Public Health 101 Series

Introduction to Public Health Surveillance

Instructor name
Title
Organization

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

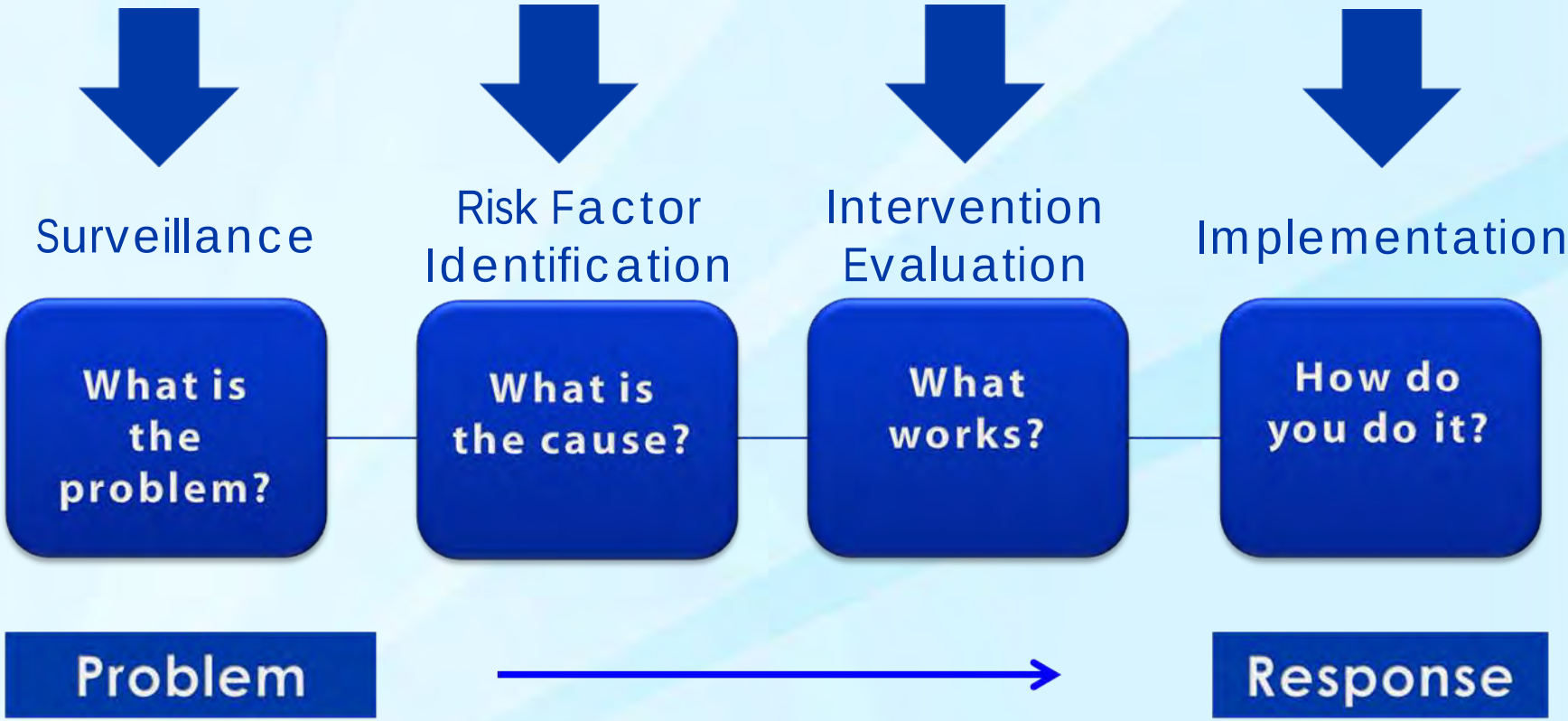
Learning Objectives

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



Public Health Core Sciences

Topic 2

What is Public Health Surveillance?

Public Health Surveillance Defined

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

Adapted from: Thacker SB, Birkhead GS. Surveillance. In: Gregg, MB, ed. Field epidemiology. Oxford, England: Oxford University Press; 2008.

Public Health Surveillance Keywords

systematic

ongoing

collection

analysis

interpretation

dissemination

health-related data

linked to public health practice

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

Smith PF, Hadler JL, Stanbury M, et al. Blueprint version 2.0: updating public health surveillance for the 21st century. J Public Health Manag Pract 2013;19:231–9.

Knowledge Check

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%

The New York Times

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.

Neuman W. Number of Rare *E. Coli* Cases In U.S. Rose Last Year. *The New York Times*. June 7, 2011. http://www.nytimes.com. Accessed July 8, 2014.

