How do we detect outbreaks?

sources:
- Surveillance data
- Medical Practitioner
- Affected persons/groups
- Concerned citizens
- Media
Why should we investigate outbreaks?

Main Question: WHAT FOR?

- Control and Prevention measures
- Research Opportunities
- Training
- Public, Political or Legal concerns
- Program Considerations

CONTROL AND PREVENTION MEASURES

- Are cases continuing to occur?
- Is the outbreak just about over?

Source/Mode of transmission

<table>
<thead>
<tr>
<th>Known</th>
<th>Unknown</th>
</tr>
</thead>
</table>
| Causative Agent
| Known |
| Investigation Control +++ | Investigation +++ |
| | Control +++ |
| Unknown |
| Investigation Control +++ | Investigation +++ |
| | Control +++ |

+++ = highest priority
+ = lower priority
Why should we investigate outbreaks?

✓ RESEARCH OPPORTUNITIES

- Newly recognized disease
  - define its natural history:
    - agent
    - mode of transmission
    - incubation period
    - clinical spectrum
  - characterize the populations at risks
  - identify risk factors

- Well – characterized diseases
  - assess control measures
  - assess usefulness of new epidemiology and laboratory techniques

✓ TRAINING

Develop the following skills through practice and experience:

- diplomacy
- logical thinking
- problem-solving ability
- quantitative skills
- epidemiologic know-how
- judgment
Why should we investigate outbreaks?

✓ PUBLIC, POLITICAL or LEGAL CONCERNS

- sometimes override scientific concerns in the decision to conduct an investigation
- essential to be “responsibly responsive” even if the concern has little scientific basis

Why should we investigate outbreaks?

✓ PROGRAM CONSIDERATIONS

- Program Evaluation
  - identify populations overlooked
  - recognize intervention strategy failures
  - identify changes in the agent or events beyond the scope of the program
Steps of an Outbreak Investigation

Step 1: Prepare for field work
Step 2: Establish the existence of an outbreak
Step 3: Verify the diagnosis
Step 4: Define and identify cases
Step 5: Perform descriptive epidemiology
Step 6: Develop hypotheses
Step 7: Evaluate hypotheses
Step 8: Execute additional studies
Step 9: Implement control and prevention measures
Step 10: Communicate findings
Step 11: Follow up recommendations
Steps of an Outbreak Investigation

Step 2: Establishing the Existence of an Outbreak

- Compare the current number of cases with the number of cases from comparable period during the previous years.
  - surveillance records
  - hospital records, registries, mortality statistics
  - data from neighboring areas
  - community survey

NOTE:
An excess of cases may not necessarily suggest an outbreak. It could be due to any of the following conditions:
- changes in local reporting procedures
- changes in the case definition
- increased local or national awareness
- improvements in diagnostic procedures
- new physician, infection control nurse, or health facility
- sudden changes in population size (resort areas, college towns, evacuees, etc.)
Steps of an Outbreak Investigation

Step 3: Verifying Diagnosis

- ensure proper diagnosis of reported cases
- rule out laboratory error as the basis for the increase in diagnosed cases
  * review clinical findings
  * review laboratory results
  * summarize the clinical findings with frequency distribution
  * visit patients

Example of a frequency distribution

Table 1. Signs and Symptoms Food Poisoning Outbreak (N=193)
Casino Filipino Manila Pavilion
August 3, 1995

<table>
<thead>
<tr>
<th>SIGNS AND SYMPTOMS</th>
<th>FREQUENCY (NUMBER)</th>
<th>PERCENTAGE (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Diarrhea</td>
<td>189</td>
<td>97</td>
</tr>
<tr>
<td>2. Abdominal Cramps</td>
<td>176</td>
<td>90</td>
</tr>
<tr>
<td>3. Fever</td>
<td>98</td>
<td>50</td>
</tr>
<tr>
<td>4. Vomiting</td>
<td>59</td>
<td>30</td>
</tr>
<tr>
<td>5. Chills</td>
<td>39</td>
<td>20</td>
</tr>
<tr>
<td>6. Nausea</td>
<td>15</td>
<td>8</td>
</tr>
<tr>
<td>7. Weakness</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>8. Headache</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>9. Flatulence</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>
Steps of an Outbreak Investigation

