Surveillance Systems: Overview of Surveillance Systems

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Public Health Concerns

- Infectious diseases
- Chronic conditions
- Reproductive outcomes
- Environmental health
- Health events related to:
  - Occupation
  - Injuries
  - Behaviors

Intervention strategies for populations & clinical preventive services for individuals.

- Prophylactic Measures:
  - Vaccination or postexposure prophylaxis (rabies, hepatitis).
- Educational services:
  - Public health messages or counseling & prophylaxis for contacts (STD).
- Inspection of food establishments
- Control of infectious and noninfectious conditions.

*For these activities, the rational development of health policy depends on Public Health information.*
Examples

• Information on the age of children with vaccine-preventable diseases:
  • establish policy of appropriate ages for delivering vaccinations.

• Documentation of the prevalence of elevated levels of lead in blood in the US population:
  • justification for eliminating lead from gasoline and
  • for documenting effects of this intervention.

• Information on the rate at which breast cancer is detected
  • has led to new policies regarding the ages at which to recommend mammograms.

Objectives of this lecture.

• Define the concept of Public Health Surveillance and describe its components.

• List the principal uses of surveillance data.

• Describe potential sources of surveillance data.

Public Health Surveillance

Surveillance is the tool that Public Health services use to monitor the health of the population.
Public Health Surveillance

• Purpose.
  To provide the institutions with the bases to establish
  • public health priorities,
  • develop work plans, and
  • take actions to promote and protect the health of the
    population.

Definition of Public Health Surveillance

• The ongoing, systematic collection, analysis, and interpretation of
  outcome-specific data.

• Timely dissemination of the data to those responsible for prevention
  and control activities.

• For use in the planning, implementation and evaluation of public health
  practice.

Outline and simple

• Systematic and ongoing
  • Collection
  • Analysis \textit{(person, time, place)}
  • Interpretation

• Timely dissemination
  • to those who undertake prevention and control

• For use in the
  • Planning
    • Implementation and
    • Evaluation of public health practice
Person, Place & Time.

- **PERSON**
  
  - Descriptive analysis of surveillance data on characteristics of the person or groups with specific diseases or injuries are important to:
    
    - understand the disease,
    - identify those at risk, and
    - targeting intervention efforts (i.e. elderly)

Person, Place & Time (cont).

- **PLACE**
  
  - Descriptive analysis of surveillance data on the unique circumstances of place or geographic distribution, sometimes determine the approach to prevention and control of disease and injury.
  
  - Diarrhea in people drinking from a contaminated well.
  - Elevated blood-lead levels in inner city children.
  - Both problems require medical & environmental interventions

Person, Place & Time (cont).

- **TIME**
  
  - Descriptive analysis of surveillance data over time shows patterns: generate hypotheses (sometimes just reflect patterns in reporting).
Surveillance: cycle of information.

- Surveillance systems are:
- information cycles
- require the participation:
  - the general public,
  - health services providers,
  - and public health institutions.

Information cycle.

- Starts when
- A disease case occurs, and seeks medical care,
- the health provider reports the case to
- the public health institution.

Information cycle (cont).

It is complete when
- information is disseminated in a timely manner
- to those taking preventive and control measures
- and others that need to know:
  - general public,
  - other institutions,
  - exposed people,
  - volunteers,
  - legislators, etc.
Purposes of Public Health Surveillance

- Assess public health status
- Define public health priorities
- Identify and evaluate control measures
- Evaluate programs
- Stimulate research

Uses of Public Health Surveillance

- Provides quantitative estimates of the magnitude of the health problem.
- Portrays the natural history of disease (malaria)
- Detects epidemics/define a problem (influenza 1976)
- Determines geographic distribution and spread of illness (or health event) (salmonella rates in New Hampshire)
- Facilitates epidemiologic and laboratory research (US Cancer Mortality mapped at county level, hypotheses of etiology & risk, clusters, nasal Cancer in county which formaldehyde industries)

Uses of Public Health Surveillance (cont.)

- Stimulate research:
  - Generate hypotheses (HIV)
  - Test hypotheses (measles elimination, vaccination for school)
- Evaluate control and prevention measures (polio)
- Monitor changes in infectious diseases (pneumonia)
- Monitoring of isolation activities
- Detect changes in health practices (cesarean rate)
- Facilitate planning (data on refugees, settle, demographics, health problems)
Uses

• Public health services use surveillance data to:
  • describe and monitor
  • health events (county, state, national)
  • and establish priorities
  • to determine
  • planning,
  • implementation, and
  • evaluation of
  • programs and
  • interventions in public health.

Surveillance Goals

GOALS:
Not only
• recollect and data analysis,
also
• guide public health policy and actions.

SURVEILLANCE provides information for action.
It is information with a PURPOSE.

Some types of Surveillance systems.

• Infectious diseases
• Nosocomial Infections
• Chronic conditions
• Reproductive outcomes (malformations)
• Health events related to:
  • Occupation
  • Injuries
  • Behaviors
• Emergencies’ response (war, natural disasters)
Purposes (CDC) *

- Evaluate current patterns of diseases and their potential to manifest in the population, to be effective on
  - research
  - control
  - and prevention

Purposes (CDC) (cont.) *

- Historically, public health institutions responded to the notification of transmissible diseases, applied measures of control, and declared quarantine.

Purposes (CDC) (cont.) *

- However, beyond the application of established measures to known diseases, there are other two purposes:
  - Learn more about the natural history, clinical aspects and epidemiology of other not well known diseases to develop preventive and control measures.
  - Use the surveillance information to evaluate the impact of preventive and control measures when they had been implemented.
Use of surveillance data (CDC) *

• Monitor health events
• Public health activities
• Other:
  • Hypothesis testing
  • Historic archives of disease presentation

Monitor health events to apply appropriate measures (4 results).

1. Detect changes in distribution or presentation of diseases (sudden increase on frequency – outbreak, initiate action)
2. Follow patterns and long term trends (ex: malaria, HIV) to know risk groups, to predict future patterns, predictions serve to plan programs and distribution of resources.

Monitor health events to apply appropriate measures (cont).

3. Identify changes in agents or in host factors (ex: constant monitoring of influenza virus; surveillance systems of risk factors for: smoking, obesity, use of seat belt)
4. Detect changes on health related practices (ex: monitoring the use of cesarean section; use of gloves by dentists).
Use of surveillance data (CDC) *

• Public health activities (4)

1. Investigation and control (Notifiable diseases: detection of source, identification of contacts, of susceptible, offering treatment, prophylaxis, education, etc).

2. Planning (base on information, programs and resources use can be anticipated)

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• Public health activities (4) (cont).

3. Evaluation of preventive and control measures (data can quantify the impact of interventions; ex: measles)

4. Hypothesis generation and originate investigation (constant monitoring of data allows hypothesis generation. Ex: in 1980 the epidemiologic surveillance permitted to determine the presence of a new disease, Toxic Shock Syndrome)

Use of surveillance data (CDC) *

• Other uses:

• Hypothesis testing.

• Under certain circumstances data can be used to test hypothesis. (Congenital malformations/use of glue).

• Historic Archive on disease presentation.

• Natural consequence of the accumulation of data. Can be local, state, national o international. Example: use of accumulated information on the development of statistical models to predict the feasibility of eradication (polio, measles).