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The Impact of Financial Inclusion on Household Health Expenditures in Africa

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Abstract

This study examines the impact of financial inclusion on household health expenditure in 17 African countries. It argues that financial inclusion is an active influencer of individuals' health demand and that Gross Domestic Product (GDP) per capita and voluntary health insurance schemes tend to be active transmission channels through which financial inclusion affects household health expenditures. The study used an instrumental variable (2SLS) technique for the analysis over a period from 2008 to 2017.Results from the study show that being financially included leads to increase household health expenditures. Suggestions for policy emerging from this study to governments in Africa are on the aspect of fostering financial inclusion to a wider population alongside enhancing the Universal Health Coverage (UHC) plan to ease the burden of out-of-pocket payments on households.

Keywords: Financial inclusion, Health expenditure, Out-of-pocket (OOP) payments, 2SLS.
JEL Code: G15; I13; C23

1. Introduction:

The importance of health across the world has been highlighted through a number of platforms with the most pertinent being the former Millennium Development Goals (MDGs) and the present Sustainable Development Goals (SDGs). With regards to financial inclusion, it has been outlined as having an important role to play in achieving SDG3[1] (Klapper *et al*., 2016) therefore implying that financial inclusion has an undeniable impact on household health expenditures. Surveys carried out on households have revealed that on a yearly basis, averagely 100 million people get impoverished and another 150 million people are exposed to dire living conditions due to financial difficulties as a result of direct expenditures on health (WHO, 2014) this has motivated Ssewamala *et al*. (2018) to call for attention on Africa due to the backward nature of the countries and living standards which is remarked by the low-income characteristic and financial hardships in most countries in the continent. At the Abuja conference in2001, various African leaders promised to step-up the share of the budget they allocated for health by making sure that at least 15% of their national budget was dedicated to the health sector in order to ease the achievement of the MDGs related to health but, it is rather unfortunate because most of these governments had difficulties meeting their commitments due to the fragility of health systems alongside the porosity of their financial systems (Owoundi, 2014). It should be noted that the little or no effort made by these countries in allocating more resources for health financing is one of the major reasons for the financial difficulties individuals get themselves into after responding to their health demands.

Global figures have revealed that out-of-pocket (OOP) payments tend to reduce as countries move up the economic scale, reason for the explanation of the high percentage of OOP payments registered in most Sub-Saharan Africa (SSA) countries since they are mainly low and lower middle-income countries in the continent (WHO, 2013). The figures showed that more than 50% of OOP payments constituting the total health expenditure in SSA came from low and lower-middle income countries while in high-income countries, the share of OOP is only 13%.

The health system in most African countries is one which is mainly financed by out-of-pocket payments as seen in the 2009 health report where spending for health care was

[1] Sustainable Development Goal 3, which is to ensure healthy lives and promote well-being for all at all ages according to the United Nations' 2030 agenda for sustainable development.

registered at over 900 billion CFA francs of which more than 60% was borne by households(WHO, 2017). The relationship between financial inclusion and OOP payments is clearly seen since one of the reasons why households suffer financial difficulties and face the dread of poverty is due to the expenditures they incur when responding to their health needs (Chuma & Maina, 2012; Edmonds & Hajizadeh, 2019; Narcı*et al*., 2015).Therefore, financial inclusion and household health expenditure can be interlocked so as to bring about not just improved health status but also as a means of saving households and individuals from the evil of catastrophic health expenditures which rather than bettering living conditions, pushes individuals below the poverty line (Xu *et al*., 2003).

Most studies carried out on this issue have shown the undeniable role played by financial inclusion in bettering health standards and reducing income inequalities (Ottovordemgenschenfelde *et al*., 2016; Tita *et al*., 2017; Popoola, 2019; Matekenya *et al*., 2021; Chireshe *et al*., 2020). However, studies that directly link to financial inclusion and household health expenditures are sparse. A study was recently carried out by Koomson *et al*. (2021) to ascertain the effect of financial inclusion on out-of-pocket health expenditures in Ghana.

Despite the studies carried out, empirical evidence in literature concerning the impact of financial inclusion on household health expenditures around the world and in Africa remains sparse. The studies have been limited to understanding the effect financial inclusion has on health expenditures and as a result, there is need to understand not just the effects butto equally understand the direction of influence of financial inclusion on health expenditures which is why studying possible transmission channels through which financial inclusion affects household health expenditures will permit a broader understanding of the relationship between the variables.

This paper specifically contributes to existing literature in the following ways. The first contribution is at the level of focus groups in the past studies. Most studies have focused on single-country based evidence such as in Ghana (Koomson *et al*., 2021). Based on our knowledge, this is going to be the very first attempt in aggregating the effects of financial inclusion on household health expenditures over a wider research area. On a second note, the involvement of transmission channels in this study is equally the first attempt to our knowledge in a bit to better understand the intensity and direction of effect of financial inclusion on household health expenditures. Third, countries in Africa are not simultaneous

with respect to their levels of income. According to the World Bank income classifications, some are low-income countries while others are lower middle-income countries and upper middle-income countries. This study therefore carries out a comparative approach in examining the different income groups.

