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МОДЕЛИРОВАНИЕ АКТИВНОГО ДОЛГОЛЕТИЯ НАСЕЛЕНИЯ В УСЛОВИЯХ ЭКОНОМИЧЕСКИХ САНКЦИЙ

MODELING ACTIVE LONGEVITY UNDER ECONOMIC SANCTIONS

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Аннотация. Цель исследования заключается в разработке методологического подхода к моделированию активного долголетия

населения в условиях демографического старения и экономических санкций. Актуальность работы обусловлена ускорением процессов старения населения, необходимостью достижения стратегических целей Российской Федерации по увеличению продолжительности жизни, а также влиянием внешних экономических ограничений на систему здравоохранения и социальную сферу. В исследовании использованы методы сравнительного анализа, демографического анализа, системного подхода, индексного моделирования и эконометрического моделирования. Предложена система количественных показателей, включающая индекс активного долголетия, коэффициент активного старения, показатель демографической нагрузки, модель достижения целевого уровня продолжительности жизни и интегральную модель активного долголетия. Проведен анализ международного и российского опыта реализации политики активного долголетия. Установлено, что старение населения представляет собой многофакторный процесс, требующий комплексного государственного регулирования. Показано, что существующие демографические тенденции затрудняют достижение целевого уровня ожидаемой продолжительности жизни без дополнительных мер государственной поддержки. Разработанные модели позволяют осуществлять количественную оценку эффективности программ активного долголетия и могут использоваться для принятия управленческих решений на федеральном и региональном уровнях.

Abstract. The purpose of the study is to develop a methodological framework for modeling active longevity under conditions of demographic aging and economic sanctions. The relevance of the research is determined by accelerating population aging processes, the need to achieve the strategic life expectancy targets of the Russian Federation, and the influence of external economic constraints on healthcare and social welfare systems. The study employs comparative analysis, demographic analysis, systems approach, index modeling, and econometric modeling methods. A system of quantitative indicators is proposed, including the

Active Longevity Index, Active Aging Coefficient, Demographic Dependency Ratio, Target Longevity Achievement Model, and an Integrated Active Longevity Model. International and Russian experiences in implementing active longevity policies are examined. The findings indicate that population aging is a multidimensional phenomenon requiring comprehensive public policy responses. Current demographic trends are shown to complicate the achievement of strategic life expectancy targets without additional policy interventions. The proposed models provide a quantitative framework for evaluating the effectiveness of active longevity programs and may be applied in decision-making processes at both regional and national levels.

Ключевые слова: активное долголетие, старение населения, демографическая нагрузка, продолжительность жизни, экономические санкции, индексное моделирование, эконометрическое моделирование, государственная политика, качество жизни пожилого населения

Keywords: active longevity, population aging, demographic dependency, life expectancy, economic sanctions, index modeling, econometric modeling, public policy, quality of life of older adults

Research Problem and Study Rationale

Population aging has become a global challenge affecting economies that collectively account for approximately 78% of global GDP, according to estimates by Morgan Stanley analysts. By 2100, the world’s population is projected by the United Nations to maintain a stable growth trajectory and reach 11.2 billion people [1], more than one-quarter of whom will be aged 60 years and older [2]. In 2018, for the first time in recorded history, the number of individuals aged 65 years and over exceeded the number of children under the age of five [3]. At present, the status of an “aging society” is characteristic not only of developed European countries but also of the United States, Canada, China, India, South Africa, Mexico, Türkiye, Argentina, Indonesia, and the Russian Federation.

As a consequence, the growth rate of the global working-age population has slowed, reaching 1.0% in 2016 compared with an average annual rate of 1.6% during the preceding two decades. This trend contributes not only to an increase in the demographic dependency burden, measured as the ratio of retirees and children to the working-age population, but also to the aging of the labor force itself. The global share of workers aged 55–64 years is projected to increase from the current 13% to 15% over the next decade, compared with a relatively stable level of approximately 10% observed throughout the previous five decades [4, p. 3].

International evidence indicates that older adults in high-income countries are increasingly seeking alternatives to traditional life-course trajectories. Survey findings from the United States demonstrate that the majority of individuals approaching the conventional retirement age are not willing to retire and prefer to remain economically active [5].

Among the countries classified as aging societies, the Russian Federation faces two closely interconnected challenges: population aging and the consequences of economic sanctions, including restrictions imposed not only by Western countries. According to economic estimates, losses associated with sanctions amounted to approximately RUB 800 billion; however, sanctions were not the sole driver of the economic crisis experienced by the country [6, p. 7]. Consequently, externally imposed sanctions further intensified pre-existing structural and economic challenges.

According to data provided by the Federal State Statistics Service (Rosstat), presented in Figure 1, 14.7% of retired women and 5.2% of retired men in the Russian Federation continue to participate in the labor market [7, p. 119].

