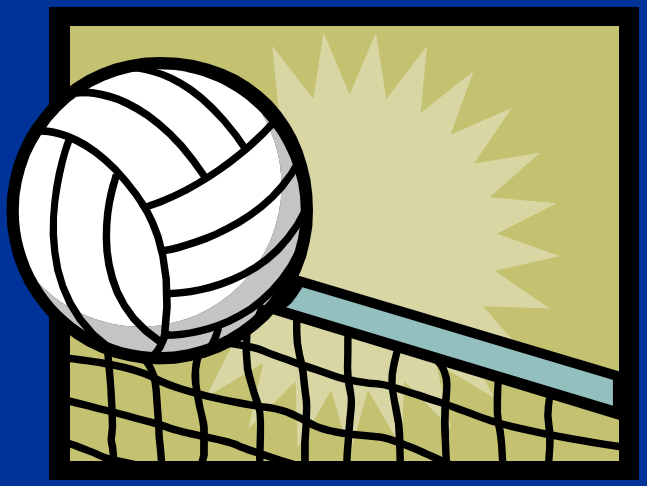
So!!

- The outcomes from last session were:



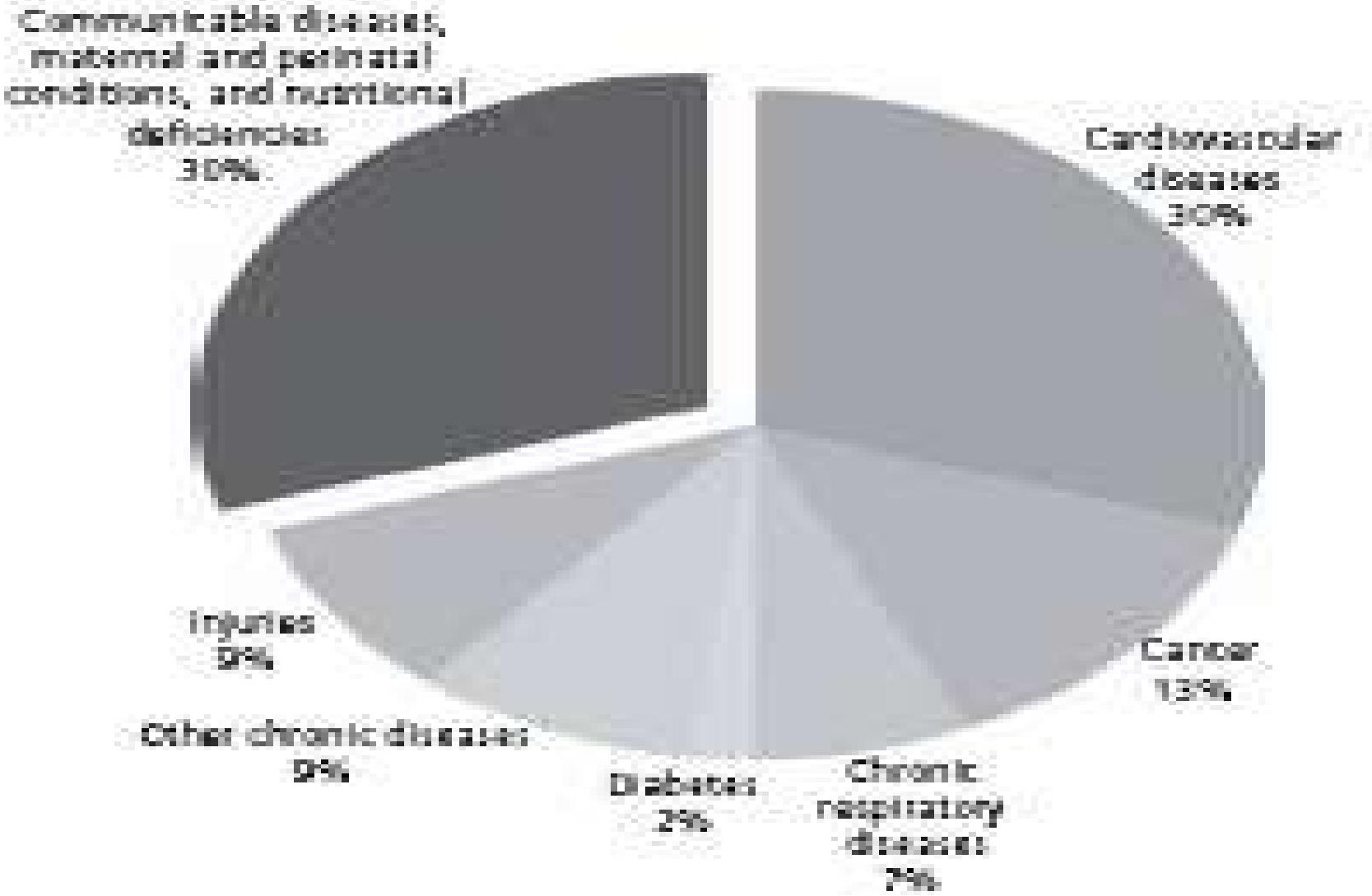
Remember

- Principles of Prevention
- Levels of prevention with examples from non communicable diseases
- Discuss advantages and disadvantages of different strategies for primary prevention
- Define screening and its criteria

Diseases Categories

- Communicable diseases:
- Contagious Diseases:
- Non Communicable diseases:

