Insuring the Poor:

Overcoming Adverse Selection and Increasing Demand for Health Insurance

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Abstract: Low demand and adverse selection are potential explanations for missing health insurance markets in low-income countries. Institutional innovations such as insuring groups can help complete insurance markets by mitigating adverse selection, but has ambiguous effects on total insurance demand. This study evaluates a micro health insurance (MHI) offered either as group insurance or individual insurance through Self Help Groups in rural Maharashtra, India. I 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. The total demand for group insurance is significantly higher (57 percent compared to 16 percent) and the relative effect of poor health on insurance demand is significantly reduced among those offered group insurance (35 percent compared to 100 percent). Together, these results are consistent with group insurance increasing demand and reducing, but not eliminating, adverse selection relative to individual insurance. Surprisingly, I also find that insurance demand is higher for those with greater preference for risk, but fail to find support for additional demographic characteristics, including age and gender, predicting insurance demand.

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I. Introduction

Despite health care being a significant expenditure for poor households (Banerjee et al. 2009 Dupas and Robinson 2009) and informal risk pooling shown to be incomplete (Townsend 1994, Morduch 1999, Jalan and Ravallion 1998), until recently, health insurance has been virtually non-existent in most low-income countries.[1] The lack of health insurance among the poor has led to a growing effort among community based organizations, particularly microfinance institutions (MFIs), to use their organizations as platforms to provide health insurance for low-income populations, often referred to as micro health insurance (MHI). A promising feature of MFIs is their ability to provide group insurance, rather than individual insurance, potentially reducing adverse selection, but with ambiguous effects on overall demand. Insuring preexisting groups theoretically reduces the effect of health on insurance demand and thereby mitigates adverse selection, the informational asymmetry in which insurance demand increases with poor health and insurers are unable to price premiums according to health risks. Indeed, group insurance dominates many established health insurance markets, including the United States, suggesting it may be an important institutional feature for successfully developing health insurance markets. However, empirical evidence has found low levels of insurance demand among the poor in low income countries and mixed evidence on the significance of adverse selection. Thus, it is unclear whether group insurance can help promote health insurance markets in low income countries where insurance demand is already low and the extent of adverse selection is unclear.

[1] http://apps.who.int/nha/database/Comparison_Report/Index/en

To assess whether group insurance can advance health insurance markets in such settings, I exploit an MHI offered both as group and individual insurance. Group insurance was offered to members of Self Help Groups (SHGs[2]), a common grassroots organization unit throughout South Asia, and individual insurance was offered to remaining household members. I estimate whether insurance demand is a function of baseline health as a test for adverse selection. I then compare enrollment rates and enrollment sensitivity to baseline health across group and individual insurance offers to determine whether group insurance impacted demand and reduced adverse selection.

I find evidence for adverse selection in both types of insurance offers, but that among those offered group insurance, insurance demand is higher and adverse selection is less severe. Among SHG members offered group insurance, 58 percent enrolled in the MHI for at least one year. In contrast, only 16 percent of those eligible for individual insurance enrolled in the MHI. These striking differences in enrollment rates are consistent with group insurance increasing demand and cannot be explained by observable differences. Additionally, the demand among those offered group insurance is much higher than most micro insurance programs in which uptake rates rarely exceed 30 percent (Matul et al. 2013).

In this context of high demand for MHI, I find strong evidence of adverse selection in both group and individual insurance. The marginal effect of poor health on enrolling in the insurance is similar regardless of the unit at which the insurance was provided. However, the higher enrollment among those offered group insurance suggests group insurance lowered

[2] An SHG (Self-Help Group) is usually 15 to 20 women who come together to borrow and save. Many MFIs, including the Indian government, have organized themselves around the SHG model.

adverse selection by improving the average health of the risk pool relative to voluntary individual insurance. For example, among both group-insured SHG members and individually-insured non-SHG household affiliates, reporting illness (weekly recall) prior to the MHI offer increased enrollment by 15 to 19 percentage points, but this represents a doubling of the likelihood of enrolling among the individually-offered and only a 35 percent increase among the group-offered. Similarly, reporting a critical illness (annual recall) prior to the MHI offer increased enrollment by 74 percent among individually-offered while having no discernible effect on enrollment among group-offered. This suggests that the average health of the risk pool is significantly improved when insurance is offered to groups, such as SHGs, relative to when offered to individuals.

These results are consistent with the theory that providing insurance to preexisting groups reduces the correlation between health and insurance demand. These relationships are mitigated slightly, but continue to be robust, when including group (i.e., SHG) and household fixed effects and additional observable covariates, reducing concerns of omitted variables driving the observed relationship between health and insurance demand.