СТРУКТУРА ЗАНЯТЫХ ПО ВОЗРАСТНЫМ ГРУППАМ

EMPLOYMENT BY AGE GROUPS

(в процентах к итогу / *percent of total*)

	Занятые – всего *Employed – total*	в том числе в возрасте, лет / *including at age, years*										Средний возраст занятых, лет *Average age of employed, years*
		15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-72	
Всего / *Total*												
2000	100	2,6	9,6	12,1	11,6	15,0	15,8	14,1	9,8	4,4	5,0	39,2
2010	100	1,0	9,4	13,6	12,9	12,5	11,5	13,7	13,0	8,3	4,2	40,0
2015	100	0,6	7,0	14,5	13,9	13,0	12,2	11,4	13,0	9,3	5,1	40,6
2016	100	0,6	6,4	14,5	14,3	13,2	12,5	11,2	12,7	9,4	5,3	40,7
2017	100	0,5	5,7	14,4	14,6	13,6	12,7	11,4	12,1	9,6	5,3	40,8
Мужчины *Male*												
2000	100	2,9	10,2	12,7	11,8	14,7	15,0	13,2	9,2	5,0	5,2	38,9
2010	100	1,3	10,2	14,5	13,2	12,3	11,0	12,8	11,9	8,7	4,2	39,6
2015	100	0,7	7,7	15,5	14,5	12,8	11,7	10,7	11,9	9,5	4,9	40,0
2016	100	0,7	7,1	15,5	14,8	13,0	12,0	10,5	11,7	9,7	5,0	40,2
2017	100	0,6	6,3	15,4	15,2	13,5	12,1	10,7	11,1	10,0	5,2	40,3
Женщины *Female*												
2000	100	2,2	8,9	11,4	11,3	15,3	16,7	15,2	10,4	3,7	4,8	39,5
2010	100	0,7	8,5	12,7	12,6	12,7	11,9	14,7	14,1	7,9	4,2	40,5
2015	100	0,4	6,3	13,4	13,2	13,2	12,7	12,2	14,2	9,0	5,3	41,2
2016	100	0,4	5,7	13,4	13,6	13,3	13,1	12,0	13,8	9,1	5,5	41,2
2017	100	0,4	5,1	13,4	13,9	13,7	13,4	12,2	13,2	9,2	5,5	41,3

Figure 1. Distribution of Employed Population by Age Group (% of Total Employment) [7, p. 119]

Changes in the statutory retirement age in the Russian Federation are expected to alter existing socio-economic patterns, necessitating the adaptation of public policies and the promotion of new approaches to aging. According to classifications proposed in psychological research, five individual aging patterns can be distinguished:

– Regression, characterized by a return to behavioral patterns associated with earlier stages of life;

– Escape, involving relocation or withdrawal from previous social environments in order to avoid emerging personal and social challenges;

– Isolation, characterized by social disengagement, passivity, and limited participation in community life;

– Self-centered aging, associated with an increased need for attention and recognition from others;

– Active aging, characterized by continued participation in social life, maintenance of health, and proactive management of age-related health conditions.

Current demographic and socio-economic developments in the Russian Federation highlight the importance of promoting the fifth aging pattern, namely active aging. This approach is closely aligned with the concept of healthy aging, the primary objective of which is the maintenance of functional ability and well-being throughout later life.

According to the World Health Organization (WHO), active aging is defined as the process of optimizing opportunities for health, participation, and security in order to enhance quality of life as people age. Active longevity represents a strategic framework aimed at implementing the principles of healthy aging and is recognized by the WHO as an internationally accepted policy approach.

Based on epidemiological evidence covering the period from 1990 to 2017, a research team from the University of Washington, publishing in The Lancet in 2019, estimated the average global age at which multiple age-related diseases tend to accumulate. The global average was found to be approximately 65 years. Considerable cross-country variation was observed:

– approximately 76 years in Japan and Switzerland;
– 53 years in the Central African Republic;
– 51 years in Afghanistan;
– 45 years in Papua New Guinea.

The Russian Federation was identified as one of the countries experiencing accelerated aging relative to the global average. Age-related disease profiles commonly associated with older populations were found to emerge at approximately 59 years of age among the Russian population [8, p. e164]. A comparative ranking of countries according to the age of onset of age-related disease accumulation is presented in Figure 2.

