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DOES HEALTH AID REDUCE HIV/AIDS PREVALENCE IN NIGERIA?

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ABSTRACT

There has been influx of official development assistance (foreign aid) into the health sector in Nigeria but little or nothing is known about the impact of such funds on specific health outcomes in Nigeria. Given the economic implication of HIV/AIDS, this study therefore assessed the effect of health aid on the prevalence of the HIV/AIDS in Nigeria. Relevant data spanning 1990 to 2017 were sourced from World Development Indicator (WDI) and Organization for Economic Cooperation and Development (OECD) database and analyzed within the Autoregressive Distributed Lag (ARDL) framework. Model estimation results revealed that health aid had no significant effect on HIV prevalence in the country. Effective utilization of health aid was advocated in order to reduce the HIV prevalence rate thereby reducing the accompanying burden on the people and the economy.

Keywords: Health aid, HIV prevalence, ARDL, Nigeria

INTRODUCTION

Health is known to be an important input for economic development as a healthier population can raise the level of productivity in a country. Hence, good health is necessary for the economic development of a nation. However, human health is limited by illness. Lack of health contributes to the problems people face in their everyday lives and illnesses occur partly due to different societal and economic problem faced by every nation in the world. Diseases cause loss of lives and low level of productivity both at micro and macro level. While many diseases are curable due to advancement in scientific research and discoveries, some are not. HIV/AIDS contributes substantially to

mortality and morbidity around the world. According to WHO (2018), an estimated 940,000 people died from HIV globally in 2017, though, this represented a 52 percent fewer than 2004 figure (peak) and about 34 percent fewer than 2010 in spite of a period of significant population growth in many high burden countries such as Swaziland, Lesotho, Botswana and South Africa. The complexity of HIV infection stems from its tendency to lower the level of immunity of an infected person thereby creating room for other opportunistic infections. The virus destroys the white blood cells called the T-helper cells (also known as CD4 cells) and makes copies of itself inside this T-helper cells with multiple economic and social im-

plications. Scientific research and statistics have confirmed that most popular way people contract the virus is by having anal and vaginal sex without a condom. According to WHO (2017) some ways of contracting the disease is by using infected needles, syringes, other sharp/piercing objects or blood transmission. It can also be transmitted during pregnancy/delivery from mother to child or breast feeding. Currently, no cure has been found to treat HIV/AIDS but there are treatments that can reduce its rate of duplication in the body and enable people to live a good, long and healthy life.

HIV/AIDS is a pandemic affecting several Latin American, Asian and African countries (especially sub-Saharan countries). For example, the Federal Ministry of Health - FMOH (2010) reports that out of 2.9 million HIV/AIDS related death in 2003, 2.2 million were from sub-Saharan Africa countries. In a recent report, UNAIDS(2018) reports that although there was decline in AIDS related death in sub-Saharan African region due to sharp reductions in Eastern and Southern Africa which was about 30 percent decline, the region still maintained highest prevalence ratio due to the contributions of western and central Africa which account for 21percent of the world's new HIV infections and 30 percent of global deaths from AIDS-related illnesses. Zakari and Abdullahi (2013) reported that negative attitude and presentation by medical personnel and the sensational captions by the Nigerian mass media on the so-called death sentence nature of HIV/AIDS epidemic made it so scary that people found it difficult to accept its presence and therefore people especially women with the disease are stigmatized.

With the global agenda of United Nations

to end the AIDS epidemic by 2030 as stated in the Agenda for Sustainable Development 2016-2030, there have been growing intensity of billions of dollar investment and collective efforts of national governments, community-based organizations and researchers to achieve this goal (UNAIDS, 2018). One major way of achieving this goal is through foreign aids especially for developing countries whose budgetary spending are always less than needed to bring about the significant improvement in health outcomes. This had led to the influx of foreign aid into Sub-Sahara Africa region as means of battling development challenges (health challenges in this specific case). Since the declaration of the Millennium Development Goals in 2000, the aid to health sector in developing countries around the world has been on the increase. For example, gross disbursement of ODA (Official Development Assistance) from 2002 to 2016 increased from \$759 million to \$2,670.85 million per year (OECD, 2016). Nigeria as a Sub-Sahara African nation has been greatly financed by health aid. The gross disbursement of ODA to Nigeria from 2002 to 2016 has increased from \$52.189 million dollars to \$184.527 million dollars with very high disbursement in 2015 amounting to about \$269.69 million dollars.

