

# Foodborne Disease Surveillance

## Washington State

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*A systematic approach to foodborne disease surveillance introduced in Washington state in 1969 demonstrates the capacity of systematic surveillance to help control foodborne disease within a defined area, and it suggests that the nationwide data, although deficient for making quantitative estimates, provide a reliable profile of the qualitative aspects of the problem.*

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### Introduction

One of the major themes sounded at the 1971 National Conference on Food Protection was the need for active collection and analysis of information regarding occurrence of foodborne disease outbreaks.<sup>1</sup> Such surveillance, it was reasoned, plays a major role in determining current causes of foodborne disease and guiding control measures.

In 1951 to 1960, the National Office of Vital Statistics published annual compilations of foodborne disease outbreaks voluntarily reported from all over the United States.<sup>2</sup> Since 1966, the Center for Disease Control (CDC)

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has compiled annual summaries of foodborne disease outbreaks, based again on information submitted on a voluntary basis from throughout the country. Both of these reporting systems have been dependent upon the quality and quantity of state and local investigations of foodborne disease. It is acknowledged that, in most parts of the country, foodborne disease outbreaks, except when dramatic in size or severity, are not generally investigated and reported. In view of this, the currently available nationwide data have been of limited value in characterizing the nature of the foodborne disease problem in the United States. To define the problem, attention must be directed toward improving the investigation and reporting of foodborne disease at the state and local levels.

During the 1960s, members of the divisions of epidemiology in the Washington State Department of Social and Health Services and the Seattle-King County Health Department gave special emphasis to the investigation of outbreaks of enteric disease, particularly those involving *Salmonella* species. This interest was reflected in the publication of a number of well studied outbreaks<sup>3-6</sup> and public presentations of various recommendations regarding

the investigation of communicable enteric diseases.<sup>7,8</sup> Based upon this background of interest and experience, a formal surveillance system for investigating and reporting foodborne disease outbreaks was developed and introduced on a statewide basis in 1969. It was the objective of this system to provide estimates of the qualitative and quantitative aspects of the foodborne disease problem based on a uniformly implemented reporting system.

Figure 1 depicts the operational scheme of the surveillance system. The basic components are the physicians, hospitals, and patients from whom foodborne disease complaints arise (shown on the periphery) and the several local, state, and federal agencies which may become involved in the investigation and control of such problems. As depicted by the solid lines, reports of outbreaks arising from the public come to the state health department, sometimes via other agencies such as the Food and Drug Administration (FDA), U.S. Department of Agriculture (USDA), and CDC, sometimes directly from the public, but usually from local health departments. Upon reaching the state health department, the reports are evaluated and appropriate actions are taken. Such actions, represented by dotted lines, include assistance with local investigation and control measures, reporting of pertinent findings to the public, and communication with other states and federal agencies where problems of an interstate nature are involved. (Further communications or actions that might be undertaken by federal agencies are not depicted in this state-based scheme.)

This paper reviews methods of implementation, results of a full year in operation, and implications to be drawn regarding the nature of the foodborne disease problem nationwide.

### Implementation

To implement the system effectively, a standard approach to investigating and reporting was introduced at the local level. This was achieved by conducting seminars throughout the state attended by one or more members of virtually every local health department as well as regional USDA and FDA staff members. Several essential ingredients went into the seminars:

1. They were conducted as a cooperative effort between the laboratory, environmental, and epidemiology sections of the state health department, thus emphasizing the point that foodborne disease surveillance is a multidisciplinary endeavor.

2. Certain simple principles of evaluating food-related complaints were provided. It was stressed that two or more associated illnesses (usually including significant gastrointestinal tract symptomatology) following a common meal constitutes grounds for suspecting a foodborne outbreak. The use of epidemiological and laboratory methods of evaluation was demonstrated.

