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Insuring Health or Insuring Wealth? An Experimental Evaluation of Health Insurance in Rural Cambodia

By DAVID LEVINE, RACHEL POLIMENI, IAN RAMAGE*

We randomize the insurance premium for the SKY micro-health insurance program in rural Cambodia, allowing us to estimate the causal effects of health insurance on economic, health care utilization, and health outcomes. SKY insurance has its greatest impact on economic outcomes. SKY also changed health-seeking behavior, increasing the use of covered public facilities and decreasing the use of uncovered private care for major illnesses. As expected due to low statistical power, we did not find statistically significant impacts on health. Keywords: Insurance, Health, Impact, Randomized Trial, Cambodia

In 2007 and 2008 SKY micro-health insurance expanded into several new regions in rural Cambodia. As part of their marketing, they held a lottery that distributed coupons for a deep discount to those who attended the marketing meeting. This lottery lets us study the effects of health insurance using a randomized controlled design.

It is difficult to rigorously evaluate the impact of health insurance because insured people are typically very different from the uninsured (Levy and Meltzer (2008)). There are a few high-quality randomized trials that study the effects of insurance in the United States (Lohr et al. (1986), Finkelstein et al. (2011)), and even fewer studies that use

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randomization in developing countries (Sine (1994), Thornton et al. (2010)).

In this study we examine the impact of SKY insurance on : (1) economic outcomes, such as out-of-pocket medical spending and new debt to pay for health care; (2) health care utilization, such as timely utilization of curative care and substitution to public facilities from private health centers and traditional medicine; and (3) health outcomes, such as frequency of major health shocks and stunting and wasting. Our analyses and exposition follow closely the seminal work by Finkelstein, et al. (2011).

We present the impact of being randomly offered insurance at a steep discount by comparing those offered the discount to those not offered the discount. We also estimate the impact of buying SKY insurance by using the receipt of a steep discount as an instrument for insurance purchase. Being offered the steep discount increased having joined SKY for at least part of a year by 44 percentage points.

Our main data source is a survey of over 5000 households. Our analysis relies largely on the follow-up survey which took place 13 to 20 months after the initial SKY marketing meetings.

SKY has the greatest impact on economic outcomes, which is not surprising given that insurance is specifically designed to reduce economic difficulties following illness or injury. For example, compared to the control mean of 52.2 percent, the insured (due to our randomized price discount) were 10.8 percentage points less likely to have a large economic impact such as taking on new debt due to a health shock (Table 3).

The expected impact of SKY insurance on health care utilization was less clear. By reducing the marginal price of care, utilization of covered health facilities should increase. This increase in use of covered health facilities may be an increase in total care. Alternatively, if households were already seeking the appropriate amount of care, insurance may reduce out-of-pocket payments and induce households to switch from uncovered care such as private facilities and drug sellers to the public health facilities partnered with SKY. We find that while SKY did not increase the amount of care sought, the insured increased the use of public facilities for serious health problems and decreased the use of private care and local drug sellers (Table 5).

Health insurance may improve health itself if it pays for valuable care that people would have forgone or delayed, increases preventative care, or redirects care from low-quality care to higher-quality insured care. We did not find statistically significant impacts on health (Table 3, Appendix Table A.1). At the same time, our sample sizes meant we did not expect to have statistical power to measure health impacts.

This research adds to the current literature in several ways. First, we study a developing country which has not been studied before, and present results on a poor population with little knowledge of health insurance and access to often inferior care.

In addition, we show that it is important to have a randomized trial. That is, we re-estimate our results using OLS and propensity score matching, controlling for a rich set of covariates. Unlike the experiment, these estimates imply that insurance worsens health and has no effect on financial outcomes (Table 6). Thus, it appears the insured and uninsured are different enough in unobservable ways that correcting for these differences econometrically is quite difficult.

Our results also tie into the literature on consumption smoothing and asset accumulation. For example, while households reported some self- and mutual-insurance prior to SKY, the insured were less likely to pay for care by selling assets (Appendix Table A.3), and less likely to pay for care using a loan (Table 4), possibly aiding in consumption smoothing and asset accumulation. However, without consumption data, we cannot say whether SKY increases consumption smoothing or merely crowds out other means of insurance.

Finally, this study also fits into the emerging literature on demand for health and health care services. Our results are consistent with some price elasticity of demand for insurance and health care provider: in the first six months after the insurance offer, purchase of insurance increases from 6.7 percent to 48.7 percent with the 80 percent discount in price (an elasticity of -7.8, Appendix Table A.6)[1]. Households also switch providers when faced with reduced marginal price of public care. For example, insured households

[1] For elasticity calculations we use take-up in the first 6 months after the initial SKY offer because we are more certain of the price paid for insurance during this period of time. At other points in the paper we refer to the difference in ever having purchased SKY at the time of the second round survey, which takes place 13 to 20 months after the initial SKY offer.

are 15.8 percentage points more likely to visit a public health center for first treatment than the control mean of 14.1 percent (Table 5). At the same time, the insured and uninsured had equal number of treatments following a major health incident, implying that there was no increase in demand for health care overall. (Table 5).

Results of our study can be useful as Cambodia looks to expand health insurance to other parts of the country. It may also be relevant to other countries that have recently implemented health insurance programs (e.g., Thailand and Vietnam). At the same time, differences in insurance packages and copayment plans caution against overgeneralizing.

I. The Setting

Our randomized experiment was carried out as the SKY micro-health insurance program expanded to 245 villages from November 2007 to December 2008. The expansion took place in Takeo, Kandal, and Kampot provinces, all rural areas of Cambodia. Sokapheap Krousat Yeugn (SKY) micro-health insurance — the Khmer name means "Insurance for our Families" — was originally developed by Groupe de Recherche et d'Échanges Technologiques (GRET), a French NGO, as a response to high default rates among its micro-finance borrowers due to illness. Since 1998 GRET has been experimenting with micro-insurance schemes by examining responses to different premiums and benefits. Historically, take-up of insurance has ranged from 2% in regions where insurance has been only recently introduced to 12% in the longest-served regions. SKY is the only health insurance available to households in these areas.

Cambodia is among the world's poorest nations, with high infant mortality and low life expectancy (Central Intelligence Agency (2010)). Major health shocks often contribute substantially to indebtedness and loss of land (Van Damme et al. (2004), Annear (2006), Kenjiro (2005)).

Rural Cambodians rely on a mix of health care providers: public providers, private medical providers, private drug sellers (typically without formal training), and traditional healers. Public facilities consist of local health centers for everyday illnesses, operational

district referral hospitals for illnesses requiring more involved treatment, and provincial hospitals for care of more severe health shocks. Public facilities are subsidized by the Cambodian government and often other organizations. Private providers of varying capabilities are typically more popular than public ones, even when more expensive, because they often are more attentive to clients' needs, more available, visit patients in their homes, provide treatments patients prefer, and provide credit (Collins (2000); Annear (2006)). At the same time, while households often utilize local private doctors and drug sellers for small health shocks, most visit public hospitals for surgery and other major health problems. In 2005 the average rural household spent 9.48 USD per month on health care, of which 2.50 USD was spent on public health center and hospital visits (DHS (2005))[2]. Using GDP per capita in 2005 of 471 USD (GDP had reached 897 USD by 2011, World Bank (2013)), households typically spent around 5.5 percent of income on health expenditures. SKY covers treatment only at public facilities, to discourage use of unqualified private doctors[3].

At the time of the study, SKY sold insurance at prices ranging from 0.50 USD per month for a single-person household to around 2.75 USD per month for a household with eight or more members. Households initially sign up for a six month cycle, paying for the first month's coverage plus two reserve months up front. A household that fails to pay the insurance premium for one month can remain insured, as the payment comes from the first month of reserve. However, if that household fails to pay back the reserve in the next month, insurance is cancelled and the second reserve month is forfeited. A household can join SKY at any time, but coverage will not begin until the start of the next calendar month. Households buying insurance for the first time are offered slightly lower premiums (in the form of a one-month coupon) to encourage take-up. With their insurance, household members are entitled to free services and prescribed drugs at local public health centers and at public hospitals with a referral (SKY (2009)).

[2]Calculations are based on average spending by rural individuals in the 31 days prior to the DHS 2005 survey, multiplied by 4.9 to account for an average of 4.9 persons per household in rural areas. Spending by households overall (urban and rural) was similar, at 10.71 USD and 2.42 USD total and public spending, respectively. Due to the skewness in health expenditures, the mean is not an ideal measure of risk.

[3]As noted by a referee, public facilities have inconsistent quality as well. SKY typically partnered with public facilites that are relatively high quality, as judged by ratings in SKY-administered surveys of facilities.

While the SKY program targets the poor, it also tried to become financially sustainable. Thus, the policy includes several terms that limit adverse selection. For example, SKY does not pay for the delivery of babies within the first few months of joining. Also, insurance is purchased at the household-level, eliminating the possibility that households would purchase insurance for only very ill or frail members. Finally, SKY insurance does not cover long-term care of chronic diseases. (Government programs pay for the very expensive drugs for HIV/AIDS and tuberculosis.)

A. Randomization of Prices

When the SKY program first rolls out into a region, SKY holds a village meeting to describe the insurance product to prospective customers. The meetings are advertised ahead of time via loudspeaker announcements in each village. All households are offered a coupon for a 1 month discount off of the first 6 months of insurance coverage. We worked off of this existing marketing technique to create an exogenous increase in the purchase of insurance. To randomize the price of insurance, we implemented a lottery whose winners received a deeply discounted price: 5 months of free insurance in the first 6-month cycle, with the option to renew for a second 6-month cycle with a coupon for 3 months fee. Everyone else (the control group) was still entitled to the 1-month coupon[4].An enumerator recorded the name of one representative of each household in attendance.

