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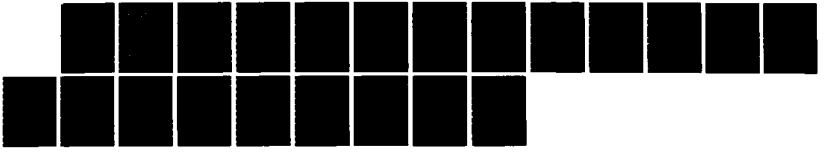

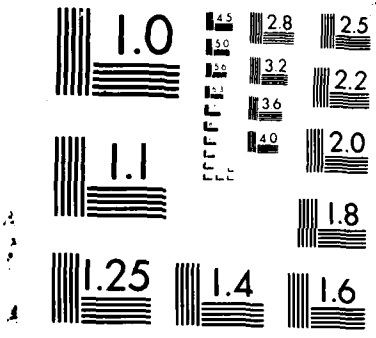

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ETHNICITY AND DISEASE INCIDENCE IN A COHORT OF ENLISTED NAVY MEN

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This paper describes the results of a longitudinal study of ethnic group differences in rates of first hospitalization for all diseases and injuries among a cohort of U.S. Navy men who enlisted in 1974. This group was followed for a six-year period. Age-adjusted rates for ethnic subgroups by diagnostic category, occupation, and education were calculated. Considerable variation in disease risk was found among the different ethnic groups. Overall, Filipinos had the lowest rates of total first hospitalizations and Native Americans had the highest rates. Blacks had the second highest rates of total hospital admissions, followed by

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Caucasians, Hispanics, members of unspecified groups, and Asian-Americans. Similar patterns of disease risk by occupational category were found among all ethnic groups but wide variations were observed with respect to level of education. Ethnic group differences remained after controlling for education and occupation. Results of the study indicate that ethnic groups are not uniformly at risk for first hospitalizations in all disease categories when social environment and access to medical care are controlled for, and that the relationship between ethnicity and disease incidence is multifactorial.

ETHNICITY AND DISEASE INCIDENCE IN A COHORT OF ENLISTED NAVY MEN

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SUMMARY

Problem

Ethnic differences in the distribution of disease and injury have been attributed to a constellation of genetic, social, and cultural factors associated with ethnicity. In order to facilitate health care for growing numbers of minorities in the U.S. Navy, a better understanding of risk factors associated with ethnic group membership is required.

Objective

This paper describes the results of a longitudinal study of ethnic group differences in rates of first hospitalizations for all diseases and injuries among a cohort of U.S. Navy men who enlisted in 1974.

Approach

All U.S. Navy men who entered the service in 1974 were included in the study and followed for a six-year period using computerized medical and service files available at the Naval Health Research Center. Seven groups were defined on the basis of the self-designated ethnic identity of each cohort member. Age-adjusted incidence rates were derived from all first hospitalizations during the follow-up period and then grouped into 16 ICDA-8 diagnostic categories. Socioeconomic differences in rates of first hospitalization for each ethnic group also were examined.

Results

No consistent pattern for disease risk for anyone of the ethnic groups across all diagnostic categories was observed. When compared to Caucasians, an excess risk was observed among Filipinos for diseases of the circulatory system; among Hispanics for diseases of the genitourinary system; among Native Americans for infective and parasitic diseases; and among blacks for diseases of the blood, diseases of the genitourinary system, and special conditions. In the remaining disease categories, the rates of the minority groups were either not significantly different from or were less than the rate of the Caucasian group. Controlling for differences in socioeconomic status reduced but did not eliminate the differences in rates of first hospitalization between Caucasians and the minority ethnic groups.

Conclusions

The results from this study indicate that ethnic groups are not uniformly at risk for first hospitalizations in all disease categories when social environment and access to medical care are controlled for, and that the relationship between ethnicity and disease incidence is multifactorial. Eliminating the disparity in disease risk among ethnic groups requires a better understanding of the complexity of interrelated etiologic factors which are tied to ethnic group membership and ethnic identity.

A-1

ETHNICITY AND DISEASE INCIDENCE IN A COHORT OF ENLISTED NAVY MEN

One of the major sources of variation in the distribution of disease and injury within a population has been ethnic group status. Ethnic group differences in rates of disease incidence and prevalence and mortality due to accidents and violence have been noted in several studies (1-8). These differences have been attributed to a constellation of different factors associated with ethnicity, including genetic predisposition (9-10), acculturation and modernization (11-12), discrimination associated with minority status (13-14), low socioeconomic status (15-17), diet (18-19), strategies and resources for coping with stress (20-21), and health care practices and beliefs (22-25). Many of these factors have been implicated in studies of ethnic group differences in disease incidence among U.S. Navy personnel. When compared to Caucasians, for example, black enlisted personnel have been found to have greater hospitalization rates for mental disorders; diseases of the digestive system; diseases of the musculoskeletal system; diseases of the circulatory system; diseases of the genitourinary system; and diseases of blood and blood-forming organs (26-27). On the other hand, black enlisted personnel have exhibited lower rates of first hospitalizations for diseases of the skin and subcutaneous tissue and accidents, poisonings and violence than their Caucasian counterparts (27).

