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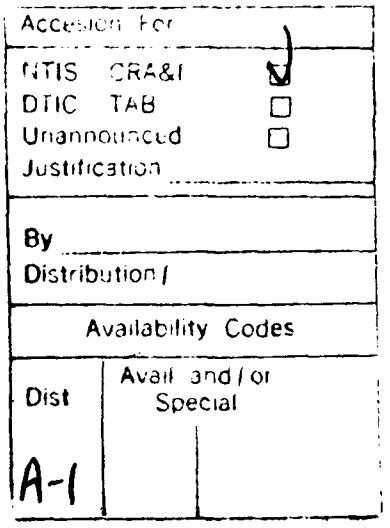

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SUMMARY

Disease and Non-Battle Injury (DNBI) rates needed for medical planning were derived from the hospital admissions records and outpatient visits of U.S. Navy enlisted personnel. Hospital admissions of personnel from 290 U.S. Navy ships and 983 shore stations for the years 1980 through 1984 were examined. Records of outpatients requiring bed rest were collected from 12 U.S. Navy ships and three shore facilities. DNBI rates were computed from these data for forces afloat and forces ashore in Northeast Asia, Southwest Asia, and Europe. In addition, DNBI rates were computed for hospital admissions of personnel stationed in the Continental United States. Hospital Admission rates ranged between 0.125 and 0.412 admissions per 1,000 persons per day. Mental Disorders, Diseases of the Digestive System, and Accidents Poisonings and Violence accounted for the greatest number of hospitalizations of shipboard personnel. Although results were mixed for shore facilities, Mental Disorders continued to account for a large proportion of the hospitalizations. Overall, DNBI rates were higher for outpatients requiring bed rest than patients admitted to a hospital. The categories that contributed most to the outpatient DNBI rates were Respiratory Illness, Diseases of the Digestive System, and Infective and Parasitic Diseases. Although these results reflect DNBI rates under peacetime conditions, it was concluded that these data may be useful in developing projections for wartime operations.

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

Military planners rely on computer models to estimate the facilities, personnel, and supplies needed to provide proper health care support.[1] The planners operate these models by entering an array of disease and injury rates so they can evaluate a wide range of combat scenarios. To obtain the illness and injury rates needed to produce valid projections of the medical resources required, a study was initiated to derive the Disease and Non-Battle Injury (DNBI) rates for various geographic areas of the world.[2]

The above study by Blood et al.[2] was constrained by the data available, however. Although a large number of hospital admission and sick call records were available, information on ship deployments was not readily accessible. Consequently, because the location of patients could not be determined, the sample size was restricted. Further, the value of the previous sick call data was limited because the existing medical planning models are oriented toward hospital admissions. However, Hoeffler and Melton[3] argue that medical planners should examine outpatient data as well as hospital admissions because many disorders such as respiratory and dermatological illnesses are not always reflected in hospital admissions, and they conclude, "It is obvious that outpatient morbidity must be added to hospitalizations and mortality, if accurate planning is to result."

The goal of the current effort was to augment the earlier results to provide the peacetime DNBI rates that form the baseline from which wartime rates can be projected. This goal was accomplished by extending the analysis of both the hospital admission data and the outpatient visit information. The hospital admission analyses were extended by acquiring information on virtually all ship deployments since 1980. As a result, the sample size used in the analysis of hospital admission was increased many fold. To augment the outpatient analyses, additional sick call visit information was gathered from twelve U.S. Navy ships. These data included specific diagnosis, treatment, and disposition information, thereby allowing DNBI rates to be computed for individuals requiring a bed, which is a more relevant statistic for medical planning than total outpatient visits.

Method

Computation of DNBI rates for separate geographic areas requires information specific to each area on the incidence of disease and injury, as well as the population at risk per unit time. To obtain the required data, the population was defined in terms of duty stations. Using Navy personnel files, people assigned to selected duty stations were identified, and ships movement files were used to determine the location of deployed personnel. From these data, the DNBI rates were computed by counting patient encounters within each geographic area for each subpopulation, dividing the result by the corresponding person-days at risk, and then multiplying by 1,000 so that each rate could be expressed as the incidence per 1,000 persons per day.

The geographic regions studied included Northeast Asia, Southwest Asia, Europe, and the United States. The definitions of geographic regions employed by medical planners (shown in Appendix I) were used. To determine the number of person-days at risk for each geographic area, the number of Navy personnel attached to each duty station was multiplied by the number of days that duty station was in each particular geographic area.

Hospital Admissions.

To obtain a large sample of Navy enlisted personnel stationed in the geographic areas of interest, data for the five calendar years 1980 through 1984 were analyzed. Strength data on all U.S. Navy duty stations, were reviewed for these five years and duty stations which had an average strength of less than 25 people, or, deviated more than ten percent from its annual average, were deleted from the analysis. The resulting study population consisted of 290 U.S. Navy ships and 983 shore facilities. Tables 1 and 2 show the number of person-days at risk, by year, for ships and shore facilities respectively.

