

# Outbreak Investigations: The 10-Step Approach

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# Learning Objectives

- 1. List three reasons why outbreak investigations are important to public health**
- 2. Know the steps of an outbreak investigation**
- 3. Give an example of a single overriding communication objective (SOCO)**

# Reasons to Investigate an Outbreak

- Identify the source (and eliminate it)
- Develop strategies to prevent future outbreaks
- Evaluate existing prevention strategies
- Describe new diseases and learn more about known diseases
- Address public concern
- It's your job!

# When to Investigate

Consider the following factors:

- Severity of illness
- Transmissibility
- Unanswered questions
- Ongoing illness/exposure
- Public concern

# Environmental Investigation

- Vital part of investigation
- Should be done *with* (not instead of) epidemiologic investigation

# Collecting and Testing Environmental Samples

- Ideally, epidemiologic results guide sample collection
  - Often collected at the same time
- Can support epidemiologic findings
  - Positive or negative results can be misleading

# Principles of Outbreak Investigations

- Be systematic!
  - Follow the same steps for every type of outbreak
  - Write down case definitions
  - Ask the same questions of everybody
- Stop often to re-assess what you know
  - Line list and epi curve provide valuable information; many investigations never go past this point
- Coordinate with partners (e.g., environmental and epidemiology)

# 10 Steps of an Outbreak Investigation

1. Identify investigation team and resources
2. Establish existence of an outbreak
3. Verify the diagnosis
4. Construct case definition
5. Find cases systematically and develop line listing
6. Perform descriptive epidemiology/develop hypotheses
7. Evaluate hypotheses/perform additional studies as necessary
8. Implement control measures
9. Communicate findings
10. Maintain surveillance



# 10 Steps of an Outbreak Investigation

1. Identify investigation team and resources

# Investigation Resources

- Local
  - Epi teams
- State
  - CD Branch epidemiologists / subject matter experts
  - Nurse Consultants
  - PHRST teams
  - Disease Investigation Specialists (DIS)
- Other
  - Team Epi-Aid (UNC)
  - CDC

# 10 Steps of an Outbreak Investigation

1. Identify investigation team and resources
2. Establish existence of an outbreak

# What is an Outbreak?

Increase in cases above what is expected in that population in that area

- Four kids with cough and runny nose in a child care center in January?*
- Woman vomiting after eating at Restaurant A?*
- 10 members of the swim team vomiting after eating at Restaurant A?*
- One case of smallpox?*

# 10 Steps of an Outbreak Investigation

1. Identify investigation team and resources
2. Establish existence of an outbreak
3. Verify the diagnosis

# Verify the Diagnosis

- Obtain medical records and lab reports
  - Contact Public Health Epidemiologist in Hospital & Infection Preventionists
- Conduct clinical testing if needed
  - Consult with CD Branch, State Lab

# 10 Steps of an Outbreak Investigation

1. Identify investigation team and resources
2. Establish existence of an outbreak
3. Verify the diagnosis
4. Construct case definition

# Components of Case Definition

- Person..... Type of illness  
(e.g., “a person with...”)
- Place..... Location of suspected exposure
- Time..... Based on incubation  
(if known)



# Sample Outbreak Case Definition

Hepatitis A outbreak:

- *Person:* An acute illness involving jaundice or elevated liver function tests
- *Place:* Occurring after visiting or residing on Property A
- *Time:* During May–August 2006

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# What to Put on a Line List

1. Clinical information
  - Symptoms (type, duration)
  - Onset dates and/or times
2. Demographic information
3. Exposure information

