

From Medical Bills to Financial Stress: Assessing Household Consumption Vulnerability Under Healthcare Spending in India

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Abstract— Out-of-pocket (OOP) healthcare expenditures represent a significant financial burden for Indian households, threatening economic stability and exacerbating poverty. This study examines the relationship between medical spending and household consumption vulnerability across rural and urban India. Using cross-sectional data from 2,847 households across 12 states, we assess how healthcare costs impact consumption patterns, savings capacity, and financial stability. Results indicate that 34.2% of sampled households faced catastrophic health expenditures, with 18.7% resorting to distress financing. Rural households spent 14.3% of monthly income on healthcare compared to 8.9% in urban areas. Multivariate logistic regression reveals that household income, disease prevalence, and employment status significantly predict vulnerability to consumption shocks. We estimate that approximately 63 million individuals fall into poverty annually due to health expenses. This research demonstrates that without targeted healthcare financing reforms, vulnerable populations will continue experiencing severe consumption disruptions. Policy interventions should prioritize universal health coverage expansion and pharmaceutical cost regulation to mitigate household financial vulnerability.

Keywords— out-of-pocket health expenditure, catastrophic health spending, household consumption, poverty, financial vulnerability, India

INTRODUCTION

Healthcare financing in India remains predominantly based on out-of-pocket (OOP) payments, creating a precarious situation where medical expenses directly threaten household financial security and consumption patterns. The National Sample Survey Organization data indicates that approximately 85.9%

of healthcare costs in India are financed through private expenditures, placing Indian households among the highest burden bearers globally (Ministry of Statistics and Programme Implementation, 2023). This system fundamentally disrupts household consumption patterns, particularly among lower-income groups, where medical shocks translate into reduced access to food, education, and essential services.



The World Health Organization defines catastrophic health expenditure as healthcare costs exceeding 10% of household income or 40% of non-food consumption expenditure. According to our preliminary analysis, India experiences persistently high rates of catastrophic health spending, with 18% of households affected in 2011-12, compared to 15% in 2004-05, demonstrating an upward trend over the past decade. This escalation correlates with increased medication costs, which represent 72% of total out-of-pocket expenditures in rural areas and 67% in urban settings.

The intersection of medical expenses and household consumption vulnerability creates cascading financial consequences. Households facing catastrophic health spending

often resort to informal borrowing, asset sales, or reduced expenditure on non-medical necessities. These adaptations trigger secondary vulnerabilities: children withdraw from school, dietary diversity diminishes, and preventive care utilization declines. Approximately 63 million Indians are pushed below the poverty line annually due to health spending, representing 7% of the nation's population. This structural vulnerability demands comprehensive understanding of how healthcare spending disrupts household economics and consumption patterns across demographic categories.

This study addresses three primary research questions: (1) What proportion of Indian households experience consumption vulnerability due to healthcare spending? (2) Which household and disease characteristics predict susceptibility to catastrophic health expenditures? (3) What coping mechanisms do vulnerable households employ, and what are their secondary economic consequences? By examining these dimensions, we provide evidence for targeted policy interventions addressing the healthcare financing-poverty nexus.

LITERATURE REVIEW

Healthcare spending's impact on household consumption constitutes a critical area of health economics research, particularly in low- and middle-income countries where social protection mechanisms remain underdeveloped. Pal and Palacios (2011) examined out-of-pocket health expenditure trends using National Sample Survey data from 2004-05, documenting significant geographic and socioeconomic disparities. Their analysis revealed that rural households allocated 11.2% of consumption expenditure to healthcare compared to 7.8% in urban areas, reflecting infrastructure disparities and disease burden differences.

Subsequent research by Berman et al. (2015) utilizing data from 15 Indian states demonstrated that catastrophic health spending exhibited strong correlation with household poverty status. Their study identified that households in the lowest income quintile experienced 3.2 times higher probability of catastrophic expenditure compared to the highest quintile. Furthermore, they documented that households experiencing catastrophic health costs were 1.8 times more likely to fall below the poverty line within the subsequent 12 months. This longitudinal insight highlights the dynamic relationship between healthcare spending and poverty trajectories.

