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# MAPPING RELIGIOUS HEALTH ASSETS: ARE FAITH-INSPIRED FACILITIES LOCATED IN POOR AREAS IN GHANA?

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*The Christian Health Association of Ghana is the largest federation of faith-inspired provider of health services in Ghana. With 168 hospitals and clinics at the time this paper was written, 70 percent of which are affiliated with the Catholic Church, the federation accounts for more than a fourth of all hospital beds in the country according to administrative data from the Ministry of Health. Using poverty mapping techniques and simple regression analysis, this paper aims to answer the following question: Are CHAG facilities located primarily in areas that have a high proportion of Catholics or Christians, or in areas that have a high proportion of the population living in poverty? It appears that the location of CHAG facilities is correlated today more with the share of Catholics living in specific districts than with the level of poverty in those districts.*

## INTRODUCTION

There is substantial interest in developing countries in mapping religious health assets, with mapping exercises taking many different forms. Some analysts rely on GIS technology to locate formal health facilities, with the aim of guiding the location of new facilities, as well as understanding potential overlaps or complementarities among facilities from different providers but located within a given area. The World Health Organization has undertaken work in this area among others through its Service Availability Mapping (SAM) project (see also WHO-CIFA 2009). In Ghana SAM provided detailed information on the distribution of health services at the district level, including in the area of HIV-AIDS baseline monitoring data (Ministry of Health 2007). Some private providers of health services also conduct mapping analysis of this type, albeit in a simpler way, to show their contribution to national health systems. For example the Christian Health Association of Ghana (CHAG 2009) collected information on all the facilities operated by its institutional members affiliated with various Christian denominations.

Geographic mapping should be differentiated from another type of mapping exercises which is more participatory in nature and focuses on documenting and understanding the role of informal groups and organizations in specific aspects of health care provision or support (see for example Olivier et al 2012, based on ARHAP 2006, see also de Gruchy et al 2011). These approaches can be useful to locate geographically specific community-based activities, especially when they integrate GIS data, but the primary objective is often more to gather data on community perceptions and services as part of a broader process of understanding and community engagement in health. Still other 'mapping' studies aim simply to document the role of various actors in the health system of a country. These exercises tend to take the form of reviews of existing literature or

information, at times accompanied by additional qualitative interviews, and could be considered as exercises in ‘landscaping’ the often broad range of organizations involved in a country’s health system. Such studies help in showing the role of non-governmental organizations in health beyond the traditional focus on the operation of public facilities operated by Ministries of Health.

In this paper, within the broader literature on mapping religious health assets, our objective is to assess whether faith-inspired health service providers in Ghana are located in the country’s poor areas. The focus is on the Christian Health Association of Ghana, the largest faith-inspired provider of health services in Ghana. The number of CHAG Member Institutions or facilities has grown from 25 in 1967 to 168 in 2008, with approximately 70 percent of the institutional members linked to the Catholic Church. In terms of regional distribution, the Ashanti region has the highest number of CHAG facilities (23 percent of the total), followed by the Brong Ahafo and Eastern regions (12.5 percent each) and the Northern region (11 percent). Other regions have only between three and ten percent of CHAG facilities (on Christian Health Associations in Africa more generally, see Dimmock et al 2012; see also Wodon 2013).

In order to assess whether CHAG facilities are located in poor areas, we combine administrative data on the location of the facilities with data from a new poverty map constructed for Ghana by Coulombe and Wodon (2012a). Following work by Elbers et al (2002, 2003) who have shown how to construct detailed poverty maps by combining census and household survey data, there has been a growing literature on the construction of these maps and their use. In Ghana a first poverty map was constructed by Coulombe (2008) using the fourth round of the Ghana Living Standards Survey (GLSS4) implemented in 1998/99 and the Housing and Population Census of 2000. Yet that map probably fails to represent the geography of poverty today because poverty has been reduced dramatically from 39.5 percent in 1998-1999 to 28.5 percent in 2005-2006 according to results based on the fifth round of the Ghana Living Standards Survey (Coulombe and Wodon 2007). Furthermore, the reduction in poverty has not been uniform in the country. The data suggested a possible increase in poverty in the capital city of Accra, a sharp reduction in poverty in the coastal and forest areas, and stagnation or only very limited progress towards poverty reduction in the northern savannah area. These changes in the geography of poverty must be taken into account in order to assess the extent to which today CHAG facilities are located in poor areas.

