

***INFECTIOUS DISEASE RATES IN THE
U. S. NAVY, 1980-1995***

***E. K. E. Gunderson
C. Garland
L. L. Hourani***

Report No. 00-10

20000830 060

Approved for public release; distribution unlimited.



**NAVAL HEALTH RESEARCH CENTER
P O BOX 85122
SAN DIEGO, CA 92186-5122**

**BUREAU OF MEDICINE AND SURGERY (MED-02)
2300 E ST. NW
WASHINGTON, DC 20372-5300**

DTIC QUALITY INSPECTED 4



Infectious Disease Rates in the US Navy, 1980-1995

E. K. Eric Gunderson, Ph.D.,

Cedric Garland, Dr. P.H., and Laurel L. Hourani, Ph.D., M.P.H.

Naval Health Research Center

Health Sciences and Epidemiology Department

P.O. Box 85122

San Diego, CA 92186-5122

Infectious Disease Rates in the US Navy

Abstract

Objectives. The impact of increasing numbers of women in the US Navy, particularly those aboard Navy ships, on infectious disease risk, is unknown. This study examines gender and other demographic differences among all US Navy enlisted personnel in first hospitalizations for infectious and parasitic diseases from 1980 through 1989 (N = 33,334 first hospitalizations), and it identifies trends in incidence rates of first hospitalization across this 10-year time period. It also examines trends in first hospitalization rates of certain infectious diseases according to admissions to shore-based facilities during the extended period from 1980-1995.

Methods. All information used in the study was from official personnel and medical records. First hospitalization rates were computed using the Epidemiological Interactive System, a computerized program that permits rapid access to and analyses of epidemiological data.

Results. Varicella and other viruses and chlamydiae accounted for more than 20,000 hospitalizations among Navy enlisted personnel in the 1980s. In 7 of the 12 categories of common infectious diseases, women's rates were higher than those for men, particularly for viral meningitis, herpes simplex, syphilis, gonococcal disease, and candidiasis.

Conclusions. In general, the 1980s were marked by downward trends in many infectious diseases, by relatively stable rates of sexually transmitted diseases, and by brief epidemic periods of measles, mumps, and varicella. Downward trends in admissions to shore facilities were also present for selected infectious diseases during 1980-1995. An excess of certain common infectious diseases among women and non-white ethnic groups emphasizes the need for continuing education and surveillance in these populations.

Introduction

Knowledge of the epidemiology of infectious and parasitic diseases in the Navy is important for health care planning and for a better understanding of their etiology, effects of new treatments and prophylactic measures, and prevention of high-risk exposures and future outbreaks. Navy personnel are exposed to a unique variety of risk factors because of crowded, confined living conditions aboard ships and in barracks, and contact with numerous unusual infectious agents potentially encountered in foreign ports while on worldwide duty assignments. Historically, infectious disease outbreaks have resulted in severe degradation of combat readiness and enormous costs in terms of health care costs and manpower loss, sometimes proving decisive in the success or failure of military operations. Modern medicine and technology have greatly reduced the threat of such catastrophic effects, but a range of threats remains for naval personnel because of the ubiquitous nature of respiratory and intestinal infectious agents in many naval duty settings.¹⁻⁸

The large increase in the number of women serving in the Navy has raised questions concerning the impact of infectious disease risks on women's health during recent years, particularly aboard Navy ships.⁹ Generally, Navy women have higher rates of first hospitalization for infectious diseases than Navy men. Between 1970 and 1972, the annual first hospitalization rate for infectious and parasitic diseases in women was more than four times as high as the rate in men.¹⁰ In later years this wide difference diminished considerably, but a difference has persisted for a number of such diagnoses. The present study will update these observations and present more detailed information about gender and demographic differences.

Methods

Data for the study were extracted from the Career History Archival Medical and Personnel System (CHAMPS) database created and maintained by the Naval Health Research Center, San Diego, Calif.¹¹ This data file is composed of six separate databases containing medical and career history information for all Navy and Marine Corps personnel. Data for Navy enlisted personnel extend from January 1, 1965, to the present. The data were compiled from four medical databases supplied by the Naval Medical Data Services Center (now the Naval Medical Information Management Center) in Bethesda, Md. These were hospitalization, Medical Board, Physical Evaluation Board, and death records. Also, data were compiled from personnel record extracts and monthly extract tapes reflecting important changes in military status (eg, promotions, demotions, unauthorized absences/desertions, changes in duty station and occupation, and type of discharge). Data elements from all files were combined and organized in chronological order by date and type of event. The database currently has more than 5 million members and tracks each member from entry into service until discharge.

Cases for most analyses in this study included all Navy enlisted personnel with first hospitalizations for infectious and parasitic diseases during 1980 through 1989 (N = 33,334 first hospitalizations). Beginning in 1991, inpatient admission reports were available in CHAMPS only for shore-based medical treatment facilities, including the major US and overseas Navy medical centers in Bethesda, San Diego, Portsmouth, and elsewhere. The most recent data available from shore facilities extended through 1995. Therefore, rates of selected infectious diseases were also calculated for shore facilities during the entire period 1980-1995. Infectious and parasitic diseases were identified using 3-digit International Classification of Diseases, 9th Revision (ICD-9) diagnostic categories.¹² These diagnostic categories are used by the Department

of Defense for disease classification. Preliminary analyses determined disease categories that had less than 1 new case per 100,000 person-years. These categories were omitted from subsequent analyses.

Diagnoses were made by physicians, usually at naval hospitals, at the time of discharge from the hospital and usually after a period of observation and diagnostic testing. All information used in the study was from official personnel and medical records.

First hospitalization rates were computed using the Epidemiological Projection Interactive System (EPISYS), a computerized program that permits rapid access to and analyses of CHAMPS epidemiological data. EPISYS currently contains demographic, occupational, duty assignment, and hospitalization data for all Navy enlisted personnel on active duty from January 1980 through December 1997. Denominators used by EPISYS were person-years, calculated by a method described elsewhere.¹³ Individual year denominators used for calculating rates during 1980-1989 are available from the authors. Average annual denominators (person-years of exposure) for demographic statistics are shown below.¹³

Total Navy enlisted personnel	4,997,151
Sex	
Men	4,577,138
Women	420,012
Race	
White	3,979,524
Black	686,550
Other	331,077
Age in years	
17-19	619,767
20-21	979,808
22-24	1,117,966
25-29	1,054,109
30-34	605,402
35-39	410,979
>39	211,620

Results

Specific 3-digit disease categories were organized by type of disease as shown in the ICD-9 manual.¹² This listing by type is reflected in Table 1. Rates are shown only where they exceeded 1 case per 100,000 person years. A large number of disease categories had zero or few cases so further analysis was not performed on these. The category with the most cases was "Viral diseases with exanthem" in which varicella (chickenpox) was the most common. Several categories of infectious or parasitic disease had no more than 1 case per 100,000 person-years, and are not included in this report. Hospitalized incidence rates for diseases with first hospitalization rates of 1 per 100,000 or higher are shown in Table 1. Rates varied from 1.2 per 100,000 (typhoid/paratyphoid, meningococcal infection, and neurosyphilis) to 133.9 per 100,000 (chickenpox).

Demographic differences for selected diseases are shown in Figure 1 and can be briefly summarized as follows:

Pulmonary tuberculosis. The incidence rate was higher for men than women. The rate for Other race was much higher than for white and black racial groups. Also, cases tended to be older than cases of any other infectious disease.

Viral meningitis. Women had more than double the rate in men. The white and black racial categories had higher rates than the Other race category. The highest rate occurred in the 25-29 year age group.

Herpes simplex. The first hospitalization incidence rate was 9 times higher for women than men. White and black racial groups had higher rates than the Other racial group. Cases tended to fall toward the younger end of the age range.

Measles. The rate was slightly higher for men than women and higher for whites than other racial groups. The highest first hospitalization rate was in the 20-21 year age group.

Other exanthema. The rate was slightly higher for men than women and higher for whites than the other racial groups. The rate was highest in the youngest age category.

Mumps. Women had a marginally higher rate than men, and the Other race category had a higher rate than whites or blacks. The youngest age category (17-19 years) had a much higher rate than other age categories.

Early syphilis. The rate for women was more than double that for men, and the rate for blacks was much higher than that for the other racial groups. Individuals aged 20-24 years had the highest rates.

Gonococcal disease. The rate for women was 3 times higher than that for men, and the rate for blacks was much higher than that for other racial groups. The highest rates were seen in the youngest age groups.

Other venereal disease. The rate for men was markedly higher than that for women. The rate for blacks was higher than the rate for other racial groups.

Dermatophytosis. The rate was much higher for men than women and was lower for the other race group than for the white or black groups. Rates were quite stable across age categories but highest in the youngest and oldest groups.

Candidiasis. The rate in blacks was higher than in other racial groups. Rates were constant across age groups.

Sarcoidosis. Women had a slightly higher rate than men, and blacks had almost 10 times the rate of the other racial groups. Rates tended to be constant across age groups, except for the 20-21-year group, which had a lower rate.

Changes in incidence rates over time for specific infectious diseases are shown in Figures 2 and 3. Trends for diseases shown in Figure 2 were:

Pulmonary tuberculosis. There was a downward trend over the entire decade.

