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Equity Analysis of Quality Malaria Treatment in Ghana

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Abstract

Malaria is the dominant communicable disease in Ghana and is responsible for about forty percent of outpatient cases in health care facilities. Access to good quality health care is thus important to ensure good health status of the general population. The health facilities of the Ghanaian health care system are categorized into teaching, regional, and district hospitals as well as policlinics and health center. This study compares the quality of services provided by health facilities according to geographical location, and the type of facility providing the service. Quality indicators used included doctor shortage, waiting period, clarity of communication, and effectiveness of treatment. The results show that there are statistically significant variations in quality across regions as well as the type of facility regardless of patient, characteristics such as education, age, and occupation. Teaching hospitals provided the most effective treatment with high equity while the regional hospitals performed worse than district hospitals. Low effectiveness of treatment implies that the parasites remain in the blood stream and so further infection to others continues and incidence remains high. Recommendations are made to improve effectiveness of treatment and reduce variation.

Introduction

Malaria is the major cause of morbidity and mortality in Ghana with pregnant women and children under five being the most vulnerable groups [1]. The disease accounts for about 40 percent of outpatients in health facilities and 61 percent of children in hospital admissions are caused by malaria. According to the sixth Millennium Development Goal, Ghana is to reverse the incidence of malaria and other major diseases by 2015. Since malaria is a major cause of mortality and morbidity in the population, reversing its incidence can significantly improve the health of the population. To achieve the Millennium Development Goal, the government has engaged in preventive measures through the distribution of insecticide treated bed nets, encouraging patients to seek health care when sick, as well as introducing more varieties in malaria treatment drugs [2].

The communicable nature of the disease makes effective treatment crucial to ensure a reduction in incidence of the disease. The presence of one person with the parasite can make others susceptible to the disease. It is therefore important that malaria patients receive effective treatment which implies equalization of access to high quality treatment. However, equity in quality of care is not part of the government's policy to meet the sixth Millennium Development Goal [3].

Inequity in treatment quality means that those that do not receive effective treatment would still carry the parasites in their bodies after treatment and hence infect others through mosquito bites. The purpose of this paper is to test equity in the quality of care received by malaria patients across and within various types of public health facilities in Ghana. Since resource allocation to public health facilities in Ghana is done according to facility types, testing for equity across various types of health facility provides information to policy makers on the outcome of the resource allocation. In addition, inequity of quality within particular types of facility would provide information to policy makers on the need to ensure efficiency of resource used in those facility types and/or review resource allocation to various facilities within the category.

The literature on equity in healthcare (e.g., AR Green, A Tan-McGrory, MC Cervantes, JR Betancourt [4]) has used disparity to represent inequity and hence reduction in disparity represents equity. Equity in quality of care then refers to equality or low disparity in the quality of care received by patients in health facilities regardless of ability to pay and social characteristics [4]. Equity in the quality of care for malaria patients in a health system implies that there is no statistically significant difference in the doctor/nurse patient ratio, waiting period, treatment type etc. regardless of the location, the type of the health facility or the characteristics of the patients. Thus if the economy has the technology to treat malaria, then people with malaria should have statistically the same quality input in treatment. Lack of equity in quality could imply that some people receive proper treatment while others do not and hence can still retain parasites in their blood and slow down the reduction in the incidence of malaria.

The literature on equity in health care delivery

has mostly focused on quantity of care and interpret health care equity as equality of access, allocation according to need and equality of health. Access to health care refers to the maximum amount of health care that can be consumed given money and time prices, as well as income [5]. From the point of view of need, equality in health care refers to allocation according to need regardless of ability to pay [5]. This definition can be applied to equity in quality of care, in that people with equal need receive the same quality of care regardless of ability to pay or location or social characteristics.

The health equity literature has mostly used quantitative variables. Example, Wagstaff and Doorslaer [6] were interested in finding if people of equal need of treatment (health utilization) received similar treatment regardless of income. Utilization of care was measured by healthcare expenditure with the assumption that given prices, patients with higher health care expenditure received more treatment than those with lower expenditure. While medical expenditure captures some aspect of intensity of care, it misses the quality aspects such as waiting time, clarity of communication, and personnel shortage, all beneficial for treatment.

In J. Grytten, G. Rongen, R. Sørensen [7] number of visits was used to represent healthcare utilization in testing for equity in healthcare utilization in public healthcare system. Number of visits here is more of measurement of quantity of care than quality but the implied quality is fixed per visit and so increase in utilization could also imply increase in quality of care. Obviously, quality can vary across patients with the same number of visits and so such a study does not capture equity in quality of care.

