Noncommunicable Disease Surveillance in Public Health

Presenter's Name

Presenter's Title

Title of Event

Date of Event

Learning Objectives

- Identify whether a noncommunicable disease (NCD) surveillance system is active or passive
- Draw a diagram of the flow of data through an NCD surveillance system
- Identify possible sources of selection bias and information bias for an NCD surveillance system

Lesson Overview

- Role of surveillance in NCD public health
- Structure and function of public health surveillance systems
- Operational aspects of surveillance systems
- Example of surveillance systems

ROLE OF SURVEILLANCE IN NCD PUBLIC HEALTH

Definition of Public Health Surveillance

"Systematic ongoing collection, collation, and analysis of data and the timely dissemination of information to those who need to know so that action can be taken."

– *World Health Organization (WHO)*

How can surveillance provide epidemiologic and clinical information?

Establish baseline rate of disease and detect increases

Estimate magnitude of a health problem

Determine geographic distribution

Understand the natural history

Generate hypotheses, stimulate research

How can surveillance help inform public health efforts?

Evaluate control measures

Monitor changes in chronic disease presentation or infectious agents

Detect changes in health practices

Facilitate planning

Examples of NCD Surveillance Data

Diagnoses

- Type 2 diabetes
- Stage IV ovarian cancer

Conditions

- Screening results (e.g., elevated glucose levels)
- Overweight/Obesity

Lifestyle factors

- Smoking habits
- Dietary intake
- Physical activity

Similarities of Infectious Disease and NCD Surveillance

- Document prevalence of disease
- Document risk factors
- Can be used to describe time trends
- Can include a variety of data including:
  - Laboratory data
  - Self report data
  - Medical record data

Obstacles to NCD Surveillance

- Lack of resources, infrastructure
  - Limited or no data collection mechanism
  - Limited data transmission capability
  - Lack of workforce training capacity
  - Limited availability of needed technology
- Low priority NCD or lack of political will to address
- Unenthusiastic system participants

STRUCTURE AND FUNCTION OF PUBLIC HEALTH SURVEILLANCE SYSTEMS

Components of Surveillance: Population

- National surveillance
- Specific to high-risk groups
  - Occupation
  - Health status (e.g., pregnancy clinics)
  - Geographic area

Components of Surveillance: Data Collection

- Health departments and/or organizations
  - Collect the data
  - Use forms for paper-based, fax, or emailed reports
  - Mine data from electronic records
- Laboratory
  - Testing
  - Diagnosis

Existing Data

Use of data already existing for other purposes can help maximize resources.

Health management information systems (HMIS)/administrative data

Vital statistics

Research Surveys vs. Public Health Surveillance

Research Surveys		Public Health Surveillance
Hypothesis-testing	⟺	Hypothesis-generating
One time	⟺	On-going
Goes into depth within specific health issue	⟺	Looks at broad trends and patterns across health issues, geographic areas

