UDC 314.02

Ye. Kh. Tukhtarova, A. I. Kuzmin, N. P. Neklyudova
Institute of Economics of the Ural Branch of RAS (Ekaterinburg, Russian Federation; e-mail: tyevgeniya@yandex.ru)

THE SOCIO-CULTURAL FACTORS OF SURVIVAL FOR MEN AND WOMEN OF ECONOMICALLY ACTIVE AGE: REGIONAL ANALYSIS

The period of starting and ending a professional career or labor activity generally matches the age when the self-preservation behavior develops. It is a time when a person aims for a healthy and safe lifestyle. During this period, an individual assumes the main standards, values of the self-preservation behavior inherent in an ethnic, social and cultural macro-environment. To research the socio-cultural factors of survival, the authors applied the econometric modeling of demographic processes based on discrete and probabilistic indicators of mortality tables within the boundaries of the economically active ages for men and women. The econometric model included the elements of temporal and spatial characteristics of the territories in terms of relationship between the indicators of survival probability and life expectancy in the regions of Russia. The main socio-cultural factors were selected based on the strength of relationship between the variables and their sensitivity (by assessing the coefficients of the econometric model) to insignificant and a significant change in the composition of the source data. The most significant socio-economic factors, which determine the self-preservation behaviour of males are the following: 1) the size of Gross Regional Product per capita; 2) state of the health care infrastructure; 3) investments in fixed assets; 4) population with monetary income below the subsistence minimum (share coefficient of income differentials). In women, the hierarchy of socio-economic factors is the same, except for the sensitivity of variables to regional differentiation of characteristics. The difference is that for women, the low-income factors turned out to be insignificant. Overall, the model demonstrated its forecasting value for the assessment of the above factors in the short and medium term.

Keywords: population census, generation, cohort, economically active age, mortality tables, probability of survival, econometric models, demographic transition, culture of self-preservation behavior, personality values, region, healthy lifestyle, infant mortality, premature mortality, cohort analysis

Introduction

The transition to democratic reforms and, as a result, the long-running modernization of the Russian society were marked by the trends of long-term and steady decline of the population in Russia. In 1992–2010, Russia lost about 13 million people due to natural population decrease (the difference between the number of births and deaths). The subsequent improvement in the demographic situation as a result of actively pursued pro-natalist policy and innovations in the health care system has reduced the scale of natural population decrease by almost four and a half times. The growth of the total birth rate, i.e. the average number of children born per woman of notional generation, was markedly improved from 1.3 in 2006 to 1.77 in 2016.[1] However, by the end of 2017, it became clear that the overall birth rate in Russia significantly declined, which prompted the Russian Government to strengthen measures of pro-natalist policy with regard to maternal (family) capital, and the amount of pregnancy and maternity benefits. But the total birth rate is going down. At the same time, most Russian regions failed to achieve the life expectancy target of 75 years [1]. The decrease of the reproductive contingent in 2017 relaunched the processes of depopulation in the demographic system of the Russian Federation, which allowed to identify the alarming factors aggravating the impact of mortality on the demographic potential in most regions. The spending on health care programs, including those aimed at reducing the infant and maternal mortality, has been impressive. In 2003–2016, the life expectancy increased by 7.8 years and reached 72.6 years. However, in 2008–2016, the increase was only 4.6 years[2]. The President of the Russian Federation instructed the Ministry of Economic Development to bring the life expectancy in Russia to 74 years by 2018. At the same time, for example, in the Pskov region (marked

[1] Poslanie Prezidenta Federal'nomu Sobraniyu 12 dekabrya 2017 goda. 13:15 [The President's Address to the Federal Assembly December 12, 2017, 13:15]. Moscow, Kremlin. Retrieved from: http://kremlin.ru/transcripts/19825/work (date of access: 7/3/2017). (In Russ.)

[2] Rost prodolzhitelnosti zhizni v Rossii priznali neustoychivoy tendentsiyey [The increase in life expectancy in Russia was recognized as fragile]. RBC. Retrieved from: http://www.rbc.ru/economics/18/05/2016/573c991c9a794791383853a5 (date of access: 7/3/2017). (In Russ.)

by a significant outflow of young people and the "core of the labor force" abroad and to neighboring megacities), the average life expectancy does not exceed 66 years. Therefore, the positive effect of active demographic policy and the reduction of infant mortality did not allow to increase the viability of the Russian population and to sustain the extended reproduction of generations.

Nevertheless, the further growth of the vital potential of the population in Russia faces a problem that is no longer related to the capabilities of medicine and healthcare, but is associated with the low culture of self-preservation behavior of Russian people [2].

In the context of studying this problem, it is necessary to address the issue of selecting the methods for statistical measurement of the development level with regard to the self-preservation behavior (SPB) of men and women in the Russian regions with a huge territory and quite complex ethnic structure of the population.

In our opinion, in addition to sociological indicators (subjective assessments of life expectancy, motives to live the individual life path, survival rate, etc.), a substantial socio-cultural and economic role is played by the tools used for demographic assessment of the probability of survival for men and women in economically active ages based on mortality tables in the subjects of the Russian Federation. Currently, the Russian Federal State Statistics Service (Rosstat) fully ensures this ability by taking into account the differentiation of urban and rural areas. In addition to a large amount of state medical statistics, it is important to consider the results of All-Russia micro-census conducted in 2015.

