Increasing Equitable Participation in a Voluntary National Health Insurance Scheme: The Experience of Ghana [1]

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Abstract

In 2005 Ghana implemented a National Health Insurance Scheme (NHIS), and by 2009 half of the country's population is registered in the program, and a third is currently covered. The composition of those who voluntarily enrolled in this highly subsidized public program are disproportionately better educated Ghanaians, who are presumably better able to pay the public cost of the scheme, and to assess their future program benefits. This paper analyzes the NHIS enrollment based on a nationally representative household survey collected in 2009-10. Individual insurance enrollment is related to district registration fees and renewal premiums, national exemptions from such fees, and household proximity to the district NHIS administrative office. These estimates suggest how restructuring of the program could expand coverage, especially among the less educated and more dispersed segments of the population, and thereby increase equitably the program's coverage.

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1. Introduction

A widely endorsed social goal is universal coverage of health care, which may depend on wide access to these services and low financial barriers to their utilization, allowing all parts of the population to have comparable health care, and presumably improving the population's health status and well-being (WHO, 2010; Mwabu, 2013). One route to this goal of universal health care involves some form of national health insurance. There are many barriers and trade-offs to making such a complex institutional arrangement effective, efficient, equitable, and financially sustainable.

Ghana is one of a handful of low income countries that has implemented a National Health Insurance Scheme (NHIS), and implemented this program starting in 2005. A nationally representative household Ghana Socio-Economic Panel Survey (GSEPS) collected in 2009-10 is used in this paper to evaluate who has registered for 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 possible determinants of NHIS coverage, while controlling for exogenous socioeconomic characteristics of individuals and communities that could affect the diffusion of information about NHIS and the demand for health insurance and medical care. Information on the characteristics of the local supply and quality of health care provided by the NHIS is not readily derived from the survey, and thus these supply determinants of demand for health insurance are unfortunately omitted variables in this analysis. Evidence is sought on how the district average pecuniary registration and renewal prices of the NHIS, the distance to the NHIS offices that reflects the opportunity cost of time to be a member of the program, are related to registration and continuing coverage in this heavily subsidized program.

Implementation of such a government health care system requires broadly based political commitment and a willingness to experiment with many interacting features of the system, and empirical evaluation of these features may help to improve the program over time. This paper analyzes such a social insurance

program, and proposes ways to assess how it could be reconfigured to serve more of the population, and especially to better serve the less educated, rural segments of the population and women and their children.

Section 2 of the paper reviews briefly the NHIS. The heuristic framework guiding the analysis of survey data and the conditions under which the relationships of interest are identified are discussed in Section 3. The data are detailed in Section 4, and the empirical results reported in Section 5. Section 6 concludes with some of the questions for further research that might be pursued with the future waves of the GSEPS or other representative surveys.

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 location of health facilities was not 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 inflation and the weakening of the public health system, with many health personnel seeking employment opportunities abroad or in the private sector. A structural adjustment plan, negotiated between the government of Ghana and donors including the World Bank, introduced after 1985 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 (Shaw and Griffin, 1995; Mensah, et al. 2010; Durauraj, 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 (145 districts by 2009), and required people to register with an administrative office in each district to participate in a District Mutual Health Insurance Schemes (DMHIS). These district administration offices were responsible for issuing District membership cards to those paying a registration fee that would activate their annual insurance coverage after a

processing delay of about three months.

After the initial year of insurance registration, annual premiums are paid to the district administration office of GH Cedis 7.2 to 48 (or about 5 to 24 US$) to extend a member's insurance coverage, where the premium is adjusted according 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. Individuals age 70 and older are covered without a premium, as are "indigents" (core poor) who amounted to only about 1 percent of the NHIS members by 2008 (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, financial obligation for maternal care was assumed by NHIS in 2008, which extended coverage to women without the need to pay and register, if they were three months pregnant, and their free services included prenatal and postnatal care, as well as delivery. However, family planning services or supplies, or abortion procedures, which are legal in Ghana, are not covered by the NHIS (Witter and Garshong, 2009; Aboagye and Agyemang, 2013).

The financing of the NHIS comes from four sources: a 2.5% sales tax (Value Added Tax) is collected by the Central Government, which constituted about 70 percent of the revenues in 2009 to the National Health Insurance Fund (NHIF); 23 percent of the revenues of the NHIF in 2009 were from the Social Security National Insurance Trust which remits a wage deduction of 2.5 percent for Social Security covered employees retired pensioners; and about 5 percent of the NHIF is derived from NHIS member registration fees and annual premiums (Blanchet, et al. 2012). Of the persons registered under the NHIS in the 2005 Ghana Standards of Living Survey (GLSS 5), 95 percent were under the District Mutual Insurance Schemes, 2 percent covered by employers 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 and pay for their health insurance by wage deductions collected by employers.

District NHIS offices registered and accredited local health care providers and reimbursed them for documented services provided to those covered by the NHIS.

Health care provider groups from physicians to hospitals were formed from accredited local providers. Invoices for services provided have been standardized into Diagnostic Related Groups (DRG), for which reimbursed prices are set by the NHIS centrally.[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, dialysis, and HIV (for which there are other sources of funding). 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). The coverage of NHIS may be evolving slightly as experience with the program accumulates and the administrative, financial, and political constraints, priorities, and preferences of stakeholders are better understood.

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, and the complexity of administering district decentralized management of membership records and reimbursements to health care providers. Oxfam (2011) and other NGOs challenged the lack of transparency of program evaluations, and financial accounting, and criticized the scheme for requiring most people to pay in advance for their health insurance. The Ghana Living Standards Survey of 2005 (GLSS 5) reports that 16 percent of the population reported themselves as covered in the NHIS after the program had been in operation for less than a year (Ghana Statistical Service, 2008: Table 3.21; Bhasin, 2013), although other evaluations of the NHIS report 27 percent of the GLSS 5 survey population is covered by the NHIS (Durairaj, et al.,2010). Witter and Gershong (2009) citing health sector reviews 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

[2] With the expanding coverage of the NHIS, uninsured may face a higher price for DRGs which are influenced by NHIS (Witter and Garshong, 2009). A parallel situation occurred in Indonesia where a maternal midwife health subsidy for the poor had the effect of raising the prices of midwife-services for the uninsured or non-poor, and diminishing demand for this form of health care among the uninsured (Triyana, 2013).

and 29 percent of the men age 15 to 49 (GDHS, 2009: Tables 3.8.1 and 3.8.2). The nationally representative GSEPS survey collected in 2009-10 indicates the NHIS coverage rate was 33 percent for females and 27 percent for males age 19 or more, while 51 and 41 percent are ever registered in the health insurance scheme, respectively. The NHIS website (www.nhis.gov.gh/ contacted August 20, 2013) indicates that as of June 2010, 66 percent of the population is registered as members of NHIS and 54 percent are active (currently covered). This paper considers the question who has ever registered in the NHIS in 2009-10, and who had a valid current NHIS health insurance card, or is currently covered.

3. Demand for Health Insurance and its Distributional Effects

A variety of factors are expected to influence an individual's demand for voluntary health insurance such as provided by NHIS in Ghana.[3] Wealth, W, is likely to positively affect the demand for health insurance. But with sufficiently high wealth (assets and human capital), individuals may be better able to deal with the financial risks associated with illness, and their desire to insure themselves formally against these events may diminish. Limitations of NHIS coverage may also become less attractive with increasing wealth, if the insurance requires the use of specific facilities, traveling perhaps to more distant or lower quality providers, or excluding reimbursement for traditional care, or certain medical treatments or drugs not on the covered "essential drug list". Conversely, the pecuniary price, P_i , of the NHIS is expected to reduce the demand for the insurance, other things being equal. In addition, the distance or access, D, to insurance administrators and the time required for the individual to register and renew insurance annually would diminish demand, other things equal. The individual's expected need for (or utility from) health care, N , may increase demand for NHIS, as well as for the health care of her children who are under age 18.

Insurance is essentially an inter-temporal contract that requires in this case current payments involving reduced consumption today in exchange for future uncertain benefits. Plausible models for such demand can be specified, which often

[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 (1%) or those exempted from payment of NHIS fees (1%) as described in later Table 3.

postulate utility maximizing behavior on the part of the individual with systematic discounting over time, 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 and preferences may be systematically affected by the individual's schooling, S , and age, A, which may also affect an individual's information on how health is produced, the reliability of the local health care providers, or the government itself. Health insurance schemes are not always widely adopted when offered, even when heavily subsidized, if they require prepayments, as is the case with the NHIS, which poses the question is insurance for health care driven by the assumed optimizing behavior, or are other motivations relevant, as emphasized in behavioral economics.[4] Finally, unexplained variation among individuals in their demand for insurance can be due to omitted variables, errors in measurement, and random variation, and they are represented heuristically in eq. (1) by the disturbance e_1 :

(1) $I = I (W, P_{i,} D, N, S, A, e_1)$.

Specific features of the NHIS affect how these general constraints on the demand for health insurance may be incorporated into the empirical estimation of demands

[4] For example, enrollment in subsidized health insurance programs in Kerala, India is more frequent among higher income and better educated populations, as is common elsewhere. Insurance consultants who are supposed to provide consumers with information about the Indian insurance program and receive a proportional incentive from policies, are associated with increasing adoption rates among higher income groups who are more likely to adopt more expensive insurance plans (Vellakkal, 2013). Ghana has employed some field workers in the NHIS to provide information and recruit new members, but the expenditures on these outreach efforts could not be located by district 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., 2011), and extended in rural China (Wagstaff, et al., 2009). 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). 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 (Currie and Gruber, 1996; Levy, 2005; Thornton, et al. 2010; Aterido, et al. 2011; Acharya, et al., 2013).

in Ghana. First, the health insurance decision for virtually all Ghanaians is a single discrete no/yes choice between having no health insurance or paying for the NHIS package. This decision is for the majority of Ghanaians unrelated to their employment, as in the United States, and the extent of coverage or limits of deductibles is not negotiable. Consequently, a binary-choice framework to account for health insurance coverage in the case of Ghana is reasonable.