3. Basic tools for investigating outbreaks were provided and their use was graphically reviewed. The tools consisted of a simple epidemiological questionnaire to be

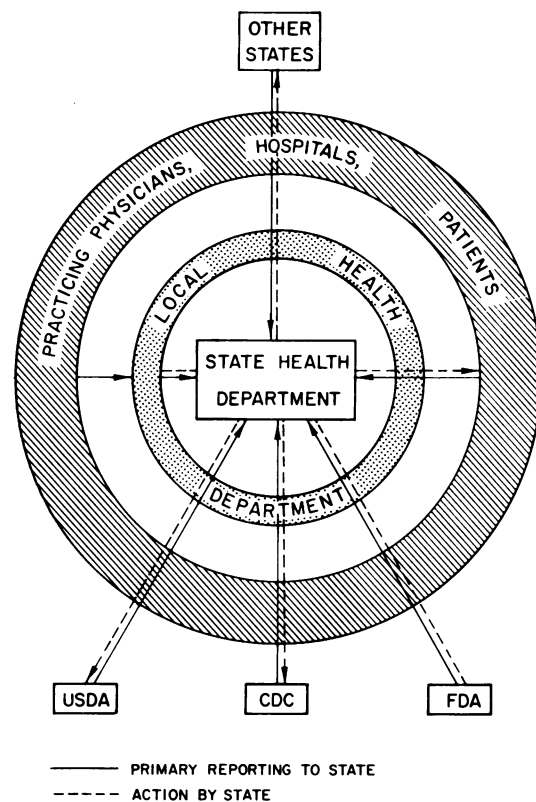


FIGURE 1 A state system of foodborne disease outbreak surveillance.

filled out, tabulated, and analyzed by the local investigator and sent to the state division of epidemiology in the form of an outbreak report, preaddressed mailing cylinders for collecting and sending stool specimens to the laboratory, and a 5-gallon can filled with sawdust for packing and sending food specimens.

Reports received by the state division of epidemiology were evaluated, using the following criteria for foodborne disease outbreaks:

1. Epidemiologically confirmed outbreaks
  - a. Two or more persons associated in time and place experiencing onset of a similar acute illness following exposure to common food or beverage;
  - b. No similar illness occurring in other persons associated in time and place, but not exposed to the common food or beverage;
  - c. No obvious evidence, laboratory or otherwise, of a nonfoodborne etiology.
2. Laboratory-confirmed outbreaks
  - a. Epidemiologically confirmed outbreaks in which a known foodborne pathogen compatible with the observed symptomatology is isolated from food and/or patient specimens;
  - b. Single well documented cases of rare and relatively severe types of foodborne disease, including botulism and trichinosis.

To complement the reporting from local investigators, various forms of informal and formal feedback from the state health department were instituted; these included



The preventive measures stemming from this surveillance activity are difficult to estimate. However, several specific results may be cited: (1) improper equipment or procedures were corrected in many restaurants, and one restaurant was permanently closed; (2) an unlicensed carbonated beverage business was discovered and closed; (3) several incriminated commercial products were investigated in cooperation with the FDA or USDA and were removed from the market; (4) a salmonella outbreak involving persons throughout the country was detected; and (5) as noted above, two etiologies of foodborne disease previously almost unrecognized in the United States were investigated and brought to the attention of the public.

### Washington-U.S.A. Comparison, 1969

It is of interest to compare the Washington data and the U.S. data reported to CDC in 1969 and published in the "Foodborne Outbreak Annual Summary." A total of 371 outbreaks were reported for the entire nation during the year. Figure 4, taken from the CDC report, shows the distribution by state; there were great differences in levels of reporting from different states. The incidence of outbreaks was 1.9 per million population for the country as a whole compared with 23 per million for Washington state, a rate far exceeding that for any other state. Based on the Washington rate, one would estimate that over 4000 outbreaks might have been detected and reported nationwide, in contrast to the 371 actually reported (Table 2).

Comparison of the Washington and U.S. experiences in terms of various contributing factors is depicted in Table 3. With respect to etiological agents, *Staphylococcus aureus* was a leading offender, accounting for 25 per cent of outbreaks in both systems. The distributions for *Clos-*

*tridium perfringens*, *Salmonella* species, and less common agents were generally quite similar. In terms of vehicle foods, the distributions were comparable for the leading categories, meat and poultry, with some variability noted among the less frequently involved foods. For the place where the incriminated food was eaten, the findings were again similar, with homes and restaurants accounting for the bulk of the problem. Finally, in the category that is of greatest importance in focusing on the cause and control of foodborne disease, errors in food preparation were traced in order of frequency to food services, homes, and food processors in both instances.