The remaining sections of the paper will be as follows: section two presents a brief literature review. Section three carries on the methodology. The results and discussions are presented in section four and section five concludes with policy implications.

2. A brief literature review

Understanding the effect of financial inclusion on health expenditures, health status and welfare has been a point of interest in recent times. The World Bank (2018) reports that since 2011, over a billion adults have had access to an account and great moves are continuously being made on a world-wide scale to include more people into financial services because of the vital role it plays. Today, more than 69% of adults across the world have an account but despite the increase over the years, a reasonable portion of adults are still unbanked (that is 1.7 billion which is 31% of adults) as revealed by the latest Findex data. It should be noted that most of these unbanked people are women and poverty-stricken households in rural areas. Following the importance attached to financial inclusion in achieving 7 of the present SDGs, the Group of 20 (G20) took upon themselves to advance financial inclusion on a worldwide basis and equally committed themselves to foster the G20High-Level Principles for Digital Financial Inclusion (World Bank, 2018).

On a more general note, as of the year 2012, 23% of adults in Africa had an account at a formal financial institution. Comparing the account ownership in Africa to other world regions, the high-income countries accounted for 89%. East Asia and the Pacific registered 55%, Europe and Central Asia45%, Latin America and Caribbean 39%, South Asia 33%, then Africa 23% (as said above) and lastly the Middle East with 15% of adults who had a formal account at a financial institution in 2012 (AfDB, 2013).Taking a comparative look at the various regions in SSA, Southern Africa was noted to have the highest account penetration level of 51%, followed by 28% in Western Africa, 23% in Eastern Africa and lastly, Central Africa registered the lowest figure of 11%. For most of the SSA territory, men account for more bank accounts than women. On a global basis, financial inclusion has registered an eighteen percent increase between the years 2011 to 2017 but despite the increase, gender gaps still persist. This gender imbalance in financial inclusion is specifically

predominant in developing countries, where the difference between men and women account ownership is 20% (that is 79% and 59% respectively (Demirgüç-Kunt *et al*., 2018).

In the world at large and from country-to-country, there exist significant variations on the actual amount each country spends on health per capita wise. High-income countries spend over US$ 3000 on average, whereas the low-income countries spend only US$ 30 per capita. 64 countries that were recorded in the year 2008 had health expenditure per capita was less than a hundred US dollars, a value which is far from that spent by the high-income countries. According to Ke *et al*.(2011) *"some countries spend more than 12% of GDP on health, while others spend less than 3%, on health."* (p. 1).Hence, a consequent result of differences in economic development which therefore affirms the fact that as countries move up the economic scale, their health spending varies greatly from that of those at the bottom of the scale. This is the case in Africa, characterised with both low and middle-income countries. A wide disparity in health expenditures is thus noticed among countries in Africa due to differences in levels of development and growth. Therefore, in this section we look into a number of pertinent studies both at individual and cross-country levels that have in one way or another focused on capturing the link between financial inclusion and health expenditure.

The theory engaged from literature is the Health Demand Model of Grossman (1972) wherein individuals derive satisfaction when they respond to their health needs. According to the model, a household tends to derive utility from the consumption of a health good and other goods which make up their consumption basket. The utility function adopted by the household is represented as follows:

$U = U (H, E_h, G)$

Where H represents the health good, E_h represents goods that have an effect on the health good (such as nutrition, housing) and G represents other goods in the household's consumption basket. The health of the household, H, is determined by the household's income level (Y), medical care inputs (Z) and a certain level of initial health endowments (that is due to genetics and some environmental influences) represented by θ. The household's health is therefore determined by:

$H = f(Y, Z, \theta)$

The household then maximises its utility function subject to the following budget constraint:

$E_hPE_h + GP_G + ZP_z \leq Y$

PE_h, P_G and P_z represent the price of goods that have an effect on health, price of other goods and price of medical services respectively. The following equation captures the household's health expenditures:

$OOP = f(Y, PE_h, P_G, P_z, \theta)$

Household health expenditure is captured by the amount of money spent out-of-pocket for health. As such, considering that being financially included has prospects of raising one's income when he has access to credit, it equally guarantees it has an influence on household health expenditures. Following the works of Jalilian and Kirkpatrick (2002) financial inclusion empowers the poor through a number of ways. In the first place, it acts as a productive asset, secondly it avails and fosters their entrepreneurial capacities and thirdly, it helps them engage in businesses as well as invest in their education and health. Equally, where financial education and sensitization programs are skilfully carried out, it fosters the growth of financial inclusion and in the medium and long-run, it will enable households respond to health shocks and other economic demands (Koomson *et al*., 2020b). Conclusively, where there is an increase in financial inclusion, an income effect is expected to emerge afterwards which will permit the household to have access to a higher income status thus enabling a higher consumption of health goods and others. That is, a higher consumption of E_h, G and Z.

