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IMPACT OF PUBLIC HEALTH EXPENDITURE ON LIFE EXPECTANCY IN SUB-SAHARAN AFRICA

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Abstract

The study examined the impact of public health expenditure on life expectancy in sub-saharan African. We utilized a balance panel data of 42 African countries from Sub-Saharan region for the period of 2000 to 2022 from World Bank Development Index (WDI, 2023). Life expectancy at birth was specified as dependent variable, while healthcare expenditure, basic sanitation, urban population and HIV prevalence rate as independent variables. We used descriptive statistics, fixed effect and two-stage least square as methodology to the study, the result of the analysis revealed that; healthcare expenditure has a significant and positive impact on life expectancy in Sub-Saharan Africa. This implies that an increase in public healthcare expenditure is positively associated with an increase in life expectancy. Based on these findings, recommendations made are: There should be an increase in the funds allocated to healthcare in Sub-Sahara Africa in order to ensure adequate facilities and funds for improved health care delivery. This means that money spent on health will improve the health condition of the people thereby causing the nation to have a healthy labor force, Steps should be taken to reduce the various bottlenecks that hinder the proper disbursement of funds for health purposes. The administrative and political issues such as corruption should be checked to ensure quick and efficient allocation of funds to the health sector.

Keywords: Public Health Expenditure, Life Expectancy, Basic Sanitation and HIV Prevalence

1. Introduction

Similar to education, health is a crucial component of economic development (Barro, 2013; & Weil, 2013). Given its importance in the economic survival and prosperity of every nation, great emphasis has been given to it by policy makers, concerned private and public agencies and allied researchers. It is established that pathways like increase in labour productivity, investments in physical and human capital and decline in mortality and fertility rates link improved health to economic growth. Human capital theory laid a solid and indisputable foundation for understanding the crucial role that health plays in raising labour productivity,

investments, educational attainment, workforce, and economic growth (Becker, 1962; Mushkin, 1962). Early studies based on the human capital theory demonstrate that elements including medical care, diet, and nutrition, as well as hereditary and environmental factors, impact health outcomes (Fayissa & Gutema, 2008; Grossman, 1972; Rosenzweig & Schultz, 1983). From the above, it can be deduced that good health is fundamental component for the human pleasure and prosperity and it performs a major role in economic growth and development because healthy people are more productive, efficient, and can live longer (Awais, Salman & Ahmad 2021).

Sub-Saharan Africa is argued to be the least-developed region in the world, with its major setbacks in health problems. It is suspected that the poor health status in the region might contribute to the slow pace of economic growth. Communicable diseases and short life expectancy are more prevalent in SSA than other regions in the world (WHO, 2010). The possible explanation for government's failure to meet the required target may be found in the paucity of funds or a sheer reluctance to increase the allocation of the health sector to the required amount despite the Abuja Declaration of 53 African countries pledging to devote 15% of their national budgets to health (Olatubi et.al 2018). Though, Health expenditure in SSA increased from \$42.82 to \$97.07 per capita from 2003 to 2011 respectively but unfortunately, this has not translated into significant improvements in health outcomes. Infant and adult rates mortality declined from 86.52 to 64.88 and 140.82 to 99.56 per 1,000 live births, respectively, while life expectancy at birth increased slightly from approximately 51 years to 56 years within the same period (World Bank, 2014).

Meanwhile, the percentage improvement in health status is abysmal compared to the percentage increase in health expenditure per capita for the period. Some studies have suggested that the marginal improvement in health outcomes may be due to inadequate health spending. For instance, World Bank (2014) reports that the average health expenditure in SSA of \$85 was far below the world average of \$950 per capita recorded in 2010, and further argues that SSA spends only 6 percent of GDP on health care compared to 13 and 17 percent respectively in the Organization for Economic Cooperation and Development (OECD) countries and North America. Over the years there have been empirical arguments on whether there is consensus on the nature of relationship between health expenditure and life expectancy. The fact remains that some studies have reported a significant effect of health expenditure on life expectancy and others have suggested that health expenditure has no significant effect on life expectancy.

