The Distributional Consequences of Ghana's National Health Insurance Scheme [1]

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Abstract

National health insurance is one means to provide health care. This paper describes the financing of and enrollment in the Ghana National Health Insurance Scheme (NHIS) implemented in 2005. To describe the half of the population who register and may benefit from the NHIS, a representative 2009 Ghana Socio-Economic Panel Survey (GSEPS-I) is examined. The probability of program registration and current coverage of an individual in 2009-10 is partially explained, as expected, by demographic groups exempted from paying enrollment fees, and is inversely associated with the distance from households to NHIS offices and medical facilities. NHIS legislation indicates that membership fees are to increase with the individual's "ability to pay", but premiums paid by survey respondents do not increase regularly with adult education, by consumption within districts. The average registration fee determined within the health district is inversely associated with the probability an individual is registered in that district. Registration fees and premiums account for less than 5 percent of the NHIS funding, with about 70 percent financed by a 2.5% value-added consumption tax. Households with more consumption and individuals with more schooling and better health are more likely to be registered and covered. The policy implications of these empirical regularities are explored, and the limitations of these non-experimental findings for evaluating the distributional consequences of the program are discussed.

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1. Introduction

Universal coverage of health care is a widely endorsed social goal, which depends on wide access to health care services and low financial barriers to their utilization, which is expected to improve the health status of the population (WHO, 2010; Mwabu, 2013). One route to this goal involves a national health insurance. There are many barriers and trade-offs to making such an institutional arrangement effective, efficient, equitable, and financially sustainable. It is expected that fees and access to health insurance are likely to affect take up rates, as well as the characteristics of the population. Lacking randomized trials to introduce variations in such policies, this paper uses variation in fees and proximity to health insurance by administrative district, to infer how the demand for health insurance varies, controlling for observed characteristics of the population and program that are arguably exogenous.

Ghana is one of a handful of low income countries that has established a National Health Insurance Scheme (NHIS), and implemented its program in 2005. A nationally representative household Ghana Socio-Economic Panel Survey (GSEPS) collected in 2009-10 is analyzed here to evaluate who has registered and is currently covered by the NHIS. District variation in the prepayment fees of the NHIS and household proximity to NHIS administrative offices are treated as independent determinants of NHIS coverage, while controlling for exogenous socioeconomic characteristics of individuals that could affect the diffusion of information about NHIS and the demand of consumers for health insurance and medical care. Local variation in the quality and market price of health care services are expected to also affect consumer demand for health insurance. Lacking good measures of these pre-program variables may bias estimates of the response of consumer demand for health insurance to local health insurance prices and the distance from a household to the new administrative offices of the decentralized district health insurance system. Evidence is sought on the pecuniary and user time cost to enroll in the NHIS in order to relate these costs to the probability that individuals decide to register with the program and then continue to renew annually her membership.

Section 2 of the paper reviews briefly the NHIS. The heuristic framework guiding

the analysis of survey data and the conditions under which the demand relationships of interest are identified are discussed in Section 3. The data are described in Section 4 along with prior studies of the NHIS, and the empirical results of this study are reported in Section 5. Section 6 summarizes the findings and concludes with questions for further research.

2. Ghana's National Health Insurance Scheme

From independence in 1957 the government of Ghana sought to provide at no out-of-pocket cost health services to its entire population, though the location of health facilities was not geographically uniform and the proximity of health facilities undoubtedly favored urban residents. By the 1980s the decline in per capita national income and the increase in public cost of providing education and health care contributed to the weakening of the public health system, with many health personnel seeking employment opportunities abroad or in the domestic private sector. A structural adjustment plan, negotiated between the government of Ghana and donors, including the World Bank, introduced user fees for health services and drugs to help finance the public health system. As national economic conditions improved in the 1990s, the use of public health services continued to decline, and inequality in access to health care became more salient, leading to a reassessment of how to finance health services (Griffin and Shaw, 1995; Mensah, et al. 2010; Durairaj, et al., 2010; Jehu-Appiah, et al. 2011; Blanchet, et al. 2012).

In 2003 legislation (Act 650, www.nhis.gov.gh/) was enacted to establish the National Health Insurance Scheme (NHIS) and it was implemented in 2005 to replace what had become called the "cash and carry" system. The program was decentralized to the District level (171 districts), and required individuals to register with an administrative office in each district to participate in a National/District Mutual Health Insurance Scheme (DMHIS). These district administration offices were responsible for issuing district membership cards to those paying an unspecified registration fee for a year's coverage. Thereafter, annual premiums were required to continue coverage, with certain groups provided price exemptions.

After the initial registration-year of insurance, annual premiums paid at the district administration office are legislated to be between 7.2 and 48 GH Cedes (or about 4

to 24 US$). The legislation indicated premiums would be adjusted to the individual's "ability to pay" (Mensah, et al. 2010; Jehu-Appiah, et al., 2011; Blanchet et al. 2012; Aboagye and Agyemang, 2013). Children under 18 are covered for no extra charge, if their parents are covered, although the requirement that parents be covered to qualify their children for insurance may have been relaxed over time. Individuals age 70 and older are covered without an annual premium, as are "indigents" (poor with no means of support) who amounted to only about 2 percent of the NHIS members by 2008, as shown in Appendix Table A-1, Panel A (Cf. Witter and Garshong, 2009). Although the provision of free maternal health care was financed after 2004 by a Highly Indebted Poor Country (HIPC) relief fund established by international donors, financial obligation for maternal care was assumed in 2008 by NHIS. Woman who are at least three months pregnant qualify for free prenatal and postnatal care, as well as their delivery. However, family planning services or supplies, or abortion procedures, which are legal in Ghana, are not covered by the NHIS, and pregnant women are not distinguished consistently by the National Health Insurance Authority (NHIA) (Cf. Table A-1; Witter and Garshong, 2009; Aboagye and Agyemang, 2013).

The financing of the NHIS comes from four sources (NHIA, 2009, 2011; Cf. Appendix Table A-1, Panel A): a 2.5% sales tax (Value Added Tax) is collected by the Central Government, which constituted about 61 percent of the revenues in 2009 of the National Health Insurance Fund (NHIF) and has increased to 74 percent by 2012 ; 16 percent of the revenues of the NHIF in 2009 were from the Social Security National Insurance Trust which transfers to NHIF 2.5 percent of employee wages enrolled in the social security pension system or receive pensions from this system; 4 percent of the NHIF revenues are derived from NHIS member registration fees and annual premiums in 2009 (Blanchet, et al. 2012); investment income and other forms of central budget support amounted to a further 20 percent of program funds in 2009.

Participation rates of the population in the NHIS have been assessed by various household surveys and program administrative records. Of the persons registered under the NHIS in the 2005 Ghana Living Standards Survey (GLSS 5), at least 95 percent were under the District Mutual Insurance Schemes, 2 percent are covered by social security wage deductions, and 1.2 percent from private mutual insurance (Ghana Statistical Service, 2008: Table 3.23). In sum, virtually all health

insurance in Ghana is administered under the DMHIS, and only a couple of percent of individuals work in the formal sector NS are subject to mandatory wage deduction to pay their insurance premiums.

District NHIS offices reimburse accredited local health care providers for invoiced services, consumed by persons insured under the NHIS. Invoices for services have been standardized into diagnostic related groups, for which reimbursed prices are set at the national level.[2] The range of health care services provided under NHIS is comprehensive (including 95 percent of the burden of medical conditions in Ghana, according to the NHIS website), but excludes care for some chronic diseases, such as most cancers (except breast and cervix), cardiovascular surgery, organ transplants, and dialysis. Specific funding is available for HIV. Coverage included preventive care and vaccinations, treatment of infectious and parasitic disease, in- and-out-patient services, oral and eye care, and emergencies (Mensah et al, 2010).

There is controversy on how rapidly and equitably the NHIS expanded its coverage of the population, and whether it is sustainable financially, given the requirement for advanced payment for the insurance, and the complexity of administering district decentralized membership records, and complaints from providers who want to be reimbursed more quickly. Oxfam (2011) and some other NGOs criticized the lack of transparency of program evaluations, its financial accounting, and the requirement that most people pay in advance for their health insurance.

NHIS coverage of the Ghanaian population may be increasing, but remains short of universal according to a variety of representative surveys and administrative statistics. The Ghana Living Standards Survey of 2005 (GLSS 5) reports that 16 percent of the population reported themselves as covered under the NHIS after the program had been in operation for less than a year (Ghana Statistical Service, 2008: Table 3.21). Witter and Gershong (2009), citing health sector reviews,

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[2] With the expanding coverage of the NHIS, the uninsured may face a higher price for medical services if the NHIS has contributed to driving up prices in the private marketplace (Witter and Garshong, 2009). A parallel situation occurred in Indonesia where a maternal midwife health subsidy for the poor raised the prices of midwife-services for the uninsured or non-poor, and diminished demand for this form of health care among the uninsured (Triyana, 2013).

conclude that 19 percent of the population was covered in 2005, and 54 percent by 2008. The Ghana Demographic Health Survey collected in 2008 reports that NHIS coverage stood at 39 percent of the women age 15 to 49 and 29 percent of the men age 15 to 49 (GDHS, 2009: Tables 3.8.1 and 3.8.2). According to the 2012 GLSS 6 , 71 percent of females and 64 percent of males are registered or covered (GLSS 6 , Table 4.21). When survey respondents are asked in 2012 for why they are not registered or covered, their answers point to salient barriers to enrollment: about 10 percent of the respondents report the premiums are too high, 11% think they do not need insurance, 4.3 percent indicate the registration office is too far away, less than one percent say they did not know where to register or had no knowledge of the program. The majority (56 %) of those not registered say they had no money (Table 4.22). The NHIS website (www.nhis.gov.gh/ contacted August 20, 2013) reported that as of June 2010, 66 percent of the population is registered in the NHIS administrative data base, and 54 percent are active (currently covered). This paper considers those ever-registered in the NHIS as of 2009-10 in the GSEPS I, and those who are covered or had a valid current NHIS health insurance card. The Demographic Health Survey from 2014 adds subsequent estimates of the slowly growing coverage of the NHIS, but notes the widespread satisfaction of those who decided to enroll and use the NHIS. According to the nationally representative 2009-10 GSEPS I survey 51 percent of females over the age of 18 are registered, whereas 33 percent are currently covered. Among males over age 18 42 percent are registered and 27 percent covered. A policy objective is to understand why so few are enrolled in the health insurance scheme that is almost entirely subsidized by the state.