SKY's field coordinator then described the product. The enumerator set the number of high-value coupons to be raffled off equal to 20 percent of attendance (capped at 12 high-value coupons per meeting). The remaining households drew a coupon for one month free in the first 6-month cycle[5] These high- and low-value coupons were placed in an opaque bag. At the end of the meeting, the field coordinator announced that the lottery and explained the coupons, pointing out that a coupon could only be used by the

[4] We pilot tested discounts of 3 months and 5 months off of the first 6 month cycle, but found that insurance take-up did not increase by enough to provide sufficient statistical power. After observing higher-than-expected drop-out after the first 6 months in our initial trial, we expanded the offer to include 3 months off of the second cycle.

[5] Households receiving the coupon for one month free are our control group, as this coupon is part of the usual marketing effort of the SKY program.

family who had won it. The names from the attendance list were called off one by one, and one representative from each family came to the front of the room to draw a coupon. The enumerator ensured that the person drawing could not see inside the bag. Following the meeting, our staff and the village chief drew village maps with the location of the families chosen for our sample. SKY Insurance Agents then visited these households to offer health insurance. We encouraged members who received the steeply discounted offer to renew by offering additional discounts after the initial 12 months had passed.

II. Data and Methodology

We included all households winning a steep discount in our survey sample. Research field staff also chose every fourth low-coupon household from the roster until they matched the number of winners of the steep discount.

A. Data

Our analyses use a longitudinal household survey and SKY data on membership.

HOUSEHOLD SURVEY. — Our main data source is a survey of over 5000 households. We use some data from the first-round survey administered one to eight months after the village meetings, but we rely largely on the follow-up survey which took place a year later, that is, 13 to 20 months after the initial SKY marketing meetings. The surveys cover demographics, wealth, objective health measures, health care utilization and spending, assets and asset sales, savings, debt, trust of health care institutions, and so forth. The complete survey can be found in the online appendix. We asked households to describe health care utilization following a major or costly health shock, which we define as a health incident causing a death, the inability to carry out usual household activities for seven or more days, or an incident causing an expense of over 100 USD[6]. In most analyses we do not include behavior following a 100 USD health expense because households

[6]We focused on health shocks with the highest potential costs of care because they are the most relevant for studies of insurance. We did not ask about about minor health shocks due to time constraints.

with SKY insurance would be less likely to fall into this category. In each village we interviewed all households that drew the steeply discounted price and an equal number of households that were offered the regular price. In total, our randomized sample consists of 2617 households offered the steep discount and 2618 households offered the regular price, of which we interviewed 2561 and 2548 households, respectively, in the first round survey, and 2502 and 2506 households, respectively, in the follow-up survey[7]. Figure 1 summarizes the timeline and sample size of the evaluation[8]. Because there was a delay between the first offer of insurance and the first-round survey, first-round survey results are not necessarily pre-insurance results. As a robustness check, we include "baseline" levels of some impact variables as controls. If insurance has already had an impact on households a few months after joining SKY, then the delay in the first-round survey will bias the estimated effects of insurance downwards.

SKY MEMBERSHIP. — For each household that becomes a SKY member, SKY records the date that coverage begins, and, if applicable, the date the household drops out.

B. Statistical power

We chose our sample size to have 80 percent power to detect a feasible and economically important reduction in several important outcome measures. For example, we expected to have 80% power to detect a 2.6 percentage point reduction in the percentage of households spending over 1.25 USD on health care in the previous four weeks (compared to the 10.1 percent mean in the 2005 DHS), or a 2.0 percentage point increase in the number of households using a public facility in the past four weeks (compared to the 5.1 percent utilizing public facilities in 2005 DHS data). Although we collected data (and report) on prenatal care, birth outcomes, anthropometric measures for children, and frequency of major illness or death, the evaluation was not designed to have statistical

[7] Thus, for the first round survey we interviewed 97.8 and 97.3 percent of our desired sample of households offered the large discount and those offered the regular price. Attrition between the first and second survey was also extremely low: 2.3 percent for those offered the large discount and 1.6 percent for controls.

[8] This figure includes only households randomized into the sample and not oversampled households that were interviewed for a separate study.

power to detect impacts on these measures[9].

III. Empirical Framework

INTENTION TO TREAT. — The randomization of prices allows us to answer the question, "What is the effect of offering insurance at a deeply discounted price?" This result can be calculated by comparing average outcomes for households that received the large discount (including those that chose not to buy even at the discounted rate) to households that did not receive this large discount. Mathematically:

$$Y = \beta \cdot T_i + \varepsilon_i \tag{1}$$

where i is a household and $T_i = 1$ for those offered the steeply discounted price.

LOCAL AVERAGE TREATMENT EFFECT OF SKY(LATE). — We can also estimate the effect of SKY insurance on households that purchased insurance due to the discount (the effect of the treatment on the treated population). Because purchase of SKY is endogenous, we instrument for SKY membership with the randomized treatment, with $T_i = 1$ for those offered the steeply discounted price. Our first stage is:

$$SKY_{it} = \gamma_0 + \gamma_1 \cdot T_i + u_{it} \tag{2}$$

Our survey collects data on major health shocks using respondent recall over the 12 month period immediately prior to the survey date. Thus, for outcomes that are a direct result of an individual health incident in month t, t is defined as the month of the incident,

[9] For example, using our sample, we calculated that we could detect a 3.5 percentage point decrease in the percentage of households reporting any illness in the last 4 weeks (compared to the baseline mean of 20.2 percent in DHS 2005 data. Using our actual survey measure of percent of individuals with an illness lasting more than 7 days, we have 80 percent power to detect a 2.6 percentage point decrease compared to the control of 10.2 percent reporting such an illness. Even with increases in utilization of public facilities, which may provide better care than unregulated treatment, we did not expect to see this level of change in the percentage reporting ill. For prenatal care, birth outcomes, and anthropometric measures, we have data on only a small portion of our sample, further reducing statistical power.

and the instrument is equal to 1 if household i received a steep discount and 0 if the household did not. SKY status in month t, SKY_{it}, is defined as a three-month average membership rate centered in month t, to account for imperfect recall of the timing of health incidents. Thus, SKY_{it} can take on the values 0, $\frac{1}{3}$, $\frac{2}{3}$ or 1. For example, for a health incident occurring t months after the village meeting, SKY_{it} equals 1 if household i was insured in months $t-1$, t, and $t+1$, but equals $\frac{1}{3}$ if the household was insured in only in month $t-1$.

We use a similar approach for birth outcomes, except that t is defined as the month of the birth. For outcomes measured by behavior in the three months prior to the interview, such as having visited a public facility (for any reason, whether or not related to an illness), we define SKY_{it} as average membership in the four months prior to the survey (again, to account for imperfect recall).

For outcomes that take time to accumulate such as health-related loans, SKY_{it} is defined as the share of the year prior to the interview that the household was a SKY member. The precise dating of membership never affected results.

As in Finkelstein et al. (2011), the ITT and instrumental variables estimates are based on linear models, even though many of our outcomes are binary. The linear probability models provide unbiased estimates of differences in means of treatments and controls in the absence of covariates (Angrist and Pischke (2009)). As randomization was performed at the village level, standard errors are clustered at the village level.

Our instrumental variables methodology requires that SKY membership be strongly correlated with our instrument, the steeply discounted price. Figure 2 shows that this is in fact the case. For treatments, membership peaked at around 47 percent at month six, then steadily declined. For controls, membership did not change much over time, averaging around 3.0 percent after month six.

Table 2 shows the first stage estimates of equation 2 for household-level data. Column 2 shows that by the time of the second round survey, 44.2 percentage points more treated households had purchased insurance for at least one month than the control (52.7 percent versus 8.5 percent, respectively). First stages for the other specifications are in the Web

Appendix. All are similar to Table 2 and show similarly large effects of the treatment on SKY membership and similarly strong statistical significance.

Using our randomized price as an instrument identifies the effect of insurance on those households who purchase insurance due to the deeply discounted price. For simplicity, we will often refer simply to the effect of SKY on the "insured" and contrast it with the control group (those without a high-value coupon), even though a small portion of the control group also purchased SKY. The causal effect on households that purchase insurance due to the deeply discounted price is the local average treatment effect ("LATE"; Imbens and Angrist (1994)). Below we discuss how well our estimates may generalize to other groups of rural Cambodians.

A. Validity of the Experimental Design

Table 1 shows average characteristics of the treatment and control groups prior to the SKY meeting (for health shocks) or at the time of the first round survey. Of the thirty variables tested, only three show a statistically significant difference between the two groups at the 5 percent confidence level. 14 percent of control households have wealth level subjectively graded by enumerators as "poor", while only 10 percent of treatment households are rated as "poor". Similarly, control households are slightly more likely to live in a house made of palm, another measure of lower wealth. Other wealth indicators did not show significant differences. Households offered the steep discount are also slightly less likely to be Khmer (as opposed to a minority ethnicity): 94.6 percent versus 95.3 percent, respectively. Both groups are identically likely to report the death of a member or a member missing seven or more days of work due to illness (7 percent).

Due to logistical constraints, our first round survey was implemented with a delay, sometimes as much as eight months after the intervention (the Village Meeting). When we examine only households interviewed within three months of the Village Meeting (871 and 868 households in the control and treatment groups, respectively), patterns are the same, although significance of the differences vary. In the case of early interviews, households offered the steep discount are significantly more likely to report a member ill

in the household (73 versus 69 percent, $P < 0.05$), and own more hectares of farm land (0.91 versus 0.80 hectares, $P < 0.01$). If households winning steep discounts are in fact in poorer health, this should bias results downwards when we examine average health expenditures and health outcomes. We keep in mind these differences when interpreting results and, for some variables, we test whether holding first round survey values constant affects our results.

