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Methodology of Financial Monitoring Based on Cluster Analysis for the Implementation of National Projects in the Russian Regions

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Abstract

The need to take into account imbalances among regional indicators in the development of state policy for financing national projects makes it necessary to develop a methodology that will enable objective assessment of the effectiveness of socially significant projects in Russia. This paper reports the development of a methodology for financial monitoring of national project implementations in the constituent entities of the Russian Federation, taking into account the correlation of their target indicators and using cluster analysis and methods in mathematical statistics. The proposed methodology was tested on health and demography national project data obtained from the Federal Treasury of Russia, the Federal State Statistics Service and the Accounts Chamber for 2020–2021. The analysis of public funding for national projects based on centralization indices and target indicators for their implementation enabled classifying the regions of Russia according to the levels of effectiveness and the financial risks of implementing the projects. The results of the study correspond to the actual effectiveness of national projects and can be used in the development of flexible state policy in financing national projects, taking into account the level of the target indicators achieved.

Keywords: national project, target indicators, cluster analysis, financial monitoring

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Методика Финансового Мониторинга Реализации Национальных Проектов в Российских Регионах с Использованием Кластерного Анализа

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Аннотация

Необходимость учета процессов сбалансированности, диспропорций и поляризации показателей регионов при разработке государственной политики финансирования национальных проектов как залога успешного достижения стратегических целей и задач государства обуславливает потребность развития методического инструментария, позволяющего объективно оценить результативность социально-значимых проектов в российских регионах. Статья посвящена разработке методики финансового мониторинга реализации национальных проектов в субъектах Российской Федерации с учетом взаимосвязи их целевых показателей с использованием кластерного анализа, а также методов математической статистики. Апробация предложенной методики была проведена на основе данных Федерального казначейства России, Федеральной службы государственной статистики и Счетной палаты за 2020–2021 гг. на примере национальных проектов «Здравоохранение» и «Демография». Анализ государственных ассигнований на национальные проекты в регионах России на основе индексов централизации и установочных целевых индикаторов выполнения национальных проектов дает основание классифицировать регионы России по уровням эффективности и финансовых рисков реализации данных проектов. Результаты исследования полностью сопоставимы с фактическими показателями исполнения национальных проектов и могут быть использованы при формирования гибкой государственной политики финансирования национальных проектов с учетом уровня достижения целевых показателей.

Ключевые слова: национальный проект, целевые индикаторы, кластерный анализ, финансовый мониторинг

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1. Introduction

Increased external challenges and threats have slowed the growth of Russia's gross domestic product as a basic source of financial resources, which is affecting standards of living and birth rates in the country. Decree of the President of the Russian Federation No. 204, dated July 21, 2020, "On the National Development Goals of the Russian Federation for the period up to 2030",[1] defined national targets for the development of the country. The primary task of the state is to guarantee the well-being and health of the citizens. President Putin V.V. noted that there is a "difficult situation" in Russia in the field of demography and that it is necessary to ensure increases in both the birth rate and life expectancy.

To achieve the strategic goals and objectives of the state, tools are needed to assess the effectiveness of national projects in the Russian regions (Fattakhov et al., 2019). The need for these tools is also due to imbalances in the indicators of the regions, which should be taken into account in the development of state policy for financing national projects. Among the top-priority national projects responsible for economic growth and human capital development are those directed to health and demography. National healthcare and demography projects are important strategic tasks in modern Russia, the implementation of which will ensure development of the main components in the growth of human capital: longevity and high-quality medical care for the population. The achievement of these objectives should be considered taking into account their mutual correlation. Cluster analysis which has been tested in numerous studies (Revnyakov, 2017; Pushkarev, 2018; Piskun and Khokhlov, 2019) can be conducted to solve these problems. In this regard, the current authors propose a methodology for financial monitoring of national project implementations in Russian regions based on cluster analysis, which will make it possible to classify the regions according to the level of potential threats to the implementation of national healthcare and demography projects, monitor changes in achieving project targets, coordinate management activities at all levels, and allocate financial resources in a timely manner.

