Morbidity Rates

Summary Measures of Population Health

- Measure of Morbidity
- Mortality-based measures
- Combined disability & mortality methods

Learning objectives:

At the end of this lecture you (will) be able to:

- **List the main measures of morbidity**
- **Define and calculate Morbidity Rates**
- **Recognize the relation between incidence and prevalence rates**
- **Identify the fators affecting the prevalence**

Measures of morbidity

- **Morbidity rates are used as indicators of health**
- **In epidemiology, the main measures of disease frequency are:**
  - **Incidence Rate**
  - **Attack Rate**
  - **Prevalence Rate**

Incidence rate

Incidence measures the number of new cases of a disease (or other health-related phenomenon) that occur during a specified period of time in a population at risk

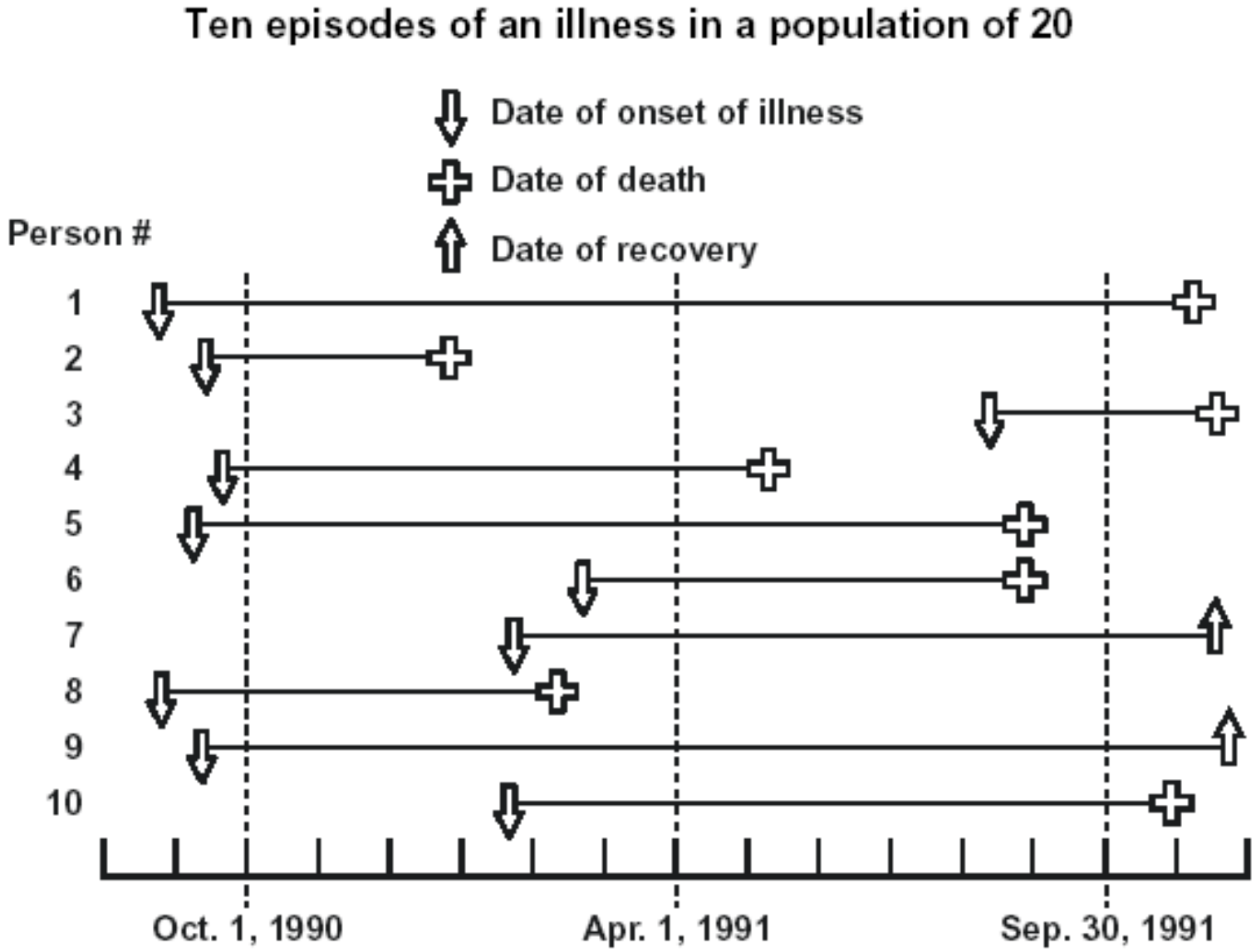
$$\text{Incidence rate} = \frac{\text{new cases ocurring during a given time period}}{\text{population at risk during the same time period}} \times 10^n$$

$$\text{Incidence rate} = \frac{\text{numerator}}{\text{denominator}}$$

- The numerator should reflect new cases of a disease which occurred during the specified period.
- The numerator should not include cases which occurred earlier.
- The numerator has to come from the population at risk for developing disease (it is a part of the denominator)

- The **denominator** should include persons at risk to develop the disease that is being described during the time period covered.
- The denominator does not include persons with the disease.
- The denominator may change over time as people develop disease

What is the incidence rate from October 1, 1990 to Sep 30, 1991?



