European Proceedings of
Social and Behavioural Sciences
EpSBS

www.europeanproceedings.com
e-ISSN: 2357-1330

DOI: 10.15405/epsbs.2021.04.22

CDSES 2020

IV International Scientific Conference "Competitiveness and the development of socio-economic systems" dedicated to the memory of Alexander Tatarkin

EFFECTIVE PUBLIC-PRIVATE PARTNERSHIP IN REGIONAL HEALTHCARE

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Abstract

The article discusses the possibilities of solving the social sector's infrastructure problems, including healthcare, using the public-private partnership (PPP). The purpose of the study is to create an algorithm for assessing the effectiveness of the public-private partnership projects in healthcare at the regional level using statistical, structural, comparative, and factor analysis. The paper presents an analysis of Russian and international experience of implementing various PPP models in healthcare. The implementation of the public-private partnership in the Sverdlovsk region's healthcare system is demonstrated in the example of the Nuclear Medicine Centre. The author's algorithm for assessing the effectiveness of the public-private partnership projects in the regional healthcare system examines the dynamics of changes in the incidence and mortality of the working-age population and calculates the economic effect. As a result, the presented approach allowed assessing PPP's effectiveness in the example of the Nuclear Medicine Centre in the Sverdlovsk regional oncology service, confirming the importance of the public-private partnerships in ensuring mutually beneficial cooperation between the regional healthcare and socio-economic systems. The author's approach to assessing the effectiveness of public-private partnerships in regional healthcare can be applied in any constituent entity of the Russian Federation.

Keywords: Assessment of PPP effectiveness, public-private partnership models, regional healthcare system

https://doi.org/10.15405/epsbs.2021.04.22
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Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

1. Introduction

Citizens all over the world, especially in transition economy countries, face "infrastructure deficit" in the form of congested roads, poorly maintained transit systems and recreational facilities, deteriorated schools, hospitals, water treatment systems, and other infrastructure assets. It majorly affects the country's social and demographic security, resulting in increased accidents, reduced access to medical care, and reduced life expectancy and fertility, consequently leading to losses to society.

In the context of slowing demographic growth, aging of the population, and deterioration of social facilities, built 30-40 years ago, it is necessary to attract investments for constructing new buildings, supplying facilities with modern medical equipment, and introducing high-tech methods of treating patients. Abroad, the public-private partnership (PPP) is considered one of the most effective mechanisms to solve these problems. Ultimately, it contributes to an increase in the country's socio-economic development. As a rule, PPP mechanisms are used for implementing long-term projects aimed at creating and ensuring the functioning of public infrastructure facilities (see https://www.pwc.ru/ru/services/legal-services/practices/ppp.html). The public-private partnership is a mutually beneficial institutional and organizational alliance between the state and business that implements socially valuable projects, including in the healthcare system (the most important social sector).

2. Problem Statement

The share of healthcare expenditures in Russia remains below the minimum recommended by the World Health Organization (WHO), which is 5-6% of gross domestic product (GDP). The Russian average is 3.3% for the period from 2017 to 2019; the consumption of fixed capital in the field of health and social services amounted to 52.7% in 2018 (see Russian statistical yearbook 2019. https://gks.ru/bgd/regl/b19_13/Main.htm). In the context of the funding deficit in the Russian healthcare system, it is advisable to expand the use of the public-private partnership mechanisms in the country in order to create a more comfortable environment for providing medical care to the population using modern technologies. The research examines the processes of the public-private partnership in healthcare at the international, national, and regional levels. Additionally, it assesses the effectiveness of the public-private partnership projects in the regional healthcare system.

3. Research Questions

The study focuses on two main research questions:

1) Examination of the experience of implementing the public-private partnership models in the Russian and international healthcare**;**

2) Substantiation of the applicability of PPP in regional healthcare**.**

4. Purpose of the Study

The study aims to create an algorithm for assessing the effectiveness of the public-private partnership projects in regional healthcare.

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5. Research Methods

The research was conducted using the methods of statistical, structural, comparative, and factor analysis.

6. Findings

6.1. International experience in the development of public-private partnerships in healthcare

Due to the annual increase in the cost of medical care, even countries with a high level of government funding have to use public-private partnership instruments. Some scientists (Buso et al., 2017; Bonfim et al., 2018; Comendeiro-Maaløea et al., 2019; Chauhan & Marisetty, 2019; Kostyak et al., 2017; Kretser et al., 2017; Reich, 2000) claim that public-private partnerships are able to solve accumulated problems in the healthcare sector, improve its technological level and increase the level of comfort and service.

