DNBI rates for Navy personnel, however. Although the operational tempo may have been elevated for shipboard personnel during the Vietnam conflict, actual combat was primarily among land-based forces. In addition, Navy medical data were collected in a way that would allow DNBI rates to be determined only for personnel aboard aircraft carriers, and it has been previously reported they are not representative of the overall Navy population [3,6]. Consequently, data from World War II (WWII) was sought because that was the last time U.S. Navy ships saw sustained combat at sea. Medical information for WWII on Navy and Marine Corps forces combined was obtained from reports prepared by the Bureau of Medicine and Surgery[7]. From this source, hospital admission rates can be determined only for the entire population for each year during WWII. It was found that DNBI hospital admission rates for 1942 through 1945 were 0.54, 0.50, 0.48, and 0.55, respectively. The mean of these rates yields an overall rate of 0.52 per 1,000 per day during WWII.

Table 3

DNBI INCIDENCE RATES BY ICD-9 CATEGORY
FOR NAVY AND MARINE CORPS PERSONNEL DURING 1945
(Patients per 1,000 personnel per day)

	PACIFIC			ATLANTIC		
ICD-9 CATEGORY	JUNE	JULY	AUG	JUN	JUL	AUG
Infective & Parasitic	0.236	0.206	0.313	0.448	0.451	0.480
Neoplasms	0.019	0.021	0.014	0.014	0.010	0.022
Endocrine, Nutritional & Metabolic	0.018	0.013	0.012	0.018	0.018	0.022
Blood & Blood Forming Organs	0.004	0.004	0.002	0.005	0.004	0.003
Mental Disorders	0.051	0.046	0.026	0.047	0.019	0.018
Nervous Sys & Sense Organs	0.095	0.093	0.096	0.068	0.068	0.072
Diseases of Circulatory Sys	0.017	0.017	0.007	0.014	0.020	0.010
Diseases of Respiratory Sys	0.388	0.260	0.130	0.224	0.209	0.283
Diseases of Digestive Sys	0.183	0.158	0.152	0.174	0.167	0.204
Diseases of Genitourinary Sys	0.075	0.079	0.075	0.086	0.087	0.126
Complications of Pregnancy	0.000	0.000	0.001	0.000	0.000	0.007
Diseases of the Skin	0.046	0.048	0.026	0.033	0.028	0.036
Diseases of the Musculoskeletal Sys	0.054	0.052	0.025	0.042	0.029	0.041
Congenital Anomalies	—	—	—	—	—	—
Perinatal Morbidity & Mortality	—	—	—	—	—	—
Symptoms & Ill-Defined Conditions	0.237	0.205	0.226	0.167	0.165	0.137
Accidents Poisonings & Violence	0.208	0.181	0.179	0.176	0.179	0.143
TOTAL	1.631	1.383	1.301	1.516	1.454	1.597

More detailed information was provided by this same data source on illness incidence (outpatient and inpatient data combined). Incidence rates were tabled according to different geographic areas for each month for specific illness categories. To compare these data to the peacetime information, the diagnostic categories were converted to the set used in the Ninth Revision of the International Classification of Diseases Adapted for use in the United States Navy (ICD-9) in the manner described in Appendix I. However, the

geographic regions could not be mapped onto regions used for the peacetime analyses. So, overall DNBI rates for the Atlantic and Pacific regions were computed using an unweighted average of the rates for areas within the two regions. Rates for each region were computed for June, July, and August of 1945 because these months were near the end of WWII when combat casualties reached their highest levels. The information obtained on the incidence of DNBI during WWII is shown in Table 3.

Analysis

For Vietnam, when the previously reported peacetime inpatient Northeast Asia DNBI rate of 0.12 [4] is compared to the wartime rate of .85 shown in Table 2, a seven fold increase from peacetime to wartime becomes evident. For WWII, it was necessary to aggregate the separate peacetime rates to form overall DNBI rates because the wartime data could not be separated into comparable geographic regions or by deployment status (afloat or ashore). Throughout the following computation, unweighted means were used to form the combined averages.

