

# MMWR™

MORBIDITY AND MORTALITY WEEKLY REPORT

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## **Implementation of Health Initiatives During a Cease-Fire — Sudan, 1995**

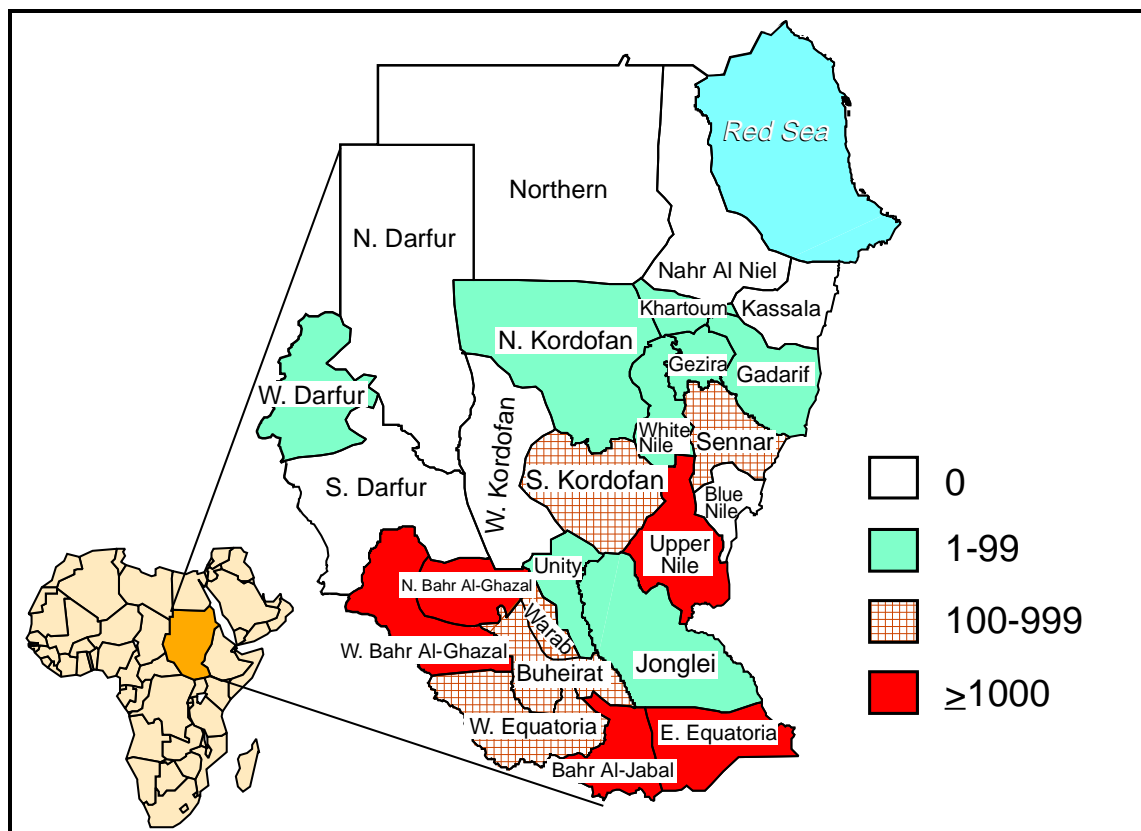
In 1994, Sudan (1994 population: 27 million) reported to the World Health Organization (WHO) one third of the global total of cases of dracunculiasis (i.e., Guinea worm disease), which is targeted for eradication by the end of 1995 (1,2). On March 27, 1995, the government of Sudan announced a cease-fire of 2 months' duration in the 12-year-old civil war in the southern part of the country—both sides agreed to the cease-fire primarily to permit acceleration of efforts to eradicate dracunculiasis and to promote treatment of other health problems including onchocerciasis (i.e., river blindness), administration of childhood vaccines, and distribution of vitamin A. This report summarizes the status of dracunculiasis and onchocerciasis in Sudan and provisional information on activities undertaken by the government of Sudan and other organizations during the cease-fire.

In 1994, the national Guinea Worm Eradication Program in Sudan reported to WHO a total of 780 villages with endemic dracunculiasis and 53,271 cases. The states with the highest prevalence of disease were Upper Nile, Bahr Al-Jabal, Eastern Equatoria, Western Bahr Al-Ghazal, and Northern Bahr Al-Ghazal states (Figure 1). As of 1995, the prevalence of onchocerciasis in Sudan was estimated to be 620,000. Southern Sudan also includes the most highly endemic foci for blinding onchocerciasis; the main endemic foci are located in Western Equatoria, Northern Bahr Al-Ghazal, and Western Bahr Al-Ghazal States (Figure 2).

Immediately after the cease-fire was announced, the Carter Center and CDC began providing technical assistance to complement preexisting activities conducted by the United Nations Children's Fund (UNICEF), bilateral donors, and nongovernmental organizations. During the cease-fire, health workers from several organizations (including the Sudan Guinea Worm Eradication Program, the onchocerciasis and vaccination programs, and nongovernmental organizations), in collaboration with UNICEF's Operation Lifeline Sudan, trained approximately 1265 additional community health volunteers and deployed about 30 mobile teams of health workers. On April 27, health leaders from both sides met in Juba, Sudan, to exchange information, including maps showing the location of villages with endemic dracunculiasis to help ensure maximum coverage for investigation and interventions. Accelerated interventions began in late April.

*Sudan — Continued*

**FIGURE 1. Number of cases of dracunculiasis, by state — Sudan Guinea Worm Eradication Program, 1994**



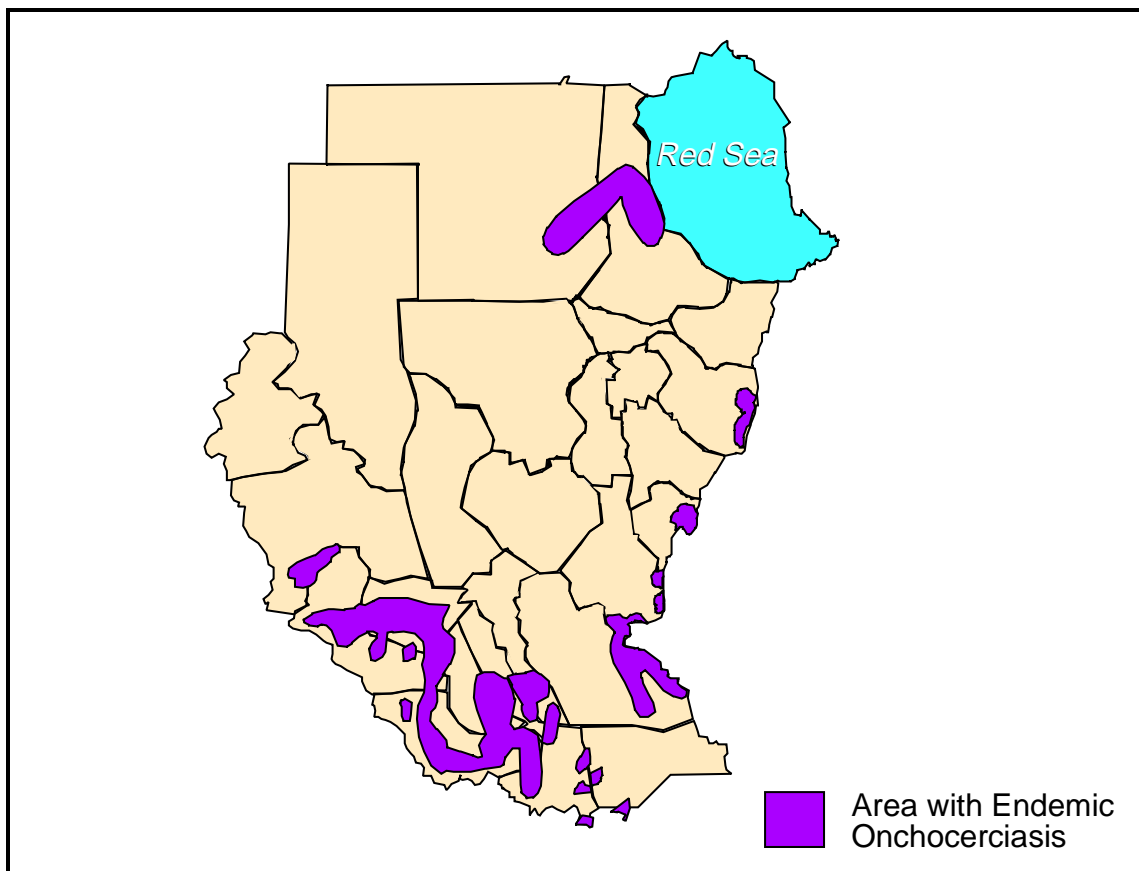
From late April through June 13, a total of 2028 villages were visited, including at least 651 villages in which dracunculiasis was first documented during the visit. Health workers identified 8922 new cases of dracunculiasis and distributed 87,703 cloth filters to households in villages with endemic disease. Through June 13, a provisional total of 9454 cases of dracunculiasis had been reported during 1995, including the cases newly identified during the cease-fire. In comparison, during January–May 1994, 15,798 cases were reported.