The features of a public-private partnership are:

- Long-term cooperation;
- Significant government support of the projects in the field of creation, renovation, maintenance of social infrastructure funded by the private sector that bears most of the risks;
- High reputation of the organizations, etc.

Effective cooperation between the public and private sectors in the national healthcare system introduces high-tech medical services and innovations and improves the quality of medical care provided to the population. The most popular models of public-private partnerships in international healthcare (DBFO, DBFM, BOO, BOLB, and other) combine various functions, such as designing, building, financing, operating. It is appropriate to review the international experience in developing public-private partnerships in the healthcare sector in the following examples (Table 1).

Table 1. Examples of PPP in international healthcare

Country	Forms and models of PPP implementation in healthcare
France	The successful example of the hospital centre “Sud Francilien" demonstrates PPP's effectiveness for both public and private sectors. This form of cooperation is mutually beneficial: as the operator takes responsibility for the risks, the project is implemented within the shortest time, creating a new hospital complex that provides patients with affordable and high-quality medical care and services.
United Kingdom	The British PPP model is characterized by the possibility to choose between different contractual forms: 1) corporatization; 2) Private Finance Initiative (PFI) in the form of long-term agreements between the public and private partners to construct, fund, maintain and operate infrastructure facilities; 3) outsourcing or transfer of the government functions to business (Fadyushin, 2019). Currently, the PFI model is being revised and renovated (Zavyalova & Dabagyan, 2019).

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Turkey	Turkey prefers such a form of PPP as outsourcing, which is gradually becoming more important. Over the years, the number of medical facilities that implemented outsourcing has only increased. At first, only non-core functions were transferred to third-party organizations; now the transferred functions partly include the main ones (see https://rmbic.ru/upload/iblock/ac0/Gosudarstvenno_chastnoe-partnerstvo-v-zdravookhranenii-_daydzhest-za-2016_2017-g.g.pdf).
Canada	Despite various problems, such as the lack of public awareness, resistance from trade unions, complexity of transactions, the implementation of PPP mechanisms in Canada has yielded positive results. They include high-quality construction and timely completion of more than 50 medical facilities, increased hospital bed capacity, creation of the most comfortable environment for patients and employees. Transferring risks to a private partner resulted in saving taxpayer funds and generating an economic effect at the community level. Thus, Canada's public-private partnership sector is considered one of the most developed in the world (see https://investinfra.ru/mezhdunarodnaya-praktika/gchp-v-sisteme-zdravoohraneniya-kanady.html).
Germany	Germany has the practice of transferring state medical institutions to private investors for a nominal price. The most commonly used forms of public-private partnership projects in German healthcare are: the acquisition of a medical facility by the state after the end of the contract; the relationship between public and private partners based on the "leasing model"; leasing of a hospital by a private partner, etc. (Panova, 2015).
Spain	The public-private partnership model Alzira, implemented in the La Ribera hospital, defines the responsibilities of public and private partners in the healthcare sector to improve the quality of medical services: • On the one hand, the hospital is on the state-owned land, belongs to the state healthcare system; it operates according to the model of State per capita funding; the public partner monitors the quality of provided medical services; • On the other hand, for a certain period, the state agrees with the private company/concessionaire that is obliged to provide high-quality medical services and patient care.
Peru	Peru is the Latin American country that widely uses the public-private partnership instruments, including in healthcare; most of the projects focus on renovating the infrastructure of medical facilities (Zavyalova & Dabagyan, 2019). Some PPP projects (for instance, the renovation of the Torre Trecca hospital) are implemented according to the “design-build-operate-deliver” model, which includes not only design, construction, and operation, but the provision of medical services. Various countries such as Italy, the Philippines, the Republic of Korea, etc. increasingly use this model. The public-private integrated partnership model includes various types of healthcare services: medical research, non-medical services, catering, transport services, etc. (Zavyalova & Dabagyan, 2019).

The analysis of international experience in implementing the public-private partnership in the healthcare sector indicates a variety of forms and models that require further institutional development. Such development is necessary for decreasing risks for private investors, improving the level and quality

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of medical services in order to satisfy the population, and increasing the efficiency of mutually beneficial cooperation between the state and business.

6.2. Analysis of the Russian experience in developing public-private partnerships in healthcare

A variety of Russian scientists has examined and described the possibilities of applying PPP in the social sector, including healthcare (Fadyushin, 2019; Molchanova, 2016; Nisan et al., 2012; Varnavsky, 2011).

