Reserves for Reducing Mortality in Russia Due to the Efficiency of Health Care

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Abstract—Approaches to assessing the role of health care in reducing mortality in Russia from the standpoint of controlling manageable causes are discussed. Based on the concept of avoidable mortality, trends in regional variability of mortality, the nosological and gender characteristics for the years 2000–2019 have been analyzed. The patterns revealed indicate the following: a significant contribution of medicine and health care to the decrease in the premature reduction in the life expectancy of the population, the expediency of developing a regional classification of the list of avoidable causes of mortality, and the decisive role of prevention and the improvement of the lifestyle of the population of young and middle ages in the past two decades against the background of a slow increase in the capacity of clinical medicine in the diagnostics and treatment of diseases.

Keywords: avoidable mortality, health care efficiency, life expectancy, causes of death.

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In the period of the COVID-19 pandemic, which is facing Russia, as well as the rest of the world, the importance of clinical medicine and health care as a social institution is unquestionable. However, at present, health care is forced to carry out its functions in an extraordinary, mobilization mode, which will inevitably be canceled when the pandemic declines. What is the role of health care in maintaining health and life expectancy in “peacetime”?

To assess the efficiency of health care as a social institution adequately, in 1976 D. Rutstein and his colleagues proposed the concept of avoidable mortality [1], based on determining the causes of death from which people should not die under the modern development of medicine. In accordance with this concept, the scale of mortality from avoidable causes and its contribution to total mortality, as well as the rate of

decline in avoidable mortality, serve as criteria for assessing the level of health care.

Numerous studies in the world have shown that Rutstein’s ideas implemented in the practice of health care management have significantly increased the efficiency of investments in public health protection. The concept gained recognition when it was found to outstrip the rate of the decrease in mortality from causes classified as avoidable compared with the consequences of other diseases, as well as the total mortality [2–4]. The undoubted merit of the concept lies in quantitative criteria that make it possible to assess the situation based on objective data that do not depend on market circumstances.

All losses from causes classified as avoidable are divided into three groups, reflecting the stages of the process: at the first stage (first group), these are causes of mortality which can be avoided by primary prevention measures; at the second stage (second group), by timely detection of the disease, i.e., due to the quality of diagnosis; and at the third stage (third group), by adequate treatment and medical care.

With the growth of life expectancy, the criteria of avoidability and, consequently, the causes classified as avoidable, as well as the age of avoidable mortality, changed [5–10]. In 2004, E. Nolte and M. McKee [11] compiled a new list of causes with a proven effect

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Fig. 1. Dynamics of life expectancy of the population of Russia in the 2000s–2010s.

of health services on mortality with account for advances in medical knowledge and technology in the EU countries in the 1980s and 1990s. Previous lists of causes of death, compiled by J. Charlton et al. [5] and J. Mackenbach et al. [6], were revised. In the updated list, they were characterized as *amenable* or *treatable*. For Russia, in accordance with the average life expectancy in our country, as shown by one of the authors of this article, the most adequate classification is based on a broader assessment of avoidable deaths and broader determinants of public health, such as behavior, lifestyle, socioeconomic status, and environmental factors [12].

When analyzing the avoidable mortality of the Russian population in the period after 1989, which included the stage of the crisis and the beginning stage of social recovery, domestic researchers showed that mortality in crisis sociopolitical and economic conditions grows at a faster rate than it decreases when the living conditions of the population improve [13–16].

In the course of these studies [17–19], it was revealed that, at present, both in Russia and in postindustrial countries, the most significant is the first group of causes of avoidable mortality, that is, those that can be avoided by preventive measures, since they are formed at the expense of behavioral risk factors—from injuries and poisoning to cancer of the trachea, bronchi, and lung. However, it would be a clear exaggeration to blame health care for such losses because they are largely determined by the standard, style, and quality of life of the population. In this situation, health care is supposed to play an informational and educational role. It was established that the largest differences between countries in mortality trends are associated with causes that are fully or partially amenable to primary prevention [20]. Noticeable differences in the level of avoidable mortality between areas of European cities are associated with social deprivation of the population [21].

It seems that most objectively the effectiveness of health care can be assessed by the scale of losses and the dynamics of mortality from causes of the second and third groups, determined by the timely diagnosis of diseases and the quality of treatment. This study, which covers the time span of the first two decades of the 21st century, assesses the reserves for reducing mortality in Russia determined precisely by the efficiency of health care, primarily clinical medicine. We proceeded from the data of the Federal State Statistics Service of Russia (Rosstat) and their integrative assessment based on the Factual Automated Information Reference System (FAIRS) “Potential.” Avoidable causes of mortality were classified using the system proposed in the corresponding European Community Atlas [8] (Table 1). According to it, mortality from these causes is avoidable under the age of 65 years.

