Getting the Poor to Enroll in Health Insurance, and Its Effects on Their Health: Evidence from a Field Experiment in Ghana

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Abstract

Many developing countries have recently instituted social health insurance schemes (SHIs) to ease financial barriers to utilization of healthcare services and help mitigate the effects of adverse health shocks. Although these SHIs offer generous terms and benefits, enrollment remains low especially among the poorest households who are the intended primary beneficiaries. This paper implements randomized interventions to (i) understand the reasons for low enrollment; (ii) estimate the effects of insurance coverage on utilization of healthcare, financial protection and health; and (iii) provide insights into intra-household allocation of health resources. My results show that imperfect information, and insurance premium and fees affect enrollment. The demand for insurance is price elastic in the sense that small subsidies generate substantial enrollment effects. I find that insurance coverage leads to increased utilization of healthcare services, reduced out-of-pocket payments among individuals with prior positive expenses and improvement in health outcomes. My results suggest strong complementarities between providing information and providing subsidies in utilization and health outcomes, an indication of the importance of the combined interventions for achieving changes in health-seeking behavior and outcomes. Finally, I find evidence of son preference in the allocation of health resources within households.

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1 Introduction

Health shocks have non-trivial negative effects on the financial conditions of uninsured poor households and their ability to smoothen consumption (Townsend, 1994; Deaton, 1997; Gertler and Gruber, 2002; Wagstaff, 2007). Yet many poor households in developing countries lack access to mechanisms for pooling risks and suffer health-related poverty in the wake of adverse health shocks. In the absence of insurance, a high fraction of medical expenses are borne by households in the form of out-of-pocket payments, and financial constraints are significant barriers to access to healthcare in many low-income countries (Xu et al, 2003).[1]

With encouragement from international organizations and donor governments, many developing countries have recently instituted social health insurance schemes (SHIs) to remove financial barriers to healthcare and help mitigate the impact of adverse health shocks (WHO, 2005; WHO, 2010).[2] Moreover, countries with existing insurance programs for formal sector workers have recently extended them to the informal sector.[3] However, in spite of the relatively low cost of signing up and the generous benefits offered by SHIs, take-up rates are very low in many countries especially among the poorest households (Acharya, et al forthcoming). Low take-up of government programs is not peculiar to health insurance programs in low-income countries; it is pervasive across programs and countries.[4] It is a concern for policy-makers because it undermines their purpose of promoting equity and redistributing income. This concern is exaggerated in the case of health insurance programs due to the potential for adverse selection and its welfare implications. Yet, in spite of the growing literature evaluating SHIs, little attention has been paid to the issue of low take-up.

An important related issue is whether enrollment in SHIs provides adequate financial protection, increases utilization of healthcare services and, ultimately, improves health outcomes. An extensive empirical literature in the US, both experimental and non-experimental, has shown that insurance coverage reduces out-of-pocket payments and increases utilization of healthcare services while evidence on the impact on

[1] For instance, according to WHO (see http://www.who.int/mediacentre/factsheets/fs320.pdf) 11.3% of all medical expenses in Germany are borne by households while in the Democratic Republic of the Congo about 90% of the money spent on healthcare is paid directly by households to providers.

[2] Recent examples include Georgia, Ghana, Kenya, Nigeria, Tanzania and Vietnam. Countries in the process of instituting SHIs include Cambodia, Laos, Malaysia and South Africa.

[3] Examples include Colombia's Regimen Subsidiado, Mexico's Seguro Popular, Phillipine's National Health Insurance Program and Nicaragua's Insitituto Nicaraguense de Securidad Social (INSS)

[4] A large empirical literature from developed countries, especially the United States, has highlighted the role of non-financial factors in low take-up of government programs for the poor (Moffitt, 1983; Currie and Grogger, 2001; Bitler et al, 2003; Remler and Glied, 2003; Hernanz et al, 2004; Bansak and Raphael, 2006; Currie, 2006; Kleven and Kopczuk, 2011). Studies from developing countries emphasize both financial and non-financial factors (Clert, 2000; Coady and Parker, 2009; Amior et al; 2012).

health outcomes is mixed (Newhouse et al 1993; Currie and Gruber, 1996; Card et al, 2008; Finkelstein and McKnight, 2008; Card et al 2009; Michalopoulos et al, 2011; Finkelstein et al, 2012). However, the structure of the health insurance market in the US differs in important ways from those of developing countries. First, supply-side constraints, in the form of availability and quality of health facilities and personnel, are more binding in developing countries. Second, a high fraction of the population in the US obtain health insurance from private markets. By contrast, with limited or non-existent private health insurance markets, SHIs in low-income countries tend to be single-payer country-wide government-run insurance schemes. A growing empirical literature has evaluated the effects of SHIs on utilization and out-of-pocket payments (See Acharya et al, forthcoming, for a review of this literature). However, many of these studies fail to adequately address concerns about selection in the take-up of insurance and their estimates may be biased. King et al (2009) and Thornton et al (2010) are exceptions.

This paper seeks answers to three broad questions. First, what accounts for the low enrollment in SHIs? To what extent do the levels of premiums, incomplete information and remoteness from enrollment locations contribute to low enrollment? Second, how do resource-constrained households allocate health resources among its members? Third, does enrollment in SHIs improves access to healthcare services, provides financial protection against out-of-pocket expenses and improves health outcomes?

To understand low enrollment in insurance, I introduced randomized interventions in a poor, rural and agrarian district in northern Ghana to encourage take-up of a nationwide health insurance scheme. I then used the resulting random variation in insurance coverage to estimate the effects of enrollment on utilization of healthcare services, probability of making out-of-pocket expenses and health outcomes. The interventions are a convenience intervention, an education campaign and a subsidy intervention. The convenience intervention sought to increase the convenience of enrolling in insurance by allowing individuals in randomly selected communities to sign up in their community instead of traveling over 18km (mostly by foot) to the district capital. The education intervention assesses the role of incomplete information on enrollment by providing information on registration procedures, premiums and exemptions, and benefits of the insurance scheme. For the subsidy intervention, households in randomly selected communities were randomly assigned to receive amounts equivalent to 1/3, 2/3 or the full financial cost of signing up for insurance. I use the resulting variation in the price of insurance to estimate the price elasticity of demand.

To provide insights into intra-household allocation of health resources, I randomly varied the ability of households to decide allocation of subsidy amounts. Specifically, households who did not receive a full subsidy received a voucher that either specified an amount for each household member that could not be changed or one that only specified the total amount of subsidy, allowing the household to determine the allocation among its members.

My experimental set-up was designed to test for possible complementarities among the interventions. An important ongoing debate in development policy is focused on the proper design of multiple interventions. Although it is frequently presumed that an integrated approach of multiple anti-poverty interventions has stronger effects[5], there is limited empirical demonstration of the presumed complementarities that underlie this approach. I test for possible complementarities by stratifying my interventions and including a complete set of interactions.

Seven months after the introduction of the interventions, I find that providing additional convenience of signing up has no effect on take-up but the price of insurance (premium and fees) and information are significant determinants. My estimates suggest that the demand for insurance is price elastic. Providing a moderate amount of subsidy has strong effect on enrollment. For instance, a 33% subsidy on premiums and fees doubles enrollment. There is no evidence of complementarities among the interventions in terms of take-up. However, I find evidence of adverse selection: individuals from lower socioeconomic backgrounds and in poorer health respond more to the interventions, especially the education intervention, and are also more likely to take up the 1/3 subsidy.

Insurance coverage has strong effect on utilization of healthcare. My two-stage least square local average treatment effect (LATE) estimates suggest that insurance coverage increases utilization by 120% to 211%, which is consistent with the evidence on adverse selection on health. I also find evidence that insurance coverage improves health outcomes. For instance, insurance coverage reduces the number of days of illness by 0.339 days (or 42%) and the number of days an individual is unable to perform normal daily activities by 0.805 days (or 52%). I also find improvement in self-reported health outcomes.

[5] PROGRESA and the Millennium Villages Project (MVP) are recent examples. Pronyk et al (2012) discusses the logic behind the approach of the MVP.

More importantly, my reduced-form estimates imply strong complementarities between the education and subsidy interventions in utilization of healthcare and health outcomes. This is an important finding in the light of the absence of complementarities in the first-stage estimation. It suggests that to the extent that policy makers care about utilization of services and health outcomes but not take-up of insurance in itself, policy should combine price interventions with education. It is also a significant finding because it informs the ongoing policy debate about the proper design of multiple development interventions mentioned earlier. Although previous studies have provided macro-level evidence on policy complementarities (De Macedo and Martins, 2008; Chang et al, 2009), my paper is among the first to demonstrate complementarity in a convincing way at the micro-level.

In terms of financial protection, only a small fraction of individuals make positive out-of-pocket (OOP) health expenditure (12.6% of individuals at baseline) in my setting. Unsurprisingly, I find no effect of insurance coverage on the likelihood of a positive OOP for my full sample. However, for individuals with positive baseline expenditures, I find that insurance coverage leads to a 2.7 percentage point reduction in the probability of making such expenditures at the follow-up. These results are consistent with findings from previous studies that use nationally representative data from Ghana.

In terms of the allocation of health resources within the household, my results suggest that households enroll more boys than girls when allowed to determine allocation of subsidies. Among households receiving less than full subsidy who are allowed to choose which members to enroll with the subsidy, enrollment of male children is 11.7 percentage points (or 14.7%) higher than female children. There is no such differential when households are not allowed to determine allocation of subsidy amounts. I provide suggestive evidence that this gender difference in enrollment is not due to differences in risky behavior or health characteristics. This finding is consistent with the strict patrilineal system of inheritance in my setting.

My paper contributes to a large empirical literature on health insurance. It is one of very few studies that provide experimental evidence on health insurance in low-income countries. King et al (2009), Thornton et al (2010) and Barofsky (2011) are the closest of the existing work to my paper. My contribution to this literature is two-fold. Firstly, to my knowledge, my paper is the first to use multiple randomized interventions to understand enrollment decisions of vulnerable rural populations. Thorton et al (2010) also implement multiple interventions to study enrollment in Nicaragua but they focus on an urban population and they do not

test for possible complementarities nor examine the effect of insurance on health outcomes. Secondly, my paper is the first to provide experimental evidence on the effect of enrollment in a nation-wide government-run health insurance scheme. Although King et al (2009) and Barofsky (2011) also examine the effect of Mexico's nationwide Seguro Popular (SP) on utilization, health spending and health outcomes, SP was implemented along with other health interventions which makes it difficult to isolate the effect of health insurance from the other interventions.

My paper also contributes to a growing body of work explaining low take-up of public programs. Within this strand, it is more closely related to the empirical literature on the role of pricing in take-up and use of health products and services in developing countries.[6] My results are consistent with previous studies that find that the demand for health products and services is price elastic (Kremer and Miguel, 2007; Dupas, 2009; Cohen and Dupas, 2010). My elasticity estimate is however lower than those of existing studies. This difference may be explained by the fact that health insurance is a more broadly defined good and that in previous studies positive prices are introduced after the product had been available at zero price.

Finally, the paper contributes to a large body of work on intra-household allocation.[7] It is more closely related to the empirical literature that focuses on parental allocation of resources among children. Several studies find evidence of gender bias in allocation among children especially in East Asia (Thomas, 1990; Subramanian and Deaton, 1991; Duflo, 2003; Barcellos et al 2011), while recent work has focused on allocation in response to endowment of children (Adhvaryu and Nyshadham, 2012; Aizer and Cunha, 2012). To my knowledge, my paper is the first to demonstrate the existence of gender bias in allocation of health resources among children using an experimental design. Moreover, I demonstrate this in a setting with no documented evidence of sex selection, minimizing potential biases that plague studies from settings where there is significant pre-natal sex selection.

The rest of the paper is organized as follows: section 2 documents the institutional context by providing details of the NHIS; section 3 describes the research design and data collection; section 4 describes the

[6] Holla and Kremer (2009) reviews the recent evidence of the effect of price on access to education and health services from randomized evaluations.

[7] A large part of this literature has focused on husband-wife allocations in unitary and non-cooperative household models (Pitt et al, 1984; Udry, 1996; Chiappori, 1997; Duflo and Udry, 2004).

empirical framework; section 5 presents the main results and section 6 concludes the paper.

2 Institutional Background

2.1 Historical Context

At independence in 1957, Ghana established a tax-financed publicly provided health care system with no payment for services at point of use. Healthcare personnel were trained and paid by the government which also provided supplies for health facilities. In the early post-independence era, the Ghanaian economy, boosted by high international prices for its main exports, especially cocoa, was able to support this health financing arrangement. From the late 1960s, however, as world prices of Ghana's main exports commodities began to tumble and the economy began to deteriorate sharply, it became increasingly difficult to sustain publicly provided "free" healthcare. Health facilities began experiencing acute shortage of essential medical supplies and equipments and quality of health services deteriorated.

Major health care reforms were introduced in 1985, as part of a broader Structural Adjustment Program. These reforms led to the introduction of user fees at public health facilities in the form of co-payment for health services (Ramachandra & Hsiao, 2007). By 1992, this arrangement had evolved into a system of full cost recovery, infamously known as the "cash and carry" system. The sector was also liberalized to allow private sector participation in the provision of healthcare (Gajate-Girrado & Ahiadeke, 2012).

The cash and carry system was found to have accentuated inequities in financial access to healthcare and deprived the poor of access to basic and essential services (Waddington and Enyimayew, 1990). As widespread discontent over this financing arrangement grew, pressure mounted on political leaders to replace it with a different health financing system. In response, and with encouragement of the Ministry of Health, a number of community-initiated mutual health insurance schemes began to emerge in 1990s. These schemes clustered around major health facilities and required members to pay periodic premiums in order to enjoy the benefits offered. While these schemes partially bridged the gap in social protection between the formal sector which benefits from the national social security system, and the impoverished informal sector, most members could not afford the very low premiums (Ramachandra & Hsiao, 2007). Nevertheless, the community-based initiatives became an important foundation for the introduction of the National Health Insurance Scheme.

2.2 The National Health Insurance Scheme

The National Health Insurance Scheme (NHIS) was established by the National Health Insurance Act (Act 560) in 2003. The scheme became fully operational in 2005. It aims to improve access to and the quality of basic healthcare services for all citizens, especially the poor and vulnerable, through the establishment of an affordable healthcare financing arrangement (MOH, 2004).

