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Health Financing and Health Outcomes in Sub-Saharan Africa: A PLS-SEM Application

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Abstract. This study investigated the effect and relationship between health financing and health outcomes in Sub-Saharan African, using current data spanning between 2000 and 2015. The study adopted, the Partial Least Square (SEM) Structural equation Modelling a multidimensional estimation method and the Grossman theory on demand for health to examine the interactions between health financing and health outcomes in 25 sampled Sub-Saharan African countries. The study found a negative and statistically significant relationship between health financing and health outcomes. The result of the study indicates that health financing proxy by both public and private health expenditure has both direct and indirect effect on health outcomes measured by under- five mortality rate, maternal mortality rate and life expectancy at birth in SSA. The direct effect is greater than the indirect effect. The direct effect of health financing is on health outcomes and demographic dividend measure by both young and old dependency ratios. The indirect effect is on both primary and secondary school enrolment, and dependency ratio. This is contributed by poor health outcomes. Findings of the study has revealed that government in the region could improve on the poor heath outcomes by increasing their annual budget allocation to the health sector.

Keywords: Grossman theory, Health Financing, Health Outcomes, PLS-SEM, Sub-Saharan Africa

I. INTRODUCTION

The health situation of the inhabitants of a country is key for both economic growth and development since poor health outcome has a direct effect on the individual and the economy as a whole. It also incapacitates and hinders the inhabitants from taking part in productive and meaningful activities that will increase economic output. The inclusion of health outcomes as a target in millennium development makes it more important for sustainable development. Apart from its contribution to sustainable development, it is a key indicator for productivity enhancement since a population with a healthy workforce will have high production and growth output. Therefore, a country needs to invest in its health sector. According to Elola[1], a country with resources will have a better health system and better health outcomes compared to a country with fewer resources.

The performance of the health system in a country can be assessed effectively through the understanding of the link between health financing and health outcomes. In recent decades, global health outcomes have improved substantially, due to an increase in health financing. Thus, the global health expenditure per capita has increased from US$593.71 to US$1295.72 (2000 to 2015)[2]and a corresponding reduction in under-five mortality by 49%, maternal mortality ratio by 45% in 2015, and an improvement in life expectancy at birth from 64years to 71years in 2015[3].

Sub-Saharan African governments, like any other government in the world, improvement in health resources remains a major component on its development agenda, but because of the lack of adequate health resources to improve the health system in the region, the region has constantly performed poorly over the past two decades with regards to health outcomes compared to other regions in the world. The region recorded a maternal mortality ratio of 846 maternal deaths in 2000 and 547 per 100,000 live birth in 2015, an Under-five mortality rate of 152.8 in 2000 and 84.8 per 1,000 live birth in 2015, life expectancy at birth for the region in 2000 was 50.45years and that of 2015 is 59.59years. The region also recorded an infant mortality rate of 91.2 in the year 2000 and 57.2 per 1,000 live birth in 2015. Though the region has made some progress in these health outcomes, comparing to other regions such as Europe

& Central Asia, East Asia & Pacific, Latin America & Caribbean, Middle East & North Africa and South Asia shows that the region has performed poorly in all these health outcomes for the same period [3].

Health financing has become a challenge in Sub-Saharan Africa since the majority of the expenditures on health are financed from grants and loans from international organizations which governments in the region have no total control over. The per capita health expenditure for the region is the lowest, compared to other regions in the world. The per capita health expenditure (PPP,2011) for SSA increased from US$98.72 in the year 2000 to US$198.34 in 2015 and that of the world also increased from US$593.71 to US$1295.72. The per capita health expenditure for SSA is significantly less than that of the world. The large disparity in terms of health resource compared to other world regions have also contributed to the poor health infrastructure and limited workforce in the health sector across the region. Therefore, there is a need to examine the relationship between health financing and health outcomes, and their effect in Sub-Saharan. A recent study conducted to examine the relationship between health expenditure and health outcome found evidence for the existence of a significant relationship [4; 5; 6;7]. They used a panel regression analysis to examine the short and long-run relationship between these variables. Their estimation method examined only the direct relationship between these variables of interest, but these relationships and effects are not only direct, the effect of health financing and health outcome could be indirect. The examination of these indirect effects could assist in the implementation of policies to assist in addressing the poor health outcomes in Sub-Saharan African is due to the low health investment. It is against this background, this study is conducted to examine the effect and causal relationship between health financing measured by both private health and public health expenditure and health outcomes proxy by maternal mortality ratio(MMR), the under-five mortality rate(U5MR), and life expectancy at birth (LEB) in Sub-Saharan Africa by using Partial Least Square(PLS) Structural Equation Modelling(SEM), a multidimensional estimation method to understand the direct and indirect interaction between these variables of interest and how they influence the Sub-Saharan African economy. There is no single study, that has used this estimation method to examine the effects and relationships between health financing and health outcomes in Sub-Saharan Africa.

