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III. WATERBORNE DISEASE OUTBREAKS, 1973

This report summarizes data from waterborne disease outbreaks reported to CDC during 1973.

A. Definition of Outbreak

A waterborne disease outbreak is defined in this report as an incident in which (1) 2 or more persons experience similar illness after consumption of water, and (2) epidemiologic evidence implicates the water as the source of the illness. In most of the reported outbreaks the implicated water source was demonstrated to be contaminated; only outbreaks associated with water used for drinking are included.

B. Source of Data

Waterborne disease outbreaks are reported to CDC by written communications from state health departments. No standard reporting form is used but one has recently been devised and is presently being field tested in 8 states. In addition, the Water Supply Research Laboratory, Environmental Protection Agency (EPA), contacts all state water supply agencies to obtain information about additional outbreaks. Personnel from CDC and EPA work together in the evaluation and investigation of waterborne disease outbreaks.

When requested by a state health department, CDC and EPA can offer epidemiologic assistance and provide expertise in the engineering and environmental aspects of water purification. Data from all outbreaks are reviewed and summarized by representatives from CDC and EPA. A line listing of reported waterborne outbreaks in 1973 is included (see pages 40-41).

In this report municipal systems are public or investor owned water supplies that may serve either large or small communities. Individual water systems, generally wells or springs, are used exclusively by single residences in areas that are without municipal systems. Semi-public water systems, also found in areas without municipal systems, are developed and maintained for use by several residences (e.g. subdivisions), industries, camps, parks, resorts, institutions, hotels, and other establishments without municipal supplies in which the general public is likely to have access to drinking water.

C. Interpretation of Data

The data included in this summary of waterborne disease outbreaks have limitations similar to those outlined in the foodborne disease summary and must be interpreted with caution since they represent only a small part of a larger public health problem. These data are helpful in revealing the various etiologies of waterborne disease, the seasonal occurrence of outbreaks, and the deficiencies in water systems that most frequently result in outbreaks. As in the past, the pathogen(s) responsible for many outbreaks remains unknown. It is hoped that advances in laboratory techniques and standardization of reporting of waterborne disease outbreaks will augment our knowledge of waterborne pathogens and the factors responsible for waterborne disease outbreaks.

D. The Data

There were 24 waterborne disease outbreaks (see pages 43-44) involving 1,720 cases reported to CDC in 1973 (Table 1).

Table 1

	Waterborne Disease Outbreaks, 1973			
	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>Total</u>
Outbreaks	18	29	24	71
Cases	5,179	1,638	1,720	8,537

The largest outbreak occurred in Arkansas in July when 225 persons developed a syndrome diagnosed as "sewage poisoning." Two elderly residents of a nursing home

died with shigellosis in an outbreak in Maryland in December 1973; these were the only reported deaths in waterborne outbreaks during 1973.

Figure 1 shows the geographic distribution of these outbreaks by state. Twelve (24%) states reported at least 1 outbreak.

Fig. 1 WATERBORNE OUTBREAKS, 1973



Figure 2 depicts the trend in reported waterborne disease outbreaks over the last 3 decades. During the last 3 years, there has been an increase in the annual average number of reported outbreaks. This increase probably represents in part a renewed interest in the reporting of disease outbreaks and in other surveillance activities.

