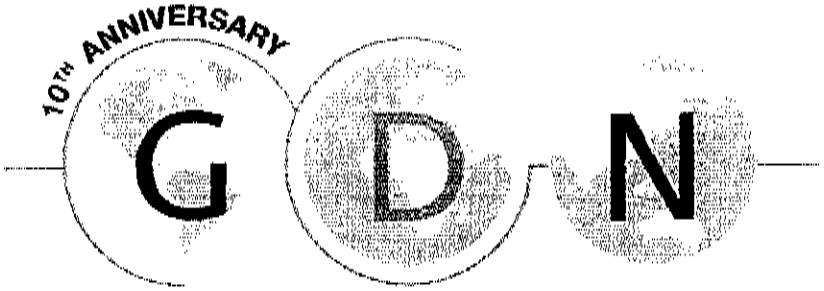

Global Development Network 1999 - 2009

GDN Working Paper Series

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Working Paper No. 40

March 2010

About GDN

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This Working Paper has been prepared within the GDN's Global Research Project *Promoting Innovative Programs from the Developing World: Towards Realizing the Health MDGs in Africa and Asia*. The project has been fully funded by the Bill & Melinda Gates Foundation, United States. The views expressed in this publication are those of the author(s) alone.

An Evaluation of the Ghana National Health Insurance Scheme in the Context of the Health MDGs

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Abstract

In 2003 the Government of Ghana established a National Health Insurance Scheme (NHIS), to make health care more affordable for Ghanaians; it is envisaged that the NHIS will eventually replace the existing *cash-and-carry system*. Sponsored by the Bill and Melinda Gates Foundation and the Global Development Network (GDN), this study evaluates the NHIS to determine whether it is fulfilling the needs for which it was established. We accomplish this task by focusing on the health status of women to see whether the NHIS has yielded any positive health outcomes regarding maternal and child health in Ghana. With this approach, we are able to situate our evaluation in the context of the Health MDGs, two of which (#4 and #5) deal specifically with the health of women and children. We rely primarily on *Propensity Score Matching* to undertake our evaluation. With this we are able to match relevant background characteristics of women who are enrolled in the NHIS with those of non-members and compare their health outcomes. Our findings suggest that the NHIS has yielded some verifiable positive outcomes: Women who are enrolled are more likely to give birth in hospitals, to have their births attended by trained health professionals, to receive prenatal care; to have fewer birth complications, and to experience fewer infant deaths.

Keywords: Ghana, national health insurance, propensity score matching, health outcomes.

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General Outline

1. Introduction

Access to effective and affordable health services is a rarity in most developing countries. The problem, as the GTZ (2005, 4) points out, is not only due to the poor health care services often found in rural areas, or the inadequate quality of care across most of these countries, but also to the high cost of obtaining these services. Invariably, the very poor are the most vulnerable, as they are less capable of recovering from the financial consequences of illness and tend to have higher health risk, since they usually have poor working and living conditions, with limited access to healthy food, clean water, and adequate sanitation (ILO, GTZ, WHO, 2006). In the immediate post-independence era, Ghana had a healthcare system that provided 'free' medical services in public health institutions to all citizens. However, during the 1970s and the early 1980s, persistent budgetary constraints, deteriorating health infrastructure, falling standards of healthcare, coupled with massive emigration of healthcare practitioners, compelled the government to implement a cost recovery regime, or *cash-and-carry* system of payment, as part of its IMF- and World Bank-sponsored Structural Adjustment Programs [SAPs] (Mensah, Oppong-Koranteng, and Frempah-Yeboah, 2006).

There are indications that the *cash-and-carry* system has undermined access to, and utilization of, health services in the country. For instance, research shows that under the system, many low-income households in the country regularly postpone medical treatment, resort to self-treatment, or use traditional medicine provided by unregulated healers, spiritualist, and itinerant drug vendors (Oppong, 2001). It is against the background of these problems that, in 2003, the Government of Ghana established a National Health Insurance Scheme (NHIS), with the hope of making healthcare readily available and more affordable to Ghanaians. It is envisaged that the NHIS will eventually replace the *cash-and-carry* system throughout the country. Despite the financial protection offered by social health insurance schemes against the uncertainties of illness, some Ghanaians are hesitant to enroll in the incipient NHIS. Without empirical data, it is difficult to determine reasons for non-participation or whether the NHIS is actually accomplishing its purpose of making health care available and affordable to all. This study seeks to provide empirical-based answers for these questions.

1. 1 Research Objective

The present study seeks to evaluate the Ghana National Health Insurance Scheme (NHIS) to see how it has fared since its creation. Our specific objectives are threefold:

- To compare the health characteristics and outcomes of women (18-49 years) who are enrolled in the NHIS with those of women who are not;
- To explore the differences in health care access and utilization between these two groups of women, and to understand why some women join the scheme and others do not; and
- To assess whether the Scheme has been successful or not; and if it has, to explore the extent to which it could be replicated in other African countries.

The present study is part of a Global Development Network's (GDN) Global Research Project on "Promoting Innovative Programs from the Developing World: Towards Realizing the Health MDGs in Africa and Asia." Consequently, our research objective—and, indeed, our methodology—is guided by the *Terms of Reference* (TOR) specified by the GDN. Our focus on women is deliberate: It helps us to zero in on maternal and child health issues vis-à-vis Ghana's NHIS to determine the extent to which the new Scheme has engendered positive or negative health characteristics and outcomes for women who are enrolled and their children. Of the 8 Millennium Development Goals (MDGs), two—i.e., MDG #4 and MDG #5—are particularly important for our study. With MDG #4, the global community seeks to "reduce by two-thirds, between 1990 and 2015, the under-five mortality rate; and with MDG #5, the target is to "reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio" (UNDP, 2006, 421).

To accomplish our stated objectives, we use survey data from four administrative districts in Ghana to compare the health characteristics and outcomes of women who are members of the NHIS with those of their counterparts that are not. Findings from a focus group discussion, involving key informants selected from the study districts provides additional insights into the operations of the NHIS and supplements our quantitative data. To ease presentation, and avoid the usual disciplinary and epistemological tensions between qualitative and qualitative methodologies, we summarize our Focus Group Discussion findings separately in Appendix I.

Our empirical findings suggest that the NHIS has yielded variable benefits for its members. For instance, women who are members of the NHIS are more likely to give birth at a hospital, receive prenatal care, have their deliveries attended by trained health care practitioners, and experience less birth complications. In a recent comprehensive review of the literature on maternal protections under social health insurance Schemes in Africa (for the ILO), Mensah and Oppong (2007) noted that:

> *A direct link between health insurance, or any prepayment system, on the one hand, and maternal health outcomes, on the other hand, is difficult to ascertain. None of the available studies (reviewed) was able to draw that causal connection with any degree of certainty. While it is intuitively appealing to expect an increase in access and utilization of maternal care services as a result of a good prepayment system, one cannot stretch this argument to link health insurance or any prepayment system directly to the reduction of say maternal mortality* (p. 49).

With this observation in mind, we steer clear of some of the conventional (and long-term) measures of maternal health outcomes, such as 'maternal mortality ratios,' and rely on health characteristics, such as 'uptake of prenatal care' and 'birth at hospitals,' as proxy measures of health outcome in this study. Consequently, we urge our readers to interpret our results pertaining to health outcomes some caution.

This report is organized under 10 main sections. The next, Section 2, provides the theoretical grounding for the work, by examining the evolution of health insurance in African countries and highlighting the problems of maternal and child health care across the continent. This is followed by a profile of Ghana's political economy and health care system in Section 3,

together with some insights into maternal and child health care trends in Ghana. Section 4 deals with the program description, where we identify the key features of the Ghana National Health Insurance Scheme—the subject of the present evaluation. This is then followed by a discussion of our empirical strategy in Section 5, where we outline the sampling and statistical techniques used for the study. Section 6 offers a comparative overview of the four District Health Insurance Schemes (NHIS) in our study. Following this, Section 7 contrasts the characteristics of members of the NHIS with non-members, along a host of variables, including socioeconomic background, health status, health care access and utilization, and inclinations toward health care pluralism. Section 8 focuses primarily on the results of the Propensity Score Matching technique, while the penultimate section, offers some arguments in favor of a possible replication of Ghana's NHIS across Africa, based on our empirical results. We conclude the report with some comments on our main findings.

2. Theoretical Background

2.1 Evolution of Health Insurance in African Countries

Formal health insurance Schemes emerged only recently in African countries. Historically, Africans relied on informal, kinship, and other communal networks and associations for mutual support and solidarity during illness, bereavement, and other contingencies. At independence formal health care systems in African countries favored privileged elites and urban residents because they were intended to serve the Europeans and their immediate dependents and employees. Independent African countries extended the reach of their formal health care systems with sizeable investments in health care, training indigenous health personnel, and strategies to redress the inequalities of the colonial era. In fact, most African countries embraced the primary healthcare strategy outlined at the historic *Alma Ata Conference* in 1978 that emphasized community-based care and resolved that comprehensive health care was a basic right of citizens and a responsibility of government. Thus, most countries provided 'free' and publicly-funded health care with virtually no out-of-pocket payments. These efforts were quite successful in increasing not only the numbers of health professionals employed in the public sector and the health care infrastructure, but also extended care to areas and populations previously without access. In Tanzania, for example, the government succeeded in expanding access to health care nationwide to the extent that by 1977 more than three-quarters of Tanzanians lived within 5 km of a health care facility (Yudkin, 1999).

Amidst rapid population growth and economic decline, such free universal health care systems quickly became unsustainable (Criel, 1998). During the OPEC oil crisis of the 1970s most African governments were compelled to reduce their budget allocations to social services, including health. The worsening economic circumstances of the 1980s compounded the problems and forced most African countries to seek financial assistance, in the form of loans and grants, from international financial institutions such as the World Bank and the IMF. As a major funding conditionality, these governments were required to switch from their socialist-based development policies toward open-market reforms under the Structural Adjustment Programs (Mensah, 2006). Removal of government subsidies and imposition of

user-fees for social services such as education and health care became common requirements by the early 1990s (Mensah, 2008a and 2008b). Suddenly, out-of-pocket payment for health care services, which used to be the exception in the early post-independence years in Africa, became the rule (Mwabu, 2008; Vandemoortele et al., 1997).

Available studies suggest that the system, which came to be known as *cash and carry*, had disastrous results; health indicators plummeted as health care became less accessible (WHO, 2007; Oppong, 2001). According to WHO (2007), life expectancy at birth was 45 years in 1970, increased to 49.2 years in the late 1980s but fell to 47 years by the late 1990s and early 2000s. The deteriorating health indicators were greeted with unanimous uproar—UNICEF, for one, called for *adjustment with a human face,* while the ILO advocated decent work arrangements under economic reform (Mensah, 2008c). Similarly, the United Nations, the G8 countries, the African Union, and WHO joined the deafening chorus advocating increased funding for healthcare in Africa.

National health insurance schemes emerged as a solution to the crisis of health care funding in African countries. In fact, many African countries (e.g., Rwanda, Tanzania, Kenya, Nigeria) are experimenting with a variety of comprehensive, social health insurance schemes that combine private and public-funding arrangements in creative ways (Mensah and Oppong, 2007). Indeed, there are evidence from a number of studies—including those of Van Doorslaer et al., (2006) in Asia; of Jutting (2004) in Senegal; of Schneider and Diop (2001) in Rwanda; and of Criel and Kegels (1997) in Zaire—that catastrophic out of-pocket payments for care can push entire households into poverty, and that membership in prepayment schemes is often associated with higher utilization of modern health care, in the form of outpatient visits or hospitalization. Still, whether or not the Ghana National Health Insurance Scheme is effective in improving health care delivery is unknown, in the absence of a systematic evaluation of the scheme—hence the need for the present study.

2.2. Typology of Health Insurance Schemes in African Countries

A complex variety of health insurance arrangements have emerged across Africa. For analytical purposes, we group them into two broad categories: *voluntary* and *mandatory*. Most mandatory health insurance schemes cover formal sector employees and are funded by mandatory employment-based contributions. In contrast, voluntary membership is by choice. Mandatory and voluntary health insurance programs may be commercial or not-for profit. Commercial schemes are usually expensive and risk-rated, but non-profit schemes are based on ability to pay, and have a relatively restricted package of benefits due to their more limited resource base (Nitayarumphong and Mills, 1998).

A third type, Social Health Insurance, combines features of both the voluntary and mandatory schemes. Typically, it begins as a mandatory earnings-based, risk-pooling mechanism for formal sector workers, managed by a government agency or other autonomous body (Bachmann, 1994). Subsequently, such schemes are extended to cover workers in the informal economy including farmers, traders, and other self-employed people. Because these new target populations usually have irregular and unstable incomes, creative methods of premium collections are necessary to facilitate such an extension.

Perhaps the most striking feature of Social Health Insurance programs is their emphasis on social solidarity, entailing an explicit cross-subsidization of lower income members by the

relatively well-to-do, and of the ill by the healthy (Hasio, 1996)—an arrangement that fits well with the endemic communalism of Africa's traditional culture. By allowing enrollees to contribute on the basis of their ability to pay and by pooling low- and high-risk people together, this system of insurance usually eschews adverse selection. Social Health Insurance Schemes are commonly called National Health Insurance Schemes (NHIS) when they seek to assume national coverage, as in the case of Ghana.

Another type that has emerged in Ghana is the Community-Based Health Insurance (CBHI). While couched in social solidarity and risk-sharing terms like the NHIS, CBHI focuses more on those who work in the informal economy and usually have limited geographic or community coverage. They are usually community-owned and managed by autonomous, not-for-profit community health organizations.

Mutual Health Insurance (MHI) is another type of health insurance scheme that is common in Africa. MHI are usually established by an external organization, such as a hospital, a donor organization, an NGO, or a church, to assist a group of people having difficulties in accessing health care. Like the CBHI, MHI schemes target people in the informal sector, and while most are managed by autonomous community solidarity groups and NGOs, some are managed by central government organizations working with local officials (Sabi, 2005). Since most Mutual Health Insurance organizations are community-based, or emerged out of older community-based programs, the two terms 'Community-based Health Insurance" and "Mutual Health Insurance" are often used interchangeably (Mwabu, 2008; Diop and Butera, 2005; Schmidt, Mayindo and Kalk, 2006).

2.3. Maternal and Child Health Predicaments: Africa's "Silent Epidemic"

Africans face extremely high maternal, newborn, and child mortality rates from preventable causes. Dubbed the *Silent Epidemic*, it has attracted international attention and is the target of MDGs #4 and #5. Despite concerted efforts such as the Safe Motherhood Initiative, only isolated improvements in maternal and newborn health are visible, with little reduction in overall maternal mortality. Worldwide, the WHO estimates that the maternal mortality rate (MMR) in 2000 was 400 per 100,000 live births. By region, the MMR was highest in Africa (830, per 100,000 live births), followed by Asia (330), Oceania (240), Latin America and the Caribbean (190), and the developed countries (20). The highest MMRs of 1,000 or greater per 100,000 live births, were, in order of magnitude, Sierra Leone (2,000), Afghanistan (1,900), Malawi (1,800), Angola (1,700), Niger (1,600), the United Republic of Tanzania (1,500), Rwanda (1,400), and Mali (1,200). Others include Central African Republic, Chad, Guinea-Bissau, Somalia and Zimbabwe (1,100 each); and Burkina Faso, Burundi, Kenya, Mauritania and Mozambique (1,000 each). In fact, 19 of the 20 countries with highest MMR in the world are in Africa —the only exception being Afghanistan (WHO, 2007). A woman in sub-Saharan Africa faces a 1-in-16 chance of dying from complications of pregnancy or childbirth during her lifetime, compared with 1 in 2800 in developed countries.

Within the Africa region itself, significant geographic variations in MMR exist. In 2000, the estimated MMR per 100,000 live births were: 1,060 for East Africa, 1,020 for West Africa, 950 for Central Africa, 340 for Northern Africa and 260 for Southern Africa (WHO, 2001). Few countries including Cape Verde, Mauritius, and Seychelles have low rates comparable to

developed countries (WHO, Africa Regional Office, 2007). Among other factors, serious deficiencies in the existing health services have been blamed for the problem (WHO, 2001). For example, an estimated 85% of all maternal deaths in Africa result directly from complications arising during pregnancy or delivery (Abdoulaye, 2006), and are therefore preventable.

Lack of affordable, high-quality healthcare is a major factor contributing to Africa's high maternal mortality. Until recently, the only method of health care finance in most African countries was the "cash-and-carry" system, which is seen by some observers (e.g., ILO, 2007; 2005) to be highly regressive, with detrimental consequences, particularly for the poor. Due to cost, many pregnant women delay seeking healthcare until their conditions deteriorate to the point where treatments become too expensive or too late (Mensah and Oppong, 2007; Preker, 2004; WHO 2001).

(Un)surprisingly, the major causes of newborn death in Africa include severe infections, preterm births, and neonatal tetanus—all conditions that could be prevented with prenatal care. The most vulnerable mothers are least likely to have access to such care. As a result the world's highest neonatal mortality rates are found in Africa. Although Africa has about 11% of the world's population, it has 29% of global neonatal deaths (WHO, 2007). Moreover, Africa accounted for 30 percent of an estimated 3.3 million stillborn babies globally in 2000. In 2003, 4% of the global deaths of children under-five years of age occurred in Africa. They died mostly from conditions that are easily preventable or treatable when pregnant women and children have access to good quality health care. In short, prenatal care, skilled care during childbirth, emergency obstetric care, and efficient postnatal care are critical ingredients for addressing Africa's silent epidemic. Sadly, poverty, weak health care systems, and shortage of skilled health workers remain endemic intractable problems that fuel the silent epidemic. It is estimated that only 43% of deliveries in the Africa Region are attended by skilled health workers. In event of complications, transportation is extremely difficult to obtain in rural areas, and even when pregnant women get to a health facility, the latter is typically unable to deal with major complications.

