



# Global Demography Concepts and Population Pyramid

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# Objectives

- Define the terms; demography and population dynamics
- Apply demographic concepts in health system
- Describe major sources of population data
- Describe features of population pyramid and compare the pyramids of developed and developing countries
- Describe the concept of demographic equation

# Objectives Cont.

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- Describe and understand the theory of demographic transition
- Describe the effect of population momentum on growth of population
- Explain the phenomenon of migration and its effect on population size
- Define, compute and interpret the rates of population increase and population doubling time

# What is demography?

- It is the scientific study of human populations
  
- It encompasses three domains:
  1. **Change in population size**
  2. **Composition of a population**
  3. **Distribution of a population in space**

# Sources of population data

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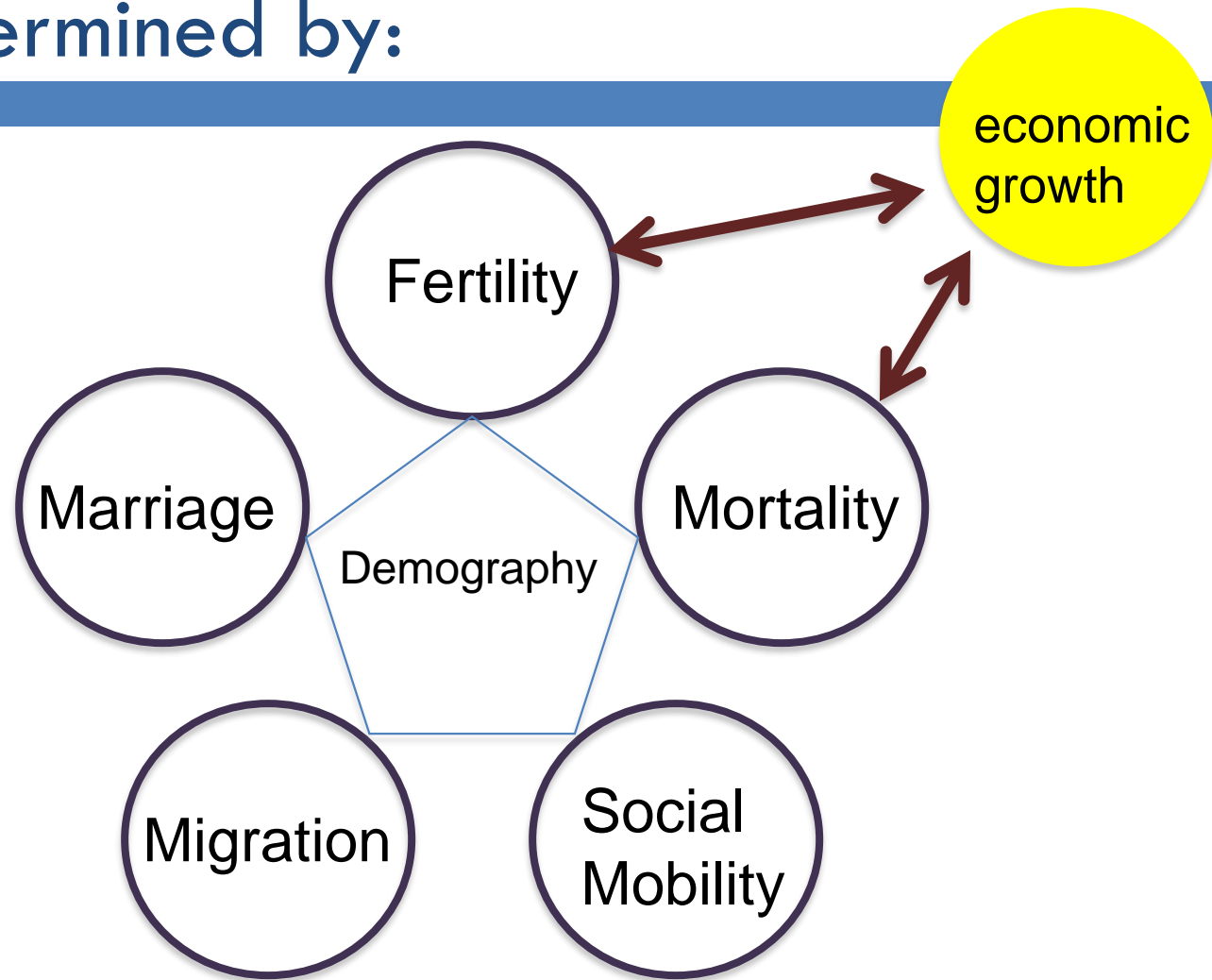
- Census data
- Ministry of health
- World Health Organization statistics
- United Nations
- World Bank Statistics

# Why is demography important?

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- The health of people in a community depends on the dynamic interaction between size of the population and the space they occupy

# Population size, distribution and composition are determined by:



# 1-Fertility

- The actual bearing of children, is determined by:
  1. *Age at marriage (inverse relationship)*
  2. *Duration of married life (most happen in early y)*
  3. *Spacing of children*
  4. *Education (inverse relationship)*
  5. *Economic status (inverse relationship)*
  6. *Religion*
  7. *Nutrition (Inverse relationship)*
  8. *Family planning*
  9. *Other factor....physiological, biological, cultural, social*