Other studies have examined quality of healthcare as well. For example, A.D. Asante, A.B. Zwi and M.T. Ho [8] used deprivation of certain basic resources in selected communities in two regions in Ghana to test for equity of resource allocation for health. Communities with deprivation of the resources required for health were expected to have poor access to adequate healthcare and hence had poor health status. In a later study A.D. Asante and A.B. Zwi [9] examined factors that influence equity in resource allocation in the Ghanaian health system. The study concluded that institutional factors such as transparency and commitment to equity are the important factors that affect equity in allocation of resources in the health system. Also LC Cummings, BA Bennett, AE Boutwell, and E.L. Martinez [10] showed that availability of resources, such as personnel, as well as appropriate communication with patients regardless of race are required for equity in quality. A.R. Green, A. Tan-McGrory, M.C. Cervantes, and J.R. Betancourt [11] highlighted improvement in proper communication that is sensitive to patients' culture as important in ensuring equity in quality of care. The current study then examined equity in the distribution of human resources, clarity of communication, waiting time, and effectiveness of treatment as indicators of quality.

Methodology

Study Area, Design and Data Collection

Data used for the study were obtained from a 2010 survey sponsored by the African Economic Research Consortium and first used in E. Amporfu, J. Nonvignon, and S. Ampadu in [12]. The data covered information on twenty six health facilities over three of the ten administrative regions in Ghana. The three regions are Northern, Ashanti and the Greater Accra regions. The facilities were classified into teaching hospitals, regional hospitals, district hospitals, and health centers and the data covered three teaching hospitals (one from each region), three regional hospitals (one from each region), twelve district hospitals (four from each region) and eight health centres (three from Ashanti, three from Greater Accra and the rest from the Northern region). Teaching hospitals in Ghana are tertiary hospitals while the regional and district hospitals are secondary hospitals with the regional hospitals serving as referral hospitals to the district hospitals. The three regions were chosen because the three major teaching hospitals in the country are located in these regions. In general, health centres are found in rural areas than urban areas. The health centres are thus located in the rural areas, the teaching and regional hospitals are located in the capital cities of the regions. The district hospitals are spread over the cities and small towns.

The survey interviewed facility administrators as well as patients, who had received malaria treatment within one month before the interview, from the selected health facilities. The quality indicators were outpatient overcrowding, doctor shortage, waiting period, clarity of communication, and effectiveness of treatment. The information on outpatient overcrowding was obtained by observation. The researcher visited each health facility three times and observed if all patients had seats whilst waiting for service. If patients were found standing during at least two of the visits, the facility was classified as having overcrowded outpatient department which implies a low structural quality. Information on patient characteristics were obtained through interviews.

The number of patients interviewed per facility depended on the type of facility. Since there was no information on population served by each of the health facilities used for the study, it was not possible to compute a sample size for them. Convenient sampling method then was used. Twenty patients were interviewed from each health centre, hundred from each teaching hospital, and eighty from each regional hospital. In the case of the district hospitals, the number of patients interviewed ranged between eighty and sixty. The unit of observation for the analysis was patients, with a sample size of 1,291, after eliminating those with missing observations.

Quality Indicators Used

Quality of care refers to all aspects of treatment that are beneficial to the patient [13]. The literature distinguishes three types of quality: structural quality, process quality and outcome quality [14]. Structural quality is defined as the availability of human and physical resources for the provision of care.

Examples include equipment, doctors and other personnel [15]. Doctor shortage and outpatient overcrowding in health facilities were therefore used in the current study as indicators of structural quality. Shortage of doctors reduces quality because doctors might have to spend less than the time required on a patient which may in turn weaken the effectiveness of treatment. Shortage of doctors then may result in some vulnerable groups in society not having access to adequate medical care [16]**.** Specifically, doctor shortage in the study refers to whether or not the doctor population ratio of a health facility exceeds that of the national ratio. Since the national doctor population ratio is the average, health facilities with ratios below the national ratio would be facing more shortage than the average health facility in the country. Thus, a facility with doctor population ratio below the national ratio was considered in this study as having doctor shortage. Since malaria is a common disease in Ghana, nurses are likely to provide treatment in the absence of doctors, especially in small health facilities. However, a doctor is better skilled than a nurse in the treatment of the disease and given that the interest in the study was in effectiveness of treatment an indicator related to a doctor was used. Even though the literature (e.g., JW Peabody, MM Taguiwalo, DA Robalino, J Frenk in [14], Association of American Medical Colleges in [17]) has used doctor shortage as an indicator of quality, to the author's knowledge no research has used the doctor shortage as defined in the current study for analysis.

Outpatient overcrowding was used in the study to refer to insufficient furniture at the outpatient implying that patients may have to stand whilst waiting to see a doctor or for medicine. Since malaria patients have low energy level, forcing them to stand whilst waiting for treatment could further weaken them. Weak patients are likely to sit on the floor but this increases the probability of contracting other diseases or could discourage them from going to the health facility for further treatment. Previous studies (e.g., G Holdsworth, P A Garner, T Harphan in [18]) have used patient overcrowding as a quality indicator. Patient overcrowding could result from inadequate management of patient flow [18].

Waiting time and clarity of communication were used as indicators in the current study for process quality. Process quality is the behavior of health care provider in the process of providing health care; examples include: clarity of communication with patients, waiting period, diagnosis, and treatment type [14]. Many studies (e.g., C J Hill, K Joonas, in [19], WTA in [20]) have used waiting time as an indicator of quality. The justification of waiting time as an indicator comes from the fact that long waiting period before seeing a doctor could deteriorate treatment since it increases the time cost of treatment. Long waiting period to see the doctor could discourage patients from seeking care from health facilities hence delay proper treatment and worsen the severity of the disease. Clarity of communication refers to how treatment is communicated by health workers to patients. This is also an important

indicator of quality because it ensures compliance to treatment [21]. Proper compliance is required to ensure effectiveness of treatment.