To estimate the determinants of demand for health insurance from individual data, the conditioning variables in eq. (1) are typically assumed to be independent of the error, e_1 , or not affected by decisions of the individual or community that are likely to be correlated with unobserved factors affecting both the conditioning variables and demand for insurance. One way to be confident that this working assumption is satisfied is for the health insurance to be offered or administered randomly (Levy and Meltzer, 2008). The roll out of the Ghana NHIS did not include a randomized control trial (RCT). I know of one exception: a field experiment by Asuming (2013) which is based on a sample of one District from one of the poorest Northern regions of Ghana, described later. An alternative approach is to consider what is known regarding individual demand characteristics, household geographic access to the NHIS offices and major health facilities, and then jointly estimate the effects of health insurance fees set by districts for registration and annual premiums, assuming all of these variables are exogenous to the individual enrollment preferences and unobserved supply conditions.

A goal for future research is to estimate how the proximity and price of health insurance affects the demand for health insurance and thereby independently influences the use of health inputs, health outcomes, and financial problems of the household. To proceed toward this goal and evaluate how health insurance causally affects the utilization of health care, health outcomes, and the incidence of family health-induced financial crises requires 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 having health insurance. These “exclusion restrictions” to identify statistically the role of health insurance on health behavior and outcomes are difficult to conceptualize and to measure in analogous empirical studies of consumer demands (Dubin and McFadden, 1984; Cameron et al. 1988). The matching of propensity scores to demand for health insurance within various segments of populations that

are “treated” can then be compared to the outcomes for a suitably matched control populations (Trujillo et al. 2005; Mensah, et al., 2010). Appendix A outlines some of these issues as part of a future research agenda.

Second, the price of the insurance varies with some of the individual’s characteristics, implying interactions between the regular pecuniary price and these characteristics could be relevant for NHIS choices. Thus, demands may initially vary by an individual’s age and sex, but in addition age and sex may directly influence eligibility for a NHIS price exemption. Persons over age 69 qualify for an exemption from the price, and those under age 18 are also exempted from the premium price, if their mother (and father) is insured. The latter exemption might account for why women with more living children might have greater demand for their own health insurance coverage. But many children in a representative household survey in Ghana are not coresident with their father and mother. Pregnant women are exempted from NHIS payments after they are three months pregnant, but there is also a processing delay of three months before an NHIS registration card is issued, leaving the future health coverage of mothers and their children vulnerable.

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, a challenging task in a poor, predominantly small farm agricultural 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 proposed here as an observable indicator of “ability to pay”. The expected positive income effect of schooling on the demand for health insurance may in Ghana be potentially offset by any increase in the premium of the insurance paid by the better educated applicants who are assumed to have the “ability to pay”. The benefits and costs of the new health insurance scheme may also be more readily assessed by the better educated who are not already in the Social Security System. Those living in urban areas or nearer to major (tertiary) health facilities might have more experience with the modern health care system and may be more willing to pay for the option of joining the NHIS. Empirical studies have found inconsistent relationships between the demand for health insurance and available survey measures of income, but a more

consistent positive empirical relationship between schooling and demand for health insurance (e.g. Cameron and Trivedi, 1991; Nguen and Knowles).

A third factor affecting the demand for health insurance is the need or expected future utility from health care. This motivation could depend on risk aversion or current and expected health status, and contribute to what is called "adverse selection", and is often expected to raise public expenditures on insurance per enrollee, whereas it also implies insurance is demanded by those who might otherwise suffer the greatest financial hardship if denied health insurance. Some research in the United States and elsewhere finds evidence of selection of the less healthy into the groups demanding more health insurance (Pauly, 1986; Pauly and Zweifel et al, 2006). But there is no agreement on how to measure the expected need for or value of health care. Predicted health has been approximated by current or lagged subjective responses as to an individual's subjective health status, past expenditures on health care, medically diagnosed chronic health problems, and days recently unable to work due to illness. The empirical evidence of the adverse selection relationship between these indicators of expected health and insurance demand tend to be ambiguous in both low and high income countries, and the direction of causality is moreover ambiguous, except where the access to insurance has been implemented randomly (Cameron and Trivedi, 1991; Vellakkal, 2013; Wagstaff and Manachotphong, 2012).

Insurance and credit can also be viewed as coordinated institutions in poor agricultural communities to help smooth consumption over time, such as 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 any increase in expenditures on health care reduce other forms of consumption. If the health shocks are idiosyncratic and thus not attributable to negligence or risky behavior, there may be a basis for informal health insurance in the extended family or community that should diminish the demand for formal health insurance. Forms of insurance for other risks are examined in agriculture, but less often in relation to the adoption of formal health insurance (Rosenzweig and Mobarak, 2012; Karlan, et al., 2013). Health risks in the locality may be related to the lower formal wage opportunities for women than for men, where women's contracted labor supply is less reliable, because they customarily care for

the ill within the family (Gutierrez, 2011).

One indirect consequence of public health insurance, such as the NHIS, is on the functioning of the labor market. Providing workers in the informal sector with comprehensive health insurance erodes the incentives to search for employment in the public sector or formal sector firms which offer health benefits. The NHIS thus reduces the incentive for the covered population to search for and accept a job in the formal sector, increasing the number working as self employed or in unpaid capacities in their families. Major health reforms in Mexico and Colombia have been evaluated as a cause for diminished formal sector participation, and though some effects are found, it is doubtful they offset the gains of extending health insurance to a majority of people, many of whom are otherwise poor (Knaul and Frenk, 2005; Levy, 2008; Thornton, et al. 2010; Aterido, et al. 2011; Acharya, et al.,2013).

The risk of an uninsured health shock can lead to costly financial problems for a poor family, particularly where credit is not widely available. There are, however, examples where the provision of health insurance does not reduce out-of- pocket medical expenditures, as observed in rural China (Wagstaff et al. 2009). This outcome is attributed to the Chinese community medical insurance subsidizing expensive tertiary medical care that poor rural families without insurance do not otherwise use. 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 selection problem, they cannot confidently deal with selection due to unobserved traits (Mensah et al. 2010; Blankett et al. 2012; Bhasin, 2013; Gajate-Garrido and Ahiadeke, 2013).

In sum, the empirical specification of the determinants of demand for health insurance includes District set money prices of registration and annual premiums, distance to District insurance office, nationally legislated eligibility for exemptions from the prices of health insurance, controlling for the effects of urban/rural residence, and age and sex of the applicant, as well as prices by age, sex, and possibly number of children who could derive benefits.

4. Data and the Setting in Ghana and Previous Evaluation Studies

This paper analyzes the Economic Growth Center of Yale University and the Institute of Statistical, Social & Economic Research (ISSER) of the University of Ghana, Legon, Ghana Socioeconomic Panel Survey (GSEPS), which was collected from November 2009 to April 2010.[5] It is a representative household sample at the level of the 10 regions of Ghana, with information on 5009 households and 18,889 individuals, with modules on local conditions and institutions for the 325 urban and rural Census Enumeration Areas (EA), from which 15 households are randomly selected from each Census listing of a sampled EA. As already noted, the administration of the District (Mutual) Health Insurance Scheme (DMHIS) is decentralized to the level of the District, of which there are 171 listed in the codebook, and the GSEPS includes households in 119 of these 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 HIS office, and distance to nearest tertiary public health facility (clinic or hospital). About 23 percent of the households did not include GPS information in the survey files (finalized in 2012) and those without GPS are assigned a dummy for "distance missing" equal to 1, and the others 0, whereas the distance variable is set to 0 for those without GPS. Including both missing and those reporting distances allows the analysis to include all households and signals if the selected sample with GPS codes are otherwise different with respect to characteristics, behaviors and outcomes of interest.

Some features of Ghana may 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). Gross National Income per capita, adjusted for purchasing power parity (relative prices) was US$2154 in 2009, and has been growing relatively rapidly in the last decade. 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). According to the GSEPS, 36

[5] www.econ.yale.edu/~egcenter/egc_ISSER_overview2012.html.

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 or 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 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 paying for the NHIS contributed to this shift of health expenditures from private to public sources (Witter and Garshong, 2009; Schieber, et al. 2012).

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 after the implementation of the NHIS, and conclude the increase in-patient visits after 2005 is related 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 matched 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 summarize the respondent's assessments of the quality, convenience, benefits, adequacy, price, and provider attitudes of the NHIS. Schooling at various levels and urban residence are the most consistently positively related to current enrollment, whereas health status (adverse selection) and log expenditures and household size (income) are not related to current enrollment. The authors conclude that the differences in NHIS enrollment between the rich and poor document the need to stimulate enrollment among the poor to improve the equity of the NHIS.

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 they 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 the uninsured women. These propensity score matching methods cannot correct for unobserved factors that might be associated with both enrollment in the NHIS and variation in prior or current health care (Levy and Meltzer, 2008).

A randomized field experiment provides the basis for estimating the NHIS enrollment effects of program fee subsidies, program information, and geographical access to NHIS offices. The experiment occurred over seven months in 2011-2012 across 680 communities in the poor rural district of Wa West, in the Upper West Region of Ghana (Asuming, 2013). 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 about the NHIS, and a treatment designed to make enrollment more convenient 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 convenience interventions were also experimentally introduced to assess complementarity among the three treatments. Although the administrative convenience treatment did not have a significant effect on enrollment or subsequent health outcomes, the insurance subsidies and information

intervention were both related to increased enrollment in NHIS. Individual education and household wealth are positively associated with enrollment when included as controls, and program subsidies had larger effects on the poorest and those with no schooling. The size of the subsidy increased the uptake of insurance or outcomes, but not by a significant differential amount in most cases. This study documented substantial NHIS enrollment increases due to the fee subsidies, and 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, on 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. The question remains whether these experimental results are indicative of the consequences of such variations in the program, if they were extended to other parts of Ghana.

With about half of the population of Ghana registered with the NHIS by 2009, and almost a third currently insured by this highly subsidized public welfare program, it is important to quantify how coverage varies by socioeconomic groups, how the program is affecting the inequality in receipt of health care, and whether the less healthy are disproportionately enrolling in the insurance program, i.e. adverse selection or moral hazard. Finally, do program fees discourage more strongly the registration and coverage among those who are not exempt from making payments for their insurance. Geographic proximity to NHIS offices may also affect the time costs of registration and coverage, and perhaps the distance to major public health care facilities is a deterrent to NHIS membership or to consumer understanding of how they and their families might benefit from the insurance coverage given their access to the existing medical system.

