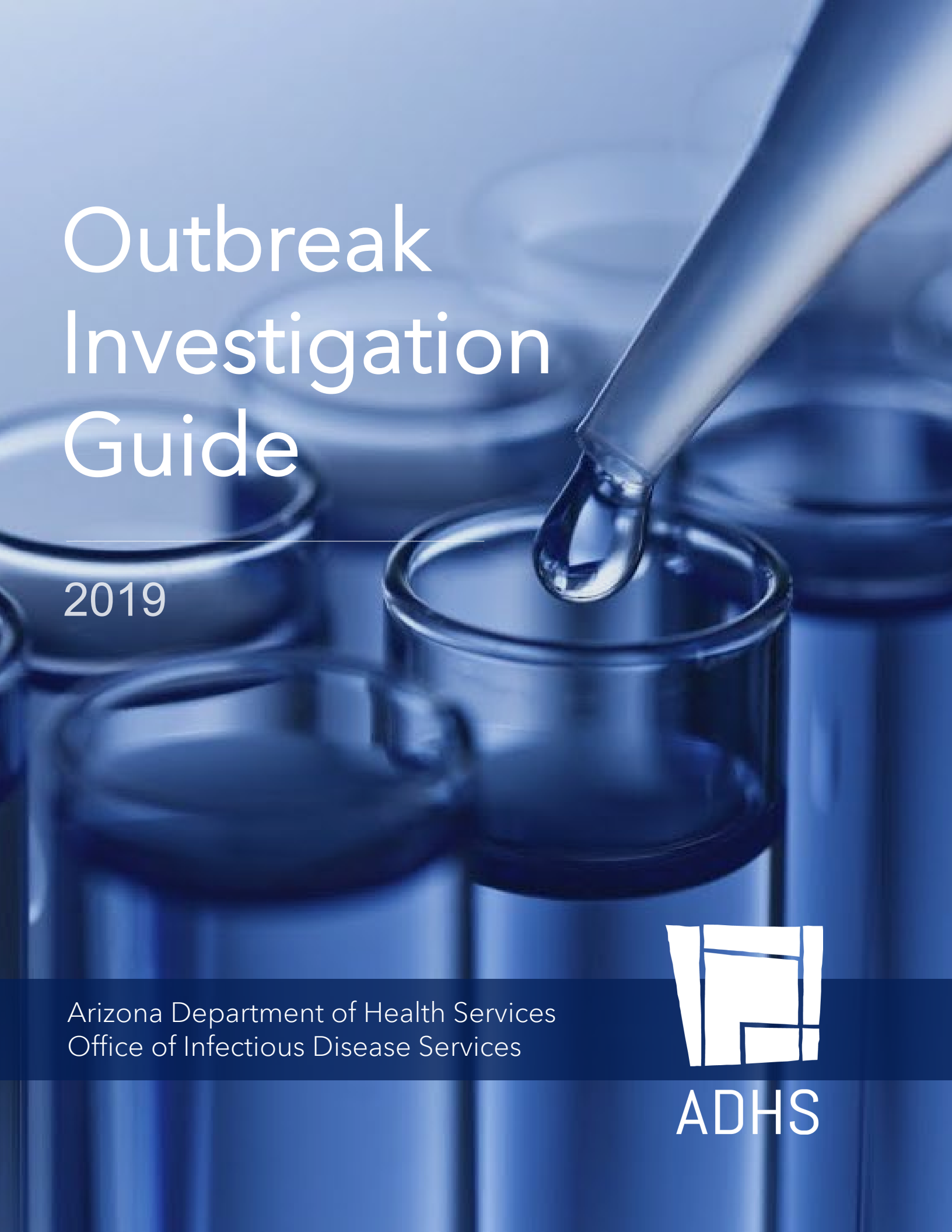

Outbreak Investigation Guide

2019

Arizona Department of Health Services
Office of Infectious Disease Services

ADHS

The following is intended as a guide for the management of an infectious disease outbreak investigation. It also provides information for the formation and management of a local health department outbreak response team.

Arizona Department of Health Services Office of Infectious Disease Services (OIDS) epidemiologists are available to assist in any outbreak investigation –

Main Line: 602-364-3676
24/7 Reporting: 480-303-1191

PRE-OUTBREAK PLANNING

Before an outbreak occurs, health departments should form a response plan for responding to outbreaks.

1. PERSONNEL
   Identify an investigation team of individuals within the health department who could provide expertise and leadership in an outbreak. Ensure key personnel are familiar with responsibilities for their role. Depending on the size of the outbreak, individuals may fill multiple roles. A sample list of personnel is below; a complete list of key personnel, including a description of key responsibilities, is included in **Appendix: Infectious Disease Epidemiologic Response Checklist**.

	Name	Emergency Contact Number
Team Leader		( )
Epidemiology Lead		( )
Laboratory Lead		( )
Communications Lead		( )
Data Lead		( )
		( )

2. COMMUNICATION NETWORKS (see additional information under "Communications")
   Create and maintain a communication network with stakeholders. Obtain contact information for all hospitals, clinics, healthcare workers, nursing homes, schools, day cares, etc. Communication may be achieved through email listservs, blast faxes, meetings, telephone calls, etc. Document these communication networks (examples below).

Communications Network	Maintained By	Contact Information
Healthcare Facilities		
School nurses		

3. OUTBREAK SUPPLIES
   Maintain a ready supply of specimen collection kits, transport media, and submission forms. (See Laboratory Disease Investigation Resources). Document supply that is currently available, including expiration dates as applicable (example below). The ADHS Guide to Laboratory Services: Microbiology provides information about what tests are available and how to submit samples for testing. See **Appendix: Enteric sample kit contents** for what to include for enteric sampling.

Supply Materials	Location	Quantity	Expiration Date
Cary-Blair			
Stool collection hats			
Sterile gloves			
Sterile urine cups			
Shipping containers			

   Additionally, in the event that staff are deployed into the field for outbreak response, see **Appendix: Supply Checklist** for a suggested list of items needed when conducting a field investigation.

