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Mapping religious health assets: Are faith-inspired facilities located in poor areas in Ghana?

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Abstract

It has long been argued that faith-inspired health facilities serve the poor in priority in sub-Saharan Africa, in part by being located in remote and poor areas where the reach of government services may remain limited. Unfortunately, proper empirical evidence to back up such claims is rarely available. In this paper, we use geographic poverty mapping techniques to assess whether the facilities associated with the Christian Health Association of Ghana (CHAG) are located in poor areas. From the point of view of CHAG which may look only at the distribution of its facilities and hospital beds in the districts where it is active, there is some evidence that it tends to serve poorer areas in priority. But from the point of view of a national government or outside observer looking at the distribution of CHAG facilities and hospital beds in the country as a whole, the relationship is weaker, in part because CHAG does not have facilities and hospital beds in some relatively poor districts. Thus, while there is some evidence that CHAG facilities do serve poor areas, the evidence is weaker than one might have expected.

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1. Introduction

It has long been argued that faith-inspired health facilities play a significant role in sub-Saharan Africa, that they serve the poor in priority, and that they are often located in poor and remote areas where the reach of government health services remains limited. More than twenty years ago, De Jong (1991) stated that "*missions involved in health-related activities tend to be particularly represented in poorer, more remote areas, either out of commitment to serve the under privileged (e.g., religious missions often state this explicitly) or because they can fill a gap in such areas not already met by government services.*" Since then similar statements have been made by both researchers and Christian Health Associations – the main faith-inspired providers of healthcare in Africa, including among others for Burundi (Hanson and Berman 1994), Ghana (CHAG 2006), Kenya (Muriithi et al 2007), Malawi (Ward et al 2010, CHAM 2008), Senegal (Knowles 1994), Tanzania (CSSC 2007, Todd et al 2009), Zambia (Nussbaum 2005, Mogedal and Steen 1995, Robinson and White 1998), Zimbabwe (Gilson et al 1994, Green and Matthias 2005), and sub-Saharan Africa as a whole (Parry 2003; Dimmock *et al.* 2012).

Unfortunately, as noted by Olivier and Wodon (2012a, 2012b), proper empirical evidence to back up such statements is rarely available. For this reason, there has been substantial interest in recent years in ways to better map religious health assets, with mapping exercises taking various forms (ARHAP 2006; WHO-CIFA 2009). Geographic mapping relies on GIS technology to locate health facilities with the aim of guiding the location of new facilities and assessing potential overlaps or complementarities among facilities from different providers located within a given area. The World Health Organization has undertaken work in this area among others through its Service Availability Mapping (SAM) project[1]. Another type of mapping exercise is more participatory and focuses on documenting and understanding the role of informal groups and organizations in specific aspects of health care provision or support (Olivier *et al.* 2012a; de Gruchy *et al.* 2011; Blevins *et al.* 2012). These approaches can be useful to locate geographically specific community-based activities, especially when they integrate GIS data, but the primary objective is often to gather information on community perceptions and services as part of a broader process of understanding and community engagement in health.[2]

In this paper, our objective is to use geographic poverty mapping techniques to assess whether faith-inspired health facilities in Ghana are located in the country's poor areas. The focus is on the Christian Health Association of Ghana because it is the largest faith-inspired provider of health services in the country. The number of CHAG Member institutions/facilities has grown from 25 in 1967 to 168 in 2008, with approximately 70 percent of the facilities operated by the Catholic Church (on the role of faith-inspired and

[1] In Ghana the SAM provided detailed information on the distribution of health services at the district level, including HIV-AIDS baseline monitoring data (Ministry of Health 2007).

[2] 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 health care. Such studies help in documenting the role of non-governmental organizations in health beyond the traditional focus on the operation of public facilities operated by Ministries of Health.

other private health care providers in Ghana, see Boateng *et al.* 2006, Makinen *et al.* 2011, Salisu and Prinz 2009, Rasheed 2009, Olivier *et al.* 2012b, and Shojo *et al.* 2012).