Figure 7.1. Projected main causes of death worldwide, all ages, 2005: total deaths 59 million[1]



Communicable Disease

- A communicable (or infectious) disease is one caused by transmission of a specific pathogenic agent to a susceptible host.
- Infectious agents may be transmitted to humans either:
  - directly, from other infected humans or animals, or
  - indirectly, through vectors, airborne particles or vehicles

Contagious diseases

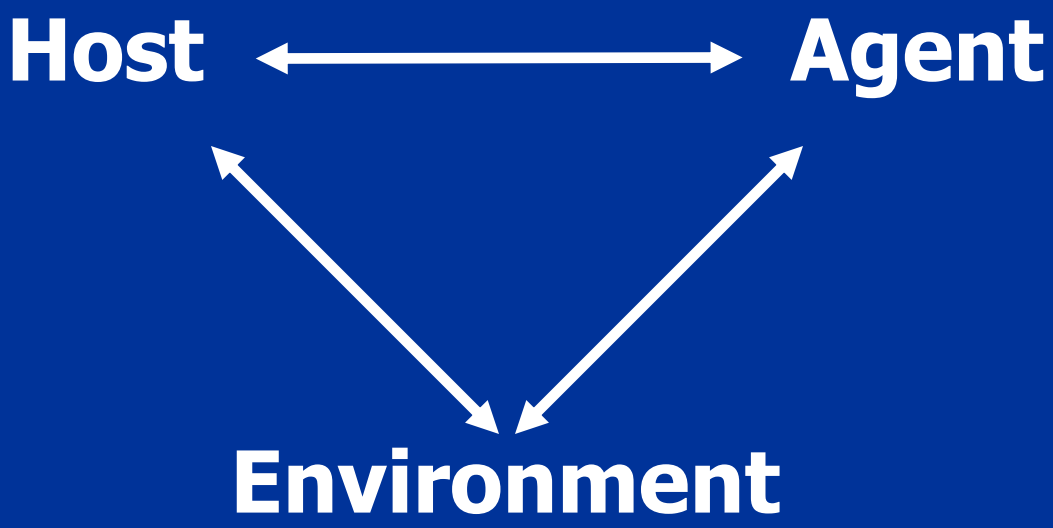
- Contagious diseases are those that can be spread (contagious literally means “by touch”) between humans without an intervening vector or vehicle

Emerging diseases

- New diseases and diseases with increasing incidences caused by viruses, bacteria, fungi and protozoa

