Technical Efficiency of Hospitals Owned by Faith Based Organisations in Kenya

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Abstract

The desired goal for Kenya's Vision 2030 and the millennium development goals are to provide efficient and reliable healthcare that will reduce child mortality, improve maternal health and combat HIV/AIDS, Malaria and other diseases. Kenya's health care sector is among the most inefficient globally with high disease prevalence, high mortality rates, poor access to healthcare services and corruption. Hospitals owned by faith based organisations in Kenya play a key role in healthcare provision and contribute to about 40% of all private healthcare needs. This paper employs the Data Envelopment Analysis to unravel the technical efficiency of hospitals owned by faith based organisations in Kenya. Input orientation is adopted where the input variables are: medical officers, nurses, beds and cots and an aggregate of other hospital workers. The number of inpatients and outpatients recorded annually are considered as the output variables. Data obtained from the Kenya Conference of Catholic Bishops, the Christian Health Association of Kenya, the Supreme Council of Kenya Muslims and the Ministry of Health Master Facility List is used. Results indicate that 36.67 percent of faith based organized hospitals are inefficient. This paper concludes that if they would operate as a group, their technical efficiency would be 79 percent.

Key words: Technical Efficiency; Data Envelopment Analysis.

Introduction

The major problems facing Kenya after the colonial administration were ignorance, diseases and abject poverty (Republic of Kenya, 2008). The independence government embarked on promoting coverage and access to healthcare services. Consequently by 1980, hospitals owned by Faith Based Organisations played central role in healthcare provision characterised by higher accessibility and affordability. Health indicators showed rising fertility rates reaching averagely 8.1 births for women in their fertility ages in the 1980s (Republic of Kenya, 1994). However there was a considerable drop to 5.4 by 1992 while by 2010 the total fertility rate was recorded at 4.6. This could be attributable to pronounced population check measures alongside the prevalence of HIV/AIDS epidemic. Infant mortality went down from 98 deaths per 1000 live births between 1974 and 1977 to around 63 deaths per 1000 live births by 1993. By early 1990's the crude death rate had dropped from the 20 per 1000 births recorded at independence to 12 per 1000 while the crude birth rate dropped from 50 per 1000 population to 46 per 1000 in the same period (Owino, 1997). In 2013, crude death rate stood at 8.19 per 1000 while the crude birth rate stood at about 40 in the same year thus giving a natural rate of increase of about 31.81 per thousand population (World Bank, 2014). Child mortality was recorded at 93.2 deaths per 1000 live births by 1993, (Republic of Kenya, 1994; 1999). UNICEF data indicate that in 2012, the under-five mortality rate stood averagely at 73.

(Korir, 2010) asserts the existence of inefficiency in the health sector and that between Kshs. 1 billion and 1.4 billion in financial terms would be salvaged if public hospitals as a group operated efficiently. Efficiency measurements in health care are hence a vital component in policy formulation and implementation. Despite numerous health sector reforms and relatively sufficient financing anchored on efforts to solve inefficiency, little has been achieved in levelling efficiency in the Kenyan healthcare sector (Republic of Kenya, 1994).

Health care in Kenya is provided by both the public and the private sectors. Of the 1440 private health facilities[1] recorded in 2010, 75 were hospitals owned by faith based organisations (Korir, 2010). The Christian Health Association of Kenya, (CHAK) oversees 15 hospitals, the Kenya Conference of Catholic Bishops, (KCCB) oversees 49 hospitals while the Supreme Council of Kenya Muslims, (SUPKEM) runs 11 hospitals (The Republic of Kenya, 2012)[2].

While non-governmental providers are significantly important accounting to about 50% of all hospitals in Kenya and 36% of total available hospital beds, 40% of these are owned by faith based organizations (World Bank, 2010). They offer specialized healthcare with subsidized user fees and ambient health financing mechanisms demystified by the ability to make central decisions at unit levels with less bureaucracy (Collins *et al*, 1996).

Hospitals owned by faith based organizations largely depend on donor funding and government subsidy for their operation. However, in the recent years, donor funding in general has significantly reduced while regulations by the donor countries have been heightened to facilitate efficient utilization of the donations (Karlstedt, 2010).

Government expenditure on health has remained relatively dismal with targets such as the Abuja declaration[3] having not been met more than a decade on owing to poor governance, high poverty levels, inconsistency in donor funding and general treasury reluctance (World Health Organization, 2011). Figure 1 shows the trend in government financing as a percentage of total budget estimates to health since 1995 to 2011 and the 15% threshold set at the Abuja declaration.

