

THE EFFICIENCY OF HEALTHCARE SYSTEM IN INDONESIA IN 2014-2018

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Abstract

Purpose of the study: The purpose of the study is to measure the efficiency of the healthcare system in Indonesia in 2014-2018.

Methodology: The Data Envelopment Analysis model was used to analyze 33 Provinces in Indonesia in the 2014-2018 period. The input variables are the number of health human resources at the community health centre, health human resources at the hospital, the number of hospitals, the number of community health centres and the realization of per capita deconcentration health funds. The output variable was Life Expectancy Index.

Main Findings: The results of the analysis show that Lampung, West Java, Banten, West Nusa Tenggara and West Sulawesi whose health system reaches efficiency compared to other provinces in Indonesia during the observation period.

Applications: This result suggests that the provinces where health services are inefficient are caused by the low absorption of health deconcentration funds. These findings indicate that the distribution of health services in all regions has not been equally conveyed. These findings can be used to develop a program to assist and improve the efficiency of the health care system in Indonesia.

Novelty: One of the input variables used in this study is the realization of health deconcentration funds per capita which is the novelty of previous research.

Keywords: Healthcare, Deconcentration funds, Efficiency, DEA, Indonesia, Life Expectancy Index.

INTRODUCTION

Health is the core of well-being and is fundamental to forming broader human capabilities, which is at the core of the meaning of development Husain, 2010. Furthermore, health is a prerequisite for increasing human labor productivity. Therefore, health can be seen as a vital component of growth (Well, 2007) and development (Husain, 2010), as an input to the aggregate production function. Its dual role as input and output causes health to be very important in economic development (Todaro and Stephen, 2006; Strauss et al., 1998).

The success of the development of a nation is not only marked by the high level of economic growth but also includes human health. Health is a basic human right. Improved health will produce reliable human resources. According to Schultz (1961), health facilities and services as an effort to build human quality, which includes all expenses that affect life expectancy, strength, and stamina, energy and vitality of the community.

The quality of human development can be seen in the Human Development Index (HDI) (Yakunina et al., 2015). HDI as a measurement tool that can be used to assess the quality of human development, both physically and non-physically. The physical quality is in terms of health by knowing the life expectancy index (LEI). LEI is a device for evaluating authorities' performance in enhancing the welfare of the population in general, and improving the status of health in particular. Low LEI in a place has to be observed by way of health improvement programs, and other social programs, together with environmental health, nutritional adequacy, and energy including poverty eradication programs.

Life expectancy is also one indicator in measuring the human development index (Robine et al., 1991). The improvement in health services through the success of development in the health sector can be indicated by an increase in life expectancy at birth. The increase in life expectancy at birth provides an overview of improving the level of health and socioeconomic level of the community.

According to the United Nations, LEI Indonesia is ranked 6th in ASEAN and 108th out of 191 countries. LEI Indonesia in 2018 reached 71.20 which increased from the previous year, which was 71.06. Efforts to improve health services continue to be made. Basic Health Research 2018 noted that the Ministry of Health was only able to reduce the stunting rate from 37.2 percent to 30.8 percent over five years. While malnutrition did not decrease much, from 19.6 percent to 17.6 percent.

On the other hand, the obesity rate actually increased from 14.8 percent to 21.8 percent. The development of non-communicable diseases is also worth noting. Almost all non-communicable diseases experience an increase such as cancer, stroke, chronic kidney disorders, diabetes, and hypertension. Appreciation should be given to the Ministry of Health for being able to significantly reduce the number of infectious diseases. Upper respiratory tract infections, malaria, diarrhea, and tuberculosis have decreased the number of sufferers. In addition to physical health, mental illness is also worthy of attention. Noted, this disease jumped from 1.7 percent in 2013 to 7 percent in 2018.

