

4<sup>th</sup> lecture:

# Natural History of Diseases

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Lecture objectives:

**At the end of the session students should:**

Understand Describe natural history and spectrum of infectious diseases and their implications for public health.



### Introduction:

The epidemiology has an important function which is; Observation of the disease or anything related to the community. While doing that, we come up with the natural history of diseases.

### Natural history of disease:

It is the progress of a disease process in an **individual** over time, in the **absence** of intervention.

It also describes the course of the disease in an individual starting from the moment of **exposure** to the causal agents till one of the possible **outcomes** occurs.

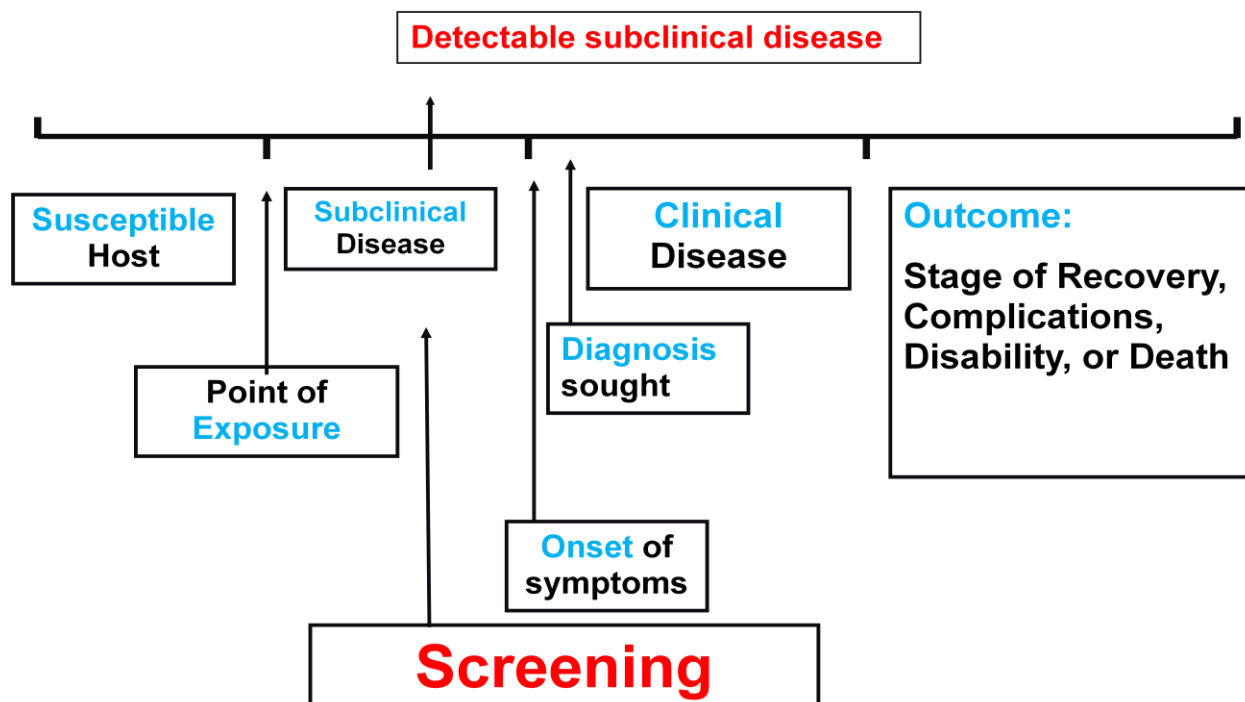
Example: Aids was first known in 1981, showed on a group of people having common symptoms which are manifestation of immunodeficiency in the form of any mild, or opportunistic infection that are eventually fatal. While observing without intervening we now know the “course” or the “Natural History of the Disease.”

### Natural history Phenomena:

Induction: time to disease initiation (the period of time between exposure to a causal agent and the initiation of the disease.)

Incubation: form the initiation to the clearance of symptoms (infectious disease).

Latency: time to detection (for non-infectious disease) or to infectiousness.



### Stages of Natural History of a disease:

1. Exposure to an infective agent or any precursors to a certain non-infectious disease.
2. Subclinical stage: the pathological changes before symptoms of a disease. (Can be detected by screening).  
Pathological changes: Induction stage until onset of symptoms. (Induction + incubation or latency)
3. Onset of symptoms (Clinical disease): Diagnosis can be made in this stage.
4. Outcome: either full recovery, controlled if it was a condition, disability, remaining stability, complications, or even death.

The problem is that we will only know about the disease when a person seeks care for the symptoms. It could be, one hour to even days. We might know about disease onset when symptoms occur but it rarely happens.

