DISEASE SURVEILLANCE

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Goals

- Define surveillance, explain surveillance systems
- Describe basic surveillance techniques by person, place, time
- Touch on importance of standardization
- Provide overview of how to present surveillance data

What Is Surveillance?

- Centers for Disease Control and Prevention (CDC): epidemiologic surveillance is "ongoing systematic collection, analysis, and interpretation of health data essential to the planning, implementation, and evaluation of public health practice, closely integrated with the timely dissemination of these data to those who need to know."

Why Is Surveillance Important?

- Collecting data is merely one step
- Critical goal is to control and/or prevent diseases
  - Any data collected must be organized and carefully examined
  - Any results need to be communicated to public health and medical communities

Why Is Surveillance Important?

- Vital to communicate results
  - During potential outbreak so public health and medical communities can help with disease prevention and control efforts
  - During non-outbreak times to provide information about baseline levels of disease
    - Baseline provides information to public health officials monitoring health at community level, serves as reference in future outbreaks

Why Is Surveillance Important?

- Surveillance information has many uses:
  - Monitoring disease trends
  - Describing natural history of diseases
  - Identifying epidemics or new syndromes
  - Monitoring changes in infectious agents
  - Identifying areas for research
  - Evaluating hypotheses
  - Planning public health policy
  - Evaluating public health policy/interventions

Surveillance Systems

- Classified as passive or active
- Passive surveillance:
  local and state health departments rely on health care providers or laboratories to report cases of disease
  - Primary advantage is efficiency: simple and requires relatively few resources
  - Disadvantage is possibility of incomplete data due to underreporting
  - Majority of public health surveillance systems are passive

Surveillance Systems

- Active surveillance:
  health department contacts health care providers or laboratories requesting information about conditions or diseases to identify possible cases
  - Requires more resources than passive surveillance
  - Useful when important to identify all cases
    - Example: between 2002 and 2005, active surveillance used to detect adverse events associated with smallpox vaccine.

How to Conduct Surveillance

- Surveillance data allow description and comparison of patterns of disease by person, place, and time
- Several ways to describe and compare patterns, from straightforward presentations to statistically complex analyses

How to Conduct Surveillance: Person

- When available, demographic characteristics such as gender, age, race/ethnicity, occupation, education level, socio-economic status, sexual orientation, immunization status can reveal disease trends
  - Example: ILI (influenza like illness)

(For use by Health Clinic)

Influenza-Like-Illness Surveillance

Clinic :_____

Date : _____

Total number of OPD attendances: _____

Diagnosis	Age						Total
	0 – 6 Yrs	7 - 12 Yrs	13 - 17 Yrs	18 - 24 Yrs	25 - 59 Yrs	60 and above	
Influenza-Like-Illness (ILI)							

* data can be collected using the tally method (𝍸) = 5

How to Conduct Surveillance: Person – Numbers and Rates

- Table 1 shows data collected on *Streptococcus pneumoniae* from CDC Emerging Infections Program Network, a surveillance program that collects data from multiple counties in 10 US states

Table 1. Reported cases of *Streptococcus pneumoniae* by race, 2006 (4)

Race	Number
White	2,614
Black	1,095
Other	213

Unknown race (n=684) distributed among knowns

How to Conduct Surveillance: Person – Numbers and Rates

- Data show majority of cases reported among whites
- Can draw only limited conclusions because race not recorded for 684 cases (15%)
- Shows only *number* of reported cases, not *rate*
- Total number of individuals by race needed to determine if there is a disproportionate burden of disease among races

Table 1. Reported cases of *Streptococcus pneumoniae* by race, 2006 (4)

Race	Number
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Black	1,095
Other	213

Unknown race (n=684) distributed among knowns

How to Conduct Surveillance: Person – Numbers and Rates

- Table 2 shows same data with 2006 population estimates of total number of persons in each racial category used to calculate disease rates

Table 2. Rates of invasive pneumococcal disease by race, 2006

Race	Number	Rate*
White	2,614	11.8
Black	1,095	25.1
Other	213	12.8

*Cases per 100,000 population of surveillance areas

How to Conduct Surveillance: Person – Numbers and Rates

- While Table 1 showed that whites had the highest *number* of cases, Table 2 indicates that the *rate* of disease was highest among blacks
- Using rates, stratifying by race provides information about disease burden in different populations that would not be apparent from total case numbers

Table 2. Rates of invasive pneumococcal disease by race, 2006

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More on Rates

- **Rates**—A rate is "an expression of the frequency with which an event occurs in a defined population"
- Using rates rather than raw numbers is essential to compare different classes of persons or populations at different times or places.