In Russia, healthcare is a leader in terms of PPP social projects. Currently, 118 PPP projects are being implemented in the healthcare sector (including projects in which a private investor participates not only in the creation but also in the operation of the infrastructure). Moreover, 88% of private sector investments (in relation to the total investment in the project) ensure the implementation of these projects (https://www.economy.gov.ru/material/file/764aafac33fa544aec5b3008619e92a8/reiting_gchp_022020.pdf). The Expert Council for Public-Private Partnership Development under the Russian Ministry of Economic Development (Decree, 2018), established in 2019, is aimed at improving the cooperation between the public and private sectors regarding the development of PPP mechanisms, their methodological support, legal regulation, and project support.

The institutional and contractual forms of the public-private partnership are the most popular in the world. The institutional form implies the joint participation of the state and private business in the capital created for implementing a socially significant project. The contractual form is a strategic partnership between the state and private businesses based on a contract for the performance of certain functions regarding the public infrastructure object without creating a joint venture (Ershov, 2013). In the Russian healthcare, the practice of concession agreements is the most common legislative PPP form that allows the extension of the project implementation period up to 49 years; such PPP projects are usually implemented in the regions or municipalities (Molchanova, 2016).

Table 2 shows various options for implementing PPPs at the regional level.

Table 2. Possible options for implementing PPP projects in the field of healthcare

PPP projects	Advantages for the region	Implementation issues
Design, Build and Equip	Solving the problem of replacing fixed assets, and supplying medical facilities with modern equipment with the help of business	The risk of inability to sign contracts due to limitations, difficulty in attracting bank financing for a project
Build and Operate	Solving the problem of operation of medical facilities with the help of business	The long duration of the competition
Build, Operate, and Deliver medical care	Integrated public-private partnership that enables creation of a comfortable environment for patients and ensures the provision of high-quality medical services (including high-tech services)	The long duration of the competition

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70% of healthcare initiatives including the application of new public-private partnership models are implemented in such areas as primary health care, specialized, high-tech and innovative medical care, medical rehabilitation and health resort treatment (Zavyalova, & Tkachenko, 2018).

There is a variety of cases of the implemented PPP projects in the Russian healthcare:

– Republic of Tatarstan, Kazan: an educational centre for high medical technologies (the joint project of the Ministry of Health of the Republic of Tatarstan and the company "Johnson & Johnson"); the outpatient haemodialysis centre in Kazan awarded as the best social infrastructural project in Russia by ROSINFRA.

– Novosibirsk: provision of high-tech medical care due to concession of the former Maternity Hospital No. 1 to the private partner CJSC Medical Centre "Avicenna" that reconstructed and restored the building;

– Moscow and the Moscow Region: concession of the City Clinical Hospital No. 63 in Moscow to the European Medical Centre; concession of Moscow regional oncology centres in Balashikha and Podolsk for 12 years, when the Moscow region guarantees the concessionaire the provision of services and tariffs stated in the compulsory health insurance.

— Saint Petersburg and the Leningrad region: construction of a new building of the City Hospital No. 40 in Saint Petersburg; concession of the Rehabilitation Centre in the Leningrad region for 25 years, etc.

6.3. Implementation of public-private partnerships in healthcare at the regional level

The Ministry of Economic Development of the Russian Federation annually ranks the constituent entities of the Russian Federation by the level of the public-private partnership development in each entity. The regions are rated in accordance with the indicator "The level of the public-private partnership development in the constituent entity of the Russian Federation".

In 2019, the Ministry revised the existing approaches to calculating the indicator in order to increase the transparency of the rating (https://www.economy.gov.ru/material/file/764aafac33fa544aec5b3008619e92a8/reiting_gchp_022020.pdf) and create conditions to stimulate the executive authorities and local governments of the constituent entities of the Russian Federation to more actively use PPP mechanisms. The attraction of private investment in infrastructure development assists in the implementation of the Decree of the President of the Russian Federation of May 7, 2018 No. 204 "On national goals and strategic objectives of the development of the Russian Federation for the period until 2024" (Decree, 2018).

In the 2019 rating of the Russian Federation's constituent entities by the level of the public-private partnership development, the Sverdlovsk Region took 7th place out of 85 constituent entities of the Russian Federation and 2nd place in the Ural Federal District. It is appropriate to examine the regional experience in implementing PPP projects in healthcare. The "design-build-operate-deliver" model was most fully implemented in the Nuclear Medicine Centre of the Sverdlovsk Region.

The problem of cancer incidence and mortality is multifaceted, as it involves not only medical and demographic but also socio-economic aspects. Premature mortality of the working age population results in reduced labour potential and threatens national economic security. In the Russian Federation, the

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economic losses due to premature mortality caused by cancer and its consequences, including treatment, annually account for more than 1.0% of gross domestic product (GDP). This problem requires the creation of effective mechanisms for preventing cancer and reducing economic losses from it (Zayukov et al., 2020).