3. Demand for Health Insurance

An individual's demand for health insurance, such as provided in Ghana by the NHIS, may be affected by many observed and unobserved factors.[3] Permanent income, approximated here by household consumption per adult or per capita, is expected to increase generally the demand for health insurance, but at a diminishing rate, and is thus expressed here in logarithms. As income (assets and

[3] The legislation states that NHIS is compulsory, but in fact it requires the voluntary prepayment of membership fees for all but a small fraction of persons in the social security system (2%) and those exempted as indigent from payment of NHIS fees (1%) as described in Appendix Table A-1 Panel B, and from the GSEPS in Table 3.

human capital) increases, individuals may be less credit constrained in dealing the financial risks associated with illness, and can self-insure. The modest limitations of NHIS coverage may nonetheless be less attractive than private market alternatives with increasing household wealth.[4]

Conversely, a higher price of registration and annual renewal, Pr and Pa, implemented at the level of the district DMHIS are expected to reduce the demand for the insurance in the district, other things being equal. In addition, a greater distance, D, measured in kilometers between the household and the District insurance office, approximates the time required by the consumer to register and renew her insurance, and is expected to diminish insurance demand, other things equal.

The individual's expected need for (or utility from) health care, N, may increase demand for health insurance, captured in part by socioeconomic and demographic controls for the adult's schooling, age, and gender (i.e. S, A, G).

Insurance is a complex inter-temporal contract that requires current payments involving reduced savings or consumption today of items other than health care in exchange for future uncertain health care benefits, if available and needed. Plausible models for such demand can be specified, which often postulate utility maximizing behavior on the part of the individual with systematic discounting over time, specified forms of aversion to risk, and access to credit. These models are difficult to confirm empirically or externally validate, because they imply few predictions that can be empirically rejected with observational data (Cameron, et al.1988; Cameron and Trivedi. 1991). Social attitudes in Ghana toward modern and traditional forms of medicine may also influence preferences for the NHIS that is geared toward providing consumers with modern medical care. These attitudes may systematically differ by an individual's schooling, age, and gender, which may also affect an individual's understanding of how health is produced, and the effectiveness of local health care providers. Even when health insurance is priced at less than costs of production or its apparent actuarial (human capital) value, as is the case with the NHIS, many individuals do not enroll, as illustrated by the recent

[4] NHIS may not reimburse all forms of care, excluding some forms of high priced private facilities, traditional care and healing, and excluding some medical treatments and drugs not on the "essential drug list".

U.S. experience.[5] First, reduced-form linear additive equations (1) are estimated to approximate individual demand for health insurance, I, with the unexplained error, e_1, that embodies the effect of unobserved variables, errors in measurement, functional forms, and random variation:

(1) $I = I (C, Pr , Pa , D, N, S, A, G, e_1)$.

Specific features of the NHIS affect how these general constraints on the demand for health insurance may be incorporated into the empirical estimation in Ghana. First, the health insurance decision for virtually all Ghanaians is a binary choice between having no health insurance, or buying into the NHIS package. In other words, this decision is for virtually all Ghanaians unrelated to their employment, and the extent of coverage or limits of deductibles is not subject to individual choice. A reduced form equation (1) is specified as a logit model estimated by maximum likelihood methods for whether individuals have ever registered for health insurance, R, and whether they currently have a valid health insurance card, or are now covered, C. The working assumption is that the observed individual characteristics and district insurance prices and accessibility in (1) are independent of unobserved personal preferences and needs for health insurance. To be confident that this working assumption is satisfied, the health insurance might be

[5] For example, enrollment in a subsidized health insurance programs in Kerala, India occurs more often among higher income and better educated populations, as is common elsewhere. To provide information on how the insurance policies operated, insurance consultants were hired, and were motivated by an incentive from the price of the policies they sold. This arrangement may explain why the consultants increased adoption rates primarily among higher income groups, who were more likely to buy more expensive insurance plans (Vellakkal, 2013). Banerjee, et al (2014) found in India that when subsidized health insurance was added to micro finance loans upon renewal, loan recipients were less likely to renew their loan combined with the subsidized insurance, indicating that the clients did not value the health insurance more highly than the subsidized add-on price. Ghana has employed some field workers in the NHIS to provide information and recruit new members, but I could not locate expenditures on these outreach efforts by district or region to include them in this study. Subsidized health insurance for the poor has been introduced in Colombia (Trujillo, et al. 2005), and in Mexico and Nicaragua for those in the informal sector (Knaul and Frenk, 2005; Thornton, et al., 2010), and extended in rural China (Wagstaff, et al., 2009), and Viet Nam (Wagstaff, 2010). India's health insurance for the poor (RSBY) has received more favorable evaluations, but mostly in terms of the program increasing the use of hospital care and not in improving it quality, or the efficient allocation of resources in the health system (Fan, 2013; Joshi and Sivaram, 2014). Another policy issue is whether such targeted programs to persons outside the formal sector of the economy reduces the incentives for adults to seek paid employment, which might deter less educated women and mothers from seeking employment in the formal sectors of the economy (Madden et al., 1995; Currie and Gruber, 1996; Levy, 2008; Thornton, et al. 2010; Aterido, et al. 2011; Acharya, et al., 2013).

offered or administered randomly to individuals or communities (Levy and Meltzer, 2008). The roll out of the Ghana NHIS did not include a national randomized control trial (RCT). One exception is a field experiment described by Asuming (2013), which is based on a sample of one district from one of the poorer Northern regions of Ghana, and it is described in section 4.

In this paper I estimate how the proximity to health insurance and health facilities and district prices of health insurance are related to the demand for health insurance. The next step in this research will be to evaluate how variation in NHIS enrollment induced by program proximity and price parameters influence the use of health inputs, health outcomes, and the out of pocket costs of health care for the individual or household. To proceed toward this goal requires the specification of variables that impact only the demand for insurance, but do not otherwise influence the utilization of health care, health, or financial outcomes, except by the mechanism of obtaining health insurance. These "exclusion restrictions" to identify statistically the role of health insurance on health behavior and outcomes are critical to evaluate the effects of analogous variations in consumer demands for other long run services (Manski and McFadden, 1982; Cameron et al. 1988). Another approach is to control for a propensity scores predicting the receipt of health insurance within various segments of a treated population (Trujillo et al. 2005; Mensah, et al., 2010). Even in this case, unobserved variables remain a potential source of bias, if matching variables are related to consumer preferences and personal health behavior and choices.

The NHIS legislation prescribes exemptions to the insurance price for certain vulnerable groups. Persons over age 69 qualify for a price exemption, and those under age 18 are also exempted from the premium price, if their mother (or father) is insured. But many children in a survey do not reside in a household with both of their parents, making it impossible to determine empirically if the children are exempted, and the application of these rules may be subject to local interpretation. Pregnant women are legislatively exempted from NHIS payments after they are three months pregnant, but not all women who report themselves pregnant indicate they are covered or exempted from the insurance price.

The NHIS legislation indicates that premiums, or prices charged for annual insurance coverage, are to be based on "ability to pay", but does not specify how

this is measured for applicants (Act 650, www.nhis.gov.gh/). It is undoubtedly difficult for a district insurance administrator to assess "ability to pay" in a poor, predominantly small-farm, agricultural society or in a poor mobile urban society. Years of schooling completed is positively related to the labor earnings of both men and women in Ghana, as confirmed by repeated representative GLSS surveys conducted by the Ghana Statistical Service since 1988 (Schultz, 2004). Schooling is, therefore, treated here as an observable indicator of adult "ability to pay" just as is the log of consumption per capita can predict household ability to pay. The expected positive income effect associated with schooling or consumption on the demand for health insurance may be partly offset in Ghana, if the better educated applicant from a higher household consumption reports paying higher health insurance premiums within their district, which would presumably not be a reflection of different insurance quality between districts (Deaton, 1997).

Living in urban areas or nearer to health facility provides an individual with more experience with the modern health care system and is expected to increase her willingness to pay to join the NHIS. According to the GSEPS, 96 percent of the adults who had ever registered with the NHIS had used their health card to pay for their care in the last 12 months, indicating that those who have registered have accumulated experience obtaining health care through the NHIS. Empirical studies of the demand for health insurance have not found consistent relationships between the receipt of health insurance and available survey measures of income, but the positive empirical relationship between schooling and the demand for health insurance is a frequent finding (e.g. Cameron and Trivedi, 1991; Nguen and Knowles. 2010; discussed in footnote 4).