Records of Navy hospitalizations for the study population were extracted from a computer file maintained at the Naval Health Research Center. This file contains information in a format that corresponds to the Ninth Revision of the International Classification of Diseases Adapted For Use in the United States (ICD-9). For shipboard populations, hospitalizations were counted only when they occurred while the ship was in one of the target geographic regions.

Outpatient Visits.

A new data collection form was developed and implemented to collect the outpatient data. The development and use of this instrument, the Patient Encounter Report, is described in a recent paper.[4] The Patient Encounter Report, documents outpatient visits in sufficient detail to code the data according to ICD-9 classifications. In addition, identifying information on the Patient Encounter Report allows Navy data to be separated from Marine Corps data, and disposition is coded so that personnel returned to duty can be separated from those not returned to duty.

Information was collected with the Patient Encounter Report from three shore facilities and 12 U.S. Navy ships -- six from the Pacific Fleet and six from the Atlantic Fleet. The ships were studied while they were deployed during the first six months of 1989. One ship was eliminated from the analyses because very little of its deployment time was spent in any of the target geographic areas. Information gained from the shore facilities was limited because all the shore facilities were located in Northeast Asia. In addition, data collection was constrained to three months at two shore sites and to one month at the third site. The total amount of exposure for the shore-based sample was 65,444 person-days. The number of person-days at risk by ship is shown in Table 3. Only those encounters for Navy enlisted personnel who were not returned to duty were used for the analyses.

Ninety-five percent confidence intervals were computed to indicate the reliability of the total DNBI rates. These computations assumed that the underlying distributions were Poisson.

Results

Hospital Admissions.

Hospital admissions of Navy enlisted personnel for disease and injury are shown in Table 4. Inspection of these data reveals a greater overall variation in DNBI rates among geographic locations for shore-based personnel than for shipboard populations. For the shore facilities, DNBI rates ranged from 0.125 admissions per 1,000 persons per day in Southwest

Asia to a rate of 0.412 in Europe. Also, one can observe that injuries were a greater percentage of all admissions for shipboard populations than for shore based populations in the same geographic area.

Specific hospitalization rates by ICD-9 categories are shown for ships in each geographic region in Tables 5-9. Regardless of the year or geographic region, the three ICD-9 categories which had the highest contribution to the total rate were Mental Disorders, Diseases of the Digestive System, and Accidents Poisonings and Violence. Another consistent trend was for shipboard populations in Northeast Asia to have a higher rates for Infective and Parasitic Disease, Mental Disorders, and Respiratory Illness than personnel aboard ships in Europe, Southwest Asia, or the United States.

The corresponding data for personnel at shore facilities is shown in Tables 10-14. For shore facilities outside the United States, the Mental Disorders category always had the highest contribution to the total hospital admissions. Within the continental United States, Mental Disorders, and Accidents Poisonings and Violence, had almost equal contributions to the total number of hospital admissions. Across these tables, a tendency was seen for the total hospitalization rate to increase within Europe and Northeast Asia for each succeeding year. The temporal pattern for each component category was then examined and one -- Complications of Pregnancy -- was found to increase steadily from one year to the next within each region. Following the rate of Infective and Parasitic Diseases from 1980 to 1984 revealed another interesting trend within Europe where these diseases increased sharply from 1980 to 1983.

Outpatient Data.

Disease and injury rates for Navy enlisted personnel treated at an outpatient clinic and not returned to duty, are shown in Table 15. These data show that the overall incidence rates determined from outpatient encounters are somewhat higher than hospital admission rates for personnel in the same geographic region. Also, it can be seen that the DNBI rates for Southwest Asia remain the lowest of the three geographic regions outside the United States.

In view of the finding from an earlier study that aircraft carriers tended to have lower DNBI rates than other ships[5], and considering the fact

that aircraft carrier personnel represented 56 percent of the total person-days at risk in these analyses, it was decided that DNBI rates should be examined for aircraft carriers and non-aircraft carriers separately. These data are shown in Table 16. Again, the personnel aboard aircraft carriers clearly have lower DNBI rates than the other ships studied. In Table 17, the outpatient data are separated according to ICD-9 categories, to show how each category contributes to the total rate. Diseases of the Respiratory System were found to have either the first or second highest contribution to the total for both aircraft carrier and non-carrier populations at sea. Other ICD-9 categories that tended to have relatively high incidence rates were Diseases of the Digestive System, and Infective and Parasitic Diseases. The rates of Accidents, Poisonings and Violence also tended to be elevated except among personnel from the aircraft carrier deployed in the Atlantic region.

Discussion

In comparison to the earlier DNBI study[2], the current investigation was more focused on personnel requiring a bed rather than initial visits to the ship's dispensary. Therefore, greater emphasis was placed on hospital admissions and those outpatient visits for which the individual was not returned to duty. When the current hospital admission rates are compared to the earlier findings, the results are, for the most part, very similar. Differences that exist may be a function of a variety of factors. First, the greater size of the current sample should reduce variations due to chance, and limit the possibility of confounding effects. For instance, the possibility that geographic differences found in the current study are related to ship type, or are representative of a particular subgroup has been reduced. Second, the time periods are different. The earlier study examined data collected two different years a decade apart (i.e., 1975 and 1985), while this study examined data collected over a five year period (1980-1984). Third, the definition of geographic regions differed between the two studies.

