FINANCING INCIDENCE OF CATASTROPHIC HEALTH EXPENDITURES ACROSS GEOPOLITICAL REGION IN NIGERIA

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Abstract: -

This study investigates effects of health financing incidence of catastrophic health expenditures across geopolitical region in Nigeria. The study which x-rayed health financing incidence of catastrophic health expenditures across geopolitical region provided a more robust regional analysis effect of health financing incidence using the Nigeria Health and Demographic Survey data 2018. The study employed the Hosmer and Lemeshow's goodness of fit test, and the Link post estimation tests to ascertain the robustness of the results and to further demonstrate that health facility visited, body mass index, cigarettes consumption, marital status, un-spaced children, household size and wealth index have positive incidence when it comes to the implication of catastrophic health expenditure in the country with regions like north east, south-south, and south west having more of such effects among other region when compared to north central. The findings further demonstrated that households that sought health care out of pocket experienced catastrophic expenditure and others were impoverished by health care payments incidence which account for why catastrophic out of pocket health payments are disproportionally concentrated among the better-off households in Nigeria possibly due to poor utilization of healthcare service by poor households, free healthcare services and exemption mechanisms; and the by-pass of low quality public primary healthcare (PHC) facilities by better-off households; Also, that health facility visited and used appears to be the highest incidence factors accounting for about 20 per cent households' catastrophic health expenditure in Nigeria. While, other indicators like household size which covers family numbers are at 14 per cent, and health care utilization which covers health access, consultation, medication and hospitalization account for 13 per cent incidence level accounting for households' catastrophic health expenditure in Nigeria. Hence, need for government to deepen provision of essential medicines and equitable distribution of health facilities will improve coverage and utilization of healthcare services for the poor and most vulnerable households so as to urgently address UHC issues.

Keywords: - *Health care, Households, Catastrophic Health Expenditures, Financial incidence.*

1.INTRODUCTION

Individual's health is important as it affects all aspects of his/her life. The effects of good health accrue not only to an individual, but are also extended to the family, community and the nation. Poor health reduces working hours; lowers production and productivity; reduces Gross Domestic Product (GDP) and savings, and increases health care expenses. Health expenditures are borne by the individuals and also by the society at large (Bourne, 2009; Lawson, 2004) because of increased health care expenditures, ill-health leads to re-allocation of expenditure from social development sectors such as education to health care. This switching of costs due to ill health can lead to or increase poverty for an individual or his/her family (Awiti, 2014; Bourne, 2009; Lawson, 2004).

Health of an individual can be influenced by many factors among them unobservable biological factors, health-related behaviours, non-medical market inputs, market medical inputs and various socio-economic factors (Awiti, 2014). In case of poor health, there is a wide variety of actions that an individual could take to improve it. The individual may decide to choose self-medication, consult a traditional healer, or seek treatment from a private or public health facility or a pharmacist. The particular action taken depends on individual characteristics, health care provider characteristics, societal factors, and geographical factors. However, a major individual factor is the affordability of the required health care (Asfaw, 2003; Awiti, 2014). Hence, poor people may opt not to seek any treatment or if they do, they may visit cheap health care facilities that may not offer the best health care. Alternatively, they may not utilize fully the minimum required health services leading to more complications.

Thus, health care seeking behavior of individuals is an indicator of their willingness to improve their health and preserve life (Bourne, 2009). Access to health care is, therefore, a crucial determinant of health worldwide. However, there exist potential barriers to accessing health care. These barriers include distance and travel costs to health facilities, socio-cultural factors, poverty and cost of service especially in resource challenged countries like Nigeria. Other barriers may include functional accessibility to health service and inequalities in health services and infrastructural distribution across the country (Yawson, Malm, Adu, Wontumi, and Biritwum, 2012).

Despite the realization of the importance of health, that requires the actions of many other social and economic sectors in addition to the health sector, there exists gross inequality in the health status of individuals. The inequality applies to people across regions and countries. This is particularly between developed and developing countries as well as within countries. The inequality in health status may not be acceptable socially, economically and politically (Edeme, Ifelunini, and Obinna, 2014; WHO, 1978). Edeme et al., (2014) observes that of the 30 countries with the world's highest child mortality rates, 27 are in sub-Saharan Africa (SSA). Wagstaff, Claeson, Hecht, Gottret, and Fang (2006) makes a similar observation by indicating that, of the 11 million under five mortality rates that occurred in the world in the year 2000, less than one per cent occurred in high-income countries. This is compared to 42 per cent in SSA, 35 per cent in South Asia, and 13 per cent in East Asia (Wagstaff et al., 2006). The authors further indicated that of the 3.1 million people who died from Human Immunodeficiency Virus and Acquired Immune Deficiency Syndrome (HIV/AIDs) in 2003, almost all (99 per cent) were in the developing world with SSA contributing 74 per cent.

