

Healthy Life Expectancy of People Over Age 65: Results of the Russian Epidemiological Study EVCALIPT

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Abstract—The health of a population is an important indicator of the general well-being of the population, and it has its practical significance, as it determines the costs of providing care, and social and medical assistance for the elderly. The study presents an assessment of healthy life-expectancy indicators of people over age 65 based on the results of the Russian epidemiological study EVCALIPT and a comparison of this results with data from other surveys in Russia and European countries.

Keywords: mortality, health, healthy life expectancy, old age, Russia

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INTRODUCTION

Life expectancy, LE (at birth or at any other age) is an integral characteristic of the mortality rate of the population. At the same time, as life expectancy increases and the population ages, additional indicators are needed that reflect not only changes in mortality in certain age groups, but also the health status of the population, mainly the elderly [29]. The state of health of the population is an important indicator not only of its general well-being, but is also of practical importance, as it determines the costs of caring for the elderly, and social and medical assistance.

The indicator of healthy life expectancy (HLE) is provided for in Decree of the President of the Russian Federation No. 204 dated May 7, 2018 “On the national goals and strategic objectives of the development of the Russian Federation for the period up to 2024” (increasing the HLE to 67 years). According to an approved methodology, this indicator is assessed using information on the self-rated health of the population according to selective federal statistical observation of the state of health of the population conducted by Rosstat.¹ According to published estimates by Rosstat, the HLE at birth was 60.3 years in 2019 and 58.9 years in 2020.

Self-rated health in general is widely used to calculate the integral indicators of health at the population

level, such as HLE or years of life lost. A number of studies show a significant association between poor self-rated health and a higher risk of death in different countries [23, 34]. Self-rated health correlates well with morbidity and mortality within population groups, but this correlation is not always observed at the population level between the populations of different countries and regions [11].

In Russia, for the analysis of the state of public health, data from the Russian Monitoring of the Economic Situation and Health of the Population of the Higher School of Economics (RMEH), as well as the study “Parents and Children, Men and Women in the Family and Society” (P&CM&W) are widely used [3, 8, 10, 19, 35]. Thus, it was shown that in terms of HLE, Russia is inferior to European countries, mainly due to the high mortality of men of working age and poor health, according to the self-rated health of older women [1, 3, 8]. At the age of over 65 years, HLE indicators calculated according to the RLMS self-assessment of health are higher for men than for women due to lower self-rated health in older women, despite a higher life expectancy of women compared to men in general [3, 4].

Thus, self-reported health is the most common indicator of the health status of the population, often supplementing life expectancy. At the same time, the assessment of health status at an older age requires the involvement of more objective and meaningful indicators, including taking into account limitations in daily activity and the need for assistance with self-care. As

¹ Rosstat Order No. 95 of February 25, 2019 “On approval of the methodology for calculating the indicator “Healthy life expectancy” (years).”

mentioned above, data on the self-reported health of the population in Russia are presented in several surveys of the population (RMEH, P&CM&W, sample survey of Rosstat); however, a comprehensive assessment of the health status, especially of the elderly population, requires specialized surveys aimed, among other things, at obtaining objective indicators of health status and functional status. To obtain such information in Russia, a large epidemiological study EVCALIPT (Epidemiological study of the prevalence of geriatric syndromes and age-associated diseases in the elderly in regions of the Russian Federation with different climatic, economic and demographic characteristics), which collected information on the prevalence of geriatric syndromes and carried out assessment of the health status of people over 65 years based on the results of a comprehensive geriatric assessment was conducted [2]. This study was organized in 2018 at the initiative of the Russian Association of Gerontologists and Geriatrics and the Russian Gerontological Research and Clinical Center in cooperation with the National Research University Higher School of Economics. The aim of the study was to obtain domestic data on the prevalence of age-associated and chronic non-communicable diseases, senile asthenia and other geriatric syndromes in people over age 65, as well as to analyze the contribution of these diseases and syndromes to indicators of general health and functional status. The study has limitations, which lie in the fact that the features of sample formation do not allow us to consider it representative of the population of Russia. A more detailed description of the study is given in the relevant publications [2].

