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Determining the Levels of Technical Efficiency Changes in Bomet County Before and After Devolution

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Abstract

The study aimed at determining the levels of technical efficiency changes in Bomet County before and after devolution. A cross-sectional study design was used where secondary and quantitative data was collected using a data checklist from the ministry of health and the county's information platforms. '*Ex-ante'* and '*ex-post'* data from the devolution periods were used to calculate the technical efficiencies using a non-parametric econometric technique, Data Envelopment Analysis (DEA). Key informant interviews were done after analyses of data to get the views of the county's health managers on the results. The mean constant returns to scale technical efficiency (CRS TE) scores for the county increased from 92.4% in 2012 to 96.1% in 2015, while the varied returns to scale technical efficiency (VRS TE) score showed an increase of 3.4% from 96.6% to 100%. The county mean scale efficiency scores increased from 95.7% before devolution to 96.1% after devolution. Bomet County ought to create more demand for its health services and therefore increase the utilization of its resources. This could be done through the use of community units, which is responsible for bringing out the unmet needs in the population and linking the populations to the health facilities.

Keywords: *Technical efficiency changes, Bomet County, before and after devolution*

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1.1 Introduction

The Constitution of Kenya (2010) provides for devolution of health services, which implies that service provision and management is now primarily a function of the counties and functions of stewardship for the health policy including standards and guidelines left with the national government (KHSSP 2014-2018, 2014). Devolution is a form of decentralization that involves the transfer of authority from the central government to smaller legally constituted autonomous units. Functions and resources are assigned to both levels of government where they coordinate and not subordinate to each other (Murkomen, 2012).

Devolution has been seen by its proponents as a way of improving the access and efficiency in the delivery of services to the people since the decisions are made close to the people hence decision makers are more accountable to them (World Bank, 2012). Efficiency in healthcare provision is the relationship between a specific product of the health care system (output) and the resources used to create that product (inputs), thus involves the maximizing of output for a given set of inputs or minimizing inputs used to produce a given output (Hussey, Vries, Romley, Wang, Chen, Shekelle & McGlynn, 2009).

Since March 2013, healthcare services have largely been under the county governments with a lot of streamlining in the sector to fit in to the new system. The Transition Authority (TA), which was tasked with overseeing the smooth transfer of devolved functions to the counties and their coordination, stipulates the functions of each level of government and the unbundled functions which are a responsibility of both levels. The national government is in charge of the two national referral hospitals (KNH & MTRH), the two special hospitals (Spinal Injury and Mathari Mental hospitals), the Semi-Autonomuos Government Agencies (SAGA's) and policy and strategy formulation and implementation. The counties on the other hand are in charge of all county health facilities including the county referral hospitals all the way to the community units, in terms of health service provision and promotion. Ambulatory and emergency services also fall within the counties, so as public health functions.

The two levels however share the responsibilities in legislation, health financing (resource mobilization, policy and regulation), financial management, planning and budgeting, quarantine administration, disease prevention & control (policy & coordination); including surveillance, partnerships; including public and private, intergovernmental relations, procurement of health products and technologies, human resources management and development, monitoring and evaluation, health research (regulation and implementation) and health information systems. Infrastructural and process changes have been seen since the new system started operating, with differences in the change indicators in different counties according to The Annual Health Sector Performance Report (AHSPR), July 2013 – June 2014 from the Ministry of Health.

Though it is still a new concept in the Kenyan health system, global devolution literature spells a lot on its implementation and advocacy as a system to improve healthcare efficiency, but little has been done to ascertain the real efficiency gains of devolution. The few technical efficiency studies done in Kenya (Kirigia, *et. al.*, 2002 & Kirigia, *et. al.*, 2004) used Data Envelopment Analysis to measure the relative technical efficiencies. The studies respectively showed that 74% of the public hospitals sampled were operating efficiently, a technical efficiency score of 100%, while among the sampled health centers, 56% were found to be

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efficient. These studies were carried out almost a decade before devolution was rolled out in the country.