In countries where out-of-pocket expenditure is the most important source of health care financing, the effect of health expenditure on household economic status can be severe, particularly among the poor (Baeza and Packard, 2006). According to World Health Organization (2000), direct out-of-pocket payment for health at point of service is considered an inequitable means of financing a health system, since there is danger of burdening different social sub-groups unequally, especially the poor and the elderly. In such systems, the greatest financial burden tends to be placed on the household, and if the cost of health care exceeds the ability to pay at the time-of-service use, it can give rise to avoidance of necessary care or to a delay in seeking health care. Poor families are often forced by out-of-pocket expenditures to choose between satisfying basic needs such as education, food and housing and saving loved-ones from illness and suffering (Knaul, Arreola-Ornelas, Méndez-Carniado, Bryson-Cahn, Barofsky, Maguire, and Sesma 2006). Thus, health spending can be an important cause of poverty (Baeza and Packard, 2006; van Doorslaer et al., 2006; Wagstaff and Van Doorslaer, 2002).

The threat that out-of-pocket expenditures pose to households' living standards is increasingly recognized as a major consideration in financing health care (van Doorslaer et al., 2006). Such a concern is justified based on the unpredictability of out-of-pocket expenditures; their large magnitude relative to household resources and their uneven distribution in relation to that of income. Thus, any health care system with the welfare of its citizens in mind, must work to reduce the adverse effects of out-of-pocket expenditures and especially catastrophic expenditure.

Despite that during health shocks, informal coping mechanisms can be employed by households to mitigate cost of illness especially in low- and middle-income countries including Nigeria where there is poor financial protection. Adegboye, Rotimi and Akande (2018) argued that it has been proven that this can have implications for both transient poverty and long-term poverty traps. Health shocks may adversely influence household financial burden, increase hardship, affect ability to contribute to positive child health and education outcome which is a dire consequence of high reliance of OOP payment, it also further widens the intergenerational equality which UHC tends to preach against. Catastrophic Health Expenditures as a result of OOP payment when health shocks occur is an enormous challenge to achieving UHC.

The government of Nigeria initiated policies intervention with the aim of cushioning the citizens from high out-of-pocket health expenditures and enhancing access to healthcare. This intervention includes the establishment of National Health Insurance Scheme (NHIS) with the aim of providing access to good healthcare services and also ensuring the protection of households from the financial burden of out-of-pocket payments that most a times become catastrophic and free maternal health to help pregnant mother. The policies are aimed at increasing health care accessibility, utilization and improved welfare. These efforts notwithstanding, out-of-pocket expenditures remain high at 76.6 % in 2018 and access to health care is still a challenge to many households, especially the poor and poverty still remains high. It is against this

backdrops that the study investigates health financing incidence of catastrophic health expenditures across region in Nigeria.

2. LITERATURE

Catastrophic expenditure is "any health expenditure that threatens a household's financial capacity to maintain its subsistence needs and does not necessarily equate to high health care costs. Even relatively small expenditures on health can be financially disastrous for poor households" (Su et al., 2006), forcing them to reduce expenditure on basic items. Likewise, large health care expenditures can lead to financial catastrophe and bankruptcy even for rich households (Xu et al., 2007).

Interestingly studies have come to identifies some important determinants of catastrophic expenditures as aging, chronic illnesses, low levels of insurance coverage, health financing system, rural/urban differences, socio-economic status, types of illness, demographic composition of the household, and the characteristics of household head such as age, sex, education (Kawabata, Xu, and Carrin, 2002; Xu et al., 2003). Su et al., (2006) found that economic status was a key determinant of catastrophic health expenditures in Burkina Faso. In Georgia, Gotsadze et al., (2009) found that households in the richest quintile were four times less likely to face catastrophic expenditure when compared with the poorest quintile. Catastrophic health expenditures were positively associated with the change in poverty in Mexico, implying that households had more income to spend on health as poverty declined (Knaul et al., 2006).

There are a number of studies which have explored how health financing systems impact on the incidence of catastrophic health expenditures. Xu, et al., (2003; 2007) found that rates of catastrophic spending are higher in poorer countries and those with limited prepayment systems. Xu, et al., (2007) found that operating a tax-financed system or a social health insurance system makes no difference to the incidence of catastrophic expenditures. Malaysia and Thailand reflect the low reliance on out-of-pocket expenditures in financing health care and the limited use of user fees in the public sector. By contrast, the high rate of incidence in Korea reflects the high co-payments in the country's social insurance system and the partial coverage of inpatient care (Lee, 2011).