Therefore, Public health expenditure and its relationship to life expectancy remain an important

area, which needs further study. The decline in longevity of people in SSA between the years 2000-2015 overlapped with the increase in public health expenditure in some SSA countries (Odhiambo et al. 2015). In addition, there has been an increase in the amount of donor funding in SSA for health programs from US\$ 1.4 billion in 2002 to US\$ 8.7 billion in 2010 (Wexler et al. 2013). These interventions have resulted in the decline of death from malaria, measles and pertussis, infectious diseases such as cholera and from HIV/AIDS-related illnesses (WHO 2011; UNAIDS 2012).

However, despite the improvement in some health infrastructures in SSA countries, studies indicate that poorer nations, as well as households have the highest concentration of poor health (Abhishek 2013). As an example, Cutler et al. (2006) notes that in low-income countries under-five mortality accounts for 30% of the total mortality as compared to 1% in rich countries. Further studies reveal that 10 million deaths are due to avoidable illnesses that remain uncommon in high-income countries (Kumar & Abhishek 2013). Most people with low-incomes face challenges of a limited right to use health care services owing to inability to afford it (Nyamuranga, 2016). He further points out that it is people with low-income rather than the wealthy people who usually use public health facilities. With this, public health expenditure is more crucial to the poor than to the rich (Gupta et al. 2003; Gani 2008). Also, increasing the health care budget expands the accessibility of health care services while reducing the cost, thereby resulting in the decline of the likelihood of deaths (Gani 2008). Therefore, the question of whether public health expenditure has an impact on life expectancy is still not settled. Furthermore, existing studies on public health expenditure's effect on life expectancy have not investigated the potential regional heterogeneity across SSA regions. Hence, this study attempts to fill in the gap in the existing body of research by examining specifically the impact of public health expenditure on life expectancy in Sub-Saharan Africa.

2. Literature Review

2.1 Conceptual Issues

Life Expectancy

Life expectancy is a key measure of population health and economic development, determined by mortality patterns across all ages and relatively independent of the age structure of the population (Becker, 2016). It reflects the overall health conditions, including impacts of mortality and morbidity, and has generally increased worldwide over the last decade. However, it can decline due to factors such as famine, war, disease, and poor health. Improvements in health and welfare can increase life expectancy (Hossain, 2013).

In sub-Saharan regions, life expectancy is influenced by several indicators: Literacy Rate; The adult literacy rate, which measures the percentage of people aged 15 and above who can read and write, is crucial for intellectual growth and social and economic development. It is an outcome indicator for educational attainment, though it doesn't necessarily reflect education quality (World Bank, 2022). Undernourishment: The prevalence of undernourishment, indicating the percentage of the population with insufficient dietary energy intake, is critical for assessing health and nutrition (Smith & Haddad, 2000). Basic Sanitation Services: Access to improved sanitation facilities, which are not shared with other households, impacts life expectancy. These facilities include flush/pour flush toilets, septic tanks, pit latrines, and more (World Bank, 2022).

Net Official Development Assistance (ODA) and Official Aid Received (OAR): ODA consists of concessional loans and grants aimed at promoting economic development and welfare in recipient countries. It plays a significant role in sustaining health expenditures in sub-Saharan regions (World Bank, 2022).

Public Health Finance in Sub-Saharan Africa

Health financing is crucial for the functioning of health systems and achieving health-related sustainable

development goals, such as universal health coverage (UHC). It determines access to health services and financial protection for the population, influenced by a country's historical, social, political, and economic context. Health financing comprises three main functions: revenue collection, risk pooling, and purchasing health services.