Measles. Rates were relatively high in 1980 and 1984 but much lower in other years, including zero in 1989.

Mumps. The rate was very low early in the decade but increased considerably toward the end of the decade.

Other venereal disease. Rates were stable.

Candidiasis. Rates increased steadily and had risen almost 4-fold by 1989.

Sarcoidosis. Rates were stable over the decade.

Trends for diseases shown in Figure 3 were as follows:

Viral meningitis. There was a clearly upward trend in this disease; rates more than doubled.

Herpes simplex. Rates were stable through 1985 but trended moderately upward during 1986 through 1989.

Other exanthema. The rate was high in 1980 but declined sharply over the decade.

Early syphilis. Rates were approximately level over the decade.

Gonococcal disease. Rates declined slightly and then were stable.

Dermatophytosis. Rates were stable until 1985, then increased steadily through 1989.

Incidence rates of first hospitalization for the most common infectious diseases by sex, race, and age are shown in Figures 4 through 9. Results were as follows:

Chickenpox. Rates were highest over all sex-race combinations for the 17-19 age group (Figure 4). This would suggest that many of these infections occurred during recruit training. Male blacks had the highest rate at ages 17-19 years, but other race males had generally higher rates over the remainder of the age ranges. Other sex-race subgroups were homogeneous in first hospitalization rates according to age.

Viral hepatitis. Rates at ages 17-19 years were not elevated for any subgroup (Figure 5). The highest rate was for Other race males at age 20-21 years. Rates generally increased during the middle-age range, particularly for black males. Rates were lower for all subgroups after age 29 years.

Infectious mononucleosis. White women had a much higher rate at ages 17-19 years than other subgroups; white men also had an elevated rate at age 20-21 years (Figure 6). White men and women generally had higher rates than other subgroups. Other sex-race combinations had homogeneous rates over other age categories.

Streptococcal sore throat. White women had a much higher first hospitalization rate at ages 17-19 years than other groups, although the other groups also had elevated rates in this age group (Figure 7). Rates were stable and homogeneous over older age groups, with the over-39 year age group having the lowest rates.

Intestinal infections due to other organisms and Ill-defined intestinal infections combined. This category includes a number of specific bacterial infections (food poisoning), including *E. coli*, infectious colitis, and infectious diarrhea. Rates were much higher for women than men except in the over-39 age group (Figure 8). The highest rates were in the 17-21 year age range for women. Rates for men tended to be relatively low and homogeneous over all age groups.

Other diseases due to viruses and chlamydiae and viral and chlamydial infection in conditions classified elsewhere and of unspecified site. Rates were much higher for women than men in all age groups except the oldest (Figure 9). The highest rates were seen for women ages 17-21 years. Rates for men were homogeneous according to race and were slightly lower in the oldest age groups.

Figure 10 shows changes in first hospitalization rates over time for the most common diseases for the entire Navy enlisted population.

Chickenpox. Rates increased precipitously over the decade—almost 10-fold from 1980 to 1988-1989.

Viral hepatitis. Rates declined slowly and steadily from 1980 through 1989.

Infectious mononucleosis. Rates were stable over the decade.

Other and ill-defined intestinal infections. Rates declined during 1980 through 1982, increased during 1985, and decreased again during 1986 through 1989.

Other viruses or chlamydiae classified elsewhere and unspecified site. Rates declined during 1980 through 1984, increased during 1985 through 1986, declined during 1987, and plateaued in 1988-1989.

For additional comparisons of demographic and temporal changes in rates over the decade, diseases were grouped into three broad types: viral, bacterial, and sexually transmitted (Figure 11). Viral diseases comprised, by far, the largest number of first hospitalizations. There were 21,346 first hospitalizations among men and 2702 first hospitalizations among women.

The number of first hospitalizations for bacterial illnesses was 4402 (3597 men or 78.6 per 100,000 and 805 women or 191.7 per 100,000). The rate for whites was slightly higher than rates for blacks or other races.

The number of hospitalized sexually transmitted disease cases was 1900 (1519 men for a rate of 33.2 per 100,000 person-years vs. 381 women for a rate of 90.7 per 100,000 person-years). Rates for men remained stable during 1980-1989, but rates for women, after declining somewhat from 1980 through 1984 (from 105.2 to 52.5), increased sharply during 1985 through 1989 (to 135.7 in 1989).

Trends in hospital admissions ashore were also evaluated during the entire period from 1980-1995 in shore-based facilities only. The epidemic of varicella which peaked during 1987-1989 ended by 1992, when rates returned to endemic levels of approximately 80 per 100,000 person-years (Figure 12). Viral hepatitis (A, B, C, and other) first hospitalization rates declined from approximately 37 per 100,000 person-years in 1990 to approximately 17 per 100,000 in 1995. When the rates for Hepatitis A (HA) and Hepatitis B (HB) were examined separately, comparable decreases during this period were noted for both types. Rates of tuberculosis and gonorrhea also declined during 1990-1995; while syphilis continued in a long-term declining secular trend, reaching a level of approximately 0.5 per 100,000 in 1994-1995 (Figure 13). Meningococcal meningitis rates varied between 0 and 1.4 during 1990-1995.

Discussion

Varicella and other viruses and chlamydiae accounted for more than 20,000 hospitalizations among Navy enlisted personnel in the 1980s. In 7 of the 12 categories of common infectious diseases, women's rates were higher than those for men. The female excess was particularly evident for meningitis, herpes simplex, early syphilis, gonococcal infections, and candidiasis. These results are similar to those reported for Navy women in an earlier time period.¹ The observed rates of first hospitalization for sexually transmitted disease emphasize the need for

further education in this population. First hospitalization rates also varied greatly by ethnic and age groups, with whites having more than double the rate of measles and other viral exanthema; blacks having the highest rates of syphilis, venereal diseases and sarcoidosis; and individuals of other ethnic groups having the highest rates of pulmonary tuberculosis and mumps. The much greater incidence of syphilis among blacks is consistent with data reported from the Navy and Marine Corps Disease Alert Reporting system (DAR).¹⁴ On the other hand, the higher rate for women found in the present study is in contrast to findings from the DAR.¹⁴ One possible explanation might be underreporting of female cases to the DAR.

In general, the 1980s were marked by downward trends in many infectious diseases, by relatively stable rates of sexually transmitted diseases, and by brief epidemic periods of measles, mumps, and varicella. The young age of personnel with these latter diseases suggests that many infections occurred during recruit training. This is consistent with findings of high rates of seronegativity for mumps, measles, and varicella among US Navy and Marine Corps recruits.⁴ The higher rates of chickenpox among young black men in the present study suggest a greater proportion of susceptibles or poorer immunization coverage in this population. Rural blacks may be less exposed to the varicella zoster virus, since varicella epidemics are less frequent in isolated areas than in urban areas. It is unknown whether the cases occurred in blacks of primarily rural origin; however, inner-city African American children also have lower rates of immunization.¹⁵ While rates in black women were considerably lower than in black men, they were 3 times as high as in white women. This is also consistent with poorer immunization coverage in blacks.^{15,16}

The hospitalized incidence rate of viral meningitis during the 1980s was 12.4 per 100,000 person-years, which was 2 to 4 times higher than the rate reported to the Centers for Disease Control (CDC) during 1980 through 1994. The rate of viral meningitis based on passive reporting

to CDC through the notifiable disease system varied between 3 and 6 per 100,000 population per year.¹⁷ In contrast, a study based on medical records review in Olmstead County, Minn, reported an incidence rate of 10.9 per 100,000 person-years,¹⁸ which was closer to the Navy rate. The slightly higher rate in the present study compared with Olmstead County may be due to the greater representation in the Navy of persons in the age range where incidence rates were highest (20-34 years) and possibly to closer living conditions in the Navy shipboard population.

Active pulmonary tuberculosis during the 1980s was uncommon overall in the Navy population, but there were important ethnic differences in incidence rates of hospitalized disease. The relatively high incidence rate in individuals of races other than white or black suggests that more frequent screening for early infection of individuals in the other ethnic group may be warranted to identify those with early tuberculosis infections before they advance to active pulmonary tuberculosis. In the Navy, these individuals were mainly of Pacific Island (including Philippine) and Asian heritage.

The higher rate of measles in Navy men than women was somewhat unexpected and should be further examined. The highest incidence rate was in the age group 20-21 years, which also was unexpected because most infectious diseases are most common in the youngest age group (ages 17-19 years).

Unlike most infectious diseases, mumps rates rose during 1984 through 1989, especially during 1986-1989. It is possible that the increase in mumps may represent demographic changes or greater tendency to hospitalize cases in more recent years, but the association of the rise with the steep rise in HIV infections during the corresponding time period may warrant further investigation. The rise in mumps rates and concurrent decline in measles also may reflect

differences in vaccination rates with the monovalent measles versus the trivalent measles-mumps-rubella vaccines.

In a study examining the cost-effectiveness of an immunization program for mumps in the US Army, Arday et al.⁵ concluded that Army mumps rates would have to more than double from 1986 levels for a blanket immunization program to be cost-effective. Although cost figures were not collected in the present study, it should be noted that Navy mumps rates tripled between 1986 and 1989, and it is likely that such an immunization program would be cost-effective under such circumstances, particularly if targeted to the recruit population.

