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Epidemiologic Notes and Reports

Waterborne Giardiasis Outbreaks — Washington, New Hampshire

Two waterborne outbreaks of giardiasis have been reported to CDC in the past year. One occurred in Camas, Washington (pop. 6,000), in the spring of 1976; in this outbreak 128 people had laboratory-confirmed giardiasis. The other outbreak, still ongoing, is in Berlin, New Hampshire (pop. 15,000), where 205 people to date have developed confirmed giardiasis.

Camas: On May 6, 1976, the laboratory section of the Washington State Department of Social and Health Services contacted CDC to report a large number of *Giardia*-positive stools from Camas. Only 2 people from Camas had been stool-positive for *Giardia* in 1975, whereas the same laboratory had reported 32 positives in April and May of 1976. The 32 patients' residences were scattered throughout the town, and they had limited interpersonal contact, suggesting waterborne transmission. Therefore, an area of the city where half of the residents received Camas city water and the other half used private well water was chosen for a preliminary survey. Six of the 38 users of city water compared to none of 40 users of private water had an illness compatible with giardiasis (p=0.01), implicating waterborne transmission. A larger study was undertaken to define the extent and character of the outbreak.

Two mutually exclusive groups were investigated: those people who were ill and spontaneously sought medical care (hereafter called confirmed cases) and those people who were interviewed during a survey and found to be ill (clinical cases). The confirmed cases consisted of 128 people who voluntarily contacted their physicians reporting a diarrheal illness and were stool-positive for *Giardia*. Analysis of data obtained from confirmed cases and their medical records revealed that diarrhea for 10 or more days was the single statistically significant symptom. Among confirmed cases, the outbreak began during the first week in April and peaked the first week in May. The outbreak spontaneously declined on May 10, and on May 15 the city switched to well water exclusively to prevent any further exposures by surface water.

The second group consisted of the respondents to a randomized community questionnaire survey administered to 496 Camas residents and 318 residents in an adjacent control town (receiving only well water). Because diarrhea of 10 or more days was characteristic of confirmed cases it was used as the case definition to interpret the survey questionnaires. Nineteen people (4%) of Camas respondents fit the case definition for giardiasis; none did in the control town (p=0.01). Thus, at least 240 persons (clinical cases) were ill with giardiasis in Camas. The stools of 18 people — 9 well and 9 ill with any diarrheal illness — were examined; no viral or bacterial pathogens were found. Two of the ill persons (22%) and 1 of the not ill (11%) were stool-positive for *G. lamblia*. Giardiasis was not associated with pet ownership, travel, or recreational activities such as swimming which involve raw water.

Camas has 2 water sources — a pair of mountain streams and a set of deep wells. Those residents living in areas receiving less than 70% surface water (more than 30% well water) reported no cases, while those receiving more than 70% surface water had an attack rate of 4.7%. *Giardia* cysts were recovered from the raw surface water entering the city's water treatment plant. Because the city chlorinated and filtered its surface water supplies in a closed pressurized system, flocculation efficiency was marginal. Sedimentation could not be used. *Giardia* cysts were also recovered from 2 reservoirs holding water which had already passed through the water treatment facility (finished water). Deep well water used by the city was not contaminated. An investigation of the watershed revealed 2 remote mountain streams in a fenced area with no evidence of human contamination. Several animals near the watershed were trapped. Trapping yielded 9 negative animals (including coyote, opossum, nutria, porcupine, and beaver) and 3 positive beavers. The beavers lived in a pond bordering a heavily used state park, but were within foraging distance of the water intakes for Camas.

Berlin: On April 19, 1977, a medical technologist at a local hospital in Berlin called CDC to report that 10 cases of giardiasis had been diagnosed in the past 9 days. By April 26, New Hampshire had reported a total of 90 cases in comparison to no cases of giardiasis reported in Berlin in the previous 5 years. Because cases were randomly distributed throughout the community, waterborne transmission was suspected.

Again, 2 groups were investigated: those people who were ill, voluntarily sought medical care, and were stool-positive (confirmed cases) and those people who were interviewed during a survey and were found to be ill (clinical cases). As of May 20, there were 205 confirmed cases. The outbreak began on April 8 and peaked on April 25. On April 22, Berlin residents were instructed to boil drinking

Giardiasis — continued

water, and the city increased its level of chlorination. However, approximately 5 people per day continue to be diagnosed as stool-positive for *G. lamblia.*

A randomized community questionnaire survey was done in Berlin (692 surveyed) and in an adjacent control town (286). One hundred sixty-five people (24%) in Berlin and 31 people (11%) in the control town reported diarrheal illness. However, because analysis of confirmed cases is not yet complete, the case definition for giardiasis in this outbreak has not been established. Therefore, the percentage of diarrheal illness attributable to *Giardia* infection has not yet been determined.

Berlin uses 2 rivers for its water supply: The Amonoosuc and the Androscoggin. People receiving Amonoosuc River water and those receiving Androscoggin River water had similar attack rates of diarrheal illness (23% vs. 27%, respectively). *Giardia* cysts have been recovered from the raw water from both rivers. *Giardia* cysts were recovered from 3 sites within the distribution system, including the regional hospital.

An investigation of the watersheds revealed that the Amonoosuc River is a small stream located in the White Mountain National Forest. However, access is not restricted, and an estimated 3,000 people used the area for recreational activities during October, November, and December 1976. The water is chlorinated and filtered under pressure without sedimentation or flocculation. The physical plant is 30 years old, and 3 of its filters were badly worn. The Androscoggin River receives untreated sewage effluent from a number of homes in 2 communities upstream from Berlin. Because of the known sewage contamination of the Androscoggin, a new water treatment plant was put in service on March 10, 1977. However, because of cross connections secondary to faulty construction and difficulty creating the proper weight floc, the new plant was ineffective. The town is repairing the plant.

Reported by J Allard, PhD, State Epidemiologist, Washington Dept of Social and Health Services; DA Champaign, MD, Southwest Washington Health District; R Delisle, Berlin; H Mires, MD, MPH, FRSH, Director, New Hampshire Division of Public Health; E Lippy, Epidemiology Br, Field Studies Division, Health Effects Research Lab, Environmental Protection Agency; Field Services Div, and Parasitic Diseases Div, Bur of Epidemiology, CDC.

