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RESEARCH
PAPER No.24
NOVEMBER 2012

THE IMPACT OF A HEALTH INSURANCE PROGRAMME: EVIDENCE FROM A RANDOMIZED CONTROLLED TRIAL IN KENYA[1]

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ABSTRACT

We evaluate the impact of introducing a new health insurance product using an RCT in rural Kenya, in an area where there are competing health insurance products. During the intervention period, the adoption of health insurance increased similarly in both the control and treatment area from about a quarter to about half the households in the area. We do not find evidence that the basic marketing of the new product (at full price) expanded the market, but the new product captured a substantial market share. Market demand is sensitive to price discounts, but not to training in financial and risk literacy. Surprisingly, a referral incentive whereby the product is sold with a discount if other clients are joining as well, reduces the market size, possibly because it reminded potential clients of local Ponzi schemes. In terms of impact, we find that health insurance reduced net health expenditures, reduced informal borrowing for medical costs and increased non-food and overall consumption. This suggests a positive impact, even though health outcomes are not significantly different between control and treatment groups. Finally, we investigate consumer satisfaction with the product and find that substantially more buyers are positive than negative. We also find that the main determinants of (hypothetical) renewal are positive or negative usage experiences, rather than hospital usage and price.

1. INTRODUCTION

Households living in developing countries face significant shocks that can lead to a reduction in consumption and deterioration of capital and physical assets. Income shocks can be due to a multitude of reasons: adverse weather, price fluctuations, business failure and household illness. Health shocks can produce particularly severe effects on household wellbeing. In the absence of insurance these shocks may lead to reduced household consumption and costly risk-mitigation strategies (Dercon 2004).

A large economic literature shows that poor households have developed sophisticated strategies to respond to risk and protect themselves against shocks. Dercon (2002) suggested that these strategies can be divided into risk management and risk-coping strategies. Risk-management strategies are ex-ante mechanisms that consist of specialization in low-risk (and often, as a consequence, low-return) activities. Risk-coping strategies are ex-post mechanisms that can alleviate the negative effects due to shocks. Common risk-coping strategies include depletion of assets to smooth consumption; access to informal credit; engagement in informal mutual support networks.

Microinsurance products could provide an alternative, reducing welfare costs associated to shocks and vulnerability. Microinsurance initiatives are taking place all over the world; however, there is lack of rigorous, experimental evidence of their effects. This paper aims to fill this gap by investigating the impact of health insurance based on a randomized control trials form a health insurance program in Kenya.

This study uses a unique panel data set collected in 2010 and 2012 among tea farmers belonging to the Wananchi Savings and Credit Cooperative Society and living in central region of Kenya. Member farmers in treatment arms were invited to purchase the *Bima ya Jamii* insurance policy, which was promoted using alternative marketing strategies and individual price variation. *Bima ya Jamii* is a composite health insurance offered by Cooperative Insurance Company (CIC) of Kenya, that combines public and private insurance. It costs KShs 3,650 per year (approximately US $43) and comprises in-patient hospitalization, funeral costs, disability and lost income during hospitalization stays.

Wananchi members are organized in 162 tea collection centres. From these 150 were selected and randomly allocated either to a control group, where no insurance was offered (60 centres), or to one of three different treatment groups composed of 30 centres each. In the first of these treatment arms, a basic marketing strategy was followed, consisting of a local meeting in which information about the product was provided. In the second treatment group, this same marketing strategy was followed, but it was preceded by a ten-week course on financial literacy, which was designed by the Swedish Cooperative Center (SCC). In the last treatment group, Wananchi members received the basic marketing intervention, with one twist: they were given the opportunity to reduce the premium of the policy by signing

1 This work has been supported by the ILO Microinsurance Facility, to which we are grateful. We thank Michal Matul (ILO), Anne Wambui and David Ronoh (CIC Kenya), Edward Kinyungu and Lydia Wathobio (Wananchi SACCO) for their comments and support in the design and implementation of the project. All errors are our own. Stefan Dercon is at the University of Oxford and DFID, Jan Willem Gunning is at the VU Amsterdam, Andrew Zeitlin is at the University of Georgetown and Simone Lombardini is at the University of Oxford. Contact: stefan.dercon@economics.ox.ac.uk.

their peers up for participation. In addition to these cluster-level treatments, a second dimension of randomization at individual level was introduced. In each of the three treatment groups, individuals were randomly assigned discount vouchers that would reduce premium costs by either zero, ten, or twenty percent.

This paper explores five issues related to our health insurance intervention and its consequences. The first aim of this paper is to study the demand for microinsurance products, and to analyse how demand for health insurance responds to different marketing strategies and price interventions. Basic marketing strategies and price discounts are found to have a positive effect in convincing people to purchase Bima ya Jamii. However, *Bima ya Jamii* was not the only health insurance product available on the market at the time of the study, so marketing strategies and discount vouchers may have more to do with gaining market share. We therefore we need to study the market as whole. Investigating take-up for any health insurance product available on the market, we find that – when farmers are offered the *Bima ya Jamii* policy at full price – take-up across cluster-level treatment groups is not higher than in the control group. This suggests that an increase in policy suppliers will not necessarily produce higher demand for insurance. By contrast, when the marketing of the product was accompanied by reductions in the price of the *Bima ya Jamii* product, overall take-up of health insurance did increase. The referral incentive actually had a negative effect on take-up, which is sufficiently large to offset any benefits of reduced premium costs on insurance demand within that arm of our experiment. Surprisingly, literacy training courses on finance and risk are not effective in expanding the market or even market shares. The key lesson is that only price incentives managed to expand the market, while basic marketing or financial literacy training had no impact; referral incentives as offered here reduced both the market size and market share.

The second goal of this paper is to investigate the impact of health insurance on health care utilization and health care outcomes. Exogenous variation in the premium price and marketing strategy allow us to predict the policy purchase decision, and so to investigate the impact of health insurance for those individuals whose decision to purchase insurance is affected by these treatments. Testing for health access and health outcomes, the results suggest a reduction in total medical expenditure and inpatient costs. There is, however, no evidence of changes in either the utilisation of health facilities or in subjective wellbeing.

Third, micro-insurance can impact households' behaviour also on a variety of outcomes such as consumption, assets, savings and other welfare dimensions (Dercon and Kirchberger, 2008). Therefore, in addition to health outcomes, this paper also investigates the impact of insurance on a variety of outcomes not directly related to health. The data suggest a positive effect on household non-food consumption and per-capita consumption (net of the premium): buying insurance allows one to earn more or save less, it would appear. Moreover, the data suggest that health insurance reduces the probability of borrowing from informal sources to cover medical costs. Given that households are insured against health expenditure, they appear not to need to undertake loans to pay for medical expenditures.

The fourth aim of this paper is to describe utilization, experience and willingness to renew insurance policies among *Bima ya Jamii* clients. High levels of satisfaction were found. Among all the *Bima ya Jamii* clients in our sample, 48% of declared to be satisfied or very satisfied, while 17% replied to be unsatisfied or very unsatisfied. The main covariates correlated with willingness to renew policy insurance are (positive or negative) usage experiences, rather than hospital usage and price.

Fifth and finally, exploiting price variation in the experiment design, we test for the presence of (adverse) self-selection among *Bima ya Jamii* clients. We find that on average individuals who purchased insurance at higher price are more likely to require inpatient visits, providing suggestive evidence of self-selection among insurance users.

2. EXPERIMENTAL DESIGN

2.1 PRODUCT DESCRIPTION

Bima ya Jamii is a health insurance product offered by the Cooperative Insurance Company (CIC) of Kenya. It was commercialized in the intervention area in the summer 2010 and was available to individuals in our study population through September of 2011.[2] The product combined public and private insurance. It included in-patient hospitalization cover, provided by the National Hospital Insurance Fund to all public-sector employees, as well as funeral insurance and cover for not working during hospitalization. The full price for the insurance was KShs 3,650 (approximately US $43) per year, covering all the members of the household, and this was due as a lump-sum at the start of the contract.

