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Effect of the Relationship between Healthcare Utilization and Patient Characteristics on the Ghanaian National Health Insurance Scheme. The Case of Malaria in a Rural District Hospital

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Abstract

This study used data on malaria inpatients from a rural health facility to estimate the effect of the relationship between healthcare utilization and patient characteristics on the National Health Insurance Scheme. Using length of stay as a proxy for expenditure, the study used the Poisson estimation method. The results showed that in a pool of malaria patients, the potential high users of health care can be grouped into three: those who spend a long time in the hospital, (females, people in the active age (between five and fifty nine years), and those with tertiary education), those with high cost per day, (children under five years of age), and those with high cost per day and spend a long time in the hospital (farmers or fishermen). The results also showed that, with the exception of those with tertiary education, patients with primary and junior secondary education were low users of care. Given that the high users of health care mentioned are likely to be poor or belong to deprived communities, the results of this study imply that the poor are likely to be high users of care and hence big spenders. The study makes recommendations to ensure sustainability of the National Health Insurance.

Key words: risk sharing, health care expenditure, malaria, Ghanaian national health insurance

1. INTRODUCTION

Length of stay in the hospital is a measure of healthcare utilization (or quantity of care). All things being equal, an increase in length of stay, and hence quantity of care, leads to an increase in the cost of care. In other words, marginal cost is positive. Thus, changes in the quantity of care for malaria in Ghana can have a significant effect on the cost of care. This is because malaria is the major cause of morbidity among the Ghanaian population. Between 40 and 45 percent of outpatients cases as well as 36 percent of inpatient cases in health facilities are due to malaria.[1] Consequently, significant resources in health facilities are used in malaria treatment and a significant percentage of the national health expenditure as well as the expenditure of the National Health Insurance Scheme (NHIS) goes into malaria treatment. In 2008, for example malaria treatment used up the entire national health budget of $772 million representing 10 percent of the country's gross domestic product. [2] Malaria treatment then is likely to be a major cause of claims made by accredited health facilities to the NHIS.

The quantity of care for malaria and hence the cost of care is likely to vary according to demographic, social, and economic characteristics of health care consumers. Information on such variation could guide health facilities as well as the NHIS, which is regulated through reinsurance, in the estimation of future health expenditure. Such estimate provides important information on the amount of revenue required to ensure sustainability of the scheme. The purpose of this paper is to use data on malaria inpatients in a Poisson and logistic models to estimate the effect of patients' characteristics on the quantity of care. Given the strong positive link between quantity and cost of care, high users of care are also likely to increase the cost borne by the NHIS.

Significant information exists on the pattern of vulnerability of malaria across different demographic and economic groups. Children under five, females and the poor in society are vulnerable to the disease [1]. Such information is necessary for the selection of a target group for malaria prevention programs. Equally important is information on the pattern of utilization and hence the pattern of the cost of care across different demographic, economic and social groups. Such a pattern would provide information on which group in society is likely to require high cost of malaria treatment. And such information is especially important in the case of the NHIS which uses reinsurance as a form of risk sharing to ensure access to health care regardless of ability to pay.

Risk sharing requires information on factors affecting healthcare expenditure. Following Van de Ven and Ellis [3] risk sharing refers to mandatory reinsurance at regulated

reinsurance premium. Reinsurance is generally aimed at protecting insurance companies from insolvency. When health plans disproportionately attracts high risk customers, insurers run the risk of bankruptcy. To prevent this from happening, health insurers categorize patients according to risk so that risk adjusted premiums could be calculated. In this way customers are charged their actuarially fair premiums which equal their expected costs. Since asymmetric information does not allow the insurer to know the risk type of each customer health plans categorize consumers according to risk and charge equal premiums to those within the same category. This implies that high risk consumers pay higher premiums than the low risk consumers. This necessarily implies that the high risk who cannot afford their premium may have to leave the market.