There is growing international consensus that universal coverage is the best way to address the inequities underlying these dire statistics. It is also argued that universal coverage, by assuring payment for needed services, improves the overall quality of health care for all by generating the revenue to fund additional equipment and personnel. We will test these assumptions in this study.

3. Ghana: Political Economy and Health Care

At independence in 1957, Ghana was a prosperous country with the highest per capita income in West Africa. Agriculture, based on cocoa production, accounted for about half of the nation's GDP (Bequele, 1983). Cocoa exports enabled the economy to grow at 4.1% annually from 1950 to 1960, and Ghana became the leading destination of migrant labor across West Africa (Mensah, 2006b). Ghana's post-independence economic strategy emphasized rapid industrialization by state-owned enterprises (SOEs). With cocoa prices

falling after 1960, industrialization appeared to be a plausible strategy, although it inadvertently minimized the importance of cocoa production and led to further decline in cocoa and general agricultural production (Fitch and Oppenheimer, 1966). Poor performance of the SOEs caused further economic deterioration and annual inflation jumped from about 6% during 1965-73 to 50% during the following decade. This coincided with severe declines in agricultural output between 1970 and 1981. By 1982 per capita income had fallen by 30% in real terms, export earnings were halved, and import volumes fell to one-third of their 1970 levels (World Bank, 1985).

Massive emigration of skilled labor and deterioration of national infrastructure, particularly roads and highways, compounded the problems. External factors, including the collapse of primary commodity prices for cocoa, coffee, and timber, as well as the oil crisis of the 1970s, worsened the economic situation. At the end of 1982, with Ghana's external debt standing at 105.7% of GDP, the government of Flight Lt. Jerry Rawlings, and his military Provisional National Defense Council (PNDC), embraced an Economic Recovery Program (ERP), considered to be one of the severest the IMF and World Bank have ever persuaded a developing country to accept (Saris and Shames, 1991). Among other things, it required severe devaluation of the national currency, removal of subsidies on social services including health and education, and imposed user fees for health care services.

While the SAPs began the slow process of reversing the economic decline, it had mixed results. Agricultural and industrial production increased, inflation fell from 31 percent in 1988 to 10 percent in 1992; domestic savings increased and the budget deficits decreased (Ewusi, 1993). Increased incentives to exporters and the expansion of operations in the major industries led to increases in the output of the major commodities—cocoa, timber, and gold. While the incomes of wealthy businessmen directly engaged in the export of timber, gold, and other raw materials increased, for most Ghanaians, particularly rural dwellers that depended on subsistence farming, survival became more difficult. The emphasis on export promotion at the expense of rural agriculture exacerbated rural poverty. For example, between 1983 and 1990 the number of farmers living below the poverty line in the Northern region increased 4.5 times (Saris and Shams, 1991). Health conditions deteriorated dramatically in parallel, as hunger and malnutrition increased, and the sick, unable to afford payments, delayed seeking health care with often grave consequences (Oppong, 2001; Shaw and Griffin, 1995). Experienced health workers left the country in large numbers to find better conditions of service elsewhere. While, 1,639 Ghanaian physicians were working outside the country, only 1,294 were serving the entire Ghanaian population in 2000 (Clemens and Pettersson, 2006). In 2001, Horton estimated that there were 900 Ghanaian doctors and 200 residents-in-training in the United States alone (Horton, 2001). Nevertheless, the difficulties of Ghana's economy made the SAPs arguably inevitable.

Responding to pressure from the World Bank and IMF, the Rawlings government introduced multi-party democracy in 1992 and ruled the country until 2000 (Mensah, 2006a, 2006b). The opposition presidential candidate, John Kuffour, defeated the former Vice-President, Professor Atta Mills in 2000. Under the NPP government, the economy improved. The service sector expanded; exports grew from 16% of GDP in 1980-83 to 28% in 1999-2001 (Mensah, 2006c). Tourism also grew fast with earnings quadrupling in the last decade. The

official data on poverty show major declines, with the poverty rate falling from 60% in 1987/88 to less than 40% in 1999, although it varies substantially across the country, with much higher rates of poverty in the Northern and Upper Regions. Life expectancy has increased, infant mortality is nearly half the rate in the 1970s, and access to safe water, adult literacy, and child immunization rates have improved (Mensah, 2006b). Kuffour's NPP government, which ruled from 2000 to 2008, introduced the National Health Insurance Scheme in 2003 as a way to address the intractable problem of health care finance.

3.1 The Structure and Geography of Health Services in Ghana

Formal health facilities in Ghana are hierarchically organized, and comprise four levels in the urban areas and five in rural areas. Central place hierarchy, with specified levels of care for threshold populations at set travel distances, is the dominant structure. This dates back to 1981 when Ghana implemented a primary health care system under the auspices of the WHO. The health post is the first level provider in the rural areas. Health centers or clinics, district hospitals, regional hospitals and tertiary hospitals follow in that order. Due to the lack of resources and poor quality of lower level facilities, however, health posts are usually by-passed, while high level facilities continue to be bombarded with minor ailments that could be treated at lower level facilities (Oppong and Hodgson, 1998).

Perhaps, the most striking feature of Ghana's health system relates to spatial disparity, particularly between northern and southern Ghana, and between rural and urban areas of the country. Table 3.1 shows the number of people per doctors, per nurses, and per health facility as of 1999. With more than 15,000 people per facility, Eastern, Central, and Northern regions have clearly worse access than the others. The national average in 1999 stood at 11,000 people per health facility, but the Volta Region had only 4,000 per facility compared to 9,000 per facility in the Greater Accra Region (Figure 3.1)—home to the national capital city, Accra. The number of people per doctor is strikingly higher in the three regions of northern Ghana. Northern Region for one had a whooping 71,912 persons per doctor, while Upper East and Upper West regions had 57,591 and 43,221 persons per doctor respectively in 1999. In 2007, the situation had not changed much. While one doctor in Greater Accra Region served only 5,200 people, in the Northern Region, it was 92,000. Similarly, one in Upper West Region served 4 times as many people as the national average. The ratios of population to nurses in the three regions in northern Ghana are no better in 1999, although they had improved by 2007 (Table 3.1). Nevertheless the disparities between regions remained – one nurse in Northern Region served twice as many people as in Greater Accra.

Table 3.1: Distribution of Health Professionals and Facilities, 2007

Region	Population per doctor		Population per nurse		Population per Health facility
	1999	2007	1999	2007	1999
Greater Accra	14,482	5,202	734	979	9,000
Western	25,819	33,794	1,195	1,993	11,000
Ashanti	31,240	10,667	1,987	2,024	12,000
Volta	18,614	28,269	700	1,266	4,000
Brong Ahafo	26,022	22,749	1,837	1,099	11,000
Eastern	38,146	18,141	1,269	1,173	20,000
Central	32,040	29,260	1,085	1,476	16,000
Northern	71,912	92,046	2,924	1,868	16,000
Upper West	43,221	43,253	1,507	1,208	11,000
Upper East	57,591	33,111	1,868	1,243	12,000
Ghana		13,683		1,451	

Source: Ghana Ministry of Health. 1999a; Ghana Ministry of Health Annual Report 2007.

Access to health care, defined as the percentage of people who take 30 minutes or less to reach a health facility based on their usual mode of travel, is presented in Table 3.2 The spatial disparities are startling: For the nation as a whole, 80 percent of urban residents have access compared to only 37 percent for rural residents. Greater Accra and Western regions have better access than the national average for urban residents. Upper West, Upper East, Northern and Western regions have less rural access than the national average—14%, 16%, 16%, and 31%, respectively. Due to the relatively rugged terrain, Volta Region does not have as much access as its many health facilities would imply.

Rural health facilities are grossly under-equipped and under-staffed in many parts of Ghana. Describing experiences in the Northern Region, Horton (2001, 2143-44) wrote:

There are neither doctors nor nurses readily available... A nurse and a medical assistant can visit each village once a month via the rough bush paths. .... [The] village health worker could neither read nor write, yet his first task was to record births and deaths in his village. ... [The] health district has run out of new growth charts. It will be harder to track progress of these children without them. ... [I]n the hospital, there is no anaesthetist. ... The lamp for the hospital's one functioning microscope is broken. A light bulb is propped up facing the microscope's mirror. Sometimes, the bright sunlight is a better source of illumination (Horton, 2001: 2143-44).

On the Tamale Regional Hospital, the main referral facility for the entire Northern Region, Horton wrote:

Drug supplies are haphazard, there are too few beds, and simple diagnostic measures (e.g., blood glucose, serum potassium, blood cultures) are often unavailable. The admissions area is well equipped and wards are spacious, but dilapidated, with no clean bedclothes (Horton, 2001: 2144).

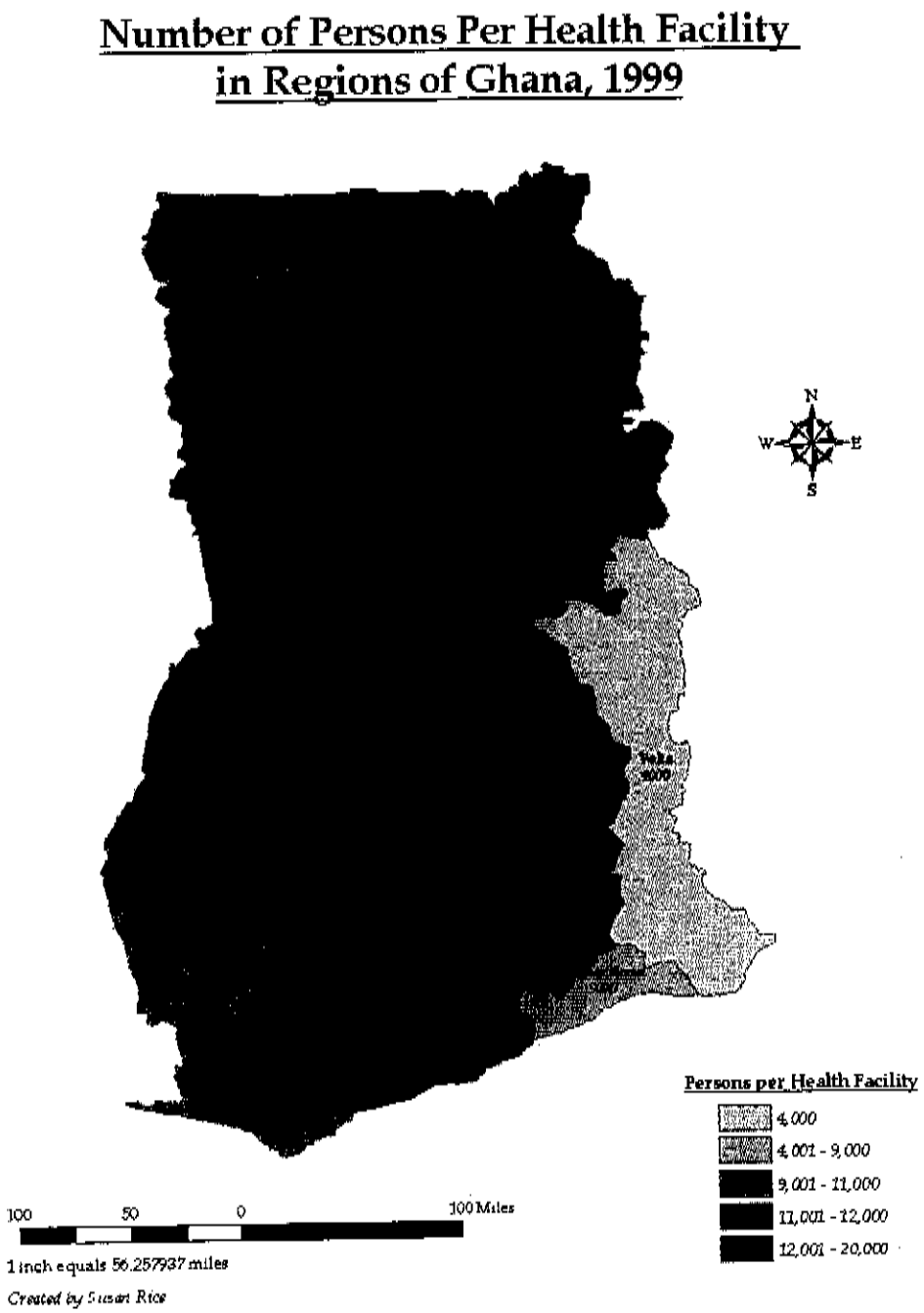
Unfortunately, these conditions are not unique to the Northern region. They are common throughout rural Ghana. Moreover, these problems are magnified and reinforced by the spatial distribution of poverty (Table 3.2). The three northernmost regions with poorer health care access—i.e., Upper East, Upper West, and Northern Regions—also had the highest poverty rates. In contrast, the Greater Accra Region, with much better health care access, also had the least poverty (7.3%) compared to the national average of 42% (Table 3.2).

Table 3.2: Geographic Distribution of Health Facilities and Access to Health Services

Region	District Hospital or Higher	Health Center or Clinic	Total Health Facilities	% Population with Access to services		% Poor
				Urban	Rural	
Greater Accra	22	249	271	94	63	7.3
Western	19	180	199	85	31	24.9
Ashanti	64	226	290	75	48	35.7
Volta	26	476	476	75	51	37.4
Brong Ahafo	23	179	202	76	38	38.8
Eastern	25	128	153	76	45	48.4
Central	14	104	118	75	42	49.7
Northern	13	116	29	50	16	69.1
Upper West	4	51	55	83	14	88.3
Upper East	5	75	80	22	16	89.3
Ghana	215	1758	1973	80	37	42.1

Source: Canagarajah and Ye, 2001, p. 26

Figure 3. 1:


Number of Persons Per Health Facility
in Regions of Ghana, 1999
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Persons per Health Facility
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1 inch equals 56.257937 miles
Created by Susan Rios

3.2 Ghana Demographic and Health Statistics

In 2007, Ghana's population was estimated at 23 million. Compared to developed countries such as the United States, Ghana's demographic indicators are poor, indeed (WHOSIS, 2008). In 2006, life expectancy at birth was 57 years in Ghana compared to 78 in the United States. Even more disturbing, infant and neonatal mortality rates in Ghana were ten times the US rates. Maternal mortality in Ghana was a whopping 50 times the US rate (WHOSIS, 2008). This partly reflects the higher fertility rate in Ghana. These figures reflect differences in government expenditure on health care—the US outspent Ghana by almost 100 times, as can be seen from Table 3.3. Similarly, while there was only nine beds per 10,000 people, the US had 32. Compared to other African countries, however, Ghana is much better off (Table 3.3). For example, the IMR in oil rich Nigeria is 99, life expectancy is 48 years and per capita expenditure on health is a mere $14.00. Expectedly, South Africa has much better indicators.

Table 3.3: Demographic and Health Indicators for Ghana and Selected Countries

Indicator	USA	Ghana	Nigeria	Kenya	South. Africa
Life Expectancy at birth (for 2006)	78	57	48	53	51
Infant Mortality rate per 1000 live births (for 2006)	7	76	99	79	56
Births attended by Skilled Personnel (for 2006)	100%	50%	35	42	92
Maternal Mortality Ratio per 100,000 live births	11	560	1100	560	400
Neonatal mortality rate per 1000 live births	4	43	47	34	17
Total Fertility Rate (for 2006)	2.1	4.0	5.5	5.0	2.7
Per capita government expenditure on health 2005 (ppp international $)	$2,862	$32	$14	$44	$338
Hospital beds per 10,000 population (for 2005)	32	9	5	14	28

Source: WHOSIS 2008

Like other African countries, Ghana is struggling with a dual disease burden of infectious and degenerative diseases. While HIV/AIDS and malaria were the leading causes of death in 2002 (Table 3.4), the emerging importance of degenerative diseases, particularly cerebrovascular disease, heart disease, and chronic obstructive pulmonary disease should not be ignored. The trends in Ghana mirror those of the African continent and suggest a globalization of obesity and "diseases of affluence," with a very interesting spatial twist—degenerative diseases prevail in urban areas while communicable diseases dominate rural areas (Oppong, forthcoming). In Ghana HIV infection is most severe among those aged 25-34 (this group accounts for 40% of cases) and an estimated 60% reported in 2007 occurred among females aged 15-49 (UNAIDS, 2008).