ANALYZING MAJOR HEALTH SHOCKS. — We analyze a number of outcomes that measure behaviors following a major health shock. If insurance affects the probability of a major health shock, then for these measures we are no longer identifying the effect of insurance solely using the randomized price.

For example, suppose a member of a household with SKY insurance gets sick, seeks care, and therefore misses seven days of work. At the same time suppose that an uninsured person with the same illness doesn't seek care and continues working. By our measure, the insured household will be counted as having a "serious" illness while the uninsured household would not. Behavior by the insured individual will be included in our measure, while that for the uninsured individual will not, causing bias in our results.

One factor that helps to reduce this potential bias is that SKY does not greatly increase the incentive to spend a week at the hospital. Even with SKY insurance, hospital stays require family members be present to handle some of the patient's care, including feeding. In addition, by the sixth day hospitals no longer charge an out-of-pocket copayment. SKY members may also be less likely to have a death than non-SKY members because they may get better health care, but it is unlikely SKY would affect death rates by much over such a short time.

Consistent with our assumptions, the rates of major health shocks are almost identical in the high and low-coupon samples (Appendix Table A.1). There are almost identical numbers of deaths for the treatment group (those offered the steeply discounted price) and the control group; both groups had average death rates of 0.007 and there was no statistically significant difference between them. The percentage of individuals who suf-

fered health shocks requiring missed activity for seven or more days was 10.2 percent for both the treatment and control groups[10].

B. Summary statistics

Control means and treatment differences (intention to treat results) are presented in each outcome table. Table 1 shows additional characteristics of households at the time of the first round survey. Households in our sample are more or less typical of rural Cambodian houses in general. On average, households have 5.0 members with an average age of 27.6 years (not shown). Seventy-four percent of households have no toilet.[11] Seventy percent of household respondents reported at least one member in poor health and 16 percent have a child under age 5 that is either stunted or wasted (averaging zeros for households with no members under age 5). Of members under the age of 5 (not shown), 33 percent are stunted (more than two standard deviations below the reference population in height-for-age) and 11 percent are wasted (more than two standard deviations below the reference in weight-for-height).[12]

The rate of major shocks are almost equivalent between the control and treatment groups: Prior to SKY, in the month (31 days) prior to the Village Meeting (when we have recall data for all households, and recall was probably the best), 2.8 percent of treated households reported a major health shock (seven missed days of normal activities, a death, or a 100USD expense), and 2.9 percent of control households reported such a shock. Cost of care for the median incident in any month prior to the Village Meeting was 34 USD, with an average cost of 113 USD (not shown). Figure 3 presents the distribution of expenditures for incidents prior to the Village Meeting. There is not a clear pattern of differences between the high and low coupon groups. Following SKY, incidents in households with the large-valued coupon were more likely to have costs under 10 USD,

[10] When we examine the financial impacts of SKY, we include households that spend more than 100 USD on care of a health shock, in addition to the above categories. In that case, if SKY households are less likely to sort into this category, it is part of the impact of SKY and not considered to cause bias in results.

[11] For comparison, for rural areas, the 2005 Demographic and Health Survey in Cambodia reports average household size of 4.9 household members with an average age of 25.1 years, with 78.1 percent of households with no toilet in the household (DHS (2005)).

[12] This is similar to DHS 2005 statistics, where 38 and 7 percent of children under 5 are stunted or wasted, respectively.

while incidents in households offered the regular price for SKY were more likely to have higher costs (Figure 4).

IV. Results

A. Economic, Health, and Birth Impacts

Our survey collects data on several measures of economic, health care utilization, and health outcomes. To avoid issues of multiple tests and to understand the overall impact of SKY, we create four indices that summarize economic and health outcomes, and then present results on changes in health care utilization[13].

Our first economic index measures overall change in wealth as a result of health insurance. We add the value of all household assets, gold, cash, businesses, and land, and truncate at the 98th percentile to remove outliers. Table 3 shows no difference in overall wealth using this measure. Households who did not receive a large discount for insurance had an average of $2547 in assets, and households receiving the large-valued coupon had almost identical assets (treatment difference is $14, not significant)[14].

Our second economic index measures health care expenditures[15]. We create an index equal to 1 if the household as a whole spent more than $250 on care in the 12 months prior to the survey; any individual spent more than $100 on a single incident; the household ever paid for care using a loan with interest; the household had more debt in the follow-up than in the first round survey; the household had more debt specifically due to health; or the household had less land than reported in the first round survey. While the control has 52.2 percent of households falling into one of these categories, households receiving the steep discount for insurance were 3.2 percentage points less likely to experience one of these economic outcomes (Table 3, $P < 0.05$). Using the randomized coupon as an instrument for SKY purchase, we find that households that purchased SKY due to the

[13] To avoid data mining, we follow the outline of our research protocol (Levine, Polimeni and Ramage (2010))

[14] Using uncensored results, or taking natural log of uncensored results, similarly produced no significant differences between treatment and control groups; IV results were also statistically insignificant.

[15] Like many household surveys, we use recall data to gauge these expenditures, and we are unsure of their reliability. Measurement error is one reason we use statsitcal methods that are robust to large outliers.

steep discount were 10.8 percentage points less likely than the control to have at least one of these adverse economic outcomes (Table 3, $P < 0.05$).

Our third index examines health impacts of SKY, assigning a value of 1 to any household experiencing a death, a serious illness (with seven or more days of missed regular activities), or with a child that is stunted or wasted (more than 2 standard deviations below the reference population). As expected given our sample size, there is no significant difference between treated and control households for this index of health measures (Table 3)[16].

Similarly, we expected to have little statistical power to measure changes in birth outcomes. Our final index examines births that occurred three or more months after the Village Meeting, assigning a value of 1 to any birth in a health facility (versus at home), or for which the mother received at least one ante-natal checkup, one post-natal checkup, or one tetanus shot. We find no significant difference between the treatment and control groups (Table 3). Health and Maternal Health indices are broken down into their component parts in Appendix Tables A.1 and A.2; no coefficients are large or statistically significant.

Given that SKY had the greatest impact on economic outcomes related to health, we break down this index into its parts (Table 4). Treated households are less likely to have each of the negative outcomes, although not all differences are statistically significant. Using coupon as an instrument, households that purchased insurance due to the large discount were 4.5 percentage points less likely to have spent over 250 USD (P=.053), 4.9 percentage points less likely to have an individual shock cost more than 100 USD ($P = 0.13$), 8.3 percentage points less likely to have paid for care with a loan with interest ($P < 0.01$), 6.4 percentage points less likely to report more debt than in the first round survey ($P = 0.17$), 7.9 percentage points less likely to report more debt due to health than in the first round survey ($P < 0.01$), and 4.0 percentage points less likely to have less village or farm land than in the first round survey ($P = 0.14$). The same table also

[16] Thus, we know with 95 percent confidence that health insurance did not increase the incidence of major health events by more than 6 percentage points, nor did it decrease incidence of major health events by more than 11 percentage points (versus the control mean of 50 percent with health incidents).

shows total indebtedness. Using our coupon as an instrument for purchase, the insured had $69.67 less in loans, and $22.86 less in health-related loans ((P $<$ 0.05, P$<$ 0.001, respectively). Lending further support to SKY insurance protecting households financially when a serious health problem arises, when we examine payments for individual incidents (instead of aggregating at the household level), we find that households that purchased insurance due to the large discount were 13.1 percentage points less likely to pay for care with a loan with interest (versus 19.6 percent in the control group, P $<$ 0.05), and 10.0 percentage points less likely to sell assets to pay for treatment (versus 22.4 percent in the control group, P $<$ 0.05) (Appendix Table A.3).

B. Health Care Utilization

If the marginal price of care reduces care-seeking, SKY insurance may increase health care utilization. In addition, as SKY covers only public health facilities, it may alter the pattern of health care utilization among those who purchase SKY. Table 5 examines changes in health care utilization for SKY households. Most outcomes are for utilization following major health shocks, meaning an incident resulting in seven days of missed regular activities or a death. We find that households receiving the large discount for SKY were more likely to visit public health centers for care and less likely to visit private health facilities or drug sellers than the control group. Using receipt of a large discount as instruments, insured households were 15.8 percentage points more likely to use a health center for first treatment (P $<$0.001) and 10.7 and 8.0 percentage points less likely (P $<$ 0.05, P $<$ 0.05)) to visit a private doctor or drug seller, respectively, for first treatment compared to the control group. There was no statistically significant impact of SKY on first treatment at a public hospital. The estimated effects of SKY on use of public vs private facilities for any treatment (not just first treatment) are similar (see Appendix Table A.4).

We find some evidence SKY reduced rates of forgone care due to lack of funds: Using our IV results, insured households were 4.1 percentage points less likely to forgo care compared to the control mean of 5.2 percent (P = 0.08).

We expected that, in the absence of insurance, households may delay care until it is absolutely necessary. However, while the average time until treatment is 3.3 days for the control group, following a large health shock, individuals in households that purchased insurance waited 1.8 more days to seek treatment ($P < 0.05$), and were 8.2 percentage points less likely to receive treatment on the first day of an illness ($P = 0.14$). When we look specifically at visits to facilities other than drug sellers (to measure time until first visit to a doctor, whether public or private), we get similar results, although they are not precise. Thus, we cannot rule out the hypothesis that SKY members had similar delays before going to see a public or private provider, but were less likely to visit a local drug seller immediately after an illness.

