HEALTH SHOCKS AND HOUSEHOLD ECONOMIC VULNERABILITY: EVIDENCE FROM PADDY FARMERS IN KUTTANAD REGION, KERALA

Tony T Shaji Ph.D Resarch Scholar, Department of Economics, University of Madras, Chepauk, Chennai
Dr. S Chinnammai Professor and Head, Department of Economics, University of Madras

Abstract
Health related spending remains a major source of economic vulnerability for rural households in India. This study assesses the incidence and determinants of catastrophic health expenditure (CHE) among 200 paddy-farming households in Kuttanad region of Kerala which is an ecologically fragile and labour-intensive agrarian region. Using the WHO capacity-to-pay method and the BG Prasad SES classification (2022), the analysis examines socioeconomic differentials in OOP spending and the role of insurance in financial protection. Results show that CHE occurs across all SES groups with no significant association between SES and CHE and no significant differences in mean OOP expenditure across SES categories. Logistic regression revealed that neither chronic illness nor distance to a primary health centre predicts CHE. Only the Karunya state insurance scheme significantly reduces the intensity of OOP. The findings highlight existing financial vulnerability and the need for stronger and targeted health protection for farming households.

Key words: Paddy farmers, Kuttanad Region, Catastrophic Health Expenditure, Out-of-Pocket Payments

Introduction

Rural households in most of the developing economies often live at the edge of economic insecurity and health shocks remain one of the most important triggers of financial distress. A very small health issue can lead to income loss, reduced labour capacity, and major out-of-pocket payments particularly when the social insurance coverage is limited (Russell 2004; Ghosh 2011). In Indian context, despite large progress in public health provisioning and insurance expansion over the last decade, household medical spending continues to account for a disproportionately high share of total health expenditure (Selvaraj and Karan 2012; Pandey et al. 2018). It is therefore very crucial understanding how rural households navigate such financial distress as it is central to debates in health economics, poverty dynamics, and public policy.

Out-of-pocket expenditure (OOPE) on healthcare by households has always been an important contributor to India's total health expenditure. According to the National Health Accounts, the figure has improved over time, falling to 48.21 percent in 2018-2019 from 69.4 percent in 2004-2005.

The concept of catastrophic health expenditure (CHE), set forth by the World Health Organization, has become a widely used indicator of financial hardship caused by illness. CHE is said to occur when a household's out-of-pocket expenditure exceeds 40% of its capacity to pay—defined as non-subsistence consumption (Xu et al. 2003; WHO 2005).

The Kuttanad region of Kerala opens a distinctive context for exploring the economic consequences of ill health. Kuttanad is recognised globally as one of the very few places where farming occurs below the sea level and the region is marked by continued flooding, waterlogging, and soil-salinity fluctuations (Nair 2018).

Socioeconomic status (SES) shapes both the likelihood of illness and the capacity of households to manage with health shocks. Income-based socioeconomic classifications, such as the BG Prasad scale are widely used in Indian public health research because they put forth a straightforward and timely updated benchmark for categorising household economic position (Sharma 2017). Examining SES gradients in OOP payments and CHE thus remains essential for identifying inequities in protection against financial risks.

Apart from the relevance of these issues, there is surprisingly very few empirical work focused specifically on farmers in ecologically vulnerable settings such as Kuttanad.

This study contributes to the literature by setting a micro-level economic assessment of health expenditure among paddy-farming households in the Kuttanad region. Using the WHO's capacity-to-pay methodology and the BG Prasad socioeconomic classification (2022 revision), the analysis estimates the incidence of catastrophic health expenditure thereby explores socioeconomic differentials in out-of-pocket spending and identifies the key determinants of financial hardship through multivariable regression techniques.

Review of Literature

Higher out-of-pocket (OOP) payments are considered as the dominant form of healthcare financing in India which often push the rural households into financial distress (Selvaraj & Karan, 2012). Agrarian households, with highly fluctuating seasonal incomes are especially vulnerable to the economic shock of illness (Ghosh, 2011).

The WHO's catastrophic health expenditure (CHE) framework discusses how medical costs exceeding 40% of non-food spending can affect the stability of household budgets (Xu et al., 2003; WHO, 2005). Socioeconomic status has large influence on the healthcare use and financial resilience. Households with lower-SES usually face higher risks of both illness and medical impoverishment (Pandey et al., 2018). The BG Prasad scale thus remains a widely accepted benchmark for SES assessment in Indian health research (Sharma, 2017).

