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Abstract

This study examines the prevalence of catastrophic OOP health spending among households in Nigeria following the Xu et al. (2003) framework using two benchmarks – total and non-food expenditures. Using data from the 2018/2019 Living Standards Survey, it disaggregates CHE incidence and concentration across six thresholds – 5%, 10%, 15%, 25%, 30% and 40% - to capture effects across heterogenous household income groups in the context of high poverty, informality, and limited social protection as obtains in Nigeria. The study finds that more than a fifth of households experience catastrophic spending at 15% threshold and below, and that this increases monotonically under both benchmarks as the threshold is lowered from 40% to 5%. As thresholds increase above 15%, incidence of catastrophic expenditure declines more noticeably, signalling constrained access to care and potential for forgone health services for the poor. Estimates of both incidence and concentration of the non-food benchmark indicate greater vulnerability of discretionary consumption to health shocks. The study finds that CHE is characterised by both frequent OOP payments at lower thresholds and by less common but severe shocks that overwhelm household resources at higher thresholds. Disproportionate financial fragility and CHE burden indicating financial distress from relatively modest health expenditures at lower thresholds (pro-poor CHE) appear to co-exist with less frequent but high-end health costs (pro-rich CHE) at higher thresholds. The study recommends differentiated policy responses that reflect the heterogeneity of household vulnerability which simultaneously incorporate early-stage financial distress among the poor as well as exposure to severe health shocks among wealthier households.

Keywords: Catastrophic Health Expenditure, Out-of-Pocket, Universal Health, Concentration Index, Poverty.

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1. Motivation

Just five years from the SDG's target year for ending poverty, estimates indicate that roughly 808 million persons remain in extreme poverty globally, three-quarters of whom are in Sub-Saharan Africa. Nigeria contributes more than any other country to these numbers. As at 2025, the country contributed 15.4% to Africa's population, but constituted 19% of its poor – clearly more than its fair share. At the same time, it has one of the lowest life expectancy rates in Africa. Poor financial health protection for households, emanating particularly from increasing out-of-pocket (OOP) health expenditure, remains a leading cause – and possibly a leading consequence.

The literature confirms that Nigeria has significant OOP health financing crisis that has translated to catastrophe for many households. Between 1995 and 2018, direct payments at the point of service averaged 71% of Nigeria's aggregate health financing – one of the highest in sub-Saharan Africa (SSA) (World Bank, 2023). A couple of studies have pointed to poor fiscal space for the health sector as chief cause, with evidence from Public Expenditure Review and National Health Accounts (NHA) reporting public health spending to constitute less than 5% of public expenditure and less than 25% of total health spending. Added to that is the challenge of poor coordination and fragmentation of government health policies and finances. Other studies point to the weakness, unevenness and limited coverage of the risk pooling and insurance system which means that several vulnerable households are without an insurance anchor. After over two decades of operation, Nigeria's National Health Insurance Scheme (NHIS) provides coverage for just between 5% and 10% of the population (Eze & Iheonu, 2025). Thus, households, particularly those in the

poorest quintiles, are left to rely on OOP health spending that has exposed them to increased incidence and vulnerability to poverty, forcing many to deplete savings, sell assets, incur debt to finance health needs or altogether forego badly needed health services (Yimer & Moracha, 2020; Andersen & Newman, 2005; Amakom & Ezenekwe, 2012; and Nwanosike et al., 2022).

What is not yet very clear is the nature of this CHE when fully disaggregated along thresholds in order to capture both incidence and concentration across household income quintiles in a manner that informs policy directed at group-specific needs. Research on Nigeria's OOP health payment and the consequent catastrophe has revolved around seven broad themes. These, with one example of each, include: magnitude and trends of OOP spending (Aregbeshola, 2016); incidence, depth and thresholds in CHE (Onwujekwe et al., 2010); impoverishment and poverty effects of OOP payments (Ichoku and Leibbrandt, 2003) as well as equity and inequality (concentration and regressivity) (Aregbeshola & Khan, 2020). Other themes include effectiveness of insurance, especially the NHIS (Adebayo & Uthman, 2019); household coping mechanisms (Uzochukwu et al., 2015) and policy failure and UHC implications (Aregbeshola, 2022). Despite this substantial body of literature, important analytical and policy-relevant gaps remain in respect to threshold sensitivity and equity dynamics across alternative benchmarks, particularly at the lowest thresholds. Existing studies have largely concentrated on single or limited thresholds, most commonly Xu et al.'s, 2003 40% benchmark), 30% and 20%. But Nigeria's widespread poverty, informality, and limited social protection demands more. As it were, current evidence may understate the true extent of financial vulnerability faced by households experiencing even relatively modest health shocks. There is, therefore, the need to explore a more comprehensive, multi-threshold assessment of CHE incidence (headcount) and distribution (concentration index).

