



CAPABILITY 13: Public Health Surveillance and Epidemiological Investigation



Public health surveillance and epidemiological investigation is the ability to create, maintain, support, and strengthen routine surveillance and detection systems and epidemiological investigation processes, as well as to expand these systems and processes in response to incidents²⁸⁶ of public health significance.

This capability consists of the ability to perform the following functions:

Function 1: Conduct public health surveillance and detection

Function 2: Conduct public health and epidemiological investigations

Function 3: Recommend, monitor, and analyze mitigation actions

Function 4: Improve public health surveillance and epidemiological investigation systems

Function 1: Conduct public health surveillance and detection

Conduct ongoing systematic collection, analysis, interpretation, and management of public health-related data to verify a threat or incident of public health concern, and to characterize and manage it effectively through all phases of the incident.

Tasks

This function consists of the ability to perform the following tasks:

Task 1: Engage and retain stakeholders, which are defined by the jurisdiction, who can provide health data to support routine surveillance, including daily activities outside of an incident, and to support response to an identified public health threat or incident.

Task 2: Conduct routine and incident-specific morbidity and mortality surveillance as indicated by the situation (e.g., complications of chronic disease, injury, or pregnancy) using inputs such as reportable disease surveillance, vital statistics, syndromic surveillance, hospital discharge abstracts, population-based surveys, disease registries, and active case-finding. *(For additional or supporting detail, see Capability 6: Information Sharing)*

Task 3: Provide statistical data and reports to public health and other applicable jurisdictional leadership in order to identify potential populations at-risk for adverse health outcomes during a natural or man-made threat or incident.

Task 4: Maintain surveillance systems that can identify health problems, threats, and environmental hazards and receive and respond to (or investigate) reports 24/7.²⁸⁷ *(For additional or supporting detail, see Capability 6: Information Sharing)*

Performance Measure(s)

This function is associated with the following CDC-defined performance measure:

Measure 1: Proportion of reports of selected reportable diseases received by a public health agency within the jurisdiction-required time frame²⁸⁸

- **Numerator:** Number of reports of selected reportable disease received by a public health agency within the jurisdiction-required time frame
- **Denominator:** Number of reports of selected reportable disease received by a public health agency

Resource Elements

*Note: Jurisdictions must have or have access to the resource elements designated as **Priority**.*

PLANNING (P)

P1: (Priority) Written plans should document the legal and procedural framework that supports mandated and voluntary information exchange with a wide variety of community partners, including those serving communities of color and tribes.²⁸⁹

P2: (Priority) Written plans should include processes and protocols for accessing health information that follow jurisdictional and federal laws and that protect personal health information via instituting security and confidentiality policies. *(For additional or supporting detail, see Capability 6: Information Sharing)*



Function 1: Conduct public health surveillance and detection

Resource Elements *(continued)*

P3: (Priority) Written plans should include processes and protocols to gather and analyze data from the following:²⁹⁰

- Reportable condition surveillance (i.e., conditions for which jurisdictional law mandates name-based case reporting to public health agencies). Jurisdictions should plan to receive Electronic Laboratory Reporting for reportable conditions from healthcare providers using national Meaningful Use standards.²⁹¹ *(For additional or supporting detail, see Capability 6: Information Sharing)*
- Syndromic surveillance systems. Jurisdictions are encouraged to establish or participate in such systems to monitor trends of illness or injury, and to provide situational awareness of healthcare utilization²⁹²
 - Participation in the CDC BioSense data-sharing program is encouraged *(For additional or supporting detail, see Capability 6: Information Sharing)*
- Surveillance of major causes of mortality, including the use of vital statistics as a data source *(For additional or supporting detail, see Capability 5: Fatality Management)*
- Surveillance of major causes of morbidity
Suggested Resource: Natural Disaster Morbidity Surveillance Individual Form:²⁹³
<http://www.bt.cdc.gov/disasters/surveillance/pdf/NaturalDisasterMorbiditySurveillanceIndividualForm.pdf>
- Written plans should be able to adapt to include novel and/or emerging public health threats.

