

DEPLOYMENT MEDICAL SURVEILLANCE IMPLEMENTATION**Southwest Asia Theater Deployment Data, 1997-99**

Questions of data quality arise when new data gathering systems are introduced. The US Navy introduced the Naval Disease Reporting System (NDRS) in 1997 to replace the cumbersome Disease Alert Report (DAR) system. The NDRS is an electronic system requiring data entry by medical personnel at a keyboard to report sentinel events of medical readiness. A formal evaluation of the NDRS is underway, to be reported in a future issue of *NMSR*.

NDRS is adapted from the program developed by the Air Force Air Combat Command to survey its forces deployed in Southwest Asia. The Air Combat Command of the USAF has been collecting deployment data in the Southwest Asia (SWA) theater since early 1997. The two versions of the programs used to collect these data are now referred to as Desert Care I and Desert Care II. The original program is also called the Medical

Surveillance in Theater Program (MS_T). Space precludes the description of the history and intricacies of this system, but the end result is data gathered at the MTFs in theater. With this system the Air Force has now collected two years worth of data. In a collaborative effort with them, Navy epidemiologists examined the first 59,026 records of this system from March of 1997 to January of 1999. This represents 27,305 service members of all Uniformed Services over a twenty-two month period.

We present three assessments of the quality of these data: an overview of the database with selected error and misclassification rates, a more detailed validation of diagnostic coding on a randomly selected subset (1%) of records, and an evaluation of misclassification in the most populous DNBI category (Medical/Other).

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I Data Quality of Southwest Asia Theater Surveillance

From March 1997 to January 1999, there are 59,026 records in the database. This represents all visits at all MTFs for all reasons by 27,305 active duty service members from all

services (Table 1). The average number of visits per person was 2.16 (generally initial and follow-up visit). Among these visits, the most common ones were for administrative reasons or minor maladies.

Table 1. Type of Visit by Diagnosis

Diagnosis	No. of Visits
General Medical Exams	2,555
Prescription Refill	953
Athlete's Foot/Tinea	891
Viral Syndrome	833
Electrolyte Imbalance/Dehydration	470
Warts	430
Depression/Anxiety	232

Data quality may be assessed in a variety of ways. An assessment of misclassification rates is one such measure. As the general approach in the military epidemiology community is to categorize by ICD-9 code for analysis of aggregate data, the ICD-9 code error rates on the SWA data are a logical starting point.

Three hundred ten records had entries which were not actual ICD-9 codes (Table 2). This yields an overall misclassification rate of .007. Thus, 99.5% of records have a valid ICD-9 code.

Table 2 illustrates the number of error codes. The most numerous were codes which had multiple zeros.

Table 2. Most Common Invalid Entries for ICD-9 Codes

Entry	No. of Records
Less than 002 e.g. "0000"	200
"K" "M" or "S" code e.g. "K0090" or "M002"	89
"X" code e.g. "X0007.5"	4
Greater than 999.9 e.g. "99999"	16

Therefore, 58,717 records over two years collected at 18 sites have valid ICD-9 codes.

II Validation of Diagnostic Coding on a Sample of Records

A 1% random sample was drawn from the 27,305 individuals represented in the database. Each visit was reviewed by an experienced physician/epidemiologist for consistency among four key fields contained in the MS_T program: chief complaint, diagnosis, ICD-9 code, and DNBI category. The intent was to assess the level of consistency among information in these variables.

There were 273 individuals in the sample who had 694 records in the database. An individual may have a second record either for a second visit or for a second diagnosis on the same visit. The average number of visits per individual was 2.3 per individual. Each diagnosis

field was compared with the verbal description of the ICD-9 code and DNBI category. There were four records (0.6%) with an invalid ICD-9 code representing two individuals with dental visits.

Four individuals were considered misclassified: a dental disorder miscoded as paratyphoid fever (ICD-9 002.1); heat exhaustion as viral illness (078.8); strep throat as viral URI (465.9); and cutaneous mole as hydatidiform mole (631.0). Therefore, 686 of 694 records were correctly classified as judged by diagnosis field and ICD-9 code. A total of 189 ICD-9 code were used in this sample, compared to 1,409 in the total of 59,026 records.

III DNBI Re-Classification

A second, different sub-set selected from the total database was examined for consistency of DNBI categorization. We chose all cases seen at a large MTF (Prince Sultan Air Base) so that there would be more internal consistency of population and provider over the two-year period. The most populous DNBI category was "MED/Other" with 5,640 records. Each of these was re-examined by diagnosis

(text), ICD-9 code, and clinical information. Reassignment occurred where a more specific diagnostic category could be assigned from the more detailed information contained in the database, e.g. "Upper Respiratory Infection" into respiratory, "conjunctivitis" into EYE, or "dysmenorrhea" into GYN.

A total of 1,081 (19%) cases could be more accurately re-classified as shown in Table 3.

Table 3. Reassignment of DNBI Category from Clinical Data in 1,081 Cases from One Large Deployment Site

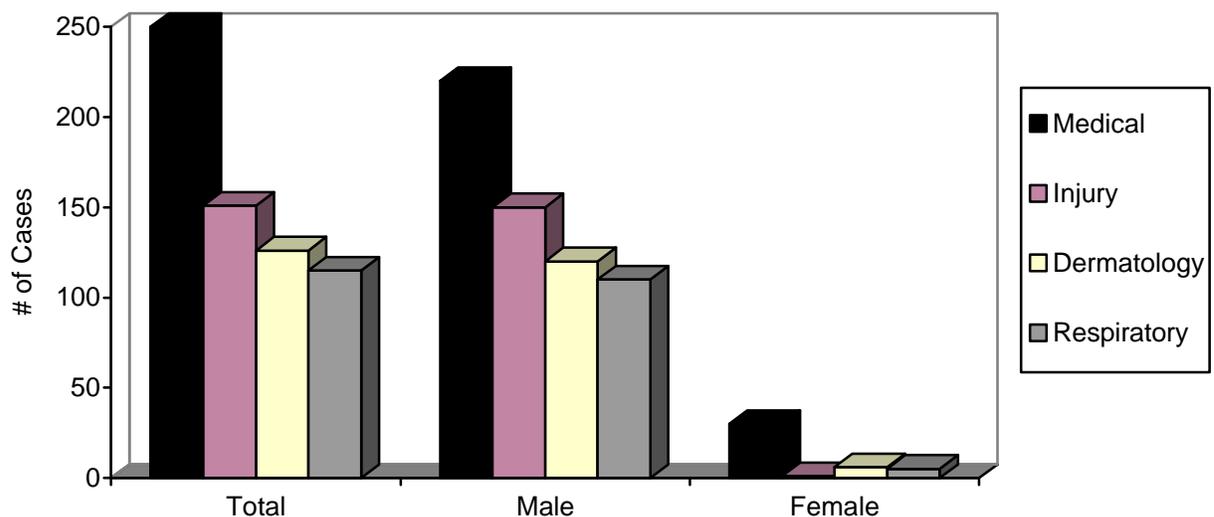
New DNBI Category	No. of Cases	Percent of MED/Other
Respiratory	608	11%
Gynecology	174	3%
Heat Injury	131	2%
Dermatology	99	1%
Injury	45	<1%
Acute Gastroenterology	11	<1%
Eye	9	<1%
Psychiatry	2	<1%
STD	2	<1%

IV USN/USMC Service Members in Southwest Asia

Data on USN and USMC active duty service members serving in SWA can be extracted from the Air Force database. These data represent 1,224 visits by USN and USMC members. They are predominantly male (81%). The age and rank range represents

nearly the entire spectrum of Naval operations: ages range from 19 to 51 years, and rank from E-1 to O-7. Figure 1 represents the distribution by category and sex for the four most common DNBI categories for these visits for the two-year period.

