Insuring the Poor:

Using informal financial groups to overcome adverse selection and low demand for health insurance

Low demand and adverse selection are potential explanations for missing health insurance markets in low-income countries. In recent years, informal financial institutions have attempted to complete these markets by offering insurance to *individuals*. However, these common institutions generally have internal groupings that may be amenable to *group-level insurance*, potentially mitigating adverse selection and overcoming coordination failures that inhibit insurance demand. We evaluate a health insurance product offered both as group-level insurance and individual-level voluntary insurance through informal financial institutions (Self Help Groups) in Maharashtra, India. We find strong evidence for adverse selection: both group and individual enrollees are significantly more likely than non-enrollees to report negative health incidences *prior* to the enrollment period. This suggests that adverse selection is an important barrier, and persists even when insuring informal financial groups as a unit. We observe that 57 percent of those offered the group-level insurance enrolled, an enrollment rate that is well above the average for new insurance products targeting poorer populations. And finally, we find the severity of the adverse selection is significantly reduced and demand is significantly higher for group-level insurance relative to individual insurance. Our results suggest that insuring informal financial groups, rather than the current norm of voluntary individual insurance, may be a promising method for improving the provision of insurance in low-income countries.

I. Introduction

Health care is a significant expense for poor households (Banerjee et al. 2009, Dupas and Robinson 2009) and informal risk pooling is incomplete (Townsend 1994, Morduch 1999, Jalan and Ravallion 1999), suggesting formal health insurance could increase welfare and reduce vulnerability of the poor. Yet usually, formal health insurance has been virtually non-existent in most low-income countries (World Health Organization, 2015). These missing health insurance markets are often explained by information asymmetries, such as adverse selection, moral hazard, and low trust in insurance providers. In recent years, informal financial institutions[1] have attempted to overcome these missing markets by delivering health insurance through their platforms, commonly referred to as micro health insurance, MHI. Informal financial structures have the benefit of existing networks that successfully provide outreach to poorer households. They additionally have internal structures that may overcome information asymmetries, particularly adverse selection: when insurance demand increases with adverse health and insurers are unable to price premiums according to health risk (Akerlof, 1970). This paper is one of the first to evaluate the effectiveness of providing health insurance, as measured by adverse selection and insurance demand, through these promising and ubiquitous informal financial institutions.

These recent efforts of MHI have generally been met with surprisingly low demand, suggesting lack of demand may be a first-order barrier to completing insurance markets rather than the traditional concerns of asymmetric information in which the insurance provider is less

[1] Examples of informal financial institutions include microfinance institutions, Self Help Groups (SHGs), Rotating Savings and Credit Associations (ROSCAs), and Village Saving and Loans Associations (VSLAs).

informed of an individual's health risk (Matul et al. 2013, Acharya et al. 2013). The high prevalence of individual voluntary insurance, as opposed to group-level insurance, offered through informal finance institutions may be partly responsible for the low demand. As Janssens and Kramer (2016) find in a framed-laboratory experiment, when groups of individuals are jointly liable for one another's loans, insurance demand may be suppressed due to members knowing others will have strong incentives to repay their debts in the case of a health emergency. The high prevalence of joint liability in informal financial institutions suggests then that group level insurance may be welfare enhancing and increase demand by eliminating this incentive to free-ride. Furthermore, individual voluntary insurance is also more likely to suffer from adverse selection stemming from asymmetric information in which the provider cannot determine the health risk of the individual to price premiums accordingly. Insuring heterogeneous fixed groups may be one method to overcome adverse selection (Bhattacharya and Vogt, 2014). However, Banerjee et al. (2014) highlight the potential concern of insuring an entire microfinance institution by bundling loans with insurance –reduced loan take up and loss of clients. Furthermore, they observe that the lost clients of the microfinance institution was not predicted by baseline health, suggesting that health risk was not an important determinant for insurance demand. This suggests that adverse selection may be less of a barrier in low income countries where insurance is still relatively a new concept.

The theoretical concerns of adverse selection and dampened demand among individual insurance, and the countervailing concern of low retention when bundling MHI to membership directly, suggests that group insurance provided at smaller units within informal financial structures may be a more promising way forward. A significant portion of informal finance operates through smaller internal groups, and providing voluntary *group* insurance to these units

may increase demand and reduce the correlation between health risk and insurance demand, relative to individual voluntary insurance, without the concern of significant withdrawal or resorting of members. We empirically test the effectiveness of group insurance through Self Help Groups (SHGs), a common informal financial institution, in Maharashtra, India. We find that the group insurance had high demand: we observe an enrollment rate of 58 percent among SHG members, an enrollment rate significantly higher than most microinsurance programs, in which take up rates rarely exceed 30 percent (Matul et al. 2013). Along with this high demand, we also find the group level insurance suffered from adverse selection. Those experiencing poor health prior to the insurance were 1.88 times more likely to have purchased the health insurance. We additionally find that members who were *more* risk loving had higher demand for insurance, perhaps exacerbating adverse selection concerns. The findings provide empirical evidence that adverse selection is a barrier among low-income populations in developing countries, even in group insurance through informal financial institutions. Comparing across randomly selected (unbalanced) villages that differed by whether or not they were offered the health insurance, we find no evidence of members leaving or resorting their financial group arrangements for two years, suggesting that adverse selection concerns would not worsen and demand for other products offered through the SHGs would be unaffected, at least in the medium-run.

In addition to describing demand and adverse selection under group-level insurance, we also provide suggestive evidence of how the same insurance product would fare if offered as individual voluntary insurance, the norm in MHI. Though the insurance was offered to SHG members as group-SHG insurance, it was offered to additional family members on an individual voluntary basis. The voluntary individual insurance experienced much lower demand (16 percent) and significantly greater adverse selection – those with poorer health at baseline were 3.33 times

more likely to enroll in the MHI. The strong correlation between adverse health and insurance demand remains even when comparing insurance decisions within a household (i.e., using household fixed effects) and controlling for observable covariates, increasing confidence that an insurer would not be able to price premiums according to baseline health risk. These striking differences in the health of the insurance pool among those individually insured and those group-insured cannot be explained by observable differences and are consistent with the theoretical promise of SHG-based group insurance increasing demand and reducing adverse selection.

The primary contribution of this paper is to be the first to provide a well-identified test of adverse selection and document insurance demand for health insurance in the novel and promising context of group insurance using the internal organization of informal financial institutions[2]. Given the prevalence of informal financial groups in outreach to underserved populations, this paper is the first to provide evidence of how health insurance performs in this context. An additional contribution is suggestive evidence on whether the group level insurance increased demand and mitigated adverse selection relative to if the same insurance had been provided as individual insurance. Battacharya and Vogt's (2014) theoretical model concludes employer insurance can reduce adverse selection when switching costs are high, and Thomasson (2002, 2003) documents the role of group insurance in the history of the US health insurance market, highlighting that empirical evidence on how group insurance can be leveraged in low-income countries is a critical policy question. Jansenns and Kramer (2016) additionally highlight that voluntary insurance may dampen demand in joint liability contexts. The findings in this paper build on these theoretical

[2] A number of studies have suggested that SHGs increase inclusion and sustainability of MHI (Montalvao et al. 2011; Devadasan et al. 2004). However, this is the first to our knowledge that assesses the potential of SHGs as an insurable unit to overcome concerns of low demand and adverse selection.

foundations and find that group insurance within informal financial institutions may indeed help increase insurance demand and limit, but not eliminate, adverse selection.

The paper further contributes to a relatively limited literature of adverse selection in low-income countries, where insurance markets are experiencing rapid growth, by providing a well-identified estimate of adverse selection. The literature has found mixed support of adverse selection in micro health insurance with limited attention to how effects differ when offering insurance to groups. A handful of recent papers[3] have provided robust tests for identification of adverse selection (Levine and Polimeni 2012, Wang et al. 2006, Banerjee et al. 2014). Their findings have generally been mixed, particularly when observing demand of clients from informal financial institutions. One potential explanation for their different findings is the unit at which the insurance was offered, individual household insurance (Levine and Polimeni 2012) versus bundling insurance with microfinance loans (Banerjee et al. 2014). Similar to these more recent papers, we offer a robust test of adverse selection by relying on health measures and risk preferences elicited *prior* to the insurance decision and find strong evidence of adverse selection and increasing demand with risk tolerance. We further use a novel measure of adverse selection: we show that demand for health insurance is sensitive to present health conditions.

The remainder of this paper is organized as follows: Section 2 provides a framework for the provision of MHI through informal financial institutions, Section 3 describes the MHI and data

[3] An older literature that is less well-identified also finds mixed results on adverse selection: a handful of papers find that MHI coverage is correlated with poor health (Lammers and Warmerdam, 2010; Bendig and Arun, 2011; Asenso-Okyere et al. 1997, Dror et al. 2007), while others fail to find support for the correlation (Panda et al. 2014, Jutting 2004, Dror et al. 2005). However, these studies generally have used willingness to pay surveys or observed health *after* the decision to enroll in insurance has already been made. The former methodology is limited by its reliance on hypothetical insurance markets and the latter cannot isolate adverse selection from moral hazard.

used in this paper's analysis, Section 4 details the identification strategy, Section 5 discusses results, and Section 6 concludes.

