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CAPACITY UTILIZATION OF COUNCIL DESIGNATED HOSPITALS BEFORE AND AFTER CONVERSION: THE USE OF RATIOS ANALYSIS

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ABSTRACT

It is argued that financial and non-financial ratios share very important information as far as hospital performance is concerned. Non-financial ratios carry vital information such as hospitals' capacity utilization or capacity information (may include number of admissions, number of full time employees, number of beds in services, etc.) this study employs hospitals non-financial ratios to analyze capacity utilization of eight (8) Council Designated Hospitals (CDHs) before and after conversion. Findings revealed that before conversion hospitals were efficiently utilizing their capacity, conversion brought inefficiency in terms of increase in average length of stay (ALOS) and full time equivalent (FTEs), it is possible that increase in ALOS was the result of inefficient FTEs. It is obvious that if there was an increase in ALOS and FTEs inefficiency is high, then it could possibly result into the occupancy rate which does not reflect the hospitals efficiency. However, hospitals' bed turnover was high over the study period while FTEs productivity was low particularly after conversion. In the totality of analysis of capacity utilization, the findings contend that after conversion number of inputs particularly FTEs were higher in relation to outputs. The study recommends that hospitals administrators should control and make efficient allocation of the resources so as to reduce excessive capacity in Council Designated Hospitals (CDHs).

Keywords: Capacity, utilization, hospital, performance, Tanzania.

INTRODUCTION

Generally, excess hospitals capacity is regarded as the wasteful (unnecessary use of hospitals' resources) (Ferrier et al., 2007). Unlike the study by Ferrier et al., (2007) in which the hospitals capacity utilization rate was just computed, this study attempted to compute the optimal level of capacity and examined how the hospitals utilized their capacity before and after conversion to

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CDHs. Capacity can be viewed from different angles (i.e. economics or engineering point of view), this study regard the capacity from the economic stand point. As the organization, hospitals capacity affects the ability to compete as well as the level of health services made available to the community. Hospitals literature argues that one way of reducing the health care cost may be to reduce the excess capacity of hospitals. All over the world hospitals are under the pressure to provide cost effective healthcare services, to achieve this hospitals needs to focus on capacity utilization (i.e. hospitals beds, employees and adopt the cost-effective technologies that enhance cost reduction). One of major challenges facing CDH's administrators is that the Government synchronizes the pricing of health services in these hospitals and makes it less effective to the hospital managers to use the pricing strategies as a tool in achieving their objectives. CDHs are also facing high employees turn over particularly those situated in remote – rural areas.

Hospitals literature argued that for the hospitals to be successful (i.e. operate efficiently) and generate revenue it should have qualified and competent labors and reduce the employees' turnover to make full utilization of the available capacity (beds available and equipment/technology). As Bhat and Jain (2006) contended, reducing the average length of stay (ALOS) is one of the policy objectives in hospitals management in many countries and is thought to indicate efficiency; ALOS is associated with quality of services. Therefore, increase in ALOS of CDH longer than expected ALOS indicate poor quality of care, a lower ALOS indicates a good quality of care and likely to enhance the image of hospitals. In many countries ALOS has been used in the hospitals industry as the policy tool. On the other hand increase in ALOS with fewer patients will pull down the occupancy rate hence lead to underutilization. The two have negative relationships; high ALOS (with fewer patients) indicates low occupancy rate and the two lead to low efficiency.

Objectives and Significance of the Study

Generally, objective of the study is to examine the capacity utilization of CDHs before and after conversion. Specifically the study aims at examining *Occupancy Percentage, Average Length of Stay (ALOS), and Fulltime Equivalents per Occupied Bed, Admission per Bed, and Admission*

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Vol. 4, No. 2 (2018), pp. 130-143
http://www.ajaronline.com
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per FTEs before and after conversion

If the capacity underutilization occurred in a hospital, it means that costs are higher than the necessary and average resources costs of treatment will not be covered. The study is significant since it examines the capacity utilizations in CDHs before and after conversion. More importantly, the findings will give the picture of the labor and bed productivity as well as occupancy rate before and after conversion. Consequently, the hospitals' managers (CDHs) will be able to plan, allocate and control the scarce healthcare resources available.

