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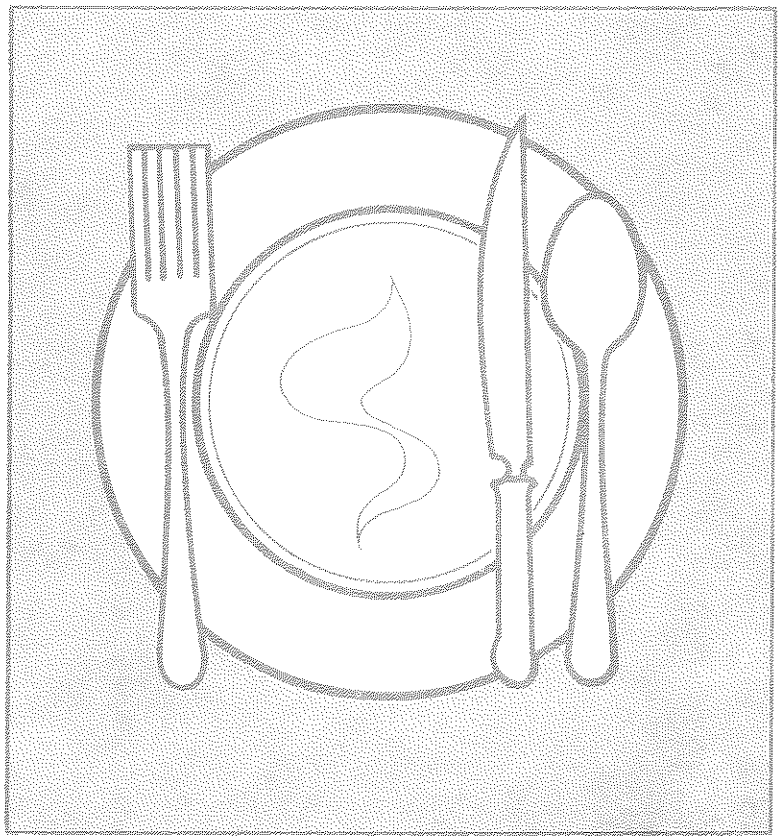
CENTERS FOR DISEASE CONTROL

FOODBORNE DISEASE SURVEILLANCE



U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES • Public Health Service

PREFACE

This report summarizes information received from state and local 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 by 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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SUGGESTED CITATION

Centers for Disease Control: Foodborne Disease Outbreaks
Annual Summary 1978, Revised
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* This report has been reissued because of numerous tabular errors in the original 1978 *
* Foodborne Disease Surveillance Report released in November 1979. The data from the *
* previous 1978 report should be disregarded and copies should be discarded. *
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I. INTRODUCTION

The reporting of foodborne and waterborne diseases in the United States began over half a century 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. The 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, it added summaries of outbreaks caused by all foods. 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, the National Office of Vital Statistics reviewed reports of outbreaks of foodborne illness and published summaries of them annually in Public Health Reports. In 1961 the Center for Disease Control (CDC), then the Communicable Disease Center, assumed responsibility for publishing reports on foodborne illness. For the period 1961-66 CDC discontinued publication of annual reviews, but reported pertinent statistics and detailed individual investigations in the Morbidity and Mortality Weekly Report (MMWR).

In 1966 the present system of surveillance of foodborne and waterborne diseases began with the incorporation of all reports of enteric disease outbreaks attributed to microbial or chemical contamination of food or water 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 disease outbreaks. Due to increasing interest and activity in waterborne disease surveillance, foodborne and waterborne disease outbreaks were reported in separate annual summaries for the first time in 1978. This report summarizes data from the foodborne disease outbreaks reported to the CDC in 1978.

Foodborne disease surveillance has traditionally served 3 objectives:

1. Disease Prevention and 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 prevention and control measures resulting from surveillance of foodborne disease.

2. Knowledge of Disease Causation: The responsible pathogen was not identified in 30% to 60% of foodborne disease outbreaks reported to CDC in each of the last 5 years. In many of these outbreaks, pathogens known to cause foodborne illness may not have been identified because of late or incomplete laboratory investigation. In others, the responsible pathogen may have escaped detection even when a thorough laboratory investigation was carried out because the pathogen is not yet appreciated as a cause of foodborne disease or because it cannot yet be identified by available laboratory techniques. It is probable that these pathogens can be identified and suitable measures to prevent or control diseases caused by them can be instituted if more thorough clinical, epidemiologic, and laboratory investigations are employed. Pathogens suspected of being, but not yet determined to be, etiologic agents in foodborne disease include Group D Streptococcus, Citrobacter, Enterobacter, Klebsiella, Pseudomonas, and the presumably viral agents of acute infectious non-bacterial gastroenteritis. Other pathogens such as Escherichia coli, Bacillus cereus, Yersinia enterocolitica, Vibrio parahaemolyticus and Campylobacter fetus subspecies jejuni are known causes of foodborne illness, but the extent and importance of their role have not been adequately assessed as yet.