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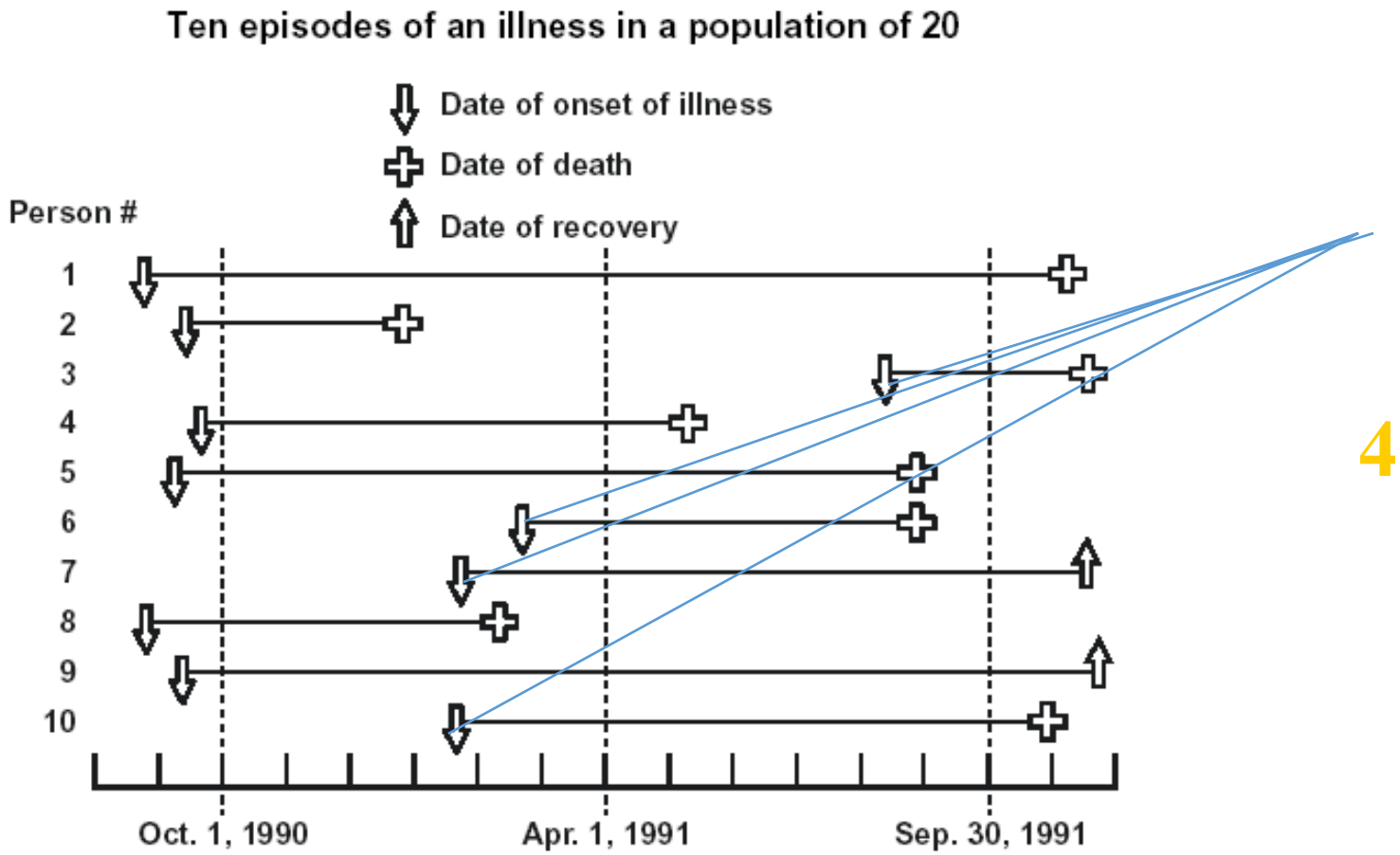


4

4 / 14

Factors affecting incidence rate

- **New risk factor**
  - oral contraceptives and increase in thrombo-embolism;
  - food additives and cancer
  - New virus (HIV and AIDS)
- **Changing habits**
  - increased smoking and lung cancer
  - fluoridated water and decrease in dental caries

Factors affecting incidence rate

- **Changing virulence of causative organisms**
  - drug-resistant bacteria (TB)
  - Influenza virus mutation Increase influenza (H1N1)
  - drug resistance to malaria prophylaxis and increase in malaria

- **Changing of intervention programmes**
  - vaccination against measles ⇩ measles
  - Polio eradication campaigns ⇩ polio
  - Chemoprophylaxis ⇩ meningitis, Rheumatic diseases

- **Selective migration** of susceptible persons to an endemic area ⇧ incidence
- **Population pattern**
  - Aging ⇧ Degenerative diseases
- ***Reporting***
  - Increase reporting ⇧ incidence
- ***Screening***
  - Early detection of cases ⇧ incidence
- ***New diagnostic tools***
  - New diagnostic tools ⇧ detection of cases

Attack Rate

An attack rate is a variant of an incidence rate, applied to a narrowly defined population observed for a limited time, such as during an epidemic.

The attack rate is usually expressed as % **percent.**

$$\text{Attack rate} = \frac{\text{Number of new cases among the population during the period}}{\text{Population at risk at the beginning of the period}} \times 100$$

Example

Of 76 persons who attended a picnic, 46 subsequently developed gastroenteritis.

