

**What is an outbreak? The
Role of Research in
disease outbreak**

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Global Health Trials



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What is an outbreak



A disease outbreak is the occurrence of **cases of disease in excess** of what would **normally be expected** in a defined community, geographical area or season.

An outbreak may occur in a restricted geographical area, or may extend over several countries. It may last for a few days or weeks, or for several years.

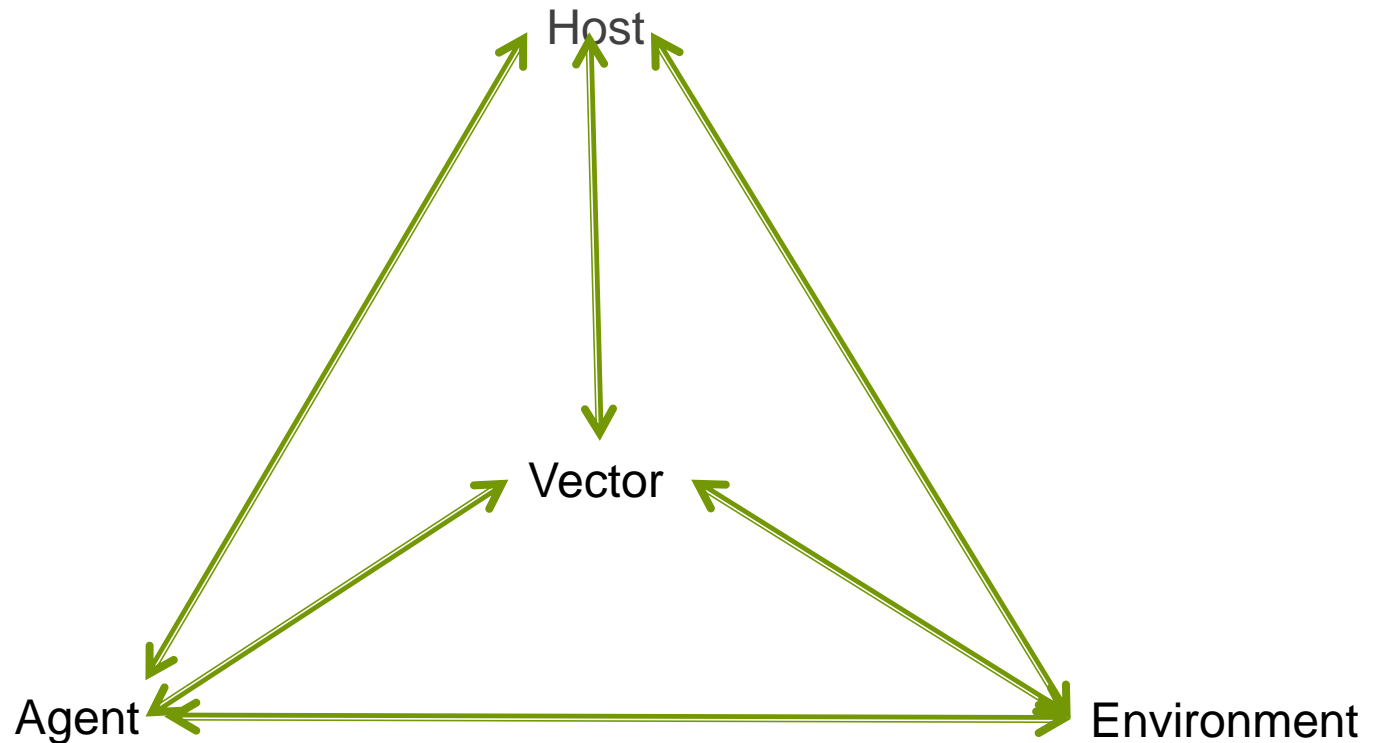
A single case of a communicable disease long absent from a population, or caused by an agent (e.g. bacterium or virus) not previously recognized in that community or area, or the emergence of a previously unknown disease, may also constitute an outbreak and **should be reported and investigated.**

“Rudyard Kipling”

- I keep six honest serving men, (they taught me all I knew). Their names are
 - What
 - Why
 - When
 - How
 - Where
 - Who



The epidemiologic triad of a disease



Modes of Disease Transmission

■ Horizontal

❖ Common Vehicle

➤ Single exposure

➤ Multiple exposure

➤ Continuous exposure

❖ Contact (person-to-person)

