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Technical Efficiency of Secondary Health Care Service Delivery in the Gambia

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ABSTRACT

This study is conducted with specific objectives: a) To measure the technical and scale efficiency of the health centers in the Gambia; b) To estimate the amounts of output increases and/or input reductions that would be required to make inefficient health centers more efficient. The study uses output-oriented variable return to scale Data Envelopment Analysis (DEA) method. The findings show that 9 (22%) health centers are efficient, 32 (78%) health centers are technically inefficient with an average technical efficiency score of 65% and standard deviation (STD) of 26%. Furthermore, 4 (10%) health centers are scale efficient, 37 (90%) health centers scale inefficient with an average scale efficiency score of 87% and standard deviation (STD) of 12%.The widespread inefficiency across the entire secondary health care service delivery system in the Gambia is alarming and the results suggest that health centers are using resources more than they actually need.

Key words: DEA secondary health care, technical efficiency, the Gambia

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Any remaining errors or omissions rest solely with the author(s) of this paper.

INTRODUCTION

An adequate health care service delivery is paramount for the development and well-being of all citizen irrespective of their ethnicity, religion and social status. The Gambian secondary health care service delivery system comprises of 41 public health centers countrywide. These health centers provide cheap, local and easily accessible health care for the poor as well as the rich in the districts they are located. The Gambia relies heavily on secondary health care in its fight against maternal and child mortality as well as the fight against HIV/AIDS, TB, Malaria and other communicable diseases. More importantly, the secondary health care service delivery of the Gambia is the first point of call for many patients across the country. Its close proximity to remote villages and towns makes it a suitable choice for people to rely on for health care. Despite the critical work performed by this sector in the Gambia, little is known in terms of its performance in relation to how well they utilize the resources allocated to them for service delivery.

The Gambia like any other developing nation in the world is faced with an increasing scarcity of resources for effective health care service delivery. The equitable and efficient allocation of government resources in the Gambia to the entire health sector is a pressing problem given the scarcity of resources. The Gambian government is responsible for health financing in the country at all levels in the public health sector. The government's health care financing has a further responsibility of coping with the double burden of both communicable and non-communicable diseases. World Bank (2013) has estimated that the entire Gambian health system receives approximately not more than 11% and 14% of the total government expenditure. As this is a significant share of the annual budget, there is a need to get the best from the millions of dollars of public expenditure on the health sector.

Motivated by this, the current study examines the overall technical efficiency of the Gambian secondary health care service delivery system. Therefore, this study is conducted with the specific objectives: a) To measure the technical and scale efficiency of the health centers in the Gambia; b) To estimate the amounts of output increases and/or input reductions that would have been required to make inefficient health centers efficient. For the purpose of this study, Data Envelopment Analysis (DEA) methodology was employed to determine technical efficiency scores for government secondary health care service delivery in the Gambia. Data Envelopment Analysis (DEA) has become the most famous statistical tool used to determine firm efficiency.

THEORETICAL BACKGROUND

In the past three decades, health care efficiency has emerged as an issue of great interest to many governments and private sectors. This rise in interest is basically geared towards meeting the desired expectations of citizens by satisfying their health care needs. A growing population coupled with increasing scarcity of health care resources make health care a challenge for governments across the world as they endeavor to meet public expectations of proper health careservice delivery. However, an efficient and productive health care system is needed to provide ethical, affordable and sustainable services to take care of the general public (Rasiah *et al*., 2011).For any health system to be able to deliver the goods, it has to be efficient during the service delivery process.

In recent years, there has also been a growing demand for quality service delivery in the health sector (Hsu 2010). Governments have seen the need for more robust action toward quality service delivery due to growing public interest in the way health institutions should be run. This action cannot be fulfilled without knowing the operationalization status of the entire health system. In other words, we first need to arrive at a definitive answer to the question of how productive and efficient public health facilities are during service delivery.