I also find that higher tolerance for risk increases demand for MHI, despite the common assumption that insurance demand increases with risk aversion. In contexts where insurance is a novel product and providers do not have a history of supplying insurance, it is not surprising that those who are more willing to take risks are the first purchasers of MHI. This result is also consistent with observed adverse selection in new health insurance markets. One explanation for advantageous selection, as opposed to adverse selection, is that risk averse individuals are more likely to demand insurance and take care of their health resulting in a positive correlation

between being healthy and demanding insurance. In contexts where demand is higher among those who are risk loving, such risk preferences may exacerbate adverse selection concerns.

This paper contributes to the expansive literature of adverse selection as a cause of incomplete insurance markets (Akerlof 1970, Rothschild and Stiglitz 1976), and the critical role of institutional features, in this case group insurance, in the completion of markets. Group insurance can play a vital role in mitigating adverse selection; for example, 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.

The small proportion of this literature focused on low income countries has found mixed results on adverse selection and is mostly based on limited identification with minimal attention to institutional features. The majority of studies find that poor health is correlated with enrolling in MHI (Lammers and Warmerdam, 2010; Arun and Bendig, 2011; Asenso-Okyere et al. 1997, Dror et al. 2007; Wang et al. 2006), with a small minority failing 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. Specifically, it is unclear whether the correlation reflects increased demand for insurance among those with greater health needs or increased utilization of health services as a result of becoming insured.

I am aware of only two studies which use alternative methods to overcome these drawbacks: Levine and Polimeni (2012) find evidence of adverse selection for an insurance

product offered to households in rural Cambodia by randomizing the premium price of the insurance. In contrast, Banerjee et al. (2014) find very low demand for MHI and fail to find support for health status affecting insurance demand. Consistent with the results in this paper, one potential explanation for these different findings is the unit at which the insurance was offered, individual household insurance in the former versus MFI group insurance in the latter. Banerjee et al. (2014) findings also highlight that insuring large groups may fail when there is very low demand for insurance. They find that when the group insured was the entire MFI (i.e., the MHI was made a mandatory product for receiving a loan), clients preferred to leave the MFI rather than be forced to purchase the health insurance and this decision was unrelated to health status. This underscores the difficulty in determining how best to use group structures to offer MHI, especially in low income settings where most are self-employed, and concerns of adverse selection may be secondary to low insurance demand.

This paper contributes to the existing literature by using an improved identification strategy in testing for adverse selection and being one of the first to assess whether the institutional design of group insurance mitigates low demand and adverse selection. Unlike the majority of the literature assessing health insurance demand in low income countries, I rely 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. The paper adds to the particularly scarce literature in developing country contexts where insurance markets are experiencing rapid growth and insurance demand can be evaluated in the absence of an existing saturated formal insurance market.

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

Microfinance institutions in low income countries commonly provide credit to assist in health shocks (Banerjee et al. 2009; Gertler et al. 2007). The borrowing patterns in this study's sample are consistent with this finding: 17% of households with a current loan stated health as their reason for borrowing, and health was named as the second most common reason for taking a loan, second only to business and agricultural loans. Given that health is a primary reason for credit, MFIs are a natural candidate to provide insurance.

An added benefit is MFIs' existing platform through which to deliver health insurance. This existing infrastructure can reduce transactional costs, but adverse selection and low demand may still prevent MHI from being a sustainable product. Insuring groups, rather than individuals, could increase the overall risk pool while reducing the effect of health on insurance demand. One option would be to insure Self-Help Groups (SHGs), a common grassroots level organization in South Asia in which 10 to 20 women form a savings-lending group. By 2012, over 100,000,000 households in India are associated with an SHG according to India's National Bank for Agriculture and Rural Development, and the Indian government has advocated SHGs as a mode of 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 Association (ROSCAs), commonly found in other low income

countries, are analogous structures, illustrating that these grassroots groups have a large geographical reach among lower-income populations and could help overcome barriers to insuring the poor.

If groups are formed based on health, then insuring an SHG (or other financial grassroot groups) will not protect against adverse selection relative to individual insurance. If health affects loan performance and repayment, then SHGs may form based on health and result in "healthy" SHGs and "sick" SHGs. However, if other factors are more important in group formation (e.g., trust, proximity) and members form groups without considering health, then insuring SHGs should reduce the relationship between health and insurance demand relative to insuring individuals. Natural variation in health across SHGs may still prevent group insurance from eliminating the effect of health on insurance demand.

