

Welfare Effect of Catastrophic Out-of-pocket Health Spending in Nigeria: Do Remittances Play a Moderating Role?

Evidence from the Nigeria General Household Survey – Panel (Wave 5)

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¹The views, interpretations, and conclusions expressed in this presentation are solely those of the authors and do not necessarily reflect the views of any affiliated institutions, organizations, or individuals.

The Problem & Motivation

- Health shocks are a major driver of poverty and vulnerability in Nigeria.
 - 56% in extreme poverty (World Bank, 2024)
 - 90% employment in the informal sector
- **Catastrophic Out-of-Pocket (OOP) Spending:**
 - Health expenditures $> 40\%$ of non-food consumption.
 - Forces households to sacrifice essentials (food, education), creating poverty traps.
- **The Research Gap:**
 - Can informal safety nets, like **remittances**, buffer these shocks?
 - Most studies focus only on international remittances, overlooking domestic flows.
- **This Study Asks:** Do domestic and international remittances moderate the poverty impact of catastrophic health spending?

What is Catastrophic Health Spending?

Definition

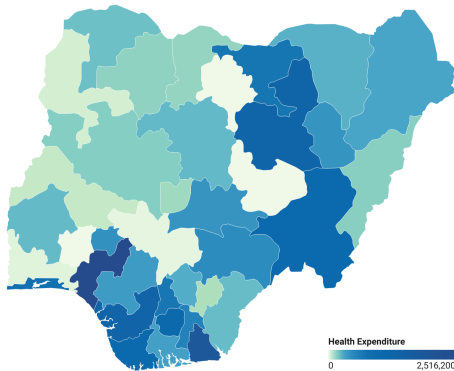
OOP health spending that exceeds a substantial share of a household's capacity to pay.

Common Thresholds:

- $\geq 10\%$ of **total** household consumption
- $\geq 20\%$ of **total** household consumption
- $\geq 40\%$ of **non-food** household consumption

(Threshold used in this study)

Health Expenditure in Nigeria



Source: Nigeria General Household Survey-Panel (GHS-Panel), Wave 5 (2023/2024) • Created with Datawrapper

Research Objectives

This study seeks to:

- 1 Estimate the incidence of catastrophic OOP health spending in Nigeria.
- 2 Analyse its welfare effect (proxied by the probability of falling into poverty).
- 3 Determine if **domestic remittances** (monetary and in-kind) moderate this adverse effect.
- 4 Determine if **international remittances** (monetary and in-kind) moderate this adverse effect.

Setup of the Problem

This study models household behaviour under the dual influence of:

- Catastrophic out-of-pocket (OOP) spending shocks
- Remittance inflows

Households are assumed to maximise their expected intertemporal utility from consumption while facing:

- Income shocks
- Accessing informal risk-sharing mechanisms (remittances)

$$\text{Catastrophic OOP} = \begin{cases} 1, & \text{if } \frac{\text{OOP}}{E_{nf}} > \tau \text{ or } \frac{\text{OOP}}{E_{tot}} > \tau \\ 0, & \text{otherwise} \end{cases}$$

OOP = Out-of-Pocket health expenditure

E_{nf} = Non-food expenditure

where:

E_{tot} = Total expenditure

$\tau \in \{0.10, 0.20, 0.40\}$ = threshold proportion

Utility Function

We assume a standard CRRA utility function:

$$U(C_t) = \frac{C_t^{1-\sigma}}{1-\sigma}, \quad \sigma \neq 1$$

- C_t is household consumption at time t
- σ is the coefficient of relative risk aversion

At each time t , the household faces

Budget Constraint:

$$C_t + S_t = Y_t + R_t + A_t$$

where:

- C_t : consumption
- S_t : catastrophic OOP shock
- Y_t : labour income or earnings
- R_t : remittance inflow
- A_t : asset drawdown or borrowing

Assume no capital accumulation, so A_t is fixed or exogenous.

