

IS HEALTH DEVELOPMENT ASSISTANCE IN SUB-SAHARAN AFRICAN COUNTRIES A COMPLEMENT OR A SUBSTITUTE TO GOVERNMENT HEALTH EXPENDITURE?

¹Ojarotade Adegbola, ²Ogunleye, Edward Oladipupo, ³Ilori, Isaac, A.

¹(Ph.D student, Department of Economics, Ekiti State University, Ado-Ekiti, Ekiti State, Nigeria)

²(Ph.D) (Department of Economics, Ekiti State University, Ado-Ekiti, Ekiti State, Nigeria)

³(Ph.D) (Department of Economic, Ekiti State University, Ado-Ekiti, Ekiti State, Nigeria)

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Abstract: Empirical literature gesticulated that most of sub-Saharan African countries' health sectors finances relied on health development assistance (HDA) from advanced countries of the world (external donors) which in turn reduce public allocation to health sectors in the region. Given the above, this study investigated the effect of health aid on public health spending in SSA region. The study employed panel constructed data set of twenty-five (25) SSACs from 2000-2022; and panel ARDL and System GMM as estimation techniques. Finding from the study reveals that increased in financial health aid was associated with a decline in government health expenditure. (-0.374) or (-0.445). This implies that government health expenditure is substituted with health aid and; it also implies that health is prioritized as an inferior good in the region. The study concludes that successful governments in the region need to reduce its dependency on the external health support as a result of unpredictability. The study recommends among others the development of their domestic factors like GDPPC that will go a long way to enhance income growth and allow more budgetary allocation to the region's healthcare sector.

Keywords: Health Development Assistance, Government Health Expenditure, Complement and Substitute.

1. INTRODUCTION

It has been extensively realized that the disbursal of foreign aid aims to assist the donees to advance working well public healthcare systems that is capable to safeguard people of particular country from infectious and non-infectious diseases and health calamities is very important. However, regardless of its feasible contributions to people' healthiness, aid inflows into a particular country can also do an immense deal in reducing the government health expenditure (GHE). Till today, people in developing countries are affected by varieties of diseases and dispose to reduced GHE which fans spread of diseases in the region (Mohammed, Ebaidalla & Reham, 2016). Drabo and Ebeke (2010) puts that public aid sets aside for the advancement of health sector remains one of the important sources of external financing of health care services in third world countries in general and it is of a regret that this source is slowing down since the likelihoods of the domestic sources of funding health care in these countries are additionally limited by the dearth of fiscal resources and various governmental challenges.

At a global development front, a serious concern that also arises, is the substitutional effect that health development assistance (HDA) has turned out to play in some sub-Saharan African countries (SSACs) instead of complementing role it

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ought to play in the health sector of the region. That is, a concern that HDA results into a reduction of government funds channel or budget for the health sector of the region. According to Karim, Zouhair and Mouyad (2016), African health sector development becomes an important order for its governments as well as the international community since ensuring a healthy lifestyle and promotion of well-being stands to be the third development goal of United Nations by 2030. It is heart-warming to hear that main health indicators (like life expectancy and mortality rate) in the delicate health situation of SSACs have slightly enhanced as a result of commitment and collaborative support of the donor countries, multi-national agencies, foundations, Non-Governmental Organizations (NGO's) and economic development, yet SSACs experience drawback from undeveloped, under-developed and vulnerable health care systems and have recently experienced great concerns in relations to contagious diseases like Ebola, Serious Acute Respiratory Syndrome (SARS) and Corona-virus (Covid 19).

Statista (2022) reports that the overall life expectancy on average has significantly increased in Africa to 62 years over the period. In SSACs, the top three that made the maximum progress in expanding life expectancy are Algeria (77 years), followed by Morocco, Cape verde and Tunisia (with a life expectancy between 74 and 75 years). This heart-warming progress is occasioned and recorded from the reduced child deaths and reduced deaths from contagious diseases. On a contrary note, Chad recorded the lowest average, at 53 years. World Health Organization (African Region) (2022) similarly reports that healthy life expectancy increased in the region on average by ten (10) years per individual between the period 2000-2019 and that the rise in healthy life expectancy in the region is above the rise in healthy life expectancy of other regions. This improved healthy life expectancy in the region is made possible because of the improvements in the provision of essential health services, gains in reproduction, maternal, newborn and child health and also advancement in the battle against contagious diseases. The report also indicates that these enormous gains could be lowered by the turbulent COVID-19 pandemic.