Efforts to achieve healthy levels need to be assisted by the government through the allocation of government spending on health ([Lu et al., 2010](#)). The health budget is 5% of the total State Budget (APBN). In an effort to improve the quality of human capital, the principle of efficiency in government spending must clearly be taken into account. If the level of efficiency is high, then expenditure can be calculated as precisely as possible according to the intended target and ultimately expected to improve human quality.

Rationale and objective of the study

Indonesia is a vast country grouped into three regions, namely western Indonesia, central Indonesia, and eastern Indonesia. Western Indonesia is relatively better in terms of facilities and infrastructure. For transportation in western Indonesia the main transportation is land transportation while in central and eastern Indonesia is water transportation. Eastern Indonesia besides large islands, but very much consists of small islands. In terms of the population, nearly two-thirds of Indonesia's population is on the island of Java while the rest are scattered in other parts of Indonesia. Indonesia's vast territory is different in terms of geographical and demographic, this causes differences in the needs of health workers both in hospitals and health centres. So considering the above points the authors aim to measure the efficiency of the healthcare system in Indonesia in 2014-2018.

LITERATURE REVIEW

The concept of evaluating the efficiency of the health service system is used to assess the contribution of various health service resources to health outcomes in a population. Fair and efficient health services are very important to improve the health status of the community ([Asandului et al., 2014](#); [Hadad et al., 2013](#)).

In this study, using DEA to evaluate the efficiency techniques ([Farrell, 1957](#)) of health service. Efficiency measurement with DEA requires input and output variables. The inputs used are the realization of deconcentration funds for health, the number of hospitals per 100000 populations, the number of community health centers per 100000 population, the number of health human resources in hospitals per 1000000 population, the number of health human resources in community health centers per 100000 population, while the output is life expectancy. The DMUs analyzed are Indonesia's provinces.

The performance of health services can be seen from the index of life expectancy ([Robine et al., 1991](#)). The Life Expectancy Index is a tool for evaluating the performance of authorities in improving the welfare of the general population and, in particular, improving health status. This research LEI (Life Expectancy Index) is used as an output variable. As in Hadad's research ([Hadad et al., 2013](#)). This index of life expectancy is part of the index of human development (or Human Development Index/HDI) ([Yakunina et al., 2015](#)). Human Development Index as a measurement tool that can be used both physically and non-physically to evaluate the quality of human development.

To achieve a high life expectancy index, adequate health facilities are needed ([Kanchanachitra et al., 2011](#); [Anand et al., 2004](#); [Chen et al., 2004](#)). These health facilities include the availability of hospitals, community health centers, health resources at community health centres and at hospitals, and the availability of health expenditure. Health expenditure is an important part of measuring the efficiency of health services ([Musgrave, 1999](#); [Anderson et al., 2006](#); [Rao et al., 2008](#)).

According to [Rivera \(2001\)](#), who examined the relationship between health expenditure and public health status, showed that the higher the health expenditure, the better the public health status. To achieve healthy levels need to be assisted by the government through increasing the allocation of government spending on health ([Lu et al., 2010](#)).

[Payne et al \(2007\)](#); [Atkinson et al \(2008\)](#); [Mathers et al \(2006\)](#); [Zaim et al \(2001\)](#); [Benneyan et al \(2007\)](#) state that life expectancy will be higher if health expenditure is also high. [Benneyan et al \(2007\)](#) also stated that health facilities and infrastructure affect health services to the community. These health indicators measured by physical health, mental health, health, infrastructure and care ([Chongsuvivatwong et al., 2011](#); [Gunawan et al., 2015](#); [Kruk et al., 2008](#); [Tchouaket et al., 2012](#)).

The research gap between this study and other studies is the use of input variables. This variable uses health deconcentration funds while other studies use expenditure variables for health ([Rao et al., 2008](#); [Hollingsworth et al., 2002](#)). Deconcentration funds are funds originating from the Health to the State Budget that are implemented by the government, which includes all revenues and expenditures in the context of the implementation of decentralization. Deconcentration funds for each province in Indonesia are different. This is different from other countries. Because Indonesia implements regional autonomy.