Table 3.4: Top ten causes of death, all ages Ghana, 2002

Cause of Death	Deaths	%
HIV/AIDS	30,000	15
Malaria	23,000	11
Lower respiratory infections	16,000	8
Perinatal conditions	16,000	8
Cerebrovascular disease	11,000	6
Ischaemic heart disease	10,000	5
Diarrheal diseases	9,000	5
Tuberculosis	8,000	4
Road traffic accidents	5,000	3
Chronic obstructive pulmonary disease	3,000	2
All Causes	**207,000**	100

Source: Death and DALY estimates by cause, 2002
http://www.who.int/entity/healthinfo/statistics/bodgbddeathdalyestimates.xls

3.3. Maternal and Child Health in Ghana

After improving between 2005 and 2006, institutional maternal mortality—i.e., maternal deaths recorded in health facilities—worsened between 2006 and 2007 from 197 per 100,000 to 244 per 100,000 (Ghana Ministry of Health, 2007). Utilization of antenatal care in 2007 was 89.5%, compared with 88.4 in 2006; similarly average number of prenatal visits per person was 3.2, compared with 3.3 in 2006 (Ghana Ministry of Health, 2007). First and third trimester registration were 34.8% and 18.6%, respectively. Adolescent antenatal care attendance was 12% in 2007, having declined from 14% in 2005, and 13.2% in 2006. Ghana urgently needs to take measures to improve access to prenatal care and delivery by skilled personnel in order to arrest these worsening indicators (Ghana Ministry of Health, 2007).

The proportion of deliveries attended by skilled personnel varies between regions (Table 3.5), between urban and rural areas, and between socioeconomic groups (Ghana Ministry of Health, 2007). The Demographic and Health Survey (DHS) data for 2003 indicate that the proportion of home deliveries ranges from 13% in Dangbe West in Greater Accra Region to 95% in Savelugu-Nanton District in Northern Region. The three northernmost and also poorest regions had the highest rates of home delivery, whereas Greater Accra and Ashanti, the two most developed regions, had the lowest rates. Slum areas in Accra and Kumasi had higher rates of home delivery than the rest of the respective metro areas, reflecting socioeconomic differences. Nearly 70% of women had at least 4 antenatal clinic visits, but the effectiveness and quality of antenatal clinic care varied with socioeconomic backgrounds (Ghana Ministry of Health, 2007).

Data from the 2006 Multiple Indicator Cluster Survey (MICS), a comprehensive survey of maternal health, child nutrition and protection, HIV/AIDS, water and sanitation and about 100 indicators addressing the Millennium Development Goals (MDGs), confirm these regional disparities in under-five mortality rates (U5MR) and IMR (Ghana Statistical

Service, 2006). For example, IMR ranged from 45 in Western Region to 114 in Upper West Region. U5MR were 66 and 191 respectively (Table 3.5). Similarly, only 29% of births were attended by skilled personnel and 28% of births were in a health facility compared to national averages of 50% and 49% respectively. This is in stark contrast to Greater Accra where 83% of births were delivered by skilled personnel in health facilities.

Unfortunately, free antenatal and delivery care—a major factor in the rapidly declining maternal mortality rate—was discontinued in 2007. Due to budget constraints, the exemption was not funded. Although delivery facilities did not turn away women who could not pay or were not registered with the NHIS, inability to pay appeared to deter the poor from delivering at health facilities (Ghana Ministry of Health, 2007). Numerous reports from health workers indicate that unlike NHIS registered women who report early and are likely to have had prenatal care, unregistered women presented late to delivery, were less likely to have prenatal care, and more likely to have obstetrical emergencies. In the Upper East, for example, health workers noted a higher likelihood of institutional maternal mortality – maternal deaths recorded in health facilities – among unregistered women (Ghana Ministry of Health, 2008). Perhaps, as a result of these difficulties, institutional maternal mortality increased from 197 per 100,000 in 2006 to 224 per 100,000 in 2007, while prenatal care declined from 3.3 in 2006 to 3.2 in 2007 (Ghana Ministry of Health, 2008).

Poor access to health facilities with appropriate equipment and staff, including obstetricians and midwives, remains a huge barrier in rural regions and remote areas. Lack of a functioning referral system and emergency transport compound the problems. Thus, considerable work remains to be done to improve geographic access and quality of emergency obstetrical services (Ansong-Tornui, et al., 2007). Clearly, the dearth of appropriate equipment and facilities for basic emergency obstetric care at health facilities is a reason why women did not see a difference between delivering at home and at a health center. For example, in the Kassena Nankana District in the Upper East Region, one of the poorest in the country, a facility survey indicated that none of the health centers or clinics met the criteria for basic emergency obstetric care (Ghana Ministry of Health, 2007). Although trained staff was available, basic equipment such as manual vacuum aspirators were not. Late referral, resulting from poor monitoring of the progress of labor, contributes to the poor neonatal outcomes (Ghana Ministry of Health, 2007). Such regional disparities need to receive priority attention and action (Ghana Statistical Service, 2006). Clearly, maternal and child health care provision continues to be a difficult challenge in Ghana, as in many parts of the developing world.

Table 3.5: Geographic Distribution of maternal Child Health Indicators (2006)

Region	Population per Midwife 2006#	% Delivered by Skilled Personnel 2006*	% Delivered in Health Facility 2006*	Under-5 Mortality Rate 2006*	Infant Mortality Rate*
Greater Accra	5,990.98	83.0	83.1	92	60
Western	11,124.16	39.6	39.4	66	45
Ashanti	8,207.35	60.5	59.6	113	72
Volta	4,948.49	44.6	41.7	86	57
Brong Ahafo	8,558.20	58.1	57.2	142	88
Eastern	6,856.19	38.8	39.5	93	61
Central	8,244.24	43.6	45.0	108	69
Northern	9,222.88	38.0	34.4	133	83
Upper West	4,281.55	29.1	28.4	191	114
Upper East	6,638.58	44.1	42.3	106	68
Ghana	7,255.68	49.7	48.7	111	71

Source: **Ghana Multiple Indicator Cluster Survey 2006.*
 # Independent Review, Health Sector Program of Work 2007

4. Program Description: The Ghana NHIS

Upon assumption of office in 2000, the National Patriotic Party (NPP) sought to replace the existing cash-and-carry system of healthcare payment with the incipient National Health Insurance Scheme (NHIS), following intense consultations with Ghana's international health development partners (e.g., WHO, DANIDA, DFID, and ILO) and relevant national agencies and NGOs. A Ministerial Task Force on Healthcare Financing was established in March of 2002 to conduct further studies and recommend an appropriate Scheme for Ghana. The Task Force's recommendations were submitted to parliament in 2003, culminating in the passing of the *National Health Insurance Act* of 2003 (*Act 650*), and the official birth of the NHIS that same year.

The stated mission of Ghana's NHIS is "to ensure equitable universal access for all residents of Ghana to an acceptable quality of essential health services without out-of-pocket payment being required at the point of service use" (Ghana Ministry of Health, 2004a). *Act 650* identifies three major types of health insurance in the country. These include: *(a)* District-wide Mutual Health Insurance Schemes; *(b)* Private Mutual Health Insurance Schemes; and *(c)* Private Commercial Health Insurance Schemes. All these Schemes have to register with the government to be able to operate legally in the country. However, the government provides direct financial support only to the District-wide Mutual Health Insurance Schemes, as part of its ongoing Poverty Reduction Strategy. In fact, the NHIS is structured around the District-wide Mutual Health Insurance Schemes as the dominant form, with minor variations to accommodate special variations.

The very first District-wide Mutual Health Insurance Scheme in the country is the Nkoranza Health Financing Scheme in the Brong Ahafo region, established in 1992 (Sabi, 2005; Heyen-Perschorn, 2005). The Scheme was started at a mission hospital in Nkoranza as an alternative means of financing healthcare to curtail out-of-pocket payments by clients, many of whom were poor and had difficulties making the payments to keep the hospital afloat. The success of the Nkoranza Scheme provided the impetus for the establishment of other such Schemes in Ghana. It is instructive to note that the Nkoranza District Mutual Health Insurance Scheme is one of the four examined in this study.

4.1. Administration of the Ghana NHIS

Ghana's NHIS is regulated by the National Health Insurance Council (NHIC), headquartered in Accra. Regional and District offices of the NHIC are being set up to decentralize the operations of the Scheme. The Council manages the National Health Insurance Fund (NHIF) through the collection, investment, disbursement, and administration of the Scheme. The Council also undertakes the licensing, regulation, and accreditation of healthcare providers. By the end of 2007, the NHIS had accredited 800 private healthcare providers in addition to government health facilities (Ghana Ministry of Health, 2008). It is expected that this system of accreditation will eventually raise standards and quality of care throughout the country for both insured and uninsured citizens.

At the District level, there are Health Insurance Assemblies which comprise all members of the respective District Schemes in good standing. The District Schemes are governed by Board of Trustees and Scheme Managers. The management teams at the various Districts usually include an Administrator, Accountant, Publicity and Marketing Manager, Claims Managers, Accountant, Data Control Manager, and Data Entry Clerk (Ghana Ministry of Health, 2004b; Sabi, 2005).

4.2. Premiums and Benefits

NHIS premiums are generally based on clients' ability to pay. District Health Insurance Committees identify and categorize residents into four main social groups—viz., the *core poor or the indigent; the poor and very poor; the middle class;* and *the rich and very rich*—and vary their respective contributions accordingly (Table 4.1). The *core poor* (or the indigent), together with people who are 70, or more, years of age, or former Social Security and National Insurance Trust (SSNIT) contributors who already are in retirement, are exempted from paying any premiums.

While premiums vary slightly from District to District, generally members pay no less than GH¢7.2 (US$8.00[1]), per annum. For members in the formal sector, 2.5% of their contribution to SSNIT is deducted monthly as their health insurance premium. Workers in the formal sector are automatic members of the NHIS, but they still have to register with their respective District Mutual Health Insurance Schemes. Those in the informal sector, as well as the self-employed, pay between GH¢7.2 and GH¢48.0 yearly, depending on their income. All contributors' premiums cover their children and dependents below age 18. Thus, NHIS

registrations of children were linked to those of parents. Some schemes insist that both parents must be registered (except in single-parent households) before a child can be registered, while others only require the mother to be registered. Consequently, parents with larger families had better coverage since all their children were covered as well, but children whose parents were uninsured had no coverage. Stories of infants detained at health facilities due to their parents' inability to pay for the surgery that delivered them, or that they needed as neonates, were widespread. Following intense public outcry, this coupling of parents' coverage with their children officially ended in September 2008 (Sulzbach, 2008).

In 2004, the government introduced a 2.5% sales tax (i.e., Health Insurance Levy) on selected goods and services to fund the NHIS. Other notable sources of funding for the Scheme include money from the government's budget and donor contributions (Sabi, 2005).

Table 4.1: The Ghana NHIS: Premiums per Categories of Members

Category	Operational Definition	Minimum Annual Contribution
Core Poor	Unemployed adults who do not receive any identifiable and regular support from elsewhere for subsistence.	Free
Very Poor	Unemployed adults who receive regular and identifiable financial support form sources of low income.	GH ¢7.2 (US$8.0)
Poor	Employed adults who have low income and are unable to meet their basic needs.	
Middle Income	Employed adults who are able to meet their basic needs	GH ¢18 (US19.40)
Rich	Adults who are able to meet their basic needs and some of their wants	GH ¢48 (US52.00)
Very Rich	Adults who are able to meet their basic needs and most of their wants	

Source: Ministry of Health (*n.d.*) *National Health Insurance Scheme* (A public educational campaign pamphlet).

The benefits package of the NHIS includes general out-patient services, in-patient services, oral health, eye care, emergencies and maternity care, such as prenatal care, normal delivery, and some complicated deliveries. Diseases covered include malaria, diarrhea, upper respiratory track infections, skin diseases, hypertension, asthma, diabetics etc. According to the Legislative Instrument which accompanied *Act 650*, about 95% of all common health problems in Ghana are covered (Ghana Ministry of Health, 2004a and 2004b)—how this estimate was ascertained is, however, difficult to establish. The government has a specified minimum benefit package to which all District-wide schemes should adhere. Some services, such as HIV antiretroviral therapy, hearing aids, dentures, and VIP accommodations are excluded from the health benefit package, either because they are considered too expensive, non-medical, or because there are alternative national arrangements for them. Vignette 4.1 shows the complete list of excluded services.

Vignette 4.1: Exclusion List, Ghana NHIS

These are services that will not be covered under the NHIS. Note that 'exclusion' is used loosely here, as insurance Schemes have the freedom to decide whether or not they will offer these services as additional benefits to their members.

- Rehabilitation other than physiotherapy
- Appliances and prostheses (optical aids, hearing aids, orthopedic aids, dentures etc)
- Cosmetic surgeries and aesthetic treatments.
- HIV retroviral drugs (symptomatic treatment of opportunistic infections and other AIDS related diseases will be covered).
- Assisted Reproduction (e.g., Artificial insemination) and gynecological hormone replacement therapy.
- Echocardiography
- Angiography
- Dialysis for chronic renal failure
- Organ transplantation
- All drugs that are not listed on the NHIS drug list
- Heart and Brain Surgery (other than those resulting from accidents and Cancer treatment (other than breast and cervical)
- Mortuary Services
- Diagnosis and treatment abroad
- Medical examination for purposes other than treatment in accredited health facilities (e.g., visa applications, education, institutional, driving license etc.
- VIP ward (Accommodation).

Source: Ghana Ministry of Health, *National Health Insures Policy*, 2003.

By the end of August 2007, 55% of the total national population had registered with the NHIS (Table 4.2). The largest numbers of enrollees, in absolute term, were in the Brong Ahafo Region (1.4 million), the Eastern Region (1.2 million), and the Northern Region (1.0 million). Surprisingly, only 24.1% of Greater Accra's population had enrolled in the NHIS by August 2007 (Table 4.2 & Figure 4.1). This reflects the growing number of transients, slum-dwellers, and rural-urban migrants who have come from outside the region in pursuit of the ever-dwindling employment opportunities in Accra (the national capital) and its surroundings. Available data show that of the total number of Ghanaians enrolled by June 2007, some 7.4% were over 70 years of age; and 1.9% were indigents—all of whom are exempted from premium payments.

Undoubtedly, we cannot get a full picture of Ghana's NHIS and of its sustainability without some insight into its cost effectiveness and funding mechanisms in the context of health care financing in the country. Unfortunately, though, as in many African countries, it is highly difficult to obtain a comprehensive overview of the funding to Ghana's health sector, in general, and to the NHIS, in particular, due to the lack of a reliable data, which is in turn attributable to the fragmentations in funding sources, uses, and flows. Moreover, mismatches between the funding captured on-plan by the nation's "Program of Work," on-budget via its "Medium Term Expenditure Framework," and on-account through its "Financial Statement" have also undermined the reliability of data on health care financing in the country (Ministry of Health 2008, 49). Also, while there has been some progress in the Health Care Budget Management Center's reporting of internally generated funds from out-of-pocket sources and from NHIS subsidies from the government, this is still incomplete and therefore unreliable for any meaningful analysis at the national level (Ministry of Health, 2008, 49).

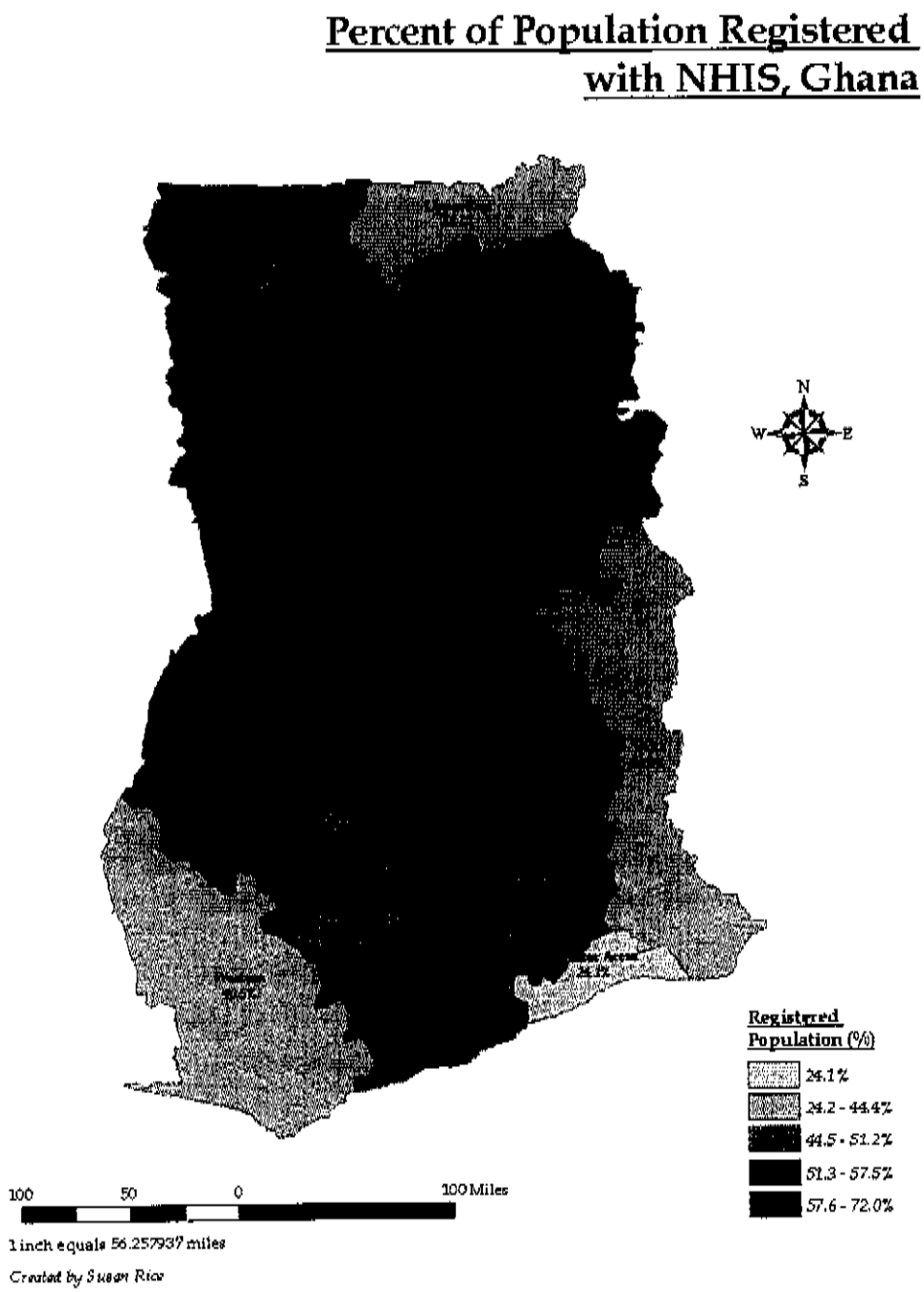
Notwithstanding these data problems, we know from the 2006 National Budget that some 13% of Ghana's national expenditure of GH¢2.8 billion then was allocated to the health sector (Government of Ghana, 2006). Similarly, of the total planned national expenditure of GH¢3.9 billion slated for January to December of 2007, some 11.46 % was allocated to the health sector Government of Ghana, 2006). And, according to the Independent Review of the Health Sector Program of Work for 2007, the total expenditure on health as a percentage of GDP stood at 4.4% in 2006, and the estimated per capita total expenditure on health was about US$25.4 the same year (Ministry of Health, 2008). Moreover, estimates from the Ministry of Health (2008) show that spending on the National Health Insurance Scheme, as a share of the nation's health care sector financing, increased from 5% in 2006 to 29% in 2007. Also, government subsidy to the various District Health Insurance Schemes to cover the exempted groups and some operational cost grew by 150% from GH¢35 million in 2006 to GH¢86.8 in 2007. The increase in financial distress support for the various District Schemes was even greater, rising by a whopping 600% from GH¢1.3 million in 2006 to GH¢9.3 million in 2007 (Ministry of Health 2008). To the extent that health care is increasingly being delivered and financed through the NHIS, it is understandable that the share of the NHIS in the nation's health care budget will also increase. However, in the absence of a reliable dataset capturing the sources, flows and uses of funds at the district, regional, and national levels, it is virtually impossible to evaluate the cost dimensions of the Ghana NHIS scheme, to see the relationships between its financial resources and any improvements in health care delivery engendered by the scheme.

