Socioeconomic Inequalities in Catastrophic Health Expenditure in Sindh Province of Pakistan

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ARTICLE INFO	ABSTRACT
	This study aims to examines the socio-economic inequality in Catastrophic Health Expenditure(CHE) by using the data from the Household Integrated Economic Surveys. Catastrophic Health Expenditure(CHE) was computed using the ability-to-pay-approach. To assess socioeconomic inequality in CHE for the years 2018, both generalized and standard concentration Indices were used. The results of concentration index revealed that Catastrophic Health Expenditure(CHE) concentrated among the poor in Sindh. The inequality decomposition analysis reveals that wealth status was the main cause of the inequality. The upper wealth quantiles had larger contribution, while the lower quantiles showed smaller contribution to inequality in CHE. Further, employed head of the household, Educated head of household, private provision of healthcare, and inpatient access of healthcare were negative contributors to CHE inequality in Sindh.

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1.   Introduction

In pursuance of United Nations Sustainable Development Framework, developing countries have taken concrete steps towards achieving Universal Health Coverage (UHC), aiming to address the healthcare needs of all individuals irrespective of their financial capabilities (Collaborative, 2021; Hogan, Stevens, Hosseinpoor, & Boerma, 2018). However, evidence suggests that financial hardship poses a significant barrier to equitable healthcare access in these countries, particularly in instances where out-of-pocket healthcare payments share a substantial portion of healthcare expenses (Rahman, Gasbarro, & Alam, 2022). Out-of-pocket (OOP) medical expenses refer to payments made directly by households to acquire healthcare services. Statistics reveal that in Low-Income Countries, the share of OOP stands at 41%, significantly higher than the 22% observed in High-Income Countries. Similarly, for lower-middle-income and upper-middle-income nations, out-of-pocket health expenditure accounts for 40% and 31% of total healthcare spending, respectively (Global spending on health: a world in transition, 2019). These figures underscore the heavy reliance of low-income countries on private healthcare financing, particularly through OOP health expenditure. In Pakistan due to limited provision of healthcare services in the public sector, a significant share of healthcare costs is incurred by the private sector. According to healthcare financing data for the fiscal year 2019-20, approximately 40% of healthcare expenses are funded by the general government, while around 59.5% are shouldered by the private sector. Out of substantial 89% of the expenses incurred by the private sector are OOP, which are directly borne by individualsn (Pakistan Bureau of Statistics, 2021).

Sindh's share of total out-of-pocket (OOP) expenditure in the country stands at 23%. However, within its provincial healthcare expenditure, the share of OOP expenses rises significantly to 52% (Pakistan Bureau of Statistics, 2021). The dependence on OOP expenses leaves individuals inadequately protected against financial difficulties, often resulting in unmet

healthcare needs. Moreover, these financial hardships can exacerbate socio-economic inequalities in health, leading to a decline in overall health status (Hajizadeh, Pandey, & Pulok, 2023). Health expenditure is deemed catastrophic when out-of-pocket expenses for health exceed either 10% of total expenditure of household or 40% of household non-food expenses (Wagstaff, Van Doorslaer, & Watanabe, 2003). The catastrophic healthcare expenditure have the potential to push households into impoverishment (Rezapour, Vahedi, Khiavi, Esmaeilzadeh, Javan-Noughabi, & Rajabi, 2017; Vahedi et al., 2020). Reliance on OOP healthcare financing exposes households to the risk of depleting savings or resorting to borrowing. When healthcare costs surpass a household's financial capacity, it can lead to a significant decline in their quality of life, reaching catastrophic levels (Van Doorslaer et al., 2007). Catastrophic health expenditure (CHE) exacerbates socio-economic inequalities in health. For example, in Brazil, between 2002 and 2009, socio-economic inequality in CHE increased significantly, with the poorest individuals experiencing a 5.2-fold increase and those with the lowest education level facing a fourfold increase (Boing, Bertoldi, Barros, Posenato, & Peres, 2014). Similarly, poor households residing in both slum and non-slum areas of Hanoi, Vietnam, encountered a greater likelihood of CHE. However, only poor households in slum areas were at a heightened risk of falling into impoverishment due to healthcare expenses (Kien, Van Minh, Giang, Dao, Tuan, & Ng, 2016). Over the past decade in India, the average OOP health expenditure has been on the rise. Notably, wealthier households tend to allocate a larger portion of their spending on inpatient care, while the poorer spend more on outpatient care (Akhtar, Ahmad, & Roy Chowdhury, 2020).