II. MFIs providing MHI: Offering Group Insurance

Informal financial credit is commonly used for health shocks (Banerjee et al. 2009; Gertler et al. 2009). The borrowing patterns in this study's sample are consistent with this finding: 17% of households with a current loan stated health as the purpose of their loan, second only in loan purpose to business and agriculture. While credit allows one to protect against health shocks by smoothing financial resources across time, insurance has the benefit of smoothing resources across both time and space. Therefore, financial institutions are a prime candidate to offer insurance to improve clients' risk smoothing, while also improving the expected performance of their credit portfolio.

An added benefit of informal financial institutions is their existing platform of outreach. In addition to generally serving lower-income populations, many have internal group structures embedded in their lending operations, providing natural candidates for the provision of group insurance. This is particularly useful as insuring groups, rather than individuals, theoretically reduces concerns of joint liability dampening insurance demand (Jansenns and Kramer, 2016) and improves the average health of the risk pool (Battacharya and Vogt, 2014)[4]. This paper focuses on Self-Help Groups (SHGs) in South Asia, a common grassroots informal financial institution in which 10 to 20 women form a savings-lending group. By 2012, over 100,000,000 households in

[4] In high income countries, employer insurance is believed to reduce adverse selection by providing group insurance. However, in most low-income countries, self-employment is predominant making it difficult to heterogeneous groups through which to provide health insurance. Informal financial groups are ubiquitous and therefore a prime candidate for preexisting grouping in communities.

India were associated with an SHG and the Indian government has advocated SHGs for increased outreach, highlighting the ubiquitous role of SHGs as an organizational unit for low-income women (NABARD 2012, GoI 2011). Village Savings and Loan Associations (VSLAs) and Rotating Savings and Credit Associations (ROSCAs), commonly found in other low income countries, are analogous structures, illustrating that these informal financial institutions have a large geographical reach among lower-income populations and may serve as a promising unit for insuring the poor.

There are limitations in whether these groups can eliminate adverse selection concerns. Firstly, if demand for health insurance is very low, then adverse selection is mechanically a non-issue in missing insurance markets. Second, even if insurance demand is significant, it still may be that lending groups are formed partly based on the health of members – if health risk affects loan performance and repayment, then SHGs may already be sorted by health risk. If members perfectly sort with respect to health risk, insuring an SHG (or other informal financial group) will not protect against adverse selection relative to the norm of individual insurance. Third, it may be that SHGs are too small in size to sufficiently protect against adverse selection. For example, even if members do not sort on health risk, there may be significant natural variation in health risk due to the small size of SHGs. In such a case, if health risk predicts insurance demand, we should expect insuring SHGs reduces, but does not eliminate, the relationship between adverse health and insurance demand. And finally, health insurance may result in members resorting group membership based on insurance demand; this would result in group level insurance reducing adverse selection only in the short run.

All else equal, the joint liability of lending groups suggests that group insurance will theoretically increase demand. However, bargaining power in SHGs is not well understood, suggesting that group insurance may either increase or decrease insurance demand, specifically if bargaining power is systematically correlated with insurance demand.

Therefore, SHGs are theoretically a promising unit to insure because of their potential to reduce adverse selection (assuming health needs increase insurance demand) and increase insurance demand in joint liability settings. However, there are limitations to these theoretical predictions, highlighting the necessity of providing empirical support.

III. Overview of the MHI

The microhealth insurance was offered by Chaitanya, a non-profit microfinance institution (MFI) working on women's empowerment and microfinance in Maharashtra through Self Help Groups (SHGs). The SHGs are united into a larger informal financial institution that provides loans and support; default is rare and joint liability is somewhat more diffuse relative to microfinance institutions.[5]

Overview of the Micro Health Insurance (MHI) Contract

In November 2012, Chaitanya expanded its MHI program, Dipthi Arrogya Nidhi (DAN), to over 900 members across 22 villages in the semi-urban and rural sub-district of Junnar, Maharashtra.[6] DAN shares many characteristics common to MHI in general, including

[5] Chaitanya's official policy is that a handful of SHGs (typically at the village level) are jointly liable for each others' loans. Because default is relatively rare and repayment decisions are made locally, it is difficult to confirm how well joint liability is enforced.

[6] The MHI was currently operating in 21 randomly selected villages in the Junnar sub-district since January 2011. These 22 villages represent the control villages of a randomized controlled trial.

distribution through an existing informal financial institution (a common provider of MHI), a flat premium, reducing the cost of health care from the first dollar spent, and a coverage cap and co-pay (Morduch 2006, Liber et al. 2007).

A key difference is the requirement of group insurance. The option to purchase the insurance is limited to SHGs in which at least 80 percent of the members in the group purchase the MHI. The 80% requirement was made to allow for exceptions in the group for members who may legitimately not benefit from the insurance and to protect the majority from outliers in the SHG that were unyielding in their insurance demand decision. Conditional upon enrolling themselves, SHG members could then decide the number of additional household members to enroll, if any. Therefore, SHG members were offered *group insurance* through SHGs, but their dependents were offered *voluntary individual insurance*. Enrollment into MHI occurred at SHG meetings through SHG members. Therefore, the decision to enroll additional household members was mediated through the SHG member.

The MHI premium is Rs. 200 (USD 4) per person per year if the SHG member insures none or one additional person in her household, or Rs. 150 (USD 3) per person per year if she insures two or more additional persons in her household. The main provisions of the health insurance contract are discounted prices (5 to 20 percent) negotiated at private network medical facilities (e.g., hospitals, clinics, medical laboratories, and pharmacies) and reimbursement for in-patient treatment (60 percent reimbursed at network private facilities and 100 percent reimbursement at government facilities, up to a limit of Rs, 15,000 (USD 300) per event).[7] The

[7] Specific illnesses may have lower coverage caps based on predefined categories of illness type. Relative to other micro health insurance plans, this limit is relatively generous. For example, VimoSEWA, a large micro insurer in Gujarat, India, has a limit of Rs. 2,000 – 6,000 (USD 40 – 120) and RSBY (government insurance for households

product had also included a 24-7 medical help-line, health camps, and monthly village visits by a doctor to offer referrals and basic medications, but the health camps and doctor visits to villages were discontinued prior to the start of enrollment for members observed in this study.

Data Sources

The primary data used in this paper is a household health survey conducted in October 2012, one month prior to the introduction of the MHI, on a randomly selected subsample of 905 current SHG members of Junnar sub-district.[8] This is a detailed questionnaire on demographics and health of individuals in a household. The most common survey respondent was the SHG member. The Appendix provides greater detail on the sampling method for the survey and non-response.

As a robustness check, additional analysis uses data collected from monthly surveys on SHG members' households' health conducted at SHG meetings. These monthly surveys were conducted from October 2011 to July 2012 (4 to 13 months prior to the initial MHI offering) and have a high non-response rate (approximately 50 percent) because survey completion was dependent on attendance in SHG meetings. However, 86 percent of SHG members' households responded in at least one monthly survey.

Enrollment decisions and insurance claims are accessed from Chaitanya's internal records and are observed from November 2012 to August 2014.

---

below the poverty line) has a limit of Rs. 30,000 (USD 600) per year for the entire household (SEWA 2013, RSBY 2013a).

[8] This Household Health Survey was used as an endline survey to evaluate the MHI through a randomized controlled trial methodology and was conducted 21 months after the MHI had been introduced to treatment villages in the Federation. The Appendix describes the data sources in more detail, including non-response.

Enrollment Rates and Demographic Characteristics

Table 1 describe SHG members' household demographics (Panel A), the SHG member herself (Panel B), and her non-SHG household members (Panel C). Typical of a non-profit rural informal financial institution, a significant proportion of SHG members belong to households below the poverty line (46.7%), categorized as belonging to a disadvantaged caste by the government (70.6%), and have household members employed as agricultural laborers within the previous year (70.4%). Both SHG members and their additional household members have relatively few years of schooling. SHG members are restricting to adult females, resulting in their non-SHG household members to mechanically be more male and younger. SHG members were also asked to rate themselves on a scale of 0 to 10, increasing in their preference for risk.[9] On average, SHG members self-report a risk preference of 6. We observe some non-response for each given question, referring primarily to sensitivity of questions on caste status and poverty status.

Table 2 describes the primary variables of interest used in this paper, health characteristics of SHG members (those offered group insurance) and non-SHG household members (those offered individual voluntary insurance). Using weekly recall periods, 21.8% of SHG members experienced being ill, 5.6% were admitted to a health facility, and the average health expenditure[10] was Rs. 157 (approximately USD 3). Among non-SHG household members, 9.76% experienced illness, 2.8% were admitted to a facility, and average health expenditure was Rs. 83 (approximately USD 1.8). When asked about the previous year, excluding illness in the weekly recall, 17.8 percent of SHG

[9] Self-reported risk preferences correlate with other with other measures of risk preferences (Dohmen et al. 2005). We ask respondents 'How do you see yourself: are you generally a person who is fully prepared to take risks or do you try to avoid taking risks? Please rate yourself on a scale of 0 to 10, where 0 means you are "unwilling to take any risks" and 10 means you are "very much prepared to take risk".'

