DISEASE AND NON-BATTLE INJURY RATES FOR MARINE CORPS ENLISTED PERSONNEL DURING PEACETIME

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Summary

Problem

Military planners need reliable estimates of Disease and Non-Battle Injury (DNBI) rates in order to provide line commanders with expected manpower losses and to allocate proper medical resources to deployed units.

Objective

The present investigation seeks to provide baseline DNBI rates for U.S. Marine Corps personnel serving in various geographical regions around the world in peacetime.

Approach

Inpatient data for shorebased U.S. Marine Corps personnel serving in specified worldwide geographical regions during 1980-84 were extracted from historical medical files. Outpatient data were collected from a sample population of Marines serving aboard U.S. Navy ships during 1989 deployments. These data were matched against population data to provide inpatient and outpatient DNBI rates for specific geographical regions. Rates were computed for each of the major illness and injury categories defined in the International Classification of Diseases, Ninth Revision (ICD-9).

Results

The area with the highest overall hospital admission rates for shorebased Marines was the Northeast Asia region. The highest number of hospital admissions in all regions was for the Injury and Poisoning category, followed by Mental Disorders and Diseases of the Digestive System. The area with the highest outpatient visit rates for deployed shipboard Marines was the European region (Atlantic/Mediterranean). The highest outpatient visit rates in all regions were for Diseases of the Digestive System in Europe and Northeast Asia, and Diseases of the Respiratory System in Southwest Asia.

Conclusions

Although these results reflect DNBI rates under peacetime conditions, it is expected that these data will be useful in developing projections for overseas medical support requirements in times of conflict.

Introduction

The United States Marine Corps, recognized for its ability to respond readily to conflicts anywhere in the world, relies on Navy medical personnel to provide the needed care for Marine Corps casualties. For planning purposes, the estimated number of casualties likely to occur, either as a direct result of combat, or from Disease and Non-Battle Injuries (DNBI), needs to be determined. Previous studies have shown that DNBI has a substantial impact on the number of personnel incapacitated during battle. During the Vietnam conflict, there were more hospital admissions of Marine Corps personnel for DNBI than for wounds or injuries sustained in combat[1]. Data from earlier conflicts involving U.S. Navy and Marine Corps military personnel in World War I (WWI), World War II (WWII), and the Korean War also support this finding[1-2]. Similarly, Reister showed that DNBI rates were much higher than battle injury rates for the Army in WW I and WW II[3].

Medical planners need to have reliable estimates of the number and types of losses expected to occur during a conflict (both combat-related and non-combat related) for two reasons. First, and most importantly, the line commanders need to know what the returns to duty and replacement demand for the fighting forces will be, and secondly, medical planners must be able to anticipate the amount of medical resources that will be required to treat casualties during a conflict. One important factor used to estimate the number of battle injuries that will be sustained in wartime is combat intensity. Other important factors are the presence of endemic diseases and the potential for non-battle

injuries in a combat environment. Because many diseases and injuries are prevalent in particular climates or geographic regions[4], it is critical that baseline (peacetime) DNBI rates be established for all areas. The baseline DNBI rate, along with combat intensity information, can then be used for effective planning for medical support of combat personnel who may serve in those areas. Peacetime DNBI rates for U.S. Navy personnel have been previously reported by Pugh et al.[2] The goal of this study is to provide the corresponding peacetime DNBI rates for Marine Corps personnel stationed in Europe, Northeast Asia, Southwest Asia, and the Continental United States (CONUS). DNBI inpatient rates were computed for each of five years (1980 through 1984) and DNBI outpatient rates were computed for a six month deployment period (January through June 1989).

