MSMR

Medical Surveillance Monthly Report

Vol. 7 No. 2 **February 2001**

USACHPPM

Contents

Data in the MSMR are provisional, based on reports and other sources of data available to the Army Medical Surveillance Activity (AMSA). Notifiable events are reported by date of onset (or date of notification when date of onset is absent). Only cases submitted as confirmed are included.

Current and past issues of the MSMR may be viewed online at: *http://amsa.army.mil*

Surveillance trends

Infectious Mononucleosis among Active Duty US Servicemembers, 1998-1999

Infectious mononucleosis is an acute infectious illness that is characterized by fever, sore throat, diffuse lymphadenopathy, and fatigue that typically lasts for 1-2 months. It is estimated that more than 90% of classic infectious mononucleosis cases are caused by Epstein-Barr Virus (EBV), a member of the herpes virus family.[1, 2] The incubation period is generally 4-6 weeks.

EBV is shed in the saliva of infected, but not necessarily symptomatic, carriers. EBV transmission, therefore, can occur when infected individuals kiss or share eating or drinking utensils with immunologically susceptible individuals. In less developed countries, most individuals are infected with EBV as young children. Fortunately, most children have inapparent to mild clinical manifestations of acute EBV infections. In the United States, most individuals have antibodies indicative of prior EBV infections prior to adulthood; however, in socioeconomically advantaged subgroups, as many as half of young adults may be immunologically susceptible to EBV.[1,2]

In 1970, a review of the epidemiology of infectious mononucleosis among US servicemembers was conducted.[1] The report described significant variability in hospitalization rates across Services, over time, and in relation to assignment locations. For example, Service-specific hospitalization rates ranged from 65 per 100,000 person-years in the Army, 1940-1946, to 228 per 100,000 person-years in the Air Force, 1967.[3] In 1946, hospitalization rates were higher among soldiers stationed in Japan (231 per 100,000) and Europe (220 per 100,000) compared to those stationed in the US (152 per 100,000). From 1955-1961, hospitalization rates were higher among soldiers in Japan (311 per 100,000) compared to those in Europe (170 per 100,000) and the United States (110 per 100,000).[1]

There have been no recent reports of rates of or risk factors for infectious mononucleosis among members of the US Armed Forces in general. This report describes recent rates, trends, and demographic correlates of risk of infectious mononucleosis among active duty members of the US Armed Forces.

Methods. The Defense Medical Surveillance System was searched to identify all outpatient visits and hospitalizations for "infectious mononucleosis" (ICD-9-CM: 075) among active duty servicemembers from January 1998 through December 1999. Only primary diagnoses were considered, and only one diagnosis (the earliest) for each individual was included in the analyses. Incidence rates were

Continued on page 7

The Medical Surveillance Monthly Report is prepared by the Army Medical Surveillance Activity , Directorate of Epidemiology and Disease Surveillance, United States Army Center for Health Promotion and Preventive Medicine (USACHPPM).

IInquiries regarding content or material to be considered for publication should be directed to: Editor, Army Medical Surveillance Activity, Building T-20, Room 213 (Attn: MCHB-TS-EDM), 6900 Georgia Avenue, NW, Washington, D.C. 20307-5001. E-mail: editor@amsa.army.mil

To be added to the mailing list, contact the Army Medical Surveillance Activity @ (202) 782-0471, DSN 662-0471. E-mail: msmr@amsa.army.mil

Figure 1. Incidence rates of infectious mononucleosis among females, by age and race, US Armed Forces, 1998-1999