A third factor affecting the demand for health insurance is the need for health care, or the expected future welfare gain from receiving such care. This motivation could depend on risk aversion or current and expected health status, and contribute to what is called "adverse selection", which is expected to raise public expenditures on insurance per enrollee. In other words, insurance may be demanded by those who might otherwise incur a greater financial hardship if they remained uninsured. Some research finds evidence of "adverse" selection of the less healthy demanding more health insurance, but this form of selection is not generally documented in low income countries, perhaps because of the health

inequality (Pauly, 1986; Pauly and Zweifel et al, 2006). [6]

Insurance and credit may be coordinated institutions in poor agricultural communities to help smooth consumption over time, such as documented in Northern Nigeria (Udry, 1994) or India (Townsend, 1994). Shocks to production in poor rural areas due to variation in weather are often salient, but shocks to health can also reduce family income/profit, as sick family members are unable to work, and increased expenditures on health care reduces other forms of consumption or wealth accumulation. If the health shocks are idiosyncratic or are not attributable to negligence or risky behavior, informal health insurance in the extended family or community could substitute for formal health insurance. [7]

Public health insurance, such as the NHIS, may affect the functioning of the labor market. Providing workers in the informal sector with comprehensive health insurance erodes the incentives for people to search for employment in the public sector or formal sector firms, which might offer health benefits. The NHIS thus reduces the incentive for the covered population to search for and accept a job in the formal sector, potentially increasing the number working as self employed or in unpaid capacities within their families.[8]

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[6] Nor is there agreement on how to measure the expected need for or value of health care on the demand for health insurance. Predicted health has been empirically measured by current or lagged health seeking behavior, such as past expenditures on health care, medically diagnosed chronic health problems, and days recently unable to work due to illness, and could be viewed as a lagged endogenous variable that is not independent or predetermined. The empirical evidence of the adverse selection relationship between these prior indicators of health and insurance demand are not robust in low or high income countries, and the direction of causality remains ambiguous (Cameron and Trivedi, 1991; Vellakkal, 2013; Wagstaff and Manachotphong, 2012).

[7] Forms of insurance for other risks are examined in agriculture, but are less often studied in relation to the adoption of formal health insurance (Rosenzweig and Mobarak, 2012; Karlan, et al., 2013). Health risks in a locality may depress wage opportunities in the formal wage labor force when employers do not deduct from compensation for the days an employee is unable to work. Moreover, these spillovers from local health conditions to formal wage rates are expected to be stronger for women than for men, if women's contracted labor supply is less reliable, possibly because women customarily care for the ill within the family, as in a case study of Mexico (Gutierrez, 2011). Alsan (2016) finds that young girls benefited from more primary schooling when they have younger siblings after Turkey coordinated a program of childhood immunization that is credited with reducing childhood morbidity and mortality, whereas there was no significant advance in the schooling of boys.

[8] Health reforms in Mexico and Colombia have been studied as a cause for diminished formal sector labor force participation, and though some effects in the expected direction are found, they do not seem substantial enough to offset the benefits of extending health insurance (Knaul and Frenk, 2005; Levy, 2008; Thornton, et al. 2010;

Uninsured health shocks can lead to financial problems for a poor family, especially when credit is not widely available. There are, however, examples where the provision of health insurance does not reduce out-of- pocket medical expenditures, as noted in rural China (Wagstaff et al. 2009). This outcome is attributed to the Chinese setting to the fact that the community medical insurance subsidized primarily tertiary medical care that poor rural families would not otherwise have used without insurance. Studies that fail to adjust for the selection bias of individuals who enroll in health insurance are likely to find more medical care consumed by the insured than the uninsured. Although matching methodologies try to deal with this sample selection problem, selection due to unobserved traits may still introduce bias (Mensah et al. 2010; Blankett et al. 2012; Bhasin, 2013; Gajate-Garrido and Ahiadeke, 2012; Kusi, et al. 2015).

In sum, the empirical specification of the determinants of demand for health insurance includes household consumption, district money prices of registration and annual premiums, distance to the district insurance office, nationally legislated eligibility for premium exemptions, and controls for the effects of urban/rural residence, schooling, age and sex of the applicant.

4. Data and the Setting in Ghana and Results from Prior Evaluations

This paper analyzes the first wave of the Ghana Socioeconomic Panel Survey (GSEPS I) collected from November 2009 to April 2010 by the Economic Growth Center of Yale University and the Institute of Statistical, Social & Economic Research (ISSER) of the University of Ghana, Legon.[9] The GSEPS is a representative household sample stratified at the level of the 10 regions (states) of Ghana, and drawn from 325 random census enumeration areas (EA), from which about 15 households are randomly selected from each EA. Coordinated surveys describe conditions and institutions in each rural or urban EA. The GSEPS includes a response for 18,889 individuals resident in 5009 households. As already

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Aterido, et al. 2011; Acharya, et al., 2013; Kusi, et al. 2015). As noted earlier, only a couple of percent of the Ghana adult population receives health insurance through their employer.

[9] A description is available at www.econ.yale.edu/~egcenter/egc_ISSER_overview2012.html.

noted, the administration of the District (Mutual) Health Insurance Scheme (DMHIS) is decentralized to the level of the District, and the GSEPS includes households in 115 of these 171 Districts. Global Positioning System (GPS) coordinates are coded at the household level and are used to approximate the distance from each household to the nearest District MHIS office, and the distance to nearest health facility as described in the GSEPS.

A brief description of Ghana and previous evaluations of the NHIS provide the context for this study. Ghana had an estimated population in 2009 of about 23 million, of whom 69 percent lived in rural areas and 31 percent in urban areas, according to the GSEPS (Appendix Table A-2). Gross National Income per capita, adjusted for purchasing power parity (relative prices) was US$2154 in 2009, and had been growing relatively rapidly in the decade before the survey. Half of the labor force is employed in agriculture, contributing a quarter of the national income, with cocoa being a major export, whereas the 15 percent of the labor force in industry contributes 27 percent of GDP, with the balance being in services (World Bank Data Bank, 2013). According to the GSEPS, 36 percent of respondents age 19 or more have never attended school; 13 percent reported completing no more than 1-6 years of primary school, 36 percent some junior secondary or middle school (3-4 years); 9.5 percent some senior secondary school (3-5 years), and the remaining 5.5 percent completing some tertiary schooling (1-5 years), including teacher training and technical/professional educational institutions. Older women received substantially less schooling than men of the same age, though this gender gap in schooling has nearly closed in the current school-aged population, except at the tertiary level. Life expectancy at birth is estimated to be 68 years in 2009, with a four year gap favoring women, and child mortality under age five is about 53 per 1000 live births (World Bank, Data Bank). From 1995 to 2009 public expenditures on health increased 13 percent more rapidly than did GDP, and public health expenditures channeled through the NHIF that reimburses the NHIS contributed to this marked shift of health expenditures from private to public sources (Witter and Garshong, 2009; Schieber, et al. 2012; Powell-Jackson, et al. 2014).

Several studies evaluate the impact of the NHIS on the use of health care services, and on the determinants of NHIS enrollment. Witter and Garshong (2009) trace the frequency of in-patient visits over time and conclude that the increase in in-patient

visits after 2005 is due to the implementation of the NHIS.

A purposive sample survey from urban and rural districts in the Central and Volta Regions of Ghana collected in 2007 suggest that pregnant women who are voluntarily enrolled in NHIS are more likely to receive prenatal care, give birth in a hospital, and have a skilled attendant at their birth, than are women without coverage under NHIS, using a propensity score matching methodology based on survey observables to adjust for the differences between those enrolled in the NHIS and other pregnant women. These NHIS treatment-associated differences are substantial and significant under a variety of statistical assumptions on how the matching is performed (Mensah, et al. 2010).

A representative survey of Central and Eastern Regions of Ghana collected in April 2009 has been analyzed to understand who is enrolling in the NHIS and why (Jehu-Appiah, et al. 2011). A multinomial logistic regression is estimated for whether a household is currently enrolled in the NHIS, or never enrolled, or only previously enrolled. This three way outcome is fit to 35 explanatory variables within quintiles of households defined by consumption expenditures. Several of the explanatory variables are intended to summarize the respondent's assessments of the quality, convenience, benefits, adequacy, price, and the attitudes of those providing local health services. Schooling at various levels and urban residence are consistent positively related to current NHIS enrollment, whereas subjective reports of good health status (adverse selection), log household expenditures, and household size are not shown to be related to current enrollment

Blanchet et al. (2012) study a representative survey of women age 18 and older residing in the Accra Metropolitan Area (WHSA) collected in 2008 and 2009. They report health care use is generally greater among women who are voluntarily enrolled in the NHIS. Moreover, the greater use of health care among the insured remains significant and substantial after controlling by propensity score matching on survey observables. The probability that those enrolled use a clinic in the past year is 40 percent larger, overnight stays in a hospital 83 percent more likely, and having a drug prescription 57 percent more likely among the NHIS insured women than among uninsured women.

A representative survey of 5465 women of child bearing age in seven districts in

North East Ghana in 2011 indicated that 60 percent of respondents were registered with the NHIS, and 40 percent had valid current insurance cards, or were covered. Of women with no schooling, 37 percent were insured; of those with at most primary or junior secondary education 41 percent were insured, and of those with some senior secondary or tertiary education 65 percent were insured (Akuzili, et al. 2014).

A randomized field experiment provides the basis for estimating the NHIS enrollment effects of program fee subsidies, supplemental program information, and improved geographical access to NHIS offices (Asuming, 2013). The experiment was conducted over seven months in 2011-2012 across 680 communities in the poor rural district of Wa West, in the Upper West Region of Ghana. The magnitude of the insurance subsidy varied from a none (control) to 1/3 to 2/3 to a full annual subsidy, and the experiment also included subgroups treated to an information session in the community about the NHIS, and a treatment designed to make enrollment more convenient and accessible in this remote area by providing agents who would collect registration and renewal forms and process them at the district office of the DMHIS. Interactions between the subsidy, information, and access interventions were also experimentally introduced to assess complementarity among the three treatments.

Although the administrative access treatment did not have a significant effect on the probability of enrollment, the insurance subsidies and information intervention were both related to increased enrollment in NHIS. Individual education and household wealth were positively associated with enrollment when included as controls, and program subsidies had larger effects on the poorest individuals and on those with no schooling. The size of the subsidy increased the uptake of insurance, but not by a significant differential amount. This study found substantial NHIS enrollment increases due to the fee subsidies, as well as with the information treatment, especially among the least educated population. The reduced-form effect of the treatment on utilization of health care, or the two-stage estimate of treatment on insurance uptake and on use of health care did not find that subsidies consistently increased visits to health facilities or reduced out of pocket medical expenditures, two common objectives of health insurance. Whether these experimental results are indicative of the consequences of such variations in the program design in other regions of Ghana cannot be inferred.

