Examination of Efficiency Change of Provincial Hospitals in Azerbaijan with Malmquist Index

Fuad SELAMZADE[1], Oğuzhan YÜKSEL[2]

Corresponding Author

Fuad SELAMZADE

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ABSTRACT

The level of development in health is an important criterion for countries. In a study aimed at measuring the performance of the health system in Azerbaijan on a provincial basis, the change in health efficiency of 56 cities between 2015-2019 was analyzed with the Malmquist Total Factor Productivity Index (MPI). As an input variable, the number of hospital beds, the number of health workers and the number of physicians were used in the provinces. The values used in input variables are figures per 10,000 people. As an output variable, the number of deaths of infants (under 1 year old), the number of deaths and the number of outpatient clinics were determined. The values used in the output variables are figures per 1000 people. The average MPI scores of the provinces covered by the study were 0.998 in 2015-2016, 1.002 in 2016-2017, 1.036 in 2017-2018 and 1.027 in 2018-2019. Out of the sample cluster of 56 provinces, Total Factor Productivity (TFP) increased in 36 (64.29%), remained constant in 1 (1.79%) and decreased in 19 (33.93%). Furthermore, TFP values were highest in Gazakh (20.6%), Aghdam (12,7) and Dashkesen (12,2). As a result of the study, it was found that there was an increase in productivity levels during the time period when the health performance of the provinces in Azerbaijan was evaluated. For this reason, it is proposed to develop actions and policies aimed at improving performance in low-productivity provinces and to allocate resources taking into account social needs.

[1] Ph. D.Faculty of Health Sciences, Department of Health Management, Mus Alparslan University, Mus, Turkey. f.salamov@alpaslan.edu.tr
Orcid Number: https://orcid.org/0000-0002-2436-8948

[2] Dr., Dentist, Ministry of Health, Oral and Dental Health Center in Isparta, Isparta, Turkey. oguzhan@doctor.com
Orcid Number: https://orcid.org/0000-0003-0539-4136

INTRODUCTION

Health as an important service area is directly related to human and community life. On the other hand, it also affects economic performance as a whole through investment, employment and production. When the direct and indirect effects are calculated, the value of knowing the efficiency levels of hospitals that are enterprises of the health sector is revealed. Because public hospitals use public resources. It is necessary to determine how efficiently they use this resource and to know their efficiency by comparing them with the increasing number of private health organizations. The data obtained will contribute to the evaluation of policies (Kutlar and Salamov, 2016). In developing countries, 30-50 percent of health spending should be used in hospital services. In addition, factors such as diversity in per capita service use, population growth and prices lead to an increase in hospital spending (Raei et al., 2017).

Performance measurement and control in health can achieve success with a good understanding of the role of the systems used, development by experienced people and participation of the entire organization (Tengilimoglu et al., 2017). There is little consensus on the philosophy of measurement, analysis techniques, or how to report data on health performance. Although measurements add new costs to the health system, demands for data and information are expected to increase in the future (Loeb, 2004). By measuring the organization, it can be understood how good or bad performance is based on internal and external criteria. Then necessary steps must be taken to meet the goals (Henri, 2004). Maximum attention should be paid to creating performance criteria, and variables that best reflect goals should be selected.

High productivity means being able to produce more with equivalent resources (Prokopenko, 2011). The main indicator of performance in Normal businesses is profit. In non-profit public sector organizations, performance criteria vary due to the fact that they have subunits located throughout the country, work for the purpose of serving the public, differences in management and supervision. For these reasons, analysis needs to be done in more detail (Şahin, 1999).

