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Abstract

In India, the out-of-pocket health expenditure by households accounts for around 70 percent of the total expenditure on health. Large out-of-pocket payments may reduce consumption expenditure on other goods and services and push households into poverty. Recently, health insurance has been considered as one of the possible instruments in reducing impoverishing effects of large out-of-pocket health expenditure. In India, health insurance has limited coverage and the present paper studies whether it has been effective so far. Literature defines out-of-pocket health expenditure as catastrophic if its share in the household budget is more than some arbitrary threshold level. In the present paper, we argue that for households below poverty line any expenditure on health is catastrophic as they are unable to attain the subsistence level of consumption. Thus, we take zero percent as a threshold level to define catastrophic health expenditure and examine the impact of health insurance on probability of incurring catastrophic health expenditure.

Key words: Out-of-pocket health expenditure, Catastrophic health expenditure, Health insurance

JEL Code(s): I12, I19

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1. Introduction:

In India, around 70 percent of the total expenditure on health[2] is out-of-pocket (OOP) payments[3] by households (Government of India (GoI), 2005). Other major sources of financing health care are the government, insurance, and external sources such as grants and loans from international organisations. The share of the government in total health expenditure has remained low. It has reduced marginally from 18.4 percent in 1998 to 17.9 percent in 2001 (IIPS and WHO, 2006). Further, as a part of the health sector reforms initiated in the early 1990s most of the Indian states have introduced user charges in public health facilities for patients belonging to families above poverty line[4]. Due to low share of government in total health care expenditure and introduction of user fees in public sector, households have to bear most of the expenses in the event of health shock, which may lead to a fall in consumption expenditure below subsistence level, i.e., to catastrophic OOP health expenditure. Health insurance can provide financial protection to household in the event of health shock and can reduce catastrophic OOP expenditure on health care. In India, health insurance coverage has been very low with only 1.6 percent of population covered in year 2003[5]. Households have to depend on informal networks to make health care payments. For example, in Hyderabad 24 percent of the households had to borrow to pay for health expenditure in 2006 (Banerjee and Duflo, 2007). Recently, efforts have been made to increase insurance coverage particularly to poor households. Policies to expand the insurance coverage can be formulated on a large scale if insurance proves to be important instrument to reduce catastrophic OOP payments. However, knowledge about the effectiveness of medical insurance to reduce OOP expenditure is limited for India as few studies examine effect of insurance on household's health expenditure. Against this background, the present study aims to:

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[2] Total expenditure on health is defined as spending on care and treatment associated with illness, on administrative expenses associated with such treatment, spending on public health programmes, on medical research and training, rehabilitation, immunisation programmes and selected components of programme associated with maternal and child health.

[3] Out-of-pocket health payments refer to the payments made by households at the point they receive health care services. Note that out-of-pocket payments are net of any insurance reimbursement. (For further details see International Institute for Population Sciences (IIPS) and World Health Organisation (WHO) (2006))

[4] See GoI (2007)

[5] See IIPS and WHO (2006)

1) Examine factors that determine incidence and extent of catastrophic health expenditure by households and;
2) Study impact of health insurance on catastrophic health expenditure by households.

There have been many studies, which address issues related to OOP expenditure. Our study differs from the existing literature on OOP with reference to two major aspects:

- We examine the impact of health insurance on catastrophic OOP health expenditure for India. Few studies have examined this.
- For the purpose of our study, we define catastrophic health expenditure as OOP payments on health care that exceed some fixed (threshold) proportion of total household expenditure. In literature, this threshold level is normally defined as some arbitrary proportion of total household expenditure. We argue that for households below the poverty line any spending on health care is a catastrophic health payment. Thus, we take threshold limit to be zero.

Results of our analysis point out poorer households as more vulnerable than their richer counterparts. Poor households end up spending larger proportion of their total budget on health care. Appropriate policies need to be formulated to reduce this financial burden of illness on poor. Health insurance might be one of the instruments. Our findings show that health insurance has negative and significant impact on probability of incurring catastrophic OOP health expenditure. Our analysis shows that the probability of catastrophic OOP expenditure reduces by 10 percentage points due to medical insurance. Further, insurance reduces the extent of catastrophic OOP expenditure in urban areas. This has important policy implication as higher coverage of health insurance may bring down the monetary burden of health shocks on households. Secondly, our results show that the extent of OOP health expenditure is lower for households where highest level of education completed by the economic head of the household is either primary or secondary level of education. This finding brings out the importance of investing in elementary education to reduce household's OOP expenditure on health care. Our findings also show that usage of clean cooking fuels is an important determinant of catastrophic OOP payments by households. Usage of clean cooking fuels reduces the share of OOP health spending in total household expenditure.

The rest of the paper is organised as follows: the next section reviews the existing literature on issues related to OOP health care payments. Section 3 provides information on data source. Section 4 elaborates on the distribution of OOP expenditure for different income groups in six states of India. Section 5 describes methodology and explanatory variables

used for our analysis. Section 6 discusses the empirical findings. Finally, section 7 concludes.

2. Literature Review:

Large OOP expenditure on health may push household's consumption expenditure below poverty line. Various studies examine effect of OOP health expenditure on poverty head count and whether such expenses push households deeper into poverty. Wagstaff and Doorslaer (2003) pioneered the minimum standard approach based on the concept of horizontal equity. Many studies (for instance, Wagstaff and Doorslaer, 2003, Van Damme *et al.*, 2004, Garg and Karan, 2005a, Schneider and Hanson, 2006, Markova, 2006, and Mendola *et al.*, 2007) use this and other approaches such as concentration index to analyse distribution of financial burden due to OOP health expenditure and poverty impact of OOP health expenditure for different countries. Findings of these studies call for policy measures to protect household's consumption expenditure in the event of health shock. For this purpose, it is important to analyse the determinants of health expenditure and provide some policy measures to reduce household's OOP payments on health care. Studies such as Sepehri *et al.* (2006), and Rous and Hotchkiss (2003) examine the determinants of health care spending by households.

Sepehri *et al.* (2006) examines the impact of social health insurance in Vietnam on OOP expenditure using panel data for households to account for unobserved heterogeneity. This specification captures the effect of household level unobserved factors which are constant over time. The study shows that insurance has negative and significant impact on OOP health expenditure. Further, insurance is found to reduce OOP expenditure more for patients with lower incomes than for the patients with higher income. Sepehri *et al.* (2006) examines the determinants of absolute level of health expenditure. However, this analysis does not bring out the effect of OOP health expenditure on household's consumption expenditure. We incorporate this effect in our analysis by examining the share of OOP health expenditure in total household expenditure and provide some important policy implications for India. Sepehri *et al.* (2006) considers economic access to health care, but ignores physical access. Factors like availability of health care facilities and provider of health care (for instance, public vs. private) are important in determining household's spending on health care.