Act 560 provides for the establishment of three types of insurance schemes: District Mutual Health Insurance Schemes (DMHISs), Private Mutual Health Insurance Schemes (PMHISs) and Private Commercial Insurance Schemes (PCHISs). The DMHISs are publicly-run and subsidized by the government through the National Health Insurance Fund (NHIF).[8] It accounts for more than 96% of insurance coverage (GSS, GHS and ICF, 2009) and is the focus of this study. The law mandates that every citizen enroll in at least one scheme although in practice obtaining insurance is voluntary as no penalties are prescribed for those who do not enroll. Almost all of the 170 administrative districts of Ghana operate its own DMHIS. They are run as semi-independent corporate bodies under the control of the National Health Insurance Authority (NHIA), the regulator. Individuals enroll in their district of residence but membership is readily transferable from one district to another. DMHISs accept and process applications, collect premiums (and fees), provide membership identification cards and process claims from accredited facilities for reimbursement. Premiums collected by DMHISs are transferred to the NHIF from which claim reimbursements are made.[9]

Act 560 provides for means-tested premiums to be charged to informal sector workers, ranging from GHC7.20 ($5) to GHC48 ($32) annually. However, due to the lack of information on household incomes, this has proved difficult to enforce. In practice, poor rural districts tend to charge the lowest premiums while the urban districts charge higher premiums. Premiums can be adjusted upwards after approval by the NHIA. Indigents, children under 18 years of age and the elderly (aged 70 years and above) are exempt from premiums.[10] Beginning from July 2008, pregnant women also enjoy premium exemption status under the

[8] PMHIS are non-profit non-subsidized schemes run by NGOs, religious bodies and cooperative societies. Most schemes under this catergory existed before the passage of Act 560 but were previously unregulated. PCHISs are for profit schemes that do not receive government subsidies.

[9] Informal sector premiums contribute 5% of total funding for the NHIS (NHIA, 2010). The other sources of funds to the NHIF are a 2.5% VAT levy on selected goods and services (61.49%), retention of 2.5% of formal sector workers's salaries (16.87%), sectoral budgetary allocation (4.76%) and donor support.

[10] The law defines an indigent as "a person who has no visible or adequate means of income or who has nobody to support him or her and by the means test qualifies as an indigent". Regulation 58 of LI 1809 provides more concrete criteria. An indigent is a person who satisfy all of these criteria i) unemployed and has no visible source of income, ii) does not have a fixed place of residence according to

Free Maternal Care program. All members (except indigents and pregnant women) are required to pay a registration fee at first registration and subsequent renewal. To put the annual premiums in context, annual per capita income estimated from latest Ghana Living Standards Survey was 400 cedis or $433 in 2006 (GSS, 2008).

There is a minimum waiting premium period of three months before new members become eligible for benefits. Existing members who do not renew their membership at the due date are liable to pay a penalty when they eventually renew their membership.

The benefits package of the NHIS, which is specified by a legislative instrument and is the same across DMHISs, is very generous. Table A9 summarizes included and excluded services. Broadly, it covers i) full outpatient and inpatient (surgery and medical) treatments and services; ii) full payment for medications on the approved list; iii) payments for referrals on the approved list and iv) all emergencies. The NHIA estimates that 95% of disease conditions that affect Ghanaians are covered by the scheme. Excluded services include aesthetic treatments, assisted reproduction, appliances and prostheses, anti-retroviral drugs for HIV/AIDS, cancer treatment other than breast and cervical cancer, cosmetic surgeries, brain and heart surgery, organ transplant and all treatments obtained outside Ghana.

In spite of the low premiums and generous benefits, enrollment in the NHIS remains low. By the end of 2010, the total active membership stood at 34% of the population of Ghana (NHIA, 2011). Enrollment is particularly low among the poorest quintile. A 2008 nationwide survey found that 29% of the individuals in the lowest wealth quintile were active members of the scheme compared to 64% of households in the highest quintile (NDPC, 2009). Membership is also lower among individuals with no education, those employed in the informal sector and those who reside in rural areas.

2.3 Setting

The study was conducted in the Wa West district in the north-western part of Ghana. Wa West is a poor and remote rural district located in the Savanna High Plains. It covers an area of approximately 5,899.3 square kilometers and had population of about 81,000 in 2010. The district is inhabited mainly by the Dagaaba,

standards determined by the scheme iii) does not live with a person who is employed and who has fixed place of residence iv) does not have any identifiably consistent support from another person

Brefo, Lobi and Wala ethnic groups. Settlements patterns are highly dispersed with majority of residents living in hamlets of about 100-200 people.[11] This, coupled with poor road network, makes traveling within the district difficult and expensive.

The economy is largely agrarian. Over 90% of the labor force are subsistence farmers who grow food crops such as maize, sorghum and vegetables. The district is classified as one of the most deprived districts in Ghana and is located in the poorest region of Ghana, the Upper Region. Latest estimates of household incomes from the Ghana Living Standard Survey (GLSS V) in 2006 indicates that per capita income for a person living in a rural savannah locality, like Wa West, was GHC232 or $252.80[12] (GSS, 2008). The annual per capita health expenditure was GHC24 cedis or $26.

Besides income poverty, the district also has a high basic infrastructure deficit. It is one of few districts yet to be connected to the national electricity grid. Only the district capital and the health centres have access to electricity powered by solar energy. The district has no tertiary health facility and only 6 public health centres. However, following recent reforms in Ghana Health System 13 Community-Based Health Planning and Services (CHPS) facilities have been placed in areas farther away from health centers, leading to a fairly even distribution of health facilities and a significant reduction in the distance to primary health care services.[13][14] All these facilities are accredited to provide care under the NHIS. As at June 2010, the district had no medical doctor but 15 professional nurses (Nang-Beifua, 2010).

The district has a high disease burden. The most common cause of out-patient (OPD) visits in the region is malaria (a third of all OPD visits), which has a reported prevalence of 16.5 (as of 2004).[15] Other common causes of OPD visits are acute respiratory-tract infections, skin diseases and snakebites. Trachoma (an infectious blindness-causing disease) and guinea worm are endemic in the district.

The Wa West Mutual Health Insurance Scheme became operational in January 2007. Although the Upper West Region has the highest active membership rate in the NHIS of 53% (NHIA, 2011), Wa West has one of the lowest enrollment rates in Ghana. The baseline enrollment rate for the study sample is 21%. At the

[11] See: http://www.ghanadistricts.com/districts/?r=9&_=115&sa=3249

[12] At 2006 exchange rate: $1=GHC0.92

[13] CHPS (Community-Based Health and Planning Services) facilities are located within rural communities with limited access to larger hospitals and manned by regular and community health nurses to provide primary health care services. Among the services are treatment of common ailments (malaria and diarrheal diseases) and maternal and child care services.

[14] Seventy-five percent (75%) of communities in the study sample are within 6 km (3.73 miles) of a health facility.

[15] http://www.statsghana.gov.gh/Prm.html

start of the project the Wa West DMIHS charged a uniform premium of GHC8.20 ($5.46) for adults (18-69) and processing fee was GHC4 for first-time members and GHC1 for renewals. Late renewals attract a fee of GHC2 in addition to full premiums for all years for which membership was not renewed.[16]

3 Research Design

3.1 Experimental Design

The study introduced three interventions: a subsidy towards the payment of NHIS premium and fees, an education campaign and a convenience intervention as well as a complete set of their interactions (see Figure 1a). All interventions were randomized at the community level. The convenience intervention sought to reduce the cost of signing up for NHIS resulting from remoteness from the district capital where the DMHIS office is located by allowing residents of selected communities to sign up in their own community.[17] For this intervention, an official from the Wa West DMHIS, accompanied by a fieldworker visited randomly selected communities to register or renew membership of community members. There were two visits seven days apart, each lasting from 9am to 5pm, and on different days of the week. Each visit was pre-arranged with community leaders who were informed that the exercise was strictly for members of that community.

The goal of the education intervention was to assess the impact of lack of or incomplete information about the NHIS on enrollment. This intervention provided basic information on the NHIS including registration information, premiums and exemptions, and benefits of the scheme as well as general education on the importance of being insured. As with the convenience intervention, trained fieldworkers visited randomly selected communities to provide information/education and answer questions about the scheme. It also involved two visits, each from 9 am to 5pm, seven days apart and on different days of the week.

The subsidy intervention gave households in randomly selected communities subsidies to defray all or part of the cost of enrolling in the NHIS. The level of subsidy received was randomized at the household level. Households in subsidy communities were assigned to receive a full subsidy (GHC 12.20 or $8.13),

[16] The exchange rate used here is $1=GHC1.5. This rate will be used in all subsequent conversions.

[17] To deal with the problem of remoteness, the Wa West DMHIS has an "agent system" in place. Under this system, community leaders from strategic locations are appointed as "local informants" for the scheme to collate registration and renewal forms for onward transmission to the scheme. The convenience intervention is therefore a test of the additional convenience on top of this existing arrangement.

subsidy worth 2/3 (GHC 8.10 or $5.40) or 1/3 (GHC 4 or $2.67) of insurance premiums and fees (See Figure 1b). In all cases, children (aged less than 18 years) and the elderly (aged 70 years or more) received full subsidies for registration fees so the variation in subsidy level applies to adult household members. Subsidies were given in the form of vouchers with a two-month validity period and redeemable only at the Wa West DMHIS. The voucher specified names, ages and gender of all household members, expiration date and where it should be redeemed. Households not receiving full subsidy were informed about the extra amount needed to register all members. For such households vouchers took one of two forms. In one case, household members were listed along with the total amount of subsidy, allowing the household to allocate the amount among its members (henceforth, unspecified voucher). In the other case, an amount was specified against the name of each member and reallocation was not possible (henceforth, specified voucher). Figure 2 presents an illustrative example. Adult members in the two households in the top panel of the figure are both assigned to receive 2/3 subsidy. In the top left panel, an amount is specified against the name of each household member (specified voucher). In the top right panel, no amount is specified for each member but the total subsidy for the household is specified (unspecified voucher). The value of the subsidy is the same in this case because of the household size and age structure. Households in the bottom panel received 1/3 subsidy. Both the level of subsidy and voucher type are stratified by the broader treatment arms.

Vouchers were issued irrespective of the individual's enrollment status so that currently enrolled individuals could use the vouchers only if their membership expired within the two-month validity period. To aid the redemption of vouchers, a list of all subsidy recipients as well as amount of subsidy assigned was given to the Wa West DMHIS office. The DMHIS verified the names and amount assigned when vouchers were presented for redemption and retained the redeemed voucher. An amount equivalent to half the total value of vouchers issued was deposited with the scheme at the start of the subsidy intervention. The scheme continued to redeem vouchers in excess of this amount and was reimbursed at two weeks interval for additional vouchers redeemed until the end of the validity period.

3.2 Data Collection

The sampling frame was limited to communities with 30-400 residents that are at least 1km from the nearest other community. The size restriction was informed by budgetary considerations because interventions were randomized at the community level. The distance restriction was to minimize spillover of education and convenience interventions to neighboring communities. All 61 communities meeting these criteria were included and all households in these communities were interviewed.

The baseline survey was conducted in September 2011. Interventions were implemented in October 2011 with the follow-up survey in April 2012. The household questionnaire used for both surveys was adapted from the Ghana Demographic and Health Survey (GDHS) 2008 and the Ghana Livings Standards Survey 2005/2006 (GLSS V). The baseline survey collected information on demographic characteristics, employment, health history, general health and utilization of healthcare services, expected future health, enrollment in the NHIS and health behaviors for all household members. Information on knowledge of health insurance was collected from household heads or an adult respondent present if the household head was not present. Information on pre-natal care, delivery and post-natal care was collected for all women aged 15 to 49 years. Additional information on household characteristics, including ownership of assets, and GIS information on all communities and health facilities in the district was collected.

Table A1 provides information on attrition. Panel A shows that the follow-up survey successfully re-located almost 94% of individuals from the baseline sample. More importantly, there is no statistically significant difference in attrition rate between treatments and control groups. Panel B shows that among individuals who could not be relocated, 58% had traveled outside the district, 26% had relocated outside the district and 8% were deceased.

3.3 Descriptive Statistics

Table 1a presents descriptive characteristics from the baseline survey and tests of balance between treatments and control groups. The first column reports summary values for the full sample. The baseline survey collected information on 4625 individuals from 680 households in the 61 communities. The average household has 6.8 members, including 3.9 children under 18 years of age. The average age is 23 years. Forty-eight

percent (48%) of individuals are male and 80% of households are headed by males. Fifty-one percent (51%) of households own a farmland and 59% own a mosquito net. Half of the households belong to the Dagaaba ethnic group and about 43% are Christian. A third of all individuals have some formal education.

In terms of health characteristics of the sample, 7% reported having a chronic health condition lasting more than six months and 12% reported a sickness or injury in the last four weeks. Utilization of formal healthcare is low even among those with illnesses. Only 8.7% of all respondents (including 36% of those reporting illness or injury) visited a health facility in the last four weeks. About 12.6% made a positive out-of-pocket health expenditure. Among those reporting a positive expenditure, the average expenditure was GHC11.95 ($6.64) over the four-week period. The average household lives within 5.36km of a health facility and 18.43km from the district capital where registration for NHIS takes place. The subjective probability of being sick over the next 12 months is 0.447. Eleven percent (11%) of adults respondents (18 years and above) are current or past smokers and 53% had an alcoholic beverage in the two weeks before the baseline survey. About 54% of individuals reported sleeping under a mosquito net the night before the survey.

Although 96% of adult respondents had heard about the NHIS, on average, they answered less than 11 of 18 questions on knowledge of NHIS premiums levels, exemptions and benefits correctly. Enrollment rate in the NHIS is 21% but 37% of individuals had registered with the scheme once before. The re-enrollment rate is 63%.

The remaining columns of Table 1a present the balance test between the control and treatment groups. All tests are pairwise comparisons between each treatment and the control group and columns report mean differences. Tests adjust standard errors for intra-cluster (intra-community) correlation. The table shows a good balance between treatments and control groups. Although there are statistically significant differences for some variables, the magnitude of differences are small and the number of such significant differences (16) is not very different from what is expected by chance for 182 comparisons at 10% level (18). Table 1b presents a similar balance test between the control group and subsidy treatments by level of subsidy and voucher type. This table shows that these treatments and control group are also reasonably balanced.