5. Empirical Results

According to the 2009-10 GSEPS, the survey-weighted percent of the population "ever registered" and currently "covered" by a health insurance scheme is reported in Table 1, first by age groups and gender, and then by three ecological zones of Ghana (Savanna-North, Forest-middle, and Coastal-South), rural/urban, and gender. Forty six percent of the population has ever registered in a health insurance scheme, and 30 percent are currently covered in 2009-10, and consequently 16 percent have 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, but higher in the Savanna regional zone, which is generally poorer than the rest of Ghana. More than 95 percent of those who have registered with a health insurance system have enrolled in a National District Mutual Insurance Scheme, and only a couple of percent obtain NHIS insurance through their employer or the social security system, or from a private commercial health insurance scheme, or community groups, such as churches.[6]

The first panel of Table 2 shows the relative distribution of females and males age 19 or more by the highest level of schooling they entered, but may not have completed. Among these women, 43.5 percent had never gone to school, whereas among men only 26.4 percent were unschooled. Twice as many men as women, or 13.2 compared to 6.7 percent have entered the (senior) secondary school level, but not continued to the tertiary level. Panels 2 and 3 of Table 2 illustrate the tendency for men and women with more schooling to be more likely to be "ever-registered" or currently covered by a health insurance scheme. For example, 45 percent of the women with no schooling are "ever registered", whereas among those with some tertiary schooling the percentage is 73.9 , and the respective rates of current coverage increase between these groups women by schooling from 26.1 to 61.7 percent.

Respondents to the GESPS are asked to report what they paid (or expected to pay) for their registration and premium fees with DMHIS and this is summarized in Table 3 for women and men age 19 or older. With the newly established District decentralized insurance scheme, many respondents may not have understood eligibility rules for the exemptions from the insurance fees.

For example, of the 968 individuals in the GSEPS over age 69 and officially exempt from paying fees for their health insurance coverage, only 459 report they are covered by the NHIS, and among those covered, 209 indicate in Table 3 they

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[6] GSEPS tabulations are by the author and those from GDHS of 2008 and the GLSS5 of 2005 are from the descriptive reports of these surveys.

are exempted from paying for the cost of their health insurance coverage. The balance of 250 elderly respondents report they thought others are paying for their insurance coverage. Similar differences exist for who is reported to have paid initial registration fees in the NHIS.

Of the 700 women surveyed with a pregnancy in the last 12 months, 94 percent of the 246 who had health insurance coverage received prenatal care, whereas among those women with a pregnancy but not reporting insurance, 82 percent received prenatal care. This difference in any prenatal care between the insured and uninsured when estimated in a linear regression framework indicate a significant positive partial association (t = 4.01). Even after controlling for age, five levels of years of schooling, and urban residence, the women with a pregnancy who are insured 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. 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). See the further discussion in Appendix A.

Health Insurance Fees and Premiums

GSEPS respondents are asked what they paid (or expected to pay) to register for the DMHIS and what they paid for annual premiums. There are notable differences across District Mutual Insurance Schemes (DMHIS). Individuals reports these payments for registration fees in 6477 cases, and 108 dummy variables for their residential districts accounted to 30 percent of the sample variation, where the mean is 5.08 GH Cedis or about US$ 2.60 ; SD = 2.96 Cedis. Annual premiums as reported by 5158 individuals in the survey are also significantly related to districts, explaining 18 percent of the variance in individually reported premiums paid, where the population weighted District average premium about twice as large as the registration fee (mean 10.5 Cedis ; SD = 3.73).

Because some groups are exempted from paying these insurance fees and premiums, and these groups may be concentrated in different districts, Table 4 first reports how registration fees and premiums are related to ten socioeconomic controls in Col. (1) and (4), respectively. Controls include the individual's gender,

age (5 categories, including the NHIS exemptions under age 19 and over 69), years of schooling completed by a five level spline to control for earnings potential as an indicator of "ability to pay", and urban residence (Appendix Table A-1). These and all subsequent regression estimates are weighted by the survey probability weights (ppweight), stratification by region, and the standard errors of the estimated coefficients are adjusted accordingly for the 323 sample clusters available from the survey design.

The fees and premiums are lower for children under 19, and for the elderly over 69 (compared to the omitted age group 19 to 34), higher for urban residents, and higher for those with more years of primary schooling. The pattern of fees by age and urban/rural residence correspond to the stated goals of the legislation. However, the partial correlation with schooling as a possible administrative indicator of "ability to pay" is positive and significant ($p<.05$) only with respect to completed years of primary schooling and registration fees, and not with respect to annual premiums. One interpretation of this pattern of pricing the DMHIS is that "ability to pay" of the applicants for insurance is not being strictly enforced by the administrative system (col. 3 and 6).

The second specification of the regressions on insurance registration fees and premiums in Table 4, col. (2) and (5), include the proximity of the household to the NHIS administrative office, the distance to a major medical facility, and a dummy if these distances are not available. These measures of the travel time costs for consumers to register and renew with the NHIS and access tertiary health care services are not consistently related to district prices, though in col. (2) registration fees are lower, on average, for those residing further from a major health facility.

Holding constant for the socioeconomic controls and access to the administrative office and health facilities, the district effects on insurance prices remain jointly significant in col. 3 and 6 of Table 4, with the R^2 increasing to .33 for registration fees and to .31 for annual insurance premiums. Some of the other coefficients on the socioeconomic controls increase in magnitude when the district effects are controlled, such as the exemptions for children and the elderly.

However, these samples of persons reporting insurance payments are not representative of all people in Ghana offered the opportunity to enroll in the NHIS,

or in other words, the samples include only those who report payments and is thus biased toward including those who decided to register and continue their coverage. These reported "prices" for the NHIS are likely to be endogenous at the individual level of demand for health care and potentially associated as well with other health-related behavior and local quality of care. Reported payments are, therefore, averaged across individuals in each district to minimize potential bias due to individual heterogeneity and only this district average is treated as arguably exogenous to the health insurance choice an individual makes in a District. These same socioeconomic control variables are also included in the subsequent regressions predicting the decision of individuals to register and to renew their insurance coverage with the NHIS. Consequently, any remaining association between the demand for health insurance and the district averaged fee is designed to approximate the influence of variation in district fees for observationally similar individuals, to the extent that the heterogeneity is captured by the ten control variables.

These district averaged prices for NHIS are imputed to all individuals in the survey on the basis of their district of residence. Variations in the registration fee and premiums are notable across the ecological zones and by urban and rural areas. Generally, the registration fees are about half the size of annual premiums, as noted earlier, and these fees and premiums are lower in the Savanna than in the Forest or Coastal zone, while the rural prices are lower than urban fees, except in one case with registration fees in the Forest zone. [7] To the extent that higher district prices of the Health Insurance reduce the demand for health insurance, they should contribute to greater demand for health insurance in the poorer Savanna zone and in the poorer rural compared to urban areas. Thus, the broad regional pattern of price variation in the NHIS health insurance is expected to narrow regional inequalities in health care associated with socioeconomic inequality in Ghana, but not necessarily with respect to educational attainment.

[7] Individuals in districts in the rural areas of the Northern Savanna zone report the lowest average registration fee of 2.84 Ghanaian Cedis (about US$ 1.50), whereas the 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.

Proximity of Households to District Insurance Offices and Health Centers

A second indicator of the private cost of enrolling in the DMHIS is the distance between the household and the District administrative office of the insurance scheme. This distance could also be positively associated with the distance to major medical facilities in the district, such as a hospital or clinic. Consequently, as a robustness check on the specification of the demand equation, the distance to the administrative insurance office and the nearest major health facility are both included as explanatory variables to try and distinguish between the two mechanisms; one involves administrative time costs associated with the proximity of the insurance office or the concentration of the population in its vicinity, and the other the convenience, cost, and information diffusion consequences for the consumer due to her living closer to a major health facility. It is of course possible that the choice of residence is influenced by proximity to medical facilities and even government offices, though the DMHIS offices were only opened in 2005, a few years before the GSEPS is collected, and unlikely to be a factor motivating residential location.

There are two potential problems due to multi-collinearity among the explanatory variables in the proposed empirical specification of the demand relationship for health insurance. First, the registration fee and premium are highly correlated, .34, both of which are averaged across survey respondents at the district level. District administrators might be pressured to vary both NHIS fees to compensate for higher or lower local prices of health care services, or if there was a shortfall between district health expenditures reimbursed and the revenues centrally allocated by the NHIA to the district mutual insurance fund. The second source of multicollinearity is due to the correlation between the distance to the DMHIS office and distance to the major medical facility, and as expected these two indicators of distance are significantly positively correlated at .17.

Estimation Sample for Enrollment in NHIS by Informal Workers

Adults over the age of 18, who previously had health insurance in the formal sector through their private employer or Social Security National Insurance Trust [8], do

[8] Obtained from the GSEPS s6a_a4 response 3 or 4 as reported among the insured in Table 3.

not have to register or annually renew their coverage with the NHIS, because 2.5 percent of their wages are automatically contributed to the NHIF and they receive coverage. These "formal sector" wage earners might be excluded from the estimation sample of individuals analyzed here, because their insurance registration and renewal behavior is not expected to be determined by district mutual health insurance fees, distance to DMHIS office, and other individual demand characteristics. This exclusion of formal sector workers from the estimation sample reduces the number of males covered by the NHIS in the working sample by 3.3 percent and the number of females covered by 1.7 percent, but this change in sample has little effect on the demand estimates.

Those who identify themselves as covered by the NHIS, but report themselves as exempt from NHIS registration fee or premiums, as described in Table 3, are a self selected sample of those officially exempt, and not likely to be representative of the groups that are eligible for fee exemptions. For example, of those 625 persons in the GSEPS who are age 70 or more, who are officially exempt as elderly from NHIS fees, only 235 indicate they are covered and exempt from fees in the survey, whereas 362 report their fees are paid primarily by household members and relatives. More puzzling, of the 137 women who report they are pregnant at the time of the survey, only 14 identify themselves as covered and exempt from paying NHIS fees, whereas 123 report household members and relatives paid for their health insurance. Consequently, the decision to be registered and covered may be affected by the individual's demand for coverage, which may in turn influence their effort to decipher who qualifies for a program exemption. The estimation sample from the survey nonetheless includes those reporting an exemption.

