CHAPTER- THREE

DISEASE SURVEILLANCE AND RESPONSE

LEARNING OUTCOMES

At the end of this chapter participants will be able to:

➢ Discuss overview of disease surveillance and response

➢ List components of disease surveillance and response

➢ Set priority diseases targeted for surveillance and response

➢ List core functions of surveillance system

➢ Discuss overview of Disease surveillance and response, Ethiopian context (PHEM)

➢ List diseases under surveillance in Ethiopia

➢ Identify reporting, types and tools

Overview of disease surveillance and response

What is Surveillance?

It is an on-going systematic, **collection**, **analysis**, **interpretation** and **dissemination** of **health-related data** essential to the **planning**, **implementation**, and **evaluation** of public health practice.

Overview of disease surveillance and response

Surveillance:

❖ Includes dissemination of the resulting information

❖ Is also essential for **planning**, **implementation** and **evaluation**

❖ Helps health workers to set **priorities**, **plan interventions**, **mobilize** and **allocate resources**, **detect epidemics early**, **stimulate research**, **trigger public health action**, **initiate prompt response** to epidemics and **evaluate** and **monitor health interventions**.

❖ Helps to assess **long term** disease trends

➢ **Generally**, it informs the management of public health programs and direction of public health policy

➢ **N.B:** Collection and analysis should not be allowed to consume resources if action does not follow

Process of Public Health Surveillance

- Data collection

- Data analysis

- Data interpretation

- Information dissemination

- Link to action

Data Sources for surveillance

- Records of notifiable diseases

- Laboratories

- Vital records

- Registries

- Surveys

- Other data sources

Vital Statistics

- **Records of births and deaths**: a basic but critical cornerstone of public health surveillance

- **Mortality data** over past century show decrease in rate of deaths due to infectious diseases; rate of death from non-infectious causes remain steady

- **Infant mortality rate** (number of deaths among infants per 1,000 births) is used as indicator of **overall population health**

- **Birth data** used to monitor incidence of **preterm birth**, risk factor for variety of adverse health outcomes

Three types of surveillance

❖ Passive surveillance/passive case detection

❖ Active Surveillance

❖ Sentinel Surveillance

Passive surveillance

❖ Is a mechanism for routine survey based on passive case detection and on the routine recording and reporting system.

❖ The information provider comes to the health institutions for help, be it medical or other.

❖ It involves collection of data as part of routine provision of health services.

Passive surveillance

Advantages

❖ Covers a wide range of problems

❖ Does not require special arrangement

❖ It is relatively cheap

❖ Covers a wider area

Disadvantage

❖ The information generated is unreliable, incomplete and inaccurate

❖ Most of the time, data from passive surveillance is not available on time

❖ Most of the time, you may not get the kind of information you desire

❖ It lacks representativeness as it is mainly from health institutions

❖ There is no feedback system

Active Surveillance

❖ A method of data collection usually on a specific disease, for relatively limited period of time.

❖ It involves collection of data from communities

❖ This can be arranged on presence or absence of new cases of a particular disease at regular intervals.

Active Surveillance

❖ The techniques employed to collect information for active surveillance are:

- Sending out a letter describing the situation and asking for reports,

- Making a telephone call

- Visit the facilities to collect information on cases.

- Alerting the public directly, using local media, to visit a health facility if they have symptoms

- Asking patients if they know anyone else with the same condition.

- Conducting a survey of the entire population.

Active Surveillance

Advantages

❖ The collected data is complete and accurate

❖ Information collected is timely.

Disadvantages

❖ It requires good organization,

❖ it is expensive

❖ Requires skilled human power

❖ It is for short period of time (not a continuous process)

❖ It is directed towards specific disease conditions

Active Surveillance

Conditions in which active surveillance is appropriate

❖ For periodic evaluation of an ongoing program

❖ For programs with limited time of operation such as eradication program.

❖ In unusual situations such as

- New disease discovery

- New mode of transmission

- When a high-risk season/year is recognized.

- When a disease is found to affect a new subgroup of the population.

- When a previously eradicated disease reappears.

Sentinel Surveillance

❖ It uses a pre-arranged sample of reporting sources to report all cases of one or more conditions.

❖ It provides a practical alternative to population-based surveillance, in developing countries.