Revenue Collection: Involves raising funds from various sources like taxes, social security, fees, grants, and loans. Risk Pooling; Combines and manages revenue to share health risks among individuals, protecting them from health expenditures. Purchasing; Transfers pooled funds to health service providers to deliver health services to the population. All countries face challenges in financing healthcare, with more severe issues in low- and middle-income countries (LMICs), where healthcare needs are highest, and resources are scarce. Global health spending has grown significantly, from \$3.5 trillion in 1995 to \$8 trillion in 2016, but disparities exist. For example, in 2015, health spending per capita was \$110 in low-income countries (LICs) versus \$5551 in high-income countries (HICs). Government health spending accounts for less than 30% of total expenditure in LICs, compared to nearly 80% in HICs, leading to heavy reliance on out-of-pocket (OOP) payments in LMICs, which restricts access to health services and pushes many into poverty (UNESCO, 2023).

Efficient allocation and use of resources are critical for expanding access to quality health services. However, many LMICs struggle with resource allocation, often prioritizing hospital services over primary healthcare, exacerbating health inequalities. In 2016, health spending per capita in Africa averaged \$80 compared to \$4003 in OECD countries. Health financing systems in Sub-Saharan Africa (SSA) are marked by low government spending, under-developed insurance schemes, high OOP payments, and reliance on external funding. In 2017, domestic government health spending in Africa averaged 1.9% of GDP, compared to the global average of 3.3%. Despite the Abuja Declaration in 2001, where African governments committed to allocating at least 15% of their annual budgets to health,

only a few countries have met this target, with average spending at around 7.2%. High OOP payments remain a prominent financing source, averaging 36% of current health expenditure in SSA, the second highest globally after South Asia. (UN, 2020)

2.2 Empirical Review

From the empirical front, researchers have conducted many studies to identify the link that exist among public health expenditure and life expectancy among which includes; Salami and Mamman (2021) examined that the nature of relationship between healthcare expenditure and life expectancy in a panel data of 45 African countries, grouped into sub regions in the continent. The dependent variable is life expectancy at birth while health expenditure is the main independent variable. GDP per capita, basic sanitation and urban population are used as control variables. The study used fixed effect method and two stage least square technique. The study found that healthcare spending is an important predictor of life expectancy in Africa; it was also positive and significant to influence life expectancy in West Africa, however significant and negative to influence life expectancy in central and southern regions of Africa. Contrariwise, the two stage least square shows that healthcare spending is a negative predictor of life expectancy in central Africa but not a significant predictor in eastern, northern, southern and western Africa. The study concluded that healthcare expenditure is significant negative predictor of life expectancy in central Africa; but not a significant predictor of life expectancy in eastern, northern, southern and western region of Africa.

In another similar study, Raghupathi and Raghupathi (2020) posited the significance of healthcare expenditure and analyze its association with the economic performance. The study uses visual analytic; data were obtained from bureau of economic analysis and bureau of labor statistic for the year 2003-2014. The study found that there was a strong positive correlation between healthcare expenditure and the economic indicators of income, GDP, and labor productivity. While healthcare expenditure was negatively associated with multi-factor productivity, it

was positively associated with the indicators of labor productivity, personal spending and GDP. The study concluded that an increase in healthcare expenditure has a positive relationship with economic performance. Thus, recommended that strategic investment in various healthcare aspects will boost income, GDP, and productivity, and alleviate poverty. It also recommends that research can be done in countries with single-payer system to see the link to productivity exist there.

Bhuiyan (2020) analyzed the determinants of life expectancy. The dependent variable was Life expectancy at birth (years) and independent variables were population over 65, Number of Doctors, Death rate, Infant mortality rate, expense for health, GDP per Capita. The study used fixed effect model. The study found that that there was a considerable influence across socio-economic factors on the overall health care system. The study concluded that investing in the public health system is critical to improving health status in LDC countries to reduce infant deaths, death rates; HIV cases increase the primary health care system such as immunization, number of doctors, sanitation. The study was critized on the following group Education, Unemployment with higher education, HDI, Gini Coefficient, Urbanization are important variables to the measurement of life expectancy. Nevertheless, these variables are excluded from the study due to the lack of time-series information. There are random missing data because it is hard to get reliable data about LDC countries.