Hypothesis of the Study

The goal of the study is to provide an in-depth analysis of the ratio of survival in youth and older age groups in the regional context. The scope of the study is the spatial processes of survival in men and women in economically active ages.

The authors suggest that the used ratios for the numbers of those who survive from the beginning to the end of the working age (according to the mortality tables) may be interpreted as the data describing the existing level of culture of self-preservation behavior inherent to the population of a particular region, krai, republic, or metropolis of Russia. The hypothesis of the study is the assumption that there is a substantial regional differentiation of SPB forms under the impact of socio-cultural and economic factors.

It is important to recognize that, by the beginning of the working age (economically active age, in a case of international comparisons) and subject to successful socialization, the formation of basic self-preservation attitudes in young generations for a safe, active, and healthy lifestyle is completed in general. By the age of 15–18, young generations complete the formation of not only reproductive, but also self-preservation attitudes, which in the overwhelming majority of cases are only slightly adjusted in the subsequent life. The same age is marked by the start of the mass engagement in the labor relations and economic activities. Therefore, the period of beginning and ending the professional career or labor activity generally matches the period of more active employment, addressing the reproductive objectives, building a family, and maintaining the values of a healthy, safe, and full-fledged existence of individuals and their immediate social environment. This period is marked by laying down the basic norms and values of self-preservation behavior, which is inherent to a particular social and cultural macro environment (territory). The estimates of the probability of survival both in the working-age period and economically active period of life on the basis of the full tables of mortality [3, pp. 20–37], including those compiled annually by Rosstat, reflect the territorial differentiation of characteristics and the level of culture of mass SPB in a particular region (subregion). These estimates complement the picture of socio-demographic differentiation in vital attitudes obtained during a specific sample of conducted sociological studies, this time, at the macro level, including the differences between the countries. In addition, the effective combination of demographic statistics methods with the capabilities of modern econometric analysis allows not only to identify and assess specific factors, but also to forecast the further development of the situation in Russia.

1. Theoretical Review

In modern Russian science of population and demography economics, there are virtually no works providing the detailed socio-economic analysis of factors that contribute to the trend towards the "transformation of self-preservation behavior" amid the "health transition" (the mass transition of people to new standards of self-preservation behavior).

Translation

The concept of "gradual spread of healthy lifestyle among different groups of the population" fits quite organically into the model of demographic transition presented in the works of John Caldwell [4]. However, in scientific discussions, the problem is usually examined at the level of typical arguments about the dangers of alcoholism, smoking, and other problems of health preservation [5]. In our view, combining the concepts of "health transition" and historical modifications of the demographic transition (the third and even the fourth demographic transition) requires a separate in-depth methodological study. In particular, there is an issue of the impact made by migration on morbidity and mortality of the population, the reproduction of which proceeds, for example, during the third demographic transition.

It should be recognized that the Russian science does not study the problems of the mass transition of people to new standards of self-preservation behavior. Fundamentally, the concept of the demographic behavior does not contradict the ideas of "sociology of human reproduction" developed by K. Davis. At the micro level, the development occurred primarily in the studies of reproductive behavior, while the research of SPB is advancing with great difficulty, given a large number of medical works with clearly clinical aspects of measurement.

A particular role in studying the problems of SPB in the Soviet Union and modern Russia was played by the works of L.E. Darsky. He was one of the first who managed to correctly formulate the problem and design the first effective indicators for measuring SPB [6].

We should also note that in 2013, N.M. Rimashevskaya and N.E. Rusanova wrote a review paper on the significance of public health "as the main qualitative characteristic of human potential," where they once again recognized not only the importance of longevity, "but also the ability of a person to maintain the working capacity and the very desire to live as he ages." The article also draws attention to the importance of studying the characteristics of SPB in specific socio-demographic groups [7].

In their book "The Vanishing World Power," S. Zakharov and his German colleagues provided an extensive review of mortality problems in the Federal Districts and the CIS. They proposed a detailed clustering for demographic processes in Russia in their regional aspect. The decline of life expectancy was registered in the period of transition to market relations in regions with a high share of the ethnic Russian population, including under the impact of alcoholism factor [8, p. 55, 26].

There are papers that examine the specifics of SPB during wars and social upheavals. For example, in her article, M. Yusupova made an attempt to consider the health and SPB of respondents, who lived through the first and second "Chechen" wars [9, p. 77].

A fairly strong hypothesis on the causes behind the inconsistency of the SPB demonstrated by the population in Russia is the assumption about the influence exercised by the structure of personal life strategies on SPB and, in principle, on all lines of demographic behavior. An inherent feature of self-preservation behavior is a personal motivation that can be both vital and aimed at viability or autoagressive. A.I. Antonov, one of the first researchers of SPB in Russia, noted that, according to mass sociological surveys, a quarter of respondents did not want to "live long" because they feared serious diseases and suffering (a survey of 1,500 citizens was conducted in the 1980s); and today the surveys on the survival prospects of respondents to retirement age reveal the same results. [10, pp. 725–726]

He expressed his point of view on the concept of SPB as early as in 1997 in connection with the definition, in the methodological context, of the concept of "family self-preservation function" as an activity aimed at maintaining a safe, healthy and full-fledged existence of family members and family as a group in general [11, p. 29]. In this case, he identified constructive and destructive types of behavior. Rosstat planned to conduct similar surveys on a regular basis. Some questions on reproductive behavior and SPB in the regions and major cities of Russia were used during All-Russia census 2015.