During the same period, mass oral treatment for onchocerciasis with ivermectin was initiated for the first time in many of the areas in the country with the highest prevalence of disease. Treatment was administered to a total of 25,499 persons from 84 villages in parts of Bahr Al-Ghazal and Equatoria zones, in which prevalences in 28 villages exceeded 40%, and to most eligible persons in the area around Raga, Western Bahr Al-Ghazal state. Assessments are continuing in other areas of the two zones with suspected endemic disease.

As of June 13, at least 30,865 children had received oral poliovirus vaccine, 35,996 were vaccinated against measles, and 19,204 had received bacille Calmette-Guérin (BCG) vaccination. In addition, 29,349 children had received vitamin A, and oral rehydration treatment had been administered to at least 5475 children with diarrhea. Health workers also had conducted health-education sessions to promote prevention

Sudan — Continued

**FIGURE 2. Areas of Sudan where onchocerciasis (river blindness) is endemic — Sudan, 1995**



of dracunculiasis, onchocerciasis, and diarrhea and to promote vaccination of children.

*Reported by: Federal Ministry of Health, Khartoum, Sudan. Global 2000, Inc, The Carter Center; Task Force for Child Survival and Development; Mectizan Donation Program, Atlanta. World Health Organization Collaborating Center for Research, Training, and Eradication of Dracunculiasis, Div of Parasitic Diseases, National Center for Infectious Diseases; International Health Program Office; National Immunization Program, CDC.*

**Editorial Note:** The cease-fire in Sudan permitted rapid development and implementation of activities to address dracunculiasis and other priority health problems. Interventions against dracunculiasis and onchocerciasis were expanded substantially from earlier levels and should accelerate the control of these diseases in Sudan and aid the global eradication effort. In 1994, control measures for dracunculiasis had been provided to approximately 50% of the villages with known endemic disease, and distribution of ivermectin to treat onchocerciasis in the southern part of the country had been restricted to only a limited number of clinics.

Because of this "Guinea worm cease-fire" in Sudan, the global campaign to eradicate dracunculiasis now encompasses all countries with endemic disease. In addition, this cease-fire is an unprecedented opportunity for Sudan to intensify efforts to eradicate poliomyelitis and to control onchocerciasis, measles, and vitamin A deficiency.

*Sudan — Continued*

Efforts to address health problems during negotiated periods of tranquility in civil and military strife have been conducted previously in Lebanon, El Salvador, Sudan, and other countries; however, the duration of these efforts has been substantially shorter than the current program in Sudan. On May 25, the government of Sudan and opposing forces announced their willingness to extend the cease-fire for an additional 2 months through late July to enable continued disease-control efforts.

*References*

1. World Health Organization. Dracunculiasis eradication: update—Sudan. *Wkly Epidemiol Rec* 1995;70:48–50.
2. World Health Organization. Dracunculiasis: global surveillance summary, 1994. *Wkly Epidemiol Rec* 1995;70:125–32.

**Mercury Exposure in a Residential Community — Florida, 1994**

Residential exposure to elemental mercury typically involves small amounts (e.g., the approximately 0.3 mL in a thermometer). During August 1994, five children residing in a neighborhood in Palm Beach County, Florida, found 5 pints of elemental mercury in an abandoned van. During the ensuing 25 days, the children shared and played with the mercury outdoors, inside homes, and at local schools. On August 25, 1994, a parent notified local police and fire authorities that her children had brought mercury into the home. On the same day, 50 homes were immediately vacated and an assessment of environmental and health impacts was initiated by the State of Florida Department of Environmental Protection, the Health and Rehabilitative Services of the Palm Beach County Public Health Unit, and the U.S. Environmental Protection Agency. This report summarizes the investigation of this incident.

Door-to-door interviews of the entire neighborhood (n=363) were conducted, and a decontamination facility was established at the civic center. Based on information collected during the initial survey, residential structures and several classrooms at the local high school were tested for the presence of mercury. Ambient air samples (i.e., adult breathing zone grab samples collected approximately 5 feet above the floor) were collected in affected structures during the 6 days following the report of children handling mercury. In addition, during August 25–29, initial blood and urine samples were collected from potentially exposed persons and analyzed for mercury levels.

A total of 58 residential structures were monitored for indoor mercury vapor concentrations; unsafe indoor air levels of mercury ( $>15 \mu\text{g}/\text{m}^3$ ) were detected in 17, prompting the immediate evacuation of 86 persons. Several classrooms at the local high school were determined to be contaminated. This school was closed for 4 days until clearance air sampling indicated that the mercury level was  $\leq 10 \mu\text{g}/\text{m}^3$ . This level of mercury was considered safe for students and teachers rotating among the rooms for 50-minute classes. Pregnant women and young children were excluded from entering classrooms until mercury levels decreased to  $\leq 0.3 \mu\text{g}/\text{m}^3$ .

A total of 477 persons identified by the survey as potentially exposed were evaluated at the emergency department of the local hospital or the health department clinic for mercury poisoning by testing both blood and urine specimens for total inorganic mercury levels. Elevated blood and/or urine mercury levels were detected in

*Mercury Exposure — Continued*

54 persons: blood levels ranged from 1.1 µg/dL to 5.5 µg/dL (normal: <1 µg/dL) and urine levels ranged from 21 µg/L to 66 µg/L (normal: <20 µg/L). Ambient air samples ranged from 6.5 µg/m<sup>3</sup> to 300 µg/m<sup>3</sup>. Although these 54 persons were asymptomatic, concentrations of mercury detected in their blood and urine were consistent with the levels of mercury detected in their homes.