CIC marketed this product to the informal sector through cooperative societies and other financial intermediaries.

2 At that time, the National Health Insurance Fund's decision to change its in-patient cover, which was bundled in the Bima ya Jamii policy, was first put into place (and shortly thereafter, challenged in court). This change led CIC to withdraw the Bima product from the market.

The experiment described here was conducted among tea farmers living in Nyeri District, central province of Kenya, who belonged to Wananchi SACCO. Wananchi is a savings and credit cooperative society with 30,466 members divided into 162 tea-collection centres. Farmers joining Wananchi obtain a bank account through which they receive payment from the Kenya Tea Development Agency for their tea harvest. Payments from KTDA typically comprise a number of regular payments during the period in which farmers sell tea, followed by a substantial, one-time bonus paid in November. For those farmers who purchased the policy using our experimental program, Wananchi paid premiums upfront in August of 2010, and deducted these costs from farmers' bonus payments.[3]

2.2 FIELD EXPERIMENT

Among the 162 tea centres belonging to Wananchi SACCO, we selected a representative sample of 150 tea centres. In each of these tea centres we randomly selected 9 ordinary tea farmers and the delegate of each tea center, implementing a first-round survey between December 2009 and January 2010.

The field experiment provided variation at center level in terms of the way that the product was marketed (if at all), and, in centres where marketing occurred – henceforth, 'treated' centres –variation in the premium associated with the policy was created at the individual level. In the first dimension of the randomization, tea centres were assigned as follow: 30 tea centres were assigned to the basic marketing group, where members were invited to a meeting at the centre level that provided information about the product and an opportunity to sign up; 30 tea centres were assigned to the literacy group, where they were offered a ten-week course on financial literacy and risk management prior to the basic marketing treatment; 30 tea centres were assigned to the referral incentive group, where Wananchi members had the opportunity to reduce the costs of membership by signing their peers; and, finally, 60 tea centres were assigned to the control group, where insurance was not offered.

A second dimension of the experiment was conducted at the individual level. During marketing meetings in all but the control group, Wananchi members in treated centres were randomly allocated discount voucher in order to reduce the premium cost by 0, 10% and 20%, with equal probability. Results concerning the effectiveness of treatment groups are reported in Dercon et al. (2012). Individuals in the control group received no information and no price discounts, even if theoretically it was possible to purchase the policy. Whereas all the individuals in the treatment groups received their meetings between April and September 2010, and by then they had to make their insurance decision. Eventually in January and February 2012 a follow-up survey was conducted interviewing the same individuals in the sample in 2010.[4]

3. DESCRIPTIVE STATISTICS

This section initially provides an overview for the insurance policy participation in our population, and it follows with a summary statistics for the variable of interests.

3.1 INSURANCE PARTICIPATION

As reported in table 1, 20.3% of the population interviewed in the follow-up survey undertook *Bima ya Jamii* health insurance. Our policy was not the only one available in the area. 33% of the individuals in our sample reported to have health/hospitalization insurance different from Bima ya Jamii. The most widespread insurance policies available in the area are NHIF and Majani insurance. NHIF (National Hospital Insurance Fund) covers inpatient and outpatient treatments in government hospitals.[5] Majani insurance is targeted towards tea farmers. It covers inpatient treatments and death episodes. Both insurance policies were available on the market at the time of the baseline.

In 2010, at the time of the baseline, 27% of the respondents claimed to live in a household with someone covered by health insurance. At the time of the follow-up survey in early 2012, 50% of the respondents reported to live in a household covered by health insurance, suggesting that demand for health insurance increased over this two years period.

3 The fact that farmers made decisions about purchases in advance, and that payments were automatically deducted from subsequent wages, is hypothesized to have helped mitigate potential problems of time inconsistency that might have deterred farmers from signing up. See, e.g., Duflo, Kremer, and Robinson (2011) for an example in which individuals' investment decisions are better made when locked in farther in advance.

4 In order to have most information available regarding health insurance utilization were interviewed also 28 tea farmers who purchase Bima ya Jamii but were not included in the original sample.

5 At the time that individuals made decisions about whether to purchase Bima ya Jamii under our experiment, NHIF covered only inpatient care. The expansion to include outpatient care – with an accompanying near-doubling of insurance premiums – is the reason that CIC took the Bima policy, which included NHIF cover, off the market.

Table 1: Summary statistics: insurance participation

Variable	Mean	(Std. Dev.)	Min.	Max.	N
Baseline					
1[covered by any health/hospitalization insurance]	0.27	(0.444)	0	1	1525
Follow-up					
1[covered by ByJ -survey data-]	0.203	(0.403)	0	1	1514
1[covered another health/hospitalization insurance apart from ByJ]	0.332	(0.471)	0	1	1514
1[covered by any health/hospitalization insurance]	0.495	(0.5)	0	1	1514

Note: This table include summary statistics about insurance perceptions at the baseline and followup survey. Column (1) and (2) report, respectively, sample averages and standard deviations. Columns (3) to (5) report respectively the minimum and maximum value of the variables and the number of observations.

This is not simply an expansion linked to Bima ya Jamii. Table 2 reports transition probabilities from one policy insurance state to the other. Among the individuals who were covered with a health insurance at the time of the baseline, we find that 42% renewed that policy, 21% subscribed to *Bima ya Jamii* and 36% had cancelled their policy by the time of the endline survey. On the other hand, among those who were not covered by health insurance, 19% subscribed to Bima ya Jamii, and 25% purchased another health insurance, while the rest remained uninsured. Overall, *Bima ya Jamii* gained a market share of 39% in the local health insurance market.

Table 2: Transition probabilities health insurance status

	Followup			
	Other Health Insurance	Bima ya Jamii	None	Total
Baseline				
Other Health Insurance	170	83	145	398
	(42.71%)	(20.85%)	(36.43%)	(100%)
None	266	199	606	1071
	(24.84%)	(18.58%)	(56.58%)	(100%)
Total	436	282	751	1469
	(29.68%)	(19.20%)	(51.12%)	(100%)

Note: This table include transaction of insurance status from baseline to follow-up. In brackets are reported transaction probabilities.

Tables 3 and 4 present cross tabulations for insurance take-up in treatment and control groups, divided between baseline and follow-up data. Table 3 reports take-up rate for any health insurance. At the baseline the insurance take-up rate was 28% in the control group, and 26% in the treatment group. At the follow-up in 2012, take upwas 49% in the control group and 50% in the treatment group.

Table 3: Insurance purchase, by treatment

	1[covered by any health insurance]		
	No	Yes	Total
Baseline			
Control Group	72.03 %	27.97 %	100
Treatment Group	73.60 %	26.40 %	100
Follow-up			
Control Group	50.96 %	49.04 %	100
Treatment Group	50.23 %	49.77 %	100

Note: This table display the percentage of individuals who purchased insurance in the baseline and follow-up survey by center-level treatment.

Hence health purchase decision in treatment and control groups are very similar in treatment and control group both at the baseline and at the end-line survey.

Table 4: Bima ya Jamii purchase, by treatment

	1[covered by ByJ]		
	No	Yes	Total
Baseline			
Control Group	100 %	0 %	100
Treatment Group	100 %	0 %	100
Follow-up			
Control Group	85.46 %	14.54 %	100
Treatment Group	75.56 %	24.44 %	100

Note: This table display the percentage of individuals who purchased Bima ya Jamii in the baseline and follow-up survey by center-level treatment.

Table 4 reports on the *Bima ya Jamii* insurance purchase decision. As expected, the take up rate for *Bima ya Jamii* insurance is zero at the baseline (although the product was being sold by then in other areas, it had not been rolled out in the survey area). Whereas in the end line 24% of the individuals in the treatment and 15% in the control group subscribed to Bima ya Jamii. Purchase decisions in the control group are probably due to spillover effects of our marketing intervention; for practical and ethical reasons, *Bima ya Jamii* was made available to all Wananchi members, and individuals in control centres may have learned of its availability either from peers in treated centres or at the SACCO's branch offices. Taken together, health insurance expanded similarly in the control and treatment group, and *Bima ya Jamii* expanded in both as well, but disproportionately.