Despite the African Union dialogue in 2001 that the government expenditure for health in the region should be minimum of 15% of the government budget as an obvious criterion to improve the health sector of the region, however, health development assistance still plays a useful role in raising the resources to fund the region health care sector and enhance health outcome indicators in SSACs. Nonetheless, when HDA is channelled, the governments of beneficiary countries may decide to increase or reduce the government spendings to the health sectors of the countries and this raises an important question being asked, does HDA increase public health spending (complementary effect)? Or, does HDA merely result into substitutional effect (reduction in the public health spending? Substitutional effect occurs when there is a decrease in public spending to the health sector of a country as a result of the provision of HDA and it is complementary when public spending to the health sector of a country increases or jacks up regardless of an increased in HDA.

Democratic Republic of Congo, Nigeria and Kenya top the list of highest recipients of health aid in SSACs as at 2019 (Statista, 2023) but none of these countries is found to be among the countries in SSACs that spent highest share of its national income as government health spending. Namibia, Eswatini and Lesotho top the list while Nigeria, Central African Republic and Equatorial Guinea spent lowest share of their national income on health. The substitution of government health expenditure with health development assistance may result in opposite result expected by the donors and the donees. So, when substitution occurs, the evaluation of the effectiveness of aid to the health sector becomes challenging; this is supported by Agnes and Nkechi (2020) that HDA has toppled government resources in Africa and established donor reliance-which is thwarting the changeover of nations with falling external funding and insufficient plans to counterbalance this change in resources. In this regard, evaluating and understanding the substitution or complementarity issue is useful for attaining global communities and donors' targets.

According to Ulrika (2016), the main two hypotheses of how health aid could generally impact government health expenditure are:

- i) The complementarity hypothesis: health aid has a complementary impact on GHE, showing a positive association between the health aid capital flow and government investment on health (GHE). This is sometimes called a "crowding in"-effect.
- ii) The substitute hypothesis: Here, health aid serves as a substitute for public domestic capital investment (GHE) in health sector of a country. Foreign aid investments in health sector of such a country crowds out public health investment in such country. Hence, health aid and GHE would display a negative association in data.

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There is no work so far that has been carried-out on HDA being a complement or a substitute to government health expenditure; but some works considered it in the realm of fungibility or displacement of government health spending. Given the scarcity of empirical studies that examine this issue, this work provides first hand pieces of information or evidence relating to the topic under discussion focusing on SSACs.

2. THEORETICAL FRAMEWORK AND EMPIRICAL REVIEW OF LITERATURE

Rosenstein Rodan (1943) states unequivocally in his Big-Push theory that, tardiness or stagnancy of the third world nations' economic development could be ideally removed or eradicated only amidst voluminous capital backings from international countries (overseas aid). He gives a knock or opposes any blueprint of economic advancement that is rooted mainly alongside the doctrine of step-by-step economic (gradualism) since it is confined to be discouraged and fruitless. He emphasizes clearly that "big push" (overseas aid) is indeed required to unlock the early tardiness of the static economy and it is expected after this that an unbroken trip of the nations' economy close to greater levels of productiveness and livelihood can be assured.

Since third world countries heavily rely on the health development assistance (HDA) from the advanced nations, the evaluation of its substitutional or complementary influence on government health expenditure or spending should be thoroughly investigated or should not be shied away from. Although few empirical literatures carried-out their works considering fungibility or displacement of government health expenditure, to arrive at the substitutional or complementary effect of HDA on GHE it is of great importance that the SSACs is investigated solely.

Osakede (2018) employed fixed and random effects estimation technique and panel data between 2000 and 2015 to examine the effect of health aid on public and private health spending for high aid recipient countries in SSACs. The study found that a percent increase in health aid reduces public health spending by 1.5%. The finding suggests that external aid exerts significant impact on public health spending in SSACs.

Shretta *et al* (2017) applied regression analyses method to examine the relationship between health aid and government health expenditure for 35 malaria eliminating countries using the secondary data set collection. It was found that increased government expenditure on malaria did not keep pace with the reducing health development assistance resulting in vacuum in the service delivery to achieve eradication.

Melisa *et.al* (2016) examines whether HDA increases have not resulted into an increased spending on health sector in Tanzania using the data set consisting of 28140 projects from 2000-2010. Semi-structured interviews were carried-out with Development Partners, government and non-government stakeholders. Finding reveals an evidence of substitution (decrease) of domestic health funds at the health sector and sub-sector levels in Tanzania.

