

# **Epi 101**

95<sup>th</sup> Annual CASA & FDA

Food Protection Education and Training Seminar

May 18, 2011

Alvina Chu, MHS

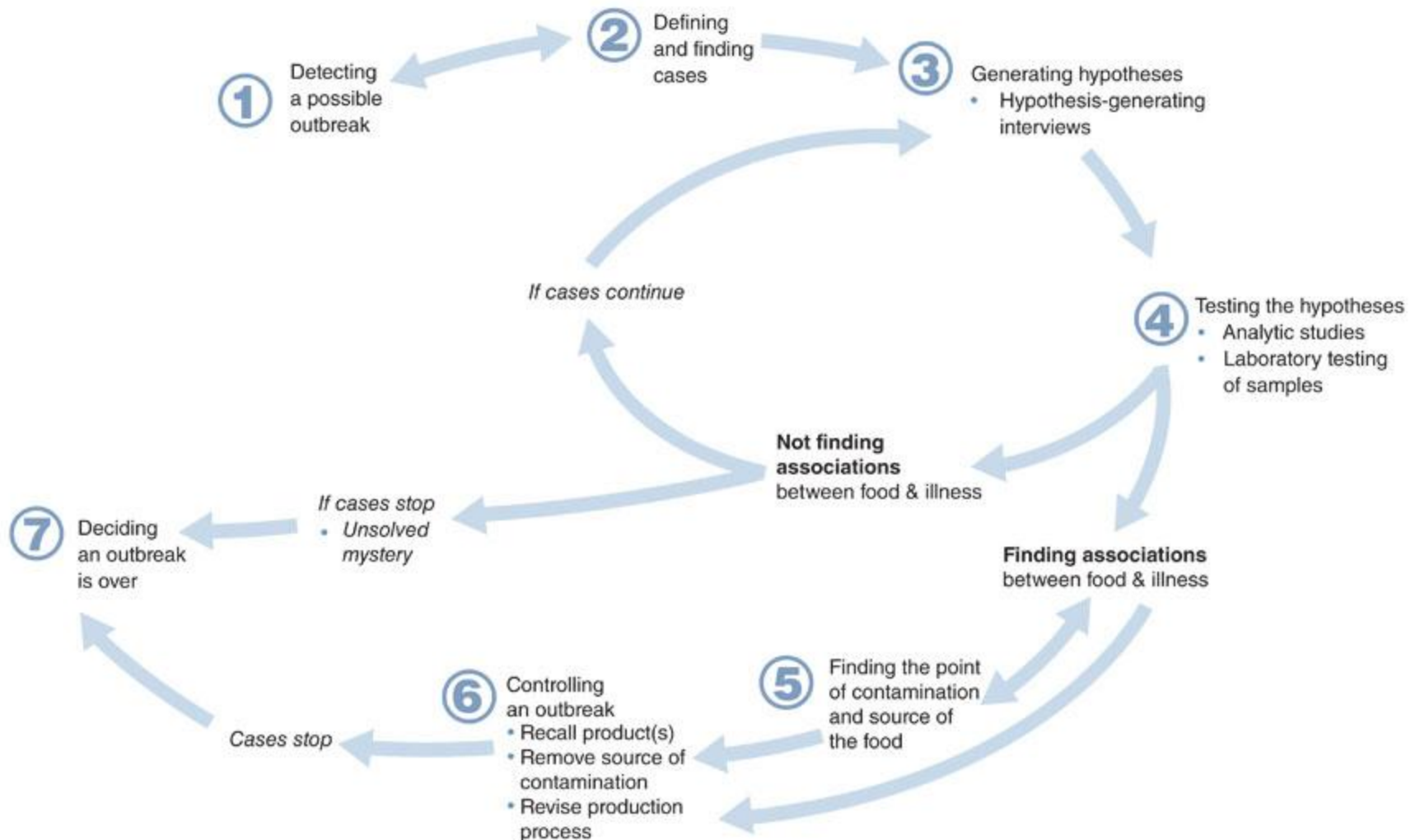
Chief, Division of Outbreak Investigation

Maryland Department of Health and Mental Hygiene

# MISSION

- To improve the health of Marylanders by reducing the transmission of infectious diseases, helping impacted persons live longer, healthier lives, and protecting individuals and communities from environmental health hazards
- We work in partnership with local health departments, providers, community based organizations, and public and private sector agencies to provide public health leadership in the prevention, control, monitoring, and treatment of infectious diseases and environmental health hazards.

# Steps in a Foodborne Outbreak Investigation



# 1. Detecting a possible outbreak

- Ill persons calling the LHD to report related illnesses
- Astute providers recognizing related cases
- Facility infection control staff noting case increases
- Reports from congregate settings (e.g., schools, prisons)
- Watch lists for facilities, individual complaints, etc.
- HD reviewing routine surveillance reports
  - LHD
  - State
- Recognition by lab (including PFGE cluster investigations)
- Syndromic surveillance