The Nuclear Centre in the Sverdlovsk region was created due to the necessity to improve methods for cancer diagnosis. In the region, the issue of effectively combating cancer is very acute: malignant tumours are ranked second in the structure of mortality. The national and regional cancer control programs set the task to increase the identification of malignant tumours at the early stages to 58%, as well as to increase the proportion of treated patients with malignant tumours registered for five years or more to 58.2% in 2024. To fundamentally change the oncological situation, following the guidelines of the national project “Healthcare”, at the end of 2012, the Government of the Sverdlovsk Region and “PET-Technology” LLC signed an agreement on the establishment of a diagnostic medical centre and the subsequent provision of services under the compulsory health insurance.

Currently, the Nuclear Medicine Centre “PET-Technology” in the Sverdlovsk region is the largest investment project in the field of healthcare in the Russian Federation (see https://www.pet-net.ru/centres/ekaterinburg). The Nuclear Medicine Centre, located in a detached building on the territory of the Sverdlovsk Regional Oncology Centre, is conducting research using positron emission tomography. In 2019, the second high-tech scanner for diagnosing tumours started working there. The new PET/CT scanner can examine almost the whole body. This diagnostics allows identifying tumour foci, their prevalence, and stage of the disease and helps doctors determine the correct treatment tactics. The new PET/CT scanner is capable to examine 97% of the patients free of charge (via compulsory health insurance), as well as 3% of residents from other regions and 52 countries (https://www.obltv.ru/news/science/v-uralskom-tsentre-yadernoy-meditsiny-zapustili-novyy-pet-skaner).

The Government of the Sverdlovsk Region, Federal State Autonomous Educational Institution of Higher Education «Ural Federal University named after the first President of Russia B. N. Yeltsin», Joint Stock Company “Rusatom Healthcare” and Limited Liability Company “Med Invest Group” signed an agreement for implementing a joint investment project. The project "Creation of the Nuclear Medicine Centre for the diagnosis and treatment of cancer" in the Sverdlovsk region of July 10, 2018, relies on the principles of the public-private partnership. The subject-matter of the agreement is the intention of the parties to cooperate in creating and operating the Cyclotron Centre for Nuclear Medicine. Additionally, the parties agreed to produce radiopharmaceuticals, conduct research, organize educational activities, and provide medical services for radionuclide diagnostics on the basis of the centre (https://minzdrav.midural.ru/news/show/id/3701/news_category/74).

The implementation of the project on the creation of a nuclear medicine cluster using integration, interdisciplinary approaches resulted in the introduction of various organizational, informational, and medical innovations (see https://www.uralonco.ru/tsentr-yadernyy-meditsina-vyl-pozvolit/):

- Creation of a building for radionuclide therapy, a radiochemical laboratory, a radiosurgery centre, and expansion of the use of positron emission tomography (PET);
- Creation of the Cyclotron centre on the basis of the Ural Federal University aimed at the production of radiopharmaceuticals for the diagnosis of cancer and cardiovascular diseases;

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- Development of new methods for the selective delivery of anticancer drugs using tissue penetrants (“Tizol”, “Silavatit”) and carbon-coated metal nanoparticles necessary for treating malignant tumours (in cooperation with the Ural Branch of the Russian Academy of Sciences);
- Development of a program/an engineering implementation of the model that determines tumour margins based on the type of brain glioma in a Magnetic Resonance Imaging (MRI). At all stages of the algorithm, this unique model takes into account additional signs indicating the existence of internal heterogeneity of the brain glioma while identifying tumour margins (Centre for Scientific Research "Avantrend") and others.

6.4. Assessment of the effectiveness of PPP in regional healthcare

Examination of the cases of successful implementation of the public-private partnership projects in Russia and abroad allows formulating the author's hypothesis concerning the healthcare sector. According to this hypothesis, in the context of the increasing cost of medical care, the expansion of the use of PPP is an effective tool for mutually beneficial cooperation between the regional healthcare and the socio-economic systems. The private sector investments in infrastructure and medical equipment have a positive effect. On the one hand, they result in improving the regional medical and demographic indicators. On the other hand, due to the preservation of the working age population and increase in the number of jobs in newly created social infrastructure facilities, the contribution to gross regional product (GRP) increases as well.

In this regard, it is advisable to determine the benefits of using the public-private partnership for all process participants.