Unfortunately, most of the studies which have explicitly examined ethnic differences in the Navy have been largely restricted to blacks. A study by Holberg, Berard and Ernst (28) examined five different groups, but they were defined on the basis of race rather than ethnicity, and differences in age and socioeconomic status were not controlled for. While blacks comprise the largest non-white ethnic minority in the Navy, other ethnic groups are represented by growing numbers of enlisted personnel. Hispanics, for example, represent an estimated 3.5 percent of all enlisted personnel in the Navy today (29). Filipinos, who are admitted into the Navy through a special treaty with the Philippines, also represent a sizable proportion of enlisted personnel

This paper describes the results of a longitudinal study of ethnic group differences in rates of first hospitalizations for all diseases and injuries among a cohort of U.S. Navy men who enlisted in 1974. While the Navy includes restricted samples of the ethnic groups in the United States, one of the major advantages of examining the role of ethnicity in disease risk among Navy personnel is that a comparison of different groups in a relatively uniform environment enables us to control for potential confounding factors such as differential access to health care, diet and socioeconomic status. Moreover, a prospective study of a cohort controls for differences in income by examining a disease-free population which begins the study at the same income level (recruit).

METHODS

The study population consisted of all Navy enlisted men who entered the service in 1974. This group was followed for a six-year period with the end of the study designated as 31 December 1979. Hospitalization records, originally collected by the Navy Medical Data Services Center in Bethesda, Maryland, were edited and compiled into individual medical records for research purposes at the Naval Health Research Center in San Diego. Variables examined in this study include disease diagnosis, age, ethnic group status, education, length of service, paygrade, occupational specialty, and year hospitalized. Diagnoses were in accordance with the Eighth Revision, Inter-

national Classification of Disease Adapted for Use in the United States. Sixteen of the 18 major diagnostic categories were included in the study. Two categories--complications of pregnancy, childbirth and the puerperium, and certain causes of perinatal morbidity and mortality--were not relevant to the study. Because the numbers of minority female personnel were insufficient to produce meaningful rates in many of the variable-specific categories, only males were examined.

Incidence rates were defined on the basis of the first hospitalization for a new or different ICDA-8 diagnosis of each cohort member. In order to establish complete cases ascertainment, all first hospitalizations for unique diagnoses (per cohort member) were included. Thus, one individual may be hospitalized more than once, but multiple hospitalizations are recorded only if they are for different reasons. Incidence rates are expressed as the number of first hospitalizations per 10,000 person years.

Population at risk was compiled from data files obtained from the Manpower and Personnel Management Information System (NMPC 15642). These files contain information on date of entry into the service, age at entry, education, date and type of separation from service, and occupation at time of separation or end of study period, whichever came first. Population at risk, defined in terms of person-years, was computed as the number of cohort members who remained on active duty each year for the six-year follow-up period. A step-wise method was employed in the calculation of person-years at risk by age in order to take into consideration the movement of cohort members from one age group to the next during the study period. Thus, personnel who entered the study as members of the 17-19 year old group would be in the 20-24 year old group by the end of the study if they remained on active duty.

Ethnic groups were defined on the basis of the self-designated ethnic identity of each member of the cohort. Service history records contain the responses of each enlistee to a question as to their ethnicity. Twenty-one categories, listed in Table 1, comprise the range of responses of cohort members. Some of these categories were grouped on the basis of cultural similarities in order to construct statistically meaningful populations for purposes of comparison. Individuals who listed themselves as belonging to the two last categories (Other and None) were further distinguished on the basis of race to identify Black and Caucasian members of the cohort who did not identify themselves as belonging to a specific ethnic group.

Age-adjusted rates for the diagnostic categories and total first hospitalizations were calculated using the direct method of adjustment with the total cohort comprising the standard population (30) in order to control for potential confounding by differences in socioeconomic status. Incidence (first hospitalization) rates also were calculated for subgroups of each ethnic group on the basis of occupation and education. Levels of significance were obtained using 95% confidence intervals.

RESULTS

Demographic Characteristics of Cohort

A description of the demographic characteristics of each ethnic group is provided in Table 2. Group comparisons were made using analyses of variance and chi square tests. Pairwise comparisons were made using the Scheffe procedure and 95 percent confidence intervals. As this table indicates, no significant differences were observed in the mean ages of Hispanics, Native Americans, and Caucasians at the time of entry into the service. Filipinos and those who identified them-

Table 1. Ethnic Identify, 1974 Cohort of Enlisted Males

Ethnic Identifier	N	%	Ethnic Group	N	%
Spanish Descent (1)	4,576	5.8	Hispanic	6,440	8.2
Puerto Rican	605	0.8			
Mexican American (2)	1,214	1.5			
Cuban American	35	0			
Latin American (3)	10	0			
Native American	828	1.1	Native American	867	1.1
Eskimo	34	0			
Aleut	5	0			
Asian American	161	0.2	Asian American	262	0.3
Asian Indian	3	0			
Chinese	35	0			
Japanese	37	0			
Korean	18	0			
Melanesian	1	0			
Polynesian	7	0			
Filipino	2,057	2.6	Filipino	2,057	2.6
Other (4)	21,974	28.0	Unspecified	238	0.3
None (5)	36,203	46.2	Black	8,995	11.5
Not Reported	10,570	13.5	Caucasian	59,511	75.9
Total	78,370	99.7		78,370	99.9

(1) Includes all persons of Spanish extraction, except when delineated separately.
(2) Including Chicano.
(3) With Hispanic descent from Central or South America.
(4) Member of an ethnic group not reported above.
(5) Member considers himself to be of the general population.

selves as belonging to unspecified ethnic groups were significantly older than each of the other group members. Filipinos also remained in the Navy for a significantly longer period of time than any other ethnic group and blacks remained in the service for the shortest period of time ($p < .05$).