While households increased use of public facilities following major health shocks, there was no increase in use of government facilities by households in general: 30 percent of both control and treatment households reported visiting a public doctor at least once in the three months prior to the second round survey (Table 5).

V. Robustness Checks

A. Tests of Main Results

For many of the outcomes above, we ran tests on several sub-groups, for example, only households with major health shocks or only those without. We tested impacts both with and without health incidents for which more than 100 USD was spent on care (but that did not cause seven days of missed work or death). We also varied the cutoff for some economic outcomes, testing the percentage of incidents or households with expenditures above \$5, \$50, \$100, etc. In most cases these changes did not affect results; instances where they did are mentioned above. Changes in our definition of SKY_{it} in equation 3 also did not change general results (see Table 6 column 1 for an example).

Due to households dropping out of SKY over time, the effect of the initial steep discount declined over time. In supplementary runs we include as an instrument the offered

price interacted with the number of months since the village meeting ($Months_{it}$):

$$SKY_{it} = \gamma_1 \cdot T_i + \gamma_2 \cdot Months_{it} + \gamma_3 \cdot Months_{it} \cdot T_i + u_{it} \tag{3}$$

These results were very similar to the main results.

Our randomization tests showed that treatment households were slightly richer at the start of our study, suggesting that pre-SKY differences may have influenced our results. We test this effect for a few variables that make up our main indices by including the value of the variable at the time of the first round survey, when possible (see Appendix Table A.5). While statistical significance decreased below the 5 percent level for some outcomes, the general results were the same. As noted above, because the first round survey was administered several months after the start of insurance, these results may be somewhat biased downwards. One concern is that our results may be due partly to an income effect from the value of the coupons. However, our coupons were worth at most about 0.5 percent of annual family income. Thus, we do not anticipate income effects had a material effect on observed behavior.

B. Is Randomization Necessary?

We developed the randomized controlled trial of insurance under the assumption that factors such as adverse selection and moral hazard would mean that econometric methods alone would not be enough to control for the differences between insured and uninsured households. Randomization is costly, so it is useful to know if we could have arrived at similar results using econometric methods. To test for the importance of randomization, we compare our IV results to results using OLS (regressing each outcome on insurance status and a number of control variables), and to results that use a propensity score to match insured households to uninsured households. Table 6 column (1) shows our IV results. Because we use the binary variable "ever purchased SKY" for our propensity score estimates, we also use this binary variable as an instrument here for comparison (as opposed to using percent of the year in SKY, as we do in our above

IV regressions). OLS results are presented in column (2), using "ever purchased SKY" as the measure of SKY purchase and controlling for a number of demographic and pre-SKY health and health care utilization characteristics (not shown in table). Column (3) presents propensity score results using kernel density method of matching insured to uninsured households. Propensity score analyses using nearest neighbor matching and stratification matching produced similar results (not shown). Focusing on economic outcomes, OLS and propensity score results show statistically insignificant impacts of insurance on household wealth and health-related financial outcomes. Thus, these methods would have missed the effect of insurance on reducing expenditures on care, loans, etc. However, while IV results show no detectable effect of insurance on health, OLS and propensity score estimates show that insurance increases the likelihood of illness or death ($P < 0.05$ and $P < 0.01$ for OLS and propensity score, respectively). These results reflect the biases we expect with an insurance program, where buyers are less healthy than non-buyers in ways that are unobservable to the insurer or researcher; that is, there is unobserved heterogeneity among households. Households that purchase insurance are more likely to be ill, and have higher expected expenditures than households that do not purchase. OLS and propensity score are not enough to control for these differences – what Heckman refers to as "essential heterogeneity" (Heckman, Urzua and Vytlacil (2007))[17].

VI. Discussion

We randomly distributed a large-valued coupon for SKY health insurance in rural Cambodia which induced a large increase in the purchase of insurance. We then used the randomized coupon as an instrument for insurance purchase to estimate the unbiased

[17]Our set-up satisfies the assumptions needed for LATE (Imbens and Angrist (1994)): existence of an instrument that sufficiently increases treatment and that is not correlated with outcomes, and monotonicity. Due to randomization, receipt of a deep discount is not correlated with the decision to participate in SKY except through the discount itself. Also, the discount itself should not impact the outcomes (health, health care utilization, etc.) except through the decision to purchase insurance. The discount does represent a wealth transfer, but it is small, and even with the discount the impacts on wealth outcomes are larger than the amount of the discount. We also show that receipt of the discount strongly effects purchase of insurance. Finally, their monotonicity assumption requires that nobody who would take up the program without the instrument will decline it with the treatment. In our setting, having a coupon for a steep discount will not discourage insurance purchase for anyone who would have purchased insurance at the regular price.

impact of health insurance on economic, health care utilization, and health outcomes.

A primary goal of insurance is to help households smooth consumption without large asset sales or new debt. As expected (Alderman and Paxson (2004), Gertler and Gruber (2002), Chetty and Looney (2005), De Weerdt and Dercon (2006), Robinson and Yeh (2012)), households in our sample with costly health shocks engage both in self-insurance (by reducing savings, borrowing with interest, and selling assets) and in mutual insurance (e.g., by borrowing from relatives at zero interest, Appendix Table A.3). Formal health insurance may displace these self-insurance and mutual insurance mechanisms, which can reduce or even eliminate insurance's ability to improve consumption smoothing and increase ability to pay for care.

In fact, the insured were substantially less likely to pay for care using a loan (with or without interest), less likely to have increased debt between the first and second surveys (Table 4), and less likely to pay for care by selling assets (Appendix Table A.3). Point estimates show decreased reliance on family, although results are not statistically significant. The insured also had lower out of pocket expenditures (Table 4) and were less likely to have large expenditure for care (Appendix Table A.7). While we cannot say with certainty that insurance is increasing the ability to smooth consumption, it appears to be crowding out some more costly measures of doing so. At the same time, if the biggest reduction in consumption following a health shock comes from decreased ability to work (Gertler and Gruber (2002)), even fully insuring health care expenses may only partly smooth consumption.

The financial protection we estimate is in line with recent studies that have also shown that health insurance decreases out of pocket spending and debt following serious illnesses (King et al. (2009) in Mexico, Finkelstein et al. (2011) in the U.S., Bauhoff, Hotchkiss and Smith (2011) in Ghana and Babiarz et al. (2010) in China). At the same time, others have found only small impacts on out of pocket expenditures (Nguyen, Rajkotia and Hong (2011) in Ghana, Wagstaff (2010) in Vietnam), or that out of pocket expenditures fell, but less than the insurance premiums (e.g., Thornton et al. (2010) in Nicaragua). Still another study found an increase in catastrophic expenditures (Wagstaff

and Lindelow (2008) in China).[18] [19]

Our research also adds evidence to the recent literature on the elasticity of demand for health care. Recent studies have shown that a small decrease in the cost of preventative services (e.g., bednets, water treatment, and deworming products) produces a large increase in uptake (Kremer et al. (2011); Cohen and Dupas (2010); Kremer and Miguel (2007); Abdul Lateef Jameel Poverty Action Lab (2011)), while other studies have found that demand for coverage of acute illness is relatively inelastic (Cohen, Dupas and Schaner (2012), Townsend (1994)), possibly because households insure against health risks through social networks (Robinson and Yeh (2012)). Lending support to somewhat elastic demand for care, we find that decreasing the marginal price of care at public facilities increased care at covered public health centers and decreased care at uncovered private doctors and drug sellers. This result has important implications for policy makers, as they may be able to lower price in public facilities to steer patients towards higher-quality services.

At the same time, we find no increase in utilization for general health services (not necessarily following a health shock). Thus, we find that while source of care sought is elastic, overall demand for care is not very responsive to price[20].Our results are in line with other studies that have found that while insurance increases use of covered facilities, it does not increase utilization overall (Babiarz et al. (2010) in China, Thornton et al. (2010) in Nicaragua, King et al. (2009) in Mexico, Bauhoff, Hotchkiss and Smith (2011) in the Republic of Georgia, Wagstaff (2010) in Vietnam). In contrast, other randomized studies have shown an increase in overall health care utilization for the insured or those with lower copayments (Finkelstein et al. (2011) and the RAND experiment Lohr et al. (1986); Manning (1987), both in the U.S., and Sine (1994) in China).

[18] The authors hypothesized this increase in spending was due to the nature of the insurance program, which gave medical facilities incentives to encourage more complex treatments.

[19] Of the studies mentioned here and below, King et al. (2009), Finkelstein et al. (2011), Thornton et al. (2010), Sine (1994), and the U.S. RAND experiment - Keeler (1992), Lohr et al. (1986) and Manning (1987) - use experimental designs, while other studies use non-experimental approaches.

[20] Thus, the decrease in total expenditures on health care is due to shifting care from private to public facilities and to decreased price of care, but not to a change in quantity of treatment. This pattern is consistent with low credit constraints. Indeed, qualitatively, most Cambodians have access to formal and informal sources of credit. At the same time, the fact that 5 percent of serious incidents in control households stopped treatment due to lack of money is consistent with (though hardly proof of) liquidity constraints.

Demand for SKY insurance itself responds to price: decreasing the price of SKY greatly increased take-up to almost 50 percent from around 7 percent. However, considering that the price of insurance was reduced by 80 percent, it is surprising that we did not have almost universal coverage, especially considering that overall savings to insured households compare favorably with the cost of insurance for these households. SKY members induced to purchase SKY by the steep discount decreased health expenditures by an average of 60 USD per year, or 22 USD if we top-code at the 98th percentile (P = 0.08 and 0.06, respectively; Appendix Table A.7). This savings is larger than the regular price of SKY (which averaged about 20 USD per year), implying that ex ante far more Cambodians would have expected to benefit from SKY than the 8 percent who purchased at the regular price.