Despite this influx of health aid to Nigeria, the country is still faced with myriad of health problems. The degrading state of the health sector is felt by most HIV/AIDS patients who are in need of sound medical care, advice and counseling. According to NACA (2014), Nigeria's HIV/AIDS prevalence increased steadily from 1.8 percent in 1991, to 4.5 percent in 1995, peaked at 5.8 percent in 2001 and started to decline to 5 percent in 2003 and 4.1 percent in 2010. HIV prevalence is relatively higher in some high

burden states, such as Abia (7.3 percent), Akwa Ibom (10.9 percent), Anambra (8.7 percent), Bayelsa (9.1 percent) and Benue (12.7 percent). As at 2017, HIV/AIDS prevalence rate in Nigeria was 2.8 percent. However, considering the huge population of the country (estimated to be about 200 million as at 2019) the actual number of infected people may be scary. According to USAIDS (2018), Nigeria had 220,000 new HIV infections in year 2010 which declined to 210,000 in 2017 while the AIDS-related deaths dropped from 180,000 in 2010 to 150,000 in 2017. About 3.1 million people in Nigeria are estimated to be living with HIV and this brings Nigeria close to South-Africa as the second largest HIV epidemic country in sub-Sahara Africa. This spread of HIV in the country poses threat to lives of Nigerians as it may lead to fall in productivity of the people due to direct and indirect costs of illnesses.

Surprisingly, literature on the effect of health aid on HIV prevalence is scarce. Though, there have been studies which examined the impact of health aid on health outcomes (e.g. Burfeind 2014, Pickbournand Ndikumana, 2019), there is no specific study to the best of our knowledge that have captured the effect of health-aid on HIV prevalence, especially in Nigeria. This study bridges this knowledge gap by examining the effect of health aid on HIV prevalence in Nigeria. The rest of this paper consists of Section 2 which reviewed past literature, Section 3 described the study methodology and Section 4 presents and discussed relevant results while Section 5 summarized and concluded accordingly.

LITERATURE REVIEW

As the debate about the effectiveness of foreign aid in improving different compo-

nents of human development rages on, two contrasting hypotheses have emerged. One is a public interest argument where authors such as Sen (1999) and Sachs (2005) are of the opinion that aid can, and should be used to assist in the development process. The other view is the "*public choice hypothesis*" promoted by authors such as Bauer (2000) and Easterly (2001) which posited that foreign assistance is not effective and has the tendency to inhibit future growth potentials.

The effectiveness of foreign aid in fostering human development has been at the front burner of discussions in development economics in recent decades. Health is a major component of human development, hence, substantial proportion of foreign aid has been channeled into the health sector over the years. While some authors have established the significance of foreign aid in improving health outcomes (e.g. Mishra & Newhouse, 2009; Bendavid & Bhattacharya, 2014, Burnfeind, 2014) some others have reported negative relationship while some have reported no significant relationship (e.g. Williamson, 2008; Wilson, 2011 and Gebhard *et al.*, 2008). Williamson (2008) empirically tested the hypothesis that increases in human welfare can be achieved through health aid using data from OECD database from 1973 to 2004 for all countries receiving foreign aid. The study reported that foreign aid was not effective in increasing health outcomes leaning towards the view that foreign aid was not a successful human development tool.

Chauvet, Gubertet and Mesplé-Somps(2008) examined the respective impact of remittances and foreign aid on human development measured by infant and child mortality rates using a sample of 109 developing countries and cross-country quintile-level data on a sample of 47 developing countries.

The study reported that remittances significantly improved child health and concluded that remittances seemed to improve health outcome of children belonging to rich homes whereas health aid neither showed pro-poor nor anti-poor effect. Asiama and Quartey (2009) examined the effect of development aid on welfare variables in sub-Saharan African countries using a sample of 39 sub-Saharan countries from 1975 to 2003. The data were analyzed using the Generalized Method Moments (GMM) and it was found that aggregate bilateral aid do not have significant effect on human development index and also did not significantly affect infant mortality. The study concluded that not all types of aid have same effect on welfare and poverty indicators.

Orem, Freddie and Okuonzi (2009) assessed the prerequisites for effectiveness of donor aid in Uganda. The study specifically investigated the proportion of health aid to overall health funding, predictability, comprehensiveness, alignment to country priorities, and channeling mechanisms. It was reported that more than 50 percent of foreign aid were off budget and unavailable for meaningful planning. There was disproportionate funding for certain items such as drugs. The study further reported that important health system factors, especially, infrastructure and human resources were not given due attention in investment decisions. The study concluded that though official development assistance (foreign aid) was found to be significant there was urgent reason to invest in the prerequisites that would guarantee its effective use. Younde (2010) evaluated the relationship between health aid, HIV prevalence and government spending in 15 countries from 2004 to 2008 using Pearson correlation analysis. The study which stimulates future research to

address the relationship between health aid and HIV prevalence found a statistically negative relationship between adult HIV prevalence and health aid. It was concluded that relationship between foreign aid and domestic government spending was addictive in nature suggesting that government might depend on foreign monies instead of their own money to fund AIDS related programs.