In one of its recent annual reports, CHAG stated that its "*member institutions are located predominantly in the rural areas and are aimed at reaching the marginalized and poorest of the poor"* (CHAG 2006). In addition, the Memorandum of Understanding (MOU) signed between CHAG and Ghana's Ministry of Health notes the desire to improve health services *"…especially at the rural and deprived communities where CHAG facilities are situated by choice, and experienced in serving such communities, in line with their Christian mission of service to the poor, marginalized and disadvantaged*." The MOU also states that while the government is responsible for the provision of health needs of the population as a whole, "*CHAG institutions, in line with their Christian teachings, shall target service provision to the poor and the marginalized in the society*" (Ghana Ministry of Health and CHAG 2006). In order to assess whether CHAG facilities are indeed located for the most part in poor areas, we combine administrative data on the location of the facilities with data from a new poverty map constructed by Coulombe and Wodon (2012a). The structure of the paper is as follows. Section 2 provides information on data sources, which include household surveys as well as CHAG administrative data and census data. Section 3 provides the empirical analysis. A brief conclusion follows.

2. Data and Methodology

Three 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 (49,003 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 not only to its large sample size but also to the underlying sampling frame which ensures district-level representativeness.

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 the 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. 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 and the structure of the error terms are applied to the CWIQ data to predict consumption for each household in the CWIQ. Finally, 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 many observations on which the measures are based.

The details of the construction of the CWIQ-based poverty map are given in Coulombe and Wodon (2012a), and the methodology used for the estimation is summarized in the Annex in this paper. 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[3]. 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 adjacent districts and splitting them into three districts). The district estimates of poverty used here are those based on the original 110 districts in the CWIQ survey, as this is the level at which the CWIQ survey is deemed representative.

In addition to the poverty map, we use administrative data on the location of all CHAG facilities. Data on the location of CHAG facilities by district 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, three 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 an alternative way to assess the allocation of resources (at least for hospitals and clinics with beds) than relying solely on the number of facilities.

Maps visualizing the key data are provided in Figures 1 and 2. The first map displays the poverty estimates by district according to the headcount index which measures the share of the population that is poor in each district. 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. Clearly, when comparing the two 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 high share of the population in poverty, but the relationship is not necessarily very strong or monotonic. In the next section we look more closely at this relationship.

[3] 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). As pointed to us by a referee, just because poverty rates have declined substantially does not mean that poverty does not remain a pervasive issue, especially in some areas. Indeed, 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.

3. Results

Are CHAG facilities located more in poorer than in wealthier areas? Consider first the evidence provided in table 3. In that table the facilities are first 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. Next, the facilities are grouped by quintiles of the population in poverty 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 (this thus factors in the size of the population in poverty of the various districts). The results in table 3 suggest that when looking at quintiles of districts without population weights, CHAG facilities tend to serve slightly more districts that have a lower level of poverty or higher level of well-being on average. By contrast, when considering quintiles of poverty that are population-weighted (taking into account the size of the population in each district), CHAG facilities tend to serve slightly more the poorer quintiles. The evidence as to whether CHAG facilities are located more in poor areas is thus mixed, especially given the Chi square tests that suggest only marginally statistically significant relationships. Still, if one factors in the population of the various districts as one probably should, the pattern appears to be slightly pro-poor even if overall CHAG facilities clearly are distributed geographically in both poor and less poor areas.

Another way to look at the data consists in using the information on hospital beds. This factors in the size of the facilities, although the facilities without hospital beds are then not taken into account. The results are presented visually in Figures 3 and 4 which provide scatter plots with the number of beds in CHAG facilities per 1,000 inhabitants on the vertical axis and either the share of the district population in poverty (in Figure 3) or the average level of consumption per equivalent adult in the district (in Figure 4) on the horizontal axis. 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 regional level estimates of occupancy rates for facilities with bed computed by CHAG for its facilities. 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 regional-level occupancy rates for 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). The analysis is also carried only on those districts which have a positive number of beds in CHAG facilities.

In Figure 3, upward trend lines would suggest that CHAG facilities tend to be located more in poor than in better off areas. 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 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 own facilities in the districts where it is 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.

The same result is observed in Figure 4, but instead of looking at the relationship between the bed rates and poverty, we use 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 and hospital beds. Overall then, there is some pattern in the scatter plots that suggest a relationship between the placement of facilities and poverty or low consumption at the district-level, but the relationships are not very strong when the whole sample of districts is taken into account.