None of the studies investigating the socioeconomic inequality in Pakistan is found. Hence this study aims to address the current research gap by investigating the socio-economic inequality in catastrophic healthcare expenditure in Sindh province of Pakistan. Firstly, it seeks to assess the incidence of catastrophic healthcare expenditure. Secondly, it aims to examine the presence of socio-economic inequality in CHE. Additionally, the study explores the contributing factors to socio-economic inequality in CHE and their extent. The paper follows this sequence: Section II covers the data and methodology, Section III presents the results, Section IV provides the discussion, followed by conclusion.

2. Methodology
2.1. Data and Sampling Strategy
The study extracted its data from the Household Integrated Economic Surveys (HIES) and National Health Accounts (NHS) conducted by the Pakistan Bureau of Statistics, covering the years 2018-19. The HIES provided extensive coverage of various socio-economic indicators, including Health, Education, Housing, Population Welfare, Water Sanitation and Hygiene, Income and Expenditure, Information Communication and Technology (ICT), and Food Insecurity Experience Scale (FIES), among others. Pakistan Bureau of Statistics employed different data collection approaches, based on sampling constructed from Census 2017 data. To ensure comprehensive coverage, enumeration blocks were selected from all four provinces for the survey, with each block averaging 200-250 houses. These blocks were further categorized into rural and urban areas, treating enumeration blocks as Primary Sampling Units (PSUs) in urban regions and dividing villages into blocks with clearly defined boundaries and maps in rural areas. The study extracted a sample of 24,809 households in 2018-19. As this study focuses on Sindh, data specific to Sindh (A sample of 9,763) was extracted from the survey.

2.2. Catastrophic Health Expenditures CHE
There are two widely accepted approaches to measuring catastrophic health expenditure. The budget share method assesses catastrophic healthcare expenditure when out-of-pocket (OOP) healthcare expenses exceed 10% of a household's total consumption expenditures (Van Doorslaer et al., 2007). In contrast, the capacity-to-pay method examines OOP healthcare expenses that surpass 40% of none-food expenditure. It has been observed that while the budget share approach underestimates catastrophic health expenditure for poorer households, it overestimates it for wealthier households. For low and middle-income households, the capacity-to-pay approach is deemed more appropriate (Wagstaff, Van Doorslaer, & Watanabe, 2003). This study aims to measure health inequality in catastrophic health expenditure based on the ranking of total household expenditures, hence the utilization of the capacity-to-pay method exclusively

$$hi = 0 \; if \; \left\{ \frac{OOPi}{(Ei - f(Ei))} \right\} < Z$$

$$hi = 1 \; if \; \left\{ \frac{OOPi}{(Ei - f(Ei))} \right\} \geq Z$$

The variable "hi" evaluates whether Catastrophic Health Expenditures (CHE) exceed the 40% threshold, where:

hi = (Catastrophic Healthcare expenditure (CHE) / Total expenditures of Household)
OOPi = Out of pocket healthcare expenditures
Ei = Total expenditures of Household
f(Ei) = Household expenditures on food z = Given CHE threshold

2.3. Concentration index

The Concentration index(CI) is commonly used to measure the socio-economic inequality related health. In the assessment of inequality concerning catastrophic health expenditures, employing the standard concentration index for relative inequalities and the generalized concentration index for absolute inequalities is appropriate (O'Donnell, O'Neill, Van Ourti, & Walsh, 2016). In this study, we used both relative and absolute measures to assess the socio-economic inequality in CHE. The SCI takes following form

$$C(h|y) = \frac{2\,\text{cov}(h_i, R_i)}{\bar{h}} = \frac{1}{n} \sum_{i=1}^{n} \left[\frac{h_i}{h} \left(2R_i - 1 \right) \right]$$

Where, n = The total number of the samples
h_i = Either the household incurs Catastrophic Healthcare Expenditures(CHE) or not
R_i – 1 , = The fractional range of per capita expenditures, with i=1 for poorest and i=n for the richest individuals
The Generalized Concentration Index (GCI) can be expressed as

$$GCI = C(h|y) = \frac{1}{n} \sum_{i=1}^{n} \left[h_i \left(2R_i - 1 \right) \right]$$

The SCI and GCI values ranges in between -1 and +1, with zero representing "perfect equality (Hajizadeh et al., 2023; O'Donnell et al., 2007).

