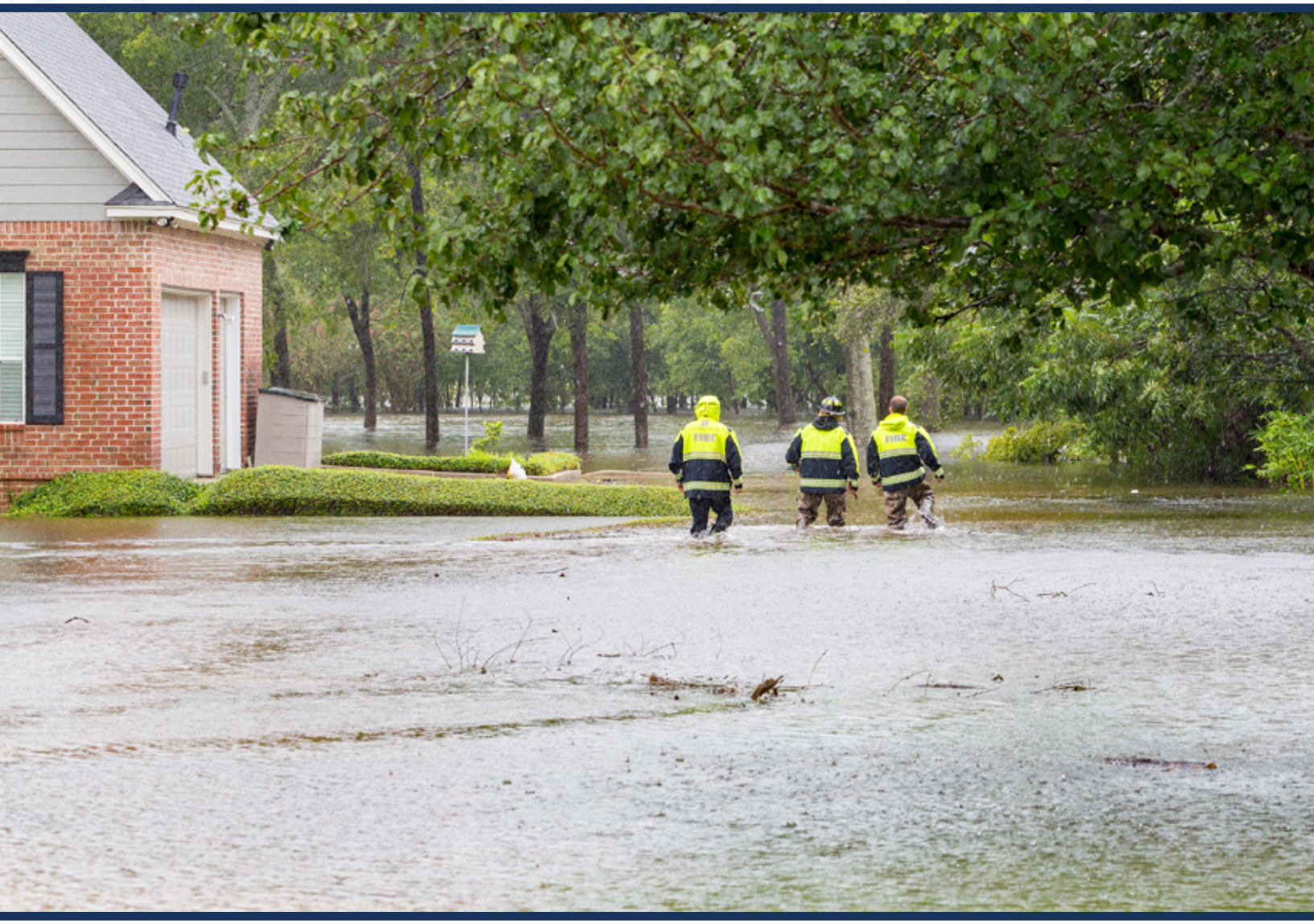
CSTE Emergency Preparedness and Response Training for Public Health Epidemiologists



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ACRONYMS

- **AAR** - After-Action Review
- **ACE** - Assessment of Chemical Exposures
- **BRFSS** - Behavioral Risk Factor Surveillance System
- **CASPER** - Community Assessment for Public Health Emergency Response
- **CDC** - Centers for Disease Control and Prevention
- **CMIST** - Communication, Maintaining Health, Independence, Safety, Support, Self-Determination, Transportation
- **CSTE** - Council of State and Territorial Epidemiologists
- **DAC** - Disaster Assistance Center
- **EMS** - Emergency Management Services
- **EOC** - Emergency Operations Center
- **ERHMS** - Emergency Responder Health Monitoring Surveillance
- **FEMA** - Federal Emergency Management Agency
- **HSEEP** - Homeland Security Exercise and Evaluation Program
- **ICS** - Incident Command System
- **JIS** - Joint Information System
- **LA** - Los Angeles
- **MAC** - Multi-agency Coordination
- **MCH** - Maternal and Child Health
- **NHANES** - National Health and Nutrition Examination Survey
- **NIMS** - National Incident Management System
- **NSSP** - National Syndromic Surveillance Program
- **PH** - Public Health
- **PHEP** - Public Health Emergency Preparedness
- **POD** - Point-of-Dispensing
- **PPE** - Personal Protective Equipment
- **PRAMS** - Pregnancy Risk Assessment Monitoring System
- **RHAD** - Reproductive Health and Disasters
- **SMARTIE** - Specific, Measurable, Achievable, Relevant, Time-bound, Inclusive, Equitable
- **SVI** - Social Vulnerability Index
- **WGS** - Whole Genome Sequencing

LESSON 1

CSTE Emergency Preparedness and Response Training for Public Health Epidemiologists: Course Overview

GOAL OF LESSON:

Provide an overview of the course and interactivity, reasons for its development, and the topics to be covered in the training.

COURSE LEARNING OBJECTIVES:

- Define the **emergency management** cycle, **incident** management cycle, and existing federal management systems (Lesson 2).
- Explain the role of epidemiologists in public health emergency planning, exercises, drills, and response (Lessons 3 and 4).
- Identify disproportionately impacted individuals and populations, health impacts of public health emergencies, and considerations for access and functional needs (Lesson 5).
- Describe available sources of data and surveillance tools (Lesson 6).
- Consider specialized data needs and use during a public health emergency (Lesson 6).
- Recognize the importance of **after-action review**, reports, and debriefs and how to apply this knowledge to emergency management cycles (Lesson 7).

LESSON 1: CSTE EMERGENCY PREPAREDNESS AND RESPONSE TRAINING FOR PUBLIC HEALTH EPIDEMIOLOGISTS: COURSE OVERVIEW

INTRODUCTION TO COURSE AND PURPOSE

This training course was developed to provide necessary information about emergency preparedness and response to epidemiologists of all disciplines. The CSTE Maternal and Child Health (MCH) Epidemiology Emergency Preparedness and Response Capacity Assessment served as a basis for understanding the knowledge gaps of MCH epidemiologists in emergency preparedness and response. From this report, the Council of State and Territorial Epidemiologists (CSTE) identified six key areas of learning as needs for all epidemiologists who may participate in emergency preparedness and response activities. The lessons for this course were developed to address the six key areas of learning.

This training course will provide an overview of the topics above and use thought prompts and activities to allow participants to directly apply the new knowledge as they complete the training lessons. Epidemiologists can use this information and training to better participate in their agency's emergency preparedness and response program, drills, activities, and emergency response.

HOW TO COMPLETE THE TRAINING

This is a self-guided, self-paced training. There are seven lessons in total, including this one, within the CSTE Learn platform. The time to complete the narrated lessons is estimated at three hours for the lecture portion only. Thought prompts, activities, and quizzes will add to the total amount of time needed to complete the course. The more time that is spent on learning and applying that knowledge during exercises, the more you will learn from this course.

Participants can start lessons and come back on their own time; however, the system does not save your place in the lesson's video unless you have completed it. Take note of where you left off in the lesson video if you need to take a break from the training and return to it. The participant workbook has timestamps for the thought prompts and activities so you can easily return to your place in the video once you have completed the exercises.

COURSE INTERACTIVITY

This training course has been designed with several different interactive elements to maximize learning and application of that learning. The training lesson videos contain places to pause for exercises and quizzes at the end of each lesson.

In thought prompts, participants are encouraged to think about past experiences and how they can apply the training material. Space is provided in the participant workbook to answer these prompts.

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Additionally, an emergency response scenario is provided based on a real emergency for participants to work through activities in the lessons to apply the information they have just learned. The participant workbook also contains pages for completion of these activities throughout the lessons.

At the end of each lesson a short quiz will be provided to test participant knowledge of the material in that lesson and the activities. You must score 80% or better on the quiz to move on to the next lesson.

Reference documents, resources, and articles are provided as links in the CSTE Learn platform and at the end of the participant workbook in case participants want to learn more or review the primary source information.

In addition to providing space for completion of thought prompts and activities, the participant workbook contains detailed information from each lesson that should be followed as you work through the lessons and videos. It will provide additional information and detail to complement what is presented in the lesson slides and videos.

Disclaimer: This course is not a substitute for the Federal Emergency Management Agency (FEMA)'s National Incident Management System (NIMS) or Incident Command System (ICS) training modules which may be required by your health department and is more detailed/in depth on those topics than this course.

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LESSON 2

Introduction to Emergency Management and Federal Management Systems

GOAL OF LESSON:

Introduce emergency and disaster management and National Incident Management System (NIMS) and Incident Command System (ICS) concepts.

LEARNING OBJECTIVES:

- Define the emergency management cycle and the incident management cycle
- Differentiate between types of public health emergencies and disasters
- Introduce National Incident Management System (NIMS) and Incident Command System (ICS) concepts
- Apply understanding of public health emergencies to your community

WHAT IS EMERGENCY MANAGEMENT?[1,2]

Emergency management involves the critical tasks and activities necessary to create, sustain, and improve capacity to prevent, protect against, respond to, and recover from an emergency.

To do this, emergency management involves consideration of potential **hazards** and types of emergency events and the likelihood of their occurrence. It considers local factors such as geographic location in the case of natural disasters or proximity to hazardous sources (like a chemical plant) and plans for ways to prevent or minimize damage from these potential emergencies before they happen.

Flexible emergency management systems that can be adapted to suit the emergency that is occurring are important because not all **events** have occurred before in a particular area especially emerging situations like COVID-19. Although the situation is potentially unknown, emergency preparedness and response plans are still needed to respond to these events.

To be effective, emergency management systems are cyclical. This is so they can account for lessons learned as part of recovering to incorporate quality improvements in preparing for future events.

WHAT IS A PUBLIC HEALTH EMERGENCY?[1,2]

An **emergency** is a potentially life-threatening event that requires immediate response but that is generally contained to a jurisdiction. Whereas a **disaster** is a larger-scale event that can overwhelm affected jurisdictions or span multiple jurisdictions, disrupt societal function and cause human, material, or environmental damage. These large-scale disasters often require calls for external assistance and response.

Although the terminology is different and points to the scale of the event, at a high level these types of incidents both tend to be referred to as part of "emergency management" since the need to respond to an emergency is more immediate and may arise out of a disaster to prevent future damage.

Emergencies have public health **risks** that require both short-term and long-term responses since the impact of events can cause damage to community resources, infrastructure, and ecosystems. Immediate response is needed for severe injuries and causalities, lack of shelter due to a disaster, or illness from an outbreak. However, emergencies can also lead to secondary damage including lack of safe water due to infrastructure issues and chemical exposures after an initial spill or release.

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Thought Prompt 1: Local Emergencies and Preparedness Plans

Consider the area where you live:

- What types of emergencies or disasters is your area prone to? (e.g., natural disasters, communicable disease outbreaks, border humanitarian crises, industrial accidents)

- Do you have any emergency preparedness plans for your household because of it? (e.g., earthquake, flooding, wildfires)

Please return for the second video of Lesson 2

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INTRODUCTION TO EMERGENCY MANAGEMENT CYCLE[1]

Emergency management defines emergencies as recurring events that fall into four phases. These phases are mitigation, preparedness, response, and recovery. The phases are cyclical with one playing into the next in a cycle of continuous improvement for preparedness activities. At the end of an immediate emergency, the recovery phase informs future mitigation activities aimed at preparing better for a future emergency. All of the phases tie into one another and can be looked at as continuous phases within the emergency management cycle.