4. PRACTICE
   Work through past or published outbreaks of different diseases to help define these roles and responsibilities. Ensure methods to maintain communication of information, decision-making, media messages, outbreak updates, etc.

   Many practice scenarios have already been developed and are available for free use. For example, some scenarios can be found at the following locations:
   Integrated Food Safety Centers of Excellence
   North Carolina Institute for Public Health
   FDA FREE-B practice scenarios

5. INCIDENT COMMAND STRUCTURE (ICS)
   Consider including emergency preparedness staff and using a limited incident command structure (depending upon the magnitude, impact, or epidemic potential) to manage and coordinate the outbreak response.
   - Any outbreak or all-hazard type of event that utilizes staff outside of their normal job duties or exceeds capacity should incorporate the ICS structure.
   - All staff should be trained in ICS beforehand. ICS 100 and IS-700 are required for all new ADHS employees.

WHAT IS AN OUTBREAK?

An outbreak is defined as an increase in cases of disease in time or place that is **greater than expected**. Frequently, an outbreak occurs when a common source causes illness in two or more people from different households.

If a condition is rare (e.g., measles) or has serious public health implications (e.g., bioterrorism agent), an outbreak **may involve only one case**.

Outbreak threshold guidelines have been developed for specific diseases assisting with determining if an outbreak may be occurring in schools or in healthcare settings. These are *guides*, and they are not meant to be definitive rules. If there is ever a suspicion that an outbreak may be occurring, it should be reported immediately to ADHS for further investigation. See **Appendix: Outbreak Threshold Guides and Priority Disease Matrix**.

WHAT IS A CLUSTER?

A cluster is a group of ill individuals with either unknown diagnoses with similar signs and symptoms related by time and space or a group of ill individuals will a similar illness that has no known etiology (Acute Flaccid Myelitis, Guillain Barre Syndrome, most cancers, chronic fatigue syndrome, etc.); or a group of illnesses not clearly above the expected number to call an outbreak or it is unclear if there are strain type, exposure, time and space linkages.
Clusters of some enteric bacterial illness, including *Salmonella, Listeria* and Shiga toxin-producing *E. coli* [STEC], are commonly identified through molecular laboratory techniques, including pulsed-field gel electrophoresis (PFGE) and whole genome sequencing (WGS).

WHEN TO REPORT AN OUTBREAK

Any *suspected* outbreak or cluster shall be reported to local health departments (LHDs), who should then report **immediately** to ADHS (no later than within 24 hours of receipt of initial report, including weekends and holidays). When suspecting an outbreak, if possible verify the

diagnosis of each suspected case to verify the number of true cases and that they are consistent with the case definition or all have clinically compatible syndromes. Often times, facilities or the public will report a suspected outbreak that upon closer examination are not true cases, such as positive single serologies for *Legionella pneumophila*, or positive stool culture for *Listeria* spp. (normal flora).

It is important to report *suspect* outbreaks immediately, in order to track all of the important public health work to investigate these suspect reports. These reports can always be "ruled out" if they are determined not to be true outbreaks.

Outbreaks shall be reported **within 24 hours** by entering initial report information into **MEDSIS Outbreak Module** with at least the five required fields:

- Outbreak Name – Name for the outbreak investigation, assigned by investigating jurisdiction.
- Date Reported to Local Health Dept. – Date (suspected) outbreak was reported to LHD.
- Morbidity – Etiology of the outbreak. If the etiology is unknown, morbidity should be entered as "Unknown GI Illness", "Unknown Rash Illness", or "Unknown Respiratory Illness".
- Setting – Setting/location where the outbreak is occurring.
- County – County where the suspected outbreak exposure occurred.

COMMUNICATIONS

Per A.R.S. §§36-661-664, maintaining patient confidentiality is of critical importance during outbreak investigations. Using an ICS is often the most efficient way to ensure communication is effectively coordinated internally and externally (see No. 5 above). To ensure that protected health information and personally identifiable information are communicated appropriately, review **Appendix: Information Sharing Guide**.

BEFORE AN OUTBREAK

Establish a contact list of partners to include on regular outbreak communications, perhaps separated by outbreak etiology type. Update the contact list every 3–6 months. Partners to consider in your communications, if necessary:

- All staff within your agency involved in the outbreak response or who would serve as back-up or surge capacity investigators if needed;
- Neighboring jurisdictions or jurisdictions with residents involved in your investigation. Consider notifying all LHDs if the outbreak could impact them or their residents;
- ADHS epidemiologists;
- ADHS environmental health and food safety staff;
- Arizona Department of Agriculture;
- Arizona State Public Health Laboratory (ASPHL) staff who may need to test clinical or environmental (including food) specimens;
- Public Information Officers (PIO), particularly if there may be media inquiries;
- (For ADHS) Federal partners, such as CDC, FDA, USDA.

DURING AN OUTBREAK

Consider notifying the following, as appropriate. Note that the notification may vary depending on the level of your agency. In general, communication between LHDs should be initiated by

and/or include the ADHS epidemiologist or team assigned to the disease. Communication with other states and with federal agencies is typically handled by ADHS.

LHD:
- Local Health Officer
- Epidemiologist
- Public Information Officer

Other State Agencies:
- Arizona Department of Agriculture
- Arizona Department of Corrections

Federal Agencies:
- CDC
- Food & Drug Administration (FDA)
- U.S. Department of Agriculture (USDA)
- For a suspected intentional event, FBI

ADHS:
- Epidemiologist/team assigned to the disease
- Office of Infectious Disease Services Program Manager
- State Epidemiologist
- Arizona State Public Health Laboratory
- Office of Environmental Health Chief
- Arizona Immunizations Program Office Chief
- Public Information Officer

For communication outside of public health, issue health alerts (e.g., HANs) or media releases, as appropriate. Consider sending alerts to providers, labs, schools, healthcare facilities, and any other group that is involved in the outbreak, or could become involved. Ensure that all messaging is consistent across agencies by working with all involved public health partners to develop the communications and, when feasible, disseminate joint messages. More details about sending HANs are found in **Appendix: Sample Health Alert Network Methodology & Templates**.