EMERGING INFECTIOUS DISEASES

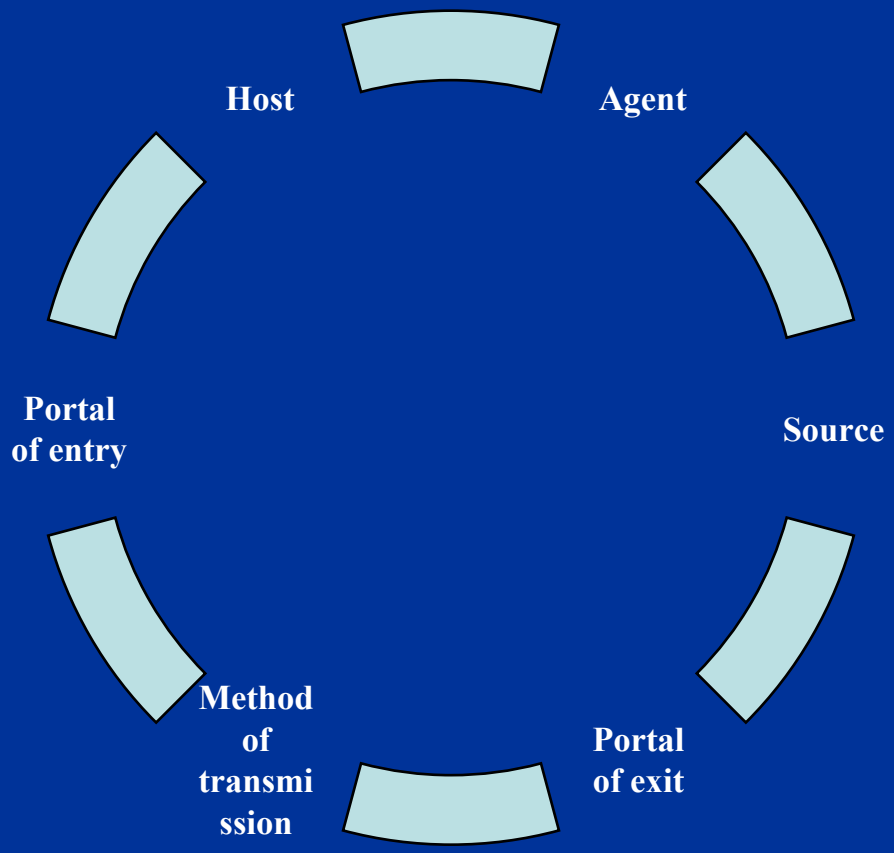
Remember! Epidemiologic Triad



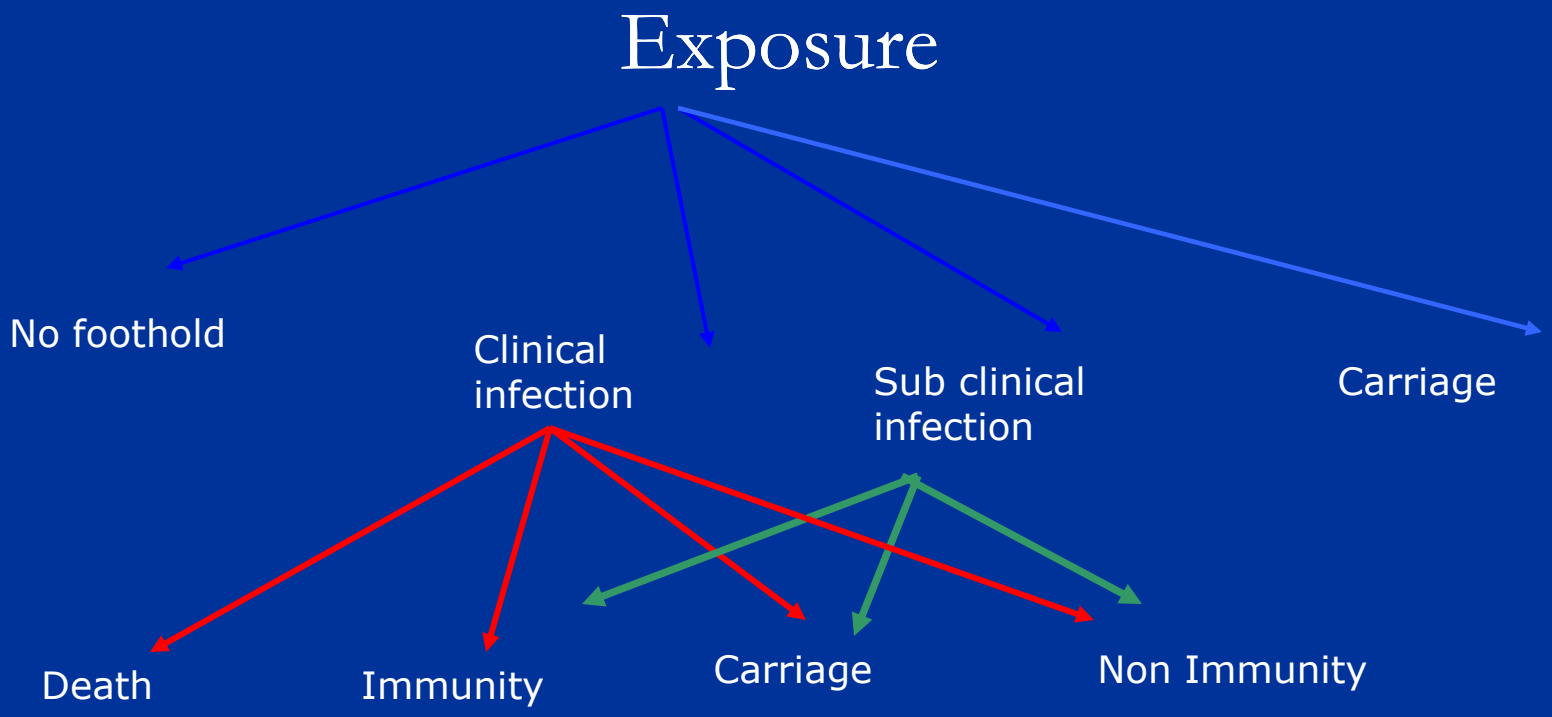
Chain of infection

- Communicable diseases occur as a result of the interaction between:
  - the infectious agent
  - the transmission process
  - the host
  - the environment.

Chain of Infection



The possible outcomes of an exposure to an infectious agent



The infectious agent

- A large number of microorganisms cause disease in humans. Infection is the entry and development or multiplication of an infectious agent in the host.
- Infection is not equivalent to disease, as some infections do not produce clinical disease.

Characteristics of IA

- **The pathogenicity** :its ability to produce disease, measured by the ratio of the number of persons developing clinical illness to the number exposed.

- **Virulence**: a measure of the severity of disease, which can vary from very low to very high

- **Infective dose**

Also

- The reservoir of an agent: its natural habitat, which may include humans, animals and environmental sources.
- The source of infection: the person or object from which the host acquires the agent.
- Knowledge of both the reservoir and the source is necessary if effective control measures are to be developed.

Also

- An important source of infection may be a carrier – an infected person who shows no evidence of clinical disease. The duration of the carrier state varies between agents. Carriers can be asymptomatic throughout the course of infection or the carrier state may be limited to a particular phase of the disease.
- Carriers played a large role in the worldwide spread of the human immunodeficiency virus due to inadvertent sexual transmission during the long asymptomatic period.

Transmission

- The second link in the chain of infection is the transmission or spread of an infectious agent through the environment or to another person. Transmission may be direct or indirect

Direct transmission

- Direct transmission is the immediate transfer of the infectious agent from an infected host or reservoir to an appropriate entry point through which human infection can take place

Indirect transmission

- Indirect transmission may be vehicle-borne, vector-borne or airborne.

Table 7.2. Modes of transmission of an infectious agent

Direct transmission	Indirect transmission
Touching Kissing	Vehicle-borne (contaminated food, water, towels, farm tools, etc.)
Sexual intercourse	Vector-borne (insects, animals)
Other contact (e.g. childbirth, medical procedures, injection of drugs, breastfeeding)	Airborne, long-distance (dust, droplets) Parenteral (injections with contaminated syringes)
Airborne, short-distance (via droplets, coughing, sneezing)	
Transfusion (blood)	
Transplacental	

To decide on prevention!