TABLE 1—Etiological Agents, Foodborne Disease Surveillance, Washington State, 1969

	Outbreaks		Cases	
	No.	%	No.	%
<i>Clostridium perfringens</i>	17 (4)*	25	677	60
<i>Staphylococcus aureus</i>	17 (12)	25	220	19
<i>Salmonella</i> species	5 (1)	7	42	4
<i>Vibrio parahaemolyticus</i>	2 (2)	3	71	6
<i>Bacillus cereus</i>	1	1	5	1
<i>Clostridium botulinum</i>	1	1	1	
<i>Brucella melitensis</i>	1	1	1	
<i>Trichinella spiralis</i>	1	1	1	
Mushroom	2	3	3	
Copper	1	1	8	
Tin	4	6	32	
Unknown etiology	17	25	74	6
<b>Total</b>	<b>69 (19)</b>		<b>1135</b>	

\* Number of outbreaks in which the agent was highly suspect, but laboratory confirmation was lacking.

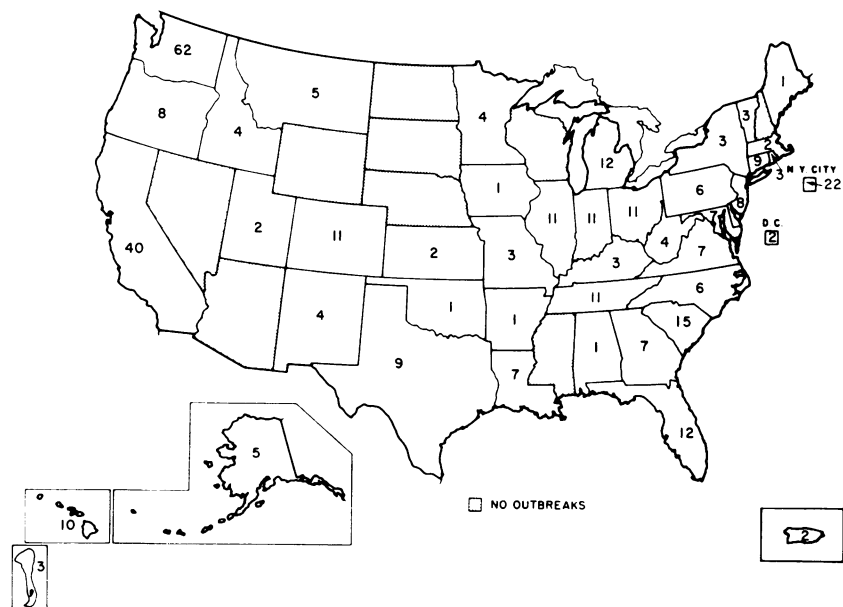


FIGURE 4 Number of outbreaks of foodborne illness by state, 1969. Seven Washington outbreaks were not reported in time for inclusion in the national surveillance report.

**TABLE 2—Incidence of Reported Outbreaks, Foodborne Disease Surveillance, Washington State and U.S.A., 1969**

	Population (Millions)	No. of Outbreaks	Outbreaks/ Million
Washington	3	69	23.0
U.S.A.	200	371	1.9*

\* U.S.A. estimated outbreaks per million based on the Washington rate = 4600.

**TABLE 3—Distribution of Selected Parameters, Foodborne Disease Surveillance, Washington State and U.S.A., 1969**

	Washington		U.S.A.	
	No.	%	No.	%
<b>Etiologic agents</b>				
<i>Staphylococcus aureus</i>	17	25	94	25
<i>Clostridium perfringens</i>	17	25	65	18
<i>Salmonella</i> species	5	7	49	13
Miscellaneous pathogens	6	8	56	15
Chemical	7	10	27	7
Unknown	17	25	80	22
Total	69	100	371	100
<b>Vehicle foods</b>				
Meat	24	35	135	34
Poultry	9	13	76	19
Seafood	5	7	25	6
Dairy	2	3	10	3
Bakery	9	13	21	5
Vegetable	8	12	46	12
Other	1	1	32	8
Unknown	11	16	53	13
Total	69	100	398*	100
<b>Place of consumption</b>				
Home	33	48	163	44
Restaurant	23	33	105	28
School	3	4	38	10
Other	10	15	65	18
Total	69	100	371	100
<b>Source of error</b>				
Food service	23	33	114	31
Consumer	13	19	48	13
Food processor	9	13	31	8
Undetermined	24	35	178	48
Total	69	100	371	100

\* Multiple foods incriminated in 20 outbreaks.

