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Health, income inequality and climate related disasters at household level: reflections from an Orissa District

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Health, Income Inequality and Climate Related Disasters at Household Level: Reflections from an Orissa District[1]

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Abstract

Rural households tend to rely heavily on climate-sensitive resources. Climate Change can reduce the availability of these local natural resources, limiting the options for rural households that depend on natural resources for consumption or economic activities. During and after the climate related disasters the health condition of the rural households get adversely affected and hence, reduce the ability to employ themselves in economic activities and income of the households get adversely affected. In this connection, this paper is an attempt to analyze the adverse health effect due to climate related disasters; mostly due to flood. To understand this phenomenon, this work utilizes primary data collected at the household level from select villages of Kendrapada district in Orissa state in India. The sample consists of 150 rural households. We try to link income and health inequality of the sample households and analyze whether climate related disaster and climate shocks have any impact on their health behavior. We have further attempted to check the difference or similarity in health losses based on each coping strategies of the sample households. Using an econometric approach this study further finds the determinants of health impact of the households due to climate related disasters.

Keywords: Climate change, Health, Energy Consumption, Income inequality, Orissa

JEL Classification: D31, I18, Q54, Q56

1   Introduction

The study of determinants of health quality of populations and variations in health quality is currently attracting multidisciplinary interest. Individual lifestyles (Kenkel, 1995), genetic factors (Baird, 1994), psychosocial factors (Wilkinson, 1996), material factors (Pritchett and Summers, 1996; Fiscella and Franks, 1997), health in infancy and childhood (Barker and Osmond, 1987) and access to response to medical care (McCord and Freeman, 1990) have been proposed as influential determinants of the '*average*' level of health within a population and the degree of inequalities in health between its sub-groups. Traditionally, research has focused on one of the above factors in isolation, and has paid little attention to

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interactions between them. More recently however, research has considered how the health response of an individual to changes in one health-influencing factor might be conditional upon the levels of another one. For example, (Blaxter 1990) using data from the British Health and Lifestyle Survey, found that healthy behaviour has a strong influence on health in '*favourable*' circumstances such as higher social class, but little influence in '*unfavourable*' circumstances. Other recent research (Kooiker and Christiansen, 1995) has also considered such interactions.

Following Contoyannis and Forster (1999) this paper presents a general framework to analyze variations in the distribution of population health. The effect of differential individual health production functions on the expected, or population, health function is shown to depend on the nature of these functions and the distribution of health-influencing factors within the population at each income level. In turn alternative '*shapes*' of the expected health function have strikingly different implications for features of the distribution of population health in any sub-groups. These sub-groups may be defined by *observable characteristics* such as schooling, or *unobservable characteristics*, such as the rate of time preference (Kenkel, 1991). In general, all that is required for the framework to be applicable is that individual production functions are non-separable in their inputs.

This paper is organized as follows. Section-2 presents the effect of climate related disasters on health and discusses the link among the income, health and climate related disaster. Section-3 describes study area. Section-4 focuses on the descriptive analysis of the sample. Section-5 focuses on analysis of income and health inequalities and the determinants of health expenditure. The final section concludes the findings with appropriate policy suggestions.

2   Climate Related Disasters and Health Quality

It is widely accepted that income and health are interrelated. However, climate related disasters can bring shocks to the health behavior and hence, higher expenditure on health directly effects mostly at the household level. Therefore, climate related disasters and health quality of the households can also be related. In view of this we have formulated the linkage among two most important factors of households; income and health expenditure with climate shocks. However, the assumption here is that the health related expenditure is not immediate related to household expenses as the immediate health shock is ether taken care by

the Government Agencies and/or any international support and/or NGOs and Social Institutions. Hence, the focus of this paper is to exclude these supports for any health related expenditure immediately after disasters and more directed to the post disaster scenarios.

As literature supports, we can link climate related disasters and health impact together and look at the consequences of either of them. In the first attempt based on our framework, we can divide the climate related disasters and health in two broader distinctions. Exposure to bad health which is health related problems not associated with climate change and the other category is the climate related disasters and its consequences on health. Hence, concentrating on the first sub-classification, we can further divide the exposure to bad health related to low-income and low-saving as well as less-investment on health issues and decrease in the quality of food. The above classification is focused on the rural households. Hence, when there is a probability of exposure to bad health, the poorer section of the society will not be in a condition to invest more in health expenses of the house as first they suffer from low-income class and hence having lower-saving potential.

