What is 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

"The 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."

U.S. Centers for Disease Control and Prevention

In other words: Surveillance

Continuous and systematic vigilance over the occurrence and distribution of disease and events or conditions which increase the risk of disease

Objectives

- The objectives of surveillance
- The type of surveillance
- The step involved in surveillance
- the limitations of surveillance systems

Surveillance: general objectives

- To follow trends in the health status of a population over time.
- To establish health care and public health priorities
- To ensure those with greatest need are prioritized.
- To detect and respond to epidemics
- To evaluate the effectiveness of programmes and services

What are the specific objectives of surveillance?

- **The principal objectives are to :**
- **Give early warning of change of incidence- as with the recent increase in tuberculosis in many countries following along period of decline**
- **Detect outbreaks early**
- **Evaluate the effectiveness of interventions – the introduction of new vaccines , for instance**

Examples of events that may require surveillance are:

- **Epidemic diseases, e.g. measles, meningococcal meningitis**
- **Malnutrition**
- **Animal reservoirs and vectors of communicable diseases**
- **Environmental pollution, particularly of water**
- **Demographic events, such as births and deaths**

Assessment of whether targets have been reached

Assume a national goal has been set to "Reduce malaria Deaths by 20% in the next five years"

There is a baseline figure on malaria deaths
There is a way of monitoring trends in deaths over time

What are the objectives of surveillance?

- **To identify high-risk groups:** (e.g. by age and occupation), geographical areas where the problem is common, and variation over time (e.g. seasonal and year to year).

This also assist in planning programmes.

Surveillance might provide the impetus to establish , say , a neonatal BCG programme to prevent tuberculosis in children at higher than standard risk

- **Help set priorities for resource allocation**

  In general , surveillance systems alone do not contribute greatly to this as the importance of a condition is often a function of its health consequence and the treatments available for established cases ,rather than simply its incidence .

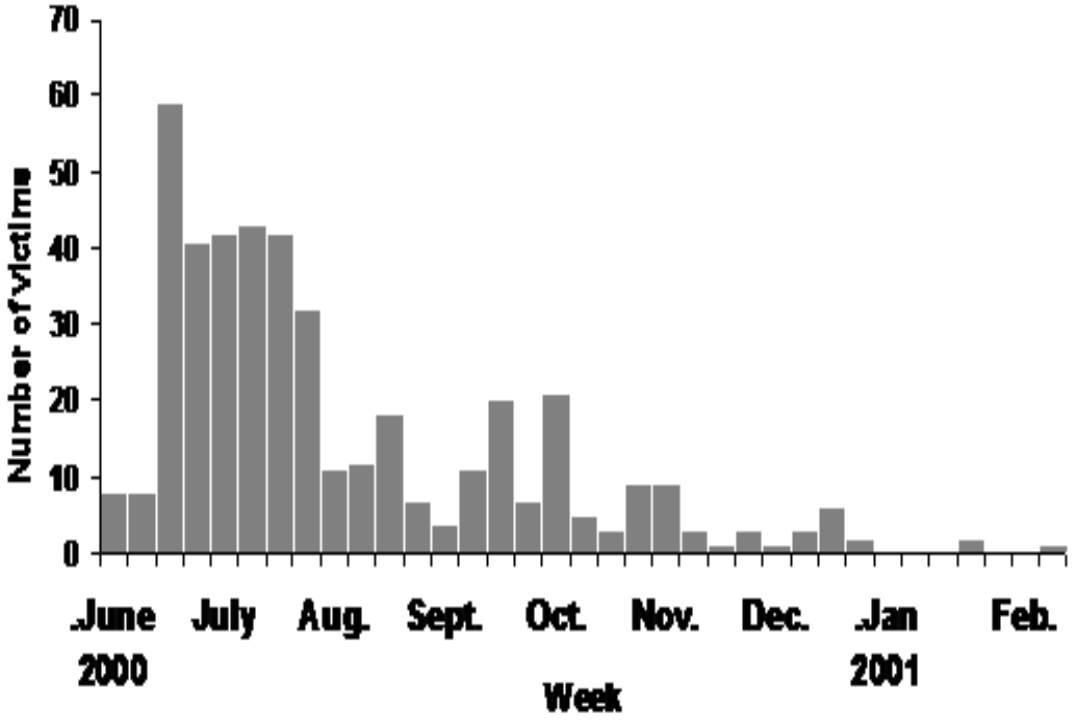
Surveillance

- Surveillance can often produce information which is more timely than information gathered by other methods, such as surveys. It can also allow you to monitor trends more easily.