[10] Health expenditure is windsored at 99 percent.

Table 1: Summary Statistics

	Mean	SD	Min	Max	Obs
Panel A: SHG Members' Household					
Below the Poverty Line	0.467	0.499	0	1	868
Pucca (Proper) House	1.716	0.668	1	3	903
Disadvantaged Caste	0.706	0.456	0	1	859
Agricultural Cultivator	0.775	0.418	0	1	897
Agricultural Laborer	0.704	0.457	0	1	899
Household Size	5.887	2.831	1	20	905
Panel B: SHG Members					
Female	1	0	1	1	905
Age	41.34	13.34	14	98	904
Education	5.152	4.106	0	15	868
Risk Preference	6.108	2.544	0	10	750
Panel C: Non-SHG Household Members					
Female	0.346	0.476	0	1	4079
Age	28.21	21.10	0	101	4098
Education	6.412	4.483	0	15	3970

Notes:
(1) Observations are limited to active SHG members' households surveyed in the Household Health Survey and are weighted to be representative of the target population.
(2) Risk Preference is a variable from 0 to 10, increasing in the member's preference for risk.

members and 7.45 percent of non-SHG household members had experienced an illness requiring significant expenditure (over Rs.1,000 or USD 20), being admitted to a health facility, or bed rest for at least five days.[11] Reported directly beneath health expenditure in Rupees is the inverse hyperbolic sine transformation of health expenditure, our preferred unit of measurement given the skewed distribution of expenditure (Burbidge et al., 1988). Weekly recall measures are the

[11] Additional health variables collected were visiting a doctor and health on the given day of the survey. Visiting a doctor was almost identical to reporting illness, and health on the given day suffered from higher non-response.

preferred recall period based on Das et al. (2007) findings that shorter recall periods have greater accuracy.

Table 2: Baseline Health Summary Statistics

	Mean	SD	Min	Max	Obs
Panel A: SHG Members					
Experienced Illness	0.218	0.413	0	1	905
Admitted	0.0560	0.230	0	1	905
Health Expenditure (per Rs. 1000)	0.157	0.732	0	10.15	905
IHS of Health Expenditure (Rs.)	1.272	2.659	0	9.918	905
Significant Illness (Annual Recall)	0.178	0.382	0	1	905
Panel B: Non-SHG Household Members					
Experienced Illness	0.0976	0.297	0	1	4105
Admitted	0.0280	0.165	0	1	4105
Health Expenditure (per Rs. 1000)	0.0827	0.561	0	10.15	4105
IHS of Health Expenditure (Rs.)	0.602	1.940	0	9.918	4105
Significant Illness (Annual Recall)	0.0745	0.263	0	1	4105

Notes:
(1) All health variables reflect a weekly recall period, except Significant Illness (Annual Recall). Significant Illness (Annual Recall) is an indicator for whether the individual experienced an illness in the previous year, excluding the week of the survey, that required being admitted overnight to a health facility (or commuting for multiple days), an expenditure over Rs. 1,000, or bed rest for 5 or more days.
(2) Health Expenditure is windsored at the 99% level and then transformed using the inverse hyperbolic sine function (referred to IHS of health expenditure).
(3) Observations are limited to active SHG members' households surveyed in the household health survey and are weighted to be representative of the target population.

On average, SHG members reported worse health than non-SHG household members. This may accurately reflect differences in health status, particularly given adult women are often more vulnerable within a household. Alternatively, the difference in health may reflect survey reporting bias from respondents, most commonly SHG members, recalling their own health differently from

other household members' health. We discuss the extent to how such respondent bias may change the interpretation of our results in Section 5.

Table 3 documents MHI enrollment. From November 2012 to August 2014, 58 percent of SHG members enrolled in the program for at least one year.[12] Enrollment for non-SHG household members is significantly lower. Conditional upon the household's SHG member enrolling in the MHI, only 16% of non-SHG household members enrolled for at least one year.[13] Interestingly, renewal rates (conditional upon initial enrollment) are similar to the initial enrollment rate for both SHG members and their non-SHG household members. We do not observe renewal rates for an extended period, but the initial trend suggests that enrollment will reduce over time, and more so for non-SHG household members.[14]

Though the significantly higher enrollment rate for SHG members is consistent with both group insurance increasing MHI demand and demand being predicted by adverse health, Section 4 and 5 provide supportive evidence of the latter explanation not accounting for the higher enrollment rate.

Table 3, Panel B, report how many additional household members enrolled in the program. Among non-SHG household members, approximately a fifth of the household enrolled in the MHI

[12] This enrollment rate is conditional upon SHG members surveyed in the Household Health Survey in October 2012.

[13] 11 non-SHG household members of 4,402 were enrolled in MHI though no reported SHG member was enrolled, representing .2 percent of observations. This may be due to non-compliance (i.e., becoming enrolled as listed on another SHG member's family) or due to non-reported SHG membership (the household member's enrollment in an SHG went unreported).

[14] Enrollment rates are not observed after August 2014, but we do know that the program was scheduled to be discontinued in 2017. Chaitanya reported this was due to member feedback of discontent for a product that did not provide tangible benefits to all who paid premiums. It is unclear to what extent this is a comment on insurance as a product versus the implementation of this specific product. At the time of this decision, the premiums were able to cover the claims, but not the administrative costs of implementing the insurance. Chaitanya's MHI program has been able to support claims through premiums for almost 8 years prior to planned discontinuance.

Table 3: MHI Enrollment Rates

Panel A: Enrollment Rates		
	SHG Member	Non-SHG Household Member
Enrolled	58%	10%
Obs	905	4105
Conditional Upon SHG Member Enrollment	NA	16%
Obs	NA	2394
Renewal Rate	58%	13%
Obs	349	304
Panel B: Household Enrollment Details		
Proportion of Additional Household Members Enrolled	0.18 (.3160)	
Obs (Enrolled SHG Members)	531	
Panel C: SHG Enrollment Details		
Enrolled SHG (Enrollment > 0%)	74%	
Enrolled SHG (Enrollment > 50%)	62%	
Compliance with Eligibility Requirement	74%	
Obs (SHG)	82	

Notes:
(1) Enrolled is an indicator of having ever been enrolled in the MHI.
(2) Renewal rate is conditional on enrolled individuals with a coverage start date of June 1, 2013 or earlier.
(3) Panel C excludes SHGs for which data is available for less than two members.
(4) Observations are limited to active SHG members' households surveyed in the Household Health Survey and are weighted to be representative of the target population.

program. The majority of SHG members choose to not enroll any additional household members (66 percent). Due to the pricing schedule of the MHI, the next most common option is to enroll two additional household members. Conditional on SHG member enrollment, 90% of members

enrolled 2 or fewer additional household members. Compliance[15] with group insurance requirements is relatively high: 74 percent of SHGs complied by having either no SHG members enroll or having at least 80 percent of their members enrolled.

Though enrollment for MHI is high, the proportion of enrolled individuals that filed a claim for reimbursement is only 4 percent (Table 4). The average health expenditure eligible to be claimed was Rs. 15,499 (USD 310) and the average disbursement amount was Rs. 2,625 (USD 53). Though not possible to validate, the amount saved among claimants by discounted negotiated prices is Rs. 1,733 (USD 35). The claims process appeared to work well generally: 69 percent of claims were settled and paid. The primary reason for lower reimbursement amounts was use of non-network facilities, where the norm was to reimburse 10 percent, which arguably may have become less of a concern over time as members become more familiar with the MHI.

Table 4: MHI Claim Summary Statistics

	Mean	SD	Max	Obs (HH)
Proportion Filed Claim	0.04	0.20	1	1094
Proportion of Claims Settled and Paid	0.69	0.47	1	41
Amount Claimed (Rs.)	15,499	12,933	59,009	41
Amount Saved by MHI Price Discount	1,733	5,710	40,000	41
Amount Disbursed	2,625	2,631	10,000	41

Notes:
(1) Observations are limited to active SHG members' households surveyed in the Household Health Survey and are weighted to be representative of the target population.

IV. Estimating Equations for MHI Demand

[15] Compliance is calculated for those selected and surveyed in the Household Health Survey. SHG level analysis excludes SHGs for which less than 2 members were surveyed (due to random sampling or survey attrition relative to the baseline roster from which SHG members were selected for the survey sample).

The Household Health Survey conducted in October 2012 captures health data *prior* to the MHI offer. We estimate whether baseline health reported in the Household Health Survey is statistically different among those who choose to enroll:

$$(1)^{16}\ Enrolled_{ihgvt} = \alpha + \beta AdverseHealth_{ihgvt-1} + \vartheta_{ihgvt}$$

where *Enrolled* is an indicator for whether the individual enrolled for at least one year in the MHI from November 2012 to August 2014; *AdverseHealth* is a proxy for poor health at the time of the Household Health Survey (i.e., prior to the introduction of MHI); and subscript *i* indicates the individual, subscript *h* indicates the household, subscript *g* indicates the SHG to which the affiliated SHG member belongs, subscript *v* indicates the village, and subscript *t* indicates the time period when the MHI was available.