Rous and Hotchkiss (2003) accounts for choice of health care provider and addresses the issue of physical access to health care. In particular, the paper takes into account the

effect of probability of getting ill and choice of health care provider on OOP health expenditure. The study emphasises the importance of household income, demographic characteristics of the household head and residential setting of the household in determining spending on health care. However, Rous and Hotchkiss (2003) like Sepehri *et al.* (2006) considers absolute health expenditure by households, and thus is unable to throw light on how OOP health expenditure affects consumption expenditure of households. Some major studies examining the issues related to catastrophic OOP health expenditure, i.e., OOP expenditure that adversely affects consumption expenditure, are reviewed below.

Cavagnero *et al.* (2006) analyses determinants of health service utilisation and probability of incurring catastrophic OOP payments. The paper brings out the importance of medical insurance in reducing the probability of catastrophic OOP health payments. The results also show that presence of senior members, education of head of the household and income increase the probability of incurring catastrophic OOP health expenditure. In this study, catastrophic OOP health expenditure is said to occur if OOP health expenditure exceeds 40 percent of capacity to pay (income after food consumption). The limitation of this approach is that threshold level defining catastrophic OOP payments is set arbitrarily at 40 percent. Another limitation is that the paper does not extend the analysis to examine the determinants of extent of catastrophic OOP expenditure.

Recently, various issues related to OOP expenditure on health have also been studied for India. Gumber (2001), Garg and Karan (2005b) and O'Donnell *et al.* (2005) study OOP health spending using household level primary and secondary data. Gumber (2001) uses primary survey in Gujarat to find the effect of micro health insurance provided by SEWA, a women's union, on access to health care and OOP expenditure by estimating two-part model. The results of this study show that social insurance, care provider, and demographic characteristics of household are important determinants of OOP health expenditure. The study is based on a purposive sample survey covering 1,200 households from Ahmedabad and neighbouring areas. Thus, sample is not representative and results are valid only for the sample. In our study, we use a representative sample survey, namely, World Health Survey, and aim to examine the impact of health insurance on catastrophic health care payments for six Indian states.

Garg and Karan (2005b) and O'Donnell *et al.* (2005) examine the determinants of probability of incurring catastrophic OOP health expenditure and extent of catastrophic payments using two-part model. While Garg and Karan (2005b) concentrates on India, O'Donnell *et al.* (2005) studies determinants of OOP expenditure for six Asian countries

including India. For India, these studies use household level consumption expenditure data collected by the National Sample Survey Organisation for year 1999-2000. The findings show that higher consumption expenditure is associated with higher probability of catastrophic OOP expenditure. Inclusion of household's total expenditure as one of the explanatory variables leads to endogeneity problem. We use wealth index[6] to avoid the problem of endogeneity in our study. Further, both the above-mentioned studies take OOP health expenditure higher than 10 percent of the total household expenditure as catastrophic OOP expenditure. However, our argument is that an arbitrary 10 percent threshold limit to define catastrophe is too high for households below the poverty line. Any expenditure on health is a catastrophe for the households who do not posses enough resources to secure even the subsistence level of consumption. Thus, we take zero percent as a threshold for households below the poverty line[7]. Further, we also take threshold level as zero, the global minimum, for households above poverty line. To the best of our knowledge, few studies have examined how insurance affects the probability and extent of catastrophic health spending for India.

3. Data Source:

The World Health Survey (WHS) was conducted in six states of India, namely, Assam, Karnataka, Maharashtra, Rajasthan, Uttar Pradesh and West Bengal during February to May 2003. States were selected with respect to their geographic location and level of development as measured by infant mortality rate, female literacy rate, percentage of safe delivery and per capita state domestic product. All Indian states with population five million and above, except for Jammu and Kashmir, were divided into six geographical regions and six levels of development. Then the states were chosen in such a manner that one state is selected from each region and from each level of development category (IIPS and WHO, 2006)[8]. Therefore, this sample can be broadly taken as representative of India.

A total of 10,750 households were covered under the survey from the six states of India. A two stage stratified sampling was used for the selection of households in rural areas. The villages were the primary sampling units (PSU). Households were selected from these villages at the second stage. In urban areas, a three-stage design was used with the selection

[6] Refer Section 5.1 for detailed description of wealth index and its construction.
[7] In our data set, 26 percent of the households are below poverty line. Here, poverty line is defined as the household food expenditure whose food share of total household spending is at the median of the country (IIPS and WHO, 2006)
[8] For more details on selection of states see IIPS (2006)

of wards, census enumeration blocks and households in that order. An adult member of the household in the age 18 and above was randomly selected from household roster using KISH grid tables for answering the individual questionnaire modules on health. We have combined the information collected from household and individual questionnaire for our study.

The World Health Survey, conducted in 2003, collected information on various topics related to health including health expenditure, health insurance, risk factors, and health status. Some of these variables are reported at household level while others at individual level. In our study, the unit of measurement is a household. Thus, we construct variables at household level from the information available at individual level. For example, health insurance status is reported at the individual level. From this information we have created two different dummies. The first dummy is defined to separate households with at least one insured member from the rest, whereas the second one is to distinguish households with insured economic head from the rest of the households.

Further, note that information on environmental risk factors is obtained from individual questionnaire. We can use this information for the study at household level. For example, the information regarding availability of safe drinking water or sanitation is likely to be same for all the household members.

Major limitation of the data is that information on health costs of insured member is not given separately. Thus, we can only see the impact of insurance status at household level.

4. Descriptive Statistics:

The average monthly OOP spending on health is Rs. 116 and the average proportion of total household expenditure on health care is 12.48 percent for India. However, these averages do not bring out the entire story and thus, we look at the ordered distribution of share of OOP health expenditure. The ordered distribution of share of OOP health expenditure is depicted using box plot diagrams (Figure 1 to Figure 4) across wealth index quintiles, insurance status, rural-urban sectors, and six Indian states. Note that the distribution of share of OOP expenditure is positively skewed in all the cases. In such a situation, median is a better measure of central tendency than mean. Median share of health expenditure is lower for higher wealth index quintiles. Similarly, for the households with at least one insured member and households residing in urban areas median share on OOP health expenditure is lower. Consistent with these results, richer state Karnataka shows lower median share of OOP expenditure than states of Rajasthan and Utter Pradesh. Interestingly, Maharashtra shows higher median share of OOP expenditure on health in spite of being a richer state. This fact

might be explained by higher morbidity rates in Maharashtra than in Karnataka and Rajasthan in the year 2004 (GoI, 2006).