Types of surveillance

- Surveillance can be classified into the following types:
- ***Passive surveillance:*** a system in which data generated without solicitation, intervention or contact by the health agency carrying out the surveillance. Other agencies initiate reporting.
- The data collator awaits its reporting , as with the British system of notifiable disease reporting

This figure is an example of data gathered by passive surveillance from the hospitals run by one organization:



Types of surveillance

- ***Active surveillance*** – the organization conducting surveillance initiates procedures to obtain reports
- The data collator checks that the reporting agency is indeed collecting the source data , and doing so as completely as the collection mechanism allows

Types of surveillance

- **Negative surveillance:** where the data collator presses the collector to report even the absence of cases.
- This is the typically required for uncommon disorders so that the collator can be sure that a ‘nil report’ truly reflects zero incidence over the period and not simply a failure to report.
- Paediatric surveillance units around the world use negative reporting schemes.

Sentinel surveillance

- Instead of attempting to gather surveillance data from all health care workers, a sentinel surveillance system selects, either randomly or intentionally, a small group of health workers from whom to gather data.
- These health workers then receive greater attention from health authorities than would be possible with universal surveillance.

- Sentinel surveillance also requires more time and resources, but can often produce more detailed data on cases of illness because the health care workers have agreed to participate and may receive incentives.
- It may be the best type of surveillance if more intensive investigation of each case is necessary to collect the necessary data.
- For example, sentinel influenza surveillance in the Jordan collects nasopharyngeal swabs from each patient at selected sites to identify the type of influenza virus. Collection of such data from all health workers would not be possible.

Mortality surveillance

- Another type of surveillance is often done for deaths.
- In most countries, the health authorities require that each death in the population be reported or registered. These reports are then periodically counted up to calculate a death rate. Death registration systems are universal, albeit of widely differing quality and completeness.

- Why is death a common condition under surveillance?

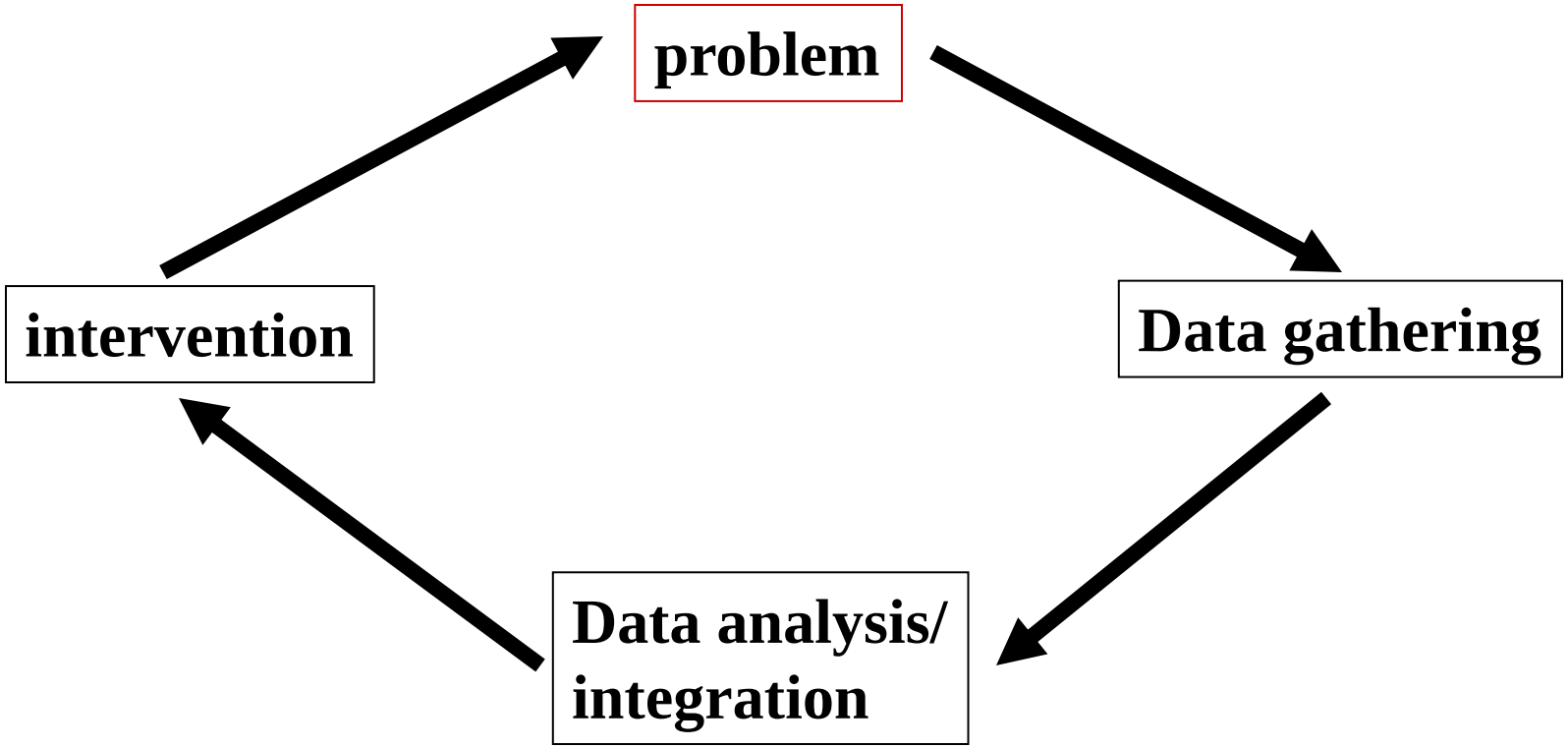
Death is the final common outcome of severe disease. If you can only measure one condition to follow the health status of a population, death is probably the best. If the death rate in a population is normal, the health status of the population is probably not very bad.

