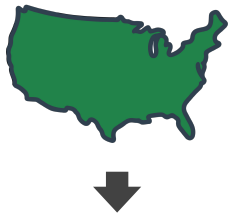
TOPIC: INTRODUCTION TO EPIDEMIOLOGY

- **Public Health**: the practice of *protecting* & *improving* the health of the _____ human population.
  - **Epidemiology:** study of the distribution, patterns, & determinants of health & _____ in human populations.
    - **Etiology**: the study of the _____ or *origin* of a disease.
- In the USA, the *national* agency for disease prevention is the **C**enters for **D**isease **C**ontrol & Prevention **(**_____**)**.
  - The *international* agency for disease prevention is the **W**orld **H**ealth **O**rganization **(**_____**).**



CDC
U.S. CENTERS FOR DISEASE CONTROL AND PREVENTION

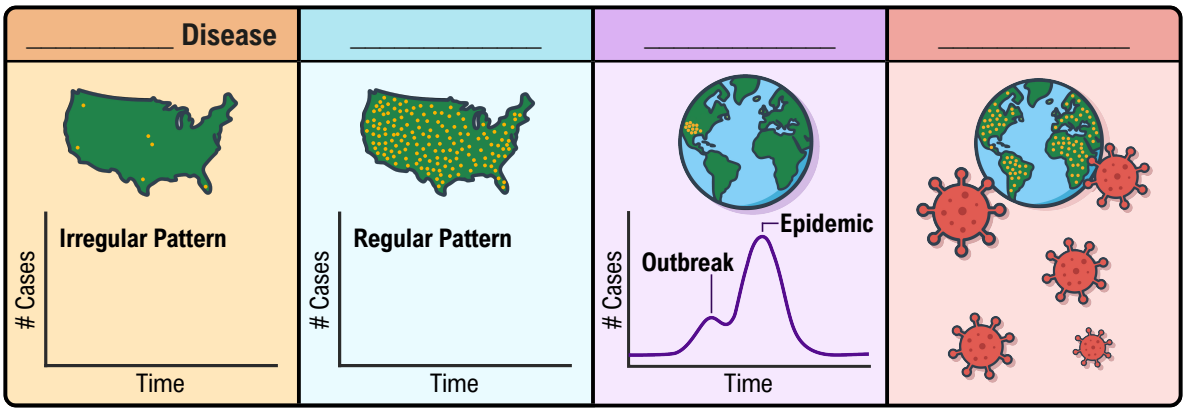
WHO
World Health Organization

TOPIC: INTRODUCTION TO EPIDEMIOLOGY

Scope of Diseases

◆ The scale & geographic spread of a disease are critical:

- **Sporadic Disease:** *occasionally* present in *isolated* groups with an _____ pattern (e.g *rabies*).
- **Endemic:** _____ present in a population with a *regular* pattern (e.g. *common cold*).
- **Epidemic:** *unusually* _____ number of disease cases in a population (e.g. *measles*).
  - Often preceded by an **outbreak** (brief, localized, small-scale increase in disease cases).
- **Pandemic:** epidemic that spreads around the entire _____ (e.g. *COVID-19*).



EXAMPLE

Match the terms on the left with their correct definitions.

Endemic	
Epidemic	
Outbreak	
Pandemic	

1) An epidemic that spreads worldwide.
2) Unusual/dramatic increase in # of cases in a large population.
3) Disease that is consistently present within a population.
4) Localized, rapid increase in # of cases.

TOPIC: INTRODUCTION TO EPIDEMIOLOGY

Morbidity: Incidence vs. Prevalence

- **Morbidity:** the state of having an _____. Often expressed as *incidence* or *prevalence*.
  - **1) Incidence:** *only* the # of _____ disease cases in the population during a specific time period.
  - **2) Prevalence:** total # of **ALL** the disease cases (***new*** & _____*-existing*) in the population at a specific time.
- These are raw counts, but epidemiologists are more concerned with *standardized measures* (e.g. proportions):

$\text{Incidence Proportion} = \frac{\#\ of\ \textbf{NEW}\ cases\ during\ a\ time\ period}{Initial\ population\ size\ \textbf{at risk}} \times 100\%$	*"***At risk**" means to exclude anyone who already has the disease or is not susceptible.
Indicates fraction of healthy/susceptible people that got the disease by the end.	

$\text{Prevalence Proportion} = \frac{\#\ of\ \textbf{NEW} + \textbf{PRE} - \textbf{EXISTING}\ cases\ at\ a\ specific\ time}{Total\ population\ size\ at\ that\ time} \times 100\%$
Provides a "snapshot" of everyone who has the disease at a given time.

EXAMPLE

A college dorm houses 200 students, 8 of whom are already sick with influenza at the beginning of the month. During the first week, 60 students attended a crowded dorm party, including 3 who were already sick. Within a few days, 24 attendees who had previously been healthy developed influenza symptoms. Throughout the entire month, the dorm records a total of 42 new influenza cases (including the 24 linked to the party). By the end of the month, 18 students in the dorm are still actively sick with influenza, 5 of which were new cases reported on the last day of the month. Calculate the:

1	**Incidence proportion** of influenza in the dorm during the entire month. _____
2	**Prevalence proportion** of influenza in the dorm at the end of the month. _____

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PRACTICE

A nursing home houses 120 residents. At the beginning of the month of April, 10 residents already have salmonellosis, a gastrointestinal illness caused by the bacterium *Salmonella*, which typically spreads through contaminated food or water and causes diarrhea, fever, and abdominal cramps. During the entire month of April, 18 new cases of salmonellosis are confirmed among residents who were not already sick at the start of the month.
By the last day of April, 12 residents in total are still actively sick with salmonellosis (this includes 2 carried over from the original 10 cases at the start of the month, and 10 from the 18 new cases identified during April).

