Long-term Forecasting of the Number of Labor Pensioners in the Region

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Abstract

In the article the methodological foundations of long-term forecasting of the pensioner number, based on the method of advancing age are analyzed. Scientific novelty of the rese arch is an approach to the assessment of the future number of pensioners, taking into account the regional dimension, which allows taking into consideration the territorial features of the socio-economic and demographic development of the Russian Federation. Demographic methods of forecasting, especially mortality tables used in actuarial practice are analyzed. According to the results of the demographic processes' study of a particular region the models of age-specific mortality and table the disposal of the working-age population are constructed which formed the basis of the forecast of the pensioner number by types of pensions up to 2030. According to the study of regional demographic processes the models of age-specific mortality table and disposal of the working population were built, that served as the basis for the development of the forecast number of pensioners by type of retirement pensions until 2030. The age structure of pension recipients for age and gender is developed with five-year cohorts to estimate the potential number of working pensioners. The causes of the future pensioner structure changes are determined. The forecast of the number of old-age pensioners in the total population of the region is represented, if the retirement age is increased. This study allows developing and planning the pension policy to maintain a decent standard of living for pensioners.

Keywords: *methods demographic forecasting, mortality table, table outflow of the working population, the retirement age, actuarial calculations.*

1. Introduction

The population pension coverage is an important indicator of socio-economic situation in the country. Maintaining the decent level of pension payments in the conditions of weak social orientation of the economy requires an adjustment of pension and economic relations, both at the national and regional levels. We note that the development basis of measures to improve the population pension system must be methodologically reasonable forecasts of the population size and structure, including pensioners by types of retirement pensions. Availability of high-quality forecasts of the number of retirement pension recipients is necessary to regional offices of the Pension Fund in the cost planning on the payment of insurance part of labor pension.

2. Methodological Framework

Forecasting the number of retirement pension recipients is based on one of the methods of demographic forecasting:

- *method of advancing age* is based on the using of information about the sex-age structure of the population by age and mortality rates. This method is suitable for the long-term demographic projection development, it

takes into account the gender and age structure of the population, its disadvantage is the lack of consideration of population migration. The application of the method involves the drawing up regional fertility tables, determining the predictive values of age-specific mortality rates;

- *method of extrapolation*, which adopts the assumption of conservation trends of population fertility, mortality, migration during the forecast period. It is based on the use of summarizing performance indicators: the average absolute growth, average growth rate or the average rate of population growth or different growth curves. The application of the method is justified in the development of short and medium-term population projections. Its disadvantage is the lack of information about the demographic structure changing of the population in each forecasted period;
- *method* of *statistical modeling* is based on multiple regression analysis, in which analytical models based on population from a number of factors are built, e.g. socio-economic, environmental ones. Use of this method for developing long-term demographic methods is difficult because of a short retrospective period, which does not allow building high-quality regression model with a sufficient number of explanatory variables;
- *method of reference predicting* or forecasting by analogy has several varieties: comparison with standard tables of mortality, comparison with “the more advanced” populations, comparison with the "optimal" mortality table (Kurkina, 2005).

The information source for the population projection development is the number and gender-age structure of the population, the age-specific fertility rates and mortality rates, age ratios of disability for reasons, population migration; the number and gender-age structure of pensioners by types of pensions. Age-specific mortality rates of pensioners. The sources of information are publications of the Federal state statistics service, the database of the regional branch of the Pension Fund.

Let us consider in more detail the method of advancing age groups. The method of advancing age is to identify the population at the age of *x* "passing" in the forecast period, the age group *x + 1*. The mathematical procedure is as follows:

$S_{x+1}^{t+1} = S_x^t - S_x^t \times q_x + M_x$,

where S_x^t — is the population aged *x* at the beginning of year *t,* q_x — the mortality rate of the population aged *x,* M_x — migration balance of the population aged *x* (Kurkina, 2005).

To determine the number of newborns *(x=0)* age-specific fertility rates *(*f_x*),* the infant mortality rate *(*q_0*),* the number of women of reproductive age *(*$S_x'^t$*)* are used (Kurkina, 2005). :

$S_0^{t+1} = (1 - q_0) \sum_{x=15}^{54} f_x \times S_x'^t$.

