

Efficiency Level of Health Spending Governments: Evidence from North Maluku Indonesia

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Abstract

This study aims to determine and analyze the level of technical efficiency, cost, technical systems and corrective steps that need to be taken by inefficient regions in 10 regencies/cities in North Maluku Province in 2016-2020. This research uses secondary data from 10 districts/cities in North Maluku Province. The variables used include the APBD expenditure variable according to the health function as input, the variable number of health center, posyandu, medical personnel and midwives at health center and government hospitals as intermediate output variables and the variable Infant Mortality Rate (IMR), Maternal Mortality Rate (AKI), Number Life Expectancy (AHH) and Human Development Index (IPM) as outcome output variables. This research method uses Data Envelopment Analysis (DEA) with the assumption of Variable Return to Scale (VRS) and is input oriented. The results obtained are an average cost technical efficiency of 0%, while the technical efficiency of the system reaches 70%, so that there are indications of inefficiency in the allocation of health sector spending and corrective measures are needed based on the potential for regional improvement which are still not efficient so that the proportion of input and output can be efficient according to the needs of each region.

Keywords: Health Expenditure, DEA, Cost Technical Efficiency, System, Technical Efficiency, Potential Improvement

JEL Classification: B22; E12; E62

INTRODUCTION

Human resources are an investment that has an important role for the welfare and progress of a country. Health is one of the main assets for a country to achieve social welfare and quality human resources. Whereas in Law Number 36 of 2009 concerning Health, it is stated that health is a state of health, both physically, spiritually and socially which enables everyone to live productively socially and economically. Medium large provincial, district/city regional government health budgets are allocated at least 10% (ten percent) of the regional revenue and expenditure budget excluding salaries. Then in the Sustainable Development Goals (SDGs) agreement which was agreed upon by nearly 200 world leaders at the end of 2015 in New York, making Indonesia one of the countries that agreed to the agreement which contains seventeen goals that must be pursued and achieved by 2030, and on the goals set out in the SDGs, especially the third SDGs goal explaining the importance of the health and welfare of the entire population for a country. Then health is one indicator of the success of human development in Indonesia. According to (Asandului et al., (2014),

efforts from the health sector in terms of developing human resources play an important role in labor productivity. Currently, both the central and regional governments are pursuing development in the health sector by increasing government spending in the health sector which is used to finance each health program/activity allocated to all provinces and districts/cities in Indonesia. The expenditure budget according to the function of health is used as a source of funds for health financing which is used to guarantee an optimal increase in public health status. This health expenditure is allocated to provide quality infrastructure, facilities and services in the health sector including the number of health centers, hospitals, medical personnel, social security, insurance and so on in order to improve the health status of the community. The increase in health spending must be used effectively and efficiently to provide good infrastructure, facilities and health services so that the attainment of optimal health status can be achieved for every community. Broadly speaking, health spending in North Maluku Province has increased significantly since 2016. This shows that the government's attention to the development of the health sector is high.

The allocation of health spending can be used effectively and efficiently so that the resulting output is optimal and on target, this study uses three reference variables, namely input variables, intermediate/intermediate variables and outcome variables. The input variable is in the form of health sector expenditure which is reflected in APBD expenditure according to the health function, while the intermediate/intermediate output variable is in the form of health facilities and services and the output outcome variable is the final output in the form of public health status (Charles & Daud, 2021). According to Rambe & Syahputra (2017), efficiency can be interpreted as savings in using resources in the activities or programs of an organization. This efficiency refers to how resources are used properly and correctly to produce output.

The opinion quoted by Charles et al (2020), Regional Revenue and Expenditure Budget (APBD) is essentially a policy instrument that is used as a tool to improve public services and community welfare in the regions, therefore DPRD and local government must make concrete and structured efforts to produce a Regional Revenue and Expenditure Budget (APBD). which can reflect the real needs of the community in accordance with the potential of each region, and can meet the demands of the regional budget that is oriented to the interests of the community.

The results show that local government spending according to the health function of 10 districts/cities in North Maluku Province during the study period tends to fluctuate, of the 10 districts/cities over the past 5 years, South Halmahera district has been the most consistent in allocating its health spending, which is 1.035 trillion and the lowest is Taliabu Island district, which amounted to 297.827 million. With this large health sector expenditure, it is expected that local governments will be able to manage and optimize the fulfillment of the basic needs of public health. This can be realized by providing health facilities or facilities so that they can bridge the allocation of the health budget to improve the health status of the community in each region. It is known that the number of health facilities, both posyandu, number of health center, number of medical personnel and midwives at health center and government hospitals in 2016-2020 in North Maluku Province did not experience significant changes. In 2016, there were 1545 posyandu units, 134 health center units, 231 medical personnel and 1494 midwives in hospitals and health center . Since 2016-2020 the number of facilities has been almost the same and has not increased. This shows that the lack of role of local government in providing health facilities.

