ARF INDIA
Academic Open Access Publishing
www.arfjournals.com

Life Expectancy in Different Countries and in the World

Sergey A. Surkov[1] and Ellen G. Trofimova[2]

[1]*International Institute of Management LINK, Moscow, Russia. E-mail: context2002@yandex.ru, context2002@yahoo.com*
[2]*Russian Medical Academy of Continuous Professional Education, Moscow, Russia. E-mail: elentrofi@yandex.ru*

Abstract: Problems of average life expectancy in Russia and in the world are considered. It has been established that in both cases, the average life expectancy is steadily increasing. It was confirmed that for the countries of the world in general, including Russia, the direct role of the material factor is decreasing, while that of non-material factors is increasing, while for Russia separately it was not possible to obtain a certain result in this direction.

Keywords: Average life expectancy, factors of material well-being, indicators of economic development

1. Introduction

The life expectancy indicator attracts the attention of economists all over the world, as a factor of economic development and, at the same time, as an indicator of the level of such development. Variables affecting longevity are of particular interest, since it is assumed that knowledge of these factors will influence life expectancy. For example, Myers [1] describes a study by Carroll and etc, in which they studied old cemeteries in Glasgow. The authors of the study measured the height of the monuments, linking this value with the level of wealth, and compared it with the life expectancy recorded by the inscriptions on the monuments. As a result, the authors established the existence of a relationship between these values. Similar results were obtained not only for Scotland, but also for the United States and the whole of Great Britain.

This result has a rather general character, without specifying the contribution of various factors, which does not allow for effective management of the target indicator.

2. Literature Review

It follows from the definition that "life expectancy at birth is the number of years that, on average, one person from a certain model generation of born

would have to live, provided that throughout the life of this generation, the mortality rate at each age remains the same as in years for which this indicator is calculated" [2]. Shcherbakova [3] indicates that, in her opinion, the average life expectancy of the world's population is steadily growing; having increased from 47 years in the middle of the last century to 71 years by 2015, but in Russia the picture is different. She believes that everything that affects the living conditions of the population, to one degree or another, affects the indicators of its health. These factors include natural-climatic and socio-economic factors, and the peculiarities of the prevailing stereotypes of individual and group behavior. However, this author does not indicate the methodology for calculating the average values, without which it is impossible to assess the reliability of this statement. Dubynin [4] notes that "now the average life expectancy in the Russian Federation has exceeded 70 years ... Dubynin [4] notes that "now the average life expectancy in the Russian Federation has exceeded 70 years ... life expectancy is steadily increasing since 2002-2004." However, this work also does not consider methods for calculating average life expectancy. Medvedev [5] points out that "over the past 100 years, the average life expectancy in almost all countries has grown rapidly. The reasons are the progress of medicine, social security and other benefits of civilization." Here the author does not justify the choice of reasons for the increase in life expectancy in any way. Zhukova *et al.* [6] found, and based on statistical data, substantiated that life expectancy in the regions of Russia is negatively affected by air and water pollution, the workload of doctors and alcohol consumption, and the positive effect is associated, in general, with an increase in income, ie, in fact, with the ability to "buy" services, including medical. However, the listed factors need to be clarified, since the dependencies can be multidirectional. Rybakovsky *et al.* [7] notes that "the accuracy of the obtained indicators..., in addition to the chosen methodology and the reliability of the initial information, are largely determined by the size of the population itself, for which the calculation is made." Accordingly, for complex populations of population groups, a special approach to calculating average life expectancy is required. Calculating the average life span for a population consisting of several components is, in essence, the problem of calculating a weighted average [8].

3.   Materials and Methods

The population of the countries of the world and, in particular, Russia was chosen as an object for study. Data on population parameters were collected by analyzing the pages of 3 search engines Yandex, Google and Mail. The subject of the research is life expectancy in the world and in the Russian

Federation. To obtain the calculated values, from 80 to more than 200 points were used for each indicator.

The average life expectancy in the world was calculated by the formula [8]

$$T = \Sigma a_i t_i / \Sigma, a_i \tag{1}$$

Where a_i is the population size by country,

t_i is life expectancy in these countries.

The data is collected on the Internet, and the calculations take into account significant differences in values for different countries. Shcherbakova [9] points out that "it is expected that in the coming years, significant differences between... groups of countries of the world will remain, [and] will gradually decrease... By the end of the century they will drop to 11 years between more and less developed countries, while in 1950-1965 the difference between them reached 29 years." This makes us take a more careful approach to the selection and processing of statistical data. Data on life expectancy in the Russian Federation are taken from the sources [10] - [12], in terms of population - from a source [13], per capita GDP - [14], [15]. Similar data for the countries of the world are given in the sources [16] - [24], [25], [26], [27] - [31], respectively. The population of Russia and the Earth as a whole is presented in the sources [32], [33].

