

DEFINITIONS OF SURVEILLANCE

LANGMUIR, 1963

“The continued watchfulness over the distribution and trends of incidence through the systematic collection, consolidation, and evaluation of morbidity and mortality reports and other relevant data, together with dissemination to those who need to know.”

DEFINITIONS OF SURVEILLANCE

D.A. HENDERSON, 1976

“Surveillance serves as the brain and nervous system for programs to prevent and control disease.”

DEFINITIONS OF SURVEILLANCE

A Dictionary of Epidemiology, 4th ed, 2001
(J.M. Last (ed))

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

Source: World Health Organization

DEFINITIONS OF SURVEILLANCE

KEY ELEMENTS (Detels, 1989)

1. Collection of health data expressly for use in health planning, disease control/ prevention, and/or health promotion
2. Ongoing collection of data
3. Timely analysis
4. Easily understood
5. Dissemination of results
6. Action based on results
7. Periodic evaluation of the system

USES OF SURVEILLANCE SYSTEMS (1)

- ❖ To monitor changes or trends in health factors:
 - Prevalence/incidence of disease and/or risk factors
 - Emerging diseases
 - Geographic distribution
 - Risk group distribution

USES OF SURVEILLANCE SYSTEMS (2)

- ❖ To detect outbreaks/early warning systems
 - Human disease
 - Zoonotic diseases; e.g., SARS, H5N1
 - Food safety
 - Drug-resistant organisms (e.g., MDR-TB)

USES OF SURVEILLANCE SYSTEMS (3)

- ❖ To provide health information that can be used to design rational intervention programs
- ❖ To evaluate the effectiveness of intervention strategies (e.g., vaccines, health education/behavioral programs, legislation)

SURVEILLANCE VS. SCREENING

Surveillance

- ❖ Data collection to measure magnitude, changes, and trends in populations
- ❖ The objective is intervention in defined populations

Screening

- ❖ Testing to identify individuals with infection or disease
- ❖ Objective is either:
 - Personal intervention
 - Protection of the public (e.g., blood donors)
- ❖ Measurement of prevalence in screened populations

REQUIREMENTS FOR SURVEILLANCE

- ❖ Diagnostic algorithm
- ❖ Staff members
- ❖ Sampling frame
- ❖ Access/network
- ❖ Competent laboratory

SURVEILLANCE SYSTEMS

SURVEILLANCE VS. FINDING THE RESERVOIR

- ❖ For surveillance, want a representative sample
- ❖ For finding the reservoir, want to find infected individuals

SURVEILLANCE SYSTEMS

DEFINING A CASE

- ❖ Establishing a functional case criteria
 - **Quickly and easily defined**
- ❖ Selecting the right test or definition
 - **Easy, specific**
- ❖ Clinical versus epidemiological diagnostic criteria
 - **Function over precision**
- ❖ Disease versus infection
 - **i.e., AIDS and HIV infection**

SURVEILLANCE SYSTEMS

SELECTING THE POPULATION

- ❖ Defining the selection criteria
 - Human populations
 - Zoonotic populations
- ❖ Gaining access to target populations
 - NGOs/support groups
- ❖ Obtaining and maintaining cooperation of target population

SURVEILLANCE SYSTEMS

SELECTING THE APPROPRIATE STRATEGY

- ❖ **Need for cultural sensitivity**
- ❖ **Understanding the implications and limitations of different strategies**
- ❖ **Selecting the appropriate surveillance strategy**

Analysis

- ❖ Changes in prevalence of:
 - Infection
 - Disease
 - Risk activities
- ❖ Establishment of:
 - Trends
 - New reservoirs
 - New foci (groups/locations)

SURVEILLANCE SYSTEMS

OTHER CONSIDERATIONS

- ❖ Timely data processing
- ❖ Results and action
 - Interpretation
 - Facilitating appropriate action based on surveillance results

SURVEILLANCE SYSTEMS

EVALUATION AND REVISIONS

- ❖ Importance of ongoing evaluation
- ❖ Revising the surveillance program
 - **When and why**
(e.g., Thailand 1993)

SURVEILLANCE SYSTEMS

ACTIVE VS. PASSIVE SURVEILLANCE

❖ **Passive = reporting**

➤ **Hospitals**

➤ **Laboratories**

➤ **Clinics**

➤ **Physicians**

❖ **Active = searching**

SURVEILLANCE SYSTEMS

EVENT-BASED REPORTS

Global Public Health Intelligence Network:
Websites, news wires, newspapers

Health Map Project:

Mapping of outbreaks from reservoirs and monitoring of electronic sources; and
Official alerts and surveillance reports

EpiSPIDER:

Merging of relevant data from Health Map, the Data Disaster Alert Coordinator System and ProcMED mail

Regional (e.g., Mekong infectious disease reporting)

SENTINEL SURVEILLANCE

SURVEILLANCE SYSTEMS

SENTINEL GROUPS

- ❖ **High-risk individuals**
- ❖ **Vulnerable individuals**
- ❖ **Exposed individuals (e.g., health workers)**
- ❖ **Population surrogates (e.g., antenatal women; asthmatics)**