Where it is socially undesirable for people to be denied access to health care as a result of inability to pay, health insurers may be regulated. The regulation may take various forms with the goal of restricting variation of premium contributions and hence allowing cross subsidization from low risk to high risk or from the rich to the poor. [3][4]. However, such risk pooling policies create incentive for insurers to cream skim and hence regulations are accompanied by risk sharing as in the case of Ghana, or risk adjusted payments, such as risk adjusted premium subsidies and solidarity contributions (used extensively in Europe), by the government (the sponsor) to the insurer.

Risk adjustment can be used by both the insurer and a sponsor. While the insurer uses risk adjustment to compute the premiums paid by consumers, the sponsor can use the information to subsidize premiums when society highly values equity. Under risk sharing, health insurers are obliged to reinsure with the government (the sponsor) at specified reinsurance premiums so that in the event that they are not able to pay all claims, given the regulated premiums, the sponsor could reimburse them to meet their claims. Obviously the amount of claims applied could vary across insurers depending on the demographic, social and other physical factors that affect healthcare utilization. Information on patient characteristics that affect healthcare utilization is therefore important in explaining observed variations in health expenditure. Sustainability of the health system then would require information on the extent of the existence of such characteristics among the clients of the various insurers. Such information would guide the sponsor on the amount of claims to expect from the various insurers and hence the amount of revenue required for financing the health system for a given period.

1.1 The Ghanaian National Health Insurance Scheme

The demand side public sector health care financing in Ghana has gone through a lot of changes over the years. After independence health care provided in public health facilities was free. Health services were financed directly by the government. However over time the government was unable to keep up with the cost of care and

so public health facilities were not well funded for adequate operation.

A user fee system called the Cash and Carry system was introduced in the 1980s to help raise revenue required for the running of health care facilities. However, this system of financing was not equitable because it made health care accessible only to those who could afford, resulting in many deaths from treatable diseases [4]. The system was thus considered inequitable and so a prepayment system was needed. Thus the National Health Insurance Scheme (NHIS) was introduced in 2004 to replace the Cash and Carry System. In a prepayment system the burden of payment is not only borne by the government as in the post independence period or only on the patient as under the Cash and Carry system. The burden of care is borne by both the government and the consumers (or potential consumers) of health care and hence is more likely to be sustainable than the previous systems.

The NHIS is made up of non-profit District, Sub metro and Municipal Mutual Health Insurance Schemes regulated by the National Health Insurance Council (NHIC). The Mutual Insurance Schemes can sell health insurance to any Ghanaian resident regardless of risk type and income. The annual premiums charged range between ¢7.20 and ¢25.00 (about $5US and $20US) according to members income brackets and an additional ¢4.00 for the NHIS identification card. The premiums of the indigent and those above 70 years of age are paid by the government. The scheme is equitable because there is ex ante cross subsidization from the rich to the poor and ex post cross subsidization from the healthy to the sick. [4] Such regulation is necessary to ensure access to care for all residents regardless of income.

To avoid any possible cream skimming a risk sharing arrangement exists between the schemes and the NHIC. Under the risk sharing program the schemes are obliged to reinsure with the NHIC at a regulated reinsurance premium. The risk sharing may not necessarily reduce the risk faced by the schemes in that it does not reduce the variation of the schemes' expenditure but reimburses the schemes for expenditures that they cannot cover. The NHIC operates with funds from a health levy of 2.5 percent on selected goods and services. These are to ensure sustainability of the schemes.

Since almost every district in the country has a mutual health insurance scheme, the residents are likely to register with the Schemes in their districts which implies that schemes in poor districts are likely to attract lower premium contributions than schemes in the richer districts or municipalities. Thus reimbursement paid out to the schemes is likely to vary across the schemes and time. Since reimbursement under risk sharing is made ex post, variation in the expenditure of a given scheme is likely to correlate with variation in the reimbursement paid out to the schemes. Thus information on the risk factors of consumers would help the NHIC to predict well the expenditure of various schemes based on the risk factors of the registered members of the schemes.

