

AN OUTBREAK OF ACUTE SORE THROATS
FOLLOWING A CHARITY LUNCHEON

Practical Exercise

A.

INTRODUCTION

This exercise describes an outbreak of sore throats that took place in Baltimore some years ago and was investigated by the Baltimore City Health Department. The exercise will give you an idea of how such an investigation is carried out. In addition, it will introduce you to a number of important concepts including the epidemic curve, the median incubation period, the attack rate or incidence rate and the relative risk.

It will also demonstrate how an investigator attempts to discriminate among several possible etiologic factors in order to identify the one most likely to be the cause of the disease.

Concepts covered in this problem include:

- Definition of a case
- Selection of a study population
- Epidemic curve
- Incubation period
- Attack rate (incidence rate)
- Relative risk

While working through this problem, assume that you are investigating this outbreak for the Health Department. Acute outbreaks of any disease should be investigated as soon as possible, and efficiency is improved if steps are taken in logical sequence. In this example some of the steps have already been taken.

B. DESCRIPTION OF THE OUTBREAK

On Friday, February 8th, a private physician telephoned the Baltimore City Health Department to report that on the day before and the morning of his call, he had seen several women with acute sore throat. Each of the women gave a history of attendance at a luncheon at a National Guard Armory on Wednesday, February 6 at 12:00 noon. The physician described the illnesses as characterized by acute onset with chills, fever, general malaise, and sore throat; physical examination revealed inflamed throat with some exudate, cervical adenitis, and temperature between 38.8 to 40.0 degrees Celsius.

In addition, he stated that one of the husbands, who had not attended the luncheon, had an acute sore throat. The physician further made the observation that the wife had brought home some leftover food and her husband had eaten this for supper on February 6.

An investigation was immediately undertaken, and the District Health Officer, who made the first home visits, verified the physician's original report and obtained additional information which indicated that this was an outbreak of major proportions.

The luncheon had been a fundraising effort to help fight cancer in children and had been an annual affair of an organization of 96 women for several years. Between 800-900 people, mostly women, attended the luncheon. The procurement and preparation of the food served had been done largely by the women themselves. A commercial caterer and a restaurateur had voluntarily assisted in the preparation of the food. The complete menu,

which was served cafeteria style, was as follows: egg salad, tuna fish salad, macaroni and cheese, cottage cheese with nuts and cherries, pickles and olives, ice cream, coffee and cookies.

A questionnaire was prepared by the Health Department and distributed one week after the luncheon to as many people who had attended as possible. The questionnaire requested the following information: clinical details of the illness, time of onset of the illness, name of the attending physician, history of foods consumed at the luncheon, and a statement whether any food had been taken home and if so, who had eaten it with what result. The accompanying table (see appendix) consists of a summary of the information obtained from the returned questionnaires. Listed in this table are all 96 members of the organization and the 67 guests who supplied information.

C. SUMMARY OF INFORMATION OBTAINED FROM QUESTIONNAIRES OF MEMBERS

Methods for Handling Data

The data are given in tabular form in the appendix. Information for all 96 members and 67 guests who responded to the questionnaire are available in the table. To extract data from the tables, one could use a highlighting marker to draw a band of transparent color across the line for each case or noncase, based on your definition of which symptoms constitute illness. In this instance, there are fewer noncases than cases. Highlighting the noncases will be less work than highlighting the cases. This technique will increase the accuracy of data extraction. Sorting and counting of the data can be done simultaneously by more than one student in the group.

D. INVESTIGATION OF THE OUTBREAK: QUESTIONS TO ANSWER

After you have read sections A C of this exercise, you are ready to analyze the data. The first step in an outbreak investigation is to define the epidemic. To do this, you must calculate the overall *attack rate* of illness. Similar to an incidence rate, the calculation of the attack rate requires two important decisions to be made: deciding on a case definition and defining the population at risk.

1. Case Definition: You have to consider the best way in which to define a case of illness. There are several possibilities and each definition you choose will yield a different number of cases. The goal is to include as many "true" cases and as few "false" cases as possible. Each definition will differ in its validity, i.e. its ability to properly classify those who are truly sick and those who are truly not sick. As a group, decide which symptom(s) will be your case definition. You will use this to determine the *numerator* of the attack rates that you will calculate later.