Empirical evidence from previous studies using a wide range of estimation techniques converge to same conclusions. Koomson *et al*. (2021) carried out a study examining the effect of financial inclusion on household health expenditures in Ghana using the 2SLS method of estimation alongside Lewbel's instrumental variable approach. The results revealed that when financial inclusion increases by a unit, out-of-pocket health payments by households increase between 0.1367 and 1.7608. These results are more pronounced for households headed by women and households resident in urban areas. Another aspect of their results equally revealed that financial inclusion records more expenses on medical goods than on outpatient services.

Chireshe *et al.* (2020) studied the relationship between financial development and health expenditures in SSA. Using the 2SLS estimation method, financial development was found to have a positive and significant effect on health expenditure. Furthermore, an examination of the effect of financial development on private healthcare expenditure showed that financial development is positively linked to private health care expenditure. The results showed that a 10% increase in the number of bank branches per 100000 people, leads to a 1.1% increase in the proportion of private health care expenditure to GDP. Also, the proportion of broad money and bank credit to the private sector as percentage of GDP leads to a1.7% and a 1% increase in the proportion of private health care expenditure respectively.

In another study by Doan *et al.* (2011)using Quintile Treatment Effects (QTE) estimates to capture the effect of household credit on education and health spending by the poor in Vietnam, it was discovered that credit impacts health expenditure positively and significantly. Borrowers spent at least 93 thousand Vietnamese dong (VND) more while responding to their health needs than the non-borrowers. Likewise, they examined the influence of formal and informal credit on health expenditure and the variation between the two. It was found that informal credit positively affects health expenditure but at a very marginal rate while formal credit doubled the effect of the informal credit on health expenditure. Hence it was concluded that credit highly affects the health and education spending of the poor in the peri-urban areas in Vietnam in a positive and significant manner.

Prina (2012) carried out a field experiment in Nepal and found that when individuals have access to saving accounts, it increases their monetary as well as total assets which in turn positively affect their income. Using a field experimental study, she endeavoured to find out if having access to an account has an influence on household expenditures. Her results revealed that having access to financial services positively affects health expenditures. To obtain more credible results, she evaluated a sample of the total population that had faced a health crisis within the last 30 days exactly before the conclusion of her field experiment and the results revealed a much stronger and statistically significant effect. Hence, it was concluded that households tend to spend more on treatment in the early phase of a health crisis so as to escape the burden of charges eminent with longevity of an illness.

Thanh and Duong (2017) in a study on health shocks and the mitigating role of microcredit in rural Vietnam, obtained mixed results concerning the role microcredit plays in mitigating health shocks which highly depends on the type of health shock involved.

However, households with access to microcredit appear to better handle health shocks compared to households that do not have the access.

3. Methodology

The empirical model employed in Equation (1)is inspired and consistent with existing literature

$$OOP = \beta_0 + \beta_1 NDC_{it} + \beta_2 X_{it} + \varepsilon_{it} \quad \textbf{(1)}$$

Where OOP is out-of-pocket payments for health, NDC is the number of depositors with commercial banks per 1000 adults. X denotes the set of control variables. ε is the error term while subscripts i and t represent the individual (country) and the time (duration) dimensions of the panel.

OOP is the dependent variable and is used to capture household health expenditures and is consistent with existing literature (Koomson *et al*., 2021; Ataguba & Goudge, 2012).Financial inclusion is proxied by the number of depositors with commercial banks per1000 adults (NDC) which is the independent variable of interest and consistent with existing literature (Popoola, 2019; Olaniyi, 2016; David *et al*., 2018).As a result of what has been previously discussed, the first hypothesis of the study is stated thus: **Financial inclusion affects household health expenditures in Africa.**

X captures other variables used in the model which have possible impacts on OOP payments. These other variables are termed control variables because they control for omitted variable bias in the model. In this model, they are six in number. The control variables include: population ages 65 and above (pop>65), population ages 0-14 (pop<15),domestic credit to private sector as % of GDP (CPGDP) which is a proxy of financial development (FD), number of individuals using the Internet (INT), income proxied by GDP per capita (GDPC), and voluntary health insurance (VHI). Chireshe *et al*. (2020) argued that GDPC, CPGDP, pop<15 and pop>65 all positively influence OOP payments in SSA. As such, due to previous arguments, the expected sign to be associated to these variables is a positive one. Benvenuto *et al*. (2019) argued that having access to internet increases OOP payments. A positive sign is equally expected to be associated to this variable. Ataguba *et al*. (2012) and Koomson *et al*. (2021) agree that VHI positively influence OOP payments. Thus, a positive sign is expected from this variable.

