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COMMUNITY MEDICINE

DOCTOR 2019 | MEDICINE | JU

Dr. HAMZA ALDURAIDI

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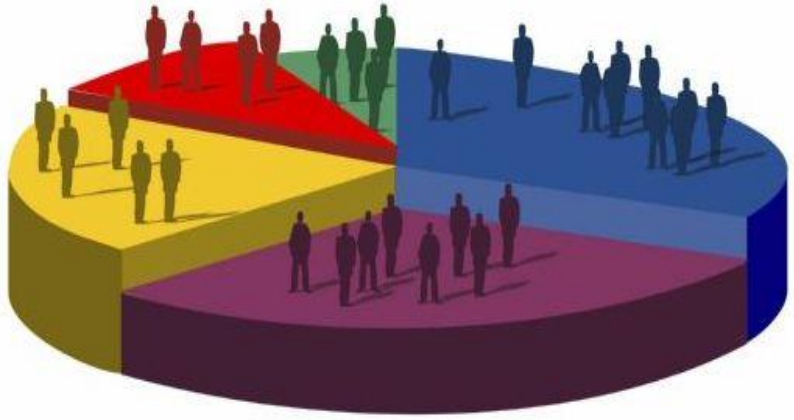
Demography (Part 1)



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Community Medicine Course 2020-2021

Faculty of Medicine/ The University of Jordan

Lecture Objectives

- Present the need for population studies (demography)
- Introduce the components of population dynamics (births, deaths, migration)
- Introduce the basics of fertility and mortality and their measures
- Discuss determinants of fertility
- Describe population composition
- Describe types of population profiles
- Introduce basics of population change
- Introduce basics of population transition

Resources:

- Population Handbook, 6th International Edition, 2011.
- Jordan Population and Family Health Survey for the years 2017/18.

Demography

DEMOGRAPHY (*POPULATION STUDIES*):

IS THE STUDY OF HUMAN POPULATIONS: THEIR SIZE, COMPOSITION, AND DISTRIBUTION AS WELL AS THE CAUSES AND CONSEQUENCES OF CHANGES IN THESE CHARACTERISTICS.

Demography

- Demography is the scientific study of population (based on science not opinions)
- Demographers seek to know the levels, trends, tendencies and patterns in population size and its components (very important for planning for future and for resource location in any country). They search for explanations of demographic change and their implications for societies.
- They use censuses, birth and death records, surveys, visa records, even motor vehicle and school registrations. They shape these data into manageable forms such as simple counts, rates, or ratios.

Demography

- Censuses: most method used for studying which is a scientific mathematical way of determining what a population looks like in terms of it's numbers and characteristics
  → it's benefit: very effective way to compare the present with the past and hopefully in predicting population in future
- Most of the principal measures used in demography (counts, rates, ratios, and proportions) will be defined in these lectures, together with recent examples of their use.

Demography

- Everyone of us is a member of a population, regardless of his settings.
- Population factors have an impact on many facets of life—from where we live to the prices we pay for goods and services, we should take these things in consideration.

Demography

- The need for health care preoccupies the political leaders of the industrialized countries whose populations are “aging,” while the need for classrooms, employment opportunities, and housing preoccupies the leaders of countries that are still growing rapidly.
- In summary: we need in medicine (in community medicine specifically) to know how our entire population (rather than individuals) looks like to take good health care

The Tools of Demography

1) COUNT: (simplest one) The absolute number of a population or any demographic event occurring in a specified area in a specified time period. (For example, 2,027,000 live births occurred in Egypt in 2010.). (just a number information, it doesn't imply any comparison between it and anything in other area or time)

The Tools of Demography

2) RATE: The frequency of demographic events in a population during a specified time period (usually a year) divided by the population "at risk" of the event occurring during that time period**. Rates tell how common it is for a given event to occur and it gives a type of comparation (it has a nominator and denominator). (**For example, in 2008 in Zambia the death rate was 16 per 1,000 population.) Most rates are expressed per 1,000 population.