These results are in a way encouraging, in that CHAG facilities tend to be located slightly more in poor areas, but also perhaps disappointing, in that the emphasis on serving poor areas may be lower than often assumed given the widespread perception as noted in the introduction that CHAG serves primarily rural and poor areas. But it must be recognized that even if historically some CHAG facilities may have been located several decades ago in especially underserved areas, patterns of migration and development may have changed the nature of the areas in which CHAG facilities are now located. As stated by CHAG (2006) itself in one of its recent 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). While this is not captured in the analysis presented in this paper, it may have reduced the relative reach of CHAG facilities to the poor as compared to public facilities.

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. In any case, our results on the location of CHAG facilities are consistent with findings from the GLSS5 and CWIQ household surveys that suggest separately that faith-inspired providers, most of which belong to CHAG, may not today serve today the poor much more than public health providers, even if they do serve the poor substantially more than (mostly urban) private secular health facilities (Coulombe and Wodon 2012b).

4. Conclusion

Using poverty mapping techniques, the objective of this paper was to assess whether CHAG facilities are located more in poorer or better off areas? The results provide mild evidence that CHAG facilities are located in 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 looking 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 location of CHAG facilities in poor areas appears to be lower than one might have expected on the basis of common perceptions in the country, at least three explanations could be provided. Faster recent development in traditional CHAG areas, a recent increase in the 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 facilities by the Ministry of Health in underserved areas may all have led to a reduction of the role that CHAG plays in preferentially serving the health care needs of the poor in Ghana, as compared to the perception of that role that prevails.

This being said, even if the footprint of CHAG facilities is not strongly pro-poor in terms of the geographic areas served, this does not imply in any way that CHAG facilities do not provide essential quality care at an affordable cost for a substantial share of the population, including the poor. Furthermore, the collaboration between CHAG and the Ministry of Health in the provision of care is considered as best practice in Africa.

Annex: Poverty Mapping Methodology

The idea behind the poverty map methodology using a survey and a census as proposed by Elbers *et al.* (2003) is simple. First, a regression model of the logarithm of expenditure per equivalent adult is estimated using survey data, using explanatory variables which are common to both the survey and a census (in this paper, instead of a census, we use a very large second survey representative at the district level for Ghana). Next, parameters from the regression are used to predict expenditure for every household in the census. Third, a series of poverty indicators are constructed for different geographical areas. Although the idea is simple, its implementation requires complex computation to account for spatial autocorrelation and heteroskedasticity. As suggested by a referee, the methodology is outlined in this annex (following Mistiaen *et al.*, 2002).

First step. We first need to determine a set of explanatory variables from both databases that meet some criteria of comparability. In order to be able to produce a poverty map in the census consistent with the associated poverty profile from the survey, it is important to only select variables that are fully comparable between the census and the survey. We start by checking the wording of the different questions in the two questionnaires as well as the proposed answer options. From the set of selected questions we build a series of variables which are tested for comparability. Although we might want to test the comparability of the whole distribution of each variable, in practice we only test the equality of the means in the census and in the survey. In order to maximize the predictive power of the predictive models, analyses are performed at the strata level, including tests of the comparability of the variables on which the models are estimated.

Second step. We first model household expenditure per equivalent adult using the survey, with separate models for urban and rural areas. Denote expenditure by y_{ch} for household h in location c, by $\boldsymbol{x_{ch}}$ a set of explanatory variables, and by u_{ch} the residual, the model is $ln\ y_{ch} = \boldsymbol{x'_{ch}\beta} + u_{ch}$. The vector of disturbances u is distributed $F(0,\Sigma)$. The model is estimated by Generalized Least Square in order to account for spatial autocorrelation (expenditure from households within a cluster are likely to be correlated) and heteroskedasticity. The error terms is specified as $u_{ch} = \eta_c + \varepsilon_{ch}$ where η_c is a location effect and ε_{ch} is the individual component of the error term. In practice, we first estimate the model by OLS and decompose the residuals into uncorrelated household and location components. The location term is estimated as the cluster mean of the overall residuals and the household component is then subtracted. Heteroskedasticity is modeled by regressing square values of the household component of the error terms on all independent variables in the base model plus their squares and interactions effects as well as the imputed poverty (or welfare) measures (see Mistiaen *et al.*, 2002, for details).

