Case and Outbreak Investigation

For assistance, contact the Defense Centers for Public Health–Aberdeen (DCPH-A) Disease Epidemiology Team
Email: dha.apg.pub-health-a.mbx.disease-epidemiologyprogram13@health.mil
Phone: 1-410-417-2377

DCPH-A Phone: Toll-Free: 1-800-222-9698

DHA-PH Email: Defense Health Agency (DHA) Public Health Operations at
dha.ncr.pub-health.mbx.operation@health.mil

Web page: https://ph.health.mil/topics/healthsurv/de/Pages/DRSiResources.aspx

Case Investigation

A case investigation is conducted for suspected, probable, or confirmed reportable medical events.

Case definition

A standard set of criteria for determining if an individual should be classified as having the health condition. The criteria include clinical features and restrictions by person, place, and time, which are applied to all persons under investigation.

- Clinical features: objective measures associated with the illness/condition (e.g., three or more loose bowel movements per day; or fever $\geq101ºF$)
- Person: characteristics (e.g., no previous history of a positive TB skin test)
- Place: a geographic location or facility (e.g., Soldiers at field training exercise)
- Time: a period of time associated with onset of illness (e.g., onset of illness within the past 2 weeks)

Procedure

1. Review the electronic health record (EHR) for clinical findings and laboratory results. Review the Armed Forces Reportable Medical Events (AFRME) Guidelines & Case Definitions for disease information, clinical description, and reporting information.

2. Consult with the diagnosing provider, as needed, for additional information to confirm that the case meets reporting criteria, and to identify needed prophylaxis or treatment.

3. Inform Chief, Installation Department of Public Health (DPH) to notify MTF Command, Infection Control, Defense Centers for Public Health–Aberdeen (DCPH-A) and local/state public health departments.

4. Submit a preliminary outbreak report to the Disease Reporting System-internet (DRSi) no later than 24 hours after suspecting an outbreak. Obtain state epidemiology and laboratory resources, case report forms, and procedures to guide the investigation.

5. Obtain or develop an interview tool for the disease or condition of interest. Maintain documentation of a line list (see the end of this section).

6. Interview the patient.

For further information, contact DRSi and Reportable Medical Event Help Desk:
DSN: 867-2377, COMM: 410-417-2377
Email: dha.apg.pub-health-a.mbx.disease-epidemiologyprogram13@health.mil

Case and Outbreak Investigation

- Review symptoms and potential exposure to specific risk factors, as indicated.
- If the disease is transmissible from person-to-person, request information (i.e., name, phone number, email) for individual(s) with whom the case had contact.
- If the condition is environmental or occupational (e.g., heat illness), request information for individuals who may have also been exposed.
- Provide education on agent-specific prevention and control measures.
- Provide instructions on how to obtain testing, treatment, medications, or vaccinations.

7. Submit updates to DRSi; submit reports to the local/state public health departments.

8. Write reports, as needed, and submit through command channels.

Contact Investigation

1. As identified in the case interview, contact the individuals who may have been potentially exposed or at risk of infection, illness, or injury. Contact the individual by phone and schedule an interview to—

- Inform of possible exposure to the agent of infection, illness, or injury (**do not** disclose the name of the confirmed case or person who identified them as a contact).
- Obtain information on health status.
- Provide information on risks, signs, and symptoms; mode of transmission; incubation period; active surveillance, if necessary (e.g., temperature checks); prevention measures (e.g., quarantine, isolation); testing and treatment options; and when and where to seek medical care.
- Request contact information for all individuals who may have been exposed or at risk.
- Refer to primary healthcare provider or civilian health department for vaccination or prophylaxis, if indicated.

2. Consult with Chief, DPH, to notify the unit and MTF Commander and civilian public health department to ensure testing, treatment, and implementation of control measures.

- Incubation periods help determine which contacts are at risk based on information from the Centers for Disease Control and Prevention (CDC), AFRME, and the Control of Communicable Diseases manual.
- Determine the follow up and prophylaxis/treatment or other control measures of a person identified as a close contact to the case.
- If the number of contacts exceeds the PHN capacity, then other DPH, MTF, or installation personnel may be utilized to call identified contacts.