Collection of information

- Geographic subunits
- Age
- Sex

Important concepts in surveillance

The surveillance arc



If data are to be used for decision-making, they need to be made available and understandable to public health decision makers in a timely fashion.

Problems:

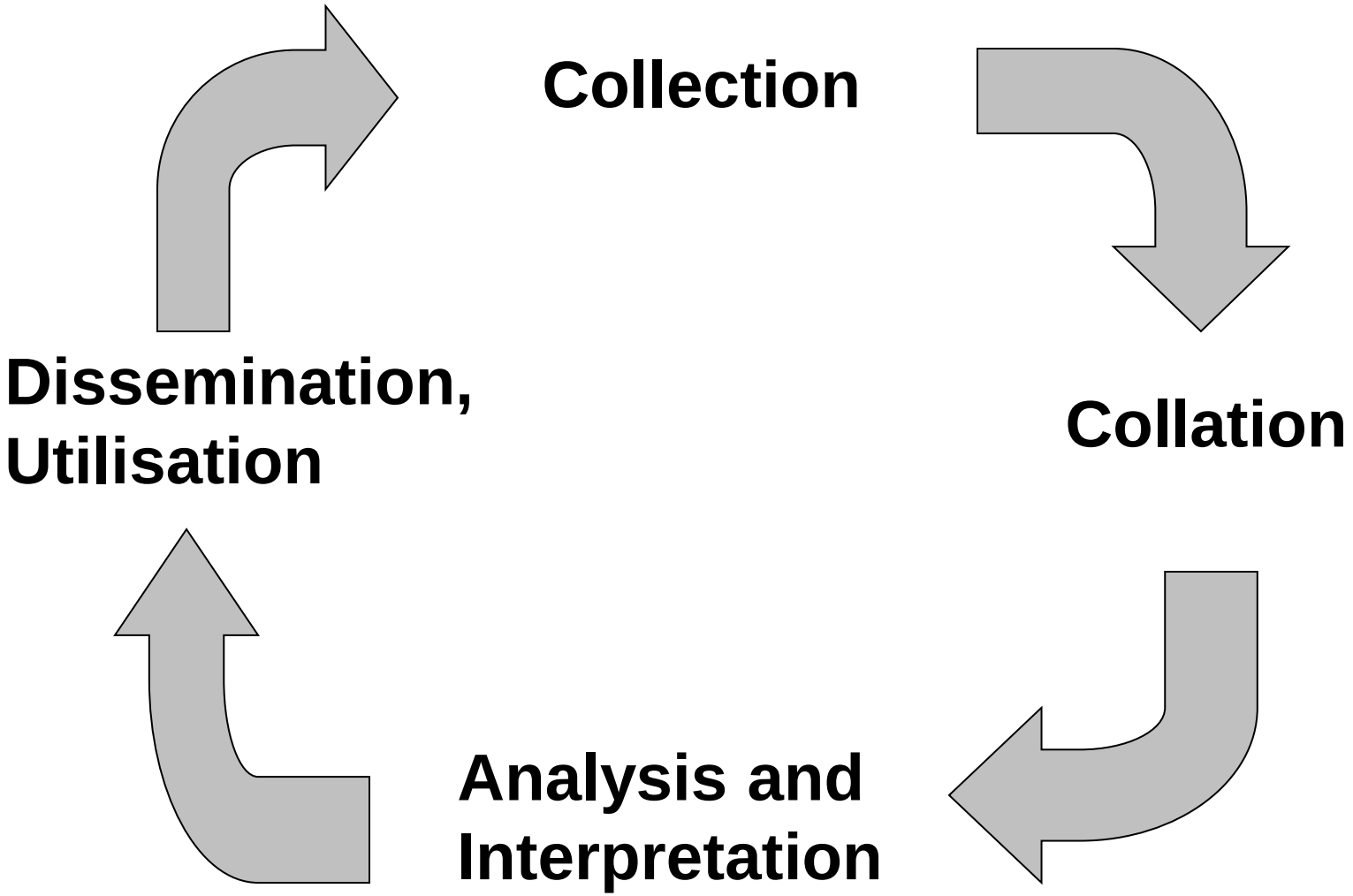
- **Data analysis**
  gathering, summary, dissemination
- **Interventions**