Situations where you might want to release information on your investigation:

- Action is required by the public, providers, or other groups in order to prevent further transmission or illness;
- Severe morbidity/mortality;
- Rare pathogen involved;
- Investigation has already received media attention or is likely to receive media attention;
- Outbreak pathogen has high epidemic potential;
- Evidence of ongoing transmission;
- A need for active case finding;
- Specific public health control measures you need to communicate to groups or the public at large.

AFTER AN OUTBREAK

For large outbreaks or investigations that involved multiple agencies, conduct an after-action debriefing, or “hotwash”, as soon as possible after completing your investigation to identify lessons learned. Include key partners who participated in the investigation, and communicate findings (including an action plan with a timeline to address improvement areas) to all stakeholders. Sample after-action report. See **Appendix: ADHS Hotwash Form**.

HOW TO INVESTIGATE AN OUTBREAK: Initial Phase

Communication between ADHS and LHDs – LHDs shall notify ADHS of an outbreak within 24 hours via MEDSIS Outbreak Module in order to ensure resources at the state and federal level are available and to coordinate specimen submissions and laboratory testing. If ADHS is notified first, ADHS should notify affected LHDs within 24 hours.

- The ADHS disease-responsible epidemiologist will serve as the communication liaison between the local and state health departments, the state epidemiologist, the state laboratory, and federal agencies, if warranted. He/she will also serve as point of contact and consultant to the local jurisdiction outbreak team leader.
- Review specimen collection and any transport issues with the appropriate ADHS epidemiologist and/or outbreak team lead. Identify time, temperature, transport media, sampling methods, quantity, and what specimens are needed to identify and type the agent.
- Request for ADHS assistance as needed, either on-site or from Phoenix.

Identify Lead Agency – If the outbreak is limited to one county and county resources are adequate, the lead investigator may be a member of the LHD staff.

- If the outbreak affects multiple jurisdictions or if local resources are inadequate, or if the disease is serious or requires additional expertise, state involvement may be necessary.
- If the outbreak affects citizens in another state, ADHS OIDS will coordinate with the other states and CDC.
- Regardless of local capacity, assistance and consultation from the state is available.

Brief Investigation Team Members – The nature of the disease will dictate which investigation team members should attend the briefing. At this time, it is important to bring everyone up-to-date on the outbreak. Provide frequent email updates to team members (at local and state levels) throughout the investigation; consider setting up or using a shared address list to ensure all team members receive communications and that there are designated back-ups in the event of staff outages.

Designate an Outbreak Team Leader at the LHD – The team leader will serve as the point of contact for ADHS. This individual should have knowledge of diseases and experience investigating an outbreak. A list of outbreak team responsibilities can be found in **Appendix: Epidemiologic Response Checklist**. Consider implementing ICS structure (see more in "Pre-Outbreak Planning").

Prepare for Fieldwork – If staff needs to deploy for an outbreak response, please see **Appendix: Safety Guidelines** to review safety guidelines. In the event of dispatch to the outbreak site, it is important to prepare for fieldwork in advance.

The following is a list of activities that will help prepare the team member(s) in such an event.

- Research the possible diseases and pull any reference materials that may be useful.
- Gather supplies and equipment. A list of useful supplies and equipment is listed in **Appendix: Supply Checklist**.
- Make necessary administrative and personal arrangements for travel and accommodations.
- Consult with all team members to determine what role each will play in the investigation.

HOW TO INVESTIGATE AN OUTBREAK: General Steps

These are general steps that can be used when investigating an outbreak of any morbidity, but please remember:

- Not all outbreaks are created equal!
- You may not conduct all these steps in every outbreak investigation.
- Steps may not be always be conducted in the same order, may need to be repeated, and may even occur simultaneously.

1. **Verify the diagnosis** and **confirm the outbreak - this is an extremely important step**!
    a. Ensure that the disease under investigation has been properly diagnosed. Verify through laboratory testing, if possible. Review clinical findings and laboratory results for the cases. Compare results with established case definitions.
    b. Submit specimens for confirmatory laboratory testing if not already done.
        - Goal: collect at least 2 clinical specimens for testing at ASPHL.
    c. Determine if the reported number of cases is unusual.
        - Compare current numbers with baseline surveillance data.
        - Verify a rise in numbers is <u>not</u> due to changes in reporting procedures, case definition, diagnostic procedures, or increased awareness at the local or national level.
        - Consult with the ADHS OIDS to check on historical data trends and/or to see if surrounding jurisdictions are noting the same increase.
        - Consider sending an alert via MEDSIS Secure Messaging or Health Alert Network to other jurisdictions.

2. Define a case and conduct case finding.
    a. Establish a case definition, and use it to search for additional cases.
        - Characterize cases by clinical signs/symptoms and epidemiologic information related to person, place, and time.
        - Keep case definition broad initially in order to find as many cases as possible. Case definition can be narrowed later in the investigation.
        - Additional guidance on creating an outbreak case definition: https://www.cdc.gov/urdo/downloads/CaseDefinitions.pdf
    b. Utilize all possible channels to find cases (e.g., restaurant credit card receipts, social media). Appropriate methods will depend on the outbreak and population affected.
    c. If interviewing in person, be aware that cases or symptomatic contacts may be infectious! Always use Standard Precautions at a minimum and others as appropriate.
    d. A standardized interview form (DSO) should be completed for each case in the specified format.
        - Investigation forms also available on the ADHS website.
    e. For some diseases, specimen collection may be necessary. Specimen submission forms for ASPHL are located in the Laboratory Surveillance Guide in the investigation manual. Specimen submission forms for ASPHL can also be found on the State Laboratory Services website.