Moreover, these box plot diagrams consistently suggest that the inter-quartile range (IQR) for relatively affluent sections is smaller than their poorer counterparts. The ordered distribution of share of OOP expenditure has the highest IQR for the first wealth index quintile (see Table 3). This IQR declines gradually with wealth index and becomes the lowest IQR for the fifth wealth index quintile. Further, the Bowley's measure of skewness[9] shows that skewness of share of OOP expenditure is the highest for the first wealth index quintile. This result means that median is closer to first quartile and large proportion of households from first wealth index quintile allocates lower share for OOP health expenditure. Similarly, IQR is the smallest in the case of relatively affluent regions such as urban areas and the states of Maharashtra and Karnataka[10]. The IQR of share of OOP health expenditure is also lower for households with at least one insured member as against those households without any insured member. For insured households skewness of ordered distribution of OOP expenditure share is lower than that for uninsured households. A plausible explanation for these results is that the poorer households ignore minor health shocks and spend lower (negligible) proportion on health care due to lack of resources. However, in case of severe health shock, they have little choice but to spend large amount on health care, which forms huge proportion of their entire household budget. On the other hand, richer households can attend minor health shocks. Further, even if severe health shocks demand large amount of spending in absolute terms, it accounts for relatively smaller proportion of total budget of rich household. As a result, IQR of share of OOP expenditure is higher in case of poorer households than richer households.

This section shows that relatively poor households are affected in case of severe health shocks. Apart from income, other factors such as regional factors and insurance status affect share of total budget spent on OOP health expenditure. In the next section, we analyse relation between catastrophic health expenditure and it determinants by carrying out econometric analysis.

[9] Bowley's measure of skewness is based on quartiles and thus is a robust estimate of skewness in case of skewed distribution.

[10] Assam shows the lowest IQR amongst all six states. This result is hard to explain.

5. Empirical Methodology:

We examine the determinants of incidence and extent of catastrophic OOP health care expenditure. Studies (for instance Wagstaff, 2003, O'Donnell *et al.*, 2005, Garg and Karan, 2005a, Mendola *et al.*, 2007) define catastrophic OOP health expenditure as OOP expenditure on health, which exceeds some threshold percentage of total household expenditure. However, most of the studies arbitrarily set the threshold limit. Our argument is that for households below poverty line any expenditure on health care is catastrophic since these households are unable to meet the subsistence consumption. As a result we take zero percent as threshold limit to define catastrophic OOP health expenditure. For the households above the poverty line, threshold limit should vary with income. However, for the present study we have taken threshold limit to be zero, the global minimum, for all the households.

We use two-part model[11] to estimate the probability of incurring catastrophic OOP health expenditure and extent of such spending given that household has spent on health care more than the threshold limit. The probability of incurring health expenditure/ catastrophic health expenditure is modeled[12] as follows:

$$\Pr(h_i = 1) = e^{x_i\beta} / (1 + e^{x_i\beta})$$

where h_i represents the event of incurring catastrophic health expenditure, x_i is a vector of various explanatory variables and ε_i is random error term.

The second part models extent of catastrophic health expenditure. For this purpose, only the households with health spending more than the threshold limit are considered. Note that, in this case our dependent variable is a proportion. Thus, dependent variable is bounded between zero and one. Further, in our data set the dependent variable does not take on the boundary values[13]. Hence, we use the logistic specification:

$$y = \frac{e^{x_i\beta+\varepsilon_i}}{1 + e^{x_i\beta+\varepsilon_i}}$$

[11] Heckman's sample selection model is another alternative used in the literature. It is useful when we want to examine potential health expenditure rather than the actual (Duan, *et al.*, 1984). We also carry out our analysis using Heckman's sample selection model and find that the inverse mills ratio was insignificant. Heckman's sample selection model also gives similar results.

[12] We also carried out probit specification for estimating probability of catastrophic OOP payments and found the similar results. In particular, the sign and significance of the explanatory variables do not change.

[13] Papke and Wooldridge (1996) proposed the generalised linear models (GLM) to estimate the parameters with fractional dependent variable, which takes on the boundary values.

OR

$$\ln(y_i/(1-y_i)) = x_i\beta + \varepsilon_i$$

where y_i is health expenditure expressed as proportion of total household expenditure, x_i is a vector of explanatory variables and ε_i is random error term.

We estimate the model with and without sampling weights. As mentioned in the third section, survey uses stratified sampling with different probabilities for each household. As a result, in order to obtain unbiased estimates of coefficients we have used sampling weights (see Deaton, 1997 for details).

5.1. Variable Description:

In this subsection we will describe the explanatory variables that are considered while modeling the incidence and extent of catastrophic OOP health expenditure. We have categorised the variables into four groups, namely, economic variables, health risk factors, demographic variables and regional variables.

Economic Variables:

Among other factors, OOP health expenditure is determined by household's income. Household with higher income have resources to allocate towards health care. On the other hand, households below poverty line are unable to meet even their subsistence consumption expenditure. These households do not have enough resources to incur any type of health care spending. Further, for rich households health expenditure is expected to account for lower share than for poor households. We use wealth index[14], constructed from twenty permanent income indicators, to analyse the impact of income on incidence and extent of catastrophic health spending. These twenty assets include number of rooms in the house, chairs, tables, cars, electricity, bicycle, clock, bucker, washing machine for dishes, washing machine for clothes, refrigerator, telephone, mobile/cellular telephone, television, computer, moped/scooter/motorcycle, livestock, sewing machine, radio/transitor/tape-recorder and bullock cart. For the purpose of constructing wealth index we use the method of principle components as explained in Filmer and Pritchett (2001). The permanent wealth index also

[14] In our data set the correlation between wealth index and household's consumption expenditure is negative. This puzzling result may be due to lack of precision in measuring consumption expenditure. Since our data set categorise consumption expenditure only in six heads, there might be problem while recollecting the amount correctly due to aggregation.

captures household's capacity to finance OOP health expenditure through borrowing and selling assets. Literature uses per capita consumption expenditure to find out the effect of income on health care spending (for example, Gumber, 2001, O'Donnell *et al.*, 2005, Rous and Hotchkiss, 2003 and Sepehri *et al.*, 2006). However, O'Donnell *et al.* (2005) points out that consumption expenditure can be endogenous. Since wealth index does not include health expenditure, the problem of endogeneity is avoided.