## Discussion

This 1-year experience has demonstrated the capacity of this state-based surveillance system to contribute to both primary and secondary prevention of foodborne disease.

First, it has documented the quantitative and qualitative nature of the problem, applying a uniform reporting system to a defined population. This has in turn offered an opportunity for comparing and evaluating the foodborne disease surveillance statistics compiled on a national basis

by CDC. On the one hand, the Washington experience gives some perspective to the acknowledged deficiency of the national statistics for providing a quantitative estimate of the problem, suggesting that the true incidence is at least 10 times that which is reported to CDC. On the other hand, the similarities between the Washington and CDC patterns, with regard to etiological agents, vehicle foods, place of consumption, and the parties responsible for food errors, suggest that the national data, despite their quantitative deficiencies, provide a reasonably reliable profile of the major qualitative aspects of the foodborne disease problem. This impression is strengthened by a recent report of similar findings comparing investigations of foodborne disease in New York City with that reported from the rest of the country.<sup>1,2</sup> The consistency of patterns resulting from three quite different reporting systems should prove reassuring to those government and professional groups that use these foodborne disease statistics as a guide to the development and implementation of primary preventive measures.

## Summary

In 1969, a systematic approach to foodborne disease surveillance was introduced in Washington. Methods of investigating outbreaks were reviewed with all local health departments. Liaison was established with other government agencies involved in food protection. All reported outbreaks were evaluated by an epidemiologist, laboratory specimens were obtained whenever possible, and control measures were instituted as indicated.

Sixty-nine outbreaks were confirmed epidemiologically, and laboratory confirmation was obtained for 33. Underlying food errors were determined and corrections were instituted in 45 instances.

The Washington data may be compared with the U.S. data for 1969. Distributions of outbreaks by etiology, vehicle, setting, and type of food error were similar. Incidence differed markedly: 23 outbreaks per million population for Washington versus 1.9 per million for the United States. (Applying the Washington rate to the nation, an estimated 4000 outbreaks per year might be detected, in contrast to the 300 to 400 actually reported.)

This experience demonstrates the capacity of systematic surveillance to recognize and contribute to the control of foodborne disease within a defined area. Additionally, it suggests that the nationwide data, although deficient for making quantitative estimates, provide a reliable profile of the qualitative aspects of the problem.

Second, the introduction of systematic investigation of suspect foodborne disease complaints at the local level has been associated with the detection and correction of numerous specific sources of foodborne disease. Such successful secondary preventive achievements were probably in large measure dependent upon the coordinated efforts of local health personnel in initiating investigations, the state health department in providing ready epidemiological, laboratory, and environmental consultation, and federal agencies in providing further investigative assistance

as needed and implementing regulatory measures where appropriate. The implementation of similar multidisciplinary, multiagency surveillance systems should prove useful in other parts of the country.

### ADDENDUM

In 1970, 1971, and 1972 between 45 and 68 foodborne disease outbreaks were reported to the Center for Disease Control from Washington. Washington was one of several states involved in documenting interstate outbreaks involving enteropathogenic *Escherichia coli* in imported cheese, *Staphylococcus aureus* in salami, and cadmium in imported candy in 1971. (Source: Center for Disease Control: Foodborne Outbreaks Annual Summary 1970, 1971, and 1972.)

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## SOUTHEASTERN OCCUPATIONAL HEALTH CONFERENCE

The annual Southeastern Occupational Health Conference will be held in Winston-Salem, NC, at the Hyatt House, October 3-5. Topics for discussion include: Rehabilitation of Mental Health Problems, Insurance—Vocational Rehabilitation—Compensation, and Rehabilitation of Workers with Skin Problems. Special half-day sessions for nurses and physicians are also being planned.

For additional information on the Conference write: D. H. Robinson, MD, Chief, Bureau of Occupational Health and Safety, South Carolina Dept. of Health and Environment, J. Marion Sims Bldg., 2600 Bull St., Columbia, SC 29201.