❖ Vector

■ Vertical



Disease Transmission

- Direct Transmission
- Indirect Transmission



Clinical Disease

- CLINICAL Disease: Characterized by signs and symptoms
- NONCLINICAL (INAPPARENT) Disease
 - Preclinical Disease...Yet to be clinically apparent
 - Subclinical disease...liver disease ...
 - Persistent(Chronic disease)...Post polio syndrome
 - Latent Disease



Mode of spread



Role Research in outbreaks: When do you apply research methodologies and design

- Research methodologies enable us to identify outbreaks



- Surveillance
- Cross Sectional Studies
- Surveys
- Case series
- Case report

Surveillance

- Meningitis outbreaks
- Rabies outbreaks
- Cholera
- Influenzae



Enzootic Cycle

New evidence strongly implicates bats as the reservoir hosts for ebolaviruses, though the means of local enzootic maintenance and transmission of the virus within bat populations remain unknown.

Ebolaviruses:

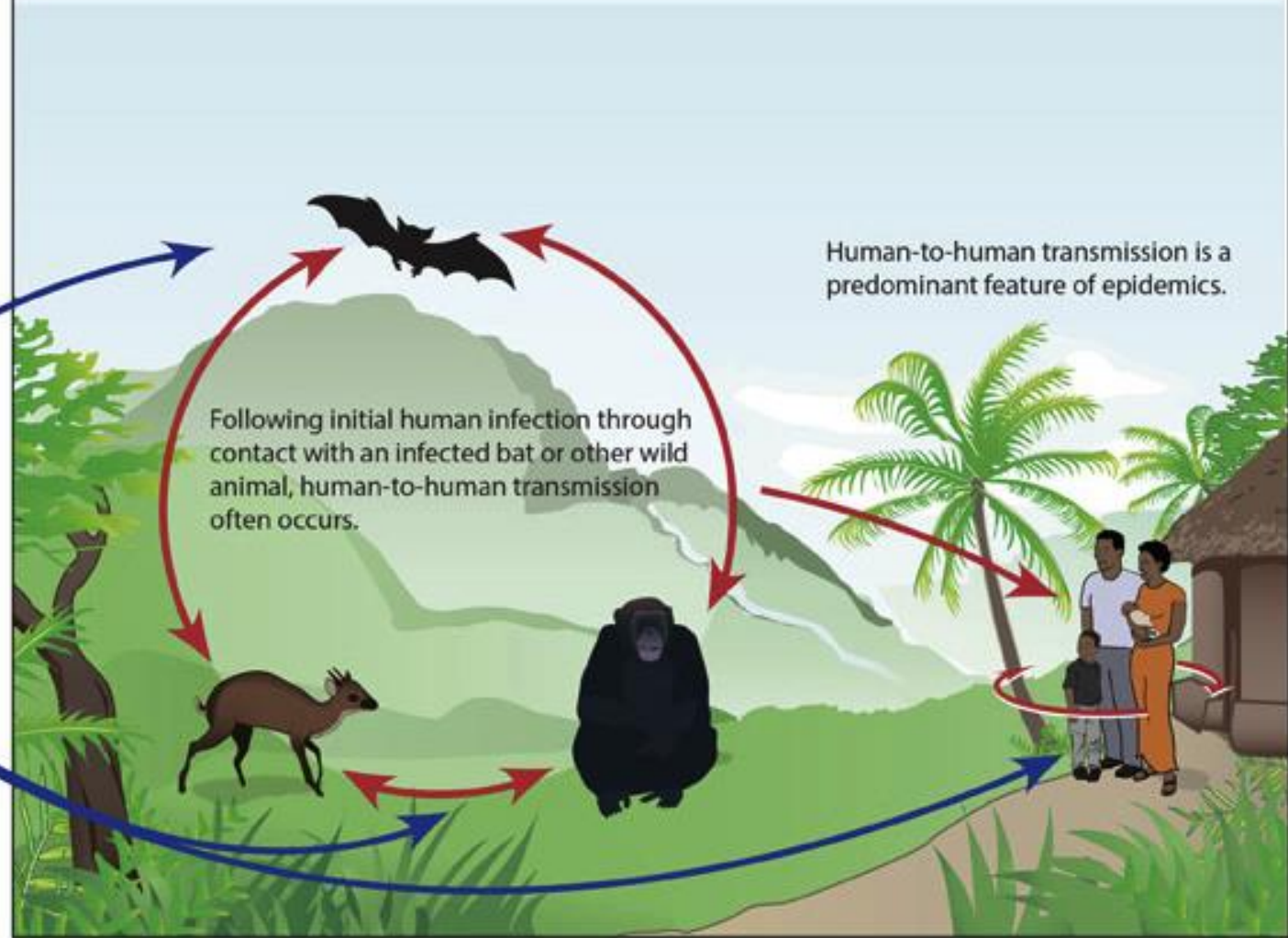
- Ebola virus (formerly Zaire virus)
- Sudan virus
- Tai Forest virus
- Bundibugyo virus
- Reston virus (non-human)