The Health Sector Analytical Report 2013-2014 by the Ministry of Health is a more recent study which has an aspect of technical efficiency in it. The report estimates that the country average technical efficiency stands at 56.43%, a mean value of the relative technical efficiencies of the 47 counties. The analytic report is the first of its kind by the ministry of health, though it does not look into the devolution effects on this performance indicator.

The Millennium Development Goals (MDG's) which were central to the health sector proved a challenge to meet by most countries in sub-Saharan Africa, Kenya included. A look at goal number 5 on maternal health for example, shows that improvements were realized in reducing maternal deaths as shown in figure 1, but not by 75% as was the target.

Source: KDHS 2015

Figure 1: Trends in maternal mortality ratio from 2000 to 2013

The World Health Organization termed the progress by Kenya in realizing the goal on maternal mortality as insufficient. This is despite the enormous resources that were dedicated to realize this goal among others when countries were committing at the 2000 millennium summit (WHO, 2014), which can point to inefficiency in their use.

The National Health Accounts (NHA) 2012/2013 (GOK, 2015) showed, in their findings, a general increase in government expenditure on health as a percentage of total government expenditure from 4.6% in 2009/10 to 6.1% in 2012/13. The Total Health Expenditure (THE) increased from Kshs 163 billion in 2009/10 to Kshs 234 billion in 2012/13. Total health spending accounted for 6.8% of GDP up from 5.4% in 2009/10. Despite these increase in health care allocations and spending, little improvements have been seen in terms of health indicators, according to Health Sector Working Group report (2012). This may imply that these resources may not have been efficiently utilized to improve on the health outcomes. Devolution came into practice at almost the closing period of the report. This study therefore came in handy to ascertain whether there are any efficiency gains after devolution in Bomet

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County, with analysis of the changes in the healthcare investments against the changes in the outcome indicators.

1.2 Statement of the Problem

With the onset of Kenya's devolution in March 2013 as provided for in the Constitution of Kenya (2010), healthcare resources have been at the dispensation of the counties together with all the devolved functions. However, there is no assurance of any efficiency gains brought about by this phenomenon in the health sector as alluded by the devolution literature.

There have been numerous industrial actions by the healthcare workers through their unions agitating for recentralization of the health sector. The year 2014 saw 800 doctors resign from civil service according to the Kenya Medical Practitioners and Dentists Union (KMPDU). A bill was once tabled in Kenya's parliament that wanted the health sector to be taken back to the national government. These events denote problems in the devolved health sector that need attention.

Notably, Bomet county healthcare workers did not participate in the 2014 strikes according to the Ministry of health. The Council of Governors also in their report of 2014 placed Bomet County in second place in terms healthcare service delivery among the counties. However, the Health Sector Analysis Report (2013-2014) shows its relative efficiency as below average (43.1%). These seemingly differential results make Bomet County an area of interest.

Goals of the health sector will only be realized if the scarce healthcare resources are properly utilized to realize greater efficiencies. Obtaining and putting into best use of the scarce health resources is an essential function of the health system (WHO, 2000). Inputs into the health sector by the various counties produced different output levels with some proving much technically efficient in health provision than others (Health Sector Analysis Report 2013-2014). More calls have been made by leaders to increase the funding to the counties for improved service provision while others feel the counties are not doing enough with what they already have.

The Health Service Assessment Report (GOK, 2014) cited challenges in county health systems with financial resources in particular proving to be most challenging to manage by the devolved governments with no clear guidelines on its management. Facility Improvement Funds (FIF) which are supposed to be ploughed back to the facility 100% were on average only ploughed back to 90.4%. Requirement of some facilities to deposit FIF in a common account by county governments resulted to less or more funds than collected being re-invested for development.

In devolution literature, while the focus is on implementation of decentralization policies due to perceived benefits available in blueprints and country experiences, it is worth noting that recentralization by previously devolved countries citing efficiency as one reason to recentralize (Saltman, *et al.*, 2007) calls for analyses of devolved systems and their efficiency gains. While broad studies and assessments have been taken by the ministry of health to gauge the progress in attaining the health sector goals due to the health sector reforms including devolution, it proved difficult to access a specific study that has been done to ascertain how devolution affects the efficiency of health care provision in counties. This study therefore sought to fill this gap by determining levels of technical efficiency changes in Bomet County before and after devolution.