5. Empirical Results

5.1 Aggregate Variation in Insurance Prices and Insurance Enrollment

The population "ever registered" and currently "covered" by a health insurance scheme is reported in Table 1, according to the 2009-10 GSEPS, in the upper panel by age groups and gender, and in the lower panel by three ecological zones of Ghana (Savanna-North, Forest-middle, and Coastal-South), rural/urban, and gender. Forty six percent of the population had ever registered in a health insurance scheme, and 30 percent are currently covered in 2009-10, and consequently 16 percent registered and dropped their coverage under the health insurance scheme. Registration and coverage is greater among those over age 69, who are officially exempt from fees, and more frequent among women than men. The registration and coverage is greater in urban than rural areas of the population, and is unexpectedly higher in the Savanna regional zone, which is generally poorer than the rest of Ghana. More than 95 percent of those who are registered with a health insurance system enrolled directly in a decentralized District Mutual Health Insurance Scheme (DMHIS), and only a couple of percent of the population obtain DMHIS insurance through their formal sector employer and the social security pension system, and a few percent from a private commercial health insurance scheme, or community group, such as a church.[10]

Table 2 describes the educational composition of the adult population as recorded in the 2009-10 GSEPS. The first panel shows the percentage distribution of females and males age 19 or older by the highest level of education obtained. The second and third panel shows the extent to which males are better educated than females, but females are more likely to be registered or currently insured in the NHIS than males. For both men and women, those with more schooling are more likely to be registered and insured. The ratio of insured in the higher education categories to the lower education categories tends to be larger than for the registered, implying that the proportion of the registered who renew that coverage

[10] GSEPS tabulations are performed by the author, and are not precisely the same samples as later included in the regression analysis with no missing variables in the benchmark specification.

with annual premiums is also larger for the more educated.

The GESPS reports who paid for each individual to be registered or paid her annual premium with the DMHIS, and the responses are summarized in Table 3. Some respondents may not have understood who was eligible for the insurance price exemptions or who was actually paying for their NHIS coverage. For example, of the 947 individuals in the GSEPS over age 69 who are officially exempt from paying premiums for their health insurance, only 424 are reported as covered by the NHIS, and among these covered, only 209 indicate in Table 3 that they are exempted from paying for the cost of their health insurance, and another 81 are exempted from registration fees. Among the elderly, 134 report others, e.g. relatives, are paying for their insurance coverage. Similar differences exist among the elderly who report having paid initial registration fees to the NHIS.

Of the 4210 women age 15 to 49, 31 percent are current insured by the NHIS, and this insured share increases to 37 percent for those who are pregnant at the time of the GSEPS, less than the universal coverage offered by the legislation. Of the 246 women who were pregnant in in the last 12 months, 94 percent of those with health insurance coverage received some prenatal care, whereas among uninsured pregnant women, 82 percent received prenatal care. This difference in obtaining any prenatal care associated with current insured status is not significant according to the design-based Pearson test.[11]

5.2 Determinants of Registration Fees and Annual Premiums for Insurance

Survey respondents in the GESEP are asked what they paid to register with the DMHIS and what they paid for their annual premium, including those who report paying nothing for these enrollments. There are substantial differences in these fees across districts. Registration fees are reported by 6473 individuals resident in 108 Districts. District dummy variables account to 29 percent of the variation in

[11] After controlling for age, five levels of years of schooling, and urban residence, the women with a pregnancy and covered are more likely to have had prenatal care ($t = 3.60$). However, enrollment in the NHIS is not random; it is a voluntary choice for most people. Even for those who are initially covered by the social security health insurance, they must register with their district insurance office to be covered by NHIS. Thus, this pattern of utilization of health care should not be interpreted as causal evidence that the health insurance coverage is responsible for this increased use of prenatal health care (Levy and Meltzer, 2008).

reported registration prices. The sample weighted mean registration price is 4.93 GH Cedis (or about US$ 2.44); the standard deviation (sd) = 5.54 Cedis. Annual premiums are reported in the GSEPS by 5151 individuals, and are also significantly related to 108 district dummy variables, which explain 18 percent of the individual variance in prices. The average premium paid is about twice as large as the registration fee, 10.2 GH Cedis; sd = 8.87.

Because some groups are exempted from paying these insurance fees and others may have their fees adjusted according to their "ability to pay", registration fees and premiums may be explained by various socioeconomic controls as listed in Table 4, first for adults over age 18, and then for children under age 19, who might have been exempted from insurance fees in the previous year because their parents were covered. Controls include the individual's gender, age (5 categories, including the NHIS exemption for the elderly over 69), log of household consumption per adult, years of schooling completed for adults by five levels using a linear spline, urban/rural residence, distance in km. to the nearest insurance office, distance to nearest medical facility, and a dummy variable for households which did not have gps coordinates and hence no distance measures. These and all subsequent logit regression estimates of binary insurance enrollment are weighted by the survey (ppweight), and the standard errors of the estimated coefficients are adjusted for the correlations within the sampled clusters.

Registration fees and premiums are lower for children under 19, and lower for the elderly over 69, compared in the adults to the omitted age group 19 to 34, and higher for urban residents; these regularities are generally consistent with the goals of the NHIS legislation and the cross tabulations in Tables 1 and 2. Col. (1) and (3) in Table 4 report the results only for adults, for whom schooling is an indicator of lifetime human capital and earning opportunities. Schooling is not associated systematically with the registration fees, although the annual premiums are lower for those with no schooling, and somewhat more for those with more tertiary education, but not with the inclusion of district fixed effects. Registration fees are higher for adults in households with proportionately greater consumption per adult, even after controlling for district fixed effects. Increasing household consumption per adult by one standard deviation (+.878) is associated in the logit estimates for registration fees in col. 1, Table 4 of an increase in of .51 Cedis, compared with the mean registration fee of 5.99 or a 8.5 percent rise for a household with 141

percent more consumption per adult. This association of registration fees with consumption increases when district fixed effects are included. The association between the standard deviation increase in consumption and the premium is .85 Cedis (marginal effect of .964 in col. 4, times .878) , which is equal to only a 6.7 percent increase, which is no longer significant in col. 4 when district effects are controlled. Schooling which is generally significant without a control for consumption does not contribute partially to the explanation or registration or premiums in Table 4. One interpretation of these socioeconomic patterns of individual insurance pricing is that district administrators of the health insurance system did not adjust the insurance premiums within districts to be commensurate with the adult applicant's "ability to pay" as prescribed in the NHIS legislation, while district differences capture most of the differences in insurance premiums associated with the education and consumption of the adult. Less of the individual variation in registration fees or annual premiums is explained for children than for adults, consistent with some children being registered and covered without paying.

The price variation of 2 to 4 Cedis within districts is an important sign that the price exemption for the elderly is widely enforced, and the insurance prices in urban areas remain significantly higher even when measured within districts, where registration fees are 2.15 Cedis higher and premiums are 1.76 Cedis more. The NHIS price differences for adults by district remain jointly significant at conventional levels in col. (3) and (6) of Table 4, with the R^2 increasing .069 to .382 for registration fees, and from .086 to .246 for annual premiums, after including the 14 socioeconomic controls. An objective of this paper is to now estimate how these district price effects are presumed to inversely affect individual demand for the health insurance, both registration and current coverage under the NHIS.

These survey samples of persons who report what they paid for health insurance are not necessarily representative of the prices faced by all people in Ghana who are offered the opportunity to enroll in the DMHIS. In other words, the samples include disproportionately those who actually registered and renewed their insurance in the past and are consequently able to report what they paid. These reported "prices" for the NHIS can be therefore be thought of as endogenous, at least at the individual level, with their demand for health insurance and potentially their other health-related behavior will be potentially heterogeneous, or possibly

correlated with the local quality of care or institutional supply conditions, and the demand for health care induced by the prevalence of local diseases and challenging features of the health environment. Reported payments are, therefore, averaged across individuals in each district, to obtain the district-wide average price, in an effort to mitigate the bias due to the endogenous source of individual district prices. The working assumption is that the partial associations estimated in the next section between the demand for health insurance and the district averaged prices approximate the influence of exogenous variation in insurance prices for similar types of individuals, to the extent that individual heterogeneity is captured by the control variables.

These district averaged prices for the NHIS are assumed to be representative of an individual's price and are imputed to all individuals in the survey on the basis of their district of residence, regardless of whether they reported what they paid.[12] To the extent that higher district prices of the health insurance reduces the demand for health insurance, the inter-zone variation in prices noted earlier should contribute to greater demand for health insurance in the poorer Savanna zone and in the poorer rural compared to urban areas of each zone, as reflected in Table 1. These broad regional patterns of price variation by district in the DMHIS may thus narrow regional inequalities in access to health insurance, but may not eliminate socioeconomic inequalities within and between districts that are related to individual educational attainment and household consumption levels.

5.3 The Distance from Households to a District Insurance Office and Health Facilities

A second indicator of the private cost of enrolling in the DMHIS is the distance between the household and the administrative office of the district mutual health insurance scheme. However, because this distance is positively related to the

[12] These district averaged registration fees and premiums tend to be lower in the Savanna than in the Forest or Coastal zone, while the rural prices are generally lower than urban fees, except in one case with registration fees in the Forest zone. Individuals in districts in the rural areas of the Northern Savanna zone report the lowest average registration fee of 2.84 GH Cedis, whereas the average annual premium is 8.14 Cedis. In the urban areas of the Savanna the registration fee averaged 4.99 Cedis and the average premium is 9.29. In the Forest zone the rural registration fee is 5.87, whereas the premium is 10.4, while in the urban areas the registration fee is 5.05 and the premium is 11.5. In the Southern Coastal zone including Accra the registration fee in rural areas is 6.05 and the premium 11.4, whereas in urban areas they are 7.74 and 13.5 Cedis, respectively.

distance to medical facilities that might influence their prior use and affect their future demand for these services, both distance variables are included as possible controls for demand. This specification may help to discriminate between two possible mechanisms: one involving consumer-time costs associated with the registering and renewing coverage at the insurance office, and the other mechanism involving the convenience, cost, and consumer's experience with using the medical system, because she lives closer to a health facility.[13] Clearly, in the sparsely populated parts of Ghana both indicators of distance to the insurance office and medical facilities will be above average.