With regard to overall hospital admission rates, the rates for both ships and shore stations in Europe found in the current study were between the rates reported earlier for the years 1975 and 1985. Also, the rate for ships in Northeast Asia fell between the rates previously reported, but the

rate for shore stations in the current analysis was somewhat higher than earlier figures, perhaps reflecting a shift in the geographical definition of Northeast Asia. Also, any comparison of rates for Southwest Asia between the current and earlier studies should be done with caution because of the difference in the definition used in the two studies.

The trend for Mental Disorders and Accidents to be among the highest contributors to the total number of hospital admissions was replicated in this study. The finding that the overall rate of Infective and Parasitic Disease was somewhat less in the current study than reported for 1975 is consistent with the trend reported for infectious diseases to have decreased from 1975 to 1985[6]. In the current study, however, an interesting counter-trend for Infective and Parasitic Disease was observed for Europe between 1980 and 1983 which should be investigated further.

Another trend not apparent in the earlier effort, was for accident admissions to be greater among personnel aboard ship than for those ashore. This may be a reflection of the nature of the work aboard ship. Because ships are essentially an industrial facility, sailors aboard ship are more likely to be exposed to hazardous working conditions than those at many shore installations.

The tendency for aircraft carriers to have lower illness rates than other ships may be explained by the fact that nearly one half of the personnel onboard aircraft carriers belong to the airwing which, as a group, typically performs highly technical work. Because personnel working in technical jobs tend to have lower illness rates[7], it would be expected that the disease rate for the crew of aircraft carriers would be lower than for other types of ships.

Analysis of data from outpatients not returned to duty generated results that were somewhat different than observed for hospital admissions. The differences were particularly striking when personnel stationed aboard aircraft carriers were excluded from the analysis. First, the rates for outpatients not returned to duty tended to be higher than hospital admission rates. Second, Respiratory Illness, and Infective and Parasitic Diseases, contributed more to total outpatient rates than to hospital

admission rates. These differences between hospital admissions and outpatient rates conform to expectations articulated by Hoeffler and Melton[3].

It is interesting to note that the distribution of hospital admissions for Marines in Vietnam[8] can be viewed as a combination of the distributions for hospital admissions and outpatient encounters found in this study. It could be that the stress of combat operations reduces the ability to implement preventative measures thereby making troops more susceptible to endemic conditions. Another explanation would attribute the result to the evacuation policy. During combat, casualties are passed through an evacuation chain. First aid and resuscitative treatment are carried out at the forward echelons of care, while principle treatment and convalescent care are conducted at rear echelon facilities. To insure that there will be enough beds to accommodate the flow of casualties, an evacuation policy is implemented which limits the period of time a person is to be kept at a forward treatment echelon. So, in peacetime with modern treatment methods, a patient can be effectively treated at a forward facility and returned to duty, whereas during wartime the evacuation policy would demand the same patient be sent to a rear echelon for treatment. The effect of limiting time spent at forward echelons would be to increase the number of DNBI cases seen at rear echelons, thus, increasing the number of hospital admissions for DNBI and skewing distributions toward infectious diseases.

Although the effect of combat must be assessed before estimating DNBI rates appropriate for medical planning, it is within the context of the afloat and ashore conditions that these effects of combat will be manifest. The current data provide the foundation for developing the estimates needed by military planners which can be supplemented by a wartime DNBI adjustment factor that reflects the effects of stress, exposure to endemic agents, and the impact of accelerated evacuation procedures.

References

1. Pugh, W.M., A Strategy for Computing Disease and Non-Battle Injury Rates. Naval Health Research Center, Report No. 89-45, San Diego, CA, 1989.

2. Blood, C.G., Pugh, W.M., Griffith, D.K., and Nirona, C.B., Navy Medical Resource Planning: Rates of Illness for Various Operational Theaters. Naval Health Research Center, Report No. 88-42, San Diego, CA, 1988.

3. Hoeffler, D.F., and Melton, L.J., Changes in the Distribution of Navy and Marine Corps Casualties from World War I Through the Vietnam Conflict. Military Medicine, 146, 776-779, 1981.

4. Hermansen, L.A. and Wilcox, W.W., An Analysis of Navy Outpatient Morbidity Reporting. Naval Health Research Center, Report No. 89-9, San Diego, CA 1989.

5. Blood, C.G., and Griffith, D.K., Ship Size as a Factor in Illness Incidence, Naval Health Research Center, Report No. 88-48, San Diego, CA, 1988.

6. Palinkas, L.A., Pineda, T.S., Burr, R.G., Hyams, K. C., Ten-Year Profile of Infectious and Parasitic Disease Hospitalizations in the U.S. Navy, Naval Health Research Center, Report No. 89-4, San Diego, CA. 1989.