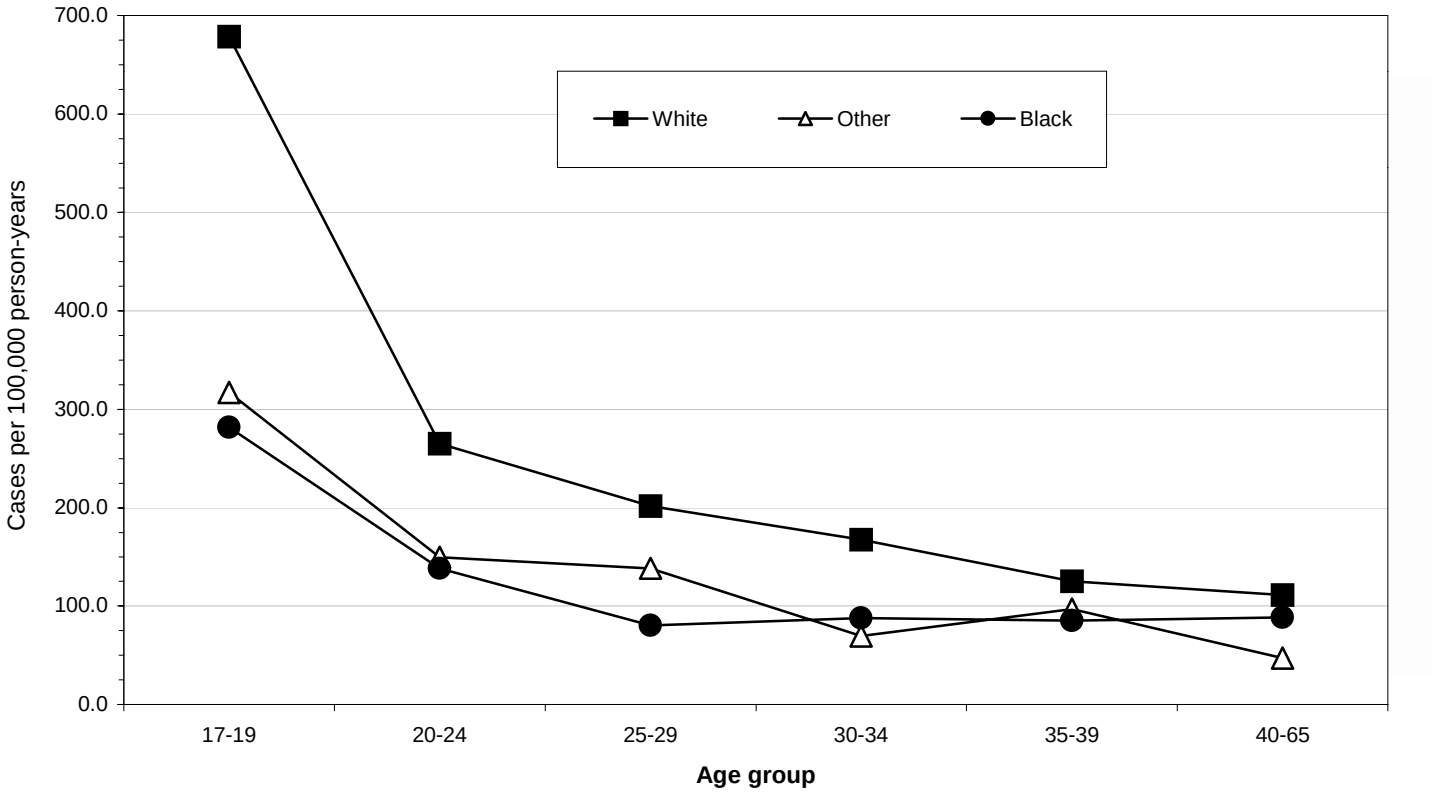


Figure 2. Incidence rates of infectious mononucleosis among males, by age and race, US Armed Forces, 1998-1999

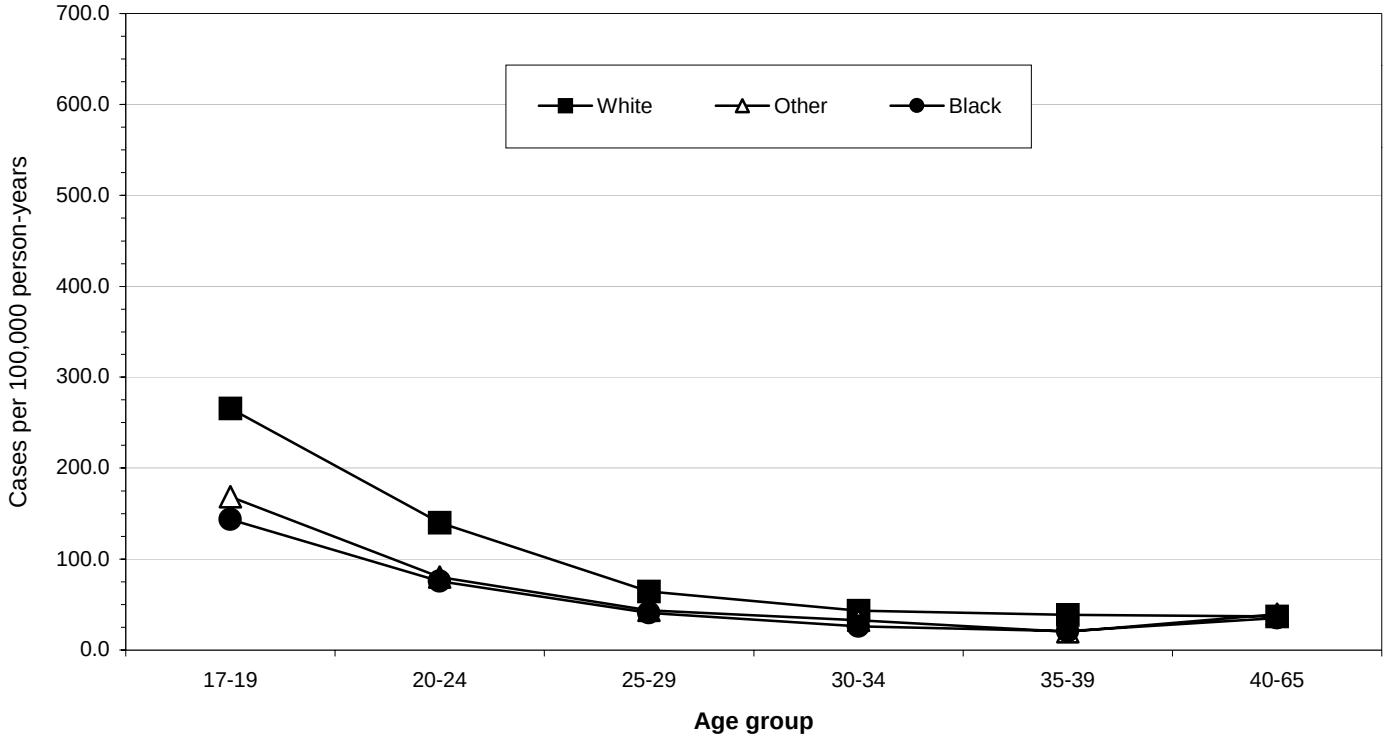


Table I. Sentinel reportable events, US Army medical treatment facilities[1]
Cumulative events for all beneficiaries, calendar year through January 31, 2000 and 2001[2]