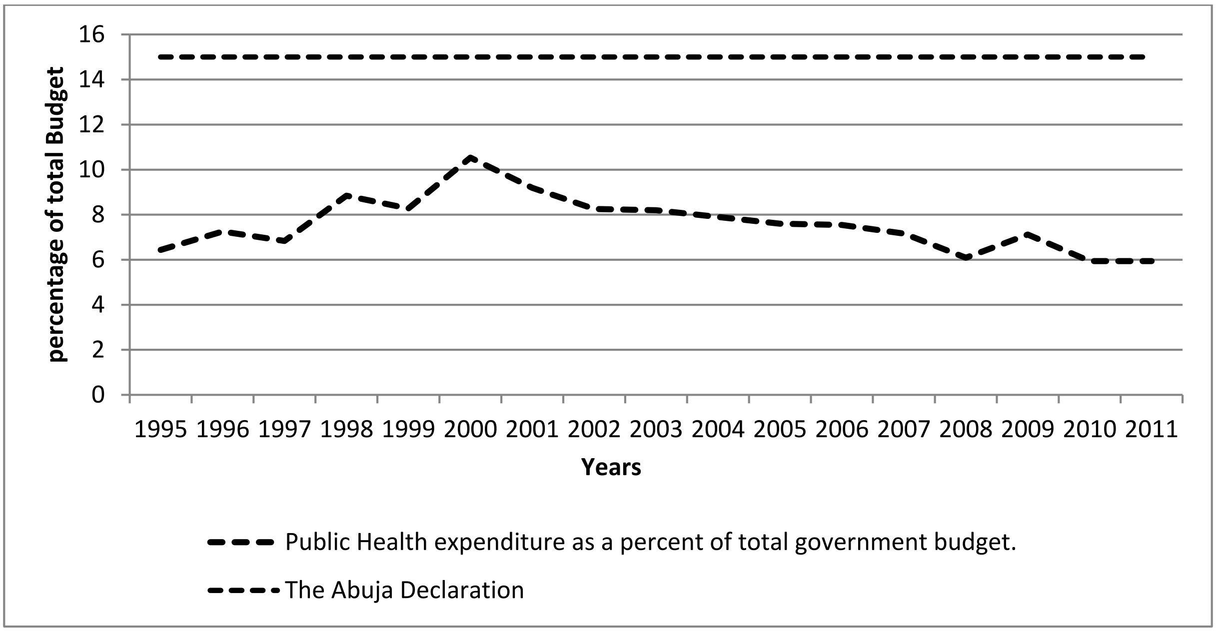

Figure 1.1: Kenya public health expenditure as a percentage of total government budgets.

Note the rising proportion of healthcare financing since 1995 up to 2001 (Abuja declaration) where the share of GDP directed to healthcare declines considerably from 11% to about 6% further from the envisioned 15%.

Health sector personnel are also highly unequipped, unequally distributed and few relative to population density. There is therefore need for the healthcare providers to ensure efficient use of the donor funds, government subsidies and employment of the already scarce health personnel not only for better health care provision but also to ensure continued support. Figures 2 and 3 represent the comparison of the approximate number of doctors and nurses operating in Kenya County Governments both in the public and private health facilities and the minimum required doctors and nurses, as per WHO thresholds, in regard to the population densities in those counties respectively.

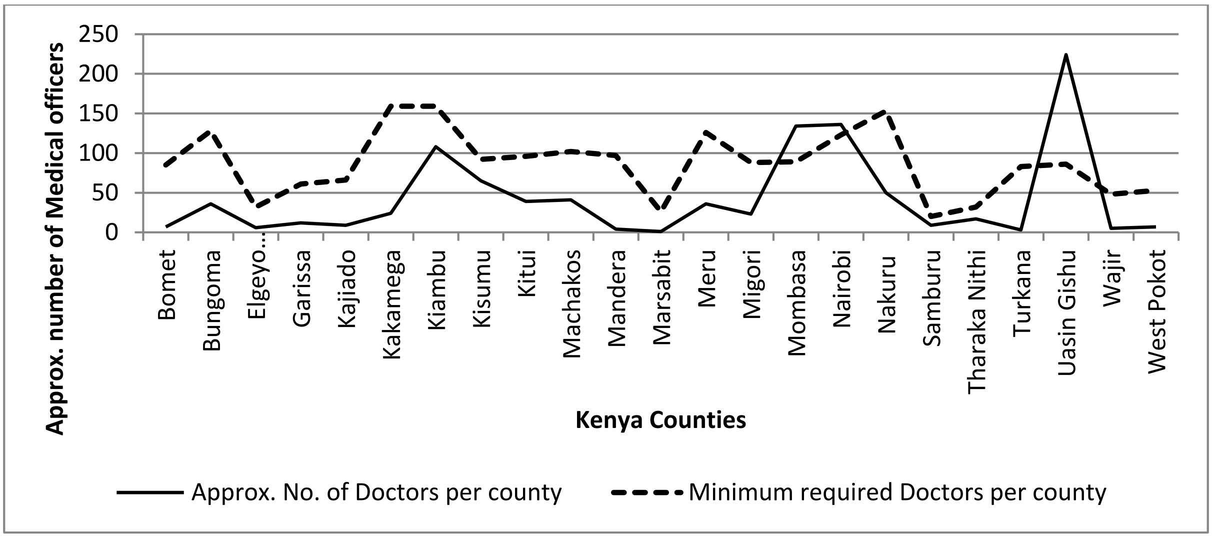

Fig 1.2: Approximate number of doctors against the minimum required in various Kenya counties. Source: Kenya Economic Report, 2013.