Filipinos and members of unspecified ethnic groups were the best educated at the time of enlistment with a mean number of years in school of 12.9 and 12.3 respectively ($p < .05$). Blacks, Hispanics, and Native Americans had the largest percentages of members in apprentice occupational rates at the time of discharge or end of study, and Filipinos had the lowest percentages of personnel in these rates. This, however, is a reflection of ethnic differences in length of service with an inverse relationship between mean months served and percent of ethnic group in this occupational category. With respect to the other occupational categories, the greatest proportion of the Filipino group were in medical and administrative/clerical rates. Filipinos had a small proportion of personnel in electronic/technical rates relative to other groups, however.

Table 2. Characteristics of Enlisted Cohort by Ethnic Group, 1974 Male Enlistees

	Ethnic Group						
	Hisparics	Native Americans	Asian Americans	Un-specified	Fili-pinos	Blacks	Cau-casians
Mean Age	18.93	19.00	19.43	20.73	22.20	19.46	18.98
Lower 95% C.L.	18.89	18.88	19.18	20.38	22.10	19.42	18.97
Upper 95% C.L.	18.98	19.13	19.68	21.08	22.30	19.50	19.00
F Ratio = 1043.16 p < .0001							
Mean Months Served	39.18	38.97	52.37	70.91	90.26	35.74	40.96
Lower 95% C.L.	38.48	36.99	48.40	66.70	89.00	35.06	40.70
Lower 95% C.L.	39.87	40.94	56.34	75.13	91.51	36.42	41.22
F Ratio = 899.41 p < .0001							
Mean Education	11.41	11.35	11.84	12.32	12.92	11.60	11.49
Lower 95% C.L.	11.38	11.28	11.71	12.18	12.86	11.58	11.49
Upper 95% C.L.	11.44	11.43	11.97	12.47	12.98	11.61	11.50
F Ratio = 613.13 p < 0001							
Occupation	%	%	%	%	%	%	%
Apprent/Recruit	38.1	39.8	24.2	15.4	5.6	45.6	27.6
Blue Collar	37.2	34.7	39.2	49.1	48.6	26.1	41.7
Admin/Clerical	9.0	8.9	12.5	18.4	31.6	14.1	7.2
Elect/Tech	12.2	12.4	15.0	9.8	4.0	10.8	19.6
Medical	3.2	4.1	9.2	7.3	10.1	2.9	3.7
Other	0.3	0.1	0	0	0.2	0.4	0.2
	100.0	100.0	100.0	100.0	100.0	100.0	100.0

x^2 = 4124.4; d.f. = 30; p < .0001

Incidence Rates

Table 3 provides data on the rates of first hospitalization for all diagnoses and for all diagnoses within a diagnostic category. These data indicate considerable variation in disease risk among the different ethnic groups. Overall, Filipinos had the lowest rates of total first hospitalizations and Native Americans had the highest rates. Native Americans had the highest rates for infective and parasitic diseases; mental disorders, especially drug and alcohol abuse; diseases of the respiratory system; diseases of the skin and subcutaneous tissue; diseases of the musculoskeketal system; symptoms and ill-defined conditions; and accidents, poisonings and violence. Native Americans also had the lowest rates for diseases of the circulatory system.

Blacks displayed the second highest rate for total first hospitalizations. Blacks also displayed the highest rates for neoplasms; diseases of blood and blood-forming organs; diseases of the digestive system; and diseases of the genitourinary system.

Caucasians displayed the third highest rate for total first hospitalizations. Caucasians also displayed the highest rates for diseases of the nervous system and sense organs.

Hispanics ranked fourth in rate of total first hospitalizations. However, Hispanics displayed the lowest rates among all ethnic groups for diseases of the respiratory system; congenital anomalies; and special conditions.

Table 3. Age-Adjusted First Hospitalization Rates (per 10,000 person years) and 95 Percent Confidence Limits for Enlisted Males by Ethnic Group and Diagnostic Category, 1974 Enlisted Cohort: 1974-1979