Ilemona and Salami (2019) examined the impact of healthcare expenditure on maternal mortality in a panel of 45 African countries. The study uses pooled ordinary (POLS) and fixed effect method. It was found that the impact of healthcare expenditure differs across different regions of Africa. While the effect is positive in southern region of Africa, it is negative in central and western region of Africa. The study concluded that the impact of healthcare expenditure differs across different regions of Africa. It was recommended that policy makers and regional organizations in Africa should design platforms that will improve not only maternal health, but overall health statues of people in Africa.

Rahman and Khanam (2018) investigated a relationship between the healthcare expenditures and three main health status outcomes (life expectancy at birth, crude death rate and infant mortality rate) in the region. The study used the World Bank data set for 20 years (1995-2014) in 15 countries of the region, a panel data analysis was conducted where relevant fixed and random effect models are estimated to determine the effects of healthcare expenditures on health outcomes. The separate effects of private and public health expenditures were also explored. The study found that health expenditure, public health expenditure and private health expenditure have significant effect in reducing infant mortality rate and the extent of effect of private health expenditure is greater than that of public health expenditure. Private health expenditure also has significant role in reducing crude death rate. Per capita income growth and improved sanitation facilities have also significant positive roles in improving population health in the region. The study concluded that healthcare expenditures, along with income growth rate and improved sanitation facilities, should be considered as an important determinant in improving population health status in the region. The study recommended that government and private joint initiatives should continue side by side to take the right actions for improving the health status outcomes. However, the study has not found any significant effect of health expenditure on life expectancy at birth.

Ahmed and Hasan (2016) analyzed the impact of public health expenditure and governance on health outcomes in Malaysia using data from 1984-2009. Adopting an Autoregressive Distributed Lag (ARDL) cointegration framework, the results based on the bounds testing procedure show that a stable, long-run relationship exists between health outcomes and income level, public health expenditure, corruption and government stability. The results also reveal that public health expenditure and corruption affect long and short-run health outcomes. To improve the quality of life in the country, the study emphasizes on the importance of health program while reducing or eliminating the corruption rate in the country.

2.3. Theoretical literature

The study is centered on two strands of theories the Grossman (1972) model of health capital and Wagner's expenditure theory. Grossman (1972) explains how individuals aspire to maximize optimum health outcome which largely depends on the capacity to finance health care services among others. The consideration of Grossman (1972) framework to investigate the effect of public health expenditure on life expectancy is based on the fact that this theoretical model envisages that individual health status is a function of individual inputs and is specified as shown below:

$$Y=f(W).....(1)$$

Where Y measures individual health status and W represents inputs to the health function. With such health production, one can easily carry out and empirically estimate the effect of health expenditure on life expectancy. On another position, since health care services and health facilities are capital intensive, Wagner (1838) theory acknowledged the fact that individual lacks the capacity to pay for their desired healthcare needs for efficient health outcome. Therefore, government roles in financing health care services are imperative in strengthening quality, access and equitable healthcare services to the masses. Above all, the two theories stated have provided a link between health care expenditure or inputs and health outcomes. Therefore, both private and public health expenditure are essential inputs that are required to bring about quality health perhaps wellbeing. Because when the health sector is well funded in terms of provision of adequate health care facilities, qualified personnel, decent and subsidize health fee to enable equitable access to health care needs especially, the maternal mortality rate, infant mortality rate would decrease and also life expectancy of an average country could improve.