In a good economic and socio-political atmosphere, it is but normal that financial inclusion will lead to more spending on health by individuals who are financially included. The spill over effect of financial inclusion is mainly captured by an increase of individuals' GDP per capita, since these individuals will be able to obtain credit and benefit from other financial services such as insurance and free sensitization education on the benefits and use of financial services which in turn, helps them meet their health demands. The benefits of financial inclusion therefore reach individuals through the above-mentioned channels. Building on the above narrative, a second hypothesis is made which states that **GDP per capita and voluntary health insurance are the main channels through which financial inclusion affects household health expenditures in Africa.**

These transmission channels are therefore included in the econometric model of Equation (1)by introducing a multiplicative interactive term of GDPC and VHI.

$$OOP = \beta_0 + \beta_1 NDCit + \beta_2 GDPCit + \beta_3 VHIit + \beta_4 Pop > 65it + \beta_5 Pop < 15it + \beta_6 CPGDPit + \beta_7 INTit + \gamma_1 (GDPCit \times NDCit) + \gamma_2 (VHIit \times NDCit) + \varepsilon it \quad \textbf{(2)}$$

βdenotes the coefficient of the variables that capture the direct effect of the factors which explain OOP payments. γ on the other hand, is the coefficient of the variables that captures the indirect effect of OOP payment determinants. When the above Equation(2)is differentiated at first level with respect to NDC, a more concise equation for the transmission channels is thus represented below in Equation (3);

$$\frac{\partial OOPit}{\partial NDCit} = \beta_1 + \gamma_1 GDPCit + \gamma_2 VHIit \quad \textbf{(3)}$$

Based on the results and the significance of the coefficients obtained from the direct effects and indirect effect variables, the interaction of these two effects work to bring about a net effect. Following the works of Nchofoung *et al.* (2021), the net effects is expressed as follows in Equation (4):

$$\textbf{Neteffect} = \boldsymbol{\beta 1} + (\dot{m} \times \boldsymbol{\gamma}) \quad \textbf{(4)}$$

The above net effects apply if and only if the coefficient of $\beta_1$and $\boldsymbol{\gamma}$ are opposing in sign and all significant. It will be '**non-applicable'** if their signs are the same or at least one of them is insignificant. $\dot{\boldsymbol{m}}$ denotes the mean of the mediating variable.

3.1 Data

The study employed data from secondary sources, being the World Bank's World Development Indicators (WDI, 2020) database and from the World Bank's World Health Organization (WHO, 2020) database. The study is carried out in 17 African countries and covers the period 2008 to 2017, consisting of 10 years and 170 observations. The sources of data and list of countries are outlined in the appendix (that is Appendices 1 and 2, respectively). Table 1 presents summary statistics of all the variables included in the model.

Table 1: Summary of descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
OOP[1]	170	44.676	18.556	2.993	77.225
NDC[2]	160	215.893	188.227	4.85	923.23
P65[3]	170	2.953	.625	1.871	5.188
P14[4]	170	42.934	4.348	32.556	50.264
CPGDP[5]	170	18.147	8.091	3.724	42.798
INT[6]	169	11.808	11.022	.44	44.95
GDPC[7]	170	1490.199	1565.26	322.418	7864.251
VHI[8]	170	4.015	4.636	0	30.806

Source: **Computed by Author:** [1] Out-of-pocket expenditures as % of Current health expenditures, [2] Number of depositors with commercial banks per 1000 adults, [3] Population ages 65 and above as % of total population, [4] Population ages 0-14 years as % of total population, [5] Domestic credit to private sector as % of GDP, [6] Individuals using the Internet, [7] GDP per capita, [8] Voluntary health insurance.

The correlation table (Appendix 3) shows the strength and direction of association that exist between variable in the model. The values range between -1 to +1 and the closer they are to 1, the stronger the correlation while the closer the values are to zero, the weaker the correlation. This analysis is a check for the presence of multicollinearity amongst the independent variables.

3.2 Estimation method

In order to successfully and accurately run the transmission channel analysis, the econometric technique employed is the Two-Stage Least Squares (2SLS) estimation method which has been adopted in contemporary literature focusing broadly on the same subject matter (Koomson *et al*., 2021; Chireshe *et al*., 2020) due to the comparative relevance of the approach in producing results that are robust to the simultaneity dimension of endogeneity. This technique is employed because it makes use of more than one instrument and also, due to the availability of endogenous explanatory variables. This method solves the problem of

omitted variable bias as is the case with lags in some variables of the study and possible measurement errors. If the problem of endogeneity is ignored, the model will be carried out using biased parameters which leads to inaccurate results and conclusions (Antonakis *et al*., 2010).