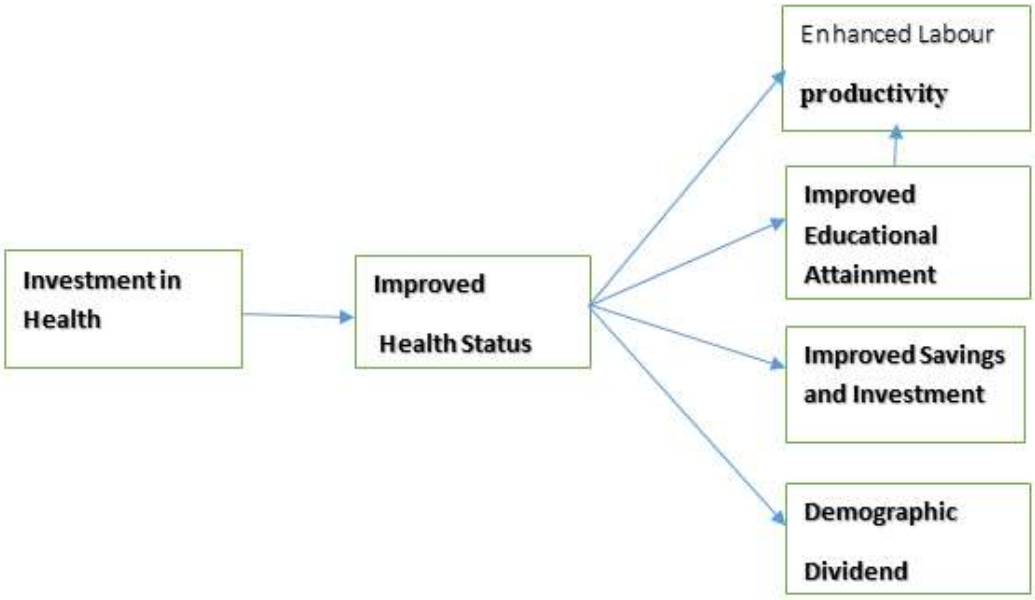
The remaining sections of the paper are structured as follows; section two discusses the theoretical and empirical literature on the study. Section three focuses on the methodology which consists of the data type, source, and method of estimation. The fourth section covers the empirical result and discussions. Finally, section five presents the conclusion and policy implications of the study.

II. THEORETICAL AND CONCEPTUAL FRAMEWORK FOR THE STUDY.

The theoretical framework underpinning this study is drawn from Grossman's [8] theory on demand for health, whiles the conceptual framework is based on Akanni [9] model framework on the relationship between health expenditure and health outcome. The Grossman [8] theory on health hypothesizes that investment in health care utilization will contribute to a significant improvement in health outcomes. The theory is basically on how the individual distributes its resources to produce health, and it also behaves the same as the unrestricted utility maximization theory which is about how the individual uses available resources to maximize its utility. This theory also postulates that the individual maximizes his/her utility through personal investment. This investment is made purposely to produce the health status desired. The Grossman theory, generally explains the link between health investment and health outcomes. This theory sees the health input demanded by the individual as derived demand, and not for consumption purposes, but rather to produce a particular health outcome. The individual can achieve this goal by investing in health inputs, which can be acquired through health expenditure, which is an accumulation of public and private finance, exercise, dietary intake, environment, exercise, time used for some production activities that produce particular health and outcome. Finally, the Grossman theory hypothesizes that the main reason for increasing health financing in a country is to improve the health of its inhabitants.

The conceptual framework by [9] on the relationship between health expenditure and health outcomes also draws it theoretical foundation from the Grossman model by postulating that investment in health in the form of health financing will influence health outcomes which will lead to an improvement in labour productivity, educational attainment, saving and investment and finally improve demographic dividend in the economy. Improvement in labour productivity, educational attainment, savings, and investment, and demographic dividend is key for every economy since to could lead to an improvement in economic growth, which can also influence the wellbeing of the inhabitants of the nation. The path diagram(Figure1) shows that the main reason why the nation and its inhabitant invest in their health is to improve their health outcomes.