This study responds directly to methodological concerns in the global and Nigerian literature that CHE estimates are highly sensitive to threshold choice, and that reliance on a few "standard" cut-offs may obscure gradients of financial risk exposure across income groups by evaluating CHE across six benchmarks (5%, 10%, 15%, 25%, 30%, and 40%). This broad range allows for a more nuanced appreciation of household transition from mild financial strain to severe financial catastrophe, enriching understanding beyond binary catastrophic/non-catastrophic classifications.

In addition to explicitly addressing threshold sensitivity, there is need for more in-depth integration of incidence and equity analyses across multiple benchmarks using recent nationally representative data. While CHE incidence and the consequent equity challenges have been much studied, relatively few studies integrated headcount measures with concentration indices across multiple thresholds within same framework. Such joint analysis helps identify both incidence and distribution of the burden among household income groups at different levels of financial stress. This is particularly important for a country like Nigeria where emerging evidence suggests CHE concentration among poorer households at lower thresholds but with shifts towards better-off households at higher thresholds, a pattern that has implications for understanding the dynamics of financial risk protection, equity and policy. The study uses the 2018/19 Nigeria Living Standards Survey (NLSS), which is currently the most recent nationally representative dataset prior to major health-system disruptions with high-quality data that enable robust estimation of CHE and its distribution across welfare quintiles. The findings would, therefore, provide more granular and policy-relevant baseline for evaluating potency of existing policies and reforms in addressing identified financial protection deficits and progress towards universal health coverage (UHC). It

will also strengthen the empirical foundation for health financing reforms aimed at reducing OOP burden and improving equity in Nigeria.

2 Brief Review of Related Literature

Two theories – cost of illness (COI) and willingness-to-pay (WTP) – complement each other in providing the framework for understanding and explaining key dynamics in health financing and the burden of out-of-pocket health payments. The cost of illness theory objectively measures both the direct and indirect economic burden of disease on individuals, households, and society. Such costs are in three categories – portion of income that must be set aside to treat a sickness, the forgone production benefits during sickness or death and the costs incurred to avoid pain and suffering inflicted by illnesses. The willingness-to-pay theory, rooted in welfare economics, defines the amount an individual is prepared to pay to obtain a health service or to avoid a health risk. This reflects the individual's perception of the expected utility from the service, income constraints, risk assessment and preferences. Unlike COI, WTP is subjective and reflects both the value individuals attach to health improvements and their ability to pay, making it directly relevant to the design of user fees, insurance premiums, and benefit packages (Yimer & Moracha, 2020). In OOP-dominated systems, observed health spending often approximates WTP under constraints. But where income is low, it can under-approximate needed care among poorer households. In the empirical literature, three main themes dominate the literature on developing country health financing. The first is the importance of public expenditure, particularly when moderated by strong institutions, for health outcomes. The second is the poverty and welfare implications of out-of-pocket health financing, which reflects inadequate financial protection in healthcare. The third is

the (apparently entrenched) gaps in efficiency and governance of public health financing structures and institutions in many developing countries.

On the first theme, – the importance of public expenditure supported by strong institutions for health outcomes – consensus appears to coalesce around the understanding that expenditure matters, but so also do the capacity of complementary institutions that support it. Such multi-country studies as Bokhari, Gai, and Gottret (2007), Makuta and O'Hare (2015) and Piabuo and Tieguhong (2017) confirm this. Bokhari et al. (2007), for example, using panel data of African countries, find that the positive effect of public health spending on child mortality in poor countries is highly sensitive to governance quality, suggesting that weak institutions dilute the impact of public expenditure. Similarly, Makuta and O'Hare (2015) and Piabuo and Tieguhong (2017), using data from across Africa, find that higher health expenditure improves life expectancy and reduces child mortality, but these effects are weaker in countries with poor macroeconomic and institutional environments.

Several country-specific country studies like Alhassan et al. (2016) and Akazili et al. (2017) – in Ghana – find that public health financing, particularly through tax-funded services and social health insurance, has contributed to improvements in maternal and child health outcomes. The former specifically noted the contribution of increased public health investment under the National Health Insurance Scheme (NHIS) to improved maternal and child health outcomes. Similarly, in Kenya, Barasa et al. (2018) demonstrate that it is the inefficiency in public spending, and not just the low value of the spending, that deter positive health outcomes. Evidence from Asian studies, though mixed, appears to be broadly consistent with those from Africa. In India, Gupta and

Chowdhury (2020), while acknowledging dominance of private health spending and high OOP payments especially among rural and informal-sector households, show that higher public health spending improves life expectancy and reduces infant mortality.