The literature on poverty has already justified that a higher portion of the income from the poorer section of the households are spent on food expenses, the expenses on health remains marginal. Availability of quality food is one more concern of these households as, due to bad health the probability of engaging in work is less and hence the income is less therefore, they can be interrelated. Further, low income of the households can lead to possibility of loan or selling assets and/or household durables and/or livestock of the households. The negative health impact of the household will further have a direct or indirect impact of the employment of the household. Hence, to cope up with the employment crisis the household will try to migrate from the village in search of possible employment. However, in most of the recent literature, we can find that the possible migration to any town/city also leads to health hazards for the migrants and hence, their family members like HIV.

However, the aim of this paper is restricted to the impact of the climate related disasters at the household level and more specifically on the health condition of the households. In view of this, let us now look at the impact of the climate related disaster and the possible income and health related impact at the household level. The immediate impact of any climate related (more specifically flood/cyclone) is damage to the household assets including house, livestock, human loss etc. thereafter, the diseases and epidemics at the

effected villages. This in turn leads to high risk of health hazards and hence loss of income and employment. The loss in income and employment further will lead to possible loan at the household level. At the worse condition the household will opt for migration for survival and again migration may lead to possible health hazard. Based on the above discussion the following variables are considered in this study.

The existing literature evidence suggests that there is an extensive system of health care delivery which is however quite dysfunctional in many ways, making reforming the system something of a challenge. A recently completed a survey of absenteeism in public health facilities in several Indian states (Chaudhury et *al*., 2003) suggests a very high level of absence (44%) of health care providers in public facilities; a survey of private providers in Delhi (Das, 2001) showed that 41% of the providers are unqualified. Sen et *al*., (2002) used two NSS surveys, separated by almost a decade (1986-87 and 1995-96) to study the relationship between income and access to health care, and showed a worsening of inequalities in access to health care. This paper confirms these patterns, and delves deeper into these phenomena and their relationships with health status.

3 The Study Area, Sample, Variable and Model

As the study is focused on the impact of the extreme events such as flood on the health conditions of the households, this work focuses on two blocks selected from Kendrapada district of Orissa State.
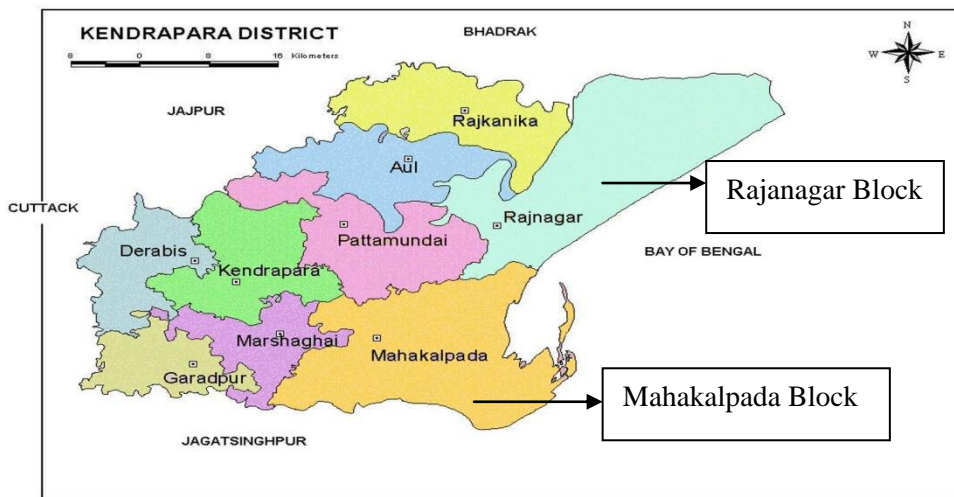
Map 1: Map of the sample blocks
Map not to scale, Source: Website of District Office Kendrapada

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The two blocks selected for the study are "Mahakalpada" and "Rajanagar". These two blocks are on the east coast and are one of the highly vulnerable in terms of the extreme events mostly by floods and cyclones; those are due to the changes in mean sea-level rise. These two blocks are too characterized as rural blocks. The map of the district and village is given in Map-1.