Ebeke and Drabo (2011) analyzed the impacts of remittances, health aid and public spending on access to health care in developing countries. Using an intra-country data and instrumental variables estimation it was found that remittances, health aid and public spending are important determinants of access to health services in recipients' countries and the results suggested that, remittances lead to a sectorial glide in the uses of health care services from the public to the private sector for the intermediate income class. Yogo and Mallaye(2012) assessed the relationship between health aid and health improvement in sub-Sahara Africa using a sample of 28 sub-Saharan African countries from year 2000 to 2010. The study used instrumental variable approach, took endogeneity into account and reported that health aid improved health outcomes (though, marginally) in sub-Saharan African countries.

Banchani and Swiss (2014) assessed the impact of foreign aid on maternal mortality using data from OECD, WDI and the Institute of Health Metrics and Evaluation (IHME) for 106 low and middle income countries using Two-stage, fixed effects panel regression models and results show that total foreign aid has a small but statistically significant negative effect on maternal mortality but that aid allocated to the reproductive health sector was associated with noticeable larger reductions in maternal mortality.

Shirazi, Abdul-Manap and Ali (2018) empirically assessed the validity of the assertion that foreign aid promotes growth and development in Pakistan using vector error correction approach. The study reported a feedback Granger causality as economic growth stimulated foreign aid and foreign aid stimulated economic growth. Unidirectional causality running from foreign aid was also reported for education, life expectancy and Human development index. Burnfeind(2014) investigated the effectiveness of foreign aid for the health sector on child mortality rate using data from 47 developing countries from 2000 to 2009. It was found that health aid as share of total health spending reduced under-five mortality, though, marginally. It was asserted that there was minimal improvement in child mortality rates with a very large increase in external resources as a percentage of health spending. However, the finding did not imply that all foreign aid are ineffective but that health aid did not have enough impact required to achieve the targeted development goal.

Ikhide (2014) reported that health aid was a significant variable in explaining health outcomes. It was reported that an increase in foreign aid targeted at the health sector resulted in reduction in under-5 and infant mortality rate. Positive (though, not significant) relationship between health targeted aid and life expectancy was reported in the study and it was opined that efforts must be made to fulfill new pledges and timely disbursement of health sector targeted foreign aid especially in those countries severely affected by malaria, tuberculosis and HIV/AIDS. The encouragement of policy makers in countries considered to have grown beyond foreign aid in Africa was also considered necessary to stimulate growth.

Mishra and Newhouse (2014) investigated the relationship between health aid and infant mortality using data from 118 countries between 1973 and 2004 which were analyzed within the Generalized Method of Moment framework and reported that health aid significantly affected infant mortality rate. However, the study did not find overall aid to be significantly affecting infant mortality and it was concluded that despite the increasing health aid per capita, the effect on infant mortality per thousand birth is small relative to the targets of the (then) template for development i.e. the Millennium Development Goals (MDGs).

Pearson (2015) assessed the effect of health aid on health development outcome and it was reported that the models and the case studies supported aid as an asset in the health development of a country. Gutema and Mariam (2018) analyzed the effect of development assistance for health on health status in Ethiopia using dynamic time series analytical approach on data from 1978 to 2013 and it was reported that health aid had significant positive effect on life expectancy at birth in the country. Odonkonyero *et al.*, (2016) combined household panel data with geographically referenced sub national foreign aid data to assess the contribution of health aid to health outcomes in Uganda. The study adopted the difference-in-differences approach and reported that aid actually reduced productivity burden of disease proxied by days of productivity lost due to illness but was less effective in reducing disease prevalence. Furthermore, it was reported that health aid was more beneficial to people living closer to the aid projects. The authors concluded that health aid probably quicken recovery times rather than prevent disease. From the selected past empirical

works reviewed so far, it is evident that findings have been diverse and the need for further research is glaring.

METHODOLOGY

Theoretical Framework and Model Specification

The theoretical reference of the present study is the Grossman model of 1972 (Grossman, 1972). The model is virtually a micro-level model but can be manipulated to fit into macro-level analysis. According to the model, an individual is both a producer and consumer of health i.e. health is seen as a commodity that yields utility and as an investment which is needed to achieve other goals. Grossman model started with a utility function where utility is a function of healthy days (health stock over time) and other composite goods thus:

$$U = U(H, O) \dots \dots \dots (1)$$

where U is utility, H is health stock and O is the other composite goods.

