September 2005

IFMR
INSTITUTE FOR FINANCIAL MANAGEMENT AND RESEARCH

Centre for Micro Finance Research
Working Paper Series

Health Shocks and economic vulnerability in rural India: break the vicious circle

Recommendations to Seva Mandir

Annie Duflo

Annie Duflo is the Research Co-ordinator of Centre for Micro Finance Research (CMFR) at the Institute of Financial Management and Research (IFMR). The views expressed in this note are entirely those of the author and do not in any way reflect the views of the institutions.

TABLE OF CONTENTS

Executive summary

Issue and client

In rural areas of Udaipur district (Rajasthan, India), households are not only poor, they are vulnerable: they are sensitive to various shocks that affect their income and consumption and could easily push then into extremer poverty. Health is one of the major shocks hitting households. How to break the economic vulnerability to health shocks?

Seva Mandir, an NGO working in the area since the 70s, has asked us advice on the following issues: what is the extent and nature of health shocks in Udaipur rural areas, and how do households cope with these shocks? What options does Seva Mandir have, given its limited means and the difficult context, to help households reduce their vulnerability to health shocks?

Summary of results: Need for a NGO provided health insurance

- People spend a high fraction of their income on health.
- Health shocks are frequent and there is a huge variability in health expenditures.
- There are important gaps in market-provided insurance or credit mechanisms, and the government fails to provide poor people with free health services.
- There are some informal insurance mechanisms, but they are not sufficient.
- As a result of health shocks, many people do not seek health care when they are sick because of financial constraints, and households are not able to smooth consumption.
- Seva Mandir can intervene at the intersection of formal and informal coping mechanisms by putting in place an insurance system. Because it combines some of the advantages of both formal and informal insurance mechanisms, an NGO is an attractive solution to fill the gaps in insurance.
- Although the whole sample is poor and vulnerable, there are some important disparities within the sample. Seva Mandir will need to take those into account when implementing the scheme.

This paper discusses possible alternatives to the following insurance implementation issues: hose to deal with adverse selection and moral hazard? How to provide a fair subsidy? what services should be used?

We suggest three different insurance schemes combining the best solutions to these different issues:

Scheme 1: Insurance against operations and lab-tests

- Mandatory for Seva Mandir participants
- Reimburse only against services provided by Government general hospital and Community Health Centers (CHCs)
- Third payment system

Scheme 2: Insurance against operations and lab-tests + usual illnesses

- The scheme will have to be accepted by vote at the village level
- Mandatory for all households in those villages
- Own network of nurses for usual illnesses
- Government hospital and CHCs for operations and lab-tests

Scheme 3: **Insure against operations and lab-test + medicines**

- The scheme will have to be accepted by vote at the village level
- Mandatory for all households in those villages
- Own network of pharmacies
- Government hospitals and CHCs for operations and lab-tests.
- Joint insurance against medicines (limited number of claims per group).

Action plan

Evaluate and compare the impact of each scheme through a randomized evaluation.

Introduction

Health shocks and economic vulnerability

Udaipur district is one of the poorest districts of Rajasthan, which is among the poorest states India. Rural households in this district are not only poor, they are also vulnerable: they face regularly numbers of shocks that affect their income and consumption and that could easily push them into extreme poverty: bad weather, production loss, etc. Health shocks are among the most important and most unpredictable shocks: a serious illness or an accident can result in enormous health expenditure. Such high expenditure may lead to important drops in consumption, which in turn is likely to affect health: poverty and vulnerability to health shocks drive each other in a vicious circle.

What is the extent and the nature of health shocks faced by rural households in Udaipur district? How do households respond to these shocks, and to what extent are they able to cope with them? How to break the vicious circle of poverty and vulnerability to health shocks?

Seva Mandir

Our client, Seva Mandir, is an NGO active in the district since the 70s in several development areas (health, education, agriculture, water management). It has put in place a system of heath workers trained to visit households regularly and provide them with mild medicines and advice in preventive care. However, such a program does not help households cope with important health shocks, and Seva Mandir is considering implementing a new program in order to reduce vulnerability to health shocks.

Given the difficult context and its limited means, what can Seva Mandir do to help households cope with health shocks?

Part I. Theoretical framework and methodology

I-1 Theoretical framework

Why is consumption smoothing important?

A poor household would derive more satisfaction (or marginal utility) from receiving an extra dollar than a better off household. Similarly, a household would derive more satisfaction from receiving an extra dollar in "difficult times" than in "good times". This means that households, when they can, are better off shifting money from the good times to the bad times: this is called consumption smoothing. This is particularly important in developing countries, where households are subject to an important number of shocks affecting their income: weather shocks, illness, job loss etc.

Poverty and vulnerability

This is why the static definition of poverty (having an income below a certain threshold, usually the poverty line) does not capture an important dimension, which is vulnerability. "Many households, while not currently in poverty, recognize that they are vulnerable and that events could easily push them into poverty — a bad harvest, a lost job, an unexpected expense, an illness, a lull in business." (Pritchett 2000). Vulnerability can therefore be defined as a probability: the risk a household will fall into poverty at least once in the next few years. Households are vulnerable when they are not able to smooth consumption, despite various formal and informal coping mechanisms. Moreover, vulnerability and poverty reinforce each other. Indeed, poverty is a source of vulnerability (poor people are more likely to fall badly sick or to be affected by political events) and repeated exposure to downturns reinforces poverty (Morduch 1999).

Various strategies, formal or informal, can help reduce uncertainty: they can be ex-ante (before the shock), through reducing the probability of risk; or they can be ex-post (after the shock): through borrowing or insurance.

The concept of insurance

Broadly defined, insurance involves risk-sharing between many households, or risk sharing within the same household between different times (savings) or different activities (crop diversification). The theory of full insurance posits that households will fully share the risk of idiosyncratic shocks so that the changes in household consumption will not depend on household resources once the changes in aggregate community resources are taken into account (Gruber-Gertler 1997). Insurance can be informal (households helping each other through reciprocal exchange of gifts) or formal.

Formal insurance

Formal insurance consists in households or individuals paying a regular premium to an insurer, worth the expected value of the risk. In the event they are hit by a shock, they are compensated for the loss incurred. Insurance is valuable because it relies on the fact that what is unpredictable for an individual is highly predictable for a large number of individuals (Criel 1998). Therefore, a formal insurance system is efficient only if the risks insured do not hit the community as whole. Since marginal utility is the highest for low levels of income and diminishes for high levels of income, the value of insurance is the highest for events that have low probability but high magnitude.

Asymmetric information: Moral hazard and adverse selection

However, implementing a formal insurance system is made difficult by the problems of hidden action and asymmetric information: the insurer can not observe the actions of his client

and does not have perfect information about his type. Similarly, it can not verify which treatment was administered by the provider. Because of these information problems, providing insurance can lead to inefficient changes in behavior: once he is insured the client may take fewer precautions to avoid risks or use health care more than is required, and the provider may provide unnecessary treatments in order to get reimbursed higher amounts. As a result, the cost of insurance will increase in an inefficient way: this is called moral hazard[1] . In addition, if the insurer does not know the probability of being hit by a shock of his potential clients, it is likely that only the worse risks will buy insurance. This will in turn put pressure on the premiums (in order to cover the cost of the losses), which will cause the better risks to leave the market. This is called adverse selection. Finally, in order for the insurance to be successful, the event that is insured against must be verifiable, which is made difficult by asymmetric information. In developing countries, the information problems are even more acute: with the formal legal system at slow and fairly minimal levels, and with limited powers of verifiability, it is difficult to obtain formally verifiable accounts of incidents; the risk of moral hazard is therefore exacerbated (Ray, Debraj 1998). In addition, some mechanisms commonly used to overcome adverse selection problems (for example, insurance through employer) are not feasible in a context where the majority of the population is self employed in agriculture. As a result, formal insurance mechanisms are rare in developing countries.

Government insurance

In developed countries, when market-provided mechanisms such as savings accounts, credit, pensions, insurance, etc. are not sufficient, governments interfere and provide poverty alleviation programs, unemployment benefits, health insurance or social security. But low income countries do not have the administrative capacity or the ability to raise sufficient taxes to build such public safety nets (Morduch 1999). Indeed, states are not spared by information problems and in developing countries the lack of governments' administrative capacity exacerbates them.

Health: a main source of vulnerability

Illness is one of the events that can push non poor households into poverty, or poor households into extreme poverty. "Illness pushes households into poverty, through lost wages, high spending for catastrophic illnesses, and repeated treatment for other illnesses." (WDR 2004). Not only one of the most sizable, health shocks are also one of the least predictable shocks (Gruber-Gertler 1997). Although several studies have found that households are able to fully or partially insure themselves against production shocks or weather shocks, health shocks are different: in order to prevent production shocks, households can choose non risky activities, so that less smoothing is necessary ex post; although weather shocks are highly unpredictable, farmers understand them, and know to some extent how to deal with them. This is not the case with health shocks, which are therefore likely to make households more vulnerable than other kinds of shocks (gertler-gruber 1997). Fafchamp and Lunds show indeed households are less able to cope with health shocks than with other shocks.

Rationale for NGO involvement in insurance

NGOs' intervention in the insurance market is attractive because it can reduce the problems of adverse selection and moral hazard by making use of local knowledge that is readily available among people living in close communities (Ahuja 2004). In addition, having NGOs provide insurance can considerably reduce its transaction costs in rural areas (collection of premiums etc.) as NGOs already have networks of village workers and knowledge of the population.

---

[1] Note that behavior can also change in an efficient way as a result of health insurance: if there was under-utilization of health care, increased utilization as such is not inefficient. Insurance, depending on how it is implemented, can also influence the provision of health services in an efficient way, for example by introducing competition between providers.

In this paper, we ask to which extent health events result in economic vulnerability in rural areas of Rajasthan, and whether households are able to cope with these shocks using informal insurance mechanisms. We then examine what Seva Mandir can do to help households cope with vulnerability to health.

I-2 Data and methodology

The Data

We use data from a survey on health status and health care delivery in rural areas of Rajasthan, conducted by a team of researchers of MIT/Poverty Action Lab-Princeton (Abijhit Banerjee, Angus Deaton, Esther Duflo). The data has been collected in Udaipur district in 100 villages from January 2002 to August 2003. I was myself part of the team that supervised the data collection. 5 data sets are used in this study: 1) a household questionnaire administered to 1023 households; 2) an adult questionnaire, administered to 2519 individuals; 3) a questionnaire on public health facilities, administered in 146 facilities; 4) a continuous facility survey, monitoring providers' attendance in 146 public facilities; 5) a questionnaire to all private providers in the sample villages.

Methodology

Analysis will be conducted in three phases:

1) *Analysis of health shocks: nature and extent*

- Since we do not have longitudinal data, we use variation across households to estimate the probability of each household to be hit by health shocks.
- We use a combination of prisms to estimate the extent and the long-term impact of shocks: probability of expense, magnitude of expense, opportunity cost, debt for health.

2) *Do health shocks result in economic vulnerability?*

- How well do coping strategies work? Using econometric analysis, we estimate whether coping strategies reduce the probability of health shocks, using debt for health as measure of health shock.

$$Shock = \alpha + \beta(coping\ strategy) + \gamma(X) + \varepsilon$$

where X represents household characteristics[2].

- Can households smooth consumption? We ask whether health shocks result in a reduction of non medical expenditure, estimating equations of the following type:

$$Change\ in\ food\ consumption = \alpha + \beta(shock) + \gamma(X) + \varepsilon$$

3) *The cost of insurance*

To estimate the cost of adverse selection and moral hazard when implementing an insurance scheme, we use scenario analysis.

---

[2] In each regression, standard errors are corrected for heteroskedasticity and grouped structure ate the village level.

Part II : Poor people, poor health, poor health services

II-1 A poor district

Udaipur district is one of the poorest districts in Rajasthan, which is among the poorest states in India. The average monthly consumption per capita is worth 454 Rs (less than 10 dollars). For comparison, according to the NSSO[3] the average per capita expenditure in rural India during 2000-01 was Rs.500 (Frontline, 2004), 10% more than in our sample. In urban India, monthly expenditure was Rs. 933 (19$), more than twice the average monthly consumption in our sample.

Table 1: Economic characteristics of the sample

Monthly expenditure per capita (Rs)	454
% of households having land	97%
Average Landsize (bighas[2])	4
Number of animals	10.1
Observations	1023

Most households rely on agriculture or animal husbandry, however land holdings are in average very small (2.5 ha), as well as the number of animals (10). Finally, more than half of the sample is not educated.

II-2 Poor health

Health and nutritional status in our sample are very low. The average Body Mass Index[5] is 17.8 among adult men, and 18.1 among adult women. For comparison, a BMI from 18.5 to 22 is considered as normal, a BMI below 18.5 is too low, and a BMI below 17 is extremely low (WHO). As shown in table 2, 60% of individuals in our sample are underweight, with a BMI below 18.5[6], and 34% of individuals are extremely underweight, with a BMI below 17. 53% of people are anemic (i.e have a hemoglobin level below 11 g/dl)[7]. In addition, 26% of individuals have low lung capacity, and 16% of individuals have high blood pressure. People's perception of their health, accordingly, is quite low: on a scale from 1 (worse) to 10 (best), the average perceived health score was 6.