The functional status of the elderly may decrease due to physiological changes during life, as a result of which they become limited in basic and instrumental activity. Basic daily activities are self-care activities that include personal hygiene, eating, etc. Instrumental daily activities are more complex activities that require a higher level of autonomy and cognitive function and are necessary for independent living (using transportation, cooking, laundry, etc.). The need for help or difficulty in performing certain daily activities is considered as the presence of limitations in basic or instrumental activity [17]. The use of information on the prevalence of limitations in daily activities to calculate life expectancy without limitations provides important information about the health of the population, which can be used in planning in the healthcare system and social assistance and in the development of appropriate social and demographic policies [25, 28].

The purpose of this study is to assess the life expectancy of people aged 65 years or over and compare the results obtained with data from sample surveys of the population in Russia and European countries, as well as assess the conformity of the results obtained according to EVCALIPT data to the characteristics of self-assessment of the health of the general population (population of Russia) according to RMEH. The

paper compares the self-assessment life expectancy of people over age 65 according to the EVCALIPT study, the population of Russia according to the RMEH data, and also compares it with European countries according to the ESS and SHARE surveys. Additionally, according to EVCALIPT and SHARE data, the life expectancy is calculated taking into account the functional status of the respondents (the presence of limitations on basic and instrumental activity).

MATERIALS AND METHODS

The source of data on the self-assessment of health and the presence of limitations in basic and instrumental activity are data from several surveys of the population in Russia and European countries. For comparison with EVCALIPT data on the self-assessment of health, we used the data of the Russian Monitoring of the Economic Situation and Health of the Population of the National Research University "Higher School of Economics" (RMEH) of the 27th wave (the surveys were conducted in 2018). The total sample size of the RMEH [5] of the 27th wave in the Russian Federation at the age of 65 years and older was 2283 people and that of the EVCALIPT sample, 4308 people, of which data on the self-assessment of health are indicated for 3963 people. Data on self-reported health in European countries are presented based on the results of the 9th wave of The European Social Survey [20] and the 7th wave of the Survey of Health, Aging and Retirement in Europe² (SHARE) [13–15]. We also used SHARE data on the presence of limitations in basic and instrumental activity. The list of countries based on the data of these surveys and the sample size are presented in Table 1.

The EVCALIPT study used a visual analog scale [6] for self-assessment of health status, ranging from 0 (very poor) to 10 (very good).

Basic daily activity (Bartel index) was assessed according to the standard method [6]. The subjects were asked 10 questions regarding the ability to independently eat, take care of themselves at home, dress, go to the toilet, take a bath, control urination and def-

²The collection of data for SHARE was financed by the European Commission within the framework of FP5 (QLK6-CT-2001-00360), FP6 (SHARE-13: RIICT-2006-062193, COMPARE: CIT5-CT-2005-028857, SHARELIFE: CIT4-CT-2006-028812), FP7 (SHARE-PREP: GA no. 211909, SHARELEAP: GA no. 227822, SHARE M4: GA no. 261982, DASISH: GA no. 283646) and Horizon 2020 (SHARE-DEV3: GA no. 676536, SHARECOHESION: GA no. 870628, SERISS: GA no. 654221, SSHOC: GA no. 823782) and the European Commission Directorate-General for Employment, Social Affairs, and Inclusion. Additional financing was obtained from the Federal Ministry of Education and Research of Germany, the Max Planck Society for the Advancement of Science, and the National Institute on Aging of the USA (U01_AG09740-13S2, P01_AG005842, P01_AG08291, P30_AG12815, R21_AG025169, Y1-AG-4553-01, IAG_BSR06-11, OGHA_04-064, HHSN271201300071C) and various national sources of financing.

Table 1. List of countries and population survey sample sizes included in the analysis

Country, survey	Countries	Men	Women	Total
Russia EVCALIPT RMEH	Russia	1163 671	2800 1612	3963 2283
Eastern Europe ESS SHARE	Bulgaria, Czech Republic, Estonia, Croatia, Hungary, Lithuania, Latvia, Poland, Slovenia, Slovakia	3030 9886	1748 6843	4778 16729
Western Europe ESS SHARE	Austria, Belgium, Switzerland, Germany, Spain, France, UK, Ireland, Iceland, Italy, Netherlands, Portugal	3096	2806	5902
	Austria, Belgium, Switzerland, Germany, Spain, France, Italy, Portugal	9621	8087	17708

education, climb stairs, move around the house and outside it. For each answer to the question, points were awarded (0 is needs help/completely dependent on outside help; 5, 10 or 15 points, depending on the question: does not need or partially needs help), the scores were totaled.