Figure 1. Number of Cases in each DNBI Category, USN/USMC, SWA Theater, 1997-99



NAVAL DISEASE REPORTING SYSTEM (NDRS)

Summary of 1998 Data

Disease	Total	USN	USMC	Disease	Total	USN	USMC
Amebiasis	4	4	0	Measles	0	0	0
Anthrax	0	0	0	Meningitis (viral)	66	47	19
Bites, Non-venomous rabies vax given	115	50	65	Meningococcal disease	3	1	2
Bites, Venomous	7	5	2	Mumps	7	5	2
Brucellosis	0	0	0	Onchocerciasis	0	0	0
Campylobacter	1	1	0	Paratyphoid Fever	0	0	0
Chancroid	4	3	1	Pertussis	0	0	0
Chlamydia	2066	1064	1002	Plague	0	0	0
Coccidioidomycosis	2	1	1	Poliomyelitis	0	0	0
Cryptosporidiosis	5	5	0	Psittacosis	0	0	0
Dengue Fever	1	1	0	Q Fever	0	0	0
Diphtheria	0	0	0	Rabies Human	0	0	0
<i>E. coli</i> 0157:H7 Infection	3	0	3	Relapsing Fever	0	0	0
Encephalitis	3	2	1	Rheumatic Fever	1	1	0
Ehrlichiosis	0	0	0	Rift Valley Fever	0	0	0
Filariasis	0	0	0	RMSF	4	2	2
Giardiasis	18	16	2	Rubella	0	0	0
Gonorrhea	701	469	232	Salmonellosis	38	26	12
Gullian-Barre Syndrome	0	0	0	Schistosomiasis	0	0	0
Hantavirus Infection	0	0	0	Shigellosis	10	8	2
Hepatitis A	7	7	0	Smallpox	0	0	0
Hepatitis B	14	9	5	Strep, Invasive	4	2	2
Hepatitis C	9	9	0	Syphilis	36	21	15
<i>H. Influenzae</i> , Invasive	0	0	0	Tetanus	0	0	0
HIV, Occupational exposure	2	2	0	Toxic Shock Syndrome	1	1	0
Influenza (outbreak only)	0	0	0	Toxoplasmosis	0	0	0
Lassa Fever	0	0	0	Trichinosis	2	2	0
Legionellosis	1	1	0	Trypanosomiasis	0	0	0
Leishmaniasis	1	1	0	Tuberculosis (Pulmonary)	47	29	18
Leprosy (Hansen's Disease)	1	1	0	Tularemia	0	0	0
Leptospirosis	0	0	5	Typhoid Fever	0	0	0
Listeriosis	0	0	0	Typhus	0	0	0
Lyme Disease	30	20	10	Varicella	25	5	20
Lymphogranuloma Venereum	8	3	5	Yellow Fever	0	0	0
Malaria	9	8	1				

The electronic surveillance program NDRS was operational in 1998. All NEPMUs reported medical events electronically. Many of the "field" sites, MTFs, and individual vessels are in the process of converting from Disease Alert Reports (DARs) to NDRS. Tables 1 and 2 present the summary data by reportable disease in active duty and non-active duty beneficiaries, respectively. We will present further analysis of this data in future issues.

Many more cases of commonly diagnosed STD's, notably chlamydia and gonorrhea, were reported in 1998.

Discussions with preventive medicine departments throughout the two services indicate that this is the result of a better reporting mechanism, and not a true increase in incidence. Diseases with potential to seriously degrade military missions, but of low incidence, such as malaria, meningitis, pulmonary TB, or hepatitis showed no proportional increase indicating a truly low incidence in active duty forces. Data on beneficiaries are preliminary and not representative since this a new requirement not yet fully implemented.

Table 2. Reportable Diseases in Navy & Marine Corps Non- Active Duty Beneficiaries, Case Frequency, 1998

Disease	TOTAL	USN	USMC	Disease	TOTAL	USN	USMC
Amebiasis	0	0	0	Measles	0	0	0
Anthrax	0	0	0	Meningitis (viral)	32	31	1
Bites, Non-venomous rabies vax given	25	20	5	Meningococcal disease	3	2	1
Bites, Venomous	4	4	0	Mumps	0	0	0
Botulism	0	0	0	Onchocerciasis	0	0	0
Brucellosis	0	0	0	Paratyphoid Fever	0	0	0
Campylobacter	13	7	6	Pertussis	0	0	0
Chancroid	0	0	0	Plague	0	0	0
Chlamydia*	8	7	1	Poliomyelitis	0	0	0
Coccidioidomycosis	6	6	0	Psittacosis	0	0	0
Cryptosporidiosis*	4	4	0	Q Fever	0	0	0
Dengue Fever	0	0	0	Rabies Human	0	0	0
Diphtheria	0	0	0	Relapsing Fever	0	0	0
<i>E. coli</i> 0157:H7 Infection	0	0	0	Rheumatic Fever	0	0	0
Encephalitis	0	0	0	Rift Valley Fever	0	0	0
Ehrlichiosis	0	0	0	RMSF	3	0	3
Filariasis	0	0	0	Rubella	0	0	0
Giardiasis	36	25	11	Salmonellosis	97	48	49
Gonorrhea	3	2	1	Schistosomiasis	1	1	0
Gullian-Barre Syndrome	0	0	0	Shigellosis	20	17	3
Hantavirus Infection*	0	0	0	Smallpox	0	0	0
Hepatitis A	4	4	0	Strep, Invasive	0	0	0
Hepatitis B	8	4	4	Syphilis	0	0	0
Hepatitis C	5	2	3	Tetanus	0	0	0
<i>H. Influenzae</i> , Invasive	2	2	0	Toxic Shock Syndrome	2	1	1
HIV, Occupational exposure	0	0	0	Toxoplasmosis	0	0	0
Influenza (outbreak only)	0	0	0	Trichinosis	0	0	0
Lassa Fever	0	0	0	Trypanosomiasis	1	0	0
Legionellosis	0	0	0	Tuberculosis (Pulmonary)	8	8	0
Leishmaniasis	0	0	0	Tularemia	0	0	0
Leprosy (Hansen's Disease)	0	0	0	Typhoid Fever	2	2	0
Leptospirosis	0	0	0	Typhus	0	0	0
Listeriosis	1	1	0	Varicella	16	14	2
Lyme Disease	22	15	7	Yellow Fever	0	0	0
Lymphogranuloma Venereum	0	0	0				
Malaria	1	1	0				

OUTBREAKS

Navy-Marine Corps Team Tuberculosis Outbreak:

26th Marine Expeditionary Unit (Special Operations Capable), USS WASP (LHD 1)

CDR James LaMar, MC, USNR, II Marine Expeditionary Force; LCDR Mark Malakooti, MC, USN, Navy Environmental Preventive Medicine Unit 2; LT Joseph Sposato, MC, USNR, LT Joseph McPhee, MC, USNR, LT Paul Russinko, MC, USNR, 2D Marine Division; LTJG Matthew Sullivan, MSC, USNR, 2D Force Service Support Group; HM1 Tracy Barling, USN, Camp Lejeune Naval Hospital

Background. The 26th Marine Expeditionary Unit (MEU) and the Amphibious Ready Group transporting them, USS WASP (LHD 1), USS TRENTON (LPD 14), and USS PORTLAND (LSD 37), completed a five-month Mediterranean deployment in July 1998 (Figure 1). Upon arrival on July 25, 1998 at Morehead City, North Carolina, a Marine who had been an inpatient on the USS WASP's hospital ward since July 20 was transported directly to Naval Hospital Camp Lejeune, where he was

diagnosed with active pulmonary tuberculosis (TB).

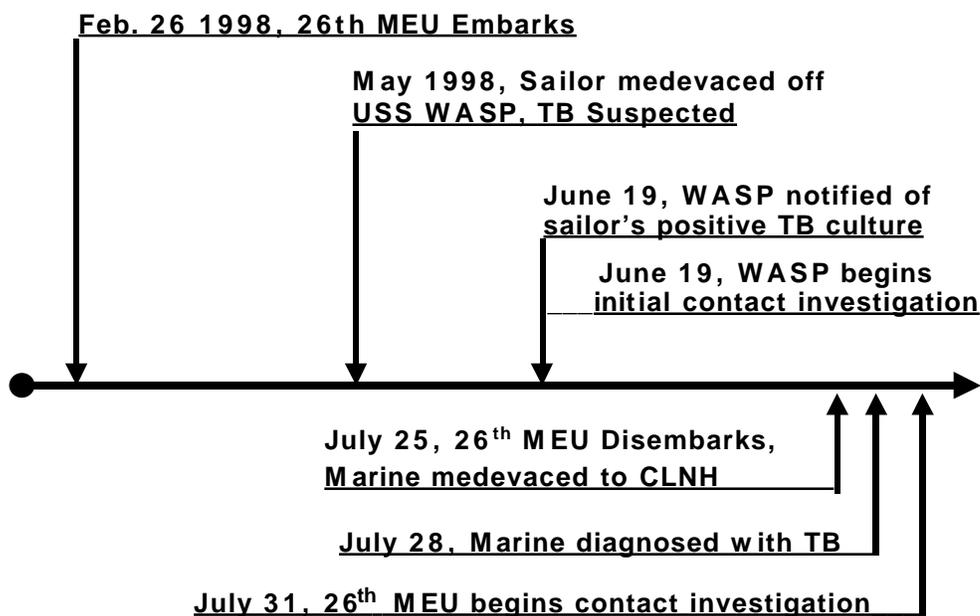
The 26th MEU medical department, II Marine Expeditionary Force, Preventive Medicine, Naval Hospital Camp Lejeune and the USS WASP initiated an investigation of close contacts as directed by BUMED Instruction 6224.8 (8 FEB 93). Earlier during the deployment (May 1998), a USS WASP sailor was evacuated from the ship with a diagnosis of possible pulmonary TB. Definitive

diagnosis of pulmonary TB was made at Portsmouth Naval Medical Center and the USS WASP was notified on June 19, 1998. Following notification the ship's medical department conducted an investigation of the sailor's close contacts. The results of the initial and subsequent investigations follow.