The benchmark individual estimates of the demand for health insurance registration and current coverage are reported first for the entire survey population in Table 5, with the sample statistics reported in Appendix Table A-1, col. (1). The age, gender and schooling patterns of insurance registration and coverage noted in the cross tabulations in Tables 1 and 2 are corroborated in the regressions estimated with all of the controls at the individual level in Table 5. Children are about 10 percentage points more likely to be registered and currently covered than adults age 19 to 34, whereas individuals over age 69 are about 25 percentage points more likely to be registered and covered. Schooling is associated with a greater probability of registration and coverage, but because schooling is not completed

for the majority of persons until about age 15, and exemptions from insurance fees are available for children of covered parents until age 17, a second set of insurance estimates are restricted in Appendix Table B-1, col (1) and (3), to the adult sample of individuals greater than age 18.[9] (Sample statistics are reported in Appendix Table A-1).

An adult woman 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 .23 higher than for women with no schooling, which represents an increase of 45 percent on the sample mean registration rate. The probability of being registration among men is .13 higher than those with no schooling, which represents 31 percent higher than the sample mean of .42. Current insurance coverage association with schooling is proportionately larger for both women and men.[10] These estimated spline linear associations between years of schooling completed by school level are plotted in Figure 2 for women who have completed each school level and ever-registered, and plotted in Figure 3 plotted for current coverage. Alternatively, the association of insurance with schooling can also be categorized in 5 groups by the highest level of schooling completed, which in the linear probability model are plotted in Figures 4 and 5 (full regressions not reported). At the 95 percent confidence level one can reject the hypothesis that those with some tertiary education have similar registration and current coverage of health insurance to those with less than secondary schooling. The differences between none, primary and middle schooling are not significantly different ($p<.05$) in their partial association with enrollment in health insurance.

To assess whether the variables representing district prices of insurance exert differential effects on insurance enrollment among specific groups, such as those

[9] The number of youth reporting a price exemption from the NHIS does not decrease until after age 18 when it collapses, perhaps due to those age 17 having been exempted in the previous year, or errors in reporting age to the DMHIS offices or to the GSEPS.

[10] Combining the adult women's regression coefficients in Table 5, col. (2), that for primary schooling times 6 years (.0104), plus middle schooling times 3 (.0278), secondary times 3 (.0301), minus the no schooling coefficient (.0076), and then the sum is divided by the sample mean registration rate (.505) implies a 45 percent increase at sample mean of the registration probability. These linear probability model regression estimates can be also re-estimated by maximum likelihood methods and the marginal effects evaluated at sample means using the delta method, with very similar magnitudes and significance levels.

who are not exempt from prices, as for example most of those age 19 to 69, interactions between age controls and District prices are estimated and they are not found to be significantly different from zero at the 5 percent confidence level. One might hypothesize that the insurance registration fees and premiums would be a larger deterrent to enrollment among those without schooling, for whom the fees are likely to be a larger share of income. But the data do not support this conjecture (interaction estimates are not reported here to conserve space).

A sample standard deviation increase in the distance from the household to the nearest NHIS office for women is .104 ArcGIS units (roughly 10 kilometers) that is associated in Table 5 with a decline in registration of .050 or by 10 percent of the sample. The coefficient on the distance to a major medical facility is not significantly different from zero, suggesting that the proximity to tertiary medical facilities is not a major factor affecting the demand for health insurance or a source of bias in estimating the impact of the location of the insurance office.

Urban residence is not significantly associated with registration, when schooling controls are included, but is positively associated with being currently covered which increases by .077 or by 26 percent from the sample mean. A standard deviation increase in the registration fee of 2.96 Cedis is associated with a decline in registration probability of .049, or by 10.5 percent of the sample mean.

Insurance Enrollment Behavior of Women of Childbearing Age

A goal of the health financing reforms in Ghana is to improve access of women to medical care for themselves and their families (Mensah et al, 2010). Table 6 reports in col. (1) and (4) the same benchmark estimates for the adoption of health insurance, where now the sample includes only younger women age 19 to 49. Women who have completed secondary school are 46 percent more likely to be registered for the health insurance scheme compared to women with no schooling, and .76 percent more likely to be currently covered. Urban residence is not significantly related to registration or current coverage. The distance to a NHIS office is again a deterrent to registration, where a standard deviation increase in this distance is related to an 11 percent decline in registration and 8.6 percent decline in coverage. Distance to major medical facilities is not associated with registration or current coverage, but the NHIS registration fee in the district is

described as a nominal charge to pay for the district administrative cost of issuing the NHIS identity cards, although the greater dispersion in District registration fees is significantly negatively associated with the likelihood that women register and continue to renew insurance coverage. A standard deviation increase in registration fees in a district is associated with an 8.6 percent decline in women's registration, and 6.3 percent decline in their coverage.

Regressions in col. (2) and (5) in Table 6 adds the number of living children the woman has at the time of the survey. As expected, her demand for insurance is greater if she had more living children under age 18, who maybe thus be insured at no additional cost if she is covered. Young children are also subject to greater morbidity and mortality than adults, and therefore might be expected to benefit more from health insurance than prime aged adults. A standard deviation increase in this measure of surviving fertility of 2.27 children is associated with an 8.0 percent greater expected registration and 8.2 percent greater coverage rates. On the other hand, past fertility may be a behavioral indicator that is also correlated with a woman's preferences for both the quantity and quality of her children, and thus could be a factor conditioning the demand for health insurance. Introducing fertility or household size as a control variable may impart simultaneous equations bias and inconsistency, although it may be noted that other empirical studies of the demand for health insurance have also adopted this specification (e.g. Ngugen and Knowles, 2010; Cameron and Trivedi, 1991; Asuming, 2013).

The final specification in Table 6 in the regressions col. (3) and (6) include whether the woman is pregnant at the time of the survey. Though the NHIS program states that pregnant women are exempted from paying for reproductive health care and postnatal services, the estimates shows only an insignificant association between currently pregnant and those ever registered, whereas pregnant women do report they are 8 percent more likely to be currently covered by the NHIS, which is a significant 25 percent increase in expected insurance coverage for otherwise similar women who are not pregnant (.080/.315).

A key policy issue is how to design a sharing across the population of the benefits and public costs of the program, and disseminate information about program fees, price exemptions and coverage to consumers that would have the effect of increasing their demand for health insurance. Demand for NHIS registration and

current coverage appears to be lower in districts where registration fees are higher and where the distance to the NHIS office is greater. Since the registration fees are likely to provide only a couple of percent of the revenues to the NHIF, registration fees might be eliminated, and other mechanisms could be introduced to exempt children under age 18 from NHIS annual premiums. In the case of malaria prevention experiments, the free distribution of bed nets and supplies in Kenya induced substantial increases in uptake and use, even though these anti-malarial supplies were already widely available for a small fraction of their unsubsidized cost (Cohen and Dupas, 2010). The renewal premiums for adults age 18 to 69 might also be officially varied directly with adult schooling or household assets, which could be monitored by the local DMHIS staff and thereby increase enrollments among the less educated and reduce consumer uncertainty regarding what insurance fees would apply to children in the future.

Financial risk mitigation by a national health insurance scheme is expected to be welfare enhancing, if it were adopted universally. But often the rate of take up, especially in low-income settings, is relatively low, even when the cost to consumers is highly subsidized.[11] The question is to identify efficient means to motivate enrollment without undermining the financial solvency of the program. Although Ghana's central government has already financed about three fourths of the NHIS from a flat consumption tax plus additional government contributions, and one half of the population has not yet been registered, and a third of those registered are no longer covered. The distance to the NHIS office appears to be a salient barrier to enrollment that one would expect to be reduced if additional NHIS registration offices were opened, perhaps even for one day a week, or modern cell phone technology is harnessed to allow consumers to remotely pay their annual insurance fee. However, the field experiment by Asuming (2013) found that recruitment efforts did not increase registration and renewal rates. In the future, alternative interventions to help inform and service a dispersed rural population should be tested in randomized field trials. Nonetheless, there are hints that the program is narrowing over time regional differences in enrollment. The registration-coverage rates were twice as large in urban as in rural areas in the GLSS 5 collected in 2005-06 after the first year of the program, 23 vs. 13 percent. Four years later in 2009-10 this urban-rural gap in coverage in the GSEPS had

[11] See also discussion in footnote 4.

declined to a third higher in urban than rural areas, 42 vs. 32 percent (Ghana Statistical Service, GLSS 5, Table 3,21, and author's tabulations of the GSEPS).

Preventive health services are often underutilized, even when laboratory and clinical evidence suggest they offer high returns as private human capital investments and generate beneficial social externalities by reducing the spread of infectious and parasitic disease. These medical and public health inputs may not be widely used even when provided at highly subsidized prices, and yet uptake can be responsive to further publicized reductions in prices, or even free distribution of health insurance.

The NHIS in Ghana, which is about 70 percent nationally subsidized, may be seen by consumers as a risky investment in preventive health, one which many individuals are unwilling to purchase, especially in a low income country. Although this pattern of behavior could be attributed to a lack of information about health benefits, further price subsidies can nonetheless induce an increase in insurance demand and use of medical care, as illustrated by random controlled trials in the adoption and use of anti-malarial bed nets in Kenya (Cohen and Dupas, 2010). Residing in a district in Ghana where the NHIS registration fees are a standard deviation below the national average is associated with female and male registration rates and coverage rates being 8 to 9 and 7 percent higher, respectively. A policy intervention is sought that allows individuals to more conveniently visit the district office of the DMHIS to enroll and annually renew their insurance coverage. The reduction in registration fees appears to be a modest initial cost the program can sustain going forward, whereas further research may be needed to identify additional administrative reforms that improve access and information at a justifiable cost to the program.

6. Conclusions

A National Health Insurance Scheme (NHIS) initiated in Ghana in 2005, had by 2009 been widely adopted, though its financial design and distributional consequences remain controversial, especially with regard to its limited coverage of the reproductive health services of women and their children that were intended to be essentially universal. The Ghana Socio-Economic Panel Survey (GSEPS) of 2009-2010 is analyzed in this paper and confirms that half the population has paid

an initial registration fee to participate in the NHIS for their first year, and only one third are currently covered by the comprehensive health insurance. These aggregate patterns indicate that a third of those registered have already allowed their initial insurance coverage to lapse. The question explored in this paper is who has registered and who has maintained their health insurance coverage, and how can representative survey information be used to modify the NHIS policies to increase the coverage of the population and to provide health insurance more equitably to the poor and middle class.