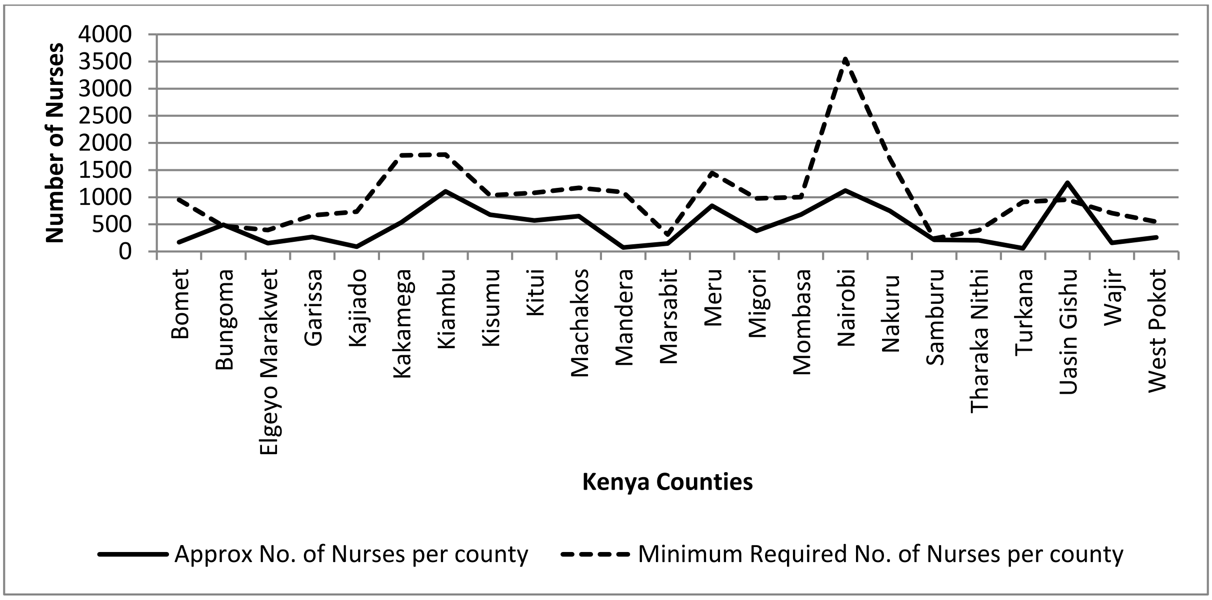

Fig 1.3: Approximate number of nurses against the minimum required in various Kenyan counties. Source: Kenya Economic Report, 2013.

Various governments have grappled with reversals and gains in health system instrumentation with major policies being implemented and amended. This paper, by employing the Data Envelopment Analysis[4] (DEA) technique, seeks to show the technical efficiency scores of hospitals owned by faith based organisations and to which if addressed could assist in Kenya's healthcare provision goals.

The remainder of the paper is designed as follows: section 2 sheds light on the theoretical and empirical underpinnings of DEA and its application while section 3 and 4 deal with the methodology and data source (sections 5 and 6 discuss the results and presents the concluding remarks).

Efficiency Measurement of Healthcare Units

Firm efficiency consists of a comparison between observed and optimal values of its outputs and inputs (Lovell, 1993). Following the works of (Debreu, 1951) and (Koopmans, 1951), (Farrell, 1957) defines a simple measure of firm efficiency that could account for multiple inputs and multiple outputs. Firm efficiency consists of two components: technical efficiency, which simply reflects the ability of a firm to obtain maximal output from a given set of inputs, and allocative efficiency, which basically reflects the ability of a firm to use the inputs in optimal proportions, given their respective prices and the production technology, (Farrell, 1957). The combination of the two measures provides a unit measure of total economic efficiency. Whereas there are two approaches to understanding the technical efficiency of firms, this paper employs the input oriented approach anchored on the assumption that the choice of which hospital to visit remains in the spheres of a given patient. The input orientation DEA seeks to radially contract the use of inputs while still remaining able to produce the same output. For instance, a given hospital could be able to restructure the composition of its labour and capital inputs while still recording the same number of outpatients and inpatients annually.