The problem of endogeneity is therefore addressed with an instrumental variable approach, using the 2SLS analysis as adopted in this study. To statistically prove the presence of endogeneity the Durbin-Wu-Hausman test is used and results outlined in Appendix4. The results therefore reject the null hypothesis which postulates that the variables are exogenous. Hence, the alternative hypothesis that the variables are endogenous is not rejected. The test justifies the use of the IV(instrumental variable) method. The validity and strength of the instruments in use was tested using the Sargan test(Appendix 5*)*. The results obtained confirm the non rejection of the null hypothesis which postulates that the instruments used are valid and strong. Hence, the results obtained through the 2SLS are valid. For robustness, the countries involved in the panel set were separated into income groups (low-income and lower middle-income countries) following the World Bank income classification (2021) to see if differences arise at the level of the effects of financial inclusion on OOP payments in the different groups.

4. Presentation of results and discussions

The first part of the results presents the direct effect and the indirect effect of financial inclusion on OOP payments for the whole panel set. The second section deals with results based on robustness checks, wherein the countries used in the panel are separated into two income groups (low-income and lower middle-income countries), followed by testing for the direct effect and the various transmission channels under the different income groups.

4.1 Direct effect results

The results in column two (eq1)of Table 2 shows the direct effect. From the results, it can be seen that financial inclusion positively influences household health expenditures at a 1% significance level. Looking at the other variables, Pop>65, Pop<15, INT and VHI positively and significantly influence OOP payments. GDPC influences OOP expenditures but it is negatively significant. CPGDP influences OOP payments negatively and it is insignificant.

The positive significant effect of NDC on OOP payments is obvious since the more people are able to access financial services (that is services like savings and credits), the more likely they are to demand health goods and services. The result is in concordance with the results obtained by Koomson *et al.* (2021) and Chireshe *et al.* (2020). These results present a good reason why financial inclusion should be made more accessible to the excluded so as to ease their demand and consumption of health goods in Africa.

Voluntary health insurance schemes tend to positively and significantly influence OOP expenditures. This is because VHI is another form of private health spending which still involves individuals paying for health insurance with their resources. This result is in accordance with the works of Ataguba *et al.* (2012) who found out that health insurance schemes positively and significantly influences OOP expenditures. Koomson *et al*. (2021) had a positive but insignificant result. However, the influence is relatively low due to the fact that health insurance schemes are still very marginal in most African countries.

GDP per capita tends to have a negative significant influence on OOP expenditures. This result is contrary to that of Doan *et al.* (2011), Fedeli (2015) and Chireshe *et al. (2020)* who had as results an increase in household health expenditures when income percapita is increased. The negative significant result is justified by the fact that, when people have access to increased income (that is GDP per capita) they tend to spend more in areas that sustain their welfare (such as on good nutrition, water, sanitation and clothing) which indirectly reduces the risk of being ill due to the lack of certain necessities. This therefore reduces the frequency of being ill and hence decreases OOP expenditures on health.

Credit to private sector has a negative insignificant influence on out-of-pocket expenditures. This result is contrary to that obtained by Chireshe *et al.* (2020).These results can be supported due to the percentage of domestic credit to private sector in Africa which is comparatively lower than the percentage in other regions of the world. With this low levels therefore, it makes the funds channelled out relatively insignificant in meeting the needs of the population.

Table 2: 2SLS regression results.

VARIABLES	eq1 OOP	eq2 OOP	eq3 OOP
NDC[1]	0.0617***	0.118***	0.0667***
	(0.0137)	(0.0144)	(0.0126)
P65[2]	20.46***	17.94***	18.76***
	(3.170)	(2.759)	(2.592)
P14[3]	3.846***	4.194***	4.136***
	(0.701)	(0.521)	(0.582)
CPGDP[4]	-0.121	-0.0671	0.211
	(0.213)	(0.206)	(0.165)
INT[5]	0.243*	-0.302*	-0.0361
	(0.147)	(0.183)	(0.111)
GDPC[6]	-0.0106***	0.0245***	0.00401
	(0.00174)	(0.00643)	(0.00464)
VHI[7]	1.683*	0.801	6.056***
	(0.891)	(0.691)	(0.959)
GDPC×NDC		**-4.98e-05*** **	
		(8.66e-06)	
VHI×NDC			**-0.0163*** **
			(0.00281)
Constant	-189.3***	-222.5***	-220.6***
	(41.11)	(30.48)	(33.03)
Net effects	-----	**0.0437881**	**0.00125**
Threshold	-----	**2369.4779**	**4.09202**
Observations	91	91	91
Fisher statistic	19.24***	24.48***	32.97***
r2c	0.424	0.592	0.678
r2u	0.909	0.935	0.949

Source: Author. Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1: [1] Number of depositors with commercial banks per 1000 adults, [2] Population ages 65 and above as % of total population, [3] Population ages 0-14 years as % of total population, [4] Domestic credit to private sector as % of GDP, [5] Individuals using the Internet, [6] GDP per capita, [7] Voluntary health insurance.