Methods

To calculate DNBI inpatient rates for shorebased Marines in each of the four geographic regions, the total number of hospitalizations which occurred among personnel in each area during the time period 1980-1984 were tallied. The hospitalization data were drawn from Naval Health Research Center's (NHRC) computerized Inpatient Follow-up Data System, which contains records of all inpatient hospital admissions for active duty Navy and Marine Corps personnel for the period 1965 through 1985 [5]. All hospitalizations were identified by their treatment facility and assigned to one of the primary geographic regions defined by military medical planners. The four defined regions were Europe,

Northeast Asia, Southwest Asia, and CONUS (Appendix 1). Population data for Marine Corps personnel serving in these areas were obtained from Marine Corps computerized records which provided the number of active duty enlisted personnel stationed in each region between 1980 and 1984. The number of hospital admissions for each geographic region was found by aggregating the number of admissions at each individual hospital in each geographic region. The population at risk was the number of Marine Corps personnel stationed within each geographic area during each year. DNBI rates were computed to reflect the number of illnesses per 1,000 persons per day. This was accomplished by dividing the number of hospitalizations by the person-days at risk (i.e., the product of the number of people in an area and the number of days they were in the area). Finally, rates are expressed as this result multiplied by 1,000 (i.e., Rate = [hospitalizations/(population x days)] x 1,000).

Cases included all enlisted Marine Corps personnel who were hospitalized for any of the eighteen International Classification of Diseases, Ninth Revision (ICD-9)[6] categories. A total of 36,709 hospitalizations of Marine Corps personnel occurred between 1980 and 1984. No U.S. Navy treatment facilities were located within the area specified as Southwest Asia, therefore inpatient DNBI rates could not be determined for that area.

In addition to hospital admission rates, outpatient DNBI rates were computed for Marines aboard U.S. Navy ships. These data reflected the number of men treated aboard ship who were given one or more days of bed rest. These data were collected from twelve U.S. Navy ships that were deployed during January through June of 1989. Average Marine Corps strength data from

each ship were forwarded to NHRC monthly, along with Patient Encounter Forms that were completed for each individual sick call visit during the month. The Patient Encounter Forms provided the date of visit, diagnosis, and disposition data[7]. Each ship in the study also sent a deployment log to NHRC each month which provided the ship's location data. The number of visits divided by the average monthly Marine Corps strength for ships in each geographic region during the course of the deployment provided the DNBI rates for each area.

Results

Table 1 shows the population at risk for shorebased Marine Corps personnel by year in Europe, Northeast Asia, and CONUS in terms of person-days (number of people x days). It can be seen that a relatively small number of Marines were stationed in Europe. The area with the highest overseas strength was Northeast Asia and the majority of those Marine Corps personnel were stationed in Okinawa. Hospitalization rates for Marine Corps enlisted personnel by ICD-9 categories for each year from 1980 to 1984 are shown in Tables 2 through 6. Disease and Non-Battle Injury rates ranged from a low of 0.090 to a high of 0.137 per 1,000 Marines per day. The European area had the lowest inpatient DNBI rates among the four world regions. The ICD-9 categories showing the highest admission rates, regardless of year or geographical region, were Mental Disorders, Diseases of the Digestive System, and Injury and Poisoning.

The DNBI rates for shipboard Marine Corps outpatients are shown in Table 7. The four categories with the highest rates were

Diseases of the Digestive System, Infective and Parasitic Diseases, Diseases of the Respiratory System, and Injury and Poisoning. The area with the highest overall outpatient rates for deployed Marines was the European region (Atlantic/Mediterranean) and the area with the lowest was the Southwest Asia region.

Discussion

Hospitalization rates for the CONUS and Northeast Asia regions were nearly identical for the five year period. However, rates for Infective and Parasitic Diseases and Diseases of the Digestive System were slightly, but consistently, higher in Northeast Asia during all five years. This was expected since many Infective and Parasitic diseases are endemic to the area.[8]

The European region had the lowest rate of all the regions for hospital admissions among Marines. This may reflect real differences in the actual morbidity, a difference in the tendency to seek medical treatment, or perhaps a difference in the method of patient referrals. Because a relatively small number of Marines are spread over a large area in the European region (where there are only four Navy hospitals), a number of Marines with acute illnesses or injuries may have been treated in non-Navy facilities.

The three categories contributing the most to hospitalization admission rates in all regions were Mental Disorders, Diseases of the Digestive System, and Injuries and Poisoning. This finding is consistent with an earlier study by Pugh et al.[2] which reported the same ICD-9 categories as the highest rate for Navy enlisted

personnel.

