

Introduction to Outbreak Disease Surveillance

Module 1 of the Strengthening Interprofessional Education for HIV
(STRIPE HIV) Pandemic Preparedness Certificate

Approximate time to complete module: 120 minutes



**Strengthening
Interprofessional
Education
for HIV**

Public Health: Definition

Public health is the science of protecting and improving the health of people and their communities.

This work is achieved by promoting:

- healthy lifestyles
- researching disease
- injury prevention
- detecting, preventing and responding to infectious diseases.

Overall, public health is concerned with **protecting the health of entire populations**. Comparable terms for public health are social medicine and community medicine.

Epidemiology and Epidemiologists: Definitions

Epidemiology is:

- Understanding and controlling diseases within populations. It involves studying patterns, causes, and effects of diseases or health-related events to develop strategies for prevention and control.
- Epidemiology helps to explore the causes of disease, the risk factors associated with disease, and the measures needed to prevent or control disease.

Epidemiologists:

Investigate the patterns, causes, and effects of health and disease conditions in defined populations.

The Importance of Outbreak Disease Surveillance to Public Health: Some Examples

- **Serves as an early warning system** for impending outbreaks that could become public health emergencies
- **Allows for an early response**, which can prevent or limit further spread of disease
- **Helps in understanding the dynamics of the outbreak**, and **directing interventions**
- **Enables monitoring and evaluation** of the impact of interventions
- **Guides priority-setting and planning** for public health strategies

How to Identify Early Warning Indicators (5 minutes)

Syndromic disease presentations: Unusual presentation of specific syndromes (fever, respiratory distress, rash, hemorrhagic fever, etc.)

Abnormal patterns of health care utilization: Changes in number of patients admitted, prescriptions given, lab tests ordered, etc.

Unusual disease trends: New or more severe symptoms, unusual increase in cases, changes in demographics (age, sex, occupation, etc.), etc.

Clustering of cases: Concentration of cases geographically, within a time period, by sex, age, occupation, etc.

Public health alerts: Media, social media, news outlet reports of unusual disease patterns.

Syndromic Presentations

Syndromic Presentation: Fever + Rash (Sample)

Scenario:

You are working at a city clinic where you have seen several patients present with symptoms of fever, malaise, headache, and an unusual skin rash. The fever seems to come on first, followed by the rash a few days later.

On examination of one of the patients, a 25-year-old man, the clinician found that he had swollen lymph nodes and a vesicular rash that covered his face, hands and chest. The patient mentioned that his girlfriend also had a similar but much less extensive rash on her face. The patient mentioned that they had recently traveled to Kinshasa to attend his cousin's wedding celebration.

1 of 2: Possible Monkeypox (mpox) Outbreak (Sample)

Patient History & Exam	Notes and Findings
• Main complaint • Other symptoms • Physical exam findings	• Main complaint: rash • Other symptoms: fevers, malaise, headache • Exam findings: swollen lymph nodes, vesicular rash
Exposure History	Notes and Findings
Who or what were patients exposed to that could have led to this possible infection?	• Wedding in Kinshasa • Possible transmission between patient and girlfriend
Possible Causes of The Clinical Syndrome	Notes and Findings
• Consider both “routine” causes and less common, emerging, or re-emerging causes • Include causes that could be life-threatening or pose a risk of a community outbreak	• Routine: chickenpox (varicella), hand-foot-mouth disease, herpes, syphilis • Less common: monkeypox (mpox), smallpox

2 of 2: Possible Monkeypox (mpox) Outbreak (Sample)

Early Warning Indicators	Notes and Findings
What are the reasons to be concerned that this pattern is unusual?	• Atypical age to be diagnosed with chickenpox; rash is too diffuse for herpes • Possible transmission between patient and girlfriend
Initial Control Measures While Waiting for Laboratory/Diagnostic Tests	Notes and Findings
• Should the patient be isolated? • Should PPE be worn (and, if so, what PPE)? • Should patients start on any medications?	• Isolation of patients (either in the hospital or at home depending on severity of infection) • PPE for healthcare workers: gloves, gowns, masks if available
Actions After Confirmation of Your Differential Diagnosis	Notes and Findings
• What should be communicated to the public? • What can public health officials do?	• Communication: increase awareness of symptoms, avoid close contact with individuals who have symptoms • Public health work: establish surveillance systems to find cases in the community

