

## IMPOVERISHING EFFECTS OF CATASTROPHIC HEALTH OUT-OF-POCKET PAYMENTS IN NIGERIA

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### ABSTRACT

Out-of-Pocket (OOP) expenditure on healthcare is a major share of total healthcare expenditure in many developing countries, including Nigeria. Households in different income groups in Nigeria spent a larger share of income mainly on consumption and basic needs, hence, OOP expenditure for health constituted a burden with attendant effects on household well-being. Catastrophic headcount and Overshoot mean positive gap and concentration indexes were used to capture the incidence and severity of catastrophic health expenditure. The poverty headcount, poverty gap, normalized poverty gap, and its mean estimate were used to empirically identify the effect of catastrophic health expenditure using the national poverty line of ₦137,430 per year. Data on 22,110 households with non-zero expenditure were obtained from the 2018/2019 Nigeria Living Standard Survey. The incidence and severity of catastrophic health expenditure were higher for poorest and poor income quintiles using total consumption expenditure and total non-food expenditure at various catastrophic thresholds. The results indicated that about one million Nigerians were pushed into poverty due to OOP expenditure. Widening the coverage of the available social health insurance and implementation of alternative means of healthcare financing would minimize the financial burden on many poorest and poor households

Keywords: Income groups, Out-of-pocket, total consumption expenditure, non-food expenditure, threshold

JEL CODE: I1, I19, I39

## 1. Introduction

Most health systems in low and middle income countries are financed mainly through out-of-pocket (OOP) payments. This indeed has great consequences for household well-being and their access to medical consumption in the period of illness. This can also make individuals to drop beneath the poverty line when they pay for medical care at the expense of meeting other non-medical consumption (Mahumud *et al.*, 2017, Aregbeshola and Khan, 2018; Edeh, 2022). However, there is controversy on what should constitute OOP health expenditure. That is, whether OOP payments should be considered to include direct payments to the healthcare providers, or indirect payments (tax paid by households to the government, the premium paid to insurance companies) or both. World Health Organization (WHO) describes OOP payments as direct payments given to healthcare providers by individuals at the time of service provided. This exempts any pre-payment for health services in form of taxes or particular insurance premiums or contributions and, where possible, net of any compensation to the individual(s) who made the payment. It is the most fragmented method of payment across individual consumers as payments vary from one healthcare provider to another, with no possibility of pooling risks (see Krutilova and Yaya, 2012).

Unfortunately, an expansion in the share of OOP payments for healthcare imposes financial incapability on households and individuals living in poverty by consuming larger part of household income, which limits them to search for adequate quality and quantity of care (see Garcia-Daiz and Sosa-Rub, 2011; Kwesiga, 2012). When OOP payments for healthcare are on the high side, poor households may decide not to strive for healthcare when the need be rather than becoming impoverished from healthcare expenses (Li *et al.*, 2014). Health expenditure through OOP payments becomes financially catastrophic when it restraints the ability of the household to withstand its usual standard of living (Berki, 1986). This expenditure may prevent households from achieving their daily primary necessities and compel some households to adopt unplanned strategies such as sale of an asset (Gupta and Joe, 2013), dissaving and borrowing in order to smoothen consumption. Inevitably, the coping strategies are likely to tip the household into poverty either for a short or extended period.

Unexpected OOP payments for healthcare may endanger households to considerable financial risk and in most inevitable cases lead to economic impoverishment (Mahumud *et al.*, 2017). Impoverishment happens when a household whose level of expenditure initially beyond the poverty line drops beneath the poverty line due to OOP payments (Koch *et al.*, 2017) or those beneath the poverty line sinks further beneath the poverty line due to OOP payments. The impact of OOP payments can be very severe on disposable income and this can be a reason why households remain in poverty over time. Health spending beyond certain thresholds of total household expenditure or capacity to pay can be impoverishing. However, there is no consensus in the literature as to what this threshold should be, but studies have shown that the threshold can

range from 5% of total household expenditure (Berki, 1986) to 40% of capacity to pay or non-subsistence expenditure (Xu, 2005).

Countries depending mostly on OOP payments financing generally have the greatest prevalence of catastrophic health payments (Van Doorslaer, 2005). Nigeria is one of the developing countries with high OOP payments (Ataguba, 2012), because there is lack of risk pooling method of financing healthcare and households that have access to health insurance are restricted to less medical coverage. In situation where households' medical needs are out of the health insurance list, such households will resort to paying for healthcare through OOP. Household OOP payments account for at least three-quarters of the total health expenditure in Nigeria. For instance, statistics from the World Development Indicators (WDI) reflect that in 2020, OOP payments recorded approximately 75% of the total health expenditure. This endangers majority of Nigerians in a great deal of financial risk and further distorts their access to healthcare when needed. Majority of Nigerians are compelled to dispose their personal possessions at ridiculous prices and are further indebted in their search for health (Demsy *et al.*, 2013). According to Saksena *et al.* (2006), the magnitude of the problem of OOP payments is a valid indicator of the incidence of catastrophic household health expenditure in a population. This confirms Ichoku *et al.*'s (2009) argument that OOP payments are part of the causes of high incidence of catastrophic spending and impoverishment in Nigeria. Aregbeshola (2016) averred that over reliance on OOP payments in Nigeria can make households and individuals encounter catastrophic health expenditure and this can increase the level of poverty. An empirical investigation by Onoka *et al.* (2010) showed that about 15% of the people in Anambra state were affirmed to experience catastrophic health expenditure at 40% non-food expenditure. Undoubtedly, payment for healthcare through OOP that is capable of affecting household's ability to purchase other necessity goods, can also lead to impoverishment.

OOP payments serving as major means of channelling funds to the healthcare provider are vast in the literature but how it becomes catastrophic and tips the households further into poverty is the major concern of this study. This paper examines the incidence and severity of catastrophic OOP payments among income groups with separate use of total consumption expenditure and total non-food expenditure to compare results. In addition, the determination of the impacts of catastrophic OOP spending on poverty in rural areas, urban areas and the entire country was done. There is paucity of studies on catastrophic household health expenditure and its effects on household impoverishment in Nigeria. Ichoku *et al.* (2009) and Aregbeshola and Khan (2018) provided empirical evidence in Nigeria on catastrophic health expenditure and impoverishment. However, Ichoku *et al.* (2009) sampled only Enugu State in the eastern part of Nigeria out of 36 states and using this result to generalize for the entire country may not be tenable. While Aregbeshola and Khan (2018) used nationally representative data to provide result for the entire country, the study failed to tackle the intensity/severity of catastrophic health expenditure, which is usually captured in the literature by "Mean Positive Gap (MPG)" through the concept of "overshooting estimate". They instead estimated concentration index to know the income group for which the intensity

affected. In addition, none of the identified existing studies distinguished between rural and urban estimates, which are capable of suggesting to policy makers on how specific health financing programs may be structured and implemented in the rural and urban areas. This study fills these gaps as empirical contribution to the existing knowledge.

The remaining part of this paper is discussed as follows: section 2 hinges on literature review, section 3 discusses methodology, section 4 is for data and preliminary results, section 5 focuses on results and discussion as well as limitation and direction for further studies and section 6 is majorly on conclusion of the study.

## 2. Literature review

The general claim under the incidence and severity of catastrophic health expenditure is that out of pocket payments increase catastrophic health expenditure at various thresholds. The lower the thresholds, the higher are the incidence and intensity of catastrophic health expenditure. Empirical estimates of the incidence of catastrophic health spending in Malawi show that OOP payments moved between 0.73 and 9.4 percent of the households to encounter catastrophic health expenditure, while the overshoot result estimated for intensity ranged between 0.08 and 1.01 percent (Mchenga *et al.*, 2017). The results from about eight countries in South-East Asia show that poorer households had a lower incidence of catastrophic spending and across the eight countries; approximately 243 million individuals had catastrophic expenditure at 10 percent threshold and 56 million at 25 percent threshold (Wang *et al.*, 2018). Gupta and Joe (2013) observed that the prevalence of catastrophic expenditure was higher in rural areas where households travelled to more advantaged cities to seek quality healthcare in India. Wagstaff *et al.* (2017) investigated the incidence of catastrophic health spending among 133 countries, though there was variation across the incidence of catastrophic spending, yet the global result showed that eight hundred and eight million individuals incurred catastrophic health spending. Chantzaras and Yfantopoulos (2018) affirmed that prevalence and severity of catastrophic health expenditure were higher for the wealthier and middle expenditure strata at higher threshold, while economically less-advantaged households were typically associated with a higher mean overshoot at a lower threshold in Greece. Thakur *et al.* (2018) estimated concentration indexes for both rural and urban areas, and the estimates were positive, suggesting that the households with higher non-food expenditure (rich quintile) are more likely to incur catastrophic health expenditure because they can spend more, while the poorer households are striving to meet the cost of necessities apart from healthcare. Sene and Cisse (2015) noted that regardless of the type of expenditure used, approximately 6 percent of the households incurred health expenditure beyond the critical threshold of 10 percent and the excess of catastrophic out of pocket health spending is around 8 percent of the household income in Senegal, with a more severe effect in locations out of the capital.