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1.3 Specific Objective

To determine the levels of technical efficiency changes in Bomet County before and after devolution.

2.0 Literature Review

2.1 Theoretical literature

2.1.1 Devolution and efficiency

Devolution is a form of decentralization that involves the transfer of authority from the central government to smaller legally constituted bodies. The smaller lower level units are autonomous; hence the central government has no direct control over their activities. Functions and resources are assigned to both levels of government where they coordinate and not subordinate to each other (Murkomen, 2012).

However, Sherwood (1969) argues devolution has a concept of separateness therefore quite separate from decentralization. Functions are divested by the central government to created units of governance where the central government has no direct control. The argument he and others have is that decentralization and devolution are different phenomena: where decentralization is used within an organization while devolution is used between organizations i.e. national and devolved units (Sherwood, 1969). This review nonetheless uses decentralization and devolution interchangeably based on the concept of moving health services decisions closer to the people. Health services are among the functions devolved to counties in Kenya with the national government remaining with stewardship and oversight authority as stipulated in schedule IV of Constitution of Kenya (2010).

Efficiency in healthcare provision is the relationship between a specific product of the health care system (output) and the resources used to create that product (inputs). The health system would be efficient if it was able to maximize output for a given set of inputs or to minimize inputs used to produce a given output (Hussey, *et al.,* 2009). Allocative efficiency concerns provision of public health goods and services to the public which the benefits accrue to a larger population rather than private goods and services where benefits go to individuals (Schwartz, Guilkey & Racelis, 2002).

Technical efficiency on the other hand refers to the ability to transform healthcare resources into health services in the most productive way, combining inputs so as to achieve the maximal output without wastage or over-use of inputs, for example, appropriate staffing levels, regular drugs supply, and equipment necessary for a health facility's case mix. Economic efficiency is concerned with operating in the most productive manner with the lowest input costs, e.g., generic drug use (Hutchinson and LaFond, 2004). It is worth noting that the production process in healthcare is complex, therefore measuring efficiency is difficult. The output is the health status of the population being served, which renders it quite difficult to measure (O'Neilla, *et al.,* 2008). The various determinants of health to the population including the socio-economic and environmental factors are exogenous to the health production process in the health sector, therefore difficult to quantify in the production equations.

Decentralization has been advocated for in developing countries for decades by health sector reform advocates with the view as an administrative reform possible for efficiency and

quality improvements, promotion of democracy and accountability to the local population (Bossert 1998). Decentralization is based on the idea that properly structured and steered smaller organizations are more agile and accountable than larger organizations (Saltman, *et al.,* 2007). Even Max Weber, the German sociologist famed for the bureaucratic model admitted that small scale organization is the alternative to bureaucracy (Weber, 1947). As by the proponents of decentralization, authority for control and policy making when closer to the constituents eliminate inefficiencies and lack of responsiveness that are rampant with central systems. However, critics of devolution do not trust that local governments can improve efficiency, with fears of resources used to produce private goods in place of services with greater public health benefits (Angeles, *et al.*, 1999).

Ideally, decentralization can improve technical efficiency if it removes excess administrative levels, if it leads to innovation and discovery of new techniques for health service delivery, or if greater oversight and accountability of health workers and planners decrease wastage of resources (Hutchinson and LaFond, 2004). Studies done on federal systems have in their findings reported that central governments have an upper hand in making equitable allocation decisions, more so for assisting the poor while devolved units more effectively utilize funds to achieve efficiency (World Bank, 2003).

Levaggi and Smith (2003), during the Conference on Economics and Health Policy put forth economic arguments favouring devolution of policy making of public services to lower levels of Government. They argued that because devolved units are closer to local institutions and the constituents, sources of inefficiency can be identified by the management and therefore addressed. The local people are also actively involved and therefore there is expected efficient delivery of the health services governed locally. They also brought in the idea of accountability, where the financing of public goods is the responsibility of the local beneficiaries, which increases Allocative efficiency and if properly implemented contribute to economic efficiency (Levaggi and Smith, 2003).