- Needs to understand means of transmission

The host

- The host is the third link in the chain of infection and is defined as the person that provides a suitable place for an infectious agent to grow and multiply under natural conditions.

- The points of entry to the host vary with the agent and include the skin, mucous membranes, and the respiratory and gastrointestinal tracts.

Interaction between host, agent

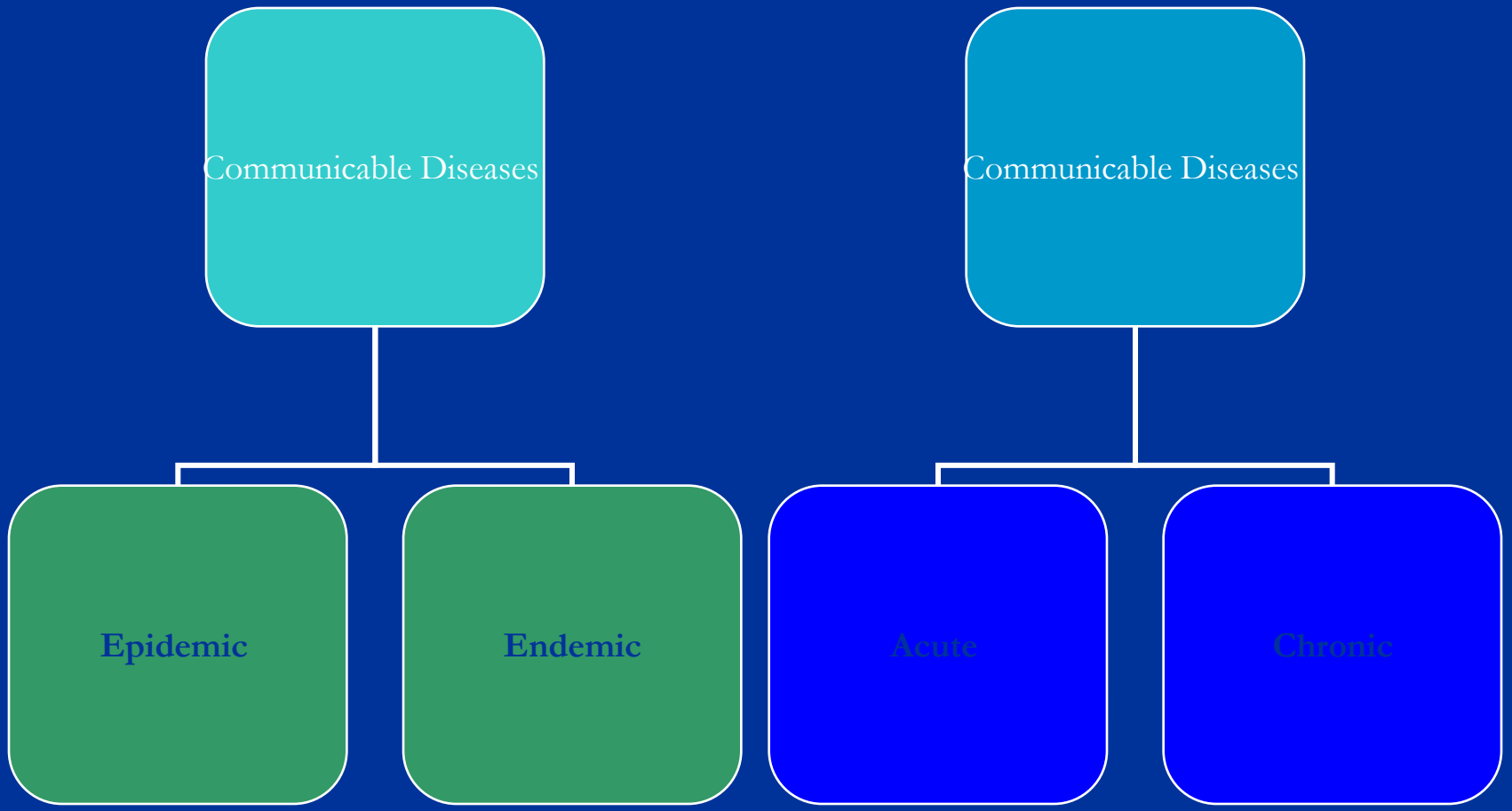
- Determined by certain factors.
- The incubation period—the time between entry of the infectious agent and the appearance of the first sign or symptom of the disease—varies from a few hours (staphylococcal food poisoning) to years (AIDS)

- The consequences of infection are largely determined by the host's resistance.
- Such resistance is usually acquired through previous exposure to or immunization against the agent in question.
- Immunization (or vaccination) is the protection of susceptible individuals from communicable disease by the administration of a vaccine

The environment

- The environment plays a critical role in the development of communicable diseases.
- General sanitation, temperature, air pollution and water quality are among the factors socioeconomic factors – such as population density, overcrowding and poverty – are of great importance.

Communicable Diseases



Diseases Categories Based on Frequency of occurrence

- Sporadic
- Endemic
- Epidemic
- Pandemic

Epidemics

- Epidemics are defined as the occurrence of cases in excess of what is normally expected in a community or region. When describing an epidemic, the time period, geographical region and particulars of the population in which the cases occur must be specified.