Other input variables that differentiate with other literature are the human resource health variable and public health center. In this study, human health resources used are the total of all human resources working in the health sector, consist of doctors, dentists, nurses, midwives, pharmacy workers, public health workers, environmental health workers, nutrition workers, medical laboratory personnel, health support personnel. [Tchouaket et al. \(2012\)](#) research also uses these health resources, but his analysis uses descriptive analysis in developed countries. Other studies use the number of doctors, nurses, midwives ([Kanchanachitra et al., 2011](#); [Anand et al., 2004](#); [Chen et al., 2004](#)).

The next input variable is public or community health centres in Indonesia as the first place for health services to provide referrals to the community before going to the hospital. This community health centre provides basic health services to the community. Another study did not use the number of community health centres but used the number of hospitals as input variables or the availability of beds in hospitals ([Hadaad et al., 2013](#)). Considering that in Indonesia health services to the community are tiered. From basic health facilities to advanced health services.

METHODOLOGY

The analytical method used is DEA, a system explicitly designed to measure the relative efficiency of Decision-Making Units (DMUs), which use multiple inputs and multiple outputs (multi-input multi-output) with distinct units that are difficult to complete with various performance element analysis techniques ([Mahlberg and Obersteiner, 2001](#); [Seiford et al., 1990](#)). The DEA principle is based on research conducted by Farrell in 1957 ([Farrell, 1957](#)).

There are two models to measure efficiency when using DEA, namely CCR made by Charnes, Cooper, and Rhodes in 1978 ([Charnes, et al., 1978](#)) and BCC made by Banker, Charnes, and Cooper in 1984 ([Banker, et al., 1984](#)). It is assumed that the model of CCR is a constant return to scale (CRS) while the model of BCC is considered a variable return to scale (VRS).

The efficiency measured by DEA analysis has a different character from the concept of efficiency in general. First, the measured efficiency is technical, not economic. That is, the DEA analysis only takes into account the absolute value of a variable. The basic unit of measurement that reflects the economic value of each variable such as price, weight, length, content and so on is not considered. Therefore, it is possible to calculate a combination of various variable patterns with different units. Second, the value of money efficiency generated is relative or only applies in the comparable set of DMUs.

This study uses secondary data released by the Ministry of Health of the Republic of Indonesia, which is recorded in the Indonesian Health Profile. The analysis year for five years is 2014 - 2018.

Input variables used in this analysis are the realization of health deconcentration funds per capita, the number of hospital per 100,000 population, the number of community health centres per 100,000 population, the number of health human resources in hospitals per 100,000 population, the number of health human resources in health centers society per 100,000 population. The output variable is Life Expectancy. This variable refers to research from [Asandului et al. \(2014\)](#); [Benneyan et al. \(2007\)](#); [Alexander et al. \(2003\)](#); [Grosskopf et al. \(2006\)](#); [Mirmirani et al. \(2008\)](#); [Hollingsworth et al., 2002](#).

Provinces analyzed totalled 33 of 34 provinces in Indonesia. North Kalimantan Province is not analyzed because it is a new province in Indonesia, so the available data are incomplete.

The DEA assumptions used in this study are output-oriented and VRS. Because the same input will produce a larger output and the addition of input and output are not the same. Measurement of the efficiency of government spending on human development with DEA is formulated as follows:

$$E_k = \sum_{r=1}^s u_{rk} \cdot Y_{rk} \quad (1)$$

Constraint:

$$\sum_{r=1}^s u_{rk} \cdot Y_{rj} - \sum_{i=1}^m v_{ik} \cdot X_{ij} \leq 0; j = 1, \dots, n \quad (2)$$

$$\sum_{i=1}^m v_{ik} \cdot X_{ik} = 1 \quad (3)$$

$$u_{rk} \geq 0; r = 1, \dots, s \quad (4)$$

$$v_{ik} \geq 0; i = 1, \dots, m \quad (5)$$

Where:

Y_{rk} : Total output r (life expectancy) of the province

X_{ij} : Number of inputs i (realization of deconcentration funds for health per capita, required by the variety of hospitals per 100,000 population, number of neighbourhood health facilities per 100,000 population, variety of health human resources in hospitals per 100,000 population, number of health human resources in community health center per 100,000 population) required by t Y_{rj} : total output r (life expectancy) of the province.