	Ethnic Group						
	Hispanics	Native Americans	Asian Americans	Unspecified	Filipinos	Blacks	Caucasians
INFECTIVE AND PARASITIC DISEASES							
N of Cases	178	41	6	11	97	256	1,915
Rate	93.7	162.3	64.1	124.8	133.7	108.0	104.5
Lower CL	79.9	112.6	12.8	51.0	107.1	94.7	99.8
Upper CL	107.5	212.0	115.4	198.5	160.3	121.2	109.1
NEOPLASMS							
N of Cases	22	4	2	3	9	38	270
Rate	11.2	15.3	19.3	55.1	4.5	15.6	14.9
Lower CL	6.3	0.3	0	0	1.5	10.6	13.1
Upper CL	16.1	30.3	46.0	117.4	7.4	20.5	16.6
ENDOCRINE, NUTRITIONAL, AND METABOLIC DISEASES							
N of Cases	16	3	1	1	7	20	149
Rate	8.5	13.2	9.6	9.7	15.5	8.4	8.3
Lower CL	4.3	0	0	0	4.0	4.7	6.9
Upper CL	12.6	28.2	28.5	28.7	27.0	12.1	9.6
DISEASES OF BLOOD AND BLOOD-FORMING ORGANS							
N of Cases	19	0	1	0	6	50	100
Rate	10.0	0	9.6	0	3.0	21.4	5.5
Lower CL	5.5	0	0	0	0.6	15.5	4.4
Upper CL	14.6	0	28.5	0	5.4	27.3	6.5
MENTAL DISORDERS							
N of Cases	423	68	13	12	28	513	3833
Rate	233.1	266.5	137.1	134.5	48.7	216.5	210.7
Lower CL	201.8	203.1	62.6	58.4	30.6	197.7	204.0
Upper CL	244.3	329.8	211.7	210.5	66.7	235.2	217.3
DISEASES OF THE NERVOUS SYSTEM AND SENSE ORGANS							
N of Cases	71	10	2	2	28	81	767
Rate	38.3	40.3	22.4	19.4	15.6	34.4	42.7
Lower CL	29.4	15.3	0	0	9.8	26.9	39.6
Upper CL	47.2	65.3	53.5	46.3	21.4	41.9	45.7
DISEASES OF THE CIRCULATORY SYSTEM							
N of Cases	48	6	3	3	31	88	515
Rate	26.6	23.5	28.9	35.2	58.6	37.0	28.6
Lower CL	19.1	4.7	0	0	38.0	29.3	26.2
Upper CL	34.1	42.4	61.6	75.1	79.2	44.7	31.1
DISEASES OF THE RESPIRATORY SYSTEM							
N of Cases	281	68	16	12	80	426	3898
Rate	140.3	259.7	191.2	193.6	210.8	183.0	211.1
Lower CL	123.9	198.8	97.5	84.1	164.6	165.6	204.4
Upper CL	156.7	321.4	284.9	303.1	257.0	200.4	217.7
DISEASES OF THE DIGESTIVE SYSTEM							
N of Cases	204	21	3	7	79	299	1902
Rate	105.8	86.2	28.4	74.0	74.6	125.4	104.6
Lower CL	91.3	49.3	0	19.2	58.3	111.2	99.9
Upper CL	120.3	123.1	61.5	128.9	91.1	139.6	109.3

DISEASES OF THE GENITOURINARY SYSTEM							
N of Cases	160	21	5	5	25	440	848
Rate	87.5	80.2	54.5	32.7	28.4	182.8	46.9
Lower CL	74.0	45.9	6.7	4.0	17.3	165.7	43.8
Upper CL	101.1	114.4	102.2	61.4	39.6	199.8	50.1
DISEASES OF THE SKIN AND SUBCUTANEOUS TISSUE							
N of Cases	136	29	5	6	1	160	1851
Rate	69.6	111.7	54.5	69.4	99.3	67.3	100.9
Lower CL	57.9	71.0	6.7	13.9	70.0	56.9	96.3
Upper CL	81.3	152.4	102.2	125.0	128.6	77.8	105.5
DISEASES OF THE MUSCULOSKELETAL SYSTEM							
N of Cases	170	34	1	6	25	308	2005
Rate	90.0	134.3	9.6	64.3	72.9	128.9	110.3
Lower CL	76.4	89.2	0	12.9	44.3	114.5	105.4
Upper CL	103.5	179.5	28.5	115.8	101.5	143.3	115.1
CONGENITAL ANOMALIES							
N of Cases	29	4	5	1	11	60	453
Rate	14.5	15.3	50.6	9.7	30.6	25.4	24.8
Lower CL	9.2	0.3	6.2	0	12.5	19.0	22.5
Upper CL	19.7	30.3	95.0	28.7	48.7	31.8	27.1
SYMPTOMS AND ILL-DEFINED CONDITIONS							
N of Cases	134	22	2	4	33	188	1123
Rate	68.6	86.9	19.3	44.9	78.2	79.0	61.7
Lower CL	57.0	50.6	0	0.9	51.5	67.7	58.1
Upper CL	80.2	123.2	46.0	89.0	104.8	90.3	65.3
ACCIDENTS, POISONINGS, AND VIOLENCE							
N of Cases	598	95	28	27	105	601	6001
Rate	311.4	373.9	319.4	245.7	104.7	251.4	328.9
Lower CL	286.4	295.7	201.1	153.0	84.7	231.3	320.6
Upper CL	336.3	449.1	437.7	338.4	124.7	271.5	337.2
SPECIAL CONDITIONS							
N of Cases	45	10	4	2	22	215	789
Rate	22.6	38.3	41.0	45.4	156.2	92.6	42.9
Lower CL	16.0	14.6	0.8	0	90.9	80.2	39.9
Upper CL	29.2	62.0	81.2	108.2	221.4	105.0	45.8
TOTAL FIRST HOSPITALIZATIONS							
N of Cases	2534	436	97	192	630	3744	26422
Rate	1321.8	1707.7	1060.0	1158.4	994.8	1577.4	1447.2
Lower CL	1270.3	1547.4	849.1	933.6	917.2	1526.9	1429.8
Upper CL	1373.2	1867.9	1271.0	1564.3	1072.5	1627.9	1464.7
PERSON YEARS AT RISK							
	19,394.5	2503.5	962.5	1060.5	13378.0	23,868.0	181,060.5

Highest and lowest rates for each diagnostic category are underlined. Rates based on 3 or fewer cases were not used in comparisons.