Several investigators have examined the issue of effective vaccination in the military. It has been suggested that varicella vaccination in particular may prevent more than 7000 hospital-bed days,¹⁹ annually in the military. A proposed cost-effective strategy would be to serologically test personnel with a negative history and vaccinate those without protective antibodies.^{2,20} This strategy was found to reduce the incidence of clinical rubella in US Air Force trainees.²¹

Data that were available from shore-based facilities during 1980-1995 indicated that trends reported from shore-based facilities were similar to those in the entire Navy (including medical treatment facilities aboard ships or temporary camps). The majority of inpatient hospital admissions are to shore-based facilities, and patients with serious diseases admitted to hospital aboard ships or in forward areas are generally transferred to shore-based hospitals for definitive treatment and convalescence.

Analysis of trends for selected infectious diseases during 1990-1995 revealed a steady decline in incidence rates of hospitalization. The varicella epidemic of 1987-1989, which was particularly associated with recruits or junior ranks,^{2,4,19} and was present in the Army as well as the Navy,² did not recur. The decline in hepatitis (A, B, and total) was similar to general declines

in incidence of cases of HA and HB reported to CDC.²² The minor peak in rates of meningococcal disease in 1994, followed by a rapid decline, was suggestive of a possible very limited epidemic that year. CDC reported cases of meningococcal disease per 100,000 population rose in 1994 but did not decline in 1995.²²

A limitation of the present study is that those with infectious diseases that are usually less serious, such as influenza, are generally not hospitalized and were not part of this analysis. Their impact on military readiness may be substantial. The primary strength of this study is the examination of the entire spectrum of infectious disease categories with a common methodology in a 10-year longitudinal analysis. This procedure has permitted both comparisons in rates and in demographic risk factors, allowing better identification and monitoring of high-risk groups.

Acknowledgements

We gratefully acknowledge Mr. Martin White, Mr. Milan Miller, and Ms. Rae Jackson for their helpful contributions to this report.

Report No. 00-10 was supported by the Office of Naval Research, Arlington, VA, Department of the Navy, under work unit number 63706N M0095.001-6706. The views expressed in this article are those of the authors and do not reflect the official policy or position of the Department of the Navy, Department of Defense, or the US Government. Approved for public release; distribution is unlimited. This research has been conducted in compliance with all applicable Federal Regulations governing the Protection of Human Subjects in Research.

References

1. Palinkas LA, Pineda TS, Burr RG, Hyams, KC. Ten-year profile of infectious and parasitic disease hospitalizations in the US Navy. *Mil Med.* 1990;155:401-406.
2. Herrin VE, Gray GC. Decreasing rates of hospitalization for varicella among young adults. *J Infect Dis.* 1996;174:835-838.
3. Mull NH, Amundson DE, Tribble WR, Call TB. Manifestations of adult varicella in the United States Navy, 1984-1987. *West J Med.* 1992;157(2):197-198.
4. Struewing JP, Hyams KC, Tueller JE, Gray GC. The risk of measles, mumps, and varicella among young adults: a serosurvey of US Navy and Marine Corps recruits. *Am J Public Health.* 1993;83(12):1717-1720.
5. Arday DR, Kanjarpane DD, Kelley PW. Mumps in the US Army, 1980-86: should recruits be immunized? *Am J Public Health.* 1989;79(4):471-474.
6. Dembert ML, Shaffer RA, Baugh NL, Berg SW, Zajdowicz T. Epidemiology of viral hepatitis among US Navy and Marine Corps Personnel, 1984-85. *Am J Public Health.* 1987;77:1446-1447.
7. Hyams KC, Palinkas LA, Burr RG. Viral hepatitis in the US Navy, 1975-1984. *Am J Epidemiol.* 1989;130(2):319-326.
8. Cross ER, Hyams KC. Tuberculin skin testing in US Navy and Marine Corps personnel and recruits, 1980-86. *Am J Public Health.* 1990;80:435-438.
9. Nice DS, Hilton SM. Sex differences and occupational influences on health care utilization aboard U.S. Navy ships. *Military Psychology.* 1994; 6(2):109-123.
10. Hoiberg A. *Infectious Disease Trends in the U.S. Navy, 1966-1984.* San Diego, Calif: Naval Health Research Center; 1987. NHRC Tech. Rep. No. 87-40.

11. Navy and Marine Career History Archival Medical and Personnel System (CHAMPS) [database]. San Diego, Calif: Naval Health Research Center; 1999. Updated January 5, 1999.
12. *International Classification of Diseases*. 9th rev, Clinical Modification, 5th ed. Salt Lake City, Utah: Medicode, Inc.; 1996.
13. Jaeger JA, White MR, Show IT. *Epidemiological Interactive System (EPISYS) User's Guide, Version 1.0*. San Diego, Calif: Naval Health Research Center; 1997. NHRC Tech. Rep. No. 97-1A.
14. Dembert ML, Finney LA, Berg SW. Epidemiology of reported syphilis among U.S. Navy and Marine Corps Personnel, 1985-1987. *Sex Transm Dis*. 1990;17(2):95-98.
15. Wood D, Halfon N, Donald-Sherbourne C, et al. Increasing immunization rates among inner-city, African American children. A randomized trial of case management. *JAMA*. 1998;279(1):29-34.
16. Kelley PW, Petruccioli BP, Stehr-Green P, Erickson RL, Mason CJ. The susceptibility of young adult Americans to vaccine-preventable infections. A national serosurvey of US Army recruits. *JAMA*. 1991;266(19):2724-2729.
17. Centers for Disease Control. Summary of notifiable diseases, United States, 1994. *MMWR*. 1994;45:1.
18. Nicolosi A, Hauser WA, Beghi E, Kurland LT. Epidemiology of central nervous system infections in Olmstead County, Minnesota, 1950-1981. *J Infect Dis*. 1986;154:399-405.
19. Gray GC, Palinkas LA, Kelley PW. Increasing incidence of varicella hospitalizations in United States Army and Navy personnel: are today's teenagers more susceptible? Should recruits be vaccinated? *Pediatrics*. 1990;86:867-873.

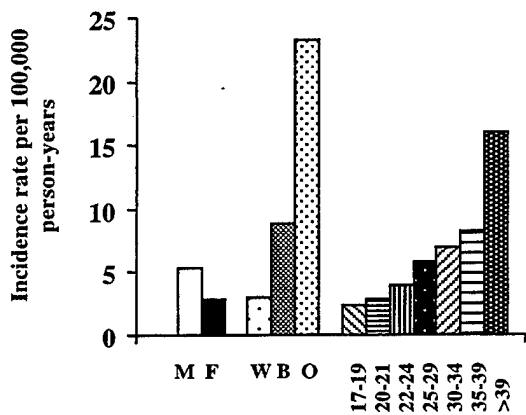
20. Jerant AF, DeGaetano JS, Epperly TD, Hannapel AC, Miller DR, Lloyd AJ. Varicella susceptibility and vaccination strategies in young adults. *J Am Board Fam Practice*. 1998; 11(4):296-306.
21. Blouse LE, Lathrop GD, Dupuy HJ, Ball RJ. Rubella screening and vaccination program for US Air Force trainees: an analysis of findings. *Am J Public Health*. 1982;72(3):280-283.
22. Groseclose SL, Knowles CM, Hall PA, et al. Summary of notifiable diseases, United States, 1998. *MMWR*, 31 Dec 1999; 47(53):1-93.

Table 1. Hospitalized incidence rates per 100,000 person-years for infectious and parasitic diseases in the US Navy, 1980-1989 (ICD-9 code in parentheses)*