The structure of the paper is as follows. Section 2 provides information on our data sources, which include household survey as well as CHAG and census data. In section 3, we try to answer two questions. First, we ask whether in a simple econometric model CHAG facilities tend to be located in areas with a higher proportion of Catholics or in poorer areas controlling for the correlation between the two types of areas. Second, independently of the faith affiliations in various districts, we ask statistically whether facilities are located proportionately more in poor areas or not. A conclusion follows.

## DATA AND METHODOLOGY

Four sources of data are used in the paper. The first two sources are nationally representative household surveys. The first survey is the Ghana Living Standards Survey (GLSS5) implemented in 2005-2006. The GLSS is a multi-purpose household survey covering demography, health, education, employment, migration, housing, agriculture activities, non-farm self-employment, household expenditures, durable goods and, remittances and other incomes. The 2005/06 round of the survey was administrated to around 36,500 individuals grouped into 8700 households. This nationwide sample is deemed representative at the level of the ten regions. The second survey is the large sample (50,000 households) 2003 Core Welfare Indicator Questionnaire (CWIQ) survey, deemed representative at the district level. Although this second survey does not provide information on the consumption level and thereby poverty of households, it has the advantage of being representative at the district level due to its large sample size.

Data from both household surveys are used to construct in the large sample CWIQ survey a poverty map that is representative at the district level. The poverty map was estimated by Coulombe and Wodon (2012a) using the methodology developed by Elbers et al (2002, 2003). The basic idea is simple, but its implementation is complex. The large sample CWIQ survey is used as an equivalent to a census – while it does not include consumption data, it is large enough in terms of sample size so that it can be used to estimate district-level poverty measures. In practice, consumption data for each household is imputed into the CWIQ using the poverty mapping technique. To this end, a regression of adult equivalent consumption is first estimated using the GLSS5, limiting the set of explanatory variables to those common to both the GLSS5 survey and the CWIQ (and applying a test of the equality of the means of all selected explanatory variables to ensure comparability between the two surveys). Next, the coefficients from that regression as well as the structure of its error terms are applied to the CWIQ data to predict consumption for each household in the CWIQ. Third, predicted consumption in the CWIQ is used to estimate district level poverty measures which tend to be precise at that level of aggregation because of the sufficient number of observations on which the measures are based<sup>1</sup>.

The details of the construction of the CWIQ-based poverty map are given in Coulombe and Wodon (2012a). The result is a series of poverty estimates at the district level which can be used to assess whether faith-inspired facilities are located in poorer or wealthier districts. At the time of the implementation of the CWIQ survey in 2003, there were 110 districts. In 2004, a district remapping yielded 28 new districts, essentially by splitting a number of large districts into two separate districts (or in one case by combining two

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<sup>1</sup> Although the above procedure is conceptually simple, its implementation requires complex computations due to the need to take into account spatial autocorrelation (expenditure from households within the same cluster or area are often correlated) and heteroskedasticity in the development of the predictive model. Another issue is the need to compute standard errors to assess the degree of precision of poverty estimates. Those standard errors are important since they help assess how far the information can be disaggregated (the smaller the area and the number of observation are, the larger the standard errors of the poverty measures are likely to be), and whether using a large survey can be a legitimate alternative to using a census.

adjacent districts and splitting them into three districts). The estimations of poverty used here are those based on the original 110 districts, as this is the level at which the CWIQ survey is deemed representative. The poverty map obtained for Ghana is visualized in the first map on the left of Figure 1 for the headcount index of poverty. Clearly much higher measures of poverty are observed in the northern parts of the country.

In addition to these two surveys used to construct the poverty map for Ghana, we also use administrative data on the location of all CHAG. The number of CHAG Member Institutions of facilities has grown from 25 in 1967 to 168 in 2008. Data on CHAG facilities by district available according to the new definition of those districts (post-2008) were mapped to the 110 districts available in the CWIQ. The 168 CHAG facilities, including 75 clinics, 3 specialist clinics, eight health centers, 58 hospitals, 13 primary health care units, one polyclinic, and ten training institutes. Table 1 below shows that the Ashanti, Brong Ahafo and Eastern regions had the largest number of facilities in 2008. Of the 168 facilities, information on the number of beds was also available for 120 facilities, and of those 77 facilities had beds (table 2). The data can be used to compute the number of CHAG beds per 1,000 individuals at the district level, which is probably a better way to assess the allocation of resources than relying solely on the number of facilities (given that facilities with a larger number of beds tend to provide substantially more services than other facilities).