The study was built on Resources Dependency Theory (RDT), which advocates that the organization viability will depend on the extent to which it can explore and utilizes the resources from the environment in which it is situated. As contended by Mudambi and Pedersen, (2007) organization that can obtain the resources from the environment exhibits greater power and enhance the viability. This study is also significant since it test RDT by assessing utilization of hospitals resources obtained by CDHs after conversion. It should also be borne in mind that in the hospital industry, resources include patients, physicians or plants (Kim and McCue, 2008).

Result of this study is important to academicians (and other researchers) since it adds to the existing body of knowledge, to the administrators of CDHs hospitals and policy makers finding is very important since it reveals resources utilization in relation to hospitals conversion.

REVIEW RESOURCE DEPENDENCY THEORY

The term resources are given a broader meaning in other field of study. However, in healthcare sector the term resources implies the; patients, *hospitals' bed, physicians or plant* (Kim and McCue, 2008). Organizations that obtain the resources from the environment have a greater chance of attaining the organizational power and enhanced financial viability (Mudambi and Pedersen, 2007). As far as this study is concerned, CDHs are the hospitals that can easily obtain *patients, physicians or plant resources*; this includes even the financial resources from the government and other donors. They can easily obtain patients because of nature of their locations and services that they offer. Mostly, they are located in rural areas where competition of hospitals is very low, and their services are subsidized by the government since they are operating under the Public Private Partnership (PPP), therefore the fees charged is very low

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Vol. 4, No. 2 (2018), pp. 130-143
http://www.ajaronline.com
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compared to the private for profit hospitals. Hospital sector in Tanzania involves different stakeholders (i.e. central and local Governments, donors, policy makers, owners of the private hospitals such as faith based organizations, NGOs, health insurance, etc.). According to Watkins(2000) different hospitals stakeholders are very much interested in examining different aspects of hospitals performance.

According to Resource Dependency Theory (RDT) organization viability will depend on the extent to which it can explore and utilizes the resources from the environment in which it is situated. A good example of the applicability of Resource Dependency Theory is evidenced by the study conducted by Kim and McCue (2008) where they used the RDT to study the hospitals' capital investment. They added that hospitals operating in a resources endowed environment are more likely to excel and attain financial strength. RDT implications for hospitals planning shows that like in other organizations, hospitals solvency depend upon its ability to participate in acquisitions, joint ventures and limited partnership with other organizations (Semritc, 2009). In line with the argument by the Semritc, the inclusion of RDT in this study provides the basis for evaluation on how well the CDHs are participating in the partnership with the government after conversion and utilizes the resources (patients, plants, funds, employees etc.) efficiently.

RESEARCH METHODOLOGY

The study used non-financial data to support the analysis and ensure relevancy of the study contributions. This study follows several previous studies in different countries that have been undertaken to measure the impact of conversion (i.e. adaptation of restructuring, implementation of new health programs, health policy etc.) on hospitals performance and employed the most widely used technique of non-financial ratio analysis. Therefore, the robustness of the result on assessing capacity utilization in relation to conversion is of no doubt.

Following the work of Watkins (2000) and Ehreth (1994), the following ratios were employed in this study: *Occupancy Percentage, Average Length of Stay (ALOS), and Fulltime Equivalents per Occupied Bed, Admission per Bed, and Admission per FTEs.*

ISSN: 2408-7920

African Journal of Applied Research
Vol. 4, No. 2 (2018), pp. 130-143
http://www.ajaronline.com
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i. Occupancy percentage(OCCP) = $\frac{patients \cdot days}{beds \cdot in \cdot services}$ *365

Occupancy percentage measures the actual utilization of an inpatient health facility for a given time period, the information is applicable in health planning (i.e. identifying the existing capacity, used and unused capacity). It is calculated by taking total in patient days of care divided by bed in services (bed days available)

ii. Average length of stay (ALOS)= . $\frac{patients \cdot days}{admission}$

It is an important indicator to measure performance in the hospital sector; it has the influence on the cost of healthcare delivery and can be considered as means of assessing the hospitals costs. Hospitals with relatively higher ALOS may be considered as efficient in the use of the resources, while low ALOS signifies inefficiency. According to Thomas et al, (1997) ALOS is sometimes related to quality of health care. It is also useful in health policy, as reducing the ALOS is considered as the policy objective in many countries. Lower ALOS is also an indication of good quality and it is likely to enhance the image of the hospital.

