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**"Global Challenges and Prospects of the Modern Economic Development"****INTENSITY OF MORBIDITY AND MORTALITY PROCESSES IN  
RUSSIA**

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*Abstract*

The health complication caused by spreading dangerous diseases and manifested in a decrease of the healthy life quality impedes the continuous and sustainable socio-economic development of the state. The national health quality is the main resource to develop the state. To preserve the population, such an important demographic process as mortality should be influenced. Therefore, the statistical analysis of morbidity in relation to mortality in the Russian Federation is very relevant. The object of the study is the intensity of morbidity and mortality in Russia. The subject of the study is the quantitative patterns of morbidity and mortality in the Russian Federation. The study of morbidity and mortality was based on a comprehensive approach and statistical methods: time series analysis, generalizing indicators, structural and structural-dynamic analysis, and tabular method. The exclusivity of the study is to develop information and methodological approach, including the analysis of structural differences in morbidity and mortality, as well as to modernize the methodology for analysing the morbidity outcomes based on the criticality indicator of morbidity outcomes represented by the ratio of mortality and morbidity. The proposed approach allows taking into account the territorial features of morbidity and mortality developing programs at different levels. This approach also allows adopting management decisions to determine the socio-demographic direction of improving the healthy life quality of the population.

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**Keywords:** Quality of life, incidence, mortality, dynamics, indicators, adverse outcome of disease.

## 1. Introduction

Ensuring a high level and life quality of the population serves the purposes to develop the national state. The structural components of the life quality are living standards and conditions. The national health reflects the living conditions and is an important part of the social wealth and the main resource to develop the state. Health deterioration among citizens in the spread of dangerous diseases, the deterioration of the living environment and healthy life expectancy prevent continuous and sustainable development (Nikitenko & Karelina, 2017; Khadzhalova, 2016, Eliseeva & Raskina, 2018).

One of the most important criteria to characterize the health of the population is morbidity. In our opinion, to characterize the health of the population it is possible to use the indicator «morbidity rate». High premature mortality leads to a decrease in the population which has a negative impact on the welfare of the Russian state. In this regard, morbidity and mortality rates of the Russian population occupy an important place in the subject field of our study.

Along with the morbidity of the population, the problem of high mortality is becoming particularly acute among the socio-demographic problems in the Russian state. Over the past 10 years, the number of deaths in the country amounted to 19.3 million people and only in 2017 – 1.8 million people. Against the background of a low birth rate, the task of reducing mortality becomes a priority in developing measures of the state demographic policy. Particular attention should be paid to the impact of socio-economic conditions on morbidity, mortality and survival (Manser & Bauerfeind, 2014).

## 2. Problem Statement

Significant attention was paid to the statistical assessment of public health, morbidity, mortality and healthy life expectancy in the works of such researchers as: Sidorov, Zaitsev, Trukhina, and Savelyev, (2015); Ananyev, Trukhina, Sennikova, and Gorbacheva, (2018); Malkhazova, Semenov, Shartova, and Gurov, (2015); Schepin and Medik (2012); Foster, (1992). Analysis of premature mortality is presented in Martinez, Soliz, Caixeta, and Ordunez, (2019). In the work of Mishchuk, and Anosova, (2014) health is defined as an important socio-demographic factor of human capital formation. This aspect of the study included consideration of interrelations with various aspects of demographic security (Bokov, Karmanov, Smelov, Epshtain, & Egorova, (2015); Karmanov, Kuchmaeva, & Petriakova, 2015).

The article presents a comparative analysis of trends in the mortality level and structure and their relationship with the level of morbidity. The use of the morbidity severity indicator of outcomes allows deepening the analysis of morbidity in Russia.

## 3. Research Questions

The article provides a study of the morbidity and mortality intensity in the Russian Federation. It provided:

- to implement the structural and dynamic approach to the analysis of the relationship between morbidity and mortality at the Federal level;
- to identify the degree of differences in the structure of mortality and morbidity in the main classes of diseases in the Russian Federation based on the structural analysis of mortality and morbidity;

- to modernize the methodology of morbidity and mortality analysis, including the analysis of morbidity outcomes by the criticality indicator of its outcomes.