We estimate Eq (1) separately for SHG members and non-SHG household members. α is the mean enrollment rate among those that do not report adverse health. A positive β represents the marginal percentage point increase in the likelihood of enrolling into the MHI if a person has adverse health, thereby indicating adverse selection. Therefore, $\frac{\beta}{\alpha}$ is a measure of the *percent increase* in the probability of enrolling in the MHI when a person has adverse health. Differences between $\frac{\beta}{\alpha}$ among group-insured SHG members and individually-insured non-SHG household members provide suggestive evidence of whether group insurance reduces the proportion of the risk pool that has poorer health.

[16] A linear model, rather than a probit or logit, is used due to the expansion of the model to include fixed effects.

To the extent that the relationship between health and enrollment, β, is due to spatial differences or confounded by omitted household variables, Eq (1) can be expanded to include village fixed effects and the covariates listed in Table 1. For non-SHG household members, we further expand the model to include SHG fixed effects and household fixed effects to control for unobservable characteristics that are constant within the SHG and household.

The identifying assumption for consistently estimating β and α is that individuals are not altering their health care (and health) in anticipation of being offered MHI. This is unlikely as the expansion of the MHI required time and SHG members would have not known how long they would have to wait before being eligible to enroll in MHI. Specifically, the median coverage date started four months after the completion of the survey. Furthermore, Table 4 documents that claims are low and on average the length of duration from enrolling into MHI and filing a claim was approximately 10 months. Together, this suggests that health care utilization reported in the survey is unlikely to have been altered based on anticipation of MHI enrollment.

Interpreting differences in α and β across SHG members and non-SHG members as differences in group versus individual insurance assumes that the underlying parameters of the insurance demand function is the same for SHG members and their non-SHG family members. In this context, we argue that all enrollment decisions within a household reflect the same preferences for the following reasons. First, all enrollment decisions are being mediated by one person in the household, the SHG member. In addition, decisions to visit the health care providers, even for the SHG member, is unlikely to be a decision she makes by herself[17]. Therefore, it is unlikely that

[17] For example, the 2015-16 Demographic Health Survey in India reports only 12 percent of female respondents as being the main decision-maker about her own health.

differences in α and β reflect omitted preferences specific to a family member, as the decision to enroll is not asked independently from each family member, and is determined at one time through one person. Of course, the SHG member and her family will consider the benefit and costs each household member (e.g., if certain household members are more or less likely to use the insurance, or if there are different values over household members' health and financial loss).

One may also be concerned that estimates of β and α reflect omitted variables that are correlated with health, rather than the effect of health on insurance demand. The inclusion of fixed effects and the additional covariates from Table 1 help reduce this concern. This is especially true for specifications including household fixed effects, in which estimates are identified using observed differential enrollment *within* the same household and the final enrollment decision is made through a single person (the SHG member).

From a policy perspective, the insurer is concerned about the relationship between health and the risk pool regardless of the mechanism behind the relationship. To the extent that potential omitted variables are driving differences in health between the enrolled and non-enrolled even *within the household*, it seems unlikely that an insurer would be able to observe this underlying characteristic and be able or willing to price premiums accordingly. This is especially true for MHI in which flat premiums are the norm. Therefore, even if the relationship is driven by an omitted factor, from a policy perspective, the adverse selection in health is still of critical importance in completing insurance markets.

In addition to *AdverseHealth*, we estimate Eq (1) with the covariates listed in Table 1 as independent variables to estimate whether these factors predict MHI demand.

Estimating Bounds

Because compliance with the eligibility requirement was imperfect, and the eligibility requirement itself fell short from insuring the entire SHG sub-unit, we create bounds to confirm the robustness of the estimates to perfect group insurance for SHGs. For all SHGs that do not have the same enrollment status for all members (i.e., 0 or 100% enrollment), we assume that these SHGs either enroll all their members in the MHI (*upper bound*) or enroll none of their members in the MHI (*lower bound*). These assumptions create bounded estimates of α and β in the case of perfect group insurance.

Respondent Bias

SHG Members were the most common respondent for the health survey. As Table 2 documented, SHG members also reported higher levels of illness, raising the concern of respondents recalling their own health differently. Using household fixed effects and limiting observations to SHG members, we test whether SHG member respondents have differential recall of health events relative to SHG member non-respondents within the same household:

$$(2)\ AdverseHealth_{ihgv} = \delta_1 Respondent_{ihgv} + \omega_h + u_i$$

A positive δ_1 is consistent with respondents having higher recall of adverse health events than non-respondents.

V. Results

Table 5 estimates Eq (1) using only covariates listed in Table 1 as independent variables for SHG members. Surprisingly, we find no statistically significant relationship between basic

Table 5: SHG Member Enrollment by Demographic Characteristics

	(1)	(2)	(3)
Dependent Variable	Enrolled (Observed)	Enrolled (Lower Bound)	Enrolled (Upper Bound)
Risk Preference	0.0286***	0.0192**	0.0180***
	(0.00694)	(0.00795)	(0.00683)
Age	0.00108	0.0000335	0.00110
	(0.00204)	(0.00210)	(0.00173)
Education	-0.00653	-0.0127	-0.00363
	(0.00792)	(0.00802)	(0.00717)
Below the Poverty Line	-0.00527	-0.00576	-0.0881*
	(0.0596)	(0.0680)	(0.0487)
Pucca (Proper) House	-0.0307	-0.0382	-0.0150
	(0.0343)	(0.0326)	(0.0279)
Disadvantaged Caste	-0.0903	-0.0383	-0.118
	(0.0813)	(0.0991)	(0.0769)
Agricultural Cultivator	-0.0549	-0.0752	-0.0178
	(0.0765)	(0.0820)	(0.0794)
Agricultural Laborer	0.0239	-0.00216	-0.00808
	(0.0481)	(0.0523)	(0.0460)
Household Size	-0.0121*	-0.00591	-0.0120*
	(0.00712)	(0.00742)	(0.00690)
Constant	0.619***	0.619***	0.826***
	(0.162)	(0.179)	(0.146)
Obs (SHG Members)	638	638	638

Notes:

(1) Lower Bound assumes those SHGs that did not comply with the eligibility would not have enrolled any members if the eligibility requirement was enforced. Upper Bound assumes those SHGs that did not comply with the eligibility would have had all members joined the MHI if the eligibility requirement would have been enforced.

(2) Standard errors are in parentheses and are clustered at the SHG level.

(3) Observations are limited to active SHG members' households surveyed in the Household Health Survey and are weighted to be representative of the target population.

(4) Statistical significance levels are as follows: *10%, **5%, ***1%.

demographic characteristics such as education, poverty status, or age in an SHG member's decision to enroll[18]. However, we do find that SHG members who report a *higher* tolerance for risk have slightly greater demand for MHI, though the magnitudes of the effect is small.[19] A one unit increase on a scale of 0 to 10, increasing in riskiness, is associated with a two percentage point increase in the likelihood of enrolling in MHI. This contradicts the common theoretical assumption that insurance demand increases with risk aversion. However, in contexts where health insurance is a relatively new product and suppliers do not have a history of providing insurance, the opposite may be true – those who are *more* tolerant of risk are more willing to try the novel MHI. Column (2) and (3) estimate bounds for demand for group insurance by assuming SHGs with enrollment rates between 0 and 100% either did not enroll any of their members (lower bound) or enrolled all of their members (upper bound). The relationship between insurance demand and self-reported risk preferences continues to be robust. We also find no significant effect of demographic characteristics on the enrollment of non-SHG households members offered individual insurance (not shown)[20].

Table 6, Column (1), estimates group insurance demand as a function of baseline health. Having adverse health in the week of the survey increased the probability of enrolling in MHI by

[18] Though Table 5 suggested that demand was not sensitive to basic demographic covariates, we expand the model to estimate non-linearities in age and gender bias in insurance demand for children. The most likely household member to enroll is the SHG member's husband – for this reason, we restrict testing for gender bias among enrollment of children. We find no evidence for either of these hypotheses.

[19] These results are robust to using a probit (.124) or logit model (.077) and without clustering standard errors. Survey non-response is higher for Table 5 due to different characteristics not reported for different observations. The estimates are robust to having estimated each relationship separately, for which survey response is mechanically higher. There is no additional source for which to confirm whether characteristics are balanced across non-response, raising some concern on the representativeness of the results to the entire SHG member population.

[20] Female non-SHG household members are less likely to be enrolled in the MHI. However, this is due to significant others, all male, being the most likely household member to enroll.