SURVEILLANCE SYSTEMS

SENTINEL SITES

- ❖ **Previous reports of high prevalence**
- ❖ **Exposure to high-risk individuals**
- ❖ **Suspected concentration of high-risk groups**
- ❖ **Susceptible/vulnerable groups**
- ❖ **Cross-border regions**
- ❖ **Commercial centers**

THE MAJOR PRODUCTS OF A SENTINEL SURVEILLANCE PROGRAM

- ❖ The identity and location of the core transmitters (reservoirs)
- ❖ Trends in prevalence in risk groups, the surrogates of the general population and geographic areas (spread)
- ❖ Trends in incidence (e.g., estimated from prevalence in the youngest age groups; i.e., those who have the shortest cumulative exposure interval, or laboratory strategies – detuned ELISA)

THE MAJOR PRODUCTS OF A SENTINEL SURVEILLANCE PROGRAM (continued)

- ❖ Estimates that can be used for “advocacy” messages to recruit support and educate the public and decision-makers
- ❖ Estimates of the number, location and characteristics of cases that can be used to anticipate future needs to cope with the epidemic

VALUE OF SENTINEL SURVEILLANCE (1)

1. Early warning of epidemic
 - Incidence and prevalence in high-risk groups/areas
2. Identification of size and scope of epidemic
 - Incidence and prevalence in high- and low-risk groups, by time and geographic region
3. Short-term evaluation of control efforts
 - Change in EFFECT variables (i.e., risk factors) in high- and low-risk groups
4. Long-term evaluation of control efforts
 - Incidence and prevalence in high- and low-risk groups
5. Stimulate political and social action

VALUE OF SENTINEL SURVEILLANCE (2)

1. Early warning of HIV epidemic

- HIV incidence/prevalence in high-risk groups

Presence of HIV infection in high-risk groups warns local people that unless control measures are taken, HIV infection will soon spread throughout the general community

VALUE OF SENTINEL SURVEILLANCE (3)

2. Identification of size and scope of HIV epidemic

- **HIV prevalence in high- and low-risk groups, by time and geographic region**

Once the magnitude of the HIV epidemic is recognized, political leaders will be able to unite the people in their efforts to control the disease

VALUE OF SENTINEL SURVEILLANCE (4)

3. Short-term evaluation of HIV/AIDS control efforts

- Change in prevalence
- Change in EFFECT variables (i.e., risk factors) in high- and low-risk groups

After the HIV control program is underway, the surveillance system is used to measure changes in factors leading to infection

VALUE OF SENTINEL SURVEILLANCE (5)

4. Long-term evaluation of HIV/AIDS control efforts

- **HIV incidence in high- and low-risk groups**

After many years, the surveillance system will be able to evaluate if control programs have reduced the size and scope of the HIV epidemic

VALUE OF SENTINEL SURVEILLANCE (6)

5. Stimulate political and social action

Information on HIV puts pressure on political system to provide additional resources for stimulating action in the community

EVALUATION OF A SURVEILLANCE SYSTEM

- ❖ Sensitivity
- ❖ Timeliness
- ❖ Representativeness
- ❖ Predictive value positive
- ❖ Acceptability
- ❖ Flexibility
- ❖ Simplicity
- ❖ Cost/benefit
- ❖ Dissemination of results
- ❖ Appropriate action taken

EVALUATION OF A SURVEILLANCE SYSTEM

SENSITIVITY

- ❖ What proportion of “cases” are identified?
- ❖ Does the system give an accurate picture of trends and magnitudes?

EVALUATION OF A SURVEILLANCE SYSTEM

TIMELINESS

- ❖ Is information disseminated rapidly enough to permit timely action based on the surveillance system?

EVALUATION OF A SURVEILLANCE SYSTEM

REPRESENTATIVENESS

Do reported cases differ from unreported cases?

EVALUATION OF A SURVEILLANCE SYSTEM

PREDICTIVE VALUE POSITIVE

What proportion of those identified actually have the disease or factor?

EVALUATION OF A SURVEILLANCE SYSTEM

ACCEPTABILITY

- ❖ Does the system stimulate the cooperation of respondents?
- ❖ Does the process discourage participation?

EVALUATION OF A SURVEILLANCE SYSTEM

FLEXIBILITY

Can changes be easily made in the system to reflect changes in trends, magnitude, and other relevant factors?

EVALUATION OF A SURVEILLANCE SYSTEM

SIMPLICITY

Can the system be simplified and still obtain the necessary information?

EVALUATION OF A SURVEILLANCE SYSTEM

COST/BENEFIT

- ❖ Is the system worth the cost?
- ❖ Can costs be reduced without sacrificing the essential quality of the system (e.g., each 12 vs each 6 months)?

EVALUATION OF A SURVEILLANCE SYSTEM

DISSEMINATION OF RESULTS

- ❖ To decision-makers
- ❖ To data collectors
- ❖ To the general public

EVALUATION OF A SURVEILLANCE SYSTEM

APPROPRIATE ACTION TAKEN

- ❖ Are appropriate actions taken in response to the surveillance data?
- ❖ Does surveillance lead to effective intervention?

DISSEMINATION

- ❖ Decision-makers
- ❖ Staff (motivation)
- ❖ Public