4 Empirical Framework

4.1 Intent-to-treat estimation

I estimate reduced-form effects of being assigned to each treatment on various outcomes by ordinary least squares estimation of the following equation:

$$y_{ihc} = \alpha + \beta_1 sub_c + \beta_2 edu_c + \beta_3 conv_c + \beta_4 edu\&conv_c + \beta_5 sub\&conv_c + \beta_6 sub\&edu_c + \beta_7 sub\&edu\&conv_c + X_{ihc}\theta + Z_{hc}\delta + V_c\omega + \varepsilon_{ihc} \quad (1)$$

where i denotes an individual, h denotes a household and c denotes a community and y_{ihc} refers to an outcome of interest. $educ_c$, sub_c and $conv_c$ indicate assignment to education and subsidy and convenience interventions respectively, β_1- β_7 are the reduced-form estimates of the effect interventions on the outcome variable. $educ\&conv_c$ denotes an indicator for assignment to education and convenience treatments. X_{ihc} denote a set of individual-level covariates that are potentially correlated with the outcome (individual's age grouping (under 18, 18-69 or 70+), gender, indicator for having some formal education, indicator for having a health condition at baseline, indicator for visiting a health facility at baseline and indicator for having ever registered with the NHIS). Z_{hc} and V_c denote household-level covariates (household size, religion, ethnicity, wealth) and community-level covariates (distance to nearest health facility, distance to the district capital) respectively. The measure of household wealth used here is a three-category index constructed from principal component scores of household assets. The outcomes considered here are: utilization of healthcare services, out-of-pocket expenses, health status, and self-reported health status. In all estimations, standard errors are clustered at the community level. Estimations employ linear probability models (LPM).

4.2 Local Average Treatment Effect

Instrumental variables (IV) estimates of the effect of insurance coverage on the outcomes are obtained from estimation of the following systems by two-stage least squares (2SLS):

$$enrolled_{ihc} = \alpha + \rho_1 sub_c + \rho_2 edu_c + \rho_3 conv_c + \rho_4 edu\&conv_c + \rho_5 sub\&conv_c + \rho_6 sub\&edu_c + \rho_7 sub\&edu\&conv_c + X_{ihc}\varphi + Z_{hc}\psi + V_c\rho + \upsilon_{ihc} \quad (2)$$

$$y_{ihc} = \nu + \pi enrolled_{ihc} + X_{ihc}\sigma + Z_{hc}\vartheta + V_c\xi + \mu_{ihc} \quad (3)$$

where $enrolled_{ihc}$ is an indicator for being enrolled in the NHIS at the follow-up survey and (2) is the first-stage estimation using treatment status as the excluded instrument. The coefficient of interest, π, from the outcome equation (3) is the local average treatment effect (LATE) of insurance coverage. It measures the causal effect of insurance among the subset of intervention recipients induced to take-up insurance but who would otherwise not have obtained insurance.

5 Results

5.1 First-stage results

5.1.1 Effect of interventions on insurance take-up

Figure 3 presents the effect of the interventions on insurance coverage. The blue bars show the baseline enrollment rate while the green bars show the rate at the follow-up. The figure shows that enrollment rose slightly (about 7 percentage points) in the control group between the baseline and follow-up. All interventions had strong effect on enrollment. The convenience treatment had the weakest effect on enrollment: the increase in enrollment for this treatment is similar to that of the control group. Moreover, adding the convenience intervention to other interventions had little or no additional effect on enrollment. For instance, the effect of the education only treatment is almost identical to the effect of the education with convenience treatment. The subsidy with education treatment had the strongest effect on enrollment, stronger than the treatment that combined all three interventions.

Table 2 presents results from the first-stage estimation. Each column represents a separate regression and the outcome variable is an indicator that an individual is enrolled in the NHIS at follow-up. Column 1 reports regression without other covariates and columns 2-4 adds individual, household and community

covariates. The results show that all but the convenience only treatment have statistically significant positive effect on the enrollment. Column 4, the preferred specification, shows that education only and subsidy only treatments led to 14.7 and 37 percentage points increase in the likelihood of enrollment respectively, representing 53% and 133% increase from the control group. The convenience treatment is associated with a 1.3 percentage point increase in the likelihood of insurance take-up but this is not statistically significant. Moreover, adding the convenience treatment to either education or subsidy or their combination does not change the coefficient of either intervention alone by much and formal tests confirm that convenience produces no significant additional effects. Combining education and subsidy leads to a 52.5 percentage point increase in the probability of being enrolled. This coefficient is not statistically different from the sum of the coefficients on education only and subsidy only.[18] This suggests that there is no complementarity between the two interventions in terms of take-up of insurance. Similar tests of interaction between education and convenience, and subsidy and convenience find no evidence of complementarity. The F-statistic associated with the excluded instruments is sufficiently high at 21.22.

Columns 5 and 6 report separate regressions for adults (18 years +) and children respectively. They show that the effects are similar between the two groups with the exception of the education intervention. The effect of education campaign is concentrated in adults members, with coefficients of 0.261 (significant at 1% level) for adults and 0.05 (not statistically significant) for children.

In sum, the results from Figure 3 and Table 2 suggest that incomplete information and insurance premiums and fees are two of the factors behind the low take-up of the NHIS. The absence of an effect of the convenience intervention may seem surprising given the significant costs of traveling within the district. It might be the case that the "agent system" already in place in the district have reduced costs associated with remoteness. While my results is consistent with this reasoning, my study was not designed to test the effectiveness of this system.

[18] More formally, a test of the null hypothesis: Subsidy & education - (subsidy only + education only) = 0 has a p-value of 0.9291

5.1.2 Effect of education intervention of knowledge of NHIS

Table 3 investigates the effect of the interventions on knowledge of the NHIS. Although 96% of household heads or adult respondents reported that they had heard about the NHIS at baseline, much of their knowledge of the NHIS were incomplete or inaccurate. In Table 3 knowledge of NHIS has been classified under three main headings: knowledge of premium levels, exemptions and benefits. The knowledge of premiums outcome variable is generated from questions asking respondents to quote the premiums and fees for children, adults and the elderly in the Wa West District. Correct answers are tallied and standardized scores are used as outcome variables. Outcome variables for knowledge of exemptions and benefits are generated in a similar fashion. The fourth outcome variable is an aggregated standardized score of all three knowledge variables. The regressions include controls for baseline score of each outcome variable so the coefficients are difference-in-difference estimates.

The results in columns 1-3 show that the education intervention had significant positive impact on all knowledge of all aspects of the NHIS. The coefficient on all treatments with some education intervention is positive and statistically significant in 7 out of 12 instances. The subsidy treatment also has positive impact on knowledge of NHIS although the magnitudes are smaller and fewer of these coefficients are statistically significant. This possibly reflects additional knowledge gained from interaction with NHIS officials during registration process and/or use of services covered under the NHIS. Column 4 confirms these findings using the aggregate measure of knowledge. The convenience intervention has no effect on knowledge of NHIS. The results from this subsection indicate the education intervention improved the knowledge of the NHIS of its recipients. The subsidy intervention also resulted in slight improvement in knowledge of recipients.

5.1.3 Effect of subsidy levels on insurance take-up

Figure 4 and Table 4 present the effect of the subsidy level on enrollment. Figure 4 shows enrollment rates by levels of subsidy offered at baseline and follow-up. As expected, the enrollment rate is increasing in the amount of subsidy offered. However, the differences in enrollment rates by subsidy level is not very large, particularly between 2/3 subsidy and full subsidy. The enrollment response to the 1/3 subsidy is strong: 1/3 subsidy is associated with a 28 percentage point (or 100%) increase in enrollment. Table 4 presents

the corresponding regression results. In these regressions, I pull all subsidy recipients and include dummy variables for receiving education and convenience interventions.[19] Column 1 reports regressions without other covariates while the columns 2-4 progressively add individual, household and community covariates. As expected enrollment is increasing in the level of subsidy offered. The preferred specification in column 4 shows that receiving 1/3, 2/3 and full are associated with 26.2, 35.6 and 37.4 percentage points higher likelihood of enrolling in insurance. The difference between 1/3 and 2/3, and between 1/3 and full subsidies are statistically significant but the difference between 2/3 and full subsidy is not. Columns 5 and 6 report separate regressions for adults and children. They show similar effects of subsidy levels on enrollment for children and adults. This suggest that although children always receive full subsidy, their enrollment is still strongly related to the enrollment of adult household members.

My elasticity estimate is much larger than the -0.2 estimated for United States by Manning et al (1987). However, it is lower than estimates from previous experimental studies of health products and services in Africa (Kremer and Miguel, 2007; Dupas, 2009; Cohen and Dupas, 2010).[20] The finding that take-up varies with level of subsidies is consistent with Dupas (2009) but contrasts with Kremer and Miguel (2007), who find that take-up of a deworming drug is insensitive to level of positive prices. Economic theory suggests that health insurance is a more broadly defined product with relatively few substitutes and therefore its demand is likely to be less price-elastic compared with ITN or a specific deworming drug which has more close substitutes. The difference may also be explained by the fact that in previous studies positive price is introduced after the product in question has been available at zero price while the opposite is the case in my setting. Shampan'er et al (2007) have demonstrated that special psychological effects associated with zero financial price may lead to such dramatic response to positive prices.

[19] Table A2 in the appendix presents results from regressions that isolates subsidy levels for subsidy only recipients. The coefficients from those regressions are very similar to those presented in the main analysis here.

[20] In Kremer and Miguel (2007), the introduction of a $0.15 user fee on deworming drugs led to a 62% drop in take-up in Kenya. Dupas (2009) finds that an increase in the price of an insecticide-treated mosquito net (ITN) in Kenya from $0 to $1 led to a 35 percentage point drop in take-up and a further 25 percentage point drop when price increases from $1 to $2. In Cohen and Dupas (2010), take-up of ITN dropped by 60% when price increased from $0 to $0.60. By contrast, my results suggest that an increase in the price of insurance from $0 to $2.67 leads to a 2.8% fall in enrollment and a further increase in price from $2.67 to $5.67 leads to a 14.8% percent fall in enrollment.

5.1.4 Heterogeneous impact of treatments

Tables A3-A6 in the appendix investigates possible heterogeneous response to the interventions. Tables A3 and A4 present evidence on differential response by household's socioeconomic status. Column 1 of Table A3 reports results from interacting an indicator for being in the poorest third of household wealth distribution with treatment status. The results show that the poorer households were more responsive to the subsidy intervention, especially when combined with the education intervention. Among those receiving education and subsidy treatments, enrollment was at least 25 percentage points higher for individuals in the poorest third of the wealth distribution. Column 2 estimates response to subsidy levels by household wealth. Relatively poor households were more likely to take advantage of the lower levels of subsidies. Table A4 presents similar evidence of heterogeneous response by education status of the household head. Column 1 shows that individuals from households where the head is educated were more responsive to the subsidy and education intervention, particularly the combined education/subsidy treatment. Column 2 confirms that such households were also more likely to use the 2/3 and full subsidies.

Tables A5 and A6 present results from interacting treatments with baseline health status.[21] Column 1 of Table A5 shows that enrollment was higher among individuals with chronic conditions at baseline especially among those receiving the education intervention. Among recipients of the education only treatment, individuals with chronic conditions were 15.6 percentage points more likely to enroll. The coefficients for those receiving education with subsidy and all three interventions are 10.5 and 16.3 percentage points respectively. Column 2 shows that there is no interaction between subsidy level and chronic health status. This indicates that the result in column 1 may have been driven by the education campaign. Table A6 focuses on individuals with "unmet need" for healthcare, defined as anyone with a chronic health condition but who had not been receiving treatment for it at baseline. The results are very similar to those from Table A5. Among individuals from education only or education with subsidy communities, those with unmet need for health care are more likely to enroll in insurance. Unlike in Table A5, there is an interaction between subsidy level and unmet need. Among one-third subsidy recipients, those with unmet need at baseline were more likely use the subsidy.

[21] In regressions not reported here, I also undertook similar investigations by baseline health expenditures, probability of illness/injury over the coming year and expected health expenditure and found no systematic patterns along these characteristics.

The results in this subsection shed more light on the first-stage results. They are indicative of adverse selection on health condition and socioeconomic status. These are not unexpected given baseline enrollment and utilization patterns. Baseline enrollment was strongly correlated with wealth status: enrollment was 8.4 percentage points lower among the poorest third of households. Moreover, while there was no difference in the incidence of illness by wealth status, use of health facility is strongly related to enrollment status and visits to health facilities conditional on illness/injury was 3.7 percentage points lower for their poorest third of households. This suggests that poorer households had higher unmet need for healthcare services and responded more to the interventions.

5.2 Effect of Insurance Coverage on Care utilization, out-of-pocket expenses and Health

5.2.1 Utilization of healthcare services

Table 5 presents the effects of insurance coverage on the utilization of healthcare services in the short-run. Utilization is measured by i) an indicator for visiting a health facility in the last four weeks, ii) an indicator for visiting a health facility in the last six months, iii) number of visits to a health facility in the last six months and iv) an indicator for visiting a facility to seek treatment for malaria, the leading cause of OPD visits in the district. Panel A presents the IV results. Insurance coverage leads to an increase in utilization of healthcare services. The coefficient on insured is positive and statistically significant in all regressions. The effects are strong: utilization increases by 120% to 211% among individuals induced to take up insurance by the interventions. Table A7 in the appendix presents results separately for adults (odd-numbered columns) and children (even-numbered columns). Although insurance coverage increases utilization for both children and adults, effects are stronger for children. Indeed, columns 7 and 8 show that insurance coverage increases the probability of visiting a facility for malaria treatment for children but not for adults.

Columns 1-4 Panel B present the reduced-form results. Both education alone and subsidy alone have positive but statistically insignificant effects on utilization. The combined education and subsidy treatment has the strongest impact on utilization of healthcare services across all outcomes except visiting a facility for malaria treatment. The treatment combining all three interventions is positive and significant across all

specifications but the magnitude is smaller than the education with subsidy treatment in all but column 4.

The magnitude of coefficients in Panel B suggest there is complementarity between the education and subsidy. This contrasts with results from the first-stage. The preferred first-stage specification is reproduced in column 5 for ease of comparison. Panel C performs a formal test of the complementarities between the education and subsidy interventions by testing the hypothesis that the sum of education only and subsidy only treatments is equal to the combined education and subsidy treatment. The F-statistic and p-values from these tests are reported. The null hypothesis (of no complementarity) is rejected in all cases for the utilization outcomes (columns 1-4) but it is not rejected in the first-stage (column 5). This implies that while education and subsidy may each have strong effects on enrollment, it is the combination of the two that induces changes in health-seeking behavior. It also suggests that besides financial cost, cost of information remains a significant barrier to utilization of healthcare services in this setting. More generally, this result also speaks to an ongoing lively policy debate about the design of multiple interventions. This debate has been rekindled by the Millennium Villages Project which simultaneously introduce multiple interventions in villages in rural Africa (Pronyk et al 2012). Although complementarities among interventions is a key underlying assumption behind this approach, this has not been demonstrated rigorously at the micro level. My results provide a convincing demonstration of the existence of such complementarities.