This part of the study deals with the survey methodology and sampling procedure adopted for the household surveys. The initial process of data collection involved discussions with various stakeholders (villagers, representative of NGOs and representatives of Government, institutions involved in the process of disaster risk reduction) in and around the study areas. Based on the literature review and the exploratory discussions, a comprehensive list of indicators/proxies was prepared for data collection. A well structured questionnaire was prepared and administered during data collection. The finalization of the questionnaire was carried out after pilot survey in a nearby village which is equally affected by the flood due to the rise in the mean sea-level. Thereafter, the questionnaire was modified and a final version of the questionnaire was prepared for the households of the selected study villages. The questionnaire focused on questions covering flood related issues and the second questionnaire was based on the questions/information which will help to understand the problem faced by the households. Since a census of all the households in the study area was not feasible, sample survey was undertaken. Twenty-five households from each village (from six villages, in two blocks) were finalized for the sample survey. Each of the household was selected from a random sampling method consisting of different categories. The criteria of the data collection in the sampling were as followed:

- Villages were divided into three zones based on the caste structure
- Measures were taken in selection of the households situated near sea and far from sea-level
- 10th household was selected in each group so as to cover the village in terms of sampling.

Table-1: Definitions of Variables

Sl. No	Symbol used	Definition
1	H	Ratio of health expenses to Income of the household
2	F	Expenses on food Consumption of the household
3	A	Age of the head of the household
4	E	Education level of the household (either educated or not)
5	L	Loan of the household (dummy variable 1 if household has outstanding loan, 0 or else)
6	M	Migration from the household (dummy variable 1 if household has reported migration, 0 or else)
7	S	Saving of the household (dummy variable 1 if household has saving, 0 or else)
8	FM_1	Number of family members of the household (dummy if 1-5 members, 0 or else
9	FM_2	Number of family members of the household (dummy if 6- 10 members, 0 or else
10	LA	Loss of Asset (dummy If household loss of asset is reported than 1, or else 0
11	DH	Total Damage to house (dummy if household has reported full damage of house 1, 0 otherwise)
12	AH	Dummy takes the value 1, for sell of animal husbandry if one of the coping strategy of the household; 0 otherwise
13	D	Dummy takes the value 1, if household reported death of any family member after disaster
14	HE	Dummy takes the value 1, if household has reported higher health related expenditure after disaster; 0 otherwise
15	LM	Loss of man-days (dummy capturing loss of man-days, 1 for household loss of man-days is higher than mean loss of man-days of the sample; 0 otherwise
16	C	Caste of the household, dummy takes the value 1 if backward or else 0
17	Loc_1	Location Dummy (1 for Mahakalpada, or else 0)

The theoretical approach to the research question is discussed in the paragraph above. This part of the section deals with the econometric model specification. As discussed earlier, the distribution of relative health and income at the household level can be calculated as ratio of health expenses to total household income. However, the effect of the climate related disasters on health and income status of the household will be estimated using linear regression with income, health expenses and other household characteristics. Table-1 describes the list of variables considered for econometric estimation. The econometric specification is based the climate shock variables and other household characteristics. The econometric specification of the study takes the following functional form. The basic idea of the specification is to capture the effect of climate change on the health standards of the rural households.

$$H = \alpha + \beta_1 F + \beta_2 A + \beta_3 E + \beta_4 L + \beta_5 M + \beta_6 S + \beta_7 FM_1 + \beta_8 FM_2 + \beta_9 LA$$
$$+ \beta_{10} DH + \beta_{11} AH + \beta_{12} D + \beta_{13} HE + \beta_{14} LM + \beta_{15} C + \beta_{16} Loc_1 + u_i \qquad (1)$$

4 Descriptive Analysis of the Sample

The household characteristics of Mahakalpada Block sample survey is given in table-1. From the table it is observed that the survey captured 580 people from 75 households with minimum family size of 3 members and the maximum family size of 26 members. Further, the sample consists of 170 of male members, 167 of female members, 118 of male children and 131 of the female children. 61 of the total sample from the block are male headed household. The mean age of the head of the household irrespective of their sex is calculated to be 50 years. The sample consists of 68% of the literates accounting for 51 members. 64% of the sample has reported to have BPL (Below Poverty Line) card issued by the government of India, which accounts for 48 households. 30 households (40% of the sample) have reported to be the members of SHG (Self Help Group) in the block. Further, 47% of the sample has reported that the incremental increase in the household income is due to migration. 41 members represent the 54% of the migration to various places in the block, in Orissa as well as outside Orissa. 32 households have reported that in the last 10 years they lost their family member due to the extreme events such as cyclone/flood.