Instrumental daily activity was assessed using the Lawton scale [6]. The questionnaire includes eight questions related to the ability to independently use the phone, take medicine, manage finances, cook food, go to the grocery store, do housework, wash clothes, and get to places located outside the usual walking distances. For each answer to the question, 0 or 1 point was awarded (0 is cannot; 1 is can independently or with outside help), the points obtained were summed up.

The analysis was carried out using binary variables for the self-assessment of health and the presence of limitations on basic and instrumental daily activities. The wording of the questions and the scale for assessing health and the presence of limitations differ between the surveys used (Table 2). It should be noted that differences in the wording of the questions may affect the comparability of the results obtained on the prevalence of poor health [16].

The comparison of EVCALIPT data and SHARE data for European countries in terms of the proportion of people without limitations on basic and instrumental activity is given taking into account at least one limitation; however, the calculation of life expectancy without limitations according to EVCALIPT data is based on the presence of a pronounced dependence, the criteria for which are also given in Table 2. Data on self-reported health and other characteristics of the respondents, disaggregated by sex and age, were used to calculate the age-specific rates of poor health and limitations on basic and instrumental activity.

To calculate the mortality tables for Russia, we used the data of the Federal State Statistics Service (Rosstat) on the distribution of the dead and the population by sex and age groups for 2018 (in accordance

with the year of the main part of the EVCALIPT surveys). For international comparisons, we also used data on the number of deaths and population for a number of European countries with reliable mortality statistics from the Human Mortality Database (HMD), which is the most authoritative source of mortality data [12, 22], for 2017–2018 or the latest available year for the respective countries.

The estimate of the HLE/unlimited life expectancy was made according to the Sullivan method [36] using summary tables of mortality for Russia and countries of Eastern and Western Europe. The Sullivan method consists in dividing the population of those living in each age interval into those with poor and good health, then, taking into account the proportion of people with good health, the indicators of the mortality tables (for the relevant generation) for the population with good health are calculated. HLE is the average number of years that a person is expected to live in a healthy state, assuming that throughout their life (at an age older than the age for which the indicator is calculated) the same age-specific mortality rates and proportion of the population with poor health as in the year for which the indicator is calculated, is preserved. Thus, HLE takes into account both the mortality rate and the state of health.

RESULTS AND DISCUSSION

Figure 1 shows the proportion of respondents with poor health according to self-assessment by sex and age reported by RMEH and EVCALIPT, indicating the 95% confidence interval. First of all, it should be noted that there are a higher proportion of respondents with poor health aged 65–69 years for men and 65–79 years for women according to the EVCALIPT survey. The proportion of men with poor health according to EVCALIPT increases with age from 33.7% at the age of 65–69 years to 82.4% over age 95; according to the RMEH, this increases from 19.5% at the age of 65–69 years to 75% over the age 90; and for

Table 2. Determination of scales for health status and the presence of limitations

Parameter	Poor health or limitations	Good health or no limitations
Self-reported health		
EVCALIPT	0–5 points—bad	6–10 points—good
RMEH	Bad and very bad	Very good, good and average
ESS	Bad and very bad	Very good, good and average
SHARE	Average and bad	Excellent, very good, good
HLE EVCALIPT		
limitations on basic activity (Bartel scale)	0–60 points—the presence of limitations, complete and pronounced dependence	65–100 points—no limitations (moderate, mild dependence and no dependence)
limitations of instrumental activity (Lawton scale)	0–3 points for men and 0–5 points for women—the presence of limitations, pronounced dependence	4–8 points in men and 6–8 points in women—no limitations (moderate dependence and no dependence)
Comparison with European countries		
limitations on basic activity	EVCALIPT: 0–90 points—the presence of limitations; SHARE—the presence of one or more limitations	EVCALIPT: 95–100 points—mild dependence and no dependence; SHARE—no limitations
limitations of instrumental activity	EVCALIPT: 0–7 points—the presence of limitations; SHARE—the presence of one or more limitations	EVCALIPT: 8 points—no limitations; SHARE—no limitations

Here and in Table 3 and 5: LE is life expectancy; HLE is healthy life expectancy; uHLE is unhealthy life expectancy.

women, from 38.8 to 76%, respectively, according to EVCALIPT and from 28.4 to 74%, according to RMEH. Estimates based on the EVCALIPT data change more steadily with age, and in older age groups, due to the larger sample size, they are charac-

terized by a smaller confidence interval compared to the RMEH data.