Third step. Expenditure levels are then predicted in the census. Since the complex disturbance structure makes computation of the variance of imputed poverty (or welfare) measures intractable, bootstrapping techniques are used. Coefficients and disturbance terms are drawn from their distributions. For each household in the census, we compute the poverty or welfare measure as $\hat{y}^r_{ch} = \exp(\mathbf{x}'_{ch}\tilde{\beta}^r + \tilde{\eta}^r_c + \tilde{\varepsilon}^r_{ch})$. That process is repeated 100 times, each time redrawing coefficients and disturbance terms. The mean of the simulated poverty or welfare measure becomes our point estimate and its standard deviation is the standard error through bootstrapping of the simulated estimates. Software to perform these various steps in the estimation is available from Zhao (2005).

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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
Total	**58**	**78**	**13**	**10**	**8**	**1**	**168**	**100**

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
Total	168	120	77

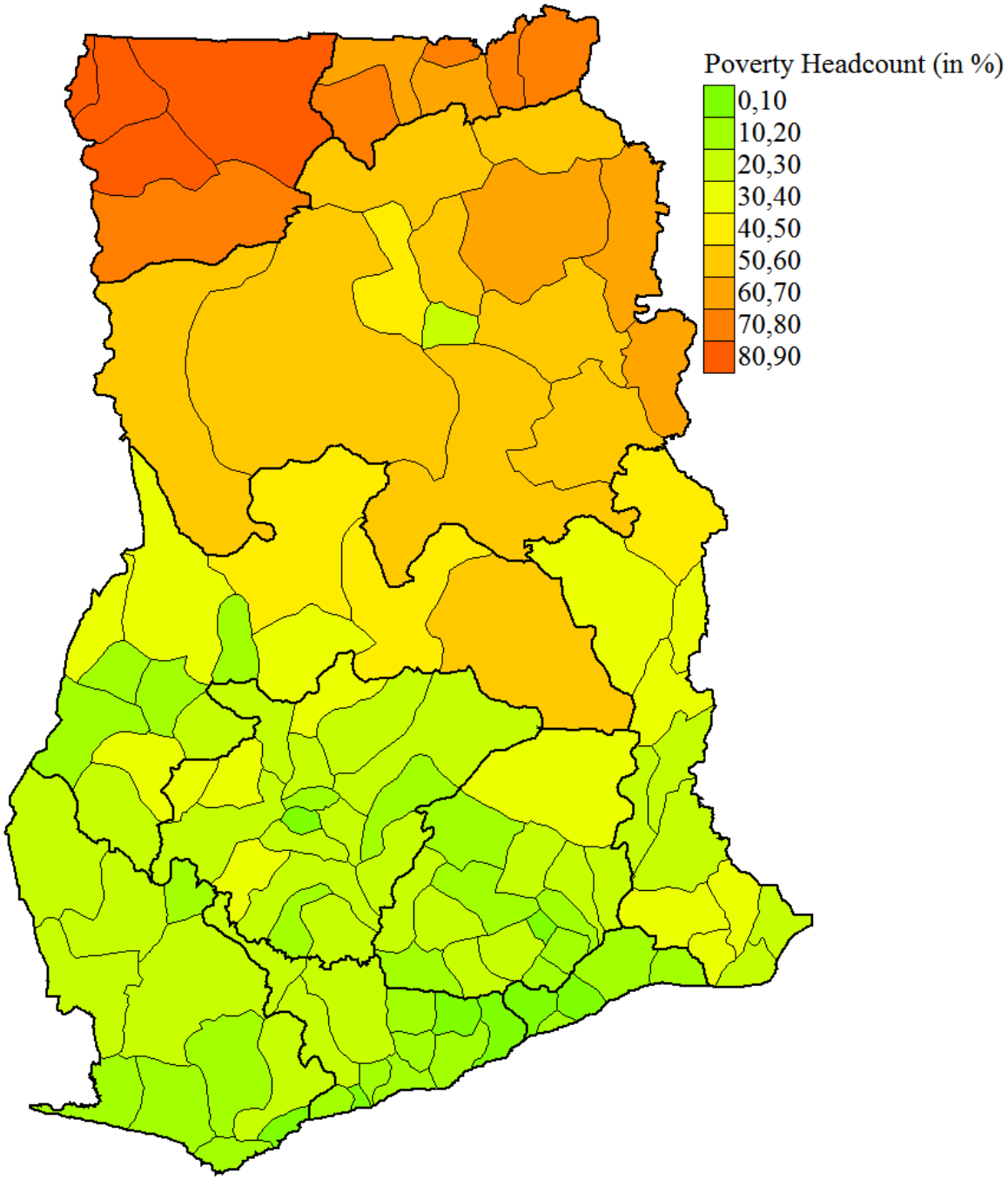
Source: CHAG (2009).