Editorial Note: An outbreak of giardiasis in Rome, New York, in the spring of 1975 was the first laboratory-documented epidemic of waterborne giardiasis in the United States; it affected over 4,800 people (MMWR 24:[43],1977). The outbreak the following spring in Camas, where at least 240 people developed giardiasis, again demonstrated the ability of *Giardia* organisms to cause citywide outbreaks of diarrhea. Significant morbidity was demonstrated, as the illness produced was characterized by prolonged diarrhea (≥10 days).

In Rome, the absence of filtration and optimum chlorination left the city unprotected against waterborne giardi-

(Continued on page 175)

Table I. Summary—Cases of Specified Notifiable Diseases: United States

[Cumulative totals include revised and delayed reports through previous weeks]

DISEASE	20th WEEK ENDING		MEDIAN 1972–1976	CUMULATIVE, FIRST 20 WEEKS		MEDIAN 1972–1976
	May 21, 1977	May 22, 1976		May 21, 1977	May 22, 1976	
Aseptic meningitis	40	31	47	720	681	708
Brucellosis	5	12	5	68	106	52
Chickenpox	6,698	6,144	---	123,811	115,089	---
Diphtheria	3	-	4	37	100	100
Encephalitis, Primary	12	17	15	231	295	312
Encephalitis, Post-Infectious	7	7	5	65	110	106
Hepatitis, Viral, Type B	286	283	189	6,125	5,496	3,691
Hepatitis, Viral, Type A	545	615	778	12,404	13,623	17,046
Hepatitis, Viral, Type unspecified	167	200		3,539	3,323	
Malaria	9	6	6	141	132	96
Measles (rubeola)	3,539	1,888	1,126	36,519	24,210	17,738
Meningococcal infections, total	27	31	29	884	751	678
Civilian	27	31	28	879	746	660
Military	-	-	1	5	5	17
Mumps	497	1,217	1,810	11,419	25,046	33,191
Pertussis	28	19	---	269	369	---
Rubella (German measles)	1,125	593	748	13,742	7,878	10,808
Tetanus	1	1	1	16	14	22
Tuberculosis	735	648	---	11,610	12,511	---
Tularemia	2	2	1	32	45	34
Typhoid fever	5	9	7	137	123	122
Typhus, tick-borne (Rky. Mt. spotted fever)	27	36	15	140	99	71
Venereal Diseases:						
Gonorrhea, Civilian	19,267	19,380	---	356,997	370,609	---
Gonorrhea, Military	442	470	---	10,122	11,773	---
Syphilis, primary and secondary, Civilian	354	486	---	8,087	9,768	---
Syphilis, primary and secondary, Military	5	3	---	119	136	---
Rabies in animals	49	58	59	1,039	1,011	1,158

Table II. Notifiable Diseases of Low Frequency: United States

	CUM.		CUM.
Anthrax:	-	Poliomyelitis, total: *Mass 1 (para.)	3
Botulism:	66	Paralytic:	3
Congenital rubella syndrome: Ups NY 1, Minn. 2	7	Psittacosis: Calif. 1	24
Leprosy: *La. 1, Calif. 3	45	Rabies in man:	-
Leptospirosis: *Conn. 1, Calif. 1	16	Trichinosis: *Conn. 3	41
Plague:	1	Typhus, murine: *S. Car. 1, Tex.1	20

*Delayed reports: Leprosy: Va. 1 (1976); Leptospirosis: Va. 1 (1976); Polio, non-para.: Idaho 1 (1976); Trichinosis: Va. 1 (1976), Pa. 2 (1977); Typhus, murine: S. Car. 1 (1977)