The overall inpatient DNBI rate for Navy personnel was computed from the eight rates for Navy forces afloat and ashore in four geographic regions. The result was a rate of 0.24. Similarly, the three geographic rates for the Marine Corps in Northeast Asia, Europe, and the Continental United States (CONUS) were used to compute an overall Marine Corps inpatient DNBI rate of 0.12. Then an overall Navy and Marine Corps rate of 0.18 was formed by computing the mean for the two services.

Although these data suggest that the inpatient DNBI rate for WWII (0.52) was nearly three times the peacetime level (0.18), it does not approach the seven-fold increase observed among Marines in Vietnam. This is likely to be a result, at least in part, of the fact that the WWII rate reflects personnel both in and out of the combat zone. If it is assumed that the WWII rate of 0.52 is a simple mean of people in combat and people in non-combat areas, and, if individuals in non-combat areas manifest illness at a rate comparable to peacetime forces, then we have:

$$(0.18 + X) / 2 = .52$$

and so,

$$X = .86.$$

That is, given the above assumptions, a combat zone hospital admission rate for WWII can be computed, and the value obtained (0.86) is nearly identical to the rate found for Marines during the Vietnam conflict (0.85).

The DNBI incidence rates for WWII shown in Table 3 contain data for the quarter in which the greatest number of casualties were incurred, and thus presumed to be the period of greatest combat intensity. Mean incidence rates of 1.44 and 1.52 were found for the Pacific and Atlantic regions, respectively, and combining these two rates yields an overall mean incidence rate of 1.48. Now, removing the WWII mean inpatient rate of 0.52 from this overall incidence rate yields an outpatient rate of 0.96.

In order to compare this WWII outpatient rate to the peacetime outpatient rate, it was necessary to aggregate separate Navy and Marine Corps geographic rates to form an overall peacetime outpatient rate. This rate was computed using the outpatient rates for Navy personnel from ships other than aircraft carriers and the three rates for Marine Corps personnel. The mean rate for these data was 0.54, or about one half the WWII rate. However, the WWII rate includes personnel both within and out of the combat zone. To estimate a combat zone rate, the same method that was used above can be employed, where:

$$(0.54 + X) / 2 = 0.96$$

and so, $X = 1.38$

Therefore, from the available data, the estimated WWII combat zone outpatient DNBI rate was 1.38. Results of these analyses of DNBI data reported for Navy and Marine Corps personnel are summarized in Table 4. Because exact ratios (i.e., Navy vs. Marines, and combat vs. non-combat strengths) were not available, unweighted means were used. However, the model is very robust so that extreme differences in the actual ratios would result in minimal differences in the estimated incidence rates. For example, when the ratio of Navy to Marine Corps personnel was allowed to range between 1:1 and 7:1, and the ratio of personnel in combat to those not in combat ranged between 1:4 and 4:1, the estimated peacetime incidence rate remained between 0.72 and 0.87 and the combat zone DNBI rate ranged from 1.63 to 4.52.

Table 4

Summary of DNBI Rates for Navy and Marine Corps Personnel

Patient Status	Level of Combat: Peacetime (Non-Combat)	Overall WWII	Estimated WWII Combat Zone
Outpatient	0.54	0.96	1.38
Inpatient	0.18	0.52	0.86
Total incidence	0.72	1.48	2.24

The data in Table 4 indicate that both inpatient and outpatient DNBI rates increase as the level of combat becomes more intense. However, this trend is more pronounced for the inpatient rates. So, as the level of combat increases, it would appear that more individuals are treated on an inpatient rather than outpatient basis. Figure 2 graphically demonstrates this trend by plotting the rates shown in Table 4 with respect to the sum and ratio of the inpatient rate and outpatient rate for each level of combat. In addition, each subpopulation which had both inpatient and outpatient data was entered onto this figure. Thus, Figure 2 also shows the relationship between Table 4 and the DNBI rates found for Marines in Europe (Marines Europe), Marines in Northeast Asia, (Marines NEA); and Navy personnel aboard ships (excluding aircraft carriers) operating in European waters (Navy Europe), in Northeast Asian waters (Navy NEA), and in Southeast Asian waters (Navy SEA). Also, the WWII information is shown on this figure.