Figure 1 depicts the distribution of illness within an SHG for SHG members and Figure 2 for the SHG's extended household members. Given the relatively small number of members in an SHG, Figure 1 suggests members are not sorting exclusively on health and the distribution is consistent with SHG formation being mostly orthogonal to health with some natural variation. 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.[3] Health variation being greater within SHGs suggests that if adverse selection is a barrier to providing health insurance, then insuring SHGs may be a

[3] 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 I cannot reject the null of equal variances (a p-value of .98 using Bartlett's test of equal variances).

promising method to reduce it. Moreover, 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 (Battacharya and Vogt 2014).[4]

Though insuring SHGs should theoretically reduce adverse selection, group insurance has ambiguous effects on total insurance demand. Insuring SHGs could increase total demand if individuals demanding insurance successfully encourage fellow SHG members to enroll. SHG members who disagree with the enrollment may choose to exit the SHG, but only if the cost of doing so is less than the premium. Alternatively, total demand would decrease if individuals demanding insurance are unable to convince others in the SHG to enroll. SHG members may leave to join another SHG that does prefer the insurance, but only if the cost of doing so is less than the value of the insurance. Assuming the costs of changing membership in an SHG is not trivial, then it is unclear whether group insurance will increase or decrease insurance demand relative to individual insurance offers. Therefore, SHGs are a promising unit to insure because of their potential to reduce adverse selection, assuming health needs increases insurance demand, but their effect on the size of the risk pool remains ambiguous.

III. Overview of the MHI

Chaitanya is a non-profit microfinance institution (MFI) working on women's empowerment and microfinance in Maharashtra. The institution is organized into SHGs in which multiple SHGs combine to form a Federation, the umbrella organization covering a sub-district. As of April 2015, Chaitanya is promoting 49 Federations, comprised of over 100,000 SHG

[4] In this context, I find no evidence of SHG members offered MHI being more likely to leave the MFI or change their SHG (Sheth, 2015).

women members. This study focuses on one Federation that was introducing the MHI to their clients.

Overview of the Micro Health Insurance (MHI) Contract

In November 2012, Chaitanya expanded its community based MHI program, Dipthi Arrogya Nidhi (DAN), to 22 villages in the semi-urban and rural sub-district of Junnar, Maharashtra.[5] DAN shares many characteristics common to MHI, including distribution through an existing MFI (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).

The MHI premium is INR 200 (USD 4) per person per year if the SHG member insures none or one additional person in her household, or INR 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 INR 15,000 (USD 300) per event).[6] The product had also included a 24-7 medical help-line, health camps, and monthly village visits by a

[5] 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.

[6] 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 INR 2,000 – 6,000 (USD 40 – 120) and RSBY (government insurance for households below the poverty line) has a limit of INR 30,000 (USD 600) per year for the entire household (SEWA 2013, RSBY 2013a).

doctor to offer referrals and basic medications, but the health camps and doctor visits to villages were discontinued prior to the start of enrollment of this study's sample.

Insuring SHGs: Group and Individual Insurance

The MHI is offered to Chaitanya's clients through their SHGs. 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.[7] However, conditional upon enrolling themselves, SHG members can 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.

This requirement falls short of eliminating the effect of health on insurance demand by three factors: heterogeneity in health across SHGs, requiring 80 percent compliance (as opposed to 100 percent), and non-compliance with the 80 percent rule.

Enrollment into MHI occurred at SHG meetings with SHG members. Therefore, the decision to enroll additional household members was mediated through the SHG member. This mitigates concerns that comparisons across SHG members and non-SHG household members reflect different underlying unobserved preferences for the insurance.

Data Sources

[7] The 80% requirement was made to allow for exceptions in the group or members who may legitimately not benefit from the insurance and to not protect majority from outliers in the SHG that were unyielding in their insurance demand decision.

The primary data source is a Household Health Survey conducted in October 2012 on a randomly selected subsample of the baseline SHG member population of Junnar sub-district.[8] The Household Health Survey is a detailed questionnaire on demographics and health of individuals in a household and the most common survey respondent was the SHG member.

The baseline roster from which households were sampled is based on SHG members as of January 2011, almost two years prior to the survey and almost 4 years prior to the end of the observed enrollment period. The survey has a response rate of 80 percent, partly reflecting the significant length of time between the baseline roster and the survey. For the purposes of the analysis in this paper, those listed on the baseline roster that were surveyed and stated they were no longer members of an SHG at the time of the survey (i.e., prior to the MHI offer) were dropped from the analysis (4% of the original roster).

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 (13 to 4 months prior to the initial MHI offering) and suffered a high non-response rate (approximately 50%) because survey completion was dependent on attendance in SHG meetings.

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

Enrollment Rates and Demographic Characteristics

[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.