Finally, the effectiveness of treatment as perceived by the patient was also used as an indicator of outcome quality. Outcome quality refers to the effect of treatment on the health of the patient [14]. Ideally, a laboratory test result after treatment indicating the presence of malaria parasites or lack of it would have been a better indicator than the patient's evaluation but laboratory test results were not available. Nevertheless, patient's perspective of the effectiveness of treatment is a good indicator of effectiveness in that ineffective treatment would easily lead to relapse and patients would be able to evaluate the effectiveness of treatment received by the preference weight they place on their health status about a week after treatment. Patients whose health status improves significantly are likely to put a higher weight than those with less improvement in their health after treatment. Studies, e.g., MD Clemes, LK Ozanne, and WL Laurensen in [22] have evaluated health outcome according to patient's evaluation as an important quality indicator.

More than fifty percent of the health facilities in Ghana are publicly owned [24]. Each of the nine administrative regions in Ghana has all categories of health facilities [24]. Given that the distribution of resources could vary across these facilities and regions, the question is, is treatment quality equitable across the facilities or regions? Even if there is equity or inequity, between given categories of health facilities, information on equity within the various categories of health facilities could be beneficial to policy makers on the need to improve quality in certain facilities. The current study then tested for equity by using two approaches to test for equity of quality across facilities and administrative regions. The first approach used regression analysis to test for equity in the various quality indicators, while the second approach used the median approach test for equity across and within facility types as well as administrative regions.

Data Analysis: Regression Approach

The regression equation used to test for equity of quality is shown below:

$$y_i = \beta_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + e_i$$

where y_i represents the quality indicator for person *i*. As discussed above, the indicators used were outpatient overcrowding, doctor shortage, waiting period, clarity of communication between patients and health care workers, and finally, effectiveness of treatment as evaluated by the patient. Both outpatient overcrowding and doctor shortage were coded as dummy variables with the outpatient overcrowding equaling one if enough seats were not available for patients and zero otherwise. Similarly, doctor shortage dummy was coded as one when the doctor patient ratio of the facility was less than the national doctor patient ratio of 1:10,380 [26]. Waiting period was measured in minutes, while clarity of communication and effectiveness of treatment were coded in integers between 1 and 7 with 1 meaning

poor ranking and 7 meaning excellent ranking.

The variable X_2 is a vector of demographic factors, mainly gender and age; X_3 is a vector of four dummy variables on the highest education levels attained by the individual with uneducated as the control group. The education dummy variables are primary, Junior High School (JHS), Senior High School, (SHS), and tertiary. The variable X_4 is a vector three dummy variables on employment: employed in the formal sector, informal sector, with unemployed as the control group. Another dummy variable, farmer, was included to determine any existing variation in quality of care between farmers and non farmers. X_5 is also a vector of locations of the hospital, i.e., whether the facility was in the Northern (the control group), Ashanti or Greater Accra region. Finally, X_6 is a vector of hospital type, i.e., whether the hospital was a teaching hospital, or regional hospital, or district hospital or a health center which is the control group. The last variable, e_i, is the error term of the regression equation and it is assumed to be white noise.

The statistical significance of a coefficient implied inequality between the category of a characteristic and the control category. For example, illiteracy was the control group for education and so the significance of the coefficient of primary education implied inequality between the qualities of care received by people in the two categories of education: primary and uneducated. Equality of the coefficients of the categories in each vector represents equity in the quality of care received by those in the categories.

The method of estimation of the regression equation depended on the quality indicator. Doctor and outpatient overcrowding were dummy variables and so logistic regression was used to estimate the coefficients. Duration method of estimation was used for waiting period. Duration method of estimation was used because the dependent variable was the length of time it took to see a doctor given that the patient had waited for a given period of time. Typically the observations in duration model are divided into two types: the censored and the uncensored group [23]. In the current study, the censored group would be those that had not yet seen the doctor at the time data was collected and the uncensored would be those that had seen the doctor. However, the data used were collected after patients had seen the doctor. Thus to validate the data for duration estimation, the mean waiting time was used as the cut off so that those who waited longer than the mean waiting time were treated as the censored group and those who waited less than the mean waiting time were treated as the uncensored group.

Ordered logistic regression method of estimation was used for the estimation of the regressions with clarity of communication and effectiveness of treatment as the dependent variables. The coding of clarity of communication and effectiveness of treatment represented the rankings of the two variables by respondents. The variables per se are not observable and so are being measured by the coding from 1 to 7 which were observable.

The difference between 1 and 2, for example cannot be treated the same as that between 5 and 6. The variables then were ordinal and so ordered logistic regression was the appropriate method of estimation [23].