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 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 protection programs will be kept informed of the factors involved in foodborne disease outbreaks. Comprehensive surveillance would result in a clearer appreciation of priorities in food protection, institution of better training programs, and more rational utilization of available resources.

II. FOODBORNE DISEASE OUTBREAKS

In 1978, 481 outbreaks of foodborne disease involving 10,639 cases were reported to the Centers for Disease Control.

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.

1. Laboratory confirmed--Outbreaks in which laboratory evidence of a specific etiologic agent is obtained, and specified criteria are met (see Section G).

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 poisoning), 1 to 7 hours (probable Staphylococcus food poisoning), 8 to 14 hours (probable Clostridium perfringens), and greater than 14 hours (infectious or toxic agents).

B. Source of Data

The general public and local, state, and federal agencies which have responsibility for public health and food protection participate in foodborne disease surveillance. Consumers, physicians, hospital personnel, and persons involved with food service or processing report complaints of illness to health departments or regulatory agencies. Local health department personnel (including epidemiologists, sanitarians, and public health nurses) carry out most epidemiologic investigations of these reports and make their findings available to state health departments. State agencies concerned with food safety frequently participate in the initial investigation of the outbreak and offer laboratory support. State or other officials eventually summarize the findings of the investigation on the standard CDC reporting form (see Section E) and send these to CDC (Table 1). Occasionally, on special request, CDC participates in an investigation, particularly if the outbreak is large or involves products that move in interstate commerce.

The 2 federal regulatory agencies that have major responsibilities for food protection, the Food and Drug Administration (FDA) and U.S. Department of Agriculture (USDA), report episodes of foodborne illness to CDC and to state and local health authorities which, in turn, report to FDA or USDA any foodborne disease outbreaks involving commercial products. The U.S. Armed Forces also report outbreaks directly to CDC.

By special arrangement, Connaught Laboratories of Canada, the only commercial producer of botulinal antitoxin in the Western Hemisphere, immediately report all requests for botulinal antitoxin to CDC. This is sometimes the first communication of a botulism outbreak to public health authorities, although physicians are urged to promptly report all suspected botulism cases. In botulism outbreaks, 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 the responsible food or foods so that proper corrective action can be taken.

C. Interpretation of Data

The limitations on the quantity and quality of data presented here must be appreciated in order to avoid misinterpretation. The number of outbreaks of foodborne disease reported by this surveillance system clearly represents a small fraction of the total number that occur. The likelihood of an outbreak coming to the attention of health authorities varies considerably depending on consumer and physician awareness, interest, and motivation to report the incident.

Not all cases of foodborne illness have an equal likelihood of being reported. For example, interstate outbreaks, large intrastate outbreaks, and outbreaks of serious illness such as botulism or amanitotoxin (mushroom) poisoning are more likely to come to the attention of health authorities than cases of mild illness following a family cookout.

The quality of the data presented here depends upon the commitment given to foodborne surveillance by the state or local health departments. Not only the department's interest in foodborne disease investigation but its investigative and laboratory capabilities are essential determinants of the quality of the investigation. Similarly, the likelihood that the findings of an investigation will be reported varies from one locale to another.

Just as this report should not be the basis of firm conclusions about the absolute incidence of foodborne disease, it should not be used to draw conclusions about the relative incidence of foodborne disease of various etiologies (Table 2). For example, foodborne diseases characterized by short incubation periods such as most outbreaks of chemical etiology or outbreaks caused by staphylococcal enterotoxin are more likely to be recognized

as common-source foodborne disease outbreaks than those diseases with longer incubation periods such as hepatitis A. The relatively small number of outbreaks attributed to parasites and viruses may be due to the long incubation periods of these agents masking the common-source nature of many cases. Similarly, outbreaks involving B. cereus, E. coli, V. parahaemolyticus, Y. enterocolitica, or C. fetus ssp jejuni are probably less likely to be confirmed because these organisms are often not considered in clinical, epidemiologic, and laboratory investigations.

The number of reported outbreaks attributed to some etiologies depends upon the interest of a particular health department or individual. For example, the cholera cases uncovered in Louisiana in 1978 might have been missed if it had not been for the persistence of a laboratory technician who sought aid in identifying an organism which he could not type.

Establishing the true number of deaths caused by foodborne disease outbreaks is difficult because information on deaths in the reports is often incomplete or absent. Further contributing to the under-reporting is the fact that foodborne disease may not be recognized as contributing to the demise of an elderly or debilitated person unable to withstand otherwise minor physical stresses. These limitations on the data must be understood in interpreting Table 3.

