Strengthening IPC for Effective Epidemic Preparedness

FOCAL PERSONS IPC TRAINING

Topic: Outbreak Investigation in IPC

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Outbreak Investigations

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Rural health Mission Nigeria
Eliminating Barriers to quality healthcare...

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TEACHING
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HOSPITAL
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HUMANITY

DEPARTMENT OF HEALTH & HUMAN SERVICES USA

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

Learning Objectives

When you have completed this session you will be able to:

- Describe the principles of outbreak investigation
- Describe steps in outbreak investigation
- Highlight some co-ordination and methodological issues

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What is an outbreak ?

- Occurrence of more cases of disease than expected in a given area among a specific group of people over a particular period of time

- **Two or more linked cases of the same illness**

Definitions

- Outbreak
  - Occurrence of more cases of disease than expected in a given area or among a specific group of people over a particular period of time
- Epidemic
  - Used interchangeably with outbreak

What is an outbreak?

- A public health emergency !
- A political emergency
- An economic emergency
- An unusual event
- An event requiring rapid action
- Surveillance failure
- Control failure
- An opportunity !

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Objectives of outbreak investigations

- To control ongoing outbreaks
- To prevent future outbreaks
- To provide statutorily mandated services
- To strengthen surveillance at local level
- To advance knowledge about a disease
- To provide training opportunities

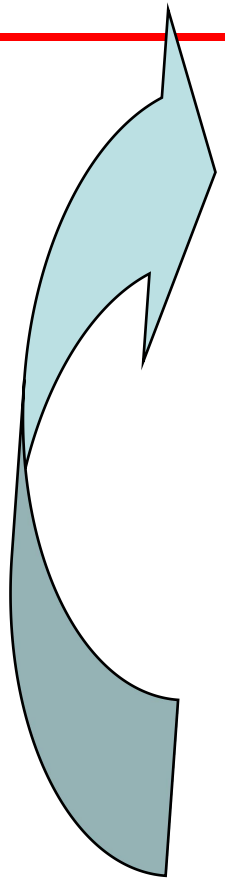
What is outbreak management ?

- The process of anticipating, preventing, preparing for, detecting, responding and controlling outbreaks in order that the health and economic impact is minimised

Definitions

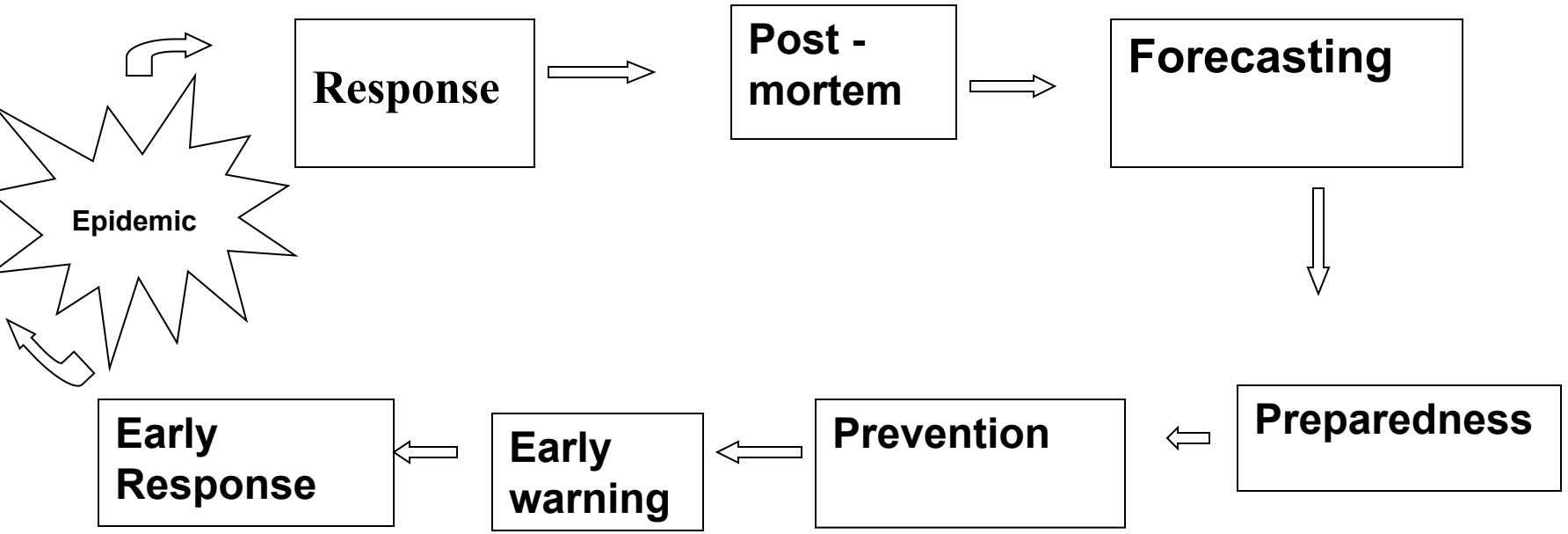
- Cluster
  - Group of cases in specific time and place that may or may not be greater than the expected rate
  - Aim of investigating cluster is to determine the baseline rate of disease for that time and place

Components of Effective Outbreak Management



- Anticipation/Prediction
- Preparedness
- Early warning/detection
- Effective and coordinated investigation/response
- Evaluation

Epidemic Cycle



Objectives of Outbreak Management

- Anticipation/prediction
  - so that epidemics be prevented
- Preparedness
  - so there is readiness to respond
- Early detection
  - to know when there is a problem
- Rapid Investigation
  - to describe the event and identify interventions
- Effective Response
  - to implement appropriate control measures
- Evaluation
  - to identify what went right and wrong before and during the outbreak

Epidemic Preparedness

- Epidemic Preparedness constitute all the activities that have to be undertaken for central/peripheral levels to be ready to respond effectively to epidemics/outbreaks
- When all the activities are put together in a plan then we have an Epidemic Preparedness Plan

Elements of Epidemic Preparedness

- Ensure that routine surveillance system can detect outbreaks
- Ensure that staff are organized to confirm, investigate, and respond to outbreaks
- Maintain buffer stocks of drugs, essential equipment, materials and supplies
- Ensure financial support for preparation and response

Specific demands when investigating outbreaks

- Unexpected event
- Need to act quickly
- Need for rapid control
- Need for interdisciplinary coordination
- Work carried out in the field

→ **Systematic approach**

Steps of an Outbreak Investigation

- Establish the existence of an outbreak
- Verify the diagnosis
- Define a case and count cases
- Orient the data in terms of time ,place and person
- Determine who is at risk of becoming ill
- Develop a hypothesis
- Compare hypothesis with established facts
- Plan a more systematic study
- Prepare a written report
- Execute control and prevention measures

Preparing for the field

- Assemble a team (EPR team + EPR plan)/RRT
- Assemble relevant supplies and equipment (transport media, specimen bottles, IEC, treatment guidelines & medical supplies, transport, communication means, investigation and surveillance forms, funds, fuel, etc).
- Read and Consult further
- Clarify your and others roles
- Team leadership

Detection

Routine surveillance
Clinical / Laboratory
General public
Media

- Review clinical findings.
- Visit patients yourself (interview and examine for symptoms and signs).
- Laboratory diagnosis.
- Choose a working case definition: who is a case and who is not (by person, place, time). Should be highly sensitive.
- Establish index case.