Health insurance reduces the risk of catastrophic health spending (Gakidou, et al., 2006; Knaul, et al., 2006; Lamiraud, Booysen, and Scheil-Adlung, 2005; Limwattananon, Tangcharoensthien, and Prakongasi, 2007; Xu, et al., 2006). Gakidou, et al., (2006), Knaul, et al., (2006) found that the introduction of the Popular Health Insurance Scheme (PHIS) in Mexico from 2001 led to a reduction in the incidence of catastrophic health expenditures. Limwattananon, et al., (2007) found that rates of catastrophic spending in Thailand were lower after the universal health care scheme was introduced in 2001. Lamiraud, et al., (2005) found that in South Africa, social health protection can help to reduce incidence of catastrophic health expenditures. Xu et al., (2006b) found that those insured had a low financial burden than the uninsured. Other studies which have examined the effect of health insurance on incidence of catastrophic health expenditures showed the limitation of insurance in reducing and eliminating catastrophic health expenditures. Wagstaff (2007) found that even with the introduction of social health insurance scheme in Vietnam in 1993 and the subsequent extension of the scheme to the poor, poor households were still spending a high proportion of their income on health care and at considerable risk of catastrophic spending. Xu, et al., (2006) found that with the introduction of health insurance in Vietnam, the rates of catastrophic expenditure for the non-poor declined between 2000 and 2003, while it surprisingly remained at the same level for the poor. They argue that this could be due to the frequent unavailability of drugs at government facilities after the removal of user fees, forcing patients to purchase drugs from the private sector. In Kenya, health insurance was not significant in explaining catastrophic health expenditures (Xu, et al., 2006). The authors argued that this could be due to limited insurance coverage both in terms of population and benefit package.

There are a few other studies which, surprisingly, have found a positive relationship between insurance and incidence of catastrophic health expenditures. In Zambia, health insurance did not provide financial protection against the risk of catastrophic expenditures; rather it increased the risk (Ekman, 2007). Cavagnero, et al., (2006) found no evidence that households with social health insurance coverage are protected against catastrophic health expenditures. They concluded that the issue is not so much the presence of health insurance coverage but the depth of the coverage in terms of benefits package. Apart from health insurance, area of residence has also been confirmed as a significant determinant of catastrophic health expenditures. For example, in Botswana, Akinkugbe, et al., (2011) found that households in the rural areas were more likely to face catastrophic health expenditures compared to their urban-residing counterparts. Living in an urban area was protective against financial catastrophe in Kenya (Xu, et al., 2006), whereas in Uganda it was protective for the non-poor and not the poor (Xu, et al., 2006). However, in Georgia, the odds of facing catastrophic health spending were almost two times higher for the capital city residents compared to those households that received care in East and West Georgia (Gotsadze, et al., 2009). They attributed this finding to the fact that there were higher costs of more complex health care services available in the capital, and relatively easy access to facilities in the capital city.

Characteristics of the household head (gender, education and working status) are also key in explaining catastrophic health expenditures. Being employed and having a higher level of education could be translated into more opportunities to cope with the financial burden such as borrowing money or selling assets. In Mexico, for example, Knaul, et al., (2006) found that education of the household head is associated with a lower probability of catastrophic health expenditures. Similarly in Uganda, having a household head with low education increased the odds of catastrophic health expenditures (Xu, et al., 2006). Female headed households and those with an educated household head were found to be less likely to face catastrophic health expenditures in Botswana (Akinkugbe, et al., 2011). On the contrary, female-headed households are more likely to encounter financial catastrophe than households headed by males in Argentina (Cavagnero, et al., 2006). However, the sex of the household head did not influence the probability of catastrophic expenditures among the poor in

Uganda, but female-headed households were more likely to encounter financial catastrophe than those headed by males among the non-poor (Xu, et al., 2006).

Nevertheless, studies have demonstrated different perspectives especially, Onwujekwe et al., (2012) estimated the level of catastrophic healthcare expenditures for different healthcare services and facilities and their distribution across socioeconomic status (SES) groups. The study took place in four Local Government Areas in Southeast Nigeria using interviewer-administered questionnaires administered to 4873 households such that Catastrophic health expenditures were measured using a threshold of 40% of monthly non-food expenditure. The finding showed that average total household health expenditure per month was 2354 Naira ($19.6), while, outpatient services, average monthly expenditure was 1809 Naira ($15.1), whereas inpatient services was 610 Naira ($5.1). the study demonstrated that higher health expenditures were incurred by urban residents as overall, 27% of households incurred catastrophic healthcare expenditures, higher for poorer socioeconomic groups and for rural residents with only 1.0% of households' household member enrolled in health insurance scheme. The study argued that the worse-off households (the poorest SES and rural dwellers) experienced the highest burden of health expenditure. There was almost a complete lack of financial risk protection. Health reform mechanisms are needed to ensure universal coverage with financial risk protection mechanisms.

