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IMPACT EVALUATION OF INDIA'S 'YESHASVINI' COMMUNITY-BASED HEALTH INSURANCE PROGRAMME

ARADHNA AGGARWAL*

Department of Business Economics, South Campus, University of Delhi, Delhi-110021, India

SUMMARY

Using propensity score matching techniques, the study evaluates the impact of India's Yeshasvini community-based health insurance programme on health-care utilisation, financial protection, treatment outcomes and economic well-being. The programme offers free out-patient diagnosis and lab tests at discounted rates when ill, but, more importantly, it covers highly catastrophic and less discretionary in-patient surgical procedures. For its impact evaluation, 4109 randomly selected households in villages in rural Karnataka, an Indian state, were interviewed using a structured questionnaire. A comprehensive set of indicators was developed and the quality of matching was tested. Generally, the programme is found to have increased utilisation of health-care services, reduced out-of-pocket spending, and ensured better health and economic outcomes. More specifically, however, these effects vary across socio-economic groups and medical episodes. The programme operates by bringing the direct price of health-care down but the extent to which this effectively occurs across medical episodes is an empirical issue. Further, the effects are more pronounced for the better-off households. The article demonstrates that community insurance presents a workable model for providing high-end services in resource-poor settings through an emphasis on accountability and local management.

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1. INTRODUCTION

Most national governments in developing countries have, in recent years, been trying to promote community-based health insurance programmes (CBHI) as part of their health policy. While the concept of CBHI holds theoretical appeal, empirical evidence about its effectiveness remains scarce. Most existing studies have focused on the impact of community financing programmes on health-care utilisation and financial protection (Wagstaff *et al*., 2007; Ekman, 2004; Jakab and Krishnan, 2001, 2004; Preker *et al*. 2001; for surveys). The important question about whether these programmes have improved the health outcomes and economic well-being of the poor, which are the ultimate objectives of the health policy, has received scant attention. This study addresses this gap in the literature. It evaluates the impact of one of the most innovative and successful non-government CBHI programmes in India not merely in terms of the traditional health-care utilisation and financial protection outcome indicators but more importantly in terms of its effectiveness in promoting better health outcomes and economic well-being of the enrollees. The programme, 'Yeshasvini health insurance' for cooperative rural farmers and informal sector workers, is a voluntary, not-for-profit prepayment insurance

*Correspondence to: Department of Business Economics, Benito Juarez Road, South Campus, University of Delhi, Delhi-110021, India. E-mail: aradhna.aggarwal@gmail.com

programme that covers highly catastrophic and less discretionary in-patient surgical procedures at a low contribution. The programme, which began in 2003 in Karnataka, a state in the southern part of India, has a total of three million members, the equivalent of 15% of the target population and 8.6% of the total rural population in the State.

We evaluate its health and economic impacts using propensity score matching (PSM) methods. Impact assessment requires comparing outcomes of a group of individuals who have participated in the programme (treatment group) with an equivalent group of non-participants (control or comparison group). In theory, the best way to do this is by means of a randomised experiment, where individuals are assigned at random to the treatment or control group (Rossi and Freeman, 1993). In practice, however, it is not always possible or even ideal to use experiments (Heckman and Smith, 1995). Quasi-experimental designs are often the best alternative viable approach. This involves constructing a comparison group of individuals who are comparable to the participants. This can be done either by statistically controlling for differences between participants and non-participants (standard regression) or by matching the two groups according to key observable traits believed to influence the outcomes of interest (matching method). The key advantage of matching over standard regression methods is that it is non-parametric and is less demanding with respect to the modelling assumptions. However, if the number of observable pre-treatment characteristics is large, it is difficult to determine along which dimensions to match units or which weighting scheme to adopt (Dehejia and Wahba, 2002, p. 1). Rosenbaum and Rubin (1983) propose an alternative method for matching that is based on the propensity score—the conditional probability of receiving treatment given the observed covariates. Evidence suggests that with a sufficiently rich data set and appropriate techniques, it is possible to arrive at reliable estimates of impact using PSM methods (Michalopoulos *et al.* 2004, for discussion). However, in addition to PSM estimators, for comparison and internal validity, we have also presented OLS estimates. A household survey of 4109 households across 82 villages in 16 districts of Karnataka state was conducted, and all data were analysed using STATA statistical software 9.0. If our findings can demonstrate that there is a relationship between programme enrollment and improved health and economic outcomes, it would have important policy implications for health financing for the poor in the country, in particular, in the area of high-end medical care.

The rest of the study is organised into seven sections. Section 2 provides a brief description of the Yeshasvini programme, highlighting its innovative features. Section 3 describes the hypotheses and presents a summary overview of the existing empirical evidence. Section 4 explains the methodology, while Section 5 focuses on the database used to evaluate the performance of the programme. Section 6 discusses the estimation results of the propensity score functions and post-matching balancing tests. Section 7 presents the main results. Finally, Section 8 concludes the analysis and draws policy implications.

2. YESHASVINI HEALTH INSURANCE PROGRAMME: INNOVATIVE FEATURES

Introduced in June 2003 by the Karnataka State Department of Co-operation for cooperative rural farmers and informal sector workers, the Yeshasvini health financing insurance programme has received widespread attention and acclaim for its success in providing health insurance coverage to a large section of the rural poor. It has a number of innovative design and operational features (Kuruvilla and Liu, 2007; IDPAD, 2007; ILO, 2006; Radermacher *et al.*, 2005), which intend to overcome the weaknesses that generally plague community-based insurance schemes (Carrin *et al.*, 2005; Preker *et al.*, 2001).

Sound administrative structure: One of the key constraints in the success of CBHI schemes is that the administrative establishments underlying them are weak and the techno-managerial expertise that exists in their context is limited. As a result, they are vulnerable to adverse incentives and corruption (Preker *et al.*, 2001). A unique feature of Yeshasvini is that it is based on tri-sector partnership between the

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public, private and cooperative sectors, and benefits from the expertise of each partner through the appropriate allocation of responsibilities. The State Government Co-operation Department mobilises membership, collects revenue and oversees operations of the programme. Cooperative societies that organise farmers and other informal sector workers in rural areas in an institutional framework and act as a communication channel between the government and the rural population provide a useful platform to explain the principles of health insurance to the community, assist the State Department in mobilising membership and implement the programme at the grassroots level. The designated health-care providers in the programme are mainly private sector hospitals, although government-run and charitable hospitals are also part of the network.

Innovative governance: Although the programme is run under the aegis of a government department, it is governed by an independent Trust with the Principal Secretary of the Co-operation Department acting as chair of the Trust and representatives of the relevant government departments and network hospitals as its members. While the government participation provides the management of the programme with access to the cooperative network and its administrative infrastructure to implement the programme, an independent trust ensures that it is not susceptible to local political influences. The Trust is assisted by a third party administrator (TPA) as an executive organ. In general, a TPA offers back-office support to insurance companies by issuing ID cards to subscribers, processing claims, making payments, etc. However, Yeshasvini has managed to negotiate a cashless system with service providers by using its services.

Wide membership base: While the scope of most CBHI schemes is limited in terms of geographic area and population coverage (Carrin *et al.*, 2005, ILO, 2005), Yeshasvini intended from the outset to achieve wide coverage of the population across the state. To mobilise large sections of the rural population for health insurance purpose, it targets members of rural cooperative societies. There are 19.5 million members registered with 32,804 societies. Since the target population base is large and the programme is voluntary, the administrative machinery of the State Co-operation Department exerts considerable effort to achieve high levels of participation. It defines a membership target for each renewal period (Table I). The total target fixed for a given year is broken down to the district level. This is communicated to district-level officials of the department, who, in turn, seek the cooperation of cooperative societies' secretaries and governing bodies to disseminate information, and encourage and motivate the people to become members. In addition, health camps are regularly organised to spread awareness among the people about health and health insurance. Recognising that the subscription may be a financial obstacle to membership, the premium has been kept at a very low level (Table I). Currently, the annual premium is fixed at a flat rate of Rs. 120 (US$2.4)[1] per person. In addition, a 15% discount is offered on family packages for five members. Further, the enrollment schedule has been kept long and flexible. It is spread across five months namely, from January to May. These are the months when cash crops such as cotton and sugarcane are harvested, making it easier for farmers to pay the subscription. Finally, the mode of payment is also flexible; it is decided by the local cooperative societies depending on local conditions.[2] Thus, community ownership, and trained and competent management with strong involvement have contributed to the enrollment in the programme. Currently, the programme has a membership of three million people, which marks a 29.3% increase over the base of the previous year. Although it is 15% of the potential target population of about 20 million people, it makes up 48.4% of the target fixed by the management for this year.

Generous benefits: Most CBHI schemes offer limited benefits by focusing on primary health care or by fixing low ceilings on hospitalisation costs. However, Yeshasvini covers only surgical

[1]Assuming an exchange rate of $1 = Rs. 50.

[2]For instance, some societies accept monthly payments during the enrollment period, others demand a lump sum payment and some accept bi-monthly payments. Credit cooperative societies generally deduct the subscription amount with the consent of the member while lending money. Profitable co-operative societies pay a part of the premium on behalf of their members.

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Table I. Financial performance indicators of the programme

	2003–2004	2004–2005	2005–2006	2006–2007	2007–2008	2008–2009
Enrollment (mn)	1.6	2.02	1.47	1.85	2.32	3.0
Targets (mn)	—	5	3.76	6.01	6.2	6.2
Enrollment-target ratio (%)	—	42.11	39.24	30.85	37.4	48.4
Premium (Rs)	60	60	120[a]	120	120	120
Contribution collected (Rs. mn)	96.91	119.76	163.44	215.45	276.3	361.0
Government contribution (Rs. mn)	45	35.8	110	208.5	200	150.0[b]
Other sources (Rs.mn)	3.88	11.34	5.45	5.06	20.15	—
Total amount collected (Rs. mn)	145.79	166.89	278.9	429.02	496.46	—
No. of surgeries	9047	15 36	19 677	39 602	60 668	—
Surgery to enrollment ratio	0.57	0.75	1.35	2.13	2.60	—
Utilisation–subscription ratio (%)	30.1	114.8	160.1	178.8	195.7	—
Amount of money sanctioned per surgery (Rs.)	11 786.49	12 124.09	13 299.49	9784.908	8915.7	—
No. of free OPDs[c]	35 814	50 171	52 892	206 977	155 572	—

Source: The Yeshasvini Trust.
[a]Rs. 60 for the under-8 age group population.
[b]For the year 2008–2009 State Government has provided Rs.400 mn of which Rs.150 mn has been released so far.
[c]Out-patient diagnosis.

procedures,[3] i.e. a high-cost low-probability highly catastrophic medical event. The programme does not cover non-surgical in-patient admissions. The maximum coverage per person per year is Rs. 200 000 (US$4000) with free out-patient diagnosis (OPD). Considering that the average per capita income of the state is around US$516 (2007–2008 figure), the package is generous. In addition, it offers free OPD for all types of medical events and up to 50% discount on all laboratory tests. Table I shows that there has been a rapid increase in the number of surgeries over time; in 2003–2004, there were 9047 surgeries, but the number increased to 60 668 in 2007–2008. Starting with 35 814 in 2003–2004, the number of OPDs also increased to 155 572 in 2008.

Large risk pool: Risk pooling is an important principle of insurance that allows transfers of financial resources from low-risk to high-risk members. However, there is a concern that it is not effectively put in place in voluntary CBHI programmes due to adverse selection. It is believed that this problem can be tackled by creating a large membership base. However, Yeshasvini is not financially sustainable even though the management has created a large membership base because it covers high-end medical treatment at low contribution. Table I shows that while surgeries accounted for only 2% of the total membership, the utilisation to collection ratio was over 195% in 2007–2008. Unlike most CBHI schemes, however, Yeshasvini receives financial support from the state government (Table I). The Trust also receives donations from private and government bodies. The programme has thus created a large pool of resources. As of July 2008, the Trust had a fund of Rs. 500 million.

