HEALTHCARE INFLATION AND VULNERABILITY IN NIGERIA: IDENTIFYING AT-RISK POPULATIONS (1985–2023)

BY

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Abstract
Healthcare inflation has remained a persistent challenge in Nigeria, significantly undermining the affordability of medical services and exacerbating existing health inequalities. Rising costs of healthcare disproportionately affect vulnerable populations, limiting access to essential services and widening the gap between different socio-economic groups. This study examines the relationship between healthcare inflation and vulnerability, with a particular focus on at-risk populations over the period from 1985 to 2023. To achieve its objectives, the study adopts an Autoregressive Distributed Lag (ARDL) model, which allows for the analysis of both short- and long-term dynamics among the variables. The findings indicate that healthcare inflation in urban areas has a significant positive effect on vulnerability, suggesting that increases in medical costs in cities intensify the exposure of populations to health-related risks. In contrast, healthcare inflation in rural areas is found to have an insignificant effect, possibly due to lower utilization of formal healthcare services or differing cost structures in those regions. Furthermore, the results reveal that health expenditure as a percentage of Gross Domestic Product (GDP) has a significant negative effect on vulnerability. This implies that increased public investment in healthcare can help reduce the adverse impacts of rising medical costs and improve overall population resilience. On the other hand, GDP per capita growth is shown to have an insignificant moderating effect, indicating that economic growth alone does not necessarily translate into improved healthcare access or reduced vulnerability. Based on these findings, the study recommends that governments at all levels prioritize policies aimed at controlling healthcare inflation, increasing effective healthcare spending, and fostering inclusive economic growth to enhance access and equity in Nigeria's health sector.
Keywords: Healthcare, Vulnerability, Risk Population, Inflation

Introduction

The Vulnerability Index is a complete tool which shows differences by gender, region, and socioeconomic status (Miller, et al., 2010). It serves as metric to measure the risks households face when seeking access to healthcare. This tool steers Nigeria's efforts toward universal health coverage through promotion of equity. Global healthcare systems are facing growing pressure from widening socioeconomic inequalities, shifting population trends, and rising costs. These challenges are particularly severe in low- and middle-income countries (LMICs) due to fragile health systems which exist alongside widespread poverty and limited social support structures. Nigeria is a clear example of this situation. Between 1985 and 2023, the country has experienced significant healthcare inflation was driven by factors such as currency depreciation, inefficiencies in public health financing, and over dependence on imported medical supplies and technologies.

In Nigeria, out-of-pocket spending accounts for over 70% of total health expenditure (World Bank Group, 2023) and it places a significant financial strain on households. As healthcare costs continue to rise, many people are forced to delay treatment which might lead to higher mortality rates and a decline in overall quality of life. These challenges are not isolated as healthcare inflation is deeply intertwined with broader socioeconomic issues. Persistent income

inequality, high unemployment, and uneven access to healthcare services across regions exacerbate the situation. For households already living below the poverty line, a minor increase in medical expenses can be overwhelming and trigger catastrophic spending, deepen poverty and restrict access to essential care. According to the Multidimensional Poverty Index, more than 63% of Nigerians remain vulnerable to these pressures (Nnamdi & Ngwu, 2025)

Nigeria has limited access to basic health services, as evidenced by its Universal Health Coverage (UHC) ranking of 38.42 out of 100 which is below World Health Organization (WHO) African average (World Health Organization, 2025). Access to basic health services remains limited due to poor health coverage. This low score points to deeper systemic problems such as poor health infrastructure, lack of skilled professionals and uneven access to healthcare services across states. Sadly, progress toward universal health coverage in Nigeria has remained slow and limited despite establishment of National Health Insurance Scheme (NHIS). Studies such as (Aniebo, Lawani, & Eze, 2025; Wright, et al., 2025) examined out-of-pocket health expenditure and catastrophic health expenditure using cross-sectional data. The analyses are largely cross-sectional and geographically limited. They do not adequately capture the long-term trajectory of healthcare inflation and its cumulative impact on population vulnerability. This gap is particularly important given Nigeria's persistent socioeconomic inequalities, high poverty levels and structural weaknesses in the health system. All of these amplify the effects of rising healthcare costs. To better understand how healthcare inflation shapes vulnerability over time, a more comprehensive, longitudinal approach is needed. This study also derived vulnerability index using composite function as against Universal Health Coverage widely used by World Health Organization as proxy.