Case definition and contact investigation protocol. Contact investigation protocol was performed in accordance with BUMED Instruction 6224.8. A *converter* was

defined as any individual whose tuberculin skin test reacted with induration of 5mm or more after February 1, 1998. *Converters* received chest x-rays and were evaluated by a Medical Officer. If no evidence of active TB was found, *converters* were started on a six-month regimen of isoniazid (INH). Skin testing was repeated in three months on individuals whose initial tests were negative.

Figure 1. Event Timeline



A *Prior Reactor* was defined as any individual who reacted to a tuberculin skin test before February 1, 1998. *Prior reactors* received a chest x-ray and clinical evaluation.

A TB Case was defined as any individual who had a positive *Mycobacterium tuberculosis* (MTB) culture or chest x-ray and clinical findings consistent with pleural TB. All cases were started on 4-drug therapy for at least two months. MTB drug sensitivities were determined, and therapy was narrowed accordingly to appropriate single or multiple drugs to complete six months of treatment.

Initial USS WASP Contact

Investigation. The contact investigation was initiated on June 19, 1998 upon notification that the sailor evacuated the month before had been diagnosed as an active TB case. Close contacts were defined as all service members of the E-6 mess, and those who worked with or shared berthing space with the TB case.

A total of 208 Sailors and 62 Marines were screened. Of that number, 21 Sailors and 6 Marines were diagnosed as *converters* (conversion rate of 10%). One of the Marine *converters* was eventually diagnosed as a TB case (diagnosed at Naval Hospital, Camp Lejeune after disembarking and reporting for chest x-ray and clinical evaluation).

26th MEU Contact Investigation. The diagnosis of pulmonary TB in the Marine evacuated from the USS WASP to Naval Hospital, Camp Lejeune prompted a contact investigation of all 26th MEU personnel. Skin testing began on July 31, 1998.

Initial testing was done on 2,043 of 2,138 deployed MEU personnel. Testing was not done on 114 personnel because 53 were *prior reactors*, and 42 had converted since February 1 (six during the initial USS WASP contact investigation, 36 during routine annual testing).

Initial screening identified 469 *converters*, a rate of 22.5% (469/2085). Three-month testing identified another 56 *converters* for a total conversion rate of 25.2 %

(525/2085). Of the *converters*, 56 had abnormal chest x-rays and submitted sputum specimens for evaluation. A total of 14 TB cases were identified, 9 pulmonary and 5 pleural (two culture negative). Culture sensitivity showed 11 cases were sensitive to all drugs; the other case showed intermediate resistance to INH. One hundred thirty two personnel did not receive 3-month follow-up testing or testing results were not available because of their transfer or release from military service. -See result details in Table 1.

Ship assignment data for 26th MEU personnel were collected. Conversion rates for embarked 26th MEU personnel were 34.6% for those aboard the USS WASP, 6.4% on the USS TRENTON, and 2.0% on the USS PORTLAND. Assignment to the USS WASP was correlated with TB conversion. Some MEU personnel changed ships during the deployment, which may explain the conversion rate on the USS TRENTON. Figure 2 shows MEU conversion rates by ship, and Figure 3 shows USS WASP conversion rates.

Contact investigations on 59 other contacts (family members, shore personnel) identified 3 *converters*. Of these, only one was related to this outbreak, a Naval Hospital, Camp Lejeune nurse who cared for a hospitalized 26th MEU TB case.

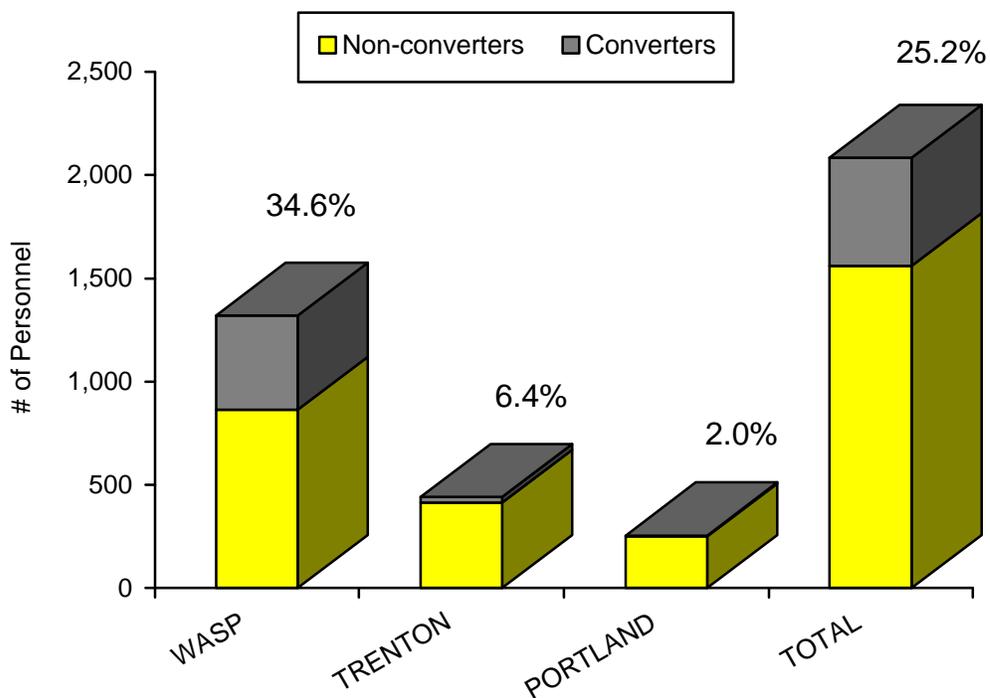
2nd USS WASP Contact Investigation.

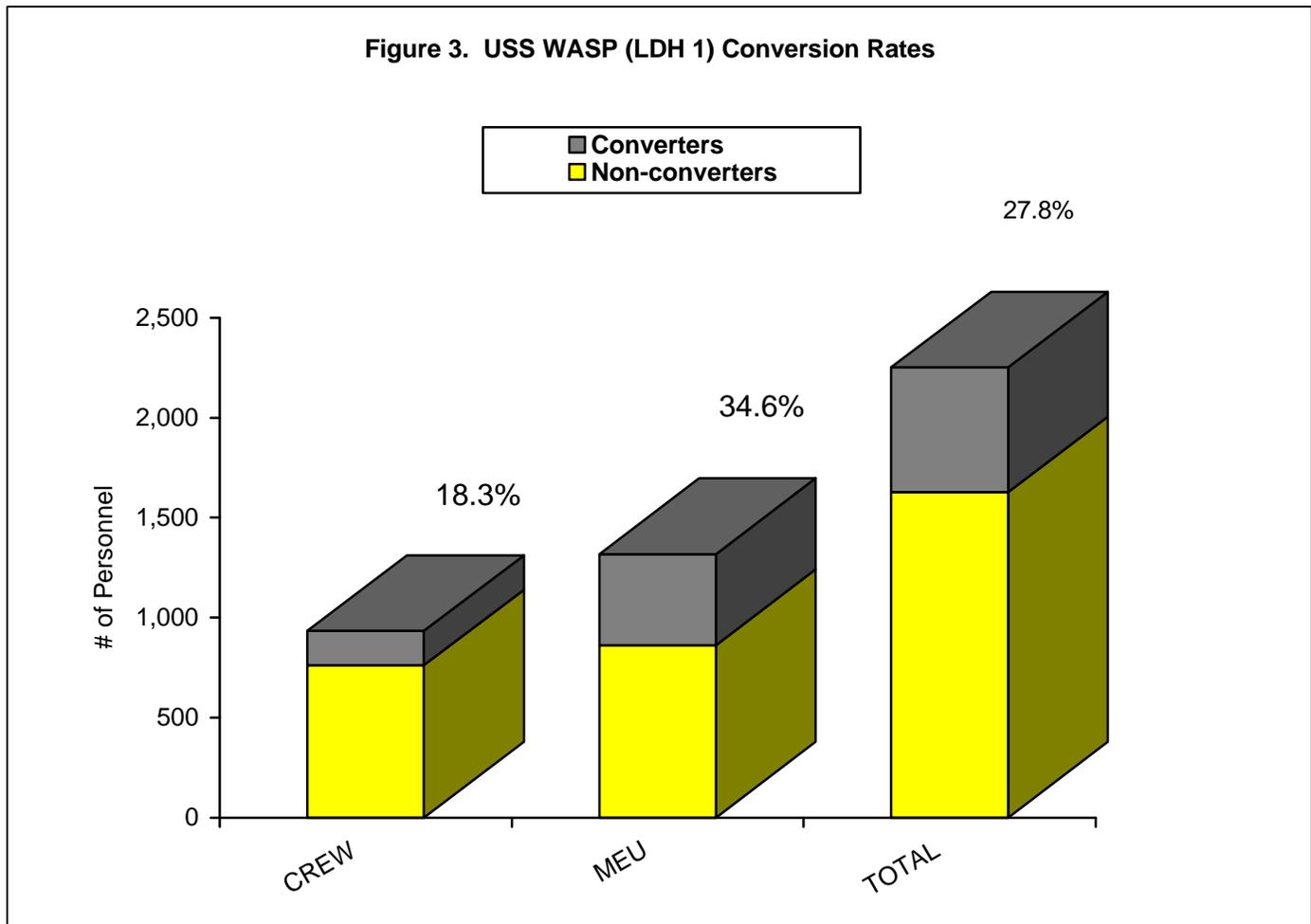
In response to the diagnosis of active pulmonary TB, the USS WASP conducted a second contact investigation beginning in August. The initial evaluation of 1,019 crew members revealed 132 *converters*, 85 *previous reactors* and three cases (MTB cultures on each sensitive to all drugs tested). A further 39 *converters* and no cases were identified at 3-month follow-up, yielding a final crew member conversion rate of 18.3%. Results from 262 other riders (Midshipmen, etc.) evaluated revealed 13 *converters*, two *previous reactors* whose chest x-rays were normal, and no cases. Rider conversion rate was 5%.