Data Analysis: Median Based Approach

With the exception of waiting period, the quality indicators used in the study were qualitative variables and hence the median based approach for the measurement of equity by R. A. Allison and J. E. Foster [25] was used. The method basically compares the extent of inequity among distributions. Unlike the traditional measures of inequality, such as the Gini coefficient, and Atkison's measures that are mean based, the median approach, as the name indicates, is median based. Since the computation of mean is sensitive to the scale, the use of a scale dependent measure could give misleading results [24]. The median based approach then is less misleading.

The equity comparison, as described in [25] involves computing two spread indices for each distribution. The indices are $s_L(x:c) = m(x:c) - \mu_L(x:c)$ and $s_H(x:c) = \mu_H(x:c) - m(x:c)$ where *m* is the median, *c* is the scale; μ_L is the mean of the distribution of categories that are equal and less than the median while μ_H is the mean of the distribution of the categories equal and greater than the median. Assume two distributions (for two hospital types) *x* and *v* with the same median, it can be said that *x* has a greater spread than *v* implying greater equity in *v* than *x*, if $s_L(x:c) \geq s_L(v:c)$ and $s_H(x:c) \geq s_H(v:c)$. In addition, *x* is said to first order dominate *v*, implying *x* has higher quality than *v* if $s_L(x:c) \leq s_L(v:c)$ and $s_H(x:c) \geq s_H(v:c)$.

In the median approach used by [25] for equity analysis of health status (qualitative variable), the scale was such that high values represented high health status. The qualitative variables used in the current study can be grouped into two: dummy variables: doctor shortage and outpatient overcrowding (with two categories) and patient ranked variables: clarity of communication and effectiveness of treatment (with seven categories). Given the nature of the qualitative variables used in the current study, two types of scale were used. For doctor shortage and outpatient overcrowding, the scale was (1, 2) with one representing overcrowding/shortage and two representing no overcrowding/shorta ge. Given that overcrowding/shortage is low quality, 'no overcrowding/shortag' represents high structural quality. The scale used for clarity of communication and effectiveness of treatment was (1, 2, 3, 4, 5, 6, 7) with 1 representing low quality and 7 representing excellent quality. As shown above, the median approach requires the computation of means ($\mu_L(x:c)$ and $\mu_H(x:c)$) which are computed by multiplying each value in the scale by the number of times it appeared in the relevant variable, summing the products and dividing by the sum of the distribution [25]. For example, suppose outpatient overcrowding for a given hospital type had 10 ones and 12 twos, then obviously, the median is 2 and the distribution of the lower values including the median is (10, 1) with a scale (1, 2), the distribution of the higher values is (11) with a scale (2). Thus

$\mu_L(x:c) = \left(\frac{(10*1)+(1*2)}{10+1} = 1.09\right)$; similarly, $\mu_H(x:c) = \left(\frac{(11*2)}{11} = 2\right)$.

For each of the quality indicators, the study measured the inequity across regions and hospital types. Before a quality indicator could qualify for equity comparison under this method, the distributions of the indicator in each hospital type or region should have the same median category [25]. Thus, for example, the data on effectiveness of treatment were categorized according to region and the distribution of the data for each region was compared.

The distributions that were used for the study were those of patients' rankings of quality indicators: effectiveness of treatment, and clarity of communication, as well as information on doctor shortage and outpatient overcrowding, in each hospital type: teaching hospital, regional hospital, district hospital, and health center; and in each region: Ashanti, Northern and Greater Accra regions. If the distributions had the same median the method was applied otherwise quality could not be compared for that quality indicator.

Gini Coeffiicent

Among the quality indicators used in the study only waiting period was a quantitative variable and so the Gini coefficient was used to measure and compare the inequity in waiting period in the three regions as well as that among the hospital types. The value of the Gini coefficient is between 0 and 1 where 0 represents perfect equity, i.e., every patient of a given diagnosis had the same waiting period, and 1 represents perfect inequity implying that one person waited for a very long time. The method used to compute the Gini coefficient, obtained from Wikipedia [26] and the computation was as follows: first, the distribution was ranked in ascending order. Letting n be the sample size for the category and x_i be the waiting period of patient i, with $i = 1 .. n$, the Gini coefficient for a given distribution was computed as:

$$G = \frac{1}{n}\left(n + 1 - 2\left(\frac{\sum_{i=1}^{n}(n+1+i)x_i}{\sum_{i=1}^{n} x_i}\right)\right)$$

Results and Discussion

Data Description

As shown in Table 1, the respondents (with a sample size of 1291) were on average in their mid-thirties and mostly educated and working in the informal sector. Almost half of the respondents received care from district hospitals. On average 65 percent of the facilities were classified as overcrowded. Doctor shortage was a dummy variable which equaled one, when the doctor patient ratio was less than the national ratio, and zero otherwise.