In effect, growing private health financing in Nigeria and other developing countries is merely a response to either low public expenditure or inefficiency of such expenditures. Unfortunately, substitution of private health payments for public health expenditure does not generate same positive result for health outcomes. Nwanya et al. (2025) analyze effectiveness of government health financing on primary healthcare outcomes over the period 1990 to 2023 and find that OOP expenditures are linked to higher infant mortality rates, highlighting the positive role of public spending and health insurance. Likewise, Nwanosike et al. (2022) and Nnamdi and Ngwu (2025) using data between 1985 and 2020, compared relative impact of public health expenditure, private health expenditure and health insurance on health outcomes (proxied by life expectancy and infant mortality). They find that private health expenditure is the dominant determinant of improvements in health outcomes and that public spending exhibits weak or negative relationship with life expectancy and infant mortality. While such results may reflect scale effects of private financing relative to public financing, it is difficult to disentangle them from the efficiency weaknesses that trail public expenditure.

The second theme in the literature is the welfare implications of OOP health payments, particularly as they relate to financial risk protection and exposure to health shocks. The literature finds this mode of health financing to be regressive, welfare-reducing, and a major driver of catastrophic health expenditure (CHE). The seminal works of Xu et al. (2003) led the way in defining the

conceptual, empirical and methodological frameworks for measuring such welfare implications. Using household survey data from 59 countries, the study finds that a large proportion of households in low-income countries with weak risk-pooling mechanisms experience catastrophic payments and are pushed into poverty each year. It notes a strong correlation between high OOP reliance, low public health spending, and high incidence of catastrophic expenditure. It establishes the 10%, 25%, and 40% thresholds currently used by many empirical works. Subsequent studies confirm the disproportionate burden of OOP expenditures borne by poorer households and those without insurance coverage. Wagstaff et al. (2009) find that OOP expenditure and catastrophic spending that followed China's market-oriented health reforms was characterised by persistent inequities across income and regional lines. Similarly, Van Doorslaer et al. (2007) report high utilization of healthcare services in Vietnam being accompanied by catastrophic health expenditure, indicating that the lack of financial protection exacerbated poverty even though there was improved access to health services. Later, Wagstaff et al. (2018), using multi-country data, find that households in low- and middle-income countries (LMICs) face a substantially higher risk of CHE when OOP payments account for a large share of total health expenditure. Meanwhile WHO (2022) reports that in many SSA countries over 40% of total health spending is financed through OOP payments; and this is much higher than levels compatible with effective financial protection. A number of other works like Hailemichael et al. (2019) on Ethiopia and Chuma and Maina (2012) on Kenya and Tanzania also find that high OOP payments discourage timely healthcare utilization, increase reliance on informal providers and worsen health outcomes.

Some studies on Nigeria have attempted to analyze the causes, effects and consequences of OOP spending on citizens' welfare and healthcare delivery. Aregbeshola and Khan (2018) using the

Harmonized Nigeria Living Standard Survey (HNLSS) 2009/2010 found that approximately 16.4% of Nigerian households experienced catastrophic health payments at threshold of 10%total consumption expenditure whereas,13.7%facedcatastrophic health payments in the form of non-food expenditure to protect non-household spending needs from different shocks like illness. More recently, Eze and Iheonu (2025) examine the role of current health insurance as a social protection mechanism based on the 2023/2024 Generalized Household Survey (GHS). Their estimates of household vulnerability using Chaudhuri's (2003) vulnerability-as-expected poverty framework reveal that 56.1% of Nigerian households are vulnerable to poverty using the international $2.15/day poverty line. This number increases to 59.2% when the national $2.48/day poverty line is used. The study finds evidence that health shocks significantly increase households' vulnerability to poverty and perpetuate existing poverty, notwithstanding the poverty line adopted. Ozor et al's (2025) use cross-sectional data from eight urban slums in Enugu and Anambra States, with 1,025 participants to estimate mean difference in OOP expenditure using gamma regression. They find that households in the middle wealth quintile incurred higher costs than those in the poorest quintile and that poorest households used informal healthcare more. This implies that OOP expenditure drives poor households out of formal health sector services into the informal when the burden becomes unbearable, leading to questions of unmet needs and forgone care not captured by expenditure calculations.

The literature on the third major theme – gap in efficiency of institutional arrangements for reducing OOP expenditures – emphasizes expanding risk pooling and health insurance mechanisms, but notes that outcomes depend on institutional design and governance. Comparative studies indicate that Thailand's Universal Coverage Scheme's success in reducing CHE and

improving equity was underpinned by sustained public financing and administrative coordination (see Tangcharoensathien et al., 2018). Unfortunately, not many lower income countries meet these conditions. India's insurance scheme has had much more limited success in reducing OOP due to fragmented risk pools, high copayments and weak enforcement (Prinja et al., 2019). Rwanda's community-based health insurance reduced CHE and OOP financing, but carries concerns about sustainability due to high dependence on external funding. Likewise, Ghana's National Health Insurance Scheme (NHIS) has seen increased enrolment but still has delays in provider reimbursement (Chemouni, 2018 and Kusi et al., 2022). Nigeria has made much less progress. Onwujekwe et al. (2019) evaluate financing across two states – Niger and Kaduna – and the FCT using mixed-methods approach and purposive interviews. They find that health financing mechanisms in these states operate sub-optimally while allocation and use of resources are neither evidence-based nor results-driven. Resource allocation is also so poorly coordinated that none of the financing mechanisms adopted by the states protects households from catastrophic health expenditure.

