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## ESTIMATION THE EFFECTIVENESS OF PUBLIC GOVERNANCE OF THE HEALTH SYSTEM IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT

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**Abstract.** The article is devoted to assessing the effectiveness of public administration of the health system, taking into account the medical reforms carried out in post-socialist countries in the context of sustainable development. During the study, the authors revealed that one of the main problems in achieving the sustainable development goal - "ensuring a healthy lifestyle and promoting well-being for all at any age" is the lack of a sound methodology for assessing the effectiveness of public administration reforms in the healthcare system. On the example of the Republic of Kazakhstan, a comprehensive analysis of the effectiveness of the health system was carried out, based on data from medical and demographic indicators, financing indicators, as well as an integrated indicator of assessing the effectiveness of the health system - the expected life expectancy of the population. Based on economic and mathematical methods in management, a forecast of the expected life expectancy of the population was carried out; the results of forecast calculations show that in the medium term, the indicator of the expected life expectancy of the population will have a slight upward trend. As the main recommendations for improving the effectiveness of public administration of the health system in transformational economies, the authors substantiated the need to determine the key parameters of a unified methodology for assessing the effectiveness of the health system. The use of a unified system of healthcare performance indicators makes it possible to assess the degree to which goals have been achieved to increase the efficiency of resource use and ensure a high level of quality and accessibility of medical services.

**Keywords:** efficiency; public administration; health care system; sustainable development; life expectancy, health care expenses; health financing

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### 1. Introduction

One of the most important and socially significant areas of public policy, requiring a balanced approach by the government, is the public administration system in the health sector, which has a direct impact on the welfare, life and health of the population. Having come a long way since gaining independence, the countries of the former

socialist space demonstrate various successes in reforming the legacy healthcare system based on state ownership, non-price rationing, centralized planning and control.

A generalization of the experience of medical reforms carried out in European countries (Romania, Poland, Bulgaria) suggests that the modernization of national systems for organizing, managing and financing health care in these countries was based on the introduction of compulsory medical insurance (with centralized collection and distribution of financial resources), which primarily due to the problems of limited budget funding.

Previous studies of the authors on a comparative analysis of medical reforms in Ukraine and Kazakhstan led to the conclusion that the Kazakh and Ukrainian health systems have common features due to the Soviet legacy, and the need to reform the health systems in these countries is due to their low efficiency. At the same time, the main directions of medical reforms in these countries have their own peculiarities related to the reorientation of the national system of financing health care to the patient in Ukraine and the introduction of compulsory social health insurance in Kazakhstan. At the same time, the analysis confirmed that modern health care reforms are a complex process through which post-socialist states goes through with varying speed and degree of success (Grazhevskaya, Aymagambetov, Tyngishev, 2019).

Monitoring achievements and failures in this area, as well as creating a well-thought-out strategy for the further development of the medical industry, is impossible without developing a modern methodology for assessing the effectiveness of public administration of the healthcare system. In this regard, the authors of the proposed study conducted a comprehensive analysis of the performance indicators of the health care system (for example, the Republic of Kazakhstan), based on which the existing problems were identified and recommendations for improving reforms in the healthcare sector were substantiated.

## **2. Research background**

The problems of the functioning and development of the public sector, of which the healthcare sector is an important component, are disclosed in the works of J. Stiglitz, "The Economics of the Public Sector," Specific Properties of Medical Services as an Object of the Normative Economy, Comparative Characteristics of the Medical Services Industry with the Standards of the Welfare Economy, Analysis of the Inefficiency of the Medical Services Market, due to the asymmetry of information, the uncertainty of demand, external health effects have found in K. Arrow studies (Organizational and financial mechanism of public management of the health care system in foreign countries, 2019). A fundamental study on the effectiveness of the health system was published in 2018 by experts from the European Observatory on Health Systems and Policies (Cylus, Papanicolas, Smith, 2016).

Theoretical and practical aspects of reforming the systems of organization, management and financing of health care in the countries of the former socialist space are reflected in the scientific works such as "Analysis of the National Health Strategy for 2014-2020" (Popescu, 2015), "The Evolution Of The Medical System And Health Status In Romania" (Maxim, Diaconu, Maxim, 2015).