Furthermore, Akinkugbe et al., (2011) examined the health financing and catastrophic payments for health care in Botswana. The study employed the Household and Expenditure Survey (HIES) 2002/2003 for Botswana and by the Household Budget Survey (HBS) 2002/2003 for Lesotho. Findings showed that in Botswana the proportion of households facing catastrophic health expenditure at the 20% and 40% thresholds was 11% and 7%respectively, and the share of out-of-pocket health payment during the survey period was about0.93%. For Lesotho the proportions of those facing catastrophic health expenditure at the 20% and 40%thresholds were 3.22% and 1.25%, and the share of out-of-pocket payment in total monthly expenditure was 1.34%. finding also showed having at least one senior member in the household imposes a higher risk for catastrophic health expenditure for the household in Lesotho; for Botswana gender and education status of households' head influence the probability of facing catastrophic health expenditure. In designing health systems, policy makers need to ensure that households are not only able to access health services when needed, but that they are also protected from facing financial catastrophe by reducing out-of-pocket payments.

Also, Onoka et al., (2011) measured catastrophic healthcare expenditure in Nigeria and examined its implications for financial risk protection. Data were collected from 1128 households (4988 individuals) between January and June 2008. Households were randomly selected from four Local Government Areas in Enugu and Anambra states, Southeast Nigeria (1 rural and 1 urban area in each state). Designed Instrument were used to gather information on illness, expenditure on health, transportation, food, education, entertainment, clothing, cooking and fuel over a one-month period. Findings showed high incidence of catastrophic expenditure on healthcare and that 15% of households studied experienced catastrophic health financing where threshold level was set at 40% of non-food expenditure among those classified under the poorest households.

While, Kronenberg and Barros (2014) assessed the extent of catastrophic healthcare expenditure, leading to impoverishment, even in a country with a National Health Service, such as Portugal. The level of catastrophic healthcare expenditure from the Portuguese Household Budget Surveys of 2000 and 2005, and then analyzed using logistic regression models. The results showed that catastrophic healthcare payment from out-of-pocket are a sizeable issue in Portugal as vulnerable groups are among the highest group facing catastrophic healthcare spending. These vulnerable groups include children, people with disabilities and individuals suffering from chronic conditions. Disability proxies offer straightforward policy options for an exemption for the elderly with recognized disabilities.

In addition, Özgen, Şahin, and Yıldırım (2015) examined the prevalence of catastrophic health payments, the determinants of catastrophic expenditures, and the poverty impact of out-of-pocket payments. Data came from the 2004 to 2010 Household Budget Survey Turkey was employed. Findings showed that the percentage of households that catastrophically spent their consumption expenditure and capacity to pay increased from 2004 to 2010, regardless of the threshold used. Households with a share of more than 40 % health spending in both consumption expenditure and capacity to pay accounted for less than 1 % across years. However, when a series of potential confounders were taken into account, the study found statistically significantly increased risk for the lowest threshold and decreased risk for the highest threshold in 2010 relative to the base year. Household income, size, education, senior and under 5-year-old members, health insurance, disabled members, payment for inpatient care and settlement were also statistically significant predictors of catastrophic health spending.

While, Myint, Liabsuetrakul, Htay, Wai, Sundby, and Bjertness (2018) assessed the levels of impoverishment and catastrophic expenditure due to out-of-pocket payments for antenatal care (ANC) and delivery care in Yangon Region as well as the determinants of impoverishment and catastrophic expenditure created need for investigation. Employing a community-based cross-sectional survey among women giving birth within the past 12 months in Yangon, Myanmar, using three-stage cluster sampling procedure. Findings showed out of pocket payments were made by 75% of the women for antenatal care and 99.6% for delivery care. Also, evidence demonstrated how poverty headcount ratios after payments increased to 4.3% among women using the antenatal care services, to 1.3% among those using delivery cares and to 6.1% among those using both antenatal care and delivery care. The incidences of catastrophic expenditure after payments were found to be 12% for antenatal care, 9.1% for delivery care and 20.9% for both antenatal care and delivery care in Yangon, Myanmar.