Table 5 explores this further, by presenting estimates of the impact of our treatment arms on the demand for health insurance. The first four columns estimate a linear probability model, with the dichotomous dependent variable equal to one if at the time of the follow-up survey, any insurance is purchased. The first column shows results for a pooled specification, in which the treatment indicator equals to one if the respondent belongs to any

treatment group. The second column considers separately all of our experimental treatments, and the third column presents a saturated model that allows for all interactions between different treatments.

When facing the full premium cost of the policy, individuals in treatment groups are not more likely to purchase health insurance than individuals in the control group: basic marketing does not expand the market for insurance. As shown in column (2), reductions in price do appear to induce individuals to purchase health insurance, and column (6), where the dependent variable is *Bima ya Jamii* policy in particular, reveals that this is broadly driven by decisions to purchase the policy in question. Notably, the referral incentive – which in principle allowed individuals to achieve a lower price for the policy by referring other members of their tea centre to join – appears to have hurt rather than helped demand; this effect is sufficient to offset entirely the average effect of the discount vouchers on take-up across treated centres. We conjecture that, in a climate in which concerns over ponzi schemes were widespread (and anectodal evidence suggests that there had been several high-profile Ponzi schemes around the time of the marketing intervention), the referral incentive may have undermined trust in the product. Moreover, financial literacy training courses did not expand demand for health insurance in general, or for Bima in particular

Therefore overall these results suggest that the decision to purchase health insurance coverage was sensitive to prices, but just increasing policy suppliers did not increase total demand. The overall increase in health insurance policies in the area is likely to be linked with secular trends rather than anything specific about the expansion of suppliers.[6] Price discounts to *Bima ya Jamii* boosted overall demand and the size of the market. Referral incentives dampened demand for *Bima ya Jamii* but also overall demand. Columns five to seven estimate a linear probability model whose dependent variable is equal to one if *Bima ya Jamii* is purchased. Individuals in treatment groups are 9.9 probability points more likely to purchase *Bima ya Jamii* than individuals in the control group. The CIC marketing strategy and price reduction proved to be effective in gaining market shares relative to the other two competitors (NHIF and Majani insurance). Finally, columns eight to ten estimate a linear probability model where the dependent variable is equal to one if any other health insurance different from Bima ya Jamii has been purchased. Note that the sum of first fourth and seventh column is not equal to zero due to 61 individuals who purchased *Bima ya Jamii* and another health insurance. Here, it is notable that the referral incentive appears to have sufficiently affected trust in the health insurance offered that it actually reduced demand for competitors' policies as well as for Bima ya Jamii.

6 We cannot fully exclude that large spillovers from the presence of Bima ya Jamii in the treatment group boosted overall demand in the control group, contributing to the overall increase in uptake in a way indistinguishable from a secular trend.

Table 5: Impact of treatment arms on insurance demand

	Any Health Insurance				Bima ya Jamii			Other Health Insurance		
treatmmy	0.0186				0.0990***			-0.0829**		
	(0.0374)				(0.0250)			(0.0382)		
voucher 365 KShs		0.115***		0.0850***		0.0693*			0.0468	
		(0.0365)		(0.0318)		(0.0364)			(0.0369)	
voucher 730 KShs		0.0858**				0.0962***			-0.0106	
		(0.0413)				(0.0329)			(0.0382)	
CIC only		0.0224	0.0144			0.0737*	0.126**		-0.0428	-0.0695
		(0.0478)	(0.0515)			(0.0419)	(0.0534)		(0.0518)	(0.0570)
CIC + referral incentive		-0.111**	-0.129*	-0.0850**		0.0128	-0.0311		-0.149***	-0.135**
		(0.0557)	(0.0653)	(0.0425)		(0.0353)	(0.0405)		(0.0539)	(0.0612)
CIC + SCC		-0.0505	-0.0244			0.0472	0.0391		-0.0895*	-0.0792
		(0.0471)	(0.0575)			(0.0444)	(0.0441)		(0.0504)	(0.0584)
t1v1			0.106				-0.0496			0.0893
			(0.0645)				(0.0757)			(0.0688)
t1v2			0.117*				0.0485			0.0291
			(0.0642)				(0.0675)			(0.0660)
t2v1			0.149**				0.163***			0.00794
			(0.0608)				(0.0577)			(0.0578)
t2v2			0.107				0.141**			-0.0231
			(0.0681)				(0.0590)			(0.0596)
t3v1			0.0895				0.0933**			0.0435
			(0.0639)				(0.0467)			(0.0640)
t3v2			0.0340				0.0986**			-0.0958
			(0.0800)				(0.0409)			(0.0713)
Constant	0.490***	0.497***	0.490***	0.503***	0.145***	0.145***	0.145***	0.380***	0.380***	0.380***
	(0.0319)	(0.0319)	(0.0320)	(0.0209)	(0.0174)	(0.0175)	(0.0175)	(0.0316)	(0.0317)	(0.0317)
Observations	1514	1514	1514	1514	1514	1514	1514	1514	1514	1514

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Linear probability model, with robust standard errors clustered at tea-center level. In column (1), (2) and (3) (4) dependent variable is an indicator of insurance purchase (it equals 1 if respondent self-reported to have at least one health insurance). In column (5), (6) and (7) dependent variable is an indicator of *Bima ya Jamii* purchase (it equals 1 if respondent self-reported to have purchased Bima ya Jamii). In column (8), (9) and (10) dependent variable is an indicator of any health insurance purchase except *Bima ya Jamii* (it equals 1 if respondent self-reported to have health insurance but not *Bima ya Jamii*).

3.2. OUTCOMES OF INTEREST

3.2.1. HEALTH OUTCOMES

Our first outcomes of interest are health facilities' utilization indicators reported in Table 6 for follow-up data. The first column shows mean values and standard deviations for each variable are reported. The second and third column gives estimates and standard errors for a multiple regression with 'Any health insurance at the follow-up' and 'Bima ya Jamii' variables. The second column offers the difference between individuals with any health insurance and individuals with no health insurance, while the third column is the difference between individuals with any health insurance and individuals covered with Bima ya Jamii. Note that these differences are just descriptives suggesting correlates, and not telling us whether health insurance or *Bima ya Jamii* had any impact on these outcomes, as this is not a comparison between treatment and control groups but comparisons based on actual decisions to buy *Bima ya Jamii* or other health insurance across these groups. Actual impacts of insurance are discussed in the next section.

On average 56% of the respondents in the sample reported health expenditure in the last year, spending on average 12,524 KHsh (approximately 140 USD).

Estimates reveal that individuals with health insurance are on average more likely to incur medical expenditure relative to individuals with no health insurance (after taking into account insurance). They are also more likely to occur in inpatient and outpatient treatments, and spend more on average.

In the follow-up sample 38% of the household reported to have at least one household member suffering from a range of diseases such as: fever, diarrhoea, vomiting, and injury due to accident in the last three months. On average households covered with health insurance are more likely to report such diseases. For all the household members older then 12, it was asked if they were unable to work, and if not, the total number of days they were unable to perform their usual daily activities due to diseases. On average 13% of the individuals reported to have household members not able to work due to illness, for an average number of 2.3 days in the last three months. There seems to be no differences between individuals covered with health insurance and individuals without policy coverage in terms of likelihood to be unable to work due to illness.