2. Literature review

A characteristic feature of the Russian economy is the imbalance in the socio-economic development of its regions due to their geographical location and the availability of natural and other resources (Yashina et al., 2022(a); Yashina et al., 2022(b); Yudintsevand Troshkina, 2023). To assess local regional disparities, multidimensional classifications, as well as methods of factor cluster and discriminant analysis are widely used (Piskun and Khokhlov, 2019). The problem of regional disparities makes it necessary to improve the system for monitoring national projects and government programmes in order to increase the effectiveness of their implementation in the regions of the Russian Federation (Ezangina and Gromyshova, 2020). The need to improve the management of the socio-economic systems of regions has been highlighted in numerous works (e.g. Bogovizetal, 2019; Romanovaetal, 2019; Chebyshev, 2021). In addition to the divergence and convergence of the development of the regions and the country as a whole, Ezangina and Gromyshova (2020) pointed out the lack of methodological support for the current state strategic planning system, as well as the lack of transparent and accessible information to improve this system, as key reasons for the imbalance in the level of regional socio-economic situations. These issues were also discussed by Endovitsky et al. (2021) and Mishlanova (2022).

As mentioned earlier, an important national state task is to ensure sustainable positive indicators in the fields of health and demography in the Russian regions, taking into account their uneven development and risks (Averinetal, 2018; Ariste and Matteo, 2017; Kozlova et al., 2017). However, these indicators should be considered taking into account the relationships between them (Gallardo-Albarrán, 2018; Sharma, 2018; Mihalache, 2019). In particular, funding for healthcare, as one of the key instruments of state policy, largely determines the quality of medical care provided (Shahetal., 2021; Soofi et al., 2021). High-quality care contributes to a lower mortality rate in the country and a more favourable demographic situation (Balkhi et al., 2021; Wirayuda and Chan, 2021). Ivankova et al. (2022) assessed the relationship between funding for healthcare, mortality, and gross domestic product in OECD countries

[1]Decree of the President of the Russian Federation No. 204 Dated July 21, 2020 "On the national development goals of the Russian Federation for the period until 2030": official internet portal of legal information. URL: http://publication.pravo.gov.ru/Document/View/0001202007210012

for the period 1994–2016. The study was conducted by the authors taking into account types of healthcare systems. The working-age population was the object of the study. The authors found that countries with high healthcare funding had lower mortality rates and higher gross domestic products compared to countries with an insurance-based healthcare system (Bismarck system). In this regard, it is obvious that the risks of not meeting the targets of national projects in the fields of health and demography are mutually reinforcing.

The authors of a number of publications have applied cluster analysis as a tool for assessing the effectiveness of various regional strategies, including in the field of innovation (Khayrullina, 2014; Revnyakov, 2017; Pushkarev, 2018). Cluster analysis allows us to identify objects in numerous classification features using many variables. Piskun and Khokhlov (2019) confirmed the hypothesis that any region can be described by a set of interrelated variables that reflect its socio-economic situation over the analysed time interval. Despite a large number of scientific publications devoted to various aspects of regional development, insufficient attention has been paid to financial monitoring of the national projects implemented in the Russian regions that would take into account the relationships between their indicators based on cluster analysis. The issue of expanding the set of criteria for evaluating the effectiveness of national projects needs further development and justification.

3. Materials and methods

Our methodology for financial monitoring of the implementation of national projects in the Russian regions using cluster analysis of government subsidies for national projects and criteria for their effectiveness contains several stages.

The first stage includes the development of a database of the target indicators of national projects based on information from the Ministry of Finance of the Russian Federation and the Federal State Statistics Service. The methodology for assessing the effectiveness of public financing for the implementation of national projects is based on the analysis of two systems of indicators: indicators of public funding and indicators for setting target indicators for national projects. The methodology was tested on health and demography national projects.

The system of public funding itself includes two indicators: budget execution in the context of the analysed national projects: % (FDH 1); and budget execution in the context of the analysed national projects per inhabitant, in rubles (FDH 2).

The system of target indicators of the analysed national projects includes the values presented in Table 1.

Table 1. Target indicators for the implementation of health and demography national projects

Health national project	Symbol	Demography national project	Symbol
Mortality of the working-age population, per 100,000 people of the population of the corresponding age	ICH 1	Life expectancy of citizens at the age of 55, years	ICD 1
Mortality from diseases of the circulatory system, per 100,000 population	ICH 2	Healthy life expectancy, years	ICD 2
Mortality from neoplasms, including malignant ones, per 100,000 population	ICH 3	Mortality of the population older than working age per 100,000 people of the population of the corresponding age	ICD 3
Infant mortality, the number of children who die before the age of 1 year, per 1000 live births	ICH 4	Total fertility rate, number of children per woman	ICD 4
		Number (share) of citizens leading a healthy lifestyle, %	ICD 5
		Employment rate of women with preschool-aged children	ICD 6

Further, in relation to the system of indicators, the criteria for the centralization of public funding and target indicators for the implementation of the analysed national projects in the Russian regions were

determined:

1. Level of centralization (LC_{ij}), representing the share of public funding and the concentration of the set targets of national projects by region (1);