# Detecting a possible outbreak

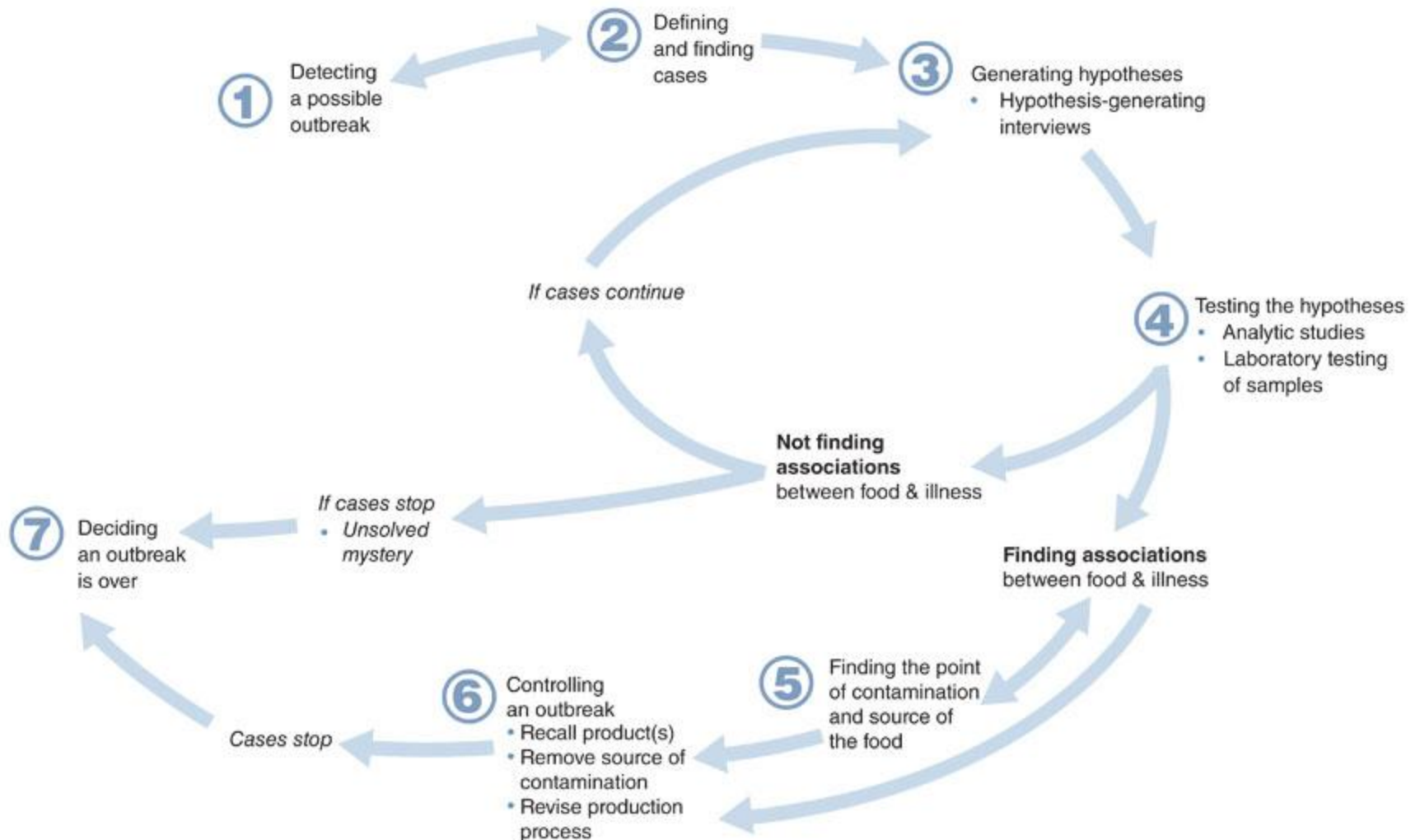
- Friday, March 11 (around noon) - DHMH contacted by a local County Health Department (LHD)
- The local hospital lab had identified 4 salmonellosis cases
- LHD had obtained info about 3 of the 4
  - All 3 had attended a pancake breakfast fundraiser on March 5
  - No other common events/locations identified
  - LHD began investigating event immediately

# The Event

- Breakfast fundraiser on the previous Saturday morning
- Held at a church in Thurmont
- Required no pre-registration; attendees just dropped by
- Cash only; no credit cards
- Organizers estimated about 500 attendees