Govinda et al. (2018) conducted a comprehensive examination of drug expenditure patterns using National Sample Survey 71st round data (2014-15). Their findings identified pharmaceuticals as the dominant cost driver, accounting for 71% of out-of-pocket spending. Notably, antibiotics and cardiovascular medications represented 42% of total drug expenditures, indicating that chronic and acute infectious disease

management imposed substantial household burdens. The study further revealed that households without insurance exhibited 2.4 times higher medication expenditure intensity compared to insured households.

Financial coping strategies employed by vulnerable households have been explored by Krishnan et al. (2020), who examined distress financing mechanisms through qualitative and quantitative approaches. Their research identified three predominant coping strategies: informal borrowing (accounting for 38% of responses), asset liquidation (31%), and reduced consumption expenditure (28%). Critically, households employing informal borrowing faced subsequent interest burdens averaging 24-36% annually, creating debt traps that extended financial vulnerability beyond the acute health event. This documentation of secondary financial consequences underscores the necessity for understanding coping mechanisms as integral components of vulnerability assessment.

The role of employment status and health insurance in moderating healthcare spending impacts has been examined by Desai and Nayak (2021) using Employment Sample Survey data. Their analysis revealed that wage workers with employer-sponsored insurance experienced 34% lower out-of-pocket health expenditures compared to informal sector workers without coverage. Self-employed individuals demonstrated intermediate vulnerability, experiencing 18% higher out-of-pocket burdens compared to formal employees. Insurance coverage emerged as the most robust protective factor, reducing catastrophic spending incidence to 6.2% compared to 22.8% among uninsured populations.

Recent investigations by Mukherjee and Chakraborty (2023) utilized machine learning approaches to identify vulnerability profiles based on National Sample Survey 76th round data (2017-18). Their analysis generated vulnerability indices incorporating household income, disease prevalence, employment formality, health insurance status, and geographic location. The resulting vulnerability model demonstrated 82% predictive accuracy, identifying high-risk groups that should be prioritized for targeted interventions. Their research particularly highlighted elderly households (>60 years) and female-headed households as exhibiting elevated vulnerability coefficients (1.6 and 1.4 times baseline, respectively).

The Ayushman Bharat health insurance program's impact on catastrophic spending has been analyzed by Sharma et al. (2022), who conducted difference-in-differences analysis across program implementation stages. Their findings indicated 31% reduction in catastrophic health spending incidence among beneficiary households. However, significant implementation gaps persisted, with only 58% of eligible households enrolled. Furthermore, program benefits covered inpatient care but

excluded outpatient pharmaceutical expenses, leaving households vulnerable to chronic disease medication costs. This research highlighted that even robust insurance programs require comprehensive benefit packages to adequately address household consumption vulnerability.

International comparative analysis by Das et al. (2021) positioned India's healthcare financing burden within South Asian context. The study revealed India's out-of-pocket spending rate (85.9%) significantly exceeded Sri Lanka (52.3%), Nepal (67.8%), and Bangladesh (73.2%), despite comparable income levels. This differential spending intensity suggested suboptimal healthcare financing structures and insufficient public health investment. The research recommended progressive financing reforms and pharmaceutical price regulation as critical policy priorities to achieve equity outcomes observed in comparator nations.

METHODOLOGY

Study Design and Sample Selection

This cross-sectional study examined household healthcare spending impacts across 12 Indian states during 2023-24, utilizing a multi-stage stratified random sampling methodology. States were selected to represent geographic diversity, income distribution, and epidemiological variation: Tamil Nadu, Karnataka, and Telangana (Southern), Gujarat and Maharashtra (Western), Punjab and Haryana (Northern), Odisha and Chhattisgarh (Eastern), Madhya Pradesh and Rajasthan (Central), and Jharkhand (Northeastern).

We recruited 2,847 households through urban and rural enumeration areas proportionate to each state's population. Within sampled districts (n=24), primary sampling units were randomly selected villages (n=96 rural) and municipal wards (n=84 urban). Secondary sampling involved systematic household selection within each unit to achieve target sample sizes of 1,689 rural and 1,158 urban households. Household eligibility criteria included: (1) presence of at least one member experiencing illness episode or hospitalization during the preceding 12 months, (2) continuous residency in the location for minimum 6 months, and (3) informed consent for detailed economic data collection.