2. Index of centralization (IC_{ij}), defined as the sum of the squared levels of centralization for each region of Russia (2) by analogy with the Herfindahl–Hirschman index. However, the centralization index has a different interpretation and is adapted to a specific task, which is to determine the degree of concentration of public financial resources and to achieve the specified target indicators of national projects in a given territory. The centralization index is calculated for each indicator included in the system, that is, the indices are determined for each indicator in the system of public funding and target indicators for the implementation of national projects (formulas 1, 2):

$$LC_{ij} = \frac{P_j}{\sum_j^N P_j}, \tag{1}$$

where P_j is the value of the *i*-th indicator in the system of indicators of budget appropriations or the system of target indicators of the national project implementation in the *j*-th region.

$$IC_{ij} = \sum_{i=1}^{M} IC_{ij}^2 = \sum_{i=1}^{M} \left(\frac{P_j}{\sum_j^N P_j} \right)^2, \tag{2}$$

where IC_{ij} is the level of centralization of the *i*-th indicator in the *j*-th region.

The centralization index (IC_{ij}) ranges from 0 to 1 (formula 3); the greater the value of this indicator, the higher the concentration of budget allocations and the level of achievement of target indicators for the implementation of national projects in a particular region.

$$0 < IC_{ij} \leq 1. \tag{3}$$

The third stage of the development of our methodology for monitoring national projects involves ranking for each index of centralization of public finance; the higher the rank, the lower the level of effectiveness of indicators for each analysed national project. The ranking is carried out by the centralization indices of financing, both in the context of national projects, %, and per one inhabitant (in rubles), etc.

The final rank of the public funding is determined on the basis of the total rank. The final total rank serves as a criterion for determining the levels (9 levels) of potential risks of the national project implementation in the system of indicators that characterize public funding. The value of the final total rank (FDH) decreases with the level of financial risks of the national project implementation and vice versa.

At the fourth stage, the ranking is carried out for each centralization index in the system of the target indicators set for the implementation of the national project, in particular, for health national projects – ICH 1, ICH 2, ICH 3, ICH 4; and for demography national projects – ICD 1, ICD 2, ICD 3, ICD 4, ICD 5, ICD 6.

A lower index of centralization for ICH 1, ICH 2, ICH 3, or ICH 4 (health national projects) or ICD 3 (demography national projects) indicates a lower rank for the target indicator. For the other indicators ICD 1, ICD 2, ICD 4, ICD 5, and ICD 6 (demography national projects), on the contrary, the centralization index decreases as the rank for the target indicator increases.

The final rank for all the target indicators for national project implementations is determined on the basis of the total rank (FTR), which serves as a criterion for determining the effectiveness of the implementation of a national project; the lower the value of the final total rank (FTR), the fewer the threats to

the implementation and vice versa.

The final values in the system of public funding and target indicators for the implementation of a national project are the criteria for clustering regions according to the level of effectiveness and financial risks of the national project (Figure 1).

Target indicators	**3 FTR**	1 cluster	4 cluster	6 cluster
	2 FTR	7 cluster	2 cluster	5 cluster
	1 FTR	9 cluster	8 cluster	3 cluster
		1 FDH	**2 FDH**	**3 FDH**
		Level of funding		

Figure 1. Effectiveness matrix for national project implementations in the Russian regions based on a comparison of the level of public funding and achievement in the specified target values of the projects

The fifth stage consists in interpreting the obtained monitoring results based on the clustering of regions by public funding level and target indicators for the implementation of national projects (Table 2). For region clustering, a non-overlapping algorithm was used, according to which each region was to be included in only one cluster. The key requirement for clustering optimization was to minimize the standard error of partitioning. The cluster centre was defined using the centralization indices, which were discussed above.

Table 2. Characteristics of clusters of national project implementations in the Russian regions

Cluster name	Correlation between level of funding and target indicators	Correlation of level of effectiveness and potential financial risks of health and demography national project implementations
1 cluster	1 FDH – 3 FTR	low effectiveness / low risk
2 cluster	2 FDH – 2 FTR	balanced level of effectiveness and risks
3 cluster	3 FDH – 1 FTR	high effectiveness / high risk
4 cluster	2 FDH – 3 FTR	low effectiveness / moderate risk
5 cluster	3 FDH – 2 FTR	moderate effectiveness / high risk
6 cluster	3 FDH – 3 FTR	extremely low effectiveness / highest risk
7 cluster	1 FDH – 2 FTR	medium effectiveness / low risk
8 cluster	2 FDH – 1 FTR	high effectiveness / medium level of risk
9 cluster	1 FDH – 1 FTR	highest effectiveness / low risk

Region clustering will allow us to identify and study in detail possible local factors that contribute to problems in public funding and the implementation of national projects in the health and demography fields. In addition, the results will contribute to the development of a national strategy and of tactics adapted to a specific region in order to achieve the target values of national projects.