Homes and classrooms were decontaminated by spreading powdered sulfur absorbent on the floors and vacuuming surfaces with high efficiency particulate-arresting (HEPA) filters. Contaminated items (e.g., carpeting, padding, linoleum, clothing, bedding, vacuum cleaners, furniture, and washing machines) were removed and taken to a hazardous waste facility, and some homes required ventilation for periods up to 3 months. Because of the potential for residential exposure of many children and childbearing-aged women, an air mercury concentration of ≤0.3 µg/m<sup>3</sup> was established as a threshold at which families would be permitted to return to their homes. Ambient air samples were collected 24 inches above the ground (i.e., a child's breathing zone), under normal living conditions for at least 8 hours.

By December 1, 1994, all displaced families had been permitted to return to their homes, and urine mercury levels of all exposed persons decreased. However, the Palm Beach County Health Department continues to monitor persons with persistently elevated urine mercury levels. This incident is under criminal investigation, and information regarding the source of the mercury has not been released.

*Reported by: JM Malecki, MD, Health and Rehabilitative Svcs/Palm Beach County Public Health Unit, R Hopkins, MD, State Epidemiologist, State of Florida Dept of Environmental Protection. U.S. Environmental Protection Agency. Air Pollution and Respiratory Health Br, National Center for Environmental Health, CDC.*

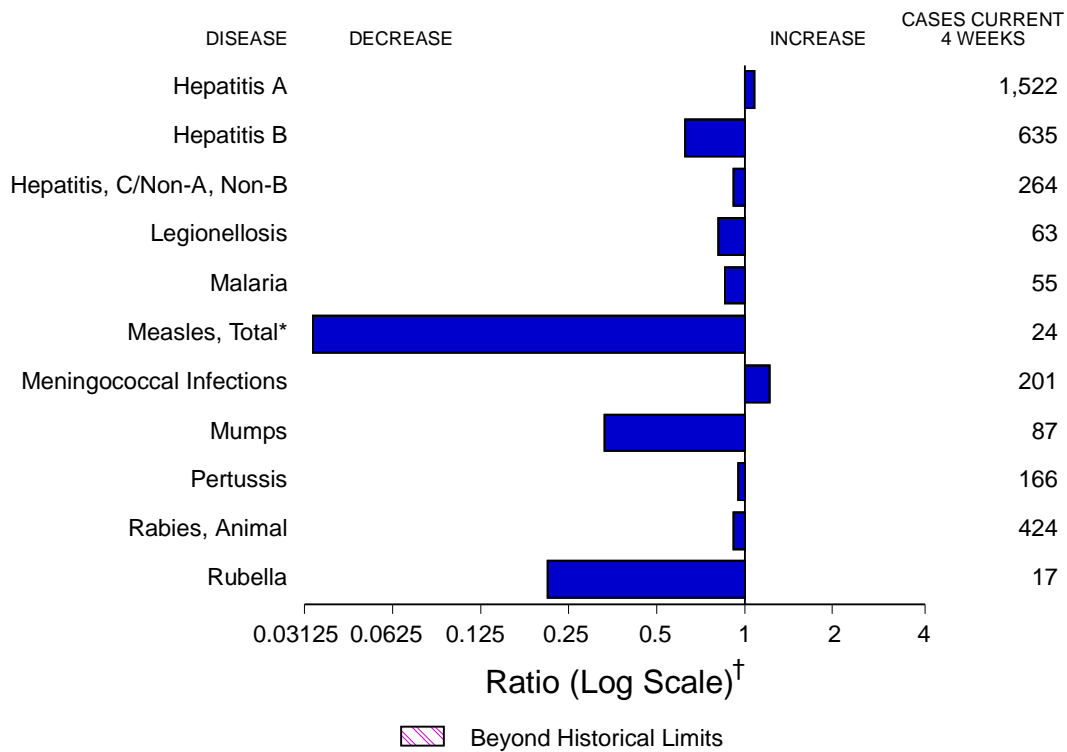
**Editorial Note:** Most poisonings associated with exposure to elemental mercury occur in occupational settings, and reports of nonoccupational elemental mercury vapor poisonings are rare, especially in community-based settings (1,2). The exposures described in this report primarily affected homes and schools.

Inorganic mercury is a heavy, silver-white metal that is liquid at room temperature. The vapor pressure of mercury is high compared with other metals, creating the continual hazard of airborne exposure to mercury vapor, which is odorless and colorless. Mercury is absorbed into the blood following inhalation and is then transported to the brain and other areas of the nervous system and to all other tissues. Most elemental mercury is excreted unchanged in feces.

The development of clinical manifestations as the result of inhalation of mercury vapor is related to several factors, including the concentration of vaporized mercury, length of exposure, and individual susceptibility (2,3). Acute exposure to elemental mercury produces symptoms of metallic taste, burning, irritation, salivation, vomiting, diarrhea, upper gastrointestinal tract edema, abdominal pain, and hemorrhage (4). Symptoms of high levels of exposure usually begin abruptly and include fever, chills, malaise, nausea, coughing, shortness of breath, chest pain and tightness; the clinical course may progress to pulmonary edema and death (5). In comparison, chronic inorganic mercury poisoning can result in intention tremor, memory loss, insomnia, depression, irritability, excessive shyness, emotional instability, delirium, and acrodynia and may result in a neurologic syndrome known as "mad hatter syndrome" (2-5).

*(Continued on page 443)*

**FIGURE I. Notifiable disease reports, comparison of 4-week totals ending June 10, 1995, with historical data — United States**



\*The large apparent decrease in the number of reported cases of measles (total) reflects dramatic fluctuations in the historical baseline.

<sup>†</sup>Ratio of current 4-week total to mean of 15 4-week totals (from previous, comparable, and subsequent 4-week periods for the past 5 years). The point where the hatched area begins is based on the mean and two standard deviations of these 4-week totals.

**TABLE I. Summary — cases of specified notifiable diseases, United States, cumulative, week ending June 10, 1995 (23rd Week)**

	Cum. 1995		Cum. 1995
Anthrax	-	Psittacosis	27
Brucellosis	33	Rabies, human	1
Cholera	7	Rocky Mountain Spotted Fever	84
Congenital rubella syndrome	3	Syphilis, congenital, age < 1 year <sup>†</sup>	-
Diphtheria	1	Tetanus	10
<i>Haemophilus influenzae</i> *	577	Toxic shock syndrome	93
Hansen Disease	60	Trichinosis	20
Plague	2	Typhoid fever	131
Poliomyelitis, Paralytic	-		

\*Of 564 cases of known age, 139 (25%) were reported among children less than 5 years of age.

<sup>†</sup>Updated quarterly from reports to the Division of Sexually Transmitted Diseases and HIV Prevention, National Center for Prevention Services. First quarter data not yet available.