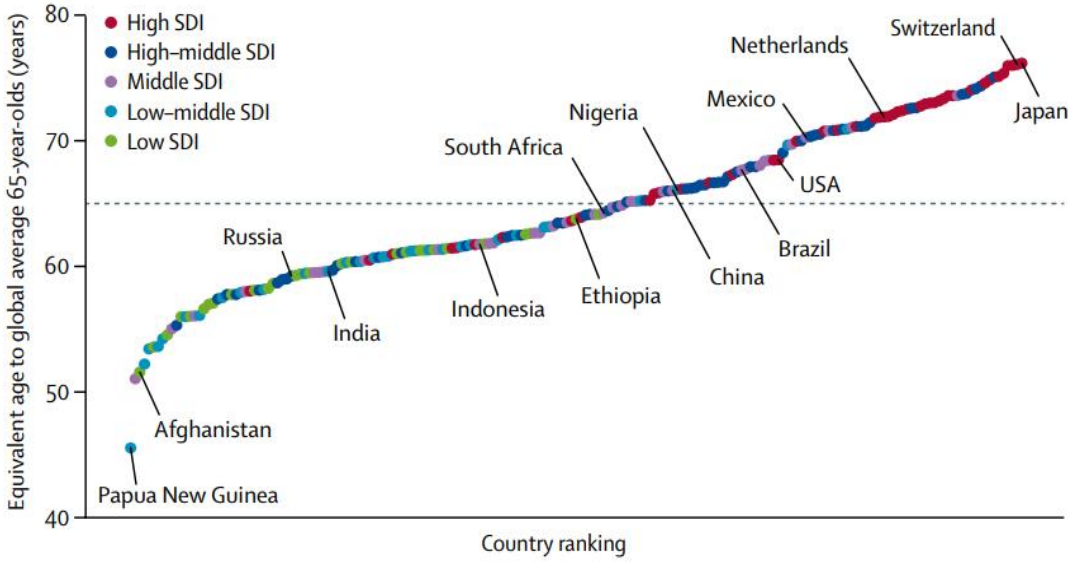

Figure 2. Ranking of Countries by the Average Age of Accumulation of Age-Related Diseases [8, p. e164]

Similar conclusions had previously been reached by Russian researchers. In 2017, Anatoly Vishnevsky, Director of the Institute of Demography at the National Research University Higher School of Economics, emphasized that although chronological aging is a universal process, the health status of a typical 60-year-old individual in the Russian Federation is often comparable not to that of a 60-year-old resident of Italy or Japan, but rather to that of a 70-year-old individual in those countries. While approximately 20% of the Russian population is aged 60 years and older, a comparable share of the Japanese population is represented by individuals aged 70 years and older. Earlier onset of aging implies an earlier emergence of challenges associated with healthcare provision, social services, and long-term support for older adults. These observations further underscore the importance of implementing the healthy aging concept in the Russian Federation.

The relevance of this research is also determined by the strategic development objectives of the Russian Federation. In the Presidential Decree “On National Goals and Strategic Objectives of the Development of the Russian Federation through 2024,” a target was established to increase life expectancy to the level observed in developed countries by 2030 [9].

According to the United Nations Human Development Index (HDI) rankings for the period 1990–2017, the Russian Federation ranked 49th and was included among the group of countries characterized by a very high level of human development, comprising 59 countries in total [10, p. 26] (Figure 3).

-	Rank ▼	Country	Human Development Index (HDI) (value)	Life expectancy at birth (years) SDG3	Expected years of schooling (years) SDG 4.3	Mean years of schooling (years) SDG 4.6	Gross national income (GNI) per capita (PPP $) SDG 8.5
	41	Latvia	0.847	74.7	15.8	12.8	25,002
	41	Portugal	0.847	81.4	16.3	9.2	27,315
	43	Bahrain	0.846	77.0	16.0	9.4	41,580
	44	Chile	0.843	79.7	16.4	10.3	21,910
	45	Hungary	0.838	76.1	15.1	11.9	25,393
	46	Croatia	0.831	77.8	15.0	11.3	22,162
	47	Argentina	0.825	76.7	17.4	9.9	18,461
	48	Oman	0.821	77.3	13.9	9.5	36,290
	49	Russian Federation	0.816	71.2	15.5	12.0	24,233
	50	Montenegro	0.814	77.3	14.9	11.3	16,779

Showing 41 to 50 of 189 entries ← Previous Next →

Figure 3. Human Development Index Trends, 1990–2017 [10, p. 26]

However, despite its relatively high position in the Human Development Index ranking, the Russian Federation remains considerably below the level achieved by the world's leading developed countries in terms of life expectancy. According to World Bank data presented in Figure 4, the country has not yet reached the group of nations with life expectancy exceeding 80 years ("80+ club"), although a positive trend has been observed over the past fifteen years.

