Population change and reproduction

Chapter 10

Plan

1. Definition of population reproduction
2. Main indicators of population reproduction
3. Factors that determine the types of reproduction of the population
4. Types of reproduction of the population
5. Reproduction of population
6. Gross and net reproduction ratios

Definition

Reproduction of population

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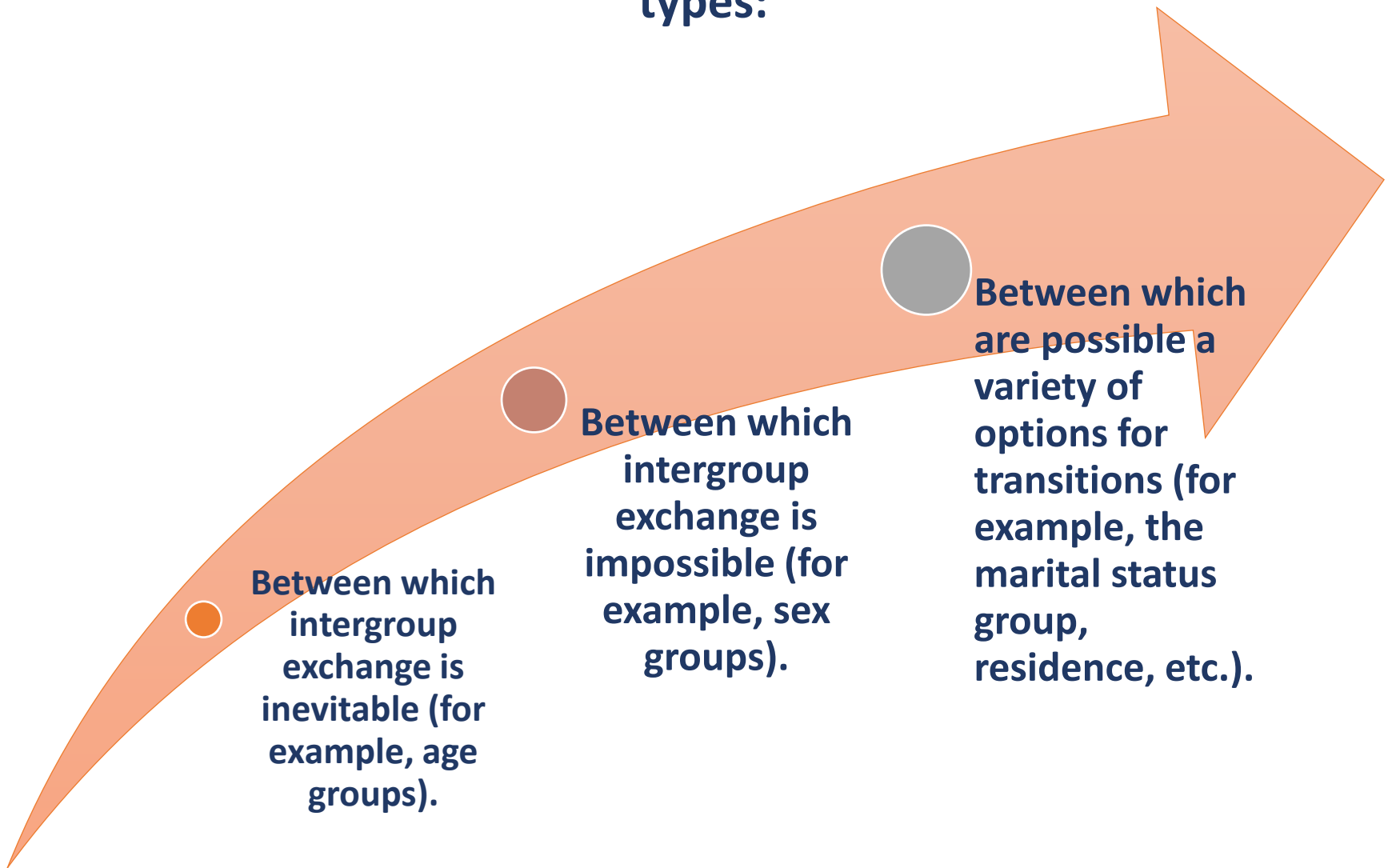
The groups of the population, allocated according to the most diverse characteristics, contribute to the reproduction of the population and to the definition of its type. By the possibilities of intergroup exchange, their (group) can be divided into three types:



The main indicators of population reproduction are:

Total fertility rate

Gross and Net reproduction ratios of the population

Factors that determine the types of reproduction of the population:

1	• the level of development of economic relations and productive forces;
2	• norms, traditions of behavior

three main types of population reproduction

1. Archetype.
2. Traditional (primitive).
3. Modern.

Each type corresponds to the stages (periods) of human development

- The first stage - the periods of gathering (primitive communal system).
- The second stage is the agrarian society (family production).
- The third stage is an industrial society.

Factors determining the archetype of population reproduction:

1

- natural factors;

2

- biological factors.