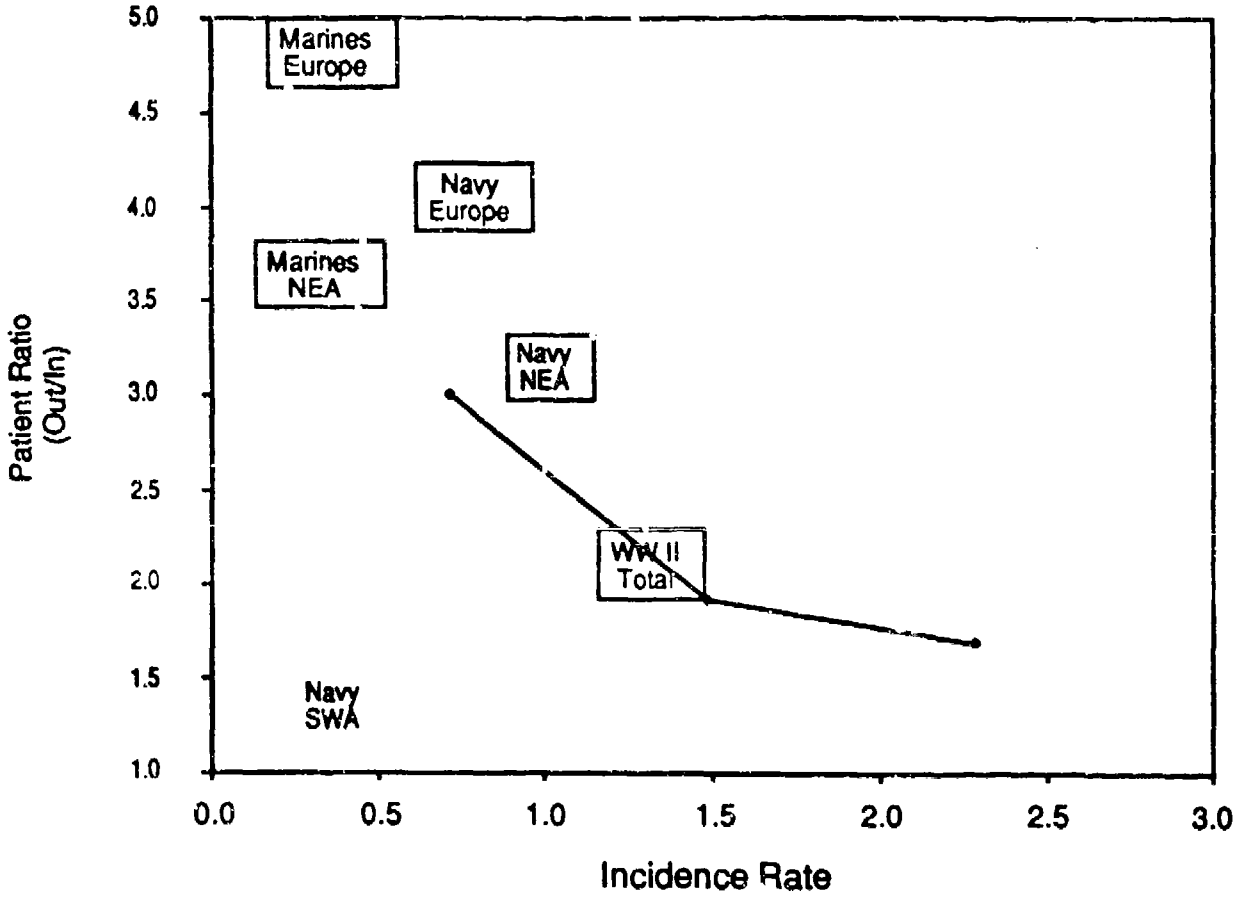

Fig 2. Ratio of outpatients to inpatients by incidence rate for low, medium, and high levels of combat.