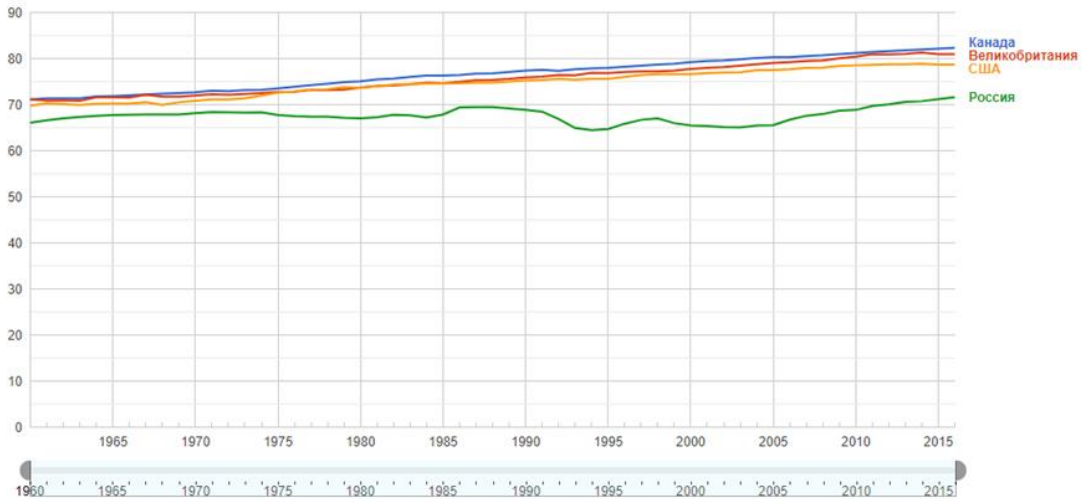

Figure 4. Life Expectancy at Birth (Years). The x-axis represents the observation year, and the y-axis represents life expectancy at birth. Source: World Bank (accessed June 17, 2026).

An analysis of life expectancy data across the regions of the Russian Federation for 2018 (Figure 5) indicates that only one region—the Republic of Ingushetia—had already achieved a life expectancy level consistent with membership in the "80+ club."

Таблица ожидаемой продолжительности жизни за 2018 год

№	Субъект России	Оба пола↓	Мужчины	Женщины
1	Республика Ингушетия	81,52	77,91	84,54
2	г. Москва	78,18	74,30	81,83
3	Республика Дагестан	77,79	74,52	80,93
	Северо-Кавказский ФО	76,00	71,71	79,99
4	Кабардино-Балкарская Республика	75,98	71,10	80,55
5	Карачаево-Черкесская Республика	75,81	71,22	80,10
6	г. Санкт-Петербург	75,79	71,11	79,82
7	Республика Северная Осетия – Алания	75,56	69,88	80,88
8	Чеченская Республика	74,80	71,64	77,84
9	Ставропольский край	74,71	69,87	79,25
10	Республика Татарстан	74,15	68,28	79,82
	Центральный ФО	74,05	68,73	79,14
11	Белгородская область	73,94	68,57	79,16
12	Ханты-Мансийский АО-Югра	73,91	68,81	78,89
13	Краснодарский край	73,86	68,79	78,77
14	Московская область	73,59	68,28	78,54
15	Республика Адыгея	73,55	68,11	78,93
16	Республика Калмыкия	73,47	68,24	78,73
	Южный ФО (с 2010 года)	73,45	68,28	78,47
17	Пензенская область	73,44	67,69	79,00
18	Республика Мордовия	73,38	67,71	78,96
19	Волгоградская область	73,30	67,90	78,55
20	Ростовская область	73,22	68,13	78,14
21	Тюменская область	73,08	67,69	78,42
22	Ямало-Ненецкий авт.округ	73,02	68,13	77,77
	Северо-Западный ФО	73,02	67,50	78,24
23	Воронежская область	72,99	66,86	79,13
24	Тамбовская область	72,99	67,11	78,93
25	Рязанская область	72,77	66,93	78,49
26	Саратовская область	72,71	67,04	78,19
	Российская Федерация	**72,70**	**67,13**	**78,12**
27	Астраханская область	72,67	67,31	77,99
28	Чувашская Республика	72,66	66,73	78,66
29	Томская область	72,56	67,15	77,86
30	Ленинградская область	72,54	67,05	78,01
31	Кировская область	72,41	66,40	78,50
32	Липецкая область	72,37	66,46	78,18
33	Ненецкий авт.округ	72,30	66,42	78,31
34	Ярославская область	72,28	66,14	78,10
35	Новосибирская область	72,16	66,27	78,01
36	Курская область	72,10	66,00	78,19
37	Калужская область	72,03	66,33	77,68

Figure 5. Life Expectancy at Birth in the Regions of the Russian Federation (Years). Source: Federal State Statistics Service (Rosstat), available at: https://cbsd.gks.ru (accessed January 17, 2026).

According to the revised demographic forecast published by Rosstat on December 28, 2019, population projections were developed under three scenarios—low, medium, and high—based on alternative assumptions regarding future trends in migration, fertility, and mortality.