The average registration fee paid by survey respondents is 5.08 Ghanaian Cedis (about US$2.50), and the annual renewal premium for continuing the health insurance after the initial registration year is reported in the survey to be twice as large or 10.50 Cedis (Table A-1). These prepayment prices for membership in the health insurance scheme cover less than 5 percent of the program's public expenditures (Blanchet, et al., 2012; NHIA, 2009). But because fees vary at the District level, which administers the DMHIS, the GSEPS asks respondents how much they paid to register and paid for their subsequent annual renewal premiums. These consumer-reported "prices" differ widely across districts. This survey information on the district variation in average insurance prices is then exploited here to account for the probability that individuals register and subsequently pay their annual premiums for continuing coverage. The average registration fee and premium paid by survey respondents are key policy variables that may partially explain who demands and renews health insurance and who does not, just as prices of health care affected the use of health care before NHIS was established (Nyonator and Kutzin, 1999).

The evidence reported in this paper is that the modest registration fee is a significant barrier to registration, and lowering this fee is likely to increase substantially registration without lowering substantially the revenues of the NHIF or the financial sustainability of the NHIS. Although it was expected that higher premiums for continuing NHIS membership would also deter renewals, the estimated effects of district variation in premiums is only weakly related to coverage.

When individuals are registered, they may realize benefits from continued coverage and their demand for health insurance could become less responsive to

variation in district premiums, or price inelastic. Registration fees are already lower in rural areas and in the Northern Savanna zone of Ghana, in which incomes and education are lower, and women are at a greater disadvantage compared to men, in terms of their schooling, earnings and empowerment.

The second policy lever is the requirement that individuals who want to register for and renew their NHIS coverage are required to go to their district administrative office of the DMHIS. The estimated relationship between insurance enrollment and this distance from the household to the NHIS office is interpreted as an additional travel cost to consumers of the insurance. These distances to NHIS offices could simply reflect the proximity of major medical facilities, which affects consumer information about the modern health care system and their experience with its services. But controlling for this distance to the tertiary medical care system does not diminish the estimated effect of distance to the administrative office of the district insurance. In the regions of Ghana where population densities are lower, the analysis suggests registration and coverage might be increased by establishing additional DMHIS offices, such as in the Northern, Upper West and Upper East regions of Ghana, or in the predominantly rural districts throughout the country. Districts could employ out-reach workers in sparsely population areas with poor public transportation to inform people of the program benefits and eligibility for exemptions from fees, and assist them in registering and renewal for health insurance.

There are indications that some features of the design of the NHIS are contributing to greater equality in the population's access and use of health care, but other features may offset these gains and require modification. For example, children under age 18 and elderly over age 69 might be automatically exempted from the registration and premium fees and issued health insurance cards on demand; these age groups already appear to be 10 and 25 percent more likely to register, respectively, than adults age 19 to 34, which is consistent with the original NHIS legislative goals and the purpose of fee exemptions for children. Although the insurance fees are intended to vary with the individual's "ability to pay", it is not clear how this "ability to pay" is determined by the district administrators. Transparent national schedules for fees according to observable qualifications of applicants could dispel uncertainty for consumers and could increase enrollment. Better educated Ghanaians are much more likely to be registered and be currently

covered than the less educated, especially at the level of tertiary schooling. If the district administration of the DMHIS were to fix premium fees at a higher level for better educated applicants in the future, this arrangement would presumably reduce the current inequitable disparity in receipt of health insurance by education. Because the NHIS is currently heavily subsidized by the broadly based public sales tax, a more explicit progressive (by education) schedule of insurance premiums would have distributional advantages and might also be designed to improve the sustainability of the system as the public costs of health care increase.

Mothers have an extra institutionalized incentive to register and continue their NHIS coverage in order to secure at no extra cost health insurance for their children under age 18. The survey suggests that this incentive effect designed into the program may have an effect, but it is modest according to the pattern of women's registration increasing modestly with the number of their living children. Women who are pregnant are officially exempt from insurance fees, but pregnant women do not all indicate an awareness of this exemption or automatic coverage. A more effective extension of NHIS services to reproductive-aged women and their children might be beneficial, especially for women with less than average levels of schooling. The exclusion of family planning services from the otherwise comprehensive coverage of preventive health care services by the NHIS is an anomaly which should also be reappraised.

In the short span of five years Ghana has implemented a national health insurance scheme, and has registered half of the population, more than achieved by many voluntary national health insurance schemes. But the educational composition of those enrolled and benefitting from the substantial NHIS public subsidy is concentrated among the better educated, who are presumably better endowed to pay their own share of the public cost of the health insurance scheme, and better trained to evaluate their likely risks and benefits extended by the program. Modification in the placement of DMHIS administrative offices, greater use of outreach workers to recruit and retain members from remote areas, a reduction in registration fees, and the adoption of more transparent schedules for annual premiums that increase with income or education, could improve equity and increase participation toward the universal goal of the legislation.

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Appendix A: Related Issues for Estimating the Consequences of Health Insurance on the Demand for Health Inputs and Health Outcomes

The use of health inputs, namely, services, supplies, drugs, and health related behavior at time t, U_t , is often assumed to increase with wealth (W) and decrease with their pecuniary cost , P_h , or increase if the inputs are more accessible, or are viewed as being of higher quality. Health insurance affects use of health inputs by reducing the private out-of-pocket cost for the insured individual, but the demand for health insurance is also likely to be endogenous to the demand for health inputs and health outcomes (Cameron and Trivedi, 1988, 1991). Consequently, the partial correlation between voluntary enrollment in health insurance and the use of health inputs or health outcomes is not satisfactory evidence of a causal relationship (Levy and Meltzer, 2004).

Schooling could affect the individual demand for health inputs in many ways, adding to their household earning capacity, reducing the cost of evaluating information on the benefits and risks of using health inputs, as well as potentially in the case of Ghana NHIS, by increasing the price based on "ability to pay". The error in the eq. (2) accounting for health input demand, e_2 , also captures omissions, measurement error, and unpredictable variation across individuals and over time:

(2) $U_t = U (W, P_h , D, N, S, A, I , e_2)$.

Finally, a third goal of health research is to learn about the technological production function for health outcomes at time t , O_t , such as information on the

marginal product of specific health inputs for different types of persons, where the heterogeneity of people (by N, S, etc.) is expected to affect the benefits from their use of health inputs (Schultz, 2010). The individual's initial genetic and environmental endowment at conception or birth, G, conceptually controls for what parents and the health care system know about a child's healthiness and fragility from the start of life as well as unobservables, which could possibly influence how health inputs are allocated to the individual by themselves, their family, and health care personnel (Schultz, 2010; Almond and Mazumder, 2012). These past and current uses of health inputs, U_p , U_t , respectively, may interact with past health realized outcomes, O_p , and an error, e_3 , reflecting again many omissions, errors and unpredictable shocks:

(3) $O_t = O (G, N, S, A, U_t, U_p, O_p, e_3)$.

The estimation of the demand for health inputs or health related behavior in eq. (2) requires that observed variation in current input use is independent of past inputs use, U_p , and e_2, or estimates will be subject to bias due to simultaneity or omitted heterogeneity. In this study of the Ghana NHIS it is convenient to hypothesize that the district level prices of registration and premiums, as well as the distance to the NHIS district office, affect the demand for health insurance by changing the price and access to NHIS, but are independent of the errors in equations (2) and (3), or uncorrelated with omitted determinants of demand for health insurance, health related inputs, or health itself.

Lastly, the technological production function for health in eq. (3) is difficult to estimate and thereby derive the net effects of health insurance treatment and the mechanisms or inputs by which insurance affects health outcomes. All of the relevant lifetime health inputs and past outcomes should in principle be measured and adequately identified by exogenous changes in environmental conditions in order to implement two-stage estimates of the health production function that would be arguably consistent and unbiased (Schultz, 2010).

In other words, to estimate how access to health insurance affects health status over time, it would be useful to randomly administer to individuals the health insurance option, and a panel study must then be sustained for a long enough period to cumulate distinguishable impacts, if any, on health status (Levy and

Meltzer, 2008). Since learning about the benefits of the intervention is likely to be reinforced by the density of the treatment, the randomization in treatment should occur at the community level rather than at the household or individual levels. Infectious and communicable diseases spillover on the health status of neighbors. Such a social experiment has not been performed in Ghana, except in a single district (Asuming, 2013). For this reason, reliable estimates of health production functions tend to focus on infants or young children for whom the life cycle provision of health inputs is brief, and less likely to respond behaviorally to initial health endowments that are unobserved by the researcher, starting with the health conditions of an individual's mother at the time of her conception (e.g. Mwabu, 2008; Schultz, 2010; Almond and Mazumder, 2012; Currie and Vogl, 2013).

Further research on this topic is likely to rely on instrumental variable, discontinuity designs, and propensity score matching estimates of equations (2) and (3). The effects of access to and price of health insurance in Ghana as described in this paper would help to determine current health insurance coverage, and permit estimation of how health induced variation in insurance coverage affects the use of health care, and health outcomes, both subjective (feel healthy) and more objective (activities of daily living or days sick in a reference period which result in inability to engage in normal activities).

Logit and Probit estimates are similar to the linear probability model reported in this paper. The multinomial logistic framework is then estimated that includes the restrictions across the three choices to sum to one, and again does not change substantially the relative effects on the choices or their statistical significance.

Appendix B : Econometric Models of Health Insurance Choice

To describe who obtains health insurance under the NHIS, the paper views the process as involving two binary choices: whether to be ever-registered [R] in a health scheme, and whether to remain currently covered [C] by the health scheme at the time of the survey. These two choices are summarized by estimating linear probability models (LPM) which are estimated by ordinary least squares regression, adjusted for the differences in survey sampling probabilities of individuals in the different strata (10 regions) of the GSEPS, allowing for the shared errors within the cluster (about 323 after dropping a couple of clusters due

to there being no responses on paid insurance fees and premiums within the cluster). To avoid predicted values outside of the logical 0-1 interval, which can occur with LPM, the logistic distribution of the errors or the standard normal may be assumed and estimated as a logit or a probit binary model, respectively, and the maximum likelihood estimated marginal effects evaluated at the sample mean. The single equation logit estimated marginal effects at sample means appear very similar to those implied by the LPM reported in this paper. Table B-1 reports the estimates for the LPM and logit estimation of the demand for health insurance and illustrates that the marginal effects of the logit estimates evaluated at sample means are quite similar to those of those obtained from the linear regression.