Reporting Facility	Number of reported events[3]		Environmental				Food- and Water-borne							
			Cold		Heat		Campylobacter		Giardia		Salmonella		Shigella	
	Cum. 2000	Cum. 2001	Cum. 2000	Cum. 2001	Cum. 2000	Cum. 2001	Cum. 2000	Cum. 2001	Cum. 2000	Cum. 2001	Cum. 2000	Cum. 2001	Cum. 2000	Cum. 2001
NORTH ATLANTIC RMC														
Walter Reed AMC, DC	4	21	-	-	-	-	-	-	-	-	-	-	-	1
Aberdeen Prov. Grd., MD	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT Belvoir, VA	14	10	-	-	-	-	-	-	-	1	-	-	-	-
FT Bragg, NC	63	59	-	1	-	2	-	-	-	-	-	-	-	-
FT Drum, NY	11	30	-	-	-	-	-	1	-	-	-	-	-	-
FT Eustis, VA	8	12	-	-	-	-	-	-	-	-	-	-	-	-
FT Knox, KY	13	26	-	-	-	-	-	-	-	-	-	-	-	-
FT Lee, VA	2	31	-	-	-	-	-	-	-	-	-	-	-	-
FT Meade, MD	14	7	-	-	-	-	-	-	-	-	1	-	-	-
West Point, NY	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GREAT PLAINS RMC														
Brooke AMC, TX	48	22	-	-	-	-	-	1	-	-	-	-	-	-
Beaumont AMC, TX	16	13	-	-	-	-	-	-	-	-	-	-	-	-
FT Carson, CO	20	75	-	-	-	-	-	-	-	-	-	1	-	-
FT Hood, TX	29	24	-	-	-	-	1	1	-	-	-	-	-	-
FT Huachuca, AZ	4	1	-	-	-	-	-	-	-	-	-	-	-	-
FT Leavenworth, KS	1	1	-	-	-	-	-	-	-	-	-	-	-	-
FT Leonard Wood, MO	16	19	3	1	-	-	-	-	-	-	-	-	-	-
FT Polk, LA	19	37	-	-	-	-	-	-	-	-	-	-	-	-
FT Riley, KS	-	19	-	-	-	-	-	-	-	-	-	-	-	-
FT Sill, OK	-	27	-	-	-	-	-	-	-	-	-	-	-	-
SOUTHEAST RMC														
Eisenhower AMC, GA	7	21	-	-	-	-	-	-	-	-	-	-	-	-
FT Benning, GA	33	33	-	-	-	-	-	-	-	-	-	1	-	-
FT Campbell, KY	17	61	1	-	-	-	-	2	-	1	-	1	-	-
FT Jackson, SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FT Rucker, AL	-	6	-	-	-	-	-	-	-	-	-	1	-	-
FT Stewart, GA	49	53	-	-	-	-	-	-	-	-	-	-	-	-
WESTERN RMC														
Madigan AMC, WA	46	53	-	-	-	-	-	1	-	-	-	1	-	-
FT Irwin, CA	1	3	-	-	-	-	-	-	-	-	-	-	-	-
FT Wainwright, AK	2	3	1	-	-	-	-	-	-	-	-	-	-	-
OTHER LOCATIONS														
Tripler, HI	56	91	-	-	-	-	3	4	4	3	1	2	-	1
Europe	18	82	1	-	-	-	-	3	-	-	1	1	-	-
Korea	6	1	1	-	-	-	-	-	-	-	-	-	-	-
Total	**517**	**841**	**7**	**2**	**-**	**2**	**4**	**13**	**4**	**5**	**3**	**8**	**-**	**2**

1. Main and satellite clinics.

2. Events reported by February 7, 2000 and 2001.

3. Tri-Service Reportable Events, Version 1.0, July 2000. Not all reportable events are displayed in Table I.
Number of events in a row may not equal the total number of reported events for the reporting facility.

Table I. (Cont'd) Sentinel reportable events, US Army medical treatment facilities[1] Cumulative events for all beneficiaries, calendar year through January 31, 2000 and 2001[2]

Arthropod-borne				Vaccine Preventable						Sexually Transmitted							
Lyme Disease		Malaria		Hepatitis A		Hepatitis B		Varicella		Chlamydia		Gonorrhea		Syphilis[4]		Urethritis	
Cum. 2000	Cum. 2001	Cum. 2000	Cum. 2001	Cum. 2000	Cum. 2001	Cum. 2000	Cum. 2001	Cum. 2000	Cum. 2001	Cum. 2000	Cum. 2001	Cum. 2000	Cum. 2001	Cum. 2000	Cum. 2001	Cum. 2000	Cum. 2001
-	-	-	-	-	-	-	-	-	1	-	4	-	3	-	2	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	13	7	1	2	-	-	-	-
-	-	-	2	-	-	-	-	-	-	25	22	19	15	-	-	19	15
-	-	-	-	-	-	-	-	-	-	8	23	3	6	-	-	-	-
-	-	-	-	-	-	-	-	-	1	5	8	3	3	-	-	-	-
-	-	-	-	-	-	1	-	-	-	11	19	1	7	-	-	-	-
-	-	-	-	-	-	-	-	-	-	2	23	-	8	-	-	-	-
-	-	-	-	-	-	-	-	-	-	11	5	2	2	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	1	-	14	11	4	5	-	-	-	-
-	-	-	-	1	-	-	-	-	-	10	11	4	1	-	-	-	-
-	-	-	-	-	-	-	-	-	-	19	52	1	13	-	-	-	8
-	-	-	-	-	-	-	-	-	1	19	7	6	5	-	-	3	7
-	-	-	-	-	-	-	-	-	-	2	1	2	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-
-	-	-	-	-	-	-	-	5	2	4	11	3	1	-	-	1	-
-	-	-	-	-	-	-	-	-	-	17	22	2	11	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	18	-	1	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	18	-	5	-	-	-	4
-	-	-	-	-	-	-	-	-	-	7	20	-	1	-	-	-	-
-	-	-	-	-	-	-	-	5	-	19	19	6	11	2	-	-	-
-	-	-	-	-	-	-	-	-	-	3	48	13	9	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	4	-	1	-	-	-	-
-	-	-	-	-	-	-	-	-	-	18	20	13	12	-	-	18	21
-	-	-	-	-	-	-	1	-	-	24	33	6	12	-	-	13	5
-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	1	3	-	-	-	-	-	-
-	-	-	-	1	-	1	-	-	-	26	63	4	6	-	-	-	-
-	-	-	-	-	-	-	-	-	2	11	68	2	8	-	-	-	-
-	-	-	-	-	-	-	-	-	-	5	1	-	-	-	-	-	-
-	**-**	**-**	**2**	**2**	**-**	**2**	**1**	**11**	**7**	**276**	**542**	**95**	**149**	**2**	**2**	**54**	**60**