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*

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

Passive Surveillance	Active Surveillance
• Diseases are reported by health care providers • Simple and inexpensive • Limited by incompleteness of reporting and variability of quality	• Health agencies contact health providers seeking reports • Ensures more complete reporting of conditions • Used in conjunction with specific epidemiologic investigation

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

Attribute	Question It Answers
Usefulness	How useful is the system in accomplishing its objectives?
Data quality	How reliable are the available data? How complete and accurate are data fields in the reports received by the system?
Timeliness	How quickly are reports received?
Flexibility	How quickly can the system adapt to changes?
Simplicity	How easy is the system's operation?

Surveillance System Attributes

Attribute	Question It Answers
Stability	Does the surveillance system work well? Does it break down often?
Sensitivity	How well does it capture the intended cases?
Predictive value positive	How many of the reported cases meet the case definition?
Representativeness	How good is the system at representing the population under surveillance?
Acceptability	How easy is the system's operation?

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?

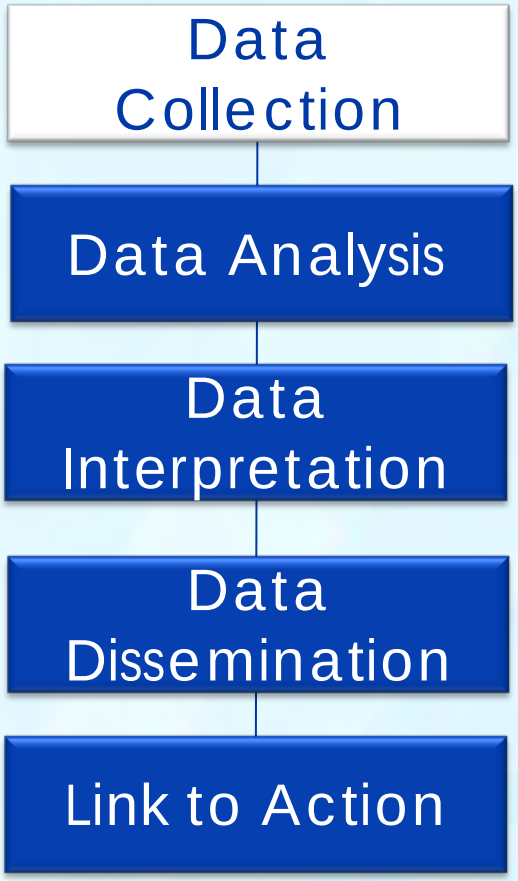
A. Passive

✓ B. Active

Topic 6

Public Health Surveillance Process

Surveillance Process

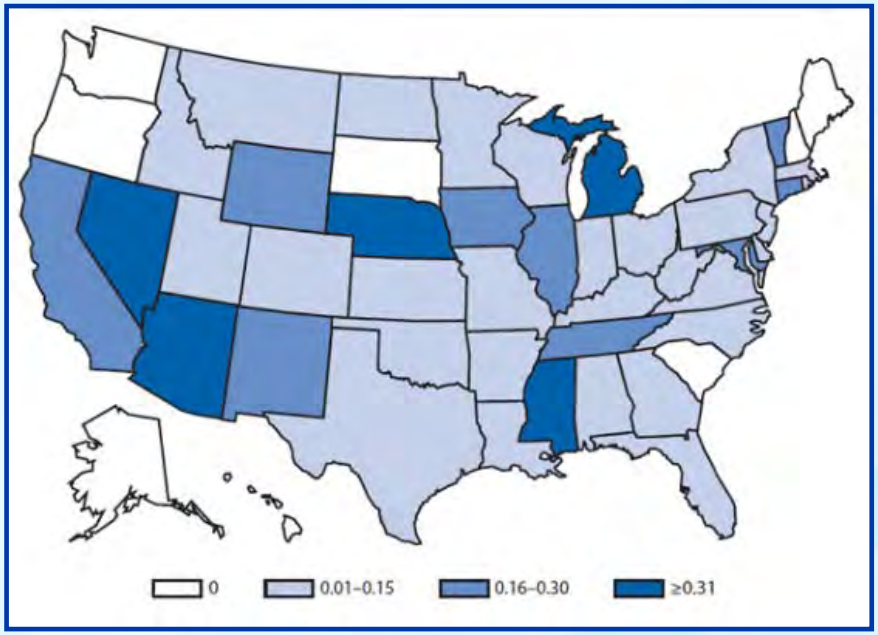


Before collecting data, decide on the overarching goal of the system

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)