Table 2: health characteristics of the sample

	Male	Female	Total
% of underweight (BMI<18.5)	63%	57.5%	60%
% of extremely underweight (BMI<17)	35%	34%	34%
% people anemic (<11g/dl)	51%	56%	53%
% people very anemic (<8g/dl)	1%	5%	3%
% people with high blood pressure	19%	14%	16%
% people with low lung capacity	21%	30%	26%
Perceived health* (1 to 10)	6.1	5.8	6
Observations	1143	1376	2519

3 National Sample Survey Organization

4 One bigha is around 0.62 ha.

5 Calculated as Weight(kg)/Height(m)^2

6 This is a higher proportion than found in other surveys. According to a survey conducted by the National nutrition Monitoring bureau in 10 states, 50% of population has a BMI below 18.5 (WHO, Nutritional status country Profile. http://w3.whosea.org/nhd/pdf/38-44.pdf)

7 This estimate is close to other estimates found in India. According to the USAID, 52% of the female population in India is anemic. (USAID about India. 2003. http://www.usaid.gov/in/UsaidInIndia/Activitiesnutrition.htm)

II-3 Poor health services

The system of government health services, on paper, is quite extensive. There are three levels of facilities. The smaller units are the Sub-Centers, who serve 3600 individuals and are usually staffed by one nurse (Banerjee Deaton Duflo 2004). Almost every village is served by a sub-center, and all of them are supposed to be regularly visited by a nurse. The next unit is the PHC (Primary Health Center), which is a referral unit for 6 sub-centers (Government of India 2004) and serves 48000 individuals (Banerjee Deaton Duflo 2004). Finally, a CHC (Community Health Center) is the first referral unit for four PHCs and is supposed to have testing facilities and four specialists (Government of India0.

However, in practice government health services work very poorly, and fail clients in two ways: lack of quality, and lack of accountability.

Distance and quality

Despite the extensiveness of the network, many villagers still live quite far from the closest government health facility: villages are in average 5km away from the closest sub-center, and 13 km away from the closest PHC. In addition, the services provided are most of the time of poor quality. When people go to public facilities, only 20% of the time they are given medicines at the facility; 6.5% of the time they buy medicines outside. Finally, infrastructure quality is very low, as shown in table A1 in appendix 1: for example, only 8% of sub-centers have electricity, and 7% of them have a bathroom.

Lack of accountability: bribes and absenteeism

The average cost of visiting a public facility is 77 Rs: this is not much cheaper than visiting a private facility (84Rs) and more expensive than visiting a bhopa[8] (61Rs) (Banerjee-Deaton-Duflo 2004). Since public facilities are supposed to be free, the only explanation is that doctors and nurses ask for bribes. In addition, there is a serious absenteeism problem, as it is the case in the rest of India and in other developing countries. 42% of the time, nurses could not be found in the Sub-center or in the field[9].

Table 3: Absenteeism in health facilities

	Sub-center	PHC	CHC
Percentage of time closed	42%	3.4%	0.3%
Percentage of medical staff absent	43%	34.4%	40%

II-4 "Poor" health behavior

As a result, people go only 25% of the time to public facilities, 50% of the time to private facilites, 21% of the time to traditional health providers and only 2% of the time to proximity providers (NGO health workers or Traditional Birth Attendants).

This is despite the fact that private facilities are of very poor quality. According to a survey of private health care providers, 41% of those who call themselves "doctors" do not have a medical degree, 18% have no medical training at all, and 17% have not graduated form high school. The treatment received in these facilities is often not appropriate: in 67% of cases, people are given an injection, in 12% of cases they are administered a drip (Banerjee-Deaton-Duflo 2004).

8 Traditional healer

9 This result is similar to those found in Chaudhury et al. 2003 and Chaudhury and Hammer 2003: 43% absenteeism in PHCs in India, 35% in Bangladesh

Part III - Health shocks: short term costs and long-term impact

III-1 High expenditure on health

Ratio of monthly expenditure per capita spent on health

Households spend a lot on health: they spend in average 42 Rs per month, which is about 7.4 % of monthly expenditure per capita (see figure A1 in appendix 2 for detailed allocation of households' expenditures).

Health expenditure and wealth

The richer people are, the more they spend on health: an increase in expenditure per capita of 1 Rs is associated with an increase in health expenditure of 0.16 Rs. The constant elasticity of health expenditure with respect to wealth is 1.2%, which means that a 1% increase in total monthly expenditure per capita is associated with a 1.2% increase in monthly health expenditure per capita[10].

Richer people spent also a higher fraction of their consumption on health: A 1% increase in expenditure per capita is associated with a 5 percentage points increase in the ratio of monthly expenditure per capita spent on health.

III-2 Health "shocks": High variability in health expenditure

Figure 1

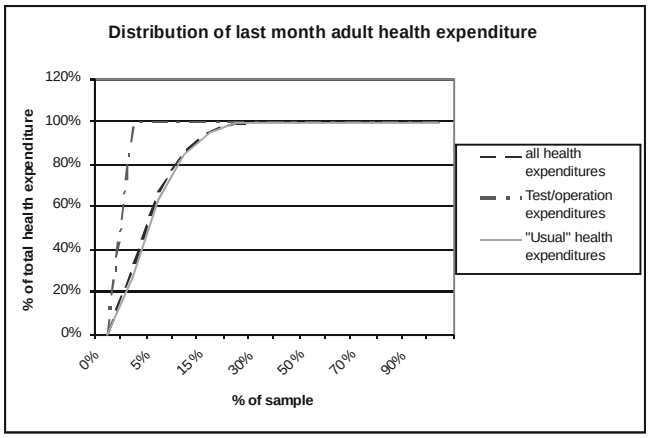
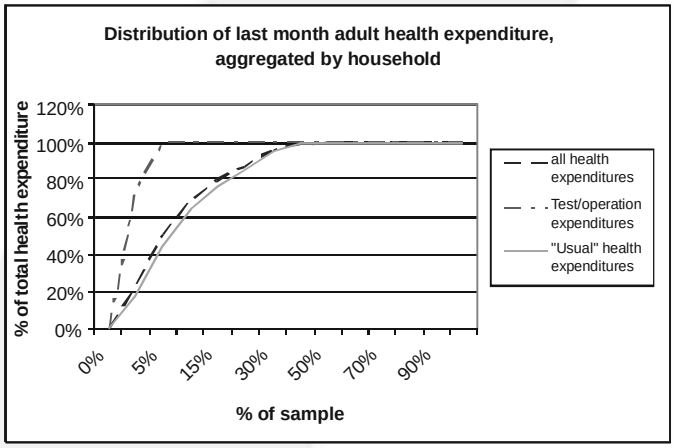


Figure 1 shows that less than 30% of individuals account for 100 % of total health expenditure in the sample. 10% of individuals account for 80 % of total health expenditure. Health events can therefore be defined as "shocks": events which happen with a small probability but have a high magnitude.

The distribution of health expenditures is even more skewed for operations and lab-test expenses: 1.4% of adults account for 100% of test and operations expenses.

When we consider household rather than individual expenditure on health, the distribution is less skewed, as shown in figure 2, where we aggregated adult information by households. However it is still lumpy: 50% of households account for 100% of total health expenditures, and 5 % of households account for 100% of operations and lab tests expenditure.

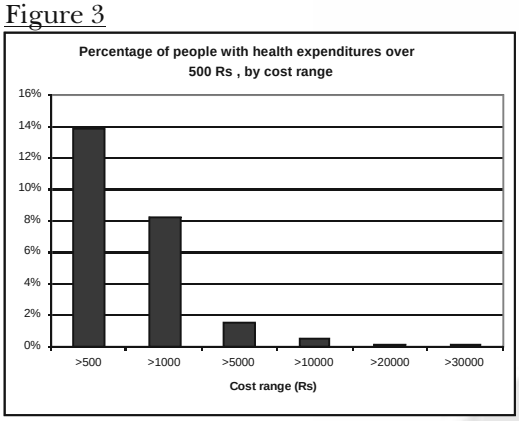
Figure 2



10 Calculated using a log-log specification

III-3 Magnitude of health shocks

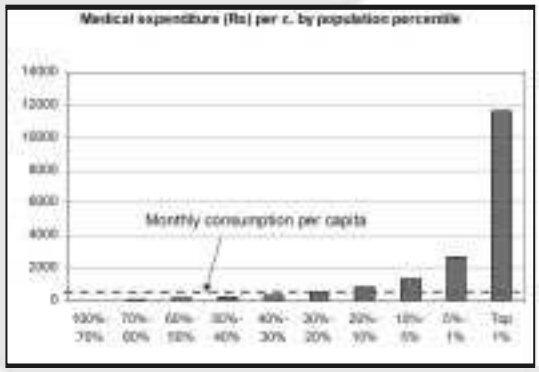
Figure 3



The magnitude of health shocks is very high: figure 3 shows that 14% of adults spend more than 500 Rs (10$) per month on health (including visits, medicines and transportation costs), 8% spend more than 1000 Rs (20$), and almost 2% spend more than 5000 Rs (100$).

Figure 4 shows the average monthly health expenditure per capita for different percentiles of the health expenditure distribution. The "top 1% health spenders" (i.e those at the tail of the health expenditure distribution, who spend 38% of total health expenditures[11]) spend in average 11,628 Rs (230$) per capita per month on health, which is almost 26 times the value of average monthly total consumption per capita.

Figure 4



III-4 Nature of health shocks

What do the top 15% "health spenders" spend this money on?

The most expensive treatments are operation and lab-test: an operation costs in average 6,792 Rs (136$), and a set of lab tests 1694 Rs (34$). Therefore we would expect that the 15% top "health spenders" spend comparatively more for these two things than the average. This is indeed what we find: compared to the average, the percentage of visits to health providers including an operation or/and a lab test is much higher among the 15 % top spenders, and they also spend a higher fraction of their total health expenditure on operation or/and lab test (see table 4).

Table 4: Allocation of health visits and health expenditure

	All sample		Top 15% spenders	
Treatment received	% of total health expenditure	% visits expenditure	% of total health	% visits
Operation, no lab test	1.1%	0.4%	1.2%	1.4%
Lab test, no operation	32.7%	5.6%	39.1%	27.2%
Both lab test and operation	26.1%	0.8%	31.7%	5.2%
Operations or/and lab tests (total)	**59.9%**	**6.8%**	**72.0%**	**33.8%**
Other (no lab test, no operation)	40.1%	71.8%	28.0%	66.2%
No visit	0.0%	21.5%	0%	0%

Table 5 (below) shows the probability of using different types of services when people visit health facilities, for different percentiles of the health expenditures distribution and for the whole sample. The services for which there is the biggest difference between the 1% top spenders and the average are operations and lab-tests: the top 1% spenders are 19 times more likely than the average to undergo an operation when they visit a provider, and 13 times more

[11] From now on, we will call those who spend 38% of total health expenditures the "top 1% health spenders", those who spend 80% of total health expenditure the "top 10% health spenders" etc.

likely to have a lab-test done. Although on a smaller scale, medicines bought outside facility and transportation follow the same pattern.

Table 5: Likelihood of having to pay for the following expenses when visit a health provider

	Top 1 % spenders	Top 5 % spenders	Top 10 % spenders	Top 15 % spenders	All sample with some health expenditure
Consultation	88%	93%	94%	94%	79%
Medicines in facility	60%	73%	79%	82%	72%
Medicines outside facility	52%	38%	30%	25%	14%
Operation	1.9%	0.4%	0.2%	0.1%	0.1%
Lab-test	40%	12%	7%	5%	3%
Other (hospital stay etc)	4%	1%	1%	1%	1%
Transportation	86%	71%	61%	57%	35%

Table A3 in annex shows in detail the reasons why people had to undergo an operation. The most common reported reasons are accidents/fractures, deliveries, and tumors.

Where do people go for "big expenses"?

As can be seen in table A4 in annex, almost 60% of operations and 55% of tests happen in a hospital (either Udaipur government referral hospital, or private hospitals[12]). In average, 14% of operations and 14% of lab-tests happen in CHCs. As can be seen in more detail in table A3 in annex, where we disaggregated the information by type of operations, only a few operations types did not require to go to a hospital. Overall, the number of places where people can go for operations and lab-tests is limited. This has an important implication: it can be relatively easy to obtain information about these kinds of treatments and to verify whether people have received these treatments or not, which is important for insurance.

III-5 Health shocks are random shocks

High health expenditures are not only due to higher consumption per capita

The probability of belonging to the top spenders is positively correlated with consumption per capita. We run the same regression three times, with three different dependant variables: (1) belonging to the 1% top spenders, (2) belonging to the 5% top spenders, (3) belonging to the 10% top spenders. The coefficient for log consumption is the highest when the dependent variable is belonging to the 10% top spenders and the smallest when the dependant variable is belonging to the 1% top spenders. This indicates that the higher the expenses, the less they are due to the wealth of the household; in other words, the higher the expenses, the less avoidable they are, therefore the more catastrophic.

Table 6: correlation of expenditure per capita and "top spenders"

	Belonging to 1% top spenders (1)	Belonging to 5% top spenders (2)	Belonging to 10% top spenders (3)
Log of expenditure per capita	0.012	0.0459	0.077
	(0.0024)	(0.0074)	(0.0120)
Other household members belonging to the same percentile	0.004	0.0018	0.0162
	(0.0050)	(0.0165)	(0.0173)
Observations	2519	2519	2519

[12] In fact, most of the private hospitals reported are located in Gujarat. There is a belief (probably justified) that private health care services work much better in Gujarat, which is not very far from some of our sample villages.