**Table 1: Regional Distribution of CHAG Facilities**

Region	Hospital	Clinic	PHC	TI	HC	Polyclinic	Total	Share of total (%)
Ashanti	17	18	1	3			39	23
Brong Ahafo	10	6	2	2	1		21	12.5
Central	4	6					10	6
Eastern	6	11	2	1	1		21	12.5
Greater Accra	2	3			1		6	3
Northern	5	9	2		2		18	11
Upper East	1	8	3	1	3		16	10
Upper West	2	1	1	2			6	3
Volta	7	6	1			1	15	9
Western	4	10	1	1			16	10
<b>Total</b>	<b>58</b>	<b>78</b>	<b>13</b>	<b>10</b>	<b>8</b>	<b>1</b>	<b>168</b>	<b>100</b>

Source: CHAG (2009).

Note: PHC = primary health care units; TI = training institutes; HC = health centers.

**Table 2: Information on Number of Hospital/Clinic Beds for CHAG Facilities**

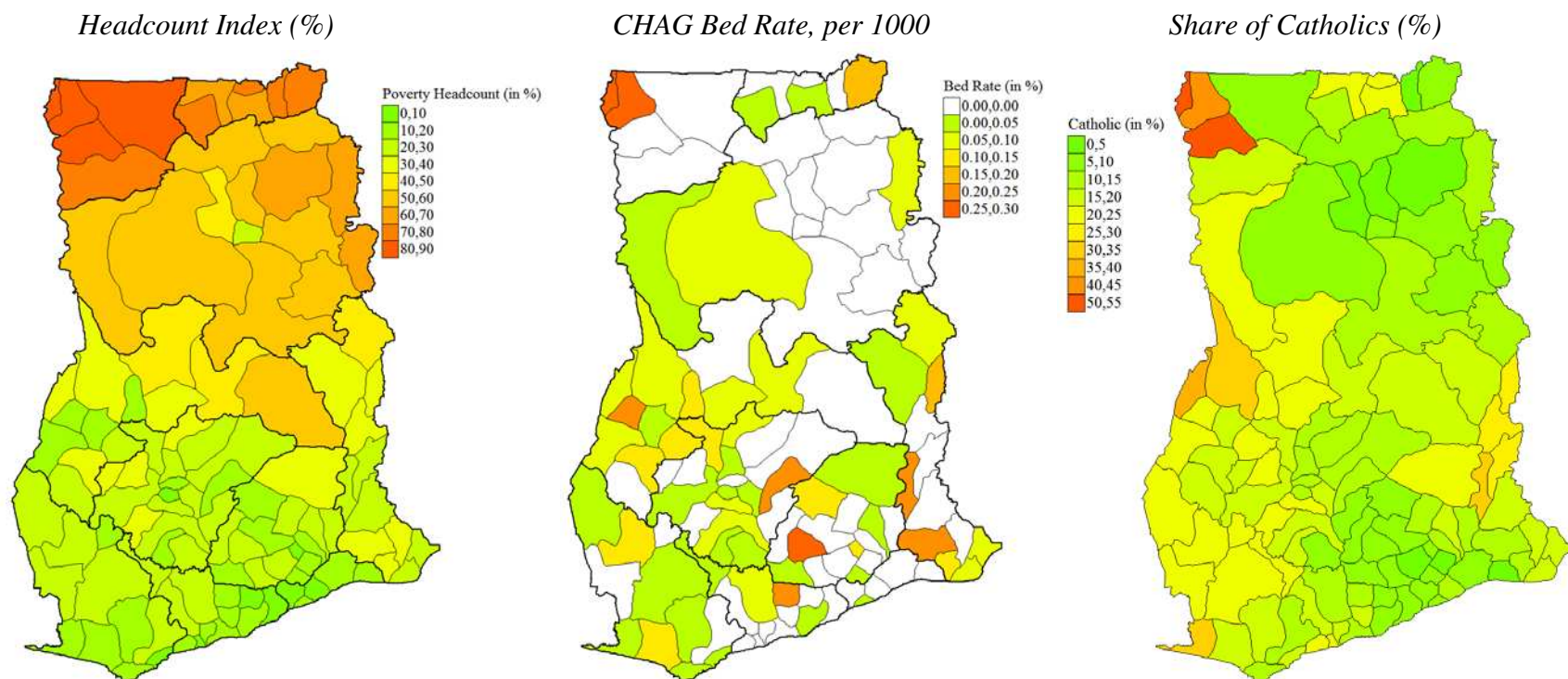
Type of facilities	Number of facilities	Number of facilities with information on number of beds	Number of facilities with positive number of beds
Clinic	75	53	26
Clinic specialist	3	2	0
Health center	8	5	4
Hospital	58	50	44
PHC (Primary Health Care)	13	9	2
Polyclinic	1	1	1
Training institute	10	0	0
<b>Total</b>	<b>168</b>	<b>120</b>	<b>77</b>

Source: CHAG (2009).

