


American College of Occupational and Preventive Medicine 2011 Annual Meeting, Orlando, Florida, November 1, 2011

Investigating an Acute Outbreak

H. S. Teitelbaum, D.O., Ph.D., M.P.H.
Chair, Preventive and Community Medicine
DeBusk College of Osteopathic Medicine

1. Verify the Diagnosis and Confirm the Outbreak
2. Define a Case and Conduct Case Finding
3. Tabulate and Orient Data: Time, Place, Person
4. Take Immediate Control Measures
5. Formulate and Test Hypotheses
6. Plan and Execute Additional Studies
7. Implement and Evaluate Control measures
8. Communicate Findings

10/25/2011 AOCOPM 2



On Friday, May 17, 19XX, assistance was requested to investigate an outbreak of 32 cases of jaundice which occurred between April 30 and May 16 in Jones County.

10/25/2011 AOCOPM 3

Jones County


Area: 576 square miles
 Population: 9,680 (1960 census)
 County Seat: Dalton (pop. 2,025)
 Townships: 14 (pops. 107 to 1,399)
 Other Cities: Ray City (pop. 435)
 Rice (pop. 308)

10/25/2011 AOCOPM 4

**JONES COUNTY
19XX**

10/25/2011 AOCOPM 5

Jones County is predominantly rural, divided between farmland and forest. Most of the permanent residents represent the lower or lower middle socioeconomic class. A large influx of tourists occurs in the summer.



10/25/2011 AOCOPM

American College of Occupational and Preventive Medicine 2011 Annual Meeting, Orlando, Florida, November 1, 2011

Jones County Health Resource

District Health Department

- Located in Dalton

Hospital

A 60-Bed Community Hospital in Dalton which serves Jones County and surrounding areas

Medical Practitioners

- Dalton - 5 M.D.
- Ray City -1 D.O.
- Rice -1 D.O.



10/25/2011

AOCOPM

7

Clinical Description of Cases

Practically all cases of illness were characterized by:

- acute onset of fever
- anorexia
- nausea
- malaise
- abdominal discomfort
- jaundice

Only one anicteric case was detected.



10/25/2011

AOCOPM

8

Surveillance Data District Health Department

Prior to April 1, 19XX, seven cases of infectious hepatitis were reported, of which four occurred in one family outbreak in August of the previous year. No relationship was established for the remaining three cases which were scattered over time.

10/25/2011

AOCOPM

9

Sources of Information to Discover Additional Cases

Medical practitioners

10/25/2011

AOCOPM

10

Sources of Information to Discover Additional Cases

Medical practitioners
Hospitals and clinics

10/25/2011

AOCOPM

11

Sources of Information to Discover Additional Cases

Medical practitioners
Hospitals and clinics
Laboratories

10/25/2011

AOCOPM

12

American College of Occupational and Preventive Medicine 2011 Annual Meeting, Orlando, Florida, November 1, 2011

Sources of Information to Discover Additional Cases

Medical practitioners
Hospitals and clinics
Laboratories
Associates of known cases

10/25/2011

AOCOPM

13

Characterization of the Epidemic

I. TIME

Duration
Incubation Period

II. PLACE

Status
Location of the Epidemic
Common Associations
Friends

III. PERSON

Age
Sex
Race
Socioeconomic Status
Occupation
Habits
Family and Friends

10/25/2011

AOCOPM

14

Population of Jones County by Township or City and Sex
1960 Census

Township	Male	Female	Total
Claxton	85	73	158
Palmetto	298	276	574
Jackson	77	73	150
Wadley	173	138	311
Hampton	178	166	344
Lee	285	238	523
Jones	229	298	527
Clinton	221	276	497
Lawson	338	298	636
Lyons	193	185	378
Hawkins	327	282	609
Wilcox	195	187	382
Dixon	377	275	652
Jackson	180	281	461
Elmore			
New Elmore	287	228	515
Hampton	385	387	772
None	152	156	308
Total	4,957	4,723	9,680