Surveillance is a Cycle

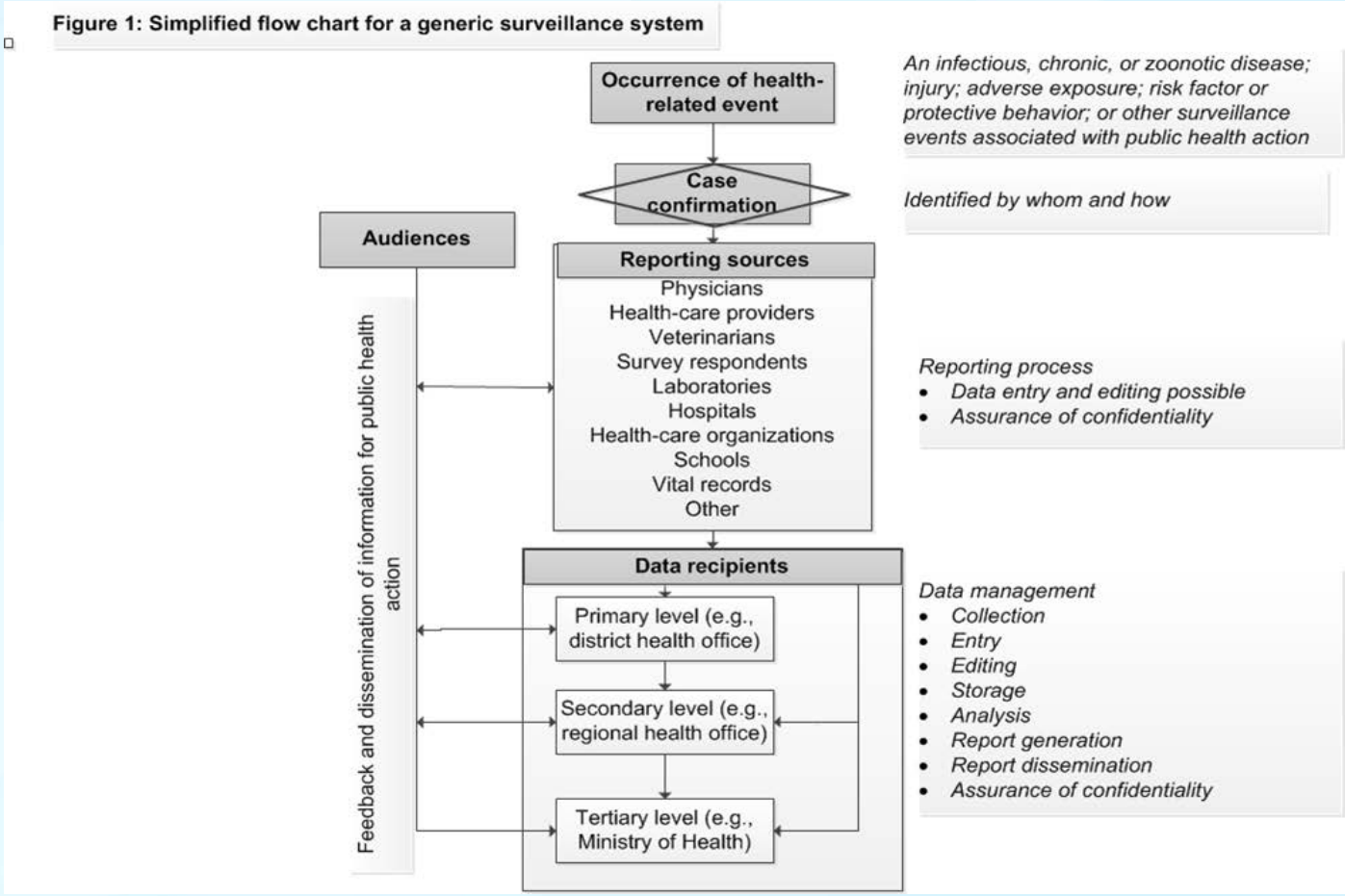
- Data collection must be followed by data analysis and interpretation
- Data analysis and interpretation must be followed by dissemination of information
- Dissemination of information must be followed by action/intervention
- Action/intervention must be followed by repeating the cycle

Be wary of spending resources in one area of a surveillance system without considering all of the system components

Analysis, Interpretation, Dissemination

- Surveillance System
  - Collate, process, analyze data
  - Monitor and interpret health indicators
  - Monitor system indicators and make improvements
  - Create regular reports

Surveillance System

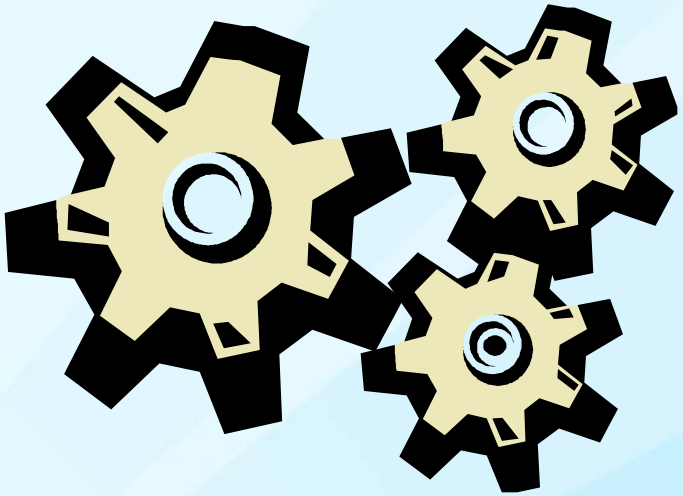


Adapted from CDC's Updated Guidelines for Evaluating Public Health Systems (CDC, 2011).

