Approved by the Order of the Chairman of the Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan

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**Methodology for making population projections**

Chapter 1. General Provisions

1. Methodology for compiling population forecasts (hereinafter - Methodology) refers to the statistical methodology developed in accordance with the [Law](http://adilet.zan.kz/rus/docs/Z100000257_#z0) of the Republic of Kazakhstan dated March 19, 2010 "On State Statistics".
2. This Methodology determines the methods for calculating the forecast population using official statistical data generated within the framework of existing nationwide statistical surveys.
3. The need for demographic forecasting is associated with the tasks of forecasting and planning socio-economic processes in general.
4. The sources of information for making forecasts are administrative data obtained in accordance with the Rules for the provision of administrative data by administrative sources on a gratuitous basis, approved by order and acting Chairman of the Agency of the Republic of Kazakhstan on Statistics dated July 14, 2010 No. 183 (registered in the Register of State Registration of Regulatory Legal Acts No. 6394).

**Chapter 2. Variations and classification of population projections**

1. Population projections, according to the international standards of the United Nations, are carried out in the following options:
2. high (optimistic);
3. middle (the most probable outcome of the event);
4. low (pessimistic).
5. Classification by the length of the forecast horizon:
6. short-term (5–10 years);
7. medium-term (25–30 years);
8. long-term (30–50 years).

**Chapter 3** **Indicators used in forecast calculations**

1. The following indicators are used in forecast calculations:

1) The age-specific fertility rate is expressed in ppm and shows the number of births to women of a certain age. For the lower and upper limits of the reproductive age, 15 years and 49 (44) years are usually taken. Births to women under 15 years of age and to women over 50 (45) years of age are included in the lower and upper limits. Age coefficients are calculated by the formula:

ASFR =(B x /F x ) × 1000,

where:

ASFR - age-specific fertility rates;

B X - the number of births to women of age x years;

F X - the average annual number of women of age x years.

2) For predictive calculations of the size and composition of the population, survival rates calculated on the basis of mortality tables are used. Mortality table indicators:

M x = D x / P x,

where:

M x - the observed mortality rate;

D x - the number of deaths at the age of x years;

P x - the average annual population at the age of x years.

q x = m x / (1+(1- a x ) × m x ),

where:

q x - the probability of dying at the age of x years (in the age range from x to x + 1 years);

m x - age-specific mortality rate in the age range from x to x + n years;

a x - correction factor ( a 0 - 0.3, a 1 - 0.5 ).

p x =1-q x,

where:

p x - the probability for those who survived to the age of x years to live until the next year of age x + 1 years;

q x - the probability of dying at the age of x years (in the age interval from x to x + 1 years).

l o =100000, l x +1 = l x × p x, l x +2 = l x +1 × p x +1 etc.,

where:

l x - the number of people surviving to the age of x years, the initial number of the generation or the root of the table is taken equal to 100,000 people;

p x - the probability for those who survived to the age of x years to live to the next year of age x + 1 years.

d x =lx - lx +1, \_ \_

where:

d x - the number of those dying at the age of x years (in the age range from x to x + 1 years);

l x - the number of people surviving to the age of x years, the initial number of the generation or the root of the table is taken equal to 100,000 people.

L x = l x + a x × d x,

where:

L x - the number of years living at the age of x years (in the age interval from x to x + 1 years);

d x - the number of those dying at the age of x years (in the age range from x to x + 1 years);

l x - the number of people surviving to the age of x years, the initial number of the generation or the root of the table is taken equal to 100,000 people;

a x - correction factor ( a 0 - 0.3, a 1 - 0.5 ).

T x =L x + L x +1 +…+ L w,

where:

T x - the number of people living at the age of x years and older (the number of person-years of life ahead for a given generation);

L x - the number of years living at the age of x years (in the age interval from x to x + 1 years).

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where:

e 0 – average life expectancy at birth;

T 0 - the number of people living at the age of 0 years;

L x - the number of years living at the age of x years (in the age interval from x to x + 1 years);

l 0 - the initial number of the generation or the root of the table is taken equal to 100,000 people.

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where:

e x - the average life expectancy for people who have reached the age of x;

ω - the age limit to which no person lives;

T x - the number of people living at the age of x years and older (the number of person-years of life ahead for a given generation);

L x - the number of years living at the age of x years (in the age interval from x to x + 1 years);

l x - the number of those living to the age of x years.

**Chapter 4** **Basic methods of demographic forecasting**

1. The main method of demographic forecasting is the age shift method or the component method (cohort-component method). Forecasts are made for the closed population (where there is hypothetically no population migration) and for the open population (with population migration).
2. The method of components (cohort-component or the method of shifting ages) makes it possible to obtain not only the total population, but also its sex and age structure. The component method also takes into account age-specific migration rates (arrivals and departures).

The initial size and structure of the population "moves" into the future, decreasing due to the dead and those who left, replenishing due to those born and those who arrived. For the forecast, the initial data are the size and structure of the population obtained from the results of the population census and hypotheses regarding the trends in the reproduction and migration of the population in the forecast period. Predictive calculations are made separately for the female and male populations. The movement is carried out in time steps equal to the length of the age group of the population. At each step of the forecast, the surviving number of the age group moves to the next (oldest) age interval. To do this, the size of each age group of the initial population (the population at the beginning of the forecast period) is multiplied by the coefficient of survival to the next (older) age interval, which is the ratio of two adjacent groups of living numbers L xfrom the mortality tables designed to characterize the estimated trends in mortality in the forecast period.

For each step, a hypothetical number of births is determined and added to the younger age group (adjusted for the probability of surviving newborns to the end of the first age interval). At each next step of the forecast, the entire calculation procedure is repeated. The calculation looks like this:

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Where:

Р x+ n– predicted population at the age of x + n years;

Р x – initial population at the age of x years;

L х and L х+ n – the numbers of those living from the mortality tables for two adjacent age groups;

n – the length of the age interval (and, at the same time, the length of the predictive step);

MC х – the balance of migration of the population of the corresponding sex and age with a positive or negative sign.

1. This procedure is repeated for each year of the forecast period and the population of each age and sex, the total population, general birth and death rates, as well as the rates of general and natural increase are determined.
2. Forecast calculations are made for one-year-olds and for different age groups (5-year-olds or 10-year-olds). The technique of prospective calculations is exactly the same in both cases. The population of both sexes and its age structure is obtained by summing the female and male populations. All forecast parameters of fertility, mortality and migration change for each year or interval of years of the forecast period.
3. The number of babies born is determined by multiplying the number of women aged 15-49 years by the appropriate age-specific fertility rates, based on the projected increase in fertility. The number of babies born to women of the indicated ages is applied in the proportion of 105-107 boys per 100 girls (105-107:100) depending on the regions of the country, this gives the number of boys and girls born. These data are further reduced by the number of infant deaths by the probabilities of mortality under the age of 1 year, taking into account the projected reduction in mortality.
4. As a result of the forecast, the prospective total population, the size and proportion of the population of all sex and age groups are determined.