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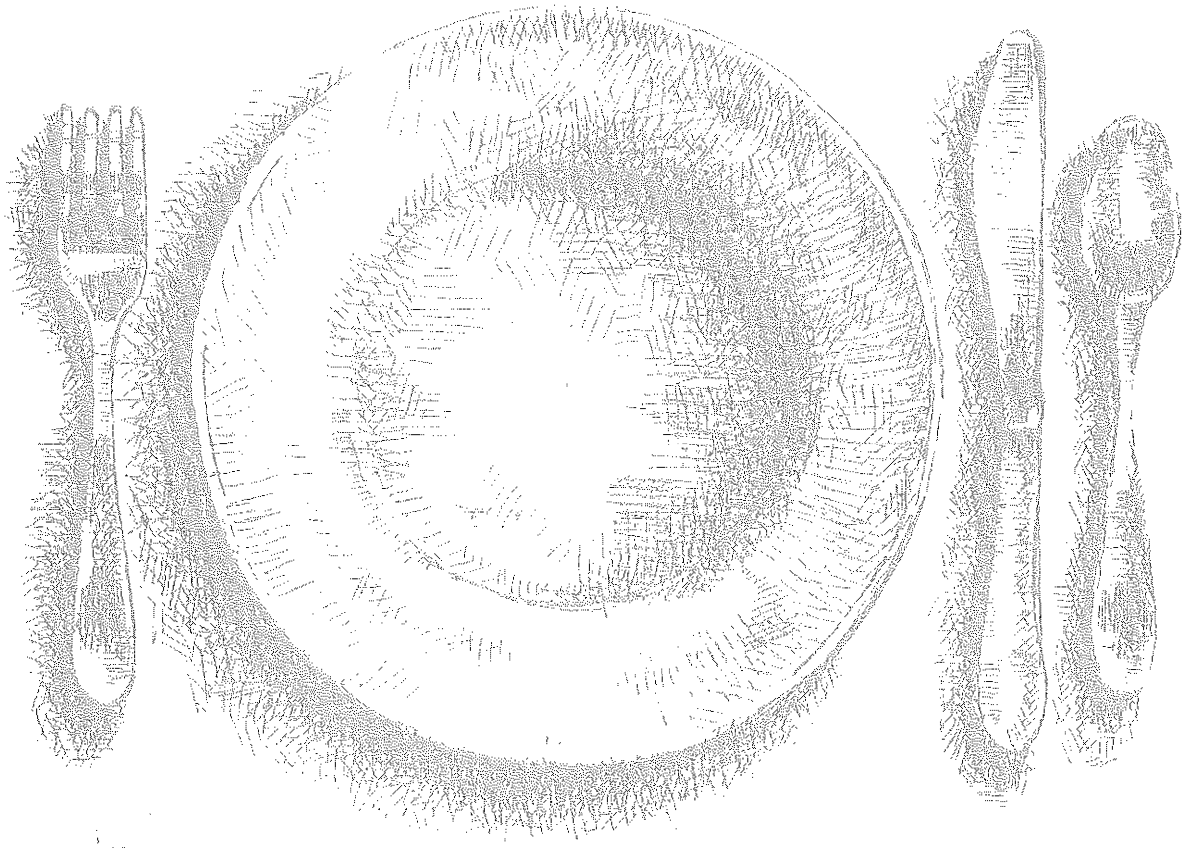
CENTER FOR DISEASE CONTROL

FOODBORNE & WATERBORNE DISEASE OUTBREAKS



U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE / Public Health Service

This report summarizes information received from state and city health departments, the Food and Drug Administration, the U.S. Department of Agriculture, and other pertinent sources. The information is preliminary and is intended primarily for use of those with responsibility for disease control activities. Anyone desiring to quote this report should contact the Enteric Diseases Branch for confirmation and further interpretation.

Contributions to the report are most welcome. Please address them to:

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I. INTRODUCTION

The reporting of foodborne and waterborne diseases in the United States began about 50 years ago when state and territorial health officers, concerned about the high morbidity and mortality caused by typhoid fever and infantile diarrhea, recommended that cases of enteric fever be investigated and reported. Their purpose was to obtain information about the role of food, milk, and water in outbreaks of intestinal illness as the basis for sound public health action. Beginning in 1923, the United States Public Health Service published summaries of outbreaks of gastrointestinal illness attributed to milk. In 1938 reports of outbreaks caused by all foods were added to these summaries. These early surveillance efforts led to the enactment of important public health measures which had a profound influence in decreasing the incidence of enteric diseases, particularly those transmitted by milk and water.

From 1951 through 1960, reported outbreaks of foodborne illness were reviewed and published annually in Public Health Reports by the National Office of Vital Statistics. In 1961, responsibility for reporting was transferred to the Communicable Disease Center (CDC). From 1961 to 1966, the publishing of annual reviews was discontinued, but pertinent statistics and detailed individual investigations were reported in the Morbidity and Mortality Weekly Report (MMWR).

The present system of surveillance of foodborne and waterborne diseases began in 1966 with the incorporation of all reports of enteric disease outbreaks attributed to microbial or chemical contamination of food or liquid vehicles into an annual summary. Since 1966, the quality of investigative reports has improved primarily as a result of more active participation by state and federal agencies in the investigation of foodborne and waterborne outbreaks. In this report data from foodborne and waterborne disease outbreaks reported to CDC in 1973 are summarized.

Foodborne and waterborne disease surveillance has traditionally served 3 objectives:

1. Disease Control: Early identification and removal of contaminated products from the commercial market, correction of faulty food preparation practices in food service establishments and in the home, and identification and appropriate treatment of human carriers of foodborne pathogens are the fundamental control measures resulting from surveillance of foodborne disease. Identification of contaminated water sources and adequate purification of these sources are the primary control measures in the surveillance of waterborne disease outbreaks. Rapid reporting and thorough investigation of outbreaks are important for prevention of subsequent outbreaks.

2. Knowledge of Disease Causation: The responsible pathogen has not been identified in 30 to 60% of foodborne disease outbreaks reported to CDC in each of the last 5 years. The appreciation in England of Clostridium perfringens as an important foodborne pathogen and an awareness in Japan of the role of Vibrio parahaemolyticus in foodborne illness 15 years before the importance of either organism as a foodborne pathogen was recognized in the United States emphasizes the need for a detailed description of clinical, epidemiologic and laboratory features in the investigation of foodborne outbreaks. The importance of some foodborne pathogens, e.g., Bacillus cereus and pathogenic Escherichia coli, still needs to be defined. The etiologic agent(s) responsible for "sewage poisoning," the most commonly reported cause of waterborne outbreaks, also awaits identification.

3. Administrative Guidance: The collection of data from outbreak investigations permits assessment of trends in etiologic agents and food vehicles and focuses on common errors in food and water handling. By compiling the data in an annual summary, it is hoped that local and state health departments and others involved in the implementation of food and water protection programs will be kept informed of the factors involved in food and waterborne outbreaks. Comprehensive surveillance should result in a clearer appreciation of priorities in food and water protection, institution of better training programs, and more rational planning.

II. FOODBORNE DISEASE OUTBREAKS

A. Definition of Outbreak

For the purpose of this report a foodborne disease outbreak is defined as an incident in which:

1. 2 or more persons experience a similar illness, usually gastrointestinal, after ingestion of a common food, and
2. epidemiologic analysis implicates the food as the source of the illness.

There are a few exceptions; 1 case of botulism or chemical poisoning constitutes an outbreak.

In this report outbreaks have been divided into 2 categories:

1. Laboratory confirmed -- Outbreaks in which laboratory evidence of a specific etiologic agent is obtained and specified criteria are met (see pages 32-34).
2. Undetermined etiology -- Outbreaks in which epidemiologic evidence implicates a food source, but adequate laboratory confirmation is not obtained. These outbreaks are subdivided into 4 subgroups by incubation period of the illnesses -- less than 1 hour (probable chemical), 1 to 7 hours (probable staph), 8 to 14 hours (probable C. perfringens), and greater than 14 hours (other infectious agents).

B. Source of Data

Participants in foodborne disease surveillance include the general public and local, state, and federal agencies which have responsibility for public health and food protection. Complaints of illness originate with the general public (e.g. consumer, physicians, hospital personnel, food service establishments and the food processing industry) and are then reported to health departments or regulatory agencies. Most epidemiologic investigations are carried out by local health department personnel (epidemiologists, sanitarians, public health nurses, etc.) and are subsequently reported to state health departments. State agencies concerned with food safety frequently participate in the initial investigation of the outbreak and offer laboratory support. Utilizing the standard CDC reporting form (see pages 15 and 16), a summary of the outbreak is sent to CDC. A line listing of reported foodborne outbreaks in 1973 is included (see pages 16-31).

The 2 federal regulatory agencies which have the major responsibilities for food protection, the Food and Drug Administration (FDA) and the U.S. Department of Agriculture (USDA), participate actively in the CDC surveillance program. They report episodes of foodborne illness to CDC and to state and local health authorities. CDC and state and local health authorities in turn report to FDA or USDA any foodborne disease outbreaks which might involve commercial products. Both agencies assist state and local health departments in epidemiologic and laboratory investigations.