Sentinel Surveillance

Advantages

❖ Relatively inexpensive

❖ Provides a practical alternative to population-based surveillance

❖ Can make productive use of data collected for other purposes

Disadvantages

❖ The selected population may not be representative of the whole population

❖ Use of secondary data may lead to data of lesser quality and timeliness

Function of Surveillance

❖ The program monitoring function of surveillance of communicable diseases

encompasses a variety of goals such as

- ▪ Prevention and control (eg. Malaria)

- ▪ Elimination (eg. measles)

- ▪ Eradication (e.g. of guinea worm, poliomyelitis, onchocerciasis)

Function of Surveillance

Surveillance Provides Information for action

Surveillance
- ❖ Collection
- ❖ Analysis
- ❖ Interpretation
- ❖ Dissemination

Public Health Action
- ❖ Priority Setting
- ❖ Planning, Implementing and evaluating diseases
  - ▪ Investigation
  - ▪ Control
  - ▪ Prevention

Although surveillance is meant to guide a larger action it also provides the basis for identifying individuals who need treatment and preventive services

Fig. Actions to follow during surveillance and action

Strengthening Surveillance Systems

A structured approach to strengthen disease surveillance systems could include:
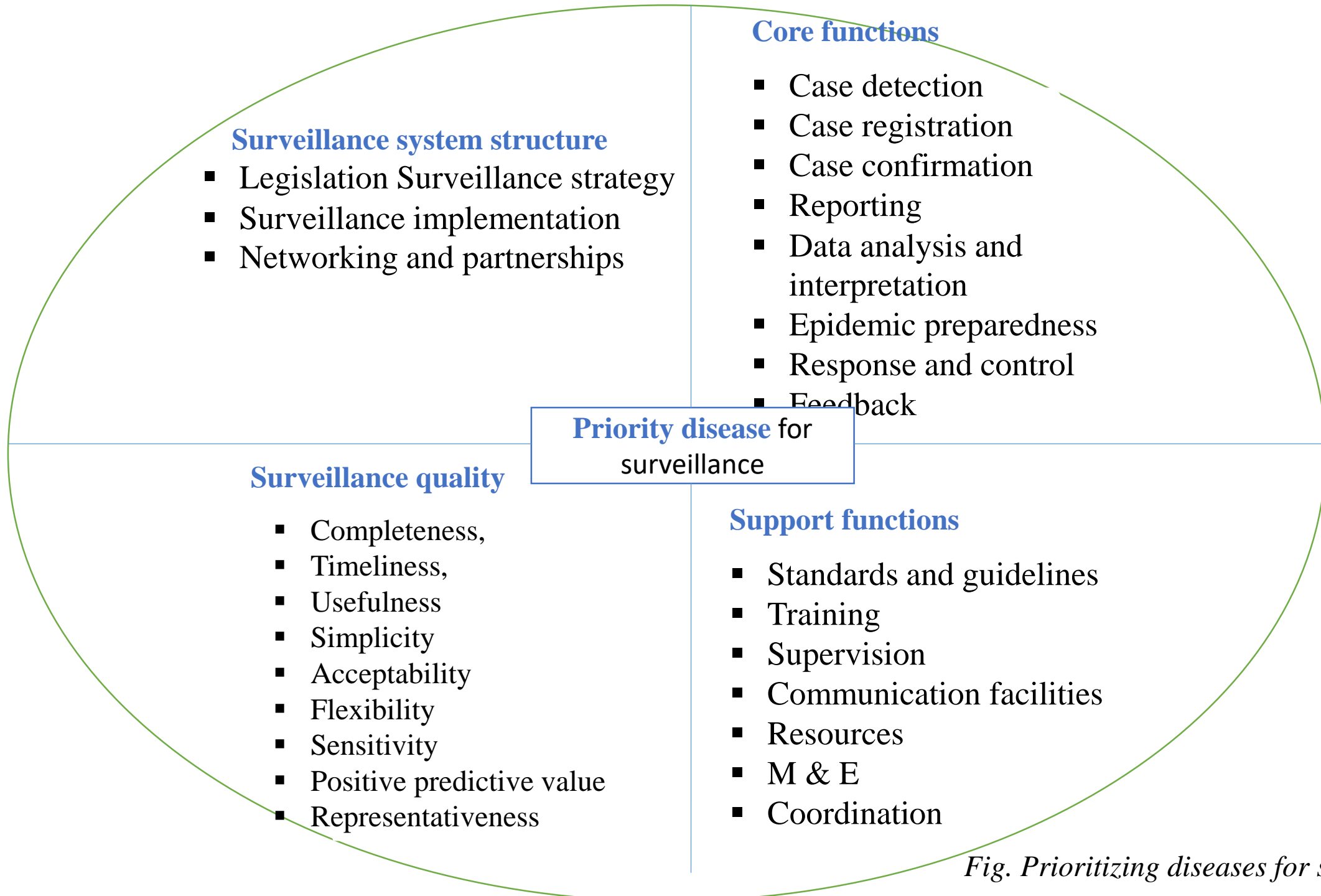
- ✓ Identifying major public health threats.