3. Methodology

3.1. Data and Source

The study utilized a balance panel data of 42 African countries from Sub-Saharan region for the period of 2000 to 2022. The dependent variable is life expectancy at birth, while the independent variables are healthcare

expenditure, basic sanitation, urban population and HIV prevalence rate. The choice of the countries is based on availability of data. These data were sourced from World Bank Development Index (WDI, 2023)

3.2 Model Specification

The study adopted and modified model used by Salami and Mamman (2021), Boachi, Ramu and Põlajeva (2018) for the choice of variables for this study. Different from the two studies, we up-to-dated the data by five years period to observe changes that might occur within the study period to investigate the relationship between healthcare expenditure and life expectancy in Sub-Saharan African countries. A modified model is implicitly stated in equation (2)

$$\text{LIFEEXP} = f(\text{PHEXP}, \text{BISAN}, \text{PHIV}, \text{URBANPOP}) \quad (2)$$

The explicit form of the model is shown in equation 3

$$\text{LIFEEXP}_{it} = \beta_0 + \beta_1 \text{PHEXP}_{it} + \beta_2 \text{BISAN}_{it} + \beta_3 \text{PHIV}_{it} + \beta_4 \text{URBANPOP}_{it} + U_{it} \dots \dots \dots (3)$$

Where LIFEEXP is life expectancy, PHEXP is public healthcare expenditure, BISAN is basic sanitation,

PHIV prevalence of HIV and URBANPOP is urban population

Apriori Expectation

The following spells out the a priori expectation of the relationship between the dependent variable and the explanatory variables: PHEXP ($\beta_1 > 0$); URBANPOP ($\beta_3 < 0$); BISAN ($\beta_4 > 0$); PHIV ($\beta_5 < 0$).

3.3. Method of Data Analysis

We conducted Descriptive statistics in form of mean, median, maximum, minimum, standard deviation to describes the characteristics and pattern of relationship among variables, skewness, kurtosis and Jarque-Bera statistics were also incorporated into the analysis. We adopted Hausman Test from Green (2008) to choose between fixed or random effects, the null hypothesis of the test revealed that the preferred model is random effects against the alternative ‘the fixed effects’. It basically tests whether the unique errors (u_i) are correlated with the regressors, the null hypothesis states that they are not. After the test is run, the best among the two estimations was chosen and interpreted to explain the relationship between healthcare expenditure and life expectancy in the Sub-Saharan Africa.

4. Results and Discussions

Table 1: Descriptive Statistics

Variables	Observations	Mean	Standard Deviation	Minimum	Maximum
LIFEEXP	740	58.01	6.70	42.91	83.90
PHEXP	740	274.78	1234.72	4.65	9870.66
URBANPOP	740	7,958,888	1.31	76,778	1.04e+08
BISAN	740	42.56	18.98	10.39	99.90
PHIV	740	4.66	5.70	0.2	25.9

Sources: Author’s Computation, (2023)

Table 1: shows the average life expectancy at birth of the Sub-Saharan Countries is 58 years, a minimum of 43 years and maximum of 84 years. Public health expenditure has an average of US\$2735 billion of dollar with a minimum of over US\$5 billion and maximum of US\$9870 billion. Percentage of population using at least basic sanitation services has an average 42.56% of

the total population, with a minimum of about 10% and a maximum of 99.90% of the total population. HIV prevalence has an average of 4.66% of population with minimum of 0.2% of population and a maximum of 25.9% of total population. Urban population has an average of 7 958 888, minimum of 76 778 a maximum and maximum of 104 million people.

Table 2: Correlation Matrix.

	LIFEEXP	URBAN POP	PHEXP	BISAN	PHIV
LIFEEXP	1.0000				
URBAN POP	-0.0617	1.0000			
PHEXP	0.5971	-0.0133	1.0000		
BISAN	0.4969	0.0269	0.5260	1.0000	
PHIV	-0.3013	-0.1098	-0.0821	0.1569	1.0000

Source: Author's Computation, (2023).

Table 2: revealed that urban population has a weak and negative correlation with life expectancy; public health expenditure has about 60% positive correlation with life expectancy, and a negative and weak correlation with urban population. Utilization of Basic sanitation services has about 50% positive correlation with life expectancy, a weak and positive correlation with urban population and about 53% positive correlation with

public health expenditure. HIV Prevalence has a weak and negative correlation with life expectancy, urban population and public health expenditure, but a positive correlation with basic sanitation. It can be seen that most of the variables are weakly correlated, with the exception of health expenditure and life expectancy. To account for the likely multicollinearity in the model, all the variables, except PHIV Prevalence rate were logged in the inferences analyses.