This model can be reframed as a macro-level model since the summation of individual utilities in a society gives the social welfare, thus the model can be written to portray social welfare as a function of national health stock over time and total composite goods consumed over time. Thus can be rewritten as Equation 2;

$$s = s(H, O) \dots \dots \dots (2)$$

Where S is Social welfare, H is national or society's Health and O is the total composite goods consumed by the society. However, in the Grossman model, health is a form of healthy days derived from health stock

overtime and health stock over time is determined by the level of investment into one's health (I), level of health stock in the previous period (H_{t-1}) and the depreciation rate (δ), that is:

$$H = H(H_{t-1}, \delta, I) \dots \dots \dots (3)$$

Considering the objective of the present study, national health stock is seen to depend on the aggregate investment by the people into their health. Such investment into one's health refers to the individual health input such as medical care, education, income, exercise, nutrient intake etc. However, since the society is faced with shortage of income which can be used to purchase the needed amount of health stock, the society seems to depend on health aid to finance its health stock overtime. Thus the model expressed as equation 3 can better be written as;

$$H = H(\text{health aid}) \dots \dots \dots (4)$$

For the purpose of this study, health stock over time is a specific health outcome which in this case is the HIV prevalence rate. Thus the model becomes;

$$HIV = f(\text{health aid}) \dots \dots \dots (5)$$

The study however incorporated other factors affecting health stock into the model thus:

$$HIV = f(HPC, SSE, GDPPC, OPP) \dots \dots \dots (6)$$

The empirical model is therefore stated explicitly in the ARDL form as in Equation 7:

Where HIV represents HIV prevalence rate,

$$\begin{aligned} \Delta HIV_t = & \alpha_0 + \sum_{j=1}^n \beta_{1j} \Delta HIV_{t-j} + \sum_{j=0}^n \partial_{1j} \Delta HPC_{t-j} + \sum_{j=0}^n \pi_{1j} \Delta SSE_{t-j} + \sum_{j=0}^n \varphi_{1j} \Delta GDPPC_{t-j} \\ & + \sum_{j=0}^n \omega_{1j} \Delta OPP_{t-j} + \gamma_1 HIV_{t-1} + \gamma_2 HPC_{t-1} + \gamma_3 SSE_{t-1} + \gamma_4 GDPPC_{t-1} \\ & + \gamma_5 OPP_{t-1} + \varepsilon_t \dots \dots \dots (7) \end{aligned}$$

HPC represents health aid per capita, SSE represents secondary school enrollment rate (to proxy society's enlightenment level), GDPPC is GDP per capita (to represent income), and OPP indicates out of pocket expenditure as percentage total health expenditure. β , ∂ , π , φ , ω are short-run coefficient while γ 's are long-run co-efficient. ε represents the error term, n represents the optimal lag length, Δ is the difference operator and j represent minimum lag.

This study adopts Augmented Dickey Fuller test of unit root in its pre-estimation analysis and Bound test of co-integration which is most suitable within the ARDL framework. The ARDL (Autoregressive Distributed Lag) model proposed by Pesaran, Shin and Smith (2001) was adopted for this study due to its suitability when variables are integrated of different orders and co-integration exists between variables in the model, its ability to handle endogeneity problem and ability to estimate both the short-run and long-run equations simultaneously.

The post-estimation tests conducted were the Jarque-Bera normality test, Breusch-Godfrey serial LM test and Breusch-Pagan-Godfrey heteroskedasticity test and the Ramsey RESET.

Data Sources and Measurement

This study examined the effect of health aid on HIV prevalence in Nigeria from 1990 to

2017. The data for the study were from secondary sources. HIV prevalence which is percentage of people from age 15-49 who are infected with the Human Immunodeficiency Virus was obtained from the World Development Indicator, Health aid (constant US price of 2016) was obtained from creditor reporting system on the OECD database. The health aid data were divided by population data extracted from World Development Indicator to obtain the per capita value. Secondary school enrollment rate was used to capture the level of enlightenment/literacy in the country and it was sourced from World Development Indicator. GDP per capita (constant US price) and out of pocket expenditure as percentage of total health expenditure was sourced from World Development Indicator.

RESULTS AND DISCUSSION

Pre-estimation: Analyzes carried out here included graphical illustration of study variables, descriptive statistics, correlation analyses of the study variables and the unit-root test.

Description of trends of study variables

HIV: The HIV prevalence rate keep rising from 1.2 percent in 1990 to a scary level of 3.7 percent in 2002 before it started declining in 2004. The prevalence rate had reduced to 2.9 percent as at 2016.