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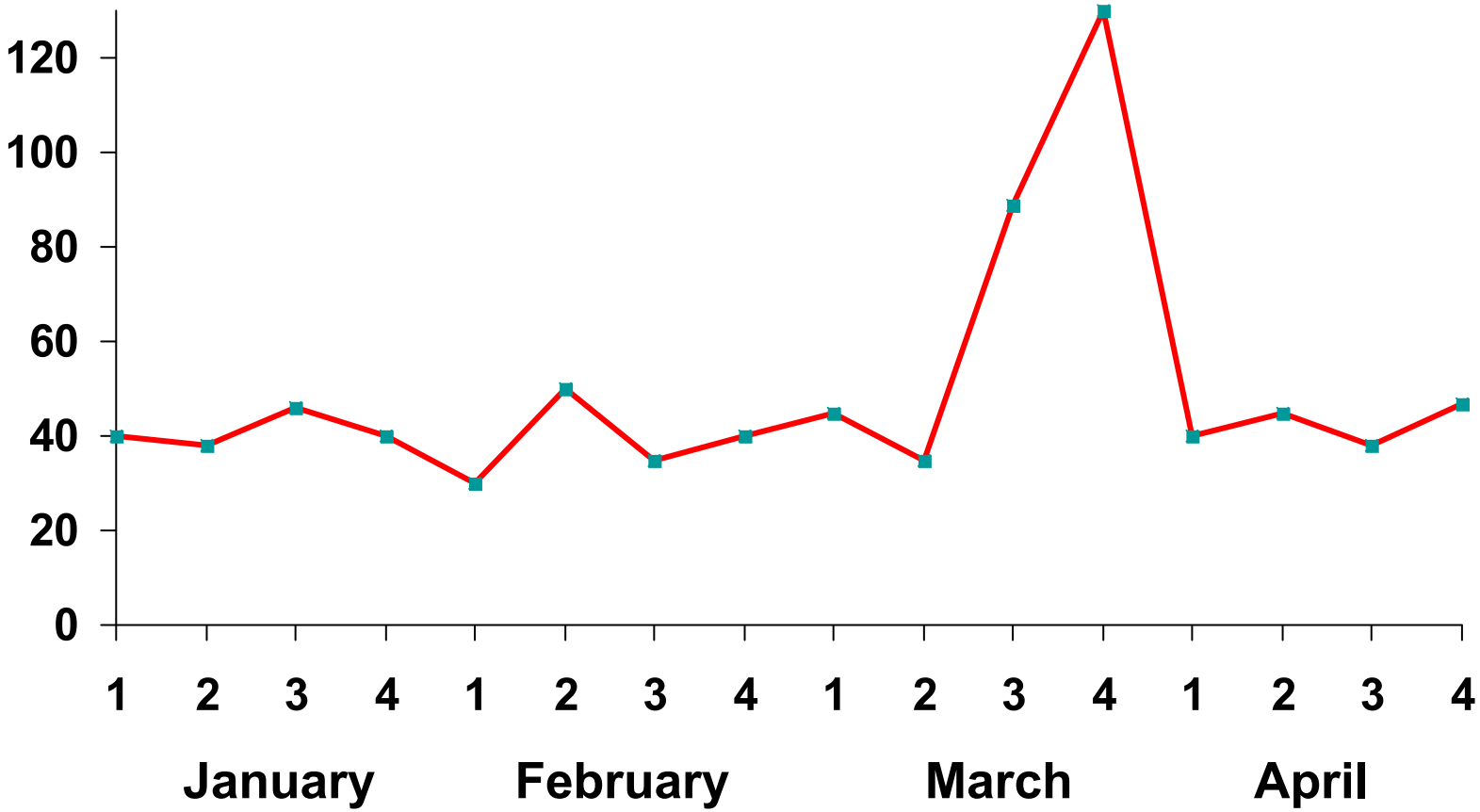
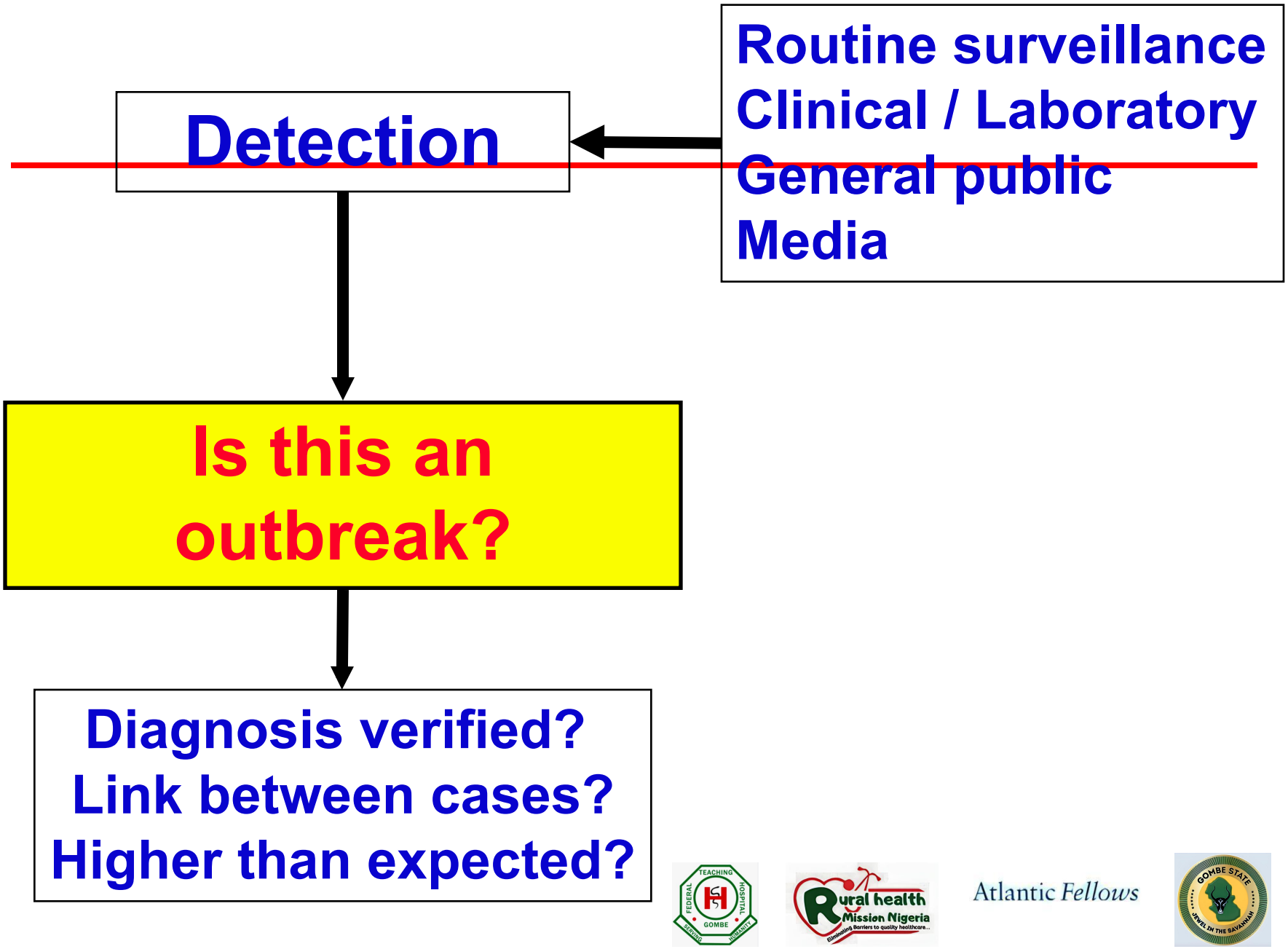
The media: main source of outbreak-related information

Surveillance

Cases of acute bloody diarrhoea in a rural district by month, January 1999- April 1999

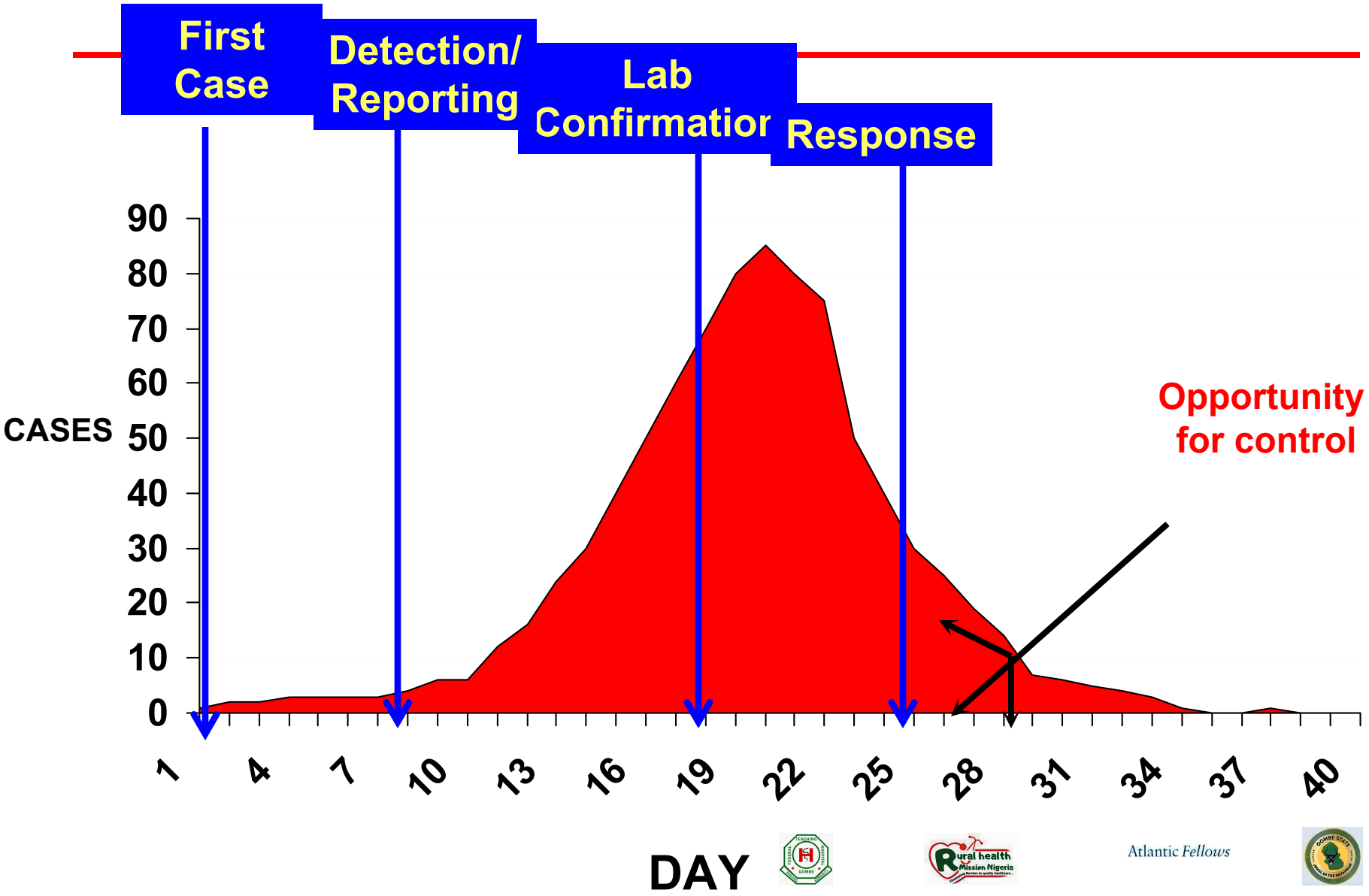



Routine surveillance
Clinical / Laboratory
General public
Media
Detection
Is this an outbreak?
Diagnosis verified?
Link between cases?
Higher than expected?

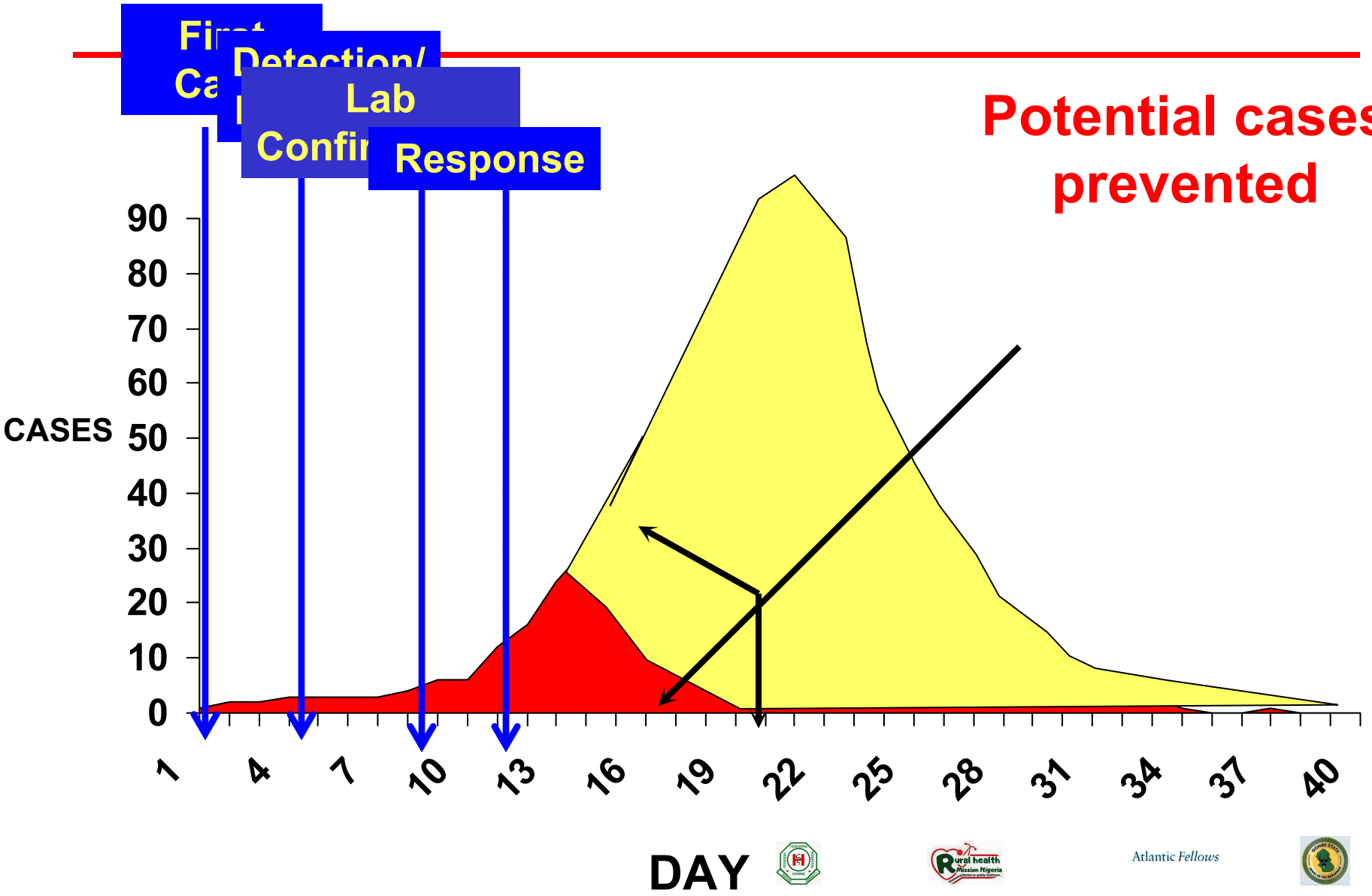
Is it an outbreak?