Self-reported health in Eastern European countries and Russia deteriorates with age at a faster rate than in Western European countries. At the age of 65–

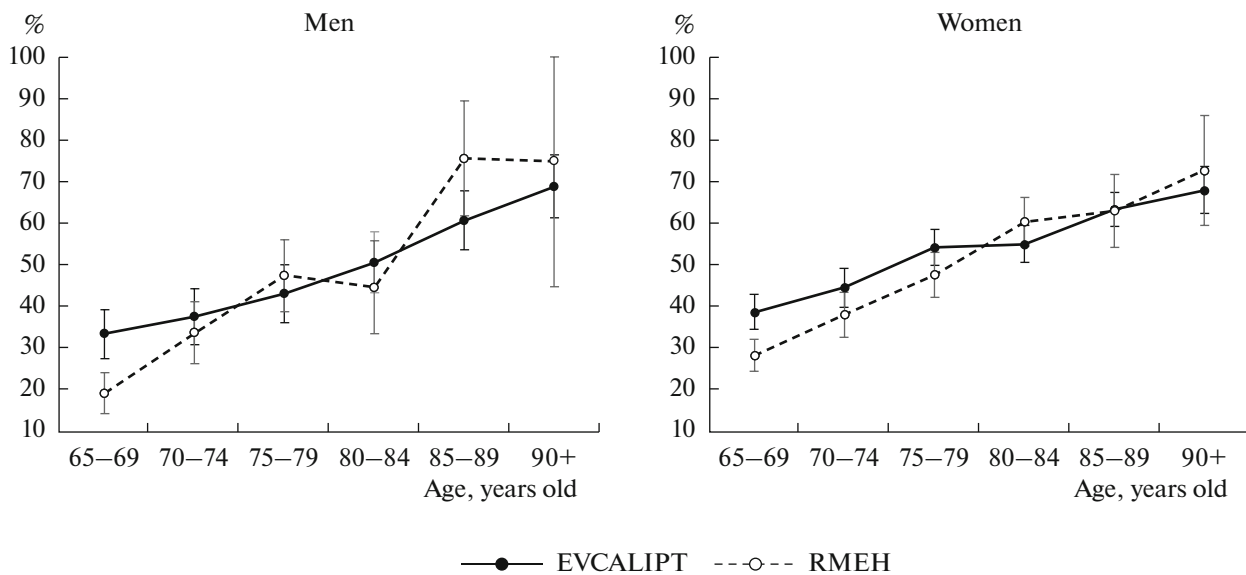


Fig. 1. Share of respondents with poor health according to self-assessment in Russia (according to RMEH and EVCALIPT).

