Introduction to Public Health Surveillance

Instructor name
Title
Organization

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Course Topics

Introduction to Public Health Surveillance

1. A Public Health Approach
2. What is Public Health Surveillance?
3. Public Health Surveillance Role and Uses
4. Public Health Surveillance Legal Basis
5. Public Health Surveillance Types and Attributes
6. Public Health Surveillance Process
Learning Objectives

By the end of this session, you will be able to

- define public health surveillance
- describe the goal of public health surveillance
- describe the uses of a public health surveillance system
- recognize the legal basis for public health surveillance in the United States
- compare active and passive public health surveillance
- identify sources of data commonly used for public health surveillance
- describe the public health surveillance process
Topic 1
A Public Health Approach
A Public Health Approach

Surveillance

What is the problem?

Risk Factor Identification

What is the cause?

Intervention Evaluation

What works?

Implementation

How do you do it?

Problem

Response
Public Health Core Sciences

Prevention Effectiveness

Surveillance

Epidemiology

Informatics

Laboratory
Topic 2
What is Public Health Surveillance?
The ongoing, systematic collection, analysis, and interpretation of health-related data essential to planning, implementation, and evaluation of public health practice, closely integrated with the timely dissemination of these data to those responsible for prevention and control.
Goal of Public Health Surveillance

Provide information that can be used for health action by public health personnel, government leaders, and the public to guide public health policy and programs.

Public Health Surveillance is the __________, __________ collection, analysis, and interpretation of health-related data.

A. systemic, short-term

B. ongoing, systemic

C. ongoing, systematic

D. methodical, ongoing
Knowledge Check

What is the goal of public health surveillance?

A. To give public health personnel policies to regulate
B. To provide information to be used for public health action
C. To guide Congress in enacting public health laws
D. To keep the public aware of new diseases
Topic 3
Public Health Surveillance
Role and Uses
Uses of Public Health Surveillance

- Identify patients and their contacts for treatment and intervention
- Detect epidemics, health problems, changes in health behaviors
- Estimate magnitude and scope of health problems
- Measure trends and characterize disease
- Monitor changes in infectious and environmental agents
- Assess effectiveness of programs and control measures
- Develop hypotheses and stimulate research
Public Health Headlines

Whooping Cough Kills Five in California; State Declares an Epidemic

New CDC Report Shows Adult Obesity Growing or Holding Steady in All States

Increase Seen in Deaths from Pneumonia and Flu

Number of Rare *E. Coli* Cases In U.S. Rose Last Year

Percentage of New Yorkers Lighting Up is Down to 14\%
Number of Rare *E. Coli* Cases In U.S. Rose Last Year

By WILLIAM NEUMAN

Federal officials said on Tuesday that a national monitoring system for food-borne illness detected an increasing number of sicknesses last year from a group of rare *E. coli* bacteria related to the little-known and highly toxic strain that has been ravaging Germany.

For the first time, the group of rare *E. coli* strains was collectively identified as the cause of more illnesses in the United States than the more common form of the pathogen, probably because more laboratories have begun to test for their presence, said officials at the Centers for Disease Control and Prevention, which on Tuesday released 2010 results from its nationwide tracking system for food-borne diseases.
Knowledge Check

Identify the surveillance uses that can be linked to the New York Times E. coli article.

A. Measure trends of a particular disease
B. Estimate the magnitude of the problem
C. Monitor changes in infectious and environmental agents
D. Assess effectiveness of programs and control measures
E. All of the above
Topic 4
Public Health Surveillance
Legal Basis
Legal Authority for Conducting Public Health Surveillance

States have authority based on the U.S. Constitution
- General welfare clause
- Interstate commerce clause

CDC responds when
- Disease or condition has interstate implications
- Invited by a state
State-Based Notifiable Disease Surveillance Systems

- Mandated by state law or regulation
- Health care providers, hospitals, and laboratories are required to report cases to the local health department (LHD)
- The LHD is usually responsible for case investigation and action
- The LHD forwards the disease report to the state health department
- The state health department assists the LHD as needed
Knowledge Check

The purpose and legal basis for public health surveillance is granted by which U.S. document?

A. Bill of Rights
B. Declaration of Independence
C. U.S. Constitution
D. 1812 Treaty of Public Health

C. U.S. Constitution
Knowledge Check

CDC must be invited by a state before conducting public health surveillance.