An alternative specification of this decision process converts the choices into three mutually exclusive and exhaustive outcomes: never-registered [1-R], those currently covered [C], and the remainder who registered but are not currently covered or dropped their insurance [R- C]. Employing again the LPM model for two of these three outcomes implies the prediction for the third outcome. The attraction of this specification of the choices of insurance is that it allows the estimation of a joint multinomial logit model (MLM), assuming the logistic distribution for the errors. Maximum likelihood estimates are then summarized for two of the outcomes relative to the third outcome, with the base case in this insurance problem being never-registered in the NHIS. The MLM has the unappealing implication that either choice relative to the third choice is unaffected by the characteristics of the remaining choice, the so-called independence of irrelevant alternative (IIA) restriction, which precludes substitutability among all choices and the statistical framework is not readily derived from a utility maximizing choice process (Manski and McFadden, 1982). In the study of demand for health insurance, the reason an individual drops her insurance coverage is likely to be affected by the cost of the renewal premium, and registration would be especially responsive to the registration fee. The conditional logistic model (CLM) associated with McFadden's work extracts estimates of such flexible substitution between outcomes, and is consistent with consumer utility maximization, assuming a generalized extreme value distribution of errors.

Table 1: Proportion of Subpopulation Ever Regisstered and Currently Covered in a Health Insurance Scheme, by Gender, Age, Ecological Zone, and Rural-Urban Residence

Samples by Gender	FEMALE		MALE		TOTAL	
Health Insurance Group:	EVER REGISTERED	CURRENTLY COVERED	EVER REGISTERED	CURRENTLY COVERED	EVER REGISTERED	CURRENTLY COVERED
Age Groups:						
Total of 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
Regionaal 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 COVERED BY HEALTH INSURANCE*

	NO SCHOOLING	PRIMARY	MIDDLE	SECONDARY	TERTIARY	ALL EDUCATIONAL GROUPS
Population or Insurance Status						
(sample size)						
1. Percent of Population by Schooling						
Females (5418)	43.5	14.3	31.6	6.7	4	100
Males (4282)	26.4	10.9	42.2	13.2	7.4	100
2. Percent Ever Registered in 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
3. Currently Covered by 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 OF PERSONS REPORTING WHO PAID FOR THEIR HEALTH INSURANCE REGISTRATION FEE AND Annual Premium by Employment Type, Exemption Category, and Network Relationship

SubSample	ALL PERSONS		WOMEN 15-49	
Ever Registered or Currently Insured	EVER REGISTERED	CURRENTLY COVERED	EVER REGISTERED	CURRENTLY COVERED
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 69	290	209	-	-
Pregnant	47	28	46	28
Indigent	17	5	2	1
Pensioner	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: ESTIMATES OF PAYMENTS OF INDIVIDUALS FOR REGISTRATION AND ANNUAL PREMIUMS FOR COVERAGE UNDER NATIONAL HEALTH INSURANCE SCHEME

Dependent Variable:	REGISTRATION FEE PAID			ANNUAL PREMIUM PAID		
Explanatory variables	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**	**[6]**
Male	0.0427	0.0489	0.0193	-0.751	-0.738	0.565
	[0.21]	*[0.24]*	*[0.13]*	*[2.52]*	*[2.38]*	*[2.05]*
Age 0 to 18	-1.53	-1.55	-1.80	-5.37	5.38	-5.96
	[3.99]	*[4.14]*	*[5.85]*	*[9.88]*	*[9.44]*	*[10.9]*
Age 35 to 49	-0.0427	-0.0447	-0.315	0.876	0.856	0.651
	[0.12]	*[0.12]*	*[1.02]*	*[1.96]*	*[1.90]*	*[1.40]*
Age 50 to 69	-0.0428	-0.0619	-0.260	0.206	0.162	0.0877
	[0.10]	*[0.15]*	*[0.82]*	*[0.48]*	*[0.38]*	*[0.22]*
Age 70 and up	-1.44	1.51	1.73	-3.18	-3.23	-3.78
	[3.77]	*[3.90]*	*[4.77]*	*[3.07]*	*[3.08]*	*[3.34]*
Years of schooling:						
No Schooling	0.190	0.187	0.147	0.303	0.223	0.173
	[0.75]	*[0.76]*	*[0.65]*	*[0.45]*	*[0.32]*	*[0.27]*
Primary	0.216	0.206	0.0991	0.212	0.204	0.152
	[3.24]	*[3.23]*	*[1.81]*	*[1.56]*	*[1.51]*	*[1.23]*
Middle	0.0868	0.0793	-0.0056	0.296	0.287	0.225
	[0.88]	*[0.80]*	*[0.07]*	*[1.56]*	*[1.48]*	*[1.19]*
Secondary	0.0500	0.0603	0.0511	-0.0308	0.0360	-0.072
	[0.27]	*[0.34]*	*[0.36]*	*[0.19]*	*[0.23]*	*[0.56]*
Tertiary	-0.102	-0.107	-0.0465	0.787	0.777	0.414
	[0.37]	*[0.39]*	*[0.25]*	*[1.50]*	[1.48]	*[0.97]*
Urban	1.97	1.91	1.54	2.12	2.14	2.13
	[3.29]	*[3.04]*	*[1.70]*	*[3.30]*	*[3.31]*	*[2.78]*
Distance to NHIS		0.207	-3.60		-0.749	5.39
		[0.09]	*[0.94]*		*[0.20]*	*[0.94]*
Distance to Health Facility		-3.14	-1.38		-2.80	-3.21
		[2.40]	*[0.62]*		*[1.27]*	*[0.89]*
Distance Missing		-0.459	-1.01		-1.11	0.525
		[0.66]	*[1.33]*		[1.42]	[0.61]
Including district effects	No	No	Yes	No	No	Yes
Constant	4.38	0.475	-	10.7	11.2	-
	[10.75]	*[8.02]*		*[16.3]*	*[13.6]*	
R2	0.0844	0.0892	0.325	0.177	0.180	0.310
Observations						
Mean of Dep. Variables	6475	6475	6475	5154	5154	5154

***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: ESTIMATES OF EVER REGISTERED AND CURRENTLY COVERED BY A HEALTH INSURANCE SCHEME

Dependent Variable	EVER REGISTERED	CURRENTLY COVERED
Explanatory Variables:	**[1]**	**[2]**
Male	-0.0564	-0.0457
	[6.31]	*[5.77]*
Age 0-18	0.0953	0.0951
	[6.27]	*[6.98]*
Age 35-49	0.0277	0.0221
	[1.89]	*[1.73]*
Age 50-69	0.0893	0.0824
	[5.03]	*[5.00]*
Age 70-up	0.258	0.239
	[8.98]	*[8.45]*
Years of Schooling:		
No Schooling	-0.0327	0.0063
	[1.67]	[0.36]
Primary	0.0031	0.0119
	[0.66]	*[2.95]*
Middle	0.0205	0.0153
	[3.34]	*[2.83]*
Secondary	0.0164	0.0221
	[1.76]	*[3.07]*
Tertiary	0.0942	0.1029
	[8.96]	*[7.86]*
Urban	0.0577	0.0774
	[1.26]	*[1.98]*
Distance to NHIS	-0.587	-0.367
	[3.78]	*[2.66]*
Distance to Health Facility	-0.661	-0.350
	[0.44]	*[0.23]*
Distance Missing	-0.0424	-0.0488
	[0.98]	*[1.27]*
District Price:		
Registration	-0.0166	-0.0071
	[2.78]	*[1.58]*
Premiums	0.0042	0.0020
	[0.87]	*[0.54]*
Constant	0.588	0.278
	[7.98]	*[4.26]*
R2	0.0534	0.0495
Observation	18,488	18,488
Dep. Variable Mean	0.466	0.299

***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 : ESTIMATES OF EVER REGISTERED AND CURRENTLY COVERED BY HEALTH INSURANCE: WOMEN AGE 19-49

Dependent Variable	EVER REGISTERED			CURRENTLY COVERED		
Explanator Variables	[1]	[2]	[3]	[4]	[5]	[6]
Age 35-49	0.0304	-0.0084	-0.0058	0.0221	-0.0043	0.000
	[1.62]	*[0.41]*	*[0.26]*	*[1.26]*	*[0.22]*	*[0.00]*
Years of Schooling						
None	0.0686	0.0840	0.0811	0.0174	0.0276	0.0240
	[0.84]	*[1.01]*	*[0.98]*	*[0.22]*	*[0.35]*	*[0.31]*
Primary	0.0209	0.0246	0.0243	0.0097	0.0121	0.0118
	[1.32]	*[1.53]*	*[1.51]*	*[0.64]*	*[0.81]*	*[0.78]*
Middle	0.0255	0.0268	0.0267	0.0280	0.0288	0.0288
	[1.99]	*[2.07]*	*[2.07]*	*[2.49]*	*[2.56]*	*[2.55]*
Secondary	0.0313	0.0352	0.0358	0.0383	0.0410	0.0415
	[2.06]	*[2.28]*	*[2.31]*	*[2.84]*	*[2.99]*	*[3.03]*
Tertiary	0.0870	0.0900	0.0901	0.0947	0.0967	0.0968
	[5.17]	*[5.28]*	*[5.26]*	*[3.92]*	*[3.96]*	*[3.94]*
Urban	0.0155	0.0212	0.0221	0.0356	0.0394	0.0405
	[0.37]	*[0.51]*	*[0.54]*	*[0.92]*	*[1.02]*	*[1.05]*
Distance to NHIS	-0.507	-0.543	-0.538	-0.441	-0.465	-0.458
	[3.09]	*[3.40]*	*[3.37]*	*[2.92]*	*[3.10]*	*[3.06]*
Distance to Health	-0.122	-0.115	-0.121	-0.0315	-0.0358	-0.285
Facility	*[0.75]*	*[0.70]*	*[0.73]*	*[0.18]*	*[0.21]*	*[0.16]*
Distance Missing	-0.0601	-0.0595	-0.0592	-0.0595	-0.0592	-0.0588
	[1.41]	*[1.41]*	*[1.40]*	*[1.51]*	[1.51]	*[1.50]*
District Price						
Registration	-0.0143	-0.0138	-0.0137	-0.0067	-0.0063	-0.0062
	[2.30]	*[2.24]*	*[2.22]*	*[1.37]*	*[1.30]*	*[1.27]*
Premium	-0.0057	-0.0055	-0.0054	-0.0028	-0.0027	-0.0026
	[0.92]	*[0.90]*	*[0.88]*	*[0.73]*	*[0.70]*	*[0.67]*
Children Living		0.0173	0.0171		0.0114	0.0112
		[2.52]	*[2.50]*		*[2.07]*	*[2.03]*
Pregnant Now			0.0652			0.0800
			[1.40]			[1.98]
Constant	0.528	0.472	0.468	0.312	0.275	0.270
	[4.90]	*[4.24]*	*[4.20]*	*[3.23]*	*[2.81]*	*[2.76]*
R2	0.0543	0.0587	0.0595	0.0620	0.0642	0.0656
Observations	3655	3665	3655	3655	3655	3655