1.2 Malaria in Ghana

As already mentioned, malaria is the major cause of ill health in Ghana. There were about 4.5 million reported cases of malaria in 2008 which represents a drop from 5.2 in 2007. [5] With a malaria mortality rate of 109 per 100,000 in 2008 and a population of 23,382,848, the disease killed about 25,487 people in 2008 in Ghana alone, 43 percent of whom are aged less than five years. [5][6][7] The under-fives are especially vulnerable because their maternal antibodies that fight malaria decrease with time and so they become less immune to the disease. Those who survive to older years are able to reach a protective semi immune status. [8]

Malaria is a communicable disease which means that a person can only contract the disease if bitten by a mosquito which has the malaria parasite. If a mosquito bites someone with the parasite, it transmits it into the blood of the next person it bites. Extensive malaria education is undertaken to discourage people from breeding mosquito and hence ensure clean environment. The communicability of the disease implies the existence of externality. If one leaves one's environment conducive for breeding mosquitoes and is surrounded by people with the parasite one is likely to get the disease.

As a result of various malaria control programs, progress has been made in reducing malaria cases in Ghana. For example, according to the Ghana Health Service [5], malaria prevalence decreased by 12.2 percent in 2007, but increased again by 35 percent in 2008. Studies have also shown that placental malaria and maternal anaemia have declined as a result of a new treatment therapy. [9] However, malaria remains the major source of ill health to the workforce and as a result causes low productivity hence slowing down economic activities in the country. [10]

Thus information on risk factors that affect the expenditure on malaria is especially important to the NHIS in allocating resources towards care. Given the high prevalence of malaria in the country expenditure on malaria treatment is significant. For example in 2008, the total government expenditure on malaria increased to $772 million using up the entire national health budget. [2] Studies have been done on the factors that affect the probability of getting malaria. Apart from pregnant women and the under-fives, people with AA genotype are likely to get the disease. However, to the author's knowledge no study has been done on the variation in the cost of treatment as a result of patients' characteristics. Information on the factors that affect expenditure could serve as an important guide to policy makers when allocating scarce resources in choosing cost effective treatments. The rest of the paper is organized as follows. Section 2 focuses on materials and methods while the two remaining section focus on Results and Discussion, and Conclusion respectively.

2. Materials and Methods

2.1 Conceptual Framework

Information available in the data is the quantity of treatment provided. All things

being equal, an increase in the quantity of care, leads to an increase in the expenditure on treatment. Length of stay in the hospital is often used in the literature to represent quantity of care. Thus length of stay in the hospital is used as a proxy for expenditure. The validity of length of stay as a proxy for expenditure then requires that the data be disease specific. Suppose two inpatients are suffering from the same disease, all things being equal, the cost of hospital treatment is likely to be higher for the one who stays longer in the hospital than the one who is discharged early. The reason is that the intensities of treatment for two patients of the same disease and risk are likely to be similar.

Using length of stay to proxy expenditure, however, leaves out the cost of treatment after discharge. Thus the study focuses on the factors that affect the variation in the cost of inpatient treatment. Given that 36 percent of all admissions in hospitals are malaria cases, information on the factors that affect the cost of inpatient care for malaria is important to policy makers. Besides, the NHIS covers only hospital costs, thus information on the factors affecting hospital cost of care is important in the prediction of health expenditures for a given period.

Length of stay measured as the number of days spent in the hospital is count data and the appropriate regression model has to be used for the estimation. The standard regression used for count data is the Poison regression. For a given count variable (or event) to follow the Poison distribution two assumptions are to be fulfilled. First, the probability of the occurrence of the event is the same in any two intervals of equal length. Second, the occurrence of the event in any given interval is independent of the occurrence in another interval. [11] Length of stay satisfies both assumptions. The first assumption implies uniform distribution of the probability of spending a day in the hospital during an episode of malaria. Length of stay in the hospital is determined by patient's condition and characteristics as well as hospital policy. Since there was no hospital policy change on hospital stay during the period under study, only patient condition determined length of stay. A patient is asked to spend a day in the hospital if his/her severity of illness exceeds a certain threshold. Thus given that a patient's severity of illness exceeds a certain threshold, given the patients' social and demographic characteristics, the probability of staying in the hospital is one and constant over the period spent in the hospital. The first assumption then holds. Because the decision to let a patient spend an additional day in the hospital depends on his or her condition, given the patient's social and demographic characteristics, and not on the number of days already spent in the hospital, the probability of spending a day is independent of the number of days already spent. The second assumption also holds. Thus, length of stay can be assumed to follow the Poisson distribution.