Discussion

The finding that DNBI rates increase with the level of combat could be a result of factors identified in the conceptual model that was presented. The perception of stress, or the fatigue and degraded hygiene practices resulting from the mobilization of forces could result in greater rates of disease and injury. But, why should inpatient rates increase more rapidly than outpatient rates? The conceptual model suggests two possibilities. First, the finding may be a result of purely physiological phenomena. If this is the case, the additional DNBI patients must have a tendency to incur more severe disorders than patients being treated during peacetime. This situation would occur if patients with relatively minor disorders tended not to seek medical attention during periods of combat. The finding that total sick call visits tended to be lower for the crews of ships stationed off Vietnam during the period of the Vietnam conflict, than during the period following the conflict[8] lends support to the notion that individuals will be less likely to seek treatment during periods of combat.

The second possible reason for the tendency to treat more patients on an inpatient basis rather than an outpatient basis during high levels of combat may be due to changes in patient handling. In fact the conceptual model shows the re-evaluation of outpatients to be a function of the evacuation policy. That is, the level of combat and the requirement for beds and other medical resources to treat combat casualties may severely limit the patient length of stay near the forward edge of battle. Thus, patients that would be treated on an outpatient basis during peacetime must be sent back in the evacuation chain during combat, and consequently they become an inpatient. The relatively high rate of infectious and parasitic disease for Marines hospitalized in Vietnam[5] may, in part, be a result of this effect, since infectious and parasitic diseases were found to be somewhat more likely to be treated on an outpatient basis during peacetime[3].