***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 A-1: Sample Statistics : All Persons, Women Age 19-49 and Adults Age 19-69

Mean [Stanard Deviation]*

Variable Name:	All Persons	Women Age 19-49	Adults Age 19-69
Dropped Coverage	0.167	0.178	0.165
Ever Registered	0.466	0.493	0.459
Currently Covered	0.299	0.315	0.294
Male	0.477	---	0.426
Age 0-18	0.543	---	---
Age 19-34	0.181	0.553	0.427
Age 35-49	0.149	0.447	0.352
Age 50-69	0.094	---	0.221
Age 70-up	0.0337	---	---
Years of Schooling:			
No Schooling	0.43	0.364	0.33
Primary	2.77	3.59	3.82
	[2.74]	*[2.84]*	*[2.81]*
Middle/JSS	0.868	1.46	1.67
	[1.43]	*[1.59]*	*[1.65]*
Secondary/SSS	0.191	,321	0.418
	[.746]	*[.917]*	*[1.02]*
Tertiary	0.0414	0.0641	0.0911
	[.340]	*[.381]*	*[.478]*
Urban Resident	0.309	0.36	0.354
Distance to NHIS Office	0.106	0.0943	0.0994
	[.113]	*[.108]*	*[.110]*
Distance to Health Facility	0.0686	0.0633	0.0641
	[.125]	*[.120]*	*[.122]*
Distance Missing	0.225	0.254	0.238
Registration Fee	5.08	5.22	5.27
	[2.96]	*[2.98]*	*[3.00]*
Annual Premium	10.5	10.8	10.7
	[3.73]	*[3.86]*	*[3.79]*
Children Alive	---	2.73	---
		[2.27]	
Pregnant Now	---	0.0517	---
Pregnant last 12 months	---	0.17	---
Sample Size	18488	3,665	8,545

The standard deviations of binary variables are not reported, because the standard deviation = (mean(1-mean))**0.5 .

TABLE B-1: ESTIMATES OF EVER REGISTERED AND CURRENTLY COVERED BY HEALTH INSURANCE, ADULTS AGE 19 TO 69, LINEAR PROBABILITY MODEL AND LOGISTIC MODEL

Dep.Varible:	EVER REGISTRED		CURRENTLY COVERED	
Explanatory Variables	**Linear Regression**	**Marginal Logit**	**Linear Regression**	**Marginal Logit**
	{1}	{2}	{3}	{4}
Male	-0.135	-0.135	-0.102	-0.103
	[10.2]	*[10.3]*	*[8.52]*	*[8.51]*
Age 35 to 49	0.0292	0.0287	0.0222	0.0224
	[2.02]	*[1.99]*	*[1.76]*	*[1.74]*
Ages 50 to 69	0.0949	0.0933	0.0858	0.0853
	[5.24]	*[5.21]*	*[5.09]*	*[5.23]*
Years of Schooling:				
None	0.0568	0.0587	0.0275	0.0362
	[0.99]	*[0.99]*	*[0.52]*	*[0.58]*
Primary	0.0147	0.0151	0.0119	0.0144
	[1.35]	*[1.35]*	*[1.15]*	*[1.22]*
Middle	0.0289	0.0278	0.0234	0.0218
	[3.61]	*[3.53]*	*[3.16]*	*[2.98]*
Secondary	0.0242	0.0226	0.0272	0.0243
	[2.33]	*[2.25]*	*[3.23]*	*[3.41]*
Tertiary	0.1018	0.145	0.1061	0.095
	[9.89]	*[6.84]*	*[7.45]*	*[5.80]*
Urban	0.0502	0.0484	0.0721	0.0624
	[1.22]	*[1.18]*	*[2.10]*	*[1.96]*
Distance to NHIS	-0.452	-0.465	-0.322	-0.378
	[3.11]	*[2.99]*	*[2.57]*	*[2.51]*
Distance to Health	-0.0695	-0.0676	0.0018	0.0044
Facility	*[0.51]*	*[0.48]*	*[.01]*	*[.03]*
Distance Missing	-0.0388	-0.0385	-0.0433	-0.0428
	[0.99]	*[1.00]*	*[1.27]*	*[1.30]*
District Price:				
Registration	-0.0148	-0.0152	-0.0075	-0.0077
	[2.68]	[2.64]	*[1.84]*	[1.76]
Premium	-0.0063	-0.0064	-0.0027	-0.0028
	[1.12]	*[1.12]*	*[0.77]*	*[0.78]*
Constant	0.529	NA	2.82	NA
	[6.08]		*[3.76]*	
R^2	0.0731	NA	0.0758	NA
Observations	8545	8545	8545	8545
Sig. Tests Program	5.81	5.28	2.38	2.27
4 Variables (*)	*[.0002]*	*[.0004]*	*[.0517]*	*[.0612]*
Test of Schooling	38.9	19.2	30.2	20
5 Variables (*)	*[.0000]*	*[.0000]*	*[.0000]*	*[.0000]*

Figure 1: Map of Ghana with households (red), NHIS offices (blue) and health facilities (green)

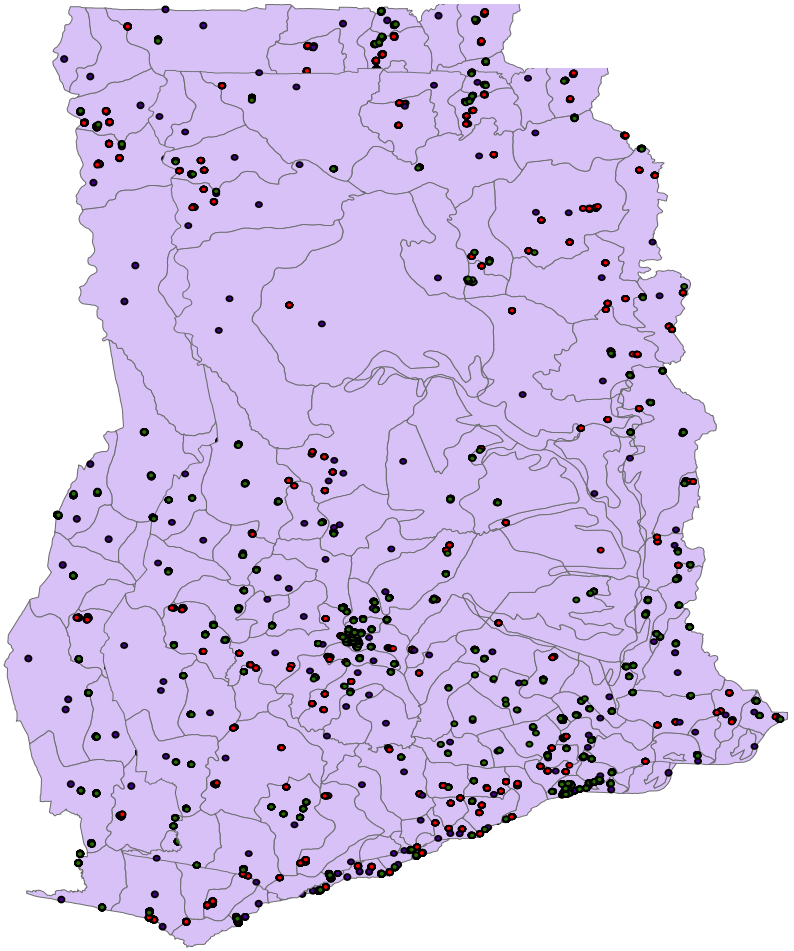

Fig.2:Percent of Population Ever Registered in Health Insurance Scheme by Completed Years of Schooling

