Health indicators

- **Objectives :**

1-Explain the need to use “indicators” to measure “health” status
2. State the characteristics of health indicators
3. List the uses of health indicators
4. State with examples the types of health indicators

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- **Resources :**
  Slides.
  Doctor’s notes.

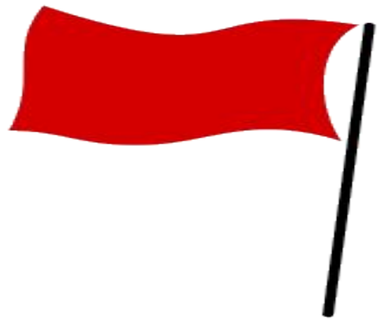
[Colors index : Important | Golden notes | Note | Slides | Extra] [Editing file | Share note]

“Health Indicators”

What is an indicator?

★ An indicator acts like a red flag that draws your attention to something that is going on and makes you ask questions such as:
- What does this number mean?
- Why did we get this result?
- Are we getting better or worse over time?
- Are we providing the right care?
- How are we doing in comparison to other countries, institutions, groups, etc?

★ An indicator is an indication of a given situation and a measurable variable



Definitions:

★ Variables that measure indirectly a health status which can not be measured directly
★ They are an indication of a given situation;
★ They are used to compare between areas or population group at a certain time .
★ They are used to measure changes over a period of time.

- Health status is measured indirectly as it is multidimensional and dynamic
- Indicators without time are pointless. They are used to **quantify population**

HEALTH INDICATORS QUANTIFY THE HEALTH OF THE POPULATION

Characteristics of an ideal indicator :

Valid

Measures what it is supposed to measure.

Relaiable

Provides same information under different observations & conditions.

Sensitive

Sensitive to changes in the situation.

Specific

Reflects changes only in that situation.

Relevant

Relevant to the community needs & problems.

Feasible

The ability to obtain data when needed

An example in our community we are more concerned with road traffic injuries than bacon poisoning .[a]

Feasible data is the data easily obtained from surveillance devices .

Ideal indicators are RARE cause health is Multidimensional

Uses: (why we need indicators?)

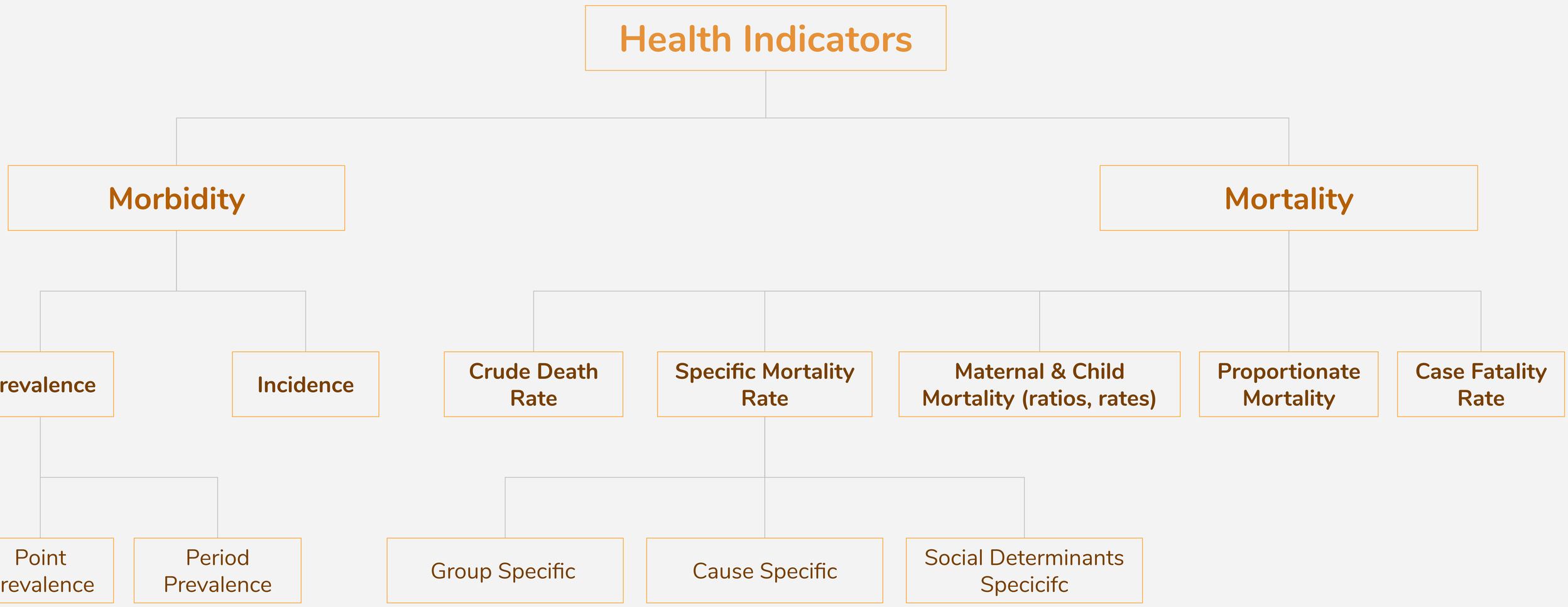
★ health status in a community.Measure
★ Compare health status between countries or over time.
★ Assessment of health care needs.
★ Allocation of resources according to needs.
★ Monitoring and evaluation of health services.