A. True

B. False
Topic 5

Public Health Surveillance
Types and Attributes
## Types of Public Health Surveillance

<table>
<thead>
<tr>
<th>Passive Surveillance</th>
<th>Active Surveillance</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Diseases are reported by health care providers</td>
<td>• Health agencies contact health providers seeking reports</td>
</tr>
<tr>
<td>• Simple and inexpensive</td>
<td>• Ensures more complete reporting of conditions</td>
</tr>
<tr>
<td>• Limited by incompleteness of reporting and variability of quality</td>
<td>• Used in conjunction with specific epidemiologic investigation</td>
</tr>
</tbody>
</table>
Other Types of Public Health Surveillance

Sentinel Surveillance

Reporting of health events by health professionals who are selected to represent a geographic area or a specific reporting group

Can be active or passive

Syndromic Surveillance

Focuses on one or more symptoms rather than a physician-diagnosed or laboratory-confirmed disease
## Surveillance System Attributes

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Question It Answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usefulness</td>
<td>How useful is the system in accomplishing its objectives?</td>
</tr>
<tr>
<td>Data quality</td>
<td>How reliable are the available data? How complete and accurate are data fields in the reports received by the system?</td>
</tr>
<tr>
<td>Timeliness</td>
<td>How quickly are reports received?</td>
</tr>
<tr>
<td>Flexibility</td>
<td>How quickly can the system adapt to changes?</td>
</tr>
<tr>
<td>Simplicity</td>
<td>How easy is the system’s operation?</td>
</tr>
<tr>
<td>Attribute</td>
<td>Question It Answers</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------------------------------------------</td>
</tr>
<tr>
<td>Stability</td>
<td>Does the surveillance system work well?</td>
</tr>
<tr>
<td></td>
<td>Does it break down often?</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>How well does it capture the intended cases?</td>
</tr>
<tr>
<td>Predictive value positive</td>
<td>How many of the reported cases meet the case definition?</td>
</tr>
<tr>
<td>Representativeness</td>
<td>How good is the system at representing the population under surveillance?</td>
</tr>
<tr>
<td>Acceptability</td>
<td>How easy is the system’s operation?</td>
</tr>
</tbody>
</table>
Knowledge Check

The New York State Department of Health contacts the health providers in District A every Friday to obtain the number of patients examined with Influenza. What type of surveillance is this?

A. Passive

✓ B. Active
Topic 6
Public Health Surveillance Process
Before collecting data, decide on the overarching goal of the system.
Data Sources for Public Health Surveillance

- Reported diseases or syndromes
- Electronic health records (e.g., hospital discharge data)
- Vital records (e.g., birth and death certificates)
- Registries (e.g., cancer, immunization)
- Surveys (e.g., National Health and Nutrition Examination Survey [NHANES])
Nationally Notifiable Disease Surveillance System (NNDSS)

Many diseases on a state list are also nationally notifiable
Internationally Notifiable Diseases

Reporting to WHO is required for cases of:

- Smallpox
- Poliomyelitis (wild type)
- Human influenza caused by any new subtype
- Severe acute respiratory syndrome (SARS)
Surveillance Data Analysis

- Who will analyze the data?
- What methodology will they use?
- How often will they analyze the data?
Patients Hospitalized with West Nile Virus Infection, by Week, New York, 1999

Surveillance Data Analysis by Place
Laboratory-Confirmed WNV Human Cases — August-September 1999

North Queens Serosurvey Area

Map Courtesy of the New York City Department of Health and Mental Hygiene
### Data Analysis by Person