Figure 1: Path relationship between health financing and health outcome



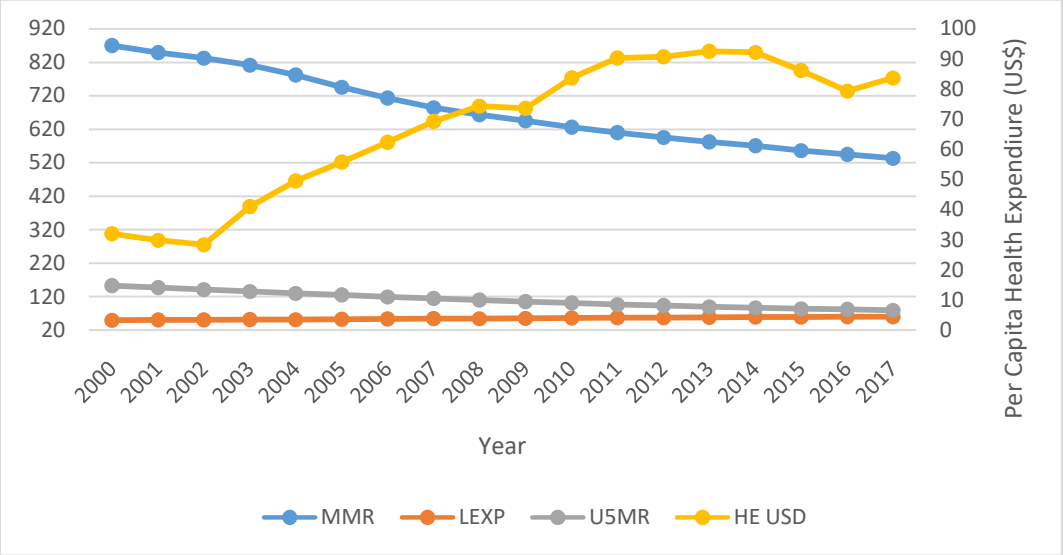
Source: Authors own construction based on Grossman [8]theory and Akanni [9]

2.1 Health Expenditure and Health Outcomes Trends in Sub-Saharan Africa

Figure 2, depicts health outcomes and health expenditure trends in Sub-Saharan Africa for the period 2000 to 2017. A critical observation of Figure 2 shows an increase in current health expenditure, even though there were fluctuations in some years during the period under review. It decreased marginally from USD$31.97 in the year 2000 to USD$ 28.42 in the year 2002 and started increasing sharply from USD$40.99 to USD$ 74.42 for the year 2003 and 2008, and after which it decreased by a small margin to USD$73.64 in 2009, that is, a year after the global financial crisis. The per capita expenditure for the region started to increase again from USD$83.69 to USD$92.24 for the years 2010 and 2014, and fluctuated but stood at USD83.75 in the year 2017. The trend is depicted in Figure 2 indicates that per capita health expenditure for the region has increased from 31.97 in 2000 to USD83.75 in 2017, but the increase is not stable in the period under review.

The trend analysis on Under-five mortality (U5MR), presented in Figure 2 shows that U5MR stood at 152.8 per 1000 live birth in the year 2000 and steadily declined from 136.4 per 1000 live birth in 2003 to 79.9 live birth in 2017. The maternal mortality ratio for the region also stood at 870 per 100,000 live in the year 2000, but constantly decreased from 782 per 100,000 live in 2004 to 534 live birth in the year 2017. Additionally, Life Expectancy at birth has also increased from 50.45 years in 2000 to 60.88years in 2017. The trend analysis on health expenditure and health outcome indicators shows an improvement in these indicators for the period under review, and this improvement could be linked to the implementation of the Millennium development goals (MDGs) and the Sustainable Development goals (SDGs). However, comparing the performance of the region in terms of these indicators to other region shows that more need to be done to improve the health expenditures and health outcomes in the region

Figure 2: Trends of Health Expenditure and Health Outcomes in Sub-Saharan Africa



Source: Authors own construction

2.2 Empirical Literature Review

This section presents the empirical studies on health financing and health outcomes. The empirical studies consist of studies conducted in both developed and developing countries. The studies are summarized in a table form for easy understanding. The empirical studies are summarized according to the authors and year of publication, sources of data used in the study, the model type, and scope, the variables considered in the empirical analysis, and major findings of the study, as presented in Table 1.

Table 1: Empirical Studies on Health Financing and Health Outcomes

Author(s) name and year	**Data source**	**Model type and scope**	**Variables included**	**Major findings**
Kaur, A. (2020)	Economic Survey of India, Hand Book of Statistic, Health and Family welfare Statistics, India	Toda–Yamamoto causality test 1981-2016 India	Gross Domestic Product, Government health expenditure, Life expectancy, Infant mortality	The study revealed a long-run relationship between government health expenditure, GDP, and infant mortality. The causality test showed a bidirectional relationship between infant mortality and life expectancy
Akinlo, A. E., &Sulola, A. O (2019)	United Nations and World Bank	Pooled OLS and Fixed Effect(FE) Panel Model 2000-2008 10 Sub-Saharan African countries	Under-five mortality rate, Infant mortality rate, Government health expenditure, Health Aid, HIV prevalence rate, Immunization, Urbanisation	Government health expenditure has a negative influence on infant mortality and under-five mortality rate. The study further revealed a significant and negative effect of GDP per capita, Health aid, HIV prevalence, and immunisation on