Vast network of quality service providers: The programme has been able to create a vast network of service providers. Evidence suggests that the absence of a quality health-care infrastructure or the expenses involved in creating one have limited the growth of health insurance schemes for the rural poor. Yeshasvini, however, convinced reputed private and public sector hospitals to participate in the programme. Another unique feature here is that a formal process has been set up to evaluate hospitals before they can join the network. The objective is to ensure the delivery of quality service. Currently, there are 349 network hospitals spread across 27 districts. These hospitals have at least 25 beds and are equipped with modern health facilities. Some of them are super-specialty hospitals.

[3]The benefits are reviewed from time to time and appropriate changes are introduced in the package depending on the demand. For instance, recently, normal deliveries and emergencies such as snake bites, bull gore and dog bites have also been included in the package, keeping in view the growing demand for such coverage. Medico-legal cases (such as assaults, rapes, and accidents) are however not covered under the programme.

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Cost containment: In a review of 12 CBHI schemes in India, Devadasan *et al*. (2004) found no evidence of cost containment with the exception of Yeshasvini, where the management has negotiated fixed tariffs for each procedure covered by the programme. According to ILO (2006), the tariff is 40–50% off the 'regular' tariff applied by private hospitals. Several other mechanisms have been built into the design of the programme for cost containment and quality service delivery. First, the procedures for approval and cash reimbursement have been minimised; transactions are cashless and patients are not involved in any administrative process. Second, network hospitals are monitored by the management and the TPA; there are regular inspections of network hospitals to ensure that they adhere to the commitments made to the Trust and any hospital that is found to have indulged in fraud or cheating patients is blacklisted. There are also well-defined penalties for other offences and defaults. Finally, the programme is implemented using the existing administrative infrastructure of the Department of Co-operation and the cooperative sector; no additional administrative structures have been created. Thus, the management saves money on the cost of creating and operating additional administrative structures. Further, network hospitals are directed to create their own facilitating infrastructure for Yeshasvini members,[4] because the Trust does not bear these expenses. This produces significant economies for the Trust. The cost per member including the fee of the TPA was as low as Rs. 3.82 per member in 2008–2009 and is likely to further decrease in 2009–2010 when the enrollment has increased to three million members.

In short, this is one of the most innovative programmes in community health financing in India. Its innovativeness lies in the fact that it has developed efficient partnership arrangements between the government, private, and cooperative sectors to exploit their respective strengths to promote the health status and economic well-being of the targeted disadvantaged group. The synergy between these sectors is directed to finance high-cost medical treatment for the poor who otherwise have no health security provided by the state. It is designed and managed by professionals who have developed well-specified procedures for enrollment, empanelment of hospitals, treatment and claim settlement, and monitoring. Surgery rates are fixed and are well below market rates. Finally, there are periodic reviews to upgrade the programme. The scheme is therefore expected to achieve the goals of promoting health-care use and health outcomes in the state.

3. HEALTH AND ECONOMIC OUTCOMES: MAJOR HYPOTHESES AND EMPIRICAL EVIDENCE

Insurance lowers (or avoids) the cost of treatment at the point of treatment. Theoretically, the price reduction effects of insurance induce an increased consumption of health care and, in accordance with the demand for a health model (Grossman, 1972), health. Empirical evidence also indicates that there is responsiveness by individuals to price (Besley, 1989). According to Nyman (2001), the programme is expected to generate not only price reduction effects but also income transfer effects. His theory suggests that the difference between the payoff and the premium is a transfer of income from those who remain healthy to the person who becomes ill. The income transfer effect of the price-payoff insurance would reinforce the effect of price reduction and would increase medical care consumption of services more than would be justified by the price reduction effect alone. Insurance-induced health-care utilisation is, therefore, positively related to the gap between the premium and payoff. As discussed above, Yeshasvini offers the poor the opportunity to access advanced and expensive surgical treatments, which otherwise would be unavailable to them. Given that premiums are low and flat but payoffs are

[4]For instance, they are expected to employ an exclusive staff for guiding Yeshasvini members, set-up exclusive Yeshasvini counters, and have a dedicated telephone line.

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large, the programme is expected to generate substantial insurance-induced health-care utilisation effects.

The above arguments notwithstanding, concerns have been expressed that health insurance may actually foster excessive health-care utilisation. Arrow (1963) for instance emphasised the special characteristics of the health-care market, namely, the agency problem, both, between the doctor and the patient and between the doctor and the health insurance (private or public), and the physician's behaviour concerning demand inducement. These characteristics, he argued, could lead to the problem of moral hazard, which (in health care) means that insured consumers tend to demand more health care since they do not have to pay the full cost for treatment (consumer moral hazard), while providers have an incentive to render more or unnecessary care than might be medically appropriate (provider-induced moral hazard). This may increase the risk of financial insecurity by driving up the cost (Ekman, 2007). Given the 'intrinsic unpleasantness of illness', Besley (1989, p. 28) dismisses the possibility of consumer moral hazard. Furthermore, he suggests that even if health care is provided free of charge, the associated non-health-care costs in consuming it might be substantial. For example, time off work and spent queuing may be substantial, or there may be travel costs involved in visiting a health facility (Besley, 1989: p. 23). He could not, however, rule out the possibility of provider moral hazard. A closer look at Yeshasvini indicates that the concerns of moral hazard in the context of providers may also be an exaggeration. Yeshasvini covers only 'surgeries' to minimise the possibility of provider moral hazard. Further, to discourage service providers from prescribing surgery where it is not required, the tariff for each procedure is fixed and is 40–50% below the market rate. The tariff schedule has not been adjusted for price inflation since the inception of the programme. In addition, there are significant exclusions. These include implants (valves, grafts, mesh, stents, and nails), joint replacement surgeries, liver transplant surgeries, and follow-up investigations. All these measures along with a tight monitoring system may discourage over-prescription of health-care services.

Another problem is adverse selection. Any evidence of increased health-care utilisation could strongly suggest adverse selection. There is an enormous literature on the role of adverse selection in insurance markets but the empirical findings are mixed. Siegelman (2004) argues that while adverse selection in insurance markets is a possibility, it is often not a serious problem. According to Arrow (1963), such problems are diminished when health insurance schemes operate for large groups of randomly selected individuals.

Any post-insurance increase in health-care utilisation over pre-insurance levels may not thus be dismissed as excessive demand. One can expect that in the rural context, where there is no insurance and almost nobody can afford expensive surgical treatment because of low incomes and credit market failures, the advent of health insurance might make surgeries affordable. Further, free OPD, lab tests at discounted rates and income transfer effects (as predicted by Nyman (2001)) may induce increased use of primary health care. Our first hypothesis, therefore, is that Yeshasvini induces significant increases in health-care utilisation.

Further, since surgical interventions involve huge expenses, their financial consequences for the poor are severe both in the short and the long term. Heavy reliance on out-of-pocket expenditure, in particular, in the event of surgery exposes the poor to severe risks of impoverishment by pushing them into an irreversible debt trap. A World Bank study (Peters *et al*., 2002) reports that more than 40% of hospitalised patients have to take loans or sell assets to pay for hospitalisation. Of greater concern is the fact that because the poor lack the resources to pay for health care, they are likely to avoid going for care, thereby exposing themselves to health risks. By focusing on surgical interventions and by offering generous benefit packages, Yeshasvini is expected to provide significant financial protection to poor enrollee farmers against financial insecurities and health risks. This is our second hypothesis.

Finally, increased access to health-care services and financial protection should translate into better treatment outcomes and improved economic well-being (Grossman, 1972). Jütting (2004) argues that, in the context of rural settings, insured members no longer have to search for credit or sell assets for

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treatment. Since there are no delays in seeking care, treatment outcomes are expected to be more satisfactory because recovery is faster. Further, considering that people in rural areas rely mainly on their own labour and on assets such as livestock for income generation, a serious income loss is also prevented. Stabilisation of income and hence consumption improves the health of all household members, which, in turn, contributes to overall income and, thereby, the economic well-being of the poor. However, there is a possibility that the system of capitation payment, below-market rate tariffs, and tight monitoring of service providers may result in poorer services and hence poorer treatment outcomes for Yeshasvini members.[5] Our final hypothesis, therefore, is that the treatment and economic outcomes of Yeshasvini are subject to empirical testing.

A voluminous literature on community health insurance schemes has examined the effectiveness of these schemes in improving health-care utilisation and providing financial protection (for reviews, see Ekman, 2004; Bennett *et al*., 1998; ILO, 2002; Jakab and Krishnan, 2001, 2004). Several studies have found an increased use of health-care services across countries with diverse settings such as China (Bogg *et al*., 1996); Congo (Criel and Kegels, 1997); Ghana (Atim, 1999); Senegal (Jütting, 2004); India (Ranson *et al*., 2007); and Philippines (Dror *et al*., 2005, 2006). Nonetheless, the results are not unambiguous (Ekman, 2004). ILO (2002) found that only 14 out of 24 studies that examined the health-care utilisation impacts of CBHI reported positive results. Jakab and Krishnan (2004), however, showed that in 13 out of the 16 studies that they reviewed, members were likely to use more health-care services than non-members; two reported no difference while one found a slight decrease in health-care use. Results pertaining to financial protection are also ambiguous. While several studies have found positive impacts of CBHI on financial protection (Bennett *et al*., 1998, Ekman, 2004; ILO, 2002), most of them (Devadasan *et al*., 2007; Baeza *et al*., 2002; Jowett, 2002; Jütting, 2004) suggest that protection has been only marginal. Ranson (2001) finds no evidence of an effective protection effection. Ekman (2007), on the other hand, found that it increased the financial risk, possibly due to excessive use of medical care. There is little evidence of the impact of CBHI on treatment outcomes, health status, and economic well-being of members. Hamid *et al*. (2009) found a positive association between micro-health insurance, on the one hand, and household income growth, investment in productive assets and stabilisation of household income, on the other; however, the evidence was not robust for any of the outcomes. In general, the results are found to be influenced by the contexts in which these programmes operate, the design of the programmes, the policies adopted, and the methodology adopted for analysis.

4. METHODOLOGY

We apply PSM methods for impact evaluation and compare the results with parametric estimators based on the standard regression method. PSM is a non-parametric estimation method[6] that works by creating a comparison group comprising non-programme participant individuals with identical distributions of observable characteristics to those in the programme participants' (treatment) group. The basic idea is to find, for every individual in the participants' group, a matching individual in terms of all relevant observable characteristics X from among the non-participants' group. Matching is performed conditioning on the propensity scores of X (the probability of participating in the programme conditional on X) rather than on X. The mean effect of treatment can then be calculated as the average difference in outcomes between the participants and non-participants. This means that the outcomes of members are compared with the potential outcomes of comparison households. More specifically, if $P = 1$ for the treatment group and $P = 0$ for the comparison group, then the average

[5]During our field interviews with service providers, we found a widespread feeling of resentment against the tariffs fixed for various procedures, which they felt were inadequate and irrational.

[6]The seminal paper on propensity matching is Rosenbaum and Rubin (1983). For important theoretical contributions, see Abadie and Imbens (2002), Heckman *et al*. (1997), Heckman *et al*. (1998), among others.

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treatment effect on treated (ATT) on an outcome variable Y is

$$\text{ATT} = E(Y_1 - Y_0|P = 1),$$

which means,

$$\text{ATT} = E(Y_1|P = 1) - E(Y_0|P = 1)$$

While data on $E(Y_1|P = 1)$ are available from the programme participants, estimation of the counterfactual $E(Y_0|P = 1)$ is based on the assumption that after adjusting for observable differences, the mean of the potential outcome is the same for $P = 1$ and $P = 0$. While implementing the technique, we had to address several questions at each step of the procedure and make several choices. In what follows, we briefly describe them.