Indicators help in deciding how distribute health budget between different cities .

“Health Indicators”

Types:

- ★ **Mortality indicators** (crude mortality rate, specific mortality rate, proportionate mortality , case fatality rate, maternal & child mortality)
- ★ **Morbidity indicators** (incidence, prevalence)
- ★ **Disability indicators** (DALY,QALY,....)
- ★ **Nutritional status indicators** (anthropometric measurements,...)
- ★ **Health care delivery indicators** (doctor-population ratio, population-bed ratio,.....)
- ★ **Utilization rates**(bed turnover ratio, vaccine coverage ratio,...)
- ★ **Social & mental health indicators** (tobacco use, substance abuse, responsible sexual behavior, mental health)
- ★ **Environmental indicators** (Environmental Quality)
- ★ **Socioeconomic indicators** (rate of population increase, dependency ratio, literacy rate,....)
- ★ **Health policy indicators** (GNP spent on healthcare,...)
- ★ **Indicators of quality of life**
- ★ **Other indicators** (health for all, MDG, SDG,....)



“Health Indicator Concepts”

Indicators are measurments!

1. *Tools of Measurements;*

- ★ Indicators are measurements of disease magnitude.
- ★ Indicators are expressed in terms of:
  - **Ratio** تناسب
  - **Proportion** نسبة
  - **Rate** معدل
- ★ Clear understanding of the above terms is a **MUST** for **interpretation of indicators.**

“We had 400 deaths from Road Traffic Injuries in Riyadh in 2010” **So What?!**

Tool of Measurement	Ratio (simple ratio) البسط ليس جزء من المقام	Proportion البسط جزء من المقام	Rate Proportion+ time+ multiplier
Definition	The relationship in size of **one measure/variable to another**	**A specific type of ratio!** that relates a part to a whole	**A special type of proportion!** that measures the occurrence of an event in a population during a given time.
Use	Size of two different variables or quantities	Magnitude of the part of a whole	To allow comparisons
Differentiating Element	The numerator is **NOT** a component of the denominator.	The numerator is **ALWAYS** a component of / included in the denominator.	There must be a **time dimension** and a **multiplier** (per 1000, per 100,000)
Example	Out of the 400 death, 300 were males and 100 were female. The male to female ratio is 300/100 or 300:100 or 3:1 i.e. there are 3 male deaths for every female death	Out of the 400 deaths, 300 were males. i.e the proportion of males who died from RTI is (300/400 X 100) = 75%.	In 2010 population of Riyadh 1,000,000. The mortality rate from RTI in 2010 is (400/1,000,000 X 100,000)= 40 deaths per 100,000 population in 2010.