Fig. 2 AVERAGE ANNUAL NUMBER WATERBORNE DISEASE OUTBREAKS, 1938-1973

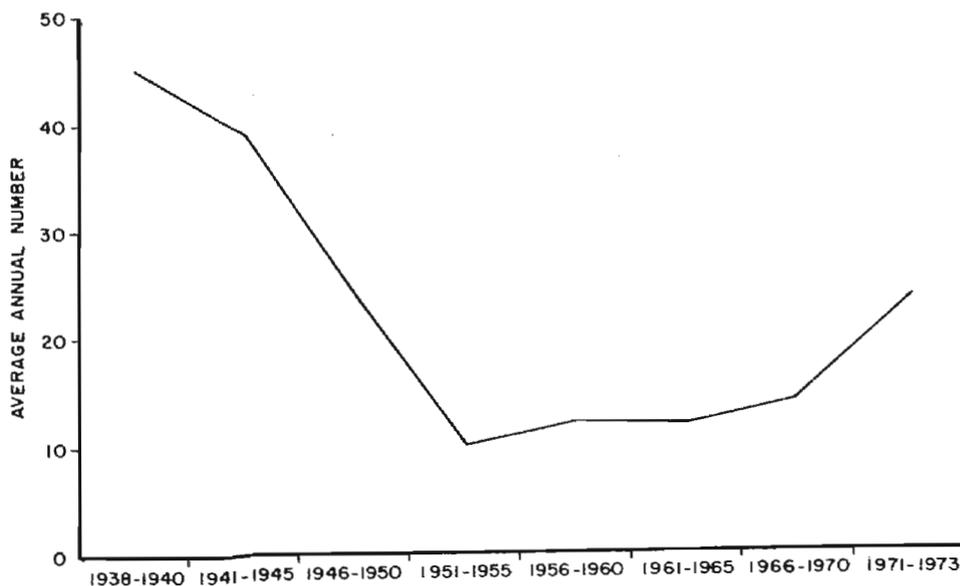


Table 2 shows the number of outbreaks and cases by etiology and type of water system. Thirteen (54%) outbreaks with 1,065 (62%) cases are grouped under the category of "sewage poisoning." These include outbreaks characterized by nausea, vomiting, diarrhea, and fever for which no specific etiologic agent could be identified. Shigellosis was the illness of known etiology which caused the most outbreaks and cases.

Table 2

	MUNICIPAL		SEMI-PUBLIC		INDIVIDUAL		TOTAL	
	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases
"Sewage poisoning"	2	268	11	797			13	1,065
Shigellosis	1	50	2	275	1	2	4	327
Hepatitis A	1	50	1	35			2	85
Giardiasis	1	12	1	16			2	28
Typhoid fever			1	210	1	2	2	212
Chemical poisoning	—	—	—	—	<u>1</u>	<u>3</u>	<u>1</u>	<u>3</u>
TOTAL	5	380	16	1,333	3	7	24	1,720

The data in table 2 indicate that outbreaks most commonly involved semi-public systems (67%) compared with municipal (21%) and individual (13%) water systems. Outbreaks attributed to water from municipal systems affected an average of 76 persons (380/5) compared with 83 (1,333/16) persons in outbreaks caused by water from semi-public systems, and 2 (7/3) persons in outbreaks attributed to water from individual systems. Semi-public systems were responsible for over 3 times as many outbreaks and cases as municipal systems.

The distribution of all outbreaks by month is shown in Table 3. A seasonal variation is apparent with 14 (61%) of 23 outbreaks occurring during June, July, and August.

Table 3

Waterborne Disease Outbreaks by Month of Occurrence, 1973

<u>Month</u>	<u>Number of Outbreaks</u>	<u>Month</u>	<u>Number of Outbreaks</u>
January	0	July	4
February	2	August	5
March	1	September	1
April	1	October	1
May	0	November	0
June	5	December	3
Total		23*	

*1 month unknown

Additional analysis of the 16 outbreaks associated with the semi-public water supplies (Table 4) indicates that 12 (75%) occurred in visitors to areas used mostly for recreational purposes and that 11 (92%) of the 12 occurred between June and September.

Table 4

Waterborne Disease Outbreaks Involving Semi-Public Water Supplies,
by Month and Population Affected, 1973

<u>Month</u>	<u>Number of Outbreaks</u>	<u>Usual Population*</u>	<u>Visitors**</u>
January	0		
February	1	1	
March	1	1	
April	0		
May	0		
June	4		4
July	3	1	2
August	4		4
September	1		1
October	0		
November	0		
December	<u>2</u>	<u>1</u>	<u>1</u>
Total	16	4	12

* Outbreaks affecting individuals using the water supply on a regular basis

** Outbreaks affecting individuals not using the water supply on a regular basis

Table 5 classifies outbreaks and cases by type of water system and the system deficiency responsible for the outbreak. Treatment deficiencies (46%), including inadequate chlorination and breakdown in chlorination equipment, and untreated ground water (33%) were the factors most often associated with outbreaks. In 1 outbreak involving a municipal system, a deficiency in the distribution system was responsible. Treatment deficiencies were also responsible for most of the outbreaks involving semi-public systems.

Table 5

Waterborne Disease Outbreaks, by Type of System and Cause of System Deficiency, 1973

	MUNICIPAL		SEMI-PUBLIC		INDIVIDUAL		TOTAL	
	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases
Untreated surface water	1	74	1	16			2	90
Untreated ground water	1	12	5	174	2	4	8	190
Treatment deficiencies*	2	100	9	1,141			11	1,241
Deficiencies in distribution system	1	194					1	194
Miscellaneous**			1	2	1	3	2	5
TOTAL	5	380	16	1,333	3	7	24	1,720

*Includes outbreaks in systems using a known contaminated source for which chlorination is required at all times to ensure potability

**Includes 1 outbreak of "sewage poisoning" traced to contaminated bottled water and 1 outbreak of selenium toxicity traced to contaminated ground water

E. Waterborne Outbreaks on Cruise Ships, 1973

An explosive waterborne outbreak of shigellosis affecting approximately 690 passengers and crew which occurred aboard a cruise ship in the Caribbean Sea in June 1973 was not included in the 1973 data. Epidemiologic investigation implicated water and ice aboard the ship as vehicles of transmission. Six water samples obtained from the distribution system at the time of the outbreak contained elevated total and fecal coliform counts.