Xu *et al.* (2003) averred that the share of households experiencing catastrophic payments from out of pocket health expenses varied among 59 countries investigated, from less than 0.01 percent in

the Czech Republic and Slovakia to approximately 11 percent in Vietnam. Similarly, a study for Vietnam by Wagstaff and Van Doorslear (2003) noted that between 1993 and 1998, both incidence and intensity of catastrophic payments fell, in terms of both total expenditure and ability to pay while the incidence and intensity were less concentrated among the poor. Some studies in Nigeria (Ichoku *et al.*, 2009; Amakom and Ezenekwe, 2012; Cleopatra and Eunice, 2018 and Aregbeshola and Khan, 2018) found inconsistent results regarding the concentration of catastrophic health expenditure among socioeconomic groups. Ichoku *et al.* (2009), Amakom and Ezenekwe (2012) and Aregbeshola and Khan (2018) found that catastrophic health expenditures were more profound among the richest income quintile while Cleopatra and Eunice (2018) found that the intensity of catastrophic health expenditure was higher among the poorest quintile in Nigeria. A similar result by Akazili *et al.* (2017) and Barasa *et al.* (2017) was found in Ghana and Kenya, respectively, that people living in poverty were distorted more with catastrophic health expenditure. Van Doorslear *et al.* (2005) found a contrary result in Asia that in most low/middle income countries, the non-poor were likely to spend a larger fraction of total household resources on healthcare, which reflects the inability of the people living in poverty to divert resources from basic needs. However, Somkotra and Lagrada (2008) and Arsenijevic *et al.* (2012) found the burden of out of pocket payment for healthcare to be the highest among the richest and middle-income quintiles in Thailand and Serbia.

To get a sense of impoverishing impacts of health OOP payments, most studies either considered national poverty line / and international poverty line to determine households that may cross the poverty line or those that may sink beneath the poverty line after taking payment for healthcare into consideration. Mchenga *et al.* (2017) used Malawi poverty line of approximately K37, 000 per year and found that about 0.93 percent fell beneath the poverty line after accounting for healthcare expenditure. Van Doorslaer *et al.* (2005) noted that among the eleven low/middle income countries investigated in Asia, seventy eight million persons were pushed beneath the very low threshold of \$1 per day due to payments for healthcare. Wang *et al.* (2018) investigated financial protection among the eight countries in South-East Asia; fifty eight million persons were pushed beneath the extreme poverty line of US\$1.90 in India, Bangladesh, 64.2million people below \$3.10 (per capita) in Maldives, and Nepal, due to out of pocket spending. Sene and Cisse (2015) estimated that about one hundred and ninety six thousand persons were pushed beneath the national poverty line in Senegal due to catastrophic health spending of which rural dwellers were more than urban dwellers. Gupta (2009) also observed that there was a 4.2 percent difference between the rural and urban health payment adjusted poverty, suggesting that OOP payments were more poverty-inducing in the rural areas than the urban areas in India. Another study in India by Keane and Thakur (2018) affirmed that the hidden poverty rate, due to medical cost, was more profound in the rural than the urban because approximately 39 million and 11 million people were pushed beneath the poverty line of \$54 and \$66.18 per month respectively. Dorjdagva (2016) found that after accounting for out of pocket payments, approximately 0.78 percent of the population was forced into poverty in Mongolia. For all the three (poverty head count, poverty count and poverty squared indices) measures of impoverishment estimated by Ichoku *et al.* (2009)

for the southeast zone in Nigeria at ₦2900 poverty line, health care financing through OOP payments worsened the rate of poverty. Similarly, about 1.3 million Nigerians were pushed beneath the poverty line due to payments through OOP at the rate of \$1.25 a day poverty line (Aregbeshola and Khan, 2018). Two studies in Kenya by Kimani and Maina (2015) and Barasa *et al.* (2017) also found that quantum number of households were pushed into poverty after accounting for out of pocket health spending. However, Somkotra and Lagrada (2008) observed that universal health coverage policy was effective in reducing impoverishment due to OOP payments for healthcare since both the poverty headcount and poverty gap declined from the pre-universal coverage to post-universal health coverage. Garcia-Diaz and Sosa-Rub (2011) suggested that the use of health insurance compared to out of pocket payment could reduce poverty induced health payment because the result for Mexico showed that the use of public health insurance programme for the poor in Mexico has a better distributional impact when households were faced with illness compared to other poverty-reducing policies.

Stemming from the literature, the general empirical claim on the incidence and intensity of catastrophic health expenditure is that OOP payments increase catastrophic health expenditure at different thresholds without comparing the results between the use of total consumption expenditure and non- food expenditure. Similarly, the use of national poverty line/ and international poverty line to determine impoverishing effects of health expenditure in the extant literature show that households above and beneath the poverty line were forced into poverty due to OOP payments. However, very few studies affirmed that OOP payments are more poverty inducing in the rural areas than the urban areas. This study fills the identify gaps in the literature.

### 3. Methodology

#### 3.1 Measuring the incidence and severity of catastrophic health expenditure

Following Wagstaff and Van Doorslaer (2003) model, the catastrophic headcount ( $H_{cat}$ ) measures the incidence of catastrophe, representing the percentage of the population incurring catastrophic health payment. The severity of catastrophic expenditure, which gives the overall average catastrophic gap, is the mean positive gap ( $MPG_{cat}$ ) and it is captured through the concept of overshooting estimate (O) or catastrophic payment gap, denoting the actual height above which a household exceeds  $z_{cat}$ . Taking total expenditure to be a proxy for income (Y),  $D(Y)$  represents the deduction allowed in determining a household's ability to pay (spending on necessities like food) and the measure of ability to pay is  $x=Y- D(Y)$  which is usually captured by non-food expenditure. The ratio of OOP payments to total expenditure (Y) or ability to pay/ non-food expenditure (x) is stated as:

$$z_i = \frac{OOP_i}{Y_i} \quad \text{or} \quad \frac{OOP_i}{x_i} \quad (1)$$

Let  $E_i = 1$  and 0 otherwise if  $z_i$  exceeds  $z_{cat}$ . The threshold,  $z_{cat}$ , is assumed to be 5,10,15,25, 30 and 40% under this model. This is to capture the percentage below and above the Sustainable Development Goals (SDGs) thresholds. The catastrophic headcount ( $H_{cat}$ ) is specified as:

$$H_{cat} = \frac{1}{N} \sum_{i=1}^N E_i = \eta_E \quad (2)$$

Where N is the sample size and  $\eta_E$  is the mean  $E_i$ . However, this measure fails to check the height beyond which households exceed the threshold actually exceeds it. This prompts the specification of the catastrophic payment gap to be defined as an overshooting measure (O), which captures the height by which  $z_i$  exceeds  $z_{cat}$ . Let the household catastrophic overshoot be  $O_i = E_i(z_i - z_{cat})$  and the average overshoot be specified as:

$$O = \frac{1}{N} \sum_{i=1}^N O_i = \eta_O \quad (3)$$

The total average catastrophic payment gap, which measures the severity of catastrophic payment, is:

$$MPG_{cat} = \frac{\sum_{i=1}^N O_i}{\sum_{i=1}^N E_i} = \frac{\eta_O}{\eta_E} \quad (4)$$

Above stated  $E_i$  and  $O_i$  are not weighted as to how the proportion of the household beyond the thresholds varies across the income distribution. By implication, the methods fail to differentiate the opportunity cost of health spending to the poor and the non-poor by not indicating the income groups that exceed the thresholds. Thus, the weighted  $H_{cat}$  and  $O$  with income distribution (poor and non-poor) are stated as:

$$\begin{aligned} H_{cat}^w &= \eta_E(1 - C_E) \\ O^w &= \eta_O(1 - C_O) \end{aligned} \quad (5)$$

Where  $C_E$  and  $C_O$  are the concentration indexes for  $E_i$  and  $O_i$  measuring the distribution of catastrophic payments in relation to income. A positive value of  $C_E$  reflects a greater tendency for the non-poor to go beyond the payment threshold, while the reverse is the case for the negative value of  $C_E$ . Similarly, a positive value of  $C_O$  suggests that the payment gap is concentrated among non-poor household, while a negative  $C_O$  indicates that the large excess payment is concentrated among the poor households.