Table 6: Health and MHI Demand, Insuring SHG Units

	(1)	(2)	(3)	(4)
Dependent Variable: Enrolled				
Panel A: Experienced Illness				
Experienced Illness	0.188***	0.152***	0.131***	0.0869***
	(0.0346)	(0.0304)	(0.0272)	(0.0249)
Constant	0.543***			
	(0.0488)			
Panel B: Admitted				
Admitted	0.141**	0.0979*	0.128**	0.0572
	(0.0636)	(0.0537)	(0.0526)	(0.0412)
Constant	0.577***			
	(0.0483)			
Panel C: Health Expenditure				
IHS of Health Expenditure (Rs.)	0.0302***	0.0210***	0.0191***	0.0116***
	(0.00548)	(0.00452)	(0.00393)	(0.00362)
Constant	0.546***			
	(0.0490)			
Panel D: Significant Illness (Year Recall)				
Significant Illness	-0.0103	-0.0228	-0.0368	0.0149
	(0.0436)	(0.0344)	(0.0338)	(0.0297)
Constant	0.586***			
	(0.0486)			
Observations (SHG Members)	905	905	905	905
Village FE	No	Yes	Yes	Yes
Lower Bound	No	No	Yes	No
Upper Bound	No	No	No	Yes

Notes:

(1) Standard errors are clustered at the SHG.

(2) Observations are limited to active SHG members' households surveyed in the Household Health Survey and are weighted to be representative of the target population.

(3) Statistical significance levels are as follows: *10%, **5%, ***1%.

18.8 percentage points (β), an increase of 35 percent $\left(\frac{\beta}{\alpha}\right)$. Being admitted in the previous week increased enrolling by 14.1 percentage points (24 percent), and a one percent increase in health expenditure is associated with increasing enrollment by 3.02 percentage points (6 percent).[21] However, significant illness in the previous year does not increase the probability of enrollment. The annual recall captures more severe illnesses, suggesting that more severe illnesses may surprisingly not increase insurance demand. Figure 1 provides a graphical description of Panel A, Column 1, in which enrollment is higher among SHGs that reported more illnesses at the time of the survey.

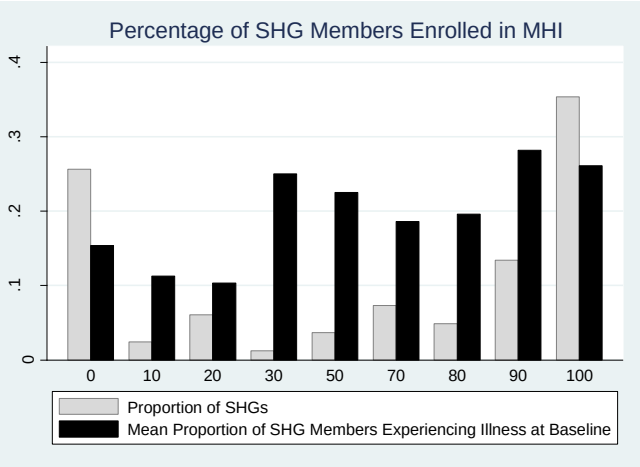

Figure 1: SHG Enrollment by Mean Baseline Illness of Members

The slight drop in magnitude after the inclusion of village fixed effects in Column 2 suggests that part of the relationship between health and insurance demand may be due to spatial differences in health, though most of the variation appears to stem within villages.

[21] The results found in Column 1, Table 6, are robust to both probit and logit models with respect to both magnitude and statistical significance.

Recall, the group insurance required only 80 percent of members in a given group to enroll and that compliance with this 80 percent group enrollment was imperfect. Column 3 and 4 provide estimates assuming complete group insurance (i.e., either all members enroll or not enroll). The results suggest that the observed relationship between health and insurance demand would persist even with perfect group insurance, though with less robustness to severe illnesses (even in the weekly recall). Table 6 suggests that the observed adverse selection cannot be explained by spatial differences in health, commonly considered demographics, non-compliance or the flexibility in the group enrollment[22,23].

There are handful of reasons that adverse selections would persist even with group level insurance. One explanation is that SHG members match on health risk, as health may be a consideration for loan repayment. Figure 2 depicts the distribution of illness within an SHG for SHG members and for the SHG's extended household members. The distribution suggests limiting sorting of members by health. Indeed, the health variation within SHGs is much greater than the variation across SHGs and there is no statistically significant relationship between an SHG member's health and the health of the other SHG members in her group.[24] Our results suggest that groups do not appear to be matching on health, but that the small size results in natural variation such that demand is a function of the mean health of a group. One may also be concerned that

[22] Even within SHGs that did not comply with 0 or 100 percent enrollment, baseline health status predicts member's enrollment (i.e., SHG fixed effects specification of Equation 1).

[23] Table 6 excludes additional covariates as controls due to the loss of sample size. Appendix Table 1 provides estimates when additional covariates are included and confirms that the estimates are affected due to the changes in underlying sample composition rather than the additional covariates themselves. The results found in Column 1 - 3, Appendix Table 1, are robust to both probit and logit models with respect to both magnitude and statistical significance.

[24] The within group sum of squares accounts for over 90 percent of the total sum of squares for weekly recall of experiencing illness (141.17 of 154.12) and we cannot reject the null of equal variances (a p-value of .98 using Bartlett's test of equal variances).

adverse selection would exacerbate over time as members re-sort based on insurance demand. However, if the cost of switching (or leaving) an SHG outweighs the cost of the MHI premium, then group insurance should not lead to a resorting of SHG members based on health (Battacharya and Vogt 2014). And indeed, comparisons between villages with and without the MHI offer suggests that SHG members are no more likely to leave the MFI or change their SHG upon the introduction of MHI.

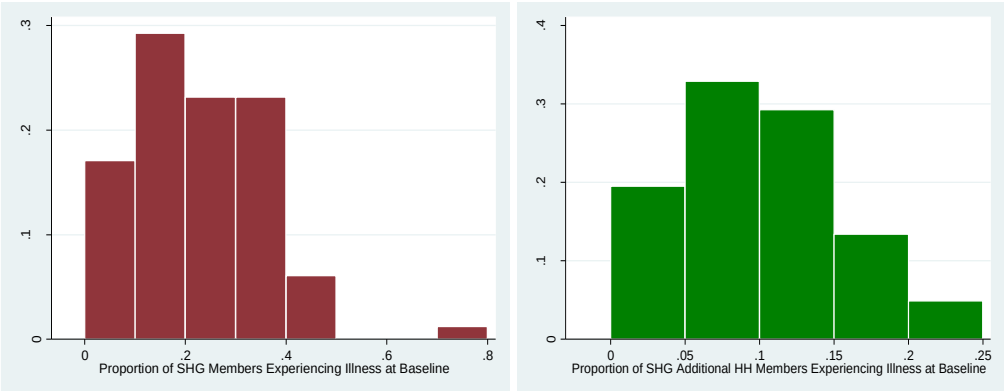

Figure 2: Baseline Illness Across SHGs by SHG Members (left) and non-SHG household members (right)

Table 7 estimates Eq (1) for the non-SHG household members offered voluntary individual insurance (i.e., household members of SHG members enrolled in MHI[25]).[26] The columns impose increasingly restrictive identification assumptions by including SHG fixed effects (Column 2), and household fixed effects (Column 3). Similar to Table 6, we find that individuals with worse health

[25] Ideally, we could observe insurance decisions for all non-SHG household members; Instead, we only see decisions for the non-random sub-sample of non-SHG household members who had an SHG member enroll in the insurance. On average, this eligible non-SHG household sample is statistically similar to ineligible households (see Appendix Table 3), suggesting the subsample is representative and enrollment decisions as a function of health would have been similar among the ineligible sample as well.

[26] Appendix Table 2 provides estimates that the results are robust to including covariates and the corresponding change in sample composition. The results found in Column 1 – 3 are robust to probit and logit models with respect to both magnitude and statistical significance.

are more likely to enroll in the MHI program. However, the ratio of interest, $\frac{\beta}{\alpha}$, is much larger.[27] Among group insured SHG members, general illness increased the likelihood of enrolling in MHI by 35 percent, but among individually insured non-SHG household members the likelihood of enrolling increased by over 100 percent. A one percent increase in health expenditure is associated with a 1.89 percentage point increase in enrollment, implying a percent increase that is twice as large than among SHG members. Though the impact of being admitted is not statistically significant, the magnitude implies a percent increase 1.5 times as large as that found among SHG members. When expanding the recall period to the previous year, there were no differences in enrollment among SHG members by large illnesses, but having a significant illness in the previous year increased enrollment by 74 percent (11 percentage points) among non-SHG household members. We observe no statistically significant increase in enrollment by admit rates and health expenditure in the previous week, but the percent magnitude is 1.5 to 2 times as large.

Using a regression framework, we find that the percent increase based on illness in the previous week and significant illness in the previous year is statistically greater among the individually insured than group insured (p-value of .069 and .003, respectively). Though the difference is not statistically significant for admittance and health expenditure, the magnitudes are in the same direction.

The inclusion of SHG fixed effects reduces the magnitudes slightly, suggesting that geographical and socioeconomic factors captured by SHG formulation do account for a component

[27] The results found in Column 1, Table 7, are robust to both probit and logit models with respect to both magnitude and statistical significance. In fact, the effect of admit rates on enrollment becomes statistically significant at the 10 percent level when using a logit model.