In outbreaks of unknown etiology, listed by incubation period (Table 4), the accuracy of reported information is always suspect. In these outbreaks when the epidemiology incriminating a particular food item was very weak, the food was listed as unknown in this report (Table 5). Previously, persons with botulism for which no vehicle could be implicated were included in the foodborne totals. However, in 1978 the definition of foodborne botulism was restricted to cases where a food source was confirmed either by laboratory or epidemiologic evidence. In addition to the 12 foodborne botulism outbreaks, there were 10 botulism outbreaks in 1978 involving 13 persons where no food or wound source could be found.

Information on the place of eating suspect food in foodborne outbreaks was judged to be reliable and was recorded (Table 6). However, information on the place where food was mishandled or improperly cooked or stored in these outbreaks was generally judged unreliable; in many of them the place of mishandling was listed as unknown (Table 7). Only in outbreaks in which a specific etiology was highly suspected, although unconfirmed in the laboratory, and in which the information on mishandling was consistent with the suspected etiology was a known place of mishandling designated.

The implications of a food-processing establishment mishandling food are great both to public health authorities and the establishment concerned. Consequently, the outbreaks attributed to mishandling at these establishments are thoroughly investigated and reported data carefully scrutinized. No foodborne disease outbreaks were linked to mishandling of food at a food processing plant in 1978.

Much is known about contributing factors in foodborne disease. The five most common factors contributing to foodborne disease outbreaks in the United States in order of frequency of occurrence include (1) inadequate cooling of foods, (2) lapse of a day or more between preparing and serving, (3) infected persons handling foods which are not subsequently heat-processed, (4) inadequate time or temperature or both during heat processing foods, and (5) insufficiently high temperature during storage of hot foods (1). For example, in most outbreaks of botulism and trichinosis, the food is usually inadequately heat treated. In most of the outbreaks of bacterial etiology other than botulism and in outbreaks of scrombroid (in which bacterial growth is responsible for toxin production), the food is usually stored at improper holding temperatures. By definition, in outbreaks of ciguatera, puffer fish poisoning, mushroom poisoning, and paralytic and neurotoxic shellfish poisoning, the food itself is unsafe, and illness is not related to improper handling or preparation.

The investigators of foodborne disease outbreaks are usually aware of these contributing factors and consequently seek and find the appropriate answers. Sometimes, however, investigators report factors which are not known to be contributing to outbreaks of the type of etiology confirmed. In such cases the factors are considered in light of the evidence presented; if they are totally unsubstantiated, they are rejected. These considerations must be borne in the mind in interpreting Table 8.

Reference

1. Bryan FA. Factors that contribute to outbreaks of foodborne disease. J Food Protection 1978;41:816-827.

D. Analysis of Data

In 1978, 481 outbreaks of foodborne disease involving 10,639 cases were reported to the CDC Foodborne Disease Surveillance Activity, compared with the 5-year average of 426 outbreaks and 13,709 outbreaks from 1973 to 1977. Outbreaks were reported from 42 states, New York City, Puerto Rico, Guam, and the Virgin Islands. No outbreaks were reported from 8 states or the District of Columbia.

The large number of outbreaks reported by several states and New York City undoubtedly reflects the interest and effort at control of the respective health departments in foodborne disease surveillance. The Washington State Department of Social and Health Services has continued its record of reporting more outbreaks than any other state (Table 1). California, Pennsylvania, and Hawaii again are among the leading states in reporting outbreaks of foodborne disease. New York City has reported more foodborne outbreaks than any other reporting agency since 1975. Connecticut, Maryland, New Mexico, and Virginia reported a substantial increase in the number of outbreaks in 1978.

As has been seen in each of the 5 preceeding years, bacterial agents were the most common causes (68%) of the foodborne outbreaks of confirmed etiology. Following in frequency were chemical agents (24%), parasitic (5%), and viral (3%). The overwhelming majority of confirmed cases (90%) were of bacterial etiology, nearly matching the 5-year average of 91%. Salmonellae accounted for about one-third of the confirmed outbreaks and nearly 40% of the cases, figures consistent with results for 1973 to 1977. The second most common agent was Staphylococcus aureus which was implicated in 15% of the outbreaks and 27% of the total cases.

For the first year since the beginning of foodborne disease reporting, an outbreak of Vibrio cholerae serotype O1 disease was detected in the United States (1). In addition to 1 cluster involving 4 persons, 7 additional individual cases were uncovered, all in Louisiana, with boiled crabs identified as the vehicle.

In 1978, 14 deaths were reported as associated with foodborne outbreaks (Table 3). Four deaths were caused by hepatitis, 3 by botulism, and 7 were caused by diseases of unknown etiology.