Overall, the level of attainment of indicators of public health degrees seen from IMR, AKI, and AHH in North Maluku Province in 2016-2020 still needs to be improved. This indicates that the level of attainment of public health degrees in North Maluku Province in 2016-2020 is not comparable to the increase in the health budget in North Maluku Province.

As stated by (Masfufah & Rahman, 2019) the results of the technical efficiency value of the regional health service system which has reached efficiency indicates that the area has reached a point where the number of health facilities and services available and their utilization have resulted in a fairly good degree of public health. The addition of the availability of health service facilities in each region will also have an additional effect on the health status of the community. Achievement of the level of efficiency technically the system is far better than on cost technical efficiency. This is supported by the resulting efficiency scores which show that during the five years during the study period many regions experienced far less technical system inefficiencies compared to technical costs whose inefficiencies were very severe, in fact only a few regions achieved an average of 100% for five year.

Research conducted by Neneng, et al., (2014) , Analysis of Regional Expenditure Efficiency in Sumbawa Regency (case study in education and health) . Method efficiency measurement uses Data Envelopment Analysis (DEA). The results of the study show that (i) the average inefficiency in both technical cost efficiency and technical system efficiency (ii) the efforts of the Sumbawa Regency Government to improve the efficiency of education and health spending are : (a) In the health sector, to overcome the shortage of medical personnel, with horizontal referrals, several clinics that become horizontal referrals, as satellite clinics, as well as empowerment of temporary doctors and temporary midwives. (b) In the field of education, the ratio of teachers in each school is relatively less, in anticipation that schools are allowed to appoint honorary teachers financed from school operational funds. (c) Work zone or sub division for program /activity packages so that the allocation of resources can be carried out effectively and efficiently. and (d) Determination of priority scale, identification and synchronization of data on facilities and infrastructure.

Ikhwan & Siradjuddin, (2016). Efficiency of Government Spending in the Education and Health Sector in South Sulawesi Province . The results of this study indicate that in general most of the districts/cities in South Sulawesi Province are still not efficient in terms of technical costs and technical systems. This indicates that there is still a significant amount of wastage in spending on education and health spending but is not followed by education and health services and facilities and there has been no effort to improve the system to improve the education and health status of the community.

Then research was conducted by Sihaloho et al., (2019) . Analysis of Health Expenditure Efficiency in Maluku Province. This study calculates the technical efficiency score using the Data Envelopment Analysis (DEA) method and uses the Tobit method for environmental factor analysis. This study calculates the technical efficiency score of health spending in 8 districts and 2 cities in Maluku province from 2012 to 2015.

Herdiyana, (2016) , Evaluation of the Operational Performance of Community Health Service Centers in Bogor City. The results of measuring the relative efficiency of public health centers in the public sector using the DEA BCC model (assuming VRS) input and output orientation were obtained from six health centers in Bogor City, there were 4 health centers that were included in the efficient health center category (Achieved 100%), including East Bogor Health Center, East Bogor Health Center Kayu Cinnamon, South Bogor Health Center and Tanah Sareal Health Center. For Community Health Centers that are classified as inefficient Health Centers, they are Warung Jambu Health Center (Achieved 91.16%) and Sempur Health Center (Achieved 93.75%).

Jafarov & Gunnarsson, (2008) Government Spending on Health Care and Education in Croatia. Efficiency and Reform Options. The analysis found evidence of significant inefficiencies in Croatian spending on health care and education, related to inadequate cost recovery, weaknesses in financing mechanisms and institutional arrangements, weak competition in the provision of these services, and weaknesses in targeting public subsidies

on health care and education . This inefficiency means that government spending on health and education can be reduced without compromising the quality of those services. This paper identifies a way to do that.

RESEARCH METHOD

This research is a quantitative descriptive study using quantitative data types. The data source comes from secondary data from 10 districts/cities in North Maluku Province. Data were obtained from the Directorate General of Fiscal Balance, BPS Province of North Maluku and Publication of the Health Service in the form of Health Profile of North Maluku Province for 2016-2020. The data used in this study is secondary data, namely data published by agencies in the local area. The location of this research is the local government of 10 regencies/cities in North Maluku Province. The population in the study is 10 districts/cities in North Maluku Province from 2016 - 2020. The districts/cities referred to are West Halmahera, Central Halmahera, Sula Islands, South Halmahera, North Halmahera, East Halmahera, Morotai Island, Taliabu Island, City of Ternate and Tidore Islands. The sample of this research is data on government spending according to health function, number of posyandu, number of health center, number of medical staff and midwives at government owned health center and Hospitals, Human Development Index, Infant Mortality Rate, Maternal Mortality Rate and Life Expectancy Rate. Documentation study data collection techniques, researchers rely on documents as a source of data to support research, such as collecting written and electronic document data in the form of financial report data, government publications, official websites, journals, literature, and other supporting references.