Epidemics

- Epidemics are either:
  - Common-Source epidemics
  - Propagated source epidemics

The number of cases in epidemics

- varies according to the agent, the size, type and susceptibility of population exposed, and the time and place of occurrence.
- The identification of an epidemic also depends on the usual frequency of the disease in the area among the specified population during the same season of the year.

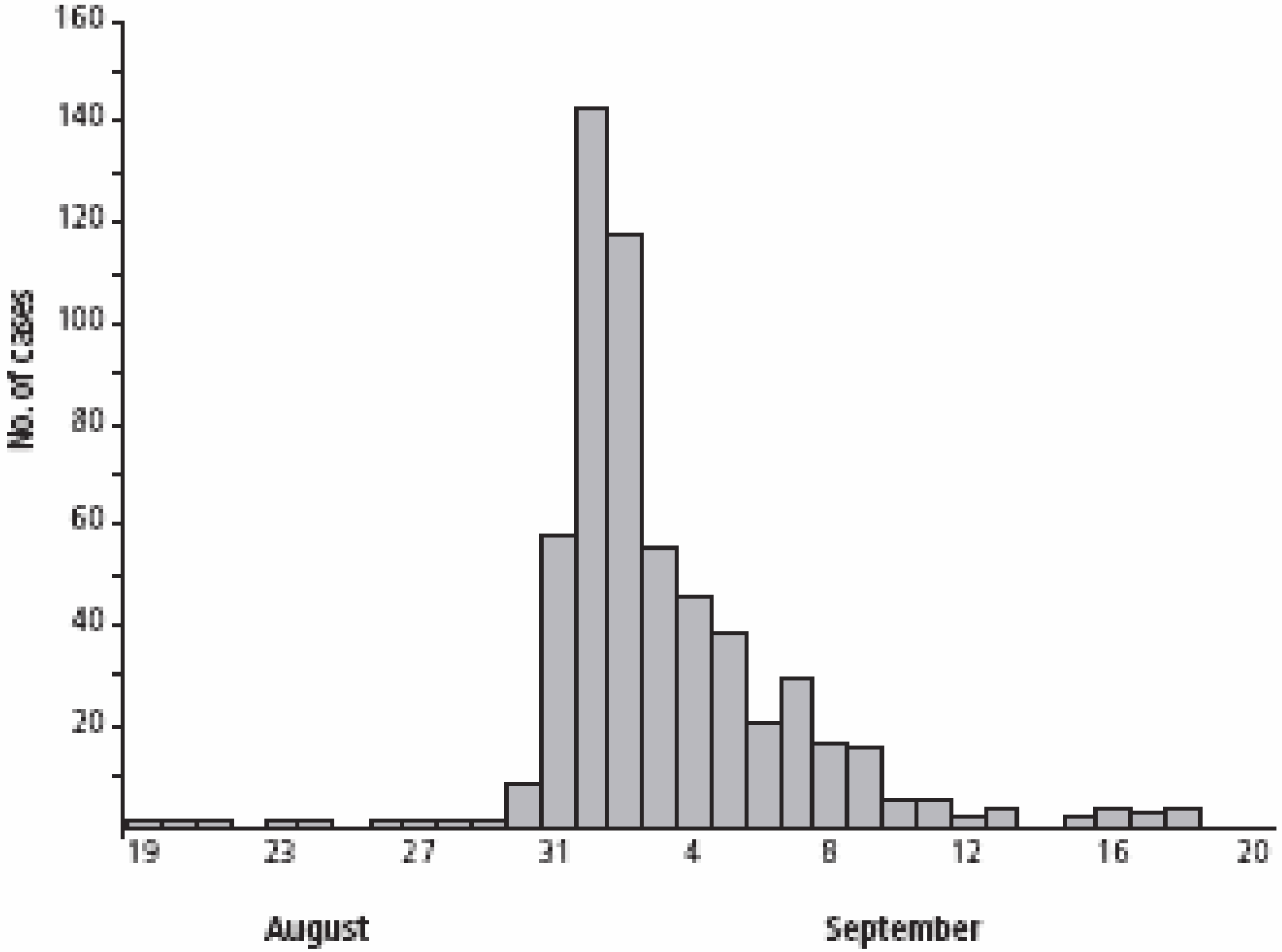
The dynamics of an epidemic

- Is determined by the characteristics of its agent and its pattern of transmission, and by the susceptibility of its human hosts