The etiologic agent was confirmed in 32% (154/481) of the outbreaks, which is slightly lower than the 5-year average of 40%. Table 4 lists the outbreaks of diseases 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 chemical poisoning, that those in which median incubation period was 1-7 hours were of staphylococcal intoxication, and that those in which the median incubation period was 8-14 hours were caused by C. perfringens, then 60% of the outbreaks of unknown etiology can be accounted for. In addition to these agents, B. cereus, which is rarely considered either from an epidemiologic standpoint or in the laboratory, is associated with 2 separate food poisoning syndromes which closely resemble the more familiar ones caused by S. aureus and C. perfringens (2). Determination of the relative importance of B. cereus infections must await an increased awareness of the potential of the organism to cause foodborne illness.

The vehicle of transmission was identified in 81% of the 154 outbreaks of known etiology. The most common vehicles were meat (39/154) and fish and shellfish (34/154) in outbreaks of bacterial etiology for which a single food item could be identified.

Home canned foods were the most frequently incriminated vehicle in outbreaks of botulism. However, potato salad prepared in commercial food establishments was implicated in 2 outbreaks involving 45 of the 58 cases. Salmonella outbreaks were caused by a variety of vehicles including meat, poultry, dairy products, salads, and Mexican food. Ciguatoxin, the third most frequently reported confirmed agent, caused outbreaks involving mainly coral reef fish. All the outbreaks of paralytic shellfish poisoning were associated with scallops or mussels.

Food eaten in the home (122/481) and restaurants (234/481) accounted for 74% of the 1978 foodborne outbreaks. Of the 105 bacterial outbreaks, 39 were attributed to food eaten in the home and 32 in restaurants. Chemical outbreaks were more likely to occur in the home (21 of 37), and 6 of the parasitic outbreaks occurred in the home.

In 1978 no reports of foodborne outbreaks due to mishandling or improper cooking and storage of food at food processing establishments were reported (Table 7). Mishandling of food at food service establishments accounted for 28% of the outbreaks while mishandling at home was implicated in 8%.

Errors in food handling practices responsible for outbreaks were reported in 75 of the 154 outbreaks of known etiology (Table 8). Improper holding temperatures or inadequate cooking were responsible for most of the outbreaks of bacterial etiology. Poor personal hygiene of a food handler was also frequently reported as a contributing factor, especially

in foodborne shigellosis and in viral hepatitis outbreaks. Inadequate cooking was a factor in all outbreaks due to parasites in which contributing factors were reported.

Since the toxins responsible for ciguatera, mushroom, and paralytic shellfish poisoning are heat stable, thorough cooking of food does not provide protection from these illnesses. Furthermore, there is no practical way to distinguish fish or shellfish containing ciguatoxin or neurotoxin. For these reasons, a place of food mishandling was not specified in outbreaks of ciguatera, mushroom, or shellfish poisoning.

In reviewing the 481 outbreaks, at least 1 contributing factor was implicated in 206 (43%) (Table 8). The data mirrored patterns seen the previous 5 years. In reported outbreaks of botulism, the most frequent error was inadequate cooking of food. Improper holding temperatures most frequently contributed to reported outbreaks of salmonellosis, staphylococcus intoxication, and C. perfringens foodborne illness. Heavy metal poisoning was usually due to storage of acidic beverages in containers or pipes from which metal ions could be leached. In outbreaks of ciguatera, paralytic shellfish, and mushroom poisoning, the foods were unsafe to begin with because they contained toxins.

The date of onset of an outbreak was designated as the date of onset of the first case (Table 9). Certain types of foodborne disease outbreaks showed a definite seasonality (Table 9). For example, outbreaks of paralytic shellfish poisoning occurred in September and October following the peak period of growth of dinoflagellates in the warm summer months.

References

1. Blake PA, Allegra DT, Snyder JD, Barrett TJ, et al. Cholera--a possible endemic focus in the United States. N Engl J Med 1980;302:305-9.