The analysis model for this research is the Variable Return to Scale (VRS) instrument . This study uses the Variable Return to Scale (VRS) model , the same as Sutanto's research, (2015), which uses the DEA analysis method and VRS assumptions. In addition, the assumptions used are input oriented both for the calculation of cost technical efficiency and system technical efficiency. The VRS model assumes that the ratio of input and output additions is not the same. The Input-Oriented assumption is more aimed at minimizing the use of inputs so as to produce a certain number of outputs. Determination of strategies for increasing efficiency, both technical costs and systems that are still not efficient, using the results of potential improvements based on the efficiency calculation obtained using Banxia Frontier Analysis (BFA) version 4.1.1.

This research analysis method is the Data Envelopment Analysis (DEA) method. Asandului et al., (2014) DEA is often used as an analytical tool to calculate or assess the efficiency of a set of Decision Making Units (DMU). Meanwhile, according to Amirillah, (2014) DEA is a procedure specifically designed to measure efficiency values using multi-input and multi-output, where input and output combinations cannot be performed. In addition, DEA produces relative efficiency as a planning and decision-making technique in managing limited resources to achieve goals . Yanti & Kustiani, (2016), The DEA analysis method is designed for economic activity units (UKE) in measuring efficiency using multi-input multi-output. According to Purwantoro (2003) in Budi, (2010), the advantages possessed by DEA include (1) being able to measure many inputs and outputs, (2) no correlation between variables is needed, (3) direct comparisons between similar UKEs can be made, and (4) the variables used have different units. While the disadvantages are (1) sample selection only, (2) wrong measurements lead to fatal errors, (3) relative efficiency measurements are not absolute, and (4) because they are non-parametric, it is difficult to test the hypothesis from the DEA results.

Rusydziana (2013). states that in the DEA approach there are two assumptions based on the relationship between input and output variables, namely Constant Return to Scale

(CRS) and Variable Return to Scale (VRS). The approach used in this research is Variable Return to Scale (VRS), with the assumption that the ratio of the addition of input and output is not the same because in the health sector the addition of the proportion of input may not necessarily increase the proportion of output with the same value. This is because there is other factors that also influence such as level of education, awareness community and environmental conditions.

Table 1. Criteria for Measures of Technical Efficiency Level of Health Expenditures

Efficiency Criteria	Efficiency Technical Value (In %)
Perfect	100
Tall	81-99
Currently	60-80
Low	41-59
Not efficient	<40

Source: Hidayat in Fathoni

One of the advantages of calculating efficiency analysis with the DEA method is besides being able to find the relative efficiency value of each item, the DEA method can also create scenarios for improving inputs and outputs, for inputs and output that is not yet efficient through input identification steps too much or too low output. Results of data analysis with the method DEA will show values that have inefficient input/output. So From this, the next steps for improvement will be determined.

RESULT AND DISCUSSION

This research or research produces a relative technical efficiency value of the Economic Activity Unit (UKE) studied. The value of technical efficiency is said to be efficient if the value is 100% whereas if the value is less than 100% then it is said to be inefficient. The Economic Activity Unit (UKE) in this study covered 10 regions consisting of 8 regencies and 2 cities in North Maluku Province during the 2016-2020 period. Efficiency calculations include the level of technical efficiency of health sector expenditure costs and technical efficiency of the health service system. The model used is Variable Return to Scale (VRS) while the assumptions used are input oriented (input minimization).

The value of technical cost efficiency is obtained from a comparison between input variables and intermediate output variables using the input-oriented Variable Return to Scale (VRS) model. The input variable used by 10 regencies/cities in North Maluku Province is in the form of the Regional Revenue and Expenditure Budget (APBD) according to the health function of each region in rupiah units. While the indicators in the form of health facilities and services as intermediate output variables include the number of health center, the number of posyandu, the number of medical personnel at the health center and government hospitals and the number of midwives in all regions per 100,000 population. Based on the variables that contain health facilities and services, it shows that the level of success of the local government in North Maluku Province in providing various good health facilities and services for every community. The results of the cost technical efficiency value are useful for knowing how efficient the input issued by the local government is in using health spending so that it can produce health facilities and services to achieve the highest health status.

Data in Table, it is known that in 2016 there were 7 regencies showing a perfect level of technical efficiency in health expenditure costs, 100%, namely West Halmahera Regency, Central Halmahera Regency, Sula Islands Regency, South Halmahera Regency, North Halmahera Regency, East Halmahera Regency and Island Regency Morotai. While 3 Regencies/Cities showed a high level of technical efficiency in health costs (81-99), namely

Pulau Taliabu Regency, 82.3%, City of Ternate, and City of Tidore Islands, 97.1%.

In 2017, 2 Regencies/Cities showed a perfect level of efficiency, namely West Halmahera Regency and Tidore Islands City, while 3 Regencies showed a high level of efficiency, namely Sula Islands Regency, 89.3%, South Halmahera Regency, 98.0%, and Halmahera Regency East, 89.6%. Furthermore, there are 3 regencies showing moderate efficiency levels (61-80), namely Central Halmahera Regency, 62.0%, North Halmahera Regency, 74.6% and Morotai Island Regency, 70.7%, then 2 Regencies/Cities, namely Taliabu Island Regency and the City of Ternate still show a high level of efficiency, respectively 86.5% and 83.1%.