There is, however, debate about treating efficiency of resource utilization as a priority in the health care sector. This argument is based on the premise that health care service delivery systems are said to be non-profit organizations and may not exhibit a firm profit maximization characteristic. As such, it is said to be not too important for them to be efficient during the service delivery process (Hollingsworth *et al*., 1999). While the public service aspect of health care is of paramount interest, the proper management of resources is not antithetical to this notion, and creating efficiency ensures that the system can be run sustainably in the long term without a resource crunch. Citizens will prefer a health care delivery system, which is more efficient, less expensive and entails minimum waiting period. All these cannot be achieved unless the utilization of the already scarce health resources is maximized.

According to Moshiri *et al*. (2011), health care efficiency is a measure to determine the extent to which a health care facility is able to produce the maximum output using a certain amount of resources during a specific period. This basic idea shall be extended further to address the question of which health centers in the Gambiautilize given resources or inputs to produce output of maximum quality and quantity. Productivity growth and efficiency measurements in health care service delivery can be done in terms of measuring productivity change, technical and

allocative efficiency, which plays an important role in the evaluation of the health policies and help governments to make informed decisions (Kontodimopoulos *et al*., 2006). Biørn *et al*. (2003) states that this type of measurement also supports comparative analyses of the whole health care system in terms of performance and individual health center productivity.

In his pioneering study in 1957, Farell defined a simple measure of firm efficiency that could give a description for multiple inputs, based on the premise that technical efficiency is the ability of a firm to obtain maximal output from a given set of inputs. This definition of technical efficiency resulted in the development of methods for estimating technical efficiencies in the context of a profit oriented or non-profit oriented firm (Farell 1957).

Furthermore, DEA is a non-parametric linear programming technique and was first introduced by Charnes, Cooper, and Rhodes (CCR) in 1978. But it was not until 1984, when Banker, Charnes and Cooper actually formalized DEA has a suitable method for efficiency analysis. DEA as earlier described can be use to measure technical efficiency. This is due to the fact that itidentifies best practice within a given sample of firms and measures efficiency based on the differences between the determined DEA score and best practice score. DEA is used to determine a production or output frontier by constructing a piecemeal linear approximation of the efficient frontier, which in microeconomic terms can be call the frontier of an isoquant. Normally, this also involves enveloping that plots a distribution of sample points and constructs a kinked line outside. More importantly, cost information is not needed when using DEA for technical efficiency measurement.

LITERATURE REVIEW

Data envelopment analysis (DEA) is a popular analytical non-parametric method that has been used intensively by researchers all over the world for the past three decades. DEA method has also been widely employed in research on different health care service delivery systems, such as, general hospitals, acute hospitals, nursing homes, primary health systems, health centers and profit and non-profit organizations. The earlier literature on technical efficiency since the initial development of DEA in 1978 is dominated by research on American and European health care sectors.

However, there is a significant knowledge gap in the use of DEA in Sub-Saharan Africa due to the fact that limited literatures are found on health care performance studies in the region. These means that there is need for researchers studying health care in these countries to use methodologies, such as the DEA, to help in accurate analyses for proper utilization of the scarce health resources in the region. One of

the pioneering studies in this field was conducted by Kirigia *et al*. (2002) in Kenya to measure relative technical efficiencies of 54 public hospitals using the Data Envelopment Analysis (DEA) technique. The findings of the study revealed that 14 (26%) of the public hospitals were technically inefficient. The study provided concrete policy suggestions by singling out inefficient hospitals and measuring specific input reductions or output increases needed to attain technical efficiency.

Akazili (2008a) also conducted a study using the DEA method to estimate the technical efficiency of 89 randomly sampled health centers in Ghana. The aim was to determine the degree of efficiency of health centers and recommend performance targets for inefficient facilities. The findings showed that 65% of health centers were technically inefficient and using resources that they did not actually need. In another study, Akazili (2008b) again used the DEA method to calculate the technical and allocative efficiency of 113 randomly sampled health centers in Ghana. The study found that 78% of health centers were technically inefficient, and the health centers were 88% allocative inefficient and 90% overall inefficient. The results of both studies broadly indicated the grave issue of endemic inefficiency in the health care delivery system of public health centers and suggested that significant amounts of resources could be saved if measures were put in place to curb the waste.