1 of 2: Possible Avian Influenza Outbreak – Notes and Findings

Patient History & Exam

- Main complaint: respiratory distress
- Other symptoms: fever, cough, muscle aches
- Exam findings: conjunctivitis, pulmonary crackles

Exposure History

- Possible transmission between family members
- Possible transmission from sick poultry

Possible Causes of The Clinical Syndrome

- Routine: seasonal influenza, tuberculosis, COVID-19, RSV
- Less common: avian influenza (H5N1)

2 of 2: Possible Avian Influenza Outbreak – Notes and Findings

Early Warning Indicators

- Conjunctivitis
- Possible transmission from sick poultry
- Severity of illness (one death)

Initial Control Measures While Waiting for Laboratory/Diagnostic Tests

- Isolation of sick patients
- PPE: masks, gowns, gloves for healthcare workers
- Consider antiviral medications

Actions After Confirmation of Your Differential Diagnosis

- Communication: increase awareness of symptoms, avoid close contact with birds and individuals who have symptoms
- Public health work: test and isolate sick birds, intensify case finding in the community

1 of 2: Possible Ebola Outbreak – Notes and Findings

Patient History & Exam

- Symptoms: fever, shortness of breath, vomiting, diarrhea, abdominal pain
- Exam findings: crackles over lungs, conjunctival erythema, lethargy, tender abdomen, bleeding

Exposure History

- Travel to hometown
- Funeral

Important: Demonstrating respect for cultural practices and non-judgmental communication is key. This communication will help healthcare workers both identify how cultural practices may contribute to the spread of infection *and* counsel patients on how to take measures to protect themselves.

Possible Causes of The Clinical Syndrome

- Routine: severe malaria, typhoid fever, influenza
- Less common: Ebola, Margburg, Lassa fever

2 of 2: Possible Ebola Outbreak – Notes and Findings

Early Warning Indicators

- Bleeding makes hemorrhagic fever causes more likely
- Severity of illness (and relative who died of similar illness)

Initial Control Measures While Waiting for Laboratory/Diagnostic Tests

- Isolation of sick patients (treatment in specialized centers if available)
- PPE: gowns, gloves, masks, face shields
- Decontamination of medical equipment/spaces

Actions After Confirmation of Your Differential Diagnosis

- Communication: inform public of symptoms, exposures, avoiding sick contacts
- Public health work: immediate contact tracing, quarantine of exposed patients, isolation and treatment of sick patients

1 of 2: Possible Meningitis Outbreak – Notes and Findings

Patient History & Exam

- Main complaint: headache and fevers
- Other symptoms: nausea, vomiting
- Exam findings: stiff neck, lethargy, rash

Exposure History

- Community college

Possible Causes of The Clinical Syndrome

- Malaria, bacterial meningitis, viral meningitis, COVID-19, influenza

2 of 2: Possible Meningitis Outbreak – Notes and Findings

Early Warning Indicators

- Severe illness
- Fever and headache suggests meningitis
- Purpuric lesions raise suspicion for bacterial meningitis from meningococcus
- Transmission in area of close crowding

Initial Control Measures While Waiting for Laboratory/Diagnostic Tests

- Isolation of sick patients
- PPE: masks for healthcare workers
- Consider prophylactic antibiotics (e.g. rifampin) to close contacts

Actions After Confirmation of Your Differential Diagnosis

- Communication: education about symptoms and transmission, particularly to those attending the college
- Public health: vaccination (if available), case finding, antibiotics to close contacts

1 of 2: Possible Cholera Outbreak – Notes and Findings

Patient History & Exam

- Main complaint: diarrhea
- Other symptoms: vomiting
- Exam findings: significant dehydration

Exposure History

- Possible exposure to infection from nomadic community
- Possible common contaminated water or food-borne source? (ground water/well, stagnant water)

Possible Causes of The Clinical Syndrome

- Routine: rotavirus, shigella, salmonella, typhoid, etc.
- Less common: cholera

2 of 2: Possible Cholera Outbreak – Notes and Findings

Early Warning Indicators

- Severity of illness (including death)
- Rapid rise in cases
- Multiple family members infected