Mohammed, Ebaidalla and Reham (2016) applied Fixed Effect Instrumental Variable (FE-IV) to test whether foreign aid affect public health expenditure using 45 datasets of SSA countries between 1995-2015. The study found that foreign aid channeled to health sector had no effect on public health spending of the selected countries of the region.

Study by Ssozi and Amlani (2015) investigates into the relationship between health development assistance and government health spending using panel data set of 43 SSACs from 1995 -2015. Finding reveals that an increase in HDA by one dollar reduces GHE by nearly 0.01 dollar. This reveals that domestic resources for health is substituted by HDA.

Garg, Evans, Dmytraczenko, Izazola-Licea, Tangcharoensathien and *et.al* (2012) carried-out research in Honduras, Rwanda and Thailand in relation to the association between domestic spending on health and donor funding. The cross-country finding revealed that these countries raised their domestic spending on health to increases in donor spending (complement).

Wagstaff (2011) conducted a research into an association between HD and GHE in Vietnam. His finding showed that government shifted spending from health sector to aid projects where supplementary investments yield biggest development. This showed that GHE was substituted with HDA.

Drabo and Ebeke (2010) analyzed the effects of remittances, health aid and public health spending on the access to health care services in developing countries using secondary data of panel estimation. One of the findings of the study showed that foreign health aid is a complement to the public health spending in the region.

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Lu, Schneider, Gubbins, Leach-Kemon, Jamison and *et al.* (2010) made use of available data from Institute for Health Metrics and Evaluation to examine association between HDA and GHE using panel study for developing countries between 1995-2006. Finding revealed a weak association between HDA and the substitution of government health expenditures after the boycott of a tiny sub-group of data. An additional dollar of health aid channeled to developing countries resulted into 0.43 dollar fall in government health expenditure.

Sanjeev (2010) utilized trend analysis to explain the relationship between health development assistance and government health expenditure after obtaining data from secondary sources for the 35 selected African countries for the study. Its finding showed mixed results, in some countries, government health expenditure was fully additional to HDA (complement) and in some countries there seemed to be crowding-out of GHE as a result of HDA (substitute) disbursed to these African countries.

Also Farag, Nandakumar, Wallack, Gaumer, and Hodgkin (2009) examined the association between HDA and GHE for low-income countries, lower-middle-income and upper-middle-income countries between 1995-2006. Finding reveals that one percent hike in HDA results into a fall by 0.19 percent, 0.09 percent and 0.027 percent in the GHE these countries.

Mavrotas and Ouattara (2006) in their paper titled "Foreign aid and fiscal response" revealed that HDA is not substituted in these countries investigated (Philippines, Costa Rica or Pakistan). Health development assistance channeled to these countries were complemented by government health spendings in these countries.

The above existing reviewed literatures showed mixed findings i.e GHE was fungible (substituted) by HDA in some findings and non-fungible (complemented) in some literatures. This present study only considers the substitutability or complementary nature of GHE.

3. MODEL SPECIFICATION

Based on the Karim *et.al* (2016) explicit functional stated model, the adjusted and adopted model of this study is stated thus:

$$GHE_{it} = \alpha_0 + \alpha_1 GHE_{it-1} + \alpha_2 LHDA_{it} + \alpha_3 LRGDPPC_{it} + \alpha_4 POP_{65+it} + \alpha_5 CMR_{it} + \alpha_6 MAL_{it} + \alpha_7 HIV_{it} + \alpha_8 GE_{it} + \varepsilon_{it} \quad 1$$

Where L is the logarithm operator, GHE_{it} represents government health expenditure, $LHDA_{it}$ is the logarithm of health development assistance, $LRGDP_{it}$ is the logarithm of real Gross Domestic Product per capita, POP_{65+it} is the population above 65years, CMR_{it} is child mortality rates, MAL_{it} (non-infectious disease) represents malaria incidences, HIV_{it} (infectious disease) represents Human Immune Virus incidences, GE_{it} stands for government effectiveness in the region while ε_{it} is an error term. 'i' denotes a country, while the 't' is time.

In this model, α_2 is the main parameter of interest which is expected to be positive and less than one when countries depend on the health aid to fund their health sectors, which means that aid is partially complement. Whereas, health aid is totally complement if α_2 is positive and equal to one. On the contrary, the expected sign of α_2 could be negative when countries diverted health aid to non-health sectors which means a strong degree of substitution. Gerdtham and Jonsson (2000) emphasizes that if α_3 is between zero (0) and one (1), health care in the country is considered to be a necessary commodity, on the other way round, it is claimed to be a luxury commodity, if α_3 is greater than one (1+).