Under the high-growth scenario, life expectancy at birth is projected to increase from 73.53 years in 2019 to 81.66 years by 2035, while the gender gap in life expectancy is expected to decline to 6.4 years, reaching 78.26 years for men and 84.66 years for women. Under the medium-growth scenario, life expectancy is projected to rise from 73.42 years in 2019 to 79.10 years in 2035, with a gender gap of 7.5 years (75.18 years for men and 82.69 years for women). Under the low-growth scenario, life expectancy is expected to increase from 73.31 years in 2019 to 75.40 years by the end of 2035, while the difference between male and female life expectancy is projected to remain at 8.4 years (71.12 and 79.51 years, respectively) [11].

The forecast results indicate that the strategic objective of increasing life expectancy to 80 years by 2030 is unlikely to be fully achieved, even under the most optimistic scenario, without additional policy interventions. Several factors may contribute to this outcome.

First, life expectancy in the Russian Federation is significantly influenced by geographical and environmental conditions. Among the ten leading regions in terms of life expectancy (Figure 5), several are characterized by relatively favorable environmental conditions, including the Republic of Ingushetia, the Republic of Dagestan, the Kabardino-Balkarian Republic, the Republic of North Ossetia–Alania, and the Chechen Republic.

Second, one of the distinctive challenges associated with longevity in the Russian Federation is the limited prevalence of health-oriented behavioral patterns, including systematic health monitoring and long-term health planning.

Further evidence is provided in Figure 6, which presents the proportion of individuals aged 65–74 years and 75 years and older experiencing limitations in

performing one or more activities of daily living (ADL) across countries [5]. As illustrated in the figure, the Russian Federation demonstrates one of the highest shares of older adults reporting limitations in daily activities among the countries included in the comparison, both in the 65–74 and 75+ age groups.

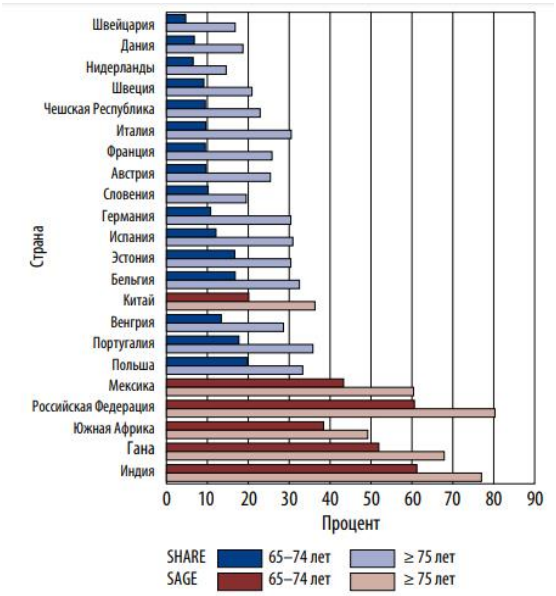

Figure 6. Prevalence of Limitations in Activities of Daily Living (ADL) among Individuals Aged 65–74 and 75+ Years, by Country [5]

According to Government Order No. 164-r of February 5, 2016, “On the Approval of the Strategy of Actions in the Interests of Older Citizens in the Russian Federation through 2025,” approximately 80% of older adults suffer from multiple chronic conditions. On average, individuals aged over 60 years are diagnosed with four to five chronic diseases. Healthcare expenditures for patients aged 70 years and older are estimated to be seven times higher than those incurred for individuals aged 16–64 years [12, p. 7].

It may be hypothesized that economic sanctions have contributed to this situation. However, according to public opinion surveys conducted by the Public Opinion Foundation (FOM), the majority of respondents do not perceive sanctions as a major factor affecting these trends (Figure 7) [13].

Figure 7. Public Perceptions of the Impact of Economic Sanctions on Population Well-Being [13]

As noted above, the sanctions regime has been characterized by a reciprocal nature. While external sanctions contributed to the deterioration of an already fragile economic situation through rising consumer prices and currency depreciation, their effects may not have been immediately apparent to survey respondents. At the same time, countermeasures implemented in the form of the 2014 food embargo had a more direct impact on domestic consumers.

Despite the introduction of the embargo, food prices did not decline. In addition, concerns emerged regarding the substitution of natural food products with lower-quality alternatives, a trend that may have adverse implications for public health, particularly among older adults. According to survey results conducted by the Public Opinion Foundation (FOM) and presented in Figure 8, an increasing proportion of respondents have expressed doubts regarding the effectiveness and appropriateness of such countermeasures.

The potential health consequences associated with changes in food quality and dietary patterns during the period of the food embargo warrant further investigation.