-: no reported cases

**TABLE II. Cases of selected notifiable diseases, United States, weeks ending June 10, 1995, and June 11, 1994 (23rd Week)**

Reporting Area	AIDS*	Gonorrhea		Hepatitis (Viral), by type						Legionellosis	
				A		B		C/NA,NB			
				Cum. 1995	Cum. 1994	Cum. 1995	Cum. 1994	Cum. 1995	Cum. 1994		
UNITED STATES	29,887	152,685	167,729	10,868	9,685	4,191	5,110	1,893	1,896	568	655
NEW ENGLAND	1,471	2,122	3,509	104	141	84	183	49	68	11	11
Maine	26	33	44	14	12	6	8	-	-	3	-
N.H.	49	47	33	5	6	11	15	5	5	-	-
Vt.	14	20	11	3	2	1	5	1	6	-	-
Mass.	652	1,220	1,270	43	63	32	115	42	46	7	5
R.I.	122	229	200	11	13	8	3	1	11	1	6
Conn.	608	573	1,951	28	45	26	37	-	-	N	N
MID. ATLANTIC	7,605	15,699	18,957	657	671	510	660	165	230	66	77
Upstate N.Y.	836	2,612	4,287	169	231	155	174	83	98	21	19
N.Y. City	3,952	5,501	6,997	318	223	146	144	1	1	-	-
N.J.	1,794	1,704	2,357	92	144	127	178	69	110	14	14
Pa.	1,023	5,882	5,316	78	73	82	164	12	21	31	44
E.N. CENTRAL	2,492	32,919	33,754	1,395	904	427	521	125	168	156	224
Ohio	544	10,891	10,069	876	284	56	85	5	12	79	76
Ind.	200	2,894	3,573	63	144	90	93	-	4	33	75
Ill.	1,105	8,963	10,178	203	267	86	149	29	45	11	18
Mich.	502	7,885	6,854	175	117	174	157	91	107	18	35
Wis.	141	2,286	3,080	78	92	21	37	-	-	15	20
W.N. CENTRAL	697	8,284	9,366	648	466	228	282	45	36	56	44
Minn.	148	1,290	1,463	66	83	21	28	2	6	-	-
Iowa	40	657	585	38	26	19	16	3	7	12	21
Mo.	280	4,997	4,979	439	204	150	207	26	7	31	12
N. Dak.	2	13	19	14	1	3	-	3	1	3	4
S. Dak.	7	78	85	17	15	1	-	1	-	-	-
Nebr.	61	-	622	25	74	16	15	5	6	7	5
Kans.	159	1,249	1,613	49	63	18	16	5	9	3	2
S. ATLANTIC	7,773	45,711	44,216	508	472	586	1,008	139	251	87	161
Del.	154	890	784	7	14	2	7	1	1	-	-
Md.	1,133	5,343	8,398	89	75	98	166	5	15	17	36
D.C.	464	2,046	2,857	4	10	10	16	-	-	3	5
Va.	552	4,701	5,472	86	59	40	54	5	17	6	4
W. Va.	36	294	313	11	5	29	10	23	15	3	1
N.C.	405	10,676	10,884	56	47	137	129	27	27	16	10
S.C.	398	5,358	5,312	20	12	24	17	9	3	17	9
Ga.	935	7,562	U	43	23	50	424	11	148	10	73
Fla.	3,696	8,841	10,196	192	227	196	185	58	25	15	23
E.S. CENTRAL	961	18,981	19,348	518	210	417	507	549	365	15	49
Ky.	116	2,000	1,973	22	91	34	48	8	13	2	5
Tenn.	380	5,543	5,905	416	66	329	423	539	344	9	25
Ala.	263	8,023	6,986	51	31	54	36	2	8	3	7
Miss.	202	3,415	4,484	29	22	-	-	-	-	1	12
W.S. CENTRAL	2,513	14,411	19,429	1,287	1,267	611	551	257	187	7	14
Ark.	108	1,802	2,906	116	23	21	10	2	3	-	4
La.	366	5,215	5,292	42	68	77	77	62	52	2	-
Okla.	131	1,122	1,885	265	111	206	137	178	103	3	8
Tex.	1,908	6,272	9,346	864	1,065	307	327	15	29	2	2
MOUNTAIN	975	3,346	4,219	1,836	1,887	366	271	217	197	103	43
Mont.	8	38	38	30	13	9	9	9	4	4	14
Idaho	24	55	34	184	151	44	42	28	46	1	-
Wyo.	5	23	36	70	10	9	11	87	59	3	2
Colo.	339	1,300	1,471	235	220	58	46	32	30	30	8
N. Mex.	81	382	456	361	495	136	90	28	32	3	1
Ariz.	268	1,253	1,304	524	696	61	27	20	8	44	1
Utah	58	83	148	376	183	34	21	5	9	5	3
Nev.	192	212	732	56	119	15	25	8	9	13	14
PACIFIC	5,400	11,212	14,931	3,915	3,667	962	1,127	347	394	67	32
Wash.	463	1,080	1,302	296	507	73	105	102	123	6	7
Oreg.	184	202	354	700	379	39	69	22	18	-	-
Calif.	4,587	9,357	12,573	2,824	2,658	836	925	213	249	56	23
Alaska	45	335	374	16	95	5	7	1	-	-	-
Hawaii	121	238	328	79	28	9	21	9	4	5	2
Guam	-	31	61	2	7	-	3	-	-	-	1
P.R.	1,099	233	220	48	31	333	147	197	72	-	-
V.I.	19	4	11	-	1	2	4	-	-	-	-
Amer. Samoa	-	8	15	5	4	-	-	-	-	-	-
C.N.M.I.	-	13	21	15	3	7	-	-	-	-	-

N: Not notifiable U: Unavailable -: no reported cases C.N.M.I.: Commonwealth of Northern Mariana Islands

\*Updated monthly to the Division of HIV/AIDS Prevention, National Center for Prevention Services, last update May 25, 1995.

**TABLE II. (Cont'd.) Cases of selected notifiable diseases, United States, weeks ending June 10, 1995, and June 11, 1994 (23rd Week)**