7. Gunderson, E.K.E., Colcord, C., Health Risks in Naval Occupations: An Overview. Naval Health Research Center, Report No. 82-1, San Diego, CA 1982.

8. Blood, C.G., Nirona, C.B., and Pederson, L.S., Medical Resource Planning: The Need to Use a Standardized Diagnostic System. Naval Health Research Center, Report No. 89-41, San Diego, CA 1989.

APPENDIX I
WORLD REGIONS

EUROPE	NORTHEAST ASIA	SOUTHWEST ASIA	CONUS
ISRAEL	BURMA	ASIA not already assigned	The 48 Contiguous States
LEBANON	CAMBODIA	INDIAN OCEAN	
SYRIA	CHINA	ETHIOPIA	
TURKEY	HONG KONG	KENYA	
EUROPEAN CONTINENT			
ALGERIA	JAPAN	SOMALIA	
LIBYA	KOREA	SUDAN	
MOROCCO	LAOS	SOUTH PACIFIC OCEAN ISLANDS	
TUNISIA	MALAYSIA	AMERICAN SAMOA	
NORTH ATLANTIC OCEAN AGGREGATION	NEPAL	CANTON ISLAND	
MEDITERRANEAN ISLANDS	PHILIPPINES	FIJI	
	SINGAPORE	FRENCH POLYNESIA	
	THAILAND	GILBERT AND ELLICE	
	TAIWAN	KIRIBATI	
	VIETNAM	NEW CALEDONIA	
	MARIANAS	ADMIRALTY ISLAND	
	MARSHALL AND CAROLINES	TONGA	
	NORTH PACIFIC OCEAN ISLANDS	TUVALU	
	SOLOMONS	WESTERN SAMOA	
	GUAM	SOUTH PACIFIC OCEAN	
	HOWLANDS	BANDA SEA	
	BONIN/VOLCANO	CORAL SEA	
	JOHNSTON	AMUNDSEN SEA	
	KINGMAN REEF	GULF OF BONE	
	MIDWAY	FORES SEA	
	WAKE	BELLINGHAUSEN SEA	
	EAST PAC	JAVA SEA	
	WEST PAC	BISMARK SEA	
	GULF OF SAKHALIN	BALI SEA	
	CELEBES SEA	MAKASIAR STRAIT	
	TATAR STRAIT	GULF OF CARPENTARIA	
	EAST CHINA SEA	CERAM SEA	

WORLD REGIONS

EUROPE	NORTHEAST	SOUTHWEST	CONUS
	FORMOSA STRAIT	ROSE SEA	
	GULF OF TONKIN	SOLOMON SEA	
	LUZON STRAIT	TASMAN SEA	
	SEA OF JAPAN	ARAFURA SEA	
	GULF OF SHELEKHOV		
	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		
	YELLOW SEA		
	SINGAPORE STRAIT		
	BERING SEA		
	GULF OF ALASKA		
	BERING STRAIT		

TABLE 1. Person days at risk for inpatients by year for ships* on deployment at three world locations, 1980 - 1984

Year	Europe	Northeast Asia	Southwest Asia	United States
1980	3,063,738	4,222,412	2,779,022	62,592,200
1981	3,532,445	5,128,471	3,045,019	62,939,258
1982	4,302,817	5,073,063	3,022,819	63,448,450
1983	3,667,387	5,610,870	1,758,313	66,611,388
1984	3,361,052	5,358,441	2,629,770	63,930,314
TOTAL	17,927,439	25,393,257	13,234,943	319,521,610

*290 Ships deployed throughout 1980-1984

TABLE 2. Person days at risk for inpatients by year from shore facilities* at three world locations, 1980 - 1984

Year	Europe	Northeast Asia	Southwest Asia	United States
1980	1,647,404	6,221,438	370,400	66,325,694
1981	1,625,910	6,073,390	389,102	65,753,334
1982	1,632,135	5,939,513	427,506	65,716,394
1983	1,748,980	6,014,634	475,325	68,153,890
1984	1,816,941	6,150,709	384,306	69,445,108
TOTAL	8,471,370	30,399,684	2,046,639	335,394,420

*158 shore facilities

TABLE 3. Person-days at risk for outpatients by ship type

Ship Type	No. of Ships	Person-days		
		Europe	Northeast Asia	Southwest Asia
CV/CVN	2	607,595	253,300	244,000
LHA/LPH	2	78,650	102,706	
LPD	3	33,133	84,484	11,439
LST/LSD	3	41,728	57,548	21,607
FF	1	38,259		
TOTAL	11	799,365	498,038	277,046

TABLE 4. Hospital admission rates per 1,000 person-days for Enlisted Navy personnel during 1980 - 1984

Population	Illness Category	Location: Europe	Northeast Asia	Southwest Asia	United States
Ship	Disease	0.177	0.241	0.162	0.136
	Injury	0.047	0.056	0.029	0.043
	TOTAL	0.224	0.297	0.190	0.179
	C.I.*	(0.217,0.231)	(0.290,0.304)	(0.183,0.198)	(0.177, 0.180)
Shore	Disease	0.360	0.256	0.113	0.159
	Injury	0.052	0.036	0.012	0.029
	TOTAL	0.412	0.292	0.125	0.188
	C.I.	(0.399,0.426)	(0.286,0.298)	(0.110,0.141)	(0.187, 0.190)