4.1. Estimating the propensity score

The first step in implementing the technique was to estimate propensity scores using probit or logit models. The propensity score function is a statistical tool that enables us to construct a propensity score. Three choices had to be made: treatment and comparison groups, the model to be used for the estimation, and the variables to be included in the specification.

4.1.1. Treatment vs comparison groups. Estimation of the propensity score function required two sets of households: programme participants (treatment group) and non-programme participants (comparison group). This was not a simple choice in this study. Since we have included in our impact evaluation a wide range of outcome variables representing health-care use, financial protection, treatment outcome, and economic well-being and have covered medical events ranging from OPD to surgery and maternal health, to accommodate them all in a single study we needed to identify more than one category of treatment group depending on the duration of participants' membership and their status as claimants (or beneficiaries). We identified three broad categories of the treatment group: households that had member status at the time of the survey (YH); households that had been renewing their membership for the past three years or more (YH+3); and households that had availed of the benefit of membership at least once during the past 4 years (YB). The objective was to have a sufficient time frame to capture the programme impacts on health outcomes across different medical events and on economic outcomes that are slightly structural in nature. While the outcomes related with the medical events of OPD and hospitalisation could be evaluated using current members as the treatment group, surgery related health outcomes and economic status indicators could be meaningfully evaluated by focussing on claimants and YH+3, respectively, as the treatment groups.

Non-programme participants were also categorised into two broad groups of households: non-Yeshasvini cooperative households (NYCH) and non-Yeshasvini non-cooperative households (NYNCH). The issue was which of the two groups should be used as the 'comparison group'. The argument in favour of NYCH was that the matching of YH with NYCH might be more successful since both were cooperative households and were therefore likely to be more comparable than the non-cooperative population group. However, it could be that the decision of NYCH households not to select themselves into the programme was largely influenced by unobservables that were not fixed over time. Some participants, for instance, might be in the programme precisely because they were high-risk households that might not have been observed by us. Some non-participants, on the other hand, might deliberately not have joined the programme because they recently received treatment and felt that they did not need such treatment in the near future. Did this mean that NYNCH was necessarily a more appropriate untreated group and that observable factors were more likely to capture the difference between YH and NYNCH groups? Perhaps not. Participation in cooperative societies is voluntary, and the possibility of unobservable self-selection bias could not be ruled out. Since the relative magnitudes of bias could not be ascertained in the two groups, we decided to consider both NYCH and NYNCH as

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comparison groups in alternative specifications. This would also help us examine the sensitivity of the results to the choice of the comparison group. We thus had three treatment and two comparison groups. Propensity score methods require that a separate propensity score specification be estimated for each treatment-comparison group combination (Dehejia, 2005). We therefore constructed six propensity score models.

4.1.2. Model choice. Little guidance is available in the literature regarding which functional form to use, Probit or logit. In principle, any discrete choice model could be used. However, in general, this choice is influenced by the quality of matching achieved. Following this broad principle, we used probit models in the analysis.

4.1.3. Choice of variables. While analysing the factors affecting the demand for health insurance, most studies focus on individuals' or households' observable traits, such as income, nature of economic activity, demographic patterns, age structure, health patterns, social status, education, and personal preferences. The socio-economic contexts within which households live are generally ignored. We have explicitly taken into account village-specific and district-specific attributes along with household-specific characteristics. These include economic conditions, literacy, health infrastructure, distance from the nearest health facility, distance from the nearest Yeshasvini facility, living conditions, poverty, transport facilities and the coverage of cooperative societies. We compiled information on more than 400 variables at the village and the district level, each. The statistical significance approach together with the 'hit-or-miss method' was adopted in the final selection of models. This means that we started with a basic model of demand for health insurance and then added new variables to test their performance. Variables were kept if they were statistically significant and increased the prediction rates noticeably.

4.2. The balancing test

Since conditioning is not done on covariates but only on propensity scores, the matching procedure should be able to balance the distribution of the relevant variables in both the comparison and the treatment group. For this, we had to decide whether the test should be performed only on the observations that had propensity scores within the common support region, i.e. precisely on the subset of the comparison group that was most comparable to the treatment group or on the full set of the comparison group. It is believed (Heckman *et al.*, 1997) that imposing the common support restriction in the estimation of propensity scores improves the quality of the estimates. However, there are also arguments against imposing this restriction. Lechner (2001), for instance, argues that besides reducing the sample considerably, imposing the restriction may lose high-quality matches at the boundary of the common support region. However, following the standard practice to limit comparisons to a subset of cases lying on the common support of propensity scores, we also dropped households off the common support. This means that participant households with propensity scores that were larger/smaller than the maximum/minimum propensity score observed in the comparison group were excluded.

To assess the quality of matching, the situation before and after matching needs to be compared to check if any differences remain after conditioning on the propensity score. Various indicators to assess the quality of matching are available in the literature (Caliendo and Kopeinig, 2008). We used the standardised bias (Rosenbaum and Rubin, 1985), pseudo-R^2 (Sianesi, 2004) and log likelihood ratio tests (Table III), which could be applied using the pstest command (in psmatch2) of STATA.

4.3. Choosing algorithm for matching

Various PSM methods have been proposed in the literature as a means to identify a comparison group. Each method implies a trade-off between quality and quantity of the matches (for a discussion, see Caliendo and Kopeinig, 2008). We used the Kernel method, which uses *all* households units in the

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comparison group to construct counterfactual outcomes for the treatment group individuals. This is a type of weighted regression of the outcome on the treatment indicator variable, the kernel weights being a decreasing function of the absolute difference in propensity score between the treated and comparison unit (Smith and Todd, 2005). A Gaussian kernel with bandwidth of 0.06 was used for the analysis.

4.4. Outcome variables

Outcome variables were classified into four broad groups: (i) health-care utilisation; (ii) financial protection; (ii) treatment outcome (days lost in illness, income lost in illness, perception regarding the level of satisfaction, abnormal deliveries and caesarean deliveries); and (iv) economic well-being (change in income, savings, borrowings, sale and purchase of assets, and total savings and borrowings over the past three years). Two things are important to note. One, health-care utilisation variables such as waiting period, consultations, OPD visits, and incidence of hospitalisation are commonly used in the literature on health economics. Following this literature, we developed measurable indicators of health utilisation across four different categories of medical episodes: (i) out-patient treatment, (ii) in-patient treatment, (iii) surgery, and (iv) pregnancy. A comprehensive coverage of health-care use indicators in the context of different medical episodes in a single study is scarce in the literature. Two, the literature bases the measures of 'financial protection' on people's out-of-pocket spending (Oops) on medical care. Oops are direct outlays of households on medical care and exclude payments from health insurance plans. The assumption underpinning these approaches is that the household's non-medical expenditure in the period under consideration would have increased by an amount equal to its out-of-pocket expenditures on medical care had it not been forced to incur the Oops (Wagstaff *et al*., 2008a, p. 17). However, according to Grossman (1972), medical outlay is a normal product that yields higher utility than other consumption product during illness. It is, therefore, not welfare-reducing to incur such expenses. Besides, the assumption that consumption drops *pari passu* with medical outlays is rather naïve. Any shortfall in resources due to such emergency expenditures is made up by borrowing or sale of assets. In fact, it is indebtedness or selling of assets that has large impoverishing effects on the poor in rural areas (Jütting, 2004). Simply looking at the share of out-of-pocket expenditures in total medical expenditure can overstate the threat to consumption and the catastrophic consequences of health payments. We have, therefore, used the proportion of medical expenditure that is financed by selling assets, borrowing, or both rather than income, savings, or other sources, as an indicator of financial protection.

4.5. Estimation of standard errors

The estimated variance of the treatment effect includes the variance due to the estimation of the propensity score, the imputation of the common support, and possibly also the order in which treated individuals are matched. These estimation steps add variation beyond the normal sampling variation (Heckman *et al*., 1998). The most commonly used method to deal with this problem is bootstrapping of standard errors as suggested by Lechner (2002). Using this technique, we modified the estimates of standard errors by bootstrapping 50 replications. In general, 50 replications are observed to be good enough to provide a good estimate of standard error (Efron and Tibshirani, 1993). In addition to the bootstrapped standard error, we have also presented, in the text, the analytical standard errors for comparison.

4.6. Limitations of the methodology

Matching removes any bias caused by selection on observable variables, but leaves the possibility of bias due to selection on unobservable variables. Thus, perfect matching is not possible. Any bias due to selection on time invariant unobservables could, however, be removed by combining the matching technique with the difference-in-difference method to look at the changes between 'programme

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participant' and 'non-programme participant' households before and after the programme's implementation (Heckman *et al*., 1997). However, there were no suitable baseline data to allow us to use this method. We therefore used matching between the two groups in the post-implementation phase.

5. DATABASE

The database is based on secondary and primary sources and contains three levels of hierarchy: household, district, and village level.

5.1. Household-level data

We carried out a household (HH) survey covering 4109 households: insured and uninsured, in 82 villages across 16 districts of the state during the months of December 2007 to May 2008. A multi-stage sampling method was used in the selection of insured and uninsured households. The Karnataka Agricultural Department has divided the State into five zones: north, south, east, west, and central. These zones are further divided into 10 sub-zones based on the rainfall pattern (quantum and distribution), soil types, depth and physio-chemical properties, elevation, topography, major crops, and vegetation. We selected 42 blocks representing all 10 sub-zones. Our sample blocks covered 67.4% of the total population and 67% of the households in the state. To select the villages, villages identified in the Census of India, 2001 constituted the sampling frame. Two to three strata of villages were formed in each block based on the number and distribution of households. One village was randomly selected from each stratum. The sample villages, therefore, represent very small villages (with fewer than 1000 people) to very large villages (with populations of more 5000). In the final sampling stage, a random sample of households per village was selected. The number of households selected in each village was proportionate to the village population. Lists of Yeshasvini members were obtained from cooperative societies in each village. For a sample of non-Yeshasvini members, we divided each village into the appropriate number of blocks based on the number of households and from each block we randomly selected a pre-fixed number of households after excluding Yeshasvini members. It was ensured that non-cooperative members were also sampled from each block in proportion to the population. A total of 4109 households were surveyed; they covered 21 630 people with an average household size of 5.26, which is slightly below the figure of 5.3 provided in the Census of India, 2001.

A fully structured questionnaire was used to collect information on the economic, social, behavioural, and health status of each sampled household. In almost 80% of the cases the responses were made by the head of the family or spouse. In the remaining cases, responses were made by adult children of the head of the family (15%) or other members of the household including parents and brother/sisters of the head of the family (5%).

The sample comprised three groups of households: Yeshasvini households (1555 constituting 37.84% of the sample); non-Yeshasvini cooperative households (1402), and non-cooperative HH (1152). A household that had at least one Yeshasvini member at the time of the survey was classified as a 'Yeshasvini household'.

5.2. Village-level data

Village-level information was based on both primary and secondary sources. The primary data were collected from all 82 villages covered in the sample. A questionnaire was designed to obtain village-level information. The questionnaire sought information on social, economic, and health conditions. It also acquired information on the number of cooperative societies and their members. The primary information was supplemented by secondary information sourced from the Department of Rural Development and Panchayat Raj. The department provides information on 387 parameters pertaining

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to 21 broad categories including location, demography, health, water supply and sanitation conditions, educational infrastructure, agriculture, housing, transport, roads, and welfare programmes.

5.3. District-level data

The district-level information pertaining to more than 400 variables covering economic, social, health, and cooperatives' status was collected using a wide range of sources. Several departments of the state government were approached for the information.

6. PROPENSITY SCORE FUNCTIONS AND THE QUALITY OF MATCHING

As discussed above, we had three treatment groups: current Yeshasvini enrollees (YH), claimants of benefits (YB), and members for at least the past three years (YH+3); and two comparison groups: non-Yeshasvini cooperative households (NYCH) and non-Yeshasvini non-cooperative households (NYNCH). For pair-wise comparisons, we estimated two sets of propensity score functions with NYCH and NYNCH as comparison groups: Models 1 and 2. Each set in turn comprised three propensity score functions: a, b, and c, with YH, YB, and YH+3 as treatment groups, respectively. We thus constructed six functions: Models 1a (YH vs NYCH), 1b (YB vs NYCH), 1c (YH+3 vs NYCH), 2a (YH vs NYNCH), 2b (YB vs NYNCH), and 2c (YH+3 vs NYNCH). While estimating these functions, the pre-matching balancing (the DW) test was performed. Only those propensity score specifications were considered, which satisfied the pre-matching balancing property (for discussion, see Lee, 2006).

