EXAMINING THE LEVEL AND VARIATION IN THE EFFICIENCY OF COUNTY HEALTH SYSTEMS IN KENYA, AND HOW IT CAN BE IMPROVED

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June 13, 2019

ABSTRACT

The Ministry of health in the government of Kenya in a line with the big four agenda has been implementing various health sector reforms (for example, expansion and upgradation of public health facilities, provision of round the clock services in selected primary health centres and continuous availability of quality medicines decentralisation) in a bid to improve efficiency in health care. However, few attempts have been made to make an estimate of the efficiency of health systems in the Kenyan Counties. The government has chosen four pilot survey counties for the big four agenda on Universal health coverage. They include; Kisumu, Machakos, Nyeri and Kisumu County.

OBJECTIVES

The objectives of this study are:

1. To estimate the relative technical efficiency (TE) and scale efficiency (SE) of a sample of public hospitals in Counties in Kenya
2. To inform policy implications for health sector policy makers.

SPECIFIC OBJECTIVES

Among the commonly used inputs in the health systems' technical and scale efficiency measurement using DEA include the number of doctors, number of nurses, number of beds, number of other medical staffs, number of other non-medical staffs, number of total employed staffs, total expenditure, total non-labour cost, value of fixed capital and cost of drug supply.

As for the outputs in the county health systems' technical and scale efficiency, some of the commonly used for measurement including the total inpatients, average daily admission, number of outpatients, number of surgeries, number of deliveries, ALOS, BOR and total revenue.

For this study the researcher wants to give an example of how similar research can be done using DEA analysis.

VARIABLES OF INTEREST

Even though this study has identified the commonly used inputs and outputs in measuring county health systems' technical and scale efficiency, the researcher selected number of beds, number of labs and total budget allocation as inputs and number of births and total revenue as outputs. This was done while taking into account the objectives of the study and the available secondary data the researcher had access to at that time.

Variable	Description of Variable
Outputs	
Number of births	Reported Births by County, 2017
Total revenue	Annual County Governments Revenue , FY 2017/18
Inputs	
Number of beds	Health Facility Beds by County, 2017
Number of labs	Registered Medical Laboratories by County, 2017
Total Budget allocation	Consolidated County Governments Budget Allocation, FY 2017/18

TABLE 1: DESCRIPTION OF VARIABLES

Source : Statistical Abstract 2018

POPULATION

INTRODUCTION

The researcher in with the aim of examining the technical and scale efficiency of county health systems in Kenya will consider the target population as the 47 counties in Kenya. They include; Baringo County, Bomet County, Bungoma County, Busia County, Elgeyo Marakwet County, Embu County, Garissa County, Homa Bay County, Isiolo County, Kajiado County, Kakamega County, Kericho County, Kiambu County, Kilifi County, Kirinyaga County, Kisii County, Kisumu County, Kitui County, Kwale County, Laikipia County, Lamu County, Machakos County, Makueni County, Mandera County, Meru County, Migori County, Marsabit County, Mombasa County, Muranga County, Nairobi County, Nakuru County, Nandi County, Narok County, Nyamira County, Nyandarua County, Nyeri County, Samburu County, Siaya County, Taita Taveta County, Tana River County, Tharaka Nithi County, Trans Nzoia County, Turkana County, Uasin Gishu County, Vihiga County, Wajir County and West Pokot County.

Code	County	Former Province	Area (Squared km)	Capital
1	Mombasa (County)	Coast	212.5	Mombasa (City)
2	Kwale	Coast	8,270.3	Kwale
3	Kilifi	Coast	12,245.9	Kilifi
4	Tana River	Coast	35,375.8	Hola
5	Lamu	Coast	6,497.7	Lamu
6	Taita-Taveta	Coast	17,083.9	Mwatate
7	Garissa	North Eastern	45,720.2	Garissa
8	Wajir	North Eastern	55,840.6	Wajir
9	Mandera	North Eastern	25,797.7	Mandera
10	Marsabit	Eastern	66,923.1	Marsabit
11	Isiolo	Eastern	25,336.1	Isiolo
12	Meru	Eastern	6,930.1	Meru
13	Tharaka-Nithi	Eastern	2,409.5	Kathwana
14	Embu	Eastern	2,555.9	Embu
15	Kitui	Eastern	24,385.1	Kitui
16	Machakos	Eastern	5,952.9	Machakos
17	Makueni	Eastern	8,008.9	Wote
18	Nyandarua	Central	3,107.7	Ol Kalou
19	Nyeri	Central	2,361.0	Nyeri
20	Kirinyaga	Central	1,205.4	Kerugoya / Kutus
21	Murang'a	Central	2,325.8	Murang'a
22	Kiambu	Central	2,449.2	Kiambu
23	Turkana	Rift Valley	71,597.8	Lodwar