Based on the literature data, the following hypothesis can be put forward.

Hypothesis: The decline in the role of material well-being as the main factor causing a gradual increase in life expectancy for countries of the world, including Russia. This article is devoted to testing the validity of this hypothesis.

4. Results

The processing of statistical data for the regions of Russia made it possible to build graphs. shown in Fig. 1.
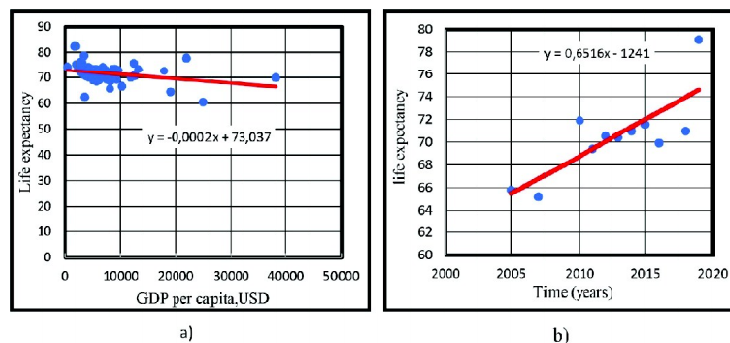

Figure 1: Indicators of life expectancy in Russia: a) depending on GDP per capita in the regions of Russia; b) change in average life expectancy in Russia as a whole by years

The dependence in Fig. 1a) is practically absent, which is confirmed by the 0.131 correlation coefficient, which is insignificant for any of the reasonable levels of significance. This means that, unlike other countries in the world, life expectancy in Russia is not determined by welfare factors. Such a low level of correlation indicates that the experimental points might not belong to a single aggregate. Then this graph breaks down into three parts.

For underdeveloped regions of Russia with low values of GDP per capita, with an increase in this indicator, life expectancy falls. This is possibly due to the general unfavorable environment for life in economically depressed regions. Such a factor may be the peculiarities of the lifestyle of the population in conditions of a shortage of jobs, for example, the lack of infrastructure to support life, the high level of the cost of utilities, the spread of alcoholism.

Another factor is environmental pollution even with minimal industrial development, since not enough attention is paid to the issues of cleaning industrial emissions into the environment. At higher levels of GDP per capita, the dependence on this indicator is much weaker and practically absent. In the third part of the entire range (i.e., with significantly higher values of GDP per capita), the dependence is the same as in the first part, that is, with an increase in the indicator, life expectancy decreases. Apparently, the improvement of health care for the population with higher incomes due to industrial development in these regions does not compensate for the damage to health from environmental pollution, overcrowding of residents in large cities, transport problems, behavior patterns, etc.

The correlation coefficient for the graph Fig.1b) is 0.786 and is essential for th significance levels exceeding 0.01 levels. It follows from this that the dependence is stable, and there is an increase in the average life expectancy in Russia over the years. The scatter of points on the graphs in Fig. 1 is explained by the fact that the components of the values on the graph change according to multidirectional dependencies and at each moment of time from the analyzed points the values may fluctuate within certain limits. For the countries of the world, as can be seen from the data in Fig. 2, the dependence is different than for Russia. Figure 2a) shows a typical example of the dependence of life expectancy in the countries of the world on GDP per capita in these countries. Figure 2b) shows the same relationship, but on a logarithmic scale along the GDP per capita axis.

Depending form Fig. 2b) for different years characterized correlation coefficients of 0.73 to 0.83, which are essential for all levels of significance level exceeding 0.1.
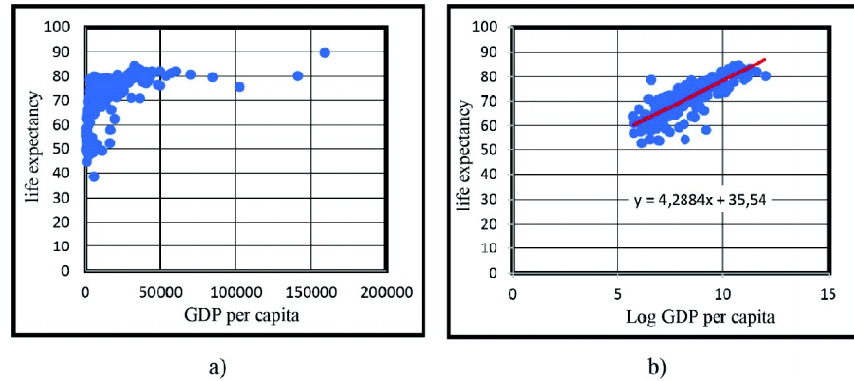
Figure 2: The dependence of life expectancy on GDP per capita for the countries of the world: a) in an unscaled form; b) after using a logarithmic scale for GDP per capita