Table II reports the descriptive statistics of variables that were included in the propensity score functions. It can be observed that, in general, Yeshasvini households (YH) are fairly similar to non-Yeshasvini cooperative households (NYCH) but they tend to be different from non-Yeshasvini non-cooperative households (NYNCH).

Non-yeshasvini non-cooperative households (NYNCH) are more likely to be landless agricultural labourers. They tend to have lower per capita income and wealth and fewer chronic diseases, have less access to print or audio/visual media, are more likely to belong to scheduled caste or scheduled tribe communities,[7] and live further from a health facility in villages characterised by poorer health and transport infrastructure, lower presence of panchayats (local governing bodies) and a greater likelihood of natural calamities. This means that the YH that enjoy relatively higher economic and social status would match with NYCH; the opposite would be true for the YH versus NYNCH pair matching. Matching on two socially and economically unequal comparison groups would yield results that have important implications in terms of the impact of membership across the two different segments of enrollees. Few studies have looked at the effects of CBHI across different income groups (for exceptions, see Ekman, 2007; Wagstaff *et al.*, 2008b). This study thus makes a useful contribution to the literature.

The probit coefficients of all the variables have the expected signs in all six models.[8] However, there are noticeable differences in their statistical significance across models. Consistent with most insurance studies our probit estimations of Model 1a (YH vs NYCH) suggest that the probability of participating in the programme is influenced by household size, composition (in terms of sex and demography), socio-economic characteristics, access to information, and health status, although health and transport facilities also play a significant role in the decision. The quality of government health facilities at the district level influences it negatively and significantly, while transport facilities affect it positively. Other village- and district-specific characteristics have the expected signs but they do not emerge as significant.

[7]Scheduled Castes (SC) and Scheduled Tribes (ST) are Indian population groups that are explicitly recognised by the Constitution of India; they were previously called 'depressed classes' by the British.
[8]Results of the estimated propensity score functions are available on request.

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Table II. Descriptive statistics of observable characteristics of sample households by membership

	YH		NYCH		NYNCH	
Variable	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Presence of chronic patient (1 = yes)	0.320	0.577	0.236	0.501	0.210	0.473
No. of years of education–head	5.988	4.982	4.446	4.641	3.883	4.579
Education status-head	2.148	1.209	1.813	1.049	1.712	1.051
Average no. of education years-HH	6.573	3.215	5.222	3.345	4.383	3.126
Age of HH Head	51.409	12.311	50.413	12.860	47.431	13.019
No. of HH members	5.534	2.672	5.288	2.340	4.778	2.146
Wealth index	0.260	0.776	−0.026	0.726	−0.330	0.670
% of members in working age group	70.601	21.986	68.919	22.661	68.062	22.888
Income per capita	12 977	9800	12 064	12 757	10 404	11 434
Caste (1 = upper class)	0.117	0.321	0.218	0.413	0.295	0.456
Share of female members in HH	0.473	0.150	0.479	0.166	0.499	0.178
Income share from cultivation[a]	2.543	1.516	2.414	1.631	1.526	1.695
Agricultural labour[a]	0.470	1.137	0.823	1.446	1.579	1.772
Income share from selling milk[a]	0.661	0.770	0.579	0.727	0.379	0.693
Access to newspaper[b]	1.586	1.255	1.247	1.219	0.978	1.160
Access to radio[b]	2.253	1.175	2.114	1.210	1.796	1.324
Access to TV[b]	2.511	1.004	2.196	1.183	1.844	1.290
Herfindahl index of income sources	6715	1835	6801	1797	6864	1663
Member of self-help group (1 = yes)	0.487	0.648	0.416	0.601	0.417	0.586
Index of village health infrastructure	0.197	1.201	0.166	1.132	0.142	1.156
Distance from nearest village health facility adjusted by area	0.000	0.732	−0.049	0.715	0.104	0.760
Index of village transport facilities	0.041	0.763	0.055	0.791	−0.005	0.710
Index of annual natural disasters	−0.039	0.999	−0.065	0.968	−0.084	0.796
No. of panchayats per village in district	0.249	0.110	0.258	0.113	0.229	0.111
District per capital income	15 023	4276	15 333	3811	14 801	4889
Index of district health infrastructure	−0.137	2.366	0.147	2.528	−0.375	2.303
No. of health centres per 1000 population	0.076	0.027	0.073	0.028	0.076	0.025
Share of female members in panchayats	0.967	2.243	0.786	1.842	1.188	2.628
No. of cooperative societies per 1000 population	0.002	0.002			0.002	0.002

Notes: (a) Likert scale: 0–4; 0 = none; 4 = 100% (b) Likert scale 1–4; 1 = never; 4: daily.

The results of Model 1c (YH+3 and NYCH) suggest that long-term participation in the programme is also influenced by socio-economic, demographic, and health-specific characteristics of the households, just as in the case of Model 1a. However, in addition, village- and district-specific characterstics also come up significant with the expected signs. Households are more likely to renew their membership in villages that have greater exposure to natural calamities, higher density of cooperative societies, lower poverty rates and, most importantly, a health facility in the vicinity. Similarly, districts with higher per capita income, better transport facilities, and poorer government health services are more likely to have renewal of programme membership. Interestingly, the estimation of Model 1b (claimants vs non-claimants in NYCH group) indicates that governance and the proximity to a Yeshasvini facility matter. Claimants are more likely to reside in locations where the density of cooperative societies is high, more women participate in gram panchayats, and the Yeshasvini facility is closer. The role of other factors is relatively diminished. Estimations of Models 2a, 2b, and 2c yield similar results but the impacts vary. The estimation of different propensity score functions for different binary combinations of treatment and comparison groups in the study therefore sets the stage for good quality matching.

Using kernel density estimation techniques, participants were matched with non-participants over a common region of the matching variables. The level of rejections of the Yeshasvini households (treatment group) was not evenly distributed across the outcome indicators. In some cases, no observation was discarded for reasons of support while in others 1–9 observations were dropped. The only outcome variable where more than 5% observations were dropped was 'caesarean' (33 of 599).

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Table III. Kernal matching performance: results of the mean and median absolute bias, pseudo-R^2 and LR-χ^2 tests

Model		Median	Mean	Std. dev.	Model	Sample	Median	Mean	Std. dev.
1a	Unmatched	10.747	13.904	11.17	2a	Unmatched	19.431	26.821	19.960
	Matched	*2.257*	*2.300*	*2.79*		*Matched*	*2.898*	*3.306*	*2.147*
1b	Unmatched	11.418	12.509	7.41	2b	Unmatched	11.634	14.954	10.694
	Matched	*2.080*	*1.869*	*1.06*		*Matched*	*1.924*	*2.056*	*1.585*
1c	Unmatched	9.545	13.804	10.55	2c	Unmatched	14.434	19.340	16.162
	Matched	*1.782*	*2.193*	*1.99*		*Matched*	*1.729*	*2.501*	*1.849*
		Pseudo-R^2	LR χ^2	$p>\chi^2$			Pseudo-R^2	LR-χ^2	$p>\chi^2$
1a	Unmatched	0.058	223.080	0.00	2a	Unmatched	0.170	492.620	0.000
	Matched	*0.003*	*8.640*	*0.98*		*Matched*	*0.006*	*16.240*	*0.702*
1b	Unmatched	0.058	223.080	0.00	2b	Unmatched	0.089	39.230	0.001
	Matched	*0.003*	*8.640*	*0.98*		*Matched*	*0.002*	*0.750*	*1.000*
1c	Unmatched	0.059	177.780	0.00	2c	Unmatched	0.105	264.000	0.000
	Matched	*0.003*	*4.470*	*1.00*		*Matched*	*0.004*	*6.330*	*0.998*

B: Claimnants; +3: Yeshasvini members for 3 years or more.

Thus, enforcing the support requirement did not result in significant loss of data and is therefore unlikely to compromise the representativeness of the results.

Table III reports the results of matching quality assessment tests:

Pseudo-R^2: Pseudo-R^2 is obtained by regressing treatment propensity scores on all covariates used in matching, on the matched and unmatched samples. It measures the extent to which the covariates explain the participation decision (Caliendo and Kopeinig, 2008). If the propensity scores balance covariates well in a matched sample, the covariates should be similarly distributed, and the pseudo-R^2 ought to be fairly low. Table III shows that the pseudo-R^2 substantially decreased after matching in all the cases.

Absolute mean and median biases: Matching clearly removed a large part of mean and median biases in all the six models. Rosenbaum and Rubin (1985) suggest that a standardised difference of >20 should be considered as 'large.' Our results show that, post-matching, none of the standardised differences have absolute values larger than 3.

The results of matching for individual covariates are presented in Appendix Tables AI–AIII. Evidently, there were large differences in the covariates between the treatment and comparison groups in the original sample. These differences are considerably reduced after kernel matching. In some cases, where they increased, they were not significant even in the unmatched samples. In all the cases, the absolute mean bias turns out to be insignificant.

Likelihood-ratio test of the joint significance: Likelihood ratio turns insignificant in all the models in the matched samples, confirming the results of the previous two tests.

It is thus evident that matching has achieved a significant reduction in bias on observables. The reduction is much larger when non-cooperative households are used as the comparison group. This difference in results is simply because pre-matching bias is much larger for non-cooperatives than for cooperatives. The results of the post-matching diagnostic tests used in the study thus suggest an adequate performance of the match. Based on the above results, the PSM results appear to be reliable.

Since the average treatment effect on participants (ATT) is defined only in the region of common support, an important step is to check the overlap and the region of common support between treatment and comparison group. For the analysis the most straightforward method, i.e. a visual analysis of the density distribution of the propensity score in both groups (Lechner, 2000) was used for the analysis.

Figure 1 shows histograms for the propensity density functions for the treated and comparison groups in all the treatment and comparison combinations specified earlier. Two observations may be made. One, as expected, the pre-matching distributions are more skewed where the comparison group is

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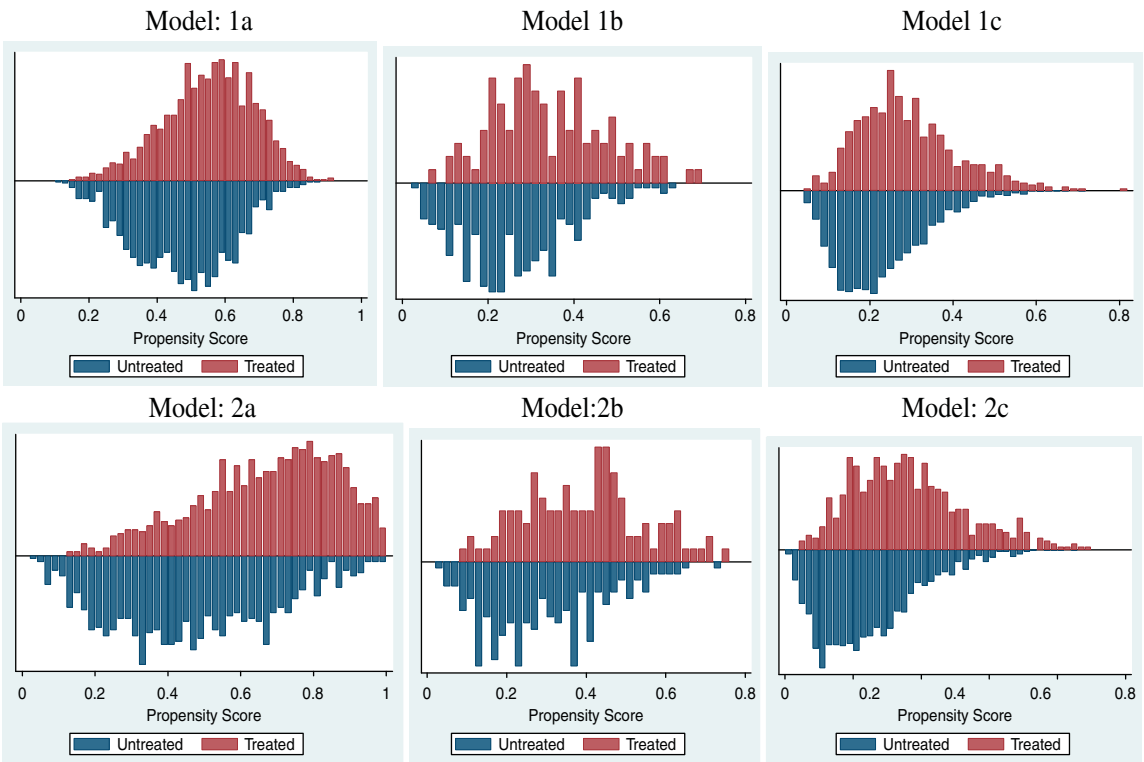

Figure 1. Propensity scores histograms

NYNCH than where the comparison group is NYCH. Second, in both cases, distributions are more skewed when the treatment group constitutes HHs that have been Yeshasvini members for the past 3 years or more. The skewness notwithstanding, the region of common support is ample in all cases.

