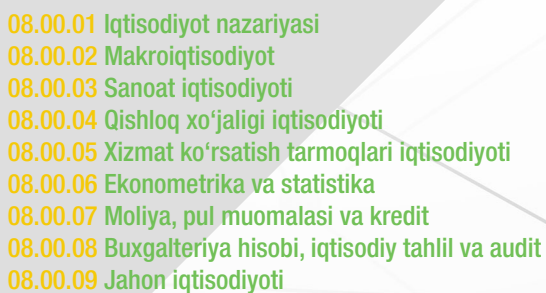


IQTISODIYOT
va
TARAQQIYOT

Ijtimoiy, iqtisodiy, siyosiy, ilmiy, ommabop jurnal



Yashil

IQTISODIYOT va TARAQQIYOT

Ijtimoiy, iqtisodiy, siyosiy, ilmiy, ommabop jurnal

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BASING AND FORECASTING THE PRIORITIES OF INTRODUCING INNOVATIVE MEDICAL SERVICES IN KHOREZM REGION

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Abstract: this article presents the results of the regional medical services market development forecast in 2022-2026. According to him, the effect of factors such as the number of private clinics and the number of employees of medical institutions in the development of the medical services market was interpreted using the regression analysis method.

Key words: model, quality medical service, private clinics, the number of medical personnel, private sector, health services, correlational analysis, real income, service price, population income, MARE indicator, Durbin-Watson index, Regression analysis.

Annotatsiya: ushbu maqolada 2022–2026-yillarda hududiy tibbiy xizmatlar bozorini rivojlantirish prognozi natijalari keltirilgan. Unga ko'ra, tibbiy xizmatlar bozorini rivojlantirishda xususiy klinikalar soni va tibbiyot muassasalari xodimlari soni kabi omillar regressiya tahlili usuli yordamida amalga oshirilishi samarasi talqin qilingan.

Kalit so'zlar: Model, sifatli tibbiy xizmat, xususiy klinikalar, tibbiyot xodimlari soni, xususiy sektor, sog'liqni saqlash xizmatlari, korrelyatsion tahlil, real daromad, xizmat narxi, aholi daromadi, MARE ko'rsatkichi, Durbin-Watson indeksi, regressiya tahlili.

Аннотация: в данной статье представлены результаты прогноза развития регионального рынка медицинских услуг на 2022-2026 годы. По его словам, влияние таких факторов, как количество частных клиник и численность работников медицинских учреждений на развитие рынка медицинских услуг, интерпретировалось методом регрессионного анализа.

Ключевые слова: Модель, качество медицинских услуг, частные клиники, численность медицинского персонала, частный сектор, медицинские услуги, корреляционный анализ, реальные доходы, стоимость услуг, доходы населения, показатель MARE, индекс Дарбина-Уотсона, регрессионный анализ.

INTRODUCTION

Improving the quality of medical services at the global, national, regional and local levels in the world, and attracting foreign investment resources to the health care sector, is considered as a strategic goal of sustainable development in the period until 2030. All over the world, medical problems, especially due to the global impact of COVID-19, are increasingly affecting the economies of developed and developing countries. At a time when national economic growth is expected to slow down to 5.5 percent from the pre-pandemic level in developing countries starting from China, Taiwan (86.4), South Korea (82.3), France (80.9), countries such as Japan (80.6), Denmark (79.9), Finland (76.4) are experiencing a decrease in GDP ^[1].

A more promising model of quality management is a channel model based on systematic analysis and econometric modeling. The strength of this method is that it is possible to test for time-varying factors.

It is urgent to protect the health of the population, expand the level of coverage of quality medical services, increase the type and range of offered medical services, and attract new equipment to the medical field by involving the private sector.

For this reason, development of promising indicators for the next years, identifying the development trends of the industry today and the factors affecting the development of the industry, is considered one of the important tasks of this research work.

The number of existing private clinics and the number of medical workers in them can be seen as important indicators of the development of the medical field in the region. Because, in 2010-2021, both indicators increased by 7.9 percent and 15.7 times, respectively. As a result, it was possible to increase the real volume of healthcare services by 11.2 times.