The main problem of the method of advancing age groups is the need to determine the predictive values of age-specific mortality rates and fertility rates. It is possible to use the methods of extrapolation, mathematical modeling, multiple regression analysis, the reference prediction for their definition. The choice of a particular method depends on the availability and reliability of demographic information, value of resources available to the researcher. Based on the obtained values regional demographic tables (mortality tables for male and female population, fertility tables), the forecast of the number and demographic population structure of the region are based on.

The method of mathematical modeling is based on the use of the "law of mortality", that is some mathematical function that describes the change in the intensity of mortality and other demographic indicators as functions of age. Theoretical models allow revealing the main regularities of interest to researchers, even in a simplified study of reality. At the same time, some real processes of mortality are fairly well approximated by analytical laws. The advantage of theoretical models is the fact that for them, the probabilistic characteristics of the demographic indicators can be calculated by a small number of parameters. This fact is particularly important when there is limited statistical data. Thus, the prediction by the "law of mortality" is to define its parameters and their subsequent extrapolation to a depth of forecast horizon and the substitution of the forecast values of model parameters age-specific mortality rates in the formula to obtain the values of age-specific mortality rates.

The technology of forecasting by comparing consists of selecting the most suitable system of standard demographic mortality tables. Then the parameters of the selected system are determined for a number of periods in the past and after that, they are extrapolated to obtain predictive values.

The choice of mortality table is an important task for the insurance activities, as the size of tariffs, insurance reserves, and financial stability of the insurer depend on it.

In actuarial practice, mortality tables are usually classified according to several criteria:

- by the length of age intervals: complete and short;
- by the number of signs of data differentiation: aggregative (only for age) and differentiated on several grounds;
- by target population: for men, women and population of both gender;

- on the territorial basis: for the urban and rural population, for the entire country and separately for the regions and cities;
- mortality tables can be displayed separately for various social, professional and ethnic groups;
- according to the period of description: retrospective and perspective;
- depending on the chosen method, there are tables constructed by longitudinal analysis and tables constructed by cross-sectional analysis (Lewis, 1986).

The condition for pension payment at risk insurance is not just reaching retirement age but also other factors, such as disability to determine the amount of insurance premiums are used tables disposal. Tables disposal take into account the termination of the insurance for several reasons. The main condition for the construction of tables' disposal is the independence and mutual exclusiveness of the reasons for the retirement. In the pension insurance, the following factors are taken into account:

- death of the insured person;
- termination of the insurance contract;
- permanent disability (invalidity);
- the retirement age;

Tables disposal are constructed by analogy with the mortality tables using the following standard notation: l_x — the number of insured aged *x*; d_x — is the number of deaths aged *x* years to *x+1* years; w_x — is the number of terminated insurance at the ages of *x* years old to *x+1* years; i_x — the number of retired on disability from age *x* years old to *x+1* years; r_x — the number of retired old age at the ages of *x* years old to *x+1* years. The absolute performance of retirement of the insured are determined on the basis of the respective probabilities of retirement for the reasons: q_x^d — the probability of death of the insured person within one year after reaching the *x* years old; q_x^w — the probability of termination of insurance in the aged from the *x* years old up to *x+1* years old; q_x^i — the probability of retirement for disability from age *x* years old to *x+1* years old; p_x^r — the probability of retirement age from age x years old to *x+1* years old.

For the calculation of the contribution size to pension insurance for a particular person the system of probabilities is used:

- the probability for a person aged *x* years old to stay in the number of insured in n years: ${}_np_x = \frac{l_{x+n}}{l_x}$;
- the probability to drop out from the number of insured for *n* years after reaching age x: ${}_nq_x = 1 - {}_np_x = \frac{l_x - \sum_{j=1}^{n}(d_{x+j}+w_{x+j}+i_{x+j}+r_{x+j})}{l_x}$.
- the probability for a person aged x years to die within a year after *x+m* years: ${}_{m|}q_x = \frac{l_{x+m}}{l_x} \times \frac{d_{x+m}}{l_{x+m}} = \frac{d_{x+m}}{l_x}$.