- Compare observed incidence with expected:
  - No seasonality: compare with incidence from previous weeks/ months,
  - Seasonality: compare incidence from similar periods of earlier years.
- Use action threshold.
- Linelist cases

“Usual” sequence of events



Ideal sequence of events



Outbreak confirmed ✓

Immediate control measures?

- Prophylaxis
- Exclusion / isolation
- Public warning
- Hygienic measures
- Others

Further investigation?

- Unknown aetiology
- Cases serious
- Cases still occurring
- Public pressure
- Training opportunity
- Scientific interest

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Control vs. further investigation

	Source/Mode of Transmission: Known	Source/Mode of Transmission: Unknown
Known causative agent	Investigation + Control +++	Investigation+++ Control +
Unknown Causative agent	Investigation+++ Control +++	Investigation+++ Control+

Outbreak confirmed, further investigations warranted

Form Outbreak Control Team?

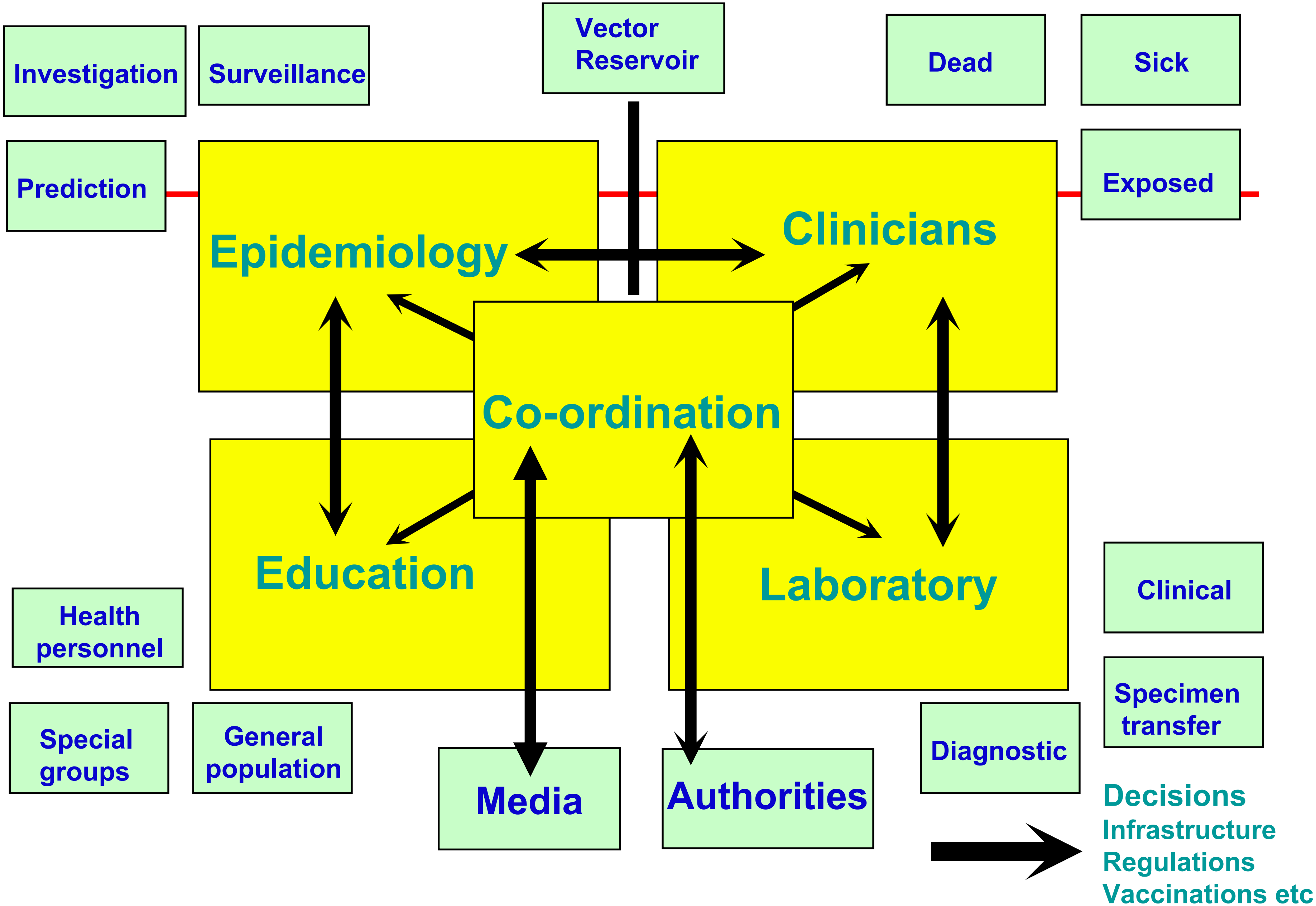
- Epidemiologist
- Microbiologist
- Clinician
- Environmentalist
- Government
- Press officer
- Others

Team coordinates field investigation

Role of the Epidemiologist

- Systematic Description
- Identification of risk factors (by descriptive or analytical means)
- Identification of interventions
- Work with others to implement control measures that prevent:
  - Exposure
  - Infection
  - Disease
  - Death/Disability

YOU MAY BE THE ONE TO COORDINATE !



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Epidemiologist
Microbiologist
Environmental specialist
Ministry / Government
Press officer
Others

Outbreak Investigation Team?

Assess situation
Examine available information
Preliminary hypothesis ?
Case definition
Case finding

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Case definition

- Standard set of criteria for deciding if a person should be classified as suffering from the disease under investigation.
- Clinical criteria, restrictions of time, place, person
- Simple, practical, objective
- Sensitivity versus specificity

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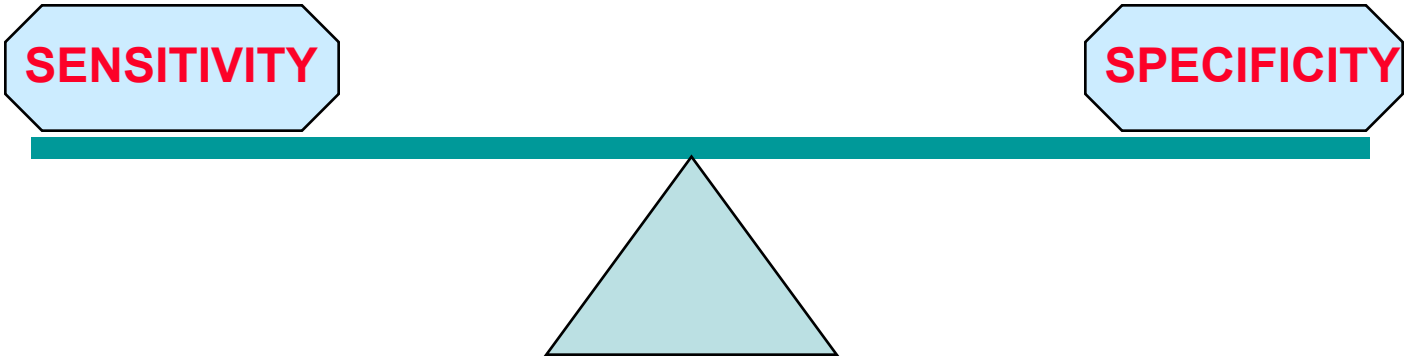
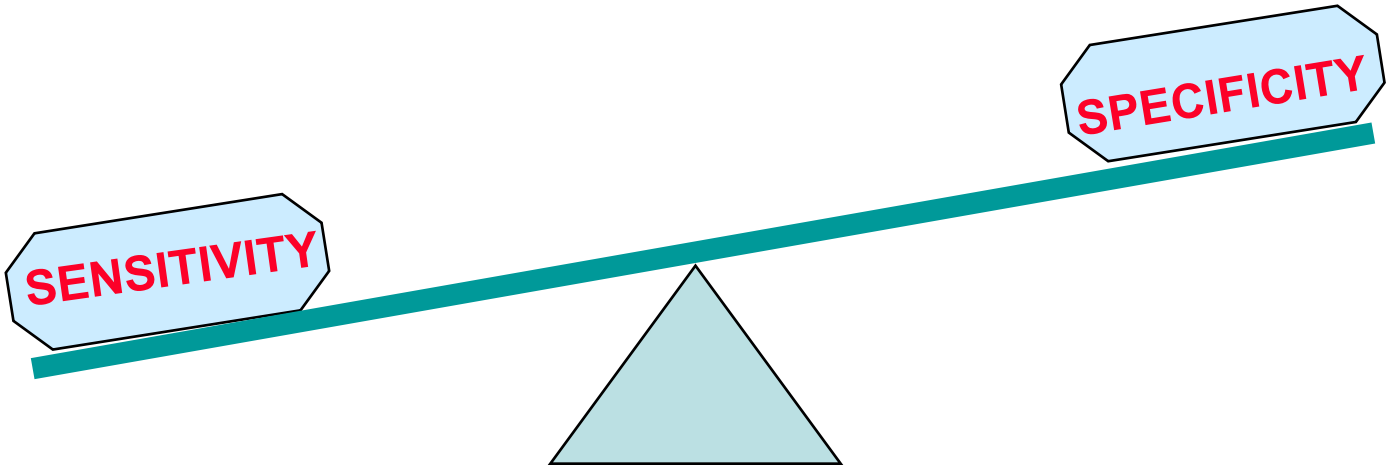
Sensitivity versus specificity