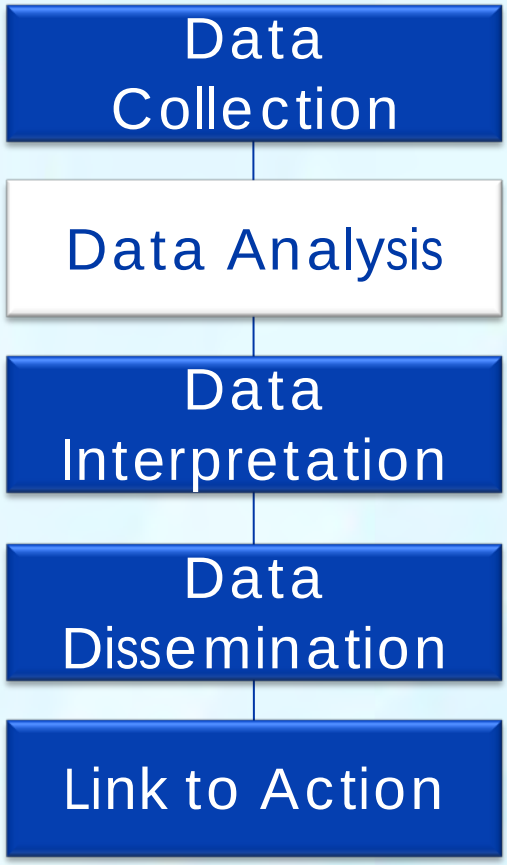
Many diseases on a state list are also nationally notifiable

Internationally Notifiable Diseases

Reporting to WHO is required for cases of

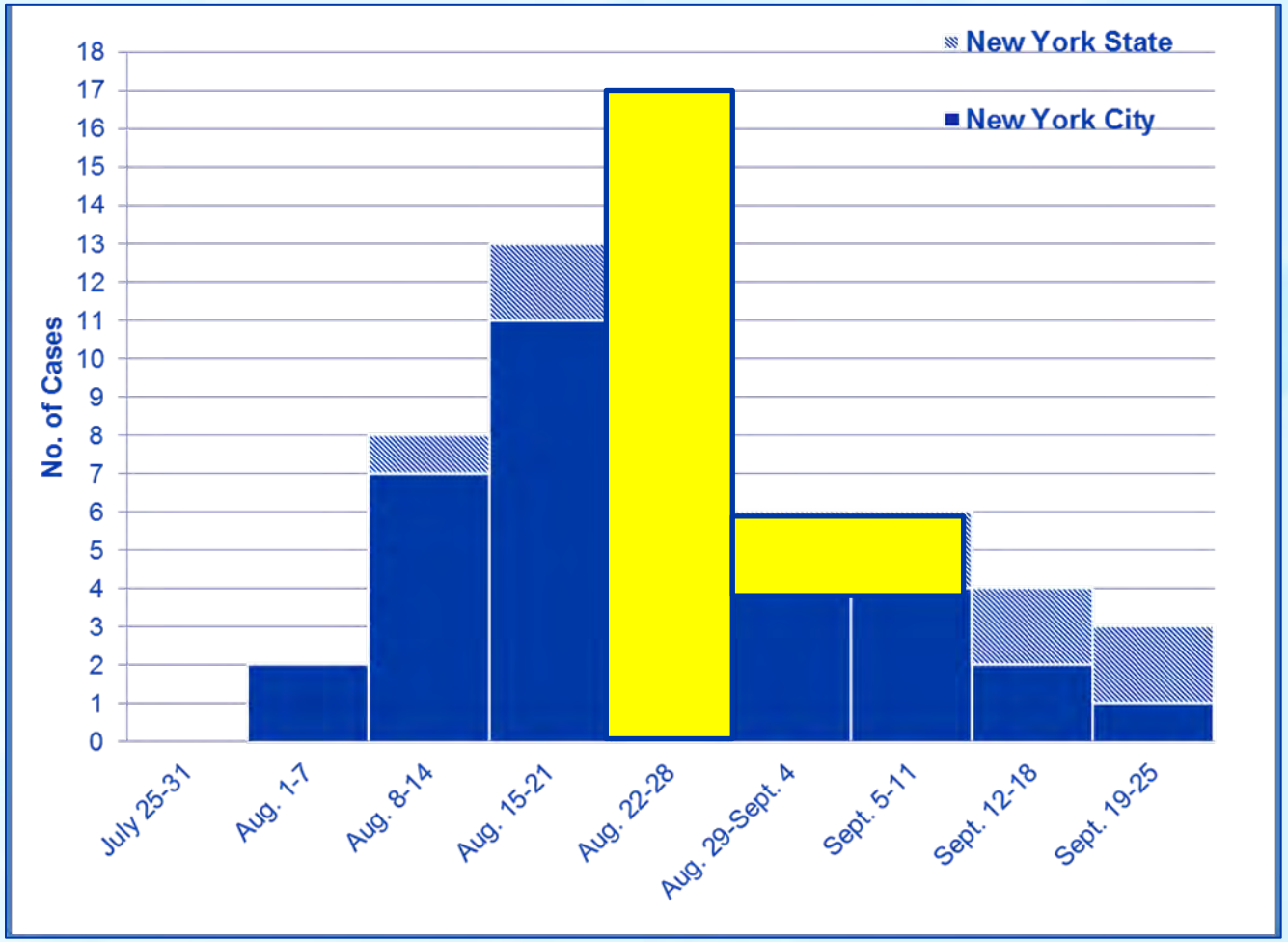
- Smallpox
- Poliomyelitis (wild type)
- Human influenza caused by any new subtype
- Severe acute respiratory syndrome (SARS)

Surveillance Data Analysis



- Who will analyze the data?
- What methodology will they use?
- How often will they analyze the data?