(We prefer rate rather than population because rate gives us a appreciation of how good or bad is a certain number)

Nominator → 16 **denominator → 1000**

Types of rates

a) Crude rates are rates computed for an entire population regardless for population subgroup (e.g. age, gender ……)

b) Specific rates are computed for a subgroup (certain demography), usually the population more nearly approximating the population “at risk” of the event (age-specific, sex-specific, race-specific, occupation-specific)

The Tools of Demography

3) RATIO: The relation of one population subgroup to or to another subgroup; that is, one subgroup divided by another. (For example, the sex ratio (most famous example is sex ratio) in France in 2010 was 94 males per 100 females.)

4) PROPORTION: The relation of a population subgroup to the entire population; that is, a population subgroup divided by the entire population. (For example, the proportion of Vietnam's population in 2008 classified as urban (lives in cities) was 29 percent.)

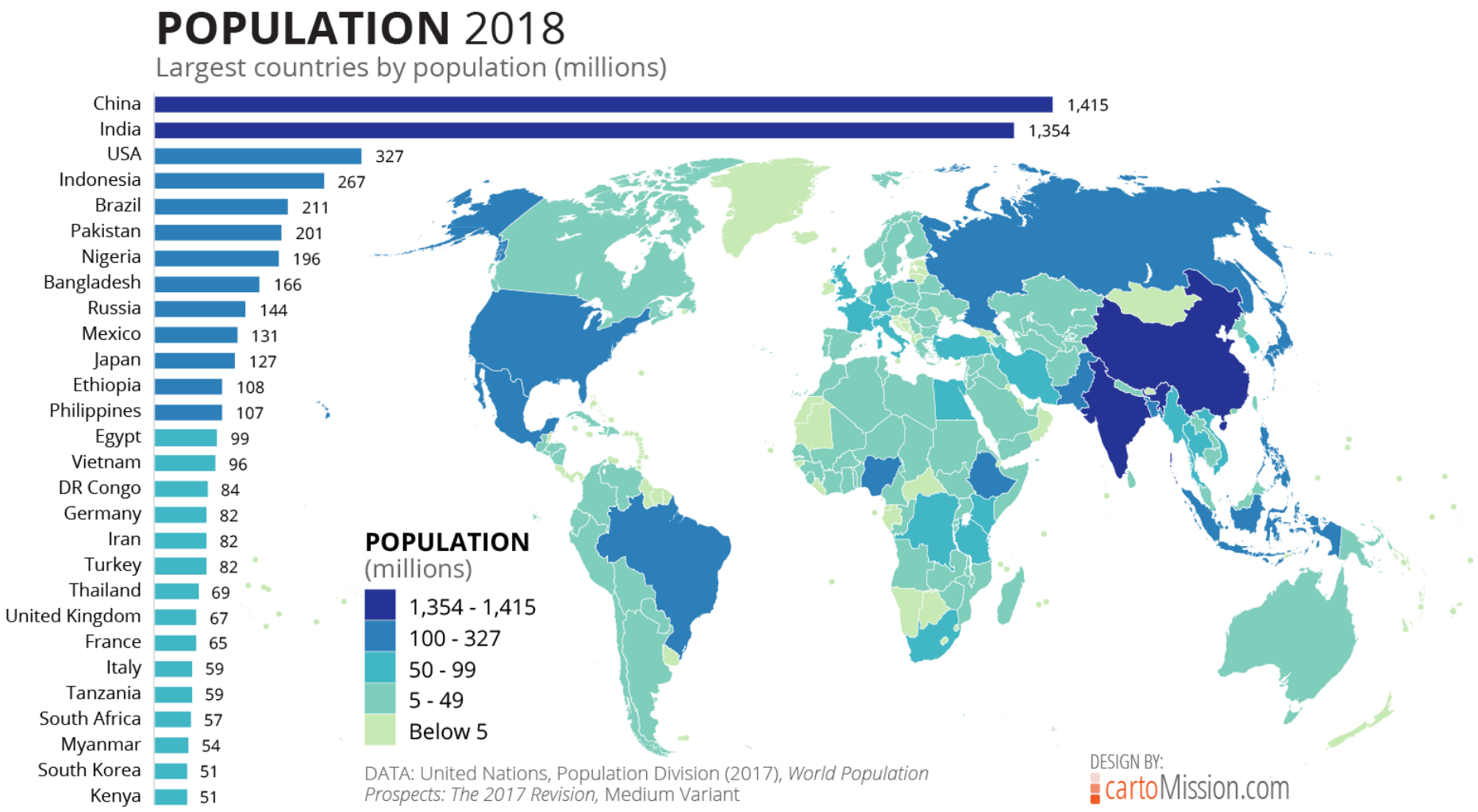
→ Important information: realize the difference between

Proportion and ratio


11
JULY
WORLD
POPULATION DAY

Distribution of 7.65 billion people in the world in 2018

(numbers changed but the order of countries is the same)



Reference: http://www.worldometers.info/world-population/

(The top Arabic country is Egypt about 100 million)

Demography:
People population is very Dynamic !