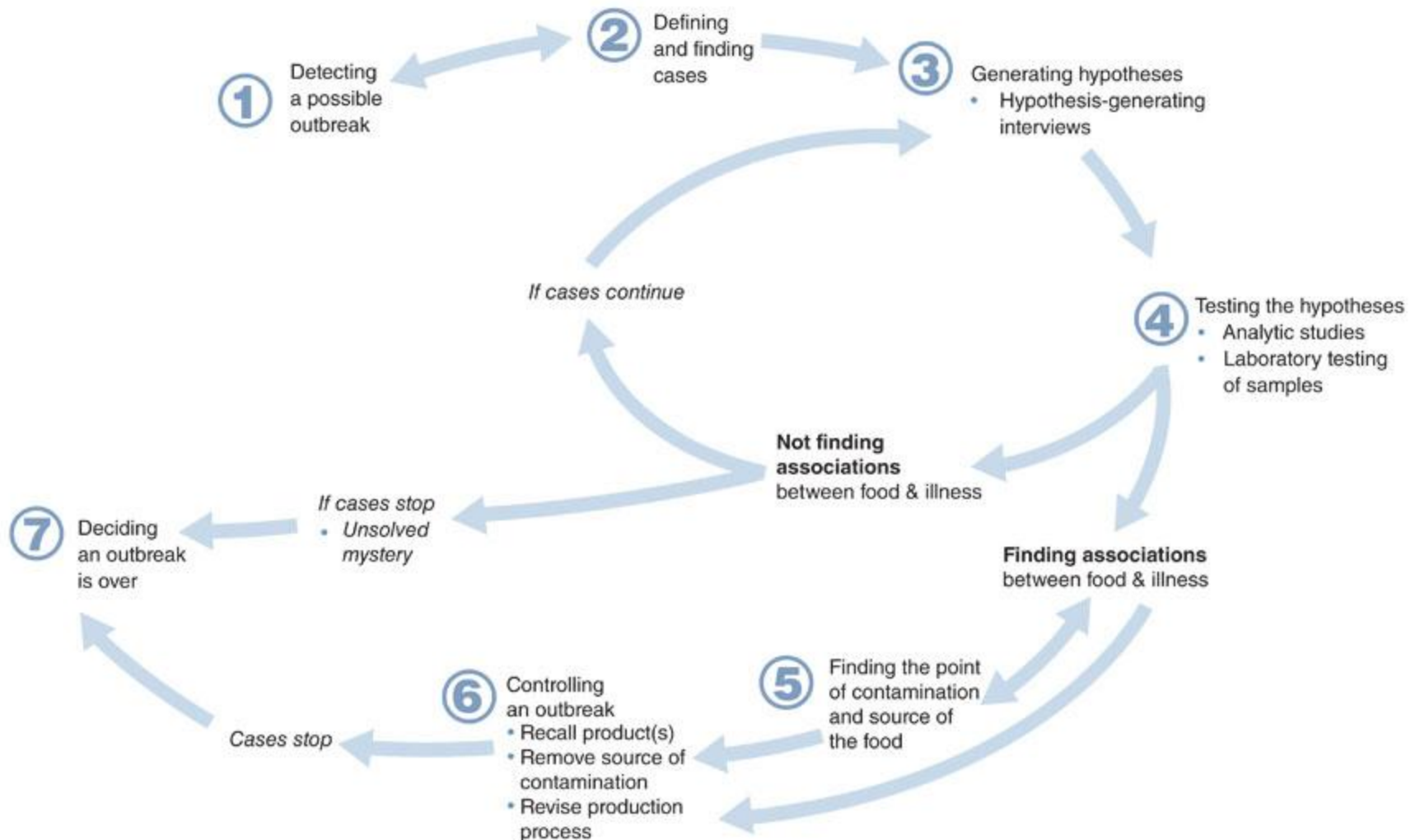
# Steps in a Foodborne Outbreak Investigation



## 2. Defining and finding cases

- Standard set of criteria for deciding whether an individual should be classified as having the health condition of interest
- We created a survey through Survey Monkey
  - developed letter for the attendees explaining the need for their participation in the survey

# Steps in a Foodborne Outbreak Investigation



# 3. Generating hypotheses

- Gastroenteritis (GE) case report form (routinely collected and reviewed)
- Hypothesis-generating interviews
- “Shotgun” questionnaires
- In-home visits
- Shoppers cards records
- Outbreak-specific questionnaires
  - Based on menu items/foods served or sold