In 2018, 4 out of 10 regencies/cities showed perfect efficiency, namely South Halmahera Regency, East Halmahera Regency, Ternate City and Tidore Islands City. Especially the City of Ternate in 2016 and 2017 always shows a high level of efficiency, respectively 85.8% and 83.1%, but in 2018 it achieved a perfect efficiency level, 100%, however, Central Halmahera Regency, 63.7%, North Halmahera, 76.1% and Morotai Island Regency, 71.1% are still at a moderate level of efficiency, the same as in 2017, while the City of Tidore Kepulauan is able to maintain a perfect efficiency level, 100% the same as in 2017.

In 2019, all Regencies/Cities in North Maluku Province did not show a perfect level of efficiency, but there were 7 Regencies/Cities out of 10 Regencies/Cities showing a high level of efficiency namely, West Halmahera Regency, 94.4%, Sula Islands Regency, 84.1%, South Halmahera Regency, 89.8%, East Halmahera Regency, 83.3%, Taliabu Island Regency, 85.3%, Ternate City, 83.0%, and Tidore Islands City, 94.3%. Then 3 regencies out of 10 regencies/cities show a moderate level of efficiency, namely Central Halmahera Regency, 55.3%, North Halmahera Regency, 69.8% and Morotai Island Regency, 70.1%. However, when compared to the efficiency level in 2016, there were 4 regencies/cities that showed a change from perfect efficiency to high efficiency, namely South Halmahera Regency, East Halmahera Regency, Ternate City and Tidore Islands City.

In 2020, the technical efficiency level of health spending costs shows that 6 out of 10 regencies/cities show a perfect level of efficiency, namely West Halmahera Regency, Sula Islands Regency, South Halmahera Regency, Pulau Taliabu Regency, Ternate City and Tidore Islands City. Meanwhile, East Halmahera Regency showed a high level of efficiency, the same as in 2019, then there were 3 regencies showing a moderate level of efficiency, namely Central Halmahera Regency, 62.3%, North Halmahera Regency, 71.1% and Morotai Island Regency, 78.0%.

Regions where the results of measuring the level of technical efficiency of costs reach a perfect score of 100% indicate that the region has been efficient in allocating the amount of health spending to be spent in accordance with the government's needs in the health sector. Health spending is allocated to provide output in the form of health facilities and services. In this study, the output was in the form of providing the number of health center, the number of posyandu, the number of medical staff and the number of midwives at the health center and hospitals. Regions that achieve an efficiency level of less than 100% are included in areas that are inefficient in terms of the technical costs of health sector spending. If the value of efficiency decreases, it can be said that spending in the health sector is increasingly inefficient. The calculation results show that 10 regencies/cities in North Maluku Province experience wasted health spending, this happens because it is not accompanied by an increase in the number of health facilities and services provided to its population. The following table shows the results of the technical efficiency level of health spending on the VRS (Variable Return to Scale) model with the assumption that it is input oriented in 10 Regencies/Cities in North Maluku Province in 2016-2020.

Table 2. Results of Expenditure Cost Technical Efficiency Calculations North Maluku Province Health Sector 2016-2020 (%)

No.	Regency/City	<i>Input/Output Contributions</i>					<i>Average Regency/City</i>
		2016	2017	2018	2019	2020	
1	West Halmahera	100	100	95.9	94.4	100.0	98.06
2	Central Halmahera	100	62.0	63,7	55,3	62,3	68,66
3	Sula Islands	100	89.3	99.8	84,1	100.0	94.64
4	South Halmahera	100	98.0	100.0	89.8	100	97.56
5	North Halmahera	100	74,6	76,1	69.8	71,1	78,32
6	East Halmahera	100	89.6	100	83.3	96.7	93,92
7	Morota Island	100	70,7	71,1	70,1	78.0	77.98
8	Taliabu Island	82.3	86.5	85.9	85,3	100	88.00
9	Ternate	85.8	83,1	100	83.0	100	90.38
10	Tidore Islands	97.1	100.0	100	94.3	100	98.28
	Provincial Average	96.52	85,38	89.25	80.94	90.81	88.58

Source: BPS Data Processed

Based on the calculation of the average level of technical efficiency in the spending costs of the Regency/City sector in 2016-2020, it proves that there is no Regency/City that shows a perfect efficiency level of 0%. This shows that these regions did not consistently use the health sector budget efficiently during the study period.

