

**Centers for Disease Control and Prevention
Epidemiology Program Office
Case Studies in Applied Epidemiology
No. 401-303**

Oswego – An Outbreak of Gastrointestinal Illness Following a Church Supper

Revised NC Student's Guide

Learning Objectives

After completing this case study, the participant should be able to:

- Define the terms “outbreak” and “epidemic;”
- List the steps in the investigation of an outbreak;
- Draw, interpret, and describe the value of an epidemic curve;
- Compare food-specific attack rates to identify possible vehicles;
- List reasons for investigating an outbreak that has apparently ended.

This case study is based on an investigation conducted by the New York State Department of Public Health Division. The case study was developed by Wendell Ames, MD, Stafford Wheeler, MD, and Alexander Langmuir, MD in the early 1940s. It has been substantially updated and edited since then by Philip Brachman, Michael Gregg, and Richard Dicker, with input from the many instructors who have reviewed and taught "Oswego" as part of the EIS Summer Course each year.

****Please note that this case study has been slightly altered from its original format for the purposes of the North Carolina 2012 'Steps of an Outbreak Investigation: Back to Basics' training and Field Services Program Update.****

PART I – Background

On April 19, 1940, the local health officer in the village of Lycoming, Oswego County, New York, reported the occurrence of an outbreak of acute gastrointestinal illness to the District Health Officer in Syracuse. Dr. A. M. Rubin, epidemiologist-in-training, was assigned to conduct an investigation.

When Dr. Rubin arrived in the field, he learned from the health officer that all persons known to be ill had attended a church supper held on the

previous evening, April 18. Family members who did not attend the church supper did not become ill. Accordingly, Dr. Rubin focused the investigation on the supper. He completed interviews with 75 of the 80 persons known to have attended, collecting information about the occurrence and time of onset of symptoms, and foods consumed. Of the 75 persons interviewed, 46 persons reported gastrointestinal illness.

Question 1: Would you call this an epidemic? Would you call it an outbreak?

Question 2: Review the steps of an outbreak investigation.

Clinical Description

The onset of illness in all cases was acute, characterized chiefly by nausea, vomiting, diarrhea, and abdominal pain. None of the ill persons reported having an elevated

temperature; all recovered within 24 to 30 hours. Approximately 20% of the ill persons visited physicians. No fecal specimens were obtained for bacteriologic examination.

Question 3: List the broad categories of diseases that must be considered in the differential diagnosis of an outbreak of gastrointestinal illness.

The investigators suspected that this was a vehicle-borne outbreak, with food as the vehicle.

Question 4: What is a vehicle? What is a vector? What are other modes of transmission?

Question 5: If you were to administer a questionnaire to the church supper participants, what information would you collect? Group the information into categories.

Dr. Rubin put his data into a line listing.

Question 6: What is a line listing? What is the value of a line listing?

PART II

Description of the Supper

The supper was held in the basement of the village church. Foods were contributed by numerous members of the congregation. The supper began at 6:00 p.m. and continued until 11:00 p.m. Food was spread out on a table and consumed over a period of several hours.

Data regarding onset of illness and food eaten or water drunk by each of the 75 persons interviewed are provided in the attached line listing. The approximate time of eating supper was collected for only about half the persons who had gastrointestinal illness.

Question 7: What is the value of an epidemic curve?

Question 8: Look at the line list on pages 6-7. How could the data in the line listing be better presented?

Question 9: Are there any cases for which the times of onset are inconsistent with the general experience? How might they be explained?

Line listing from investigation of outbreak of gastroenteritis,
Oswego, New York, 1940