Health Aid Per Capita: This has been fluctuating but rose to its peak in 2007 and declined afterwards.

GDP per capita: This rose sharply in 2002 and this upward trend has been sustained since then.

Out-of-Pocket Expenditure (OPE): This has been fluctuating greatly since 1994 till date.

Secondary School Enrolment Rate: This has been rising over time (Figure 1)

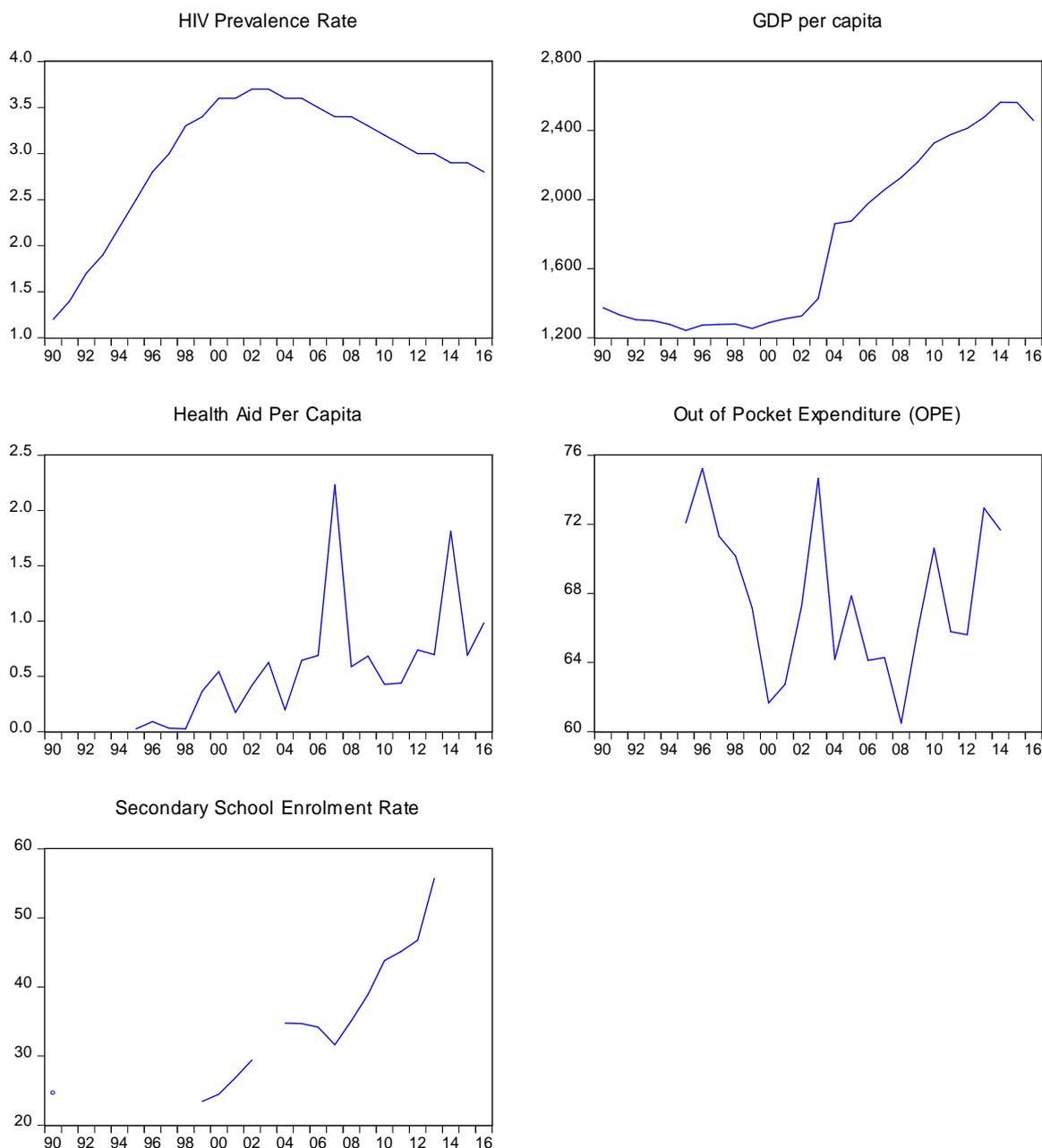


Figure 1: Graphical illustration of study variables

Descriptive Statistics of Variables

The descriptive statistics presented in table 1 gives a glimpse of the basic statistics of the study variables. It includes measures of central tendencies, dispersion, minimum and maximum values, degree of peakedness (measured by the kurtosis values), asymmetry (measured by the skewness statistics), and the normality test (measured by the Jarque-Bera statistics) of all the series considered in the study.