2. Terranova W, Blake PA. Bacillus cereus food poisoning. N Engl J Med 1978; 298;143-4.

Fig. 1 REPORTED FOODBORNE DISEASE OUTBREAKS, 1978

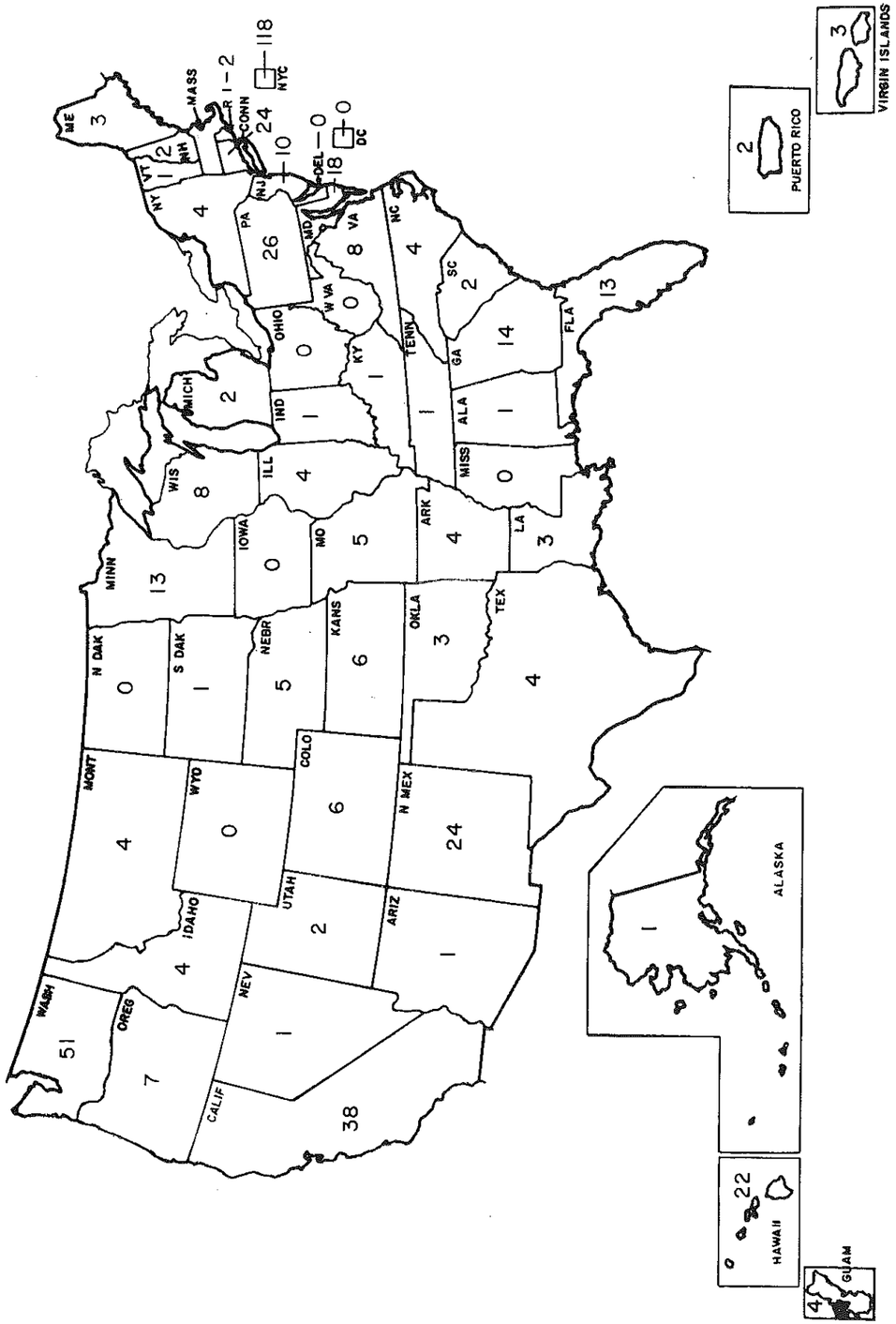

Table 1
Foodborne Disease Outbreaks, United States, by Location, 1978

State	Number of Outbreaks	State	Number of Outbreaks
Alabama	1	New Jersey	10
Alaska	1	New Mexico	24
Arizona	1	New York City	118
Arkansas	4	New York State	4
California	38	North Carolina	4
Colorado	6	North Dakota	0
Connecticut	24	Ohio	0
Delaware	0	Oklahoma	3
D.C.	0	Oregon	7
Florida	13	Pennsylvania	26
Georgia	14	Puerto Rico	2
Hawaii	22	Rhode Island	2
Idaho	4	South Carolina	2
Illinois	4	South Dakota	1
Indiana	1	Tennessee	1
Iowa	0	Texas	4
Kansas	6	Utah	2
Kentucky	1	Vermont	1
Louisiana	3	Virginia	8
Maine	3	Washington	51
Maryland	18	West Virginia	0
Massachusetts	0	Wisconsin	8
Michigan	2	Wyoming	0
Minnesota	13	Virgin Islands	3
Mississippi	0	Guam	4
Missouri	5	Total	481
Montana	4		
Nebraska	5		
Nevada	1		
New Hampshire	2		

Table 2
Confirmed Foodborne Disease Outbreaks and Cases, and Percents of Known Etiology, 1978