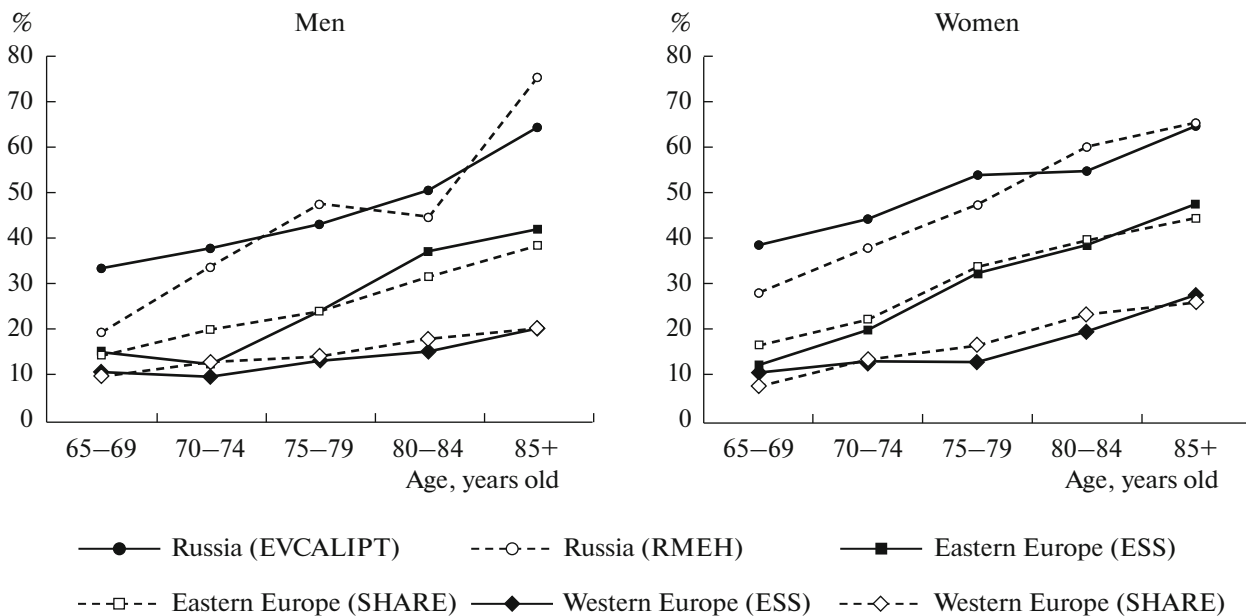


Fig. 2. Share of respondents with poor health according to self-assessment in Russia and European countries.

69, the indicators in European countries, as well as in Russian men, according to the RMEH data, are comparable with each other; with age, the gap in the proportion of respondents with poor health between Russia and European countries increases (Fig. 2).

According to the EVCALIPT data, the HLE for men at the age of 65 was 8.1, which is 0.6 years lower compared to the estimate according to the RMEH data (Fig. 3); for women it was 9.2 years (according to the RMEH data it was 10 years).

Depending on the data source, the difference in the HLE at age 65 between Russia and Eastern Europe is 3.2–4 years for men and 3.6–4.8 years for women. In Western Europe, men at the age of 65 are expected to live in good health 7.4–8.5 years more than in Russia, and women, for 8.6–9.6 years. At the same time, the difference in the life expectancy in general at the age of 65 between Russia and the countries of Western Europe is significantly lower and amounts to 5.2 years for men and 4.7 years for women (Table 3).

Russia is ahead of European countries in terms of the difference in life expectancy between men and women; however, the difference in life expectancy between the sexes in Russia, on the contrary, is minimal, and amounts to 1.1 years according to EVCALIPT data and 1.3 years according to RMEH data (in Eastern Europe, it is 1.7–2 years and in the countries of Western Europe, 2.1–2.4 years).

Thus, the EVCALIPT data show a larger proportion of people with poor health according to self-assessment in younger age groups compared to the RMEH data, and lower, but comparable estimates with HLE.

The proportion of respondents without limitations on instrumental activity (taking into account the presence of at least one limitation) according to the EVCALIPT survey is lower than in European countries. For women, the indicators in the countries of Western and Eastern Europe and in Russia, according to the EVCALIPT data, appeared to be closer; at the

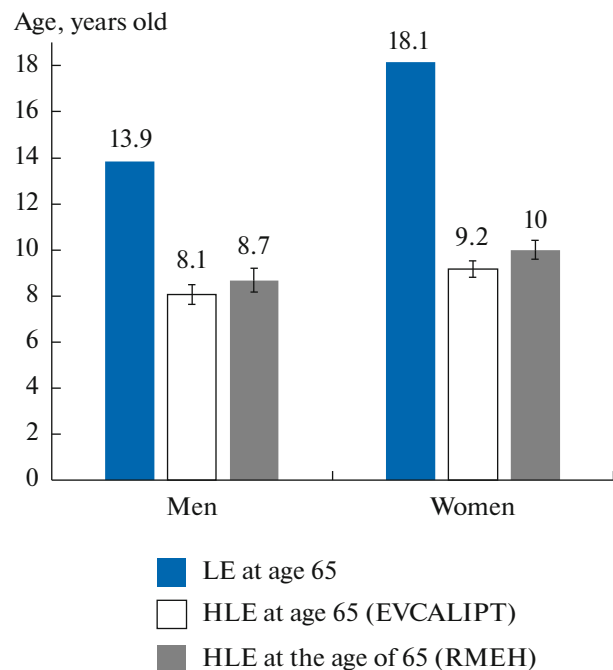


Fig. 3. Life expectancy (LE) and healthy life expectancy (HLE) in Russia (according to EVCALIPT and RMEH).

Table 3. Life expectancy (LE) and healthy life expectancy (HLE) in Russia and European countries, years

Country, study	Men		Women		Both sexes	
	LE	HLE	LE	HLE	LE	HLE
Russia						
EVCALIPT	13.9	8.1	18.1	9.2	16.5	8.7
RMEH	13.9	8.7	18.1	10	16.5	9.5
Eastern Europe						
SHARE	15.5	11.9	19.5	13.7	17.7	12.9
ESS	15.5	12	19.5	14	17.8	13.1
Western Europe						
SHARE	19.1	16.3	22.8	18.7	21.1	17.6
ESS	19.1	16.6	22.5	18.6	20.9	17.7

same time, the tendency for the countries of Eastern Europe to lag behind the countries of Western Europe and Russia from the countries of Western and Eastern Europe remains (Fig. 4).