Table III

Cases of Specified Notifiable Diseases: United States

Weeks Ending May 21, 1977 and May 22, 1976 – 20th Week

AREA REPORTING	ASEPTIC MENINGITIS	BRUCELLOSIS	CHICKENPOX	DIPHTHERIA		ENCEPHALITIS			HEPATITIS, VIRAL			MALARIA	
						Primary: Arthropod-borne and Unspecified		Post Infectious	Type B	Type A	Type Unspecified		
	1977	1977	1977	1977	CUM. 1977	1977	1976	1977	1977	1977	1977	1977	CUM. 1977
UNITED STATES	40	5	6,698	3	37	12	17	7	286	545	167	9	141
NEW ENGLAND	1	–	778	–	–	–	2	–	11	11	12	–	7
Maine	–	–	10	–	–	–	–	–	–	–	–	–	–
New Hampshire*	–	–	1	–	–	–	–	–	–	2	–	–	–
Vermont	–	–	7	–	–	–	–	–	–	2	–	–	1
Massachusetts	1	–	323	–	–	–	2	–	1	–	11	–	2
Rhode Island	–	–	186	–	–	–	–	–	2	3	–	–	2
Connecticut	–	–	251	–	–	–	–	–	8	4	1	–	2
MIDDLE ATLANTIC	5	1	1,053	–	5	–	–	–	51	76	20	2	32
Upstate New York	1	–	757	–	–	–	–	–	2	16	1	–	8
New York City	–	–	167	–	5	–	–	–	9	10	3	2	18
New Jersey	4	1	NN	–	–	–	–	–	13	23	9	–	4
Pennsylvania*	–	–	129	–	–	–	–	–	27	27	7	–	2
EAST NORTH CENTRAL	–	–	2,419	–	–	2	5	2	41	99	7	–	9
Ohio*	–	–	166	–	–	1	3	1	10	35	–	–	5
Indiana	–	–	169	–	–	–	–	–	1	8	5	–	–
Illinois	–	–	691	–	–	–	–	–	4	25	1	–	1
Michigan	–	–	915	–	–	1	1	1	18	24	1	–	2
Wisconsin*	–	–	478	–	–	–	1	–	8	7	–	–	1
WEST NORTH CENTRAL	1	1	658	–	1	1	–	2	19	45	9	1	14
Minnesota	–	–	–	–	–	–	–	1	3	5	–	–	4
Iowa	–	–	123	–	–	–	–	–	2	3	–	–	–
Missouri*	–	–	19	–	1	–	–	–	11	26	4	–	7
North Dakota	–	–	25	–	–	–	–	–	–	5	–	–	–
South Dakota	–	–	26	–	–	–	–	–	–	–	–	–	1
Nebraska	1	1	54	–	–	1	–	–	1	–	2	–	–
Kansas	–	–	411	–	–	–	–	1	2	6	3	1	2
SOUTH ATLANTIC	4	1	370	–	–	1	–	1	36	90	18	1	22
Delaware	–	–	8	–	–	–	–	–	–	4	1	–	–
Maryland	–	–	7	–	–	1	–	–	11	4	4	–	6
District of Columbia	–	–	–	–	–	–	–	–	–	–	–	–	1
Virginia*	–	1	68	–	–	–	–	1	–	5	1	–	3
West Virginia	–	–	119	–	–	–	–	–	2	14	–	–	1
North Carolina	1	–	NN	–	–	–	–	–	6	15	2	–	4
South Carolina*	–	–	–	–	–	–	–	–	2	2	3	–	–
Georgia*	–	–	–	–	–	–	–	–	8	26	–	–	3
Florida*	3	–	168	–	–	–	–	–	7	20	7	1	4
EAST SOUTH CENTRAL	2	1	154	–	–	1	5	–	16	22	3	–	3
Kentucky	–	–	121	–	–	–	–	–	–	–	–	–	3
Tennessee	2	1	NN	–	–	–	1	–	11	13	2	–	–
Alabama	–	–	27	–	–	–	1	–	–	–	1	–	–
Mississippi*	–	–	6	–	–	1	3	–	5	9	–	–	–
WEST SOUTH CENTRAL	5	–	294	–	1	1	2	1	13	45	40	1	8
Arkansas*	–	–	–	–	–	–	–	–	–	–	1	–	–
Louisiana	1	–	NN	–	–	–	–	–	3	6	2	–	–
Oklahoma	1	–	10	–	–	–	1	–	2	14	4	–	–
Texas	3	–	284	–	1	1	1	1	8	25	33	1	8
MOUNTAIN	–	–	222	–	1	–	–	–	13	34	12	–	6
Montana	–	–	8	–	–	–	–	–	1	2	–	–	–
Idaho	–	–	40	–	–	–	–	–	–	2	–	–	–
Wyoming	–	–	–	–	–	–	–	–	–	–	–	–	1
Colorado	–	–	127	–	–	–	–	–	12	7	4	–	4
New Mexico*	–	–	–	–	–	–	–	–	–	1	1	–	–
Arizona	–	–	NN	–	1	–	–	–	–	15	2	–	1
Utah	–	–	43	–	–	–	–	–	–	7	5	–	–
Nevada	–	–	4	–	–	–	–	–	–	–	–	–	–
PACIFIC	22	1	750	3	29	6	3	1	86	123	46	4	40
Washington	1	–	598	3	27	1	–	1	2	9	2	–	–
Oregon	4	–	2	–	–	–	–	–	12	24	2	–	1
California*	12	1	–	–	1	4	3	–	72	87	42	3	34
Alaska	–	–	111	–	1	1	–	–	–	–	–	1	1
Hawaii	5	–	39	–	–	–	–	–	–	3	–	–	4
Guam	NA	NA	NA	NA	–	NA	–	–	–	NA	NA	NA	–
Puerto Rico	–	–	6	–	–	–	–	–	–	2	4	–	–
Virgin Islands	–	–	–	–	–	–	–	–	–	–	–	–	–

NN: Not notifiable
NA: Not available
*Delayed reports: Asep. Meng.: Va. add (1976), Pa. add 1 (1977); Bruc.: Va. add 1 (1976); Chickenpox: Va. delete 127 (1976), N. Hamp. add 1, Pa. 96, Fla. add 1, Calif. add 60 (1977); Enceph.: Va. add 1 (1976), Pa. add 1 (1977); Enceph., post: Pa. add 1 (1977); Hep. B: N. Hamp add 1, Pa. add 27, Ohio add 1, Mo. delete 1, S. Car. delete 4, Fla. delete 2, Ark. add 1, N. Mex. add 7 (1977); Hep. A: Va. add 1 (1976), N. Hamp. add 1, Pa. add 32, Ohio delete 1, Wisc. delete 1, Mo. delete 1, S. Car. add 4, Ga. add 17, Fla. delete 3, Miss. delete 2, Ark. add 13, N. Mex. add 3 (1977); Hep. Unsp.: Va. delete 1 (1976), Pa. add 5, Mo. delete 1, Fla. delete 2, N. Mex. add 2 (1977); Malaria: Pa. add 1, Mo. delete 2 (1977).

Table III-Continued
Cases of Specified Notifiable Diseases: United States
Weeks Ending May 21, 1977 and May 22, 1976 — 20th Week