MATRIX OF DNBI RATES

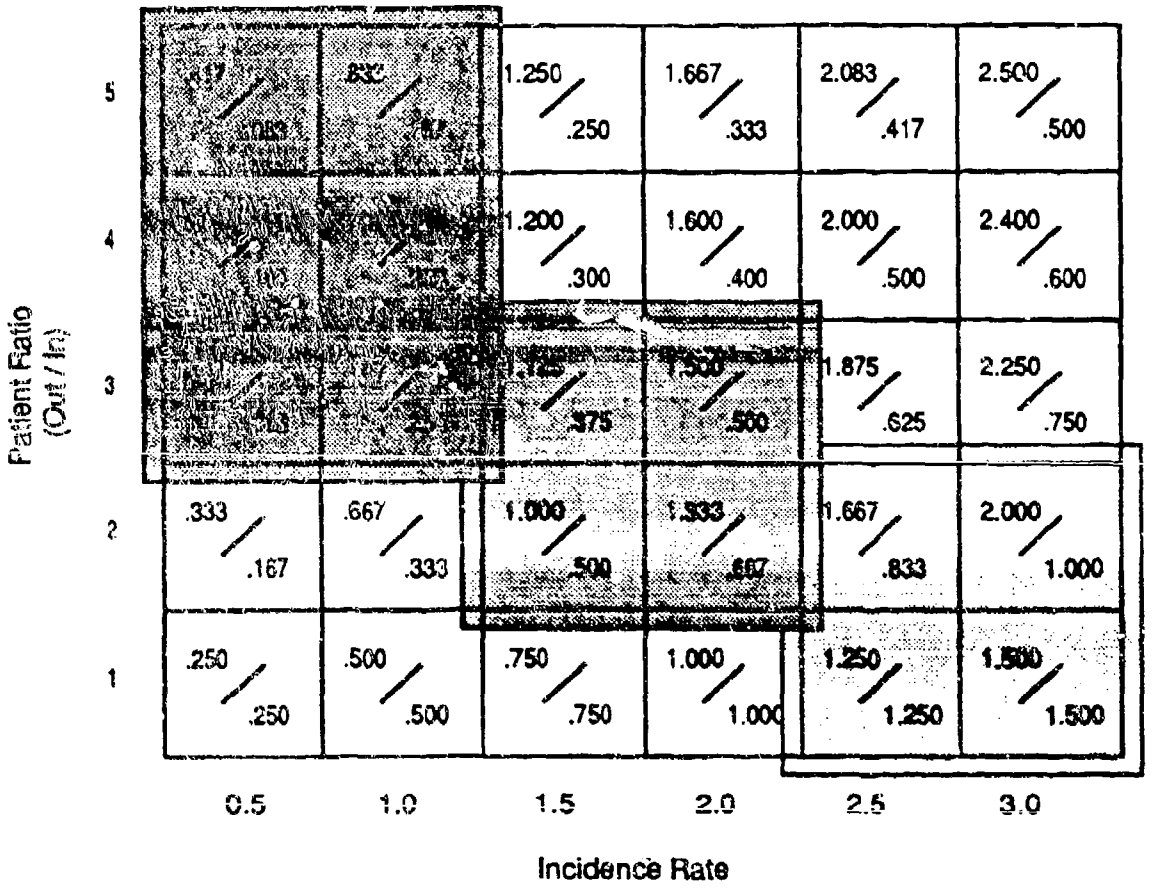

Figure 3. Matrix of outpatient and inpatient rates for low, medium, and high levels of combat

The pattern of relationships created by systematically pairing the sum and the ratio of the inpatient and outpatient DNBI rates is shown in the matrix presented in Figure 3. Each cell contains an outpatient DNBI rate over an inpatient DNBI rate. The sum of these two values or the incidence rate is shown at the bottom of each column. The ratio of these two values is shown to the left of each row. For example, within the cell in the upper left corner are the values 0.417/0.083. At the bottom of the column is 0.5 which is the sum of the two values, and the value to the left of that row is 5, which is the ratio of the two values.

Inspection of the cells in the matrix shows that the cell in the first column and the fourth row from the bottom has the values 0.400/0.100. These values are among the closest to those found for Marines during peacetime. The cell at the juncture of the third column and the second row from the bottom has the values 1.000/.500 which are nearly identical to those obtained for WWII. Finally, the fifth column and the second row from the bottom has the values 1.667/0.833. This inpatient rate (0.833) is very near the Vietnam hospitalization rate of 0.852. Thus, this matrix would suggest an overall DNBI incidence rate for Vietnam to be 2.5. Finally, it should be noted the Navy and Marine Corps wartime incidence rates are comparable to the DNBI incidence rates for Army expeditionary forces in the European theater which were 1.75 and 1.5 for World War I and II respectively[2].

These observations provide a guide for determining which DNBI rates correspond to low, medium, and high levels of combat. Low levels of combat would include cells with a total incidence up to 1.0 and outpatient to inpatient ratio of 3 to 1 or greater. Medium levels of combat would include the higher levels of incidence up to 2.0 with outpatient/inpatient rates between 2 to 1 and 3 to 1, and high levels would include incidence rates greater than 2.0 and a patient ratio of 2 to 1 or less. These ranges are shown on Figure 3 by three shaded areas. The six cells shaded in the upper left-hand portion of the matrix correspond to low levels of combat intensity, the four cells in the center portion of the matrix would correspond to medium levels of combat, and the four shaded cells in the lower right-hand portion of the matrix would correspond to high levels of combat.

Organizing DNBI rates in this manner not only provides an indication of the range of the total incidence rates for different levels of combat, but also

reveals a picture of the varying patient composition (i.e. outpatient/inpatient ratio). Therefore, planners can determine both the resources needed for outpatient care and inpatient care and see how to vary these for different levels of combat.

Conclusions

The analysis of DNBI rates indicates that the level of combat does have an effect, and that during wartime, the incidence of DNBI may be double or triple peacetime levels. Further, although all types of DNBI increased during combat, the distribution of disorders treated at a particular facility changes, with infectious diseases becoming treated on an inpatient basis more often at the higher levels of combat. By developing a matrix of these relationships and indicating the areas that are associated with low, medium, and high level of combat, a planning tool has been created for medical planners. Now the information on the effect of combat level can be combined with the data on the geographic effects, differences between Navy and Marine Corps, and other factors found to affect DNBI to generate projections of DNBI for a wide range of target populations.

