Community 432 Medicine

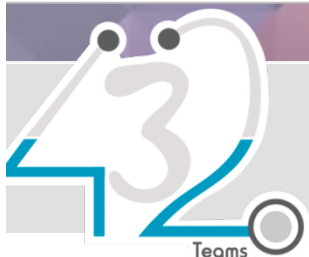| 23	DEMOGRAPHY: Population Dynamics

Objectives

1. Calculate rates measuring population growth
2. Determine population doubling time
3. Understand stages of demographic transition
4. List factors affecting Population Dynamics
5. Define and calculate fertility rates
6. Define and calculate mortality rates
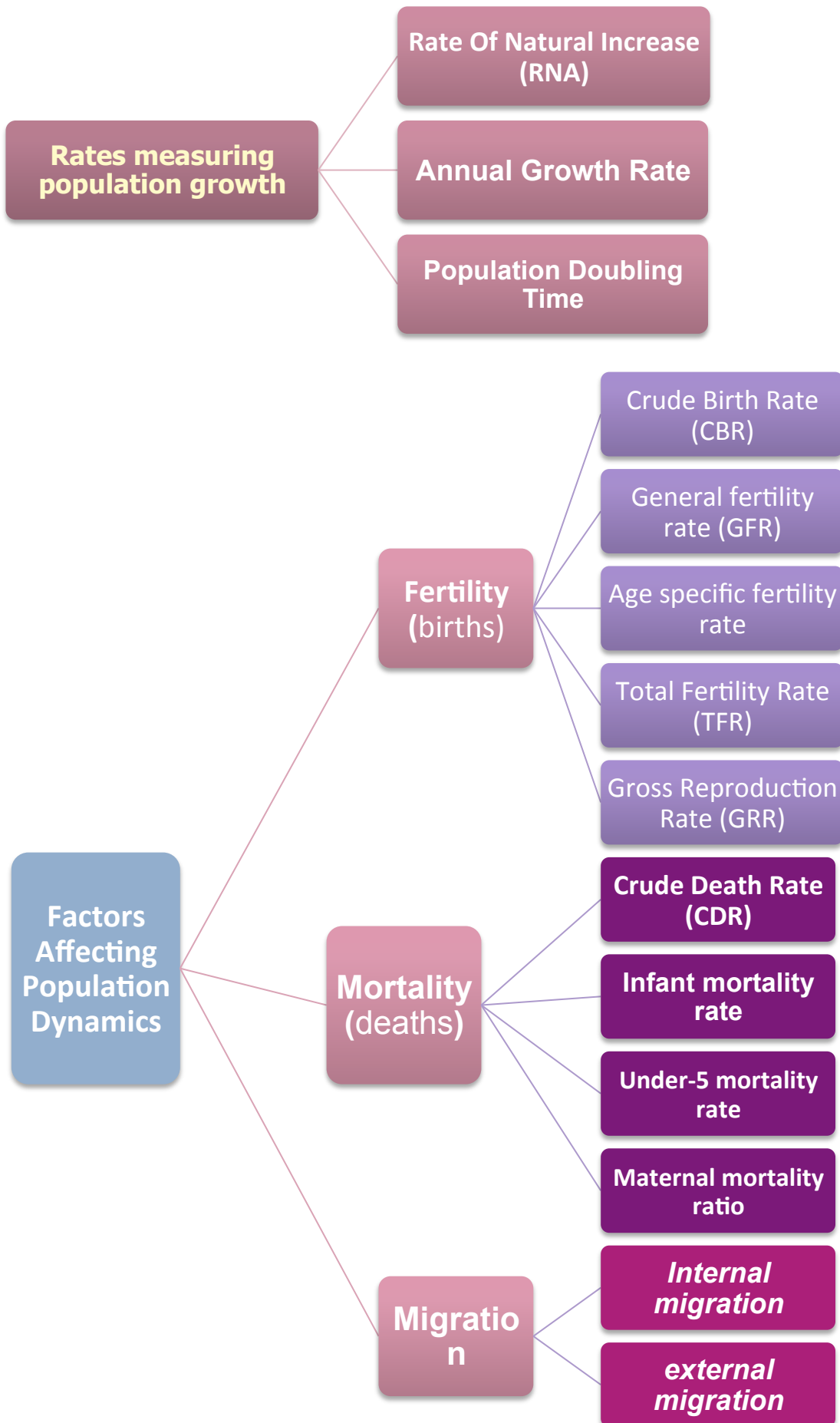7. Define and mention types of migration

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Mind Map

Rates measuring population growth
- Rate Of Natural Increase (RNA)
- Annual Growth Rate
- Population Doubling Time