Income may limit household's access to health care, whereas insurance may guarantee higher access to health care as reimbursements from insurance company reduce the OOP health expenditure. On the other hand, insurance may lead to moral hazard problem and individual having insurance may not have incentive to take care of their health and invest in the preventive care. At the same time, health insurance might increase economic access to better and expensive health care. This may increase the probability of getting ill and thus expenditure on health will be higher. As a result, net effect of health insurance is ambiguous in theory. We study the impact of health insurance through two specifications. First specification includes a dummy for insurance status of the economic head of the household[15]. To check the robustness of this aggregation, in the second specification we consider a dummy for households with at least one insured member. Moreover, it is possible that the insurance status affects households in different income groups differently. In order to capture this possible effect, we include interaction term between wealth index and insurance status.

Another important variable that might affect OOP expenditure is education. Literature points out three reasons to explain the relation between education and health, namely, efficiency mechanisms, unobserved heterogeneity and future opportunity cost (Cowell, 2006). The Grossman's model states that individual produces health in order to optimise his intertemporal budget constraint. In this formulation, education comes as one of the inputs in the production function of health and education increases the productive and allocative efficiency of individual (Grossman, 1999 and Cowell, 2006). Higher education means that person will be able to produce more health with higher education for given level of health care expenditure.

The future opportunity cost relates education to health through forgone wages due to illness. Higher education is generally associated with higher wages and thus in order to reduce opportunity cost of health shock household would invest more in preventive health

[15] Economic head of the household is a member of the household who provides main economic support (see IIPS and WHO 2006).

care. We include education of the economic head of the household to examine the impact of education on health expenditure by household.

Environmental Risk Factors:

Access to clean drinking water, sanitation facilities, and other environmental factors are likely to influence health risks to which the household is exposed. For instance, Karn *et al.* (2003) finds that in the slums of Mumbai, incidence of water-related diseases is much less in the households with higher consumption of water and better housing conditions. Apart from sanitation and drinking water, air pollution inside house also has adverse impact on health status. Long-term exposure to solid cooking fuels increases the chances of falling ill (Parikh *et al.*, 2003). The extent of exposure to health risk in turn determines the level of health expenditure. Thus, we include dummies for access to piped water, hygienic toilet facilities and clean cooking fuels to account for such environmental risk factors[16].

Demographic Variables:

Composition of household may affect the health expenditure. For example, children or elderly persons are more vulnerable to health risks and thus households with more number of children and elderly persons may have to spend more on health care. According to Grossman's model of health capital, health depreciates over the period and the depreciation rate increases with age. As a result, higher OOP expenditure on health care might be required at old age (see Grossman, 1972; Zweifel and Breyer, 1997). Further, we also expect household size to increase health expenditure, as there is more chance that a household member gets sick. On the contrary, larger household size may reduce the health care spending due to higher amount of care can be provided at home.

Further, social status might influence OOP health expenditure. In order to capture this factor, we include religion of household head as one of the regressors. Gender and age of the household head also influences the probability of incurring catastrophic OOP health expenditure. Female-headed households have higher chance of facing catastrophic OOP expenditure (Cavagnero *et al.*, 2006). Thus, we include these two variables as regressors in our model.

[16] See Table 1 for the detailed description of explanatory variables.

Regional Variables:

One would expect health care spending to differ across rural and urban sectors. Thus, we include dummy variable for urban sector. Further, we have included state dummies to control for health determinants at state level.

6. Results:

Our results show that presence of insurance, wealth index, education of head of the household, household size, number of children and elderly persons in the household and usage of clean cooking fuels are important determinants of catastrophic health expenditure. Households with lower wealth index spend larger proportion of their total budget on health care. This result depicts that the poorer households are more vulnerable and policies have to be formulated to reduce this economic burden on poorer households. Further, our results suggest that increasing insurance coverage may prove to be important instrument for extent (urban sector) of catastrophic OOP expenditure. Similarly, education might act as an instrument to reduce the probability of incurring catastrophic health expenditure through reducing chance of getting ill. At the same time, access to clean cooking fuels might also reduce risk of falling ill and thus in turn reduce expenditure on health care. In the remaining part of this section we will discuss the effect of various explanatory variables on catastrophic health expenditure in detail.

6.1. Results from Two-Part Model:

Economic Variables:

Our findings suggest that index of permanent income of the household does not affect the probability of catastrophic OOP health expenditure. However, wealth index does have negative and significant impact on the extent of health care spending[17]. Our results contradict findings of O'Donnell et al. (2005) that report positive impact of consumption expenditure on incidence and extent of OOP expenditure. The fact that consumption expenditure includes health expenditure explains this difference in the results. Further, note that proportion allocated to OOP health expenditure reduces with permanent income of the household. This suggests that rich households have large resources and thus OOP expenditure constitutes smaller fraction in their total budget as compared to poor households. These findings point

[17] We also carry out the same analysis with two different thresholds for OOP health expenditure, five percent and ten percent of total household expenditure. Our results do not change with the change in threshold level.

out that the poorer households are vulnerable and it is essential to formulate appropriate policies to protect them from financial risk associated with illness.

As mentioned in the previous section we examine the effect of health insurance on OOP expenditure with two distinct specifications. One specification is with a dummy for households where economic head has health insurance and the other is with a dummy variable for households with at least one member having health insurance. In both the specifications, households with medical insurance have lower probability of incurring catastrophic health expenditure as compared to those without insurance[18]. Furthermore, interaction term between insurance and wealth index has positive sign suggesting that this effect is stronger for households in lower income group. Thus, our results suggest that insurance can be tried out as an instrument to reduce the monetary burden of OOP expenditure on households[19]. However, this result should be interpreted with a caution. Insurance can reduce the probability of incurring health expenditure either if there is total reimbursement or the probability of getting ill for households with insurance is lower than those without insurance. In the first situation, insurance will prove to be an important instrument to reduce probability of incurring OOP health expenditure.

Education of head of the household is another important factor in determining the extent of health expenditure. If head of the household has completed either primary or secondary school, then household allocates less proportion of expenditure to health care as compared to the households where head does not have any formal schooling (in the first specification). Thus, education can reduce proportion of share of OOP expenditure in household's budget.

Environmental Risk Factors:

Only one out of three explanatory variables capturing environmental risks, namely, usage of clean cooking fuels significantly affects OOP expenditure. Using clean cooking fuels such as kerosene and LPG reduces proportion of health expenditure in total household expenditure. This result suggests that improvement in environmental factors can be effective in reducing health payments by households.

[18] Our results do not change if we take five percent as threshold level. However, for 10 percent threshold limit, health insurance has significant negative impact on OOP health expenditure but does not affect the probability of incurring catastrophic OOP expenditure. Thus, our results remain same qualitatively.

[19] Benefits from insurance might also depend on knowledge regarding existence of insurance and process of obtaining reimbursement. To examine the joint effect of insurance and education on health expenditure we include interaction terms in our specification. However, we do not find any significant impact of these interaction terms either on probability or on magnitude of catastrophic health spending.