Three modes of population reproduction:

- an expanded

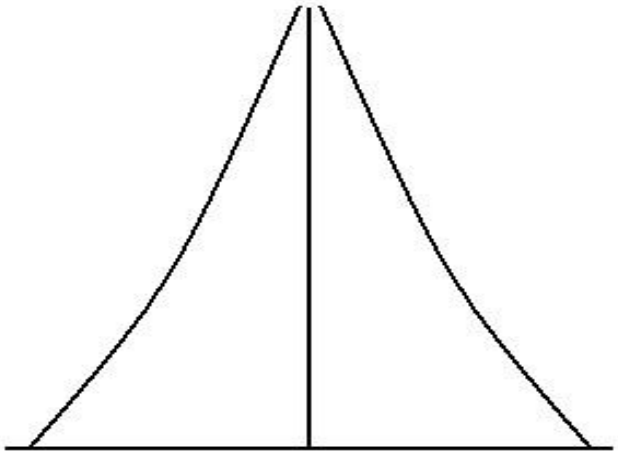
1

- simple

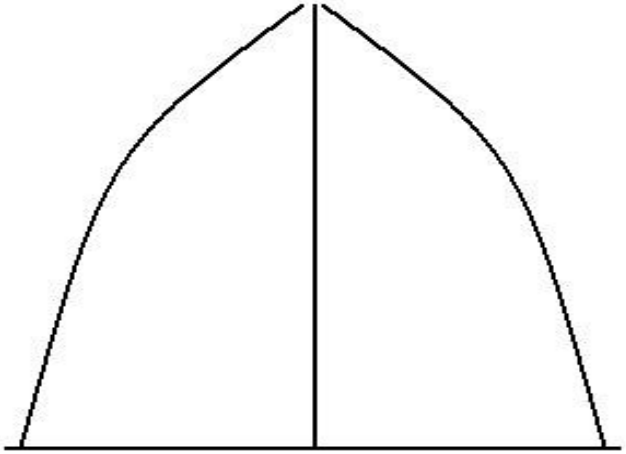
2

- narrowed

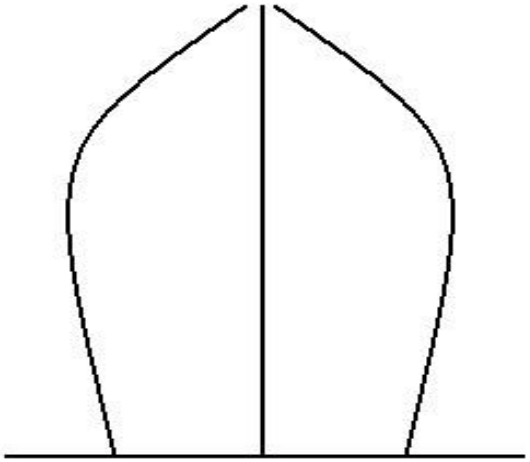
3



Расширенное воспроизводство



Простое воспроизводство



Суженное воспроизводство

Basic concepts characterizing the process of continuous population change

total increase (decrease)

natural increase (decrease)

balance of migration

Population reproduction rates

Gross and net reproduction ratios

Gross and net reproduction ratios

$$R = \Delta \times TFR = \Delta \times \sum_{15}^{49} ASFR_x$$

formula for calculating the gross reproduction rate

$$R = 5\Delta \cdot TFR = 5\Delta \sum_{15}^{49} {}_5ASFR_x \, .$$

Population reproduction rates

Net reproduction rate of population

Net reproduction rate of the population (Boek-Kuchinski coefficient)

$$R_0 = \Delta \sum_{15}^{49} \frac{ASFR_x}{1000} \times \frac{Lx}{l_0}$$

The gross and net reproduction coefficients of the population have a number of characteristics:

- Unlike the coefficient of natural increase, these indicators characterize the change in the population not in a year but in the period during which the parent generation is replaced by the generation of its children.