*95% Confidence Intervals

TABLE 5. Hospital admission rates per 1,000 person-days for Disease and Non-Battle Injuries for Enlisted Navy personnel deployed during 1980

ICD-9 Categories	Europe	Northeast Asia	Southwest Asia	United States
Infective & Parasitic Diseases	0.008	0.024	0.010	0.009
Neoplasms	0.004	0.003	0.001	0.002
Endocrine, Nutritional & Metabolic	0.003	0.004	0.002	0.001
Blood & Blood Forming Organs	0.001	0.001	0.003	0.000
Mental Disorders	0.057	0.060	0.030	0.032
Nervous System & Sense Organs	0.007	0.008	0.005	0.005
Diseases of Circulatory System	0.007	0.011	0.010	0.005
Diseases of Respiratory System	0.008	0.021	0.011	0.011
Diseases of Digestive System	0.021	0.039	0.026	0.020
Diseases of Genitourinary System	0.009	0.010	0.024	0.009
Complications of Pregnancy	0.000	0.000	0.000	0.000
Diseases of the Skin	0.011	0.018	0.026	0.009
Diseases of the Musculoskeletal System	0.018	0.025	0.017	0.018
Congenital Anomalies	0.001	0.002	0.000	0.002
Perinatal Morbidity & Mortality	0.000	0.000	0.000	0.000
Symptoms & Ill-Defined Conditions	0.016	0.017	0.018	0.008
Accidents Poisonings & Violence	0.055	0.065	0.036	0.045
TOTAL	0.236	0.316	0.225	0.183

TABLE 6. Hospital admission rates per 1,000 person-days for Disease and Non-Battle Injuries for Enlisted Navy personnel deployed during 1981

ICD-9 Categories	Europe	Northeast Asia	Southwest Asia	United States
Infective & Parasitic Diseases	0.006	0.013	0.005	0.008
Neoplasms	0.003	0.003	0.002	0.003
Endocrine, Nutritional & Metabolic	0.003	0.003	0.003	0.001
Blood & Blood Forming Organs	0.001	0.001	0.001	0.000
Mental Disorders	0.038	0.059	0.029	0.029
Nervous System & Sense Organs	0.008	0.010	0.008	0.006
Diseases of Circulatory System	0.008	0.010	0.003	0.005
Diseases of Respiratory System	0.008	0.014	0.004	0.011
Diseases of Digestive system	0.026	0.039	0.019	0.018
Diseases of Genitourinary System	0.022	0.017	0.014	0.010
Complications of Pregnancy	0.000	0.000	0.000	0.000
Diseases of the Skin	0.012	0.017	0.010	0.009
Diseases of the Musculoskeletal System	0.016	0.019	0.013	0.018
Congenital Anomalies	0.001	0.003	0.000	0.001
Perinatal Morbidity & Mortality	0.000	0.000	0.000	0.000
Symptoms & Ill-Defined Conditions	0.016	0.015	0.011	0.009
Accidents Poisonings & Violence	0.056	0.056	0.021	0.043
TOTAL	0.234	0.287	0.150	0.180

TABLE 7. Hospital admission rates per 1,000 person-days for Disease and Non-Battle Injuries for Enlisted Navy personnel deployed during 1982

ICD-9 Categories	Europe	Northeast Asia	Southwest Asia	United States
Infective & Parasitic Diseases	0.005	0.020	0.012	0.010
Neoplasms	0.003	0.004	0.003	0.002
Endocrine, Nutritional & Metabolic	0.004	0.003	0.001	0.002
Blood & Blood Forming Organs	0.001	0.002	0.002	0.000
Mental Disorders	0.037	0.074	0.043	0.033
Nervous System & Sense Organs	0.010	0.007	0.008	0.006
Diseases of Circulatory System	0.007	0.007	0.010	0.004
Diseases of Respiratory System	0.008	0.023	0.013	0.012
Diseases of Digestive system	0.020	0.035	0.026	0.018
Diseases of Genitourinary System	0.014	0.019	0.012	0.008
Complications of Pregnancy	0.000	0.000	0.000	0.000
Diseases of the Skin	0.013	0.023	0.022	0.008
Diseases of the Musculoskeletal System	0.015	0.018	0.015	0.016
Congenital Anomalies	0.001	0.001	0.000	0.002
Perinatal Morbidity & Mortality	0.000	0.000	0.000	0.000
Symptoms & Ill-Defined Conditions	0.011	0.015	0.017	0.009
Accidents Poisonings & Violence	0.040	0.049	0.034	0.043
TOTAL	0.205	0.307	0.229	0.182

TABLE 8. Hospital admission rates per 1,000 person-days for Disease and Non-Battle Injuries for Enlisted Navy personnel deployed during 1983