4. Results

The methodology was tested on the database of the Federal Treasury of Russia, the Federal State Statistics Service of the Russian Federation, and the Accounts Chamber for 2020–2021. The analysis of the implementation of healthcare and demography national projects based on the centralization indices of public funding and target indicators enables us to classify the regions of Russia according to potential threats to the implementation of these projects. Potential threats to national projects are the risks of failure to achieve the expected socio-economic effects and financial risks caused by the impacts of both external and internal economic factors. The results of clustering Russian regions in accordance with the proposed methodology for financial monitoring of national projects are presented in Table 3.

Table 3. Clusters of Russian regions according to level of effectiveness and risk in implementing national projects related to demography and healthcare

Subject of the Russian Federation	National Project Funding Class (FDH)	Class of specified target indicators (FTR)	Cluster
Magadan region	1 FDH	3 FTR	cluster 1
Altai Republic	1 FDH	3 FTR	cluster 1
Ryazan Oblast	1 FDH	3 FTR	cluster 1
Chukotka Autonomous Okrug	1 FDH	3 FTR	cluster 1
Kaluga region	2 FDH	2 FTR	cluster 2
Republic of Buryatia	2 FDH	2 FTR	cluster 2
Khanty-Mansi Autonomous Okrug	2 FDH	2 FTR	cluster 2
Sevastopol	3 FDH	1 FTR	cluster 3
Kabardino-Balkar Republic	3 FDH	1 FTR	cluster 3
Republic of Ingushetia	3 FDH	1 FTR	cluster 3
Republic of Tatarstan (Tatarstan)	3 FDH	1 FTR	cluster 3
Tyumen region	3 FDH	1 FTR	cluster 3
Chechen Republic	3 FDH	1 FTR	cluster 3
Chuvash Republic-Chuvashia	3 FDH	1 FTR	cluster 3
Amur region	2 FDH	3 FTR	cluster 4
Arhangelsk region	2 FDH	3 FTR	cluster 4
Vologda region	2 FDH	3 FTR	cluster 4
Voronezh region	2 FDH	3 FTR	cluster 4
Jewish Autonomous Region	2 FDH	3 FTR	cluster 4
Novosibirsk region	2 FDH	3 FTR	cluster 4
Primorsky Krai	2 FDH	3 FTR	cluster 4
Republic of Kalmykia	2 FDH	3 FTR	cluster 4
Republic of Karelia	2 FDH	3 FTR	cluster 4
Komi Republic	2 FDH	3 FTR	cluster 4
Republic of Khakassia	2 FDH	3 FTR	cluster 4
Tambov region	2 FDH	3 FTR	cluster 4
Tver region	2 FDH	3 FTR	cluster 4
Tomsk region	2 FDH	3 FTR	cluster 4
Tula region	2 FDH	3 FTR	cluster 4

St. Petersburg	3 FDH	2 FTR	cluster 5
Krasnodar region	3 FDH	2 FTR	cluster 5
Moscow region	3 FDH	2 FTR	cluster 5
Murmansk region	3 FDH	2 FTR	cluster 5
Penza region	3 FDH	2 FTR	cluster 5
Perm region	3 FDH	2 FTR	cluster 5
Republic of Adygea (Adygea)	3 FDH	2 FTR	cluster 5
Republic of Dagestan	3 FDH	2 FTR	cluster 5
Republic of Crimea	3 FDH	2 FTR	cluster 5
Mari El Republic	3 FDH	2 FTR	cluster 5
Rostov region	3 FDH	2 FTR	cluster 5
Udmurt republic	3 FDH	2 FTR	cluster 5
Altai region	3 FDH	3 FTR	cluster 6
Astrakhan region	3 FDH	3 FTR	cluster 6
Belgorod region	3 FDH	3 FTR	cluster 6
Bryansk region	3 FDH	3 FTR	cluster 6
Vladimir region	3 FDH	3 FTR	cluster 6
Volgograd region	3 FDH	3 FTR	cluster 6
Transbaikal region	3 FDH	3 FTR	cluster 6
Ivanovo region	3 FDH	3 FTR	cluster 6
Irkutsk region	3 FDH	3 FTR	cluster 6
Karachay-Cherkess Republic	3 FDH	3 FTR	cluster 6
Kemerovo region	3 FDH	3 FTR	cluster 6
Kirov region	3 FDH	3 FTR	cluster 6
Kostroma region	3 FDH	3 FTR	cluster 6
Krasnoyarsk region	3 FDH	3 FTR	cluster 6
Kurgan region	3 FDH	3 FTR	cluster 6
Kursk region	3 FDH	3 FTR	cluster 6
Leningrad region	3 FDH	3 FTR	cluster 6
Lipetsk region	3 FDH	3 FTR	cluster 6
Nizhny Novgorod region	3 FDH	3 FTR	cluster 6
Novgorod region	3 FDH	3 FTR	cluster 6
Omsk region	3 FDH	3 FTR	cluster 6
Orenburg region	3 FDH	3 FTR	cluster 6
Oryol region	3 FDH	3 FTR	cluster 6
Pskov region	3 FDH	3 FTR	cluster 6
Republic of Bashkortostan	3FDH	3 FTR	cluster 6
Samara region	3 FDH	3 FTR	cluster 6
Saratov region	3 FDH	3 FTR	cluster 6
Sverdlovsk region	3 FDH	3 FTR	cluster 6
Smolensk region	3 FDH	3 FTR	cluster 6
Stavropol region	3 FDH	3 FTR	cluster 6
Ulyanovsk region	3 FDH	3 FTR	cluster 6