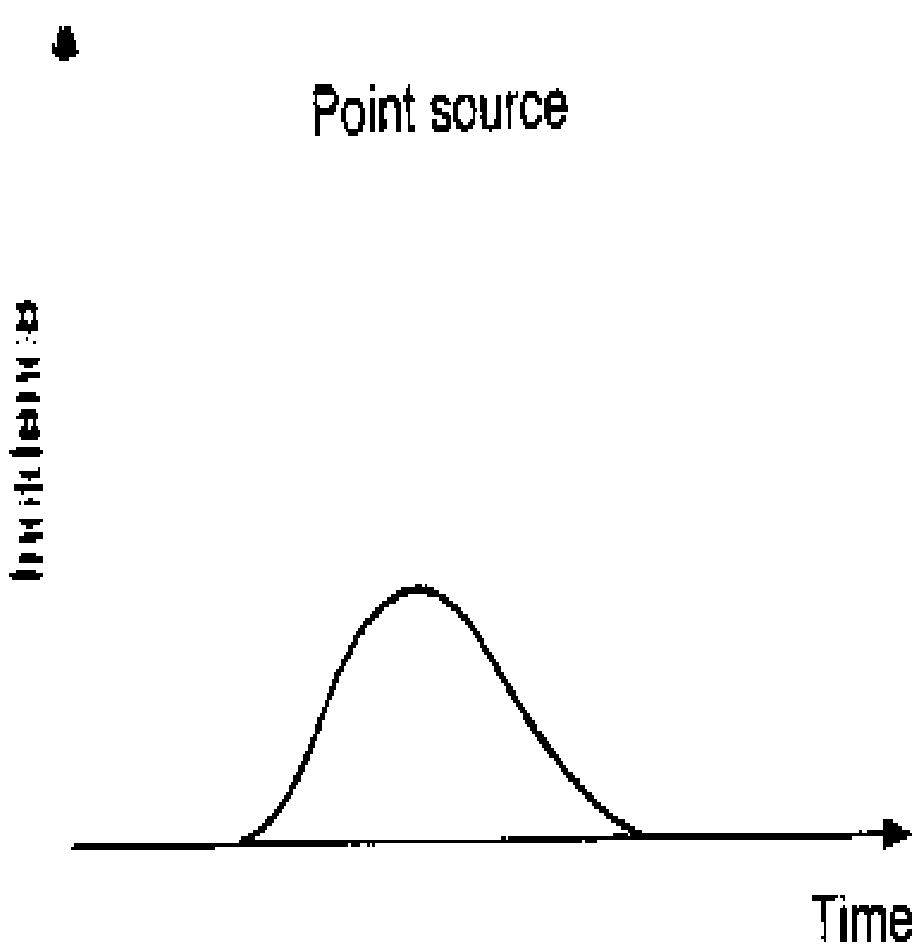
Point-Source Epidemic

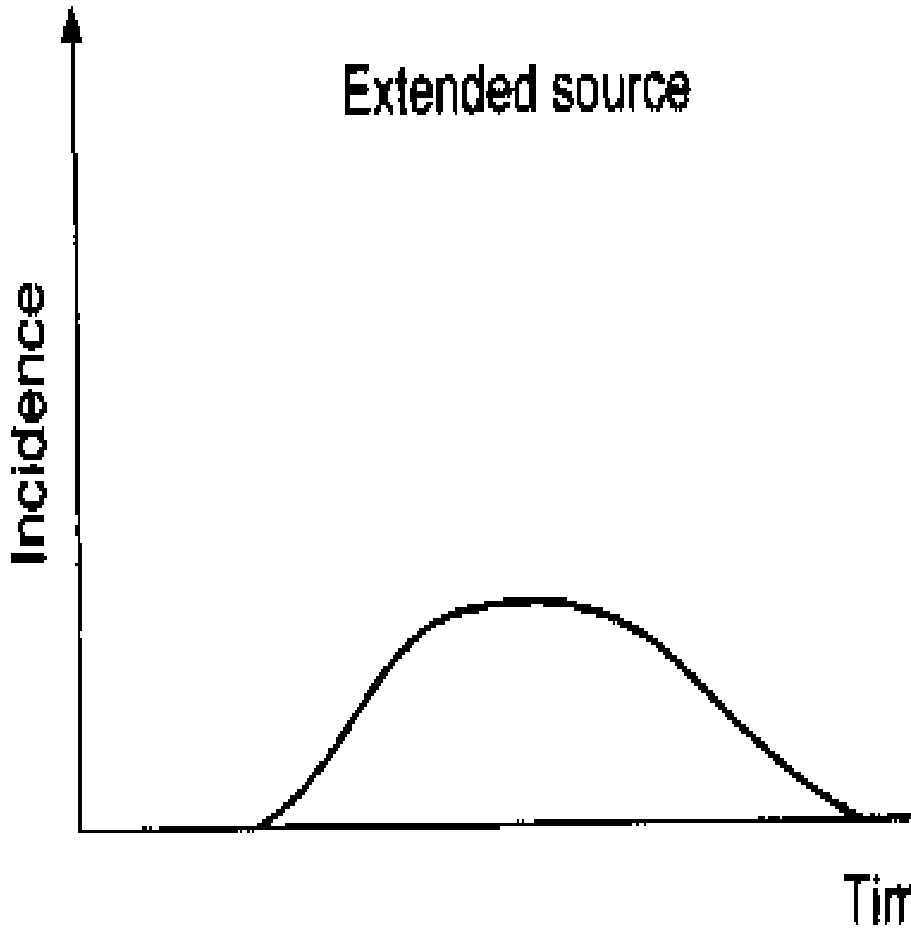
- In a point-source epidemic, susceptible individuals are exposed more or less simultaneously to one source of infection. This results in a very rapid increase in the number of cases, often in a few hours.