If SKY is in fact cost-saving for consumers, the question remains as to why it has had historically low take-up, and why more households did not buy with the greatly discounted price. One possibility is that households that did not buy SKY, even with the steep discount, are those that knew their health care costs would be below the SKY premium. Another possibility is that many households prefer private providers not covered by SKY. One reason may be the convenience of private care, which may explain our unexpected results that insured households wait longer to receive care than their uninsured counterparts (Table 5). It may be that the insured are delaying care because of the inconvenience of visiting public facilities. Households may also not fully understand the concept of insurance, as health insurance is a new product in the region[21]. For example, one villager at a Village Meeting asked why they would want to pay for SKY when no one in their household is sick. If the lower price for insurance induces households to try insurance, long-run take-up may be higher than in the absence of the intervention. There are several other reasons households may not be purchasing insurance, including distrust of the provider (SKY), distrust of public facilities, high discount rate, low levels of risk aversion, etc. A companion paper explores these possibilities (Polimeni (2011)).

[21] At the time of the study, there were no other health insurance programs operating in the area, nor were there other types of formal insurance available (rainfall, etc.).

Finally, while a few studies have shown some positive impacts of insurance on health (Finkelstein et al. (2011), Keeler (1992), both in the U.S.), we did not find any statistically significant impact of SKY on health outcomes. On the one hand, the sample size and time frame of our study meant that we did not have statistical power to detect meaningful improvements in health outcomes. On the other hand, it is possible that SKY has no impact on health: Treatment at low-quality public facilities in rural Cambodia may not improve health compared to treatment at other facilities, or if care is poor enough, may not improve health at all.

Randomization is expensive, but we find that the results of the current study could not have been replicated by econometric methods alone. OLS and propensity score matching estimates erroneously imply that insurance decreases health and has no impact on economic outcomes. These results are contrary to our conclusions using randomization and are presumably due to unobservable characteristics that differ between households that purchase insurance and those that do not. It is possible that a more in-depth survey would be able to capture and control more of the differences between the insured and uninsured, but that in itself would be a costly endeavor.

This study examines one insurer operating in a few regions of a single nation. We examine a group of households in rural Cambodia that have similar demographic characteristics to other households in rural areas of Cambodia (DHS (2005)). To that extent, results may generalize well to the rest of rural Cambodia. At the same time, SKY partners only with health facilities that are above average quality. The impact of a community-based health insurance scheme would most likely be worse in areas where health facilities are of lower quality.

Our results can be applied to insurance programs in other countries only insofar as the programs offer similar costs and benefits. For example, like SKY, Thailand's universal coverage covers prescription medicines, hospitalization, and preventative care, along with more expensive services such as surgery (Lindelow, Hawkins and Osornprasop (2012), World Bank (2012)). Unlike SKY, Thailand's program is provided free of charge, but the low price for our study's treatment group also led to high uptake. Thus,

our results are probably somewhat informative for Thailand. In contrast, high copayments and other differences in Vietnam's and China's health insurance policies reduce confidence in how well results from SKY insurance apply to those settings.

Using our randomized price as an instrument identifies the effect of insurance on the roughly one-third of households who purchase insurance due to the deeply discounted price. This price-sensitive group is relevant for business and public policy, as these customers are probably the most likely to purchase insurance if there were a greater subsidy, successful new marketing techniques, and so forth. However, the effects of insurance on this group are probably not representative of the effects of insurance on the entire population. For example, a companion paper (Polimeni and Levine (2011)) demonstrates substantially more self-selection among the population who paid full price for SKY insurance than for the larger group who bought insurance only at a deeply discounted price. To the extent those who anticipate the greatest benefits of insurance buy insurance at the full price, their benefits from insurance will be higher than our estimates. Conversely, those who decline insurance even with the steep discount may correctly expect low benefits, perhaps because they are unlikely to need health care or because they live far from high-quality public facilities. In that case, the never-buying group would have fewer benefits from insurance than our estimates. At the same time, if the main barrier to uptake is low understanding of the benefits of western medicine or extreme poverty, those who decline insurance even with a steep discount would have as high or higher benefits as those who purchase with the discount. It is difficult to be sure how expansion to universal insurance would affect this part the population; as time goes on, understanding of insurance probably rises, which may affect take-up of insurance in the long run.

In addition to limitations of our identification strategy, our measures all had limitations. For example, we did not measure the quality of private care. Thus, it is hard to tell if SKY increased effective care or simply replaced low-quality private care with equally low quality public care. As noted, the study was too small to detect several longer-term outcomes, including changes in health. It bears repeating that "absence of evidence is not

evidence of absence," so it is possible that health insurance does improve health. The low take-up of voluntary health insurance emphasizes the importance of other programs to increase access to health care for the rural poor (Bitran, Turbat and Meesen (2010)). At the time of our study SKY itself was managing one of Cambodia's health equity funds, which provide free care for the rural poor. It is important to evaluate the impacts of health equity funds and other alternatives as a complement to this evaluation.

VII. Tables and Figures

	Price, Mean	Deep	ttest		
Observations	**2503**	**2499**			
Highest ranked wealth by enumerator	0.13	0.14	-1.14		
Lowest ranked wealth by enumerator (Omitted category is "medium wealth")	0.14	0.10	3.63	**	
Answered all literacy/numeracy questions correctly	0.15	0.15	0.10		
Household Size	5.02	5.01	0.17		
Highest Grade of Respondent (13 equals secondary)	3.81	3.76	0.57		
At least one household member with poor self-reported health	0.70	0.72	-1.42		
At least one member 65 or over	0.25	0.26	-1.29		
No child age 4 or under	0.61	0.62	-1.34		
Household has a stunted or wasted child age 4 or under	0.17	0.15	1.00		
All vaccines fulfilled for members age 5 or under, 0 if no 5 or under, pre-mtg	0.27	0.25	1.08		
Miss 7 or more days of work or death due to illness, 2 to 4 months pre-Meeting	0.07	0.07	0.04		
Major health shock (†) and used health center for care (0 if no shock)	0.01	0.02	-1.10		
Major health shock (†) and used hospital for care (0 if no shock)	0.02	0.02	0.19		
Major health shock (†) and use private health care (0 if no shock)	0.06	0.05	0.12		
Ln (1 + max days ill for a major health shock (†), pre meeting (0 if no shock))	0.24	0.25	-0.54		
Major health shock (†) and spent 120,000 riel on care (USD30) (0 if no shock)	0.05	0.05	-0.35		
Khmer Household (Omitted: Cham/Islam, Chinese, Vietnamese, Other)	0.95	0.95	1.99	*	
Ln (1 + approximate value of animals, durables, and business (USD))	6.47	6.49	-0.65		‡
Ln (1 + approximate value of animals, durables, business, cash, and gold (USD))	6.68	6.74	-1.81		‡
Hectares of farm land owned by household	0.81	0.86	-1.05		‡
Hectares of village land owned by household	0.14	0.13	0.85		‡
Household has at least one toilet	0.26	0.26	0.54		
House made of palm	0.04	0.03	2.21	*	
Roof made of palm	0.05	0.04	1.30		
Roof made of tin	0.37	0.38	-0.68		
Roof made of tile	0.51	0.52	-0.50		
House made of brick	0.03	0.03	-0.35		

All data is from the baseline survey. Sample is all households receiving the large coupon and other households in the randomized sample that completed the baseline survey. Ttest clustered at the village level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Major shock (†) includes all health events causing 7 or more days of missed work or a death. Variables are measured several months after the first introduction of SKY at the Village Meeting. Some, especially those marked with ‡,, may be slightly changed since initial SKY take-up. Results are similar for the sample of households interviewed within 3 months of the Village Meeting. In that case, significance of all differences goes away (due to smaller sample size), but the difference in "area of farm land owned by household" becomes significant.

TABLE 1—RANDOMIZATION TEST

`	(1)	(2)	(3)	(4)
	Current SKY Status	Ever in SKY	Percent Year in SKY	Last 4 Months Sky Status
Large-valued coupon for SKY	0.189***	0.442***	0.301***	0.224***
	(17.69)	(31.37)	(26.10)	(20.41)
Constant	0.0533***	0.0849***	0.0518***	0.0535***
	(8.96)	(11.86)	(9.78)	(9.02)
Observations	4980	4980	4980	4980
Adjusted R^2	0.07	0.23	0.18	0.10
F-Test	312.92	984.22	681.31	416.69

* p < 0.05, ** p < 0.01, *** p < 0.001; t-statistics in parentheses. Each column regresses the endogenous variable for SKY .status on the instrument "received a large-valued coupon". Columns (1), (2), (3) and (4) use SKY status (insured or uninsured) at the time of the second round survey, an indicator for ever being insured, percent of the previous 12 months the household is insured, SKY status in the 4 months prior to the second round survey, as the endogenous variables, respectively.