Multi-collinearity among the explanatory variables in the implied empirical specification of the demand relationship for health insurance can be addressed in a variety of ways. First, the registration fee and premium are highly correlated, .39, both of which are averaged across different survey respondents at the district level. This covariation in NHIS prices might reflect omitted variables that could also influence demands. For example, district administrators might vary both of these NHIS fees to compensate for variation in local prices of private health care, or to narrow imbalances between district insurance reimbursements of health expenditures and the revenues centrally allocated by the NHIA to each district for health care providers.

A second source of multicollinearity is due to the correlation between the distance to the DMHIS office and distance to a medical facility, which are positively correlated at .36. The estimation of the separate effects of these price and proximity variables on health insurance uptake should therefore be interpreted with caution and at a minimum their explanatory significance might be tested jointly.

5.4 Sampling Errors and Individual Reports of Health Insurance Payments

The average district prices for health insurance derived from a household survey have the additional problem of sampling measurement error, because they are based on different numbers of price respondents across sampled districts. In the extreme case, if no one surveyed in a particular district reports what they paid as a

[13] The choice of residence may be influenced by proximity to medical facilities and government offices, though the DMHIS offices were only opened after 2005, four years before the 2009 GSEPS, and are unlikely to have been an important factor influencing interregional migration and residential location.

registration fee or a renewal premium for health insurance, the district price cannot be inferred directly. This could introduce a possible sample selection bias into the cross sectional comparisons of district prices and individual demand.[14]

This strategy to estimate the effect of decentralized prices on insurance demand is unable to adjust for the tendency for district average price variables to be measured with less sampling error in those districts with more persons and more of them reporting prices. If this measurement error were classically distributed independently of the enrollment regression residuals, the estimated response of demand to the measured variation in district average prices would be biased toward zero. These classical assumptions are not likely to apply in the case at hand.

5.5 Reduced-Form Determinants of Registration and Coverage

The maximum likelihood estimates of a logit model for the probability of registration and currently insured are reported in Table 5, for adults age more than 18 in col. (1) and (3), for children less than age 19 in col. (2) and (4). Because of the nonlinear form of the logit model, the marginal effects of the explanatory variables are reported at the means of the samples. The sample statistics are in Appendix Table A-2, col. (1) and (2).[15]

The age, gender and schooling patterns of insurance registration and current coverage from the cross tabulations in Tables 1 and 2 are corroborated by the multivariate regressions estimated in Table 5. Although women are more likely to be insured then men, the price, income, consumption, schooling, and distance variables were not significantly different for females than males, and are

[14] There are 171 health districts in Ghana in 2009, and the GSEPS survey clusters include 115 districts, 6 of which have no individual reporting what they paid for their insurance premiums or registration fee. These 6 districts include 186 respondents out of the adult survey sample of 9700, or 2 percent, who are therefore dropped here from the estimation for the adult sample. When those missing district prices are included in parallel estimates, but with the addition of a control dummy variable for missing their price variables, no distinct changes in the estimated price elasticities were noted.

[15] The binary form of the dependent variables for registration and current coverage lead to the reported estimates of the demand equations using a logit regression specifications. But the marginal effects of the maximum likelihood logit estimates, evaluated at sample means of the explanatory variables, are similar to the probit estimates, and even the linear probability model when the coefficients of both models are statistically significantly different from zero at 5 percent confidence level.

consequently estimated here with only the difference in levels by gender. In col. (1) in Table 5, adults age 50 to 69 are 10.1 percentage points more likely to be registered than individuals age 19 to 34, the omitted age category, and 9.9 percentage points more likely to be currently insured in col. 3. The elderly, over age 69, are some 31 percentage points more likely to be registered, and 28 percentage points more likely to be currently insured than the excluded age group. Among adults, those with no schooling or differing only in years of primary schooling do not exhibit significantly different registration or coverage. Adults with more middle school, secondary school, and tertiary education are significantly associated with greater probability of registration and current coverage. The magnitude of the estimated effects of an additional year of schooling tends to increase at higher levels of education, as noted with respect to log wage returns to schooling in Ghana.[16]

Adults who had completed secondary school, equivalent to about 12 years of schooling, after the educational reforms in 1990 (World Bank, 2004: p. 9), have a probability of being ever-registered that is 17 percentage points higher than those who have just completed (6 years of) primary schooling, compared to the sample mean registration rate of .47. The probability of adults being current insured increases 16 percentage points for 12 years of schooling compared to those who complete no more than primary school. Each year of tertiary schooling is associated with 12 percentage points increase in registration and 7.5 percentage points greater probability of being currently insured.

A standard deviation (linearized approximation of variance in the adult weighted sample) increase in the distance from a household to the nearest NHIS office is 12.3 km. Increasing the distance to the NHIS office by this amount is estimated to reduce the probability of adult registration by .048 (-.0052 * 12.3), or by 10 percent of the sample mean registration probability. The current insurance rate is reduced by .0042 per km. to the insurance office, which implies a standard deviation increase would reduce the probability of being currently insured by .053, or by 17 percent of the sample mean. Increasing the distance from the household

[16] The number of youth reporting a price exemption from the NHIS does not decrease abruptly until they are older than 18. This might be explained if they were exempted in registering or renewing their coverage in the year before the survey when they were still 17. This restriction on the age limits of the child sample to include 18 did not have a noticeable effect on the estimates.

to the nearest health facility (standard deviation = 8.9 km.) is associated with a reduction in registration probability by 5.5 percent, and a reduction in current insurance probability by 8.7 percent of the sample mean, respectively. The urban/rural differentials between registration and between insurance coverage in the NHIS as shown in Table 1 are largely accounted for by the controls for by individual schooling and household consumption.

A standard deviation increase in the registration fee for adults in a district of 3.04 GH Cedis is associated with a decline in registration probability of .061, or by 12.8 percent of the sample mean of .473. This increase in registration fee is associated with a .046 decrease in the probability of being currently insured, or by 15 percent of the sample mean. A standard deviation increase in the district average insurance premium for adults is estimated to reduce registration by a smaller amount, or 5.1 percent, but the premium has no significant effect on the probability of being currently insured. The estimated partial effect of the district prices of registration on the registration for children is significant and of a similar magnitude as for adults, but the annual premiums are not related to the registration or current insurance status for children, probably due to the exemption from the premium for children when their parent is insured.

Household consumption per adult is significantly associated with both registration and who is currently insured, with a standard deviation increase in consumption associated with an increase in registration of .13 of the sample mean, and of .15 of the probability of being currently insured. In sum, registration fees appear to decrease registration markedly and coverage for both adults and children, although the annual premiums are less strongly associated with reduced enrollment than the initial registration fees. Moreover, the registration fee is a quantitatively important factor depressing the demand for health insurance for both adults and children.

Groups who are exempted from paying premiums for their insurance are expected to respond less (negatively) to district premiums in their demand for insurance than other groups. This hypothesis is tested by adding an interaction variable between the group exemption dummy, and the average district price. These price interactions are not significantly different from zero, however, for the exempted elderly group, or for women who are currently pregnant. But as noted earlier, knowledge of eligibility for an exemption from the price of health insurance may

not be universal given the complexity of this newly implemented program.

Three variables are hypothesized to identify independent variation in the demand for health insurance: the two district average prices of registration and annual premiums, and the distance from the household to the insurance office. These three variables are jointly significant for adults in Table 5 , col 1 and 3 at the .001 level (adjusted Wald test), as they are for children in col 2 and 4 , even though the premium price does not contribute to the significance for children, probably due to the child's exemption from premiums if a parent or guardian is insured.

5.6 Insurance Enrollment Behavior of Reproductive Aged Women

A goal of the health financing reforms in Ghana was to improve access of women to medical care for themselves and their families (Witter and Garshong, 2009; Mensah et al, 2010; Aboagye and Agyemang, 2013). Table 6 therefore reports in col. (1) and (4) the benchmark estimates for the adoption of health insurance for women in the reproductive ages of 19 to 49, to exclude those who might qualify for a price exemption as a child or elderly. Women who have completed secondary school are .16 more likely to be registered for the health insurance scheme compared to women who have not completed more than primary schooling, and report .16 greater probability of being currently insured; these represent a substantial increase of 32 percent in registration from the sample mean, and 52 percent increase in the proportion currently insured. The association between women with tertiary schooling and her registration and coverage is even larger and more significant, though it applies to a relatively small segment of the sampled population (Cf. Tables 2 and A-2). The partial association with urban residence is again not significantly related to registration or current coverage, when women's schooling and household consumption are controlled.

Logit regressions in Col. (2) and (5) in Table 6 adds as an explanatory variable the woman's number of living children. As speculated, her demand for insurance is greater, if she has more living children, who may qualify for insurance at no additional cost, if she is insured. A standard deviation increase in this measure of surviving fertility is 2.39 children, and it is associated with a 4.6 percentage point greater registration probability, and 3.3 percentage point greater coverage rates. In col. (3) and (6) a variable is added for whether the woman is pregnant at the time

of the survey, and this is also related to an increase in coverage probability of .048, but is not significantly associated with registration. Past fertility and current pregnancy are indicators of behavior that are expected to be correlated with a woman's preferences for both the number of children and investments in their children's human capital, and fertility is arguably jointly determined with her demand for health-insurance. Introducing fertility or household size as a control variable could, therefore, introduce simultaneous equations bias and lead to inconsistent final estimates of demand for health insurance, and therefore the benchmark estimates remain those in col.1 and 3.[17] However, in the current case of Ghana the other estimates of the demand determinants for health insurance in Table 6 are not notably changed by the inclusion of these two indicators of fertility.

