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MSMR

Medical Surveillance Monthly Report

Table of Contents

Acute respiratory illnesses, pneumonias, and influenza, US Army,
 January 1998 - May 1999 2

Sentinel reportable events by reporting facility 4

Sentinel reportable events, active duty soldiers 6

Predictors of accidental death in male soldiers, 1990-1998 8

Injuries among senior officers, US Army War College,
 Carlisle Barracks, Pennsylvania 12

ARD surveillance update 13

Supplement #1: Reportable medical events 16

 Quarterly update, all reportable conditions, 1999 16

 Sentinel reportable events 17

 Sentinel reportable STDs 18

Active duty force strength (June 1999) 19



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amsa.army.mil

Data in the MSMR are provisional, based on reports and other sources of data available to the Army Medical Surveillance Activity. 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.

Surveillance Trends

Hospitalizations and Ambulatory Visits for Acute Respiratory Illnesses, Pneumonias, and Influenza, Active Duty Soldiers, January 1998 - May 1999

For more than three decades, the Army has conducted routine surveillance of febrile acute respiratory illnesses among trainees. However, there has been no routine surveillance of acute respiratory illnesses among soldiers in general. This report summarizes frequencies, rates, and seasonal trends of hospitalizations and ambulatory visits of active duty soldiers for acute respiratory infections and pneumonia and influenza.

Methods: On a regular basis, the Army Medical Surveillance Activity (AMSA) receives and integrates into the Defense Medical Surveillance System (DMSS) records of all hospitalizations and ambulatory visits of active duty servicemembers in US military hospitals and ambulatory clinics worldwide. For each hospitalization, there are up to eight discharge diagnoses that are coded based on the *International Classification of Diseases, 9th revision, clinical modification* (ICD-9-CM). For each ambulatory visit, there are up to four diagnoses that are coded based on the ICD-9-CM. AMSA also regularly

receives and integrates into DMSS a monthly report of all servicemembers on active duty.

For this summary, all hospitalizations and ambulatory visits of active duty soldiers from January 1998 through May 1999 with primary diagnoses of "acute respiratory infection" (ARI) (ICD-9-CM code 460-466) or "pneumonia and influenza" (P&I) (ICD-9-CM codes 480-487) were identified in the DMSS database. ARI diagnoses include acute sinusitis, pharyngitis, tonsillitis, bronchitis, and the "common cold." P&I diagnoses include pneumonias of viral, bacterial, and unspecified etiologies and influenza. When soldiers had more than one ARI or P&I hospitalization or ambulatory visit in a 10-day period, only the record of the earliest encounter (the "incident case") was included for analyses. Incidence rates (overall and in demographic subgroups) were calculated by dividing the numbers of incident ARI or P&I cases during specified time intervals by the cumulative years of Army active service during the intervals.

Continued on page 7

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Views and opinions expressed are not necessarily those of the Department of the Army.

Figure I. Incidence of acute respiratory infections, pneumonia, and influenza among US Army active duty personnel, January 1998 - May 1999

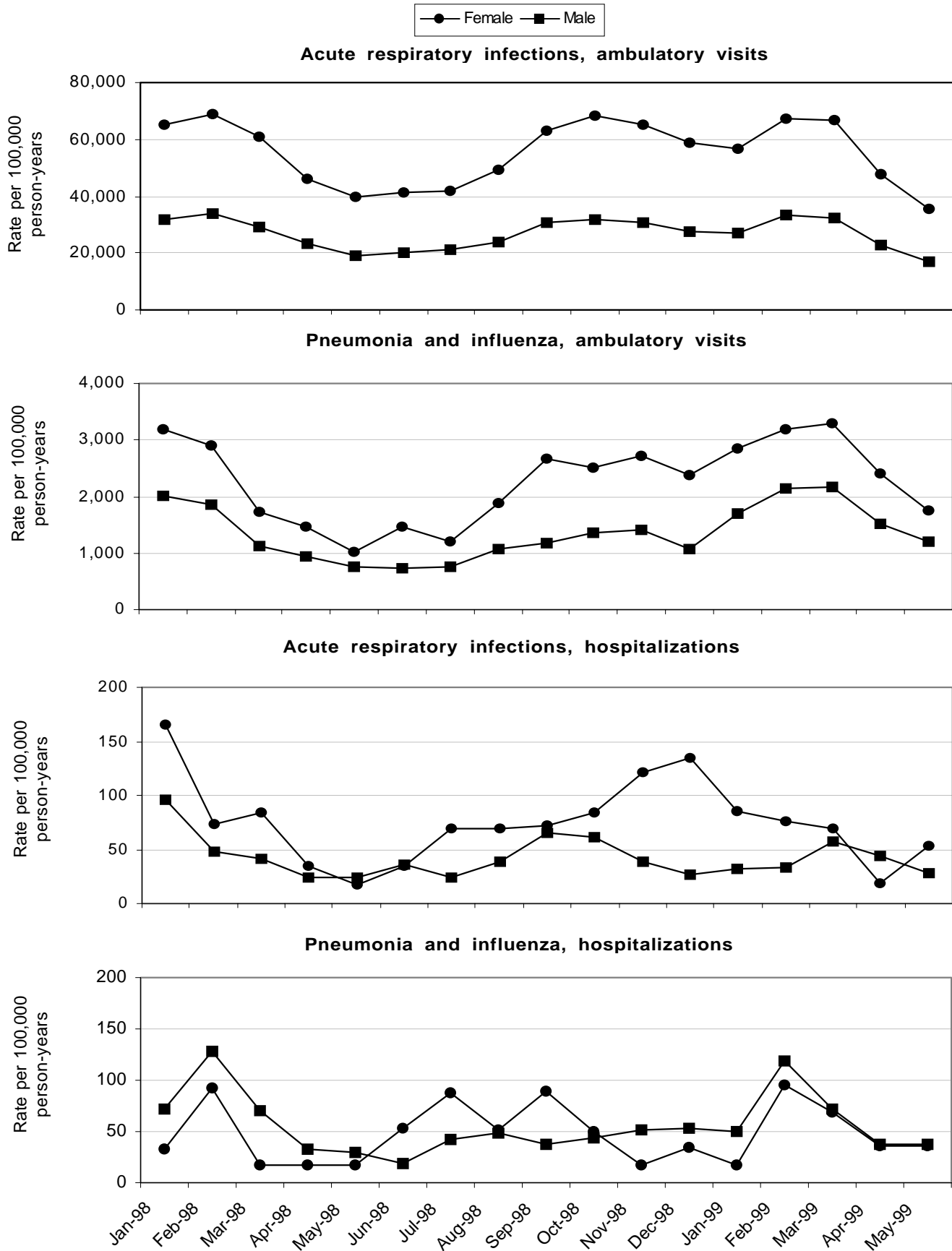


Table I. Sentinel reportable events, US Army medical treatment facilities¹
Cumulative events for all beneficiaries, calendar year through October 31, 1998 and 1999²