Initial Control Measures While Waiting for Laboratory/Diagnostic Tests

- Isolation of sick individuals
- PPE: gowns and gloves
- Rehydration (oral if tolerated or intravenous)
- Antibiotics

Actions After Confirmation of Your Differential Diagnosis

- Communication: alert public to possible source(s) of infection, symptoms, need for prompt treatment, hand hygiene
- Public health work: investigation of common water (or food) source, access to treated water, improved sanitation measures if needed, case finding



Types of Early Warning Indicators (EWI)

EWI: Abnormal Patterns of Healthcare Utilization

Early Warning Indicator	Cadres
Pharmacy utilization: An increase in purchases of medications beyond what is expected (e.g., a rise in medication purchases to treat diarrhea or cough)	Pharmacists
Diagnostic test utilization: An increase in diagnostic testing (e.g., malaria testing or COVID-19 testing) could indicate an outbreak of those infections or similar infections is underway	Radiology and laboratory workers
ICU bed utilization or patients visiting the emergency room: This could indicate a rise in rates of a severe illness in the community.	Hospital administrators, front-line healthcare workers

EWI: Abnormal Clustering of Cases

Early Warning Indicator	Cadres
Geographic clustering: Monitor for cases of disease that occur in specific geographic areas that wouldn't normally be expected, or for a sudden concentration of cases in an area where the disease is not endemic.	Clinicians, nurses, community healthcare workers
Temporal clustering: Look for an unusual spike in cases within a short period of time (e.g., a sudden increase in the number of people showing symptoms of a specific disease in the community) or a time period a rise in cases during the time of year (e.g. rainy or dry season) that is atypical	Clinicians, nurses, community healthcare workers
Age/sex/occupation clustering: Look out for cases occurring in specific demographic groups or occupations (for example rising cases in healthcare workers, sex workers, students, prisoners, or people without access to running water).	Clinicians, nurses, community healthcare workers

EWI: Unusual Disease Trends

Early Warning Indicator	Cadres
Abnormal case presentation: A change in the clinical presentation of disease (e.g., new or more severe symptoms) can indicate a novel pathogen or a change in the behavior of an existing pathogen.	Clinicians, nurses, community healthcare workers
Changes in disease incidence: An increase in cases of a disease beyond expected seasonal or usual (baseline) levels could indicate an emerging outbreak.	Clinicians, nurses, community healthcare workers
Changes in disease demographics: Keep an eye out for changes in disease demographics. An increase in a previously unaffected group or an abnormal surge in the group that is primarily affected could be a signal for a new outbreak.	Clinicians, nurses, community healthcare workers
Severity of Cases: A higher-than-usual severity of illness or mortality could be an indicator that an outbreak is under way, or that the outbreak is more severe than expected.	Clinicians, nurses, community healthcare workers

Where to Report Early Warning Indicators

Reporting Level	Responsible Body
Local / Place of employment	<i>Facilitators, add examples you would use here</i>
District / Regional	
National	
International	

Information on local disease outbreaks and cases of transmissible diseases can be found at:

Reporting Potential Outbreaks

Key elements of reporting potential outbreaks:

- ✓ **Identification** of potential outbreak
- ✓ **Investigation** and confirmation of outbreak (number of cases, clinical features, demographics, dates of onset etc.).
- ✓ **Reporting** to relevant authorities (facilities, local & national health departments etc.)
- ✓ **Case Definition** creation for possible and confirmed cases to standardize monitoring
- ✓ **Monitoring** entails consolidation, updating of reports to support decision-making. Dashboards are an ideal way to do this.
- ✓ **Communication** to the public to provide information on the outbreak and guidance on preventative measures in a clear, transparent and timely manner. This includes identification of vulnerable groups with targeted messaging to these groups.

Learning Objectives

1. Appreciate how epidemiology fits into public health practice
2. Understand the role of outbreak disease surveillance in improving public health
3. Identify early warning indicators of a potential outbreak by recognizing patterns, unusual trends and case presentations
4. Know how to report a potential outbreak in your context