The reviewed works converge on three key insights – the positive effect of public health expenditure when accompanied by strong institutions, the negative effects of heavy reliance on OOP payments for equity and poverty and the positive effect of risk-pooling on health outcomes. The present work is situated within the second theme – effects of OOP on poverty and vulnerability. Two previous studies – Aregbeshola and Khan (2018) and Ozor et al. (2025) – came close to integrating drivers of OOP, health outcomes, financial protection, and poverty analysis in their analyses. But while the first used the 2009/2010 Living Standards Survey, which is a bit dated, the second is geographically localized on urban slums in two states. The current study

departs from these by using the NLSS (2018 and 2019) to examine the impoverishing effect of OOP health payments in relation to households' minimum wage. Also, analytical framework of most studies on Nigeria is regression (Onyejekwe et al., 2019 being the exception). The current work adopts Xu et al.'s (2003) threshold technique.

3 Methodology

3.1 Analytical Framework

This study adopts the financial risk protection framework developed by Xu et al. (2003) that characterises OOP payment as catastrophic if it absorbs a sufficiently large share of a household's available resources as to threaten its ability to meet basic needs. While the Xu et al. (2003) methodology is fairly standardized for cross-country comparable measurements, some data limitations relating to food consumption reporting, recall periods for health expenditure, and the high prevalence of informal income constrain its wholesale application to Nigeria. Consequently, this study makes some modifications to the methodology while retaining its social welfare theory and logic.

3.2 Data Source

Data for the analysis is from the Nigerian Living Standards Survey (NLSS 2018/19) conducted by the National Bureau of Statistics. The 2018/2019 NLSS is the most recent round of NLSS in the country and provides national data on household demographics, health, fertility behaviour, education/skills/training as well as housing. It also has information on social capital, agriculture, household income, consumption and expenditure across the 36 states and Federal Capital Territory (FCT). The sample covers 22,200 households nationwide. The current analysis, however, is

restricted to households with complete information on total consumption expenditure, food expenditure, OOP health expenditure and household demographics.

3.3 Measurement of Out-of-Pocket Health Expenditure

Out-of-pocket health expenditure is total direct payments made by households for different healthcare services at the point of delivery net of reimbursements. This is put as:

$$OOP_h = \sum_{j=1}^{J} H_{hj} \quad (1)$$

Where:

H_{hj} denotes household i''s spending on health-related item j,

Subscript j represents array of services paid for (e.g. doctor charges, drugs, etc less prepaid contributions).

The above specification assumes that households make clear distinction between health and non-health expenses and use formal healthcare. But data indicates that a large share of OOP health payments occurs outside the formal sector. For example, households patronize pharmacies, patent medicine dealers and even herbal medicine dealers, most of which are outside the formal system. Besides, access and costs associated with transportation to distant facilities can also be high, especially in rural areas. To reflect these realities, we modify equation 1 above as follows:

$$OOP_h = \sum_{j=1}^{J} H_{hj} + M_h + T_h - R_h \quad (2)$$

Where:

OOP_h in equation (2) is out-of-pocket health expenditure modified to include Nigeria's unique health financing basket.

H_{hj} are formal healthcare payments (like hospital beds, diagnostics, consultation fees, etc.).

M_h are expenditures on drugs and medical supplies from pharmacies, patent medicines and other vendors.

T_h represent health-related transportation and access costs, and

R_h are reimbursements or refunds from insurance, employers, or NGOs (where such exist).

Next, recall period in the NLSS is monthly as opposed to annual figures in standard Xu et al.'s (2003) framework. To regularize this, OOP health expenditure will be:

$$OOP_h = 12 \times OOP_{OP,h}^{30} + OOP_{IP,h}^{12} \quad (3)$$

Where:

OOP_h = Total data-modified OOP

$OOP_{OP,h}^{30}$ = Outpatient spending for last one month (30 days).

$OOP_{IP,h}^{12}$ = Inpatient spending for the last 12 months.