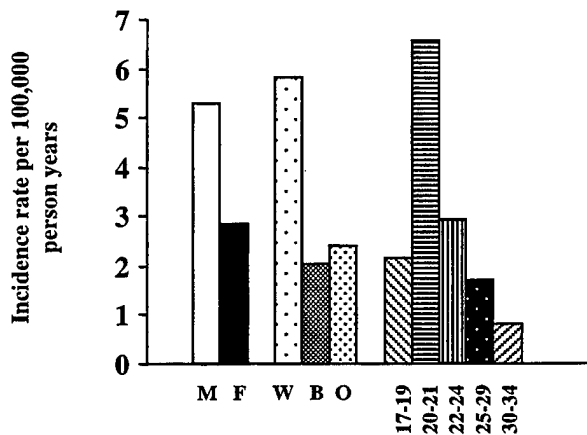
<u>Disease</u>	<u>N</u>	<u>Rate†</u>	<u>Disease</u>	<u>N</u>	<u>Rate†</u>
<u>Intestinal infectious diseases</u>			<u>Other diseases due to viruses and chlamydiae (Cont'd)</u>		
Salmonella (003)	153	3.1	Mumps (072)	297	5.9
Food poisoning, other bacterial (005)	153	3.1	Conjunctivitis (077)	137	2.7
Shigellosis (004)	105	2.1	Other diseases due to viruses and chlamydiae (078)	1848	37.0
Other protozoal (007)	96	1.9	Unspecified viral and chlamydial infections (079)	3711	74.3
Amebiasis (006)	87	1.8	<u>Rickettsiosis and other arthropod-borne diseases</u>		
Typhoid/paratyphoid (002)	61	1.2	Malaria (084)	67	1.3
Other infect. organisms (008)	1958	39.2	<u>Syphilis and other venereal diseases</u>		
Ill-defined infections (009)	1217	24.4	Gonococcal infections (098)	599	12.0
<u>Tuberculosis</u>			Early syphilis (091)	582	11.6
Pulmonary tuberculosis (011)	258	5.2	Other and unspecified syphilis (097)	192	3.8
<u>Other bacterial diseases</u>			Neurosyphilis (094)	59	1.2
Streptococcal sore throat (034)	1294	25.9	Other venereal (099)	308	6.2
Septicemia (038)	212	4.2	<u>Mycoses</u>		
Meningococcal infection (036)	64	1.2	Dermatophytosis (110)	974	19.5
Bacterial infection of other or unspecified site (041)	1153	23.1	Candidiasis (112)	241	4.8
<u>Other non-arthropod-born viral infection of CNS</u>			Other dermatomycosis (111)	181	3.6
Viral meningitis (047)	618	12.4	<u>Other infectious and parasitic diseases</u>		
<u>Viral diseases with exanthem</u>			Sarcoidosis (135)	350	7.0
Chickenpox (052)	6690	133.9	Trichomoniasis (131)	142	2.8
Herpes simplex (054)	602	12.1	Acariasis (133)	78	1.5
Measles (055)	254	5.1	Other infestation (134)	87	1.6
Herpes zoster (053)	228	4.6	Other and unspecified infectious diseases (136)	95	1.9
Other viral exanthema (057)	435	8.7	<u>Other diseases due to viruses and chlamydiae</u>		
<u>Other diseases due to viruses and chlamydiae</u>			Viral hepatitis (070)	3310	66.2
Viral hepatitis (070)	3310	66.2	Infectious mononucleosis (075)	3198	64.0
Infectious mononucleosis (075)	3198	64.0			

*No diseases in these categories had more than 1 new case per 100,000 person-years: Zoonotic bacterial diseases, Arthropod-borne viral diseases, Other spirochetal diseases, Helminthiases, and Late effects of infectious and parasitic diseases.

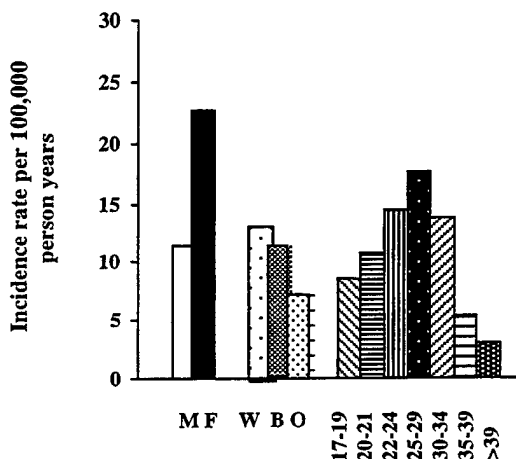
†The number of new cases (first hospitalizations) per 100,000 person-years.



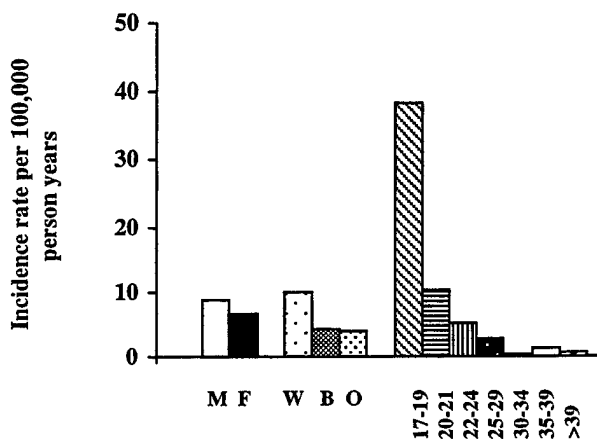
Pulmonary TB



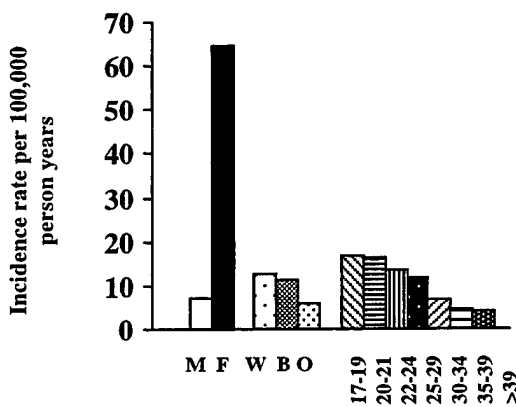
Measles



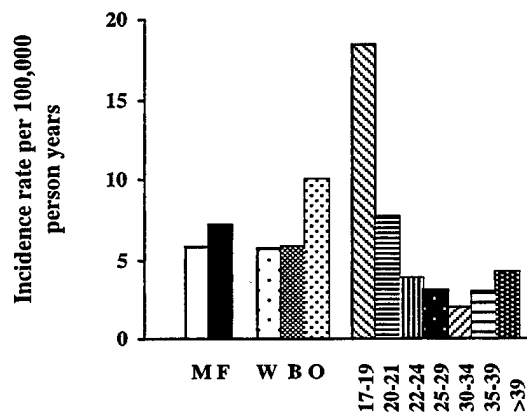
Viral meningitis



Other exanthema

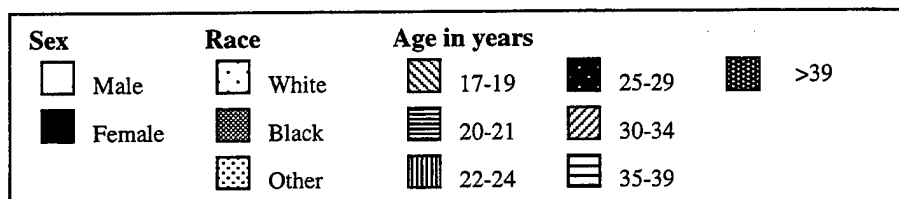


Herpes simplex



Mumps

Figure 1. Demographic differences in hospitalized incidence rates for selected infectious and parasitic diseases, 1980-1989.



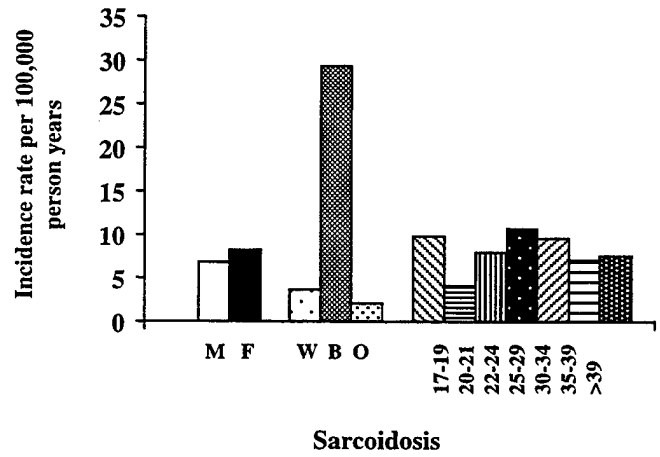
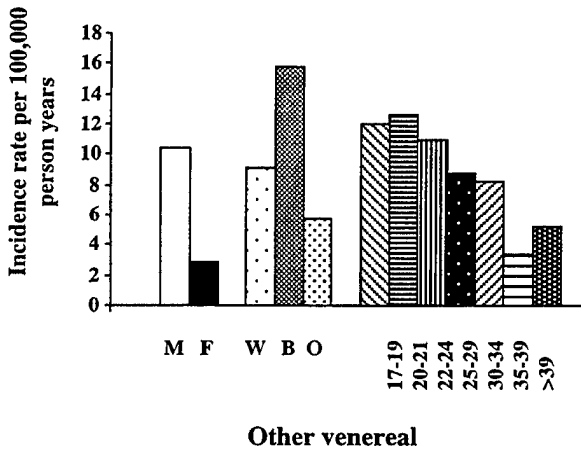
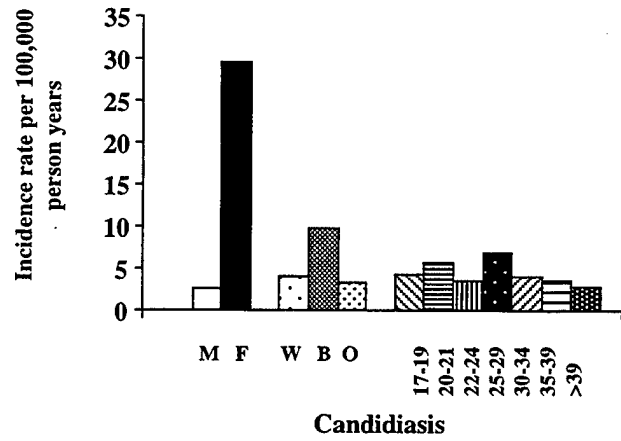
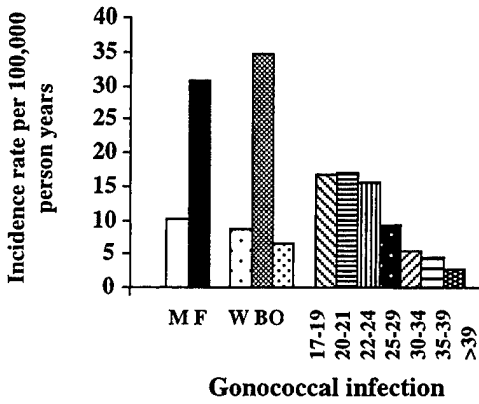
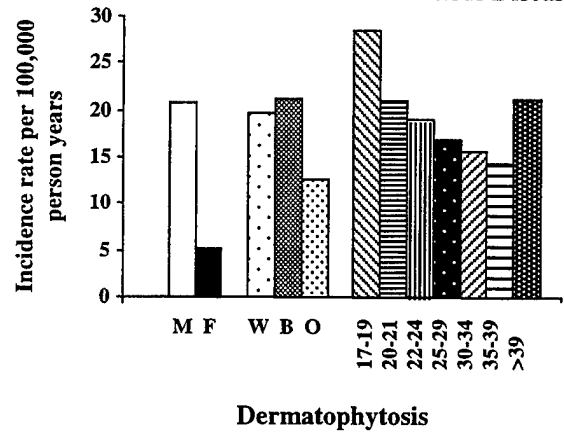
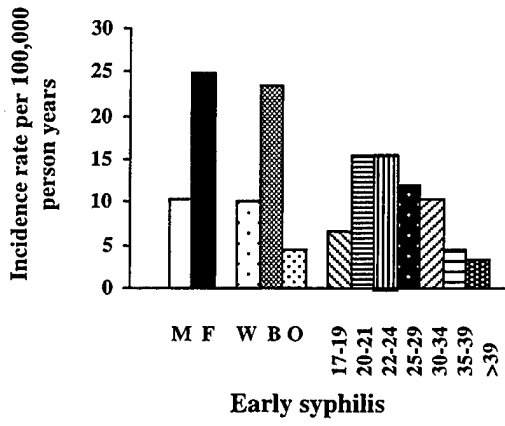
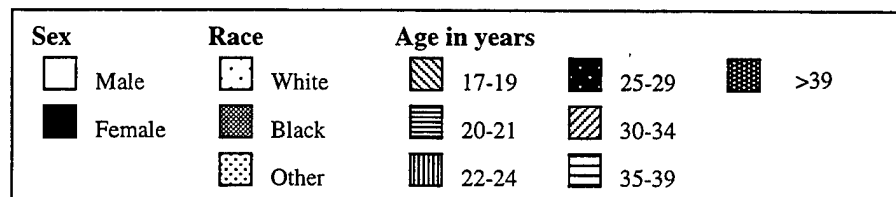