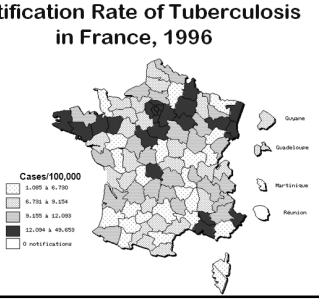
$$\text{Rate} = \frac{\text{number of events in a specified period}}{\text{average population during the period}}$$

How to Conduct Surveillance: Place

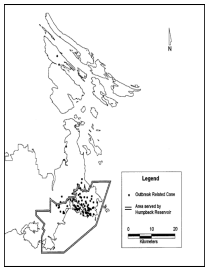
- Best to characterize cases by place of exposure rather than by place at which cases reported
- The two may differ and place of exposure is more relevant to epidemiology of a disease
  - Example: travelers on a cruise ship exposed to a disease just prior to disembarking but become symptomatic and are diagnosed after return to various home locations
  - Example: person exposed to disease in small rural town but referred to tertiary care center 100 miles away where disease is diagnosed and reported

How to Conduct Surveillance: Place – disease mapping

Also helpful to use maps to facilitate



How to Conduct Surveillance: Place – Spot Maps



- Example: spot map used to show geographic spread of cases in 1995 outbreak of toxoplasmosis thought to be associated with a municipal water system in British Columbia, Canada
- Spot maps show geographic distribution of cases but not population size at each location, so should not be used to assess disease risk

How to Conduct Surveillance: Time

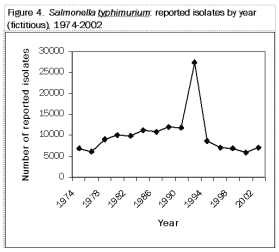
- Compare number of cases reported in time period of interest (weeks, months, years) to number of cases reported during similar historical period

How to Conduct Surveillance: Time – Line Graphs

- Especially helpful for examining data not likely to have much short term variation
  - Example: there is limited variation in number of AIDS cases reported each month
- Provide valuable qualitative information; disease outbreaks often obvious from visual inspection of data, may not require a quantitative analysis

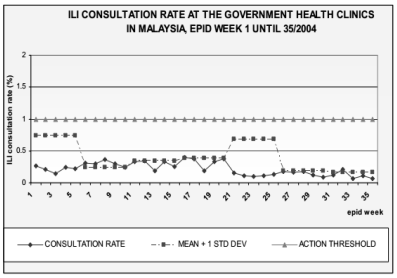
How to Conduct Surveillance: Time – Line Graphs

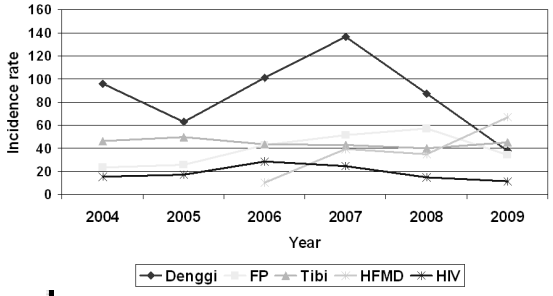
- Example of line graph using fabricated data: reported cases of *Salmonella typhimurium* for 2-year time intervals from 1974 to 2002
- Spike in 1994 indicating outbreak of *S. typhimurium* obvious without quantitative analysis



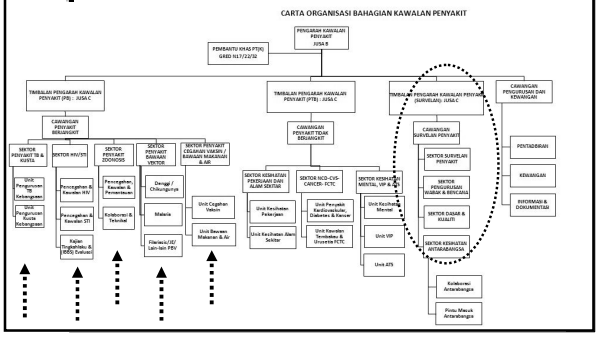
Example of monitoring data on the consultation rate for influenza (ILI) in Malaysia, 2004.