The first phase is **mitigation** which involves actions taken to: prevent an emergency from occurring, reduce the chance of an emergency occurring, or reduce the damaging effects or consequences of the emergency if it does occur. Considerations for mitigation actions should occur well in advance of emergency situations. They can include systematic or widespread activities such as ensuring homes are built or anchored to withstand wind or hurricanes and redirecting water to try to prevent flooding during heavy rains. These are done to try to prevent the emergency or reduce the loss of life and property by minimizing the impact of the emergency. These activities differ from those that occur in the preparedness phase which are focused on planning for an emergency that is likely or eminent.

The second phase is **preparedness** which involves actions taken to: ensure an effective and efficient response to emergencies, minimize potential damages (including using forecasting or warning systems), equip emergency operations centers with necessary resources and supplies, and train and exercise responding personnel including epidemiologists and other public health professionals. The creation of emergency preparedness plans should be based on an assessment of credible **threats**, risks, and hazards likely to cause an emergency. These plans include information about what to do, where to go, what supplies are needed, and who to call for help in an emergency and are often coordinated at an agency or higher level. Conducting drills, tabletop exercises, or full-scale exercises is an important part of preparedness activities to evaluate these plans and make modifications before an emergency strikes. Preparedness activities focus on preparing for an emergency, as compared to mitigation which aims to prevent the emergency from happening in the first place or minimize the overall impacts.

The **response** phase involves actions taken immediately after the onset of an emergency to implement preparedness and response plans, account for personal safety and wellbeing, reduce damage and the probability of secondary damage, and account for non-normal business and other operations. The scale and duration of the response will depend on the emergency but can be quite large-scale and extend for long periods of time in the event of a natural disaster or extended communicable disease outbreak. Response efforts will be coordinated with other partners likely based on FEMA's National Incident

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Management System if response activities involve firefighters, EMS, the National Guard, or other types of responders.

The final phase of emergency management before the cycle begins again is the **recovery**. This phase involves actions taken to recover and restore to regular operations and activities after the emergency, evaluate preparedness and response to the emergency, and incorporate lessons learned into future planning and resiliency efforts. Understanding how well the response went and what issues or roadblocks were found during this response can help with future preparation to avoid those situations in future emergency responses.

This emergency management cycle feeds back into itself to use these lessons learned to aid in future preparedness activities, revise emergency plans, and improve emergency exercises and drills. For instance, if structures were damaged, they can be rebuilt based on newer building code or fortified to prevent future emergencies.

Similar to the steps of the emergency management cycle, FEMA has outlined the National Preparedness System: a process for identifying and assessing risks, estimating capability and activity requirements, building and sustaining those capabilities, planning to deliver the capabilities, validating the activities and plans, and finally reviewing and updating capabilities, resources, and plans.

TYPES OF DISASTERS[3,4]

There are three general categories of disasters that include natural, human-induced, and complex.

Natural disasters include weather-related events such as hurricanes, flooding, tornados, and ice storms, geological events including earthquakes and volcanic eruptions, and transmission events such as outbreaks, epidemics, and pandemics of infectious diseases.

Human-induced disasters (formerly called man-made disasters) result from either deliberate or unintentional events that were brought on by humans. These include acts of biological, chemical, radiological, or nuclear terrorism, human-caused wildfires (note: there are also wildfires caused by natural causes such as lightning strikes), and engineering failure especially relating to structural components such as failure of a dam or building collapse due to earthquakes when not built to code.

Complex disasters occur on a much larger scale than natural disasters and include events like war, drought, civil disturbance, large-scale movement of people, and famine.

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Thought Prompt 2: Local Emergencies Source and Outcomes

Consider recent public health emergencies in your area, whether or not you helped to respond professionally:

- What was the source?

- How severe was it?

- Who was impacted?

- Did you notice any changes that resulted from that event?

- How did you follow the outcomes?

- Did you receive any type of text, email, or app notifications about the event?

Please return for the third video of Lesson 2

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INTRODUCTION TO INCIDENT MANAGEMENT CYCLE[3,5]

Like the emergency management cycle discussed before, there is also the concept of a disaster management cycle that has been used by the WHO to describe the phases of a disaster and response activities. This three-phase cycle may look familiar since it contains many of the aspects of the emergency management cycle. For this course, the concept will be referred to as the **"incident management cycle"** to cover all emergencies and incidents not just disasters.

The **pre-incident phase** is comprised of planning, prevention, preparedness, and mitigation. Planning occurs to determine the response and recovery strategies based on a vulnerability or risk assessment. Prevention, based on the risk assessment, is then used to reduce the overall likelihood and consequence of the emergency. Preparedness includes long-term programmatic activities to strengthen capacity to manage emergency response and transition from response through recovery. Finally, mitigation includes measures aimed at reducing or eliminating the impact of the emergency on society and the environment. The pre-incident phase is like the mitigation and preparedness phases of the emergency management cycle.

The **incident phase** is when the disaster or incident occurs, and emergency response is needed. Emergency response can include many factors depending on the incident and include search and rescue, evacuations and providing shelter, and public health activities including surveillance.

The **post-incident phase** takes place after the immediate response and involves the immediate recovery from the emergency and ways in which the event is used to help develop capacity and resilience to prevent future emergencies and avoid some of the expected damage. Rehabilitation involves the development of capacity and resilience after an emergency. Finally, reconstruction includes infrastructure improvements to help protect the community from future incidents because of natural or human-induced disasters.

INTRODUCTION TO THE NATIONAL INCIDENT MANAGEMENT SYSTEM (NIMS)[6]

NIMS provides a systematic, proactive approach to allow partners to work together to prevent, mitigate, respond, and recover from incidents or emergencies. NIMS serves as the framework for the National Response Framework which helps guide response to all types of disasters and emergencies. This framework describes Emergency Support Functions (ESFs) that group functions to provide structure for coordinating federal support and response to incidents. ESF8 provides coordination for Public Health and Medical Services where many epidemiologists may be placed to support the emergency management cycle.

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MANAGEMENT CHARACTERISTICS OF NIMS[6,7]

1. **Common Terminology-** involves communication to promote understanding among all partners managing the incident.
2. **Modular Organization-** allows for the establishment and expansion of the structure based on the size and complexity of the incident.
3. **Management by Objectives-** uses strategies, tasks, and activities to achieve specific, measurable objectives.
4. **Incident Action Planning-** creates a concise, easy to understand way to communicate priorities, objectives, strategies, and assignments in the operational and support activities during an incident.
5. **Manageable Span of Control-** defines how many individuals one supervisor can manage during an incident.
6. **Incident Facilities and Locations-** are established by incident command if needed based on the incident.
7. **Comprehensive Resource Management-** describes a standard process to identify, order, acquire, track, and mobilize resources including personnel, facilities, equipment, and supplies.
8. **Integrated Communications-** are established through a common communications plan and interoperable systems.
9. **Establishment and Transfer of Command-** to the jurisdiction or organization of primary responsibility is necessary to ensure clear command of the response.
10. **Unified Command-** may be used if there is no jurisdiction or organization with primary responsibility to allow for many partners to fulfill their specific roles in an incident.
11. **Chain of Command and Unity of Command-** describe how the flow of orders should occur during an incident and has individuals receiving assignments only from their Incident Command System (ICS) supervisor to avoid confusion.
12. **Accountability-** defines the principles needed to ensure individuals are accountable in completing activities and using resources.
13. **Dispatch/Deployment-** ensures resources are only deployed or dispatched by the appropriate authority within the resource management component.
14. **Information and Intelligence Management-** establishes a process for managing, using, and sharing information and intelligence.

MAJOR COMPONENTS OF NIMS[6,7]

There are three major components of NIMS including Resource Management, Command and Coordination, and Communications and Information Management. This course focuses on the Command and Coordination component because that is where the Incident Command System is described in detail.

Resource Management- responsible for identifying resources, qualifying personnel, planning for resources, and acquiring and inventorying resources.

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Command and Coordination- includes four structures to achieve its responsibilities including: Incident Command System (ICS), Emergency Operations Centers (EOCs), Multi-agency Coordination (MAC) Groups, and the Joint Information System (JIS).

Communications and Information Management- provides a flexible communications and information systems to maintain situational awareness and update incident information continuously.

The Incident Command System (ICS) uses a standardized system of management to ensure effective management and communication during an emergency. ICS can be used during small or large incidents and can be used during emergencies and planned events. ICS establishes a common set of processes for planning and management of resources within an organizational structure. It promotes cooperation between disciplines and agencies. For more information about the functional areas of ICS please review this California Department of Public Health video on using ICS to implement a type of emergency assessment called the Community Assessment for Public Health Emergency Response (CASPER) which will be discussed further in future lessons.

There are five functional areas of ICS which are activated by the Incident Commander as needed in the following order of activation:

1. **Command or Incident Command-** has the overall responsibility for the incident and sets objectives, strategies, and priorities. If needed, the Incident Commander may activate any of the following functional sections depending on the incident and the response needs. It is possible for the Command function to do all of the response but often it includes at least the Operations function of ICS.
2. **Operations-** reaches the objectives of response and directs all operational resources including personnel.
3. **Planning-** supports incident action planning through tracking resources, collecting and analyzing information, and maintaining necessary documentation.
4. **Logistics-** arranges and orders resources and services (personnel, facilities, supplies, and equipment).
5. **Finance/Administration-** monitors costs, negotiates contracts, provides timekeeping and accounting, and procurement services.

The Emergency Operations Centers (EOCs) are physical locations staffed with incident management personnel from many agencies. An EOC can also be a concept for a coordination center that does not have to be a physical location. EOCs can be configured using ICS structure or departmental structure. Epidemiologists may be called upon to EOCs in public health emergencies and will need to understand the structure and framework of response activities.

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The Multi-agency Coordination (MAC) Groups provide offsite support for ICS and EOCs through policy guidance and resource allocation.

The Joint Information System (JIS) is used to integrate information from ICS, EOCs, and MAC Groups and handle public affairs and communication.

Thought Prompt 3: NIMS/ICS Activation Response

Think of an example of a public health emergency response that requires NIMS/ICS activation:

- If you had to participate in the response, how prepared do you feel to do so based on your current knowledge and experiences?

- What did everyone else's roles look like in that situation?

- Who in your agency is responsible for determining if an ICS activation is warranted or who initiates the ICS?

Please return to the third video of Lesson 2 at 9:06

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LESSON TWO REVIEW

This lesson described emergency management and the emergency management cycle. This cycle is made up of four phases including Mitigation, Preparedness, Response, and Recovery phases. Also, emergencies and disasters and their subtypes of natural, human-induced, complex events were defined. Then the disaster management cycle, referred to in these modules as incident management cycle, consisting of the Pre-incident, Incident, and Post-incident phases was described. Additionally, the National Incident Management System's fourteen management characteristics and three major components were introduced. Finally, the Incident Command System and its five functional areas were detailed.

LESSON THREE PREVIEW

The upcoming lesson will review **disaster epidemiology**, the use of epidemiology to investigate the short- and long-term health effects of disasters and to predict the health consequences of future disasters. It will also describe the role of epidemiologists in emergency planning and drills. Then it will describe the "Public Health Emergency Preparedness and Response Capabilities" report and how these capabilities are performed by epidemiologists. Finally, the lesson will describe emergency plans and exercises including: the types of exercises, information on exercise planning, the goals and objectives of exercises, and how to conduct and evaluate exercises.

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LESSON 3

The Role of Epidemiologists in Public Health Emergency Preparedness, Exercises, and Drills

GOAL OF LESSON:

Describe how epidemiologists can help in emergency planning, exercises, and drills.

LEARNING OBJECTIVES:

- Explain the role of epidemiologists in public health emergency preparedness
- Describe the types of emergency preparedness exercises (plans, exercises, and drills)
- Examine preparedness activities

EPIDEMIOLOGY IN THE INCIDENT MANAGEMENT CYCLE-PRE-INCIDENT PHASE[3,5]

To aid in performing pre-incident activities, epidemiologists can conduct epidemiologic investigations and studies that help emergency managers obtain necessary information to make decisions. Epidemiologists conduct assessments that characterize the scope of a problem, identify risk factors for morbidity and mortality, create interventions, and evaluate the effectiveness of those interventions.

Additionally, considerations and experiences from the post-incident phase and post-disaster epidemiologic data (including tracking and registries) can be used to identify potential areas for improvement in epidemiology activities during future incidents, recognize specific risks to individuals and to the community from a disaster, and to better understand the long-term impact of types of disasters and responses.

EPIDEMIOLOGY IN EMERGENCIES[4,5]

The application of epidemiology in the pre-incident and other phases of disaster response is not a new concept. The first descriptions of epidemiology roles in disaster response originated in the 1980s. Around 20-30 years later the use of the term “disaster epidemiology” established it as a subdiscipline of epidemiology with a wide application of uses.

