

Sustainability of Health Insurance Enrollment: Evidence from a Field Experiment in Ghana¹

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Abstract

Despite low premium and generous benefits of social health insurance in developing countries, enrollment rates remain low. To study how to promote enrollment and the impacts of insurance coverage, we randomly provided subsidy for premium and fees, education campaign on health insurance, and the option for easy sign up. We find that our overall intervention promoted and sustained insurance enrollment. Subsidy was the most effective intervention in promoting enrollment and sustaining it. Insurance coverage increased utilization of health services. Positive effects on health status in the short-run disappeared in the long-run. Moral hazard behavior helps explain this pattern.

Key words: health insurance; enrollment; moral hazard; sustainability; randomized experiments; Ghana.

JEL code: I1, O12

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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; Gertler and Gruber, 2002; Wagstaff, 2007). However, many poor households in developing countries lack access to mechanisms for pooling risks in the wake of adverse health shocks (Dercon, 2002). In the absence of insurance, a high fraction of medical expenses are borne by households in the form of out-of-pocket payments (Gertler and Gruber, 2002; Wagstaff, 2007).

To address this concern, many developing countries have recently instituted social health insurance schemes (SHIs) to help mitigate the impact of adverse health shocks (WHO, 2005; WHO, 2010).⁵ However, despite relatively low cost of signing up and generous benefits, SHIs take-up rates are very low in many countries, especially among the poorest households (Acharya, et al, 2013).⁶ It is a concern for policy-makers because it undermines their purpose of promoting equity and redistributing income. Despite the growing literature evaluating SHIs, little attention has been paid to the issue of low take-up.

Another important question is whether enrollment in SHIs provides adequate financial protection, increases utilization of health care services, and improves health outcomes. Many studies in developing countries have examined these topics (e.g., King et al., 2009; Barofsky, et al., 2011; Levine et al., 2016). However, these studies are limited to analyzing the short-run effects and less is known about the long-run effects.

In this study, we provide experimental evidence on how to promote take-up of a nationwide health insurance scheme in a rural district in northern part of Ghana. We also provide evidence on sustainability of our interventions in the long-run (i.e., three years after

⁵ Recent examples include, Ghana, Kenya, Nigeria, Tanzania and Vietnam. Countries in the process of instituting SHIs include Cambodia, Laos, Malaysia, Zimbabwe, and South Africa. (Wagstaff, 2010)

⁶ Low take-up of government programs is not peculiar to health insurance programs in low-income countries; it is pervasive across programs and countries. 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; 2010).

intervention). Lastly, we show how insurance coverage affects utilization of health care services, objective and subjective health status, and out-of-pocket health expenses in the long run.

We provided three independent interventions to promote health insurance enrollment: subsidy, education campaign, and convenience. *Subsidy* intervention provides subsidy for the insurance premium and fees for one year coverage. Subsidy levels are randomly selected among one third, two thirds, and full subsidy. *Education* campaign intervention provides various information on health insurance including registration, premiums, exemptions, benefits through a community gathering at the village. In *Convenience* intervention, we provided an option for individuals to sign up in their community instead of travelling to the district capital. To measure the impact of these interventions, we conducted two follow-up surveys. The first follow-up was conducted in April 2012, while the second follow-up was conducted in December 2014, which was about seven months and three years after the initial intervention, respectively.

Overall, we find evidence on sustainable positive effects of our interventions on both short- and long-run insurance take-up. Specifically, those treated⁷ are 26 percentage points (96%) and 18 percentage points (77%) were more likely to enroll in the health insurance in the short and long run, respectively. More importantly, our intervention increased re-enrollment rate by 19 percentage points (72%). These results suggest that our interventions engendered persistent effects on the uptake of insurance program even though our intervention was only valid for one year.

Among the three broad interventions⁸, *Subsidy* is the most effective intervention in promoting enrollment and sustaining it, while *Education* is the least effective. Compared to the control group, *Subsidy* recipients were 38 percentage points (140 %) and 17 percentage points (63 %) more likely to enroll in short run and re-enroll in the long run, respectively. The enrollment effects of *Subsidy* disappeared in the long run. *Convenience*, on the other hand, was only effective in promoting enrollment in the long run.

⁷ The treated refers to those who received any type of intervention.

⁸ We categorize interventions into three broad categories: any subsidy (*Subsidy*), any education (*Education*), and any convenience (*Convenience*). *Subsidy* includes subsidy only, joint subsidy and education, joint subsidy and convenience, and joint subsidy and education and convenience. *Education* includes education only, joint education and subsidy, joint education and convenience, and joint subsidy and education and convenience. *Convenience* includes convenience only, joint convenience and education, joint convenience and subsidy, and joint subsidy and education and convenience.

Specifying the amount of subsidy into three levels (i.e., $\frac{1}{3}$, $\frac{2}{3}$, and full subsidy) allows us to examine individuals' responses to price. We find that the demand for the health insurance is highly responsive to the amount of subsidy. Providing a moderate amount of subsidy has strong effects on enrollment, particularly in the short run. For instance, a one-third subsidy more than doubles short-run enrollment. However, the difference between two-third and full subsidy is relatively small.

Insurance coverage has strong effects on health care utilization in both short and long run. Insurance coverage also improves objective and self-reported health status in the short run, but the impacts disappear in the long run. We find some evidence of moral hazard to help explain this pattern: those covered by insurance were less likely to have bednets for malaria prevention, sleep under their own bed nets, and use safe-water technologies in the long run. In terms of financial protection, we find evidence of positive relationship between insurance coverage and out-of-pocket (OOP) health expenses in the short run, but not in the long run.

Our study is related to several strands of the literature. First, our study is closely related to the growing empirical literature on health insurance. Ours is one of the few studies that provide experimental evidence on health insurance in low-income countries.⁹ Particularly, our study is among the first to provide experimental evidence on the effect of enrollment in a nation-wide government run health insurance scheme. 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, but SP was implemented along with other health interventions.¹⁰ This makes it difficult to isolate the effect of health insurance from the other interventions.

Second, our study contributes to the literature on sustainability of health intervention program. This study is among the first to document evidence on the long-run effects of interventions on insurance enrollment retention in developing countries. This topic remains relatively understudied even though it has important implications towards policy. While the idea

⁹ Some exceptions are King et al (2009) who study universal health insurance program in Mexico; Thornton et al (2010) who examine a voluntary health insurance program to informal workers in Nicaragua; Barofsky (2011) who studies Mexico's Seguro Popular program; Capuno et al (2015) who study Individual Paying Program (IIP), the voluntary component of health insurance program in the Philippines; and Wagstaff et al (2015) who study subsidized voluntary health insurance program for informal sector in Vietnam.

¹⁰ For other studies examining the effects of SP, see, for example, Galárraga et al (2010), Knaul et al (2012), Azuara and Marinescu (2013).

of promoting sustainability is attractive, in practice sustainability is difficult to achieve (Kremer and Miguel, 2007). They argue that one-time external interventions or subsidy alone are often insufficient to encourage people to use a health product with large private values indefinitely, let alone those with large social values. The challenges in promoting sustainable health insurance enrollment could be bigger because health care service in developing countries is generally of low quality and unreliable.¹¹

Third, our study complements a growing body of work explaining the role of pricing in take-up and use of health products and services in developing countries. Our 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). Our demand estimate is, however, relatively 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.

Fourth, our study contributes to the broad empirical literature on the effects of intervention and insurance coverage on health outcomes in the long run. While many studies have examined this topic, majority of them focus on the US. The influential RAND experiment reports insignificant effects of insurance coverage on average health outcomes, but finds negative effects on health outcomes for the more vulnerable subgroups (Newhouse et al., 1993). Relatively recent studies find positive effects of exposure to public health insurance during childhood period on various long-term health outcomes (Currie, Decker, and Lin, 2009; Wherry and Meyer, 2016; Boudreaux, et al., 2016). To our knowledge, this study is the first to examine the effects of insurance coverage on long-run health outcomes in low-income setting. Existing literature on developing countries mostly focus on examining short-run health effects (e.g., Fink et al., 2013; Barros, 2009; King et al., 2009; Barofsky et al, 2011).

Finally, our study also speaks to extensive empirical literature on the effects of insurance coverage on out-of-pocket (OOP) health expenses and health care utilization. Existing studies, which are mostly concentrated in studying the US, suggest mixed evidence (e.g., Newhouse et al

¹¹ See, for example, Banerjee, Deaton, and Duflo, (2004), Goldstein, et al (2013), and Das, et al., (2016) for illustrations of low health care quality in developing countries. Alhassan et al (2016) provides illustrations for Ghana.

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). Existing literature focusing on developing countries also find mixed evidence on the effects of health insurance on OOP expenses and health care utilization. Some studies observe no or negative (increasing) effects of insurance on OOP expenses (e.g., Wagstaff and Lindelow, 2008; Fink et al., 2013), while others find the opposite (e.g., Galárraga et al, 2010). Similarly, some studies find that health insurance increases health care utilization (e.g., Chankova et al., 2008; Franco et al., 2008), while others find the opposite (e.g., Schneider and Hanson, 2006).

The remainder of the paper is structured as follows. Section 2 outlines the research context and design. Section 3 describes the data and reports sample statistics. Section 4 presents empirical framework. Section 5 presents the main results on enrollment and its sustainability, heterogeneity results, demand elasticity of insurance, health care utilization and out-of-pocket expenses, and health status and behavior. Section 6 concludes.

2. Institutional Background

2.1. National Health Insurance Scheme (NHIS)

The National Health Insurance Scheme (NHIS) was established by the National Health Insurance Act (Act 560) in 2003 and became fully operational in 2005.¹² It aims to improve access to and the quality of basic health care services for all citizens, especially the poor and vulnerable (MOH, 2004). The law mandates that every citizen enroll in at least one scheme. However, in practice, there are no penalties for those who do not enroll.

Almost all of the 170 administrative districts of Ghana operate its own District Mutual Health Insurance Schemes (DMHIS) (Gajate-Garrido and Owusua, 2013). Each DMHIS accepts and processes applications, collects premiums (and fees), provides membership identification

¹² There are three types of insurance schemes in Ghana: District Mutual Health Insurance Schemes (DMHIS), Private Mutual Health Insurance Schemes (PMHIS) and Private Commercial Insurance Schemes (PCHIS). The focus of this study is DMHIS, which explains 96 percent of insurance coverage (GSS, GHS and ICF, 2009). They are operated and subsidized by the government through the National Health Insurance Fund (NHIF).

cards, and processes claims from accredited facilities for reimbursement. Individuals enroll in their district of residence but membership is readily transferable from one district to another.

Annual means-tested premiums are to be charged to informal sector workers, ranging from USD5 (GHC7.20) to USD32 (GHC48).¹³ Due to the lack of information on household incomes, rural districts tend to charge the lowest premiums in practice while the urban districts charge higher premiums. Indigents, pregnant women, children under 18, and elderly over 70 are exempt from premiums.¹⁴ All members (except indigents and pregnant women) are required to pay a registration fee at first registration and subsequent renewal. 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. New members have to wait for three months before they can enjoy insurance benefits. Table A1 summarizes included and excluded services. Broadly, it covers 1) full outpatient and inpatient (surgery and medical) treatments and services; 2) full payment for medications on the approved list; 3) payments for referrals on the approved list; and 4) all emergencies. The NHIA estimates that 95 percent of disease conditions that affect Ghanaians are covered by the scheme.

Despite low premium and generous benefits, enrollment in the NHIS remains low. By the end of 2010, the total active membership stood at 34 percent of the population of Ghana (NHIA, 2011). Enrollment is particularly low among the poorest. A 2008 nationwide survey found that 29 percent of the individuals in the lowest wealth quintile were active members of the scheme compared to 64 percent 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.

¹³ At 2006, the exchange rate: \$1 = GHC0.92. To put the annual premiums in context, annual per capita income estimated from the latest Ghana Living Standards Survey was 400 cedis or USD 433 in 2006 (GSS, 2008).

¹⁴ 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”. Specifically, 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 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.

2.2. Setting

This study was conducted in the Wa West, a poor and remote rural district in the north-western part of Ghana as shown in Figure 1. It covers an area of approximately 5,899 square kilometers and had population of about 81,000 in 2010. Settlement patterns are highly dispersed with majority of residents living in hamlets of about 100-200 people. This, coupled with poor road network, makes traveling within the district difficult and expensive. The economy is largely agrarian where over 90 percents of the population are farmers. Estimate from the 2006 Ghana Living Standard Survey (GLSS V) indicates that per capita income of an average person living in a rural savannah locality, like Wa West, was USD 252 (GHC 232) (GSS, 2008).¹⁵ The annual per capita health expenditure is USD 26 (GHC 24).

In the study area, even though CHPS (Community-Based Health and Planning Services), has increased accessibility to health care service,¹⁶ there are only six public health centers, and zero tertiary health facility.¹⁷ During the study period (as of June 2010), the district only had fifteen professional nurses and no medical doctor (Nang-Beifua, 2010). The district has a high disease burden. The most common cause of out-patient (OPD) visits in the region is malaria, which comprises a third of all OPD visits. As of 2004, reported prevalence of malaria was 16.5. Other common causes of OPD visits are acute respiratory-tract infections, and skin diseases.

The Wa West Mutual Health Insurance Scheme became operational in January 2007. The baseline enrollment rate for the study sample is 21 percent. In 2011, the Wa West DMIHS charged a uniform premium of USD 5.46 (GHC 8.20) for adults (18-69) and processing fee was USD 2.6 (GHC 4) for first-time members and USD 0.6 (GHC 1) for renewals. Late renewals attract a fee of USD 1.3 (GHC 2) in addition to full premiums for all years for which membership was not renewed.¹⁸

¹⁵ At 2006, the exchange rate: \$1 = GHC 0.92.

¹⁶ The CHPS is a community health facilities to provide basic primary health care. It is located within rural communities with limited access to larger hospitals and manned by regular and community health nurses. Among the services are treatment of common ailments (malaria and diarrheal diseases) and maternal and child care services.