3. Tabulate and orient data according to person, place, and time.
    a. Create a line list of cases. Consider including the following:
        - Name, DOB, sex;
        - Case identifier (MEDSIS ID and/or state lab ID);

        - Case/outbreak classification (confirmed, probable, suspect);;
        - Onset date, symptoms;
        - Hospitalization status;
        - Date of symptom resolution;
        - Visit to a medical provider and/or results of laboratory testing, both positive and negative, if helpful;
        - Relevant exposures, epi-links;
        - Any other case or outbreak detail that provides context and helps identify trends.
    b. Summarize data using descriptive epidemiology.
        - Provides a description of an outbreak by showing its trend over time, its geographic extent, and the populations affected by the disease.
    c. Create an epidemic curve.
        - An epidemic curve, or epi curve, is a histogram that displays the case incidence over time.
        - It gives a simple visual display of the outbreak's magnitude and time trend.
        - The epi curve can help determine mode of transmission, time of exposure, and outbreak etiology, in some situations.

4. **Implement control and prevention measures**.
    a. Determine if disease transmission is still ongoing.
    b. Implement control measures as quickly as possible to prevent spread of disease.
        - Examples: recommending that sick persons stay home and away from others, closing a restaurant, prohibiting swimming in a certain area, enacting isolation or quarantine, administering vaccine or prophylaxis, or providing educational information about disease prevention.

5. Develop a hypothesis about the cause of the outbreak.
    a. The initial hypothesis is a starting point for the investigation.
    b. Although information may be limited early on, the nature of the disease may shed some light.
        - Understand disease pathogen and mode of transmission.
    c. Review interview data and other information gathered to identify exposure or risk factor commonalities.
    d. Develop outbreak-specific questionnaires and conduct additional interviews if needed to gather more information about specific exposures.

6. Plan and execute additional studies, if necessary and resources allow.
    a. Case-control or retrospective cohort studies, as appropriate.
        - A cohort study follows a group of people (cohort) over time, selected based on exposure status, to evaluate the occurrence of the outcome (disease) of interest.
        - A case-control study compares people with a disease (cases/patients) with a group of people without the disease (controls) to ascertain differences in exposures.

7. Evaluate and implement additional or long-term control measures.
    a. Act upon additional findings from hypothesis-testing and analytic studies to ensure that the source has been removed or other immediate measures to stop or slow transmission in the current outbreak.

b. Recommend or implement longer-term control measures to end current outbreak and prevent future outbreaks.
    - Examples: recommending different food safety procedures in a restaurant, implementing better disinfection protocols at a local swimming pool, and establishing screening programs in local emergency rooms, or identifying policy changes to prevent outbreaks or disease transmission.

8. Communicate findings. (See "Communications")
    a. Conclusions should be summarized in a report.
    b. Within your agency, to other agencies/partners, and to the public.
        - This can be an opportunity to educate about health promotion and disease prevention.
    c. Conduct an after-action review or "hotwash" to discuss lessons learned and improvement areas for future outbreak investigations.
    d. Complete your summary form in MEDSIS Outbreak Module within 30 days of completing your investigation.

WHEN TO DECLARE AN OUTBREAK OVER

Generally, an outbreak can be declared over once no new cases have been identified within **two maximum incubation periods** of the disease under investigation, since the onset of the last known case. Lab confirmation (or, ruling out any suspect cases) may be required, depending on the nature of the disease under investigation. However, it is important not to prematurely declare an outbreak over; allow for any delays in reporting of new cases when considering whether the two incubation periods have passed. Consultation with the ADHS disease-responsible epidemiologist may be desirable.

DISEASE CATEGORIES

Vector-Borne Diseases:

This section includes important reminders to assist in the response and investigation of outbreaks of vector-borne and zoonotic diseases (VBZD). Refer to individual disease protocols for complete details on how to address special situations. Outbreaks of vector-borne and zoonotic diseases are rare due to the nature of exposures. However, if an outbreak of a vector-borne or zoonotic disease is ever suspected, it should be entered into Outbreak Module within 24 hours. Key interview questions for vector-borne and zoonotic diseases that are suspected to be part of an outbreak should include symptom onset, travel, recent outdoor, occupational or recreational activities, insect or animal exposure, pets in the home, and ill household contacts.

There are many diagnostic options for vector-borne and zoonotic diseases, including serology, PCR, and direct assays. Provide consultation with health care providers regarding appropriate specimen collection and timeframes.

Some other considerations are listed below.

West Nile virus (WNV) and Saint Louis encephalitis (SLE) virus:

- Coordinate additional testing - confirmatory testing at ASPHL is required to distinguish between WNV and SLE, so all WNV IgM positive samples should be forwarded to ASPHL in the event of a suspected outbreak.

- Collect laboratory results, onset date, symptom information (including presence of encephalitis or meningitis), sick household contacts, travel and vaccination history for closely related neuroinvasive flaviviruses (yellow fever, Japanese encephalitis and tick-borne encephalitis), as well as history of blood transfusions or solid organ transplantation.
- WNV and SLE are endemic in Arizona, so travel history is not essential but might provide information on the mosquito exposure and to rule out other mosquito-borne diseases that may present with similar symptoms.
- Provide education to the case on mosquito bite prevention and use the above information to classify the case (refer to the ADHS Case Definition Manual).
- For confirmed or probable cases, consider contacting your vector control agency to implement mosquito control around the area of the case's residence (particularly during the first week after onset, although WNV viremia is usually too low to infect mosquitoes).
- Work closely with your vector control agency during mosquito season, to collect information on any mosquito pools positive for WNV or SLE.
- If the number of confirmed and probable cases is higher than expected, follow the steps listed in the previous pages of this guide and communicate with your vector control agency to review available data and implement mosquito control activities (see items listed under "Actions" in the ADHS Arboviral Handbook).

For general disease information and Arizona-specific data see the WNV and SLE web pages on the ADHS website.