Table-1: Household characteristics

Sl. No.	Household Characteristics	Mahakalpada Block			Rajanagar Block		
		Mean	Min	Max	Mean	Min	Max
1	Family members	7.73	3	26	7.72	2	20
2	Male members	2.27	0	8	2.63	1	8
3	Female members	2.23	1	7	2.45	1	10
4	Male children	1.57	0	9	1.41	0	6
5	Female children	1.75	0	6	1.43	0	6
6	Age of the head of the household	50.68	24	75	50.72	28	80
7	Literacy of the head of the household	0.68	NA	NA	0.76	NA	NA
8	Households having BPL card	0.64	NA	NA	0.63	NA	NA
9	Migration of the households	0.55	0	2	0.63	0	3

Source: Author's own calculation based on Primary data collected during 2009, Note: NA- Not Available

The household characteristics of the Rajanagar Block sample survey is also presented in table-1. From the table it is observed that the survey captured 579 people from 75 households with minimum family size of 2 members and the maximum family size of 20 members. Further, the sample consists of 197 of male members, 184 of female members, 106 of male children and 107 of the female children. 62 of the total sample from the block are

male headed households. The mean age of the head of the household irrespective of their sex is calculated to be 50 years. The sample consists of 76% of the literates accounting for 57 members. 63% of the sample has reported to have BPL (Below Poverty Line) card issued by the government of India, which accounts for 47 households. 36 households (48% of the sample) have reported to be the member of the SHG (Self Help Group) in the block. Further, 41% of the sample has reported that the incremental increase in the household income is due to migration. 47 members represent the 62% of the migration to various places in the block, in Orissa as well as outside Orissa. 32 households have reported that in the last 10 years they lost their family member due to the extreme events such as cyclone/flood.

The distribution of the sex of the head of the household in the sample blocks are given in table-2. From the table we can observe that in Mahakalpada block more than 18% of the sample is female and 81% of the sample is male. In both the blocks majority of the households are headed by male members.

Table-2: Distribution of households based on sex of the head of the household

Category	Mahakalpada		Rajnagar		Study Area	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Female	14	18.7	13	17.3	27	18
Male	61	81.3	62	82.7	123	82
Total	75	100	75	100	150	100

Source: Author's own calculation based on Primary data collected during 2009

Table-3: Distribution of households based on composition of caste

Category	Mahakalpada		Rajnagar		Study Area	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
ST	0	0	4	5.3	4	2.65
SC	3	4	3	4	6	4
General	25	33.3	23	30.7	48	32
OBC	36	48	20	26.7	56	37.35
SCBC	11	14.7	25	33.3	36	24
Total	75	100	75	100	150	100

Source: Author's own calculation based on Primary data collected during 2009

The caste structure of the sample is given in table-3. We can observe from the table that, in Mahakalpada block there is no ST (Scheduled Tribe) population where as 5.3% of the sample in Rajanagar Block are ST, with 2.65% of ST for the full sample. The OBC (Other Backward Class) population, are the major share in the caste based population distribution in the sample with 37.35% in the sample and 48% for Mahakalpada block and 26.7% for Rajanagar block respectively. Next to OBC population, the SEBC (Socially and

Economically Backward Caste) has the higher share in the distribution. The general caste is third in the population distribution in the sample. From the graph it is seen that there are mostly three caste dominate in the sample (General, OBC & SEBC). Hence, ST & SC (Scheduled Caste) population are the marginalized.

From table-4 it is clear that agricultural labour is the primary source of income in the sample areas. However, dependency on the agricultural labour is higher in Mahakalpada block (78.7%) as compared to the Rajanagar block (61.3%). Own farm agriculture as well as nonfarm wage labour stands for around 14% in the sample as the primary source of income in the sample. Business of any kind as the primary source of income is however, only 2% in the sample. Hence, higher share of the sample are dependent on the agricultural based activities.