10/25/2011

AOCOPM

15

Population of Jones County by Age and Sex, 1960 Census

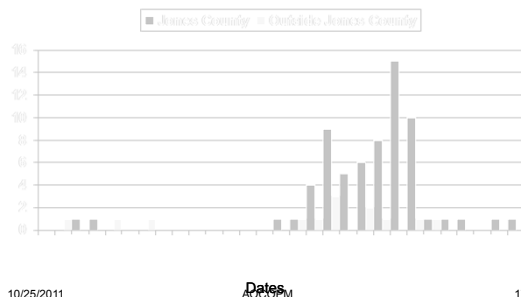
Age Group In Years	Male	Female	Total
0-4	1,276	1,311	2,587
5-9	1,427	1,413	2,840
10-14	1,488	1,477	2,965
15-19	1,440	1,423	2,863
20-24	2,231	2,154	4,385
25-29	2,338	2,156	4,494
30-34	2,138	2,272	4,410
35-39	2,487	2,318	4,805
40-44	2,773	2,771	5,544
45-49	2,813	2,638	5,451
50-54	2,613	2,786	5,399
55-59	1,183	1,074	2,257
Total	4,957	4,723	9,680

10/25/2011

AOCOPM

16

Infectious Hepatitis Cases By Date on Onset April-May 19XX



10/25/2011

AOCOPM

17

Infectious Hepatitis Cases and Attack Per 1,000 Population, by
Township and City, Jones County, April-May, 19XX

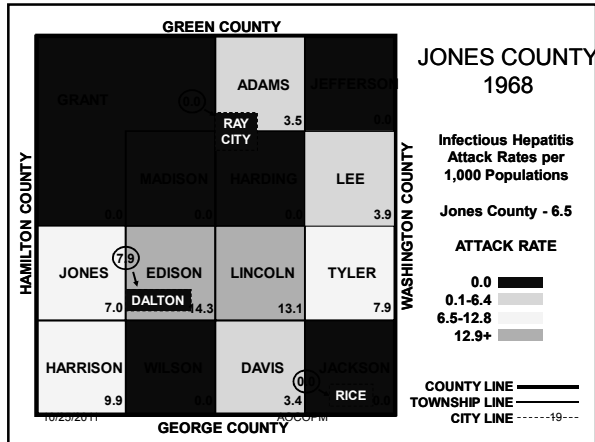
Townships	Number of Cases	1960 Population	Attack Rate Per 1,000 Pop.
Claxton	0	158	0.0
Palmetto	2	574	0.3
Jackson	0	150	0.0
Wadley	0	311	0.0
Hampton	0	344	0.0
Lee	2	523	0.3
Jones	4	527	0.8
Clinton	2	497	0.4
Lawson	0	636	0.0
Lyons	3	378	0.8
Hawkins	6	609	1.0
Wilcox	0	382	0.0
Dixon	2	652	0.3
Jackson	0	461	0.0
Elmore	0		0.0
New Elmore	0	515	0.0
Hampton	15	772	2.0
None	0	308	0.0
Total	63	9,680	6.5

10/25/2011

AOCOPM

18

American College of Occupational and Preventive Medicine 2011 Annual Meeting, Orlando, Florida, November 1, 2011



Infectious Hepatitis Cases and Attack Rate Per 1,000 Population, by Age and Sex, Jones County, April-May, 19XX

Age Group in Years	Male			Female			Total		
	No Cases	1960 Pop.	Attack Rate	No Cases	1960 Pop.	Attack Rate	No Case	1960 Pop.	Attack Rate
0-4	0	1,021	0.0	0	911	0.0	0	1,932	0.0
5-9	2	987	0.2	3	898	0.3	5	1,885	0.3
10-14	12	898	13.3	6	887	6.8	18	1,785	10.2
15-19	17	896	18.9	7	822	8.5	24	1,718	13.8
20-24	1	728	0.1	3	656	4.6	4	1,384	0.3
25-29	0	523	0.0	1	474	0.2	1	997	0.1
30-34	2	473	0.4	0	322	0.0	2	795	0.3
35-39	4	389	1.0	3	367	0.8	7	756	0.9
40+	2	1,806	0.1	0	1,368	0.0	2	3,174	0.1
1960	57	5,897	0.9	25	4,722	0.5	82	10,619	0.8


10/25/2011 AOCOPM 20

Initial Characterization

- TIME**
 - Common source
 - Possible incubation period of about 30 days
- PLACE**
 - Localization within a few townships
- PERSON**
 - Highest attack rates in the 10-14 and 15-19 years age groups with an attack rate among males twice that of females

10/25/2011 AOCOPM 21

Jones County Schools



- Four public school districts in county (two are extensions from adjacent Washington County)
- School Locations
 - Dalton - 2
 - Rice - 1
 - Ray City - 1
 - (Hale, Lincoln, and Jefferson schools-adjacent counties)

10/25/2011 AOCOPM 22

Edison School

- Located near downtown Dalton
- Serves largest Public School District
- 1,525 Students, grades K-12
- School buses used by 70 percent of the students
- School cafeteria available