iii. Full-time equivalent per occupied bed (FTEs / bed)= $\frac{FTEs}{occupied \cdot beds}$

It measures the number of staff allocated to the occupied bed, this shows the employees efficiency. As the number of employees per bed increases, it implies the inefficiency to the employees.

iv. Admission per bed (AD/Bed)= $\frac{admission}{number \cdot of \cdot bed \cdot in \cdot service}$

It measures the allocation and provision of beds, hospital bed is one of the scarce hospitals resources. It does not only implies the bed as the place to sleep rather it encompasses all services given to the inpatients (admitted patients) such as admission processing, physicians visits time, nursing care and diagnostic. Efficiency measure of inpatient activity produced by each bed, it is also known as the bed productivity.

v. Admission per Full Time Equivalent (FTEs) = $\frac{admission}{FTEs}$

Admission per Full Time Equivalent (FTEs) provides a measure of efficiency and a comparison

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African Journal of Applied Research
Vol. 4, No. 2 (2018), pp. 130-143
http://www.ajaronline.com
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of one hospital relative to another according to Full Time Equivalent (FTEs). It measures the employee productivity (the number of admissions the FTEs can handle).

FINDINGS AND DISCUSSION

Table 1: Median -Capacity Ratios before conversion 2002/03 – 2005/06

Performance dimension(indicators)	2002/2003	2003/2004	2004/2005	2005/2006
Occupancy percentage	0.629269807	0.567405176	0.535192411	0.753472421
Average length of stay (ALOS)	4.768617859	4.534354127	4.283334313	4.560556116
FTEs per occupied Beds	1.904386598	1.810594558	1.487028318	1.343103909
Admission/ bed (Adm/Bed)	42.15552927	39.85140693	34.75640693	40.9958153
Admission per FTEs	42.75704225	42.9724799	50.90784167	49.31608807

Source: Research Findings, 2017

There are several non-financial ratios that can be used in analyzing capacity utilization. However, decision on what kind of ratio to be employed in this study was the function of the availability of data and relevancy of particular ratios in assessing what we wanted to know. Table 1 presents the capacity utilization measures (five ratios) of eight (8) CDHs hospitals before conversion. Hospitals converted between 2006/2007 and 2008/2009 are Makiungu Hospital, Mbalizi Evangelical Hospital, Mvumi hospital, Peramio hospital, ST. Gema hospital, ST. Joseph hospital, Tosamaganga hospital and Turiani hospital.

Table.2: Median -Capacity Utilization Ratios after conversion 2009/2010 – 2012/13

Performance dimension(indicators)	2009/2010	2010/2011	2011/2012	2012/2013
Occupancy percentage	0.812321157	0.781638508	0.881674277	0.927013871
Average length of stay (ALOS)	5.775173747	7.397044593	7.476847218	6.957420331
FTEs per occupied Beds	0.812413618	1.044148359	1.19453679	1.19717666
Admission per bed (Adm/Bed)	39.77015873	36.31428571	37.31389018	43.57945055
Admission per FTEs	55.18712854	48.62605042	54.7017094	49.5824193

Source: Research Findings, 2017

Table 2 presents the median of capacity utilization ratios after conversion from VAHs to CDHs.