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1. What was the *incidence proportion* of salmonellosis in the nursing home during the entire month of April?
   a) 10.0%
   b) 15.0%
   c) 16.4%
   d) 20.0%

2. Also, what was the *prevalence proportion* of salmonellosis in the nursing home at the end of April?
   a) 6.0%
   b) 8.3%
   c) 10.0%
   d) 12.5%

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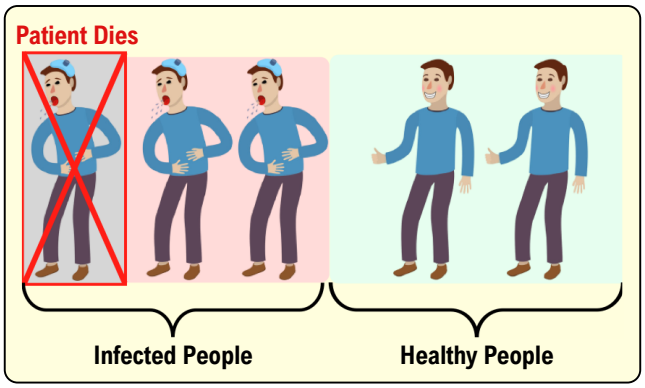
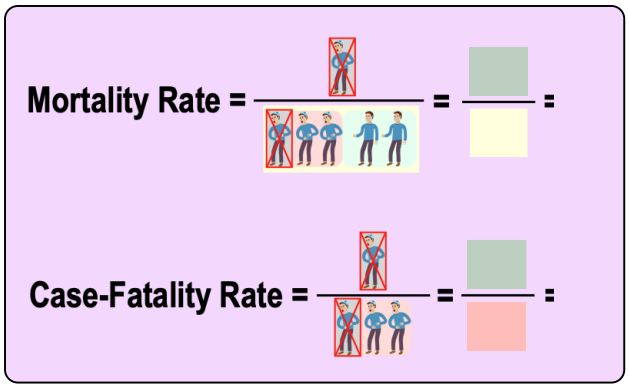
Mortality & Case-Fatality Rates

- **Mortality:** general term that refers to _____.
  - **Mortality Rate:** proportion of deaths amongst _____ individuals in the *initial* population over time.
    - The chance a _____ person from the entire population will *die* from the disease.
  - **Case-Fatality Rate (CFR):** proportion of deaths amongst *only* the _____ individuals over time.
    - The chance an *already diagnosed* person will die.





EXAMPLE

The city of Pearsonville has a population of 340,000. During an outbreak in the winter of 2024-2025, 35,000 residents are diagnosed with the influenza virus. Of those infected, 107 patients die from the disease. Calculate the mortality rate and the case fatality rate of influenza in the city of Pearsonville.

Mortality rate = _____% Case fatality rate = _____%

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PRACTICE

Disease A has a high case fatality rate but a relatively low prevalence. Disease B has a very low case fatality rate but a relatively high prevalence. Which of the following statements is true?

a) Disease A will infect more people than disease B because it has a higher mortality rate.
b) Compared to disease B, disease A has a higher % of deaths among those diagnosed.
c) If both diseases are present in the same population, they will likely both infect the same number of people.
d) Disease A spreads more easily than disease B.

PRACTICE

Which of the following statements about mortality rates & case fatality rates is true?

a) For any given disease, CFR is always higher than or equal to mortality rate (if both are expressed as a percentage).
b) Mortality rate is often expressed as deaths per unit of population (e.g. per 100,000 people), while CFR is usually expressed as a percentage.
c) “Mortality” refers to death, while “morbidity” refers to illness/disease.
d) All of the above are true.

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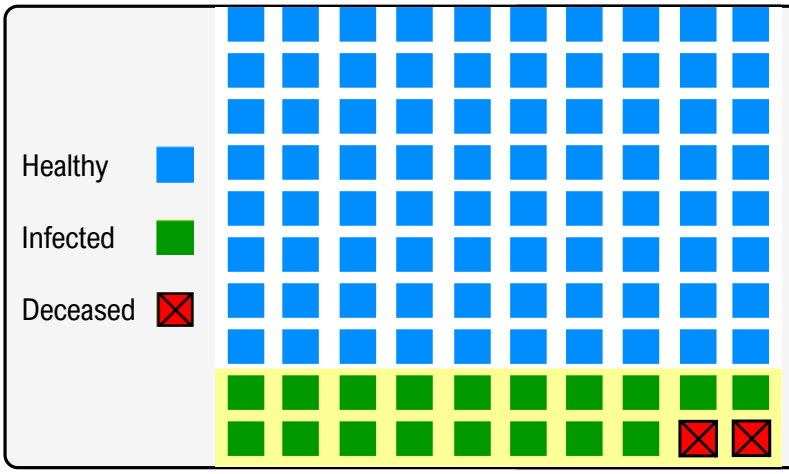

The image represents a population of people and a disease infecting that population. Each colored square represents an individual person in the population. Blue squares are uninfected, healthy individuals. Green squares are individuals infected with the disease. Red squares with an "X" in the center are individuals who have died from the disease.

PRACTICE

When calculating the case fatality rate (CFR) for this disease, you will have to divide the total number of fatalities by a value represented by which of the following in the square above?

a) All the blue squares.
b) All the green squares.
c) The yellow highlighted area.
d) All except the 2 red squares.

PRACTICE

The mortality rate of this population is:

a) 1%.
b) 10%.
c) 2%.
d) 20%.

PRACTICE

The case fatality rate for this disease is:

a) 2%.
b) 20%.
c) 10%.
d) 15%.