REPORTING AREA	MEASLES (Rubeola)			MENINGOCOCCAL INFECTIONS TOTAL			MUMPS		PERTUSSIS	RUBELLA		TETANUS
	1977	CUMULATIVE		1977	CUMULATIVE		1977	CUM. 1977	1977	1977	CUM. 1977	CUM. 1977
		1977	1976		1977	1976						
UNITED STATES	3,539	36,519	24,210	27	884	751	497	11,419	28	1,125	13,742	16
NEW ENGLAND	170	1,750	241	-	38	34	9	495	-	109	964	-
Maine	9	13	3	-	3	-	3	35	-	40	66	-
New Hampshire*	4	426	5	-	3	2	2	86	-	10	207	-
Vermont	2	258	-	-	4	3	-	5	-	-	61	-
Massachusetts*	33	482	2	-	10	10	2	84	-	20	289	-
Rhode Island	7	18	14	-	-	4	1	39	-	9	116	-
Connecticut	115	553	217	-	18	15	1	246	-	30	225	-
MIDDLE ATLANTIC	624	4,738	5,079	6	124	102	42	749	1	364	3,958	-
Upstate New York	259	1,643	1,994	1	33	38	10	134	-	193	2,093	-
New York City	19	236	277	1	25	25	17	306	-	11	213	-
New Jersey*	3	103	524	-	26	16	14	197	-	99	1,393	-
Pennsylvania*	343	2,756	2,284	4	40	23	1	112	1	61	259	-
EAST NORTH CENTRAL	402	7,692	10,066	2	86	98	187	4,002	1	128	2,904	1
Ohio*	10	745	316	1	31	41	29	551	1	32	928	-
Indiana	170	3,627	2,018	-	7	4	6	215	-	29	797	-
Illinois	49	977	1,032	-	14	10	57	600	-	8	198	-
Michigan	43	718	4,122	-	24	35	55	1,365	-	39	684	1
Wisconsin*	130	1,625	2,578	1	10	8	40	1,271	-	20	297	-
WEST NORTH CENTRAL	756	7,172	816	1	64	58	114	2,753	-	28	426	2
Minnesota	189	1,571	226	1	21	13	-	3	-	1	10	-
Iowa*	486	3,834	24	-	5	8	5	1,203	-	3	149	-
Missouri*	74	668	10	-	27	17	36	647	-	3	33	1
North Dakota	-	8	1	-	1	3	2	9	-	-	7	-
South Dakota	5	50	2	-	4	2	-	58	-	-	5	-
Nebraska	-	178	40	-	-	3	-	35	-	-	2	-
Kansas*	2	863	513	-	6	12	71	798	-	21	220	1
SOUTH ATLANTIC	432	2,732	1,393	4	182	148	33	471	5	114	1,318	4
Delaware	-	22	114	-	3	2	8	87	-	1	21	-
Maryland	-	279	643	1	13	11	1	27	-	-	3	-
District of Columbia	-	1	3	-	-	2	-	5	-	-	-	-
Virginia*	158	1,397	210	-	11	18	6	58	-	94	484	1
West Virginia	21	132	138	-	8	4	7	123	3	5	74	-
North Carolina	1	35	-	1	49	29	8	27	2	6	396	-
South Carolina	1	118	3	-	17	27	-	9	-	6	162	-
Georgia	240	641	-	1	33	13	-	8	-	-	45	-
Florida*	11	107	282	1	48	42	3	127	-	2	133	3
EAST SOUTH CENTRAL	220	1,288	525	-	104	57	25	603	-	59	1,708	2
Kentucky	204	666	505	-	19	10	2	75	-	2	55	1
Tennessee	10	534	5	-	25	23	17	347	-	52	1,574	1
Alabama	1	63	-	-	39	17	5	159	-	4	73	-
Mississippi	5	25	15	-	21	7	1	22	-	1	6	-
WEST SOUTH CENTRAL	75	1,712	498	8	157	118	32	958	6	45	614	3
Arkansas	-	1	-	-	8	5	5	20	-	-	1	-
Louisiana	3	69	131	3	57	16	-	29	2	1	21	1
Oklahoma	-	47	229	-	5	18	-	355	-	2	24	-
Texas	72	1,595	138	5	87	79	27	554	4	42	568	2
MOUNTAIN	111	1,761	4,196	1	31	20	7	501	-	24	297	1
Montana	52	1,004	163	-	2	2	-	3	-	-	8	-
Idaho	42	72	1,823	-	2	2	1	113	-	2	4	-
Wyoming	-	2	-	-	1	-	-	-	-	-	2	1
Colorado	8	436	188	-	1	4	4	224	-	21	220	-
New Mexico*	1	15	12	-	15	1	-	93	-	-	7	-
Arizona*	4	147	218	1	8	7	-	-	-	-	10	-
Utah	-	5	1,736	-	1	4	2	62	-	1	42	-
Nevada*	4	80	56	-	1	-	-	6	-	-	4	-
PACIFIC	749	7,674	1,396	5	98	116	48	887	15	254	1,553	3
Washington	31	386	93	2	13	19	12	206	3	84	380	-
Oregon	-	222	87	-	10	9	4	162	3	-	76	-
California	711	6,992	1,214	2	56	80	22	481	9	169	1,090	3
Alaska	-	55	-	1	17	6	7	24	-	1	1	-
Hawaii	7	19	2	-	2	2	3	14	-	-	6	-
Guam	NA	3	7	-	-	-	NA	1	NA	NA	4	-
Puerto Rico	8	516	108	-	-	2	8	327	-	1	19	5
Virgin Islands	-	10	4	-	-	-	-	161	-	-	-	-

NA: Not available

*Delayed reports: Measles: Va. delete 6 (1976),N. Hamp. add 1, Mass. delete 4, Pa. add 104, Ohio delete 1, Wisc. delete 4, Iowa delete 108, Mo. delete 1, Kans. add 138, Fla. add 3, N. Mex. delete 1, Ariz. add 85 (1977); Men. Inf.: Va. add 2 civ, add 8 mil. (1976) Pa. add 1 civ., Mo. delete 2 civ., Kans. delete 2 civ., N. Mex. add 1 civ., (1977); Mumps: Va. add 2 (1976), Pa. add 6, N. Mex. delete 6, Nev. add 1 (1977); Pertussis: Va. add 1 (1976), Pa. add 1 (1977); Rubella: Va. delete 2 (1976) N. J. add 1, Pa. add 31, Iowa delete 10; Mo. delete 1, N. Mex add 1 (1977).