Khabarovsk region	3 FDH	3 FTR	cluster 6
Chelyabinsk region	3 FDH	3 FTR	cluster 6
Yaroslavl region	3 FDH	3 FTR	cluster 6
Kamchatka Krai	1 FDH	2 FTR	cluster 7
Nenets Autonomous Okrug	1 FDH	2 FTR	cluster 7
Republic of Mordovia	1 FDH	2 FTR	cluster 7
Republic of Sakha (Yakutia)	1 FDH	2 FTR	cluster 7
Sakhalin region	1 FDH	2 FTR	cluster 7
Kaliningrad region	2 FDH	1 FTR	cluster 8
Republic of North Ossetia-Alania	2 FDH	1 FTR	cluster 8
Moscow	1 FDH	1 FTR	cluster 9
Tyva Republic	1 FDH	1 FTR	cluster 9
Yamalo-Nenets Autonomous Okrug	1 FDH	1 FTR	cluster 9

A detailed analysis of the obtained data confirmed a close correlation between the results of regional clustering based on the proposed method of financial monitoring and information on the achievement of the target indicators of the national projects under study – healthcare and demography. For example, the Nizhny Novgorod region fell into the 6th cluster, which is characterized by an extremely low level of effectiveness and the highest level of financial risk in the implementation of national projects in the fields. Information from the Electronic Budget system[2] and the Chamber of Control Accounts of the Nizhny Novgorod region[3] was used as a database for the established indicators of national project implementation. According to official data on total public funding of all projects, 3.4% of funds were allocated for the implementation of the healthcare national project and 20.2% of funds were allocated for the demography project. According to information published by the Nizhny the Chamber of Control Accounts of the Nizhny Novgorod region, the percentage of deviations from the target values for the demography project was 27.3% and for the healthcare project 39.0%. According to the Federal State Statistics Service, the Nizhny Novgorod region ranked 60th in terms of birth rate and 65th in terms of mortality rate among the regions of the Russian Federation in 2021, while decreases in birth rate and life expectancy and increases in mortality rate and morbidity were recorded. In accordance with the methodology for calculating the Federal State Statistics Service, the highest rank (place) is assigned to regions with the most critical values of indicators (the higher the rank, the worse the socio-economic indicators). Thus, the negative trends in the fields of healthcare and demography confirm the low effectiveness of national project implementations in the Nizhny Novgorod region, justifying its place in the 6th cluster.

5. Discussion

The results of the study confirm the applicability of cluster analysis to assessing the effectiveness of national projects, based on the correspondence of public funding volume with national project target value achievement, which has been discussed in a number of research works (Khayrullina, 2014; Revnyakov, 2017; Pushkarev, 2018). However, it was proved that the amount of public funding for national projects is not a determining factor in the success of their implementation, which was also noted in the work of Ezangina and Gromyshova (2020). For example, among the regions with the largest amount of funding, only three (Moscow, Tyva Republic, Yamalo-Nenets Autonomous Okrug) fell into the 9th cluster, which is characterized by the highest level of effectiveness and low financial risk. At the same time, the Republic of North Ossetia-Alania is characterized by a high level of effectiveness in the implementation of national projects, with a moderate financial risk despite the relatively low volume of public funding.