The four categories with the highest outpatient rates were Diseases of the Digestive System, Infective and Parasitic Diseases, Diseases of the Respiratory System, and Injury and Poisoning. Although these rates were consistently lower than those reported for shipboard Navy enlisted personnel[2], the same four ICD-9 categories were found to have the highest rates for both the Navy and Marine Corps. The highest category for outpatient visits in the European and Northeast Asia regions was Diseases of the Digestive System and the highest category for outpatient visits in the Southwest Asia region was Diseases of the Respiratory System.

Since all outpatients visits analyzed in this study took place on deployed ships, the effects of different geographical regions on DNBI trends (i.e., exposures to diseases endemic to those areas) would most likely manifest themselves during port visits. Therefore, further analyses of illness trends during and shortly after visits to different foreign ports need to be undertaken in future studies. Although this study identifies broad trends within inpatient and outpatient data for both shipboard and shorebased Marine Corps personnel in the areas specified, further questions still need to be answered. For example, when DNBI rates are computed for large geographical regions containing many different countries, significant differences in rates between the countries in those regions may exist but go unnoticed. So analyses of smaller geographic areas may reveal region specific trends. Therefore, future studies will be undertaken to delineate smaller geographical regions, thereby allowing the characteristic patterns of each region to be examined.

Table 1. Person days at Risk for Marine Personnel by Year From Various Shore Facilities Around the World

Year	Europe	Northeast Asia	CONUS
1980	694,960	7,971,235	48,852,695
1981	464,280	8,505,230	48,680,780
1982	488,005	8,696,125	50,096,980
1983	965,790	8,660,355	51,057,660
1984	796,795	8,273,820	51,636,550
Total	**3,409,830**	**42,106,765**	**250,324,665**

Table 2. Inpatient Rates per 1,000 Person-days for Disease and Non-Battle Injuries for Enlisted Marine Corps Personnel During 1980.

ICD-9 Categories	Europe	Northeast Asia	CONUS
Infective & Parasitic Diseases	0.006	0.007	0.005
Neoplasms	0.001	0.001	0.002
Endocrine, Nutritional & Metabolic	0.000	0.000	0.000
Blood & Blood Forming Organs	0.000	0.000	0.000
Mental Disorders	0.024	0.016	0.021
Nervous System & Sense Organs	0.000	0.003	0.004
Diseases of Circulatory System	0.001	0.002	0.004
Diseases of Respiratory System	0.003	0.005	0.008
Diseases of Digestive System	0.004	0.012	0.011
Diseases of Genitourinary System	0.006	0.004	0.007
Complications of Pregnancy	0.003	0.001	0.003
Diseases of the Skin	0.003	0.006	0.007
Diseases of the Musculoskeletal System	0.007	0.007	0.013
Congenital Anomalies	0.000	0.000	0.001
Perinatal Morbidity & Mortality	0.000	0.000	0.000
Symptoms & Ill-Defined Conditions	0.009	0.005	0.006
Injury & Poisoning	0.030	0.031	0.028
Special conditions	0.001	0.006	0.006
Total	**0.099**	**0.116**	**0.127**

Table 3. Inpatient Rates per 1,000 Person-days for Disease and Non-Battle Injuries for Enlisted Marine Corps Personnel During 1981.

ICD-9 Categories	Europe	Northeast Asia	CONUS
Infective & Parasitic Diseases	0.015	0.009	0.006
Neoplasms	0.000	0.002	0.003
Endocrine, Nutritional & Metabolic	0.000	0.000	0.001
Blood & Blood Forming Organs	0.002	0.001	0.000
Mental Disorders	0.011	0.025	0.018
Nervous System & Sense Organs	0.002	0.002	0.004
Diseases of Circulatory System	0.004	0.003	0.003
Diseases of Respiratory System	0.004	0.006	0.009
Diseases of Digestive System	0.015	0.013	0.011
Diseases of Genitourinary System	0.006	0.007	0.006
Complications of Pregnancy	0.002	0.002	0.004
Diseases of the Skin	0.000	0.008	0.005
Diseases of the Musculoskeletal System	0.011	0.011	0.013
Congenital Anomalies	0.000	0.001	0.001
Perinatal Morbidity & Mortality	0.000	0.000	0.000
Symptoms & Ill-Defined Conditions	0.006	0.005	0.006
Injury & Poisoning	0.039	0.031	0.026
Special conditions	0.002	0.004	0.008
Total	**0.121**	**0.129**	**0.125**

Table 4. Inpatient Rates per 1,000 Person-days for Disease and Non-Battle Injuries for Enlisted Marine Corps Personnel During 1982.