3.4 Estimating Capacity to Pay

One of the critical indices of the OOP health payment is the capacity to pay (CTP). In Xu et al. (2003), it is defined as total consumption net of subsistence (particularly food) expenditure viz:

$$CTP_h = TE_h - SE_h \quad (4)$$

Where:

CTP_h is household capacity to pay

TE_h is total household expenditure

SE_h is household subsistence expenditure

Again, there is need to adapt the specification of capacity to pay to accommodate household non-discretionary, non-food essentials like energy, transportation, water and basic education that are critical for subsistence. So,

$SE_h = F_h + E_h$ (5)

Where F_h is household food expenditure while E_h is household essential non-food expenditure.

To reflect extreme vulnerability of some households and to avoid negative values for CTP, the latter is usually set equal to subsistence expenditure for households with consumption expenditure below subsistence level i.e.

If $TE_h < SE_h$, then $CTP_h = TE_h$ (6)

This study maintains that same condition.

3.5 Measurement of Catastrophic Health Expenditure

Following Xu et al. (2003), we define OOP health expenditure as catastrophic if it exceeds 40% threshold.

$$CHE_h = \begin{cases} 1 & if \ \frac{OOP_h}{CTP_h} \geq 0.40 \\ 0 & if \ otherwise \end{cases} \quad (7)$$

In addition to the standard 40 per cent threshold, lower thresholds of 30%, 25%, 15%, 10% and 5% will be used to estimate capacity to pay given the context of high poverty, vulnerability and limited social protection in Nigeria. This allows for assessment of sensitivity of results to varying definitions of financial hardship and assumptions of subsistence in low-income settings like Nigeria. This study does not explicitly provide for treatment of variations in regional prices given that observed household consumption expenditure was used as the welfare measure, implicitly reflecting local price conditions. Secondly, the current study focuses on national-level financial

risk protection rather than inter-regional welfare comparisons and has alternative definitions of capacity to pay and catastrophic expenditure thresholds that provide additional robustness checks.

3.6 Declarations

3.6.1 **Ethics approval and consent to participate –** The study relied on anonymized secondary data publicly available from Nigeria National Bureau of Statistics. Ethical approval is therefore not required.

3.6.2 **Consent for publication** – Consent for publication of this article is not applicable.

3.6.3 **Data availability**– All data and materials used are publicly available at the National Bureau of Statistics website.

3.6.4 **Competing interests** – There are no financial or other competing interests in the conduct of this research as both authors are independent researchers.

3.6.5 **Funding** – The Authors did not receive any funding for this research.

3.6.6 **Authors' contributions** – The contribution of the authors is limited to analysis and reporting of the findings in the research.

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4. Findings

4.1 Distribution of Catastrophic OOP Health Expenditure among Households Groups

The objective of this study is to ascertain the distribution of OOP health expenditure and its relationship with household income and poverty in Nigeria. As in Xu et al. (2003), financial

catastrophe is assumed to occur with healthcare payments at or exceeding 40% of a household's capacity to pay in any year. However, given the severity of poverty in Nigeria, this study would simulate catastrophic health expenditure using other thresholds. Table 1 presents incidence of catastrophic OOP health payment at different thresholds ranging from 5% to 40% relative to two alternative benchmarks – total household expenditure and non-food consumption expenditure. These two benchmarks provide complementary insights into household vulnerability, consumption trade-offs, and the nature of financial risk protection in Nigeria.

Table 1: Catastrophic OOP Health Expenditures of Nigerian Households

Incidence of Catastrophic out-of-pocket health payment						
	5%	10%	15%	25%	30%	40%
Threshold Budget Share (%) of Total Expenditure						
Headcount (H)	21.2%	21.1%	20.1%	17.0%	11.4%	10.0%
Concentration index, C_E	-0.211	-0.203	-0.222	0.242	0.247	0.249
Concentration index, C_O	-0.241	-0.245	-0.247	0.253	0.255	0.258
Threshold Budget Share (%) of Non-food Expenditure						
Headcount (H)	22.0%	20.0%	17.2%	16.4%	12.5%	12.0%
Concentration index, C_E	-0.221	-0.261	0.268	0.269	0.275	0.283
Concentration index, C_O	-0.641	-0.645	0.645	0.646	0.648	0.668

Source: Researchers' computation

As shown in Table 1, the incidence of catastrophic OOP health expenditure increases monotonically under both expenditure benchmarks as the catastrophic threshold is lowered from 40% to 5% of household expenditure. At the conventional 40% threshold, 10% of households incur catastrophic health spending when measured relative to total expenditure, compared with 12% when measured relative to non-food expenditure. These estimates are consistent with earlier Nigerian evidence, including Aregbeshola and Khan (2018) and Onwujekwe et al. (2019), who

report incidences ranging between 9% and 14%. When the threshold is reduced to 30%, the headcount of households experiencing catastrophic health expenditure rises modestly to 11.4% under the total expenditure benchmark and 12.5% under the non-food expenditure benchmark. At both the 40% and 30% thresholds, the incidence measured relative to total expenditure remains lower than that measured relative to non-food expenditure, reflecting the more restrictive nature of the latter benchmark.