2. Population at risk: Your group must decide who to include in your study. The individuals you select to be in your study will constitute the *denominator* of the attack rate you calculate later. Ideally, they should be *representative* of all the people who ate at the luncheon and thus, all people at risk of becoming ill. To be representative they should be unbiased with respect to the foods eaten and to whether or not they became ill. Consider whether the data for both the members and the guests should be used in your analysis. Do both sets of data meet the requirements for representativeness mentioned above? Why or why not?

3. Attack rates: Using your case definition and definition of the population at risk of developing illness, calculate the estimated overall attack rate of the illness among those attending the luncheon?

4. Epidemic curve: Orient the outbreak as to time by tabulating the cases by day of onset, and where possible by time of day. Graph the distribution and find the median time (in hours) of onset. Note that only a date is given in some cases, whereas time of day (AM or PM) is given in other cases. Consider how to use this information while making maximum use of all of the data available. Make any possible inferences as to the type of outbreak and the probable time of exposure.

5. Food-specific attack rates: An important issue is whether a particular food can be implicated as the source of the agent causing the illness. In order to determine this, make appropriate tables of the rates needed to identify the probable source of the outbreak. Refer to the CDC form in the appendix. Compare the attack rates for eaters and noneaters of each food by calculating: (1) the *difference* between the two rates, and (2) the *ratio* of the two rates.

6. Conclusion. What is the responsible food for the outbreak?

SUMMARY OF INFORMATION OBTAINED FROM QUESTIONNAIRES OF MEMBERS

Member Number	Date of Onset	Symptoms					Foods Eaten					
		S/T	F	H/A	V	D	E/S	M/C	C/C	T/S	I/C	OTH
1	2/7	X		X			X	X	X	X	X	X
2	2/6	X	X	X	X		X	X	X	X	X	X
3	2/7	X	X	X			X	X	X			X
4	Not Sick						X		X	X		X
5	2/7	X		X		X	X		X	X	X	X
6	2/7 (p.m.)	X	X	X			X	X	X	X		X
7	Not Sick										X	X
8	2/8 (p.m.)	X					X	X			X	X
9	2/7 (noon)	X	X	X			X	X		X	X	X
10	2/10	X		X			X			X		X
11	2/8	X	X	X			X		X	X	X	X
12	2/8 (a.m.)	X	X	X			X	X	X	X	X	X
13	2/7 (p.m.)	X	X	X		X	X			X	X	X
14	2/8				X	X	X			X		X
15	2/7	X	X				X	X		X		X
16	Not Sick							X	X	X	X	X
17	2/7	X	X	X			X		X	X	X	X
18	2/7 (p.m.)	X				X	X	X	X	X	X	X
19	2/8	X					X			X		X
20	2/8 (a.m.)	X	X				X		X	X		X
21	2/9	X				X	X	X	X	X	X	X
22	Not Sick						X			X		
23	2/7 (a.m.)	X	X				X			X		X
24	2/9	X	X	X			X	X	X	X	X	X
25	2/7 (a.m.)	X	X		X		X		X	X	X	X
26	Not Sick							X	X		X	X
27	2/8	X	X						X	X	X	X
28	2/7	X	X				X			X		X
29	2/8	X	X				X	X		X		X
30	2/7	X	X				X		X	X	X	X
31	Not Sick						X		X			X
32	2/8	X		X			X					X
33	2/8	X	X				X	X	X	X	X	X
34	2/8	X	X	X	X		X					X
35	Not Sick									X		X

S/T = Sore Throat, F = Fever, H/A = Headache, V=Vomiting, D = Diarrhea T/S = Tuna Salad
I/C = Ice Cream, OTH = Other E/S = Egg Salad, M/C = Macaroni & Cheese, C/C = Cottage Cheese