Gathering and analyzing data from the following sources should also be taken into consideration:

- Environmental conditions²⁹⁴
- Hospital discharge abstracts
- Information from mental/behavioral health agencies
- Population-based surveys²⁹⁵
- Disease registries
- Immunization registries/Immunization information systems
- Active case finding (e.g., by healthcare logs and record reviews)

(For additional or supporting detail, see Capability 1: Community Preparedness, Capability 6: Information Sharing, and Capability 10: Medical Surge)

P4: (Priority) Written plans should include procedures to ensure 24/7 health department access (e.g., designated phone line or contact person in place to receive reports) to collect, review, and respond to reports of potential health threats.^{296,297} *(For additional or supporting detail, see Capability 3: Emergency Operations Coordination)*

P5: (Priority) Written plans should include processes and protocols to notify CDC of cases on the Nationally Notifiable Infectious Disease List within the time frame identified on the list, including immediate notification when indicated. Electronic exchange of personal health information should meet applicable patient privacy-related laws and standards, including state or territorial laws. These include the Health Insurance Portability and Accountability Act, the Health Information Technology for Economic and Clinical Health Act, and standards from the National Institute of Standards and Technology and the Office of the National Coordinator for Health Information Technology of the U.S. Department of Health and Human Services. Plans should include procedures to move to electronic case notification using CDC's Public Health Information Network Case Notification Message Mapping Guides.

Suggested resource

- Case Notification Message Mapping Guides:
<http://www.cdc.gov/phinf/resources/guides/mmghomepagecasenotification.html>

P6: Written plans should include a process to conduct surveillance if the primary notifiable surveillance system (i.e., electronic system) is disrupted during an incident. The process should describe not only electronic back-ups, but also how surveillance will be conducted if no electricity or electronic infrastructure is available or in place.

Suggested resource

- Natural Disaster Morbidity Surveillance Individual Form:
<http://emergency.cdc.gov/disasters/surveillance/pdf/NaturalDisasterMorbiditySurveillanceIndividualForm.pdf>



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Function 1: Conduct public health surveillance and detection

Resource Elements *(continued)*

SKILLS AND TRAINING (S)

S1: (Priority) Public health staff conducting data collection, analysis, and reporting in support of surveillance and epidemiologic investigations should achieve, at a minimum, the Tier 1 Competencies and Skills for Applied Epidemiologists in Governmental Public Health Agencies.

- When creating new surveillance systems, consideration should be given to securing assistance (e.g., from academic institutions or state-level staff) from individuals with Tier 2 Competencies and Skills for Applied Epidemiologists in Governmental Public Health Agencies.
- Note: Formal educational degree requirement and masters' degree supervision requirement is suggested but not required.

Suggested resources

- Tier 1 Competencies and Skills for Applied Epidemiologists in Governmental Public Health Agencies: http://www.cste.org/dnn/Portals/0/AEC_Summary_Tier1.pdf
- Tier 2 Competencies and Skills for Applied Epidemiologists in Governmental Public Health Agencies: http://www.cste.org/dnn/Portals/0/AEC_Summary_Tier2.pdf

EQUIPMENT AND TECHNOLOGY (E)

E1: (Priority) Have or have access to health information infrastructure and surveillance systems that are able to accept, process, analyze, and share data for surveillance and epidemiological investigation activities. *(For additional or supporting detail, see Capability 6: Information Sharing)*

- Electronic exchange of personal health information should meet applicable patient privacy-related laws and standards, including state or territorial laws. These include the Health Insurance Portability and Accountability Act, the Health Information Technology for Economic and Clinical Health Act, and standards from the National Institute of Standards and Technology and the Office of the National Coordinator for Health Information Technology of the U.S. Department of Health and Human Services. *(For additional or supporting detail, see Capability 6: Information Sharing)*

E2: Have or have access to a system compatible with the National Electronic Disease Surveillance System that can determine or report the following:

- Electronic case reporting,²⁹⁸ including the data that follows:
 - Number of case reports received
 - Case Report Classification: infectious or non-infectious
- Integrated Data Repository²⁹⁹
- Case Notification,³⁰⁰ including the data that follows:
 - Number of case notifications sent to CDC
 - Number of case notifications sent to other jurisdictions
- Establish an integrated repository or record locator that enables all condition reports for an individual to be retrieved and reviewed

E3: Have or have access to equipment that may be necessary to ensure the electronic management and exchange of information (e.g., laboratory test orders, samples, and results) with hospitals, doctor's offices, community health centers, and poison control centers

Function 2: Conduct public health and epidemiological investigations

Identify the source of a case or outbreak of disease, injury, or exposure and its determinants in a population (e.g., time, place, person, disability status, living status, or other indices) to coordinate and report the summary results of the analysis to jurisdictional and federal partners, as appropriate.