ICD-9 Categories	Europe	Northeast Asia	Southwest Asia	United States
Infective & Parasitic Diseases	0.006	0.014	0.004	0.008
Neoplasms	0.001	0.003	0.001	0.002
Endocrine, Nutritional & Metabolic	0.006	0.003	0.002	0.002
Blood & Blood Forming Organs	0.001	0.002	0.001	0.000
Mental Disorders	0.045	0.061	0.032	0.032
Nervous System & Sense Organs	0.007	0.012	0.004	0.005
Diseases of Circulatory System	0.005	0.009	0.007	0.004
Diseases of Respiratory System	0.008	0.018	0.006	0.012
Diseases of Digestive system	0.041	0.035	0.022	0.020
Diseases of Genitourinary System	0.010	0.014	0.005	0.007
Complications of Pregnancy	0.000	0.000	0.000	0.000
Diseases of the Skin	0.011	0.015	0.010	0.008
Diseases of the Musculoskeletal System	0.022	0.017	0.013	0.017
Congenital Anomalies	0.002	0.002	0.000	0.001
Perinatal Morbidity & Mortality	0.000	0.000	0.000	0.000
Symptoms & Ill-Defined Conditions	0.009	0.014	0.009	0.009
Accidents Poisonings & Violence	0.046	0.063	0.030	0.043
TOTAL	0.228	0.288	0.147	0.177

TABLE 9. Hospital admission rates per 1,000 person-days for Disease and Non-Battle Injuries for Enlisted Navy personnel deployed during 1984

ICD-9 Categories	Europe	Northeast Asia	Southwest Asia	United States
Infective & Parasitic Diseases	0.004	0.015	0.006	0.007
Neoplasms	0.003	0.005	0.001	0.003
Endocrine, Nutritional & Metabolic	0.007	0.004	0.001	0.001
Blood & Blood Forming Organs	0.001	0.001	0.000	0.000
Mental Disorders	0.039	0.074	0.026	0.031
Nervous System & Sense Organs	0.006	0.012	0.060	0.005
Diseases of Circulatory System	0.008	0.010	0.006	0.004
Diseases of Respiratory System	0.003	0.019	0.005	0.010
Diseases of Digestive system	0.050	0.031	0.020	0.019
Diseases of Genitourinary System	0.018	0.015	0.011	0.008
Complications of Pregnancy	0.000	0.000	0.000	0.000
Diseases of the Skin	0.006	0.016	0.006	0.007
Diseases of the Musculoskeletal System	0.019	0.016	0.005	0.018
Congenital Anomalies	0.000	0.002	0.000	0.001
Perinatal Morbidity & Mortality	0.000	0.000	0.000	0.000
Symptoms & Ill-Defined Conditions	0.013	0.015	0.008	0.009
Accidents Poisonings & Violence	0.041	0.049	0.022	0.040
TOTAL	0.223	0.293	0.184	0.173

TABLE 10. Hospital admission rates per 1,000 person-days for Disease and Non-Battle Injuries for Enlisted Navy personnel at shore facilities during 1980

ICD-9 Categories	Europe	Northeast Asia	Southwest Asia	United States
Infective & Parasitic Diseases	0.010	0.018	0.005	0.009
Neoplasms	0.005	0.004	0.003	0.004
Endocrine, Nutritional & Metabolic	0.007	0.002	0.003	0.002
Blood & Blood Forming Organs	0.001	0.002	0.000	0.000
Mental Disorders	0.060	0.042	0.027	0.030
Nervous System & Sense Organs	0.010	0.006	0.005	0.006
Diseases of Circulatory System	0.008	0.007	0.003	0.006
Diseases of Respiratory System	0.011	0.014	0.005	0.011
Diseases of Digestive system	0.025	0.027	0.008	0.020
Diseases of Genitourinary System	0.024	0.021	0.003	0.011
Complications of Pregnancy	0.024	0.019	0.000	0.010
Diseases of the Skin	0.006	0.014	0.000	0.006
Diseases of the Musculoskeletal System	0.018	0.014	0.014	0.017
Congenital Anomalies	0.001	0.003	0.000	0.002
Perinatal Morbidity & Mortality	0.000	0.000	0.000	0.000
Symptoms & Ill-Defined Conditions	0.019	0.011	0.008	0.008
Accidents Poisoning & Violence	0.039	0.031	0.008	0.030
TOTAL	0.273	0.248	0.097	0.181

TABLE 11. Hospital admission rates per 1,000 person-days for Disease and Non-Battle Injuries for Enlisted Navy personnel at shore facilities during 1981