This notification procedure is ideal, but variations often occur. If an outbreak is large or if multiple local jurisdictions are involved, a local health department may ask for immediate assistance from the state health department. If an outbreak involves illness in persons from more than 1 state, CDC should be notified during the investigation of the outbreak and may provide epidemiologic assistance. CDC also renders assistance in large intrastate outbreaks when requested.

In suspect botulism cases, physicians and health authorities are urged to promptly notify CDC. In such instances CDC works closely with physicians, state and local health authorities, and FDA or USDA representatives to provide diagnostic and therapeutic consultation and to rapidly identify responsible foods and remove them from market, preventing further public consumption.

Outbreaks are occasionally reported to CDC through communications to the Morbidity and Mortality Weekly Report or by the U.S. Armed Forces, pharmaceutical companies (notably in the case of botulism outbreaks), and private physicians. Reports to other CDC surveillance systems, including those for hepatitis, brucellosis, and trichinosis also provide information about foodborne outbreaks.

C. Interpretation of Data

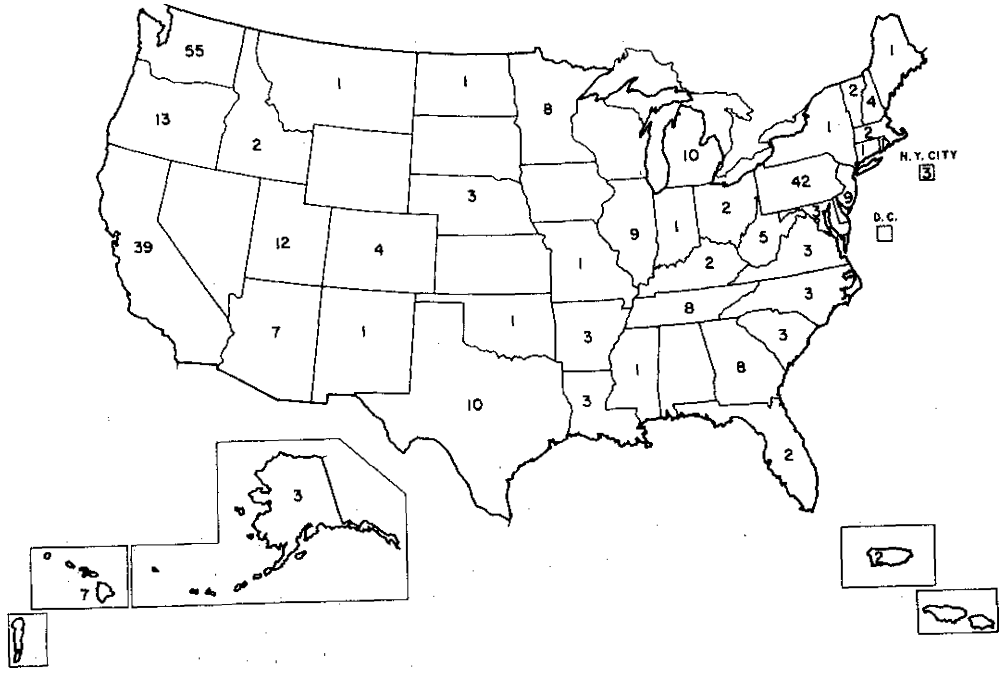
As in the past, the variation in quality of foodborne disease investigation and reporting among state and local health departments places limitations on the data presented in this report. A number of factors, including consumer awareness, physician interest, and health department budgetary constraints and investigative and laboratory capabilities vary considerably.

These data, based upon a variety of reporting systems, must be used carefully as they present only a selected part of a public health problem, the true dimension of which is unknown.

D. The Data

Figure 1 shows the geographic distribution of the 307 foodborne outbreaks reported for 1973; 8 states and the District of Columbia reported no outbreaks. Of the 307 outbreaks, 300 (98%) emanated from state, local, or territorial health departments, 2 were reported by the U.S. Armed Forces, 3 by other federal agencies, and 1 by a private physician.

Fig. 1 REPORTED FOODBORNE OUTBREAKS, 1973*



*5 OUTBREAKS – MORE THAN 1 STATE INVOLVED

A comparable number of outbreaks were reported in 1971, 1972, and 1973 (Table 1). As in 1972, the 3 state health departments reporting the most outbreaks in 1973 were Washington, Pennsylvania, and California; these 3 states reported 44% of the total outbreaks. Compared with 1972, a substantial increase in reported outbreaks was apparent in 1973 in Minnesota, Oregon, Tennessee, Texas, and Utah, while decreases occurred in Kansas, New Jersey, and Wisconsin.

In the 307 outbreaks, 12,447 cases of foodborne illness were reported. Laboratory confirmation was obtained for 127 (41%) of these outbreaks which accounted for 7,711 cases (62%). Bacterial pathogens accounted for 66% of outbreaks and 89% of cases of confirmed etiology (Table 2).

Despite the implementation of strict criteria for laboratory confirmation in 1972, 41% of outbreaks were confirmed in 1973 and 45% in 1972 compared with only 29% in 1971. The overall frequency of confirmed outbreaks and cases of bacterial etiology was approximately the same in 1972 and 1973. However, the proportion of confirmed outbreaks caused by Staphylococcus aureus decreased in 1973; this apparent

decrease probably reflects the fact that quantitation of staphylococci isolated from implicated foods was lacking from many reports (criteria for confirmation were therefore not satisfied) rather than a true decrease in staphylococcal foodborne disease. An increase in the number of outbreaks and cases caused by shigella and fish toxins occurred in 1973. The large increase in cases due to fish toxins may be explained in part by the occurrence of an outbreak of scombroid fish poisoning involving 232 cases and traced to a commercial product. Chemical food poisoning was responsible for 22% of the outbreaks of known etiology reported in 1973 compared with 21% for 1972.

Fifteen deaths were reported in outbreaks in 1973: Clostridium botulinum was responsible for 4, C. perfringens 1, salmonella 7, Trichinella spiralis 1, and mushroom poisoning 1; 1 death occurred in an outbreak of unconfirmed etiology.

Table 1

Foodborne Disease Outbreaks, by Location, 1971-1973*

State	1971	1972	1973	State	1971	1972	1973
Alabama	2	1	0	Missouri	2	3	1
Alaska	5	2	3	Montana	2	0	1
Arizona	1	4	7	Nebraska	3	2	3
Arkansas	3	9	3	Nevada	1	0	0
California	31	34	39	New Hampshire	2	1	4
Colorado	1	6	4	New Jersey	14	22	9
Connecticut	2	0	1	New Mexico	9	0	1
Deleware	2	0	0	New York City	16	0	3
District of Columbia	1	2	0	New York State	9	3	1
Florida	5	3	2	North Carolina	2	3	3
Georgia	11	13	8	North Dakota	1	1	1
Hawaii	10	12	7	Ohio	8	5	2
Idaho	3	0	2	Oklahoma	6	6	1
Illinois	5	8	9	Oregon	0	6	13
Indiana	1	4	1	Pennsylvania	14	33	42
Iowa	4	0	0	Puerto Rico	4	5	2
Kansas	4	11	0	Rhode Island	1	1	1
Kentucky	3	5	2	South Carolina	15	5	3
Louisiana	3	2	3	South Dakota	1	2	0
Maine	1	0	1	Tennessee	3	2	8
Maryland	6	4	3	Texas	3	4	10
Massachusetts	2	3	2	Utah	4	0	12
Michigan	14	11	10	Vermont	1	1	2
Minnesota	6	2	8	Virginia	2	3	3
Mississippi	1	0	1	Washington	57	45	55
Other				West Virginia	0	1	5
Virgin Islands	0	0	0	Wisconsin	8	6	0
Guam and Trust				Wyoming	0	0	0
Territories	2	1	0	Others**	3	2	5
Canal Zone	0	2	0				

1971 total 320
1972 total 301
1973 total 307

*Annual Summaries, 1971-1973
**Others include 2 unknown and 8 multiple state outbreaks

Table 2

Confirmed Foodborne Disease Outbreaks and Cases, by Bacterial and Non-bacterial Etiology, 1972-1973