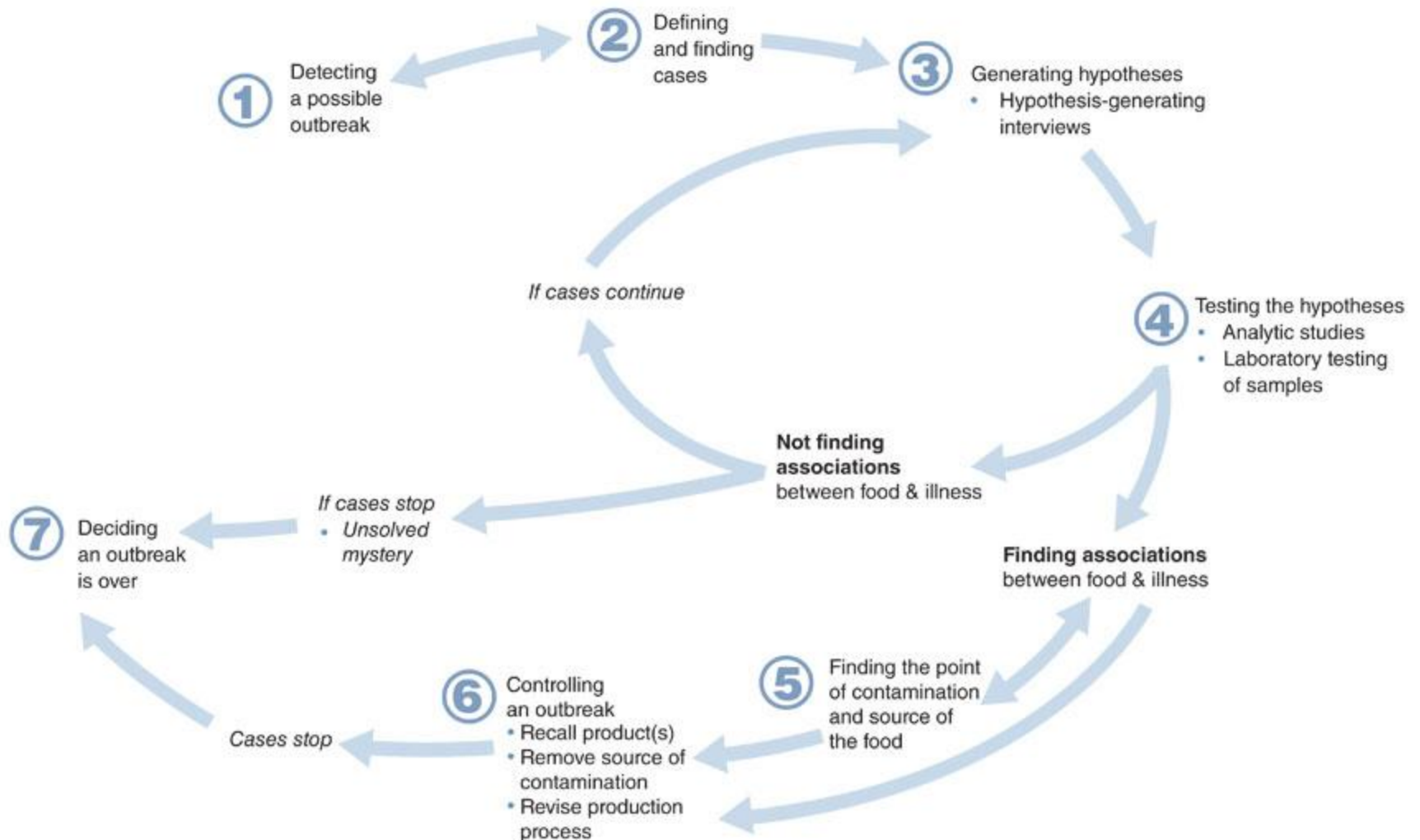
# Generating hypotheses

2. Did you consume the following foods and drinks served at the benefit breakfast on March 5?

	Yes	No
Pancakes	<input type="radio"/>	<input type="radio"/>
syrup	<input type="radio"/>	<input type="radio"/>
butter	<input type="radio"/>	<input type="radio"/>
sausage	<input type="radio"/>	<input type="radio"/>
pudding	<input type="radio"/>	<input type="radio"/>
hominy	<input type="radio"/>	<input type="radio"/>
scrambled eggs	<input type="radio"/>	<input type="radio"/>
chipped beef gravy	<input type="radio"/>	<input type="radio"/>
biscuits	<input type="radio"/>	<input type="radio"/>
fruit	<input type="radio"/>	<input type="radio"/>
juice	<input type="radio"/>	<input type="radio"/>
coffee	<input type="radio"/>	<input type="radio"/>
cream	<input type="radio"/>	<input type="radio"/>
tap water	<input type="radio"/>	<input type="radio"/>
bottled water	<input type="radio"/>	<input type="radio"/>
any drink with ice	<input type="radio"/>	<input type="radio"/>

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# Steps in a Foodborne Outbreak Investigation



# 4. Testing the hypotheses

- Analytic studies
- Laboratory testing of samples

# Analytic studies

- Compare information from ill persons and well persons to see whether ill persons are more likely to have a certain exposure
- If a specific exposure is reported more often by sick people than by well people, it may be associated with illness

# Analytic studies

- Use epi methods to determine:
  - whether more than one food/exposure might be involved
  - how strong this association is
  - how likely it is to have occurred by chance alone

# Attack rate (AR)

- Out of a defined population (those who were exposed), the proportion of people who became ill
- Can be event-specific or food-specific

$$AR = \frac{\text{\# ill people who were exposed}}{\text{Total \# people exposed}}$$

# Attack rate (AR)

Example:

At a benefit breakfast that served 500 people, 50 people became ill within a day after eating scrambled eggs from the breakfast buffet. A total of 100 people ate the scrambled eggs.

AR for illness among those who ate the eggs:

$$\frac{50 \text{ ILL guests ate eggs}}{100 \text{ guests ate eggs}} = 50\%$$

# Quantifying association and risk

- Quantifies the relationship between exposure and disease
- This method does not prove that a particular exposure caused a disease, but it is very helpful and effective in evaluating possible vehicles of disease.

# Relative risk (RR)

- RR is the risk of developing a disease given a certain exposure
- RR is a ratio of AR in exposed persons to AR in non-exposed persons
- That is, RR is a comparison of ill and wells given a certain exposure

# Relationship of attack rate to relative risk

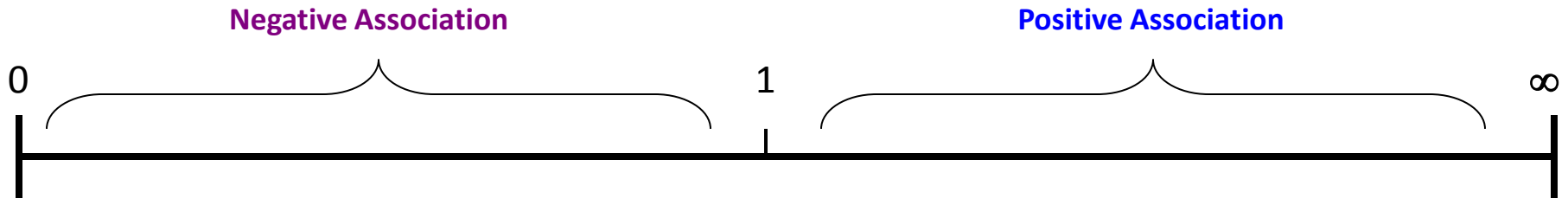
$$RR = \frac{\text{Attack rate exposed}}{\text{Attack rate NOT exposed}} = \frac{\frac{\text{number who have disease AND are exposed}}{\text{total number exposed}}}{\frac{\text{number have disease AND are NOT exposed}}{\text{total number NOT exposed}}}$$