LITERATURE REVIEW

The theoretical and methodological questions related to the characteristics and possibilities of the population's use of medical services, J. K. Arrow, R. B. Saltman, J. Figeras, E. Pittacco, M. Caynor. Lifits [2, 3, 4, 5], A. V. Dubynina [7], Y. M. Komarov [8], Y. M. Belyaev [9], E. M. Chernenko, I. V. [10], Taranova, R. M. [11] Shagiakhmetov [12] are researched in the scientific work. Taking into account the national initiative, the scientific-theoretical, organizational-legal, methodological foundations of the formation of the service sector and social sphere in Uzbekistan are presented by M. K. Pardaev, M. E. Polatov, M. M. Mukhammedov, I. S. Tukhliev, Q. J. Mirzaev, B. N. Navruz-zoda, J. P. Zaynalov, B. A. Abdukarimov, K. B. Orazov, B. Kh. Toraev and others have been widely covered. The book was written in the scientific work of our local scientists M. T. Haydarov, O. Rajabov, M. Kasimov, M. N. Umrzakova and others [6].

RESEARCH METHODOLOGY

A 2.2-fold increase in the number of hospital institutions, which are considered important from the point of view of provision of comprehensive medical services, and where a large part of the population applies, has been ensured, with a positive trend observed. Taking into account these mentioned indicators, it is necessary to pay attention to the results of the correlation analysis in order to select the factors for the model and evaluate the density of the relationship between them, that is, to avoid the problem of multicollinearity (Table 1).

EXPERIMENTAL RESULTS

From the results of the correlation analysis, it can be seen that health care services have a high degree of correlation with all the indicators selected for analysis. In addition, it was found that the correlation between the given indicators is high, and their inclusion in one model creates the problem of autocorrelation [13].

Table 1: Correlation analysis results in Khorezm region

	PE	WPG	HSG	H	PCRINR	PCTINR
PE	1,00					
WPG	0,98	1,00				
HSG	0,96	0,93	1,00			
H	0,96	0,97	0,93	1,00		
PCRINR	0,91	0,87	0,98	0,84	1,00	
PCTINR	0,99	0,98	0,98	0,96	0,95	1,00

Here: PE – the number of available private clinics in the region (unit); WPG – number of medical workers working in private clinics (person); HSG- Real value of health care services at constant prices (billion soums); H – the number of operating hospital institutions (unit); PCRINR – real total income per capita at constant prices (thousand soums); PCTINR – total income per capita at constant prices (thousand soums).

Real and total income per capita was also considered as an important social factor. There are two reasons for this, firstly, the increase in the income of the population increases their ability to comply with and use medical standards, and secondly, the increase in the share of the private sector makes the price of the service and the income of the population one of the important factors in the use of medical services.

Taking into account the results of the aforementioned analysis, the impact of these factors on the volume of medical services provided in the region was assessed using quantitative indicators using the regression analysis method.

The existence of a strong correlation between the factors indicates that it is not possible to use the multifactor regression equation. Because, due to the problem of multicollinearity, the opposite signs of the coefficients were determined in the equation. Therefore, the influence of each factor was considered separately. A logarithmic function was used for this, because the parameter representing the effect of the factor in the equation of this form is equal to the elasticity coefficient.

The results of three important criteria for justifying the adequacy of the developed models were mentioned, that is, if the adequacy of the determined parameters based on the Student's criterion was justified, the coefficient of determination and the MAPE indicator were used to justify the suitability and reliability of the model.

According to the obtained results, it was determined that the number of private clinics has a positive effect on health services. However, the coefficient of elasticity between the two indicators is 0.7, which is the smallest value among the parameters determined by the selected factors.

On the other hand, all criteria excluding MAPE indicate that the influence of this factor is higher than others. The same situation can be observed in terms of the number of items in private clinics, that is, the coefficient of



elasticity for this factor is 0.74. It is important to pay special attention to the effect of the change in the number of operating hospitals. Because the coefficient of elasticity determined by this factor has the highest value and is 2.54. It is observed that the Student criterion cited to justify the adequacy of this parameter is at the required level.

However, the coefficient of determination is 0.68, indicating that this factor accounts for 68% of the variation in the volume of health care services excluding other factors and interactions. This is the smallest value among the determined coefficients of determination. In addition, the MAPE indicator has the highest value, indicating that the reliability of this model is low compared to other models. To find out why, we look at the relationship between changes in population income and the demand for health services. Incomes of the population were considered in two ways, i.e. real and total incomes per capita. With an elasticity coefficient of 2.48 representing the effect of real income per capita, it appears as the factor with the highest effect after the number of operating hospital facilities.

It should be noted that all the criteria cited for the justification of the adequacy and reliability of this model and its parameters have a high value. In particular, the MAPE indicator of 2.95 justifies the reliability of this model as 97 percent. The coefficient of elasticity determined by total income per capita is almost twice as small. It can be observed that the model representing the influence of this factor, as well as the real per capita income, has a high degree of adequacy and reliability of its parameters.