EPID WEEK	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
CONS. RATE (%)	0.266	0.213	0.148	0.248	0.222	0.307	0.301	0.361	0.293	0.245	0.329	0.345	0.186	0.334	0.249	0.394	0.377	0.192	0.332	0.374
Mean + 1SD	0.745	0.745	0.745	0.745	0.745	0.243	0.243	0.243	0.243	0.243	0.343	0.343	0.343	0.343	0.343	0.39	0.39	0.39	0.39	0.39



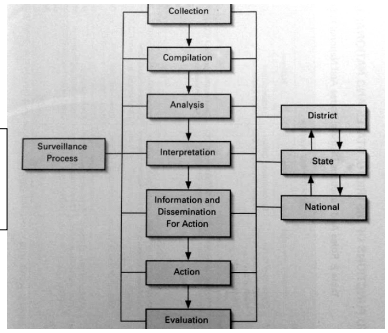


Surveillance of Infectious Disease in Malaysia



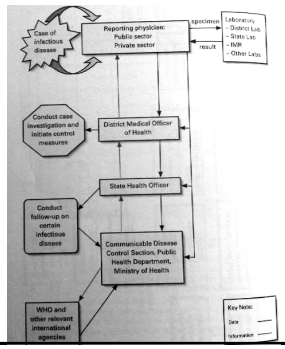
Surveillance of Infectious Disease in Malaysia

SURVEILLANCE ACTIVITIES AT VARIOUS LEVEL



Surveillance of Infectious Disease in Malaysia

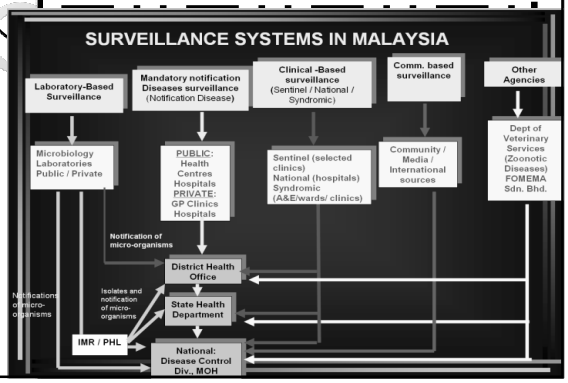
FLOW OF SURVEILLANCE DATA AND INFORMATION DISSEMINATION



Surveillance System

- The notification data were collected and compiled on a weekly basis by the District Health Office.
- A summary report was sent to the State Health Department and Statistic Unit, Disease Control Division, Ministry of Health Malaysia .

Surveillance of Infectious Disease in Malaysia



1) Mandatory notification surveillance system

Started 1967
With Malaria Eradication Program
1970s – surveillance of 36 notifiable disease

- **Mandatory notification** - under Section 10(2) Act 342:
  Prevention & Control of Infectious Disease Act 1988.
- for surveillance and disease control and prevention activities

➢27 infectious diseases – within 24 hrs/1 week.
➢Every medical practitioners (notifying facilities) to nearest District Health Office
➢Compounded offenses if fail to notify
➢Notification – phone & form – fax/post/by hand – Manual System

1) Mandatory notification surveillance system

List of Notifiable Infectious Disease First Schedule (Section 2)

- **Part I:**
- **1. Chancroid**
- **2. Cholera**
- **3. DF & DHF**
- **4. Diphteria**
- **5. Dysenteries (All forms)**
- **6. Ebola**
- **7. Food Poisoning**
- **8. Gonoccocal Infection. (All)**
- **9. Leprosy**
- **10. Malaria**
- **11. Measles**
- **12. Myocarditis**
- **13. Plague**
- **14. Poliomyelitis (Acute)**
- **Rabies**
- **16. Relapsing Fever**
- **17. Syphilis (All forms)**
- **18. Tetanus (All forms)**
- **19. Tuberculosis (All forms)**
- **20. Typhus & Other Rickettsioses**
- **21. Typhoid & Paratyphoid Fevers**
- **22. Viral Encephalitis**
- **23. Viral Hepatitis**
- **24. Whooping Cough**
- **25. Yellow Fever**
- **26. Any other life threatening microbial**
- **infection**
- **Part II:**
- **HIV Infection (All forms)**