Three major factors determine the dynamics of a population:

- Births (fertility): How many people are born in certain population and specific time
- Deaths (mortality): How many people die in certain population and specific time
- Migration:(الهجرة) How many people leave the population and how many people join the population in specific time

Demography:
People population is very Dynamic !

If some groups within a population grow or decline faster than others, the composition of the whole is altered. The three factors (birth, death and mortality) determine the most basic characteristics of a population, as well as its demographic future.

→Note: most county's population are growing (e.g. developing countries like Jordan), few are shrinking.

Fertility

Fertility is the number of live births women have in certain country and time.

- **Total Fertility Rate (TFR): is the average number of children that would be born to a certain woman by the time she ends childbearing.**
- The **TFR** is one of the most useful indicators of fertility because it gives the best picture of how many children women are currently having.
- **The average for the world it is 2.42 (2016)**
- **In Jordan total fertility rate is 2.7 (JPHS, 2017/18) (Jordan before 10-20 years was higher).**

Table 3 Current Fertility

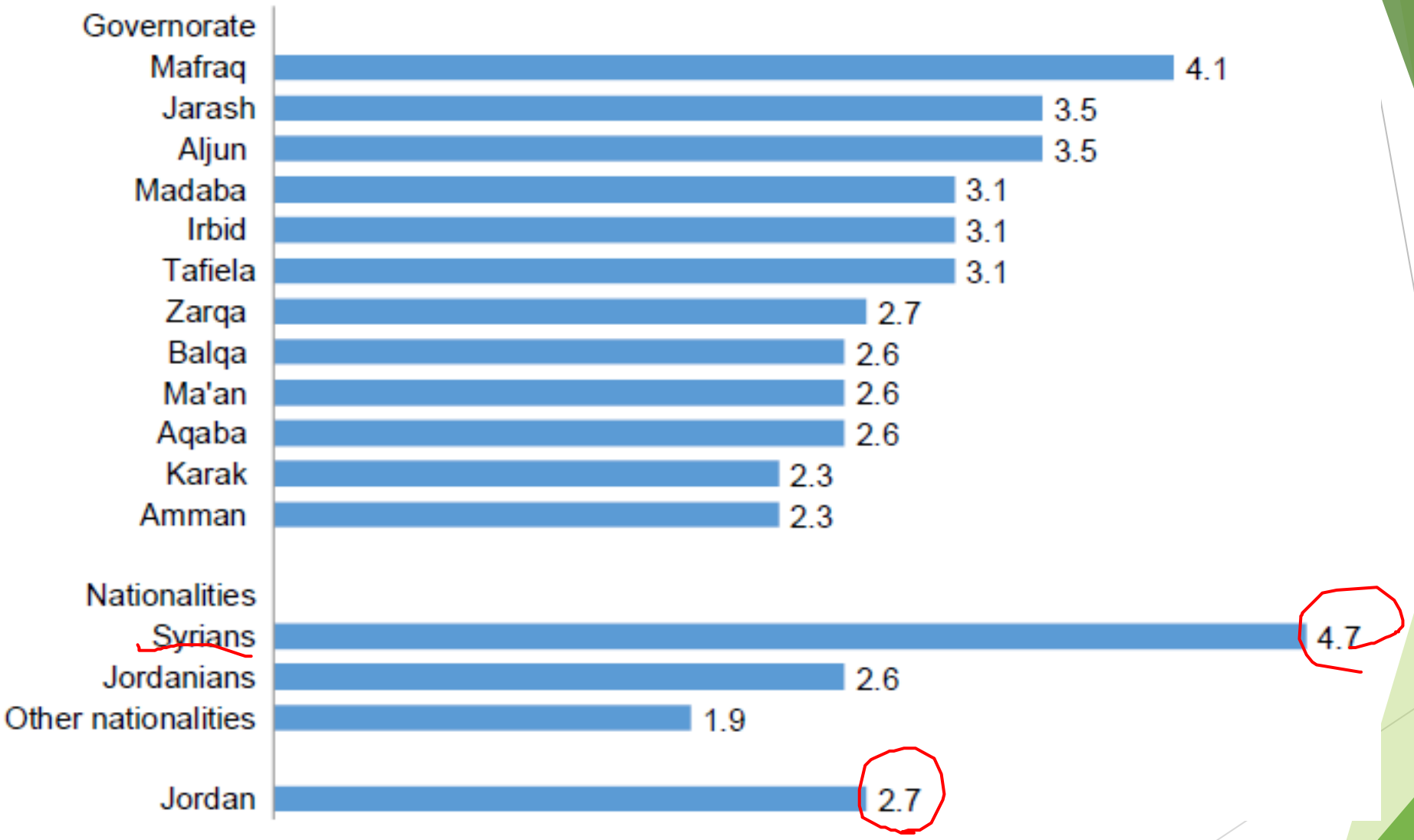
Age-specific and total fertility rates, general fertility rate, and the crude birth rate for the 3 years preceding the survey, according to residence, Jordan DHS 2017-18