Steps involved in surveillance

There are four steps:

- Data collection
- Data collation
- Data analysis
- Dissemination.
- Action may or may not flow from the last.

Flow of Surveillance Data

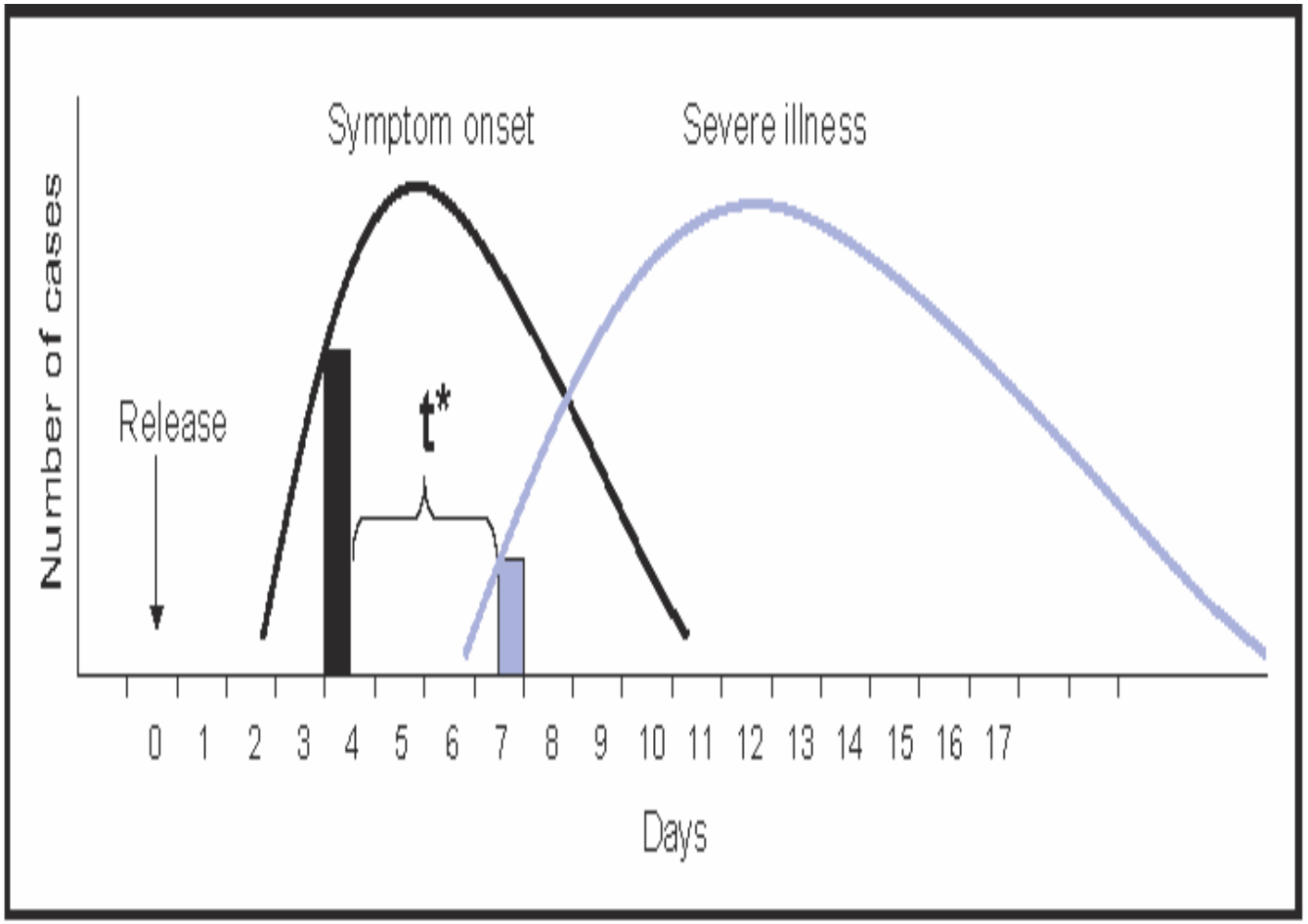


Data collection

- ***Laboratory-based reporting*** – a surveillance system in which the reports of cases come from clinical laboratories instead of healthcare practitioners or hospitals
- Laboratory data might be considered intrinsically more reliable than notifiable disease data, but case- definitions are needed for this too. For example, the significance of an organism isolated from a site or specimen may mean little in itself. The clinical picture determines its importance .