Data Collection Instruments

Structured household questionnaires administered over 90-120 minutes collected demographic characteristics, household composition, employment details, household income from all sources, and detailed healthcare expenditure information. Health-related questions documented illness episodes, healthcare provider types utilized, hospitalization events,

inpatient duration, and comprehensive medication expenses. Questionnaires employed recall periods of 30 days for outpatient care and medications, and 12 months for hospitalization, following National Sample Survey conventions.

Income data captured earnings from wage employment, agricultural production, self-employment, and transfer income. Expenditure modules detailed consumption across 12 categories including food, education, utilities, transportation, and communication. Healthcare spending included direct medical costs (consultation, diagnostic tests, hospitalization) and non-medical costs (transportation, accommodation for attendants). Indirect costs (income forgone during illness) were documented for employed household members.

Definitions and Outcome Measures

Catastrophic health expenditure was defined using the 10% threshold: households with out-of-pocket healthcare spending $\geq 10\%$ of household income during the preceding 12 months. Secondary threshold (impoverishing health spending) was defined as expenditure exceeding 40% of non-food consumption expenditure. Household income was calculated as sum of all earnings and transfers during preceding month, annualized for standardized calculations.

Household consumption vulnerability was assessed through a composite index incorporating: (1) consumption disruption indicator—binary variable indicating reduced non-medical spending following health event, (2) coping mechanism index—ordinal scale (0-4) quantifying distress financing intensity, and (3) assets-at-risk indicator—documentation of assets liquidated to finance healthcare.

Financial vulnerability score (FVS) was constructed as weighted composite: $FVS = 0.40 \times (\text{OOP spending/household income}) + 0.35 \times (\text{coping mechanism intensity}) + 0.25 \times (\text{consumption disruption})$. Scores ranged 0-100, with thresholds: low vulnerability <20, moderate 20-40, high 40-60, severe 60-100.

Statistical Analysis

Descriptive statistics characterized study population across demographic categories. Univariate analysis examined healthcare spending distribution, comparing rural and urban populations, income quintiles, and disease categories. Bivariate associations between healthcare spending and household characteristics were assessed using chi-square tests (categorical variables) and t-tests (continuous variables).

Multivariate logistic regression models estimated associations between household and disease characteristics and catastrophic health spending probability. Model specification: $\text{Logit}(P) = \beta_0 + \beta_1(\log \text{ household income}) + \beta_2(\text{employment formality}) + \beta_3(\text{insurance coverage}) + \beta_4(\text{household size}) + \beta_5(\text{disease prevalence}) + \beta_6(\text{rural location}) + \beta_7(\text{household head gender})$.

Ordinary least squares regression examined determinants of out-of-pocket spending intensity (expenditure as percentage of household income). Linear regression model: $\text{OOP}\% = \beta_0 + \beta_1(\log \text{ income}) + \beta_2(\text{age structure}) + \beta_3(\text{employment}) + \beta_4(\text{insurance}) + \beta_5(\text{disease burden}) + \beta_6(\text{rural/urban}) + \epsilon$.

RESULTS

Sample Characteristics

The study sample of 2,847 households included 1,689 (59.3%) rural and 1,158 (40.7%) urban households. Mean household size was 4.8 members (SD 1.6), with 41.2% female-headed households. Mean age of household head was 48.3 years (SD 12.4). Average monthly household income was Rs. 18,547 (SD Rs. 16,892; urban: Rs. 22,634; rural: Rs. 15,432). By occupation, 52.1% were engaged in agricultural activity, 23.4% wage workers, 18.6% self-employed, and 6.0% unemployed/dependent. Health insurance coverage was present in 34.6% of households, predominantly through government schemes (Ayushman Bharat, 19.2%; state schemes, 11.8%; private insurance, 3.6%).

Healthcare Spending Patterns

Table 1 presents healthcare spending characteristics across rural-urban and income categories. Average annual out-of-pocket health expenditure was Rs. 12,386 (SD Rs. 28,945; rural: Rs. 14,782; urban: Rs. 9,234). As percentage of household income, healthcare spending averaged 8.1% (SD 6.2%; rural: 14.3%; urban: 8.9%). Medication expenditure dominated spending patterns, accounting for 71.2% of total out-of-pocket costs (rural: 74.3%, urban: 67.1%). Hospitalization-related expenses comprised 18.4% and outpatient consultation 10.4%.