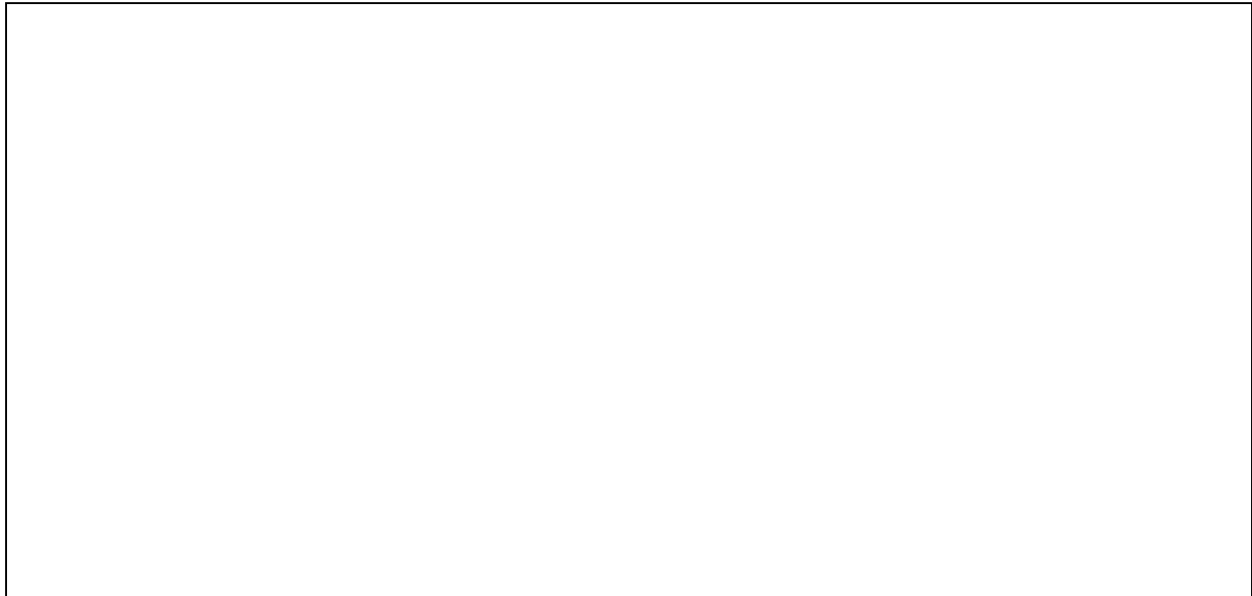
ID	AGE	SEX	TIME OF MEAL	ILL	DATE OF ONSET	TIME OF ONSET	Baked ham	Spinach	Mashed potatoes	Cabbage salad	Jello	Rolls	Brown bread	Milk	Coffee	Water	Cakes	Van ice cream	Choc ice cream	Fruit salad
1	11	M	unk	N			N	N	N	N	N	N	N	N	N	N	N	N	Y	N
2	52	F	8:00pm	Y	4/19	12:30am	Y	Y	Y	N	N	Y	N	N	Y	N	N	Y	N	N
3	65	M	6:30pm	Y	4/19	12:30am	Y	Y	Y	Y	N	N	N	N	Y	N	N	Y	Y	N
4	59	F	6:30pm	Y	4/19	12:30am	Y	Y	N	N	N	N	N	N	Y	N	Y	Y	Y	N
5	13	F	unk	N			N	N	N	N	N	N	N	N	N	N	N	N	Y	N
6	63	F	7:30pm	Y	4/18	10:30pm	Y	Y	N	Y	Y	N	N	N	N	Y	N	Y	N	N
7	70	M	7:30pm	Y	4/18	10:30pm	Y	Y	Y	N	Y	Y	Y	N	Y	Y	N	Y	N	N
8	40	F	7:30pm	Y	4/19	2:00am	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N
9	15	F	10:00pm	Y	4/19	1:00am	N	N	N	N	N	N	N	N	N	N	Y	N	Y	N
10	33	F	7:00pm	Y	4/18	11:00pm	Y	Y	Y	N	N	Y	Y	N	N	Y	N	Y	Y	N
11	65	M	unk	N			Y	Y	Y	N	Y	Y	N	N	N	N	N	Y	N	N
12	38	F	unk	N			Y	Y	Y	N	N	Y	N	N	Y	N	N	Y	Y	Y
13	62	F	unk	N			Y	Y	N	Y	Y	Y	Y	N	N	Y	N	N	N	N
14	10	M	7:30pm	Y	4/19	2:00am	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N
15	25	M	unk	N			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
16	32	F	unk	Y	4/19	10:30am	Y	Y	N	N	N	Y	N	N	Y	N	Y	Y	Y	N
17	62	F	unk	Y	4/19	12:30am	N	N	N	N	N	N	N	N	N	N	N	Y	N	N
18	36	M	unk	Y	4/18	10:15pm	Y	Y	N	Y	N	Y	Y	N	N	N	N	Y	N	N
19	11	M	unk	N			Y	Y	?	Y	N	Y	N	N	N	Y	N	N	Y	N
20	33	F	unk	Y	4/18	10:00pm	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	N
21	13	F	10:00pm	Y	4/19	1:00am	N	N	N	N	N	N	N	N	N	N	Y	Y	N	N
22	7	M	unk	Y	4/18	11:00pm	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	N
23	64	M	unk	N			N	N	N	N	N	N	N	N	N	N	N	Y	N	N
24	3	M	unk	Y	4/18	9:45pm	N	Y	Y	N	N	Y	N	N	N	Y	Y	Y	N	N
25	65	F	unk	N			Y	Y	Y	Y	Y	N	Y	N	Y	N	Y	Y	Y	N
26	59	F	unk	Y	4/18	9:45pm	N	Y	Y	Y	N	Y	Y	N	N	Y	Y	Y	N	N
27	15	F	10:00pm	Y	4/19	1:00am	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	N
28	62	M	unk	N			Y	Y	N	Y	N	Y	Y	N	Y	Y	Y	N	Y	N
29	37	F	unk	Y	4/18	11:00pm	Y	Y	Y	N	Y	Y	Y	N	Y	N	Y	Y	N	N
30	17	M	10:00pm	N			N	N	N	N	N	N	N	N	N	N	Y	Y	Y	N
31	35	M	unk	Y	4/18	9:00pm	Y	Y	Y	N	Y	Y	Y	N	Y	N	Y	Y	N	Y
32	15	M	10:00pm	Y	4/19	1:00am	N	N	N	N	N	N	N	N	N	N	Y	Y	N	N
33	50	F	10:00pm	Y	4/19	1:00am	N	N	N	N	N	N	N	N	N	N	N	Y	N	N
34	40	M	unk	N			Y	Y	N	N	N	Y	Y	N	Y	Y	Y	N	Y	Y
35	35	F	unk	N			Y	Y	Y	N	N	Y	Y	N	Y	Y	N	N	Y	N
36	35	F	unk	Y	4/18	9:15pm	Y	Y	Y	Y	N	Y	Y	N	Y	N	N	Y	N	N
37	36	M	unk	N			Y	N	Y	Y	N	Y	Y	N	Y	N	N	N	Y	N
38	57	F	unk	Y	4/18	11:30pm	Y	Y	N	Y	Y	Y	Y	N	Y	N	Y	Y	Y	N
39	16	F	10:00pm	Y	4/19	1:00am	N	N	N	N	N	N	N	N	N	N	Y	N	Y	N
40	68	M	unk	Y	4/18	9:30pm	Y	N	Y	Y	N	N	Y	N	Y	N	N	Y	N	N