Finally, the fourth and last source of data is Ghana's last census (dating back to the year 2000) which is used to gather information on the share of individuals affiliated with particular faiths at the district level. Because approximately 70 percent of the facilities operated by CHAG are Catholic, we focus on this denomination in the empirical work in the next section.

A visualization of the various sources of data is provided in Figure 1. The first map provides a visualization of poverty by district according to the headcount index which measures the share of the population that is poor in each district. This map is obtained using the first two sources of data mentioned above, namely the GLSS5 survey and the CWIQ survey. The poverty map was obtained by applying the technique of the poverty map using the two surveys, with the model for the correlates of poverty estimated with the GLSS5 data and applied to the data in the CWIQ survey in order to come up with district level estimates of poverty. The second map is based on the administrative data from CHAG, which were used together with population data by district in order to compute bed rates in each of the district. The last map provides the share of the population who are Catholics according to the 2000 census. Clearly, when comparing the three maps, it appears that some of the areas where CHAG has a higher density of facilities as measured through bed rates are also areas that tend to have a higher share of the population that is Catholic, while the relationship with poverty measures appears to be weaker. In the next section simple regression analysis is used to look more closely at these relationships.

**Figure 1: District-level Poverty Headcount and CHAG Bed Rate in Ghana**



*Sources:* Authors' calculation based on the 1998 Census, the GLSS 2005-2006 and the CWIQ 2003 survey data, as well as administrative data from CHAG.

## RESULTS

In this section, we would like to answer two simple questions. The first question is whether CHAG facilities tend to be located primarily in areas that have a higher proportion of Catholics, or in areas that have a higher proportion of the population living in poverty. This is analyzed using simple econometric techniques. The second question is whether CHAG facilities are located proportionately more in poor areas, independently of whether this is related or not to the proportion of Catholics in those areas. This is analyzed through statistical analysis, considering both the districts in which CHAG has facilities and all districts taken together, including those where CHAG is not present.

To answer the first question, we estimate six simple regressions. The first regressions are probits to assess the correlation between the presence or absence of any CHAG facility in the various districts as a function of four variables: the share of the population in the district that is urban (as a proxy for the need for facilities such as hospitals and clinics that tend to be located in or near urban centers), the share of the population that is Catholic, the share of the population that is associated with other Catholic denominations, and finally the share of the population in poverty. The probit regressions are estimated both for CHAG facilities as a whole, and for the facilities that belong to the Catholic Church. Next, we estimate ordinary least squares (OLS) regressions in those districts that have a positive number of beds from CHAG facilities to relate the bed rate ratio to the same four variables. Finally, we estimate censored regressions (tobits) that factor in both the zero values and the positive values for the bed rates in a single estimation.

In all regressions, the only variable that appears to be statistically significant is the share of the population that is Catholic (see table 3). Even if the magnitude or size of the coefficients seems small, and even if the explanatory power of the regressions is also small, this nevertheless suggests that the location of CHAG and especially Catholic facilities was probably driven (historically) more by the share of the population that was Catholic or Christian in various parts of the countries than by poverty. We must however acknowledge that while the faith landscape of various areas is likely to change only relatively slowly over time (despite the growth of the Charismatic movement), poverty measures can change more rapidly within one or two decades, and we use here contemporary measures of poverty (representative of the year 2005-2006) rather than those that prevailed when most CHAG facilities were established over thirty years ago.



**Table 3: Correlates of the CHAG Hospital Bed to Population Ratio in Ghana**

	Probit (dF/dX)		OLS for Positive Bed Rates		Tobit	
	All	Catholic	All	Catholic	All	Catholic
Constant	..	..	-0.0900	-0.0439	-118.1	-114.1
Urban (%)	-0.0028	*0.0040	0.0002	0.0008	0.6165	-0.7155
Catholic (%)	**0.0113	**0.0104	**0.0029	***0.0041	***4.4591	**5.2353
Other Christian (%)	0.0005	-0.0017	0.0012	0.0005	0.5180	0.5724
Poverty (%)	-0.0037	-0.0008	0.0181	0.0008	0.0705	-1.1577
R <sup>2</sup> or Pseudo-R <sup>2</sup>	0.080	0.046	0.136	0.159	0.010	0.013
Observations	110	110	57	39	110	110

Source: Authors' estimation.