Table 6: Summary statistics: Health indicators - followup data

	Mean	Any insurance at followup	Bima	N
Health Usage				
1[Any hh medical expenditure]	0.56	0.08***	0.00	1463.00
	(0.50)	(0.03)	(0.04)	(.)
1[In-patient treatment in last 12 months]	0.13	0.04*	0.00	1511.00
	(0.34)	(0.02)	(0.03)	(.)
1[Out-patient treatment in last 12 months]	0.52	0.08***	-0.02	1511.00
	(0.50)	(0.03)	(0.04)	(.)
Health Expenditure				
ln(tot hh medical expenditure, -all episodes available- KShs)	4.51	0.84***	0.02	1514.00
	(4.07)	(0.24)	(0.30)	(.)
ln(tot hh inpatient costs -last episode-, KShs)	1.05	0.37**	0.12	1513.00
	(3.00)	(0.18)	(0.22)	(.)
ln(tot hh outpatient costs -last episode-, KShs)	3.33	0.56***	-0.02	1498.00
	(3.38)	(0.20)	(0.25)	(.)
Health Indicators				
1[If anyone in the HH suffered from fever, diarrhea, couching with blood, or pre	0.38	0.08***	0.01	1527.00
	(0.49)	(0.03)	(0.04)	(.)
1[unable to work due to illness]	0.13	0.02	0.02	1527.00
	(0.34)	(0.02)	(0.03)	(.)
total number of days unable to work due to illness	2.26	-0.23	0.54	1526.00
	(9.82)	(0.59)	(0.73)	(.)
Subject Wellbeing				
Feel stand on the ladder (10 best possible)	4.86	0.35***	-0.13	1513.00
	(1.75)	(0.10)	(0.13)	(.)
hh aggregate health, own perception	0.72	0.04***	-0.02	1402.00
	(0.20)	(0.01)	(0.02)	(.)
Health Shock				
1[HH suffered in the last year a serious illness/accident shock]	0.20	0.03	0.02	1527.00
	(0.40)	(0.02)	(0.03)	(.)

Note: Follow-up data only. In the first column are displayed mean values and standard deviation in parenthesis. In the second and third column are reported estimates and standard errors for a multiple regression with *Any health insurance* and *Bima ya Jamii* variables.

Our first indicator for subject wellbeing is based on a question that asks to indicate on a scale from one to ten where the respondent would place his life satisfaction at present. On average individuals living in households covered with health insurance consider the quality of their life better than individuals living without health insurance. This variable is not directly capturing health status, for this reason a second indicator is explicitly intended to report household aggregate health status perception. It is based on a self-reported health score, adjusted on respondent's scale in order to make it comparable across different individuals, and averaged with the worst and the best healthy person in the household. By construction this indicator varies between zero and one, where low values indicate lower self-perceived health status. Respondents living in household covered with health insurance on average report higher values for self-reported health perception.

3.2.2. OTHER OUTCOMES

Table 7 reports a variety of individuals' characteristics, different from health, that are likely to be affected by health insurance. On average, households living with health insurance have higher levels of consumption compared with those without coverage. We construct a measure for food consumption as the sum of purchased food in the last 7 days, plus the value of food consumed from own stock or production, and received as gift or transfer for a range of 30 different food items. Our measure of non-food consumption is based on the sum of the estimated value for 24 different non-food items purchased in the past month. Including goods such as clothes, shoes, toilet products, electricity and phone charges but do not include health related items, nor health insurance. Finally, per capita consumption is based on total consumption (sum of food and non-food consumption in the last month) divided by the number of individual living in the household.

Consumption data suggest that individuals covered with health insurance are richer than individuals with no health coverage. On the other hand, households covered with the *Bima ya Jamii* insurance policy appear to have consumption values significantly lower than households with other insurance policies.

Households covered with health insurance have higher values of assets and savings. A measure of household assets value is calculated by summing the value of cattle own by the family, the value of car, motorcycle, TV and mobile phone, and finally the value of savings and money owed by the household. The total value of savings is given by the amount of savings deposited with Wananchi

Table 7: Summary statistics: Other indicators - followup data

	Mean	Any insurance at followup	Bima	N
Consumption				
ln(value of food consumption in past 7 days, KShs)	7.67	0.17***	-0.04	1509.00
	(0.63)	(0.04)	(0.05)	(.)
ln(value of hh non-food consumption, last month, KShs)	8.57	0.67***	-0.47***	1527.00
	(1.69)	(0.09)	(0.11)	(.)
ln(per capita consumption, KShs/month)	8.62	0.32***	-0.16***	1509.00
	(0.79)	(0.05)	(0.06)	(.)
Assets				
ln value HH assets, KShs	11.04	0.41***	-0.09	1480.00
	(1.05)	(0.06)	(0.08)	(.)
Savings				
Value of total savings owned, KShs	9433.09	3047.26*	-981.19	1527.00
	(28445.70)	(1698.51)	(2109.67)	(.)
1[Always/frequently keep cash or savings reserve for emergency expenses]	0.46	0.11***	-0.07*	1511.00
	(0.50)	(0.03)	(0.04)	(.)
Credit				
1[Borrowed from any source for medical cost]	0.04	0.01	-0.01	1527.00
	(0.19)	(0.01)	(0.01)	(.)
1[Borrowed from formal source for medical cost]	0.02	0.00	0.01	1527.00
	(0.15)	(0.01)	(0.01)	(.)
1[Borrowed from informal source for medical cost]	0.02	0.01	-0.03***	1527.00
	(0.13)	(0.01)	(0.01)	(.)

Note: Follow-up data only. In the first column are displayed mean values and standard deviation in parenthesis. In the second and third column are reported estimates and standard errors for a multiple regression with *Any health insurance* and *Bima ya Jamii* variables.

SACCO and other financial institutions. On average 46% of the individuals in our sample keep always or frequently precautionary savings for emergency expenses. In this respect *Bima ya Jamii* holders differ from other insured people for keeping less precautionary savings.

Table 8 and table 9 report the same variables now for baseline data. In addition to the first three columns presented in the previous tables, the fourth column reports estimates and standard deviations for a single regression with individuals who were covered by health insurance at the baseline. It shows that individuals covered with health insurance are richer than those not covered with health insurance – bringing home clearly that we should be careful to attribute any causality between insurance and the outcomes introduced in this section. Exploiting the experiment, the next section will more systematically try to address the question of impact of health insurance on a set of outcomes.

Table 8: Summary statistics: Health indicators - baseline data

	Mean	Any insurance at followup	Bima	Any insurance at baseline	N
Health Usage					
1[Any hh medical expenditure]	0.41	0.06**	-0.07**	0.02	1453.00
	(0.49)	(0.03)	(0.04)	(0.03)	(.)
1[In-patient treatment in last 12 months]	0.10	0.02	-0.04	0.02	1484.00
	(0.30)	(0.02)	(0.02)	(0.02)	(.)
1[Out-patient treatment in last 12 months]	0.36	0.06**	-0.06	0.01	1477.00
	(0.48)	(0.03)	(0.04)	(0.03)	(.)
Health Expenditure					
ln(tot hh medical expenditure, -all episodes available- KShs)	6.90	0.32**	-0.08	-0.07	600.00
	(1.76)	(0.16)	(0.21)	(0.16)	(.)
ln(tot hh inpatient costs -last episode-, KShs)	9.33	0.28	-0.14	0.07	120.00
	(1.73)	(0.35)	(0.48)	(0.34)	(.)
ln(tot hh outpatient costs -last episode-, KShs)	6.47	0.29*	0.13	-0.02	528.00
	(1.49)	(0.15)	(0.19)	(0.14)	(.)
Health Indicators					
1[if anyone in the HH suffered from fever, diarrhea, etc.]	0.38	0.04	-0.07*	-0.00	1525.00
	(0.48)	(0.03)	(0.04)	(0.03)	(.)
1[unable to work due to illness]	0.15	0.02	-0.03	-0.02	1525.00
	(0.35)	(0.02)	(0.03)	(0.02)	(.)
total number of days unable to work due to illness	1.74	0.81*	-0.29	-0.12	1524.00
	(7.26)	(0.44)	(0.56)	(0.42)	(.)
Subject Wellbeing					
Feel stand on the ladder (10 best possible)	4.58	0.36***	0.14	0.25***	1485.00
	(1.69)	(0.10)	(0.13)	(0.10)	(.)
hh aggregate health, own perception	0.72	0.02	0.01	0.01	1402.00
	(0.19)	(0.01)	(0.02)	(0.01)	(.)
Health Shock					
1[HH suffered in the last year a serious illness/accident shock]	0.16	0.05**	-0.00	0.06***	1525.00
	(0.36)	(0.02)	(0.03)	(0.02)	(.)