Table 1. 26th MEU and USS WASP (LHD 1) Contact Investigation Results

Unit	Total Personnel	Prior Reactors*	Total Converters (Initial/3-month)	Conversion Rate	Active Cases
Battalion Landing Team	1208	14	396 (359/37)	33.2%	10
MEU Service Support Group	269	10	26 (23/3)	10.0%	1
Air Combat Element	433	15	75 (65/10)	17.9%	3
MEU Command Element	228	14	28 (22/6)	13.1%	0
26 th MEU Totals	2138	53	525 (469/56)	25.2%	14
USS WASP	1019	85	171 (132/39)	18.3%	3

*converted prior to Feb. 1, 1998

Figure 2. 26th MEU Conversion Rates By Ship



Lessons Learned

1. The service member who was the probable source of the outbreak had not had routine annual PPD skin testing before deploying. This was not in compliance with Navy and Marine Corps instructions. Studies have shown that living and working conditions aboard ship increase the risk of exposure to communicable diseases. Immunizations, TB skin testing and all mandated public health practices must be followed to protect the health of embarked sailors and Marines, and ensure combat readiness.

2. Opinions differ as to whether a single active TB case on a ship necessitates immediate screening of all the crew. Navy instruction recommends close-contact

investigation, and requires the expansion of the initial investigation when conversion rates are determined to be elevated. The instruction also states that it may be easier to screen the entire crew rather than attempting to identify close contacts. As soon as elevated conversion rates were discovered in June 1998, a contact investigation on all personnel aboard the USS WASP should have been launched. Living and working conditions aboard ship increase the risk of exposure to TB and other communicable diseases, making it necessary to take extraordinary public health measures. The delay in aggressively broadening the investigation increased the risk of exposure of civilians to this pathogen necessitating subsequent investigations which

were costly and manpower intensive, and did not take advantage of the natural quarantine afforded by being aboard ship.

3. Methods of ensuring compliance with care and treatment will always be a challenge with TB. Problems encountered during this outbreak included the Marine who was identified as a *converter* during the initial USS WASP contact investigation and failed to return for evaluation and treatment in a timely manner. He eventually developed active pulmonary TB and required hospitalization. At least two cases of active TB developed in the Marines who were appropriately started on prophylaxis but failed to comply with the daily INH therapy. Numerous times during the investigations repeat tuberculin skin tests had

to be performed because of failure of personnel not returning for reading of skin tests.

4. All medical care providers, from junior corpsmen to senior medical officers, must consider TB as a differential diagnosis when evaluating a patient who complains of chronic cough, even if the patient appears young and "healthy". Tuberculin skin tests should be placed and read by individuals experienced in the technique and equivocal results or missed readings should lead to an immediate repeat of the test. Delays in TB diagnosis in the shipboard environment can rapidly lead to compounding of problems, as demonstrated by this outbreak.

COMMUNICABLE DISEASES

Necrotizing Fasciitis in Active Duty USN/USMC Personnel from 1996 – 1998

In response to a report of a cluster of 2 cases of necrotizing fasciitis (NF) within a four month period in Basic Underwater Demolition/Seals (BUD/S) students at the Naval Special Warfare Center (NSWC), we conducted a review of available data to assess the status of this disease in our personnel. According to DoD hospitalization data obtained from Naval Health Research Center (NHRC), there were 16 cases of NF, ICD-9-CM 728.86 in active duty personnel in the USN and USMC from 1996-1998. This infection as a primary diagnosis, first appeared in that database in March 1996. Of these cases, a total of 12 (75%) were in USN and 4 (25%) were in USMC (Figure 1).

Figures 2 through 5 depict the breakdown of cases by age, sex, race, and pay grade. Based on simple epidemiologic analysis there is no evidence of a definite pattern of disease. The cases range in age from 19 to 64 years, with a missing age data on one of the cases.

A majority of the cases were in the 34-45 (33%) and 56-65 (33%) age categories. Gender information was not available on several of the cases but of the nine cases with this data, 8 (89%) were males. Two (12.5%) of the cases occurred in Asians, 1 (6.25%) in Blacks, 12 (75%) in Caucasians, and 1 (6.25%) in a race category labeled "Other". While 12/16 (75%) of the cases were in enlisted personnel, it is interesting that the four officers with reported cases were in the O-4 to O-6 grade levels.

While an in-depth operational risk assessment for this infection cannot be made from these data, there is no obvious indication that this infection is a major medical concern at any of our training sites. It appears that the majority of these cases are isolated occurrences at different MTFs. The incidence rates of this infection in our personnel are actually lower than those in the civilian community and the other military services. However, we in the general medical and

preventive medicine communities must continue to be vigilant in our efforts to encourage and enforce those preventive practices that will both decrease the chance of

acquisition and propagation of such infection or diseases among our personnel, thereby ensuring the physical readiness of our forces.