	1972				1973			
	Outbreaks		Cases		Outbreaks		Cases	
	#	%	#	%	#	%	#	%
BACTERIAL								
B. cereus	0	0.0	0	0.0	1	0.8	2	0.03
Brucella	0	0.0	0	0.0	1	0.8	4	0.1
C. botulinum	4	2.9	24	0.4	10	7.9	31	0.4
C. perfringens	9	6.6	973	16.2	9	7.1	1,424	18.5
Salmonella	36	26.5	1,880	31.4	33	26.0	2,462	31.9
Shigella	3	2.2	86	1.4	8	6.3	1,388	18.0
Staphylococcus	34	25.0	1,948	32.5	20	15.7	1,272	16.5
Group A streptococcus	1	0.7	35	0.6	1	0.8	250	3.2
Group D streptococcus	1	0.7	50	0.8	0	-	0	-
V. parahaemolyticus	6	4.4	701	11.7	1	0.8	2	0.03
Alkalescens dispar	1	0.7	39	0.7	0	-	0	-
Subtotal	95	69.9	5,736	95.7	84	66.2	6,835	88.6
PARASITIC								
T. spiralis	8	5.9	20	0.3	10	7.9	59	0.8
VIRAL								
Hepatitis A	5	3.7	90	1.5	5	3.9	425	5.5
CHEMICAL								
Chinese restaurant syndrome (MSG)	1	0.7	3	0.1	2	1.6	6	0.1
Mushroom poisoning	9	6.6	21	0.4	9	7.1	41	0.5
Fish toxin	9	6.6	82	1.4	14	11.0	333	4.3
Heavy metal	3	2.2	8	0.1	0	-	0	-
Other chemical	6	4.4	32	0.5	3	2.4	12	0.2
Subtotal	41	30.1	256	4.3	43	33.9	876	11.4
Total Known Etiology	136	100.0	5,992	100.0	127	100.1	7,711	100.0

Table 3 lists the outbreaks of undetermined etiology by median incubation periods. If one assumes that most outbreaks in which the median incubation period was less than 1 hour were of chemical etiology, that those in which the median incubation period was 1-7 hours were of staphylococcal etiology, and that those in which the median incubation period was 8-14 hours were caused by C. perfringens, then these agents were responsible for substantially more outbreaks than suggested by the data (Table 2). The median incubation period was between 1 and 7 hours in 48% of outbreaks of unknown etiology in which the incubation period of the illness was known. That few outbreaks of C. perfringens were confirmed is related in part to the problems involved in the transport and culturing of anaerobic specimens.

Table 3

Foodborne Disease Outbreaks of Unknown Etiology, by Incubation Period, 1973

Incubation Period	Number of Outbreaks	Percent of Total Outbreaks
<1 hour	9	5
1-7 hours	77	43
8-14 hours	45	25
>15 hours	29	16
Unknown	20	11
Total	180	100

Table 4 lists vehicles of transmission by specific etiology. The most commonly incriminated vehicles were beef (9%), pork and pork products including ham (9%), fish and shellfish (7%), meat, fish, and vegetable salads (7%), and poultry (6%). In 86 outbreaks (28%) vehicles were unknown. Staphylococcal intoxication was most often associated with pork and pork products including ham, C. perfringens outbreaks with various meats, and salmonella outbreaks with a variety of foods, most of which were of animal origin.

Table 5 lists the settings in which the outbreaks occurred. About one-third of the outbreaks occurred in homes (39%) and one-third in restaurants (32%). Five percent of outbreaks occurred in schools; all of the school outbreaks where the etiology was known were attributed to a bacterial pathogen.

The location where the food responsible for the outbreaks was improperly handled is shown in Table 6. Food processing establishments are locations where a food is prepared for market. Food service establishments are locations where food is prepared for public consumption, i.e., restaurants, cafeterias, caterers, institutions. In 1973 food service establishments were responsible for the mishandling of food in 36% of all outbreaks and in 56% of outbreaks in which the place of mishandling was reported. The homemaker was responsible for 36% of outbreaks in which the place of mishandling was reported while the food processing industry was responsible for only 8% (Table 7). When all outbreaks are considered, the food processing industry was responsible for only 4.9% of the outbreaks and 5.9% of the cases. Five of these 15 outbreaks (33%) had a chemical etiology. In 36% of outbreaks the place of improper handling was not determined. A majority of the salmonella, shigella and C. perfringens outbreaks were attributed to mishandling of food in food service establishments.

Table 8 lists the factors contributing to foodborne outbreaks by etiology. Although this information was provided for only 58% of the outbreaks, it is evident from the available data that improper storage or holding temperature was a major factor responsible for all outbreaks due to C. perfringens and staphylococcal intoxication and for many shigellosis and salmonellosis outbreaks. Inadequate cooking was important in trichinosis and botulism outbreaks, contaminated equipment contributed to many salmonella outbreaks, and poor personal hygiene of food handlers was a contributing factor primarily in shigellosis and hepatitis A outbreaks.

Table 9 lists the month of occurrence of outbreaks by etiology. Outbreaks were assigned to a month according to the date of onset of the first case. Outbreaks were distributed equally throughout the year except for a slight decline in January and June.

Table 4

Foodborne Disease Outbreaks, by Vehicle of Infection and Specific Etiology, 1973

	Beef	Poultry	Fish (excluding Shellfish)	Ham	Pork*	Shellfish	Sausage	Other meats	Eggs**	Milk	Ice Cream	Cheese	Bakery Products	Pizza	Fruits & Vegetables	Salads***	Mexican Food	Chinese Food	Mushrooms	Multiple Vehicles	Other Foods****	Unknown	Total
Bacterial															1								1
B. cereus												1											1
Brucella															4						1	1	10
C. botulinum			4																		1		9
C. perfringens	2	4	1		1				1	1	4		3			1				6	1	5	33
Salmonella	7	3	1												1	3				1		2	8
Shigella		1														2				1	1		20
Staphylococcus		3		6				2	2				3			1							1
Group A Streptococcus						1																	1
V. parahaemolyticus																							
Parasitic																						2	10
T. spiralis					6		2																
Viral																				4			5
Hepatitis A						1																	
Chemical																							
Chinese restaurant Syndrome (MSG)																		2					2
Mushroom poisoning																			9				9
Scombroid			11													1							12
Shellfish poisoning						2																	2
Other chemicals													1								2		3
Unknown							2	1		2			3	4	6	12	9	5	2	3	3	86	180
Total	19	8	1	9	5		4	3	3	3	4	1	10	4	12	20	9	7	11	15	9	96	307
	28	19	18	15	12	4																	

*Includes frankfurters

**Includes egg salad and egg nog

***Includes poultry, fish, vegetable and jello salads

****Includes soup, chili, chili sauce, salad dressing, and Japanese food

Table 5

Foodborne Disease Outbreaks, by Place of Acquisition and Specific Etiology, 1973

	Home	Restaurant	School	Picnic	Church	Camp	Other*	Total
Bacterial								
B. cereus	1							1
Brucella	1							1
C. botulinum	9						1	10
C. perfringens	4	2					3	9
Salmonella	9	7	2	1	2	1	11	33
Shigella		2	2				4	8
Staphylococcus	6	4	3	3	1		3	20
Group A Streptococcus				1				1
V. parahaemolyticus	1							1
Parasitic								
T. spiralis	9						1	10
Viral								
Hepatitis A		4					1	5
Chemical								
Chinese restaurant syndrome (MSG)		2						2
Mushroom poisoning	7			1			1	9
Scombroid	4	7					1	12
Shellfish poisoning	2							2
Other chemicals	2						1	3
Unknown	64	70	9	6	3	3	25	180
Total 1973	119	98	16	12	6	4	52	307
Total 1972	90	102	31	13	5	5	55	301

*Includes 7 outbreaks in which place of acquisition unknown

Table 6

Foodborne Disease Outbreaks, by Place Where Food Was Mishandled and Specific Etiology, 1973

	Food Processing Establishments	Food Service Establishments	Homes	Unknown-Unspecified	Total
Bacterial					
B. cereus	1				1
Brucella	1				1
C. botulinum	1		8	1	10
C. perfringens		6	3		9
Salmonella	3	18	7	5	33
Shigella		5	1	2	8
Staphylococcus	2	9	6	3	20
Group A Streptococcus		1			1
V. parahaemolyticus			1		1
Parasitic					
T. spiralis			8	2	10
Viral					
Hepatitis A	1	4			5
Chemical					
Chinese restaurant syndrome (MSG)		2			2
Mushroom poisoning		1	8		9
Scombroid	3			9	12
Shellfish poisoning			2		2
Other chemicals	2			1	3
Unknown	1	63	25	91	180
Total 1973	15	109	69	114	307
Total 1972	9	132	60	100	301

Table 7

Foodborne Disease Outbreaks Caused by Mishandling of Food
In Food-Processing Establishments
1973

Etiology	Vehicle	Number of Cases
Bacillus cereus	vegetable sprouts	4
Brucella mellitensis I	goat's milk cheese*	2
Clostridium botulinum, type B	peppers	7
Salmonella dublin	raw milk	22
Salmonella eastbourne	chocolate candy**	115
Salmonella thompson	custard desserts	23
Staphylococcus aureus	lemon-filled jelly roll	2
Staphylococcus aureus	lemon-filled jelly roll	2
Hepatitis A	oysters	285
Scombroid	tuna casserole	30
Scombroid	tuna	232
Scombroid	tuna salad sandwich***	1
Caustic Wash	soft drink	2
Machine Grease	soft drink	1
Unknown****	raw milk	8
Total		736

*Cheese purchased in Mexico, consumed in Colorado
**Candy produced in Canada, distributed in U.S. and Canada
***Tuna salad prepared from tuna canned in Japan and imported into U.S.
****Symptoms and incubation period compatible with staphylococcal foodborne disease; staphylococci isolated from raw milk but quantitative data not available for confirmation