3. Consult the DCPH-A Disease Epidemiology Division team. Email: dha.apg.pub-health-a.mbx.disease-epidemiologyprogram13@health.mil

Cluster Evaluation

A cluster is an aggregation of cases in a given area over a period of time without regard to whether the number of cases is more than expected. A cluster may be an outbreak with a common cause, or unrelated cases of the same disease, or unrelated cases of similar but unrelated diseases.

A cluster evaluation may relate to non-infectious diseases (e.g., cancer) where exposure occurred years ago; or an infectious disease (e.g., varicella) where exposure occurred within the past few weeks or days.

For further information, contact DRSi and Reportable Medical Event Help Desk:
DSN: 867-2377, COMM: 410-417-2377
Email: dha.apg.pub-health-a.mbx.disease-epidemiologyprogram13@health.mil

Case and Outbreak Investigation

The DPH will request the assistance of the Medical Readiness Command and DCPH-A to determine if there is a need for a disease cluster investigation and provide guidance.

The response team will include subject matter experts in epidemiology, occupational and environmental medicine, and the possible exposure and/or disease of concern.

Criteria for a cluster evaluation include:
- Clinically similar health events or conditions without a plausible alternative explanation
- Excess occurrence of such events (over baseline)
- Plausible temporal association with the possible exposure
- Disease present in a particular demographic group in which it is not routinely identified, or the disease is present in a subpopulation and not affecting other groups
- One or more cases of a very rare disease or condition

Outbreak Investigation

An outbreak is the occurrence of more cases of illness/injury/condition than expected among persons in a community, institution, region, or other defined area over a period of time.

Foodborne Disease Outbreak: Two or more persons who experience a similar illness after ingestion of a common food. There may be exceptions, such as one case of botulism or chemical poisoning constituting an outbreak.

Waterborne Disease Outbreak: Two or more persons who experience a similar illness after consumption or use of water intended for drinking. Outbreaks in association with recreational water may include exposure to or unintentional ingestion of water.

Outbreaks can be caused by a variety of etiologic agents, transmitted person-to-person or via a common source, resulting in mild to serious illness, or death. The number of cases that constitutes an outbreak depends on the expected number of cases and circumstances. The purpose of any outbreak investigation is to determine the factors associated with the illness or condition and implement measures to prevent new cases.

The **10-step approach** guides and organizes the investigation.

The Chief, DPH, participates in and/or oversees the investigation to include identifying team members and coordinating and communicating with the chain of command, military and civilian partners, and community stakeholders.

Step 1: Prepare for fieldwork: **Gather information and tools, establish team.**
    1. Gather information on the illness/condition including symptoms, case definitions, modes of transmission, risk factors, diagnostic tests, treatment protocols, control measures, interview forms, technical references, and points of contact.
    2. Notify DCPH-A, local civilian public health agencies, chains-of-command, as needed: medical (regional health), operational (installation), and community (garrison).
    3. Consult with the MTF laboratory on proper collection with personal protective equipment, storage, and transportation of specimens if collected outside of the facility.
    4. Select and prepare the investigation team.
- Identify a lead investigator.
- Identify team members based on the type of outbreak.
- Identify a primary and alternate spokesperson.

For further information, contact DRSi and Reportable Medical Event Help Desk:
DSN: 867-2377, COMM: 410-417-2377
Email: dha.apg.pub-health-a.mbx.disease-epidemiologyprogram13@health.mil

Case and Outbreak Investigation

5. Ensure each team member knows their own roles and responsibilities and is aware of the role of the other team members.

6. Distribute phone roster of team members.

7. Establish communication plan: when – frequency (e.g., daily), why – purposes (e.g., new information), and how – mechanism based on purpose (e.g., phone for immediate discussion; or email (encrypted), EXSUM, meeting for routine updates) within the team, with the chain of command and partner agencies.

8. Gather necessary equipment and supplies (e.g., laptops, cell phones).

Step 2: Establish the existence of an outbreak.

1. Determine if the incidence of the illness/condition is higher than *expected* for the population based on surveillance records or data sources (e.g., DRSi, MHS Genesis, and ESSENCE), historical documents, and medical literature.