Note: Baseline data only. In the first column are displayed mean values and standard deviation in parenthesis. In the second and third column are reported estimates and standard errors for a multiple regression with *Any health insurance at the followup* and *Bima ya Jamii* variables. Finally in the fourth column are reported estimates and standard deviations for a single regression with individuals who were covered by health insurance at the baseline.

Table 9: Summary statistics: Other indicators - baseline data

	Mean	Any insurance at followup	Bima	Any insurance at baseline	N
Consumption					
ln(value of food consumption in past 7 days, KShs)	7.60	0.14***	-0.04	0.12***	1487.00
	(0.59)	(0.04)	(0.05)	(0.03)	(.)
ln(value of hh non-food consumption, last month, KShs)	8.00	0.32***	-0.01	0.75***	1525.00
	(1.74)	(0.10)	(0.13)	(0.10)	(.)
ln(per capita consumption, KShs/month)	8.33	0.06	0.07	0.25***	1487.00
	(0.74)	(0.04)	(0.06)	(0.04)	(.)
Assets					
ln value HH assets, KShs	10.60	0.36***	0.02	0.35***	1465.00
	(1.12)	(0.07)	(0.08)	(0.06)	(.)
Savings					
Value of total savings owned, KShs	8925.33	2029.77	-3867.81	2948.24	1525.00
	(50079.03)	(3057.25)	(3880.28)	(2887.94)	(.)
1[Always/frequently keep savings for emergency expenses]	0.37	0.05*	0.02	0.05*	1476.00
	(0.48)	(0.03)	(0.04)	(0.03)	(.)
Credit					
1[Borrowed from any source for medical cost]	0.04	0.01	-0.02	-0.01	1525.00
	(0.19)	(0.01)	(0.01)	(0.01)	(.)
1[Borrowed from formal source for medical cost]	0.02	0.01	-0.03**	0.00	1525.00
	(0.15)	(0.01)	(0.01)	(0.01)	(.)
1[Borrowed from informal source for medical cost]	0.01	0.01	0.01	-0.01	1525.00
	(0.12)	(0.01)	(0.01)	(0.01)	(.)

Note: Baseline data only. In the first column are displayed mean values and standard deviation in parenthesis. In the second and third column are reported estimates and standard errors for a multiple regression with *Any health insurance at the followup* and *Bima ya Jamii* variables. Finally in the fourth column are reported estimates and standard deviations for a single regression with individuals who were covered by health insurance at the baseline.

4. IMPACT OF HEALTH INSURANCE

This section evaluates the impact of having a health insurance product. Given our design, it is possible to investigate the impact of microinsurance product on different dimensions of both health and economic outcomes. Given that being uninsured implies expensive ex-ante risk management strategies, health insurance can change outcomes even among those households that do not experience health shocks. We begin by presenting the econometric strategy employed for the analysis, followed by an interpretation of the impact on the outcomes of interest. This econometric strategy is common across outcome measures, except where otherwise noted.

4.1. ECONOMETRIC STRATEGY

For descriptive purposes, we first estimate for each outcome measure an unconditional Ordinary Least Squares (OLS) regression, that compare outcomes *Y* across treated and non-treated individuals *i* in tea centre *c* and period *t*. The value of the dummy variable Insurancei is equal to one for those individuals who purchased any health insurance,[7] and is zero otherwise. The estimate regression is:

$$Y_{ict} = \alpha + \beta_1 Insurance_{ict} + \varepsilon_{ict}, \quad (1)$$

where in this specification we restrict attention to the post-intervention period, $t = 2$. The main problem in estimating equation (1) is that the decision to purchase insurance is likely to depend on individuals unobservable characteristics. Self-selection of individuals based on characteristics that also affect the outcome Y_i implies a non-zero correlation between the insurance indicator, $Insurance_i$, and the error term, ε_i, in equation (1). This represents a violation of one of the key assumptions of OLS, leading to biased estimates for the causal effect of insurance participation. In order to obtain unbiased estimates of appropriately defined causal effects, as discussed below, we will exploit the programme experimental design used promoting *Bima ya Jamii* insurance policy.

The first estimation methodology implemented is the Intent-to-Treat effect (ITT). In the scenario with experiments with imperfect compliance ITT compares individuals according on whether or not they were randomly offered the treatment, even if those individuals may have not ended up taking up the treatment.

$$ITT = E[Y_{ict}|Z_{ict} = 1] - E[Y_{ict}|Z_{ict} = 0] \quad (2)$$

Our experiment program placement (defined as Z_{ict}) was randomly assigned among different tea centers. Therefore the difference expressed in equation 2 can be causally attributed to the program placement. However, since individuals were free to decide whether or not to take insurance, this is not equal to the effect of having *Bima ya Jamii* health insurance – rather, it reflects the impact of the marketing (or related) treatment. This estimate is of direct policy interest, since it reflects the impacts of those cluster-level marketing policies that are under policymakers' control, and at which level the fixed costs of intervention are incurred.

7 As will be described below, we employ similar specifications for both the purchase of health insurance of any type, and of the Bima ya Jamii policy in particular.

ITT is empirically estimated implementing the following regression:

$$Y_i = \alpha + \beta_1 Treatment_i + \varepsilon_i \quad (3)$$

where *Treatment*, is a dummy variable equal to one if the individual *i* belongs to a tea center were the insurance was promoted. Since treatment was randomly assigned, β_1 has a causal interpretation. When the various marketing treatments are pooled in this fashion, this parameter represents the causal effect of offering health insurance, averaged across the three treatment arms. These averages embody both the impacts of health insurance for those who take it up, and the (potentially different) take-up rates within each treatment arm.

The second approach exploits the fact that experimental treatment arms are randomly distributed across the population and uses them as instrumental variables to predict health insurance purchase decision. This instrumental variables (IV) approach requires having at least one instrument that affects the likelihood of an individual to receive the treatment, but it has no direct effect on the outcome of interest. That means that instruments need to satisfy two basic conditions: instrument exogeneity and instrument relevance.

The first condition requires that the instruments are both *independent* of potential outcomes – that is, that they are 'as good as' randomly assigned – and that the instruments satisfy an *exclusion restriction*, under which they have no effect on outcomes of interest apart from their impact on insurance demand. As previously explained, program implementation was based on three treatment arms randomly distributed in the population. They were based on three different marketing strategies, leaving one control group where the policy was not promoted. Moreover, within the three treatment groups a second round of randomization was implemented, distributing discount vouchers respectively of 10% and 20%. Given that treatments were randomly distributed, independence should hold. However, the exclusion restriction is harder to satisfy in this context. There are some cases in which marketing assignments might be thought to affect outcomes directly. Firstly, such a violation could occur if the reduction in premium price made treated individuals better off than untreated. But this would be hardly the case given the small amount of money given as discount. Secondly, the exclusion restriction might be violated if attending SCC trainings made individuals more conscious about their health, and so affected either health-seeking or savings behaviors in that way.

The second condition required is that instruments are relevant in explaining the variation of the endogenous variable. If instruments are not relevant we would have a weak instruments problem. The Cragg-Donald test can be implemented for testing weak identifications. In the first four columns in table 5 are reported estimated value for all our treatment arms on insurance participation. In order to satisfy the Cragg-Donald test we implemented the following reduced form implementing a limited information maximum likelihood (LIML) estimator, as reported in column four table 5. Insurance participation is estimated with v_{ict} and $referral_{ict}$, where: v_{ict} is a dummy variable equal to one if individual *i* received a discount voucher that reduce premium costs by ten percent, zero otherwise; $Referral_{ict}$ is a dummy variable equal to one if individual *i* belongs to a tea center where were given the opportunity to reduce the premium price of the policy by signing their peers.

$$Insurance_{ict} = \gamma_0 + \gamma_1 v_{ict} + \gamma_2 referral_{ict} + u_{ict} \quad (4)$$

The rationale for using an LIML estimator is that it has the same asymptotic distribution as 2SLS, but it provides a finite-sample bias reduction (Andrist and Pischke, 2009). As can be seen from the results, our instruments perform reasonably albeit rather weak.[8] It means that some caution is required with the results, although as will be seen the patterns are sensible.