Factors Affecting Population Dynamics

Fertility (births)
- Crude Birth Rate (CBR)
- General fertility rate (GFR)
- Age specific fertility rate
- Total Fertility Rate (TFR)
- Gross Reproduction Rate (GRR)

Mortality (deaths)
- Crude Death Rate (CDR)
- Infant mortality rate
- Under-5 mortality rate
- Maternal mortality ratio

Migration
- *Internal migration*
- *external migration*

❖Rates Measure Population Growth

1. Rate Of Natural Increase (RNI):

Natural increase in size of any population is the product of subtraction of deaths from births.

$$RNI = \frac{Crude\ birth\ rate - Crude\ death\ rate}{10}$$

E.g.: In Saudi Arabia (2012)
Crude Birth rate: 22.5 births/1,000 population
Crude Death rate: 3.8 deaths/1,000 population
Calculate RNI? = 22.5 – 3.8= 18.7/10 = 1.87%

2. Annual Growth Rate:

Growth rate takes into consideration not only births and deaths but also migration.

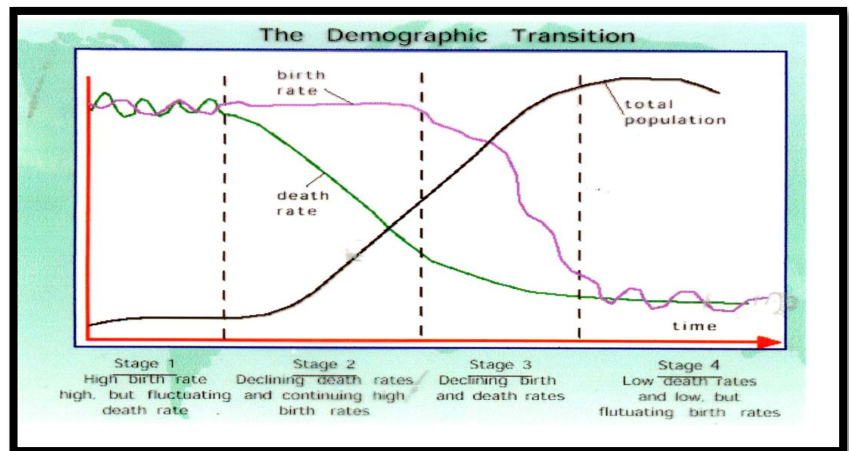Growth rate (GR) = RNI + Net migration rate

3. Population Doubling Time Law of 70:

If a population growing at a constant rate of 1% per year, it would be expected to double in 69.3 years (approximately every 70 years). A Law of 70 is much simpler to remember than a Law of 69.3

Q) If the rate of growth is 2%, what is the expected doubling time? 70/2 or 35 years.

The Demographic Transition:

The demographic transition is the description of **secular** (in long-term) trends in population growth in relation to changes over time in death or mortality rates and birth or fertility rates. Demographic transition describes the major demographic

trends that happened to Western countries in the past two centuries.

Stages	Discerption:	Reasons:
Stage 1 (high stationary): (Birth rate = Death rate)	**Stable population that has a zero growth rate with constant numbers of births while the death rate fluctuates each year. both birth rates and death rates are high.The birth rate is constant, while the death rate fluctuates in the face of natural disasters as famines, floods, epidemics, and wars**	**Due to epidemics, famines, poor nutrition poor hygiene and little medical care=high infant mortality, so parents tend to have more children to compensate for deaths=High fertility. Children are also needed to work on the land to grow food and for family support**
Stage 2 (early expanding): (Birth rate > death rate)	**Birth rate remains high but the death rate begins a sharp decline due to major improvements in living standards attributable to industrialization. The large gap between the birth rate and the death rate accounts for the population explosion.**	**Improvements in sanitation and water supply, Better quality and quantity of food, improved transport of food and medical supplies**
Stage 3 (late expanding): (Birth rate > death rate)	**Birth rates fall rapidly as people start controlling their fertility and limiting family size.**	***Lower infant mortality rate so, most of the children will actually survive into adulthood, so no need for more children.** ***Children become more expensive to raise largely because of increasing educational demands. ,** ***A declining need for children as farm labors due to industrialization and mechanization** ***access to contraception**
Stage 4 (low stationary): (death rate = birth rate)	**in contrast to stage 1, birth rates fluctuate both birth rates and death rates are low.**	**Indicative of fertility control as people alter their reproduction according to socioeconomic changes.**
Stage 5 (declining): (Birth rate < Death rate)	**New fifth stage added, due to some countries such as Germany, Japan, having higher death rate than birth rate, so that their populations are actually falling.**	

❖ Factors Affecting Pop. Dynamics

1- Fertility (births)　(Natality Rates):

- **Crude Birth Rate (CBR)**

Simplest indicator of fertility.