Figure 1. Cases of NF in USN/USMC, 1996 - 1998

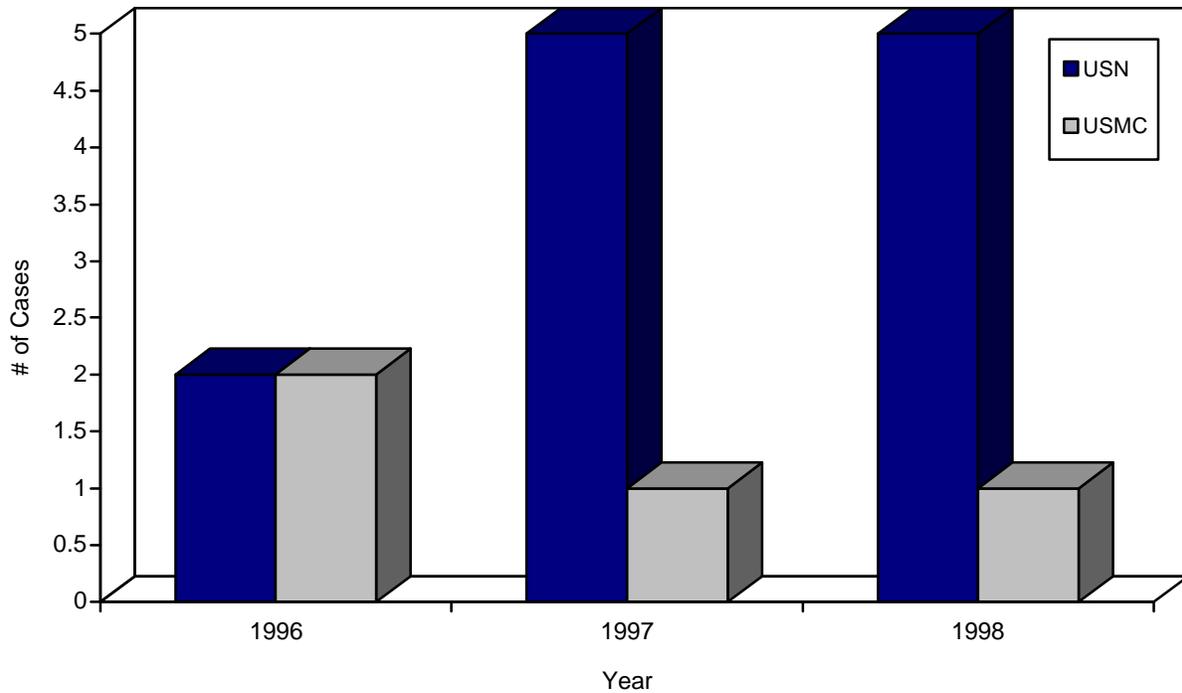


Figure 2. Age Distribution of NF Cases in USN/USMC, 1996 - 1998

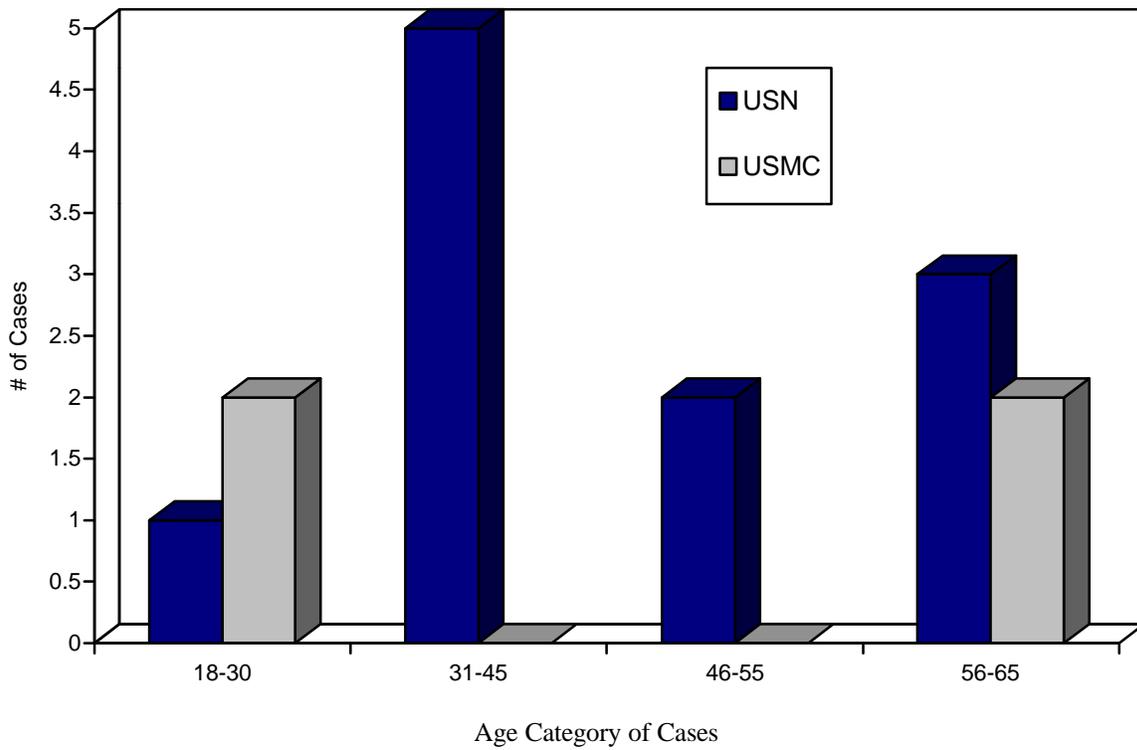


Figure 3. Cases of NF in USN/USMC, 1996 - 1998, by Race/Ethnic Group

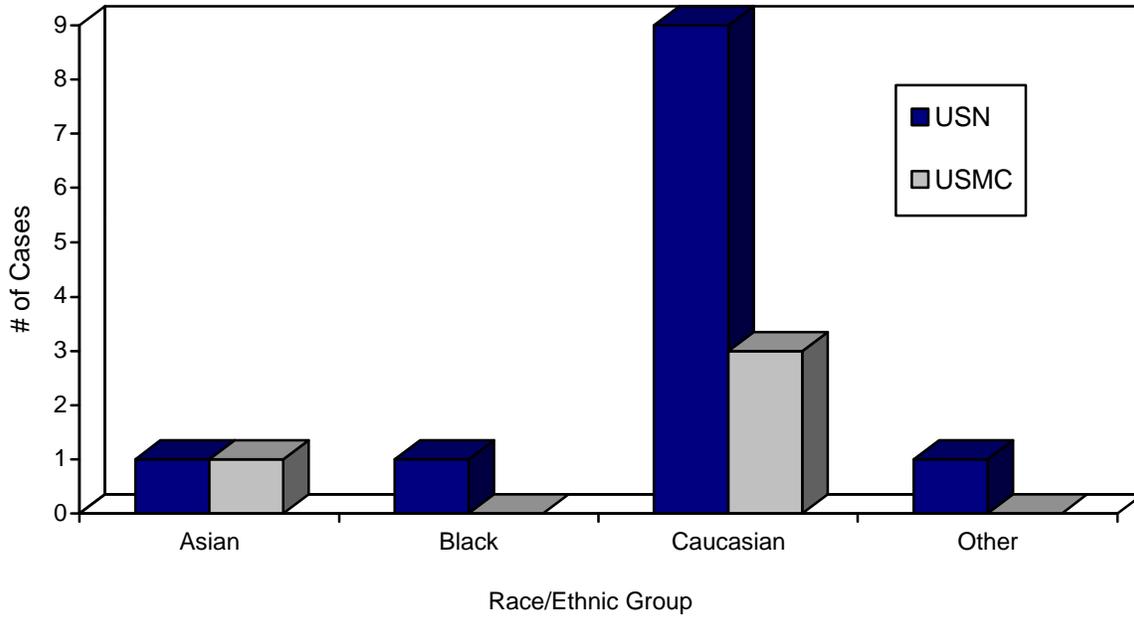


Figure 4 . NF Cases in the USN/USMC, 1996 - 1998, by Pay Grade

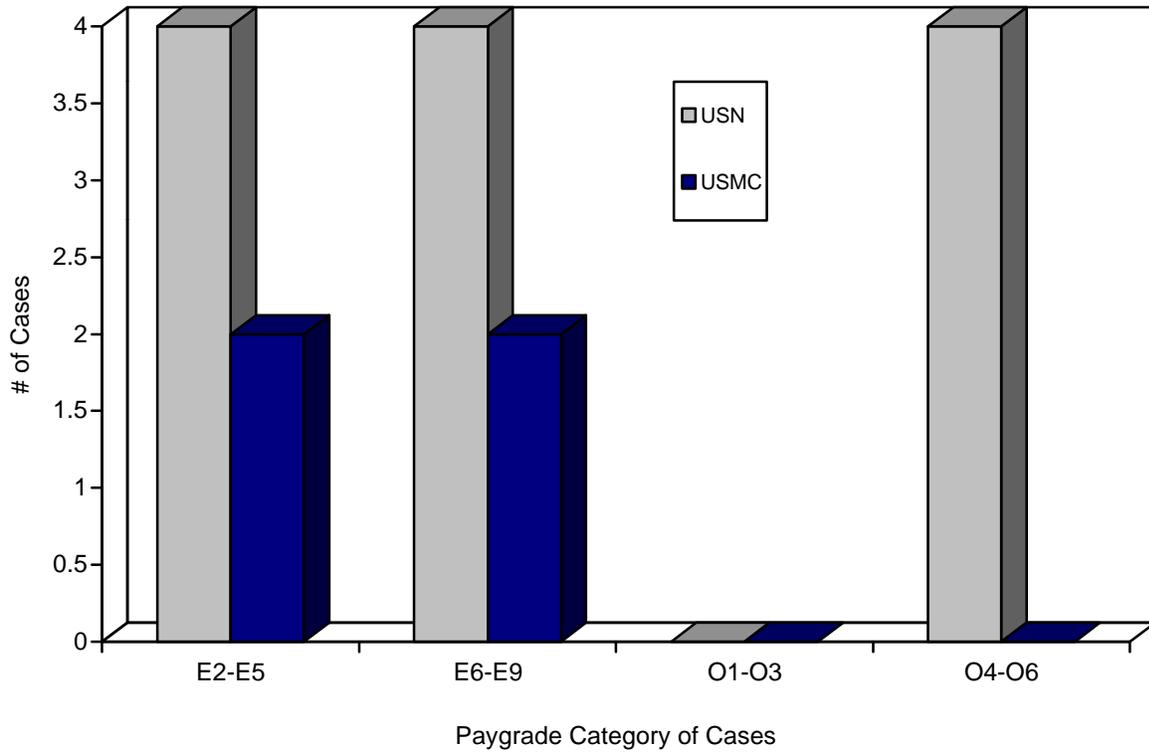
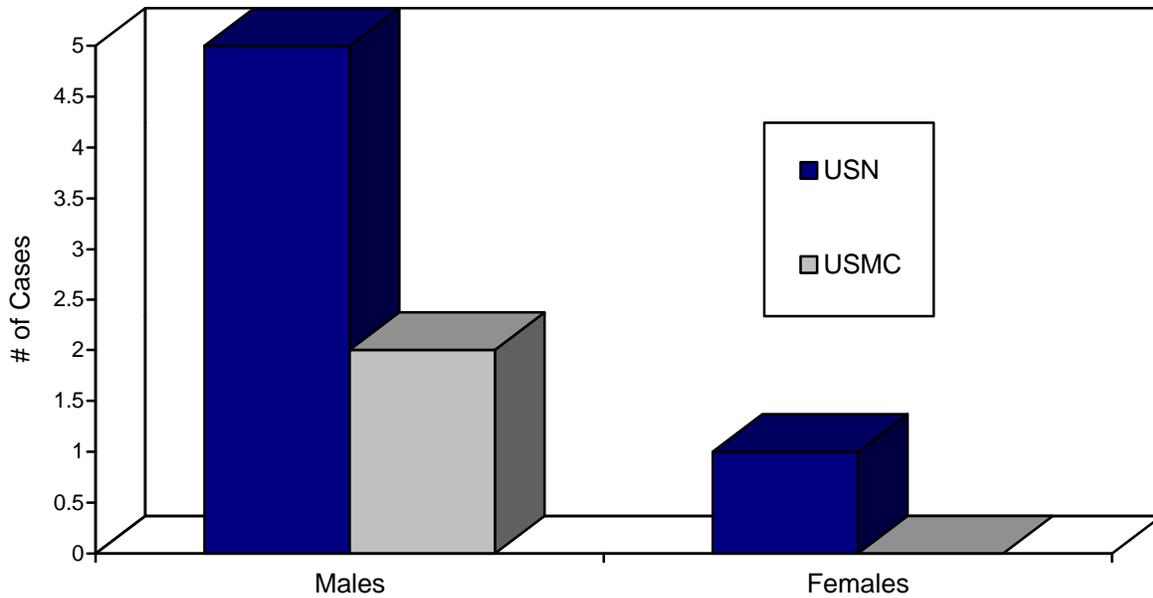