The results of the analysis show that the highest elasticity coefficient corresponds to the number of operating hospitals, but the adequacy and reliability of the model and its parameters are low. On the other hand, it has been found that the effect of real and total income per capita is high. To conclude, a large volume of health care services is provided by the operating hospital institutions, only the increase in the income of the population causes an increase in the demand for the services provided by private clinics. As a result, although the effect of the number of hospital facilities in operation is high, the majority of the change in health services is accounted for by private clinics.

Based on the results of the above-mentioned analysis, the volume of health care services in the region and the factors influencing it were developed for the next years. For this, the necessary model was developed using regression analysis. First of all, we will focus on the results of the regression analysis, which was carried out on the development of the necessary model to calculate the forecast values of the change of healthcare services in the region in the next five years.

A graphical method was used to select the type of the model, and when connecting the points, two views correspond to their shape, i.e. a straight line and a parabola (Figure 1). According to the results of the implemented graphic method, it is appropriate to use a two-view model to develop a prognosis. In both cases, the coefficient of determination is close to one. But the results obtained using this method are not enough to justify the adequacy of the models and their parameters, so we found it appropriate to carry out additional analyzes to choose the most optimal model [13].

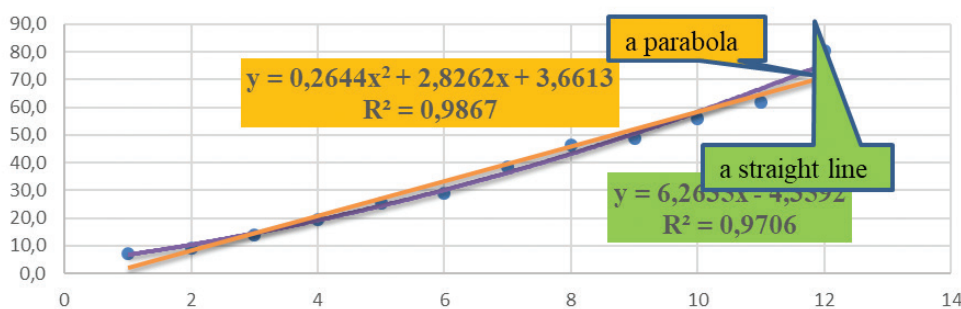


Figure 1: The results of the graphical method for the selection of the necessary model for the development of forecast values of the volume of health services in Khorezm region

The Gretl program was used to perform the comparative regression analysis, and as a result of developing the mentioned linear model, the free term was found to be inadequate according to Student's criterion. All other criteria are at the required level, indicating the adequacy of the model. However, it was found that the MAPE indicator representing the reliability of the model is 12.3 and has a slightly higher value (Appendix 1). The results of the model determined by excluding the free term are adequate for almost all criteria, except for the decrease of the Durbin-Watson index and the almost unchanged MAPE index. Taking into account the results of the aforementioned analysis, an alternative option, i.e. a comparative analysis of the results of the parabola, was carried out. Similarly, when the model presented in the graph was developed using Gretl, it shows that the free term is not adequate according to the Student's criterion, but other parameters are adequate. In addition, the remaining factors justify the high level of the model. In particular, the value of MAPE was found to be equal

to 5.6. Therefore, we found it appropriate to use the following model to calculate the forecast indicators of the real value of healthcare services provided in the region.

$$HSC = 3,99 \times t + 0,19 \times t^2$$

Here: **HSC** – Real value of health care services at constant prices (billion soums); **t** – the trend starts from 2010.

Adequacy of this model was judged by a number of criteria and it was proved that the model is adequate and reliable in all of them (Table.2). The results of the model developed to calculate the forecast indicators of the real value of health services provided in Khorezm region ^[13].

Table 2: (Model 7: OLS, using observations 2010-2021 (T = 12) Dependent variable: HSC)

	Coefficient	Std. Error	t-ratio	p-value	
Time	3.99465	0.470951	8.482	<0.0001	***
Time2	0.186511	0.0487307	3.827	0.0033	***
Mean dependent var	36.35353	S.D. dependent var		22.92323	
Sum squared resid	89.37712	S.E. of regression		2.989601	
Uncentered R-squared	0.995870	Centered R-squared		0.984537	
F(2, 10)	1205.554	P-value(F)		1.20e-12	
Log-likelihood	-29.07501	Akaike criterion		62.15002	
Schwarz criterion	63.11983	Hannan-Quinn		61.79096	
Rho	-0.200290	Durbin-Watson		1.796001	

CONCLUSION AND SUGGESTIONS

In particular, all the coefficients are not only adequate according to Student's criterion, but their p-value is less than 0.01 and their reliability is high. The coefficient of determination equal to 0.99, that is, almost one, indicates that the selected factors are fully covered by the resulting factor changes.

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