



Harvard School of Public Health  
Center for Public Health Preparedness

## **EPIDEMIOLOGY & SURVEILLANCE**

### **TRAIN THE TRAINER PROGRAM**

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CENTER FOR PUBLIC HEALTH PREPAREDNESS  
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# EPIDEMIOLOGY & SURVEILLANCE

## TRAIN THE TRAINER PROGRAM

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# EPIDEMIOLOGY & SURVEILLANCE

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### **WELCOME:**

Welcome to the Maine Train the Trainer Program, Epidemiology & Surveillance module. Before we begin, let us have introductions so we are better acquainted with one another.

### **INTRODUCTIONS & ICE BREAKER:**

In this exercise, you will be introducing the person next to you. Please turn to the person to your right or left and find out three items about them; a) their name b) primary position or role c) one of their favorite pastimes. With this information, please introduce this colleague to the larger group.

**Post-Introductions:** Now that we are introduced to one another, let us proceed with the presentation. I encourage each one of you to continue getting to know one another throughout the time that we are gathered here today.

### **PRESENTATION OVERVIEW:**

This presentation has been prepared by the Harvard School of Public Health Center for Public Health Preparedness to provide an overview of Epidemiology & Surveillance. This presentation is intended for use by individuals for personal education, or by educators and trainers to present to a class of students.

The content has been developed for public health professionals, but should prove beneficial to all hospital personnel, first line-responders, and the general public interested in learning more about epidemiology and surveillance in emergency preparedness.

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### PRE-TEST QUESTIONNAIRE

This Pre & Post Test Questionnaire is designed to measure achievement of the Epidemiology & Surveillance learning objectives for this module by first measuring level of knowledge about the fundamentals of Epidemiology & Surveillance among training participants prior to receiving a training on this topic and measuring level of knowledge gained after participants have completed the training.

- Please complete this questionnaire and hand it back to your trainer.
- Please circle the correct answer from the answer choices provided.

#### 1. Epidemiology is the study of

- a) cellular response to epinephrine
- b) infectious diseases implicated in epidemics
- c) the distribution and determinants of disease

#### 2. Analytic epidemiology

- a) is the study of causal relationships between exposures and outcomes
- b) is not possible without first conducting descriptive epidemiology
- c) involves establishing and evaluating hypotheses
- d) all of the above

#### 3. An outbreak

- a) is a rash of unknown etiology
- b) is always bioterrorism-related
- c) is the occurrence of more cases of disease than expected
- d) is always foodborne
- e) will usually resolve without intervention

#### 4. Public health surveillance is important because it

- a) provides accurate assessment of baseline health status in a population
- b) allows for detection of an outbreak
- c) is a good way of identifying potential terrorists
- d) can be used to guide disease control and prevention measures
- e) a, b & d

#### 5. In Maine, health care providers must report cases of Notifiable Conditions directly to

- a) the patient's employer
- b) the Centers for Disease Control and Prevention in Atlanta, GA
- c) the Maine Bureau of Health, Division of Disease Control
- d) nobody – there are no notifiable conditions in Maine

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### **6. Syndromic surveillance is**

- a) surveillance for genetic syndromes such as Downs Syndrome
- b) a form of automated surveillance that uses data on symptoms rather than diagnoses to allow for earlier detection of an outbreak
- c) most effective when coupled with routine surveillance
- d) b & c

### **7. Outbreaks can be recognized by**

- a) review of routinely collected surveillance data
- b) astute observation of a sentinel event or cluster by a health care provider
- c) members of the community who observe an unusual trend in illness
- d) all of the above

### **8. A case definition**

- a) includes clinical information about the disease
- b) includes information regarding person, place, and time
- c) has subcategories of confirmed, probable, and possible
- d) all of the above

### **9. During an outbreak, control and prevention measures**

- a) should be implemented as soon as possible
- b) may include eliminating the source of disease
- c) should be consistent with the findings of the outbreak investigation
- d) may entail throwing away contaminated food
- e) may entail mass vaccination
- f) all of the above