### 3.2 Measuring impoverishment due to out-of-pocket (OOP) payments

A health payments-adjusted poverty method by Wagstaff and Van Doorslaer *et al.* (2003) was adopted to capture the poverty effect of OOP payments as part of the objective of this study. Let  $k$  be the poverty line and  $\pi$  as the poverty gap. Denote  $Y_i$  as per capita total expenditure and  $\pi_i$  as poverty gap for household  $i$ . Consider household expenditure gross of OOP payments to represent the prepayment income (income before payment for health) and household expenditure net of OOP payments represents the post-payment income (income after paying for health), the poverty headcount for the gross of OOP payments ( $H_{Pov}^{Gross}$ ) is:

$$H_{Pov}^{Gross} = \frac{\sum_{i=1}^N S_i P_i^{Gross}}{\sum_{i=1}^N S_i} = \eta_{p^{Gross}} \quad (6)$$

Where  $P_i^{Gross} = 1$  if  $Y_i < k$  and it is zero otherwise, the household size is denoted as  $s_i$  and  $N$  is the sample size. Defining poverty gap for gross of OOP payments by  $\pi_i^{Gross} = P_i^{Gross} (k - Y_i)$ , the average poverty gap in Naira is:

$$G_{Pov}^{Gross} = \frac{\sum_{i=1}^N S_i \pi_i^{Gross}}{\sum_{i=1}^N S_i} = \eta_{\pi^{Gross}} \quad (7)$$

For ease of comparison and interpretation to know if poverty gap is moderately considerable or otherwise in the world with different poverty lines and currency units, a normalised poverty gap is stated in form of ratio:

$$NG_{Pov}^{Gross} = \frac{G_{Pov}^{Gross}}{k} \quad (8)$$

The severity of gross OOP payments is calculated by the mean poverty gap:

$$MPG_{Pov}^{Gross} = \frac{\eta_{\pi^{Gross}}}{\eta_{p^{Gross}}} \quad (9)$$

Replacing all the superscripts from equations (6) to (9) with net gives similar measures for household expenditure net of OOP payments. The measures for the impoverishing impact of payments through OOP by the households are the difference between gross of OOP (pre-OOP) payments and the net of OOP (post-OOP) payments, which are conceptualised through the poverty headcount, poverty gap and normalised poverty gap.

$$PI^H = H_{Pov}^{Net} - H_{Pov}^{Gross} \quad (10)$$

$$PI^G = G_{Pov}^{Net} - G_{Pov}^{Gross} \quad (11)$$

$$PI^{NG} = NG_{Pov}^{Net} - NG_{Pov}^{Gross} \quad (12)$$

## 4. Data and preliminary results

### 4.1 Data

The analysis of this study was based on 2018/2019 Nigeria Living Standard Survey (NLSS), conducted by the Nigerian National Bureau of Statistics (NBS). The survey commenced in 2018 with 22,200 households selected from NIHS2 (National Integrated Household Surveys) of 60 EAs (enumeration areas) in the 36 states and FCT. However, 22,110 households' data were recorded in the survey because of the security challenge in one of the 36 states, Borno, in Nigeria. Data extracted from the survey were place of residence (rural/urban) of the respondents, household size, computed household food expenditure, computed household non-food expenditure and computed



total amount paid to healthcare providers per household (including cost of drugs and medical supplies). The national poverty line used for this study was obtained from NLSS report of the National poverty rate for Nigeria, estimated by the NBS. Using the per capita absolute poverty approach, which assigns 2251 calories to every Nigerian as the minimum daily calories requirement, the latest poverty line was estimated to be ₦137,430 per person per year. Analysis of data was done using STATA and ADePT.

#### 4.2 Preliminary results

The descriptive statistics presented in Table 1 summarises the mean and standard deviation of variables used. Households spent an average of ₦88,9307.4 per year. As shown in the table, the mean value of non-food expenditure was almost three times lower than total household expenditure, which invariably suggests that majority of the households spent more on food than non-food. OOP health payments for four weeks preceding the survey show an average value of ₦58,227.52, per-capita expenditure was ₦218,780.7 and per capita non-food expenditure was ₦89,531.05. The data revealed that rural setting dominates in Nigeria. This indicates that more than two-third of the households covered in the survey resides in the rural areas; while less than one-third resides in the urban areas. Nevertheless, Per-capita expenditure, per-capita non-food expenditure and per-capita OOP values were higher for the households in the urban areas than rural areas. Obviously, urban dwellers are considered to have better income compared to rural dwellers based on the below statistics.

**Table 1** Descriptive statistics

Variables	Obs.	Mean	Std. dev.
Total household expenditure	22,110	889307.4	682105.9
Total non-food expenditure	22,110	362236.6	434076.8
OOP	22,110	58227.52	129522.5
Household size	22,110	5.258209	3.326211
Per-capita expenditure	22,110	218780.7	211997
Per-capita non-food expenditure	22,110	89531.05	140687.3
Per-capita OOP	22,110	13075.88	32058.68
Per-capita expenditure (Rural)	15,302	184446.4	151293.7
Per-capita non-food expenditure (Rural)	15,302	68624.98	75333.15
Per-capita OOP (Rural)	15,302	12807.23	28978.09
Per-capita expenditure (Urban)	6,808	295952.3	293111.3
Per-capita non-food expenditure (Urban)	6,808	136520.6	219862.5
Per-capita OOP (Urban)	6,808	13679.7	293111.3

Source: Computed by Author from 2018/2019 NLSS

## 5. Results and discussion

### 5.1 Incidence and severity of catastrophic health payments (OOP) using total consumption expenditure

In Table 2, the catastrophic payment headcount ( $H_{cat}$ ), which describes the percentage of households with health payment budget share higher than 5% threshold of total consumption expenditure, for the lowest quintile of income (poorest) was 47.7%. An increase in the threshold from 10% to 40% of total expenditure shows that the incidence of catastrophic payments declined from 24.0% to 0.5%. The higher the threshold, the lower is the catastrophic payment headcount at different thresholds. Results among income groups suggest that the incidence of catastrophic health payments declined with income specifically between 5% and 15% thresholds and increased with income at higher thresholds between 25% and 40%. This could be because the poor households expended a larger budget share of their income on healthcare at lower threshold than the non-poor did.

The overshoot estimates (O), which reflects the extent to which the household health payment budget share is more than 5% also shows the same trend as the catastrophic headcount ratio, as the overshoot reduced from 3.5% to 0.0% at the threshold of 5% and 40%. Households in the poorest quintile of income expended more than 5% of the total expenditure on healthcare, expending on an average of 12.4% (5% + 7.4%), while those in the highest quintile expended 14.4%. Interestingly, the severity of catastrophic health payments increased when the threshold was raised and also increased with income for households under consideration. This result is similar to what Somkotra and Lagrada (2008) found in Thailand that the burden of healthcare payment, on average, is highest for the richest group of income than the poorest group.

At 5% of total consumption expenditure, the incidence of catastrophic health expenditure in terms of headcount is less severe in Nigeria compared to 64.3% reported in Togo by Atake and Amendah (2018). However, the severity of the catastrophic headcount is less relative to the estimate for Nigeria in the study by Van Doorslaer *et al.* (2005) for countries like Malaysia (6.62%), Taiwan (19.14%), Thailand (8.43%), Sri Lanka (10.97%) and Nepal (14.72%). Similarly, Kwesiga (2012) reported 38% in Uganda, while Ghosh (2011) reported 29.98% in India. Two different studies on Vietnam by Wagstaff and Van Doorslaer (2003) and Van Doorslaer *et al.* (2005) reported 33.02% and 33.77%, respectively. Furthermore, other studies by Sene and Cisse (2015) reported 16.2% in Senegal, Akazili *et al.* (2017) recorded 11.0% in Ghana, Dorjdagva *et al.* (2016) reported 12.1% in Mongolia and Somkotra and Lagrada (2008) reported that 10.75% of the households in Thailand expended more than 5% of their total consumption expenditure. It can be deduced that most of these researchers also found that the more the threshold is increased beyond 5%, the lesser the catastrophic headcount ratio becomes.