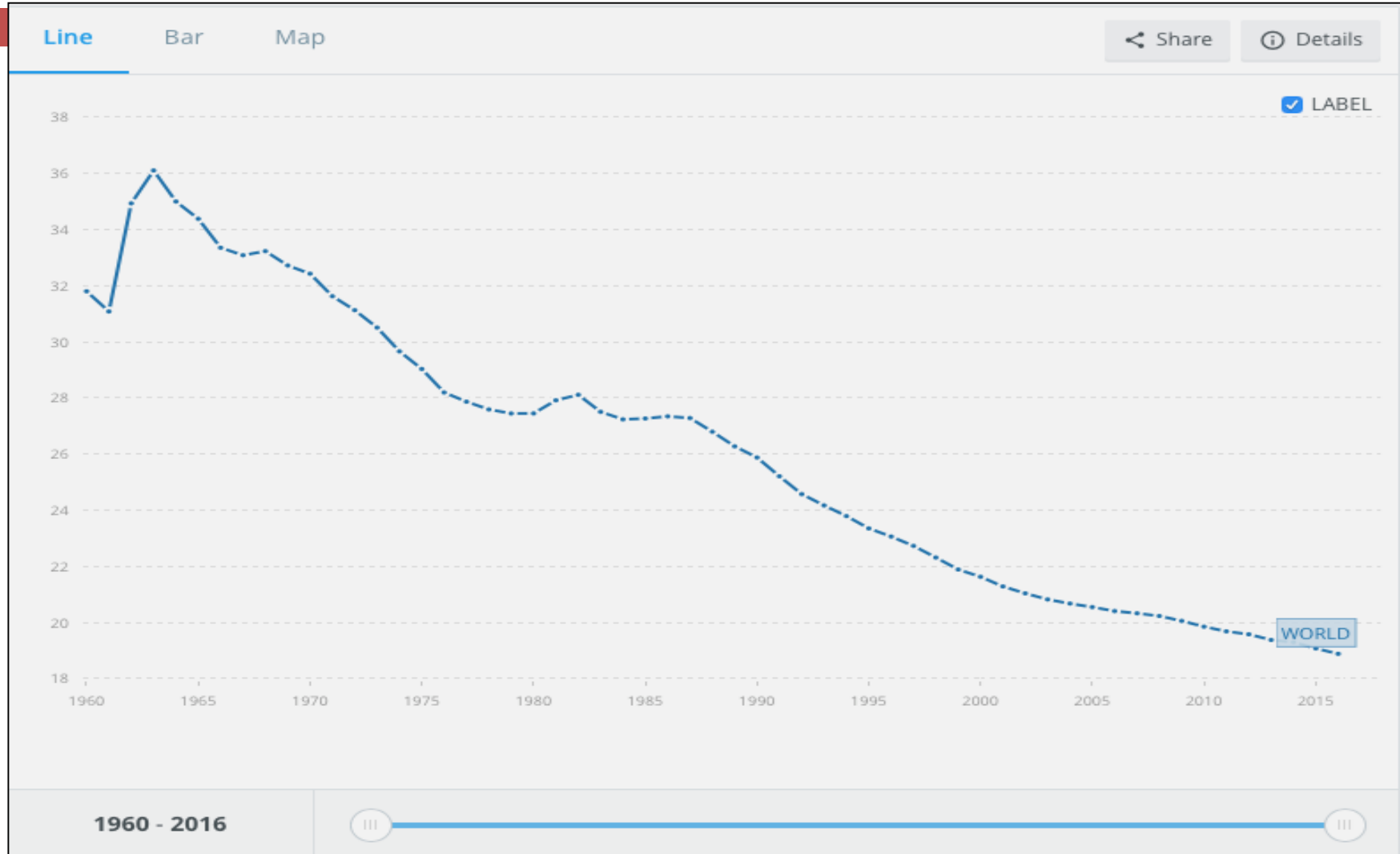


# Measures of Fertility

## 1. Crude Birth Rate:

Number of live births in a year in a specific locality X 1000  
estimated mid-year population size in that same year  
and locality

# Crude Birth Rate Trend (World Bank)



Source: <https://data.worldbank.org/indicator/SP.DYN.CBRT.IN>:

# Measures of Fertility cont.

## 2. General Fertility Rate:

number of live births per 1000 women in the reproductive age-group (15-44 or 49 years) in a given year

Number of live births in a year in a specific locality X 1000

Mid-year female population age 15-49 (reproductive age) in that same year and same locality

Problems? – not all women in denominator at risk for childbirth or married

# Measures of Fertility cont.

3. *General Marital Fertility Rate*:
  - number of live births per 1000 **married** women in the reproductive age group (15-44 or 49) in a given year

Number of live births in a year in a specific locality X 1000

Mid-year female married population age 15-49  
in that same year and same locality

# Measures of Fertility cont.

## 4. Age-specific Fertility Rate:

- number of live births in a year to 1000 women in any specified age-group

Number of live births among a specific age group X 1000

Mid-year female population in that age group  
in that same year and same locality

# Measures of Fertility cont.

## 5. Total Fertility Rate: (rate per woman)

the average number of children a woman would have if she were to pass through her reproductive years bearing children at the same rates as the women now in each age group

Approximates “completed family size”

Sum of age specific fertility rates (rate per woman)

1000

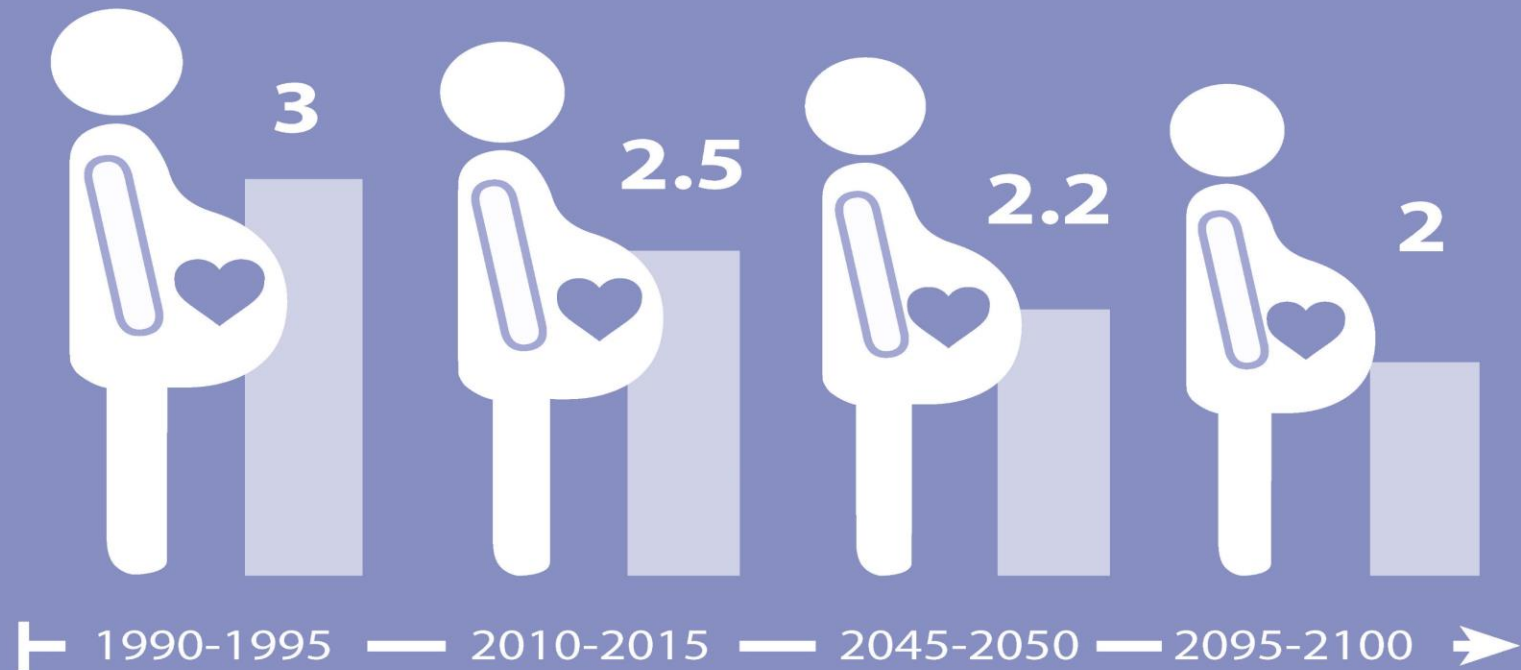
or *Sum of age specific fertility rate* (rate per 1000 women)