Figure 8. Public Attitudes toward Russia's Food Embargo and Related Counter-Sanctions [13]

It should also be noted that economic sanctions may constrain the financial resources available for the implementation of social programs and public health initiatives.

In addition, reforms within the healthcare system and a reduction in the number of practicing physicians may have contributed to unfavorable demographic and health outcomes. According to World Bank data, the Russian Federation has approximately four physicians per 1,000 population (Figure 9). This trend may be associated with increased pressure on healthcare services and may adversely affect the accessibility and effectiveness of medical care.

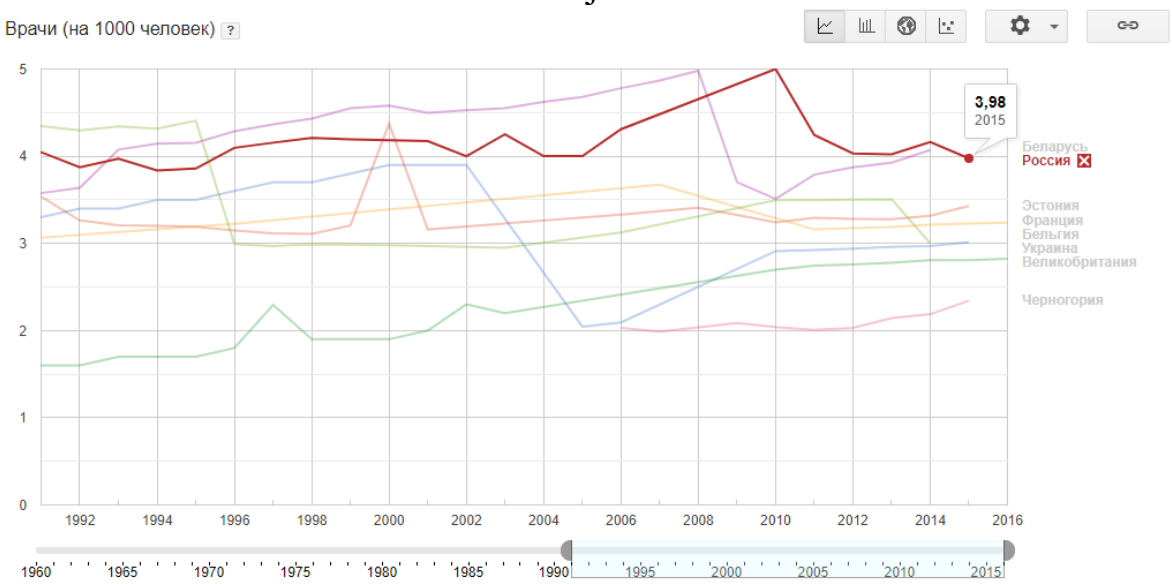

Figure 9. Number of Physicians per 1,000 Population. Source: World Bank (accessed June 17, 2026).

Nevertheless, as illustrated in Figure 10, a positive trend can be observed both in the Russian Federation and internationally with respect to one of the key public health indicators. The indicator demonstrates a steady increase over the period under consideration, reflecting improvements in healthcare performance and treatment outcomes.

Figure 10. Tuberculosis Treatment Success Rate (% of Registered Cases). Source: World Bank (accessed June 17, 2026).

The significance of this study is further reinforced by the need to achieve national strategic development goals under conditions of both internal demographic challenges and external economic constraints. Alongside structural issues associated with population aging, the Russian Federation operates within an environment shaped by international sanctions and responsive policy measures. These factors may influence economic performance, population well-being, and the effectiveness of programs designed to improve health outcomes and support active longevity.

Methodology for Modeling Active Longevity under Economic Sanctions

The complexity and multidimensional nature of active longevity require the application of an integrated methodological framework capable of simultaneously accounting for demographic, economic, social, and healthcare-related factors. Existing studies emphasize that longevity outcomes are determined not only by biological characteristics but also by living conditions, healthcare accessibility, economic activity, social inclusion, and institutional support mechanisms [15–17].

To assess the effectiveness of active longevity policies under conditions of demographic aging and sanctions-related constraints, a system of interconnected indicators and econometric models is proposed.

Active Longevity Index

At the first stage, an integral Active Longevity Index (ALI) is constructed to enable interregional comparisons and identify territories demonstrating the highest effectiveness in implementing active longevity policies.

The index is defined as:

$$ALI = w_1 H + w_2 E + w_3 S + w_4 Q$$

Where:

H denotes the health status index;

E represents the employment index of older adults;

S is the social participation index;

Q denotes the quality-of-life index;

w_i are weighting coefficients satisfying

$$\sum_{i=1}^{4} w_i = 1$$

The proposed index allows the aggregation of heterogeneous indicators into a single quantitative measure and facilitates regional benchmarking [18].