- ✓ Prioritization of public health threats

- ✓ Assessment of existing systems (SWOT)

- ✓ Development of a strategic plan of action based on assessment findings

- ✓ Implementation of activities planned to strengthen the systems.

- ✓ Monitoring progress in implementation of planned activities

- ✓ Evaluating outcomes and overall impact of the surveillance system

Components of disease surveillance and response

The components of surveillance and response systems targeted for M &

E comprise:

- The priority diseases targeted for surveillance

- The structure of the system

- Core functions of the system

- Support functions of the system

- Quality of the system

Surveillance system structure
- Legislation Surveillance strategy
- Surveillance implementation
- Networking and partnerships

Core functions
- Case detection
- Case registration
- Case confirmation
- Reporting
- Data analysis and interpretation
- Epidemic preparedness
- Response and control
- Feedback

Priority disease for surveillance

Surveillance quality
- Completeness,
- Timeliness,
- Usefulness
- Simplicity
- Acceptability
- Flexibility
- Sensitivity
- Positive predictive value
- Representativeness

Support functions
- Standards and guidelines
- Training
- Supervision
- Communication facilities
- Resources
- M & E
- Coordination

Fig. Prioritizing diseases for surveillance

Priority diseases targeted for surveillance and response

❖ Surveillance priorities may be **communicable** and **non-communicable**

diseases, conditions or events that include national or local priorities such as

- Acute outbreaks,

- Maternal deaths

- Events associated with human health

❖ Depending on the objectives of the system, **priority diseases for surveillance** should be identified and reviewed regularly to ensure that they remain relevant and important.

Priority diseases targeted for surveillance and response

❖ The following are some of the Selection Criteria for Disease

Surveillance:

- Magnitude of the disease

- Feasibility of control measures

- Need for monitoring and evaluating the performance of a control

  program

- Resource availability Support functions of the system

Core functions of surveillance system

❖ The core functions include:

- Case detection,

- Case registration,

- Case confirmation,

- Reporting,

- Data analysis and interpretation, and

- Public health response including reports and feedback

Core functions of surveillance system

A. Case detection

❖ **Case detection** is the process of identifying cases and outbreaks.

❖ Case detection can be through the **formal health system**, **private health systems** or **community structures**.

❖ Case definitions and a functioning rumor verification system are vital for case and outbreak detection.

Core functions of surveillance system

B. Case registration

- ❖ **Case registration** is the process of recording the **cases identified**.

- ❖ This requires a standardized register to record minimal data elements on targeted diseases and conditions.

- ❖ Monitoring should establish the proportion of health facilities having the **standardized registers**.

- ❖ Evaluation could then examine the **validity** and **quality of information** recorded as well as factors that affect the registration of cases.

Core functions of surveillance system

C. Case confirmation

❖ Case/outbreak confirmation refers to the **epidemiological** and **laboratory capacity** for confirmation.

❖ Capacity for case confirmation is enhanced through **improved referral systems**, **networking** and **partnerships**.

❖ This means having the capacity for appropriate **specimen collection**, **packaging** and **transportation**.

Core functions of surveillance system

D. Reporting

❖ Reporting refers to the process by which surveillance data moves through the **surveillance system** from the **point of generation**.

❖ It also refers to the process of reporting **suspected** and **confirmed** outbreaks.

❖ **Different reporting systems** may be in existence depending on the type of data and information being reported, purpose and urgency of relaying the information and where the data/information is being reported.