### **10. One may suspect an outbreak to have been caused by bioterrorism if**

- a) it is caused by an uncommon agent with no alternative explanation
- b) unusual disease presentation is observed
- c) the organism implicated in the outbreak is of an unusual strain
- d) unusual geographic or seasonal distribution is observed
- e) all of the above

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### GROUP EXERCISE

#### Investigating an Outbreak

*Instructions: Read each section and answer the accompanying questions. Finish the questions for a section before moving on to the subsequent sections. Do not read ahead!*

On the evening of April 18, Dr. Volandes, the emergency department attending at Maplewood Hospital is troubled by an influx of patients all presenting with nausea, diarrhea, abdominal pain, fever and headache. Though their symptoms indicate a typical gastroenteritis, it is the number of patients with the same apparent illness that alarms Dr. Volandes.

Question 1: *What action should Dr. Volandes take at this time?*

A law-abiding physician, Dr. Volandes knows that a suspected foodborne outbreak is a Category 1 Notifiable Condition in the state of Maine. Dr. Volandes telephones this report to the Bureau of Health prior to the end of his shift on Monday morning. Upon receiving Dr. Volandes' report, Dr. Regan, the Regional Epidemiologist begins investigation of this potential epidemic.

Question 2: *What should Dr. Regan do to determine if the cluster of patients with gastroenteritis reported by Dr. Volandes is indeed an epidemic?*

Dr. Volandes knew enough about investigating an outbreak to order that fecal specimens be obtained for all of the patients he saw presenting with gastroenteritis on Sunday night. On Monday afternoon, the Laboratory Technician at Maplewood Hospital calls Dr. Regan with the results. It turns out that *Salmonella enterica* was isolated in the fecal specimens for 17 of the 18 gastroenteritis patients seen by Dr. Volandes. Dr. Regan has names and contact information for these patients from Dr. Volandes' reports. She begins the process of contacting these patients.

Question 3: *What questions should Dr. Regan ask these case-patients in order to establish a case definition for this outbreak and identify any additional cases?*

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### GROUP EXERCISE

#### Investigating an Outbreak, Continued

At this point all but one of the 17 case-patients had been sent home to recuperate. One 81 year old woman was very ill and kept at Maplewood Hospital for treatment. Telephone calls to cases-patients reveal that all had attended a luncheon at a local church the previous day. The spouse of one of the patients, not ill herself, had organized the luncheon and gave the roster of all attendees to Dr. Regan. Dr. Regan contacts all church luncheon attendees and finds that 36 of the 48 attendees were suffering symptoms consistent with *Salmonella enterica*.

Dr. Regan contacts the luncheon organizer again to learn more about the foods that had been served at the luncheon. Upon obtaining a list of all dishes, Dr. Regan contacts all luncheon attendees once again and asked them about what they ate at the luncheon. It turns out that 32 of the 36 case-patients drank coffee at the luncheon, while only 4 of the 12 luncheon attendees who did not become ill drank coffee. Based on this information, Dr. Regan hypothesizes that the coffee was the source of the *Salmonella enterica*. However, she is perplexed by the facts that 4 coffee drinkers did not get sick, and 4 of the case-patients did not drink coffee.

Question 4: *What do you think of the coffee hypothesis? What are some alternate hypotheses that Dr. Regan may wish to pursue?*

On a hunch, Dr. Regan contacts all luncheon attendees again and finds out that the 32 coffee drinkers who got ill took their coffee with cream, while the 4 coffee drinkers who did not get ill took their coffee black. Furthermore, the 4 case-patients who did not have coffee did have tea with cream. Dr. Regan revises her hypothesis based on this information, and sets out to obtain more evidence that cream was the source of the *Salmonella enterica*. On Wednesday afternoon, the luncheon organizer agrees to give Dr. Regan access to the church hall.