Demographic Variables:

Household size and number of children in household increase the probability of catastrophic OOP health expenditure[20]. Studies such as O'Donnell *et al.* (2005) and Cavagnero *et al.* (2006) point out that the age composition of the household might have an impact on OOP health expenditure. Results of our study show that number of children and elderly persons increase the share of OOP expenditure in total household expenditure. As mentioned earlier, children and elderly persons are more vulnerable to health risks. As a result, households with more children and elderly persons end up spending larger share on health care.

Regional Variables:

Health facilities differ across regions and states and thus OOP health expenditure is also likely to differ across states. Our study points out that households belonging to urban areas spend lower proportion of total household expenditure on health care in comparison to rural households. Further, most of the state dummies are significant reflecting wide variation in probability of incurring health expenditure and its share in total expenditure across states.

6.2. Predicted Probabilities:

In this sub-section, we examine how different explanatory variables affect the predicted probabilities of catastrophic OOP expenditure[21]. We take a base household belonging to first wealth quintile, without insurance, having clean sanitation and drinking water facilities, without any child or aged person in the house, with female, uneducated head, belonging to Hindu religion and staying in rural area of Karnataka[22]. We change these attributes sequentially to examine the impact of different attributes on probability of catastrophic health care payments by household.

The probability of catastrophic OOP health expenditure for the base household is 61 percent (see Table 6). Households with one child and one aged person are more vulnerable

[20] Household size increases the probability of catastrophic OOP health expenditure when we change the threshold limit to five percent, however does not have any significant impact when threshold level is ten percent of the total household expenditure. Further, number of elderly persons also increases the probability of catastrophic OOP expenditure, when threshold limit is taken as either five or ten percent of total household expenditure.

[21] To compare the probabilities for different wealth classes, we take five quintiles of wealth index and re-estimate the model.

[22] Household size and age of household head is set at the mean level.

and the probability increases to 65 percent for such households. If head of the household is a male member then the probability is lower at 63 percent. Note that if head of the household has health insurance then it reduces the chance of paying catastrophically on health care to 51 percent. Thus, insurance reduces the probability of incurring catastrophic OOP expenditure on health care by 10 percent. This result indicates that it might worth the while to extend insurance coverage for vulnerable households (e.g. households with children and aged persons and female-headed households) to reduce the probability of catastrophic OOP expenditure on health. Further, note that probability of catastrophic OOP payments changes drastically across states. For example, if the same base household were to reside in the state of Maharashtra instead of Karnataka, then its probability of catastrophic payments increases drastically to 85 percent. One possible explanation of differences in probability of catastrophic OOP payments may be the differences in utilisation of health care facilities across states. Probability of spending on health care services is affected by the utilisation of health care services. If the ailing person does not receive any medical treatment then there will not be any spending on health care. Thus, the variation in utilisation might explain the variation in predicted probabilities of incurring catastrophic OOP payments on health care. Table 7 shows the percentage of untreated ailments for each of the six states. It is evident that in Maharashtra only 10.3 percent and 8.6 percent ailments are untreated in rural and urban areas respectively. On the other hand, the figures stand at 23.6 percent and 13.3 percent for the state of Karnataka. Lower probability of incurring OOP payments on health care services in Karnataka might be explained by high percentage of untreated ailments. This shows that it is required to first identify the areas where households are more likely to incur catastrophic health care expenditure and then target such areas to extend health insurance.

6.3. Results from Separate Specifications for Urban and Rural Sectors:

The determinants of catastrophic OOP health expenditure might vary across urban and rural sectors. In order to examine these sectoral differences, we carry out our analysis separately for the two above-mentioned sectors[23]. Interestingly, results show that insurance has significant negative impact on probability of incurring catastrophic OOP expenditure only in rural sector (Table A.1). However, in urban sector presence of insurance significantly reduces the extent of catastrophic OOP expenditure (Table A.2). Secondly, availability of clean toilets reduces the probability and extent of catastrophic OOP health expenditure

[23] For this purpose, we construct the wealth index separately for urban and rural sectors, as weights of assets are likely to be different for two sectors.

significantly in urban sector. Effect of education on OOP health expenditure is visible only in rural sector where it reduces the extent of catastrophic OOP payments. Even though there are sectoral differences, presence of insurance remains to be an important determinant of probability and extent of catastrophic OOP payments.

7. Conclusion:

Our paper examines the determinants of probability and magnitude of catastrophic OOP health expenditure. We examine the impact of health insurance on catastrophic health expenditure. This issue has received little attention in the past. We argue that any positive health expenditure is a catastrophe for poor households and thus set the threshold limit at zero percent.

Our results show that the poorer households are more vulnerable and have to spend larger proportion of their total budget on health care than the richer households. These findings point out the need to formulate the policy to financially protect poorer households from health shocks and reduce the economic burden of illness. Further, households with children and elderly persons are more vulnerable. Identifying vulnerable groups and formulating appropriate policies, such as expanding insurance coverage, is required to reduce the economic burden of health shocks.

Findings of our analysis show that the probability of catastrophic OOP expenditure reduces by 10 percent if the head of the household has medical insurance. Also, our findings also show that insurance reduces the extent of total budget allocated towards OOP health expenditure in urban areas. This result has important policy implication particularly when the government is introducing user fees in public sector and government's share in total health expenditure is reducing. Increased insurance coverage may protect households from catastrophic health expenditure without increasing public expenditure on health. However, further examination in this matter is required as the insurance coverage increases from its present negligible level.

Apart from insurance other factors such as education and usage of clean cooking fuels may act as an instrument to reduce financial burden of health shocks on households. Primary and secondary level of education reduces the catastrophic OOP health expenditure. However, the gains of education are not visible at higher levels of schooling. Thus, increasing the coverage of elementary and secondary education might help to decrease the health expenditure. Increasing the coverage of clean cooking fuels also might reduce health care spending by households.