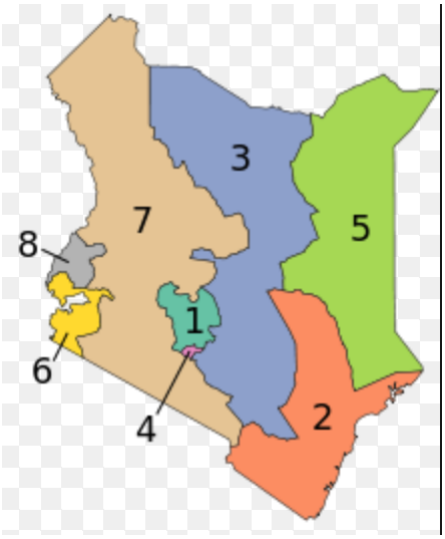

Figure 1: Counties by Provinces

Code	County	Former Province	Area (Squared km)	Capital
24	West Pokot	Rift Valley	8,418.2	Kapenguria
25	Samburu	Rift Valley	20,182.5	Maralal
26	Trans-Nzoia	Rift Valley	2,469.9	Kitale
27	Uasin Gishu	Rift Valley	2,955.3	Eldoret
28	Elgeyo-Marakwet	Rift Valley	3,049.7	Iten
29	Nandi	Rift Valley	2,884.5	Kapsabet
30	Baringo	Rift Valley	11,075.3	Kabarnet
31	Laikipia	Rift Valley	8,696.1	Rumuruti
32	Nakuru	Rift Valley	7,509.5	Nakuru
33	Narok	Rift Valley	17,921.2	Narok
34	Kajiado	Rift Valley	21,292.7	Kajiado
35	Kericho	Rift Valley	2,454.5	Kericho
36	Bomet	Rift Valley	1,997.9	Bomet
37	Kakamega	Western	3,033.8	Kakamega
38	Vihiga	Western	531.3	Vihiga
39	Bungoma	Western	2,206.9	Bungoma
40	Busia	Western	1,628.4	Busia
41	Siaya	Nyanza	2,496.1	Siaya
42	Kisumu	Nyanza	2,009.5	Kisumu(City)
43	Homa Bay	Nyanza	3,154.7	Homa Bay
44	Migori	Nyanza	2,586.4	Migori
45	Kisii	Nyanza	1,317.9	Kisii
46	Nyamira	Nyanza	912.5	Nyamira
47	Nairobi (County)	Nairobi (Province)	694.9	Nairobi (City)
			581,309.0	Nairobi

Table 2 : Distribution of Counties in Kenya

Source: wikipedia, 2009

Table 1, shows the distribution of counties in Kenya, their county code, former provinces, the area they cover in squared kilometres and their capitals.

FIGURE 1 : Distribution of Counties by Provinces in Kenya

Source: wikipedia, 2009

SAMPLING TECHNIQUE

The researcher opted to use the multi- stage sampling technique to sample from the total population. The first stage of the sampling was conducted by clustering the counties into their former provinces, that is; Eastern, Western, Rift valley, Northern- eastern, Nyanza, Nairobi, Central and Coast province. Then the research used clustered sampling technique to pick four provinces at random from the eight to avoid bias. And further selected one country from this using simple random sampling. In this case, the researcher picked Machakos county in Eastern province, Kakamega county in Western province, Nyeri county in Central province and Garissa county in Northern eastern province.

Code	County	Former Province	Area (Squared km)	Capital
7	Garissa	North Eastern	45,720.2	Garissa
16	Machakos	Eastern	5,952.9	Machakos
19	Nyeri	Central	2,361.0	Nyeri
37	Kakamega	Western	3,033.8	Kakamega

Table 3 : Distribution of Sampled Counties in Kenya

Source: wikipedia, 2009

ANALYSIS

DATA COLLECTION TOOLS

The researcher used mostly secondary data collection methods for this study. This was done by mainly collation of secondary data on inputs and outputs with the aim to determine the level of efficiency in the county health systems in Kenya.

The Statistical Abstract 2018 document was used to source the revalant data for this study.

DATA ANALYSIS PROCEDURE

The Data Envelopment Analysis (DEA) approach, a well-known operations research (OR) technique for relative efficiency evaluation of a set of similar decision making units (DMU), was used to estimate the efficiency of these county health systems.

FINDINGS, DISCUSSIONS AND RECOMMENDATIONS

The data on input and outputs is shown in the table 3 below.