¹⁷ Seventy-five percent (75 percent) of communities in the study sample are within 6 km (3.73 miles) of a health facility.

¹⁸ The exchange rate used here is \$1=GHC1.5. This rate will be used in all subsequent conversions.

3. Research Design

3.1. Intervention Description

To promote health insurance enrollment, we introduced three interventions: a subsidy for the insurance premium and fees (subsidy), information provision on national health insurance (education), and the option for individuals to sign up in their community instead of traveling to the district capital (convenience) (see Figure 2). All interventions were randomized at the community level and effective only in the first year of the study.

The subsidy intervention for insurance premiums and fees was provided to households in randomly selected communities. The level of subsidy was further randomized at the household level: 1/3 USD 2.67 (GHC 4), 2/3 USD 5.40 (GHC 8.10) or full subsidy USD 8.13 (GHC 12.20).^{19,20} Subsidies were given in the form of vouchers, which were distributed between November 2011 and January 2012, with a two-month validity period and redeemable only at the Wa West DMHIS. The voucher specifies names, ages and gender of all household members, expiration date and place of redemption. For the treatment arm combining the two interventions, the subsidy intervention will be stratified by the subsidy level and voucher type for the education intervention.

Households that did not receive full subsidy were informed about the extra amount needed to register all members. For such households, vouchers took one of two forms: specified and unspecified. If a household received a specified subsidy voucher, its members were listed in the voucher along with specific amount of subsidy for each one of them. Thus, reallocation of subsidy within household was not possible. If a household received an unspecified subsidy voucher, reallocation of subsidy is possible because the voucher only shows total amount of subsidy for the whole household, not specific for each member.

¹⁹ Note that due to some human errors in the field work, our enumerators did not manage to provide documentations on specific subsidy level received by particular household. Thus, there is some discrepancy between the total number of subsidy recipients, 1999 households, and total number of households receiving specific subsidy level, 1780 households, which consists of 314 households ($\frac{1}{3}$ subsidy), 522 households ($\frac{2}{3}$ subsidy), and 944 households (full subsidy).

²⁰ The variation in subsidy level only applies to adult household members. Children (aged less than 18 years) and the elderly (aged 70 years or more) received full subsidies for registration fees.

Figure 3 presents an illustrative example. Panel A shows an example of vouchers for households who received 2/3 subsidy. Panel B shows example of 1/3 subsidy vouchers. In the top and bottom left, an amount is specified against the name of each household member (specified voucher). In the top and bottom right, no amount is specified for each member but the total subsidy for the household is specified (unspecified voucher). Note that the value of the subsidy is the same in this case due to the same household size and age structure. 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.

Education intervention assessed the impact of lack of or incomplete information about the NHIS on enrollment. This intervention provided the following basic information on the NHIS: registration information, premiums, exemptions, benefits, and general education on the importance of being insured. For this intervention, trained fieldworkers visited randomly selected communities to provide information/education and answer questions about the insurance scheme. It involved two visits, each from 9AM to 5PM, seven days apart and on different days of the week.

Convenience intervention intended to reduce the cost of signing up for NHIS stemming from long-distance travel. We allowed residents of randomly selected communities to sign up in their own community, instead of having to travel to DMHIS office in the district capital. 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.

3.2. Data Collection

We conducted a baseline and two follow-up surveys.²¹ To minimize potential spillover of education and convenience interventions to neighboring communities, we restrict the sampled

²¹ The household questionnaire used for baseline and follow-up surveys was adapted from the Ghana Demographic and Health Survey 2008 and the Ghana Living Standards Survey 2005/2006.

communities of 30-400 residents to be at least 1km from the nearest other community. As a result, we surveyed 4,625 individuals of 643 households in 60 communities that met the selection criteria. The baseline survey was conducted in September 2011. It collected information on demographic characteristics, employment, health status, health care services utilization, enrollment in the NHIS and health behaviors for all household members. To measure subjects' familiarity with NHIS, we collected information on knowledge of NHIS of the household head (or an adult household member if the household head was absent).²² Information on prenatal care, delivery and postnatal care was collected for all women aged 15 to 49 years. In addition, we also collected information on household characteristics, including ownership of assets, and GIS information on all communities and health facilities in the district.

The first follow-up survey was conducted in April 2012, about seven months after the intervention. It collected information on health care utilization (e.g., health facility visit and medical expenditure), objective health status (e.g., total sick days), subjective health status²³ (e.g., very healthy), knowledge on NHIS, and health behaviors²⁴ (e.g., the use of mosquito bednet).

The second follow-up survey was conducted in December 2014. It asked similar questions and modules as in the first follow-up survey, but with greater details. For example, we asked specific dates and respondent's status for up to three episodes of several important illnesses, such as malaria, acute respiratory diseases, and skin diseases. Note that there are some differences in the construction of short- and long-run utilization measures.²⁵

²² Questions on knowledge about NHIS can be categorized into four main parts: questions on premium (e.g., amount of premium for children, adult, and seniors), benefits (e.g., whether one has to pay for consultation or X-ray), exemptions (e.g., whether children are exempt from paying premium or fees), and others (e.g., frequency of membership renewal).

²³ Questions on subjective health status are restricted to those aged 18 years old or older.

²⁴ Questions on health behavior are restricted to those aged 12 years old or older.

²⁵ Health facility visit in the first follow-up were constructed from the following question: "The last time (in the last four weeks / last six months) (NAME) was ill or injured did he/she visit any health facility?" However, in the second follow-up survey, the same variables were constructed from questions about respondents' visits in illness episodes. For example, an individual is said to visit a health facility in the last six months if their illness episode occurred in the last six months and they sought treatment in the health facility. Thus, the magnitude of effects between short- and long-run are not directly comparable. Moreover, last four weeks measure in the long run is taken from individuals' response based on October 2014 because of the survey timing, there are many missing responses in the November and December 2014. Similarly, our last six month measure in the second follow-up survey is based on between May 2014 to October 2014.

The main outcome variables of interest in this paper are health insurance enrollment, knowledge on NHIS, health care utilization, health behaviors, and health status. First, health insurance enrollment is measured at individual level. Second, knowledge on NHIS, which is measured at household level²⁶, is average of correct answers on questions related to knowledge on premium, benefits, exemptions, and other insurance-related topics. Third, health care utilization is measured by health facility visit in the last four weeks and six months, number of visits in the last six months, health care facility visit for malaria, the leading cause of OPD visits in the district. As in construction of long-run utilization measures, we also use information from individuals' illness episodes to construct long-run health outcomes.

Fourth, objective health status is measured by the following: i) number of days an individual suffered an illness in the past month; ii) an indicator for not being able to perform normal daily activities due to such illness in the past month; and iii) the number of days that an individual was unable to perform normal daily activities.²⁷ Finally, the subjective health measure is measured by an indicator for whether the respondent reports being healthy or very healthy around the survey time.

The attrition rate in the first follow-up survey is relatively low (4.5 percent) and relatively high in the second follow-up (21.1 percent) as shown in Table A2.²⁸ In general, short- and long-run survey participations are not systematically correlated with our interventions.

3.3. Descriptive Statistics

Table 1 presents descriptive statistics from the baseline survey and balance test between treatment and control group. Column 1 reports total number of observations and Column 2 report

²⁶ Each household only has one respondent: either the head or another adult respondent. Thus, one household only has one measure. We used 18 questions on premium, benefit, exemption, and others to measure the respondent's knowledge on NHIS.

²⁷ 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.

²⁸ The main reasons for attrition in the first follow-up are deceased (17.78 %), traveled (62.22 %), relocated to other districts (14.07 %), and others (5.93 %).

average characteristics of the study sample. The average respondent is about 23 years old and 48 percent are male. Although 96 percent of adult respondents had heard about NHIS, on average, they only managed to answer 10 out of 18 questions (59 %) about knowledge on NHIS correctly. Lastly, 21 percent were enrolled in the NHIS at the baseline and 38 percent had ever registered with the scheme. In terms of health characteristics, 12 percent reported a sickness or injury in the last four weeks. About 8 percent visited a health facility in the last four weeks and 13 percent made a positive out-of-pocket health expenditure. The average household lives within 5.39 km of a health facility and 18.34 km from the district capital.

Columns 3 to 9 compare each treatment group with the control group. Panels A, B, and C report average values of individual, household, and community characteristics. Overall, treatment and control groups are reasonably balanced at the baseline. Only 1 (0.6%), 7 (4.2%) and 7 (4.2%) out of 168 t-tests for balance check are statistically significant at 1, 5, and 10 percent level, respectively, suggesting that our randomization was generally successful in creating balanced research groups.

4. Empirical Framework

To measure the effects of our intervention on various outcomes, we estimate three reduced-form equations, wherein the only difference is the categorization of intervention. First, we estimate the effects of receiving any intervention below

$$y_{ihc} = \beta_0 + \beta_1 Any_c + \theta X_{ihc} + \delta Z_{hc} + \omega V_c + \varepsilon_{ihc} \quad (1)$$

, where y_{ihc} denotes outcomes of individual i of household h in community c . The outcomes of interest include utilization of health care services, out-of-pocket expenses, and health status. Any_c indicates an assignment to any intervention. \mathbf{X} denotes a vector of baseline individual covariates, such as age dummies, indicator variables for gender, religion, ethnicity, schooling, NHIS enrollment, having ever enrolled in NHIS, and health facility visit. Household covariates \mathbf{Z} includes household size and wealth index indicator (poor third, middle third, and rich third). The

measure of household wealth is a three-category index constructed from principal component scores of household assets.²⁹ Community covariates \mathbf{V} includes distance to nearest health facility and distance to NHIS registration center. Estimations employ linear probability model. Standard errors are clustered at the community level in all estimations.

Second, we modify Equation (1) by further categorizing any intervention, Any_c , into $Any Subsidy$, $Any Education$, and $Any Convenience$. $Any Subsidy$ equals one if an individual received either subsidy only, joint subsidy and education, joint subsidy and convenience, or joint subsidy and education and convenience, equals zero if an individual did not receive any intervention. Those in education only, convenience only and joint education and convenience were omitted in this regression. We use similar categorization to construct $Any Education$ and $Any Convenience$. We conducted three separate regressions of each outcome y_{ihc} on any grouped intervention (i.e., $Any Subsidy$, $Education$, and $Convenience$).³⁰

Finally, we also estimate the effects of each original intervention, which is given by the reduced-form equation below

$$y_{ihc} = \beta_0 + \beta_1 SUB_c + \beta_2 EDU_c + \beta_3 CON_c + \beta_4 EDU \cdot CON_c + \beta_5 SUB \cdot CON_c + \beta_6 SUB \cdot EDU_c + \beta_7 SUB \cdot EDU \cdot CON_c + \theta X_{ihc} + \delta Z_{hc} + \omega V_c + \varepsilon_{ihc} \quad (2)$$

, where SUB_c , EDU_c , CON_c , refer to an indicator for being assigned to subsidy, education, and convenience interventions, respectively. In addition, to obtain the effects of insurance coverage for compliers, we conducted 2SLS regression, where the first-stage regression equation is Equation (2). For each outcome, we present its short- and long-run estimations. Reduced-form results estimating Equation (2) are presented in Appendix B.

5. Results

²⁹ Assets included in the calculation can be broadly grouped as follow: dwelling characteristics (e.g., number of rooms and bed rooms in the house), enterprise (e.g., whether owning any private non-farm enterprise), livestock (e.g., number of chickens, pigs), and other assets (e.g., motorcycle, bicycle).

³⁰ We do not include *Subsidy*, *Education*, and *Convenience* in one regression. For example, when we regressed enrollment on *Subsidy*, we controlled for other interventions involving education and convenience and, of course, \mathbf{X} , \mathbf{Z} , and \mathbf{V} . Similarly, subsidy and convenience interventions were included when we regressed short-run enrollment on *Education*; subsidy and education interventions were included when we regressed short-run enrollment on *Convenience*.

5.1. Impacts on Insurance Take-up and Sustainability

Figure 4 displays enrollment rates of control and seven treatment groups at the baseline, short-run, and long-run follow-up surveys. In general, it shows our intervention significantly promoted enrollment in the short-run as well as in the long-run even though the impacts had been attenuated. On average, control group enrollment rates are about 20, 27 and 23 percent in the baseline, short run follow-up and long run follow-up, respectively. The corresponding numbers for the treated group are 21, 62 and 43.

Formal regression results are presented in Table 2. Columns 1 to 3 present short- and long-run impacts on enrollment and re-enrollment.³¹ As shown in Panel A, overall intervention increases insurance enrollment by 26 percentage points (96%) and 18 percentage points (77%) in the short and long run, respectively (Columns 1 and 2). Column 3 confirm that our intervention promoted re-enrollment by 19 percentage points (184 %). The last fourth row of Column 3 shows that 27 % of our sample remained after three years (the gap between first and second follow-up surveys).³² Together, these reflect the effectiveness of our intervention, which was although only valid for one year, the effects were relatively sustained after three years.

Panels B, C, and D suggest that *Subsidy* was the most effective intervention in promoting short-run enrollment and re-enrollment (Columns 1 and 3). On the other hand, the treated did not seem to respond to *Education* differently from the untreated. One possible explanation is that because education intervention only provided information to community, not exclusively to each individual.³³ While *Convenience* was not effective in promoting short-run enrollment, we find some evidence that it was effective in the long run. This result seems surprising. It is possible

³¹ We define re-enrollment as enrollment rate of those who enrolled in both short and long run. Re-enrollment equals one if an individual enrolled in both short and long run and equals zero if he either only enrolled in the short run or only enrolled in the long run or did not enroll in both short and long run.

³² The re-enrollment rate for those who had enrolled in the short run is even higher. One out of two NHIS members retained their membership after three years. This is unusually high for health insurance enrollment in developing countries. For instance, evaluating a health insurance program in Nicaragua, Thornton et al (2010) find that only 10 % retained their health insurance after only one year.