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Function 2: Conduct public health and epidemiological investigations

Tasks

This function consists of the ability to perform the following tasks:

- Task 1:** Conduct investigations of disease, injury or exposure in response to natural or man-made threats or incidents and ensure coordination of investigation with jurisdictional partner agencies. Partners include law enforcement, environmental health practitioners, public health nurses, maternal and child health, and other regulatory agencies if illegal activity is suspected.
- Task 2:** Provide epidemiological and environmental public health consultation, technical assistance, and information to local health departments regarding disease, injury, or exposure and methods of surveillance, investigation, and response.³⁰¹
- Task 3:** Report investigation results to jurisdictional and federal partners, as appropriate. *(For additional or supporting detail, see Capability 6: Information Sharing)*

Performance Measure(s)

This function is associated with the following CDC-defined performance measures:

- Measure 1:** Percentage of infectious disease outbreak investigations³⁰² that generate reports
 - Numerator: Number of infectious disease outbreak investigation reports generated
 - Denominator: Number of infectious disease outbreak investigation reports investigated
- Measure 2:** Percentage of infectious disease outbreak investigation reports that contain all minimal elements³⁰³
 - Numerator: Number of infectious disease outbreak investigation reports generated containing all minimal elements
 - Denominator: Total number of infectious disease outbreak investigation reports generated
- Measure 3:** Percentage of acute environmental exposure³⁰⁴ investigations that generate reports
 - Numerator: Number of acute environmental exposure investigation reports generated
 - Denominator: Number of acute environmental exposures investigated
- Measure 4:** Percentage of acute environmental exposure reports that contain all minimal elements
 - Numerator: Number of acute environmental exposure reports generated containing all minimal elements
 - Denominator: Number of acute environmental exposure investigation reports generated

Resource Elements

Note: Jurisdictions must have or have access to the resource elements designated as **Priority**.

PLANNING (P)

P1: (Priority) Written plans should include investigation report templates that contain the following minimal elements:^{305,306,307,308}

- Context / Background – Information that helps to characterize the incident, including the following:
 - Population affected (e.g., estimated number of persons exposed and number of persons ill)
 - Location (e.g., setting or venue)
 - Geographical area(s) involved
 - Suspected or known etiology
- Initiation of Investigation – Information regarding receipt of notification and initiation of the investigation, including the following:
 - Date and time initial notification was received by the agency
 - Date and time investigation was initiated by the agency
- Investigation Methods - Epidemiological or other investigative methods employed, including the following:
 - Any initial investigative activity (e.g., verified laboratory results)
 - Data collection and analysis methods (e.g., case-finding, cohort/case-control studies, environmental)
 - Tools that were relevant to the investigation (e.g., epidemic curves, attack rate tables, and questionnaires)
 - Case definitions (as applicable)
 - Exposure assessments and classification



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Function 2: Conduct public health and epidemiological investigations

Resource Elements *(continued)*

PLANNING (P)

- Review of reports developed by first responders, lab testing of environmental media, reviews of environmental testing records, industrial hygiene assessments, questionnaires
- Investigation Findings/Results - all pertinent investigation results, including the following:
 - Epidemiological results
 - Laboratory results (as applicable)
 - Clinical results (as applicable)
 - Other analytic findings (as applicable)
- Discussion and/or Conclusions – analysis and interpretation of the investigation results, and/or any conclusions drawn as a result of performing the investigation. In certain instances, a Conclusions section without a Discussion section may be sufficient
- Recommendations for Controlling Disease and/or Preventing/Mitigating Exposure – specific control measures or other interventions recommended for controlling the spread of disease or preventing future outbreaks and/or for preventing/mitigating the effects of an acute environmental exposure
- Key investigators and/or report authors – names and titles are critical to ensure that lines of communication with partners, clinicians, and other stakeholders can be established.

P2: Written plans should include processes for how and when the jurisdiction will conduct investigations of health incidents (e.g., infectious disease outbreaks, injuries, and other incidents) and environmental public health hazards. Depending on the investigation, a plan will include at minimum the following information:

- Trigger points for initiating the investigation (e.g., elements/instances that trigger the start of an investigation)
- When the investigation began
- Processes for identifying the population(s) at risk
- Processes to identify confirmed cases or exposures as well as presumed or probable cases or exposed persons
- Processes that ensure the ability to perform contact tracing or identification of exposed persons
- Processes that ensure the ability to determine transmission, exposure, and source
- Processes to map/geo-code identified and suspect cases, injuries, or exposures within the jurisdiction

P3: Written plans should include processes and protocols for conducting investigations in coordination with other governmental agencies, key stakeholders, and organizations that support populations at-risk for adverse health outcomes.