Core functions of surveillance system

E. Data analysis and interpretation

❖ Surveillance data should be analyzed **routinely** and the information interpreted for use in **public health actions**.

❖ Appropriate "**alert**" and "**epidemic**" threshold values for diseases with **epidemic tendencies** should be used by the surveillance staff.

❖ Capacity for routine data analysis and interpretation should be established and maintained for **epidemiological** as well as **laboratory data**.

Core functions of surveillance system

F. Epidemic preparedness

❖ Epidemic preparedness refers to the existing level of preparedness for potential epidemics and includes:

- Availability of preparedness plans,

- Stockpiling (buildup stocks),

- Designation of isolation facilities,

- Setting aside of resources for outbreak response, etc.

Core functions of surveillance system

G. Response and control

❖ Public health surveillance systems are only useful **if they provide data for appropriate public health response and control**.

❖ **For an early warning system**, the capacity to respond to detected outbreaks and emerging public health threats needs to be assessed.

❖ This can be done following a **major outbreak response** and containment to document the quality and impact of public health response and control.

Core functions of surveillance system

H. Feedback

❖ Feedback is an important function of all surveillance systems.

❖ Appropriate feedback can be maintained through **supervisory visits, newsletter** and **bulletins**.

❖ It is possible to monitor the provision of feedback by the different levels of surveillance and to evaluate the quality of feedback provided, and the implementation of **follow-up actions**.

Disease surveillance and response, Ethiopian context (PHEM)

❖ **PHEM**: is designed to ensure rapid detection of any **public health threats**, preparedness related to logistic and fund administration, and prompt response and recovery from various public health emergencies.

❖ It is the process of **anticipating**, **preventing**, **preparing** for, **detecting**, **responding to, controlling** and **recovering** from consequences of public health threats in order that health and economic impacts are minimized.

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Disease surveillance and response, Ethiopian context (PHEM)

❖ The major public health risks identified in the Ethiopian health system are:

- Epidemics of communicable disease

- Drought conditions with malnutrition

- Food contamination

- Flood

- Pandemic Influenza

- Diseases that affect people during conflicts and in displaced populations

- Accidents

- Earthquake, volcanic eruptions

- Bioterrorism

- Currently chronic disease is also an issue

Guiding principles of PHEM

A. Multi-hazard approach

❖ Every hazard is determined by the **potential importance** of the risk identified

❖ Any health hazard, irrespective of their **origin or source**, including those caused by:

✓ **Biological,**

✓ **Chemical agents** **or**

✓ **Radio-nuclear materials** are considered by this approach.

Guiding principles of PHEM

B. From risk assessment to recovery

❖ PHEM will cover **the entire cycle of an emergency** or disaster;

➔ From **prevention** and **detection** to response and recovery

❖ The extent of the activities in the process will vary according to the type of **Public Health Emergency** (PHE).

Guiding principles of PHEM

C. Risk assessment and mitigation

❖ One of the major changes in emergency management is change from the **old concept** of disease management to a **new approach of risk management.**

❖ Therefore, systematic analysis of the **vulnerability to health hazards** and assessment of the risk is an **innovative area of focus.**

❖ Each and every level in health system is required to understand the health hazards and risks posed on their population and map this using technology such as *Geographic Information System (GIS).*

Guiding principles of PHEM

D. International Health Regulations (IHR2005)

❖ The PHEM process considered and encompassed international obligations that Ethiopia ratified.

❖ IHR 2005 is to prevent, protect against, control and provide public health response to the international spread of disease in ways that are relevant and restricted to public health risks, and which avoid unnecessary interference with international traffic and trade.

Diseases under surveillance in Ethiopia

❖ It is clear that surveillance could not be carried out for all diseases and conditions due to many reasons.

❖ Therefore, priority should be given to those diseases that are of interest at national and international levels.

❖ In Ethiopia context 20 diseases (**13 are immediately reportable** whereas **7 are weekly reportable**) are selected to be included into the routine surveillance.