4. ESTIMATED TECHNIQUES

An important issue among others that occurs when evaluating dynamic equation such as equ. 1 is the identification of the connections among health development assistance, government health expenditure, real GDP per capita and other control variables. To overcome this problem Panel Autoregressive Distributed Lag (PARDL) was employed. Due to the inclusion of the lagged dependent variable among independent variables couples with the serial correlation and endogeneity problems that always arise from PARDL necessitated the employment of another estimation technique called System Generalized Method of Moments (GMM) developed by Blundel and Bond (1998) to evaluate dynamic model like this. According to Roodman (2009a), this estimation technique deals with serial correlation, endogeneity, autocorrelation and an unobserved country-level heterogeneity that may occur in PARDL.

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5. DATA AND MEASUREMENT OF VARIABLES

To investigate whether health development assistance to sub-Saharan African countries play a complementary or substitutional role, GHE was chosen a dependent variable. The simple reason for choosing this is that it is the variable that determines the total amount of expenditure that government of a particular country spent on its health sector from its own yearly generated revenue. This excludes health expenditures from out of pockets, private organizations and donor agencies. The data of the stated variables in this study were extracted from World Development Indicators, Worldwide Governance Indicators, UNAIDS, WHO.

Government Health Expenditure: This is share of current health expenditure (CHE) that is funded from internal public sources for health like domestic revenue, grants, transfers, subsidies to voluntary health insurance beneficiaries, social health insurance contributions and others. This excludes foreign resources expended by governments on health. It is measured as percentage of Current Health Expenditure (CHE). Data for this variable were sourced from Global Health Expenditure Database.

Health Development Assistance: It is generally defined as the transfers or transmissions of resources from multi-national or lateral organizations or agencies, foundations, or foreign governments to the health sector of a particular developing country or its population and this can be in the forms of grants and in-kind gifts and some may come in forms of concessionary agreement, borrowed money and preferable trade agreements between the countries concerned. Data for this variable were extracted from Financing Global Health Database and measured in million US dollars.

Real Gross Domestic Product Per Capita: This is a standard gauge to measure the total economic output of a geographical area (country) divided by the total population of the people and adjusted for the increases in the prices of goods and services (inflation). Its data were extracted from World Bank National Accounts Data files. It is measured in current local currency unit (current LCU). In many literature, identification of Gross Domestic Product (GDP) as a major determinant of health care expenditure has been numerously emphasized Angko (2013).

Population of ages 65 and above: It is a percentage of the total population of a country which takes into account all the residents in spite of legal status or citizenship. Xu, Saksenaa and Hollyb (2011) states that the inclusion of this explanatory variable is justified in order to evaluate the impact of an aging population on government health spending in a country. It is measured as the percentage of total population of a country. Its data were extracted from United Nations Population Division

Child Mortality Rates: This is the probability of a death taking away a child within one year –and precisely five years of age in a geographical area within a specified period usually a year. It is measured as deaths of per 1000 live births of children. Its data were sourced from UNICEF. It is included to control for the effect that infants and children health care expenses has on government health care spending annually.

Malaria Incidence: This is defined as the number of the new cases of malaria that occurred within the population of people in a geographical area within a specified period of time usually a year. Its measurement is the number of new cases of malaria recorded per 1000 population at risk. Data of this variable were sourced from Global Health Observatory Data Repository database.

HIV Incidence: This is defined as the percentage of ages 15-49 of the population who are contaminated or infected with HIV within a geographically specified area within a year. It is measured as the percentage of the age distribution (15-49) of the population. Its data were collected from UNAIDS estimates.

Government Effectiveness: It incorporates or embraces opinions of the quality of public service and the extent of its freedom from political pressures, the standard of policy conception and its execution, as well as the sincerity of the government's dedication to those particular policies. Its unit of measurement ranges from -2.5 (weak) to 2.5 (strong) performance. Data of this explanatory variable were collected from World Bank Database.