Demographic Dependency Ratio

Given the growing demographic burden associated with population aging, the demographic dependency ratio is incorporated into the model:

$$DR = \frac{P_{65+}}{P_{15-64}}$$

where:

P_{65+} represents the population aged 65 years and older;

P_{15-64} represents the working-age population.

An increase in the value of DR indicates a rising burden on economically active population groups and social support systems [19].

Active Aging Coefficient

To evaluate the degree of social integration of older citizens, the Active Aging Coefficient (AA) is proposed:

$$AA = \frac{E_{60+} + V_{60+} + L_{60+}}{3}$$

where:

E_{60+} denotes the employment rate among individuals aged 60 years and older;

V_{60+} represents participation in volunteer activities;

L_{60+} characterizes involvement in lifelong learning programs.

Higher values of the coefficient indicate a greater degree of social engagement and successful implementation of active aging policies [20].

Econometric Model of Longevity Determinants

To quantify the influence of socio-economic factors and sanctions-related constraints on life expectancy, the following regression model is proposed:

$$LE_t = \alpha + \beta_1 GDP_t + \beta_2 HC_t + \beta_3 SAN_t + \varepsilon_t$$

where:

LE_t denotes life expectancy at birth;

GDP_t represents gross regional product (or GDP) per capita;

HC_t denotes healthcare expenditures;

SAN_t represents a sanctions pressure index;

ε_t is the random disturbance term.

The model makes it possible to estimate the relative contribution of economic development, healthcare investment, and external constraints to longevity outcomes [21].

Target Longevity Achievement Model

To assess the feasibility of achieving the strategic target of life expectancy exceeding 80 years, the following indicator is proposed:

$$\Delta LE = LE_{target} - LE_{current}$$

where:

LE_{target} denotes the target life expectancy level;

$LE_{current}$ denotes the observed life expectancy level.

The annual growth rate required to achieve the target is calculated as:

$$R = \frac{\Delta LE}{T}$$

where T denotes the number of years remaining until the target year.

This indicator allows policymakers to evaluate whether current demographic trends are sufficient to achieve strategic objectives [22].

Integrated Model of Successful Active Longevity

To account for the multidimensional nature of longevity, the following integrated model is proposed:

$$AL = \alpha H + \beta M + \gamma S + \delta E + \theta D$$

where:

H denotes health status;

M represents healthcare accessibility and quality;

S characterizes social participation;

E denotes economic activity;

D represents digital literacy and access to information technologies.

The model reflects the contemporary understanding of active longevity as a multidimensional socio-economic phenomenon and enables comprehensive regional assessments [23].

Investment Efficiency in Active Longevity Programs

Considering the WHO position that expenditures on older adults should be viewed as investments rather than costs, the return on investment in active longevity programs can be estimated using:

$$ROI = \frac{B - C}{C} \cdot 100\%$$

where:

B denotes the economic and social benefits generated by the program;

C denotes implementation costs.

The indicator provides a quantitative assessment of the economic effectiveness of public policies aimed at extending healthy life expectancy and improving the quality of life of older citizens [24].

The proposed methodological framework combines demographic, economic, healthcare, and social indicators into a unified analytical system. Its application enables the quantitative assessment of regional disparities, identification of key determinants of active longevity, and evaluation of the effectiveness of public policies implemented under conditions of demographic aging and economic sanctions.

Scientific novelty of the study consists in the development of an integrated methodological framework for assessing active longevity under demographic aging and economic sanctions, including the Active Longevity Index (ALI), Active Aging Coefficient (AA), Target Longevity Achievement Model, and ROI-based evaluation of active longevity programs.

Research Results and Discussion

The conducted analysis confirms that chronological age and biological aging should not be considered synonymous concepts. Considerable international variation exists in the age at which age-related diseases accumulate, indicating substantial differences in health status among populations of the same chronological age. Evidence suggests that in several developed countries, the onset of age-related morbidity occurs significantly later than in the Russian Federation, thereby contributing to longer periods of healthy and active life.

The findings indicate that the demographic challenges faced by the Russian Federation are associated not only with population aging itself but also with the relatively early onset of age-related health deterioration. Consequently, increasing life expectancy alone cannot be regarded as a sufficient policy objective. Greater emphasis should be placed on extending healthy life expectancy and maintaining functional capacity among older adults.

Application of the proposed Active Longevity Index (ALI) framework demonstrates that active longevity is determined by a combination of healthcare, economic, social, and quality-of-life factors. Sustainable improvements in longevity outcomes therefore require coordinated interventions across multiple policy domains rather than isolated healthcare measures.

The analysis further confirms that existing healthcare systems, both in the Russian Federation and internationally, remain insufficiently adapted to the needs of aging populations. In particular, long-term care systems, preventive healthcare mechanisms, and social inclusion programs require further development to ensure successful aging trajectories.