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 MFI, a significant proportion of SHG members belong to households below the poverty line (47%), categorized as being a disadvantaged caste by the government (71%), and have members employed as agricultural laborers within the previous year (70%). Both SHG members and their additional household members have relatively few years of schooling. SHG members are all adult female, resulting in non-SHG household members to mechanically be more male and younger.

Table 2 describes the primary variables of interest used in this paper, health characteristics of SHG members (offered group insurance) and non-SHG household members (offered individual insurance conditional on SHG member enrollment), and the SHG member's self-reported risk preference. Using weekly recall periods, among SHG members 22% experienced being ill, 19% sought care from a doctor, 5.6% were admitted to health facilities, and the average health expenditure[9] was Rs. 157 (approximately USD 3). Among non-SHG household members, 10% experienced illness, 9% sought care from a doctor, 3% were admitted, and average health expenditure was Rs. 83 (approximately USD 1.8). When asked about the previous year, excluding illness in the weekly recall, 18 percent of SHG members and 7 percent of non-SHG household members had experienced an illness requiring significant expenditure (over Rs.1,000), being admitted to a health facility, or bed rest for at least five days. The preferred health outcomes are based on weekly recall for greater accuracy (Das et al. 2007).

[9] Health expenditure is windsored at 99 percent.

On average, SHG members reported worse health than non-SHG household members. This may accurately reflect differences in health status, especially given SHG members are often considered to be vulnerable women within a household. Alternatively, the difference in health may reflect survey reporting bias of respondents, most commonly SHG members, recalling their own health differently from other household members' health. I discuss how both possibilities affect the interpretation of my results in the following section.

SHG members were also asked to rate themselves on a scale of 0 to 10, increasing in their preference for risk.[10] On average, SHG members self-report a risk preference of 6.

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.[11] 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.[12] Interestingly, renewal rates (conditional upon initial enrollment) are similar to the initial

[10] Self-reported risk preferences correlate with other with other measures of risk preferences (Dohmen et al. 2005).

[11] This enrollment rate is conditional upon SHG members having been surveyed in the Household Health Survey in October 2012. Because the enrollment period extends to 2 to 4 years after the baseline roster is established, using a baseline definition reflects both lack of demand for the MHI and members that have left the sample overall. Additionally, the baseline roster only exists for SHG members, not their additional household members. However, using the baseline roster definition suggests a similar enrollment rate of 52%.

[12] 11 non-SHG household members of 4402 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).

enrollment rate for both SHG members and their non-SHG household members. We do not observe renewal rates for an extended period of time, but the initial trend suggests that enrollment will reduce over time, and more so for non-SHG household members.

The significantly higher enrollment rate for SHG members is consistent with group insurance increasing MHI demand and establishing a larger risk pool. Section 4 and 5 suggest that the higher enrollment rate is unlikely to be explained by the worse health reported by SHG members.[13]

Figure 3 and 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 program. As seen in Figure 3, the majority of SHG members choose to not enroll any additional household members. 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 with requiring group insurance for SHG members is relatively high. [14] 74% of SHGs complied by having either no SHG members enroll or having at least 80% of their members enrolled.

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[13] Using estimates of the propensity to enroll as a function of health yields a predicted enrollment rate of only 24% among SHG members. This assumes that the propensity to enroll as a function of health under voluntary individual insurance is the same as individually-insured non-SHG household members and is reported in Table 7.

[14] SHG level analysis excludes SHGs for which less than 2 members were surveyed (due to random sampling or survey attrition). Members belonging to SHGs are defined as their membership at the time of the baseline roster in January 2011. However, compliance is calculated as the proportion enrolled conditional upon being selected and

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 INR 15,499 (USD 310) and the average disbursement amount was INR 2,625 (USD 53). The claims process generally works well with the majority of claims request being settled and paid. The primary reason for lower reimbursement amounts was use of non-network facilities, which arguably will become less of a concern over time as members become more familiar with the MHI.

Though the filing rate appears low, based on the average disbursement reported in Table 4, the *maximum* filing rate supported by the premium price is 7.6% per year (assuming no operational loading costs and all members paid Rs. 200 for the MHI). Given the short observation period, it is unclear whether the MHI will eventually reach, and even surpass, a claims ratio of 100 percent. If admit rates reported in Table 2 are an accurate proxy for in-patient care covered by the insurance, then this suggests the claims ratio will eventually become unsustainable. Nonetheless, Chaitanya's MHI program has been able to support claims through premiums for almost six years.