A pronounced increase in the incidence of catastrophic health payment is observed at the 25% threshold, where the proportion of affected households rises sharply to 17% under the total expenditure measure and 16.4% under the non-food expenditure measure. Notably, this threshold marks a reversal in the relative ordering of the two benchmarks, with catastrophic incidence under total expenditure exceeding that under non-food expenditure. This reversal persists at lower thresholds. At the 15% threshold, 20.1% of households experience catastrophic health spending as a share of total expenditure, compared with 17.2% when assessed relative to non-food expenditure. Similarly, at the 10% threshold, the corresponding figures are 21.1% and 20.1%, respectively. At the lowest threshold of 5%, the incidence of catastrophic health expenditure reaches its highest levels, affecting 21.2% of households under the total expenditure benchmark and 22% under the non-food expenditure benchmark. At this point, the relative ordering reverses, with a slightly higher proportion of households classified as catastrophic under the non-food expenditure measure.

The above suggests that a substantial share of poor households experience financial distress from relatively modest health expenditures. At the 15% threshold and below, more than a fifth of

households experience catastrophic spending suggesting that routine health expenses like medicines, diagnostics, and outpatient care exert significant pressure on household budgets. This compromises households' ability to finance other essential non-food needs like housing, transportation, education, and energy. It also relates to OOP health financing structure that is particularly burdensome for households with limited discretionary resources. For this set of households, small health payments regularly crowd out essential consumption. It would, for example, be noted that there is minimal change in incidence of OOP catastrophe between the 5% and 10% thresholds implying that many households cluster just above these lower expenditure shares. This points to the prevalence of frequent, low-to-moderate health expenses that, nonetheless, have huge welfare-reducing consequences as well as widespread exposure to health-related financial risk that exist way below the 40% expenditure levels traditionally considered catastrophic.

As thresholds increase above 15% of both total consumption and non-food expenditure, the incidence of catastrophic expenditure declines more noticeably. This sharper decline in catastrophic headcount at higher thresholds may signal constrained access to care and the prevalence of forgone health services. It indicates that relatively fewer households have resources enough to sustain very high OOP payments, signalling strong and binding budget constraints among poorer households. Left with OOP expenditure in the face of rising health-care costs, these households delay treatment or forego (especially formal) care altogether. They thin down or altogether disappear from participating in formal health in response to high costs and reduced access. Consequently, indications of lower incidence of catastrophic spending at higher thresholds may not reflect increased financial protection as much as they do unmet health needs and a

population disappearing from formal health services. It is also important to note that the margin (as in the table) between the headcount of households in the 5% benchmark and those in the 10% thresholds is very minor. This implies that the absence of catastrophic spending at high thresholds among poorer households may reflect exclusion from costly but potentially necessary health services rather than protection from financial risk.

The substantial difference between incidence at the 5% and 40% thresholds demonstrates both the sensitivity of catastrophic headcount estimates to the choice of threshold and the non-linear differences that arise from alternative expenditure benchmarks. As noted by some previous studies, it implies that standard thresholds used in assessing catastrophic payments have the tendency to significantly underestimate the OOP challenges facing households in countries with widespread poverty, limited access to formal healthcare, and weak formal mechanisms for financial protection, as in Nigeria. While the 40% benchmark, for example, is excellent and, therefore, widely used for international comparability, it may only capture households that incur exceptionally large health expenditures relative to their consumption. Policy conclusions based exclusively on such high catastrophic cut-offs risk overlooking a large segment of households that experience meaningful welfare losses from lower-level OOP payments. For poor households in poor countries, the real plague emanates from routine OOP payments for basic services and medical consumables that deal with relatively cheap and minor but recurrent health challenges which, when unattended, grow to become life-threatening and drain household resources. These low cost but suppressed sicknesses are often the subject of attention in the many regularly-over-subscribed ‘free medical outreaches’ by public-spirited organizations and individuals across communities in Nigeria – and other parts of Africa! While such free medicals can provide useful but temporary lifelines for the poor, they

are symptoms of underlying exclusion from necessary health services. From both research and policy standpoints, therefore, complementing conventional high catastrophic thresholds with lower cut-offs when assessing financial risk protection, particularly in low-income settings, remains important.