Modern demographic mortality rates are calculated by using the indirect or demographic, method. This method allows building a table, most adequately reflecting the real situation. In this case, the value of the outcome indicators is not affected by the fluctuations in the number of births and deaths in the years prior to the calculation. Here benchmark is the age-specific mortality rate (disability), which is equivalent to tabular mortality (disability) and based on which all the functions of demographic table are defined (Dzhaksumbaeva, 2012).

The methodological basis of forecasting of the number of pensioners are tables of disposal of the working-age population and private mortality tables for pensioners. Tables disposal characterize the change in the working age population under the influence of a number of factors: disability, mortality, early appointment of old-age pension.

When building tables for the retirement based on retrospective data the following indicators are calculated: the probability of a primary disability before reaching retirement age; the probability of early exit on a labor old-age pension before reaching the statutory retirement age; the probability of death; the expected duration of preservation of working capacity at a certain age.

Regional tables of disposal of the working-age population include the following indicators:

- the probability of primary disability (i_x);
- the probability of retirement pension up to normal retirement age (p_x);
- the probability of death (q_x);
- expectancy preserve disability (e_x).

Based on the tables disposal retirement old-age pensioners and disability pensions are assigned in the current year.

3. Results

In order to select an analytic function that describes the process of extinction of the region's population by age, authors have calculated parameters of analytical models of age-specific mortality rates with the help of MS Excel. The main quality criterion was the coefficient of determination. The study revealed that the distribution of age-specific mortality rates of the population of the Republic of Buryatia corresponds to the Weibull distribution. The model based on the Weibull distribution and the exponential function, which is a special case of the Weibull distribution, allows us to describe not less than 90,0% level changes in age-specific mortality rate male and female population of the Republic of Buryatia at different age intervals between 1990 and 2013.

Analytical expression of models is following (Sayan, Kiraci, 2001):

- $\mu_x = kx^n$ — *power* (Weibull model);
- $\mu_x = ae^{bx}$ - exponential.

Mortality among men aged 18-35 described by the Weibull model, in the older age group 36-70 the variation of mortality based on age and other feature is described by exponential function. Mismatch of patterns of mortality in the young and older age is due to differences in the increment of mortality at different age ranges, from 35 to 36 years old, there has been relatively high-rise in the level of mortality. Mortality among women throughout the given interval is described by the exponential law, but the construction of the model for a single group of 18-70 leads to deterioration of the main characteristics of the quality of the simulation criterion, so it seems appropriate to partition of the interval 18-70 years of age in two age groups: 18-35 and 36-70.

The absolute increase in mortality rates by age among the male population of the Republic of Buryatia at the age of 18-35 decreases with increasing age. For example, the mortality rate in 2013 during the transition from 20 to 21 increased by 0,00024 ‰, from 30 to 31 on 0,00019 ‰, i.e. in the age group of 20-35 years old, the rate of increment in the intensity of mortality is reduced. On the contrary, at the age group of 36-70 with increasing age, the rate of increment of the mortality rate increases, accounting for 41 years old 0,0049 ‰, and in 61 — 0,0138 ‰, i.e. at the age of 41 1000 people die of 4,9 persons more than 40 years old, and 61 years old 13.8 persons more than 60 years old.

The change in the mortality intensity by age of the female population of the Republic of Buryatia is described by the exponential function, and in 2013 at the age of 35, the increment of the mortality force is equal to 0,0011 ‰, at the age of 60 — 0,0063 ‰.

Changes in the development of demographic processes are long term, therefore, it is fair to assume that in the absence of crisis in the economy in the short term, and age-specific mortality rate of the population has the same distribution and is described by a single distribution model. In this case, we can assume that in the short term demographics will be close to a certain constant value, although the study of them in the long run they will certainly show the trend of development. In the absence of trends in mortality rates at age *x* the model parameters are constant.