Table 7: consumption per capita correlated with ratio of institutional vs non institutional health expenditures

Ind. Var	Log of monthly expenditure spent on Non-Institutional medical	Log of monthly expenditure spent on Institutional medical
	1.5231	1.03
Expenditure	**(0.1757)**	(0.1653)
per capita	**2518**	2518

Another measure shows the same insight: in the household survey, there is a distinction between monthly "non institutional" medical expenditure (medicines, simple consultations etc.) and yearly "institutional" medical expenditures (hospitalization, nursing home, lab test etc.). Non-institutional medical expenditure is more elastic to wealth than institutional expenditure, which indicates that even poor people can not avoid make some of the "big" health expenses.

No correlation within households

As show in table 6 (above), after controlling for expenditure per capita the fact that other household members belong to a "high spending" group does not help predict that someone will belong to this group. This seems to indicate that, not taking consumption per capita into consideration, "health shocks" hit the population at random. This has important implications since as we mentioned in part I, an insurance system works only if shocks are unpredictable at the individual level.

Of course, other factors can make insurance difficult. In particular, shocks received by individuals can persist: an accident or a long term disease may result in repeated visits to health services, so that private insurance companies usually try to screen out these people.

III-6 Opportunity cost and psychological cost

In addition to the direct cost of health shocks, the second way through which health shocks affect households is through the opportunity cost: time of work lost due to illness.

Opportunity costs

Table 8: Cause of earners' death

	No. of "earners" who died	Percentage
Illness	30	71.4%
Accident	7	16.7%
Bit by poisonous animal	1	2.4%
went mad	1	2.4%
was killed	1	2.4%
total	42	100.0%

We do not have data on days not worked because of sickness or accident, but we have data on death, which is the extreme case of opportunity cost. Someone died in the last 5 years in 23% of households (19% of households lost one person, and 4 % of households lost two or three people). 4% of households lost an adult in the capacity to work (an "earner", i.e 15 to 50 years old), and 2 % of households lost a male "earner". All adults aged between 14 and 50 but one died because of illness, accident or other health reason (poisoned, mental health).

As shown on table A5 in appendix 2, the death of an earner in the household is not correlated with any significant reduction in consumption per capita. However, the death of a male earner is correlated with a 19% reduction in consumption per capita (the coefficient, however, is not significant at 90% level). This seems to indicate that illnesses affect consumption through income rather than through household or agricultural activities, since men go for labor more than women (however, we can not exclude that the relationship could be die to the reverse causality).

Another way to estimate the opportunity cost of health shocks is to look at ADLs (Activities of daily living[13]). Indeed, ADLs can be used as a proxy for having been hit badly by a health shock, since they capture only the illnesses or accidents that prevent people from performing certain daily tasks (Gertler and Gruber 1997). Although part of the inabilities measured by ADLs can be attributed to age or long term disability, Gertler and Gruber argue that in developing countries, an important fraction of these incapacitations are transitory and due to illness. Using Gertler and Gruber's formula, we constructed a health index using these ADLs[14]. Although we do not have panel data and can not look at changes in ADLs (which would capture the best the effect of illness versus long term disability), we found that only 30% of variations in ADL-based health scores are explained by age or being handicapped, so that an important part in the variations across ADLs can be attributed to illnesses or accidents. Controlling for age and handicap, going from a health score of zero to a health score of one is correlated with a 66% increase in income. This means that if one of the earners of the household is completely unable to work, the income of the household will be badly affected, and this is often due to serious transitory illnesses or accidents.

Psychological cost

Even opportunity cost is not enough to evaluate the losses resulting from health shocks. Health has a broader, psychological impact on individuals, more difficult to measure: 25 % of the people said that during the past 12 months, they had a period lasting one month or longer when most of the time they felt "worried, tense, or anxious" Out of them, 40% said it was because of health problems.

III-7 Long term impact of health shocks

Debt for health is unproductive

It is not sufficient to estimate direct and opportunity costs at the time of the event. Indeed, health shocks can have long lasting effects. One way in which they have a long-term impact is through debt. Controlling for monthly consumption, households with more assets are more likely to have a debt in general, but they are less likely to have a debt for health (see table 9). This indicates that a debt (not for health) and a debt for health do not have the same value. While having a debt in general is a good thing: the sign that one has access to credit and an opportunity to invest, having a debt for health, on the contrary, is unproductive.

Table 9: Health debts and assets

	Have a debt	Have a debt for health	debt value	health debt value	Ratio of debt for health/total debt (if have a debt)
Number of assets	**0.00396**	**-0.0025**	**640.8**	37.09	**-0.00144**
	-(0.0018)	**(0.0014)**	**(94.8600)**	(27.2100)	**(0.0007)**
Observations	**1023**	**1023**	**1023**	1023	**676**

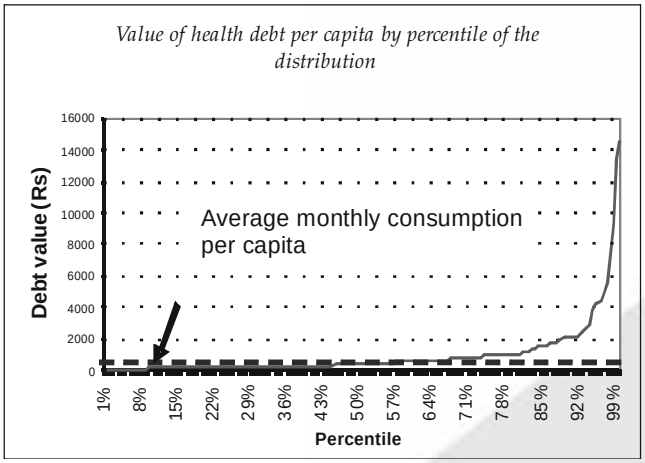
Debt for health is often unsustainable

677 households (69% of the sample) are indebted. 21% of them have some debt for health (i.e 14% of the total sample). Among the households who have some debt for health, the ratio of debt for health/total debt is 64%. On average, debt for health per capita amounts to

[13] We have 15 ADL questions in our survey, such as: can you dress on your own, can you walk 200m/5km etc. For each question, there are 4 options: can do, difficult but can do, can do only with help, can't do.

[14] (Score-minimum score)/(Maximum-Minimum)

Figure 5



958 Rs (about 20$), which is 2.08 times the average value of monthly consumption per capita Figure 4 (see also figure A2 in annex) shows that 44% of households have a debt for health per capita higher than the average monthly consumption per capita. 20% of households have a debt for health per capita at least twice as large as monthly consumption per capita. More than 10 % of households have a debt for health per capita four times as large as the monthly average expenditure per capita.

As can be seen on figure 5, health debt per capita can reach huge amounts: the highest value of health debt is 14,600 Rs (about 292$, or 290 days of labor). Given the scarce sources of revenue, and given that an important part of consumption per capita is in kind, such a debt is unsustainable.

Part IV Lack of formal coping mechanisms

We mentioned in part I that information problems make the provision of formal insurance and credit difficult, which results in important gaps in the market, and that this is all the more true in developing countries. Our sample confirms this result.

IV-1 Insurance

None of the households in our sample is covered by any kind of health insurance. Generally in India, all insurance schemes put together[15] cover about 110 million people or about 11 percent of the population (Ahuja 2004). Life insurance exists, but only 4% of individuals in our sample have one (11% of households – but they are the richest ones[16] - have a member with a life insurance).

IV-2 Credit

There is no well functioning credit market. Table 10 shows that only 6% of the loans obtained in our sample come from commercial banks; the major sources of credit are shopkeepers, family and money lenders.

The average interest rate is 28% per year, and it can be as high as 72% (from moneylenders). Since in average households had been having these loans for 25 months at the time of the survey, and that the average debt is 5542 Rs, it means that households had to repay 9080Rs (181$) per loan in average at the time of the survey.

Table 10: sources of credit (all loans types)

Source of loan	Average percentage of loans	Average annual interest rate
Shopkeeper	39%	26%
Family	24%	27%
Money Lender	19%	72%
Commercial bank	6%	0.46%
Neighbor	4%	
Self Help Group	2%	
Cooperative	2%	
Friend	2%	
Other	2%	
Total	100%	28%

15 "Existing health insurance schemes in India are mandatory schemes, private (voluntary) schemes, employer based insurance, and the schemes in the NGO/voluntary sector." (Ahuja 2004)

16 A 1% increase in per capita monthly consumption is correlated with a 4.4% increase in the probability of having life insurance.

Part V - Failure of informal insurance mechanisms

High health shocks and gaps in formal insurance mechanisms are problematic only if these events result in economic vulnerability, i.e if there are no other mechanisms to smooth non-medical consumption after the shocks. Indeed, poor households are not completely exposed to risk. Most develop coping strategies to deal with shocks which are provided neither by the market nor by the state but instead are private "informal insurance" arrangements (Morduch 1999). As mentioned in part I, households use various ex ante and ex post mechanisms to cope with shocks. They include self-insurance activities: savings, diversifying crops and expanding income-generating activities (ex ante) or borrowing and selling of physical assets[17] (ex post); or they can be community actions, like reciprocal labor exchange and sharecropping contracts (ex ante) or reciprocal exchange of gifts and rotating saving groups (ex post). In this section, we show that informal coping mechanisms work to some extent in Udaipur district, but are largely insufficient.

V-1 Types of coping strategies in Udaipur district

Table 11: Financing of "big" health expense

Source	Percentage of people who used this source
Savings	60%
Loan	46%
Gift	4%
Self help group[2]	0%
Sold	13%
Other	2%
No of obs.	322

A question in the household survey asks whether households had to spend at once 500Rs or more on health in the last year, and how they financed it. 31% of households had such an expense[19]. On average, they relied on 1.2 sources to finance it. The most common source is households' own savings; however, although 60% of households used their own savings to finance the expense, only 39% relied *only* on this source. The other important sources are borrowing and selling of assets.

We review now these mechanisms in more detail, ask to which extent they help households cope with health shocks, and show that they are insufficient.

V-2 Regular income and savings

Savings is the most obvious way to overcome financial shocks and to smooth consumption. It is the most common coping strategy to cope with health shocks in our sample, yet often they are not sufficient on their own. Indeed, savings can help overcome shocks at any time only if households have a regular source of income. Yet someone has a regular salary in only 9% of households. Although the average salary is 30518 Rs per year (610$), there are wide disparities between regular incomes, which go from 300 (60$) to 180000 Rs (3,600$) per year. Therefore, for some households regular income is not even sufficient to overcome important health shocks[20].

---

17 For example, buying and selling bullocks is an important consumption smoothing device in India: Rosenzweig and Wolpin (1993)

18 A Self Help Group is a women savings group organized by Seva Mandir, where women contribute regularly and from which they can borrow.

19 As shown in table A6 in appendix 3, this money was used mostly on operation and transportation, which confirms our earlier findings

20 Regular income can come from a tenured teacher job, which must be one of the highest salaries in these areas, or from a school cook contractual job, which has a very low pay.

V-3 Borrowing

Table 12: Source of loans for health

Source of loan	Average percentage of loans for health
Family	41.6%
Money Lender	26.6%
Shopkeeper	10.7%
Neighbor	5.2%
Friend	4.2%
Cooperative	2.1%
Self Help Group	2.0%
Commercial bank	0.3%
Other	6.3%

Among households who spent more than 500Rs at once on health, 46% borrowed money to finance the expense. We showed earlier that official credit market is scarce. For health, it is even inexistent: almost all health loans are informal. Major sources of credit for health are family, money lenders and shopkeepers. Given the generally poor economic status of the sample, it is probable that families are not always able to provide the money.

In addition, the average interest rate of health loans (59% per year) is even higher than for other types of loans (28% per year). On average, households had been having these health loans for 15 months. Since the average health loan amount is 3,172Rs, per household, it means that for each health loan households owed 5,050 Rs (around 100$) at the time of the survey. We showed earlier that almost half of the debts for health are unsustainable, and that health debts are unproductive loans. The fact that interest rates are so high reinforces this finding.

V-4 Selling Assets

Among the people who had to spend more than 500Rs at once on health, 13 % sold an asset to cope with the expense. As shown in table 9 above (section III.7), having 10 more assets is correlated with a 10% reduction in the probability of having a debt for health, and among the people who have a debt, it reduces the fraction of debt spent on health by 1.4%. However, assets number is generally low: the mean number of saleable assets[21] is 13. This means that in order to reduce the likelihood of having a debt for health by 10%, one would need to increase his number of assets by 77%. So if households had to rely only on assets to overcome shocks, their stock would be rapidly depleted.

V-5 Social capital

Social capital is the "set of (…) social networks and associated norms that have an effect on community productivity and well-being. Social networks can increase productivity by reducing the costs of doing business. Social capital facilitates coordination and cooperation"[22] (World Bank Social capital Website).One way social capital can increase productivity is through solidarity between households when one of them is hit by a shock. If this is true, having more social capital should be correlated with less vulnerability to health shocks. We computed an index of social capital[23], and we use having a debt for health as proxy variable for being victim of a health shock. The index has no effect, but controlling for consumption per capita, "having a group of friends with which share regular activities"[24] is related with a 6% reduction in the probability of having a debt for health, and with a 6% reduction in the fraction of debt spent on health. Belonging

[21] Including number of TVs, wells, bikes, pressure cookers, number of sarees, of jewels etc.