The types of activities that epidemiologists can perform and other ways they can contribute during emergency preparedness and response will be covered with detailed examples in lesson 4.

INTRODUCTION TO DISASTER EPIDEMIOLOGY[4,5]

Disaster epidemiology is the application of epidemiologic activities during any phase of the emergency management cycle with a focus on investigating the health effects of disasters, using surveillance and other methodologies to help plan, implement, and evaluate public health interventions in disaster situations, to track and identify health consequences and exposures from an event. These epidemiology activities can help emergency managers to adjust priorities in a disaster and allocate resources to help prevent further or secondary impact of the emergency and to predict what health effects future disasters may have.

Around the same time as the widespread use of the term “disaster epidemiology” began, the CDC published their initial preparedness capability standards for public health preparedness and response capacity in 2011 that include epidemiological activities and roles that epidemiologists may be asked to fill during emergency preparedness and response activities.

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PUBLIC HEALTH EMERGENCY PREPAREDNESS (PHEP) AND RESPONSE CAPABILITIES REPORT[8]

The most recent version of these capabilities can be found in the Public Health Emergency Preparedness and Response Capabilities: National Standards for State, Local, Tribal, and Territorial Public Health report. This document serves as a framework for jurisdictional public health agencies to organize and evaluate emergency responses and exercises, ensure public health consequences of emergencies are a response priority, and promote collaboration by establishing a common language.

PHEP CAPABILITIES OVERVIEW[8]

1. Community Preparedness
2. Community Recovery
3. Emergency Operations Coordination
4. Emergency Public Information and Warning
5. Fatality Management
6. Information Sharing
7. Mass Care
8. Medical Countermeasure Dispensing and Administration
9. Medical Materiel Management and Distribution
10. Medical Surge
11. Nonpharmaceutical Interventions
12. Public Health Laboratory Testing
13. Public Health Surveillance and Epidemiological Investigation
14. Responder Safety and Health
15. Volunteer Management

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Thought Prompt 1: PHEP Capabilities Relevance

- Which Public Health Emergency Preparedness and Response Capabilities do you think have the most epidemiologic relevance?

- Which have you been involved in?

Please return to the first video for Lesson 3 at 6:00

PLANNING AND PREPAREDNESS-SPECIFIC PHEP CAPABILITIES[5,8]

Within these PHEP capabilities there are functions that describe how the capability can be performed. The following bullets highlight capabilities and functions that may be performed by epidemiologists during emergency planning activities directly from the PHEP document and a summary of the functions.

CAPABILITY 1: Community Preparedness

This capability includes identifying individuals with access and functional needs that may be disproportionately impacted by an incident and addressing these needs (a focus of a later lesson in this course), supporting the development of systems that support the community, and promoting community partnerships to help strengthen communities and their resilience. Epidemiology PHEP functions may include:

- Determine risks to the health of the jurisdiction
- Strengthen community partnerships to support public health preparedness
- Coordinate training and provide guidance to support community involvement with preparedness efforts

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CAPABILITY 6: Information Sharing

This capability is important for epidemiologists involved in emergency planning because it considers the alignment of public health surveillance and data strategies (including data security and cybersecurity) and identifies partners for their data needs and develops standards and systems needed to share this public health data and provide public health alerts. Epidemiology PHEP functions may include:

- Identify partners that should be incorporated into information flow and define information sharing needs
- Identify and develop guidance, standards, and systems for exchange

CAPABILITY 7: Mass Care

This capability addresses considerations for accommodating individuals with access and functional needs in sheltering situations and how to coordinate ongoing surveillance and health assessments. These functions can and should be included in the pre-incident phase in planning and preparedness by an epidemiologist who understands the population health needs and the surveillance systems in place or that may be needed. Epidemiology PHEP functions may include:

- Determine public health role in mass care operations
- Determine mass care health needs of the impacted population

CAPABILITY 8: Medical Countermeasure Dispensing and Administration

Before responders can dispense or administer medical countermeasures, jurisdiction-specific strategies should be coordinated to determine the specific population's risks, availability of resources, and establish a network of dispensing/administration sites to activate during an incident. Epidemiologists often evaluate population characteristics and risks that can be used to determine the need for medical countermeasures and establish community partnerships that can be used to determine appropriate sites. Epidemiology PHEP functions may include:

- Determine medical countermeasure dispensing/ administration strategies

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CAPABILITY 11: Nonpharmaceutical Interventions

Epidemiologists can be involved in engaging partners and identifying factors that impact nonpharmaceutical interventions such as working with community partners, healthcare providers, and partner agencies to create written agreements, develop case definitions based on surveillance data, help providers rapidly report suspect and confirmed cases, and assess and plan for access and functional needs. Epidemiologists also serve an important function in determining NPIs including isolation and quarantine determinations, promoting social distancing, and decontamination and sanitation measures. Epidemiology PHEP functions may include:

- Engage partners and identify factors that impact nonpharmaceutical interventions
- Determine nonpharmaceutical interventions

CAPABILITY 12: Public Health Laboratory Testing

In the planning phase, epidemiologists can create procedures for cooperation, coordination, and information sharing with hospitals, public health agencies, laboratories, healthcare providers, and others in the event of a public health emergency. This capability function can be exercised as part of preparedness drills with external laboratory partners. Epidemiology PHEP functions may include:

- Enhance laboratory communications and coordination
- Support training and outreach

CAPABILITY 13: Public Health Surveillance and Epidemiological Investigation

This capability focuses on the critical role of epidemiologists in PHEP to conduct public health surveillance and epidemiologic investigations to create, maintain, support, and strengthen routine surveillance and detection systems to prepare for incidents of public health concern. Epidemiologists are also involved in recommending, evaluating, and analyzing measures and interventions meant to mitigate a threat, hazard, risk, or incident. Epidemiology PHEP functions may include:

- Conduct or support public health surveillance
- Conduct public health and epidemiological investigations
- Recommend, monitor, and analyze mitigation actions
- Improve public health surveillance and epidemiological investigation systems

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CAPABILITY 14: Responder Safety and Health

In the pre-incident phase, epidemiologists can conduct risk assessments to include in planning that account for the health and safety risks of responders including identifying exposure limits and injury risks and hazards that may be encountered in response. They can also identify the need for medical or mental/behavioral health assessments for responders, and PPE needs for preparedness efforts. Epidemiology PHEP functions may include:

- Identify responder safety and health risks
- Identify and support risk-specific responder safety and health training

CAPABILITY 15: Volunteer Management

Epidemiologists may also participate in the recruitment, coordination, and training of volunteers, especially those needed for enhanced surveillance efforts in a large disaster scenario. This coordination and training can and should be included in preparedness and planning activities to identify and maintain these resources in the event they are needed for an emergency response or drill. Epidemiology PHEP functions may include:

- Recruit, coordinate, and train volunteers

In 2015, CSTE's disaster epidemiology subcommittee created the Public Health Preparedness (PHP) Capabilities and Disaster Epidemiology Crosswalk between the PHEP capabilities and disaster epidemiology that lists the PHEP capability, the functions relating to disaster epidemiology, available tools and training, and the linkage of the capability to disaster epidemiology.

TYPES OF EMERGENCY PLANS

There are many different types of emergency plans that a jurisdiction or organization may have including:

- public health emergency declaration plan,
- all-hazards emergency operations response plan,
- pandemic influenza or other infectious diseases of high consequence plan,
- continuity plan,
- volunteer coordination and management plan,
- specific emergency response plans based on the type of emergency including:
  - ◊ radiological,
  - ◊ chemical,
  - ◊ natural disasters,
  - ◊ fatality management,
- disaster recovery plan.

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As an epidemiologist, you may be consulted in the creation or revision of all, some, or none of these plans, however, understanding the role that you play in your agency's response plans is important to facilitate a comprehensive and effective response.

INTRODUCTION TO EMERGENCY EXERCISE PLANNING[9]

The CDC encourages public health agencies to use routine public health activities to exercise and evaluate their plans and capability standards and document this. They suggest that after-action reports and corrective action plans should be developed and implemented as well after exercises, events, and incidents.

There are two main categories of exercises including **discussion-based** (which includes tabletop exercises) and **operations-based**.

Depending on the scale, exercises may include only agency partners or involve more participants such as local, state, or federal partners and external responders. Exercises can involve significant time and resources to plan so care must be taken in planning them to ensure they are appropriate for the emergency scenario or plan being tested and that the objectives, participants, and evaluation criteria are well defined to ensure a useful exercise is performed. In some instances, exercises may be required based on state or federal guidelines, funding, or other requirements.

Exercises should be created that are consistent with the Homeland Security Exercise and Evaluation Program (HSEEP). The HSEEP provides guidelines for emergency exercise and evaluation programs. It also creates a common framework for exercise design, development, performance, evaluation, and improvement activities that can be used across agencies. Public health jurisdictions should conduct exercises that are consistent with HSEEP guidance.

notes

WHY SHOULD PLANS BE EXERCISED?[9]

Conducting exercises can be important to evaluate emergency response plans but they also help to test readiness and assess how well training and other developmental activities have been conducted. In general, there are three reasons to review the agency's emergency plans and exercise them:

1. Test the implementation of procedures and protocols: to determine the feasibility of the response plans and to see if there are issues that can be identified and corrected before an event occurs
2. Test internal coordination of the plan- this allows for coordination within the public health agency so everyone can understand their proposed roles in the event of a public health emergency
3. Practice coordination with external responders- if the incident response will require NIMS/ICS activation or the involvement of outside agencies including them in plans so everyone can understand what support they will provide and their expectation of the authority and role designations. The first time that the organization meets an outside responder should not be during an actual emergency response.

DISCUSSION-BASED EXERCISES[9]

Workshops or Seminars can be used to orient new staff with the emergency preparedness and response plans or familiarize experienced staff with new or changing procedures. These exercises should focus on a single function with clearly defined roles and responsibilities for the participants. Workshops or seminars can include a variety of learning techniques including lectures, films, slides, videos, and panel discussions.

Tabletop Exercises occur after initial orientation but before operations-based exercises. Tabletops are lower stress discussions of simulated incident where decision making using deliberate problem-solving is employed. In a tabletop exercise, a scenario is presented as an intelligence briefing of a selected event that is realistic for the organization or location and is facilitated by someone who records, documents, and paces the exercise.

notes

OPERATIONS-BASED EXERCISES[9]

Drills use repetition to test training, response time, cooperation and resources, and capabilities of the workforce and equipment. A general briefing introduces and defines the drill's category, purpose, objectives, and required actions.

Functional Exercises test and evaluate the capabilities of an emergency response system. They may occur over an extended time included within the scenario. Functional exercises may be announced or unannounced. A participant briefing introduces the exercise's objectives, procedures, and timeframe. The participants then react to the simulated event and coordinate with other participants that would be needed in a real emergency.

Full-scale Exercises can be designed which involve multiple partners from different agencies in a larger test of emergency operations and planning. A simulated event begins the exercise and activates the emergency operations plan where then the participants physically go to an emergency operations center (EOC) and respond to on-site activities and prompts including simulated victims, utilize necessary equipment and resources, coordinate response volunteers, and more. Full-scale exercises are by far the most intensive to organize and implement, however they provide the best hands-on experience and evaluation of the written emergency management plans.

There are many partners and organizations that may be needed in discussion-based or operations-based exercises and can include the following organizations: animal services and agencies, health care associated infection control programs, housing and sheltering authorities
human services providers, law enforcement, media organizations, mental/behavioral health providers, state public health preparedness programs, schools and education agencies, social services, Other surveillance programs, volunteer organizations, childcare organizations, communicable disease programs, community coalitions, emergency management agencies, emergency medical services (EMS), environmental health agencies, fire and rescue departments, groups representing and serving populations with access and functional needs, health care coalitions, organizations, systems and providers.

notes

Planning Activity 1: Flood Exercise Type Selection

Consider a flood event:

- What type of exercise would you want to do for this emergency? Why?

- What internal and external partners would you include as part of your exercise?

- Why did you choose to include them?