IV. Estimating Equations for MHI Demand

The Household Health Survey conducted in October 2012 captures health data *prior* to the MHI offer. I estimate whether baseline health reported in the Household Health Survey is statistically different among those who enroll relative to those who do not:

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surveyed in the Household Health Survey. This is because the baseline roster was formed almost two years prior to the start of the MHI offer and therefore it is not possible to identify whether low enrollments in SHGs are due to non-compliance or SHG members having left the group.

$$(1)^{15}\ Enrolled_{ihgvt} = \alpha + \beta AdverseHealth_{ihgvt-1} + \vartheta_{ihgvt}$$

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.

I estimate Eq (1) separately for SHG members and non-SHG household members. A positive β represents the marginal percentage point increase in the likelihood of enrolling into the MHI if a person is ill and indicates adverse selection; α is the mean enrollment rate among the healthy. Therefore, $\frac{\beta}{\alpha}$ is a measure of the percent increase in the probability of enrolling in the MHI when a person is ill. 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.

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, I 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.

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

I also include SHG fixed effects when estimating Eq (1) for SHG members. However, in this case, β estimates the relationship between health and enrollment for only those SHGs which enrollment was neither 0 or 100 percent. Therefore, the inclusion of SHG fixed effects provides suggestive evidence of the underlying relationship between health and MHI demand in the absence of the bundling requirement.

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 operational 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 at baseline is not likely to be 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, it is likely that all enrollment decisions reflect the preferences of the SHG member because the MHI is offered to her and she mediates the enrollment decision for herself and her household. For example, imagine non-SHG household members have different risk preferences or less trust for the provider on average than SHG members. It is unlikely that differences in α and β reflect such omitted preferences as it is the SHG member that makes the

final decision of whether or not her family member should become enrolled. Thus, the estimates of α and β will reflect the underlying preferences of the SHG member, even when observing non-SHG member enrollment, unless one believes that the SHG member considers the risk preference or trust level of that non-SHG household member.

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 by a single person (the SHG member).

From an operational standpoint, the insurer is concerned about the relationship between health and the risk pool regardless of the mechanism for that 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 where 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*, I estimate Eq (1) with the self-reported risk preference of SHG members and the other covariates listed in Table 1 as independent variables to estimate whether these factors contribute to MHI demand.

Estimating Bounds

Because compliance with the eligibility requirement was imperfect, and the eligibility requirement itself fell short from insuring the entire sub-unit SHG, I create bounds that assume 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), I 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

As Table 2 documented, SHG members report higher levels of illness. Given SHG members are more likely to be survey respondents, and if respondents have higher recall of their own illnesses, then differences in $\frac{\beta}{\alpha}$ between SHG members and non-SHG members may reflect differential recall rather than differential demand for insurance as a function of health. By observing household with multiple SHG members, I can assess whether respondent bias is driving my results.

Using household fixed effects and limiting observations to SHG members, I test whether SHG member respondents have differential recall of health events relative to SHG non-respondents:

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

A positive δ_1 is consistent with respondents having higher recall than non-respondents. I then estimate whether insurance demand as a function of health differs by respondent status:

$$(3)\ Enroll_{ihgv} = \gamma_1 Respondent_{ihgv} + \gamma_2 AdverseHealth_{ihgv} + \gamma_3 Respondent_{ihgv} * AdverseHealth_{ihgv} + \omega_h + v_i$$

where γ_1 and γ_3 is the respondent bias in α and β, respectively. This suggests I should adjust respondent estimates to correct for the bias $\left(\frac{\alpha - \gamma_1}{\beta - \gamma_3}\right)$ to compare estimates of non-respondents and quantify the extent to which respondent bias is driving differential estimates between group insured SHG members and individually insured non-SHG household members.

V. Results

Table 5 estimates Eq (1) using only covariates listed in Table 1 as independent variables for SHG members. I find no statistically significant relationship between basic demographic characteristics such as education, poverty status, or age in an SHG member's decision to enroll. However, I 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.[16] 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, it is not surprising that the opposite holds true – those who are more tolerant of risk are more willing to

[16] 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.

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. I also find no significant effect of demographic characteristics on the enrollment of non-SHG households members offered individual insurance (not shown)[17].

Table 6, Column (1), estimates that even when MHI is offered as group insurance, demand is higher among those that reported poor health at baseline. The relationship is most robust for indicators of health in the past week and does not extend to significant illness in the prior year. Having an illness during the week of the survey increased the probability of enrolling in MHI $\left(\frac{\beta}{\alpha}\right)$ by 35 percent (Panel B, Column 1). Enrollment rates were 25 percent higher among those who had been admitted, and approximately 6 percent higher for every INR 1,000 (USD 20) additional spent on health (Panel D and E, Column 1).[18]

The estimating model becomes more conservative with additional columns – village fixed effects (Column 2), SHG fixed effects (Column 3), and limiting the sample to those SHGs which enrolled none or all members (Column 4). The slight drop in magnitude after the inclusion

[17] 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.