2. *Numerator & Denominator:*

Numerator — Measure of an event

- ➔ Number of times an event (e.g. death, sickness, births, etc) has occurred in a population during a specified time period.
- ➔ The numerator is **always** components of (included in) the denominator of **proportions and rates**
- ➔ The numerator is **not** a component of (included in the denominator of **ratio**

Denominator — The group you are interested in studying an event about

- ➔ Denominators are especially important for rates.
- ➔ It might be related to:
  - ◆ **The population** such as mid-year population in a given year
  - ◆ **Total events** where it’s more relevant than than total population. For example, case fatality rate from car injuries, it’s more meaningful to have the denominator of ‘number of vehicles’.
  - ◆ Why? As not the whole population drives cars, some use other means of transportation. So its less accurate to include them

3. *Multipliers (10n / per 100, 1000, 100,000)*

- ★ Majority of formulae include a multiplier of 100 and most often a multiplier of 1000, 10,000 or even 100,000.
- ★ A multiplier is used to:
  - Indicate how often something occurred per 1000 population or per 100,000 population
  - Decrease the use of minute decimal fractions.e.ga mortality rate of 0.000071, huh? This is necessary for common people to understand
  - Increase data comprehension (how well we understand the presented data)
- ★ In certain rates, rather than specifying a multiplier such as 1000 or 100,000, you can use 10n so the most appropriate multiplier can be selected to facilitate the data interpretation. In practice its used if you are not sure what is the multiplier used by your fellow statician
- ★ **Example:** A rate with a numerator of 190,000 and a denominator of 23,000,000 results in a value of 0.00826
  - Using a multiplier of 1000: 8.3 per 1000 population
  - Using a multiplier of 10,000: 82.6 per 10,000 population

Standarization of population by using Multipliers. is to help in comparisons in rates and to make comprehension of data easier

“Morbidity Indicators” (Incidence)

Definition	Number of **new** cases occurring in a **defined population** during a **specified period of time.**
Tool of Measurement	Rate
Numerator	Number of **new** cases of specific disease during a given time period
Denominator	**Population at risk*** during that given time period *does not include population that is already infected with the disease
10n	per 1000
Time frame	per **year** (usually a year unless otherwise specified)
Uses	1. Taking action (outbreak), 2. Control disease (outbreak) 3. Research for etiology and pathogenesis 4. Efficacy of therapeutic and preventive measures "When we take measures and we want to see how effective it is we use incidence"
Formula	$\text{Incidence} = \frac{\text{Number of new cases of specific disease during a given time period}}{\text{Population at-risk during that period}} \times 1000$

★ There are special types of incidence rates such as attack rates (limited time less than year during outbreaks), secondary attack rates, hospital admission rates.

★ **Example:** In 2010, the number of new cases of influenza in Riyadh region was 5000. The midyear population of Riyadh region during the same year was 3 million.

- **Calculate:**
  - 5000 / 3000000 x 1000 = 1.67per 1000 per year

Doctor mentioned it should be written as 1.67 new cases of influenza per 1000 population per year.

"It is very important to know how to interpret the results of an indicator/ to express it in the right way; you will be marked on those in OSCE and in MCQs you may have the same result but different interpretation; be careful!!

“Morbidity Indicators” (Prevalnce)

★ Disease prevalence refers to all cases **(new & old)** existing at a given **point** in time **or** over a **period** of time in a given **population.**

★ Prevalence is a snapshot of the population!

"Uses of each indicator are **important** "

Point prevalence is not useful in certain diseases such as seasonal flu, because you may do the survey in autumn while the flu cases are peak at spring so the prevalence does not really reflect the reality.