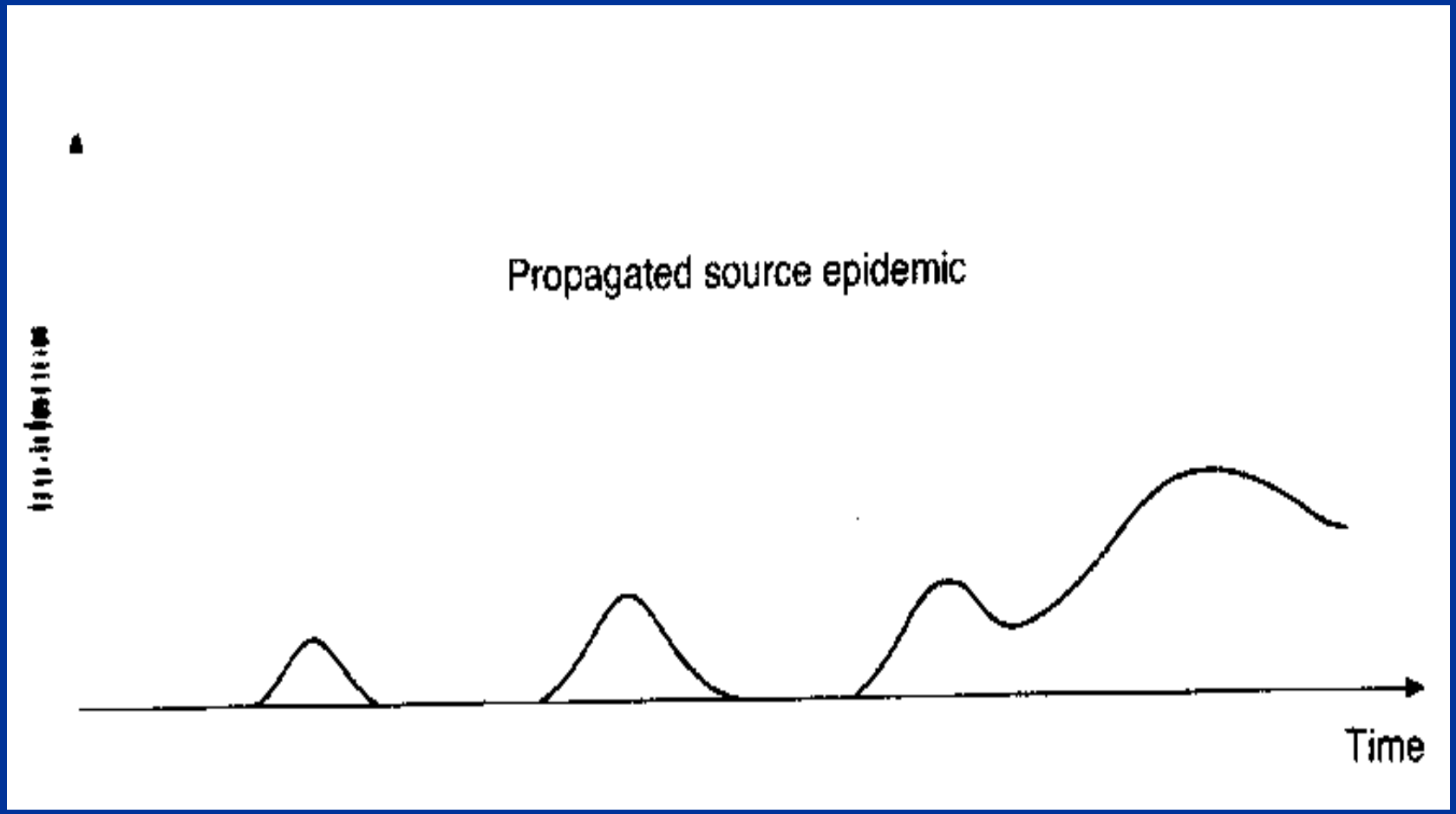
Figure 7.5. Cholera epidemic in London, August–September 1854