In his work [12], A. Fenelon analyzed the divergence (sustainable expression of diversity signs) of mortality processes in various territories of the United States. In particular, the researcher provided the econometric analysis of population losses from "cigarette smoking," a factor that is usually taken into consideration in such cases, and painted a picture of juvenile mortality from this "bad habit." Teenagers know about the dangers of cigarette smoking, but abuse it, which creates the basis for addiction and "smoking" lifestyle among young men and women [12, p. 619].

We should note that currently, the econometric models are used primarily for the studies of migration forms in self-preservation behavior [13, p. 61]. The interpretation of macro-demographic factors affecting the probability of survival described in the monograph of C. Vandeschrick is close to our own position [14, p. 14–15].

Translation

A set of macro indicators to analyze the survivals may have a socio-political aspect. For example, in her study of the mortality belt in Belarus, Russia, Ukraine, Yuka Minagawa used econometric models describing the relationship between the life expectancy and GDP in the former Soviet Union and in Eastern Europe [15]. The factors identified by Y. Minagawa had not only economic, but also socio-political nature. The studied macro factors included the extent of corruption in society, economic freedom, press freedom, terrorist threat, share of the prison population, per capita GDP, and morbidity. As a result, the article presented a picture of spatial clustering in Eastern Europe by the level of a health condition in connection with the adjusted life expectancy of men and women aged 20–74 years old, which Yuka Minagawa qualified as partial Healthy Life Expectancy, HLE. On 2008 spatial map, Russia held a place in the lower left corner of the diagram square with the lowest rates in Western and Eastern Europe for both men and women [15].

One of the large-scale projects implemented by the state authorities (Rosstat, Ministry of Health and Social Development, Russian Sports Agency, and the Institute of Social Research) was a study of socio-cultural and economic factors in SPB of population in 24 subjects of the Russian Federation conducted in 2008 [17, pp. 290–349]. Later, L.L. Rybakovsky and A.E. Ivanov repeated this attempt on a smaller sample and reduced the number of indices and indicators. The results revealed the attitude to the health as a vital value, orientation towards life expectancy and supplemented the picture with regard to the prevalence of "bad habits." The study confirmed the validity of scientific hypothesis on the contradictory attitude displayed by the majority of the population towards their health and behavioral factors for supporting it based on the "values and anti-values" of SPB.

The impact of education level on the level of population's health, mortality and birth rates were examined on the basis of the meta-analytical model (according to the works by Evelyn Kitagawa) in the collective paper written by D. Baker et al. [18, pp. 314–316, 322–326].

We also should mention the work of A.G. Zlotnikov, a Belarusian scientist who used the input-output model to demonstrate the multi-channel impact of socio-economic factors on the models of demographic development. [19].

2. Research Methods

To assess the impact of socio-economic factors on SPB indicators of the population in economically active age, we developed a methodological toolkit, including a system of indicators and methodology for their analysis. The system of indicators is based on separate blocks, which were further systematically modeled on the basis of correlation and regression analysis by using the panel data.

The applied study of self-protection (preventive) behavior was conducted by A.I. Kuzmin in the second half of the 1980s mainly on materials provided by the selective sociological studies including the questions asked from respondents on standard and expected the duration of life and motivation for the duration of life in Ekaterinburg, the cities of Khanty-Mansi Autonomous District — Yugra (Megion, Nizhnevartovsk, Yugorsk). This period was marked by the publication of three monographs and a number of articles and reports on socio-cultural factors in SPB.

In 2013–2015, the indices and indicators of expected and standard life expectancy, well-being, health and safety values were included in the program of a mass survey of residents in the border areas of the Ural Federal District and Sverdlovsk region (grant of the Russian Foundation for Humanities No. 13–33–028 "The Socio-Cultural Factors and Motives of Shuttle Migration in Border Areas of Russia"). The research involved the interviews with 1,160 people, and the sample was optimized by using Vortex 10, a licensed computer application suite, to 800 questionnaires. The use of Vortex allowed to build a multidimensional model of socio-cultural factors of life expectancy expected by the migrants at the micro level.

The average score for the value of health was 8.26, while the deprivation ratio was 0.61. Given the deprivation ratio, the health of respondents is mostly affected by the desire for financial well-being, success, the value of the family, support of parents (relatives), quality of consumed goods and services. The structure of self-preservation motives is topped by the desire to remain with family and loved ones for as long as possible, a factor of professional success, career, desire to share the life experience with grandchildren, desire to live in order to learn "what will happen next" (cognitive motive).

According to Cramer's coefficient, the top five basic factors in the assessment of "the opportunity to live in a healthy environment" include the desire of respondents for financial and spiritual well-being, consumption of high-quality goods and services, family circle, support of parents, and full-fledged

leisure time. The same can be observed when weighing the factors on a ten-point scale. In this case, the average score for the health value reaches 8.26, while the financial well-being is viewed significantly higher at 9.9; for success, the score is 9.17; for opportunity to live in a healthy environment, 8.71; for family, support of parents, 8.65; for quality of goods and services, 8.29; for full-fledged leisure time, 8.11. The personal security does not feature in this group of factors. For respondents, the value of security correlates primarily with the importance of selecting the place of residence or place of migration. This fact is very important for the econometric analysis of macroeconomic factors for survival of men and women in economically active ages, as it is provided in this article.