TABLE 2—FIRST STAGE REGRESSION FOR HOUSEHOLD-LEVEL OUTCOMES

	Intention to Treat			Impact on the Insured		
	Control Mean	Treatment Difference	T-Statistic	IV Difference	IV T-Statistic	N
Household pooled value of all assets, gold, cash, business, and land (USD), truncated at 98th percentile	2547.705 (77.616)	14.143 (82.706)	0.17	47.062 (275.103)	0.17	4980
Household spent >$250 for care, spent >$100 on a single incident, paid for care with loan with interest, more debt than first round survey, more debt due to health, or less land than first round.	0.522 (0.012)	-0.032* (0.014)	-2.28	-0.108* (0.048)	-2.27	4980
A death, serious illness (> 7 days), or stunted/wasted child in the household (controls for under 6 in household)	0.499 0.010	-0.04 0.015	0.62	-0.0248 (0.044)	-0.56	4660
At least one ANC, PNC, tetanus shot, or birth in facility (includes births three months more more post Village Meeting)	0.972 (0.012)	0.010 (0.016)	0.605	0.032 (0.054)	0.60	337

Notes: * p < 0.05, ** p < 0.01, *** p < 0.001. Standard errors in parentheses, adjusted for clustering by village. All health and financial impacts are at the household level, aggregated over individual incidents when necessary. The endogenous variable is percent of year in SKY, which is instrumented by a large-valued coupon for SKY. Maternal/birth outcomes include treatment for births three or more months after the SKY Village Meeting, and use average SKY membership in the month before, during, and after the birth as the endogenous variable. Data is from the Round 2 survey, except "More debt from first round survey", which compares Round 2 reported amount of debt to Round 1 reported amount of debt. Financial impacts include incidents for which the shock resulted in 7 days of missed work, a death, or a 100USD expense, while health impacts do not include health shocks that resulted in a 100USD expense but did not also result in 7 days of missed work or death.

TABLE 3—IMPACT ON ECONOMIC, HEALTH, AND MATERNAL HEALTH INDICES

	Intention to Treat			Impact on the Insured		
	Control Mean	Treatment Difference	T-Statistic	IV Difference	IV T-Statistic	N
Index Breakdown						
Total cost of major health shocks in a household more than 250USD, past 12 months	0.080	-0.014	-1.95	-0.045	-1.93	4980
	(0.006)	(0.007)		(0.023)		
Total cost of a single major health shock to an individual in a household is more than 100USD past 12 months	0.181	-0.015	-1.50	-0.049	-1.50	4980
	(0.008)	(0.010)		(0.033)		
Paid for care with loan w. interest	0.101	-0.025**	-3.22	-0.083**	-3.18	4980
	(0.007)	(0.008)		(0.026)		
More debt than first round survey	0.369	-0.019	-1.39	-0.064	-1.39	4980
	(0.011)	(0.014)		(0.046)		
More debt due to health, Follow-up versus First-Round Survey	0.089	-0.024**	-2.93	-0.079**	-2.89	4980
	(0.007)	(0.008)		(0.027)		
Less village or farmland, Follow-up versus First-Round Survey	0.093	-0.012	-1.49	-0.040	-1.48	4980
	(0.007)	(0.008)		(0.027)		
Total Indebtedness						
Total Value of Loans, Censored at 98th percentile	194.708	-20.937*	-2.46	-69.668*	-2.43	4980
	(10.070)	(8.519)		(28.733)		
Total Value of Health Loans, Censored at 98th percentile	28.943	-6.877***	-3.70	-22.885***	-3.63	4980
	(1.811)	(1.859)		(6.310)		

Notes: * p < 0.05, ** p < 0.01, *** p < 0.001. Standard errors in parentheses, adjusted for clustering by village. All impacts are at the household level, except for paying for care with a loan with interest, which looks at individual incidents. Major health shocks include any causing 7 days of missed work, a death, or a 100 USD health care expense. The endogenous variable is percent of year in SKY, which is instrumented by a large-valued coupon for SKY. Data is from the Round 2 survey, except "More debt from first round survey", which compares Round 2 reported amount of debt to Round 1 reported amount of debt.

TABLE 4—FINANCIAL IMPACTS

	Intention to Treat				Impact on the Insured		
	Control Mean	Treatment Difference	T-Statistic	N	IV Difference	IV T-Statistic	IV N
Following a Major Health Shock							
Was the incident first treated at a public hospital?	0.157	0.003	0.23	4207	0.001	0.02	3890
	-0.010	-0.012			-0.042		
Was the incident first treated at a health center?	0.141	0.047***	4.01	4207	0.158***	3.98	3890
	-0.010	-0.012			-0.040		
Was the incident first treated at a private doctor?	0.468	-0.031*	-2.03	4207	-0.107*	-1.96	3890
	-0.013	-0.015			-0.054		
Was the incident first treated at a drug seller?	0.143	-0.024*	-2.31	4207	-0.080*	-2.09	3890
	-0.010	-0.011			-0.011		
Number of treatments, any provider	1.697	-0.002	-0.08	4207	-0.014	-0.13	3890
	-0.026	-0.033			-0.110		
Forgone care							
Stopped treatment because of no money	0.052	-0.013	-1.84	4207	-0.041	-1.75	3890
	-0.006	-0.007			-0.024		
Delayed Care							
Days until first treatment. Top-coded at 30 days. Never treated is 30 days.	3.346	0.505*	2.18	4207	1.761*	2.18	3890
	-0.183	-0.232			-0.808		
Percent receiving treatment on first day of illness	0.594	-0.029	-1.79	4207	-0.082	-1.48	3890
	-0.013	-0.016			-0.056		
Days until provider other than drug-seller. Top-coded at 30 days. Never went to non-drug-seller coded as 30 days.	5.001	0.490	1.41	2749	1.177	0.86	2432
	-0.225	-0.347			-1.372		
Percent visiting non-drug-seller on first day of illness	0.519	-0.008	-0.42	2749	-0.023	-0.31	2432
	-0.014	-0.019			-0.074		
All Households, with or without shock							
Percent of households with a visit to a public doctor in the last three months, whether or not ill	0.305	0.002	0.17	4980	0.009	0.17	4980
	-0.011	-0.012			-0.056		

Notes: * p < 0.05, ** p < 0.01, *** p < 0.001. Standard errors in parentheses, adjusted for clustering by village. Percent of households with a visit to a government doctor is measured at the household level, and includes visits to doctors even without a major health shock. The endogenous variable is average SKY status in the four months prior to the second round survey, which is instrumented by a large-valued coupon for SKY. All other impacts are for utilization following a major health shock (shocks causing 7 days of missed work or a death) and are at the incident level. The endogenous variable is average SKY status in the month prior to, during, and after the health incident (to account for recall error), which is instrumented by a large-valued coupon for SKY. Data is from both the first round and second round surveys, and includes any incidents following the SKY Village Meeting. Days till provider other than drug seller uses only second round survey data (this question was not asked in the first round survey). N is lower for IV estimates due to missing data on SKY status during the month of the incident.

TABLE 5—PROVIDER TYPE, FIRST TREATMENT AFTER MAJOR HEALTH INCIDENT

	IV impact, Using Ever in SKY (1)	N	OLS Impact (2)	N	Propensity Score Impact (3)	N
Household pooled value of all assets, gold, cash, business, and land (USD), truncated at 98th percentile	32.010 (187.20)	4980	14.290 (83.19)	4637	85.129 (105.49)	4631
Household spent >$250 for care, spent >$100 on a single incident, paid for care with loan with interest, more debt than first round survey, more debt due to health, or less land than first round.	-0.0735* (0.03)	4980	0.0156 (0.017)	4637	0.022 (.017)	4631
A death, serious illness (> 7 days), or stunted/wasted child in the household (controls for under 6 in household)	-0.004 (0.03)	4660	0.0381* (0.016)	4443	0.056** (.013)	4631
At least one ANC, PNC, tetanus shot, or birth in facility (includes births three months more more post Village Meeting)	0.0218 (0.04)	355	-0.000958 (0.020)	324	-0.002 (.021)	277

Sample: Marginal effects, Standard errors in parentheses, adjusted for clustering by village. * p < 0.05, ** p < 0.01, *** p < 0.001. Includes all households with second round data in randomized sample that have data on all instruments. Column (1) shows IV results using "ever in SKY" as the endogenous SKY variable for all outcomes (for comparison purposes, as the binary "ever in SKY" variable is used for propensity score matching). Receipt of a large-valued coupon is used as the instrument for this endogenous SKY variable, except for birth-level outcomes, which use insurance status in the month of, month prior to, and month following the birth. Column (2) presents the OLS estimate using the endogenous "ever in SKY" as the independent variable, including controls for demographics and pre-Meeting health and health care use (not shown). Column (3) uses propensity score with kernel-based matching to compare SKY buyers to households with similar characteristics that did not buy SKY. Households are matched on demographic and health characteristics in the first round survey, where health characteristics include presence of a health shock causing 7 days of missed work, a death, or a 100 USD expense. Controls are included for households that do not have 12 months of recall data in the first round survey. Some households did not have first round survey data for the predictors of propensity score; thus N is lower for these results. All other data for these regressions are from the second round survey. Propensity results include only households with common support; no households were eliminated for being out of this range.

TABLE 6—IS RANDOMIZATION NECESSARY?