Surveillance System Stakeholders

- Participants in the system
- Users of the system
- Users of the results
- Public health practitioners
- Healthcare providers
- Community representatives
- Local, state, and national governments
- Nonprofit organizations
- Public

Engage stakeholders to ensure the system provides useful information.



OPERATIONAL ASPECTS OF SURVEILLANCE SYSTEMS

Priority Data Sources for NCD Surveillance

- Vital registries
- Disease registries
- Ongoing periodic health surveys
- Administrative data
- Sentinel surveillance

Types of Surveillance

Types of surveillance data collection

- Passive
- Active

Types of surveillance systems

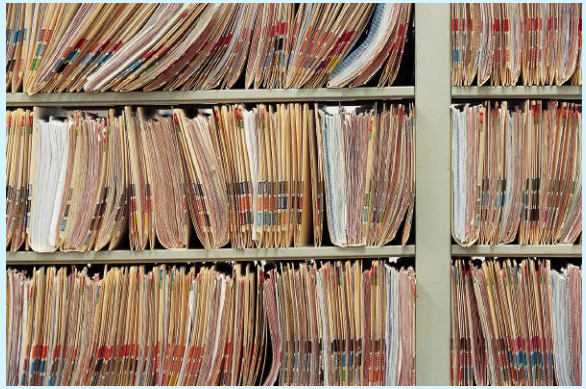
- Population-based
- Sentinel

Passive Surveillance Defined

"Passive" initial report for public health authorities

Most common type of data collection

- Healthcare providers and laboratories submit standard forms
- Can rely on data collected for other reasons



Passive Surveillance in Use

Advantages	Disadvantages	Examples
• Inexpensive for the health office • Relative low effort approach	• Barriers to electronic reporting • Delay in reporting • Missing data • Minimal data on risk factors	• Lab reporting (e.g. cancer, lead, pollutants) • Discharge records • Administrative data

Active Surveillance Defined

Action required by local public health authority to collect data

- Phone calls
- In-person visits

Requires more resources than passive surveillance

Active Surveillance in Use

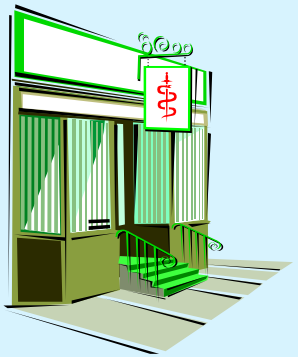
Advantages	Disadvantages	Examples
• More targeted/ detailed/ specific data • May facilitate timely collection of data	• May be more expensive than passive • Need for dedicated personnel	• Annual surveys on lifestyle and behavioral risk factors

Population-Based Surveillance

- System accepts data from all providers and/or laboratories in a country
- Sometimes involves a legal mandate for providers and laboratories to report (“reportable” or “notifiable”)
- Reporting forms are standardized by health district or nationally
- Reporting accomplished through local collection, passed through district/province level to the national level

Sentinel Surveillance

- Surveillance on a selected subset of potential sources
- Collection of data from a limited number of sites
  - Can be passive, active, or a combination
- Sites can be chosen to be representative of a population of interest
  - Clinics
  - Hospitals
  - Laboratories
  - Individual providers