defined as the number of live births per 1000 mid-year population in a given year and locality

CBR = 22.5 Births/1,000 population (Saudi Arabia, 2012)

$$CBR = \frac{Total\ number\ of\ live\ births\ in\ a\ certain\ year\ and\ locality}{Estimated\ midyear\ population\ (same\ year\ and\ locality)} \times 1000$$

- **General fertility rate (GFR)**

The number of live births in a calendar year, divided by the number of women in the child bearing ages 15-49 at mid year, multiplied by 1000.

$$GFR = \frac{Total\ number\ of\ live\ birth\ in\ a\ certain\ year\ and\ locality}{mid-year\ reproductive\ female\ population\ (aged\ 15-49)} \times 1000$$

- **Age specific fertility rate**

$$\frac{Total\ number\ of\ live\ births\ born\ by\ females\ in\ a\ specific\ age\ group\ in\ a\ certain\ year\ and\ locality}{Female\ population\ in\ the\ same\ specific\ age\ group} \times 1000$$

- **Gross Reproduction Rate (GRR)**

The average number of female births that would be born to a woman throughout her reproductive period. (Expressed as daughters per woman)

  _ predicts the fertility of the next generation.

- **Total Fertility Rate (TFR) (per woman)**

The average number of births that would be born to a woman throughout her reproductive period. (Expressed as children per woman)
  - TFR (Children per woman) 2.87 (in Saudi Arabia 2012)
  - In developing countries, the TFR is over 6.0.
  - In most developed countries, the TFR is under 2.0.

2- Mortality (deaths):

- **Crude Death Rate (CDR)**

Mortality rate is the mortality rate from all causes of death for an entire population. We usually multiply by 1000.

CDR = 3.8 deaths/1,000 population (Saudi Arabia, 2012)

$$\text{Crude Death Rate} = \frac{\text{Total number of deaths in a certain year and locality}}{\text{Estimated mid} - \text{year population (Same year and locality)}} \times 1000$$

- **Infant mortality rate**

Probability of a child born in a specific year or period dying before reaching the age of one.
  - both sexes 16.2 /1000 live births (Saudi Arabia, 2012)

$$\text{Infant mortality rate} = \frac{\begin{array}{c}\text{Total number of deaths from} \\ \text{zero up to less than one year during a} \\ \text{year and in a given locality}\end{array}}{\begin{array}{c}\text{Total number of live births in} \\ \text{the same year and locality}\end{array}} \times 1000$$

- **Under-5 mortality rate**

Probability of a child born in a specific year or period dying before reaching the age of five.
  - both sexes 18.7/1000 live births (Saudi Arabia, 2012)

$$\text{The under 5 - years mortality rate} = \frac{\begin{array}{c}\text{Total number of deaths among children under} \\ \text{5 - years of age during a year and in a given locality}\end{array}}{\text{Total number of live births in}} \times 1000$$

- **Maternal mortality ratio**

Number of maternal deaths per 100 000 live births during a specified time period, usually 1 year.

Maternal death is the death of a woman while pregnant or within 42 days after termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.

- MMR= 14 (Saudi Arabia, 2012)

Maternal mortality ratio

$$= \frac{\textit{Number of Maternal deaths asigned to causes related to pregnancy in a given year and locality}}{\textit{Number of live births in the same year and locality}} \times 100,000$$

3- Migration:

Migration is the movement of populations across a specified boundary for the purpose of residing.
Migration is the change of residence of a person or group of persons for better life and higher standard of living.

Immigration and **emigration** are used to refer to moves between countries (international migration).

in-migration and **out-migration** are used for internal movement between different areas within a country (internal migration).

Types of Migration

- **Internal migration:** movement within the boundaries of a given country.

    Examples of internal migration:

    · Rural - Urban migration.

    · Movement of nomads.

    · Movement of temporary and seasonal nature.

    · Movement between and within urban areas.

- **External migration:**

    - **Permanent migration:** e.g. permanent movement of Arabs to the U.S.A., Australia and Canada.

    - **Temporary migration:** for the aim of working for a number of years, with the intent of an eventual return to the motherland. e.g. migration of Egyptian professionals and laborers to Arab Countries. In many countries, the effect of migration is minimal when compared to fertility and mortality

Q1) In which stage birth rates fluctuate:

A. Stage 1
B. Stage 2
C. Stage 3
D. Stage 4

Q2) Annual Growth Rate depends on :

A. Births
B. Deaths
C. Migration
D. All the above

Q3) Which on of these is expressed as children per woman:

A. Total Fertility Rate
B. Gross Reproduction Rate
C. Maternal mortality ratio
D. General fertility rate

Q1) D	Q2) D	Q3) A

If you find any Mistakes please contact me:
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