In Ukraine, the problems of implementing and evaluating the effectiveness of medical reform were reflected in the writings of V. Moskalenko (substantiation of the principles for constructing an optimal healthcare system in the Ukrainian context) V. Lehan, G. Slabkogo, M. Shevchenko (argumentation of the strategic directions of the healthcare system development in the context of market transformation of the national economics). In the context of the problem under study, the monograph "The State Administration of Health Protection of Ukraine", prepared by specialists of the Ukrainian Institute for Strategic Studies of the Ministry of Health of Ukraine, which discloses the theoretical and methodological foundations of the study of state management of the healthcare sector, the impact of the state on the medical and demographic situation and the health status of the population of Ukraine,

deserves attention, regulatory support for the development of the national healthcare industry, financial and economic mechanism of state regulation, as well as ways to improve public policy and public management of the domestic medical industry (Grazhevskaya, Aymagambetov, Tyngishev, 2019).

The problems of organizing the healthcare system in Kazakhstan are the subject of scientific analysis of many famous scientists. A theoretical study of the essence of public health management, the development of scientifically based proposals and recommendations for improving legislation at the initial stage of the formation of the Republic of Kazakhstan were proposed by G. Utibaev. Social and organizational and legal characteristics of healthcare management, issues of legal regulation of permissive and supervisory activities in the field health care were highlighted in a dissertation study by Kozhabek K. "Legal Regulation of public health administration in the Republic of Kazakhstan: problems and prospects (The current state of the healthcare system of the Karaganda region, 2019). Issues of state regulation and management of the health care system of the Republic of Kazakhstan at the present stage of development were investigated by A. Rakhimbekova (Rakhimbekova, 2015) and Ryskulova M. (Ryskulova, 2017). Assessment of the current state and justification of the main directions of reforming the healthcare system in Kazakhstan are reflected in the writings of Orynbasarova S (The current state of the healthcare system of the Karaganda region, 2019). Regarding the organization of public administration in a market economy, this issue was investigated by L. Komekbayeva, A. Legostayeva, O. Tyan, and Y. Orynbasarova Government Measures for Economic Support in the Conditions of a Floating Exchange Rate of the National Currency (Komekbayeva, Legostayeva, Tyan, Orynbasarova, 2016).

At the same time, despite a significant number of scientific developments devoted to the organizational foundations of public administration in the healthcare sector, the problems of assessing the effectiveness of public administration of the healthcare system are not well developed, which determined the purpose and objectives of this study.

### **3. Materials and methods**

The study is based on modern theoretical approaches (systemic, comparative, institutional), concepts and models of public administration of the healthcare system (mainly state, social insurance, mainly private). The study used economic and statistical methods, as well as a comparative analysis of statistical data. The authors assessed the effectiveness of the healthcare system in the Republic of Kazakhstan for the period 2013-2017 based on the data of medical and demographic indicators, financing indicators, as well as an integrated indicator of the expected life expectancy of the population.

The information base of the study was compiled by the materials of the World Health Organization, legislative and regulatory acts in the field of healthcare in post-socialist countries, as well as official publications, analytical and statistical collections on the activities of healthcare organizations and health indicators of the population of the Republic of Kazakhstan. At the same time, the incompleteness of statistical databases, as well as the lack of a well-established generally accepted methodology for assessing the effectiveness of public administration of the health system in these countries, became a limitation in the proposed study.

### **4. Results and Discussion**

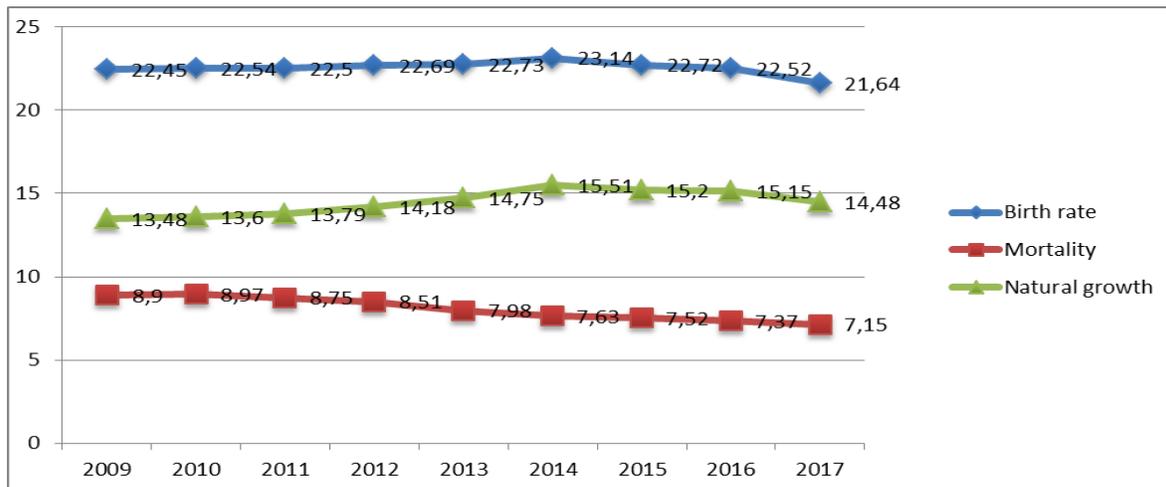
The fundamental role of protecting public health as an integral condition of society is recognized in article 29 of the Constitution of the Republic of Kazakhstan (1. Citizens of the Republic of Kazakhstan have the right to protection of health. 2. Citizens of the Republic are entitled to receive a guaranteed amount of medical care established by law for free) (Grazhevskaya, Tyngisheva, 2018). The Strategic Plan of the Ministry of Health of the Republic of Kazakhstan for 2017-2021 defines specific strategic goals (Strategic plan Strategic plan of the Ministry of Health of the Republic of Kazakhstan for 2017 - 2021). Also, since 2016, the state continued the