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

of village fixed effects suggests that part of the relationship between health and insurance demand may be due to spatial differences in health.

Appendix Table 1 finds that the results in Table 6, Column 2, are robust to bounded estimates that assume complete group insurance. In other words, the adverse selection found in Table 6 cannot be explained by non-compliance or the flexibility in the group enrollment. Recall, the group insurance allowed for 20 percent of members to not enroll in the MHI even if the other members did enroll and compliance with 80 percent group enrollment was imperfect. This suggests that the relationship between health and insurance demand would persist even with perfect insurance.

Column 3 and 4 suggests how much of adverse selection is driven by differences across groups versus variation of enrollment within groups. Column 3 estimates how much of the variation found in Column 1 is due to differences in enrollment *within* an SHG. The positive coefficients suggest that clients within groups are enrolling as a function of health. Non-compliance with perfect group enrollment goes in the same direction one would expect if individual insurance demand is a function of poor health – those that report better levels of health at baseline are choosing not to enroll. However, the reduced magnitudes of Column 3, relative to Columns 1 and 2, suggest that differences in health *across* SHGs are a primary reason for the adverse relationship. This is further supported by Column 4, which limits the sample to SHGs that enrolled either none or all of their members. The higher magnitudes found in Column 4 relative to Column 3 suggest that much of the relationship between health and insurance is being driven by differences in average health across SHGs.

Though Eq (1) was expanded to include village and SHG fixed effects in Table 6, it excludes additional covariates as controls due to the loss of sample size. Appendix Table 2 provides estimates when additional covariates are included and suggests how much estimates are affected due to inclusion of meaningful covariates versus changes in the underlying sample composition. Differences in the estimates of β between column (1) and (2), column (4) and (5), column (7) and (8), and column (10) and (11) are due only to changes in the sample composition when additional covariates are included – the estimating model is constant across each comparison. Differences between column (2) and (3), column (5) and (6), column (8) and (9), and column (11) and (12) are due to changes when the model includes potentially important covariates, but the underlying sample is held constant. The results in Appendix Table 2 show that this second comparison provides almost identical estimates that do not statistically differ from one another, suggesting that the additional covariates are not important explanatory variables for a consistent estimate of the relationship between health and MHI demand.[19]

Table 7 estimates Eq (1) for non-SHG household members offered voluntary individual insurance (i.e., household members of SHG members enrolled in MHI).[20] The columns impose increasingly restrictive identification assumptions by including SHG fixed effects (Column 2), and household fixed effects (Column 3). Similar to Table 6, I find that individuals with worse health are more likely to enroll in the MHI program. Column 1 suggests relatively similar

[19] The results found in Column 1 - 3, Appendix Table 2, are robust to both probit and logit models with respect to both magnitude and statistical significance.

[20] Appendix Table 3 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.

magnitudes of β as those estimated in Table 6 for group insurance, but the percentage increase, $\frac{\beta}{\alpha}$, is much larger.[21] Among group insured SHG members, general illness (Panel B) increased the likelihood of enrolling in MHI by 35 percent, but among individually insured non-SHG household members the likelihood of enrolling increased by 100 percent. Though not statistically significant in Table 7, being admitted increased the likelihood by 24% among SHG members, but 38% among non-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 among non-SHG household members.

The inclusion of SHG fixed effects (Column 2) controls for confounding geographical and socioeconomic unobservable factors. The point estimates drop when SHG fixed effects are included, consistent with significant differences in health across SHGs partially explaining the relationship between health and enrollment. However, the pattern of adverse selection is robust across all measures of health.

Column (3) expands the model to include household fixed effects. By 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)

[21] 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.

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.[22] In other words, the enrollment patterns suggest that the observed adverse selection is driven more by variation in health across households than by the variation within households.

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 percentage point increase in the likelihood of enrolling are relatively similar, though the percentage increase they represent is much higher among individually insured non-SHG household members. This suggests that offering group insurance to SHGs, rather than voluntary individual insurance, does reduce the proportion of those with poor health in the risk pool. But the estimates suggest that insuring SHGs fails to eliminate adverse selection, perhaps because enrollment patterns are responsive to variation in health across SHGs. Nonetheless, the increased average enrollment when enrolling groups is greater than predicted by baseline health and supports group insurance as a method to expand the risk pool and improves its average health.