³³ It is worth emphasizing that we did not provide information exclusively to each household. It is less intense than individual information session, and thus, expectedly generates less effective results. This result differs from, for example, Capuno et al (2015) who find positive and significant effect of randomly distributing brochure and showing videos individually via home visits on insurance enrollment.

that the pre-existing “agent system” in the district reduced costs associated with remoteness. We realize that this argument, however, remains inadequate to explain the significant long-run effect even though it is only borderline significant (p-value = 0.087).

Columns 1, 2, 6, and 7 of Table A3 present impacts on adults and children enrollment. Columns 1 and 2 of panel A show that the positive effects of overall intervention on enrollment among adult and children³⁴ are statistically indistinguishable in the short (27 and 25 percentage points, respectively) and long run (14 and 21 percentage points, respectively) suggesting strong correlation between children’s and adults’ enrollment.

Subsidy recipients (adults and children) were significantly more likely to enroll than the untreated (Columns 1 and 2 of Panel B). This is plausibly because NHIS requires that children are only exempt from paying premium if both parents are enrolled, as well.³⁵ *Education* promoted short-run enrollment rates among treated adult members (Panel C). Consistent with general enrollment rates (Panel D of Table 2), *Convenience* was not effective in encouraging neither adults nor children to enroll in the short run. We do not find evidence of long-run effects of *Subsidy*, *Education*, and *Convenience* on adult’s enrollment rate.³⁶

5.2. Impacts on Knowledge on Insurance Scheme

Although 96% of household heads respondents reported that they had heard about the NHIS at baseline, much of their knowledge of the NHIS were inaccurate, as shown in Table 1. Columns 4 and 5 in Table 2 show short- and long-run impacts on knowledge on NHIS, respectively.³⁷ Panel A shows that our intervention improved respondent’s knowledge by 0.564σ in the short run, but this effect disappeared in the long run. Panels B, C, and D show that *Subsidy*

³⁴We use the term ‘children’ for convenience. This term refers to household members younger than 18 years old. They are not necessarily children of the household head.

³⁵ This argument does not necessarily asserts that adults and children in Table A3 are parents and children.

³⁶ These results may seem contradictory to the significant effect of any intervention on adult’s and children’s enrollment (Columns 7 and 8 of Panel A). However, note that this is mainly because Panels B, C, and D only show the main interventions. Some of the other interventions that we control in those panels are significant (results are not shown).

³⁷ As mentioned in Section 3, we measure knowledge on NHIS for household head in each household. Knowledge score is the standardized average of correct answers on questions pertaining to knowledge on premium, benefits, exemptions, and others.

and *Convenience* recipients had significantly more knowledge than the control group in the short run. On the other hand, *Education* did not make significant impact. As explained before, our *Education* campaign did not provide intensive information session for each individual. Thus, it may have been less effective in knowledge improvement. *Subsidy*, *Education*, and *Convenience* recipients did not have better knowledge than the control group in the long run. To check the robustness of our NHIS knowledge measure, we estimate the effects of our interventions on alternative measures.³⁸ Estimation results are presented in Table A4. In general, the results in Table 2 are echoed in Table A4.

Table A3 presents results on each domain of NHIS knowledge. Panel A shows that short-run increase in NHIS knowledge is driven by knowledge on premium and its exemptions, but only knowledge on premium remains in the long run. Consistent with significant effects on overall NHIS knowledge (Table 2), *Subsidy* and *Convenience* recipients have better knowledge than the untreated in the short run, as shown in Columns 3 and 4 of Panels B and D, respectively.

5.3. Price Elasticity of Demand for Health Insurance

Figure 5 shows enrollment rates by level of subsidy at the baseline, short-run, and long-run follow-up surveys. In general, enrollment rate increases with subsidy level, but the increase is largest between control and the 1/3 subsidy. Formal regression results are presented on Table A5. Column 1 shows that receiving 1/3, 2/3, and full subsidy are associated with 33, 46, and 48 percentage points higher likelihood of enrolling in insurance than the control group in the short run. Columns 2 and 3, which report results for adults (aged 18 to 69 years old) and children (younger than 18 years old), respectively, confirm that the impacts are rather similar for adults

³⁸ We created four alternative measures of NHIS knowledge, all of which are standardized. The first measure is constructed by taking the average score of correct answers on questions pertaining to knowledge on premium, benefits, exemptions, and others. This measure is slightly different from the main knowledge measure estimated in Table 2. This alternative measure includes an indicator of whether the respondent gives correct answer on exemption knowledge, which is equal to 1 if he gives at least one correct answer on who are exempt from paying annual premium (e.g., pregnant women, household members older than 69 years old). We do not categorize exemption knowledge in our main measure in Table 2. Instead, we include all respondent's answers on those who are exempt from paying premium. Thus, the main measure is more comprehensive than the alternative. In the second alternative measure, knowledge score is constructed by taking the average of correct answers on questions related to knowledge on premium, benefit, and exemption. In the third measure, we take the average of average knowledge scores on premium, benefit, and exemption. Finally, we add average knowledge score on others to the third measure.

and children. Consistent with insignificant effects of *Subsidy* on long-run enrollment (Table 2), we find that subsidy level was not effective either in affecting enrolment in the long run (Columns 4 to 6).³⁹

Our results suggest that individuals were highly responsive to each subsidy level only in the short run. An increase in the price of insurance from \$0 to \$2.73, from \$2.73 to \$5.46, and from \$0 to \$5.46 lead to a 2.7 percent, 19.2 percent, and 22 percent decreases in short-run enrollment, respectively.⁴⁰

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. Health insurance is a more broadly defined product with relatively few substitutes. 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 our setting. Shampman'er et al (2007) have demonstrated that special psychological effects associated with zero financial price may lead to such dramatic response to positive prices.

To make comparison of price elasticity of demand for health insurance or health products from related studies, we calculate arc elasticities.⁴¹ The short-run elasticity estimates when price increases from \$0 to \$2.73, \$2.73 to \$5.46, and \$0 to \$5.46 are 0.02, 0.16, and 0.18, respectively. Although not directly comparable, our elasticity estimates, in general, are slightly lower than estimates from previous experimental studies of health products and services in developed and

³⁹ Except for full subsidy that was significant in affecting children enrollment (Column 6).

⁴⁰ In Kremer and Miguel (2007), the introduction of a \$0.15 user fee on deworming drugs led to a 62 percent 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 points 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 percent when price increased from \$0 to \$0.60. By contrast, our results suggest that an increase in the price of insurance from \$0 to \$2.73 leads to a 2.7 percent in short-run enrollment.

⁴¹ Arc elasticity is generally preferred to point elasticity for large changes. Because the households who receive full subsidy in this study pays zero price for premium and fees, a percent change is not well defined. Arc elasticities are easier to work with. Arc elasticity can be obtained by the following formula: $[(Y_a - Y_b)/(Y_a + Y_b)]/[(a - b)/(a + b)]$.

developing countries (e.g., Newhouse and team, 1993; Ashraf, Berry, and Shapiro, 2010; Cohen and Dupas, 2010).⁴²

5.4. Heterogeneity in Health Insurance Enrollment

In this subsection, we explore who were more responsive to our interventions. Table 3 summarizes heterogeneous results by illness and health care utilization at the baseline and short run.⁴³ Dependent variables of Panel A, B, and C are enrollment in the short run, long run, and both short and long run.

Table 3 shows that individuals responded to the incentives differently by their health status (Columns 1 to 3) and health care utilization (Columns 4 and 5). They only responded to the former. We find the opposite pattern of responses by health status in the short and long run. For example, those who are limited in daily activities are more responsive to intervention in the short run, but they are less likely to enroll in the long run. We do not find evidence of different responses on re-enrollment rate (Panel C).

A possible explanation for increased enrollment in the short run, but not in the long run is that those who had gotten sick responded more to the intervention in the short run in order to seek affordable health care in NHIS facilities. They did not do so in the long run because they did not receive health care services that they had expected. This is consistent with Alhassan et al (2016) who find high rate of client dissatisfaction among NHIS clients due to poor quality of health care services. Thus, enrollment decision in the long run might have been driven by the projection bias, as formalized in Loewenstein, O'Donoghue and Rabin (2003). Projection bias conjectures that those who received disappointing health care in the short run might have exaggerated their past health care experience in the long run. As a result, we may observe a decreased enrollment rate in the long run among the sick.

⁴² Newhouse and Team (1993) find the price elasticity of demand for preventive health care in the United States ranges between 0.17 and 0.43. Ashraf, Berry, and Shapiro (2010) find the elasticity for chlorine, a disinfectant that prevents water-borne diseases in Zambia, is 0.6. Cohen and Dupas (2010) find elasticity of 0.037 for ITNs for malaria prevention in Kenya.

⁴³ Heterogeneous responses to short-run enrollment are based on baseline illness and health care utilization, whereas responses to long-run enrollment and re-enrollment are based on illness and health care utilization in the short run.

5.5. Impacts on Utilization of Health Care Services

Table 4 presents the effects of insurance coverage on the utilization of health care services in the short (Columns 1 to 5) and long run (Columns 6 to 10). Panel A, the 2SLS results, shows that insurance coverage leads to an increase in utilization of health care services in both short and long run. For example, in the short run, extensive and intensive margins of health facility visit in the last six months increased by 17 percentage points (197%) and 0.365 days (199%), respectively (Columns 2 and 3). As increase of health insurance enrollment sustained in the long-run, utilization of health care facilities also increases in the long-run (Columns 6 to 8 of Panel A). Panel B confirms that receiving (any) intervention has positive impact on health care utilization even in the long run. This pattern is very similar to health insurance enrollment suggesting strong correlation between enrollment and utilization. In addition, Panels C, D, and E show that *Subsidy*, *Education*, and *Convenience* recipients were more likely to utilize health care services in the long run than the untreated.

Lastly, we find that those with insurance coverage increased out-of-pocket (OOP) expense in the short run (Column 5), but not in the long run (Column 10).⁴⁴ There are two possible explanations. First explanation involves a simple cost-benefit analysis. OOP expenses are usually associated with better healthcare quality, even among those with NHIS coverage (Alhassan et al, 2016). Thus, in the short run, NHIS subscribers made OOP expenses expecting better care. However, they probably realized that OOP expenses did not make substantial differences. In the long run, the proportion of NHIS subscribers who made OOP expenses may not have differed from the non-subscribers. Second, the insured may have learned about the NHIS benefits over time. Thus, in the long run, they would not want to pay OOP expenses more

⁴⁴ The magnitude of short- and long-run are not directly comparable because the short- and long-run OOP expense are constructed rather differently. In the short run, respondent was asked about more general OOP expenses than in the long run, where OOP expenses only recorded expenses related to treatment of several important illnesses (e.g., malaria, skin diseases, and acute respiratory infection). Specifically, the short-run OOP expense, we use individual's response from the following question: "On (NAME's) most recent visit to a health facility did he/she pay any money from pocket at a health facility in the last six months?". On the other hand, to construct the long-run OOP expense, we use information of whether individuals made positive OOP expense in each illness episode (i.e. malaria, acute respiratory infection, skin diseases) that occurred in the last six months. The last six month OOP is constructed from individual's response between May 2014 to October 2014. Thus, respondents are more likely to report OOP expenses in the short run than in the long run.

than the untreated. This leads to the absence of the effect of insurance coverage on OOP expenses in the long run. Temporary increasing effect on OOP expenses is consistent with some studies in developing countries (e.g., Wagstaff and Lindelow, 2008; Fink et al., 2013).⁴⁵

5.6. Impacts on Health and Health Behaviors

Table 5 presents the effects of insurance coverage on health status. Panel A, presenting 2SLS results, shows that insurance coverage improves health status in the short run (Columns 1 to 4), but this effect disappears in the long run (Columns 5 to 8). Further, Panel B shows that overall intervention has positive effects on subjective health in the short run, but not in the long run. In addition, we find negative effects on number of sick days and daily activities in the long run (Columns 6 to 8). Panels C, D, and E confirm this pattern: positive effects of *Subsidy*, *Education*, and *Convenience* and health status in the short run, but negative in the long run.

To shed lights on negative health effects in the long run, we investigate individuals' health behaviors. Specifically, Table 6 reports short-run estimation results on sleep under bednet (Column 1)⁴⁶ and long-run results on bednet ownership (Column 2), number of bednets (Column 3), sleep under bednet (Column 4), sleep under owned bednet (Column 5), and safe water technology (Column 6).⁴⁷

We find some evidence of moral hazard behavior to explain absence of or negative health effect in the long run even after controlling for baseline behaviors. Panel A indicates that individuals with insurance coverage are less likely to have mosquito nets (Column 2), have less mosquito nets (Column 3), less likely to sleep under own mosquito nets (Column 5), and use safe water technologies (Column 6). The effects are large. For example, those covered by insurance were 37 percentage points (78 %) less likely to sleep under their own bednets. In contrast,

⁴⁵ Wagstaff and Lindelow (2008) find positive effect of health insurance on high and health catastrophic spending in China. They find that insurance coverage increases likelihood of health care utilization and demand for better and more expensive facilities. Similarly, Fink et al (2013) also find that conditional on reporting health issues, insured individuals spend higher OOP expenses. They argue that the insured often do not benefit from the scheme due to poor communication between the insurance providers and the subscribers.

⁴⁶ We only analyze individual's response to whether an he slept under mosquito net last night in the short run, because we only added other health behaviors in the long run follow-up survey.

⁴⁷ There are several methods: boil, bleach/chlorine/alloy, strain through a cloth, solar disinfection, let it stand and settle, and other method.

insured and uninsured individuals do not behave differently when it comes to sleeping under borrowed nets. This implies that insured individuals who borrow nets to sleep have less disincentives to engage in reckless health behavior than those who sleep under their own nets. Panel D suggest that *Education* increases awareness of the importance of sleeping under bednets. In particular, receiving *Education* results in the increased likelihood of sleeping under borrowed bednets (Columns 1 and 4) but did not reduce likelihood of sleeping under owned bednets (Column 5). Together, these may result in higher proportion of people sleeping under bednets.