Reporting Area	Lyme Disease		Malaria		Measles (Rubeola)						Meningococcal Infections		Mumps	
	Cum. 1995	Cum. 1994	Cum. 1995	Cum. 1994	Indigenous		Imported*		Total		Cum. 1995	Cum. 1994	Cum. 1995	Cum. 1994
					1995	Cum. 1995	1995	Cum. 1995	Cum. 1995	Cum. 1994				
UNITED STATES	1,810	2,260	408	415	8	174	-	8	182	709	1,538	1,480	413	677
NEW ENGLAND	193	237	18	26	-	4	-	-	4	22	77	62	6	11
Maine	3	-	1	1	-	-	-	-	-	4	5	12	4	3
N.H.	11	8	1	3	-	-	-	-	-	1	15	6	-	4
Vt.	3	2	-	1	-	-	-	-	-	2	6	2	-	-
Mass.	43	36	5	11	-	2	-	-	2	6	24	26	1	-
R.I.	41	24	2	4	-	2	-	-	2	6	-	-	-	1
Conn.	92	167	9	6	-	-	-	-	-	3	27	16	1	3
MID. ATLANTIC	1,310	1,508	94	62	-	1	-	2	3	192	192	146	58	62
Upstate N.Y.	795	1,213	20	19	-	-	-	-	-	14	63	45	15	15
N.Y. City	29	2	40	17	-	1	-	2	3	10	19	21	5	-
N.J.	130	166	23	16	-	-	-	-	-	161	55	35	5	11
Pa.	356	127	11	10	-	-	-	-	-	7	55	45	33	36
E.N. CENTRAL	23	183	41	46	-	6	-	1	7	91	195	199	70	123
Ohio	17	11	3	7	-	1	-	-	1	15	63	54	22	31
Ind.	3	6	2	8	-	-	-	-	-	1	27	24	1	6
Ill.	2	9	25	18	-	-	-	-	-	54	58	72	24	55
Mich.	1	1	9	11	-	3	-	1	4	18	40	26	23	27
Wis.	-	156	2	2	-	2	-	-	2	3	7	23	-	4
W.N. CENTRAL	21	31	9	22	-	1	-	-	1	161	91	101	27	34
Minn.	-	-	3	5	-	-	-	-	-	-	16	9	2	3
Iowa	1	1	1	4	-	-	-	-	-	-	16	12	8	9
Mo.	4	26	3	9	-	1	-	-	1	159	33	48	13	19
N. Dak.	-	-	-	1	-	-	-	-	-	-	1	1	-	2
S. Dak.	-	-	-	-	-	-	-	-	-	-	4	6	-	-
Nebr.	1	1	2	2	-	-	-	-	-	1	9	8	4	1
Kans.	15	3	-	1	-	-	-	-	-	1	12	17	-	-
S. ATLANTIC	178	220	92	87	2	3	-	-	3	11	263	222	45	103
Del.	7	27	1	3	-	-	-	-	-	-	3	2	-	-
Md.	121	73	23	39	-	-	-	-	-	2	15	13	-	25
D.C.	-	1	9	8	-	-	-	-	-	-	1	2	-	-
Va.	12	22	16	9	-	-	-	-	2	31	38	13	24	24
W. Va.	12	7	1	-	-	-	-	-	-	-	4	9	-	3
N.C.	14	26	7	2	-	-	-	-	-	-	45	35	16	24
S.C.	5	3	-	2	-	-	-	-	-	-	33	11	7	6
Ga.	5	57	11	12	-	-	-	-	2	59	51	-	7	7
Fla.	2	4	24	12	2	3	-	-	3	5	72	61	9	14
E.S. CENTRAL	10	17	8	12	-	-	-	-	-	28	92	116	14	13
Ky.	1	11	-	4	-	-	-	-	-	-	29	24	-	-
Tenn.	6	5	3	5	-	-	-	-	-	28	24	22	4	5
Ala.	1	1	5	2	-	-	-	-	-	-	24	46	4	1
Miss.	2	-	-	1	-	-	-	-	-	-	15	24	6	7
W.S. CENTRAL	42	35	9	14	2	13	-	-	13	12	192	177	25	148
Ark.	2	1	2	-	-	2	-	-	2	1	19	27	2	4
La.	1	-	1	2	2	11	-	-	11	1	28	23	7	15
Okla.	16	19	-	2	-	-	-	-	-	-	20	18	-	21
Tex.	23	15	6	10	-	-	-	-	-	10	125	109	16	108
MOUNTAIN	3	1	27	18	4	46	-	1	47	146	120	107	26	45
Mont.	-	-	2	-	-	-	-	-	-	-	2	2	1	-
Idaho	-	1	1	2	-	-	-	-	-	-	5	13	2	5
Wyo.	1	-	-	-	-	-	-	-	-	-	5	5	-	1
Colo.	1	-	15	8	4	7	-	-	7	19	27	17	1	1
N. Mex.	-	-	3	2	-	28	-	-	28	-	26	11	N	N
Ariz.	-	-	3	1	-	10	-	-	10	-	42	40	5	25
Utah	-	-	2	4	-	-	-	1	1	118	6	15	10	7
Nev.	1	-	1	1	U	1	U	-	1	9	7	4	6	6
PACIFIC	30	28	110	128	-	100	-	4	104	46	316	350	142	138
Wash.	2	-	11	13	-	13	-	2	15	-	54	53	10	8
Oreg.	2	2	4	10	-	1	-	-	1	-	51	76	N	N
Calif.	26	26	87	97	-	86	-	1	87	44	203	215	119	120
Alaska	-	-	1	-	-	-	-	-	-	-	6	2	9	2
Hawaii	-	-	7	8	-	-	-	1	1	2	2	4	4	8
Guam	-	-	-	-	U	-	U	-	-	214	2	-	3	3
P.R.	-	-	1	2	-	9	-	-	9	11	12	5	-	2
V.I.	-	-	-	-	U	-	U	-	-	-	-	-	2	2
Amer. Samoa	-	-	-	-	U	-	U	-	-	-	-	-	-	1
C.N.M.I.	-	-	-	1	-	-	-	-	-	29	-	-	-	-

\*For imported measles, cases include only those resulting from importation from other countries.

N: Not notifiable U: Unavailable -: no reported cases



**TABLE II. (Cont'd.) Cases of selected notifiable diseases, United States, weeks ending June 10, 1995, and June 11, 1994 (23rd Week)**

Reporting Area	Pertussis			Rubella			Syphilis (Primary & Secondary)		Tuberculosis		Rabies, Animal	
	1995	Cum. 1995	Cum. 1994	1995	Cum. 1995	Cum. 1994	Cum. 1995	Cum. 1994	Cum. 1995	Cum. 1994	Cum. 1995	Cum. 1994
UNITED STATES	36	1,290	1,544	9	51	163	6,665	9,478	7,572	9,003	2,827	3,138
NEW ENGLAND	1	157	171	1	7	113	84	98	150	172	752	820
Maine	-	18	2	1	1	-	2	4	-	-	-	-
N.H.	-	13	39	-	1	-	1	1	5	6	88	92
Vt.	-	3	27	-	-	-	-	-	1	2	104	70
Mass.	1	116	89	-	2	112	32	37	81	84	265	314
R.I.	-	-	3	-	-	1	1	9	18	18	123	5
Conn.	-	7	11	-	3	-	48	47	45	62	172	339
MID. ATLANTIC	6	114	283	2	5	5	393	613	1,611	1,733	672	755
Upstate N.Y.	-	61	102	2	3	5	24	80	177	227	270	526
N.Y. City	-	22	59	-	2	-	208	288	853	1,064	-	-
N.J.	-	2	9	-	-	-	81	101	300	302	170	139
Pa.	6	29	113	-	-	-	80	144	281	140	232	90
E.N. CENTRAL	6	132	248	-	-	6	1,146	1,349	770	842	10	17
Ohio	3	44	69	-	-	-	403	491	120	126	1	-
Ind.	-	8	34	-	-	-	97	106	21	73	-	3
Ill.	1	28	51	-	-	1	444	465	439	415	2	3
Mich.	2	40	23	-	-	5	130	144	166	204	6	5
Wis.	-	12	71	-	-	-	72	143	24	24	1	6
W.N. CENTRAL	1	63	59	-	-	2	340	558	259	216	131	85
Minn.	-	28	27	-	-	-	21	22	58	43	4	8
Iowa	-	2	6	-	-	-	28	21	33	15	47	35
Mo.	-	5	14	-	-	2	282	478	99	110	16	9
N. Dak.	-	6	3	-	-	-	-	1	1	4	16	4
S. Dak.	-	7	-	-	-	-	-	-	10	9	22	12
Nebr.	1	4	3	-	-	-	-	6	10	7	-	-
Kans.	-	11	6	-	-	-	9	30	48	28	26	17
S. ATLANTIC	-	111	163	6	15	10	1,613	2,375	1,404	1,755	950	846
Del.	-	5	-	-	-	-	7	13	12	14	33	21
Md.	-	14	53	-	-	-	36	99	193	141	202	279
D.C.	-	2	3	-	-	-	57	110	44	49	8	2
Va.	-	8	15	-	-	-	295	306	105	165	177	175
W. Va.	-	-	2	-	-	-	1	8	45	40	43	34
N.C.	-	50	44	-	-	-	518	783	130	212	189	84
S.C.	-	11	10	-	-	-	292	308	138	185	59	80
Ga.	-	1	11	-	-	-	234	381	260	332	136	168
Fla.	-	20	25	6	15	10	173	367	477	617	103	3
E.S. CENTRAL	3	27	90	-	-	-	1,818	1,662	452	626	79	94
Ky.	-	-	52	-	-	-	93	100	53	141	8	5
Tenn.	-	4	16	-	-	-	350	428	162	184	11	34
Ala.	3	23	14	-	-	-	282	319	172	191	60	55
Miss.	-	-	8	-	-	-	1,093	815	65	110	-	-
W.S. CENTRAL	-	61	40	-	2	7	966	2,206	983	986	52	330
Ark.	-	-	8	-	-	-	182	231	75	89	11	14
La.	-	4	5	-	-	-	486	831	-	7	23	41
Okla.	-	13	20	-	-	4	35	71	96	108	18	17
Tex.	-	44	7	-	2	3	263	1,073	812	782	-	258
MOUNTAIN	15	438	176	-	4	3	102	143	247	206	54	56
Mont.	-	3	3	-	-	-	3	1	3	9	20	7
Idaho	2	74	23	-	-	-	-	1	6	6	-	-
Wyo.	1	1	-	-	-	-	2	-	1	2	16	10
Colo.	6	12	93	-	-	-	65	74	4	20	-	1
N. Mex.	1	30	9	-	-	-	5	6	40	27	3	2
Ariz.	5	303	34	-	3	-	17	33	134	92	13	34
Utah	-	10	12	-	1	2	3	7	10	-	1	-
Nev.	U	5	2	U	-	1	7	21	49	50	1	2
PACIFIC	4	187	314	-	18	17	203	474	1,696	2,467	127	135
Wash.	1	34	41	-	1	-	7	20	121	105	-	-
Oreg.	-	7	41	-	1	-	6	17	23	54	-	-
Calif.	3	130	226	-	15	15	189	434	1,446	2,164	123	104
Alaska	-	-	-	-	-	-	1	2	35	30	4	31
Hawaii	-	16	6	-	1	2	-	1	71	114	-	-
Guam	U	-	1	U	-	1	1	3	4	23	-	-
P.R.	-	6	2	-	-	-	135	149	56	62	18	41
V.I.	U	-	-	U	-	-	1	22	-	-	-	-
Amer. Samoa	U	-	1	U	-	-	-	1	3	3	-	-
C.N.M.I.	-	-	-	-	-	-	3	-	13	9	-	-