Similarly, Aregbeshola and Khan, (2018) analyzed the out-of-pocket payments, catastrophic health expenditure and poverty among households in Nigeria 2010. Secondary data from the Harmonized Nigeria Living Standard Survey (HNLSS) of 2009/2010 was utilized to assess the catastrophic and impoverishing effects of out-of-pocket health payments on households in Nigeria. Finding showed that a total of 16.4% of households incurred catastrophic health payments at

10% threshold of total consumption expenditure while 13.7% of households incurred catastrophic health payments at 40% threshold of nonfood expenditure. Using the $1.25 a day poverty line, poverty headcount was 97.9% gross of health payments. Out-of-pocket health payments led to a 0.8% rise in poverty headcount and this means that about 1.3 million Nigerians are being pushed below the poverty line. Better-off households were more likely to incur catastrophic health payments than poor households.

Hailemichael et al., (2019) examined the catastrophic health expenditure and impoverishment in households of persons with depression in rural Ethiopia. The study adopted a comparative cross-sectional survey with 128 households of persons with depression and 129 households without. Depression screening was conducted using the Patient Health Questionnaire, nine item version (PHQ-9). Linear probability model. Interestingly, findings showed that catastrophic payments at any threshold level for households with depression and high disability recorded high ratio of outcomes occurrence among households leading to high incidence of health expenditure and impoverishment.

Whereas, Koch and Setshegetso, (2020) examined catastrophic health expenditures and the potential for such payments to impoverish South African households. Despite the differences in measurements, findings showed limited incidence of health care expenditure catastrophe, although larger shares of capacity are being devoted to health care in more recent years. Also, that very few households are subsequently impoverished, because of health care costs among households in South Africa.

However, studies reviewed showed different limitation and perspectives which failed to investigates health financing incidence of catastrophic health expenditures across geopolitical region in Nigeria. Attempts by previous studies to explain the determinants catastrophic health care expenditure affects health care utilization and poverty have been made on specific segment of the population such as region, maternal health, child health and infants health in Nigeria, example; Onwujekwe et al., (2012) focused their study on south east region only; Onoka et al., (2011) focused only on two states of the country. Adeoti and Awoniyi (2014) concentrated on the health status of children while Salihi et al., (2012) used only HIV as variable as such specifically evaluated the health financing incidence of catastrophic health expenditures across geopolitical region in Nigeria.

3. METHODOLOGY

The theoretical framework for this study is anchored on the choice theory which is a collection of procedures that defines four elements namely: the decision maker; the alternatives; the attributes; and the decision rule (Ben- Akiva & Lerman, 1985). In a discrete choice model, an individual is faced with a challenge of choosing between two or more alternatives that have different combinations of attribute levels. An individual is expected to act rationally in evaluating the available alternatives in each choice set and choose the alternative which gives the greatest relative utility, by making trade-offs across the different alternatives (de Bekker-Grob, 2009). Thus, an individual will choose alternative A over B if U(X ,Z) U(X ,Z) A B > where U is indirect utility function of an individual from certain alternatives, A X are attributes of alternative A; B X are attributes of alternative B ; and Z is socioeconomic characteristics of the individual that influence his/her utility.

In a discrete choice decision making framework, choices are modeled within a Random Utility Theory (RUT) (de Bekker-Grob, 2009). In the random utility models, the decision maker is assumed to have a capability to perfectly discriminate. However, a researcher is assumed to not have complete information and, therefore, there is need to take into account uncertainty (Ben-Akiva and Bierlaire, 1999). The uncertainty emanates from four sources including: alternative attributes that are unobserved; individual's unobserved tastes; measurement errors; and instrumental variables or proxy (Ben-Akiva and Bierlaire, 1999). In the case of choosing who to consult in case of illness/injury, an individual is faced with a number of health care providers each of which yields indirect utility. An assumption is made that individual n chooses alternative j that maximizes his/her indirect utility amongst all alternatives in the choice set n C. Thus, in order to reflect the uncertainty, the latent utility of an alternative j in a choice set n C (as perceived by individual n) is written as:

$$\mathbf{Ujn = Vjn + \varepsilon jn} \qquad \mathbf{1}$$

where Ujn is the indirect utility of individual n for choosing health care provider j; Vjn is the deterministic (systematic) part of utility, and ε jn is the random component. It on this background that the propensity score model was adopted.

The propensity score model has a two-stage estimation process for binary and effect treatment estimation among household heath care utility incidence considering that the response variable is binary and therefore intends in the first phase to consist of a logit regression while the second is to estimate the average treatment effect based on propensity score through matching or stratification. Some statistical packages analyze it step by step, and are explained as such for better comprehension. The first phase has a dummy variable as dependent variable that represents households with catastrophic health expenditure. That is, 1 if the household under goes catastrophic health expenditure and 0 if otherwise.

The first stage is estimated with a logit regression where the dependent variable is the dummy variable for households' levels of catastrophic health expenditure and the X's are the socio economic determinants of catastrophic health expenditure.