[22] Note that a broader definition includes vertical relationships and the political and social environment that shape social relationships and norms; however, we are not interested in this broader view in this context.

[23] We used a series of 10 questions about involvement in formal groups, informal group of friends with whom share a regular activity, having a close friend, having been victim of a crime, trust in neighbors, etc. WE gave equal weight to each question and added the scores in order to compute the index.

[24] Such as fetching water, wood etc. – most often women activities

Table 13: Social capital correlated with health debt

	Dependant variables	
	Have a debt for health* (1)	Fraction of debt for health if have debt (2)
Social capital index (1)	–0.0011 –(0.2600)	–0.0152 –(0.0120)
Have a group of friends with which share activities (2)	**–0.0619** **-(0.0257)**	**–0.0626** **-(0.0255)**
Belong to a formal group (3)	–0.56 –0.1419)	**–0.0866** **–(0.0443)**

to a formal group is correlated with a 8% decrease in the fraction of debt spent on health. Note that the direction of causality is not clear: being sick probably makes people less sociable. However, at least part of the relationship is probably due to the fact that having a group of friends helps cope with shocks because of reciprocal exchange of gifts or other kind of help. However, only 56% of the adults interviewed said they have a group of friends with which they share regular activities. In addition, since the whole sample is very poor compared to other areas in India, social capital can overcome shocks only to a certain extent.

V-6 Savings groups

One of the community-level informal coping mechanisms sometimes mentioned in the literature consists in rotating saving groups. Similar schemes exist in Udaipur district: in particular, Seva Mandir runs women Self Help Groups, where women contribute a regular amount and from which they can borrow. However, only 10% of adults belong to any kind of saving group. In addition, table 11 above showed that among the people who had to pay more than 500 Rs on health last year, nobody used loans from self help group. As a matter of fact, monthly contributions are low: 80Rs in average for SHGs, 167Rs in average for Bisi[26]. Therefore saving groups are insufficient to prevent households in our sample from health shocks.

Table 14: participation in saving groups

	Percentage
Any saving group	10%
Self Help Group	6%
Bisi[25]	1%
Other saving group	3%

[25] Bisi is another kind of saving group.

[26] These contributions vary widely according to wealth: for example, contributions to SHG amount to 15 Rs on average for the poorest 33% % of the population, and to 169 Rs on average for the richest 33%.

Part VI- Between formal and informal insurance: The need for NGO-provided health insurance

In this section we show that the failure of formal and informal mechanisms has two consequences: many individuals do not seek treatment when they are sick because of financial constraints, and households' food consumption is negatively affected by health shocks.

VI-1 Financial constraints prevent people from seeking treatment

74% of people reported being sick during the last month. However, only 44% of them sought treatment. Table A7 in appendix 4 shows the reasons why they did not. Lack of money is the obstacle the most frequently reported, by 34% of them. Interestingly, a close look at the data confirms these reported reasons. A 1% increase in monthly consumption is correlated with a 8.8% increase in the probability of visiting a provider when sick.

VI-2 Health shocks prevent households from smoothing consumption

Health shocks and cutting meals are positively related

Table 15: correlation of health shocks and cutting meals

		cut meal	Obs
log of medical expenditure	(1)	0.0289 (0.0079)	1023
Had to spend more than 500Rs at once on health in last year	(2)	0.0646 (0.0303)	1023
Had an operation in household	(3)	0.0242 (0.0520)	1023
household operation cost	(4)	0.0000 (0.0000)	1023
had an operation or a lab-test in household	(5)	0.0241 (0.0295)	1023
household test and operation cost	(6)	0.0000 (0.0000)	1023
have a debt for health	(7)	0.1088 (0.0389)	1023
have a debt	(8)	0.0977 (0.0249)	1023
ADL	(9)	–0.3040 (0.0846)	2476

Note: all independent variables are estimated in different regressions

Since we do not have a panel data, it is difficult to estimate whether health shocks result in sudden changes in consumption; however, we have information on whether people had to cut a meal in the last year because of lack of resources; since cutting meals is a shock and not a level, we can use this information to estimate the impact of health shocks on sudden changes in consumption. When they face health shocks (which we proxy using different measures, as shown in table 15), households are more likely to cut meals. For example, having debt for health is correlated with a 10% increase in the probability that someone in the household had to cut meals in the last year. Going from being able to do every daily activity to being able to do none of them (i.e going from an ADL-based health score of one to zero) is correlated with a 30% increase in the probability of cutting meals. This correlation could partly be due to the fact that eating less may make people more likely to fall sick. However, the fact that overall debt is also correlated with cutting meals (but less than debt for health) seems to indicate that at least part of the relationship must be caused by health shocks.

VI-3 Disparities in the sample

We have highlighted until now that the whole sample is quite poor compared to the rest of India, and vulnerable to health shocks. However, there are important disparities in the sample, and Seva Mandir will have to take those into account when implementing an insurance scheme. We summarize the main disparities, which are shown in more detail in appendix 4.

Disparities in wealth and vulnerability

Consumption levels vary across households. On average, the richest third consume more than three times the consumption of the poorest third. "Scheduled tribes" (75% of the households) are the most disadvantaged in terms of economic status, even after controlling for education years and other household characteristics. They are also more vulnerable: for example, they have more debt for health than other categories.

Inequality in health status

Richer people have a better health status. Even after controlling for expenditure per capita and other household characteristics, scheduled tribes are disadvantaged in terms of health: they are 19% more likely to be anemic, and their BMI is 0.71 lower than for other groups.

Health expenditures distribution is more skewed for the poor (see figure A3 in appendix 4)

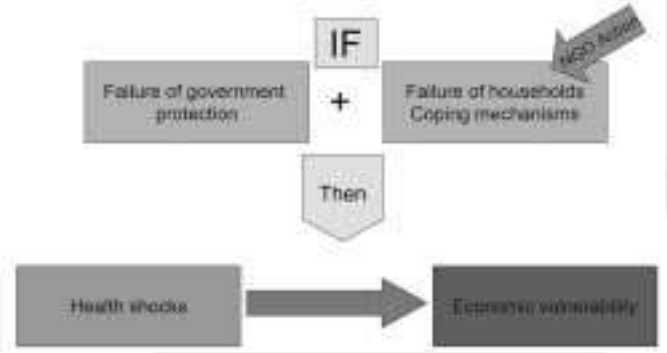
This has important implications: it means that on average poor people may be less willing to take up insurance. Therefore higher subsidies will be needed for the poorest groups.

V-4 Summary of results

The main results of the analysis presented above are:

- People spend a high fraction of their income on health.
- Health shocks are frequent, and there is a huge variability in health expenditures.
- There are important gaps in market-provided insurance or credit mechanisms, and the government fails to provide poor people with free health services.
- There are some informal insurance mechanisms, but they are insufficient.
- As a result, many individuals do not seek health care because of financial constraints, and households are not able to smooth consumption.
- At the intersection of formal and informal insurance mechanisms, the NGO can intervene by putting in place an insurance system.
- Although the whole sample is poor and vulnerable, there are some disparities within the sample; Seva Mandir will need to take those into account when implementing the scheme.

The picture below summarizes the results of the analysis.



Part VII - Recommendations

Implementing a health insurance system raises the following issues:

- What risks should be covered?
- How to calculate the premium?
- How to encourage all people – not only the ones with higher risks - to participate?
- How to avoid inefficient over-utilization of services and fraud?
- How to subsidy people in a fair and simple way?
- What kinds of services should be used?

In this section we discuss first these implementation problems one by one. We consider some possible alternatives to each of them, and evaluate which options would work best in Udaipur context, given the analysis conducted above. We suggest three different packages that combine the preferred alternatives to these six issues.

VII-1 What risks should be covered?

- Operations and lab test are the treatments that the "top spenders" consume in high proportion compared to the average, and happen with low probability and high magnitude. According to theory, value of insurance is the highest for such events. Therefore, operations and lab tests need to be insured against in priority.
- The other important sources of expenses for the top spenders are prescribed medicines bought in pharmacy[27] . Therefore insuring against medicines is also important.
- As we have seen, many people do not consult providers because of financial constraints, even for small diseases, so that insuring against usual illnesses is also worth considering.

Depending on the risks covered, the preferred solutions to the implementation issues we highlighted may vary.

VII-2 How to calculate the actuarially fair premium?

To calculate the actuarially fair premium (or full insurance premium), we need:

- The probability of needing the treatment (p): for that, we use the proportion of people getting a treatment in our sample.
- The average cost of the treatment (M). For operations and tests, we use the average cost from the sample: 6792Rs and 1694 Rs respectively. For "usual illnesses"[28] and medicines, we estimate how much they would cost if these services were provided by Seva Mandir own facilities: 60Rs for "normal consultation", 150 Rs for medicines in pharmacy[29].

---

27 We precise "prescribed" medicines because medicines that people buy on their own are not expensive.

28 From now on, we define as "usual illnesses" all illnesses or symptoms that require no particularly complex treatment, as opposed to operations or lab-tests.

29 We use this rather than average cost from the sample because we do not want to insure against existing facilities. The cost of a visit at Kojawara (Seva Mandir hospital) is 88 Rs. Since there are 2 doctors and advanced facilities in this hospital, we estimate that the cost of "small" facilities will be less, around 60 Rs in average. Cost of medicines bought in pharmacies is 175 Rs in the sample; since these pharmacies make profits from medicines, we estimate tat the cost of medicines provided by Seva Mandir would be around 150Rs.

Table 16: Actuarially fair (AF) premiums

	P	M*	AF=p*M
Usual illnesses	0.38	60	23
Operation	0.00075	6792.8	5
Lab-test	0.0138	1694	23
Medicines in pharmacy (prescribed)	0.075	150	11

We calculated the following premiums, displayed in table 16: 28Rs for operations and lab-tests together (about 60 cents, or 6.1% of monthly consumption); 23 Rs for usual illnesses (about 50 cents, or 5% of monthly consumption); 11Rs for prescribed medicines (10 cents, or 2.5% of monthly consumption). However, these premiums do not take into account adverse selection and moral hazard.

VII-3 Adverse selection and moral hazard

VII-3-a The cost of adverse selection and moral hazard

Adverse selection

As mentioned in part I, this is one of the main issues with insurance. Indeed, as figure 1 (section III-2) showed, a small percentage of households account for a high percentage of total health expenditures. Therefore, we expect that the least risky households would not be willing to participate in an insurance scheme.

Increased utilization, moral hazard, and fraud[30]

- As a result of health insurance, behavior may change and utilization may increase. To estimate the increase in utilization, we use the number of people who said they did not seek health care because of financial constraints. The probability of seeking treatment for usual illness would then increase from 0.38 up to 0.7 (i.e a 80% increase).
- In a context where verifying information from clients and providers is difficult, and where bribes seem common, it is very difficult to introduce an insurance system without fraud: people may try to get reimbursed for services they did not use, or doctors may try to get paid for services they did not provide.

As mentioned in part I, theory shows that adverse selection and moral hazard can result in a significant increase of insurance cost, which in turn would increase the cost of premium. Table 17 below shows how premiums for usual illnesses, operations/lab-tests and medicines would increase in our sample according to three scenarios of adverse selection and three scenarios of moral hazard (scenario 0/0 being the actuarially fair premium).

Table 17: Cost of adverse selection and moral hazard (all villages): premium

Moral hazard scenarios / Adverse selection scenarios	Scenario 0 (no MH)	Scenario 1 (Some MH)	Scenario 2 (a lot of (MH)	Scenario 0 (no MH)	Scenario 1 (Some MH)	Scenario 2 (a lot of (MH)	Scenario 0 (No MH)	Scenario 1 (a lot of (MH)	Scenario 2 (Some MH)
	Usual risks			Operations-lab tests			Medicines		
Scenario 0 (no adverse selection)	22.8	31.9	41.3	29	36	55	11.3	15.8	20.4
Scenario 1 (only all spenders on health)	28.2	39.5	51	45	54	78	13.1	18.3	23.6
Scenario 2 (only 15 % top spenders)	16.8	23.5	30.4	150	185	272	13.4	18.7	24.2

[30] We distinguish increased utilization from moral hazard to highlight the fact that increased utilization because as mentioned earlier, all increases in utilization and all changes in behavior are not necessarily inefficient: if there is under-utilization of health services, increased utilization as such is not an inefficient outcome. Note that we do not separate inefficient from efficient change in behavior in the estimations below, since it would be difficult to do and that in any case, both need to be taken into account in calculations of premiums and costs.

The premium for usual illnesses could rise from 23 Rs to 51Rs (if utilization increases a lot and if only people who spend money on health buy the scheme[31]). For operations and lab tests, the premium could rise from 29 Rs to 272 Rs.[32] For medicines, the premium could increase from 11 Rs to 24 Rs.

VII-3-b How to avoid adverse selection

Alternative 1: Different policies to different people

This is a policy commonly used by private insurance companies. However, although test and operation seem to be positively correlated with age, this number is not significant economically and it seems difficult in our context to determine who is a "riskier type". In addition, such a scheme would not be equitable and difficult to implement given the means of the NGO.