U: Unavailable - : no reported cases

**TABLE III. Deaths in 121 U.S. cities,\* week ending  
June 10, 1995 (23rd Week)**

Reporting Area	All Causes, By Age (Years)						P&J <sup>†</sup> Total	Reporting Area	All Causes, By Age (Years)						P&J <sup>†</sup> Total
	All Ages	≥65	45-64	25-44	1-24	<1			All Ages	≥65	45-64	25-44	1-24	<1	
NEW ENGLAND	582	392	101	56	17	16	45	S. ATLANTIC	1,326	813	272	173	41	27	68
Boston, Mass.	144	77	30	19	10	8	6	Atlanta, Ga.	154	90	28	26	5	5	2
Bridgeport, Conn.	35	25	5	5	-	-	2	Baltimore, Md.	174	108	33	27	5	1	22
Cambridge, Mass.	16	13	3	-	-	-	3	Charlotte, N.C.	84	57	15	8	2	2	4
Fall River, Mass.	30	23	2	5	-	-	-	Jacksonville, Fla.	115	75	23	13	3	1	5
Hartford, Conn.	82	48	21	11	-	2	2	Miami, Fla.	122	64	27	25	2	4	2
Lowell, Mass.	20	16	2	2	-	-	-	Norfolk, Va.	81	53	18	5	2	3	4
Lynn, Mass.	9	8	-	1	-	-	1	Richmond, Va.	60	39	14	4	1	2	1
New Bedford, Mass.	18	15	2	1	-	-	1	Savannah, Ga.	51	37	8	5	1	-	8
New Haven, Conn.	53	38	12	2	-	1	7	St. Petersburg, Fla.	61	44	4	9	3	1	1
Providence, R.I.	43	30	7	3	2	1	4	Tampa, Fla.	214	140	46	21	6	1	17
Somerville, Mass.	8	7	1	-	-	-	-	Washington, D.C.	202	102	54	29	10	7	2
Springfield, Mass.	40	25	10	1	4	-	6	Wilmington, Del.	8	4	2	1	1	-	-
Waterbury, Conn.	26	20	3	2	1	-	1	E.S. CENTRAL	730	480	140	79	18	12	58
Worcester, Mass.	58	47	3	4	-	4	12	Birmingham, Ala.	115	73	23	11	3	4	3
MID. ATLANTIC	2,385	1,510	478	304	62	31	104	Chattanooga, Tenn.	99	74	19	5	-	1	6
Albany, N.Y.	48	34	9	2	3	-	4	Knoxville, Tenn.	58	38	11	6	3	-	6
Allentown, Pa.	25	15	5	4	1	-	-	Lexington, Ky.	45	26	14	5	-	-	5
Buffalo, N.Y.	102	78	12	10	1	1	-	Memphis, Tenn.	115	74	22	15	2	2	11
Camden, N.J.	32	20	4	5	2	1	3	Mobile, Ala.	71	53	8	5	2	3	2
Elizabeth, N.J.	22	11	5	6	-	-	3	Montgomery, Ala.	72	49	11	9	3	-	14
Erie, Pa.‡	46	33	10	-	2	1	-	Nashville, Tenn.	155	93	32	23	5	2	11
Jersey City, N.J.	41	18	6	15	1	1	-	W.S. CENTRAL	1,436	909	287	145	58	37	88
New York City, N.Y.	1,280	778	279	181	29	13	28	Austin, Tex.	58	39	6	11	-	2	4
Newark, N.J.	68	26	22	17	1	2	3	Baton Rouge, La.	37	28	5	1	-	3	3
Paterson, N.J.	26	14	6	6	-	-	2	Corpus Christi, Tex.	37	26	7	3	-	1	-
Philadelphia, Pa.	301	187	57	37	14	6	26	Dallas, Tex.	215	128	52	22	8	5	2
Pittsburgh, Pa.§	56	40	12	1	3	-	6	El Paso, Tex.	48	30	13	3	2	-	4
Reading, Pa.	14	12	2	-	-	-	-	Ft. Worth, Tex.	115	73	22	8	6	6	5
Rochester, N.Y.	130	104	15	7	2	2	13	Houston, Tex.	339	215	61	42	14	7	29
Schenectady, N.Y.	19	13	5	-	1	-	-	Little Rock, Ark.	72	35	19	7	9	2	9
Scranton, Pa.§	28	23	4	1	-	-	2	New Orleans, La.	141	91	22	19	6	3	-
Syracuse, N.Y.	99	70	18	5	2	4	11	San Antonio, Tex.	195	126	44	16	5	4	19
Trenton, N.J.	32	19	6	7	-	-	3	Shreveport, La.	69	44	14	5	4	2	6
Utica, N.Y.	16	15	1	-	-	-	-	Tulsa, Okla.	110	74	22	8	4	2	7
Yonkers, N.Y.	U	U	U	U	U	U	U	MOUNTAIN	950	627	167	97	31	28	56
E.N. CENTRAL	2,193	1,494	388	187	63	61	139	Albuquerque, N.M.	108	69	21	14	3	1	3
Akron, Ohio	58	46	8	2	-	2	-	Colo. Springs, Colo.	52	37	8	3	1	3	4
Canton, Ohio	32	26	3	1	-	2	4	Denver, Colo.	136	77	29	21	3	6	4
Chicago, Ill.	449	285	92	51	11	10	39	Las Vegas, Nev.	171	111	40	13	3	4	6
Cincinnati, Ohio	133	104	18	6	4	1	17	Ogden, Utah	27	20	3	2	2	-	1
Cleveland, Ohio	156	101	25	16	4	10	2	Phoenix, Ariz.	176	96	31	26	14	9	15
Columbus, Ohio	190	132	39	13	2	4	18	Pueblo, Colo.	21	20	1	-	-	-	-
Dayton, Ohio	119	87	20	6	4	2	10	Salt Lake City, Utah	99	70	15	9	2	3	13
Detroit, Mich.	241	132	49	36	18	6	5	Tucson, Ariz.	160	127	19	9	3	2	10
Evansville, Ind.	39	30	4	2	1	2	2	PACIFIC	2,126	1,443	344	231	51	30	150
Fort Wayne, Ind.	72	50	9	8	5	-	4	Berkeley, Calif.	14	11	2	1	-	-	-
Gary, Ind.	24	14	4	6	-	-	-	Fresno, Calif.	88	57	12	12	3	4	9
Grand Rapids, Mich.	53	36	13	1	-	3	9	Glendale, Calif.	31	25	4	1	-	-	3
Indianapolis, Ind.	172	121	28	13	7	3	4	Honolulu, Hawaii	89	61	17	8	1	2	7
Madison, Wis.	41	22	11	5	1	2	4	Long Beach, Calif.	81	54	17	5	4	1	4
Milwaukee, Wis.	109	76	24	4	1	4	6	Los Angeles, Calif.	531	352	97	68	11	2	29
Peoria, Ill.	38	26	7	2	1	2	1	Pasadena, Calif.	23	18	3	2	-	-	4
Rockford, Ill.	45	32	7	4	-	2	5	Portland, Ore.	190	137	29	10	11	3	10
South Bend, Ind.	43	36	3	3	-	1	2	Sacramento, Calif.	199	145	32	17	3	2	19
Toledo, Ohio	97	73	18	5	-	1	4	San Diego, Calif.	179	112	33	26	3	4	24
Youngstown, Ohio	82	65	6	3	4	4	3	San Francisco, Calif.	173	95	20	29	3	2	8
W.N. CENTRAL	716	525	93	52	18	18	50	San Jose, Calif.	184	124	34	18	5	3	19
Des Moines, Iowa	85	69	8	3	2	3	9	Santa Cruz, Calif.	30	21	4	3	1	1	1
Duluth, Minn.	26	21	2	2	-	1	5	Seattle, Wash.	139	100	21	12	2	4	8
Kansas City, Kans.	U	U	U	U	U	U	U	Spokane, Wash.	69	53	8	5	2	1	3
Kansas City, Mo.	95	53	18	10	1	3	7	Tacoma, Wash.	106	78	11	14	2	1	2
Lincoln, Nebr.	35	27	4	4	-	-	1	TOTAL	12,444 <sup>¶</sup>	8,193	2,270	1,324	359	260	758
Minneapolis, Minn.	205	150	29	13	8	5	12								
Omaha, Nebr.	89	70	8	6	3	2	6								
St. Louis, Mo.	119	93	12	8	3	3	5								
St. Paul, Minn.	62	42	12	6	1	1	5								
Wichita, Kans.	U	U	U	U	U	U	U								