Information on Members *(continued)*

Member Number	Date of Onset	Symptoms					Foods Eaten					
		S/T	F	H/A	V	D	E/S	M/C	C/C	T/S	I/C	OTH
36	2/8 (a.m.)	X	X	X		X			X	X	X	X
37	2/8	X	X				X		X	X	X	X
38	2/8	X	X	X			X	X	X	X		X
39	Not Sick								X			X
40	Not Sick										X	X
41	Not Sick						X		X			X
42	Not Sick							X	X	X	X	X
43	2/7	X	X	X			X			X		X
44	Not Sick											X
45	Not Sick									X		X
46	2/8 (a.m.)	X	X				X	X	X	X		X
47	2/7 (p.m.)	X	X		X		X			X		X
48	2/7	X	X				X	X	X	X	X	X
49	2/7 (a.m.)	X							X			
50	2/6 (p.m.)	X		X			X		X	X	X	X
51	Not Sick						X		X	X		X
52	2/8	X		X			X		X	X	X	X
53	2/7 (p.m.)	X	X	X			X	X	X	X	X	X
54	Not Sick						X	X	X	X	X	X
55	2/7	X	X				X		X	X	X	
56	2/9	X	X			X	X			X		X
57	2/8	X					X		X	X		X
58	Not Sick						X	X	X			X
59	Not Sick								X			X
60	2/8	X		X			X	X	X		X	X
61	Not Sick						X	X	X			
62	Not Sick						X	X		X	X	X
63	2/7	X	X	X			X	X		X		X
64	2/8	X		X			X		X		X	X
65	2/8	X	X	X			X	X	X	X	X	X
66	Not Sick						X	X	X	X	X	X
67	2/7 (p.m.)	X										X
68	2/7 (p.m.)	X		X			X		X	X		X
69	2/7 (p.m.)	X	X	X			X					X
70	2/7	X								X		X

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Information on Members *(continued)*

Member Number	Date of Onset	Symptoms					Foods Eaten					
		S/T	F	H/A	V	D	E/S	M/C	C/C	T/S	I/C	OTH
71	Unknown	X	X	X			X	X	X	X		X
72	2/7	X	X				X	X	X	X		X
73	2/8	X	X	X		X	X		X	X	X	X
74	2/7 (a.m.)	X	X	X								X
75	2/7	X	X	X			X	X	X	X		X
76	Not Sick								X	X	X	X
77	2/7	X	X	X			X		X	X	X	X
78	Not Sick											X
79	2/7 (a.m.)	X	X				X		X	X	X	X
80	Not Sick								X	X		X
81	2/8	X					X	X		X	X	
82	2/7	X	X	X			X	X	X			X
83	2/7	X					X			X		X
84	2/7	X	X	X			X	X	X	X	X	X
85	Not Sick								X	X		
86	Attended but did not eat											
87	Could not be contacted											
88	Could not be contacted											
89	Could not be contacted											
90	Could not be contacted											
91	Did not attend											
92	Did not attend											
93	Did not attend											
94	Did not attend											
95	Did not attend											
96	Did not attend											

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E/S = Egg Salad, M/C = Macaroni & Cheese, C/C = Cottage Cheese, T/S = Tuna Salad,
I/C = Ice Cream, OTH = Other

SUMMARY OF INFORMATION OBTAINED FROM QUESTIONNAIRES OF GUESTS

Guest Number	Date of Onset	Symptoms					Foods Eaten					
		S/T	F	H/A	V	D	E/S	M/C	C/C	T/S	I/C	OTH
97	2/7	X	X	X			X		X	X		X
98	Unknown	X	X				X		X	X	X	X
99	2/8	X	X				X	X	X	X		X
100	2/8	X	X				X	X	X	X		X
101	2/7(p.m.)	X	X	X	X	X	X	X	X	X		X
102	2/8	X	X				X			X		
103	2/7	X	X	X	X		X	X	X	X	X	X
104	2/7	X	X	X			X	X	X	X		X
105	2/7	X	X				X	X	X	X	X	X
106	2/8	X	X	X			X		X	X	X	X
107	2/6	X		X			X		X	X	X	X
108	2/7 (a.m.)	X	X	X	X		X	X	X		X	X
109	2/9		X		X	X	X					
110	2/7	X	X	X			X	X	X	X		X
111	2/7(p.m.)	X	X	X	X		X	X			X	X
112	2/7 (a.m.)	X				X	X	X	X	X	X	X
113	2/7	X	X	X			X	X	X	X		X
114	2/6 (p.m.)	X	X	X			X			X	X	X
115	Not Sick						X	X	X	X	X	X
116	2/7 (p.m.)	X	X				X	X	X	X	X	X
117	2/7	X	X	X	X	X	X	X	X	X	X	X
118	Not Sick								X	X		
119	2/7 (a.m.)	X	X	X			X	X	X	X	X	X
120	2/8 (p.m.)	X	X				X	X	X	X	X	X
121	2/8 (p.m.)	X	X	X			X		X			
122	Not Sick						X	X	X	X		X
123	2/7 (p.m.)	X	X	X	X	X	X		X			X
124	2/7	X	X			X	X					X
125	2/8	X	X				X	X	X	X	X	X
126	2/6 (p.m.)	X	X	X			X	X	X	X	X	X
127	2/7 (p.m.)	X	X	X			X	X	X	X	X	X
128	Not Sick						X	X	X	X	X	X
129	2/8	X	X	X			X	X	X	X	X	X
130	Not Sick						X	X	X	X	X	X
131	2/7	X					X	X		X	X	X