Table 4.2: Ghana NHIS: Membership by Regions, June 2007

Region	Population	Total Registered	% Registered
Ashanti	3,924,425	2,008,002	51.2
Eastern	2,274,453	1,161,071	51.0
Brong Ahafo	1,968,205	1,417,540	72.0
Central	1,687,311	934,894	55.4
Western	2,042,340	826,340	40.5
Upper West	561,866	261,443	46.5
Upper East	963,448	366,702	38.1
Northern	1,790,417	1,029,593	57.5
Greater Accra	3,576,312	861,414	24.1
Volta	1,636,462	726,021	44.5
Total	*20,425,239*	*9,593,040*	46.9

Source: The NHIS, National Headquarters, August, 2007

Figure 4.1


Percent of Population Registered with NHIS, Ghana
N
W
E
S
Registered Population (%)
24.1%
24.2 - 44.4%
44.5 - 51.2%
51.3 - 57.5%
57.6 - 72.0%
100
50
0
100 Miles
1 inch equals 56.257937 miles
Created by Susan Rice

5. Empirical Strategy

The purpose of evaluation is to assess whether or not a change in policy or the introduction of a new program engenders positive or negative outcomes for participants. The ultimate aim is to make an informed, empirically- and theoretically-grounded decision on whether to expand or contract, terminate or continue the program in question. In this particular case, our aim is to see whether the Ghana NHIS is accomplishing the task for which it was set up (i.e., to facilitate the provision of effective and affordable health care to Ghanaians) by comparing the health outcomes of women who are members of the Scheme with those of non-members.

We apply the statistical technique of *Propensity Score Matching* (PSM) to a survey dataset collected from two of the ten administration Regions of Ghana, namely the Brong Ahafo Region and the Upper East Region. These two Regions were purposively selected based on a number of factors. First, they have district mutual health insurance schemes that have longer periods of operation than those in the other regions of the country. In fact, the very first District-wide Mutual Insurance Scheme in the country was established in the Nkoranza District, in the Brong Ahafo Region in 1992. Second, located at the geographic center of the country, the Brong Ahafo region is known to have people of diverse ethno-cultural backgrounds, acting as a transitional zone for both the physical and human geographies of Ghana. Third, Upper East, like any of the three Regions of northern Ghana (the other two being Northern Region and Upper West Region) is known to be the poorest region, in the country, and its inclusion provides more insights into how poor women interact with the NHIS. With the technique of PSM, we are able to match a set of women who are members of the NHIS (i.e., treatment group) with a set of women who are not (i.e., comparison group) on the basis of selected observable characteristics, and then compare their health outcomes. In what follows we describe the procedures used to select the two groups for matching.

5.1. Selection of Treatment and Comparison Groups

A combination of multistage, purposive, and systematic sampling was used to procure our primary data, using a sample size of 2000 respondents, made up of 400 *treatment* 1600 *comparison* group members, drawn from the two study regions. We targeted a ratio of 1:4 (400:1600) to be able to get a large enough sample for matching. The power calculation used to arrive at the sample size of 2000 is found in Appendix II.

Rather than conducting interviews across the vast expanses of the two regions, we purposively selected two administrative districts from each of the two regions: the Sunyani Municipal District (for urban focus), and the Nkoranza District (for our rural focus) in the Brong Ahafo Region; and the Bolgatanga Municipal District (for our urban focus) and the Talensi-Nabdam District (for rural focus) in the Upper East Region [2].

In the next stage of sampling, a systematic random sampling was used to pick 100 respondents from each of the 4 selected districts to constitute a total *treatment group* of 400. The sample frame for the selection of the treatment group was the list of women enrolled in

the NHIS from the 4 Districts. Some of the electronic listings of participants had no addresses, or any other geographic reference data such as house numbers, and we had to follow up with local NHIS clerks to obtain rough, hard copy listings to be able to identify people.

By far the most difficult aspect of our sampling design related to the selection of the 1,600 comparison group members, given the absence of a sample frame listing all women who are not enrolled in the NHIS. Our efforts to obtain a reliable listing of all households from previous research projects were unsuccessful[3]. We used a two-pronged approach to ascertain our comparison group: First, for every treatment group member interviewed in the urban areas, we tried to get four comparison group members living north, south, east, and west of the residential location of the treatment group member interviewed. This approach helped us to attain our targeted one-to-four ratio for the treatment and comparison groups in each of the four districts. This approach was found to be the most reasonable and practical in the cities where first-hand listing of all women outside the NHIS was not possible. Secondly, to enhance the 'randomness[4]' in the sampling design, a listing of women in the rural areas in the study was undertaken to serve as a sampling frame. This turned out to be manageable in the small rural communities, many of which have small populations. With these two approaches, we managed to procure a primary dataset, under very difficult circumstances—not the least of which were transportation and cultural difficulties; changing and shifting district boundaries; and the fact that Ghana underwent a currency redenomination in December of 2007, compelling us to adjust our income categories in the middle of our data collection.

5.2. The Propensity Score Matching Technique

Program evaluation can be accomplished through a variety of experimental, non-experimental, and qualitative research designs. In ideal circumstances, a randomized experiment, where women would be assigned at random to an experimental group (i.e., participants of the NHIS) or a control group (i.e., non-participants of the NHIS) would be the best approach. Such random assignment would ensure the comparability of the two groups, with little or no selection bias. However, it is difficult to imagine how such a randomized experiment could be conducted in our particular case, given the obvious ethical (if not political and even legal) issues implicated in justifying why some women might be deprived of health insurance, because of a research project. Consequently, instead of an experimental design, we rely on the non-experimental technique of *Propensity Score Matching (PSM)* to examine the difference in health outcomes between matched groups of women who are *in* and those who are *outside* of the Ghana NHIS.

Since the seminal work of Rosenbaum and Rubin in 1983, PSM has gained considerable currency in the evaluation of public health care programs (Heller et al., 2005; Ellis et al., 2003; Kneipp, 2000; Rubin, 1997); health finance and insurance schemes (White-means and Hersch, 2005; Trujillo et al., 2005; Trukillo, 2003); employment and vocational programs (Social Development Canada, 2004; Purdon, 2002; Bryson, Dorsett and Purdon, 2002) and many other areas of evaluation research worldwide. The basic logic of matching in non-experimental design is fairly straightforward: if observable characteristics of individuals in

the treatment group match those of non-treatment group members, the "mean effect of treatment can then be calculated as the average difference in outcomes between treated and non-treated" (Bryson, Dorsett, and Purdon, 2002, 10). However, matching has been problematic, tedious, and patently data-hungry until the introduction of PSM by Rosenbaum and Rubin in 1983. As the number of characteristics used in the matching increases, the chance of finding a match decreases. Indeed, even including a relatively small number of variables in the matching can quickly yield unmatched cases. With the technique of PSM, we are able to reduce the entire collection of background characteristics to a single composite characteristic that appropriately captures the collection—there lies the power, and the obvious appeal, of PSM.

Rosenbaum and Rubin (1983) have demonstrated that such a matching could easily be achieved, using what they called a "propensity score." In their work, they examined health outcomes of individuals with heart disease who had self-selected into either a medical or a surgical treatment. They first estimated the probability of having surgery in the sample, using logistic regression (as their choice model) that included a number of variables and higher level interaction terms. They then used the predicted probability of having surgery from the logistic regression, which they called the propensity score (PS), to stratify the entire sample into quintiles, based on the participants' propensity to have surgery. After stratification, it became clear that the data were balanced on most of the variables used to predict the Propensity Score. They noted that the data in the two groups (those who elected to have surgery and those who elected to have a medical intervention) have the same distribution on important predictors within the P-Score quintiles. This is analogous to the balanced data that result when a randomized experiment is properly executed. From the stratified results, an estimate of the outcome difference for the surgery and medical groups is easily calculated. The key points to note in the use of PSM for evaluation research are thus, as follows:

(i) Estimating the Program Participation

The first crucial task in PSM is to estimate the propensity to participate in a particular treatment. Any resulting estimate of the effect of a treatment depends on the quality of the participation estimate. In our particular case, this calls for an estimate of the probability to enroll in the NHIS. Since we are dealing with a single treatment, we deployed a *logit* choice model in this estimation, using a simple binary (yes/no) coding for the treatment variable as our dependent variable; and a set of predictor or independent variables that can presumably account for why people enroll in the NHIS. Extreme care must be exercised in the choice of the independent variables to be used in predicting the dependent variable. The key point here is not to select independent variables which could, in turn, be influenced by the dependent variable. Thus, a variable such as respondents' "health status," seems on the surface to be a good predictor of why one would join the NHIS, but a careful look would show that membership in the NHIS could in turn affect one's health status (recursively). In a nutshell, the best independent variables are those that do not change easily over time. In this example, if one were to use "the health status of respondents" as one of the independent variables, then it should be "respondents' health status before joining the NHIS;" thus, if reliable data were to be available.

(ii) Fulfilling the Common Support Requirement (CSR)

Before moving ahead with the actual matching of treatment and comparison groups, one needs to fulfill the requirement of common support. This prerequisite ensures that any combination of characteristics found among the treatment group is also found among the comparison group. Often, this condition is fulfilled by discarding outliers, or treatment group members with propensity scores outside the range found among the comparison group.

(iii) Doing the Actual Matching

Having satisfied the Common Support Requirement (CSR), the next major step is to perform the actual matching—this is where one matches treated individuals with the pool of non-treated individuals with the closest p-scores to yield the comparison group. There are several matching procedures, but the commonest ones include *Nearest-Neighbour Matching, Kernel Matching, Radius Matching, and Stratification Matching;* more details on these matching procedures are provided in Vignette 5.1 below.

Vignette 5.1: Matching Procedures for Propensity Score Matching (PSM)

- *Nearest-neighbor matching*: Here one takes each treated individual and match it with the non-treated individual with the closest p-score; the resulting set of non-treated individuals constitutes the comparison group. The method can be applied with replacement, in the sense that the non-treated individual can be used to match more than one treated individual, so that one does not run out of non-treated individuals.

- *Stratification matching*: With this technique, one divides the range of the p-scores into intervals such that within each interval treated and non-treated units have on average the same p-score.

- *Radius matching*: In stratification matching there may be treated units which are discarded because no control is available in their block. In the nearest neighbor matching, all treated units find a match. However, some of these matches may be very weak. In radius matching each treated unit is matched only with the control unit whose p-score falls in a pre-defined neighborhood of p-score of the treated unit.

- *Kernel matching*: Here all treated individuals are matched with a weighted average of all controls with weights that are inversely proportional to the distance between the p-scores of the treated and the control. Put differently, the Kernel is a function that weights the contribution of each comparison group member, so that more importance is attached to those non-treated group members (or comparators) providing a better match: thus, exact matches get a large weight, and poor matches get a small weight.

(iv) Estimating the Average Treatment Effect on the Treated (ATT)

The ultimate aim of the p-score procedure in evaluation research is to be able to estimate the average effect of the treatment on the treated. The difference between the average outcomes of the treated and the comparison groups constitutes the ATT[5]. Vignette 5.2 offers a more mathematically-grounded exposition of the PSM technique.

In addition to our quantitative analysis—by way of the PSM performed on our survey dataset—we conducted a Focus Group Discussion (FGD) to complement our findings. With this combination of quantitative and qualitative research methodologies, we are able to ascertain a more comprehensive overview of the Ghana's NHIS. The write-up from our FGD is presented in Appendix I. The debate over whether a perfect, or totally objective, evaluation is possible continues to rage in the research methodology. Still, we use a variety of techniques to be as 'objective' as possible in our evaluation. Among other strategies, we rely mainly on our primary data, and take any information or data from government sources or the mass media with a proverbial grain of salt. Also, we use multiple, or triangulation, methods to crosscheck the validity and reliability of claims and information derived from various sources. More importantly, we endeavor to back our arguments with multiple, reputable references, whenever possible.

Vignette 5.2: Propensity Score Matching

Let Y_{i1} be the variable of interest when individual i is given some specified treatment (1) and Y_{i0} the value of the same variable when individual i is exposed to the control group (0). In our context, treated individuals are those that have NHIS membership and the comparison (or control) group is made up of individuals without NHIS membership. The variable Y_{ij}, $j = 0, 1$, is some specific health outcome upon which one wants to compare the treatment group with the control group. In our particular case, the health outcomes of interest include "Whether or not birth is attended by skilled health personnel" (i.e., *BAttended*) and "Whether or not birth occurred at a hospital" (i.e., *HosBirth*).

In a non-experimental setting (like ours), for individual i the usual treatment effect as defined by

$$\tau_i = Y_{i1} - Y_{i0}, \tag{1}$$

is biased. This biasedness is due to problems such as self-selection or researcher's systematic judgement in assigning individuals to treatment and control groups (Trujillo *et al.*, 2005). For such data, a question of relevance is what would have happened to the treated individuals if they had not been treated. This is the so-called expected treatment effect for the treated, which is defined as

$$\begin{aligned} \tau|_{\delta=1} &= E(\tau_i|\delta_i = 1) && (2)\\ &= E(Y_{i1}|\delta_i = 1) - E(Y_{i0}|\delta_i = 1), && (3) \end{aligned}$$

where

$$\delta_i = \begin{cases} 1 & \text{if individual } i \text{ is treated} \\ 0 & \text{if individual } i \text{ is not treated} \end{cases}$$

Note that $E(Y_{i0}|\delta_i = 1)$ is inestimable since the event Y_{i0} given $\delta_i = 0$ is unobservable. Estimating (3) is therefore a missing data problem. For experimental data,

$$E(Y_{i0}|\delta_i = 1) = E(Y_{i0}|\delta_i = 0) \tag{4}$$

and hence (3) may be rewritten as

$$\tau^e = E(Y_{i1}|\delta_i = 1) - E(Y_{i0}|\delta_i = 0). \tag{5}$$

Rosenbaum and Rubin (1983) provide the proof of (4). Although (5) is estimable, it is a biased estimator of (3) in the non-experimental context. One approach for the missing data problem in (3) is propensity score matching. By matching, we mean pairing each individual i in the treatment group to a group of individuals J_i in the control group, with similar covariates x_i. Here, the set J_i may be a singleton. The thinking is that, if matching is done well, the systematic difference between the treated and control groups will be eliminated. As such well-matched non-experimental data in the above context may be viewed as experimental and

$$\tau_x|_{\delta=1} = E(Y_{i1}|\delta_i = 1, x_i) - E(Y_{i0}|\delta_i = 0, x_i). \tag{6}$$

Vignette 5.2 (continued)

In practice, however, matching i with J_i is nontrivial, especially for high-dimensional covariates x_i. Estimating (6) for large covariates fits into the well known curse of dimensionality problem. Propensity score matching circumvents the curse of dimensionality problem by mapping the p-variate vector x_i to a scalar $\rho(x_i)$, the propensity score, which is defined by

$$\rho(x_i) = Pr(\delta_i = 1|x_i).$$

Trujillo *et al.*, (2002), argue that

$$E(Y_{ir}|\delta_i = r, x_i) = E(Y_{ir}|\delta_i = r, \rho(x_i)) \quad \forall x_i, \quad r = 0, 1. \tag{7}$$

From (6) and (7), expected treatment effect for the treated, $\tau_x|_{\delta=1}$ may be written as

$$\tau_x|_{\delta=1} = E(Y_{i1}|\delta_i = 1, \rho(x_i)) - E(Y_{i0}|\delta_i = 0, \rho(x_i)). \tag{8}$$

Julius Berry Dasah, GIMPA.