7. EMPIRICAL RESULTS

The results based on the PSM technique are presented in Tables IV–VII. Appendix Table AIV contains the parametric regression results. Given the large number of outcome variables, the complete set of regression results could not be presented. The results pertaining to the relevant outcome variables alone are presented for comparison. It is worth noting that the two estimators produced very similar results.

7.1. Health-care utilisation

7.1.1. Outpatient care. As reported in Table IV, our results on the impact of the programme on health-care use indicate that there were statistically significant differences in the average number of health-care visits between insured (YH) and uninsured cooperatives (NYCH) during the recall period. Although the waiting time before the first appointment with a doctor did not appear to have been affected by insurance, the number of consultations and visits to medical facility was 6–7% per cent higher for insured cooperative members than their uninsured counterparts in the comparison group. Our results appear to be in line with several studies that have shown that community financing of health-care promotes the use of the health-care facility (Ekman, 2004; Wagstaff *et al.*, 2007). Could it be due to adverse selection? Since we have already matched households on health status, this possibility is less

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Table IV. Propensity score matching estimates of the average effect of Yeshasvini on health-care utilisation based on kernel method

		Comparison group: Non-Yeshasvini cooperative HHs						Comparison group: Non-cooperative HHs					
Medical episode	Variable	ATT	SE	Bootstrap SE	Tstat	Comparison group	Participant group	ATT	SE	Bootstrap SE	Tstat	Comparison group HHs	Participant HHs
OPD	Frequency of health facility visits	0.070	0.0276	0.033	*2.14*	998	1078	0.033	0.039	0.051	0.64	661	945
	Frequency of consultation	0.063	0.026	0.023	*2.69*	998	1078	0.030	0.037	0.039	0.77	661	945
	No. of sick days	0.174	0.092	0.094	*1.84*	1340	1412	−0.049	0.132	0.134	−0.37	884	1250
	Frequency of illness	0.056	0.032	0.028	*2.00*	1340	1412	0.003	0.046	0.048	0.06	884	1250
	No. of facility visits per sick day	0.004	0.009	0.008	0.48	998	1078	0.020	0.012	0.010	1.92	661	945
	No. of consultations per sick day	0.005	0.011	0.010	0.55	998	1078	0.020	0.016	0.017	1.19	661	945
	No. of waiting days per illness	0.079	0.058	0.060	1.32	998	1078	−0.084	0.113	0.115	−0.73	661	945
	Share of visits to private health facility	0.030	0.020	0.017	*1.81*	986	1069	0.028	0.031	0.021	1.32	655	938
	Share of visits to Yeshasvini health facility	0.031	0.005	0.005	*5.73*	986	1069	0.030	0.005	0.005	*5.53*	655	938
	Share of visits to government health facility	−0.061	0.020	0.017	*−3.54*	986	1069	−0.062	0.031	0.027	*−2.32*	655	938
In_patient	Frequency of hospitalisation	−0.007	0.029	0.013	−0.56	123	131	0.004	0.041	0.021	0.17	66	107
	Hospitalisation facility (1 = private institution)	0.086	0.061	0.075	1.14	123	131	−0.020	0.134	0.0640	−0.31	66	107
Surgery	Frequency of surgery in past 4 years	0.064	0.035	0.019	*3.36*	283	110	0.061	0.037	0.026	*2.35*	237	113
	Surgeries in government hospital	−0.248	0.038	0.038	*−6.47*	283	110	−0.262	0.042	0.044	*−5.95*	237	113
	Willingness to undergo surgery (1 = yes)	0.090	0.026	0.023	*3.97*	252	360	0.070	0.033	0.036	*1.97*	154	319
Maternal health	Visits for check-up	0.112	0.069	0.075	1.49	139	160	0.099	0.114	0.093	1.06	89	128
	Facility (1 = private institution)	0.013	0.061	0.067	0.25	138	156	0.0567	0.090	0.0976	0.56	89	125

Note: Significant differences are highlighted in italics ($p < 0.10$).

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Table V. Propensity score matching estimates of the average effect of Yeshasvini on financial protection based on kernel method

		Comparison group: non-Yeshasvini cooperative HHs						*Comparison group: Non-cooperative HHs*					
Medical episode	Variable	ATT	SE	Bootstrap SE	Tstat	Comparison group HHs	Participant HHs	ATT	SE	Bootstrap SE	Tstat	Comparison group HHs	Participant HHs
OPD	Share of borrowing in expenses	−0.012	0.011	0.017	−0.72	918	981	−0.053	0.022	0.026	*−2.08*	603	822
In_patient	Borrowing in in-patient expenses	1919.04	1058.5	902.2	*2.13*	123	131	549.286	1391.5	2009.17	0.27	66	107
	Share of borrowing in expenses	0.080	0.043	0.046	*1.74*	120	128	−0.068	0.078	0.081	−0.84	64	105
Surgery	Share of out-of-pocket expenditure	−3961.84	1328.2	1192.9	*−3.32*	283	107	−3611.8	1481.7	1199.7	*−3.01*	237	113
	Share of borrowing in expenses	−0.29	0.033	0.036	*−8.29*	283	110	−0.295	0.037	0.043	*−6.91*	237	113
	Borrowing in expenses	−4029.95	2987.3	2785.7	−1.45	283	107	−2845.03	3210.7	2104.49	−1.35	237	113
Maternal health	Share of out-of-pocket expenditure	−0.09	0.078	0.083	−1.06	33	31	0.000	0.125	0.128	0	17	25
General	Health expenditure	40.624	14.641	17.073	*2.38*	1138	1225	20.287	20.28	21.98	0.92	800	1096
	Share of health expenditure in total	0.010	0.004	0.004	*2.39*	1138	1225	0.005	0.007	0.004	1.25	800	1096
	Per capita health expenditure	8.866	3.121	4.423	*2.85*	1138	1225	−0.785	5.003	4.312	−0.18	800	1096

Note: Significant differences are highlighted in italics ($p<0.10$).

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Table VI. Propensity score matching estimates of the average effect of Yeshasvini on treatment outcomes based on kernel method

		Comparison group: non-Yeshasvini cooperative HHs						Comparison group: Non-cooperative HHs					
Medical event	Variable	ATT	SE	Bootstrap SE	Tstat	Comparison group HHs	Participant HHs	ATT	SE	Bootstrap SE	Tstat	Comparison group HHs	Participant HHs
OPD and in_patient	Satisfaction level (Likert scale 1–3)	0.054	0.030	0.027	*1.99*	1008	1072	0.017	0.042	0.034	0.52	651	944
	Days lost per sick time	0.578	0.639	0.534	1.08	988	1056	0.687	1.16	0.779	0.88	650	924
	Income lost per sick time	0.00003	0.0001	0.0001	0.53	958	1028	−0.0003	0.0001	0.000	*−1.53*	629	902
	Income lost as ratio of income	0.00005	0.0001	0.000	0.76	1103	1203	−0.0004	0.0002	0.000	*−2.36*	755	1060
	Whether work regularly (1 = yes)	0.076	0.029	0.024	*3.18*	1024	1102	−0.01	0.042	0.046	−0.22	675	968
Surgery	Whether require post-surgery intervention (1 = yes)	−0.059	0.059	0.054	−1.08	277	108	−0.045	0.062	0.069	−0.65	231	111
	Care rating in surgeries (Likert scale 1–4)	−0.053	1.921	1.993	−0.03	270	107	−0.035	1.952	1.703	−0.02	222	110
	Whether life improved post-surgery (1 = yes)	3.803	2.280	2.409	*1.58*	275	107	2.671	2.409	2.150	1.24	229	110
	Whether work regularly post-surgery	2.421	2.409	2.040	1.19	277	107	0.668	2.598	2.252	0.3	232	110
	Whether money saved (1 = yes)	4.964	2.839	2.760	*1.8*	277	107	4.331	3.034	3.508	1.23	232	110
Maternal health	Whether abnormal delivery (1 = yes)	0.003	0.020	0.011	0.3	145	161	0.011	0.042	0.012	1.01	92	128
	Whether Caesarean (1 = yes)	−0.0415	0.003	0.037	−1.11	364	412	−0.054	0.040	0.034	*−1.71*	245	321

Note: Significant differences are highlighted in italics ($p < 0.10$).

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Table VII. Propensity score matching estimates of the average effect of Yeshasvini on economic well-being based on kernel method

	Comparison group: non-Yeshasvini cooperative HHs						Comparison group: non-cooperative HHs					
Variable	ATT	SE	Bootstrap SE	Tstat	Comparison group	Participant HHs	ATT	SE	Bootstrap SE	Tstat	Comparison group	Participant group
Total expenditure	164.044	88.338	91.913	*1.78*	1336	1405	135.3616	111.56	116.6074	1.16	881	1244
Per capita expenditure	20.32	15.35	13.109	*1.55*	1336	1405	24.730	19.61	19.301	1.28	881	1244
Borrowing – income ratio	0.021	0.020	0.021	0.99	1865	565	0.073	0.021	0.017	*4.34*	1336	508
Savings-income ratio	0.015	0.022	0.021	0.7	1865	565	0.046	0.023	0.022	*2.07*	1336	508
Assets sold as ratio of income during past 3 years	0.006	0.007	0.008	0.73	1865	565	0.008	0.007	0.007	1.15	1336	508
Assets purchased as ratio of income during past 3 years	−0.017	0.019	0.021	−0.79	1071	283	0.009	0.015	0.017	0.55	621	259
Growth of income during past 3 years	0.033	0.008	0.009	*3.6*	1865	565	0.027	0.009	0.010	*2.56*	1336	508

Note: Significant differences are highlighted in italics ($p<0.10$).

evident. In the rural context, the possibility of moral hazard should not be serious either. Increased health care could then either be due to increased reporting of self-illness or increased intensity of use (more care per episode of illness). It may be seen that the insured households reported significantly more cases of illness over the recall period than the uninsured cooperative households (NYCH). The ATT is 0.056 for the frequency of illness and 0.17 for the number of sick days, signifying a 5–6% increase in the incidence of illness. However, these variables turned insignificant when insured households were matched with lower socio-economic group households (NYNCH). One can argue that the affordability of care results in increased reporting of illness by those who are better informed and better equipped. This is because, as discussed above, even if health-care services are free there are non-medical costs associated with their use, which could be afforded only by the better-off sections. Interestingly, however, there is evidence of improved health-care use even in the lower socio-economic group where insurance is associated with a 2% increase in the intensity of health-care use. Clearly, the health-care utilisation impacts of the programme, though small, are positive and significant. Further, they vary across the socio-economic groups of the insured population. By making health-care affordable and by spreading health awareness, the programme seems to have led to greater reporting of health problems among the better-off sections of YH, and encouraged more intensive use of primary health care among the relatively lower socio-economic segment of YH. These findings are supported by the regression results presented in Appendix Table AIV. The results are thus robust with respect to the methodology used.