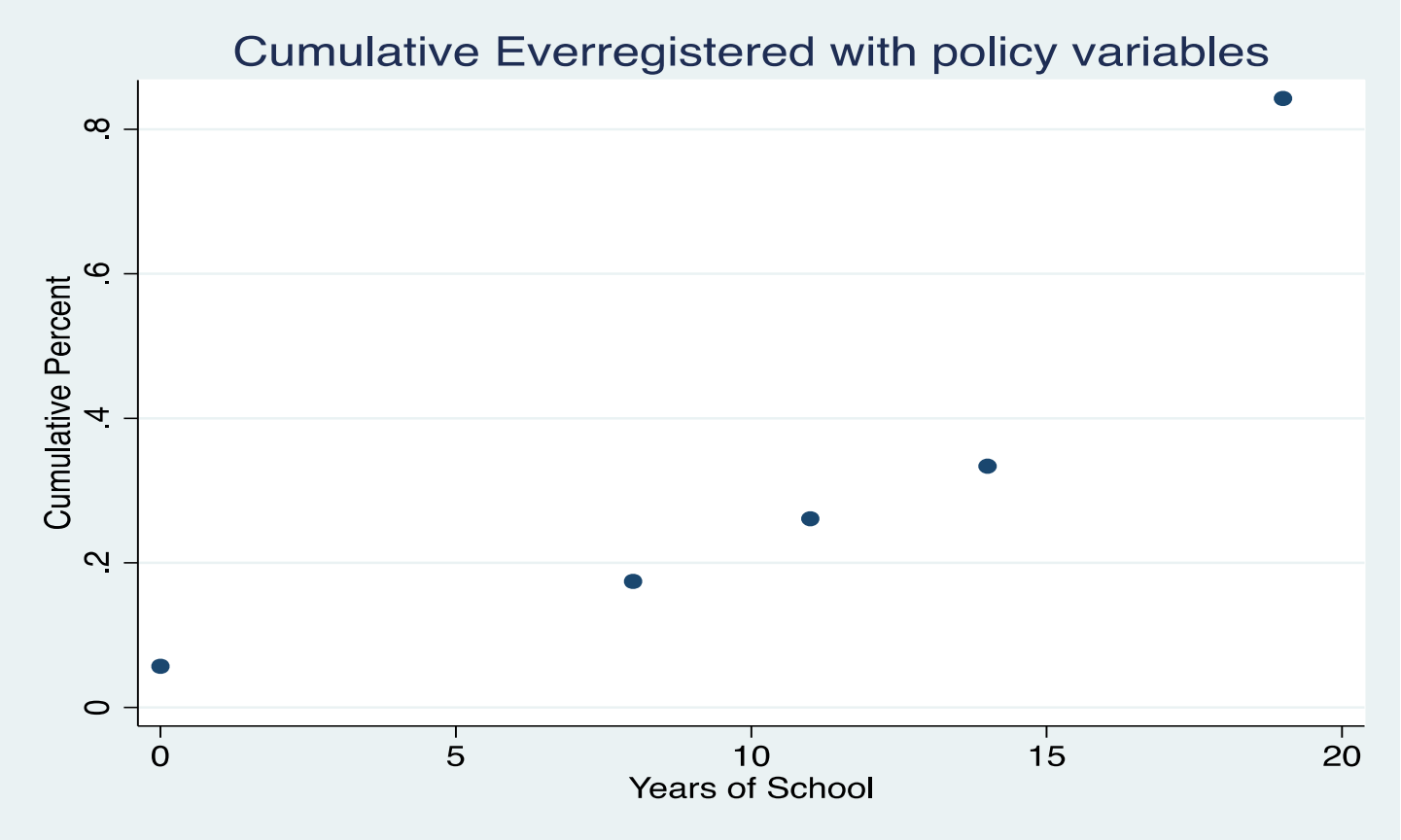

Fig.3: Percent of Population Currently Covered by Health Insurance by Completed Years of Schooling

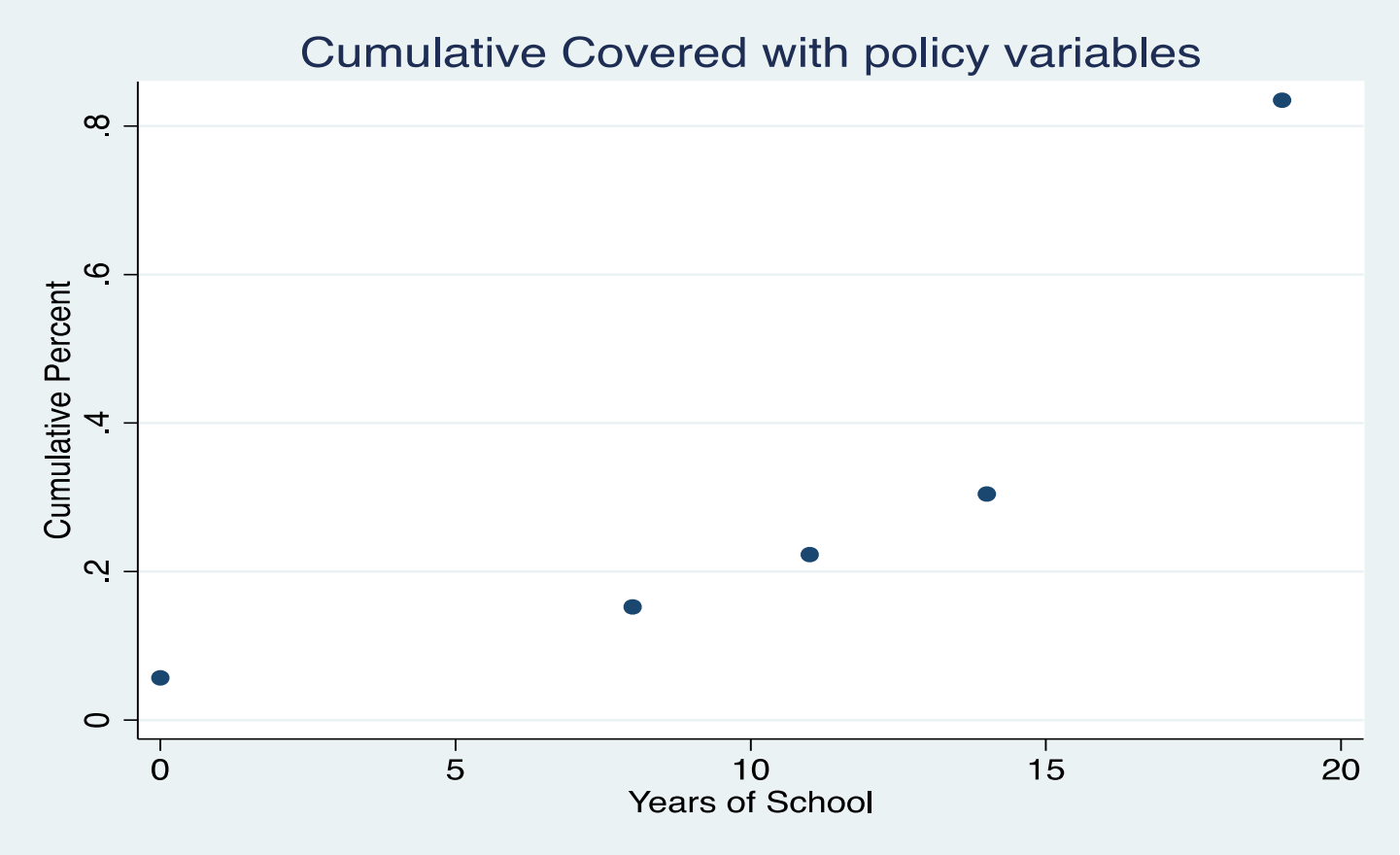

Fig.4: Percent of Population Ever Registered in Health Insurance Scheme by Highest Levels of Schooling

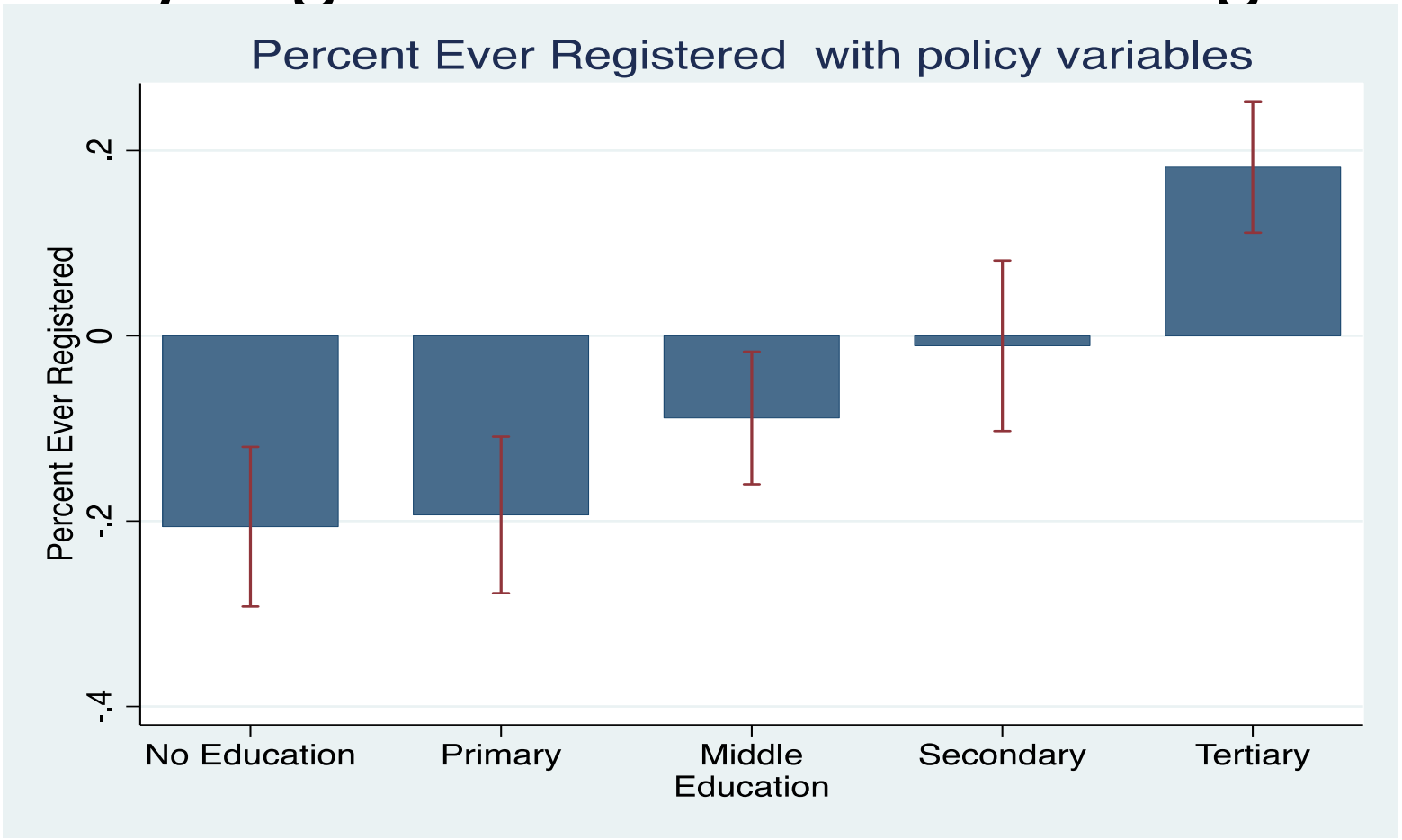

Fig. 5: Percent of Population Currently Covered by Health Insurance Scheme by Highest Level of Schooling