If using a 5-year period, then:  $\sum$  age specific fertility rate x 5

# Global Total Fertility Rate 2017

## Global Fertility Rate

*Projected number of births per woman\**



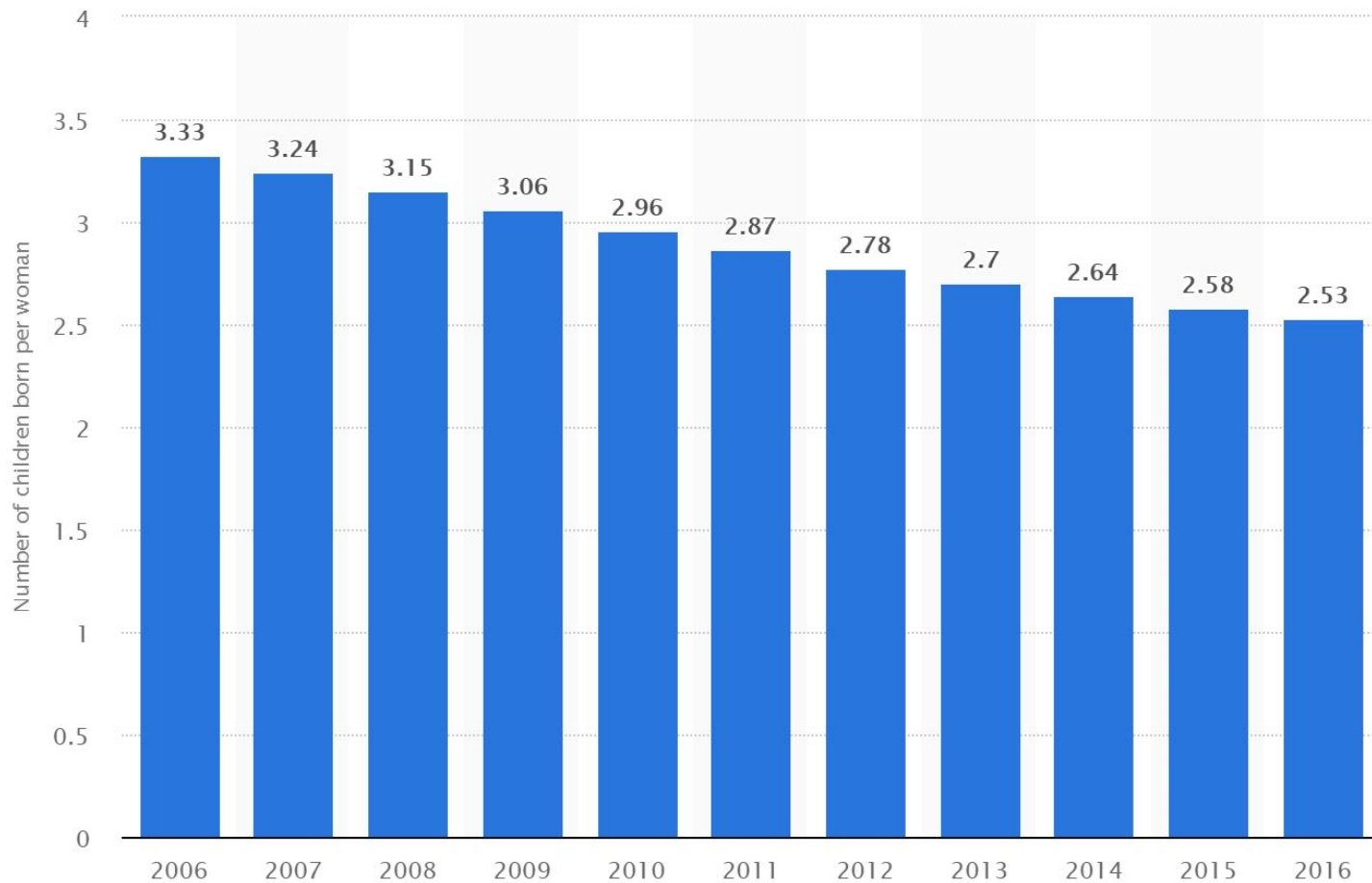
Source: United Nations Department of Economic and Social Affairs,  
Population Division, *World Population Prospects: The 2017 Revision*  
Produced by: United Nations Department of Public Information



\*Fertility data from the *World Population Prospects* are average values referring to five-year periods.

# Saudi Arabia Fertility Rate

## Saudi Arabia: Fertility rate from 2006 to 2016





# Impact of fertility on age distribution in a population

- High fertility  $\Rightarrow$  High proportion of young people in the population (e.g. developing countries)
- Low fertility  $\Rightarrow$  Condensed proportion of retired people in a population (e.g. developed countries)

## 2- Migration

- According to UN reports, 258 million people live outside the country where they were born
- Of these, 26 million (10%) are refugees or asylum seekers
- Migration is towards high-income countries, except for refugees mostly migrate to low-income countries
- Median age of migrants is 39 years
- Mostly women

# Migration continues

- Ranking of countries that host migrants:

	Country	No. of migrants hosted
1	USA	49.8 million
2	Saudi Arabia	12 million
3	Germany	around 12 million
4	Russia	around 12 million
5	UK	9 million

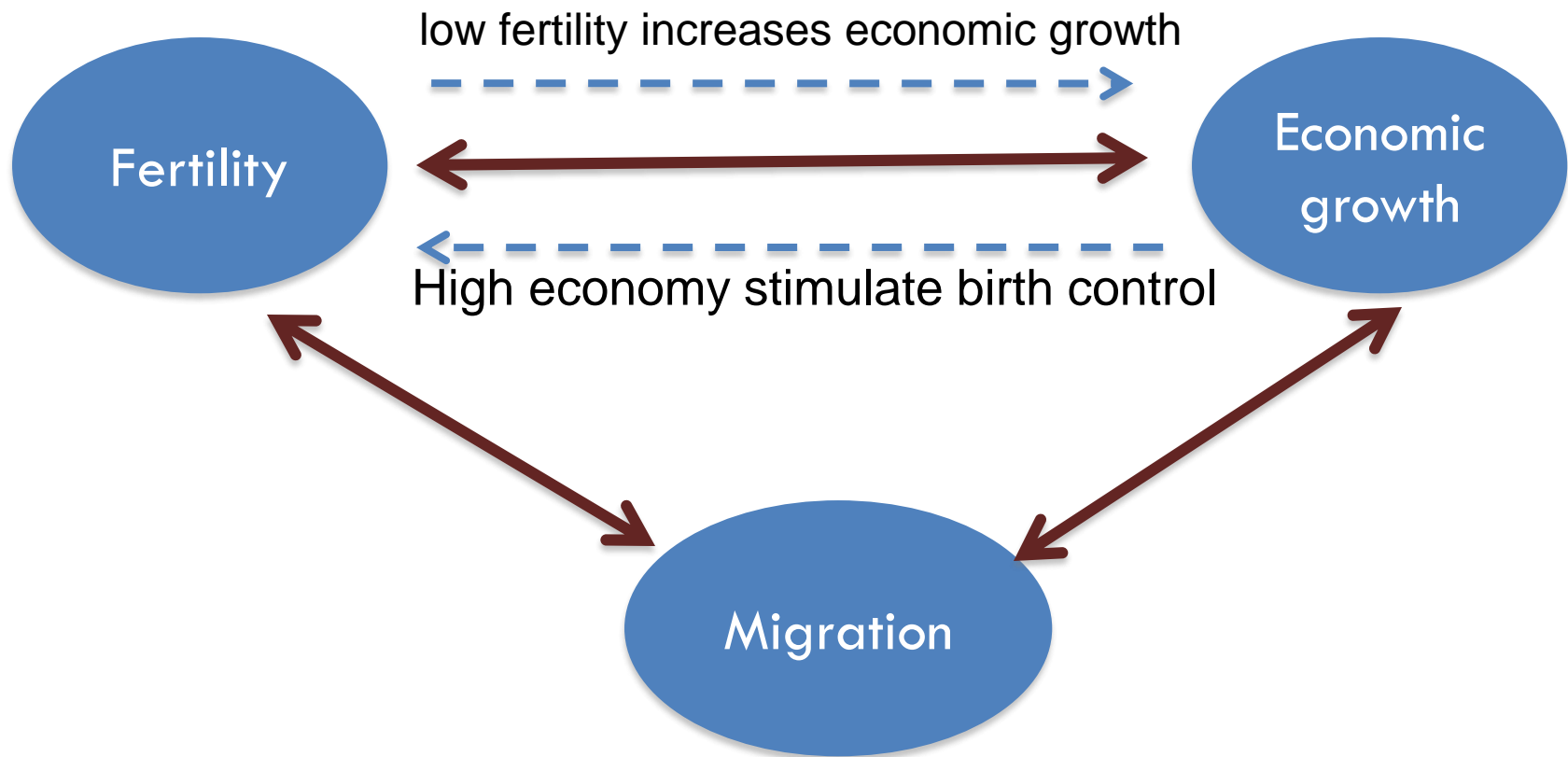
- Saudi Arabia ranks the **second** worldwide in hosting migrants