Use line list to summarize information

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# Descriptive Epidemiology

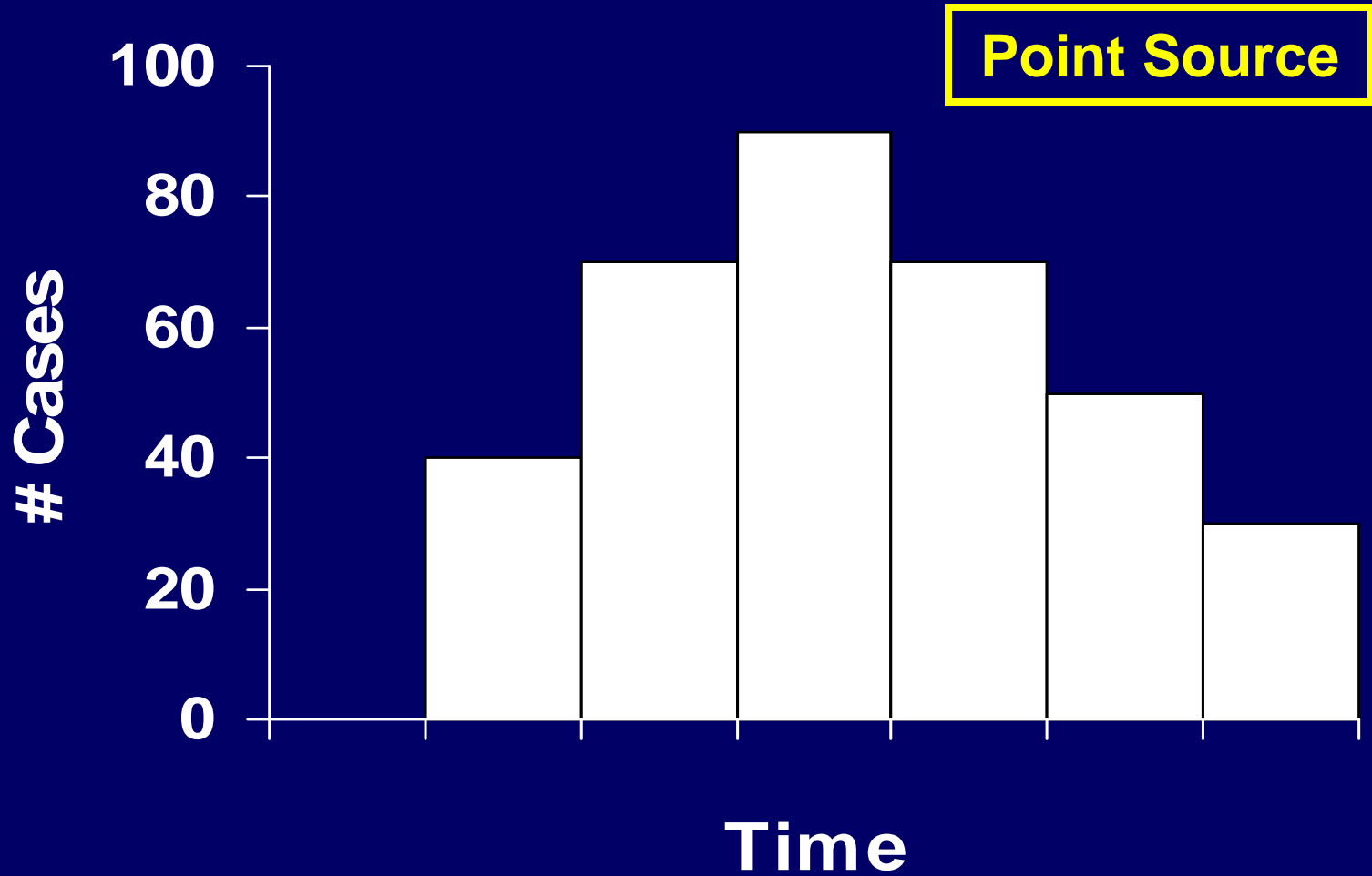
- Person, place and time
- Line lists and epi curves useful in developing hypotheses