2.2 Empirical Specification

Two regressions were ran: a Poisson regression and a logistic regression. The dependent variable used for the Poison

regression is discretely measured length of stay in the hospital, with patients' characteristics as the covariates. The equation is specified as:

$$LOS_i = \beta_1 + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \beta_6 X_{6i} \quad (1)$$

where LOS_i represents length of stay, measured as number of days in the hospital, where X_2 represents age, X_3 represents gender dummy which equals one if patient is a female and zero otherwise, X_4 is a vector of four dummy variables for education levels: primary, Junior secondary school, senior secondary school, and tertiary. The control group for education is the illiterate group. Similarly, X_5 is a vector of two dummy variables for occupation: agricultural workers (farmers or fishermen), petty traders, professionals and so the control group is the unemployed and those outside the labour force. X_{6i} is a vector of two variables on the patients' diagnostics, i.e., high risk and resistant malaria, with regular malaria as the base group.

The dependent variable for the logistic regression is a dummy variable which equalled one if patient was high risk and zero otherwise. The independent variables are the same as those in (1) except X_{6i}.

2.3 Method of Estimation

Since the two assumptions for Poison distribution hold, length of stay follows the probability function: $\Pr(Y = y) = \frac{\lambda^y e^{-\lambda}}{y!}$, where y represents *LOS* or length of stay, λ is the mean of length of stay. Thus $\Pr(Y = y)$ represents the probability of spending a day in the hospital given an average length of stay of λ from historical data. The Poison regression is obtained by parameterizing the relationship between the mean and the regressors, i.e., $\lambda_i = \exp(X'\beta)$. The vector $X'\beta = \beta_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6$ The regression uses maximum likelihood estimation to estimate the parameters with the log likelihood function being: $lnL(\beta) = \sum_{i=1}^{N} (y_i X_i'\beta - \exp(X_i'\beta) - lny_i!)$. The standardized method was used for the Poisson estimation to deal with the inherent heteroscedasticity problem with Poisson.

2.4 Data Description

The study used data on NHIS malaria inpatient records from a district hospital in the Central Region of Ghana located a few kilometers from Cape Coast, the regional capital. After removing the observations with missing variables and those with diagnosis other than malaria, the sample size used for the study was 1558 with length of stay averaging at 3.5 days a with standard error of 7.7 and ranging between less than a day and 160 days. Patients' age ranged between less than 1 year to 95 years with a standard deviation of 17 implying a wide spread around the mean. As shown in Table 1 below, the gender proportion is about equal with slightly more females than males, which is consistent with the population. The patients were predominantly illiterates with 12.9 percent of the illiterates between 6 and 30 years old, i.e., the school going age. This is not a surprise since the patients mostly reside in rural areas. Also, 83 percent are dependent because they were either too young or they were students, while a small percentage of them are working. With the

help of a nurse midwife, 10.9 percent of the patients were classified as high risk and 85.1 percent had resistant malaria. A patient was classified as high risk if his or her principal diagnosis was cerebral malaria, convulsion, typhoid fever, meningitis, malaria in pregnancy and septicaemia.

Table 1: Data Summary

Patient's Characteristics	Percentage
Length of stay	3.5 days (average)
• Minimum	0.5 day
• Maximum	160 days
Age	9.37 years (average)
Under five years	33.9
Gender	
• Males	49.7
• Females	50.3
Illiterates	90.8
Adult illiteracy	19.8
Primary	2.0
Junior Secondary School	3.2
Senior Secondary School	2.9
Tertiary Education	1.1
Dependants	78.4
Farmers	8.7
Professionals	1.6
Petty traders	2.2
High Risk	11.0
Resistant malaria	85.1

Ghana has a literacy rate of 65 percent and a dependency rate of about 48 percent. [12][13] The high proportion of dependants and illiterates in the data for the current study makes the data not a good representation of the whole country. The data are however a representation of the rural and small town population where the illiteracy and dependency rates are high (see for example www.ghanadistricts.com). The country has 124 rural districts, 6 metropolitans and 40 municipalities. [14] Thus, rural districts form about 72.9 percent of the administrative assemblies in the country. Besides, about 51 percent of Ghanaian residents live in rural areas [15], and the NHIS is available to residents in every corner of the country. Hence the data used for the study remains a good representation of more than half of the country's population.