Diseases under surveillance cont…

Diseases and conditions selected based on one/more of the following criteria:

I. Diseases which have **high epidemic potential**:

1. Anthrax,

2. Avian Human Influenza,

3. Cholera,

4. Measles,

5. Meningococcal Meningitis,

6. Pandemic Influenza,

7. Smallpox,

8. Severe Acute Respiratory Syndrome (SARS),

9. Viral Hemorrhagic Fever (VHF)

10. Yellow Fever

Diseases under surveillance cont…

II. **Required internationally** under IHR2005:

1. Smallpox,

2. Poliomyelitis due to wild-type Poliovirus,

3. Human Influenza caused by a new subtype,

4. SARS

Diseases under surveillance cont…

III. Diseases targeted for eradication or elimination:

1. Poliomyelitis due to wild-type Poliovirus,

2. Dracunculiasis,

3. Neonatal Tetanus (NNT)

Diseases under surveillance cont…

IV. Diseases which have a significant public health importance:

    1. Rabies,

    2. Dysentery,

    3. Malaria,

    4. Relapsing Fever,

    5. Typhoid Fever,

    6. Typhus And

    7. Severe Malnutrition

V. Diseases that have available effective control and prevention measures for addressing the public health problems they pose.

Immediately and Weekly reportable disease

Table: The current list of reportable diseases / conditions in Ethiopia context, 2018

Immediately reportable disease	Weekly reportable disease
1. Acute Flaccid Paralysis	1. Dysentery
2. Anthrax	2. Malaria
3. Avian Human Influenza	3. Meningitis
4. Cholera	4. Relapsing fever
5. Dracunculiasis/Guinea worm	5. Typhoid Fever
6. Measles	6. Typhus
7. Neonatal tetanus	7. Severe Acute Malnutrition
8. Pandemic Influenza A(H1N1)	
9. Rabies	
10. Small pox	
11. SARS	
12. Viral Hemorrhagic Fever (VHF)	
13. Yellow Fever	

Cases/ conditions	Case definition
Acute Febrile Illness	Any person with fever, severe headache and /or diarrhea
Bloody diarrhea	Any person with diarrhea and visible blood in the stool
Malaria	Any person with fever OR fever with headache, back pain, chills, rigor, sweating, muscle pain, nausea and vomiting OR suspected case confirmed by RDT
Meningitis	Any person with fever, severe headache and neck stiffness
Severe acute Malnutrition	Children age 6 months to 5 years with MUAC less than 11cm and bilateral leg edema OR Children age 6 months to 5 years with bilateral leg edema.

Standard Case Definitions of surveillance in Ethiopia

A case definition: is a set of criteria used to decide if a person has a particular disease, or if the case can be considered for reporting and investigation.

Standard case definition: is a case definition that is agreed upon to be used by everyone within the country.

❖ **Standard case definition** can be classified as:

- ✓ Confirmed,
- ✓ Probable
- ✓ Possible or suspected

Standard Case Definitions of surveillance in Ethiopia

➢ **Confirmed**: a case definition by appropriate laboratory test

➢ **Probable**: a case with typical clinical features of the disease without laboratory confirmation

➢ **Possible/ Suspect**: a case with few of the typical clinical features

Standard Case Definitions of surveillance in Ethiopia

Importance of case definition

❖ Facilitate **early detection** and **prompt management** of cases

❖ Useful in areas where there is **no laboratory**

❖ Facilitate **comparison more accurately** from area to area

❖ Facilitates observation of trends within **specified geographic areas**

Read the case definition of diseases in PHEM Guideline

Target population can be:

- Individuals at specific institutions

- Residents of a community

- Residents of a nation, etc.

✓ A surveillance system remains effective when it is **continuously assessed**.