Alternative 2: Household premium

As mentioned above, high magnitude risks do not seem to be correlated within households. Therefore a household premium would help reduce adverse selection since for each risky person non risky persons would also be enrolled. In addition, as shown in appendix 4, some types of people are less likely to enroll in saving schemes (women, old people). If we expect that willingness to participate in insurance would follow the same pattern, household premium would also help solve this problem. However, it would not eliminate completely adverse selection: as figure 2 (section III-2) showed, the distribution of health expenditure by households is also skewed. Therefore, although household premium is attractive in any case because it would make the collection of premiums much easier, it will not be sufficient on its own to solve adverse selection problem.

Alternative 3: Compulsory participation for Seva Mandir members

In the villages where Seva Mandir works (i.e 60% of the sample), 31.5 % of adults say they are involved with Seva Mandir[33] and 60 % of adults are in a household where someone is involved with Seva Mandir. So if only Seva Mandir members were buying insurance, the scheme would already cover more than half of households. Table 18 below reproduces the scenario analysis conducted above for villages where Seva Mandir works, taking into account that all Seva Mandir participants would buy insurance, plus some fraction of other people (especially the higher risks)[34] . This method does not eliminate completely adverse selection, but reduces considerably its cost. In the previous section, the premium could increase from 22Rs to 51Rs for common illnesses (more than double). Here it increases from 24Rs to 47Rs (less than double).

---

31 Note that for usual illnesses, premium increases more in scenario 1 than in scenario 2 of adverse selection, which is first surprising, but this is due to the fact that the top 15% spenders do not spend much on usual illnesses but mostly on operations and lab-tests.

32 For usual illnesses, the scenario 2 of moral hazard is based on the number of people who say they did not seek care because of money: if they were all seeking care after insurance is introduced, utilization would increase by 80%. Scenario 1 is a downward estimate of that number: increased utilization by 40%. An estimate of increased utilization between 40% and 80% seems indeed quite plausible. According to the World Development Report, "In Egypt making health insurance available to school children in the early 1990s almost doubled the probability of a health facility visit among the poorest fifth of the population" (WDR 2004) For operations and lab tests, we guessed a number: for operations, we suppose that increased utilization would be pretty low, as moral hazard with this kind of intervention should be low. For lab tests, we estimated an increased utilization somewhat inferior to the increase in utilization of usual care.

33 which could mean be an active participant as well as attend the meetings once a while

34 Note that the probability of seeking treatment is significantly higher in Seva Mandir villages, but inside Seva Mandir villages, it is not significantly different for Seva Mandir participants and for non participants. Therefore, we need to calculate anew the actuarially fair premium for Seva Mandir villages. In addition to Seva Mandir participants, we need to take into account that other households, especially the ones with high risks, will want to participate.

For operations, the cost increases from 37Rs (AF premium) to 91 Rs (scenario 3/3), instead of increasing from 29 to 275Rs.

Table 18: Cost of adverse selection and moral hazard (SM villages): premiums

Moral hazard scenarios / Adverse selection scenarios	Scenario 0 (no MH)	Scenario 1 (Some MH)	Scenario 2 (a lot of MH)	Scenario 0 (no MH)	Scenario 1 (Some MH)	Scenario 2 (a lot of MH)	Scenario 0 (No MH)	Scenario 1 (a lot of MH)	Scenario 2 (Some MH)
	Usual risks			Operations-lab tests			Medicines		
Scenario 0 (no adverse selection)	24.00	33.60	43.44	37.00	46.00	68.00	12.45	17.43	22.53
Scenario 1 (only all spenders on health)	26.40	36.96	47.78	38.00	47.00	70.00	13.65	19.11	24.71
Scenario 2 (only 15 % top spenders)	24.00	33.60	43.44	48.00	60.00	91.00	12.90	18.06	23.35

The disadvantage of this strategy is that many Seva Mandir activities focus on the community as a whole (sanitation activities, agriculture work etc), and not individuals, so that it would be difficult to make insurance compulsory in exchange of personal benefits. Therefore it would be more effective to combine health insurance with an activity where membership is individual and where people have personal incentives to participate, like microfinance.

Alternative 4: Combine the insurance with a microfinance program

Given the number of people who borrow and the malfunctioning credit markets, we expect that demand for microfinance would be higher than demand for health insurance; therefore make health insurance compulsory for borrowers would help solve the adverse selection problem. In addition, provided that microfinance is combined with a micro-savings scheme, it would also help solve two failures that make households vulnerable to shocks: lack of savings and credit facilities. However, this would not eliminate adverse selection completely, because some riskier types may ask for credit *in order to* get insurance. The household-level premium will attenuate this problem. In terms of cost estimates, it is reasonable to expect the number of people who would use the microfinance scheme to be at least as large as the number of people who are involved with Seva Mandir (between 30 and 40%). We must also take into consideration that some riskier types will enroll just to get the insurance. Therefore we can make a scenario analysis similar to the one presented in the previous paragraph.

Although the combination of insurance and microfinance is attractive, it does not solve completely the adverse selection problem and more importantly, it may be difficult and expensive for Seva Mandir to introduce microfinance.

Alternative 5: Make the insurance compulsory for the whole village.

The best solution to adverse selection is to introduce an insurance scheme mandatory at the village level, on the model of Gram Vikas' (another NGO in Orissa) Rural Health and Environment Program. Although the nature of their program is different[35], this method is applicable in our case since the context is similar (rural areas, high proportions of tribal populations), and having as many villagers as possible participate and contribute money was also a condition of Gram Vikas program.

[32] the objective is to construct and maintain sanitation facilities

Box 1: Gram Vikas Model

"It was clear from the beginning that the intervention would be successful only if the complete participation of every household was ensured (…) A general body of men and women is formed and meetings held on a regular basis to discuss the specific aspects of the program, with an executive committee to ensure implementation (…) Ensuring participation of all families is by far the biggest challenge of RHEP. Gram Vikas contributes part of the money to develop the infrastructure. The villagers raise the rest from their own resources and loans (…) A cash contribution, however small, is mandatory for all families." (Gram Vikas web site)

For contributions to be successfully collected, Seva Mandir will need to have a strong commitment device and incentive system at the village level.

The scheme we propose will have the following features:

- The NGO will approach villages (Several meetings will probably be needed) and propose the mandatory insurance scheme, highlighting that the premiums are highly subsidized. The village will vote whether it wants it or not.
- If after a year the total contribution of the village has not been raised, the compulsory insurance scheme will be stopped and replaced with a mandatory insurance scheme for Seva Mandir participants, and a voluntary scheme for others. This "back-up" insurance scheme will be less attractive because the premium will be higher (first, because of adverse selection, and secondly, because the NGO will make the subsidy smaller).

The objective is that the incentive to have the first insurance scheme rather than the second will be strong enough for some villagers, so that they make sure that other villagers participate.

Adverse selection- Recommended method:

- Household-based insurance.
- Insurance compulsory for all households in village who voted in favor of the scheme.

VII-3-c How to mitigate moral hazard?

We need a way to limit inefficient increase in cost and utilization, while not decreasing, or even encouraging efficient increase in utilization.

Alternative 1: cap on expenses

For every treatment, Seva mandir will not reimburse above a certain threshold, so that the average cost that we estimated does not increase after introduction of insurance.

Alternative 2: co-pay

Co-pay is commonly used in order to decrease moral hazard. In developed countries, it is usually around 20%. Since co-pay, while diminishing moral hazard, also diminishes the value of insurance, and given that in our context, we assume there is rather under-utilization than over-utilization of services, we propose a co-pay smaller than 20%: 16% for usual illnesses and medicines and 5% in the case of lab-tests. There will be no co-pay for operations (for which cost

is too high and moral hazard relatively low), and no co-pay for preventive care, in order to induce a shift in demand from curative care to preventive care.

As shown in table 19 below, co-pay will reduce the premiums paid by households (because it reduces both the actuarially fair premium and the cost from increased utilization[36]):

Table 19: Cost of adverse selection and moral hazard (all villages, copay): premiums

Moral hazard scenarios / Adverse selection scenarios	Scenario 0 (no MH)	Scenario 1 (Some MH)	Scenario 2 (a lot of MH)	Scenario 0 (no MH)	Scenario 1 (Some MH)	Scenario 2 (a lot of MH)
	Operations-lab tests			Medicines		
Scenario 0 (no adverse selection)	26	29	38	1.3	15.3	19.9
Scenario 1 (only all spenders n health)	42	45	58	13.1	17.7	23.1
Scenario 2 (only 15 % top spenders)	139	151	196	13.4	18.1	23.6

Alternative 3: Joint insurance

On the model of joint liability, commonly used in microfinance in order to induce peer-monitoring, a solution to moral hazard is to provide insurance to groups of five to ten households (Ahuja-Jutting 2003). The number of claims will be limited for each group, so that members of the group would make sure that their partners do not over-consume services. This method would probably not be appropriate for operations or lab-tests, where moral hazard is not as high as in other cases, and where villagers would not be able to know accurately whether their group members really needed the service. However, this method could be used for medicines, where moral hazard can be high and peer monitoring relatively easy (because villagers may have a sense of when their partners over consume medicines if they do not really need it, as opposed to more technical treatments such as lab-tests). In order to decide what would be the maximum number of medicines per group, we advise Seva Mandir to estimate with the help of its doctors what would be the average need per individual for different types of medicines, and to have limits based on this estimation. Groups will receive a collection of coupons (different coupon types for different medicines types), and when they go to the Seva Mandir pharmacy, they would exchange a coupon against the prescribed medicine.

Moral hazard- Recommended method:

- Cap on expenses for all treatments
- Cop-pay for lab-tests and medicines.
- Joint insurance for medicines (limited number of claims per group).

[36] To estimate the reduction in moral hazard from co-pay, we use the elasticity of health expenditure with respect to consumption per c., which is is 1.2%. For usual illnesses, cop-pay is 10Rs, which is worth 2.2% of average consumption per capita, so that having to pay 10Rs more on a monthly visit would be the same as loosing 2.2% of consumption, so that according to elasticity people would spend 2.86% less on health; so we estimate that the probability of seeking treatment is 2.28% less than with no co-pay, and substract 2.28% from the previously estimated increases in utilization. (and 20% for lab tests, after doing similar calculations)

VII-4 Subsidy

- The actuarially fair premium is high compared to average monthly consumption. For test and operation together, the AF premium is 26 Rs, about 6% of the average monthly consumption per capita. If we base the premium on the scenario 0/1 (no adverse selection, some moral hazard), the premium for operations and lab tests would be 29 Rs, which is 6.4 % of the monthly consumption. Therefore, Seva Mandir will need to provide an overall subsidy.
- However, a constant subsidy would not be fair, because of the disparities in the sample highlighted above, nor would it be efficient: poor people would be less willing to buy insurance at the same level of premium than richer households. Therefore we need to find a fair and simple way to subsidy the poorest people more than others.

VII-4-a How much subsidy?

It is difficult to find out how much people would be able and willing to pay, but we can use the contribution in saving groups and life insurance in order to estimate how much people are willing to contribute in such schemes[37]. On average, they contribute 75 Rs per month in SHGs[38] (including people who are not members, so do not contribute anything). Therefore, the premium should not go beyond 75 Rs on average. The other interesting findings are that participation in SHG and Bisi is not related to wealth, which means that even poor people are wiling to contribute in such schemes; however, poor people contribute less, which indicates the need for a progressive subsidy.

VII-4-b How to provide a progressive subsidy in a fair and simple way?

Alternative 1: Give a subsidy to BPL (below poverty line) households.

We recommend not to use this classification, as it is very politicized and does not correspond closely to the financial situation of households: as shown on table 20, a significant fraction of households in the richest 33% are classified as BPL, while not all poor households are[39].

Table 20: BPL household and financial status

	Poor	Middle	Rich
Monthly expenditure per c. (Rs)	217	363	772
% of BPL households	65%	59%	48%
% of antiyoda households	20%	12%	9%
% of BPL and antiyoda households	18%	11%	9%
Observations	337	338	348

Alternative 2: Have three tariffs based on PRA wealth estimation

A method commonly used by Seva Mandir and other NGOs to target the poorest household in a village is to organize a PRA (participatory resource appraisal, or village meeting), and to ask villagers to divide households in 3 categories; very poor, poor, non poor. According to a study on efficiency of targeting done by BRAC, this method gives good results.

---

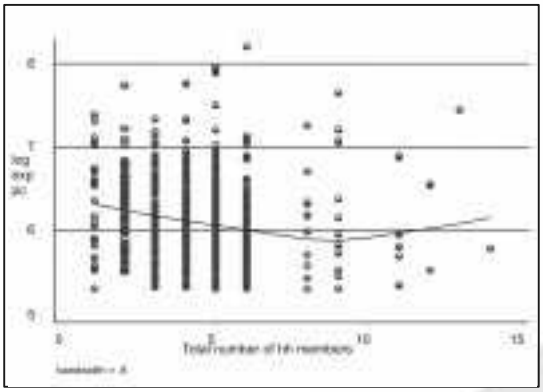
37 although saving groups are different, since people get what they contribute, where as insurance involves risk pooling, it is a useful comparison since both kind of schemes have similar objectives: protect against shocks, smooth consumption

38 We use SHGs rather than other saving groups because these are the groups with the lowest contributions, and we want a lower bound rather than an upper bound.