Step 4: Define and Identify Cases

A. Establish a Case Definition

- standard set of criteria for the health condition
  - clinical criteria (signs and symptoms)
  - restrictions by time, place and person
  - apply without bias

NOTE: *Never include the EXPOSURE or RISK FACTOR in the case definition!*

Examples of case definition of diseases used by the National Epidemic Sentinel Surveillance System (NESSS)

**Dengue fever** – fever of 2-7 days duration, (+) tourniquet test &/or petechiae, or any hemorrhagic manifestations &/or low platelet count (<100,000/mm³).

**Measles** – fever of 3-7 days duration, with generalized blotchy maculopapular rashes; with history of cough, coryza, conjunctivitis or Koplik’s spots.
### Steps of an Outbreak Investigation

#### Step 4: Define and Identify Cases

**B. Identify and Count Cases**

1. **identifying information**
   - name, address, telephone no.
2. **demographic information**
   - age, sex, race, occupation
3. **clinical information**
   - date of onset, hospitalization, death
4. **risk factor information**
   - food or water sources, toilet facility
5. **reporter information**

#### Step 5: Perform Descriptive Epidemiology

- **characterize by TIME**
  - draw an epidemic curve
  
  *can be used to determine:*
  - the type of epidemic
  - the difference between maximum & minimum incubation period
  - the probable time of exposure
  - the incubation period when probable time of exposure is known
Steps of an Outbreak Investigation

Types of Epidemic Curves:

- Common source epidemic
  - point source
  - extended source
- Propagated or progressive epidemic

Incubation Period, Food Poisoning Cases (N=68)
Laguna, February 1995

HOURS

0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30

<1 2 4 6 8 10 12 14 16 17+
Steps of an Outbreak Investigation

Types of epidemic curves:

- Common source epidemic
  - extended source

Onset of Illness, Cholera Cases (N=48)
Calima, Pola, Oriental Mindoro
March 20 - April 15, 1995

Steps of an Outbreak Investigation

Types of epidemic curves:

- Propagated or progressive epidemic

Measles Morbidity Rate in Evacuation Centers
Province of Albay
Feb. 2 - May 17, 1993
Steps of an Outbreak Investigation

Step 5: Perform Descriptive Epidemiology

- characterize by PLACE
  - geographic extent
    - spot map
    - area map

- characterize by PERSON
  - host characteristics
    - age
    - race
    - sex
    - medical status
  - exposures
    - occupation
    - leisure activities
    - tobacco use
    - use of medications/drugs
Steps of an Outbreak Investigation

Step 6: Developing Hypotheses

Consider:

- source of the agent
- mode of transmission
- vectors of transmission
- risk factors

* hypotheses should be testable

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Steps of an Outbreak Investigation

Step 7: Evaluating Hypotheses

Ways:

- compare with established facts
- use analytical epidemiology

✓ case-control studies
✓ retrospective cohort studies
Steps of an Outbreak Investigation

Step 8: Refining Hypotheses and Executing Additional Studies

why:
- unrevealing analytic studies
- poor hypotheses
- need more specific exposure histories
- need more specific control group

Step 9: Implement Control and Prevention Measures

- Primary public health reason
  - prevent additional cases
  - prevent outbreaks in the future
Steps of an Outbreak Investigation

Step 10: Communicate Findings

Through:
- writing and disseminating full reports
- meetings and discussions
- local and mass media

To the:
- local government officials
- local health workers
- concerned authorities
- regional health authorities
- Department of Health

Steps of Outbreak Investigation

Steps 11: Follow-up Recommendation

- what activities have been undertaken
- if health status has improved
- if health problems has been reduced
Thank you!