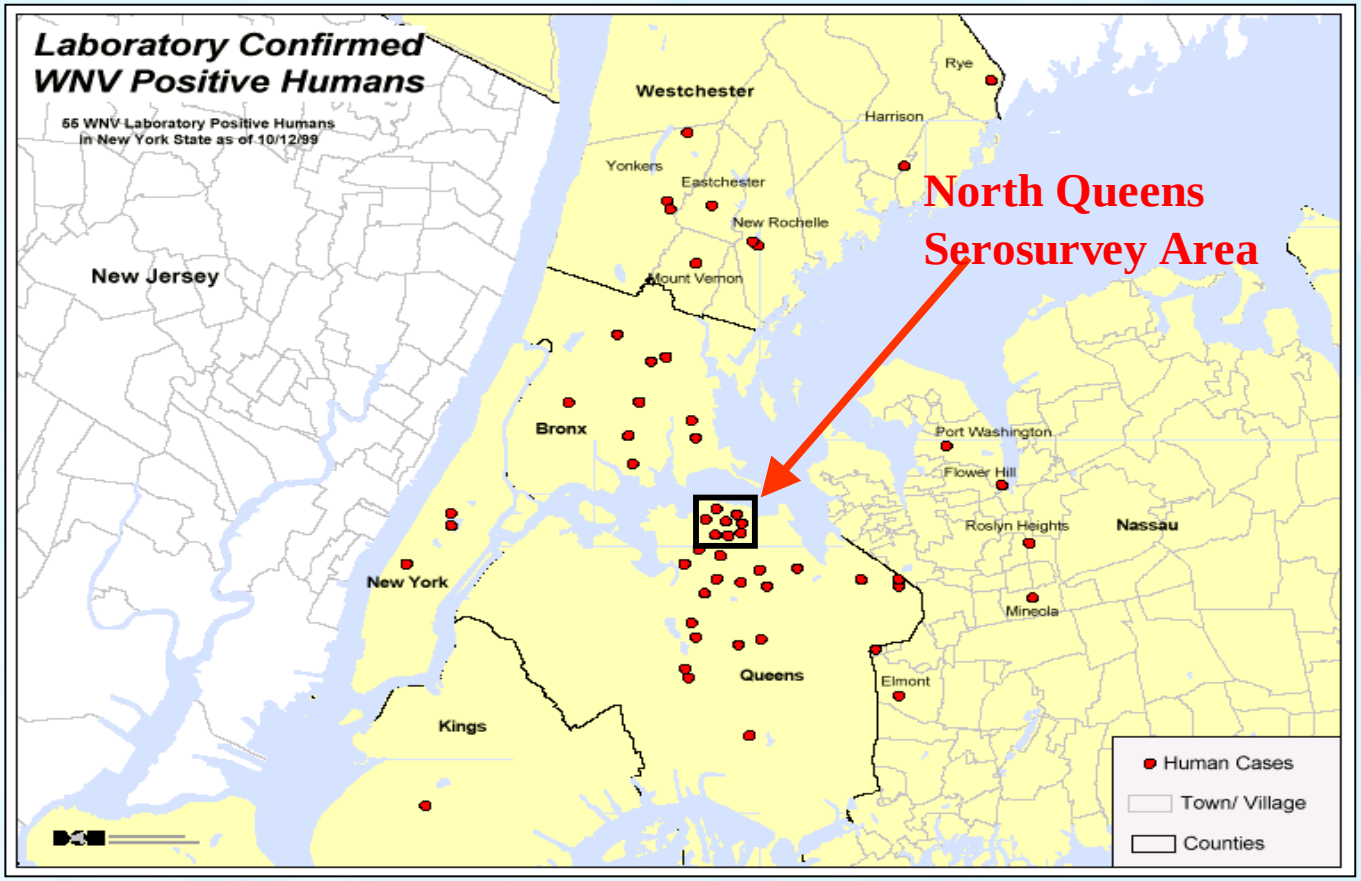
Patients Hospitalized with West Nile Virus Infection, by Week, New York, 1999



Nash D, Mostashari F, Fine A, et al. Outbreak of West Nile virus infection in the New York City area in 1999. N Engl J Med. 2001;344:1807–14.