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Information on Guests (continued)

Guest Number	Date of Onset	Symptoms					Foods Eaten					
		S/T	F	H/A	V	D	E/S	M/C	C/C	T/S	I/C	OTH
132	2/7	X					X	X		X	X	X
133	2/7	X	X	X		X	X	X	X			X
134	2/7 (p.m.)	X	X	X		X	X	X	X			X
135	2/7 (a.m.)	X					X					X
136	Not Sick						X	X	X		X	X
137	2/7	X	X				X		X	X	X	X
138	2/7	X	X	X			X		X	X	X	X
139	2/7	X	X			X	X	X	X	X	X	X
140	Unknown	X					X	X	X	X	X	X
141	Not Sick						X	X	X	X	X	X
142	2/7 (a.m.)	X					X			X		X
143	2/8	X	X				X			X	X	X
144	2/7 (p.m.)	X	X	X			X	X		X	X	X
145	Unknown	X	X	X			X	X	X	X	X	X
146	2/7	X					X				X	X
147	2/8	X	X	X				X	X		X	X
148	2/7 (p.m.)	X	X	X			X					X
149	2/7 (a.m.)	X	X				X	X	X	X		X
150	2/7	X	X	X			X					
151	Not Sick						X	X	X	X	X	X
152	2/7	X					X	X	X	X	X	X
153	2/7 (a.m.)	X	X	X			X	X	X	X		X
154	2/8	X	X				X	X		X	X	X
155	2/8	X	X				X	X	X	X	X	X
156	2/6	X	X	X		X	X	X	X	X	X	X
157	Unknown	X	X	X			X					
158	2/8	X	X				X	X	X	X	X	X
159	Not Sick						X					
160	2/8 (p.m.)	X	X	X		X	X	X	X			X
161	2/7 (p.m.)	X	X	X			X	X	X	X	X	X
162	2/7 (p.m.)	X	X	X					X			X
163	2/7 (p.m.)	X	X				X		X	X	X	X

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 I/C = Ice Cream, OTH = Other

CDC FORM FOR INVESTIGATION OF A FOODBORNE OUTBREAK

DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
CENTERS FOR DISEASE CONTROL
ATLANTA, GEORGIA 30333

CDC USE ONLY
(1-4)

FORM APPROVED
OMB NO. 0920-0004

INVESTIGATION OF A FOODBORNE OUTBREAK

1. Where did the outbreak occur? State _____ (5-6) City or Town _____ County _____		2. Date of outbreak: (Date of onset 1st case) _____ MO / DA / YR (7-12)	
3. Indicate actual(a) or estimated(e) numbers Persons exposed _____ (13-17) Persons ill _____ (18-22) Hospitalized _____ (23-27) Fatal case _____ (28-31)		4. History of Exposed Persons: No. histories obtained _____ (32-35) No. persons w/ symptoms _____ (36-39) Nausea ____ (40-43) Diarrhea ____ (44-47) Vomiting ____ (48-51) Fever _____ (52-55) Cramps ____ (56-59) Other, specify _____ _____ (60-79)	
		5. Incubation period (hours): Shortest _____ Longest _____ (80-83) (84-87) Approx. for majority _____ (88-91)	
		6. Duration of illness (hours): Shortest _____ Longest _____ (92-95) (96-99) Approx. for majority _____ (100-104)	