A summary of these dependencies is shown in Fig. 3. For calculations, the obtained dependencies were analyzed in the form

$$Y = Ax+B \qquad (2)$$

where Y is life expectancy;

x is the logarithm of GDP per capita;

A is the slope coefficient of the straight line;

B is a free term, that is, an indicator of life expectancy that will take place with zero influence of the level of GDP per capita on life expectancy.

The correlation coefficients are 0.751, -0.815 and 0.800, respectively. All coefficients are essential for all significance levels greater than 0.1. As can be seen from Fig. 3a), the slope of the straight line steadily decreases over the years, which indicates a decrease in the relationship between the indicators "GDP per capita" and "life expectancy". At the same time, in Fig. 3b) the free term is steadily increasing, which indicates an increase in the influence of other factors. For example, such a factor may be the level of
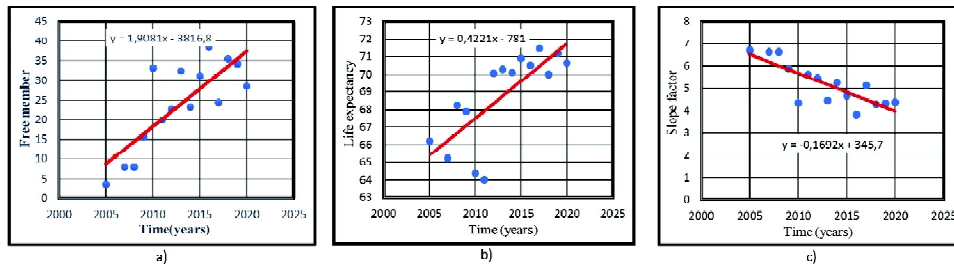

Figure 3: Indicators of life expectancy for the countries of the world by years: a) the coefficient of the slope of the straight line in Fig. 2b; b) a free member; c) change in life expectancy by years

technologies used to preserve and maintain health, which at the present stage is very different for different countries, depending on the vector of the state's social policy. The average life expectancy in the world is growing steadily. The scatter in the data in Fig. 3 is due to the large number of factors that contribute to the calculated target values.

6. Conclusion

It has been established that the direct relationship between the average level of material well-being and life expectancy weakens over time with an increase in other factors. The increase in life expectancy in Russia and in the world as a whole has also been confirmed. Thus, the hypothesis put forward has been verified. To increase the average life expectancy, along with economic growth, it is necessary to develop other factors, for example, improve the medical infrastructure and improve the socio-psychological climate in society.

References

David G. Myers. Social Psychology. McGRAW-HILL, INC., 2007, pp. 593.

Population of Russia for 100 years (1897-1997) (Statistical collection), M., Rosstat-Moscow publishing house, 1998, pp. 222. *https://istmat.info/files/uploads/15864/naselenie_rossii_za_100_let_1897-1997.pdf*

Shcherbakova E. Life expectancy in Russia - 72.5 years.Is it a lot or a little? The demographer Ekaterina Shcherbakova explains.September 15, 2017. Meduza. *https://meduza.io/feature/2017/09/15/prodolzhitelnost-zhizni-v-rossii-72-5-goda-eto-mnogo-ili-malo*

Dubynin V. The brain and its needs. From nutrition to recognition. Publishing house "Alpina non-fiction", 2021, pp. 572. *https://zvooq-knigi.ru/mozg-i-ego-potrebnosti-ot-pitaniya-do-priznaniya-404248Medvedev Y. And life lasts longer than a century ... Life expectancy in all countries is growing.Does it have a limit?Russian newspaper.Capital issue.No. 271 (7139), 11/16/2016.https://rg.ru/2016/11/29/uchennye-opredelili-biologicheskij-predel-prodolzhitelnosti-zhizni.html*

Zhukova A.K., Silaev A.M., Silaeva M.V. Analysis of life expectancy, taking into account the spatial dependence of the regions of Russia. Spatial Economics. 2016. No. 4. pp. 112-128. *https://cyberleninka.ru/article/n/analiz-ozhidaemoy-prodolzhitelnosti-zhizni-s-uchetom-prostranstvennoy-zavisimosti-po-regionam-rossii/viewer*