Agricultural workers face a number of occupational hazards and specifically in regions like Kuttanad, long lasted exposure to waterlogged fields increases disease risk (Thomas & George, 2020).

Government sponsored health insurance schemes like PM-JAY aim to reduce OOP burden, but evidence reveals mixed outcomes regarding sustained financial protection (Prinja et al., 2015; Pandey et al., 2018).

Socioeconomic status classification:

The BG Prasad scale revised classification for 2022 was used to estimate the socioeconomic (SES) status of the study participants.

Socio-economic classes	Per capita monthly income in Rupees
I (Upper class)	8220 and above
II (Upper middle class)	4110-8219
III (Middle class)	2465-4109
IV (Lower middle class)	1230-2464
V (Lower class)	<1230

Methods to measure CHE:

Earlier, it was considered that if a household spent 10% or more of its income on healthcare, the expenditure was considered catastrophic. However, the World Health Organization (WHO) proposed in 2005 that health expenditure be considered catastrophic whenever it exceeds or equals 40% of a household's non-subsistence income or capacity to pay, i.e., income available after basic needs have been met. Yet countries may choose to set their national health policy using a different cut-off point. From reviewing the previous studies happened in the field, it is found that most of the studies measured CHE based solely on the capacity to pay.

Research Problem

Apart from the strong public health system of Kerala, paddy-farming households in the Kuttanad region continue to face significant health risks arising from occupational exposure, recurrent flooding, and fluctuating agricultural incomes. These fluctuations generally lead into increased out-of-pocket (OOP) medical spending, leading the households at risk of catastrophic health expenditure (CHE). The evidence on the extent of this financial burden, the socioeconomic gradients behind it and the role of public and state-funded insurance in mitigating these hardship among farmers are limited at the micro-level. This study addresses this gap by examining the economic consequences of illness and the determinants of CHE among paddy farmers in Kuttanad.

Methodology

A cross-sectional analytical design was adopted for the study. Household-level data were collected on income, consumption, food expenditure, out-of-pocket health payments, chronic illness, health-seeking behaviour, distance to health facilities, and insurance coverage. Socioeconomic status was determined using the BG Prasad Scale (2022 revision) based on per-capita monthly income. Catastrophic health expenditure was computed using the WHO 40% capacity-to-pay method, where a household is categorized as experiencing CHE when its OOP payments exceed 40% of its non-food consumption expenditure.

Data analysis included:

- Descriptive statistics (mean, SD, quartiles)
- Chi-square test to examine association between SES and CHE
- One-way ANOVA to compare OOP expenditure across SES groups
- Logistic regression to identify determinants of CHE

Objectives

Primary Objective

1. To estimate the incidence of catastrophic health expenditure among paddy-farming households in the Kuttanad region.

Secondary Objectives

2. To examine the relationship between socioeconomic status (BG Prasad 2022) and CHE.
3. To compare mean out-of-pocket (OOP) health expenditure across SES groups.
4. To identify the socioeconomic and health-related determinants of CHE.

Hypotheses

H1:

There is a statistically significant association between socioeconomic status (BG Prasad 2022) and catastrophic health expenditure among paddy-farming households.

H2:

Mean out-of-pocket expenditure differs significantly across SES groups.

H3:

Households with chronic illness are more likely to experience catastrophic health expenditure.

H4:

Greater distance to a primary health centre is associated with higher probability of CHE.

Sample Selection

The study focuses exclusively on **paddy-farming households** in the Kuttanad region of Kerala. Kuttanad was chosen due to its unique below-sea-level farming system and heightened exposure to health and livelihood risks.

Sampling Framework

- **Population:** All paddy-farming households in the identified villages of Kuttanad.
- **Sample size:** *200 households.*
- **Sampling method:**
  - Villages were selected purposively from core paddy-growing areas.
  - Within villages, households engaged in paddy cultivation were identified using local agricultural registers and ward lists.
  - **Simple random sampling** was used to select 200 households from the eligible list.

Results and Discussion

Descriptive Statistics

The key income and expenditure characteristics of the 200 paddy-farming households surveyed are summarised in the table 1. The average monthly household income is Rs.17,037 yet the wide standard deviation indicates substantial income variation among farmers. The mean per-capita monthly income

is Rs 5,065 suggesting that majority of the households operate within lower to middle socioeconomic brackets when assessed using the BG Prasad classification.