Members of Unspecified ethnic groups displayed the smallest rates for diseases of the digestive system (along with Filipinos); diseases of the musculoskeletal system; and symptoms and ill-defined conditions.

Asian-Americans displayed the lowest rates for infective and parasitic diseases; and diseases of the skin and subcutaneous tissue; and the highest rate for congenital anomalies.

Filipinos displayed the smallest rates for diseases of blood and blood-forming organs; mental disorders; diseases of the nervous system and sense organs; diseases of the digestive system

(along with Unspecified groups); diseases of the genitourinary system; and accidents, poisonings and violence. Filipinos, however, displayed the highest rates among all ethnic groups for diseases of the circulatory system; special conditions; and endocrine, metabolic and nutritional diseases.

While this table provides a clear indication of highest and lowest rates within each disease category, cross-comparisons among all of the ethnic groups is a complex process yielding limited information because of the small number of cases in many disease categories. Therefore, it was

Table 4. Relative Risk[1] of First Hospitalizations by Diagnostic Category for Enlisted Males Belonging to Minority Ethnic Groups, 1974 Enlisted Cohort: 1974-1979

	Ethnic Group					
	His-panics	Native Americans	Asian Americans	Unspeci-fied	Fili-pinos	Blacks
INFECTIVE AND PARASITIC DISEASES	0.90	1.55*	0.61	1.19	1.28	1.03
NEOPLASMS	0.75	1.03	-	-	0.30	1.05
ENDOCRINE, NUTRITIONAL, AND METABOLIC DISEASES	1.02	-	-	-	1.87	1.01
DISEASES OF BLOOD AND BLOOD-FORMING ORGANS	1.82	-	-	-	0.55	3.89*
MENTAL DISORDERS	1.11	1.26	0.65	0.64	0.23*	1.03
DISEASES OF THE NERVOUS SYSTEM AND SENSE ORGANS	0.90	0.94	-	-	0.37*	0.81
DISEASES OF THE CIRCULATORY SYSTEM	0.93	0.82	-	-	2.05*	1.29
DISEASES OF THE RESPIRATORY SYSTEM	0.66*	1.23	0.91	0.92	1.00	0.87*
DISEASES OF THE DIGESTIVE SYSTEM	1.01	0.82	-	0.71	0.71*	1.20
DISEASES OF THE GENITOURINARY SYSTEM	1.87*	1.71	1.16	0.70	0.61*	3.90*
DISEASES OF THE SKIN AND SUBCUTANEOUS TISSUE	0.69*	1.11	0.54	0.69	-	0.67*
DISEASES OF THE MUSCULOSKELETAL SYSTEM	0.82*	1.22	-	0.58	0.66*	1.17
CONGENITAL ANOMALIES	0.58*	0.62	2.04	-	1.23	1.02
SYMPTOMS AND ILL-DEFINED CONDITIONS	1.11	1.41	-	0.73	1.27	1.28*
ACCIDENTS, POISONINGS, AND VIOLENCE	0.85	1.14	0.97	0.75	0.32*	0.76*
SPECIAL CONDITIONS	0.53*	0.59	0.00	-	3.64*	2.16*
TOTAL FIRST HOSPITALIZATIONS	0.91*	1.18*	0.73*	0.80	0.69*	1.09*

*[illegible]

[1]Defined as the rate of first hospitalizations of each minority ethnic group divided by the rate of first hospitalizations of the Caucasian group.

decided to compare the rates of each minority ethnic group with those of the Caucasian group in order to obtain estimates of relative risk. This comparison was not based on the assumption that Caucasians should serve as a reference group against which all other groups should be evaluated. However, it does enable us to test the hypothesis that certain ethnic groups are at risk for morbidity by virtue of their minority status in a population (13-14, 31). Significance of this estimate was determined by means of the confidence limits from Table 3.

A comparison of these estimates by disease category is provided in Table 4 above. Native Americans and blacks had significantly higher rates of total first hospitalizations than Caucasians, while Hispanics, Asian Americans and Filipinos had significantly lower rates.

The Hispanic rates for diseases of the respiratory system, diseases of the skin and subcutaneous tissue, diseases of the musculoskeletal system, congential anomalies, and special conditions were significantly lower than the Caucasian rates for these disease categories. However, Hispanics displayed a significant risk relative to Caucasians for diseases of the genitourinary system. A large number of hospitalizations (N = 88) for circumcisions accounted for most of this excess risk.