Latest: leptospirosis

2) Laboratory based surveillance system

- Monitoring of disease agent : introduced on August 2002
- Complement the mandatory surveillance system
- Reporting of micro-organisms isolated in all private/public lab in Malaysia
- Facilitate outbreak identification and investigation through strain identification
- Example:
  - V.cholerae, H. influenzae B, Salmonella spp., S.typhi/paratyhpi, N. meningitides, Leptospira , H1N1 virus

3) Clinical based surveillance system

- Can help to assess situation fast to determine epidemiological link and potential source
- Act as 'smoke detector'
- A clinical approach before lab confirmation is available
- 2 recent example:
  - SARS
  - Anthrax

3) Clinical based surveillance system

- Include surveillance of:
  - National (Acute flaccid paralysis, conjunctivitis, acute gastroenteritis)
  - Sentinel (Hand Foot and Mouth Disease)
  - Syndromic surveillance (6 syndromes)
    - Acute dermatological syndrome
    - Acute haemorrhagic syndrome
    - Acute Jaundice syndrome
    - Acute respiratory syndrome
    - Acute neurological syndrome
    - Acute diarrhoeal syndrome

3) Clinical based surveillance system

Table 4: Proxy indicators of existing surveillance system

Proxy	Disease/problem
Acute Gastroenteritis	Food and water borne disease
Acute Flaccid Paralysis	Poliomyelitis
HFMD	Enteroviruses
Acute Respiratory Infection	Pneumonia, Influenza virus
The defined syndromes under the syndromic notification system	Emerging or unknown infections
Unexplained/ill defined death of infectious origin	Emerging or unknown infections

4) Communicable disease surveillance system by others agency

- Veterinary: zoonotic disease (rabies, JE, avian influenza)
- FOMEMA: Communicable disease among foreigners

NO	DISEASE
1	Rabies
2	Nipah Virus Infection
3	Avian Influenza
4	Japanese Encephalitis
5	Vancomycin Resistant Enterococcus
6	Bovine Tuberculosis
7	Bovine Spongiform Encephalopathy
8	Brucellosis
9	Anthrax Infection
10	Toxoplasmosis
11	Leptospirosis
12	Salmonella Enteritidis/Typhimurium
13	Rift Valley Fever
14	Q Fever
15	Hanta Virus
16	Filariasis
17	Yellow Fever

5) Community based surveillannce system

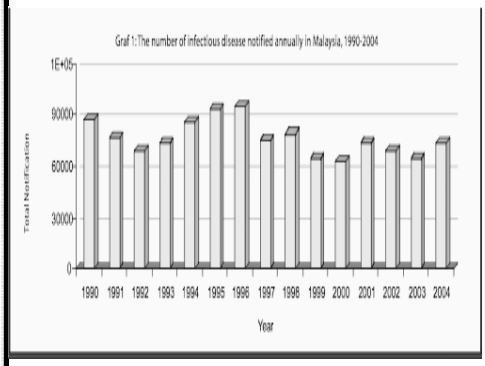
Community Based Surveillance
- *Media/Rumour Surveillance*

Media reporting
- Obtain reports on possible infectious diseases occurring locally and in other countries
- Monitor global and local situation
- Provide alert if necessary
- Initiate data gathering for surveillance
- Collaborate with other agencies in surveillance and preparedness

5) Community based surveillannce system

- **Methodology**
  - Passive: News
  - Active: Mobilising communities
    - Police stations
    - Private clinics / hospitals
    - Pharmacies

- News
- Printed
- Internet
- Telecast
- Others
  - Word-of-mouth
  - Calls
  - E-mail



Case report internationally to WHO under International Health Regulation

Q: What are the International Health Regulations?

A: The International Health Regulations (IHR) are an international legal instrument that is binding on 194 countries across the globe, including all the Member States of WHO. Their aim is to help the international community prevent and respond to acute public health risks that have the potential to cross borders and threaten people worldwide.