X_{ik} : Number of inputs i (realization of deconcentration funds for health per capita, number of hospitals per 100,000 population, number of community health centres per 100,000 population, the number of health human resources in

hospitals per 100,000 population, the number of health human resources in the community health center per 100,000 population) required by the province.

- s: Number of provinces.
m: Number of inputs.
 u_{rk} : The weight of the output r of each province.
 v_{ik} : The weight of input i used by each province.
 E_k : Relative efficiency of each province.

RESULT

This study uses Banxia Frontier Analyst 3 to analyze the efficiency of the health service system in Indonesia. Observations were made in all provinces in Indonesia, except North Kalimantan Province because of the availability of incomplete data. The observation year is 2014 - 2018. The summary of the results of the analysis are as follows:

Table 1: Efficient Province

Year	Province
2014	Jawa Barat, Banten, NTB, Lampung
2015	Banten, Jawa Barat, NTB, Lampung
2016	Banten, Jawa Barat, NTB, Lampung
2017	Banten, Jawa Barat, NTB, Lampung
2018	Riau, Banten, Jawa Timur, NTB, Jawa Barat, Lampung

Source: secondary data

Based on the results presented in Table 1, Banten Province, West Java Province, NTB Province (Nusa Tenggara Barat Province) and Lampung Province are provinces in Indonesia that have efficient health management systems throughout the observation period. Whereas in 2018, there were two provinces besides the four efficient provinces in 2014-2017, namely Riau Province and East Java Province. Under these conditions, the provinces that achieved the efficiency of the health management system where fewer compared to other provinces in Indonesia. Only around 12% of the provinces in Indonesia were efficient during 2014-2016 and 18% in 2018.

The complete efficiency gains during the observation year are as follows:

Table 2: Performance Efficiency

No.	Province	2014	2015	2016	2017	2018
1	Aceh	44.07	47.74	47.65	51.79	60.26
2	North Sumatera	75.51	70.77	68.3	86.84	76.09
3	West Sumatera	54.68	53.99	53.63	58.88	67.61
4	Riau	72.01	74.11	70.12	73.45	100
5	Jambi	65.17	65.63	65.1	70.78	76.31
6	South Sumatera	84.08	79.91	79.35	83.03	73.7
7	Bengkulu	58.65	65.56	58.81	59.48	67.95
8	Lampung	100	100	100	100	100
9	Kepulauan Bangka Belitung	52.26	51.79	54.17	53.28	59.33
10	Kepulauan Riau	59.24	57.64	60.37	57.37	59.16
11	Jakarta	92.32	71.46	73.87	75.59	66.54
12	West Java	100	100	100	100	100
13	Central Java	83.27	86.04	86.1	87.63	87.64
14	Yogyakarta	62.49	66.26	66.87	62.59	64.39
15	East Java	87.17	88.05	88.31	86.78	100
16	Banten	100	100	100	100	100
17	Bali	70.79	73.64	68.7	68.12	70.21
18	NTB	100	100	100	100	100
19	NTT	69.02	73.9	76.36	92.19	90.32