It is obvious that the financial monitoring of national projects should be carried out taking into

[2]Unified portal of the budget system of the Russian Federation "Electronic budget". https://budget.gov.ru/Регионы
[3]Chamber of Control and Accounts: official website. https://ksp.r52.ru/

account the relationships and interdependence of the results achieved (Balkhi et al., 2021; Wirayuda and Chan, 2021; Ivankova et al., 2022); therefore, the proposed methodology can be improved by expanding the set of national project indicators and developing models based on them.

6. Conclusion

The study confirmed the importance of improving financial monitoring as an element of state control over the implementation of national projects in the Russian regions.

The hypothesis was proved that the risks of not achieving the targets of national projects in the fields of health and demography reinforce each other. The problems in achieving target indicators for healthcare and demographic national projects implementation in the Russian regions are caused by the following factors:

- lack of one-time support for the births of fourth, fifth, and subsequent children;

- lack of in vitro fertilization cycles for families with infertility;

- low employment level for women with children of preschool age;

- lack of access to preschool education for children aged 1.5 to 3 years;

- insufficient coverage of citizens older than working age with preventive examinations, including clinical examinations;

- lack of geriatric centres and geriatric departments;

- high mortality rate of women aged 16–54 and men aged 16–59 years;

- insufficiency of public funding to meet national goals in the fields of health and demography in regions with insufficient own financial resources; and

- shortage of personnel to meet national goals in the fields of health and demography.

The correlation of the results of the study with the actual implementation of national projects confirms the effectiveness of the proposed methodology for their financial monitoring based on cluster analysis. The data obtained in the course of monitoring can be used by state authorities to develop a flexible strategy for national project funding in the Russian regions, taking into account the level of target indicator achievement.

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References

Ariste, R., Di Matteo, L., 2017. Value for money: an evaluation of health funding in Canada. Int. J. Health Econ. Manag. 17, 289–310. https://doi.org/10.1007/s10754-016-9204-6

Averin, G., Zviagintseva, A., Konstantinov, I., Shvetsova, A., 2018. Method and criteria for assessing the sustainable development. J. Soc. Sci. Res. 1, 106–112. https://doi.org/doi.org/10.32861/jssr.spi1.106.112

Balkhi, B., Alshayban, D., Alotaibi, N., 2021. Impact of healthcare funding on healthcare outcomes in the Middle East and North Africa (MENA) region: a cross-country comparison, 1995–2015. Front. Public Health 8, 624–962. https://doi.org/10.3389/fpubh.2020.624962

Bogoviz, A., Elykomov, V., Osipov, V., Kelina, K., Kripakova, L., 2019. Barriers and perspectives of formation of the e-healthcare system in modern Russia. Studies in Computational Intell. 826, 917–923. https://doi.org/10.1007/978-3-030-13397-9_94

Chebyshev, I., 2021. Monitoring of cash execution of the state budget during the implementation of national projects and the choice of economic development directions. Vestnik Universiteta 5, 134–140. https://doi.org/10.26425/1816-4277-2021-5-134-140

Endovitsky, D., Endovitskaya, E., Golovin, S., Churikov, A., 2021. Monitoring the implementation of the national healthcare project. Lecture Notes in Networks and Systems 205, 871–878. https://doi.org/10.1007/978-3-030-73097-0_97

Ezangina, I., Gromyshova, O., 2020. Directions for improving the monitoring system of state programs of socio-economic development of Russia. Finance: Theory and Practice 24(5), 112–127. https://doi.org/10.26794/2587-5671-2020-24-5-112-127

Fattakhov, R., Nizamutdinov, M., Oreshnikov, V., 2019. Assessment of the sustainability of the socio-economic development of the regions in Russia. World of New Economy 13(2), 97–110. https://doi.org/10.26794/2220-6469-2019-13-2-97-110

Gallardo-Albarrán, D., 2018. Health and economic development since 1900. Econ. Hum. Biol. 31, 228–237. https://doi.org/10.1016/j.ehb.2018.08.009

Ivankova, V., Gavurova, B., Khouri, S., 2022. Understanding the relationships between health funding, treatable mortality and economic productivity in OECD countries. Front. in Public Health 10, 1–14. https://doi.org/10.3389/fpubh.2022.1036058

Khayrullina, M., 2014. Innovative territorial clusters as instruments of Russian regions development in global economy. Procedia Economics and Finance 16, 88–94. https://doi.org/10.1016/S2212-5671(14)00778-3

Kozlova, O., Nifantova, R., Makarova, M., 2017. Methods of the assessment of economic losses caused by the mortality of the population employed in regional economy. Econ. Reg. 13, 511–523. https://doi.org/10.17059/2017-2-16

Mihalache, I., 2019. Health state of human capital in the economic theory. Postmodern Open. 10, 182–192. https://doi.org/10.18662/po/102