Further, there is a clear evidence of increased use of private health services for primary health care among the insured households. Insured households use the services of private hospitals networked with the programme more heavily than the uninsured ones across both socio-income groups under consideration. It may be recalled that OPD is free and lab tests are available at lower rates to programme participants in the networked hospitals. Interestingly, ATT is negative and significant for government hospital use. Membership resulted in 19% reduction in the share of government facility visits (in total visits), irrespective of the socio-economic group of the insured households. This is despite the fact that government services are provided free of charge; the primary reasons for this shift lie in the poor services, absenteeism, and corrupt practices in government hospitals. As discussed above, members are more likely to renew their membership in districts that have poorer quality of government infrastructure. Price reduction thus appears to have had a significant impact on the use and quality of primary health care.

7.1.2. In-patient treatment. The differential effect of insurance on the utilisation of in-patient care between the insured and non-insured groups turns out to be insignificant. While the programme does not cover in-patient non-surgery events, it was expected that the income transfer effects of insurance could generate secondary effects to promote the use of those services as well that were not directly covered under the programme. However, there is no evidence of secondary effects. The facility of free OPD and lab tests at concessional rates offered by the network hospitals has however resulted in a 17% increase in the use of private hospital services for in-patient treatment among insured households in the better-off segment of the population. In the lower socio-economic groups, this shift is not visible.

7.1.3. Surgeries. Impacts of health insurance seem to be the most pronounced in the use of surgeries. Insured households reported more surgery cases than uninsured ones during the past four years. This could be because low income households tend to avoid surgical treatment if they are not insured. Further, individuals suffering from chronic illness were asked whether they would undergo surgery if the doctor prescribed it. A significantly larger number responded in the affirmative. Since the programme focuses on surgical procedures, the results are not unexpected. Finally, quite understandably, participants are more likely to use a Yeshasvini facility, in particular, in the private sector.

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The use of government facilities was approximately 25% lower, irrespective of the comparison group selected.

7.1.4. Maternal health. There was no appreciable impact of the programme on maternal health care in particular in the lower socio-economic groups. The number of visits to hospitals for pre-delivery check-ups was 11% higher for participants in the better-off group, although it missed significance at the 10% level. But the insurance-induced impact on pre-delivery use of medical care in the lower income group remained negligible. Further, the insured status did not result in greater likelihood of using the private institutional health facility, as has been evident in other medical events. The reason could be that the programme did not cover normal deliveries until recently. Further, normal deliveries are free in government hospitals; the fee for a caesarean is nominal. Since these medical procedures are technically standardized, the preference for a health facility for maternal health is more price sensitive. Therefore, the programme participants do not appear to have benefited significantly in the case of maternal health. Our results thus reveal that the programme has improved utilisation of health care among different segments of the insured households by reducing the price and making health care affordable though the impacts vary across medical events and socio-economic groups. Further, there is a shift away from the use of government hospital services to private facilities, thereby reducing pressures on the former.

To analyse the service providers' perspective, we conducted a survey of network hospitals. Over 75% of the respondents revealed that they expanded their health facilities either in the year they entered the Yeshasvini network or after.

Clearly, while the average health-care use effects of the programme at the household level are small, at the macro-level these effects have translated into a significant difference for the service providers. The programme is therefore likely to have a positive impact on the expansion of health-care facilities in the state.

7.2. Financial protection

A good insurance programme is not merely about improving access to health-care facilities. One of its primary objectives is that people are protected from the financial consequences associated with the use of medical care. While assessing the impact of the programme on financial protection, we have used borrowings, selling of assets or both resulting from medical payments as an indicator of financial protection. Our results, as presented in Table V, reveal that in the event of surgery, which involves catastrophic expenditures, total borrowings are 36 and 30% less for enrollees in the better-off and the worse-off group, respectively. The payments made out of savings, incomes, and other sources, on the other hand, are up to 74% less for enrollees. Thus, there is strong evidence of financial protection offered by the programme in cases of surgical treatment where the programme has a significant direct price reduction effect.

Further, borrowing and/or asset sales associated with primary health-care use are 61% lower for the relatively worse-off group, which is significant at the 5% level. Although the primary health care resulted in lower indebtedness even for better-off insured households, it was not significant. In line with our expectations, the financial impact is not significant in the event of hospitalisation or maternal care. In fact, in-patient treatment other than surgery resulted in increased borrowings for the relatively better-off YH group. This could be due to increased use of private facilities by better-off sections of YH. Non-cooperative participants were not affected significantly. Finally, overall health expenditures are 19–20% higher for YH compared with uninsured cooperatives. This could be due to the more extensive and better quality health services availed by them. However, the lower socio-economic group did not show a perceptible increase in their health expenditures. They are thus offered better health at little extra cost. Thus, financial protection effects are more substantive for lower income groups. Regression estimations support these results (Appendix Table AIV).

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7.3. Treatment outcome

Treatment outcome was assessed using four indicators: post-treatment work ability, income lost during illness, days lost during illness, and the overall satisfaction level from treatment. Table VI shows that while economically better-off programme enrollees assess their post-treatment work ability on higher scales than their counterparts, the relatively lower income participants are more emphatic about lower income loss during illness. This could be because non-cooperative households are more likely to be daily wage earners who seem to be more concerned about income loss; cooperative members, on the other hand, are more likely to be cultivators who do not subsist on daily wages. The average treatment effect on treated is not significant for days lost in any combination. Overall, the better-off programme participants report higher level of satisfaction than their counterpart comparison households.

Treatment outcomes of surgery treatments also turn out to be more pronounced for the better-off group of programme participants. Even while care rating is assessed to be lower by programme participants, they report better post-surgery life, lower monetary loss, and fewer requirements for post-surgery processes. It could be that below-market tariffs, non-coverage of post-surgery processes, and tight monitoring of the hospitals resulted in more efficient use of medical processes. Surgery is generally performed only when it is necessary and post-surgery procedures are not prescribed unless required. This seems to have prevented unwarranted use of surgery and post-surgery medical care for patients and yielded greater satisfaction. The results are statistically significant for higher socio-economic groups, perhaps because they are better informed.

Maternal health: There are no perceptible better outcomes in maternal care, but it is worth noting that, contrary to the widely held belief, participation status does not result in a larger number of caesarean deliveries. Caesarean cases are 30% lower for relatively lower income YH population than the comparison group. For the better-off group, it is negative though statistically insignificant. This could be because the rate fixed by the Trust for caesarean delivery is as low as Rs. 5500 while the market rates vary from Rs. 15 000 to Rs. 20 000. Contrary to popular belief, service providers are extremely critical of these below-market rates and are unwilling to take such cases.

In general, better informed and relatively higher income programme participants report better treatment outcomes than the relatively worse-off group.

7.4. Economic status

There is evidence of positive *albeit* weak income effects (Table VII). Post-matching, the average annual income growth (over the past three years), is found to be significantly higher for the insured households across both socio-economic groups. This could be because post-treatment work ability is reported to be higher by better-off programme participants, while income losses are reported to be lower by the relatively lower economic group compared with the comparison group. However, insurance status has had different effects on consumption and savings across different income groups. While better-off enrollees appear to spend more than the comparison group, lower income enrollees have higher savings rates. Surprisingly, borrowings are also significantly higher for poorer programme enrollees. It could be that insurance-induced feelings of empowerment are stronger at lower income levels. Regression results also support these findings, but there is a major caveat that needs attention. Cross-sectional matching estimators do not remove time invariant unobservables, which may introduce systematic bias in identification conditions required for matching.

8. CONCLUSION

This study examined evidence on the impact of being insured by the Yeshasvini community health financing programme in India on health-care utilisation, financial protection, treatment outcomes, and economic well-being. Yeshasvini is a major community health insurance programme aimed at making

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expensive surgical treatments affordable at low subscription to the disadvantaged population in rural areas of Karnataka state in India. The programme is innovative because it is embedded in a tripartite paradigm involving three sectors: public, private, and cooperative. Its institutional and organisational structures, mechanisms, and practices are designed to achieve optimal outcomes by harnessing the synergies created by the combination of expertise and resources of the private service providers, the administrative infrastructure and power of the government, and social capital of the cooperative sector; by enhancing trust between consumers, service providers, and managers, and by ensuring quality care at lower costs.

Our results reveal that the programme has increased health-care use among insured households, though there are differences across income groups and medical events. The likelihood of seeking out-patient services and surgical treatment increases among better-off programme participants; lower-income participants use health care more intensively when ill. This behaviour cannot be attributed entirely to over-utilisation or moral hazard-like behaviour of insured households. In micro terms, the effects are rather small, in particular, for members with relatively lower socio-economic status. At the macro-level, however, this has the potential to make an important impact on the expansion of health-care services by providers. Over two-thirds of the population live in rural areas and are excluded from quality treatment. With this exclusion, it is difficult to achieve economies of scale in the health-care sector and this, in turn, creates a vicious circle of high cost and non-accessibility of treatment. Our findings suggest that a successful CBHI programme can effectively break this vicious circle. Further, there is a clear evidence of a shift away from the use of government facilities to private facilities. This is likely to reduce pressures on the public health services and provide the government with an opportunity to address problems of scarcity and regain public trust.

While measuring financial protection by borrowings and selling of assets, we found strong evidence that CBHI provides substantial financial protection by reducing the need to borrow money or sell assets to meet the medical expenses. In rural areas, where people rely on their own labour and assets for income generation, this can prevent a serious decline in their incomes. Existing studies suggest that CBHI provides only marginal protection due to small pay-offs. Our results are at odds with this literature. This is because Yeshasvini covers surgical treatment which involves catastrophic expenditures; offers, unlike most CBHI pprogrammes large pay-offs through cashless transactions; and has a vast network of hospitals spread throughout the state to ensure accessibility. Surprisingly, programme participation offers considerable financial protection even in OPD cases, in particular to lower-income participants. Apparently, the relatively poorer households borrow even to finance their OPD treatment that does not normally involve large expenditure. By offering free OPD and low priced lab tests, and, more recently, by extending the coverage to non-surgical medical emergencies, the programme appears to have had a significant impact on the financial implications of OPD, particularly for the poorer enrollees. Overall health expenditures of the better-off programme participants increase perhaps because the utilisation effect has been stronger in their case. But we argue that medical expenditures are not poverty-enhancing; rather, borrowing or sale of assets to meet such expenditures leads to impoverishment.

Treatment outcomes are also positive but vary across socio-economic groups of the population and the type of medical event. But these effects appear more pronounced for the better-off group among the insured households. The reason seems to lie in the fact that they are better equipped with information and resources and are located in villages and districts that have better transport facilities, larger cooperative societies, and gram panchayats; the Yeshasvini facility is closer.

The economic outcomes also turn out to be significant. This is not surprising in view of the fact that programme participation has had a positive effect on health outcomes. But we suspect that this is partly due to the effects of unobserved time-varying heterogeneity. Economic outcomes are largely structural in nature and impact evaluation in their context requires a longer time-frame and control of time-variant heterogeneity. Some unobserved heterogeneity is likely to remain in cross-sectional estimators.

In general, however, the programme appears to be successful in extending benefits to the poor in catastrophic medical events, despite the low premium and presents an interesting case study. The study

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thus indicates that community financing arrangements can be effectively implemented if there is transparency and accountability among those managing the programme and a good network of service providers exists to ensure accessibility of health care.