- Representative sample of cases is highly recommended

Sentinel Surveillance in Use

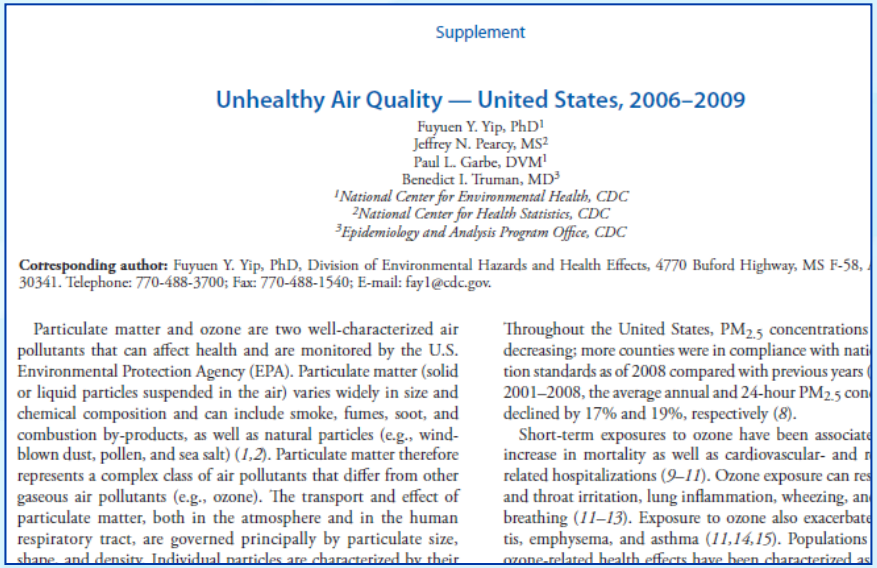
- Useful if there is no existing surveillance system or if one has been disrupted
- Can be expensive
- Difficult to ensure that selected sites are representative of a larger population
- More information on risk factors can be collected
- Example:
  - Demographic Surveillance System

Dissemination of Information

- To which groups of people should surveillance results be distributed?
- Decision-makers (policy makers as well as heads of surveillance, epidemiology, or public health offices)
- Participating providers/reporters, colleagues
- The population under surveillance (the community)

Methods of Dissemination

- Decision makers
  - Reports, staff meetings, conferences
- Participating providers
  - Weekly, monthly, or yearly bulletins or summaries
- General population or public
  - Press releases, websites, posters, radio announcements, community meetings



Supplement

Unhealthy Air Quality — United States, 2006–2009

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Particulate matter and ozone are two well-characterized air pollutants that can affect health and are monitored by the U.S. Environmental Protection Agency (EPA). Particulate matter (solid or liquid particles suspended in the air) varies widely in size and chemical composition and can include smoke, fumes, soot, and combustion by-products, as well as natural particles (e.g., wind-blown dust, pollen, and sea salt) (*1,2*). Particulate matter therefore represents a complex class of air pollutants that differ from other gaseous air pollutants (e.g., ozone). The transport and effect of particulate matter, both in the atmosphere and in the human respiratory tract, are governed principally by particulate size, shape, and density. Individual particles are characterized by their

Throughout the United States, $PM_{2.5}$ concentrations decreasing; more counties were in compliance with nati tion standards as of 2008 compared with previous years (2001–2008, the average annual and 24-hour $PM_{2.5}$ con declined by 17% and 19%, respectively (*8*).

Short-term exposures to ozone have been associate increase in mortality as well as cardiovascular- and r related hospitalizations (*9–11*). Ozone exposure can res and throat irritation, lung inflammation, wheezing, an breathing (*11–13*). Exposure to ozone also exacerbate tis, emphysema, and asthma (*11,14,15*). Populations ozone-related health effects have been characterized as

Accuracy of Surveillance

- Bias: A systematic error in the collection or use of data
  - May lead to an over- or under- estimate of a problem
  - May lead to false conclusions
  - Incorrect conclusions may lead to misdirected public health interventions

- Types of bias
  - Selection
  - Information

Selection Bias

- Degree to which surveillance data do not represent the population or geographic areas
- Method of accessing the population affects the information gathered
  - Point of medical care vs. lack of resources or availability to access care
  - Physicians or organizations which are easily recruited vs. those that are *representative*