Other methods that can be employed to estimate efficiency of hospitals include the Stochastic Frontier Analysis (SFA). This assumes a stochastic functional form to the frontier and thus employs econometric techniques in obtaining the coefficients. Even though Stochastic Frontier Analysis takes into account the stochastic noise in the data, the initial process to specify a functional form is computationally challenging (Gachanja *et al*, 2013). It is however fundamental in conducting conventional tests of hypotheses. DEA on the other hand dominates the non-parametric methods of estimating efficiency. The overarching advantages of employing DEA over other methods include; firstly, it is computationally simple and has the advantage that it can be implemented without specifying the frontier functional form, secondly, DEA focuses on each decision making unit in contrast to population averages thus producing a single efficiency measure for each decision making unit (Kirigia, 2013), thirdly, DEA can adjust for exogenous variables that are beyond the control of the decision making unit. Such adjustments have a strong bearing on efficiency levels of decision making units. For instance, a health facility may be ranked inefficient based on its inputs and outputs while say climate, civil unrest by workers or general political instability characterized the health sector. In themselves, the exogenous variables contract to causes of inefficiency (Kirigia, 2013). In its variable returns to scale (VRS) method, DEA does not require a priori knowledge of prices for the inputs and outputs so as to compute allocative efficiency of decision making units. Hence, tests comparing the sensitivity of Stochastic Frontier Analysis results against those of DEA using the same data have revealed consistency with the inefficiency scores yielded by DEA being lower than those yielded by SFA (Korir, 2010).

Empirical Literature

Adoption and use of the Data Envelopment Analysis (DEA) technique is gaining popularity in the third world countries and beyond. (Kirigia, 2001) investigated the technical efficiency of 155 primary health care clinics in Kwazulu-Natal province of South Africa using Data Envelopment Analysis. The study observed that 47 (30%) were technically efficient while the remaining 70% were inefficient. Among the 108 technically inefficient clinics 17 (16%) had technical efficiency score of less than 50% indicating to large extent, underemployment of the inputs. This applied to Kwazulu-Natal clinics which had decreased input by 417 nurses and 457 general staff. At the same time, output had increased by 115,534 antenatal visits, 1,010 births (deliveries), 179,075 child care visits, 5702 dental visits, 121,658 family planning visits, 36032 psychiatric visits, 56068 sexually transmitted diseases visits and 34270 tuberculosis visits during the study period. This study concluded that there was the need for more detailed studies in a number of relatively efficient clinics to determine why they are efficient with a view to documenting determinants of their efficiency (Kirigia, 2001).

(Kirigia *et al,* 2004) carried out a study on the efficiency of public health centres in Kenya. The findings of the study showed that 44% of Kenya's Public Health Centres were technically inefficient. Those that were technically efficient were 56% of the total. Inefficiencies were attributable to other external factors out of the study explanatory variables such as corruption, poor budgeting and delayed supply of consumables.

(Masiye *et al*, 2006) estimated the technical, allocative and cost efficiency among 40 health centres in Lusaka, Central and Copper-Belt provinces of Zambia. 58% were government owned and 42% private-for-profit enterprises. The study used the numbers of clinical officers, nurses and other staff as inputs, and the number of outpatient visits as output. The average technical efficiency, allocative efficiency and cost efficiency scores for the private health centres were 70%, 84% and 59%, respectively. These scores were 56%, 57% and 33%, respectively, for public health centres[5]. For the whole sample, the averages were 61.9% for technical efficiency, 68.5% for allocative efficiency and 44.5% for cost efficiency. Out of the 17 private health centres, 5 had a technical efficiency score of 100 and 4 had allocative efficiency and cost efficiency scores of 100%. Contrastingly, only 1 of the 23 government health centres had all the efficiency scores of 100%. This is an interesting outcome that may require further interest in research.

(Amado and Santos, 2009) assessed the performance of 337 health centres in Portugal in 2005. Assuming an input orientation of DEA, the study considered the inputs as doctors, nurses, administrative and other staff. The outputs were family planning consultations, maternity consultations, consultations by patients grouped in ages of 0-18, 19-64, and 65 and above, home doctor consultations, home nurse consultations, curatives and other nurse treatments, injections given by a nurse, and vaccinations given by a nurse. The mean technical efficiency score was 84.4%.

(Kirigia, 2010) using the Data Envelopment Analysis (DEA), investigated the technical and scale efficiency of hospitals in the republic of Benin. A sample of 23 hospitals from a zone in the Republic of Benin with data over a period of five years, 2003 – 2007, was considered.

From the study, the yearly analysis revealed that 20 (87%), 20 (87%), 14 (61%), 12 (52%) and 8 (35%) of the hospitals were inefficient in 2003, 2004, 2005, 2006 and 2007 respectively and they needed to either increase their output or reduce their input in order to become technically efficient. The average variable returns to scale (VRS) technical efficiency scores were 63%, 64%, 78%, 78% and 88% respectively during the review period. The study also depicted that there was some window for providing out-patient curative and preventive care and in-patient care to extra patients without additional inputs. This would entail leveraging of health promotion approaches and lowering of financial barriers hindering access to health services, to boost the consumption of underutilized health services, especially health promotion and disease prevention.

Korir (2010) worked to measure the efficiency levels of different categories of public hospitals in Kenya. Using DEA and Stochastic Frontier Analysis to estimate cost efficiencies the paper found out that productivity in Public Hospitals (PH) in Kenya increased over time while both the Stochastic Frontier Analysis, (SFA) and Data Envelopment Analysis, (DEA) measures of scale efficiency of 20 public hospitals depicted that the average actual costs of the hospitals exceeded the minimum cost by 34.31% and 27.40% respectively. If the public hospitals as a group were operating efficiently, the savings in financial terms would have been over KES 1 billion annually.