Financial sustainability, however, remains an issue because membership is voluntary and the premium is very low. While membership has grown steadily since its inception with three million members currently enrolled throughout the state, it forms only 15% of the target population. Increasing the premium levels will further discourage the poor from joining. Placing limitations on a benefit package is likely to reduce the level of effective protection provided against financial risk. While this will affect all income groups, it may have the most severe consequences for the poorest. The managers of the Yeshasvini programme have been trying to maintain low operational costs and a fixed surgery price schedule. The rules for reimbursement are also stringent. However, these steps have created dissatisfaction among service providers. There is a general feeling that the prices fixed for most of the procedures are inadequate and irrational. Hospitals cannot cover even the cost. Most hospitals do not have in-house facilities for all types of surgeries. They have freelance doctors on their panel. It is not financially viable to seek their services at the rate prescribed by Yeshasvini. Further, hospitals cannot claim money for any additional medical process required at the time of surgery for which pre-authorisation has not been taken. It is therefore suggested here that managers should augment the resources. The introduction of a sliding contribution scale rather than a single flat rate contribution, and family packages may improve membership and collection of resources. Further, strategies may be adopted to widen the membership base through initiatives that enhance trust and caring. Our field interviews revealed that lack of information presents a major obstacle to enrollment, in particular, in far flung areas. Campaigns for information dissemination, training of cooperative societies' representatives, free health checks on regular basis, and incorporation of a formal complaint mechanism within the programme may prove to be important trust building measures. Besides, efforts need to be made to augment the resources with other means of financing including government subsidies, donations, and sponsorships of information campaigns. Finally, managers *should* seriously consider compulsory membership for cooperative members as a viable option. The cooperative network provides a platform where the informal sector workers in rural areas are organised in an institutional framework. This institution can be used to take a leap forward in the direction of implementing social insurance. This would also help create a large pool of resources and offer a better package of services. Thus, there is need to carry the programme to the next level.

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CONFLICTS OF INTERESTS

No conflicts of interests disclosed.

APPENDIX A

The results of matching for individual covariates are presented in Tables AI–AIV.

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Table AI. Mean absolute biases among covariates before and after kernel matching: models 1a and 2a

		Mode 1a : YH vs NYCH					Model 2a : YH vs NYNCH				
		Mean					Mean				
Variable	Sample	Participant group	Comparison group	% bias	% reduction bias	t-Statistics	Participant group	Comparison group	% bias	% reduction bias	t-Statistics
Presence of chronic patient	Unmatched	0.32	0.24	15.10		4.15	0.32	0.21	20.4		5.07
(1 = yes)	*Matched*	*0.37*	*0.34*	*5.60*	*63.20*	*1.16*	*0.37*	*0.35*	*4.6*	*77.7*	*0.89*
Herfindahl index of income	Unmatched	6714.90	6792.40	−4.30		−1.17	6714.90	6864.20	−8.5		−2.13
sources	*Matched*	*6789.50*	*6800.90*	*−0.60*	*85.30*	*−0.14*	*6798.10*	*6793.50*	*0.3*	*96.9*	*0.06*
Education status-Head	Unmatched	2.15	1.81	29.40		8.08	2.15	1.71	38.5		9.6
	Matched	*2.11*	*2.05*	*5.20*	*82.40*	*1.17*	*2.09*	*2.06*	*2.6*	*93.3*	*0.52*
% of members in working	Unmatched	70.57	68.82	7.90		2.16	70.57	68.06	11.2		2.83
age group	*Matched*	*69.27*	*70.31*	*−4.70*	*40.70*	*−1.11*	*69.70*	*68.74*	*4.3*	*61.6*	*0.96*
Age of HH Head		—	—	—	—	—	51.33	47.43	30.8		7.82
					51.92	52.01	−0.7	97.8	−0.15		
No. of HH members	Unmatched	5.55	5.32	8.80		2.42	5.55	4.78	31.7		7.85
	Matched	*5.81*	*5.74*	*3.10*	*65.00*	*0.68*	*5.72*	*5.61*	*4.5*	*85.7*	*0.86*
Member of self-help group	Unmatched	0.48	0.41	11.60		3.19	0.48	0.42	10.3		2.58
(1 = yes)	*Matched*	*0.50*	*0.52*	*−3.20*	*72.60*	*−0.70*	*0.50*	*0.55*	*−8.1*	*21.4*	*−1.6*
Caste (1z = upper class)	Unmatched	0.12	0.22	−27.8		−7.68	0.12	0.29	−45.2		−11.8
	Matched	*0.12*	*0.11*	*0.90*	*96.80*	*0.24*	*0.12*	*0.10*	*4.7*	*89.6*	*1.28*
Share of female members in	Unmatched	0.47	0.48	−3.00		−0.84	0.47	0.50	−16		−4.1
HH	*Matched*	*0.47*	*0.48*	*−2.30*	*25.70*	*−0.54*	*0.47*	*0.47*	*1.3*	*91.7*	*0.31*
Income per capita	Unmatched	9.29	9.19	16.20		4.41	9.29	9.06	38		9.56
	Matched	9.29	9.28	1.90	88.00	0.46	9.27	9.26	2.5	93.5	0.54
Wealth index	Unmatched	0.26	−0.03	38.40		10.36	0.26	−0.33	81.5		20.07
	Matched	0.26	0.27	−0.50	98.70	−0.11	0.24	0.20	6.2	92.4	1.29
Access to newspaper	Unmatched	2.41	2.75	−27.0		−7.40	2.41	3.02	−50.4		−12.6
	Matched	*2.48*	*2.52*	*−3.00*	*88.80*	*−0.69*	*2.49*	*2.53*	*−3.4*	*93.3*	*−0.71*
Access to TV	Unmatched	1.49	1.81	−29.1		−7.99	1.49	2.16	−57.8		−14.9
	Matched	*1.51*	*1.52*	*−0.10*	*99.60*	*−0.03*	*1.50*	*1.49*	*1*	*98.2*	*0.26*
Index of water and sanitation	Unmatched	−348.72	−297.28	−1.50		−0.40	−0.07	0.04	−18.7		−4.37
condition in village	*Matched*	*−386.76*	*−273.09*	*−3.30*	*−121*	*−0.76*	*−0.07*	*−0.09*	*3.2*	*82.7*	*0.74*
Distance from nearest village	Unmatched	−0.01	−0.05	6.20		1.68	−0.01	0.10	−14.8		−3.71
health facility adjusted by area	*Matched*	*0.01*	*−0.01*	*1.90*	*68.90*	*0.44*	*−0.06*	*−0.10*	*6*	*59.2*	*1.3*
No. of cooperative societies	Unmatched	0.00	0.00	−2.00		−0.53	0.00	0.00	8		1.98
per 1000 population	*Matched*	*0.00*	*0.00*	*2.30*	*−19.0*	*0.57*	*0.00*	*0.00*	*2.1*	*74.2*	*0.45*
Index of district health	Unmatched	−0.11	0.15	−10.7		−2.96	−0.11	−0.37	11.1		2.8
infrastructure	Matched	−0.23	−0.28	2.00	81.60	0.50	−0.19	−0.24	2.2	80	0.47
Index of annual natural	Unmatched	−0.04	−0.07	2.50		0.67	−0.04	−0.08	4.7		1.14
disasters	*Matched*	*−0.01*	*0.02*	*−2.90*	*−15.5*	*−0.59*	*0.02*	*−0.03*	*5.8*	*−24*	*1.09*
No. of panchayats per village	Unmatched	0.25	0.26	−8.70		−2.39	0.25	0.23	19.4		4.9
in district	*Matched*	*0.24*	*0.24*	*−0.20*	*97.90*	*−0.05*	*0.24*	*0.24*	*1.3*	*93.4*	*0.28*
Index of district transport	Unmatched	−0.25	−0.37	14.00		3.85	−0.25	−0.07	−19.5		−4.95
facilities	*Matched*	*−0.22*	*−0.22*	*−0.10*	*99.20*	*−0.03*	*−0.25*	*−0.23*	*−1.5*	*92.6*	*−0.32*

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Table AII. Mean absolute biases among covariates before and after kernel matching: models 1b and 2b

		Model 1b: YB vs NYCH					Model 2b: YB vs NYNCH				
		Mean					Mean				
Variable	Sample	Participant group	Comparison group	% bias	% reduction bias	*t*-Statistics	Participant group	Comparison group	%bias group	% reduction bias	*t*-Statistics
Share of 60+ members in HH	Unmatched	0.66	0.67	−1.5		−0.15	0.65672	0.60223	7.3		0.7
	Matched	*0.7*	*0.68*	*2.5*	*−63.9*	*0.19*	*0.68142*	*0.66959*	*1.6*	*78.3*	*0.11*
Caste (1 = upper class)	Unmatched	0.08	0.15	−24.6		−2.24	0.07463	0.15985	−26.7		−2.4
	Matched	*0.06*	*0.06*	*−0.4*	*98.3*	*−0.04*	*0.06195*	*0.06446*	*−0.8*	*97.1*	*−0.08*
Share of female members in HH	Unmatched	0.47	0.46	10		0.96	0.4736	0.47259	0.7		0.06
	Matched	*0.47*	*0.47*	*1.7*	*82.5*	*0.12*	*0.47411*	*0.46658*	*5*	*−650.1*	*0.37*
Member ship of self-help group	Unmatched	0.51	0.53	−2.6		−0.25	0.50746	0.56877	−8.5		−0.81
	Matched	*0.5*	*0.52*	*−2.8*	*−7.2*	*−0.2*	*0.50442*	*0.53533*	*−4.3*	*49.6*	*−0.31*
Presence of chronic patient	Unmatched	0.61	0.48	19.8		1.95	0.61194	0.44238	25.2		2.42
(1 = yes)	*Matched*	*0.57*	*0.58*	*−0.5*	*97.3*	*−0.04*	*0.58407*	*0.5824*	*0.2*	*99*	*0.02*
Average no. of education	Unmatched	6.99	6.3	21.3		2.02	6.9652	6.1026	26.9		2.52
years-HH	*Matched*	*6.71*	*6.83*	*−3.6*	*82.9*	*−0.27*	*6.7502*	*6.5984*	*4.7*	*82.4*	*0.36*
Income per capita	Unmatched	9.33	9.26	9.3		0.88	9.322	9.19	20.4		1.91
	Matched	*9.31*	*9.31*	*−1.2*	*87.6*	*−0.09*	*9.3024*	*9.3022*	*0*	*99.9*	*0*
Age of HH Head	Unmatched	55.55	53.15	19.2		1.83	55.537	51.368	32.5		3.02
	Matched	*56.59*	*56.3*	*2.3*	*87.9*	*0.17*	*56.398*	*56.554*	*−1.2*	*96.3*	*−0.09*
Index of water and sanitation	Unmatched	−0.03	−0.08	9.8		0.87	−0.07536		9.2		0.82
conditions in village	*Matched*	*−0.05*	*−0.04*	*−1.9*	*80.3*	*−0.15*	*−0.05588*		*0*	*99.9*	*0*
Distance from nearest village	Unmatched	0.05	0.01	6.5		0.62	0.05343	0.01276	5.5		0.51
health facility adjusted by area	*Matched*	*−0.01*	*−0.02*	*0.7*	*89*	*0.05*	*−0.01074*	*0.01034*	*−2.8*	*48.2*	*−0.21*
Index of village health	Unmatched	0.21	0.16	4.4		0.41	0.19688	0.18429	1.1		0.1
infrastructure	*Matched*	*0.11*	*0.14*	*−2.2*	*49.3*	*−0.19*	*0.11945*	*0.09272*	*2.4*	*−112.3*	*0.21*
Index of district transport	Unmatched	−0.16	−0.28	12.9		1.24	−0.41181		11.2		1.06
facilities	*Matched*	*−0.21*	*−0.24*	*2.7*	*78.8*	*0.21*	*−0.41485*		*2.2*	*80.8*	*0.17*
Female members in gram	Unmatched	1.06	0.67	19.1		2.02	1.0467	0.78834	12.1		1.19
panchayat-District	*Matched*	1.01	1.06	−2.4	87.4	−0.15	1.1624	1.1252	1.7	85.6	0.11
No. of cooperative societies	Unmatched	0	0	14.5		1.38	0.00203	0.00148	29.2		2.77
per 1000 population-village	*Matched*	*0*	*0*	*3.2*	*77.8*	*0.23*	*0.00199*	*0.00205*	*−2.9*	*90*	*−0.2*
Distance from the nearest	Unmatched	36.05	42.09	−19.8		−1.86	35.91	41.833	−19.3		−1.78
Yeshasvini facility	*Matched*	*35.04*	*35.48*	*−1.5*	*92.7*	*−0.12*	*34.752*	*35.399*	*−2.1*	*89.1*	*−0.18*
District per capita income	Unmatched	15 252	15 457	−4.9		−0.5	15 346	15 505	−3.6		−0.35
	Matched	*15 444*	*15 441*	*0.1*	*98.6*	*0*	*15 317*	*15 358*	*−0.9*	*74.4*	*−0.06*