ID	AGE	SEX	TIME OF MEAL	ILL	DATE OF ONSET	TIME OF ONSET	Baked ham	Spinach	Mashed potatoes	Cabbage salad	Jello	Rolls	Brown bread	Milk	Coffee	Water	Cakes	Van ice cream	Choc ice cream	Fruit salad
41	54	F	unk	N			Y	Y	Y	N	N	Y	N	N	Y	N	Y	N	Y	N
42	77	M	unk	Y	4/19	2:30am	N	N	N	N	N	N	N	N	N	N	N	Y	N	Y
43	72	F	unk	Y	4/19	2:00am	Y	Y	N	Y	Y	N	Y	N	Y	N	Y	Y	Y	N
44	58	M	unk	Y	4/18	9:30pm	Y	Y	Y	N	N	N	Y	Y	Y	N	N	Y	?	Y
45	20	M	10:00pm	N			N	N	N	N	N	N	N	N	N	N	Y	Y	Y	N
46	17	M	unk	N			Y	Y	Y	N	N	Y	N	N	N	Y	N	Y	Y	N
47	62	F	unk	Y	4/19	12:30am	Y	Y	N	N	N	Y	N	N	N	Y	N	Y	N	N
48	20	F	7:00pm	Y	4/19	1:00am	N	N	N	N	N	N	N	N	N	N	N	Y	N	N
49	52	F	unk	Y	4/18	10:30pm	Y	Y	Y	Y	N	Y	N	N	Y	N	N	Y	Y	N
50	9	F	unk	N			N	N	N	N	N	N	N	N	N	N	Y	N	Y	N
51	50	M	unk	N			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N
52	8	M	11:00am	Y	4/18	3:00pm	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N
53	35	F	unk	N			N	N	N	N	N	N	N	N	N	N	N	Y	Y	N
54	48	F	unk	Y	4/19	12:00am*	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	N
55	25	M	unk	Y	4/18	11:00pm	Y	N	Y	N	N	Y	Y	N	N	Y	Y	Y	Y	N
56	11	F	unk	N			N	N	N	N	N	N	N	N	N	N	N	N	Y	N
57	74	M	unk	Y	4/18	10:30pm	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y	N	N
58	12	F	10:00pm	Y	4/19	1:00am	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	N
59	44	F	7:30pm	Y	4/19	2:30am	Y	Y	Y	N	N	Y	N	N	N	Y	Y	N	Y	N
60	53	F	7:30pm	Y	4/18	11:30pm	Y	Y	Y	Y	Y	N	Y	N	Y	Y	Y	Y	Y	N
61	37	M	unk	N			N	N	N	N	N	N	N	N	N	N	N	N	Y	N
62	24	F	unk	N			Y	Y	Y	N	N	Y	N	N	Y	N	N	N	N	N
63	69	F	unk	N			N	Y	Y	N	Y	N	Y	N	N	Y	Y	N	Y	N
64	7	M	unk	N			Y	Y	Y	Y	Y	Y	N	N	N	Y	Y	N	Y	N
65	17	F	10:00pm	Y	4/19	1:00am	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	N
66	8	F	unk	Y	4/19	12:30am	Y	N	Y	Y	Y	N	N	N	N	N	Y	Y	Y	N
67	11	F	7:30pm	N			Y	Y	Y	Y	N	Y	N	N	Y	Y	N	N	Y	N
68	17	M	7:30pm	N			Y	Y	Y	Y	N	Y	N	N	Y	N	Y	Y	N	N
69	36	F	unk	N			N	N	N	N	N	N	N	N	N	N	N	N	Y	N
70	21	F	unk	Y	4/19	12:30am	Y	N	N	Y	Y	N	N	N	N	N	N	Y	Y	N
71	60	M	7:30pm	Y	4/19	1:00am	N	N	N	N	N	N	N	N	N	N	Y	Y	N	N
72	18	F	7:30pm	Y	4/19	12:00am*	Y	Y	Y	Y	Y	N	N	N	N	Y	Y	Y	Y	N
73	14	F	10:00pm	N			N	N	N	N	N	N	N	N	N	N	Y	Y	N	N
74	52	M	unk	Y	4/19	2:15am	Y	N	Y	N	Y	Y	Y	N	Y	Y	Y	Y	Y	N
75	45	F	unk	Y	4/18	11:00pm	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y	N	Y