The study also indicates that external economic constraints may influence the implementation of active longevity policies through their effects on public expenditures, healthcare financing, and household welfare. The econometric model proposed in this study provides a framework for future quantitative assessment of the relationship between sanctions-related factors and longevity outcomes.

Forecast analysis based on Rosstat demographic projections suggests that achieving a life expectancy level of 80 years by 2030 remains challenging under current demographic trends. The target longevity model demonstrates that additional policy measures aimed at improving population health, increasing social participation, and strengthening preventive healthcare may be required to achieve the stated strategic objectives.

Analysis of regional practices identified three principal approaches to active longevity governance in the Russian Federation:

1. Active participation strategy;
2. Decentralized regulation strategy;
3. Mixed strategy.

Among these approaches, the active participation strategy appears to be the most effective, as it directly promotes social engagement, lifelong learning, physical activity, and community involvement among older adults.

The review of regional initiatives revealed a broad spectrum of successful practices, including social transportation services, family-based care programs, volunteer support networks, universities of the third age, preventive healthcare programs, employment support initiatives, and lifelong learning opportunities. These measures contribute to higher levels of social participation and can be incorporated into the proposed Active Aging Coefficient (AA) framework.

Implementation of active longevity policies is expected to generate multiple socio-economic benefits, including:

– increased labor force participation among older adults;
– greater involvement in volunteer and community activities;
– expansion of social interaction opportunities and reduction of social isolation;
– improved access to healthcare services and preventive medical care;
– reduction of long-term healthcare expenditures through healthier aging trajectories.

Overall, the results support the conclusion that active longevity should be viewed as a multidimensional socio-economic objective requiring coordinated action across healthcare, labor market, education, and social policy systems.

Policy Recommendations

According to the World Health Organization (WHO), traditional perceptions of aging require substantial reconsideration. Contemporary approaches to healthy aging emphasize the need to strengthen the capacity of older adults to adapt successfully to changing social, economic, and technological environments rather than focusing exclusively on disease prevention and treatment [5, 15].

From an economic perspective, expenditures associated with aging populations should be regarded not as costs but as long-term investments capable of generating substantial social and economic returns through increased labor force participation, reduced healthcare expenditures, enhanced social inclusion, and improved quality of life [5, 24]. The structure of such investments and their expected returns are presented in Figure 11.

Figure 11. Investments and Returns on Investments in Population Aging Policies [5]

The WHO identifies four priority directions for the implementation of active longevity policies [5]:

1. Alignment of healthcare systems with the needs of aging populations;

2. Development of long-term care systems;

3. Creation of age-friendly environments;

4. Improvement of measurement, monitoring, and evidence-based decision-making.

In addition, the healthy aging framework emphasizes the following strategic priorities:

1. Prevention, early detection, and management of chronic diseases;

2. Promotion of lifestyles supporting functional capacity;

3. Removal of barriers to social participation and compensation for age-related functional decline;

4. Provision of conditions ensuring dignity and well-being in later life;

5. Support for healthy behavioral patterns throughout the life course;

6. Effective management of chronic diseases at advanced stages;

7. Delay or reversal of functional decline whenever possible.

The proposed Active Longevity Index (ALI) and Active Aging Coefficient (AA) may serve as practical instruments for monitoring the effectiveness of these policy interventions and evaluating regional performance in the field of active longevity [18, 20].

Despite existing economic constraints, implementation of active longevity policies should remain a strategic priority. Analysis of regional practices demonstrates that among the three identified governance approaches—active participation, decentralized regulation, and mixed governance—the active participation strategy provides the greatest opportunities for improving social engagement, maintaining health, and increasing quality of life among older adults.

Based on the review of successful regional initiatives, the development of online Universities of the Third Age is proposed as a priority policy measure. Such projects correspond to the principles of lifelong learning established by the Federal Law “On Education in the Russian Federation” and address several challenges associated with population aging.

The proposed initiative pursues the following objectives:

– development of digital and information literacy among pre-retirement and retirement-age citizens;

– creation of an accessible and high-quality distance learning system for older adults;

– reduction of information inequality and social exclusion;

– expansion of opportunities for lifelong learning and social participation;

– improvement of digital competencies required for participation in contemporary economic and social life.

The implementation of online Universities of the Third Age is expected to contribute directly to improvements in the Active Aging Coefficient (AA) through increased participation in educational programs and enhanced social engagement. In addition, higher levels of digital literacy may positively affect healthcare accessibility, social inclusion, and overall quality of life among older adults.

Consequently, active longevity policies should be considered not only as a component of social protection but also as an investment mechanism contributing to human capital development, economic sustainability, and long-term demographic resilience.

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