Figure 1 Continued. Demographic differences in hospitalized incidence rates for selected infectious and parasitic diseases, 1980-1989.



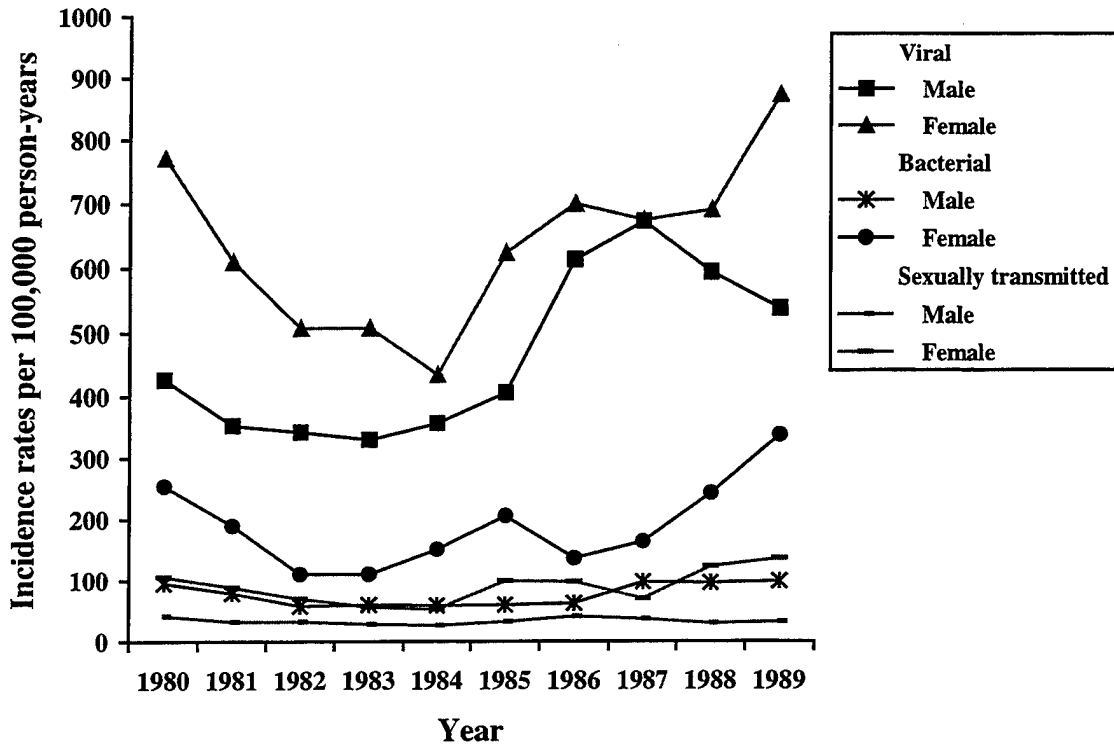


Figure 2. Hospitalized incidence rates of selected infectious and parasitic diseases by year, 1980-1989.

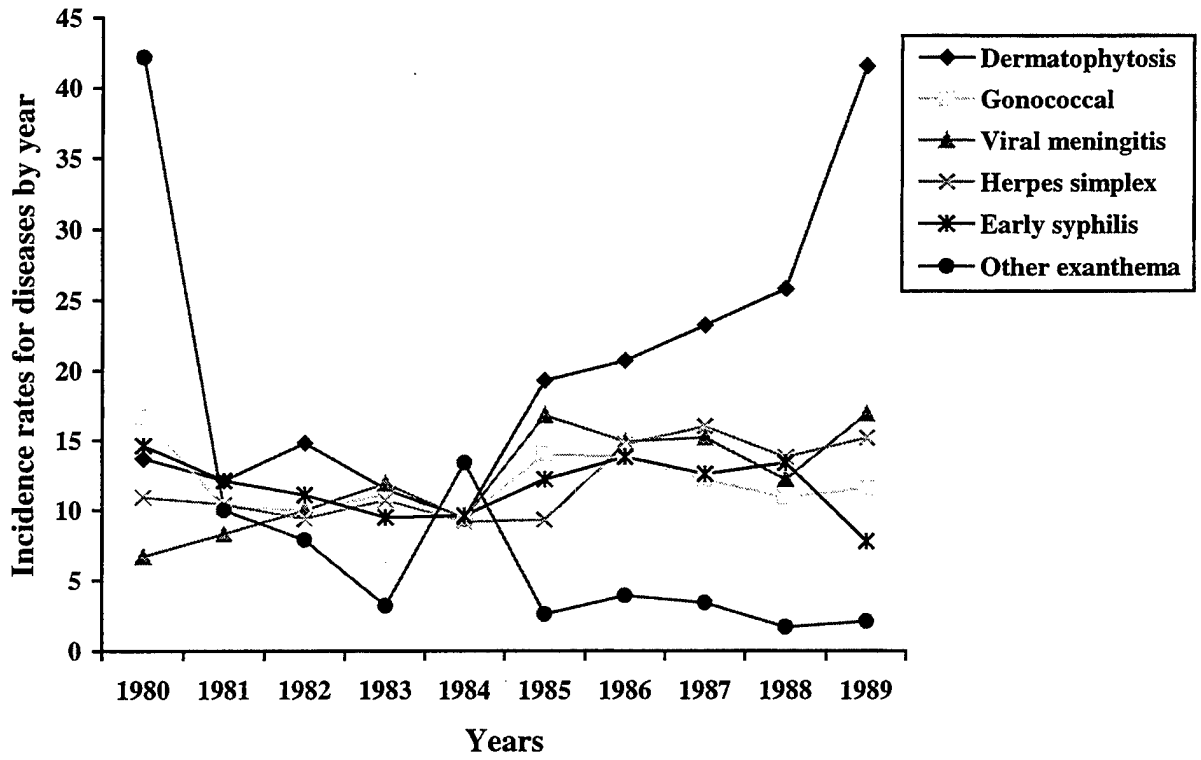


Figure 3. Hospitalized incidence rates of selected infectious and parasitic diseases by year, 1980-1989.