Please return to the second video for Lesson 3 at 7:23

EXERCISE PLANNING[9]

Exercises will be planned by a team that defines roles in an ICS functional area by individual people or groups. The command role assigns tasks and responsibilities and makes sure the exercise is developed. The operations role ensures the scenario is accurate, applicable, and develops evaluation criteria. This group may include epidemiologists as subject matter experts (SMEs) for surveillance activities. The planning group reviews policies and procedures and ensures the exercise continues in an orderly fashion. In small planning teams this is grouped with operations. The logistics group collects resources required for performing the exercise. And finally, the administrative/finance group accounts for costs associated with the exercise and planning.

notes

The exercise planning team defines the timeline for planning and the purpose of the exercise. They select the scenario, goals, and objectives and schedule the exercise. They are responsible for preparing all documentation, facilitating the exercise, and training the response team in their responsibilities.

GOALS AND OBJECTIVES[9]

Exercise goals are defined by the agency but overall strive to improve emergency preparedness activities. The objectives should be demanding but achievable and supportive of the emergency preparedness and response plans. Exercise objectives should be SMARTIE (Specific, Measurable, Attainable, Realistic, Time-bound, Inclusive, and Equitable) and consider: the current state of emergency preparedness and response readiness at the agency, gaps and areas for improvement identified in prior exercises or events, staff knowledge of their roles and responsibilities in PHEP, and relevance to future emergency situations.

Planning Activity 2: Flood Exercise Objectives

Consider the flood from activity 1:

- What are some objectives for the exercise you selected?

Please return for the third video of Lesson 3

CONDUCTING DISCUSSION-BASED EXERCISES[9]

In discussion-based exercises, the facilitator introduces the scenario, exercise objective(s), and issues to consider including participant roles, timeline, and assumptions. The discussion is facilitated as participants move through the scenario in a large group or sometimes smaller focused groups. Decisions and actions to be taken based on the scenario and objective(s) are provided by the participants based on the scenario and their roles. At the end, decisions, actions, and findings from the exercise are evaluated to improve future exercises and emergency management plans.

notes

CONDUCTING OPERATIONS-BASED EXERCISES[9]

Operations-based exercise implementation varies by complexity, scenario chosen, and number of internal and external participants. Participants are separated into groups based on being players, actors, or observers and briefed on their roles in the exercise. Resources and equipment are distributed based on the emergency scenario to the groups that would have it in an emergency response. Then the players report to their respective locations and begin response activities based on the scenario and their roles in response. Before everyone is released to respond, they are given a time and place to report back for debriefing after the response to evaluate and collect lessons learned.

EVALUATING EXERCISES[9]

Exercises must be evaluated to be effective training tools and improve emergency management plans. Evaluation can lead to improvements in emergency management plans not often afforded to the organization unless an emergency occurs. Evaluation criteria should be developed as part of the planning process and include evaluating a number of conditions including the drafted emergency preparedness and response plan, how well the plan activities were accomplished, the speed of plan implementation, the efficiency of plan execution, and staff competency in their assigned roles.

Planning Activity 3: Flood Exercise Evaluation

Consider the flood from activities 1 and 2:

- What criteria would you use to evaluate your planned exercise based on the objective(s) you identified in activity 2?

Please return to the third video of Lesson 3 at 4:40

notes

LESSON THREE REVIEW

In this lesson, disaster epidemiology and the role of epidemiologists in emergency planning and drills were reviewed. The "Public Health Emergency Preparedness and Response Capabilities" report and how these capabilities are performed by epidemiologists were described. The lesson also explained emergency plans and exercises including the types of exercises, information on exercise planning, the goals and objectives of exercises, and how to conduct and evaluate exercises.

LESSON FOUR PREVIEW

The upcoming lesson will explain the role of epidemiology in the incident and post-incident stages of the disaster management cycle. It will describe the "Public Health Emergency Preparedness and Response Capabilities" report and focus on how response capabilities are performed by epidemiologists. Additionally, the lesson will detail ways epidemiologists may respond in NIMS/ICS activation. Finally, it will introduce a hurricane emergency scenario for use in activities throughout the remaining lessons.

notes

LESSON 4

The Role of Epidemiologists in Public Health Emergency Response

GOAL OF LESSON:

Describe how epidemiologists can help in public health emergency responses.

LEARNING OBJECTIVES:

- Explain the role of epidemiologists in public health emergency response
- Relate National Incident Management System, Incident Command System, and preparedness concepts to public health and epidemiological emergency response

EPIDEMIOLOGY IN THE INCIDENT MANAGEMENT CYCLE- INCIDENT PHASE[3,5]

To aid in incident phase activities, epidemiologists can use their skills to conduct health surveillance for the community, volunteers, and emergency responders. They can conduct rapid needs assessments, investigations, and studies to provide information to inform emergency response activities in the short-term. This can help to shift resources and focus depending on the needs identified from assessments including the disaster burden, the health status of the community, and the needs of the community.

NON-EPIDEMIOLOGY RESPONSE OF EPIDEMIOLOGISTS

An epidemiologist can take on multiple roles in emergency response. Some of these roles are "epidemiological" in nature, others are NIMS/ICS-driven and are not "traditional epidemiology" roles. An epidemiologist may function to:

- be an Operations Section Coordinator or lead an Epidemiology Branch within the ICS Operations function where they lead a strategic or tactical team,
- be a technical specialist within Planning and Intelligence ICS function (including operating as a GIS analyst, situation unit analyst, or data analyst),
- be an EOC or Incident Command Safety Officer or implement Emergency Responder Health Monitoring and Surveillance (ERHMS) if they have skills and training in ERHMS and disaster epidemiology, or to
- implement Hospital Incident Command System (HICS) if acting in a healthcare facility.

PUBLIC HEALTH EMERGENCY PREPAREDNESS (PHEP) AND RESPONSE CAPABILITIES REPORT[8]

As a reminder, this report serves as a framework to organize and evaluate emergency response and planning exercises, to ensure consequences of emergencies are a response priority, and to promote collaboration among preparedness professionals by establishing a common language.

notes

RESPONSE-SPECIFIC PHEP CAPABILITIES[5,8]

In addition to capabilities related to preparedness, there are also specific capabilities related to response activities that can be performed by epidemiologists.

CAPABILITY 3: Emergency Operations Coordination

In an emergency response, an epidemiologist may be involved in the emergency operations coordination capability. Epidemiologists will serve as part of a team to identify the public health risks of the emergency and determine the role of public health in emergency management for the response. Additionally, through surveillance activities and rapid needs assessments, epidemiologists contribute to maintaining health situational awareness during the response to focus response resources based on the data. Epidemiology PHEP functions may include:

- Conduct preliminary assessment to determine the need for activation of public health emergency operations
- Manage and sustain the public health response

CAPABILITY 4: Emergency Public Information and Warning

The emergency public information and warning capability provides an avenue for epidemiologists to collect and disseminate health information, alerts, and educational information to the public, considering diverse populations and access needs. Epidemiology PHEP functions may include:

- Issue public information, alerts, warnings, and notifications

CAPABILITY 5: Fatality Management

During an emergency response, epidemiologists may be tasked with collecting information on fatalities and/or antemortem data and sharing that with partners to support resource distribution and electronic reporting. Epidemiology PHEP functions may include:

- Identify and facilitate access to public health resources to support fatality management operations
- Assist in the collection and dissemination of antemortem data

notes

CAPABILITY 6: Information Sharing

Some planning and preparedness capabilities related to information sharing were detailed in the previous lesson, but in the actual emergency response, epidemiologists may be asked to collect and store data in accessible but secure repositories to facilitate a common operating picture about the incident. Epidemiology PHEP functions may include:

- Exchange information to determine a common operating picture

CAPABILITY 7: Mass Care

During the emergency response, epidemiologists may be asked to monitor the health of individuals who have congregated in locations by assessing biological, chemical, nuclear, or radiological contamination, identifying injuries or illnesses and exposure risks, and providing information on the health needs in these situations. Epidemiology PHEP functions may include:

- Monitor mass care population health

CAPABILITY 8: Medical Countermeasure Dispensing and Administration

In the response phase, epidemiologists may conduct surveillance to determine the need for medical countermeasure dispensing and administration and may support the reporting of adverse events associated with the use of medical countermeasures. Medical countermeasures can include vaccines, antibodies, antimicrobial drugs, and diagnostic tests. Epidemiology PHEP functions may include:

- Determine medical countermeasure dispensing/ administration strategies
- Report adverse events

CAPABILITY 9: Medical Materiel Management and Distribution

Epidemiologists can assess the needs of medical materiel distribution by evaluating risk-based scenarios, identifying resources to support distribution, and understanding the population demographics for medication and medical supply needs. Epidemiology PHEP functions may include:

- Direct and activate medical materiel management and distribution

CAPABILITY 10: Medical Surge

In collaboration with Emergency Support Function (ESF) #8 partners, healthcare responders, and other partners, epidemiologists may collect health and disease surveillance data to assess the incident's nature and scope. This allows for a more accurate picture of the medical surge needs during an emergency. Epidemiology PHEP functions may include:

- Assess the nature and scope of the incident

notes

CAPABILITY 11: Nonpharmaceutical Interventions

During the emergency response, epidemiologists may be involved in determining and monitoring nonpharmaceutical interventions which can include quarantine, isolation, social distancing, disinfecting surfaces, and other infection prevention strategies. Epidemiologists may conduct surveillance to monitor transmission, contamination, infection, and the severity of exposure. These commonly used epidemiological methods involve creating case definitions, surveys, and epidemic curves and conducting contact investigations and surveys. Additionally, electronic laboratory reporting, electronic case reporting, environmental monitoring, and other reporting activities can be used to support these nonpharmaceutical interventions during response. Epidemiology PHEP functions may include:

- Monitor nonpharmaceutical interventions

CAPABILITY 12: Public Health Laboratory Testing

As part of their surveillance and response activities, epidemiologists may coordinate with laboratory partners in order to support data collection, communication and necessary investigations. Epidemiology PHEP functions may include:

- Enhance laboratory communications and coordination

CAPABILITY 13: Public Health Laboratory Testing

This capability directly applies the skills and experiences of epidemiologists to emergency response. Epidemiologists conduct and support routine and incident-specific surveillance, share findings, and maintain and improve surveillance systems. They conduct and support epidemiologic investigations by conducting case investigations and using the Community Assessment for Public Health Emergency Response (CASPER) and the Assessment of Chemical Exposures (ACE) toolkits and share the findings. Epidemiologists use this information to recommend and assess actions to mitigate the impact of the emergency on public health. Finally, epidemiologists evaluate the surveillance and investigation processes and systems and suggest corrective actions to improve them during the response and for future events. Epidemiology PHEP functions may include:

- Conduct or support public health surveillance
- Conduct public health and epidemiological investigations
- Recommend, monitor, and analyze mitigation actions
- Improve public health surveillance and epidemiological investigation systems

notes

CAPABILITY 14: Responder Safety and Health

Throughout the course of an emergency response, epidemiologists may be asked to identify risks to responders' safety and health, conduct training needs assessments to identify and provide training to support safety and health needs, and to conduct monitoring and surveillance activities for responders during and following an incident response to determine any adverse health risks or effects from the response. Epidemiology PHEP functions may include:

- Identify responder safety and health risks
- Identify and support risk-specific responder safety and health training
- Monitor responder safety and health during and after the incident response

CAPABILITY 15: Volunteer Management

To support epidemiologic investigations and surveillance activities (such as CASPER and case investigations), epidemiologists may need to organize and deploy volunteers to assist in these resource heavy investigation activities. Additionally, epidemiologists can monitor the safety and health of volunteers and conduct surveillance based on the risks identified for specific volunteers in their response activities. Epidemiology PHEP functions may include:

- Notify, organize, assemble, and deploy volunteers
- Conduct or support volunteer safety and health monitoring and surveillance

notes

Thought Prompt 1: Emergency Response

- Have you participated in a public health emergency response?

◊ What role(s) did you fill in the response?

◊ What gaps did you notice in the emergency response?

- If you were not involved in a public health emergency response, how would you have liked to contribute?

- In what other ways could you have been involved in the response?

Please return for the second video of Lesson 4

notes

ROLE OF EPIDEMIOLOGISTS IN PUBLIC HEALTH EMERGENCY RESPONSE

Generally, epidemiologists may be asked to develop questionnaires and modify databases to capture rapidly evolving data, triage calls on suspected cases, perform case investigations and chart reviews, perform data management and cleaning, report data to inform leadership and update websites frequently, help with laboratory and epidemiology integration for clinical samples to a public health lab (such as whole genome sequencing or WGS), and monitor the severity of disaster impact by assessing hospitalizations and deaths. Epidemiologists may perform these and other functions in health departments, but they also may work in environmental health/protection agencies, vector control agencies, water control agencies, housing agencies, emergency medical services organizations, or healthcare organizations.