Epizootic Cycle

Epizootics caused by ebolaviruses appear sporadically, producing high mortality among non-human primates and duikers and may precede human outbreaks. Epidemics caused by ebolaviruses produce acute disease among

humans, with the exception of Reston virus which does not produce detectable disease in humans. Little is known about how the virus first passes to humans, triggering waves of human-to-human transmission, and an epidemic.



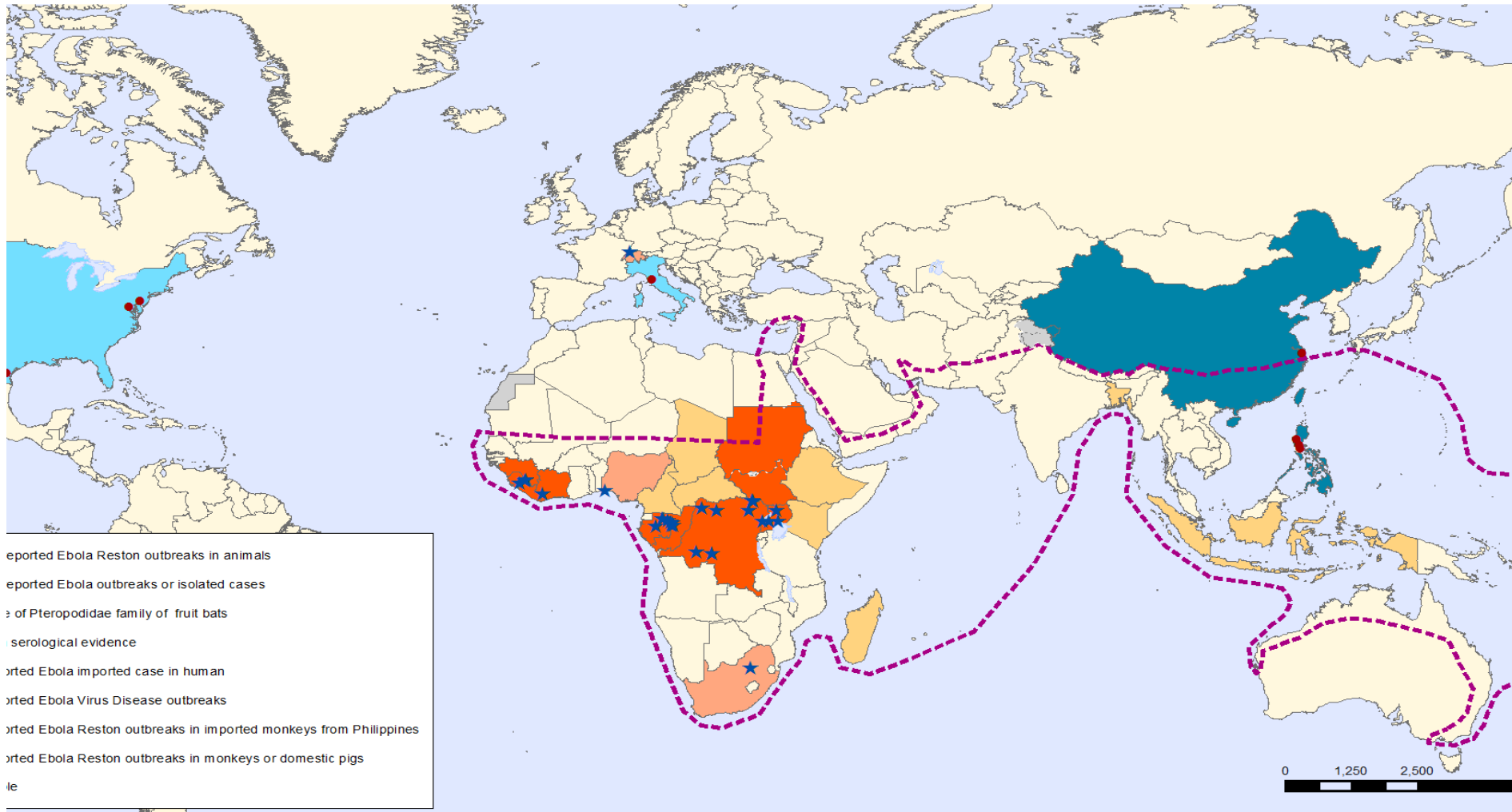
Human-to-human transmission is a predominant feature of epidemics.