Question 5: *What should Dr. Regan look for at the church hall? What samples should she take back to the State Laboratory?*

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### GROUP EXERCISE

#### Investigating an Outbreak, Continued

Dr. Regan takes the opened carton of cream that had been used at the luncheon. She also takes the jug that had been used to dispense the cream. To Dr. Regan's surprise, both the carton of cream and the jug tested negative for *Salmonella enterica*. The jug was less of a surprise as it had already been thoroughly washed following the luncheon, but she had been certain about the cream. Dr. Regan returns to her office to a call from Maplewood Hospital that the 81 year old woman has died. Stumped by the lab results, Dr. Regan's thoughts are interrupted by an excited colleague, urging her to turn on the television. On the television is a news report that the previous day, a man had been caught pouring a vial of what has just been identified as *Salmonella enterica* into the jug cream set out for coffee at a church reception in a nearby town. Dr. Regan immediately contacts the Regional Epidemiologist covering the case and finds that the strain of *Salmonella enterica* is identical to that causing the outbreak she is investigating.

*Question 6: Now that bioterrorism is suspected, how does the interagency coordination change in this investigation? With what other agencies will Dr. Regan now be collaborating?*

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### POST-TEST QUESTIONNAIRE

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- Please complete this questionnaire and hand it back to your trainer.
- Please circle the correct answer from the answer choices provided.

#### 1. Epidemiology is the study of

- a) cellular response to epinephrine
- b) infectious diseases implicated in epidemics
- c) the distribution and determinants of disease

*Answer: c) epidemiology is defined as the distribution and determinants of disease.*

#### 2. Analytic epidemiology

- a) is the study of causal relationships between exposures and outcomes
- b) is not possible without first conducting descriptive epidemiology
- c) involves establishing and evaluating hypotheses
- d) all of the above

*Answer: d) analytic epidemiology is the study of causal relationships between exposures and outcomes, and it involves establishing hypotheses and evaluating these hypotheses using formal statistical methods. It is not possible to conduct analytic epidemiology without first collecting data on person, place, and time, a practice referred to as descriptive epidemiology.*

#### 3. An outbreak

- a) is a rash of unknown etiology
- b) is always bioterrorism-related
- c) is the occurrence of more cases of disease than expected
- d) is always foodborne
- e) will usually resolve without intervention

*Answer: c) an outbreak is the occurrence of more cases of disease than expected over a defined period of time.*

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### 4. Public health surveillance is important because it

- a) provides accurate assessment of baseline health status in a population
- b) allows for detection of an outbreak
- c) is a good way of identifying potential terrorists
- d) can be used to guide disease control and prevention measures
- e) a, b & d

*Answer: e) public health surveillance is important because it provides an accurate assessment of baseline health status in a population, and, using this baseline data allows for detection of an outbreak. Furthermore, public health surveillance can be used to guide disease control and prevention measures.*

### 5. In Maine, health care providers must report cases of Notifiable Conditions directly to

- a) the patient's employer
- b) the Centers for Disease Control and Prevention in Atlanta, GA
- c) the Maine Bureau of Health, Division of Disease Control
- d) nobody – there are no notifiable conditions in Maine

*Answer: c) in the state of Maine, all Notifiable Conditions by law must be reported directly to the Maine Bureau of Health, Division of Disease Control.*

### 6. Syndromic surveillance is

- a) surveillance for genetic syndromes such as Down's Syndrome
- b) a form of automated surveillance that uses data on symptoms rather than diagnoses to allow for earlier detection of an outbreak
- c) most effective when coupled with routine surveillance
- d) b & c

*Answer: d) syndromic surveillance is a form of automated surveillance that uses data on symptoms rather than diagnoses to allow for earlier detection of an outbreak, and is most effective when coupled with routine surveillance.*

### 7. Outbreaks can be recognized by

- a) review of routinely collected surveillance data
- b) astute observation of a sentinel event or cluster by a health care provider
- c) members of the community who observe an unusual trend in illness
- d) all of the above