General trends in avoidable mortality. In the last two decades, the dynamics of life expectancy of the Russian population was characterized by two periods: in 2000–2003, when the consequences of the crisis caused by the 1998 default were not yet exhausted, its indicators decreased by 0.5 years in the male population and 0.4 years in the female population. The decade and a half that followed 2003 were marked by the longest positive trend over the past 55 years: by 2019, life expectancy had increased by 9.7 years in the male population and 6.3 years in the female population, reaching 68.3 and 78.2 years, respectively (Fig. 1). Thus, 2003 became the reference point, the year of the change in the mortality trends of the Russian population in the 2000s–2010s.

Note that, in the early 2000s, the rates of negative mortality trends at the “avoidable age” (under 65 years) were multiple times higher than those in older ages, amounting to 7.7% versus 2.6% in the male population and 8.2% versus 1.4% in the female population. However, after 2003, the situation changed to the mirror image: the decrease in the mortality rate of the population under the age of 65 was much higher than that in older ages, amounting to 49.3% versus 34.4% for men and 43.5% versus 34.6% for women. Thus, it can be stated that the increase in life expectancy during that period was primarily due to the population of children and working-aged people (Fig. 2).

It is noteworthy that even during the period of a negative trend in life expectancy (2000–2003), the growth rates of avoidable mortality turned out to be lower than the growth rates of total losses in both the male and female populations, amounting to 4.2% versus 7.7% for men and 7.3% versus 8.2% for women, respectively. Moreover, in those years, the growth rate of mortality from causes that could be avoided with the help of clinical medicine turned out to be several times lower compared not only to the overall mortality but also to the total avoidable mortality, amounting to 2.7% among men and practically not increasing

Table 1. Classification of causes of death according to stages of avoidability

No.	Causes of death	ICD-10 code
Causes losses from which can be avoided by primary prevention measures (first group)		
1	Malignant neoplasms of the lip, oral cavity, and pharynx	C00—C14
2	Malignant neoplasms of the esophagus	C15
3	Malignant neoplasms of the liver and intrahepatic bile ducts	C22
4	Malignant neoplasms of the larynx	C32
5	Malignant neoplasms of the trachea, bronchi, and lungs	C33, C34
6	Malignant neoplasms of other and ill-defined localizations of the respiratory and chest organs	C30, C31C37—C39
7	Malignant neoplasms of the bladder	C67
8	Malignant neoplasms of other and unspecified urinary organs	C65, C66, C68
9	Subarachnoid hemorrhage	I60
10	Intracerebral and other intracranial hemorrhages	I61—I62
11	Cerebral infarction	I63
12	Stroke not specified as hemorrhage or infarction	I64
13	Other cerebrovascular diseases	I67—I69
14	Alcoholic liver disease (alcoholic cirrhosis, hepatitis, fibrosis)	K70
15	Fibrosis and cirrhosis of the liver (except alcoholic)	K74
16	Other liver diseases	K71—K73, K75—K76
17	Injury, poisoning, and some other consequences of external factors	S00—S99, T00—T98
Causes losses from which can be avoided by timely detection of diseases (second group)		
1	Malignant melanoma of the skin	C43
2	Other malignant neoplasms of the skin	C44
3	Malignant neoplasms of the breast	C50
4	Malignant neoplasms of the cervix	C53
5	Malignant neoplasms of other and unspecified parts of the uterus	C54, C55
Causes from which losses can be avoided by improving treatment and medical care (third group)		
1	Malignant neoplasms of the prostate	C61
2	Malignant neoplasms of other male genital organs	C60, C62, C63
3	Hodgkin's disease	C81
4	Non-Hodgkin's lymphoma	C82—C85
5	Leukemia	C91—C95
6	Chronic rheumatic heart disease	I05—I09
7	Hypertonic disease	I11— I13, I10, I15
8	Stomach ulcer	K25
9	Duodenal ulcer	K26

Table 1. (Contd.)

No.	Causes of death	ICD-10 code
10	Diseases of the appendix	K35—K38
11	Hernias	K40—K46
12	Gallstone disease (cholelithiasis)	K80
13	Cholecystitis	K81
14	Infectious and parasitic diseases	A00—A99, B00–B99
15	Respiratory diseases	J00—J99
16	Complications of pregnancy, childbirth, and the postpartum period	O00—O99

among women (growth of indicators is only 0.1%) (Fig. 3).