ICD-9 Categories	Europe	Northeast Asia	CONUS
Infective & Parasitic Diseases	0.004	0.007	0.005
Neoplasms	0.002	0.003	0.002
Endocrine, Nutritional & Metabolic	0.004	0.000	0.001
Blood & Blood Forming Organs	0.000	0.000	0.000
Mental Disorders	0.020	0.027	0.016
Nervous System & Sense Organs	0.002	0.002	0.003
Diseases of Circulatory System	0.000	0.002	0.003
Diseases of Respiratory System	0.000	0.007	0.008
Diseases of Digestive System	0.018	0.013	0.011
Diseases of Genitourinary System	0.008	0.006	0.005
Complications of Pregnancy	0.000	0.002	0.006
Diseases of the Skin	0.002	0.007	0.006
Diseases of the Musculoskeletal System	0.010	0.011	0.014
Congenital Anomalies	0.000	0.001	0.001
Perinatal Morbidity & Mortality	0.000	0.000	0.000
Symptoms & Ill-Defined Conditions	0.004	0.005	0.006
Injury & Poisoning	0.059	0.025	0.026
Special conditions	0.002	0.004	0.008
Total	**0.137**	**0.119**	**0.120**

Table 5. Inpatient Rates per 1,000 Person-days for Disease and Non-Battle Injuries for Enlisted Marine Corps Personnel During 1983.

ICD-9 Categories	Europe	Northeast Asia	CONUS
Infective & Parasitic Diseases	0.005	0.011	0.005
Neoplasms	0.001	0.002	0.002
Endocrine, Nutritional & Metabolic	0.000	0.000	0.000
Blood & Blood Forming Organs	0.000	0.000	0.000
Mental Disorders	0.017	0.019	0.016
Nervous System & Sense Organs	0.003	0.003	0.003
Diseases of Circulatory System	0.000	0.003	0.003
Diseases of Respiratory System	0.003	0.010	0.008
Diseases of Digestive System	0.006	0.013	0.012
Diseases of Genitourinary System	0.001	0.005	0.006
Complications of Pregnancy	0.001	0.003	0.007
Diseases of the Skin	0.002	0.007	0.005
Diseases of the Musculoskeletal System	0.013	0.010	0.013
Congenital Anomalies	0.000	0.001	0.000
Perinatal Morbidity & Mortality	0.000	0.000	0.000
Symptoms & Ill-Defined Conditions	0.005	0.004	0.006
Injury & Poisoning	0.029	0.030	0.024
Special conditions	0.003	0.004	0.009
Total	**0.090**	**0.127**	**0.121**

Table 6. Inpatient Rates per 1,000 Person-days for Disease and Non-Battle Injuries for Enlisted Marine Corps Personnel During 1984.

ICD-9 Categories	Europe	Northeast Asia	CONUS
Infective & Parasitic Diseases	0.007	0.012	0.005
Neoplasms	0.000	0.001	0.002
Endocrine, Nutritional & Metabolic	0.000	0.000	0.000
Blood & Blood Forming Organs	0.000	0.000	0.000
Mental Disorders	0.012	0.020	0.016
Nervous System & Sense Organs	0.005	0.003	0.003
Diseases of Circulatory System	0.002	0.002	0.003
Diseases of Respiratory System	0.006	0.008	0.006
Diseases of Digestive System	0.014	0.013	0.011
Diseases of Genitourinary System	0.006	0.009	0.006
Complications of Pregnancy	0.002	0.002	0.006
Diseases of the Skin	0.002	0.006	0.006
Diseases of the Musculoskeletal System	0.005	0.009	0.013
Congenital Anomalies	0.000	0.000	0.000
Perinatal Morbidity & Mortality	0.000	0.000	0.000
Symptoms & Ill-Defined Conditions	0.006	0.005	0.006
Injury & Poisoning	0.026	0.030	0.023
Special conditions	0.006	0.005	0.009
Total	**0.103**	**0.126**	**0.119**