The overall mean positive overshoot shows that at 5%, households in Nigeria that spent more than 5% on healthcare expended on average 13.0% (5% + 8.0%) of their income on healthcare, while

at 40%, Nigerian households expended an average 49.9% (40% + 9.9%) of their income on healthcare. At the empirical front, the severity of catastrophic health expenditure is high for Nigeria at 5% compared to what is obtainable in countries like Vietnam (11.14%), Thailand (10.98%), China (12.84%) and India (11.91%), as documented by Wagstaff and Van Doorslaer (2003) and Somkotra and Lagrade (2008). On the contrary, the percentage is lower in Nigeria compared to Uganda (14.96%), Mongolia (13.13%), Togo (16.06%), Bangladeshi (15.01), Hong Kong (13.56%), Korea (14.07%) and Indonesia (13.71%) as reported in Kwesiga (2012), Dorjdagva *et al.* (2016), Atake and Amendah (2018), and Wagstaff and Van Doorslaer (2003) respectively.

**Table 2** Incidence and severity of catastrophic health payments, using total consumption expenditure (national)

	Health Budget Share Thresholds (in %)					
	5	10	15	25	30	40
<b>Headcount (<math>H_{cat}</math>)</b>						
Q <sub>1</sub>	47.7	24.0	12.4	3.4	1.7	0.5
Q <sub>2</sub>	47.1	24.1	12.6	4.1	2.3	0.6
Q <sub>3</sub>	44.6	22.3	11.5	3.9	2.1	0.9
Q <sub>4</sub>	39.9	19.3	11.0	3.2	1.8	1.0
Q <sub>5</sub>	32.4	17.0	10.1	3.9	2.8	1.4
Total	42.3	21.4	11.5	3.7	2.1	0.9
<b>Overshoot (O)</b>						
Q <sub>1</sub>	3.5	1.8	0.9	0.2	0.1	0.0
Q <sub>2</sub>	3.7	1.9	1.1	0.3	0.2	0.1
Q <sub>3</sub>	3.5	1.9	1.1	0.4	0.2	0.1
Q <sub>4</sub>	3.1	1.7	1.0	0.3	0.2	0.1
Q <sub>5</sub>	3.0	1.9	1.2	0.5	0.4	0.2
Total	3.4	1.8	1.0	0.4	0.2	0.1
<b>Mean positive overshoot (<math>MPG_{cat}</math>)</b>						
Q <sub>1</sub>	7.4	7.5	7.6	7.1	6.8	4.4
Q <sub>2</sub>	7.8	8.0	8.5	8.4	8.4	9.4
Q <sub>3</sub>	7.8	8.4	9.3	9.6	10.6	10.7
Q <sub>4</sub>	7.8	8.8	8.8	10.8	12.4	8.3
Q <sub>5</sub>	9.4	11.0	11.9	13.6	13.5	12.9
Total	8.0	8.6	9.1	9.9	10.6	9.9

Note: Q<sub>1</sub>- Lowest quintile (Poorest), Q<sub>2</sub>- 2nd quintile (poor), Q<sub>3</sub>- 3rd quintile(Middle income), Q<sub>4</sub>- 4th quintile (Second richest), Q<sub>5</sub>- Highest quintile (Richest)

The synopsis of results in Tables 3 and 4 shows that the catastrophic payment headcount estimate for both urban and rural areas decreased as the threshold increased from 5% to 40%. The overshoot for the rural-urban divides in Nigeria decreased as the threshold moved from 5% to 40%. The incidence of catastrophic health expenditure for the highest quintile of households in the rural areas was almost one and half times higher than the highest income quintile in urban areas at 5% threshold while at 40% threshold; it was about two times higher than urban areas. Similarly, the

severity of catastrophic health expenditure for the lowest quintile of households in the rural areas was 1.2% more than the lowest income quintile in the urban areas while at 15%, 25% and 30% thresholds; the severity was more for urban households than rural households for the lowest income quintile.

**Table 3** Incidence and severity of catastrophic health payments, using total consumption expenditure (urban)

	Health Budget Share Thresholds (in %)					
	5	10	15	25	30	40
<b>Headcount (<math>H_{cat}</math>)</b>						
Q <sub>1</sub>	40.4	17.6	8.4	2.3	1.2	0.8
Q <sub>2</sub>	34.4	17.0	8.6	2.3	0.9	0.1
Q <sub>3</sub>	33.0	15.1	6.7	1.9	1.0	0.9
Q <sub>4</sub>	27.2	13.2	6.9	1.6	0.9	0.4
Q <sub>5</sub>	26.2	13.8	8.3	3.2	2.4	0.9
Total	32.2	15.3	7.8	2.3	1.3	0.6
<b>Overshoot (O)</b>						
Q <sub>1</sub>	2.7	1.3	0.7	0.2	0.1	0.0
Q <sub>2</sub>	2.4	1.2	0.6	0.1	0.0	0.0
Q <sub>3</sub>	2.2	1.1	0.6	0.2	0.1	0.0
Q <sub>4</sub>	1.9	1.0	0.5	0.1	0.1	0.0
Q <sub>5</sub>	2.5	1.6	1.0	0.4	0.3	0.2
Total	2.4	1.2	0.7	0.2	0.1	0.1
<b>Mean positive overshoot (<math>MPG_{cat}</math>)</b>						
Q <sub>1</sub>	6.6	7.4	8.1	9.2	10.3	4.5
Q <sub>2</sub>	7.1	7.0	6.5	4.9	3.8	1.8
Q <sub>3</sub>	6.8	7.3	8.8	10.4	13.3	4.9
Q <sub>4</sub>	7.0	7.4	7.4	8.9	9.3	8.4
Q <sub>5</sub>	9.7	11.3	12.0	13.5	12.7	17.7
Total	7.3	8.0	8.6	9.7	10.6	8.9

All the estimated results for rural households were higher than urban results for the catastrophic headcount, catastrophic overshoot and the mean positive overshoot using the total result. The incidence of catastrophic payments for both households in rural and urban areas also decreased with income between 5% and 15% and increased with income between 25% and 40% thresholds. The severity of catastrophic payments varies with income at different thresholds; the severity was higher for rural than urban at all thresholds except at 30% in Nigeria using the total result. These results are in line with the empirical outcome in the study by Thakur *et al.* (2018) for India, which reflects that the catastrophic headcount ratio for rural areas is slightly more than that of urban areas by 0.43%, while the catastrophic overshoot increased for urban areas by 55.62%. This result is affirmative as Gupta and Joe (2013) also found that the incidence of catastrophic expenditure is higher among rural areas where households travel to cities to search for quality healthcare.

**Table 4** Incidence and severity of catastrophic health payments, using total consumption expenditure (rural)

	<b>Health Budget Share Thresholds (in %)</b>					
	<b>5</b>	<b>10</b>	<b>15</b>	<b>25</b>	<b>30</b>	<b>40</b>
<b>Headcount (<math>H_{cat}</math>)</b>						
Q <sub>1</sub>	47.6	25.0	13.2	3.5	1.7	0.4
Q <sub>2</sub>	50.5	25.3	13.2	4.4	2.3	0.4
Q <sub>3</sub>	50.5	26.5	13.9	4.9	3.1	1.3
Q <sub>4</sub>	47.8	24.3	14.0	4.7	2.2	1.0
Q <sub>5</sub>	42.9	22.2	13.5	5.1	3.6	2.0
Total	47.9	24.7	13.5	4.5	2.6	1.0
<b>Overshoot (O)</b>						
Q <sub>1</sub>	3.7	1.9	1.0	0.2	0.1	0.0
Q <sub>2</sub>	3.8	2.0	1.1	0.3	0.2	0.0
Q <sub>3</sub>	4.2	2.3	1.3	0.5	0.3	0.1
Q <sub>4</sub>	4.0	2.2	1.3	0.5	0.3	0.1
Q <sub>5</sub>	4.0	2.5	1.6	0.7	0.5	0.2
Total	3.9	2.2	1.3	0.5	0.3	0.1
<b>Mean positive overshoot (<math>MPG_{cat}</math>)</b>						
Q <sub>1</sub>	7.8	7.6	7.6	6.7	6.3	4.5
Q <sub>2</sub>	7.5	7.8	8.1	7.7	7.7	10.1
Q <sub>3</sub>	8.2	8.7	9.6	9.9	9.0	7.3
Q <sub>4</sub>	8.3	9.2	9.2	10.1	13.4	14.1
Q <sub>5</sub>	9.4	11.1	11.8	14.2	14.0	11.3
Total	8.2	8.8	9.3	10.0	10.6	10.3

As shown in Table 5, households in Nigeria expended a substantial large percentage of their non-food expenditure on healthcare through OOP payments. At 5% and 40% thresholds of non-food expenditure, approximately 66.4% and 10% of households, respectively, expended over the specified thresholds. The catastrophic headcount and catastrophic overshoot estimates decreased as the threshold increased but move higher using total non-food expenditure than total household expenditure. For all the estimated results, the incidence of catastrophic payments declined with the status of income at different thresholds used. This implies that poor households cut from the non-food expenditure to cope with healthcare payment through OOP payments at different thresholds. The severity of catastrophic health spendings decreased with status of income at lower thresholds between 5 and 15% and it rose with status of income at higher threshold above 15%. The incidence of catastrophic health expenditure was more profound at the lowest quintile than the highest quintile for different thresholds. On the whole, the higher the threshold, the lower the severity of catastrophic health expenditure, though, the severity varies at different thresholds with income groups. It should be noted that the overshoot estimate declined with non-food expenditure at various thresholds.