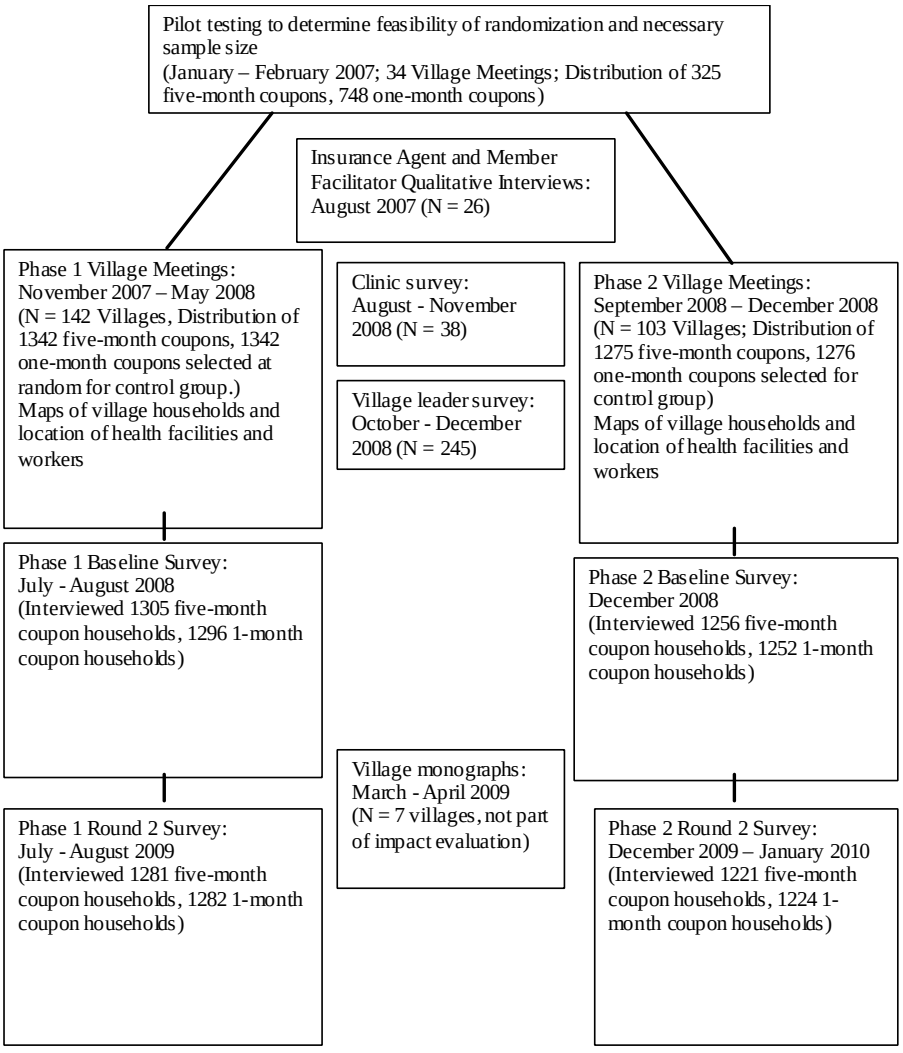

FIGURE 1. TIMELINE OF EVALUATION

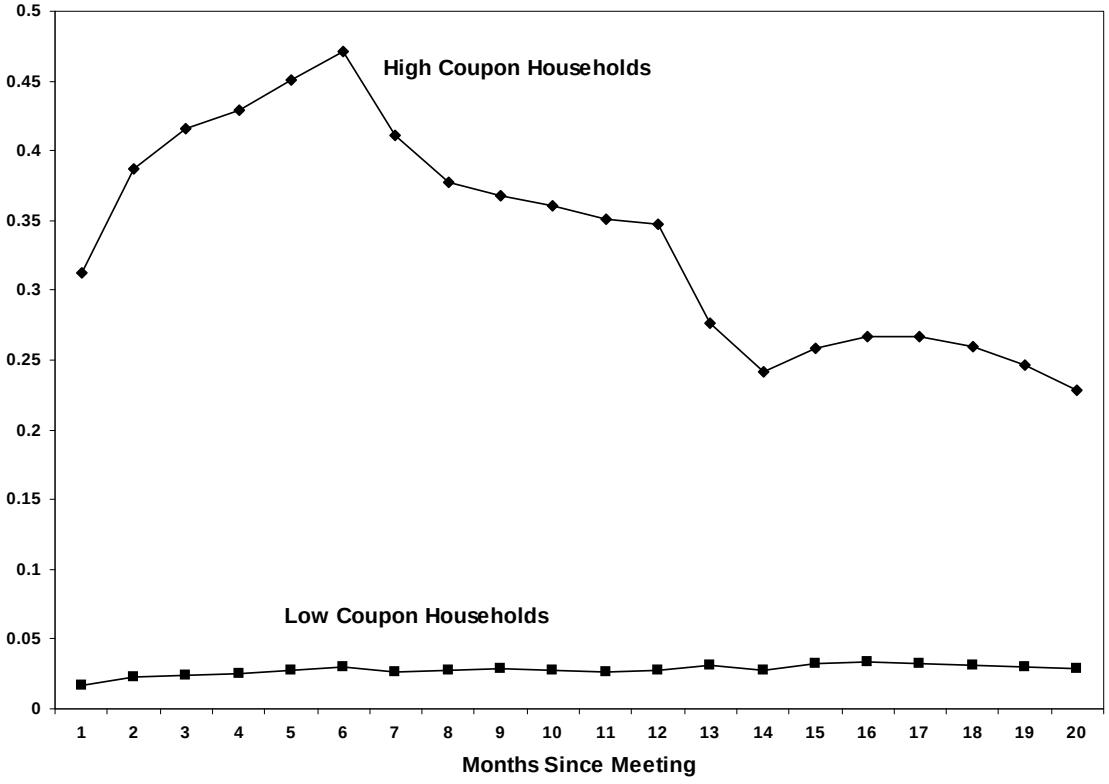

FIGURE 2. MEMBERSHIP IN SKY, BY MONTHS SINCE VILLAGE MEETING AND COUPON TYPE

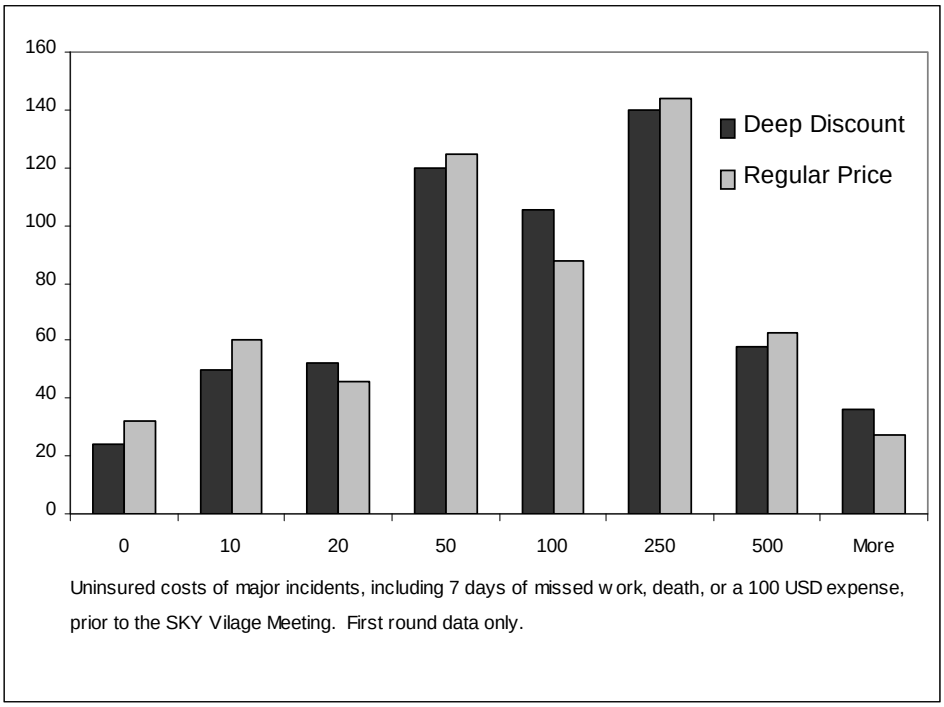

FIGURE 3. UNINSURED COSTS PER INCIDENT, PRE-MEETING

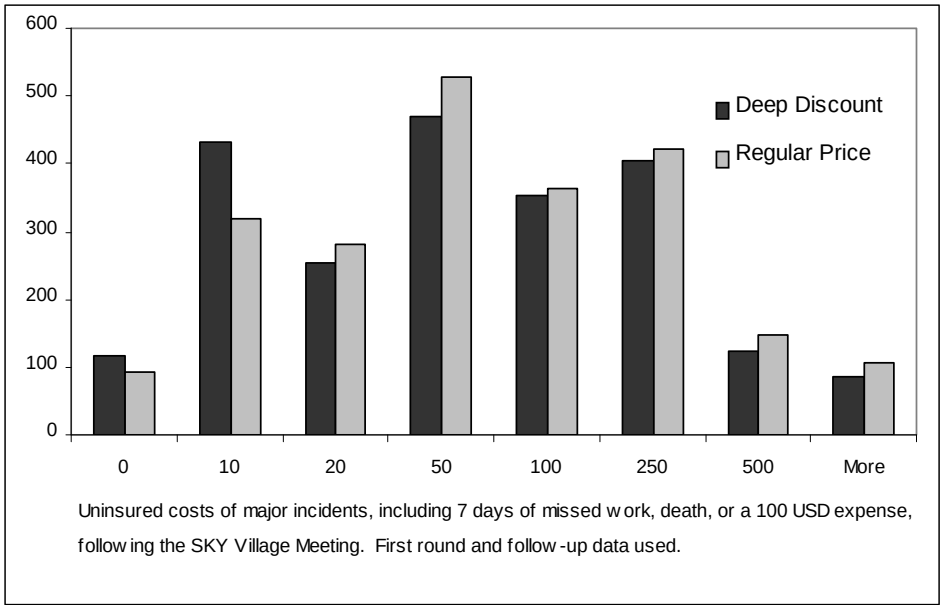

FIGURE 4. UNINSURED COSTS PER INCIDENT, POST-MEETING

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APPENDIX

	Intention to Treat				Impact on the Insured		
	Control Mean	Treatment Difference	T-Statistic	N	IV Difference	IV T-Statistic	IV N
Major Health Shocks							
Percent of individuals who died in the last year	0.007	0.000	0.32	24865	0.001	0.35	24741
	(0.001)	(0.001)			(0.003)		
Percent of individuals sick for 7 or more days in the last year	0.102	0.000	-0.08	24684	-0.001	-0.11	24560
	(0.003)	(0.004)			(0.012)		
Anthropometrics							
Length/height-for-age z-score	-1.386	0.000	0.00	2223	0.037	0.23	2208
	(0.04)	(0.05)			(0.158)		
BMI-for-age z-score	-0.690	-0.008	-0.15	2222	-0.036	-0.22	2207
	(0.03)	(0.05)			(0.164)		
Weight-for-age z-score	-1.364	-0.005	-0.12	2234	-0.003	-0.02	2219
	(0.03)	(0.04)			(0.132)		

Notes: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in parentheses, adjusted for clustering by village. Impacts are at the individual level. The endogenous variable is percent of year in SKY, which is instrumented by a large-valued coupon for SKY. Percent of individuals sick for 7 or more days includes only individuals that did not die. Anthropometrics include only individuals age 5 or under.