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African Journal of Applied Research
Vol. 4, No. 2 (2018), pp. 130-143
http://www.ajaronline.com
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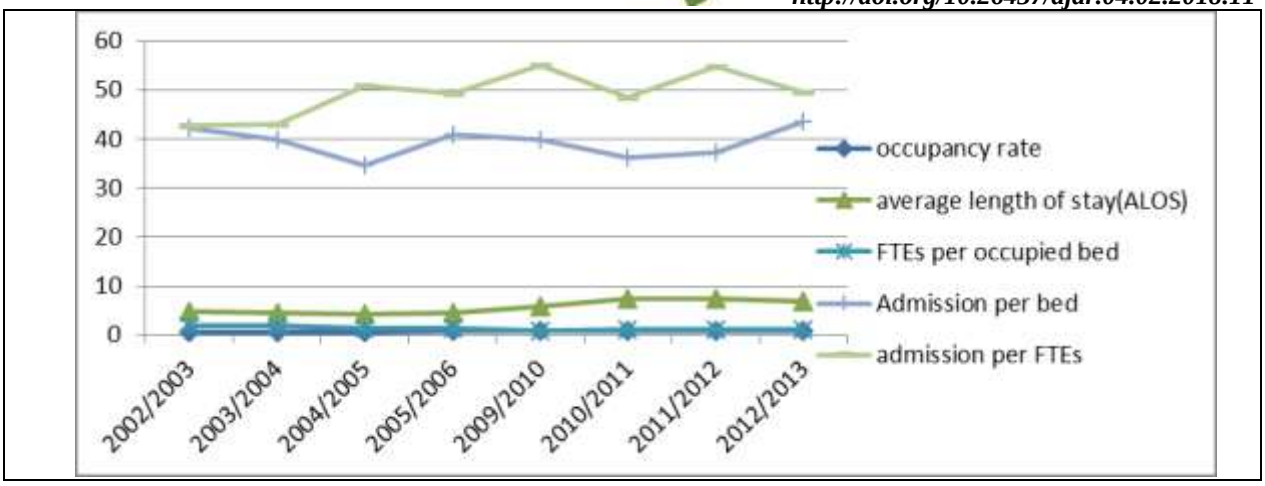

Figure 1: Change of Hospitals' Capacity Utilization and after Conversion

Source: Research Findings, 2017

The analysis starts with the *occupancy rate (also known as bed occupancy rate)* – which measure utilization of the available hospitals' bed, indicating the percentage of beds occupied by patients in a defined period of time usually a year. Results of occupancy rate revealed that before conversion in the year 2002/2003 it was 62.9%, it grew to 75.3% in 2005/2006, a growth rate of 20.9%. After conversion occupancy rate was 81.23% in 2009/10 and grew up to 92.7% in 2012/13, a growth rate of 13.6% after conversion. Implying that after the conversion CDHs continued increasing their utilization rate, though it was still below 100% (which indicates that they still had excess capacity). Growth in capacity utilization rate also is depicted in **Fig. 1** above which indicates steady increase in utilization rate after conversion (after 2009/10). When compared to previous study by Kerr et al., (1999) where the best practice capacity utilization were used in Netherlands, the findings revealed that in period I, the smaller hospitals had the capacity utilization of 77.8% while large hospitals 81.4%. In period II, results also indicated that performance deteriorated within the large hospitals and both group's capacity were operating at approximately 76%. Findings revealed that before conversion utilization rate of 75.3% was less than that of the small hospitals (77.8%) and large hospitals (81.4%) in Netherlands in period one, on the other hand after the conversion the utilization rate of 92.7% of faith-based hospitals in Tanzania was greater than that of both the small and large hospitals in Netherlands 76%. This indicates improvement in the utilization after hospitals' conversion which implies improvement of efficiency.

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Vol. 4, No. 2 (2018), pp. 130-143
http://www.ajaronline.com
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The second measure is *Average length of stay (ALOS)* - it measures the average number of days a patient spends in the hospital. It is calculated by taking inpatient days divide by number of admissions. Results revealed that before conversion of hospitals to CDHs in the year 2002/2003 ALOS was 4.77 days and in the year 2005/2006 average length of stay was 4.56 days a decrease of 4.4 % between 2002/2003 and2005/2006. After the conversion in 2009/10 ALOS was 5.77 days while in the year 2012/2013 was 6.95 days, an increase of 20.4%. Generally, the higher the ALOS means, the lower the efficiency. Hospitals with high ALOS may be relatively inefficient in the resources utilization meanwhile those with low ALOS are considered to be efficient. Internationally, the best hospitals have ALOS of 3.5 days (Bhat and Jain, 2006)