The capacity to innovate within the counties and enhanced cost-consciousness as recognized in devolution leads to improved efficiency (Bergman, 1998). Jervis and Plowden (2003) also reported that health care strategies are better implemented under devolved systems based on need. Efficiency advantages as a result of decentralization policies also come through due to reduced risk of bottlenecks at the central level, which in turn increases the overall process capacity of the system (Saltman, *et al.,* 2007). Furthermore, decentralization is attributed to cost cutting and avoidance of duplication of services, especially secondary and tertiary health care. This can be done when responsibility is connected to the community within the coverage area (Mills, 1994). According to Regmi *et al* (2010), decentralization improves efficiency through enhancing accountability of regional administrators and allocation efficiency basing on local needs and interests which improves governance and public service provision.

The dissatisfaction with the efficiency of centrally provided (health) services has contributed to the high adoption of devolution. The large coverage areas and high populations could be the reason for such inefficiencies because of the difficulties to coordinate all the services from the central point. The extra bureaucracy and management levels required in centralized systems lead to diseconomies of scale and decision making takes longer time (Hutchinson and LaFond, 2004). Information on local conditions is also likely to be scant in centralized

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systems and it may involve more costs for decision makers at the central system or government to collect such information than it would have been for local decision makers. The higher information and transaction cost involved has been argued by some researchers as the need to decentralize decision making closer to the people, more so in developing countries than the developed ones (Shah, 1998).

2.1.2 Devolution and Recentralization

Despite the literature that supports the idea of devolution to improve health services efficiency, some experiences denote contradicting results. Brazil's devolved units are the municipalities which were entitled to receive funds directly from the federal government to facilitate for all levels of care. This was through The Gestão Plena do Sistema Municipal. It incentivized municipalities to invest more in hospitals, laboratories, and high-tech equipment. These were before then under-utilized because of the municipality population sizes. There emerged new inefficiencies from the system of direct transfers to municipalities which were attributed to; loss of the economies of scale normally realized when producing most complex medical services, reduced size of risk-pool which was used to finance the advanced care; and large increases in transactional costs because of replication of administrative functions throughout the municipalities (World Bank, 2003).

Norway has undergone some form of recentralization too after almost two decades of devolution. Norwegian reform process can serve as a good illustration of how difficult an application of fiscal federalism to the health care sector is in practice (Magnussen, *et al.*, 2007). The devolved system was created in 1998 with 19 counties. Responsibility was given over education, health and part of road infrastructure. However, specialized care was regained by the central government more and more in the 15 years that followed through more regulations on the counties (Magnussen, 1998). The year 2002 the saw the recentralization of specialized care to the central government. Further, operating authority was recentralized from the 19 elected counties to the central government who appointed 6 regional boards in their place. The responsibility for financing health sector remained at national and not regional level. These actions were prompted by the experiences they had with devolved units.

The decentralized system saw hospitals in Norway agree on soft budgeting with the counties, which was eventually passed to the national government. The system therefore failed to satisfice from the efficiency perspective or that of containing the cost, failing on the main objectives of devolution for healthcare (Saltman, *et al.*, 2007). The devolved units also seemed to be in competition for services which resulted in service duplication therefore decreased technical efficiency (Magnussen & Mobley, 1999). The reforms, however, have not proven any better for Norway with the first two years of the reform seeming to show growing inefficiencies while effects on total cost containment uncertain.

Other countries also seem to be in the same boat as Norway with their recentralization policies on important health system functions. Denmark recentralized operating and financing responsibility from the 14 county councils (elected) in 2006. It then created 5 regional governments with health care operating authority, but the financing responsibility remained exclusively with the state. Poland and Slovakia has also recentralized what was regionalized sickness fund structure. These trends tend to raise fundamental questions regarding

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decentralization policies in healthcare. "Is the local democracy argument now being supplanted by the economic efficiency argument?" (Saltman, *et al.*, 2007).