✓ **Periodically updating information** about the catchment area is necessary

Time period of data collection

✓ It is useful to identify problems and solve timely

✓ There are three periods of reporting
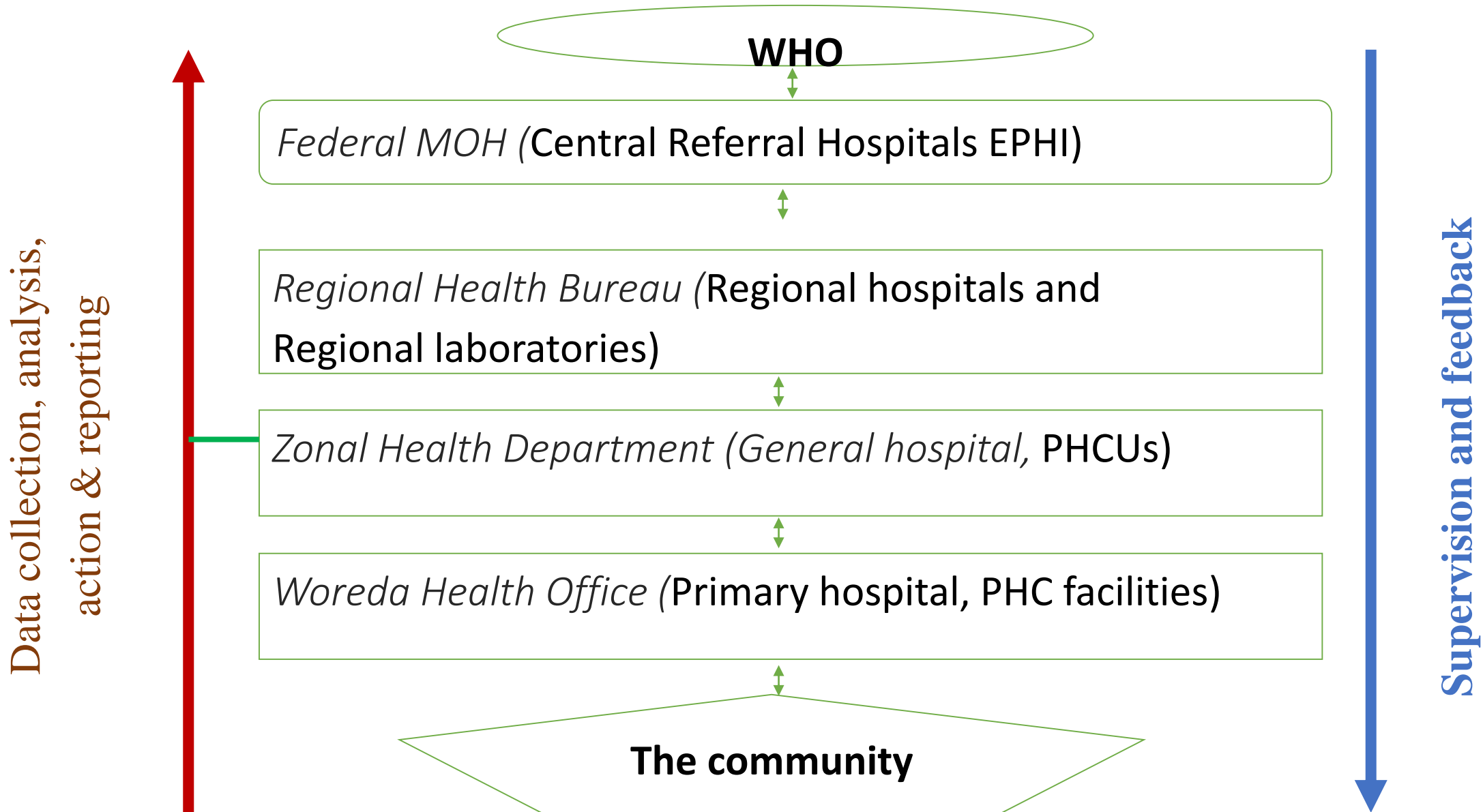
1. **Immediate reporting**:

   A. For diseases considering presence of **a single case** to result to a suspicion for an epidemic.

   B. Suspected epidemic when **a threshold is crossed**

2. **On weekly basis**: For epidemic prone diseases. Eg. Malaria, meningitis

3. **On monthly basis**: For Routine surveillance. Eg. Tuberculosis, Leprosy, AIDS cases

Information Flow in Surveillance System

WHO

*Federal MOH (*Central Referral Hospitals EPHI)

*Regional Health Bureau (*Regional hospitals and Regional laboratories)

Zonal Health Department (General hospital, PHCUs)

*Woreda Health Office (*Primary hospital, PHC facilities)

The community

Data collection, analysis, action & reporting

Supervision and feedback

Reporting diseases under surveillance, Type of reports and tools

❖ **Reporting**

- The routine flow of surveillance data is usually from **reporting sites** to the **next level up to the central level**.

- The community and health facilities especially health posts are the main source of information.

- The information collected from this site is compiled in standard forms, analyzed and then forwarded, to the woreda health office.

- Woreda level uses standard formats to compile aggregate, and send the data to zone/region, from which the central level receives.

- Feedback and information sharing will follow the same route.