Thus, we can assume that the parameters of the models between 1990 and 2013, form a sequence of change of the average expected level of which does not depend on the passage of time. To test this hypothesis, we will test the time series of indicators for the presence of trends in their development. The most common testing practices of rows of the presence of trends is the use of statistical testing of hypothesis about the immutability of the trends for a number, i.e. it is necessary to test the sequence for randomness of distribution. For this purpose the cumulative T-test, comparison of average levels of the time series, the Abbe criterion(criterion of squares of successive differences) are used more frequently (Davis, 1997).

Testing confirmed the hypothesis about the absence of trends in the parameters of the models describing the age-specific mortality rate male and female population between 1990 and 2013, which form a stationary time series.

To build age-specific mortality of men aged 18-35 data from 17 age groups over 14 years old (238 observations) and men aged 35-70 years data from 35 age groups over 14 years (490 cases) are used.

Model levels of age-specific mortality rates of the male population of the Republic of Buryatia have the form:

$\hat{\mu}_x = 0{,}00003\, x^{1{,}7441}$, $R^2 = 0{,}929$ at the age of 18-35 (1)

$t_{est}\ (34{,}15)$

$\hat{\mu}_x = 0{,}00194\, e^{0{,}0523\, x}$, $R^2 = 0{,}959$ at the age of 35–70 (2)

$t_{est}\ (46{,}76)$

The model construction of age-specific mortality rates of women was carried out similarly as for men.

Level models of age-specific mortality of the female population of the Republic of Buryatia have the form:

$\hat{\mu}_x = 0{,}00031 e^{0{,}0734\, x}$, $R^2 = 0{,}962$ at the age of 18–35 (3)

$t_{est}\ (37{,}23)$

$\hat{\mu}_x = 0{,}00037\, e^{0{,}0658\,x}$, $R^2 = 0{,}977$ at the age of 35–70 (4)
t_{est} (54,93)

Quality criteria of the models are shown in Table 1.

Table 1. Characteristics of the model adequacy

Statistical characteristic	Model number			
	1	2	3	4
Significance level (α)	0,05	0,05	0,05	0,05
The coefficient of determination (R^2)	0,929	0,959	0,962	0,977
The average error of approximation ($\bar{\delta}$), %	1,626	2,657	1,680	1,768
The observed value of F — Fisher criterion (F_{est})	1631,4	5645,5	1118,6	10305,0
The table value of F- Fisher criterion ($F_{tabl(1;\infty)}$)	3,84	3,84	3,84	3,84
Ttale value of t- Student criterion ($t_{tabl(\infty))}$	1,96	1,96	1,96	1,96

Descriptive quality models, which describe age-specific mortality of the female population of the Republic of Buryatia, higher than models that characterize the age-specific mortality of the male population. Male mortality is more subject to fluctuations depending on the influence of social, economic character than female mortality.

To predict the number of pensioners selective mortality tables are built (Table 2.).

The number of pensioner survivor's pension is determined based on mortality of the working age population, the average number of persons dependent.

Table 2. Table of the working population outflow in the Republic of Buryatia in 2013, men

x	l_x	i_x	p_x	q_x	e_x	*x*	l_x	i_x	p_x	q_x	e_x
16	1000	0,0002	0,0000	0,0036	32,4	**39**	835	0,0040	0,0004	0,0127	15,3
17	996	0,0003	0,0000	0,0038	31,5	**40**	821	0,0045	0,0004	0,0135	14,6
18	992	0,0003	0,0000	0,0041	30,7	**41**	806	0,0049	0,0005	0,0143	13,8
19	988	0,0004	0,0000	0,0043	29,8	**42**	790	0,0054	0,0005	0,0152	13,1
20	983	0,0005	0,0000	0,0046	28,9	**43**	773	0,0059	0,0006	0,0161	12,4
…	…	…	…	…	…	**…**	…	…	…	…	…
34	896	0,0024	0,0002	0,0094	19,1	**55**	484	0,0149	0,0317	0,0330	3,7
35	885	0,0027	0,0002	0,0100	18,3	**56**	446	0,0159	0,0395	0,0350	2,9
36	874	0,0030	0,0002	0,0106	17,6	**57**	406	0,0170	0,0479	0,0372	2,2
37	862	0,0033	0,0003	0,0113	16,8	**58**	364	0,0182	0,0569	0,0395	1,4
38	849	0,0037	0,0003	0,0119	16,0	**59**	322	0,0194	0,9387	0,0419	0,6

The basis for the forecast of the number of pensioners is population forecast by gender and age. As the result of calculations, forecast of the number of recipients of retirement pensions until 2030 is obtained. (Table 3.).

