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ORIGINAL ARTICLE

Associations between Health Needs, Utilization Factors, and Catastrophic Healthcare Expenditure in Bauchi State, Nigeria

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Abstract

Background: Catastrophic healthcare expenditure (CHE) poses a significant financial burden on households, particularly in low-resource settings like Bauchi State, Nigeria, where out-of-pocket (OOP) payments dominate healthcare financing. Understanding the interplay between health needs, utilization factors, and CHE is critical for developing targeted interventions to mitigate financial hardship. This study examined the associations between health needs, healthcare utilization factors, and CHE among households in Bauchi State, Nigeria, using a mixed-methods approach.

Methods: Employed a cross-sectional design to examine the associations between health needs, healthcare utilization factors, and catastrophic healthcare expenditure (CHE) involving 986 households. Quantitative data were analyzed using descriptive and inferential statistics (logistic regression).

Results: The prevalence of CHE was 41.5%, with a mean overshoot of ₦80,291.13 (SD = ₦92,568.99). Key predictors of CHE included: Predisposing factors: Younger household heads, male-headed households, lower educational attainment, larger household size, and rural residence. Enabling factors: Lack of health insurance, reliance on OOP payments, and lower income levels. Need factors: Presence of children under five, chronic illnesses, and inpatient healthcare utilization.

Conclusion: CHE is highly prevalent in Bauchi State, disproportionately affecting vulnerable households. Strengthening health insurance coverage, expanding subsidized healthcare services, and addressing systemic barriers to access are essential to reducing financial hardship. Policy reforms should prioritize equitable healthcare financing to achieve Universal Health Coverage (UHC) and Sustainable Development Goals (SDGs) related to health and poverty reduction.

Keywords: Catastrophic healthcare expenditure, Out-of-Pocket payment, Nigeria, Universal Health Coverage

Introduction

Access to affordable and equitable healthcare is a fundamental component of social well-being, yet in many low- and middle-income countries (LMICs), this remains a distant goal. In Nigeria, healthcare financing is predominantly through out-of-pocket (OOP) payments, which account for over 70% of total health expenditures (Aregbeshola and Khan 2018). This financial structure exposes households to a heightened risk of catastrophic health expenditure (CHE)—defined as healthcare spending that compromises a household's ability to maintain a basic standard of living (Xu et al. 2003). Bauchi State, located in Nigeria's northeast region, typifies this national trend. With a largely rural population, widespread poverty, and limited access to quality healthcare, residents of Bauchi face numerous obstacles in meeting their health needs without incurring severe financial hardship. The persistent reliance on OOP payments in Bauchi, combined with inadequate health infrastructure and limited social health protection schemes, has contributed to unmet healthcare needs and adverse health out-

comes. Despite the introduction of community-based health insurance (CBHI) initiatives and other interventions aimed at reducing financial barriers, these measures have yet to achieve broad coverage or effectiveness due to issues such as low enrollment, weak governance, and insufficient funding (Onoka et al. 2011). As a result, vulnerable groups—particularly low-income, rural households remain disproportionately burdened by the cost of healthcare services. The complex interplay between household health needs, service utilization patterns, and socioeconomic factors has been explored through theoretical frameworks such as Andersen's Behavioral Model of Health Service Use, which considers predisposing, enabling, and need-based factors as determinants of health-seeking behavior (Uzochukwu et al. 2015). Empirical studies across Nigeria and Sub-Saharan Africa have consistently shown that income level, education, geographic location, and proximity to health facilities significantly affect both the likelihood of seeking care and the risk of CHE (Ichoku and Fonta 2009; Xu et al. 2007). In Bauchi State, these challenges are further exacerbated by cultural beliefs, lack of health awareness, and physical barriers to healthcare access. These non-financial constraints often delay care-seeking and increase the risk of severe illness, which in turn escalates healthcare costs when services are eventually accessed. Without adequate risk pooling mechanisms such as health insurance, households often resort to borrowing, asset sales, or forgoing essential care practices that entrench poverty and deepen health inequities. Given the limited research focusing on the direct linkages between perceived health needs, healthcare utilization, and CHE in Bauchi, this study aims to fill an important gap. By examining how household health needs and utilization behavior contribute to the likelihood of experiencing CHE, the study provides evidence to inform the design of equitable and sustainable healthcare financing policies. Ultimately, the findings are intended to support Nigeria's broader efforts to achieve Universal Health Coverage (UHC) and protect its most vulnerable populations from the financial shocks associated with ill health.