WOOLSEY WILDFIRE RESPONSE[10]

In November 2018, in Los Angeles County a large, coordinated response was required for the Woolsey fire incident. This fire covered 151.5 square miles across two counties, destroyed 1,643 structures, damaged 364 structures, and the insured losses were expected to total between 3-5 billion dollars. The LA County department of public health served several important roles in the response including participating with city, county, state, and federal partners at the county's EOC, requesting resources, and exchanging response information to provide situational awareness.

These department of public health staff supported evacuation and sheltering, responded to environmental health concerns, and assisted with public health concerns in recovery. The LA county DPH helped in the response by performing the following activities:

1. Worked at the county Joint Information Center (JIC) and provided safety messages and materials in multiple languages, using social media and other distribution methods, to the responders and the public on many topics including food and fire safety, animal safety and health, cleanup, and mental and behavioral health.
2. Staffed four shelters for evacuated individuals and supplied public health nursing staff to monitor infectious disease spread and give influenza and tetanus vaccines.
3. Monitored air quality data and water quality to issue smoke and air quality advisories and alerts and advise on boil water notices.
4. Developed plans and arranged efforts to remove solid waste, hazardous materials, and debris and declared a local public health emergency to assist with waste cleanup and disposal.
5. Collected and provided information to responders about populations who needed electric-powered medical equipment, dialysis, other medical services, or were deemed medically fragile patients to assist in the evacuation of these individuals.

notes

6. Went into areas affected by the fire and provided personal protective equipment (PPE) and additional health information to the community.
7. Conducted almost 500 food safety inspections at restaurants in the area.
8. Evaluated environmental health and safety of the responders' camps and shelters.
9. Conducted air monitoring to assess health risks associated with radiation exposure at several worksites in the area with radiation potential.
10. Provided information and healthcare services

MARYLAND VACCINATION POINT-OF-DISPENSING PLANNING[11]

Maryland Department of Health multi-agency planning response for COVID-19 vaccination points of dispensing (POD) report describes the MDH's plan for providing vaccines during COVID-19 using an ICS structure. It includes considerations for:

1. Acquiring supplies and vaccine doses from the federal government and through MDH to provide to local health departments.
2. Handling and cold storage of the vaccines.
3. Prioritization of populations for initial doses based on medical need, the size of these populations, the spread of disease, and the availability of doses.
4. Distributing vaccine doses to these populations based on supply and efficacy.
5. Communicating vaccine information to gain community trust and combat vaccine hesitancy.

The structure for response activities was set up using an Incident Command System structure including an incident commander who oversees communications and legal and the other roles and was advised by a technical advisory group and a stakeholder group.

- **Incident Commander-** oversees communications, legal, and the other functional areas.
- **Operations**- responsible for epidemiology and surveillance activities, ordering, distributing, and securing the vaccines, dispensing and creating open and closed PODs, scheduling appointments and training providers, and data tracking and reporting.
- **Planning-** responsible for providing documentation and evaluation, involving the core planning group, and identifying and reaching out to populations at high risk for severe illness or personnel likely to be exposed.
- **Logistics-** responsible for managing volunteers and resources including PPE, supplies, transportation, and cold storage.
- **Finance/Administration-** responsible for procuring resources and supplies and managing financial duties.

notes

HURRICANE EMERGENCY SCENARIO[12]

The following scenario will be used to work through activities in the remaining lessons of the training. The scenario was developed based on an actual emergency scenario that has been modified for the purposes of this training course.

It is mid-August and your community along the gulf coast of Texas has been watching a tropical storm forming in the Caribbean. After a few days and passing through the Yucatan Peninsula, this storm has reformed into a tropical depression. The storm has been forecasted to become at least a Category 4 hurricane and make landfall in South/Southeast Texas. Damaging winds and flooding are expected.

You are an epidemiologist at a local health department and will be expected to participate in the emergency response activities associated with this emerging hurricane situation. This developed scenario is based upon actual emergency situations that have been modified for the purposes of this training course. This scenario will be used to work through considerations for health impacts of a hurricane and impacted populations in lesson five and conducting data analysis and reporting in lesson six.

For additional information and background reading on hurricane season preparedness, response, and recovery please see reference 13: “Hurricane Season Public Health Preparedness, Response, and Recovery Guidance for Health Care Providers, Response and Recovery Workers, and Affected Communities – CDC, 2017”.

LESSON FOUR REVIEW

In this lesson, the role of epidemiology in the incident and post-incident stages of the disaster management cycle was explained. The “Public Health Emergency Preparedness and Response Capabilities” report and how the response capabilities are performed by epidemiologists were described. The lesson also detailed ways epidemiologists may respond in NIMS/ICS activation. Finally, a hurricane emergency scenario for use in activities throughout the remaining lessons was introduced.

LESSON FIVE PREVIEW

The upcoming lesson will describe direct and indirect effects of emergencies on population and individual health. It will describe disproportionately impacted populations and why they may be disproportionately impacted and provide information on the access and functional needs framework for helping these populations. Then the lesson will use this information to consider these populations and emergency planning efforts in the context of a hurricane scenario.

notes

LESSON 5

Impacted Populations, Special Considerations, and the Health Impacts of a Public Health Emergency

GOAL OF LESSON:

Consider the health impacts of different kinds of emergencies and how to identify disproportionately impacted populations and their preparedness needs.

LEARNING OBJECTIVES:

- Examine hazards and risk factors that impact populations in public health emergencies
- Review different population characteristics that may lead to disproportionate health impacts
- Demonstrate knowledge of health impacts of emergencies and population-specific access and functional needs

PUBLIC HEALTH IMPACTS OF EMERGENCIES[14]

Emergencies can cause environmental damage that leads to environmental hazards. These hazards can impact populations and lead to public health impacts either directly due to the emergency (**primary hazards**) or due to conditions resulting from the emergency (**secondary hazards**) that may persist long after a disaster impact.

Emergencies can also cause health impacts either directly (caused by the event itself) or indirectly (caused by a condition or exposure from the disaster) that may not be observed until long after the disaster impact.

ENVIRONMENTAL HAZARDS ASSOCIATED WITH EMERGENCIES[14]

Emergencies can result in environmental hazards of two types, called primary and secondary hazards.

PRIMARY HAZARDS are the direct result of the event and include physical forces including fire, flooding, damage to structures, bombs, chemical or biological release.

SECONDARY HAZARDS occur after a public health emergency due to the event but not directly and can include several types of impacts.

1. **Contamination of air and water-** include pipeline rupture, loss of containment of radiological or chemical materials from structural damage or power loss, and release of chemicals due to a natural disaster. These hazards require clean-up and can lead to temporary or permanent displacement of populations depending on the severity of the contamination.
2. **Changes to ecosystems-** a result of flooding or droughts or heatwaves that can change the reservoir areas for animals, fish, pests, etc. that can lead to future events (such as wildfires, vector borne disease outbreaks, or soil erosion).
3. **Presence of vectors or pests-** resulting from additional water sources (mosquitoes) or solid waste and debris from an emergency or supplies used during response. This can lead to outbreaks of disease or injury from debris.
4. **Damage to infrastructure-** can occur after a disaster and prevent use of roads and other methods of transportation, clean water systems, health care facilities, and other resources that can impact response or recovery by preventing access to necessary resources, health care, or materials.
5. **Worsening of structural inequities-** during an emergency which can impact access to resources (food, safe housing, childcare, clean water, etc.).
6. **Presence of waste and debris-** resulting from the disaster event (flooding, tornado, hurricane, fire, etc.) that can cause injuries, serve as a reservoir for vectors or pests, and be expensive to remove.

notes

EMERGENCY ASSOCIATED HEALTH IMPACTS[14]

Like the environmental hazards associated with emergencies, health impacts can be divided into two categories: direct and indirect. Emergencies can cause both morbidity and mortality either through direct or indirect means

DIRECT HEALTH IMPACTS are caused directly by the emergency during the emergency in the short-term and can include:

1. Chemical, biological, radiological, or nuclear exposure during the emergency
2. Injuries (cuts, broken bones, blunt force trauma, burns, crushing) caused by the disaster incident
3. Hypothermia or hyperthermia
4. Drowning due to floods, hurricanes, tsunamis, etc.

INDIRECT HEALTH IMPACTS result from unsafe or unhealthy conditions in the response to or after the emergency in either the short-term or long-term depending on the duration of the hazardous conditions resulting from the emergency. These can include acute or chronic health impacts such as:

1. Injuries not directly from the disaster (such as from evacuation or cleaning efforts) during the short-term
2. Chemical or other exposure from cleaning efforts or buildings damaged during the disaster in the response or ongoing exposure
3. Environmental hazards including debris, vectors, unsafe water, etc. as described above that can result in injury, illness, or disease
4. Shortages in resources or restricted access to healthcare services and interruption of services/continuity of care
5. Exacerbation of chronic health conditions including asthma, cardiac issues, mental health or behavioral health issues, substance abuse, violence, etc. acutely after the disaster or for a prolonged period

RISK FACTORS FOR HEALTH IMPACTS IN EMERGENCIES[14,16]

Risk factors for health impacts including morbidity and mortality will depend on the hazard (in this case the emergency event), the exposure (whether an exposure happens, for how long, how severe it is, etc.), and the susceptibility or vulnerability of the individual to a particular health impact. Specific risk assessments involving many factors are needed therefore it is not possible to predict or detail all the possible combinations of hazards, exposures, and vulnerable or susceptible individuals in this training course. However, the CDC, FEMA, OSHA, and other organizations provide great resources relating to specific emergency or disaster situations, possible exposures, and individuals, populations, or occupations that may be more susceptible to or vulnerable to specific disasters that can be incorporated into emergency planning and jurisdictional risk assessments. Some considerations for risk factors associated with those health impacts previously identified are provided below.

notes

DIRECT HEALTH IMPACTS

1. **Chemical, biological, radiological, or nuclear exposure-** if the disaster event involves an exposure to these sources such as at work, health impacts may vary based on how close individuals were to the source, what dose or concentration they were exposed to, and specific populations (children, pregnant persons, people with skin conditions, and older individuals) since they may be more susceptible to injury based on their skin permeability/integrity.
2. **Injuries-** individuals who do not have access to shelter or who are outdoors during natural disasters while working will be more vulnerable to direct injury caused by the disaster (such as being struck by debris or burned by fires).
3. **Hypothermia or hyperthermia-** individuals who do not have access to shelter or who are outdoors while working during extreme heat or cold are more vulnerable to hypothermia or hyperthermia.
4. **Drowning-** individuals who do not have access to shelter or who are outdoors during floods may be swept away in their vehicles by water and drown.

INDIRECT HEALTH IMPACTS:

1. **Injuries (during evacuation or cleaning)**- individuals without emergency plans may be more likely to operate under stress during an emergency and can injure themselves when preparing to evacuate while in their homes or due to car accidents.
2. **Chemical or other exposure (during cleaning or a release)**- individuals who are not properly trained on cleaning with disinfectants or who do not have the appropriate PPE may be exposed to chemicals leading to health impacts. Individuals living near chemical manufacturing or nuclear facilities may have a more significant chance of exposure to these materials due to a release from damage during a disaster.
3. **Environmental hazards-** individuals who live in areas where debris cleanup is delayed may be bitten by mice or rats who are living in the debris and waste, which can lead to infections.
4. **Exacerbation of chronic conditions (including asthma, cardiac conditions, mental health symptoms)-** individuals with these chronic conditions will be more susceptible to exacerbation during a disaster.

In the emergency planning process, it is important to conduct a risk assessment to consider the disaster (or hazard), all the potential exposures and types of exposure, as well as what individuals or populations may be impacted by the disaster and what types of health impacts are common with that type of emergency.

notes

Hurricane Activity 1: Health Impacts and Risk Factors

Consider our hurricane scenario:

- What are some direct health impacts?

- What are some indirect health impacts?

- What are some risk factors for morbidity and mortality associated with the emergency?

Please return for the second video of Lesson 5

DISPROPORTIONATELY IMPACTED POPULATIONS[16,17]

In emergencies and disasters many populations will be impacted but there are certain individuals or populations who may be **disproportionately impacted** based on characteristics of the individual or population. An individual or population's impact may differ depending on the emergency and their status as having one or multiple of the criteria listed.

notes

Additionally, other populations may be disproportionately impacted based on the emergency and other individual factors (such as their occupation). While planning for emergency situations, consider these categories of individuals and populations that may be disproportionately impacted by the emergency.

Children- have different communication skills, instincts, medical needs, and physical and mental abilities than adults based on their developmental stage.