Sensitive case definition

Most cases detected, but …

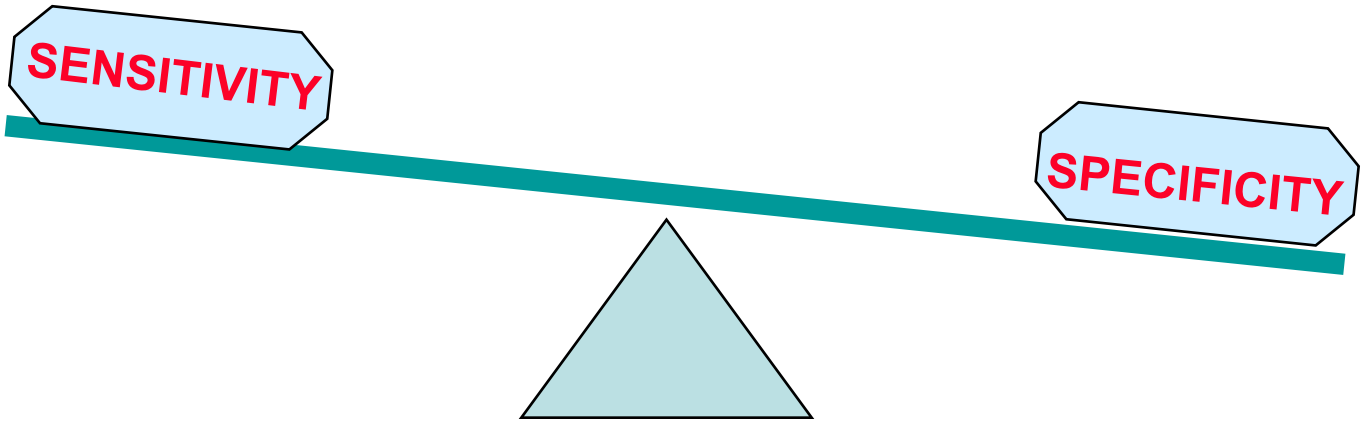


many false positives
many specimens to test
low % tested specimens +ve

Danger of overload

Specific case definition

Cases missed, but …



few false positives
fewer specimens to test
high % tested specimens +ve

Danger of underload

Case definition: example

Patient older than 5 years with severe dehydration or dying of acute watery diarrhoea in town “x” between 1 June and 20 July 1999

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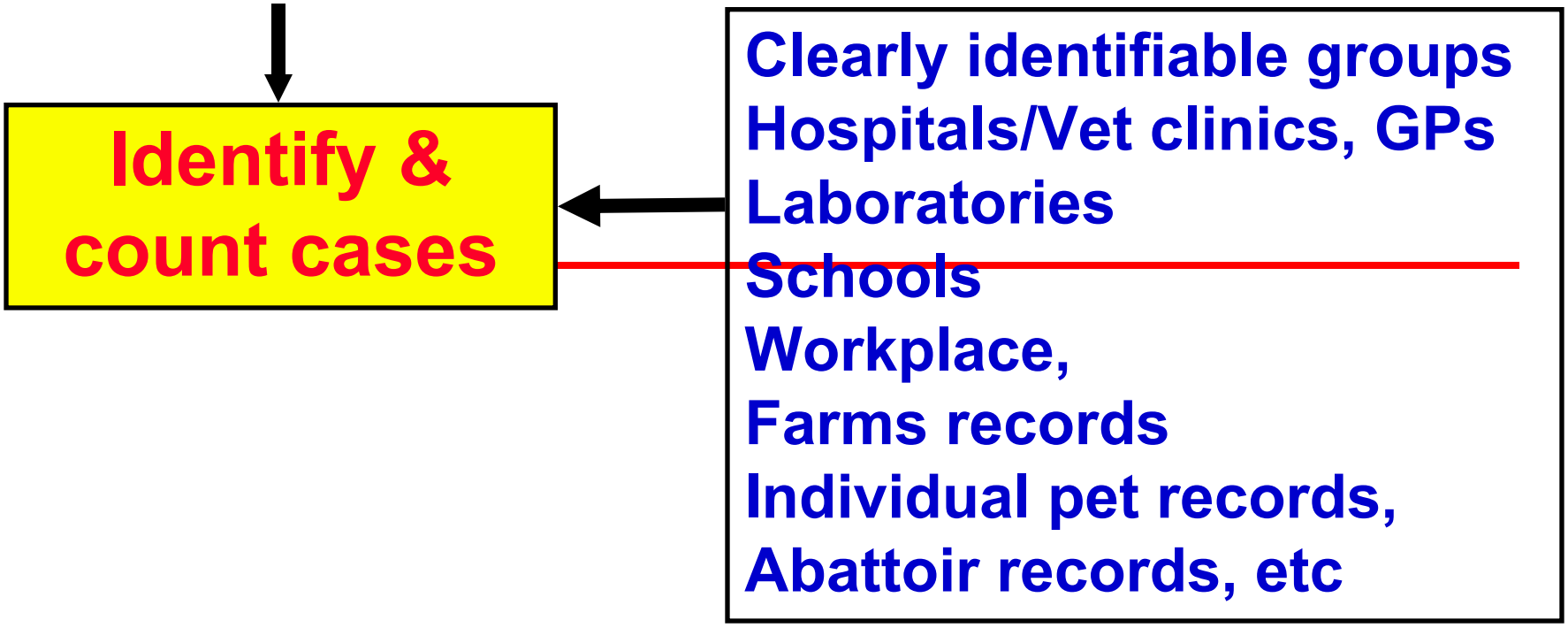
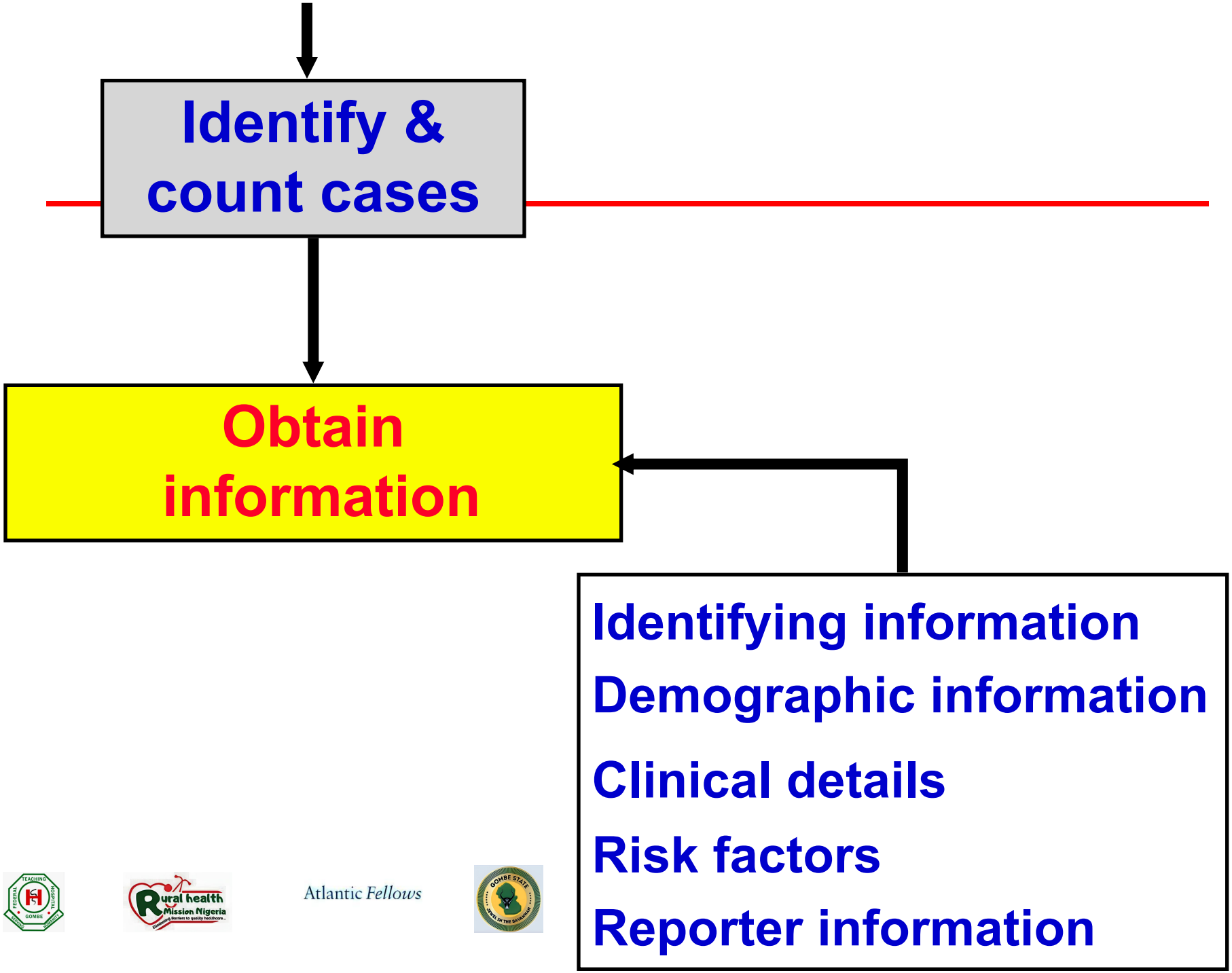
Multiple case definition

- Suspected
  - Patient with severe diarrhoea ...
- Probable
  - Patient older than 5 years with severe dehydration or dying of acute watery diarrhoea ...
- Confirmed
  - Isolation of *Vibrio cholerae* from stool of patient ...