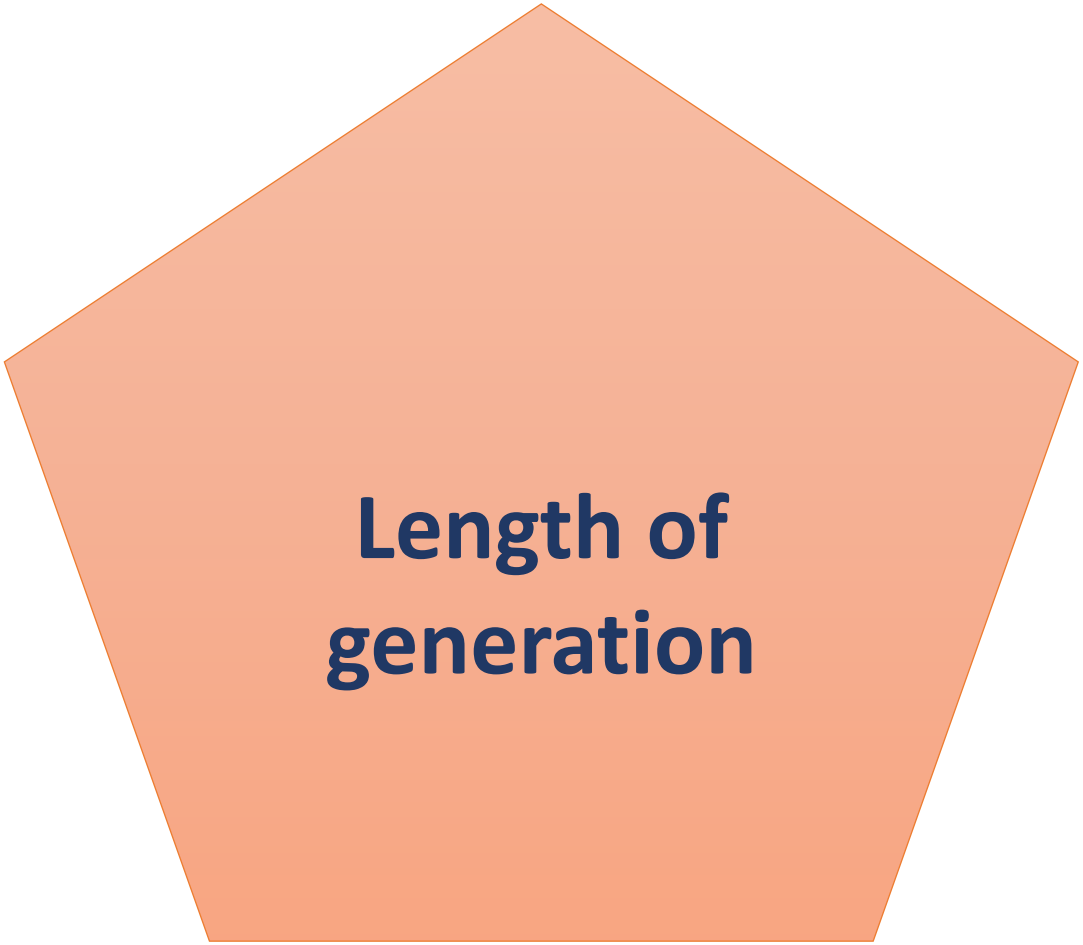
- Since the replacement of generations is characterized by the ratio of birth and death rates, and the latter is significantly different in males and females, rates of population reproduction are calculated separately for each sex, more often for females.

- Usually, this does not take into account the external migration of the population, i.e., the so-called closed population is conventionally not subject to external migration.

An important parameter of the process of population reproduction

length of generation (T)

length of the time interval between the same events in the life of different generations: children and parents;


Length of
generation

Length of generation

$$T = \frac{n\Delta \sum_{15}^{49} (x + 0{,}5n) F_x \frac{n L_x^f}{l_0}}{n\Delta \sum_{15}^{49} F_x \frac{n L_x^f}{l_0}},$$

methods for determining the length of the generation:

The average age of parents is minus the average age of children.

The average age of the parents is minus the average age of the average (younger or older) child.	**The average age of the father is minus the average age of sons (son) - the length of the generation in the male line**	**The average age of the mother is minus the average age of daughters (daughters) - the length of the generation by the female line.**

Length of the female generation

$$T = \frac{n \times \delta \times \sum_{15}^{49} (x + 0{,}5n) F_x \times \frac{{}^{F}L_x}{l_x}}{n \times \delta \times \sum_{15}^{49} F_x \times \frac{{}^{F}L_x}{l_x}},$$

The true coefficient of natural increase

$$R_0 = e^{rT}, \Rightarrow T = \frac{\ln R_0}{r} \text{ и } \Rightarrow r = \frac{\ln R_0}{T}.$$

the nature of replacement of generations (reproduction of the population) is estimated in accordance with the following rule:

Ro	Nature of population reproduction
<1	The narrowed (the number of the "child" generation in Ro times less than the "parent" in a time equal to the length of the generation)
= 1	The simple number (of the "child" generation in a time equal to the length of the generation, remains the same as the number of the "parent" generation)
>1	Expanded (the number of "child" generation in Ro times greater than "parent" in a time equal to the length of the generation)

zero natural population growth at a given level of mortality and the existing age structure:

$$TFR_1 = \frac{GMR}{GBR} \cdot TFR_0,$$

simple reproduction of the population

$$\rho = \frac{R}{R_0}.$$

$$TFR = \frac{\rho}{\Delta}.$$

$$TFR_h = \frac{\rho}{\Delta} = \frac{\frac{R}{R_0}}{\Delta} = \frac{R}{\Delta R_0} = \frac{0{,}6048}{0{,}487 \cdot 0{,}5830} \approx 2{,}13.$$

parameters that determine the reproduction of the population

1

- **birth rate**

2

- **mortality**

change of types of reproduction of the population

demographic transition

Quantitative measure of the reproduction process