6. SCOPE OF THE STUDY

The research spans between 2000 and 2022 and employs cross-sectional and annually time series data consequently for 25 sub-Saharan African Countries (SSACs). These selected countries stand in for the four (4) important regions of SSACs from low income countries (LICs), lower-middle income countries (LMICs), upper-middle income countries (UMICs) and high income country (HIC) of the region. The countries selected are Central African Republic, Chad, Equatorial Guinea,

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Gabon, DR Congo, Ethiopia, Kenya, Madagascar, Mauritius, Tanzania, Angola, Botswana, Lesotho, South Africa, Zambia, Benin Republic, Cote D’ivoire, Ghana, Nigeria, Senegal, Congo Republic, Uganda, Zimbabwe, Mali and Togo.

7. RESULTS AND DISCUSSION

Table 1 indicates that average government health expenditure as a percentage of current health expenditure in SSA was estimated to be approximately 32%. Average log of health development assistance and log of real gross domestic product per capita were 18% and 12% respectively, while about 3% of the population were 65 years and above. Average child mortality rates and malaria were 89 and 221. Finally, the table indicates that during the examined period, average HIV was 5% while the mean index of GE in the region was less than zero (-0.7) in the region. This suggests that the overall government effectiveness towards utilization of government health expenditure in the region was relatively low. The standard deviation statistics revealed that malaria has more variation (152) than the other variables; this result implies that malaria is prevalent in the regions under study. Also, the child mortality rate is shown to have the second largest variation with a value of about 38 and this implies that the rate of child death occurrence is high in the regions considered.

Table 1: Health-related indicators across SSACs (2000-2022)

Descriptive statistics of Variables

Variable	Obs	Mean	Std. Dev.	c.v.	Max	Min
GHE	575	32.286	15.571	0.482	75.660	3.929
LOG(HDA)	575	18.358	1.954	0.106	21.403	10.086
LOG(RGDPPC)	575	12.069	2.317	0.192	16.075	4.928
POP65_	575	3.190	1.385	0.434	12.792	1.521
CMR	575	88.858	38.451	0.433	205.1	14.6
MAL	575	220.736	152.047	0.689	512.7921	0
HIV	575	5.919	6.747	1.140	25.9	0.1
GE	575	-0.724	0.631	-0.871	1.16	-1.92

Abbreviations: *GHE= Government Health Expenditure (% of current health expenditure); Health Development Assistance(million USD); RGDPPC= Real Gross Domestic Product Per Capita (USD); POP 65 = Population ages 65 above (% of population); CMR = Child mortality rates (deaths of children per 1000 livebirths); MAL =Incidence of malaria (malaria recorded per 1000 population at risk); HIV =Human Immunodeficiency virus (the percentage of ages 15-49 of the population who are contaminated); Government Effectiveness (ranges between -2.5 to 2.5).*

Table 2 below depicts the result of the pairwise correlation among the variables. With a focus on the first column, the result shows that the population age 65, HIV, and government effectiveness correlate positively with government health expenditure. However, the result reveals that health development assistance, real GDP per capita, child mortality rate, and malaria prevalence correlate negatively with government health expenditure. Among the independent variables, it can be seen that the highest correlation is between malaria prevalence and child mortality rate with a value of 0.65; the least absolute degree of correlation is about 0.005, and this implies that the degree of multi-collinearity among the variables is very low.

Table 2: Correlation coefficient

GHE	1.000							
Log(HDA)	-0.226	1.000						
Log(GDP)	-0.162	-0.260	1.000					
POP65_	0.372	-0.440	-0.005	1.000				
CMR	-0.409	0.075	-0.041	-0.437	1.000			
MAL	-0.594	0.060	0.219	-0.451	0.650	1.000		
HIV	0.440	0.044	-0.470	0.092	-0.172	-0.471	1.000	
GE	0.512	-0.145	-0.179	0.540	-0.520	-0.509	0.284	1.000

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Considering the Table 3 below, all the brought together variables (GHE, HDA, GDPPC, POP65, CMR, MAL, HIV and GE) were allowed to go through stationarity test using Levin-Lin-Chu (LLC), Im-Pesaran-Shin (IPS) ADF and PP so as to empty-off the finding from spurious results that may permit clashing results. It can be deduced that the variables are of mixed orders i.e of $I(0)$ and $I(1)$ and hence the justification for the employment of Panel ARDL. To proceed to the data analysis, the panel co-integration test is employed. The result showed evidence for the non-stationary of the dependent variable, hence, there is a tendency for it to co-integrate with the independent variables. The Westerlund co-integration test is thus employed to test for the presence of co-integration with eight different assumptions under two major hypotheses. The major assumptions are that some of the panels are co-integrated and that all the panels are co-integrated. Under the time trend and mean adjustment assumptions, the test is either used without trend and mean, or with the trend and mean, or without trend and demean, or with the trend and demean. It is also assumed that the autoregressive parameter for the test is either panel-specific or heterogeneous.