2. Check for reports of outbreaks.
   - CDC www.cdc.gov/outbreaks/index.html www.cdc.gov/foodsafety/outbreaks/lists/index.html
   - FDA https://www.fda.gov/food/outbreaks-foodborne-illness/public-health-advisories-investigations-foodborne-illness-outbreaks

3. Evaluate the possibility of changes in reporting. Have there been changes or improvements in reporting? Changes in laboratory testing? Changes in population?

4. Contact DCPH-A and the local public health department to discuss the expected incidence of the illness or condition.

5. Enter a preliminary outbreak report in DRSi.

Step 3: Verify the diagnosis.

1. Confirm the diagnosis to determine control measures. Review clinical findings. Compare with established case definitions.

2. Rule out laboratory or reporting error as the basis for the increase in cases.

3. Assess clinical features. This may involve interviewing patients about their signs and symptoms, exposures, and activities prior to becoming ill.

4. Consult with the Chief, DPH, public health or infectious disease physicians, or DCPH-A epidemiologists regarding possible diagnoses, tests, treatments, and mitigation strategies.

5. Coordinate with supervising physician for orders (lab tests, radiology studies, pharmacy prescriptions) to test and/or treat individuals per consultation with the MTF, civilian public health, and/or DCPH-A.

Step 4: Construct a working case definition.

1. A case definition is a standard set of criteria for deciding whether an individual should be classified as having the health condition of interest.

2. Use established criteria (e.g., AFRME, CDC, or local civilian public health). Criteria include clinical features and restrictions by person, place, and time, which are applied to all persons under investigation.

3. Update the case definition as more information is obtained.

Step 5: Find cases systematically and record information.

1. Identify additional cases through passive and active surveillance.

2. Utilize the Labs Needing Review (LNR) module in DRSi.

3. Contact providers and request reporting of cases that meet the case definition.

4. Review hospital records to identify possible cases that were undetected or unreported.

5. Develop questionnaire in coordination with DCPH-A.

6. Interview cases.

For further information, contact DRSi and Reportable Medical Event Help Desk:
DSN: 867-2377, COMM: 410-417-2377
Email: dha.apg.pub-health-a.mbx.disease-epidemiologyprogram13@health.mil

Case and Outbreak Investigation

7. Record case information systematically by using an established case report investigation form (e.g., in DRSi, or from CDC).

8. Organize information in a line list of demographic, clinical, and exposure characteristics.

Step 6: Perform descriptive epidemiology.

1. Describe the outbreak by characteristics of time, place, and person. This process may be repeated several times during the investigation as cases are identified or new information becomes available. This characterization identifies or infers the population at risk, provides insight into etiology, as well as source and modes of transmission that can inform a hypothesis and intervention and prevention measures.

- Time: Construct an epidemic curve (epi curve) of onset times to provide a simple visual display of the magnitude and time trend. Use a unit of time one-eighth to one-third as long as the incubation period.
  https://www.cdc.gov/foodsafety/outbreaks/basics/epi-curves.html
- Place: Map the cases to assess the outbreak by place and visualize the geographic extent of the problem, which may also demonstrate clusters or patterns that provide important etiologic clues.
- Person: Calculate the proportion of affected individuals by host characteristics (e.g., age, race, sex, medical status, etc.) and possible exposures (occupation, events attended, etc.).

2. Consult the epidemiologist to plot the frequency on a histogram and decide whether to proceed with more complex epidemiological studies.

Step 7: Develop hypotheses.

1. Review the data collected thus far and ask the following:

- What is the agent's usual reservoir?
- How is it usually transmitted?
- What vectors are commonly implicated?
- What is the incubation period?
- What are common symptoms?
- What is the gold standard diagnostic test?
- What are the known risk factors?
- Who are the at-risk groups?
- Where is this found (geographic significance)?

2. Discuss with case-patients, the team, and DCPH-A for insights.

Step 8: Evaluate and refine hypotheses epidemiologically and with data from laboratory and environmental studies.

Consult with the Chief, DPH, and DCPH-A for assistance to compare the hypothesis with data collected.