Note: Levels of statistical significance: \*:0.90; \*\*:0.95; \*\*\*:0.99.

Our results are limited by the fact that we do not have data here on the precise location of the CHAG facilities within districts that can be combined with equally precise (and current) data on poverty at sub-district levels. This is because the poverty map used can be considered as statistically robust only at the level of districts, and the previous poverty map estimated by Coulombe (1998) does not represent the situation of poverty in Ghana today. It has been argued that CHAG facilities tend to be located more in poor and marginalized areas within districts than is the case for public facilities. While we can't check this directly here, the household survey evidence to this effect is however rather weak. As noted by Coulombe and Wodon (2012b) one observes in national household surveys few differences between faith-inspired and public facilities in terms of how they serve different households groups defined according to quintiles of well-being, and in addition the benefit incidence of both faith-inspired and public facilities still remains to tilted towards better off segments of the population. This does not seem to suggest then that on average, CHAG facilities would be serving within a given district the poor substantially more than other groups, or in comparison with public facilities.

Now, even if it is correct that historically the location of CHAG facilities was driven in part by where Catholics and other Christians lived, this does not mean that the facilities do not serve the poor today. A key aspect of this question remains whether CHAG facilities are located proportionately more in poor areas than in wealthier areas. In table 4, the facilities are grouped by quintiles of district-level well-being (ranked from the poorest to the richest districts, with each quintile representing one fifth of all districts), as well as by quintiles of the population assuming that in any district, a CHAG facility would serve proportionately in the same way all individuals from various levels of well-being living in that district (again, this assumption does not appear to be too restrictive given the results on benefit incidence analysis using household surveys obtained by Coulombe and Wodon 2012b in this volume).

The results in table 4 suggest that when looking at quintiles of districts, CHAG facilities tend to serve slightly more districts that have a higher level of well-being on average, while by quintiles of population (taking into account the size of the population in each district, which is more appropriate), CHAG facilities tend to serve slightly more the poorer quintiles. The evidence as to whether CHAG facilities are located proportionately more in poor areas is thus somewhat mixed, but overall the pattern seems to reflect a

broad distribution of the facilities in the country in both poor and less poor areas, so that this tends to confirm the results of benefit analysis using household surveys (Coulombe and Wodon 2012b). In table 4, the data is provided in terms of facilities rather than beds, but the results are similar when considering the number of beds.

**Table 4: Number of CHAG Facilities, by Quintiles and Type, 2009**

	Poorest	Second	Third	Fourth	Richest	Total
Quintile of Individuals						
Hospitals	10	18	15	9	7	59
Clinics	31	11	35	16	6	99
Training Institutes	3	1	2	3	1	10
Total	44	30	52	28	14	168
Quintile of Districts						
Hospitals	6	11	17	12	13	59
Clinics	26	8	23	25	17	99
Training Institutes	3	0	1	5	1	10
Total	35	19	41	42	31	168

Source: Authors' calculations based on qualitative fieldwork data.

Notes: The quintiles of individuals represent 20 percent of individuals living in districts ranked by the share of their population in poverty; the quintiles of districts represent 20 percent (i.e., 22 districts in each case) of the districts ranked by the share of their population in poverty.