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Table 1: Description of Explanatory Variables

Variable	*Variable Definition*
Economic Variables	
Wealth Index	Index created using information on twenty questions regarding assets held by the household
Medical Insurance	= 1 if at least one member of the household is covered with health insurance; = 0 otherwise
Insurance_Head	= 1 if economic head of the household is covered with health insurance; = 0 otherwise
Interaction between Wealth Index and Insurance	
Primary	= 1 if household head has completed primary education ; = 0 otherwise
Secondary	= 1 if household head has completed secondary education; = 0 otherwise
Highschool	= 1 if household head has completed high school or any above level of education; = 0 otherwise
Health Risk Factors	
Toilet	= 1 if the household has hygienic toilet facilities; = 0 otherwise
Drinking Water	= 1 if the main source of drinking water is piped water; = 0 otherwise
Cooking Fuel	= 1 if the household uses gas, electricity or kerosene for cooking; = 0 otherwise
Demographic Variables	
Muslim	= 1 if household member belongs to Muslim community; = 0 otherwise
Other	= 1 if household member belongs to Other communities; = 0 otherwise (Hindu community is taken as base category)
HHsize	Household size
Child	Number of children (below 5 yrs of age) in the household
Aged	Number of elderly persons (above 65 yrs of age) in the household
Age_head	Age of household head
Gender_head	= 1 if household head is male; = 0 otherwise
Regional Variables	
Urban	= 1 if household resides in urban area; = 0 otherwise
State Dummies	Dummy variable for each of six Indian states

Table 2: Descriptive Statistics of Explanatory Variables

Varaible	Mean	Standard Deviation	Minimum	Maximum
Economic Variables				
Wealth Index	5.58e-11	2.216	-3.123	11.429
Medical Insurance	0.037	0.188	0	1
Insurance_Head	0.036	0.187	0	1
Insurance_HH	0.014	0.118	0	1
Primary	0.134	0.340	0	1
Secondary	0.153	0.360	0	1
Highschool	0.926	0.261	0	1
Health Risk Factors				
Toilet	0.225	0.418	0	1
Drinking Water	0.302	0.459	0	1
Cooking Fuel	0.288	0.453	0	1
Demographic Variables				
Muslim	0.118	0.322	0	1
Other	0.074	0.262	0	1
HHsize	0.266	0.442	0	1
Child	0.633	0.922	0	6
Aged	0.631	0.710	0	4
Age_head	45.837	13.987	1	110
Sex_head	0.926	0.261	0	1
Regional Variables				
Urban	0.279	0.449	0	1

Source: World Health Survey, 2003 and Author's Calculations.

Table 3: Distribution of Proportion of OOP Health Expenditure

	Q1	Q2	Q3	Bowley's Skewness	IQR
Wealth Index Quintiles					
First Quintile	0.000	0.082	0.232	0.296	0.232
Second Quintile	0.000	0.083	0.199	0.163	0.199
Third Quintile	0.000	0.067	0.175	0.234	0.175
Fourth Quintile	0.003	0.073	0.170	0.160	0.166
Fifth Quintile	0.011	0.066	0.147	0.192	0.136
Rural/Urban Sector					
urban	0.012	0.055	0.128	0.259	0.116
Rural	0.000	0.081	0.200	0.187	0.200
Insurance Status					
insured	0.000	0.061	0.143	0.152	0.143
uninsured	0.000	0.077	0.194	0.205	0.194
States					
Assam	0.000	0.055	0.134	0.183	0.134
Karnataka	0.000	0.067	0.167	0.200	0.167
Maharashtra	0.029	0.083	0.182	0.289	0.153
Rajasthan	0.000	0.087	0.219	0.208	0.219
Uttar Pradesh	0.000	0.077	0.213	0.277	0.213
West Bengal	0.004	0.071	0.187	0.262	0.183

Source: World Health Survey, 2003 and Author's Calculations.

Table 4: Determinants of Probability of Catastrophic Health Expenditure

Variable	Coefficient	dy/dx	p-value	Coefficient	dy/dx	p-value
Economic Variables						
Wealth Index	0.015	0.003	0.596	0.026	0.005	0.329
Insurance_head	-0.796	-0.175	0.000			
Interaction (Wealth & Insurance head)	0.401	0.076	0.000			
Medical Insurance				-0.656	-0.141	0.002
Interaction (Wealth & Med insurance)				0.352	0.067	0.000
Primary	0.097	0.018	0.327	0.099	0.019	0.282
Secondary	0.154	0.028	0.253	0.143	0.026	0.251
Highschool	0.063	0.012	0.637	0.064	0.012	0.607
Health Risk Factors						
Toilet	-0.152	-0.030	0.328	-0.076	-0.015	0.583
Drinking Water	0.112	0.021	0.289	0.163	0.030	0.100
Cooking Fuel	0.019	0.003	0.896	0.001	1.5E-04	0.995
Demographic Variables						
Muslim	0.027	0.005	0.817	-0.024	-0.005	0.827
Other	-0.071	-0.014	0.625	-0.026	-0.005	0.850
HHsize	0.083	0.016	0.000	0.077	0.015	0.000
Child	0.095	0.018	0.075	0.086	0.016	0.083
Aged	0.077	0.015	0.228	0.048	0.009	0.414
Age_head	0.001	1.7E-04	0.784	0.001	1.9E-04	0.729
Sex_head	-0.111	-0.021	0.516	-0.073	-0.014	0.635
Regional Variables						
Urban	0.139	0.026	0.177	0.068	0.013	0.486
Constant	0.118		0.651	0.058		0.806
Observations	6603			7338		
Log Pseudo-likelihood	-3661.91			-4085.52		

Note: Standard errors are adjusted for heteroscedasticity. Marginal effects are evaluated at the mean.

Table 5: Determinants of Extent of Catastrophic Health Expenditure
(Dependent variable is after logistic transformation)

Variable	Coefficient	p-value	Coefficient	p-value
Economic Variables				
Wealth Index	-0.045	0.008	-0.051	0.002
Insurance_head	-0.221	0.152		
Interaction (Wealth & Insurance head)	0.045	0.362		
Medical Insurance			-0.131	0.344
Interaction (Wealth & Med insurance)			0.050	0.248
Primary	-0.133	0.050	-0.064	0.322
Secondary	-0.190	0.059	-0.117	0.224
Highschool	-0.008	0.946	-0.021	0.850
Health Risk Factors				
Toilet	-0.113	0.290	-0.153	0.115
Drinking Water	4.2E-04	0.995	-0.021	0.737
Cooking Fuel	-0.195	0.044	-0.189	0.042
Demographic Variables				
Muslim	0.112	0.169	0.107	0.177
Other	0.177	0.053	0.156	0.072
HHsize	-0.018	0.170	-0.020	0.100
Child	0.106	0.001	0.107	0.000
Aged	0.218	0.000	0.195	0.000
Age_head	-0.004	0.067	-0.002	0.224
Sex_head	-0.114	0.273	-0.101	0.259
Regional Variables				
Urban	-0.205	0.002	-0.202	0.002
Constant	-1.901	0.000	-1.965	0.000
Observations	4810		5321	
R-squared	0.068		0.067	

Note: Standard errors are adjusted for heteroscedasticity.