While Native Americans displayed high first hospitalization rates in several diagnostic categories as evidenced by Table 3, the only rate to attain statistical significance relative to the Caucasian rate was in the category of infective and parasitic diseases. Although the risk of any single diagnosis in this category among Native Americans was not significantly greater than it was for Caucasians, Native Americans did have higher rates of diarrheal disease, tuberculosis, viral hepatitis, mononucleosis, and venereal diseases.

Relative to Caucasians, Filipinos had significantly lower rates of mental disorders; diseases of the nervous system and sense organs; diseases of the digestive system; diseases of the genitourinary system; diseases of the musculoskeletal system; and accidents, poisonings and violence. Filipinos, however, also displayed significantly higher rates of diseases of the circulatory system; and special conditions relative to Caucasians.

Blacks displayed significantly lower rates for diseases of the respiratory system; diseases of the skin and subcutaneous tissue; and accidents, poisonings and violence than Caucasians. However, they also displayed significantly higher rates of diseases of blood and blood-forming organs; diseases of the genitourinary system; symptoms and ill-defined conditions; and special conditions. A large number of diagnoses of hereditary hemolytic anemias (N = 24), orchitis and epididymitis (N = 40), and circumcisions (N = 273) accounted for much of the excess risk in the first two categories.

Socioeconomic Status

As noted in Table 2, the ethnic groups in this cohort differ with respect to two different indices of socioeconomic status--education and occupation. One of these, education, indicates socioeconomic status prior to entry into the service while the other reflects status during active duty in the Navy. Because of the potential confounding by the association between socioeconomic status and disease risk, rates of total first hospitalizations by education and occupation were calculated. The results are presented in Table 5. Only among Asian Americans, Filipinos and Caucasians does a clear inverse relationship exist between education and disease incidence. However, only among Caucasians are the rates of each educational group significantly different

from one another. Significant differences were observed between those with 11 years or less of formal education and high school graduates within the Hispanic and black groups and between high school graduates and those with one or more years of college within the Native American group.

Table 5. Age-Adjusted Total First Hospitalization Rates (per 10,000 person years) and 95 Percent Confidence Limits for Enlisted Males by Ethnic Group and Socioeconomic Status, 1974 Enlisted Cohort: 1974-1979

	Ethnic Group						
	Hispanics	Native Americans	Asian Americans	Unspecified	Filipinos	Blacks	Caucasians
EDUCATION							
11th Grade or Less							
N of Cases	962	143	24	8	12	1185	8776
Rate	1531.9	1556.5	1476.4	1514.3	950.2	1794.1	1888.1
Lower CL	1435.1	1301.4	885.9	979.2	411.9	1692.0	1848.6
Upper CL	1628.7	1811.6	2067.0	2049.3	1488.5	1896.3	1927.6
High School Graduate							
N of Cases	1439	276	65	70	353	2261	15870
Rate	1211.3	1937.5	954.5	1042.5	867.9	1485.8	1306.4
Lower CL	1148.7	1708.8	722.4	798.4	777.3	1424.5	1286.1
Upper CL	1273.9	2166.1	1186.6	1286.6	958.4	1547.0	1326.7
One or More Years of College							
N of Cases	133	17	8	24	265	298	1773
Rate	1260.9	1055.5	664.7	1134.3	795.6	1585.3	1255.0
Lower CL	1151.6	533.5	204.4	680.6	699.9	1405.3	1196.6
Upper CL	1370.3	1557.7	1125.1	1588.0	891.4	1765.3	1313.4
OCCUPATION							
Apprentice/Recruit							
N of Cases	1309	250	49	52	256	2351	13581
Rate	2775.3	3954.8	3747.4	5915.5	8272.4	3474.7	5049.4
Lower CL	2625.0	3464.2	2842.1	4305.2	7259.1	3334.4	4964.5
Upper CL	2925.6	4445.4	5052.7	7525.8	9285.7	3615.0	5134.3
Blue Collar							
N of Cases	713	117	24	30	192	677	7105
Rate	881.5	1173.1	597.1	541.1	423.0	856.0	860.6
Lower CL	816.8	960.2	358.3	348.3	363.4	791.5	840.6
Upper CL	881.5	1386.0	835.9	733.9	482.6	920.5	880.6
Administrative/Clerical							
N of Cases	128	24	15	4	74	128	1520
Rate	1812.1	2561.5	1641.8	620.7	697.6	1615.8	2141.8
Lower CL	1497.8	1536.9	816.7	12.4	538.6	1335.5	2034.2
Upper CL	2126.4	3586.1	2466.9	1229.0	856.6	1896.1	2249.4
Electronic/Technical							
N of Cases	217	29	7	4	14	272	3133
Rate	745.0	663.6	477.2	474.7	410.5	829.3	716.2
Lower CL	645.7	422.7	117.5	9.5	193.0	730.8	691.1
Upper CL	844.3	904.5	836.9	939.9	628.0	927.8	741.3
Medical							
N of Cases	164	16	2	12	94	306	1058
Rate	828.2	638.6	148.1	283.7	156.9	782.1	801.6
Lower CL	701.5	325.7	0	123.0	125.2	694.4	753.3
Upper CL	954.9	951.6	354.0	444.4	188.6	869.7	849.9

Highest and lowest rates for each educational and occupational category are underlined. Rates based on 3 or fewer cases were not used in comparisons.