Table 3. Forecast of the number of pensioners in the Republic of Buryatia by the types of pensions up to 2030, thousand people

Indicators	2015	2016	2017	2018	2019	2020	2030
All recipients of retirement pensions, including	238,3	242,7	246,7	250,1	252,7	254,9	265,4
forodage	197,1	201,7	205,8	209,2	211,9	214,2	224,4
fordisability	31,5	31,6	31,6	31,5	31,4	31,3	30,9
onsurvivor	9,7	9,5	9,4	9,3	9,3	9,4	10,1

In 2030 the total number of recipient pensioners will be 265.4 thousand people, in comparison with 2013, the number of pensioners will increase by 44.7 thousand people, including recipients of old-age pensions will grow 33.9 thousand people, recipients of disability pension will increase by 13.2 thousand persons, pensioners survivor benefits will be reduced by 2.4 thousand people. The change in the number of pensioners is due, primarily, the deterioration of the demographic structure of the population. The proportion of recipients of labor pensions in the total population will reach 28.9 % (Figure 1.).

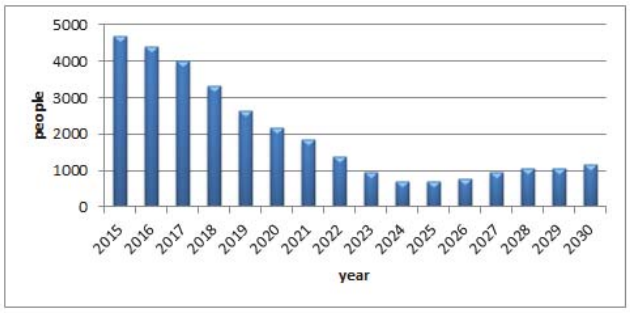

Figure 1. The absolute increase forecast of the number of recipients of labor pensions in the Republic of Buryatia up to 2030

The change in the number of pensioners is due, primarily, to the deterioration of the demographic structure of the population. The growth in the number of pensioners in 2015-2020 is associated with the retirement-age generation, born in the 1960s.

The total number of pensioners is projected to increase the proportion of women. In 2030, the share of women among pensioners will be 74,0 %, including among old-age pensioners — 75.4%, disability — 63,2 %, survivor — 74,8 %. The disparity growth of pensioners by gender negatively affects the degree of implementation of insurance principles of pension insurance, leads to the redistribution of pension rights in favour of women (Table 4.).

Table 4. Forecast of the gender structure of recipients of labor pensions of the Republic of Buryatia up to 2030, %

Indicators	2015	2020	2025	2030
Total recipients of pensions, including	100,0	100,0	100,0	100,0
men	28,3	28,1	27,5	26,0
women	71,7	71,9	72,5	74,0
Total recipients of old-age pensions, including	100,0	100,0	100,0	100,0
men	26,9	26,9	26,3	24,6
women	73,1	73,1	73,7	75,4
Total recipients of disabity pensions, including	100,0	100,0	100,0	100,0
men	36,9	37,1	36,5	36,8
women	63,1	62,9	63,5	63,2
Total pension beneficiaries survivor, including	100,0	100,0	100,0	100,0
men	28,5	26,6	26,4	25,2
women	71,5	73,4	73,6	74,8

The average age of old-age pensioners will be male - 65,7 years old, female — 64,6 years old, retired on disability respectively of 49,6 and 53,7 years old. The mortality rate of retirement pension male recipients is higher than female: the mortality rate of old age pension male recipients is equal to 65,4%, and female — to 34,7 ‰, the mortality rate of disability pension recipients , respectively 141,7 and 89,7 ‰.