# Relative risk (RR)

	Ill	Well	Total
Ate Eggs	50	50	100
No Eggs	10	390	400
Total	60	440	500

$$\text{RR} = \frac{\begin{array}{l} = \text{AR ate} \\ \text{eggs} \end{array}}{\begin{array}{l} = \text{AR no} \\ \text{eggs} \end{array}} = \frac{\begin{array}{l} = \underline{50} \\ 100 \end{array}}{\begin{array}{l} = \underline{10} \\ 400 \end{array}} = \frac{50\%}{25\%} = 2$$

# Interpretation of RR



RR is interpreted as follows:

- = 1** indicates no association
- > 1** indicates a positive association
- < 1** indicates a negative association

# Interpretation of RR

Relative risk = 2

- Persons who ate scrambled eggs from the benefit breakfast buffet were 2 times more likely to become ill than persons who did not eat scrambled eggs.
- Consuming scrambled eggs at the benefit breakfast is associated with *Salmonella* infection.

# Testing the hypotheses

2. Did you consume the following foods and drinks served at the benefit breakfast on March 5?

	Yes	No
Pancakes	<input type="radio"/>	<input type="radio"/>
syrup	<input type="radio"/>	<input type="radio"/>
butter	<input type="radio"/>	<input type="radio"/>
sausage	<input type="radio"/>	<input type="radio"/>
pudding	<input type="radio"/>	<input type="radio"/>
hominy	<input type="radio"/>	<input type="radio"/>
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coffee	<input type="radio"/>	<input type="radio"/>
cream	<input type="radio"/>	<input type="radio"/>
tap water	<input type="radio"/>	<input type="radio"/>
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any drink with ice	<input type="radio"/>	<input type="radio"/>

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# Testing the hypotheses

18 ill, 33 well

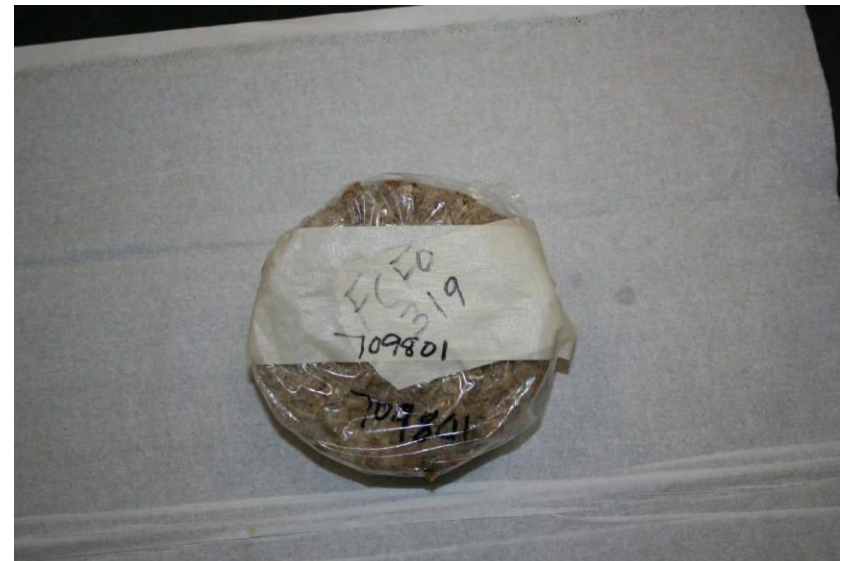
	ILL			WELL			Attack Rate Ate	Attack Rate Did not eat	RR
	Yes (Ate)	No (did not eat)	% Ate the food	Yes (Ate)	No (did not eat)	% Ate the food			
pancakes	16	2	89%	25	8	76%	39%	20%	1.95
syrup	6	12	33%	11	22	33%	35%	35%	1.00
butter	4	14	22%	8	25	24%	33%	36%	0.93
sausage	17	1	94%	24	9	73%	41%	10%	4.15
pudding	13	5	72%	9	24	27%	59%	17%	3.43
hominy	8	10	44%	13	20	39%	38%	33%	1.14
eggs	17	1	94%	25	8	76%	40%	11%	3.64
chipped beef gravy	11	7	61%	17	16	52%	39%	30%	1.29
biscuits	8	10	44%	9	24	27%	47%	29%	1.60
fruit	9	9	50%	15	18	45%	38%	33%	1.13
juice	11	7	61%	15	18	45%	42%	28%	1.51
coffee	10	8	56%	15	18	45%	40%	31%	1.30
cream	5	13	28%	3	30	9%	63%	30%	2.07
tap water	4	14	22%	2	31	6%	67%	31%	2.14
bottled water	0	18	0%	0	33	0%	#DIV/0!	35%	#DIV/0!
drink with ice	2	16	11%	0	33	0%	100%	33%	3.06