When compared to other studies, ALOS decreased from 9.6 days to 6.9 days between 1985 and 2000 respectively in European countries showing the improvement of efficiency (Bhat and Jain, 2006) meanwhile in this study result revealed that after conversion to CDHs the ALOS increased by 20.4% (2009/10 – 2012/13), implying increase of inefficiency among converting hospitals. Consequently, the decrease of ALOS in CDHs after conversion is the negative impact of hospitals' conversion on the efficiency performance. When compared to the international bench mark of ALOS of 3.5 days, the CDHs hospitals in Tanzania do not meet the benchmark either before or after conversion. However, it is also argued that too short ALOS implies low quality which may cause the re-admission. Among the possible causes for the increase or decrease in ALOS includes change in the environment in which the services are being provided (policy of shorter hospitals stay may reduce the demand for length of stay in the CDHs). Large number of patients seeking admissions may cause the decrease in length of stay in order to keep pace with the outstanding demand. However, ALOS and occupancy rate should be handled with lots of care, if the Hospital is able to reduce the ALOS it means the hospital has the room to increase more capacity to treat more patients. If the capacity increased is not fully utilized and the number of patients doesn't increase, it pulls down the occupancy rate and no change in efficiency. This happens because the occupancy rate has remained constant and offset the advantages obtained through reduction in ALOS.

The third is *Full time equivalent per bed (FTEs per bed*) - this examines the employees allocated (employed) to serve the inpatients. It is obvious that employment of skilled labor requires substantial funding; however, having skilled staff is quite inevitable if the hospital wants to make

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African Journal of Applied Research
Vol. 4, No. 2 (2018), pp. 130-143
http://www.ajaronline.com
http://doi.org/10.26437/ajar.04.02.2018.11

full utilization of capital investment. FTEs per bed measures the employees' efficiency, the higher the number of employees per occupied shows the employees inefficiency. In the year 2002/03 before conversion FTEs/bed was 1.904 per occupied bed while in the year 2005/06 it was 1.3431 showing the decrease of 29.5 % over the period of four years. After conversion the FTEs/bed was 0.812 in the year 2009/10 and 1.197 in the year 2012/13 showing an increase of 47.4 %. The general analysis of the FTEs per bed is that after conversion number of employees per occupied bed has increased showing increase in the employee inefficiency after conversion (Ref**.** Fig.1). The last two measures gauge the employees' and hospitals bed productivity; the measures are *admission per bed* and *admission per FTEs* (full time equivalent employees). Result for the CDHs revealed that, before conversion the *admission per bed* and *admission per FTEs* in 2002/03 was 42 and 43 patients respectively, while in the year 2005/06 was 41 and 49 patients respectively. On the other hand after conversion the *admission per bed* and *admission per FTEs* in the year 2009/10 was 40 and 55 patients respectively while in the year 2012/13 it was 44 and 50 patients respectively. *Admission per bed* shows the increase in hospitals' bed productivity after conversion, meanwhile *admission per FTE* shows a slight decrease in employee's productivity after conversion. This indicates increase in utilization of hospitals' bed (high hospitals' bed productivity) at the same time decrease in the utilization of the full time equivalent employees (FTEs). When compared to previous study by Levitz and Brooke (1985) labor productivity was measured by FTEs per day census, it was found to be higher for system affiliated hospitals compared to free standing hospitals. However, study measure impact of conversion on the labor productivity, and result revealed that there is underutilization of FTEs after conversion. Generally, higher variability in the staffing ratios and poor standardization in human resources management (particularly FTEs) may cause underutilization of labor.