Sebastian and Lemma (2010) in the study of efficiency of the health extension programmes in Tigray, Ethiopia estimated the technical efficiency of 60 health posts. The inputs that were employed included, the number of health extension workers and the number of voluntary health workers. The outputs were health education sessions given by health extension workers, pregnant women who completed three antenatal care visits, child deliveries, number of persons who repeatedly visited the family planning service, diarrheal cases treated in children under five and malaria cases treated. The study revealed that fifteen (25%) health posts were technically efficient and 38(63.3%) were operating at their most productive scale size.

In an effort to unravel the technical efficiency of primary health units in Kailahun and Kenema districts of Sierra Leone, (Kirigia *et al*, 2011) estimated the technical efficiency of samples of community health centres (CHCs), community health posts (CHPs) and maternal and child health posts (MCHPs). The study employed the Data Envelopment Analysis approach on 36 MCHPs, 22 CHCs and 21 CHPs using input and output data of 2008. The findings of the study revealed that77.8% of the MCHPs, 59.1% of the CHCs and 66.7% of the CHPs were variable returns to scale technically inefficient. The study further revealed significant technical efficiencies in the use of health system resources among peripheral health units in kailahun and Kenema districts of Sierra Leone. As such, the study concluded that there is need to strengthen national and district health information systems to routinely track the quantities and prices of resources injected into the health care systems and health service outcomes to facilitate regular efficiency analyses.

It is surprisingly of interest that much of the research around healthcare systems efficiency has ignored facilities owned by non-government entities. Apart from (Masiye *et al*, 2006) that attempted to measure at least 42% of its sample as privately owned health facilities, all the other studies have concentrated on public health facilities in different parts of the world. Hence, justifications for the inclination towards public health sector are scanty. Public health sector has barely over 50% of coverage to the entire world's health care demands (World Development Report, 1996). The other approximate 50% of the demand is anticipated to be complemented by the private sector. It is therefore a big oversight that studies endeavoring in efficiency measurements for private facilities continually become scanty. The vision for universal access to quality and efficient health care for Kenyans by 2020 can only be achievable if all heath sector stakeholders participate in the process of quality and efficient service delivery. The world's millennium development goals to reduce infant mortality, improve maternal health care and combat HIV/AIDS, Malaria and other diseases require efficient allocation of health care resources by all healthcare facilities.

Methodology

The key construct of a Data Envelopment Analysis model is the envelopment surface (Charnes *et al*, 1995). The efficiency projection path to the envelopment surface will differ depending on scale assumption and the nature of the model; whether output or input-oriented depending on the optimization process characterizing the firm.

For health facilities, the input-oriented model is appropriate to determine how much input-mix the hospital would reduce and still obtain the same output level. This is based on the assumption that the decision to use a particular hospital or not, is the full discretion of the patient. In such a case, output, therefore, is an exogenous variable that the hospital management has no control over. (Banker *et al*, 1984) and (Coelli *et al*, 2005) postulate that the DEA is a relative measure of efficiency where the general problem is stated in the form of constant returns to scale (CRS). This paper sets off in the spirit of (Coelli *et al*, 2005) to state the (DEA) linear programming process as:

$$Max_{X_o} = \sum_{r=1}^{s} \varphi_r \, y_{rj_o}$$

Subject to: (1)

$$\sum_{r=1}^{s} \varphi_r y_{rj_o} - \sum_{j=1}^{m} \lambda_i \, x_{ij_o} \leq 0$$

$$\sum_{j=1}^{m} \lambda_i \, x_{ij_o} = 1$$

$$\varphi_r \lambda_i \geq 0$$

$$j = 1, \dots \dots n$$

Where: y_{rj_o} is the amount of output r from hospital j x_{ij_o} is the amount of input i to hospital j. φ_r is the weight given to output r, λ_i is weight given to input I,n is the number of hospitals, s is number of outputs and m is number of inputs.

Also referred to as the multiplier form, this model indicates the general presentation of the constant returns to scale DEA. Whereas the first constraint seeks to subject that all efficiency measures be less than or equal to one, the second constraint is imposed to make the number of the possible solutions finite.

In employing the input orientation of DEA, this paper assumes the dual of the generic DEA linear programming problem that seeks to radially reduce the use of inputs while at the same time producing the same output. Therefore, using duality, it is possible to obtain an equivalent form of the generic DEA model as below (2).

$$Min_{\emptyset\lambda}\ \emptyset$$

$$Subject\ to: (2)$$

$$\begin{gathered} -q + Q\lambda \geq 0 \\ \emptyset x_i - X\lambda \geq 0 \\ \lambda \geq 0 \end{gathered}$$