Methods

This study adopted a cross-sectional design to explore the associations between health needs, healthcare utilization patterns, and catastrophic healthcare expenditure (CHE) in Bauchi State, northeastern Nigeria. The state, characterized by a predominantly rural population and constrained healthcare infrastructure, presents a suitable setting for investigating financial risk protection in health service delivery. The study population comprised households across selected local government areas (LGAs) in the state. A multistage sampling technique was utilized, beginning with the selection of LGAs using probability proportional to size, followed by random selection of enumeration areas (EAs) and households within those areas. The primary respondents were adult household heads or informed representatives capable of providing accurate information on household income, health expenditures, and health-seeking behavior. Inclusion criteria required households to have resided in the selected areas for at least six months prior to data collection, with a consenting adult (aged 18 years or older) available to provide relevant data. Additionally, only households that reported healthcare utilization either outpatient care within the past 30 days or inpatient care within the past six months were included to ensure accurate measurement of out-of-pocket (OOP) spending. Households were excluded if they declined participation, provided incomplete or inconsistent data, or belonged to institutional settings such as dormitories or hospitals, which do not represent typical household expenditure patterns.

Sample Size Determination

The sample size for the quantitative component of the study was calculated using Cochran's formula for cross-sectional studies::

$$n = Z^2 \cdot \frac{p(1-p)}{d^2} \tag{1}$$

where n = required sample size, Z = Z-score for 95% confidence level (1.96), p = estimated prevalence of catastrophic healthcare expenditure (set at 50% to maximize sample size), d = margin of error (0.05).

Substituting the values:

$$\begin{aligned} n &= \frac{(1.96)^2 \times 0.5 \times (1-0.5)}{(0.05)^2} \\ &= \frac{3.8416 \times 0.5 \times 0.5}{0.0025} \\ &= \frac{0.9604}{0.0025} \\ &= 384.16 \approx 384 \end{aligned}$$

After adjusting for a design effect of 2 (due to multistage sampling) and a 20% non-response rate:

$$\begin{aligned} n_{\text{adjusted}} &= 384 \times 2 = 768 \\ n_{\text{final}} &= 768 + (0.2 \times 768) = 921.6 \approx 922 \end{aligned}$$

However, a total of 986 households were ultimately surveyed to ensure adequate power for subgroup analyses and compensate for any incomplete responses. Data collection involved administering a structured and pre-tested questionnaire by trained field workers. The instrument captured key domains including demographic and socioeconomic characteristics, indicators of health need such as chronic illnesses or recent episodes of ill health, patterns of healthcare utilization (e.g., frequency of visits, facility type, inpatient or outpatient status), and OOP health expenditures. In addition, households were asked about their total consumption expenditures to facilitate the identification of CHE incidence based on established thresholds. Data were analyzed using STATA version 19. Descriptive statistics were used to summarize the demographic and health characteristics of the respondents, while bivariate and multivariate logistic regression analyses were performed to examine the relationships between health needs, healthcare

utilization, and the risk of CHE. Statistical significance was set at a p-value of < 0.05.

Ethical Considerations The Bauchi State Ministry of Health Research Ethics Committee granted ethical approval for this study, guaranteeing compliance with accepted research governance guidelines. All participants gave their informed permission after being fully informed about the goals, methods, and rights of the study. Strict anonymization and safe data storage procedures preserved confidentiality. All ethical practices upheld the values of autonomy, beneficence, and justice by being in line with international standards for research involving human beings.

Results

Prevalence and Financial Impact of Catastrophic Healthcare Expenditure (CHE)

At the 10% threshold of household income, the prevalence of catastrophic healthcare expenditure among households in Bauchi State was 41.5% (n = 406). The mean overshoot of CHE was ₦80,291.13 (SD = ₦92,568.99), with a mean percentage overshoot of 151.37%, indicating that affected. Table 1 shows that 41.5% of households in Bauchi State experienced catastrophic healthcare expenditure (CHE), defined as out-of-pocket spending exceeding 10% of household income. On average, affected households overspent by ₦80,291.13, with a mean percentage overshoot of 151.37%, indicating severe financial strain. These findings underscore the urgent need for policies that enhance financial protection in healthcare.