Pregnant persons- may lack access to necessary medical care and prenatal records in an emergency, which can lead to medical issues in childbirth and increased mental distress.

Older adults- may be more likely than younger individuals to have chronic illnesses, functional needs, or disabilities that can affect their mobility and ability to evacuate and, prepare for disasters. They may require medical treatment or equipment that can be impacted during disasters.

People with disabilities (including physical or mental impairment that limits one or more major life activities)- may have difficulties in understanding and preparing for disasters or physically being able to respond or evacuate without assistance.

People with chronic health conditions- may rely on medication or electricity-dependent medical equipment (such as a ventilator, dialysis machine, or wheelchair) that can be unavailable or disrupted during an emergency. Additionally, necessary medical care may be reduced or unavailable in the aftermath of a disaster.

People with limited English proficiency- may not understand risk communication messaging based on language knowledge or cultural beliefs and values.

People with limited financial resources- may not be able to prepare for emergencies based on recommendations due to their financial situations (such as gathering emergency food and water supplies to shelter-in-place). Additionally, lower income populations may experience more health inequities and untreated medical conditions that can be exacerbated.

People without access to transportation- may be unable to evacuate in an emergency if relying only on public transportation or do not have access to their own vehicles.

People experiencing homelessness- may be unable to evacuate in an emergency and may also be impacted because they are in other groups described above.

People who have been historically under resourced- may lack access to medical and other professional services as described in other groups above.

notes

ACCESS AND FUNCTIONAL NEEDS (AFN) FRAMEWORK[16]

In 2011, the United States adopted a "whole community" approach to emergency management which describes preparedness as a shared responsibility among individuals and families, businesses, faith-based and community organizations, nonprofit groups, schools and academia media outlets, and all levels of government. This includes individuals with access and functional needs, which refers to people with or without disabilities who may need additional assistance because of a temporary or permanent condition that can impact their ability to respond in an emergency. Individuals with AFN may be disproportionately impacted by disasters, as described in the previous section.

The CMIST framework was developed to plan for five basic functional needs categories:

1. **Communication-** individuals who speak sign language, have limited English proficiency, or have issues speaking, hearing, seeing, or understanding.
2. **Maintaining health-** individuals who need medications or medical supplies (durable medical equipment and electricity-dependent equipment).
3. **Independence-** individuals who need assistance from mobility devices, assistive technology, vision or communication aids, and service animals.
4. **Safety, support, self-determination-** individuals who require caretakers or other personal assistance care, have high levels of distress or existing mental or behavioral health issues, or have past experience with trauma.
5. **Transportation-** individuals who do not have personal vehicles or cannot drive (due to mobility issues, disability, temporary conditions, injury, or legal restrictions).

Additional resources for equitable emergency preparedness and response activities include FEMA's Equity National Preparedness web page, the Racial Equity Impact Assessment Toolkit and A Scoping Literature Review on Indicators and Metrics for Assessing Racial Equity in Disaster Preparation, Response, and Recovery eBook.

notes

Hurricane Activity 2: Disproportionately Impacted Populations

Consider our hurricane scenario:

- What populations may be disproportionately impacted from our emergency? Why?

- What considerations can you make during emergency planning activities to account for these populations?

Please return for the third video of Lesson 5

LESSON FIVE REVIEW

In this lesson, the direct and indirect effects of emergencies on population and individual health were described. Disproportionately impacted populations were described and why they may be disproportionately impacted and the access and functional needs framework for helping these populations was explained. Additionally, the lesson considered these populations and emergency planning efforts in the context of a hurricane scenario.

LESSON SIX PREVIEW

The upcoming lesson will describe types of surveillance needed during an emergency and the challenges associated with these data sources and disaster data collection. Then it will provide sources of available national data and specialized disaster data and review data collection tools and how to plan for data analysis and reporting during an emergency. Finally, the lesson will evaluate cases of hurricane-associated disease and ask participants to create a short report on the investigation.

notes

LESSON 6

Data Sources, Rapid Needs Assessment Tools, and Data Analysis in a Public Health Emergency

GOAL OF LESSON:

To outline available sources of data, rapid needs assessment and surveillance tools. To consider data analysis and reporting in real time during an emergency.

LEARNING OBJECTIVES:

- Identify sources of data collection during an emergency response
- Name specialized surveillance tools for disasters
- Review data collection and entry for surveillance tools
- Practice disaster surveillance data analysis and presentation

TYPES OF SURVEILLANCE[3-5]

There are many types of surveillance that can be useful in emergency situations. These methods may be commonly used in other types of epidemiologic surveillance but adapted or modified to address the emergency situations.

Sentinel surveillance uses selected hospitals, clinics, or participants to provide information on specific health impacts that may be associated with the disaster from a limited number of potential cases. However, this may miss rare events or common events if the sites are not representative of the affected populations.

Syndromic surveillance uses case definitions, chief complaints, or specific signs and symptoms of health impacts and does not wait for formal laboratory or clinical diagnosis. This type of surveillance may be less specific for particular morbidities or can misclassify cases, however, it can provide rapid information to detect outbreaks in early stages and quickly impact the response.

Mortality surveillance specifically determines the rate of death associated with the emergency and can help to provide the scope of the emergency and be used to prevent future deaths.

Morbidity surveillance determines the rate of disease, illness, or injury associated with the disaster. Common reporting of morbidity surveillance includes incidence, prevalence, and rates based on age, sex, and/or location).

Shelter surveillance may include the previously mentioned types of surveillance applied in a shelter situation. This surveillance can be used to identify outbreaks or other health impacts, track populations, and evaluate the health and safety of shelter environments.

Responder health surveillance is performed to assess the impact of response activities on emergency responders' health. The CDC has created the Emergency Responder Health Monitoring Surveillance (ERHMS) framework to assist in this evaluation.

Retrospective surveillance can be used after an emergency to assess the full burden of the morbidity and mortality associated with the disaster. During an active emergency response, it may not be possible to collect all the data that may be available after diagnoses have been made, deaths or disease have been attributed to the disaster, or the long-term indirect health impacts of the disaster are fully realized. This surveillance can be important to prepare for future disasters and preparedness or prevention efforts.

Case investigations can be performed during an emergency to assess the impacts of a disaster and identify potential exposure events that may be related to the morbidity or mortality that has been identified from other surveillance activities.

notes

Thought Prompt 1: Useful Data Sources

- What types of data sources do you think may be useful in emergencies and/or disasters?

- What are the benefits to using one data source over another type?

Please return for the second video in Lesson 6

DATA SOURCES[4]

Before conducting surveillance activities in an emergency, consider researching or reviewing existing data sources that may be available to use that are already collecting the information that is needed. These data sources may include

- national data (such as the census or health surveys)
- emergency data (social vulnerability index or community assessment for public health emergency response (CASPER)
- available mortality, morbidity, and shelter assessment forms
- existing rosters or registries

Ensure that the data sources are appropriate for the type of surveillance that will be conducted by considering both direct and indirect health impacts of the emergency, some of which may not be seen for an extended period of time after the disaster impact.

notes

DISASTER SURVEILLANCE DIFFICULTIES[4]

Although there are many types of surveillance data that can be collected or accessed in an emergency, it may be difficult to obtain this data because of the disaster scenario due to several factors described by the CDC, including:

1. Lack of time to collect, analyze, and report surveillance data during emergency response.
2. Lack of prioritization for surveillance activities and provision of resources needed for conducting surveillance due to other partners' needs during an emergency response.
3. Lack of baseline data for the population to determine the threshold for reporting increases in disease or assess the negative health impacts.
4. Lack of denominator data due to changes in the population related to the disaster will impact the ability to generate accurate rates.
5. Non-standardized data collection and reporting may occur during emergencies due to differences in collection by jurisdictions if not planned for during preparedness activities.
6. Underreporting during emergencies due to the complexity of certain diseases and lack of access to care may suppress the effectiveness of surveillance and underestimate the scope of the health impacts related to the emergency.
7. Availability of financial resources to conduct surveillance and test specimens during an emergency may impact the ability of epidemiologists to conduct surveillance.

Damage to infrastructure can wipe out healthcare facilities and/or records that prevent reporting of health impact due to lack of access to care, records, or ability to securely transmit data.

In general, data may be collected and provided by public health and other sources in a range of different ways that can create gaps in surveillance including during disasters. The CDC's Data Authority modernization would allow the CDC to have legal access to data elements in a nationally coordinated way. Collaboration with the CDC and other federal partners may be necessary during a public health emergency which can impact or alter the needs for data collection and analysis.

notes

LOCATING AVAILABLE NATIONAL DATA[4]

There are many sources of existing national data that can be used for surveillance activities that collect useful information for emergency response and surveillance. These data sources can provide information on the demographics of impacted populations, frequency of chronic conditions, increases in disease (or syndrome) identification, and preparedness activities and attitudes. The data may serve as baseline measures to set population thresholds, identify disproportionately impacted populations including those with chronic health conditions, and be used to identify population denominators. Examples of these available national data sources include:

1. Mortality tracking such as from state vital statistics and electronic death registration systems.
2. The Behavioral Risk Factor Surveillance System (BRFSS) which collects information on health-related risk behaviors, use of preventative services, and chronic health conditions.
3. The United States Census collects demographic information of the population including race and ethnicity, living arrangements, and on social determinants of health.
4. The National Health and Nutrition Examination Survey (NHANES) collects information and laboratory samples related to specific diseases and conditions, environmental exposures, and infectious diseases.
5. The Pregnancy Risk Assessment Monitoring System (PRAMS) collects information to monitor the health of mothers and infants, which is not available in other data sources.
6. The National Syndromic Surveillance Program (NSSP) and the BioSense Platform are commonly used to rapidly detect public health impacts of infectious diseases and other syndromic data such as opioid overdose, disaster-related health impacts, and lung injury caused by e-cigarette or vaping products.
7. FEMA's National Household Survey which collects information on disasters, emergency preparedness, hazard mitigation, and individual and public assistance programs and grants.
8. The National Wastewater Surveillance System (NWSS) which tracks the presence of SARS-CoV-2 in wastewater samples across the US.

notes

SPECIALIZED DATA SOURCES FOR EMERGENCIES AND DISASTERS[5,19,20]

There are also resources and data collection tools that are specific for emergencies and disaster epidemiology surveillance activities. CSTE has collected a number of resources in their "Disaster epidemiology tool and resource repository" web page to centralize emergency data collection tools and other disaster epidemiology resources. Specific emergency data sources include:

1. The Assessment of Chemical Exposures (ACE) was developed to evaluate exposure to hazardous materials (biological, chemical, nuclear, radiological, or other), symptoms, and health needs.
2. The Community Assessment for Public Health Emergency Response (CASPER) is a rapid needs assessment that may be implemented to evaluate the effects of an emergency, the health status and needs of a population, and the response and recovery efforts.
3. The Emergency Responder Health Monitoring and Surveillance (ERHMS) toolkit contains information on surveillance activities for emergency responders relating to the stage of the emergency. Responders may face unique or exacerbated hazardous exposures because of their proximity to hazards and the duration of their response to emergency situations.
4. The Reproductive Health and Disasters (RHAD) Assessment Toolkit 2.0 was developed to evaluate the health needs of women of reproductive age, pregnant or postpartum persons, infants, and individuals caring for infants who have been impacted by a disaster.
5. The Environmental Health Assessment for Disaster Shelters is a rapid needs assessment for evaluating health threats in shelter situations including considerations for facility adequacy, food and drink, health or medical issues, waste management, sanitation and hygiene, childcare facilities and resources, and other health topics.
6. The Social Vulnerability Index (SVI) was created to assist emergency responders to plan for the needs of individuals who may be disproportionately impacted by an emergency or disaster. This includes information to assist in estimating supplies, how many responders may be needed, where to locate shelters and how to evacuate individuals with access and functional needs. The SVI incorporates geographic information systems (GIS) to map vulnerability by scale and location.

Other GIS tools (such as ArcGIS) may be useful in mapping, categorizing, and presenting emergency response surveillance data as well as conducting CASPERs. As with all surveillance activities it is important to ensure that data security and privacy rules are followed when collecting, sharing, and reporting emergency surveillance data. Ensure that you understand your jurisdiction's rules and that you are able to communicate these to other partners and the public if necessary.

notes

Traditional surveillance activities and resources can also be adapted to emergency situations including community health assessments, mortality and morbidity surveillance, syndromic surveillance, and case investigations and contact tracing. Many, if not all, of these data sources and tools require collaboration and partnership with other partners or the impacted population(s) to effectively implement. These relationships are best built over time and in emergency preparedness activities rather than during a response when the rapport to use these tools and conduct community assessments is actively needed. Whenever possible, use established partnerships through your health agency to support and assist in your epidemiologic surveillance activities.