According to research by Asandului et al., (2014), it is proven that developed countries that produce high per capita GDP are technically inefficient and precisely with limited input resources have been used efficiently. This statement is in line with this research that higher government spending on health does not guarantee an efficient budget allocation. In line with the results of research conducted by Azmi, (2020) an analysis of the efficiency of local government spending on the health sector in districts/cities of Central Java province in 2015-2017. The results showed that the severity of inefficiencies occurred in cost-technical efficiency, with only 2 districts/cities achieving perfect efficiency, while 4 districts/cities achieved perfect efficiency in sustainable city system technology. Then research conducted by Ikhwan & Siradjuddin, (2016), The Efficiency of Government Spending in the Education and Health Sector in South Sulawesi Province. The results of this study indicate that in general most of the districts/cities in South Sulawesi Province are still not efficient in terms of technical costs and technical systems. This indicates that there is still a significant amount of wastage in spending on education and health spending but is not followed by education and health services and facilities and there has been no effort to improve the system to increase the level of public education and health.

Similar research was conducted by Putri (2015), technical efficiency of the health sector budget in West Java Province. The results of the study indicate that even though each region in West Java Province has an annual increase in the health budget, it will result in a small increase in the output of health facilities and services and it is not optimal to meet the basic health needs of the community. This inefficient regional budget is due to Rp. 421.8 billion of the total health budget for the province of West Java is not entirely used for the procurement of health facilities and services. Only 50%, namely Rp. 213 billion to be used one of them in the procurement of health facilities and services.

Next, the research conducted by Kurniawan et al., (2020), every province in Indonesia is said to be technically efficient if it is able to use as little input (government spending) as possible to obtain a high output HDI value, of the 34 provinces in Indonesia studied, only 14 provinces experienced efficiency or 41.2%.

Then research by Merini, (2013) in the Southeast Asia region, the level of efficiency of public sector spending varies in the Southeast Asian region, where Singapore is the

country with the highest average level of efficiency in the three sectors and Malaysia experiences the most severe inefficiency in public spending. Countries with upper middle income, such as Malaysia, Thailand, Brunei Darussalam and Vietnam tend to have high levels of public sector spending which makes them inefficient. Meanwhile, poor countries such as Cambodia and Laos, although they have a higher degree of efficiency, have the worst level of public services, both in the health and education sectors. The high level of efficiency is mostly due to the low input level. For countries that have a degree of efficiency in the middle zone, such as Indonesia and the Philippines, they can increase the degree of efficiency by reducing inputs at a fixed output level through budget allocations that are right on target and or conversely increasing output at a fixed input level.

According to the theory of Rambe & Syahputra, (2017) states that efficiency is a form of saving in the use of resources in an activity or organization, but the phenomenon that occurs in many areas that have large input resources is inefficient and the resulting output is low as in Surabaya . The average level of technical efficiency in Surabaya city costs during 2012-2016 shows an inefficiency of 12.50%. Meanwhile, from the input side, health spending is larger than other regions, such as Pacitan Regency and Blitar City, the input produced is much smaller, this indicates a waste of health expenditure which results in inefficiency.

The calculation of the value of the level of technical efficiency of the system is obtained by comparing the intermediate output variables which are used as input in the form of health facilities and services including the number of health centers, the number of posyandu, the number of medical personnel and the number of midwives in government owned health centers and hospitals per 100,000 population. The input is compared with the outcome variable in the form of health status as an output, in the form of Infant Mortality Rate (IMR) per 1,000 population, Maternal Mortality Rate (MMR) per 100,000 population, Life Expectancy Rate (AHH), and Human Development Index (IPM).

The level of technical efficiency of this system shows how efficient the local government in North Maluku Province is in seeking the number of health centers, the number of posyandu, the number of medical personnel and midwives available at the health center and the number of government-owned hospitals as inputs. so as to produce the highest degree of public health. System measurement techniques use the assumption of the Variable Return to Scale (VRS) model while the orientation used is input-oriented. Judging from the results of the system's technical efficiency values obtained from the calculation results of intermediate output variables and outcome variables with the assumption of input oriented Variable Return to Scale (VRS). Based on table 4.5. The calculation results obtained that in 2016 the results of calculating the level of technical efficiency of the health service system in 10 districts/cities in North Maluku province showed that the level of technical efficiency of the system reached a perfect efficiency value of 100 percent. The areas are West Halmahera Regency, Central Halmahera Regency, Sula Islands Regency, South Halmahera Regency, North Halmahera Regency, East Halmahera Regency, Morotai Island Regency, Taliabu Island Regency, Ternate City and Tidore Islands City. While for health in 2017 there was only 1 district that did not show a perfect level of efficiency, namely Pulau Taliabu Regency, while 9 districts/cities showed a perfect level of efficiency. Furthermore, in 2018 there were 2 districts that achieved a high level of efficiency. These two districts experienced a decrease in their level of efficiency from the previous year, 2017, from a perfect efficiency level to a high efficiency level, 99.9 percent. The districts referred to are West Halmahera Regency and Morotai Island Regency, while the Taliabu Island Regency in 2018 was able to increase its efficiency to an efficiency level. perfect compared to 2017, only achieving a high efficiency level of 99.7 percent. Furthermore, 8 other regencies/cities were able to maintain the achievement of the same perfect efficiency level as in 2017, while the regencies/cities meant to show perfect efficiency, namely West Halmahera Regency , Central Halmahera Regency,

Sula Islands Regency, South Halmahera Regency, North Halmahera Regency, Halmahera Regency East, City of Ternate and city of Tidore Islands.