Where ϕ is a scalar whose value once obtained shows the efficiency score for the *i*th hospital. It satisfies$\phi \leq 1$, with a value of one indicating a point on the frontier which implies that the hospital in consideration is technically efficient (Farrel, 1957). λ is a 1x1 vector of constants. Also, the linear programming must be solved (I) times, once for each firm in the sample. Hence, a value of ϕ will be obtained for each firm. The intuition behind linear programming model (2) above is that the problem seeks to radially contract the input vector, x_i as much as possible, while still remaining within the feasible input set. The inner boundary of this set is a piece-wise linear isoquant which is determined by the observed data point (i.e. all the firms in the sample size); the radial contraction of the input vector, (x_i) produces a projected point $(x\lambda, Q\lambda)$on the surface of this technology. This projected point is a linear combination of these observed data points. The constraint in the problem ensures that this projected point cannot lie outside the feasible set. According to (Fare *et al*, 1994), the production technology associated with the linear programming problem above is given as $T = \{(xq): q \leq Q\lambda, x \geq X\lambda\}$. Furthermore, according to (Fare *et al*, 1994), this technology defines a production set that is closed and convex, and it exhibits constant returns to scale and strong disposability.

Accounting for the variable environmental factors such as inclined government interventions, financial constraints, labour organisation advocacy among others we reformulate the input oriented CRS model (2) is modified by the addition of a convexity constraint indicated as $II'\lambda = 1$. Thus, this paper assumes this empirical foundation.

$$Min_{\emptyset\lambda}\ \emptyset$$

$$Subject\ to: (3)$$

$$-q + Q\lambda \geq 0$$
$$\emptyset x_i - X\lambda \geq 0$$
$$II'\lambda = 1$$
$$\lambda \geq 0$$

Where II' is a 1x1 vector of ones. This approach forms a convex hull of intersecting planes that envelope the data points more tightly than the CRS conical hull, and therefore provides technical efficiency scores that are greater than or equal to those obtained by using CRS model.

Again, it should be noted that the convexity constraint is essentially to ensure that an inefficient hospital is only benchmarked against hospitals of similar size a feature that lack in the CRS case. Hence, in a CRS analysis, a hospital may be benchmarked against hospitals that are substantially larger than it, and therefore, the λ-weights sum to a value less than one.

Definition and Measurement of Variables

This paper undertakes two broad categories of variables in the analysis; inputs and outputs. Hence, inputs include: the number of medical officers and medical specialists (this paper defines medical officers as doctors in charge of the health services of a civilian or military authority or other organization while medical specialists are defined as those doctors who have advanced qualifications in education and clinical training on specific areas of medicine[6]; the number of nurses in individual FBO hospitals (for the purposes of this study, a nurse was defined as those registered by the nursing council of Kenya and provide and coordinate patient care as well as provide advice and emotional support to patients and their family members; the number of beds and cots in an individual facility (hospital beds are those beds specially designed for patients admitted in the hospitals while cots are meant for new born babies who are in need of health care; and other hospital workers (other aggregated workers in individual health facilities). Hence, this variable takes into consideration a pool of all other hospital workers in all departments of individual FBO hospitals inclusive of administrative and subordinate avoiding double enumeration[7].

In this study in regards to outputs, it is difficult to measure the level of patient recovery that can be attributable to the impact of an efficient health service. Therefore inpatient and outpatient numbers in general for any hospital in a year are used. The paper defines inpatients as those patients recorded as admitted in the hospital records and who occupy bed space in the hospital wards. Outpatients are taken to be all those patients visiting the hospital for health care but do not occupy space in the hospital wards, and hence they were not admitted.

Data

The Kenya health Master Facilities List categorizes health facilities into categories, type of ownership that include the Ministry of Health, Faith Based Organizations, Non-governmental organizations and private ownerships. The FBO hospitals are further classified as those under the Christian Health Association of Kenya, the Kenya Conference of Catholic Bishops and the Supreme Council of Kenya Muslims. The three umbrella bodies oversee a total of 75 facilities made up of 15 hospitals under the Christian Health Association of Kenya, 49 hospitals under the Kenya Conference of Catholic Bishops and 11 under the Supreme Council of Kenya Muslims. A simple random sample of 30 hospitals is selected for this study translating to 40% of the population. The sample of the 30 hospitals 10, 19 and 1 hospitals from the Christian Health Association of Kenya, the Kenya Conference of Catholic Bishops and the Supreme Council of Kenya Muslims, respectively.

The study uses secondary data sourced from individual hospitals' records department and from the Ministry of Health's Master Facility List. Data on the number of beds and cots was obtained from the Master Facility List while the rest of the input and output variables were sourced from individual hospital records. Collected data is tabulated in an excel sheet before analysis begin and in a serialized format, the data is arranged in columns starting with outputs and finally the inputs as required in the Data Envelopment Analysis Program version II (This procedure can be done using new commands in Stata following "*st0193 from http://www.stata-journal.com/software/sj10-2*" published in the Stata journal). As an ethical requirement, hospitals are serialized for anonymity purposes as efficiency scores can be used to their disadvantage.