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Table AIII. Mean absolute biases among covariates before and after kernel matching: models 1c and 2c

Presence of chronic patient (1 = yes)	Unmatched	0.370	0.248	21.6		5.3	0.370	0.236	24		5.74
	Matched	0.402	0.380	3.8	82.2	0.57	0.390	0.377	2.3	90.3	0.33
Herfindahl index of income sources	Unmatched	6672.800	6777.600	−5.7		−1.35	6672.800	6815.100	−7.9		−1.84
	Matched	6721.200	6709.900	0.6	89.2	0.1	6777.800	6656.800	6.7	14.9	1.04
Average no. of education years-HH	Unmatched	6.693	5.679	31		7.14	6.693	5.286	43.3		9.77
	Matched	6.696	6.659	1.1	96.4	0.19	6.750	6.697	1.6	96.2	0.27
% of members in working age group	Unmatched	69.815	69.690	0.6		0.13	69.815	69.442	1.7		0.38
	Matched	68.568	69.665	−4.9	−780.8	−0.84	68.849	69.882	−4.6	−176.8	−0.75
No. of HH members	Unmatched	5.750	5.340	15.9		3.78	5.750	5.036	28.1		6.59
	Matched	5.890	5.800	3.5	77.9	0.55	5.829	5.772	2.2	92.1	0.32
Member of self-help group (1 = yes)	Unmatched	0.492	0.431	9.7		2.33	0.492	0.440	8.2		1.93
	Matched	0.503	0.502	0.2	98.3	0.03	0.492	0.498	−0.9	88.7	−0.14
Caste (1 = upper class)	Unmatched	0.108	0.185	−21.8		−4.83	0.108	0.220	−30.6		−6.59
	Matched	0.108	0.100	2.2	89.8	0.43	0.112	0.101	3	90.2	0.57
Share of female members in HH	Unmatched	0.481	0.473	4.6		1.05	0.481	0.485	−2.7		−0.6
	Matched	0.482	0.479	2	57	0.34	0.480	0.472	5.5	−103.3	0.93
Income per capita	Unmatched	9.291	9.232	9.4		2.22	9.291	9.162	20.2		4.65
	Matched	9.312	9.314	−0.3	97.1	−0.05	9.304	9.278	4.1	79.7	0.65
Wealth index	Unmatched	0.355	0.046	39.7		9.42	0.355	−0.111	59.7		13.8
	Matched	0.356	0.331	3.3	91.7	0.53	0.355	0.321	4.3	92.8	0.67
Access to newspaper	Unmatched	2.328	2.654	−25.8		−6.13	2.328	2.789	−36.7		−8.51
	Matched	2.375	2.387	−0.9	96.5	−0.15	2.358	2.372	−1.1	97.1	−0.17
Access to TV	Unmatched	1.433	1.710	−26.4		−5.88	1.433	1.887	−41.5		−8.96
	Matched	1.430	1.422	0.8	96.9	0.15	1.408	1.402	0.5	98.7	0.1
Index of water and sanitation	Unmatched	−254.570	−345.450	2.4		0.6	0.015	−0.044	9.5		2.11
condition in village	Matched	−341.940	−363.880	0.6	75.9	0.09	−0.003	−0.032	4.8	49.9	0.72
Distance from nearest village health	Unmatched	0.009	−0.039	6.7		1.55	0.009	0.051	−5.6		−1.27
facility adjusted by area	Matched	−0.025	−0.027	0.4	94.7	0.06	−0.065	−0.061	−0.7	88.3	−0.11
No. of cooperative societies per 1000	Unmatched	0.002	0.002	13.8		3.31	0.002	0.002	20.4		4.79
population	Matched	0.002	0.002	2	85.3	0.33	0.002	0.002	−1.8	91.1	−0.26
Index of district health infrastructure	Unmatched	−0.144	0.061	−8.4		−1.98	−0.144	−0.251	4.4		1.04
	Matched	0.028	0.059	−1.2	85.1	−0.2	0.081	0.043	1.6	65	0.22
Index of annual natural disasters	Unmatched	−0.019	−0.065	4.5		1.07	−0.019	−0.074	5.7		1.36
	Matched	0.013	−0.072	8.3	−86.9	1.36	0.045	0.033	1.3	76.6	0.16
No. of panchayats per village in	Unmatched	0.247	0.257	−8.3		−1.98	0.247	0.239	7.7		1.8
district	Matched	0.257	0.261	−3.7	55.9	−0.6	0.256	0.255	0.6	92.8	0.08
Index of district transport facilities	Unmatched	−0.245	−0.324	9.3		2.16	−0.245	−0.147	−11		−2.45
	Matched	−0.298	−0.311	1.6	82.8	0.26	−0.316	−0.305	−1.2	89.1	−0.2
District per capital income	Unmatched	15 493	15 064	10.6		2.5	15 493.0	14 711.0	17.9		3.97
	Matched	15 471	15 568	−2.4	77.5	−0.42	15 546.0	15 597.0	−1.2	93.5	−0.19

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Table AIV. OLS estimates explaining the impact of Yeshavini on health and economic indicators

Medical episode	Outcome variable	Comparison group: NYCH				Comparison group: NYNCH			
		Coeff.	SE	*t*-stat	NOB	Coeff.	SE	*t*-stat	NOB
Health-care utilisation									
OPD	Frequency of health facility visits	0.044	0.025	1.79	2079	0.001	0.03	0.04	1842
	Frequency of consultation	0.038	0.024	1.58	2079	−0.003	0.028	−0.11	1842
	No. of sickdays	0.121	0.081	1.48	2756	−0.057	0.098	−0.59	2432
	Frequency of illness	0.038	0.028	1.35	2756	−0.009	0.033	−0.29	2432
	No. of facility visits per sick day	0.006	0.009	0.61	2079	0.02	0.01	1.97	1842
	No. of consultations per sick day	0.007	0.011	0.64	2079	0.02	0.013	1.58	1842
	No. of waiting days per illness	0.065	0.053	1.22	2079	−0.089	0.079	−1.13	1842
	Share of visits to private health facility	0.02	0.019	1.05	2058	0.045	0.023	1.98	1826
	Share of visits to Yeshasvini health facility	0.03	0.005	6.16	2058	0.029	0.005	5.35	1826
	Share of visits to government health facility	−0.05	0.019	−2.56	2058	−0.073	0.022	−3.31	1826
In-patient	Frequency of hospitalisation	0.041	0.028	1.46	260	0.032	0.044	0.72	215
	Hospitalisation facility (1 = private institutional)	0.0654	0.0567	1.15	260	0.155447	0.0851	1.82	215
Surgery	Frequency of surgery in past 4 years	0.074	0.015	4.95	395	0.05	0.018	2.87	2432
	Willingness to undergo surgery (1 = yes)	0.068	0.026	2.64	616	0.082	0.034	2.39	546
	Surgeries in government hospital	−0.26	0.037	−7.03	395	−0.271	0.037	−7.28	371
Maternal health	Visits for check up before delivery	0.059	0.071	0.84	303	−0.01	0.077	−0.14	267
	Delivery facility (1 = private institutional)	−0.027	0.058	−0.46	298	0.0745	0.0671	1.11	262
Financial protection									
OPD	Share of borrowing in OPD expenses	0.0077	0.0104	0.74	1902	−0.0265	0.01484	−1.79	1679
In_patient	borrowing in inpatient expenses	2653.1	1353.8	1.96	260	2578.09	1661.54	1.55	215
	Share of borrowing in inpatient expenses	0.0918	0.047	1.95	254	−0.0142	0.07251	−0.2	209
Surgery	Share of borrowing in surgery expenses	−0.2958	0.0309	−9.55	395	−0.301	0.03331	−9.04	351
	Borrowing in surgery expenses	−4111.2	2842.8	−1.45	395	−3882.2	2806.07	−1.38	351
	Share of out of pocket expenditure in surgery (excl. borrowings or sale of assets)	−4205.1	1304.0	−3.22	395	−4073.9	1252.46	−3.25	351

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Maternal health	Share of out of pocket expenditure in delivery (excl. borrowings or sale of assets)	0.0556	0.0940	0.59	65	−0.0205	0.1532	−0.13	51
General	Monthly health expenditure	33.161	13.658	2.43	2366	18.0156	14.7612	1.22	2142
	Share of health expenditure in total	0.0090	0.0037	2.4	2366	0.00576	0.0057	1.01	2142
	Per capita health expenditures	7.3210	2.8333	2.58	2366	2.81592	3.30792	0.85	2142
Treatment outcome									
OPD and in_patient	Satisfacn_level	0.5579	0.71004	0.79	2084	0.7536	0.848	0.89	1826
	Day lost persick time	0.0614	0.5688	0.11	2047	−0.2037	0.73	−0.28	1809
	Income lost per sick time sicktime	−0.00001	0.00009	−0.11	1988	−0.0003	0.0001	−1.75	1752
	Income lost as ratio of income	−0.00001	0.00009	−0.16	2309	−0.0004	0.0001	−2.49	2076
	Whether work regularly (1 = yes)	0.0542	0.0275	1.97	2130	−0.0008	0.0322	−0.03	1885
	Whether fully satisfies (1 = yes)	0.0142	0.0291	0.49	2130	0.0282	0.0343	0.82	1885
Surgery	Whether require post-surgery intervention (1 = yes)	−0.0898	0.0543	−1.65	387	−0.0801	0.0584	−1.37	343
	Care rating in surgeries (Likery scale 1-4)	1.0562	1.8839	0.56	379	0.03605	1.884	0.02	333
	Whether life improved post surgery (1 = yes)	4.0694	2.1539	1.89	384	3.232	2.213	1.46	342
	Whether work regularly post surgery	2.756	2.3198	1.19	386	1.2412	2.412	0.51	343
	Whether money saved (1 = yes)	5.5828	2.7172	2.05	386	5.2466	2.867	1.83	343
Maternal health	Whether abnormal delivery (1 = yes)	0.0087	0.0251	0.35	310	0.024	0.029	0.81	229
	Whether caesarian (1 = yes)	−0.066	0.0298	−2.21	785	−0.058	0.034	−1.7	599
Economic outcomes									
	Total expenditure	97.34	64.18	1.52	2745	−56.89	66.56508	−0.85	2132
	Per capita expenditure	15.50	12.25	1.27	2745	−19.13	13.803	−1.39	2132
	Borrowing – income ratio	0.028	0.021	1.32	2430	0.068	0.019	3.62	2091
	Saving-income ratio	0.008	0.02	0.42	2430	0.033	0.02	1.64	2091
	Assets sold as ratio of income during past three years	0.005	0.008	0.69	2430	0.0072	0.007	1.04	2091
	Assets purchased as ratio of income during past 3 years	−0.02	0.023	−0.86	1354	0.002	0.018	0.13	980
	Growth of income during past 3 years	0.034	0.008	4.23	2430	0.029	0.008	3.57	2091

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