Information Bias

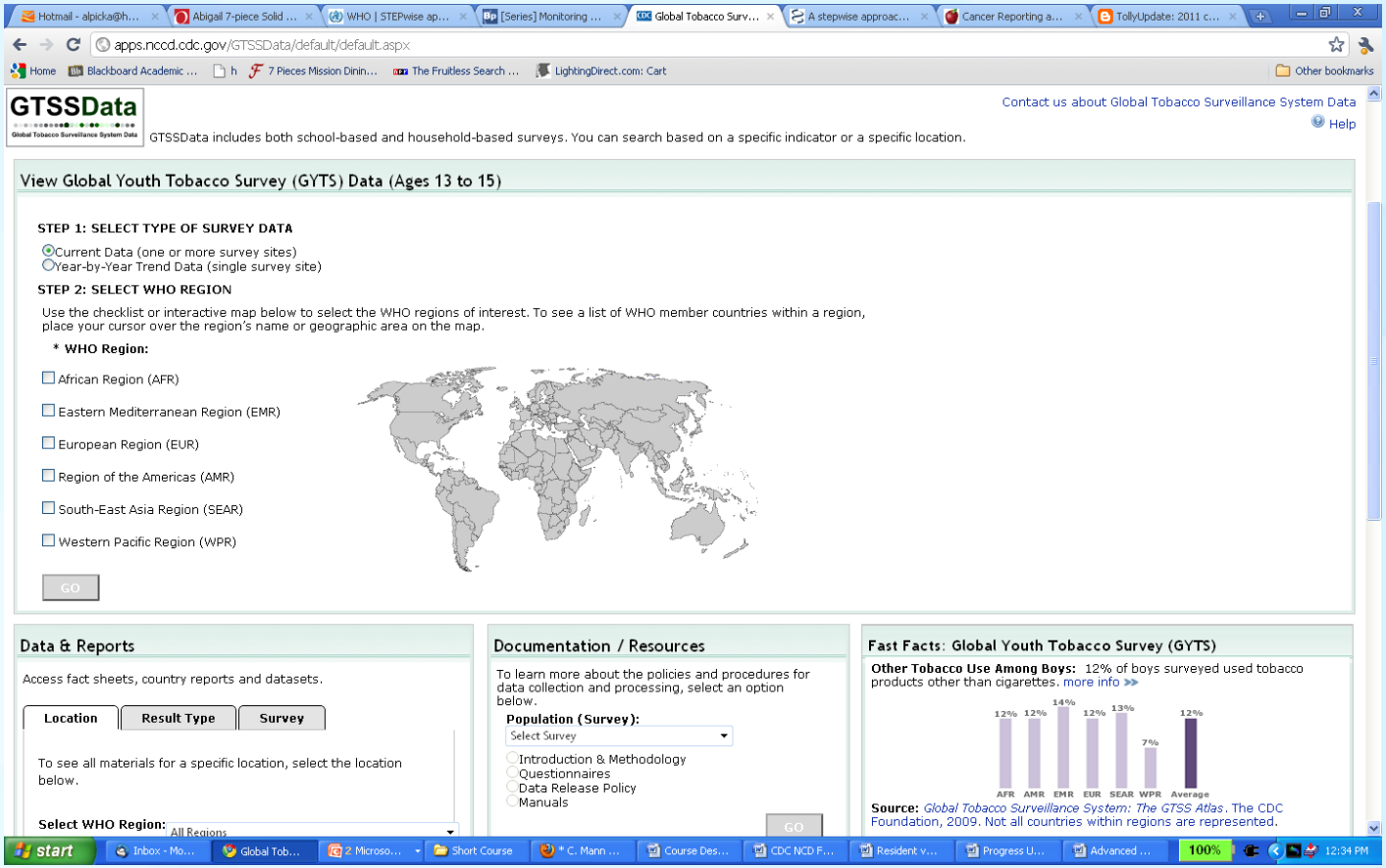
- Degree to which the data obtained do not accurately reflect the true values or measures
  - Missing fields, especially those important to the topic
    - Example: “Smoking” field is blank, especially among smokers who may not want to admit to smoking
  - Question or field is open to interpretation
    - Example: “Diagnosis” could be from the initial doctor, the hospital discharge records, the underlying cause of disease, or listed as cause of death