Reporting Facility	Number of reported events ³		Environmental				Food- or Water-borne							
			Cold		Heat		Campylobacter		Giardia		Salmonella		Shigella	
	Cum. 1998	Cum. 1999	Cum. 1998	Cum. 1999	Cum. 1998	Cum. 1999	Cum. 1998	Cum. 1999	Cum. 1998	Cum. 1999	Cum. 1998	Cum. 1999	Cum. 1998	Cum. 1999
NORTH ATLANTIC RMC														
Walter Reed AMC, DC	183	157	-	-	-	-	7	4	4	5	9	2	-	-
Aberdeen Prov. Grd., MD	35	24	-	-	2	-	-	-	-	-	-	-	-	-
FT Belvoir, VA	209	186	-	-	6	2	5	9	3	8	9	11	1	3
FT Bragg, NC	299	1089	1	8	131	101	6	5	-	2	48	30	19	-
FT Drum, NY	171	183	14	15	-	3	1	1	2	4	1	1	-	-
FT Eustis, VA	202	182	-	1	21	3	2	2	-	-	3	4	5	1
FT Knox, KY	231	261	-	2	4	15	1	3	-	2	-	1	-	3
FT Lee, VA	57	144	-	-	-	1	-	-	-	-	-	1	-	-
FT Meade, MD	118	52	-	-	-	-	-	-	2	-	1	-	-	-
West Point, NY	47	60	-	-	1	2	-	-	-	-	1	-	-	1
GREAT PLAINS RMC														
Beaumont AMC, TX	359	243	-	-	-	5	-	-	-	-	3	4	4	-
Brooke AMC, TX	226	364	2	-	3	9	1	-	2	-	7	7	1	4
FT Carson, CO	633	643	2	2	5	-	5	5	3	10	3	6	-	1
FT Hood, TX	1325	1205	-	-	10	8	-	2	-	1	-	8	4	8
FT Huachuca, AZ	38	43	-	-	-	2	-	1	-	-	2	1	-	1
FT Leavenworth, KS	39	17	-	-	-	-	-	2	4	1	1	-	-	-
FT Leonard Wood, MO	183	143	1	3	5	3	-	-	1	1	1	2	-	-
FT Polk, LA	183	195	-	-	17	1	-	-	-	-	-	-	-	-
FT Riley, KS	294	220	1	1	-	11	-	-	5	-	1	-	3	-
FT Sill, OK	273	257	-	-	11	9	-	-	-	-	2	-	-	1
SOUTHEAST RMC														
Eisenhower AMC, GA	238	183	-	1	3	4	1	-	-	-	-	4	-	-
FT Benning, GA	305	349	2	-	27	100	4	1	5	2	6	14	3	2
FT Campbell, KY	537	509	1	2	1	10	6	18	11	6	4	17	20	85
FT Jackson, SC	307	402	1	-	3	-	-	-	-	-	2	1	1	-
FT Rucker, AL	35	48	-	-	-	4	-	-	-	-	-	-	-	1
FT Stewart, GA	419	430	1	-	29	20	-	-	-	3	-	3	2	-
WESTERN RMC														
Madigan AMC, WA	513	570	-	-	-	-	17	2	5	7	2	7	1	1
FT Irwin, CA	36	38	-	-	-	-	-	-	1	-	-	-	-	-
FT Wainwright, AK	49	116	9	43	-	-	1	-	-	-	-	-	-	-
OTHER LOCATIONS														
Tripler, HI	392	489	-	-	2	1	18	22	7	12	8	11	1	1
Europe	990	852	23	3	1	-	17	20	7	-	53	18	1	6
Korea	132	382	1	8	7	5	-	-	-	-	-	-	-	-
Total	9058	10036	59	89	289	319	92	97	62	64	167	153	66	119

1. Main and satellite clinics

2. Events reported by November 7, 1998 and 1999

3. Tri-Service Reportable Events, Version 1.0, July 1998

**Table I. (Cont'd) Sentinel reportable events, US Army medical treatment facilities¹
Cumulative events for all beneficiaries, calendar year through October 31, 1998 and 1999²**

Arthropod-borne				Vaccine Preventable						Sexually Transmitted							
Lyme Disease		Malaria		Hepatitis A		Hepatitis B		Varicella		Chlamydia		Gonorrhea		Syphilis ⁴		Urethritis	
Cum. 1998	Cum. 1999	Cum. 1998	Cum. 1999	Cum. 1998	Cum. 1999	Cum. 1998	Cum. 1999	Cum. 1998	Cum. 1999	Cum. 1998	Cum. 1999	Cum. 1998	Cum. 1999	Cum. 1998	Cum. 1999	Cum. 1998	Cum. 1999
4	1	1	4	2	1	-	-	4	3	66	79	24	16	1	3	11	1
-	-	-	-	-	-	2	-	-	1	24	8	5	13	-	-	2	2
1	-	-	-	-	1	-	-	1	-	138	117	39	32	4	-	-	-
2	4	4	3	-	-	8	-	-	1	47	489	13	230	-	2	-	210
-	-	1	3	-	-	2	-	6	6	92	98	44	46	1	-	4	3
-	-	-	1	-	-	-	1	8	1	111	124	48	41	-	-	-	-
1	-	1	-	-	-	-	-	18	1	153	176	48	54	-	1	-	-
-	-	-	-	-	-	1	1	-	-	36	114	20	24	-	3	-	-
2	2	-	-	-	-	-	-	7	1	55	42	11	5	3	-	34	-
9	17	-	-	1	-	1	2	1	1	24	31	6	3	-	-	-	-
-	-	2	1	-	1	-	-	10	2	261	196	69	18	1	-	-	11
-	2	1	2	4	3	2	4	2	2	146	161	41	48	1	-	-	1
-	-	-	-	-	-	-	1	3	1	416	460	88	82	1	-	105	67
-	1	1	4	-	1	10	1	3	3	743	701	347	193	2	4	195	234
-	-	-	-	-	1	-	-	-	-	24	31	10	4	-	-	-	-
-	-	2	-	-	-	-	-	-	-	27	11	5	3	-	-	-	-
-	-	-	1	-	-	-	1	21	11	93	82	32	22	-	1	23	8
-	-	1	1	-	-	-	-	-	-	127	154	36	35	1	2	-	-
-	-	2	-	-	-	-	-	3	-	211	153	66	55	1	-	-	-
-	-	1	1	-	-	10	6	1	6	126	139	85	55	-	2	36	30
-	-	1	-	-	1	1	3	-	2	204	144	26	13	-	1	-	-
-	-	1	1	-	1	2	-	2	1	176	113	71	81	-	1	3	-
1	1	2	5	-	-	-	-	5	1	335	247	143	115	2	-	-	-
-	-	1	-	3	-	-	-	7	6	204	330	82	51	1	6	-	-
-	-	-	-	-	-	-	-	-	-	30	32	5	11	-	-	-	-
-	-	1	4	-	-	1	1	3	4	122	138	105	82	-	-	152	173
1	-	3	5	-	1	-	1	3	-	302	364	45	67	-	1	124	103
-	-	-	-	-	-	2	5	-	-	29	29	4	4	-	-	-	-
-	-	-	1	-	-	2	1	-	2	33	58	3	9	-	-	-	-
-	-	2	6	1	-	3	1	-	-	245	304	67	76	-	-	-	-
12	9	3	2	3	2	24	8	12	12	619	580	111	172	11	1	-	1
-	-	15	19	4	-	11	14	1	3	63	281	20	11	2	15	-	-
33	37	46	64	18	13	82	51	121	71	5282	5986	1719	1671	32	43	689	844