After 2003, the dynamics changed: both in the male and especially in the female population, the rate of decrease in losses caused by the medical component was inferior to the positive trends in the cumulative avoidable mortality, amounting to 49.2% versus 54% in men and 29.7% versus 47.9% in women, respectively. At the same time, while in men the rate of decrease in total avoidable mortality was noticeably higher than that for total mortality (54% versus 49.3%), and the rate of decrease in mortality preventable by the efforts of clinical medicine was 49.2%, that is, it was only 0.1% lower than the rate of decrease in the total mortality, in women the situation developed according to a slightly different scenario. On the one hand, avoidable mortality decreased faster than overall mortality (47.9% versus 43.5%); on the other hand, the rate of decrease in mortality due to the medical component was 29.7%, that is, it was inferior to those for both avoidable and total mortality.

Interestingly, while in men the variability in the contribution of the medical component of avoidable mortality to total mortality over the years of our study was rather insignificant (from 12.6% in 2004 to 13.8% in 2011), in women the indicators varied from 16.6% (2003–2004) to 21.3% (2017). We have noted the gender synchronicity of the dynamics of the contribution of the medical component to total mortality until 2011, after which these trends diverged in men and women: until 2017, there was a decrease in men and an increase in women. Only in the last two years of the study has the contribution of medicine to both male and female mortality decreased (to 12.9% and 20.6%, respectively) (Table 2).

Diseases and causes of death avoidable through timely diagnosis and quality treatment. The data in Tables 1, 3, and 4 show that the losses determined by the medical component of avoidable mortality are caused by the following pathologies: neoplasms (melanoma and other malignant skin tumors, leukemia, Hodgkin's disease and non-Hodgkin's lymphoma, as well as breast cancer, cancer of the cervix and other

Fig. 2. Dynamics of the mortality rate of the population of Russia at the ages under and over 65 years in the 2000s–2010s (standardized coefficient per 100 000 people).

Table 2. Reserves for reducing the mortality rate of the population of Russia under the age of 65 at the expense of losses avoidable due to activities of medicine and health care

Years	Total mortality		Medical component of avoidable mortality		Contribution of the medical component to total mortality	
	standardized coefficient per 100 000 people (European standard)				%	
	men	women	men	women	men	women
2000	1180.6	383.2	159	68.6	13.5	17.9
2001	1209.2	393.9	156	66.8	12.9	17.0
2002	1248.8	405.7	163.8	68.5	13.1	16.9
2003	1271.3	414.6	163.3	68.7	12.8	16.6
2004	1242.0	404.8	156.5	67.3	12.6	16.6
2005	1240.3	402.7	160.1	67.6	12.9	16.8
2006	1102.6	365.3	141.5	63	12.8	17.2
2007	1017.6	338.6	133.2	61.4	13.1	18.1
2008	995.1	332.5	132.9	60.4	13.4	18.2
2009	933.1	317.4	128	61.4	13.7	19.3
2010	920.2	313.9	123.1	58.5	13.4	18.6
2011	864.5	297.3	119.4	58.5	13.8	19.7
2012	824.2	286.9	110.2	55.6	13.4	19.4
2013	794.3	276.3	105.9	55.5	13.3	20.1
2014	789.2	274.3	103.7	54.9	13.1	20.0
2015	757.8	267.0	100.6	54.3	13.3	20.3
2016	727.5	256.8	97.6	53.5	13.4	20.8
2017	670.2	240.4	88.5	51.1	13.2	21.3
2018	664.3	239.4	86.5	50.3	13.0	21.0
2019	644.5	234.1	83	48.3	12.9	20.6

parts of the uterus in women, and cancer of the prostate and other genital organs in men); diseases of the circulatory (chronic rheumatic heart disease and hypertension), respiratory (overall), and digestion (stomach and duodenal ulcer, appendicitis, cholelithiasis and cholecystitis, and hernias) systems; and infectious diseases (in general), as well as complications of

pregnancy, childbirth, and the postpartum period in women.

In 2000–2003, the negative trends in avoidable mortality due to the medical component were characterized by a number of features. Thus, in both the male and female populations, mortality from preventable diseases of the digestive system decreased (by 14.9%

Fig. 3. The rate of change in total avoidable mortality and mortality caused by the activity of clinical medicine in the population of Russia under the age of 65 in the 2000s–2010s, %.

and 9.1%, respectively): in men, from infectious diseases (by 0.7%), and in women, from avoidable cardiovascular diseases (by 13.4%). The quantitative indicators of mortality from amenable oncological pathologies were stable in men and practically stable (an increase of 0.3%) in women (see Tables 3 and 4).