From the result presented in Table1, HIV, HPC, GDPPC, OPE and SSE have mean values of 2.951852, 0.595716, 1761.137, 67.78454 and 35.29741 respectively. All the variables except HIV prevalence rate were positively skewed and also HIV and HPC were leptokurtic, GDPPC and OPE were platykurtic while SSE was mesokurtic. The probability value of the Jarque-Bera statistic for all the variables indicated that they were normally distributed except HPC.

Table 1: Descriptive Statistics of Study Variables

| | HIV | HPC | GDPPC | OPE | SSE |
|--------------|----------|----------|----------|----------|----------|
| Mean | 2.951852 | 0.595716 | 1761.137 | 67.78454 | 35.29741 |
| Median | 3.1 | 0.564356 | 1426.903 | 67.22811 | 34.69912 |
| Maximum | 3.7 | 2.232367 | 2563.092 | 75.22885 | 55.70422 |
| Minimum | 1.2 | 0.023506 | 1242.738 | 60.48491 | 23.41556 |
| Std. Dev. | 0.707308 | 0.538142 | 513.5608 | 4.337142 | 9.355004 |
| Skewness | -1.14077 | 1.689612 | 0.356596 | 0.119564 | 0.59602 |
| Kurtosis | 3.325372 | 5.856002 | 1.41611 | 1.925159 | 2.586853 |
| Jarque-Bera | 5.975165 | 17.94458 | 3.394518 | 1.010389 | 0.994781 |
| Probability | 0.050409 | 0.000127 | 0.183185 | 0.603388 | 0.608115 |
| Sum | 79.7 | 13.10575 | 47550.69 | 1355.691 | 529.4612 |
| Sum Sq. Dev. | 13.00741 | 6.081523 | 6857362 | 357.4052 | 1225.225 |
| Observations | 27 | 22 | 27 | 20 | 15 |

Source: Authors' computation 2018

Correlation Analysis

Correlation analysis was conducted in this study in order to avoid the problem of multi collinearity in the econometric model to be estimated. The study variables exhibited low co-linearity as none of them returned high correlation enough to create serious

econometric problem in the model to be estimated. Table 2 gives the detail results of the correlation analysis where no pair of the study variables have high correlation value as high as 0.95 which according to Iyoha (2004) may cause multi collinearity problem in models.

Table 2: Correlation Matrix

| | HIV | HPC | GDPPC | OPE | SSE |
|-------|----------|----------|----------|----------|-----|
| HIV | 1 | | | | |
| HPC | -0.15032 | 1 | | | |
| GDPPC | -0.80409 | 0.27816 | 1 | | |
| OPE | -0.47336 | -0.04647 | 0.363446 | 1 | |
| SSE | -0.83849 | 0.043636 | 0.903946 | 0.598093 | 1 |

Source: Authors' computation 2018

Unit-root Test

The unit root test results reported in Table 3 reveals that some of the variables were stationary at level while others were not, but, became stationary after the first difference. HIV and HPC were stationary at level as the ADF null hypothesis of presence of unit root were rejected at level at 5 percent

risk level. On the other hand, OPE, SSE and GDPPC were only stationary after first differencing i.e. I(1). Since the study variables were found to be integrated of different orders the study proceed with ARDL (Auto Regressive Distributed Lag Model) estimation.

Table 3: Augmented Dickey Fuller Unit-root Test

| Variables | Augmented Dickey Fuller test | | | | | | Decision |
|-----------|------------------------------|------------|---------------------|------------------|------------|---------------------|----------|
| | Level | | | First Difference | | | |
| | None | Intercept | Intercept and Trend | None | Intercept | Intercept and Trend | |
| HIV | -1.5550 | -4.7369*** | -4.8188*** | ----- | ----- | ----- | I(0) |
| SSE | -1.6416* | -2.1145 | -2.3408 | -6.5492*** | -6.4047*** | -6.4582*** | I(1) |
| HPC | -0.8487 | -3.1693** | -5.1478*** | ----- | ----- | ----- | I(0) |
| OPE | -0.8664 | -2.1534 | -1.1829 | -4.8067*** | -3.0738** | ----- | I(1) |
| GDPPC | 2.2004 | 0.2438 | -2.2065 | -3.2235*** | -3.6845** | ----- | I(1) |

* ** *** indicate significance at 10%, 5% and 1% critical level respectively

Source: Author's compilation 2018

Co-integration Test

The results of the Bound test for the presence of long run co-integration presented in Table 4revealed that the F statistics of the model was greater than the upper critical bounds; hence, the null hypothesis of

"no co-integration" was rejected and it was concluded that there existed a long run relationship between the variables in the model. Hence, both the static (long-run) and error correction (short-run) models were estimated.