TABLE A.1—HEALTH IMPACTS

	Intention to Treat			Impact on the Insured		
	Control Mean	Treatment Difference	T-Statistic	IV Difference	IV T-Statistic	IV N
Antenatal Care[1]						
Received at least one antenatal check-up	0.920	-0.001	-0.04	-0.004	-0.04	337
	(0.024)	(0.03)		(0.097)		
Received at least one tetanus injection during pregnancy	0.926	0.037	1.51	0.121	1.48	337
	(0.018)	(0.02)		(0.082)		
Birth						
Gave birth in a public facility[1]	0.585	0.048	0.87	0.159	0.88	337
	(0.04)	(0.06)		(0.181)		
Gave birth in a public or private health facility[1]	0.642	0.078	1.48	0.259	1.49	337
	(0.043)	(0.053)		(0.174)		
Assisted at birth by a trained birth attendant[2]	0.178	0.026	0.64	0.083	0.63	436
	(0.032)	(0.041)		(0.132)		
Assisted at birth by a midwife[2]	0.796	-0.033	-0.76	(0.104)	-0.75	436
	(0.032)	(0.043)		(0.139)		
Assisted at birth by a doctor[2]	0.022	0.006	0.41	0.020	0.41	436
	(0.010)	(0.015)		(0.048)		
Post-Natal Care[2]						
Received at least one postnatal check-up	0.690	-0.052	-0.97	-0.191	-0.97	310
	(0.039)	(0.053)		(0.198)		

Notes: * p < 0.05, ** p < 0.01, *** p < 0.001. Standard errors in parentheses, adjusted for clustering by village. Impacts are at the birth level. The endogenous variable is average SKY membership in the month before, during, and after the birth. The instrument is eceipt of a large-valued coupon. Data includes births in both the first and follow-up surveys, except post-natal care which uses only births listed in the follow-up survey. 1: Includes most recent birth 3 or more months after the first possible SKY start date. 2: Uses most recent birth after the first posible start date.

TABLE A.2—BIRTH-RELATED IMPACTS

	Intention to Treat				Impact on the Insured		
	Control Mean	Treatment Difference	T-Statistic	N	IV Difference	IV T-Statistic	IV N
Is sky used to pay for any of the treatments?	0.034	0.133***	12.33	4207	0.435***	15.14	3890
	(0.005)	(0.011)			(0.029)		
Is cash used to pay for any of the treatments?	0.481	-0.025	-1.47	4207	-0.087	-1.52	3890
	(0.014)	(0.017)			(0.057)		
Are savings used to pay for any of the treatments?	0.067	-0.001	-0.09	4207	-0.002	-0.08	3890
	(0.007)	(0.008)			(0.028)		
Does family pay for any of the treatments?	0.229	-0.016	-1.10	4207	-0.051	-1.06	3890
	(0.012)	(0.014)			(0.048)		
Is work used to pay for any of the treatments?	0.101	-0.011	-1.12	4207	-0.033	-0.97	3890
	(0.008)	(0.010)			(0.034)		
Are assets used to pay for any of the treatments?	0.224	-0.032*	-2.47	4207	-0.100*	-2.13	3890
	(0.012)	(0.013)			(0.047)		
Are loans without interest used to pay for any of the treatments?	0.128	-0.021*	-2.03	4207	-0.075*	-2.08	3890
	(0.009)	(0.010)			(0.036)		
Are loans with interest used to pay for any of the treatments?	0.196	-0.035*	-2.43	4207	-0.131*	-2.50	3890
	(0.012)	(0.015)			(0.052)		

Notes: * p < 0.05, ** p < 0.01, *** p < 0.001. Standard errors in parentheses, adjusted for clustering by village. All incidents are for a death or 7 or ore days of missed work. The endogenous variable is average SKY membership in the month before, during, and after the incident. Instrument is receipt of a large-valued coupon. Data includes post-Meeting incidents in both the first and follow-up surveys.

TABLE A.3—HOW ARE HEALTH CARE COSTS COVERED?

	Intention to Treat				Impact on the Insured		
	Control Mean	Treatment Difference	T-Statistic	N	IV Difference	IV T-Statistic	IV N
Was the incident ever treated at a public hospital?	0.269	0.017	1.05	4207	0.038	0.66	3890
	(0.01)	(0.016)			(0.057)		
Was the incident ever treated at a health center?	0.180	0.060***	4.57	4207	0.205***	4.65	3890
	(0.012)	(0.013)			(0.044)		
Was the incident ever treated at a drug seller?	0.175	-0.026*	-2.12	4207	-0.080	-1.87	3890
	(0.011)	(0.012)			(0.043)		
Was the incident ever treated at a private doctor?	0.652	-0.028	-1.93	4207	-0.099	-1.93	3890
	(0.012)	(0.015)			(0.052)		

Notes: * p < 0.05, ** p < 0.01, *** p < 0.001. Standard errors in parentheses, adjusted for clustering by village. All impacts are at the incident level, and include behavior following major health shocks, which include shocks causing 7 days of missed work or a death. The endogenous variable is average SKY status in the month prior to, during, and after the health incident (to account for recall error), which is instrumented by a large-valued coupon for SKY. Data is from both the first round and second round surveys, and includes any incidents following the SKY Village Meeting. N is lower for IV estimates due to missing data on SKY status during the month of the incident.

TABLE A.4—TREATMENT FOR HEALTH CARE SHOCKS, FIRST AND SUBSEQUENT VISITS

	Control	Impact on the Insured: IV Difference	IV T-Statistic
Household pooled value of all assets, gold, cash, business, and land (USD)[2]	2547.705	-48.023 (210.604)	-0.23
Spent more than 250USD total on care of all incidents in the household [(1)]	0.080	-0.039 (.024)	-1.61
Spent more than 100USD total on care of a single health incident [(1)]	0.181	-0.034 (.035)	-0.98
Paid for care with loan w. interest [(1)]	0.101	-0.074** (.027)	-2.77
Miss 7 days of activity due to a health incident	0.404	-0.005 (.046)	-0.11
Total debt amount[2]	234.609	-47.285 (26.648)	-1.77
Total spent on care following a health incident [(1)]	62.234	-24.549* (11.392)	-2.15

Notes: * p < 0.05, ** p < 0.01, *** p < 0.001. Standard errors in parentheses, adjusted for clustering by village. All impacts are at the household level, N = 4979. Round 1 survey levels of variables held constant in all regressions. Endogenous variable is percent of previous 12 months insured; instrument is receipt of a large-valued coupon. Months since meeting held constant for all variables following a health shock (i.e., all variables in table except total debt amount) to account for varying delays from Village Meeting to first round survey, which effects number of months of recall for health shocks. (1) Major health shocks include 7 days of mssed work, a death or a 100 USD health care expense. (2) Compressed to the 98th percentile, to remove outliers.

TABLE A.5—HOLDING FIRST ROUND VALUES CONSTANT

	Regular Price	Large Discount
Price, in Months, for 6 months insurance	5	1
Purchase within 6 months of meeting	168	1218
Number of households receiving price offer	2506	2502
% SKY	6.7%	48.7%
Price Elasticity of Demand	-7.8	

Notes: Sample includes randomized sample, not over-sampled buyers, including only households with both R1 and R2 data. Take-up is the number of households insured at least 1 month within the first 6 months after the Village Meeting, even if a household drops within this period. Price elasticity of demand equals (%Change in Take-Up)/(%Change in Price).

TABLE A.6—ELASTICITY OF DEMAND FOR INSURANCE

					Impact on the Insured		
	Control Mean	Treatment Difference	T-Statistic	N	IV Difference	IV T-Statistic	IV N
Following a Major Health Shock							
Amount spent on care							
Total USD spent on care for a given incident[1]	103.811	-13.404*	-2.33	4207	-43.952*	-2.28	3890
	(4.589)	(5.762)			(19.286)		
Total USD spent on care by a household on all major health incidents in the last 12 months (not compressed)	91.762	-18.229	-1.75	4980	-60.659	-1.74	4980
	(11.191)	(10.433)			(34.900)		
Total USD spent on care by a household on all major health incidents in the last 12 months[1]	62.234	-6.563	-1.86	4980	-21.838	-1.85	4980
	(2.981)	(3.522)			(11.783)		

Notes: * p < 0.05, ** p < 0.01, *** p < 0.001. Standard errors in parentheses, adjusted for clustering by village. All incidents are for a death or 7 or more days of missed work. The endogenous variable is average SKY membership in the month before, during, and after the incident. Instrument is receipt of a large-valued coupon. Data includes post-Meeting incidents in both the first and follow-up surveys. 1: Compressed to the 98th percentile, to remove outliers.

TABLE A.7—TOTAL SPENT ON CARE