Identify & count cases
Clearly identifiable groups
Hospitals/Vet clinics, GPs
Laboratories
Schools
Workplace,
Farms records
Individual pet records,
Abattoir records, etc


Identify & count cases
Obtain information
Identifying information
Demographic information
Clinical details
Risk factors
Reporter information
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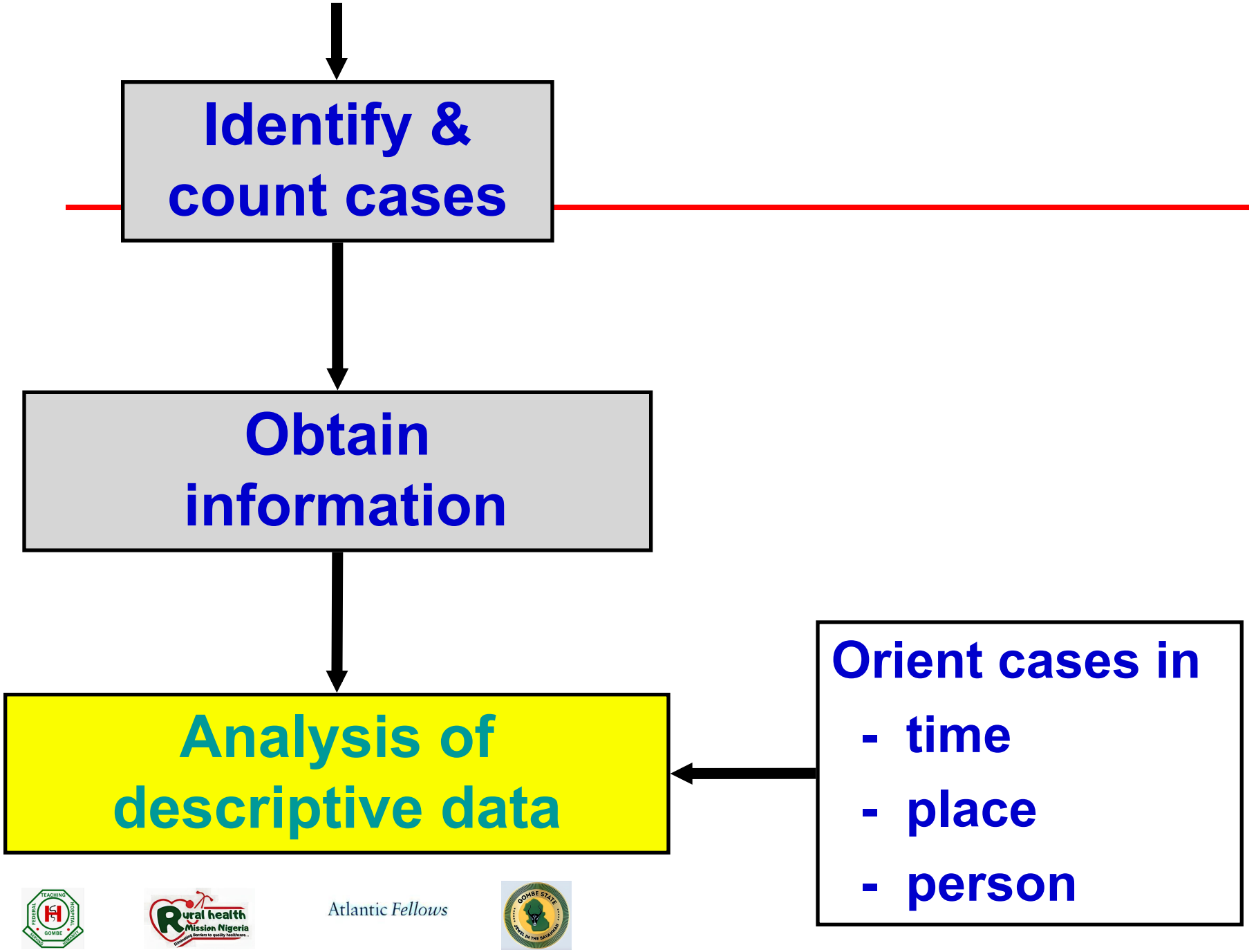
Identify & count cases
Obtain information
Analysis of descriptive data
Orient cases in
- time
- place
- person
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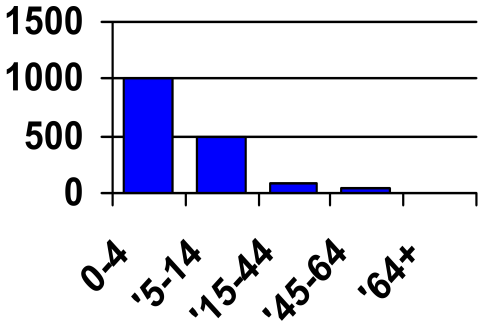
Descriptive epidemiology

- Who are the cases?
- Where do they live?
- When did they become ill?

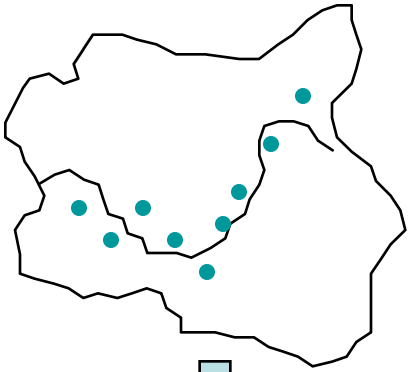
Cases

Person

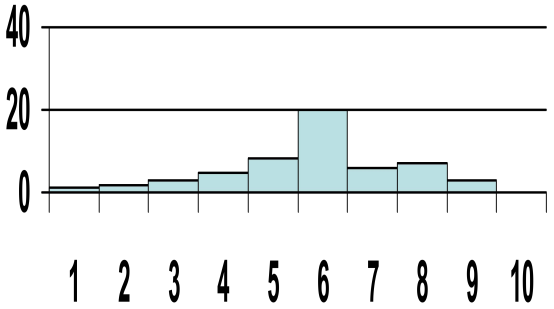


Age Group

Place



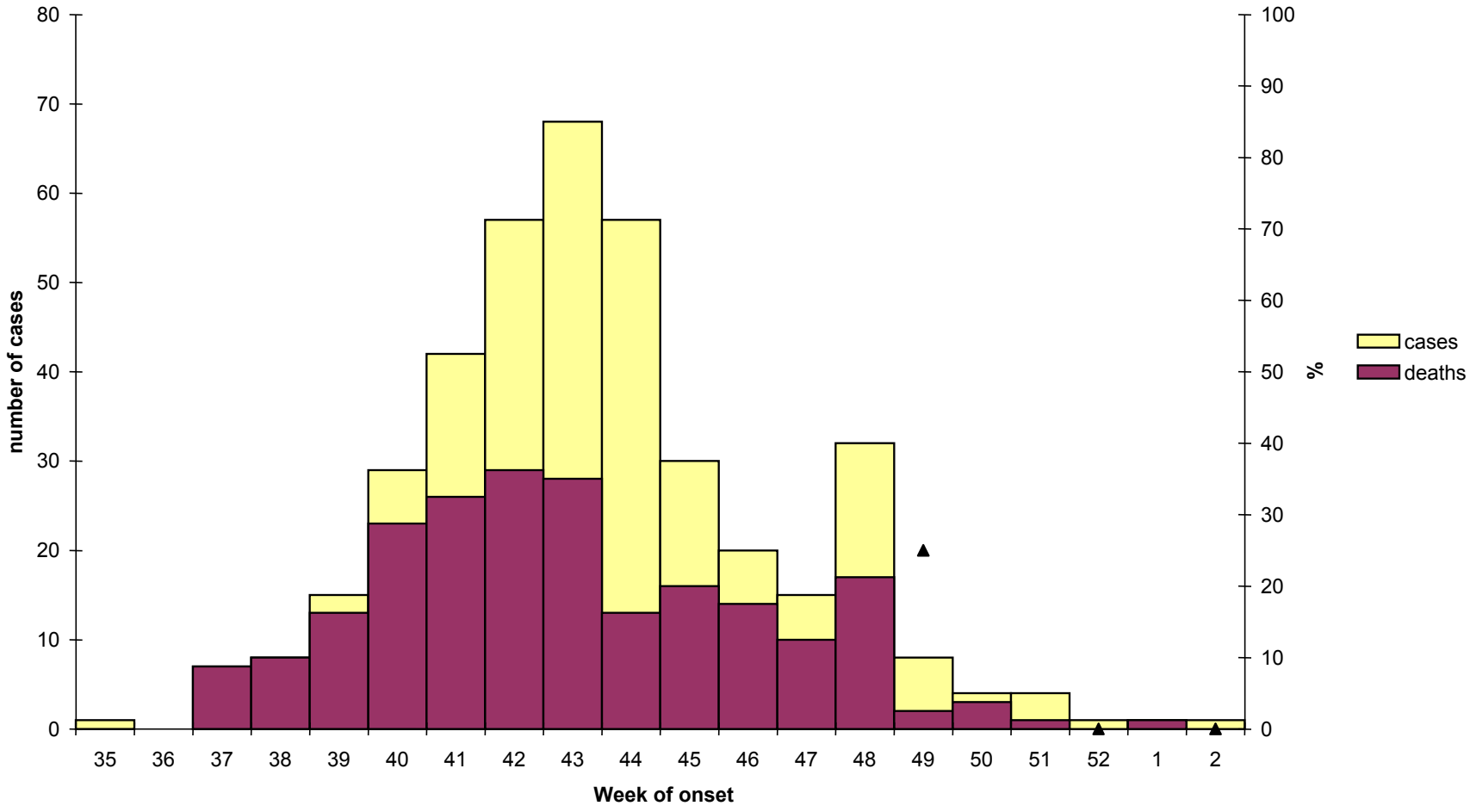
Time



Evaluate information

- Pathogen?
- Source?
- Transmission?

Cases by Week of Onset
Ebola Haemorrhagic Fever, Uganda – September 2000 to January 2001