practice of implementing the state program in the field of healthcare for 2016–2020, aimed at strengthening the health of the population to ensure sustainable socio-economic development of the country (The State Health Development Program of the Republic of Kazakhstan "Densaulyk" for March 2016-2019, 2010).

Currently, measures are being taken in Kazakhstan aimed at introducing new approaches to public administration in order to improve the availability and quality of the provision of medical services to the population. However, despite the measures taken, today in the health care system there are a number of unresolved problems, in particular, the shortage of personnel medical supplies; low level of social protection and remuneration of medical workers; low amounts of budget financing to provide free medical care to citizens, barriers to the implementation of the system of mandatory medical insurance, etc.

Thus, further improving the efficiency of managing the health care system is one of the main tasks of ensuring sustainable development. The implementation of this task largely depends on the correct choice of appropriate tools, methods and mechanisms and is determined by the available resources and their sources.

One of the key areas of assessing the effectiveness of the health care system is the study of indicators of natural population movement. Analysis of the natural movement of the population allows us to evaluate the basic characteristics of the current state of the health care system, as well as identify key problems of its functioning. In turn, an organized system for managing the health sector can reduce population mortality and increase a key indicator of the effectiveness of the health system in terms of life expectancy. Figure 1 presents a graph characterizing the indicators of natural population movement in the Republic of Kazakhstan for 2013-2017.



**Figure 1.** Indicators of the natural movement of the population of the Republic of Kazakhstan for 2013-2017

Source: compiled by authors

In accordance with the above data, in 2017 the birth rate in Kazakhstan amounted to 21.64 per 1000 people, which is 4.7% less compared to 2013. At the same time, the mortality rate at the end of the analyzed period decreased by 10.4% and amounted to 7.15 per 1000 population in 2017 (Statistical collections "Health of the population of the Republic of Kazakhstan and the activities of health organizations" 2013-2017). According to the World Health Organization, on a scale of indicative indicators for estimating fertility and mortality rates (table 1), Kazakhstan has a low mortality rate (7.15) and an average fertility rate (21.64) per 1000 population (Data of the World Health Organization). The analyzed fertility and mortality rates determined the following dynamics of natural population growth: in 2017, the natural population growth rate was 14.48, which is 1.8% less than in 2013.

**Table 1.** Indicators for assessing levels of vital movement

Grade Level	Birth rate	Mortality
Low	below 15	below 9 ‰
Average	15 - 25	9 - 15
Tall	over 25	over 15

*Source:* compiled by authors

The state of the effectiveness of the functioning of the healthcare system in Kazakhstan can be judged on the basis of the data presented in table 2.

**Table 2.** Main indicators of the healthcare system of the Republic of Kazakhstan

	2013	2014	2015	2016	2017	Rate of increase 2017/2013 (%)
Number of hospital organizations (absolute numbers)	1008	911	901	853	877	-12,9
The number of outpatient organizations (absolute numbers)	3796	3163	3149	3126	3273	-13,8
Incidence per 100,000 people of the corresponding population	53954.5	52031,5	52410,7	56773.4	57896.9	7,3
Number of doctors (absolute numbers)	53809	52756	52398	53335	56570	5,1
number of doctors per 10,000 population	31,4	30,3	29,7	29,8	31,2	-0,6
head nursing staff (absolute numbers)	135908	136273	138851	142734	152591	12,3
strength	79,2	78,2	78,6	79,7	84,0	6,1
nursing staff per 10,000 population	68,3	60,4	58,0	55,9	54,8	-19,8

*Source:* compiled by authors

Thus, over the period 2013-2017, both the number of hospital organizations (by 12.9%) and the number of outpatient clinics (by 13.8%) decreased in Kazakhstan. At the same time, the incidence rate per 100,000 people of the corresponding population increased by 7.3%. With a decrease in the number of hospital organizations, there has been a decrease in the number of hospital beds by 10 thousand people (by 19.8%).