It is worth noting that the sample used in Table 6 is restricted to household members aged 12 years old or older. This differs from that in Table 5, which includes all household members. To verify whether our interpretation holds for restricted sample, we replicated regressions in Table 5 for household members aged 12 years old or older in Table A6. In general, the signs of coefficients in Table 5 are similar to those in Table A6 confirming our interpretation.

In sum, being insured led to better health outcomes in the short run, but this effect did not hold in the long run. Insured individuals were more likely to engage in reckless health behavior and utilize health care in the long run than in the short run. We interpret these findings as evidence of moral hazard behavior.

6. Conclusion

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

One of the most important findings in this study is the persistent effect of intervention on enrollment. We find that our intervention significantly promotes enrollment three years after

initial implementation. Furthermore, we also find evidence on enrollment sustainability in the long run. Additionally, our results suggest that individuals were very responsive to subsidy. A moderate subsidy for insurance premiums leads to substantial increase in enrollment.

Insurance coverage leads to increased utilization of health care services in short and long run. We also find evidence on increased OOP expenses in the short run, but not in the long run. While we find evidence of improved health status in the short run, these effects disappear in the long run. This can partly be explained by moral hazard behavior among the insured individuals. Additionally, we find some evidence of the positive effects of insurance coverage on self-reported health in short run, but not in the long run. This is consistent with high healthcare utilization and positive effects on health status in the short run.

We acknowledge that this study has some limitations that might hinder our interpretation. First, different construction of some outcomes in the short and long run. We explain in previous sections that we use different information to construct measures of utilization, health outcomes, and OOP expense in the long run. While we are not supposed to (and allowed to) make direct comparisons of the magnitude of the effects in both periods, this does not restrain us to draw inference on long run effects of our intervention in this study. Overall, our study contributes to the literature of health insurance take up in low income settings, especially in terms of analysis of enrollment sustainability.

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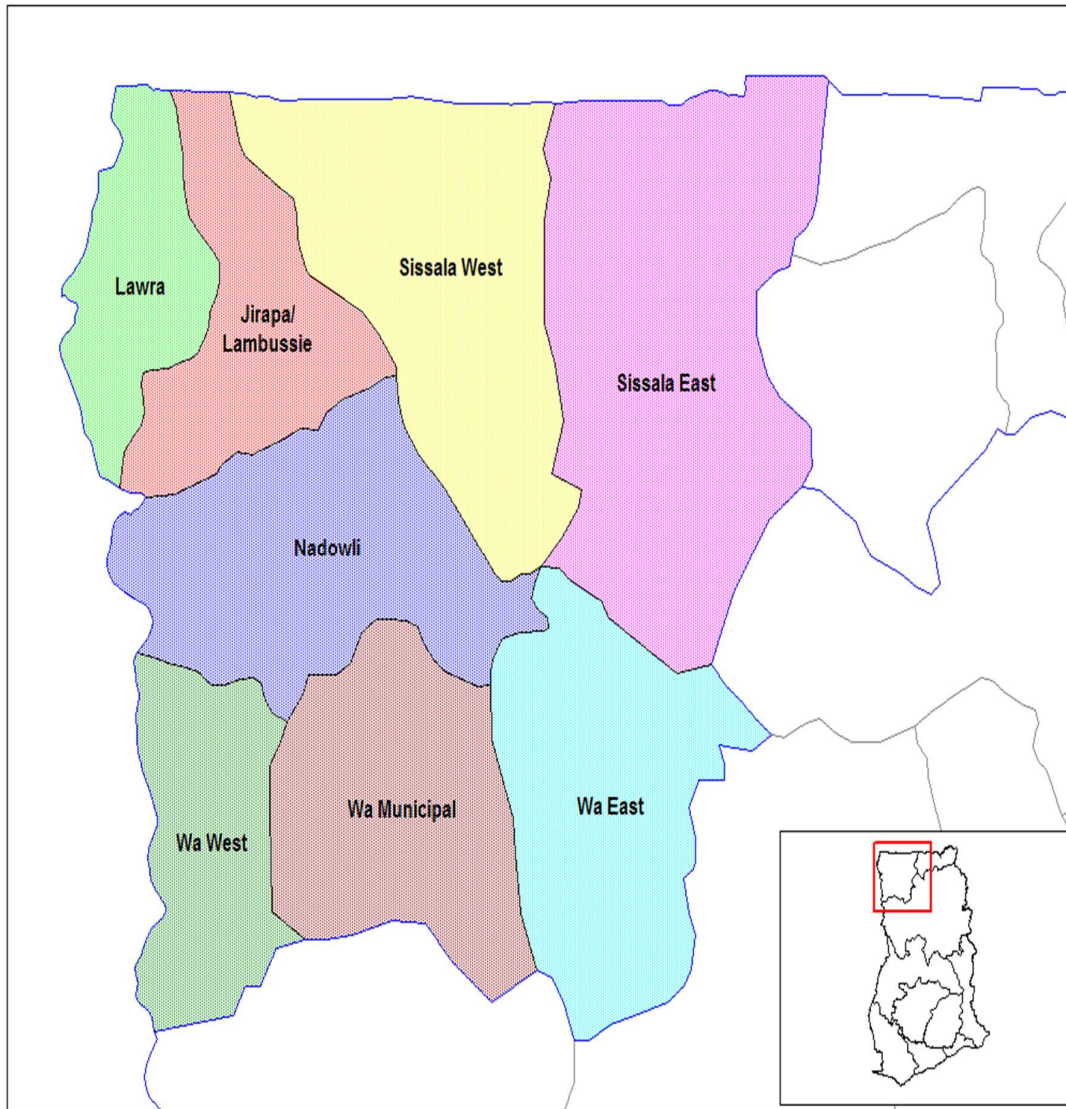
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Figures and Tables

Figure 1. Wa West District Map



Source: Wikipedia and www.wa-africa-living.com

Figure 2. Design of Interventions

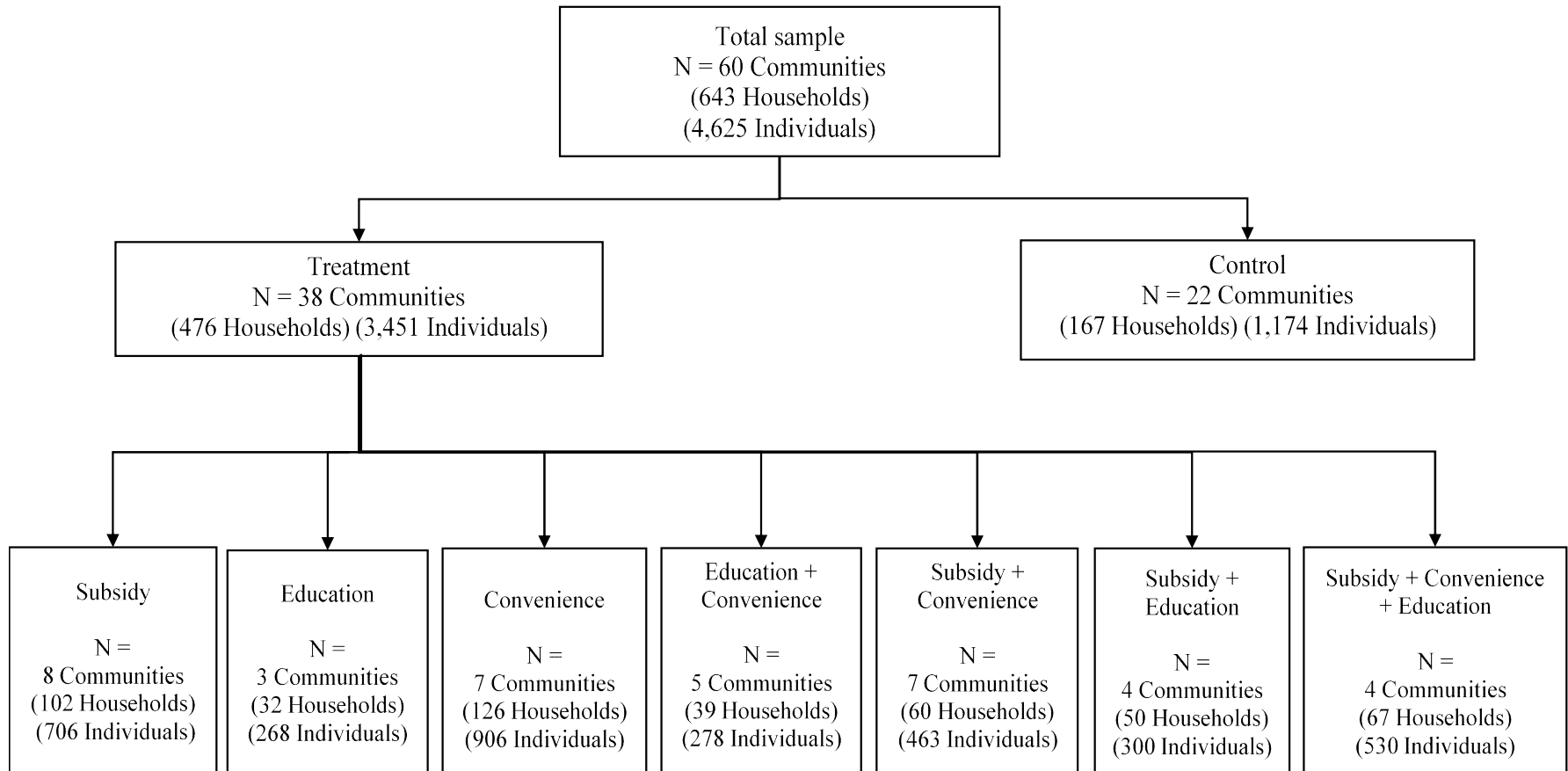
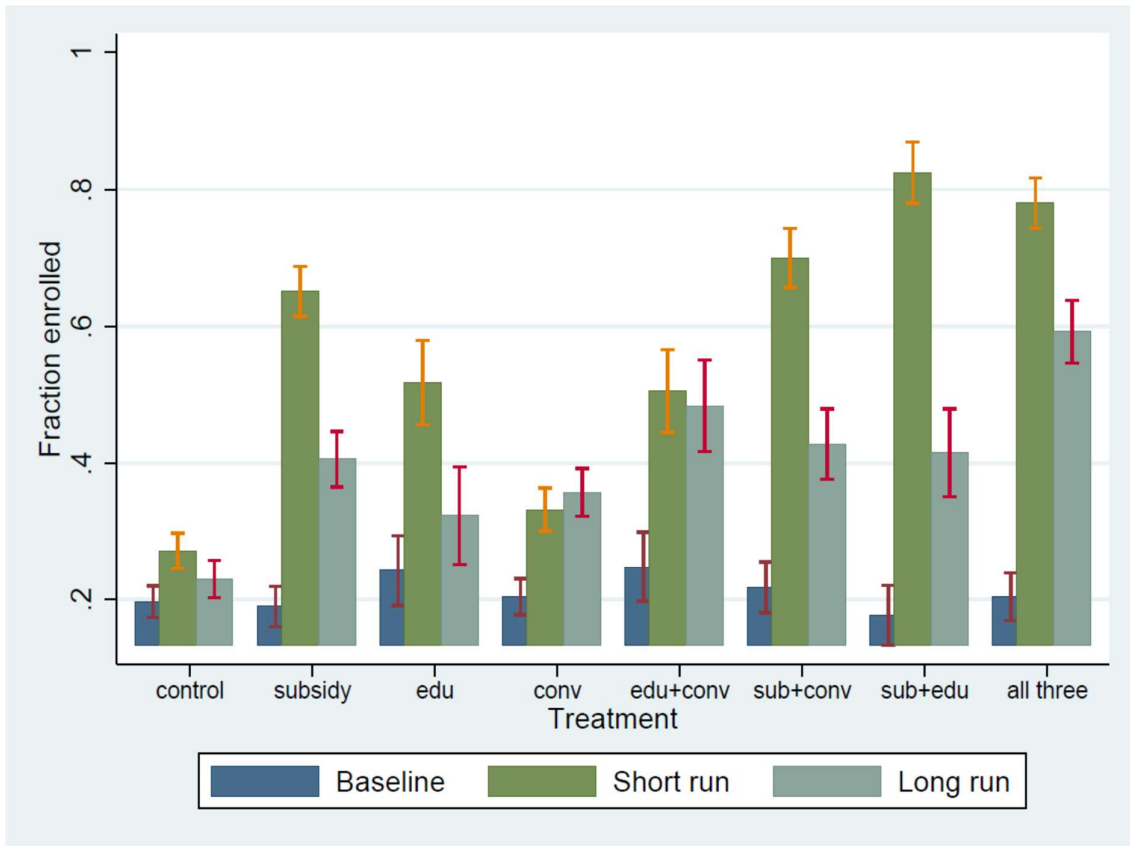


Figure 3. Sample Subsidy Voucher

Panel A: 2/3 subsidy				Panel A: 2/3 subsidy			
SEND - GHANA Subsidy voucher for NHIS				SEND - GHANA Subsidy voucher for NHIS			
<u>NAME</u>	<u>AGE</u>	<u>GENDER</u>	<u>AMOUNT</u>	<u>NAME</u>	<u>AGE</u>	<u>GENDER</u>	<u>AMOUNT</u>
Asamoah Gyan	48	M	8.1	Ibrahim Yahya	50	M	
Adwoa	41	F	8.1	Fatima	40	F	
Felicia	16	F	4	Fuseina	16	F	
Kwame	12	M	4	Iddrisu	13	M	
Akosua	79	F	4	Bukari	11	M	
Community: Kapru				Total amount for this household: GHC 28.20			
Community: Kapru				Community: Kapru			
REDEEM AT WA WEST DISTRICT NHIS valid until :23/12/2011				REDEEM AT WA WEST DISTRICT NHIS valid until :23/12/2011			
Panel B: 1/3 subsidy				Panel B: 1/3 subsidy			
SEND - GHANA Subsidy voucher for NHIS				SEND - GHANA Subsidy voucher for NHIS			
<u>NAME</u>	<u>AGE</u>	<u>GENDER</u>	<u>AMOUNT</u>	<u>NAME</u>	<u>AGE</u>	<u>GENDER</u>	<u>AMOUNT</u>
Shilla Alhassan	37	M	4	Antuo Brimah	66	M	
Maamuna	35	F	4	Rianatu	61	F	
Yakubu	9	M	4	Chorayeleye	21	M	
Abdul	4	M	4	Iddrisu	19	M	
Community: Kapru				Total amount for this household: GHC 16.00			
Community: Kapru				Community: Kapru			
REDEEM AT WA WEST DISTRICT NHIS valid until :23/12/2011				REDEEM AT WA WEST DISTRICT NHIS valid until :23/12/2011			

