12 Steps to Conducting an Outbreak Investigation

1. Prepare for Field Work
   - When information begins to come in that there may be an outbreak occurring, you have to begin preparing yourself and/or your staff for working in the field.
   - Activities to Begin: Equipment for the Field
   - Possible Team Members: Epidemiologists, Lab Personnel, Sanitarians

2. Confirm the Existence of an Outbreak
   - When reports of illness begin to surface, it is important to determine if an outbreak is truly occurring. A true outbreak may be occurring or it may be periodic and unrelated cases of the same disease or even unrelated cases of similar, but different diseases.
   - Step 1: Determine the expected number of cases before deciding if the observed number exceeds the expected.
   - Step 2: Comparing observed numbers of cases with expected values using surveillance records, hospital discharge data, disease registries, mortality statistics, lab data, other agencies, health care providers & community surveys.

3. Verify the Diagnosis
   - The diagnosis must be verified and cases separated from non-cases.
   - LABS: Ensure proper diagnosis and rule out lab error
   - CLINICIANS: Review and summarize clinical findings and lab results
   - PATIENTS: If possible, interview patients in person or over the phone to help:
     - Better understand clinical features
     - Gain a mental image of disease and the patients affected
     - Identify a possible source of exposure, include patient’s perspective
     - Identify others with similar illness
   - Generate ideas for hypothesis about the etiology and spread

4. Define the Case Definition
   - In order to begin classifying a person as a case, it is necessary to have a case definition.
   - Case definition: Standard set of criteria (see other side) for deciding if an individual should be classified as having the health condition of interest
   - Includes clinical criteria and restrictions by time, place and person
   - Must be applied consistently and without bias to all persons under investigation
   - Usually does not contain an exposure or risk factor you want to test

5. Identify Cases & Exposed Persons
   - Once initial cases have been identified, it is important to identify any additional cases, infectious sources, or exposed people. Four ways in which public health professionals can find additional cases:
     - Contact health care facilities either through enhanced passive surveillance or active surveillance
     - Alerting the public through the media
     - Always ask case-patients if they know of any others ill with the same symptoms
   - Survey the entire exposed population (effective when restricted to a small number of individuals in a focused setting)

6. Choose a Study Design
   - Before questioning large numbers of people, choose a study design. This directs who to interview estimates of the numbers of interviews needed.
   - Case-Control Studies start with a person’s disease and then investigate the exposure status and then investigate the presence of disease.
   - Cohort Studies start with a person’s exposure status and then investigate the presence of disease.
   - Attack rate is high among exposed and low among those not exposed
   - How to evaluate: Relative Risk
   - Person: Determine what population at risk
   - Numerator = number of cases
   - Denominator = number of people at risk
   - Epi Curve: histogram of the number of cases by their date of onset and shows the time course of the outbreak
   - Gives the probable period of exposure
   - Indicates whether control measures are effective in reducing new cases

7. Develop a Questionnaire
   - Key Information to Collect:
     - Demographic Information (name, birth date, contact information)
     - Illness History (onset date/time, treatment by clinicians)
     - Symptoms (type and duration)
     - Travel History
     - Exposure History (food, water, chemicals, specific behaviors)
     - Other questions to ask include:
       - Will they provide a sample (stool, urine, blood, sputum) for testing?
       - Do they have any additional information to add?
       - Can they be re-contacted if more information is needed?

8. Descriptive Epidemiology
   - Place: Geographic extent of problem
   - Clusters or patterns providing clues
   - Possible exposure sites (homes, work, etc)
   - Epidemiologists: Laptop
   - Lab Personnel: Specimen Collection kits
   - Sanitarians: Sanitizer kits
   - Questionnaires:
     - Infectious Disease Manual
     - Administrators (large outbreaks)
     - Interview forms
     - Infection Control Staff
     - Infectious Disease Manual
     - Specimen Collection kits
     - Sanitizer kits
   - Examples of Control Measures:
     - Recalling or destroying any contaminated products
     - Offering immunizations to those who are unvaccinated
     - Restricting infected workers from high-risk occupations
     - Changing or correcting procedures that may have lead to a contamination
     - Education (hand washing, food handling, proper sanitization of surfaces, etc)
     - Vector control

9. Formulate, Evaluate and Refine the Hypothesis
   - A good hypothesis should address the: 1) source of the agent, 2) mode of transmission and 3) exposure that caused the disease.
   - Formulate: consider what is already known about the disease. However, don’t disregard information collected in the course of the investigation.
   - Evaluate: talk with others involved or test the hypothesis against known cases. Refine: fit what is being observed and needed to be tested for this outbreak.