- The benefits for the private sector are the improvement of the reputation as a result of participation in regional, national, and international projects; state guarantees; reduced risks of the investment (taking into account tax benefits, budget subsidies, subventions, etc.) in the real production sector of the economy during the construction and renovation of social facilities, etc.
- The benefits for the healthcare system are the improvement of material and technical equipment; improvement of medical service; increased treatment effectiveness due to modern diagnostic equipment; increasing public satisfaction with the level of medical and non-medical services in healthcare facilities, etc.
- The benefits for the regional socio-economic system are the achievement of the multiplier effect by reducing the mortality of the working age population and increasing the contribution to GRP.
- The authors proposed the following algorithm for assessing the effectiveness of the regional PPP projects:
- Assessment of public satisfaction with medical services.
- Assessment of public satisfaction with non-medical services.
- Change in the dynamics of the diagnostics.
- Change in the dynamics of the incidence rate of the population.
- Change in the dynamics of the mortality rate of the working age population, etc.

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- • Assessment of the economic effect.

The implementation of the public-private partnership in regional healthcare was assessed in the example of the Nuclear Medicine Centre. Considering the social significance of oncological diseases, the research focused on assessing how the changes in diagnostics influence the incidence and mortality of the working age population, as well as on examining the regional economic effects or losses.

The studies on the implementation of PPP in the oncology service of the Sverdlovsk Region showed positive dynamics. Due to the improvement of diagnosis, the number of patients with detected cancer who have lived for more than five years increased in comparison with the average Russian indicators.

Table 3 presents the results of the oncological service of the Sverdlovsk region in the period 2017-2019.

Table 3. Indicators of the Sverdlovsk Regional Oncology Centre (SROC) in the period 2017-2019

Indicators	**2017**	**2018**	**2019**	**% 2019/2017**
Incidence of malignant tumours (MT) in the region (per 100,000 population.)	426.5	431.1	444.1	103.4%
Patients with suspected MT sent in the SROC, total	19441	20794	23269	1149.7%
Deaths of working age people	1755	1797	1701	97%
Gross regional product per worker, rub	928 800	1 035 932	1 051 283	
Actual damage, rub	1630044000	1861569804	1788232383	
Possible damage, rub		1818060660	1889155551	
Economic effect from reducing mortality of the working age population, rub		-43509144	100 923 168	
Total economic effect from reducing mortality of the working age population, rub			**57 414 024**	

The analysis shows a 3.4% increase in the incidence of malignant tumours in the period 2017-2019 that is caused by an improvement in diagnosis and an earlier detection of cancer, among other things.

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At the same time, the number of patients with suspected MT sent in the Sverdlovsk Regional Oncology Centre increased by 19.7%. The use of nuclear medicine technologies and introduction of innovations in the oncology service resulted in a 3% reduction in the mortality of the working age population.

The economic effect from the reduction in mortality of the working age population is calculated as the difference between possible and actual damage. The possible damage is calculated as GRP per 1 worker (in roubles) in the current year multiplied by the number of patients who died in the previous year. The actual damage is calculated as GRP per 1 worker (in roubles) in the current year multiplied by the number of patients who died in the current year.

A 2.4% increase in the number of deaths in 2018 compared to 2017 led to a negative value (-43.5 million roubles), as the actual damage exceeded the possible. A 5% decrease in the number of deaths in 2019 compared to 2018 contributed to an economic effect of 100.9 million roubles. The total economic effect for the period from 2017 to 2019 amounted to 57.4 million roubles.

The further decline in the working age population's mortality will contribute to an increase in the economic effect at the regional level. The calculations demonstrate that each percentage reduction in working age mortality will increase the regional economic effect by at least 20.0 million roubles. The positive experience of implementing the public-private partnership in the Sverdlovsk Regional Oncology Centre demonstrates the usefulness and applicability of this mechanism in the provision of high-tech medical care to residents of the region.

7. Conclusion

The conducted research of international and Russian healthcare experience demonstrates a variety of public-private partnership forms and models aimed at improving medical care and services. This tool requires further development in the national and regional healthcare systems in the context of the funding deficit. An assessment of the effectiveness of public-private partnerships in healthcare considers the benefits of successful interaction between the healthcare system and the region's socio-economic system. The proposed authors' algorithm for assessing PPP's effectiveness at the regional level determines the public satisfaction with medical and non-medical services, changes in medical and demographic indicators, losses from mortality of the working age population, and the achieved economic effect from reducing mortality of the working age population. The authors' approach is universal and can be used to assess the applicability of public-private partnership projects in regional healthcare.

Acknowledgments

The article has been prepared with the support of Russian Foundation for Basic Research within the research project № 19–010–00396 “Effectiveness of health system as a factor of sustainable social and economic development of regions.

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