39 In the issue of corruption in BPL classification, see Besley-Pande.

Alternative 3: Flat premium per household

Figure 6

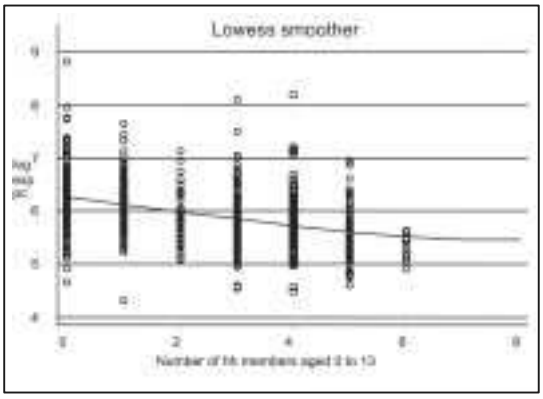


As shown on figure 6, one additional household member is associated with a reduction in monthly consumption per capita, up to 9 members. Therefore a simple way to subsidy poor households would be to charge a constant premium up to 9 members. Beyond 9 members, premium would increase. With this method, insurance would be cheaper at the individual level in bigger (and poorer) households.

Although this method has the advantage of being simple (we would not need to know the income of households), it would also be very approximate: figure 6 shows that there is a large variation of expenditure per capita at all household sizes, so that this subsidy would be generous with some big, rich households while not so generous with some small, poor households[40]. In addition, the fact that after 9 members the relationship becomes positive makes the idea more complex.

Alternative 4: Free insurance for children, half price for elderly

Figure 7



When looking more closely at the data, one sees that the relationship stated above is in fact driven by the number of children. One more child in the household is associated with a 12 % decrease in expenditure per capita. As can be seen on figure 7, the relationship is linear, unlike the relationship between total number of members and expenditure per capita. Therefore a solution to the subsidy issue would be to have adults pay but to provide free insurance to children.

With this method also, we would miss some poor people: 79 poor households (i.e with consumption per capita less than average) have no children. In these households, the ratio of old people is .4 instead of .14 in the whole sample. Therefore, one solution would be to charge half price from old people. However, we would still miss 27 poor households (2.6% of the sample) with no children and no old people. In addition, there is still an important variation in consumption level at each number of children[41] . Therefore this method would not be sufficient on its own, and would be best combined with the PRA method.

Subsidy – Recommended method

- three wealth based tariffs
- free insurance for children, half price for elderly
- in average, premium should not go beyond 75Rs

[40] there are 164 poor households (i.e with consumption per capita less than average) with 4 or less members, 86 poor households with 3 members or less, 38 poor households with 2 members or less, and 12 poor households with 1 member.

[41] In addition, we did not take economies of scale into account when calculating monthly consumption, which would make the slope flatter than it is.

VII-5 What services should be used?

As seen in part I, government services work poorly and lack accountability. In the other hand, private practitioners are mostly unqualified and provide inappropriate services. Since we do not want to insure against corrupted government health services nor against unqualified health providers, what services can be used?

Alternative 1: Use own network of services

Seva Mandir runs one rural hospital (Kojawara) staffed with two doctors and one nurse. A lot of people come from far away, as one can see in table A23 in appendix 5, which seems to indicate that: 1) it is possible for Seva Mandir to have its own facilities and to make them reliable; and 2) that a reliable facility makes a difference in people's visit patterns. Therefore, in the case Seva Mandir chooses to insure against common illnesses or medicines, it should implement its own network of pharmacies or nurses.

Own network of nurses

It is financially not feasible to have several hospitals like Kojawara, but it would be relatively easy to train, and to post nurse one per two villages. The nurse will visit each village three days a week, be based in the community building and provide preventive care and simple treatments and medicines. In order to limit absenteeism, nurses will be monitored with a system a date and time stamps[42]. To avoid fraud (the nurse could certify that the client was treated and share the reimbursement with him), the client will simply receive free care, so that there will be no money exchange (therefore there can be no co-pay with this method). Instead, there would be a coupons system as described above: the client will receive a number of coupons (coupons will have different colors for preventive care and for different medicines); at each visit, he will give away one coupon to the nurse. For visits without medicines, the number of coupons will be unlimited in order to encourage preventive care. For medicines, groups of five households will receive a limited number of coupons, according to the joint insurance model described above. Only medicines prescribed by pre-approved hospitals (government hospitals and Seva Mandir facilities) will be dispensed. The joint insurance model will limit the risk of fraud (people may try to agree with the nurse and get non pre-approved medicines and), since people will check that their partners do not use all coupons.

Own network of pharmacies

The second possibility is that Seva Mandir implements its own network of pharmacies: there would be one pharmacy per zone, located in Seva mandir zonal offices. Unlike the village nurses, these pharmacies will also provide more complex medicines. In order to avoid fraud and moral hazard, there will be a system of coupons joint insurance, as described above.

However, operations and lab-tests require more complex treatments and more qualified practitioners, so that for these services Seva mandir will not have the capacity to have its own network. It will need to rely on government facilities.

Alternative 2: Use government services, introduce a third payment system

For events to be verifiable, and in order to limit fraud, only a small number of services should be used. This is feasible since as mentioned in part II the number of places where people can go for operations and lab-tests is limited anyway. Therefore, only operations or lab-tests

---

42 This system is presently being tried by a Poverty Action Lab Experiment, therefore we already know that it is technically feasible.

performed in Udaipur general hospital or in CHCs will be reimbursed. Since a lot of people go to those places, the formula should be overall attractive.

As shown in table 3 (part II), the bigger the hospital, the less the facility is found closed. CHCs are most of the time often, so that we can rely on them more than we could rely on Sub-Centers. However, absenteeism is high (40% of medical staff absent). Therefore, if government facilities are to be used, we need to find a way to make them more accountable and to increase client's power through the insurance scheme.

One way to do that is to have a third payment system: "More than prepayment, third-party payment—whether through insurance or other solidarity funds—is what makes the difference for poor people." (WDR 2004, ch. 8).The clients would pay the insurance fees to Seva Mandir; whenever they go to the hospital, they would pay only their co-pay part, and the hospital will send the rest of the bill to Seva mandir. The NGO will have a contract with the government health services that the treatment costs can not exceed a pre-agreed threshold (as mentioned above, there will be a cap on different kind of expenses). That way, the NGO becomes an independent purchaser of health services. If the service is refused to some client, or if the doctor asks for bribes, the client would then inform Seva Mandir, and the latter would enquire about it. Given the relatively good relationships of Seva Mandir with the local health authorities[43], we can expect that the scheme would be welcomed by the government. Of course, there may be some opposition from the health providers, but since it does not threaten them directly, it will be difficult for them to protest. This system, while putting an intermediary between the client and the service provider will give clients a common voice and increase their bargaining power, improving the "short accountability route" (WDR 2004).

Since doctors are paid monthly, they will have no incentive to provide excessive treatments in order to get reimbursed. On the contrary, when facing increased demand they may start under-giving care. One solution would be to have a Seva Mandir health worker posted in the facility some days in the week, in order to help clients manage their way in the hospital[44] and to watch whether the clients receive the attention they need. Although this person will not have great power, it may have some influence on the behavior of the providers.

Services- Recommended method

- Udaipur hospital and CHCs for operations and lab tests: Third Payment system.
- Own network for usual risks and medicines

VI-6 Three recommended schemes

We propose now three schemes combining the preferred solutions elaborated above. The three schemes are: 1) insuring against operations and lab-test only; 2) combining insurance against operations and lab-tests and insurance against usual illnesses; and finally 3) a scheme combining insurance against operations and lab-test with insurance against medicines.

[43] They already came to some agreement on earlier projects

[44] One of the reasons mentioned for not seeking health care is fear of hospitals.

The three schemes are summarized in the table below.

	Scheme 1	Scheme 2	Scheme 3
Risk covered	Operations/lab tests	Combination operations/lab-tests and Usual illnesses	Combination operations/lab-tests and medicines
Avoid adverse selection	• Participation = Village-level decision **OR** Voluntary scheme, compulsory for SM members	• Participation=Village-level decision • Compulsory for all households in village	• Participation=Village-level decision • Compulsory for all households in village
Avoid moral hazard and fraud	• Co-pay of 5% for tests • Cap on expenses	• Co-pay of 5% for tests only • Cap on expenses for operations • For medicines: joint insurance (limited number of claims per group) • For preventive care: no limit (→encourage visits)	• Co-pay of 5% for tests only • Cap on expenses • For medicines: joint insurance (limited number of claims per group)
Subsidy	• 3 wealth-based tariffs (PRA estimation) • Free for children • ½ price for elderly	• 3 wealth-based tariffs (PRA estimation) • Free for children • ½ price for elderly	• 3 wealth-based tariffs (PRA estimation) • Free for children • ½ price for elderly
Services used	• Udaipur government hospital • CHCs	• For operations/lab-tests" Udaipur hospital and CHCs • For preventive care and "usual illnesses": Own network of nurses (one per 2 villages), monitored by date/time stamps	• For operations/lab-tests" Udaipur hospital and CHCs • Own network of pharmacies (one in each zonal office)
Adult Premium*	Poor: 10Rs or 30Rs Middle: 29Rs or 47Rs Rich: 38Rs or 54Rs	Poor: 46Rs Middle: 61Rs Rich: 75Rs	Poor: 25 Middle: 45 Rich: 65
Way of reimburseme	Third payment system	• Operations-tests : third payment system • Usual illnesses: Free service • Coupons system	• Operations-tests : third payment system • Medicines: free • Coupons system
Total cost per village (cost of subsidy+ estimated administration cost)	1301Rs (26$) or 1798Rs (36$)	2185Rs (44$)	2243Rs (45$)

*(*All premiums were estimated with some moral hazard (scenario 1) and no adverse selection, except for operations, in the case villages do not vote for the mandatory scheme (where we estimated according to scenario 1/1" some AS, some MH.. See tables A27 and A28 in appendix for details of premium and cost calculations)*

VII-7 How to choose among the three recommended schemes?

VII-7-a The comparative advantage of each scheme

→ ***Scheme 1***

- **Advantages:** it is the most easily feasible, and as mentioned above, operations and lab-tests should be insured in priority.
- **Disadvantages:** since the demand for operations and lab-tests is quite skewed, the risk is that most villages would not vote for it. Therefore we recommend trying the insurance scheme mandatory at the village level, but also to have a back-up plan: voluntary scheme, compulsory for Seva Mandir participants.

→ ***Scheme 2***

- **Advantage:** *1)* Since demand for usual care is less skewed, it is likely that willingness to participate in this scheme would be higher than in scheme 1. *2)* Since clients will have infinite number of coupons for preventive care, the scheme is likely to increase demand for preventive care, which will reduce ex ante moral hazard.
- **Disadvantages:** it is the most difficult and expensive scheme to implement for practical and administrative reasons, since Seva mandir will have to train and monitor the nurses and make sure community buildings are ready to host them.

→ ***Scheme 3***

- **Advantages:** *1)* as for scheme 2, it is likely to increase demand for insurance compared to scheme 1. *2)* The scheme is also easier to implement than scheme 2, because its administration will be simpler, and staff will be less (since there will be one pharmacy per zone only). *3)* In addition, since only medicines prescribed by pre-approved health services will be reimbursed, the scheme is likely to shift demand from bad treatments (often prescribed by private providers) to appropriate treatments.
- **Disadvantages:** compared to scheme 1; it is more complex to implement. Compared to scheme 2, it does not deal with preventive care.

  Were Seva mandir to choose one scheme only, this is our most recommended scheme.

VII-7-b Evaluate!

The best way to know what scheme works the best is to evaluate them with a randomized evaluation method:

- Implement each scheme in 15 villages randomly chosen, and have 15 control villages.
- Evaluate by comparing the outcomes in the 4 different groups (3 treatments, one control). This will allow us to obtain a non-biased estimate of the program. Seva Mandir is already involved in randomized evaluations, so that they already are used to this method.

Conclusion

Our analysis has shown that health shocks are frequent and important, and that formal and informal insurance mechanisms are not sufficient to cope with them. Implementing formal insurance is very difficult because of adverse selection and moral hazard. In rural areas, these problems are exacerbated because verifying information is extremely difficult and most people are engaged in the non formal sector. In this context, the intervention of Seva Mandir is valuable, because it could combine some advantages of both formal and informal insurance. Because they have local knowledge, NGOs are more adequate than government or markets to implement insurance in rural areas, because it reduces costs from moral hazard and transactions costs. And because it has higher financial and administrative capacity than households, it can do more than they manage to do with their own self-coping mechanisms. In addition to protecting households against shocks, the health insurance schemes we propose will also induce positive changes in clients' and providers' behavior. Whether Seva mandir is provider itself (in the case of usual illnesses or medicines), or whether it implements a third payment system, the insurance scheme will have impact on both people's health behavior and providers' accountability. The main implementation issue will be to get most people participate, in order for the scheme to be sustainable. The solution we propose, make villagers vote for the insurance in order to create a community level commitment device will not only prevent premium costs from increasing, it will also generate villagers' interest for insurance and health issues.

Bibliography

Ahuja, Rajeev. 2004. "Health insurance for the poor in India". Indian council for research on international economic interactions". Working paper No. 123.

Ahuja, Rajeev and Jutting, Johannes. 2003 "design of incentive-based health insurance schemes" Indian council for research on international economic interactions". Working paper No. 95.