Source: UN International Migration Report 2017. Available at:  
[https://www.un.org/development/desa/publications/international-migration-](https://www.un.org/development/desa/publications/international-migration-report-2017/)

# Why is migration important to follow?

- It helps predict how the population will be shaped
- Migration usually goes from low income to more industrialized countries (more economic opportunity)
- Younger and healthier people migrate to more industrialized areas to work
- Migration affects economic growth and is affected by economic growth

# Relationship between fertility, migration and economic growth



# 3-Mortality

- Mortality rate:
  - ▣ Number of deaths in a given population in a specific period of time
  - ▣ Expressed as per 100 population or per 1000 population

$$\text{MR} = \frac{\text{\# of deaths in a given period of time} \times 100 \text{ (or 1000)}}{\text{Total population in the same given period of time in that same population}}$$

# Crude death rate

- Crude death rate:

- Number of deaths in a given population in a specific period of time over the mid-year population of that same time period

$$\text{CDR} = \frac{\# \text{ of deaths in a given period of time} \times 1000}{\text{mid-year population in the same given period of time in that same population}}$$

mid-year population in the same given period of time in that same population

# Other measures of mortality

- Age-specific mortality rate
- All cause mortality rate
- Cause-specific mortality rate
- Infant mortality rate
- peri-natal mortality rate
- neonatal mortality rate
- Post-neonatal mortality rate
- Maternal mortality rate
- Maternal mortality ratio



# Stages of Demographic Transition

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- It explains the changes of birth rates and death rates and describes the population growth cycle relation to economic development

# 5 Stages for Demographic Transition

- Stage 1: (High Stationary)
  - ▣ High birth rate
  - ▣ High death rate
  
- Stage 2: (Early expanding)
  - ▣ Birth rates remain the same
  - ▣ Death rates begin to decline
  - ▣ e.g. many of the countries in developing world

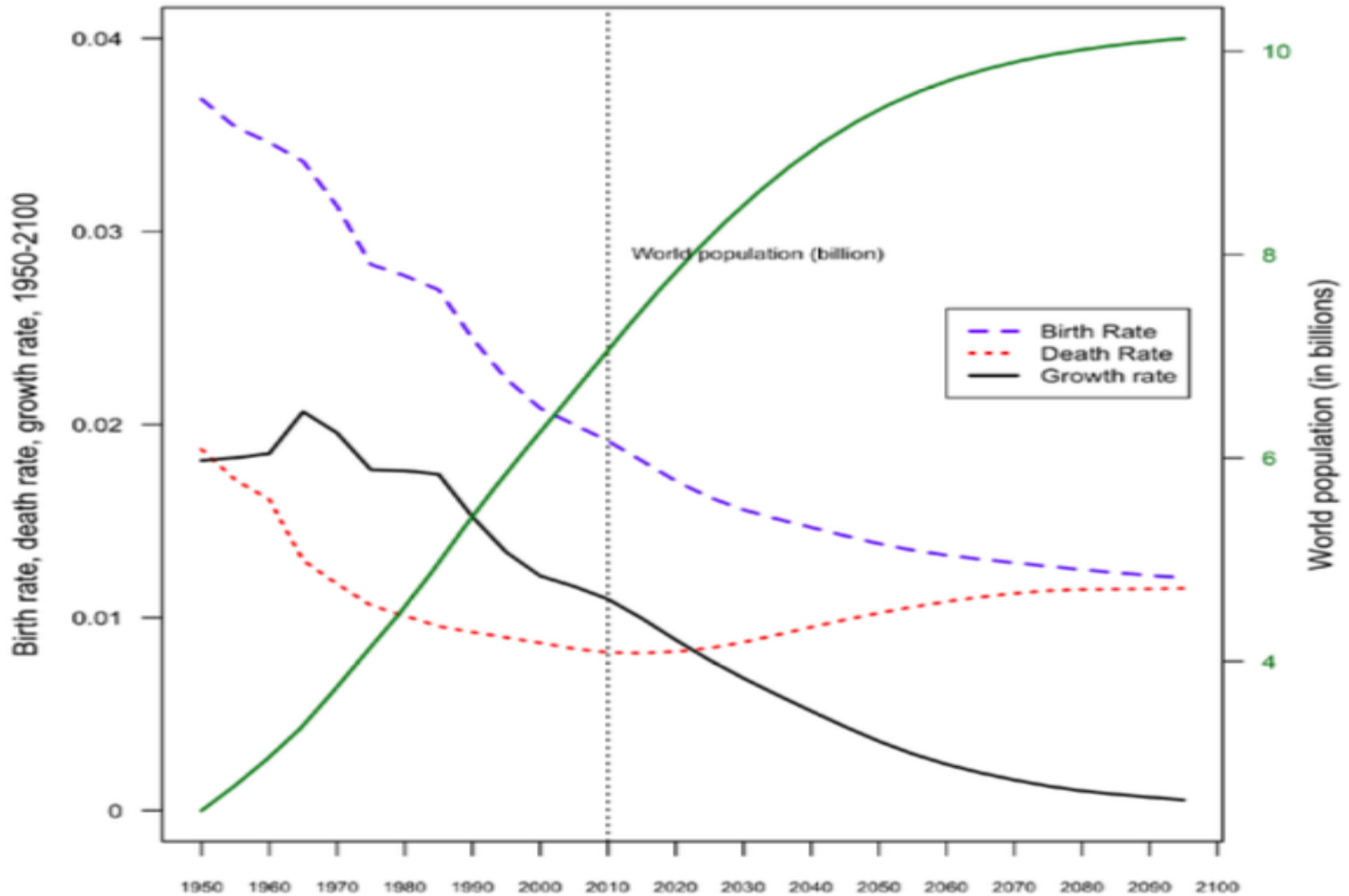
# 5 Stages for Demographic Transition

- Stage 3: (Late Expanding)
  - ▣ Death rates further decline
  - ▣ Birth rates begin to fall
  - ▣ Birth rates  $>$  death rates  $\Rightarrow$  population growth
  
- Stage 4: (Low stationary)
  - ▣ Low birth rate
  - ▣ Low death rate
  - ▣ Population becomes stationary; Zero population growth
  - ▣ Many developed countries

# 5 Stages for Demographic Transition

- Stage 5: (Late Expanding)
  - ▣ Birth rates very low
  - ▣ Death rates very low
  - ▣ Birth rates < death rates
  - ▣ Population decline
  - ▣ e.g. Germany and Hungary

# Expected population growth from 1950-2100



Source: United Nations (2011)

# Limitations of Demographic Transition Model



- Migration is not considered in the model

# How do we measure population growth

- Population growth

**Annual growth rate =**

Crude birth rate – Crude death rate

# Annual population growth

**TABLE 5**  
Relation between growth rate and population

Rating	Annual rate of growth %	Number of years required for the population to double in size
Stationary population	No growth	
Slow growth	Less than 0.5	More than 139
Moderate growth	0.5 to 1.0	139-70
Rapid growth	1.0 to 1.5	70-47
Very rapid growth	1.5 to 2.0	47-35
"Explosive" growth	2.0 to 2.5	35-28
-----"	2.5 to 3.0	28-23
-----"	3.0 to 3.5	23-20
-----"	3.5 to 4.0	20-18

Source: Park K. Park's textbook of preventive and social medicine. 23rd Edition. Jabalpur : M/S Banarsidas Bhanot, 2015.