To interpret the self-preservation behavior at the macro level, we propose to use the mortality tables prepared by Rosstat. It should be noted that the mortality tables compiled by the state statistics authorities to describe the rural population in a number of sparsely populated regions are not always valid. This applies to the source data for calculating the average life expectancy.

As the indicator of SPB at the macro level, we selected the calculated probability of survival in economically active age (15–72 years old). We considered the boundaries for both the working age and economically active age (according to ILO requirements)[3].

The use of panel data allowed to address the problem of short time series for demographic and socio-economic indicators of Russian regions. The problem of short time series is also supplemented by the fact that the method of calculating specific indicators may change and, therefore, there is another problem of not being able to compare the same indicator.

Another advantage of using the panel data is the ability to study the socio-economic processes in Russia and identify a set of regions with positive or negative characteristics. The disadvantages of this approach include the difficulty of preparing short-and long-term forecasts. However, in our study, we do not aim at making long-term forecast scenarios for the development of self-preservation behavior in economically active age.

Our analysis is based on the assessment of the probability of survival in the economically active age for men and women, which allows to estimate the level of SPB culture in the regions, which differs significantly from the region to the region, as demonstrated by our study. The novelty of this study lies in the fact that we considered the indicators of the probability of survival for men and women in economically active age. This allowed us to assess the level of SPB culture in the regions, i.e. to estimate the attitude of the population towards the preservation of its own health. SPB is a calculated indicator and can be determined by using the following formula:

$$l_x = l_j / l_i, \quad (1)$$

where l_x is the index of self-preservation behavior for men and women of a particular region in economically active age; l_j is the number of people living to the end threshold of economically active age (72 years old); l_i is the start of economically active age (15 years old). The threshold criteria for determining the age of economically active population are based on ILO methodology.

The macro indicators of socio-economic development are grouped into thematic blocks, including the morbidity block, health block, macroeconomic block, and well-being block. The indicators included in the different blocks are interrelated and sensitive to each other (Table 1). For example, the indicators of population well-being, health care, and demography are sensitive to changes in macroeconomic indicators. As a result, the increase of inflation in Russia triggers a chain of negative effects—the decline of household incomes and national budget revenue imposes restrictions on the national budget, which restricts the opportunities for financing the social sphere, including the health care system, and these effects subsequently make an impact on demographic indicators. Ultimately, this chain of macroeconomic variables ends up with constructed indicators describing the probability of population survival.

Table 1

The statistical indicators used for different blocks

Block	Statistical indicator

[3] International Labour Standards. Labour standards. Retrieved from: /http://www.ilo.org/global/standards/lang--en/index.htm (date of access: 9/4/2017).

Macroeconomic block	*GRP* per capita; consumer price index (CPI, inflation rate); purchasing power of wages in the region; investment attractiveness of the region.
Well-being block	Subsistence minimum; share of population with income below the subsistence minimum in total population; share of household expenditures on housing and utility services, cost per sq. m. of total living area; share of people with secondary special and higher education in total adult population.
Health care and morbidity block	Number of doctors per 10 thousand people; number of hospital beds per 10 thousand people; morbidity per 1,000 people; dynamics in the number of medical and health restoration institutions.
Demography block	Nuptiality and divorce rate; number of abortions per 1,000 women of childbearing age; life expectancy; viability and probability of survival in economically active age.

As a working hypothesis, we assumed the existence of direct or feedback relationship between the exogenous and endogenous factors:

$$y = a + \Sigma b_i x_i, \quad (2)$$

where '*y*' is endogenous (dependent) variable; '*x*' represents various factors from the described blocks; '*a*' and '*b*' are parameters of equations; '*i*' is the argument; '*a*' is the constant; '*b*' is the coefficient of elasticity for a particular factor (variable).

Since the considered factors are expressed in different units of measurement, all indicators were logarithmed in order to make them comparable.

3. Results of the Study

The preliminary analysis of demographic indicators allowed to build the rankings of the worst and best regions for men and women. At the same time, the analysis revealed that, in the same region, the level of SPB culture of men and women may strongly differ. For example, the probability of survival to 72 years is extremely low for men in the Northern regions, including the Jewish Autonomous District, the Tyva Republic, Amur region, and other, as well as the depressed regions in the North-Western Federal District (Table 2). For women, the worst areas for a living are only the Northern territories with their severe climate. All this allows to assume that the well-being of men is more likely to be affected by factors of personal self-realization rather than the climate in their residence area, while the health of women is more influenced by the living conditions. At the same time, the study showed that women in depressed regions can survive with a high degree of probability (58–67 %) up to the age of 72 years old, while for men in depressed regions this probability is close to 30 %. According to the mortality tables for 2016, the probabilities of survival in economically active age have improved in the Magadan region, Irkutsk region, Amur region, the Republic of Buryatia, the Republic of Khakassia, and in Zabaykalsky Krai. The situation in the Tyva Republic has aggravated. As for the men, their chances of survival until the upper boundary of economically active age are still bleak. There are some indications of improvement in the probability of survival for men in the Amur region and Karelia. In rural areas, the probabilities of survival are very low and constitute, for example, only 0.19 in the Chukotka Autonomous Region and 0.24 in the Magadan region.