Even though poor health is increasing MHI demand, the effect of health expenditure is less clear. In both Table 6 and 7, the relative increase in insurance demand as a function of health

[22] Non-SHG household health of enrolled SHG members is not statistically different from non-SHG household health of non-enrolled SHG members.

expenditure is relatively small.[23] In Table 7, this magnitude diminishes or reverses signs when including SHG or household fixed effects. From the insurer's perspective, one could argue that the primary variable of interest is health expenditure, not health. Nonetheless, it is unclear if these results reflect a true lack of correlation between health expenses and MHI demand, or are due to noisiness in the measure and low statistical power. If it is the case that health expenditure does not lead to an increase in demand for MHI on average, even though health need does increase demand, then this suggests that the insurance is excluding the most healthy *and* the least healthy, assuming health expenditure is a proxy for severity. In other words, though MHI demand increases with health needs, those with the gravest health concerns are unwilling, or unable, to access the insurance, particularly among individually insured non-SHG household members.

The effect of health on insurance demand is robust to estimates using the alternative SHG Monthly Surveys[24]. The SHG Monthly Surveys suffer from much higher attrition and are crude measures of health and enrollment at the household, unable to separately identify the health of SHG members from their non-SHG family members nor incorporate MHI enrollment status of

[23] The results found in Column 1, Table 7, are robust to both probit and logit models with respect to both magnitude and statistical significance for SHG Members. For non-SHG members, probit and logit estimates are similar in magnitude, but are statistically significant at the 10 percent level.

[24] 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 baseline population (instead of limited to the Household Health Survey sample).

additional family members. Therefore, Table 8 reports the differences in household health prior to MHI between households that eventually enrolled in MHI and households that chose not to enroll in MHI. However, it does not capture the proportion of the household enrolled in MHI, and therefore is best interpreted as differences in household health by the enrollment status of the SHG member. Based on the Household Health Survey, non-SHG family members' health prior to MHI is not statistically different across SHG ember enrollment status (see Appendix Table 4). This suggests the results in Table 8 should align closely to the adverse selection pattern found among SHG-members, not non-SHG family members (Table 6).

Similar to the previous estimates, I find that enrolled SHG members were more likely to report illness, visit the doctor, and have higher health expenditure in their household in the months prior to the MHI offer. I continue to find a lack of effect of larger illnesses predicting enrollment, as measured by admit rates and bed rest. [25] 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 support to the adverse selection among SHG members found in the Household Health Survey.

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, I compare the health of SHG

[25] 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.

members in the same household by respondent status. Table 9 finds that within households with multiple SHG members, the survey respondent does report higher incidence of weekly recall of illness, weekly recall of doctor visits, weekly health expenditure, and annual recall of significant illness. Though none of these results are statistically significant, the magnitudes are relatively large. For the self-reported health status of the day and weekly admit rates, the respondent reports slightly better levels of health, though the magnitudes are much smaller. Assuming the only difference between respondents and non-respondents when comparing SHG members within the same household is health recall, this suggests that respondents generally have better recall of weekly illness, doctor visits, and health expenditure, and significant illnesses in the previous year.

Focusing on these four health variables where recall may be higher for respondents (Column 2,3, 5 and 6), Panel B suggests that enrollment rates are not statistically different across respondent-status. In addition, the differential response to health is also not statistically significant and relatively small in magnitude, suggesting that the respondent bias is unlikely to be a primary factor for explaining the difference in adverse selection between group insured SHG members and individually insured non-SHG household members.

The exception may be Column 5, where differential response to health expenditure is relatively high, though it remains statistically insignificant. Based on these results, it may be the case that the adverse selection as a function of health expenditure may be subject to respondent bias. The results suggest that respondent bias will reduce estimates of adverse selection (relative to non-respondents), suggesting that the adverse selection found among SHG members may be a

higher bound. However, the imprecise measure of health expenditure may also explain such inconsistent results.

In general, given that average enrollment rates remain high among SHG members, regardless of respondent status, suggests that even if the differential recall reported in Table 9 is meaningful, it cannot account for the large differences in adverse selection as measured by $\frac{\beta}{\alpha}$.

Using estimates from Table 6, Column 1, and the point estimates of differential recall from Table 9, in all cases the respondent bias increases the appearance of adverse selection (i.e., the respondent correction reduces $\frac{\beta}{\alpha}$ or leaves it virtually unchanged (Column 3)). This suggests that the higher levels of adverse selection found among individually insured non-SHG household members relative to group insured is unlikely due to differential recall on the survey. Additionally, even after accounting for this potential respondent bias, I continue to find that poor health increases insurance demand (Column 2, 3 and 4). I fail to find support for health increasing insurance demand using measures of self-reported daily health or the previous week health expenditure. This may be due to the measures being less precise and thus more difficult to quantify the effect of health on insurance demand or respondent bias. I continue to find a lack of relationship between significant illness in the previous year and insurance demand, consistent with the findings in Table 6.