# Laboratory testing of samples

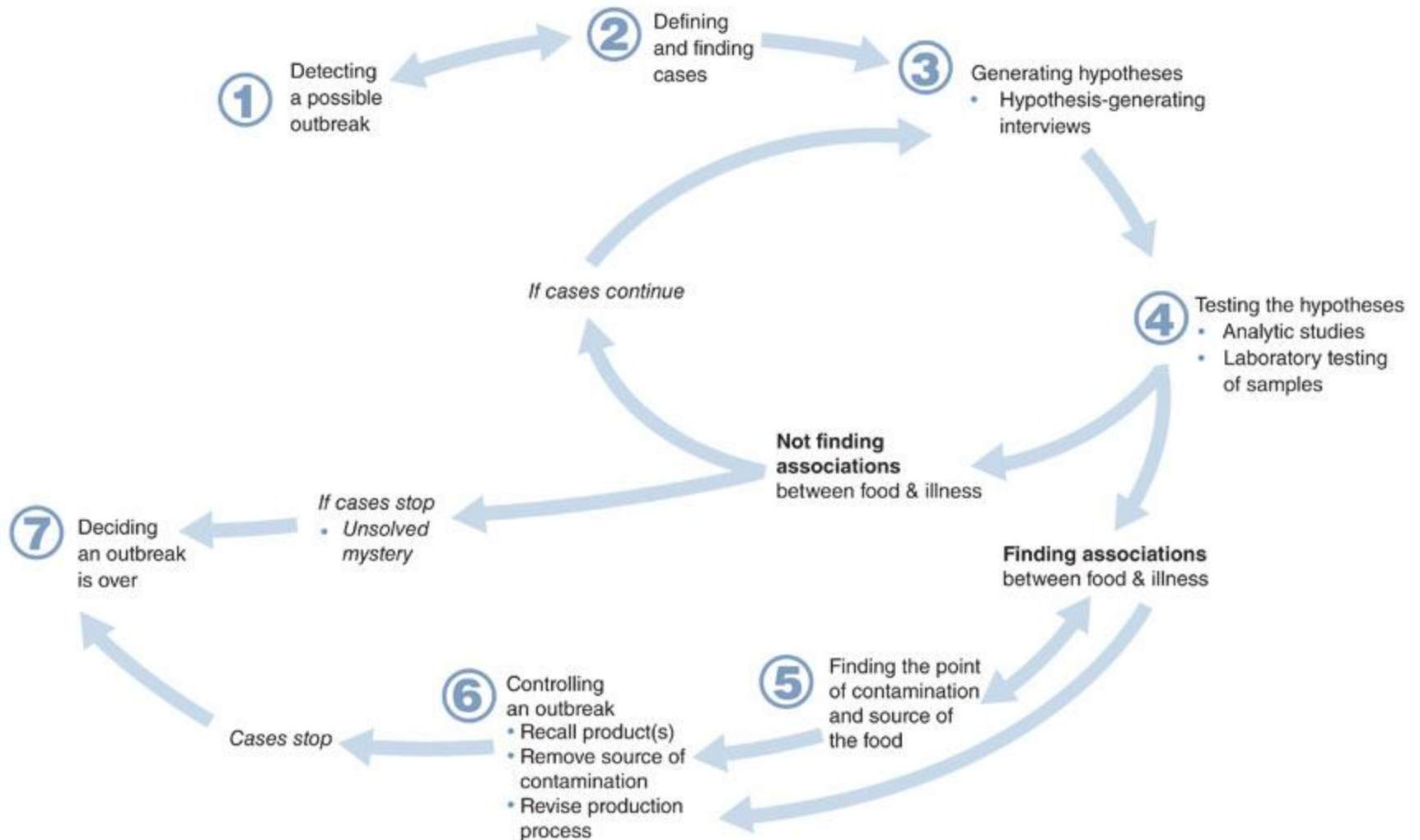
- Results from epi survey suggest a possible connection with pork products, eggs
- Results from environmental health inspection reveals:
  - Eggs were pasteurized
  - Juice was commercial product
  - Pork products from 4-H country butchering
    - Provided to church for benefit breakfast event
    - Also sold to many other customers

# Laboratory testing of samples

- 15 food samples collected from 12 different patrons and sent to state lab for testing
- 8/9 sausage samples positive for *S. Infantis*
- 0/6 pudding samples positive