References

1. Hoeffler, D.F. and Melton, L.J. III, Changes in the Distribution of Navy and Marine Corps Casualties from World War I Through the Vietnam Conflict. Military Medicine, 146, 776-779.

2. Reister, F.A. (Ed.) Medical Statistics in World War II, Office of the Surgeon General, Department of the Army, Washington, D.C., 1975.

3. Pugh. W.M., White, M.R., and Blood, C.G., Disease and Non-Battle Injury for Navy Enlisted Personnel During Peacetime, Report 89-51, Naval Health Research Center, San Diego, CA.

4. Hermansen, L.A., White, M.R., Shaw E.K., Pugh W.M., Disease and Non-Battle Injury Rates for Marine Corps Enlisted Personnel During Peacetime, Report# 90-10, Naval Health Research Center, San Diego, CA.

5. Blood, C.G., Nirona, C.B., and Pederson, L.S., Medical Resource Planning: The Need to Use a Standardized Diagnostic System. Report No. 89-41, Naval Health Research Center, San Diego, CA.

6. Blood, C.G., and Griffith, D.K., Ship Size as a Function of Illness Incidence, Report No. 88-48, Naval Health Research Center, San Diego, CA.

7. The History of the Medical Department of the United States Navy in World War II: The Statistics of Diseases and Injuries. NAVMED P-1318, Vol 3.

8. Blood, C.G., and Nirona, C.B., Outpatient Illness Incidence Aboard U.S. Navy Ships During and Following the Vietnam Conflict. Report 89-15, Naval Health Research Center, San Diego, CA

APPENDIX I

INTERNATIONAL CLASSIFICATION OF DISEASES- 9TH REVISION (ICD-9)
STATISTICS OF NAVY MEDICINE

CONVERSION TABLE

ICD-9 CLASS		STATISTICS OF NAVY MEDICINE CLASS/DIAGNOSIS	
I.	INFECTIOUS & PARASITIC	9.	INTESTINAL DISCHARGES
		10.	INSECTS, ARTHROPODS
		11.	TUBERCULOSIS
		12.	VENEREAL DISEASES
		13.	OTHER INFECTIVE
		22.	PARASITIC
		8.	ANGINA, VINCENT'S
		8.	CEREBROSPINAL FEVER
		8.	DIPTHERIA
		8.	GERMAN MEASLES
		8.	MEASLES
		8.	MUMPS
		8.	POLIO
		8.	SCARLET FEVER
		8.	SMALLPOX
II.	NEOPLASMS	23.	TUMORS
III.	ENDOCTRINE, NUTRITIONAL METABOLIC	4.	DUCTLESS GLANDS
		14.	LYMPHATIC
IV.	BLOOD & BLOOD FORMING ORGANS	1	BLOOD
V.	MENTAL	15.	MIND
VI.	NERVOUS SYSTEM & SENSE ORGANS	6.	EYE, ADNEXA
		17.	NERVOUS SYSTEM
		5.	EAR, NOSE, & THROAT
VII.	CIRCULATORY	2.	CIRCULATORY
VIII.	RESPIRATORY	18.	RESPIRATORY
		8.	CATARRHAL FEVER
		8.	INFLUENZA
		8.	PHARNGITIS
		8.	PNEUMONIA
		8.	TONSILLITIS
IX.	DIGESTIVE	3.	DIGESTIVE
		20.	HERNIAE
		27.	DENTAL