As for the staffing of the healthcare system, the number of doctors in the country over this period increased by 5.1%, but the number of doctors per 10,000 populations has not changed. It should be noted the increase in the number of paramedical personnel in absolute numbers (by 12.3%) and by 10.000 of the population (by 6.1%). It is important to note that a decrease in the number of medical institutions and a decrease in the number of medical beds did not lead to optimization of the human resources for health care, in particular, there is a shortage of doctors per 10,000 people, the reason for which is the low salary and low level of social protection of doctors.

In this regard, it is advisable to consider the situation with financing the health system in Kazakhstan. It is important to note that this system is based mainly on the state budget model. Consider the dynamics of health spending, as the most important indicator of social development and social policy of the state, for the period 2014-2017.

**Table 3.** The main indicators of financing the health system in Kazakhstan for the period 2014-2017.

	2013	2014	2015	2016	2017
Health expenditures, billion tenge.	1281	1432	1485	1762	1787
The share of health care spending in GDP, %	3,6	3,7	3,6	3,8	3,5
Health expenditures per capita, tenge	77 676	82 890	83 961	70422	97650
Health expenditure per capita, \$	501,1	462,9	381,5	289	299,5

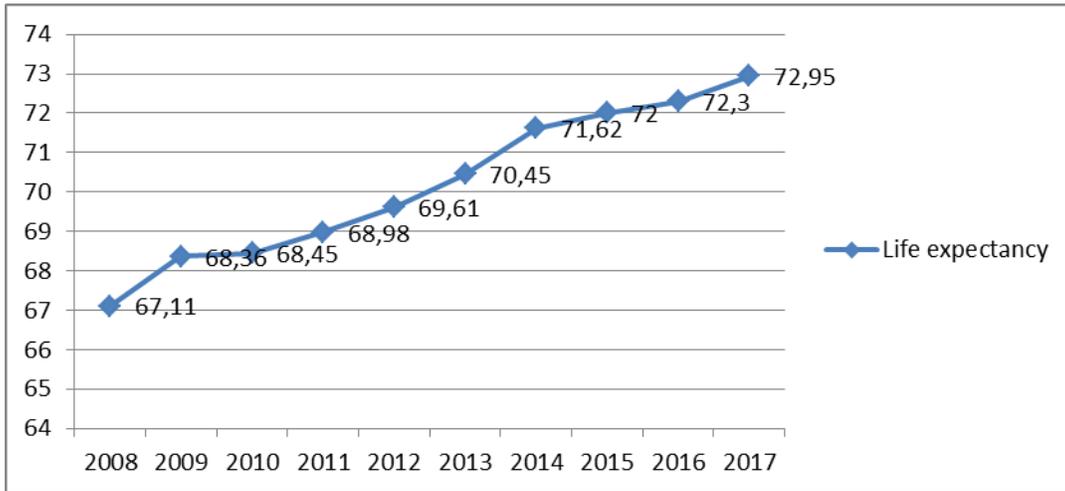
*Source:* compiled by authors

According to the table, in 2017, the total amount of health care spending in Kazakhstan amounted to 1,787 billion tenge. At the same time, per capita health care expenditures amounted to 97650 tenge or 299.5 US dollars (“National Health Accounts of the Republic of Kazakhstan review of health care expenditures for 2010-2016”). The value of this indicator is 12 times lower than the level of per capita spending in OECD countries (\$ 3,470). The share of health care expenditures in Kazakhstan's GDP in 2017 amounted to 3.5%. For comparison, in the group of middle-income countries, to which Kazakhstan belongs, the similar indicator is 6.3%, in OECD countries - 9.3% (Temekova, Ishkanova, 2018).