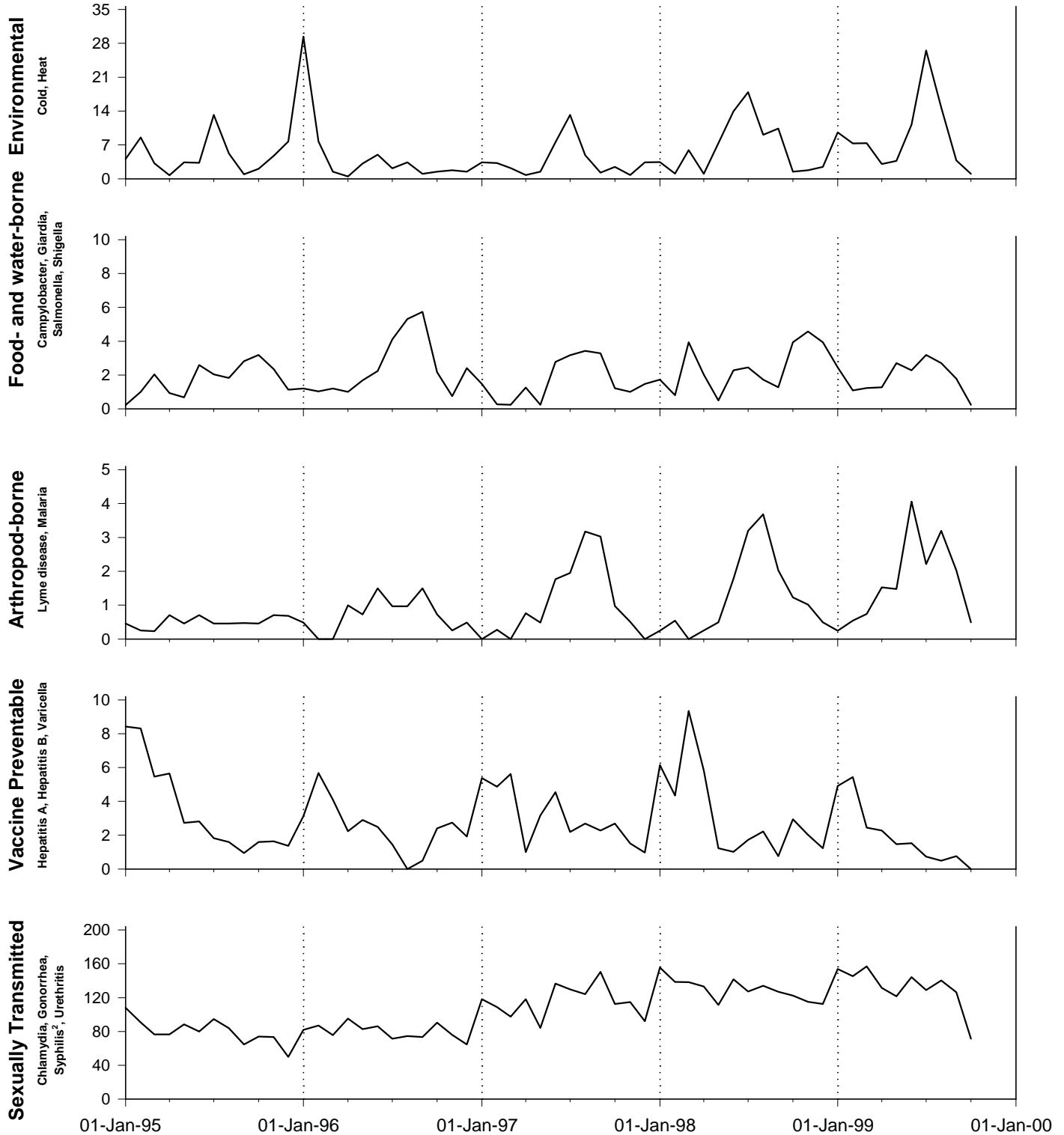
4. Primary and Secondary

Note: Completeness and timeliness of reporting vary by facility

Source: Army Reportable Medical Events System

Figure I. Sentinel reportable events (grouped), active duty soldiers, January 1995 - October 1999¹

Cases / 10,000 person-years



1. Events reported by November 7, 1999
2. Primary and Secondary

Continued from page 2

Acute respiratory infections, outpatient: During 1998, among active duty soldiers, there were 146,758 ARIs treated in outpatient clinics. The crude Armywide ARI rate was 311.3 per 1,000 person-years. The highest monthly rates were in February (390.2/1,000 person-years) and October (370.5/1,000 person-years), and the lowest was in May (223.2/1,000 person-years) (figure 1).

From January through May 1999, 58,083 ARIs cases were treated in outpatient clinics. The crude Armywide rate was 305.7 per 1,000 person-years. The highest and lowest monthly rates were in February (384.7/1,000 person-years) and May (196.1/1,000 person-years), respectively (figure 1).

A broad peak of ARI incidence lasted from early fall of 1998 through mid-winter of 1999 (with a dip in December-January that was at least partially attributable to the holidays). In 1998, a shallow trough of ARI incidence persisted from mid-spring through early summer. Thus, the major transitions in ARI incidence were in early spring (decrease) and late summer (increase).

The crude ARI rate among females was more than twice that among males. Female-to-male ARI rate ratios were remarkably consistent throughout the period (range of monthly female-to-male rate ratios, January 1998 - May 1999: 1.61-2.11).

Finally, among both males and females, ARI rates were much higher among soldiers younger than 20 years old.

Acute respiratory infections, hospitalizations: In 1998, there were 231 hospitalizations of soldiers for ARIs. The crude Armywide rate was 0.49 per 1,000 person-years. The highest monthly rate was in January (1.07/1,000 person-years) and the lowest in May (0.23/1,000 person-years).

From January through May 1999, there were 80 hospitalizations for ARIs. The crude Armywide rate was 0.42 per 1,000 person-years. There was no clear seasonal trend of ARI hospitalizations during the period.

Pneumonia and influenza, outpatient: In 1998, there were 6,212 incident P&I cases reported from outpatient clinics. The crude Armywide incidence rate was 13.2 per 1,000 person-years. The highest monthly rate was in January (21.8/1,000 person-years) and the lowest in May (8.0/1,000 person-years).

From January through May 1999, there were 3,587 P&I cases reported from outpatient clinics. The crude Armywide incidence rate was 18.9 per 1,000 person-years. The highest monthly rate was in March (23.4/1,000 person-years) and the lowest in May (12.9/1,000 person-years).

From January 1998-May 1999, the crude P&I outpatient rate among females (22.6/1,000 person-years) significantly exceeded the rate among males (13.5/1,000 person-years). In addition, during every month of the period, the P&I rate was higher among females than males. Among soldiers of both genders, the highest P&I rates were in the youngest (< 20 years) and oldest (> 50 years) age groups.

Pneumonia and influenza, hospitalizations: In 1998, there were 240 hospitalizations of soldiers for P&I. The crude hospitalization rate Armywide was 0.51 per 1,000 person-years. The highest incidence was in February (1.23/1,000 person-years).

From January through May 1999, there were 115 hospitalizations of soldiers for P&I. The crude Armywide rate was 0.61 per 1,000 person-years. The highest incidence was in February (1.15/1,000 person-years).

There were no consistent differences between hospitalization rates among males and females. For the entire period, the crude hospitalization rate was slightly higher among males.

Editorial comment: For decades, the Army has conducted surveillance of hospitalizations of basic trainees with febrile acute respiratory illnesses. Over the years, these data have helped to identify weaknesses and breakdowns in preventive

interventions, to characterize requirements for modified or new interventions (e.g., vaccines, chemoprophylactic antibiotics), and to document their effects. The routine availability of Armywide hospitalization and ambulatory data provides a unique capability to track the nature, distribution, and impacts of acute respiratory illnesses among soldiers in general. The establishment of historic

norms (e.g., by season and in demographic subgroups) will be useful to document and characterize outbreaks of acute respiratory illnesses in both seasoned and initial entry soldiers.

Analyses conducted by Scott Barnett, Ph.D., Analysis Group, Army Medical Surveillance Activity.

Surveillance Trends

Predictors of Accidental Death in Active Duty Male Soldiers, 1990-1998

Accidental deaths accounted for more than one-half of the total 3,077 active duty soldier deaths since 1990.¹ Ninety-five percent of all accidental deaths were among men. This report describes the demographic characteristics and self-reported behaviors of male soldiers who died from accidents while on active duty and compares them to those of male soldiers with contemporaneous military service.

Methods

Cases and matched noncases: The occurrence, nature, and circumstances of active duty servicemembers' deaths are reported using Department of Defense Form 1300, Report of Casualty, which classifies all deaths as "accidents," "self-inflicted," "homicide," "illness/disease," "hostile action/terrorism," or "other." For this analysis, cases were defined as male soldiers who died as a result of "accidents" while on active service between 1990 and 1998. For each case, four noncases were randomly selected from among all male soldiers who were on active duty on the day of the accidental death and entered active military service within 30 days of the same. For analysis purposes, matching noncases were retrospectively followed until the dates of the deaths of their respective cases.

Risk correlates: Demographic and medical history data used in analyses included age, race,

marital status, education level, Department of Defense primary occupational specialty, major deployment experience, and hospitalization history. Hospitalization history was based on major categories of primary discharge diagnoses as specified in the *International Classification of Diseases, 9th revision, clinical modification*. Causes of injury-related hospitalizations were characterized based on NATO Standardization Agreement (STANAG) external cause of injury codes. Hospitalization discharges within 7 days of death dates were not included to exclude hospitalizations that may have resulted from rather than preceded fatal accidents.

The Health Risk Appraisal (HRA) is a standardized questionnaire that is periodically given to soldiers to assess their behavioral risks. HRAs that were completed by cases and noncases during the study period were identified, and responses to questions considered potentially related to accident risk were included in analyses. When an individual had more than one HRA on file, the latest responses prior to his death were used. All data used for analyses were contained in the Defense Medical Surveillance System.