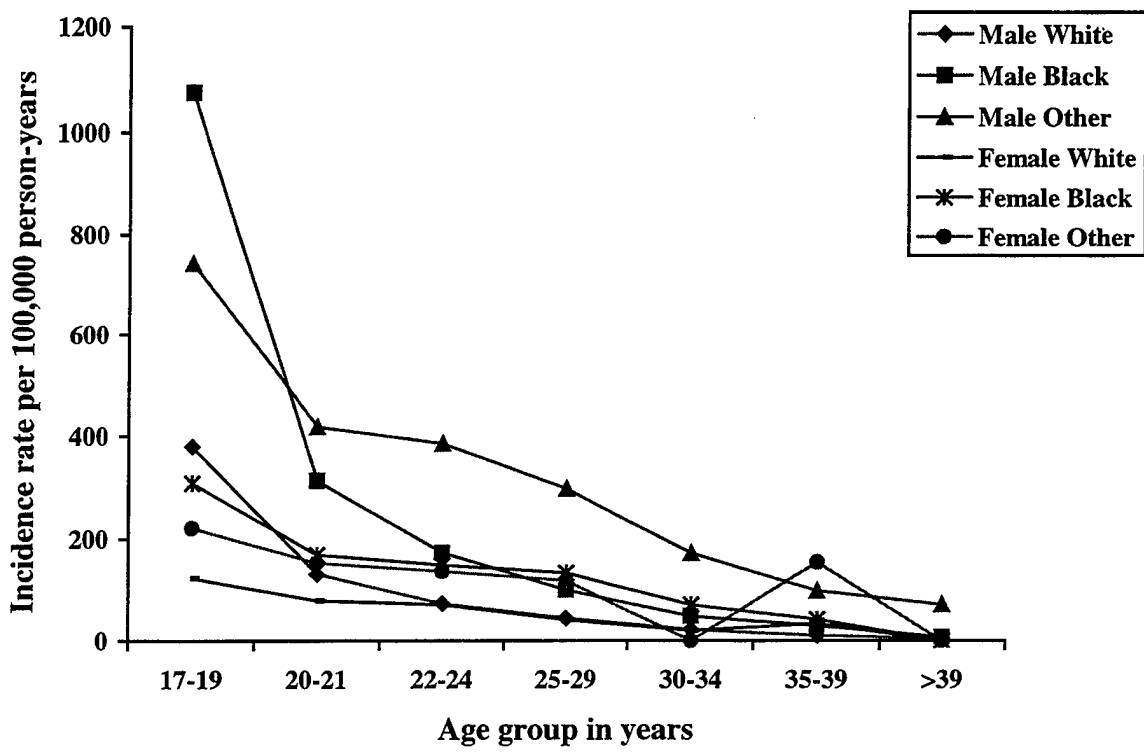


Figure 4. Hospitalized incidence rates of chickenpox by sex, race, and age group, for 1980-1989.

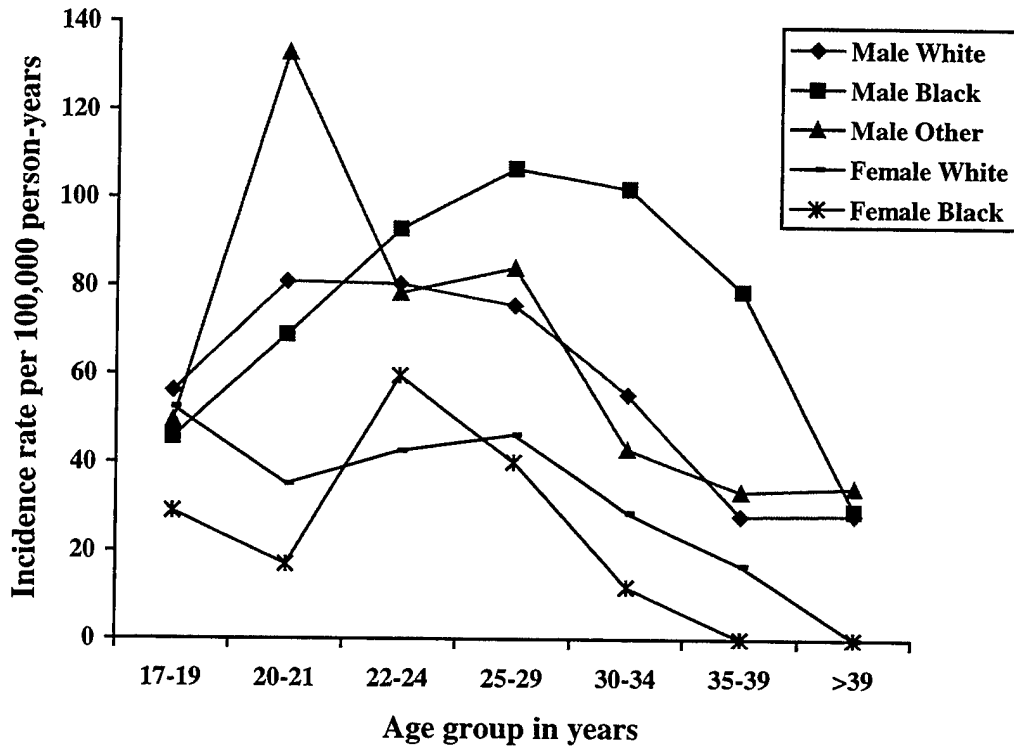


Figure 5. Hospitalized incidence rates of viral hepatitis by sex, race, and age, 1980-1989.

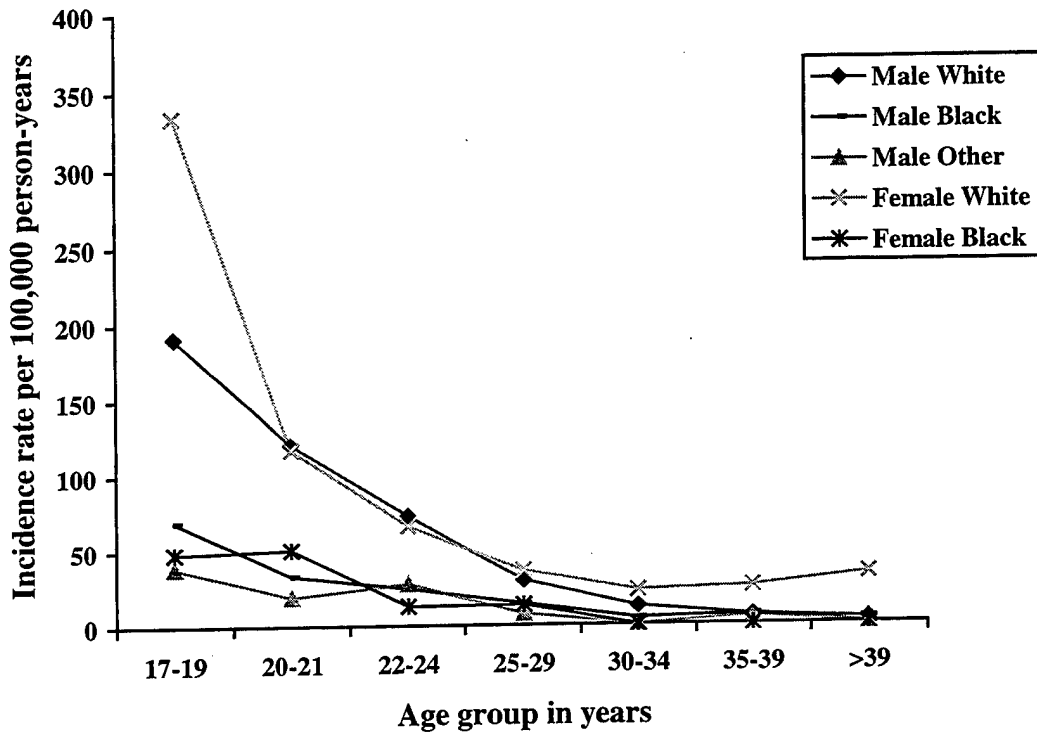


Figure 6. Hospitalized incidence rates of infectious mononucleosis by sex, race, and age, 1980-1989.

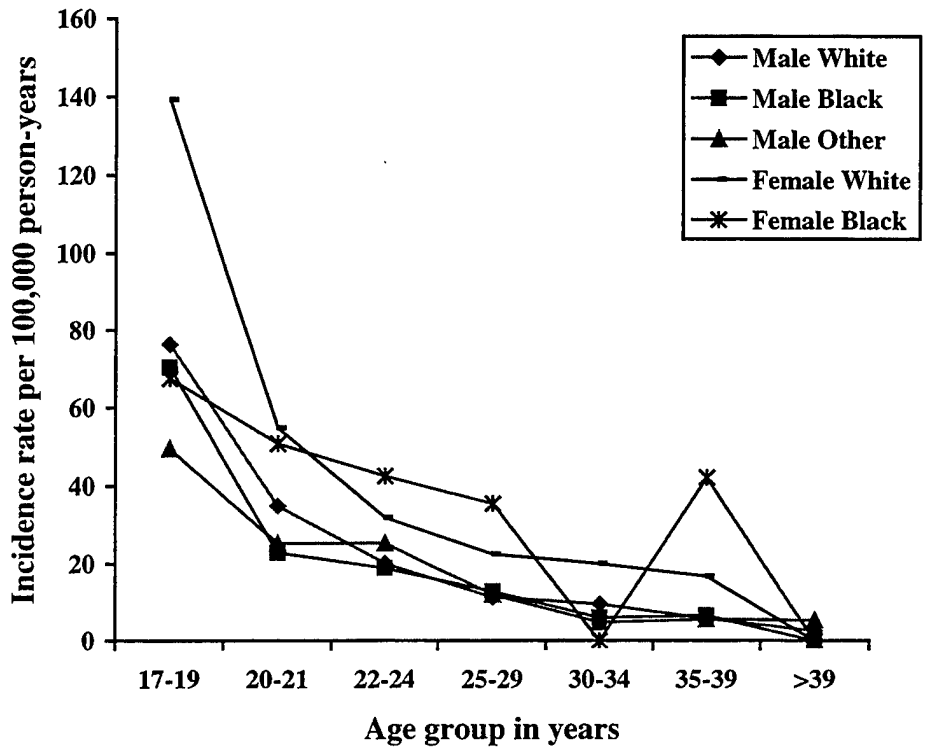


Figure 7. Hospitalized incidence rates for streptococcal sore throat by sex, race, and age group, 1980-1989.