Banerjee, Abhijit; Deaton, Angus and Duflo, Esther. 2004. "Health care delivery in rural Rajasthan". Poverty Action Lab Paper No. 7

Chaudhury, Nazmul- Hammer, Jeffrey. 2003. "Ghost doctors: Absenteeism in Bangladeshi Health facilities MIMEO, Development Research Group, World Bank.

Chaudhruy, Nazmul- Hammer, Jeffrey- Kremer, Michael- Muralidharan, Kartik- Rogers, Halsey. 2003. "Teachers and Health care providers absenteeism: A multi-country study, MIMEO, Development Research Group, World Bank

Criel, Bart. 1998. "District-based health insurance in sub-saharan Africa. Part I". *Studies in Health services organization and policy,* 9.

Frontline. 2004. Volume 21

Gertler, Paul, and Jonathan Gruber. 1997. "Insuring Consumption against Illness." NBER Working Paper 6035. National Bureau of Economic Research, Cambridge, Mass.

Government of India. Planning Commission, ch 8 poblic health care system. http://planningcommission.nic.in/aboutus/committee/strgrp/stgp_fmlywel/sgfw_ch8.pdf

Hsiao, William C. 2003. "Healthcare for the two billion: is community financing a viable solution?" MIMEO.

Lund, Susan, and Marcel Fafchamps. 1997. "Risk-Sharing Networks in Rural Philippines." Stanford

University, Department of Economics, Stanford, Calif. Processed.

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

Peters, D.H. et al. 2002. *Better Health Systems for India's Poor: Findings, Analysis, and Options*. Washington D.C.: World Bank

Ray, Debraj. 1998. *Development Economics*. Princeton New Jersey: Princeton University Press.

Rosenzweig, Mark, and Wolpin, Kenneth. 1993. "Credit Market Constraints, Consumption Smoothing, and the Accumulation of Durable Production Assets in Low-Income Countries: Investment in Bullocks in India." *Journal of Political Economy* 101(April):223–44.

Suryahadi, Asep- Sumarto, Sudarno- Pritchett, Lant. 2000. "Quantifying Vulnerability to Poverty: A Proposed Measure, Applied to Indonesia". World Bank Working paper no. 2437

USAID about India. 2003. http://www.usaid.gov/in/UsaidInIndia/Activitiesnutrition.htm

World bank. 2004. *World Development Report 2004: Making Services Work For Poor People*

WHO, Nutritional status country Profile. http://w3.whosea.org/nhd/pdf/38-44.pdf)

World Bank. "What is Social capital. In: "social capital for development" http://www1.worldbank.org/prem/poverty/scapital/whatsc.htm

APPENDIX

A-1: Appendix of part II

Table A1 Public Health facilities distance and infrastructure

	Sub-centers	PHCs
Distance from village (km)	4.71	12.81
Electricity	8%	74%
Water in building	0%	52%
Water at less than 10 m.	7%	3%
Water between 10 and 30 m.	43%	40%
Water between 30 and 100m.	14%	0%
Water further than 100m	20%	5%
Bathroom for patients	7%	80%
% of rooms that leaks	45%	35%
% of rooms with a clean floor	36%	51%
% of rooms with a fan	3%	57%
Overall Quality index* (from 0 to 26)	12	19

* was constructed aggregating all info on infrastructure

A-2: Appendix of part III

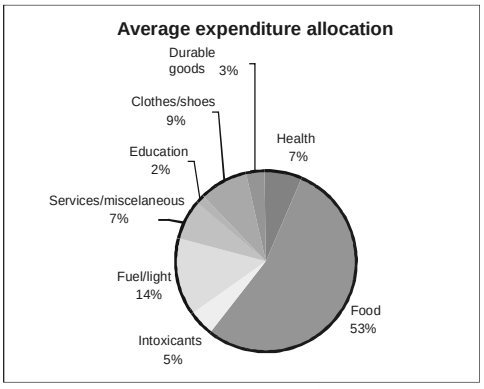


Table A2: Wealth and ratio of medical expenditure/total consumption

Independent variables	Ratio of monthly expenditure spent on health
log of expenditure per capita	**0.05**
	(0.01)
Observations	2518

Table A3: Number of operations and provider type by operation types

Reason of operation	Frequency (total)	No. performed in a city hospital (Udaipur hospital or private hospital)	No. operations performed in CHCs/PHCs	Total
Tooth	1	1	0	100%
pain-cant stand or sit	1	0	1	100%
Typhoid	1	1	0	100%
urine stopped	1	1	0	100%
appendix	1	1	0	100%
head ache	1	1	0	100%
Surgery	1	1	0	100%
closed fallopian tubes	1	1	0	100%
cant hear and talk	1	1	0	100%
tuberculosis	1	0	1	100%
uterus problems	1	1	0	100%
Accident/fracture	9	8	0	89%
Delivery	10	5	3	80%
Tumor	4	2	1	75%
blindness/eyes operation	2	1	0	25%
pain-fever	2	0	0	0%
Stomach	1	0	0	0%
uterus problem	1	0	0	0%
Warts	1	0	0	0%
body swelling	1	0	0	0%
Total	42	25	6	73%

Tables A4: Where are operations and lab-tests performed?

	Lab-tests	
	Frequency	**Percentage**
Udaipur Referral Hospital	81	30.5%
Private Hospital	65	24.4%
Private Doctor	56	21.1%
Phc/chc	36	13.5%
Other	28	10.5%
Total	266	100%

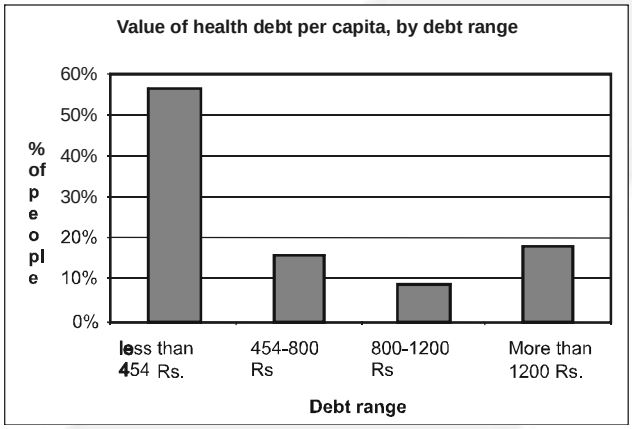
	Operations	
	Frequency	**Percentage**
Udaipur General Hospital	15	31.3%
Private hospital	13	27.1%
Phc/chc	7	14.6%
Private doctor	6	12.5%
Other	7	14.5%
Total	48	100.0%

Table A5: correlation between death of earner and consumption per capita

	Dependant variable: log of expenditure per capita	
	(1)	(2)
Earner died	-0.0380	
	(0.1015)	
Earner male died		**-0.1934**
		(0.1234)
No. observations	1023	1023

**we control for land, education level in household, household members*

Figure A2



A-3: Appendix of part V

Table A6: Allocation of "big" health expense

	Percentage of people that used the 500Rs for...
...consultation	86%
...hospital stays	46%
...operation	10%
...treatment	96%
...bhopa "fees"	21%
...labtest	70%
...transportation	87%
...other	2%
Observations	322

A-4: Appendix of part VI

Table A7: Reasons for not visiting health provider when sick

	Percentage of people quoting this reason
No money	34.10%
No need/will get alright on its own	25.90%
took medicines/wild medicines/home remedy	18.90%
fatalism: it keeps happening because of this and that	3.80%
old: why to go?/can not go	3.50%
no time/needs to stay home	3.20%
nobody to take me	2.50%
doctors useless/ doctor not there or hospital closed/too far	2.91%
Afraid/Ashamed	2.40%
Other	5%

Disparities in the sample

Wealth disparities

The following table shows different measures of wealth for three categories of income: the poorest third, the middle third, and the richest third. In average, the richest third consume more than three times the consumption of the poorest third. Other measures reflect the same disparity.

Table A8: wealth disparities in the sample

	Poorest 33%	Middle 33%	Richest 33%	All sample
Monthly expenditure per capita (Rs)	217.1	362.9	772.4	454.2
Yearly income per capita (Rs)	820.8	1486.2	3677.5	2012.2
% of households having land	98.5%	98.5%	95.1%	97.4%
Average Landsize (bighas)	3.3	4.2	4.6	4.0
Number of assets	12.1	14.9	19.8	15.6
Number of animals	10.2	10.9	9.1	10.1
Observations	337	338	348	1023

The majority of inhabitants (75% of the sample) in Udaipur rural areas are "scheduled tribes", one of the poorest and most disadvantaged groups in India. The data confirms indeed that they are disadvantaged in terms of economic status. They have less expenditure per capita, income per capita, less assets and less land than other categories, even less than scheduled casts, another disadvantaged grouping India[45] .

Table A9: Disparities between categories

	Scheduled Tribes (ST)	Scheduled Caste (SC)	Other Backward Caste (OBC)	General	All sample
Monthly expenditure per capita (Rs)	377.8	535.7	741.1	717.9	454.2
Yearly income per capita (Rs)	1603.1	3643.2	3289.7	2925.2	2012.2
% of households having land	98.8%	91.7%	88.6%	98.7%	97.4%
Average Landsize (bighas)	3.8	3.4	4.7	6.6	4.0
Number of assets	13.9	18.8	22.7	22.4	15.6
Number of animals	10.8	6.0	7.3	7.1	10.1
Observations	774	36	114	78	1023

These differences are not only due to differences in household characteristics: Even controlling for education years and other household characteristics, scheduled tribes have 48% less expenditure per capita than other categories.

[45] Expect for the fact that scheduled casts have less land

Inequality in health status

Table A11: BMI and Anemia by categories, controlling for other variables

	BMI	Anemia
ST	**-0.71**	**0.19**
	-0.3	**-0.3188**
SC	-0.25	0.25
	-0.57	-0.29
OBC	0.58	-0.25
	-0.24	-0.21
Other	0	**-0.18**
	0	**-0.05228**
Obs.	2428	1524

Table A10: BMI and anemia by categories

	ST	SC	OBC	Other	Total
BMI	17.8	18.4	18.6	18.7	18
% of anemia	57%	45%	43%	35%	53%
Observations	1858	97	310	207	2519

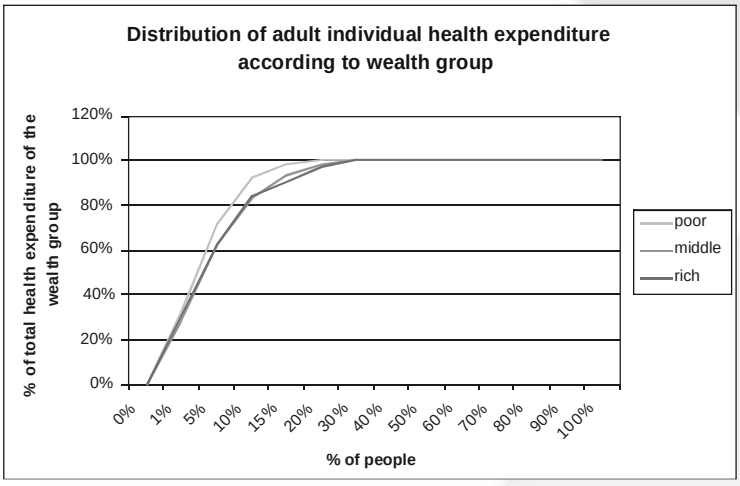
Inequalities in vulnerability

Scheduled tribes are more vulnerable, as measured in terms of debt for health.

Table A12: Health for debt by categories, controlling for other variables

	Fraction of debt paid for health	Having a debt for health if have a debt	Having a debt for health in general
Scheduled Tribe	**0.0609788** **(0.0290702)** **2477**	**0.3833854** **(0.1857888)** **2477**	0.3248775 (0.1831741) 2477
Other categories (higher casts)	-0.0508567 (0.0308413) 2477	**-0.6082635** **(0.2889346)** **2477**	**-0.4963118** **(0.2598785)** **2477**
Log of expenditure per capita	-0.0347962 (0.0296379) 2477	-0.2054412 (0.1670944) 2477	-0.2763099 (0.1558901) 2477

Figure A3



A-5: Appendix of part VII

Adverse selection and moral hazard scenario analysis

1) Scenario analysis 1 (all villages, no copay)

Table A13: Cost of adverse selection and moral hazard for insurance against usual illnesses (all villages, no copay)

Adverse selection scenarios	Moral hazard scenarios	Scenario 0 (no moral hazard)	Scenario 1 (Some moral hazard*)	Scenario 2 (a lot of moral hazard**)
Scenario 0 (non adverse selection)	p	0.38	0.5	0.7
	M	60	60	60
	Premium	**22.8**	**31.9**	**41.3**
Scenario 1 (only all spenders on health)	p	0.47	0.7	0.9
	M	60	60	60
	Premium	**28.2**	**39.5**	**51.0**
Scenario 2 (only 15 % top spenders)	p	0.28	0.4	0.5
	M	60	60	60
	Premium	**16.8**	**23.5**	**30.4**

**increased utilization for operations by 5%, for lab tests by 40%*

***increased utilization for operations by 10%, for lab tests by 80%*

Table A14: Cost of adverse selection and moral hazard for insurance against operations-lab tests (all villages, no copay)