Mishlanova, M., 2022. Development trends of the Russian system of national projects. Transport. Res. Procedia 63, 1575–1581. https://doi.org/10.1016/j.trpro.2022.06.170

Piskun, E., Khokhlov, V., 2019. Economic development of the Russian Federation's regions: factor-cluster analysis. Economy of Region. 5(2), 363–376. https://doi.org/10.17059/2019-2-5

Pushkarev, A., 2018. Cluster analysis of regional innovation activity in Russia in 2010–2015. R-ECOMONY 4(1), 10–17. https://doi.org/10.15826/recon.2018.4.1.002

Revnyakov, G., 2017. Analysis of the regional financial cluster strategies implementation. Russian J. Ind. Econ. 10(1), 82–88. https://doi.org/10.17073/2072-1633-2017-1-082-088

Romanova, T., Andreeva, O., Sukhoveeva, A., Kaptsova, V., 2019. Targeting the principal implementation in the system of social support. Int. J. Econ. Bus. Admin. 7(2), 52–62. https://doi.org/10.35808/ijeba/370

Shah, M., Rehman, A., Zeeshan, M., Afridi, F., 2021. Public health funding and health outcomes in Pakistan: evidence from quantile autoregressive distributed lag model. Risk. Manag. Healthc. Policy 14, 3893–3909. https://doi.org/10.2147/RMHP.S316844

Sharma, R., 2018. Health and economic growth: evidence from dynamic panel data of 143 years. PLoS ONE 13(10), 1–20. https://doi.org/10.1371/journal.pone.0204940

Soofi, M., Matin, B., Karyani, A., Rezaei, S., Soltani, S., 2021. Health-care determinants of mortality and recovered cases from COVID-19: do heath systems respond COVID-19 similarly? J. Educ. Health Promot. 10, 34485557. https://doi.org/10.4103/jehp.jehp_1509_20

Wirayuda, A., Chan, M., 2021. A systematic review of sociodemographic, macroeconomic, and health resources factors on life expectance. Asia Pac. J. Public Health 33, 335–356. https://doi.org/10.1177/1010539520983671

Yashina, N., Kashina, O., Pronchatova-Rubtsova, N., Yashin, S., Kuznetsov, V., 2022 (a). Assessment of budgetary stresses for socio-economic development of Regions. Lecture Notes in Networks and Systems. 368, 620–631. https://doi.org/10.1007/978-3-030-93244-2_68

Yashina, N., Kashina, O., Pronchatova-Rubtsova, N., Yashin, S., Kuznetsov, V., 2022 (b). Diagnostics of budgetary potential of regions in order to implement the value-oriented financial policy of state. Big Data in the GovTech System. Stud. in Big Data 110, 189–197. https://doi.org/10.1007/978-3-031-04903-3_22

Yudintsev, A., Troshkina, G., 2023. Socio-economic development of Russian federal entities in 2019: multivariate data analysis. Lecture Notes in Networks and Systems 234, 141–150. https://doi.org/10.1007/978-3-030-75483-9_14

Список источников

Ariste, R., Di Matteo, L., 2017. Value for money: an evaluation of health funding in Canada. Int. J. Health Econ. Manag. 17, 289–310. https://doi.org/10.1007/s10754-016-9204-6

Averin, G., Zviagintseva, A., Konstantinov, I., Shvetsova, A., 2018. Method and criteria for assessing the sustainable development. J. Soc. Sci. Res. 1, 106–112. https://doi.org/doi.org/10.32861/jssr.spi1.106.112

Balkhi, B., Alshayban, D., Alotaibi, N., 2021. Impact of healthcare funding on healthcare outcomes in the Middle East and North Africa (MENA) region: a cross-country comparison, 1995–2015. Front. Public Health 8, 624–962. https://doi.org/10.3389/fpubh.2020.624962

Bogoviz, A., Elykomov, V., Osipov, V., Kelina, K., Kripakova, L., 2019. Barriers and perspectives of formation of the e-healthcare system in modern Russia. Studies in Computational Intell. 826, 917–923. https://doi.org/10.1007/978-3-030-13397-9_94

Chebyshev, I., 2021. Monitoring of cash execution of the state budget during the implementation of national projects and the choice of economic development directions. Vestnik Universiteta 5, 134–140. https://doi.org/10.26425/1816-4277-2021-5-134-140

Endovitsky, D., Endovitskaya, E., Golovin, S., Churikov, A., 2021. Monitoring the implementation of the national healthcare project. Lecture Notes in Networks and Systems 205, 871–878. https://doi.org/10.1007/978-3-030-73097-0_97