10. Conduct Studies
    - During the course of an outbreak investigation, there are many studies that can and must be conducted.
    - ENVIRONMENTAL: These studies often take place in the initial phases of an outbreak investigation to help determine the source of exposure and mode of transmission.
    - LABORATORY: Laboratory analysis is used to confirm that a particular agent or chemical is present in clinical or environmental samples.
    - ANALYTICAL: Finally, further epidemiologic studies may need to be conducted if the disease continues to persist in a community or if the disease in question is new and undocumented.

11. Implement Control and Prevention Measures
    - Implementing control measures should really be done as soon as possible.
    - Short or long term measures can be aimed at the agent, source, or reservoir.
    - Examples of Control Measures:
      - Recalling or destroying any contaminated products
      - Offering immunizations to those who are unvaccinated
      - Restricting infected workers from high-risk occupations
      - Changing or correcting procedures that may have lead to a contamination
      - Education (hand washing, food handling, proper sanitization of surfaces, etc)

12. Communicate Findings
    - Communicating findings through written reports or orally within the department or with the community using the media.
**How Are Cases Classified?**

How a case is classified varies for each disease. The standard classifications are Confirmed, Probable, and Suspect. However, there are other classifications that may apply. In Arizona, a case can be defined in different ways to indicate the extent to which a person fits the case definition for a particular disease (although every disease may not be able to be classified in each of these ways).

**Clinically compatible case** – a clinical syndrome generally compatible with the disease's clinical description

**Probable case** – a case that is classified as probable for a disease by one or more of the laboratory methods specific for that disease (see Manual for specifics).

**Confirmed case** – a case that is confirmed for reporting purposes (often laboratory-confirmed)

**Epidemiologically linked case** – a case in which (a) the patient has had contact with one or more persons who either have/had been exposed to a point source of infection and (b) the transmission of the agent by the usual modes of transmission is plausible. A case may be considered ‘epi linked’ to a laboratory-confirmed case if at least one case in the chain of transmission is laboratory confirmed.

**Laboratory-confirmed case** – a case that is confirmed by one or more of the laboratory methods specific for that disease (see Manual for specifics).

**Submit a report by telephone or through an electronic reporting system authorized by the Department within 24 hours after a case or suspect case is diagnosed, treated, or detected or an occurrence is detected.

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<thead>
<tr>
<th>Arizona Department of Health Services</th>
<th>Infectious Disease Epidemiology/Communicable Disease</th>
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<tbody>
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<td>Arizona Health Departments</td>
<td>Arizona Department of Health Services</td>
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**Reportable Diseases in Arizona**

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<tr>
<th>Disease</th>
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| Anthrax                        | A case in which (a) the patient has had contact with one or more persons who either have/had been exposed to a point source of infection and (b) the transmission of the agent by the usual modes of transmission is plausible. A case may be considered ‘epi linked’ to a laboratory-confirmed case if at least one case in the chain of transmission is laboratory confirmed.
| Anthrax                        | How a case is classified varies for each disease. The standard classifications are Confirmed, Probable, and Suspect. However, there are other classifications that may apply. In Arizona, a case can be defined in different ways to indicate the extent to which a person fits the case definition for a particular disease (although every disease may not be able to be classified in each of these ways).
| Anthrax                        | Clinically compatible case – a clinical syndrome generally compatible with the disease’s clinical description
| Anthrax                        | **Probable case** – a case that is classified as probable for a disease by one or more of the laboratory methods specific for that disease (see Manual for specifics).
| Anthrax                        | **Confirmed case** – a case that is confirmed for reporting purposes (often laboratory-confirmed)
| Anthrax                        | **Epidemiologically linked case** – a case in which (a) the patient has had contact with one or more persons who either have/had been exposed to a point source of infection and (b) the transmission of the agent by the usual modes of transmission is plausible. A case may be considered ‘epi linked’ to a laboratory-confirmed case if at least one case in the chain of transmission is laboratory confirmed.
| Anthrax                        | **Laboratory-confirmed case** – a case that is confirmed by one or more of the laboratory methods specific for that disease (see Manual for specifics).