Literature Review

Studies indicate that inflationary shocks particularly the removal of fuel subsidies in 2023—have significantly increased the cost of healthcare in Nigeria, placing a disproportionate burden on households that depend on fixed incomes (Bala, 2024). This development underscores the fragility of Nigeria's health financing system, which remains highly sensitive to both domestic policies shifts and global economic pressures. These combined forces continue to drive inflation, making healthcare less affordable for many citizens. Although there has been a slight improvement, with out-of-pocket (OOP) health expenditure declining to 58.3% in 2024, the system still relies heavily on direct payments by individuals at the point of service. This persistent dependence on OOP payments exposes households to catastrophic health expenditures (CHE), particularly among those with limited or unstable incomes. The vulnerability of low-income households becomes even more evident when examining recent empirical studies. Aniebo, Lawani, and Eze (2025) assessed catastrophic health expenditures in Nigeria in the post-pandemic era using nationally representative household survey data. Their findings revealed that certain demographic groups are especially at risk. These include elderly individuals, female-headed households, and families residing in rural areas. The study highlighted that the incidence of CHE is not only widespread but also deeply inequitable, disproportionately affecting already marginalized populations. In response, the authors emphasized the urgent need for comprehensive and inclusive health insurance programs that can offer financial protection to these vulnerable groups and reduce their exposure to severe economic hardship resulting from healthcare costs.

Further insights are provided by Adomi et al. (2024), who carried out a scoping review focusing on the relationship between healthcare inflation and socioeconomic inequalities across Nigeria. Their analysis identified significant regional disparities, with inflation intensifying existing inequalities and deepening vulnerability, particularly in the northern regions of the country. These findings suggest that the impact of rising healthcare costs is not uniform;

instead, it varies significantly depending on geographic and socioeconomic contexts. In regions where poverty rates are already high and access to healthcare services is limited, inflation exacerbates the challenges faced by households, further restricting their ability to obtain necessary care. Urban areas, which are often assumed to have better access to healthcare services, are not exempt from these challenges. Wright et al. (2025) examined the prevalence of catastrophic health expenditures in Lagos and found that CHE is particularly common among urban residents who lack health insurance coverage. This highlights a critical gap in financial protection mechanisms, even in Nigeria's most economically vibrant city. Despite the availability of healthcare facilities, the absence of insurance coverage forces many urban dwellers to bear the full cost of medical services, increasing their risk of financial distress.

Similarly, Ozor et al. (2025) explored patterns of out-of-pocket healthcare spending in urban slums and uncovered additional dimensions of inequality. Their study revealed that poorer households frequently rely on informal healthcare providers due to the high cost of formal medical services. While the analysis indicated a progressive financing pattern—where wealthier households contribute a larger proportion of their income to healthcare—the poorest segments of the population remain largely excluded from formal healthcare systems. This exclusion reinforces a cycle of vulnerability, as reliance on informal providers often results in lower-quality care and potentially worse health outcomes. The dependence on informal healthcare services also reflects the broader intersection of poverty, inequality, and healthcare inflation in Nigeria. As formal healthcare becomes increasingly unaffordable, low-income households are pushed toward alternative options that may be less effective or even unsafe. This dynamic not only undermines health outcomes but also perpetuates social and economic disparities. In this context, healthcare inflation acts as both a driver and a consequence of inequality, amplifying existing vulnerabilities and limiting opportunities for upward mobility.

Taken together, these studies paint a comprehensive picture of the challenges facing Nigeria's health financing system. While there have been some improvements, such as the modest reduction in out-of-pocket expenditure, the overall structure remains inadequate to protect households from financial shocks associated with healthcare costs. The persistence of high OOP payments, combined with limited insurance coverage and significant regional disparities, continues to place millions of Nigerians at risk of catastrophic health expenditures. Addressing these challenges will require a multifaceted approach. Expanding access to affordable and comprehensive health insurance is a critical step, particularly for vulnerable groups such as the elderly, rural populations, and female-headed households. Additionally, targeted interventions are needed to address regional inequalities and ensure that healthcare services are both accessible and affordable across all parts of the country. Strengthening regulatory frameworks to improve the quality and affordability of healthcare services, including those provided by informal sectors, is also essential. The evidence suggests that without substantial reforms, healthcare inflation will continue to exacerbate existing inequalities and undermine the financial stability of Nigerian households. A more resilient and inclusive health financing system is necessary to ensure that all citizens can access the care they need without facing undue financial hardship.