There are various studies in the literature on the analysis of hospital productivity changes with MPI. Among them, some studies conducted in recent years have been studied. TFP analysis of hospitals in Azerbaijan with data from 2009-2013 was conducted by Kutlar and Salamov (2016). Yildirim, Kaçak and Yildirim (2018), they performed MPI analysis in 260 hospitals in Turkey in 2011-2013. Dirik and Sahin (2020) calculated the productivity change of health services in Turkey in the period 2012-2016 by MPI analysis. Yüksel and Yiğit (2020) conducted TFP analysis of 46 oral and dental health centers in Turkey in 2014-2018. Mollahaliloglu et al. (2018) conducted a study with MPI analysis to examine the results of the health transformation program in Turkey. Efficiency measurements of hospitals in the USA for the period 1985-1988 were made by Burgess and Wilson (1995) using MPI analysis. Similarly, China made various reforms in the health system and public hospitals in 2009 and 2012. Li et al. (2017) conducted a study in Anhui province with DEA and MPI analyzes to examine the results of these reforms. A study was conducted by Raei et al. using DEA and MPI to examine how 11 hospitals in Yazd province in Iran were affected by the health transformation program between 2011 and 2016.

Improving the quality of health services (within the limits of acceptable cost) is one of the responsibilities that countries must achieve. performance in health care needs to be evaluated closest to the objective. When the literature is examined, it has been seen that there are a limited number of studies in which the health efficiency changes in recent years have been studied specifically in Azerbaijan. In this study, it was aimed to compare the health performance of Provinces in Azerbaijan with the Malmquist total factor productivity index (MPI) technique using the latest data.

The research consists of 5 sections. After the introduction part of the study, there is a material and method section where information about the variables used in the research is also included. In the third section, the findings obtained as a result of the analysis are interpreted. In the discussion area, which is the fourth section, this study is compared with other articles in the literature. In the fifth and last section, the results are presented.

MATERIALS AND METHODS

In the health needs of the population living in cities, service providers perform important tasks. The level of development in the health sector is one of the important conditions in their relationship between countries. In order to compare health service assessments, performance measurement tools are needed in addition to reliable data.

The study examined 56 provinces in Azerbaijan. It is aimed to compare the provinces over the years with the health indicators between 2015-2019. Data is taken from the website of the State Statistical Committee of the Republic of Azerbaijan (ACDIK, 2020). Ethics committee approval was not required, as data from the statistical agency was used retrospectively in the study. In the study, the number of hospital beds, the number of health workers and the number of physicians were used as input variables. The values used in input variables are figures per 10,000 people. As an output variable, the number of deaths of infants (under 1 year old), the number of deaths and the number of outpatient clinics were determined. The values used in the output variables are figures per 1,000 people. In order for the difference between large cities and small cities not to affect the results of the research, the variables were selected to be 1,000 and 10,000 per person. In addition, since the increase in infant death and overall death numbers reflects a negative state, the opposite (1/output variable) was included in the analysis. In determining input and output variables, past studies found in the literature were examined and cities whose data could be accessed over a 5-year period were selected. When determining the input and output variables, it was based on the research conducted using the MPI method of changing the effectiveness of the health sector. A brief summary of the input and output variables used in the literature is presented in Table 1.