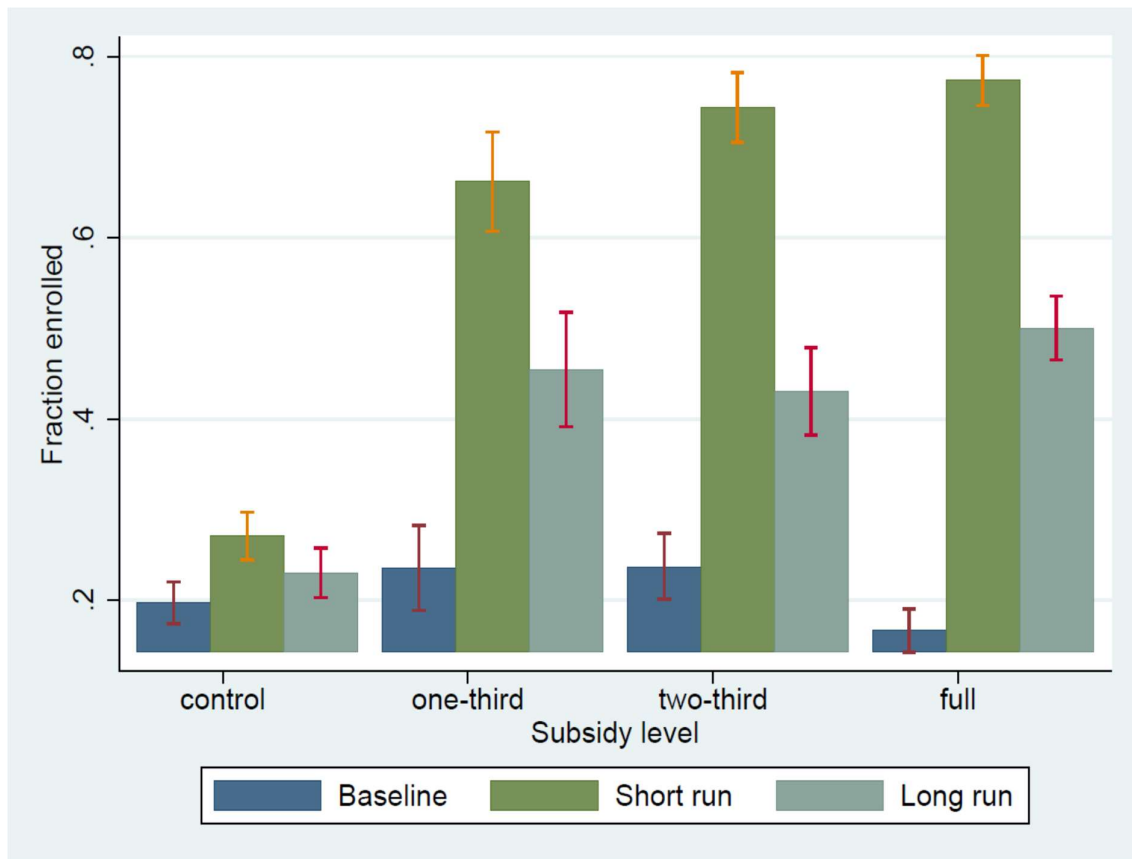
Notes: Panel A displays sample voucher for a household who received 2/3 subsidy. The left panel displays sample voucher where subsidy is specified for each household member, while in the right panel household only received voucher with total amount of subsidy without outlining specific subsidy for each member. Panel B displays sample voucher for a household who received 1/3 subsidy. The left panel is specified voucher, while right panel is unspecified voucher.

Figure 4. Enrollment by Intervention Status at Baseline, Short Run, and Long Run



Notes: Sample includes 4,625 individuals interviewed at baseline.

Figure 5. Enrollment by Subsidy Level at Baseline, Short Run, and Long Run



Notes: Sample includes those who received subsidy only and pure control individuals (N=2,323)

Table 1: Baseline Characteristics by Study Group

Variable	N	Difference between treatment and control							
		All	Sub only	Edu only	Conv only	Edu + Conv	Sub + Conv	Sub + Edu	Sub + Edu + Conv
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: Individual Characteristics									
Age	4625	23.31	0.839	1.660	2.160	0.853	1.929	-1.080	1.619
Male	4625	0.48	-0.015	-0.014	0.014	-0.025	0.020	-0.021	-0.036
Has some formal education	4625	0.33	0.026	0.072	-0.017	0.136*	0.041	0.074	-0.099
Has a health condition (≥ 6 months)	4625	0.07	0.007	0.013	-0.007	0.015	-0.012	0.012	0.010
Has been ill in the last month	4624	0.12	-0.035	-0.048	0.013	-0.071	-0.029	-0.022	-0.014
Has recently visited health fac	4625	0.08	0.002	-0.012	0.010	-0.052	-0.032	0.007	0.019
Made out of pocket expense	4625	0.13	-0.007	0.077	0.010	-0.054	-0.005	-0.007	0.014
Probably sick next year	4409	0.45	0.007	0.096	-0.008	0.041	-0.031	0.031	0.065
Ever enrolled NHIS	4625	0.38	-0.075	-0.243**	-0.033	-0.231**	-0.182*	-0.055	-0.091
Currently enrolled NHIS	4625	0.21	0.007	-0.046	-0.007	-0.051	-0.021	0.020	-0.007
Ever smoked	2727	0.11	0.005	0.004	-0.012	-0.002	0.027	-0.048	0.043
Drank alcohol in last 2 weeks	2629	0.53	0.016	-0.028	0.088	-0.040	-0.017	-0.038	0.050
Slept under mosquito nets	4005	0.54	-0.072	-0.358**	-0.037	-0.269*	-0.265**	-0.247*	0.088
Christian	4625	0.43	-0.073	0.052	-0.083	-0.131	0.025	-0.29*	-0.070
Dagaaba (ethnic group)	4625	0.53	-0.028	-0.471*	0.010	-0.160	-0.041	-0.348	-0.053
Panel B: Household Characteristics									
HH Size	4624	8.67	-0.095	-1.329	-0.126	0.634	-0.997	1.341	-1.053
Number of children under 18	4625	4.00	-0.304	-0.959	-1.017	0.656	-0.083	0.361	-1.017
Male head HH	645	0.81	-0.005	-0.088	0.146**	-0.057	0.005	-0.082	-0.045
Heard of NHIS	730	0.96	-0.031	-0.048	0.079	-0.048	-0.047*	-0.048	-0.033
Knowledge NHIS ^a	643	0.59	-0.010	-0.025	-0.002	-0.088**	0.0001	-0.002	-0.007

Variable	N	Difference between treatment and control							
		All	Sub only	Edu only	Conv only	Edu + Conv	Sub + Conv	Sub + Edu	Sub + Edu + Conv
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Owns farming land	4243	0.53	-0.189	-0.007	0.013	0.065	-0.051	0.184	-0.073
Owns mosquito net	3620	0.73	-0.063	-0.193	0.013	-0.127	-0.147	-0.105	0.140
Panel C: Community Characteristics									
Distance to NHIS regist (km)	4625	18.34	-2.712	-0.604	13.532***	-12.445**	0.956	-7.261	8.296
Distance to health fac (km)	4625	5.39	0.429	1.626	-0.336	-1.792	-0.737	0.230	-1.309
Observations (N)	4625	4625	706	268	906	278	463	300	530

Notes: ^a Unstandardized average of correct answers on questions related to all knowledge about NHIS. Exchange rate used USD1 = GHC 1.5. Reported differences are from pairwise t-tests of differences between each treatment and the control group. Column 2 reports differences between group receiving subsidy only and control; Column 3 reports differences between group receiving education only and control; Column 4 reports differences between group receiving convenience only and control; Column 5 reports differences between group receiving education&convenience treatment and control; Column 6 reports differences between group receiving subsidy&convenience and control; Column 7 reports differences between subsidy&education and control; Column 8 reports differences between group receiving all combination of subsidy treatments and control. Column 9 reports differences between group receiving all combination of education treatments and control. All tests of differences adjust standard errors for intra-cluster (intra-village) correlation. *, **, and *** denote statistical significance at 10 %, 5 %, and 1 % levels, respectively.

Table 2 Effect of Interventions on Enrollment and Knowledge on NHIS

Dep Variable	Enrollment			Knowledge	
	Short-run (1)	Long-run (2)	Both short and Long Run ^a (3)	Short-run (4)	Long-run (5)
Panel A					
Any Intervention	0.262*** (0.053)	0.180*** (0.052)	0.193*** (0.041)	0.564*** (0.161)	-0.201 (0.232)
Observations (N)	4,380	3,496	3,496	598	564
R ²	0.237	0.125	0.163	0.187	0.163
Panel B					
Any Subsidy	0.380*** (0.051)	0.119 (0.077)	0.170** (0.072)	0.480* (0.253)	-0.445 (0.269)
Observations (N)	2,997	2,421	2,421	410	383
R ²	0.310	0.154	0.193	0.284	0.221
Panel C					
Any Education	0.107 (0.073)	0.030 (0.084)	0.039 (0.061)	0.159 (0.240)	0.372 (0.358)
Observations (N)	2,414	1,894	1,894	326	298
R ²	0.363	0.192	0.251	0.371	0.297
Panel D					
Any Convenience	0.020 (0.058)	0.118* (0.067)	0.082 (0.049)	0.420** (0.207)	-0.399 (0.320)
Observations (N)	3,172	2,581	2,581	431	404
R ²	0.347	0.170	0.228	0.286	0.292
Mean	0.505	0.385	0.268	0.003	-0.016
Control group mean	0.272	0.232	0.105	-0.391	0.136
R ²	0.313	0.148	0.197	0.222	0.239

Notes: ^a Takes value 1 if enrolled in the short run and the long run, 0 if either enrolled in the short run only or enrolled in the long run only or not enrolled in both short and long run. All regressions include full covariates, which include individual, household, and community covariates. Individual covariates are: age indicators, 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. Knowledge on NHIS consists of standardized average scores of correct answers on all questions related to knowledge on NHIS premium, benefits, exemptions, and others. *, **, and *** denote statistical significance at 10 %, 5 %, and 1 % levels, respectively. Robust standard errors clustered at community level are reported in parentheses.

Table 3: Heterogeneity Effects of Illness and Utilization of NHIS

Dependent variable	X =				
	Got any illness in the last four weeks	Got Malaria in the last four weeks	Could not perform normal daily activities due to illness in the last four weeks	Visited health facility in last four weeks	Visited health facility in last six months
	(1)	(2)	(3)	(4)	(5)
Panel A: Dep. Variable: Enrolled in short run					
Any Intervention	0.265*** (0.055)	0.269*** (0.053)	0.257*** (0.054)	0.260*** (0.054)	0.262*** (0.060)
X	-0.010 (0.056)	0.097 (0.101)	-0.139*** (0.041)	0.032 (0.077)	-0.065 (0.102)
Any Intervention*X	-0.021 (0.068)	-0.137 (0.113)	0.100* (0.059)	0.022 (0.086)	0.033 (0.102)
Control group mean	0.271	0.271	0.271	0.271	0.271
Observations (N)	4,379	4,331	4,337	4,380	3,718
R ²	0.237	0.236	0.240	0.237	0.229
Panel B: Dep. Variable: Enrolled in long run					
Any Intervention	0.195*** (0.052)	0.183*** (0.052)	0.199*** (0.052)	0.192*** (0.053)	0.175*** (0.050)
X	0.196*** (0.053)	0.139 (0.128)	0.204*** (0.051)	0.183* (0.102)	0.166* (0.086)
Any Intervention*X	-0.163** (0.064)	-0.117 (0.147)	-0.198*** (0.063)	-0.123 (0.115)	-0.026 (0.090)
Control group mean	0.232	0.232	0.232	0.232	0.232
Observations (N)	3,489	3,477	3,485	3,246	3,432
R ²	0.128	0.125	0.127	0.129	0.137
Panel C: Dep. Variable: Enrolled in both short and long run					
Any Intervention	0.199*** (0.040)	0.193*** (0.040)	0.202*** (0.040)	0.200*** (0.042)	0.183*** (0.040)
X	0.130*** (0.048)	0.101 (0.088)	0.130** (0.049)	0.090* (0.052)	0.156** (0.064)
Any Intervention*X	-0.081 (0.061)	-0.026 (0.107)	-0.098 (0.062)	0.002 (0.072)	0.008 (0.071)
Control group mean	0.105	0.105	0.105	0.105	0.105
Observations (N)	3,489	3,477	3,485	3,246	3,432
R ²	0.165	0.165	0.164	0.171	0.180

Notes: X denotes baseline characteristics for Panel A; and short-run characteristics for Panels B and C, respectively. *, **, and *** denote statistical significance at 10 %, 5 %, and 1 % levels, respectively. Robust standard errors clustered at community level reported in parentheses. All regressions include full covariates (individual, household, and community).