An examination of the ethnic group rates of total first hospitalization by occupational group provides a better indication of the role of socioeconomic status within the Navy itself. As is apparent from Table 5, among all ethnic groups, personnel in apprenticeship/recruit occupations had the highest rates, followed by personnel in administrative/clerical and blue collar occupations. Personnel in electronic/technical and medical occupations exhibited the lowest rates of first hospitalization among all ethnic groups; the rates were too similar to make any significant distinction in health risks among personnel in these two occupational categories. Relative to their own ethnic groups, Filipino apprentices and recruits appear to have an unusually high rate of total first hospitalizations while Filipino and Asian American medical personnel and Filipino and Unspecified administrative/clerical personnel all have unusually low rates.

When the rates of the minority ethnic groups were compared with those of the Caucasians using estimates of relative risk (Table 6), it becomes apparent that controlling for education does not eliminate ethnic group differences in observed rates. Filipino rates remain significantly lower than the rates of Caucasians at all three educational levels. The rates of black high school graduates and those with one or more years of college remain significantly higher than those of their Caucasian counterparts. Rates among Hispanics with 12 years or less of formal education remain significantly lower than the rates among Caucasians with the same educational levels, while the rates among Asian Americans with 12 or more years of formal education remain significantly greater than their Caucasian counterparts. One interesting divergence in the pattern occurred

Table 6. Relative Risk[1] of Total First Hospitalizations for Enlisted Males belonging to Minority Ethnic Groups by Socioeconomic Status, 1974 Enlisted Cohort: 1974-1979

	Ethnic Group					
	His-panics	Native Americans	Asian Americans	Unspeci-fied	Fili-pinos	Blacks
EDUCATION						
11th Grade or Less	0.81*	0.82*	0.78	0.80	0.50*	0.95
High School Graduate	0.93*	1.48*	0.73*	0.80	0.66*	1.14*
One or More Years of College	1.00	0.84	0.53*	0.90	0.63*	1.26*
OCCUPATION						
Apprentice/Recurit	0.55*	0.78*	0.78	1.17	1.64*	0.69*
Blue Collar	1.02	1.36*	0.69*	0.63*	0.49*	0.99
Administrative/Clerical	1.01	0.80	0.18*	0.35*	0.70*	0.98
Electronic/Technical	1.04	0.93	0.67	0.66	0.57*	1.16
Medical	0.85	1.20	0.77	0.29*	0.33*	0.75*

*$p < .05$

[1]Defined as the rate of total first hospitalizations of each minority ethnic group divided by the rate of total first hospitalizations of the Caucasian group.

among Native Americans. Those with 11 years or less of formal education had a significantly lower rate of total first hospitalizations than Caucasians with the same educational background. However, Native Americans who were high school graduates displayed a significantly greater rate of total disease incidence than their Caucasian counterparts.

As was the case with education, controlling for occupational differences reduced but did not eliminate the differences in rates of first hospitalization between Caucasians and the minority ethnic groups. Among Hispanics, the significant difference in rate of total first hospitalization relative to Caucasians disappeared when occupational differences were taken into consideration with the exception of Hispanic apprentice/recruit personnel. The same was true among blacks except for apprentice and medical personnel, and among Native Americans except for apprentice and blue collar personnel.

The first hospitalization rates of Asian American and Unspecified personnel in blue collar and administrative/clerical occupations remained significantly different from the rates of Caucasians in the same occupational categories. The rate of Unspecified medical personnel also remained significantly lower than the rate of Caucasian medical personnel. The rates of Filipinos in all occupational categories with the exception of apprentice/recruits remained significantly lower than the rates of Caucasians in the same occupations. Filipino apprentice/recruits had a significantly higher total first hospitalization rate than Caucasian apprentice/recruits.

DISCUSSION

In general, the results from this study indicate that no consistent pattern for disease risk can be observed for any one of the ethnic groups across all diagnostic categories. This was particularly evident in Table 3. When the rates of each minority ethnic group were compared to those of Caucasians, however, an excess risk was observed among Filipinos for diseases of the circulatory system; among Hispanics for diseases of the genitourinary system; among Native Americans for infective and parasitic diseases; and among blacks for diseases of the blood and blood-forming organs, diseases of the genitourinary system, and special conditions. In the remaining disease categories, the rates of the minority group was either not significantly different or was significantly less than the rate of the Caucasian group.

The findings of this study approximate the results of studies on the general U.S. population with some exceptions. Infective and parasitic diseases appear to be less of a problem for Hispanics and Asian-Americans in the Navy than their counterparts in the civilian population (24). Accidents, poisonings and violence also is less of a problem among black enlisted personnel than among black male civilians (32).

As noted by Mirowsky and Ross (13), two major theoretical perspectives have been employed to account for the health and well-being of ethnic minorities in the United States: the minority-status perspective and the ethnic-culture perspective. In the first perspective, health and well-being are threatened by the disadvantaged positions occupied by minorities in the social structure and the chronic social stressors associated with these positions. In the second perspective, differences in health and well-being are the product of different values, beliefs, and patterns of living of minority ethnic groups. It is evident from these results that not all minorities are at high risk for disease morbidity relative to Caucasians in the U.S. Navy. Minority status alone is insufficient to explain all forms of excess disease morbidity. If it is a factor, it does not

apply uniformly to all ethnic minorities. Similarly, in several instances, the ethnic differences remain when current socioeconomic status, measured by education and occupation, are controlled for.