Etiology	Number of Outbreaks	%	No.of Cases	%
BACTERIAL				
B. cereus	6	3.9	248	5.0
Brucella	-	0.0	-	0.0
C. botulinum	12	7.8	58	1.2
C. perfringens	9	5.8	617	12.4
E. coli	1	0.6	35	0.7
Salmonella	45	29.2	1921	38.7
Shigella	4	2.6	159	3.2
S. aureus	23	14.9	1318	26.6
Enterococci	1	0.6	5	0.1
Streptococcus Group A	-	0.0	-	0.0
V. cholerae 01	1	0.6	11	0.2
V. parahaemolyticus	2	1.3	86	1.7
Other bacterial	1	0.6	8	0.2
Total	105	68.2	4466	90.0
CHEMICAL				
Heavy metals	1	0.6	41	0.8
Ciguatoxin	19	12.3	56	1.1
Neurotoxic shellfish poisoning	-	0.0	-	0.0
Paralytic shellfish poisoning	4	2.6	10	0.2
Scrombrotoxin	7	4.5	30	0.6
Monosodium glutamate	-	0.0	-	0.0
Mushroom poisoning	1	0.6	7	0.1
Other chemicals	5	3.2	19	0.4
Total	37	24.0	163	3.3
PARASITIC				
T. spiralis	7	4.5	35	0.7
Total	7	4.5	35	0.7
VIRAL				
Hepatitis A	5	3.2	300	6.0
Total	5	3.2	300	6.0
CONFIRMED TOTAL	154	100.0	4964	100.0

Table 3

Deaths Associated with Foodborne Disease Outbreaks, 1978

Etiology	Number of Deaths
C. botulinum	3
Hepatitis A	4
Unknown	7
Total	14

Table 4

Foodborne Disease Outbreaks of Unknown Etiology, by Incubation Period, 1978

Incubation Period	Number of Outbreaks
<1 hour	13
1-7 hours	109
8-14 hours	74
>15 hours	62
Unknown	69
Total	327

Table 5
Foodborne Disease Outbreaks, by Vehicle of Transmission, and Specific Etiology, 1978

Etiology	Beef	Veal	Lamb	Ham	Pork	Sausage	Chicken	Turkey	Other Meat	Shell Fish	Crustacea	Other Fish	Eggs	Milk
BACTERIAL														
B. cereus	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Brucella	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C. botulinum	-	-	-	-	-	-	-	-	1	-	-	1	-	-
C. perfringens	2	-	-	-	1	-	-	-	-	-	-	-	-	-
E. coli	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Salmonella	3	-	-	-	7	-	1	3	3	-	-	-	-	2
Shigella	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S. aureus	-	-	-	10	-	-	-	-	-	-	-	-	-	-
Enterococci	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Streptococcus Group A	-	-	-	-	-	-	-	-	-	-	-	-	-	-
V. cholerae	-	-	-	-	-	-	-	-	-	1	-	-	-	-
V. parahaemolyticus	-	-	-	-	-	-	-	-	-	2	-	-	-	-
Other bacterial	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CHEMICAL														
Heavy metals	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ciguatoxin	-	-	-	-	-	-	-	-	-	-	-	19	-	-
Neurotoxic shellfish	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paralytic shellfish	-	-	-	-	-	-	-	-	-	4	-	-	-	-
Scrombrotoxin	-	-	-	-	-	-	-	-	-	-	-	7	-	-
Monosodium glutamate	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mushroom poisoning	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other chemicals	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PARASITIC														
T. spiralis	3	-	-	-	1	1	-	-	2	-	-	-	-	-
VIRAL														
Hepatitis A	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CONFIRMED TOTAL	9	-	-	10	9	1	1	3	6	7	-	27	-	2
UNKNOWN	5	-	-	2	1	1	3	-	2	9	-	2	-	-
TOTAL	14	-	-	12	10	2	4	3	8	16	-	29	-	2

Continued on page 11

Table 5 (Cont'd)
Foodborne Disease Outbreaks, by Vehicle of Transmission, and Specific Etiology, 1978