**Table 5** Incidence and severity of catastrophic health payments, using total non-food expenditure (national)

	Health Budget Share Thresholds (in %)					
	5	10	15	25	30	40
<b>Headcount (<math>H_{cat}</math>)</b>						
Q <sub>1</sub>	79.0	64.2	49.5	30.0	24.6	12.9
Q <sub>2</sub>	73.6	60.2	47.7	29.4	22.8	12.3
Q <sub>3</sub>	68.1	52.8	42.5	24.7	18.5	10.0
Q <sub>4</sub>	61.6	47.0	35.8	19.7	15.0	8.6
Q <sub>5</sub>	49.9	36.6	27.9	16.2	12.2	7.4
Total	66.4	52.2	40.7	24.0	18.6	10.2
<b>Overshoot (O)</b>						
Q <sub>1</sub>	15.3	11.7	8.8	4.9	3.5	1.7
Q <sub>2</sub>	14.5	11.2	8.5	4.6	3.3	1.6
Q <sub>3</sub>	12.5	9.5	7.1	3.8	2.8	1.4
Q <sub>4</sub>	10.6	7.9	5.8	3.1	2.3	1.1
Q <sub>5</sub>	8.7	6.6	5.0	2.9	2.2	1.2
Total	12.3	9.4	7.1	3.9	2.8	1.4
<b>Mean positive overshoot (<math>MPG_{cat}</math>)</b>						
Q <sub>1</sub>	19.3	18.2	17.9	16.3	14.3	13.1
Q <sub>2</sub>	19.7	18.5	17.7	15.8	14.7	13.3
Q <sub>3</sub>	18.4	18.0	16.8	15.5	14.9	14.1
Q <sub>4</sub>	17.2	16.8	16.3	15.9	15.4	13.0
Q <sub>5</sub>	17.5	18.0	18.0	17.7	17.7	16.4
Total	18.5	18.0	17.3	16.1	15.1	13.8

The total result for the incidence of catastrophic health expenditure shows that healthcare payment absorbed a greater share of non-food expenditure in Nigeria given that the results show that 47.0% households expended more than 10% of non-food expenditure, while 8.6% of households expended more than 40% of their total non-food expenditure. The result for 10% threshold is far higher than that of Malawi (9.7%) as reported by MChenga *et al.* (2017), Greece (27.95%) estimated by Chantzaras and Yfantopoulos (2017), Vietnam (41.52%) reported by Wagstaff and Van Doorslaer (2003) and that of Ghana (4.91%) indicated in the result of Akazili *et al.* (2017) and lower than that of Togo (54.6%) in Atake and Amendah (2018). The severity of the total result for this study is more explosive than what is obtainable in other countries as reported in previous studies. In addition, the incidence and the severity of catastrophic health expenditure are higher using total non-food expenditure than total household expenditure.

**Table 6** Incidence and severity of catastrophic health payments, using total non-food expenditure (urban)

	Health Budget Share Thresholds (in %)					
	5	10	15	25	30	40
<b>Headcount (<math>H_{cat}</math>)</b>						

Q <sub>1</sub>	70.1	51.8	37.0	18.3	13.6	6.2
Q <sub>2</sub>	56.9	39.4	30.2	16.1	12.2	6.1
Q <sub>3</sub>	52.5	36.4	25.6	11.5	8.4	4.1
Q <sub>4</sub>	45.9	30.4	20.8	10.1	6.6	4.0
Q <sub>5</sub>	39.4	27.8	21.5	11.9	8.6	4.7
Total	53.0	37.2	27.0	13.6	9.9	5.0
<b>Overshoot (O)</b>						
Q <sub>1</sub>	10.4	7.3	5.1	2.5	1.7	0.7
Q <sub>2</sub>	8.5	6.2	4.4	2.1	1.4	0.6
Q <sub>3</sub>	7.0	4.9	3.3	1.6	1.1	0.5
Q <sub>4</sub>	5.9	4.0	2.8	1.4	1.0	0.4
Q <sub>5</sub>	6.3	4.6	3.4	1.8	1.3	0.7
Total	7.6	5.4	3.8	1.9	1.3	0.6
<b>Mean positive overshoot (<math>MPG_{cat}</math>)</b>						
Q <sub>1</sub>	14.8	14.1	13.8	13.7	12.6	11.7
Q <sub>2</sub>	14.9	15.6	14.6	13.1	11.5	9.6
Q <sub>3</sub>	13.4	13.3	13.0	13.6	12.8	11.0
Q <sub>4</sub>	12.9	13.3	13.3	13.4	14.5	10.5
Q <sub>5</sub>	16.0	16.7	16.0	15.3	15.4	14.3
Total	14.4	14.5	14.1	13.8	13.1	11.4

Another discernable result from Table 6 and 7 is that the incidence of catastrophic payments for the rural households outweighs the result of urban households, which means that rural dwellers cut relatively more of non-food expenditure to deal with healthcare spending than urban dwellers. The number of households that expended more than 15% threshold for the highest income quintile in the rural areas was almost two times higher than the number of households for the highest quintile in the urban areas. Increasing the threshold from 25% to 40% of the total non-food expenditure, the incidence of catastrophic health expenditure for households in the lowest quintile of income in the urban areas fell from 18.3% to 6.2% while that of rural fell from 31.5% to 14.1%. Similarly, the overshoot estimate for the lowest quintile at 5% for households in the urban areas dropped from 10.4% to 0.7% at 40% threshold while that of households in the rural dropped from 15.8 to 1.9%. Therefore, the higher the threshold, the lower the catastrophic headcount and catastrophic overshoots for both rural and urban areas. This reflects that the severity of catastrophic health expenditure is lower for households in the urban areas than rural areas at different thresholds used.

Table 7 Incidence and severity of catastrophic health payments, using total non-food expenditure (rural)

	<b>Health Budget Share Thresholds (in %)</b>					
	<b>5</b>	<b>10</b>	<b>15</b>	<b>25</b>	<b>30</b>	<b>40</b>
<b>Headcount (<math>H_{cat}</math>)</b>						
Q <sub>1</sub>	79.0	64.0	50.7	31.5	26.4	14.1
Q <sub>2</sub>	78.5	66.2	51.8	32.5	25.5	13.4

Q <sub>3</sub>	75.6	62.3	51.3	32.4	25.0	14.5
Q <sub>4</sub>	71.4	58.3	47.2	27.9	21.5	12.1
Q <sub>5</sub>	64.6	50.9	40.0	24.3	18.9	11.2
Total	73.8	60.4	48.2	29.7	23.4	13.1
<b>Overshoot (O)</b>						
Q <sub>1</sub>	15.8	12.3	9.4	5.3	3.8	1.9
Q <sub>2</sub>	15.9	12.2	9.3	5.1	3.7	1.8
Q <sub>3</sub>	16.0	12.5	9.7	5.5	4.1	2.2
Q <sub>4</sub>	14.1	10.8	8.2	4.5	3.3	1.6
Q <sub>5</sub>	12.7	9.9	7.6	4.5	3.4	1.9
Total	14.9	11.5	8.8	5.0	3.7	1.9
<b>Mean positive overshoot (<math>MPG_{cat}</math>)</b>						
Q <sub>1</sub>	20.0	19.2	18.6	16.7	14.5	13.2
Q <sub>2</sub>	20.2	18.5	17.9	15.7	14.4	13.2
Q <sub>3</sub>	21.1	20.1	18.9	17.0	16.4	14.9
Q <sub>4</sub>	19.7	18.6	17.4	16.1	15.3	13.6
Q <sub>5</sub>	19.7	19.3	19.0	18.4	18.0	17.1
Total	20.2	19.1	18.3	16.7	15.6	14.3

The analysis of catastrophic healthcare payments using non-food expenditure is consistent with the results discussed for total household expenditure for the rural and urban results. By implication, irrespective of the type of expenditure used to estimate catastrophic healthcare payments for households under consideration, households in rural areas are more affected than urban households. This could be that rural dwellers delayed access to medical care as at when needed and forced to access healthcare when the severity of illness is high, which usually lead to spending larger part of household's income on healthcare compared to urban dwellers. The result for national is inconsistent with incidence and severity of catastrophic health expenditure using non-food and total expenditure. The incidence of catastrophic health expenditure using total consumption expenditure suggests that the incidence declined with income, specifically between 5% and 15% thresholds and also increased with income at higher thresholds between 25 and 40%. The use of non-food expenditure suggests that the incidence of catastrophic health payments declined with status of income. The severity has different outcomes with income level. The severity of catastrophic health spending increases with the household status of income using total consumption expenditure, while it varies with the status of income at different thresholds for total non-food expenditure.