Calculate the attack rate of gastroenteritis

Attendees = 76

ILL = 46

Attack rate = (46 ÷ 76) X 100

= 61%

Prevalence Rate

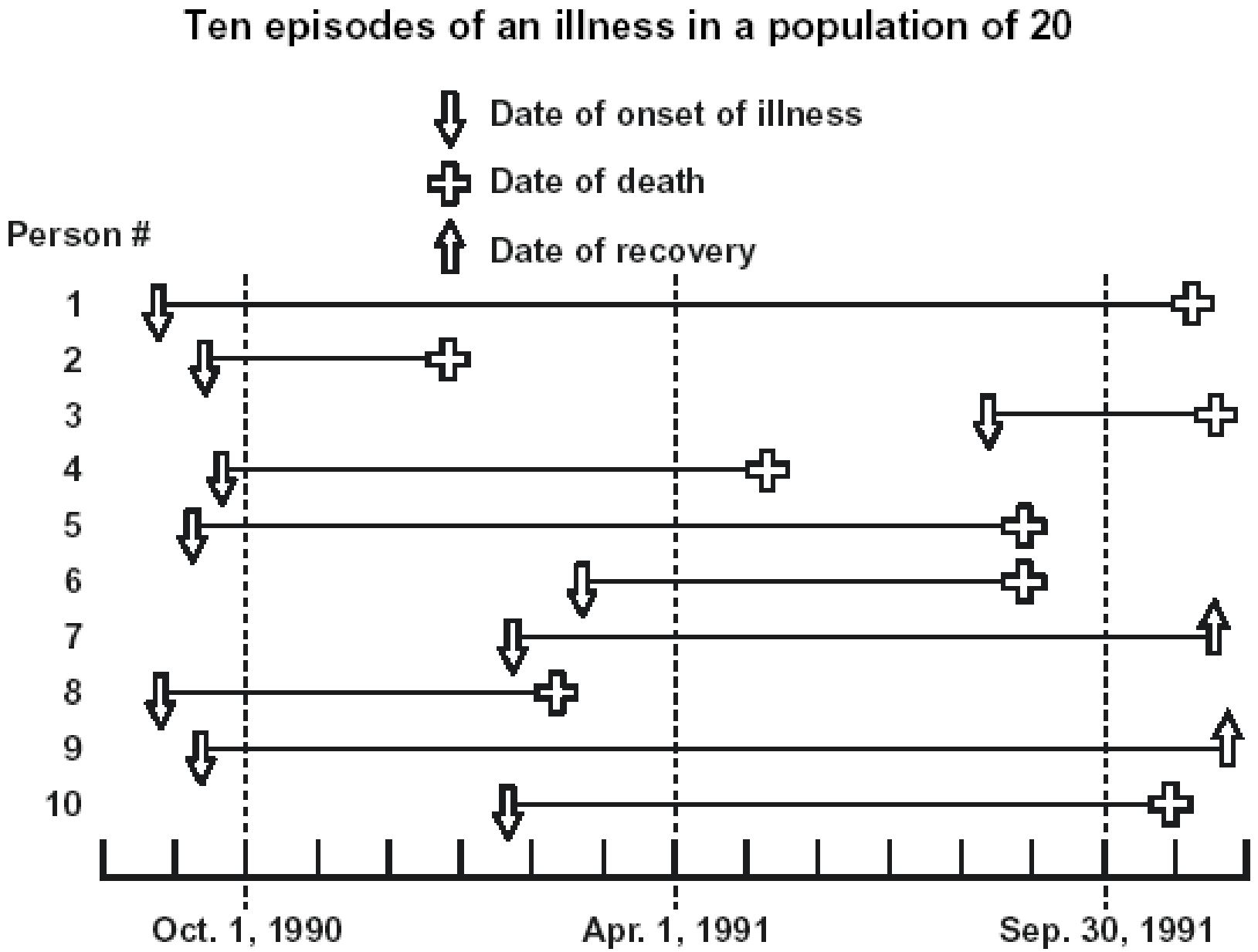
Prevalence measures the number of cases (new and old) of the disease (or other health-related phenomenon) at a point or period in time.

$$Prevalence = \frac{all\ new\ and\ pre\text{-}existing\ cases\ during\ a\ given\ time\ period}{population\ during\ the\ same\ time\ period} \times 10^{n}$$