Table III-Continued

Cases of Specified Notifiable Diseases: United States

Weeks Ending May 21, 1977 and May 22, 1976 — 20th Week

REPORTING AREA	TUBERCULOSIS		TULAREMIA	TYPHOID FEVER		TYPHUS-FEVER TICK-BORNE (RMSF)		VENEREAL DISEASES (Civilian Cases Only)						RABIES IN ANIMALS
								GONORRHEA			SYPHILIS (Pri. & Sec.)			
									CUMULATIVE			CUMULATIVE		
	1977	CUM. 1977	CUM. 1977	1977	CUM. 1977	1977	CUM. 1977	1977	1977	1976	1977	1977	1976	CUM. 1977
UNITED STATES	735	11,610	32	5	137	27	140	19,267	356,997	370,609	354	8,087	9,768	1,039
NEW ENGLAND	33	425	1	–	8	1	1	469	9,325	9,874	17	319	297	15
Maine	–	29	–	–	–	–	–	25	694	861	–	8	8	13
New Hampshire	–	11	–	–	–	–	–	14	367	266	1	2	4	1
Vermont	–	17	–	–	–	–	–	19	241	233	–	4	2	–
Massachusetts	25	233	1	–	5	–	–	212	4,066	4,682	10	235	213	–
Rhode Island	4	30	–	–	2	–	–	41	743	655	1	4	11	–
Connecticut	4	105	–	–	1	1	1	158	3,214	3,177	5	66	59	1
MIDDLE ATLANTIC	102	1,837	–	1	26	–	2	1,997	37,407	40,433	50	1,143	1,672	17
Upstate New York	12	299	–	–	4	–	2	247	5,763	6,323	5	101	110	10
New York City	37	631	–	1	11	–	–	664	16,136	17,757	28	719	1,080	–
New Jersey*	30	477	–	–	9	–	–	653	6,243	6,498	6	150	211	7
Pennsylvania*	23	430	–	–	2	–	–	433	9,265	9,855	11	173	271	–
EAST NORTH CENTRAL	140	1,867	3	–	13	–	–	2,440	54,629	59,482	28	870	898	37
Ohio*	13	284	1	–	5	–	–	567	14,205	14,513	11	223	207	–
Indiana	11	212	–	–	–	–	–	201	5,013	5,320	3	63	48	1
Illinois	80	734	–	–	1	–	–	811	18,202	22,405	10	452	482	7
Michigan*	32	548	–	–	7	–	–	547	12,063	12,210	3	94	113	3
Wisconsin	4	89	2	–	–	–	–	314	5,146	5,034	1	38	48	26
WEST NORTH CENTRAL	21	394	5	–	12	–	3	1,088	18,777	18,707	6	189	179	239
Minnesota	6	87	–	–	1	–	–	143	3,313	3,356	4	58	39	79
Iowa	–	37	–	–	–	–	–	101	2,237	2,385	–	25	19	50
Missouri*	9	163	4	–	6	–	2	469	8,028	7,481	2	68	73	18
North Dakota	2	11	–	–	–	–	–	22	335	270	–	–	–	30
South Dakota	–	17	1	–	–	–	–	30	494	534	–	1	2	47
Nebraska	4	17	–	–	1	–	–	54	1,548	1,557	–	17	13	–
Kansas*	–	62	–	–	4	–	1	269	2,822	3,124	–	20	33	15
SOUTH ATLANTIC	159	2,625	8	2	18	17	77	5,249	86,658	90,110	99	2,321	2,931	108
Delaware	2	21	–	–	–	1	1	198	1,172	1,202	2	15	34	1
Maryland	22	380	1	–	–	1	9	557	11,031	12,485	9	148	238	–
District of Columbia	7	123	–	–	–	–	–	262	5,800	6,247	5	249	240	–
Virginia	14	265	–	–	5	2	23	470	9,012	9,593	11	230	259	2
West Virginia	6	98	–	–	3	1	1	112	1,281	1,173	–	1	15	3
North Carolina	23	464	2	–	1	9	29	1,229	12,930	13,248	12	336	573	2
South Carolina*	10	275	2	–	–	2	3	341	7,922	8,795	5	103	148	1
Georgia	31	291	3	2	2	2	11	1,065	16,757	16,368	26	430	402	75
Florida*	44	708	–	–	7	–	–	1,015	20,753	20,999	29	809	1,022	24
EAST SOUTH CENTRAL	73	1,027	1	2	3	3	13	1,698	31,341	33,199	9	271	391	35
Kentucky	25	246	1	–	–	–	1	302	4,318	4,334	1	33	63	10
Tennessee	17	343	–	1	1	3	17	740	12,536	12,922	2	81	159	19
Alabama	17	265	–	–	1	–	1	354	8,570	9,370	1	48	78	6
Mississippi	14	173	–	1	1	–	–	302	5,917	6,573	5	109	91	–
WEST SOUTH CENTRAL	93	1,354	10	–	6	5	37	2,562	45,838	49,447	56	1,132	1,070	369
Arkansas*	7	150	6	–	–	–	5	288	3,533	4,572	–	25	36	41
Louisiana*	13	274	–	–	–	–	–	232	6,703	7,076	13	239	217	4
Oklahoma	3	118	1	–	–	5	23	213	4,250	4,559	1	30	39	134
Texas	70	812	3	–	6	–	9	1,829	31,352	33,240	42	838	778	190
MOUNTAIN	18	305	3	–	14	1	1	782	14,572	14,822	8	173	269	35
Montana	3	17	1	–	–	1	1	32	733	707	–	–	3	18
Idaho	–	16	–	–	–	–	–	35	706	779	–	4	12	–
Wyoming	–	5	–	–	–	–	–	16	364	320	1	13	6	–
Colorado*	–	50	2	–	7	–	–	226	3,761	3,613	3	50	68	–
New Mexico*	1	45	–	–	–	–	–	62	2,118	2,896	–	30	74	–
Arizona	9	143	–	–	3	–	–	275	4,190	4,431	4	66	78	17
Utah	–	12	–	–	4	–	–	39	841	728	–	4	10	–
Nevada	5	17	–	–	–	–	–	97	1,859	1,348	–	6	18	–
PACIFIC	96	1,776	1	–	37	–	–	2,982	58,450	54,535	81	1,669	2,061	184
Washington*	NA	92	–	–	1	–	–	310	4,223	4,558	NA	56	57	–
Oregon	4	80	–	–	2	–	–	130	4,208	4,149	2	53	53	–
California	83	1,332	1	–	33	–	–	2,369	46,820	43,302	77	1,532	1,908	174
Alaska*	–	22	–	–	–	–	–	94	1,925	1,492	–	10	8	10
Hawaii	9	250	–	–	1	–	–	79	1,274	1,034	2	18	35	–
Guam*	NA	25	–	NA	1	NA	–	NA	90	155	NA	1	1	–
Puerto Rico	8	125	–	1	3	–	–	110	1,190	1,044	13	228	220	20
Virgin Islands	–	1	–	–	–	–	–	8	68	104	–	3	31	–

NA: Not available

*Delayed reports: TB: Pa. add 34, Ohio delete 1, Mich. delete 4, Kans. delete 1, S. Car. delete 19, Fla. delete 3, N. Mex. add 3; Guam add 4 (1977); Tularemia: Ark. add 1 (1977); Typhoid Fever: Mo. delete 1 (1977); RMSF: Pa. add 1, Mo. add 1, S. Car. add 2 (1977); GC: Pa. add 591 civ., La. delete 4 civ., add 44 mil., N. Mex. delete 36 civ. Wash. add 241 civ., add 67 mil., Alaska delete 12 civ., Guam add 1 civ., (1977); Syphilis: Pa. add 6, N. Mex. delete 1 (1977); An. Rabies: N.J. delete 3, Pa. add 1, Colo. add 2 (1977).