Kirigia *et al*. (2001) conducted a study to evaluate the technical efficiency and productivity of a sample of public sector hospitals in three provinces in South Africa using the non-parametric techniques of DEA and DEA-based Malmquist Productivity Index (MPI). They found that 8 (47%) hospitals were technically inefficient, with an average TE score of 61%, while the magnitude of scale inefficiency was 59%. Zere (2000) also performed a similar study to evaluate the technical efficiency and productivity of a sample of public sector hospitals in three provinces in South Africa using the non-parametric techniques of data envelopment analysis (DEA) and DEA-based Malmquist Productivity Index (MPI).

Furthermore, Renner (2005) conducted a study to measure the technical and scale efficiency among a sample of public health units in Sierra Leone using DEA method. In this study, 22 (59%) of the 37 health units analyzed were found to be technically inefficient, with an average score of 63%, while 24 (65%) health units were found to be scale inefficient, with an average scale efficiency score of 72%. Osei *et al*. (2005) also used DEAto estimate both the relative technical efficiency (TE) and scale efficiency (SE) of a sample of public hospitals and health centers in Ghana. They found that 8 (47%) hospitals were technically inefficient with an average TE score of 61%, while 10 (59%) hospitals were scale inefficient, manifesting an average scale efficiency of 81%.

Similarly, Kirigia (2004) also did a study in Kenya, which found that 44% of public health centers were inefficient. Kirigia (2008) again employed DEA to

assess the technical and scale efficiency of health care centers in Angola. The author also estimated the productivity change over time using the Malmquist index. The study utilized a 3-year panel data from all the 28 public municipal hospitals in Angola. The findings showed that on average, productivity of municipal hospitals in Angola increased by 4.5% over the period 2000–2002. The author explained that the growth was due to improvements in efficiency rather than innovation.

As a leading researcher in the field of health care service delivery in Africa, Kirigia has authored studies that determine the degree of efficiency of the services and recommended policy actions to improve efficiency. Given the critical importance of health care in the continent, Kirigia (2004) makes the argument that this type of studies should be undertaken in the other countries in the World Health Organization (WHO) African Region with a view to empowering Ministries of Health to play their stewardship role more effectively.

Furthermore, the government of Sudan has shown deep interest in improving service quality as well as the maximal utilization of the national resources during service delivery. This is eveidently established when Ismail (2010) uses an output-orientatedDEAmodel to estimate the technical efficiency of health institutions across different states in Sudan for the year 2007. Theresultsshowedthat6statesoutof15weretechnicallyinefficientunderconstantreturns toscale(CRS),while5stateswereтechnicallyinefficientundervariablereturnstosca le(VRS). Of the6scaleinefficientstates, 3 stateswereoperatingunderdecreasing returns to scale (DRS) and the remaining 3 were operating under increasing returns to scale (IRS). The author concludes thattechnicallyinefficientstateshadexcess inputsandinsufficientoutputscomparedtoefficientstates. Given this, he suggests that the excesshealthresources not properly utilized by inefficient states should be transferred toother technicallyefficientstateswho have adeficitintheseresources. This is not to say that inefficient states should be ignored, instead he suggests that policymakerscouldimproveefficiencybycreatingdemandforhealthservicesinthe inefficientstates.Thiscouldbedonebyincreasingaccesstohealthinstitutions through redistribution of health institutions within each inefficient state.