# Where does KSA stand?

- unique cultural and religious norms
- death rates have decreased
- with economic development, women education and empowerment, fertility rates have not declined as fast as expected (lag in demographic transition)
- Result?

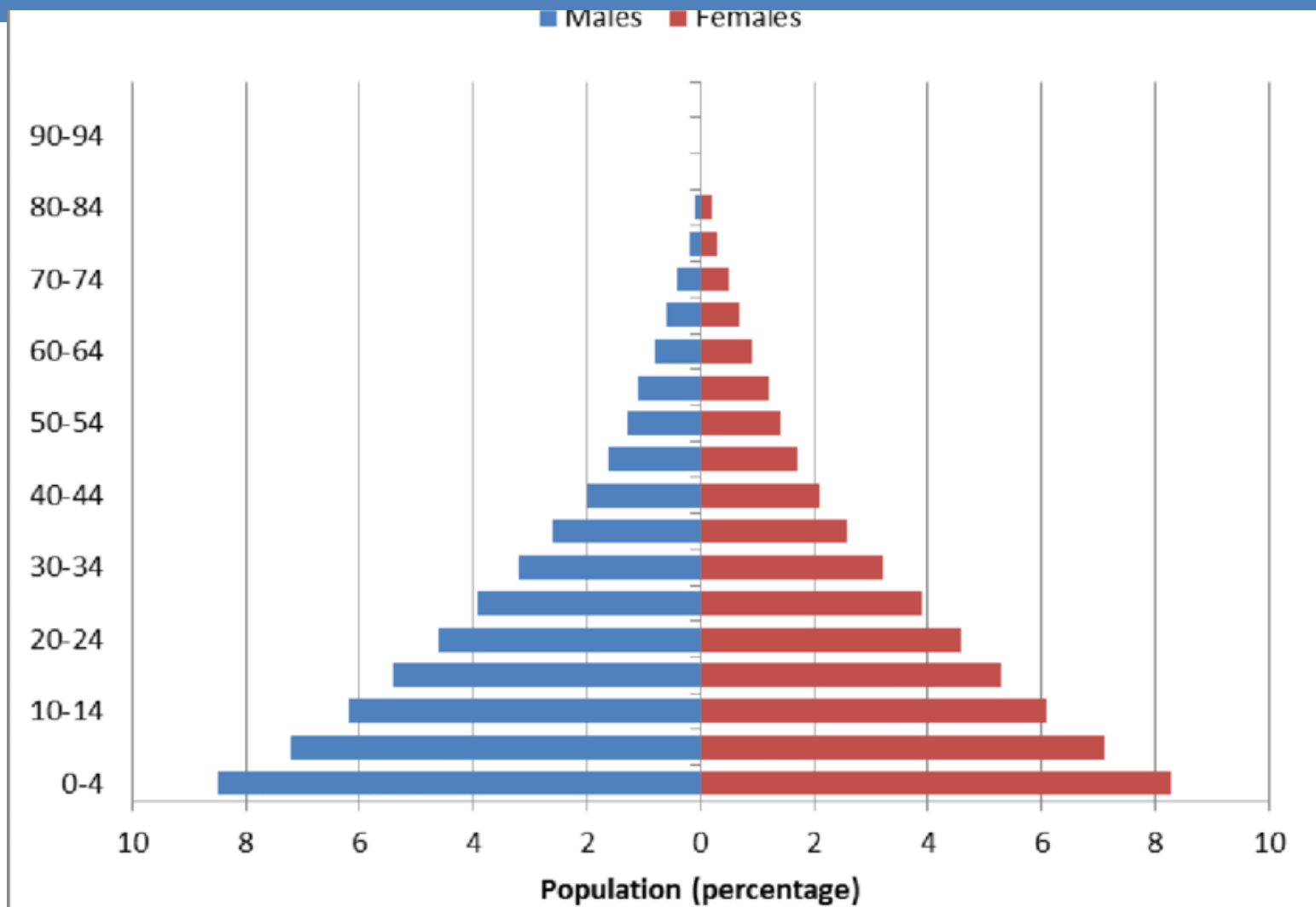


# Population Pyramid

# Population Pyramid

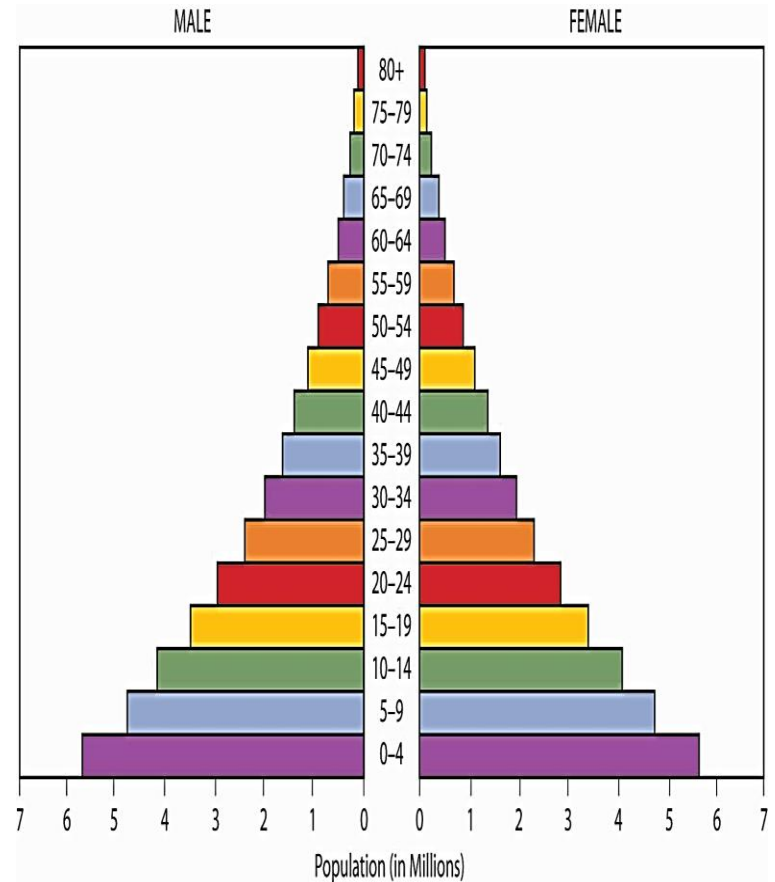
- This shows the age structure in a certain population
- By looking at the shape, you will be able to get an idea about:
  - ▣ Proportion age groups in a population
  - ▣ Male to female ratio

# Example of population pyramid



# Components of population pyramids

- **Base:** wide => high birth rate  
narrow => low birth rate
- **Apex:** old population (retired population) ....wide? narrow?
- **Height:** life span
- **Side:** change in population size due to death or migration