From the findings above, using both total and non-food consumption benchmarks provides a more comprehensive picture of financial risk protection than either measure alone and reveals important differences in the interpretation of financial hardship. The literature holds that catastrophic headcounts based on non-food expenditure are generally higher at lower thresholds than those based on total consumption, indicating that health spending competes directly with essential non-food needs such as housing, transportation, education, and energy once subsistence food requirements are met. The results in the table confirm this. When catastrophic expenditure is assessed relative to non-food consumption, the incidence is highest at the 5% threshold and declines more sharply as thresholds increase. At the 5% non-food threshold, 22% of households incur catastrophic health spending. This falls sharply to 17.2% and 16.4% at the 15% and 25% thresholds respectively. By contrast, the 21.2% catastrophe of total expenditure at the same 5% threshold only marginally diminished to 20.1% and 17.0% at the 15% and 25% thresholds. This higher incidence at the 5% threshold reflects narrower resource base represented by non-food expenditure and underscores the vulnerability of discretionary consumption to health shocks. Thus, the total consumption benchmark may understate the immediate welfare impact of health spending, particularly for poorer households with high food budget shares. Conversely, at higher thresholds, differences between the two measures narrow, reflecting the fact that only households, mostly the richer ones, with relatively greater capacity to pay are able to sustain very large health expenditures

under either definition. Overall, the wide range of benchmarks help establish that catastrophic health expenditure in Nigeria is driven both by frequent, relatively low-level OOP payments that erode household welfare and by less common but severe health shocks that overwhelm household resources.

4.2 Concentration of Catastrophic OOP Health Spending

Mirroring the trends in OOP headcount, the concentration index for catastrophic OOP expenditure is negative at lower expenditure thresholds while positive at upper expenditure thresholds for both total expenditure and non-food expenditure. For total expenditure, concentration index was negative at 5%, 10% and 15% thresholds while for non-food expenditure, it was negative at 5% and 10% thresholds. The index becomes positive at higher thresholds – 25% through 40% for total expenditure and 15% through 40% for non-food expenditure. These figures indicate the distribution of the burden of catastrophic health expenditure defined at the different thresholds across the income or consumption range. First, the negative index at lower poverty thresholds shows the disproportionate increase in poverty among poorer households arising from what would be considered relatively modest OOP health payments. In other words, incidence of OOP spending exceeding these relatively modest cut-offs (5%, 10% and 15%) is disproportionately concentrated among poorer households. This pro-poor concentration of catastrophic payments at these low thresholds indicates that minor health shocks or routine care costs are financially destabilizing and exert more-than-proportionate impact on the welfare of households that are already poor or on the margin of poverty. This reflects the greater vulnerability of low-income households to even small health expenditures, given their limited capacity to pay.

By contrast, the positive index at higher thresholds suggests that the incidence of OOP spending exceeding these more stringent cut-offs is disproportionately concentrated among better-off households. Put otherwise, catastrophic payments at high thresholds are pro-rich in distribution. At such high thresholds, only households with relatively larger resource bases are able to incur health expenditures that absorb a substantial share of their total or non-food expenditure. Again, it is to be expected that in Nigeria, very large health expenditures are more frequently incurred by better-off households, reflecting their greater ability to access and finance costly care. It is important to note that the exclusion (or less representation) of poorer households at these higher thresholds may not necessarily reflect better protection for them, but their inability to finance high-cost care or cope with high OOP payments. At such extremes, they simply forego treatment, delay care, or resort to informal and lower-cost alternatives. In effect, the concentration index reveals a double-ended spectrum. On the one end of the spectrum are the poor with extremely constrained expenditure that limit their access to even very basic care. These respond either by delaying or foregoing care and so disappear at the higher benchmarks. At the other end of the spectrum are the rich who are affected more by less frequent but high end care.

Overall, the concentration index from the data highlights a non-linear relationship between income and financial risk from OOP payments in Nigeria. At low thresholds, catastrophic health expenditure in Nigeria shows financial fragility and exposure among the poor, whereas at high thresholds it increasingly reflects utilization of expensive health services by wealthier households. This is consistent with the position of health financing literature that threshold choice critically shapes both the measured incidence and the observed socioeconomic distribution of catastrophic health expenditure. This threshold-dependent pattern highlights the regressive nature of out-of-

pocket health financing at low expenditure levels and underscores the role of unmet need and foregone care among poorer households at higher thresholds. For policy then, it becomes important to note the necessity of protecting the poor from small but frequent OOP payments like drugs and diagnostics and recognize that absence of catastrophic spending among the poor at high thresholds may signal exclusion from care, not financial protection.

5 Conclusion and Implications for Policy

Thus far, this study finds that CHE in Nigeria is heterogenous and varies by threshold, income group, and expenditure benchmark, with a pro-poor CHE at lower thresholds coexisting with a pro-rich CHE at higher thresholds. This suggests the dual crisis of widespread financial fragility among poor households driven by relatively modest but frequent OOP health payments, and exposure of better-off households to large, likely infrequent, high-end care episodes. Dealing with this crisis requires differentiated policy responses that reflect the heterogeneity of household vulnerability. Such policies would simultaneously incorporate early-stage financial distress among the poor alongside exposure to severe health shocks among wealthier households.