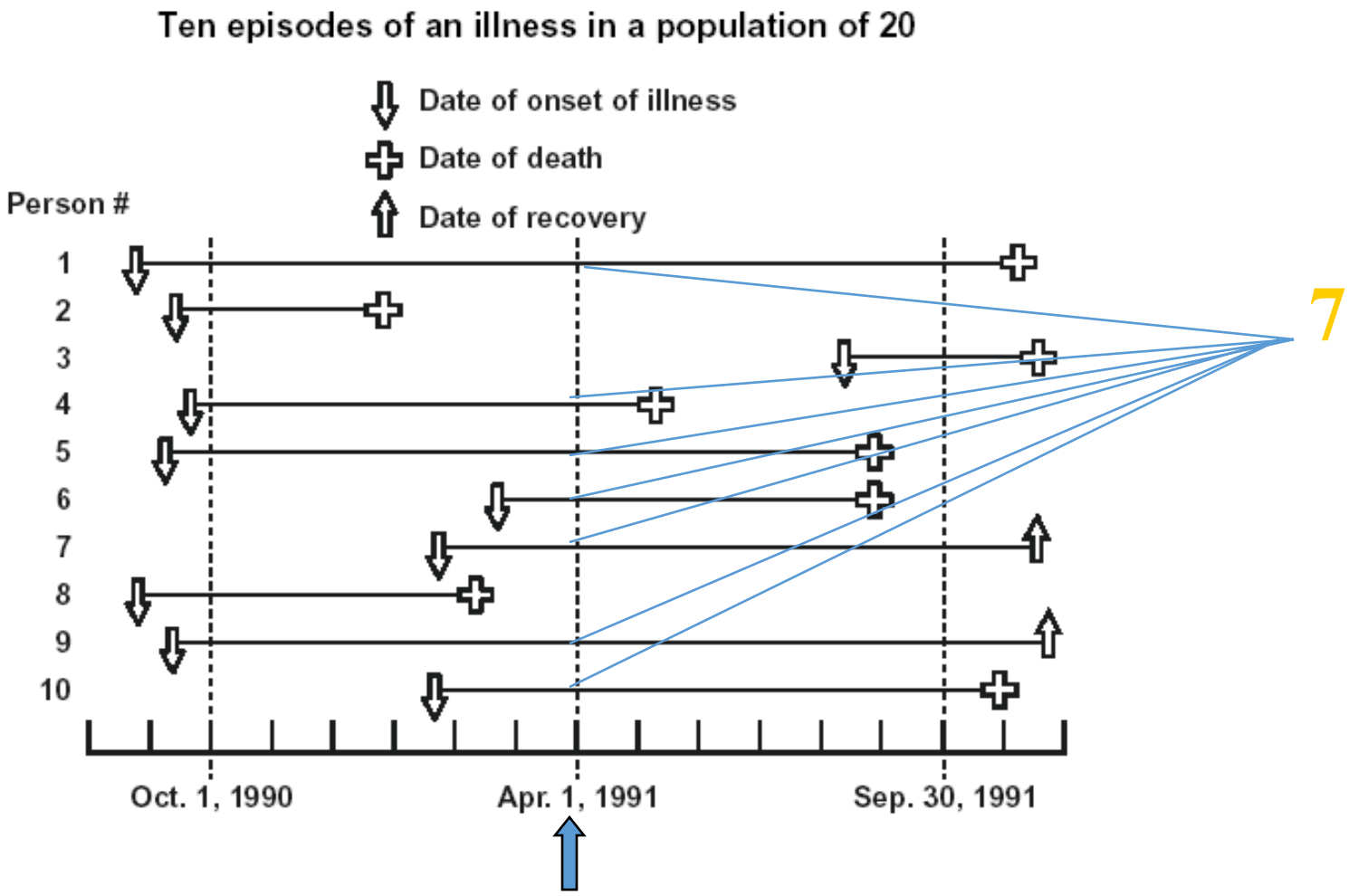
$$\text{point prevalence rate} = \frac{\text{Total number of } cases \text{(pre - existing and new) at a given point in time}}{\text{Total population at the same point in time}} \text{ x } 1000$$

$$\text{period prevalence rate} = \frac{\text{Total number of } cases \text{(pre - existing and new) disease during a given } time \text{period}}{\text{Total population during the } same \text{ time period}} \text{ x } 1000$$

What is the point prevalence on April 1?

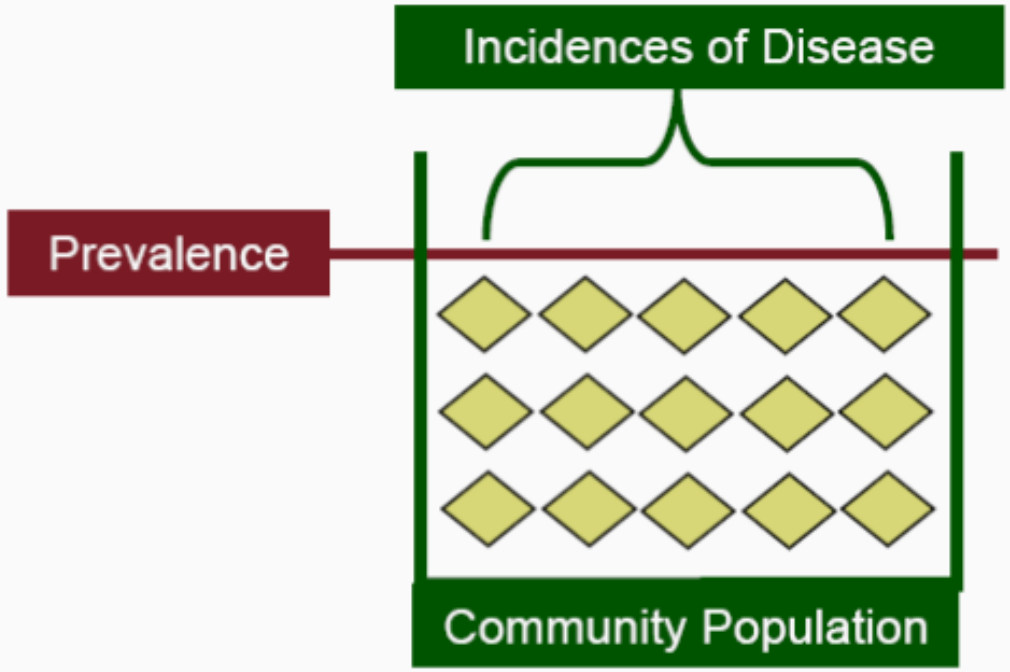


What is the point prevalence on April 1?