2.4. Decomposition of concentration index (CI)

The decomposition analysis involves investigating the connection between an outcome variable and a set of observed characteristics. In this study we use Oaxaca-type decomposition of inequality introduced by (Wagstaff et al., 2003) as a method for examining the influence of temporal changes in the determinants of health inequality. The Concentration Index is specified as a regression, represented by the following equation.

$$CI = \sum \left(\frac{\beta_\kappa \chi_\kappa}{\mu} \right) CC_\kappa + \frac{GC_\varepsilon}{\mu}$$

where x_k = mean of kth covariates,
μ = mean of the binary health outcome (i.e., household with Catastrophic Healthcare Expenditures)
CCI_k = concentration index of kth determinants calculated by using Equation 2,
k = marginal effect of parameter β_k and GC_ε/μ represents the unexplained inequality in Catastrophic Health Expenditures.

The sign of absolute contribution with respect to CI indicates either the determinant is inducing or reducing the inequality to the incidence of CHE. If the sign of the absolute

contribution concerning CI is the same, it exacerbates inequality, whereas it reduces inequality in CHE if the sign of the absolute contribution and CI are in opposite directions

3.   Results
3.1.   Measurement of Catastrophic Health Expenditures:
Catastrophic Health Expenditure (CHE) for the year 2018-19 was assessed using the capacity to pay method, which accounted for 40% of non-food expenditures. To ensure the reliability of the findings, additional thresholds were considered, including 10%, 15%, and 20% of total expenditures, with 20% of non-food expenditure also taken into account. The capacity to pay method revealed that 3.2% of the population experienced CHE in 2018-19. Table 1 presents the results of using different cutoffs, indicating that CHE rates were higher when utilizing 20% of non-food expenditure but lower when applying the same approach with a 20% cutoff.

Table 1: Incidence of Catastrophic Health Expenditure in 2018-19 in Sindh

Cut off	2018-19
@10% of Monthly total Expenditures	7.8%
@15% of Monthly total Expenditures	4.7 %
@20% of Monthly total Expenditures	3.3%
@20% of None food Expenditures	8.0 %
@40% of None food Expenditure	3.2%

Table 2 shows the socio-economic attributes of households that encountered catastrophic health expenditure in 2019. The findings indicate that 79% of households affected by CHE reside in rural areas of Sindh. The CHE prevalence is higher in male-headed households compared to female-headed ones. Moreover, households led by individuals with no formal education are more susceptible to CHE than those led by educated heads.

Table 2: Percentage distribution of Socio-economic characteristics experiencing CHE

Variable	Category	Percentage 2018-19 at 40% CTP
Region	Rural	79.3
	Urban	20.6
Gender of head of household	Male	99.1
	Female	0.1
Age of head of household	16-30years	17.5
	31-50years	37.5
	51-60years	17.5
	60years & above	27.5
Education status	Attended school	40.1
	Never attended school	59.8
Employment status	Employed	48.4
	Unemployed	51.5
Type of Healthcare access	Outpatient	70.9
	Inpatient	18.3
	Self-Medication	10.5
Type of Healthcare provider	Private	82.8
	Public	17.1
Wealth status	Poorest	30.9
	Poorer	22.8
	Middle	19.3
	Richer	12.8
	Richest	14.0
Household Size	1-3	25.9
	4-6	35.0
	7	39.0

Similarly, smaller households exhibit a higher proportion of CHE incidents compared to larger ones. The data illustrates that households with the lowest socioeconomic status (poorest) have high tendency to experience CHE in Sindh.

3.2.   Socio-economic inequality in CHE
Table 3 illustrates the results of concentration indices (standard and generalized) computed using Capacity to Pay methods for the year 2018-19. The findings demonstrate that catastrophic health expenditure (CHE) was concentrated among individuals with low

socioeconomic status (poor), as evidenced by the negative values of the concentration index. The results of standard and generalized indices presented in Table 3 reveals that concentration index values of -0.095(SCI) and -0.002(GCI), respectively.

Table 3: Concentration Indices

Index value @40% of None food Expenditures			P-Value
Standard	Generalized	Erreygers	
-0.095	-0.003	-0.012	0.0506

3.3. Decomposition of socio-economic inequality

Tables 4 display the results of the Wagstaff, Doors, and Wold decomposition (WDW) of inequality in catastrophic health expenditure (CHE) for the year 2018-1. The primary drivers of CHE inequality were the wealth quantiles, followed by urban residence.