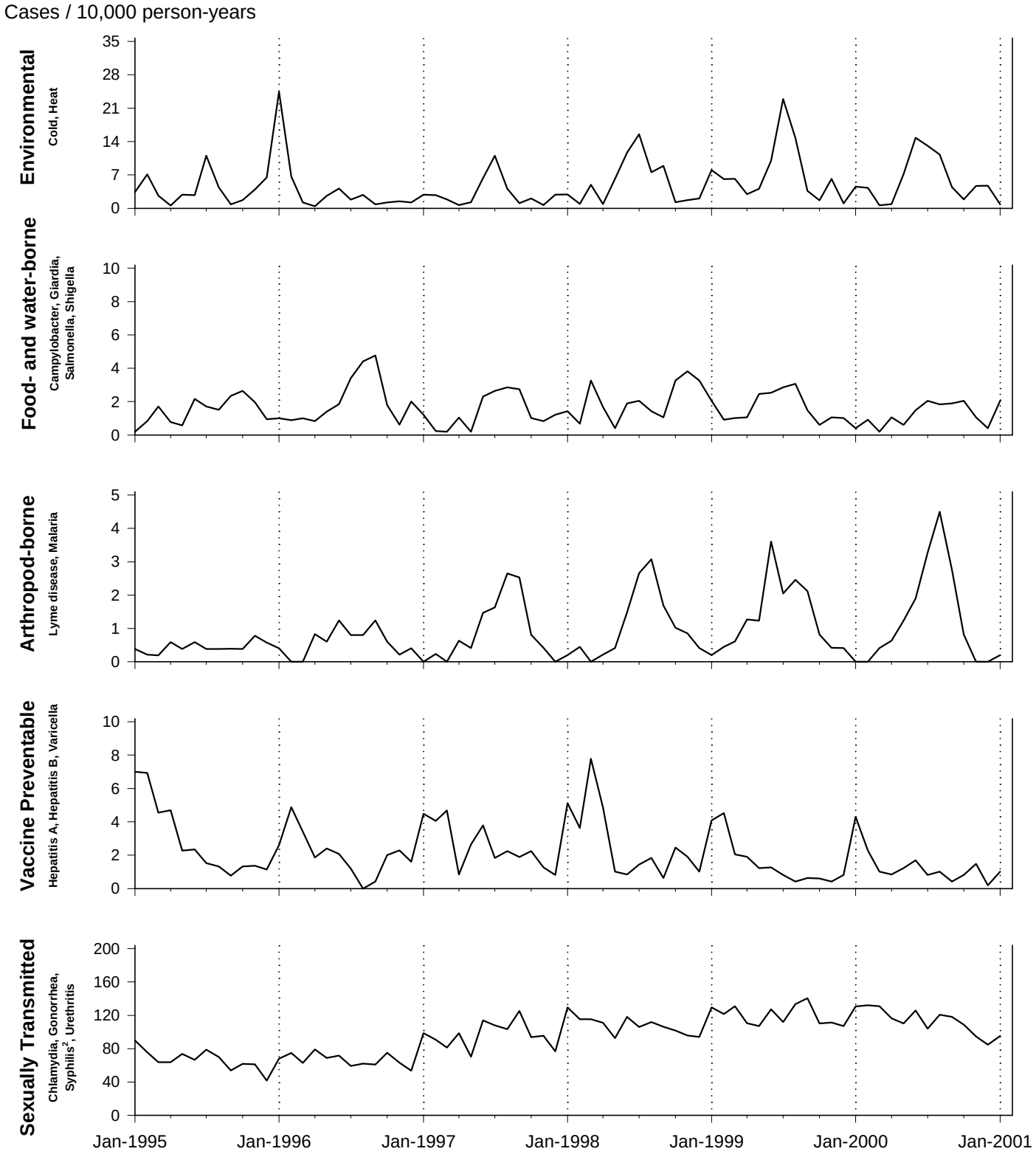
4. Primary and Secondary.

5. Urethritis, non-gonoccal (NGU).

Note: Completeness and timeliness of reporting varies by facility.

Source: Army Reportable Medical Events System.

Figure I. Sentinel reportable events (grouped), active duty soldiers, January 1995 - January 2001[1]



1. Events reported by February 7, 2001
2. Primary and Secondary

Source: Army Reportable Medical Events System

Table 1. Infectious mononucleosis, by demographic characteristics, US Armed Forces, 1998-1999

Characteristics	Cases	Rate per 100,000 person-years	Relative rate (vs lowest subgroup)
Total	2,717	98.9	
Gender			
Female	769	199.1	2.41
Male	1,948	82.5	1.00
Race			
Black	374	67.0	1.00
Other	196	75.2	1.12
White	2,147	111.3	1.66
Age			
<20	647	282.1	6.70
20-24	1,145	137.4	3.26
25-29	415	72.2	1.72
30-34	223	50.0	1.19
35-39	171	42.1	1.00
>=40	116	44.9	1.07
Service			
Air Force	947	131.3	1.89
Army	655	69.3	1.00
Marine Corps	296	86.5	1.25
Navy	819	110.5	1.59

Continued from page 2

population-based, and appropriate stratum-specific subgroups were used as denominators for rate calculations.