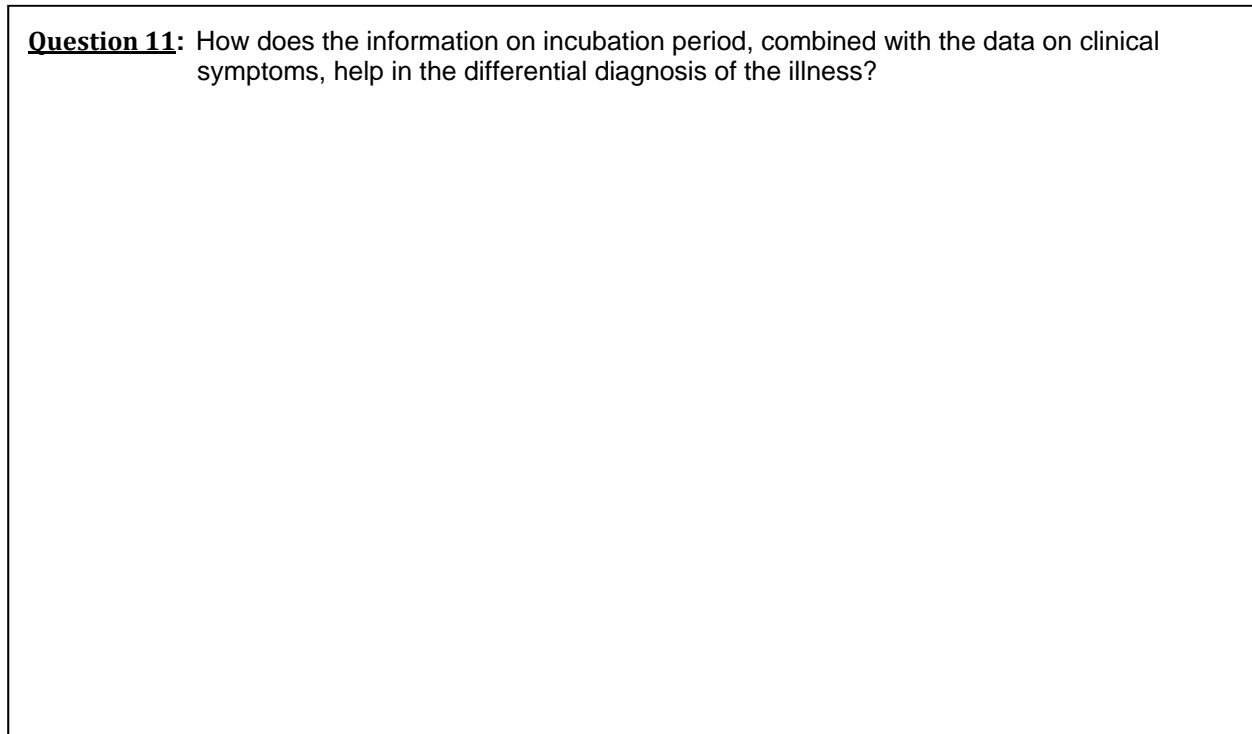
* Midnight between 4/18 and 4/19

PART III

The line listing on pages 6-7 is sorted by illness status (ill or well), and by time of onset.