Figure 5. NF Cases in USN/USMC, 1996 - 1998, by Sex



**Important Epidemiologic Contributions Made Between
1986 And 1999 By Navy Environmental and Preventive Medicine Unit 5**

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For fifty years, the Navy Environmental and Preventive Medicine Units have been preserving the health of Navy and Marine Corps personnel. Often times, policies come into place after an unfortunate event has taken place. Such is the case with the events that are described here. Significant contributions have been made by the personnel from Navy Environmental and Preventive Medicine Unit 5 (NEPMU 5) which have changed the course of events for the Navy and Marine Corps and, at times, the entire military community.

1. Acute Rheumatic Fever at a Navy Training Center (NTC), San Diego, California which was described by LCDR T. Papadimos, MC, USN and CDR J. Escamilla, MSC, USN from NEPMU 5 and others from the San Diego region in the February 26, 1988 issue of the MMWR (volume 37, pages 101-104).

Summary follows:

Between December 15, 1986, and July 15, 1987, 10 cases of acute rheumatic fever (ARF) were identified among recruits at the NTC. This outbreak was the first at the NTC in over two decades.

Five of the ten patients reported that they had had a sore throat within one month of admission to the hospital. One patient had sought treatment for sore throat and was diagnosed as having group A Beta-hemolytic streptococcal (GABHS) pharyngitis but did not complete an oral penicillin regimen. Throat cultures for four of the patients were positive for GABHS when they were hospitalized for ARF.

The attack rate for ARF was 0.75/100,000 recruits from January 1, 1982 to December 1, 1986. In 1987, it was 80/100,000. No clustering of ARF had occurred at the NTC since at least the mid-1960s.

Six cases of GABHS pneumonia also occurred among NTC recruits during the ARF outbreak. All patients responded to penicillin. One case of GABHS septic arthritis was also identified. Only two cases of GABHS pneumonia had occurred among active duty personnel in the San Diego area from 1982-1986.

From February 2, 1987 to April 13, 1987, tests were positive for GABHS in 25% (328/1,298) of the recruits seen in recruit sick call for respiratory tract symptoms. During the same time period, 44% (66/149) of the throat cultures taken in the emergency room were positive for GABHS. None of the 91 cultures taken during the same time period in 1986 was positive. The number of patient visits did not differ significantly between 1986 and 1987.

Attack rates for laboratory confirmed GABHS pharyngitis exceeded 10 cases per 1,000 recruits per week for 8 consecutive weeks beginning February 9, 1987. While this rate has not been documented at NTC in over 10 years, smaller peaks of illness were noted at other times. The Armed Forces Epidemiological Board suggested in 1959 that rates of streptococcal disease in excess of 10/1,000 recruits per week could result in epidemics of ARF.

For approximately 15 years, intramuscular benzathine penicillin G was given to all incoming recruits at NTC as prophylaxis against streptococcal infection. However, the practice was discontinued in 1980 because of a perceived decrease in the risk for ARF and related streptococcal sequelae. The Marine Corps Recruit Depot (MCRD) adjacent to NTC has used benzathine penicillin G prophylaxis continuously since the mid-1960s. No cases of ARF were reported at the MCRD during the time of the outbreak at NTC, although GABHS pharyngitis was epidemic.

During this outbreak, the mean time from entering training to diagnosis and hospitalization was 44 days. This finding is consistent with past experience and with current Navy streptococcal infection control directives, which suggest that medical departments be especially aware of the potential occurrence of ARF about 42 days after training begins. Mass prophylaxis with benzathine penicillin G (BPG) has been reinstated at NTC. All incoming recruits except those allergic to penicillin receive 1.2 million units intramuscularly. Weekly streptococcal disease surveillance rates are being scrutinized.

Contributions following this outbreak include the reinstatement of the Streptococcal Infection Control Program via the Bureau of Medicine and Surgery (BUMED) instruction 6220.6 dated 17 Aug 87, written primarily by CDR D. Conwill, MC, USN, another epidemiologist at NEPMU 5. This instruction outlines how to do disease surveillance at the recruit centers and when to use penicillin prophylaxis for group A streptococcal disease. Another contribution was a study using erythromycin prophylaxis in those recruits allergic to penicillin. This study was written up in the *Journal of Infectious Diseases* in 1992 (volume 166, pages 162-165) by a reserve Preventive Medicine Resident (Dr. J. Fujikawa, et al) while doing part of her training at NEPMU 5 and resulted in the recommendation of an alternative drug available for penicillin-allergic recruits.

2. Pneumonia outbreaks among Marines at Camp Pendleton--described by LCDR D. Carroll, MC, USNR in her Summer 1996 MPH thesis entitled "Pneumonia in United States Marine Corps Trainees." LCDR Carroll was a reserve Preventive Medicine Resident doing part of her training at NEPMU 5 under the supervision of CAPT E. Ledbetter, MC, USN.

In the winter of 1989-1990, a pneumonia epidemic occurred among Marines undergoing infantry training at Camp Pendleton, California. The only bacterial pathogen identified in this outbreak was *Streptococcus pneumoniae*,

however respiratory viruses were also isolated. A total of 128 cases occurred in the winter of 1989-1990 whereas only five cases occurred the previous year. Subsequent surveillance revealed 116 to 156 pneumonia cases per year between fiscal years 1991 and 1995 in Marine trainees at Camp Pendleton. When broken down by areas, 67% of the cases were among the School of Infantry students (52 Area) and 33% were among the MCRD recruits at Edson Range (31 Area).

Contributions following this outbreak include the routine administration of a second BPG injection at MCRD about 4 weeks after the initial injection, as well as the administration of Pneumovax to recruits every year from September to April. In addition, general preventive measures were instituted including emphasizing hand washing and decreasing crowding in berthing areas. Since the implementation of this policy, there have been no outbreaks of pneumonia at Camp Pendleton. Many more significant contributions have come in the form of numerous surveillance and research projects performed by CAPT G. Gray, MC, USN (a former epidemiologist at NEPMU 5) and his capable body of researchers and collaborators at the Naval Health Research Center (NHRC).

3. Malaria outbreaks among Marines at Camp Pendleton-- described by S. Shallow in her Spring 1995 MPH thesis entitled "Risk Factors for the Development of Vivax Malaria in a U.S. Marine Battalion in Somalia." Sue Shallow was a MPH student at San Diego State University doing part of her training at NEPMU 5 under the supervision of CAPT E. Ledbetter, MC, USN.