Point-Prevalence	
Definition	Number of all current cases **new & old** occurring in a defined population at **one point of time (a day, days, or few weeks)**
Tool of Measurement	Proportion (be careful! **it is a proportion** even when it is called rate)
Numerator	Number of all current cases **new & old** at a given **point** of **time** **Since its taken at one point in time**
Denominator	Estimated population at the same given **point** of **time**
10n	Per 100 (always expressed as percentage)
Time frame	Given point of time
Uses	1. Estimate the magnitude of health, disease and high risk populations, 2. Administrative and planning e.g. hospital beds
Formula	$= \frac{\text{Number of all current cases (old and new) of a specified disease existing at a given point in time}}{\text{Estimated population at the same point in time}} \times 100$

Period-Prevalence (less common than point-prevalence)	
Definition	Number of all current cases **new & old** occurring in a defined population at **a defined period of time (over months or annual)**
Tool of Measurement	Proportion (be careful! it is a proportion even when it is called rate)
Numerator	Number of all current cases **new & old** at a **a defined period of time**
Denominator	Estimated population at the same **a defined period of time**
10n	Per 100 (always expressed as percentage)
Time frame	Given point of time
Uses	Estimate the magnitude of health, disease and high risk populations
Formula	$= \frac{\text{Number of existing cases (old and new) of a specified disease during a given period of time interval}}{\text{Estimated mid-interval population at-risk}} \times 100$

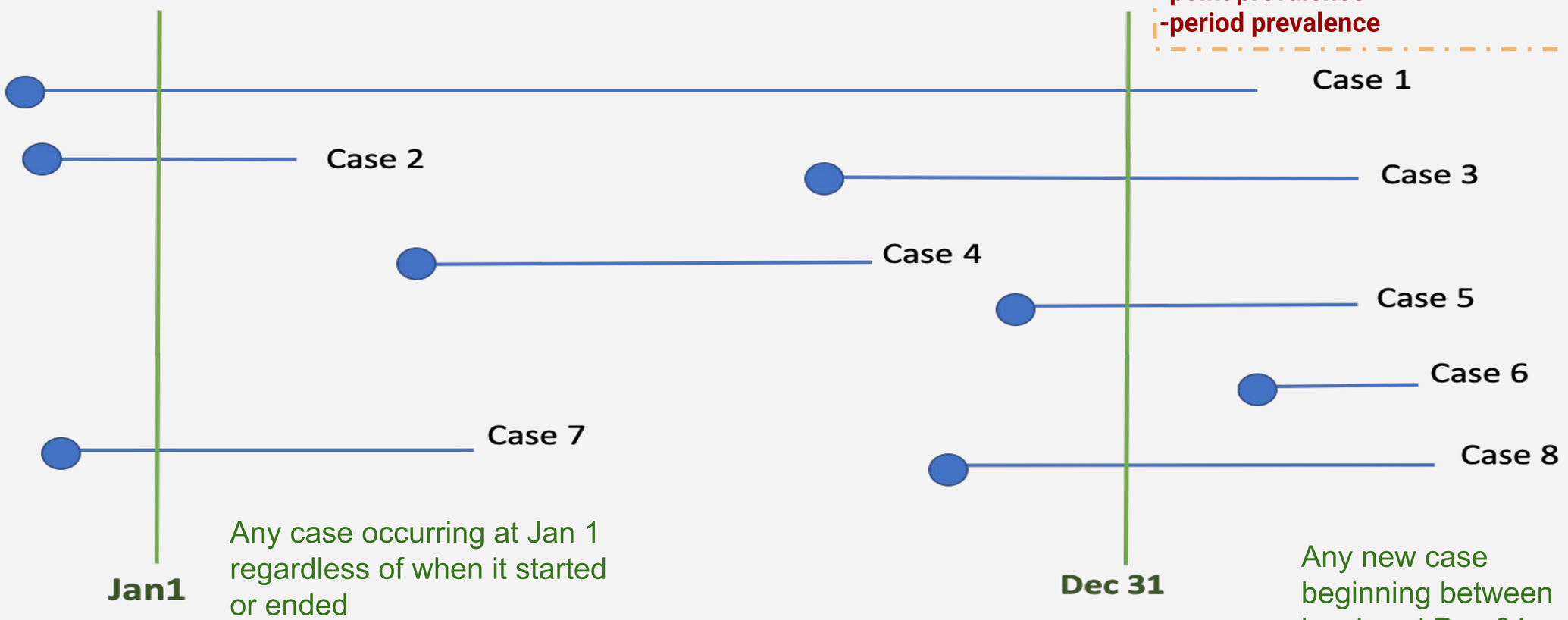
★ **Example:** In a survey of 1,150 medical students in Riyadh in 2018, a total of 468 reported symptoms of seasonal allergies during the the first week of September. Calculate the prevalence of seasonal allergies in this group.