**Do you notice any patterns in the rates?**

Demographics for Persons Hospitalized for WNV and Population Rates of Infection

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>No. of Patients (%)</th>
<th>Population at Risk</th>
<th>Rate of Infection per Million Population</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (years)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–19</td>
<td>2 (3)</td>
<td>2,324,081</td>
<td>0.9</td>
</tr>
<tr>
<td>20–29</td>
<td>1 (2)</td>
<td>1,553,981</td>
<td>0.6</td>
</tr>
<tr>
<td>30–39</td>
<td>3 (5)</td>
<td>1,549,111</td>
<td>1.9</td>
</tr>
<tr>
<td>40–49</td>
<td>1 (2)</td>
<td>1,177,190</td>
<td>0.8</td>
</tr>
<tr>
<td>50–59</td>
<td>9 (15)</td>
<td>867,331</td>
<td>10.4</td>
</tr>
<tr>
<td>60–69</td>
<td>12 (22)</td>
<td>814,838</td>
<td>16.0</td>
</tr>
<tr>
<td>70–79</td>
<td>18 (31)</td>
<td>534,785</td>
<td>33.7</td>
</tr>
<tr>
<td>≥80</td>
<td>12 (20)</td>
<td>281,054</td>
<td>42.7</td>
</tr>
<tr>
<td><strong>Age category (years)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥50</td>
<td>52 (88)</td>
<td>2,498,008</td>
<td>20.8</td>
</tr>
<tr>
<td>&lt;50</td>
<td>7 (12)</td>
<td>6,604,363</td>
<td>1.1</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>31 (53)</td>
<td>4,289,988</td>
<td>7.2</td>
</tr>
<tr>
<td>Female</td>
<td>28 (47)</td>
<td>4,812,383</td>
<td>5.8</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>41 (69)</td>
<td>5,983,901</td>
<td>6.9</td>
</tr>
<tr>
<td>Nonwhite</td>
<td>9 (15)</td>
<td>3,118,470</td>
<td>2.9</td>
</tr>
<tr>
<td>Unknown</td>
<td>9 (15)</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td><strong>Borough or county of residence</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New York City</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brooklyn (Kings)</td>
<td>3 (5)</td>
<td>2,300,664</td>
<td>1.3</td>
</tr>
<tr>
<td>Bronx</td>
<td>9 (15)</td>
<td>1,203,789</td>
<td>7.5</td>
</tr>
<tr>
<td>Manhattan</td>
<td>1 (2)</td>
<td>1,487,536</td>
<td>0.7</td>
</tr>
<tr>
<td>Queens</td>
<td>32 (54)</td>
<td>1,951,599</td>
<td>16.4</td>
</tr>
<tr>
<td>Staten Island (Richmond)</td>
<td>0</td>
<td>379,999</td>
<td>0.0</td>
</tr>
<tr>
<td>New York State</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nassau</td>
<td>6 (10)</td>
<td>1,287,348</td>
<td>4.7</td>
</tr>
<tr>
<td>Westchester</td>
<td>8 (14)</td>
<td>847,866</td>
<td>9.1</td>
</tr>
</tbody>
</table>

Data interpretation is closely coupled with data analysis
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Data Dissemination

- Health agency newsletters, bulletins, or alerts
- Surveillance summaries and reports
- Medical and epidemiologic journal articles
- Press releases and social media
Data Dissemination Target Audiences

- Public health practitioners
- Clinicians and other health care providers
- Policy and other decision makers
- Community organizations
- The general public
Public health surveillance should always have a link to action.

- Data Collection
- Data Analysis
- Data Interpretation
- Data Dissemination
- Link to Action
Link to Action
Monitor trends and patterns in disease, risk factors, and agents

Pertussis (Whooping Cough) Cases, by Year — United States, 1922–2000

Choose the option that is NOT a part of the public health surveillance process.

A. Data dissemination

B. Data storage

C. Link to action

D. Data collection
In data interpretation, by identifying the __________, __________, and _____________, you can more easily determine how and why the health event occurred.

A. disease, risk, occurrence  
B. person, protocol, risk  
C. person, place, time  
D. risk, protocol, disease

Knowledge Check

Correct answer: C. person, place, time
Choose the option that is NOT a source of data used for public health surveillance.

A. Administrative data systems
B. Vital records
C. Newspaper articles  [Corrected]
D. Disease notifications
Public Health Surveillance-Based Action

- Describe the burden of or potential for disease
- Monitor trends and patterns in disease, risk factors, and agents
- Detect sudden changes in disease occurrence and distribution
- Provide data for programs, policies, and priorities
- Evaluate prevention and control efforts
“The reason for collecting, analyzing, and disseminating information on a disease is to control that disease. Collection and analysis should not be allowed to consume resources if action does not follow.”

—William Foege, 1976

Photo: Kay Hinton, Emory University
During this session, you learned to

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- describe the goal of public health surveillance
- describe the uses of public health surveillance system
- recognize the legal basis for public health surveillance in the United States
- compare active and passive public health surveillance
- identify sources of data commonly used for public health surveillance
- describe the public health surveillance process
QUESTIONS?
Resources and Additional Reading


Resources and Additional Reading

BONUS SLIDES
Link to Action
Provide data for programs, policies, and priorities

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