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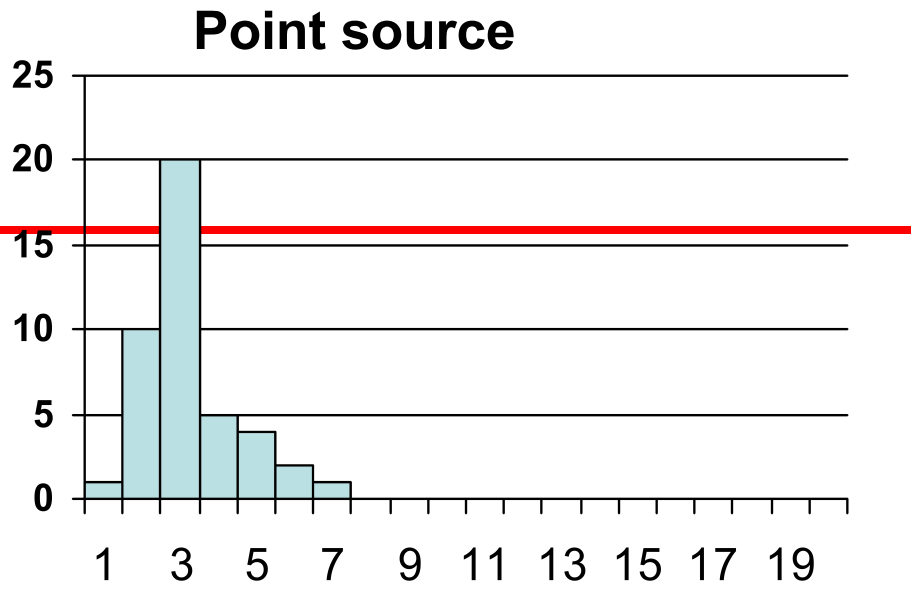
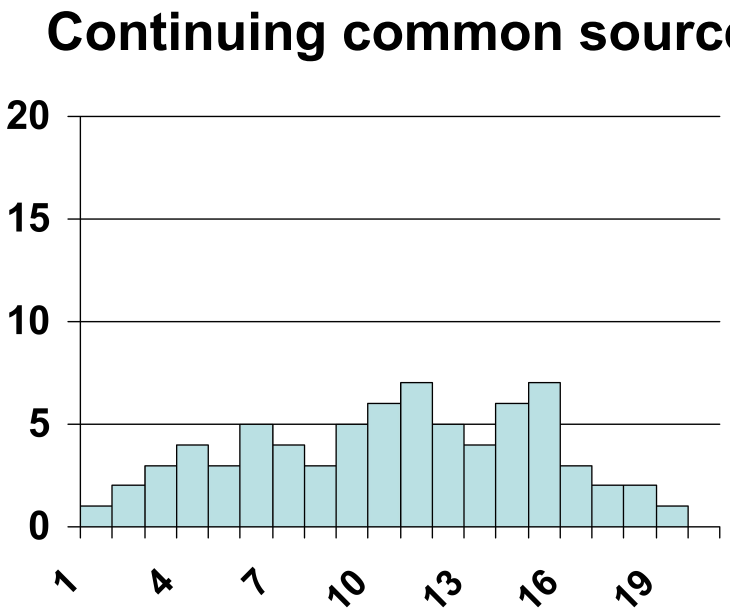
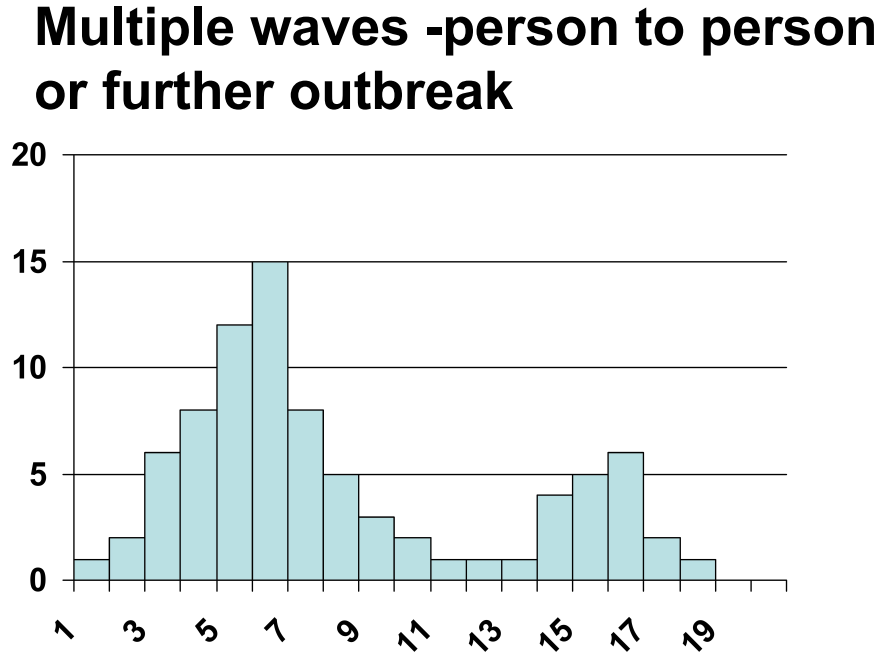
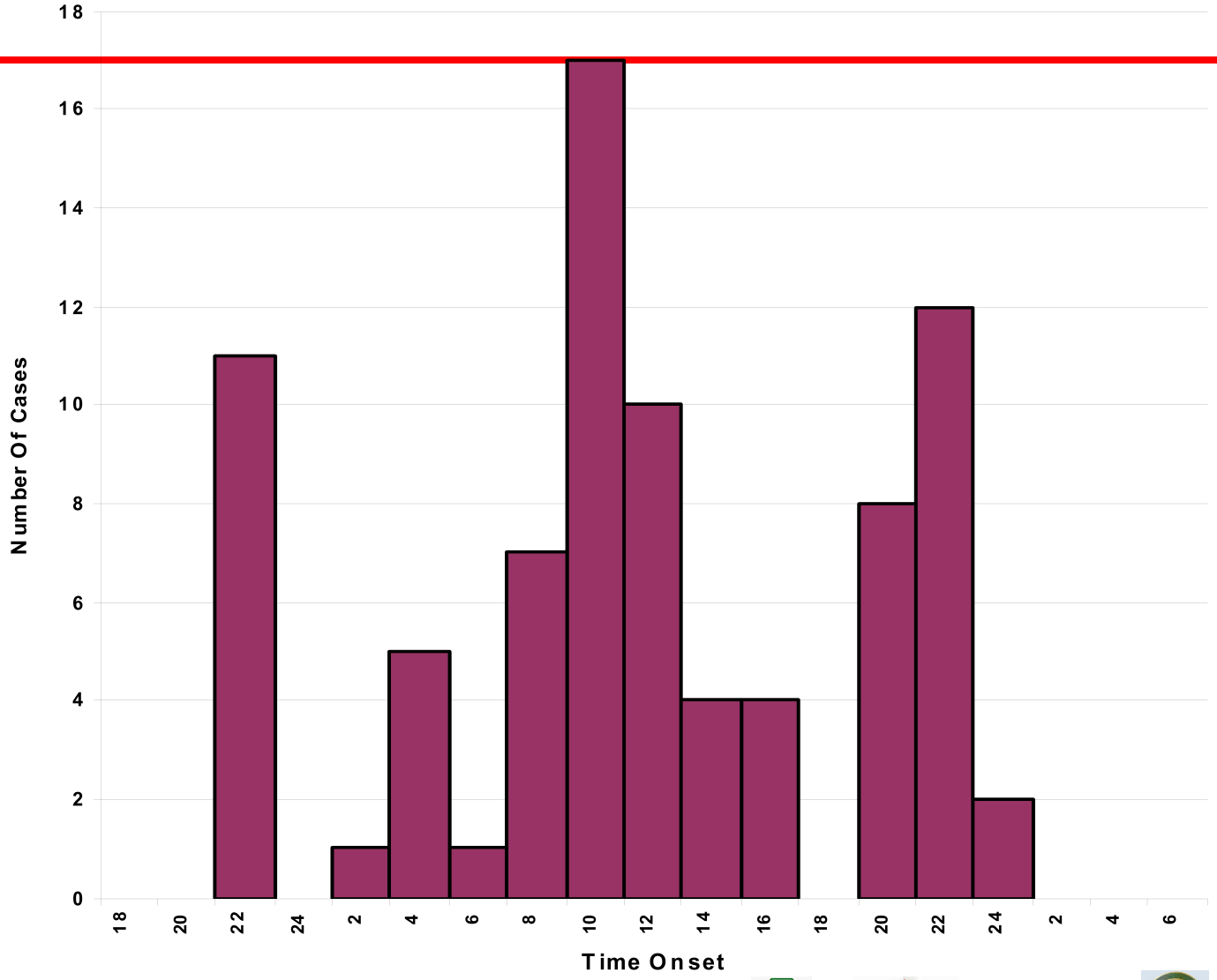
Examples of epidemic curves