The ranking of the best regions with high probability of survival until the upper threshold of economically active age traditionally includes the regions of Caucasus. Along with them, the ranking of the best regions also includes Tatarstan; Stavropol Krai; Moscow and St. Petersburg (for men), the two major megacities of Russia; Belgorod region, and Mordovia for women (Table 3). It should be noted that the life expectancy of men in Moscow also varies depending on the territory of residence. In the center of Moscow, men live up to 70 years old, which is comparable to the life expectancy in Central

Table 2

The most disadvantaged regions in terms of the men's and women's ability to successfully live through their economically active age, fractions of unit

Region	Men		Region	Women	
	2015	2016		2015	2016
Jewish Autonomous Region	0.28	0.28	Chukotka Autonomous Region	0.58	0.59
Tyva Republic	0.28	0.28	Jewish Autonomous Region	0.62	0.63
Amur Region	0.32	0.34	Magadan Region	0.62	0.66
Irkutsk Region	0.34	0.35	Tyva Republic	0.63	0.54
Zabaykalsky Krai	0.34	0.36	Zabaykalsky Krai	0.64	0.66
Sakhalin Region	0.34	0.35	Amur Region	0.65	0.67
Pskov Region	0.34	0.35	Irkutsk Region	0.65	0.66
Republic of Karelia	0.34	0.36	Sakhalin Region	0.66	0.67
Magadan Region	0.35	0.35	Republic of Buryatia	0.67	0.69
The Komi Republic	0.35	0.35	Republic of Khakassia	0.67	0.68

Source: Calculated by the authors based on the mortality tables of Russian regions for 2015 and 2016.
Note: The ranking is made in accordance with the general listing of territories (regions, republics, krai, districts).

Table 3

Best Russian regions for men and women in terms of probability of survival in the economically active age

Region	Men		Region	Women	
	2015	2016		2015	2016
The Republic of Ingushetia	0.70	0.72	The Republic of Ingushetia	0.87	0.87
Karachay-Cherkess Republic	0.68	0.65	The Republic of Dagestan	0.84	0.83
The Republic of Dagestan	0.66	0.65	Kabardino-Balkar Republic	0.80	0.80
Moscow	0.59	0.60	Moscow	0.80	0.80
Kabardino-Balkar Republic	0.54	0.55	Republic of North Ossetia — Alania	0.80	0.80
Chechen Republic	0.54	0.58	Karachay-Cherkess Republic	0.80	0.78
Republic of North Ossetia — Alania	0.51	0.53	Republic of Tatarstan	0.79	0.78
Saint Petersburg	0.51	0.52	The Belgorod Region	0.77	0.77
Stavropol Krai	0.50	0.50	Stavropol Krai	0.77	0.77
Republic of Tatarstan	0.48	0.60	Republic of Mordovia	0.76	0.76*

Source: Calculated by the authors based on the mortality tables of Russian regions for 2015 and 2016. * For Saint Petersburg, in 2016, 0.763.

and Eastern Europe, while in the remote areas of the capital, men live only up to 59 years old [20]. The Northern, South-Western and North-Western areas of Moscow are also considered favorable in terms of life expectancy. Russian scientists noted that in Moscow, the life expectancy is more affected by the level of education, while the financial well-being is less important [21]. At the same time, the trends in Moscow are in no way similar to those in the rest of Russia. Our study clearly demonstrates that, in the regions, the primary role in increasing the probability of survival for men is played by the factors of personal self-realization and regional well-being, while the women are more affected by the environment.

There was a marked improvement in the survival rate for men in Chechnya and Tatarstan. In Karachay-Cherkessia and Dagestan, the figures have declined. For women, the situation remains virtually unchanged. The data for this group may be related to statistical fluctuations.

The significant difference in the culture of self-preservation behavior of men and women is also evidenced by the correlation and regression analysis with the indicator of average life expectancy in the regions of the Russian Federation for 2015. For example, only two "worst" and three "best" regions can be identified for Russian women. Other regions have no distinctive characteristics and come as the regular acceptable territories for the residence of women in Russia. For Russian men, there are two clearly identifiable clusters, including an area with the best conditions for comfortable living (about 10 regions) and the second area representing the rest of Russia (Fig.).