*Answer: d) all of the above*

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### 8. A case definition

- a) includes clinical information about the disease
- b) includes information regarding person, place, and time
- c) has subcategories of confirmed, probable, and possible
- d) all of the above

*Answer: d) during an outbreak, a case definition includes clinical information about the disease, information regarding person, place, and time, and has subcategories of confirmed, probable, and possible.*

### 9. During an outbreak, control and prevention measures

- a) should be implemented as soon as possible
- b) may include eliminating the source of disease
- c) should be consistent with the findings of the outbreak investigation
- d) may entail throwing away contaminated food
- e) may entail mass vaccination
- f) all of the above

*Answer: f) all of the above*

### 10. One may suspect an outbreak to have been caused by bioterrorism if

- a) it is caused by an uncommon agent with no alternative explanation
- b) unusual disease presentation is observed
- c) the organism implicated in the outbreak is of an unusual strain
- d) unusual geographic or seasonal distribution is observed
- e) all of the above

*Answer: e) all of the above*

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### CLOSING EXERCISE:

- On a piece of paper list three things that you plan to do this coming month to prepare yourself or your agency to better assist in epidemiology and surveillance activities in your community.
  
- Now find a partner and share two things that you learned from today's session and share one thing that you plan to do this coming month. After 5 minutes, come back to the larger group.
  
- Each pair should share with the larger group the one thing (either an action item or a learned point) you found most enlightening. (*We all learn more from each other than what we could possibly learn by ourselves.*)
  
- Everyone, please take your own piece of paper on which earlier; you listed the three things you plan to do this next month. Crumple it up and put it in your purse, pocket, or briefcase agreeing to carry it with you for the next thirty days.

(It is amazing how often one cleans out one's purse, pocket or briefcase over a thirty day period, thinking, "What is this crumbled piece of paper here for?.....Oh, yes!!")

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### REFERENCES

- Gregg MB. *Field Epidemiology*, 2nd edition. New York: Oxford University Press; 2002.
- Rothman KJ & Greenland S. *Modern Epidemiology*, 2nd edition. Philadelphia: Lippincott – Raven; 1998.
- Teutsch SM & Churchill RE. *Principles and Practice of Public Health Surveillance*, 2nd edition. New York: Oxford University Press; 2000.
- Maine Bureau of Health Division of Disease Control [homepage on the Internet]. Augusta, ME: Department of Human Services; c2004 [cited 2004 April 21]. Notifiable Conditions Reporting. Available from: <http://www.state.me.us/dhs/boh/ddc/>
- Max DT. The Case of the Cherry Hill Cluster. *New York Times*. 2004 March 28; Sect. 6:50 (col. 1).
- EXCITE = Excellence in Curriculum Integration through Teaching Epidemiology [homepage on the Internet]. Atlanta, GA: Centers for Disease Control and Prevention; c2002 [cited 2004 April 29]. Steps of an Outbreak Investigation. Available from: [http://www.cdc.gov/excite/classroom/outbreak\\_steps.htm](http://www.cdc.gov/excite/classroom/outbreak_steps.htm)
- Centers for Disease Control and Prevention. Updated Interim Surveillance Case Definition for Severe Acute Respiratory Syndrome (SARS)—United States, April 29, 2003. *MMWR*. 2003;52:391-393.
- Public Health Training Network, Centers for Disease Control and Prevention. *Biological Warfare & Terrorism: The Military and Public Health Response*. Satellite Broadcast, September 21-23, 1999.
- Pavlin JA. Epidemiology of Bioterrorism. *Emerg Infect Dis*. 1999;5:528-530.
- Centers for Disease Control and Prevention, Epidemiology Program Office. Oswego – An Outbreak of Gastrointestinal Illness Following a Church Supper. *Case Studies in Applied Epidemiology*; 2003: No. 401-303.