Table 1. Input and Output Variables in the Literature

Authors	Input Variables	Output Variables
Burgess and Wilson (1995)	The number of acute-care hospital beds, Number of long-term hospital beds, Registered nurses, Measured in full time equivalents, Licensed practical nurses, Measured in full-time equivalent, Other clinical labor, Nonclinical labor measured in full-time equivalents, Long-term care labor measured in full-time equivalents	Acute care inpatient days, Case-mix weighted acute care inpatient discharges, Long-term care inpatient days, Number of outpatient visits, Ambulatory surgical procedures,Inpatient surgical procedures
Kutlar and Salamov (2016)	Number of physicians, Number of medical practitioner, Number of auxiliary medical personnel, Total number of hospital beds, Number of occupied hospital beds	Number of patients examined, Total number of operations, Number of patients discharged
Raei et. al. (2017)	Number of physicians, Number of nonphysician staff, Number of hospital beds	Number of admissions, Number of mortalities per hospital
Li et al. (2017)	Number of actual doctors, Number of actual nurses, Actual number of beds, Total expenditure	Number of emergency visits, Number of discharged, Number of hospitalized patients
Yildirim et al. (2018)	Number of specialist physicians, Number of medical practitioners, Number of auxiliary medical personnel, Number of hospital beds	Number of patients discharged, Day of hospitalization, Number of operations
Mollahaliloglu et. al (2018)	Number of beds, Number of specialists, Number of practitioners	Number of outpatient visits, Number of inpatient days (1/GDR), Total adjusted surgical procedures
Şahin and İlgün (2019)	Number of hospital beds, Number of doctors, Number of nurses and midwives, Number of other health care personnel	Number of polyclinic admissions, Number of inpatients, Number of surgeries, Crude mortality rate
Çağlar ve Keten (2019)	Number of specialist physicians, Number of practitioners+assistant physicians, Number of dentists, Number of pharmacists, Number of nurses, Number of midwives, Number of other health personnel	Life Expected at Birth, Brute Death Rate, Infant Mortality Rate
Dirik and Şahin (2020)	Number of specialist physicians, Number of general practitioners, Number of nurses and midwives, Number of other health personnel, Number of beds	Number of operations, Number of inpatients, Number of outpatients
Yüksel and Yiğit (2020)	Number of units, Total number of dentists	Number of tooth extractions, Number of conservative treatments, Number of endodontic treatments, Number of fixed prosthetic patients, Number of removable prosthetic patients
Torun, Ayanoğlu and Atan (2020)	Raw materials and supplies costs, Personnel salaries and benefits, Outsourced benefits and services costs, Other miscellaneous costs, Public shares, Amortization and depletion allowances	Outpatient revenues, Inpatient revenues, Other revenue

Authors	Input Variables	Output Variables
Torun, Atan, and Ayanoğlu (2020)	Raw materials and supplies costs, Personnel salaries and benefits, Outsourced benefits and services costs, Other miscellaneous costs, Public shares, Amortization and depletion allowances	Outpatient revenues, Inpatient revenues, Other revenue
Dirik and Sahin (2020)	Number of specialist doctors, Number of medical practitioners, Number of nurses, Number of auxiliary health workers	Number of operations, Number of inpatients, Number of outpatients
Baş Kaman and Yücel (2021)	Population density, The ratio of health expenditures to Gross Domestic Product, The total number of health workers per 1000 people	deaths of healthcare workers per million people, Number of cases
Ömürbek, Altin, Şimşek, and Eren (2021)	Number of hospitals, Number of beds, Number of intensive care beds, Number of family medicine units, Total number of physicians, Number of dentists, Number of nurses, Number of midwives, Number of other health personnel	Primary care application, Second and tertiary applications, Number of hospitalized patients, Number of hospitalized days, Number of operations, Bed occupancy rate, crude death rate

In this study, it was assumed that the efficiency levels of the provinces can be measured by determined variables. In addition, the period 2015-2019 covered by the study was considered sufficient in terms of being able to reveal time-dependent productivity changes. Efficiency change scores were obtained using input and output variables used in the scope of the research. It should be noted that the results may also change according to the variables that will be included or subtracted from the analysis.

It is possible to collect performance measurement methods under three main headings: ratio analysis, parametric methods and nonparametric methods (Kutlar et al. 2004). In this study, input-oriented and constant return to scale MPI analysis were used. In the health sector, input oriented technique is preferred due to the difficulties and complexity of changing outcomes.

Detecting performance changes over time is very important in health care. MPI is a method that allows performance in healthcare facilities to be compared from one period to another (Ozcan, 2014). This method, which follows the change of decision-making units (DMUs) in total factor efficiency (TFP), is divided into catch-up/recover and Frontier-shift (at the production limit). The capture (recovery) component refers to the level the DMU needs to reach in order to increase its effectiveness. The frontier shift component reflects the change in the effective production boundary surrounding the DMU between two time periods (Tone, 2004). Table 2 shows the codes and meanings used in MPI.