Figure 2 presents the age distribution of pension for 2015 and 2030, which illustrates the increase in the number of pensioners aged 65 to 80 years old in 2030 in comparison with 2015.

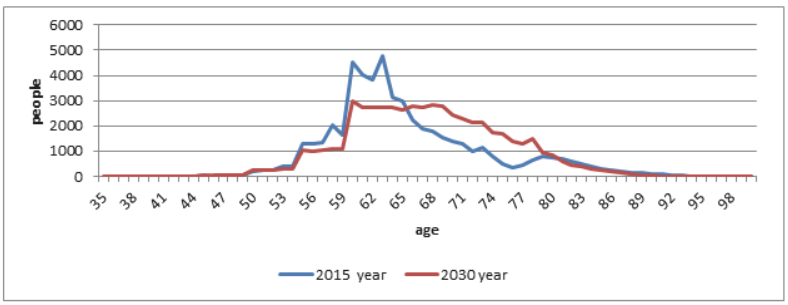

Figure 2. The distribution forecast of recipients of old age pensions in the Republic of Buryatia for 2015 and 2030 (men)

The growth of the average age of pensioners from 64.2 years old in 2015 to 66.1 years old in 2030 is expected because of the transition into older age groups a significant part of pensioners born in the 1960s. The mortality rate of old-age female pensioners in 2015 will account for 35.4%, and in 2030 will be 37.7 ‰. Age structure of disability male and female pensioners is not affected by the change, the average level of disability is the same among the working population, the mortality rate among persons with disabilities is the same too. The values of these parameters depend on patterns of regional production (the share of traumatic types of production), the level of development of the health system. The number of a retirement pension for survivor's pension recipients depends on the level of mortality of working age, the average number of children per family. It is forecasted that gender and age structure of survivor's pension recipients will not undergo significant changes.

Low level of pension payments in the current time, no real prerequisites for substantial increase in short-term and long-term, rise the question to retirees about finding extra income to ensure the decent standard of living. One way of solving this problem is the employment of people of retirement age. Most of the labor activity of pensioners (old-age) is retained in the first 10 years after retirement.

To estimate the potential number of working-age pensioners some groups are identified according the population age:

- the 1st group: men up to 60 years old, women up to 55 years old;
- the 2nd group: men from 60 to 65 years old, women from 55 to 60 years old;
- the 3rd group: men from 65 to 70 years old, women from 60 to 65 years old;
- the 4th group: men over the age of 70, women over the age of 65.

In table 5 the structure of pensioners by age group is shown.

Table 5. Age structure of labor pension's old age recipients in the Republic of Buryatia up to 2030, %

Groupsbyage		2015	2020	2025	2030
Men		100,0	100,0	100,0	100,0
1	up to 60	17,7	13,6	10,6	12,1
2	60–65	38,6	36,0	31,9	25,2
3	65–70	19,8	26,4	26,4	24,9
4	over 70	23,8	24,0	31,0	37,9
Women		100,0	100,0	100,0	100,0
1	up to 55	10,3	7,0	7,4	8,0
2	55–60	30,1	26,5	19,1	20,2
3	60–65	18,6	25,2	23,6	16,9
4	over 65	41,0	41,2	49,9	55,0
Both genders		100,0	100,0	100,0	100,0
1	up to 60	12,3	8,8	8,3	9,0
2	60 — 65	32,4	29,1	22,5	21,4
3	65 — 70	18,9	25,5	24,3	18,8
4	over 70	36,4	36,6	44,9	50,8

Most economically active pensioners are from the 1st and 2nd groups. The decline in the proportion of pensioners in the 1st and 2nd groups is expected, respectively, the growth in the proportion of pensioners 3rd and 4th group is rising. This confirms the need to increase the level of pension benefits, due to the fact that the main share of pensioners (in 2030 the share of pensioners in the 3rd and 4th groups will be 69,6 %) will be unable to continue working due to age features.