ICD-9 Categories	Europe	Northeast Asia	Southwest Asia	United States
Infective & Parasitic Diseases	0.015	0.018	0.000	0.008
Neoplasms	0.010	0.005	0.008	0.004
Endocrine, Nutritional & Metabolic	0.005	0.002	0.000	0.001
Blood & Blood Forming Organs	0.001	0.002	0.000	0.000
Mental Disorders	0.085	0.050	0.054	0.030
Nervous System & Sense Organs	0.022	0.006	0.000	0.006
Diseases of Circulatory System	0.010	0.009	0.000	0.007
Diseases of Respiratory System	0.009	0.012	0.005	0.011
Diseases of Digestive system	0.031	0.030	0.003	0.020
Diseases of Genitourinary System	0.031	0.019	0.000	0.012
Complications of Pregnancy	0.028	0.027	0.000	0.013
Diseases of the Skin	0.009	0.009	0.000	0.006
Diseases of the Musculoskeletal System	0.030	0.021	0.018	0.018
Congenital Anomalies	0.001	0.002	0.000	0.002
Perinatal Morbidity & Mortality	0.000	0.000	0.000	0.000
Symptoms & Ill-Defined Conditions	0.020	0.011	0.005	0.009
Accidents Poisoning & Violence	0.060	0.031	0.010	0.029
TOTAL	0.389	0.266	0.105	0.188

TABLE 12. Hospital admission rates per 1,000 person-days for Disease and Non-Battle Injuries for Enlisted Navy personnel at shore facilities during 1982

ICD-9 Categories	Europe	Northeast Asia	Southwest Asia	United States
Infective & Parasitic Diseases	0.026	0.013	0.002	0.007
Neoplasms	0.009	0.006	0.000	0.004
Endocrine, Nutritional & Metabolic	0.007	0.004	0.002	0.002
Blood & Blood Forming Organs	0.002	0.002	0.000	0.001
Mental Disorders	0.070	0.055	0.075	0.029
Nervous System & Sense Organs	0.014	0.009	0.016	0.006
Diseases of Circulatory System	0.010	0.008	0.005	0.006
Diseases of Respiratory System	0.017	0.016	0.000	0.012
Diseases of Digestive system	0.041	0.024	0.016	0.020
Diseases of Genitourinary System	0.046	0.023	0.002	0.012
Complications of Pregnancy	0.047	0.032	0.000	0.016
Diseases of the Skin	0.011	0.011	0.002	0.006
Diseases of the Musculoskeletal System	0.034	0.018	0.007	0.018
Congenital Anomalies	0.004	0.004	0.000	0.002
Perinatal Morbidity & Mortality	0.000	0.000	0.000	0.000
Symptoms & Ill-Defined Conditions	0.023	0.014	0.007	0.010
Accidents Poisoning & Violence	0.053	0.035	0.005	0.030
TOTAL	0.433	0.287	0.150	0.194

TABLE 13. Hospital admission rates per 1,000 person-days for Disease and Non-Battle Injuries for Enlisted Navy personnel at shore facilities during 1983

ICD-9 Categories	Europe	Northeast Asia	Southwest Asia	United States
Infective & Parasitic Diseases	0.034	0.012	0.002	0.007
Neoplasms	0.009	0.006	0.002	0.004
Endocrine, Nutritional & Metabolic	0.006	0.002	0.000	0.001
Blood & Blood Forming Organs	0.005	0.001	0.000	0.001
Mental Disorders	0.095	0.062	0.044	0.027
Nervous System & Sense Organs	0.019	0.007	0.004	0.005
Diseases of Circulatory System	0.014	0.010	0.002	0.006
Diseases of Respiratory System	0.020	0.016	0.006	0.011
Diseases of Digestive system	0.033	0.035	0.002	0.019
Diseases of Genitourinary System	0.030	0.028	0.019	0.011
Complications of Pregnancy	0.061	0.035	0.002	0.019
Diseases of the Skin	0.007	0.007	0.006	0.006
Diseases of the Musculoskeletal System	0.038	0.024	0.017	0.018
Congenital Anomalies	0.005	0.004	0.000	0.001
Perinatal Morbidity & Mortality	0.000	0.000	0.000	0.000
Symptoms & Ill-Defined Conditions	0.034	0.011	0.017	0.010
Accidents Poisoning & Violence	0.070	0.039	0.013	0.029
TOTAL	0.500	0.315	0.145	0.189

TABLE 14. Hospital admission rates per 1,000 person-days for Disease and Non-Battle Injuries for Enlisted Navy personnel at shore facilities during 1984

ICD-9 Categories	Europe	Northeast Asia	Southwest Asia	United States
Infective & Parasitic Diseases	0.023	0.014	0.005	0.008
Neoplasms	0.007	0.008	0.000	0.004
Endocrine, Nutritional & Metabolic	0.010	0.003	0.000	0.002
Blood & Blood Forming Organs	0.003	0.002	0.000	0.000
Mental Disorders	0.100	0.056	0.031	0.026
Nervous System & Sense Organs	0.010	0.012	0.003	0.005
Diseases of Circulatory System	0.015	0.011	0.000	0.006
Diseases of Respiratory System	0.018	0.019	0.000	0.012
Diseases of Digestive system	0.040	0.03[illegible]	0.021	0.020
Diseases of Genitourinary System	0.030	0.026	0.018	0.010
Complications of Pregnancy	0.076	0.036	0.000	0.021
Diseases of the Skin	0.010	0.015	0.000	0.006
Diseases of the Musculoskeletal System	0.022	0.023	0.010	0.020
Congenital Anomalies	0.001	0.004	0.000	0.001
Perinatal Morbidity & Mortality	0.000	0.000	0.000	0.000
Symptoms & Ill-Defined Conditions	0.019	0.017	0.005	0.010
Accidents Poisoning & Violence	0.039	0.040	0.023	0.026
TOTAL	0.457	0.340	0.117	0.190