Table-4: Distribution based on primary source of income

Source of Income	Mahakalpada		Rajnagar		Study Area	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Agriculture	11	14.7	10	13.3	21	14
Agricultural Labour	59	78.7	46	61.3	105	70
Non-farm wage labour	4	5.3	17	22.7	21	14
Business	1	1.3	2	2.7	3	2
Total	75	100	75	100	150	100

Source: Author's own calculation based on Primary data collected during 2009, by researchers

5   Income and Health Inequalities and Determinants of Health Expenditure

Based on the descriptive analysis of the sample, this section of the paper attempts to understand the income and health inequalities of the sample households. As discussed earlier we are using the Lorenz curve to verify the income and health inequalities of the households. Figure-1 depicts the expenditure pattern of the sample households. From the figures we can observe that the income of the sample households are more skewed. The analysis shows that there are households reported less then Rs. 5,000 income per year and at the same time there are households generating income of more then Rs. 25000 a year. And hence, the food expenditure is also skewed however in case of the food expenditure the household is mostly distributed towards the lower end of the expenditure group. Looking at the health expenditure of the households under study we can see that the health expenditure of the household is more skewed towards certain expenditure groups.

At the same time when the ratio of the health and income of the households are taken into consideration, we can observe that the ratio is distributed across different segments. Still

more than fifty households fall in the same health and income group. This distribution is not very clear on discussing the pattern of household behavior on the income and the health related expenditure. Therefore, there is an attempt to understand this phenomenon using the Lorenz curve. The output of the Lorenz curve is given in figure-2. From the Lorenz curve we can observe that the income inequality is higher than that of the health inequality. The income inequality among the households is distributed in such a way that there is a higher gap between the high income class and the poor. However, the heath inequality has turned out better when compared to the income inequality. The mean food expenditure of the sample is around Rs. 1647 per month with a high standard deviation of Rs. 2223.18. In a similar attempt the mean health expenditure of the households per month stands at Rs. 236 with a standard deviation of Rs. 237.30. The minimum health expenditure of the household per month is Rs. 24 as against Rs. 1667 as the maximum health expenditure.