In 2019, the results of the calculation of the technical efficiency of the health service system for 10 districts/cities in North Maluku Province were able to achieve a perfect efficiency level of 100 percent, the same results were shown in 2020.

Table 3. Results of Calculation of the Technical Efficiency of the North Maluku Province Health Service System for 2016-2020 (%)

No.	Regency/City	<i>Input/Output Contributions</i>					<i>Average Efficiency</i>
		2016	2017	2018	2019	2020	
1	West Halmahera	100	100	99.90	100	100	99.98
2	Central Halmahera	100	100	100	100	100	100.00
3	Sula Islands	100	100	100	100	100	100.00
4	South Halmahera	100	100	100	100	100	100.00
5	North Halmahera	100	100	100	100	100	100.00
6	East Halmahera	100	100	100	100	100	100.00
7	Morota Island	100	100	99.90	100	100	99.98
8	Taliabu Island	100	99.70	100	100	100	99.94
9	Ternate	100	100	100	100	100	100.0
10	Tidore Islands	100	100	100	100	100	100.0
Provincial Average		100	99.97	99.98	100	100	99.99

Source: BPS Data Processed by Researchers in 2023

The results of the average calculation of the efficiency of the technical system of health services for 10 districts/cities in North Maluku Province in 2016-2020 show the result that only 7 districts/cities, 70 percent achieve the perfect level of efficiency while 30 percent or 3 districts/cities, namely West Halmahera, West Halmahera Morotai Island and Pulau Taliabu District achieved a high level of technical efficiency in health services, with scores of 99.98 percent, 99.98 percent and 99.94 percent, respectively.

The condition for achieving technical efficiency of the health care system during the 2016-2020 study showed much better results than achieving cost technical efficiency in the same year. The average achievement for 5 years is that the technical inefficiencies in the health care system are not as bad as the technical inefficiencies in cost. The level of severity is shown in terms of cost technical efficiency during the research that none of the 10 regencies/cities achieve a perfect efficiency score of 100 percent. Most of the technical cost efficiencies are still in the high efficiency criteria, 70% percent with an efficiency value between 81-99 percent and 30% with a moderate efficiency value between 61-80 percent.

In contrast to the technical efficiency of the system, whose efficiency value is within the criteria for perfect efficiency, 100 percent and the criteria for high efficiency, between 81-99 percent, similar to cost technical efficiency, Regency/City areas that have achieved a system technical efficiency of 100 percent prove that empirically the area has been efficient in using its basic health facilities and services to achieve an optimal level of public health degree. Improving the health service system can be done by increasing the utilization of a number of existing Posyandu and health center, so that it will be easier for the community to reach these facilities. In addition, it is hoped that the distribution of health services by a number of medical personnel and midwives spread across various Regencies/Cities in North Maluku Province is expected to make it easier for the public to access these health services easily. This is done in order to achieve optimal public health status.

According to Indriati, (2014) regions have different input needs to achieve the same output depending on the area, population density and economic development of the area. For example the City of Mojokerto, although technically it is 100% cost efficient, technically the

system is still with the lowest average during 2012-2016 of 71.63%. This condition is caused by health service facilities that produce AHH, AKI, IMR, and Morbidity Rates are still low. Judging from the population density of Mojokerto City, it is very high, namely 6471.6 people/km². This situation makes it difficult to provide health facilities and services to all regions and communities, resulting in low output.

Similar research was conducted by Rapiuddin & Rusydi, (2017) stating that even though it has reached 100% and the input of health services is ideal, with large areas it can complicate health services so that the output is low. Some of these statements indicate that even though 100% efficiency has been achieved, it does not rule out the possibility that the utilization and equity of health facilities and services are less than optimal. The use of inputs that are too excessive and too little will affect the output produced, so that these inputs are expected to be used optimally and in accordance with the needs of each region for the welfare of society.

Research was also conducted by Masfufah & Rahman, (2019) conducted in Central Java Province in 2012-2016, based on the results of data processing, that the technical efficiency of the system was 53.34% of areas that were already efficient or there were 14 areas that were still not efficient. This phenomenon shows that the level of technical efficiency of the system is much better than the technical costs. Judging from the value of efficiency, the achievement of the value of the level of technical efficiency of the system is higher than the value of cost-technical efficiency, although there are still many areas that are not efficient, the value is not as low as the technical cost. Areas that are technically efficient show that the area has provided good health output compared to areas that are not yet efficient.

Another study conducted by Yatiman & Pujiyono, (2013), there is only one area that is technically inefficient in the system in Yogyakarta Province because it is caused by greater input from other regions but the output produced is relatively the same.