Dengue/Chikungunya/Zika virus:

- Consider additional or confirmatory testing (for testing, investigation and classification of cases of dengue/chikungunya/Zika refer to the ADHS Arboviral Handbook pages 5–36).
- Ensure an accurate travel history is collected. Determine if there are locally-acquired cases (clinically compatible cases without travel history should be prioritized for testing and your vector control agencies should be informed).
- Provide education on preventing mosquito exposure for three weeks after return from travel, and for Zika cases to avoid unprotected sex: for 8 weeks (women) and 3 months (men) after return, and for the duration of the pregnancy (pregnant women). Ensure follow up of Zika positive pregnant women.
- For jurisdictions with only imported cases (all jurisdictions in Arizona, as of Dec 2018): determine if jurisdiction is at low or elevated risk of imported cases, based on the mosquitoes present and the number of imported human cases of dengue/chikungunya/Zika (refer to the ADHS Arboviral Handbook, page 38 and 40).
- For jurisdictions with locally-acquired cases: determine if jurisdiction is at focal or widespread transmission based on the size of the affected area and on the number of locally-acquired cases (refer to the ADHS Arboviral Handbook, page 38 and 41).
- Consider implementing vector control activities and start providers and/or public messaging (see items listed under "Actions" in the table of pages 40 and 41).

For general disease information and Arizona-specific data see the dengue, chikungunya and Zika web pages on the ADHS website.

Plague/Tularemia:

- Diseases in animals and vectors (for example, plague in prairie dogs and fleas, or tularemia in rabbits, cats, or ticks) can help identify high-risk human exposures.

- Arizona Game and Fish Department will notify ADHS VBZD team if rodent (e.g., prairie dog) or rabbit die-offs are occurring in a particular area.
- If there is known contact with an animal, ASPHL can confirm disease in animals such as plague in prairie dogs or tularemia in rabbit samples. Arizona Game and Fish Department can coordinate collecting and sending wild animal samples to ASPHL. Northern Arizona University can also be contacted to collect and test fleas from prairie dog burrows if there is known human exposure to a particular prairie dog habitat.
- Education for the public on exposure prevention may be warranted or a press release about the identification of positive animals in certain areas.
- The gold standard diagnostic tool for plague and tularemia are whole blood or lymph node aspirate cultures collected before antibiotic administration.

Select Agents (tularemia, brucellosis, anthrax):

- Alert the VBZD team for any select agent specimen that may be sent for testing at ASPHL or needs to be forwarded to the Centers for Disease Control and Prevention. See Intentional Outbreaks section for additional information about bioterrorism events.

Scabies and Lice:

- Outbreaks frequently occur in the school or institutional setting.
- For scabies, one treatment is usually sufficient but sometimes a second treatment is needed 2 weeks later. Wash and dry, on the hot cycle, all bedding, towels, and clothes that have had direct contact with the patient in the past 48 hours. All household members and close or direct contacts (roommates, playmates, sexual partners, etc.) should be treated at the same time as the infested individual. The scabies mite does not survive off the human for more than 48 hours, so environmental treatment is not necessary. Patients only need to be isolated before treatment and the first day after treatment.
- For lice, infested children should be sent home if lice is identified and should not be readmitted to school until proper treatment has been initiated (Communicable Disease Rule R9-6-362), and school nurses can check the child's head before readmission. Currently, the best control strategy involves using pyrethrum or permethrin-based shampoos (once and 7–10 days later) combined with diligent nit removal. Lice do not infest classrooms and homes, therefore environmental control (spraying) is not necessary. Combs, brushes, and hair picks should be soaked in near-boiling water for at least 15 minutes and chairs, couches, and other furniture should be vacuumed and clothes should be cleaned.
    - During lice outbreaks in schools, close contact games and sports should be minimized, such as wrestling. Head-gear or clothing should not be shared (earphones, helmets, jerseys, hats, etc.). Children should be educated to not share combs, brushes, hats, headbands, or clothing. Coats and hats should be hung separately, and desks and chairs spaced apart so that children are not sitting shoulder-to-shoulder. At home, infested children should be kept separate while playing and napping.

Vector Control Measures:

- Consider vector or animal surveillance for particular disease to determine further risk to the community.
- Involve essential animal health partners, including local animal control, Arizona Department of Agriculture, and Arizona Game and Fish Department.

    - Example: Prairie dog die-off in a particular area may be associated with human exposures.
- Include environmental health and vector control partners when necessary to conduct environmental assessments and determine presence/absence and risk for a particular disease.
    - Example 1: County vector control trapping and testing mosquito pools for WNV/SLE.
    - Example 2: Tick-borne relapsing fever outbreaks are often associated with cabins that have been rodent-proofed, but have not had tick prevention or control actions taken.

Vaccine-Preventable Diseases (VPD):

Depending on the VPD, it is preferable to have laboratory specimens forwarded to ASPHL for confirmatory testing. Per A.A.C. R9-6-204, laboratories are required to submit the following to ASPHL:

- Specimens for each positive test for measles, mumps, rubella, invasive *Haemophilus influenzae* (if patient is less than five years), invasive *Neisseria meningitidis*, and smallpox.
- Specimens upon request for *Bordetella pertussis* and *Haemophilus influenzae* (if patient is five years or older.

Some rare VPDs, such as diphtheria and smallpox, have special testing requirements and testing may not be available outside of public health laboratories. Notify ADHS immediately if you suspect a rare VPD so testing arrangements can be made in advance. One case is often considered an outbreak.

For cases and contacts, it is important to collect an accurate vaccination history. This may be accomplished through several sources such as medical records, immunization records, and ASIIS.

Timely response is crucial for effective implementation of control measures. For some VPDs such as pertussis and invasive meningococcal disease, antibiotic prophylaxis may be recommended for close contacts. For other diseases such as measles, administration of vaccine or immune globulin to susceptible contacts may prevent disease if given in the appropriate time frame. Other control measures include “Dear Parent” letters and school exclusions for vaccine-exempt students. Refer to the disease chapters within the investigation manual for disease-specific recommendations or outbreak guidelines.