Table 4: Effect of Interventions on Utilization of Healthcare Services

Dep. Variable	Short run					Long run				
	Visited health facility in last four weeks	Visited health facility in last six months	# of visits in last six months	Visited Facility for malaria treatment in the last four weeks	Made an out-of-pocket for health service in the last six months	Visited health facility in the last four weeks	Visited health facility in the last six months	# of visits in last six months	Visited Facility for malaria treatment in the last four weeks	Made an out-of-pocket for health service in the last six months
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: 2SLS results										
Enrolled in NHIS	0.026 (0.023)	0.170*** (0.048)	0.365*** (0.131)	0.030 (0.019)	0.045** (0.023)	0.077* (0.046)	0.220** (0.101)	0.238** (0.115)	0.049 (0.039)	0.011 (0.027)
Control group mean	0.032	0.087	0.183	0.015	0.054	0.016	0.041	0.045	0.011	0.026
First-stage F-statistics	20.76	20.04	20.35	21.50	21.08	24.45	24.45	24.45	24.45	24.45
Observations (N)	4,036	4,268	4,238	4,225	4,379	3,496	3,496	3,496	3,496	3,496
Panel B										
Any Intervention	0.003 (0.011)	0.026 (0.020)	0.069 (0.048)	0.009 (0.006)	-0.009 (0.013)	0.034*** (0.009)	0.066*** (0.019)	0.084*** (0.022)	0.025*** (0.007)	0.004 (0.007)
Observations (N)	4,036	4,268	4,238	4,225	4,379	3,496	3,496	3,496	3,496	3,496
R ²	0.086	0.090	0.080	0.038	0.047	0.054	0.061	0.062	0.036	0.056
Panel C										
Any Subsidy	-0.007 (0.012)	0.008 (0.018)	-0.001 (0.052)	-0.001 (0.006)	-0.008 (0.012)	0.025** (0.011)	0.072** (0.029)	0.084*** (0.030)	0.018* (0.011)	-0.004 (0.009)
Observations (N)	2,753	2,914	2,895	2,892	2,996	2,491	2,491	2,491	2,491	2,491
R ²	0.103	0.110	0.102	0.053	0.074	0.061	0.078	0.081	0.052	0.071

Dep. Variable	Short run					Long run				
	Visited health facility in last four weeks	Visited health facility in last six months	# of visits in last six months	Visited Facility for malaria treatment in the last four weeks	Made an out-of-pocket for health service in the last six months	Visited health facility in the last four weeks	Visited health facility in the last six months	# of visits in last six months	Visited Facility for malaria treatment in the last four weeks	Made an out-of-pocket for health service in the last six months
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel D										
Any Education	-0.000 (0.019)	0.024 (0.025)	0.079 (0.066)	0.007 (0.010)	-0.019 (0.013)	-0.007 (0.014)	-0.008 (0.032)	-0.021 (0.037)	-0.016 (0.013)	0.004 (0.020)
Observations (N)	2,197	2,339	2,323	2,332	2,413	1,974	1,974	1,974	1,974	1,974
R ²	0.095	0.146	0.128	0.057	0.082	0.074	0.094	0.101	0.069	0.087
Panel E										
Any Convenience	-0.001 (0.014)	-0.035 (0.025)	-0.055 (0.060)	-0.002 (0.009)	-0.034** (0.017)	0.039*** (0.014)	0.048* (0.027)	0.070** (0.032)	0.025** (0.009)	0.005 (0.012)
Observations (N)	2,938	3,101	3,072	3,046	3,171	2,668	2,668	2,668	2,668	2,668
R ²	0.102	0.116	0.089	0.053	0.058	0.062	0.075	0.079	0.048	0.068
Control group mean	0.038	0.102	0.201	0.019	0.046	0.017	0.050	0.050	0.010	0.013
Observations (N)	4,036	4,268	4,238	4,225	4,379	3,496	3,496	3,496	3,496	3,496
	0.093	0.103	0.088	0.041	0.053	0.058	0.067	0.070	0.041	0.058

Notes: *, **, and *** denote statistical significance at 10 %, 5 %, and 1 % levels, respectively. Robust standard errors clustered at community level are reported in parentheses. All regressions include full covariates (individual, household, and community). Columns 1 - 5 report short-run estimation results. Columns 6 - 10 report long-run estimation results.

Table 5: Effect of Insurance Coverage and Intervention on Health Status

Dep Variable	Short run				Long run			
	Healthy or very healthy	# Days ill last month	Could not perform normal daily activities due to illness last month	# days could not perform normal daily activities in the last month	Healthy or very healthy	# Days ill last month	Could not perform normal daily activities due to illness	# days could not perform normal daily activities in last month
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: 2SLS results								
Enrolled in NHIS	0.122** (0.059)	-0.804*** (0.207)	0.020 (0.041)	-1.276 (0.794)	0.082 (0.191)	0.475 (0.460)	0.058 (0.043)	0.452 (0.329)
Control group mean	0.844	0.625	0.092	1.499	0.679	0.435	0.029	0.181
First-stage F-statistics	21.92	21.14	21.15	21.10	22.72	24.45	24.45	24.45
Observations (N)	1,323	4,355	4,363	4,366	1,020	3,496	3,496	3,496
Panel B								
Any Intervention	0.066* (0.037)	-0.094 (0.108)	0.008 (0.014)	-0.192 (0.212)	-0.071 (0.044)	0.170* (0.095)	0.032*** (0.008)	0.164** (0.065)
Observations (N)	1,323	4,355	4,363	4,366	1,020	3,496	3,496	3,496
R ²	0.122	0.044	0.057	0.054	0.239	0.057	0.048	0.036
Panel C								
Any Subsidy	0.125*** (0.033)	-0.184 (0.128)	0.000 (0.017)	0.064 (0.332)	-0.122** (0.058)	0.092 (0.128)	0.028* (0.016)	0.076 (0.115)
Observations (N)	935	2,975	2,993	2,997	710	2,491	2,491	2,491
R ²	0.159	0.069	0.071	0.071	0.272	0.075	0.074	0.055

Dep Variable	Short run				Long run			
	Healthy or very healthy	# Days ill last month	Could not perform normal daily activities due to illness last month	# days could not perform normal daily activities in the last month	Healthy or very healthy	# Days ill last month	Could not perform normal daily activities due to illness	# days could not perform normal daily activities in last month
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel D								
Any Education	0.101* (0.056)	0.013 (0.151)	-0.013 (0.022)	-0.277 (0.380)	-0.003 (0.073)	0.098 (0.166)	-0.011 (0.020)	-0.061 (0.170)
Observations (N)	719	2,404	2,410	2,414	509	1,974	1,974	1,974
R ²	0.232	0.084	0.089	0.074	0.284	0.068	0.074	0.057
Panel E								
Any Convenience	0.025 (0.051)	0.207 (0.136)	0.014 (0.024)	0.227 (0.485)	-0.172*** (0.056)	0.204 (0.135)	0.030*** (0.010)	0.180** (0.079)
Observations (N)	911	3,161	3,155	3,158	675	2,668	2,668	2,668
R ²	0.163	0.059	0.074	0.066	0.288	0.066	0.056	0.046
Control group mean	0.818	0.617	0.082	1.380	0.791	0.413	0.013	0.096
Observations (N)	1,323	4,355	4,363	4,366	1,020	3,496	3,496	3,496
R ²	0.138	0.047	0.061	0.058	0.255	0.058	0.056	0.042

Note: *, **, and *** denote statistical significance at 10 %, 5 %, and 1 % level respectively. All regressions include a full set of covariates (individual, household, and community). Questions on self-reported health are restricted to household members aged 18 years old or older. Columns 1 - 4 report short-run estimation results. Columns 5 - 8 report long-run estimation results.

Table 6: Effect of Insurance Coverage and Intervention on Health Behavior

Dep. Variable	Short run	Long run				
	Sleep under mosquito nets	Have mosquito nets	# mosquito nets	Sleep under mosquito nets	Sleep under own mosquito nets	Water safe to drink
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: 2SLS results						
Short-run enrollment in NHIS	0.164 (0.158)	-0.340** (0.165)	-1.874** (0.824)	-0.251 (0.162)	-0.367** (0.160)	-0.126** (0.056)
First-stage F-statistics	22.82	26.43	21.16	28.68	27.08	20.88
Control group mean	0.433	0.483	2.517	0.469	0.472	0.211
Observations (N)	2,225	1,640	1,189	1,740	1,294	802
Panel B						
Any Intervention	0.072 (0.068)	-0.003 (0.091)	-0.068 (0.460)	0.012 (0.066)	0.028 (0.082)	-0.072* (0.037)
Observations (N)	2,225	1,640	1,189	1,740	1,294	802
R ²	0.217	0.185	0.218	0.117	0.163	0.154
Panel C						
Any Subsidy	0.115 (0.101)	-0.069 (0.084)	-0.843** (0.392)	-0.002 (0.091)	-0.031 (0.082)	-0.042 (0.051)
Observations (N)	1,529	1,180	849	1,174	946	597
R ²	0.211	0.230	0.307	0.209	0.227	0.213
Panel D						
Any Education	0.252** (0.113)	-0.064 (0.096)	-0.105 (0.433)	0.162* (0.091)	-0.010 (0.106)	0.020 (0.097)
Observations (N)	1,243	862	608	913	687	420
R ²	0.302	0.274	0.341	0.247	0.246	0.345
Panel E						
Any Convenience	0.024 (0.114)	0.253 (0.155)	1.729** (0.837)	0.148 (0.093)	0.311** (0.151)	-0.043 (0.042)
Observations (N)	1,624	1,067	731	1,231	838	563
R ²	0.281	0.258	0.321	0.172	0.259	0.197

Dep. Variable	Short run	Long run				
	Sleep under mosquito nets	Have mosquito nets	# mosquito nets	Sleep under mosquito nets	Sleep under own mosquito nets	Water safe to drink
	(1)	(2)	(3)	(4)	(5)	(6)
Control group mean	0.449	0.455	2.590	0.474	0.435	0.273
Observations (N)	2,225	1,640	1,189	1,740	1,294	802
R ²	0.254	0.254	0.304	0.157	0.242	0.170

Note: Sample is restricted to household members aged 12 years old or older. Column 4 assumes an individual may sleep under a borrowed mosquito net. Column 5 assumes an individual sleeps under his own net. *, **, and *** denote statistical significance at 10 %, 5 %, and 1 % level respectively. All regressions include a full set of covariates (individual, household, and community) and baseline health behaviors.

Appendix A

Table A1. Included and Excluded Services: NHIS Minimum Coverage.

Included Services	Exclusion List
<p>1 Out-Patient Services</p> <ul style="list-style-type: none"> i) General and specialized consultation and review ii) Requested investigation (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 	<p>1 Rehabilitation other than physiotherapy</p> <p>2 Appliances and prostheses including optical aids, hearing aids, orthopedic aids and dentures</p> <p>3 Cosmetic surgeries and aesthetic treatment</p> <p>4 HIV retroviral drugs</p>
<p>2 In-Patient Services</p> <ul style="list-style-type: none"> i) General and specialist in-patient care ii) Requested investigations iii) Medication (prescription drugs on 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) 	<p>5 Assisted reproduction eg artificial insemination and gynecological hormone replacement therapy</p> <p>6 Echocardiography</p> <p>7 Photography</p> <p>8 Angiography</p>
<p>3 Oral Health Services</p> <ul style="list-style-type: none"> i) Pain relief which includes incision and drainage, tooth extraction and temporary relief ii) Dental restoration which includes simple amalgam fillings and temporary dressing 	<p>9 Orthotics</p> <p>10 Dialysis for chronic renal failure</p>
<p>4 Eye Care Services</p> <ul style="list-style-type: none"> i) Refraction, visual fields and A-Scan ii) Keratometry iii) Cataract removal iv) Eye lid surgery 	<p>11 Heart and brain surgery other than those resulting from accident</p> <p>12 Cancer treatment other than cervical and breast cancer</p>
<p>5 Maternity Care</p> <ul style="list-style-type: none"> i) Antenatal care ii) Deliveries (normal and assisted) iii) Caesarian section iv) Postnatal care 	<p>13 Organ transplanting</p> <p>14 All drugs that not listed on the NHIS Drug List</p> <p>15 Diagnosis and treatment abroad</p>
<p>6 Emergencies</p> <ul style="list-style-type: none"> 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 	<p>16 Medical examinations for purposes of visa applications, education and institutional driving license</p> <p>17 VIP ward accommodation</p> <p>18 Mortuary Services</p>

Source: NHIA (2011)

Table A2. Determinants of Being Attrited.

Dependent Variable: Attrited (=1)	Short run (1)	Long run (2)
Panel A		
Any Intervention	0.005 (0.019)	-0.026 (0.032)
Panel B		
Subsidy only	0.003 (0.024)	-0.021 (0.037)
Education only	-0.011 (0.027)	0.086 (0.052)
Convenience only	0.036 (0.024)	-0.034 (0.049)
Education & Convenience	-0.053 (0.037)	-0.050 (0.060)
Subsidy & Convenience	-0.011 (0.026)	-0.014 (0.038)
Subsidy & Education	-0.023 (0.027)	-0.026 (0.041)
Education & Subsidy & Convenience	0.056 (0.040)	-0.080 (0.069)
Control group mean	0.045	0.211

Notes: Dependent variables are variables indicating whether an individual had been attrited in the short- and long-run follow-up surveys. *, **, and *** denote statistical significance at 10 %, 5 %, and 1 % levels, respectively. Robust standard errors clustered at community level reported in parentheses. All regressions include a full set of covariates (individual, household, and community).