Data collection

- Data collection interval must be short for those conditions where rapid intervention may be needed.
- The collection/collation process is only part of the overall delay between a case of disease arising and becoming known to the collator – other elements of the delay are:
- The incubation period of the disease
- The interval between the patient becoming ill and seeking medical help



* t = time between detection by syndromic (prediagnostic) surveillance and detection by traditional (diagnosis-based) surveillance.

C. data analysis

- In general analysis of surveillance data does not call for sophisticated data manipulation the spreadsheet system described above can automatically generate summary data including graphs of time-trends for formal reports

- A major advantage of the spreadsheet approach , if properly set up, it update itself.

- Not only does this mean that a periodic report is simple to compile but that ad-hoc enquiries related to disease incidence over a given period, which can obviously span over more than one year, can be answered very rapidly

D. Judgment and action

- Someone has to decide, based on the results of analysis, what needs to be done.
- This is often the public health authorities at the local, provincial, or national level.
- In emergencies, it is often a joint opinion of local and national health authorities, the organization coordinating health, and all the organizations providing health services.
- If any of these steps break down or is unavailable, you will not have usable information with which to take the appropriate (and sometimes necessary) public health action.

E. Dissemination and feedback

- It is important that the original providers of data to surveillance system are given feedback.
- Data providers may become disillusioned with servicing a system that yields nothing for them. Beyond this, it is a courtesy to invite ad-hoc enquiries from the data contributors.
- With a well-designed surveillance system, this involves collator in minimal extra work and generates much goodwill.

Case definitions

- Each reporting health worker should be defining diseases in the same way, that is, they should all be using standard case definitions.

- These case definitions are not meant to define clinical diagnosis, but only to standardize what is reported to public health authorities.

- Of course, each emergency situation is different, so the diseases under surveillance as well as their case definitions may be different. Regardless, it is important that all reporting health workers in a specific population use the same case definitions.

Limitations of the surveillance systems

As with all information sources, there are four potential shortcomings of surveillance systems, covered by the mnemonic “C.A.R.T”

- Completeness
- Accuracy: is data classified correctly
- Relevance and/or representativeness
- Timeliness- does data arrive in time for effective action to limit further cases to be instituted

Feedback

Flow of information within a surveillance system

What is missing in these situation?

Feedback to the previous level within the data collection system

Communicable disease		
Acute flaccid paralysis	Anthrax	Ringworm
Polio	Rabies	Leishmaniasis
Measles	Rubella	Plague
Acute watery diarrhoea	Influenza-like illness	Leprosy
Hepatitis A	Foodborne disease	Yellow Fever
Hepatitis B	Typhus	Relapsing Fever
Meningitis	Tuberculosis	SARS
Bloody diarrhoea	Typhoid & Para Typhoid Fever	H1N1
Malaria	Mumps	Coronovirus
HIV	Chicken pox	West Nile virus
Syphillis	Brucellosis	Crimean Congo Fever
Gonorrhoea	Scarlet fever	Acute diarrhoea
Diphtheria	Tetanus	Dengue Fever
Typhus	Pertussis	Rift valley Fever
Animal bite	Bilharzia	Hydatidosis
Scabies		
Non-communicable disease		
Hypertension	Diabetes	
Asthma	Chronic obstructive pulmonary disease	
Neoplasms	Haemophilia	
Mental health		
Alcohol use disorders	Substance use disorders	
Stress related disorders	Psychosis (including Schizophrenia)	
Depression (moderate to severe)	Epilepsy/seizure	
Severe emotional disorder	Self-harm/suicide	
Behavioural disorder	Bipolar disorder	
Developmental disorder	Anxiety disorders	
Dementia	Obsessive compulsive disorder	
Unexplained somatic complaint		

In summary: surveillance can:

- Detect outbreaks
- Detect public health threats
- Detect infectious cases (case finding)
- Monitor trends in a target population
- Monitor exposed individuals for symptoms
- Monitor treated individuals for complications
- Direct public health interventions
- Evaluate public health interventions
- Generate hypotheses for further evaluation