Translation

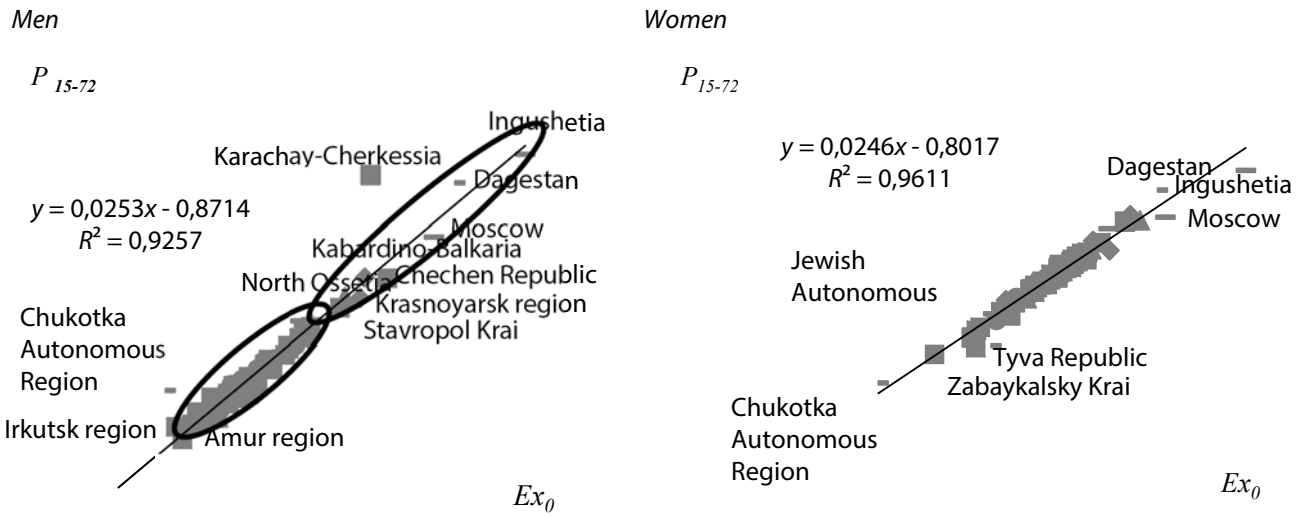

Fig. *The relationship between the probability of survival ($P_{15–72}$) and average life expectancy (Ex_0)*

To identify the range of indicators that have a significant impact on the probability of survival in the economically active age, we examined the indicators of living standards, price policy, *GRP*, and health care system provided in Table 1. The obtained results have largely modified the picture based on the correlation and regression approach. It should be recognized that, during the spatial type econometric analysis, we did not succeed to build significant equations with unbiased estimates and logical equations for all indicators. For example, we obtained the equation No. 1 with a positive (direct) impact on the probability of survival relative to changes in the CPI (Table 4). The results suggest that the higher inflation in Russia may increase the overall probability of survival, which can hardly be true. This illogical outcome for CPI may indicate a low quality of statistical data not reflecting the real level of prices in the Russian regions, which imposes certain restrictions for the equation and suggests that it would impossible to adequately assess the impact of this factor on SPB. This equation is provided as an example of why the econometric analysis does not include some of the stated factors. The econometric estimates revealed a high level of "autonomous consumption" in women. In fact, the assessment involves the survival of individual in extreme conditions below the subsistence level or, in our case, at the intersection of the equation constant with the *Y*-axis. A striking example is provided by the results obtained in equations No. 2, 3. In this case, for women, the level was 0.35, while for men, it was 1.82. This allows to conclude that women show a greater degree of survival when living in the state of "autonomous consumption," which can be explained by the need to provide for the child [22]. Overall, it should be noted that, for almost all the obtained equations, the "autonomous consumption" of men is much lower than the one of women.

These econometric assessments demonstrated the extent of the impact made by various factors on men and women. The low levels of such indicators as the attractiveness of investments in fixed capital, regional income in terms of per capita GDP lead to poverty which, in turn, greatly affects the SPB in men. For women, an important indicator in the functioning of health care system is the availability of hospital beds per capita in a particular Russian region. It should be noted, however, that this indicator is also important for Russian men. But, for women, given their natural characteristics, the availability of a functioning health care system is of particular importance, as evidenced by the high explanatory power (54 %) of that single factor along with a lower coefficient of elasticity for women.

Meanwhile, among the men in Russia, the sensitivity of survival up to 72 years old to the factor of investment attractiveness of the region is 0.03 (equation No. 8) while for women, this indicator turned out to be insignificant (equation No. 7). In other words, if the investments increase by 10 %, the probability of survival up to 72 years old will increase for the men in Russia on average by 0.3 %. The same trend can be observed for per capita GDP, another macroeconomic indicator. Thus, the sensitivity of SPB to changes in per capita GDP was 0.07 for men (equation No. 2), while for women, this indicator is insignificant (equation No. 3).

The poverty rate, as illustrated by the population with incomes below the subsistence level, also affects Russian men and women differently. For men, the sensitivity to changes in the poverty rate is 0.07 (equation No. 9), while for women, it is 0.002 (the lower sensitivity of women to poverty is

Table 4

The results of econometric modeling for the impact made by macroeconomic situation in Russian regions on the probability of individual's survival in the economically active age

No. of equation	Equation	Explanation of variables	Probability of the coefficient validity, %	*DW*	R^2
1.	p_lab = –8.5 * const + 1.55 * CPI + + 0.05 * GDP_p	p_lab is the probability of survival const is the constant (intersection with *Y*-axis) CPI is the Consumer Price Index GDP_p is GDP per capita	 99 98 99	2.18	44
2.	p_man = –1.82 * const + + 0.07 * GDP_p	const GDP_p is GDP per capita	99 99	2.14	36
3.	p_woman = –0.35 * const + + 0.02 * GDP_p	const GDP_p	99 24	2.21	42
4.	p_man = –0.29 * const + 0.05 * health	p_man is the probability of survival for men const health is the number of hospital beds per 10 thousand people	 99 99	2.14	36
5.	p_woman = –0.35 * const + + 0.02 * health	p_woman is the probability of survival for women const health	 99 99	2.23	54
6.	p_man = –0.84 * const – 0.07 * poor + + *0.03 inv	const poor inv	99 90 99	2.14	41
7.	p_woman = –0.37 * const – – 0.002 * poor + 0.01 * inv	const poor inv	99 15 99	2.14	46
8.	p_man=–0.56 * const – 0.03 * poor	const poor	99 99	2.24	38
9.	p_woman = –0.26 * const – – 0.002 * poor	const poor	98 99	2.22	44

Note: The results were obtained by using E-Views 9.0, the econometric analysis software.

associated with the redistribution of resources within the households). This allows to conclude that, with a 10 % increase in the number of people with incomes below the subsistence level, the probability of survival up to 72 years old will decrease by 0.7 % for men, while for women, the probability of survival will decrease only slightly, by 0.02 %. For women, the obtained coefficient of elasticity in terms of the number of beds per 1,000 people was 0.02, while for men, it was 0.05. This suggests that accessibility to health care services improves, in general, the SPB in the population of Russia.