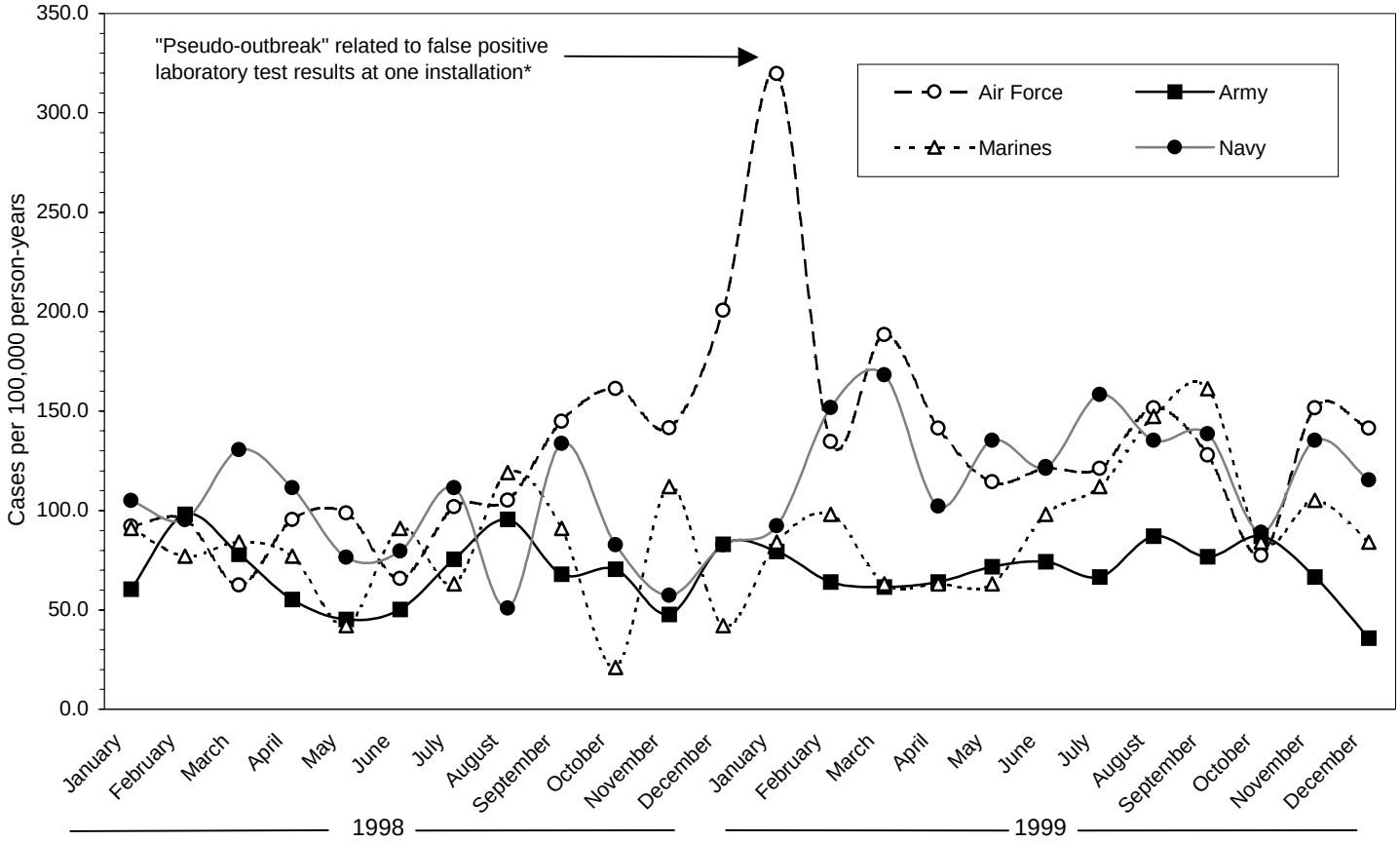
Results. During 1998-1999, 2,717 cases of infectious mononucleosis were diagnosed among active duty servicemembers. The overall incidence rate was 98.9 per 100,000 person-years.

There was a strong inverse relationship between age and rates of infectious mononucleosis. For example, the incidence rate was nearly 7-times higher among servicemembers younger than 20 compared to those 35-39 (table 1). While three-fourths (72%) of all cases were among males, the incidence rate was 2.4-times higher among females (table); and among both males and females, incidence rates were highest among servicemembers who identified themselves as White, were lowest among those who identified themselves as Black, and were intermediate among all "others" (figures 1,2, page 3). In turn, the highest subgroup-specific incidence rate (678.4 per 100,000 person-years) was among white females younger than 20 (figure 2).

During the 2-year surveillance period, there were no clear relationships between incidence rates of infectious mononucleosis and seasons of the year (figure 3, page 8). However, in January-February 1999, there were more than 100 diagnoses of infectious mononucleosis from a single Air Force installation (figure 3). An investigation by Air Force epidemiologists revealed that the apparent outbreak was a "pseudo-outbreak" caused by nearly simultaneous increases in clinical suspicion of infectious mononucleosis, in serologic tests for heterophile antibodies (Monospot®), and in the proportion of Monospot® test results that were misclassified as "positive."[3]

Editorial comment. This report documents that the incidence rate of infectious mononucleosis among US servicemembers is approximately 100 per 100,000 per year. The current rate is in the range of rates that were documented among US servicemembers in the 1940s and 1950s. Thus, the rate of infectious mononucleosis among servicemembers has remained relatively constant over time.

Figure 3. Rates of infectious mononucleosis, by month and Service, 1998-1999



*See article on page 9 for additional information.

The infectious mononucleosis rate was nearly 7-times higher among servicemembers younger than 20 compared to those older than 30. The finding is not surprising since teenaged members of young adult populations are the most likely to be immunologically susceptible to EBV—and may have the highest risk of peroral contact with EBV-infected saliva (e.g., kissing and/or sharing drinks with multiple partners).

Finally, no outbreaks of infectious mononucleosis were detected during the 2-year surveillance period. However, there was one "pseudo-outbreak" that reflected significant increases in the number of serologic tests that were ordered and in the proportion of false positive results at one installation.[3] Pseudo-outbreaks of infectious mononucleosis related to laboratory error are well and often documented in both military and civilian settings.[3-7] In contrast, we are aware of only one small (nine cases) outbreak of infectious mononucleosis in a military setting.[8] Thus, public health and clinical practitioners in military settings should be suspicious of increases in the proportion of serologic tests positive for, or the number of clinical diagnoses of, infectious mononucleosis.

Analysis and report by Scott D. Barnett, PhD, Data Analyis Group, Army Medical Surveillance Activity.