4.2 Indirect effect results

This indirect effect accounts for the transmission channels through which financial inclusion affects OOP payments and the results are presented in Columns 3 and 4. This model therefore verifies if the transmission channels (GDPC and VHI) are good mechanisms through which the effects of financial inclusion influence OOP expenditures. Based on the results obtained from the direct effects and interactive effects (that is, indirect effects), these two yields what is called the net effects. The study obtains insights from existing literature on interactive regressions (Tchamyou *et al.,* 2019; Asongu and Odhiambo, 2020; Nchofoung *et*

al., 2021). In order to obtain the net effects of financial inclusion on OOP payments, the mean of the mediating variables (that is GDPC and VHI) is used alongside the coefficient of the independent variable of interest from the direct effect and the coefficient of mediating variables from the indirect effect regression. In computing the net effects and the threshold effect, if one of the variables needed for the computation is insignificant, then the exercise will be rendered non-applicable. Equally, when the same sign is obtained from the direct and indirect effect, it makes it impossible to compute the net effect and threshold effect. In other words, the application becomes non-applicable.

From Table 2, financial inclusion has a negative indirect effect on OOP health payments through GDP per capita but the influence from the positive indirect effect of financial inclusion overcomes the negative effect which yields a positive net effect of0.043788. This indicates that financial inclusion affects OOP payments through GDP per capita in a positive significant manner. Its threshold value stands at 2369.4779 which is in accordance with the minimum and maximum values of GDPC, thus exhibiting a result which is very strong. This is the likely case because in most SSA countries, people who are financially included are better placed to enjoy financial credits and other financial services such as insurance. Having credit from financial institutions instantly increases an individual's purchasing power (GDP per capita) which when is done, leads to better purchases of health goods and services as a result of health demand. Hence increase in OOP payments.

The same applies for voluntary health insurance. When financial inclusion is interacted with this variable, it produces a negative effect but the positive effects of financial inclusion in the indirect model tends to overpower the interactive effect which yields a positive net effect of 0.00125. Its threshold stands at 4.09202 or (0.0667/0.0163) which is also very much in line with its maximum and minimum values. Individuals who undertake health insurance schemes due to their advantage of being financially included helps in better securing them in times of health shocks and or when the need for health demand arises. The premium paid by the individual out of his income for the insurance then serves as assistance in times of need. Voluntary health insurance is another form of OOP payment and hence, it increases OOP expenditures but in a way which is not much felt like direct OOP payments. The value is quite low in Africa due to the fact that insurance programs are still in the early growth stage in most of the region's countries (Asongu and Odhiambo, 2019).

Table 3: Sensitivity Analysis of the non-interactive regression: Analysis on income groups

VARIABLES	Low-Income Countries OOP	Lower middle-income countries OOP
NDC[1]	0.0471*	-0.304**
	(0.0244)	(0.0095)
P65[2]	-25.924**	-15.476**
	(9.124)	(4.491)
P14[3]	3.937***	0.401
	(0.559)	(0.680)
CPGDP[4]	1.017***	0.242
	(0.179)	(0.232)
INT[5]	0.505	-0.562***
	(0.372)	(0.149)
GDPC[6]	-0.126***	0.040***
	(0.0232)	(0.0037)
VHI[7]	2.444*	1.478*
	(1.211)	(0.692)
Constant	-28.991	29.766
	(53.364)	(37.069)
Observations	44	41
Fisher statistic	27.32***	23.02***
r2c	0.8475	0.8067
r2u	0.9807	0.9900

Source: Author. Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1: [1] Number of depositors with commercial banks per 1000 adults, [2] Population ages 65 and above as % of total population, [3] Population ages 0-14 years as % of total population, [4] Domestic credit to private sector as % of GDP, [5] Individuals using the Internet, [6] GDP per capita, [7] Voluntary health insurance.

The results reveal that financial inclusion has a negative significant influence on OOP health expenditures for lower-middle income countries in Africa. On the other hand, a positive effect is recorded for the low-income countries.