- **Calculate:**
  - 468 / 1150 x 100 = 40.7%

“Morbidity Indicators”

What cases will be included in the Incidence, Point Prevalence and Period Prevalence during the below period of time?

Important to understand this example because it summarizes differences between:
-incidence
-point prevalence
-period prevalence



Any case occurring at Jan 1 regardless of when it started or ended

Point prevalence Jan1: 1, 2, 7

Period prevalence: 1, 2, 3, 4, 5, 7, 8

Any case occurring between Jan 1 and Dec 31

Any new case beginning between jan 1 and Dec 31

Incidence: 3, 4, 5, 8

Point prevalence Dec 31: 1, 3, 5, 8

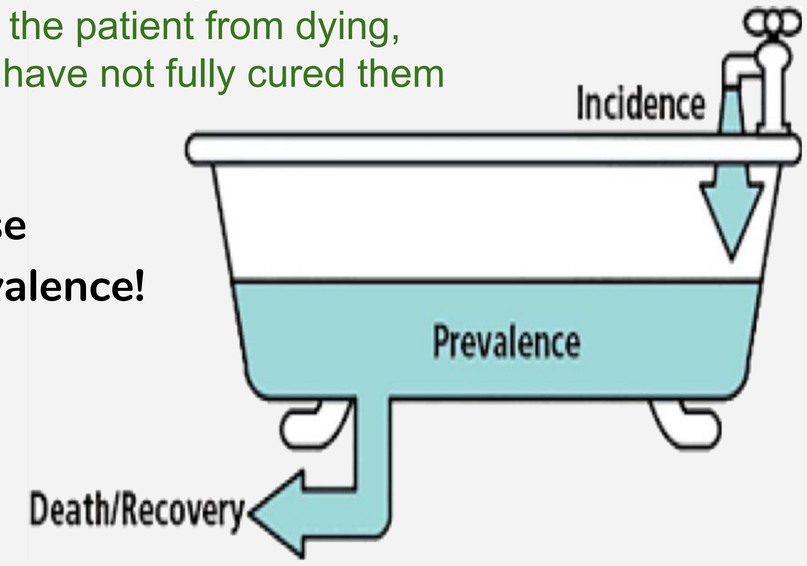
Any case occurring at Dec 31 regardless of when it started or ended

"This model represents the relationship between incidence and prevalence"

“The Epidemiologist Bathtub”

- ★ The **bathtub** represents **community.**
- ★ **Water in the tub** represents **prevalence of disease** so:
  - The more water that is in the tub the more disease prevalence is there.
  - The less water that is in the tub the less disease prevalence there.
- ★ The **prevalence represents burden of disease = how many people have the disease**
- ★ So we can get rid of the water from the tub by **draining it** so we can **lower the prevalence!**
- ★ How can we drain the tub? **TWO WAYS to** get rid of people who have the disease:
  - They can be **CURED**
  - They can **DIE**
- ★ How can we get water in the tub? Obviously through the faucet!
  - Open the faucet all the way **(fast running water): HIGH INCIDENCE**
  - Almost **closed (low running water): LOW INCIDENCE**

Sometimes its good to have high prevalence if it means you are maintaining the patient from dying, though you have not fully cured them



Lots of cases and long duration of cases

Few cases and short duration of cases

Prevalence = Incidence X Duration of Disease

“Mortality Indicators” (Crude Death Rate)

Definition	Number of **deaths** from **all causes** occurring in estimated **mid-year population** during one year in a given place.
Tool of Measurement	Rate
Numerator	Number of deaths from all causes during the year
Denominator	Mid-year population — As the population varies through the year
10n	Per 1000
Time frame	**One year**
Uses	Gives an impression of mortality in a **single figure**!
Formula	$\frac{\text{Number of deaths during the year}}{\text{Mid-year population}} \times 1000$

★ **Example:** In Saudi Arabia in 2017, a total of 119,157 deaths occurred. The estimated population was 33,099,147.