Table 4: Bounds Tests for Existence of Co-integration

| Dependent variable | Critical value | F-statistic = 16.52201 | |
|--------------------|----------------|------------------------|-------------|
| | | Lower bound | Upper bound |
| HIV | 10% | 2.45 | 3.52 |
| | 5% | 2.86 | 4.01 |
| | 1% | 3.74 | 5.06 |

Source: Authors' computation 2018

RESULTS

Long-run model

Table 5 presents the long run model results and from therein it is clear that all explana-

tory variables in the model significantly affected HIV prevalence in the long run at 5 percent significance level except health aid per capita (HPC). Though, HPC had the ex-

pected negative sign but despite the influx of health aid into the country it effect of was found to be very small and insignificant. The negative value of HPC is the correct sign since it was expected that increase in HPC should lead to decline in HIV prevalence. Out of pocket expenditure (OPE) as percentage of total health expenditure was significant at 1 percent level but came up with an unexpected positive sign. This is in fact the nature of Nigerian health system which has been characterized by large out of pocket expenditure yet the health outcome of the people is clearly depreciating. As the result posits, a percent increase in OPE causes HIV to increase by 0.016799 percent. It may be that most OPE are misapplied, for instance, purchase of self-prescribed "over the counter" drug, wrong diagnoses, patronage of quacks and unapproved medical practitioners among several

other hidden issues in the health demand and supply system in the country which usually result in negative health outcomes despite resources committed into such expeditions. SSE which is the school enrollment rate was used to proxy literacy rate in the country came up with the correct sign as increase in literacy rate is expected to cause a decline in HIV prevalence rate because more education should increase the knowledge of the people on the causes of illness. Income has always been found to contribute to improved access and demand for health. In line with this, GDPPC (GDP per capita) came up with the expected negative sign and was significant. At the macro-level, improved economic condition should result in improve health status for the populace. A percent increase in GDPPC resulted in 0.0012 percent decrease in HIV prevalence rate (Table 5).

Table 5: Long run model estimation results

Dependent Variable: HIV

| Independent variables | Co-efficient | t-statistic | Prob-value |
|-----------------------|--------------|-------------|------------|
| HPC | -0.1346 | -0.8963 | 0.3842 |
| SSE | -0.0184*** | -3.0020 | 0.0089 |
| OPE | 0.0168*** | 6.2656 | 0.0000 |
| GDPPC | -0.0012*** | -5.5025 | 0.0001 |
| CONSTANT | 5.3435*** | 9.8678 | 0.0000 |

*** indicate significance at 1% critical level respectively

Source: Author's Computation 2018

Short-run (Dynamics) model results

The results of the short run (error correction) model in Table 6 show that the estimated CointEq (-1) i.e. the error correction term was negative and significant. This supports the ARDL bound test results which suggested long co-integration among study

variables. The feedback coefficient value of -0.1914 implied a fair speed of adjustment unto the long run equilibrium path after a shock. Approximately, 19.14 per cent of the disequilibrium in the previous year due to a shock is corrected in the present year. Therefore, it will take about 5 years for the system

to adjust back to the long run equilibrium path after a major shock. The results of the short-run model indicates that lagged HIV/AIDS prevalence rate was significant and negative. A percent increase in the in the prevalence rate in the previous year caused a 0.576 percent reduction in the present year. This finding appears complex. Nevertheless, this might be as a result of urgent attention that are possibly given to HIV/AIDS pandemic by governments, non-governmental organizations and donor agencies following an alarming increase in prevalence rate. OPE (out of pocket expenditure on health) returns a positive and significant coefficient (though, very small). This implies that increases in OPE increase HIV. This may be due to the non-sustainability of OPE as means of financing healthcare along with earlier explained possible misapplication of OPE. Expectedly, GDPPC (Gross Domestic Product Per Capita) came up with negative and significant coefficient implying that increase in income significantly reduced HIV rate. This is in line with *a priori* expectation because it is known that high income people usually have enough to take care of their health,

hence, are likely to get better health outcomes. In the same vein, high income countries are known to have better health outcome such as lower HIV/AIDS prevalence rate. For instance, HIV prevalence rate in the United Kingdom (UK) as at 2015 was as low as 0.16 percent while it was 2.9 percent in Nigeria.