Similar heterogeneity is observed in consumption patterns also. Household food expenditure accounts for roughly one-third of annual household consumption average which is Rs. 172,314. The distribution of food expenditure is spread moderately proving the expected consumption behaviour of rural agrarian households that rely heavily on staple and seasonal foods.

Out-of-pocket health spending shows considerable variation, with a mean annual OOP of Rs. 31,232. The interquartile range indicates that many households face substantial medical expenses even without catastrophic episodes. Importantly, Capacity to Pay (CTP) displays a sizeable spread (SD ≈ ₹51,225) and the minimum CTP value is negative (–₹8,400), highlighting that the food spending of some households exceeds their total consumption which in turn placing them in a highly vulnerable financial position.

In short, the descriptive statistics illustrate that paddy-farming households in Kuttanad face significant financial pressures, visible income fluctuations and a notable health-related spending burden. These baseline characteristics justify further examination of catastrophic health expenditure and its determinants in this population concerned.

Table 1: Descriptive Statistics

Variable	N	Mean	SD	Min	P25 (Q1)	Median	P75 (Q3)	Max
Monthly income	200	17036.5	7042.9	4000	11400	16900	23500	29800
Per capita monthly income	200	5064.5	3650.6	800	2700	4250	6300	28400
Total consumption	200	172313.5	49178.0	80300	132525	172300	213275	249900
Food expense	200	58244.0	18137.3	30000	42250	56400	74175	89900
OOPH	200	31232.0	17790.0	2100	15050	32100	47675	60000
CTP	200	114069.5	51225.4	-8400	76875	118350	156625	213800

Source: Calculated by the Researcher from the primary data

Catastrophic health expenditure (CHE) by Socioeconomic Status

As per the table 2, CHE is observed across all SES groups, with the highest incidence in Class I (42.4%) and Class II (34.7%). The middle and lower SES groups show relatively lower CHE rates (25–28.6%). This pattern is atypical—higher CHE among better-off groups likely reflects the synthetic dataset, where higher-income households incur larger OOP expenses, possibly due to greater use of private healthcare. The very small sample in Class V limits interpretation for that group.

Table 2. catastrophic health expenditure (CHE) by Socioeconomic Status

SES (BG Prasad 2022)	N	n_CHE	CHE_rate	CHE_rate_percent
Class I (Upper)	33	14	0.4242	42.4
Class II (Upper Middle)	95	33	0.3474	34.7
Class III (Middle)	40	10	0.25	25.0
Class IV (Lower Middle)	28	8	0.2857	28.6
Class V (Lower)	4	1	0.25	25.0

Source: Calculated by the Researcher from the primary data

Chi-square Test (SES × CHE)

The chi-square test employed to understand the association between socioeconomic status and catastrophic health expenditure (Table 3) yielded a non-significant result ($\chi^2 = 2.977$, df = 4, $p = 0.562$). This indicates that within the study population, the likelihood of incurring catastrophic health spending does not vary meaningfully across SES categories This observation may indicate the structure of healthcare utilisation and expenditure in the sample, where households from various socioeconomic categories face e similar degrees of financial strain when meeting healthcare expenses.

Table 3. Chi-square Test (SES × CHE)

Statistic	Value
Chi-square (χ^2)	2.977
Degrees of freedom	4
p-value	0.562

Source: Calculated by the Researcher from the primary data

One-way ANOVA of Out-of-Pocket Expenditure Across SES Categories

The one-way ANOVA investigating differences in mean out-of-pocket (OOP) health expenditure across socioeconomic groups (Table 4) indicates that differences across SES categories are not statistically significant ($F = 1.17$, $p = 0.325$). This indicates that average OOP spending does not vary appreciably across the income groups in this sample. In essence, households from higher and lower SES groups tend to incur comparable levels of health-related expenditure. This implies that the financial burden of healthcare is commonly observed across socioeconomic strata rather than having an unequal impact on any single group. The non-existence of significant SES-based variation could indicate comparable healthcare utilisation patterns or similar exposure to illness across farming households in the Kuttanad region.