Age group	Residence		Total
	Urban	Rural	
15-19	28	20	27
20-24	111	101	109
25-29	153	183	156
30-34	135	151	137
35-39	83	128	88
40-44	27	28	27
45-49	[1]	[5]	[2]
TFR (15-49)	2.7	3.1	2.7
GFR (15-44)	89	97	90
CBR	21.3	23.7	21.6

Notes: Age-specific fertility rates are per 1,000 women. Rates for age group 45-49 may be slightly biased due to truncation. Rates are for the period 1-36 months prior to interview.
TFR: Total fertility rate expressed per woman
GFR: General fertility rate expressed per 1,000 women age 15-44
CBR: Crude birth rate, expressed per 1,000 population

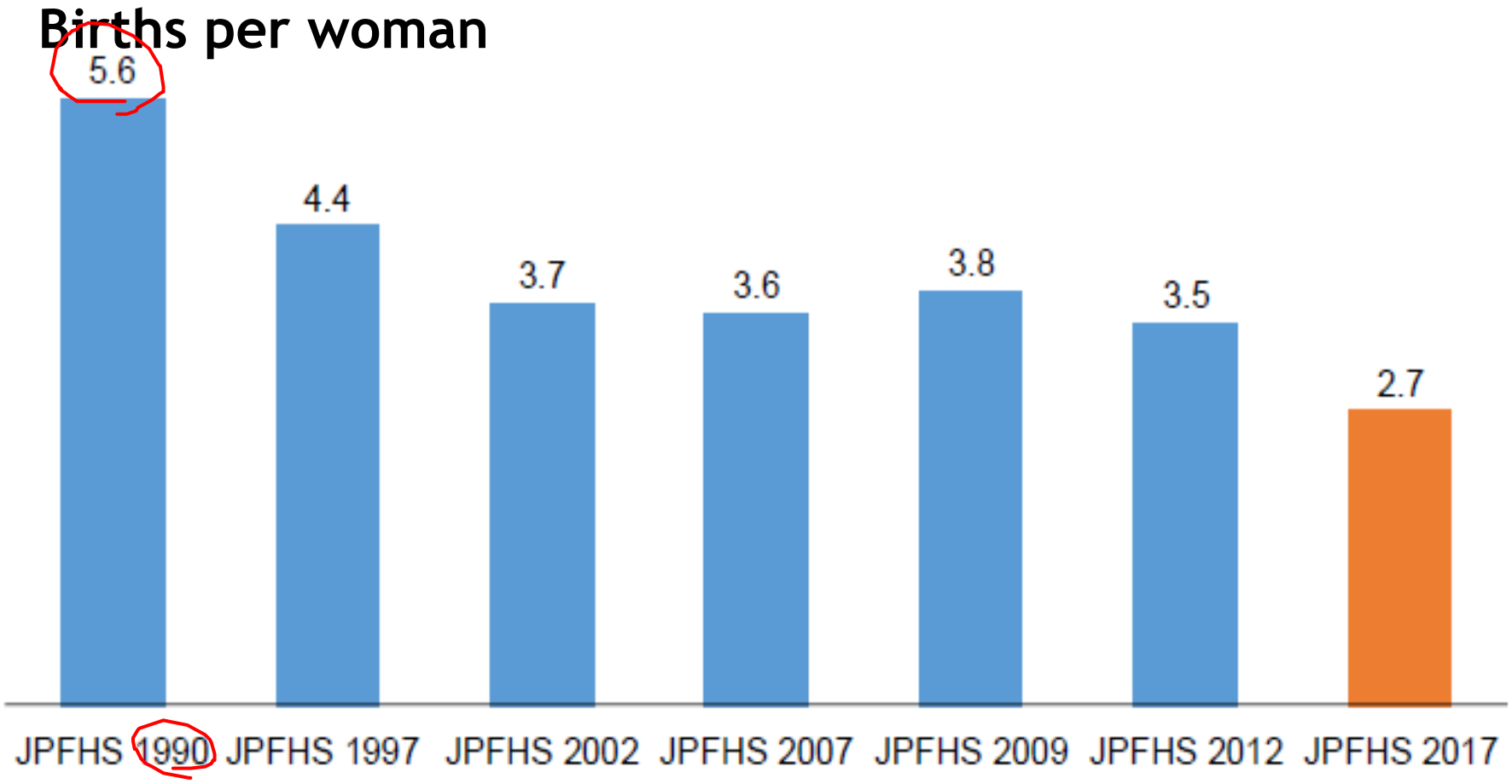
Source: Jordan Population and Family Health Survey 2017/2018
https://dhsprogram.com/pubs/pdf/PR106/PR106.pdf