Table 6 presents reduced-form effect of subsidy levels on utilization of healthcare services. The effect of prices on utilization of health products and services has received considerable attention in recent times following the introduction of user fees on social services in developing countries. Proponents of user fees argue that cost-sharing is necessary for sustainability of public programs because positive prices screen out users with low need for services and reduces waste of subsidy money (World Bank 1993; Easterly, 2006). Recent empirical work using randomized designs to test the existence of such screening effects of higher prices have found mixed results. While Ashraf et al (2010) find that high prices stimulate product use through screening effect, Dupas (2009) and Cohen and Dupas (2010) find no effect of higher prices on product use. The current design allows estimation of causal impact of price on use of healthcare services without disentangling selection effect from sunk cost effect.[22]

Consistent with Dupas (2009) and Cohen and Dupas (2010), Table 6 finds no evidence that the utilization

[22] An aspect of this project that employs a design similar to Ashraf et al (2010) to isolate the selection effect from sunk cost effect is currently on-going.

of healthcare services is increasing in the price paid for insurance. For all four outcomes, there are no statistically significant differences in the use healthcare by the level of subsidy received. Indeed, the coefficient on all three subsidy levels are not statistically different from zero.

5.2.2 Effect on Out-Of-Pocket Expenses

Table 7 presents IV and reduced-form estimates of the effect of insurance coverage on out-of-pocket (OOP) expenses. The outcome variable is an indicator for making an OOP health expenditure in the last 4 weeks. Columns 1 and 2 present the IV estimates; columns 3 and 4 present reduced-form estimates. Column 1 shows that insurance coverage has no effect on the probability of making OOP expenses in the last four weeks. Indeed, the coefficient on being insured is positive but not statistically significant. Column 2 includes an indicator for making a positive OOP at the baseline. Insurance coverage reduces the probability by 2.7 percentage points for those who made positive OOP expenses at baseline. In the reduced-form estimation, the coefficients on all but the convenience intervention are negative although very small and not statistically significant with the exception of education with subsidy treatment. Column 4 includes an interaction between treatments and an indicator for making positive OOP in the baseline. The interaction terms are negative for all but the convenience intervention and is only statistically significant for those receiving the education with subsidy treatment.

The finding that insurance coverage has no effect on the probability of making OOP expenses for the general sample is somewhat surprising because many previous studies, experimental and non-experimental, have found that insurance is associated with a reduction in OOP payments. However, it is consistent with Brugiavini and Pace (2010) who find weak effects of the NHIS on out-of-pocket expenses using data from a nationally representative sample in Ghana. The difference from other studies may be explained by the fact that in this setting, people without insurance hardly seek care at the health facilities and rather resort to the use of traditional/herbal medicines obtained at virtually zero price. Indeed, only 12.6% of individuals made positive out-of-pocket expenses at baseline. With insurance, there is substitution from traditional medicines to formal health facilities but this does not involve any expenses because of the absence of co-payment. But for those who had made positive OOP expenditure by paying at point of use, insurance coverage reduces

this likelihood of payment at facilities.

5.2.3 Effect on Health

Table 8 presents the effect of insurance coverage on health measures. My measures of health are: i) number of days an individual suffered an illness in the last month; ii) an indicator for not being able to perform normal daily activities in the last month; iii) the number of days in the last month that an individual was unable to perform normal daily activities,[23] and iv) number of days a person who reported an illness or injury waited before seeking care at a health facility.

Even-numbered columns report IV estimates while odd-numbered columns report reduced-form results. Column 1 shows that the insurance coverage is associated with 0.339 fewer days of illness suffered. This represents a 42% reduction from the control group. Columns 3-6 show the effect of coverage on ability to perform usual activities as a result of illness. There is no effect on ability to perform normal daily activities at the extensive margin although the coefficient has the expected sign. There is however a strong effect at the intensive margin. Column 5 shows that insurance coverage leads to 0.805 fewer days of inability to perform normal daily activities, a 51% reduction from the control group. Columns 7 shows that insurance coverage also leads to 1.57 fewer waiting days before seeking care although this is not statistically significant due to reduced sample size. As with utilization of healthcare, the reduced-form results show that the LATE effects of coverage on health are mainly driven by the combined education and subsidy treatments.

Table 9 presents additional results on the effects of insurance coverage on health using self-reported health outcomes. I use seven measures of self-reported health. The first is an indicator for being happy or very happy created from a question asking respondents to rank their general state of happiness (very happy, happy, so-so, unhappy, very unhappy). The second is an indicator for being healthy or very healthy generated from a question asking respondents to rank the overall state of their health (very healthy, healthy, so-so, unhealthy, very unhealthy). The other measures are an indicator for improvement in health status in

[23] In essence, this measure is similar to Activities of Daily Living (ADLs) commonly used in the literature although it is derived differently. In the literature ADLs are usually constructed from asking respondents questions about their ability to perform basic daily activities such as self-feeding, ambulation, dressing and undressing etc. The variables used here are derived from the following questions "During the last month did (NAME) have to stop his/her usual activities because of this (illness/injury)" and "For how many days (in the last one month) was name unable to do his/her usual activities". One advantage of my measure is that it is directly linked to illness/injury

the last seven months, number of days in the last month that the respondent's physical health was not good, the number of days in the last month that the respondent's mental health was not good, an indicator for feeling depressed and an indicator for being hopeful about the future.[24]

Panel A presents the IV results. All but one of the seven measures have the expected signs and four are statistically significant. Insurance coverage leads to 21.8, 13.7 and 12.5 percentage point increases in the probability of being happy or very happy, being healthy or very healthy and being hopeful about the future respectively. Individuals with insurance coverage also have 0.684 fewer days of being in poor mental health. Those with insurance coverage are however 1.1 percentage points less likely to report that their health status has improved although this is not statistically significant. Panel B reports the reduced-form estimates. Consistent with the results on utilization of healthcare services above, education with subsidy treatment is the major driver of the effect on self-reported health.

Although the results in this section indicate significant improvement as a result of insurance coverage, given the subjective nature of the outcomes considered here, there may be concerns about the extent to which they reflect actual improvements in physical health. While these concerns may be valid, they are not specific to this paper. Moreover, the fact that the reduced-form results mimic the findings from utilization of healthcare suggests that the findings on health may be due to interactions with the healthcare system.

5.3 Intra-household allocation of health resources

This section focuses on the allocation of health resources within households. I exploit aspects of the subsidy voucher design that randomly varied the ease with which households determine allocation of subsidy amount among its members by comparing allocations between households who could not reallocate subsidies (specified vouchers) and those who decided the allocation (unspecified).[25] I begin by showing the effect of subsidy levels and voucher types on enrollment rates. Column 1 of Table 10 regresses the fraction of household members enrolled on subsidy level after controlling for receipt of education and convenience

[24]The self-reported health variables are available only for 1335 adult household members who were available on the day of the follow-up survey. I have checked that all previous results hold for this restricted sample although the magnitudes differ slightly when compared with the full adult sample.

[25]In regressions not reported here, I separate 1/3 specified/unspecified vouchers from 2/3 specified/unspecified vouchers. The coefficients from those regressions are consistent with those reported here but they are not statistically significant due to reduced sample sizes for each category.

interventions. As expected, the fraction of household members enrolled is increasing in the level of subsidy. Column 2 shows that the enrollment rate was higher in unspecified voucher households than in specified voucher households. This may result from unspecified voucher households adding up to the subsidy to enroll more members or taking advantage of the flexibility of the voucher to use up the total amount of subsidy and enroll more members. Column 4 probes this by regressing the average amount households spent to enroll its members on voucher type received. Since children do not pay premiums, I control for the fraction of children enrolled. The results show that unspecified voucher households did not spend more on average to enroll its members, suggesting that they probably took advantage of the flexibility of the voucher to enroll more members.

The remaining columns of Table 10 focus on the fraction of children enrolled. Column 5 shows that child enrollment is increasing in the level of subsidy. The coefficients are not very different from those in column 1. The fraction of children enrolled is highest with unspecified subsidy and lowest with specified voucher (column 6). The last four columns present results separately for boys and girls. Enrollment rates are similar under full subsidies but lower for girls otherwise. A comparison of columns 8 and 10 shows that this difference is mainly from households receiving unspecified vouchers as enrollment rate is similar when voucher is the specified type or when the household receives full subsidy.

Next, I examine allocation within households more explicitly. The sample for this analysis is restricted to households receiving subsidy only and the pure control group. Figure 6 shows enrollment rates among members of the household - fathers, mothers, male child, female child and other relatives - by type of voucher. The "other relatives" category refers to parents of the head or spouse, brothers/sisters, cousin and other extended family members. As expected, the fraction of each category of household members enrolled is not higher with specified/unspecified voucher than with full subsidy. Overall enrollment rate is highest for male children. A comparison of specified versus unspecified vouchers shows that with the exception of female children, enrollment rates are higher under unspecified than specified although the differences are not statistically significant. Moreover, for children, enrollment is identical under specified voucher but increases marginally for males and falls for females with unspecified voucher.

Table 11 presents the corresponding regression results. Father is the omitted category of household members. The interaction between voucher type and status in the household identifies the effect of voucher

type on allocation within the household. Column 1 reports regression without other covariates while column 2 includes a full set of covariates. Within households, enrollment rates is highest among male children and lowest among other relatives. There are no significant differences in enrollment rates among various members for full subsidy households. For households receiving specified vouchers, enrollment of children is higher than other household members and there is no significant difference between boys and girls. For households receiving unspecified voucher however, enrollment of girls is 13.3 percentage points lower than fathers and 14.5 percentage points lower than boys. These differences are statistically significant at 10% level.

The remainder of this section focuses on allocation among children. Enrollment of children is of special interest because they are a highly vulnerable population. Furthermore, since all children receive full subsidy under specified voucher, the comparison with unspecified provides insights in household's decision regarding which child to enroll under resource constraint.[26]

Figure 7 shows child enrollment by level of subsidy (left panel) and by voucher type (right panel). Enrollment rate is higher for boys when households receive less than full subsidy. The right panel shows that this difference emanates from households receiving unspecified vouchers: enrollment rates are nearly identical with specified vouchers or full subsidy voucher and about 10 percentage points lower for girls with unspecified vouchers. Table 12 presents the corresponding regression results. Columns 1 and 2 present enrollment by subsidy levels and columns 3-4 by voucher type. Among less than full subsidy households, enrollment rate of boys is 6.9 and 10.8 percentage higher than girls if subsidy levels are 1/3 and 2/3 respectively. This differential vanishes with full subsidy. Column 4 confirms that this differential is mainly from households receiving unspecified vouchers. The enrollment rate is similar between boys and girls among specified voucher households but 11.7 percentage points (14.7%) higher for boys among unspecified voucher households.

The results in the preceding paragraphs show evidence of son preference in the allocation of resources. However, it is possible that households are making allocations based on other child characteristics that may be correlated with gender. For instance, boys may be engaging in more risky behavior and households could

[26]Gender comparison may be invalid in the presence of pre-natal sex selection since gender may be endogenous in that case. Studies in Ghana have found no evidence of such sex selection (Bhatia, 1984; Basu and de Jong, 2006). Indeed, sex ratio at birth and in the first five years of life around 103 males/100 females (See https//www.cia.gov/library/publications/the-world-factbook/fields/2018.html), well within the range considered natural (see Grech et al, 2002).

be responding by optimally enrolling more boys. It is also possible that boys are less healthy in general.[27] Table A8 in the appendix presents a gender comparison of indicators of risky behavior and current and expected health at baseline. To the extent that the incidence of injuries reflects risky behavior, Table A8 finds no evidence that boys engage in more risky behavior. The incidence of injury is 1.3% among boys and 1.6% among girls but the difference is not statistically significant. The other variables in the table show that there are no statistically significant differences between boys and girls in terms of chronic health status, incidence of illness, medical expenditures, or expected health over the next year. While not conclusive, Table A8 presents suggestive evidence that the differences in enrollment documented above is not due to differences in health condition.

6 Conclusion

Many developing countries have recently set up social health insurance schemes (SHIs) to ease financial barriers to utilization of healthcare services and help mitigate the effect of adverse health shocks on the poor. Although these SHIs offer generous terms and benefits, enrollment remains low especially among vulnerable populations who are the primary targets. In this paper, I implemented randomized interventions to test the role of pricing, information and convenience of signing up in low enrollment. I then used the resulting variation in insurance coverage to estimate the effect of insurance coverage on utilization of healthcare services, out-of-pocket expenses and health outcomes.

I find that the additional convenience of signing up provided by my interventions had no effect on enrollment but providing information and giving subsidies led to significant increase in enrollment. My results suggest that the demand for insurance is price elastic in the sense that a moderate subsidy for insurance premiums leads to substantial increase in enrollment.

I also find that insurance coverage leads to increased utilization of healthcare services and improvement in health outcomes, both self-reported and more objective measures of health. Unlike the first-stage, I find evidence of strong complementarity between providing information and providing subsidy in terms of

[27] Analysis of nationally representative surveys have found that under-five malnutrition and mortality rates are higher among boys. See Ghana Demographic and Health Survey 2008 (GSS, 2009 Table C.4) and Ghana Multiple Indicator Cluster Survey (GSS, MOH, USAID, UNICEF, 2006 Table NU 1)

utilization of healthcare services and health outcomes. This is an important finding because it indicates that while education and subsidy can each increase enrollment, it is the combination of two interventions that leads to changes in health-seeking behavior and improvement in health. I do not find any effect of insurance coverage on the probability of making out-of-pocket health expenditures in this setting where very few people make positive such expenditures. However, insurance coverage leads to a moderate reduction in probability of paying out of pocket among individuals who made positive expenditures at the baseline.

Finally, I find evidence of son preference in the allocation of health resources. Households allowed to choose allocation of subsidy amounts enrolled more boys than girls. I provide suggestive evidence that this differential is not due to differences in health characteristics or risky behavior.

The findings of this paper raises several questions. Given the short duration between the enrollment and follow-up survey (the average individual had been enrolled for 4.8 months at the time of the follow-up survey), my results on utilization and health outcomes represent the short-run effects of insurance coverage. To what extent will these differ from the longer-run effects? Furthermore, the strong effect of the education campaign suggests that learning about the benefits of insurance may be important. To what extent will such learning affect subsequent enrollment behavior in the absence of the interventions? Planned future work on this long-term project will seek to address these and other important questions.