According to the EVCALIPT survey, the proportion of women aged 65–69 years without limitations on instrumental activity is 75.8%, and over 90 it decreases to 10.2% (in Western Europe, it is from 87.6 to 20.1%, and in the countries of Eastern Europe, it is from 83.2 to 16.7%, respectively).

The proportion of men without limitations on instrumental activity according to the EVCALIPT survey is significantly lower than in European coun-

tries, according to SHARE, and also significantly lower than in women. As shown in Table 4, the differences in the proportion of persons without instrumental-activity limitations between men and women according to EVCALIPT data are primarily due to such activities as cooking and washing, however, the exclusion of these types of activity from the calculation of indicators for men has little effect on the presented results.

The proportion of respondents without limitations on basic activity according to the EVCALIPT survey is also lower than in European countries. The difference between the countries of Eastern and Western Europe is relatively small (Fig. 5), while for men, the difference in indicators between the EVCALIPT sample and European countries according to SHARE data increases rapidly with age, and for women, a noticeable delay is observed from the age of 65. Thus, according to the EVCALIPT data, the proportion of men aged 65–69 years without limitations on basic activity is 86.3%, by the age of 85–89 years it decreases to 50.3%, and over 90 years, it increases to 24.2% (in the countries of Western Europe, it is from 92.1 to 58.3%, and in Eastern Europe, it is from 89.6 to 49.4%, respectively). The difference in the proportion of people without limitations on basic activity according to EVCALIPT and SHARE data in women in the considered age range is 10–20%.

A subjective deterioration in health occurs on average earlier than the need for additional assistance in daily activities and self-care. Thus, according to self-assessment, life expectancy with poor health is about

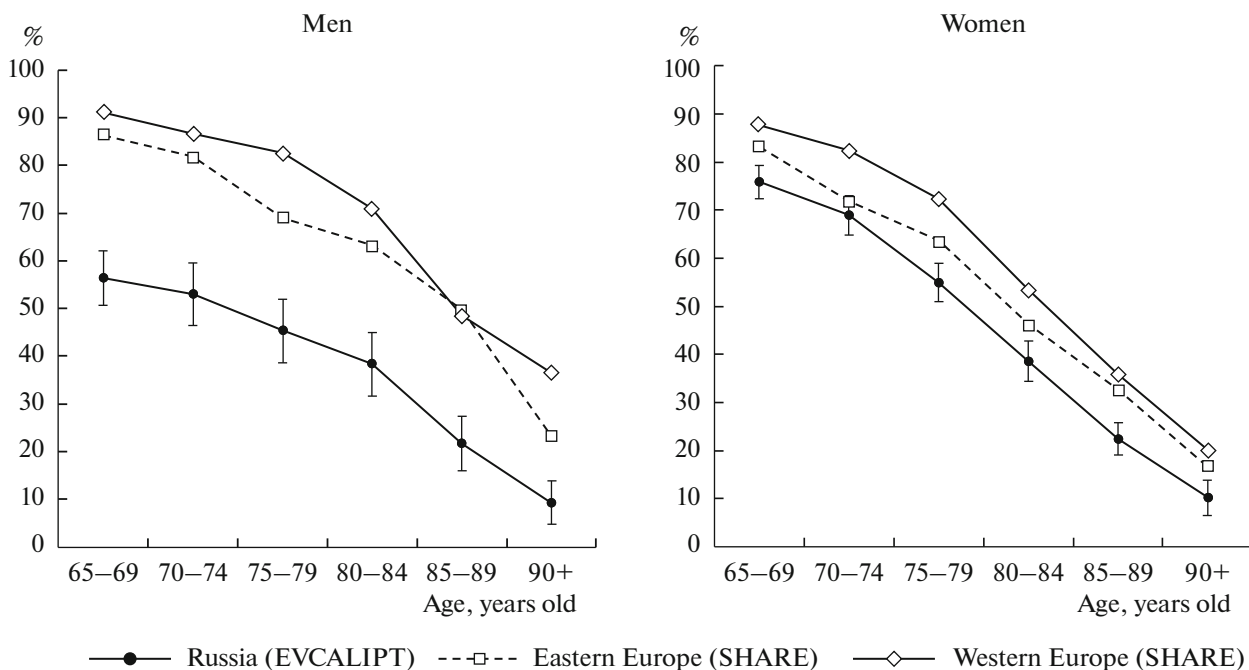


Fig. 4. Percentage of respondents without limitations on instrumental activity in Russia and European countries.