Respiratory Diseases:

Respiratory illnesses are very common at certain times of year, and not every respiratory illness, nor every respiratory illness outbreak, can be investigated. Prioritizing reported cases and outbreaks is critical to ensuring that limited public health resources are used effectively. The investigation of individual cases is required for many reportable morbidities with respiratory manifestations; for many of these morbidities, there are known public health interventions that can make a difference to the community because severe outcomes could occur without public health intervention. However, for outbreaks of other or unexplained respiratory illnesses, there are several factors to examine when deciding if an investigation is warranted, or how to prioritize an investigation. These include:

- **Setting:** Is the outbreak in a setting with a population at increased risk for severe complications to influenza or other respiratory illnesses, such as a long-term care facility, neonatal intensive care unit, or assisted living facility? Is the outbreak among an otherwise vulnerable population?
- **Severity:** Does the illness seem to be particularly severe? Some indicators of severity are: three or more hospitalizations among an outbreak associated with a group setting, two or more deaths, or pneumonia of unknown etiology confirmed by chest x-ray in three or more epidemiologically linked individuals.
- **Timing:** Is the outbreak in the summer or at some other time that is unusual given the respiratory infections known to be circulating?
- **Unusually high morbidity:** Is there high health-related absenteeism (for example, greater than 10% absenteeism for 3 or more days) in a setting such as school, preschool, or childcare center?

Ultimately, the decision of whether to investigate a respiratory disease outbreak must be made on a case-by-case basis, weighing the setting, severity, timing, impact of confirming an etiology, and opportunity for public health intervention.

Categories of Respiratory Infections:

- **Acute febrile respiratory infection (AFRI)** is defined as an illness with a fever of at least 100°F accompanied by one or more respiratory symptoms (runny nose, sore throat, laryngitis, bronchitis, cough) in the absence of a known cause.
- **Influenza-like illness (ILI)** is defined as an illness with a fever of at least 100°F accompanied by cough or sore throat in the absence of a known cause.
- **Influenza (or flu)** must be laboratory-confirmed by any of a variety of testing methods (rapid influenza diagnostic test (RIDT), direct fluorescent antigen (DFA), viral culture, or reverse-transcriptase polymerase chain reaction (RT-PCR)). Confirmation of compatible clinical symptoms is not necessary for the case definition for influenza, though presumably testing was requested because the patient has an AFRI or ILI. If the case occurs outside of the period with known (laboratory-confirmed) circulation of influenza in the state, confirmation by RT-PCR or culture may be required.

Outbreak Definitions:
The definition of an outbreak of AFRI, ILI or influenza varies somewhat by setting. The LHD may choose to consider additional scenarios as outbreaks, based on their own judgment of the situation.

- **School, preschool, or childcare center:** An outbreak in a school or childcare center is a sudden increase of cases over the normal background rate, OR five cases in one week in an epidemiologically linked group (such as a single classroom, sports team, or after school group).
- **Hospitals and medical facilities:** An outbreak of AFRI or ILI in an acute-care hospital is one or more health care facility-associated case(s) of confirmed influenza in patient(s), OR two or more health care facility-associated cases of AFRI or ILI among health care workers and patients of a facility on the same unit within 72 hours.
- **Assisted living facility:** An outbreak of AFRI or ILI in an assisted living home (10 or fewer residents) is two or more cases occurring within 72 hours, OR a sudden increase of cases over the normal background rate. In assisted living centers (11 or more residents), an

outbreak is two or more cases of AFRI or ILI occurring within 72 hours in residents who are in close proximity to each other (e.g., in the same area of the facility), OR a sudden increase of cases over the normal background rate. One case of confirmed influenza by any testing method along with other cases of respiratory infection in an assisted living facility resident is also an outbreak.

- **Long-term care facility or skilled nursing facility:** An outbreak of AFRI or ILI in a long-term care facility or skilled nursing facility is two or more cases occurring within 72 hours in residents who are in close proximity to each other (e.g., in the same area of the facility), OR a sudden increase of cases over the normal background rate. One case of confirmed influenza by any testing method along with other cases of respiratory infection in a long-term care facility resident is also an outbreak.
- **Correctional facility**: An outbreak of AFRI or ILI in a correctional facility is the occurrence of five or more cases in one week in an epidemiologically linked group. For further guidance please see the Federal Bureau of Prisons guidance on influenza.

General Control of Respiratory Illness Outbreaks:
The following measures can be applied in a variety of settings and are useful for reducing infections due to influenza and other respiratory illnesses.

- Reinforce good hand hygiene among all (including visitors, staff, residents, students, the public).
- Emphasize respiratory etiquette (cover cough and sneezes with tissue or elbow, dispose of tissues properly, and wash hands for 20 seconds with soap and warm water).
- Provide posters and health education about hand hygiene, respiratory etiquette, and influenza prevention. There are several posters available to print at http://www.cdc.gov/flu/protect/covercough.htm, http://www.cdc.gov/Features/HandWashing/, and http://www.cdc.gov/flu/freeresources/print.htm.
- Emphasize the importance of early detection of illnesses spread person-to-person and reducing the contact between ill persons and others.
- Encourage regular environmental cleaning with an EPA-registered disinfectant.
- Encourage high-risk persons and their close contacts (e.g., family members, healthcare staff) to be immunized against influenza according to recommendations from the Advisory Committee on Immunization Practices (ACIP). High-risk persons should also be immunized against pneumococcal disease according to ACIP recommendations.
- Promote practicing good personal hygiene, avoiding symptomatic persons and not working or going to school when ill with a respiratory disease. Cases may return to work/activities 24 hours after fever resolves without the use of antipyretic (fever-reducing) medications (e.g., ibuprofen, acetaminophen).
- Make sure that anyone who may be supervising ill children knows not to give aspirin to children with influenza or other acute respiratory viral illnesses.

Consult ADHS' 'Guidelines for Investigating Outbreaks of Influenza-Like Illness or Respiratory Disease' for more details on respiratory illness outbreak investigation best practices including, but not limited to, outbreak investigation initiation, outbreak etiology identification, specimen collection and testing, infection control measures and monitoring of the outbreak.

Enteric Diseases:

Specimen Collection – many enteric diseases have similar clinical presentation, so it is important to collect clinical specimens in order to determine the causative pathogen. Detailed clinical presentation information is vital to determining what pathogens to test for.