Using data from only one hospital raises the representativeness of the sample for the population into question in that several hospitals exist in the country that treat malaria inpatient cases. Ideally, the sample should cover several hospitals to ensure a good representation of the population. However, it is very difficult to obtain inpatient data with information on patients' demographic, social, and economic status. Variation in length of stay across hospitals could be partly due to local hospital policies and so length of stay of identical patients could vary across hospitals. Using data from more than one hospital, then, can create a specification challenge. When data are from more than one hospital, hospital dummy variables would have to be included in the regression. Hospital choice is correlated with severity of illness with severely ill patients choosing high quality hospitals. Thus instrumental variable estimation would have to be used to purge the hospital dummy variables to ensure

consistent estimation of the coefficients. A popular instrument used in the literature in such a case is distance between the patients' residence and the hospital. [16] Obtaining information on the distance between rural patients' residences and the hospitals could be very costly since such information may not be readily available and hence may have to be collected manually.

Using only one hospital does not require any instrumental variable estimation. Besides, any hospital policy on malaria admissions affects all inpatients regardless of patients' characteristics. Thus variations in length of stay in a given hospital, after controlling for local policy on length of stay and complications, would be due to patients' characteristics. Even if the sample used is not a good representation of the whole country it is a good representation of the Central region of Ghana because the hospital is a district level hospital and is well known for its provision of high quality of care. The hospital is located in the most populous district in the region and is the only hospital that serves two large districts in the region. The hospital therefore cares for a very significant percentage of patients from the region. Thus, variation in the cost of care of various patient types in the hospital is likely to affect significantly, variation the claims made to the NHIS in the region.

The data used for the current study did not have information on the price of care. Given that there is no maximum length of stay set by the NHIS for coverage, the lack of information on price is not likely to affect length of stay. Even if price is an important factor that affects length of stay and hence its absence representing the omission of relevant variable from the length of stay equation, such an omission is not likely to bias the results. The reason is that price is not correlated with the variables in the equation. Patients' complication, social, and demographic factors are not affected by the price of care. Besides the patients were insured under the NHIS and so did not have to pay for hospital services for malaria treatment. Hence price of care would not be correlated with patients' economic status.

The hospital data used for the study had information on inpatient during an episode of illness; hence there was no information on frequency of utilization according to patients' characteristics. Since health expenditure can vary as a result of frequency of utilization as well as the intensity of utilization, information on frequency of care utilization would be necessary for a more complete analysis. However several studies, example [1], have shown the vulnerable group in society to the disease with the most vulnerable group being those under five years of age, regardless of sex. The vulnerability decreases with age but in the case of women it increases during the young adult years (15-24 years). Thus women and children under five are likely to be frequent users of care. The contribution of the current study is to provide information on the variation in the cost of care as a result of the intensity in which care is utilized.

3. Results and Discussion

The results from the Poisson estimation are reported in Table 2 and they show that contrary to expectation, patients who were less than five years of age and those above sixty years were likely to spend less time in the hospital than those in the active age. The under five patients spent about 9.2 percent while the over sixty spent about 14.9 percent fewer days in the hospital than those outside the two age groups. This is contrary to the expectation that the under five and the aged, the vulnerable group, are intensive users. The result here implies that even though the children under five years of age and the aged may be likely to get sick and hence utilize healthcare, their consumption of health care in terms of length of stay, during an episode of illness, is less than that of the rest of the population.