Summary measures: Odds ratios (OR) and 95% confidence intervals (CI) were used as measures of association and were estimated from logistic regression. "Excess" deaths were calculated as the difference between observed and

expected cases during the study period. Expected deaths were estimated by multiplying the proportion of noncases with factors of interest by the total number of cases.

Results

Demographics (table 1): Between 1990 and 1998, there were 1,683 accidental deaths of active duty soldiers. Accidental death cases were more likely than noncases to be single (OR=1.3, CI=1.2-1.5), infantrymen (OR=1.2, CI=1.1-1.4), and veterans of a relatively recent major deployment (OR=1.7, CI=1.5-2.0). Cases and noncases were similar in relation to age, race, and level of education.

Prior hospitalizations (figure 1, page 10): Compared to noncases, accidental death cases were significantly more likely to have been hospitalized for “mental disorders” (ICD-9-CM: 290-319) (OR=1.9, CI=1.2-2.9) or “injuries and poisonings” (ICD-9-CM: 800-999) (OR=1.4, CI=1.1-1.8). Among prior hospitalizations of cases for mental disorders, about one-third were for “adjustment reactions” (ICD-9-CM: 309) and another third were for “alcohol dependence syndrome” (ICD-9-CM: 303). Among prior hospitalizations of cases for injuries and poisonings, approximately one-third were related to “falls and miscellaneous” (STANAG codes: 900-999). “Sports injuries” (STANAG codes: 200-249) and “land transport

Table 1. Demographic and other characteristics of cases and noncases

Characteristic	Crude percent		Unadjusted odds ratio (95% CI)	Adjusted ³ odds ratio (95% CI)	Excess deaths ⁴
	Cases (n=1,683)	Noncases (n=6,732)			
Age (years)					
< 25	58.5	52.5	1.2 (1.0 - 1.5)	1.0 (0.8 - 1.2)	-
25-34	30.5	35.6	0.9 (0.8 - 1.1)	0.9 (0.7 - 1.0)	-
> 34	10.9	11.9	<i>reference</i>	<i>reference</i>	-
Race					
White	66.2	65.9	1.1 (0.9 - 1.3)	1.1 (0.9 - 1.3)	-
Black	23.8	23.4	1.1 (0.9 - 1.3)	1.1 (0.9 - 1.3)	-
Non-white, non-black	10.0	10.7	<i>reference</i>	<i>reference</i>	-
Marital status					
Not married	58.5	49.4	1.4 (1.2 - 1.5)	1.3 (1.2 - 1.5)	152
Married	41.5	50.6	<i>reference</i>	<i>reference</i>	-
Education level					
No college	86.7	83.3	1.3 (1.1 - 1.5)	1.1 (0.9 - 1.3)	-
Some college or beyond	13.3	16.7	<i>reference</i>	<i>reference</i>	-
Occupational category					
Infantry	34.2	28.6	1.3 (1.1 - 1.4)	1.2 (1.1 - 1.4)	93
Health care	5.0	6.4	0.8 (0.7 - 1.1)	0.9 (0.7 - 1.1)	-
Non-infantry, non-health care	60.8	65.0	<i>reference</i>	<i>reference</i>	-
Deployment history¹					
Case casualty date during deployment	2.9	4.1	0.8 (0.6 - 1.0)	0.8 (0.6 - 1.1)	-
Case casualty date after deployment	22.3	14.9	1.6 (1.4 - 1.9)	1.7 (1.5 - 2.0)	125
Non-deployed	74.8	81.0	<i>reference</i>	<i>reference</i>	-
Hospitalization history²					
Mental disorder	1.9	1.0	1.9 (1.3 - 2.9)	1.9 (1.2 - 2.9)	15
Injury and poisoning	4.6	3.3	1.4 (1.1 - 1.9)	1.4 (1.1 - 1.8)	23
Mental disorder and injury	0.2	0.0	4.1 (0.8 - 20.3)	4.6 (0.9 - 23.4)	-
Non-mental, non-injury	11.5	12.1	1.0 (0.8 - 1.2)	1.0 (0.8 - 1.2)	-
Non-hospitalized	81.8	83.6	<i>reference</i>	<i>reference</i>	-
HRA participation					
Yes	20.6	20.7	1.0 (0.9 - 1.1)	1.0 (0.9 - 1.2)	-
No	79.4	79.3	<i>reference</i>	<i>reference</i>	-

1. For soldiers with multiple deployments, the most recent deployment was included.

2. Only one hospitalization per soldier in each diagnostic group was included.

3. Odds ratios adjusted for all variables in the table.

4. Estimates for statistically significant factors only.

accidents" (STANAG codes: 100-149) were also associated with prior hospitalizations of cases.

Behavioral risks (table 2, page 11): Approximately one-fifth of active duty soldiers had an HRA during the study period. Cases and noncases had remarkably similar HRA completion rates (OR=1.0, CI=0.9-1.2). Among those with completed HRAs, cases were more likely than noncases to have reported motorcycle use, more than nine alcoholic drinks per week, driving while drunk or riding with a drunk driver, fewer than six hours sleep per night, driving more than 5 mph over the speed limit, and infrequent ($\leq 60\%$) seat belt use. Only motor-

cycle use (OR adjusted=2.2, CI=1.4-3.2) and more than nine alcoholic drinks per week (OR adjusted=1.6, CI=1.1-2.3) were statistically significant risk factors in multivariate analyses.

Editorial comment: In 1986, the accidental death rate among US Army soldiers did not significantly differ from the rate among civilians.² Since 1986, however, the Army's accidental death rate has declined significantly. Between 1990 and 1998, the accidental death rate among active duty male soldiers was 33.1 per 100,000 person-years, which is approximately 40% lower than the rate in

Figure 1. Hospitalization experience while on active duty, accidental death cases and matched noncases, by diagnostic category