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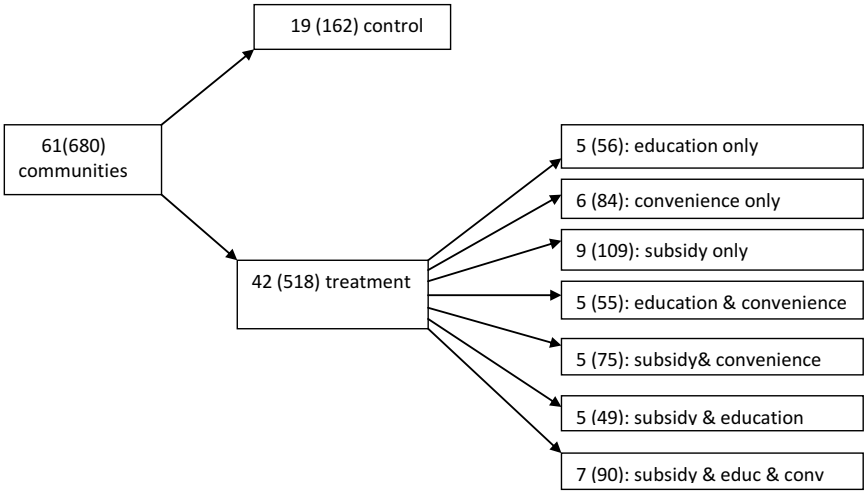
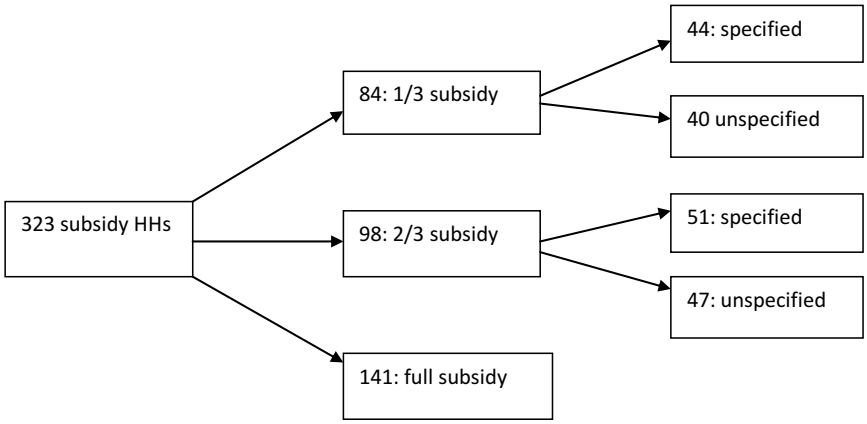
Figure 1a: Design of interventions



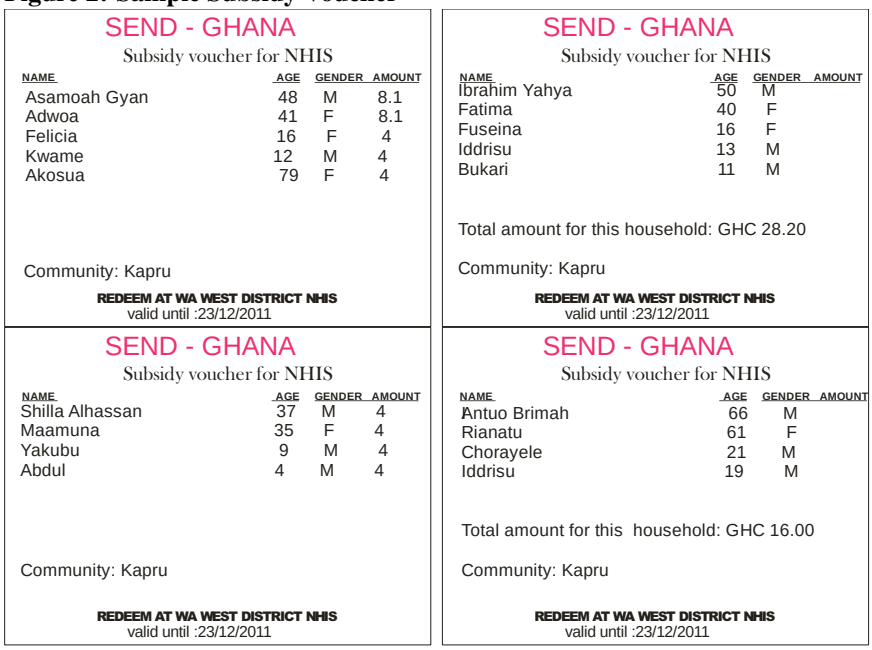
Note: Numbers refer to communities and numbers in brackets refer to affected households.

Figure 1b: Subsidy Intervention



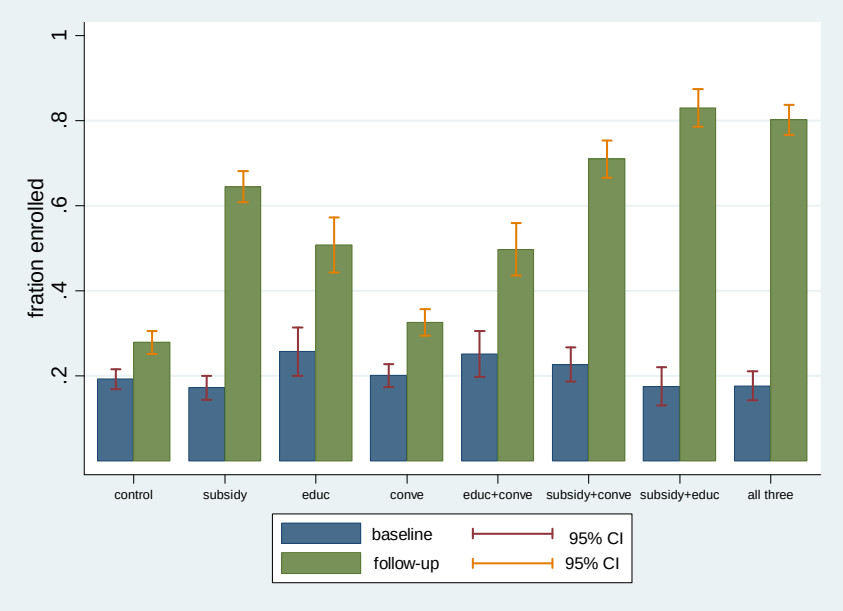
Note: Based on number of affected households. Both subsidy level and voucher type are stratified by broader treatment arms in Figure 1a.

Figure 2: Sample Subsidy Voucher



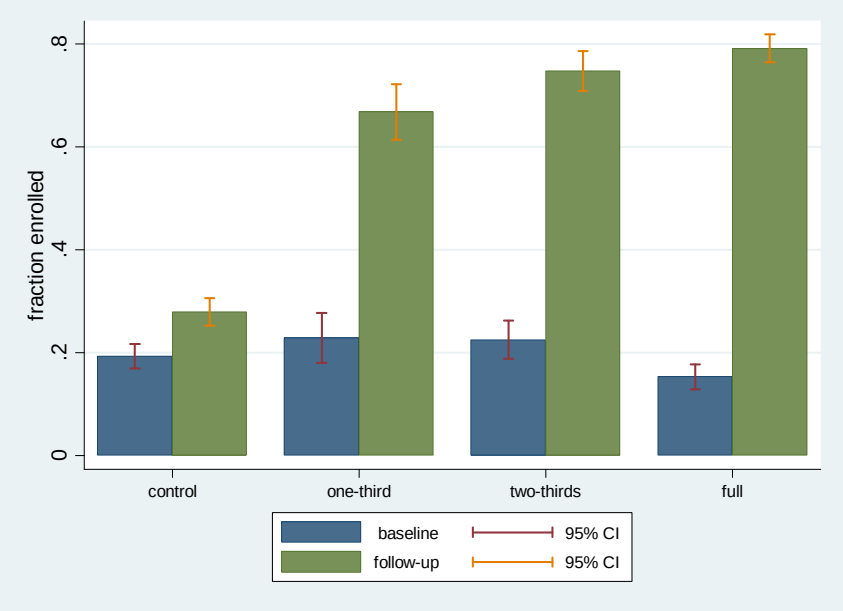
Notes: Households in top panels receive 2/3 subsidy; those in the bottom panels receive 1/3 subsidy. Left panels receive specified vouchers; right panels receive unspecified vouchers. Total amount required to enroll in NHIS in Wa West District are GHC4 for children (less than 18 years), GHC12.20 for adults (aged 18-69) and GHC4 for elderly (70 years or more). Children and the elderly always receive GHC4 with specified voucher. $1=1.5GHC.

Figure 3: Enrollment by intervention status at baseline and follow-up



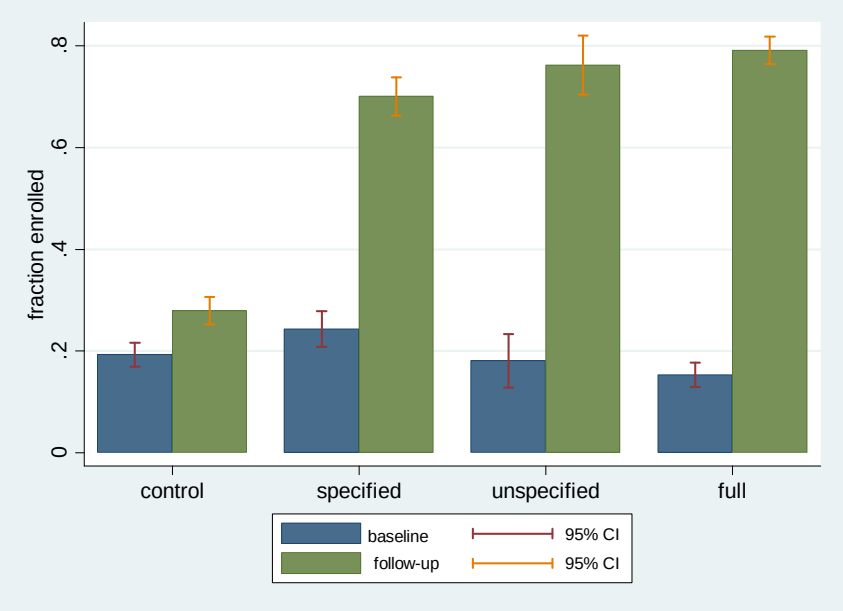
Notes: Figure uses full sample of 4298 individuals

Figure 4: Enrollment by subsidy level at baseline and follow-up



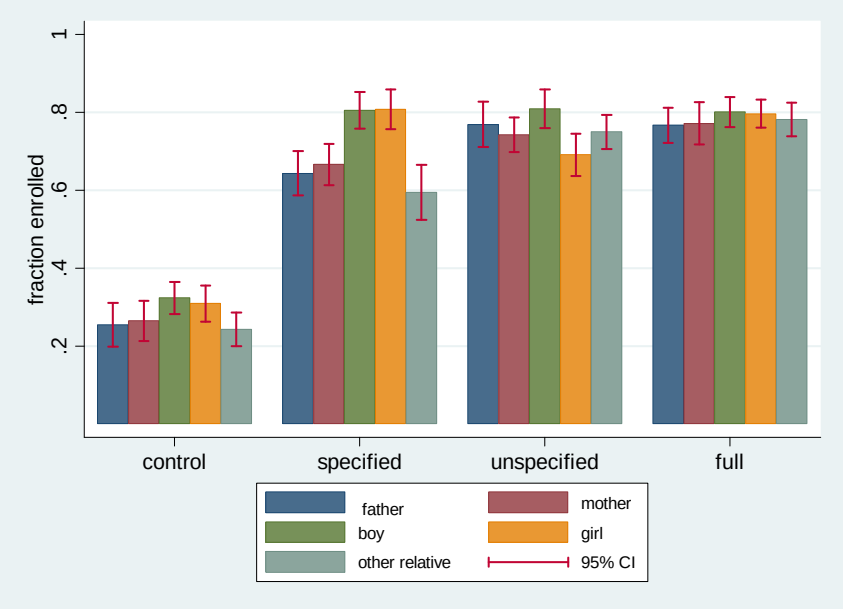
Notes: Figure is based on subsample of subsidy only and pure control households (N=2022)

Figure 5: Enrollment by voucher type at baseline and follow-up



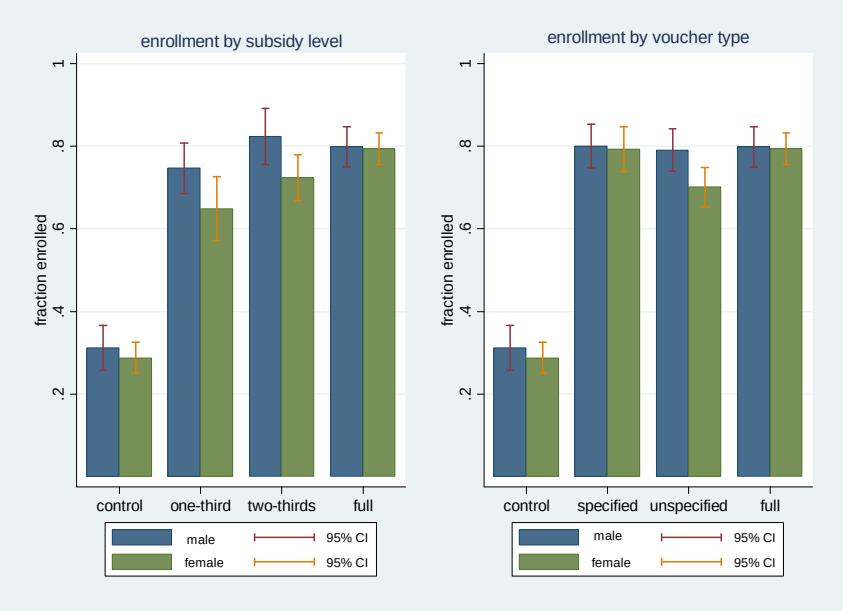
Notes: Figure is based on subsample of subsidy only and pure control households (N=2022)

Figure 6: Within household by voucher type



Notes: Figure restricted subsample of subsidy only and pure control households with mothers, fathers, at least one child and another household member (N=1989)

Figure 7: child enrollment by subsidy level and voucher type (gender)



Notes: Figure restricted to subsample of 1121 children under 18 years of age from subsidy only and pure control

Table 1a: Balance between treatments and control groups (all treatments)