- If the source of infection is established (e.g., there is clear person-to-person transmission), then formal hypothesis testing is not necessary.
- If the source of infection is not clearly established, then use analytic methods (cohort or case-control study) to quantify relationships and test hypotheses.

Step 9: Implement control and prevention measures.

1. Implement control measures against one or more segments of the chain of transmission (agent, source, mode of transmission, portal of entry, or host) based on the origin, spread, and development of the illness or condition. Do not wait for proof from laboratory tests. Measures may change or be narrowed or expanded as new information becomes available. Maintain

For further information, contact DRSi and Reportable Medical Event Help Desk:
DSN: 867-2377, COMM: 410-417-2377
Email: dha.apg.pub-health-a.mbx.disease-epidemiologyprogram13@health.mil

Case and Outbreak Investigation

confidentiality and protect the patient by not disclosing patient information to unauthorized persons without the patient's permission.

- Refer to information sources such as the—
  - CDC, which has disease specific guidance (e.g., https://www.cdc.gov/healthywater/emergency/waterborne-disease-outbreak-investigation-toolkit/control-outbreak.html
  - FDA https://www.fda.gov/food/outbreaks-foodborne-illness/investigations-foodborne-illness-outbreaks
  - Control of Communicable Diseases Manual as available https://www.apha.org/Publications/Published-Books/CCDM.
- Consult with DCPH-A and local public health department.
- Example control and prevention measures.
  - Eliminate the agent at its source: e.g., for communicable disease, treat with antibiotics to clear the infection and reduce the risk of transmission to others. For environmental toxin or infectious agent in the soil, decontaminate or cover the soil.
  - Eliminate the source: e.g., dispose of suspect water or food, inform community of established food recalls.
  - Interrupt transmission: e.g., vector control (i.e., spray for mosquitos), isolation of ill persons, cohort groups of ill persons; use personal protective equipment (PPE), clean and disinfect food facilities (may be temporarily closed), setup hand washing stations, and relocate food and waste facilities in field training exercise site.
  - Block the portal of entry: e.g., bed nets to prevent being bitten by mosquitoes that may transmit malaria.
  - Increase host defenses: e.g., vaccinations to protect against infection; and chemoprophylaxis (e.g., antimalarial medication).

2. Coordinate and communicate across stakeholders, affected populations, and the community to implement measures and maintain surveillance for new cases.
- Assess to determine if the control and prevention measures are effective.
- Is the number of new cases slowing down or new cases not occurring?
- Are new cases occurring? Where? Are the control and prevention measures being implemented?

Control and Prevention Resources:
- www.cdc.gov/csels.dsepd/ss1978/lesson6/section2.html#step11
- www.cdc.gov/foodsafety/outbreaks/steps/control.html
- https://www.fda.gov/food/outbreaks-foodborne-illness/food-safety-tips-consumers-retailers-during-outbreak-foodborne-illness

Step 10: Communicate findings.
1. Submit an outbreak and report to DRSi within 24 hours of a suspected outbreak. Add cases as needed based on guidance from DCPH-A.

2. Collaborate to provide information to MTF and installation leaders, civilian public health, and the military community at initiation, during and upon closure of the investigation through briefings, public affairs messaging to the community, and written reports per local command criteria (SIR, CCIR, SITREP, EXSUM, MFR, and AAR).
   - SIR: Serious Incident Report
   - CCIR: Commander's Critical Incident Report

For further information, contact DRSi and Reportable Medical Event Help Desk:
DSN: 867-2377, COMM: 410-417-2377
Email: dha.apg.pub-health-a.mbx.disease-epidemiologyprogram13@health.mil

Case and Outbreak Investigation

- SITREP: Situation Report
- EXSUM: Executive Summary
- MFR: Memorandum for Record
- AAR: After Action Report

3. Collaborate with DCPH-A to determine if a scientific publication should be submitted to Medical Surveillance Monthly Report (MSMR) at https://www.health.mil, Military Medicine (https://www.amsus.org), or another journal.