In Table 8, the distribution of catastrophic health expenditure using the concentration index of the incidence of catastrophic payment has generated mixed results at all specified thresholds. At lower thresholds ranging between 5% and 15%, the outcome of result was negative. This implies that poor households have a higher tendency to exceed the payment thresholds than the non-poor. At a threshold higher than 15%, the estimates were positive. Similarly, the concentration payment of overshoot indicates that the average payments surpassing the thresholds was higher among the



poor at 5% and 10%, since the value for the indices for the two thresholds was less than 0, while the reverse was the case for thresholds above 10%.

The adjusted catastrophic payment headcount  $H_{cat}^W$  was greater than the catastrophic headcount  $H_{cat}$  at 5%, 10% and 15% because catastrophic payments were more common among the people living in poverty, while it was vice versa for thresholds above 15%. The adjusted overshoot  $O^W$  was greater than the catastrophic overshoot (O) at 5 and 10% thresholds and reverse was the case above 10%. In this study, poor households have a greater tendency to exceed the payment thresholds than the non-poor at 5, 10 and 15%, while non-poor households have a greater tendency to exceed the payment thresholds than the poor at thresholds higher than 15%. This is partially similar to the result of Sene and Cisse (2015) in Senegal and Akazili *et al.* (2017) in Ghana, which affirms that people living in poverty were more likely to incur healthcare payment surpassing the specified thresholds. This result is also partially similar to the result in Nigeria at the national level by Amakom and Ezenekwe (2012) and Aregbeshola and Khan (2018). Also, studies by Thakur *et al.* (2018) and Ghosh (2011) in India, Dorjdagva *et al.* (2016) in Senegal, and Somkotra and Lagrad (2008) in Thailand found contrary result that non-poor households are in a position to expend more on healthcare as poorer households are still striving to meet the cost of necessities rather than expending on healthcare. The only reason why this study partially agrees with the earlier mentioned studies is that the type of household (poor or non-poor) who are likely to experience catastrophic health expenditure is dependent on the threshold used for total consumption expenditure.

Two more findings are discernible from Table 8. First, for the concentration index, at 5% to 15%, the poor households in the urban areas have a greater tendency to exceed the payment thresholds than the poor households in the rural areas. At 25% and 40% thresholds, the non-poor households in the urban areas have a greater tendency to face catastrophic health payments than the non-poor in the rural areas. Second, the concentration payment of overshoot shows that at thresholds of 10% and 15% of total household expenditure, the overshoot tends to be more among non-poor households in the rural areas than the non-poor households in the urban areas, while above 15% the overshoot tends to be more among non-poor households in the urban areas than non-poor households in the rural areas in Nigeria. The adjusted catastrophic headcount and the adjusted catastrophic overshoot estimated for the rural areas were higher than the urban areas. Accordingly, the catastrophic healthcare payment indices ( $C_E$ ) suggests that catastrophic payments were more common among people living in poverty (poor) in both rural and urban areas using total household consumption at 5% and 10%. Given the results of the concentration indices for the first two thresholds, one can infer that the poor households in the urban areas have a greater tendency to exceed the payment thresholds than the poor households in the rural areas. Also, at threshold of 40%, the non-poor households in the rural areas have a greater tendency to exceed the payment threshold than the non-poor households in the urban areas. This result is contrary to the result found in India by Thakur *et al.* (2018) that the non-poor households in urban areas have greater tendency to exceed the payments thresholds than the non-poor households in rural areas.

**Table 8** Catastrophic healthcare payments indices using total consumption expenditure

National Estimates	Health Budget Share Thresholds (in %)					
	5	10	15	25	30	40
Concentration index, $C_E$	-0.076	-0.072	-0.042	0.005	0.067	0.207
Rank-weighted headcount, $H_{cat}^W$	45.524	22.899	11.977	3.704	1.989	0.695
Concentration index, $C_O$	-0.036	-0.002	0.039	0.139	0.212	0.341
Rank-weighted overshoot, $O^W$	3.495	1.842	1.007	0.318	0.178	0.057
<b>Urban Estimates</b>						
Concentration index, $C_E$	-0.095	-0.062	-0.020	0.066	0.153	0.111
Rank-weighted headcount, $H_{cat}^W$	35.307	16.274	7.930	2.126	1.096	0.520
Concentration index, $C_O$	-0.025	0.029	0.091	0.216	0.290	0.503
Rank-weighted overshoot, $O^W$	2.410	1.189	0.607	0.174	0.097	0.026
<b>Rural Estimates</b>						
Concentration index, $C_E$	-0.022	-0.022	0.012	0.066	0.126	0.315
Rank-weighted headcount, $H_{cat}^W$	48.914	25.214	13.377	4.220	2.266	0.711
Concentration index, $C_O$	0.019	0.055	0.098	0.207	0.283	0.406
Rank-weighted overshoot, $O^W$	3.857	2.054	1.133	0.357	0.196	0.063

As shown in Table 9, the results of the concentration indices suggest that the poor households have a greater tendency to exceed the payment thresholds than the non-poor do. This result also reinforces the fact that catastrophic payments fell with total non-food expenditure. Similarly, the concentration payment of overshoot indicates that the average payments surpassing the thresholds were higher among the poor since the value for the indices at all specified thresholds was less than zero. I observed that the higher the threshold, the more the values of the concentration index of the incidence of catastrophic payment, while the concentration index of payment overshoot was approaching zero. This result is contrary to the results found by Somkotra and Lagrade (2008), Aregbesola and Khan (2018) and Wagstaff and Van Doorslaer (2003), though it is in line with the result found in Akazili *et al.* (2017) for Ghana.

**Table 9** Catastrophic healthcare payments indices using total non-food expenditure

National Estimates	Health Budget Share Thresholds (in %)					
	5	10	15	25	30	40
Concentration index, $C_E$	-0.089	-0.108	-0.112	-0.127	-0.144	-0.117
Rank-weighted headcount, $H_{cat}^W$	72.347	57.791	45.254	27.051	21.310	11.426
Concentration index, $C_O$	-0.113	-0.117	-0.119	-0.116	-0.108	-0.083
Rank-weighted overshoot, $O^W$	13.719	10.468	7.893	4.323	3.123	1.528
<b>Urban Estimates</b>						

Concentration index, $C_E$	-0.117	-0.130	-0.128	-0.117	-0.132	-0.078
Rank-weighted headcount, $H_{cat}^W$	59.171	41.986	30.463	15.163	11.181	5.440
Concentration index, $C_O$	-0.117	-0.112	-0.105	-0.086	-0.067	-0.017
Rank-weighted overshoot, $O^W$	8.518	6.003	4.212	2.035	1.383	0.584
<b>Rural Estimates</b>						
Concentration index, $C_E$	-0.041	-0.048	-0.046	-0.054	-0.068	-0.039
Rank-weighted headcount, $H_{cat}^W$	76.859	63.286	50.393	31.313	25.019	13.579
Concentration index, $C_O$	-0.045	-0.045	-0.044	-0.035	-0.025	0.004
Rank-weighted overshoot, $O^W$	15.566	12.063	9.215	5.146	3.747	1.863

In addition, for the concentration index at all thresholds, the poor households in the urban areas have a greater tendency to exceed the payment thresholds than the poor household in the rural areas. Similarly, the concentration payments of overshoot shows that at all thresholds of total non-food expenditure, the catastrophic overshoot tends to be more among poor households in the urban areas than poor households in the rural areas. In comparison with the result for total consumption expenditure, the concentration indices are not similar due to different outcomes in respect of signs (positive and negative) assigned to the results for urban and rural estimates. Nevertheless, both expenditures still suggest that the poor households in the urban areas have a greater tendency to exceed the payment thresholds than the poor household in rural areas at 5%, 10% and 15%.