The second-stage substitutes the predicted value of Insurance from the first-stage in to equation 5.

$$Y_{ict} = \alpha + \beta_1 \widehat{Insurance}_{ict} + \varepsilon_{ict} \quad (5)$$

If instruments are randomly assigned, then IV estimates give a local average treatment effect for a specific subpopulation. LATE is interpreted as the effect of the treatment on those who comply with the offer, but are not treated otherwise (Andrist and Pischke, 2009).

Finally, exploiting data from the baseline, we are able to perform household fixed effect estimations implementing a first different strategy combined with instrumental variable. Differencing panel data over time allows eliminating time-constant unobserved effects that might bias estimates. This is particularly useful if individuals who purchased health insurance present unobserved time invariant characteristics. While unobservable differences between individuals who decide to buy insurance and those who did not are not completely explained by unobserved time invariant factors, a fixed effect analysis combined with instrumental variables is implemented.

8 This is partly linked to the fact that we only have exogenous instruments from the experiment for the uptake of Bima ya Jamii while, given the presence of various insurance products and given that Bima ya Jamii largely captures market shares rather than expands the market, the appropriate analysis is to ask whether any health insurance has impacts on outcomes.

Treatments are assigned at the tea center level, leading to spatial correlation among farmers belonging to the same tea center. Consequently, we report standard errors clustered at the tea center level for all the previous estimates (Multon 1986).

4.2. IMPACT ESTIMATION

Table 10 reports estimates for health indicators employing the econometric models described in the previous section.

Table 10: Impact of health insurance on health indicators

	OLS	ITT	LATE	FD-IV
Health Usage				
1[Any hh medical expenditure]	0.08***	-0.03	-0.35	0.20
	(0.02)	(0.03)	(0.32)	(0.36)
1[In-patient treatment in last 12 months]	0.04**	-0.01	-0.15	0.18
	(0.02)	(0.02)	(0.16)	(0.26)
1[Out-patient treatment in last 12 months]	0.08***	-0.04	-0.25	0.33
	(0.02)	(0.03)	(0.41)	(0.44)
Health Expenditure				
ln(tot hh medical expenditure, -all episodes available- KShs)	0.28*	0.01	-2.45*	-0.25
	(0.14)	(0.12)	(1.42)	(1.77)
ln(tot hh inpatient costs -last episode-, KShs)	0.39	0.09	2.21	-1.36***
	(0.25)	(0.25)	(3.05)	(0.44)
ln(tot hh outpatient costs -last episode-, KShs)	0.15	-0.03	-0.34	2.63
	(0.10)	(0.10)	(1.28)	(4.95)
Health Indicators				
1[if anyone in the HH suffered from fever, diarrhea, etc.]	0.08***	0.06**	0.11	0.61
	(0.03)	(0.03)	(0.31)	(0.44)
1[unable to work due to illness]	0.03*	0.03	0.11	0.61
	(0.02)	(0.02)	(0.29)	(0.42)
total number of days unable to work due to illness	0.01	0.78	4.96	9.54
	(0.53)	(0.48)	(8.63)	(8.34)
Subject Wellbeing				
Feel stand on the ladder (10 best possible)	0.27***	-0.09	-0.30	-1.78
	(0.09)	(0.12)	(1.18)	(1.47)
hh aggregate health, own perception	0.03***	0.01	-0.10	-0.08
	(0.01)	(0.01)	(0.13)	(0.13)
Health Shock				
1[HH suffered in the last year a serious illness/accident shock]	0.04*	-0.01	-0.09	0.09
	(0.02)	(0.02)	(0.30)	(0.30)

Note: The value for the Kleibergen-Paap rk Wald F statistics (to be implement in substitution of the Cragg-Donald Wald F statistics in case of clustered analysis) is 5.10 for LATE estimates and 3.15 for FD-IV. Stock-Yogo weak ID critical values are the following: 8.68 for 10% maximal LIML size, 5.33 for 15% maximal LIML size, 4.42 for 20% maximal LIML size, and finally 3.92 for 25% maximal LIML size.

Estimates suggest that health insurance provides a reduction in household medical expenditure. This effect is present for LATE estimates for total medical expenditure, and first difference estimates for inpatient treatments. It is worth noting that available insurance policies (including but not limited to Bima ya Jamii) covered only inpatient treatments during the period under consideration. Therefore we do not expect any effect on outpatient treatments. Excluding the OLS estimates none of the health facility utilization estimators are statistically significant. This suggests that health insurance has not increased the probability of going to the hospital, but has decreased the amount spent on visits that would have occurred irrespective of coverage. Given the policy's focus on inpatient – largely emergency – care, this is not entirely surprising, although one might hope to see utilization rates increase over a longer period of study, as trust in the policy and views of the standard of care improve.

ITT estimates of health measures suggest that individuals in our treatment are more likely to report household members suffering fever and diarrhoea relative to individuals in our control group. It is therefore possible that our treatments made individuals more aware about their health, and in some cases produced hypochondriac behaviours in treated population.

Finally, health insurance seems to not produce any effect on self-wellbeing perception nor on health shock.

Table 11 reports estimates of the impact of health insurance on consumption, assets, savings and borrowing. The estimates suggest that health insurance is producing positive effects on household non-food consumption and per capita consumption. It is reasonable to assume that having access to health protection can induce an increase in productivity, leading to an increase in consumption or some net savings on health spending, leaving cash for other consumption spending. There is however no evidence for assets and savings being directly affected by health insurance participation.

Table 11: Impact of health insurance on poverty reduction

	OLS	ITT	LATE	FD-IV
Consumption				
ln(value of food consumption in past 7 days, KShs)	0.17***	-0.01	0.55	0.66
	(0.03)	(0.04)	(0.40)	(0.44)
ln(value of hh non-food consumption, last month, KShs)	0.49***	0.08	1.94	2.35*
	(0.07)	(0.11)	(1.34)	(1.41)
ln(per capita consumption, KShs/month)	0.25***	0.02	1.09**	0.38
	(0.04)	(0.05)	(0.49)	(0.53)
Assets				
ln value HH assets, KShs	0.39***	-0.00	-0.26	-1.45
	(0.06)	(0.08)	(1.46)	(1.46)
Savings				
Value of total savings owned, KShs	2549.58	-148.90	17517.46	-6261.74
	(1576.49)	(1671.30)	(16198.23)	(16838.56)
1[Always/frequently keep savings for emergency expenses]	0.07***	0.03	0.09	0.16
	(0.03)	(0.03)	(0.35)	(0.47)
Credit				
1[Borrowed from any source for medical cost]	0.01	-0.02**	-0.13	-0.10
	(0.01)	(0.01)	(0.13)	(0.12)
1[Borrowed from formal source for medical cost]	0.01	-0.01	-0.13	-0.13
	(0.01)	(0.01)	(0.09)	(0.10)
1[Borrowed from informal source for medical cost]	-0.00	-0.02**	0.04	0.04
	(0.01)	(0.01)	(0.06)	(0.08)

Note: The value for the Kleibergen-Paap rk Wald F statistics (to be implement in substitution of the Cragg-Donald Wald F statistics in case of clustered analysis) is 5.10 for LATE estimates and 3.15 for FD-IV. Stock-Yogo weak ID critical values are the following: 8.68 for 10% maximal LIML size, 5.33 for 15% maximal LIML size, 4.42 for 20% maximal LIML size, and finally 3.92 for 25% maximal LIML size.

ITT estimates for credit behaviour are suggesting that promoting health insurance policy is reducing the probability to borrow for cover medical costs by 2 per cent. This reduction is driven by informal borrowing sources.