Table 4. Share of respondents without limitations on instrumental activity by type of activity, gender and age groups, %

Age, years	Telephone	Shopping	Food	Household	Laundry	Transport	Medications	Finance
Women								
65–69	99	81	88	99	93	91	96	98
70–74	100	72	82	99	92	88	94	98
75–79	98	61	71	96	84	79	90	95
80–84	97	47	63	94	81	70	82	93
85–89	92	27	44	87	72	51	72	84
90–94	88	15	27	78	56	35	61	75
95+	86	9	21	51	42	12	40	51
Men								
65–69	97	74	67	90	72	89	82	95
70–74	97	71	65	90	71	86	87	95
75–79	98	60	56	92	70	85	83	96
80–84	95	59	55	92	64	79	83	95
85–89	87	33	34	80	54	59	60	88
90–94	85	17	25	73	47	35	52	80
95+	64	5	14	41	23	14	23	50

9 years for women and 5.8 years for men. Without limitations in instrumental activity (taking into account the presence of pronounced limitations), at the age of 65, the women surveyed are expected to live an average of 14.2 years and men 12.3 years; without limitations on basic activity, they are expected to live 17.2 and 13 years, respectively (Table 5).

Life expectancy with limitations on basic and instrumental activities gives an idea of how much of the life older people, on average, need extra care or assistance in daily life. The preliminary results of calculations based on the EVCALIPT study show that older people aged 65 years and older, on average, live with severe limitations in basic daily activities (eating,

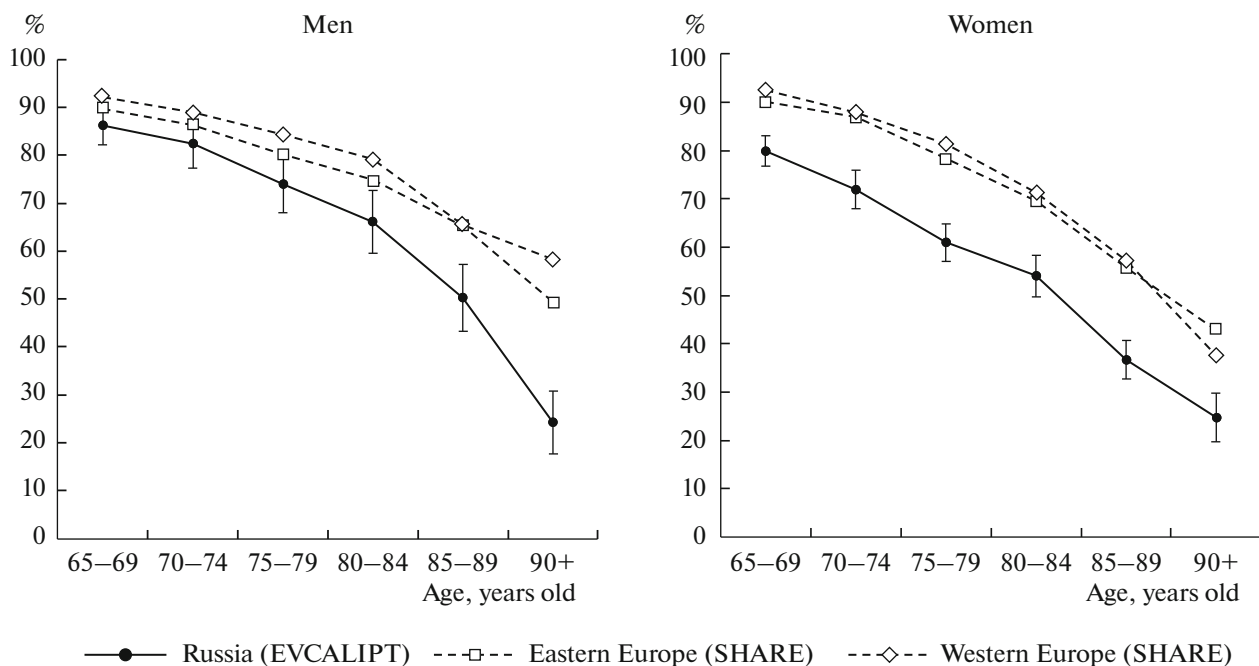
**Fig. 5.** Share of respondents without limitations on basic activity in Russia and European countries.