- Groups for consideration include veterinarians, laboratories, medical examiners, school nurses, food inspectors, poison control centers, infectious disease physicians, hospitals, school health authorities, other healthcare providers, emergency responders and other community partners including communities of color, and tribal representatives.

P4: Written plans should include memoranda of understanding or other letters of agreement authorizing joint investigations and exchange of epidemiological information with law enforcement and other agencies, as well as defined roles for each participating agency.

Suggested resources

- FBI-CDC Criminal and Epidemiological Investigation Handbook:
<http://www2a.cdc.gov/phlp/docs/crimepihandbook2006.pdf>
- Joint Public Health Law Enforcement Investigations: Model Memorandum of Understanding, created by Public Health and Law Enforcement Emergency Preparedness Workgroup, CDC and Bureau of Justice Assistance:
<http://www.nasemso.org/Projects/DomesticPreparedness/documents/JIMOUFinal.pdf>

P5: Written plans should include a procedure to ensure that jurisdictional public health departments are provided a uniform set of jurisdictional health-related data associated with potential exposure to diseases, exposures, or injury conditions. *(For additional or supporting detail, see Capability 6: Information Sharing)*



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Function 2: Conduct public health and epidemiological investigations

Resource Elements *(continued)*

SKILLS AND TRAINING (S)

- S1: (Priority)** Maintain staffing capacity to manage the routine epidemiological investigation systems at the jurisdictional level as well as to support surge epidemiological investigations in response to natural or intentional threats or incidents. This is accomplished through the following:
- Surge staff should be competent in Tier 1 Competencies and Skills for Applied Epidemiologists in Governmental Public Health Agencies
 - Consideration should be given to securing assistance (e.g., academic institutions or state-level staff) from an individual with Tier 2 Competencies and Skills for Applied Epidemiologists in Governmental Public Health Agencies
 - Note: Formal educational degree requirement and masters' degree supervision requirement is suggested but not required.
- Suggested resources
- Tier 1 Competencies and Skills for Applied Epidemiologists in Governmental Public Health Agencies: http://www.cste.org/dnn/Portals/0/AEC_Summary_Tier1.pdf
 - Tier 2 Competencies and Skills for Applied Epidemiologists in Governmental Public Health Agencies: http://www.cste.org/dnn/Portals/0/AEC_Summary_Tier2.pdf
- (For additional or supporting detail, see Capability 15: Volunteer Management)*

EQUIPMENT AND TECHNOLOGY (E)

- E1:** Have or have access to jurisdictional health monitoring systems (electronic and/or paper, if applicable) needed to monitor health status, including criteria for reporting health events and criteria/processes for maintaining and/or contributing to population health registries.
- E2:** Have or have access to electronic databases or registries of ill, exposed, and potentially exposed persons; these systems should be capable of developing Public Health Investigation Reports *(See Function 1: Planning Resource Element for Additional or Supporting Detail)* as warranted, utilizing information from clinical, environmental, and/or forensic samples, and utilizing lab and disease tracking data.
- Databases or registries should include protocols to protect personal health information in conformity with jurisdictional and federal law and via instituting security and confidentiality policies *(For additional or supporting detail, see Capability 6: Information Sharing)*

Function 3: Recommend, monitor, and analyze mitigation actions

Recommend, implement, or support public health interventions that contribute to the mitigation of a threat or incident as well as monitor the effectiveness of the interventions.