The evidence that more than one-fifth of households experience catastrophic payments at 15% and below suggests that financial distress emerges much earlier in the expenditure distribution than current Nigerian financial risk protection framework admits. Policy needs to explicitly recognise low-threshold CHE (5–15%) as target and redefine reform success not solely as preventing extreme impoverishment, but also as reducing recurrent, low-level OOP payments that gradually but persistently erode household welfare. National monitoring frameworks need to incorporate low-threshold CHE metrics that give early warning signs of vulnerability among poor households

with consumption baskets sensitive to health shocks. Similarly, uniform benefit designs in health insurance schemes and other pooling mechanisms are unlikely to provide effective financial risk protection across the income distribution. There is need for explicitly-differentiated and income-stratified benefit packages that align insurance designs with the empirical drivers of CHE as identified in this study. This implies comprehensive primary care coverage, essential medicines, diagnostics, and chronic disease management for low-income and informal households, with minimal or zero copayments as well as provision for specialised and tertiary services that protect against rare but severe health shocks like surgery, oncology, intensive care for the better-off households. Such differentiation would improve both equity and efficiency in the allocation of limited health financing resources.

Currently, the country's health insurance coverage remains under 10% of the total population, 26.3% of wage workers and much less for the informal sector that forms 92% of the economy (NBS, 2024; NHIS, 2022). Fast-tracking enrolment among the poor to expand risk pooling is critical. Obviously, the voluntary insurance enrolment model that has been used in the country over the years has proven insufficient and there may be need to shift toward automatic or default coverage mechanisms, particularly for the poor. This can involve geographically targeted subsidies using poverty maps and NLSS-based vulnerability indicators to prioritise high-risk regions or household-level premium exemptions for the poorest quintiles. It may also be necessary to integrate health insurance enrolment with the National Social Register or existing social programmes such as conditional cash transfers to reduce administrative barriers. These would directly address the low-threshold CHE that conventional insurance designs often fail to deal with. Financing this may require a constitutionally-enacted allocation from the Federation Account or a

specialized health tax either universally charged or collected from firms dealing on tobacco, alcohol, and sugar-sweetened beverages (Nigeria used this form of tax for tertiary education funding under the TETFUND).

The finding that CHE is driven both by frequent low-level payments and by severe shocks suggests the need for micro-level financial protection instruments. Beyond insurance, Nigeria could pilot medicine voucher schemes for chronic conditions common among poor households. It can also adopt annual household OOP caps at low thresholds (e.g. 10%), beyond which costs are subsidised or even establish digital reimbursement platforms linked to verified health facilities to reduce upfront payments among financially fragile thresholds. Authors like Lagarde and Palmer (2008) and McPake et al. (2013) recommend targeted fee exemptions, waivers or health vouchers for vulnerable populations, redeemable at accredited facilities and promptly reimbursed to service providers to ensure integrity. Onwujekwe et al. (2010), Mebratie et al. (2015) and Onwujekwe et al. (2019) recommend community-based health insurance (CBHI) accompanied by strategic support that provides buffer for low- and irregular-income earners. Affordable premiums (subsidized for the most vulnerable) can be channeled through trusted structures like cooperatives, religious associations, or traditional leaders and delivered to accredited service providers. This can, over time, be integrated into the National Health Insurance Scheme through State Agencies.

While the above recommendation would likely deal with constrained access and forgone care among poorer households, there is need to address supply-side weaknesses as well. This entails increasing and stabilising public funding for drug availability and diagnostic capacity in primary health care to reduce reliance on OOP payments for drugs. The Federal Ministry of Health

estimates that essential medicines account for between 40% and 60% of OOP spending among poor households (FMOH, 2020). Resolving under-supply or outright lack of essential drugs and disposables in PHCs would require strengthening the supply chain to improve availability and regulation of mark-up. This calls for coordination among Primary Health Care Development Agencies of different states for pooled/strategic procurement mechanisms that reimburse providers promptly. It will also involve decentralised provider payment reforms that incentivise cost control while maintaining service availability. Without such improvements, reductions in observed CHE may continue to mask unmet health needs rather than reflect genuine financial protection.

Governance failure hurts the poor, especially in health. Thus, while it is important to expand fiscal space for health, stronger resource governance and other initiatives that improve accountability and remove red-tapes that could be exploited to impose informal fees on the poor are also needed. Savedoff & Gottret (2008) recommend enforcing transparent fee schedules and establishing grievance redress systems and monitoring platforms. Reducing fragmentation in health policy and improving horizontal and vertical coordination across tiers of government will help credibility and improve value. Nigeria also needs to resuscitate audit and expenditure tracking in health.

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