Table 8

Foodborne Disease Outbreaks, by Contributing Factors and Etiology, 1973*

Etiology	Number of Reported Outbreaks	Number of Outbreaks In Which Factors Reported	Improper Holding Temperatures	Inadequate Cooking	Contaminated Equipment	Food From Unsafe Source	Poor Personal Hygiene	Other
Bacterial								
B. cereus	1	1				1		
Brucella	1	1				1		1
C. botulinum	10	9	1	8				2
C. perfringens	9	5	5	4	1		1	
Salmonella	33	20	11	5	9	4	8	1
Shigella	8	7	5				7	
Staphylococcus	20	18	18	3	4	2	9	
Group A Streptococcus	1	1	1					
V. parahaemolyticus	1	1		1				
Parasitic								
T. spiralis	10	10	1	10				
Viral								
Hepatitis A	5	5		2	1	1	4	
Chemical								
Chinese restaurant Syndrome (MSG)	2	1						1
Mushroom poisoning	9	9				9		
Scombroid	12	8	4		2	1		1
Shellfish poisoning	2	2				2		
Other chemicals	3	2						2
Unknown	180	77	63	10	17	3	13	2
Total 1973	307	177	109	43	34	24	42	10
Total 1972	301	186	117	36	38	--	52	--

*For many outbreaks, more than 1 factor was responsible

Table 9

Foodborne Disease Outbreaks, by Month of Occurrence and Specific Etiology, 1973

	1973												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Bacterial													
B. cereus			1										1
Brucella		1											1
C. botulinum					2	1	2	1	1	1	2		10
C. perfringens		1	1	1	2			1			1	2	9
Salmonella	1	2		2	4	3	5	4	5	2	4	1	33
Shigella		1					3	1		1	1	1	8
Staphylococcus		2	1	3	4		2	1	2		2	3	20
Group A Streptococcus							1						1
V. parahaemolyticus		1											1
Parasitic													
T. spiralis	1	3	2	1				1			1	1	10
Viral													
Hepatitis A							1		1	1	1	1	5
Chemical													
Chinese restaurant syndrome (MSG)			1	2	3					3	1	1	2
Mushroom poisoning		2	3	2		1	1	2			1		9
Scombroid									1		1		12
Shellfish poisoning													
Other chemicals						2						1	3
Unknown	8	15	15	15	25	3	11	15	22	16	16	19	180
Total 1973	10	28	24	26	40	10	26	26	32	24	31	30	307
Total 1972	10	18	28	33	34	17	23	33	29	26	29	20	300*

*month of 1 outbreak unknown

E. Foodborne Outbreaks on Aircraft and Cruise Ships, 1973

In 1973, several outbreaks aboard aircraft and cruise ships were reported to CDC. These outbreaks were not included in the data presented above but are summarized below:

1. On October 10, 1973, Quarantine Stations in New York City, Philadelphia, and San Juan were notified of gastrointestinal illness in economy class passengers on 3 separate flights of the same airline which originated in southern Europe. Investigation revealed that the illness consisted primarily of nausea and vomiting; 8 individuals were hospitalized in Philadelphia and 2 in New York. Attack rates aboard the aircrafts ranged from 28 to 84%. Staphylococcus aureus, phage nontypable and resistant to penicillin, was cultured from the stools of 2 ill passengers. A custard dessert prepared at a catering facility in Lisbon, Portugal, and served to economy passengers on the 3 flights was implicated. Phage nontypable and penicillin resistant S. aureus was isolated from samples of the custard in counts ranging from 10^5 - 10^8 colonies per gram; investigation revealed that during preparation the custard was held at a temperature above 60°F for over 4 hours.

2. In early November 1973, CDC was notified of gastrointestinal illness in 4 members of a family who had flown by commercial aircraft from Denver to Miami with an intermediate stop in Dallas on October 31. Stool cultures from the 4 individuals yielded Salmonella thompson. Additional investigation identified 6 other cases of gastrointestinal illness in passengers aboard the Denver-to-Dallas portion of the flight; 3 of the 6 also had positive stool cultures for S. thompson. The breakfast meal served aboard the Denver-to-Dallas flight was implicated; however, since all ill individuals had eaten each food item and since no non-ill individuals could be located for interview, the specific vehicle of transmission could not be identified. A detailed sanitation inspection of the catering kitchen in Denver was conducted; no specific deficiencies in food-handling practices could be identified.

3. On October 30, 1973, the Rhode Island Department of Health was informed of the isolation of Salmonella bareilly from the stool of a man who had become ill on October 17 while aboard a Caribbean cruise ship. Investigation revealed a total of 16 cases of gastroenteritis in a group of 45 Rhode Island residents who had taken the cruise; S. bareilly was isolated from the stools of 3 other ill individuals and 1 well individual; Salmonella senftenberg was also isolated from the stool of a well individual.

On December 27, the vessel notified the Quarantine Station in Miami of the occurrence of 40 cases of gastrointestinal illness among its 740 passengers during the current cruise. Investigation revealed that 53 passengers had actually been ill; S. bareilly or S. senftenberg was isolated from stool specimens obtained from 15 of the ill passengers. During the next 5 cruises in early 1974, 6 to 10% of passengers experienced gastrointestinal illness; 6 different salmonella serotypes were isolated from 20% of 199 ill passengers cultured. A total of 10 different serotypes were isolated from crew members. Environmental investigation revealed cross-contamination between raw and cooked food in the galley and inadequate refrigeration of foods during the breakfast, lunch, and midnight buffets. Control measures included removel of culture-positive food handlers from work, separation of raw and cooked foods, and adequate refrigeration of foods served at the buffets.

Certain logistic problems complicate the investigation of outbreaks which occur aboard aircraft and cruise vessels. Passengers may not become ill until after disembarkation. Notification of health authorities frequently occurs after arrival of the plane or ship. Passengers disperse to multiple destinations soon after they disembark. Schedules frequently dictate that planes and ships depart within hours after arrival. Therefore, time to organize and conduct an investigation is frequently very limited. Such investigations require close cooperation between responsible federal, state, and local agencies. Prompt reporting of diarrheal illness aboard aircraft and vessels by the aircraft pilot or vessel master is essential to permit time to plan an investigation.

Public health officials are urged to report cases of gastrointestinal illness that may have been acquired aboard aircraft or cruise ships to the Enteric Diseases Branch, Bacterial Diseases Division, or Quarantine Division, Bureau of Epidemiology, CDC.

FORM APPROVED
OMB NO. 68-R567

F. INVESTIGATION OF A FOODBORNE OUTBREAK

1. Where did the outbreak occur?
State _____ (1,2) City or Town _____ County _____

2. Date of outbreak: (Date of onset 1st case)
_____ (3-8)

3. Indicate actual (a) or estimated (e) numbers:
Persons exposed _____ (9-11)
Persons ill _____ (12-14)
Hospitalized _____ (15-16)
Fatal cases _____ (17)

4. History of Exposed Persons:
No. histories obtained _____ (18-20)
No. persons with symptoms _____ (21-23)
Nausea _____ (24-26) Diarrhea _____ (33-35)
Vomiting _____ (27-29) Fever _____ (36-38)
Cramps _____ (30-32) Other, specify _____
_____ (39)

5. Incubation period (hours):
Shortest _____ (40-42) Longest _____ (43-45)
Approx. for majority _____ (46-48)

6. Duration of Illness (hours):
Shortest _____ (49-51) Longest _____ (52-54)
Approx. for majority _____ (55-57)

7. Food-specific attack rates: (58)

Food Items Served	Number of persons who ATE specified food				Number who did NOT eat specified food			
	Ill	Not Ill	Total	Percent Ill	Ill	Not Ill	Total	Percent Ill

8. Vehicle responsible (food item incriminated by epidemiological evidence): (59,60) _____

9. Manner in which incriminated food was marketed: (Check all applicable)

(a) Food Industry (61)
- Raw ☐ 1
- Processed ☐ 2

Home Produced
- Raw ☐ 3
- Processed ☐ 4

(b) Vending Machine ☐ 1 (62)

(c) Not wrapped ☐ 1 (63)
- Ordinary Wrapping ☐ 2
- Canned ☐ 3
- Canned--Vacuum Sealed ☐ 4
- Other (specify) ☐ 5

(d) Room Temperature ☐ 1 (64)
- Refrigerated ☐ 2
- Frozen ☐ 3
- Heated ☐ 4

If a commercial product, indicate brand name and lot number
_____

10. Place of Preparation of Contaminated Item: (65)
- Restaurant ☐ 1
- Delicatessen ☐ 2
- Cafeteria ☐ 3
- Private Home ☐ 4
- Caterer ☐ 5