After 2003, against the background of a decrease in indicators in all groups of avoidable causes in men, an increase in mortality from infectious diseases was observed in the female population by almost 40%.¹ Considering the results of the past 20 years as a whole, during this period there was a decrease in losses from all groups of avoidable causes; among women, infectious diseases turned out to be an exception: the mortality rate from them increased by more than 1.5 times.

The spread in the rates of changes in mortality from the avoidable causes considered is large. The greatest inertia, with both negative and positive shifts in the male and female populations, is typical, as a rule, of oncological diseases, while the greatest lability is observed for respiratory diseases and cardiovascular pathologies, the mortality from which has decreased over 20 years, respectively, by 2.3 and 2.7 times for men and 5.4 and 2.3 times for women.

These changes could not but affect the structure of the medical component of avoidable mortality: from the data of Tables 3 and 4, it follows that, over the past 20 years, in the male and female populations there was a decrease in the significance of cardiovascular diseases—from 14 to 12.4% in men and from 14.1 to 3.7% in women, determined by the shifts of the 2010s, as

well as respiratory diseases—from 43.6% to 31.1% in men and from 23.5% to 14.3% in women. This decrease occurred against the background of an increase in the contribution of neoplasms—from 8.1% to 12.9% in men and from 46.1% to 51.1% in women, and especially infectious diseases—from 28.4% to 37.3% in men and from 12.1% to 26.7% in 2019 among women. The share of diseases of the digestive system also slightly increased—from 5.1% to 6.3% in men and from 3.2% to 3.7% in women.

Thus, in the period from 2000 to 2019, the fundamental difference in the medical component of avoidable mortality between men and women remained and manifested itself very clearly: in the female population, more than half of the losses (51.1%) are formed by oncological diseases, which seems quite predictable since this block includes breast cancer, which, if external causes are excluded, is the leading cause of death in women under 65 years of age. In men, the contribution of oncology to avoidable mortality in 2019 was 12.9%.

Another feature is that while in 2000 the contribution of avoidable cardiovascular pathologies in the male and female populations practically did not differ (14.8% and 14.1%, respectively), by the end of the 2010s the differences turned out to be many times (12.4% versus 3.7%). Also note the growth of the significance of infectious diseases, as a result of which in the male population they took 1st place among medical causes, and in the female population, they moved from 4th to 2nd place. The rank of respiratory diseases, on the contrary, decreased (from 1st to 2nd place in men and from 2nd to 3rd place in women). Nevertheless, the general vector of evolution of the medical component of avoidable mortality in the male and female populations is the growing importance of endogenous pathologies, which certainly include neoplasms.

¹ The source of the increase in infectious mortality was HIV, the losses from which increased in both men and women. In men, however, they were compensated by a decrease in mortality from tuberculosis, and the overall results of the dynamics of infectious mortality in them were positive. Whereas in women, due to the significantly lower mortality rate from tuberculosis, in comparison with men, the positive dynamics of losses from this infection did not compensate for the increase in mortality from HIV.

Table 3. Nosological profile of the medical component of avoidable mortality in the male population of Russia in the 2000s–2010s (per 100 000 men in the age category from 0 to 64 years old, standardized coefficient, European standard; %)

Cause of death	2000		2003		2019	
	per 100 000 people	%	per 100 000 people	%	per 100 000 people	%
Malignant melanoma of the skin	1.2	0.8	1.5	0.9	1.3	1.6
Other malignant neoplasms of the skin	0.6	0.4	0.5	0.3	0.3	0.4
Malignant neoplasms of the breast	0.3	0.2	0.2	0.1	0.1	0.1
Malignant neoplasms of the prostate	3.0	1.9	3.1	1.9	3.3	4.0
Malignant neoplasms of other male genital organs	0.8	0.5	0.8	0.5	0.5	0.6
Hodgkin's disease	1.1	0.7	1	0.6	0.5	0.6
Non-Hodgkin's lymphoma	1.8	1.1	1.9	1.2	2	2.4
Leukemia	4.0	2.5	3.8	2.3	2.7	3.3
Oncological diseases preventable by the activity of clinical medicine	12.8	8.1	12.8	7.8	10.7	12.9
Chronic rheumatic heart disease	4.3	2.7	3.5	2.1	0.5	0.6
Hypertonic disease	19.3	12.1	21.1	12.9	9.8	11.8
Cardiovascular diseases preventable by clinical medicine	23.6	14.8	24.6	15.1	10.3	12.4
Stomach ulcer	4.3	2.7	3.7	2.3	2.5	3.0
Duodenal ulcer	2.7	1.7	2.3	1.4	2	2.4
Diseases of the appendix	0.3	0.2	0.2	0.1	0.1	0.1
Hernias	0.3	0.2	0.3	0.2	0.3	0.4
Gallstone disease (cholelithiasis)	0.3	0.2	0.3	0.2	0.2	0.2
Cholecystitis	0.2	0.1	0.1	0.1	0.1	0.1
Diseases of the digestive system preventable by the activity of clinical medicine	8.1	5.1	6.9	4.2	5.2	6.3
Infectious diseases	45.2	28.4	44.9	27.5	31	37.3
Respiratory diseases	69.3	43.6	74.1	45.4	25.8	31.1
Medical component of avoidable mortality	159	100.0	163.3	100.0	83	100.0