The first stage of the propensity score matching model, the logit model, responds to health financing incidence of catastrophic health expenditures across geopolitical region in Nigeria. The model measures the relationship between the characteristics of the individuals, and their level of catastrophic health expenditure across geopolitical region. The specifications helped to define a probability to monitor catastrophic health expenditure as stated below

$$\mathbf{Logit}p_x = \mathbf{log}\left[\frac{P(Y=1)}{1-P(Y=1)}\right] = \sum_{k=1}^{k} \alpha_k X_k \qquad \mathbf{2}$$

The model above shows that there is a linear relationship between the logitp_x and the vector of explanatory variables X. Therefore, the study can state the probability of undergoing catastrophic health expenditure as:

$$\mathbf{Pr(Y=1)} = \frac{\sum_{ek=1}^{k} \alpha_k X_k}{\sum_{ek=1}^{k} \alpha_{kX_k}} \quad \mathbf{3}$$

While the probability of households going through catastrophic health expenditure as specified as specified thus:

$$\mathbf{Pr(Y=0)} = \frac{1}{\sum_{ek=1}^{k} \alpha_k X_k} \quad \mathbf{4}$$

Therefore, the logit model to be specified is given as:

$$Logit(P) = \ln \frac{p}{1-p} = \beta_0 + \beta_1 \delta + ... \beta_n N + \mu \quad \mathbf{5}$$

Therefore, to estimate the health financing incidence of catastrophic health expenditures across geopolitical region in Nigeria logit estimation and propensity score matching was employed. Secondary data from the 2018 Nigeria Demographic and Health Survey (NDHS) were used for the study. The NDHS 2018 is a nationally representative cross-sectional study and provides updated estimates of the basic demographic and health indicators covered in the earlier surveys such as fertility levels, marriage, fertility preferences, awareness and use of family planning methods, child feeding practices, nutritional status of women and children, adult and childhood mortality, awareness and attitudes regarding HIV/AIDS, in addition, to information on violence against women.

4. RESULT

Table 4.1: Results of the Hosmer and Lemeshow's Goodness of Fit test.

Number of observations	**3214**
Number of covariate patterns	767
Pearson chi2(71)	2563.61
Prob> chi2	0.0000

The study went further to perform the link post estimation test to show if there exist specification errors. The linear predicted value (_hat) has a z value of 4.47 which is higher than 1.96 and a probability value of 0.000 which is less than 0.05 hence significant at the standard 5% significant level. The linear predicted value squared (_hatsq) has a z value of -1.15 and a probability value of 0.251 hence not significant at the 5% level of significance. Since the linear predicted value squared (_hatsq) is not significant, and then the link test is not significant. This therefore implies that, there exist no omitted relevant variable(s) hence there exist no specification errors and the model is robust. The Results for the Link Test are equally illustrated below:

Table 4.2: Results of the Link Test post estimation test

Variables	**Coefficient**	**Z**	**P > |z|**
_hat	1.005073	4.47	0.000
_hatsq	-.0346508	-1.15	0.251
Cons	0.0635879	0.20	0.838

Also, the two assumptions that need to be validated for the propensity score matching model to be robust is the conditional independent assumption and the common support assumption. The choice of a logit model in the first stage is partly to validate the common support assumption, given that Preference for logit or probit models (compared to linear probability models and multi logit/probit models) is derived from the well-known shortcomings of the linear probability model, especially the un-likeliness of the functional form when the response variable is highly skewed and predictions that are outside the [0; 1] bounds of probabilities (Caliendo & Kopeing, 2008).

Table 4.3: First Stage Propensity Score – Logit Results of Incidence of Catastrophic Health Expenditure in Nigeria.

Variables(hh_catastro)	Coef.	Z	P > |z|
Health care utilization(m66)	-.0291824	-0.20	0.838
Duration of health utilization(m63)	-.0007862	-2.00	0.046
Health facility visited (*v394*)	.1788063	1.67	0.094
Health insurance (v481)	-.0170662	-0.07	0.947
Household food/ no food expenditure(v743b)	.0698771	1.43	0.152
Vaccination(h33)	-.054982	-1.15	0.252
Household size (v136)	.217272	7.78	0.000
Education level(v106)	.0189895	0.28	0.778
Marital status (v501)	-.4292939	-2.12	0.034
Employment status (v732)	-.1722682	-1.77	0.076
Household age (v525)	-.0136377	-1.17	0.241
Region (v101) north central as base cate			
north east	.6885489	2.81	0.005
north west	.8762977	3.04	0.002
south east	-.2109443	-1.40	0.162
south south	-.3323676	-1.88	0.061
south west	.0389506	0.26	0.791
_cons	1.572623	3.65	0.000
Log Likelihood = -1372.6709	Pseudo R2 = 0.0584		
Prob> chi2 = 0.0000	LR chi2(17) = 170.34		

Table 4.3 showed the result of incidence of catastrophic healthcare expenditure in Nigeria. The result showed that not all the observations were significant incidence of catastrophic health expenditure in Nigeria. The results in table 4.4 show a relatively low Pseudo R2, but a significant model at 1% level of significance given the chi2 probability of 0.0000. This means that the overall model is significant and conforms to the Hosmer and Lemes how's goodness of fit test that is explained above.