Institution:
- School ☐ 6
- Church ☐ 7
- Camp ☐ 8

Other, specify ☐ 9
_____
_____

11. Place where eaten: (66)
- Restaurant ☐ 1
- Delicatessen ☐ 2
- Cafeteria ☐ 3
- Private Home ☐ 4
- Picnic ☐ 5

Institution:
- School ☐ 6
- Church ☐ 7
- Camp ☐ 8

Other, specify ☐ 9
_____
_____

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL
BUREAU OF EPIDEMIOLOGY
ATLANTA, GEORGIA 30333

CDC 4.245
1-74

(Over)

LABORATORY FINDINGS (Include Negative Results)

12. Food specimens examined: (67)
Specify by "X" whether food examined was original (eaten at time of outbreak) or check-up (prepared in similar manner but not involved in outbreak)

Item	Orig.	Check up	Findings Qualitative	Findings Quantitative
Example: beef	X		C. perfringens, Hobbs type 10	$2X10^6$/gm

13. Environmental specimens examined: (68)

Item	Findings
Example: meat grinder	C. perfringens, Hobbs Type 10

14. Specimens from patients examined (stool, vomitus, etc.): (69)

Item	No. Persons	Findings
Example: stool	11	C. perfringens, Hobbs Type 10

15. Specimens from food handlers (stool, lesions, etc.): (70)

Item	Findings
Example: lesion	C. perfringens, Hobbs type 10

16. Factors contributing to outbreak (check all applicable):

	Yes	No
1. Improper storage or holding temperature	☐ 1	☐ 2 (71)
2. Inadequate cooking	☐ 1	☐ 2 (72)
3. Contaminated equipment or working surfaces	☐ 1	☐ 2 (73)
4. Food obtained from unsafe source	☐ 1	☐ 2 (74)
5. Poor personal hygiene of food handler	☐ 1	☐ 2 (75)
6. Other, specify _____	☐ 1	☐ 2 (76)

17. Etiology: (77, 78)
Pathogen _____
Chemical _____
Other _____

Suspected ☐ 1 (79)
Confirmed ☐ 2
Unknown ☐ 3

18. Remarks: Briefly describe aspects of the investigation not covered above, such as unusual age or sex distribution; unusual circumstances leading to contamination of food, water; epidemic curve; etc. (Attach additional page if necessary)

Name of reporting agency: (80)

Investigating official: | Date of investigation:

NOTE: Epidemic and Laboratory Assistance for the investigation of a foodborne outbreak is available upon request by the State Health Department to the Center for Disease Control, Atlanta, Georgia 30333.

To improve national surveillance, please send a copy of this report to:
Center for Disease Control
Attn: Enteric Diseases Section, Bacterial Diseases Branch
Bureau of Epidemiology
Atlanta, Georgia 30333

Submitted copies should include as much information as possible, but the completion of every item is not required.

CDC 4.245 (BACK)
1-74

LINE LISTING OF FOODBORNE DISEASE OUTBREAKS, 1973

Etiology	State	Number of Cases	Date of Onset	Lab Data: Patient	Lab Data: Vehicle	Lab Data: Food-handler	Vehicle	Location Where Food Mishandled And Eaten*
BACTERIAL								
BACILLUS CEREUS								
B. cereus	Texas	4	3-15		+		vegetable sprouts	(A) home
BRUCELLA								
B. mellitensis I	Colorado	2	2-29	+			goat's milk cheese	(A) home
CLOSTRIDIUM BOTULINUM								
C. botulinum, type B	Alaska	9	11-26	+			dried whitefish	(C) home
C. botulinum, type A	California	4	11-23	+	+		chili sauce	(C) home
C. botulinum, type A	Idaho	1	7-7	+			smoked salmon	(C) home
C. botulinum, type B	Kentucky	1	9-29	+			green beans	(C) home
C. botulinum, type B	Kentucky	2	10-16	+	+		blackberries	(C) home
C. botulinum, toxin type unknown	Maryland	2	7-24				polk salad	(C) home
C. botulinum, type A	Oregon	2	6-16	+			unknown	(D) unknown
C. botulinum, type E	Washington	2	5-14		+		salmon eggs	(C) home
C. botulinum, type A	Washington	1	8-4	+	+		salmon	(C) home
C. botulinum, type B	Pennsylvania, West Virginia	7	5-7	+	+		peppers	(A) home
CLOSTRIDIUM PERFRINGENS								
C. perfringens, non-typable	California	51	2-8	+			chicken	(B) convalescent hospital
C. perfringens	California	46	5-21		+		chili	(C) home
C. perfringens, non-typable	Illinois	13	4-17	+	+		gefüllte fish	(C) home
C. perfringens	Illinois	93	8-16		+		beef	(B) restaurant
C. perfringens, Hobbs type 1	Indiana	374	12-5	+	+		meat loaf	(B) prison
C. perfringens, Hobbs type 5	Tennessee	800	11-2	+	+		turkey	(B) cafeteria
C. perfringens	Tennessee	3	5-?		+		barbecue pork	(B) home
C. perfringens	Utah	11	12-24		+		turkey	(C) home
C. perfringens	Washington	33	3-11		+		turkey	(B) lodge
SALMONELLA								
S. dublin	Arkansas	270	6-29	+	+	+	barbecue beef	(B) multiple locations
S. dublin	California	22	1-?	+	+		raw milk	(A) home
S. thompson	California	33	2-12	+	+		chicken molé, potato salad	(C) home
S. thompson	California	23	8-11	+	+	+	custard desserts	(A) multiple locations
S. chester	California	66	5-16	+	+	+	turkey	(C) church
S. enteritidis	Colorado	6	10-9	+	+		"Indian bread"	(C) school
S. typhimurium	Georgia	7	7-12	+	+		ice cream	(C) home
S. london	Idaho	49	7-22	+	+	+	baron of beef	(B) ship
S. blockley	Illinois	176	6-11	+	+	+	beef	(B) multiple locations
S. enteritidis	Illinois	10	10-?	+		+	unknown	(D) restaurant
S. agona	Louisiana	18	8-22	+	+	+	multiple vehicles	(B) restaurant

*(A) - Food processing establishment; (B) - Food service establishment; (C) - Home; (D) - Unknown

Etiology	State	Number of Cases	Date of Onset	Lab Data: Patient	Lab Data: Vehicle	Lab Data: Food-handler	Vehicle	Location Where Food Mishandled And Eaten*
S. infantis	Louisiana	69	11-17	+		+	unknown	(D) restaurant
S. typhimurium	Maine	34	9-13	+	+	+	egg nog	(B) hospital
S. virchow	Maryland	24	2-11	+			corned beef	(B) home
S. chester	Massachusetts	57	4-13	+	+	+	roast beef sandwich	(B) restaurant
S. enteritidis	Massachusetts	24	5-31	+	+	+	chicken salad	(B) party room
S. infantis, S. agona, S. schwarzengrund	Minnesota	126	9-11	+		+	multiple vehicles	(B) multiple locations
S. enteritidis	Nebraska	7	8-6	+	+		ice cream	(C) home
S. typhimurium	New Jersey	50	9-15	+		+	sandwiches	(B) home
S. typhi	New Jersey	25	11-12	+		+	fish	(B) church
S. infantis	Oregon	105	7-18	+		+	multiple vehicles	(B) hospital
S. infantis	Oregon	123	8-27	+	+		roast beef	(B) picnic
S. manhatten	Oregon	60	11-11	+			turkey	(B) fraternity house
S. agona	Pennsylvania	142	4-1	+			chicken	(B) restaurant
S. enteritidis	Pennsylvania	44	7-?	+			unknown	(D) home
S. thompson	Pennsylvania	25	9-7	+		+	roast beef	(B) restaurant
S. typhimurium	Pennsylvania	8	6-16	+		+	unknown	(D) wedding reception
S. infantis	Tennessee	17	9-4	+			ice cream	(C) home
S. typhimurium	Texas	25	5-27	+			ice cream	(C) camp
S. reading	Virginia	470	11-30	+	+	+	turkey salad	(B) school
S. enteritidis	New York City	230	5-6	+	+	+	multiple vehicles	(B) community center
S. typhi	Alabama, Florida	2	7-?	+			unknown	(D) restaurant
S. eastbourne	23 States	115	12-4	+	+		chocolate candy	(A) home
SHIGELLA								
S. flexneri 2a	Arkansas	172	11-16	+			chopped turkey	(B) school
S. sonnei	California	190	7-27	+			unknown	(D) wedding reception
S. sonnei	California	399	8-30	+			fish salad	(B) restaurant
S. flexneri 2a	Connecticut	150	7-5	+		+	shrimp salad	(B) hospital
S. flexneri 2a	Hawaii	26	10-?	+			rice balls	(C) luau
S. sonnei	Illinois	66	12-23	+		+	unknown	(D) restaurant
S. sonnei	New York	248	7-13	+	+		multiple vehicles	(B) fair
S. sonnei	Texas	137	2-13	+		+	tuna fish salad	(B) school
STAPHYLOCOCCUS								
S. aureus	Arkansas	120	2-26		+		ham	(B) school
S. aureus	California	4	4-26		+		egg salad	(C) home
S. aureus	California	32	5-16		+		ham	(D) hotel
S. aureus	California	6	12-16		+		turkey	(C) home
S. aureus 3c**	Colorado	12	12-10	+		+	french toast	(D) unknown
S. aureus 47/53/54/75/77/84/85	Hawaii	5	4-24	+	+		Japanese food	(D) restaurant
S. aureus phage group III	Illinois	22	5-12		+	+	ham casserole	(B) restaurant
S. aureus 29/52/(79)/(83a)/D11	Illinois	19	7-22		+	+	mostacholli	(C) picnic
S. aureus 83A/85	Michigan	56	12-7	+	+		ham	(C) unknown
S. aureus	New Jersey	3	8-29		+		ham	(B) restaurant