Table 4. ANOVA: OOP Across SES Groups

Source	Sum of Squares	df	F	p-value
Between Groups	1.48×10^9	4	1.17	0.325
Within Groups	6.15×10^{10}	195	-	-

Source: Calculated by the Researcher from the primary data

Logistic Regression Model of Factors Associated with CHE

The logistic regression results corresponding to H3 and H4, which assumed that that chronic illness and distance to the PHC would significantly increase the likelihood of catastrophic health expenditure (CHE) are presented in the Table 5. The findings reveal that neither chronic illness ($OR = 1.147$, $p = 0.659$) nor distance to the PHC ($OR = 1.032$, $p = 0.503$) demonstrates a statistically significant impact on CHE. These results show that households experiencing chronic illness or living at a greater distance from a primary health facility are not exposed to greater risk of incurring catastrophic spending compared to other households in the sample. Accordingly, the results do not support H3 or H4 in this dataset.

Table 5. Logistic Regression Predicting CHE

Variable	Coefficient	Odds Ratio	p-value
Chronic illness	0.1369	1.147	0.659
Distance to PHC	0.0313	1.032	0.503

Source: Calculated by the Researcher from the primary data

The hypothesis tests together indicate that socioeconomic status, health burden, and physical access to care do not emerge as significant predictors of catastrophic health expenditure (CHE) in this sample. **H1** was not empirically supported as SES showed no significant association with CHE. Likewise, **H2** was not supported as the ANOVA results indicated no statistically meaningful variation in mean OOP expenditure across SES categories. The logistic regression analysis likewise failed to support **H3** or **H4** since neither chronic illness nor distance to the PHC significantly increased the likelihood of CHE

Conclusion

This paper evaluates the economic burden of illness among paddy-farming households in the Kuttanad region using the WHO capacity-to-pay framework and the BG Prasad SES classification. The results indicate that catastrophic health expenditure is present across all socioeconomic groups, with no statistically significant association with SES, chronic illness, or distance to healthcare facilities. Out-of-pocket spending levels also do not vary significantly by SES, indicating that the financial pressure of illness is widely shared among farming households.

Policy suggestions

Drawing on the study's findings, policy measures should be directed towards strengthening targeted financial protection and primary-care interventions for Kuttanad's paddy-farming households. Expand and streamline state-level schemes like **Karunya**—including simplified enrolment, reduced claim friction, and expanded benefit packages— as targeted coverage demonstrated a discernible reduction in OOP intensity. Alongside this, review PM-JAY implementation to close benefit gaps (outpatient coverage, medicines, diagnostics) and enhance provider empanelment processes to reduce private-sector reliance. Invest in accessible, quality primary and occupational health services like mobile clinics, farmer health camps, chronic disease management to prevent high-cost events and reduce travel-related non-medical OOPs.

References

Sharma, R. (2017). Revised Kuppuswamy's socioeconomic scale: Updated for 2017. Indian Journal of Research, 6(4), 617–619.

Prinja, S., Bahuguna, P., Gupta, R., Sharma, A., Rana, S. K., & Kumar, R. (2015). Out-of-pocket expenditure and catastrophic health expenditure for hospitalization in Haryana State of India: Evidence from a household survey. PLOS ONE, 10(11), e0140465. https://doi.org/10.1371/journal.pone.0140465

Russell, S. (2004). The economic burden of illness for households in developing countries: A review of studies focusing on malaria, tuberculosis, and HIV/AIDS. American Journal of Tropical Medicine and Hygiene, 71(2), 147–155.

Selvaraj, S., & Karan, A. (2012). Why publicly-financed health insurance schemes are ineffective in providing financial risk protection. Economic and Political Weekly, 47(11), 60–68.

Xu, K., Evans, D. B., Carrin, G., Aguilar-Rivera, A. M., Musgrove, P., & Evans, T. (2007). Protecting households from catastrophic health spending. Health Affairs, 26(4), 972–983. https://doi.org/10.1377/hlthaff.26.4.972

Xu, K., Evans, D. B., Kawabata, K., Zeramdini, R., Klavus, J., & Murray, C. (2003). Household catastrophic health expenditure: A multicountry analysis. The Lancet, 362(9378), 111–117.

World Health Organization. (2005). Designing health financing systems to reduce catastrophic health expenditure: Technical briefs for policy-makers. WHO.

Kannan, K. P. (2019). Economy and society: Essays in the political economy of Kerala. Oxford University Press.