5. INSURANCE RENEWALS AND EXPERIENCE

This section discusses insurance usage and the insurance experience among *Bima ya Jamii* clients. It also investigates the determinants of the willingness to renew insurance. We could not study actual renewal as since completing the experiments, the *Bima ya Jamii* has been changed substantially due to changes in the functioning of the hospitalization insurance, and currently only on offer in a very different way.

Table 13: Insurance experience with ByJ

Variable	Mean	(Std. Dev.)	Min.	Max.	N
Insurance Usage					
1[Received the card within one month]	0.601	(0.49)	0	1	306
1[Any household member attempted to use ByJ]	0.141	(0.348)	0	1	306
1[Any household member refused when attempting to use ByJ]	0.062	(0.242)	0	1	306
1[Any household member successfully use ByJ]	0.095	(0.293)	0	1	306
How many times they attempted to use it	1.326	(0.837)	1	4	43
Insurance Satisfaction					
1[If Satisfied or Very Satisfied]	0.484	(0.501)	0	1	306
1[If Unsatisfied or Very Unsatisfied]	0.173	(0.379)	0	1	306
1[glad purchased insurance]	0.824	(0.382)	0	1	306
Why Positive					
1[positive experiences with hospital staff]	0.05	(0.218)	0	1	141
1[policy was easy to use]	0.255	(0.438)	0	1	141
1[Saved Money]	0.44	(0.498)	0	1	141
1[used hospital when otherwise would not]	0.113	(0.318)	0	1	141
Why Negative					
1[difficulties in using policy]	0.585	(0.497)	0	1	53
1[negative experiences with hospital staff]	0.132	(0.342)	0	1	53
1[too expensive]	0.094	(0.295)	0	1	53
Renewal					
1[Would you purchase the same policy today]	0.719	(0.45)	0	1	306
1[Would you purchase a policy covering in-patient, out-patient and prescriptions]	0.581	(0.494)	0	1	270

Note: This table include summary statistics about insurance experience at the follow-up survey. Column (1) and (2) report, respectively, sample averages and standard deviations. Column (3) and (5) report, respectively, the minimum and maximum value of the variables and the number of observations.

Table 13 reports some summary statistics about the usage experience of the *Bima ya Jamii* clients. Among the 306 people in the sample who self-reported to be *Bima ya Jamii* clients, 14% of them attempted to use the policy in the last 12 months. Only 9.5% managed to use it successfully, and 6% of them had been rejected.

Overall satisfaction was found quite high, and 48% of the clients declared to be satisfied or very satisfied, and only 20% declared to be unsatisfied or very unsatisfied with the insurance policy. For those who declared themselves satisfied, the most common reason was that insurance allowed them to save money, while for those who were unsatisfied the most common reason are difficulties in using the policy. More than 80% of the clients were glad to have purchased the policy, and 71% of them would renew it today. Overall in our sample 59% of the people responded that they would purchase *Bima ya Jamii* today if offered, which is incidentally substantially higher than uptake of *Bima ya Jamii* during the study period, and even higher than the overall uptake of any health insurance policy in the period, which was just under 50%. Gratuitous questions are of course different from purchase decisions, but this would suggest a growing popularity of these products.

Given the high rate of respondents who reported to be willing to renew the policy, we investigate the determinants of the renewal decision investigate. The first column in Table 14 reports a linear probability model estimated where the dependent variable is a dichotomous variable equal to one if the individual kept an insurance policy from 2010 to 2012, starting from the sub-sample that had a policy at baseline. We use baseline characteristics to investigate the correlates of renewal. Recall that a quarter of the sample had health insurance at baseline, so we investigate their actual renewal decision. We find that households with educated members continued to hold a policy, but no other correlates are significant.

Table 14: Renewal decision

	1[Renewed since baseline]	1[Renew]	1[Renew]
1[Out-patient treatment in last 12 months]	0.0468	-0.0972*	-0.0592
	(0.0512)	(0.0516)	(0.0454)
1[In-patient treatment in last 12 months]	0.0378	-0.144*	-0.0914
	(0.0794)	(0.0766)	(0.0665)
age, HHH	-0.00187	0.00317*	0.00247
	(0.00201)	(0.00184)	(0.00175)
ln(HH size)	-0.0383	0.152***	0.106*
	(0.0535)	(0.0572)	(0.0578)
1[HHH female]	0.0449	-0.114*	-0.122*
	(0.0630)	(0.0605)	(0.0650)
1[any HH member post-primary education]	0.149**	-0.129*	-0.125**
	(0.0644)	(0.0720)	(0.0601)
voucher 20		-0.0133	-0.0195
		(0.0620)	(0.0578)
voucher 10		-0.0270	-0.0456
		(0.0599)	(0.0597)
1[positive experiences with hospital staff]			0.199***
			(0.0640)
1[policy was easy to use]			0.117*
			(0.0611)
1[Saved Money]			0.151***
			(0.0501)
1[used hospital when otherwise would not]			0.207***
			(0.0400)
1[difficulties in using policy]			-0.379***
			(0.0973)
1[negative experiences with hospital staff]			-0.275
			(0.201)
1[too expensive]			-0.597***
			(0.0711)
Constant	0.642***	0.581***	0.648***
	(0.136)	(0.166)	(0.155)
Observations	392	296	296

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Linear probability model, with robust standard errors clustered at tea-center level. Column (1) employs baseline data and dependent variable is equals 1 if respondent renewed any health insurance in the follow-up. Column (2) and (3) employs follow-up data and dependent variable is equals 1 if respondent self-reported to be willing to purchase again *Bima ya Jamii* .

The second and third column report a linear probability model based on the declared willingness to renew *Bima ya Jamii* using the follow-up data. CIC did not allow *Bima ya Jamii* clients to renew their policy, therefore we simply asked about a hypothetical renewal based on the same initial price[9]. In order to capture the price sensitivity we also randomly assigned (hypothetical) vouchers of 0%, 10% and 20% discount to the respondents. With the exception of the discount voucher, coefficients in the LPM model should not be interpreted as causal, but again just offering the correlates of those who renewed.

The second column suggests that having had inpatient or outpatient treatments in this period is negatively correlated with the willingness to renew insurance. However, once controlling for the feedback on the experience, whether you had outpatient or inpatient health treatment turns out to be insignificant. As expected, if one's experience with the policy and with health treatment was positive, the client is more likely to purchase the same policy today. In particular 'positive experiences with hospital staff' and 'made use of the hospital when otherwise they wouldn't use it' seems to be the most strongly correlated with the likelihood to purchase the same insurance policy again. On the other side reporting 'difficulties in using the policy' and claim that 'the policy is too expensive' are negative and statistical significant correlated with the likelihood to purchase the same policy. We find no effect of price itself on the renewal decision. Once people have had the product, their experience with the product seems more important than the price itself.[10]

In conclusion, the data suggest quite high satisfaction in the product, except for those who reported difficulties in using it. Moreover, hypothetical renewal decisions seem to be driven by factors linked to the positive or negative experience of using the policy or health services, rather than by having hospital visits during the period or the price of the product.

6. ADVERSE SELECTION

Exploiting price variation in the experimental intervention, this section investigates whether, among those individuals who purchased Bima ya Jamii, there is any evidence of self-selection based on premium price. If there is self-selection, in the form of adverse selection, then we expect that those who purchased insurance for a lower price have a lower probability to incur hospitalization.

The estimation technique is based on a linear probability model with the following specification:

$$Inpatient_{ict} = \alpha + \beta_1 v_{ict} + \beta_2 w_{ict} + \varepsilon_{ict} \quad (7)$$

where $Inpatient_{ict}$ is a dummy variable equal to one if any individual living in the household with individual i experienced an (in-patient) hospitalization episode in the last 12 months. v_{ict} and w_{ict} are dummy variables equal to one if the insurance was purchased using a discount voucher of 10 or 20 percent. The base category is those individuals who purchased the policy insurance without any discount voucher. The sample is restricted to only those individuals who purchased Bima ya Jamii. Standard errors are clustered at center level.