Geographic distribution of Ebola virus disease outbreaks in humans and animals

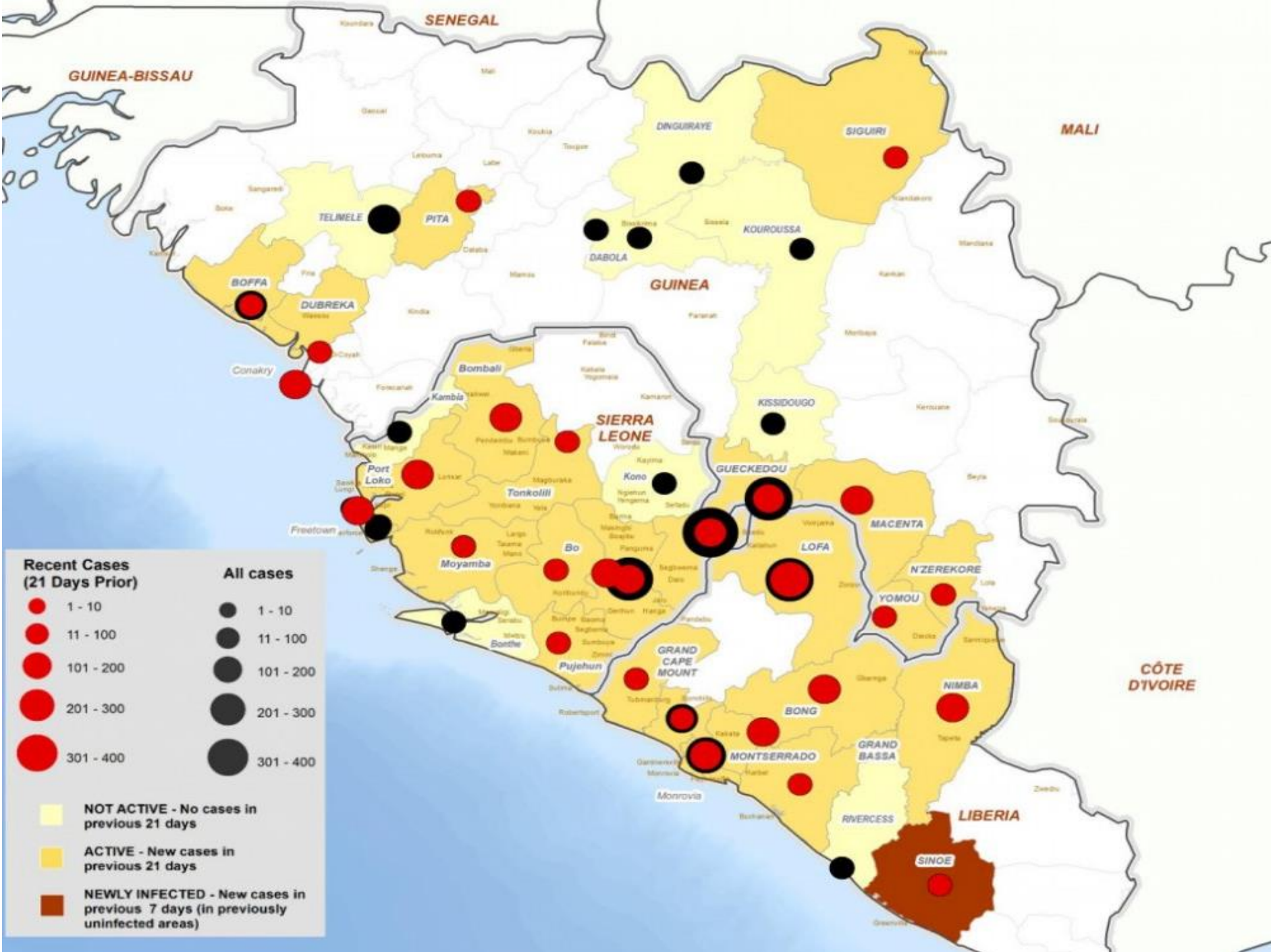


Country names shown and the designations used on this map do not imply the expression of any opinion whatsoever by the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