## 5.2 The impacts of catastrophic OOP spending on poverty

Table 10 presents the result of impoverishment due to catastrophic health spending. At the national poverty line of ₦137,430 per year, the poverty headcount, which represents the proportion of individuals living beneath the national poverty line before netting healthcare payments, was estimated to be 94.32%, while those that fell into poverty after netting healthcare payments increased to 94.78%. This indicates that more than 90% of the sample population fell beneath the national poverty line. When OOP payments for healthcare were adjusted for poverty estimate, this percentage rose slightly by approximately 0.5%. This slight increase suggests that approximately one million of the Nigeria population is pushed into poverty due to OOP payments using the population estimate of about 201 million people (Worldometer, 2021) as at 2019. A recent study by Aregbeshola and Khan (2018) in Nigeria used the Nigeria Harmonized Living Standard Survey (HNLSS) of 2009/2010 and also documented that over 90% of households are estimated to be in poverty based on total consumption expenditure. They also reported that over 1.2 million Nigerians were pushed into poverty due to OOP payments. This shows the extent to which OOP payments push many Nigerians into poverty.

The estimated poverty gap for this study rose by ₦1,868.63, which represent a relative increase of 1.87%. The estimate of the poverty gap of the poor households rose by 1.87%, from 72.69% to 74.05%, while the normalised mean poverty gap increased by 1.06% with a relative increment of 1.37%. The relative increase in the normalised poverty gap was higher than the relative increase in the normalised mean positive poverty gap (intensity of poverty). This presupposes that the increase in the poverty gap is not due to household already counted as poor before netting OOP payments but mainly due to more households being pushed into poverty among the non-poor. In line with this result, the normalised poverty gap, which captures poverty gap in percentage rather than currency unit shows that it increased from 72.69% to 74.05%, which represents 1.36% absolute poverty change and 1.87% relative change. The change in poverty gap in absolute term is severe in Nigeria when compared to the results of the studies conducted for Malawi (0.30%) as submitted by Mchenga *et al.* (2017), Uganda (0.8%) as reported by Kwesiga (2012), Mongolia (0.28%) from the empirical submission of Dorjdagva *et al.* (2016), while 0.13% was recorded for Thailand in the study conducted by Somkotra and Lagrada (2008). Other studies by Wagstaff and Van Doorslaer (2003) affirm 0.2% for Vietnam and 0.02% for Greece in the empirical study by Chatzaras and Yfantopoulos (2017). However, the percentage value obtained for Nigeria in this study is considered moderately low compared to 6% documented for Mexico by Garcia-Daiz and Sosa-Rub (2011) and 1.8% reported for India by Ghosh (2011).

**Table 10** Impoverishment due to catastrophic health expenditure (National)

	Impoverishment		Poverty Change	
	Pre-OOP	Post-OOP	Absolute	Relative
<b>Poverty line = ₦137,430 per year</b>				
Poverty headcount $H_{Pov}^{Gross\&Net}$	94.32	94.78	0.47	0.49
Poverty gap (₦) $G_{Pov}^{Gross\&Net}$	99,900.73	101,769.36	1,868.63	1.87
Normalised poverty gap $NG_{Pov}^{Gross\&Net}$	72.69	74.05	1.36	1.87
Normalised mean positive poverty gap $MPG_{Pov}^{Gross\&Net}$	77.07	78.13	1.06	1.37

### 5.3 Impoverishment due to catastrophic health expenditure by place of residence (urban and rural)

As shown in Table 11, the poverty headcount ratio for households in urban areas increased from 90.61% to 91.26%, while the rural poverty estimate increased from 96.35% to 96.72%. The change in poverty headcount in absolute term for households in urban areas was higher than rural areas with 0.27%. The difference in the change in relative poverty headcount ratio between the urban and rural represents about 0.33%. The poverty gap for households in urban areas was also higher than that of rural households in relative term. Poverty gap for urban areas was approximately ₦1,854.55, while that of the rural areas was around ₦1,876.35. This represents approximately the

difference of ₦218 poverty gap between urban and rural areas. Similarly, the normalised poverty gap in relative term was higher than the normalised mean positive poverty gap for both urban and rural areas. This means that the increase in poverty rate is because those who were beyond the poverty line before the consideration of OOP payments for healthcare dropped below the poverty line after netting out OOP payments. However, the poverty gap shows that in terms of income that could have been expended on other goods, OOP payments further pushed those in poverty before netting OOP payments into poverty after netting OOP payments.

**Table 11** Impoverishment due to catastrophic health expenditure by place of residence (urban and rural)

	Urban Estimates				Rural Estimates			
	Impoverishment		Poverty Change		Impoverishment		Poverty Change	
	Pre-OOP	Post-OOP	Absolute	Relative	Pre-OOP	Post-OOP	Absolute	Relative
<b>Poverty line = ₦137,430 per year</b>								
Poverty headcount $H_{Pov}^{Gross\&Net}$	90.61	91.26	0.64	0.71	96.35	96.72	0.37	0.38
Poverty gap (₦) $G_{Pov}^{Gross\&Net}$	86,016.31	87,870.86	1,854.55	2.16	107,515.08	109,391.44	1,876.35	1.75
Normalised poverty gap $NG_{Pov}^{Gross\&Net}$	62.59	63.94	1.35	2.16	78.23	79.60	1.37	1.75
Normalised mean positive poverty gap $MPG_{Pov}^{Gross\&Net}$	69.07	70.06	0.99	1.43	81.20	82.30	1.10	1.36

The discernible result from Table 11 is that OOP payments are more poverty inducing in the urban areas than the rural areas in Nigeria. Possible reasons for this may be because those in the urban areas have access to different health facilities, they have limited alternative means of treating themselves outside the orthodox method. The orthodox method could be much more expensive than traditional means, unlike those in the rural areas that can access cheaply traditional means to treat different ailments and injuries. In summary, all the estimated results for urban and rural areas show that OOP payments are less poverty inducing in rural areas than the urban areas. Similar result is highlighted in the study by Gupta and Joe (2013) who stated that normalised poverty gap for urban areas in India was 4.9%, while that of rural areas was 3.5%, indicating that poverty gap is higher in urban areas than rural areas. Contrarily, Garg and Karan (2005) reported that both poverty headcount and normalised poverty gap in India was higher in rural areas than urban areas.

#### 5.4 Limitations and future research directions

One of the major limitations of this study is that the same poverty line was applied to all rural and urban estimates, meanwhile, it is expected that the rural poverty line should be lower than the urban poverty line considering the standard of living in the two areas. Analysis of this study is based on consumption expenditure rather than income, which by implication is difficult to determine if households expended more than their income and identify the means through which household is able to smoothen consumption after paying for healthcare. It should be noted that the result of this study is a true reflection of available data and the limitations did not feign the results.

There are more areas of the study that are yet to be dealt with due to limited data. Analysis of this study is generalised on illness and injury and not on particular diseases under communicable or non-communicable diseases or specialised care like maternal and child or geriatric health. Therefore, future research may dig deeper to find out the impoverishing effects of household expenditure on maternal and child or elderly healthcare as a special case of this study. Further research may investigate the impoverishing effects of household expenditure on malaria, cancer or HIV/AIDS treatments. Digging further to find out if NHIS reduces catastrophic OOP payments and poverty or otherwise may be an interesting area in the future and going forward to identify the coping strategies of the household when faced with catastrophic health expenditure.

#### 6. Conclusion

Regardless of the type of expenditure and place of residence (urban and rural), the incidence of catastrophic health payment decreases as income increases at 5, 10 and 15 percent thresholds, while the severity increases at all specified thresholds. By implication, the poor households expended a larger budget share of their income on healthcare than the non-poor at 5, 10 and 15 percent thresholds and vice versa above 15 percent. Also, it is observed that the incidence of catastrophic payments is higher for rural households than for urban households using headcount ratio. In addition, the national, urban and rural results suggest that catastrophic payments are more concentrated among the poor than the non-poor at 5, 10 and 15 percent thresholds, irrespective of the type of expenditure used.

Based on the result of impoverishment due to OOP spending, the findings of this study showed that OOP payments pushed some Nigerians into poverty. More households were added to poverty bracket because those households that were above the poverty line before adjusting for OOP payments were beneath the poverty line after adjusting for OOP payments with the use poverty headcount ratio. However, those beneath the poverty line sink further into poverty through the poverty gap in terms of reduction in the income available for other necessity goods. Specifically, OOP payments are found to be more poverty inducing in the urban areas than in the rural areas in Nigeria. This may be due to the fact that those in the urban areas have access to different health facilities, and have limited means of treating themselves aside from the orthodox method, which

could be much more expensive than traditional means. Whereas, those in the rural area can access relatively cheaper traditional means to treat different ailments and injuries. Widening the coverage of the available social health insurance and implementation of alternative means of healthcare financing would minimize the financial burden on many poorest and poor households in both rural and urban areas.