Table 1: Data Summary

Variable	Percentage
Age	36.6 years (average)
Gender	
female	59
Male	41
Greater Accra	39.9
Ashanti	38.3
Northern	21.7
Education	
· Uneducated (control group)	10.8
· Primary	16
· Junior High School (JHS)	39.1
· Senior High School (SHS)	20.9
· Tertiary	13.2
Occupation	
· Formal	20
· Informal	54
· Farmer	10
· Unemployed (control group)	26
Teaching Hospital	18
Regional Hospital	15
District Hospital	48.9
Health Centre	18.1
Outpatient overcrowding	61
Doctor Shortage	65
Waiting time	160 minutes (average)
Clarity of communication	5.2 (average)
Effectiveness of treatment	5.7 (average)

According the Table 1, 65 percent of the facilities had low doctor patient ratio and so had doctor shortage. Waiting time was measured in minutes and it represented the length of time the patient had to wait before seeing the doctor. Table 1 shows that on average each patient waited for 160 minutes (2.6 hours) before seeing a doctor. The average ranking for clarity of communication was 5.2 and that for effectiveness of treatment was 5.7.

The rest of the results are those from regressions, median based equity

analysis and Gini coefficient computation.

Regression Results

The results of the equity tests from the logistic regression are reported in Table 2 and they show that education did not affect the choice of health facility as far as outpatient overcrowding is concerned. The results also showed that farmers and people who worked in the formal sector were more likely to receive care in less overcrowded health facilities than non farmers and the unemployed respectively. On average the outpatient departments of facilities in the Greater Accra and the Ashanti regions were less overcrowded than those in the Northern region. The results also showed that teaching hospitals were less overcrowded than the other types of health facilities.

Table 2a: Results of Logistic and Duration Regressions

Variables	Outpatient Overcrowding		Doctor shortage		Waiting Period	
	Coefficient	P-value	Coefficient	P-value	Hazard ratio	P-value
Age	0.099	0.000	0.083	0.000	0.998	0.374
Age^2	-0.001	0.001	0.000	0.000		
Gender (female = 1)	-0.049	0.732	-0.071	0.600	0.977	0.563
Primary	0.263	0.264	-0.973	0.000	1.094	0.209
JHS	-0.097	0.627	0.849	0.000	0.885	0.016
SHS	0.247	0.282	0.277	0.215	0.948	0.416
Tertiary	-0.516	0.051	-0.247	0.393	1.048	0.546
Formal	-0.710	0.009	1.146	0.000	1.243	0.003
Informal	0.096	0.679	0.323	0.130	0.945	0.308
Farmer	-1.605	0.000	0.471	0.063	1.051	0.474
Greater Accra	-2.327	0.000	-3.523	0.000	0.945	0.285
Ashanti	-3.486	0.000	-2.404	0.000	1.003	0.939
Teaching	-0.834	0.000	-20.950	0.991	0.490	0.000
Regional	0.266	0.27	0.330	0.200	0.573	0.000
District	0.080	0.665	3.222	0.000	0.626	0.000
Constant	0.970	0.000	-1.520	0.000		

The results from the logistic regression on doctor shortage showed that older patients were likely to choose facilities that had shortage of doctors. Facilities used by patients with primary education had higher doctor patient ratio than those

used by uneducated and those with tertiary education. Patients in the formal sector also

received care from facilities with lower doctor patient ratio than those in the informal sector and the unemployed. Both the Greater Accra and Ashanti region had a higher doctor patient ratio than the Northern region. Testing the equality of the coefficients of the two regions by the use of Likelihood ratio test, showed that they were not equal implying that Greater Accra region had a higher doctor patient ratio than the Ashanti region. The results on hospital types showed that district hospitals on average had a lower doctor patient ratio than the other types of hospitals which statistically had the same ratio as health centre, the control group.

The results from the duration model showed that only the hazard ratios for JHS, formal sector workers and the hospital types were statistically significant. Patients with JHS chose facilities with longer waiting period than those with higher levels of education as well as the uneducated. Patients from the formal sector on average waited for a shorter time than those from the informal sector and the unemployed. The results also showed that patients in health centers had the shortest waiting period before seeing the doctor than those who went to the other hospital types. Waiting period was longest in the Teaching hospitals, followed by the regional hospitals and then the district hospitals.

Table 2b: Regression Results of Ordered Logistic Regression

Variables	Clarity of Communication		Effectiveness of Treatment	
	Coefficient	P-value	Coefficient	P-value
Age	0.006	0.105	0.008	0.026
Gender (female = 1)	0.261	0.014	-0.09	0.406
Primary	0.366	0.032	0.315	0.073
JHS	-0.141	0.306	-0.097	0.487
SHS	0.149	0.369	0.38	0.023
Tertiary	0.227	0.251	0.246	0.016
Formal	0.192	0.301	0.314	0.094
Informal	0.058	0.704	-0.017	0.909
Farmer	0.282	0.202	-0.234	0.308
Greater Accra Region	1.542	0	0.682	0
Ashanti Region	-0.17	0.29	-0.876	0
Teaching Hospitals	-0.893	0	0.697	0
Regional Hospitals	-0.303	0.103	0.04	0.828
District Hospitals	-0.199	0.168	0.296	0.043
Cut 1	-3.501		-5.032	
Cut 2	2.273		-2.974	
Cut 3	-1.265		-2.158	
Cut 4	-0.278		-1.011	

Cut 5	0.968		0.005	
Cut 6	2.936		1.944	

The results on the clarity of communication regression showed that only the coefficients of gender, primary education, Greater Accra, and Teaching hospitals were statistically significant. Females found treatment communication clearer than males. The clarity of communication increased by 0.261 points, when the patient was female, holding all other variables constant. Similarly, patients with primary education got better clarity of communication than the uneducated. Clarity of communication for patients with primary education exceeded that of the uneducated by 0.366 points, holding all other variables constant. Patients in the Greater Accra region on average had better clarity of communication than those from the Northern and Ashanti regions. The clarity of communication was poorer in the teaching hospitals by 0.893 points compared with the health centers or other hospital types.