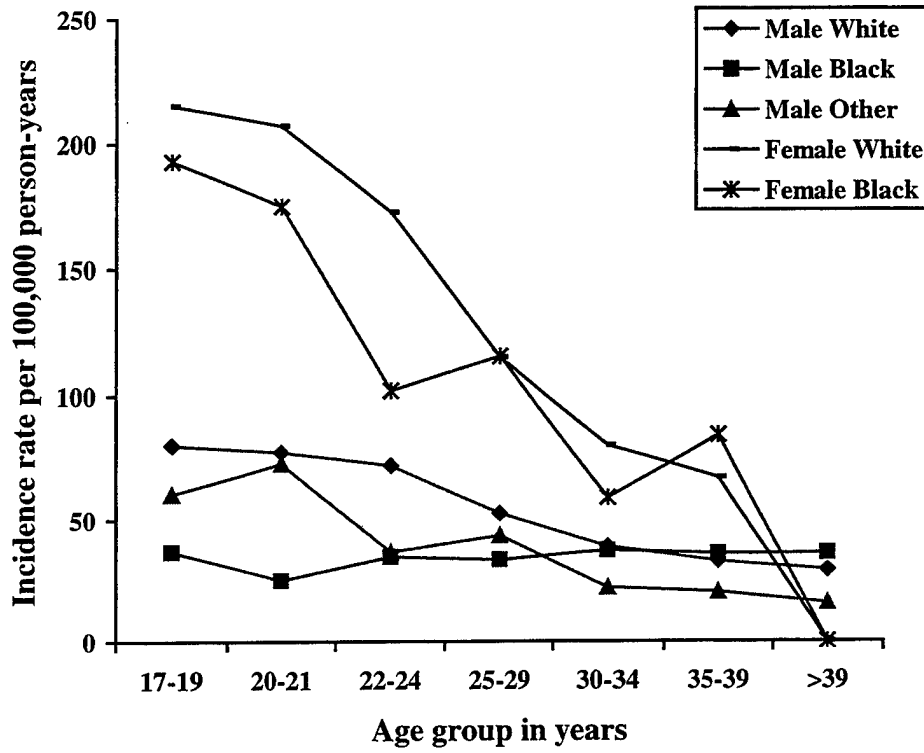


Figure 8. Hospitalized incidence rates for Other and ill-defined intestinal infections by sex, race, and age group, 1980-1989.

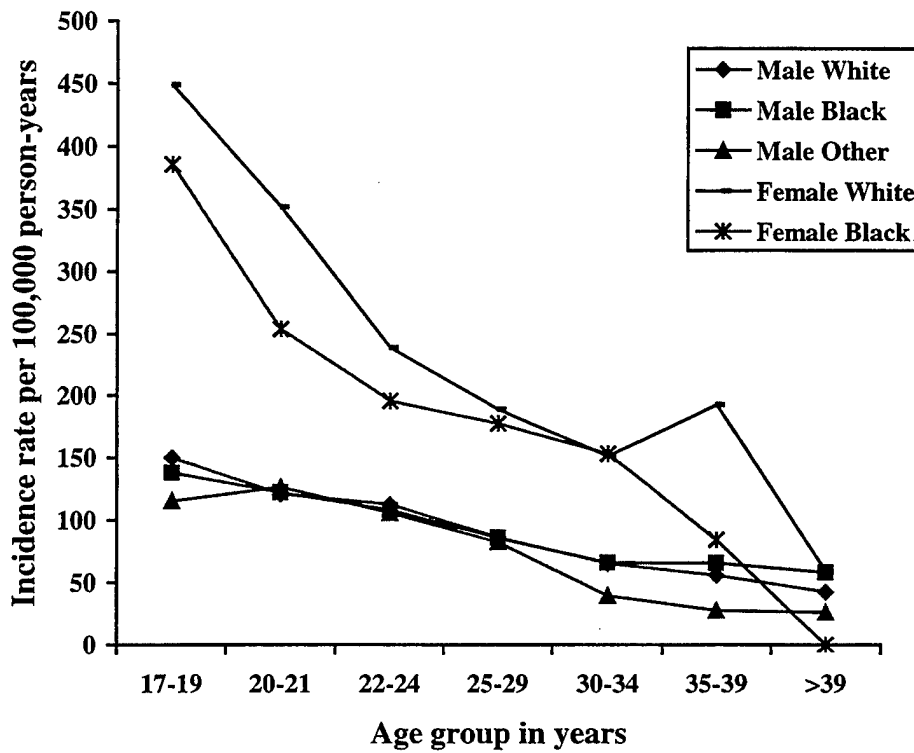


Figure 9. Hospitalized incidence rates for other diseases due to viruses and chlamydiae, viral and chlamydial conditions classified elsewhere, and of those of unspecified site by sex, race, and age group, 1980-1989.

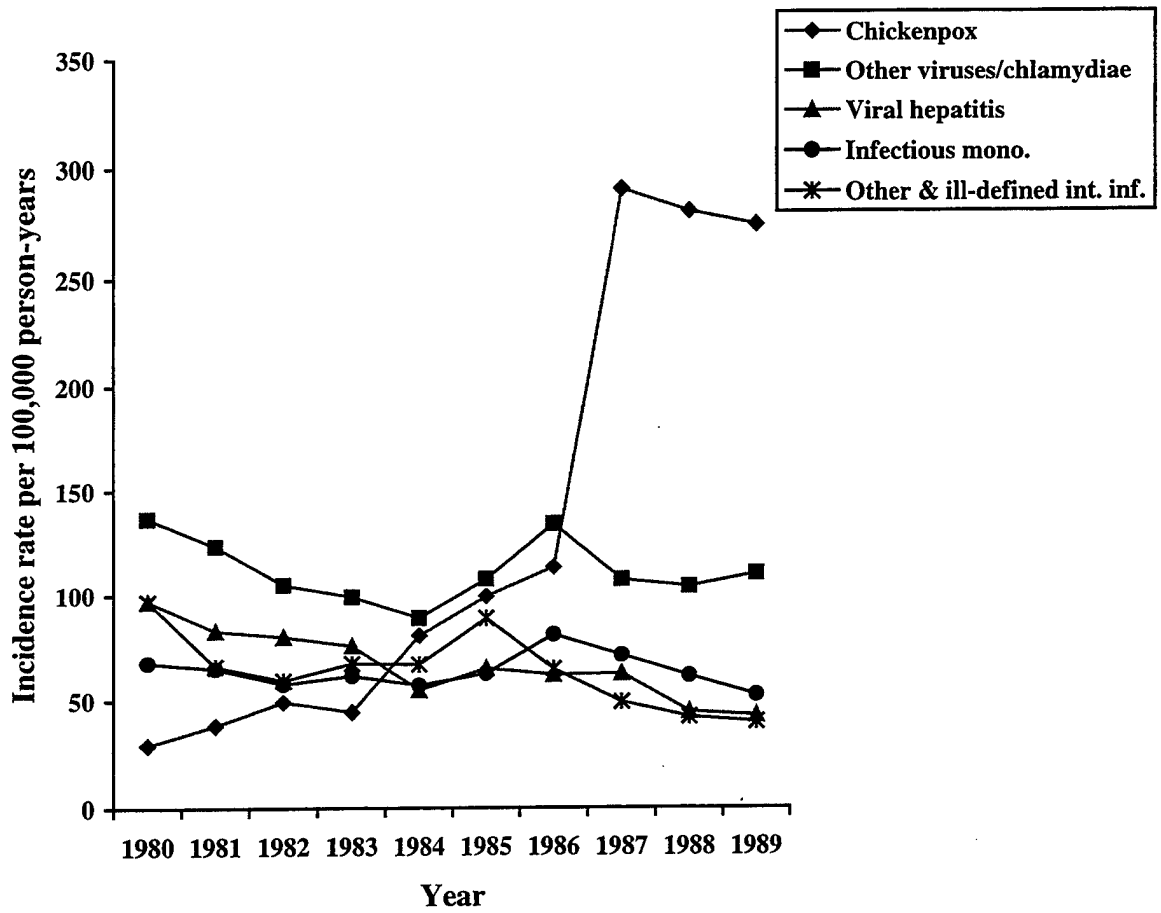


Figure 10. Most common infectious diseases by year, 1980-1989.