\*Mortality data in this table are voluntarily reported from 121 cities in the United States, most of which have populations of 100,000 or more. A death is reported by the place of its occurrence and by the week that the death certificate was filed. Fetal deaths are not included.

<sup>†</sup>Pneumonia and influenza.

<sup>‡</sup>Because of changes in reporting methods in these 3 Pennsylvania cities, these numbers are partial counts for the current week. Complete counts will be available in 4 to 6 weeks.

<sup>¶</sup>Total includes unknown ages.

U: Unavailable - : no reported cases

*Mercury Exposure — Continued*

The risks associated with mercury exposure are especially increased for children because mercury vapor is dense and settles (2) and because children may be active on the floor or playing in dirt. In addition, because of lipid solubility, mercury crosses the placenta and is excreted in breast milk and, therefore, is a potential health hazard for unborn children and breastfeeding infants (6,7).

Elemental mercury is still widely used in industry for the manufacture of thermometers, barometers, vacuum pumps, and electrical components and may be present in household products such as cleaning solutions and adhesives (2,5). Small amounts of mercury, such as from a broken thermometer, can be cleaned up by spraying the mercury gently with hairspray or dusting with an absorbent such as powdered sulfur and sweeping up the mercury and absorbent with a wisk broom. After cleaning the spill, the broom should be securely bagged and discarded (8). Any person who discovers a large quantity of mercury should immediately contact the local poison-control center or health department.

The residential exposure described in this report was unprecedented in terms of the amount of mercury involved and the extent of contamination. The rapid and coordinated response to this incident minimized the risk for and assured the health of the exposed residents.

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### **Unexplained Illness Among Persian Gulf War Veterans in an Air National Guard Unit: Preliminary Report — August 1990–March 1995**

In November 1994, the U.S. Department of Veterans' Affairs (VA), the Department of Defense (DoD), and the Pennsylvania Department of Health requested that CDC investigate a report of unexplained illnesses among members of an Air National Guard (ANG) unit in south-central Pennsylvania (Unit A) who were veterans of the Persian Gulf War (PGW) (August 1990–June 1991). These veterans had been evaluated at a local VA medical center for symptoms that included recurrent rash, diarrhea, and fatigue. A three-stage investigation was planned to 1) verify and characterize signs and symptoms in PGW veterans attending the VA medical center; 2) determine

*Unexplained Illness — Continued*

whether the prevalence of symptoms was higher among members of Unit A than among members of other units deployed to the PGW and, if so, whether the increased prevalence was associated with PGW deployment; and 3) characterize the illness and identify associated risk factors. This report presents preliminary findings from stages 1 and 2 (stage 3 is in progress).

**Stage 1**

In December 1994, a team of CDC medical epidemiologists visited the VA medical center, conducted standardized interviews and performed standardized physical examinations of 59 PGW veterans reported to be symptomatic, and reviewed medical records. Of the 59 veterans, 26 were selected from the health registry that had been established for PGW veterans who reported symptoms believed to be related to service in the Persian Gulf, and 14 were selected as typical cases by the physician who reported the illnesses to VA; the remaining 19 were listed on the registry but had not yet been evaluated at the VA medical center to determine whether they were eligible to be on the registry. In addition, 40 primary-care physicians and 16 regional hospitals in south-central Pennsylvania were surveyed; the survey did not identify additional PGW veterans with any health complaints.

The median age of the 59 persons was 39 years (range: 23–59 years), and 53 (90%) were male. All were enlisted personnel: 30 (51%) had been assigned to Unit A during the PGW and the remainder were in other Air Force units and military branches; 48 (81%) had been in the military for  $\geq 10$  years; 16 (27%) had served  $\geq 5$  years on active duty; and 19 (32%) had been deployed for  $\geq 2$  tours to the PGW theater. At the time of the survey, 89% were employed in addition to their ANG work.

The most frequently reported symptoms considered "moderate" or "severe" were fatigue (61%), joint pain (51%), nasal or sinus congestion (51%), diarrhea (44%), joint stiffness (44%), unrefreshing sleep (42%), excessive gas (i.e., flatulence, bloating, and gastrointestinal distress) (41%), "difficulty remembering" (41%), muscle pains (41%), headaches (39%), abdominal pain (36%), general weakness (34%), and impaired concentration (34%). The two symptoms identified as "most bothersome" were fatigue (27%) and diarrhea (14%). Patients reported that their symptoms began during or 2–3 months after departure from the Persian Gulf, and all reported that several symptoms persisted  $\geq 6$  months. No consistent abnormalities were identified among the participants on standardized physical examination or by review of medical records and accompanying laboratory tests performed at the VA medical center. After the war, one participant had viscerotropic leishmaniasis diagnosed and treated.