Table 4: Decomposition of catastrophic health expenditure 2010-11 and 2018-19 (CHE at 40% of non-food expenditure)

Dependent variable	Decomposition				
	Elasticity	CI	Contribution		
			Absolute	Percentage	
Second quintile	0.002	-0.053	-0.000	2.7	
Middle quintile	-0.003	0.018	-0.000	1.2	
Fourth quintile	-0.002	0.087	-0.001	32.8	
Richest quintile	-0.001	0.141	-0.001	38.7	
Female	-0.050	0.000	-0.000	1.5	
31-50 years	-0.001	-0.017	0.001	-4.5	
51+-60 years	-0.000	0.012	-0.000	0.5	
60 plus	0.018	0.008	0.001	-8.7	
Educated HH head	0.002	0.088	0.004	-12.7	
Employed HH head	-0.005	-0.045	0.001	-14.9	
4-6	-0.001	-0.003	0.000	-2.5	
7	0.001	0.088	0.008	-29.6	
Urban Residence	-0.002	0.117	-0.003	113.5	
Private provider	0.005	0.024	0.001	-10.5	
Inpatient	0.121	0.001	0.001	-8.4	
Residual			-0.001	5.1	
Total			-0.003	100	

The wealth quantiles and urban residence emerged as statistically significant contributors to inequality in CHE, with a positive impact indicating a preference for the better-off and disadvantage for the poor. On the other hand, employed head of the household, Educated head of household, private provision of healthcare, and inpatient access of healthcare were negative contributors to CHE inequality, suggesting a preference for the poor and a disadvantage for the rich. Additionally, unexplained factors played a significant and positive role in contributing to inequality in CHE, further favoring the better-off and disadvantaging the poor. The share of unexplained contributors was 5% in the inequality of CHE. The potential unexplained factors might be the income of household (as we have used consumption expenditure of household for wealth quantiles), the marital status, household with elderly, household with children and disease.

4. Discussion

The data reveals a concentration of Catastrophic Health Expenditure (CHE) among the lower socio-economic strata, in Sindh, inferred from the negative concentration index values. This suggests that individuals with lower socio-economic status face greater socio-economic inequalities in catastrophic health expenditures compared to wealthier segments of the population. The unequal burden of healthcare expenditure (CHE) on the poor may stem from the predominant reliance on private healthcare financing, which constitutes 60% of healthcare expenditure (Pakistan Bureau of Statistics, 2021). With insufficient investment leading to gaps in affordable healthcare access, a significant portion of healthcare expenses is covered through out-of-pocket (OOP) spending, often incurred at private facilities. Consequently, this scenario exacerbates the visible disparity in healthcare access between affluent and impoverished individuals (ILO, 2014). This study identifies wealth quantiles, particularly the higher ones, as the primary contributors to inequality in Catastrophic Health Expenditure (CHE), with a positive

impact on the inequality in Sindh province. Additionally, factors such as having an educated or employed head of household, reliance on private healthcare providers, and access to inpatient healthcare contribute to reducing CHE inequality. Urban residence emerges as another significant contributor to inequality in CHE, after wealth quantiles. Despite generally better accessibility to healthcare services in urban areas compared to rural regions, considerable disparities persist in the access and utilization of these services among different social groups within urban centers(De Snyder et al., 2011). In Sindh the inequality in Catastrophic Health Expenditure (CHE) persists, that predominantly concentrated among poorer segments of the population, raising concerns. Implementing integrated healthcare policies that involve multiple sectors can offer essential financial risk protection to the most vulnerable individuals. Sindh has introduced Public-Private Partnerships (PPP) in healthcare, which have yielded positive results in both primary and tertiary healthcare. This program needs to be aligned with efforts to address the exacerbating socioeconomic inequality in health within the province. Overall Pakistan lags behind its neighboring countries in the region regarding health indicators. By prioritizing the enhancement of social health protection for its populace, the country can enhance health outcomes, thereby alleviating socioeconomically driven inequalities in healthcare expenditure (ILO, 2014). Moreover, targeted interventions are necessary to tackle income disparities and regional differences, which exacerbate health inequality.

5. Conclusion

This study examines the socio-economic inequality in catastrophic health expenditure (CHE) in Sindh, delving into the contributing factors. The findings reveal persistent concentration of inequality among the lower socio-economic strata. Wealth status emerges as the primary driver of this inequality, with other factors playing lesser roles. Understanding the factors perpetuating this socio-economic inequality in CHE is crucial for designing interventions that prioritize the well-being of the economically disadvantaged households in Sindh. These interventions strive to mitigate the economic strain caused by exorbitant healthcare expenditures while also working towards reducing the overarching socio-economic inequalities. Considering the intricate interplay between health and socio-economic status is essential for addressing these inequalities effectively. In Sindh, the inequality in Catastrophic Health Expenditure (CHE) persists, predominantly affecting the poorer segments of the population, which is concerning. Implementing comprehensive healthcare policies involving various sectors can provide crucial financial risk protection to the most vulnerable individuals.

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