Surveillance Data Analysis by Place

Laboratory-Confirmed WNV Human Cases — August–September 1999



Map Courtesy of the New York City Department of Health and Mental Hygiene

Data Analysis by Person

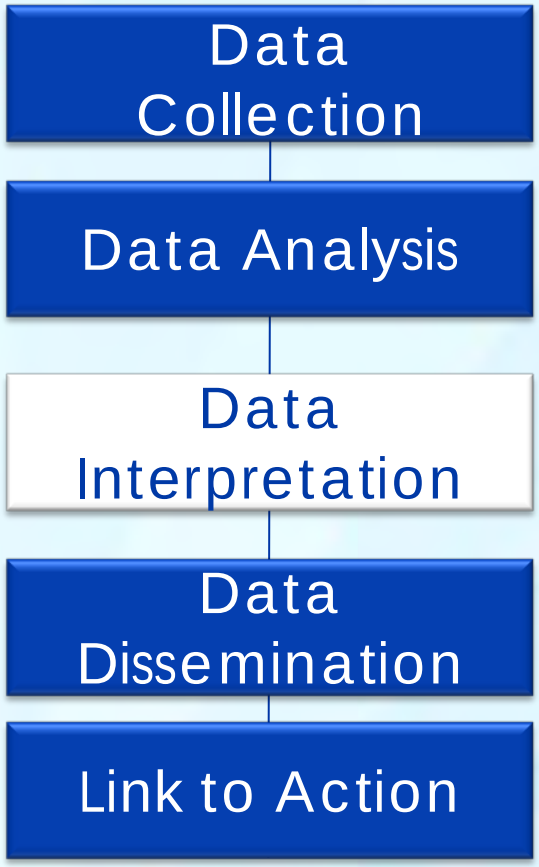
Do you notice any patterns in the rates?

Demographics for Persons Hospitalized for WNV and Population Rates of Infection

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

Nash D, Mostashari F, Fine A, et al. Outbreak of West Nile virus infection in the New York City area in 1999. N Engl J Med. 2001;344:1807–14.

Surveillance Data Interpretation



Data interpretation is closely coupled with data analysis

The New York Times

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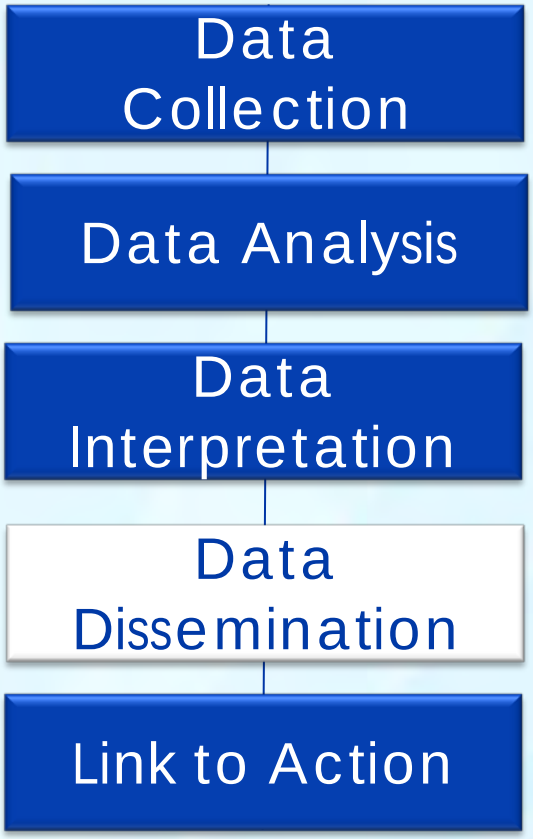
Data Dissemination

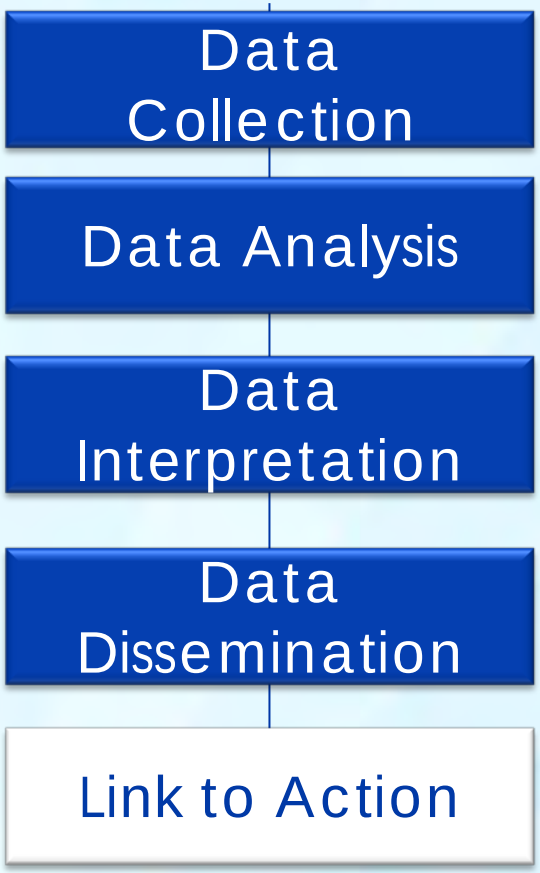


- Health agency newsletters, bulletins, or alerts
- Surveillance summaries and reports
- Medical and epidemiologic journal articles
- Press releases and social media