Figure 1 Differentials in total fertility rates, 2017-18



https://dhsprogram.com/pubs/pdf/PR106/PR106.pdf

Trends in Total Fertility Rate 1990-2017 (lowered by half)



Fecundity (physiological part of fertility)

The physiological ability of women to reproduce.(we're talking here about the woman features itself)

- Some are infecund (unable to birth) due to diseases, genetic dysfunction and injuries.
- Mothers could be infecund temporarily when they breastfeed.
- For individuals, fecundity ranges between 0-30 children.

Factors Affecting fertility

What are the factors that may influence fertility?

Cultural, social, economic, and health factors interfere with the process of human reproduction.

- These factors operate in different societies in different ways. The relative importance of these factors varies by society. These factors are:

1. General factors
2. Specific factors (proximate determinants)

1. General factors (distant factors)

- **Cultural values** e.g. (Does the society value loves large or small families?) (in agriculture and bedwen communities they love large famillies)
- **Social roles**: (Is the wife primarily a child bearer or a child rearer or expected to do much more than that ?)
- **Economic** (Do parents rely on children to look after them in old age? if yes, fertility will increase) (today it's opposite as poor people don't prefer having more children)
- **Health** (what is the prevalence of gonorrehea in a population), that will impair fecundity. (the better the health in a country the more likely the would bring babies)

2. Proximate determinants of fertility

Fertility is affected by cultural, social, economic, and health factors. Most of these factors operate **(indirectly)** through **4** other factors which explain nearly all variation in fertility levels among populations and have a **direct** biological effect on fertility:

1. **The proportion of women in sexual union**(نسب المتزوجات) .
2. **The percentage of women using contraception** (كل ما زاد وفرة وسائل منع الحمل وتنظيمه قلت نسبة الخصوبة)
3. **The proportion of women who are not currently fecund (primarily because of breastfeeding).**
4. **The level of induced abortion.** (تعتمد على الثقافة السائدة فمثلًا في المجتمعات اللبرالية هو منتشر لأنه حريّة شخصية بزعمهم)

Proximate determinants of fertility

- In US. and most developed countries ***contraceptive use and abortion*** are the most important proximate determinants. The US, Brazil, Australia, and few East and South East Asia countries have contraceptive use rates of >= 75%.
- The latest figure in Jordan is 52% for modern methods use(PFHS, 2017/18).

Proximate determinants of fertility

- **Spain** recorded **the lowest fertility rate** in a nation 1.15 births per woman of reproductive age. Basically due to 72% using contraceptives.
- **Russia** achieved low fertility rates due to having easier access to **abortion.**

Proximate determinants

- When contraceptive and abortion prevalence rates are low, the postpartum infecundity and marriage determinants are more important.
- **African countries**:

women marry early and bring more children, but they breast feed for 2-3 years, thus prolonging the period of infecundity following childbirth.