METHODOLOGY AND DATA

Model Specification

This study uses an output-oriented Banker, Charnes and Cooper (BCC) Data Envelopment Analysis (DEA) model. This is because the application of the Charnes, Cooper and Rhodes (CCR) model, where units are not operating at an optimal scale, yields technical efficiency scores that are contaminated by scale efficiencies

(Dyson, 2001). In order to circumvent this problem, Banker, Charnes and Cooper (BCC) (1984) introduced a slight modification in the CCR model to come up with a BCC model that allows the estimation of pure technical efficiencies. It was for this reason that we estimated the following output-oriented variable returns to scale BCC model:

$$\text{Max TE } (u, v)\ H_o = {}_r y_{ro} + u_o$$

Subject to

$${}_i x_{ij} = 1$$

$${}_r y_{ro} - {}_i x_{ij} + u_o \leq 0 \qquad j = 1, 2, \ldots, n$$

$$U_r \geq \varepsilon \qquad r = 1, 2, \ldots, s$$

$$v_i \geq \varepsilon \qquad i = 1, 2, \ldots, m$$

U_o is unconstrained in sign

Using the above equation to determine the technical efficiency of a particular health institution as a Decision Making Unit (DMU), the formula above assumed the following description.

Let's say:

H_o = the efficiency score of health center 0;

x_{ij}= the amount of health center input i utilized by the j^{th} health center;

y_{rj}= the amount of health centers output r produced by the j^{th} health center;

v_i = weight given to health center input i;

u_r = weight given to output r

Where: ε is an insignificant non-Archimedean quantity greater than zero. A value of $u_o > 0$ implies increasing returns to scale; $u_o < 0$ means decreasing returns to scale; and $u_o = 0$ denotes constant returns to scale. Thus, the above BCC model permits both the separation of technical and scale efficiencies, and determination of whether individual health center's operations are in regions of increasing, constant or decreasing returns to scale.

The linear programming model shown above was used for identifying the relative technical efficiency scores of all the health centers in the study. However, DEA by default assigns weights to each health center 's inputs and outputs in a way that maximizes its technical efficiency score. A health center is considered to be technically efficient if it scores 1, implying 100% relative technical efficiency, whereas a score of less than 1 implies that it is relatively technically inefficient, compared to peers in its efficiency reference set.

Sampling and Source of Data

The Gambian health system operates a three tier system comprising tertiary, secondary and primary health care service delivery. The main focus of this study is on the secondary health care service delivery system. The secondary health care system is comprised of two categories, namely, major and minor health centers. These health centers perform both outpatient and inpatient services, and can equally admit patients for the purpose of minor surgery provided that there are qualified personnel. The Gambia has 35 minor and 6 major health centers countrywide. Secondary health care facilities can be found in almost every district in the country. Due to its close proximity to villages, the health centers provide easy access to health care services with minimal cost to the people in the areas in which they are located. Data for this study were derived from the records of the Ministry of Health and Social Welfare. Specifically, the study utilizes 2011 and 2012 data collected from the Health Management and Information System (HMIS) and the human resources deparment of the Ministry of Health and Social Welfare as shown in Table 1.

Table 1 Variables used in the study

Inputs		**Output**	
Labour	**Capital**	**Inpatient**	**Outpatient**
Average number of full time staff (skilled and unskilled) of each health center at the end of each year	Average number of beds in each health center at the end of the year	Total number of inpatients admitted in each health center at the end of each year	Total number of outpatients treated and discharged in each health center at the end of each year

The study covers 41 secondary health care service delivery facilities for a period of two years. The variables used consist of inputs of each health center during service delivery in the form of capital and labor, and outputs or the results of the use of inputs during service delivery. For capital, we used the average number of beds in the year in each health center, and this data was acquired through the review of annual reports of the health centers. Labor inputs are measured by using the number of people posted at each health center as of December of each year in the form of skilled and unskilled health care workers. Skilled health care workers are those who directly deliver health care services to patients (eg. Nurses of different categories, Doctors, Public Health Officers,Nurse Attendants, Lab Technicians, Pharmacists etc).Unskilled health care workers are those who provide support during health care service delivery process (eg. Laundresses, Health Labourers,

Data Entry Clerks, Cooks Watchmen, Drivers etc.). To avoid problems, we used staff employed on full time basis to measure labor input.

In the case of outputs productivity for each health center, inpatients and outpatients cases were used as two variables. Inpatients were measured looking at the total number of patients admitted in each health center within a year. Finally, the total number of output were derived from the Health Management Information System Database.