Associations between CHE and Independent Variables

Predisposing Factors Table 2 shows CHE in Bauchi State was more prevalent among households headed by individuals aged 30–59 years, males, and those with secondary or higher education—likely due to greater healthcare use and financial responsibilities. Rural households faced higher CHE, reflecting limited access to affordable care. Larger households, those with young children, and those with chronically ill members also showed increased CHE rates, highlighting the compounding effect of greater health needs on financial burden.

Table 1. Prevalence and Overshoot of Catastrophic Healthcare Expenditure

Indicator	Value
CHE Prevalence	41.5% (n = 406)
Mean Overshoot	₦80,291.13 (SD = ₦92,568.99)
Mean % Overshoot	151.37%

Enabling Factors Table 3 highlights the financial determinants of CHE in Bauchi State. CHE is most prevalent among low-income households (65.5%) and the self-employed (63.05%), reflecting limited financial protection. Out-of-pocket payment is the strongest driver of CHE, affecting 99.75% of those relying on this method. Among households needing additional income, 90.89% experience CHE, showing their heightened vulnerability. Common coping mechanisms include borrowing (40.65%) and selling assets (35.71%), while few rely on savings (8.62%), indicating widespread financial strain and lack of resilience to health shocks.

Table 2. Distribution of CHE by Predisposing Factors

Factor	Category	With CHE (%)
Age	18–29	6.9
Age	30–59	77.1
Age	$\geq$ 60	16.0
Gender	Male	94.0
Gender	Female	6.0
Education	Secondary of higher	62.56
Residence	Rural	61.82
Household size	>5 members	83.25
Children under 5	>1 Child 8	55.42
Chronic Illness Present	Yes	55.42

Table 3. Distribution of CHE by Enabling Factors

Factor	CHE (%)
Income Class	
Low	65.50
Middle	24.14
High	9.36
Employment	
Self-employed	63.05
Payment Method	
Out-of-pocket	99.75
Additional Income	
Yes	90.89
Coping Strategy	
Borrowing	40.65
Selling Valuables	35.71
Savings	8.62

Need Factors

Table 4 reveals a strong link between poor health status, low income, and catastrophic health expenditures (CHE). Individuals who self-report poor health have the highest CHE incidence (81.08%), while 58.82% of low-income earners also report CHE, compared to just 16.81% in the high-income group. These findings highlight the compounded vulnerability of those with both poor health and limited financial means, underscoring the urgent need for targeted financial protection and inclusive health policies for these at-risk populations.

In Table 5, Logistic regression analysis revealed key predictors of catastrophic health expenditures (CHE) in Bauchi State. Individuals aged 18–59, those with lower educational attainment (especially pre-school level), urban residents, smaller households, and families with children under five were more likely to face CHE. Out-of-pocket payment was a significant risk factor, reflecting the impact of inadequate health coverage. Additionally, low- and middle-income households had

Table 4. CHE by Health Status and Income Class

Factor	CHE (%)
Income Class	
Poor	58.82
Low	16.81
Self-assessed Health	
Poor	81.08

higher odds of CHE, emphasizing the central role of income in financial vulnerability. These results highlight the need for targeted policies to enhance financial protection and healthcare affordability for at-risk groups.

Table 5. Logistic Regression Analysis of Predictors of CHE

Variable	Odds Ratio	95% CI	P-Value
Age			
18-29	3.43	2.242–6.820	0.025*
30-59	7.84	3.960–9.112	0.016*
Education			
Pre-school	5.12	0.903–4.332	0.038*
Residence			
Urban	1.85	1.057–3.246	0.031*
Household size			
<5	3.89	1.393–10.878	0.010*
≥ 5	3.89	1.393–10.878	<0.001*
Income			
Low	3.16	0.086–0.293	<0.001*
Middle	2.21	0.011–0.186	<0.001*
Payment			
Out-of-pocket	0.26	4.011–6.273	0.026*