6. Overview of the Four District Health Insurance Schemes

Before profiling our survey respondents in the next section, we provide an overview of the four health insurance schemes in our study. The presentation is based on information derived from an "institutional questionnaire" administered to the four schemes: the Bolgatanga Municipal Health Insurance Scheme and the Talensi-Nabdam District Health Insurance Scheme in the Upper East Region; and the Sunyani Municipal Health Insurance Scheme and the Nkoranza District Health Insurance Scheme in the Brong Ahafo Region.

6.1 Foundation, Governance, and Management

Established in 1992, the Nkoranza District Health Insurance Scheme is the oldest not only among the four schemes in our study, but also among all such schemes in Ghana. With the introduction of the cash-and-carry system in the 1980s, many patients of the Nkoranza St. Theresa's Hospital, like many of their counterparts across the country, found it difficult to pay their hospital bills. The situation worsened to the point of undermining the sustainability of the hospital's Poor and Sick Fund, created by the Catholic Diocese to assist those who could not pay for their health care at the St. Theresa's Hospital. In 1989, the idea of establishing a health insurance scheme was discussed at a Catholic Church Hospitals Administrators' meeting at Sunyani, the Brong Ahafo regional capital. After extensive background studies and preparations, a pilot health insurance scheme was started at the St. Theresa's Hospital in 1990/91, under the leadership of Dr. Ineke Bossman, the Nkoranza District Medical Officer of Health. In 1992 the Nkoranza District Health Financing Scheme was officially launched, with financial support from MEMISA—a Dutch NGO. The success

of the Nkoranza Scheme spurred the establishment of the West Gonja District Health Insurance Scheme in the Northern Region in 1995, and of several others across the country in subsequent years.

Unlike the Nkoranza Scheme, the other three Schemes in our study were all launched in 2004, following the promulgation of the Ghana National Health Insurance Act (*Act 650*) in 2003. In each case the District/Municipal Assemblies formed a working committee, made up of community leaders, trade union groups, and other stakeholders, to consolidate the protocols, rules, and regulations for the establishment of the respective schemes in line with the provisions of *Act 650*. Also, these District/Municipal Assemblies embarked on comprehensive community education and sensitization campaigns, with advertisements in newspapers, and on radio and television, together with promotional announcements at churches, mosques, educational institutions, workplaces and so on.

Information from our institutional questionnaire indicates that in addition to the financial and material support provided by the Ghana Government, all the four Schemes in our study received some form of assistance (monetary or otherwise) from external sources— most notably, from GTZ and DENIDA—to enhance their operations. More specifically, we learned that DANIDA provided logistical support (in the form of computer hardware and software) and technical assistance to the four schemes in our study, while GTZ funded a house-numbering exercise across the Sunyani Municipality to facilitate the operations of the Sunyani Municipal Health Insurance Scheme.

With regards to the appointment of key scheme personnel, the two schemes in the Brong Ahafo Region indicated that they usually go through formal hiring processes, entailing the short-listing of job applicants and interviews. Conversely, the key personnel of the two schemes in the Upper East Region are normally appointed by their respective Boards of Directors. In line with *Act 650*, all the schemes in our study have Scheme Managers, Claims Managers, Accountants, Publicity and Marketing Managers, Data Entry Clerks, and several Field Offices, who register clients, collect premiums, and canvass for new members. As in many other formal workplaces in Ghana, the staff members of the schemes in our study are overwhelmingly males. For instance, of the 71 Field Officers in the Sunyani Municipal Scheme, only five are females; and as many as 90 of the 96 Field Officers of the Nkoranza Scheme are males. As of the time of our fieldwork, all four schemes in our study were renting their office spaces, with plans to build their own in due course. In fact, the Talensi-Nabdam District Health Insurance Scheme and the Bolgatanga Municipal Health Insurance Scheme shared a common premise and kept a common database, due to cost constraints (and the fact that the Talensi-Nabdam District is one of the newly created districts in the Upper East Region, where Bolgatanga is the regional capital).

6.2. Membership, Benefits, and Premiums

Membership to the schemes in our study is open to all residents of the respective districts or municipalities. For the most part the schemes attract new members through public campaigns at durbars, churches, mosques, and radio advertisements. The membership renewal periods vary from scheme to scheme. For instance, whereas the Nkoranza Scheme has two renewal

periods in a year (i.e., January to May; and July to October), the Sunyani Scheme has four such periods: February to March, May to June, August to September, and November to December. Both the Bolgatanga and Talensi-Nabdam Schemes do not have specific renewal periods, and, thus, allow their members to renew their membership anytime within the year.

By December 2007, the Sunyani Municipal Scheme had by far the highest number of enrollees among the four Schemes in our study, with a total of 158,277 members, of which 88,484 were males (and the rest were females). The Nkoranza Scheme, for its part, had a total of 73,125 members (32,925 males and 40,200 females), while the Bolgatanga and Talensi-Nabdam Schemes boast of a joint membership of 98,082, consisting of 42,046 males and 56,036 females.

Also, we noted that the cost of premium varies slightly between schemes, ranging from a low of GH¢7.2[6] per person, per year, in the Bolgatanga and Talensi-Nabdam Schemes, through GH¢8.0 per person for the Nkoranza Scheme, to GH¢20 per person for members of the Sunyani Scheme; the latter even charges a registration fee of GH¢5.0 for new members. It is worth noting that because of the difficulties in categorizing their members according to the government's suggested groupings of the *core poor, poor, middle- and high-income* people (given the dearth of reliable income data in the country), all the schemes have opted for a flat premium system. Also, the waiting periods for accessing benefits vary among the schemes. For the Nkoranza Scheme, new members are expected to wait for 3 months, while those renewing their membership face a waiting period of a month before accessing benefits. In the case of the Sunyani Scheme, the waiting periods are 3 months for renewals and 6 months for new members; both the Bolgatanga and Talensi-Nabdam Schemes have a waiting period of 3 months for both renewals and new members. Table 6.1 sums up the benefit packages for the four Schemes in our study. Given our particular interest in maternal and child health care, it is worth noting that all the schemes have prenatal care, post-natal care, and delivery services as part their benefit packages.

Table 6.1: NHIS Benefit Packages of the Four Schemes under Study

Item/Disease	Sunyani	Nkoranza	Bolgatanga	T, Nandam
OPD Attendance	X	X	X	X
Hospitalization	X	X	X	X
Snake and dog bite	X	X	X	X
Prescription drug	X	X	X	X
Oral Health	X	X		
Eye care	X	X	X	X
Prenatal	X	X	X	X
Postnatal	X	X	X	X
Delivery by trained attendant	X	X	X	X
Breast-feeding classes				
Breast cancer	X			
Child delivery complications	X		X	X
Vaccination				
Emergencies	X	X	X	X
Accidents	X	X	X	X
HIV/AIDS testing	X			
HIV/ADIS Antiretroviral Drugs				

Source: Fieldwork, September to December, 2007.

7. Descriptive and Comparative Profile of Respondents

The primary objective of this section is to construct a comparative portrait of our respondents who are NHIS-insured and those who are uninsured. Using our individual level survey data, we undertake a simple descriptive analysis that cross-tabulates the independent variables describing individual background characteristics, household characteristics, community characteristics, healthcare access and utilization, maternal and child care outcomes by NHIS status (whether insured or uninsured). Wherever possible, we test for statistical significance, by way of the chi-squared contingency test. The chi-squared estimates reported in all the tables are based on the actual frequencies, and not on the percentages indicated. We have created dummies for many of the variables in this descriptive analysis, not only to economize space and simplify the presentation, but also to coincide with the categorizations used in our subsequent higher lever statistics (i.e., logistic regression and propensity score matching).

7.1. Individual, Household, and Community Characteristics

Our analysis of individual background characteristics included eight variables: age, educational level, marital status, political party affiliation, religion, employment status, gross monthly income, and ethnicity. Our cross-tabulations, presentation in Table 7.1, show some difference in age distribution between NHIS members and non-members: about 46% of NHIS members, compared to about 52% of non-members, are over 30 years. However, this variation is not statistically significant (Table 7.1). With regards to education, we found a significant difference between NHIS members and non-members, with about 78 percent of the former, compared to 62% of the latter, having more than primary education. Marital status, political party affiliation, religion (Christians and non-Christians), and ethnicity do not vary much on the basis of NHIS membership status—all four variables yielded no significant difference. Also, our data indicate that while a lower percentage of NHIS members (36%) compared to non-members (45%) are employed, the gross monthly incomes of the NHIS members are generally higher than those of the non-members. In fact, both income and employment status vary significantly by NHIS membership status, as can seen from Table 7.1.

Regarding respondents' household characteristics, our data suggest that owning or renting a house does not make much difference to one's NHIS membership status. However, owning TV, radio, and refrigerator seems to vary significantly between the insured and the uninsured (Table 7.1).

Our analysis of respondents' community characteristics was based on four variables: region of residence, district of residence, rural or urban location of residence, and distance to usual health center. The cross-tabulations revealed no significant relationship between NHIS membership status, on the one hand, and region or district of residence, or rural-urban location, on the other. However, our data show that some 65% of NHIS members, contrasted with about 51% of non-members, have their usual health care centers located within a mile of their residence. And, conversely, about 35% of NHIS members, compared with about 49% of non-members, live more than a mile away from their usual health care center. The difference here proved to be statistically significant ($p<0.05$). Understandably, proximity to a health care facility appears to be a strong incentive for NHIS membership.

Table 7.1: Comparison of NHIS Members and non-Members

	NHIS status	
	Members (%)	**Non-Members (%)**
Individual Background Characteristics		
Age	(N=393)	(N=1589)
30 years or less	53.7	48.3
Over 30 years	46.3	51.7
Educational level	**(N=388)**[1]	**(N=1547)**
Primary or less	**22.2**	**37.9**
More than primary	**77.8**	**62.1**
Marital status	(N=393)	(N=1588)
Married	47.6	50.9
Not married	52.4	49.1
Political party affiliation	(N=325)	(N=1287)
NPP	48.6	47.2
Not NPP	51.4	52.8
Religion	(N=392)	(N1576)
Christian	85.2	82.9
Not a Christian	14.2	17.1
Employment status	**(N=384)**	**(N=1443)**
Employed	**35.9**	**45.0**
Not employed	**64.1**	**55.0**
Monthly Grossed Income	**(N=160)**	**(N=669)**
Less than GH¢100	**64.4**	**88.0**
GH¢100 or more	**35.6**	**12.0**
Ethnicity	(N=393)	(N1578)
Akan	49.9	44.9
Not Akan	50.1	55.1
Household Characteristics		
TV at home	**(N=384)**	**(N=1496)**
Yes	**79.2**	**61.2**
No	**20.8**	**38.8**
Radio at home	**(N=392)**[1]	**(N=1540)**
Yes	**92.1**	**87.9**
No	**7.9**	**12.1**
Refrigerator at home	**(N=377)**	**(N=1400)**
Yes	**46.7**	**30.5**
No	**53.3**	**69.5**
Rent or own a house	(N=391)	(N=1527)
Own	46.8	49.8
Rent	53.2	50.2
Community Characteristics		
Region of residence	(N=393)	(N=1589)
Upper east	50.1	49.8
Brong Ahafo (BA)	49.9	50.2
District of residence	(N=393)	(N=1589)
Sunyani	24.9	25.1
Nkoranza	24.9	24.9
Bolgatanga	25.2	24.9
Nandam	24.9	25.1
Rural or Urban	(N=393)	(N=1589)
Urban	49.4	50.2
Rural	50.6	49.8
Distance to nearest (usual) health center	**(N=374)**	**(N=1469)**
A mile or less	**65.5**	**51.3**
More than a mile	**34.5**	**48.7**

[1]**Bold** indicates that chi-square test is statistically significant at p=0.05 level.

Source: Fieldwork, September to December, 2007.

7.2. Views and Perceptions on NHIS (Non)-Membership

In this sub-section we examine why some respondents choose to join the NHIS while other do not, based on their own assessment of the program. Issues concerning whether members are satisfied with the scheme or not; whether they have benefited from it yet or not, and whether they have ever wanted to de-enroll are explored. As can be seen from Table 7.2 the main reason why NHIS members choose to enroll has to do with the presumed cost-effectiveness and financial security engendered by the scheme—nearly 60% and 29% of the enrollees cited these as their reasons for becoming members, respectively. Half of the members described their health status prior to joining the scheme as "normal", while some 27.3% and 14.7% reported having "very good" and "somewhat good" health, respectively, before joining. Only 5.6% of the members reported having "poor" health before joining the scheme, suggesting that adverse selection is not a big problem with the scheme. Interestingly, a whooping 81.3% of the members reported having benefited one way or the other from the scheme since they joined (Table 7.2). In fact, many NHIS members were "satisfied" (35.4%) or "very satisfied" (25.7%) with the program. Some 24.4% of them were "somewhat satisfied," while 14.5% were "dissatisfied." When the insured respondents were asked whether they have ever thought of de-enrolling, only 4.2% answered affirmatively. The most-cited reason for this small group related to the cost of membership.

Of our respondents who were not members of the scheme, the most frequently cited reason for non-participation was cost (68.7% of 1,485 non-participating respondents indicated cost as their reason). Another 21.5% picked "I'm not yet ready" as their response, which typically translates into lack of financial readiness. Thus, overall, finances were the most-cited obstacle for nearly 90% of non-participants (Table 7.2).

Table 7.2: Views and Perceptions on NHIS

View/Perceptions	%[1]	N
NHIS Members		
Top reasons for participating		
It is cost effective	59.8	218
No worry about money when sick	29.1	106
Security and peace of mind	8.5	31
Facing a health problem	2.4	9
Total	99.8	364
Health status before enrolling		
Very good	27.3	108
Somewhat good	14.7	58
Normal	51.3	203
Poor	5.6	22
Very poor	1.0	4
Total	99.9	395
Ever benefited from NHIS?		
Yes	81.3	305
No	18.4	69
Total	100	374
How satisfied are you with NHIS		
Not satisfied at all	14.5	54
Somewhat satisfied	24.4	91
Satisfied	35.4	132
Very satisfied	25.7	96
Total	100	375
Ever wanted to de-enroll?		
Yes	4.2	16
No	95.7	361
Total	99.4	377
Non-Members		
Reason for NHIS nonparticipation		
Premium too costly, can't afford it	68.7	1020
I'm not yet ready	21.5	320
Unflattering stories about NHIS	3.4	51
Too aggressive collection agents	3.3	49
Benefits package not enough	1.3	20
Other reasons	1.7	25
Total	99.9	1485

[1]Some of the percentages do not add up to 100, due to rounding.

Source: Fieldwork, September to December, 2007.

7.3. Healthcare Pluralism: Reliance on Different Healthcare Providers

In this section we examine the extent to which the use of various forms of healthcare varies on the basis of NHIS membership status. Which group of women uses traditional medicine, or relies on spiritualists, or undertakes self-diagnoses and self treatment, or attends government hospitals more often? Table 7.3 shows that traditional medicine was used more often by non-members of NHIS than their insured counterparts. Compared to only 36% of NHIS members who sometimes or often used traditional medicine, 51% of non-members did.

In addition, 8% of non-members used it often, compared to 5% for members of NHIS. Still we must note that the difference here is not statistically significant, and this is not surprising, given the strong cultural affinity for this type of health intervention across Ghana. Similarly, we found no significant difference between members and non-members of the NHIS with respect to the use of itinerant drug vendors. However, we found notable difference between NHIS members and non-members on their inclination to seek spiritual healing for various ailments ($p<0.05$). About 16% of non-members used this service often, compared to 10% of NHIS members.

The rates of "self diagnosis and treatment" varied somewhat among the two groups. Whereas 20.8% of non-members claimed they have "never" practiced this, the comparable figure for members stood at 15.9%. Still, a greater proportion of non-members (20.3%) indicated that they do this "often," compared to some 15% who do likewise among the members. The chi-squared test here was not statistically significant. To the extent that many Ghanaians rely on self-diagnosis and treatment as their first line of intervention before further medical attention (Oppong, *forthcoming*), this finding is hardly surprising. Also, as Table 7.3 shows, NHIS members were more likely to use government hospitals and clinics ($p<0.05$), compared to the uninsured: about 90% of the insured used government health facilities "often" or "sometimes," compared to 85% for the uninsured.