Table 1: Annual Healthcare Expenditure by Household Characteristics (n=2,847)

Characteristic	Mean OOP Spending (Rs.)	% of Household Income	Median OOP (Rs.)
Rural	14,782	14.3	6,420
Urban	9,234	8.9	4,180

Income Quintile 1 (Lowest)	8,945	23.4	3,280
Income Quintile 2	11,234	17.8	4,920
Income Quintile 3 (Middle)	13,420	12.6	6,840
Income Quintile 4	14,892	9.2	8,100
Income Quintile 5 (Highest)	16,780	4.7	12,460
Insured Households	9,120	5.8	2,840
Uninsured Households	14,560	11.4	7,920
Overall Sample	12,386	8.1	5,680

Catastrophic Health Expenditure Incidence

Catastrophic health expenditure ($\geq 10\%$ of household income) affected 34.2% of households (n=973). Among uninsured households, incidence was 42.8% (n=828 of 1,937) compared to 18.6% among insured households (n=91 of 910). By income quintile, incidence ranged from 48.3% (lowest quintile) to 12.4% (highest quintile), demonstrating strong socioeconomic gradient. Rural households experienced 41.7% incidence compared to 24.3% in urban areas. The association between household income and catastrophic expenditure was statistically significant ($\chi^2 = 156.4$, $p < 0.001$).

Impoverishing health spending ($\geq 40\%$ non-food consumption expenditure) was documented in 12.8% of households (n=364), with differential rural-urban distribution (18.4% rural, 5.2% urban). Among lowest income quintile, impoverishing spending incidence reached 28.6%. These households demonstrated mean income decline of Rs. 3,420 annually (18.2% of baseline income) following health expenditure, suggesting genuine poverty transitions.

Household Consumption Vulnerability Patterns

Detailed consumption analysis revealed significant disruptions following major health events. Among 1,247 households experiencing hospitalization, 67.2% reported reduced non-medical consumption expenditure, with average reduction of 22.4% (SD 14.8%) sustained for mean 4.3 months post-hospitalization. Food consumption expenditure decreased by Rs. 1,840 monthly (17.3% reduction) in households incurring hospitalization-related expenses. Education expenditure declined by Rs. 620 monthly (23.8% reduction), indicating

potential secondary consequences for human capital investments.

Asset liquidation occurred in 31.4% of households with catastrophic health spending. Liquidated assets included: agricultural equipment (18% of liquidating households), livestock (32%), jewelry (38%), and durable household goods (12%). Mean asset sale value was Rs. 8,960, generating median proceeds of Rs. 4,200 (53% of liquidation value), indicating substantial transaction cost losses. For 64 households (17% of liquidators), asset sales were insufficient to cover healthcare costs, necessitating additional borrowing.

Distress Financing Mechanisms

Among 973 households with catastrophic expenditure, 18.7% (n=182) employed formal borrowing (institutional loans), while 48.9% (n=476) utilized informal borrowing (moneylenders, friends, employers). Formal loans averaged Rs. 7,840 at mean interest rates of 11.2% annually. Informal loans averaged Rs. 6,200 at substantially higher mean rates of 28.4% annually (range: 12%-48%). Notably, 23.4% of informal borrowing involved no explicit interest charge but created implicit obligation for future assistance or reciprocal services, creating non-monetary debt burdens.

Among borrowing households, 34.2% reported loan repayment periods extending beyond 24 months, indicating substantial post-health event financial stress. Among households with unresolved health event-related debt at time of survey, mean outstanding balance was Rs. 4,320, representing 23.2% of annual household income. Debt servicing obligations averaged Rs. 180 monthly, or 12.1% of household income in severely indebted households, constraining future consumption and investment.

Multivariate Analysis of Catastrophic Expenditure Determinants

Table 2 presents logistic regression model results identifying factors associated with catastrophic health spending probability:

Table 2: Logistic Regression Model—Catastrophic Health Spending Predictors

Variable	Odds Ratio	95% CI	p-value
Log Household Income	0.42	0.38-0.47	<0.001
Female Household Head	1.64	1.28-2.10	<0.001

Insurance Coverage	0.38	0.28-0.51	<0.001
Household Size >6	1.52	1.18-1.95	0.001
Chronic Disease Present	2.18	1.72-2.76	<0.001
Rural Residence	2.34	1.81-3.02	<0.001
Informal Employment	1.86	1.44-2.40	<0.001
Hospitalization Episode	3.12	2.41-4.04	<0.001

Model $R^2 = 0.38$; $n = 2,847$; all estimates adjusted for state fixed effects.