7 / 18

Relation between incidence and prevalence



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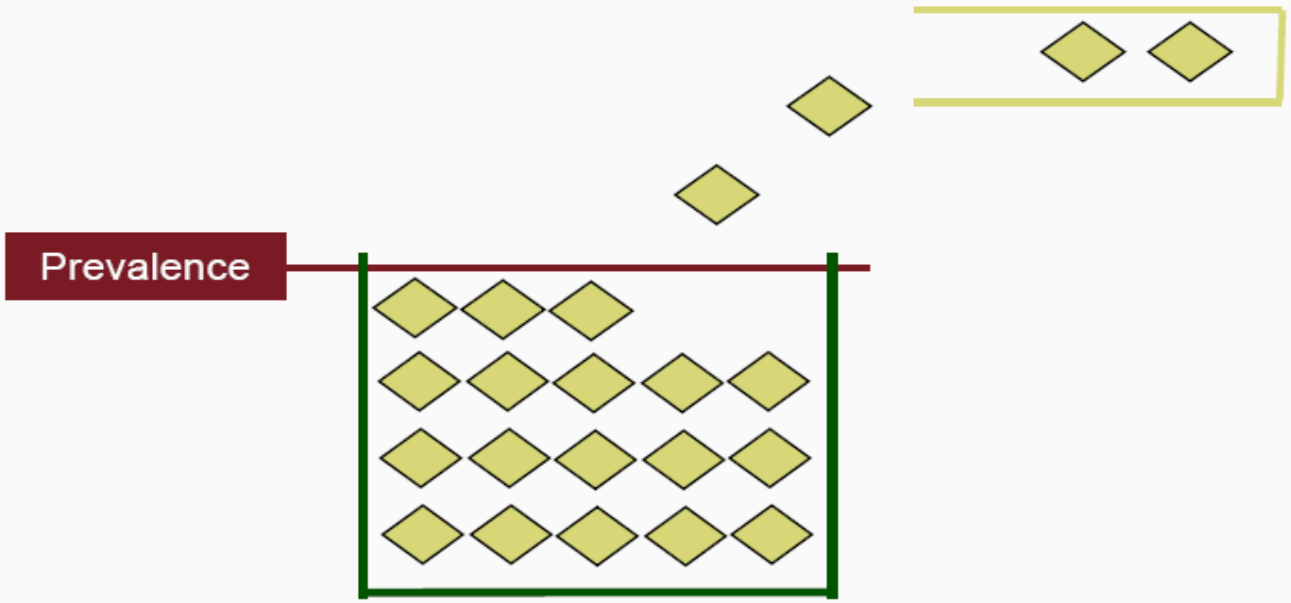
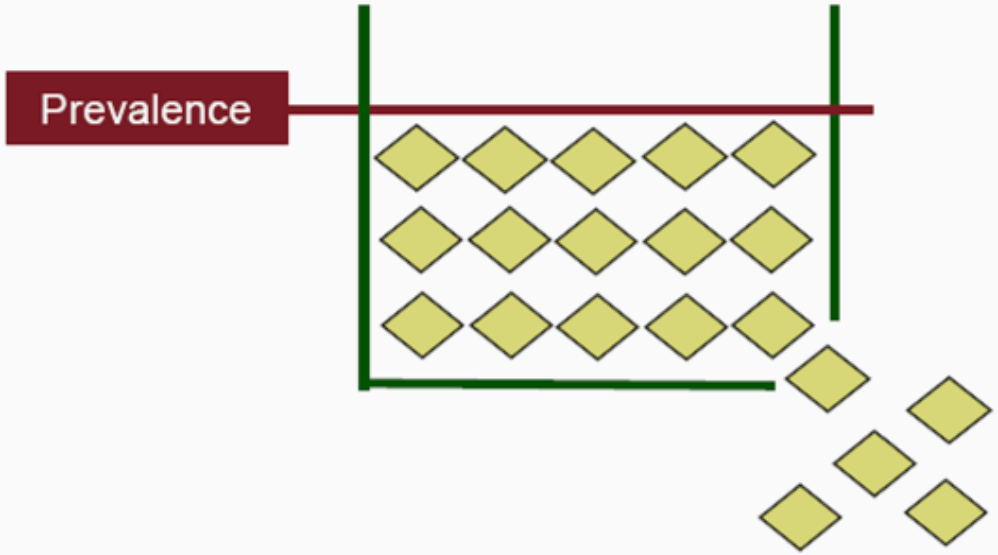


Prevalence increases as new incidences are added to the population

Relation between incidence and prevalence



Prevalence decreases as incidences are subtracted from the population by death or cure

Relation between incidence and prevalence

- **Prevalence ~ incidence x duration of disease**
  - Higher incidence results in higher prevalence
  - Longer duration results in higher prevalence

Several factors may affect prevalence rate

- Incidence
- Duration of disease
- Selective Migration
- Disease treatments & outcome