2.2 Empirical literature

While many studies have been done on devolution and decentralization around the world, less attention has been given to how it affects the efficiency of service provision in particular. Strumpf, et al. (2001) studied the effects of decentralization on allocative efficiency, with reference to the provision of public and private goods in Ugandan public health sector and acknowledged the scant attention in health economics literature to efficiency issues in health goods and services provision due to devolution. Their study used the government data on resource allocations to determine their budgeting decisions regarding provision on public goods versus private health goods. Findings indicated that local governments used more resources to provide private goods in the expense of public goods. This was because local governments provide the preferences of the citizens, who choose the goods that benefit them directly. Local governments were seen to behave like individuals and therefore choose the goods and services that accrue direct benefits. Decentralization thus decreased the Allocative efficiency in these districts (Strumpf, *et al.*, 2001).

2.2.1 Healthcare facilities and technical efficiency scores

Devolution brings the decisions on healthcare infrastructure closer to the people that they participate based on needs. Accessibility to healthcare institutions is the first step towards attaining comprehensive healthcare and therefore health centers and hospitals are built and operationalized as by the population preferences. This may however disadvantage the public goods provision (Strumpf, *et al.*, 2001). Brazil's devolved system received development funds directly from the federal government with incentives to invest more in hospitals, laboratories and high-tech equipment (World Bank, 2003) so as to increase service coverage and access to the public.

Granting autonomy to hospitals can also be viewed as decentralizing or de-concentrating authority from the national government (Rondinelli, *et al.*, 1984). There are a few studies that have been done to measure the efficiency of the autonomous hospitals compared to the ones still under the central system. Data Envelopment Analysis (DEA) and regression analyses were used to measure technical efficiency and estimate determinants of efficiency respectively (Cellini, et. al., 2000; Giuffrida, *et al.*, 2000; Fabbri, 2001). The findings, which were based on technical efficiency scores, indicated difference in efficiencies due to the different organization setups. Autonomous hospitals repeatedly showed higher efficiency scores than those still integrated to the national system. This can be replicated in devolved systems since both concepts involve transfer of authority from the centralized system.

Most technical efficiency studies globally have focused on hospitals, health centers and such health set ups. This can be attributed to the growing pressure to improve hospital performance amid the scarcity of resources through proper resource allocation (WHO, 2000). Hollingsworth (2008) provided an overview of the various studies undertaken on hospital efficiency. Data Envelopment Analysis method was widely used in these studies which cover mostly the developed countries.

Not many studies on technical efficiency on the other hand have been undertaken in Africa, but the available ones followed the trend of analyzing health facilities performances using

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Data Envelopment Analysis. Two studies on South Africa's public hospitals and public clinics (Kirigia, *et al.,* 2000; 2001) found that substantive reduction of inputs is needed to enhance efficiency of these facilities. Zere (2006) in the same country found 58% of all the hospitals inefficient- inefficiency scores of between 35%-47% percent. 58% of the facilities were operating at a sub optimal scale. In Kenya, Kirigia, *et al.* (2002) found that 74% of public hospitals were efficient, while 44% of public health centers (Kirigia, *et al.,* 2004) were found to be inefficient.

A pilot study in Ghana by Osei, *et al.* (2005) found 47% of the hospitals were technically inefficient, with an average TE score of 61%; 59% of the hospitals were scale inefficient, an average SE of 81%. Among the health centers, 18% were technically inefficient, with a mean TE score of 49%; 47% were scale inefficient, with an average SE score of 84%. Sebastian and Lemma (2010) did a study in Ethiopia (Tigray) on health extension program efficiency, and found the mean scores for technical and scale efficiency to be 0.57 and 0.95 respectively. Out of 60 health posts, 25.0% were found to be technically efficient. 63.3% were operating at their most productive scale size.

It is worth noting that among these studies on technical efficiencies, none focuses on devolution, or devolved units for that matter. They however help in pointing out the efforts to measure efficiency in the health sector in Africa.