Conclusively, the result of the converted hospitals after conversion reveal *Average length of stay* (ALOS) was 6 days in 2009/10 and then decreased to 5.3 days in 20012/13 a decrease of 11.6%, decrease in ALOS means efficiency. *Full time employees(FTEs) per occupied bed* was 0.984 in 2009/10, it went down to 0.967 in 2012/13 a decrease of 1.7%, this was less than 47.4 an increase of FTEs per occupied bed in CDHs after conversion, a decrease in FTEs per occupied bed implies improvement in the employees efficiency. *Admission per bed (adm/bed)* was 28 patients in 2009/10 and it grew up to almost 29 patients in 2012/13 an increase of 3.6%, on the

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http://www.ajaronline.com
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other hand *admission per FTEs (Adm/FTEs)* was 40 in 2009/10 and grew up to 42 in 2012/13 and increase of 5%. Increase admission per FTEs shows increase while that of CDHs was decreasing after conversion. Increase in admission per bed which was 3.6% was less than increase in admission per bed in the CDHs after conversion which was 10%. This shows that there was a slight higher increase in bed productivity after conversion (especially in the first two years after conversion).

CONCLUSION AND RECOMMENDATIONS

Generally, there are two school of thoughts one has been arguing that some degree of space capacity is very important to meet demand during the peak period (Fare et al,.1989), on the other hand another school of thought advocated by Gaynor and Anderson (1995) insisted that excessive spare capacity generate cost inefficiency. This study favored the argument that excess/spare capacity generate cost efficiency, this is because the CDHs hospitals are financed under the partnership arrangements (between the public sector and private sector) therefore allowing spare capacity may entertain misuse of the scarce health resources, and hence abuse the public resources. The result is mixed, some aspects indicating increase in the performance in terms of capacity utilization while other indicators show insignificant change in the capacity utilization before and after conversion. Specifically, after conversion there was an increase of Average Length of Stay (ALOS) and Full Time Equivalents per Bed (FTEs/bed) the two indicators measure hospitals and FTEs efficiency respectively. The result indicates increase in the hospitals inefficiency due to increase in ALOS after conversion. It was also found that FTEs efficiency decreased after conversion. Relationship between the man power productivity and hospitals' bed productivity indicate that, there was an increase in bed productivity after conversion, meanwhile the productivity of FTEs slightly decreased after the conversion. Findings further revealed that, there was slight decrease in the growth of the occupancy rate after conversion which is not a good indication of the hospitals capacity utilization as well as efficiency improvement. However, this should be interpreted with extra care since sometimes increase in the occupancy may be the result of increase in the average length of stay which lead to increase in total inpatient days.

This recommend that government in collaboration with CDHs administrators should conduct

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resources audit particularly after conversion to establish exactly the resources requirement in the hospitals, as it was observed that in some CDHs employees' productivity and efficiency decreased after conversion. This study support the argument that excessive spare capacity lead to unnecessary cost inefficiency, therefore study recommend to the policy makers that the government (through the ministry) should have tough policy on the effective resources utilization in the CDHs since healthcare resources are scarce compared to the demand for the same. To realize the benefits of partnership between the private and public sector, the study suggests that the government should continue its support (both financial and in terms of materials such as beds, equipment and medical supplies) to CDHs hospitals so as to enhance their performance in terms of capacity utilization.

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Appendix 1: Capacity Utilization of CDHs Before Conversion (2002-2006)

2002					
indicators	**Observations**	**Mean**	**Std.deviation**	**Minimum**	**Maximum**
Occupancy percentage	8	.7427024	.6071512	.0852636	1.932221
Length of stay	8	6.304941	6.251766	1.054198	21.21313
FTEper occupied bed	8	2.938185	3.034074	.1737453	9.029443
Admission per bed	8	45.77755	21.59142	12.0566	79.64445
Admission per FTEs	8	55.93724	28.34888	7.840491	99.03191
2003					
indicators	**Observations**	**Mean**	**Std.deviation**	**Minimum**	**Maximum**
Occupancy percentage	8	.743623	.6273237	.0688562	1.93911
Length of stay	8	14.87331	30.07028	1.01955	89.14845
FTEper occupied bed	8	3.089682	3.060646	.182337	7.984834
Admission per bed	8	40.71237	24.219	7.939286	72.11111
Admission per FTEs	8	43.52021	22.36989	8.944785	72.11111
2004					
Indicators	**Observations**	**Mean**	**Std.deviation**	**Minimum**	**Maximum**
Occupancy percentage	8	.8368882	.8633938	.0890654	2.732123