Variable	Full	Control mean	subsidy minus control	Educ. minus control	Conve. minus control	Edu/conv minus control	sub/conve minus control	sub/educ minus control	All 3 minus control
Observations (N)	**4625**	**1313**	**709**	**327**	**604**	**328**	**481**	**300**	**561**
Age	22.956	24.313	0.842	1.661	2.129	0.856	1.930	-1.532	1.102
Male	0.483	0.476	-0.009	-0.014	0.015	-0.023	0.020	-0.022	-0.032
Has some formal education	0.335	0.337	0.025	0.030	-0.006	0.148*	0.038	0.045	-0.019
Has a health condition [≥6 months]	0.070	0.072	0.002	0.011	-0.000	0.012	-0.018	0.004	-0.002
Has been ill in the last month	0.120	0.109	-0.003	-0.030	0.040	0.031	-0.033	-0.027	-0.018
Has recently visited health facility	0.087	0.085	-0.002	-0.003	0.007	-0.005	-0.024	-0.008	0.008
Made out of pocket expense	0.126	0.133	0.001	0.007	0.020	-0.032	-0.013	-0.017	0.007
Health expend. in last month [GHC]	11.95	13.07	3.827**	-1.283	1.213	2.519	-2.666*	0.020	2.226
Probably will be sick in the next year	0.447	0.468	0.004	0.059	0.008	0.040	-0.028	0.033	0.059
Heard of the NHIS	0.960	0.958	-0.002	0.000	-0.003	0.001	-0.002	-0.001	0.002
Knowledge of NHIS (raw score)[a]	10.710	10.576	0.044	-0.409	-0.353	-0.289	-0.068	-0.055	0.008
Ever enrolled in NHIS	0.374	0.338	-0.084	-0.085**	-0.022	-0.022	-0.091*	-0.074	0.070
Currently enrolled in NHIS	0.205	0.201	0.011	-0.045	-0.006	-0.056	-0.024	0.011	-0.011
Re-enrolled in NHIS	0.629	0.700	0.023	0.102	0.013	0.123	0.108	0.136*	0.132
Ever smoked	0.110	0.117	0.013	-0.006	-0.015	-0.012	0.024	-0.028	0.040
Drank alcohol in last 2 weeks	0.528	0.524	-0.001	-0.036	0.042	-0.048	-0.015	-0.038	0.052
Slept under mosquito net last night	0.544	0.452	-0.080	-0.103*	-0.004	0.041	-0.152*	-0.089	0.080
Christian	0.432	0.422	-0.048	0.090	0.005	0.091	0.014	-0.207**	-0.067
Dagaaba	0.502	0.438	-0.046	-0.045	0.015	-0.015	0.041	-0.170*	-0.059
Household size	6.805	6.944	0.214	-1.099	0.431	0.164	-0.805	0.862	-0.956
Number of children under 18	3.874	3.697	-0.050	-1.006	-0.116	0.166	-0.787	0.536	-0.946
Head is male	0.800	0.808	-0.007	-0.076	0.095*	-0.069	-0.008	-0.081	-0.062
Owns farming land	0.509	0.480	-0.217*	-0.020	0.013	0.058	-0.067	0.105	-0.027
Owns a mosquito net	0.590	0.544	-0.084	-0.106	0.135	-0.031	0.128*	-0.125*	0.029
Distance to NHIS regist. (km)	18.436	21.286	-2.001	0.087	5.236**	2.119	-3.246	0.071	2.981
Distance to health fac. (km)	5.359	5.501	0.981	1.092	0.049	-0.119	0.563	1.290	-0.982

a: out of 18 questions about the NHIS. 1$ = 1.5 GHC. Reported differences are from pairwise t-tests of differences between each treatment and the control group. All tests of differences adjust standard errors for intra-cluster (intra-village) correlation. *, ** and *** denote statistical significance at 10%, 5% and 1% levels respectively. Dagaaba refer to an ethnic group.

Table 1b: Balance between treatments and control groups (subsidy levels)

	Control Mean	1/3 subsidy minus control	2/3 subsidy minus control	full subsidy minus control	specified minus control	unspecified minus control
Number of individuals	**1313**	**476**	**559**	**983**	**551**	**484**
Age	24.313	-1.696	0.399	1.458	-1.326	1.304
Male	0.476	-0.015	0.012	-0.021	0.012	-0.018
Has some formal education	0.337	0.005	0.001	-0.015	0.013	-0.019
Has a health condition	0.072	-0.015	-0.014	-0.006	-0.012	-0.019
Has been ill in the last month	0.109	-0.049	-0.031	-0.019	-0.056*	-0.038
Has visited health facility	0.085	0.033	-0.019	0.004	-0.015	-0.023
Made out of pocket expense	0.133	-0.004	-0.049	0.015	-0.037	-0.047
Health expend. in last month	13.07	0.614	-0.638	0.884	-0.447	0.689
Probably will be sick next year	0.468	-0.006	0.018	0.041	-0.011	0.034
Heard of the NHIS	0.958	0.002	0.001	-0.002	-0.003	0.004
Knowledge of NHIS	10.576	-0.089	-0.412	0.130	-0.229	0.221
Ever enrolled in NHIS	0.338	0.139*	-0.056	-0.077	-0.061	-0.082
Currently enrolled in NHIS	0.201	-0.057	-0.040	0.042	-0.036	-0.033
Re-enrolled in NHIS	0.700	0.106	0.020	0.172**	0.055	0.066
Ever smoked	0.117	-0.001	0.057**	-0.001	0.028	0.016
Drank alcohol in last 2 weeks	0.524	0.028	0.027	-0.013	-0.025	0.101
Slept under mosquito net	0.452	-0.108	-0.105	-0.008	-0.172*	-0.022
Christian	0.422	-0.133	-0.110	-0.076	-0.143	-0.057
Dagaaba	0.438	-0.158	-0.140	0.025	-0.203**	-0.030
Household size	6.944	0.271	-0.081	-0.567	0.067	-0.042
Number of children under 18	3.697	-0.055	-0.162	-0.699	-0.032	-0.270
Head is male	0.808	0.037	-0.049	-0.048	-0.014	-0.034
Owns farming land	0.480	-0.102	-0.052	-0.107	-0.052	-0.102
Owns a mosquito net	0.544	-0.141	-0.209**	-0.096	-0.199**	-0.109
Distance to NHIS regist. (km)	21.286	-3.122	-1.659	4.601	-3.031	-1.885
Distance to health fac. (km)	5.501	0.046	0.096	0.573	0.567	0.909

Notes: *, ** and *** refers to statistical significance at 10%, 5% and 1% levels respectively. All tests of differences adjust standard errors for intra-cluster correlation ie intra-community/village correlation. Specified refers to households receiving 1/3 or 2/3 subsidy with specified amount assigned for each household member. Unspecified refers to households receiving 1/3 or 2/3 subsidy with no specified amount for each household member and therefore household could decide how to allocate subsidy among its members. Dagaaba refers to an ethnic group.

Table 3 First-stage: Effect of interventions on enrollment in NHIS

	Outcome variable: indicator = 0 for not enrolled, 1 for enrolled					
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Education only	0.229**	0.208**	0.156**	0.147**	0.261***	0.050
	(0.105)	(0.083)	(0.080)	(0.072)	(0.096)	(0.072)
Subsidy only	0.365***	0.372***	0.361***	0.370***	0.328****	0.408***
	(0.064)	(0.054)	(0.050)	(0.049)	(0.063)	(0.050)
Convenience	0.046	0.039	0.035	0.013	-0.012	0.016
	(0.082)	(0.062)	(0.048)	(0.048)	(0.060)	(0.070)
Educ & convenience	0.203*	0.197*	0.157*	0.186*	0.223*	0.170
	(0.113)	(0.110)	(0.095)	(0.108)	(0.127)	(0.140)
Subsidy & conve.	0.429***	0.396***	0.368***	0.354***	0.363***	0.340***
	(0.063)	(0.062)	(0.061)	(0.066)	(0.074)	(0.077)
Subsidy & educ	0.551***	0.562***	0.499***	0.525***	0.607***	0.444***
	(0.071)	(0.066)	(0.065)	(0.070)	(0.081)	(0.079)
Subsidy&educ&conve	0.523***	0.531***	0.495***	0.455***	0.470***	0.444***
	(0.054)	(0.058)	(0.057)	(0.064)	(0.072)	(0.063)
Individual covariates		X	X	X	X	X
Household covariates			X	X	X	X
Community covariates				X	X	X
Mean for control group	0.279	0.279	0.279	0.279	0.235	0.329
N	**4298**	**4298**	**4298**	**4298**	**1995**	**2303**
F-statistic	**18.54**	**20.73**	**19.07**	**21.22**	**19.41**	**20.57**
R^2	**0.1738**	**0.2527**	**0.2713**	**0.2773**	**0.2986**	**0.2817**

Notes: Robust standard errors clustered at community level are reported in brackets. *, ** and *** denote statistical significance at 10%, 5% and 1% levels respectively. F-statistic is for excluded instruments (interventions). Individual covariates are: age group (<18 years, 18-69, and 70+), gender, education status, indicator for having ever registered with the NHIS at baseline, and indicator having visited a health facility at baseline. Household covariates are: household size, religion, ethnicity and wealth index (poor third, middle third and rich third). Community covariates are: distance to nearest health facility, distance to NHIS registration center. Columns (5) and (6) restricts sample to adults aged 18 and above and children under 18 respectively.

Table 3: Effect of education intervention on knowledge of NHIS

Dependent variable:	Knowledge of premiums (1)	Knowledge of benefits (2)	Knowledge of exemptions (3)	Overall knowledge of NHIS (4)
Education	0.237	0.182**	0.293***	0.901*
	(0.183)	(0.074)	(0.091)	(0.516)
Subsidy	0.099	-0.017	0.094	0.731*
	(0.100)	(0.083)	(0.101)	(0.406)
Conve regist	-0.035	-0.036	0.070	-0.083
	(0.074)	(0.062)	(0.113)	(0.332)
Educ. &conve reg	0.278**	0.054	0.160	0.641
	(0.140)	(0.073)	(0.150)	(0.503)
Subsidy & conve reg.	0.074	0.021	0.152	0.337
	(0.070)	(0.104)	(0.177)	(0.452)
Subsidy & educ.	0.255**	0.123**	0.270***	1.129**
	(0.116)	(0.062)	(0.076)	(0.441)
Subsidy & educ & conve	0.239	0.065	0.239*	0.683**
	(0.225)	(0.062)	(0.135)	(0.279)
Baseline knowledge of premiums	0.270**			
	(0.138)			
Baseline knowledge of benefits		0.271***		
		(0.080)		
Baseline knowledge of exemptions			0.259***	
			(0.084)	
Baseline knowledge of NHIS				0.439***
				(0.132)
N	**531**	**531**	**531**	**531**
F-statistic	**9.35**	**10.23**	**7.48**	**5.34**
R^2	**0.1381**	**0.1384**	**0.3120**	**0.4817**

Notes: Robust standard errors clustered at community level are reported in brackets. *, ** and *** denote statistical significance at 10%, 5% and 1% levels respectively. The sample for all regressions is restricted to household heads or adult household members present at the time of the follow-up survey. All regressions include a full set of covariates (individual, household, community).

Table 4: Effect of subsidy levels on enrollment in NHIS

	Outcome variable: indicator = 0 for not enrolled, 1 for enrolled					
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
1/3 Subsidy	0.287***	0.284***	0.254***	0.262***	0.253***	0.279***
	(0.068)	(0.066)	(0.060)	(0.060)	(0.070)	(0.080)
2/3 subsidy	0.378***	0.374***	0.347***	0.356***	0.347***	0.358***
	(0.054)	(0.057)	(0.055)	(0.052)	(0.062)	(0.059)
Full subsidy	0.407***	0.390***	0.377***	0.374***	0.375***	0.375***
	(0.059)	(0.054)	(0.054)	(0.054)	(0.063)	(0.056)
Education	0.152**	0.143**	0.139**	0.130**	0.195***	0.073
	(0.066)	(0.059)	(0.059)	(0.058)	(0.061)	(0.064)
Conve regist.	0.017	0.001	0.001	0.023	-0.010	0.039
	(0.062)	(0.049)	(0.042)	(0.045)	(0.049)	(0.058)
Individual covariates		X	X	X	X	X
Household covariates			X	X	X	X
Community covariates				X	X	X
Mean for control group	0.279	0.279	0.279	0.279	0.235	0.329
N	**4298**	**4298**	**4298**	**4298**	**1995**	**2283**
F-statistic	**25.06**	**25.22**	**21.71**	**21.21**	**18.40**	**19.58**
R^2	**0.1700**	**0.2491**	**0.2760**	**0.2768**	**0.3000**	**0.2582**

Notes: Robust standard errors clustered at community level are reported in brackets. *, ** and *** denote statistical significance at 10%, 5% and 1% levels respectively. F-statistic is for excluded instruments (interventions). Individual covariates are: age group (<18 years, 18-69, and 70+), gender, education status, indicator for having ever registered with the NHIS at baseline, and indicator having visited a health facility at baseline. Household covariates are: household size, religion, ethnicity and wealth index (poor third, middle third and rich third). Community covariates are: distance to nearest health facility, distance to NHIS registration center. Columns (5) and (6) restrict sample to adults aged 18 and above and children under 18 respectively.

Table 5: Effect of interventions on utilization of healthcare services

Dependent variable:	Visited facility in last 4 weeks (1)	Visited facility in 6 months (2)	# of visits in last 6 months (3)	Visited facility for malaria treatment (4)	Enrolled (5)
Panel A: IV results					
Insured	0.140***	0.151***	0.324***	0.038**	
	(0.052)	(0.055)	(0.125)	(0.015)	
Control mean	0.116	0.103	0.203	0.018	
R^2	**0.0755**	**0.0672**	**0.0514**	**0.0134**	
Panel B: Reduced-form and first-stage results					
Education	0.019	0.024	0.103	0.016	0.147**
	(0.027)	(0.027)	(0.068)	(0.091)	(0.072)
Subsidy only	0.026	0.012	0.015	0.002	0.370***
	(0.020)	(0.018)	(0.051)	(0.006)	(0.049)
Conve. regist.	-0.026	-0.019	-0.008	-0.001	0.013
	(0.022)	(0.023)	(0.070)	(0.009)	(0.048)
Educ & conve	0.041	0.050	0.073	0.004	0.186*
	(0.048)	(0.049)	(0.087)	(0.015)	(0.108)
Subsidy & educ	0.106***	0.122***	0.285***	0.010	0.525***
	(0.032)	(0.040)	(0.054)	(0.009)	(0.070)
Subsidy & conve	0.005	0.014	0.023	-0.000	0.354***
	(0.040)	(0.036)	(0.090)	(0.009)	(0.066)
Subsidy&educ&conve	0.106***	0.109***	0.252***	0.033***	0.455***
	(0.031)	(0.029)	(0.062)	(0.010)	(0.064)
N	**4298**	**4298**	**4298**	**4298**	**4298**
R^2	**0.0844**	**0.0752**	**0.0526**	**0.0169**	**0.2773**
Panel C: Test of complementarity					
Hypothesis:	Subsidy & education - (subsidy only + education) = 0				
F-statistic (p-value)	7.07(0.01)	5.72(0.02)	4.58(0.04)	4.53(0.04)	0.008(0.929)

Notes: Robust standard errors clustered at community level are reported in brackets. *, ** and *** denote statistical significance at 10%, 5% and 1% levels respectively. All regressions include a full set of individual-level and household/community-level covariates. Individual-level covariates are: age-group (<18 and 70+, 18-69 is omitted), gender, indicator for having a health condition, indicator for visiting a health facility at baseline, education status. Household/community-level covariates are: household wealth (poorest third and richest third, middle third omitted), household size, religion, ethnicity, distance to nearest health facility and distance to NHIS registration point.