- **Calculate CRD for Saudi Arabia in 2017:**
  - = 119,157 / 33,099,147 x 1000 = 3.6 per 1000 people

The multiplier can be 10000 or 100000

The doctor mentioned that it should be 3.6 deaths per 1000 population per year

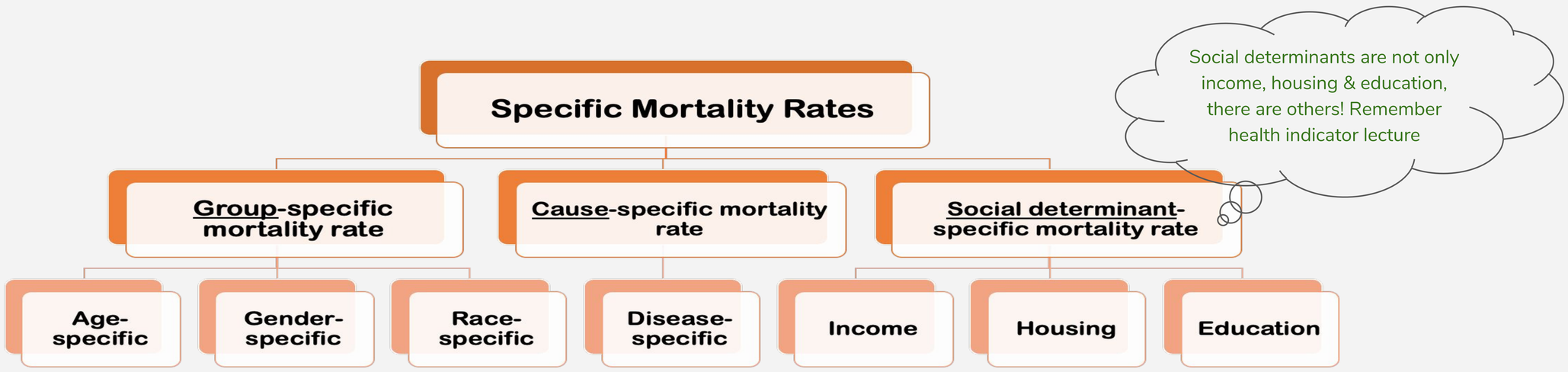
Major Disadvantage of CDR!

Popula—tion	Crude death rate	Age-specific death rates per 1000 population					
		0–1	1–4	5–7	8–44	45–64	65+
A	15.2	13.5	0.6	0.4	1.5	10.7	59.7
B	9.9	22.6	1.0	0.5	3.6	18.8	61.1

★ At first, population B appears to be healthier than A
★ When we check the composition by age (age specific mortality rates) → has higher mortality rates in all age groups! Huh?!
★ Why? cause the higher crude death rate in population A is due to more older population in comparison to B with relatively younger population.

Lack of comparability for communities with populations that differ by age, gender, race, etc

“Mortality Indicators” (Specific Mortality Rate)



Definition	Number of deaths from/in **specific** (cause, group, social determinant) occurring in **estimated mid-year population** during a **one year in a given place.**
Tool of Measurement	Rate
Numerator	Number of deaths from **specific (cause, group, social determinant)_** during the year
Denominator	**Cause-specific: mid-year population / group, social determinant: mid-year population of specific group, social determinant**
10n	Per 1000 or per 100,000
Time frame	One year
Uses	1. Identify at risk groups for preventive action 2. They allow comparison between different causes within the same population
Formula If you are taking the mortality rate of specific group then the **denominator should be the population of that group**	1. Specific death rate due to tuberculosis = (Number of deaths from tuberculosis during a calendar year / Mid-year population) × 1,000 2. Specific death rate for males = (Number of deaths among males during a calendar year / Mid-year population of males) × 1,000 3. Specific death rate in age group 15-20 years = (Number of deaths of persons aged 15–20 during a calendar year / Mid-year population of persons aged 15–20) × 1,000