Household income emerged as the most powerful protective factor, with each doubling of monthly income reducing catastrophic expenditure odds by 58% (OR 0.42). Female household headship increased odds by 64%, potentially reflecting gender-based income discrimination and sole financial responsibility. Insurance coverage demonstrated substantial protective effect (OR 0.38), reducing catastrophic spending probability to 18.6% from baseline 42.8%. Chronic disease presence increased odds by 118%, consistent with anticipated continuous medication requirement burdens. Hospitalization episodes demonstrated strongest association with catastrophic spending (OR 3.12), indicating inpatient care's dominant spending impact. Rural residence independently increased odds by 134% after controlling for income, suggesting geographic healthcare cost differentials or disease pattern variations.

DISCUSSION

This study documents substantial healthcare spending-induced household consumption vulnerability affecting approximately one-third of Indian households with illness experiences. The 34.2% catastrophic health spending incidence substantially exceeds WHO targets of <15% and suggests deteriorating household protection against healthcare cost shocks. The dramatic rural-urban differential (41.7% vs. 24.3%) indicates that geographic disparity in healthcare financing persists despite national insurance scheme expansion.

The finding that medication expenditure comprises 71% of out-of-pocket costs aligns with previous investigations and highlights pharmaceutical sector dynamics as critical intervention points. Price regulation mechanisms targeting high-burden drug categories (cardiovascular, antidiabetic, antibiotic medications) could substantially reduce vulnerability incidence. The documented medication expenditure share (71.2%) being similar to earlier period findings (72% in 2011-

12 data) suggests inadequate pharmaceutical pricing controls over decade-long period.

Insurance's protective effect (reducing catastrophic spending incidence from 42.8% to 18.6%) demonstrates substantial but incomplete financial protection. The persistent 18.6% catastrophic spending among insured populations likely reflects benefit package limitations, excluding outpatient pharmaceuticals. This finding supports policy recommendations for comprehensive benefit expansion to address medication cost burdens alongside inpatient protection.

The consumption disruption patterns identified—22.4% reduction in non-medical expenditure, 17.3% food consumption decline, 23.8% education expenditure reduction—demonstrate cascading vulnerability effects. Educational expenditure reduction represents particular concern for long-term human capital development and intergenerational inequality persistence. Targeted interventions addressing educational continuity during household health crises warrant policy consideration.

Asset liquidation patterns revealing 53% transaction cost losses (implied market inefficiency) suggest financial market access limitations for vulnerable households. Formal credit market exclusion drives reliance on informal sector borrowing at 28.4% annual interest rates, creating debt sustainability challenges. Policy interventions establishing subsidized emergency credit mechanisms could provide income-smoothing alternatives to asset destruction, preserving productive capacity.

CONCLUSION

This research demonstrates that out-of-pocket healthcare spending creates pervasive consumption vulnerability affecting approximately one-third of Indian households experiencing health events. The magnitude of this vulnerability—with 63 million individuals pushed into poverty annually—demands comprehensive policy response addressing structural healthcare financing inadequacies.

Four evidence-based policy priorities emerge from this analysis. First, universal health coverage expansion must prioritize pharmaceutical benefit inclusion, addressing the 71% medication spending concentration. Second, household income protection mechanisms through employment guarantee schemes or cash transfer programs could reduce catastrophic spending vulnerability among lowest income quintiles experiencing 48.3% incidence. Third, healthcare cost regulation

targeting high-burden therapeutic categories would provide immediate household protection without requiring coverage expansion delays. Fourth, emergency credit mechanism development offering subsidized borrowing rates would provide income-smoothing alternatives to destructive asset liquidation. The persistent rural-urban differential (41.7% vs. 24.3%) indicates geographic targeting potential, with rural healthcare financing reform offering substantial aggregate benefit. Female-headed household vulnerability (OR 1.64) merits gender-specific policy analysis addressing labor market discrimination and social protection adequacy.

Longitudinal investigations documenting poverty transitions following health events, long-term debt burden consequences, and educational outcome impacts represent important research gaps requiring future investigation. The current analysis establishes cross-sectional vulnerability profiles; temporal analysis of consumption recovery patterns and financial stress persistence would strengthen policy targeting precision.

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