Methodology

This study is hinge on the theory of vulnerability and resilience. Vulnerability shows susceptibility to harm from external shocks while resilience stresses the ability to adjust and recover from shocks (Miller, et al., 2010). The vulnerable pathway such as catastrophic health expenditure (CHE) and poverty is moderated by resilience factors which comprise health insurance coverage (NHIS, private schemes), social safety nets (government subsidies, donor programs), community support systems (extended family, local cooperatives) and household coping strategies (income diversification, savings). High vulnerability leads to financial hardship, reduced access, worsening inequality while the strong resilience mitigates impact, improves access and reduces socioeconomic vulnerability. The two concepts are complementary in analyzing how populations respond to shocks. This study employs a longitudinal time-series analysis using data from the National Bureau of Statistics, World Bank, and WHO Global Health Observatory. Key variables include Vulnerability index (VI), healthcare inflation (HI), Urban Healthcare Inflation (UHI), Rural Healthcare Inflation (RHI), health expenditure (HE) and GDP per capita growth (GC). The data spans 1985 to 2023. Healthcare inflation (HI), Urban HI, Rural HI (annual % change in Health CPI) serve as the independent variable; Vulnerability Index (VI) as the dependent variables; GDP per capita growth (GC) and health expenditure (HE) as control variables. Since health outcome indicators are measured in different units (rates vs. years), there is need to bring them into a comparable scale. Child Mortality (CM) is measure as deaths per 1,000 live births while Maternal Mortality (MM) as deaths per 100,000 live births and Life Expectancy (LE) as average years at birth. Normalize the indicators to bring them into a comparable scale by using min-max normalization to rescale values between 0 and 1.

MMR_norm = (MMR - @min(MMR)) / (@max(MMR) - @min(MMR)) 1
IMR_norm = (IMR - @min(IMR)) / (@max(IMR) - @min(IMR)) 2

For mortality indicators, higher values mean more vulnerability, so the values are kept as above. For life expectancy, higher values mean less vulnerability, so the values are inverted:

LE_norm = 1 – (LE - @min(LE)) / (@max(LE) - @min(LE)) 3

To compute the Vulnerability Index, combine the normalized values in Eq. 3.1 – 3 and divide by the indicators equal weights.
Vulnerability_Index = (MMR_norm + IMR_norm + Rev_LE_norm) / 3 4

Augmented Dickey-Fuller (ADF) test for stationary and Autoregressive Distributed Lag (ARDL) model for short- and long-run dynamics. The model for this research is a linear model for this study is as stated in Eq. 3.5.

$$VI = \alpha_0 + \beta_i \sum_{i=1}^{a} VI_{t-i} + \psi_j \sum_{j=0}^{b} HI_{t-j} + \gamma_K \sum_{k=0}^{c} UHI_{t-k} + \varphi_l \sum_{l=0}^{d} RHI_{t-l} + \delta_m \sum_{m=o}^{e} GC_{t-m} + \pi_n \sum_{n=0}^{f} HE_{t-n} + u_t \quad 5$$

Where,
VI = Vulnerability Index
HI = Healthcare Inflation
UHI = Urban Healthcare Inflation
RHI = Rural Healthcare Inflation
HE = Healthcare Expenditure
GC = GDP per capita

u = Error term

Results

The ADF results in Table 1 show that GC and UHI are stationary at level I(0), while HE, HI, RHI, and VI become stationary only after first differencing I(1). This means GC and UHI are already stable without transformation, but the other variables exhibit unit roots and require differencing to achieve stationarity, indicating mixed orders of integration across the series.

Table 1: Augmented Dickey-Fuller (ADF)UnitRootTest

Variable	Exogenous	ADF Test Statistics	Critical Value	Probability	Order of integration
GC	None	-3.9132	-2.6272 (1%) -1.9450 (5%) -1.6115 (10%)	0.0003	I(0)
HE	Intercept	-4.8113	-3.6210 (1%) -2.9434 (5%) -2.6103 (10%)	0.0004	I(1)
HI	None	-12.4027	-2.6308 (1%) -1.9504 (5%) -1.6112 (10%)	0.0000	I(1)
UHI	Intercept	-5.4939	-3.6156 (1%) -2.9411 (5%) -2.6091 (10%)	0.0000	I(0)
RHI	None	-13.2644	-2.6308 (1%) -1.9504 (5%) -1.6112 (10%)	0.0000	I(1)
VI	Intercept	-3.2515	-3.6210 (1%) -2.9434 (5%) -2.6102 (10%)	0.0248	I(1)

Source: Author's Computation (2026)

Table 2 indicates that the Vulnerability Index is highly autoregressive, persistence and mean-reverting dynamics in the short-run. Healthcare inflation has a positive and significant effect, while UHI and several of its lags consistently exert positive and statistically significant influences. Conversely, RHI(-1) has a significant negative effect while current RHI is positive and marginally significant. HEG and GCG show limited explanatory power, with only lagged HEG approaching significance. The constant term is positive and significant, while the negative trend coefficient suggests a gradual structural decline in vulnerability over time. R^2 and adjusted R^2 indicate excellent fit, the Durbin-Watson statistic suggests no serious autocorrelation, and the Jarque-Bera test implies residuals are approximately normal.