7. Food-specific attack rates:

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

8. Vehicle responsible (food item incriminated by epidemiological evidence): _____ (105-106)

9. Manner in which incriminated food was marketed: (Check all Applicable)				10. Place of Preparation of Contaminated Item: (151)		11. Place where eaten: (172)	
(a) Food Industry				Restaurant <input type="checkbox"/> 1		Restaurant <input type="checkbox"/> 1	
Raw <input type="checkbox"/> <input type="checkbox"/> (107)				Delicatessen <input type="checkbox"/> 2		Delicatessen <input type="checkbox"/> 2	
Processed <input type="checkbox"/> <input type="checkbox"/> (108)				Cafeteria <input type="checkbox"/> 3		Cafeteria <input type="checkbox"/> 3	
Home Product				Private Home <input type="checkbox"/> 4		Private Home <input type="checkbox"/> 4	
Raw <input type="checkbox"/> <input type="checkbox"/> (109)				Caterer <input type="checkbox"/> 5		Caterer <input type="checkbox"/> 5	
Processed <input type="checkbox"/> <input type="checkbox"/> (110)				Institution:		Institution:	
(b) Vending Machine <input type="checkbox"/> <input type="checkbox"/> (111)				School <input type="checkbox"/> 6		School <input type="checkbox"/> 6	
(c) Not Wrapped				Church <input type="checkbox"/> 7		Church <input type="checkbox"/> 7	
Ordinary Wrapping <input type="checkbox"/> <input type="checkbox"/> (112)				Camp <input type="checkbox"/> 8		Camp <input type="checkbox"/> 8	
Canned <input type="checkbox"/> <input type="checkbox"/> (114)				Other, specify <input type="checkbox"/> 9		Other, specify <input type="checkbox"/> 9	
Canned - Vacuum Sealed <input type="checkbox"/> <input type="checkbox"/> (115)				_____		_____	
Other (specify) _____ (116)				_____ (152-171)		_____ (173-192)	
(d) Room Temperature <input type="checkbox"/> <input type="checkbox"/> (130)				_____		_____	
Refrigerated <input type="checkbox"/> <input type="checkbox"/> (131)				_____		_____	
Frozen <input type="checkbox"/> <input type="checkbox"/> (132)				_____		_____	
Heated <input type="checkbox"/> <input type="checkbox"/> (133)				_____		_____	
If a commercial product, indicate brand name and lot number: _____ (134-150)				_____ (152-171)		_____ (173-192)	

This report is authorized by law (Public Health Service Act, 42 USC 241). While your response is voluntary, your cooperation is necessary for the understanding and control of this public health program. Public reporting burden for this collection of information is estimated to average 15 minutes per response. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to PHS Reports Clearance Officer: ATTN: PRA; Hubert Humphrey Building Bg, Rm 721-H, 200 Independence Ave, SW, Washington, DC 20201, and to the Office of Management and Budget, Paperwork Reduction Project (0920-0004): Washington, DC 20503.

CDC Form *(continued)*

12. Food specimens examined: (193) Specify by "X" whether food examined was original (eaten at time of outbreak) or <u>checkup</u> (prepared in similar manner but not involved in outbreak).				13. Environmental specimens examined: (194)		
Item		Orig.	Check Up	Findings		
Example: Beef		X		C. perfringens, Hobbs type 10		

14. Specimens from patients examined (stool, vomitus, etc.): (195)		
Item	No. Persons	Findings
Example: stool	11	C. perfringens, Hobbs Type 10

15. Specimens from food handlers (stool, lesions, etc.): (196)		16. Factors contributing to outbreak (check all applicable):		
Item	Findings	Yes	No	Unk
Example: Lesion	C. perfringens, Hobbs Type 10	1	2	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> (197)
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> (198)
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> (199)
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> (200)
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> (201)
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> (202)

17. Etiology (203-204):			
Pathogen _____	Suspected	<input type="checkbox"/>	1 (205)
Chemical _____	Confirmed	<input type="checkbox"/>	2
Other _____	Unknown	<input type="checkbox"/>	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)
(206-225)

Name of reporting agency: (226) _____
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 Centers for Disease Control, Atlanta, Georgia, 30333

To improve national surveillance, please send a copy of this report to: Enteric Diseases Branch
Bacterial Diseases Division
Center for Infectious Diseases
Centers for Disease Control
Atlanta, Georgia 30333

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