Table 3: Number of CHAG Facilities, by Quintiles and Type of Facility

	Poorest	Second	Third	Fourth	Richest	Total
Quintile of Individuals/Population						
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
Chi-squared test	Pearson chi2 (8) =15.40, Pr.=0.052					
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
Chi-squared test	Pearson chi2 (8) =15.15, Pr.=0.056					

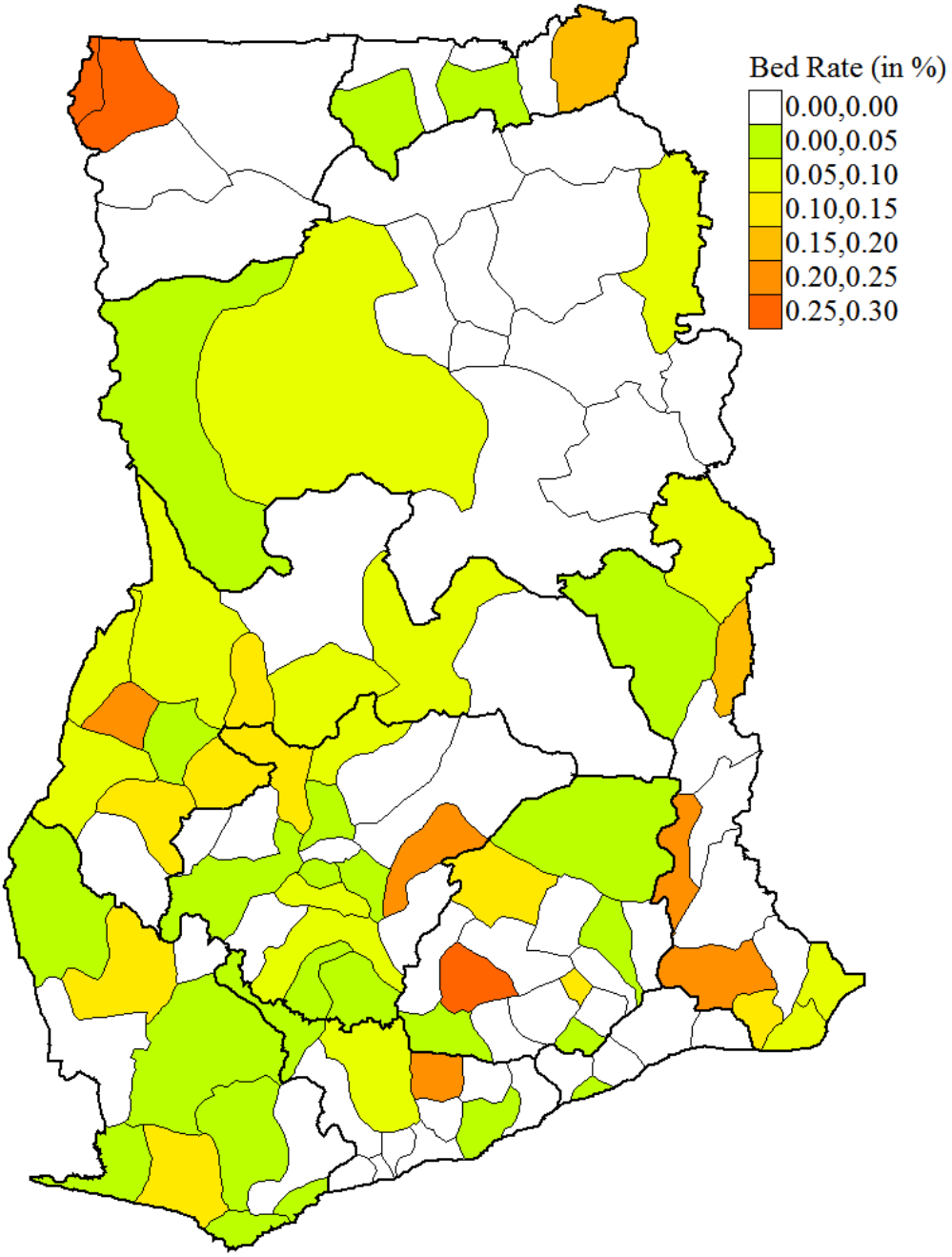
Source: Authors' calculations based on qualitative fieldwork data.
Notes: The quintiles of individuals represent 20 percent of individuals living in districts ranked by the share of their population in poverty; the quintiles of districts represent 20 percent (i.e., 22 districts in each case) of the districts ranked by the share of their population in poverty.