- Electronic Reporting: Ethiopia is introducing **DHIS2** for reporting PHEM diseases

Reporting diseases under surveillance, Type of reports and tools

❖ **Type of reports**

- ▪ Disease and conditions are classified in to two reporting periods as:

  1. Immediately and

  2. Weekly

- ▪ It's depending on their epidemic potential, diseases targeted for elimination and eradication

Reporting diseases under surveillance, Type of reports and tools

1. **Immediate reporting:**

   ▪ Currently 13 diseases are identified to be reported immediately to next reporting level.

   ▪ For the immediately reportable diseases, a single suspected case is considered as a suspected outbreak.

Reporting diseases under surveillance, Type of reports and tools

1. Immediate reporting:

Therefore, suspected outbreak of these diseases should be notified from level to level within 30 minutes of identifications as follows:

➜ From community or health post or health center to Woredas health office within 30 minutes,

➜ From Woreda health office to zone/region within another 30 minutes,

➜ From zone to regional office within another 30 minutes,

➜ From region health bureau to federal level within another 30 minutes,

➜ MOH to WHO within 24 hours of detection.
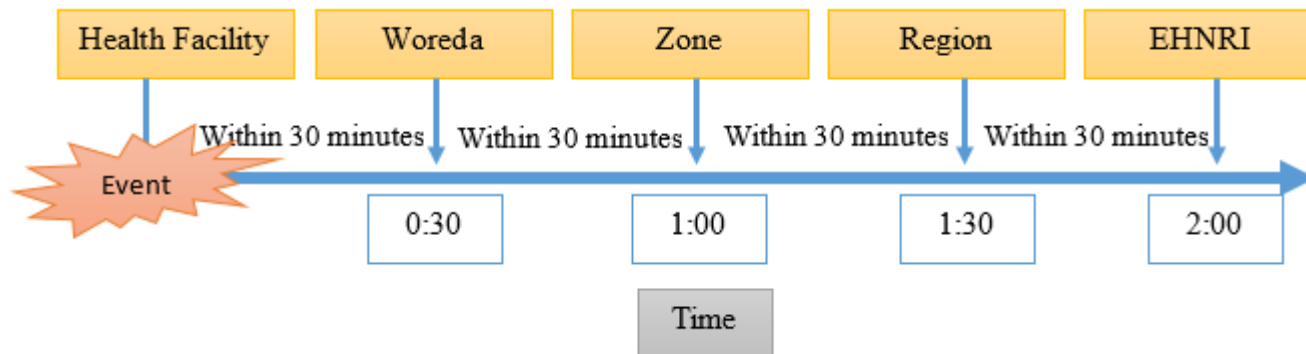
Reporting diseases under surveillance, Type of reports and tools

2. Weekly reporting:

❖ Currently **7 diseases** and conditions are identified to be reported weekly to the next reporting level.

❖ Reporting of the total number of cases and deaths seen within a week (Monday to Sunday) and should be reported to the next level as follows:

- Health facilities report data to Woreda every Monday till midday;
- Woredas report to zone/region every Tuesday till midday;
- Zone (if applicable) report to region every Wednesday till midday;
- Region report to EHNRI /PHEM every Thursday;
- EHNRI /PHEM report to stakeholders every Friday

Reporting diseases under surveillance, Type of reports and tools

❖ **Reporting tools**

Different reporting tools are developed to facilitate the reporting. These includes:

1. Weekly reporting form for health post / HEW
2. Weekly reporting format for other levels
3. Daily epidemic reporting format for Woreda **(DERF-W)**
4. Daily epidemic reporting format for Region **(DERF-R)**
5. Case based reporting format **(CRF)** for many diseases
6. AFP case investigation form
7. Guinea worm case-based reporting format
8. Guinea worm line list
9. Influenza case-based reporting format
10. Line list (for all diseases)
11. Rumor log book for suspected epidemics (for any type of public health rumors)
12. Case based laboratory reporting form (CLRF).

Activity-3

1. Observe all current list of immediately and weekly reportable diseases in Ethiopia and discuss why each disease assigned as immediately and weekly reportable?

2. Observe all disease surveillance reporting tools and discuss in groups on the following points:
   a) Data elements to be reported
   b) Reporting hierarchy and periods
   c) Who are responsible bodies for recording and reporting