CASPER INTRODUCTION[5,20]

The CASPER is a useful tool to perform a rapid needs assessment at the household level to determine community needs in an emergency response. It uses a two-stage cluster sampling methodology. In the first stage, clusters of 30 are selected from available census or other GIS data source with their probability proportional to the estimated number of households in the clusters, which must be non-overlapping sections of households in a geographic area (such as census blocks). In the second stage, seven households are selected to be interviewed by dividing the number of households in the cluster by 7 and counting that N households through the cluster to go to door-to-door with the questionnaire. Typically, CASPERs follow this 30x7 format but it may be modified to include different multiples for interviews (such as 14 or 21), or the structure may be changed if it is assessed that this will still be a CASPER.

The CDC has many available CASPER questionnaires that are available based on specific disasters or emergencies, but these may be added to as determined by the surveillance team and responders.

notes

Data Sources Activity 1: Hurricane CASPER Assessment

Review the provided CASPER assessment hurricane example. What questions do you see relating to emergency management that we have covered in other lessons:

- Preparedness activities?

- Access and functional needs?

- Direct and indirect health impacts?

- Primary and secondary environmental hazards?

Please return to the second video of Lesson 6 at 11:27

notes

CASPER DATA ANALYSIS[5,20]

CASPER is designed to evaluate weighted frequencies, percentages, and 95% confidence intervals for the interview questions that can be performed quickly and easily using statistical software that can perform multistage sample design weighting. The CDC recommends using Epi Info which is a free tool to analyze CASPER data. Once at least 80% of the CASPER has been completed (168 out of 210 interviews) a weighted formula can be used to analyze the data. If fewer than 5 observations are identified in cells they should not be presented in the results.

CASPERs may be combined and pooled for analysis through meta-analytic approaches. If identical questions were asked on different CASPERs of independent samples the results can be compared. For more information on analyzing CASPER data consult: https://www.cdc.gov/nceh/casper/phase34.htm

Data Sources Activity 2: *Vibrio* Outbreak Case Surveillance

The storm made landfall in South/Southeast Texas as a Category 4 hurricane on August 20th causing substantial devastation and flooding. While conducting surveillance you notice several cases of wound infection caused by Vibrio species being reported in local hospitals that you flagged to investigate.

- What questions might you ask in a case investigation?

- What would your case definition of wound-associated illness be?

- What does this outbreak of disease look like? Make an epidemic curve

Please return for the third video of Lesson 6

notes

POTENTIAL DATA SOURCES

Many of the national and specialized data sources that have been detailed could have been the source of the surveillance data that identified the outbreak of wound-associated Vibrio infections. Multiple sources of data may be accessed and needed during an emergency to get a full picture of the health impacts and needed response activities.

As described in this lesson, results from a hurricane CASPER could have identified injuries or illness caused during the storm or during cleanup afterwards in the community, which could lead to further data investigation within the BioSense Platform. When individuals sought care for skin or wound infections in the area in the wake of the hurricane, the data could be collected and entered into the BioSense platform which would allow local epidemiologists to conduct syndromic surveillance. An increase in chief complaints or diagnosis codes that resemble the other wound infections, concurrent with a hurricane impacted location, could signal an outbreak caused by the hurricane event.

Finally, an increase in cases or identification of a local outbreak may have occurred when conducting environmental health assessment for disaster shelter surveillance. This assessment includes questions about shelter residents that are ill, have injuries, or other reported illnesses/outbreaks that could call attention to an outbreak of wound infections associated with the hurricane response.

This is just an example of the ways in which these national and specialized data sources may be used concurrently to identify the impacts of emergencies. Other data sources outlined in this lesson may be useful in different types of emergencies and provide different or additional data to support epidemiologic activities.

PLANNING FOR DATA ANALYSIS[4]

Data analysis during an emergency response may prove difficult if there is not prior planning for how to evaluate and use this data. It is beneficial to analyze surveillance data by person, place, and time to provide a context for the surveillance to allow for quick analyses and reporting to help impact the response or recovery.

Be sure to consider the frequency of reporting needed based on emergency phase. Early in response the data analysis and reporting may be required daily to shape the emergency response efforts and mitigate existing health threats, while later in the response or recovery efforts it will taper back to weekly or even less frequently.

notes

Performing descriptive data analyses is useful because they are easy to complete and provide actionable data. Stratifying this analysis by sex, age, vulnerability, affected populations, and context (e.g., shelter vs. non) will allow for broad data presentation. Then focusing on groups that may be disproportionately impacted will help to better understand the factors that are contributing to those health impacts and evaluate whether mitigation actions can be put in place to reduce the burden.

Frequencies are often calculated to analyze disease, illness, or injury because they are simple and easy to understand. These frequencies are commonly used in epidemiologic analyses and include:

1. **Incidence-** measures new cases in a population
2. **Prevalence-** measures existing cases in a population
3. **Rates** can allow you to compare frequency in different populations, places, or times to understand the risk and burden of the health impacts

Reviewing for abnormalities in your surveillance data can identify whether there is an unusual situation based on bias or an actual health impact to the population. Increases in health condition frequency after an emergency should be reviewed to determine if these impacts require public health action. To assist in data analyses, consider using alert thresholds from the population to assess whether the increase in cases is beyond a normal baseline level and could be attributed to the disaster.

PLANNING FOR DATA REPORTING[4]

During an emergency situation that is rapidly unfolding, surveillance data that reveals health impacts should be shared quickly to mitigate the negative consequences.

As part of emergency preparedness activities, the partners who need to hear about the surveillance data should be identified and may include other public health agencies, government officials, individuals involved in the response, the populations affected, and the media.

When reporting data in a disaster, it is important to communicate a few specific items in a manner that is easily understood for all partners. These pieces of information include:

1. The source of the data and any limitations
2. Key findings from data analysis
3. What the findings mean in the context of the emergency
4. What actions are needed to mitigate future health impacts of the emergency

Consider including data visualization (graphs, databases, tables, GIS information) to assist partners to understand the information better and more quickly.

notes

Data Sources Activity 3: *Vibrio* Outbreak Short Report

Consider our *Vibrio* wound-associated outbreak and create a short report based on your findings:

- What is the source of the data and limitations?

- What is the case definition of disease?

- What were the key findings of your analysis?

- What do your findings mean?

- What actions are needed?

Please return to the third video of Lesson 6 at 7:52

notes

LESSON SIX REVIEW

This lesson described data sources, assessment tools, and information about data collection, analysis, and reporting in an emergency.

It also described the types of surveillance needed during an emergency and the challenges associated with these data sources and disaster data collection. Sources of available national data and specialized disaster data were provided. Also, the lesson reviewed data collection tools and how to plan for data analysis and reporting during an emergency. Then, participants evaluated cases of hurricane-associated disease and created a short report on the investigation.

LESSON SEVEN PREVIEW

The upcoming lesson will cover emergency recovery and how to utilize information learned from exercises and previous emergencies to improve future emergency preparedness.

The lesson will describe the importance of after-action review and after-action reports. It will detail the implications for this information in recovery and resilience activities. The participants will also practice writing an after-action report related to our flood scenario from lesson 3. Finally, it will wrap up the course and summarize the provided materials and the role of epidemiologists in emergency management.

notes

LESSON 7

Post-Event Debriefing and Reporting in a Public Health Emergency

GOAL OF LESSON:

Describe the need for after-action review (AAR) and reporting after a public health emergency.

LEARNING OBJECTIVES:

- Recognize the importance of after-action reviews (AARs) and debriefs
- Demonstrate the ability to write an after-action report

AFTER-ACTION REVIEW[23]

After action review (AAR) is an important component within the emergency management cycle in the recovery phase where the preparedness and response activities are evaluated, and lessons learned can be incorporated into future planning and resiliency activities. This AAR identifies both immediate actions needed to prepare as well as longer term actions that are needed to strengthen the capacity of the community and public health system. In some organizations, a review held immediately after an event or during a particularly long response may be referred to as a "hot wash". This activity is initiated often before a formal AAR can be conducted to capture initial comments, identify challenges, and lessons learned to date. Some organizations may use the terms AAR and hot wash interchangeably.

AAR is meant to be flexible and include the community and other partners. An AAR should address functional issues, not individual performance challenges that occur during response activities. The review may vary in scope and format but should cover:

- What the expected response was
- What actually happened in the response
- What went well and what did not and why
- How can the gaps be addressed immediately
- What needs to happen to improve future response activities

AFTER-ACTION REVIEW BENEFITS[23]

There are many benefits to conducting AAR in response to emergency activities as well as emergency exercises. AAR assesses factors that lead to what went well and what did not, it creates consensus on what follow-up is needed, and it documents lessons learned from the response or exercise. It includes multidisciplinary partners to allow for strengthening of relationships and future response. Additionally, it can be used to advocate for funding for future response, be used to improve future capacity in emergency preparedness and response activities, and support community capacity and engagement in future emergency activities.

TYPES OF AFTER-ACTION REVIEW[23]

According to the WHO there are different formats to after action review that vary in complexity and length.

Debrief AAR: The simplest type is a debrief AAR where a small group discussion that is facilitator-led occurs to review a small scope of response activities to focus on lessons learned and outcomes.

Working Group AAR: The working group AAR is interactive and structured in a way that groups a few individuals to specifically discuss different parts of the response activities and then shares results among the different partners and their experiences.

notes

Key Informant Interview AAR: Key informant interview AARs include literature and background review and then the use of surveys or interviews to obtain feedback on experiences from partners to put together the overall response picture.

Mixed Method AAR: And finally, a mixed-method AAR includes components from the three previously mentioned after-action reviews especially when all of the partners cannot convene together to discuss the incident or exercise.

These reviews should occur shortly after the response or exercise has concluded to be most useful and clear in the participants' minds. Following the discussion and review, a formal documented after-action report should be written that incorporates information from the AAR debrief and includes areas for improvement and corrective actions. No matter what format the AAR takes, notes should be taken during the review session by a dedicated notetaker and, if possible, the session should be recorded to facilitate notetaking.

AFTER-ACTION REPORT CONTENTS[23,24]

Once an after-action review has been completed a formal report should be written that details the AAR and lessons learned. This document includes:

1. Executive summary
2. Background summarizing the incident and timeline, relevant data/graphs and surveillance data, and a summary of the response
3. Scope and objectives of the AAR and why it was organized
4. Methods that were used to conduct the review
5. Findings of the review and accomplishments of the response
6. Recommendations for improvement identified
7. Next steps on how to implement the lessons learned and improvements identified
8. Conclusion to summarize the AAR and how improvements will be tracked

Ensure that when you are making recommendations for improvements that they are SMARTIE:

- **S**pecific- address who, what, where, when, and why and related to an objective,
- **M**easurable- include an action or outcome that can be measured,
- **A**chievable- be in the control of the individual assigned,
- **R**elevant- addresses the improvement goal for the deficiency,
- **T**ime-bound- include a specific, reasonable time frame for completion,
- **I**nclusive- include individuals and groups that may traditionally be excluded, and
- **E**quitable- include fairness or justice to address systemic injustice, inequity, or oppression.

For additional information on after-action review meetings and SMARTIE goals, please see the "FEMA Homeland Security Exercise and Evaluation Program After-Action Meeting" PowerPoint linked in Lesson 7 on CSTE Learn.

notes

After-Action Report Activity 1: Corrective Actions

You've been asked by a colleague to help with an after-action review of an emergency exercise that was conducted based on our objectives and evaluation criteria outlined in lesson 3. As a reminder, your objective was: to verify the ability to coordinate and train flood CASPER teams. To evaluate this objective, we came up with several evaluation criteria.

Objective	Evaluation Criteria	Outcomes
Verify the ability to coordinate and train flood CASPER teams	1. Did the volunteer coordination plan include training resources for our investigation team? 2. Were volunteers activated and able to congregate at a designated location? 3. How long did it take for volunteers to be notified? To arrive? To be trained? 4. Was the plan executed efficiently? 5. Was a lead volunteer manager identified? Did they provide appropriate training to the volunteers? Did they help coordinate other support staff to aid them in their duties?	1. No training resources were included in the volunteer coordination plan 2. Volunteers were easily activated and able to congregate at the designated location. 3. Volunteers were notified and arrived within an hour of activation, however time to be trained was very slow since no existing training resources were found in the plan. 4. Parts of the volunteer coordination plan were executed effectively (activation and assembly) but the training was not effective. 5. A lead volunteer manager was identified and provided training (after it was developed) and assisted in coordinating staff and supporting their activities.