**Stage 2**

From January through March 1995, members of Unit A and three comparison units (units B, C, and D) were surveyed to determine the prevalence of selected symptoms identified in stage 1 and to examine the relation between reported symptoms and PGW service. Comparison units were chosen for similarity in mission responsibility to Unit A and were located in Pennsylvania and another state. Units B and C (both reserve units) were surveyed during routine monthly training sessions, and Unit D (an active duty unit) was surveyed immediately after the Unit C survey. All personnel on each base at the time of the survey were asked to participate, regardless of health status or participation in the PGW, by anonymously completing a questionnaire describing the frequency, duration, and severity of 35 symptoms most commonly

*Unexplained Illness — Continued*

mentioned during the stage 1 investigation and a general health history. In addition, personnel who had been deployed to the Persian Gulf were asked about possible exposures (e.g., geography [location of service], duties [combat or support], medical and other procedures [e.g., vaccinations, dental work], outdoor activities [sports, recreation, mission-related], and food and water sources).

A total of 3927 personnel participated in the survey. Response rates varied by unit: 63% (677 of 1083) in Unit A, 36% (540 of 1520) in Unit B, 74% (843 of 1141) in Unit C, and 78% (1867 of 2407) in Unit D. The distribution of demographic characteristics and deployment status of the study participants was similar to the distribution of these variables in the population of each unit.

In all units, the prevalence of each of 13 chronic (lasting  $\geq 6$  months) symptoms was significantly greater ( $p < 0.05$ ) among persons deployed to the PGW than among those not deployed (Table 1). The prevalences of five symptom categories—chronic diarrhea, other gastrointestinal complaints (gas, bloating, cramps, or abdominal pain), difficulty remembering or concentrating, “trouble finding words,” and fatigue—were significantly greater ( $p < 0.03$ ) among deployed personnel from Unit A than among deployed personnel from each of the other units. Symptom prevalences among non-deployed personnel were similar in all units.

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**Editorial Note:** Approximately 700,000 U.S. troops (active duty, reserve, and National Guard) were deployed to the Persian Gulf region during operations Desert Shield and Desert Storm from August 1990 through June 1991. Previous assessments of the health status of PGW veterans have been based on analysis of health registries established by VA and DoD to rapidly identify and report illnesses among PGW veterans (1). Through March 1995, approximately 43,000 and 16,000 PGW veterans had enrolled in the VA and the DoD registries, respectively. Efforts have not identified a specific etiology or biologic explanation for these illnesses, nor have specific diseases or syndromes been identified.

The preliminary findings of this investigation are subject to at least two limitations. First, the stage 2 data on symptom prevalence reflect self-reported information that was not evaluated by physical examination and laboratory tests. However, standardized physical examinations and review of VA laboratory test results from patients in stage 1 did not reveal consistent abnormalities. Second, participation rates for the stage 2 survey varied widely; because persons with symptoms may have been more likely to participate, the prevalence of reported health conditions may have been over-estimated.

The preliminary findings presented in this report indicate that some chronic symptoms were reported more commonly by PGW veterans than by nondeployed PGW-era service personnel. Potential explanations for the higher prevalence of symptoms among deployed personnel—and the increased prevalence among deployed personnel from Unit A—may include factors specific to the Persian Gulf region (e.g., environmental, toxic, and infectious exposures); factors related to military service and combat (e.g., exposure to toxic agents and combat-related stress); characteristics associated with the general population (e.g., stress-related disorders, age-related

**TABLE 1. Prevalence rates and ratios\* for 13 chronic (i.e., ≥6 months' duration) symptoms reported by ≥25% of surveyed personnel in Unit A who were deployed to the Persian Gulf War theater, by unit† — January–March, 1995**

Symptom	Unit A			Unit B			Unit C			Unit D		
	Deployed (n=313)	Not deployed (n=364)	PR <sup>§</sup>	Deployed (n=119)	Not deployed (n=421)	PR	Deployed (n=262)	Not deployed (n=581)	PR	Deployed (n=470)	Not deployed (n=1397)	PR
Diarrhea <sup>¶</sup>	27%	2%	12.5	15%	3%	5.3	10%	3%	3.6	13%	3%	4.1
Memory <sup>¶**</sup>	46%	9%	5.2	23%	5%	4.5	26%	8%	3.4	28%	8%	3.6
Rash	25%	5%	5.3	15%	3%	4.5	20%	6%	3.7	19%	4%	4.4
"Trouble finding words" <sup>¶</sup>	31%	9%	3.5	10%	5%	2.2	22%	8%	2.7	24%	8%	3.1
Joint pain	38%	10%	4.0	35%	9%	4.1	29%	13%	2.2	30%	10%	3.0
Fatigue <sup>¶</sup>	54%	16%	3.4	42%	12%	3.4	36%	14%	2.7	33%	12%	2.9
Joint stiffness	33%	11%	3.0	26%	6%	4.4	26%	11%	2.4	26%	8%	3.4
Irritability or moodiness	29%	10%	2.9	20%	4%	5.3	24%	7%	3.4	23%	7%	3.3
Depression	25%	9%	2.8	13%	6%	2.4	13%	8%	1.6	13%	8%	1.8
Gastrointestinal <sup>¶,††</sup>	38%	14%	2.7	18%	11%	1.7	18%	10%	1.9	20%	10%	2.0
Unrefreshing sleep	29%	12%	2.5	29%	6%	4.6	23%	10%	2.3	22%	9%	2.5
Sinus congestion	51%	31%	1.6	45%	29%	1.6	44%	38%	1.2	44%	27%	1.6
Headache	43%	32%	1.4	41%	30%	1.4	42%	32%	1.3	46%	29%	1.6

\* All prevalence ratios were significant at  $p < 0.05$  except for sinus congestion in unit C.

† Comparison units were chosen for similarity in mission responsibility to Unit A; units B and C were reserve units, and Unit D was an active duty unit.

§ Prevalence ratio.

¶ Significantly greater ( $p \leq 0.03$ ) among deployed personnel from unit A than among deployed personnel from all of the other units.

\*\* Difficulty remembering or concentrating.

†† Gas, bloating, cramps, or abdominal pain.

*Unexplained Illness — Continued*

effects, or other poorly defined chronic illnesses); and factors especially specific to Unit A (e.g., increased local concern and media attention about illnesses related to PGW service when compared with other units). The stage 3 case-control study, which is in progress, will assess risk factors in ill and healthy PGW veterans from Unit A.

Mechanisms have been established to rapidly identify and treat PGW veterans with health problems. All PGW veterans with health problems are encouraged to obtain an evaluation at their local VA medical center or military treatment facility. Veterans can be referred for further evaluation at specialized referral centers established by VA and DoD.

PGW veterans and their eligible family members can register for medical examination and treatment by calling toll-free telephone numbers (VA: [800] 749-9387; DoD: [800] 796-9699). DoD has established a separate toll-free number ([800] 472-6719) for PGW veterans to report details of incidents they believe may be associated with a medical problem experienced since returning from the Persian Gulf and for health-care providers with questions about illnesses possibly related to service in the PGW.

*Reference*

1. Institute of Medicine. Health consequences of service during the Persian Gulf War: initial findings and recommendations for immediate action. Washington, DC: National Academy Press, 1995.

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