Data Source: World Health Organization
 Map Production: Health Statistics and Information Systems (HSI)
 World Health Organization



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Cross-sectional and Survey

- Typhoid Fever
- Schistosomiasis
- Guinea Worm
- Elephantiasis-Lymphatic Filariasis



Case Report and Case Series

- Ebola
- SARS
- Very Rare Diseases
 -
 -
 -



Roles of research in outbreak

- Cohort studies
- Case Control Studies
- Randomized control Trials



Research in Disease Outbreak

Steps in Investigation of an Acute Outbreak

- **Important to identify the following in an outbreak**



1. Determine that an outbreak has in fact occurred
2. Define the extent of the population at risk
3. Determine the measure of spread and reservoir
4. Characterizing the agent

Steps commonly used are as follows:

- Define the epidemic
 - A. Define the “numerator” (cases_
 1. Clinical features; Is the disease known?
 2. What are its serologic or cultural aspects?
 3. Are the causes partially understand?
 - B. Define the “denominator” What is the population at risk of developing disease?
- Examine the distribution of cases by the following
 - A. Time
 - B. Place
 - C. Person (Examine the riskin subgroups of the affected population according to personal characteristics-sex age residence occupation social group)



Step commonly usedCT

- Look for combinations(interactions) of relevant variables



- Develop hypothesis based on the following:
 - A. Existing knowledge (if any) of the disease
 - B. Analog to disease of known etiology
- Test hypothesis
 - A. Further analyzed existing data (case-control studies)
 - B. Collect additional data
- Recommend control measures
 - A. Control of present outbreak
 - B. Prevention of future similar outbreak

Epidemiological Curves

Figure 1. Example of an epidemic curve from a common intermittent exposure source