Table 6: Effect of subsidy level on utilization of healthcare services

Dependent variable:	Visited facility in last month **(1)**	Visited facility in last 6 months **(2)**	# of visits in last 6 months **(3)**	Visit facility for malaria treatment **(4)**
1/3 subsidy	0.020	0.005	0.028	0.009
	(0.021)	(0.020)	(0.058)	(0.007)
2/3 subsidy	0.023	0.015	0.023	0.012
	(0.025)	(0.025)	(0.079)	(0.009)
Full subsidy	0.027	0.010	0.021	0.002
	(0.028)	(0.031)	(0.083)	(0.007)
N	**2022**	**2022**	**2022**	**2022**
R^2	**0.0814**	**0.0743**	**0.0580**	**0.0186**

Notes: Robust standard errors clustered at community level are reported in brackets. *, ** and *** denote statistical significance at 10%, 5% and 1% levels respectively. Sample for all regressions is restricted to subsidy only and control households. All regressions include a full set of covariates (individual, household and community).

Table 7: Effect on out-of-pocket expenses (IV and Reduced-form)

Outcome variable: Made an out-of-pocket medical expense in the last 6 months	IV		Reduced-form	
	(1)	(2)	(3)	(4)
Insured	0.020	0.019		
	(0.014)	(0.013)		
Made positive medical expenditure at baseline		-0.027***		-0.029*
		(0.010)		(0.016)
Education			-0.005	-0.002
			(0.010)	(0.006)
Subsidy only			-0.000	-0.001
			(0.007)	(0.011)
Conve. regist.			0.012	0.013
			(0.010)	(0.009)
Educ & conve			-0.005	-0.002
			(0.009)	(0.009)
Subsidy & educ			-0.024**	-0.020*
			(0.010)	(0.011)
Subsidy & conve			0.003	0.004
			(0.017)	(0.015)
Subsidy&educ&conve			-0.009	-0.012
			(0.009)	(0.013)
Education * (baseline med expend)				0.008
				(0.034)
Subsidy only*(baseline med expend)				-0.015
				(0.030)
Conve. regist. * (baseline med expend)				0.023
				(0.034)
Educ & conve * (baseline med expend)				-0.009
				(0.032)
Subsidy & educ *(baseline med expend)				-0.060**
				(0.027)
Subsidy & conve * (baseline med expend)				-0.022
				(0.034)
Subsidy&educ&conve * (baseline med expend)				-0.027
				(0.029)
N	**4298**	**4298**	**4298**	**4298**
R^2	**0.0056**	**0.0100**	**0.0184**	**0.0244**

Notes: Robust standard errors clustered at community level are reported in brackets. *, ** and *** denote statistical significance at 10%, 5% and 1% levels respectively. All regressions include a full set of covariates (individual, household and community).

Table 8: Effect of insurance coverage on health (IV and Reduced-form)

Dependent variable:	# of days been ill in the last one month		Could not perform normal daily activities due to illness		# of days could not perform normal daily activities due to illness		days waited before seeking care	
	IV	Reduced-form	IV	Reduced-form	IV	Reduced-form	IV	Reduced-form
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Insured	-0.339*		-0.027		-0.805**		-1.572	
	(0.203)		(0.030)		(0.340)		(0.987)	
Education		-0.073		-0.015		-0.363		-0.951
		(0.213)		(0.016)		(0.428)		(0.628)
Subsidy only		-0.163		-0.029**		-0.622*		-0.416
		(0.172)		(0.012)		(0.350)		(0.941)
Conve. regist.		0.061		0.039		0.228		5.212***
		(0.267)		(0.019)		(0.501)		(0.682)
Educ & conve		0.018		0.016		-0.394		0.450
		(0.328)		(0.009)		(0.544)		(1.015)
Subsidy & educ		-0.421***		-0.044**		-0.880***		-0.683
		(0.139)		(0.010)		(0.329)		(0.756)
Subsidy & conve		-0.343*		-0.028**		-0.755*		-0.407
		(0.179)		(0.012)		(0.442)		(1.014)
Subsidy&educ&conve		-0.391**		-0.040***		-0.828**		-0.509
		(0.177)		(0.015)		(0.331)		(0.932)
Control mean	0.809		0.063		1.582		2.733	
N	**4281**	**4281**	**4281**	**4281**	**4281**	**4281**	**391**	**391**
R^2	**0.0219**	**0.0170**	**0.0228**	**0.0365**	**0.1627**	**0.1465**	**0.1388**	**0.1686**

Notes: Robust standard errors clustered at community level reported in brackets. *, ** and *** denote statistical significance at 10%, 10 and 1% levels respectively. Even-numbered columns report IV estimates; odd-numbered columns report reduced-form estimate. All regressions include both individual-level and household/community-level variables. Individual-level covariates are: age-group (<18 and 70+, 18-69 is omitted), gender, indicator for having a health condition, indicator for visiting a health facility at baseline, education status. Household/community-level covariates are: household wealth (poorest third and richest third, middle third omitted), household size, religion, ethnicity, distance to nearest health facility and distance to NHIS registration point.

Table 9: Effect of insurance coverage on self-reported health (IV and Reduced-form)

Dependent variable:	happy or very happy (1)	healthy or very healthy (2)	health has improved (3)	depressed (4)	hopeful (5)	days in poor mental health (6)	days of poor physical health (7)
Panel A: IV results							
Insured	0.218**	0.137**	-0.011	-0.043	0.125**	-0.684*	-0.259
	(0.101)	(0.060)	(0.097)	(0.036)	(0.052)	(0.371)	(0.902)
Panel B: Reduced-from results							
Education	0.213***	0.136***	0.078	0.016	0.049	0.094	0.084
	(0.063)	(0.034)	(0.088)	(0.089)	(0.038)	(0.718)	(0.711)
Subsidy only	0.061	0.011	-0.034	0.017	0.031	-0.047	-0.038
	(0.062)	(0.068)	(0.083)	(0.110)	(0.043)	(0.481)	(0.578)
Conve. regist.	-0.055	0.001	-0.121	0.098	-0.061	0.381	0.367
	(0.091)	(0.066)	(0.087)	(0.138)	(0.044)	(0.879)	(0.578)
Educ & conve	-0.024	0.037	0.027	0.088	-0.002	0.376	0.838
	(0.081)	(0.061)	(0.078)	(0.071)	(0.057)	(0.586)	(0.963)
Subsidy & educ	0.337***	0.148***	0.306***	-0.138***	0.127***	-0.035	-0.038
	(0.063)	(0.039)	(0.085)	(0.064)	(0.036)	(0.541)	(0.578)
Subsidy & conve	0.089	0.001	-0.044	0.034	0.019	-0.730*	-0.736
	(0.109)	(0.059)	(0.085)	(0.072)	(0.070)	(0.371)	(0.751)
Subsidy & educ & conve	0.325***	0.141***	0.066	-0.031	0.084**	-0.086	-0.419
	(0.062)	(0.042)	(0.062)	(0.064)	(0.033)	(0.590)	(0.777)
Control mean	0.603	0.817	0.106	0.229	0.882	0.683	1.665
N	**1335**	**1335**	**1335**	**1335**	**1335**	**1335**	**1335**

Notes: Robust standard errors clustered at community level are reported in brackets. *, ** and *** denote statistical significance at 10%, 5% and 1% levels respectively. All regression restricted to sample of household heads or adult members present at the time of survey. All regressions include individual-level and household/community-level covariates. Individual-level covariates are: age-group (<18 and 70+, 18-69 is omitted), gender, indicator for having a health condition, indicator for visiting a health facility at baseline, education status. Household/community-level covariates are: household wealth (poorest third and richest third, middle third omitted), household size, religion, ethnicity, distance to nearest health facility and distance to NHIS registration point.

Table 10: Effect of subsidy level and voucher type on enrollment rates

Dependent variable:	fraction of HH members enrolled		per capita amount spent on NHIS regis		fraction of children enrolled		fraction of boys enrolled		fraction of girls enrolled	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**
1/3 Subsidy	0.269***		-1.873*		0.277***		0.294***		0.223**	
	(0.052)		(0.980)		(0.068)		(0.086)		(0.088)	
2/3 subsidy	0.359***		-4.065***		0.332***		0.384***		0.304***	
	(0.050)		(1.727)		(0.064)		(0.069)		(0.083)	
Full subsidy	0.386***	0.386***	-6.368***	-6.368***	0.376***	0.376***	0.391***	0.391***	0.405***	0.405***
	(0.058)	(0.058)	(1.402)	(1.402)	(0.059)	(0.049)	(0.060)	(0.060)	(0.071)	(0.070)
Education	0.139**	0.088*	1.572*	1.911**	0.067	0.065	0.031	0.034	0.026	0.029
	(0.061)	(0.051)	(0.943)	(0.906)	(0.065)	(0.064)	(0.066)	(0.066)	(0.082)	(0.081)
Conve regist. `	0.002	-0.003	1.518	1.222	-0.024	-0.018	-0.009	-0.006	-0.024	-0.016
	(0.053)	(0.054)	(1.141)	(1.15)	(0.057)	(0.057)	(0.068)	(0.069)	(0.062)	(0.063)
1/3 or 2/3 specified		0.283***		-3.366*		0.307***		0.306***		0.309**
		(0.053)		(1.689)		(0.069)		(0.074)		(0.089)
1/3 or 2/3 unspecified		0.341***		-2.539*		0.407***		0.452***		0.231**
		(0.057)		(1.402)		(0.074)		(0.086)		(0.090)
N	**638**	**638**	**638**	**638**	**576**	**576**	**488**	**488**	**476**	**476**
F-statistic	**29.13**	**33.23**	**6.45**	**5.24**	**22.58**	**22.41**	**16.58**	**15.93**	**17.56**	**16.96**
R^2	**0.2882**	**0.2907**	**0.0416**	**0.0425**	**0.2587**	**0.0433**	**0.2633**	**0.2622**	**0.2399**	**0.2427**

Notes: Robust standard errors clustered at community level are reported in brackets. *, *** and *** denote statistical significance at 10%, 5% and 1% levels respectively. Per capita amount spent on NHIS registration is defined as the total amount household spent to enroll members in NHIS divided by the total number of household members enrolled. All regressions include the following covariates: the household head's age and its square, his/her religion and ethnicity and education status, household wealth index, indicator that a household member has chronic condition, distance to the NHIS registration center and nearest health facility. In addition to these covariates, columns 1 and 2 include number of children under 18 years.

Table 11: Allocation within household by voucher type

	Dependent variable: indicator = 0 for not enrolled, 1 for enrolled	
	(1)	**(2)**
Specified	0.360***	0.326***
	(0.075)	(0.061)
Unspecifed	0.481***	0.534***
	(0.083)	(0.072)
Full subsidy	0.449***	0.484***
	(0.084)	(0.089)
mother	0.009	-0.017
	(0.032)	(0.054)
boy child	0.078*	0.098**
	(0.041)	(0.048)
girl child	0.028	-0.016
	(0.057)	(0.061)
Other relative	-0.077*	-0.086*
	(0.040)	(0.046)
mother * specified	0.016	0.008
	(0.082)	(0.071)
boy child * specified	0.158*	0.121**
	(0.083)	(0.067)
girl child * specified	0.153*	0.132*
	(0.089)	(0.076)
Other relative * specified	-0.033	0.007
	(0.086)	(0.099)
mother * unspecified	-0.028	-0.043
	(0.056)	(0.050)
boy child * unspecified	0.056	0.015
	(0.057)	(0.050)
girl child * unspecified	-0.097*	-0.133*
	(0.057)	(0.073)
Other relative * unspecified	-0.007	0.003
	(0.105)	(0.103)
mother * full subsidy	-0.000	-0.016
	(0.076)	(0.070)
boy child * full subsidy	0.074	0.051
	(0.062)	(0.060)
girl child * full subsidy	0.045	0.033
	(0.062)	(0.059)
Other relative * full subsidy	0.025	0.004
	(0.094)	(0.094)
Other covariates		X
N	**2022**	**2022**

Notes: Robust standard errors clustered at community level are reported in brackets. *, ** and *** denote statistical significance at 10%, 5% and 1% levels respectively. Sample restricted to subsidy only and pure control households. Specified refers to less than full subsidy voucher that specifies subsidy amount for each household member. Unspecified refers to less than full subsidy voucher which allows household to decide the allocation among its members. Column 2 include a full set of covariates.

Table 12: Child enrollment by gender

	Dependent variable: Indicator =1 for enrolled; = 0 for not enrolled			
	(1)	**(2)**	**(3)**	**(4)**
1/3 subsidy	0.311***	0.214**		
	(0.098)	(0.096)		
2/3 subsidy	0.343***	0.283***		
	(0.056)	(0.052)		
Full subsidy	0.372***	0.359***	0.372***	0.359***
	(0.065)	(0.063)	(0.065)	(0.063)
1/3 subsidy * male	0.057	0.069*		
	(0.041)	(0.036)		
2/3 subsidy * male	0.083*	0.108*		
	(0.045)	(0.046)		
Full subsidy * male	-0.028	-0.022	-0.018	-0.021
	(0.048)	(0.043)	(0.049)	(0.050)
Male	0.002	-0.003	0.002	-0.003
	(0.023)	(0.022)	(0.023)	(0.023)
1/3 or 2/3 specified			0.307***	0.221***
			(0.070)	(0.071)
1/3 or 2/3 unspecified			0.405***	0.377***
			(0.079)	(0.077)
1/3 or 2/3 specified * male			0.001	0.007
			(0.039)	(0.043)
1/3 or 2/3 unspecified * male			0.103*	0.117**
			(0.054)	(0.055)
Other covariates		X		X
N	**1121**	**1121**	**1121**	**1121**

Notes: Robust standard errors clustered at community level are reported in brackets. *, ** and *** denote statistical significance at 10%, 5% and 1% levels respectively. 1/3 or 2/3 specified refers to less than full subsidy voucher that specifies subsidy amount for each household member. 1/3 or 2/3 unspecified refers to less than full subsidy voucher which allows household to decide the allocation among its members. Sample for all regressions restricted to children aged under 18 years from subsidy only and pure control households. Other covariates include both individual-level and household/community-level variables. Individual-level covariates are: indicator for having a health condition, indicator for visiting a health facility at baseline, education status. Household/community-level covariates are: household wealth (poorest third and richest third, middle third omitted), household size, religion, ethnicity, distance to nearest health facility and distance to NHIS registration point.