Figure 1: District-level Poverty Headcount



Source: Authors' calculation based on GLSS 2005-2006 and CWIQ 2003 survey data.

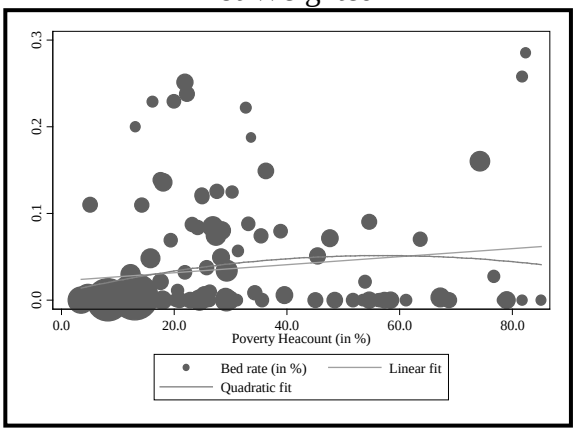
Figure 2: District-level CHAG Bed Rate



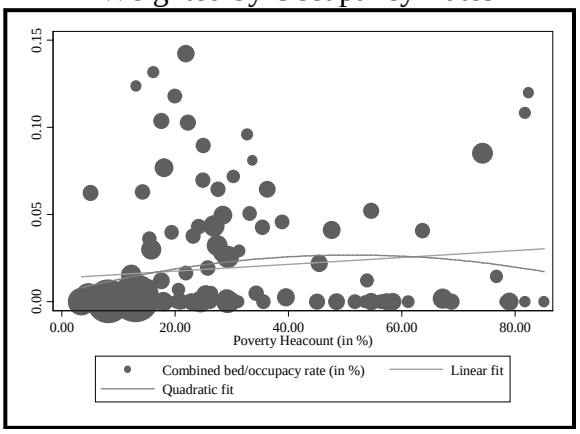
Sources: Administrative data from CHAG.

Figure 3: CHAG Beds per Thousand Persons by District and Poverty Headcount

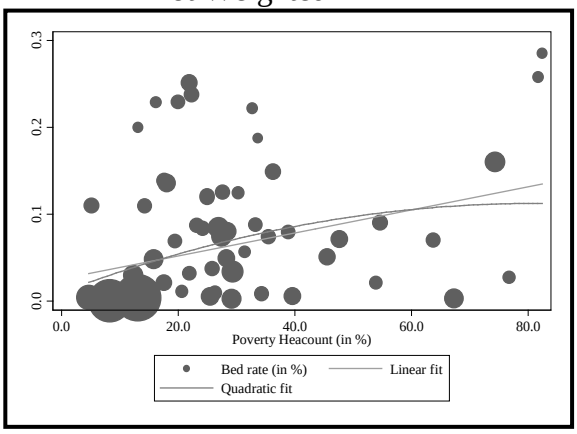
All District
Not Weighted



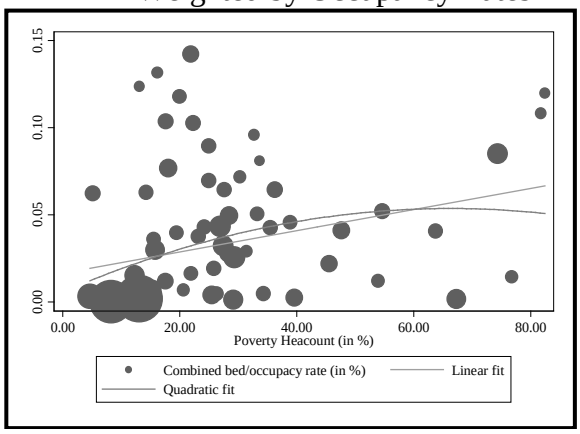
All Districts
Weighted by Occupancy Rates