Data Dissemination Target Audiences

- Public health practitioners
- Clinicians and other health care providers
- Policy and other decision makers
- Community organizations
- The general public

Surveillance Link to Action

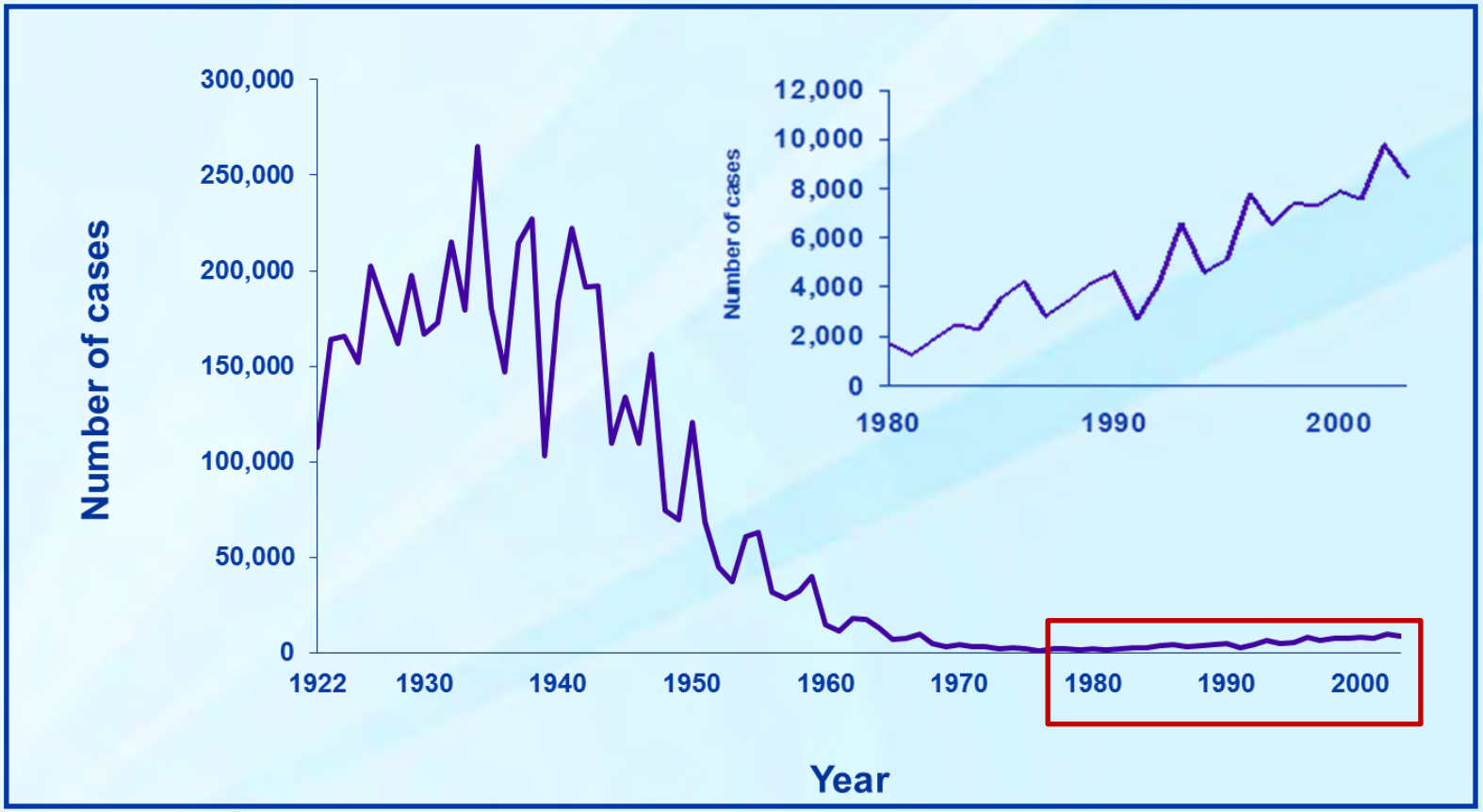


Public health surveillance should always have a link to action

Link to Action

Monitor trends and patterns in disease, risk factors, and agents

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



Source: Centers for Disease Control and Prevention (CDC). National Notifiable Diseases Surveillance System and Supplemental Pertussis Surveillance System and 1922-1949, passive reports to the US Public Health Service. Atlanta, GA: US Department of Health and Human Services, CDC. Available at: http://www.cdc.gov/pertussis/images/incidence-graph.jpg.

Knowledge Check

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

Knowledge Check

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

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
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

Foege WH, Hogan RC, Newton LH. Surveillance projects for selected diseases. Int J Epidemiol 1976;5:29–37.