TABLE 15. Outpatient rates per 1,000 person-days for Navy Enlisted personnel during January - June 1989

Illness	Location			Shore
Category	Europe	Northeast Asia	Southwest Asia	Northeast Asia
Disease	0.374	0.568	0.224	0.244
Injury	0.076	0.052	0.007	0.061
TOTAL	0.450	0.620	0.231	0.305
C.I.*	(0.405,0.499)	(0.553,0.694)	(0.178,0.295)	(0.186,0.471)

*95% Confidence Intervals

TABLE 16. Outpatient rates per 1,000 person-days for Navy Enlisted personnel by ship type during January - June 1989

Population	Illness Category	Location: Europe	Location: Northeast Asia	Location: Southwest Asia
Aircraft Carriers	Disease	0.273	0.355	0.213
	Injury	0.061	0.012	0.004
	TOTAL	0.334	0.367	0.217
	C.I.*	(0.290,0.383)	(0.296,0.450)	(0.163,0.284)
Non-Aircraft Carriers	Disease	0.694	0.789	0.303
	Injury	0.125	0.094	0.030
	TOTAL	0.819	0.883	0.333
	C.I.*	(0.696,0.957)	(0.769,1.008)	(0.166,0.596)

*95% Confidence Intervals

TABLE 17. Outpatient rates per 1,000 person-days for Navy Enlisted personnel during January - June 1989

	Europe		Northeast Asia		Southwest Asia	
	Carrier	Non-carrier	Carrier	Non-carrier	Carrier	Non-carrier
ICD-9 Categories						
Infective & Parasitic Diseases	0.053	0.068	0.099	0.123	0.041	0.030
Neoplasms	0.000	0.000	0.000	0.000	0.000	0.000
Endocrine, Nutritional & Metabolic	0.000	0.000	0.000	0.000	0.000	0.000
Blood & Blood Forming Organs	0.000	0.000	0.000	0.000	0.000	0.000
Mental Disorders	0.007	0.047	0.004	0.016	0.004	0.000
Nervous System & Sense Organs	0.003	0.000	0.000	0.025	0.000	0.000
Diseases of Circulatory System	0.003	0.010	0.000	0.000	0.000	0.000
Diseases of Respiratory System	0.095	0.172	0.111	0.237	0.066	0.061
Diseases of Digestive system	0.069	0.256	0.071	0.302	0.033	0.061
Diseases of Genitourinary System	0.007	0.016	0.004	0.008	0.004	0.061
Complications of Pregnancy	0.000	0.000	0.000	0.000	0.000	0.000
Diseases of the Skin	0.013	0.021	0.016	0.020	0.016	0.030
Diseases of the Musculoskeletal System	0.007	0.031	0.012	0.025	0.008	0.000
Congenital Anomalies	0.000	0.005	0.004	0.000	0.000	0.000
Perinatal Morbidity & Mortality	0.000	0.000	0.000	0.000	0.000	0.000
Symptoms & Ill-Defined Conditions	0.018	0.068	0.036	0.033	0.041	0.061
Accidents Poisoning & Violence	0.061	0.125	0.012	0.094	0.004	0.030
TOTAL	0.334	0.819	0.367	0.883	0.217	0.333

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(U) DISEASE AND NON-BATTLE INJURY RATES FOR NAVY ENLISTED PERSONNEL DURING PEACETIME

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

Disease and Non-Battle Injury (DNBI) rates needed for medical planning were derived from the hospital admissions records and outpatient visits of U.S. Navy enlisted personnel. Hospital admissions of personnel from 290 U.S. Navy ships and 983 shore stations for the years 1980 through 1984 were examined. Records of outpatients requiring bed rest were collected from 12 U.S. Navy ships and three shore facilities. DNBI rates were computed from these data for forces afloat and forces ashore in Northeast Asia, Southwest Asia, and Europe. In addition, DNBI rates were computed for hospital admissions of personnel stationed in the Continental United States. Hospital Admission rates ranged between 0.125 and 0.412 admissions per 1000 persons per day. Mental Disorders, Diseases of the Digestive System, and Accidents, Poisonings and Violence accounted for the greatest number of hospitalizations of shipboard personnel. Although results were mixed for shore facilities, Mental Disorders continued to account for a large proportion of the hospitalizations. Overall, DNBI rates were higher for outpatients requiring bed rest than patients admitted to a hospital. The categories that contributed most to the outpatient DNBI rates were

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Respiratory Illness, Diseases of the Digestive System, and Infective and Parasitic Diseases. Although these results reflect DNBI rates under peacetime conditions, it was concluded that these data may be useful in developing projections for wartime operations.