How, then, do we explain the results? The difference in rates in many instances are due to diseases associated with a particular genetic predisposition, such as sickle cell anemia among blacks which accounts for their high rates of diseases of the blood and blood-forming organs. Much of the observed differences can also be attributed to the interaction of genetic and sociocultural factors such as the risk of alcoholism among Native Americans, schizophrenia among blacks, hypertension among blacks and Filipinos, and diabetes among Hispanics. In these instances, sociocultural practices relating to diet, belief systems, health care practices, and stress-coping strategies play a role in the association of particular diseases with particular ethnic groups. In the case of the Filipino personnel, acculturation may also be a risk factor, especially with respect to hypertension and other diseases of the circulatory system (11, 19).

Patterns of health care utilization may also account for many of the observed differences. Differential access to modern health care systems has often been used to explain the high mortality rates among minority groups (1). In this study, however, all active duty enlisted personnel have equal access to the same health care system. Nevertheless, differential access prior to enlistment may explain certain rates. Circumcisions, for instance, account for most of the first hospitalizations for diseases of the genitourinary system among blacks and Hispanics, reflecting the practice of not circumsizing black and Hispanic male infants because of cultural beliefs and practices and the difficulty of access to adequate medical care for many black and Hispanic Americans. Similarly, the high incidence of first hospitalizations for special conditions among Filipinos are accounted for by medical examinations which are generally unavailable to the segment of the population in the Philippines.

Another factor which might account for some of the variation in disease incidence is the expectations of different groups entering the service. Filipinos, for example, are highly motivated to perform well because of the unique opportunities afforded to them by enlistment. As noted by Duff and Arthur (33), "a U.S. Navy career, in no matter how humble a capacity, represent a greater opportunity and reward than that offered them in their native rural barrios or villages from which the naval enlistees are drawn." Many of these enlistees eventually become U.S. citizens and remain permanently in the United States. A reflection of this motivation and an indication of the degree to which their expectations are met is provided by the very low attrition rate during recruit training. Less than one percent of Filipinos are lost during recruit training as opposed to an approximately eight percent attrition among all other recruits (33). Further, as indicated by Table 2, Filipinos enlisted personnel remain in the service much longer than members of other ethnic groups.

Black college graduates, in a reversal of trends seen for most other ethnic groups, have higher rates of first hospitalizations than black high school graduates. Previous research has indicated that military service provides a means for maximizing economic opportunities and upward socioeconomic mobility for blacks in general (34-35). Among black college graduates, however, the attainment of a college degree may create expectations of upward mobility which are not met by the Navy. The result is a discrepancy between the expectations associated with a college education

and the reality associated with existing social status. As with the Filipinos, the expectations held by different groups of black enlisted personnel are a product of their sociocultural background. The greater the discrepancy between expectations and existing status, the greater the stress and risk for illness (12, 27). Under this hypothesis, we would expect college-educated blacks to have a higher rate of first hospitalization than blacks with less education or Filipinos, independent of the inverse relationship between education and disease incidence found among the total cohort. While our data suggest a relationship between status incongruity and disease incidence, quantitative measures of level of expectations and degree of status incongruity by ethnic group are required to test such a hypothesis.

Finally, differences in the selection of enlisted personnel may also play a role in explaining the observed differences in rates of first hospitalization. This cohort entered the service at the end of the Vietnam conflict a few years after the draft had been discontinued. During the first few years of the transition to an all-volunteer military force, it was widely believed that recruit standards were being lowered in the effort to maintain personnel strength at relatively constant levels (36). At the same time, the number of Filipino applicants exceeded the enlistment quota established by treaty, allowing recruiters to select only those applicants in superior physical and mental condition (29, 33). The difference in selection practices, therefore, would help to explain why the rate of first hospitalization among Filipinos is much lower than the rates among the other groups.

While the data lends support to many of these explanations of differences in ethnic group morbidity, it should be remembered that this study is largely descriptive and exploratory in nature. A thorough examination of each of these possibilities requires more sophisticated techniques provided by multivariate analyses and detailed data which were unavailable at the time of this study. It should also be noted that the use of total first hospitalizations or first admissions by diagnostic category is at once too general and too complex to provide a complete understanding of specific associations between ethnicity and morbidity. Rather these data provided only a broad overview of the relationship between ethnicity and disease incidence and the effects of a limited number of social and demographic characteristics on this relationship. Finally, the results do not provide a complete picture of all disease and injury incidence because only inpatient diagnoses were included in the study. Outpatient visits and the large number of illness episodes which never come to the attention of the current health care system (22) were not included.

Despite these limitations, however, the results from this study indicate that ethnic groups are not uniformly at risk for first hospitalizations in all disease categories when social environment and access to medical care are controlled for, and that the relationship between ethnicity and disease incidence is multifactorial. Eliminating the disparity in disease risk among ethnic groups requires a better understanding of the complexity of interrelated etiologic factors which are fundamentally tied to ethnic group membership and ethnic indentity.

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