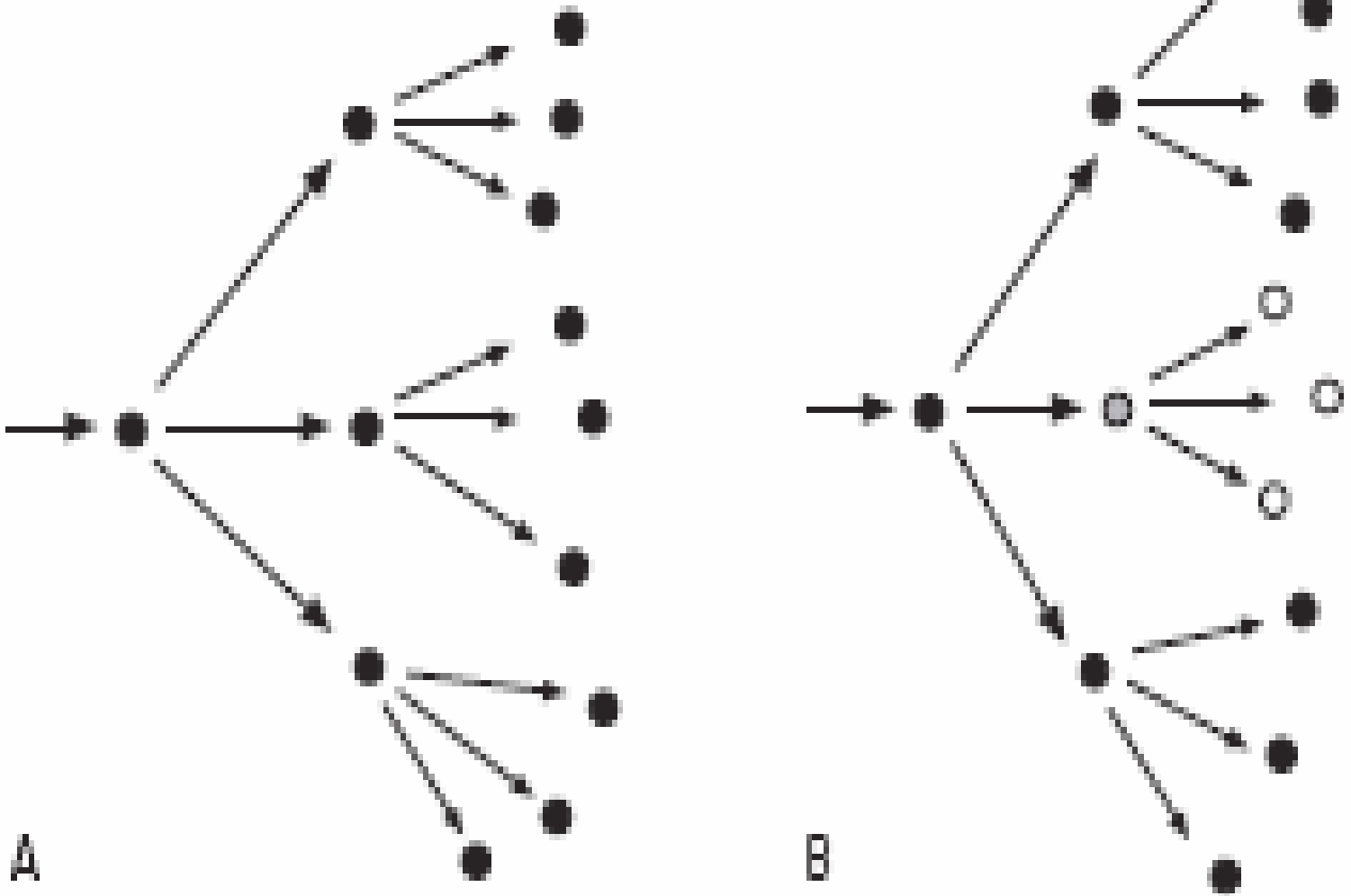


Common source epidemics






Propagated source epidemic
Time


A
B

Endemic diseases

- Communicable diseases are termed endemic when they have a relatively stable pattern of occurrence in a given geographical area or population group at relatively high prevalence and incidence

Investigation of a communicable disease

- The purpose of investigating a communicable disease epidemic is to identify its cause and the best means to control it.

Investigation of a communicable disease

- This requires detailed and systematic epidemiological work, in the following sequential or simultaneous steps:
  - undertaking preliminary investigation
  - identifying and notifying cases
  - collecting and analysing data
  - managing and controlling
  - disseminating findings and follow-up.

Surveillance

- Health surveillance is the ongoing systematic collection, analysis and interpretation of health data essential for planning, implementing and evaluating public health activities. Surveillance needs to be linked to timely dissemination of the data, so that effective action can be taken to prevent disease.

Surveillance

- Surveillance mechanisms include compulsory notification regarding specific diseases, specific disease registries (population-based or hospital-based), continuous or repeated population surveys and aggregate data that show trends of consumption patterns and economic activity.

Uses of surveillance

- recognize isolated or clustered cases;
- assess the public health impact of events and assess trends;
- measure the causal factors of disease;
- monitor effectiveness and evaluate the impact of prevention and control measures, intervention strategies and health policy changes: and
- plan and provide care.

Conditions for surveillance

- conditions for which surveillance can effectively lead to prevention.
- surveillance systems should reflect the overall disease burden of the community.
- incidence and prevalence
- indices of severity (case-fatality ratio)
- mortality rate and premature mortality
- an index of lost productivity (bed-disability days)
- medical costs
- preventability
- epidemic potential
- information gaps on new diseases.

Sources of data

- Mortality and Morbidity reports
- Hospital records
- Laboratory diagnoses
- Outbreak reports
- Vaccine utilization
- Sickness absence records
- Biological changes in agent, vectors, or reservoirs
- Blood banks.

Table 7.4. Factors that influence effectiveness of surveillance systems

Factor or element	Effective	Ineffective
Number of conditions	Fewer	Too many
Amount of information per case	Little	Too much
Burden on reporter	Small	Too complex and burdensome
Decision-makers' interest in surveillance data	High	Low
Goals for surveillance	Clear and supported	May never have been clear
Reporting strategy for serious but common conditions	Enough information to meet goals and make decisions	Complete reporting
Usefulness of data locally	High	Low
Use is limited to analysis of data and archiving	Data are well used	Limited use of data
Usefulness to decision-makers for prevention action	High	Low

Surveillance

- Information for action

International Health Regulations

- The purpose of the International Health Regulations is to maximize protection against the international spread of diseases, while minimizing interference with world travel and trade.

- The new regulations oblige countries to:
  - notify WHO of all “public health emergencies of international concern”;
  - verify outbreaks at WHO’s request;
  - maintain national core capacity for early warning and response; and
  - cooperate with rapid international risk assessment and assistance

Important

- The major thrust of communicable disease epidemiology is to clarify the processes of infection to develop, implement and evaluate appropriate control measures

Prevention in practice!!

Your Questions!!