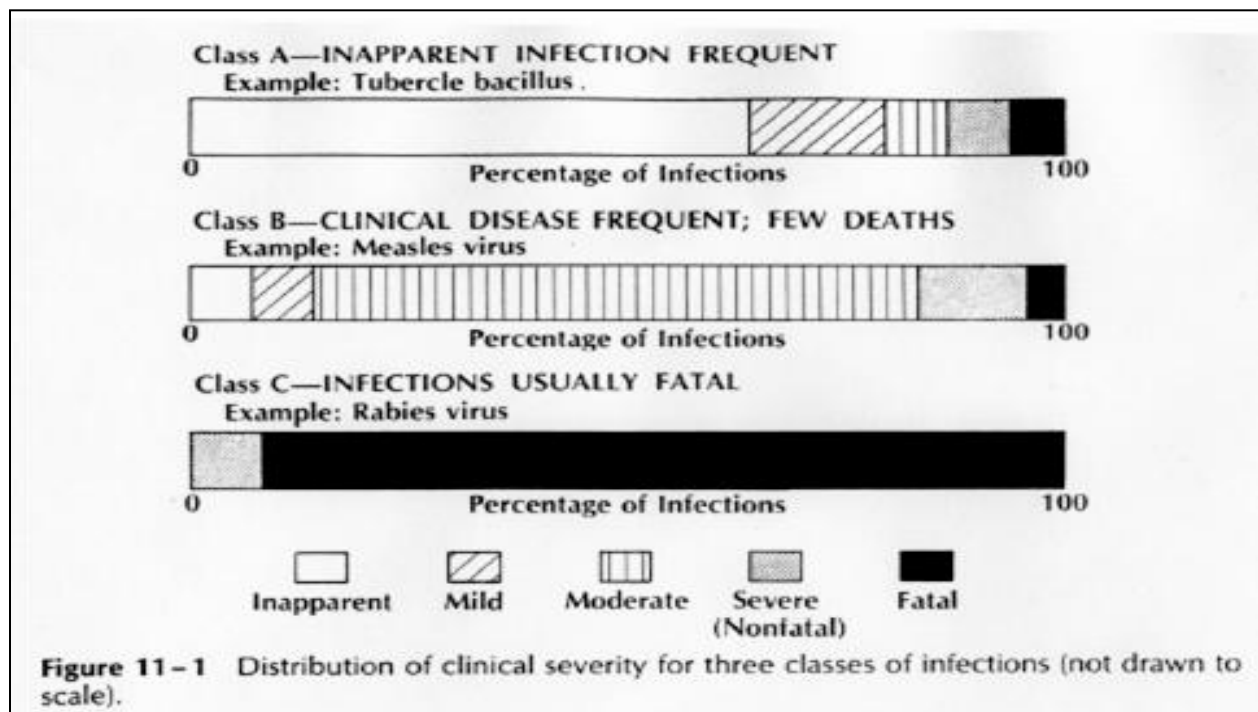
In some situations an investigator will only become aware of a case after a diagnosis is made.

### Importance of studying natural history of disease:

- The understanding of this progression from disease onset to cure or death is important for epidemiologists.
- Natural history is as important as causal understanding for the prevention and control of disease.
- The earlier you can become aware of the attack the more likely you will be able to intervene and save lives. (by intervention, but if the intervention led to no positive outcome we consider it ineffective)  
If we can detect a person in a subclinical phase with certain laboratory investigation (screening tests) could detect the disease early before it progress.  
Examples: - Rising of enzymes level in cardiac diseases.  
- Appearance of certain antibodies.
- There are 3 types of intervention:
  - Primary: it is to protect healthy people from developing a disease or experiencing an injury in the first place. (immunization against infectious disease)
  - Secondary: after an illness or serious risk factors have already been diagnosed. (recommending regular exams and screening tests in people with known risk factors for illness)
  - Tertiary: preventing further physical deterioration and maximizing of a chronic disease.

### Spectrum of disease:

- The idea that an exposure can lead to varying signs, symptoms and severity of the same disease in the population is the spectrum of disease.
- Why do we have varying degrees of severity or outcome?
- The outcome will depend on the interactions of host, agent and environmental factors.



In a population 100 persons and got infected by any disease the severity range from mild to moderate to severe then fatal.

Class A:

Frequent unapparent infection or never diagnosed unless accidentally diagnosed, another group are people who presented with mild or tolerable clinical symptoms, then a lesser group which are the moderate and lastly fatal.

Examples: **Tuberculosis, polio, hepatitis A, meningitis and AIDS.**

Class B:

Frequent moderate symptoms to severe and rarely fatal or unapparent. Those who are in a subclinical phase are lucky because they mostly have immunity.