3.0 Research Methodology

The research design used was a cross-sectional survey. *Ex-ante'* and '*ex-post'* secondary data, as is in health economics studies, from devolution periods was collected from the county's health information platforms and subjected to econometric analysis using the Data Envelopment Analysis (DEA) to allow for comparison. The study was carried out in Bomet County, Kenya. The study subjects were the five sub-counties of Bomet County as a devolved unit responsible for carrying out devolved functions, healthcare provision included. The input data captured the resources invested by the county in healthcare provision, which was collected as sub-county aggregates.

A data checklist detailing on the inputs and outputs data from the county at a period prior and after devolution was used. This is the data that was fed to the DEA model to determine the efficiency scores. A key informant interview guide was used to collect information from the county health managers regarding their views on the computed efficiency scores. Quantitative and secondary data were collected using a data checklist from the county departments of health and the Ministry of Health information platforms. The data was analysed using the DEA software. This study used DEA to evaluate relative efficiencies among the sub-counties as DMU's. Input and output data was keyed on an excel sheet then the DEA software applied to obtain the efficiency scores. Analysis took two forms, first the data from the period prior to devolution and then period after rolling out devolution. The county mean efficiency scores for the two periods were be compared to ascertain the changes if any. Information from the key informant interviews was then used to explain the results.

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4.0 Data Analysis

4.1 Technical efficiency scores

Table 1 shows the technical efficiency scores of Bomet County based on the data of the year 2012 before devolution and 2015 after devolution.

Table 1: Efficiency score summary

	Before devolution (2012)				**After devolution (2015)**			
Firm	**Crste**	**Vrste**	**Scale**	**Returns to scale**	Crste	Vrste	Scale	**Returns to scale**
Chepalungu	0.926	0.975	0.950	drs	1.000	1.000	1.000	-
Sotik	0.841	0.856	0.983	irs	0.915	1.000	0.915	drs
Konoin	0.853	1.000	0.853	drs	1.000	1.000	1.000	-
Bomet east	1.000	1.000	1.000	-	1.000	1.000	1.000	-
Bomet central	1.000	1.000	1.000	-	1.000	1.000	1.000	-
MEAN	**0.924**	**0.966**	**0.957**	**drs**	**0.961**	**1.000**	**0.961**	**drs**

Note: **crste** = technical efficiency from CRS DEA

vrste = technical efficiency from VRS DEA

scale = scale efficiency = crste/vrste

Drs = diminishing returns to scale

Irs = increasing returns to scale

4.1.1 Pre-devolution efficiency scores

Assuming a constant returns to scale (CRS) model, the results show that two of the five sub-counties (Bomet East & Bomet Central) which represents 40% are relatively efficient with a technical efficiency score of 1 or 100%. Of the three which were CRS relatively inefficient, Chepalungu had a technical efficiency score of 0.926, with Sotik's score being 0.841 and that of Konoin being 0.853. This gives a county mean score of 92.4%.

However, when it came to Varied Returns to Scale (VRS) technical efficiency scores, 60% were relatively efficient with a technical efficiency score of 100%. These were Bomet East, Bomet Central and Konoin sub-counties. Chepalungu and Sotik which are relatively technically inefficient had scores of 0.975 and 0.856 relatively. The county VRS technical score mean from the above is 0.966.

4.1.2 Post-devolution efficiency scores

The post-devolution era data showed that the Constant Returns to Scale technical efficiencies in the sub-counties improved, with now 4 out of five of them being relatively efficient, that is they have an efficiency score of 100%. Only Sotik sub-county had an efficiency score of less than 1 that is 0.915, which is also an improvement from the 0.841 in the 2012 data. The mean CRSTE for the county was 0.961, up from the 0.924 from the 2012 data.

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The varied returns to scale technical efficiency measure shows that all the five sub-counties were relatively efficient with a score of 100%. This is unlike the pre-devolution score which only 60% had an efficiency score of 100% and the VRSTE mean for the county was 0.966.