Regional features of avoidable mortality. In Russia, there are significant regional differences in avoidable mortality determined by medical factors: 4.4 times in the male population (from 39.6 per 100 000 men in the age category from 0 to 64 years in Dagestan to 174.2 in Kemerovo oblast, respectively) and 4.6 times in the female population (from 27.6 per 100 000 women in the age category from 0 to 64 years in Lipetsk oblast to

126.7 in the Chukotka Autonomous Okrug, respectively). The spread of the contribution of the medical component of avoidable mortality to the total loss of the population under the age of 65 is also significant (from 7.1% for men in Magadan oblast and 12.4% for women in the Altai Republic to 20.2% for men in Kemerovo oblast and 30.5% for women in the Chukotka Autonomous Okrug).

Note that, despite the obvious differences in the structure of the medical component of avoidable mortality in men and women caused by objective factors, its regional profile has an undeniable gender similarity, as evidenced by the rank correlation coefficient, which in 2019 was 0.83.² Moreover, the regional profile of the contribution of the medical component to the total mortality rate of the population under the age of 65 is also characterized by gender similarity (in 2019, it was 0.78) (Table 5).

Regarding the area of well-being, for a quarter of Russian territories with a minimum mortality avoidable thanks to clinical medicine, note the population of Moscow; the republics of Dagestan, Mordovia, Kabardino-Balkaria, Kalmykia, Mari El, and Chuvashia; the Yamalo-Nenets Autonomous Okrug; Stavropol' krai; Lipetsk, Belgorod, Moscow, Voronezh, Tambov, Kirov, Ryazan, Penza, Arkhangel'sk, Vologda, and Kaluga oblasts; men of Murmansk oblast and women of the Republics of Sakha (Yakutia), Altai, and Tatarstan; the Khanty-Mansi Autonomous Okrug; Krasnodar krai; and Orel and Bryansk oblasts (see Table 5).

The area of trouble—a quarter of Russian territories with high avoidable mortality depending on the effectiveness of clinical medicine—includes the city of Sevastopol; the Republics of Crimea and Tuva; the Chukotka Autonomous Okrug; Altai, Krasnoyarsk, Perm', and Primorskii kraies; Kemerovo, Irkutsk, Kurgan, Novosibirsk, Sverdlovsk, Chelyabinsk, Orenburg, Tyumen' (without autonomous okrugs), and Samara oblasts (population as a whole), as well as men of Khakassia; Khabarovsk krai; Amur, Omsk, and Leningrad oblasts; and the Jewish Autonomous Oblast and women of Buryatia; Transbaikal and Kamchatka kraies; and Tver, Sakhalin, and Magadan oblasts. (Note that Magadan oblast quite unexpectedly found itself in the quarter of Russian territories with the minimum level of avoidable mortality among men.)

Thus, with rare exceptions, the area of well-being is formed at the expense of the European regions of Russia, while the area of disadvantage consists of Asian ones. Extremely interesting is the situation emerging in Tyumen' oblast, the autonomous okrugs of which (Yamalo-Nenets and Khanty-Mansi) found themselves in the area of well-being, while the main territory of the oblast was contained in the area of trouble.

² Rank correlation is a method of correlation analysis that reflects the relationship of variables ordered by their ascending (descending) values. Spearman's rank correlation coefficient is used to identify and assess the closeness of the relationship between two series of compared quantitative indicators. In the event that the ranks of the indicators, ordered by the degree of increase or decrease, in most cases coincide (the larger value of one indicator corresponds to the larger value of the other indicator), it is concluded that there is a direct correlation. If the ranks of the indicators have opposite directions (a larger value of one indicator corresponds to a smaller value), then there is an inverse relationship between indicators.
<https://medstatistic.ru/methods/methods9.html>.