20	West Kalimantan	73.05	77.51	74.42	75.12	85.02
21	Southeast Kalimantan	75.38	76.83	78.6	85.05	86.16
22	South Kalimantan	63.68	69.39	67.92	68.15	72.18
23	East Kalimantan	51.66	49.23	50.49	48.51	58.78
24	North Sulawesi	44.12	46.58	43.84	52.78	52.76
25	Central Sulawesi	84.17	56.44	57.49	67.25	94.37
25	South Sulawesi	54.41	63.16	62.7	57.37	59.73
26	Southeast Sulawesi	58.05	85.2	62.35	65.08	62.64
28	Gorontalo	55.95	59.67	56.98	59.92	64.3
29	West Sulawesi	80.85	72.93	79.45	88.92	90.79
30	Maluku	59.77	59.06	47.68	67	77.49
31	North Maluku	56.48	64.47	44.17	66.26	63.76
32	West Papua	39.15	42.33	43.69	63.08	52.87
33	Papua	86.52	62.1	52.76	61.87	74.09
	Average	70.12	70.04	67.89	72.55	76.19

Source: secondary data, processed

Based on the calculation of DEA with the assumption of CRS and output orientation, it shows that in 2014-2016 there were 16 provinces whose efficiency achievements were above the national average, while in 2017 there were 14 provinces and in 2018 there were 11 provinces whose efficiency achievements were above the average national average. The DEA calculation results show that the efficiency of health services in Indonesia is low.

This is possible because spending on health in Indonesia is lower when compared to other countries. Health expenditure is 5% of the State Budget (APBN). According to data from the Ministry of Health of the Republic of Indonesia in 2019, the proportion of the health budget increased 1.7% from originally 3.3% in 2014 to 5% in 2016 and the proportion of the Ministry of Health and DAK is maintained at 5% in 2019. The budget proportion of the Ministry of Health & DAK (Special Allocation Fund) Health to the State Budget (APBN) increased by 0.7% in the 2014 to 2019 periods. However, the proportion of the Ministry of Health's budget to the State Budget (APBN) decreased by 0.3% in the 2014 to 2019 period. Compared to countries with the same income, health spending in Indonesia is lower.

This condition is made possible by the low absorption of health funds. According to data from the Ministry of Health of the Republic of Indonesia in 2019, there is a trend of absorption of the budget is less than the maximum on all authorities. The tendency to multiply the types and frequency of activities so that the targets covered is limited and unable to be implemented. The realization of the Deconcentration Budget for National Health Insurance and public health programs is still low.

There is a pattern of absorption of the deconcentration budget realization. According to data from the Ministry of Health of the Republic of Indonesia in 2018, West Java Province and East Java Province, the absorption of the deconcentration budget is relatively low but the achievement of the indicators is high. While Lampung Province, Banten Province, West Nusa Tenggara Province, the absorption of the deconcentration budget is relatively high, the achievement of indicators is also high.

Based on Table 1, West Java Province, Lampung Province, Banten Province, West Nusa Tenggara Province, health services were efficient throughout the analysis year and East Java Province was efficient in 2018. While Riau Province, although efficient in health services in 2018, the absorption of the deconcentration budget was relatively low. The indicator is also low.

However, the Riau Province's Life Expectancy in 2018, exceeded the national life expectancy, which was 71.19. This is because the number of doctors practicing independently both general practitioners and dentists in Riau Province is ranked 6th of all provinces in Indonesia.

Empirically states that when health expenditure increases, the life expectancy increases ([Payne et al, 2007](#); [Atkinson et al, 2008](#); [Mathers et al, 2006](#); [Zaim et al, 2001](#); [Benneyan et al, 2007](#)). Life Expectancy in Indonesia is ranked 6th among ASEAN countries. According to the World Bank, although health indicators in Indonesia have improved, this condition is still below that of other countries. Indonesia's health index is ranked 101 out of 149 countries in the world in 2017.