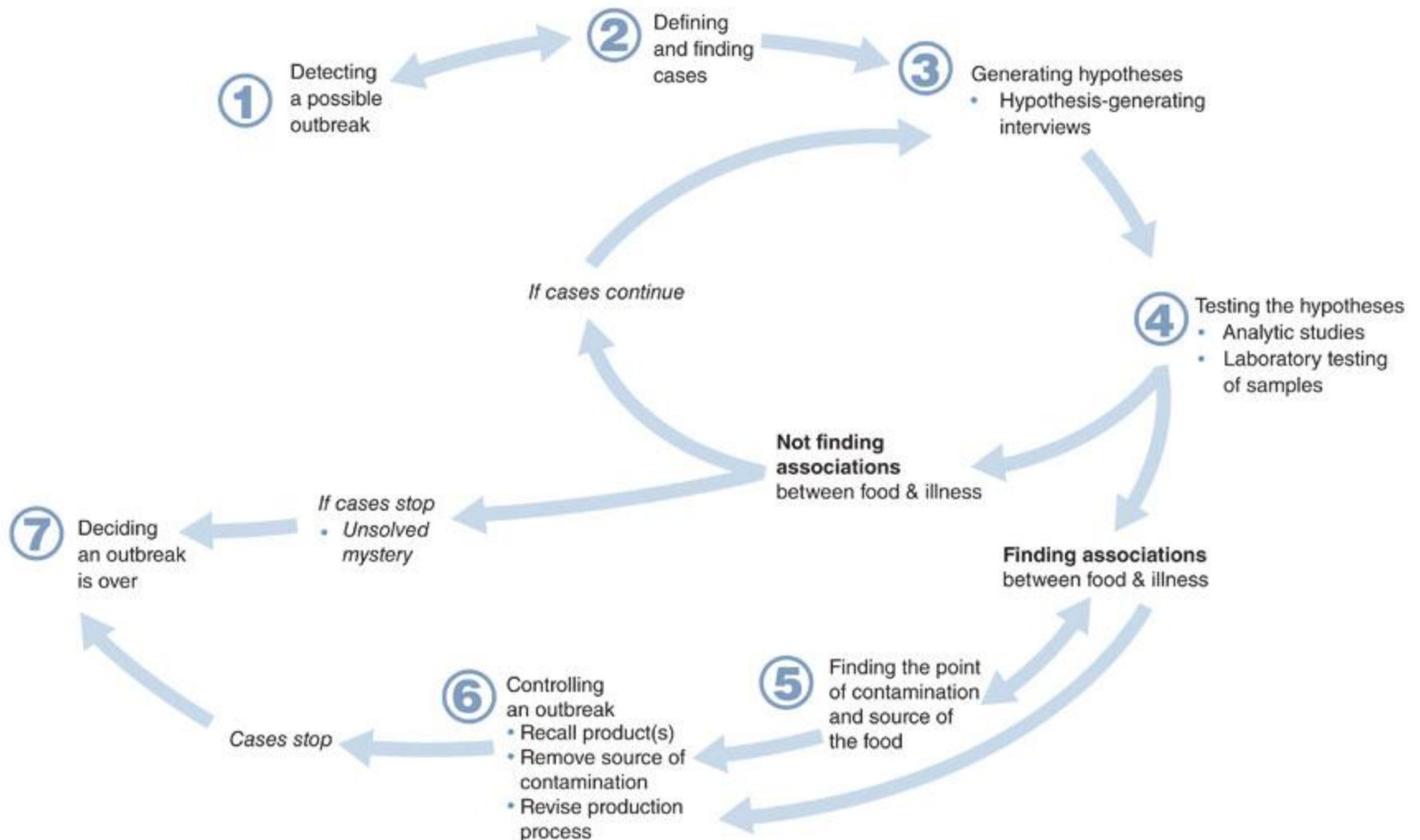
# Steps in a Foodborne Outbreak Investigation



## 5. Finding the point of contamination and source of the food

- Source of the *Salmonella* Infantis was the pork sausage produced from the 4-H country butchering event
- Point of contamination not known, but was before service at benefit breakfast either during butchering or production of the sausage

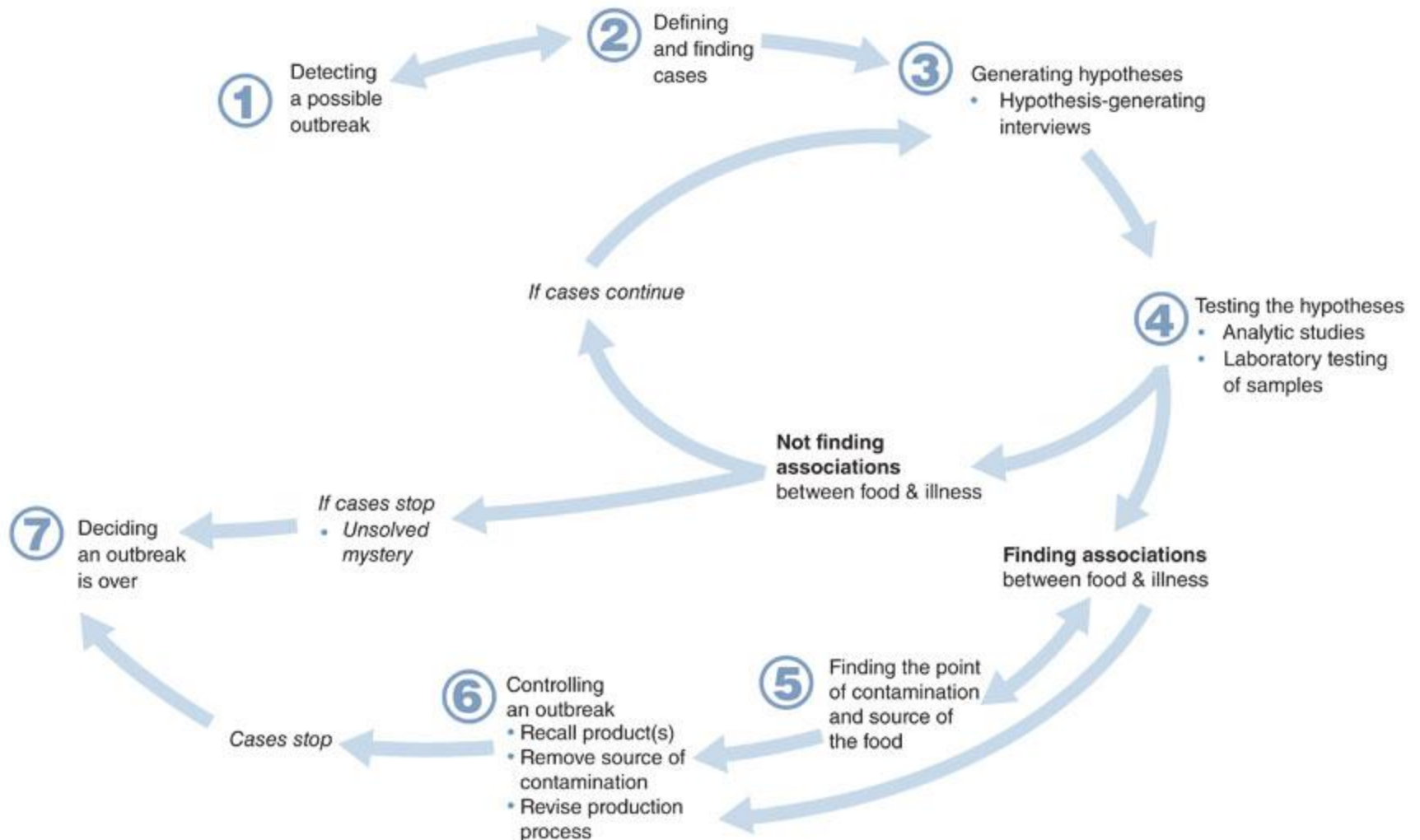
# Steps in a Foodborne Outbreak Investigation