9 The fact the insurance is no longer available poses some questions regarding the correct price to ask for the willingness to renew the insurance. Despite the high inflation rate registered in Kenya in the period 2010-2012, CIC analysis suggested that the price for Bima ya Jamii in 2012 would be same as in 2010, given higher return of investment on capital. Therefore we investigated a willingness to buy the same policy insurance at the original price of 3650KSh. In order to investigate the price elasticity, random discounts of 0%, 10% and 20% were assigned in these willingness to pay questions.

10 Finally, we control for a set of socioeconomic variables. Renewal is positive correlated with household size, but it is negative correlated with having a female head of the household and having any household member with post-primary education. Given the patterns in columns (1), (2) and (3) on these variables, we should just treat them as controls without attaching too much interpretation to them.

The first column in table 15 suggests that individuals who purchase insurance with a discounted price premium are less likely to make use of inpatient treatments. People who decided to purchase insurance when it was offered at full price have some unobservable characteristics that make them more likely to incur in-patient hospitalization. These results seem to suggest a negative selection process in the decision to purchase insurance.

Table 15: Negative selection

	all	CIC only	referral incentive	SCC
voucher 365 KShs	-0.0932*	-0.164	8.73e-17	-0.288**
	(0.0524)	(0.104)	(0.121)	(0.113)
voucher 730 KShs	-0.0696	-0.0628	-0.0867	-0.235**
	(0.0484)	(0.0916)	(0.121)	(0.109)
Constant	0.195***	0.214***	0.167*	0.368***
	(0.0295)	(0.0674)	(0.0991)	(0.0849)
Observations	306	81	61	74

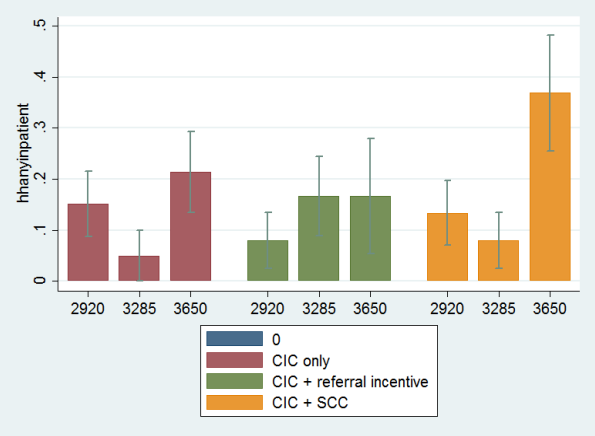
Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Linear probability model, with dependent variable equal to 1 if any household member reported inpatient visits in the last 12 months. In column (1) is employed the full sample from the followup survey. Columns (2), (3) and (4) are divided for center-level treatment arms.

Part of the experimental design was to provide also financial and risk management literacy training. The last three columns in table 15 report estimates that test separately for adverse selection within each of the possible treatment arms. Evidence for negative selection estimated in the full sample, is now found statistically significant only in literacy group training. These results seem to suggest that training courses helped individuals to understand better when it is worth to undertake health insurance, based on the expected level of health for the following year.

Figure 1 reports a visual identification for inpatient treatment.

Figure 1: Voucher and inpatient hospitalization over treatment arms



In conclusion, exogenous variation in premium prices reveals that on average individuals who purchase insurances at higher price have unobservable characteristics that make them more likely to require inpatient visits. These findings are suggesting an adverse selection process in the decision to purchase insurance. Results are similar if we estimate using the number of inpatient treatments.

7. CONCLUSIONS

This study has sought to investigate the effects of health insurance on health care outcomes and poverty. To do so, this paper employed a unique panel dataset of households involved in a randomized control trial conducted in Kenya. Households were offered to purchase *Bima ya Jamii* health insurance through different marketing strategies and at experimentally varied prices. These exogenous sources of variation allow us both to analyse the effects of alternative marketing strategies on the extent and composition of insurance demand, as well as to investigate the effect of health insurance.

The potential impacts of health insurance can be measured in several dimensions. We first investigate demand for health insurance. Data suggests that on average households that decided to purchase health insurance seem to be richer in terms of levels of consumptions, assets and savings, compared with households without health coverage.

Secondly we investigated the effects of having a health insurance on health care outcomes. Having health insurance seems to be associated with a reduction in total medical expenditure and inpatient costs. However, we do not find evidences on effects on health facility utilization or on subjective wellbeing.

Thirdly we estimate the effect of having health insurance on other outcomes. The results suggest that health insurance has positive effects on household non-food consumption and per capita consumption. Moreover, households who take up health insurance in response to the experimental treatments are less likely to borrow from informal sources to cover medical costs.

Fourthly we investigated the insurance experience and the willingness to renew the policy. On average the level of satisfaction is quite high, however some individuals reported difficulties in using the policy. The results suggest that the renewal decision is mainly driven by the positive or negative usage experience rather than simply by hospital usage and price.

Finally exploiting premium price variation we explore the possibility of adverse selection. We find that on average

individuals who purchased insurance at higher price have unobservable characteristics that make them more likely to require inpatient visits.

Taken together, these results suggest that health insurance is a potentially important policy tool in combating the adverse effects of health shocks, with two important caveats. In a mature market, interventions aimed to increase health insurance participation may function largely to divert demand from one supplier to another. In our study, whereas price does affect total demand, marketing strategies that provide information or reduce transaction costs by meeting farmers in their villages appear to have at most diversionary effects on take-up.

Moreover, while the health insurance policy appears to have been effective in reducing costs of inpatient care and, consequently, reducing needs for more costly forms of ex-post coping methods, the policy did not increase health facility utilization. This finding may be a result of the particular product under study: because it covered only inpatient care, this policy may not have affected prices for the types of preventative or non-urgent care over which individuals would have greater discretion. It is also possible that, because the study followed participants for only one year of insurance coverage, the amount of time available for participants to gain trust in the policy and in the healthcare facilities may not have been sufficient to allow for a behavioural response. Consequently, we suggest that an extension of this methodological approach to policies that encourage out-patient and preventative care appears to be an important area for future research.

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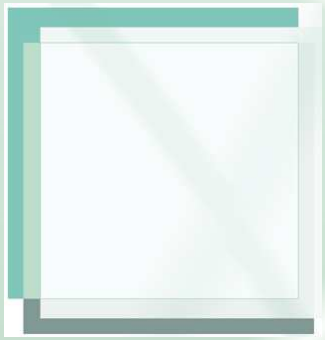
ANNEX

Table 12: Impact health insurance (ex-post)

	ln(food)	ln(non-food)	ln(pc-consumption)	ln(assets)	ln(tot-savings)
Insurance	0.505	1.244	1.026*	0.047	0.780
	(0.442)	(1.107)	(0.603)	(0.804)	(3.208)
Shock	0.011	-0.273	-0.180	0.492	-0.543
	(0.414)	(1.003)	(0.564)	(0.710)	(2.906)
InsuranceXShock	-0.071	0.546	0.166	-0.875	1.518
	(0.786)	(1.907)	(1.071)	(1.358)	(5.527)
constant	7.430***	8.022***	8.128***	10.997***	4.295***
	(0.214)	(0.536)	(0.292)	(0.391)	(1.554)
b1+b3	0.435	1.790	1.193	-0.828	2.298
Prob¿F	0.504	0.249	0.178	0.450	0.610

Note: 2SLS regression with endogenous variables *insurance* and *insruanceXshock*. In the last row are reported the two sided p-value for a Wald test testing for the sum of the coefficient is equal to zero.



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Housed at the International Labour Organization's Social Finance Programme, the Microinsurance Innovation Facility seeks to increase the availability of quality insurance for the developing world's low income families to help them guard against risk and overcome poverty. The Facility was launched in 2008 with generous support from the Bill & Melinda Gates Foundation to learn and promote how to extend better insurance to the working poor. Additional funding has gratefully been received from several donors, including the Z Zurich Foundation and AusAID.