Tasks

This function consists of the ability to perform the following tasks:

- Task 1:** Determine public health mitigation, including clinical and epidemiological management and actions to be recommended for the mitigation of the threat or incident based upon data collected in the investigation and on applicable science-based standards outlined by *Morbidity and Mortality Weekly Report*, control of Communicable Diseases Manual, Red Book of Infectious Diseases or, as available, a state or CDC incident annex.
- Task 2:** Provide information to public health officials to support them in decision making related to mitigation actions. *(For additional or supporting detail, see Capability 6: Information Sharing)*
- Task 3:** Monitor and analyze mitigation actions throughout the duration of the public health threat or incident. *(For additional or supporting detail, see Capability 2: Community Recovery, Capability 5: Fatality Management, Capability 7: Mass Care, Capability 8: Medical Countermeasure Dispensing, Capability 11: Non-Pharmaceutical Interventions, and Capability 14: Responder Safety and Health)*



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Function 3: Recommend, monitor, and analyze mitigation actions

Tasks *(continued)*

Task 4: Recommend additional mitigation activities, based upon mitigation monitoring and analysis, throughout the duration of the incident, as appropriate.

Performance Measure(s)

This function is associated with the following CDC-defined performance measure:

Measure 1: Proportion of reports of selected reportable diseases for which initial public health control measure(s) were initiated within the appropriate time frame³⁰⁹

- **Numerator:** Number of reports of selected reportable diseases for which public health control measure(s) were initiated within an appropriate time frame
- **Denominator:** Number of reports of selected reportable diseases received by a public health agency

Resource Elements

*Note: Jurisdictions must have or have access to the resource elements designated as **Priority**.*

PLANNING (P)

P1: (Priority) Written plans should include protocols for recommending and initiating, if indicated, containment and mitigation actions in response to public health incidents. Protocols include case and contact definitions, clinical management of potential or actual cases, the provision of medical countermeasures, and the process for exercising legal authority for disease, injury, or exposure control.^{310,311} Protocols should include consultation with the state or territorial epidemiologist when warranted. *(For additional or supporting detail, see Capability 8: Medical Countermeasure Dispensing and Capability 11: Non-Pharmaceutical Interventions)*

P2: Written plans should include procedures for monitoring actual performance, and document actions and outcomes using tools such as data reports or statistical summaries consistent with *Morbidity and Mortality Weekly Report* and other criteria.^{312,313}

P3: Written plans should include procedures to utilize health-related data and statistics from programs within the jurisdictional public health agency to support recommendations regarding populations at-risk for adverse outcomes during a natural or intentional threat or incident. *(For additional or supporting detail, see Capability 1: Community Preparedness)*

SKILLS AND TRAINING (S)

S1: (Priority) Public health staff participating in epidemiological investigations should receive awareness-level training with the Homeland Security Exercise and Evaluation After Action Report process.

Function 4: Improve public health surveillance and epidemiological investigation systems

Assess internal agency surveillance and epidemiologic investigation both during and after an incident and implement quality improvement measures that are within jurisdictional public health agency control.



CAPABILITY 13: Public Health Surveillance and Epidemiological Investigation

Function 4: Improve public health surveillance and epidemiological investigation systems

Tasks

This function consists of the ability to perform the following tasks:

Task 1: Identify issues and outcomes during and after the incident.

Task 2: Conduct post-incident/post-exercise agency evaluation meeting(s) including all active participants (e.g., law enforcement, volunteer agencies, clinical partners or environmental regulatory agency) to identify internal protocols and deficiencies that require corrective actions in areas such as programs, personnel, training, equipment, and organizational structure.

Task 3: Develop an After Action Report/Improvement Plan.

Task 4: Communicate recommended After Action Report Improvement Plan corrective actions to public health leadership.

Performance Measure(s)

At present there are no CDC-defined performance measures for this function.

Resource Elements

*Note: Jurisdictions must have or have access to the resource elements designated as **Priority**.*

PLANNING (P)

P1: (Priority) Written plans should include procedures to communicate the improvement plan to key stakeholders (including groups representing at-risk populations) and to implement corrective actions identified in the improvement plan.

P2: Written plans should include procedures to re-engage local public health agencies and key stakeholders and at-risk populations, as applicable, after the acute phase of a threat or incident to ensure that the jurisdiction's plans and response reached all necessary populations.

SKILLS AND TRAINING (S)

S1: Public health epidemiology staff should have awareness-level training of quality improvement processes and techniques.³¹⁴

S2: Have access to individual(s) trained to meet competencies for a Public Health Informatician as defined in Competencies for Public Health Informaticians³¹⁵ to contribute to information sourcing, use, and reuse for surveillance and epidemiologic analysis.³¹⁶

EQUIPMENT AND TECHNOLOGY (E)

E1: Have or have access to electronic or paper-based tools for data collection, management, and analysis, including methods for collecting, managing, and analyzing data electronically.