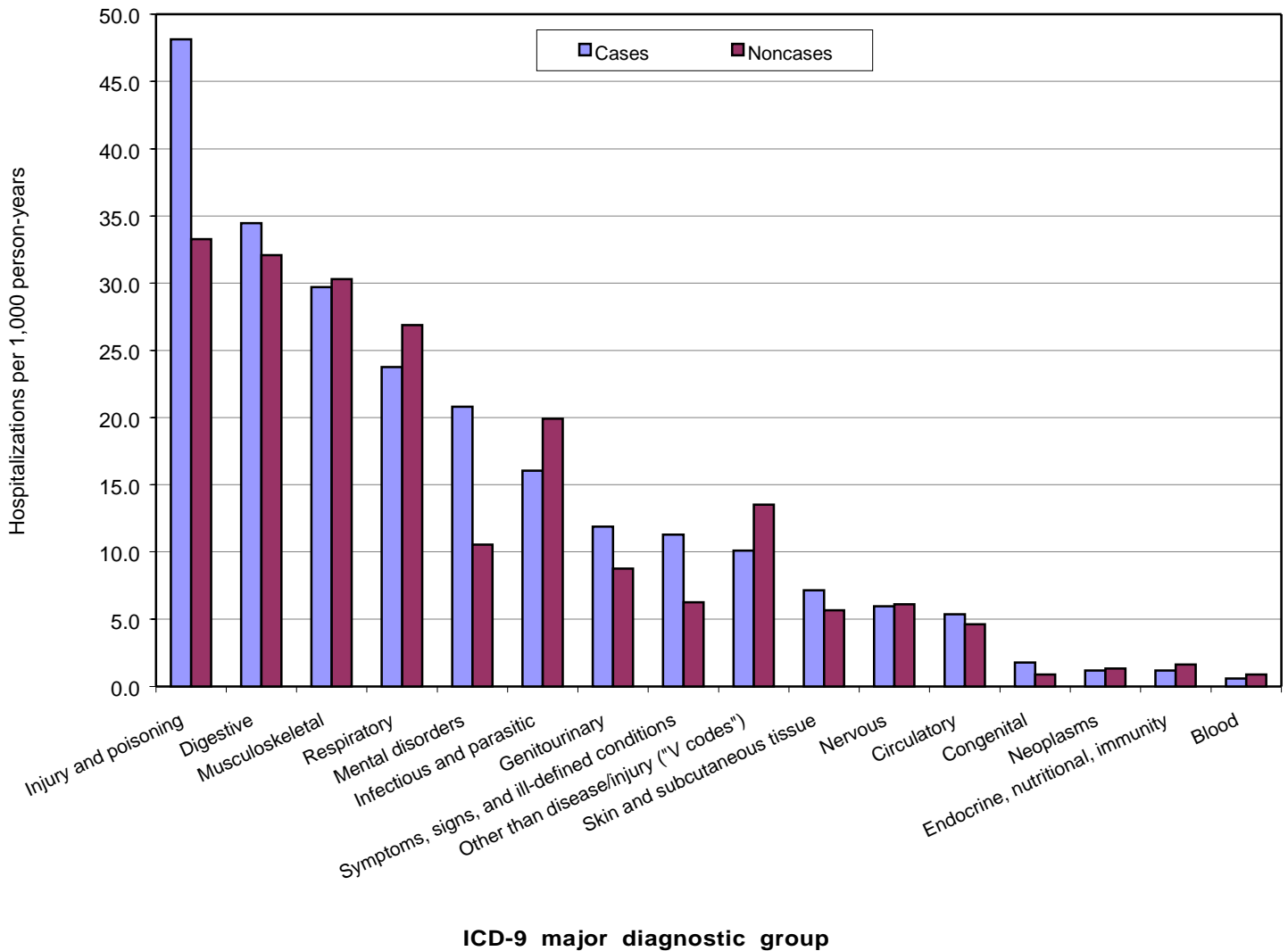


Table 2. Health Risk Appraisal responses to selected questions among case and noncase respondents

Survey Response ^{1,2}	Crude percent		Unadjusted odds ratio (95% CI)	Adjusted ³ odds ratio (95% CI)	Excess deaths ⁴
	Cases (n=347)	Noncases (n=1,392)			
Motorcycle rider					
Yes	13.5	6.5	2.3 (1.6 - 3.3)	2.2 (1.4 - 3.2)	24
No	79.3	87.4	<i>reference</i>	<i>reference</i>	-
Drives more than 5 mph over the speed limit					
Yes	46.7	40.9	1.3 (1.0 - 1.6)	1.1 (0.8 - 1.4)	-
No	50.7	57.3	<i>reference</i>	<i>reference</i>	-
Wears seatbelt 60% or less					
Yes	21.6	14.8	1.6 (1.2 - 2.1)	1.2 (0.8 - 1.6)	-
No	76.1	82.8	<i>reference</i>	<i>reference</i>	-
Drives drunk or rides with a drunk driver					
Yes	15.9	11.4	1.5 (1.1 - 2.1)	1.3 (0.9 - 1.8)	-
No	81.8	87.0	<i>reference</i>	<i>reference</i>	-
Drinks more than 9 alcoholic drinks per week					
Yes	18.4	11.6	1.7 (1.3 - 2.4)	1.6 (1.1 - 2.3)	24
No	80.4	86.6	<i>reference</i>	<i>reference</i>	-
Sleeps less than 6 hours per night					
Yes	23.3	18.2	1.4 (1.1 - 1.9)	1.2 (0.9 - 1.7)	-
No	72.9	79.5	<i>reference</i>	<i>reference</i>	-

1. For soldiers who took the Health Risk Appraisal more than once, the most recent survey was included.

2. Omitted responses were not included in the table.

3. Odds ratios adjusted for age, race, marital status, education, occupation, deployment, and hospitalizations, in addition to all variables in the table.

4. For statistically significant factors only.

comparably aged US male civilians (US male civilian rate, age-adjusted to US Army composition: 54.7 per 100,000 person-years).³ While the Army's recent successes in preventing accidental deaths are impressive and praiseworthy, accidents still account for more deaths among soldiers than any other cause.^{1,4}

Analyses presented in this report document that fatal accidents are not random occurrences among soldiers. Rather, there are factors that correlate strongly with increased risk of accidental death. For example, single infantry soldiers who are veterans of major overseas deployments (e.g., Somalia, Haiti, Kuwait, Saudi Arabia, Bosnia), soldiers who have been hospitalized for mental disorders (especially adjustment reactions or alcohol dependence) or injuries (especially from falls), and soldiers who drive motorcycles or drink alcohol regularly are at significantly increased risk of accidental death. Relationships of these factors with other adverse effects (e.g., nonfatal

injuries, medical disabilities, lost duty time, nondeployability), the distribution of these factors among soldiers (e.g., at post and unit levels), and the nature of interactions among multiple risk factors should be further assessed. In the meantime, these factors may be useful for refining Army safety and health promotion efforts.

Report and comment provided by Abigail L. Garvey, MPH, and Jeff L. Lange, PhD, Analysis Group, Army Medical Surveillance Activity.

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*Epidemiologic Investigation***Injuries Among Senior Officers Attending the US Army War College, Academic Year 1999, Carlisle Barracks, Pennsylvania**

In May 1999, the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) conducted an epidemiological consultation (EPICON) at the US Army War College (AWC), Carlisle Barracks, Pennsylvania. The Director, US Army Physical Fitness Research Institute, Carlisle Barracks, requested the consultation in response to a 66% increase in physical therapy consults compared to the previous year. The purposes of the EPICON were to determine injury rates and causes of injuries among senior officers (LTC and COL) who were attending the AWC during the 1999 academic year (AY99).

Methods: Medical records of US military officers were reviewed, and episodes of injuries and illnesses were abstracted for the 10-month period that the officers were in residence at the school. Episodes of injuries only were abstracted for the the 5 years preceding AWC attendance. For each visit to a medical care provider, the following information was recorded: date of visit; activity associated with injury, if available; diagnosis; anatomic location of injury; and disposition. Informal interviews were conducted with health care providers assigned to the AWC. Differences between groups were analyzed with the chi-square statistic.

Results, general: Medical records of 230 (92%) of the 249 U.S. military officers in residence at the AWC during AY99 were reviewed. Injuries accounted for slightly more than half (51%) of the 636 visits of student officers for medical care. There were 169 new (incident) injury cases, defined as the first visit for medical care for a specific injury. The crude injury rate was 7.3 per 100 student-months; the cumulative injury incidence, defined as the proportion of student officers with at least one injury, was 56%.

Injuries, by type and location: Of new injury visits, 39% were classified as "overuse" attributed to cumulative microtrauma; 59% were classified as "traumatic" attributed to an acute event; and 2%