Table note
* Statistical ly Significant

Discussion

This study found that 41.5% of households in Bauchi State experienced catastrophic health expenditure (CHE), highlighting the financial burden of out-of-pocket (OOP) payments in low-resource settings, consistent with global findings (Xu et al. 2003). The high mean and percentage overshoot (₦80,291.13; 151.37%) underscores the depth of financial strain, particularly among low-income and rural households. CHE was more prevalent among male-headed households aged 30–59 years (77.1%, 94%), likely due to their roles in income generation and decision-making (Wagstaff and Doorslaer 2003). Similarly, those with secondary or higher education (62.56%) may incur more CHE due to increased healthcare utilization (World Health Organization (WHO) 2010). Rural households (61.82%) faced greater exposure, reflecting persistent disparities in access (Xu et al. 2007). Larger households, under-five children, and chronic illnesses (each 55.42%) were associated with higher CHE, aligning with past evidence (Saksena, Hsu, and Evans 2014). However, these patterns may differ elsewhere. Older adults may face higher CHE due to age-related health burdens (Li et al. 2012). Female-headed and less educated households also risk CHE, especially where informal providers and unregulated costs prevail (Binnendijk, Koren, and Dror 2012; Ensor and Cooper 2004). Urban poor populations may face similar or greater financial hardship than rural ones (World Bank 2014). Low-income households (65.5%) and the self-employed (63.05%) were disproportionately affected, reflecting the lack of financial protection and insurance (Xu et al. 2003). Almost all households relying solely on OOP payments (99.75%) faced CHE, reinforcing their role as key drivers of financial distress (Wagstaff and Doorslaer 2003). Coping strategies like borrowing (40.65%) and asset sales (35.71%) mirrored findings from other LMICs (Knaul et al. 2012). Nonetheless, some households may underutilize care due to lack of credit access, masking CHE (Russell 2004). In some contexts, informal insurance may protect self-employed individuals, while middle-income groups excluded from subsidies also face high risk (Kutzin 2013). Need factors, particularly poor perceived health (81.08%) and low income (58.82%), significantly predicted CHE, reinforcing the link between vulnerability and economic burden. However, unmet health needs due to cost may lead to underreporting (Hart 1971). Robust systems with risk-pooling may mitigate this impact (Wagstaff et al. 2018). Multivariate analysis (Nagelkerke R^2 = 0.817) confirmed predictors such as age (OR = 3.426–7.836), low education (OR = 5.168), smaller household size (OR = 3.358), and under-five children (OR = 3.892) (Saksena, Hsu, and Evans 2014). Surprisingly, OOP payments (OR = 0.261) appeared protective, possibly due to higher-income groups paying OOP without hardship or care avoidance among poorer households (Russell 2004). Income remained a strong determinant (OR = 3.159–2.214), consistent with global literature (Wagstaff et al. 2018). These findings highlight the multifaceted drivers of CHE and the urgent need for equity-oriented health financing reforms.

Implications of the study

1. Strengthen the National Health Insurance Scheme (NHIS) and expand community-based health insurance (CBHI) to reduce out-of-pocket (OOP) expenditures and enhance population coverage, particularly for the informal sector and rural communities.
2. Implement targeted subsidies for vulnerable groups including low-income households, rural dwellers, and families with young children or members with chronic illnesses to ensure financial protection and equity in healthcare access.
3. Improve rural health infrastructure and services, including primary healthcare centers, to enhance access, reduce transportation costs, and minimize treatment delays that contribute to financial hardship.
4. Establish comprehensive financial protection mechanisms, such as conditional cash transfers, health vouchers, or emergency medical funds, to shield households from asset depletion, borrowing, and other harmful coping strategies.

Limitations

1. Cross-sectional design: The study's design limits the ability to infer causality between healthcare utilization, socioeconomic factors, and catastrophic health expenditure (CHE).
2. Self-reported data: Reliance on respondents' recall of health expenditures and utilization may introduce recall bias or misreporting, especially for less frequent or informal healthcare services.
3. Generalizability: Findings may not be fully generalizable beyond Bauchi State or similar low-resource settings, due to regional variations in healthcare infrastructure, insurance coverage, and cultural health-seeking behaviors.

Conclusion

This study founds that health needs, utilization patterns, and socioeconomic vulnerabilities collectively drive catastrophic healthcare expenditure in Bauchi State. These findings reinforce the urgency of multisectoral health financing reforms aimed at expanding financial protection and improving equitable access to healthcare. Addressing the identified predictors of CHE is critical to advancing Nigeria's progress toward universal health coverage and minimizing health-related impoverishment.

Competing Interests None to declare.

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