For men, the high sensitivity of SPB to key macroeconomic indicators (investments, per capita GDP, population size with the income below the subsistence level) indicates the influence of existing attitudes and even some pressure on the men in Russia associated with the need to provide for the family. The low level of income generation in the regions not only limits the opportunities for regional development, but also provides an impetus defining how psychologically comfortable would be the living of men in depressed regions. At the same time, for women, an important component is the functioning of the health care system.

4. Conclusion

The study confirmed the validity of theoretical and methodological assumption that it would be possible to effectively combine the methods for demographic statistics of mortality with modern

econometric analysis of the impact made by macroeconomic factors on the mass SPB of economically active and working-age population in the context of Russian regions. In the future, it makes sense to present the dynamic version of this experience.

The method selected to analyze the SPB of men and women was based on complete mortality tables (with year-by-year breakdown) provided by Rosstat. It proved to be effective in most cases for the purposes of macroeconomic analysis. This allowed to identify SPB clusters in most regions of Russia. The use of econometric methods allowed to raise the problem of survival faced by a significant part of the population living below the subsistence level. In our opinion, for women, the higher survival rate in the poverty is associated with the redistribution of financial and material resources in various types of households.

The data obtained for the regions with a high culture of SPB, which are also doing well in terms of the survival of young people up to the end of their working age or economically active age, suggest that the principal flows of internal migration are directed to the areas with high survival rates. This, in turn, confirms the assumptions of some demographers [23] about the impact of economic factors on mass self-preservation behavior.

It should be recognized that by the beginning of the working age (economically active age) the formation of basic self-preservation attitudes of young people for a safe, active, and healthy lifestyle is generally completed, subject to the successful socialization of the individual. Therefore, there is a need for a cohort analysis of survivals in economically active ages. The study should be continued by taking into account the factors of urbanization and ruralization in existing resettlement systems.

This study confirmed the hypothesis that the health of the population depends on the implementation of macroeconomic policy in the context of population's mass behavior. The macroeconomic factors are defining large-scale impulses that drive the demographic events, which are firmly programmed in the mass psyche and could have direct and indirect impacts on the mortality rates of the working-age population [24].

It is noteworthy that in case of direct impact, the sensitivity of the economically active population to macroeconomic policy is somewhat lower than in the event of an indirect impact (including through changes in the health care system). The presented mechanism should be considered when developing long-term forecasts for demographic, family, youth, and migration policies.

Overall, the obtained empirical data on the regions of Russia confirm the hypothesis about the incompleteness of the process of health transition (the mass transition of the population to the assimilation of new standards of self-preservation behavior) in most of Russia due to the low level of culture of self-preservation behavior among the population.

Acknowledgments

This research has been supported by the Research & Development of the Institute of Economics of the Ural Branch of RAS, topic No. 0404–2015–0021 in the Information System of State Orders of the Federal Agency for Scientific Organizations.

References

1. Arkhangelsky, V. N. & Revun, V. I. (2008). Strategicheskie aspekty demograficheskoy politiki v Rossii i v Ukraine [Strategic aspects of the demographic policy in Russia and Ukrain]. *Narodonaselenie [The Population], 3,* 37–48. (In Russ.)

2. Archangelsky, V. N. & Dzhanaeva, N. G. (2015). Using Cohort Fertility Indicators To Assess And Predict The Effectiveness Of Demographic Policies. *Ekonomika regiona [Economy of Region], 4,* 170–184. (In Russ.)

3. Darsky, L. E. & Tolts, M. S. (2013). *Demograficheskie tablitsy [Demographic tables].* In: Denisenko M.B. (Ed.). Moscow: MAKS Press, 104. (In Russ.)

4. Caldwell, J. C. (2005). On Net Intergenerational Wealth Flows: An Update. *Population and development review, 31(4),* 724–729.

5. Caldwell, J. C. (2008). Demographic Transition Theory. *Population and Development Review, 34(2),* 367–368.

6. Darskiy, L. E. (1971). Sotsialno-psikhologicheskie aspekty demograficheskogo povedeniya i ikh izuchenie [Socio-psychological aspects of demographic behavior and their study]. *Problemy demografii. Voprosy teorii i praktiki [Problems of demography. Theory and practice issues].* In: Broner D. L., Venetsky I. G. (Eds). Moscow: Statistika Publ., 169–170. (In Russ.)

7. Rimashevskaya, N. M. & Rusanova, N. E. (2015). Zdorovye rossiyskogo naseleniya v usloviyakh sotsialno-ekonomicheskoy modernizatsii [Health of the Russian population under the conditions of socio-economic modernization]. *Narodonaselenie [The Population], 4,* 33–42. (In Russ.)