In discussing the concept of avoidable mortality with regard to Russia, let us highlight several points arising from the specifics of our country as such, in particular, its enormous heterogeneity not only in the geographical and socioeconomic aspects but also in the medico-demographic one. This is evidenced by the very significant spread in the life expectancy of the population of the Russian regions (from 77.1 years for men in the Republic of Dagestan and 82.2 years for women in Moscow to 62.7 for men and 72.5 for women in Tuva), which amounted to 14.4 and 9.7 years—almost a whole demographic era.³ The World Health Organization, however, points out that life expectancy serves as an integral criterion that characterizes not only the state of health of the population but also the standard of living, as well as the quality of medical care in a particular region.

It follows from the above data that the assessment of the situation in our country as a whole cannot be universal for all its regions, and the criteria for the work of public health services applicable to Moscow are clearly irrelevant for Tuva. Hence, we can conclude that for Russia it is extremely important to classify the avoidable causes with account for local health priorities and health care opportunities and identify the causes for which mortality can be avoided due to the activities of health services.

Along with the need for a regional classification, it seems important to assess the contribution of medical factors to avoidable mortality. Recall that the first and largest share of losses relates to the sphere of prevention and is determined not so much by the work of health care, since it is largely formed due to external causes, as by the activities of a complex of social institutions. It follows from this that with the growth of social well-being in the country, the importance of the first group of causes will decrease, which, as a result, will lead to an increase in the importance of the medical component in total avoidable mortality.

The third circumstance relates to the assessment of oncological diseases as avoidable. Of course, clinical oncology in recent decades has made a huge breakthrough in the diagnosis and treatment of malignant neoplasms, but we must not forget that the etiology of cancer has not been fully investigated. In old age, it is often caused by degenerative processes. Before the age of 65, the onset and formation of pathology, as well as the prognosis, are not always determined by early diagnosis and adequate treatment. Therefore, in the case of oncological diseases, it would now be more correct to speak not about their complete elimination but about the degree to which these pathologies are avoidable.

³ The indicators of Ingushetia, where the average life expectancy in 2019, according to official data, was 81.5 years for men and 89.5 years for women, were excluded from the analysis as obviously unreliable.

Table 4. Nosological profile of the medical component of avoidable mortality in the female population of Russia in the 2000s–2010s (per 100000 women in the age category from 0 to 64 years old, standardized coefficient, European standard; %)

Causes of death	2000		2003		2019	
	per 100000 people	%	per 100000 people	%	per 100000 people	%
Malignant melanoma of the skin	1	1.5	1.1	1.6	1	2.1
Other malignant neoplasms of the skin	0.4	0.6	0.3	0.4	0.1	0.2
Malignant neoplasms of the breast	17.3	25.2	17.3	25.2	12	24.8
Malignant neoplasms of the cervix	5	7.3	5.2	7.6	5.7	11.8
Malignant neoplasms of other and unspecified parts of the uterus	3.5	5.1	3.5	5.1	2.9	6.0
Hodgkin's disease	0.6	0.9	0.6	0.9	0.2	0.4
Non-Hodgkin's lymphoma	0.9	1.3	1	1.5	1	2.1
Leukemia	2.9	4.2	2.7	3.9	1.8	3.7
Oncological diseases preventable by the activity of clinical medicine	31.6	46.1	31.7	46.1	24.7	51.1
Chronic rheumatic heart disease	3.9	5.7	3	4.4	0.4	0.8
Hypertonic disease	5.8	8.5	5.4	7.9	1.4	2.9
Cardiovascular diseases preventable by clinical medicine	9.7	14.1	8.4	12.2	1.8	3.7
Stomach ulcer	0.7	1.0	0.6	0.9	0.7	1.4
Duodenal ulcer	0.4	0.6	0.4	0.6	0.5	1.0
Diseases of the appendix	0.1	0.1	0.1	0.1	0	0.0
Hernias	0.4	0.6	0.4	0.6	0.3	0.6
Gallstone disease (cholelithiasis)	0.5	0.7	0.4	0.6	0.3	0.6
Cholecystitis	0.1	0.1	0.1	0.1	0	0.0
Diseases of the digestive system preventable by the activity of clinical medicine	2.2	3.2	2	2.9	1.8	3.7
Infectious diseases	8.3	12.1	9.3	13.5	12.9	26.7
Respiratory diseases	16.1	23.5	16.6	24.2	6.9	14.3
Complications of pregnancy and childbirth	0.7	1.0	0.7	1.0	0.2	0.4
Medical component of avoidable mortality	68.6	100.0	68.7	100.0	48.3	100.0

* * *

Thus, it seems that positive processes will be determined by a general decrease in mortality determined by medical factors against the background of an increase in the significance (but not the level!) of endogenous pathologies, primarily neoplasms, and a decrease in the proportion of exogenous diseases, which include all other diseases death from which is avoidable.