Table 5. Life expectancy (LE) and healthy life expectancy (HLE)/with and without limitations in activity at age 65, according to EVCALIPT

Index	LE	HLE/LE without limitations	uHLE/LE with limitations
Men			
Self-reported health	13.9	8.1	5.8
Limitations in instrumental activities	13.9	12.3	1.5
Limitations in basic activity	13.9	13	0.9
Women			
Self-reported health	18.1	9.2	9
Limitations in instrumental activities	18.1	14.2	4
Limitations in basic activity	18.1	17.2	0.9
Both sexes			
Self-reported health	16.5	8.7	7.8
Limitations in instrumental activities	16.5	13.4	3.0
Limitations in basic activity	16.5	15.6	0.9

personal hygiene, and so on), and therefore need appropriate care, for 0.9 years (see Table 5). For about 4 years of life in women and 1.5 years in men aged 65 and older, there are limitations in instrumental activity (going to the store, cooking, housekeeping, etc.).

Almost half of the life expectancy of women occurs in a period with poor health according to self-rated health (for men, it is 42%), including with limitations on instrumental activity, 22% for women and 11% for men and with limitations on basic activity, 5 and 6.5% respectively.

CONCLUSIONS

Self-reported health is one of the most sensitive indicators predicting the risk of death at the individual level. The strong relationship between self-reported health and mortality is evidenced by the results of studies in other countries. At the same time, self-reported health in surveys of the Russian population is on average worse than in English-speaking countries, which may indicate objective factors, such as high levels of morbidity and disability, which is also reflected in high mortality in Russia compared to other countries. However, differences in self-reported health do not always explain differences in mortality rates and may be due, among other things, to subjective factors. In addition, the use of indicators based on self-reported health does not allow the identification and assessment of the population's need for services for care of the elderly. The planning and development of measures in the health-and-social-care system also require the involvement of objective indicators of health and functional status.

One approach to using functional-status data is to calculate the "active" life expectancy, which is the expected number of years of life without limitations on

daily activity [24, 26, 28, 29], which is used, among other things, to estimate healthcare costs associated with a change in functional status [21, 30]. Studies conducted in a number of foreign countries show a trend towards a gradual decrease in the prevalence of functional-activity limitations over time [9, 17, 18, 29, 37].

The results of the EVCALIPT survey reflect patterns known for Russia in the prevalence of self-reported poor health, but show a larger proportion of people with self-reported poor health in younger age groups and, accordingly, lower, but generally comparable estimates of healthy life expectancy compared to nationally representative RMEH data.

It is necessary to note a number of limitations of the presented results according to the EVCALIPT data. Thus, the presented sample is not representative of the population of Russia, since it is based on data on patients of medical organizations in several regions of Russia. In this regard, it is necessary to refer to the obtained results with caution. In particular, the higher proportion of people with poor health in younger age groups (compared to the RMEH data) may be the result of a larger representation of people with health problems in the sample.

According to the EVCALIPT survey, interviewed patients aged 65 years and older, on average for about 1 year of life, need care associated with limitations in basic activity (eating, personal hygiene). With limitations in instrumental activity that do not require constant care, women are expected to live for 4 years and men for 1.7 years. Studies of the healthy life expectancy without limitations show the advantage of women over men in life expectancy in general, with a higher proportion of life expectancy with functional-status limitations [7, 17, 27, 28, 31–33], the so-called "male-female health-survival paradox". Estimates of healthy life expectancy according to the EVCALIPT

data also show that the proportion of life expectancy with health limitations in women is higher than in men both in terms of self-reported health and the presence of instrumental-activity limitations.

The need to develop an adapted methodology for assessing the presence of limitations in instrumental activity for men in Russia should also be noted. The results of the Lawton score used in the EVCALIPT study are likely to overestimate the proportion of men with limited activity compared to women, and also compared to European countries with a comparable proportion of people with limited basic activity.

The results obtained can be used within the framework of gerontological service to assess the characteristics of patients in gerontological clinics, including resource planning for the provision of medical and social assistance to the elderly.

COMPLIANCE WITH ETHICAL STANDARDS

We declare that we have no conflict of interest. This article does not contain any studies involving animals or human participants performed by any of the authors.

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