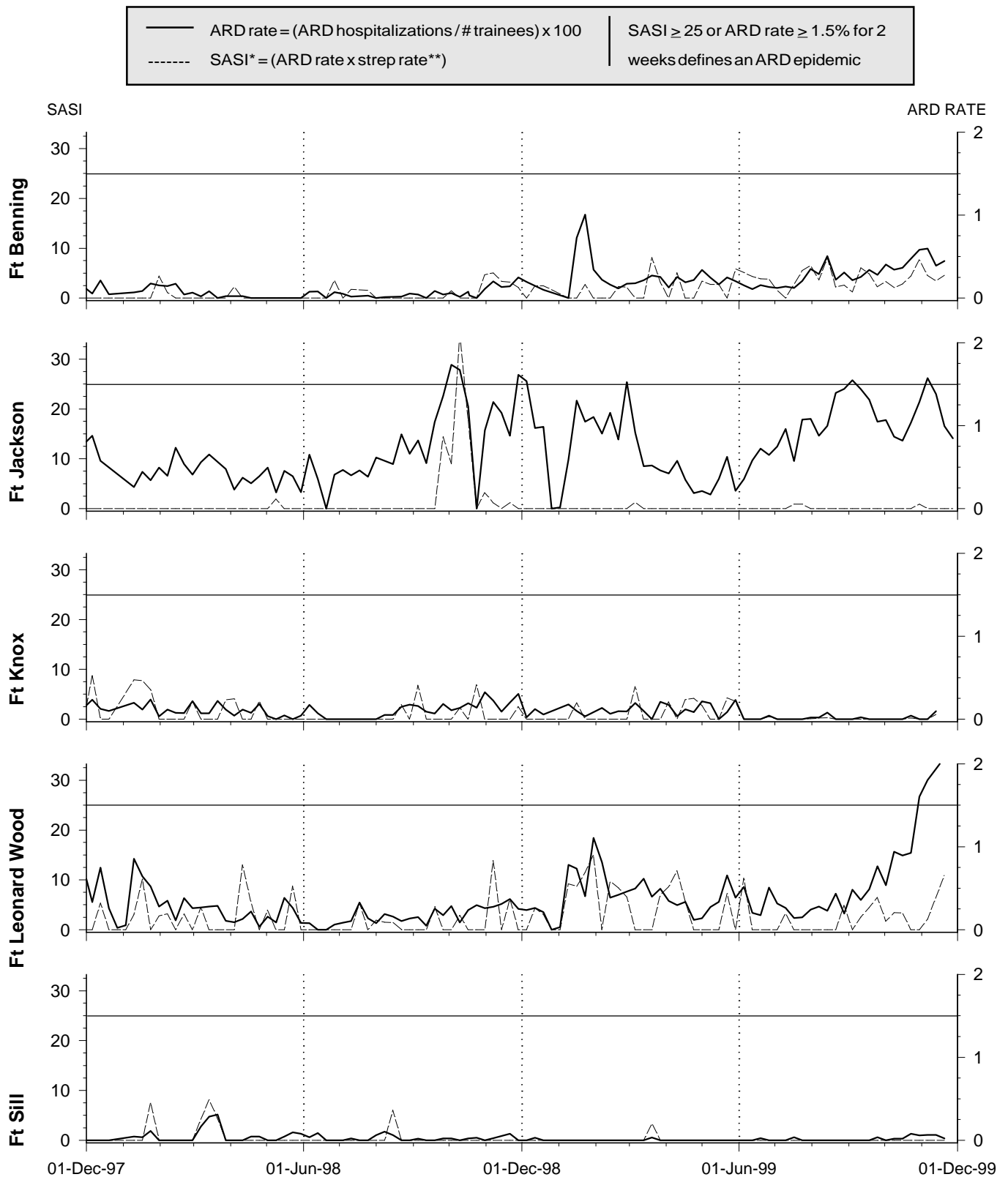
were classified as "environmental" (e.g., cold exposure, insect bites). Strains (28%) accounted for more new injuries than any other type. Upper and lower body injuries accounted for 36% and 62% of all new injuries, respectively. Knees, shoulders, the lower back, and feet were the sites of 17%, 12%, 10%, and 9% of new injuries, respectively.

Activities associated with injury: In nearly half (47%) of incident cases, activities associated with injuries were not recorded in medical records. Of the others, more than 40% (n=68) were associated with sports participation. In particular, softball (17%) and basketball (10%) were most frequently associated with new injuries. Volleyball (4%), running (4%), and other sports (6%) were less frequently implicated. Other activities (e.g., falls, moving furniture, motor vehicle accidents, striking objects), environmental exposures, and physical training accounted for 9%, 2%, and 1% of injuries, respectively. Sport-related injuries were most frequently strains, contusions, sprains, and fractures. In particular, softball injuries included 11 strains (4 of hamstrings), 7 contusions, 4 sprains, and 2 fractures; basketball injuries included 7 contusions, 4 strains, and 3 fractures (2 of fingers); and volleyball injuries included 3 strains and 2 ankle sprains.

If a student suffered any injury in the 5-year period prior to the AWC, this did not increase his or her likelihood of suffering an injury while at the AWC ($p=0.22$). However, when specific injuries were examined, students with documented ankle sprains in the 5 years prior to AWC attendance were more likely than others to suffer ankle sprains during attendance ($p=0.02$).

Conclusions and recommendations: In AY92, a study of injuries documented a cumulative injury incidence of 28%.²⁵ Thus, students in AY99 were twice as likely to be injured as were those who attended 7 years earlier ($p<0.01$, 95% confidence interval=1.6 to 2.6).

**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

The major organized sports activities at the AWC are softball, volleyball, and basketball. It is not surprising, therefore, that these were the major identifiable activities associated with injuries. Studies in other military populations and settings have found that sports-related activities accounted for between 19% and 51% of all injuries.^{12,21} In military populations including senior officers at the War College, an obvious target for injury reduction efforts is sport-related activities.

The following recommendations were made by the EPICON team based on investigation findings and suggestions from published reports:

1. *Task-specific warm-ups prior to participating in sports.* Warm-up activities should duplicate activities performed in the sport. Warm-ups should start slowly and build to higher intensities over time. Task-specific warm-ups should be performed when activities have ceased long enough to reduce body temperature (e.g., coming off the bench in volleyball or basketball) or for activities that are performed intermittently (e.g., batting or fielding activities in softball). These warm-ups should also mimic activities performed in the sport. While it has not been demonstrated that stretching or warm-up reduces the incidence of injury,^{4,7,22} warm-up prior to activity does have favorable physiological effects, such as moderate increases in body temperature, increases in blood flow, reduced muscle viscosity, increased flexibility, that may reduce the likelihood of injury, especially for muscle strains.^{14,19}

2. *Students with histories of ankle sprains should be alerted to risks of recurrence and provided with ankle orthoses.* Students with ankle sprains within 5 years of their AWC attendance were more likely to have sprains while at the AWC. Similar results have been found in other groups and settings.^{3,11} Ankle orthoses given to athletes with prior ankle sprains may reduce ankle sprain recurrences.^{18,20} They do not appear to reduce rates among individuals without prior sprains, however.²⁰

3. *New students should be informed regarding injury risks, preventive measures, and first aid procedures.* New students should be informed of the common causes of sports injuries, warm up

techniques, and procedures when injuries occur. Instruction in proper warm-up techniques may improve compliance. Immediate and appropriate first aid for injuries may reduce severity, disability, and rehabilitation times.

4. *Promote safe procedures and facilities for softball.* Softball players should be encouraged to not slide into bases, to periodically check the field for other players when running after balls, and to shout intentions to catch balls. Poles, backstops, field walls, and other potentially hazardous objects should be padded. Softball fields should be maintained to reduce or eliminate holes and rough spots. While mechanisms of softball-related injuries at the AWC were not documented, in other settings, over 90% of softball injuries were associated with sliding, catching, falling, and collisions.^{8,13} Sliding appears to be the most risky softball-related activity, accounting for 42% to 71% of softball-related injuries.^{8,13,24} In turn, the use of breakaway and compressive bases have been associated with dramatic reductions in sliding-related injuries.^{9,17} At the AWC, students are allowed to overrun second and third bases; however, sliding into bases is still permitted.

5. *Prohibit contact with the centerline during volleyball.* Training on take-off and landing techniques for blocking and spiking should be provided. While mechanisms of AWC volleyball-related injuries were not documented, other studies have found that between 16% and 50% of volleyball-related injuries were ankle sprains. Volleyball-related ankle sprains often occur when blockers land on the feet of spikers.^{1,6,15,16,23} Blocking and spiking activities are also associated with sprains and dislocations of interphalangeal and metacarpophalangeal joints, fractures of phalanges, and lacerations of web spaces.^{1,6,16} Serving, passing, setting, and digging have not been associated with high injury risks.^{2,6,15} Finally, play on cement or linoleum floors may be significantly more hazardous than play on wooden floors.⁵ At the AWC, students play on wooden floors.

6. *Quantify physical activity before and during AWC attendance.* This investigation could not quan-

tify the amount of time students participated in sporting activities. However, a dose-response relationship between injuries and the total amount of physical activity has been demonstrated in other studies.¹⁰

7. Document activities associated with injuries. In this investigation, activities associated with injuries were documented for about half of the incident cases. Complete and systematic recording of injury-associated activities in medical records would clarify the nature and relative importance of various injury mechanisms and in turn inform the development of preventive strategies.

Editorial comment: Over the years, the AWC has been proactive in its attempts to prevent injuries. Still, students were twice as likely to be injured in AY99 as in AY92. The current study found that sports-related activities accounted for a significant proportion of injuries. The investigation team made practical recommendations based on findings of their study and relevant published reports. All recommendations will not be implemented this academic year because of timing and administrative constraints. However, a review of AWC student medical records is planned for the end of this academic year to assess effects of injury prevention interventions that have been introduced.