# Important demarcating points

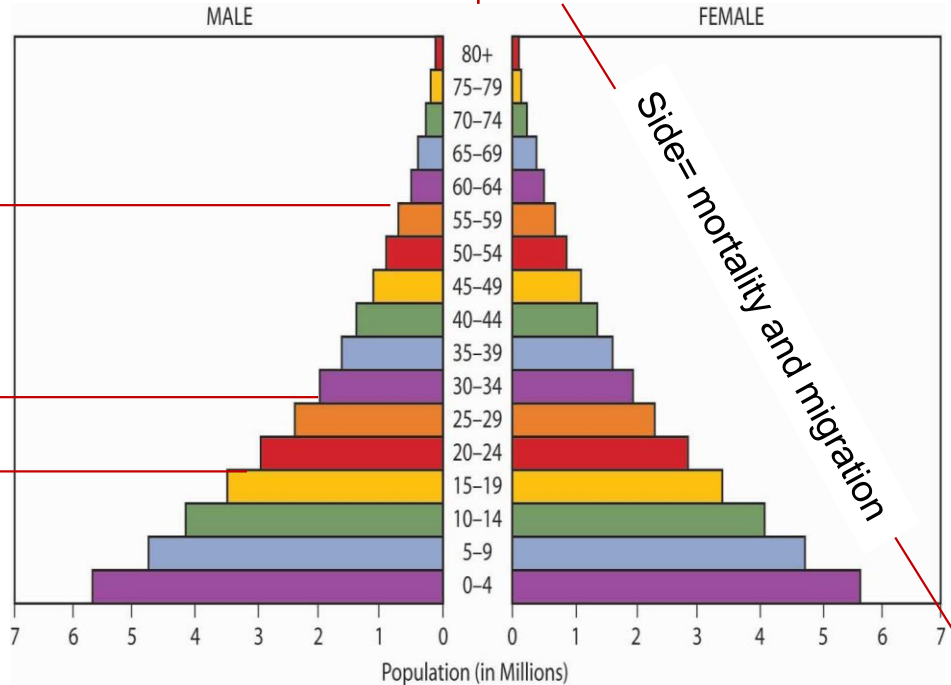
- **Less than 15**
  - Size of dependent youth  $< 15$
  - Large size in rapidly growing population
  - Small size in slowly growing population
  
- **60 + years**
  - Represents the size of dependent old  $\geq 60$
  - Large size in population with longer life span
  - Small size in population with short life span
  
- **Median age**
  - Age that divide the population into two halves
  - Small in population with high births
  - Large in population with low births

Apex= People living to old age

People ≥ 60 years=  
Old dependency

Median age

People < 15 years=  
Young dependency



Base= births

Height= life span

# Types of population pyramids

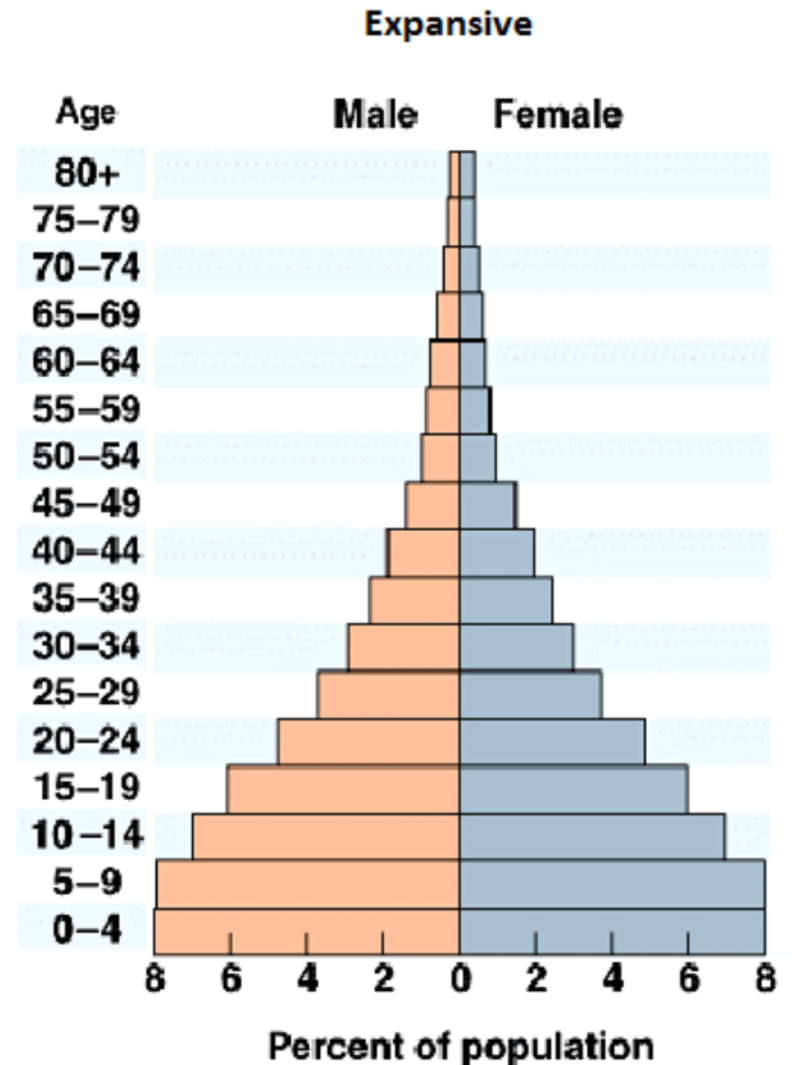
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1. **Expansive**
2. **Stationary**
3. **Constrictive**



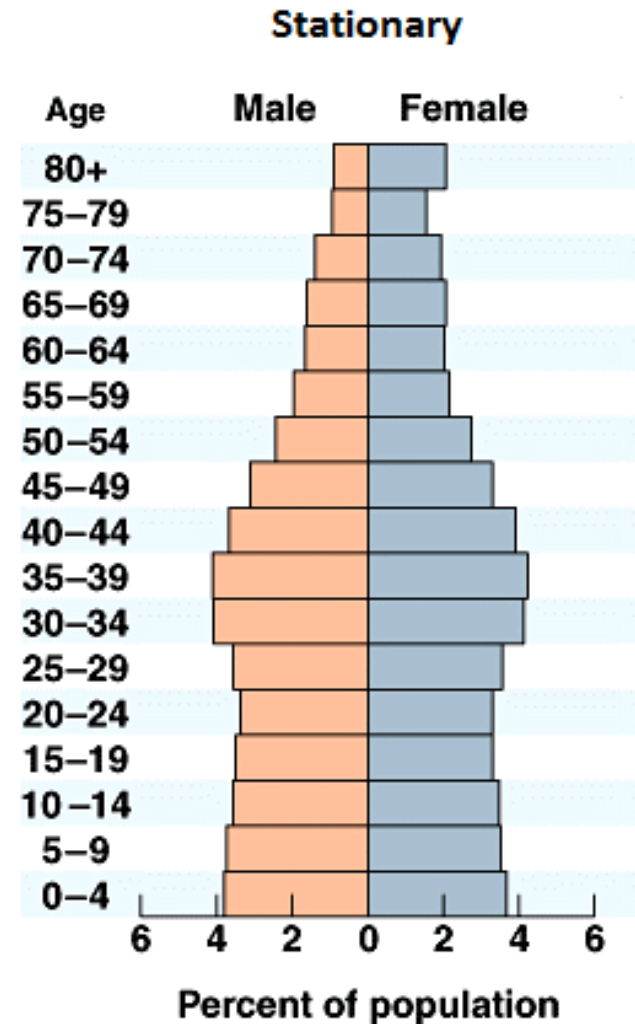
# 1 - Expansive population pyramid

- Expansive or expanding pyramid usually presents itself in the form of triangular shape with concaved edges
- High population growth due to:
  - High birth rate
  - Shorter life expectancy
  - (high death rate)
- Usually associated with lower standard of living