8. Zivert, Sh., Zakharov, S. & Klingkholts, R. *Ischezayushchaya mirovaya derzhava. Demograficheskoye budushcheye Rossii i drugikh byvshikh soyuznykh gosudarstv [Disappearing world power. Demographic future of Russia and other former Soviet States].* Berlin Institute for Population and Development. Retrieved from: https://www.berlin-institut.org/fileadmin/user_upload/Russland/Russland_rus_online.pdf (date of access: 1.08.2017). (In Russ.)

9. Yusupova, M. M. (2010). Osobennosti samosokhranitelnogo povedeniya naseleniya Chechenskoy respubliki v postkonfliktnyy period [Health behavior specifics in Chechen Republic — post-conflict period]. *Sotsis [Sociological Studies], 7,* 75–82. (In Russ.)

Translation

10. Antonov, A. I. (2013). Samosokhranitelnoye povedenie [Health behavior]. *Demograficheskaya entsiklopediya [Demographic encyclopedia].* In: Tkachenko A. A., Anoshkin A. V., Denisenko M. B. et al. (Eds). Moscow: Entsiklopediya Publ., 725–726. (In Russ.)

11. Kuzmin, A. I. (1997). *Teoretiko-metodologicheskie printsipy issledovaniya samosokhranitelnoy funktsii semyi: avtoref. diss. … d-ra sotsiol. nauk. [Theoretical and methodological principles of the research of the family's self-protection. Doctoral thesis].* Ekaterinburg. (In Russ.)

12. Fenelon, A. (2013). Geographic divergence in mortality in the US. *Population and development review, 39(4),* 611–634.

13. Ryazantsev, S. V., Pismennaya, E. E & Khramova, M. N. (2015). Formirovanie migratsionnogo potentsiala sootechestvennikov v stranakh Tsentralnoy Azii [Formation of the migration potential of compatriots in the countries of Central Asia]. *Narodonaselenie [The Population], 4,* 58–67.

14. Vandeskrik, K. (2005). *Demograficheskiy analiz [Demographic analysis].* Trans. from Franch N. Kalmykova. Moscow: Akademicheskiy proekt Publ.; Gaudeamus Publ., 272. (In Russ.)

15. Minagawa, Y. (2013). Inequalities in Healthy Life Expectancy in Eastern Europe. *Population and development review, 39(4),* 650–651.

16. Lesthaeghe, R. (2010). The unfolding story of the second demographic transition. *Population and development review, 36(2),* 211–245.

17. Kolbanov, V. F. & Rybakovsky, L. L. (2012). *Demograficheskoye nastoyashcheye i budushcheye Rossii [Demohraphic present and future of Russia].* Moscow: Ekon-inform Publ., 417. (In Russ.)

18. David, P. Baker, J. L. et.al. (2011). The 314–316 The Education Effect on Populatin Health: A Reassessment. *Population and development review, 37(2),* 322–326.

19. Zlotnikov, A. G. (2014). *Demograficheskie idei i kontseptsii [Demographic ideas and concepts].* Minsk: Pravo i ekonomika Publ., 388. (Seires: Humanities). (In Russ.)

20. Riley James, C. (2005). The Timing and Pace of Health Transitions around the World. *Population and development review, 31(4),* 741–742.

21. Rubleva, M. E., Mazharov, V. F., Gavrikov, V. L. & Khlebopros, R. G. (2016). Fertility And Women Life Expectancy in Krasnoyarsk Territory: Social And Economic Transition And Intraregional Demographic Response. *Zhurnal sibirskogo federalnogo universiteta [Journal of Siberian Federal University],* 2742–2755. (Series: Humanities and Social Sciences).

22. Boeva, A. V., Goltsova, E. V., Grigoryev, Yu. A., Leshchenko, O. Ya., Leshchenko, Ya. A., Rogacheva, O. A. & Ryashchenko, S. V. (2013). *Razvitie chelovecheskogo potentsiala Sibiri. Problemy sotsialnogo vosproizvodstva regionalnogo soobshchestva [The development of human potential of Siberia: problems of social reproduction of the regional community].* Irkutsk: Ottisk Publ., 514. (In Russ.)

23. Edwards, R. D. (2011). Changes in world inequality in length of life: 1970–2000. *Population & Development Review, 37(3),* 499–528.

24. Ajzen, I. & Klobas, J. (2013). Review Article Fertility intentions: An approach based on the theory of planned behavior. *Demographic Research, 29,* 203–232.

Authors

Evgeniya Khasanovna Tukhtarova — Leading Economist, Institute of Economics of the Ural Branch of RAS; Scopus Author ID: 57190413880 (29, Moskovskaya St., Ekaterinburg, 620014, Russian Federation; e-mail: tyevgeniya@yandex.ru).

Aleksandr Ivanovich Kuzmin — PhD in Economics, Doctor of Sociology, Professor, Leading Research Associate, Institute of Economics of the Ural Branch of RAS; Scopus Author ID: 56470348600 (29, Moskovskaya St., Ekaterinburg, 620014, Russian Federation; e-mail: kuz53@list.ru).

Natalya Pavlovna Neklyudova — PhD in Economics, Research Associate, Institute of Economics of the Ural Branch of RAS; Scopus Author ID: 57190430407 (29, Moskovskaya St., Ekaterinburg, 620014, Russian Federation; e-mail: nnp81@mail.ru).