RESULTS AND DISCUSSION

A summary of the descriptive statistic of the inputs and output mix used in the study is presented in Table 2 below, showing the mean, standard deviation, minimum and maximum of the data used in this study. According to the data, the number of beds for all health centers in the Gambia for the two years ranges from 4 to 93, while the mean is 16.68 beds during the study period. Only 3 (7.32%) health centers have a total number of beds above 40 and the rest (92.68%) had beds ranging from 4 to 39. The mean staff level of the secondary health care service delivery of the Gambia during the study is 21.6 for skilled staff and 7.8 for unskilled staff. However, there can be vast disparities in the number of staff as itis evident from the analysis that the total number of staff per health center ranges from 7 to 134. This disparity may be due to the size, geographical location and the catchment area of the health center. The mean output for both inpatient and outpatient variables in the two years is 547.84 and 26596 respectively.

Table 2 Descriptive statistics of the input and output mix

	Minimum	**Maximum**	**Mean**		**Std. deviation**
	Statistic	**Statistic**	**Statistic**	**Std. error**	**Statistic**
Inpatient	1	4272	547.84	91.500	828.564
Outpatient	6277	129104	26596.00	2619.276	23718.551
Beds	4	93	16.68	1.835	16.613
Skilled staff	5	108	21.60	3.036	22.06
Unskilled staff	2	26	7.80	0.174	5.662

It is important to note that for a health center to be efficient, it must obtain a score of 1 (100%). This means that any health center with an efficiency score of less than 1 is referred to as inefficient. Therefore, efficiency scores ranges from 0 (meaning totally inefficient) to 1 (meaning efficient). Table 3 and 4 show a

wide range of efficiency scores from a minimum of 0.28 (28%) to a maximum of 1 (100%).

Table 3 Descriptive statistics of the DEA technical efficiency variable return to scale results

Efficiency scores	N	Minimum	Maximum	Mean	Std. deviation
VRSTE(overall)	41	.28	1.00	.6479	.26396
SCALE(overall)	41	.57	1.00	.8666	.11965

According to the results of the study, there is widespread inefficiency in the Gambian secondary health care service delivery as the mean efficiency score is 0.648 (64.80%) which is less than 1 (100%) and standard deviation of (26%). The results reveal a big gap between efficient and inefficient health centers, with the minimum score at (0.28) and the maximum at 1. Surprisingly, out of the 41 health centers, only 9 (22%) health centers are technically efficient based on variable return to scale approach. From the 32 inefficient health centers, 17 health centers have efficiency scores less than or equal to 0.50. The remaining 15 (47%) inefficient health centers have technical efficiency scores greater than 0.50 but less than 1(0.50<VRSTE<1). In total, only 15 (37%) health centers have efficiency scores above 0.80.

Table 4 Frequency distribution of DEA-Variable return to scale technical efficiency result for the 2 years

Efficiency scores	Frequency	Percent
≤ 0.500	17	41.5
0.501-0.600	4	9.8
0.601-0.700	3	7.3
0.701-0.800	2	4.9
0.801-0.900	4	9.8
0.901-0.999	2	4.9
1.00	9	22.0
Total	41	100.0

Looking at all the health centers collectively, this study shows that the secondary health care service delivery of the Gambia has performed relatively poor as only 36.7% have an efficiency score above 0.80. Moreover, out of the 26 inefficient health centers with efficiency score of less than 0.80, 9 (21.95%) health centers have efficiency score between 0.50 and 0.80, while 17 (41.5%) health centers

have efficiency scores of 0.50 and below. This clearly indicates that the secondary health care system in the Gambia is not performing efficiently.

Table 5 shows the regional comparisons of efficiency in health care centers across the Gambia.There are divergences in terms of productivity change and efficiency across the secondary health care delivery system in the Gambia.