	No_of_beds	No_of_labs	Total_budget_allocation(in_millions)	No_of_Births	Total_revenue(in_millions)
Machakos	1695	35	9990.18	23233	9990.18
Kakamega	1802	26	13169.96	38771	12115.98
Nyeri	1705	32	6832.72	15385	6794.65
Garissa	747	15	7851.1	11750	364.84

	No_of_beds	No_of_labs	Total_budget_allocation(in_millions)	No_of_Births	Total revenue(in_millions)
Kenyan Total	56728	1447	374685	923487	

TABLE 4 : THE VALUE OF VARIABLES BY SELECTED COUNTIES IN KENYA

Source : Statistical Abstract 2018

	Efficiency	Machakos	Kakamega	Nyeri	Garissa
Machakos	1.0000	1.0000	0.0000	0	0
Kakamega	1.0000	0.0000	1.0000	0	0
Nyeri	0.9944	0.6801	0.0000	0	0
Garissa	0.7311	0.0000	0.3031	0	0

TABLE 5: EFFICIENCY ANALYSIS

Source : The Researcher, 2019

It is clearly evident from the above table that Machakos and Kakamega Counties are efficient, on the other hand, Nyeri and Garissa County are not effiecient

So what improvement should we recommend to Nyeri and Garissa County (inefficient ones) so that they can perform at par with the efficient Counties? This can be done by using **shadow values** (lambda values from the above table, they are the variables related to the constraints limiting the efficiency of each unit to be no greater than 1). For the inefficient DMUs of Nyeri and Garissa County, the benchmarks DMUs are Machakos and Kakamega Counties and their corresponding shadow value are 0.6801 for Nyeri County. Therefore the recommendation for DMUP3 is as follows;

NYERI COUNTY

The table below show the analysis of efficiency for Nyeri County in Kenya for the variables of interest to this study. The findings are as shown in table 6 below.

Inputs and outputs		Machakos County		Nyeri County	
	Values	Lambdas	total		Excess use by Nyeri County or deficiency
Number of beds	1695	0.6801	1152	1705	553
Number of laboratories	35	0.6801	23	32	9
Total budget allocation (Million KES)	9990.18	0.6801	6794.32	6832.72	38.398582
Number of births	23233	0.6801	15800	15385	-415
Total revenue (Million KES)	9990.18	0.6801	6794.32	6794.65	0.33

TABLE 6 : EXCESS AND DEFICIENCY IN NYERI COUNTY, KENYA

Source : The Researcher, 2019

INTERPRETATIONS OF NYERI COUNTY FINDINGS

The table shows that as compared to Machakos County, health services in Nyeri County have 533 beds and 9 laboratories more. The analysis also reveals that the budget of Nyeri is Ksh. 38.398 million more than that of Machakos. Despite the Nyeri county having 415 less deliveries than Machakos county, they produce a total revenue of Ksh. 330,000 more as compared to Machakos county, holding other factors constant.

GARISSA COUNTY

The table below show the analysis of efficiency for Garissa County in Kenya for the variables of interest to this study. The findings are as shown in table 7 below.

Inputs and outputs		Kakamega County		Garissa County	
	Values	Lambdas	total		Excess use by Garissa County or deficiency
Number of beds	1802	0.3031	546	747	201
Number of laboratories	26	0.3031	7	15	7
Total budget allocation (Million KES)	13169.96	0.3031	3991.815	7851.1	3859.285
Number of births	38771	0.3031	11751	11750	-1
Total revenue (Million KES)	12115.98	0.3031	3672.354	364.84	-3307.514

TABLE 7 : EXCESS AND DEFICIENCY IN GARISSA COUNTY, KENYA

Source : The Researcher, 2019

INTERPRETATIONS OF GARISSA COUNTY FINDINGS

Table 7 shows the fact that, as compared to Kakamega County, Garissa County had 207 beds and 7 laboratories more in 2017. The analysis also reveals that the budget of Garissa County was Ksh. 3.859 billion shillings more than that of Kakamega County. In conclusion, while difference was one in the number of children delivered, the total revenue of Kakamega County was also Ksh. 3.308 billion more than that of Garissa County in 2017, holding other factors constant.

LIMITATIONS OF THE STUDY

The research gives caution on the conclusions of this document. This is because the study was conducted mainly to show that the research understood how to conduct efficiency studies and analysis. The major challenges in this study is that data was insufficient since the open source data sets available did not provide us with enough information to conclusively make confident policy recommendations.

Areas of Further Study

The researcher opts to advocate for both human, technical and financial infrastructure to diversely do extensive research on other technical and scale efficiency inputs, outputs and determinants of county health systems' efficiency.