Table A3: Effect of Interventions on Enrollment and Knowledge on NHIS

Dependent Variable	Short run						Long run					
	Enrollment (adult)	Enrollment (child)	Knowledge on Exemption	Knowledge on Premium	Knowledge on Benefits	Knowledge on Others	Enrollment (adult)	Enrollment (child)	Knowledge on Exemption	Knowledge on Premium	Knowledge on Benefits	Knowledge on Others
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Panel A												
Any Intervention	0.269*** (0.055)	0.252*** (0.059)	0.592*** (0.144)	0.297** (0.123)	0.144 (0.163)	-0.041 (0.116)	0.145*** (0.049)	0.215*** (0.067)	0.132 (0.144)	0.227* (0.117)	0.040 (0.128)	-0.111 (0.119)
Observations (N)	1,803	2,324	489	559	589	598	1,551	1,778	318	564	543	551
R ²	0.257	0.241	0.238	0.232	0.133	0.174	0.138	0.140	0.299	0.255	0.149	0.220
Panel B												
Any subsidy	0.381*** (0.055)	0.385*** (0.059)	0.514** (0.220)	0.382* (0.207)	-0.029 (0.210)	0.100 (0.138)	0.078 (0.067)	0.128 (0.092)	0.127 (0.233)	0.422** (0.193)	0.116 (0.105)	-0.123 (0.149)
Observations (N)	1,254	1,556	343	391	407	410	1,078	1,220	200	383	369	375
R ²	0.343	0.307	0.347	0.289	0.287	0.255	0.172	0.196	0.463	0.354	0.302	0.319
Panel C												
Any education	0.216*** (0.074)	0.009 (0.087)	0.258 (0.318)	0.001 (0.184)	0.029 (0.225)	0.001 (0.220)	0.001 (0.068)	0.032 (0.131)	0.360 (0.493)	0.138 (0.244)	0.385 (0.236)	-0.255 (0.262)
Observations (N)	1,008	1,253	271	304	326	326	845	951	118	298	288	293
R ²	0.422	0.368	0.407	0.364	0.327	0.287	0.232	0.228	0.712	0.397	0.271	0.312
Panel D												
Any convenience	-0.015 (0.055)	0.020 (0.068)	0.315* (0.165)	0.437** (0.166)	0.152 (0.181)	-0.215 (0.171)	0.087 (0.067)	0.159* (0.079)	0.106 (0.221)	0.420*** (0.152)	-0.184 (0.221)	-0.159 (0.196)

Dependent Variable	Short run						Long run					
	Enrollment (adult)	Enrollment (child)	Knowledge on Exemption	Knowledge on Premium	Knowledge on Benefits	Knowledge on Others	Enrollment (adult)	Enrollment (child)	Knowledge on Exemption	Knowledge on Premium	Knowledge on Benefits	Knowledge on Others
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Observations (N)	1,289	1,718	346	400	424	431	1,134	1,335	209	404	386	392
R ²	0.381	0.355	0.394	0.293	0.211	0.226	0.184	0.195	0.401	0.304	0.197	0.300
Control group mean	0.240	0.316	-0.366	-0.234	-0.099	-0.011	0.186	0.271	-0.218	-0.191	-0.005	0.059

Notes: *, **, and *** denote statistical significance at 10 %, 5 %, and 1 % levels, respectively. Robust standard errors clustered at community level reported in parentheses. All regressions include full covariates (individual, household and community). Columns 1 - 6 report short-run estimation results. Columns 7 - 12 report long-run estimation results. Knowledge scores are in mean values and standardized.

Table A4: Effect of Interventions on Knowledge on NHIS

Dependent Variable	Short run				Long run			
	Knowledge on NHIS ¹	Knowledge on NHIS ²	Knowledge on NHIS ³	Knowledge on NHIS ⁴	Knowledge on NHIS ¹	Knowledge on NHIS ²	Knowledge on NHIS ³	Knowledge on NHIS ⁴
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A								
Any Intervention	0.592*** (0.144)	0.297** (0.123)	0.144 (0.163)	-0.041 (0.116)	0.006 (0.134)	-0.113 (0.241)	-0.036 (0.212)	-0.103 (0.191)
Observations (N)	489	559	589	598	564	564	564	564
R ²	0.238	0.232	0.133	0.174	0.216	0.154	0.171	0.182
Panel B								
Any subsidy	0.514** (0.220)	0.382* (0.207)	-0.029 (0.210)	0.100 (0.138)	0.084 (0.174)	-0.349 (0.292)	-0.183 (0.277)	-0.229 (0.238)
Observations (N)	343	391	407	410	383	383	383	383
R ²	0.347	0.289	0.287	0.255	0.272	0.225	0.229	0.220
Panel C								
Any education	0.258 (0.318)	0.001 (0.184)	0.029 (0.225)	0.001 (0.220)	0.031 (0.294)	0.409 (0.326)	0.383 (0.314)	0.187 (0.327)
Observations (N)	271	304	326	326	298	298	298	298
R ²	0.407	0.364	0.327	0.287	0.355	0.333	0.357	0.328
Panel D								
Any convenience	0.315* (0.165)	0.437** (0.166)	0.152 (0.181)	-0.215 (0.171)	-0.0004 (0.194)	-0.238 (0.331)	-0.095 (0.287)	-0.194 (0.264)

Dependent Variable	Short run				Long run			
	Knowledge on NHIS ¹	Knowledge on NHIS ²	Knowledge on NHIS ³	Knowledge on NHIS ⁴	Knowledge on NHIS ¹	Knowledge on NHIS ²	Knowledge on NHIS ³	Knowledge on NHIS ⁴
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Observations (N)	346	400	424	431	404	404	404	404
R ²	0.394	0.293	0.211	0.226	0.293	0.279	0.285	0.292
Control group mean	-0.366	-0.234	-0.099	-0.011	-0.018	0.077	0.017	0.061

Notes: *, **, and *** denote statistical significance at 10 %, 5 %, and 1 % levels, respectively. Robust standard errors clustered at community level reported in parentheses. All regressions include full covariates (individual, household and community). Columns 1 - 4 report short-run estimation results. Columns 5 - 8 report long-run estimation results. Knowledge scores are in mean values and standardized.

Table A5: Effect of Subsidy Levels on Enrollment in NHIS

Dep. variable: Being enrolled	Short run			Long run		
	All	Adults	Children	All	Adults	Children
	(1)	(2)	(3)	(4)	(5)	(6)
Subsidy level: 1/3	0.331*** (0.079)	0.328*** (0.070)	0.322*** (0.092)	0.139 (0.095)	0.136 (0.083)	0.121 (0.116)
... 2/3	0.458*** (0.059)	0.494*** (0.062)	0.449*** (0.065)	0.098 (0.082)	0.115 (0.082)	0.122 (0.095)
... Full	0.478*** (0.054)	0.536*** (0.060)	0.469*** (0.063)	0.127 (0.107)	0.061 (0.106)	0.214* (0.114)
Education	0.045 (0.056)	0.084 (0.060)	0.016 (0.057)	0.085 (0.089)	0.075 (0.084)	0.083 (0.107)
Convenience	-0.106** (0.051)	-0.160*** (0.055)	-0.107* (0.057)	0.116 (0.079)	0.103 (0.082)	0.126 (0.086)
Control group mean	0.271	0.240	0.316	0.232	0.186	0.271
Observations (N)	2,785	1,157	1,449	2,257	948	1,173
R ²	0.342	0.384	0.341	0.159	0.168	0.190

Notes: *, **, and *** denote statistical significance at 10 %, 5 %, and 1 % levels, respectively. Robust standard errors clustered at community level reported in parentheses. All regressions include full covariates (individual, household and community). Columns 2 and 5 restrict sample to adults aged 18 to 69, while Columns 3 and 6 restrict sample to household members under 18.

Table A6: Effect of Insurance Coverage and Intervention on Health Outcomes for 12 Years Old or Older

Dep Variable	Short run			Long run		
	# Days ill last month	Could not perform normal daily activities due to illness last month	# days could not perform normal daily activities in the last month	# Days ill last month	Could not perform normal daily activities due to illness	# days could not perform normal daily activities in last month
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: 2SLS results						
Enrolled in NHIS	-1.056*** (0.232)	-0.010 (0.048)	-1.528* (0.878)	0.591 (0.531)	0.053 (0.051)	0.434 (0.351)
Control group mean	0.664	0.092	1.442	0.360	0.030	0.155
First-stage F-statistics	22.89	22.99	22.96	23.67	23.67	23.67
Observations (N)	2,764	2,775	2,779	2,421	2,421	2,421
Panel B						
Any Intervention	-0.156 (0.106)	0.003 (0.016)	-0.157 (0.213)	0.169** (0.084)	0.032*** (0.009)	0.179*** (0.053)
Observations (N)	2,764	2,775	2,779	2,421	2,421	2,421
R ²	0.062	0.084	0.079	0.057	0.060	0.051
Panel C						
Any subsidy	-0.338** (0.129)	-0.013 (0.018)	0.024 (0.364)	0.237* (0.126)	0.033* (0.018)	0.129 (0.102)
Observations (N)	1,908	1,922	1,926	1,714	1,714	1,714
R ²	0.100	0.103	0.100	0.097	0.080	0.078

Dep Variable	Short run			Long run		
	# Days ill last month	Could not perform normal daily activities due to illness last month	# days could not perform normal daily activities in the last month	# Days ill last month	Could not perform normal daily activities due to illness	# days could not perform normal daily activities in last month
	(1)	(2)	(3)	(4)	(5)	(6)
Panel D						
Any education	-0.031 (0.135)	-0.024 (0.026)	-0.185 (0.374)	0.147 (0.169)	-0.008 (0.021)	-0.004 (0.153)
Observations (N)	1,522	1,527	1,531	1,346	1,346	1,346
R ²	0.122	0.135	0.117	0.085	0.083	0.078
Panel E						
Any convenience	0.244* (0.124)	0.014 (0.028)	0.411 (0.523)	0.094 (0.107)	0.025** (0.012)	0.202** (0.082)
Observations (N)	1,984	1,984	1,988	1,809	1,809	1,809
R ²	0.081	0.102	0.102	0.072	0.077	0.071
Control group mean	0.730	0.089	1.376	0.327	0.016	0.080
Observations (N)	2,764	2,775	2,779	2,421	2,421	2,421
R ²	0.067	0.089	0.085	0.058	0.066	0.055

Note: Sample is restricted to household members aged 12 years old or older. *, **, and *** denote statistical significance at 10 %, 5 %, and 1 % level respectively. All regressions include a full set of covariates (individual, household, and community). Columns 1 - 3 report short-run estimation results. Columns 4 - 6 report long-run estimation results.

Appendix B

Table B1. Effects of Intervention on Enrollment and Knowledge on NHIS

Dep Variable	Enrollment			Knowledge on NHIS	
	Short-run	Long-run	Both short and Long run ^a	Short-run	Long-run
	(1)	(2)	(3)	(4)	(5)
Subsidy only	0.361*** (0.049)	0.145* (0.078)	0.189** (0.072)	0.557* (0.290)	-0.434* (0.245)
Education only	0.100 (0.062)	0.067 (0.081)	0.061 (0.049)	0.039 (0.258)	0.459 (0.304)
Convenience only	0.001 (0.063)	0.195** (0.074)	0.146*** (0.054)	0.446* (0.250)	-0.730** (0.335)
Educ & conven	0.185 (0.147)	0.164 (0.152)	0.168 (0.114)	0.893*** (0.234)	0.295 (0.478)
Subsidy & conven	0.318*** (0.078)	0.145** (0.058)	0.163** (0.071)	0.280 (0.209)	0.133 (0.421)
Subsidy & education	0.522*** (0.076)	0.092 (0.096)	0.159* (0.081)	0.853*** (0.146)	0.047 (0.562)
Subsidy & educ & conven	0.428*** (0.063)	0.395*** (0.079)	0.418*** (0.066)	0.869*** (0.234)	0.035 (0.372)
Mean	0.505	0.385	0.268	0.003	-0.016
Control group mean	0.272	0.232	0.105	-0.391	0.136
Observations (N)	4,380	3,496	3,496	598	564
R ²	0.313	0.148	0.197	0.222	0.239

Notes: ^a Takes value 1 if enrolled in the short run and the long run, 0 if either enrolled in the short run only or enrolled in the long run only or not enrolled in both short and long run. All regressions include full covariates, which include individual, household, and community covariates. Individual covariates are: age indicators, 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. Knowledge on NHIS consists of standardized average scores of correct answers on all questions related to knowledge on NHIS premium, benefits, exemptions, and others. *, **, and *** denote statistical significance at 10 %, 5 %, and 1 % levels, respectively. Robust standard errors clustered at community level are reported in parentheses.

Table B2: Effect of Interventions on Utilization of Healthcare Services

Dep. Variable	Short run					Long run				
	Visited health facility in last four weeks	Visited health facility in last six months	# of visits in last six months	Visited Facility for malaria treatment in the last four weeks	Made an out-of-pocket for health service in the last six months	Visited health facility in the last four weeks	Visited health facility in the last six months	# of visits in last six months	Visited Facility for malaria treatment in the last four weeks	Made an out-of-pocket for health service in the last six months
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Subsidy only	-0.010 (0.010)	0.008 (0.019)	-0.006 (0.055)	0.002 (0.007)	-0.010 (0.013)	0.024** (0.011)	0.078** (0.030)	0.094*** (0.032)	0.020* (0.011)	-0.007 (0.009)
Education only	0.000 (0.021)	0.010 (0.028)	0.060 (0.070)	0.011 (0.009)	-0.016 (0.016)	-0.005 (0.009)	0.014 (0.020)	0.012 (0.025)	-0.012 (0.008)	0.016 (0.012)
Convenience only	-0.013 (0.014)	-0.016 (0.033)	-0.000 (0.080)	0.002 (0.009)	-0.030 (0.022)	0.050*** (0.016)	0.090*** (0.032)	0.133*** (0.041)	0.043*** (0.013)	0.016 (0.014)
Educ & conven	0.006 (0.020)	0.027 (0.045)	0.037 (0.090)	0.012 (0.019)	-0.030** (0.013)	0.018 (0.026)	-0.001 (0.040)	-0.019 (0.044)	-0.009 (0.014)	-0.008 (0.017)
Subsidy & conven	0.048** (0.023)	0.006 (0.023)	0.056 (0.071)	0.011 (0.009)	0.017 (0.018)	0.044** (0.020)	0.045 (0.049)	0.067 (0.057)	0.029 (0.019)	-0.002 (0.009)
Subsidy & education	-0.014 (0.013)	0.107*** (0.030)	0.238** (0.114)	-0.000 (0.010)	0.001 (0.016)	0.026 (0.025)	0.063 (0.074)	0.050 (0.076)	0.024 (0.024)	0.001 (0.015)
Subsidy & educ & conven	0.018 (0.014)	0.108*** (0.031)	0.263*** (0.068)	0.036*** (0.011)	0.019 (0.021)	0.055** (0.025)	0.109** (0.042)	0.143** (0.057)	0.044* (0.025)	0.017 (0.034)

Dep. Variable	Short run					Long run				
	Visited health facility in last four weeks	Visited health facility in last six months	# of visits in last six months	Visited Facility for malaria treatment in the last four weeks	Made an out-of-pocket for health service in the last six months	Visited health facility in the last four weeks	Visited health facility in the last six months	# of visits in last six months	Visited Facility for malaria treatment in the last four weeks	Made an out-of-pocket for health service in the last six months
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Control group mean	0.038	0.102	0.201	0.019	0.046	0.017	0.050	0.050	0.010	0.013
Observations (N)	4,036	4,268	4,238	4,225	4,379	3,496	3,496	3,496	3,496	3,496
R ²	0.093	0.103	0.088	0.041	0.053	0.058	0.067	0.070	0.041	0.058

Notes: *, **, and *** denote statistical significance at 10 %, 5 %, and 1 % levels, respectively. Robust standard errors clustered at community level are reported in parentheses. All regressions include full covariates (individual, household, and community). Columns 1 - 5 report short-run estimation results. Columns 6 - 10 report long-run estimation results.