Table 2: Results of Regressions

	Poisson Regression (dependent variable = length of stay)		Logistic regression (dependent variable = high risk dummy)	
Under five	-0.0915	(0.014)	-0.6235	(0.004)
retired	-0.1422	(0.058)	-0.2677	(0.682)
petty trader	-0.3623	(0.001)	0.0041	(0.994)
tradesman	-0.0112	(0.946)	1.0239	(0.160)
farmer or fisherman	0.0100	(0.862)	0 .3762	(0.040)
professional	-0.5443	(0.002)	-0.0421	(0.956)
gender (female = 1)	0.1297	(0.000)	0.1699	(0.519)
primary education	-0.4249	(0.000)	0.4438	(0.362)
Junior high education	0.0977	(0.199)	-0.0449	(0.916)
Senior High Education	-0.0747	(0.410)	0.4878	(0.252)
Tertiary education	0.4686	(0.012)	1.3593	(0.115)
mortality	-0.074	(0.409)	.	.
resistant malaria	0.0428	(0.559)	.	.
high risk	0.3257	(0.000)	.	.
constant	1.1912	(0.000)	-1.9191	(0.000)

P-values are in brackets

The results also show that females were on average likely to stay in the hospital 12.9 percent longer than males, after controlling for diagnostics and age. Thus given the price of care, females were higher users of healthcare than males and hence for an episode of illness, all things being equal, females were likely to make larger claims than males. The result is consistent with previous studies that have shown that men are likely to receive care in the house when sick and women are less likely to receive such care. [17].

The result on education showed the patients with primary and junior secondary education were the lowest users. While there was no statistically significant difference between

those with senior secondary education and the uneducated, those with tertiary education were the highest users. Patients with tertiary education were likely to stay longer than the uneducated by 46.8 percent. The results in the study imply that even if the highly educated were less likely to get sick compared to the less educated, the highly educated were high users of health care when they do get sick. This is contrary to the expectation that the tertiary educated, because they have spent longer time in school, are on average less likely to be sicker than those that are not educated. [18]

In the case of occupation, the coefficient of petty traders was negative which is not surprising because such workers are self employed and so they incur a high opportunity cost of sick time. Professionals, i.e., those who work in the formal sector, were also found to spend 54.4 percent less time in the hospital than the unemployed or those outside the labour force. The length of stay of farmers or fishermen and tradesmen were not statistically significantly different from the unemployed and those that were not in the labour force. Those classified in the sample as not in the labour force were mainly students, children and the retired. Thus, the results show that farmers, fishermen, tradesmen, the unemployed, and those not in the labour force are high users of care. Since employment status is an indicator of income status, the unemployed and those not in the labour force are likely to be poor. Given that children and the retired were not in the labour force, the results from the study imply that any observed high usage of care, in terms of length of stay, among children and the elderly could be driven by poverty rather than age. All things being equal, a poor patient may not be well nourished and may not live in a healthy environment and hence could be highly susceptible to malaria and would require a lot of medical care when sick.

The coefficient of those who died in the hospital was not statistically different from those who were discharged alive, neither was the length of stay of patients with resistant malaria statistically different from that of the regular malaria patients. Hence as far as length of stay is concerned one may conclude that those who died in the hospital and those with resistant malaria do not impose higher cost on the health sector than regular malaria. Such conclusion could be misleading because previous studies have shown that people who die in the hospital often require extra intervention to prevent death. [19] Similarly, the treatment of resistant malaria requires more costly tools such as intravenous medication, lab tests, and other therapeutic procedures that could be labour intensive. Thus even though the length of stay may not vary, the treatment cost per day of those who died in the hospital and those with resistant malaria may be high relative to those with regular malaria.

The raw data show that about 88 percent of those who died were diagnosed with resistant malaria. The under five patients formed about 33.9 percent of the data, but about 50 percent of those who died were under five years of age. Resistant malaria then disproportionately killed patients less than five years of age. Thus the cost of treatment per day of the under five patients

was likely to be high. Since resistant malaria was found to be the major cause of death a logistic regression was run with a dummy for resistant malaria as the dependent variable and patients' characteristics as the independent variables. The results (not reported) showed that only the coefficients of children less than five years of age and farmers or fishermen were statistically significant. While farmers or fishermen were found to be less likely (with a coefficient of -0.539), patients less than five years of age were most likely to get the disease (with a coefficient of 0.847). Thus the treatment of the under five contributed to cost through a high cost per day than length of stay.