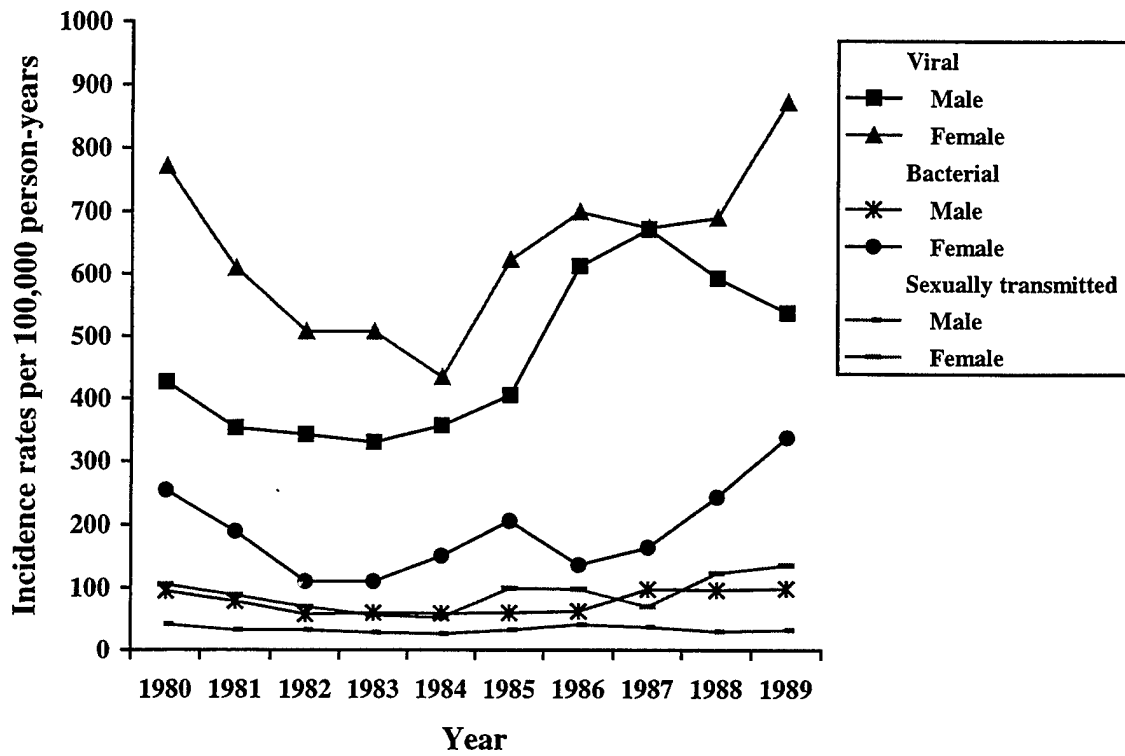


Figure 11. Changes in incidence rates for broad disease categories, 1980-1989.

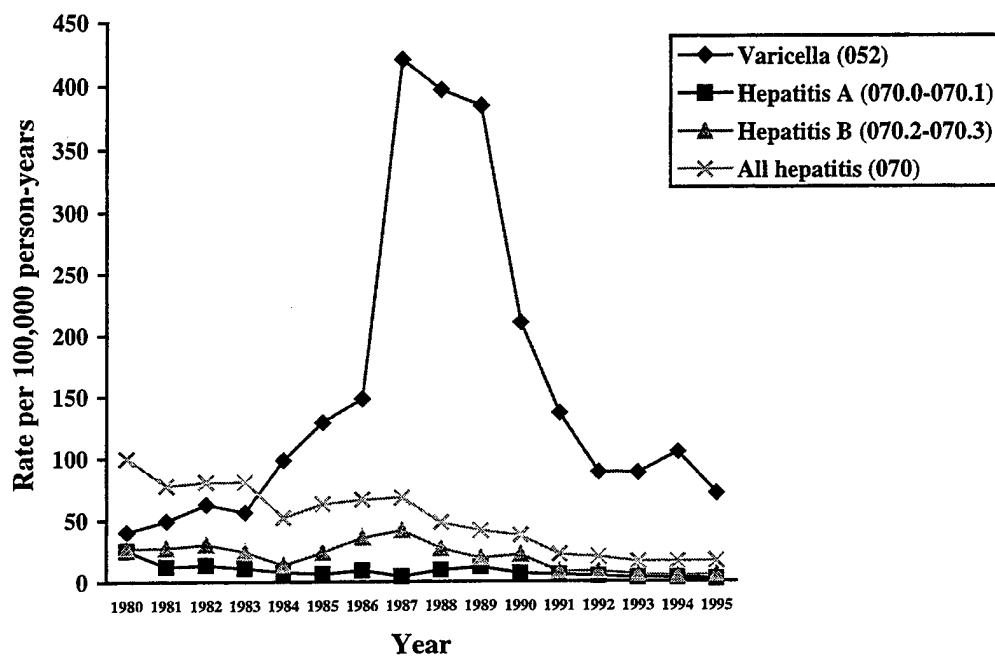


Figure 12. First hospitalization rates for selected diseases based on admissions to shore-based facilities, 1980-1995.

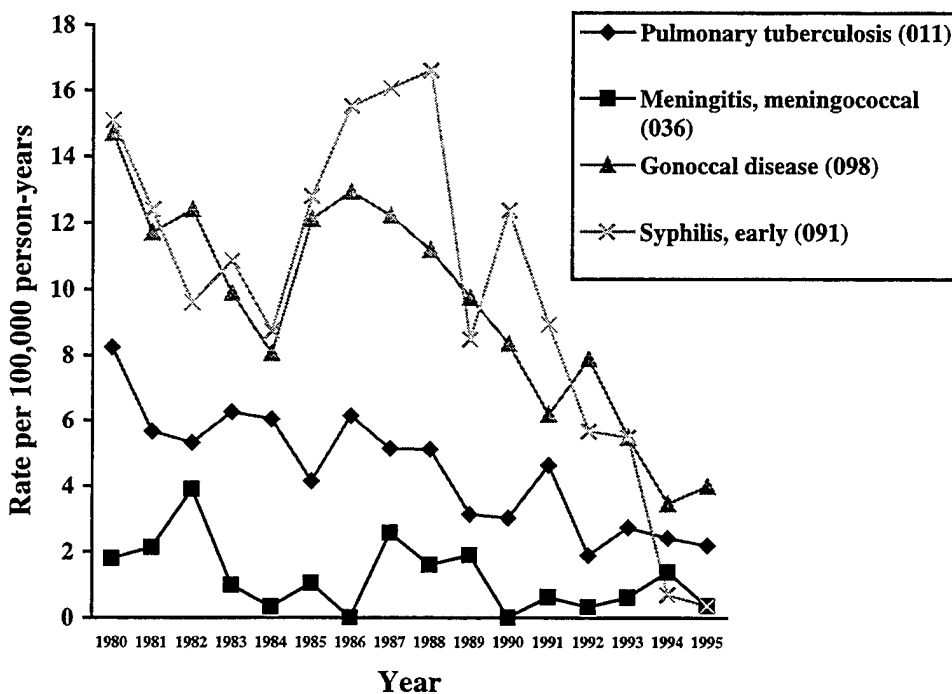


Figure 13. First hospitalization rates for selected diseases based on admissions to shore-based facilities, 1980-1995.

REPORT DOCUMENTATION PAGE

Form Approval
 OMD No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for receiving instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA. 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY <i>(Leave blank)</i>		2. REPORT DATE Oct 1999		3. REPORT TYPE AND DATE COVERED Final 1980 through 1989	
4. TITLE AND SUBTITLE Infectious Disease Rates in the US Navy				5. FUNDING NUMBERS Program Element: 63706N M0095.001 Work Unit Number: 6706	
6. AUTHOR(S) E.K.E. Gunderson, Ph.D., C. Garland, Dr. P.H., and L. L. Hourani, Ph.D., M.P.H.					
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Health Research Center PO Box 85122 San Diego, CA 92186-5122				8. PERFORMING ORGANIZATION Report No. 00-10	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Office of Naval Research 800 North Quincy Street Arlington, VA 22217-5660				10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES					
12a. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.				12b. DISTRIBUTION CODE	
13. ABSTRACT <i>(Maximum 200 words)</i> The significant increase in the number of women serving in the Navy has raised questions concerning the impact of infectious disease risks on women's health during recent years, particularly among those aboard Navy ships. This study examines gender and other demographic differences among all US Navy enlisted personnel with first hospitalizations for infectious and parasitic diseases during 1980 through 1989 (N = 33,334), and it identifies trends in incidence rates across this 10-year time period. All information used in the study was from official personnel and medical records. Varicella and other viruses and chlamydiae accounted for more than 20,000 hospitalizations among Navy enlisted personnel in the 1980s. In 7 of the 12 categories of common infectious diseases, women's rates were more frequently higher than those for men, particularly in meningitis, herpes simplex, syphilis, gonococcal disease, and candidiasis. In general, the 1980s were marked by downward trends in many infectious diseases, by relatively stable rates of sexually transmitted diseases, and by brief epidemic periods of measles, mumps, and varicella.					
14. SUBJECT TERMS Infectious disease rates, sexually transmitted diseases, varicella, epidemiology, Navy				15. NUMBER OF PAGES 35	
16. PRICE CODE					
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT Unlimited		