Physical health, mental health, health, infrastructure, and care as a tool to measure these health indicators ([Chongsuvivatwong et al., 2011](#); [Gunawan et al., 2015](#); [Kruk et al., 2008](#); [Tchouaket et al., 2012](#)). The degree of public health of a country is influenced by the presence of health facilities. Law Number 36 Year 2009 concerning Health states that a facility for health services is a tool and/or location used to

carry out healthcare activities, including encouraging, preventive, curative and rehabilitative by state, local and/or public authorities. However, health services in Indonesia have not been evenly distributed. There are still many people in remote areas who have difficulty accessing these health services ([Debora, 2019](#)). Health service facilities, according to Government Regulation Number 47 of 2016 concerning Health Service Facilities, include covering hospitals and community health centers.

The amount of public health centres has risen since 2013, from 9655 units in 2017 to 9825 units. The rise in the amount of community health centres, however, does not directly reflect the satisfaction of primary health care needs in a region ([Ramadhan et al., 2015](#)). Meeting the needs of primary health services can be seen in general from the ratio of public health centres to sub-districts. The ratio of public health centres to sub-districts in 2017 is 1.36. This illustrates that the ideal ratio of community health centres to sub-districts are at least 1 community health center in 1 sub-district, nationally, but the distribution of these community health centres across districts is uneven ([Assan et al., 2009](#)). The province with the highest ratio of public health centres to sub-districts was Jakarta at 7.73 Community health centers per district, while Papua had the lowest ratio of 0.70 Community health centres per district ([Central Bureau of Statistics, 2018](#)).

According to the Central Bureau of Statistics (2018), hospitals in Indonesia from 2013-2016 have increased. In 2014 the number of hospitals as much as 2,406 increased to 2,776 in 2017. Fulfilled or not the needs of the community for a referral and individual health services in an area can be seen from the ratio of beds to 1,000 populations. The WHO standard is 1 bed for 1,000 residents. However, the ratio of beds to the population in Indonesia is also uneven. The highest hospital bed ratio was found in Jakarta Province in 2.24 and the lowest in NTB Province was 0.68.

In addition to health facilities, medical personnel (health human resources) also determine the quality of health services provided to the community ([Kanchanachitra et al., 2011](#); [Anand et al., 2004](#); [Chen et al., 2004](#)). The majority of health human resources is distributed in Java, which is as many as 134592 workers (11.77%) in East Java Province, West Java Province as many as 130343 workers (11.4%), and Central Java Province as much as 127351 workers (11.14%). The provinces with the least number of health human resources were West Papua Province with 5209 workers (0.46%), and West Sulawesi Province with 6225 workers (0.54%) ([Central Bureau of Statistics, 2018](#)).

CONCLUSION

The number of provinces in Indonesia with less efficient health services compared to provinces with inefficient health services. This is caused by the low absorption of health deconcentration funds for health services in the community. Health services are related to costs incurred for health. If health costs are low, health services are also low.

In addition, the distribution of health service facilities and the distribution of health human resources is uneven. Health service facilities and health human resources accumulate in large cities. This causes health services in all regions in Indonesia have not been evenly distributed.

LIMITATION AND STUDY FORWARD

This study uses DEA analysis which can determine which provinces in Indonesia are already efficient and which have not been efficient during the study period. The efficiency performance of each province in Indonesia during 2014-2018 states that the unequal efficiency has the same pattern or is in line with the absorption of a lack of budget and the amount of uneven human resources on health in each province. However, this study cannot reveal in detail the causes of health services disparity in each province in Indonesia

The results of this study will be more meaningful if they can analyze deeper why some provinces in Indonesia are still inefficient so that this research can be used as a reference for further research by providing further analysis and will be the basis for making better healthcare system policies in Indonesia.

IMPLICATIONS

This study result recommends that the regions where health services are inefficient are brought about by the low ingestion of wellbeing deconcentration reserves, and the dissemination of health human resources is lopsided. These discoveries show that the appropriation of health services in all regions has not been similarly passed on. These discoveries can be utilized to build up a program to help and improve the efficiency of the health care system in Indonesia.

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