5.7 Elasticity of Registration and Insurance Coverage

Table 7 converts the regression coefficients in Tables 5 and 6 into the elasticity of the registration and current insurance probabilities with respect to key determinants demand that might be interpreted as policy or control variables for the three distinguished demographic groups: adults older than 18, children under age 19, and women age 19 to 49. The distance between the household to the NHIS insurance office exerts a larger effect on registration of children than for adults or even women of childbearing age, namely -.21, -.22 and -.12, respectively. The elasticity of demand with respect to the distance to NHIS office is larger for currently insured. The elasticities of registration with respect to the distance to nearest health facility are all significantly negative, but substantially smaller than with respect to the distance to the NHIS office, -.029 -.046 , and -.039 for the three demographic samples, and larger in absolute value for the probability of being currently insured, -.057, -.097 , and -.065. The elasticity of registration with respect to the district average price of registration is -.25 for children, -.19 for adults, and -.18 for the sample of women. The elasticity of currently insured with respect to the district registration price are of similar magnitudes, -.19, -.21, and -.18. In none of the estimates are the district prices of the annual premium statistically significant related to insurance demand ($p<.05$). A ten percent increase in the log consumption per adult is related to 11 and 14 percent increase in children's registration and current coverage, respectively, and this relationship of

[17] Nonetheless, other empirical studies of the demand for health insurance have included controls for fertility or family size (e.g. Ngugen and Knowles, 2010; Cameron and Trivedi, 1991; Asuming, 2013).

consumption to health insurance is lower, though consistently significant, for all adults and the sample of women.

The three program variables that might independently motivate insurance enrollment into the NHIS are jointly statistically significant at a confidence level of .001 in the estimates for adults in Table 5, col 1 and 3. This suggests that these program variables may help to identify the individuals drawn into the NHIS and might shed light on the effects of insurance treatment on subsequent health outcomes. However, any adverse selection on unobservables of those who are less healthy into the insurance pool would introduce a downward (positive) bias into a two-stage estimation approach, if the other 13 control variables did not account for this propensity of sick to be more likely to enroll in the NHIS. A next step in this study will be assess how health outcomes captured in the survey are in fact associated with the program induced variation in insurance registration and coverage.

6. Conclusions

Because the Ghana National Health Insurance Scheme (NHIS) is administered at a decentralized district level, the registration fees and annual premiums differ by district, according to the 2009-10 Ghana Socio-Economic Panel Survey(GSEPS). These consumer-reported prices paid are averaged in this study by district to estimate whether these local prices are associated with consumer demands for the health-insurance. Earlier studies of the demand for health care in Ghana before the initiation of the NHIS have found, not surprisingly, that market prices reduce the demand for health care (Nyonator and Kutzin, 1999). Variation in district registration fees is shown to be negatively associated with registration and continuing renewal of health insurance, but contrary to expectation, the district annual premiums are not significantly associated with demand for health insurance, though registration fees do diminish the rate of registration for adults. The distance from the household to the district administrative office of the insurance system discourages consumer registration and coverage, as does the distance from the household to the nearest medical facility. Price exemptions from the health insurance scheme for the elderly over age 69, and for children under age 19, are associated with significantly higher insurance rates for these vulnerable demographic groups, compared to adults age 19 to 69. Although pregnant women

qualify for coverage under the NHIS without payment, the GSEPS does not clearly document that pregnant women recognize their eligibility. A growing scientific literature in low and high income countries documents that the nutritional status and health care of pregnant women can not only improve their pregnancy outcome in the short run, but also enhance their child's later health, cognitive capacity, and welfare in the long run (Almond and Mazumder, 2012; Currie and Vogl, 2013). The GSEPS does not indicate that the majority of pregnant women know that they are fully covered by the NHIS and this information gap may require a targeted information campaign or better services.

The legislation for NHIS (Act 650) states that insurance premiums are intended to be higher for individuals with greater "ability to pay", and it alludes to three socioeconomic classifications of this ability as a basis for setting NHIS premiums. The survey evidence indicates premiums are slightly higher for urban than for rural residents, and lower in the Northern Savanna region that is on average poorer. But the insurance prices paid by the better educated adults are not consistently greater than the prices paid by those with less than middle (9 years) schooling, either across districts, or within districts (Table 4). After 2011, 70 percent of the financing of the NHIS is derived from a flat 2.5 percent consumption tax, whereas only 5 percent comes from registration fees and annual premiums (Table A-1). Less educated consumers appear to be subsidizing the health insurance of the better educated (Table 2). The modest entry level registration fee appears, nonetheless, to be a significant barrier to participation in the health insurance scheme in Ghana. Households with greater consumption per adult are much more likely to be registered and currently covered by the NHIS, and one can only conclude that this concentration of enrollment among higher income households contributes to greater inequality in the receipt of health insurance and the use of the health care system in Ghana, an outcome that the NHIS was proposed to remedy.

Analogous situations arise with preventive health care, vaccinations, nutritional supplements, and new health products, where these health inputs appear to yield attractive lifetime returns for the individual and their families, as well as generate positive social externalities realized by those beyond the family, due to reductions in infectious and parasitic disease and environmental communicable health risks. However, the poor, less educated, rural populations are less likely to adopt these health inputs. In the case of malaria prevention, the random distribution of

mosquito bed nets in Kenya at heavily subsidized prices induced increases in uptake and use, and led to improved health outcomes for infants and mothers (Cohen and Dupas, 2010; Dupas, 2014). According to this study, eliminating the Ghana NHIS registration fee is estimated to increase by 20 percent child insurance coverage, and by 25 percent insurance coverage for adults or 17 percent for women age 19 to 49 (Table 7). The renewal annual premiums for health insurance in Ghana for adults over age 18 might also be administratively raised at the district level for those with more schooling or more visible wealth, such as housing, consumer durables, and land, without a significantly affecting insurance coverage, and thereby compensate for the lost revenue associated with the registration fees. The registration fee appears to be a key factor governing the willingness to sign up with the NHIS, and after a year premiums do not deter renewals. Health insurance registration cards in Ghana are being replaced by biometric identity cards, which may reduce the likelihood of fraud by both consumers and health care providers, and also coordinate health records across districts and not deter interdistrict mobility.

The distance from a residence to the NHIS office is another salient and unsurprising barrier to enrollment, especially for children (Table 7). Access might be improved if additional NHIS registration offices were provided in sparsely populated districts with relatively poor public transportation, even if these additional offices were open for only one day a week or a month, as an experimental approach for reducing the private travel costs that now may be restraining enrollment.[18]

There are favorable signs that the NHIS program is narrowing inequitable regional gaps in enrollment, though the progress is slow, uneven, and not well publicized. The registration-coverage rates were about twice as large in urban as in rural areas in the 2005-06 GLSS 5 survey, or specifically 23 percent urban vs. 13 percent rural take up. Four years later in 2009-10 GSEPS this urban-rural gap in program coverage had diminished to a third higher, or 42 percent urban vs. 32 percent rural (Ghana Statistical Service, GLSS 5, Table 3.21, and author's tabulations of the

[18] In the future, consumers could imagine paying their annual insurance fees by cellphone or the internet. Alternative interventions to inform and service a dispersed rural population might be tested by randomized field trials to determine those that are most cost effective in minimizing this barrier to registration and annual renewal.

GSEPS). The 2012-13 GLSS 6 (2014: page 38) suggests continued progress with the urban registration rate less than the rural, 64 versus 72 percent, because of a puzzling low take up in Accra, but the GLSS6 reports only a combined total of persons registered and currently covered, which does not appear comparable to the tabulations from other surveys. Further analysis of these more recent data is needed as well as the second round of the GSEPS to confirm the importance of variation in district registration fees for demand, and the modest effect of premium prices, and the disproportionate enrollments of NHIS among the better educated and richer households.

In sum, Ghana has implemented an ambitious National Health Insurance Scheme, and has registered in five years half of its population, a larger fraction than achieved by many voluntary national health or hospital insurance schemes in similar countries. But the composition of those who have enrolled in and benefitted more often from the NHIS public subsidy are better educated and higher income households, who are in a more favorable position to pay a larger share of the public cost of the NHIS. Modification in the placement of DMHIS administrative offices, a reduction in registration fees, and the adoption of more transparent and enforceable schedules for setting annual premiums according to individual schooling and wealth, could boost participation in the program, while advancing Ghana toward a more equitable sharing of any health benefits that flow from the health insurance scheme.

As the financial sustainability of NHIS is periodically challenged, there is an increasing need to document how the NHIS is affecting the use of health care and the consequences of the health insurance on the population's long run health status. Most studies of the NHIS report individuals who are voluntarily registered and insured are using health care more often, controlling in some cases for observed individual characteristics, by such methods as propensity score matching. Program evaluation also depends on identifying independent conditions that explain the likelihood that individuals enrolls in NHIS, but these conditions must not otherwise affect initial health status or health related behavior. Specifying these preconditions that alter the motivation to pay for or gain greater access to enroll in the NHIS that are not otherwise related to health outcomes is the empirical challenge confronting many health evaluation studies. According to this study, the proximity of individuals to NHIS administrative offices and health facilities, and

disparities in district pricing of registration fees influence program enrollment and may increase the use of health care and improve health, schooling, and labor productivity. Needless to say, investment in a nationally representative randomized control trial (RCT) could provide Ghana's policymaker with more convincing evidence on how to achieve efficiently and equitably the nation's health objectives. Both program evaluation based on observable characteristics of the population as presented here, and randomized control trials are warranted by the importance of this national program.