ICD-9 CLASS		STATISTICS OF NAVY MEDICINE CLASS/DIAGNOSIS	
X.	GENITOURINARY	7.	GENITOURINARY
XI.	FEMALE/PREGNANCY	24.	FEMALE CONDITIONS
XII.	SKIN & SUBCUTANEOUS	19.	SKIN, HAIR, NAILS
XIII.	MUSCULOSKELETAL & CONNECTIVE TISSUE	16.	MOTOR
XIV.	CONGENITAL ANOMALIES	***	
XV.	PERINATAL	***	
XVI.	SYMPTOMS, SIGNS, & ILL-DEFINED CONDITIONS	21. 21.	UNDETERMINED DIAGNOSIS ALL OTHER MISCELLANEOUS
XVII.	INJURIES & POISONING	25. 26.	INJURIES (NON-ENEMY ACTION) POISONING (NON-ENEMY ACTION)

*** NO CORRESPONDING CLASS/DIAGNOSIS

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED	1b RESTRICTIVE MARKINGS N/A
2a. SECURITY CLASSIFICATION AUTHORITY N/A	3 DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release, distribution unlimited
2b DECLASSIFICATION/DOWNGRADING SCHEDULE N/A	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) NHRC Report No. 90 - 9	5 MONITORING ORGANIZATION REPORT NUMBER(S)
6a NAME OF PERFORMING ORGANIZATION Naval Health Research Center 6b OFFICE SYMBOL (*If applicable*) Code 20	7a NAME OF MONITORING ORGANIZATION Chief Bureau of Medicine and Surgery
6c. ADDRESS (*City, State, and ZIP Code*) P.O. Box 85122 San Diego, CA 92186-5122	7b. ADDRESS (*City, State, and ZIP Code*) Department of the Navy Washington, DC 20372
8a NAME OF FUNDING/SPONSORING ORGANIZATION National Naval Medical Center 8b OFFICE SYMBOL (*If applicable*)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (*City, State, and ZIP Code*) Capital Region Bethesda, MD 20814	10 SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO: 63706N PROJECT NO.: M0095 TASK NO: .005 WORK UNIT ACCESSION NO.: 6004

11 TITLE (*Include Security Classification*)
THE EFFECT OF COMBAT LEVEL ON DISEASE AND NON-BATTLE INJURY

12 PERSONAL AUTHOR(S)
W.M. PUGH

13a TYPE OF REPORT	13b TIME COVERED	14. DATE OF REPORT (*Year, Month, Day*)	15 PAGE COUNT
FINAL	FROM _____ TO _____	90 JUNE 06	

16 SUPPLEMENTARY NOTATION

17. COSATI CODES			18 SUBJECT TERMS (*Continue on reverse if necessary and identify by block number*)
FIELD	GROUP	SUB-GROUP	Disease and Non-Battle Injury, Illness rates, Injury rates Combat level (SDC)

19 ABSTRACT (*Continue on reverse if necessary and identify by block number*)

Disease and Non-Battle Injury (DNBI) rates may differ between peacetime and wartime because of differences in patient handling as well as physiological factors. Therefore, peacetime DNBI rates may not be proper estimates of wartime DNBI rates. To determine the effect of combat level on DNBI rates, Navy and Marine Corps data gathered since 1980 was compared to data gathered during Vietnam and during World War II. It was found that wartime DNBI rates were higher than peacetime rates. Further, this difference was found to be more pronounced for inpatient rates than for outpatient rates. These results were used to create a matrix for medical planners showing the relationship between outpatient rates, inpatient rates, and level of combat. (Keywords:

20 DISTRIBUTION/AVAILABILITY OF ABSTRACT	21 ABSTRACT SECURITY CLASSIFICATION	
☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT ☐ DTIC USERS	UNCLASSIFIED	
22a NAME OF RESPONSIBLE INDIVIDUAL William M. Pugh	22b TELEPHONE (*Include Area Code*) (619) 553-8403	22c OFFICE SYMBOL Code 20

DD FORM 1473, 84 MAR 83 APR edition may be used until exhausted
All other editions are obsolete

SECURITY CLASSIFICATION OF THIS PAGE

★U.S. Government Printing Office: 1988—607-647