## References

- Akazili, J., McIntyre, D., Kanmiki, E., Gyapong, J., Oduro, A., Sankoh, O. and Ataguba, J. (2017). Assessing the catastrophic effects of out of pocket healthcare payments prior to the uptake of a nationwide health insurance scheme in Ghana. *Global Health Action*, 10 (1). <http://dx.doi.org/10.1080/16549716.2017.1289735>
- Amakom, U. and Ezenekwe, U. (2012). Implications of Households Catastrophic Out of Pocket Healthcare Spending in Nigeria. *Journal of Research in Economics and International Finance (JREIF)*, 1(5), 136-140.
- Aregbeshola B. (2016). Out-of-pocket payments in Nigeria. *Lancet*, 387, 2506. Doi: 10.1016/so140-6736(30798-X)
- Aregbeshola, B. and Khan, S. (2018). Out-of-pocket payments, catastrophic health expenditure and poverty among households in Nigeria 2010. *International Journal of Health Policy Management*, 7(9), 798–806.
- Arsenijevic, J., Pavlova, M. and Groot, W. (2012). Measuring the catastrophic and impoverishing effect of household health care spending in Serbia. *Journal of Social Science and Medicine*, 78, 17-25.
- Ataguba, J. (2012). Reassessing catastrophic health care payments with a Nigerian case study. *Journal of Health Economics, Policy and Law*, 7 (03), 309-326.
- Atake, E. and Amendah, D. (2018). Porous safety net: Catastrophic health expenditure and its determinants among insured households in Togo. *BMC Health Services Research*, 18 (175).
- Barasa E., Maina T. and Ravishankar N. (2017). Assessing the impoverishing effects and factors associated with the incidence of catastrophic health care payments in Kenya. *International Journal for Equity in Health*, 16 (31).
- Berki, S. (1986). A look at catastrophic medical expenses and the poor. *Health Affairs*, 5(4), 138-145.
- Chantzaras, A. and Yfantopoulos, J. (2018). Financial protection of households against health shocks in Greece during the economic crisis. *Social Science and Medicine*, 6(24).
- Cleopatra, I and Eunice, K. (2018). Household catastrophic health expenditure: evidence from Nigeria. *Microeconomics and Macroeconomics*, 6 (1), 1-8.
- Demsey, T., Takim, A., Ishor D. and Abari, C. (2013). Inequality and class difference in access to healthcare in Nigeria. *Research on Humanities and Social Sciences*, 16(3), 45-51.
- Dorjdagva, J., Enkhjargal, B., Mikael S., Bayarsaikhan D. and Jussi K. (2016). Catastrophic health expenditure and impoverishment in Mongolia. *International Journal for Equity in Health*, 15 (105).
- Edeh, H. (2022). Exploring dynamics in catastrophic health care expenditure in Nigeria. *Health Economics Review*, 12 (22).
- Garcia-Diaz, R., and Sosa-Rub, S. (2011). Analysis of the distributional impact of out-of-pocket health payments: Evidence from a public health insurance program for the poor in Mexico. *Journal of Health Economics*, 30, 707–718.



- Garg, C., and Karan, A. (2005). Health and Millennium Development Goal 1: Reducing out-of-pocket expenditures to reduce income poverty - Evidence from India. *EQUITAP Project*, Working Paper 15.
- Ghosh, S. (2011). Catastrophic Payments and Impoverishment due to Out-of-Pocket Health Spending. *Economic and political Weekly (EPW)*, 46 (47), 63-70.
- Gupta, I. (2009). Out-of-pocket expenditures and poverty: Estimates from NSS 61st Round. Paper presented for consideration of the Expert Group on Poverty, Planning Commission
- Gupta, I. and Joe, W. (2013). Refining estimates of catastrophic healthcare expenditure: an application in the Indian context. *International Journal of Health Care Finance Economics*, 13, 157–172.
- Ichoku, E., Fonta, W. and Obina, O. (2009). ‘Incidence and intensity of catastrophic healthcare financing and impoverishment due to out-of-pocket payments in southeast Nigeria. *Journal of Insurance and Risk Management*, 4(4), 47-59.
- Keane, M. and Thakur R. (2018). Health Care Spending and Hidden Poverty in India. *Research in Economics*. doi: <https://doi.org/10.1016/j.rie.2018.08.002>.
- Kimani, D. and Maina T. (2015). Catastrophic Health Expenditures and Impoverishment in Kenya. Washington, DC: *Futures Group, Health Policy Project*.
- Koch, K., Camilo, C. and Andreas S. (2017). Out of Pocket expenditure and financial protection in the chilean health care system—A systematic review. *Health Policy*. <http://dx.doi.org/10.1016/j.healthpol.2017.02.013>
- Krutilova, V. and Yaya, S. (2012). Unexpected Impact of Changes in Out-of-Pocket Payments for Health Care on Czech Household Budgets. *Journal of Health Policy*, 107, 276–288.
- Kwesiga B. (2012). Financial Protection in Uganda’s Health System: Catastrophic and Impoverishment Effects of Out-of-Pocket Health Care Payments. *Health Economics Unit, School of Public Health and Family Medicine University of Cape Town, South Africa*.
- Li, Y., Wu, Q., Liu, C., Kang, Z., Xin X., Hui Y., Mingli, J., Liu, G., Hao, J. and Ning, N. (2014). Catastrophic health expenditure and rural household impoverishment in China: What role does the new cooperative health insurance scheme play? *PLoS ONE* 9 (4).
- Mahumud, A., Sarker, A., Sultana, M., Islam, Z., Khan, J. and Morton, A. (2017). Distribution and determinants of out-of-pocket healthcare expenditures in Bangladesh. *Journal of Preventive Medicine and Public Health*, 50, 91-99.
- Mchenga, M., Chijere, C. and Chiwaula, S. (2017). Impoverishing effects of catastrophic health expenditures in Malawi. *International Journal for Equity in Health*, 16 (25).
- Nigeria Living Standard Survey (NLSS) (2018/2019) National Bureau of Statistics (NBS), Abuja Nigeria. Retrieved from <http://microdata.worldbank.org/index.php>.
- Onoka, C., Onwujekwe K. and Uzochukwu B. (2010). Measuring catastrophic health care expenditure in Nigeria: Implication for financial risk. *The Consortium for Research on Equitable Health Systems research, UK*.
- Saksena, P., Xu K. and Carrin G. (2006). The Impact of universal insurance program on catastrophic health expenditure: Simulation analysis for Kenya. The World Bank, Geneva.

- Sene, M. and Cissé, M. (2015). Catastrophic out-of-pocket payments for health and poverty nexus: Evidence from Senegal. *International Journal of Health Economics Management*, 15, 307-328.
- Somkotra, T. and Lagrada, L. (2008). Payments for health care and its effect on catastrophe and impoverishment: Experience from the transition to Universal Coverage in Thailand. *Journal of Social Science and Medicine*, 67, 2027-2035.
- Thakur, R., Sangar, R., Ram, B. and Faizan, M. (2018). Quantifying the burden of out-of-pocket health expenditure in India. *Journal of Public Health*, 159, 4 – 7.
- Van Doorslaer, E. Owen O'Donnell, Ravi P. and Aparnaa, S. (2005). Paying Out-of-Pocket for health care in Asia: Catastrophic and poverty impact. *Health Econ.*, 16 (11), 59-84.
- Wagstaff, A. and Van Doorslaer, E. (2003). Catastrophe and Impoverishment in Paying for Health Care: With Applications to Vietnam 1993-98. *Health Econ.*, 12, 921-934.
- Wang H., Torres L. and Travis P. (2018). Financial protection analysis in eight countries in the WHO South-East Asia Region. *Bull World Health Organ*, 96, 610–620.
- Worldometer (2021). Nigeria Population (LIVE). Retrieved from [www.worldometers.info/world-population/nigeria-population/](http://www.worldometers.info/world-population/nigeria-population/)
- Xu, K., Evans, D., Kawabata, K., Zeramdini, R., Klavus, J. and Murray C. (2003). Understanding Household Catastrophic Health Expenditures: a Multi-country Analysis. *The Lancet*, 362, 111-17.
- Xu, K. (2005). Distribution of health payments and catastrophic expenditures methodology. *A discussion Paper prepared for the World Health Organization*.

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