7 Appendix

Table A1: Attrition

PANEL A: attrition rate				
	Full	**control**	**All treatments**	**p-value test**
Percent of baseline sample	6.48%	7.62%	6.82%	0.3351
		% of individuals not re-interviewed		
Panel B: reasons for attrition				
Deceased			7.65%	
Relocated outside district			26.23%	
Travelled			57.92%	
Other			8.20%	

Table A2: Effect of Interventions on enrollment (with subsidy levels)

	Outcome variable: indicator = 0 for not enrolled, 1 for enrolled					
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
1/3 Subsidy	0.287***	0.287***	0.271***	0.270***	0.293***	0.235***
	(0.114)	(0.077)	(0.075)	(0.082)	(0.089)	(0.091)
2/3 subsidy	0.357***	0.308***	0.322***	0.332***	0.326***	0.343***
	(0.067)	(0.070)	(0.070)	(0.072)	(0.104)	(0.096)
Full subsidy	0.473***	0.443***	0.435***	0.405***	0.473***	0.386***
	(0.086)	(0.082)	(0.080)	(0.083)	(0.094)	(0.066)
Education	0.213**	0.186**	0.176*	0.175**	0.246**	0.098
	(0.103)	(0.090)	(0.092)	(0.089)	(0.108)	(0.108)
Conve regist.	0.046	0.039	0.035	0.023	-0.022	0.054
	(0.082)	(0.062)	(0.048)	(0.048)	(0.060)	(0.082)
1/3 subsidy& conve.	0.287**	0.231***	0.186**	0.223***	0.185***	0.139
	(0.115)	(0.086)	(0.074)	(0.064)	(0.039)	(0.104)
1/3 subsidy& educ	0.398***	0.301***	0.316***	0.322***	0.449***	0.223*
	(0.124)	(0.074)	(0.078)	(0.074)	(0.097)	(0.087)
2/3 subsidy & conve.	0.478**	0.432***	0.371***	0.362***	0.355***	0.368***
	(0.070)	(0.059)	(0.054)	(0.056)	(0.064)	(0.069)
2/3 subsidy & educ	0.489***	0.454***	0.454***	0.455***	0.475***	0.419***
	(0.053)	(0.063)	(0.058)	(0.064)	(0.064)	(0.083)
Full subsidy & conve.	0.475***	0.369***	0.421***	0.445***	0.490***	0.390***
	(0.096)	(0.058)	(0.059)	(0.056)	(0.065)	(0.063)
Full subsidy & educ	0.637***	0.554***	0.568***	0.578***	0.603***	0.534***
	(0.044)	(0.048)	(0.049)	(0.049)	(0.058)	(0.066)
Individual controls	N	Y	Y	Y	Y	Y
Household controls	N	N	Y	Y	Y	Y
Community controls	N	N	N	Y	Y	Y
N	**4298**	**4298**	**4298**	**4298**	**1995**	**2283**
F-statistic	**26.38**	**24.67**	**28.83**	**30.39**	**26.00**	**25.29**
R^2	**0.1778**	**0.2557**	**0.2811**	**0.2822**	**0.2426**	**0.2640**

Notes: Robust standard errors clustered at community level reported in brackets. *, ** and *** denote statistical significance at 10%, 10 and 1% levels respectively. F-statistic is for excluded instruments (interventions). Individual covariates are: age group (<18 years, 18-69, and 70+), gender, education status, indicator for having ever registered with the NHIS at baseline, and indicator having visited a health facility at baseline. Household covariates are: household size, religion, ethnicity and wealth index (poor third, middle third and rich third). Community covariates are: distance to nearest health facility, distance to NHIS registration center. Columns (5) and (6) restricts sample to adults aged 18 and above and children under 18 respectively.

Table A3: Heterogeneous response to interventions by wealth status

	Outcome variable: indicator = 0 for not enrolled, 1 for enrolled	
	(1)	**(2)**
Education	0.150**	
	(0.078)	
Subsidy	0.336***	
	(0.060)	
Conve regist	0.053	
	(0.076)	
Educ. &conve reg	0.156*	
	(0.086)	
Subsidy & conve reg.	0.348***	
	(0.079)	
Subsidy & educ.	0.488***	
	(0.085)	
Subsidy & educ & conve	0.462***	
	(0.079)	
Poorest third	-0.131**	
	(0.053)	
Poorest third * educ	0.030	
	(0.069)	
Poorest third* subsidy	0.105	
	(0.088)	
Poorest third * conve	-0.067	
	(0.061)	
Poorest third * educ & conve	-0.029	
	(0.104)	
Poorest third*subsidy & conve	0.113	
	(0.093)	
Poorest third*subsidy & educ	0.277***	
	(0.074)	
Poorest third*subsidy & educ & conve	0.253***	
	(0.071)	
1/3 subsidy		0.202***
		(0.071)
2/3 subsidy		0.320***
		(0.074)
Full subsidy		0.418***
		(0.053)
Poorest third		-0.132***
		(0.033)
Poorest third *1/3 subsidy		0.355***
		(0.104)
Poorest third*2/3 subsidy		0.132*
		(0.078)
Poorest third*full subsidy		-0.028
		(0.091)
N	**4298**	**2022**

Notes: Robust standard errors clustered at community level are reported in brackets. *, ** and *** denote statistical significance at 10%, 5% and 1% levels respectively. All regressions include full set of covariates (individual, household, community). Regressions in columns (3) and (4) are restricted to the pure control group and households receiving subsidy only.

Table A4: Heterogeneous response to interventions by education status

	Outcome variable: indicator = 0 for not enrolled, 1 for enrolled	
	(1)	**(2)**
Education	0.152**	
	(0.068)	
Subsidy	0.315***	
	(0.056)	
Conve regist	-0.021	
	(0.061)	
Educ. &conve reg	0.190*	
	(0.105)	
Subsidy & conve reg.	0.336***	
	(0.073)	
Subsidy & educ.	0.472***	
	(0.084)	
Subsidy & educ & conve	0.430***	
	(0.075)	
HH educated * educ	0.036	
	(0.053)	
HH educated * subsidy	0.144**	
	(0.058)	
HH educated * conve	0.057	
	(0.048)	
HH educated * educ & conve	-0.023	
	(0.103)	
HH educated *subsidy & conve	0.107	
	(0.071)	
HH educated *subsidy & educ	0.155**	
	(0.068)	
HH educated *subsidy & educ & conve	0.180***	
	(0.073)	
HH educated	-0.019	0.011
	(0.039)	(0.027)
1/3 subsidy		0.215***
		(0.079)
2/3 subsidy		0.324***
		(0.065)
Full subsidy		0.390***
		(0.053)
HH educated *1/3 subsidy		0.056
		(0.088)
HH educated *2/3 subsidy		0.088**
		(0.040)
HH educated* Full subsidy		0.089*
		(0.048)
N	**4298**	**2022**

Notes: Robust standard errors clustered at community level are reported in brackets. *, ** and *** denote statistical significance at 10%, 5% and 1% levels respectively. All regressions include full set of covariates (individual, household, community). Regressions in columns (3) and (4) are restricted to the pure control group and households receiving subsidy only.

Table A5: Heterogeneous response to interventions by health condition

	Dependent variable: indicator = 0 for not enrolled, 1 for enrolled	
	(1)	**(2)**
Education	0.144**	
	(0.072)	
Subsidy	0.357***	
	(0.052)	
Conve regist	-0.004	
	(0.065)	
Educ. &conve reg	0.196**	
	(0.098)	
Subsidy & conve reg.	0.354***	
	(0.077)	
Subsidy & educ.	0.420***	
	(0.078)	
Subsidy & educ & conve	0.448***	
	(0.064)	
Chronic condition * educ	0.156***	
	(0.038)	
Chronic condition * subsidy	0.047	
	(0.087)	
Chronic condition * conve	0.037	
	(0.105)	
Chronic condition * educ & conve	-0.044	
	(0.107)	
Chronic condition *subsidy & conve	0.066	
	(0.080)	
Chronic condition *subsidy & educ	0.105*	
	(0.062)	
Chronic condition *subsidy & educ & conve	0.163***	
	(0.047)	
Chronic condition	-0.056*	-0.019
	(0.033)	(0.036)
1/3 subsidy		0.243***
		(0.071)
2/3 subsidy		0.344***
		(0.066)
Full subsidy		0.417***
		(0.043)
Chronic condition *1/3 subsidy		-0.004
		(0.103)
Chronic condition *2/3 subsidy		-0.016
		(0.066)
Chronic condition * Full subsidy		0.058
		(0.068)
N	**4298**	**2022**

Notes: Robust standard errors clustered at community level are reported in brackets. *, ** and *** denote statistical significance at 10%, 5% and 1% levels respectively. All regressions include full set of covariates (individual, household, community). Regressions in columns (3) and (4) are restricted to the pure control group and households receiving subsidy only.

Table A6: Heterogeneous response to interventions by "unmet need" for health care

	Dependent variable: indicator = 0 for not enrolled, 1 for enrolled	
	(1)	**(2)**
Education	0.141*	
	(0.077)	
Subsidy	0.339***	
	(0.049)	
Conve regist	0.001	
	(0.062)	
Educ. &conve reg	0.209	
	(0.148)	
Subsidy & conve reg.	0.349***	
	(0.074)	
Subsidy & educ.	0.524***	
	(0.077)	
Subsidy & educ & conve	0.443***	
	(0.065)	
Unmet need * educ	0.172**	
	(0.067)	
Unmet need * subsidy	0.027	
	(0.079)	
Unmet need * conve	0.016	
	(0.105)	
Unmet need * educ & conve	0.006	
	(0.163)	
Unmet need *subsidy & conve	0.016	
	(0.175)	
Unmet need *subsidy & educ	0.226**	
	(0.101)	
Unmet need *subsidy & educ & conve	0.255***	
	(0.061)	
Unmet need for health facility	-0.077	-0.083
	(0.054)	(0.041)
1/3 subsidy		0.343***
		(0.075)
2/3 subsidy		0.457***
		(0.056)
Full subsidy		0.481***
		(0.060)
Unmet need *1/3 subsidy		0.192**
		(0.085)
Unmet need *2/3 subsidy		0.093
		(0.202)
Unmet need * Full subsidy		0.016
		(0.096)
N	**4298**	**2022**

Notes: Robust standard errors clustered at community level are reported in brackets. *, ** and *** denote statistical significance at 10%, 5% and 1% levels respectively. All regressions include full set of controls (individual, household, community). An individual is defined to have unmet need for health care if he/she reports a chronic condition lasting for more than 6 months but do not seek regular treatment for the condition.

Table A7: Effect on utilization of health care services by age (IV)

Dep. variable:	Visited health facility in the last 4 weeks		Visited health facility in last 6 months		# of facility visits in last 6 months		visited health facility for malaria treatment	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Insured	0.121**	0.139**	0.126**	0.155***	0.239*	0.350***	0.017	0.053***
	(0.060)	(0.057)	(0.063)	(0.060)	(0.139)	(0.138)	(0.022)	(0.017)
Control mean	0.120	0.113	0.106	0.098	0.210	0.197	0.019	0.017
N	**1995**	**2303**	**1995**	**2303**	**1995**	**2303**	**1995**	**2303**
R^2	**0.0614**	**0.0975**	**0.0618**	**0.0768**	**0.0424**	**0.0560**	**0.0146**	**0.0195**

Notes: Robust standard errors clustered at community level are reported in brackets. *, ** and *** denote statistical significance at 10%, 5% and 1% levels respectively. All regressions include controls for both individual-level and household/community-level variables. Individual-level controls are: age-group (<18 and 70+, 18-69 is omitted), gender, indicator for having a health condition, indicator for visiting a health facility at baseline, education status. Household/community-level controls are: household wealth (poorest third and richest third, middle third omitted), household size, religion, ethnicity, distance to nearest health facility and distance to NHIS registration point. Sample regressions in (1), (3), (5) and (7) restricted to adult sample (18+) while regressions in (2), (4), (6) and (8) are restricted children (<18 years).

Table A8: Health condition of children at baseline by gender

	Males	Females	p-value
Had injury in the last 4 weeks (baseline)	1.3%	1.6%	0.4238
Illness in the last 4 weeks (baseline)	9.4%	9.6%	0.9322
Probability will be sick next yr	46.1%	46.5%	0.7719
Made positive medical exp	2.7%	2.8%	0.8157
Has a chronic condition	2.6%	2.3%	0.6304

Notes: P-values based on t-tests of differences

Table A9: Included and excluded services: NHIS minimum coverage

Included Services	Exclusion List
1. Out-Patient Services i) General and specialized consultation and review ii) Requested investigations (including laboratory investigations, x-rays and ultrasound scanning) iii) Medication (prescription drugs on the NHIS Drug List) iv) HIV/AIDS symptomatic treatment for opportunistic infection v) Out-patient/Day Surgery Operations including hernia repairs, incision and drainage, hemorrhoidectomy vi) Out-patient physiotherapy 2. In-Patient Services i) General and specialist in-patient care ii) Requested investigations iii) Medication (prescription drugs on the NHIS Drug List) iv) Cervical and Breast Cancer Treatment v) Surgical Operations vi) In-patient physiotherapy vii) Accommodation in general ward viii) Feeding (where available) 3. Oral Health Services i) Pain relief which includes incision and drainage, tooth extraction and temporary relief ii) Dental restoration which includes simple amalgam fillings and temporary dressing 4. Eye Care Services i) Refraction, visual fields and A-Scan ii) Keratometry iii) Cataract Removal iv) Eye lid surgery 5. Maternity Care i) Antenatal care ii) Deliveries (normal and assisted) iii) Caesarian section iv) Postnatal care 6. Emergencies i) Medical emergencies ii) Surgical emergencies including brain surgery due to accidents iii) Pediatric emergencies iv) Obstetric and gynecological emergencies v) Road traffic accidents vi) Industrial and workplace accidents vii) Dialysis for acute renal failure	1. Rehabilitation other than physiotherapy 2. Appliances and protheses including optical aids, hearing aids, orthopedic aids and dentures 3. Cosmetic surgeries and aesthetic treatment 4. HIV retroviral drugs 5. Assisted reproduction eg artificial insemination and gynecological hormone replacement therapy 6. Echocardiography 7. Photography 8. Angiography 9. Orthotics 10. Dialysis for chronic renal failure 11. Heart and brain surgery other than those resulting from accidents 12. Cancer treatment other than cervical ad breast cancer 13. Organ transplanting 14. All drugs that not listed on the NHIS Drug List 15. Diagnosis and treatment abroad 16. Medical examinations for purposes of visa applications, education and institutional driving license 17. VIP ward accommodation 18. Mortuary services

Source: NHIA (2011)