Tablo 2. MPI Codes and Meanings

Code	Meaning of Code
effch	Technical Efficiency Change
techch	Technological Change
pech	Pure Technical Efficiency Change
sech	Scale Efficiency Change
tfpch	Total Factor Productivity Change

Source: (Coelli, 1996).

When a technology treats the t period as a reference technology, it can be written as follows for the output-oriented Malmquist TFP change index s (base period) and t periods. X input, y output shows the yield change from t time zone to t+1 time (Coelli, et al., 2005);

$$m_0^t(y_s, x_s, y_t, x_t) = \frac{d_0^t(y_t, x_t)}{d_0^t(y_s, x_s)} \quad (1)$$

Alternatively, if the period s is examined, the calculation changes as follows:

$$m_0^s(y_s, x_s, y_t, x_t) = \frac{d_0^s(y_t, x_t)}{d_0^s(y_s, x_s)} \quad (2)$$

As can be seen from the above equations,the notation $d_0^s(y_t,x_t)$ shows the production from the t period to the s period. The change in efficiency refers to the ratio of technical efficiency in the t period to technical efficiency in the s period (Candemir and Deliktas, 2006).

$$\text{efficiency change (effch)} = \frac{d_0^t(y_t, x_t)}{d_0^s(y_s, x_s)} \quad (3)$$

$$\text{Technological Change (techch)} = \left[\frac{d_0^s(y_t, x_t)}{d_0^t(y_t, x_t)} x \frac{d_0^s(y_s, x_s)}{d_0^t(y_s, x_s)}\right]^{1/2} \quad (4)$$

The technical change in MPI is due to the change in pure technical efficiency and the change in scale efficiency (effch=pech*sech) (Flokou, Aletras, & Niakas, 2017). In the equation below, obtaining the TFP change by multiplying the technical efficiency change and the technological change (Fare, Grosskopf, Norris, & Zhang, 1994) is expressed mathematically. MPI can be expressed as the effect of catch-up the best production limit for each observation between periods s and t (Özcan, 2014).

tfpch=effch*techch (5)

In MPI, the change index in TFP in the period from s to t indicates that it is greater than 1, its efficiency increases, and this value is less than 1.

RESULTS

Minimum, maximum, average values and standard deviation statistics of input and output variables used in the study are presented in Table 3.

Table 3. Input and Output Variables Statistics

Year	Items	Inputs			Outputs		
		Number of physicians	Number of health workers	Number of hospital beds	Number of outpatients	Number of deaths	Number of deaths of infants
2016	Max.	89,70	96,90	96,10	234,40	8,00	21,50
	Min.	6,50	19,00	7,80	33,20	4,20	1,50
	Avg.	17,13	46,32	30,64	93,99	5,98	9,06
	Std. Dev.	12,56	17,46	18,22	40,56	0,81	3,69
2017	Max.	88,96	98,82	94,74	231,60	8,10	20,00
	Min.	6,16	19,01	7,76	32,96	4,10	1,50
	Avg.	16,51	45,54	30,18	93,07	6,09	9,98
	Std. Dev.	12,53	17,43	18,23	39,92	0,84	4,02
2018	Max.	88,82	90,76	93,64	229,24	8,30	18,80
	Min.	6,35	18,45	14,19	32,76	4,40	1,60
	Avg.	15,88	43,62	29,20	90,05	6,06	10,38
	Std. Dev.	12,26	17,05	16,56	36,70	0,82	3,62
2019	Max.	91,60	96,30	92,60	227,90	8,10	19,70
	Min.	6,10	18,30	14,00	32,60	4,40	2,30
	Avg.	15,56	42,96	28,64	88,91	6,01	10,92
	Std. Dev.	12,61	17,17	16,56	36,86	0,83	4,19
2020	Max.	89,10	98,70	91,60	225,70	7,90	28,30
	Min.	5,40	19,10	13,80	32,40	4,20	2,10
	Avg.	15,08	43,70	28,49	88,18	5,81	11,05
	Std. Dev.	12,41	17,22	16,47	36,81	0,76	5,30

In MPI analysis, productivity scores and averages of cities in Azerbaijan were examined separately. Changes in cities over time have been determined with consecutive 5-year data for 2015-2019 years. The summary of the MPI analysis is shown in Table 4.