Outbreak Investigation Resources
- Training: https://ph.health.mil/topics/healthsurv/de/Pages/Epi-TechTraining.aspx
- Disease Investigation Prioritization matrix: https://www.azdhs.gov/documents/preparedness/epidemiology-disease-control/disease-investigation-resources/prioritization-matrix.pdf

<u>**Line List**</u>
A line list is a table that summarizes information about individuals who may be associated with an outbreak. Each column is a variable (e.g., case identifier, age) and each row is a unique individual.

Electronic data entry: The CDC provides free access to Epi Info™, which is a public domain software package designed for the global public health community of practitioners and researchers. It provides for easy questionnaire and database construction, data entry, and analysis with epidemiologic statistics, graphs, and maps. (https://www.cdc.gov/epiinfo/)

Manual data entry: Start an Excel® file table with **headers**, as needed, for each column. (Example template: https://www.cdc.gov/urdo/downloads/linelisttemplate.pdf)

Case ID: Unique identifier assigned to each case-patient for this investigation.

Identifying information: To contact the case. Keep information confidential by assigning a case number. The file containing the case number and personal identifiers should be password protected (CAC-enabled and in a restricted access folder).
> Last name
> First name
> Date of birth
> SSN (last 4) or DOD-ID (last 4)
> Mailing address
> Phone number

> Consider whether the FMP (family member prefix) would be helpful. (e.g., 20/ for the Soldier; 01/ for first child)

Demographic information: varies based on type of outbreak to describe at-risk groups.
> Age (in years, or in months for pediatric cases, as needed)
> Sex (male (M), female (F), non-binary (X))
> Occupation (job series (MOS for Army Enlisted; AOC for Army Officer))
> Place of occupation/unit/school/childcare facility

For further information, contact DRSi and Reportable Medical Event Help Desk:
DSN: 867-2377, COMM: 410-417-2377
Email: dha.apg.pub-health-a.mbx.disease-epidemiologyprogram13@health.mil

Case and Outbreak Investigation

Clinical information: to determine if meets case definition, characterize the illness or condition, and create an epidemic curve (epi curve). https://www.cdc.gov/foodsafety/outbreaks/basics/epi-curves.html

Date of onset; time of onset (14032022 0630 = 14 March 2022 at 0630 hrs)
Nausea (Yes/No)
Vomiting (Yes/No)
Diarrhea (Yes/No)
Abdominal cramping (Yes/No)
Headache (Yes/No)
Fever (Yes/No)
Medical diagnosis (free text or drop-down menu)
Underlying conditions (immunodeficiency, medications, or conditions that may alter the individual's susceptibility or course of illness)

Laboratory tests

Specimen (stool, urine, blood, sputum)
Date collected (e.g., DDMMYYYY)
Test requested (e.g., culture, antigen detection, antibody/serology, polymerase chain reaction (PCR))
Result: findings of test (e.g., positive, negative, equivocal)
Date resulted (e.g., DDMMYYYY)

Radiology studies

Chest x-ray (Yes/No)
If yes, date performed
If yes, result

Epidemiological investigation

Dated public health identified person as potential case or contact
Date interviewed (DDMMYYYY)
Food history completed (Yes/No)
Date food history completed (DDMMYYYY)
Recent Travel (dates/locations)
Sick contacts (Yes/No)
Epi Links: known exposures, affiliations, connections to other cases

Risk factor information: varies based on type of outbreak to identify general and established risk factors and focus the investigation.

Food consumption and sources
Water sources used

Location
Dining facilities/restaurants (date/location/food/drinks)
Childcare facility attended
Event attended

Determination of Case

For further information, contact DRSi and Reportable Medical Event Help Desk:
DSN: 867-2377, COMM: 410-417-2377
Email: dha.apg.pub-health-a.mbx.disease-epidemiologyprogram13@health.mil

Case and Outbreak Investigation

Confirmed (Yes/No)
Probable (Yes/No)
Suspect (Yes/No)
Not a case (Yes/No)

Current Status: severity of illness/condition
Outpatient
Inpatient ward
Inpatient intensive care unit (ICU)
Discharged
Deceased

For further information, contact DRSi and Reportable Medical Event Help Desk:
DSN: 867-2377, COMM: 410-417-2377
Email: dha.apg.pub-health-a.mbx.disease-epidemiologyprogram13@health.mil