Etiology	Cheese	Egg Nog	Ice Cream	Non Dar Bev	Other Dairy	Baked Foods	Fruits &Vegetables	Potato Salad	Egg Salad	Other Salads	Mushrooms	Chinese Food	Mexican Food	Carbonated Bev	Multiple Foods	Other Foods	Unknown	Total
BACTERIAL																		
B. cereus	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	1	2	6
Brucella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C. botulinum	-	-	-	-	-	-	4	1	-	1	-	-	1	-	1	2	-	12
C. perfringens	-	-	-	-	-	-	-	-	-	1	-	-	2	-	1	-	2	9
E. coli	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Salmonella	-	1	1	-	1	-	-	1	-	1	-	-	2	-	3	1	15	45
Shigella	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	2	4
S. aureus	-	-	-	-	-	-	-	1	1	5	-	-	-	-	4	-	2	23
Enterococci	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1
Streptococcus Group A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
V. cholerae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
V. parahaemolyticus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Other bacterial	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
CHEMICAL																		
Heavy metals	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1
Ciguatoxin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19
Neurotoxic shellfish	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paralytic shellfish	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
Scrombrotoxin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7
Monosodium glutamate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mushroom poisoning	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1
Other chemicals	-	-	-	1	1	1	1	-	-	-	-	-	-	-	-	-	1	5
PARASITIC																		
T. spiralis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7
VIRAL																		
Hepatitis A	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	3	5
CONFIRMED TOTAL	-	1	1	2	2	1	5	5	1	9	1	2	7	1	9	4	28	154
UNKNOWN	-	-	1	-	1	4	1	-	1	4	-	5	2	-	6	1	276	327
TOTAL	-	1	2	2	3	5	6	5	2	13	1	7	9	1	15	5	304	481

Table 6
Foodborne Disease Outbreaks, by Place Where Food Was Eaten, and Specific Etiology, 1978

	Home	Restaurant	School	Picnic	Church	Camp	Other or Unknown	Total
BACTERIAL								
B. cereus	1	3	1	–	–	–	1	6
Brucella	–	–	–	–	–	–	–	–
C. botulinum	9	3	–	–	–	–	–	12
C. perfringens	3	5	–	–	–	–	1	9
E. coli	–	–	–	–	–	1	–	1
Salmonella	19	15	2	1	–	–	8	45
Shigella	1	1	–	–	–	–	2	4
S. aureus	4	4	5	2	2	–	6	23
Enterococci	–	1	–	–	–	–	–	1
Streptococcus Group A	–	–	–	–	–	–	–	–
V. cholerae 01	1	–	–	–	–	–	–	1
V. parahaemolyticus	–	–	–	–	1	–	1	2
Other bacteria	1	–	–	–	–	–	–	1
Total	39	32	8	3	3	1	19	105
CHEMICAL								
Heavy metals	–	–	–	1	–	–	–	1
Ciguatoxin	15	3	–	–	–	–	1	19
Neurotoxic shellfish	–	–	–	–	–	–	–	–
Paralytic shellfish	3	–	–	–	–	–	1	4
Scrombrotoxin	1	3	–	–	–	–	3	7
Monosodium glutamate	–	–	–	–	–	–	–	–
Mushroom poisoning	1	–	–	–	–	–	–	1
Other chemicals	1	1	–	1	–	–	2	5
Total	21	7	–	2	–	–	7	37
PARASITIC								
T. spiralis	6	–	–	–	–	–	1	7
Total	6	–	–	–	–	–	1	7
VIRAL								
Hepatitis A	1	3	–	–	–	–	1	5
Total	1	3	–	–	–	–	1	5
CONFIRMED TOTAL	67	42	8	5	2	1	29	154
UNKNOWN	55	192	10	4	1	6	59	327
TOTAL 1978	122	234	18	9	3	7	88	481

Table 7
Foodborne Disease Outbreaks, by Place Where Food Was Mishandled, and Specific Etiology, 1978

	Food Processing Establishments	Food Service Establishments	Homes	Unknown	Not Applicable	Total
BACTERIAL						
B. cereus	–	4	1	1	–	6
Brucella	–	–	–	–	–	–
C. botulinum	–	1	6	5	–	12
C. perfringens	–	7	2	–	–	9
E. coli	–	1	–	–	–	1
Salmonella	–	19	5	21	–	45
Shigella	–	–	1	3	–	4
S. aureus	–	13	3	7	–	23
Enterococci	–	1	–	–	–	1
Streptococcus Group A	–	–	–	–	–	–
V. cholerae 01	–	–	1	–	–	1
V. parahaemolyticus	–	–	–	2	–	2
Other bacterial	–	–	–	1	–	1
Total	–	46	19	40	–	105
CHEMICAL						
Heavy metals	–	–	1	–	–	1
Ciguatoxin	–	–	–	–	19	19
Neurotoxic shellfish	–	–	–	–	–	–
Paralytic shellfish	–	–	–	–	4	4
Scrombrotoxin	–	2	–	5	–	7
Monosodium glutamate	–	–	–	–	–	–
Mushroom poisoning	–	–	–	–	1	1
Other chemicals	–	4	1	–	–	5
Total	–	6	2	5	24	37
PARASITIC						
T. spiralis	–	–	–	–	7	7
Total	–	–	–	–	7	7
VIRAL						
Hepatitis A	–	2	–	3	–	5
Total	–	2	–	3	–	5
CONFIRMED TOTAL	–	54	21	48	31	154
UNKNOWN	–	82	17	228	–	327
TOTAL 1978	–	136	38	276	31	481