Report and comment submitted by Joseph J. Knapik, Sc.D., Michelle L. Canham-Chervak, MPH, COL Stephen Craig, DO, MPH, and Edward Hoedebecke, DVM, MPH, Epidemiology Program, Directorate of Epidemiology and Disease Surveillance, USACHPPM, and MAJ Rebecca McCollam, MSA(PT), US Army Physical Fitness Research Institute, Army War College, Carlisle Barracks, PA.

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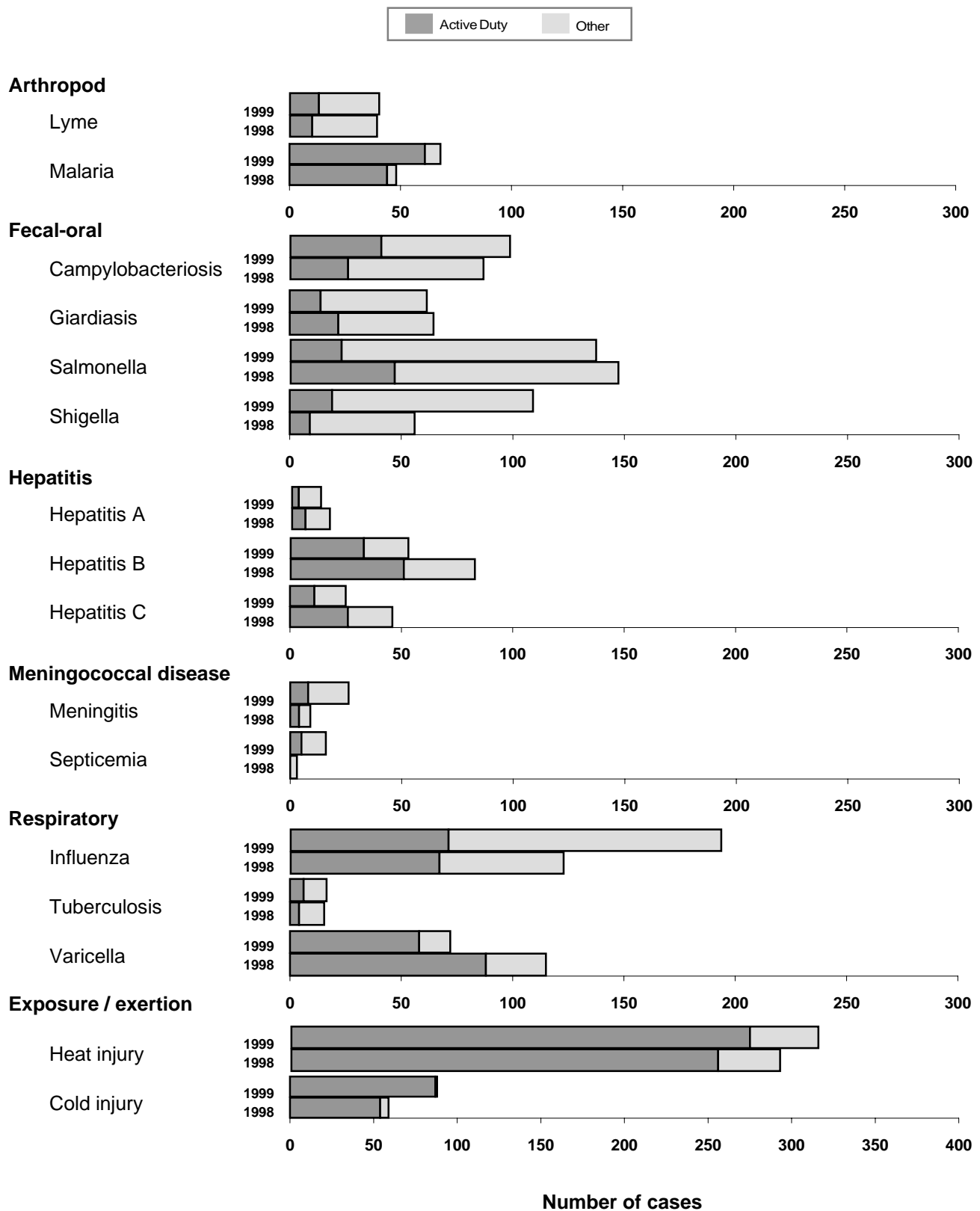
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**Table S1. Quarterly update, Reportable Medical Events System,
January-September 1999***

Diagnosis	1st Quarter	2nd Quarter	3rd Quarter	Total	Diagnosis	1st Quarter	2nd Quarter	3rd Quarter	Total
Amebiasis	1	1	0	2	Listeriosis	0	1	1	2
Anthrax	0	0	0	0	Lyme disease	2	19	19	40
Biological warfare agent exp	0	0	0	0	Malaria, falciparum	2	1	0	3
Botulism	0	0	0	0	Malaria, malariae	0	0	0	0
Brucellosis	0	0	0	0	Malaria, ovale	1	0	0	1
Campylobacteriosis	23	35	41	99	Malaria, unspecified	1	2	1	4
Carbon monoxide poisoning	0	0	0	0	Malaria, vivax	5	22	30	57
Chemical agent exposure	0	0	0	0	Measles	0	3	0	3
Chlamydia	1943	1723	1863	5529	Mening, meningitis	6	6	14	26
Cholera	0	0	0	0	Mening, septicemia	3	12	1	16
Coccidioidomycosis	1	1	0	2	Mumps (adults only)	0	0	0	0
CWI, frostbite	67	2	0	69	Pertussis	3	0	1	4
CWI, hypothermia	11	0	0	11	Plague	0	1	0	1
CWI, immersion type	6	0	0	6	Pneumococcal pneum.	10	5	3	18
CWI, unspecified	2	0	0	2	Poliomyelitis	0	0	0	0
Cryptosporidiosis	1	0	0	1	Q fever	0	0	0	0
Cyclospora	0	0	0	0	Rabies, human	0	0	0	0
Dengue fever	0	1	2	3	Relapsing fever	0	0	0	0
Diphtheria	0	0	0	0	Rheumatic fever	0	0	0	0
E Coli O157:H7	1	3	3	7	Rift Valley Fever	0	0	0	0
Ehrlichiosis	0	1	1	2	RMSF	0	2	2	4
Encephalitis	0	0	0	0	Rubella	3	0	0	3
Filariasis	0	1	0	1	Salmonellosis	21	50	67	138
Giardiasis	17	14	31	62	Schistosomiasis	0	0	0	0
Gonorrhea	594	449	493	1536	Shigellosis	10	56	43	109
H influenzae, invasive	1	1	1	3	Streptococcus, group A inv	1	0	0	1
Hantavirus infection	0	1	0	1	Syphilis, congenital	0	0	2	2
Heat exhaustion	7	47	190	244	Syphilis, latent	7	6	10	23
Heat stroke	5	32	33	70	Syphilis, prim/sec	19	18	7	44
Hemorrhagic fever	0	0	0	0	Syphilis, tertiary	6	2	3	11
Hepatitis A, acute	4	6	3	13	Tetanus	0	0	0	0
Hepatitis B, acute	31	11	11	53	Toxic shock syndrome	0	0	0	0
Hepatitis C, acute	12	3	10	25	Trichinellosis	0	0	0	0
Influenza	171	12	8	191	Trypanosomiasis	0	0	0	0
Lead poisoning	0	0	0	0	Tuberculosis, pulmonary	9	5	2	16
Legionellosis	1	2	1	4	Tularemia	0	0	0	0
Leish, cutaneous	1	0	1	2	Typhoid fever	0	0	0	0
Leish, mucocutaneous	0	0	0	0	Typhus fever	0	0	1	1
Leish, unspecified	0	0	0	0	Urethritis, non-specific	213	270	281	764
Leish, visceral	0	0	0	0	Vaccine advrs event	7	6	4	17
Leprosy	0	0	0	0	Varicella, adult only	43	17	12	72
Leptospirosis	0	0	0	0	Yellow fever	0	0	0	0
Total						3272	2850	3196	9318