The academic and political circles are actively discussing the issue of raising the retirement age for the population. In our view, this measure will temporarily reduce the pension burden, the further deterioration of the age structure of pensioners will negate the positive effect of increasing the retirement age. Table. 6 shows the results of predictive estimate the number of pensioners in the region under the following pension reforms:

- the abolition of early appointment of labor retirement pension:
- raising the women retirement age for 1-5 years.

Table 6. Forecast of the number of the labor old-age pensioners in the Republic of Buryatia up to 2013

The content of changing conditions appointment of old-age pensions	2015	2020	2025	2030
Preserving the terms of old-age pensions appointment	197 093	214 189	219 852	224 376
The abolition of the early appointment of old-age pensions	170 706	194 357	201 361	203 711
Raising the retirement age up to 56 for women	178 413	198 669	207 723	210 454
Raising the retirement age up to 57 for women	169 640	190 995	201 795	203 320
Raising the retirement age up to 58 for women	161 231	182 722	195 768	196 275
Raising the retirement age up to 59 for women	150 999	173 323	189 373	189 934
Raising the retirement age up to 60 for women	144 549	164 675	183 020	183 853

While maintaining the conditions of the appointment of a labour old-age pension number of old-age pensioners in 2015 is 197,1 thousand people, the abolition of early retirement old-age pension will reduce the number of pensioners by 26.4 thousand people. The positive effect of the abolition of early appointment of old-age pensions will be exhausted by 2021 (the number of labor old-age pensioners will be 197.0 thousand. people).

Raising the retirement age for women for a year while maintaining the early retirement will reduce the number of old age pensioners in 2015 to 18.7 thousand people. In 2020, the number of old-age pensioners will reach 198.7 thousand people. Raising the retirement age for women up to 57 years will provide decrease in the forecast number of old-age pensioners by 27.5 thousand people, while the number of retirees in 2022 will reach the level of 197.3 thousand people. Establishment of the retirement age for women at 60 years of age will reduce the number of pensioners by 52.5 thousand people, or more than 26,7% (Fig.3.).

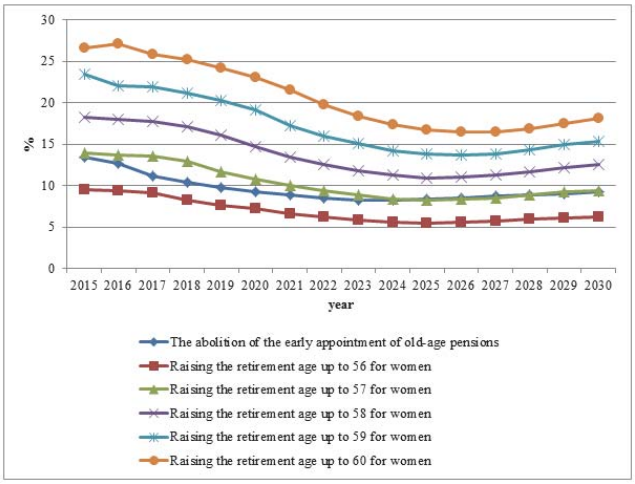

Figure 3. The forecast of change in the number of old-age pensioners in the Republic of Buryatia in 2015-2030

The positive effect of the abolition of early retirement and raising the retirement age for the female population will be most marked in the years of 2015-2020. According to our estimates, by 2030, despite the increase of the retirement age for women up to 60, the number of old-age pensioners in the total population will be 20.08% (Table 7.).

Table 7. The forecast of the labor old-age pensioners in the total population of the Republic of Buryatia up to 2030, %

The content of changing conditions appointment of old-age pensions	2015	2020	2025	2030
Preserving the terms of old-age pensions appointment	20,37	22,33	23,38	24,50
The abolition of the early appointment of old-age pensions	17,64	20,26	21,41	22,25
Raising the retirement age up to 56 for women	18,44	20,71	22,09	22,98
Raising the retirement age up to 57 for women	17,53	19,91	21,46	22,20
Raising the retirement age up to 58 for women	16,66	19,05	20,82	21,44
Raising the retirement age up to 59 for women	15,60	18,07	20,14	20,74
Raising the retirement age up to 60 for women	14,94	17,16	19,46	20,08

While maintaining the conditions of appointment of old-age pensioners share in the total population in 2030 will be 24,5%, the abolition of early retirement will reduce this figure up to 2,.25%, raising the retirement age for the female population under 60 will provide a decline to 20, 08%.