In conclusion of our analysis, it is necessary to pay attention to the following circumstances.

First, the avoidable mortality of the population in Russia determined by the activity of clinical medicine in the 2000s–2010s decreased by 47.8% in men and by 29.6% in women, lagging, especially in women,

Table 5. Regional profile of the medical component of avoidable mortality and its contribution to the overall mortality of the population under 65 years of age in Russian regions in 2019

Territories	Total mortality		Medical component of avoidable mortality		Contribution of the medical component to total mortality	
	standardized coefficient per 100 000 people, European standard				%	
	men	women	men	women	men	women
Russian Federation	644.5	234.1	83	48.3	12.9	20.6
Moscow	418.8	166.9	47.8	35.2	11.4	21.1
St. Petersburg	498.6	202.9	67.1	48.6	13.5	24.0
Sevastopol	611.5	232.9	103.4	58.8	16.9	25.2
Republics						
Adygea	591.2	201.8	86.7	38.4	14.7	19.0
Altai	780.1	279.2	77.4	34.7	9.9	12.4
Bashkortostan	686.4	244.6	82	43.8	11.9	17.9
Buryatia	786.2	314.8	74.9	58.4	9.5	18.6
Dagestan	299.2	128.1	39.6	29.3	13.2	22.9
Kabardino-Balkaria	430.8	159.3	58.3	37	13.5	23.2
Kalmykia	569.9	169.5	58.6	29	10.3	17.1
Karachay-Cherkessia	482.6	157.6	82.1	38	17.0	24.1
Karelia	798.4	283.2	80.8	41.8	10.1	14.8
Komi	785.3	281.6	71.5	44.8	9.1	15.9
Crimea	682.2	252.2	99.2	56.1	14.5	22.2
Mari El	700.8	211.4	60.8	32	8.7	15.1
Mordovia	584.8	196.4	54.9	36.2	9.4	18.4
Sakha (Yakutia)	660	242.8	65.5	33.3	9.9	13.7
North Ossetia	550.5	165.4	74.4	40.8	13.5	24.7
Tatarstan	565.6	184.6	65.8	36.6	11.6	19.8
Tuva	927.1	431.3	128.6	64.6	13.9	15.0
Udmurtia	688.1	225.4	79.9	40.7	11.6	18.1
Khakassia	798.3	290.8	95.1	43.6	11.9	15.0
Chuvashia	686.1	202.4	60.9	29.9	8.9	14.8
Krais						
Altai	731.8	275.7	135.5	61.1	18.5	22.2
Transbaikal	921.3	347.8	89	60.5	9.7	17.4
Kamchatka	781.6	295.1	70.4	55.1	9.0	18.7
Krasnodar	612.5	210.1	70.5	36.9	11.5	17.6

Table 5. (Contd.)

Territories	Total mortality		Medical component of avoidable mortality		Contribution of the medical component to total mortality	
	standardized coefficient per 100 000 people, European standard				%	
	men	women	men	women	men	women
Krasnoyarsk	757.1	292.1	99.4	61.2	13.1	21.0
Perm’	785.6	276.1	119.2	63.7	15.2	23.1
Primorskii	789.1	311.5	104.4	63.4	13.2	20.4
Stavropol’	537	200.2	55.3	37.7	10.3	18.8
Khabarovsk	887.6	320.8	94.8	48.2	10.7	15.0
Oblasts						
Amur	910.2	359.5	102.6	50.7	11.3	14.1
Arkhangel’sk	740.8	257.8	63.4	38	8.6	14.7
Astrakhan	613.2	224.7	83.8	38.5	13.7	17.1
Belgorod	574.3	194.2	52.9	31.4	9.2	16.2
Bryansk	752.1	240.8	81.3	36.9	10.8	15.3
Vladimir	748.9	257.2	76.2	39.4	10.2	15.3
Volgograd	600.8	212.5	79.9	42	13.3	19.8
Vologda	769.6	245.2	63.8	35.9	8.3	14.6
Voronezh	637.2	211.9	54.6	34.7	8.6	16.4
Ivanovo	739.1	274.3	73.9	49.5	10.0	18.0
Irkutsk	878.4	347.3	147.3	86.5	16.8	24.9
Kaliningrad	611.8	231.4	65.2	47.4	10.7	20.5
Kaluga	745.3	242.7	63.9	37.3	8.6	15.4
Kemerovo	862.5	338.5	174.2	87.8	20.2	25.9
Kirov	684.4	225	58.9	29.9	8.6	13.3
Kostroma	693.6	248.2	73.2	45.5	10.6	18.3
Kurgan	792.3	263.7	143.6	61.9	18.1	23.5
Kursk	721.2	228.9	69.1	41.5	9.6	18.1
Leningrad	674.6	240.3	95.1	50.5	14.1	21.0
Lipetsk	636.2	214.2	51.4	27.6	8.1	12.9
Magadan	888.4	315.6	63.2	63.6	7.1	20.2
Moscow	601.2	219.8	54.4	38.2	9.0	17.4
Murmansk	729.9	276.4	63.5	48.5	8.7	17.5
Nizhny Novgorod	728.4	239.4	81.6	42	11.2	17.5
Novgorod	866.2	301	86.1	44.7	9.9	14.9