The cuts represent the points on the latent variable, clarity of communication, which is a continuous mechanism that is indexed by the observed discrete values ranging between 1 and 7. The results showed that the poorest clarity of communication as perceived by patients was valued at -3.501 or less while the highest quality was valued at 2.936 or higher. Patients that had a value of -3.501 are classified as receiving the poorest communication given that they belonged to all control groups; specifically, they were males, uneducated, received treatment from a health centre in the Northern region. The patients who had 2.936 or greater are classified as receiving excellent clarity of communication given that they were males, uneducated, received treatment from a health centre in the Northern region. The rest of the patients would be classified between the two end points.

The results on effectiveness of treatment showed that effectiveness of treatment improved with age. The results also showed that primary and JHS education did not affect the effectiveness of treatment and hence people with primary and basic education had the same level of effectiveness of treatment as the uneducated. People with secondary and tertiary education however had higher effectiveness than the uneducated. Test of the equality of the coefficients for Senior High school and Tertiary education showed that tertiary educated patients had a higher effectiveness of treatment than those with senior High education. The results also showed that occupation did not have any statistically significant impact on effectiveness of treatment, hence there was no inequity.

Inequity however existed across the regions with the patients in the Greater Accra region experiencing higher effectiveness than the Northern region which had a better effectiveness than the Ashanti region. Inequity also existed among the hospital types except for regional hospitals which had the same

effectiveness as health centers. The test for the equality of the coefficients showed that patients of the teaching hospitals had the highest effectiveness followed by those in the district hospitals. According to the cutoff values, the poorest effectiveness was valued at -5.032 or less while the highest effectiveness was valued at 1.944 or higher. Again, patients that valued effectiveness of treatment at -5.032 or less fall into the group of patients who received the least effective treatment given that they were males, uneducated, received treatment from a health centre in the Northern region. Similarly, patients with cut off of 1.994 or higher were those with most effective treatment given that they were males, uneducated, received treatment from a health centre in the Northern region.

The results so far have focused on equity between regions and hospital types but do not give information on the extent of equity within the regions and hospital types. The median based approach provides such information.

Equity Results from the Median Based Approach

The results showed that only effectiveness of treatment and clarity of communication had the same median category for all the categories. The median category for effectiveness of treatment was six (6) and that of the clarity of communication was five (5). Thus the spread indices were computed for only effectiveness of treatment and clarity of communication. Doctor and patient overcrowding were not included. The results are shown in Tables 3 and 4.

Table 3: Results on Equity Measurement for Clarity of communication

	S_L	S_H	S	Median
Northern	1.04	0.73	1.77	5
Ashanti	1.17	0.74	1.91	5
Teaching hospital	0.89	0.67	1.56	5
Regional hospital	1.1	0.98	2.08	5
District hospital	0.88	0.92	1.8	5

The median for Greater Accra region as well as that of health center for clarity of communication was 6 and so was Greater Accra and Health Center were not included for comparison. The spread indices in Table 3 show that there was greater spread in the clarity of communication in the Ashanti region than the Northern region. The spread indices for the hospital types show a high spread in the regional hospitals. Teaching hospitals and district hospitals could not be compared in terms of spread but could be compared in terms of dominance. The results show that clarity of communication in the district hospitals first order dominates that in the teaching hospitals. This is consistent with the regression results that showed that the teaching hospitals had the poorest clarity of communication.

The partial spread indices were used to make more unambiguous comparison of equity in the hospital types. The results showed that there was much greater spread in the regional hospitals than the district hospitals and health centers. Using the overall spread indices, the regional hospitals again had the highest spread index followed by the health centers, the teaching hospitals, and the district hospitals. Thus the district hospitals had the highest equity in terms of effectiveness of treatment. The results also show that the partial lower spread index for Greater Accra is less than that of the Northern region but the higher spread index exceeds that of the Northern region, hence the effectiveness of treatment in the Greater Accra region first order dominates that of the Northern region. No such comparison can be made for the Ashanti region.

Table 4: Results on Equity Measurement for Effectiveness of Treatment

	S_L	S_H	S	Median
Northern	0.97	0.4	1.37	6
Greater Accra	0.56	0.43	0.99	6
Ashanti	1.11	0.33	1.44	6
Teaching hospital	0.78	0.53	1.31	6
District hospital	0.79	0.39	1.18	6
Regional hospital	1.22	0.5	1.72	6
Health Center	1.04	0.32	1.36	6

Similarly, effectiveness of treatment in the teaching hospitals first order dominates that in the district hospitals. This is consistent with the results of the regression where effectiveness of treatment was better in the teaching hospitals than the district hospitals.