- What is the largest area for improvement that you identified for this response exercise?

- What SMARTIE corrective action would you propose to address this identified need?

Please return for the second video of Lesson 7

notes

EPIDEMIOLOGY IN THE POST-INCIDENT PHASE[3,5]

As a reminder, the post-incident phase is after the disaster has occurred and the response is in progress or completed. The recovery may occur in stages and take a long time depending on the scope of the disaster, how severe health and environmental impacts were, and the overall damage to critical systems and infrastructure.

To aid in these post-incident phase activities, epidemiologists can use their skills to create tracking systems and registries either in the incident or post-incident phase to evaluate the longer-term effects of the disaster or an exposure and to identify ongoing care needs or public health interventions. These epidemiologic activities can integrate environmental health hazards, human exposures, and health outcomes to assist communities in recovering and preparing for future public health emergencies.

PUBLIC HEALTH EMERGENCY PREPAREDNESS (PHEP) AND RESPONSE CAPABILITIES REPORT[8]

As we described in previous lessons, the CDC developed emergency management capabilities that can be found in the Public Health Emergency Preparedness and Response Capabilities: National Standards for State, Local, Tribal, and Territorial Public Health report. In addition to covering preparedness and response capabilities, there are also specific capabilities relating to recovery activities that can be performed by epidemiologists including the ongoing tracking and monitoring discussed previously.

RECOVERY-SPECIFIC PHEP CAPABILITIES[5,8]

In the recovery phase of an emergency management cycle, an epidemiologist may be involved in identifying and monitoring community recovery needs and supporting recovery relating to public health for the community. Additionally, epidemiologists may be tasked to monitor and analyze the mitigation actions that were proposed during the response to determine their efficacy. Finally, monitoring responder safety and health after the incident response through surveillance is important to understand the lasting impacts of this emergency response on individuals who were critical in helping the community and preventing future damage. These capabilities can be demonstrated and aided through the creation of after-action debriefs and reports to describe key findings of epidemiologic surveillance, any mitigation activities, and the analysis of the effectiveness of these public health actions and interventions.

notes

CAPABILITY 2: Community Recovery

In the recovery phase of an emergency management cycle, an epidemiologist may be involved in identifying and monitoring community recovery needs and supporting recovery related to public health for the community. Epidemiology PHEP functions may include:

- Identify and monitor community recovery needs
- Support recovery operations for public health and related systems for the community

CAPABILITY 13: Public Health Surveillance and Epidemiologic Investigation

Additionally, epidemiologists may be tasked to monitor and analyze the mitigation actions that were proposed during the response to determine their efficacy. Epidemiology PHEP functions may include:

- Recommend, monitor, and analyze mitigation actions
- Improve public health surveillance and epidemiologic investigation systems

CAPABILITY 14: Responder Safety and Health

Finally, monitoring responder safety and health after the incident response through surveillance is important to understand the lasting impacts of this emergency response on individuals who were critical in helping the community and preventing future damage. Epidemiology PHEP functions may include:

- Monitor responder safety and health during and after incident response

LESSON 7 REVIEW

This lesson covered the importance of after-action review and after-action reports. It detailed the implications for this information in recovery and resilience activities. Then participants practiced writing an after-action report relating to the flood scenario.

notes

LESSON 8

Course Review and Evaluation

GOAL OF LESSON:

To review the full “CSTE Emergency Preparedness and Response Training for Public Health Epidemiologists” course and describe how this information can be applied. Throughout this course, the lessons have covered many topics related to emergency management and how epidemiologists may be called upon to assist in planning, responding. and recovering from a public health emergency.

LESSON TWO

In Lesson Two, the four phases of the emergency management cycle (including mitigation, preparedness, response, and recovery) and the three-phase incident management cycle (including pre-incident, incident, and post-incident) were discussed. These terms and information about what occurs in each phase provide a common language with other emergency responders and partners. It also briefly covered the National Incident Management System (NIMS) and the Incident Command System (ICS) which includes five functional areas (Command, Operations, Planning, Logistics, and Finance/Administration). This course is not a substitute for FEMA training, but it should have served as a reminder of these topics and the structure and terminology used in response to incidents using the ICS activation. For more information on these topics, please consider taking FEMA's IS-100C and IS-700B courses.

LESSON THREE

In Lesson Three, the incident management cycle framework was used to describe what types of epidemiologic activities occur in the pre-incident phase (including investigations, risk assessment and evaluation). The lesson described the field of disaster epidemiology which specifically applies epidemiology to disasters to investigate health impacts, conduct surveillance, prioritize response, and predict health impacts of future disasters. Then the lesson described the CDC's Public Health Emergency Preparedness and Response Capabilities report and focused on those activities relating to preparedness where epidemiologists can assist including community preparedness, information sharing, mass care, medical countermeasure dispensing and administration, nonpharmaceutical interventions, public health laboratory testing, public health surveillance and epidemiological investigation, responder safety and health, and volunteer management. It covered emergency exercise planning including types of exercises (discussion-based and operations-based), how to determine goals and objectives for exercises, and how to conduct and evaluate exercises.

LESSON FOUR

Then, in Lesson Four, the incident management cycle framework was used to describe the epidemiologic activities that occur during the incident phase where the response is needed including community and responder surveillance and rapid needs assessments. It covered the CDC's Public Health Emergency Preparedness and Response Capabilities report and focused on those activities relating to response and where epidemiologists may provide support. The lesson described a wildfire response and a vaccination point-of-dispensing (POD) ICS structure response plan where epidemiologists performed a lot of supportive activities including developing data assessment tools and collecting data through surveillance, issuing health notices to the public based on surveillance data and populations that may be disproportionately impacted, and evaluating health impacts to the population and responders.

notes

LESSON FIVE

Additionally, in Lesson Five, both environmental hazards (primary and secondary) that may occur during or in the aftermath of an emergency as well as direct and indirect health impacts of public health emergencies were covered. It discussed ways that individuals or populations may be disproportionately impacted by emergencies and the access and functional needs framework that assist with planning and preparing to address and assist individuals with their health needs during an emergency. The lesson also used a hurricane scenario to evaluate the direct and indirect health impacts, risk factors, and populations that may be disproportionately impacted by the hurricane.

LESSON SIX

Then, in Lesson Six, types of surveillance that are useful during emergencies and the difficulties with collecting epidemiologic data during a disaster were described. It detailed available national data sources (such as vital records and the census) as well as those that are specific for emergency surveillance (such as the assessment of chemical exposures (ACE) and the social vulnerability index). The lesson described CASPER (or Community Assessment for Public Health Emergency Response) which is a common tool to use to assess the impacts of an emergency and the needs of the community. Then it walked through a CASPER questionnaire for hurricane response and reviewed the relevance of the proposed questions to topics that we already covered of importance to emergency management including assessing access and functional needs, health impacts, and environmental hazards. Participants applied their epidemiologic surveillance skills and reviewed and evaluated a series of Vibrio wound-associated infections that occurred because of the hurricane by creating a case definition and an epi curve for the outbreak. The lesson discussed data analysis and reporting best practices and then used the outbreak to practice creating a short report about the infections that were identified.

LESSON SEVEN

Finally, Lesson Seven covered why after-action review is important and how AAR benefits future capacity and emergency management efforts. It covered the different types of AARs including debrief, working group, key informant interview, and mixed method. Then the lesson described the content that should be included in after-action reports including an executive summary, background on the incident, the scope and objectives, the methods, findings and accomplishments, improvement recommendations, next steps, and conclusions. Participants used an activity to review and evaluate a previous emergency exercise, detailed in lesson three, through after-action review. Finally, the lesson completed review of the incident management cycle and discussed the post-incident phase, and what recovery capabilities and activities epidemiologists may need to perform including tracking systems and registries.

notes

CONCLUSION

By completing this course you now have a better idea of the important role that epidemiologists play in emergency preparedness, response, and recovery efforts and what may be expected of you if you are called upon for these activities. If possible, consider applying these new skills by identifying upcoming exercises in your state or agency and reaching out to the point of contact to participate.

notes

GLOSSARY

- **Incident:** An occurrence or event, natural or manmade, that requires a response to protect life or property such as a hurricane or chemical spill. Public health uses incident and event interchangeably, however emergency management professionals do not.
- **Event:** A planned event such as a sporting event or a concert. Public health uses incident and event interchangeably, however emergency management professionals do not.
- **Emergency:** A potentially life-threatening event that requires immediate response but that is generally contained to a jurisdiction.
- **Disaster:** A larger-scale event that can overwhelm affected jurisdictions or span multiple jurisdictions that can disrupt societal function and cause human, material, or environmental damage.
- **Hazard:** A situation or thing that is likely to cause injury, illness, or damage upon its occurrence or exposure to it.
- **Risk:** The likelihood of an event or exposure to a hazard and its consequence or severity.
- **Threat:** A behavior, action, or thing that may cause harm that is often intentional and caused by the exploitation of a vulnerability.
- **Emergency Management:** The organized analysis, planning, decision-making, and assignment of available resources to mitigate (lessen the effect of or prevent), prepare for, respond to, and recover from the effects of all hazards. The goal of emergency management is to save lives, prevent injuries, and protect property and the environment if an emergency occurs.
- **Mitigation:** The first phase of the emergency management cycle that involves actions taken to prevent an emergency from occurring, reduce the chance of an emergency occurring, or reduce the damaging effects or consequences of the emergency if it does occur.
- **Preparedness:** The second phase of the emergency management cycle that involves actions taken to ensure an effective and efficient response to emergencies, minimize potential damages (including using forecasting or warning systems), equip emergency operations centers with necessary resources and supplies, and train and exercise responding personnel including epidemiologists and other public health professionals.
- **Response:** The third phase of the emergency management cycle that involves actions taken immediately after the onset of an emergency to implement preparedness and response plans, account for personal safety and wellbeing, reduce damage and the probability of secondary damage, and account for non-normal business and other operations.
- **Recovery:** The last phase of the emergency management cycle that involves actions taken to recover and restore to regular operations and activities after the emergency, evaluate preparedness and response to the emergency, and incorporate lessons learned into future planning and resiliency efforts.
- **Incident Management Cycle:** A three-phase cycle used to address public health emergencies based on the WHO's disaster management cycle that includes the pre-incident, incident, and post-incident phases.

GLOSSARY

- **Pre-Incident:** The first phase of the incident management cycle includes steps taken to plan for, prevent, prepare for, and mitigate emergency situations.
- **Incident:** The second phase of the incident management cycle occurs when an emergency has occurred, and a response is needed.
- **Post-Incident:** The last phase of the incident management cycle is after the emergency and its immediate response and includes efforts to recover, rehabilitate, and reconstruct after the incident.
- **Disaster Epidemiology:** The application of epidemiologic activities during any phase of the emergency management cycle with a focus on investigating the health effects of disasters, using surveillance and other methodologies to help plan, implement, and evaluate public health interventions in disaster situations, to track and identify health consequences and exposures from an event.
- **Discussion-Based (Exercise):** A type of emergency exercise used to orient participants with preparedness and response plans or changes in procedures, which include workshops or seminars and tabletop exercises.
- **Operations-Based (Exercise):** A type of hands-on emergency exercise that involves testing emergency preparedness and response plans, which include drills, functional exercises, and full-scale exercises.
- **Primary Hazard:** The direct result of an emergency or event that includes physical forces including fire, flooding, damage to structures, bombs, chemical or biological release.
- **Secondary Hazard:** A type of hazard that occurs after a public health emergency due to the event but not directly and can include several types of impacts including contamination of air and water, presence of vectors and pests, damage to infrastructure, and worsening of structural inequities.
- **Direct Health Impact:** Health effects that are caused by the emergency including exposure events, illnesses, and injuries.
- **Indirect Health Impact:** Health effects that result from unsafe or unhealthy conditions in the response to or aftermath of an emergency due to hazardous conditions.
- **Disproportionately Impacted (Populations):** Groups of individuals who through a permanent or temporary condition may be more susceptible or vulnerable to the damaging effects of an emergency based on their age, disability status, and other social determinants of health.
- **Access and Functional Needs (Framework):** A system that includes criteria to prepare and assist individuals who may need additional support in responding to an emergency through five categories of functional needs including communication, maintaining health, independence, safety, support, self-determination, and transportation.
- **After-Action Review:** A part of the recovery phase where preparedness and response activities are evaluated, and lessons learned are captured to incorporate into future planning and resiliency activities.

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