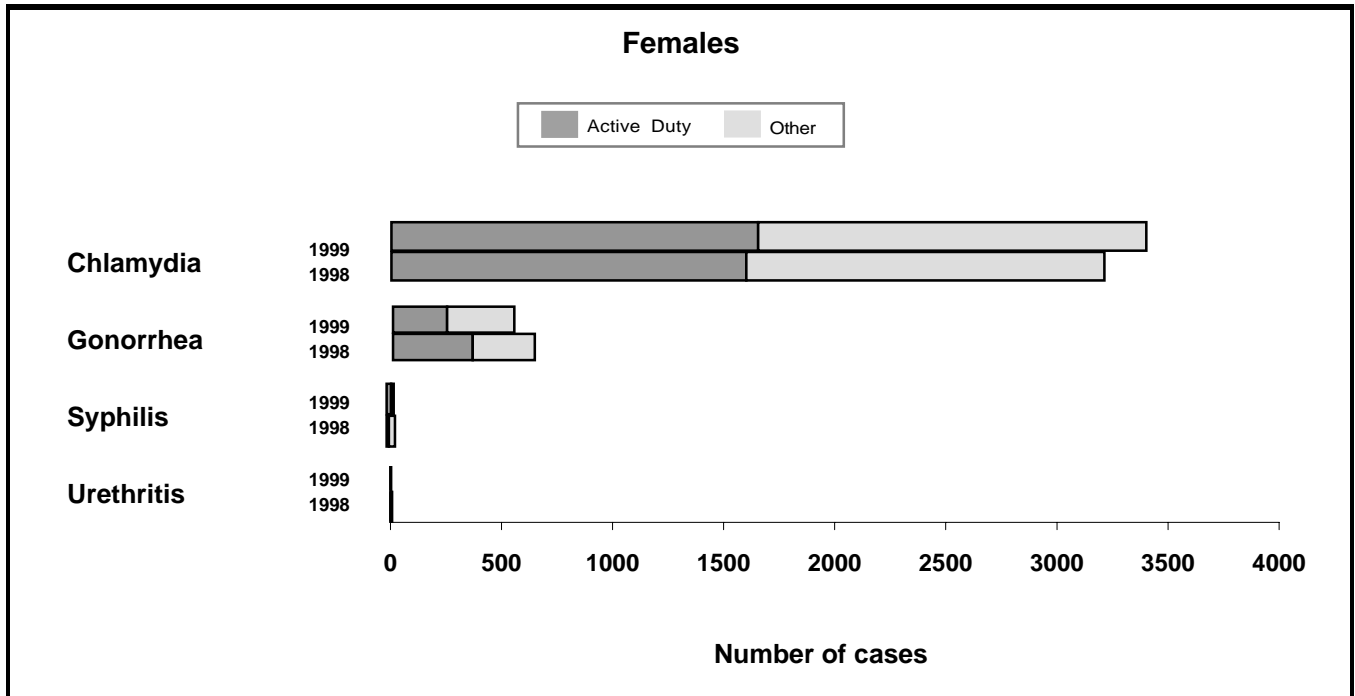
* Based on date of onset.

**Figure S1. Sentinel reportable events, United States Army*
Comparison of first nine months of calendar years 1998 and 1999**



* Based on date of onset.

Figure S2. Sentinel reportable STDs, United States Army*
Comparison of first nine months of calendar years 1998 and 1999, by gender



* Based on date of onset.

Table S2. Active duty force strength by MTF, United States Army, June, 1999*

MTF/Post**	Males							Females							All
	< 20	20-24	25-29	30-34	35-39	>= 40	Total	< 20	20-24	25-29	30-34	35-39	>= 40	Total	
NORTH ATLANTIC RMC															
Walter Reed AMC, DC	159	1766	1712	1622	1812	3096	10167	44	440	627	460	517	600	2688	12855
Aberdeen Prov. Ground, MD	257	485	261	333	370	356	2062	31	89	82	59	39	41	341	2403
FT Belvoir, VA	14	186	291	304	310	372	1477	5	77	134	79	83	76	454	1931
FT Bragg, NC	2362	11593	8201	6069	4240	2313	34778	326	1723	1170	671	461	232	4583	39361
FT Drum, NY	793	3802	2368	1385	1063	511	9922	90	458	247	167	97	55	1114	11036
FT Eustis, VA	491	1652	1240	962	932	773	6050	137	527	337	171	180	103	1455	7505
FT Knox, KY	1140	2944	1646	1299	1384	807	9220	51	234	203	134	104	65	791	10011
FT Lee, VA	275	743	605	536	442	373	2974	174	378	230	165	128	84	1159	4133
FT Meade, MD	66	661	896	879	678	773	3953	40	280	295	228	172	144	1159	5112
West Point, NY	14	268	283	593	518	555	2231	5	64	69	100	86	65	389	2620
GREAT PLAINS RMC															
Brooke AMC, TX	171	690	924	989	800	943	4517	109	366	394	322	282	292	1765	6282
Wm Beaumont AMC, TX	454	2307	1728	1302	1076	1044	7911	146	665	438	213	153	143	1758	9669
FT Carson, CO	819	4583	3403	2049	1539	829	13222	157	771	455	227	166	94	1870	15092
FT Hood, TX	2116	13431	8725	5488	3930	2211	35901	445	2460	1548	852	660	355	6320	42221
FT Huachuca, AZ	257	949	925	647	533	395	3706	108	326	223	111	105	98	971	4677
FT Leavenworth, KS	32	267	212	413	764	559	2247	14	90	54	61	87	56	362	2609
FT Leonard Wood, MO	921	1558	1020	1029	860	474	5862	275	413	242	172	116	74	1292	7154
FT Polk, LA	460	2535	1612	1290	801	378	7076	85	439	247	153	89	64	1077	8153
FT Riley, KS	784	3677	2206	1355	910	474	9406	80	462	247	140	100	57	1086	10492
FT Sill, OK	1856	3938	2405	1625	1229	751	11804	172	424	308	198	120	75	1297	13101
SOUTHEAST RMC															
Eisenhower AMC, GA	732	1753	1407	1098	1135	1149	7274	161	567	464	325	309	240	2066	9340
FT Benning, GA	2720	4913	3199	2027	1462	751	15072	100	520	371	232	168	71	1462	16534
FT Campbell, KY	1399	7539	5474	3440	2424	1142	21418	218	1028	688	356	217	99	2606	24024
FT Jackson, SC	1725	1765	892	913	736	453	6484	1062	943	411	326	190	103	3035	9519
FT McClellan, AL	252	503	359	381	450	358	2303	108	182	110	94	86	54	634	2937
FT Rucker, AL	87	640	1079	622	498	413	3339	59	194	147	78	49	35	562	3901
FT Stewart, GA	1094	6265	4162	2411	1852	973	16757	225	1067	674	390	247	147	2750	19507
WESTERN RMC															
Madigan AMC, WA	892	4907	3453	2340	1806	1255	14653	189	807	574	350	235	205	2360	17013
FT Irwin, CA	197	1425	931	736	534	270	4093	34	184	137	75	55	25	510	4603
FT Wainwright, AK	385	1929	1683	876	603	306	5782	75	316	243	136	107	54	931	6713
OTHER LOCATIONS															
Tripler AMC, HI	732	4167	3525	2038	1565	905	12932	140	846	738	391	272	193	2580	15512
Europe	2101	15539	14000	8951	6418	4211	51220	568	3144	2465	1378	991	629	9175	60395
Korea	2336	7716	5779	4212	3448	2198	25689	431	1412	1022	705	532	302	4404	30093
Other/Unknown	844	3493	3758	6488	5848	4176	24607	281	890	730	734	652	429	3716	§28337
Total	28948	120812	90690	66988	53245	36777	397460	6149	22822	16369	10278	7873	5371	68862	466336

* Based on duty zip code. Does not account for TDY.

§ Includes unknown age groups and unknown gender.

** Includes subordinate catchment areas not listed separately.

Source: Defense Manpower Data Center

DEPARTMENT OF THE ARMY
U.S. Army Center for Health Promotion
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