However, the results suggest that three (3) indicators showed significant incidence which is the relative frequency of occurrence of catastrophic health expenditure on poverty rate in the country. In order word, duration of health utilization, household size and marital status have positive incidence when it comes to the implication of catastrophic health expenditure on poverty rate in the country with regions like north east, and North West, having more of such effects among other region when compared to north central. According to the result of the study, there exists a positive and significant relationship as expected especially in most of these regions. For example, the coefficients duration of health utilization which is 0.0007862 means that for a unit increase in duration of health utilization push more households into poverty, Hence, it is expected that a unit change in duration of health utilization pushes the odds ratio that households are more likely to fall into poverty trap by 0.0007862 at 5 per cent level of significant given a p-value of 0.046 that is less than 0.05. While, household size seems to increase the incidence of catastrophic health expenditure in Nigeria. The result showed that a unit changes in household size increases the odds ratio that households are more likely to increase incidence of catastrophic health expenditure by 0.217272 at 5 per cent level of significant given a p-value of 0.000 that is less than 0.05.

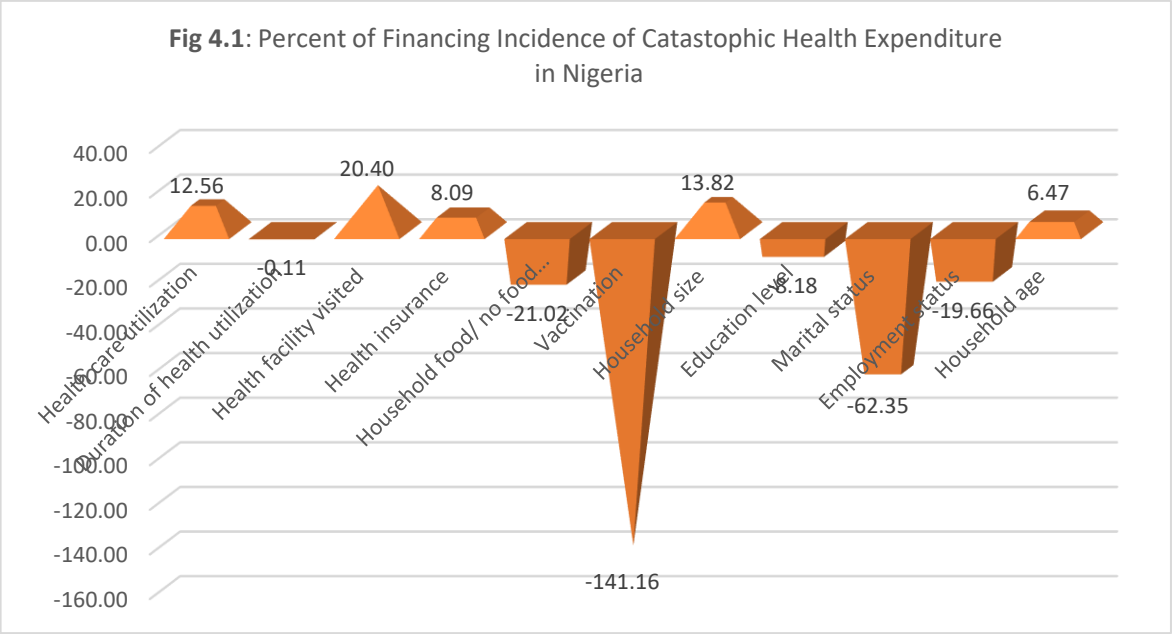
Also, marital status seems to have negative effects on the incidence of catastrophic health expenditure in Nigeria. The result showed that a unit change in marital status reduces the odds ratio that households are more likely to reduce incidence of catastrophic health expenditure by 0.4292939 at 5 per cent level of significant given a p-value of 0.034 that is less than 0.05. This implies that households that are married incurred more incidence of catastrophic health expenditure. This shared some similarities with the earlier studies by Adegboye, Rotimi and Akande (2018) and Okedo-Alex, Akamike, Ezeanosike and Uneke (2019).