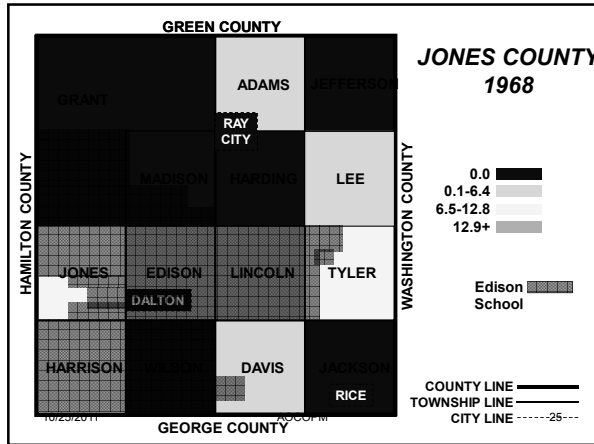
10/25/2011 AOCOPM 23

St. Joseph

- Located near downtown Dalton
- Only Roman Catholic School in County
- 250 students, grades 1-8
- St. Joseph and Edison students share same buses
- School cafeteria available

10/25/2011 AOCOPM 24

American College of Occupational and Preventive Medicine 2011 Annual Meeting, Orlando, Florida, November 1, 2011



Student Enrollment by Grade for Edison and St. Joseph School

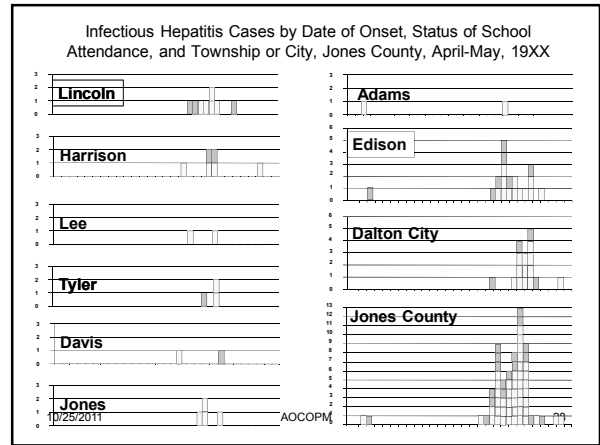
Grade	Edison School	St. Joseph School
8	175	0
9	125	0
10	123	0
11	107	0
12	106	0
13	120	0
14	111	0
15	110	0
16	120	0
17	143	0
18	125	0
19	143	0
20	125	0
21	117	0
22	0	0
Total	1,275	0

10/25/2011 AOCOPM 26

Infectious Hepatitis Cases and Attack Rates Per1,000 Population, by Grade, for Edison and St. Joseph Schools, Jones County, April-May 19XX

Grade	Edison School			St. Joseph School		
	No. of Cases	Pop.	Attack Rate	No. of Cases	Pop.	Attack Rate
8	2	175	1.14	1	12	8.33
9	0	125	0.00	1	81	1.23
10	0	123	0.00	0	12	0.00
11	2	107	1.87	0	27	0.00
12	1	106	0.94	0	25	0.00
13	1	120	0.83	0	20	0.00
14	1	110	0.91	0	17	0.00
15	1	110	0.91	0	20	0.00
16	1	120	0.83	0	21	0.00
17	2	143	1.39	0	0	0.00
18	10	125	7.96	0	0	0.00
19	2	143	1.39	0	0	0.00
Total	27	1,275	2.12	2	250	0.80

10/25/2011 AOCOPM 27



EDISON SCHOOL INVOLVEMENT

- 36 of 76 cases (47.4%) were among students attending Edison School
- 30 of 36 cases (83.3%) among the students occurred in Grades 7 through 12
- Students in Grades 7 through 12 were allowed to leave school grounds during lunch period
- The remaining 40 cases, including both students and adults, could not be associated with Edison School

10/25/2011 AOCOPM 29

Possible Common Sources of Infection

- Milk
- Water
- Food

10/25/2011 AOCOPM 30

American College of Occupational and Preventive Medicine 2011 Annual Meeting, Orlando, Florida, November 1, 2011

Milk



All commercial milk sold in Jones County comes from dairies located outside the county. These dairies distribute their products throughout the state. There is no commercial milk source with distribution limited to Jones County.

10/25/2011

AOCOPM

31

Water



Residents of Dalton are served by municipal water and sewage systems. Most other Jones County residents live in homes having individual wells and septic tanks.

10/25/2011

AOCOPM

32

Food



Many establishments offer prepared foods in the County area.