#### 4. Purpose of the Study

In a number of scientific works an important place is occupied by the study of morbidity and mortality (Agrawal, 2015; Cao, Bray, Ilbawi, & Soerjomataram, 2018). To reflect the phenomena frequency in the studied population statistics, there're widely used indicators of mortality and morbidity. In 2017, the value of the overall mortality rate in Russia remains high, its value was 12.4 people per 1000 inhabitants.

In the structure of morbidity in Russia the most common classes of diseases are: respiratory diseases (class X) - 45.4% of the total number of registered patients, the share of diseases of the genitourinary system, skin and subcutaneous tissue accounted for 11.1%. Structural analysis of the level of morbidity allowed identifying the most common classes of diseases: X, XI, and XIV classes, they account for 56.5 % of diseases (table 01).

**Table 01.** Structure of mortality and morbidity by main classes of causes of death for 2005-2017.

Years	Morbidity				Mortality			
	IX	II	XIX	Total	IX	II	XIX	Total
2005	3,1	1,3	12,1	16,5	56,4	12,5	13,7	82,6
2006	3,5	1,3	11,7	16,5	56,9	13,2	13,1	83,1
2007	3,4	1,3	11,9	16,6	57,0	13,9	12,5	83,3
2008	3,5	1,3	11,9	16,7	57,1	13,9	11,8	82,8
2009	3,4	1,3	11,3	16,0	56,5	14,6	11,2	82,3
2010	3,6	1,4	11,8	16,8	56,8	14,5	10,7	81,9
2011	3,3	1,4	11,6	16,3	55,9	15,2	10,4	81,5
2012	3,4	1,5	11,8	16,7	55,4	15,3	10,2	80,9
2013	3,7	1,4	11,6	16,7	53,5	15,6	9,9	79,0
2014	3,7	1,5	11,5	16,7	50,1	15,5	9,9	75,5
2015	4,0	1,5	11,6	17,1	48,7	15,7	9,3	73,7
2016	4,0	1,4	11,3	16,7	47,8	15,8	8,9	72,5
2017	4,1	1,5	11,3	16,9	47,3	16,1	8,4	71,8
2017 2005, p.p.	1,0	0,2	- 0,8	0,4	- 9,1	3,6	- 5,3	- 10,8

Analysis of the structure of mortality in Russia for major diseases (IX, II, XIX classes) allowed establishing:

- their share in the period under review remains very significant and amounts to 71.8% in 2017 despite a noticeable decrease of 10.8 percentage points from the level of 2005;

- there was an increase in the proportion of mortality from neoplasms-by 3.6 p. p., with a decrease from diseases of the circulatory system - by 9.1 p. p. and from external causes of death-by 0.8 p. p.

With a significant mortality share for these diseases, the morbidity proportion for them ranges from 16.0% in 2009 to 17.1% in 2015. During the period under review, the proportion of morbidity in the three classes increased by 0.4 percentage points, including diseases of the circulatory system by 1.0

percentage points, tumors-by 0.2 percentage points and decreased from external causes-by 0.8 percentage points.

Information resource on the structure of mortality and morbidity by disease classes (table.01) reveals the degree of differences in their structures in Russia. To study the structural differences in the groups under consideration, the Ryabtsev index was used:

$$I_r = \sqrt{\frac{\sum (d_{1i} - d_{0i})^2}{\sum (d_{1i} + d_{0i})^2}}$$

The results of calculations in Russia amounted to 56.9%.

Meaningful evaluation of structural differences was performed according to the proposed (Chistik, 1995) scale of structural differences. The obtained result indicates that in the period under review in Russia there are very significant differences in the studied structures. These differences are due to the fact that the diseases in question are poorly curable and cause a critical outcome.

In order to expand the possibilities of morbidity analysis in Russia, the analysis methodology was modernized, including the analysis of morbidity outcomes. In this case, it is proposed to use a coefficient that acts as a criticality indicator of the morbidity outcomes and calculated as a ratio of mortality and morbidity.