EXAMPLES OF NCD SURVEILLANCE SYSTEMS

Global Tobacco Surveillance System (GTSS)

- Purpose is to enhance the capacity of countries to design, implement, and evaluate their national comprehensive tobacco action plan and to monitor the key articles of the WHO Framework Convention on Tobacco Control
- Countries choose to administer survey components
- Data collected through four surveys
  - Aimed at youth, schoolteachers/administrators, students in the medical field, and adults
  - Each collects data about tobacco knowledge, attitude, use, and/or intention to quit in the target population.

GTSS Data Tool



WHO STEPwise Methods

- STEPwise approach to Surveillance (STEPS)
- Simple, standardized method for collecting, analyzing, and disseminating data in WHO member countries
- Risk factor assessment in three steps:
  - Questionnaire
    - Demographic factors
    - Lifestyle factors
  - Physical measurements
  - Biochemical measurements

Example Studies Using STEPwise Methods

- Combined prevalence of impaired glucose levels or diabetes in Lusaka urban district, Zambia: a population based survey
  - Recommended targeting young and middle-aged adults for prevention-based interventions
- Alcohol consumption in Mozambique: Regular consumption, weekly pattern, and binge drinking
  - Determined the pattern of current and binge drinking according to education, gender, income

REVIEW

Review: Questions 1-4

1. What is the definition of surveillance?
2. What are the three components of surveillance systems?
3. Give two examples of surveillance systems.
4. What are the two main data collection methods?

Review: Answers 1-4

1. What is the definition of surveillance? *Surveillance is the systematic ongoing collection, collation, and analysis of data, and the timely dissemination of information to those who need to know so that action can be taken.*

2. What are the three components of surveillance systems? *The population, data collection, and analysis/ interpretation/ dissemination*

3. Give two examples of surveillance systems. *There are many acceptable answers, but the Global Tobacco Surveillance System and WHO STEPwise were featured in the lecture.*

4. What are the two main data collection methods? *Active and passive data collection methods*

Review: Questions 5-6

5. Describe the cycle of surveillance.

6. What is the difference between population-based surveillance and sentinel surveillance?

Review: Answers 5-6

5. Describe the cycle of surveillance. *Surveillance begins at the population level with the detection of a health event by medical care providers and laboratories. These entities report to health departments, where data collation, cleaning, analysis, and interpretation takes place. Reports are then disseminated back to the stakeholders in the system, including health departments, reporters, and the population.*

6. What is the difference between population-based surveillance and sentinel surveillance? *In population-based surveillance, all providers and/or laboratories in the country report and data is collected at the local level. In sentinel surveillance, surveillance is on a selected subset of potential sources; sites can be chosen to be representative of a population of interest.*

Review: Questions 7-8

7. What is bias?

8. What is the difference between public health surveillance and research surveys?

Review: Answers 7-8

7. What is bias? *When looking at surveillance data, bias is an inaccurate representation of cases occurring in the population under surveillance in those data.*

8. What is the difference between public health surveillance and research surveys? *Public health surveillance is hypothesis-generating, focuses on multiple health issues, and looks at broad trends and patterns across health issues and geographical areas. Research surveys are hypothesis-testing, focus on specific health issues, and go into depth within those specific health issues.*

Skills Assessment

1. You will work in small groups to assess a given NCD surveillance system in terms of structure and design.
2. All group members should keep notes, but assign one group member to record official responses.
3. Spend no more than one hour completing the assignment.
4. Be prepared to share your work with the class.

Centers for Disease Control and Prevention (CDC). NCD Surveillance in Public Health. Atlanta, Georgia: Centers for Disease Control and Prevention (CDC); 2013.

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