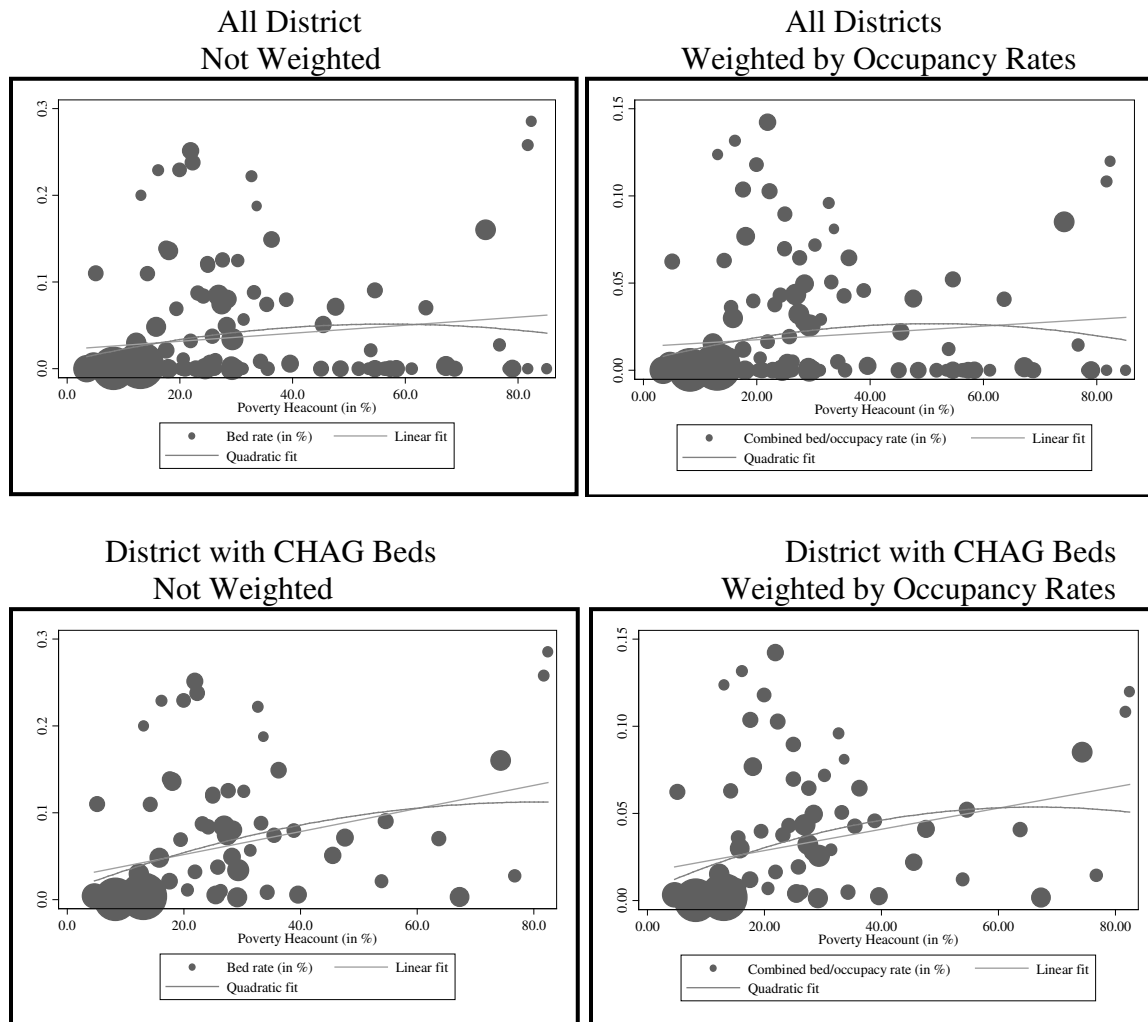
In Figures 2 and 3, data on the number of beds instead are used. The figures provide scatter plots of on the vertical axis the number of beds in CHAG facilities per 1,000 inhabitants in the various districts, while the horizontal axis represents either the share of the district population in poverty (in Figure 2) or the average level of consumption per equivalent adult in the district (in Figure 3). In each Figure, four scatter plots are provided. The first two scatter plots include all districts, including those in which CHAG does not have beds. The difference between the two scatter plots is that in the second one, rather than relying only on the number of beds, we also factor in the regional level estimates of occupancy rates for facilities with bed computed by CHAG for its facilities.

As noted by CHAG, occupancy rates in CHAG facilities in 2006 varied from 42 percent in the Upper West (and poor) region to 4.9 percent in the Western (and better off) region. The size of the dots in the scatter plots are proportional to the size of the districts in terms of population, weighted in the second scatter plot by the regional-level occupancy rates for the CHAG facilities. Linear and quadratic trend lines are then fitted through the scatter plots using weighted regressions, with the weights being proportional the size of the dots (that is, proportional to the district population with or without occupancy rates adjustment).