Fertility Measurement
Birth Rate (Crude Birth Rate)

- **The birth rate (also called the crude birth rate) indicates the number of live births per 1,000 population in a given year**
- **It is the most easily obtained and most common reported fertility measure**

Fertility Measurement

Crude Birth Rate

$$\frac{\text{Number of births}}{\text{Total mid-year population}} \times K = \frac{161{,}042}{7{,}485{,}600} \times 1{,}000 = 21.5$$

- There were 22 births per 1,000 population in Palestine in 2009 :

Around the world, birth rates vary widely. Niger's 52 per 1000 in 2010 is a very high birth rate, while tiwan 8 per 1000 in 2009 is very low

- **In Jordan, Crude Birth Rate= 21.6 (PFHS 2017/18).**

Fertility Measurement
General Fertility Rate

- **The general fertility rate GFR, (also called the fertility rate) ,is the number of live births per 1,000 <u>women</u> ages 15-49 in a given year.**
- The GFR is a somewhat more refined measure than the birth rate because it relates births to the age-sex group at risk of giving birth (usually defined as women ages 15-49).

General Fertility Rate

$$\frac{\text{Number of births}}{\text{Number of women ages 15-49}} \times K = \frac{2{,}027{,}000}{22{,}285{,}000} \times 1{,}000 = 91.0$$

There were 91 births per 1,000 women ages 15 to 49 in Egypt in 2010.

Zambia's general fertility rate from 2004 to 2007 was 214 live births per 1,000 women ages 15 to 49—one of the highest in the world. Taiwan's rate of 36 per 1,000 women in 2009 was one of the lowest in the world.

GFR in Jordan = 90 for ages 15-49 (PFHS 2017/18)

Replacement level fertility

- **The level of fertility at which a couple has only enough children to replace themselves, or about two children per couple.**
- This pop will eventually stop growing.
- It needs a TFR slightly higher than 2

Replacement level fertility

- In US it is 2.1 because death rate is not too high
- In Sierra Leone , Repl. Level Fert. would be greater than 3 because death rate is too high.
- **There is no magical and ideal number that is recommended for all countries**

ملاحظة على الهامش: ما ذكره الدكتور هو من وجهة نظر الكتاب، وإلا فشرعًا يستحب تكثير النّسل، ولا يجوز تحديده بسبب الخوف من الفقر لأنه سوء ظن بالله.

Mortality

Death Rate

- The death rate (also called the *crude death rate)* is the number of deaths per 1,000 population in a given year.

The death rate (also called the crude death rate) is the number of deaths per 1,000 population in that population in a given year.

$$\frac{\text{Number of deaths}}{\text{Total population}} \times K = \frac{8{,}504{,}709}{1{,}149{,}285{,}000} \times 1{,}000 = 7.4$$

In the 2008, the death rate in India was 7 per 1,000.

In 2009, Zambia's death rate was estimated at 16 per 1,000, while Singapore's was 4. Because of HIV

Crude death rate in Jordan in 2017 was 3.4/1000 population

Death rates:

- Age-Specific death rate
- Cause-specific death rate
- Sex-specific death rate

Usually 100,000

Disease specific death rate

$$\frac{\text{Deaths from heart disease}}{\text{Total population}} \times K = \frac{617{,}527}{304{,}050{,}700} \times 100{,}000 = 203.1$$

In 2008, 203 people per 100,000 died of heart disease, the leading cause of death in the United States.

$$\frac{\text{Deaths of population ages 15-24}}{\text{Population ages 15-24}} \times K = \frac{32{,}208}{42{,}546{,}900} \times 1{,}000 = 0.8$$

In the United States in 2008, the age-specific death rate for ages 15 to 24 was 0.8 per 1,000.

By comparison, Puerto Rico's 2008 age-specific death rate for ages 75 to 84 was 50.2 per 1,000.

Infant Mortality Rate (IMR)

The infant mortality rate is the number of deaths of infants under age 1 per 1,000 live births in a given year.