A battalion of 499 Marines who were stationed in Baardera, Somalia between December 11, 1992 and February 16, 1993 was studied to determine risk factors for the development of vivax malaria. Forty-three of these 499 Marines (8.6%) were infected with *Plasmodium vivax*. Significant factors leading to these cases included significant biting rates by mosquitoes, missing doses of mefloquine,

and not being able to use bednets while on duty at night near the river.

CAPT Ledbetter, Ms. Shallow, and CDR Hanson, MC, USN (a former epidemiologist with NEPMU 6) also wrote a letter to the editor of JAMA (dated 8 Mar 95, vol. 273, pg. 774-775) about 128 Marines who contracted malaria in Somalia. Ninety-seven of these Marines were interviewed. Since malaria was anticipated and aggressive prophylactic and preventive measures were taken to prevent the disease, less than 1% of the personnel deployed with Operation Restore Hope actually contracted malaria. Recommendations as a result of this work were to expand directly observed therapy, to encourage commands in malarious areas in enforcing prophylactic and preventive measures, and to continue to search for more acceptable repellents as well as better ways to encourage individual compliance with measures in existence.

Contributions as a result of these cases of malaria include lessons that had been learned back in World War II days (see C. Beadle and S. Hoffman, "History of Malaria in the United States Naval Forces at War: World War I through the Vietnam Conflict," *Clinical Infectious Diseases*, 1993, volume 16, pages 320-9). Also, these studies highlighted the importance of impregnated bednets in the naïve military community in malarious areas, something that many malaria researchers have already shown with semi-immune populations in malarious areas.

4. Invasive Streptococcal Outbreak among BUD/S (Basic Underwater Demolition/Seal)--

In February, 1995, an outbreak of invasive Streptococcal disease occurred among the BUD/S students in San Diego. The students were in the phase of their training known as "Hell Week" (five days of rigorous physical exertion and test of endurance with only a few hours sleep and poor hygienic practices). Near the end of Hell Week, 6 of the remaining 55 BUD/S students (11%) were hospitalized with invasive bacterial disease.

NEPMU 5 staff responded to the outbreak

within a few hours by performing throat swabs, nasopharyngeal aspirates, perianal swabs, and wound cultures as well as collecting basic demographic data on the 51 students from Hell Week who had not been identified as being ill, (Class 199) on control groups consisting of BUD/S students who dropped out during Hell Week and others who had not yet begun Hell Week. Immediately postculture, bicillin IM was given to the non-hospitalized members of Class 199. Less than 24 hours later five of the six hospitalized patients were interviewed and specimens were collected from the instructors and medical staff for the BUD/S students.

Two of the six hospitalized trainees were diagnosed with GABHS by culture, one had the classic clinical picture typical of streptococcal infection but had been on erythromycin prior to his culture, and the other three had knee wounds which grew out *Staphylococcus aureus*, but may also have had strep involvement. One of the patients with confirmed GABHS had extensive surgery including multiple skin grafts for damage due to necrotizing fasciitis, the other two had cellulitis which required debridement of their hand wounds.

Carriage rates for the 134 individuals cultured were seven (5%) for GABHS in throat cultures and only one (<1%) for GABHS in perianal culture, while all of the other specimens were negative for GABHS. Contributions following this outbreak included recommendation for increased opportunities throughout Hell Week for adequate personal hygiene (frequent hand washing with soap and hot water and increasing showers to twice daily), improvement of immune status (increasing the number and duration of periods of rest and/or sleep), and reduction in skin abrasions (using knee pads, shin guards, and other protective barriers). Other recommendations included vaccinating BUD/S students with Pneumovax and HiB vaccine prior to their training, giving all trainees bicillin IM just prior to Hell Week, and implementing a GABHS pharyngeal surveillance program. For the next five classes, NEPMU 5 personnel did

throat swabs on BUD/S students a few days before they started training, just prior to Hell Week, and at the end of Hell Week.

The overall GABHS results of these throat cultures were 1.0% for the baseline cultures, 1.2% for the pre-Hell Week cultures, and <1.0% for the post-Hell Week cultures.

None of the five classes had high rates individually, and the highest rates were 1.7% for the baseline cultures, 2.7% for the pre-Hell Week cultures, and 2.6% for the post-Hell Week cultures.

Other contributions following this outbreak included a description of our intervention program by Dr. M. D. Hughes in his Fall 1997 MPH thesis entitled "Evaluation of the Effectiveness of a Cellulitis Prophylactic Intervention Program Among United States Navy Seal Trainees." Dr. Hughes was a Preventive Medicine Resident (former Navy

Flight Surgeon) who used data from NEPMU 5 under the supervision of CAPT E. Ledbetter, MC, USN. The conclusions of his study demonstrated that our multi-faceted prophylactic intervention was effective in reducing the incidence of cellulitis and cost-effective when compared to not having the intervention.

As these four outbreaks have demonstrated, important policies have resulted which have reduced the incidence of specific infectious diseases among subsequent susceptible populations. Also, many important contributions have been made by NEPMU 5 staff (both former and current) which have not only impacted these populations, but also the entire military community. The hard work and efforts of all that are represented here deserve our praise and thanks for a job well done.

HEALTH PROMOTION

Analysis of Physical Evaluation Board Data

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Injuries in the Navy and Marine Corps continue to be a cause for concern, especially among our younger first-term personnel. Physical Evaluation Board (PEB) data from the Joint Service Disability and Evaluation Tracking System was examined for the 1998 fiscal year.

A total of 6,677 Navy and Marine Corps personnel were evaluated by the PEB (Figure 1). The possible dispositions include Physical Disability Retirement (PDR), Separation with Severance Pay (SSP), Separation Without Benefits (SWOB), Separation Temporarily Disabled (STD), and Fit for that diagnoses (FIT). The Retained Temporary Disability List was included under the Temporarily Disability List (TDL), and Permanent Disability

Retirement from the TDL was included in the PDR List for analysis purposes (Figure 2).

Figure 3 shows cases that led to separation from service for all causes, and Figure 4 for first-term individuals, 6 months to 4 years service. An analysis of diagnosis revealed the majority of cases were for musculoskeletal/ degenerative type disorders, Veteran Administration Code series 5000 (Figure 5). Dispositions for cases with that diagnosis for first-termers are depicted in Figure 6.

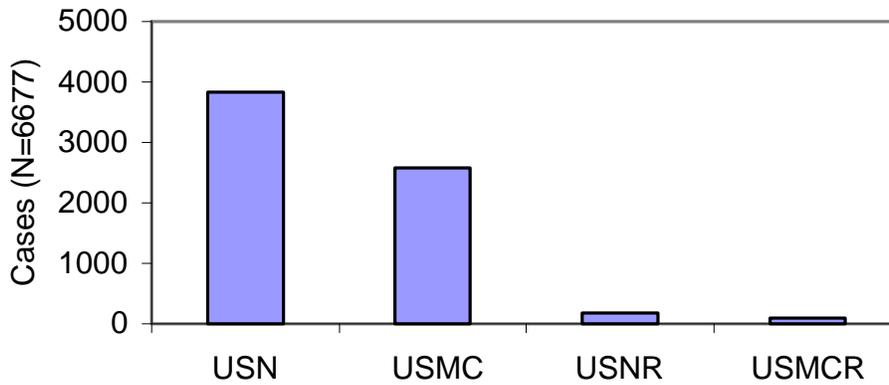
Finally, the graph in Figure 7 depicts the number of first-term cases that were separated from service due to musculoskeletal/ degenerative disorders.

Editor's Note: This injury data contributed by the Health Promotion and Medical Management Directorate of NEHC offers a service-wide overview from a recent year. It was compiled as part of NEHC's program for database development and inter-directorate collaboration on Force Health Protection. Although injuries are not reportable via the NDRS and are mandated by instructions other than BUMEDINST 6220.12A (Medical Event

Report), the data is relevant to *Naval Medical Surveillance Report*.

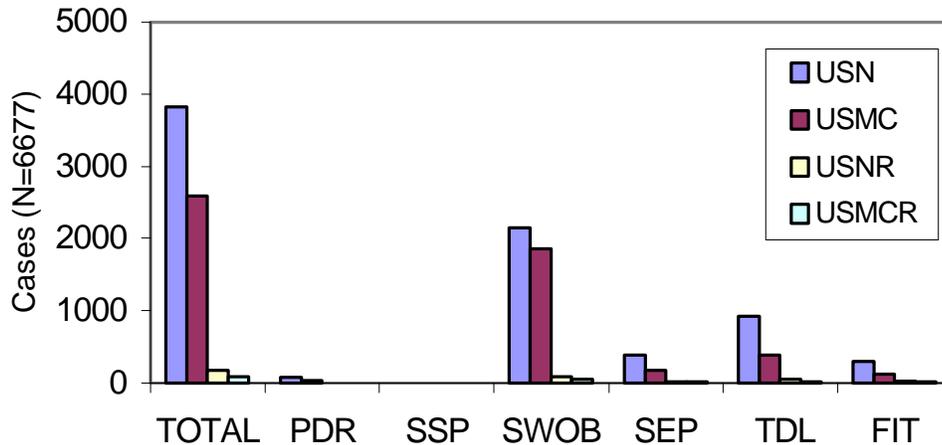
As our databases mature and our communication and cooperation develop, more detailed analysis of exposure, demographics, and outcomes of injuries will suggest newer intervention programs to reduce injuries to the lowest possible level.