- It is recommended to collect at least 2, but ideally 3–5 specimens for testing at ASPHL.
- Specimen collection protocols vary based on specimen type and pathogen. Consult disease specific pages for guidance.
- Some LHDs may have gastrointestinal (GI) outbreak kits on hand for use during outbreak investigations. Contents may include sampling supplies (sterile cup and spoon), packaging, and shipping materials (cold pack and biohazard stickers). LHDs are responsible for restocking their own sampling kits. See **Appendix: Outbreak Stool Collection Quick Sheet** for what to include for enteric sampling.
- Cary-Blair transport media is available through ASPHL; contact the ADHS food team to obtain Cary-Blair.
- Consult with ASPHL and ADHS epidemiologists on how best to transport specimens, particularly if there are weekends and holidays involved.
- For collecting environmental and food specimens, consult with ADHS epidemiologist and ASPHL to determine what and how to collect. It some circumstances, it may be better to collect specimens and hold them while determining what to test, rather than going back to collect specimens later.

Identifying clusters using genetic subtyping methods:
ADHS uses DNA subtyping (fingerprinting), including Pulsed-Field Gel Electrophoresis (PFGE, through 2019) and Whole Genome Sequencing (WGS), to identify groups of cases that may have a common source (see "What is a cluster?").

WGS is performed at ASPHL and results are uploaded to the PulseNet database. Protocols for analysis of WGS results are being developed. Generally, CDC notifies ADHS when an isolate matches others in a cluster in another state. Starting in 2019, WGS results in the form of an allele code will be available to epidemiologists. This information will be available through SEDRIC: System for Enteric Disease Response, Investigation, and Coordination, a web-based system that allows epidemiologists throughout the country to obtain laboratory information and share epidemiologic data.

When a subtyping cluster is identified:

- ADHS foodborne epidemiologist enters the information into MEDSIS OBM. Individual cases are linked to the outbreak in MEDSIS.
- Exposure data that are already available are reviewed for commonalities.
- For high-interest clusters, ADHS notifies counties and identifies action items.
- For multistate clusters, exposure information is communicated to CDC via SEDRIC.
- For additional investigation steps, see How to investigate an outbreak: General Steps or Foodborne and Waterborne Disease Outbreak Investigation Resource Manual.

Resources for investigating enteric disease outbreaks:
Foodborne and Waterborne Disease Outbreak Investigation Resource Manual (ADHS)
Council to Improve Foodborne Outbreak Response Guidelines
Arizona Food, Animal, and Water Exposure Survey

OUTBREAK SETTINGS

Outbreaks in Healthcare Settings:

Outbreaks can occur in a variety of healthcare settings, including acute care facilities, long-term care facilities, dialysis facilities, outpatient/ambulatory care facilities, and dental care facilities. Responses can vary based on type of facility, patient population, disease, and/or organism involved.

Evidence-based guidelines for controlling healthcare-associated infections can be found at https://azdhs.gov/preparedness/epidemiology-disease-control/healthcare-associated-infection/index.php#evidence-based-guidelines.

The following are examples of actions that may be needed for outbreaks in healthcare settings:

- Interview the medical staff and ask that they review records to identify staff or residents/patients with a history of the illness within a certain time period (determined by disease or organism).
  - Obtain a line list of residents/patients and staff. Include patient identifier, onset date, symptoms, date resolved, any known diagnoses or lab testing performed, and unit.
- Request an environmental health inspection for:
  - foodborne diseases, including any diarrheal illnesses;
  - waterborne diseases such as *Legionella* spp.;
  - other pathogens that commonly spread via environmental contamination such as vancomycin-resistant *Enterococcus* spp., carbapenem-resistant Enterobacteriaceae, *Clostridioides difficile*, *Acinetobacter spp.*, Candida auris, etc.
- Collect 2–5 clinical specimens for confirmation during outbreak. Work with ADHS and ASPHL to determine how and what specimens to collect, and what pathogens to test for.
- Review disease spread with administration/nurse/infection preventionist to implement control measures and ensure proper contact, droplet, or airborne precautions are taken.
  - Review Arizona Administrative Code Title 9, Chapter 6 and CDC guidelines for infection control in health care facilities for disease-specific exclusion requirements for individuals who work in patient care.
- Infection control assessments can help identify gaps in infection control practices.
  - https://www.cdc.gov/hai/prevent/infection-control-assessment-tools.html
- Ensure environmental cleaning is performed with appropriate EPA-registered disinfectant.
- Work with the facility to implement isolation of ill persons or cohorting symptomatic individuals. Exclude symptomatic staff as needed based on the etiology.
- Reinforce good hand hygiene among all staff, residents/patients. Work with the facility to implement practices to promote good hygiene and avoiding symptomatic persons.
- If warranted, arrange for vaccination.

Management of multidrug-resistant organisms (MDRO) in healthcare settings:

- When an emerging MDRO is identified, colonization screening can help identify unrecognized carriers so that infection control measures can be targeted to prevent the spread of antimicrobial resistance. Recommendations for colonization screening are described in detail for different MDROs here: https://www.cdc.gov/hai/pdfs/containment/Health-Response-Contain-MDRO-H.pdf.
- Colonization screening is available through the Antimicrobial Resistance Laboratory Network (ARLN) for some MDROs. For more information contact HAI@azdhs.gov.

Outbreaks in Schools:

- Interview the school contact (school nurse or administrator) and ask that they review attendance records to identify staff or students with a history of the illness within the past 2 weeks.
  - Obtain a line list of ill children and staff. Include patient identifier, onset date, symptoms, date resolved, any known diagnoses or lab testing performed, and classroom.
- The time period for cases returning to school is variable and dependent upon the disease and onset date.
  - Check disease-specific release guidelines for more specifics.
- Collect 2–5 clinical specimens for confirmation during outbreak. Work with ASPHL to determine how and what specimens to collect, and what pathogens to test for.
- Review disease spread with administration/nurse and implement control measures.
- Reinforce good hand hygiene among all staff and students.
- Ensure environmental cleaning is performed with the appropriate EPA-registered disinfectant as needed.
- Encourage age- and seasonally appropriate immunization.
- Promote practicing good personal hygiene, avoiding symptomatic persons and not working or going to school when ill.
- For VPDs, exclusions may be required for unvaccinated children as recommended by the local public health agency. This recommendation will depend on the disease.
- For information specific to control of infectious diseases in group settings for children (e.g. schools, child care facilities, camps, etc.), see the Infectious Disease Flip Chart.