The infant mortality rate is considered a good indicator of the health status of a population.

$$\frac{\text{Number of deaths of infants under age 1 in a given year}}{\text{Total live births in that year}} \times K = \frac{78{,}400}{3{,}227{,}000} \times 1{,}000 = 24.3$$

There were 24 deaths of infants under age 1 per 1,000 live births in Brazil in 2007.

In 2009, Sweden reported the world's lowest infant mortality rate, 2.2 per 1,000. An example of a high national rate would be Chad's, which was estimated at 130 between 2005 to 2010.

- Latest figure about IMR in Jordan is 17/1000 live births (*PFHS /2017)*

Maternal Mortality Ratio (وفاة أمومة)

- The maternal mortality ratio is the number of women who die as a result of complications of pregnancy or childbearing in a given year per 100,000 live births in that year. (could be prevented if we have a good healthcare system)
- Deaths due to complications of spontaneous or induced abortions are included.
- **a maternal death** is defined as the death of a woman while pregnant or within 42 days of termination of pregnancy from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes.

Maternal Mortality Ratio

- This measure is sometimes referred to as the maternal mortality rate

$$\frac{\text{Number of maternal deaths}}{\text{Total live births}} \times K = \frac{670}{1{,}713{,}900} \times 100{,}000 = 39$$

There were an estimated 39 maternal deaths per 100,000 live births in Russia in 2008.

- In Jordan MMR 19.1 **(Maternal Mortality Study - Jordan 2007-2008- Higher Population Council, 2009)**

Morbidity

- Morbidity refers to disease and illness, injury and disability, in a population.

- Data about the frequency and distribution of a disease can aid in controlling its spread, and in some cases, may lead to identification of it causes.

Morbidity : 1.Incidence Rate

Incidence: The incidence rate is the number of people contracting a disease during a given time period per 1,000 population at risk. The incidence rate and other morbidity rates vary so widely in magnitude that any constant may be used that expresses the rate in a clear manner (from "per 100" or "percent" to "per 100,000").

$$\frac{\text{Number of people developing tuberculosis during a given time period}}{\text{Population at risk}} \times K = \frac{252{,}316}{67{,}827{,}000} \times 100{,}000 = 372$$

The incidence of tuberculosis in the Democratic Republic of the Congo in 2009 was 372 per 100,000 population

Morbidity: 2.Prevalence

Prevalence: The prevalence rate is the number of people who have a particular disease at a given point in time per 1,000 population. This rate includes all known cases that have not resulted in death, cure, or remission, as well as new cases developing during the specified period.

$$\frac{\text{Number of people ages 15-49 with HIV/AIDS}}{\text{Total population ages 15-49}} \times K = \frac{892{,}750}{6{,}243{,}000} \times 100 = 14.3$$

The prevalence of HIV/AIDS in Zimbabwe among adults (ages 15-49) in 2009 was 14.3 per 100 population.

In 2009, the prevalence rate of HIV/AIDS for males ages 15-49 in Botswana was 20.6 percent and for females, 29.2. Corresponding rates in Argentina were 0.6 and 0.3, respectively.

Morbidity

إلى أي مدى المرض قاتل

Case Fatality Rate The case fatality rate is the proportion of people contracting a disease who die of that disease during a specified time period.

$$\frac{\text{Number of persons dying from the disease}}{\text{Number of persons contracting the disease during a period}} \times K = \frac{12{,}270 \times 100{,}000}{60{,}000{,}000} = 20.5$$

From April 2009 to March 2010, the U.S. Centers for Disease Control and Prevention estimates that there were 12,270 deaths from H1N1 flu in the United States, or 21 deaths for every 100,000 cases

Life Expectancy

- Life expectancy is an estimate of the *average* number of additional years a person could expect to live if the age-specific death rates for a given year prevailed for the rest of his or her life.
- Life expectancy is a hypothetical measure because it is based on current death rates and actual death rates change over the course of a person's lifetime.
- Each person's life expectancy changes as he or she grows older and as mortality trends change.

Life Expectancy

If the age-specific death rates between 2005 to 2010 remain unchanged, males born in Argentina during that period can expect to live 72 years at the time they are born. Females can expect to live 79 years.

- Life expectancy for Jordanians

72.8 for males, and 74.3 years for females (PFHS, 2017/18). (life expectancy is higher for female in every country in the world)