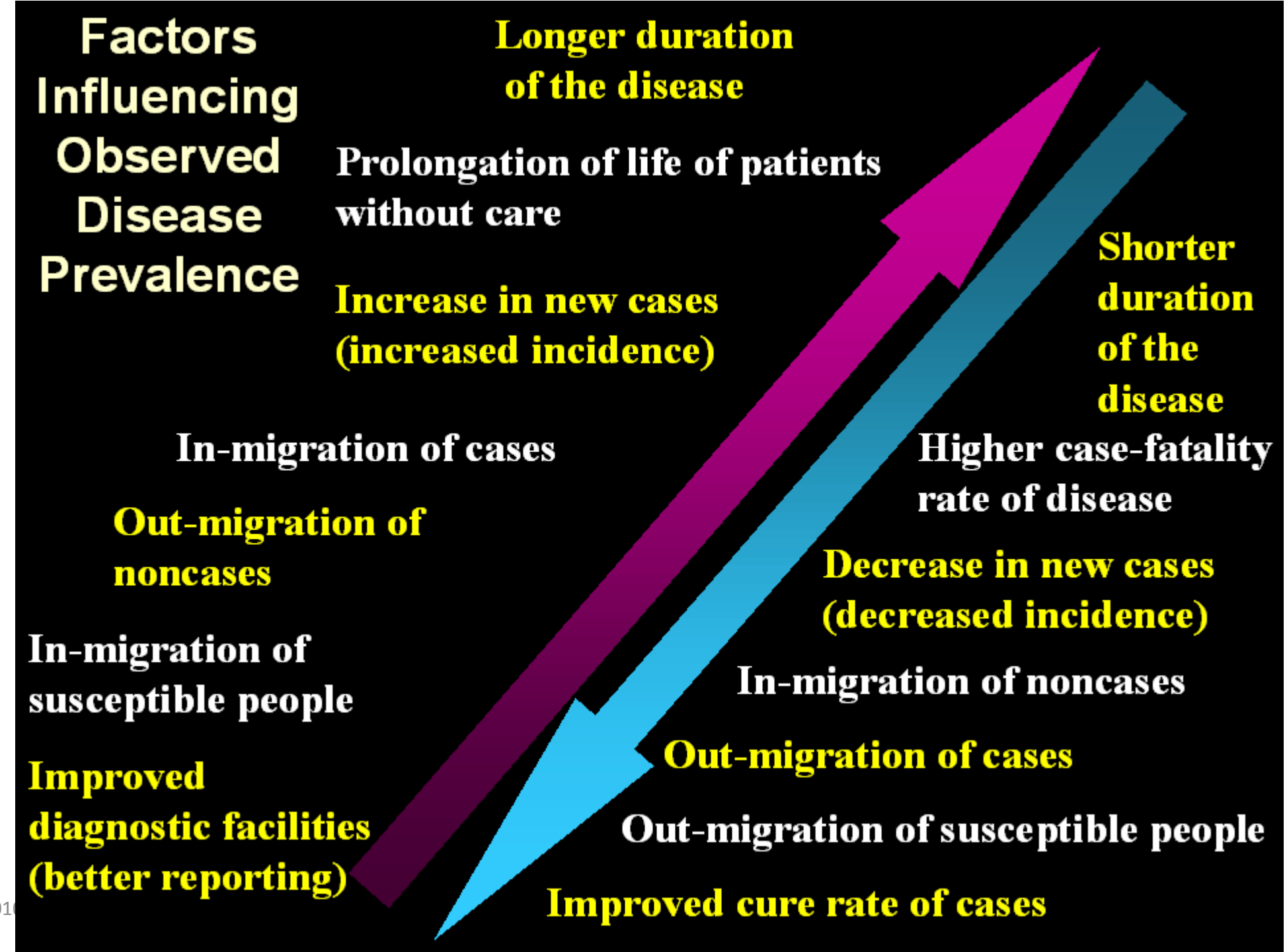
Factors affecting Prevalence:

- **Changes in incidence**

Prevalence rate= Incidence rate x average duration of disease.

High incidence produces high prevalence

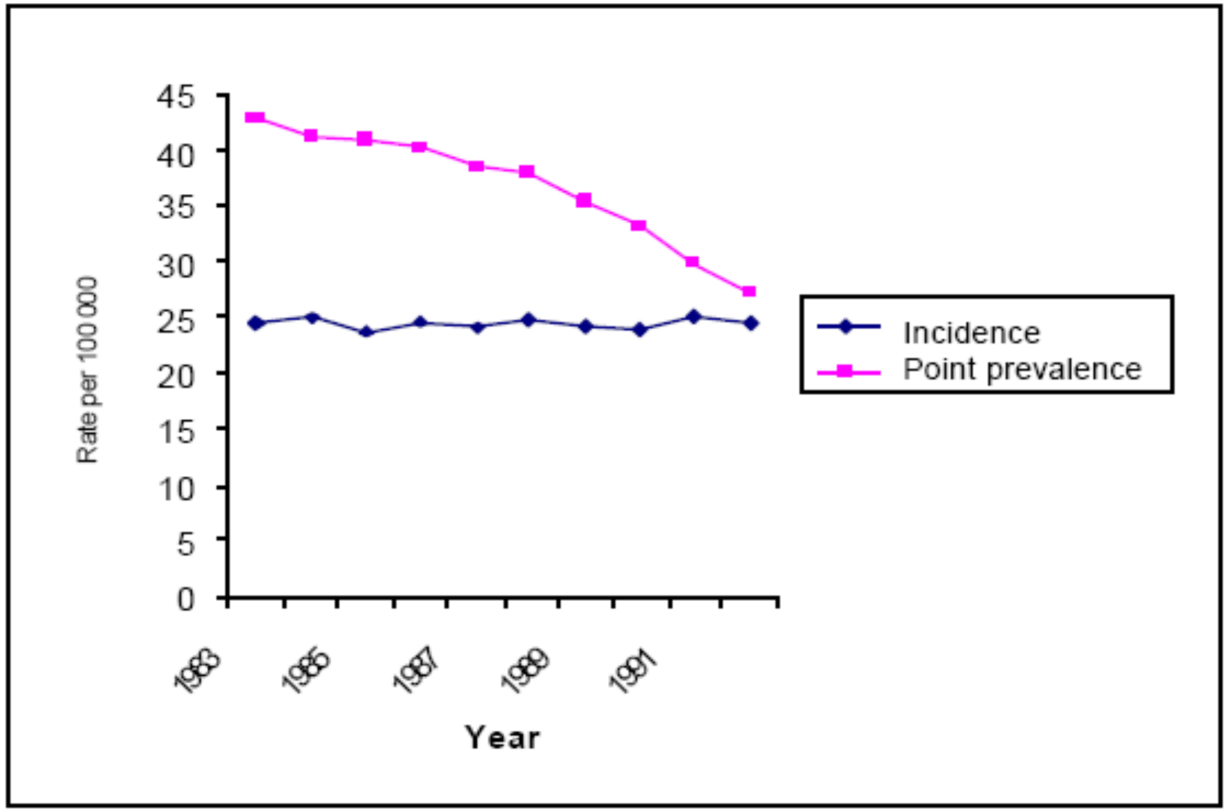
- **Changes in disease duration and chronicity**
  - **Longer duration of disease, higher prevalence**
  - **Chronic diseases are accumulating so increase the prevalence**
  - **Acute diseases of a high recovery rate or high case fatality rate decrease prevalence**