Outbreaks in Child Care Facilities:

- Interview the operator and ask that they review attendance records to identify staff or attendees with a history of the illness within the past 2 weeks.
  - Obtain a line list of ill children and staff. Include patient identifier, onset date, symptoms, date resolved, any known diagnoses, lab testing performed, & classroom.
- Reinforce the need to exclude symptomatic children or adults. Exclude symptomatic children and adults until symptoms have resolved for 24 hours, depending on the pathogen and period of infectiousness.
  - Review Arizona Administrative Code Title 9, Chapter 6 for disease-specific exclusion requirements for those caring for children in or attending a child care establishment.
- Collect 2–5 clinical specimens for confirmation during outbreak. Work with ASPHL to determine how and what specimens to collect, and what pathogens to test for.
- Review findings with daycare operator and implement control measures.
- Ensure environmental cleaning is performed with the appropriate EPA-registered disinfectant.
- Educate on how to prevent disease transmission at center and at home, appropriate for the disease (i.e., hand washing and disinfection). Investigate handwashing, diapering and disinfection procedures.
- For VPDs, exclusions may be required for unvaccinated children as recommended by the local public health agency. This recommendation will depend on the disease.
- For information specific to control of infectious diseases in group settings for children (e.g. schools, child care facilities, camps, etc.), see the Infectious Disease Flip Chart.

Outbreaks in Correctional Facilities:

- Infectious diseases in state-run prisons are in ADHS' jurisdiction. Jails and private prisons are in county jurisdiction.
- For diseases potentially spread by food, including any diarrheal illnesses, request an environmental health inspection as soon as possible.
- Interview the director of nursing, facility health administrator, or other health staff that can provide necessary information.
- Obtain a line list of ill inmates and staff. Include patient identifier, onset date, symptoms, date resolved, any known diagnoses or lab testing performed, and unit/yard.
- Identify work history for inmates. Exclude ill inmates from working as food handlers.
- Collect 2–5 clinical specimens for confirmation during outbreak. Work with ASPHL to determine how and what specimens to collect, and what pathogens to test for.
- Review disease spread with administration/nurse and implement control measures.
- Reinforce good hand hygiene among all staff and inmates.
- Ensure environmental cleaning is performed with the appropriate EPA-registered disinfectant.
- As needed, work with the facility to implement isolation of ill persons or cohorting of symptomatic individuals. Exclude symptomatic staff as needed based on the etiology. Exclusion and isolation is typically lifted after 24 hours symptom-free. Check individual disease investigation plans for more specifics.
- Work with the facility to implement practices to promote good personal hygiene and avoiding symptomatic persons.
- If warranted, arrange for vaccination.

SPECIAL SITUATIONS

Bi-National Outbreaks:

Outbreaks that are bi-national (epidemiologic linkages to Mexico or Canada) should be marked as bi-national in Outbreak Module. If the suspected exposure occurred in Mexico, the outbreak can be tracked in Outbreak Module; however, it will not be counted as an Arizona outbreak. Include the Border Health Epidemiologist from the ADHS Office of Border Health in all communications concerning outbreaks that may be bi-national with Mexico.

Tribal and Indian Health Service (I.H.S.) Partners:

Notify appropriate tribal health official and I.H.S. (medical and environmental health branch) contacts in the event that outbreak-associated tribal cases are identified. Share outbreak investigation details and updates and offer case investigation assistance to tribes as needed.

Intentional Outbreaks:

Throughout the outbreak investigation, be aware that an outbreak may have been intentionally generated. For common pathogens, an intentional outbreak may be identified when it does not fit expected epidemiologic patterns. Law enforcement agencies may pick up on chatter indicating an intentional event. Intentional events are also suspected when one or more cases of a potential bioterrorism or select agent occurs with no known exposures or suspect travel history, and not employed in an occupation that is prone to exposure. Potential bioterrorism agents are often non-endemic, or rarely seen. A list of select agents (potential bioterrorism

agents) is maintained by the Federal Select Agent program and includes anthrax, botulism, brucellosis, tularemia, and plague, among others. See these disease-specific protocols for more details about a pathogen-specific response to an intentional event. Additionally, the ADHS Public Health Emergency Preparedness Bioterrorism website has information about biological agents and additional resources.

If the event was an intentional act of bioterrorism, consider the following:

- Due to the possible delay of laboratory confirmation of agent, specific epidemiological, clinical, and microbiological findings that suggest the possibility of an intentional event should result in the immediate issue of a health alert.
- If samples are collected they will be considered evidence in a criminal investigation. Implement Chain of Custody procedures for all samples. See **Appendix: Chain of Custody and Microbiology Food Analysis Form**.
- Through investigation, define population at risk to help guide response activities. Public health authorities will play the lead role in this effort, but must consult with law enforcement, emergency response and other professionals in the process. The definition may have to be re-evaluated and redefined at various steps in the investigation and response.
- Once the mechanism and scope of delivery has been defined, identify symptomatic and asymptomatic individuals among the exposed and recommend treatment and/or chemoprophylaxis.
- Establish and maintain a detailed line listing of all cases and contacts with accurate identifying and locating information.

Partners to include when investigating an intentional event include:

- FBI and local law enforcement or ACTIC to contact all agencies at once
- Public Health Emergency Preparedness

APPENDICES

Appendix: Epidemiologic Response Checklist
Appendix: Safety Guidelines
Appendix: Outbreak Management – Key Personnel Assignments
Appendix: Resource Tracking Line List
Appendix: Request for Additional ADHS Personnel
Appendix: Sample Health Alert Network Methodology_Templates
Appendix: Time Tracking Template During an Outbreak Response
Appendix: Supply Checklist
Appendix: All Hazards Report Form
Appendix: Outbreak Threshold Guides and Priority Disease Matrix
Appendix: Outbreak Stool Collection Quick Sheet
Appendix: ADHS Hotwash Form
Appendix: Information Sharing Guide
Appendix: Chain of Custody and Microbiology Food Analysis Form