## 6. Controlling an outbreak

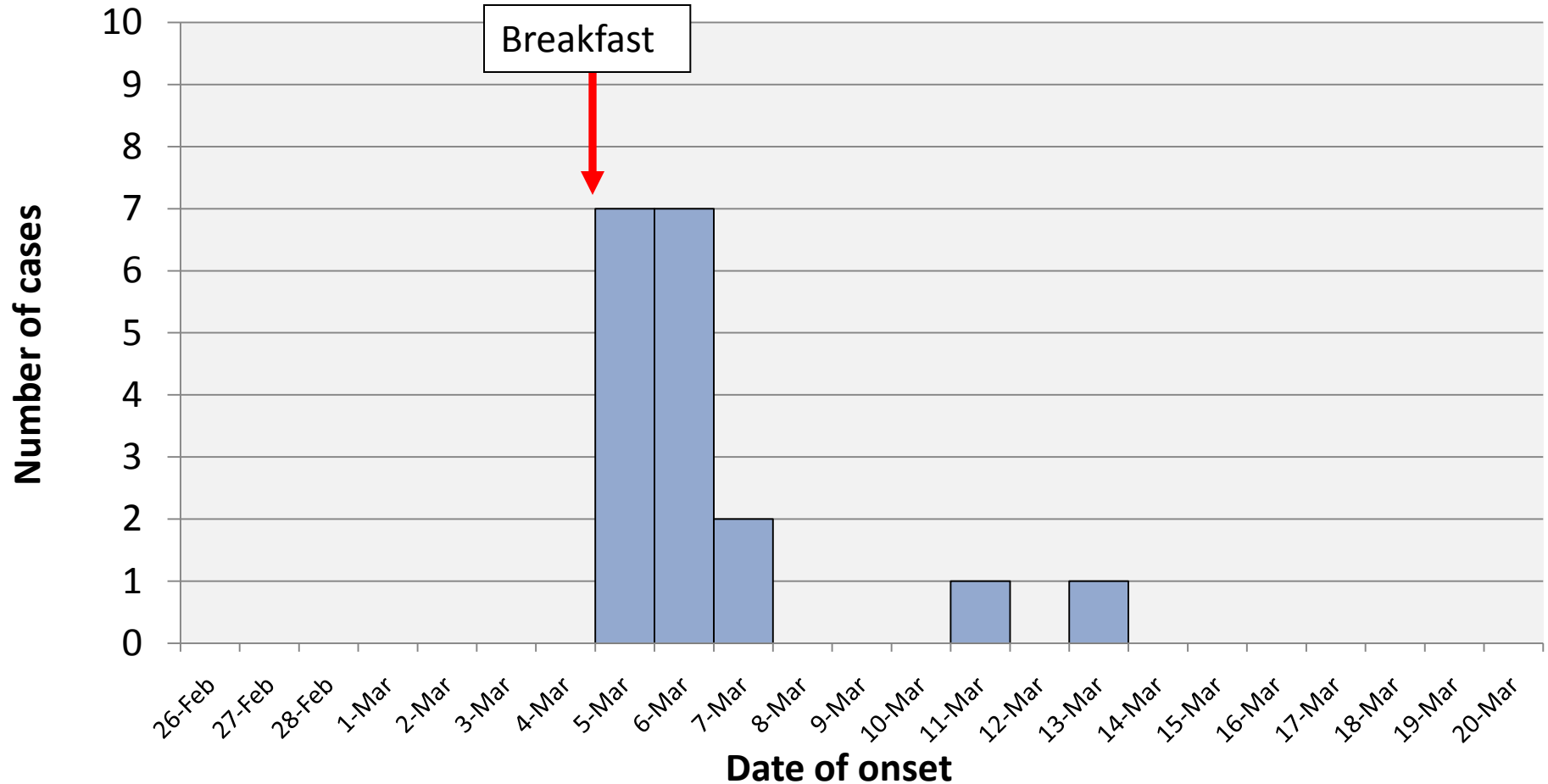
- Press release issued alerting public about outbreak
- Recall of pork sausage from 4-H country butchering event
- Each patron known to have purchased pork sausage from the butchering was contacted individually and given recommendations

# Steps in a Foodborne Outbreak Investigation



# Epidemic Curve

## Outbreak of *S. Infantis* Associated with a Benefit Breakfast – Maryland, 2011



# 7. Deciding an outbreak is over

- Rare pattern of *S. Infantis* of a specific pattern (JFXX01.0005)
- No other matches in national database
- No additional new cases
  - 18 cases identified, 9 lab-confirmed
  - 3 hospitalizations
  - No deaths