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TABLE 1: PROPORTION OF POPULATION EVER REGISTERED IN A HEALTH INSURANCE SCHEME AND CURRENTLY COVERED BY AGE, SEX, RURAL-URBAN, AND ECOLOGICAL ZONE

Sample Composition	FEMALE		MALE		TOTAL	
Dependent Category	EVER REGISTERED	CURRENTLY COVERED	EVER REGISTERED	CURRENTLY COVERED	EVER REGISTERED	CURRENTLY COVERED
Ages						
All Ages	0.483	0.312	0.438	0.280	0.462	0.297
Age 0-18	0.460	0.296	0.455	0.287	0.457	0.292
Age 19-34	0.490	0.319	0.359	0.225	0.437	0.281
Age 35-49	0.492	0.309	0.385	0.240	0.447	0.280
Age 50-69	0.515	0.337	0.481	0.328	0.498	0.333
Age 70-up	0.656	0.454	0.601	0.431	0.631	0.444
Regional Zones						
Savanna:						
Rural	0.478	0.273	0.451	0.253	0.465	0.263
Urban	0.794	0.545	0.724	0.539	0.760	0.542
Forest:						
Rural	0.447	0.301	0.390	0.256	0.419	0.279
Urban	0.612	0.461	0.554	0.390	0.584	0.427
Coastal:						
Rural	0.360	0.194	0.338	0.173	0.350	0.184
Urban	0.451	0.301	0.399	0.288	0.427	0.295
Total:						
Rural	0.447	0.273	0.407	0.243	0.428	0.259
Urban	0.566	0.401	0.512	0.368	0.541	0.386

TABLE 2: PERCENT OF ADULTS AGE 19 OR MORE, BY GENDER AND HIGHEST LEVEL OF SCHOOLING WHO ARE EVER REGISTERED OR CURRENTLY INSURED*

Schooling Groups	NO SCHOOLING	PRIMARY	MIDDLE	SECONDARY	TERTIARY	ALL TOTAL GROUPS
Insurance Status by Gender						
(sample size)						
Percent of Population by Schooling						
Females (5418)	43.5	14.3	31.6	6.7	4.0	100
Males (4282)	26.4	10.9	42.2	13.2	7.4	100
Ever Registered in a Health Insurance						
Females (5418)	45.2	45.9	54.7	64.4	73.9	50.7
Males (4282)	37.7	25.7	40.9	46.4	72.0	41.4
Currently Covered by a Health Insurance						
Females (5418)	26.1	28.6	37.1	49.3	61.7	32.9
Males (4282)	20.6	16.7	26.2	34.4	55.9	27.0

**The percentage of survey respondents ever registered and covered by Health Insurance are weighted to represent the percent in the total Ghanaian population in 2009-10.*

TABLE 3: NUMBER REPORTED TO PAY FOR REGISTRATION OR CURRENT COVERAGE OF HEALTH INSURANCE

Sample Composition	ALL PERSONS		WOMEN 15-49	
Dependent Category	EVER REGISTERED	CURRENTLY INSURED	EVER REGISTERED	CURRENTLY INSURED
Employer paid	48	23	8	2
Contributor to Social Security (formal sector)	222	182	62	50
Exempted from payment:				
Children (age 0-18)	1680	1070	126	85
Over age 69	290	209	-	-
Pregnant	47	28	46	28
Indigent	17	5	2	1
Pensioner (SSNF)	23	17	2	1
Household member	6035	4023	1852	1229
Relative & friend	460	315	128	86
Parent	24	24	3	3
Spouse	3	3	1	1
Self	54	41	14	9
Other	138	32	43	14
Total	9041	5964	2287	1509

TABLE 4: REGRESSION OF INDIVIDUAL PAYMENTS FOR REGISTRATION AND ANNUAL PREMIUMS FOR NATIONAL HEALTH INSURANCE IN GHANA, 2009-10

Dependent Variable	REGISTRATION FEE PAID CEDIS			ANNUAL PREMIUM PAID CEDIS		
	[1]	[2]	[3]	[4]	[5]	[6]
Sample Composition	Age > 18	Age < 19	Age > 18	Age > 18	Age < 19	Age > 18
	Adult	Child	Adult	Adult	Child	Adult
Explanatory variables:						
Male	-0.246	0.325	0.0529	-0.376	-0.891	0.0440
	[0.89]	*[.95]*	*[0.29]*	*[1.18]*	*[1.89]*	*[0.16]*
Age 35 to 49	-0.0599	--	-0.575	0.697	--	0.410
	[0.16]	--	*[1.97]*	*[1.64]*	--	*[0.92]*
Age 50 to 69	0.0239	--	-0.333	0.0864	--	-0.107
	[0.06]	--	*[1.03]*	*[0.21]*	--	*[0.27]*
Age 70 and up	-1.25	--	-1.95	-3.32	--	-4.51
	[2.97]	--	*[4.70]*	*[3.37]*	--	*[4.22]*
Years of schooling Completed:						
No Schooling	-0.480	--	1.17	-3.23	--	-0.276
	[0.50]	--	*[1.49]*	*[2.34]*	--	*[0.36]*
Primary	0.123	--	0.120	-0.384	--	-0.122
	[0.69]	--	*[0.80]*	*[1.60]*	--	*[0.89]*
Middle	0.0206	--	-0.082	0.187	--	0.0345
	[0.14]	--	*[0.81]*	*[1.04]*	--	*[0.22]*
Secondary	-0.0282	--	-0.053	-0.215	--	-0.177
	[0.16]	--	*[0.40]*	*[1.47]*	--	*[1.56]*
Tertiary	-0.102	--	0.0310	0.829	--	0.319
	[0.30]	--	*[0.15]*	*[1.80]*	--	*[0.80]*
Urban Residence	1.73	1.54	2.15	1.79	2.10	1.76
	[2.26]	*[2.06]*	*[2.27]*	*[2.29]*	*[2.44]*	*[2.91]*
Distance to NHIS (km)	-0.0175	-0.0064	-0.0435	-0.0492	-0.059	-0.037
	[0.60]	*[0.34]*	*[1.22]*	*[1.99]*	*[1.58]*	*[1.14]*
Distance to Health Facilit	-0.0115	-0.0212	-0.0438	0.0208	0.141	0.015
	[0.04]	*[0.88]*	*[2.03]*	*[0.59]*	*[0.93]*	*[0.57]*
Distance Missing	1.17	-0.619	-1.62	-2.64	-0.756	-6.94
	[1.22]	*[1.01]*	*[1.09]*	*[3.42]*	*[0.73]*	*[3.90]*
Log Consumption per adu	0.579	0.375	0.732	0.964	0.212	0.341
	[1.87]	*[1.56]*	*[2.75]*	*[2.20]*	*[0.49]*	*[0.89]*
Constant	1.91	1.46	--	9.44	5.14	--
	[0.96]	*[1.22]*	--	*[3.40]*	*[1.88]*	--
District Fixed Effects	No	No	Yes	No	No	Yes
R^2	0.0688	0.0458	0.3817	0.0859	0.0375	0.2457
No. Observations	3316	3157	3316	3485	1666	3485
Mean of Dependent Vari	5.99	4.04	5.99	12.7	6.18	12.7
(Standard Deviation)	*[6.53]*	*[4.33]*	*[6.53]*	*[8.48]*	*[7.98]*	*[8.48]*

***Estimated coefficients are robust, and the absolute value of the "t" statistics are reported beneath them in brackets. Regressions are weighted by survey probability sampling weights (ppweight) and the standard errors are adjusted for the relevent 323 clusters of the sample design.**

TABLE 5: LOGIT ESTIMATES OF MARGIN EFFECTS AT SAMPLE MEANS OF EVER REGISTERED AND CURRENTLY INSURED IN HEALTH INSURANCE FOR ADULTS OVER AGE 18 AND CHILDREN LESS THAN AGE 19

Dependent Variable	EVER REGISTERED		CURRENTLY INSURED	
	[1]	[2]	[3]	[4]
Sample Composition	Age > 18 Adult	Age < 19 Child	Age > 18 Adult	Age < 19 Child
Explanatory Variables:				
Male	-0.166	0.0032	-0.1315	-0.0019
	[14.4]	*[0.24]*	*[12.5]*	*[0.16]*
Age 35-49	0.0207	--	0.0218	--
	[1.52]	--	*[1.71]*	--
Age 50-69	0.1008	--	0.0990	--
	[6.70]	--	*[7.23]*	--
Age 70 & up	0.3121	--	0.279	--
	[14.5]	--	*[15.3]*	--
Years of Schooling:				
No Schooling	0.0287	--	-0.0302	--
	[0.61]	--	*[0.69]*	--
Primary	0.0130	--	0.0038	--
	[1.40]	--	*[0.44]*	--
Middle	0.0267	--	0.0266	--
	[4.43]	--	*[4.74]*	--
Secondary	0.0307	--	0.0291	--
	[4.77]	--	*[5.30]*	--
Tertiary	0.1168	--	0.0746	--
	[5.92]	--	*[5.65]*	--
Urban Residence	0.0246	-0.0064	0.0237	0.0046
	[1.72]	*[0.11]*	*[1.88]*	*[0.11]*
Distance to NHIS Office (km)	-0.00386	-0.00669	-0.00372	-0.00475
	[6.86]	*[3.50]*	*[6.71]*	*[2.71]*
Distance to Health Facility (km)	-0.00416	-0.00463	-0.00429	-0.00596
	[6.23]	*[2.12]*	*[5.95]*	*[2.42]*
Distance Missing	0.0240	0.0819	0.0206	0.0850
	[1.29]	*[1.33]*	*[1.25]*	*[1.85]*
Log Consumption per Adult	0.0674	0.0885	0.0523	0.0669
	[8.68]	*[3.96]*	*[7.43]*	*[3.23]*
District Registration Price (avg)	-0.0199	-0.0229	-0.0149	-0.0121
	[9.51]	*[3.09]*	*[7.82]*	*[2.06]*
District Annual Premium (avg)	-0.00625	-0.0048	-0.00187	-0.00171
	[3.27]	*[0.84]*	*[1.15]*	*[0.37]*
Prob > F	0.0000	0.0000	0.0000	0.0000
	[8.62]	*[9.82]*	*[4.97]*	*[6.36]*
No. Observations	9,490	8,996	9,490	8,996
Mean Dep. Variable	0.4727	0.4614	0.3060	0.2933
(standard deviation)	*[.4993]*	*[.4985]*	*[.4609]*	*[.4553]*