★ **Example**: In 2001, a total of 15,555 deaths from Road Traffic Injuries occurred among males and 4,753 deaths occurred among females. The estimated 2001 midyear populations for males and females were 139,813,000 and 144,984,000, respectively.

- **Calculate Gender Specific Mortality Rates:**
  - RTI mortality rate (males)
    - = (# RTI deaths among males / male population) × 100,000
    - = 15,555 / 139,813,000 × 100,000
    - = 11.1 RTI deaths per 100,000 population among males
  - RTI mortality rate (females)
    - = (# RTI deaths among females / female population) × 100,000
    - = 4,753 / 144,984,000 × 100,000
    - = 3.3 RTI deaths per 100,000population among females

“Mortality Indicators” (Proportionate Mortality)

Definition	Number of deaths due to a **particular cause** (or in a specific age group) **per 100 total deaths**
Tool of Measurement	Proportion
Numerator	Number of deaths from **specific cause or age group** during the year
Denominator	Total deaths from all causes (**not the population in which the deaths occurred)**
10n	Per 100 (percentage %)
Time frame	One year
Uses	1. Used in broad disease groups (e.g. communicable, non-communicable, injuries) 2. Specific diseases of public health importance (e.g cancer)
Formula	$= \frac{\text{Number of deaths from the specific disease in a year}}{\text{Total deaths from all causes in that year}} \times 100$ "This indicator is usually used by organizations such as WHO or health ministry to have a general idea about most common causes of mortality in the population"

★ **Example**: In 2003, a total of 128,294 deaths occurred among 24-44 years old. 16,283 deaths were due to heart disease and 7,367 were due to cancer.

- **Calculate Proportionate Mortality for heart disease and cancer among 25–44 years:**
  - Proportionate mortality for heart disease, 25–44 years
    - = (# deaths from heart disease/# deaths from all causes) × 100 = 16,283/128,294 × 100 = 12.6%
  - Proportionate mortality for cancer, 25–44 years
    - = (# deaths from cancer/# deaths from all causes) × 100 = 7,367/128,924 × 100 = 5.7%

“Mortality Indicators” (Case Fatality Rate)

Definition	Number of deaths due to a **particular cause** (disease) per 100 **total cases**
Tool of Measurement	Proportion **(although it is called rate!, called also: deaths to cases ratio)**
Numerator	Number of deaths due to a particular cause (disease)
Denominator	Total number of number of cases (**not the population in which the cases occurred)**
10n	Per 100 (percentage %)
Time frame	Not specified
Uses	Reflects the killing power of a disease. used mainly in **acute infectious** diseases.
Formula	$= \frac{\text{Total number of deaths due to a particular disease}}{\text{Total number of cases due to the same disease}} \times 100$

★ **Example**: In an epidemic of hepatitis A traced to green onions from a restaurant, 555 cases were identified. Three of the cases died as a result of their infections.

- **Calculate the Case-Fatality Rate.**
  - Case fatality rate = (3/555) × 100 = 0.5%

In certain cases such as death from H1N1 the CFR maybe high which could be deceptive as not all H1N1 cases were diagnosed. CFR is especially helpful in cases of outbreaks or poisoning from a certain restaurant or in certain zoonotic diseases where only a limited population came to contact with the animal

Summary

1- Healthcare indicators are Variables that **measure indirectly** a health status which cannot be **measured directly** because, Ideal indicators are RARE cause health is **Multidimensional.**

2- The Characteristics of an ideal Indicator: **valid, reliable, relevant, sensitive, specific, feasible**