Course Summary

During this session, you learned to

- define public health surveillance
- 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

- Smith PF, Hadler JL, Stanbury M, et al. Blueprint version 2.0: updating public health surveillance for the 21st century. J Public Health Manag Pract 2013;19:231–9.
- Centers for Disease Control and Prevention. CDC's vision for public health surveillance in the 21st century. Morb Mortal Wkly Rep 2012;61(Suppl, July 27, 2012):1–40.
- Centers for Disease Control and Prevention (CDC). Principles of epidemiology in public health practice [Self-Study Course]. 3rd ed. Atlanta, GA: US Department of Health and Human Services, CDC; 2006. http://www.cdc.gov/osels/scientific_edu/ss1978/SS1978.pdf.
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Resources and Additional Reading

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- Centers for Disease Control and Prevention (CDC). Surveillance resource center. Atlanta, GA: US Department of Health and Human Services, CDC; 2013. http://www.cdc.gov/surveillancepractice/.
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- Kim M, Berger D, Matte T. Diabetes in New York City: public health burden and disparities. New York: New York City Department of Health and Mental Hygiene; 2006. http://www.nyc.gov/html/doh/downloads/pdf/epi/diabetes_chart_book.pdf.
- Swerdlow DL, Woodruff BA, Brady RC, et al. A waterborne outbreak in Missouri of *Escherichia coli* O157:H7 associated with bloody diarrhea and death. Ann Intern Med 1992;117:812–9.