Figure-1: Distribution of consumption of households on Food, health expenditure, income and the ratio of health expenditure to income
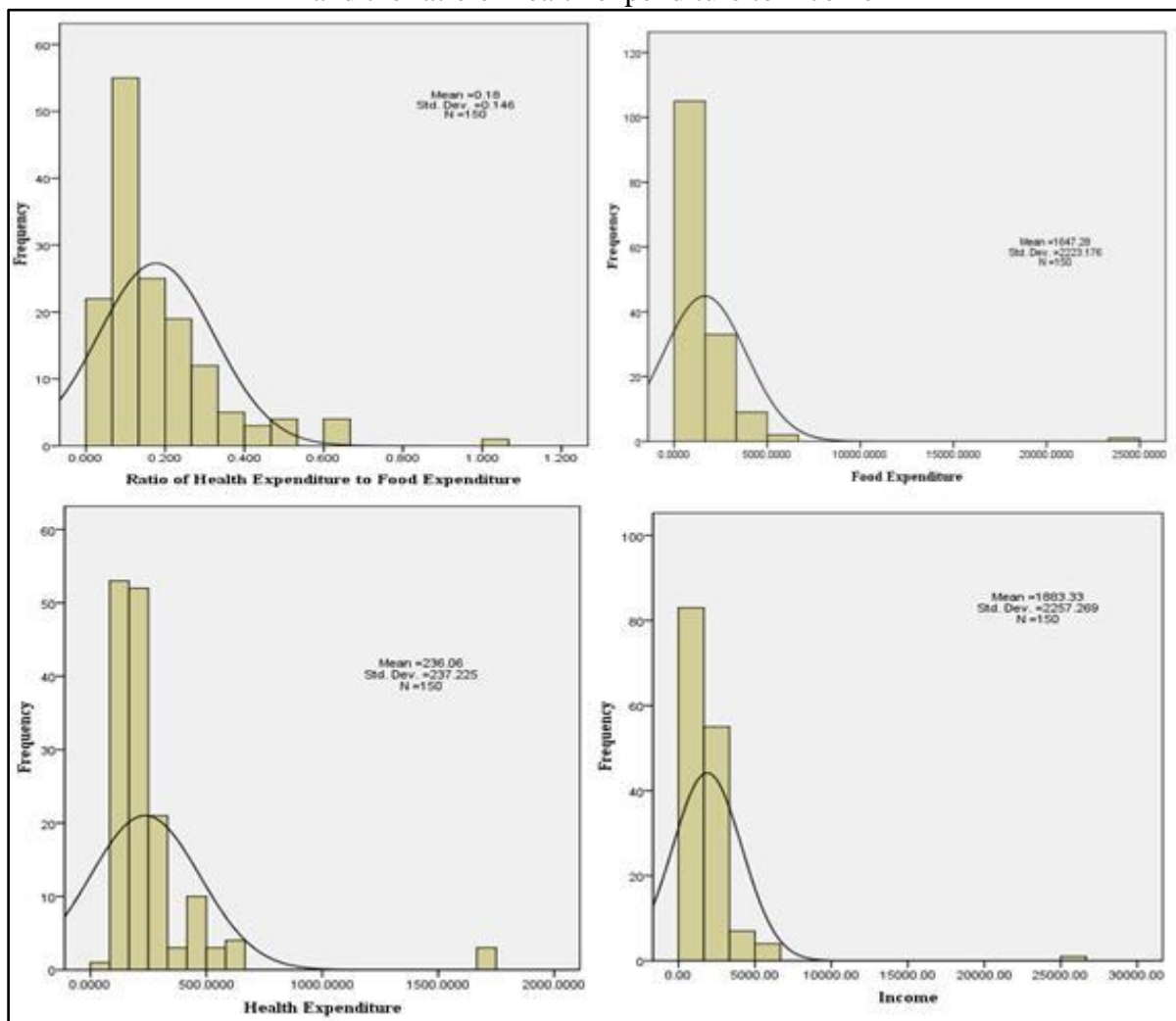
From table-5 we can observe that, in Rajanagar sample the mean total expenditure of the households is Rs. 2721 as against Rs. 2944 for the Mahakalpada block sample. Hence, the Mahakalpada sample, are spending more then the Rajanagar block sample. However in case of Mahakalpada sample the standard deviation of the total expenses are higher than that of Rajanagar block sample. But, the food expenditure is higher for the Rajanagar block as compared to the Mahakalpada block sample. Comparing the health expenditure we can observe that, Rajanagar block sample has higher mean expenditure on health as compared to the Mahakalpada block sample. Similar result is found for the ratio of food expenses to total expenses and ratio of food expenses to total expenses of the sample households in both the blocks. The detail result is given in table-5.

Table-5: Descriptive analysis of income, health & food expenses of sample households

	Mean	Standard Deviation	Minimum	Maximum
Rajnagar Block Sample (Number of Observations: 75)				
Total Household Expenditure	2721.33	1643.19	1000.00	7500.00
Household Food Expenditure	1765.56	2939.88	200.00	24875.00
Household Health Expenditure	255.67	313.38	41.67	1666.67
H/I	15.40	30.15	1.19	166.67
F/I	85.72	114.90	5.00	621.88
Mahakalpada Block Sample (Number of Observations: 75)				
Total Household Expenditure	2944.00	3686.69	500.00	20000.00
Household Food Expenditure	1529.00	1131.63	180.00	4166.67
Household Health Expenditure	216.44	119.69	83.33	583.33
H/TE (in %)	12.43	11.09	0.83	48.61
F/TE (in %)	82.14	88.86	0.00	608.33

Source: Own Calculation based on Primary Data Collected by Researchers
Note: H/TE: Health Expenditure as a ratio of Total Expenditure of the Household (In Percentage), F/TE: Food Expenditure as a ratio of Total Expenditure of the Household (In Percentage)