In general, the average level of technical and technical cost efficiency achieved for the system between 2016-2020 can be concluded that no district/city has achieved perfect efficiency results, only 10 districts/cities in North Maluku province have achieved a high level of efficiency. Therefore, it is necessary to need an improvement strategy that must be carried out by the local government to achieve efficient spending on the health sector.

The results show further calculations regarding improvement targets that must be achieved by districts/cities that are not yet efficient both technically in terms of cost and technically in the system of spending on health expenditures. The following is the result of calculating improvement targets for several regencies/cities that have not achieved technical cost efficiency or system technical efficiency values, including:

West Halmahera Regency has reached a technically cost efficient condition of 100 percent, but technically the system is still in the criteria of high efficiency with an achievement of 99.57 percent. So the corrective steps that need to be taken are more oriented towards achieving system technical efficiency. The calculation results show that West Halmahera Regency from the input side needs to reduce the ratio of Health Expenditures by -9.71% from the actual number of 24.64 to 24.15 health expenditure costs per 100,000 population. Meanwhile, from the output side, West Halmahera Regency needs to increase the scores on the health center indicator from 12.29 to 12.30 per 100,000 population, and midwives from 25.99 to 26.04 per 100 population. Based on the calculation results, it shows that Central Halmahera Regency, from the input value, needs to reduce the ratio of Health Expenditures of -156.82 from the actual number of 20.38 to 13.40 health expenditure costs per 100,000 population. Meanwhile, from the output results, Central Halmahera Regency needs to reduce the score on the midwife indicator from 21.58 to 29.44 per 100,000 population, and medical from 15.52 to 17.80 per 100,000 population.

Based on the calculation results, it shows that South Halmahera Regency, from the input value, needs to reduce the ratio of Health Expenditures by -12.20 from the actual number of 26.47 to 25.15 health expenditure costs per 100,000 population. Meanwhile, from the output results, South Halmahera Regency needs to reduce the score on the midwife indicator from 19.40 to 29.44 per 100,000 population, and medical from 12.60 to 12.94 per 100,000 population.

Based on the calculation results, it shows that East Halmahera Regency, from the input value, needs to increase the ratio of Health Expenditures by -0.30 from the actual number of 22.46 to 21.03 health expenditure costs per 100,000 population. Meanwhile, from the output results, East Halmahera Regency needs to increase the value of the midwife indicator from 23.90 to 24.04 per 100,000 population, and medical from 15.32 to 15.81 per 100,000 population. Then increase the posyandu indicator from 23.34 to 23.98 and increase the value of the health center from 14.25 to 14.82.

Based on the calculation results, it shows that North Halmahera Regency, from the input value, needs to reduce the ratio of Health Expenditures by -1.08 from the actual number of 23.89 to 18.35 health expenditure costs per 100,000 population. Meanwhile, from the output results, North Halmahera Regency needs to increase the value of the midwife indicator from 26.40 to 26.41 per 100,000 population, and medical from 10.39 to 13.89 per 100,000 population. Then increase the posyandu indicator from 28.24 to 28.98 and increase the value of the health center from 11.39 to 11.50.

Based on the calculation results, it shows that Morotai Island Regency, from the input value, needs to increase the ratio of Health Expenditures by -1.10 from the actual number of 21.94 to 16.67 health expenditure costs per 100,000 population. Meanwhile, from the output results, it is necessary to increase the value of the midwife indicator from 22.06 to 22.66 per 100,000 population, and medical from 15.92 to 18.52 per 100,000 population. Then increase the posyandu indicator from 22.56 to 26.60 and increase the value of the health center from 12.92 to 13.47.

Based on the calculation results show that the Sula Islands Regency, from the input value, needs to increase the ratio of Health Expenditures by -0.266, a change in value from the previous district, from the actual number of 20.93 to 19.72 health expenditure costs per 100,000 population. Meanwhile, from the output results, it is necessary to increase the value of the midwife indicator from 22.82 to 24.07 per 100,000 population, and medical from 12.41 to 13.55 per 100,000 population. Then increasing the posyandu indicator from 22.67 to 23.38 and while the value of the health center from 12.78 to 12.78 is the value of increasing cost efficiency from other indicator variables.

Based on the calculation results, it shows that Pulau Taliabu Regency, from the input value, needs to increase the ratio of Health Expenditures by -0.600, a change in value from the previous district, from the actual number of 20.28 to 17.77 health expenditure costs per 100,000 population. Meanwhile, from the output results, it is necessary to reduce the value of the previous midwifery indicator from 23.82 to 25.99 per 100,000 population, and medical from 11.97 to 13.58 per 100,000 population. Then increase the posyandu indicator from 21.73 to 21.75 and while the value of the health center from 13.48 needs to be increased to 13.58 to be the value of increasing cost efficiency from other indicator variables.