As already noted, in order to increase the efficiency of financing medical care, medical reform is currently underway in many post-socialist countries, aimed at strengthening the financial sustainability of the healthcare system based on the joint responsibility of the state, employer and every citizen. In this regard, in 2015, the Law on Compulsory Social Health Insurance was adopted in Kazakhstan (The Law of the Republic of Kazakhstan “On Compulsory Social Health Insurance”, 2018). The transition from the state model of organizing the health care system to the system of compulsory health insurance increases the role and importance of evaluating the effectiveness of managing the health care system, since spending resources on ineffective medical care can reduce the willingness of society to contribute to the financing of medical services.

A representative indicator characterizing the effectiveness of the management of the health care system is the indicator of the expected life expectancy of the population - one of the key indicators included in the calculation of the health system performance index (Nazarova, Borisenkova, 2017).

An analysis of the dynamics of this indicator in Kazakhstan for the period 2008-2017 (Figure 2) indicates that the life expectancy of the population in this country increased by 8.7%: from 67.11 years in 2008 to 72.95 years in 2017.



**Figure 2.** Dynamics of the indicator of life expectancy in Kazakhstan, for the period 2008-2017.

Source: compiled by authors

According to the dynamics of the life expectancy of the population for the period 2008-2017, we will build a forecast for 3 steps forward, i.e., until the end of 2020. The results of modeling and forecasting are shown in graph 3.

According to the first five points of the time series, using the statistical function in Excel, the values were estimated  $a_0 = 66,816$ ,  $a_1 = 0,562$ , which correspond to a point in time  $t=0$ .

Equation is being found:

$$y_t = 66,816 + 0,562t$$

Selected smoothing option  $\alpha = 0,3$ , then the discount factor  $\beta = 1 - \alpha = 1 - 0,3 = 0,7$ .

We determined the initial conditions of exponential means by the formulas:

$$S_0^{(1)} = a_{0(0)} - \frac{\beta}{\alpha} a_{1(0)} = 66,816 - \frac{0,7}{0,3} \cdot 0,562 = 65,5047;$$

$$S_0^{(2)} = a_{0(0)} - \frac{2\beta}{\alpha} a_{1(0)} = 66,816 - \frac{2 \cdot 0,7}{0,3} \cdot 0,562 = 64,1933.$$

The values of the exponential averages for the following periods were calculated using the formulas:

$$S_t^{(1)} = \alpha \cdot y_t + \beta \cdot S_{t-1}^{(1)};$$

$$S_t^{(2)} = \alpha \cdot S_t^{(1)} + \beta \cdot S_{t-1}^{(2)}.$$

Adjusted model parameters:

$$a_{0(t)} = 2S_t^{(1)} - S_t^{(2)};$$

$$a_{1(t)} = \frac{\alpha}{\beta} (S_t^{(1)} - S_t^{(2)}).$$

According to the model with adjusted parameters  $a_{0(t)}$  и  $a_{1(t)}$  we find the forecast for the next time:

$$\hat{y}_t(\tau) = a_{0(t)} + a_{1(t)}\tau = \hat{y}_{(t+1)} = a_{0(t)} + a_{1(t)}. \text{ (see table 4)}$$

**Table 4.** The calculated values

t	Y	$S_t^1$	$S_t^2$	$a_0$	$a_1$	$\hat{y}_t$
0		65,5047	64,1933	66,816	0,562	
1	67,11	65,9863	64,7312	67,2413	0,53788	67,378
2	68,36	66,6984	65,3214	68,0754	0,59015	67,7792
3	68,45	67,2239	65,8921	68,5556	0,57075	68,6656
4	68,98	67,7507	66,4497	69,0517	0,55758	69,1264
5	69,61	68,3085	67,0073	69,6097	0,55764	69,6093
6	70,45	68,9509	67,5904	70,3115	0,58308	70,1673
7	71,62	69,7517	68,2388	71,2645	0,64837	70,8946
8	72	70,4262	68,895	71,9573	0,65621	71,9129
9	72,3	70,9883	69,523	72,4536	0,62799	72,6135
10	72,95	71,5768	70,1391	73,0145	0,61615	73,0816
$\hat{y}_t(2018)$						73,6306
$\hat{y}_t(2019)$						74,2468
$\hat{y}_t(2020)$						74,8629

Source: compiled by authors

If  $t < n$ , then the constructed model can be used to predict the future. The point forecast is calculated by the formula:

$$\hat{y}_{(n+\tau)} = a_{0(n)} + a_{1(n)}\tau, \tau = 1, 2, \dots .$$

Using this formula, we obtain the predicted values of the life expectancy of the population for the next three years (2018-2020):