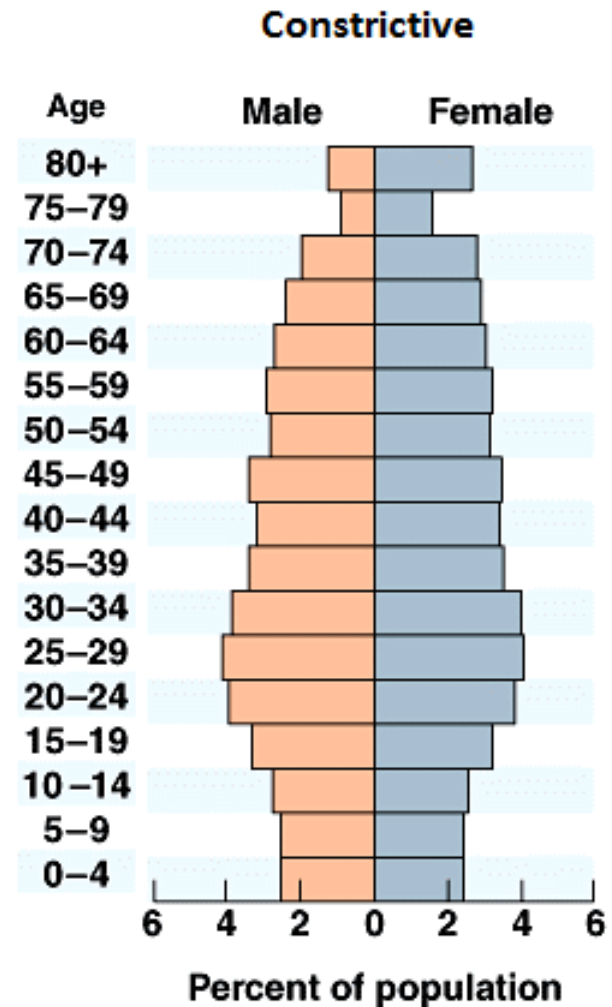
# 2-Stationary population pyramid

- It is showing unchanging pattern of fertility and mortality
- Age groups almost equal, but it is expected to see smaller figures at the oldest age groups

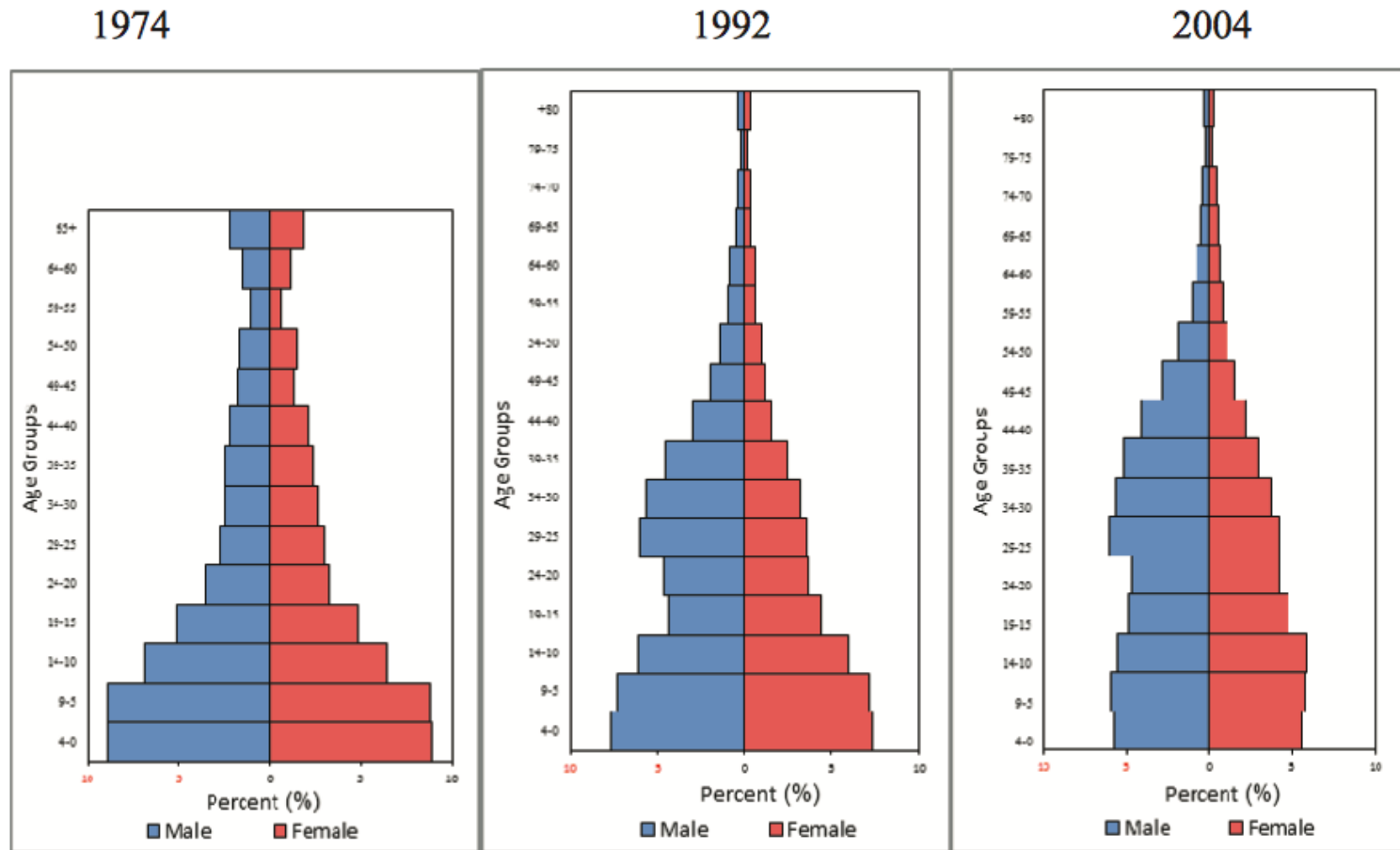


# 3-Constrictive population pyramid

- Narrow base
- Apex wider
- It is more common when immigrants are factored out
- Indicated:
  - High level of education
  - Use of birth control
  - Good health care system