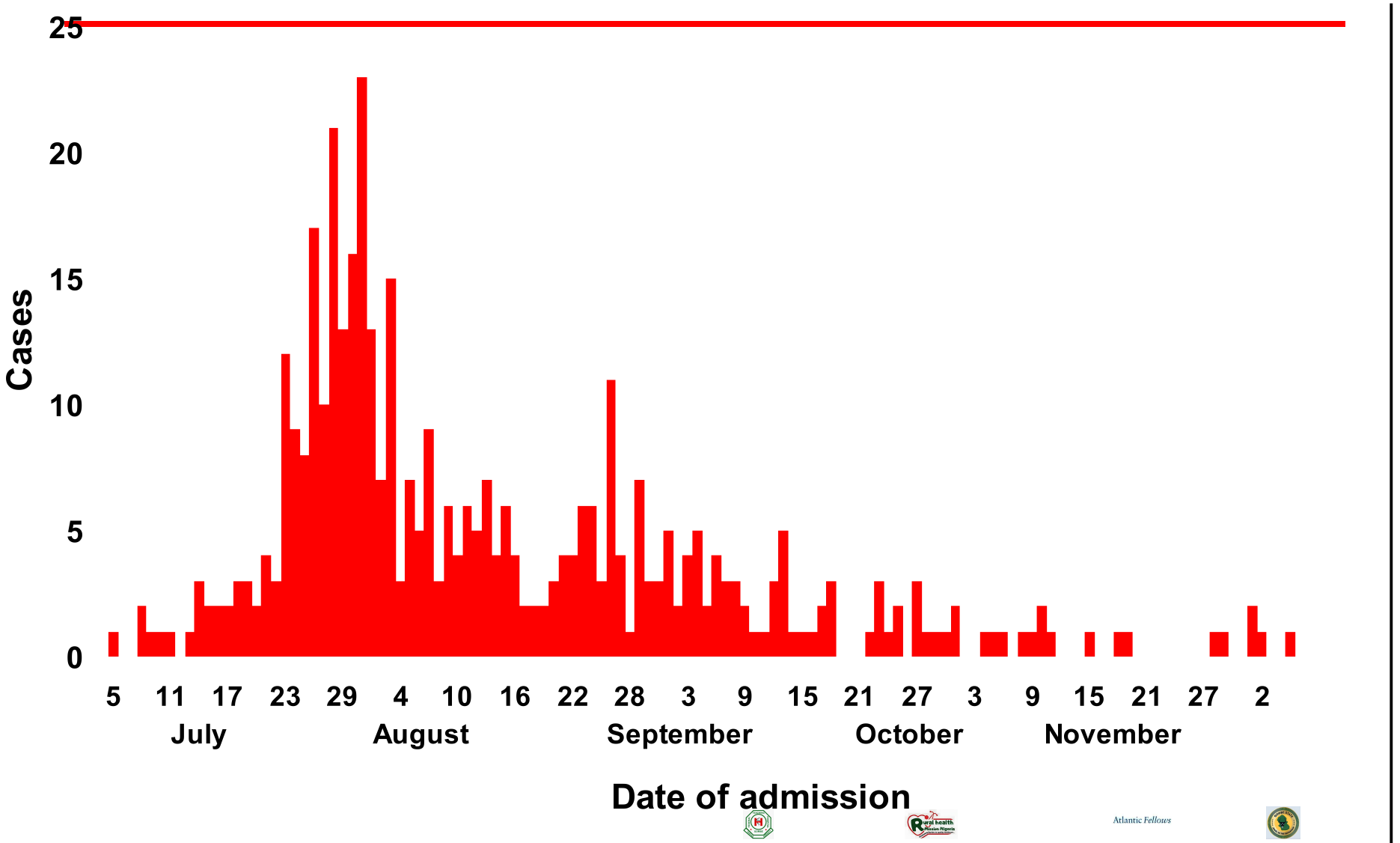




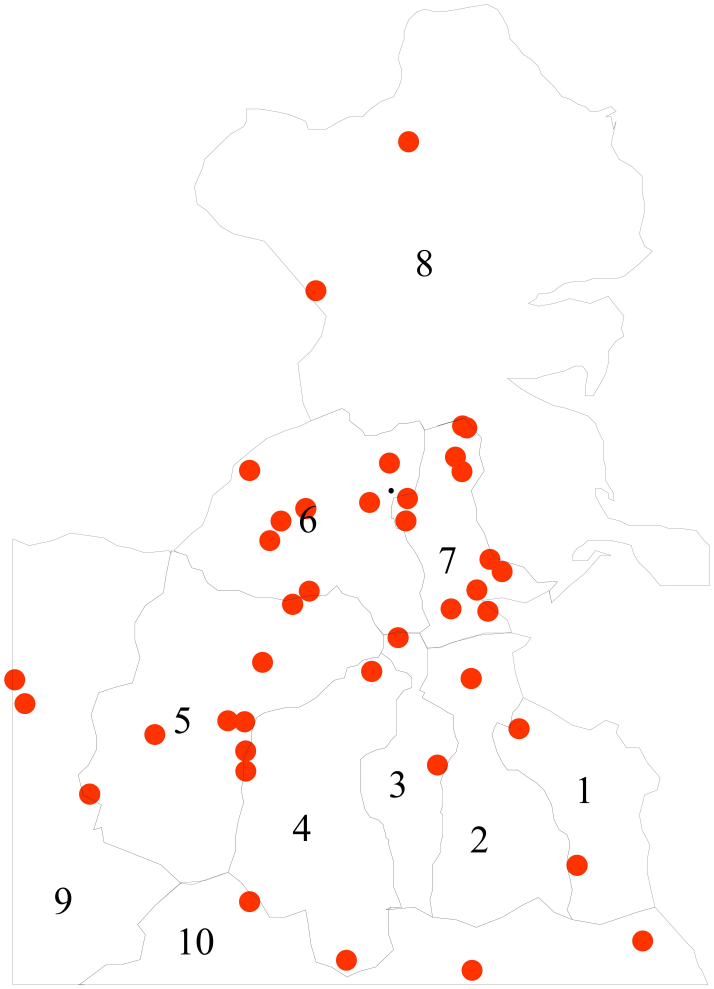
Turra Outbreak Jordan, 2002



Cases of viral meningitis by date of admission (n=416)
Cyprus, 5 July - 5 November 5 1996



Confirmed cases of meningococcal meningitis type B by residence, Dublin, 1996



1 dot = 1 case

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Develop hypotheses

- Who is at risk of becoming ill?
- What is the disease?
- What is the source?
- What is the mode of transmission?

Open-ended and wide-ranging interviews with a few people

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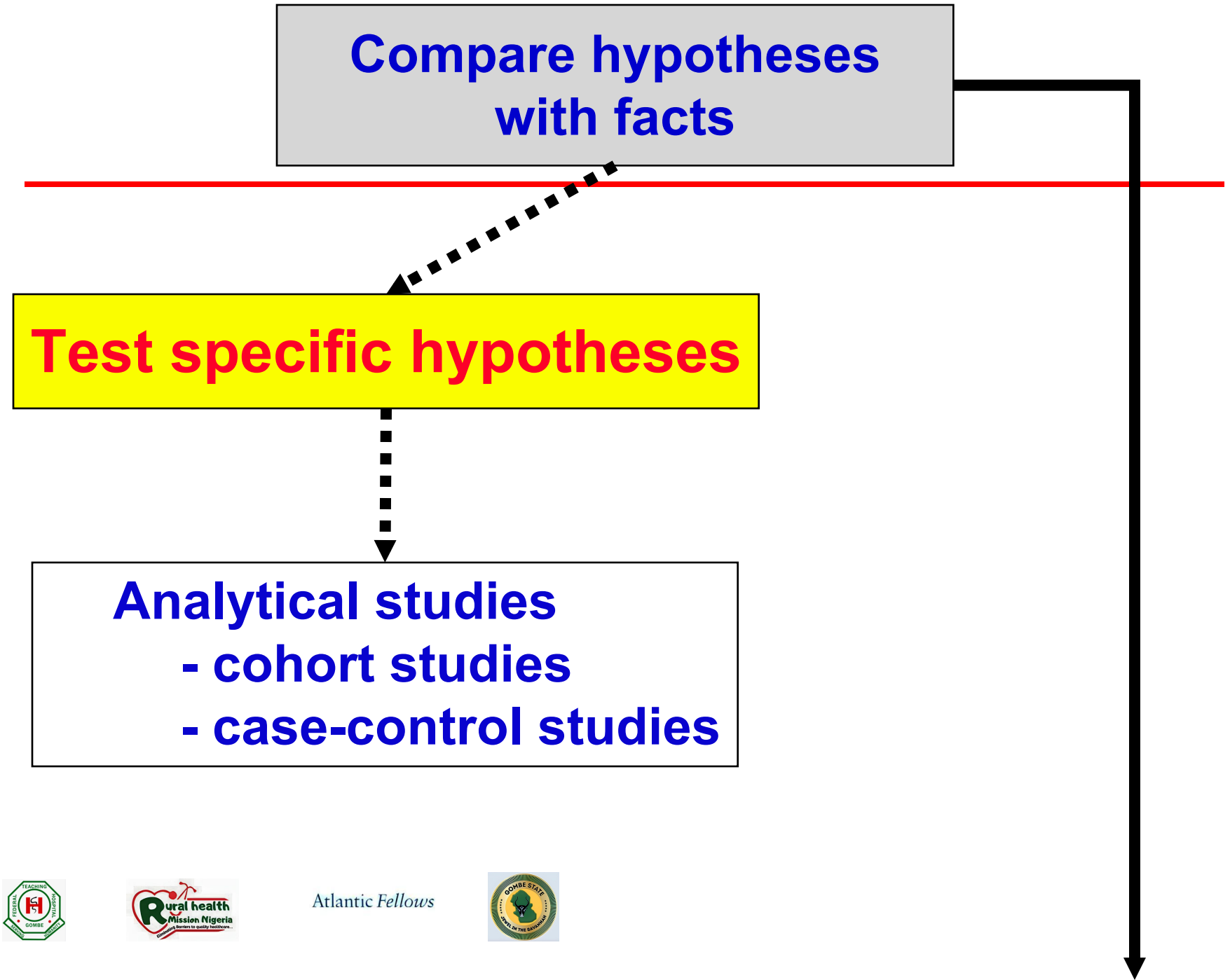
Develop hypotheses

- Who is at risk of becoming ill?
- What is the disease?
- What is the source?
- What is the mode of transmission?

Compare hypotheses with facts


Compare hypotheses with facts
Test specific hypotheses
Analytical studies
- cohort studies
- case-control studies

Testing Hypothesis

- Hypothesis should address:
  - Source of the agent.
  - Mode of transmission.
  - Exposures (risk factors).
- Where resources are available and cause not obvious, compare cases with controls in respect to exposure. Do OR, chi test, look up p-value.
- If sure of the cause, then may need only to study the cases.

Implement control measures

May (must) occur at any time during the outbreak!!

Control the source of pathogen

Interrupt transmission

Modify host response

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Assess the local response capacity

- What number and type of staff is available locally?
- Which drugs/ medical supplies/ guidelines are available to treat the cases?
- What has been done in terms of epidemic response?
- What steps have been taken to interrupt transmission?
- Has any health education been conducted?
- Alert Neighbouring Districts/provinces

Control the source of pathogen

- Remove source of contamination
- Remove persons from exposure
- Inactivate / neutralise the pathogen
- Isolate and/or treat infected persons

Control source of pathogen:

Remove persons from exposure

Control source of pathogen:
Inactivate pathogen

Control source of pathogen:

Isolate/treat infected persons

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Interrupt transmission

- Interrupt environmental transmission
- Control vector transmission
- Improve personal sanitation

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Modify host response

- Immunise susceptible
- Use prophylactic chemotherapy
- Curative therapy

Address the resource gaps

- Done as need may arise:
- Laboratory support.
- Environmental support.
- Public information.
- Specific disease control needs in terms of:

- Personnel,
- Drugs, vaccines and equipment,
- Transport, communication and logistics.

At the end

- Prepare written report
- Communicate public health messages
- Influence public health policy
- Evaluate performance

THE END

- THANK YOU FOR LISTENING

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Rapid Evaluation of Quality of Outbreak Response

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Outbreak Detection

- Interval between onset of index case to arrival of first outbreak case at the health facility (Target: <3 days)
- Interval between initial outbreak case seen at the health facility and reporting to the district health team (Target: within 24 hours):
- Cumulative interval between onset of index case to notification to the district (Target: <7 days)

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Outbreak Investigation

- Case forms/line list completed? __Yes __No
- Laboratory specimens taken? _Yes __No
- Interval between notification of district and district field investigation conducted (Target: within 48 hours)
- Interval between sending specimens to the lab and receipt of results by the district (Target: 3-7 days)

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Outbreak Response

- Interval between notification of outbreak to district and concrete response by the district (Target: within 48 hours of notification)

Evaluation and Feedback

- Interval between end of the outbreak and finalization of outbreak report with line list sent to national level (Target: 2 weeks)

- Epidemic Preparedness and Response Team met? __Yes __No
- Feedback given to health facilities and community? __Yes __No

Confirmed and Probable Rift Valley Fever Cases , Kenya 2006/07(N=340)