References

1. Evans, AS. Infectious mononucleosis in the US Armed Forces. *Mil Med,* 1970; 300-4.
2. Lehane DE. A seroepidemiologic study of infectious mononucleosis: The development of EB virus antibody in a military population. *JAMA* 1970; 212(13):2240-3.
3. Hale R, Goodman JB. Viral outbreak at Lackland AFB likely due to lab error. Report of epidemiologic investigation, 1999.
4. Armstrong CW, Hackler RL, Miller GB. Two pseudo-outbreaks of infectious mononucleosis. *Pediatr Infect Dis* 1986 May-Jun;5(3):325-7.
5. Centers for Disease Control. Pseudo-outbreak of infectious mononucleosis—Puerto Rico, 1990. *MMWR Morb Mortal Wkly Rep* 1991 Aug 16;40(32):552-5.
6. Herbert JT, Feorino P, Caldwell GG. False-positive epidemic infectious mononucleosis. *Am Fam Phys* 1977 Feb;15(2):119-21.
7. Kelley, PW (personal communication). Epidemiology Consultation: Pseudo-outbreak of infectious mononucleosis in a US military community due to false positive misclassifications of serologic tests, Bamberg, Germany, February 1986.
8. Ginsburg CM, Henle G, Henle W. An outbreak of infectious mononucleosis among the personnel of an outpatient clinic. *Am J Epidemiol* 1976 Nov;104(5):571-5.

Outbreak investigation

Pseudo-outbreak Associated with False Positive Laboratory Tests for Mononucleosis, Lackland Air Force Base, January-February 1999

On January 29, 1999, the Chief of Preventive Medicine at Lackland Air Force Base, San Antonio, Texas, was notified of a potential outbreak of Epstein-Barr Virus (EBV) infections among active duty personnel. The potential outbreak was first detected by laboratory personnel at Wilford Hall Medical Center (WHMC) who noted an increase in the proportion of Monospot® tests that were positive.

The Monospot® test is a qualitative blood test that detects the presence of heterophile antibodies (IgM antibodies that react nonspecifically against proteins or cells from other species). The Monospot® has an estimated sensitivity of 85%; however, false positives may occur during other illnesses (e.g., rubella, malaria, serum hepatitis, systemic lupus erythematosis, leukemia, and pancreatic cancer). Patients have detectable heterophile antibodies about 2 weeks after the onsets of their illnesses; however, the test often remains negative in children and infants.

A review of recent results at Wilford Hall Medical Center showed that from January 1-28, 1999, 105 (40%) of 266 Monospots® were positive. The number of tests performed and the proportion positive were much higher than during comparable periods of the preceding 2 years: January 1997 (21 positive [15.6%] of 134 tests) and January 1998 (11 positive [10.0%] of 110 tests).

The increase in testing was attributed to increased clinical suspicion of infectious mononucleosis among ambulatory patients and hospital personnel. In addition, at their requests, some family members and contacts of sick personnel were tested. Thirty of the positive results in January 1999 were among hospital personnel. The remaining positive tests were among pararescue trainees, pediatric and family medicine outpatients, and a few basic military trainees.

All of the tests were initially run in the laboratory at the primary care clinic that provided care to all hospital personnel. When laboratory personnel suspected a problem with the test, all Monospot® testing was moved to the hospital's clinical laboratory. Repeat Monospot® tests and confirmatory EBV viral capsid antigen (VCA) IgG and IgM tests were run on 20 of the 30 positive samples from hospital personnel; all 20 of the samples were negative. Laboratory personnel at Wilford Hall Medical Center contacted the manufacturer of the Monospot® test, who were unaware of problems with reagents or test kits. Prior to repeating the Monospot® tests, infection control practices were reemphasized among the hospital staff, but no duty restrictions were implemented.

During the week of February 15-19, 1999, the pararescue trainees who were initially positive were retested. All of their Monospot® tests were negative. When Monospot® testing was reinstated at the outpatient clinic laboratory, there were no apparent false positive tests in the subsequent 4 weeks. All positive Monospot® test results are now confirmed with the EBV VCA IgM and IgG.

Report provided by LTC Ronald Hale, MD, MPH, USAF, Chief, Preventive Medicine, and MAJ Janette B. Goodman, MPH, USAF, Force Health Protection and Surveillance Branch, Wilford Hall Medical Center.

Case report

Carbon Monoxide Poisoning in a Family of Five, Olsbrucken, Germany

On November 7, 2000, the 11-year old son of an Air Force retiree living in Germany awoke at 0330 with vomiting, diarrhea, and abdominal cramps. The father reported that the child was screaming, disoriented, and wandering throughout the house. After tending to the child, the father became nauseated, vomited twice, and felt disoriented; he denied having a headache, chest pain, or hallucinations. Over the next few hours, the mother had sudden onsets of headache, nausea, vomiting, and diarrhea; the 17-year old son awoke and complained of headache, dizziness, and nausea; and the 13-year old son developed a sudden headache, nausea, and vomiting. The mother contacted a neighbor who called the German ambulance service.

The ambulance staff reported that the father, who received oxygen during transport, was combative when he was loaded into the ambulance but not when he arrived at the Landstuhl Regional Medical Center emergency room. During physical examinations, all family members were alert and oriented. Their pulse rates ranged from 88 to 114 beats per minute, and their blood pressures and temperatures were within normal limits. All patients reported feeling better after leaving the house. Their histories, clinical presentations, and symptomatic improvements after leaving the house were suggestive of carbon monoxide (CO) poisoning.

The concentrations of carboxyhemoglobin (% COHb) in the blood of the parents and the three sons ranged from 19.6% to 26.5%. The father was the only member of the family who smoked (3 cigarettes daily). (See table 1 for correlations of % COHb and symptoms/medical consequences.)[1] The patients were all placed on 100% oxygen and observed in the emergency room for several hours. At 1130, the patients were discharged from the emergency room free of all presenting symptoms. The family was instructed to follow up with their primary care providers and not to enter the house until it was certified safe from toxic levels of CO.