According to the Poisson regression, high risk patients however stayed in the hospital 32.5 percent longer than those with regular malaria. Recall that high risk patients were those diagnosed with cerebral malaria, convulsion, typhoid fever, meningitis, and septicaemia. It is interesting to note that only 4 percent of the patients who died were high risk. Given that these diagnoses kill quickly, the low mortality rate among these patients could imply that these patients received intensive treatment and so are likely to have a high treatment cost per day. Because high risk patients are high users of care, as a result of long hospital stay and high cost per day, the cost of treating high risk is likely to be higher than those with resistant malaria and regular malaria with the regular malaria treatment being the cheapest. Information on the type of patients that are likely to be high risk is thus important for expenditure prediction.

The results of the logistic regression are reported in the third column in Table 2 and they show that only two patient characteristics, children under five years and farmers or fishermen, had statistically significant coefficients. Contrary to the case of resistant malaria, children under five were less likely to be high risk while farmers and fishermen were found to be likely to be high risk. Thus farmers and/or fishermen are the most expensive group to treat since they are the most likely to be high risk malaria patients.

4. Conclusions

This study used hospital data to show the effect of the relationship between healthcare utilization and patient characteristics on the expenditure in the Ghanaian National Health Insurance. Such information is important for the prediction of expenditure of care and hence claims faced by the different Mutual Health Insurance Schemes. The study's limitation is that that data used came from only one hospital and so limits the generalizability of the results. Nevertheless, the hospital serves the most populous district in the Central Region of Ghana. Hence, variation in utilization of care in the hospitals is likely to have a significant effect on the expenditures of the NHIS in the Central region.

The results of the study showed that, with the exception of those with tertiary education, patients with primary and junior secondary education as well as non-farming workers, and the aged were low users of care. The study has also shown that in a pool of malaria patients, the potential high users of health care can be categorized into three:

those who spend a long time in the hospital, those with high treatment cost per day and those with long stay plus high treatment cost.

The first category consists of females, people in the active age (between five and fifty nine years), the poor (the unemployed and those outside the labour force), and those with tertiary education. Thus communities or districts with high proportion of females, unemployed and those outside the labour force are likely to make high claims. Given that such types of people are likely to be poor or belong to deprived communities, the results of this study imply that the poor are likely to be high users of care.

These groups of people such as students and those in the active age may not be frequent users of care but, according to the results of this study, when these groups of people get sick they tend to be high users of care. The results also imply that any high utilization of care, through long stay in the hospital, that could be observed among the very young and the elderly is driven by poverty rather than age. Given that the high users of care are likely to be poor the results also imply that private insurance in which potential high users pay higher premiums than low users cannot thrive in rural areas. The results then justify the establishment of a national health insurance for a country like Ghana where a significant percentage of the population are rural and poor.

The second category of high users of care consists mainly of patients under five years of age. This category of patients is likely to get resistant malaria and likely to die from the disease. Their treatment require high intervention hence the high cost per day. Finally, the third category consists of farmers or fishermen who are likely be high risk patients and so spend a long time in the hospital and require high treatment cost per day, making the category most expensive one. This implies that the Mutual Health Insurance Schemes located in the rural areas or at least in the two rural districts served by the hospital, are likely to receive high claims. Given that rural communities are often poor and so are likely to pay low premiums, the rural Mutual Health Insurance Schemes are likely to run at a loss. These schemes then are likely to depend on the reinsurance to ensure sustainability of the NHIS.

To ensure the sustainability of the national health insurance then, the NHIS should actively participate in the malaria prevention/eradication program especially in the rural areas. Since the Mutual Health Insurance Schemes are likely to be reinsured, they do not have the incentive to engage in such programs. The reduction in malaria cases is likely to reduce significantly, the expenditure of the NHIS, it would be in the interest of the NHIS to work towards reducing malaria cases.

Previous research has shown that the poor are frequent users of care and the current research has shown that the poor are high users of care as well. Improvement in the wellbeing of the poor, especially farmers and fishermen, is important to ensure the sustainability of the NHIS. Since education can lower utilization and hence reduce the cost of care encouraging females especially

those in the rural areas, to go to school has the potential to reduce the cost of care.

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