Table 5: Results from the Gini Coefficient Computation for Waiting Period.

Regions	Gini Coefficient	Hospital Type	Gini Coefficient
Northern Region	0.25	Teaching Hospital	0.28
Greater Accra Region	0.27	Regional Hospital	0.2
		District Hospital	
Ashanti Region	0.39	Health Center	0.3
			0.36

The Gini coefficients were in general closer to zero than one implying low inequity in the categories. The results on the regions show that there was more inequity in waiting period in the Ashanti region than the other two regions. People in the other regions were more likely to have similar waiting periods than those in the Ashanti region. In the case of the hospital types, the regional hospitals had the highest equity in waiting period while the health centers had the highest inequity. The teaching and district hospitals had similar levels of equity in waiting period.

Discussion

The result on education and outpatient overcrowding implies that as far as patients' education was concerned there was equity in structural quality. In other words, both the educated and uneducated crowded up in health facilities. Given that educated people are likely to value quality more than the uneducated, the results imply that the educated who sought care in facilities with overcrowded outpatient departments, were unable to find less overcrowded facilities at the prevailing prices holding everything constant. The higher outpatient overcrowding in the Northern region implies a higher structural quality in the two regions than the Northern region. The implication is that outpatients were more comfortable in the Ashanti and Greater Accra Regions and all things being equal, were more likely to seek healthcare than those in the Northern region. Malaria then must be easier to control in the two regions than the Northern region. This is not a surprise because the Northern region is generally poor and so may lack the resources required to reduce outpatient overcrowding.

The results on increase in effectiveness of treatment with education is consistent with M. Grossman [28] which showed that education improves health stock, because the highly educated is likely to know how to combine health care consumption with other goods and so get a higher return in health from the consumption of health care than the less educated.

Given that clarity of communication is important for compliance to treatment such results imply that compliance to treatment could vary a lot among patients in the Ashanti

region than the Northern region. While high compliance could lead to good treatment, low compliance could delay treatment and hence increase the risk of spreading the malaria parasite. The greater spread in effectiveness of treatment in the regional hospitals than the other hospital types implies a high level of inequity in the regional hospitals regarding the effectiveness of treatment than the district hospitals and health centers. The result is important because regional hospitals were ranked below teaching and district hospitals.

Regional hospitals scored the same as health centers in all the quality indicators except waiting period which is longer than that in the health centers. Poor communication and low effectiveness were highly inequitable implying a high variation in the quality indicators. Regional hospitals are referral facilities to district and health centers and so are better equipped than the other two types of hospitals. The poor quality indicators in the regional hospitals could represent inefficiency or lack of adequate resources required for operation.

Conclusion

The study has shown that there is inequity in the quality of healthcare provided to malaria outpatients depending on the location and the type of health facility in which care was provided. The inequity can affect the control of the disease. Quality indicators examined were outpatient overcrowding, doctor shortage, waiting period, clarity of communication, and effectiveness of treatment. The communicable nature of the disease makes effectiveness of treatment crucial for eradication. The results showed that compared to the other hospital types, teaching hospitals on average had the most comfortable outpatient waiting area, the provided the most effective treatment but had the longest waiting period, and the worse in the clarity of communication. Effectiveness and long waiting period were both equitably spread among patients. Thus in spite of the poor communication and the long waiting period, teaching hospitals were more capable of controlling the spread of malaria than the other hospital types. This could be because patients have comfortable place to wait and better skilled doctors to attend to them than the other hospital types.

Regional hospitals scored the lowest in all quality indicators. There was high inequity in effectiveness of treatment within regional hospital, meaning that some regional hospitals performed well while others performed poorly in effectiveness. District hospitals on average had better clarity of communication than teaching hospitals, had long waiting periods, the lowest doctor patient ratio but were able to provide more effective treatment with high equity than regional hospitals and health centers.

In the case of location, patients from Greater Accra had a better outpatient waiting area than the Northern region, had the lowest doctor patient ratio, the best clarity of communication and most effective in the treatment of the disease. The Northern region scored lowest in all quality indicators. Facilities in the Ashanti region had wider variation in waiting period than other regions.

To ensure success in the fight against malaria the study recommends that the Northern region receives more attention in terms of the

provision of doctors and seats in the outpatient departments. Given that equity and high effectiveness are needed to control the disease, regional hospitals need to improve in all areas of quality to enhance their ability to control the spread of malaria. Regional hospitals should be provided with better resources to improve quality of care. Better utilization of resources in regional hospitals may also be needed to enhance quality. Overall, waiting periods of the facilities were equitably long. Reducing waiting period could simply require better organization of human resources in the facilities