Table 7.3: Healthcare Pluralism

	NHIS Members %	Non-Members %
Ever used traditional medicine		
Never	44.6	34.1
Rarely	18.3	13.5
Sometimes	30.8	42.8
Often	5.3	8.2
Total	N=377	N=1529
Ever bought drugs from itinerant vendors?		
Never	26.2	27.1
Rarely	24.3	24.1
Sometimes	37.6	33.8
Often	10.3	13.7
Total	N=370	N=1522
Ever used spiritual healing?		
Never	**48.6**[1]	**44.3**
Rarely	**13.6**	**14.4**
Sometimes	**25.3**	**22.2**
Often	**10.3**	**15.8**
Total	**N=368**	**N=1503**
Self diagnosis and treatment?		
Never	15.9	20.8
Rarely	20.9	14.1
Sometimes	43.7	41.1
Often	15.0	20.3
Total	N=359	N=1507
Ever used private hospital?		
Never	31.7	27.4
Rarely	13.7	12.6
Sometimes	24.1	32.0
Often	28.0	25.3
Total	N=357	N=1504
Ever used government hospital?		
Never	**4.8**	**5.5**
Rarely	**4.8**	**7.2**
Sometimes	**39.8**	**41.9**
Often	**50.0**	**43.5**
Total	**N=374**	**N=1527**

[1] **Bold** indicates that chi-square test is statistically significant at p=0.05 level.

Source: Fieldwork, September to December, 2007.

7.4. Healthcare Sources, Access, and Utilization

Our data show that some 80% of NHIS members use the government or private hospital in their village or town, compared to 65% for the uninsured. In addition, 18% of NHIS members use a private or government hospital outside their town or village, compared to about 28% for the uninsured. It appears people in the immediate vicinity of a health facility are more likely to enroll in NHIS than those who are not. Contrary to expectation, however,

there was no significant difference between the insured and uninsured with respect to perceived unmet health needs; about 21% of respondents in both groups indicated that they had unmet health needs.

Higher proportion of NHIS subscribers indicated that accessing health services is relatively easier in Ghana today than before the introduction of the NHIS (46% vs. 27%), but the difference here is not statistically significant (at $p = 0.05$). We also found no significant difference in OPD visit in the last 30 days preceding the survey between the NHIS members and the uninsured. About 26% of NHIS members, compared to 23% of the uninsured, had used OPD facilities in the previous month preceding the survey, whereas 74% and 77%, respectively, had not. NHIS members were more likely to have been admitted to the hospital in the previous year (27%), compared to the uninsured (21%), $p<.05$. This is surprising, as one would expect a relatively greater proportion of the uninsured to be hospitalized, since they are more likely to delay or postpone seeking health care till the situation worsen to the point of eliciting hospitalization. It would be interesting to see how "hospitalization" interacts with "NHIS membership," once we control for other background characteristics of the insured and uninsured in due course.

Table7.4: Healthcare Source, Access, and Utilization

	Members %	**Non-Members %**
Usual source of health care		
Government hospital in my town/village	72.0	57.2
Govt. hospital outside my town/village	16.2	22.1
Private hospital in my town/village	8.4	7.5
Private hospital outside my town/village	1.8	5.5
Traditional healer in my town	1.0	4.4
Traditional healer outside my town	0	1.6
Spiritualist in my town/village	0	.4
Other	.5	1.0
Total	N=382	N=1497
Any unmet health needs?		
Yes	21.3	21.5
No	78.7	78.4
	N=367	N=1463
Ease of accessing health services today?		
Relatively easier	45.5	26.9
Relatively harder	29.2	46.1
Same as last year	15.0	15.7
Don't Know	10.0	11.3
Total	N=380	N=1526
OPD visit in last 30 days?		
Yes	25.9	23.1
No	74.1	76.8
	N=367	N=1486
Admitted to hospital within last year?		
Yes	**26.9**[1]	**21.1**
No	**73.1**	**78.7**
	372	**N=1481**

[1]**Bold** indicates that chi-square test is statistically significant at p=0.05 level.

Source: Fieldwork, September to December, 2007.

7.5. Chronic Health Conditions

In this sub-section we compare the NHIS members with non-members on the basis of the chronic health conditions they may have to get more insight into the level of adverse selection implicated in the scheme. To the generic question "Do you have any chronic illness/disease?" we found no significant difference between the members and non-members of NHIS. In fact, the percentage difference between the two groups was virtually negligible (Table 7.5). However, the two groups varied significantly on the prevalence of migraine headaches, diabetes, and stroke, with NHIS members having higher proportions in these chronic diseases (Table 7.5). Furthermore, the proportions of respondents with HIV/AIDS, heart diseases, cancer, arthritis, and asthmatic conditions were slightly higher among the insured than the uninsured, even though the differences here were not statistically significant. Overall, it appears women who are currently living with chronic diseases are more likely to enroll in the NHIS, probably to help alleviate some of the financial uncertainties surrounding such long-term illnesses. We learned from our socioeconomic profile of the two groups that insured women are relatively better-off, economically, than their uninsured counterparts, and this could partly account for the prevalence of the so-called "diseases of affluence"—or in this case "of relative affluence"—such as diabetes, stroke, and hypertension among the insured. Still, another plausible explanation could be that the insured women are more likely to visit hospitals for check-ups (as we shall later see), and, therefore, more likely to be diagnosed. Diagnosing such chronic illnesses is virtually impossible without properly-resourced medical facilities with well-trained professionals.

Table 7.5: Chronic Health Problems

	Members (%)	Non-Members (%)
Any chronic health conditions?	(N=349)	(N=1417)
Yes	18.1	17.9
No	81.9	82.0
Any asthmatic condition?	(N=134)	(N=616)
Yes	21.6	10.9
No	78.4	89.1
Any arthritis, rheumatism, back problems?	(N=124)	(N=617)
Yes	16.1	11.3
No	83.9	88.7
Any hypertension?	(N=349)	(N=1417)
Yes	19.1	14.9
No	80.9	85.1
Any migraine headaches?	**(N=123)**[1]	**(N=596)**
Yes	**21.3**	**13.9**
No	**78.7**	**86.1**
Any diabetes?	**(N=127)**	**(N=634)**
Yes	**21.6**	**10.9**
No	**78.4**	**89.1**
Any Cancer?	(N=121)	(N=595)
Yes	12.4	4.4
No	87.6	95.0
Any heart disease?	(N=122)	(N=595)
Yes	17.2	5.5
No	82.8	94.5
Any Stroke?	**(N=120)**	**(N=597)**
Yes	**11.7**	**6.2**
No	**88.3**	**93.8**
Any cataracts or glaucoma?	(N=116)	(N=598)
Yes	5.2	4.2
No	94.8	95.8
Any HIV/AIDS?	(N=113)	(N=581)
Yes	7.1	1.4
No	92.9	98.6

[1]**Bold** indicates that chi-square test is statistically significant at p=0.05 level.

Source: Fieldwork, September to December, 2007.

7.6. Maternal and Child Health Care

In this sub-section, we compare the maternal and child health characteristics of the insured with those of the uninsured, keeping in mind our special interest in this particular area. Table 7.6 shows that NHIS members were more likely to deliver at a government or private hospital than their uninsured counterparts. While 41% of uninsured mothers delivered at home, only 18% of insured mothers did. Thus 81% of the insured delivered at a hospital, compared to 57% for the uninsured. Interestingly, there were twice as many c-section deliveries among the insured compared to the uninsured ($p<0.05$). Also, the insured were more likely to be delivered by a trained health professional than the uninsured. Eighty-one percent of insured mothers were delivered by a health professional, compared to 59% among the uninsured. Moreover, the uninsured were more likely to be delivered by a trained

traditional birth attendant, at a rate of 33%, compared to only 13% among the insured. Similarly, whereas untrained traditional attendants assisted 5% of deliveries among the uninsured, only 2% of the insured received similar assistance.

Prenatal care was used more frequently by the insured. About 94% of the insured used prenatal care while only 76% of the uninsured did. In addition, 30% of NHIS members had three or more prenatal care visits, compared to 17.5% for the uninsured. Thus, the insured were more likely to comply with the WHO recommended 3+ prenatal visits. However there was no significant difference in prenatal services received by the insured and uninsured. Weight measurement, blood pressure, and urine and blood test were routine among both groups.

Postnatal care was also more common among the insured. Ninety percent of the insured mothers had postnatal check-up within one month of delivery, compared to 78% for the uninsured. Postnatal care was usually obtained from a government or private hospital. Postnatal check-up content did not vary much between the two groups and comprised immunization for the newborn, including yellow fever and tuberculosis, as well as health information on nutrition, reproductive health, family planning and child care.

Insured mothers were more likely to have received information on more health risks during postnatal care than the uninsured. In addition to information about HIV/AIDS, malaria, child care and breast feeding, sanitation, hygiene and water treatment, breast examination, which were common to both groups, greater proportions of the insured received information on cholera prevention (86% vs. 78%), and dangers of smoking and drinking (76% vs. 65%).

Also, a higher proportion of the insured had a preventive check-up within the last year (40%), compared to 23% among the uninsured. Among the reasons given for nonparticipation in check-ups, respondents cited excessive cost (12% for uninsured, 7% for the insured). Moreover, 3% of the uninsured considered the current health status to be very poor compared to fewer than 0.5% among the insured.

Whereas the percentage difference between insured and uninsured mothers regarding stillbirth in the last 4 years was very small (13% vs. 11%, respectively), twice as many uninsured reported the death of a child under 5 years. Similarly 5% of uninsured reported birth complications in the last four years, compared to 3% among the insured. The data presented in Table 7.6 clearly point to better maternal and child health characteristics and outcomes among the insured, relative to the uninsured.

Table 7.6: Maternal and child health care

	Members (%)	Non-Members (%)
Place of last birth	(N = 132)	(N =408)
Home	18.2	40.9
Government hospital/clinic	73.5	49.0
Private hospital/clinic	8.3	8.1
Other	0	2.0
Mode of delivery	**(N121)**[1]	**(N=353)**
Vaginal	**85.1**	**92.6**
Caesarian section	**11.6**	**5.7**
Others	**3.3**	**1.7**
Who assisted at birth?	(N=126)	(N =359)
Health Professional	81.0	59.1
Trained Traditional Birth Attendant	12.7	32.9
Untrained Traditional Birth Attendant	1.6	4.7
Nobody	4.0	2.2
Others	.8	1.1
Any Prenatal care?	(N=145)	(N=471)
Yes	93.8	75.8
No	6.2	24.2
How many prenatal care visits?	(N=393)	(N=1586)
Less than 3	5.6	6.6
3-6	14.8	10.2
More than 6	16.0	7.3
Measured weight during prenatal visit?	(N=154)	(N=437)
Yes	94.2	8 9.7
No	5.8	9.4
Checked blood pressure at prenatal visit?	(N=154)	(N=435)
Yes	93.5	90.3
No	5.8	9.4
Any blood test at prenatal visit?	(N=152)	(N=426)
Yes	68.4	71.1
No	31.6	28.9
Any urine test at prenatal visit?	(N=152)	(N=430)
Yes	69.7	76.5
No	30.3	23.5
Postnatal checkup within first month?	(N=153)	(N=453)
Yes	90.2	77.9
No	9.8	22.1
Place of postnatal checkup	(N=140)	(N=386)
Home	9.3	12.7
Government hospital/clinic	85.0	63.5
Private hospital/clinic	5.7	22.5
Other	0	1.3
Did you have a still birth in last 4 years?	(N=263)	(N=884)
Yes	13.3	11.0
No	86.7	88.9
Death of child(ren) under 5 years in last 4 years?	(N=273)	(N=878)
Yes	2.9	5.8
No	97.1	93.7
Birth complications in last 4 years?	(N=275)	(N=876)
Yes	2.9	5.1
No	97.1	94.9

[1]**Bold** indicates that chi-square test is statistically significant at p=0.05 level. *Source*: Fieldwork, September to December, 2007.

8. Evaluating Ghana's NHIS: Propensity Score Matching

8.1 Treatment, Control, and Outcome Variables

To accomplish our task of assessing how well the Ghana NHIS has fared to date, we compare the health outcomes of women who are enrolled in the Scheme (i.e., treatment group) with those of women who are not enrolled (i.e., comparison group), using *Propensity Score Matching* (PSM). Table 8.1 shows the list of variables used for the choice modeling, by way of logistic regression. The list includes our treatment variable (i.e., NHISmember), control variables (made up of five individual, three household, and two community variables), and their respective labels, descriptions, and codes. The selected of these specific control variables in predicting our respondents' propensity to participate in the NHIS is based not only on intuitive judgment and socioeconomic theory, but also on the underlying assumptions and principles of PSM, as outlined in the by the likes of Bryson, Dorsett, and Purdon (2002), Lechner (2001), Augurzky and Schmidt (2001), and Hechman, LaLonde, and Smith (1991).

Among other major considerations, our control variables included only those that we expect to have impact on both participation and relevant outcomes (Bryson, Dorsett, and Purdon (2002). Secondly, only control variables that are not affected, recursively, by the participation were selected, so as to avoid complications in the interpretation of estimated effects (Hechman, LaLonde, and Smith, 1991). For instance, *income* was dropped from our logistic equation because of its intuitive recursive relationship with NHIS membership. We reason that a change in income can be both a potential *cause* as well as a potential *effect* of NHIS membership—thus, making it hard to interpret any estimated correlation between the two variables with appreciable degree of logical coherence and certainty. Put differently, because income tends to change easily over time, it was not deemed to be a sound independent variable in our estimation. Thirdly, we ensured that the inclusion of any variable (either in unison or in interaction with others) does not undermine the all-important balancing properties of propensity score matching. And, finally, conscious efforts were made not to over-parameterize our participation model with extraneous control variables. As we learned from Bryson, Dorsett, and Purdon (2002) and Lechner (2001), at the very least the inclusion of superfluous control variables exacerbate the common support problem; and from Bryson, Dorsett, and Purdon (2002), Augurzky and Schmidt (2001), and Lechner (2001) we learn that leaving out extraneous variables help strengthen the P-score modeling process by increasing the randomness of the selection process and by reducing the variance of the matching estimates. With these guidelines in mind, we started our logistic modeling with a wide range control variables (both in unison and in interactions with others) and finally settled on the ten control variables listed in Table 8.1.

Table 8.1: Propensity Score Estimator: Variables used for Logistic Choice Modelling

Variable Name	Variable Description	Variable Coding
Treatment Variable		
NHISmember	NHIS membership status	0 = No; 1 = Yes
Control Variables		
Individual Characteristics		
Age	Age of respondent	0 = 30 or less yrs; 1= Over 30 yrs
Education	Educational level of respondent	0 = Primary or under 1 = More than primary
Married	Marital status of respondent	0 = Not married; 1 = Married
Party	Political party affiliation of respondent	0 = Not NPP; 1 =NPP
Religion	Religion of respondent	0 = Non Christian; 1 = Christian
Household Characteristics		
TV	Whether respondent has TV at home	0 = No TV; 1 = Has TV
Radio	Has Radio at home	0 = No Radio; 1 = Has Radio
Refrigerator	Has fridge at home	0 = No Fridge; 1 = Has Fridge
Community Characteristics		
RuUrban	Respondent lives in rural or urban area	0=Rural; 1 = Urban
CDistance	Approximate distance to respondent's usual health care centre	0 = 1 mile or Less 1 = More than 1 mile

Table 8.2 lists the outcome variables with which we compare the "treated" and "non-treated" groups. These variables include three *general health outcomes*—i.e., "whether a respondent has received preventive check-up within the year of interview," "whether a respondent has had an outpatient visit within the last 30 days," and "whether a respondent has been hospitalized within the last year"—and five *maternal and child health outcome variables,* namely, "whether birth to respondent was attended by a skilled health personnel," "whether birth to a respondent occurred in a hospital," "whether respondent received prenatal care," "whether respondent has experienced any birth-related complications in the last 4 years," and "whether respondent has experienced any infant death in the last 4 years."

Table 8.3 shows the number of observations in our treatment, control, and outcome variables, and their respective means and standard deviations. It is important to note that the arithmetic means reported in Table 8.3 are proportions—for example, for the variable *NHISmember*, the mean of 0.1983 represents the proportion of individuals that have NHIS membership out of the total of 1982.