Figure 4: Dynamism of GDP per capita on the financial inclusion and out-of-pocket payment relationship

VARIABLES	Low-Income Countries OOP	Lower middle-income countries OOP
NDC[1]	-0.231	-0.235***
	(0.1754)	(0.058)
P65[2]	-21.096*	-26.583***
	(9.549)	(5.013)
P14[3]	3.776***	-3.297**
	(0.476)	(1.209)
CPGDP[4]	1.301***	0.577**
	(0.266)	(0.220)
INT[5]	0.035	-0.389**
	(0.381)	(0.126)
GDPC[6]	-0.125***	-0.0034
	(0.0244)	(0.0123)
VHI[7]	3.057*	0.984
	(1.275)	(0.6125)
GDPC*NDC	0.00033*	0.0001053***
	(0.00019)	(0.000029)
Constant	-31.565	283.202***
	(51.442)	(78.589)
Net effect	**n.a**	**-0.0780821**
Threshold	**n.a**	**2231.7189**
Observations	44	41
Fisher statistic	21.47***	43.29***
r2c	0.8568	0.8492
r2u	0.9819	0.9922

Source: Author. Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1: [1] Number of depositors with commercial banks per 1000 adults, [2] Population ages 65 and above as % of total population, [3] Population ages 0-14 years as % of total population, [4] Domestic credit to private sector as % of GDP, [5] Individuals using the Internet, [6] GDP per capita, [7] Voluntary health insurance.

The net effect in column 3 above is =-0.0780821which is obtained as follows; (1490.199×0.0001053) + (-0.235). The value 4.015in the application is the mean of GDPC. As for the threshold which is 2231.7189, it is obtained as (0.235/0.0001053). The net effect for Column 2 is non-applicable (**n.a**) because the value of NDC is not significant.

Figure 5: Dynamism of voluntary health insurance on the financial inclusion and out-of-pocket relationship

VARIABLES	Low-Income Countries OOP	Lower middle-income countries OOP
NDC	0.0316	-0.003
	(0.0370)	(0.0109)
P65	-26.713**	-2.439
	(8.887)	(4.668)
P14	3.783***	0.605
	(0.611)	(0.547)
CPGDP	1.002***	0.353
	(0.199)	(0.244)
INT	0.499	-0.264*
	(0.378)	(0.1304)
GDPC	-0.125***	0.035***
	(0.0241)	(0.0033)
VHI	1.449	4.205***
	(1.943)	(1.019)
VHI*NDC	0.00537	-0.0176***
	(0.01048)	(0.00403)
Constant	-18.059	-23.388
	(53.756)	(30.344)
Net effect	**n.a**	**n.a**
threshold	**n.a**	**n.a**
Observations	44	41
Fisher statistic	26.56***	30.74***
r2c	0.8485	0.8679
r2u	0.9809	0.9932

Source: Author. Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1: [1] Number of depositors with commercial banks per 1000 adults, [2] Population ages 65 and above as % of total population, [3] Population ages 0-14 years as % of total population, [4] Domestic credit to private sector as % of GDP, [5] Individuals using the Internet, [6] GDP per capita, [7] Voluntary health insurance.

n.a means non-applicable. That is the net effects and thresholds are ‘‘not applicable’’ here because at least one estimate needed for the computation is not significant.

The lower middle-income countries present a negative unconditional effect which predominates the positive marginal effects through GDP per capita. This results in a negative net effect of financial inclusion on OOP expenditures. This is up to a GDP per capita threshold of 2231.7189.The threshold result presents a number of policy implications because the threshold value is within the minimum and maximum values of GDPC obtained in the

summary statistics table. The net effect and threshold values for the low-income countries cannot be obtained due to the non-significance of NDC.

5. Conclusion, policy implications and future research directions

This study aimed at examining the impact of financial inclusion on household health expenditures in Africa. The study contributes to existing literature in a number of ways. The first contribution is at the level of focus groups in the past studies. Most studies have focused on single-country based evidence and to the best of our knowledge; this is the very first attempt in aggregating the effects of financial inclusion on household health expenditures over a wider research area. On a second note, the involvement of transmission channels in this study is equally the first attempt to our knowledge in a bit to better understand the intensity and direction of effect of financial inclusion on household health expenditures. Third, countries in Africa are not simultaneous with respect to their levels of income. According to the World Bank income classifications, countries in Africa are separated into different income groups with most of them being low income-countries, others lower middle-income countries and very few upper middle-income countries. This study therefore carries out a comparative approach in examining the different income groups.

As for the methodology, it employed an Instrumental Variable (IV) technique being the 2SLS regression method, carried out on 17 African countries. The results from the regression revealed that financial inclusion has a positive direct effect on household health expenditures in Africa. Based on the regression results obtained from the income levels, a direct positive effect was noticed in low-income countries while a negative significant effect was noted in lower-middle income countries in Africa. With regards to the transmission mechanisms, an introduction of the transmitting variables (i.e.the GDP per capitaand voluntary insurance) exerted a positive net effect of financial inclusion on OOP expenditures in Africa. When the countries were separated into respective income groups, the negative unconditional effect of financial inclusion subdued the positive marginal effect through GDPC. This therefore results in a negative net effect of financial inclusion on household health expenditures for lower middle-income countries. The low-income countries record a positive marginal effect through GDP per capita which predominates the negative unconditional effect, producing a positive net effect of financial inclusion on OOP expenditures.