5.0 Discussion

The CRS model of DEA shows that the county as per the 2012 data (pre-devolution) has a mean technical efficiency score of 92.4 % with 40% of the sub-counties being technically efficient, a technical efficiency score of 100%. The 60% inefficient sub-counties had a mean technical efficiency score of 87.3%, meaning that they could attain efficiency by minimizing their input ratios by 12.3% on average.

The VRS model on the same data of 2012 before devolution gives the mean technical efficiency scores of the county to be 96.6%. Here, 60% of the sub-counties are seen as technically efficient, a score of 100%. The 2 sub-counties which are inefficient have an average TE score of 91.6%, thus to attain the efficiency gradient, these sub-counties ought to slash their input ratios by 8.4%.

The pre-devolution results also showed that 2 out of the 5 sub-counties were operating optimally while 60% showed diminishing returns to scale, meaning an increase in the production inputs results in a decrease in the health outputs. The average scale efficiency score for these sub-counties is 92.87%, meaning they should scale down their productions by an average of 7.13%. These results concur with a research done in South Africa (Kirigia et al 2000; 2001) which reported that to realize efficiency, the hospitals and clinics needed to reduce its inputs substantively.

These technical efficiency results show a slight drop from the country average scores found by Kibe (2010), where the average technical efficiency scores for level four hospitals in Kenya was found to be 97.72%. The difference can however be explained by the inclusion of lower tier health facilities in this study, where the lower tiers are seen as more inefficient than the level four hospitals. This can be supported in the researches in Kenya which found out that 26% of public hospitals were inefficient (Kirigia, et al., 2002) while 44% of public health centers were found to be inefficient (Kirigia, *et al.*, 2004).

The technical efficiency scores calculated using the data from post-devolution period (2015) show some bit of improvements in the technical efficiency scores. Assuming a CRS model, the county's mean technical efficiency score was 96.1%, with the ratio of efficient sub-counties being 80%. This is an increase from the pre-devolution scores where only 40% of the sub-counties were technically efficient. The mean T.E score of the county also increased by 3.7%.

VRS DEA results from the post-devolution period shows that all the sub-counties are technically efficient, all score 100%. This is an improvement from the pre-devolution's mean technical efficiency score of 96.6% where only 60% of the sub-counties were technically efficient. The TE score post-devolution increased by 3.4 %. This is in tandem with studies which showed that devolved units better utilize their resources to achieve efficiency (World Bank 1994; Saltman *et al.* 2007).

The scale efficiency scores of the sub-counties also increased after devolution, where 80% of now had an SE score of 100%, meaning they were operating optimally. Its only Sotik sub-county with a SE score of 96.1% that showed diminishing returns to scale, therefore should

cut down or production mixes by 3.9% to realize optimum operation scale. The Sub-county medical officer of health in Sotik attributed this to the number of facilities being more and the health outputs being largely a shared value in the county.

All these efficiency scores show improvements from the pre-devolution era to the post-devolution era. These results are related to the findings by various studies (Cellini, et. al., 2000; Giuffrida, *et al.,* 2000; Fabbri, 2001) which found out that autonomous hospitals repeatedly showed higher efficiency scores than those still integrated to the national system. The autonomy in these hospitals is a concept that can be equated to the devolved healthcare in this study.

6.0 Conclusion

The CRS technical efficiency mean scores of the county show an improvement in the healthcare efficiency in the county from 92.4% in 2012 prior to devolving health services to 96.1% in 2015 after health services were devolved. This represents a 3.7% increase in technical efficiency. VRS technical efficiency score increased from 96.6% to 100%, which is also an increase of 3.4%. Therefore, the findings show a general increase in the technical efficiency scores of the county after devolution of health services.

7.0 Recommendations

The county ought to create more demand for its health services and therefore increase the utilization of its resources. This could be done through the use of community units, which is responsible for bringing out the unmet needs in the population and linking the populations to the health facilities.

Using DEA's Malmquist Total Factor Productivity Index to gauge the efficiency and productivity trends in the county or counties over time. This will clearly show how efficiency scores were affected with introduction of devolution. It can be done to go back in time five years before devolution and five years after devolution.

8.0 References

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