Factors Influencing Observed Disease Prevalence
Longer duration of the disease
Prolongation of life of patients without care
Increase in new cases (increased incidence)
Shorter duration of the disease
In-migration of cases
Higher case-fatality rate of disease
Out-migration of noncases
Decrease in new cases (decreased incidence)
In-migration of susceptible people
In-migration of noncases
Out-migration of cases
Improved diagnostic facilities (better reporting)
Out-migration of susceptible people
Improved cure rate of cases

Divergence between incidence and prevalence

Disease in which *incidence* is stable

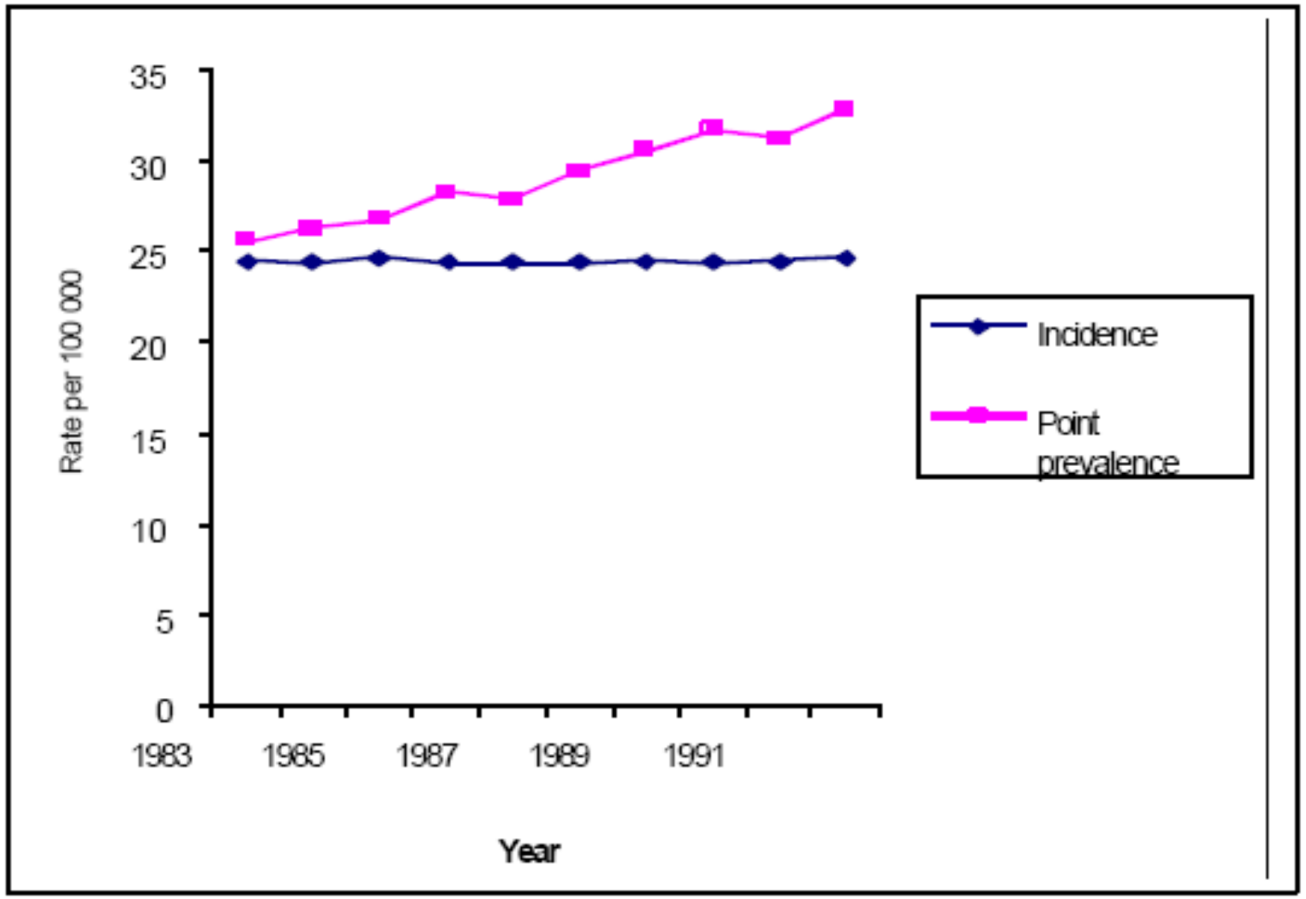
and prevalence is decreasing



Interpretation

1. Rapid recovery from disease for example,
   - a new drug has been discovered.
2. The disease is becoming more fatal for example,
   - an increase in disease virulence,
   - increasing failure of treatment, or
   - decreasing application of effective treatment.
3. Selective out migration of cases (perhaps seeking treatment elsewhere).