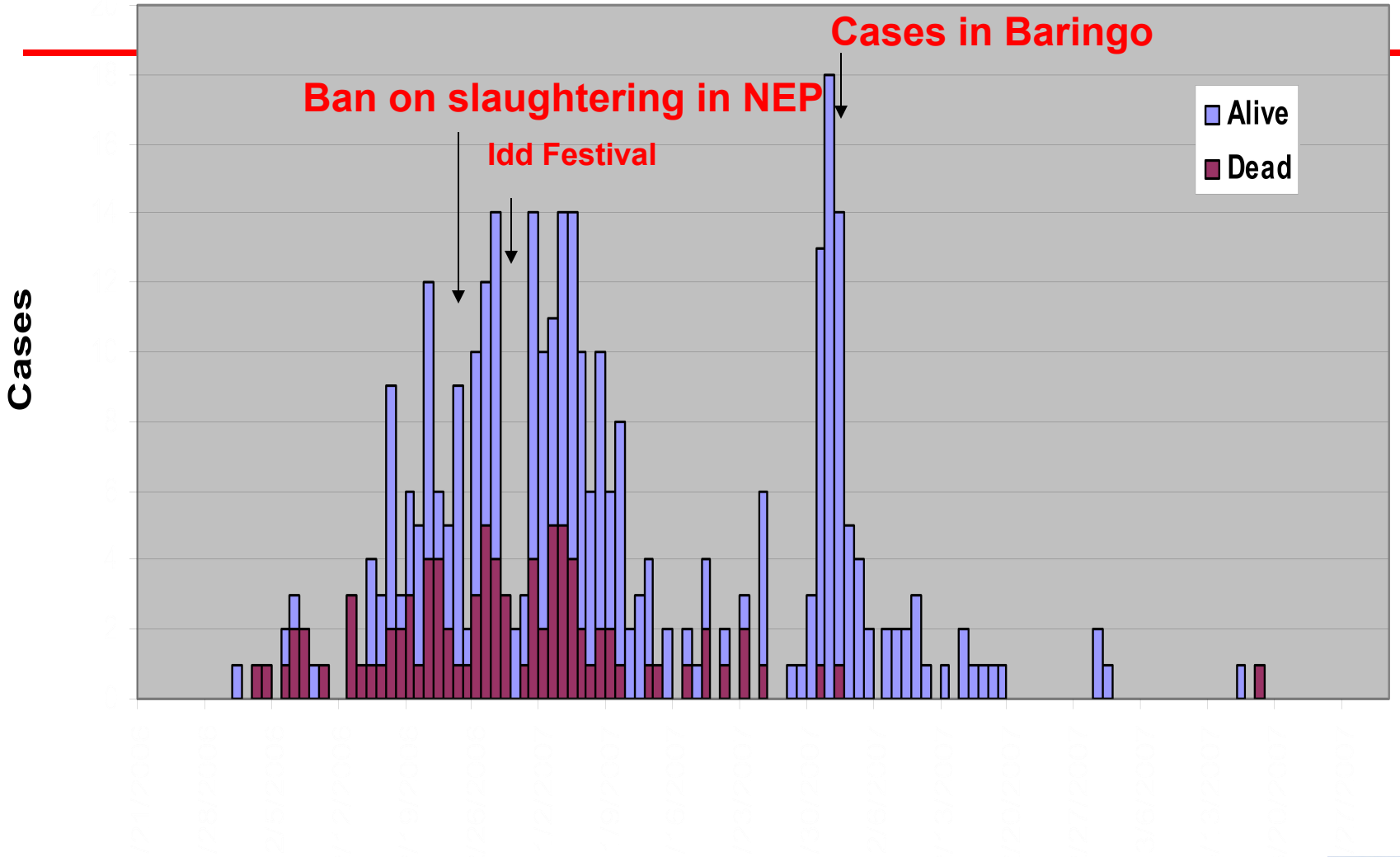
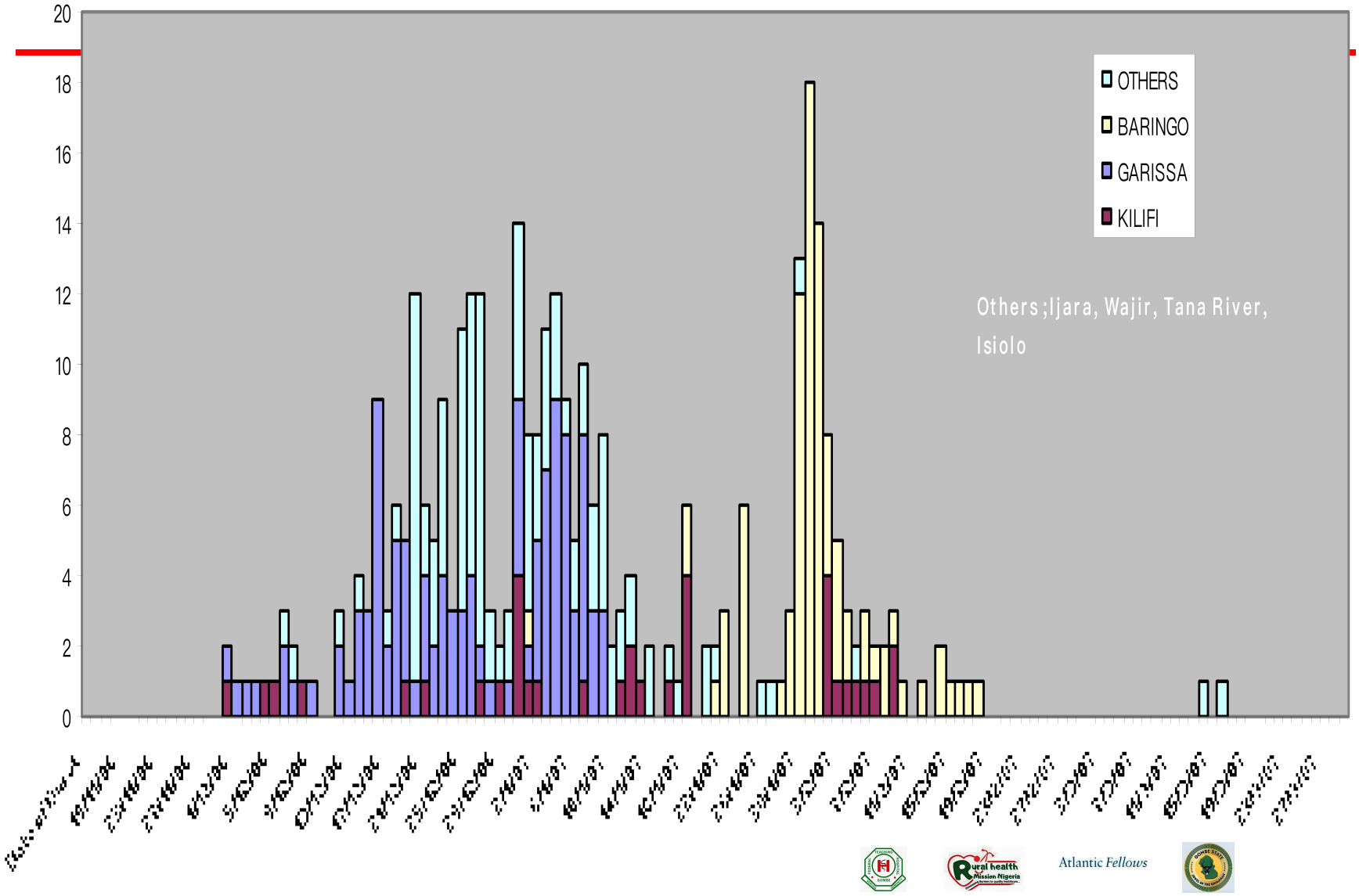
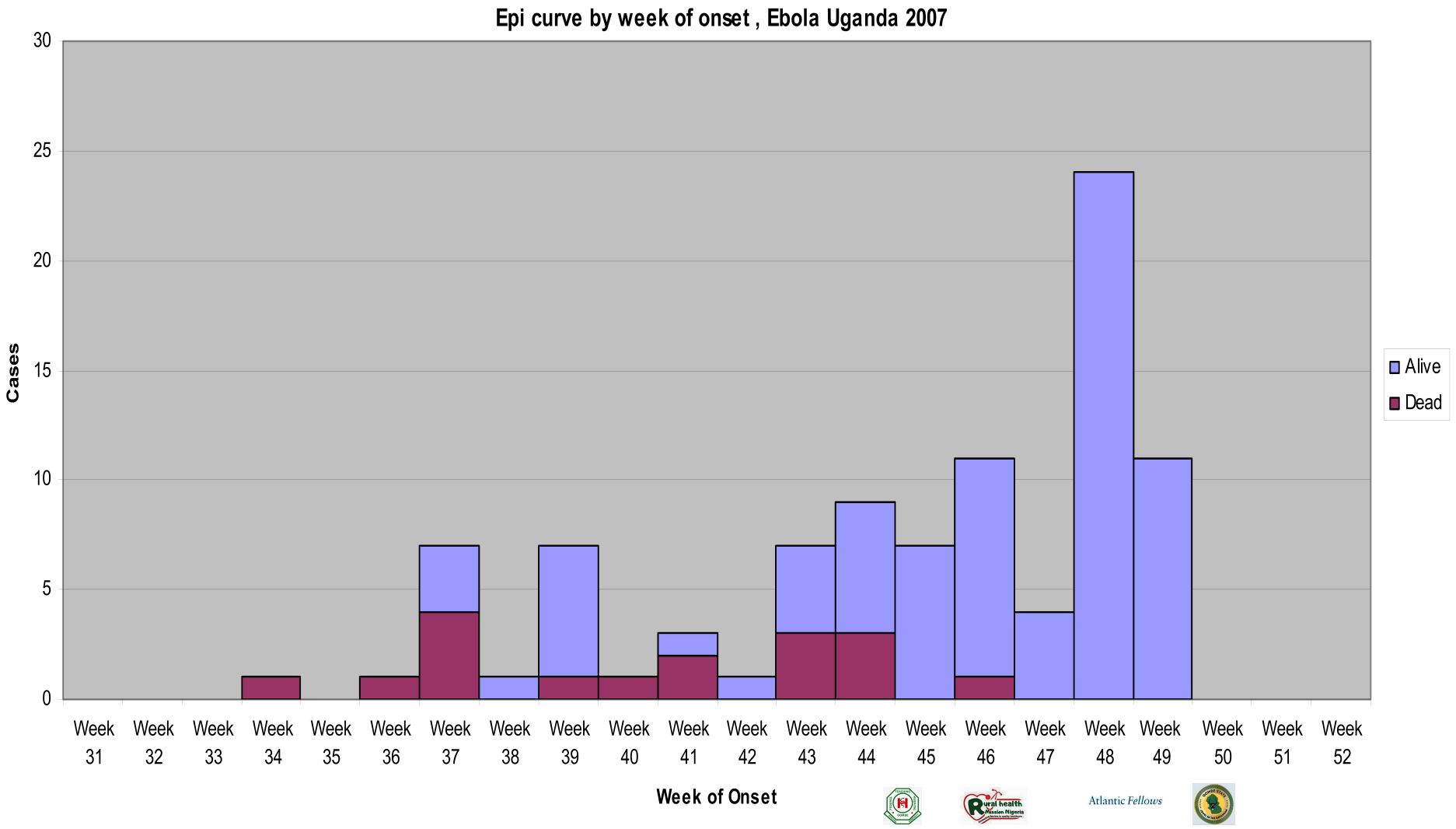


Figure 2a. Rift Valley Fever outbreak showing cases by district of origin, Kenya 2006/7



Some examples



Recap

Now that you have completed this session you should be able to:

- Describe the principles of outbreak investigation
- Describe steps in outbreak investigation
- Highlight some co-ordination and methodological issues