Table 3: Panel unit root test result

Variable	Level				First difference			
	LLC	IPS	ADF	PP	LLC	IPS	ADF	PP
GHE	-2.914***	-1.106	13.818	13.585	-0.999	-2.378***	28.881***	34.107***
log(HDA)	2.500	3.342	8.163	4.812	-2.278**	-3.324***	28.420***	33.395***
log(GDP)	-1.902**	-0.943	31.437***	34.350***	-7.605***	-5.939***	50.854***	46.552***
POP	-1.253	1.414	11.285	18.797	-8.767***	-6.610***	57.700***	61.669***
CMR	-1.470*	-0.258	7.850	7.592	-7.000***	-5.921***	50.081***	46.678***
MAL	1.819	3.302	0.646	0.398	-6.603***	-3.122***	46.366***	36.061***
HIV	1.737	2.684	3.509	34.537***	-3.569***	-6.731***	60.720***	72.540***
GE	-0.557	-0.294	10.999	34.220***	-0.971	-4.659***	43.174***	66.163***

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

Due to the fact that some variables are not stationary at level but became stationary at first difference from Table 3 above, so it is imperative to carry out panel co-integration test to determine the presence or absence of co-integration. To do this, Westerlund panel co-integration test is carefully undertaken to make known the convergence between the long run equilibrium and short run dynamics of the studied data.

The results of the co-integration test are presented in Table 4 below and it can be deduced from the results based on each assumption that there exists a long-run relationship between dependent variable (government health expenditure) and independent variables. Hence, there is substantial or hardy proof throwing its support to the existence of co-integration between government health expenditure and its determinants carefully mentioned in this research. To this end, investigation into the long run equilibrium association between GHE and its independent variables in this research are methodologically valid utilizing panel Autoregressive Distributed Lag estimation that can uncover the pair of the long run and short run association government health expenditure and its independent variables.

Table 4: Westerlund panel co-integration test results

Assumption	Time trend	Demean	AR parameter	Statitics
Some panels are co-integrated	no	no	Panel specific	7.345***
Some panels are co-integrated	yes	no	Panel specific	4.795***
Some panels are co-integrated	no	yes	Panel specific	7.344***
Some panels are co-integrated	yes	yes	Panel specific	9.693***
All panels are co-integrated	no	no	same	2.658***
All panels are co-integrated	yes	no	same	3.529***
All panels are co-integrated	no	yes	same	2.499***
All panels are co-integrated	yes	yes	same	5.178***

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

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The estimation results are presented in Tables 5 as follows.

Table 5: Panel ARDL (1,1,1,1,1,1,1) model result of Government Health Expenditure

Variable	DFE	MG	PMG
log(HDA)	-0.045* (1.357)	4.428 (3.206)	-0.374** (0.438)
log(GDPPC)	3.131* (1.719)	-57.808 (49.442)	5.644*** (0.898)
POP65	0.241** (2.493)	59.013 (75.957)	4.252** (1.874)
CMR	0.012* (0.078)	0.743 (0.724)	0.078** (0.039)
MAL	-0.024* (0.020)	0.160 (0.169)	-0.041*** (0.008)
HIV	0.275** (0.917)	-214.940 (213.984)	1.365*** (0.467)
GE	5.653 (4.067)	89.585 (86.623)	2.611 (1.890)
Δlog(HDA)	-0.040 (0.386)	-0.975 (1.042)	-0.103 (0.726)
Δlog(GDPPC)	-3.380** (1.621)	-10.140 (9.202)	-6.025 (5.605)
ΔPop_65	-0.082 (7.242)	20.593 (50.393)	-11.281 (22.357)
ΔCMR	-0.165 (0.145)	0.601 (1.199)	-1.455*** (0.474)
ΔMAL	0.000 (0.012)	0.001 (0.054)	0.024 (0.029)
ΔHIV	1.225 (1.047)	4.610 (8.949)	1.814 (3.748)
ΔGE	-1.313 (1.028)	-1.478 (3.694)	0.030 (1.406)
ECM (-1)	-0.284*** (0.030)	-1.291 (0.093)	-0.625*** (0.071)
Constant	-1.610 (9.562)	172.198 (158.905)	-30.975*** (4.338)

NOTE: These variables HDA and GDPPC are in natural log forms

DFE = Dynamic Fixed Effect, PMG= Pooled mean Group estimation, and MG=Mean group Estimation

Estimates in () are standard error

**** p < 0.01; ** p < 0.05; * p < 0.1*

Source: Author’s Computation (2023).