An investigation revealed that chlorination was inadequate. Chlorine was added to the water 20 feet proximal to charcoal filters, resulting in a contact time of only 4 seconds. Additional investigation revealed improper bunkering practices. After flushing the ship's salt water fire system with fresh water, crew members extended a hose from a fire hydrant aboard the ship to an air relief vent of a holding tank to fill the tank, permitting contamination of the water with organisms originally present in the salt water in the fire system.

Control measures included recommendations to chlorinate water at the time of bunkering, and to install an automatic hypochlorinator, a free-residual-chlorine feedback control analyzer, and a chart recorder to monitor free residual chlorine. The company was also advised to cease the practice of bunkering water through the air relief vents. The vessel cancelled its next cruise to implement the recommended control measures. No cases of shigellosis were identified on subsequent cruises.

F. Line Listing of Waterborne Disease Outbreaks, 1973

<u>State</u>	<u>Month</u>	<u>Disease</u>	<u>Cases</u>	<u>Type of System</u>	<u>System Deficiency*</u>
Alabama	Feb-Mar	Hepatitis A	50	Municipal	(3)
Alabama	? 71**	Selenium poisoning	3	Individual	(5)
Alaska	July	Shigellosis	50	Municipal	(3)
Arkansas	July	"Sewage poisoning"	225	Semi-public	(3)
Arkansas	August	"Sewage poisoning"	42	Semi-public	(2)
Arizona	June	Shigellosis	2	Individual	(2)
Connecticut	August	"Sewage poisoning"	74	Municipal	(1)
Colorado	Dec 72-Jan 73	Giardiasis	12	Municipal	(2)
Colorado	July	Giardiasis	16	Semi-public	(1)
Florida	Feb-Mar	Typhoid fever	210	Semi-public	(3)
Florida	Oct-Nov	"Sewage poisoning"	194	Municipal	(4)
Maryland	Apr-May	Typhoid fever	2	Individual	(2)
Maryland	Dec 73-Jan 74	Shigellosis	94	Semi-public	(2)
New Jersey	March	"Sewage poisoning"	2	Semi-public	(5)
New Jersey	June	"Sewage poisoning"	22	Semi-public	(2)
New Jersey	August	"Sewage poisoning"	46	Semi-public	(2)
Ohio	July-Aug	Hepatitis A	35	Semi-public	(2)
Oregon	July	"Sewage poisoning"	29	Semi-public	(2)
Pennsylvania	June	"Sewage poisoning"	38	Semi-public	(3)

Pennsylvania	June	"Sewage poisoning"	71	Semi-public	(3)
Pennsylvania	Aug	Shigellosis	181	Semi-public	(3)
Pennsylvania	Aug	"Sewage poisoning"	24	Semi-public	(3)
Pennsylvania	Sept	"Sewage poisoning"	153	Semi-public	(3)
Pennsylvania	Dec	"Sewage poisoning"	145	Semi-public	(3)

- *(1) Untreated surface water
- (2) Untreated ground water
- (3) Treatment deficiencies
- (4) Deficiencies in distribution system
- (5) Miscellaneous

**Outbreak occurred during 1971 but was investigated and reported in 1973

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Brucella

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Probable Botulism - Washington 22(38):317
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*Type B Botulism - Alaska 23(1):2

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*C. perfringens Food Poisoning - Tennessee 23(2):19

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Food Poisoning Due to S. chester - Massachusetts 22(36):302
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S. blockley Foodborne Disease Outbreak - Illinois 22(49):408
*S. reading Gastroenteritis - Virginia 23(3):27
*S. eastbourne Infections - Colorado, Illinois, Louisiana, Massachusetts, Michigan,
Minnesota, New Hampshire, New Jersey, New York, South Dakota, Wisconsin,
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*Salmonellosis on a Passenger Cruise Ship 23(8):70

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*Wild Mushroom Poisoning - Pennsylvania 23(6):50

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*Giardia lamblia Infection in Travelers to the Soviet Union 23(9):78
*Waterborne Shigellosis - Arizona 23(11):105

*Outbreak occurred in 1973; reported in MMWR in 1974