The household chooses $\{C_t\}_{t=0}^T$ to maximize:

$$\sum_{t=0}^T \beta^t \frac{C_t^{1-\sigma}}{1-\sigma}$$

subject to:

$$C_t = Y_t + R_t + A_t - S_t$$

Substituting the constraint into the objective function yields:

$$\sum_{t=0}^T \beta^t \frac{(Y_t + R_t + A_t - S_t)^{1-\sigma}}{1-\sigma}$$

First-Order Conditions

If we're looking at a static case (i.e., one period), the FOC is:

Recall that $C_t = Y_t + R_t + A_t - S_t$

$$\frac{\partial U}{\partial C_t} = C_t^{-\sigma}$$

$$\frac{\partial U}{\partial S_t} = -(Y_t + R_t + A_t - S_t)^{-\sigma}$$

$$\frac{\partial U}{\partial S_t} = \frac{\partial U}{\partial C_t} \cdot \frac{\partial C_t}{\partial S_t} = -C_t^{-\sigma}$$

$$\frac{\partial U}{\partial R_t} = \frac{\partial U}{\partial C_t} \cdot \frac{\partial C_t}{\partial R_t} = C_t^{-\sigma} > 0$$

Marginal effect of OOP shocks:

$$\frac{\partial U}{\partial S_t} = -C_t^{-\sigma}$$

- A rise in out-of-pocket spending lowers utility
- The effect is stronger when consumption is already low

Marginal effect of remittances:

$$\frac{\partial U}{\partial R_t} = C_t^{-\sigma} > 0$$

- An increase in remittances raises utility
- Acts as a buffer against welfare loss

Inter temporal Problem

If savings are allowed, households maximize:

$$\sum_{t=0}^T \beta^t \frac{C_t^{1-\sigma}}{1-\sigma}$$

subject to:

$$A_{t+1} = (1+r)(A_t + Y_t + R_t - S_t - C_t)$$

Assets tomorrow depend on today's net income (including remittances R_t , out-of-pocket shocks S_t , current income Y_t), and saving or borrowing.

The Euler equation:

$$C_t^{-\sigma} = \beta(1+r)E_t[C_{t+1}^{-\sigma}]$$

Implication: Remittances serve as a consumption buffer against shocks.

Intertemporal Budget Constraint

Households save/borrow via a one-period bond:

$$A_{t+1} = (1 + r)(A_t + Y_t + R_t - S_t - C_t)$$

or equivalently:

$$C_t + A_{t+1} = (1 + r)(A_t + Y_t + R_t - S_t)$$

Lagrangian:

$$\mathcal{L} = \sum_{t=0}^{\infty} \beta^t \left[\frac{C_t^{1-\sigma}}{1-\sigma} + \lambda_t ((1+r)(A_t + Y_t + R_t - S_t) - C_t - A_{t+1}) \right]$$

Deriving the Euler Equation

$$\text{FOC w.r.t } C_t : \beta^t C_t^{-\sigma} - \lambda_t = 0 \Rightarrow \lambda_t = \beta^t C_t^{-\sigma}$$

$$\text{FOC w.r.t } A_{t+1} : -\lambda_t + \lambda_{t+1}(1+r) = 0 \Rightarrow \lambda_t = \lambda_{t+1}(1+r)$$

Combining FOCs:

$$\beta^t C_t^{-\sigma} = (1+r)\beta^{t+1} C_{t+1}^{-\sigma}$$

Dividing by β^t :

$$C_t^{-\sigma} = \beta(1+r)C_{t+1}^{-\sigma}$$

Euler Equation:

$$\frac{C_{t+1}}{C_t} = [\beta(1+r)]^{1/\sigma}$$

Interpretation of the Euler Equation

$$\frac{C_{t+1}}{C_t} = [\beta(1+r)]^{1/\sigma}$$

- If $\beta(1+r) > 1$: Future consumption preferred $\Rightarrow C_{t+1} > C_t$
- If $\beta(1+r) < 1$: Current consumption preferred $\Rightarrow C_{t+1} < C_t$
- Sensitivity depends on σ : higher σ means greater reluctance to shift consumption over time

Key Insight

Remittances help smooth consumption over time, reducing the welfare impact of catastrophic health expenditures.

Optimization Summary

- Households face trade-offs between consumption, shocks, and remittances
- CRRA utility captures risk aversion behavior
- Remittances act as insurance against health shocks
- Euler equation shows how households allocate consumption over time
- Policy implications: Remittances can enhance household resilience to health shocks

Data Source

Nigeria General Household Survey (GHS)-Panel 2023/2024 (Wave 5)

- **Sample:** \approx 4,715 households
- **Representative:** Nationally representative

Empirical Strategy

- **Dependent Variable:** *Poverty Status* (1 if below poverty line, 0 otherwise)
- **Core Variables:**
 - Catastrophic Spending Dummy (40% threshold)
 - Remittance Dummies (Domestic/International; Cash/In-Kind)
 - Interaction Terms (Remittances \times Catastrophic Spending)
- **Models: Logit and Probit** (Average Marginal Effects reported)