Figure 2: Lorenz curve of health and income inequality

Equality Line

Income Inequality

Health Inequality
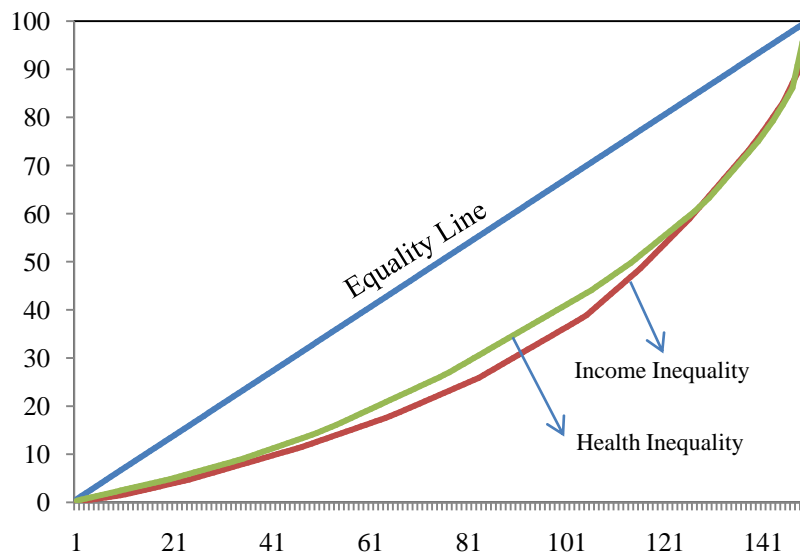
To investigate the relationship between variables under study for an analytical purpose to understand the determinants of the health expenses of the households, the correlation matrix is computed and reported in table-6. From the table we can observe that from the set of variables as described in table-1, except education of the head of the household and migration, all other variables have a negative correlation with the health expenditure of the household. This result implies that there is a possibility of higher health expenditure when the head of the household is literate; income from migration adds to the household. Education of the head of the household is important as a head of the household takes the most of the decisions.

Table-6: Correlation Matrix

	h	food	a	c	e	l	m	s	fm1	fm2	la	dh	ah	d	he	lm	loc1
h	1.00																
food	-0.36	1.00															
a	-0.06	0.01	1.00														
c	-0.07	-0.02	-0.04	1.00													
e	0.03	0.00	0.06	-0.08	1.00												
l	-0.02	-0.11	-0.17	0.09	-0.05	1.00											
m	0.02	-0.05	0.22	0.20	0.15	-0.04	1.00										
s	-0.07	-0.02	0.12	0.03	-0.06	0.09	0.07	1.00									
fm1	0.04	-0.08	-0.24	-0.03	-0.22	-0.02	-0.18	0.04	1.00								
fm2	0.00	-0.06	0.13	0.08	0.18	0.10	0.07	-0.12	-0.71	1.00							
la	0.12	-0.16	0.02	0.09	-0.02	-0.03	0.16	0.05	-0.09	-0.03	1.00						
dh	0.01	0.05	0.14	-0.09	-0.12	0.06	-0.12	-0.05	-0.15	-0.10	-0.09	1.00					
ah	0.08	-0.06	-0.15	-0.11	-0.04	0.05	-0.20	-0.05	0.39	-0.17	-0.47	-0.12	1.00				
d	0.15	-0.17	-0.12	0.11	0.12	-0.02	0.05	-0.19	-0.04	0.11	-0.05	-0.05	-0.05	1.00			
he	0.13	0.15	0.01	0.10	-0.05	0.06	0.11	0.00	-0.23	0.08	0.03	0.29	-0.21	-0.11	1.00		
lm	-0.09	0.08	0.05	-0.08	-0.06	0.05	-0.06	0.06	0.19	-0.03	0.02	0.02	0.00	-0.09	-0.11	1.00	
loc1	0.01	0.05	0.00	-0.17	-0.09	-0.13	-0.01	-0.02	0.00	-0.01	0.03	0.03	-0.03	0.19	-0.05	0.00	1.00

To capture the determinants of the health expenditure at the household level for the study area we have used equation (1) for the empirical analysis. Table-7 presents the regression output of equation (1). In the model (see equation-1), the climate shock variables includes loss of asset, damage to home due to the extreme event, selling of animal husbandry, death reported during the disaster, higher health expenses after the disaster and loss of man-days due to climate related disasters. The robustness of the estimation is revealed by high F-Value.