District with CHAG Beds
Not Weighted

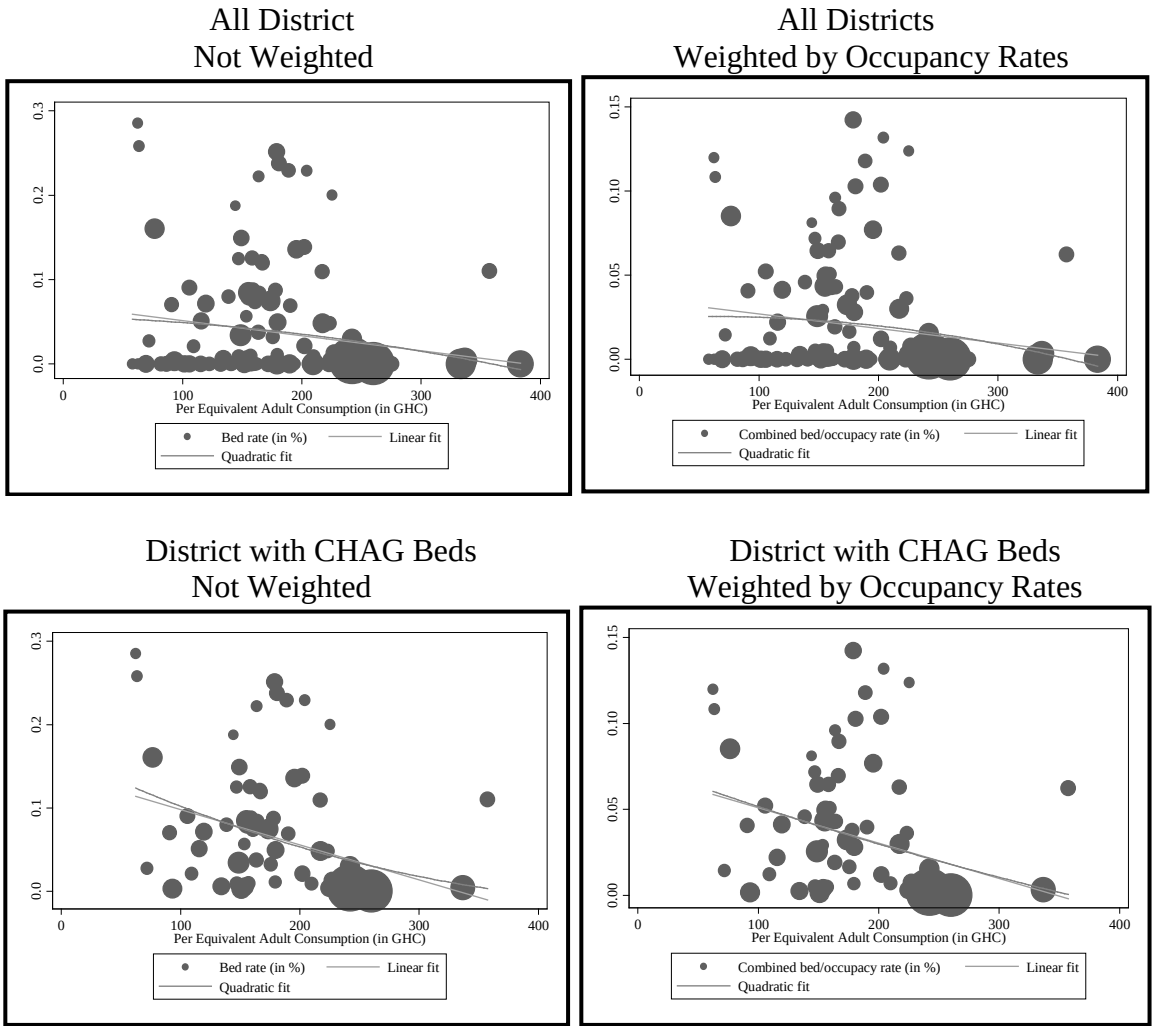


District with CHAG Beds
Weighted by Occupancy Rates



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

Figure 4: CHAG Beds per Thousand Persons by District and Consumption Level



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