Exploratory Hypotheses

Table 10 explores whether the demand for MHI by fellow SHG members influenced one's own demand for MHI. Table 10 estimates 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** is a vector of health controls.

Table 10 estimates 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. One explanation is that insurance demand is influenced by how peers demand the product, even in the absence of formal requirements. Alternatively though, 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 given that SHGs are a common unit through which social services reach low-income households.

Though Table 5 suggested that demand was not sensitive to basic demographic covariates, I expand the model in Table 11 to estimate non-linearitieis in age and gender bias in insurance demand for children[26]. I find no evidence for either of these hypotheses. Column (1) finds no support for age having a quadratic effect on insurance demand, and Column (2) finds slightly lower enrollment for girls than boys, but the difference is small in magnitude and statistically insignificant.

[26] The most likely member to be enrolled is the SHG member's husband – for this reason, I restrict testing for gender bias among enrollment of children.

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 one assumes gender biases affect insurance demand in adults, providing insurance through women's SHGs does ensure inclusion of women.

VI. Conclusion

Both low demand and adverse selection have been highlighted as potential reasons for missing health insurance among the poor. In this paper, I document insurance demand increasing with poor baseline health, suggesting that adverse selection may indeed be a barrier to insurance markets. I additionally find risk aversion to be negatively correlated with insurance demand, suggesting risk preferences may indirectly exacerbate, rather than mitigate, adverse selection.

I find support for group insurance mitigating these concerns by increasing insurance demand and reducing the severity of adverse selection. The results suggest that enrolling groups such as SHGs, relative to individuals, is 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 small groups, including Self Help Groups, ROSCAs, and VLSA. The ubiquitous nature of these groupings suggests that group insurance may be a powerful and feasible method to increasing access to insurance for the poor in low income countries.

Though considerable effort and policies have focused on reducing health risks through insurance, it is unclear whether group insurance improves welfare, even if it increases insurance coverage. Arguably, if insuring groups reduces adverse selection then group insurance could allow for lower premiums that are Pareto improving. However, in this context, the premium

price was the same for individual and group insurance, suggesting that the increased insurance demand was not a Pareto improvement: the higher demand in group insurance is due to members being compelled by the group to purchase the insurance, not a result of increased demand from reduced premiums. It therefore remains an open question if the net welfare effect of grouping insurance with other services to provide group insurance is positive, and to what extent group insurance reduces insurance premiums.

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Figure 1: Baseline Illness of SHG Members Across SHGs

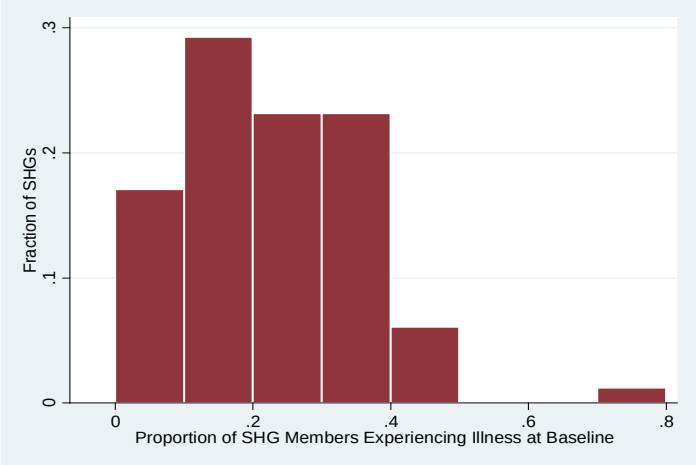

Figure 2: Baseline Illness of non-SHG Household Members Across SHGs

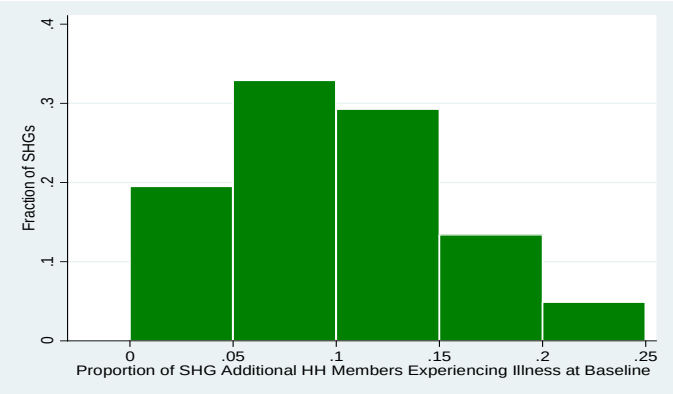

Figure 3: Enrollment of non-SHG Household Members