# Epi Curves

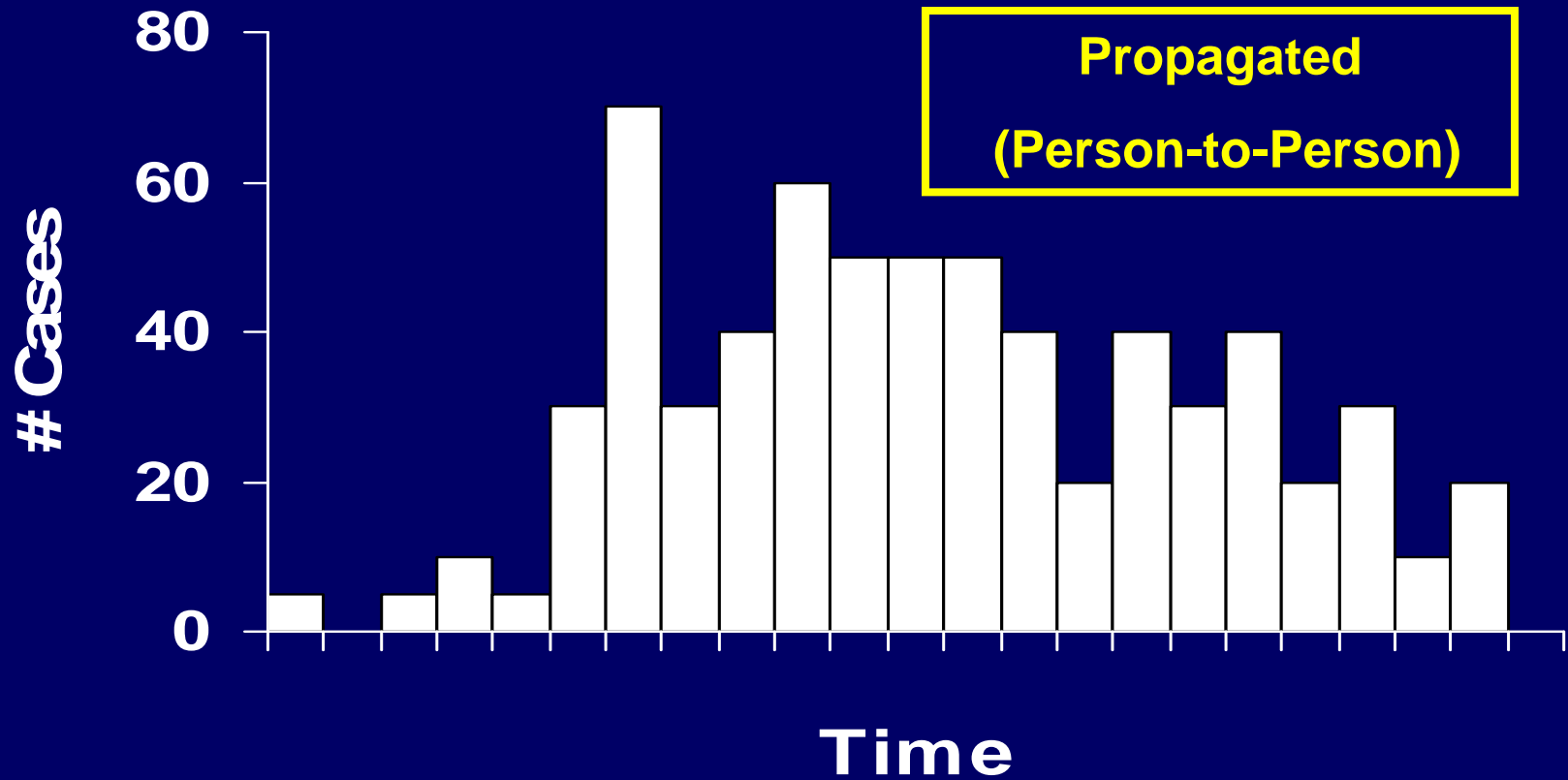
**Can suggest type of exposure**

- Point-source**
- Person-to-Person**

# Epi Curve A



# Epi Curve B

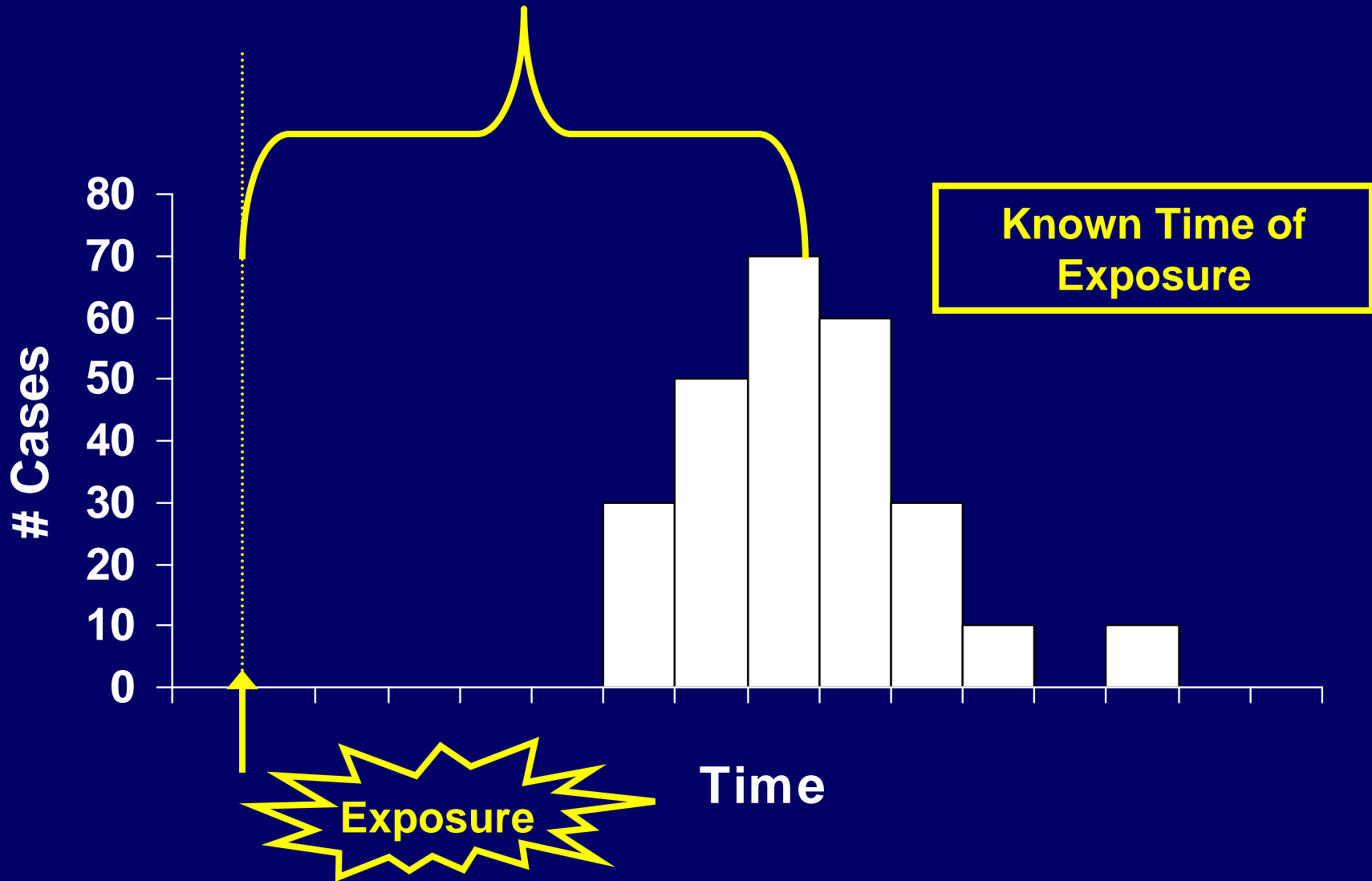


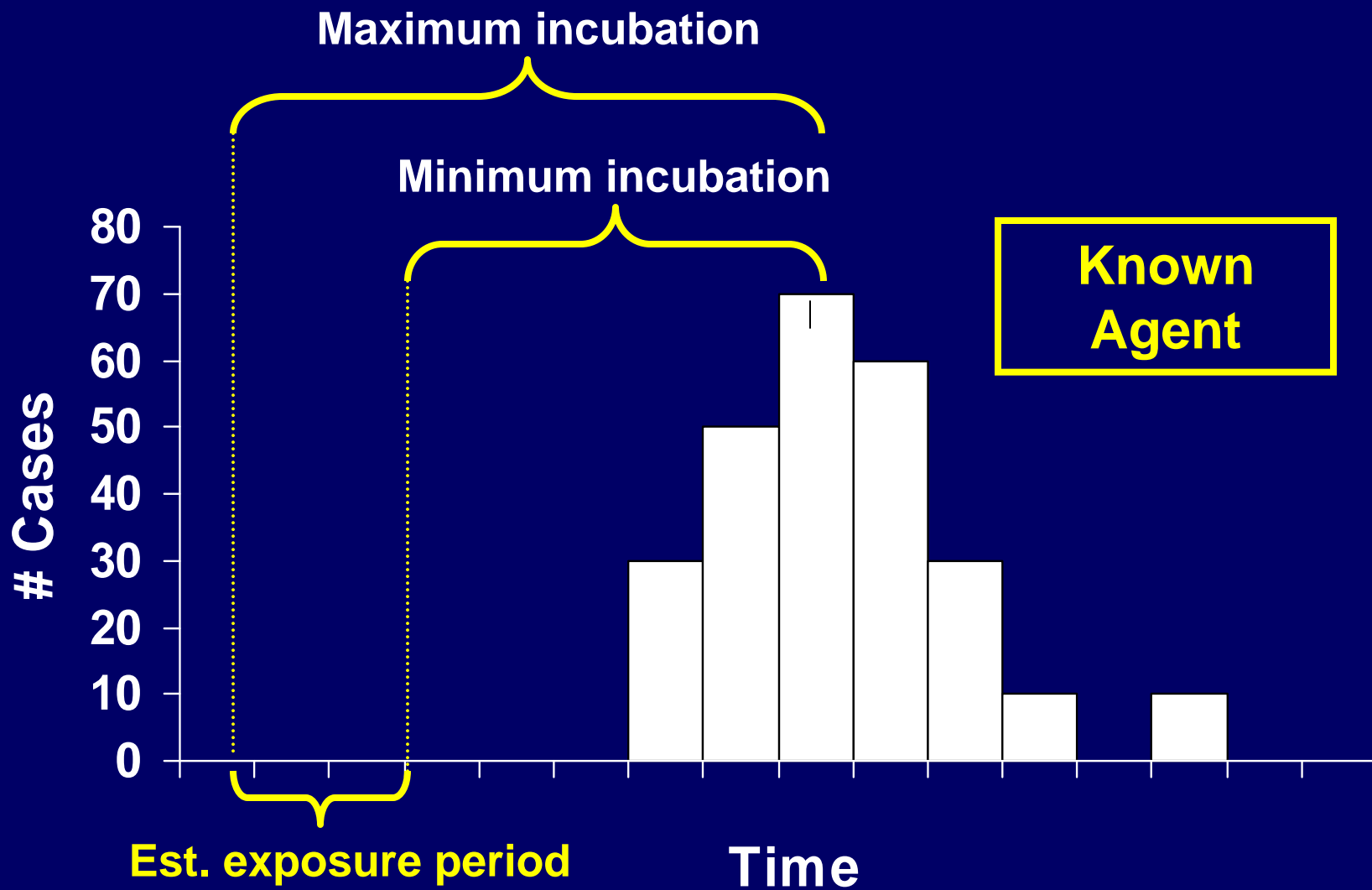


# Epi Curves

- Suggest type of exposure
  - point-source, person-to-person
- Suggest time of exposure
  - if agent known
- Suggest possible agents
  - if time of exposure known

# Average incubation





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# Additional Studies

- Types
  - Cohort
  - Case-control
- Designed to assess exposures equally among ill and non-ill

# Cohort Studies

- Include *EVERYONE* who could have been exposed
  - Only use if a complete list is available
  - Meeting attendees, students, LTCF residents, etc.
- Measure of association = Relative Risk