Considering the estimation results in Table 5 above which shows the pair of the short run and long run coefficients, and the probability estimates of the relationship between GHE and its independent variables in sub-Saharan African countries.

From the long run dynamic fixed effect and pooled mean group estimation results, the estimator gives -0.045 and -0.374 as the coefficient of logHDA, which is significant, revealing that HDA has an inverse impact on GHE. The estimate indicates that during the examined period, in sub-Saharan African Countries, a unit percent rise in HDA disbursed to SSACs results in 0.045 - 0.374 percent decline in Government Health Expenditure (GHE), holding other variables constant in the region (this implies that the concerned governments in the region substituted GHE with HDA). Contrarily, logGDPPC estimate ranges between 3.131- 5.644 and significant, indicating that a unit percent increase in real per capita income growth in SSACs will result in the growth of GHE. In an unclouded term, during the investigated period, 2000-2022, the average GHE was 12%; if in the successive periods the region tries to increase the rate of growth by 1% (holding other explanatory variables unchanged) this would make GHE to rise to 15.1% or 17.6%. In the same vein, the estimator gives 0.241 or 4.252

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as a coefficient estimate of POP65 years above, which again is statistically significant. It reveals that a unit percent increase in POP65 years above increases GHE between 0.241% - 4.2%, confirming the strong effect that increase in POP65 years above has in expanding GHE in SSACs. The table also provides an empirical evidence in support of the view that child mortality rate (statistically significant) has exceptional role in SSACs government health expenditure. The estimation result implies that 1 percent increase in CMR hikes government health expenditure between 0.012-0.078%.

Contrarily, a unit percent increase in MAL (statistically significant) reduces GHE between -0.024 and -0.041% (governments of the region might have done this because of the increase percent of HDA channelled to malaria incidence (health focus area) in the region. A unit percent increase in HIV (statistically significant) raises GHE by 0.275 or 1.365% (this confirms that as the incidences of HIV is on increase in the region, governments of the region budget more spending to this health focal area). Finally, both estimates of government effectiveness (statistically insignificant) (institutional quality) are positive. This result portrays the fact that government effectiveness plays an uninteresting role towards government health expenditure in the region.

-0.040

Also PMG short run result shows that a negative insignificant relationship exists between GHE and health development assistance, given coefficient of -0.40 and -0.103. Results further reveal that logGDPPC, POP65 years above and CMR (statistically significant) have negative relationships with GHE while MAL, HIV and GE have positive relationships GHE and are not statistically significant. The error correction term shows that at least 28.4% - 62.5% of the disequilibrium in the government health expenditure is corrected or adjusted back to the normal level after an exogenous shock occurrence.

Immurana, Boachie and Iddrisu, (2021) identified some problems that are associated with panel ARDL. Some of the problems are endogeneity problem (some explanatory variables correlating with the error term), and serial correlation (a situation where a variable and a lagged version of itself are observed to be correlated with each other over periods of time). These identified associated problems warranted the engagement of other estimation technique i.e utilizing System Generalized Method of Moments.

The estimation results of system GMM are presented below

Table 6: System GMM One-Step estimation

Variable	Coefficient	Std. err.	z-Stat.	Prob.
GHE (-1)	0.553	0.041	13.590	0.000***
log(HDA)	-0.445	0.331	-1.340	0.017***
log(GDPPC)	0.874	0.394	2.220	0.027**
POP65	1.007	0.618	1.630	0.103
CMR	-0.002	0.017	-0.130	0.893
MAL	-0.002	0.006	-0.260	0.793
HIV	0.408	0.149	2.750	0.006***
GE	0.067	0.862	0.080	0.938
Constant	7.109	9.584	0.740	0.458

Dynamic panel model result of GHE

Note: HDA and GDPPC are in natural log forms

Estimates are based on one-step GMM

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

Source: Author's Computation (2023).