10/25/2011

AOCOPM

33

Food

The most popular establishments are:

Restaurant A-Located in Dalton, specializes in full-course meals, and is patron by families and local civic groups

Restaurant B-A Dalton short-order café

Ray City Snack Shack-Popular with teenagers

Dalton Snack Shack-Popular with teenagers

Dalton Bakery-The only bakery in Jones County. Products are sold at the bakery and distributed to some retail food outlets in Jones and adjacent counties.

10/25/2011

AOCOPM

34

Infectious Hepatitis Questionnaire Food and Water Sources, May 1968

- **Name** - Have you ever had hepatitis?
 - If so, when? _____
- **Age** - How many times a week do you eat at (or eat anything from) Restaurant A or Restaurant B?
- **Sex**
- **Address** - Restaurant A?
- **School** - Restaurant B?
- **Grade** - Did you eat at (or eat anything from) Restaurant A or Restaurant B between April 1 and April 14?
- **Phone** - Restaurant A?
- Restaurant B?

10/25/2011

AOCOPM

35

Hepatitis Questionnaire (continued)

- How many times a week do you eat something from Dalton Shack or Ray City Snack Shack:
 - Dalton Snack Shack?
 - Ray City Snack Shack?
- Did you eat anything from the Dalton Snack Shack or Ray City Snack Shack between April 1 and April 14:
 - Dalton Snack Shack?
 - Ray City Snack Shack?
- How many times a week do you eat something from Dalton Bakery?
- Did you eat anything from the Dalton Bakery between April 1 and April 14?

10/25/2011

AOCOPM

36

American College of Occupational and Preventive Medicine 2011 Annual Meeting, Orlando, Florida, November 1, 2011

Hepatitis Questionnaire (continued)

- How many times a week do you drink water from the Dalton municipal water supply?
- Did you drink any water from the Dalton municipal water supply between April 1 and April 14?
- How many times a week do you drink milk from other than commercial sources?
- Did you drink any milk from other than commercial sources between April 1 and April 14?

10/25/2011

AOCOPM

37

Possible Selections of a Control Group

- AOCOPM** Random sample of households in Jones County
- AOCOPM** Random sample of non-ill students in Edison School
- AOCOPM** Non-ill family members of cases in Jones County
- AOCOPM** Non-ill 10-19 year-old family members of cases in Jones County

10/25/2011

AOCOPM

38

Although Control may have Eaten the Same Food Product as Cases

- AOCOPM** Anicteric hepatitis may have resulted
- AOCOPM** Exposure to the virus may not have occurred due to the uneven distribution of the containment
- AOCOPM** Gamma Globulin may have aborted the illness
- AOCOPM** Illness may not have developed due to the prior immunity to the virus

10/25/2011

AOCOPM

39

Summary of Food and Water Sources Survey of 69* Infectious Hepatitis Cases

Food and Water Source	Number Yes	Number No	Number Unknown	Percent Known Exposure
Uncontaminated A	226	46	1	84.3
Uncontaminated B	226	46	1	84.3
Dalton Bread & Pastry	289	28	2	88.5
Local Bread Bakery	93	13	3	85.0
Local Bakery	68	3	3	91.3
Dalton Water	157	11	1	92.9
Local Milk	7	0	1	100

Information not obtained on seven cases

10/25/2011

AOCOPM

40

Comparison of the Exposure History of the 41* Jones County Cases of Infectious Hepatitis in the 10-19 Years Age Group with the Exposure History of a Group of 59 Non-Ill Household Members in the 10-19 Years Age Group, Jones County, May, 1968

	HEPATITIS CASES 10-19 YEARS OLD				NON-ILL HOUSEHOLD MEMBERS			
	# Yes	# No	# Unknown	% Known Exposure	# Yes	# No	# Unknown	% Known Exposure
Uncontaminated A	35	25	1	58.1	22	31	3	86.3
Uncontaminated B	37	23	1	61.5	25	31	2	87.0
Dalton Bread & Pastry	76	17	1	81.3	39	17	0	89.0
Local Bread Bakery	8	37	1	18.2	6	18	0	25.0
Local Bakery	37	3	1	90.2	26	29	1	86.8
Dalton Water	38	0	0	100.0	14	5	1	93.3
Local Milk	1	39	1	2.4	0	18	0	0.0

10/25/2011

AOCOPM

41

DALTON BAKERY

Most likely source of infection.



10/25/2011

AOCOPM

42

American College of Occupational and Preventive Medicine 2011 Annual Meeting, Orlando, Florida, November 1, 2011

Infectious Hepatitis Questionnaire Bakery Products, May, 1968

- What bakery products do you usually eat from the Dalton Bakery?
- How many times a week do you eat each of these products?
- Did you eat any of the following bakery products from Dalton Bakery between April 2 and April 14?