*(A) - Food processing establishment; (B) - Food service establishment; (C) - Home; (D) - Unknown
**phage type

Etiology	State	Number of Cases	Date of Onset	Lab Data: Patient	Lab Data: Vehicle	Lab Data: Food-handler	Vehicle	Location Where Food Mishandled And Eaten*
S. aureus	New Jersey	418	9-26		+		egg salad	(B) school
S. aureus	New Mexico	11	2-28		+		mutton stew	(B) picnic
S. aureus	Oklahoma	80	11-13		+		turkey	(B) church
S. aureus	Tennessee	96	3-6		+		potato salad	(B) cafeteria
S. aureus, phage non-typable, enterotoxin C	Tennessee	308	7-27		+	+	macaroni salad	(B) school
S. aureus	Washington	3	5-18		+		barbecued chicken	(B) home
S. aureus	Washington	2	9-26		+		lemon-filled jelly roll	(A) home
S. aureus	Washington	2	11-14		+	+	lemon-filled jelly roll	(A) home
S. aureus	West Virginia	6	4-22		+		ham	(C) home
S. aureus 85	Puerto Rico	67	5-24	+	+	+	multiple vehicles	(C) picnic
STREPTOCOCCUS								
Group A β hemolytic Streptococcus	Arizona	250	7-5	+	+		potato salad	(B) picnic
VIBRIO PARAHAEMOLYTICUS								
V. parahaemolyticus	California	2	2-20	+			conch meat	(C) home
PARASITIC								
TRICHINELLA SPIRALIS								
T. spiralis	California	5	2-23	+			unknown	(D) unknown
T. spiralis	Nebraska	18	1-14	+	+		pork sausage	(C) home
T. spiralis	New Jersey	2	2-20	+			pork sausage	(C) home
T. spiralis	New Jersey	3	12-7	+			kielbasa	(C) home
T. spiralis	Ohio	2	3-11	+			pork	(C) home
T. spiralis	Texas	2	8-19	+			pork	(C) home
T. spiralis	Texas	2	11-26	+			pork	(C) home
T. spiralis	Vermont	5	2-4	+			unknown	(D) home
T. spiralis	New York City	2	3-1	+			pork	(C) home
T. spiralis	New York City	18	4-1	+			pork	(C) home
VIRAL								
Hepatitis A	Arizona	28	10-30	+		+	guacamole, tossed salad	(B) restaurant
Hepatitis A	Arizona	31	12-3	+		+	spaghetti, garnished hamburgers	(B) restaurant
Hepatitis A	Vermont	66	11-2	+			sandwiches	(B) hospital
Hepatitis A	Washington	15	7-2	+			sandwiches	(B) restaurant
Hepatitis A	Georgia, Texas	285	9-20	+			oysters	(A) restaurant
CHEMICAL								
Monosodium glutamate (Chinese restaurant syndrome)	Pennsylvania	3	12-17				won ton soup	(B) restaurant
Monosodium glutamate (Chinese restaurant syndrome)	Washington	3	11-1				Chinese food	(B) restaurant
Mushroom poisoning	California	2	3-21		+		mushrooms	(C) home
Mushroom poisoning	California	2	10-30		+		mushrooms	(C) home
Mushroom poisoning	Pennsylvania	2	10-1		+		Amanita muscaria	(C) home
Mushroom poisoning	Pennsylvania	17	10-9		+		Clitocybe sp.	(B) convent
Mushroom poisoning	Washington	1	4-29		+		Amanita pantherina	(C) home
Mushroom poisoning	Washington	1	4-29		+		Amanita pantherina	(C) home
Mushroom poisoning	Washington	2	5-4		+		Amanita pantherina	(C) home

*(A) - Food processing establishment; (B) - Food service establishment; (C) - Home; (D) - Unknown

Etiology	State	Number of Cases	Date of Onset	Lab Data: Patient	Lab Data: Vehicle	Lab Data: Food handler	Vehicle	Location Where Food Mishandled And Eaten*
Mushroom poisoning	Washington	13	5-5		+		Amanita pantherina	(C) picnic
Mushroom poisoning	Washington	1	5-9		+		Amanita pantherina	(C) home
Scombroid-like fish poisoning	California	7	2-28				mahi mahi	(D) restaurant
Scombroid-like fish poisoning	California	2	3-23		+		mahi mahi	(D) restaurant
Scombroid-like fish poisoning	California	2	4-27		+		mahi mahi	(D) restaurant
Scombroid-like fish poisoning	California	3	6-16		+		mahi mahi	(D) home
Scombroid-like fish poisoning	Hawaii	35	3-17		+		mahi mahi	(D) restaurant
Scombroid-like fish poisoning	Hawaii	7	3-30				mahi mahi	(D) restaurant
Scombroid	Hawaii	4	4-6				ulua (jack)	(D) restaurant
Scombroid	Mississippi	30	8-2			+	tuna casserole	(A) day care center
Scombroid	Rhode Island	1	7-11			+	tuna salad sandwich	(A) restaurant
Scombroid	Texas	2	8-10				tuna fish	(D) home
Scombroid	Washington	1	11-8				tuna fish	(D) home
Scombroid	Minnesota, Oregon, South Dakota, Wisconsin	232	2-13			+	tuna fish	(A) home
Paralytic shellfish poisoning	Alaska	3	9-27			+	clams	(C) home
Neurotoxic shellfish poisoning (Gymnodinium breve)	Florida	4	11-17				clams	(C) home
Caustic wash	Georgia	2	6-5			+	soft drink	(A) home
Machine grease	Washington	1	6-17			+	soda	(A) home
Phenolphthalein	Washington	9	12-17			+	brownies	(D) office party
UNKNOWN								
	Alaska	280	11-15				turkey	(B) school
	Arizona	5	1-21				ham	(B) home
	Arizona	4	2-16				alfalfa sprouts	(D) home
	Arizona	2	11-28				Mexican food	(B) restaurant
	Arizona	53	12-21				unknown	(D) community hall
	California	10	2-8				unknown	(D) restaurant
	California	20	2-13				ham sandwiches	(B) hospital
	California	4	2-19				unknown	(D) take-out establishment
	California	4	2-22				unknown	(D) home
	California	8	3-19				Chinese food	(B) home
	California	9	3-28				ham	(B) cafeteria
	California	150	4-22				multiple vehicles	(B) restaurant
	California	3	4-25				multiple vehicles	(B) restaurant
	California	2	4-29				unknown	(D) home
	California	40	5-4				unknown	(B) business party
	California	2	5-9				unknown	(D) restaurant
	California	27	5-10				potato salad	(B) restaurant
	California	5	5-19				unknown	(D) labor camp
	California	3	6-20				unknown	(D) home

*(A) - Food processing establishment; (B) - Food service establishment; (C) - Home; (D) - Unknown

Etiology	State	Number of Cases	Date of Onset	Lab Data: Patient	Lab Data: Vehicle	Lab Data: Food handler	Vehicle	Location Where Food Mishandled And Eaten*
	California	6	7-9				ham	(C) home
	California	8	7-17				Mexican food	(B) home
	California	5	7-31				Mexican food	(B) home
	California	5	11-6				Mexican food	(D) unknown
	California	150	12-16				unknown	(D) military base
	Colorado	107	5-29				unknown	(B) military leave
	Florida	30	9-6				unknown	(D) school
	Georgia	110	5-1				pork loaf	(B) mental retardation center
	Georgia	13	8-16				unknown	(D) restaurant
	Georgia	28	9-6				unknown	(D) unknown
	Georgia	8	9-17				unknown	(D) home
	Georgia	3	9-28				unknown	(D) restaurant
	Georgia	25	12-16				turkey	(B) camp
	Hawaii	122	3-25				mahi mahi	(B) wedding reception
	Hawaii	50	9-2				beef	(B) restaurant
	Illinois	35	8-22				unknown	(D) camp
	Illinois	14	12-26				fish salad	(B) home
	Louisiana	100	3-19				unknown	(D) church
	Maryland	500	4-14				unknown	(D) fire house
	Michigan	3	1-31				turkey	(C) home
	Michigan	5	3-8				pizza	(B) restaurant
	Michigan	12	3-15				unknown	(D) fraternity
	Michigan	3	3-22				hot dog	(B) restaurant
	Michigan	13	4-23				unknown	(D) home
	Michigan	21	5-13				unknown	(D) restaurant
	Michigan	48	5-15				unknown	(D) school
	Michigan	3	5-25				unknown	(C) home
	Michigan	2	12-18				unknown	(D) home
	Minnesota	5	9-23				milk	(D) home
	Minnesota	73	9-30				tenderloin tips	(B) restaurant
	Minnesota	4	10-3				unknown	(D) restaurant
	Minnesota	6	11-12				unknown	(D) home
	Minnesota	162	12-3				ham	(B) wedding reception
	Minnesota	3	12-8				unknown	(D) home
	Minnesota	2	12-17				unknown	(D) church
	Missouri	177	5-2				turkey	(B) school
	Montana	32	8-25				unknown	(D) wedding reception
	Nebraska	91	5-11				unknown	(D) wedding reception
	New Hampshire	125	2-17				unknown	(D) restaurant
	New Hampshire	104	2-23				unknown	(D) restaurant
	New Hampshire	350	10-18				unknown	(D) school
	New Hampshire	6	12-29				unknown	(D) restaurant
	New Jersey	13	3-18				unknown	(D) home
	New Jersey	20	4-6				cake icing	(D) home
	New Jersey	31	4-11				unknown	(D) camp