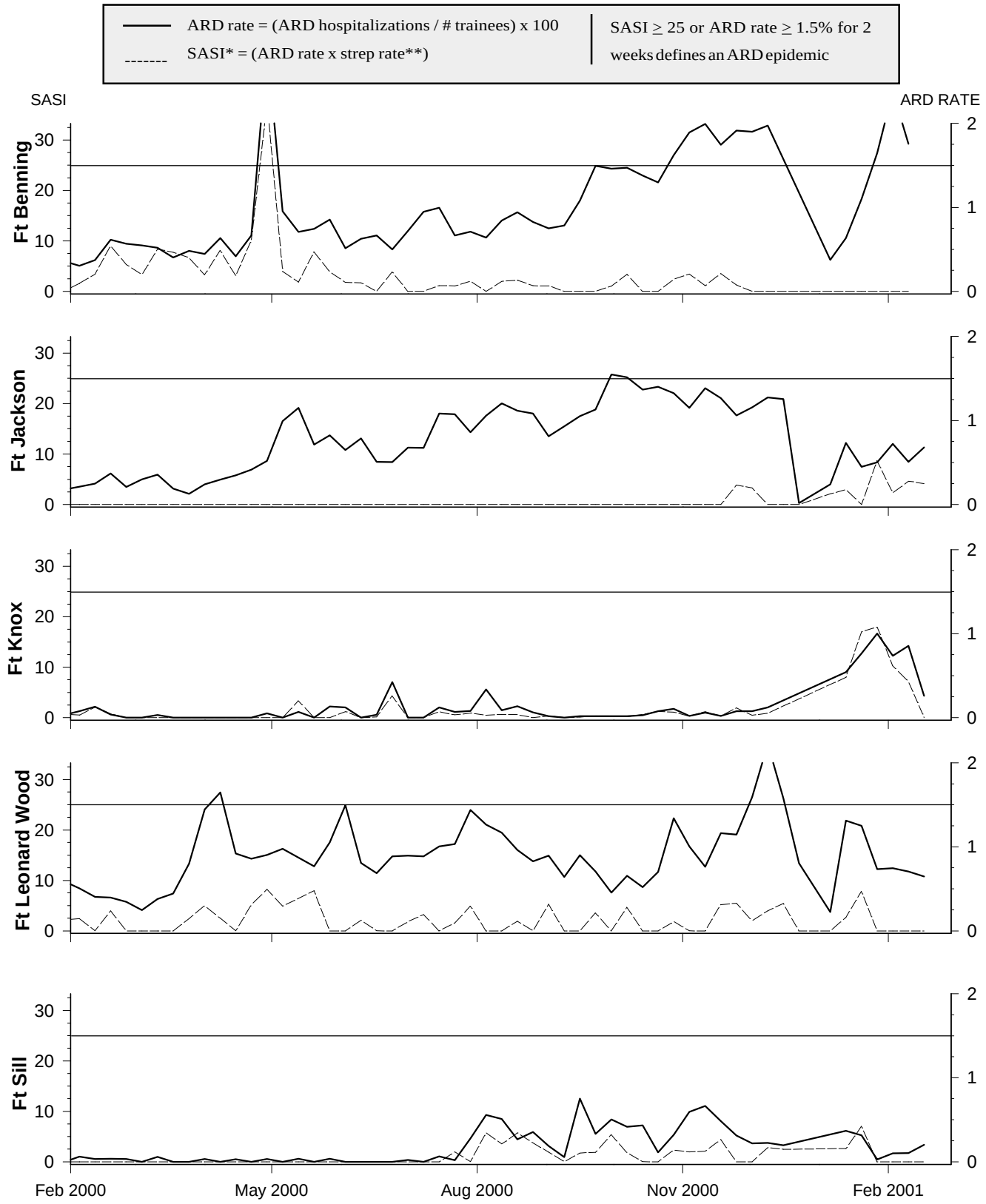
After stabilizing the patients, the emergency room doctor reported his suspicion of carbon monoxide poisoning to the Center for Health Promotion and Preventive Medicine–Europe (CHPPM-EUR). Industrial hygienists were sent to the emergency room to interview the patients. When the laboratory results confirmed the CO poisoning diagnoses, the industrial hygienists traveled to the home to conduct a survey.

The CO concentration (using a Q-TRAK™ Indoor Air Quality monitor) was 200ppm at the entrance of the house. Based on the reading, the industrial hygienists did not enter the house. In addition, they convinced the German landlord not to enter until proper authorities had arrived and deter-

Table 1. Clinical manifestations of carbon monoxide intoxication in relation to carboxyhemoglobin levels

% COHb	Symptoms and Medical Consequences
10%	No symptoms. Heavy smokers can have as much as 9% COHb.
15%	Mild headache.
25%	Nausea and serious headache. Fairly quick recovery after treatment with oxygen and/or fresh air.
30%	Symptoms intensify. Potential for long-term effects especially in the case of infants, children, the elderly, victims of heart disease and pregnant women.
45%	Unconsciousness.
50%+	Death.

Figure II. Acute respiratory disease (ARD) surveillance update
US Army initial entry training centers



* SASI (Strep ARD Surveillance Index) is a reliable predictor of serious strep-related morbidity

** Strep rate = (Group A beta-hemolytic strep(+) / # cultures) x 100

mined it to be safe. German fire department personnel, equipped with self-contained breathing apparatus, entered and surveyed the house. They reported that the CO concentration in the boiler room was greater than 500 ppm (the highest concentration measurable by their monitors). The cause of the CO build-up was determined to be ash in the chimney which prevented proper ventilation of the heating system.

Editorial comment. Carbon monoxide concentrations of 400 ppm can be life threatening in 3 hours, concentrations of 800 ppm can render a person unconscious within 2 hours, and death can occur shortly thereafter (table 2).[2,3] A fact sheet on carbon monoxide poisoning is posted at the CHPPM-Europe website: *www.chppmeur.amedd.army.mil.*

Carbon monoxide poisoning is a reportable medical event with an ICD-9 code of 986. The laboratory criterion for diagnosis is an elevated carboxyhemoglobin level: >10% in nonsmokers and >15% in smokers.[4]

Reported by LTC John Wempe, Brian Judge, and John Webster, CHPPM-Europe, and LTC Ben D'Ooge and CPT Steve Knapp, Landstuhl Regional Medical Center.