Ezangina, I., Gromyshova, O., 2020. Directions for improving the monitoring system of state programs of socio-economic development of Russia. Finance: Theory and Practice 24(5), 112–127. https://doi.org/10.26794/2587-5671-2020-24-5-112-127

Fattakhov, R., Nizamutdinov, M., Oreshnikov, V., 2019. Assessment of the sustainability of the socio-economic development of the regions in Russia. World of New Economy 13(2), 97–110. https://doi.org/10.26794/2220-6469-2019-13-2-97-110

Gallardo-Albarrán, D., 2018. Health and economic development since 1900. Econ. Hum. Biol. 31, 228–237. https://doi.org/10.1016/j.ehb.2018.08.009

Ivankova, V., Gavurova, B., Khouri, S., 2022. Understanding the relationships between health funding, treatable mortality and economic productivity in OECD countries. Front. in Public Health 10, 1–14. https://doi.org/10.3389/fpubh.2022.1036058

Khayrullina, M., 2014. Innovative territorial clusters as instruments of Russian regions development in global economy. Procedia Economics and Finance 16, 88–94. https://doi.org/10.1016/S2212-5671(14)00778-3

Kozlova, O., Nifantova, R., Makarova, M., 2017. Methods of the assessment of economic losses caused by the mortality of the population employed in regional economy. Econ. Reg. 13, 511–523. https://doi.org/10.17059/2017-2-16

Mihalache, I., 2019. Health state of human capital in the economic theory. Postmodern Open. 10, 182–192. https://doi.org/10.18662/po/102

Mishlanova, M., 2022. Development trends of the Russian system of national projects. Transport. Res. Procedia 63, 1575–1581. https://doi.org/10.1016/j.trpro.2022.06.170

Piskun, E., Khokhlov, V., 2019. Economic development of the Russian Federation's regions: factor-cluster analysis. Economy of Region. 5(2), 363–376. https://doi.org/10.17059/2019-2-5

Pushkarev, A., 2018. Cluster analysis of regional innovation activity in Russia in 2010–2015. R-ECOMONY 4(1), 10–17. https://doi.org/10.15826/recon.2018.4.1.002

Revnyakov, G., 2017. Analysis of the regional financial cluster strategies implementation. Russian J. Ind. Econ. 10(1), 82–88. https://doi.org/10.17073/2072-1633-2017-1-082-088

Romanova, T., Andreeva, O., Sukhoveeva, A., Kaptsova, V., 2019. Targeting the principal implementation in the system of social support. Int. J. Econ. Bus. Admin. 7(2), 52–62. https://doi.org/10.35808/ijeba/370

Shah, M., Rehman, A., Zeeshan, M., Afridi, F., 2021. Public health funding and health outcomes in Pakistan: evidence from quantile autoregressive distributed lag model. Risk. Manag. Healthc. Policy 14, 3893–3909. https://doi.org/10.2147/RMHP.S316844

Sharma, R., 2018. Health and economic growth: evidence from dynamic panel data of 143 years. PLoS ONE 13(10), 1–20. https://doi.org/10.1371/journal.pone.0204940

Soofi, M., Matin, B., Karyani, A., Rezaei, S., Soltani, S., 2021. Health-care determinants of mortality and recovered cases from COVID-19: do heath systems respond COVID-19 similarly? J. Educ. Health Promot. 10, 34485557. https://doi.org/10.4103/jehp.jehp_1509_20

Wirayuda, A., Chan, M., 2021. A systematic review of sociodemographic, macroeconomic, and health resources factors on life expectance. Asia Pac. J. Public Health 33, 335–356. https://doi.org/10.1177/1010539520983671

Yashina, N., Kashina, O., Pronchatova-Rubtsova, N., Yashin, S., Kuznetsov, V., 2022 (a). Assessment of budgetary stresses for socio-economic development of Regions. Lecture Notes in Networks and Systems. 368, 620–631. https://doi.org/10.1007/978-3-030-93244-2_68

Yashina, N., Kashina, O., Pronchatova-Rubtsova, N., Yashin, S., Kuznetsov, V., 2022 (b). Diagnostics of budgetary potential of regions in order to implement the value-oriented financial policy of state. Big Data in the GovTech System. Stud. in Big Data 110, 189–197. https://doi.org/10.1007/978-3-031-04903-3_22

Yudintsev, A., Troshkina, G., 2023. Socio-economic development of Russian federal entities in 2019: multivariate data analysis. Lecture Notes in Networks and Systems 234, 141–150. https://doi.org/10.1007/978-3-030-75483-9_14

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