*(A) - Food processing establishment; (B) - Food service establishment; (C) - Home; (D) - Unknown

Etiology	State	Number of Cases	Date of Onset	Lab Data: Patient	Lab Data: Vehicle	Lab Data: Food handler	Vehicle	Location Where Food Mishandled And Eaten*
	North Carolina	12	9-9				chicken soup	(B) hospital
	North Carolina	60	11-21				unknown	(D) school
	North Carolina	100	12-?				unknown	(D) restaurant
	North Dakota	28	8-19				jello salad	(C) picnic
	Ohio	7	8-5				unknown	(D) picnic
	Oregon	4	2-18				Chinese food	(B) restaurant
	Oregon	20	5-3				unknown	(D) cafeteria
	Oregon	2	7-21				unknown	(D) home
	Oregon	2	7-30				unknown	(D) home
	Oregon	2	9-28				unknown	(D) home
	Oregon	2	11-18				unknown	(D) restaurant
	Oregon	2	12-2				unknown	(D) home
	Oregon	4	12-3				unknown	(D) restaurant
	Oregon	2	12-17				unknown	(D) restaurant
	Pennsylvania	2	1-8				pizza	(B) restaurant
	Pennsylvania	2	1-31				pizza	(B) restaurant
	Pennsylvania	8	2-5				turkey	(C) home
	Pennsylvania	2	2-24				tuna salad	(C) home
	Pennsylvania	62	2-25				unknown	(D) church
	Pennsylvania	2	2-26				mushrooms	(C) home
	Pennsylvania	2	3-13				tuna salad	(C) home
	Pennsylvania	2	3-13				mushrooms	(C) home

	Pennsylvania	4	4-9				macaroni salad	(B) unknown
	Pennsylvania	3	4-?				hot dogs	(B) restaurant
	Pennsylvania	41	5-12				multiple vehicles	(B) home
	Pennsylvania	4	5-25				apricots	(D) home
	Pennsylvania	4	5-30				hamburger	(B) restaurant
	Pennsylvania	2	5-?				sausage	(C) home
	Pennsylvania	19	6-1				unknown	(D) restaurant
	Pennsylvania	3	6-?				hamburger	(B) restaurant
	Pennsylvania	4	7-18				beef stew	(C) home
	Pennsylvania	8	8-1				unknown	(D) restaurant
	Pennsylvania	2	8-2				meat loaf	(B) restaurant
	Pennsylvania	4	8-6				ham	(C) home
	Pennsylvania	9	8-13				unknown	(D) picnic
	Pennsylvania	3	8-14				pizza	(B) restaurant
	Pennsylvania	4	8-20				pork and beans	(C) home
	Pennsylvania	3	8-27				cabbage	(C) home
	Pennsylvania	4	9-10				unknown	(D) home
	Pennsylvania	2	9-26				potato pancakes with sour cream	(C) home
	Pennsylvania	8	9-26				ground beef	(B) restaurant
	Pennsylvania	3	10-1				ham	(B) restaurant
	Pennsylvania	4	10-25				unknown	(D) home
	Pennsylvania	2	11-2				turkey loaf	(C) home
	Pennsylvania	2	11-2				blue cheese dressing	(D) home

*(A) - Food processing establishment; (B) - Food service establishment; (C) - Home; (D) - Unknown

Etiology	State	Number of Cases	Date of Onset	Lab Data: Patient	Lab Data: Vehicle	Lab Data: Food handler	Vehicle	Location Where Food Mishandled And Eaten*
	Pennsylvania	2	11-2				macaroni salad	(B) restaurant
	Pennsylvania	4	11-11				tuna fish salad	(B) home
	Pennsylvania	2	11-12				unknown	(D) restaurant
	Pennsylvania	3	12-9				unknown	(D) restaurant
	South Carolina	3	4-10				unknown	(D) restaurant
	South Carolina	6	9-24				unknown	(D) restaurant
	South Carolina	4	10-3				unknown	(D) picnic
	Tennessee	3	1-31				unknown	(D) machine shop
	Tennessee	12	9-9				chicken	(B) restaurant
	Tennessee	133	10-31				roast beef	(B) jail
	Texas	53	8-12				unknown	(D) picnic
	Texas	45	8-18				ham	(C) community hall
	Texas	14	10-16				mashed potatoes	(B) restaurant
	Texas	21	10-?				green pea salad	(B) nursing home
	Utah	3	3-3				Mexican food	(B) restaurant
	Utah	2	4-22				unknown	(D) restaurant
	Utah	2	5-1				unknown	(D) home
	Utah	4	5-14				unknown	(D) home
	Utah	2	5-29				mushroom soup	(C) home
	Utah	3	9-11				unknown	(D) restaurant
	Utah	5	9-23				unknown	(D) home
	Utah	6	9-27				chocolate pie with whipped cream	(B) home

	Utah	5	10-22				unknown	(D) restaurant
	Utah	2	11-29				Chinese food	(B) home
	Utah	3	12-27				unknown	(D) office
	Virginia	17	9-19				unknown	(B) restaurant
	Virginia	159	9-19				chipped beef	(D) school
	Washington	3	1-9				unknown	(D) home
	Washington	17	1-13				potato salad	(B) restaurant
	Washington	2	1-26				unknown	(D) home
	Washington	3	2-21				roast beef	(B) restaurant
	Washington	5	2-23				hamburger	(C) home
	Washington	6	3-5				pork sausage	(C) home
	Washington	4	3-18				unknown	(D) restaurant
	Washington	2	3-21				unknown	(D) restaurant
	Washington	2	3-28				unknown	(D) restaurant
	Washington	2	4-2				unknown	(D) restaurant
	Washington	3	4-4				unknown	(D) home
	Washington	2	4-19				beef	(B) restaurant
	Washington	2	5-10				Mexican food	(B) restaurant
	Washington	3	5-10				tuna salad	(C) home
	Washington	3	5-13				unknown	(D) restaurant
	Washington	3	5-15				unknown	(D) home
	Washington	4	5-15				ham	(C) home
	Washington	4	5-26				unknown	(D) home
	Washington	4	7-5				watermelon	(C) home

*(A) - Food processing establishment; (B) - Food service establishment; (C) - Home; (D) - Unknown

Etiology	State	Number of Cases	Date of Onset	Lab Data: Patient	Lab Data: Vehicle	Lab Data: Food handler	Vehicle	Location Where Food Mishandled And Eaten*
	Washington	4	7-9				unknown	(D) home
	Washington	3	7-13				beef casserole	(B) restaurant
	Washington	3	7-20				Chinese food	(B) restaurant
	Washington	15	7-24				brownies	(C) home
	Washington	4	8-29				Chinese food	(B) restaurant
	Washington	6	9-5				hamburgers	(B) restaurant
	Washington	3	9-6				roast beef	(B) restaurant
	Washington	4	9-25				roast beef	(C) home
	Washington	2	10-3				unknown	(D) restaurant
	Washington	2	10-12				unknown	(D) restaurant
	Washington	5	10-17				venison	(B) jail
	Washington	120	10-19				roast beef	(B) restaurant
	Washington	12	10-21				roast beef	(B) restaurant
	Washington	15	10-27				Mexican food	(B) restaurant
	Washington	2	10-29				Mexican food	(B) restaurant
	Washington	3	11-2				unknown	(D) restaurant
	Washington	4	11-27				unknown	(D) home
	Washington	40	12-1				baron of beef	(B) restaurant
	Washington	8	12-12				raw milk	(A) home
	Washington	20	12-16				shrimp salad	(B) picnic
	West Virginia	17	2-3				turkey	(B) school
	West Virginia	4	4-22				unknown	(D) home
	West Virginia	60	11-8				unknown	(D) school
	West Virginia	24	12-28				unknown	(D) restaurant
	Puerto Rico	29	11-23				unknown	(D) hospital

*(A) - Food processing establishment; (B) - Food service establishment; (C) - Home; (D) - Unknown