Table 8.2: Propensity Score Matching: Outcome Variables of Interest

Variable Name	Variable Description	Variable Coding
General Outcome		
Prevent	Received preventive check-up within the year	0 = No; 1 = Yes
Outpatient	Have had an outpatient visit within the last 30 days	0 = No; 1 = Yes
Hospitalization	Admitted to hospital in the last year	0 = No; 1= Yes
Maternal & Child Health		
BAttended	Birth attended by skilled personnel	0 = No; 1 = Yes
HosBirth	Birth occurred at hospital	0 = No; 1 = Yes
Prenatal	Received prenatal care	0 = No; 1 = Yes
BirthComplication	Have had a birth complication in the last 4 years	0 = No; 1 = Yes
InfantDeath	Death to an infant (under 5) in the last 4 years.	0 = No; 1 = Yes

Table 8.3: Descriptive Statistics of Variables

Variable	No. of Observations	Mean	Standard Deviation
Treatment Variable			
NHISmember	1982	0.1983	0.3988
Control Variables			
Age	1982	0.5060	0.5001
Education	1935	0.6522	0.4764
Married	1981	0.5023	0.5001
Party	1612	0.4745	0.4995
Religion	1968	0.8333	0.3728
TV	1880	0.6489	0.4774
Radio	1932	0.8872	0.3165
Refrigerator	1777	0.3393	0.4736
RuUrban	1982	0.5005	0.5001
CDistance	1984	0.4584	0.4984
Outcome Variables			
HosBirth	540	0.6315	0.4828
BAttended	485	0.6474	0.4783
Prenatal	616	0.8003	0.4001
OPD	1851	0.2366	0.4251
Hospitalization	1849	0.2228	0.4163
Preventive	1691	0.2619	0.4398
BirthComplication	1151	0.4604	0.2096
InfantDeath	1151	0.0512	0.2206

8.2 Estimation Results

As we learned earlier on in *Section 5.2i*, the first major task in the use of p-score matching for evaluation is to compute the propensity to participate in a particular activity by way of a choice model. In our case, we rely on logistic regression for this estimation. Given that one of our research objectives specifically seeks to "understand why some women join the scheme and others do not," the use of logistic regression to predict enrollment in the NHIS is not only a means to an end, but also an end in itself here—a classic case of proverbially killing two birds with one stone. The results of our logistic regression, presented in Table 8.4, can be summed up in the following equation:

*Logit (NHISmember) = -2.102 (Constant) - 0.187*Age + 0.595*Education - 0.064*Married + 0.250*Party - 0.132*Religion + 0.520*TV + 0.123*Radio + 0.258*Refrigerator + 0.143*RuUrban - 0.421*CDistance.*

On the left side of the preceding equation is the treatment variable (*NHISmember)*, and on the right is the constant (or *y-intercept*), together with the control variables and their respective coefficients. It is clear from Table 8.4 that three of our independent variables are statistically significant predictors of respondents' propensity to enroll in the NHIS (with $p<0.05$). These include *education*, *ownership of TV*, and *distance to respondents' healthcare center*. The "education" variable has a positive coefficient, implying that the higher the respondent's

level of education, the higher the logit for enrolling in the NHIS; the same can be said of "the availability of TV in a respondent's household." Conversely, as one would expect, "distance to respondents' usual health care center" has a negative coefficient; thus, higher distances are associated with smaller logits for enrolment and *vice versa*. The positive coefficients exhibited by *Party*, is not surprising, given the increasing educational campaigns done on the NHIS at political rallies throughout the nation. Similarly, it is not surprising that *Refrigerator*, *Radio*, and *RuUrban* yielded positive coefficients: one would expect those who reside in urban areas, or possess a refrigerator or a radio to have relatively higher incomes and higher education, all of which are likely to enhance their propensity to enroll in the NHIS.

The three remaining variables—i.e., *age*, *married*, and *religion*—have negative coefficients. Of these three, the negative sign of "age" is relatively easier to interpret, as one would expect older women (between 30 and 49 years) to be less likely to enroll in the Scheme, compared to their younger counterparts (between 18 to 30 years) who are within their prime child-bearing years. The negative signs of both "married" and "religion" could be interpreted either way: For instance, while it is reasonable to expect women who are married (and, therefore, most likely to have children) to exhibit higher propensity to enroll in the Scheme, it is not unreasonable to see fewer of these same women enrolling, relative to their unmarried counterparts, due to the higher absolute cost involved in enrolling a family. Unsurprisingly, our model found "married" and "religion" to be weak predictors of the propensity to enroll in the NHIS.

Table 8.4: Logistic Regression Estimation of the Propensity to Enrôll in the NHIS

Variable	Coef.	Std. Err.	Z	p>|z|	[95% C I]	
Age	-0.1871	0.1462	-1.28	0.201	-0.4737	0.0994
Education	0.5933	0.1808	3.28	0.001*	0.2389	0.9477
Married	-0.0644	0.1452	-0.44	0.657	-0.3489	0.2201
Party	0.2508	0.1377	1.82	0.069	-0.0191	0.5208
Religion	-0.1329	0.1988	-0.67	0.504	-0.5226	0.2568
TV	0.5200	0.1971	2.64	0.008*	0.1336	0.9064
Radio	0.1237	0.2404	0.51	0.607	-0.3475	0.5949
Refrigerator	0.2588	0.1558	1.66	0.097	-0.0466	0.5642
RuUrban	0.1435	0.1371	1.05	0.295	-0.1252	0.4122
CDistance	-0.4211	0.1491	-2.82	0.005*	-0.7134	-0.1289
Constant	-2.1027	0.3311	-6.35	0.000	-2.7517	-1.4537
No of Obs	1417					
LR chi2(10)	86.41					
Prob > chi2	0.000					
Pseudo R2	0.0596					
Treatment	*NHISmember*					

Tables 8.5 and 8.6 provide some descriptive statistics on our estimated propensity scores and the blocks of comparison and treated groups that were selected in satisfying the Common Support Requirement. The estimated p-scores ranged from 0.05499 to 0.44707, with a median of 0.2018 (Table 8.5). And, as Table 8.6 shows, the optimum number of blocks for the fulfillment of the Common Support Requirement was 4. Clearly, within these four blocks any combination of characteristics found among members of the treatment group is also found among members of the comparison group Table 8.6). Evidently, the balancing property was met in the sense that the mean propensity score is not different for the treatment and comparison groups in each of the four blocks (Figure 8.1 and Table 8.6).

Table 8.5: Estimated Propensity Score

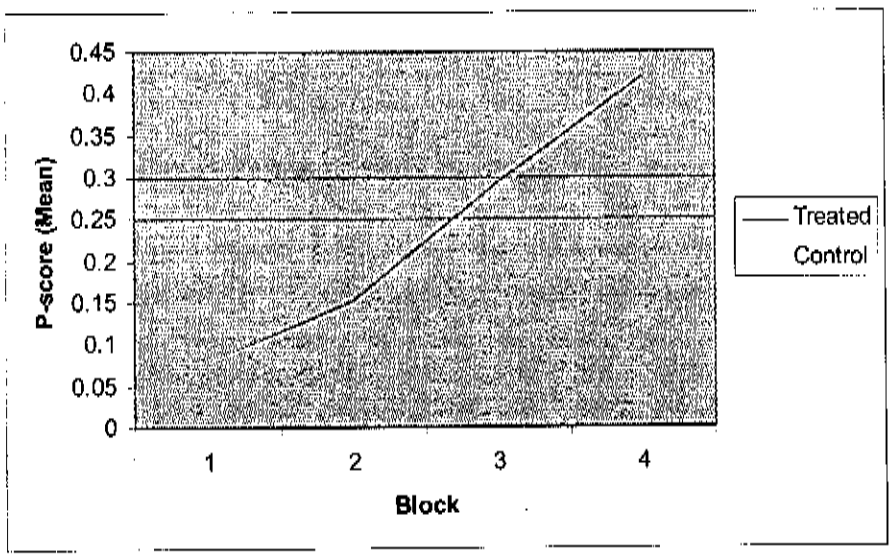
Percentiles	P-score	
		Smallest
1%	0.0617	0.05499
5%	0.0706	0.05499
10%	0.7989	0.05816
25%	0.1185	0.05816
50%	0.2018	
		Largest
75%	0.2982	0.4.450
90%	0.3406	0.41450
95%	0.3699	0.43121
99%	0.4145	0.44707

Table 8.6: Descriptive Statistics: Blocks of Treatment and Comparison Groups

	# of Obs.	Mean	Std. Err	Std Dev.	[95% Conf. Interval]	
Block 1						
Comp. (0)	237	.0790	.0007	..0114	.0776	.0805
Treat. (1)	18	.0778	.0029	.0126	.0715	.0841
Combined	*255*	*.0789*	*.0007*	*.0115*	*.0775*	*.0804*
Block 2						
Comp. (0)	376	.1474	.0015	.0295	.1444	.1504
Treat. (1)	64	.1513	.0039	.0316	.1434	.1592
Combined	*440*	*.1480*	*.0014*	*.0298*	*.1452*	*.1508*
Block 3						
Comp. (0)	483	.2848	.0023	.0506	.2802	.2893
Treat. (1)	202	.2936	.0033	.0470	.2871	.3002
Combined	*685*	*.2874*	*.0019*	*.0497*	*.2836*	*.2911*
Block 4						
Comp. (0)	19	.4145	0	0	.4145	.4145
Treat. (1)	11	.4187	.0032	.0107	.4115	.4259
Combined	*30*	*.4160*	*.0012*	*.0066*	*.4135*	*.0007*

Note: The balancing property is satisfied

Figure 8.1: P-score Estimation: Common Support



Following the estimation of our propensity score, and with the fulfillment of the Common Support Requirement, we matched our treatment and comparison group members and estimated the Average Treatment-effect on the Treated (i.e., ATT), using the nearest neighbor and kernel matching techniques. All these estimations were done with the help of *ado-files* in Stata (Becher and Ichino, *n.d.*).

Table 8.7 sums up the results of our estimations from the nearest neighbour matching. As already noted, our outcomes of interest include five maternal and child health variables—i.e., "whether birth was attended by a health professional" *(BAttended);* "whether birth occurred at a hospital" *(HosBirth);* "whether the respondent received prenatal care" *(Prenatal);* "whether respondent has experienced any birth-related complications in the last 4 years" *(BirthComplication);* and "whether respondent has experienced infant death in the last 4 years" *(InfantDeath)*—and three general health outcome variables: "whether respondent received preventive check-up within a year" *(Prevent);* "whether respondent has an outpatient visit within the last 30 days" *(OPD)*; and "whether respondent has been admitted to a hospital in the last year" *(Hospitalization).* Before presenting our results for the ATT estimations, it bears reiterating that while the outcome variable in each of the estimation varied, the treatment variable was the same in all cases (i.e., *NHISmember*), and so were the control variables which included the following ten in all cases: *Age, Education, Married, Party, Religion, TV, Radio, Refrigerator, RuUrban,* and *CDistance.*

With the outcome of *BAttended,* a total of 99 treatment group members were matched with 109 comparison group members via the nearest neighbor matching technique. The estimated ATT for *BAttended* is 0.071, implying that those with membership in the National Health Insurance Schemes (NHIS) have 7% more of their births attended by trained health personnel

than those who are outside the Scheme. In similar veins, women with NHIS membership have more births in hospitals *(HosBirth)* and received more prenatal care *(Prenatal)* than women who were outside the Scheme. The estimated ATTs of 0.096 and 0.190, respectively, favor women who are enrolled in the NHIS in both cases. The remaining two maternal and child health outcome variables yielded very small, but negative ATTs in our estimation: -0.040 and -0.020 for *BirthComplication* and *InfantDeath,* respectively. This suggests that women in the Scheme had relatively less birth complications (4%) and infant deaths (2%) than their non-NHIS counterparts.

Two of our three general outcome variables, namely, *prevention* and *OPD,* yielded positive ATTs of 0.110 and 0.042, respectively, while the third *hospitalization* yielded a negative ATT (-0.089). These findings suggest that women who are enrolled in the NHIS generally have slightly more preventive check-ups and outpatient hospital attendance than those outside the Scheme. Conversely, those outside the Scheme are more likely to be admitted to hospitals than those who are enrolled. This is unsurprising, as one would expect the propensity of being hospitalized to reduce with increased preventive checks and OPD attendance.

Table 8.7: Estimation of Average Treatment Effects Using Nearest Neighbour Matching[1]

Outcome Variable	Number of Observations		ATT[2]	Std. Err[3]	*T*
	Treatment	*Control*			
BAttended	99	109	0.071	0.067	1.058
HosBirth	105	122	0.096	0.062	1.542
Prenatal	115	141	0.190	0.055	3.430
BirthComplication	218	359	-0.040	0.023	-1.740
InfantDeath	218	365	-0.020	0.022	-0.904
Preventive	283	583	0.110	0.039	2.833
OPD	279	563	0.042	0.035	1.217
Hospitalization	283	593	-0.089	0.036	-2.466

[1]The random draw version of the nearest neighbor matching was used.
[2]The Average Treatment Effect on the Treated
[3]Analytical standard errors are reported.

Table 8.8 summarizes the results of our ATT estimations, using the kernel matching procedure. Clearly, the ATTs from the kernel matching are not much different from those obtained through the nearest neighbour matching. As in the case of the latter, only three out of the eight outcome variables had negative ATTs—these include *BirthComplication (-0.044), InfantDeath (-0.037),* and *Hospitalization (-0.028)*—with the rest yielding positive ATTs. *BAttended, HosBirth,* and *Prenatal* were all higher among NHIS enrollees, with ATTs of 0.144, 0.171, and 0.163, respectively; so were both *Preventive* checks and *OPD* attendance, with recorded ATTs of 0.125 and 0.014, respectively. It is important to note that only *OPD* produced a *t*-value of less than 1.0 (in absolute terms) in both the nearest neighbor and kernel matching estimations, suggesting that the ATTs obtained with both matching procedures are statistically significant, even though some of them (e.g., *Preventive,* under

the nearest neighbour matching) may appear small. These findings corroborate those of Becher and Ichino's (*n.d.*, p. 18) who observed that the results from their kernel matching and nearest neighbor matching estimations of ATT were "quite close to each other."

On the whole, our findings suggest that the Ghana NHIS has produced noteworthy positive outcomes for those who are enrolled in it, at least based on the treatment, control, and outcome variables used in our propensity score matching evaluation of the scheme. We must recall that similar findings surfaced earlier on in our descriptive comparison of the members and non-members of the NHIS. The fact that we are able to control for a host of background characteristics among the members and non-members of the NHIS, using the matching procedure makes the p-score-based evaluation far stronger than what we ascertained by merely comparing the health variables of members and non-members using simple cross-tabulations and the Chi-squared test. Still, while most of our p-score findings are highly intuitive, we must not overplay them to the point of drawing direct causal links between NHIS membership on the one hand, and the various outcome variables on the other. For one thing, the technique of propensity score matching works under the assumption of *ceteris paribus*, or, more specifically, of all background characteristics being equal for both the treatment and comparison groups. Needless to say, it is not only difficult to know all the relevant background characteristics, but also hard to find reliable data to measure them empirically. Thus, as with any multivariate statistical analysis, our p-score results have to be interpreted with some caution.

Table 8.8: Estimation of Average Treatment Effects Using the Kernel Matching Method

Outcome Variable	Number of Observations		ATT[1]	Std Err[2]	*T*
	Treatment	*Control*			
BAttended	99	260	0.144	0.048	3.027
HosBirth	105	312	0.171	0.050	3.444
Prenatal	115	321	0.163	0.035	4.664
BirthComplication	218	671	-0.044	0.019	-2.356
InfantDeath	218	672	-0.037	0.017	-2.212
Preventive	283	986	0.125	0.034	3.742
OPD	279	1072	0.014	0.033	0.443
Hospitalization	283	1060	-0.028	0.031	-0.917

[1]The Average Treatment Effect (on the Treated)
[2]Bootstrapped Standard Errors are reported.

9. On the Possible Replication of Ghana's NHIS across Africa

A wide range of geographic, cultural, economic and other contextual differences make it difficult to generalize about health and healthcare financing among African countries. However, the works of Castro-Leal et al., (2000) and Mensah and Oppong (2007) suggest that the healthcare system in Ghana is not much different from what pertain in many sub-Saharan African countries, such as Cote d'Ivoire, Guinea, Kenya, Rwanda, and Tanzania. Typically, public facilities provide more than two-thirds of the medical care in these countries, while private non-profit organizations provide the remaining one-third (Castro-Leal et al., 2000, 67). Moreover, there are strong indications that household income, physical access to health care, and price interact with social realities to produce inequities in the provision of health care by geography, gender, class etc., making the cost of medical consultation and health care far more burdensome for the poor, women, and rural folks in most of these countries (Castro-Leal et al., 2000; Mensah and Oppong, 2007). As in the case of Ghana, poor and rural households are often farther away from government health facilities; and members of these households, together with women and female-headed households, generally bear higher opportunity costs in obtaining healthcare.

Research suggests that in the "developing world" Latin American countries have the most extensive experience with social health insurance systems (McIntyre, 1997). In recent years, however, such schemes have gained considerable currency in Asia and Africa, culminating in the United Kingdom's Department of International Development's (DFID) workshop on social health insurance in sub-Saharan Africa in April of 2002. At this workshop, the participating governments, including those of Ghana, South Africa, Kenya, Tanzania, Nigeria, Malawi, and Uganda (and representatives from the Zimbabwean private health insurance industry) discussed the merits of introducing or expanding social health insurance schemes in their respective countries. Like Ghana, most of these countries (e.g., Kenya, Nigeria, Malawi, Tanzania) embarked on IMF- and World Bank-sponsored Structural Adjustment Programs (SAPs) in the eighties and nineties, under which they were compelled to reduce government subsidies on health care (Mensah, 2006a). Thus, the recent move by these governments toward social health insurance is part of a general effort to alleviate the financial burden wrought by SAPs on their citizens, and to improve access, affordability, equity, and efficiency in healthcare delivery in these countries (UK, DFID, 2002, 17).

Even though our study deals specifically with Ghana, it will be erroneous to assume that our findings are exclusive to Ghana, since Ghana's economy and healthcare system are similar to what obtains in many other sub-Saharan African countries. Also, one can argue that the intellectual and cultural antecedence of risk-sharing and solidarity, upon which formal social health insurance is based, is traceable, at least in part, to African and other traditional cultures, even though the particular expressions of these ideas that have proved to be definitive in contemporary world have disseminated primarily through Western scholarship (Sen, 2000, 25). Furthermore, the world of today is much more interrelated, with shared ideas, ideals, and concerns—thanks to globalization and its attendant time-space compression innovations—and, as Sen (2000) notes, it would be surprising if socially beneficial programs developed in say Ghana would fail to be relevant to say Liberia, Togo, or Zimbabwe, just because of their Ghanaian roots. Not surprisingly, Mensah and Oppong (2007) writes of an

already increasing tilt towards national social health insurance in several African countries, including Kenya, Tanzania, Rwanda, Senegal, and Nigeria. From the preceding discussion, it is clear that there is, indeed, nothing inherently special about the Ghana NHIS to compel us to downplay the applicability of our findings—and, thus, the observed benefits of Ghana's NHIS—to other African countries.