Table 7. Outpatient DNBI Rates for Marine Corps Enlisted Personnel Not Returned to Duty (January - June 1989)

ICD-9 Categories	Europe	Northeast Asia	Southwest Asia
Infective & Parasitic Diseases	0.099	0.074	0.043
Neoplasms	0.000	0.000	0.000
Endocrine, Nutritional & Metabolic	0.000	0.000	0.000
Blood & Blood Forming Organs	0.000	0.000	0.000
Mental Disorders	0.000	0.004	0.000
Nervous System & Sense Organs	0.000	0.007	0.021
Diseases of Circulatory System	0.000	0.000	0.000
Diseases of Respiratory System	0.050	0.110	0.170
Diseases of Digestive System	0.248	0.143	0.021
Diseases of Genitourinary System	0.000	0.000	0.000
Complications of Pregnancy	0.000	0.000	0.000
Diseases of the Skin	0.033	0.018	0.000
Diseases of the Musculoskeletal System	0.000	0.004	0.000
Congenital Anomalies	0.000	0.000	0.000
Perinatal Morbidity & Mortality	0.000	0.000	0.000
Symptoms & Ill-Defined Conditions	0.017	0.018	0.000
Injury & Poisoning	0.033	0.044	0.021
Special conditions	0.000	0.000	0.000
Total	**0.480**	**0.423**	**0.276**

APPENDIX 1
WORLD REGIONS

NORTHEAST ASIA	SOUTHWEST ASIA
BURMA	ASIA not already
CAMBODIA	assigned
CHINA	INDIAN OCEAN
HONG KONG	ETHIOPIA
JAPAN	KENYA
KOREA	SOMALIA
LAOS	SUDAN
MALAYSIA	SOUTH PACIFIC OCEAN ISLANDS
NEPAL	AMERICAN SAMOA
PHILIPPINES	CANTON ISLAND
SINGAPORE	FIJI
THAILAND	FRENCH POLYNESIA
TAIWAN	GILBERT AND ELLICE
VIETNAM	KIRIBATI
MARIANAS	NEW CALEDONIA
MARSHALL & CAROLINES	ADMIRALTY ISLAND
NORTH PACIFIC OCEAN ISLANDS	TONGA
SOLOMONS	TUVALU
GUAM	WESTERN SAMOA
HOWLANDS	SOUTH PACIFIC OCEAN
BONIN/VOLCANO	BANDA SEA
JOHNSTON	CORAL SEA
KINGMAN REEF	AMUNDSEN SEA
MIDWAY	GULF OF BONE
WAKE	FORES SEA
EAST PAC	BELLINGHAUSEN SEA
WEST PAC	JAVA SEA
GULF OF SAKHALIN	BISMARK SEA
CELEBES SEA	BALI SEA
TATAR STRAIT	MAKASIAR STRAIT
EAST CHINA SEA	GULF OF CARPENTARIA
FORMOSA STRAIT	CERAM SEA
GULF OF TONKIN	ROSE SEA
LUZON STRAIT	SOLOMON SEA
SEA OF JAPAN	TASMAN SEA
GULF OF SHELEKHOV	ARAFURA SEA
GULF OF CALIFORNIA	
MOLUCCA SEA	
INLAND SEA	
PHILIPPINE SEA	
SEA OF OKHOSK	
KOREA BAY	
SULU SEA	
GULF OF SIAM	
SOUTH CHINA SEA	
GULF OF TOMINI	
GULF OF CHIHLI	

NORTHEAST ASIA (cont.)

YELLOW SEA
SINGAPORE STRAIT
BERING SEA
GULF OF ALASKA
BERING STRAIT

EUROPE

ISRAEL
LEBANON
SYRIA
TURKEY
EUROPEAN CONTINENT
ALGERIA
LIBYA
MOROCCO
TUNISIA
NORTH ATLANTIC OCEAN
AGGREGATION
MEDITERRANEAN ISLANDS

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Respiratory System in Southwest Asia. Although these results reflect DNBI rates under peacetime conditions, it is expected that these data will be useful in developing projections for overseas medical support requirements in times of conflict.