References
1. Chimney Safety Institute of America. Carbon monoxide. March 2001. www.csia.org/home/cohazard.html.
2. Greiner, TH. ISU Extension Pub # AEN-172, August 1997.
3. Bacharach, Inc. Technical information on carbon monoxide and combustion testing. February 2001. www.bacharach-training.com/cozone/whatiscarbonmonoxide1.htm
4. Army Medical Surveillance Activity. Tri-service reportable events, guidelines and case definitions, July 1998.

Table 2. Effects of carbon monoxide intoxication in relation to concentrations and durations of exposures

PPM CO	Time	Symptoms
35 PPM	8 hours	Maximum exposure allowed by OSHA in the workplace over an 8-hour period.
200 PPM	2-3 hours	Mild headache, fatigue, nausea and dizziness.
400 PPM	1-2 hours	Serious headache. Other symptoms intensify. Life threatening after 3 hours.
800 PPM	45 minutes	Dizziness, nausea and convulsions. Unconscious within 2 hours. Death within 2-3 hours.
1600 PPM	20 minutes	Headache, dizziness and nausea. Death within 1 hour.
3200 PPM	5-10 minutes	Headache, dizziness and nausea. Death within 1 hour.
6400 PPM	1-2 minutes	Headache, dizziness and nausea. Death within 25-30 minutes.
12,800 PPM	1-3 minutes	Death.

Surveillance trends

Carbon Monoxide Poisoning in Active Duty Soldiers, 1998-1999

Carbon monoxide poisoning (CO) is the leading cause of accidental and intentional poisoning deaths in the United States. In addition, there are carbon monoxide hazards associated with many military occupations, activities, and settings.[1,2] Because carbon monoxide intoxication is life threatening, the threats are numerous and diverse, and most episodes are preventable, carbon monoxide intoxication is a reportable medical event in the US Armed Forces.

For this analysis, we summarized the recent carbon monoxide intoxication experiences of active duty soldiers based on hospitalization, ambulatory visit, and medical event case reports.

Methods. All data were derived from the DMSS. The surveillance period was January 1998-December 1999. For this analysis, a case was defined as an active duty soldier with a hospitalization, ambulatory visit, or case report (through the Army Reportable Medical Events System) with a diagnosis (1st-4th) of "toxic effect of carbon monoxide" (ICD-9 code 986). Only one episode per individual was included in the analysis.

Results. From January 1998-December 1999, 54 active duty soldiers were diagnosed with carbon monoxide intoxication. The crude rate of CO intoxication among active duty Army personnel was 5.7 per 100,000 person-years (95% confidence interval: 4.3-7.5) .

Seven cases (13%) were reported at duty location outside the continental United States: 4 from Germany, 2 from Korea, and 1 from Panama. Cases from outside the US were fewer than expected based on the proportion of soldiers stationed overseas. Within the continental United States, carbon monoxide cases occurred at 16 different installations. However, only 5 installations had more than 2 cases each: Fort Hood, Texas (n=14), Fort Irwin, California (n=5), Fort Benning, Georgia (n=5), Fort Carson, Colorado (n=5), and Fort Sill, Oklahoma (n=4). The highest installation-specific rate was at Fort Irwin (58.3 [95% CI: 18.9-136.1] per 100,000 person-years).

The greatest number of cases (n=18, 33.3%) occurred in the fall (September-November), and the fewest (n=10, 18.5%) occurred in the summer (June-August). There were equal numbers of cases (n=13,

Table 1. Recommendations of the Consumer Product Safety Commission for the prevention of carbon monoxide poisoning

1. Always ensure that appliances are installed according to manufacturer's instructions and local building codes. Most appliances should be installed by professionals.
2. Have the heating system (including chimneys and vents) inspected and serviced annually.
3. Follow manufacturer's instructions for safe operation.
4. Examine vents and chimneys regularly for improper connections, visible rust, or stains.
5. Pay attention to problems or symptoms that may indicate improper appliance operation:
    a. A decrease in the hot water supply.
    b. A furnace that runs constantly and/or is unable to heat the home.
    c. Build-up of soot, especially on appliances.
    d. An unfamiliar or burning odor.
6. Never burn charcoal indoors or in a garage.
7. Never service appliances without proper knowledge, skills and tools.
8. Never use the gas range or oven for heating.
9. Never operate unvented gas-burning appliances in a closed room.
10. For added safety, install a CO detector that meets UL requirement 2034.

24.1%) in the winter (December-February) and the spring (March-May).

The duty statuses of some servicemembers at the times of their intoxications were indicated on hospitalization and reportable event case reports. Nine soldiers (of 14 cases for which the information was available) were on duty at the time of their exposures. Of the 14 cases with situational details, most were associated with accidental inhalations of carbon monoxide (from automobile engines and other sources) in confined, inadequately ventilated spaces. Other cases were associated with inhalations of smoke during artillery live-fire training and with intentional self-inflicted exposures.

Editorial comment. While there have been relatively few cases of CO poisoning among soldiers in recent years, carbon monoxide remains a significant threat to the health and performance of soldiers, both on and off duty. Soldiers should be informed of the dangers of CO poisoning (and appropriate preventive measures) in residential, garrison, and field operational settings. (See recommendations in table 1, page 13.)

Analysis by Samuel C. Washington, MPH, Data Analysis Group, Army Medical Surveillance Activity (AMSA), Washington, DC.

References

1. Klette K, Levine B, Springate C, Smith ML. Toxicological findings in military aircraft fatalities from 1986-1990. *Forensic Sci Int*, 1992; 53:143-148

2. White MR, McNally MS. Morbidity and mortality in U.S. Navy personnel from exposures to hazardous materials, 1974-85. 1991; *Mil Med*; 156:70-73

DEPARTMENT OF THE ARMY
U.S. Army Center for Health Promotion
and Preventive Medicine
Aberdeen Proving Ground, MD 21010-5422

OFFICIAL BUSINESS

MCHB-DC-EDM

BULKRATE
U.S. POSTAGE
PAID
APG, MD
PERMIT NO. 1