ISSN: 2408-7920

African Journal of Applied Research
Vol. 4, No. 2 (2018), pp. 130-143
http://www.ajaronline.com
http://doi.org/10.26437/ajar.04.02.2018.11

Length of stay	8	13.77997	27.49886	1.473317	81.71584
FTEper occupied bed	8	3.002045	2.987556	.1398703	8.468678
Admission per bed	8	43.98386	30.29508	12.20357	95.375
Admission per FTEs	8	47.63429	26.72226	8.55625	95.375

2005					
Indicators	**Observations**	**Mean**	**Std.deviation**	**Minimum**	**Maximum**
Occupancy percentage	8	.8072987	.8095528	.1125557	2.577622
Length of stay	8	10.90518	18.81623	2.310483	57.30542
FTEper occupied bed	8	2.878525	3.089361	.1427118	9.164115
Admission per bed	8	43.3576	32.31437	13.73585	109.0833
Admission per FTEs	8	50.70334	29.90232	8.878049	104.72
2006					
Indicators	**Observations**	**Mean**	**Std.deviation**	**Minimum**	**Maximum**
Occupancy percentage	8	.9076815	.9837457	.0859669	3.106086
Length of stay	8	12.76726	24.70511	1.34087	73.77225
FTEper occupied bed	8	3.437532	3.579556	.1172813	8.597659
Admission per bed	8	45.73914	31.10606	12.74528	97.9
Admission per FTEs	8	49.66839	28.81495	8.391304	94.13461

Appendix 2: Capacity Utilization of CDHs After Conversion (2009-2013)

2009					
Indicators	**Observations**	**Mean**	**Std.deviation**	**Minimum**	**Maximum**
Occupancy percentage	8	1.185206	1.488404	.1719345	4.784505
Length of stay	8	12.36617	19.12124	.9998057	58.95387
FTEper occupied bed	8	1.766102	1.582951	.156756	4.539448
Admission per bed	8	48.49009	21.32871	13.98113	73.52222
Admission per FTEs	8	64.71736	40.02549	9.148149	135.6087

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African Journal of Applied Research
Vol. 4, No. 2 (2018), pp. 130-143
http://www.ajaronline.com
http://doi.org/10.26437/ajar.04.02.2018.11

2010					
Indicators	**Observations**	**Mean**	**Std.deviation**	**Minimum**	**Maximum**
Occupancy percentage	8	1.196155	1.299197	.3473973	4.253136
Length of stay	8	13.94483	18.1331	2.461342	53.78845
FTEper occupied bed	8	1.420349	1.476043	.1489097	4.494544
Admission per bed	8	44.76176	23.9675	17.77358	77.12222
Admission/ FTEs	8	69.28231	52.95116	11.28144	172.3235
2011					
Indicators	**Observations**	**Mean**	**Std.deviation**	**Minimum**	**Maximum**
Occupancy percentage	8	1.258564	1.390923	.278432	4.527108
Length of stay	8	14.08805	17.14563	1.575363	53.87267
FTEper occupied bed	8	1.302179	1.005039	.1460339	2.838281
Admission per bed	8	41.91768	18.45977	14.40566	64.51064
Admission/ FTEs	8	62.47161	48.32903	9.310976	168.4444

2012					
Indicators	**Observations**	**Mean**	**Std.deviation**	**Minimum**	**Maximum**
Occupancy percentage	8	1.415531	1.708753	.1351213	5.523699
Length of stay	8	15.41796	19.1155	1.259538	58.91348
FTEper occupied bed	8	1.288959	.8769482	.1176748	2.853304
Admission per bed	8	41.32185	16.3111	16.66981	64.66161
Admission/ FTEs	8	55.25559	29.96607	10.70909	101.5625
2013					
Indicators	**Observations**	**Mean**	**Std.deviation**	**Minimum**	**Maximum**
Occupancy percentage	8	1.376642	1.593236	.1498369	5.207108
Length of stay	8	13.22584	17.03107	1.688971	53.34586
FTEper occupied bed	8	1.731181	1.951729	.1312309	6.324336
Admission/ bed	8	44.91377	15.57463	22.0283	65.97059
Admission/ FTEs	8	50.68905	24.6992	13.98204	90.93243

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