10. Conclusion

We have used propensity score matching to compare the health outcomes of women who are enrolled in the NHIS with those who are not. Our findings suggest that members of Ghana's NHIS have relatively better health outcomes than non-members, after controlling for relevant background characteristics. NHIS members are more likely to receive prenatal care, deliver in hospitals and have their births attended by trained healthcare professionals. They are also, less likely to have experienced infant deaths and birth complications. Clearly then, Ghana's NHIS has yielded significant benefits for its members. By eliminating catastrophic payments and ensuring timely and effective access to health services, the NHIS is targeting a major impediment to better health outcomes, and promises to improve maternal mortality as envisaged.

In our study, the uninsured were more likely to have obstetric complications, hospitalization and child deaths. Consequently, non-membership of NHIS may be an indicator of unmet health need; the uninsured are more likely to delay seeking care and develop complications resulting in poor health outcomes. An effective way to improve health outcomes may thus be simply extending health care access to those currently without access. Thus, increased effort should seek to reduce the numbers of uninsured and accomplish the original goal of the NHIS – to "ensure equitable universal access for all residents of Ghana to an acceptable quality of essential health services without out-of-pocket payment being required at the point of service use" (Ghana Ministry of Health, 2004a). Since cost was found to be a major obstacle to enrolment, more effective methods for identifying the poor, and the core poor, for the purposes of premium exception and discount are needed. Also, our findings indicate that the availability of a health facility in a community is associated with higher likelihood of enrolment in the NHIS. Accordingly, extending geographical access is an important strategy for expanding NHIS membership and improving access to quality health care in the country. Moreover, because educational attainment of the household head is a strong determinant of NHIS enrolment, and those with low education are less likely to enroll, information on the NHIS has to be disseminated in ways that reach those with little or no education to ensure that these segments of the population are not excluded.

Furthermore, it is important to note that the impact of social health insurance scheme on overall health indicators usually takes time to show up. However, changes in the practices that lead to better health, such as delivery in hospitals, proper pre- and post-natal care, early detection of diseases, etc., are more quickly observable. Hence, any evaluation of newly introduced schemes should focus more on these variables rather than on overall health indicators, which tend to be more important for long term impacts.

In the final analysis, our findings—like those of Van Doorslaer et al., (2006), Schneider and Diop (2004), and Criel and Kegels (1997)—suggest that social health insurance schemes are effective tools for protecting households from the potentially catastrophic expenditures associated with hospitalization and health care costs. Thus, such schemes should be seen as a valuable health financing mechanism. We have shown that for those covered, Ghana's NHIS is worthwhile, the premium costs have translated into measurably better health outcomes. Yet, health insurance alone can hardly be an effective tool for the improvement of health care, unless the health care system as a whole is enhanced with reliable infrastructure, well-located health care facilities, efficient health care providers, and competent and accountable administration. How to extend the NHIS to all Ghanaians without compromising the quality or access to care remains a challenge. Still, our findings indicate that Ghana's NHIS is a positive step towards accomplishing the health *Millennium Development Goals,* a step that other African countries may be wise to emulate.

Acknowledgement

We would like to express our gratitude to the Global Development Network (GDN) and the Bill and Melinda Gates Foundation for sponsoring this timely Report as part of their global research project on *Promoting Innovative Programs from the Developing World: Toward Realizing the Health MDGs in Africa and Asia.* We are particularly thankful for the guidance and support of our Project Management Team from the GDN, including Lyn Squire, Ranjeeta Thomas, Vidya Damera, Sonam Sethi, and Shubhashis Gangopadhyay (who has recently moved on to work for the Indian government). We are equally thankful for all the travel arrangements made on our behalf by Carol Best-Aaron of the GDN during the course of this project. We benefited immensely from the incredible intellectual prescience and insights of our Project Mentor, Professor Christoph M. Schmidt of RWI, Essen, Germany, throughout the course of this project, and we are very grateful to him. Also, the faculty members, graduate students, and staff of RWI deserve special mention for hosting us on two occasions, with memorable hospitality, for presentations and intellectual exchanges. The Report profited considerably from the feedback and constructive suggestions from the students and faculty at RWI.

The Report is based mainly on primary data from a questionnaire administered to 2,000 people in two Regions of Ghana, and we are unreservedly indebted to our field interviewers, mostly students of the Catholic University College (CUC) in Sunyani, Ghana. These students include Mark Baffoe Sarkodie, Vivian Tiwaa, Kofi Bosomah, Maurice Yeribu, Audrey Tindnan, Atinga Johannes Apee, and Anthony Nyaabayele Nchor. We salute Yakubu Abubakari and Addah Jerome of INTEQ Consulting of Ghana, and Ebenezer Danso of CUC who did the hard work of data entry. Our thanks also go to Stephen Opoku Brobbey (of the Nkoranza District Health Insurance Scheme), Kwame Gyamfi (Sunyani Municipal Health Insurance Scheme), Ayine Roland (Bolgatanga and Talensi-Nabdam District Health Insurance Schemes), and Mr. Osei Achaempong (Ghana National Health Insurance Headquarters in Accra) for their cooperation and kind assistance throughout this research. Our students and Research Assistants at York University in Toronto, the University of North Texas in Denton, and Catholic University College of Ghana in Sunyani have all helped solidify our ideas for this Report, and they deserve our sincere appreciation, and so is Ms. Edna Aryee of University of Toronto who reviewed some literature for this project. Most of all, we would like to thank our families for their patience and invaluable support for our endless academic pursuits. To all of you, we say "thank you."

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Appendix I

Focus Group Discussion: A Synopsis

Background

On March 2, 2008, eleven key informants, chosen from the study districts were brought together for a Focus Groups Discussion (FGD) at the Catholic University College of Ghana in Sunyani. The invited group included four females and six males. For the sake of unanimity, the identity of these people will not be disclosed in this piece, except to say that the group included Hospital Administrator(s), NHIS Scheme Manager(s); NHIS Public Relations Officer(s), some NHIS Registration Agents; some NHIS enrollees, and some Research Assistants. The discussions were co-facilitated by Dr. Joseph Mensah and Dr. Kofi Bobi-Barimah. Permission was sought from the participants to tape-record the proceedings, after the objectives of the research were presented to them. Our 'Interview Guide' covered on a number of themes, including NHIS procedures for procuring health care; the premiums, benefits package, and exemptions; protocols on prescription drugs; issues concerning maternal and child care coverage; and general problems and ways forward from the perspectives of the different participants. The entire FGD lasted about 2 hours. In what follows, we present a synthesis of what transpired, as far as we were able to gather from our notes and form the transcribed tapes.

1. On Procedures

On the issue of NHIS procedures, we learned that when an enrollee goes to a hospital or any certified health care center, s/he is supposed to present the NHIS card for verification, before the s/he is steered to the consulting room to start the actual procurement of the necessary health care. Because of fraud, this verification is taken rather seriously by health care providers, who scrutinize the pictures on the card to make sure it matches the face, age, gender, etc of the holder. In most hospitals/health care centers, there are different queues for NHIS members and non-members to facilitate the process of verification and record keeping. One health care provider noted that because NHIS card holders are often separated from the uninsured in different queues, and because the queue for the later often moves faster than the former, due to the NHIS card validation process and other related paperwork, there is a growing misconception that hospitals prefer to treat the uninsured, who pay cash, than to the insured.

2. On Premiums

On the amount of premiums charged by the various schemes, the responses we got were not much different from what we ascertained through our institutional questionnaire to the various scheme administrators and from government records. The premiums for the Sunyani Municipal scheme, for instance, was found to be a flat GH¢20 per annum; and each of the two Upper East districts were found to be charging GH¢7.2 per annum; while the Nkoranza Scheme charged GH¢8, per annum.

3. Benefits and Exemptions

From a Public Relations Officer of a Scheme, we noted/confirmed that OPD services such as consultations, including reviews, general and specialist consultations are covered; so are requested medical investigations, including laboratory investigations, x-rays, and ultrasound scanning for generalized and specialist out-patient services. From a Hospital Administrator, we noted that in-patient physiotherapy and accommodation in general ward (not special ward) are covered. So are day

surgeries on conditions such as hernia repairs. Also, dental treatments for pain relief, incisions, drainage, extraction, fillings, and temporary dressing are all covered. HIV per se is not covered, but HIV symptomatic treatment for opportunistic diseases are covered. TB is not covered because there are special government programs for it; the same applies to mental health. Orthopedic works are not covered per see, but road traffic accidents are covered. And as one discussant noted "Now the problem is when somebody gets into a road traffic accident, which most of the time, comes with orthopedic problems, then what happens to the person—Thus, there are some grey areas in all these specifications." Also, we learned that ambulance service is not covered under the Scheme. Even though emergency situations are covered, the related transportation cost is not. One health provider brought to the attention of the group that the situation with emergency has not really changed much even with the insurance. It has always been the case, even under cash and carry, that you look after the patient in emergency situation first, and talk about payments later. So the health provider is not allowed to seek payment in emergency situation. As one discussant noted: "In critical situations, you don't ask about insurance or money until the person is stabilized." Evidently, the system relies a great deal on the good judgment and discretion of agents and health care providers in these instances.

On Maternal and Child Care Coverage

A Hospital Administrator opened the discussion on maternal and child care coverage with this observation:

When we say maternity care is free, there used to be a period in our history when children, old people, and people needing maternal care were exempted from paying, and government took over their bills. Now with the insurance coming in, all these things have been scrapped to encourage people to insure. Thus, if you do not go for insurance, it means you have accepted that you have the funds to be able to pay when you have any health related illness or get pregnant, and so if you go to the hospital and you do not have health insurance it means that you are willing to pay out of your pocket and those are the instances that catch people. The bottom line is that maternity services like antenatal, deliveries, both normal and assisted or C-Sections and post-natal care are all covered by the NHIS.

Another Administrator expressed disenchantment with all those who expect maternal care free of charge at the hospital without insurance in these words:
I don't sympathize with these people, because maternity is not an emergency; you just don't wake up one morning and decide to deliver. There is a gestation period for nine months and so if you really want to pay your bills you can make an effort to pay your NHIS bill. So I do not sympathize with people who give birth at the hospital with no insurance. No! I don't. Once you don't subscribe to health insurance, it means that you want to tell everybody that you can afford it, you should pay.

One participant alluded to the fact that some aspects of the NHIS benefits for women are not clear, though. This discussant noted that whether fibroid surgery is covered or not is remains unclear. It was quite surprising to learn, given the patriarchal nature of the Ghanaian society, that breast cancer is covered, while prostrate cancer is not.

On Prescription Medicine

The segment on prescription medicine opened with the following question from one of the facilitators: "From what I have learned, the scheme has a designated drug list based on which the scheme covers prescription drugs. What happens if a particular prescription in the drug list, but the hospital does not have in stock? In response to this question, we learned from various participants that

the NHIS card holder is allowed to procure the prescription from outside, mostly from a contracted or designated pharmacy, which then presents the invoice for reimbursement. At times the NHIS reimburses the patient directly, upon providing receipts.

On Problems and Ways Forward

Perhaps the leading problem identified by the discussants relates to the financial viability of the schemes. People are hesitant to pay for something for which they may or may not get anything in return. Indeed, the whole idea of formal insurance of this kind is new in Ghana. People are familiar with auto insurance, but the experience with auto insurance has been anything but satisfactory. Few people ever benefit from their auto insurance, even though it is mandatory to procure such insurance—no wonder some people are hard to convince to enroll in health insurance. With this, and many other problems of the Scheme, the group felt intensive public educational campaign is the key.

Another basic problem identified by some health providers, NHIS agents, and health care providers relates to fraud. Depending on who is speaking, the culprit could be the agent who collects premiums and embezzles them; the pharmacist who presents fraudulent claims for reimbursement, or the member of the public who tries to impersonate an NHIS enrollee to procure free health care. Here, proper record keeping, proper identification and verification mechanisms, and still more public education were suggested as ways forward.

The fact that the registration of children is tied to that of parents was also a matter of great concern to discussants. Some parents, especially father (we found), are hesitant to register, thereby restricting their children's access to the scheme, and, by implication to ready access to health care. The need to tie children's registration to just one of two parents was suggested by discussants. Also mentioned was the need to upgrade the designated drug list as frequently as possible to match pharmaceutical and medical innovations. Furthermore, excessive red-tape seems to undermine the smooth running of the schemes. This was a major concern not only for Hospital Administrators, but also for some of the pharmacists who have to go through massive paperwork and regulations to be reimbursed. Funding for the exempt groups, including the elderly, children, and the indigent, comes from the government. We noted that this often delays to the extent of undermining the operations of some of the schemes. The urgent need for a timely provision of government funding was stressed by many discussants.

Overall, the insights from our FGD confirm, and thus reinforce, most of what we gathered via both our institutional and individual questionnaires. Thus, the FGD turned out to be a worthwhile triangulation tool.

Appendix II: Power Estimation

Our Power Calculations make is based on the following assumptions/premises:
i) That, this is a two group design (those in NIHS and those not), and that the statistical test we would be using following our propensity score matching would be an independent samples *t-test*.

ii) The preceding also assumes that any given dependent variable that you are looking at is continuously scaled.

iii) That, the two groups—those I NHIS ad those outside—come from populations that have equal standard deviations on whatever dependent variable we would be examining time.

iv) In order to estimate power, we declare an effect size, and here we rely on Cohen's *d*, which is commonly use for *t-test* of two means (Cohen, 1988). Needless to say, the size of the effect will impact how much power you have; with larger effect leading to more power, holding all else constant. For instance a d=0.2 would indicate that the two group mean differ by 0.2 of a standard deviation (technically this would be 0.2 of the within population standard deviation), while a d=0.5 would be half a standard deviation, etc.

v) For now we are assuming a two-tailed test, as we have no good reason to point any particular direction or to assert that one group would perform higher than the other.

vi) Also, our calculations assume rely on the use harmonic mean of the two sample sizes (not the arithmetic mean), since our proposed sample sizes for the two groups are much different (with a ratio of 1:4, in favour of the control group). The harmonic mean of the sample sizes (n') is found with:

$n' = (2n_1n_2) / (n_1 + n_2) = 640.$

v) Given all the preceding, and assuming *alpha* = .05; two groups with n_1=400 and n_2=1600, two-tailed test: our power is presented below for various situations. With our preferred power indicated in bold as 0.94 at d=0.20.

Cohen's d effect	Power
.05	.15
.10	.43
.15	.76
.20	**.94**
.50	1.00
.80	1.00

Clearly we have a **lot of power** with effects as small as .20. (This is what Cohen would call a "small" effect; with .50 "medium"; and .80 "large". However, I think these general rules of thumb should be used with caution, because what is small in one field may not be in another.) If the obtained d=.15, you have about a 76% chance of getting a statistically significant result. Generally, one would want power of at least 80%; thus our target of 90% gives us considerable power.

Another way of conceptualizing our power estimate is to determine the sample size needed to detect various effect sizes under a given level of desired power. Below you we present the sample sizes needed to detect various effects with power = .80, which is the most commonly used target for power, and which we hope to even exceed with our simple size, by targeting power = .90.

Cohen's d	Sample size needed (power = .80)	
	n_1	n_2
.2	246	984
.5	40	160
.8	16	64

Note that the above assumes a 1:4 ratio in two group sizes (400:1600). As you can see, we can get away with much smaller samples to detect a small effect, if we are willing to live with power = .80 (or an 80% chance of getting a statistically significant result for that effect size). However, as we noted above, our target is even a higher power, of .90, which gives us the following sample sizes for the two groups, with out preferred effect and sample size indicated in bold:

Cohen's d	Sample size needed (power = .90)	
	n_1	n_2
.2	**329**	**1315**
.5	53	213
.8	21	85

The calculations above were computed from a program called G*Power, with the help of the University of North Texas' statistician, Robin Henson. The reference for this is below, along with two other references regarding power and/or effect sizes.

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[1] In 2007, Ghana changed its currency from the old cedi (¢) to New GH Cedi (¢). One New GH¢ = 1000 old Ghana ¢. The exchange rate to the US$ is now about US$1=New GH¢0.93.

[2] We must note the Talensi-Nabdam District is fairly new. It was created recently between the Bolgatanga District on the west, the Bawku West District on the east, and the Bongo District in the north; its district capital is City of Tongo. As with the other new Districts across Ghana, the boundaries of the Talensi-Nabdam District is not that firm, as they are yet to be formally gazetted.

[3] The likely listings, such as the one used for the last Demographic and Health Survey in Ghana (in 2003), were either dated and unreliable or simply unavailable to us. For reasons of time and budget constraints, we could not embark on our own (census) listing of all the hundreds of thousands of households in the four districts to ascertain a sample frame.

[4] 'Randomness' is obviously used lightly here, as one can hardly attain scientific randomness without a complete, reliable, and up-to-date sample frame of the comparison group.

[5] Becher and Ichino (n.d.) provide ***ado-files*** in **Stata** that one can use to compute the ATT in conjunction with the various matching estimators; and, of course, one can use other software (e.g., SPSS, SAS etc.), to perform a similar task.

[6] As of the time of writing in May 2008, 1US$ = 1.009 GH¢ (cedis).