In the region it is expected to increase pension burden on the working population: in 2015, the labor share of pensioners in total population will make up 24,6%, in 2030 — equal to 29,0%. The number of workers per labor pension recipient while maintaining the level and dynamics of the regional economy and the share of informal employment in 2015 is 1,03, in 2030 will be 1,01 (Table 8.).

Table 8. The forecast of pension burden in the Republic of Buryatia up to 2030

Indicators	2015	2020	2025	2030
The share of labor pensioners in the total population, %	24,6	26,6	27,7	29,0
The number of retirees per worker, person	1,03	0,96	0,98	1,01
The size of the insurance premium payment of the insurance part of labor pensions, %	20,0	20,0	20,0	20,0
The wage replacement rate of employment pension, %	40,0*	40,0*	40,0*	40,0*
The level of self-sufficiency of retirement payments in the region, %	51,5	48,0	48,9	50,3
The wage replacement rate of employment pension, % (at the expense of insurance premiums collected in the region)	20,6	19,2	19,6	20,1

* the size of the replacement rate recommended by the ILO (International Labour Organization)

When saving rate of insurance contributions made for the insurance part payment of labor pensions in the amount of 20% and the prescribed regulatory replacement ratio of 40% self-sufficiency of pension benefits (in terms of pensions) in the region in 2015 will amount to 51,5%, in 2030 – 50,3%.

4. Discussions

The proposed methodology allows estimating the absolute abundance and demographic structure of retirement pension recipients for the foreseeable future. The main condition of the forecasting results reliability is the quality of retrospective data, the using of the most appropriate mathematical functions to describe the age-specific ratios, fertility, mortality, disablement for certain categories of the population. The results of the methodology implementation can serve as the basis for the budget planning of the regional branch of the Pension Fund to estimate the expenditure obligations for the insurance part payment of labor pensions.

5. Conclusions

In the Republic of Buryatia there is a high increase in the number of pension recipients associated with the peculiarities of the age and gender structure of the population. An additional factor influencing the number of pensioners, is the early appointment of old-age residents of the territories in the region, the living conditions of which are equated to the Far North. So the average age of a pension for male old age is 56,8, for females – 51,8. At the same time in there is a low level of pension payments in the region. due to the historically agricultural specialization.

The demographic situation in the region has traditionally been characterized as favorable, at the same time, trends of demographic development are similar to trends in Russia: the high mortality rate of working age population, the birth rate, which does not ensure the simple reproduction of the population, intensive ageing of the population. During the period 1993-2006, some peculiarities of the regional population demographic structure had a positive impact on demographic processes, thereby allowing smooth worsening of the demographic situation under the influence of socio-economic upheavals in the society. Now there is a decrease in the positive impact of the population demographic structure caused by the intensive processes of population ageing, the consequences of the demographic crisis of the 1990s. Thus in the Republic of Buryatia, the main factor of causing changes in population, including pension recipients is a change in the demographic structure of the population.

The using of shifting age group methods, the construction of demographic tables for the regional population has allowed to develop a long-term forecast of the number and structure of population, as well as labor pension recipients. Thus, in the Republic of Buryatia it is expected that in 2030 the forecast population of the region will be 918,2 thousand people, including men - 46,5%, women - 53.5%. The reducing of the proportion of working age people to 57,7% is expected (in 2013 the proportion of working-age population was 60,0%), persons under working age – 22,3% (21,2%)

and the increasing of number of people older than working age – 21,5% (17,7%). According to forecasts there will be the increase in the absolute number of pensioners who in 2030 will amount to one-third of the region's population. This reduction of the working age population, the problem of maintaining their standard of living will lead to more active participation of pensioners in the labour market. However, it is predicted that in 2030 the proportion of persons aged over 70 in the total number of pensioners will make up more than half. Thus, the identified trends of demographic development, justify the need to build an effective pension system, capable of providing a decent standard of living for pensioners.

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