Table 5. (Contd.)

Territories	Total mortality		Medical component of avoidable mortality		Contribution of the medical component to total mortality	
	standardized coefficient per 100 000 people, European standard				%	
	men	women	men	women	men	women
Novosibirsk	684.3	265.1	126	62.6	18.4	23.6
Omsk	674.1	252.2	98.4	48	14.6	19.0
Orenburg	710.1	262.9	111.7	59	15.7	22.4
Orel	682.9	227.9	74.3	33.4	10.9	14.7
Penza	639.1	212.5	62.9	31.8	9.8	15.0
Pskov	806.9	316.5	69.5	45.6	8.6	14.4
Rostov	600.9	227.9	87.2	47.9	14.5	21.0
Ryazan’	667.2	218	60.6	32.5	9.1	14.9
Samara	683.3	249.9	104	56.4	15.2	22.6
Saratov	653.6	234.8	84.4	51.7	12.9	22.0
Sakhalin	810.4	310.8	81.6	54.4	10.1	17.5
Sverdlovsk	744	261.2	118	60.9	15.9	23.3
Smolensk	747.9	270	73.3	43.8	9.8	16.2
Tambov	651.4	204.2	57.3	31	8.8	15.2
Tver	775.4	289.7	91.9	58.3	11.9	20.1
Tomsk	685.9	257.7	90.6	43	13.2	16.7
Tula	727.5	255.6	71.7	46.2	9.9	18.1
Tyumen’ (without AOs)	656.3	241.9	106.1	55.7	16.2	23.0
Ulyanovsk	654.7	232.6	82.2	45.8	12.6	19.7
Chelyabinsk	721.6	266.6	113.9	64.6	15.8	24.2
Yaroslavl	702	240.2	71.1	39.1	10.1	16.3
Autonomous Regions						
Jewish Autonomous oblast	945.3	389.6	102.5	52.2	10.8	13.4
Khanty–Mansi Autonomous okrug	491.9	171.6	71.5	35.3	14.5	20.6
Yamalo-Nenets Autonomous okrug	452.1	166.6	54.7	30.5	12.1	18.3
Chukotka Autonomous okrug	933.9	414.9	148.3	126.7	15.9	30.5

behind the rate of reduction in total mortality, which showed a more than twofold decrease in the male and female populations. In fact, this means that avoidable mortality decreased mainly owing to the improvement of the population's lifestyle.

Second, the dynamics of the medical component of avoidable mortality was characterized by a more inertial development than overall mortality: for example, the rate of its growth during the period of negative trends in life expectancy and the rate of decline during

the period of positive trends turned out to be lower than the rate of the corresponding changes in the total mortality of the population under the age of 65. Thus, clinical medicine, as experience shows, turns out to be quite stable during crisis periods but requires a long period for recovery and, moreover, for building up its potential.

Third, the structure of medical factors of avoidable mortality over the two decades of the study was characterized by a pronounced gender specificity: in men, losses were largely determined by infectious and respiratory diseases, while in women, they were marked by neoplasms. This, in turn, determined the differences in the dynamics of the medical component of avoidable mortality: judging by the rate of change in indicators, men were more sensitive to both negative and positive changes.

Fourth, the changes in the structure of the medical component of avoidable mortality that took place in the 2000s–2010s were characterized by multidirectional vectors: on the one hand, there was an increase in the importance of neoplasms and endogenous pathologies not directly related to external factors.

Fifth, during the entire period of the study, the contribution of medical components to total mortality in the female population was significantly higher than in men. According to international criteria, as of 2019, the reserves for reducing the overall mortality rate of the Russian population determined by the efficiency of medicine and health care amount to 12.9% for men and 20.6% for women under the age of 65.

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