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H. Guidelines for Confirmation of Foodborne Outbreak

	Clinical Syndrome		Laboratory Criteria
1. *Bacillus cereus*	a) incubation period 1-16 hrs b) gastrointestinal syndrome		a) isolation of $\geq 10^5$ organisms per gram in epidemiologically incriminated food
		OR	b) isolation of organism in stools of ill person
2. Brucella	a) clinical picture compatible with brucellosis		a) 4x ↑ in titer
		OR	b) positive blood culture
3. *Clostridium botulinum*	a) clinical syndrome compatible with botulism (see CDC Botulism Manual)		a) detection of botulinal toxin in human sera, feces, or food
		OR	b) isolation of *C. botulinum* organism from food or stools
		OR	c) food epidemiologically incriminated
4. *Clostridium perfringens*	a) incubation period 8-22 hrs b) lower intestinal syndrome-(majority of cases with diarrhea with little vomiting or fever)		a) organisms of same serotype in epidemiologically incriminated food and stool of ill individuals
		OR	b) isolation of organisms with same serotype in stool of most ill individuals and not in stool of controls
		OR	c) $\geq 10^5$ organisms in epidemiologically incriminated food provided specimen properly handled
5. *Escherichia coli*	a) incubation period 6-36 hrs b) gastrointestinal syndrome-majority of cases with diarrhea		a) demonstration of organisms of same serotype in epidemiologically incriminated food and stool of ill individuals and not in stool of controls
		OR	b) isolation of $\geq 10^5$ organisms in implicated food
		OR	c) isolation of organism of same serotype from stool of most ill individuals

			and organisms found to be either enterotoxigenic or invasive by special laboratory techniques
6. Salmonella	a) incubation period 6-48 hrs b) gastrointestinal syndrome-majority of cases with diarrhea		a) isolation of salmonella organism from epidemiologically implicated food OR b) isolation of salmonella organism from stools of ill individuals
7. Shigella	a) incubation period 7-66 hrs b) gastrointestinal syndrome-majority of cases with diarrhea		a) isolation of shigella organism from epidemiologically implicated food OR b) isolation of shigella organism from stools of ill individuals
8. Staphylococcus aureus	a) incubation period 1-7 hrs b) gastrointestinal syndrome-majority of cases with vomiting		a) detection of enterotoxin in epidemiologically implicated food OR b) organisms with same phage type in stools or vomitus of ill individuals and, when possible, implicated food and/or skin or nose of food handler OR c) isolation of $\geq 10^5$ organisms per gram in epidemiologically implicated food
9. Group A streptococcus	a) febrile URI syndrome		a) isolation of organisms from implicated food OR b) isolation of organisms from throats of ill individuals
10. Vibrio parahaemolyticus	a) incubation period 12-24 hrs b) gastrointestinal syndrome-majority of cases with diarrhea		a) isolation of organism from epidemiologically implicated food (usually seafood) OR b) isolation of organism from stool of ill individuals

11.	*Trichinella spiralis*	a) 2 or more cases b) incubation period 3-28 days c) classical systemic syndrome-myalgias, fever (100%), high eosinophil count	a) muscle biopsy from ill individual OR b) serological tests OR c) demonstration of larvae in incriminated food
12.	Hepatitis A	a) incubation period 10-50 days b) clinical syndrome-jaundice, GI symptoms, dark urine	a) Liver function tests compatible with hepatitis in affected persons who consumed the implicated food
13.	Chemical	a) characteristic clinical picture and appropriate food epidemiologically incriminated	a) demonstration of chemical in food and/or ill individuals (if test readily available)
14.	Other potential pathogens: Group D streptococcus, *Yersinia enterocolitica*, etc.		a) lab evidence appraised in individual circumstances

*We recognize that these criteria are arbitrarily designed and that as new laboratory methods are devised and new etiologic agents identified these criteria may be altered.

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

	1971	1972	1973	Total
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

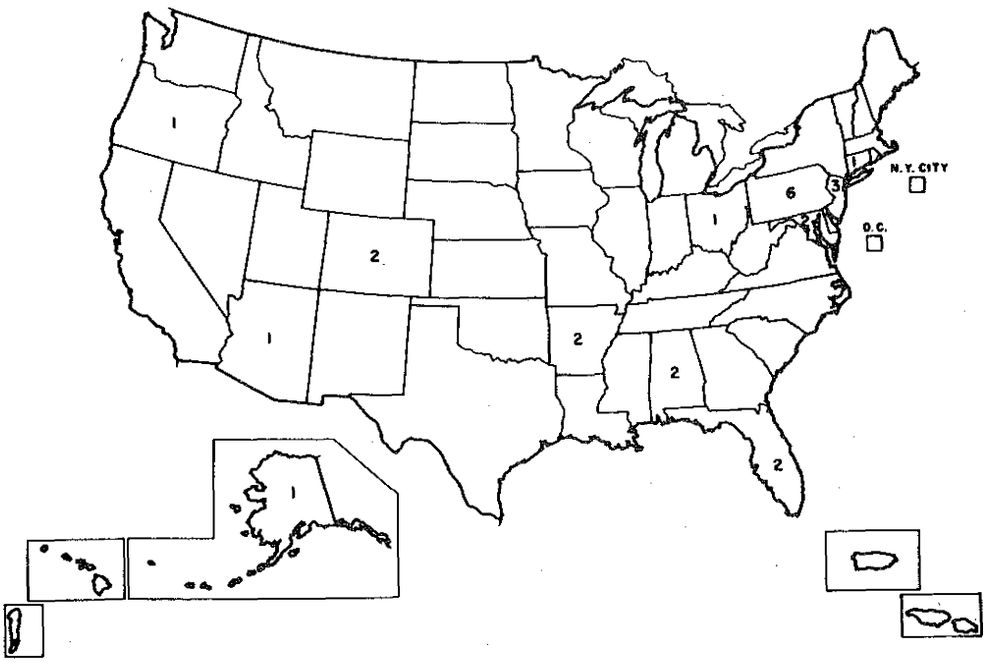

Figure 2 depicts the trend in reported waterborne disease outbreaks over the last 3 decades. During the last 3 years, there has been an increase in the annual average number of reported outbreaks. This increase probably represents in part a renewed interest in the reporting of disease outbreaks and in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

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

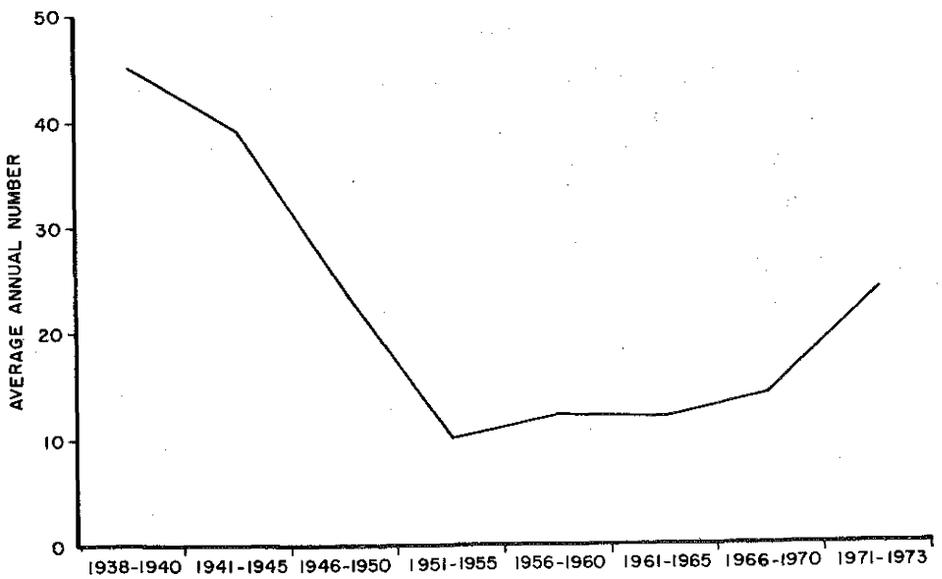

Table 2 shows the number of outbreaks and cases by etiology and type of water system. Thirteen (54%) outbreaks with 1,065 (62%) cases are grouped under the category of "sewage poisoning." These include outbreaks characterized by nausea, vomiting, diarrhea, and fever for which no specific etiologic agent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

Table 2

Waterborne Disease Outbreaks, by Etiology and Type of Water System, 1973

	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	—	—	—	—	1	3	1	3
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 out breaks 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

Month	Number of Outbreaks	Month	Number of Outbreaks
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

Month	Number of Outbreaks	Usual Population*	Visitors**
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	2	1	1
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

State	Month	Disease	Cases	Type of System	System Deficiency*
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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*Outbreak occurred in 1973; reported in MMWR in 1974

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The State Epidemiologists are the key to all disease surveillance activities. They are responsible for collecting, interpreting, and transmitting data and epidemiologic information from their individual States. Their contributions to this report are gratefully acknowledged. In addition, valuable contributions are made by State Laboratory Directors; we are indebted to them for their valuable support.

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