Table 4.4: Second Stage Propensity Score – Results of the Average Treatment Effect on the Treated (ATT)

No. Treated	No. control	ATT	Std. Err.	T
3457	474	1.59444605	0.037488792	2.61

Table 4.4 showed the second stage results show the treatment effect of incidence of catastrophic health expenditure in Nigeria. The results below therefore illustrate the extent incidence of catastrophic on household health expenditure in Nigeria. The results on table 4.5 suggest that there exists significant incidence of catastrophic health expenditure on in Nigeria. This is implied due to the t-value of the Average Treatment Effect on the Treated (ATT) given as 1.59 which is less than 1.96 but approximately 2 if based 2-t rule of thumb hence significant at the standard 10% significant level. This agreed with Koch and Setshegetso, (2020) who also examined catastrophic health expenditures and the potential for such payments to impoverish South African households and further argued that household devotes a large share of that capacity to health care, which ends up adding to households' consumption burden due to unmet necessary expenses. Whereas Hailemichael et al., (2019) earlier argued that catastrophic health expenditure impoverishment households despite the level of depression associated with it.

Fig. 4.1: The Percent of Financing Incidence of Catastrophic Health Expenditures in Nigeria



Source: Author's Computation

Figure 4.1 depicts the percent level of financing incidence of catastrophic health expenditures in Nigeria. Interestingly, health facility visited and used appears to be the highest incidence factors accounting for about 20 per cent households' catastrophic health expenditure in Nigeria. While, other indicators like household size which covers family numbers are at 14 per cent, and health care utilization which covers health access, consultation, medication and hospitalization account for 13 per cent incidence level accounting for households' catastrophic health expenditure in Nigeria. Others include health insurance at 8 per cent and age at 6 per cent. However, household food expenditure and non-food expenditure, vaccination, educational level, marital status and employment status are indicators that reduce incidence of catastrophic health expenditure among households in Nigeria.

5. CONCLUSION

The study examined the health financing incidence of catastrophic health expenditures across geopolitical region in Nigeria using Nigeria Health and Demographic Survey 2018. This was accomplished by using the propensity score matching model to estimate the health financing incidence of Catastrophic Health Expenditure across geopolitical region in Nigeria. The study employed the Hosmer and Lemeshow's goodness of fit test, and the Link post estimation tests to ascertain the robustness of the results. Findings showed that seven (7) indicators showed significant incidence which is the relative frequency of occurrence of catastrophic health expenditure on poverty rate in the country. In order word, health facility visited, body mass index, cigarettes consumption, marital status, un-spaced children, household size and wealth index have positive incidence when it comes to the implication of catastrophic health expenditure on poverty rate in the country with regions like north east, south-south, and south west having more of such effects among other region when compared to north central. According to the result of the study, there exists a positive and significant relationship as expected especially in most of these regions. This is also not surprising when compared to literature that opines that catastrophic health expenditure seems to have worsened households' poverty in Nigeria and African countries with very poor health care system.

The findings also established that households that sought health care out of pocket experienced catastrophic expenditure and others were impoverished by health care payments incidence which account for why catastrophic out of pocket health payments are disproportionally concentrated among the better-off households in Nigeria possibly due to poor utilization of healthcare service by poor households, free healthcare services and exemption mechanisms; and the by-pass of low quality public primary healthcare (PHC) facilities by better-off households; hence, policy-makers need to design policies that will ensure that resources for healthcare are equitably distributed and benefit both the poor and better-off households. In addition, health facility visited and used appears to be the highest incidence factors accounting for about 20 per cent households' catastrophic health expenditure in Nigeria. While, other indicators like household size which covers family numbers are at 14 per cent, and health care utilization which covers health access, consultation, medication and hospitalization account for 13 per cent incidence level accounting for households' catastrophic health expenditure in Nigeria. Others include health insurance at 8 per cent and age at 6 per cent. However, household food expenditure and non-food expenditure, vaccination, educational level, marital status and employment status are indicators that reduce incidence of catastrophic health expenditure among households in Nigeria.

Governments have to significantly increase public spending on health. Domestic financial resources are key to moving closer to universal health coverage (UHC) and should be increased on a long-term basis. PHC system needs to be strengthened and PHC facilities made functional with the provision of comprehensive benefit package for the poor and vulnerable populations in order to improve access to healthcare services and health outcomes. A pro-poor policy reform with improved quality of care, availability of essential medicines and equitable distribution of health workers will improve

coverage and utilization of healthcare services for the poor and most vulnerable households. The lack of financial risk protection in Nigeria's health system is a major challenge that policy-makers have to urgently address towards achieving UHC as a target of Sustainable Development Goals (SDGs). Results from this study provide a guide for future health financing reforms and a baseline for further research on financial risk protection in Nigeria.

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