Based on the calculation results, it shows that the City of Ternate, from the input value, needs to increase the Health Expenditure Ratio by -0.480, the change in the value of the district/city which should be from the actual number of 20.48 to 18.39 health expenditure costs per 100,000 population. Meanwhile, from the output results, it is necessary to increase the value of the previous midwifery indicator from 26.08 to 26.18 per 100,000 population, and medical from 14.79 to 15.23 per 100,000 population. Then increase the posyandu indicator from 25.44 to 25.51 and meanwhile the value of the health center from 7.77 needs

to be increased to 7.840 to become a value for increasing cost efficiency from other indicator variables so that the quality of health services is more guaranteed.

While the calculation results show that the City of Tidore Islands from the input value needs to reduce the Health Expenditure Ratio by -0.480, a change in value from the previous from the actual number of 23.78 to 23.35 health expenditure costs per 100,000 residents. Meanwhile, from the output results, it is necessary to increase the value of the previous midwifery indicator from 24.78 to 25.39 per 100,000 population, and medical from 16.69 to 16.95 per 100,000 population. Then increase the posyandu indicator per unit from 24.81 to 25.17 and meanwhile the value of the health center from 11.50 needs to be increased to 11.69 per unit.

Table 4. Recapitulation of Cost Technical Efficiency and Technical Efficiency System in North Maluku Province during 2016-2020 (%)

City District	Efficiency Value	Efficiency Value	Average	Criteria
	Cost	System	Efficiency	Efficiency
West Halmahera	98.06	99.98	99.02	Tall
Central Halmahera	68,66	100	84,33	Tall
Sula Islands	74,64	100	87.32	Tall
South Halmahera	97.56	100	98.78	Tall
North Halmahera	78,32	100	89,16	Tall
East Halmahera	93,92	100	96,96	Tall
Morota Island	77.98	99.98	88.98	Tall
Taliabu Island	88.00	99.94	93.97	Tall
Ternate	90.38	100	95,19	Tall
Tidore Islands	98.28	100	99.14	Tall
Total North Maluku	86.58	99.99	93,29	Tall

Source: Data Processed

Based on Table 4. above, it shows that in general technical cost efficiency and system technical efficiency in the 10 districts/cities of North Maluku Province are included in the high efficiency achievements (81-99 percent). This is demonstrated by the achievement of technical cost efficiency which achieved high efficiency in 6 regencies/cities. While the achievement of system technical efficiency, which achieved perfect efficiency was 7 regencies/cities. Even though the resulting efficiency level is included in the high efficiency criteria, it is hoped that the local government will continue to increase the efficiency level to 100 percent perfect efficiency.

On average, the technical efficiency of costs and systems in 10 regencies/cities in North Maluku Province in 2016-2020 is still not efficient but is still at a high level of efficiency. This shows that spending inefficiency in the health sector has not been optimally allocated. Optimization of the budget in the health sector is needed so that there is no waste in its use. So to achieve a perfect level of efficiency, 100% can use inputs as effectively as possible according to the needs of each region.

CONCLUSION

Based on the results of the analysis and calculation of the level of efficiency of government spending in the health sector in North Maluku, the technical efficiency level of costs reached 0% or 10 districts/cities in North Maluku province did not achieve a perfect efficiency value of 70% or 7 Regencies/cities achieve high efficiency values, and 30% or 3 regencies/cities achieve moderate efficiency values, then the technical efficiency level of the system is 70% or 7 regencies/cities achieve perfect efficiency scores and 30% or 3

regencies/cities achieve high efficiency values and corrective steps that can be taken in areas where there are still indications of inefficiency, namely by using the results potential improvement for each district/city to help improve the proportion of input and output needed by the region in order to achieve technical cost and system technical efficiency.

SUGGESTION

Based on the results of the research and presentation of the data, it is hoped that it will be able to maintain local governments in the service of health expenditures both in quality and quantity so that the value of their efficiency produces resources that are competitive and can reduce inequality between districts/cities in the North Maluku Province area, which will ultimately create the welfare of society in general. As for regencies/cities that have not yet reached the perfect level of efficiency, they must continue to improve, especially in managing the health sector expenditure budget according to regional needs. In accordance with the results of the test analysis using Data Envelopment Analysis (DEA) with the Banxia Frontier Analysis (BFA) model version 4.1.1. in the area of North Maluku Province, you can refer to each efficient district/city to get an efficiency level of 100%.

The regional government of North Maluku Province and districts/cities are advised to pay attention to the positive and negative impacts for increasing business efficiency of local government economic activities for the welfare of society. For regions that have reached efficient conditions, it is hoped that local governments will continue to monitor and evaluate their health sector expenditures to minimize the occurrence of excessive costs. With the phenomenon of each different variable, the government needs knowledge of health sector expenditures for cost technical efficiency and efficiency. technical systems so that it becomes a big concern, especially in sectors that contribute to the regions, thus further improving people's welfare and increasing efficiency rates for the regions. For further research it is recommended to add indicators so that they can expand research observations easily for thorough.

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