Table 5 Results of the technical efficiency level for each Decision Making Unit (DMU)

Name of health centers	DMUs	TEVRS	SE	Pattern of scale inefficiency
Albreda	1	0.584	0.935	Irs
Baja Kunda	2	0.34	0.961	Drs
Bakau	3	1	1	-
Banjulnding	4	1	1	-
Basse	5	0.832	0.693	Drs
Brikama	6	1	0.623	Drs
Brikamba	7	0.692	0.976	Drs
Brufut	8	1	1	-
Bureng	9	0.641	0.891	Irs
Chamen	10	0.561	0.863	Irs
Dankunku	11	0.643	0.865	Irs
Diabugu	12	0.499	0.829	Irs
Essau	13	0.775	0.73	Drs
Fajikunda	14	1	0.825	Drs
Fatoto	15	0.356	0.989	Irs
Foday Kunda	16	1	0.566	Irs
Gambissara	17	0.899	0.923	Irs
Garawol	18	0.92	0.881	Irs
Gunjur	19	0.3	0.604	Drs
Illiassa	20	0.456	0.96	Irs
Janjanbureh	21	0.436	0.976	Irs
Kafuta	22	0.555	0.959	Irs
Kaur	23	0.944	0.938	Drs
Kerewan	24	0.596	0.943	Drs
Kerr Cherno	25	0.48	0.844	Irs
Kiang Karantaba	26	0.323	0.776	Irs
Koina	27	1	0.749	Irs
Kudang	28	0.294	0.844	Drs
Kuntair	29	0.404	0.962	Drs
Kuntaur	30	0.468	0.733	Drs

Table 5 (Cont.)

Name of health centers	DMUs	TEVRS	SE	Pattern of scale inefficiency
Kwinalla	31	0.314	0.919	Irs
Ngenyen Sanjal	32	0.454	0.926	Irs
Old Jeshwang	33	0.275	0.98	Drs
Salikenni	34	0.277	0.981	Drs
Sami Karantaba	35	0.702	0.853	Irs
Sara Kunda	36	0.396	0.923	Irs
Serrekunda	37	1	0.757	Drs
Sintet	38	0.446	0.679	Irs
Soma	39	0.864	0.761	Drs
Sukuta	40	1	1	-
Yorobawol	41	0.838	0.914	Irs
Mean		**0.648**	**0.867**	

Based on regional analysis, the Gambia is divided into 7 health regions. According to the results of the study, West Coast 1 health region outperforms all other health regions with a mean technical efficiency score of 0.896 as shown in Table 5. Out of the 9 efficient health centers, 6 (66.67%) are all from the same health region (West Coast 1 Health Region). In terms of scale efficiency, only 4 (9.76%) health centers are scale efficient and are all from the West Coast 1 health region. Among the scale inefficient health centers, 16 (43.24%) health centers exhibit decreasing return to scale (drs) while 21 (56.76%) exhibits increasing return to scale.

Table 6 Average regional efficiency levels

Name of region	Number of health centers	Variable return to scale technical efficiency level	Scale efficiency level
Central River Health Region	8	0.606	0.911
Lower River Health Region	4	0.509	0.787
North Bank East Health Region	5	0.538	0.930
North Bank West Health Region	4	0.562	0.863
Upper River Health Region	9	0.685	0.846
West Coast Health Region 1	7	0.816	0.919
West Coast Health Region 2	4	0.714	0.736

On the pattern of scale efficiency, only 4 (9.76%) health centers were scale efficient while 37 (90.24%) health centers were scale inefficient. Among the scale inefficient health centers, 16 (43.24%) health centers exhibited decreasing return to scale and 21 (56.76%) health center had increasing return to scale.

The results of the study points to huge inefficiencies in the secondary health care service delivery of the Gambia as only 9 (22%) health centersare efficient and have passed the efficiency benchmark. The low efficiency scores of the health centers in the Gambia imply that more inputs are unnecessarily used during the delivery process without generating the optimum output. Further, it is suggested that 78% of the health centers that were operating inefficiently can increase their output with the current inputs in stock. Therefore, the study is in line with many other studies performed in Sub-Saharan Africa such as Kirigia *et al*. (2001), Kirigia *et al*. (2004), Kirigia *et al*. (2002), Zere *et al*. (2006), Osel *et al*. (2005), Akazili *et al*. (2008) and Jehu-Appiah *et al*. (2014).