This study calls the attention of policy makers in Africa on the issue of financial inclusion. They should not undermine the benefits that financial inclusion brings especially in helping to attain the SDGs. There is need for appropriate financial inclusion mechanisms to be put in place, as better financial inclusiveness helps individuals attend to their health demands promptly. Therefore, since financial inclusion leads to an added source of finance (which means increase in GDP per capita) and advantages of financial services (such as having knowledge of the benefits health insurance provides) all of which permit better response to health shocks whilst limiting the danger of catastrophic health expenditures on the individuals. There is equally the need for SSA governments to put in place mechanisms to foster the Universal Health Coverage (UHC) plan so as to curb the impoverishment link with health expenditures. Added to this, policies should be implemented based on country-specific characteristics most especially as regards the various income levels while taking into consideration other important characteristics.

Conclusively, the transmission channels should be such that the various thresholds identified should be an action guide in implementing policies. When faced with a positive threshold, it signifies the critical level of the mediating variable that should be attained in order for financial inclusion to positively affect household health expenditures and as such, when the mediating variable has not yet reached the said threshold, the variable should be paired with other possible policies in order to attain the desired level of influence.

This study leaves space for future studies to consider other mediating variables by which financial inclusion can affect household health expenditures and to equally consider the effect the informal financial sector has on household health expenditures.

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Appendix 1: Source of data and *summary of expected signs of variables*

Variable Names	**Acronym**	**Expected Signs**	**Source**
Out-of-pocket expenditures as % of Current health expenditures	OOP[1]		WHO
Number of depositors with commercial banks per 1000 adults	NDC[2]	+	World Bank
Population ages 65 and above as % of total population	Pop>65[3]	+	World Bank
Population ages 0-14 years as % of total population	Pop<15[4]	+	World Bank
Domestic credit to private sector as % of GDP	CPGDP[5]	+/-	World Bank
Individuals using the Internet	INT[6]	+	World Bank
GDP per capita	GDPC[7]	+	World Bank
Voluntary health insurance	VHI[8]	+	WHO

Source: **Constructed by Author.**[1] Out-of-pocket expenditures as % of Current health expenditures, [2] Number of depositors with commercial banks per 1000 adults, [3] Population ages 65 and above as % of total population, [4] Population ages 0-14 years as % of total population, [5] Domestic credit to private sector as % of GDP, [6] Individuals using the Internet, [7] GDP per capita, [8] Voluntary health insurance.

Appendix 2: ***List of countries included.***

Benin, Botswana, Burkina-Faso, Cameroon, Cote D'Ivoire, Democratic Republic of Congo, Egypt, Ghana, Madagascar, Mali, Mauritania, Niger, Nigeria, Rwanda, Senegal, Togo, Uganda

Appendix 3: C*orrelation table*

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) OOP[1]	1.000							
(2) NDC[2]	-0.115	1.000						
(3) P65[3]	0.068	0.327	1.000					
(4) P14[4]	0.217	-0.561	-0.797	1.000				
(5) CPGDP[5]	-0.102	0.341	0.492	-0.585	1.000			
(6) INT[6]	-0.074	0.603	0.441	-0.531	0.412	1.000		
(7) GDPC[7]	-0.316	0.710	0.491	-0.654	0.470	0.502	1.000	
(8) VHI[8]	-0.439	0.339	0.335	-0.514	0.426	0.239	0.719	1.000

Source: **Computed by Author using STATA.**[1] Out-of-pocket expenditures as % of Current health expenditures, [2] Number of depositors with commercial banks per 1000 adults, [3] Population ages 65 and above as % of total population, [4] Population ages 0-14 years as % of total population, [5] Domestic credit to private sector as % of GDP, [6] Individuals using the Internet, [7] GDP per capita, [8] Voluntary health insurance.

Appendix 4: *Durbin-Wu-Hausman Endogeneity Test*

Var P>65

```
Tests of endogeneity
Ho: variables are exogenous

Robust score chi2(1)            =  17.0632  (p = 0.0000)
Robust regression F(1,150)      =  77.0897  (p = 0.0000)
```

Var P<15

```
Tests of endogeneity
Ho: variables are exogenous

Robust score chi2(1)            =  19.3417  (p = 0.0000)
Robust regression F(1,150)      =   35.337  (p = 0.0000)
```

Var VHI

```
Tests of endogeneity
Ho: variables are exogenous

Robust score chi2(1)            =  3.36533  (p = 0.0666)
Robust regression F(1,150)      =   7.3658  (p = 0.0074)
```

Appendix 5: *Sargan Test*

```
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Sargan statistic (overidentification test of all instruments):         24.071
                                                 Chi-sq(7) P-val =     0.0011
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```