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References

1. Ministry of Health: Ghana maternal health survey 2007. [http://pdf.usaid.gov/pdf_docs/PNADO492.pdf]
2. NDPC, GOG, UNDP, 2010. 2008 Ghana millennium development goals report, http://www.undp-gha.org/site/docs/GhanaGhanaMDGReport-2010.pdf
3. "Plasmodium." *Encyclopædia Britannica. Encyclopædia Britannica Online*. Encyclopædia Britannica Inc., 2012. Web. 09 Apr. 2012. [http://www.britannica.com/EBchecked/topic/463621/Plasmodium]
4. Green AR, Tan-McGrory A, Cervantes MC, Betancourt JR: **Leveraging quality improvement to achieve equity in health care** *The Joint Commission Journal on Quality and Patient Safety* 2010 **36**(10):435-42
5. Oslon EO, Rodgers DL: **The welfare economics of equal access.** *Journal of Public Economics* 1991, **45**:91-106.
6. Wagstaff A, Doorslaer EV: Equity in health care finance and delivery. In *Handbook of Health Economics*. *Volume 1B*. Edited by: Culyer AJ, Newhouse JP. Amsterdam: North Holland; 2000: 1803-1862.
7. Grytten J, Rongen G, Sørensen R: **Can a Public Health Care System Achieve Equity? The Norwegian Experience.** *Medical Care* 1995, **33**(9): 938-951.
8. Asante AD, Zwi AB, Ho MT: **Equity in Resource Allocation for health: A comparative Study of the Ashanti and Northern Regions of Ghana.** *Health Policy* 2006, **78**: 135-148.
9. Asante AD, Zwi AB, **Factors Influencing Resource Allocation Decisions and Equity in the Health System of Ghana.** *Public Health* 2009, **123:** 371-377.
10. Cummings LC, Bennett BA, Boutwell AE, Martinez EL, Assuring healthcare equity a healthcare equity blueprint, National Public Health *and* Hospital Institute, Washington DC http://www2.massgeneral.org/disparitiessolutions/z_files/Assuring%20Health%20Care%20Quality_Equity%20Blueprint.pdf]
11. Green AR, Tan-McGrory A, Cervantes MC, Betancourt JR: (2010). **Leveraging quality improvement to achieve equity in health care**', *The Joint Commission Journal on Quality of Patient Safety*, **36**(10): 435-442.
12. *Amporfu E, Nonvignon J, Ampadu S:* ***Effect of institutional factors on quality***

of care in Ghanaian health care sector. *Journal of African Development 2013,* ***15****(1): 99-123.*

13. *Chalkley M, Malcomson JM:* ***Government purchasing of health services.*** *In Handbook of Health Economics. Volume 1A. Edited by Culyer AJ, Newhouse JP. Amsterdam: North Holland; 2000:849-890.*
14. Peabody JW, Taguiwalo MM, Robalino DA, Frenk J: **Improving the quality of care in developing countries**. In *Disease Control Priorities in Developing Countries. Second Edition.* Edited by Dean T. Jamison DT, Breman JG, Measham AR, Alleyne G, Claeson M, Evans DB, Jha P, Mills A, Musgrove P. 2010:1293-1306.
15. Santere RE, Nuen SP: *Health economics theories insights and industry studies.* Cengage Learning, 2007
16. Kleinman, J.C**.,** Evaluating the Definition of Physician Shortage Areas, ***Health Services Research*****; 1983,** 18 **(2 Pt 2): 280–283.**
17. Association of American Medical Colleges, Recent Studies and Reports on Physician Shortages in the US, https://www.aamc.org/download/100598/data/
18. Holdsworth G, Garner PA, Harphan T. **Crowded outpatient departments in city hospitals of developing countries: a case study from Lesotho.** *International Journal of Health Planning and Managment*, 1993, 8(4): 315-24.
19. Hill, CJ, Joonas, K. The impact of unacceptable wait time on health care patients' attitudes and actions. *Health Marketing Quarterly*, 2005; 23(2):69-87.
20. WTA. Canadians still waiting too long for health care Report Card on Wait Times in Canada, http://www.gov.nl.ca/HaveYouHeard/wta.pdf
21. Gupta D, Bhatnagar S, Nagar,A, Mishra S: 2007 **Defaulting oncology patient in a multispecialty state-run hospital in India** *American Journal of Hospice and Palliative Medicine,* 24 (1): 59-62.
22. Clemes, MD, Ozanne LK, Laurensen WL. **Patients' perceptions of service quality dimensions: an empirical examination of health care in New Zealand.** *Health Marketing Quarterly*, 2001; 19(1):3-22.
23. Kennedy P: 2003, *A Guide to Econometrics*. *5th Edition*, Cambridge: MIT Press.
24. Just Landed, *Healthcare in Ghana*, http://www.justlanded.com/Ghana/Ghana-Guide/Health/Healthcare-in-Ghana
25. Allison RA, Foster J.E: **Measuring health inequality using qualitative data.** *Journal of Health Economics* 2004, **23**(3): 493-524.
26. Wikipedia, Gini Coefficient, http://en.wikipedia.org/wiki/Gini_coefficient
27. Ghanadistricts.com: [www.ghanadistricts.com].
28. Grossman M: **The human capital model of demand for health.** In *Handbook of Health Economics. Volume 1A.* Edited by Culyer AJ, Newhouse JP. Amsterdam: North Holland; 2000: 348-408.