Table IV
Deaths in 121 United States Cities*
Week Ending May 21, 1977 — 20th Week

REPORTING AREA	ALL CAUSES					Pneumonia and Influenza
	ALL AGES	65 Years and Over	45-64 Years	25-44 Years	Under 1 Year	ALL AGES
NEW ENGLAND	630	411	157	25	22	29
Boston, Mass.	190	115	48	11	8	5
Bridgeport, Conn.	28	19	7	1	1	3
Cambridge, Mass.	24	19	3	1	1	1
Fall River, Mass.	19	17	2	–	–	–
Hartford, Conn.	45	20	19	5	1	2
Lowell, Mass.	27	17	8	–	1	3
Lynn, Mass.	21	14	6	1	–	–
New Bedford, Mass.	24	20	4	–	–	1
New Haven, Conn.	44	26	11	–	5	1
Providence, R.I.	62	41	15	1	4	5
Somerville, Mass.	11	9	2	–	–	–
Springfield, Mass.	51	34	13	3	1	4
Waterbury, Conn.	31	20	8	–	–	3
Worcester, Mass.	53	40	11	2	–	1
MIDDLE ATLANTIC	2,722	1,681	681	233	60	135
Albany, N. Y.	46	28	8	5	3	1
Allentown, Pa.	27	20	5	–	2	2
Buffalo, N. Y.	111	62	32	11	1	9
Camden, N. J.	28	17	7	4	–	2
Elizabeth, N. J.	33	26	4	3	–	1
Erie, Pa.	28	15	10	1	–	2
Jersey City, N. J.	73	41	27	4	–	–
Newark, N. J.	54	22	21	5	–	3
New York City, N. Y.+	1,372	859	324	132	26	62
Paterson, N. J.	41	27	10	4	–	1
Philadelphia, Pa.	357	205	110	27	9	23
Pittsburgh, Pa.	156	87	44	11	11	12
Reading, Pa.	38	27	5	5	–	1
Rochester, N. Y.	126	86	27	7	–	12
Schenectady, N. Y.	23	16	5	2	–	–
Scranton, Pa.	58	46	9	2	–	2
Syracuse, N. Y.	69	43	12	5	7	–
Trenton, N. J.	21	13	5	1	1	–
Utica, N. Y.	21	15	6	–	–	1
Yonkers, N. Y.	40	26	10	4	–	1
EAST NORTH CENTRAL	2,342	1,333	652	146	112	64
Akron, Ohio	60	37	17	1	2	–
Canton, Ohio	49	29	18	–	1	1
Chicago, Ill.	593	316	178	48	27	16
Cincinnati, Ohio	170	96	50	9	5	2
Cleveland, Ohio	197	109	63	12	6	7
Columbus, Ohio	139	68	44	8	9	8
Dayton, Ohio	108	66	24	13	–	2
Detroit, Mich.	273	145	68	23	26	9
Evansville, Ind.	36	23	12	–	–	–
Fort Wayne, Ind.	51	34	11	2	3	1
Gary, Ind.	15	8	6	–	1	2
Grand Rapids, Mich.	76	46	15	2	8	7
Indianapolis, Ind.	162	100	43	10	5	1
Madison, Wis.	32	19	8	–	4	2
Milwaukee, Wis.	102	70	25	2	3	2
Peoria, Ill.	45	21	12	3	7	1
Rockford, Ill.	41	25	10	3	1	2
South Bend, Ind.	42	24	13	2	2	–
Toledo, Ohio	93	62	19	6	1	–
Youngstown, Ohio	58	35	16	2	1	1
WEST NORTH CENTRAL	727	466	163	43	28	27
Des Moines, Iowa	39	29	–	–	4	–
Duluth, Minn.	22	17	4	–	–	4
Kansas City, Kans.	33	23	4	5	–	–
Kansas City, Mo.	123	72	34	6	7	4
Lincoln, Nebr.	43	29	10	1	1	3
Minneapolis, Minn.	104	64	25	7	5	1
Omaha, Nebr.	66	45	10	6	4	–
St. Louis, Mo.	199	125	53	12	5	8
St. Paul, Minn.	59	42	12	2	–	3
Wichita, Kans.	39	20	11	4	2	4