Table 4. MPI Averages by Year

Year	effch	techch	pech	sech	tfpch
2015-2016	1,015	0,983	1,01	1,005	0,998
2016-2017	1,073	0,934	1,026	1,045	1,002
2017-2018	0,958	1,082	0,986	0,971	1,036
2018-2019	1,055	0,974	1,04	1,014	1,027
Mean	1,024	0,992	1,016	1,008	1,016

In other periods other than 2017-2018, the decrease in technological change appears to have contributed to the change in TFP. In the 2017-2018 period, there was only a positive shot in technological change, while there was a decrease in all other factors. The 3.6% increase in TFP over the period 2017-2018 is due to technological change. Similarly, the decrease in TFP over the period 2015-2016 was due to the approximately 2% decrease in TFP. The average values of all time periods were; technical efficiency change 1.024, technological change 0.992, pure technical efficiency change 1.016, scale efficiency change 1.008 and TFP 1.016. There is no period when all activity values are above 1. Since the 0.2% change observed in TFP in 2015-2016 and 2016-2017 is very close to 1, it can be interpreted as stagnation in the activity change.

Table 5. MPI Summary of City Means

Cities	effch	techch	pech	sech	tfpch
Absheron	0,957	0,892	0,969	0,987	0,853
Agdash	1,105	1,004	1,125	0,983	1,110
Aghdam	1,116	1,009	1,091	1,023	1,127
Agjabedi	0,968	1,026	0,99	0,978	0,994
Agstafa	1,015	0,984	0,976	1,040	0,999
Agsu	0,949	1,021	0,990	0,959	0,969
Astara	1,007	1,001	0,997	1,010	1,008
Baku	0,979	1,004	0,981	0,997	0,983
Balaken	1,014	0,987	0,995	1,019	1,001
Barda	1,033	1,017	1,049	0,986	1,052
Beylagan	1,027	1,019	0,996	1,031	1,046
Bilasuvar	0,993	1,035	1	0,993	1,028
Dashkesen	1,046	1,073	1,029	1,017	1,122
Fizuly	1,030	1,022	1,029	1,001	1,053
Gabala	1,031	0,953	1,017	1,013	0,982
Gakh	1,092	0,990	1,066	1,025	1,081
Ganja	1,007	0,994	1,006	1,001	1,001
Gazakh	1,290	0,935	1,255	1,027	1,206
Gedabey	1	0,919	1	1	0,919
Gobustan	0,998	1,021	0,994	1,004	1,020
Goranboy	1,041	0,986	1,003	1,038	1,026
Goychay	1,080	0,953	1,060	1,019	1,029
Goygol	0,991	1,031	0,990	1,001	1,022
Guba	1,001	1	0,989	1,012	1
Gusar	1	0,98	1	1	0,980
Hajigabul	1,074	1,036	1,060	1,013	1,113
Imishly	0,970	1,038	0,997	0,973	1,006
Ismayilly	0,982	1,029	0,971	1,011	1,010
Jalilabad	1,011	1,010	1	1,011	1,021
Khachmaz	0,992	1,009	0,984	1,009	1,001
Kurdamir	0,944	1,036	0,943	1,001	0,978
Lankaran	1,048	0,932	1,040	1,008	0,977
Lerik	1	1,025	1	1	1,025
Masally	1	0,963	1	1	0,963
Mingechevir	0,985	0,985	0,963	1,023	0,970
Nakhchivan AR	1	0,935	1	1	0,935
Neftchala	1,018	0,982	1,011	1,007	0,999
Oghuz	0,989	0,999	0,992	0,997	0,987
Saatly	1,011	0,978	1,010	1	0,988
Sabirabad	1	1,006	1	1	1,006
Salyan	1,002	1,012	1,006	0,996	1,014
Samukh	1,060	0,966	1,006	1,054	1,025
Shabran	1,018	1,022	0,984	1,035	1,04
Shamakhy	1,039	0,986	1,027	1,012	1,024
Shamkir	0,944	0,968	0,927	1,019	0,914
Sheki	0,989	1,022	0,988	1,001	1,011
Shirvan	0,990	0,996	0,989	1	0,986
Siyazan	1,050	0,897	1,068	0,984	0,942
Sumgait	1,051	0,964	1,043	1,007	1,013
Terter	1,064	0,99	0,999	1,065	1,054
Tovuz	1,170	0,941	1,107	1,057	1,101
Ujar	1,003	0,998	1,014	0,989	1,001
Yardymly	1	1,016	1	1	1,016
Yevlakh	1,072	0,975	1,057	1,015	1,045
Zagatala	1,081	0,993	1,079	1,002	1,073
Zardab	1,104	1,011	1,076	1,026	1,116
MEAN	**1,024**	**0,992**	**1,016**	**1,008**	**1,016**