# Relative Risk (RR)

- **RR = 1.0**  
Risk same among exposed and unexposed
- **RR > 1.0**  
Risk is **HIGHER** among exposed
- **RR < 1.0**  
Risk is **LOWER** among exposed

# Case-Control Studies

- **Compare exposures among ill persons (case-patients) and non-ill persons (controls)**
- **Used when a complete list is not available or too large**
  - **Restaurant outbreaks, national outbreaks, etc.**
- **Measure of association = Odds Ratio**



# Interpretation of Odds Ratio

- **OR = 1.0**  
**Same odds of exposure among ill and non-ill**
- **OR > 1.0**  
**HIGHER odds of exposure among ill**
- **OR < 1.0**  
**LOWER odds of exposure among ill**

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# Control Measures

- Can occur at any point during outbreak
- Isolation, cohorting, product recall
- Balance between preventing further disease and protecting credibility and reputation of institution
- Should be guided by epidemiologic results in conjunction with environmental investigation

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# Inform Public and Media

- **Public & press are not aware of most outbreak investigations**
- **Media attention desirable if public action needed**
- **Response to media attention important to address public concerns about outbreak**
  - **Single overriding communication objective (SOCO)**
- **Results of investigations public information**

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# Maintain Surveillance

- ❑ Deciding if outbreak is over
- ❑ Documenting effectiveness of control measures

# Conclusions

- Epidemiologic investigations are essential to determine source of outbreaks
- Be systematic
- Follow the steps!