Figure 1. Physical Evaluation Board FY 98



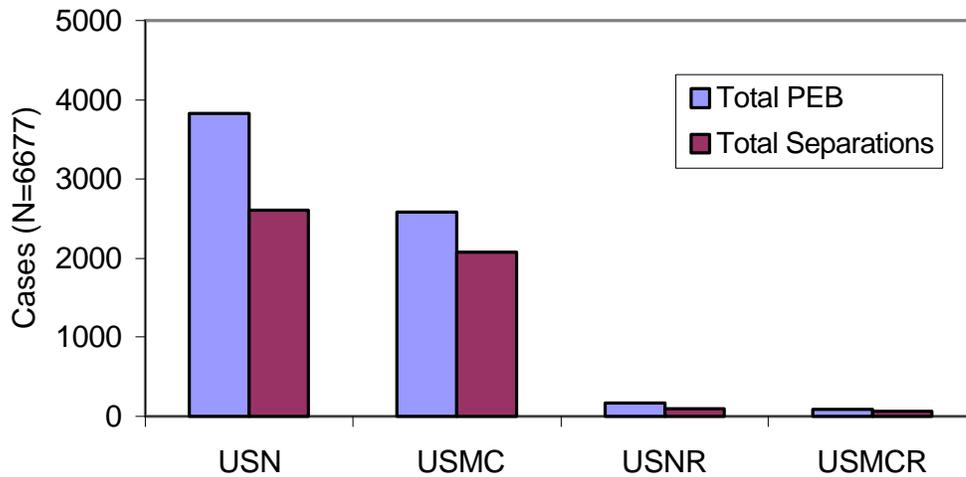
Source: Joint Service Disability and Evaluation Tracking System

Figure 2. Physical Evaluation Board Dispositon FY 98



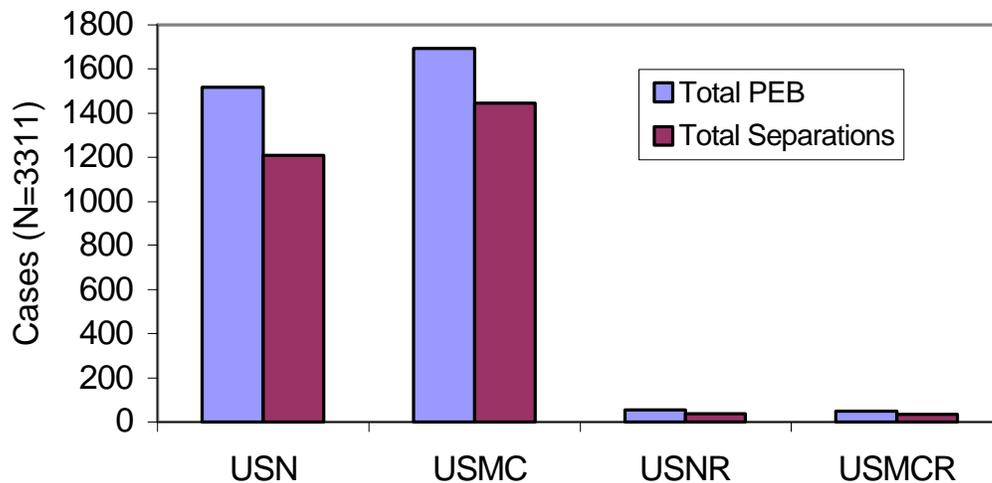
Source: Joint Service Disability and Evaluation Tracking System

**Figure 3. Physical Evaluation Board Separations
(All Causes) FY 98**



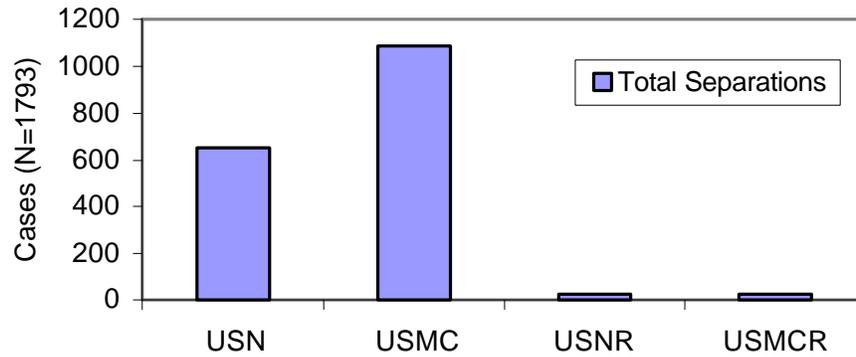
Source: Joint Service Disability and Evaluation Tracking System

**Figure 4. Physical Evaluation Board Separations
(All Causes) 6 Months to 4 Years Service FY 98**



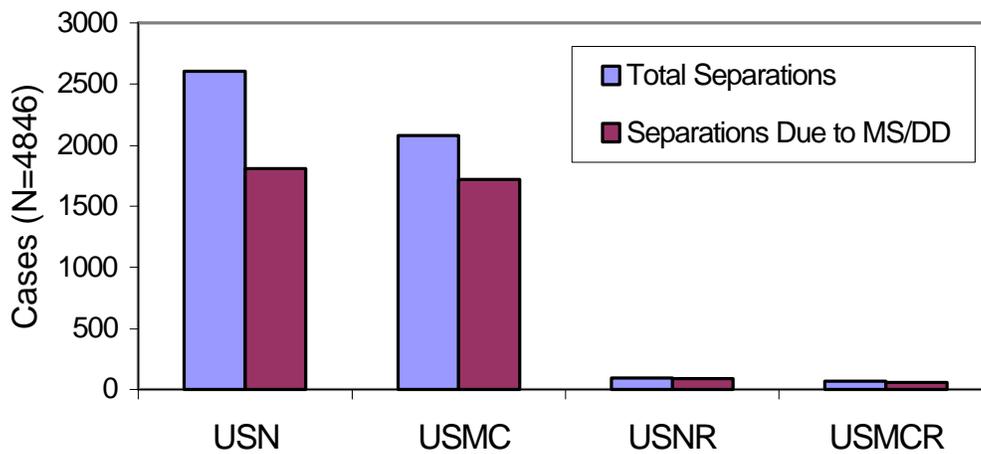
Source: Joint Service Disability and Evaluation Tracking System

Figure 5. Separations Due to Musculoskeletal/Degenerative Disorders 6 Months to 4 Years Service FY 98



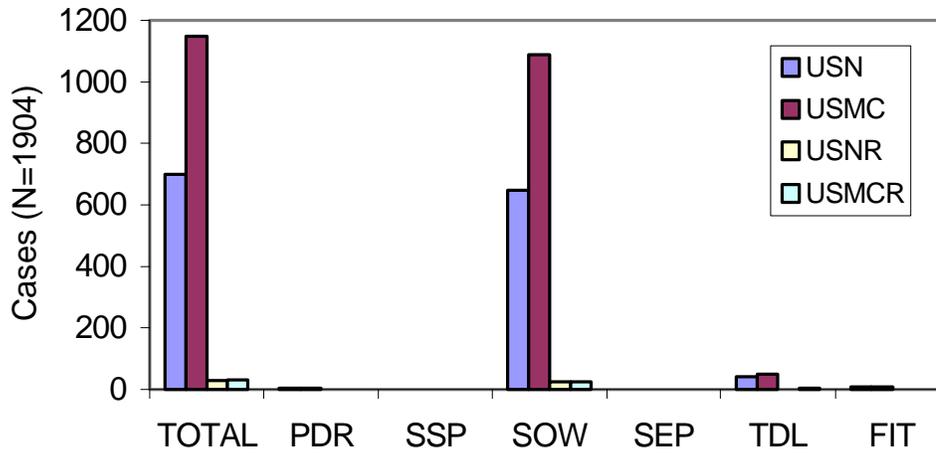
Source: Joint service Disability and Evaluation Tracking System

Figure 6. PEB Separations Due to Musculoskeletal/Degenerative Disorders FY 98



Source: Joint Service Disability and Evaluation Tracking System

Figure 7. PEB Dispositions for Musculoskeletal/Degenerative Disorders 6 Months to 4 Years Service FY 98



Source: Joint Service Disability and Evaluation Tracking System