Table 5 summarizes the 5-year MPI score averages of the provinces. In 37 of the 56 provinces, tfpch values are greater than 1 or 1. In Absheron, Mingechevir and Oghuz provinces, all efficiency scores were below 1. In Absheron, the province with the lowest TFP score-there is a decrease in TFP by -14.7%. The provinces with the greatest increase are Gazakh (20.6%), Aghdam (12.7%), Dashkesen (12.2%), Zardab (11.6%), Hajigabul (11.3%), Agdash (11%)) and Tovuz (10.1%). The increase or decrease in technological change in Nakhchivan, Gedabey, Gusar, Masally, Sabirabad, Yardymly and Lerik directly affected TFP change. There is a decrease in technical efficiency change in 16, technological change in 29, in pure technical efficiency change in 22, and in scale efficiency change in 12 provinces.

DISCUSSION

There are many studies in the literature on the analysis of hospital efficiency changes with MPI. Among them, some studies conducted in recent years have been studied. TFP analysis of hospitals in Azerbaijan with data from 2009-2013 was conducted by Kutlar and Salamov (2016). According to the study results, the score of TFP in 2009-2010 and 2011-2012 is above 1. In 2010-2011 and 2012-2013, it was below 1. There are 8 provinces with the highest TFP score. These provinces; Beylagan (20.3%), Gazakh (20.3%), Saatly (20.6%), Tovuz (21.1%), Agstafa (24.0%), Neftchala (25.8%), Oghuz (26.1%) and Astara (27.8%). In the study, which examined 55 provinces, it was found that TFP increased in 50 provinces (90.9%) and decreased in 5 provinces (9.1%). In this study, in which a more up-to-date time period was investigated, 56 provinces were examined and the number of provinces examined is approximately the same. It was found that TFP increased in 36 out of 56 provinces (64.29%). In more provinces, there is a decrease in TFP. In addition, it was similarly observed that TFP increases in Gazakh and Tovuz provinces continued in both studies. In addition, in this study, it was found that TFP significantly increased in the cities of Aghdam, Dashkesen, Zardab, Hajigabul and Agdash. It can be said that the positive developments in the health outcomes of these provinces are continuing. Additionally, it was found that there was no increase in TFP in Baku and Ganja, the major cities of Azerbaijan, on the contrary, there was a decrease in Baku. As the main reason for this, it can be said that the vast majority of the population is concentrated in these cities. In addition, the presence of many public and private hospitals in Baku also leads to this result. The findings of this study coincide with the results of the research conducted earlier in Azerbaijan by Kutlar and Salamov (2016).

Yildirim, Kaçak and Yildirim (2018); they performed MPI analysis in 260 hospitals in Turkey in 2011-2013. In the study results, it was understood that TFP increased in 146 hospitals (56%), 6 (2%) remained stable and decreased in 108 (42%). Dirik and Sahin (2020) calculated the productivity change of health services in Turkey in the period 2012-2016 by MPI analysis. In the findings determined by the radial MPI model, it was observed that health care TFP scores decreased for the provinces in the first and second group in the period 2012-2016. During the same period, it was found that it did not change for the provinces in the third group. In the non-radial MPI model, it was determined that the TFP scores of the provinces in the first group remained constant, and the scores of the provinces in the second and third groups fell.