Table 7: Health and MHI Demand, Voluntary Insurance of Non-SHG Household Members

	(1)	(2)	(3)
Dependent Variable: Enrolled			
Panel A: Experienced Illness			
Experienced Illness	0.151***	0.0881***	0.0571**
	(0.0389)	(0.0238)	(0.0242)
Constant	0.143***		
	(0.0243)		
Panel B: Admitted			
Admitted	0.0604	0.0276	0.0241
	(0.0499)	(0.0401)	(0.0391)
Constant	0.156***		
	(0.0269)		
Panel C: Health Expenditure			
IHS of Health Expenditure (Rs.)	0.0189***	0.0105***	0.00652*
	(0.00576)	(0.00357)	(0.00383)
Constant	0.146***		
	(0.0250)		
Panel D: Significant Illness (Year Recall)			
Significant Illness	0.111***	0.0769***	0.0617**
	(0.0285)	(0.0267)	(0.0248)
Constant	0.149***		
	(0.0265)		
Obs (Non-SHG HH Members)	2394	2394	2394
SHG FE	No	Yes	No
HH FE	No	No	Yes

Notes:

(1) Standard errors are clustered at the SHG for Columns 1 and 2, and are robust for Column 3.

(2) Observations conditional upon the enrollment of the household's SHG member enrolling in MHI.

(3) Observations are limited to active SHG members' households surveyed in the Household Health Survey and are weighted to be representative of the target population.

(4) Statistical significance levels are as follows: *10%, **5%, ***1%.

of the observed relationship between adverse health and insurance demand (Column 2). Column (3) expands the model to include household fixed effects. By increasingly adding more restrictive fixed effects and comparing within households, estimates reflect whether households are more likely to enroll sicker members into the insurance program. The relationship between health and insurance demand is lower within households (Column 3) than when including the variation from across households (Column 1 and 2). This suggests two points: 1) even within households, there is higher demand for insurance for those with poorer health, and 2) households that enroll additional members have poorer health on average than those that did not.[28]

In general, Table 6 and 7 document that those with greater health needs have higher demand for MHI, regardless of whether the insurance is offered as group or individual insurance. The increased probability of enrollment as a function of adverse health among the individually insured non-SHG household members is consistent with the theory of group insurance reducing adverse selection concerns. The inclusion of household fixed effects suggests that households are indeed responding to baseline health when making enrollment decisions. However, even if the relationship is driven by an unobservable third factor, to the extent that insurers are unable to include the factor into premium pricing, the results suggest that adverse selection does act as a barrier in completing insurance markets.

The results on adverse selection also provide evidence that poor health is not a sufficient explanation for the higher enrollment rates observed among the group insured. Table 2 showed that those offered the individual insurance (i.e., non-SHG household members) had better health

[28] Non-SHG household health of enrolled SHG members is not statistically different from non-SHG household health of non-enrolled SHG members (Appendix Table 3).

than the group insured (i.e., SHG members), suggesting that the higher demand observed among SHG members may have been driven by baseline health rather than the level at which the insurance was provided. However, mean enrollment among the healthy (α) is approximately four times higher for the group-insured (Table 6) than the individually-insured (Table 7). For example, Table 7 propensities for enrollment suggests that an individual insurance enrollment rate with the baseline health of SHG members should be only 18 percent (i.e., $Enrollment\ Proportion = \alpha + (1 - Prob_h)(\beta) = \ .143 + (1 - \ .78) * .151 = .18$). This predicted enrollment rate is much lower than the observed enrollment rate among the group insured SHG members, 58 percent. This suggests that only a small amount of the difference in enrollment rates is driven by baseline health, suggesting the level at which the insurance was offered was an important factor for insurance demand. Of course, we cannot exclude alternative possibilities of these differences being driven by unobservables, but the findings are consistent with informal financial groups increasing demand and reducing, but not eliminating, adverse selection relative to the norm of offering voluntary individual insurance.

The effect of health on insurance demand is robust to estimates using the alternative SHG Monthly Surveys[29]. The SHG Monthly Surveys suffers from high attrition and are crude measures of health and enrollment at the household level. Thus, we are unable to separately identify the health of SHG members from their non-SHG family members or incorporate MHI enrollment status of additional family members. Therefore, Table 8 reports the differences in household health

[29] Analysis from the SHG Surveys are limited to SHG members selected to be in the surveyed in the Household Sample. 4% of SHG members have a household member that is enrolled in the MHI, even if they themselves are not enrolled. Results are similar when using an indicator for whether the household has any member enrolled in MHI in the future (not just the SHG member). Results are also similar in magnitude and statistical significance when the sample is extended to entire the entire member population (instead of limited to the Household Health Survey sample).

prior to MHI between households that eventually had at least one member enroll in MHI and households that chose not to have any members enroll in MHI. However, it does not capture the proportion of the household enrolled in MHI. We should expect Table 8 to align with the pattern of adverse selection found among SHG-members as the health of non-SHG households members is statistically similar across SHG member enrollment (see Appendix Table 3).

Table 8: MHI Demand from SHG Monthly Surveys

	(1)	(2)	(3)	(4)
Dependent Variable: Enrolled				
Health Indicator:	Experienced Illness	Admitted	Prolonged Bed Rest	IHS, Health Expenditure
Health Indicator	0.0644**	0.0178	0.00387	0.0139***
	(0.0287)	(0.0359)	(0.0429)	(0.00464)
Obs (SHG Member - Month)	4128	4130	4123	3440

Notes:
(1) Enrolled is an indicator for whether any household member enrolled in the MHI.
(2) Standard errors are in parentheses and are clustered at the SHG level.
(3) Observations are limited to active SHG members' households surveyed in the Household Health Survey and are weighted based on the number of times surveyed in the Monthly Health Surveys.
(4) Statistical significance levels are as follows: *10%, **5%, ***1%.

Similar to the previous estimates, we find that enrolled SHG members were more likely to report illness and have higher health expenditure in their household in the months prior to the MHI offer.[30] Though the magnitudes are lower (which may reflect factors such as increased time from the insurance offer or seasonal health effects), the patterns found in the SHG Monthly Surveys are consistent and yield additional support for persistent adverse selection in group insurance demand.

[30] The results found in Table 8 are robust to both probit and logit models with respect to both magnitude and statistical significance for SHG Members.

Respondent Bias Robustness

Differences in the effect of health on insurance demand between group insured SHG members and individually insured non-SHG household dependents may reflect biases in survey responses rather than differences in the unit at which insurance was offered. To estimate the extent to which survey respondents recall health differently, we compare the health of SHG members in the same household by respondent status. Table 9 finds that within households with multiple SHG members, the differences by survey respondent status is statistically insignificant and magnitudes are generally low. However, the recall of adverse health is generally greater by respondents. Assuming the only difference between respondents and non-respondents when comparing SHG members within the same household is health recall, this suggests that respondents may generally have a lower threshold for which they report adverse health events for themselves relative to others.

We confirm that this respondent bias is not driving our primary estimation results through simulation. Specifically, Table 9 suggests that 18 percent of those who reported illness in the week of the survey among SHG members would *not* have reported illness if they had not been the survey respondent. We therefore conduct 1,000 simulations in which we randomly select 18 percent of respondent SHG members who reported illness and replace their response with having reported no illness. For each simulation, we estimate our model (Table 6, Column 1) and then report the 5th and 995th estimates of $\frac{\beta}{\alpha}$, our measure of adverse selection, thereby estimating a 99 percent interval range robust to potential respondent bias. For weekly illness we estimate a range of (.25, .42), and for annual serious illness we estimate a range of (-.13, .10). Unfortunately, a similar simulation exercise is not amenable to health expenditure, a continuous variable. However, seeing as the simulated ranges not overlap with the estimates of adverse selection for those provided individual

insurance (Table 7), this suggests that the stark difference we observe between the individually insured and group insured is not driven by respondent bias.

Table 9: Respondent Bias

	(1)	(2)	(3)	(4)
Health Variable:	Experienced Illness	Admitted	IHS, Health Expenditure	Significant Illness (Annual Recall)
Respondent	0.0360	-0.00501	0.0592	0.0449
	(0.0500)	(0.0226)	(0.0455)	(0.0403)
Obs (SHG Members)	1208	1208	1208	1208
Household Fixed Effects	Yes	Yes	Yes	Yes

Notes:
(1) Standard errors are in parentheses and are robust.
(2) Observations are limited to active SHG members' households surveyed in the Household Health Survey and are weighted to be representative of the target population.
(3) Statistical significance levels are as follows: *10%, **5%, ***1%.

Exploratory Hypotheses

We additionally explore whether the demand for MHI by fellow SHG members influenced one's own demand for MHI through the following regression:

$$(4)\ EnrolledFamily_{ihgv} = \alpha + \delta_1 SHGEnrolledFamily_{ihgv} + \boldsymbol{X}_{ihgv}\boldsymbol{\theta} + u_{ihgv}$$

for the sub-sample of non-SHG household members, where *EnrolledFamily* is an indicator for whether the SHG member enrolled additional non-SHG household members,

SHGEnrolledFamily is the number of fellow SHG members who enrolled non-SHG household members, and **X**[31] is a vector of health controls.