***Estimated coefficients are robust, and the absolute value of the "t" statistics are reported beneath them in brackets. Regressions are weighted by survey probability sampling weights (ppweight) and the standard errors are adjusted for the relevent 323 clusters of the sample design.**

TABLE 6: LOGIT ESTIMATES OF MARGINAL EFFECTS AT SAMPLE MEANS OF EVER REGISTERED AND CURRENTLY COVERED BY HEALTH INSURANCE, FOR WOMEN AGE 19 TO 49

Dependent Variable	EVER REGISTERED			CURRENTLY INSURED		
Explanatory Variables	[1]	[2]	[3]	[4]	[5]	[6]
Age 35 to 49	0.0291	0.0157	0.0121	0.0199	0.0121	-0.0072
	[1.50]	*[0.67]*	*[0.52]*	*[1.10]*	*[0.59]*	*[0.36]*
Years of Schooling:						
No Schooling	0.0865	0.105	0.103	0.0304	0.0436	0.0398
	[0.98]	*[1.16]*	*[1.13]*	*[0.34]*	*[0.49]*	*[0.45]*
Primary	0.0183	0.0226	0.0224	0.0077	0.0107	0.0103
	[1.08]	*[1.30]*	*[1.29]*	*[0.45]*	*[0.63]*	*[0.61]*
Middle	0.0250	0.0264	0.0262	0.0254	0.0264	0.0263
	[1.91]	*[1.99]*	*[1.98]*	*[2.42]*	*[2.49]*	*[2.48]*
Secondary	0.0276	0.0325	0.0331	0.0293	0.0327	0.0334
	[1.59]	*[1.84]*	*[1.87]*	*[2.35]*	*[2.55]*	*[2.61]*
Tertiary	0.1082	0.1160	0.1169	0.0755	0.0795	0.0801
	[2.83]	*[2.93]*	*[2.94]*	*[2.42]*	*[2.48]*	*[2.47]*
Urban Residence	-0.0473	-0.0413	-0.0404	-0.0266	-0.0228	-0.220
	[1.02]	*[0.93]*	*[0.90]*	*[0.68]*	*[0.59]*	*[0.57]*
Distance to NHIS (km)	-0.0047	-0.0052	-0.0052	-0.0049	-0.0053	-0.0053
	[2.74]	*[3.06]*	*[3.06]*	*[2.79]*	*[3.00]*	*[3.01]*
Distance to Health	-0.0055	-0.0056	-0.0057	-0.0055	-0.0055	-0.0057
Facility (km)	*[2.57]*	*[2.63]*	*[2.65]*	*[2.07]*	*[2.09]*	*[2.12]*
Distance Missing	0.111	0.109	0.107	0.0741	0.0720	0.0692
	[2.08]	*[2.08]*	*[2.03]*	*[1.67]*	[1.64]	*[1.56]*
Log Consumption per Adult	0.0793	0.0768	0.0761	0.0600	0.0588	0.0579
	[3.83]	*[3.74]*	*[3.71]*	*[3.19]*	[3.09]	*[3.02]*
District Registration Price	-0.0168	-0.0164	-0.0163	-0.0104	-0.0101	-0.0099
(average)	*[2.59]*	*[2.57]*	*[2.55]*	*[1.85]*	*[1.82]*	*[1.79]*
District Annual Premium	-0.0061	-0.0059	-0.0059	-0.0029	-0.0027	-0.0027
(average)	*[0.76]*	*[0.76]*	*[0.76]*	*[0.63]*	*[0.62]*	*[0.61]*
Number of Children Alive	--	0.0193	0.0191	--	0.0137	0.135
	--	*[2.71]*	*[2.70]*	--	*[2.36]*	*[2.32]*
Pregnant at Time of Survey	--	--	0.0672	--	--	0.0834
	--	--	*[1.40]*	--	--	*[2.24]*
Prob. > F Significant	0.0000	0.0000	0.0000	0.000	0.0000	0.0000
No. Observations	3660	3660	3660	3660	3660	3660
Mean of Dep. Variable	0.523	0.523	0.523	0.315	0.315	0.315
(standard deviation)	*[.499]*	*[.499]*	*[.499]*	*[.465]*	*[.465]*	*[.465]*

TABLE 7: LOGIT ESTIMATED ELASTICITY OF REGISTRATION AND CURRENTLY INSURED WITH RESPECT TO KEY VARIABLES

Dependent Variable	EVER REGISTERED			CURRENTLY INSURED		
Sample Composition	Age > 18 Adult	Age < 19 Child	Age 19-49 Women	Age > 18 Adult	Age < 19 Child	Age 19-49 Women
Explanatory Variables	[1]	[2]	[3]	[4]	[5]	[6]
Distance to NHIS Office	-0.113	-0.217	-0.123	-0.179	-0.254	-0.211
	[2.64]	*[3.40]*	*[2.72]*	*[2.58]*	*[2.70]*	*[2.79]*
Distance to Medical	-0.0293	-0.0457	-0.0393	-0.0646	-0.0969	-0.0647
Facility	*[2.38]*	*[2.14]*	*[2.58]*	*[2.29]*	*[2.39]*	*[2.05]*
District Registration Price	-0.185	-0.245	-0.176	-0.191	-0.213	-0.180
	[2.96]	*[3.14]*	*[2.61]*	*[2.21]*	*[2.08]*	*[1.84]*
District Annual Premium	-0.144	-0.108	-0.132	-0.0908	-0.0642	-0.103
	[0.98]	*[0.85]*	*[0.76]*	*[0.61]*	*[0.37]*	*[0.64]*
Log. Household Consumption	0.733	1.12	0.942	0.907	1.40	1.18
per adult	*[3.47]*	*[3.83]*	*[3.75]*	*[3.09]*	*[3.15]*	*[3.14]*
No. Observations	9490	8996	3660	9490	8996	3660

TABLE A-1: SOURCES OF REVENUE & CLASSES OF PARTICIPANTS IN THE GHANA NATIONAL HEALTH INSURANCE SCHEME

A. Percent Revenues	2008	2009	2010	2011	2012
Health Insurance Sales Tax (2.5%)	61.5	61.0	68.3	72.9	74.4
SSNIT Formal Sector Contribution	16.9	15.6	18.9	17.4	18.32
Registration and Premium	5.00	3.80	NR	4.48	3.67
Investment Income	11.8	17.0	12.8	5.16	3.72
Other Forms of Budget Support	4.8	2.5	0.1	0.1	0.2
Total Revenues	100	100	100	100	100

B. Percent of Membership in NHIS:	2008	2009	2010	2011	2012
Children < age 18	50.4	49.4	47.7	49.7	51.2
Adults in Informal Sector	29.8	29.4	31.8	36.4	35.5
SSNIT Formal	6.5	6.1	4.7	4.5	4.2
SSNIT Pensioners	0.6	0.5	0.4	0.3	0.3
Pregnant Women	3.4	5.5	8.6	NR	NR
Indigents	2.4	2.3	1.4	4.2	4.4
Elders Age > 69	6.9	6.7	5.4	4.9	4.5
Total Membership	100	100	100	100	100

NR: Not Reported

Sources: National Health Insurance Authority
Revenues: 2008 & 2009 in Annual Report 2009, Chart 8; 2010 & 2011, Annual Report 2011, Annex 1; 2012 in Annual Report 2012, Annex 3, page 54. Active Registration: 2008 & 2009 in Annual Report 2009, Table 1; 2010 in Annual Report 2010, Figure 3; 2011 in Annual Report 2011, Figure 3; 2012 in Annual Report 2012, Figure 2, page 20.

Table A-2: SAMPLE STATISTICS: ADULTS, OLDER THAN 18, CHILDREN, WOMEN AGE 19-49

	Mean [Standard Deviation]		
Sample Composition	[1] Age > 18 Adults	[2) Age < 19 Children	[3] Age 19-49 Women
Variables:			
Ever Registered for Insurance	0.473	0.461	0.494
Registered & Dropped Insurance	0.167	0.168	0.179
Currently Covered	0.306	0.293	0.315
Male	0.429	0.518	--
Age 35-49	0.325	--	0.447
Age 50-69	0.206	--	--
Age 70-up	0.074	--	--
Years of Schooling:			
No Schooling	0.364	--	0.366
Primary	3.62	--	3.58
	[2.83]	--	*[2.82]*
Middle	1.59	--	1.46
	[1.65]	--	*[1.60]*
Secondary	0.398	--	0.321
	[1.03]	--	*[.928]*
Tertiary	0.0882	--	0.0642
	[.468]	--	*[.368]*
Urban Resident	0.347	0.130	0.361
Distance to NHIS Office (km)	13.2	14.8	12.9
	[12.3]	*[12.8]*	*[12.2]*
Distance to Medical Facility (km)	3.47	4.52	3.51
	[8.86]	*[10.3]*	*[8.95]*
Distance Missing	0.0977	0.0874	0.0936
Log Consumption (Cedis)	5.277	5.031	5.872
per person age 15 and more	*[.878]*	*[.766]*	*[.830]*
District Registration Price	5.21	4.88	5.189
	[3.04]	*[2.97]*	*[3.06]*
District Annual Premium	10.65	10.38	10.78
	[3.88]	*[3.77]*	*[4.01]*
Number of Children Alive	--	--	2.73
	--	--	*[2.39]*
Pregnant at Time of Survey	--	--	0.0518
	--	--	*[0.22]*
No. Observations	9,490	8,991	3,660

The standard deviations of binary variables is equal to (mean(1-mean))**.05.