3-Uses of health indicators: **Measure health status, compare health status, assess health care needs.**

Morbidity Indictor	Incidence	Point prevalence	Period prevalence
Formula	$\text{Incidence} = \frac{\text{Number of new cases of specific disease during a given time period}}{\text{Population at-risk during that period}} \times 1000$	$= \frac{\text{Number of all current cases (old and new) of a specified disease existing at a given point in time}}{\text{Estimated population at the same point in time}} \times 100$	$= \frac{\text{Number of existing cases (old and new) of a specified disease during a given period of time interval}}{\text{Estimated mid-interval population at-risk}} \times 100$
Uses	1. Taking action (outbreak), 2. Control disease (outbreak) 3. Research for etiology and pathogenesis 4. Efficacy of therapeutic and preventive measures	1. Estimate the magnitude of health, disease and high risk populations, 2. Administrative and planning e.g. hospital beds.	Estimate the magnitude of health, disease and high risk populations
How Interpret It	E.g. 1.67per 1000 per year		

Mortality Indictor	Crude death rate	Specific mortality rate	Proportionate mortality rate	Case fatality rate
Formula	$\frac{\text{Number of deaths during the year}}{\text{Mid-year population}} \times 1000$	$\frac{\text{Number of deaths of person aged 15-20 during a calendar year}}{\text{Mid year population of person aged 15-20}} \times 1000$ $\frac{\text{Number of deaths among male during a calendar year}}{\text{Mid year population of male}} \times 1000$ $\frac{\text{Number of deaths from tuberculosis during a calendar year}}{\text{Mid year population}} \times 1000$	$= \frac{\text{Number of deaths from the specific disease in a year}}{\text{Total deaths from all causes in that year}} \times 100$	$= \frac{\text{Total number of deaths due to a particular disease}}{\text{Total number of cases due to the same disease}} \times 100$
Uses	Gives an impression of mortality in a **single figure**!	1. Identify at risk groups for preventive action 2. They allow comparison between different causes within the same population	1. Used in broad disease groups (e.g. communicable, non-communicable, injuries) 2. Specific diseases of public health importance (e.g cancer)	Reflects the killing power of a disease. used mainly in **acute infectious** diseases.
How Interpret It	E.g. 3.6 per 1000 people	E.g. 3.3 RTI deaths per 100,000 population among females		

- for All formulas that use rate to measure you need a multiplier to reach a true number
- for formulas that use proportion multiply by 100 (percentage).

Case fatality rate: proportion of deaths from a disease for example: number of deaths from aids ÷number of cases×100

MCQs

1-Which of the following is not a characteristic of an ideal indicator?

A- Reliable

B- Relative

C-Reasonable

D-Sensitive

2- ‘measures what it is supposed to measure’ is the definition of?

A-Validity

B-Feasibility

C-Relevancy

D-Specifically

3- There must be a time dimension and a multiplier for which of the following tools of measurement?

A-Ratio

B-Rate

C-Proportion

D-None of the above

4- which of the following tools of measurement don’t use proportion for calculation?

A-Case specific fatality rate

B-Proportionate mortality

C-Specific mortality rate

D-Point prevalence

5- which of the following Reflects THE KILLING POWER OF A DISEASE. Used mainly in ACUTE INFECTIOUS Diseases?

A-Specific mortality rate

B-Crude death rate

C-Case fatality rate

D-Proportionate mortality

6- what does this formula measure?

$$\frac{\text{Total number of deaths due to a particular disease}}{\text{Total number of cases due to the same disease}} \times 100$$

A-Crude death rate

B-Specific mortality rate

C-Proportionate mortality

D-Case fatality rate

7- what does this formula measure?

$$\frac{\text{Number of new cases of specific disease during a given time period}}{\text{Population at-risk during that period}} \times 1000$$

A-Period prevalence

B-Incidence

C-Point prevalence

D-Specific mortality rate

1-c 2-a 3-b 4-c 5-c 6-d 7-b