The R-square value of 0.9956 implies that 99.56 percent of the total variations in the HIV/AIDS prevalence rate was explained by the explanatory variables in the model. The significance of the F-statistic confirms the overall significance of the model. While the Durbin-Watson statistic value of about 2.0 implies non-existence of serial correlation in the estimated model. It is worthy of note that the main variable in the model (health aid) had no significant effect on HIV prevalence in Nigeria. This goes in line with the "*public choice hypothesis*" of Bauer (2000) and Easterly (2001) which is of the view that foreign aid is not effective and may retard future growth potentials. The finding of non-significance of foreign aid in the present study also corroborates that of Williamson (2008).

Table 6: Short run estimates

| Independent variables | Coefficient | t-statistic | Prob-value |
|-------------------------|-------------|-------------|------------|
| D(HIV(-1)) | -0.5764** | -3.3666 | 0.0042 |
| D(HPC) | -0.0258 | -0.9440 | 0.3601 |
| D(SSE) | -0.0013 | -1.4517 | 0.1672 |
| D(OPE) | 0.0020** | 2.8879 | 0.0113 |
| D(GDPPC) | -0.0006*** | -4.6699 | 0.0003 |
| CointEq(-1) | -0.1914*** | -6.3956 | 0.0000 |
| R ² | 0.9957 | | |
| Adjusted R ² | 0.9930 | | |
| Durbin-Watson Stat | 2.0692 | | |
| F-Value | | | 0.0000 |

* implies significant at 10%, ** implies significant at 5% and *** implies significant at 1%

Source: Author's computation 2018

Post-estimation

The post estimation diagnosis results (Table 7) reveals that the model estimated was linear (well specified), free from serial correlation, residuals were homoscedastic and were normally distributed. The Ramsey-RESET test result shows that the null hypothesis that the model was linear and well specified could not be rejected considering the probability level which was more than 5 percent. The normality test carried out with help of the Breuch-Pagan-Godfrey procedure could not reject the null hypothesis that the resid-

uals were normally distributed considering the probability level. Furthermore, Breusch-Godfrey LM test was adopted for testing for the presence of serial correlation. This test is superior to Durbin-Watson test as DW test may give inconclusive results, not applicable when a lagged dependent variable is used, and because DW cannot take into account higher orders of serial correlation. Result in Table 7 shows that errors in the model were not serially correlated since the probability value of the test is greater than 5 percent level.

Table 7: Post Estimation Diagnosis Results

| Econometric Problem | Test Procedure | Statistics (Prob) | Conclusion |
|---------------------|-----------------------|-------------------|-------------------------------|
| Linearity | Ramsey RESET | 2.10 (0.1890) | Model is linear |
| Heteroscedasticity | Breusch-Pagan-Godfrey | 0.44 (0.8925) | No heteroscedasticity |
| Autocorrelation | Breusch-Godfrey LM | 0.11 (0.8963) | No autocorrelation |
| Normality | Jaque-Berra | 3.13 (0.2091) | Residual normally distributed |

Source: Author's computation, 2018

CONCLUSION AND RECOMMENDATIONS

The study assessed the effect of health aid on HIV prevalence in Nigeria. Due to the adverse effect of HIV/AIDS on the economy, efforts within and without are being made by the government, Non-Governmental Organization, Foreign countries and Donor Agencies to reduce the prevalence of the killer disease. The country is second largest with the epidemic after South-Africa in terms of number of people infected. There have been influx of health aid into the country with little or nothing

known about the impact of health targeted foreign aid on HIV prevalence reduction in the country. Relevant data on HIV prevalence rate, GDP, Health aid, School enrolment and Out-of-Pocket expenditure (OPE) were obtained from WDI and OECD. The data were analysed within the framework of the Autoregressive Distributed Lag (ARDL) model. The Bound test reveals the presence of long-run co-integrating relationship while both the short and the long run models reveal that the health aid did not have any significant effect on HIV prevalence rate in Nigeria confirming the position of Bauer

(2000) and Easterly (2001) and the finding of Williamson (2008). Only GDPPC and lagged dependent variable were found to be significant in the short run while GDPPC, SSE and OPE were significant in the long run with a speed of adjustment of 19.14 percent from short to the long run equilibrium path. Efforts should be geared towards ensuring effective utilization of health aid in order to obtain the required positive and significant outcomes. This is one of the sure way of ensuring significant reduction in HIV prevalence rate in Nigeria. The achievement of significant reduction in prevalence rate is germane to meaningful social and economic development in the country. Furthermore, policies aimed at improving economic growth and improve public education/enlightenment should be pursued at the national level in order to achieve significant reduction in the burden of HIV/AIDS pandemic.

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