IHR 1969 → IHR 2005

Case report internationally to WHO under International Health Regulation

IHR 1969

The 1969 IHR were primarily intended to monitor and control six serious infectious diseases: cholera, plague, yellow fever, smallpox, relapsing fever and typhus.

With its focus on just three diseases (cholera, plague and yellow fever), the IHR (1969) were not equipped to address the growing and varied public health risks that resulted from increased travel and trade in the last quarter of the 20th century.

Case report internationally to WHO under International Health Regulation

The IHR (2005) aim to prevent, protect against, control and respond to the international spread of disease while avoiding unnecessary interference with international traffic and trade. The IHR (2005) are also designed to reduce the risk of disease spread at international airports, ports and ground crossings.

The IHR (2005), which are firmly grounded in practical experience, broaden the scope of the 1969 Regulations to cover existing, new and re-emerging diseases, including emergencies caused by non-infectious disease agents.

Under the IHR (2005), all cases of these four diseases must be automatically notified to WHO: smallpox, poliomyelitis due to wild-type poliovirus, SARS and cases of human influenza caused by a new subtype.

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Influenza A(H1N1)

http://h1n1.moh.gov.my/

Mitigation Phase:INFLUENZA A(H1N1) Surveillance Strategies

2. OBJECTIVE

General:
To monitor and detect changes in the geographical spread, trend, intensity and impact of the influenza A(H1N1) infection in the community.

Specific:

i. To establish a mechanism for timely reporting of influenza A(H1N1) caseload from healthcare facilities.
ii. To facilitate early detection and response towards cluster cases of influenza A(H1N1) infection.
iii. To monitor for changes in the antigenicity and antiviral sensitivity of the circulating influenza A(H1N1) virus.

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3. CASE DEFINITION OF INFLUENZA A(H1N1) INFECTION

Clinical case description:
Acute febrile respiratory illness (fever ≥ 38 °C) with the spectrum of disease from influenza-like illness to pneumonia. Other possible symptoms includes; headache, dyspnea, myalgia, joint pain, nausea, vomiting and diarrhoea.

4. NOTIFICATION OF INFLUENZA A(H1N1) CASES

Patients in need of hospital management are to be admitted, as the situation warrants. The patient should then be further managed appropriately according the clinical management recommended.

All medical practitioners attending to admitted cases of whom highly suspicious of influenza A(H1N1) infection, need to notify the nearest District Health Office (DHO) and the Crisis Preparedness and Response Centre (CPRC), Disease Control Division using the notification format

5. SURVEILLANCE ACTIVITIES FOR INFLUENZA A(H1N1)

Influenza-like illness (ILI) surveillance during this period will involve **ALL** Influenza-like illness (ILI) surveillance during this period will involve **ALL** government hospitals. In view of the current global situation, the surveillance of ILI and sARI will be done **DAILY** until further notice from Disease Control Division, Ministry of Health

5.1 INFLUENZA-LIKE ILLNESS (ILI)

Case Definition Of Influenza-Like Illness (ILI):
A person presenting with a sudden onset of fever ≥ 38oC and cough or sore throat, in the absence of other diagnosis

5.2 SEVERE ACUTE RESPIRATORY INFECTION (sARI)

Case Definition Of Severe Acute Respiratory Infections (sARI):

- Meets ILI case definition (sudden onset of fever ≥ 38oC and cough or sore throat, in the absence of other diagnosis), **AND**
- Shortness of breath or difficulty breathing, **AND**
- Requiring hospital admission.

6. CLUSTER OF ACUTE RESPIRATORY INFECTION

A cluster is defined as two or more persons presenting with manifestations of unexplained, acute respiratory illness with fever ≥ 38ºC or who died of an unexplained respiratory illness that are detected with onset of illness within a period of 7 days and in the same geographical area and/or are epidemiologically linked.

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Influenza A(H1N1)

7. ACUTE RESPIRATORY SYNDROME

Acute Respiratory Syndrome is defined as follows:

- Acute onset of cough or respiratory distress (e.g. tachypnoea, chest recession, dyspnoea, cyanosis)
- **AND** severe illness
- **WITH** an absence of known predisposing factors.

8. MONITORING OF ABSENTEEISM

Any unusual absenteeism involving a defined institution e.g. school, workplace, PLKN camps, long-term facility -