Furthermore, the study revealed that the health care system in urban regions performed more efficiently. This is in line with many technical efficiency studies performed in Africa that have shown similar results (Ismail, 2010, Zere *et al*., 2006, Osel *et al*., 2005, and Akazili, *et al*., 2008). In fact, out of the 7 health centers in the urban region, all the 6 were efficient while only 1 was technically inefficient during the period of this study.

The poor performance of this particular health center may be due to limited inpatient services provided during the period of study. However, it may also be due to the proliferation of private clinics in the region recently. Another possible reason may be the opening of a new public hospital (Serrekunda Hospital) in the same catchment area which is expected to attract more patients from the region and beyond. Indirect competition between the hospital and "Old Jeshwang" health center has left the latter with no option but to serve as an immunization center with minimal inpatient and outpatient services to the people living in the surrounding area. Despite the location of the health center in a densely populated urban settlement, it could not perform efficiently as expected due to this deficiency. This should be a cause of alarm as the country battles to tackle both communicable and non-communicable diseases while facing serious scarcity of resources. Moreover, this is at a time when the country's budget allocation to the health sector is up to 30% the total health expenditure according to World Bank (2012) and National Health Account (2013). These inefficiencies should be addressed if the Gambian health sector is to improve and make the best use of already available resources.

The results show that 16 (94%) health centers with efficiency scores less than 0.50 are either located in remote villages or towns in the rural areas. The locations of these inefficient health centers are strategic, but access is a problem for some communities. It is difficult for some individuals in the rural areas as they have to travel long distances to seek health care coupled with poor road and river transportation network in such areas, people are less motivated to seek treatment in these health centers. Furthermore, it is generally acknowledged that rural communities in Africa are normally poor with wide spread illiteracy and entrenched belief in traditional medicine (Sender and Smith, 2010; Dinkelman, 2011; O'Laughlin *et al*., 2013). These circumstances hamper the adoption of modern medicine within the rural set up.

The dominant type of scale inefficiency across the DMUs is the increasing return to scale accounting for 21 (56.76%) scale inefficient health centers. This indicates that all these 21 (56.76%) scale inefficient health centers can increase their current output without reducing or adding any inputs.

Table 7 Output increases and/or inputs reductions needed to make individual inefficient health centers efficient

Name of health centers	Outputs targets		Inputs target		
	Inpatient	Outpatient	Beds	Skilled staff	Unskilled staff
Albreda	419.685	27015.7	6	17	6
Baja Kunda	776.761	43931.12	18	12	4
Bakau	135	43368	12	11	3
Banjulnding	523	33368	4	27	8
Basse	3093.079	63664.79	61	58	13
Brikama	4272	87806	93	108	26
Brikamba	379.87	41839.19	11	18	4
Brufut	674	34633	13	20	7
Bureng	563.353	24760.17	7	19	6
Chamen	201.039	29603.65	10	8	3
Dankunku	219.394	24222.03	8	10	2
Diabugu	472.603	19743.2	8	13	3
Essau	2540.46	52348.6	46	33	8
Fajikunda	1806	95318	30	66	19
Fatoto	1427.774	35700.02	21	10	7
Foday Kunda	94	9528	5	3	4
Gambissara	418.129	26325.43	8	12	5
Garawol	652.204	22373.87	11	6	8