In Figure 2, upward trend lines would suggest that CHAG facilities are proportionately serving the poor more than the non-poor, at least in terms of their location. The analysis is also carried only on those districts that have a positive number of beds in CHAG facilities, although for national representativeness it is in principle to include all districts in the estimations of the trend lines. The trend lines suggest that there is some mild indication that the location of CHAG facilities is indeed pro-poor (especially when looking only at the districts where CHAG has facilities), but this 'pro-poorness' tends to be relatively weak. The issue of whether one should use the scatter plots with or without

the districts where CHAG has facilities may warrant further discussion. From the point of view of CHAG which may look only at the distribution of its facilities in the districts where it is indeed active, the message may be that there is quite a significant bias towards poor areas. But from the point of view of a national government or an outside observer who looks at the distribution of beds in the country as a whole, that relationship is much weaker, in part because CHAG does not have facilities in many relatively poor districts.

**Figure 2: CHAG Beds per Thousand Persons by District and Poverty Headcount**

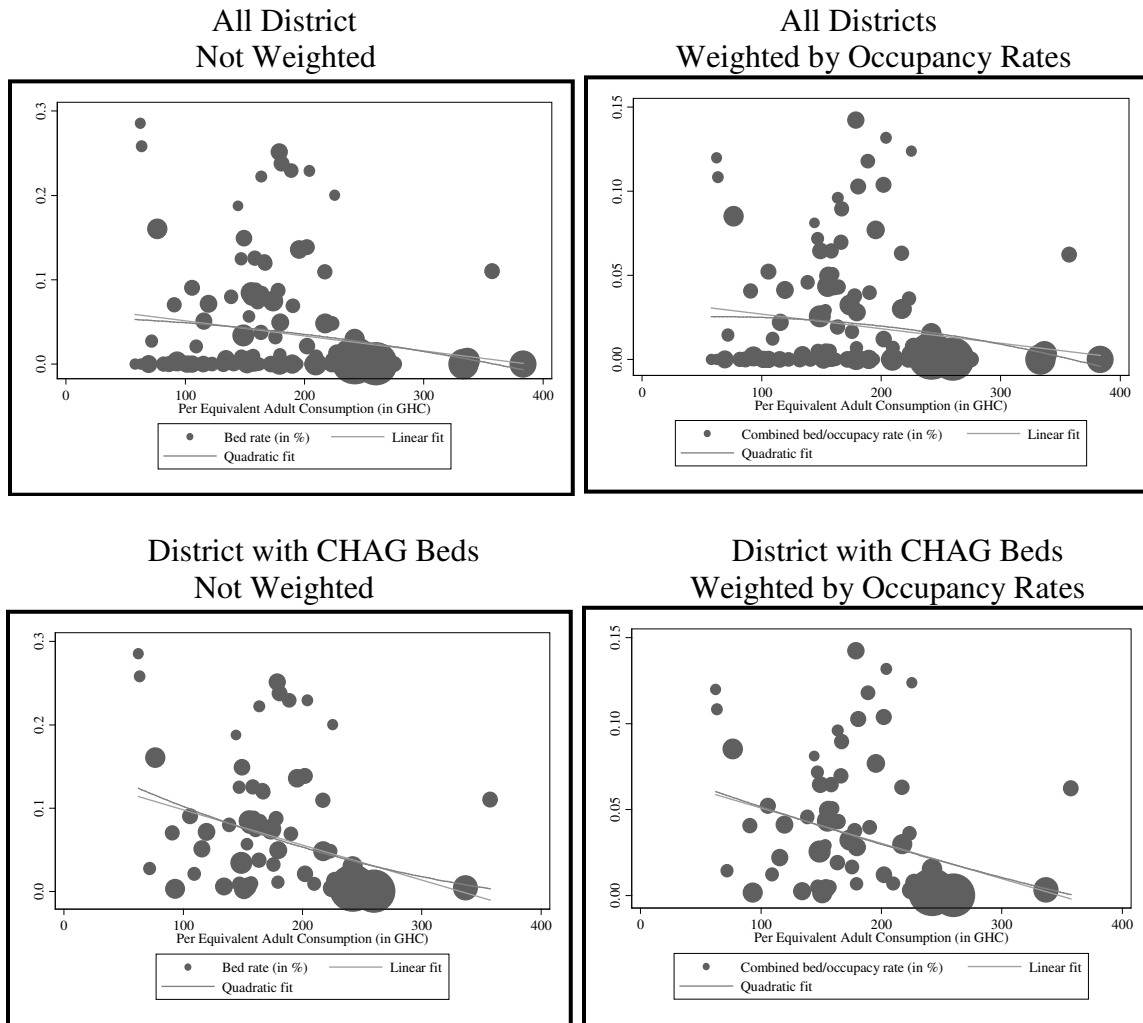


Source: Authors' estimation based on GLSS5 2005-2006, CWIQ 2003, and CHAG data.