Table 8
Foodborne Disease Outbreaks, by Contributing Factors, and Etiology, 1978

	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	6	4	4	1	1	-	-	-
Brucella	-	-	-	-	-	-	-	-
C. botulinum	12	7	-	7	-	-	-	1
C. perfringens	9	8	8	4	2	-	1	3
E. coli	1	1	1	1	1	-	-	-
Salmonella	45	23	16	12	11	3	9	4
Shigella	4	1	1	-	-	-	1	-
S. aureus	23	15	15	2	3	1	6	2
Enterococci	1	-	-	-	-	-	-	-
Streptococcus Group A	-	-	-	-	-	-	-	-
V. cholerae 01	1	1	1	1	-	-	-	-
V. parahaemolyticus	2	1	1	-	-	-	-	1
Other bacterial	1							
Total	105	61	47	28	18	4	17	11
CHEMICAL								
Heavy Metal	1	-	-	-	-	-	-	-
Ciguatoxin	19	-	-	-	-	-	-	-
Neurotoxic shellfish	-	-	-	-	-	-	-	-
Paralytic shellfish	4	4	-	-	-	4	-	1
Scrombrotoxin	7	2	2	-	-	-	-	-
Monosodium glutamate	-	-	-	-	-	-	-	-
Mushroom poisoning	1	-	-	-	-	-	-	-
Other chemicals	5	2	1	-	1	-	1	1
Total	37	8	3	-	1	4	1	2
PARASITIC								
T. spiralis	7	3	-	3	-	-	-	-
Total	7	3	-	3	-	-	-	-
VIRAL								
Hepatitis A	5	2	-	-	-	-	2	-
Total	5	2	-	-	-	-	2	-
CONFIRMED TOTAL	154	74	50	31	19	8	20	13
UNKNOWN	327	132	100	22	26	8	43	19
TOTAL 1978	481	206	150	53	45	16	63	32

Table 9
Foodborne Disease Outbreaks, by Month of Occurrence, and Specific Etiology, 1978

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Unknown	Total
BACTERIAL														
B. cereus	-	-	-	-	-	1	1	1	-	-	3	-	-	6
Brucella	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C. botulinum	2	1	-	2	1	1	-	1	-	2	2	-	-	12
C. perfringens	-	1	1	-	1	1	-	1	1	1	-	2	-	9
E. coli	-	-	-	-	-	-	-	-	1	-	-	-	-	1
Salmonella	1	1	2	3	2	5	4	7	4	6	4	4	2	45
Shigella	-	-	-	-	-	-	-	-	-	-	-	2	2	4
S. aureus	-	-	3	-	-	2	1	6	1	2	6	2	-	23
Enterococci	-	-	-	-	-	-	-	-	-	-	-	1	-	1
Streptococcus Group A	-	-	-	-	-	-	-	-	-	-	-	-	-	-
V. cholerae 01	-	-	-	-	-	-	-	-	1	-	-	-	-	1
V. parahaemolyticus	-	-	-	1	-	1	-	-	-	-	-	-	-	2
Other bacterial	1	-	-	-	-	-	-	-	-	-	-	-	-	1
Total	4	3	6	6	4	11	6	16	8	11	15	11	4	105
CHEMICAL														
Heavy metals	-	-	-	-	-	1	-	-	-	-	-	-	-	1
Ciguatoxin	5	1	-	1	-	-	4	-	3	-	1	4	-	19
Neurotoxic shellfish	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paralytic shellfish	-	-	-	-	-	-	-	-	3	1	-	-	-	4
Scrombrotoxin	1	-	3	-	2	-	-	-	1	-	-	-	-	7
Monosodium glutamate	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mushroom poisoning	1	-	-	-	-	-	-	-	-	-	-	-	-	1
Other chemicals	1	-	-	1	-	1	-	-	1	1	-	-	-	5
Total	8	1	3	2	2	2	4	-	8	2	1	4	-	37
PARASITIC														
T. spiralis	-	-	-	-	2	-	1	-	1	1	-	1	1	7
Total	-	-	-	-	2	-	1	-	1	1	-	1	1	7
VIRAL														
Hepatitis A	-	-	-	-	2	-	-	1	-	-	2	-	-	5
Total	-	-	-	-	2	-	-	1	-	-	2	-	-	5
CONFIRMED TOTAL	12	4	9	8	10	13	11	17	17	14	18	16	5	154
UNKNOWN	24	21	26	42	32	33	21	21	21	12	29	27	18	327
TOTAL 1978	36	25	35	50	42	46	32	38	38	26	47	43	23	481