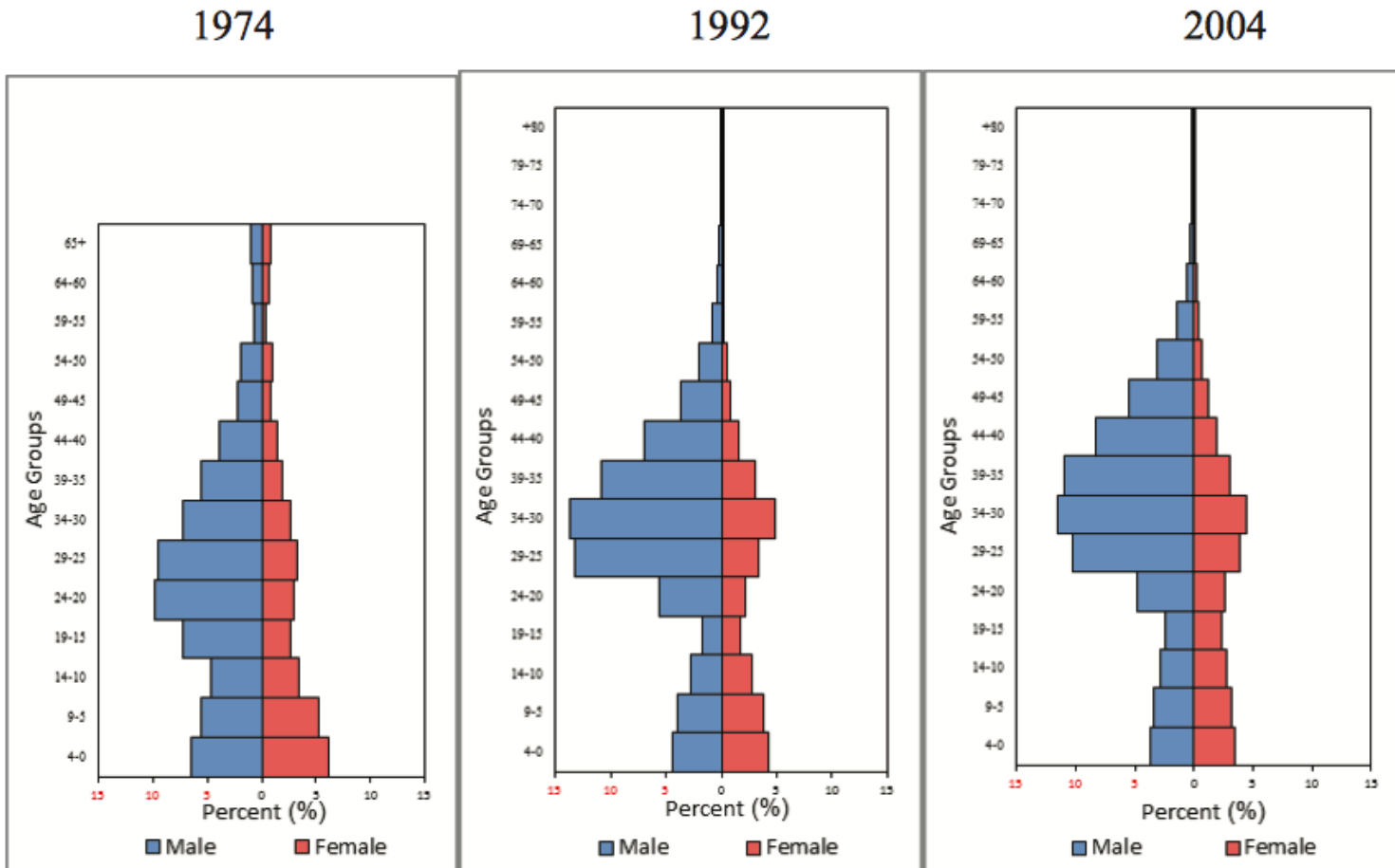
# Population pyramid in Saudi Arabia over the years



**Figure 1.** Age pyramid of total population.

Source: Abu Ashwan M, Abdul Salam A, Mouselhy MA. Population growth, structure and distribution in Saudi Arabia. *Humanities and Social Sciences Review* 2012; 1(4):33-46

# Population pyramid in Saudi Arabia over the years



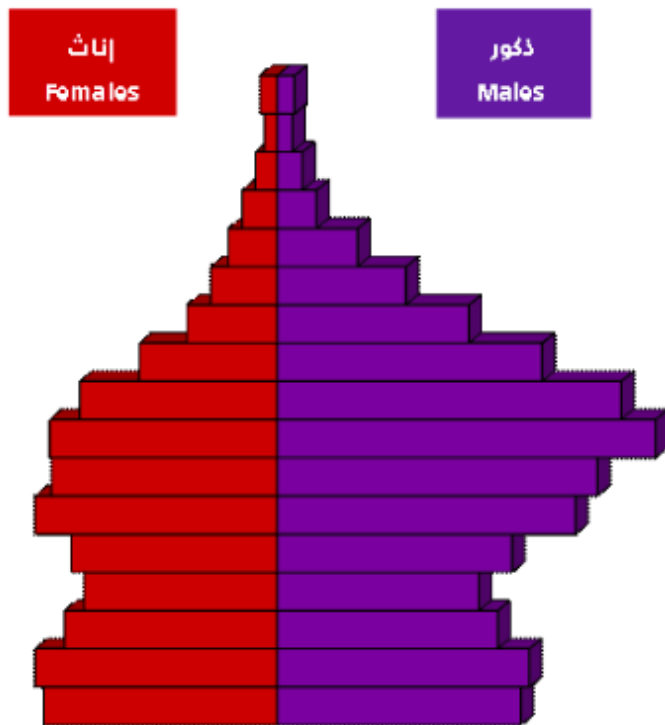
**Figure 3.** Age pyramid of expatriate population .

Source: Abu Ashwan M, Abdul Salam A, Mouselhy MA. Population growth, structure and distribution in Saudi Arabia. *Humanities and Social Sciences Review* 2012; 1(4):33–46

# Most recent KSA population pyramid (2016)

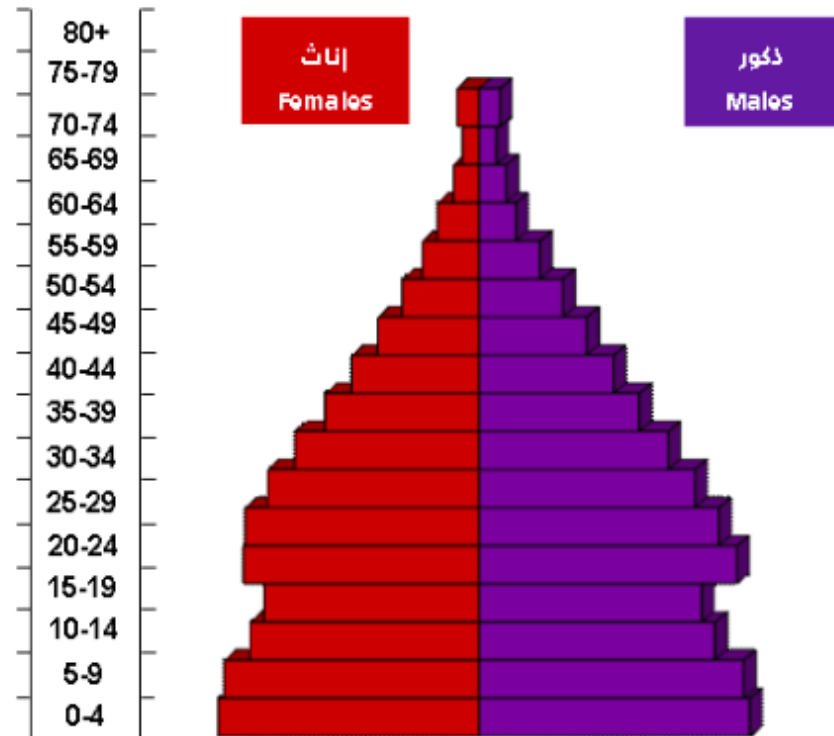
الهرم السكاني لإجمالي السكان

Kingdom's Total Population Pyramid



الهرم السكاني للسكان السعوديين

Saudi Population Pyramid



Source: General Authority for Statistics, 2016

# Other important population distribution measures

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- Sex Ratio

# Other important population distribution measures

## □ Dependency ratio (x 100)

The proportion of persons above 65 years of age and children below 15 years of age are considered to be dependant on the economically productive age group (15-64 years)

## □ Total dependency ratio (x 100)

The ratio of the combined age groups 0-14 years plus 65 years and above to the 15-65 years age group is referred to as the total dependency ratio.



# Population density

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- Total population in a certain region divided by the surface area of that same region



Any

Questions?