Question 11: How does the information on incubation period, combined with the data on clinical symptoms, help in the differential diagnosis of the illness?



Question 12: Using the data in the attached line listing, complete the table below. Which food is the most likely vehicle of infection?

Food Items Served	Number of persons who ATE specified food				Number of persons who did NOT eat specified food				Attack rate ratio
	Ill	Not ill	Total	Percent ill (attack rate)	Ill	Not ill	Total	Percent Ill (Attack rate)	
Baked ham	29	17	46	63%	17	12	29	59%	1.1
Spinach	26	17	43	60%	20	12	32	62%	1.0
Mashed potato	23	14	37	62%	23	14	37	62%	1.0
Cabbage salad	18	10	28	64%	28	19	47	60%	1.1
Jello	16	7	23	70%	30	22	52	58%	1.2
Rolls	21	16	37	57%	25	13	38	66%	0.8
Brown bread	18	9	27	67%	28	20	48	58%	1.0
Milk	2	2	4	50%	44	27	71	62%	0.8
Coffee	19	12	31	61%	27	17	44	61%	1.0
Water	13	11	24	54%	33	18	51	65%	0.8
Cakes	27	13	40	67%	19	16	35	54%	1.3
Ice cream, vanilla	43	11	54	80%	3	18	21	14%	5.7
Ice cream, chocolate	25	22	47	53%	20	7	27	74%	0.7
Fruit salad	4	2	6	67%	42	27	69	61%	1.1

Question 13: Outline further investigations that should be pursued.

Question 14: What control measures would you suggest?

Question 15: Why was it important to work up this outbreak?

Question 16: Refer to the steps of an outbreak investigation you listed in Question 2. How does this investigation fit that outline?

PART IV – CONCLUSION

The following is quoted verbatim from the report prepared by Dr. Rubin:

"The ice cream was prepared by the Petrie Sisters.

"All handlers of the ice cream were examined. No external lesions or upper respiratory infections were noted.

"Bacteriological examinations were made by the Division of Laboratories and Research, Albany, on both ice creams. Their report is as follows: 'Large numbers of *Staphylococcus aureus* and *albus* were found in the specimen of vanilla ice cream. Only a few staphylococci were demonstrated in the chocolate ice cream.'

"Discussion as to Source: The source of bacterial contamination of the vanilla ice cream is not clear. Whatever the method of the introduction of the staphylococci, it appears reasonable to assume it must have occurred between the evening of April 17 and the morning of April 18. No reason for contamination peculiar to the vanilla ice cream is known.

"In dispensing the ice creams, the same scooper was used. It is therefore not unlikely to assume that some contamination to the chocolate ice cream occurred in this way. This would appear to be the most plausible explanation for the illness in the three individuals who did not eat the vanilla ice cream.

"Control Measures: On May 19, all remaining ice cream was condemned. All other food at the church supper had been consumed.

"Conclusions: An attack of gastroenteritis occurred following a church supper at Lycoming. The cause of the outbreak was contaminated vanilla ice cream. The method of contamination of ice cream is not clearly understood."

Note: Patient #52 was a child who while watching the freezing procedure was given a dish of vanilla ice cream at 11:00 a.m. on April 18.

Addendum:

Certain laboratory techniques not available at the time of this investigation might prove very useful in the analysis of a similar epidemic today. These are phage typing, which can be done at CDC, and identification of staphylococcal enterotoxin in food by immuno-diffusion or by enzyme-linked immunosorbent assay (ELISA), which is available through the Food and Drug Administration (FDA).

If the contaminated food had been heated sufficiently to destroy staphylococcal organisms but not toxin, analysis for toxin (with the addition of urea) would still permit detection of the cause of the epidemic. A Gram stain might also detect the presence of nonviable staphylococci in contaminated food.

For your consideration:

Would cultures of individuals be appropriate, such as cultures of others who might have been in contact with the ice cream in preparation?

Reference

Gross MB. Oswego County revisited. *Public Health Reports* 1976;91:160-70.