Results and Discussions

This paper assumes the variable returns to scale in revealing that 11 (36.67%) of the hospitals were variable returns to scale technically efficient. The 11 hospitals had technical efficiency scores of one, but only 6 were both constant returns to scale and variable returns to scale technically efficient. Further observation revealed that of the 11 (36.67%) technical efficient hospitals, 9 (81.82%) were categorized under the Kenya Conference of Catholic Bishops while only 2 (18.18%) were from the Christian Health Association of Kenya.

Hence, the Kenya Conference of Catholic Bishops facilitates the running of all hospitals under the Catholic Church although the individual management of these hospitals is left to the appropriating religious congregation. These religious congregations only depend on the Kenya Conference of Catholic Bishops for resource mobilization and government policy adherence.

Such an arrangement gives the hospitals under the Kenya Conference of Catholic Bishops a much higher possibility of optimal operation as decisions are centrally made and implemented at the facility level. Unlike the Kenya Conference of Catholic Bishops arrangement, the other two categories have left a larger mandate on management to their umbrella bodies. As such, centralized management presents challenges in decision making, implementation, monitoring and evaluation. It follows therefore that most of the Kenya Conference of Catholic Bishops hospitals are optimally managed and could act as peers to others.

In the study, 65.33% of the hospitals were found to be technically inefficient with the lowest scoring 0.284. This implies that the lowest scoring hospital would reduce the use of each of its inputs by about 71.6% and still achieve the same number of inpatients and outpatients efficiently. Therefore, additional employment of units of inputs whether Medical officers, beds and cots, nurses or even other workers only manifest increased costs without any changes to the output.

In the health sector, health care providers do not determine the outputs. Management can only intervene in the use of inputs so as to efficiently provide health care. Technical efficiency circumvents the various avenues in which a firm can reduce the use of its inputs without necessarily altering its output especially when the input orientation is assumed (Kirigia, 2013). For such hospitals operating under an umbrella body, it would raise returns if inefficient hospitals learned from their peers on the right input mix.

The mean variable returns to scale technical efficiency was 0.79, the intuition being that all the hospitals would averagely be expected to reduce their use of inputs by 21%. Loosely speaking, on average the hospitals have exceeded the resource use by 21%. Thus, if Faith Based Organization hospitals were to operate as a group, they would have to reduce the use of their inputs by 21 percent. Hence, actual inputs to be reduced depend on the marginal value of each input provided by the input slacks, thus this paper discusses the results of input slacks.

Table 5.1: Results on CRS TE, VRS TE scores and hospital returns to scale

Hospital Code	CRS TE	VRS TE	RETURNS TO SCALE
1	0.355	0.45	Increasing Returns to Scale
2	0.474	0.475	Decreasing Returns to Scale
3	0.653	0.863	Increasing Returns to Scale
4	0.364	0.706	Decreasing Returns to Scale
5	0.6	1	Increasing Returns to Scale
6	0.696	0.785	Decreasing Returns to Scale
7	0.399	1	Decreasing Returns to Scale
8	0.321	0.689	Decreasing Returns to Scale
9	1	1	-
10	0.517	1	Decreasing Returns to Scale
11	0.294	0.772	Decreasing Returns to Scale
12	0.391	0.55	Increasing Returns to Scale
13	1	1	-
14	1	1	-
15	1	1	-
16	0.215	0.338	Decreasing Returns to Scale
17	1	1	-
18	0.545	0.794	Decreasing Returns to Scale
19	0.439	0.712	Decreasing Returns to Scale
20	0.28	0.284	Increasing Returns to Scale
21	0.715	0.743	Increasing Returns to Scale
22	0.634	0.651	Decreasing Returns to Scale
23	1	1	-
24	0.396	0.973	Decreasing Returns to Scale
25	0.594	0.632	Decreasing Returns to Scale
26	0.297	0.849	Decreasing Returns to Scale
27	0.242	0.35	Increasing Returns to Scale
28	0.954	1	Increasing Returns to Scale
29	0.602	1	Increasing Returns to Scale
30	0.671	0.743	Decreasing Returns to Scale
Mean	0.588	0.779	

Returns to Scale

Exactly 9 (30%) of the hospitals depict increasing returns to scale; this implies that they enjoy economies of scale with increase in one input yielding more than unitary in output. And approximately 50% of the Faith Based Organization hospitals experience decreasing returns to scale and hence face diseconomies of scale where a proportionate increase in the use of inputs increases output by less than proportionate, and only 20 percent of the Faith Based Organization hospitals depict constant returns to scale. Also, the majority of health workers in Faith Based Organization hospitals such as medical officers and nurses are on call in more than 18 hours. Hence, the majority of the nurses are in the wards working for more than average working hours; long hours on work duty have diminishing service returns that not only present inefficiencies but also pose health risks to the involved individuals.

Lovell (et al, 1990) argues that slacks may essentially be viewed as allocative inefficiency in that they measure the resource under or overuse. Theoretical underpinnings on input slacks especially when the input orientation has been assumed in analysis are that inputs have to be reduced by their marginal amounts in order for the hospital to be efficient. In the Kenyan context, this approach would be counterproductive since the demand for healthcare meets stiff and scarce resource availability. Advantageously, Faith Based Organization hospitals can use their umbrella bodies to redistribute input resources among facilities. This way, excess inputs in efficient facilities can be transferred to the inefficient ones. Output slacks imply to some extent the much that the inputs have been underutilized. Table 5.2 is insightful into this discussion.