We estimate that an SHG member is four percentage points more likely to enroll additional non-SHG household members for every fellow SHG member that does the same, even after controlling for the health of the household member (i.e., $\widehat{\delta_1}$ = .0422, with a standard error of .006). One explanation is that insurance demand is influenced by how peers demand the product, even in the absence of formal requirements. Alternatively, it may be the case that groups share common characteristics, other than health, that increase demand for MHI. It is outside the scope of this paper to disentangle these competing explanations, but the results warrant further research on how group decisions in SHGs are made, especially as SHGs are a common unit through which social services reach low-income households.

VI. Conclusion

Finding a method to deliver health insurance has been difficult in low-income self-employed populations. Informal financial groups offer a promising unit to insure, theoretically improving demand and reducing adverse selection against the common alternative of voluntary individual insurance. In this paper, we document that group insurance through Self Help Groups (SHGs), a common informal financial institution, can have high demand, significantly more so than what is typically observed in new insurance products in low income settings. We also find that even when insurance is delivered through these SHGs, insurance demand increases with adverse health and adverse selection persists. However, we do find support for the group insurance

[31] We include all health characteristics listed in Table 2 as additional controls. Observations are limited to active SHG members' households surveyed in the Household Health Survey and are weighted to be representative of the target population. Standard errors are clustered at the SHG level.

mitigating the severity of the adverse selection and increasing insurance demand relative to individual insurance, as is theoretically predicted. The results suggest that utilizing groups within informal financial institutions as a unit for health insurance, relative to insuring individuals, may be a promising way to increase the size and health of the risk pool. Many financial interventions and grassroots outreach in low income countries rely on such small groups, including Self Help Groups, Rotating Savings and Credit Associations (ROSCAs), and Village Savings and Loans Associations (VSLA). The ubiquitous nature of these groupings suggests that group insurance within informal financial institutions may be a powerful and feasible method to increasing access to health insurance for the poor in low income countries.

We additionally find risk aversion to be negatively correlated with insurance demand, suggesting risk preferences may indirectly exacerbate, rather than mitigate, adverse selection. Surprisingly though, little else predicts enrollment. However, the requirement for SHG members to be enrolled in MHI for other household members to be eligible does result in more females being insured relative to males. Thus, if gender biases affect insurance demand in adults, providing insurance through women's SHGs does ensure inclusion of women.

Through we provide evidence of such group insurance increasing demand and reducing adverse selection, it remains an open question whether it improved welfare. The increase in group demand is consistent with the theory of joint liability inefficiently inhibiting demand with individual voluntary insurance; and, to the extent that group insurance can lower premiums by increasing the health of the risk pool, it may arguably be Pareto improving. Future research on directly testing individual versus group insurance and welfare outcomes would help further inform the impact of how health insurance is delivered in these contexts.

References:

Akerlof, George A. 1970. The Market for 'Lemons': Quality Uncertainty and the Market Mechanism. *Quarterly Journal of Economics*. 84(3): 488 – 500.

Acharya, Arnab, Sukumar Vellakkal, Fiona Taylor, Edoardo Masset, Ambika Satija, Margaret Burke and Shah Ebrahim. 2013. The Impact of Health Insurance Schemes for the Informal Sector in Low- and Middle-Income Countries: A Systematic Review. World Bank Research Observer, 28:2, 236-266

Asenso-Okyere, W. Kwadwo, Isaac Osei-Akoto, Adote Anum, and Ernest N. Appiah. 1997. Willingness to pay for health insurance in a developing economy. A pilot study of the informal sector of Ghana using contingent valuation. Health Policy. 42(3): 223-37.

Banerjee, Abhijit, Esther Duflo, Rachel Glennerster, and Cynthia Kinnan. 2009. The Miracle of Microfinance? Evidence from a Randomized Evaluation. http://econ-www.mit.edu/files/4161

Banerjee, Abhijit, Esther Duflo, and Richard Hornbeck. 2014. Bundling Health Insurance and Microfinance in India. American Economic Review: Papers and Proceedings, 104(5):1-7.

Bendig, Mirko, and Thankom Arun. 2011. Enrolment in Micro Life and Health Insurance: Evidence from Sri Lanka. IZA Discussion Paper Series No. 5427. The Institute for the Study of Labor.

Bhattacharya, Jayanta, and William B. Vogt. 2014. Employment and Adverse Selection in Health Insurance. Forum for Health Economics and Policy. 17(1): 79 – 104.

Burbidge, John B., Lonnie Magee, and A. Leslie Robb. 1988. Alternative Transformations to Handle Extreme Values of the Dependent Variable. Journal of the American Statistical Association, 83(401):123 – 127.

Devadasan, N., Kent Ranson, Wim Van Damme, and Bart Criel. 2004. Community Health Insurance in India: An Overview. Economic and Political Weekly. 39(28): 3179-3183.

Das, Jishnu, Jeffrey Hammer and Carolina Sanchez – Paramo. 2012. The Impact of Recall Periods on Reported Morbidity and Health Seeking Behavior. Journal of Development Economics. 98(1): 76-88.

Dohmen, Thomas, Armin Falk, David Huffman, Uwe Sunde, Jürgen Schupp, and Gert G. Wagner (2011). Individual Risk Attitudes: Measurement, Determinants and Behavioral Consequences, *Journal of the European Economic Association*, 9(3): 522-550.

Dror, David, Elmer S. Soriano, Marilyn E. Lorenzo, Jesus N. Sarol Jr., Rosebelle S. Azcuna, and Ruth Koren. 2005. Field based evidence of enhanced healthcare utilization among persons insured by microhealth insurance units in Philippines. Health Policy. 73(3): 263-271.

Dror, David, Ralf Radermacher, and Ruth Koren. 2007. Willingness to pay for health insurance among rural and poor persons: Field evidence from seven micro health insurance units in India. Health Policy. 82(1): 12 – 27.

Dupas, Pascaline, and Jonathan Robinson. 2009. Savings Constraints and Microenterprise Development: Evidence from a Field Experiment in Kenya. National Bureau of Economic Research Working Paper No 14693.

Gertler, Paul, David Levine,and Enrico Moretti. 2009. "Do Microfinance Programs Help Families Insure Consumption Against Illness?" Health Economics, 18(3): 257-73.

GoI. 2011. Swarnjayanti Gram Swarozgar Yojana Guidelines. Ministry of Rural Development, India. http://rural.nic.in/sites/downloads/programmes-schemes/prog-schemes-sgsy.pdf

Janssens, Wendy, and Berber Kramer. 2016. The Social dilemma of microinsurance: Free-riding in a framed field experiment. Journal of Economic Behavior and Organization, 131: 47 – 61.

Jalan, Jyotsna and Martin Ravallion. 1999. Are the poor less well insured? Evidence on vulnerability to income risk in rural China? Journal of Development Economics, 58: 61 – 81.

Jutting, J. 2004. Do community-based health insurance schemes improve poor people's access to health care? Evidence from rural Senegal. World Development 32: 273 – 88.

Lammers, Judith, and Susan Warmerdam. 2010. Adverse selection in voluntary micro health insurance in Nigeria. AIID Research Series 10 – 06. Amsterdam Institute for International Development.

Levine, David, and Rachel Polimeni. 2012. Prices Matter: Comparing Two Tests of Adverse Selection in Health Insurance. Working Paper 135-12. Institute for Research on Labor and Employment, UC Berkeley.

Liber, Dominic, Michael J. McCord, and Jim Roth. 2007. The Landscape of Microinsurance in the World's 100 Poorest Countries. The MicroInsurance Center, LLC.

Matul, Michal, Aparna Dalal, Ombeline De Bock, Wouter Gelade. 2013. Why people don't buy Microinsurance and what can we do about it. Microinsurance Paper No. 20. International Labor Organization: Geneva.

Montalvao Joao, Jolene Skordis-Worrall, Nirmala Nair, Suchitra Rath, Rajendra Mahapatra, Rajesh Sinha, Audrey Prost, Anthony Costello, Prasanta Tripathy. 2011. Integration of microfinance and health education: evidence from a cluster randomized controlled trial in rural India. North East Universities Development Consortium.

Morduch, Jonathan. 1999. Between the State and the Market: Can Informal Insurance Patch the Safety Net? World Bank Research Observer, 14(2): 187 – 207.

Morduch, Jonathan. 2006. “Micro-insurance: The Next Revolution?” in Understanding Poverty, edited by Abhijit Banerjee, Roland Benabou, and Dilip Mookherjee. Oxford University Press.

NABARD. 2012. SHG2: Revisiting the SHG Bank Linkage Programme. Circular No: 65(A)/MCID-04/2011-12. National Bank for Agriculture and Rural Development, India. https://www.nabard.org/pdf/SHG2_circular.PDF

Panda, Pradeep, Arpita Chakraborty, David M. Dror, and Arjun S. Bedi. 2014. Enrolment in community based health insurance schemes in rural Bihar and Uttar Pradesh, India. Health Policy Plan. 29(8): 960-74.