Table 1: Intensity of Catastrophic Out-of-pocket spending using multiple thresholds

	10% threshold (for total household expenditure)		20% threshold (for total household expenditure)		40% threshold (for non-food expenditure)	
	Headcount	Percent of sample	Headcount	Percent of sample	Headcount	Percent of sample
Exposed	27	0.6	10	0.2	167	3.7
Not exposed	3,803	99.4	4,758	99.8	4,329	96.3

Table 2: Cross-tabulation of Poverty Status, Catastrophic OOP Health Spending, and Remittances

Key Indicators		Poor	Non-poor	Total
Catastrophic OOP health spending	Exposed	99	68	167
	Not exposed	3,003	1,325	4,328
International Remittances (Monetary)	Recipient	60	114	174
	Non-recipient	2,709	1,147	3,856
International Remittances (In-kind)	Recipient	20	29	49
	Non-recipient	2,749	1,232	3,981
Domestic Remittances (Monetary)	Recipient	634	392	1,026
	Non-recipient	2,135	869	3,004
Domestic Remittances (In-kind)	Recipient	355	239	594
	Non-recipient	2,414	1,022	3,436

Source: Author's compilation from Nigeria's GHS 2023/2024

Empirical Results

Regression Result

Table: Logit and Probit Models for the Impact of Catastrophic OOP Health Spending and Remittances on Poverty (Average Marginal Estimates)

VARIABLES	Logit				Probit			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
urban_dummy	-0.189*** (0.014)	-0.195*** (0.014)	-0.195*** (0.014)	-0.196*** (0.014)	-0.193*** (0.014)	-0.198*** (0.014)	-0.198*** (0.014)	-0.199*** (0.014)
south_east	-0.020 (0.022)	-0.017 (0.022)	-0.016 (0.022)	-0.015 (0.022)	-0.021 (0.023)	-0.017 (0.023)	-0.016 (0.023)	-0.015 (0.023)
north_east	0.115*** (0.027)	0.126*** (0.028)	0.126*** (0.028)	0.128*** (0.028)	0.104*** (0.026)	0.116*** (0.026)	0.115*** (0.026)	0.117*** (0.026)
south_south	-0.124*** (0.022)	-0.120*** (0.022)	-0.120*** (0.022)	-0.119*** (0.022)	-0.127*** (0.022)	-0.123*** (0.022)	-0.122*** (0.022)	-0.122*** (0.022)
north_central	-0.041* (0.022)	-0.034 (0.022)	-0.036 (0.022)	-0.033 (0.022)	-0.041* (0.022)	-0.034 (0.022)	-0.036 (0.022)	-0.034 (0.022)
north_west	0.033 (0.025)	0.044* (0.025)	0.043* (0.025)	0.046* (0.025)	0.029 (0.025)	0.040 (0.025)	0.039 (0.025)	0.042* (0.025)
lhsize	0.199*** (0.009)	0.199*** (0.010)	0.200*** (0.010)	0.198*** (0.010)	0.199*** (0.010)	0.199*** (0.010)	0.201*** (0.010)	0.198*** (0.010)
Cf_hs	0.044 (0.305)	0.210 (0.133)	-0.036 (0.449)	0.061 (0.158)	0.027 (0.325)	0.200 (0.134)	-0.072 (0.456)	0.059 (0.156)
Cf_size	-0.069 (0.049)	-0.050 (0.052)	-0.071 (0.050)	-0.072 (0.052)	-0.065 (0.049)	-0.048 (0.052)	-0.067 (0.049)	-0.068 (0.051)
rem_m_ab	0.144*** (0.029)				0.148*** (0.030)			
m_ab_cf	-0.002 (0.154)				0.004 (0.165)			
rem_k_ab		0.139* (0.060)				0.135** (0.061)		
m_k_cf		0.039 (0.226)				0.056 (0.230)		
rem_m_dm			0.021 (0.016)				0.022 (0.016)	
m_dm_cf			-0.115 (0.078)				-0.111 (0.078)	
rem_k_dm				0.036* (0.020)				0.036* (0.019)
k_dm_cf				-0.009 (0.089)				-0.011 (0.087)

Note: Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Different remittance proxies used: international monetary remittances (Models 1,5), international in-kind (Models 2,6), domestic monetary (Models 3,7), and domestic in-kind (Models 4,8). South West is the reference category. Source: Authors' computation.