- 2018 year

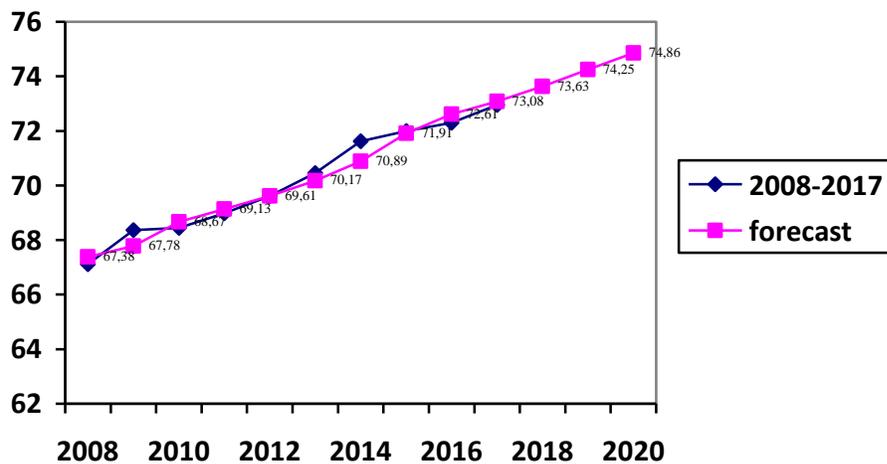
$$\hat{Y}_{(2017+1)} = a_{0(2017)} + a_{1(2017)} \cdot 1 = 73,0145 + 0,61615 \cdot 1 = 73,6306 \text{ years;}$$

- 2019 year

$$\hat{Y}_{(2017+2)} = a_{0(2017)} + a_{1(2017)} \cdot 2 = 73,0145 + 0,61615 \cdot 2 = 74,2468 \text{ years;}$$

- 2020 year

$$\hat{Y}_{(2017+3)} = a_{0(2017)} + a_{1(2017)} \cdot 3 = 73,0145 + 0,61615 \cdot 3 = 74,8629 \text{ years.}$$



**Figure 3.** The results of modeling and forecasting the expected life expectancy of the population of the Republic of Kazakhstan until 2020  
*Source:* compiled by authors

As the calculations show, the predicted values of the life expectancy of the population of the Republic of Kazakhstan in 2018, 2019 and 2020 will amount to 73.63; 74.25; 74.86 years respectively (figure 3). The reliability of the forecast data is significant, which confirms the comparison of the actual indicator of life expectancy for 2018 - 73.15 with the forecast - 73.63, with a difference of 0.48. It should be noted that the predicted indicator of the expected population duration in 2020 is 74.86 years, significantly lower than the countries with an effective health care system in the current period (Yemelina, 2015). For comparison, according to a study by the Bloomberg rating agency for 2016, the country with the most efficient healthcare system is Singapore with an average life expectancy of 82.7 years (Bloomberg: Ranking of the countries of the world on the effectiveness of health systems in 2016).

## Conclusions

Based on the analysis of evaluating the effectiveness of public administration of the health system in the context of sustainable development, the following results were obtained:

1. Reforming the healthcare sector is an urgent task of improving the system of public administration in post-socialist countries. Health systems in the countries of the post-Soviet space have common features due to the legacy of the Soviet health system. One of the main problems in achieving the goal of sustainable development in healthcare is the lack of a sound methodology for assessing the effectiveness of reforms in this area.

2. An analysis of the effectiveness of the health care system in the Republic of Kazakhstan on the basis of the proposed indicators allowed us to state the following facts: for the period 2013-2017, there is a positive trend in the decrease in the mortality rate by 10.7%. Indicators of resource provision and morbidity show a negative trend, a decrease in the number of medical facilities, reduction of beds did not lead to optimization of health care resources, since the number of doctors per 10,000 population has not changed, the incidence rate per 100,000 people corresponding to the population increased by 7.3% and per capita health expenditure of the population amounted to US \$ 299.5, well below the level of per capita expenditure in the OECD countries is 12 times (3470 US dollars).

It should be noted that the results of the analysis of the healthcare system can be used in the future to develop an optimal model of public administration efficiency in this area. Thus, the use of a unified system of healthcare performance indicators makes it possible to assess the degree to which the goals are set to increase the efficiency of resource use and ensure a high level of quality and accessibility of medical services, which in turn will bring it closer to achieving Sustainable Development Goal 3 “Ensuring a healthy lifestyle and promoting well-being for all at any age” sustainable development.

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