Yüksel and Yiğit (2020) conducted TFP analysis of 46 oral and dental health centers in Turkey in 2014-2018. As a result of the study, which included 46 oral and dental health centers, TFP scores increased in 34 (73.9%) and decreased in 12 (26.1%). It was also found that the TFP average was below 1 in 2014-2015 and above 1 in other periods. Mollahaliloglu et al. (2018) in the study conducted with MPI analysis to examine the results of the health transformation program in Turkey; the results were found to have a positive effect on hospital efficiency. The years 2001-2009 were researched. In the study; it has been found that reforms that change hospital payments and physician compensation systems help efficiency, productivity and equity.

It has been determined that the data on the number of patients who have regained their health will benefit from obtaining healthier results (Burgess and Wilson; 1995). A similar study by Raei et al. to examine the before and after (2011-2016) of the health transformation program in Iran. The study was carried out in 11 hospitals of Yazd province. Input-oriented DEA and MPI analyzes were used. The results showed that there was a positive change in productivity in the majority of hospitals (%66) during the study period, except for the years 2014-2015. The geometric mean of the MPI showed a positive change in 2011-2012 and 2015-2016, and a negative change for the remaining periods.

In the article investigating various reforms in the health system and public hospitals in China in 2009 and 2012, Liv et al. (2017); It surveyed 12 hospitals in Anhui province with DEA and MPI analysis. TFP score of 5 out of 12 hospitals between 2010 and 2015 was found to be greater than 1. Over the same period, the average overall production efficiency is 0.983. It was concluded that the total factor productivity could not be improved. Compared to the research in China, it can be said that more negative results were obtained according to the results of our study, which examined the provinces in Azerbaijan.

In this study conducted in 56 provinces, it was observed that TFP increased in 36 (64.29%), remained constant in 1 (1.79%) and decreased in 19 (33.93%).

In addition, Gazakh (20.6%), Aghdam (12,7) and Dashkesen (12,2) are the provinces with the highest TFP value.

CONCLUSIONS

Due to increasing health expenditures in many countries every day, the concept of efficiency is gaining importance. Countries strive to provide their citizens with the highest quality health care services. The findings of this study, which attempts to draw attention to productivity differences between provinces, contain important information from the point of view of policy makers and health managers.

In this study, it was attempted to reveal the change in health efficiency of the provinces in Azerbaijan in the 2015-2019 period with the most current data available. Examining the results of the study, it was found that the decrease in TFP from the 4 periods between 2015-2019 was only in 2015-2016. The average MPI scores of the provinces covered by the study were 0.998 in 2015-2016, 1,002 in 2016-2017, 1,036 in 2017-2018 and 1,027 in 2018-2019. The TFP scores of the provinces in Azerbaijan have an average productivity increase of 0.16%.

Positive developments in health technologies, increase in the number of health workers, decrease in mortality rates and correct allocation of resources can be achieved by attracting productivity increases to higher levels. In addition, at the micro level, it may be recommended that those who hold executive positions in provinces retrospectively evaluate the health indicators of cities. By identifying the main problems that cause inefficiency, actions and policies should be developed to correct them. Based on the findings of the study, it can be said that the reform movements in the Azerbaijani health system in the period 2015-2019 had a positive effect on the efficiency of the provinces. In the study, the results were tried to be obtained with the help of determined input and output variables and a certain time period. In the future, studies can be conducted that investigate the performance levels of provinces in the Azerbaijani health system using empirical methods such as time series analysis.

It is believed that this research with current data will make various contributions to the literature. It is important for managers in the provinces or policymakers in the country to reveal the positive and negative consequences of their practices and policies.

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