Name of health centers	Outputs targets		Inputs target		
	Inpatient	Outpatient	Beds	Skilled staff	Unskilled staff
Gunjur	513.047	52873.81	16.013	19	8
Illiassa	589.754	29939.33	10	13	5
Janjanbureh	144.138	39522.48	11	9	5
Kafuta	311.73	33373.15	10	9	6
Kaur	797.615	34696.85	9	21	9
Kerewan	1346.846	37354.54	19	15	5
Kerr Cherno	174.923	22939.85	7	10	3
Kiang Karantaba	243.951	19415.69	5	11	6
Koina	497	11972	9	7	6
Kudang	276.211	47758.14	13.521	13	7
Kuntair	475.123	42674.43	12	15	8
Kuntaur	737.863	52120.9	18.232	20	6
Kwinalla	232.71	29248.12	8	12	4
Ngenyen Sanjal	334.576	28243.07	8	12	5
Old Jeshwang	330.097	39124.11	8	21	6
Salikenni	480.823	41162.8	14	12	3
Sami Karantaba	302.179	21352.07	7	11	3
Sara Kunda	391.55	27542.39	10	8	4
Serrekunda	210	60378	11	60	17
Sintet	517.909	18054.82	11	6	2
Soma	1621.051	38839.22	24	62	19
Sukuta	1951	40278	30	22	10
Yorobawol	673.978	25411.96	11	10	6

In addition, 70% of the health centers can improve on their efficiency levels by increasing their output with the current inputs level available to them. However, only 3 (9%) health centers among the inefficient health centers need downsizing by reducing the number of inputs used during service delivery process.

Furthermore, to make sure that the inefficient health centers are made efficient, the Gambian government through the Ministry of Health and Social Welfare should upgrade the services offered by the secondary health care service delivery to increase demand. This means that the secondary health care service delivery needs to be more equipped to be able to perform certain minor surgeries at their level. This will not only improve people's perceptions of the capacity of their local health care centers but will equally reduce the burden on referral hospitals.As a matter of fact, increasing output means seeing more patients using the same input mix.

This means that health centers can increase output by attracting more patients with the current services they offer. Moreover, increasing output also means increasing demand, which maybe a problem given the fact that health centers are not tasked to look for patients. Instead, it should be patients who should be seeking treatment in health centers. However, health education activities should be strengthened to encourage citizens to seek treatment in public health centers as they provide a cheaper alternative.

CONCLUSION

The results of the study suggested that, on average, health centers are using more inputs than they actually need during service delivery process. The widespread inefficiency across the entire secondary health care service delivery of the Gambia is really alarming and needs to be improved. The study has shown that only (9) 22% of the health centers in the Gambia are efficient. This finding is in line with many studies conducted in Africa (Kirigia *et al*. 2001, Kirigia *et al*. 2004, Kirigia *et al*. 2002, Zere *et al*. 2006, Mastle *et al*. 2007, Osel *et al*. 2005, Akazili *et al*. 2008 and Jehu-Appiah *et al*. 2014). The consequences of this inefficiency in health care provision in the Gambia given the scarcity of resources in the health sector is of serious concern.

According to the results of the study, the pattern of scale inefficiency should be critically and carefully analyzed. As such, the results can be generalized and be used for any future referencing on this topic. This will provide the health sector policy makers as well as regional health directors with a principle or guideline so that they can improve the efficiency of all the Decision Making Units (DMUs). This can be done by separating the pattern of scale efficiency of the inefficient health centers. Meaning all the health centers, which display increasing return to scale pattern can be improved by up-sizing, while those with decreasing return to scale pattern can be improved by down-sizing. As such, each inefficient health center should be analyzed separately so as to make them efficient.

There is need to restructure and reclassify the secondary health care service delivery system so as to apportion the resources more judiciously according to the performance of the center and not on the basis of its major or minor status. This can be done by rewarding thoseminor health centers which perform well with more resources. Health centers that have a huge coverage area both in terms of land and population should be upgraded so that there will be equitable availability ofservices across the regional and demographic spectrum.

The Ministry of Health and Social Welfare should perform a benchmarking exercise in the secondary health care sector. This should be done to help

policymakers to monitor and evaluate the performance of each individual health center compared to the standards provided. It will also help them to verify the judicious use of scarce health resources at different centers for amore sustainable and cost-effective system.

In trying to improve the performance of the entire secondary health care sector, policymakers should encourage study tours among regional health directorates across the country. The inter-regional experience sharing is very important as it will promote and enhance knowledge transfer within the health sector helping less efficient centers to learn from others. This type of interaction will also promote healthy discussion of thevarious issues surrounding health care service delivery and foster healthy competition between different regions.

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