Disease in which incidence is stable
And *prevalence* is increasing



Example

- A chronic, incurable disease, such as diabetes, can have a low incidence but high prevalence, because the disease is not very fatal—but it cannot be completely cured
- Its prevalence is the sum of new and existing cases from past years

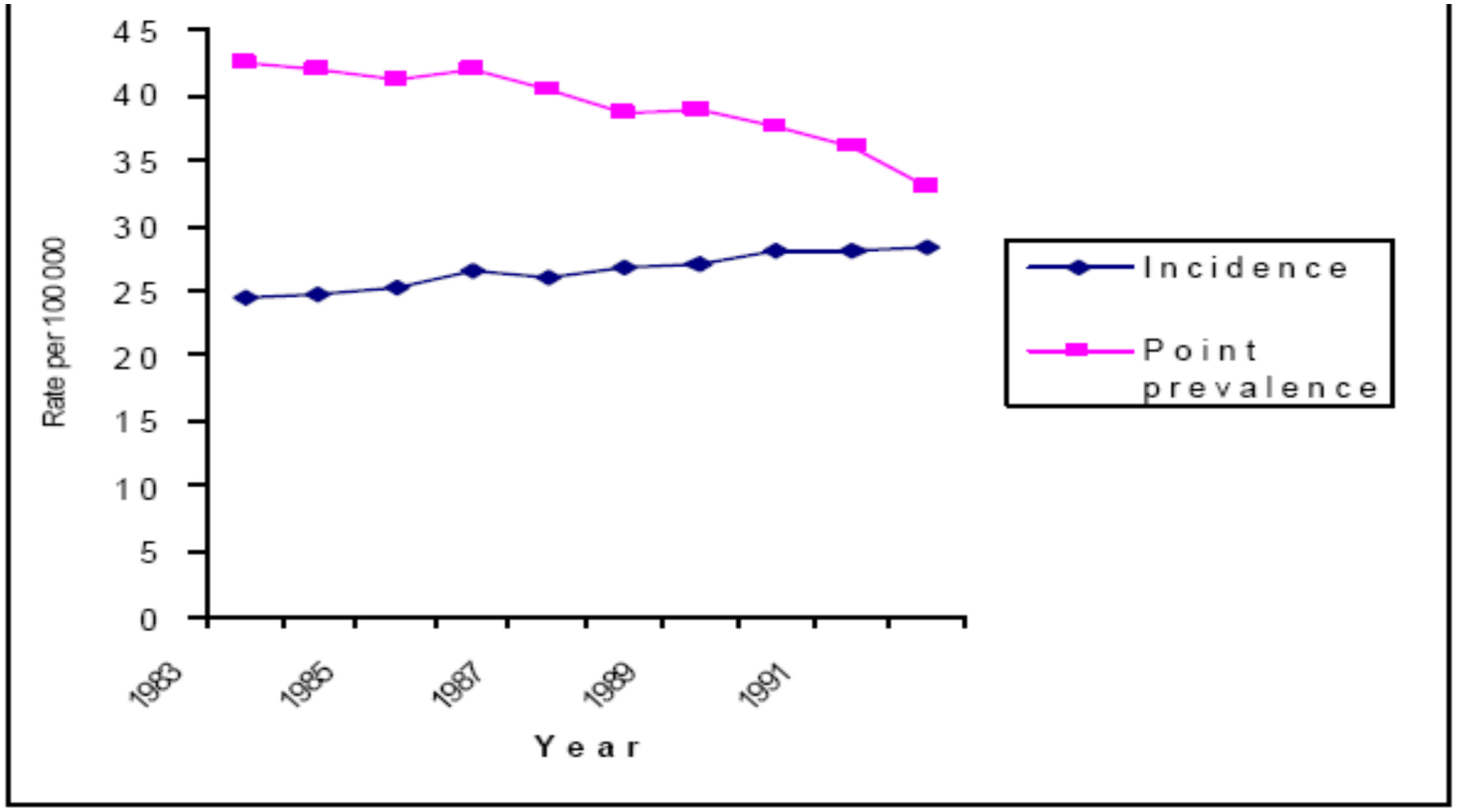
Interpretation

1. **Slow Recovery**
   (the disease is becoming more chronic) due to
   - **less effective drugs or**
   - **Poor compliance (drugs are less frequently used), or**
   - **resistance to the drugs is increasing.**

2. **The disease is becoming less fatal due to,**
   - **Use of a newly discovered, potent drug or**
   - **the organism is becoming less virulent.**
   - **Early detection of diseases**

3. **There is selective immigration of cases to the area.**

Incidence is increasing over time, but the *prevalence* is decreasing



Example

A short-duration, curable disease, such as the common cold, can have a high incidence but low prevalence, because many people get a cold or influenza each year—but it lasts for a short time

Interpretation

1. **The disease is becoming significantly shorter in duration**
2. **Better treatment with high cure rate**
3. **New agent more frequently, more acute.**
4. **The disease is becoming more fatal.**

Thank You