BONUS SLIDES

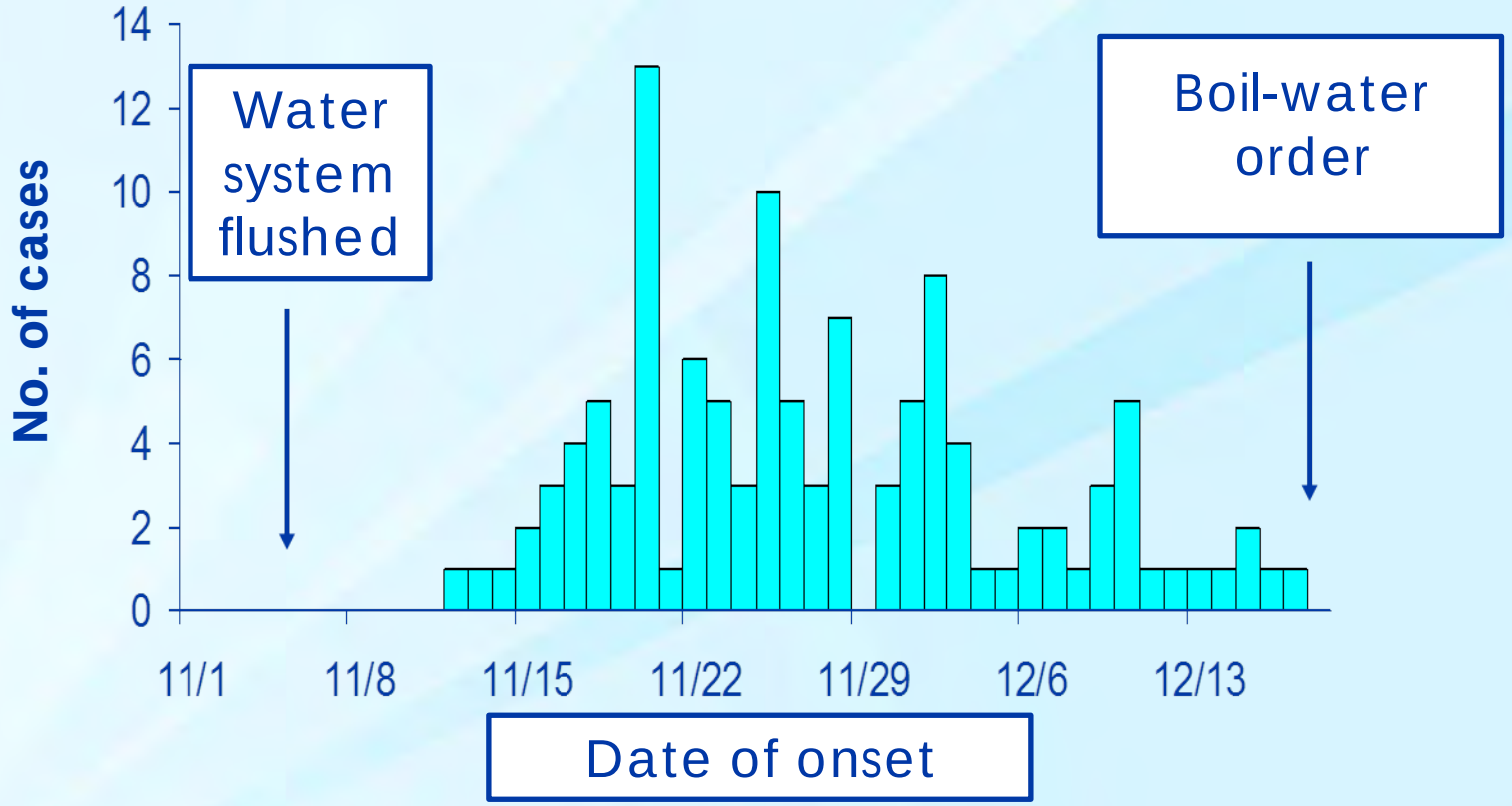
Link to Action

Provide data for programs, policies, and priorities

Kim M, Berger D, Matte T. Diabetes in New York City: public health burden and disparities. New York: New York City Department of Health and Mental Hygiene; 2006. http://www.nyc.gov/html/doh/downloads/pdf/epi/diabetes_chart_book.pdf.

Link to Action

Evaluate prevention and control efforts



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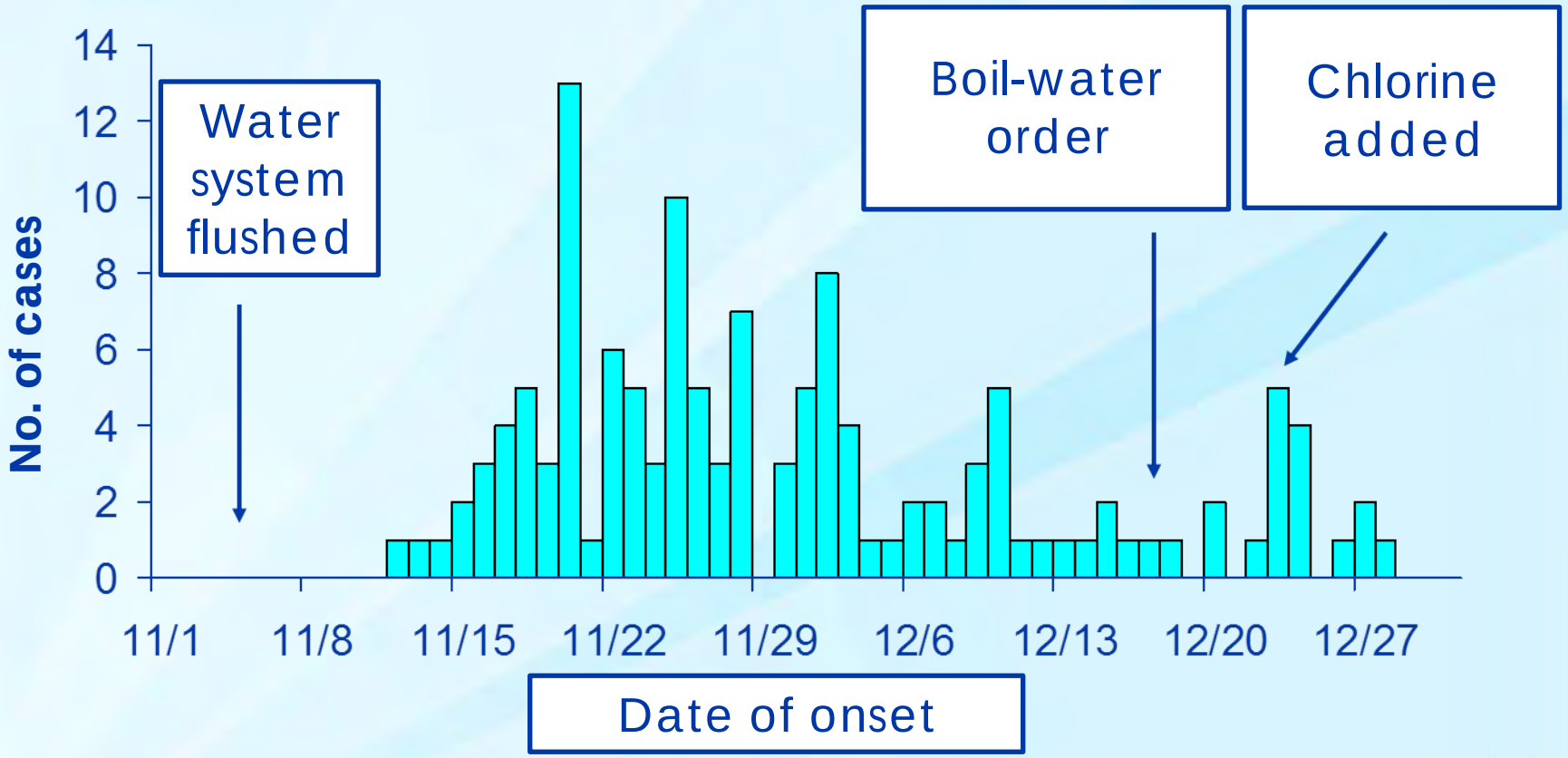
Link to Action

Evaluate prevention and control efforts (continued)



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