The result suggests that climate shock variables, caste of the household are significant at 10% level with a negative relation to the dependent variable. This implies that the general caste is less vulnerable as compared to the backward class in the sample. This result is important in terms of the factors affecting the health behavior of the households. Apart from the caste of the households the climate shock variables are also significant at different levels.

Table-7: Determinants of Health Expenditure at Household Level

Independent Variables	Coefficient	Standard Error	t Statistics
Food Expenses	0.000	0.000	-4.050***
Age	-0.000	0.001	-1.880**
Caste	-0.095	0.075	-1.270*
Education	0.006	0.027	3.230***
Loan	-0.024	0.028	-0.840
Migration	0.002	0.025	2.080***
Saving	-0.013	0.031	-0.420
FM_1	0.006	0.042	2.150***
FM_2	0.000	0.036	1.910***
LOC_1	-0.002	0.024	-2.070***
Loss of Asset	0.056	0.032	1.740**
Damage to Home	0.000	0.031	1.856**
Animal Husbandry	0.056	0.031	1.800**
Death	0.040	0.025	2.610***
Higher health expenses	0.071	0.025	2.810***
Loss of man-days	0.010	0.027	3.370***
Constant	0.143	0.084	1.700**
F(10, 139)			13.6***
R^2			0.22
Adj. R^2			0.13
Number of Observations			150

The results further indicate that loss of asset is positively related to the health expenditure of the household. This implies that higher the loss due to asset damage, higher is

the health expenditure of the household. As immediately after the disasters, the basic need of the households are food, cloth and shelter and they are badly affected by the health hazards; the loss of asset adds up with further burden on the household and the households become more vulnerable to the health related expenses. A similar result is found for the higher damage to the houses due to the disaster. Selling of livestock immediately after the disaster as a coping has turned out to be positively related to the health behavior of the sample. This implies that higher the selling of the livestock higher the health expenses. This may happen as the households do not necessarily use the amount received from selling of animal husbandry on health related issues. Death due to the disasters and the higher expenses on health due to the climate disasters both turned out to be positively significant to the ratio of health expenses to income. Because, in most of the cases death in the households are not just immediate, and person affected struggles for few days and that in turn adds up the higher health expenditure. Therefore, households reported death and higher expenses on health after disaster have higher ratio of health expenditure to the income of the household. One of the variables capturing the inability to work due to the disaster is the loss of man-days due to the climate disaster. This has become positively related to the ratio of heath expenditure to the income. This implies that higher the loss of man-days higher is the health expenditure of the household. As loss of man-days is not only due to unavailability of work but also might be due to bad health, the health expenses of those households are higher as compared to their counterparts. Further the location variable capturing the distance from the sea has turned out to be negatively related with the health income ratio of the household. This suggests that households that lie nearer to the sea are higher vulnerable to the health hazards due to climate change.

6   Conclusion and Policy Suggestions

In view of the current research on the inequality of income and health expenses of the sample households, this study has a value addition to the literature as it involves a methodological improvement in constructing an econometric model for the sample households of rural Orissa. More precisely, model formulations are based on climate shock variables to determine the changing pattern of the health expenditure of the households. This econometric model can be further used for all possible sample and households with proper modification and improvement based on the expenditure and income distributions of the sample households. The findings of the study suggest that increase in income is associated with increase in health related expenses however, not uniform across the groups. Using

Lorenz curve for the health as well as the income inequality, this study found that the health inequality is lesser than that of the income inequality. Therefore, regardless of the income status, households are concerned about their health. This is a nice example of households attaining higher health standards as this leads to higher employability and hence higher productivity. Major findings of the study suggest that smaller family size, migration income share, caste structure are the major contributing factor of household health behavior at the post disaster scenario. The location dummy used to analyze whether the distance from the sea has any impact of the health income ratio has suggested that, there is higher possibility of health expenses when the villages are near to the sea. Therefore, this study suggests an integrated approach with a climate-health policy for the households in rural areas. Further, high degree of emphasis should be given to those villages near to sea in policy formulation. Information regarding better consumption (qualitative) is necessary to improve the health standards of the rural poor. In addition to this, policy also should focus on increasing employment opportunity at village level those are vulnerable due to any climate related disasters.

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