Examples: **Measles and chickenpox.**

Class C:

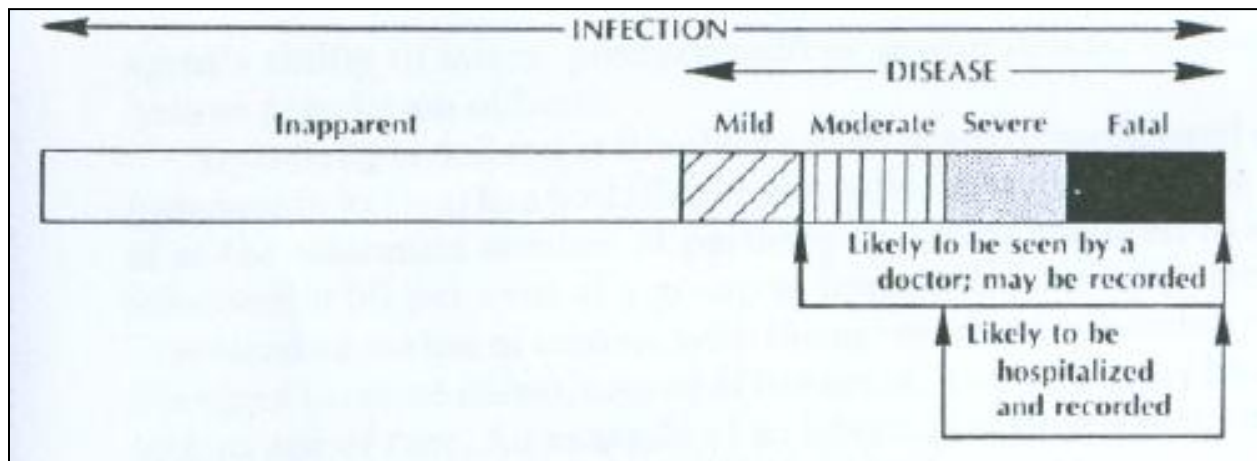
This class either severe or fatal, no mild or moderate symptoms.

Examples: **Rabies**, hemorrhagic fevers caused by Ebola and Marburg viruses.

Which one of the classes that has a major public health importance?

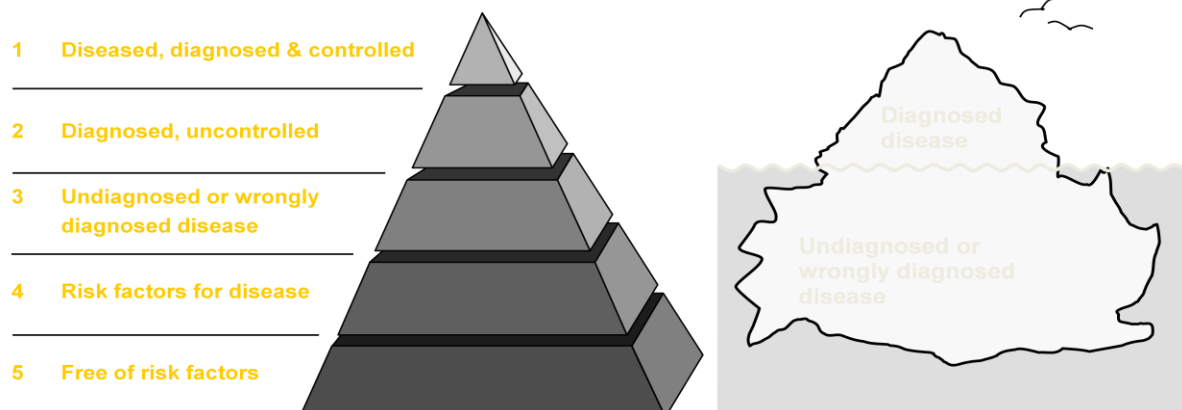
Answer: Class A, why? Because there's a great percentage of them are subclinical which means that they might be infectious.

### The relation of severity of illness to disease statistics:



### Iceberg Phenomenon:

- Cases of illness correctly diagnosed by clinicians in the community often represent only the “tip of the iceberg.”
- Many additional cases may be too early to diagnose or may remain asymptomatic.
- Examples: **Tuberculosis, meningitis, polio, hepatitis A, AIDS.** (class A)
- The risk is that persons with in-apparent or undiagnosed infections may be able to transmit infection to others.



**Implications of the concepts of natural history and spectrum of disease:**

- Persons with in-apparent or undiagnosed infections can transmit infections to others.
- Control measures must be directed toward all infections capable of being transmitted to others;
  - both clinically apparent cases and
  - those with in-apparent or undiagnosed infections.

**Reference books:**

- Principles of Epidemiology in Public Health Practice. *Third Edition*. An Introduction to Applied Epidemiology and Biostatistics. Centers for Disease Control and Prevention (CDC)
- Gordis L. Epidemiology. 2009