Summary from Regression Analysis

- Urban residence consistently reduces poverty across all models
- Regional effects vary significantly:
 - North East has higher poverty rates
 - South South has lower poverty rates
- Larger household size increases poverty probability
- Remittances show mixed effects:
 - International monetary remittances increase poverty (counterintuitive)
 - International in-kind and domestic remittances have smaller effects
- Catastrophic health spending variables (Cf_hs, Cf_size) are generally not statistically significant

Key Finding 1: Poverty is Widespread and Rising

Our Estimate

National Poverty Headcount Ratio: **69.6%**

- A significant increase from 40.1% (NLSS 2018/2019).

Spatial Disparities are Stark

	Poverty Rate (%)
National	69.6
By Settlement	
- Urban	38.6
- Rural	69.3
By Zone	
- North Central (Highest)	71.8
- South West (Lowest)	67.1

²

²The GHS-Panel ($\approx 4,750$ households) has a smaller sample and a shorter consumption module, The NLSS ($\approx 22,000$ households) is the nationally representative survey used for Nigeria's official poverty estimates (40.1% in 2018/19).

Key Finding 2: Catastrophic Spending is Less Prevalent but Severe

Incidence of Catastrophic OOP Health Spending

Threshold	Headcount	Percent of Sample
≥ 10% of total expenditure	27	0.6%
≥ 20% of total expenditure	10	0.2%
≥ 40% of non-food expenditure	167	3.7%

While less prevalent than some past estimates (e.g., 5.1% in 2018/19), for the **3.7%** of households affected, the financial burden is extreme and potentially crippling.

Key Finding 3: The Remittance-Poverty Paradox (Descriptive)

Cross-tabulation Insights:

- Households with catastrophic spending are **more likely to be poor**.
- Remittance-receiving households have **lower poverty rates** than non-recipients.
- **BUT:** A significant number of remittance recipients are *still* poor and experience catastrophic spending.

Interpretation

Remittances are **targeted at poorer households** (they need it), but are **not sufficient** to fully insure them against major health shocks. They are a symptom of vulnerability, not a cure.

Key Finding 4: The Core Regression Results

What significantly drives poverty?

- ✓ **Larger Household Size:** Strong, significant positive effect.
- ✓ **Rural Location:** Strong, significant negative effect on welfare.
- ✓ **Region:** Significant disparities (e.g., N. East worse off than S. West).

What doesn't?

- × **Catastrophic Spending Alone:** Not statistically significant *after controlling for other factors*.
- × **Most Remittance Interactions:** Not statistically significant.

The Paradox Confirmed

The positive sign on remittance variables confirms they are **received by poorer households**, not that they cause poverty. They correlate with vulnerability.

Key Finding 5: The Nuance - Domestic vs. International

Despite statistical insignificance, the **direction** of interaction effects tells a story.

Domestic Remittances

- Show a **negative** interaction effect.
- Suggests a potential buffering effect.

International Remittances

- Show a **positive or near-zero** interaction effect.
- Suggests no buffering effect.

Why? Proximity, frequency, cultural obligations, and timeliness likely make domestic transfers a more responsive, though still limited, cushion against shocks.

Remittances don't eliminate poverty, but they cushion households from falling deeper into it when health crises strike!

- Urbanization may help reduce poverty, but careful planning needed
- Regional targeting of poverty programs is essential
- Household size management through family planning could help
- Remittance channels matter - need to understand why some increase poverty
- Health shock mitigation requires more than just remittances
- Social safety nets needed to complement remittances
- Remittances act more as an **ex-post symptom of vulnerability** than an **ex-ante insurance mechanism** against **health-shock-induced poverty**.
- Their power is limited by: Usage for basic consumption, not investment/insurance.

Informal safety nets are insufficient.
Formal mechanisms are critical!

- 1 **Expand Health Insurance Coverage:** Drastically scale up programs like NHIA to reduce OOP spending at the point of care.
- 2 **Targeted Social Protection:** Design cash transfer programs for households vulnerable to health shocks.
- 3 **Leverage Remittances:** Policies could reduce transfer costs and encourage channeling remittances into health insurance premiums or health savings accounts.

This is essential for achieving SDG 1 (Poverty) and SDG 3.8 (UHC).

Thank You!

Questions?