The same result is observed in Figure 3, where instead of looking at the relationship between the bed rates and poverty, we use instead consumption per equivalent adult to measure well-being. The trend lines are downward sloping, suggesting that CHAG facilities tend to be located in areas with lower levels of consumption, but again the relationship is weak unless one considers only districts with CHAG facilities. Overall then, there is some pattern in the scatter plots that suggest some relationship between the placement of facilities and poverty or consumption at the district-level, but the

relationships are not very strong when the whole sample of districts is taken into account, and the relationships tend to be driven at least in part by high levels of poverty in a few northern districts with a high share of the population affiliated with the Catholic faith.

**Figure 3: CHAG Beds per Thousand Persons by District and Consumption Level**



Source: Authors' estimation based on GLSS5 2005-2006, CWIQ 2003, and CHAG data.

These results on the relative weakness in the relationship between the location of CHAG facilities and areas with high poverty or low levels of consumption when all districts are taken into account may seem surprising given the widespread perception that CHAG serves primarily rural and poor areas. Yet it is also recognized that even if historically CHAG facilities were indeed located several decades ago in underserved areas, patterns of migration and development may have changed the nature of the areas in which CHAG facilities are located. As stated by CHAG (2006) itself in one of its annual reports, *“a few [facilities] are in big towns now but were built there when the towns were small and rural. A few can now also be seen in the slums of some of the cities. These are targeted at serving the health needs of the poor and vulnerable populations that have been created*

*by urbanization.*” In addition, there have been profound changes in the geography of poverty in the country over the last two decades, with poverty being increasingly concentrated in the northern and rural savannah part of the country (Coulombe and Wodon 2007). Given that there are generally more CHAG clinics and hospitals in the southern and middle belts than in the northern areas, albeit with the exception of a few districts in the Upper West region where CHAG has important facilities, the changing patterns of poverty may have reduced the proportion of the services provided by CHAG that is allocated to some of the poorer areas of the country. In addition, while the share of CHAG beneficiaries located in poor areas may have been reduced, new public facilities such as clinics, health posts and mobile programs providing community-based health services have been expanded by the Ministry of Health in rural areas for primary health care (Salisu and Prinz 2009).

Together these three phenomena - population growth, migration, and development in traditional CHAG areas; a higher concentration of poverty in some of the northern regions where CHAG has traditionally had a smaller presence; and an expansion of public services by the Ministry of Health in underserved areas over the last decade or two – may have led to a reduction of the footprint of CHAG hospitals and clinics in some of the poorer areas of the country as compared to the footprint of public facilities. These results on the location of facilities are consistent with findings from the analysis based on household surveys that suggests that faith-inspired providers, most of which belong to CHAG, may not today serve the poor much more than public providers.

## **CONCLUSION**

Using poverty mapping techniques as well as simple statistical and regression analysis, the objective of this paper was to answer two questions. First, are CHAG facilities located primarily in areas that have a high proportion of Catholics or Christians, or in areas that have a high proportion of the population living in poverty? To the extent that this can be measured with contemporary data, it appears that the choice of the location of CHAG facilities may have been driven more by the share of Catholics or Christians living in specific districts than by the level of poverty in those districts. This would not be a surprising finding given the history of mission activities in Ghana, and it is not a problem in itself, so long as all of those who live in certain areas may benefit from the services provided by facilities, which is certainly the case.

Second, independently of whether the answer to this question is related or not to the proportion of Catholics or Christians living in any given area, are CHAG facilities located proportionately more in poorer than in better off areas? The results provide mild evidence that CHAG facilities tend to be located in somewhat poorer areas. From the point of view of CHAG which may look only at the distribution of its facilities in the districts where it is active, the evidence that it tends to serve poorer areas is stronger. But from the point of view of a national government or an outside observer who looks at the distribution of beds (and facilities) in the country as a whole, the relationship is weaker, in part because CHAG does not have facilities in many relatively poor districts. As to why the bias of CHAG towards poor areas seems lower than one might have expected, at

least three explanations could be provided. Faster development in traditional CHAG areas, a higher concentration of poverty in some of the northern regions with substantial Muslim populations where CHAG has traditionally had a smaller presence, and an expansion of public services by the Ministry of Health in underserved areas over the last decade or two (although this was not measured here) may all have led to a reduction of the role that CHAG has historically played in preferentially serving the health care needs of the poor in Ghana.

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