- Pastry
- Glazed/Iced Doughnuts
- Cake
- Bread
- Cookies
- Pie
- Plain Doughnuts
- Plain Sweet Roll
- Cinnamon Twists
- Glazed Iced Sweet Roll

10/25/2011

AOCOPM

43

Summary of Dalton Bakery Questionnaire Resources for 63 Infectious Hepatitis Cases, Jones County and Surrounding Area, May, 1968

Bakery Product	Number Yes	Percent With Known Exposure
Pastry	0	0%
Glazed/Iced Doughnuts	30	47.6
Cake	11	17.5
Plain Doughnuts	17	27.1
Plain Sweet Roll	20	31.7
Bread	30	47.6
Cookies	0	0%
Pie	0	0%
Plain Sweet Roll w/ Cinnamon Twist	19	30.2
Cinnamon Twist	0	0%
Glazed/Iced Doughnut	0	0%
Plain Doughnut	0	0%
Glazed/Iced Doughnut w/ Cinnamon Twist	16	25.4

10/25/2011

AOCOPM

44

Exposure History Comparison of 37 Infectious Hepatitis Cases with 26 Non-ill Household Members, Age 10-19 (Both groups consumed bakery products, Jones County, May, 1968)

Bakery Product	Persons who ate specific foods				Persons who did not eat specific foods			
	Ill	Not Ill	Total	% Ill	Ill	Not Ill	Total	% Ill
Pastry	2	3	5	40%	1	3	4	25%
Glazed/Iced Doughnuts	17	14	31	55%	25	17	42	60%
Cake	5	3	8	62.5%	12	23	35	34.3%
Plain Doughnut	11	8	19	57.9%	26	18	44	59.1%
Glazed/Iced Doughnut	25	3	28	89.3%	17	23	40	42.5%
Bread	13	11	24	54.2%	24	15	39	61.5%
Pie	6	3	9	66.7%	11	23	34	32.4%
Plain Sweet Roll w/ Cinnamon Twist	5	3	8	62.5%	14	23	37	37.9%
Glazed/Iced Sweet Roll w/ Cinnamon Twist	10	2	12	83.3%	14	24	38	36.8%
Glazed/Iced Doughnut w/ Cinnamon Twist	11	3	14	78.6%	4	23	27	14.8%

10/25/2011

AOCOPM

45

Infectious Hepatitis Cases with Documented Incubation Periods Jones County and Surrounding Area, April-May, 19XX

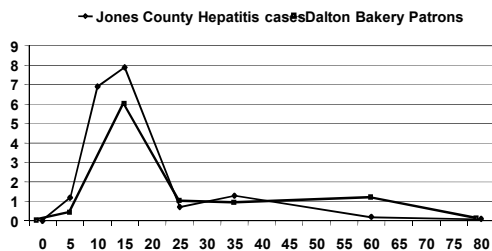
Case No.	Date of Exposure	Date of Onset of Illness	Incubation Period in Days
11	April 1	May 1	30
12	April 1	May 2	31
13	April 1	May 4	33
14	April 1	May 5	34
15	April 1	May 6	35
16	April 1	May 7	36
17	April 1	May 7	36
18	April 1	May 7	36
19	April 1	May 7	36
20	April 1	May 7	36
21	April 1	May 7	36
22	April 1	May 7	36
23	April 1	May 7	36
24	April 1	May 7	36
25	April 1	May 7	36
26	April 1	May 7	36
27	April 1	May 7	36
28	April 1	May 7	36
29	April 1	May 7	36
30	April 1	May 7	36

10/25/2011

AOCOPM

46

Percent of distribution by estimated age of 214 patrons of Dalton Bakery on June 3, vs. percent distribution by age of 61 infectious hepatitis cases occurring in Jones County April 28 - May 26, 1968

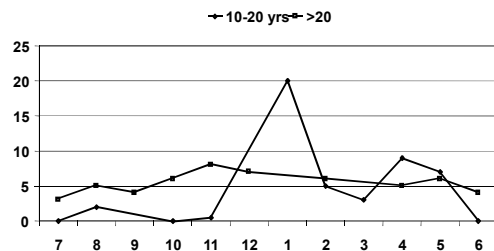


10/25/2011

AOCOPM

47

Percent distribution of 208 patrons of Dalton Bakery by hour of sale and estimated age, June 3, 1968



10/25/2011

AOCOPM

48