Table 3: Fixed and Random effect estimation

VARIABLES	Fixed Effect Model	Random Effect Model
LPHEXP	0.068*** (0.011)	0.077*** (0.011)
LURBANPOP	1.7e-09 (1.8e-09)	1.1e-09 (1.7e-09)
PHIV	-0.033*** (0.0054)	-0.020*** (0.0025)
LBISAN	0.0014 (0.00090)	0.0014* (0.00082)
Constant	3.86*** (0.058)	3.77*** (0.038)
Observations	740	740
Number of C_id	37	37
R-squared	0.695	
Hausman Test	93.42***	

Robust standard errors in parentheses* p<0.01, ** p<0.05, * p<0.1**

Source: Author's Computation, 2023

Table 3 shows the relationship between public health expenditure and life expectancy in Sub-Saharan Africa countries, using fixed and random effects estimation methods. As shown in the last row of the table, the result Hausman test is presented. The test has chi-square of 93.42 and probability value that is less than 5%. Given the probability value, we can reject the null

hypothesis and accept the alternative hypothesis that fixed effect is the best for the current model. The result revealed that; public healthcare expenditure has a significant and positive impact on life expectancy by 0.068 %. This finding is consonant to the finding of Salami and Mamman (2021) who examined the nature of relationship between healthcare expenditure and life expectancy in a panel data of 45 African countries. This

is because it has probability value less than 5%. Holding other variables constant, one percent increase in public health expenditure will lead to 0.068 percent increase in life expectancy. Also, prevalence of HIV is statistically significant and negatively influences life expectancy because it has probability value less than 5%. This implies that holding other variables constant, one percent increase in prevalence of HIV will lead to 0.033% decrease in life expectancy. Basic sanitation service and urban population are not statistically significant in influencing life expectancy. It therefore implies that the two variables are not significant determinants of life expectancy in Sub-Saharan Africa Countries.

4.1 Discussion of Major Findings

Analyzing the relationship between various factors and life expectancy in Sub-Saharan African countries reveals key insights for public health and policy effectiveness. The study highlights the following: Public Health Expenditure; A 1% increase in public health expenditure leads to a 0.068% increase in life expectancy, emphasizing the importance of investing in healthcare services to enhance availability, quality, and access to preventive and curative services. With regard to HIV Prevalence; A 1% increase in HIV prevalence results in a 0.033% decrease in life expectancy, indicating the severe impact of HIV/AIDS on population health and the need for targeted interventions, includes prevention, education, and treatment programs. Basic Sanitation Services and Urban Population; These factors are not statistically significant determinants of life expectancy in this context, suggesting that other factors may be more influential, and the effects of sanitation might be

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indirect or overshadowed by more immediate health challenges.

5. Conclusion and Recommendations

In the two estimation methods (fixed effect and two-stage least square), it was found that healthcare expenditure has a significant and positive impact on life expectancy in Sub-Saharan Africa. This implies that an increase in public healthcare expenditure is positively associated with an increase in life expectancy. Giving the findings of this study, the following recommendations are made:

- i. There should be an increase in the funds allocated to healthcare in Sub-Sahara Africa in order to ensure adequate facilities and funds for improved health care delivery. This means that money spent on health will improve the health condition of the people thereby causing the nation to have a healthy labor force and this can transform to economic growth and development.
- ii. Steps should be taken to reduce the various bottlenecks that hinder the proper disbursement of funds for health purposes. The administrative and political issues such as corruption should be checked to ensure quick and efficient allocation.
- iii. Public-private partnership may go a long way to help the region to improve the health status of the population at large. Steps should also be taken make private health more affordable. This could be done through effective health insurance programs that subsidize private health care which could greatly improve healthcare accessibility.

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