Rybakovsky L.L. Demography: textbook for universities / L. L. Rybakovsky, N. M. Kalmykova, V. M. Arkhangelsky, and others; Editor. N. A. Volgina, L. L. Rybakovsky., 2nd ed., M .: Logos, 2010., pp. 279. *https://spblib.ru/en/catalog/-/books/24578-demografia*

Sizova T.M. Statistics: Study Guide. SPb .: SPb GUITMO, 2013, pp. 176. *https://books.ifmo.ru/file/pdf/1332.pdf*

Shcherbakova E. World population according to UN estimates of the 2019 revision. Demoscope Weekly. Institute of Demography, National Research University

Higher School of Economics. No. 821-822, August 1-15, 2019. *http://www.demoscope.ru/weekly/2019/0821/barom04.php*

Life expectancy in the constituent entities of the Russian Federation. *http://www.statdata.ru/spg_russia_ussr*

Life expectancy at birth by regions of Russia (expected) for 2019 and 2018. www.statdata.ru - Site about countries, cities, population statistics, etc. 04/04/2020. *http://www.statdata.ru/spg_reg_rf*

Table of life expectancy for 2014. Ordered by: Both Genders. www.statdata.ru - Site about countries, cities, population statistics, etc. *http://www.statdata.ru/spg_reg_rf/last-year*

Population size. 1990-2019. *https://russia.duck.consulting/maps/31/2018*

Statistics: List of Russian regions by GRP (PPP) per capita. *https://ruxpert.ru/Статистика:Список_регионов_России_по_ВРП_на_душу_населения*

List of federal subjects of Russia by GDP per capita. *https://ru.qaz.wiki/wiki/List_of_federal_subjects_of_Russia_by_GDP_per_capita*

Life expectancy (2010). *http://iformatsiya.ru/tabl/532-ozhidaemaya-prodolzhitelnost-zhizni-2010.html.08.01.2011*

Life expectancy in the countries of the world 2011. *http://iformatsiya.ru/tabl/532-ozhidaemaya-prodolzhitelnost-zhizni-2010.html.28.07.2011*

List of countries by life expectancy.05.01.2021. *https://en.wikipedia.org/wiki/List_of_countries_by_life_expectancy.05.01.2021*

Life expectancy in Russia and the countries of the world in 2013. WebsiteMylektsii. *https://mylektsii.su/10-105794.html*

Average life expectancy [2007]. Website Yestravel. *https://www.yestravel.ru/world/rating_2007/.06.07.2020*

Average life expectancy [2008]. Website Yestravel *https://www.yestravel.ru/world/rating_2008/.06.08.2020*

Life expectancy in the countries of the world.[2009]. *http://iformatsiya.ru/tabl/16-prodolzhitelnost-zhizni-v-stranax-mira.html.06.10.2010*

Life expectancy in the countries of the world [2011]. *http://iformatsiya.ru/tabl/617-prodolzhitelnost-zhizni-v-stranah-mira-2011.html.28.07.2011*

Rating of countries in the world in terms of life expectancy.United Nations Development Programme (UNDP). *https://gtmarket.ru/ratings/life-expectancy-index*

Population of countries in 1980–2019 (million people). *https://svspb.net/danmark/naselenie-stran.php*

Population of the countries of the world for 2020. *https://total-rating.ru/2003-chislennost-naseleniya-stran-mira-na-2020-god..html*

GDP per capita in PPP. *https://total-rating.ru/37-vvp-na-dushu-naseleniya-po-pps.html*

List of countries by GDP per capita 2016. *http://investorschool.ru/spisok-stran-po-vvp-na-dushu-naseleniya-2016*

World GDP per capita 2018. Website Finscan. *http://fincan.ru/articles/51_vvp-na-dushu-naselenija-stran-mira-2018/*

Ranking of countries by GDP per capita 2017. *https://investorschool.ru/rejting-stran-po-vvp-na-dushu-naseleniya-2017*

Ranking of countries by GDP per capita (PPP). [2020]. *https://nonews.co/directory/lists/countries/gdp-per-capita-ppp*

The population of Russia by years in one table. *https://worldtable.info/gosudarstvo/chislennost-naselenija-rossii-po-godam-v-odno.html.13.04.2018*

The number of population in the world by years. *https://total-rating.ru/1918-chislennost-naseleniya-v-mire-po-godam.html*