REPORTING AREA	ALL CAUSES					Pneumonia and Influenza
	ALL AGES	65 Years and Over	45–64 Years	25–44 Years	Under 1 Year	ALL AGES
SOUTH ATLANTIC	1,130	643	304	85	55	53
Atlanta, Ga.	100	55	22	9	9	5
Baltimore, Md.	226	122	63	18	10	5
Charlotte, N. C.	46	28	10	4	1	3
Jacksonville, Fla.	66	44	13	5	2	4
Miami, Fla.	132	76	40	8	4	2
Norfolk, Va.	47	23	17	2	1	3
Richmond, Va.	99	53	33	6	4	8
Savannah, Ga.	24	12	9	1	–	3
St. Petersburg, Fla.	95	75	11	7	–	9
Tampa, Fla.	61	41	13	2	3	5
Washington, D. C.	182	82	59	20	19	5
Wilmington, Del.	52	32	14	3	2	1
EAST SOUTH CENTRAL	680	416	159	48	36	27
Birmingham, Ala.	126	68	27	7	19	4
Chattanooga, Tenn.	56	41	9	2	2	3
Knoxville, Tenn.	32	24	6	–	–	1
Louisville, Ky.	116	64	32	9	7	10
Memphis, Tenn.	154	95	40	14	1	1
Mobile, Ala.	60	38	13	5	2	2
Montgomery, Ala.	44	30	9	1	2	–
Nashville, Tenn.	92	56	23	10	3	6
WEST SOUTH CENTRAL	1,091	596	298	92	43	31
Austin, Tex.	37	15	14	5	–	1
Baton Rouge, La.	64	34	17	5	4	5
Corpus Christi, Tex.	27	12	9	2	2	–
Dallas, Tex.	179	94	54	18	5	3
El Paso, Tex.	43	27	10	2	1	5
Fort Worth, Tex.	78	45	22	4	4	2
Houston, Tex.	197	95	61	18	7	2
Little Rock, Ark.	53	30	16	2	2	2
New Orleans, La.	141	84	36	9	5	1
San Antonio, Tex.	145	77	40	17	5	4
Shreveport, La.	54	33	10	2	6	2
Tulsa, Okla.	73	50	9	8	2	4
MOUNTAIN	468	284	105	32	23	14
Albuquerque, N. Mex.	54	29	11	6	5	–
Colorado Springs, Colo.	25	20	5	–	–	1
Denver, Colo.	108	72	20	6	6	3
Las Vegas, Nev.	31	19	8	2	–	–
Ogden, Utah	19	8	7	2	–	2
Phoenix, Ariz.	107	65	24	9	3	1
Pueblo, Colo.	22	13	3	3	2	3
Salt Lake City, Utah	50	27	11	3	6	4
Tucson, Ariz.	52	31	16	1	1	–
PACIFIC	1,629	1,019	397	97	56	26
Berkeley, Calif.	17	11	3	1	1	–
Fresno, Calif.	61	33	16	6	3	1
Glendale, Calif.	25	20	3	1	–	–
Honolulu, Hawaii	52	25	15	4	4	–
Long Beach, Calif.	105	62	32	3	5	4
Los Angeles, Calif.	494	291	137	35	10	–
Oakland, Calif.	76	48	13	7	3	–
Pasadena, Calif.	39	31	7	1	–	2
Portland, Oreg.	119	76	28	4	6	2
Sacramento, Calif.	69	39	19	3	5	–
San Diego, Calif.	119	76	27	7	4	–
San Francisco, Calif.	182	118	41	15	5	5
San Jose, Calif.	51	40	10	–	1	3
Seattle, Wash.	133	82	32	6	8	4
Spokane, Wash.	51	38	9	2	1	4
Tacoma, Wash.	36	29	5	2	–	1
TOTAL	11,419	6,849	2,916	801	435	406
Expected Number	11,340	6,873	2,945	727	370	390

*By place of occurrence and week of filing certificate. Excludes fetal deaths.
+(NYC) Estimate based on average percent of divisional total

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Giardiasis – continued

asis. In Camas and in Berlin (on the Amonoosuc), pressure filters without sedimentation and proper flocculation failed to remove *Giardia* cysts. The Androscoggin water treatment plant in Berlin has sedimentation, flocculation, and rapid sand filters; however, flocculation difficulties and cross connections between unfiltered and finished water decreased the plant's effectiveness. Nevertheless, it has been shown that properly functioning sedimentation, flocculation, and filtration will remove particles the size of *Giardia* cysts from water, and thus can provide safe drinking water in distribution systems utilizing surface water (*1*).

Reference

1. Fair GM, Geyer JC: Water Supply and Waste-Water Disposal. New York, John Wiley & Son, Inc., 1956

Current Trends

Measles – United States

During the first 18 weeks of 1977, 30,083 cases of measles have been reported in the United States, an increase of 51.8% from the 19,817 reported during the first 18 weeks of 1976 and 93.1% above the median 15,576 cases for the preceding 5-year period. The incidence of measles in 1977 is greater for each 4-week period than in the corresponding 4 weeks of 1976; however, the differences have become less marked as the year has progressed. For the first 4 weeks of 1977, for instance, there was a 108.7% increase in reported measles compared to the first 4 weeks of 1976; by weeks 13-16, the increase was down to 35.4% (Table 1).

TABLE 1. Reported measles by 4-week periods, United States, 1976-1977.

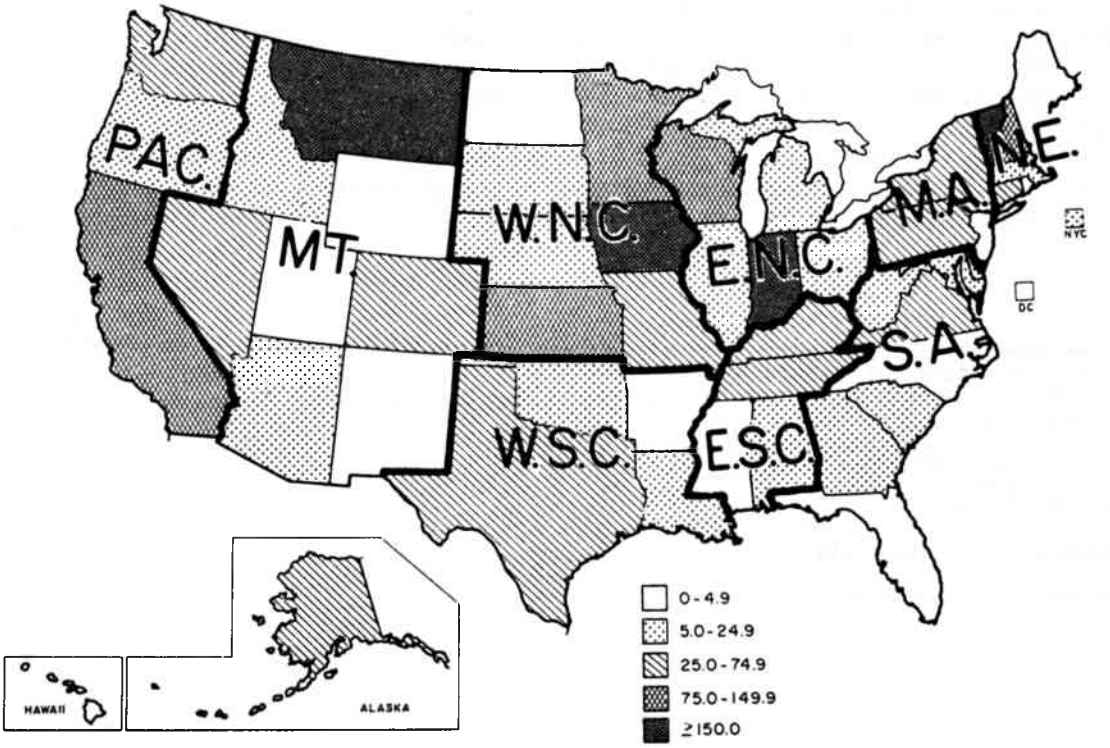
Weeks	1977 No. Cases	1976 No. Cases	% Change 1976-1977
1-4	3,389	1,624	+108.7
5-8	5,394	2,949	+82.9
9-12	7,565	5,502	+37.5
13-16	8,691	6,417	+35.4