Table B3: Effect of Insurance Coverage and Intervention on Health Status

Dep Variable	Short run				Long run			
	Healthy or very healthy	# Days ill last month	Could not perform normal daily activities due to illness last month	# days could not perform normal daily activities in the last month	Healthy or very healthy	# Days ill last month	Could not perform normal daily activities due to illness	# days could not perform normal daily activities in last month
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Subsidy only	0.131*** (0.032)	-0.161 (0.145)	0.001 (0.016)	0.135 (0.363)	-0.097 (0.063)	0.063 (0.118)	0.034** (0.015)	0.134 (0.099)
Education only	0.111*** (0.040)	-0.045 (0.178)	-0.044** (0.022)	-0.651 (0.443)	0.020 (0.056)	0.202 (0.144)	0.028** (0.011)	0.186 (0.116)
Convenience only	0.027 (0.060)	0.219 (0.152)	0.005 (0.029)	0.374 (0.636)	-0.165** (0.070)	0.260 (0.168)	0.055*** (0.014)	0.332*** (0.096)
Educ & conven	0.008 (0.079)	0.048 (0.206)	0.060*** (0.021)	-0.224 (0.321)	-0.016 (0.069)	0.060 (0.161)	-0.012 (0.016)	-0.067 (0.142)
Subsidy & conven	0.019 (0.064)	-0.283* (0.162)	0.017 (0.028)	-0.570 (0.363)	-0.016 (0.086)	0.217 (0.149)	0.032*** (0.011)	0.116 (0.077)
Subsidy & education	0.122*** (0.045)	-0.368*** (0.121)	-0.017 (0.023)	-0.880*** (0.312)	-0.108 (0.103)	0.085 (0.247)	-0.014 (0.014)	-0.157 (0.100)
Subsidy & educ & conven	-0.004 (0.063)	-0.253* (0.128)	0.029 (0.020)	-0.591** (0.274)	0.059 (0.108)	0.315 (0.324)	0.064 (0.043)	0.424 (0.305)

Dep Variable	Short run				Long run			
	Healthy or very healthy	# Days ill last month	Could not perform normal daily activities due to illness last month	# days could not perform normal daily activities in the last month	Healthy or very healthy	# Days ill last month	Could not perform normal daily activities due to illness	# days could not perform normal daily activities in last month
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Control group mean	0.818	0.617	0.082	1.380	0.791	0.413	0.013	0.096
Observations (N)	1,323	4,355	4,363	4,366	1,020	3,496	3,496	3,496
R ²	0.138	0.047	0.061	0.058	0.255	0.058	0.056	0.042

Note: *, **, and *** denote statistical significance at 10 %, 5 %, and 1 % level respectively. All regressions include a full set of covariates (individual, household, and community). Questions on self-reported health are restricted to household members aged 18 years old or older. Columns 1 - 4 report short-run estimation results. Columns 5 - 8 report long-run estimation results.

Table B4: Effect of Interventions on Enrollment and Knowledge on NHIS

Dependent Variable	Short run				Long run			
	Knowledge on NHIS ¹	Knowledge on NHIS ²	Knowledge on NHIS ³	Knowledge on NHIS ⁴	Knowledge on NHIS ¹	Knowledge on NHIS ²	Knowledge on NHIS ³	Knowledge on NHIS ⁴
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Subsidy only	0.287 (0.260)	0.586** (0.261)	0.462** (0.231)	0.486* (0.247)	0.229 (0.169)	-0.350 (0.278)	-0.159 (0.260)	-0.150 (0.222)
Education only	0.209 (0.141)	0.157 (0.315)	0.172 (0.282)	0.068 (0.245)	0.068 (0.367)	0.586** (0.270)	0.536* (0.268)	0.291 (0.335)
Convenience only	0.149 (0.234)	0.526** (0.223)	0.472** (0.209)	0.442* (0.226)	-0.170 (0.216)	-0.606* (0.356)	-0.462 (0.307)	-0.495* (0.285)
Educ & conven	0.473*** (0.164)	0.966*** (0.213)	0.980*** (0.184)	0.896*** (0.192)	0.188 (0.269)	0.365 (0.489)	0.382 (0.468)	0.281 (0.399)
Subsidy & conven	0.267 (0.171)	0.246 (0.195)	0.169 (0.206)	0.233 (0.211)	-0.068 (0.280)	0.278 (0.404)	0.286 (0.384)	0.081 (0.380)
Subsidy & education	0.546** (0.205)	0.909*** (0.135)	0.830*** (0.130)	0.778*** (0.136)	-0.149 (0.445)	0.080 (0.504)	0.072 (0.475)	-0.025 (0.530)
Subsidy & educ & conven	0.353* (0.209)	0.888*** (0.238)	0.762*** (0.209)	0.736*** (0.208)	-0.058 (0.215)	0.022 (0.369)	-0.014 (0.318)	-0.002 (0.303)
Control group mean	-0.180	-0.344	-0.293	-0.296	-0.018	0.077	0.017	0.061
Observations (N)	598	596	596	598	564	564	564	564
R ²	0.161	0.239	0.241	0.230	0.228	0.224	0.214	0.212

Notes: *, **, and *** denote statistical significance at 10 %, 5 %, and 1 % levels, respectively. Robust standard errors clustered at community level reported in parentheses. All regressions include full covariates (individual, household and community). Columns 1 - 4 report short-run estimation results. Columns 5 - 8 report long-run estimation results. Knowledge scores are in mean values and standardized.

Table B5: Effect of Insurance Coverage and Intervention on Health Behavior

Dep. Variable	Short run	Long run				
	Sleep under mosquito nets	Have mosquito nets	# mosquito nets	Sleep under mosquito nets	Sleep under own mosquito nets	Water safe to drink
	(1)	(2)	(3)	(4)	(5)	(6)
Subsidy only	0.070 (0.120)	-0.103 (0.094)	-1.127** (0.458)	-0.016 (0.098)	-0.076 (0.087)	-0.077 (0.049)
Education only	0.426*** (0.097)	-0.226*** (0.084)	-1.252** (0.557)	0.157** (0.073)	-0.185** (0.074)	0.097 (0.107)
Convenience only	-0.068 (0.143)	0.215 (0.167)	1.294 (0.834)	0.162 (0.103)	0.274* (0.158)	-0.067* (0.039)
Educ & conven	0.042 (0.135)	0.227 (0.207)	1.178 (0.856)	-0.160 (0.135)	0.255 (0.192)	-0.066 (0.136)
Subsidy & conven	0.213* (0.117)	0.100 (0.137)	0.696 (0.847)	0.123 (0.079)	0.176 (0.128)	-0.045 (0.069)
Subsidy & education	0.070 (0.090)	-0.171* (0.097)	-0.795 (0.485)	-0.098 (0.114)	-0.155* (0.087)	-0.064 (0.065)
Subsidy & educ & conven	0.027 (0.111)	-0.110 (0.184)	-1.270 (0.893)	-0.153* (0.080)	-0.101 (0.167)	-0.124*** (0.034)
Control group mean	0.449	0.455	2.590	0.474	0.435	0.273
Observations (N)	2,225	1,640	1,189	1,740	1,294	802
R ²	0.254	0.254	0.304	0.157	0.242	0.170

Note: Sample is restricted to household members aged 12 years old or older. Column 4 assumes an individual may sleep under a borrowed mosquito net. Column 5 assumes an individual sleeps under his own net. *, **, and *** denote statistical significance at 10 %, 5 %, and 1 % level respectively. All regressions include a full set of covariates (individual, household, and community) and baseline health behaviors.

Table B6: Effect of Interventions on Enrollment and Knowledge on NHIS

Dependent Variable	Short run						Long run					
	Enrollme nt (adult)	Enrollme nt (child)	Knowled ge on Exemptio n	Knowled ge on Premium	Knowled ge on Benefits	Knowled ge on Others	Enrollme nt (adult)	Enrollme nt (child)	Knowled ge on Exemptio n	Knowled ge on Premium	Knowled ge on Benefits	Knowled ge on Others
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Sub. only	0.339*** (0.059)	0.387*** (0.054)	0.572** (0.224)	0.363* (0.209)	0.018 (0.252)	0.071 (0.154)	0.113 (0.069)	0.147 (0.093)	0.279 (0.228)	0.510*** (0.190)	0.134 (0.141)	0.034 (0.135)
Educ. only	0.241*** (0.081)	-0.018 (0.078)	0.054 (0.286)	-0.154 (0.117)	0.221 (0.270)	-0.060 (0.239)	0.049 (0.060)	0.092 (0.129)	1.339 (0.835)	0.192 (0.218)	0.349** (0.166)	-0.361 (0.307)
Conv. only	-0.039 (0.063)	0.015 (0.076)	0.475** (0.187)	0.314* (0.170)	-0.001 (0.235)	-0.213 (0.183)	0.140* (0.072)	0.261*** (0.086)	-0.003 (0.224)	0.198 (0.163)	-0.030 (0.220)	-0.149 (0.229)
Educ & conv.	0.181 (0.147)	0.174 (0.153)	1.041** (0.398)	0.356 (0.310)	0.451** (0.205)	-0.233 (0.176)	0.185 (0.129)	0.124 (0.183)	0.165 (0.278)	0.262 (0.271)	-0.120 (0.123)	-0.004 (0.227)
Sub. & conv.	0.311*** (0.084)	0.305*** (0.083)	0.027 (0.167)	0.285 (0.212)	0.226 (0.198)	0.165 (0.137)	0.132** (0.060)	0.170** (0.069)	-0.218 (0.413)	0.229 (0.264)	-0.022 (0.179)	-0.348 (0.222)
Sub. & edu.	0.608*** (0.076)	0.453*** (0.072)	0.989*** (0.209)	0.570*** (0.210)	0.050 (0.286)	0.016 (0.147)	0.055 (0.095)	0.138 (0.109)	0.177 (0.580)	-0.013 (0.300)	0.019 (0.177)	-0.233 (0.359)
Sub. & educ. & conv.	0.453*** (0.077)	0.419*** (0.070)	1.036*** (0.299)	0.054 (0.118)	0.391* (0.204)	0.021 (0.156)	0.334*** (0.069)	0.474*** (0.102)	0.153 (0.309)	-0.123 (0.130)	0.137 (0.151)	0.064 (0.178)
Control group mean	0.240	0.316	-0.366	-0.234	-0.099	-0.011	0.186	0.271	-0.218	-0.191	-0.005	0.059
Observations (N)	1,803	2,324	489	559	589	598	1,551	1,778	318	564	543	551
R ²	0.349	0.320	0.302	0.249	0.149	0.185	0.159	0.169	0.329	0.279	0.157	0.232

Notes: *, **, and *** denote statistical significance at 10 %, 5 %, and 1 % levels, respectively. Robust standard errors clustered at community level reported in parentheses. All regressions include full covariates (individual, household and community). Columns 1 - 6 report short-run estimation results. Columns 7 - 12 report long-run estimation results. Knowledge scores are in mean values and standardized.

Table B7. Effect of Intervention on Health Outcomes for 12 Years Old or Older

Dep Variable	Short run			Long run		
	# Days ill last month	Could not perform normal daily activities due to illness last month	# days could not perform normal daily activities in the last month	# Days ill last month	Could not perform normal daily activities due to illness	# days could not perform normal daily activities in last month
	(1)	(2)	(3)	(4)	(5)	(6)
Subsidy only	-0.333** (0.142)	-0.010 (0.018)	0.011 (0.430)	0.233* (0.119)	0.037** (0.017)	0.177* (0.092)
Education only	-0.046 (0.121)	-0.043* (0.022)	-0.574 (0.415)	0.177 (0.227)	0.031* (0.018)	0.168 (0.192)
Convenience only	0.323** (0.133)	0.012 (0.035)	0.549 (0.670)	0.096 (0.133)	0.052*** (0.017)	0.307*** (0.101)
Educ & conven	-0.115 (0.224)	0.042** (0.021)	-0.133 (0.383)	0.171 (0.168)	-0.017 (0.021)	0.048 (0.159)
Subsidy & conven	-0.341** (0.165)	0.017 (0.026)	-0.435 (0.306)	0.081 (0.094)	0.022** (0.010)	0.077 (0.057)
Subsidy & education	-0.426*** (0.150)	-0.043 (0.029)	-0.949** (0.416)	0.199 (0.211)	-0.004 (0.016)	-0.037 (0.084)
Subsidy & educ & conven	-0.355** (0.151)	0.039* (0.023)	-0.563** (0.262)	0.238 (0.329)	0.066 (0.048)	0.362 (0.288)
Control group mean	0.730	0.089	1.376	0.327	0.016	0.080
Observations (N)	2,764	2,775	2,779	2,421	2,421	2,421
R ²	0.067	0.089	0.085	0.058	0.066	0.055

Note: Sample is restricted to household members aged 12 years old or older. *, **, and *** denote statistical significance at 10 %, 5 %, and 1 % level respectively. All regressions include a full set of covariates (individual, household, and community). Columns 1 - 3 report short-run estimation results. Columns 4 - 6 report long-run estimation results.