Table 2: Vulnerability Index (VI) short-run dynamics for

Variable	Coefficient	Standard Error	t–Statistic	Probability
VI(-1)	1.1323	0.2006	5.6446	0.0000
VI(-2)	-0.3742	0.3079	-1.2153	0.2419
VI(-3)	0.7086	0.3404	2.0817	0.0538
VI(-4)	-0.7293	0.2266	-3.2184	0.0054
HI	0.0086	0.0036	2.3889	0.0275
UHI	0.0039	0.0013	3.0000	0.0103
UHI(-1)	0.0015	0.0005	3.0000	0.0086
UHI(-2)	0.0006	0.0003	2.0000	0.0401
UHI(-3)	0.0005	0.0003	1.6667	0.1435
UHI(-4)	0.0011	0.0003	3.6667	0.0052
RHI	0.0039	0.0022	1.7727	0.0920
RHI(-1)	-0.0017	0.0006	-2.8333	0.0111
HEG	0.0013	0.0042	0.3095	0.7573
HEG(-1)	-0.0189	0.0093	-2.0323	0.0576
GCG	0.0017	0.0011	1.5455	0.1451
GCG(-1)	0.0021	0.0012	1.7500	0.0804
GCG(-2)	0.0010	0.0010	1.0000	0.3335
C	0.2531	0.0868	2.9159	0.0101
@TREND	-0.0045	0.0019	-2.3684	0.0278
R-squared	0.9989			
Adjusted R-squared	0.9976			
F-statistic	2.3977			
Prob. (F-statistic)	786.6379			
Durbin-Watson stat	2.3977			
Jarque-Bera	3.7556			
Probability	0.1529			

Source: Author's Computation (2026)

The F-Bounds test results in Table 3 show that the computed F-statistic lies above the upper critical bound at the 10% and 5% levels, but is slightly below the 1% upper bound. This means that there is strong statistical evidence of a long-run equilibrium relationship.

Table 3: F-Bounds Test for Eq. 5

Test Statistic	Value	Significance	I(0)	I(1)
F-statistic	5.1782	10%	3.087	4.277
K	5	5%	3.673	5.002
Actual Sample Size	35	1%	5.095	6.77

Source: Author's Computation (2026)

Table 4 reveals that rising healthcare costs increases vulnerability in the long-run. Urban healthcare inflation is both positive and statistically significant. However rural healthcare inflation is positive insignificant. Health expenditure as a share of GDP (HEG) is negative and significant while GDP per capita growth (GCG) is positive but insignificant

Table 4: Vulnerability index (VI) ARDL Long Form for Eq. 5

Variable	Coefficient	Standard Error	t–Statistic	Probability
HI	0.0328	0.0171	1.9192	0.0730
UHI	0.0291	0.0109	2.6614	0.0171
RHI	0.0083	0.0091	0.9163	0.3732
HE	-0.0672	0.0326	-2.0605	0.0560
GC	0.0186	0.0106	1.7518	0.0989
CoinEq(-1)	-0.2625	0.0411	-6.3868	0.0000

EC = VI – (0.0328*HI + 0.0291*UHI + 0.0083*RHI – 0.0672*HE + 0.0186*GG

Source: Author's Computation (2026)

The results indicate positive coefficients for overall healthcare inflation and urban healthcare inflation. With the urban effect being statistically significant, it indicates that rising medical costs increase household vulnerability. This suggests that urban households are more exposed to inflationary shocks due to higher reliance on formal healthcare services. By contrast, rural healthcare inflation shows no significant effect which reflects either limited access to formal care or reliance on informal providers that buffer rural households from direct inflationary pressures. Health expenditure as a share of GDP is negatively associated with vulnerability and suggests that greater national investment in healthcare reduces household exposure to financial risk. GDP per capita growth has a positive and significant effect. Therefore, economic growth may moderate vulnerability but insignificant.

Conclusion and Recommendations

Urban households are more vulnerable due to heavy reliance on formal healthcare systems. In the formal healthcare, inflationary shocks translate directly into higher costs for medical services, drugs, and hospital care. Contrarily, rural households often depend on informal healthcare providers and partially shielded from increasing healthcare costs. The evidence also shows that increased health expenditure as a share of GDP can reduce vulnerability. Thus increase in public investment in healthcare funding provides a protective buffer against inflationary pressures. Similarly, inclusive economic growth plays a moderating role by improving household income and resilience. This study recommend that government should prioritize control of healthcare inflation and expand effective health expenditure in primary healthcare and insurance coverage to directly reduce the financial burden on households. This integrated approach strengthens resilience, reduces catastrophic health expenditures, and moves Nigeria closer to achieving universal health coverage by 2030. In the long run, such reforms not only stabilize household welfare but also enhance national health security and socioeconomic equity.

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