Mortality indicators are the main tool to analyse the demographic situation. However, to characterize the socio-demographic situation, mortality rates should be supplemented by morbidity rates. As most of deaths are due to disease, it is important to trace the relationship between morbidity and mortality in Russia.

In Russia, with an increase in the number of cases by 14.3% and a decrease in the number of deaths by 20.7%, the outcomes criticality of the incidence in the period of 2005-2017 decreased by 30.7 (table 02).

**Table 02.** Indicators of severity of morbidity outcomes in Russia for 2005-2017

Indicator	2005	2017	2017/ 2005, %
Number of deaths per 100 000 sick people	1108,9	768,9	69,3

To improve the demographic well-being and to reduce mortality, in the framework of realized Federal programs in health care the diagnosis and development of preventive medicine on the basis of significant growth of budget expenditures should be the basis of the progressive development of healthcare in Russia at various levels.

Attention should be paid to the way of living, the level of medicine development and the attitude to the health of the citizens themselves, which are directly related to the causes of mortality in Russia and its regions.

There is a positive dynamic of unfavourable outcomes on the problem of tumors in the Russian Federation for the entire period under review, which is confirmed by a decrease in the outcome index of tumors by 17.0% (table 03). At the same time, there was an increase in the indicator in 2015-2016 compared to 2014 from 17.3% to 18.0% and exceeding in 2017 to the level of 2014 by 0.3 percentage points. Indicators of critical outcomes of circulatory diseases in Russia have higher values than outcomes

indicators of tumors. It should be noted that this indicator has a positive trend: the decline in the index in Russia - by 53.8%.

**Table 03.** Indicators of the criticality of the outcomes of the disease in 2005-2017, %

Years	Outcomes Criticality Indexes	
	neoplasms	circulatory illnesses
2005	21,2	39,6
2006	20,1	32,5
2007	20,1	31,9
2008	20,1	31,4
2009	19,3	30,2
2010	19,0	30,8
2011	18,4	28,3
2012	17,6	27,7
2013	17,9	23,4
2014	17,3	22,4
2015	18,0	20,4
2016	18,0	19,4
2017	17,6	18,3
2017 to 2005,%	83,0	46,2

## 5. Research Methods

The scientific validity of the results obtained is determined by the use of information resources of the Federal state statistics service with the use of statistical processing programs in the format of the direction of introduction of information technologies and the use of statistical methods. We used the method of generalizing indicators, time series analysis, structural and structural-dynamic analysis. The methodology of morbidity analysis was modernized, including the use of the outcome criticality indicator. The methods used in the study provided the solution of the tasks.

## 6. Findings

Ensuring the well-being of the Russian state is necessarily associated with the preservation of the Russian people which is determined by the increase in the duration of citizens' healthy life. To quantify the health of the population it is possible to use its indicator - an indicator of the morbidity level. In this regard, in the field of our morbidity study, it is necessary to include such an important demographic process as mortality. Due to the relatively low birth rate, the mortality and especially the premature mortality (Martinez, Soliz, Caixeta, & Ordunez, 2019) is an important demographic issue. Therefore, in our opinion, the task of reducing mortality is particularly necessary for developing measures of the state demographic and social policy to ensure a high quality of life. The paper presents an integrative information and methodological approach, including the modernization of the analysis methodology with the use of the severity indicator of morbidity outcomes. This approach, based on a wide range of

statistical methods, allows us to identify trends developing the structure of mortality and its relationship with the morbidity of the population at the Federal and regional levels.

## 7. Conclusion

The article establishes trends in morbidity and mortality, including from the main classes of diseases: circulatory system, tumors; to deepen the study of morbidity and mortality, a structural and dynamic analysis of the main classes of diseases was performed, and the differences in the structures in the Russian Federation were evaluated according to the proposed author's scale based on the V. Ryabtsev index. The method of analysis of mortality and morbidity of the population by the main classes of diseases on the basis of the index of criticality of outcomes is expanded.

To ensure a favourable socio-demographic situation and eliminate threats to demographic security, a methodological approach is proposed. It includes the deepening of the methodology for the analysis of morbidity outcomes, based on the use of the indicator of criticality of outcomes. This approach makes it possible to make informed decisions at both the Federal and regional levels.

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