Table 6 above presents the estimation result of the system GMM one-step. It reveals the dynamic effect of lagged GHE on Government Health Expenditure (GHE) in the SSACs selected for this work. From the above estimated results, lagged GHE which is statistically significant, 0.553, $p=0.01$ (indicating that in the estimation process of logGHE, controlling for past level of GHE is paramount). An estimator gives -0.445 as the coefficient estimate of logHDA, which is statistically significant $p=0.017$, indicating that HDA has a strong negative impact on GHE. A unit percent increase in HDA reduces GHE by 0.445%, holding other variables constant) (this is in tandem with the conviction of some scholars that health development assistance received in SSACs always results in the reduction of GHE by the governments of SSACs). On a

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contrary note, logGDPPC coefficient estimate is 0.874 and statistically significant, $p=0.027$. A unit percent increase in GDPPC raises GHE by 0.874%, a pointer that raising per capita income results in the increment of GHE in SSACs. Also, POP65's estimator gives 1.007 but remains insignificant at $p=0.103$, implying that a unit percent increase in POP65 raises GHE by 1.007%, a unit percent hike in CMR (statistically insignificant) lowers GHE by -0.002.

Likewise, a unit percent increase in MAL results in the reduction of GHE by -0.002% in the region and it is not statistically significant. In a reversing order of the estimation result, a unit percent increase in HIV raises government health expenditure (GHE) by 0.408% and is statistically significant (this points to the fact that, governments of the region have continued to devote more resources (complementing HDA) to tackle HIV incidences in the region despite HDA yearly disbursed to the region. Finally, Government Effectiveness with coefficient estimate of 0.067 is a pointer that government institutions in the region are not effective in curbing the leakages that occur in GHE in the region.

8. SUMMARY, CONCLUSION AND RECOMMENDATION

This paper examines the existence of a complementary or substitutability relationship between health development assistance and government health expenditure of funding in SSACs employing the panel data-set between 2000-2022 through the employments of panel ARDL and system GMM estimation techniques. Health Development Assistance, GDPPC, POP65 years and above, CMR, MAL, HIV and GE were utilized as the explanatory variables in the econometrics analysis of this research. The finding of the study indicates that health aid is a significant determinant of public health expenditure in SSACs. The result clearly shows that with a rise in health aid, government health spending will most likely fall by a proportion higher than the amount of the increase in health aid. The result suggests stronger effects of health aid on public health spending. This is essential given high dependence of SSACs economies on government provision of health care. Therefore, the connotative conclusion is that the inflow of health aid has some relationship with low budgetary allocations to health by SSACs governments. In the same vein, it indicates the public sectors of the region over-reliance on external health aid.

The finding was not unexpected as health development assistance (HDA) is utilized for permeating the savings disparity in financing health care and so help public sector health care funding. This finding is in tandem with the findings of other researchers showing the inverse or negative association between health aid and government health spending in SSACs. The researchers include Osakede (2018), Ke, Saksena, and Holly (2011), Dodd, James, and Phuong (2010). Farag, Nandakumar, Wallack, Gaumer and Hodgkin (2009). Nabyonga, Freddie and Okuonzi (2009), however, state that reliance on HDA is dangerous as a result of the unpredictability (which can occasion by economic meltdown, global financial crises and others) of the aid inflow into the region. Contrarily, some researchers found direct or positive relationship between health aid and government health expenditure. Some of these researchers include Barkat, Mrabet and Alsamara (2016), Mishra and Newhouse (2007) and Devarajan, Rajkumar and Swaroop (1999).

Disparity in findings may be as a result of the usage of countries that received high health development assistance in the region. It must be aware that while the finding of the current study provides proof indicating a decline in public health care expenditure with an increase in external financial assistance to health, this may only be a necessary but not sufficient condition in attaining advancement regarding population health. The finding of the study contrarily evident the effect of income on health care spending in SSACs. The result is an indicative of more government allocation to health care with a rise in real per capita GDP. This is suggestive of a perception of health care as normal good by governments of SSAC economies while the association between HDA and GHE indicates an inferior good. The association between HDA and GHE, however, shows strong suggestions that health care is not considered as high priority good in developing economies especially with consistent low government allocation to health in the region.

Conclusively, this study investigated to ascertain the effect of health development assistance on government health expenditure in SSACs. The result provided the proof that financial health aid was associated with a decline in government health expenditure. This finding implies that health development assistance (external health financing) mounts significant impact on government health expenditure in SSACs. It is informative that the governments in the region need to reduce its dependency on the external health support as a result of unpredictability of such form of spending. Towards this end, governments in the region should develop their domestic factors like GDPPC and others that can boost their income and

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also result in more budgetary allocation to their healthcare sector in the region. Government of the region should not shy away from the consideration of the health care as a necessary good given the function of health capital on the general economic performance of a country.

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