Table 5.2: Amounts of inputs available for reallocation and output increase potentials

Hospital Code	Beds and cots	Medical officers	Nurses	Other Workers	Outpatients	Inpatients
1	0	0	2.4	9.1	2237	398
2	3.4	0.9	11.0	0	0	0
3	21.7	0.2	12.6	0	5012.4	0
4	0	3.3	0	18.3	0	0
5	0	0	0	0	0	0
6	0	1.5	1.3	0	0	0
7	0	0	0	0	0	0
8	54.7	0.4	0	5.4	24939.5	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0.9	0	0	11823.3	0
12	12.2	0.6	0	0.4	4782.7	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0
16	0	0.7	5.0	0	0	0
17	0	0	0	0	0	0
18	0	2.8	5.1	56.9	31608.3	0
19	0	0	0	0	20761	0
20	0	0	3.3	29.2	0	0
21	0	4.2	8.0	23.9	0	15.2
22	59.9	0.0	14.0	0	0	0
23	0	0	0	0	0	0
24	104	4	0	99.2	26415.3	0
25	28.5	3.3	17.7	0	0	8.5
26	47.7	9.1	0	60.3	56345.7	0
27	0	0.5	0	0	2224.7	392.6
28	0	0	0	0	0	0
29	0	0	0	0	0	0
30	0.0	0.5	7.6	0	0	0
Mean					**6765.2**	**30.5**

Hospital code 27 could increase the number of outpatients by 2224.714 and inpatients by 392.624 without changing the input mix. This could be achieved in case hospital management to intensify community civic education on importance of seeking healthcare in both a curative and preventive fashion. In addition, mounting of medical camps and outreaches could utilize some of the inputs. 17 out of the 30 hospitals do not require any output adjustments. Another key observation is that if all the hospitals operated as a group, they would be able to increase their outpatients and inpatients on average by 6765.181 and 30.478 respectively without changing the quantity of inputs. Inefficiency of this nature exemplifies inadequate work-hour engagement and in staff service input and sub-optimal utilization of other capital equipment in the affected hospitals.

Areas for More Research

Technical efficiency is a partial measurement of total economic efficiency. This paper proposes further research on efficiency of healthcare facilities in Kenya. It would be informative for other studies to employ the Stochastic Frontier Analysis method to estimate efficiency and draw comparisons with this paper, and secondly the extension of this paper to include other determinants of efficiency in the availability of time and financial resources. And third, primary and peripheral healthcare facilities owned by Faith Based Organizations have a sizeable share of total primary healthcare provision in Kenya considering that they cater for healthcare needs especially in remote regions of Kenya and hence, further research would take into consideration the estimation of their efficiency. Last, where cost data is readily available for the health sector, further research would revolve around cost, allocative and profit efficiencies of health facilities in Kenya.

Conclusion

The paper analyses technical efficiency of hospitals owned by Faith Based Organizations in Kenya. Using Data Envelopment Analysis to analyze hospital efficiency this paper affirms the presence of inefficiency in the healthcare sector. In conclusion, this paper has found that there are inefficiencies in the hospitals owned by Faith Based Organizations and that if they worked as a group their efficiency would be approximately 79%. The inefficiency contributes into the myriad of challenges that face the Kenyan health sector which has a bearing on the difficulties that Kenya faces in its struggle to achieve universal health coverage. And therefore, this paper echoes the sentiments of (Mansfield 1999) that even with the simplicity of the secrets of efficiency, there must be a perpetual urge to keep vigil over efficiency of decision making units. As Boussifiane (et al, 1991) confirms, Data Envelopment Analysis is preferable in identifying efficient operating practices, strategies, target setting for inefficient facilities and resource allocation, and that there is undoubtedly surmountable benefits of estimating efficiency levels of healthcare facilities.

Notes

[1] This includes all levels of private health facilities from dispensaries, health centres, nursing homes to national hospitals.

[2] Christian Health Association of Kenya, Kenya Conference of Catholic Bishops and Supreme Council of Kenya Muslims are the major Faith Based Organizations blocks with centralised healthcare management systems for all institutions affiliated to them

[3] In 2001, the African heads of state arrived at a declaration that member states would increase government financing to healthcare to at least 15% of the total government budget.

[4] This is a linear programming model that measures efficiency levels of firms (Decision Making Units) that have multi-input and multi-output variables. It is non-parametric.

[5] Those owned by the government and supervised by the Ministry of Health.

[6] Definition borrowed from World Health Organization. Examples of medical specialists include addiction psychiatrist, adolescent medicine specialist, allergist (immunologist) etc.

[7] The staff enumeration avoided recounting workers in varied categories such as where a medical officer served simultaneously as the facility manager, or a nurse who coupled up as the facility secretary, the phenomena was not very observable though.

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