Table 6: Predicted Probabilities of Catastrophic Health Care Spending

Specification	Predicted Probability
Base	0.610
Maharashtra	0.846
Presence of child and aged	0.651
Presence of child and aged, and male head	0.627
Presence of child and aged, and male head and insurance	0.513
Presence of child and aged, and male head, insurance and urban sector	0.553
Presence of child and aged, and male head, insurance, urban sector and belonging to third wealth class	0.538
Presence of child and aged, and male head, insurance, urban sector, belonging to third wealth class and residing in Maharashtra	0.803

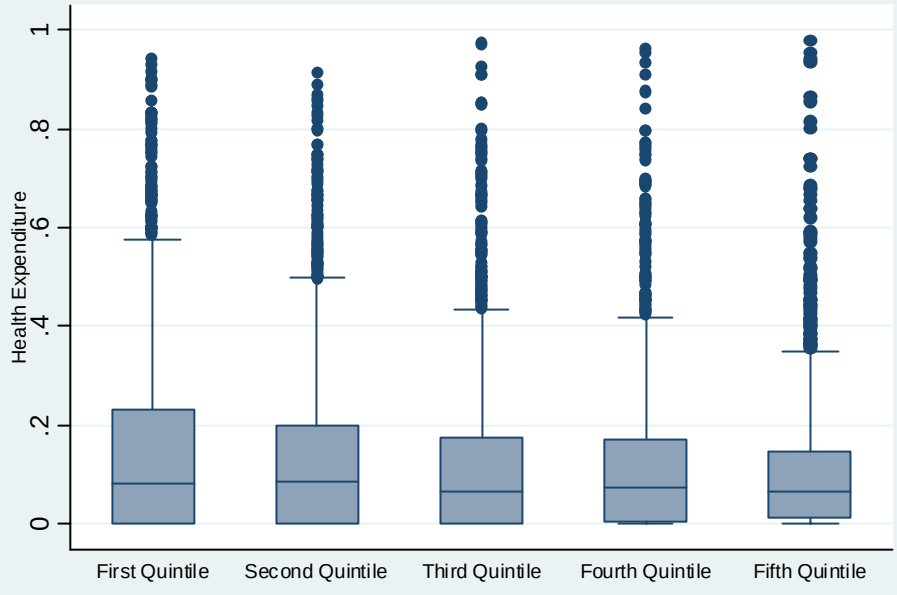
Source: World Health Survey, 2003 and Author's Calculations.

Table 7: Percentage of Untreated Ailments

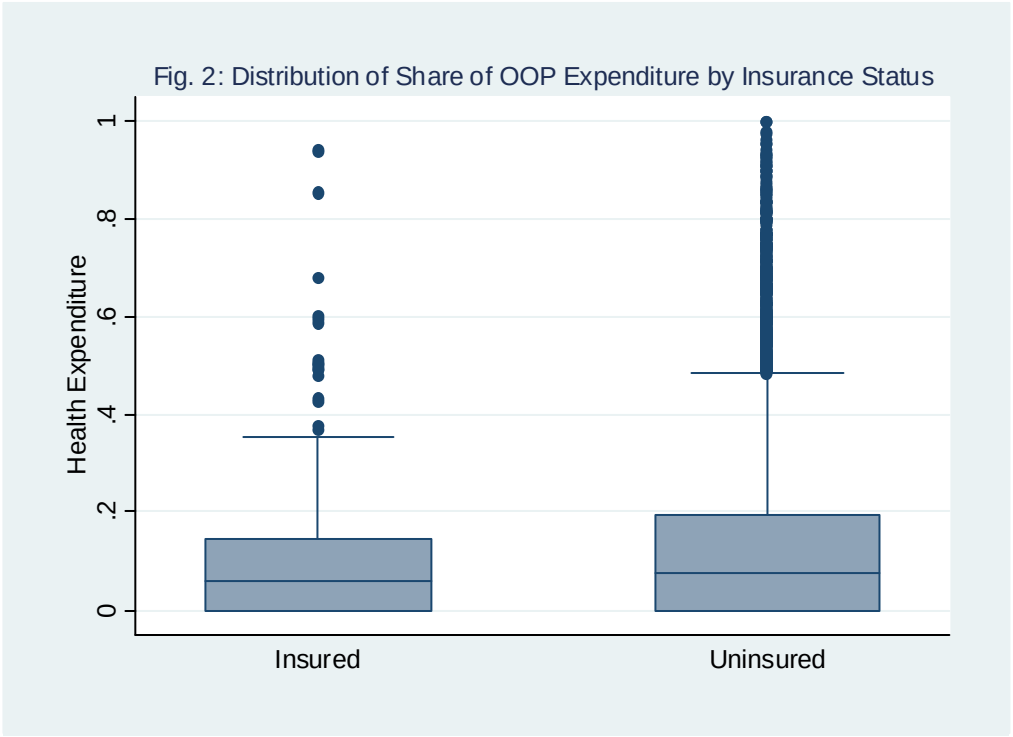
State	Untreated Ailments Out of Total Ailments (%)	
	Rural	Urban
Assam	19.8	10.6
Karnataka	23.6	13.3
Maharashtra	10.3	8.6
Rajasthan	11.2	7.4
Uttar Pradesh	21.1	13.1
West Bengal	20.2	15.4

Source: NSSO 60th Round, 2004 and Author's Calculations.

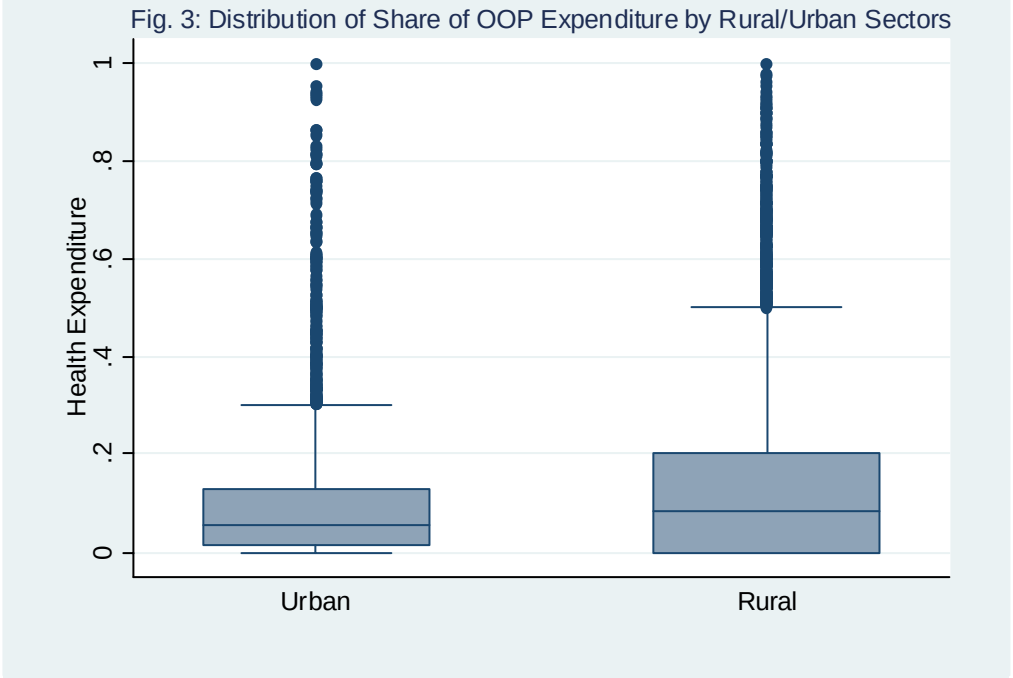
Fig. 1: Distribution of Share of OOP Expenditure by Wealth Index Quintiles