	Moral hazard scenarios	Scenario 0 (no moral hazard)		Scenario 1 (Some moral hazard*)		Scenario 2 (a lot of moral hazard**)	
		Operation	test	Operation	test	Operation	test
Scenario 0	p	0.0008	0.014	0.0008	0.018	0.0009	0.029
	M	6792.8	1694	6792.8	1694	6792.8	1694
	Premium	5	23	6	30	6	49
	Combined premium	**29**		**36**		**55**	
Scenario 1 (all spenders on health)	p	0.0022	0.017	0.0023	0.022	0.0024	0.036
	M	7102	1701	7102	1701	7102	1701
	Premium	16	29	16	38	17	61
	Combined premium	**45**		**54**		**78**	
Scenario 2 (15% top spenders)	p	0.0050	0.052	0.0053	0.068	0.0055	0.108
	M	7989	2113	7989	2113	7989	2113
	Premium	40	110	42	143	44	229
	Combined premium	**150**		**185**		**272**	

**increased utilization for operations by 5%, for lab tests by 30%*

***increased utilization for operations by 10%, for lab tests by 60%*

Table A16: cost of adverse selection and moral hazard for insurance against medicines (all village, no copay)

Adverse selection scenarios	Moral hazard scenarios	Scenario 0 (no moral hazard)	Scenario 1 (Some moral hazard*)	Scenario 2 (a lot of moral hazard**)
Scenario 0 (non adverse selection)	p	0.075	0.105	0.13575
	M	150	150	150
	Premium	11.25	15.8	20.4
Scenario 1 (only all spenders	p	0.38	0.532	0.6878
on health)	M	150	150	150
	Premium	57.0	79.8	103.2
Scenario 2 (only 15 % top spenders)	p	0.38	0.532	0.6878
	M	150	150	150
	Premium	57	79.8	103.2

2) Scenario analysis 2: Seva Mandir villages (no copay)

Table A17: cost of adverse selection and moral hazard for insurance against usual illnesses (Seva Mandir villages, compulsory for SM participants, no copay)

Adverse selection scenarios	Moral hazard scenarios	Scenario 0 (no moral hazard)	Scenario 1 (Some moral hazard*)	Scenario 2 (a lot of moral hazard**)
Scenario 0 (non adverse selection)	P	0.4	0.56	0.724
	M	60	60	60
	Premium	**24**	**33.6**	**43.44**
Scenario 1 (only all spenders on health)	P	0.44	0.616	0.7964
	M	60	60	60
	Premium	**26.4**	**36.96**	**47.784**
Scenario 2 (only 15 % top spenders)	P	0.4	0.56	0.724
	M	60	60	60
	Premium	**24**	**33.6**	**43.44**

Table A18: cost of adverse selection and moral hazard for insurance against operations and lab-tests (Seva Mandir villages, compulsory for SM participants, no copay)

Adverse selection scenarios		Moral hazard scenarios	Scenario 0 (no moral hazard)		Scenario 1 (Some moral hazard*)		Scenario 2 (a lot of moral hazard**)	
		Operation	test	Operation	test	Operation	test
Scenario 0	p	0.0013	0.019	0.0013	0.025	0.0014	0.040
	M	7116	1464.5	7116	1464.5	7116	1464.5
	Premium	9.0	27.8	9.5	36.2	9.9	57.9
	Combined premium	**37**		**46**		**68**	
Scenario 1 (all spenders on health)	p	0.0014	0.020	0.0015	0.026	0.0016	0.042
	M	6084	1455	6084	1455	6084	1455
	Premium	8.8	29.1	9.2	37.8	9.6	60.5
	Combined premium	**38**		**47**		**70**	
Scenario 2 (15 % top spenders)	p	0.0014	0.024	0.0015	0.031	0.0016	0.050
	M	6084	1629	6084	1629	6084	1629
	Premium	8.8	39.1	9.2	50.8	9.6	81.3
	Combined premium	**48**		**60**		**91**	

** increased utilization for operations by 5%, for lab tests by 30%*
*** increased utilization for operations by 10%, for lab tests by 60%*

Table A19: cost of adverse selection and moral hazard for insurance against prescribed medicines (Seva Mandir villages, compulsory for SM participants, no copay

Adverse selection scenarios	Moral hazard scenarios	Scenario 0 (no moral hazard)	Scenario 1 (Some moral hazard*)	Scenario 2 (a lot of moral hazard**)
Scenario 0 (non adverse selection)	p	0.083	0.1162	0.15023
	M	150	150	150
	Premium	12.45	17.4	22.5
Scenario 1 (only all spenders on health)	p	0.091	0.1274	0.16471
	M	150	150	150
	Premium	13.7	19.1	24.7
Scenario 2 (only 15 % top spenders)	p	0.086	0.1204	0.15566
	M	150	150	150
	Premium	12.9	18.1	23.3

3) Scenario analysis 3 (all villages, copay)

Table A20: Cost of insurance for insurance against usual illnesses (all villages) with co-pay of 16.66% (10 Rs)→MH reduced by 2.86%

Adverse selection scenarios	Moral hazard scenarios	Scenario 0 (no moral hazard)	Scenario 1 (Some moral hazard*)	Scenario 2 (a lot of moral hazard**)
Scenario 0 (non adverse selection)	P	0.4	0.5	0.7
	M	50	50	50
	Premium	19.0	26.1	33.9
Scenario 1 (only all spenders on health)	P	0.5	0.6	0.8
	M	50	50	50
	Premium	23.5	32.2	41.9
Scenario 2 (only 15 % top spenders)	P	0.3	0.4	0.5
	M	50	50	50
	Premium	14.0	19.2	24.9

Table A21: Cost of adverse selection and moral hazard for insurance against operations-lab tests insurance (test copay of 5%→MH reduced by 20%)

Adverse selection scenarios		Moral hazard scenarios		Scenario 0 (no moral hazard)		Scenario 1 (Some moral hazard*)		Scenario 2 (a lot of moral hazard**)	
		Operation	test	Operation	test	Operation	test	Operation	test
Scenario 0	p	0.0008	0.014	0.0008	0.015	0.0009	0.021		
	M	6792.8	1524.6	6792.8	1524.6	6792.8	1524.6		
	Premium	5	21	6	23	6	32		
	Combined premium	**26**		**29**		**38**			
Scenario 1 (all spenders on health)	p	0.0022	0.017	0.0023	0.019	0.0024	0.026		
	M	7102	1530.9	7102	1530.9	7102	1530.9		
	Premium	16	26	16	29	17	41		
	Combined premium	**42**		**45**		**58**			
Scenario 2 (15 % top spenders)	p	0.0050	0.052	0.0053	0.057	0.0055	0.080		
	M	7989	1901.7	7989	1901.7	7989	1901.7		
	Premium	40	99	42	109	44	152		
	Combined premium	**139**		**151**		**196**			

Table A22: cost of adverse selection and moral hazard for insurance against medicines (all villages, copay of 10%)→MH reduced by 4%

Adverse selection scenarios	Moral hazard scenarios	Scenario 0 (no moral hazard)	Scenario 1 (Some moral hazard*)	Scenario 2 (a lot of moral hazard**)
Scenario 0 (non adverse selection)	p	0.075	0.102	0.133
	M	150	150	150
	Premium	11.3	15.3	19.9
Scenario 1 (only all spenders on health)	p	0.087	0.118	0.154
	M	150	150	150
	Premium	13.1	17.7	23.1
Scenario 2 (only 15 % top spenders)	p	0.089	0.121	0.157
	M	150	150	150
	Premium	13.4	18.1	23.6

Kojawara hospital

Table A23: Percentage of people visiting Seva Mandir Kojawara Hospital

All sample	1.50%
Same village	51%
Same zone	17%
Same zone, other villages	9%

What is the willingness to pay and to enroll? Estimation from participation and contributions in savings groups?

We can use the enrollment in saving groups and life insurance to get an idea of the popularity of these schemes, and the amount that people are ready to contribute. The table shows the percentage of participation in different savings schemes for three different wealth groups, and the average contribution (including the non participants as well).

Table A24: Participation and contribution in saving schemes and life insurance

	Poor	Middle	Rich
Any saving group (SHG, BISI, or other)	8%	8%	14%
SHG	6%	5%	7%
SHG contribution (rs)	15	17	169
BISI	1%	1%	2%
BISI contribution (rs)	30	84	317
Other saving group	1%	2%	5%
Saving group contribution (rs)	60	76	697
Life insurance	1%	3%	8%
Life insurance in household	2%	9%	23%
obs.	831	831	857

What determines the participation and contribution in these schemes?

As we can see in table A 25, women are more willing to participate in SHGs. For every scheme but SHG, participation increases until a certain age, then decreases. So we can expect that it will be more difficult to reach households with only old people in it. Only saving groups other than SHG and BISI and life insurance are determined by monthly consumption, so we can hope that even poor would be willing to participate in the scheme we will design, provided we can sell it well.

Table A25: Determinants of participation in saving groups and life insurance

Independent variables	SHG (1)	BISI (2)	Savings group (3)	Life insurance (4)
Female	**0.2937**	-0.1945	-0.1296	**-1.1228**
	(0.1159)	-(0.1834)	-(0.1095)	**-(0.1683)**
Age	-0.0003	**0.0797**	**0.0978**	**0.1673**
	-(0.0017)	**(0.0298)**	**(0.0302)**	**(0.0330)**
age^2	0	**-0.0011**	**-0.0013**	**-0.0022**
	(0.0000)	**-(0.0004)**	**-(0.0004)**	**-(0.0004)**
log of expenditure	0.0715	0.1467	**0.569**	**0.7164**
per Capita	(0.1051)	(0.1534)	**(0.1301)**	**(0.1044)**
ST	-0.1609	**-0.4496**	-0.1501	**-0.4388**
	-(0.1848)	**-(0.1609)**	-(0.1400)	**-(0.2316)**
General	-0.4001	-0.6091	0.0167	-0.2605
	-(0.2366)	-(0.3170)	(0.2764)	-(0.2769)
Work	0.1346	0.6089	**0.5907**	**0.4158**
	(0.1034)	(0.2297)	**(0.1707)**	**(0.1992)**
Pseudo R_squared	0.016	0.09	0.13	0.27
Obs.	2441	2442	2442	2440

This table gives probit coefficients

However, although these variables are statistically significant, when computing marginal effects of these variables, in most cases they appear to be very low (very close to zero) and hardly economically significant. Only being a woman seems to have a significant positive effect in participation in Self Help Groups. In addition, the pseudo-R squared is low, therefore we are not able to explain more than 1.6 % (for SHG) to 27% of the total variation in savings or insurance scheme (in the case of life insurance)

Looking at the determinants of contribution for people who participate in these schemes is more useful because it gives economically more significant results.

Table A26: Determinants of contributions in savings groups

Independent variables	Contribution to SHG (1)	Contribution to BISI (2)	Contribution to Savings group (3)
Female	**-143.92**	20.86	-67.38
	-(49.8029)	-(75.2800)	-(55.1472)
Age	-0.98	16.17	-3.99
	-(1.4888)	-(19.8590)	-(15.8699)
Age^2	0	-0.3	0.03
	-(0.0015)	-(0.2181)	-(0.2452)
log of expenditure	**100.07**	**313.83**	90.02
per Capita	**-(47.4849)**	**-(121.2291)**	-(64.1618)
ST	-52.07	-80.12	71.71
	-(35.6155)	-(184.1227)	-(93.2114)
General	286.01	**-321.04**	176.32
	-(248.2592)	**-(129.1452)**	-(167.2155)
Work	-27.28	213.08	**124.49**
	-(36.5321)	-(141.9438)	**-(61.6354)**
Pseudo R_squared	0.26	0.55	0.13
Obs.	151	33	65

For the contribution, provided that people participate, being richer is related with more contributions, and being a woman with less contribution. Therefore we can expect that poorer households would be willing to pay less.

Detail of premium and cost calculations

The average premium comes from above estimations (for medicines and usual illnesses, there is no co-pay, since we want to avoid any exchange of money to make things simpler). There is a co-pay only for lab-tests. Then we decide three different premiums around the average, one lower, one higher. The middle group will pay the average, the poorest group less and the richest group less. Note that all of our premiums do not go beyond 80Rs and in addition we have free premium per children, so that we expect people to be able to purchase these premiums.

To calculate total cost of program per village, we calculate cost of subsidy + administrative cost (for this we have no estimation from data, so it is a pure supposition; we will need to replace this by more precise estimates).

Table A 27: Non-old Adult premiums by wealth groups

	Poor	Middle	Rich	Average
Scheme 1 (mandatory)	10	29	38	29
Scheme 1 (mandatory for SM participants only)	30	47	54	47
Scheme 2	56	61	80	61
Scheme 3	40	45	64	45

Table A 28: Cost of different schemes

	Scheme 1		**Scheme 2**			**Scheme 3**		
	Mandatory scheme	**Only Seva mandir participants**	**ope/lab-tests**	**usual illnesses**	**Total**	**ope/lab-tests**	**Med**	**Total**
Av Premium per adult	29	47	29	32	61	29	16	45
Number of children	2463	2463	2463	2463	2463	2463	2463	2463
Number of old people	598	598	598	598	598	598	598	598
Village Cost of Subsidy = (number of children* premium)+(number of old *premium/2)	801	1298	801	884	1685	801	442	1243
Administrative cost (assumption)	500	500	1500	500	500	1000	1000	1000
Total cost (Rs)	**1301**	**1798**	2301	1384	**2185**	1801	1442	**2243**
Total cost ($)	**26**	**36**	46	28	**44**	36	29	**45**