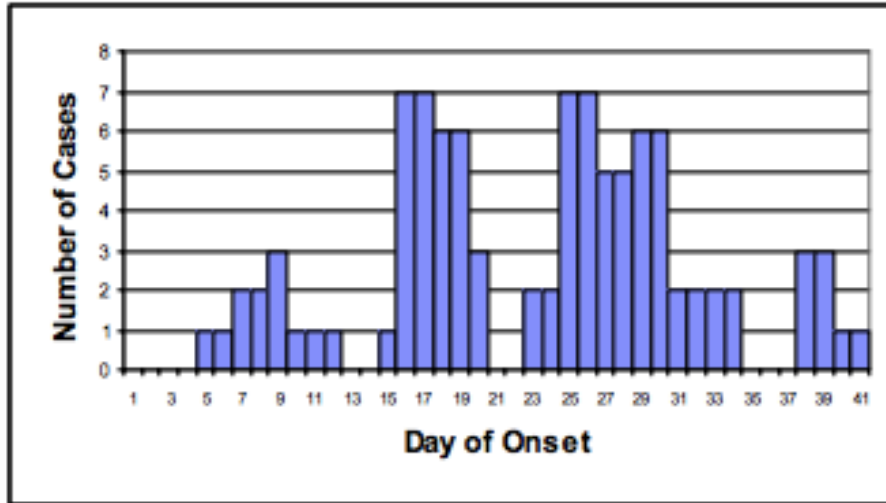


Figure 2. Example of an epidemic curve from a common continuous exposure source

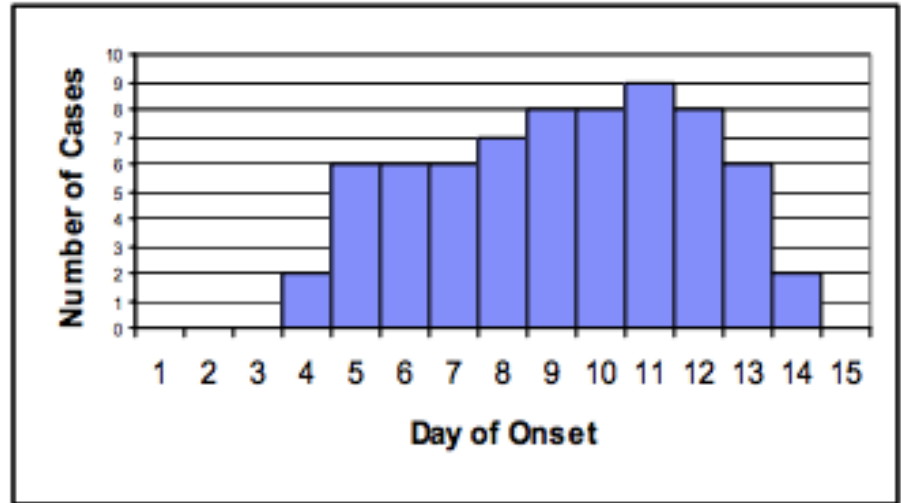


Figure 3. Example of a point source epidemic curve

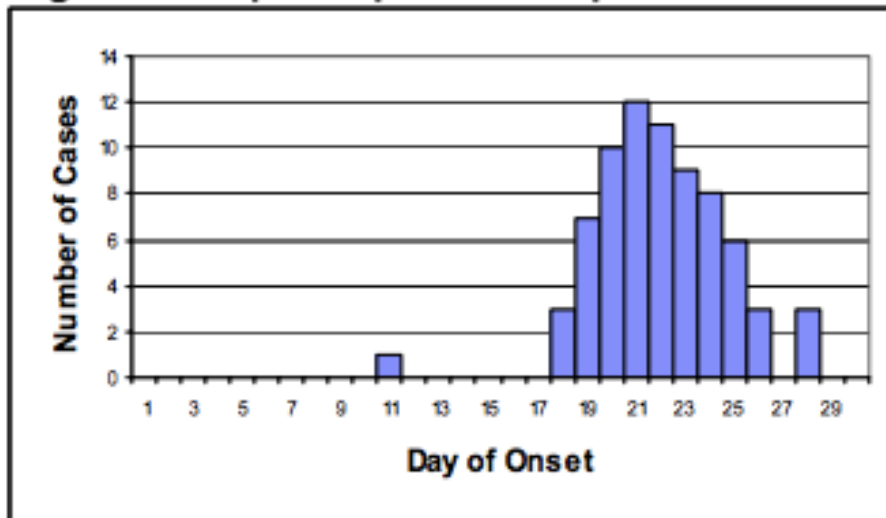
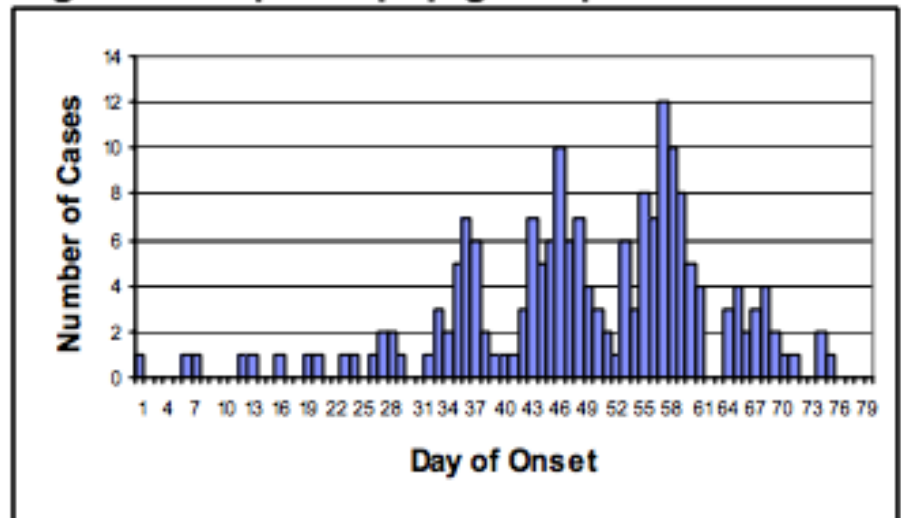


Figure 4. Example of a propagated epidemic curve



Outbreaks are noticed at the clinical and during research

- Active surveillance
- Passive surveillance



Institutions playing a role in research in outbreaks

- Health Centers
- Research Institution
 - KHRC
 - AGOGO Presby Hospital
 - Navorongo Health Centre
 - Duodowa Health Research
 - Noguchi Memorial Research Institution
- Ghana Health Services
- Ministry of Health



Professional Research Bodies



- Public Health Official
- Epidemiologist
- Microbiologist
- Social Scientist
- Economics
- Clinicians
- Biologist
- etc

- Thank you



- Question and Answers

References

- Leon Gordis-Epidemiology
- Wikipedia
- CDC-Atlanta
- Reuters