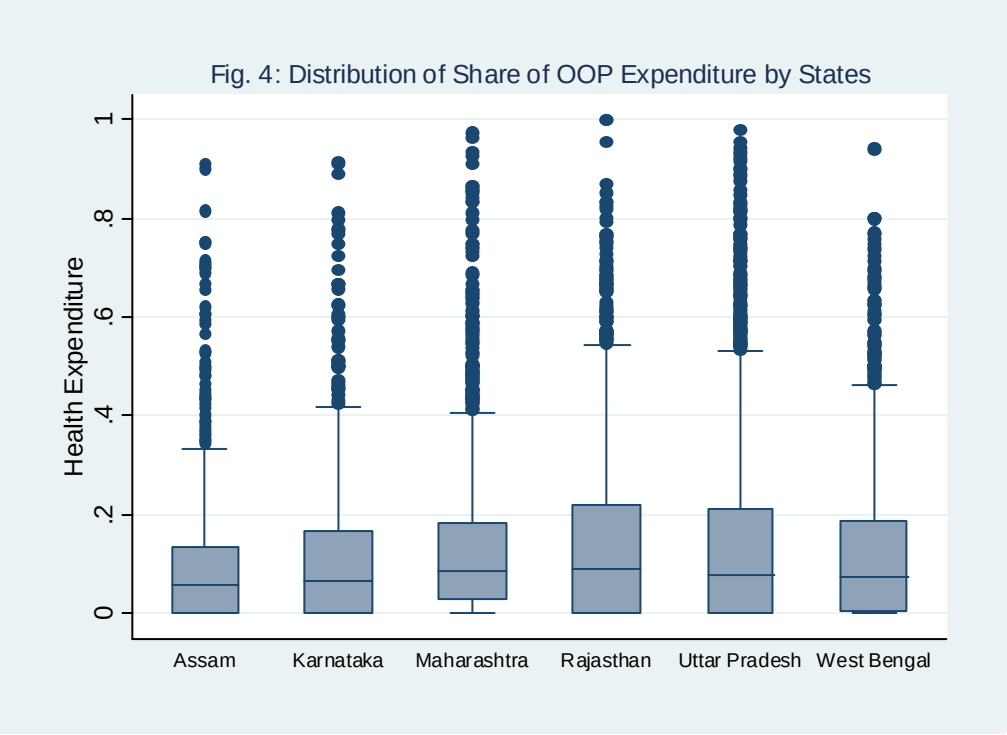
Source: Author's calculations based on World Health Survey – 2003, India.



Source: Author's calculations based on World Health Survey – 2003, India.



Source: Author's calculations based on World Health Survey – 2003, India.



Source: Author's calculations based on World Health Survey – 2003, India.

Table A.1: Determinants of Probability of Catastrophic Health Expenditure for Urban and Rural Sectors

	Urban			Rural		
Variable	**Coefficient**	**dy/dx**	**p-value**	**Coefficient**	**dy/dx**	**p-value**
Economic Variables						
Wealth Index	-0.069	-0.010	0.084	0.016	0.003	0.583
Insurance_head	-0.250	-0.040	0.379	-1.013	-0.231	0.000
Interaction (Wealth & Insurance head)	0.528	0.078	0.000	0.325	0.063	0.028
Primary	-0.253	-0.039	0.167	0.119	0.023	0.263
Secondary	-0.120	-0.018	0.562	0.173	0.032	0.260
Highschool	0.067	0.010	0.753	0.039	0.008	0.794
Health Risk Factors						
Toilet	-0.872	-0.128	0.000	0.016	0.003	0.938
Drinking Water	0.145	0.022	0.291	0.099	0.019	0.411
Cooking Fuel	0.563	0.091	0.001	-0.048	-0.009	0.776
Demographic Variables						
Muslim	0.105	0.015	0.604	0.025	0.005	0.846
Other	0.178	0.025	0.473	-0.072	-0.014	0.651
HHsize	0.069	0.010	0.035	0.086	0.017	0.000
Child	0.239	0.035	0.025	0.087	0.017	0.128
Aged	0.026	0.004	0.813	0.084	0.016	0.225
Age_head	0.000	0.000	0.971	0.001	0.000	0.841
Sex_head	-0.300	-0.041	0.234	-0.098	-0.019	0.601
Constant	-0.379		0.397	0.130		0.639
Observations	1866			4737		
Log Pseudo-likelihood	-857.82			-2670.01		

Note: Standard errors are adjusted for heteroscedasticity. Marginal effects are evaluated at the mean.

Table A.2: Determinants of Extent of Catastrophic Health Expenditure for Urban and Rural Sectors

(Dependent variable is after logistic transformation)

	Urban		Rural	
Variable	**Coefficient**	**p-value**	**Coefficient**	**p-value**
Economic Variables				
Wealth Index	-0.066	0.016	-0.043	0.018
Insurance_head	-0.389	0.028	-0.117	0.564
Interaction (Wealth & Insurance head)	0.159	0.058	-0.007	0.902
Primary	-0.044	0.653	-0.148	0.048
Secondary	-0.183	0.111	-0.194	0.096
Highschool	-0.106	0.423	0.016	0.914
Health Risk Factors				
Toilet	-0.187	0.033	-0.026	0.856
Drinking Water	-0.043	0.596	0.005	0.949
Cooking Fuel	-0.215	0.032	-0.192	0.099
Demographic Variables				
Muslim	0.045	0.700	0.131	0.159
Other	-0.160	0.309	0.206	0.044
HHsize	-0.019	0.301	-0.018	0.216
Child	0.046	0.374	0.114	0.001
Aged	0.164	0.005	0.219	0.000
Age_head	0.003	0.299	-0.005	0.049
Sex_head	0.214	0.181	-0.149	0.195
Constant	-2.345	0.000	-1.828	0.000
Observations	1405		3405	
R-squared	0.111		0.051	

Note: Standard errors are adjusted for heteroscedasticity.