Thomasson, Melissa A. 2002. From Sickness to Health: The Twentieth-Century Development of U.S. Health Insurance. Explorations in Economic History 39 (3): 233 – 253.

Thomasson, Melissa A. 2003. The Importance of Group Coverage: How Tax Policy Shaped U.S. Health Insurance. American Economic Review, 93 (4): 1373 – 1384.

Townsend, Robert M. 1994. Risk and insurance in village India. Econometrica 62, (3) (May): 539-91.

Wang, Hong, L. Zhang, W. Yip, and W. Hsiao. 2006. Adverse selection in voluntary rural mutual health care health insurance scheme in China. Social Science and Medicine. 63(5): 1236 – 45.

World Health Organization. 2015. Global Health Expenditure Database.

Appendix: Details on Study Context and Data Collection

Health Surveys: Sampling and Response Rates

In October 2012, a comprehensive Household Health Survey was completed for a subset of SHG members selected from a 2010-2011 baseline membership roster (described below). In larger villages, randomly selected SHG members were chosen to be surveyed. The analysis in the paper is weighted accordingly. In total, 1,152 SHG members from villages used in this paper were selected to be surveyed, of which 943 completed the survey. Of the 943 who completed the survey, 38 were no longer active SHG members. We drop these former members from our analysis as they were not eligible for the MHI, and use the remaining 905 members as the sample in this paper. This survey collected basic demographic indicators and household health incidents, health care utilization and health care expenditure in the past week and year. The Household Health Survey was conducted at the SHG Member's home by a team of fifteen hired surveyors (only one local to Junnar sub-district).

The survey sample was selected from a baseline membership roster that was created almost two years earlier. 87 percent of those from the baseline membership roster that were unable to be surveyed was due to the member relocating, primarily to cities, and were therefore no longer active SHG members. Only 2 members, less than 1 percent, were non-respondents due to health reasons, and our results are robust to bounds from two additional observations. Note, the survey occurred prior to the introduction of the intervention, so the non-response is a concern only to the extent that it is not representative of members – however, as the primary reason for not participating in the survey is no longer being a member, this is less of a concern.

From October 2011 to July 2012, SHG Monthly Health Surveys were conducted during the member's monthly SHG meeting.[32] These surveys collected information on household illness, health care utilization and health care expenditure of the SHG member's household with a one month recall period. The SHG Monthly Health Surveys were conducted during standard SHG meetings by the regular field staff of the informal financial institution. Completion of the

[32] The SHG Monthly Surveys are limited to households in attendance at the meetings. On average, 57 percent of households were in attendance in a given month. 85 percent of households were represented at least once during the panel period.

survey was therefore dependent on the occurrence of SHG meetings and whether the SHG member attended the meeting. As a result, the SHG Monthly Health Surveys have significant non-response rates, 55.82% of baseline SHG members over 10 months.

Both health surveys collect household level health information, but are conducted in different settings by different enumerators.

Baseline Membership Roster

The baseline membership roster was constructed by reviewing Self Help Group (SHG) meeting records from October 2010 – January 2011 for Region 1 and February 2011 – April 2011 for Region 2 and 3. It may be that some of the names were still on the official meeting roster, despite no longer being active participants in the SHG.

Background

This study is based on data collected from a randomized controlled trial for a health insurance (MHI) intervention implemented in January 2011 by Chaitanya in Junnar sub-district of Maharashtra. A village list of where Chaitanya was operational in the sub-distrct was provided by the local staff workers. Stratifying on three regions (increasingly tribal and rural), 30 villages were randomly selected to be in the treatment group (i.e., offered the MHI) and 31 villages in the control group. After the start of the study, it became known that 18 villages on the original list did not have functioning SHGs. These villages were balanced across treatment and control villages (9 villages each) and were dropped from the study prior to data collection. Therefore, the final sample was 21 treatment villages (1,314 SHG Members[33]) and 22 control villages (1,311 SHG Members).

This paper uses the control villages where the MHI was originally not offered. In these villages, the MHI became available in November 2012, with coverage beginning December 2012.

[33] The unit of observation in this paper and the data collection is based on the SHG member, either the SHG member herself or her non-SHG family members. For SHG members belonging to the same household, analysis on non-SHG household members will therefore appear twice in the analysis of non-SHG household members.

Appendix Table 1: Changing Sample Sizes with Additional Covariates for SHG Members

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable: Enrolled						
Panel A: Experienced Illness						
Experienced Illness	0.188***	0.174***	0.169***	0.152***	0.148***	0.150***
	(0.0346)	(0.0405)	(0.0406)	(0.0304)	(0.0359)	(0.0379)
Panel B: Admitted						
Admitted	0.141**	0.148*	0.146*	0.0979*	0.0901	0.0808
	(0.0636)	(0.0756)	(0.0741)	(0.0537)	(0.0663)	(0.0675)
Panel C: Health Expenditure						
IHS of Health Expenditure (Rs.)	0.0302***	0.0289***	0.0270***	0.0210***	0.0205***	0.0201***
	(0.00548)	(0.00659)	(0.00652)	(0.00452)	(0.00539)	(0.00568)
Panel D: Significant Illness (Annual Recall)						
Significant Illness	-0.0103	-0.0333	-0.0389	-0.0228	-0.0373	-0.0484
	(0.0436)	(0.0513)	(0.0504)	(0.0344)	(0.0408)	(0.0391)
Observations (SHG Members)	905	638	638	905	638	638
Includes Covariates	No	No	Yes	No	No	Yes
Sample with Covariates	No	Yes	Yes	No	Yes	Yes
Village FE	No	No	No	Yes	Yes	Yes

Notes:
(1) Standard errors are clustered at the SHG.
(2) Observations are limited to active SHG members' households surveyed in the Household Health Survey and are weighted to be representative of the target population.
(3) Statistical significance levels are as follows: *10%, **5%, ***1%.

Appendix Table 2: Changing Sample Sizes and Covariates for Non-SHG Household Members

Dependent Variable: Enrolled	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				Panel A: Experienced Illness					
Experienced Illness	0.151***	0.166***	0.160***	0.088***	0.091***	0.092***	0.057**	0.063**	0.064**
	(0.0389)	(0.0432)	(0.0419)	(0.0238)	(0.0256)	(0.0262)	(0.024)	(0.026)	(0.027)
				Panel B: Admitted					
Admitted	0.0604	0.0701	0.0706	0.0276	0.0345	0.0373	0.0241	0.0326	0.0366
	(0.0499)	(0.0572)	(0.0556)	(0.0401)	(0.0423)	(0.0433)	(0.0391)	(0.0421)	(0.0424)
				Panel C: Health Expenditure					
IHS of Health Expenditure (Rs.)	0.019***	0.023***	0.022***	0.011***	0.012***	0.012***	0.0065*	0.009**	0.009**
	(0.00576)	(0.00669)	(0.00665)	(0.00357)	(0.00378)	(0.0039)	(0.004)	(0.004)	(0.004)
				Panel D: Significant Illness (Annual Recall)					
Significant Illness	0.111***	0.109***	0.096***	0.077***	0.079***	0.064**	0.061**	0.050*	0.0465*
	(0.0285)	(0.0317)	(0.0307)	(0.0267)	(0.0279)	(0.0280)	(0.025)	(0.0256)	(0.0257)
Obs (Non-SHG HH Members)	2394	2060	2060	2394	2060	2060	2394	2060	2060
Includes Covariates	No	No	Yes	No	No	Yes	No	No	Yes
Sample with Covariates	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
SHG FE	No	No	No	Yes	Yes	Yes	No	No	No
HH FE	No	No	No	No	No	No	Yes	Yes	Yes

Notes:

(1) Standard errors are clustered at the SHG for Columns 1 to 6 and are robust for Column 7 to 9.

(2) Observations conditional upon the enrollment of the household's SHG member enrolling in MHI.

(3) Observations are limited to active SHG members' households surveyed in the Household Health Survey and are weighted to be representative of the target population.

(4) Statistical significance levels are as follows: *10%, **5%, ***1%.

Appendix Table 3:Non-SHG Household Members' Health by SHG Member's Enrollment Status

	(1)	(2)	(3)	(4)
Dependent Variable:	Experienced Illness	Admitted	IHS of Health Expenditure (Rs.)	Significant Illness (Annual Recall)
Enrolled SHG Member	-0.000379	-0.00632	-0.0197	0.0104
	(0.0113)	(0.00736)	(0.0758)	(0.00987)
Constant	0.0978***	0.0318***	0.614***	0.0682***
	(0.00820)	(0.00586)	(0.0591)	(0.00849)
Obs (Non-SHG HH Members)	4105	4105	4105	4105

Notes:
(1) Standard errors are in parentheses and are clustered at the SHG level.
(2) Observations are limited to active SHG members' households surveyed in the Household Health Survey and are weighted to be representative of the target population.
(3) Statistical significance levels are as follows: *10%, **5%, ***1%.