Six of the 9 reporting areas have reported increased numbers of cases over comparable time periods in 1976, ranging from a 63% increase in the South Atlantic States to a 13-fold increase in the East North Central States. The Middle Atlantic, East North Central, and Mountain States have reported fewer cases in the first 18 weeks of 1977 than in 1976. All states have reported at least 1 case during 1977.

The highest measles incidence per 100,000 population <18 years old has been reported from the West North Central Region: 113.4 cases per 100,000 compared to the national incidence of 46.1. Four states – Montana, Iowa, Indiana, and Vermont – have reported a measles incidence of greater than 150 cases per 100,000 population for the first 18 weeks (Figure 1). Five states – Maine, North Carolina, Arkansas, Wyoming, and Utah – and the District of Columbia have reported less than 2 cases per 100,000 population less than 18 years old.

Reported by the Immunization Div, Bur of State Services, and the Field Services Div, Bur of Epidemiology, CDC.

FIGURE 1. Measles incidence by state per 100,000 population <18 years old, first 18 weeks of 1977*



*1976 Provisional Estimate

Epidemiologic Notes and Reports

Gastrointestinal Illness Aboard the *T.s.s. Fairsea*

Outbreaks of gastrointestinal illness occurred on 3 consecutive voyages of a cruise ship, the *T.s.s. Fairsea*. The first cruise (April 23-30) and the second cruise (April 30-May 7) were 7-day round trip cruises from Los Angeles with 1-day visits to 2 ports in Mexico. The third cruise (May 7-21) was a 14-day cruise from Los Angeles to San Juan, Puerto Rico, with visits to 2 ports in Mexico and 4 in the Caribbean.

On the first cruise an outbreak of gastrointestinal illness began late April 24 and peaked on the third day of the cruise before reaching the first Mexican port. A questionnaire survey revealed that 514 passengers (58%) and 22 crew members (5%) were ill. None of these crew members worked in food preparation. The illness was characterized by diarrhea, vomiting, and abdominal cramps with headache reported in approximately half and fever reported in approximately one-quarter of cases. Symptoms lasted 2 days or less in 92% of ill individuals. Illness was not associated with any meal or food item, but risk of illness did increase with increasing consumption of water (p=.002). Approximately 200 passengers visited the ship's physicians. Stool specimens were negative for *Salmonella, Shigella, Vibrio parahaemolyticus, Bacillus cereus,* and *Yersinia enterocolitica*. One culture grew toxigenic *Escherichia coli.* Viral studies are pending. A sanitary inspection of the vessel failed to reveal any major deficiency in food or water handling, and the water distribution system had adequate residual chlorine. No coliform bacteria were found in water and ice samples.

On the second cruise, 30 of approximately 900 passengers visited the ship's physicians for a gastrointestinal illness similar to, but milder than, that seen on the first cruise. A telephone survey of 61 randomly selected passengers found that 30 (49%) individuals reported illness. The outbreak peaked on the fifth day of the cruise.

On the ninth day of the third cruise, 20 passengers reported to the ship's physicians for treatment of gastroenteritis, increasing the number seen since the beginning of the voyage to 29. An investigation found that 289 passengers (37%) and 7 crew members (2%) reported a gastrointestinal illness during the first 11 days of the third cruise, with the peak incidence occurring on the ninth day. None of the ill crew members were kitchen workers. The symptoms were similar to and as mild as those reported by passengers on the second cruise, and the duration of illness was usually 1-2 days. An increased risk of illness was again associated with consumption of increasing amounts of water (p=.007). Stool specimens were obtained for bacterial and viral studies. A sanitary inspection again revealed adequate chlorine levels in the water distribution system and no major deficiencies in food handling. No coliform bacteria were isolated from water and ice samples obtained on May 20, when the ship docked in St. Thomas. The environmental investigation revealed that bilge water sometimes covered the suction line from one of the fresh water storage tanks. Water from this storage tank was used twice during the outbreak period of the May 7-21 cruise, but at no time immediately before or during the outbreak periods of the April 23-30 and April 30-May 7 cruises. This defect was corrected before the ship departed on its present cruise.

Reported by Quarantine Div, Field Services Div, and Enteric Diseases Br, Bacterial Diseases Div, Bur of Epidemiology, CDC.

Editorial Note: The cause and source of these 3 outbreaks remain unknown. CDC is continuing to investigate the ship's water distribution system, to monitor gastrointestinal illness during the current cruise, and to process laboratory specimens. During the third consecutive outbreak of gastrointestinal illness, CDC requested that the cruise line inform all passengers booked for the May 21-June 4 cruise of the situation. The cruise line sent telegrams to travel agents stating the existence of these 3 consecutive, and increasingly mild, outbreaks of gastroenteritis and informing them of the unknown risk of similar illness to future passengers.

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE / CENTER FOR DISEASE CONTROL
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Director Designate, Center for Disease Control, William H. Foege, M.D.
Director, Bureau of Epidemiology, Philip S. Brachman, M.D.
Editor, Michael B. Gregg, M.D.
Managing Editor, Anne D. Mather, M.A.
Chief, MMWR Statistical Activity, Dennis J. Bregman, M.S.

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