				under-five mortality rate and infant mortality rate
Edeme, R. K., Emecheta, C., &Omeje, M. O. (2017)	Word Development Indicators, World Bank	OLS Regression 1981-2014 Nigeria	Public health expenditure, GDP per capita, Life expectancy at birth, Infant mortality rate, Urban population, HIV prevalence rate	The finding of the study indicates that public health expenditure is key for improvement in health outcomes. The results showed, The results further showed that adequate health finance will improve health outcome indicators such as infant mortality and life expectancy at birth in Nigeria.
Nicholas, A., Edward, N. A., &Bernardin, S. (2016)	World Bank, UNDP, WHO	Fixed Effect (FE) and Random Effect (RE) 2000-2010 Sub-Saharan African countries	Infant mortality rate, Under-five mortality rate, maternal mortality ratio, Public health expenditure, Private health expenditure, Governance, Female literacy, Water, Sanitation	The finding indicates a negative and statistically relationship between public health expenditure, infant mortality, under-five mortality rate. The results further showed that public health expenditure does not affect maternal mortality in SSA.
Matthew Oluwatoyin, A., AdegboyeFolasade, B., &FasinaFagbeminiyi, F. (2015)	WDI, World Bank, and Central Bank of Nigeria	Vector Error Correction Model (VECM) and Co-integration 1979-2012 Nigeria	Public health expenditure, Life expectancy at birth, Primary school enrolment, Carbon dioxide emissions	The results of the study statistically significant relationship between public health expenditure and health outcomes measured by life expectancy at birth. The results further indicate that the effect of the health outcomes is associated with high carbon dioxide emission in Nigeria.

Author(s) name and year	**Data source**	**Model type and scope**	**Variables included**	**Major findings**
Deluna R. and Peralta T.F. (2014)	General Appropriations Act (GAA), the publication of Department of Budget and Management (DBM) and World Bank	Vector Autoregressive Analysis(VAR) and Granger Causality test 1981-2010 Philippines	Health expenditure, GDP per capita, Infant mortality, Under-five mortality rate	The study findings showed that GDP per capita and health expenditure has a positive and statistically significant effect on life expectancy. The results also indicate that

				improvement in health expenditure is key in infant mortality reduction compared to GDP per capita.
Kim, T. K., & Lane, S. R. (2013)	OECD and WHO	Linear Mixed Models 1979-2000 17 Developed countries	Infant mortality, Life expectancy at birth, GDP per capita, Gini coefficient, unemployment rates, aging population (over 65)	The study found a negative relationship between public health spending and infant mortality. The result further indicates that high health expenditure will contribute to better health outcomes
Novignon, J., Olakojo, S. A., &Nonvignon, J. (2012)	WDI, World Bank	GLS and Pooled OLS 1995-2010 44 Sub-Saharan African countries	the crude death rate, Public health expenditure, Private health expenditure, crude death rate, HIV prevalence rate, Water, Sanitation, Number of hospital beds, Population age	The results indicate a positive statistically significant association between health status, private and public health expenditure. The findings of the study further showed that improvement in health expenditure will influence health outcomes
Akinkugbe, O., &Mohanoe, M. (2009)	Ministry of Finance and Development Planning, e Bureau of Statistics in Lesotho, UNDP and World Bank	ECM and VAR 1980-2001 Lesotho	life expectancy, infant mortality rate, and under-5 mortality rate, GDP per Capita, f Public Expenditure on Health, Female Illiteracy Rate, Population per Physician	The study found an insignificant effect of GDP per capita on health status. The results further indicate that female literacy, the number of physicians, and child immunization are key determinants of health status.
Bokhari, F. A., Gai, Y., &Gottret, P. (2007)	World Bank, Millennium Indicators Database (MID) and UNICEF	2SLS and GMM 1993-2004 Developing countries	Under-five mortality per 1000 live births, Maternal mortality ratio, GDP per capita, Gov't Health Expenditure, percentage of Pop. aged >15 not literate, Paved roads per unit area, Sanitation, Donor Funding per capita for Basic Health	The study found a significant relationship between health outcomes, Government health expenditure, and GDP per Capita respectively. The results further showed that a good road network is a key determinant for infant mortality and maternal mortality reduction in developing countries.

Source: Author(s) own compilation

III. METHODOLOGY

3.1 Data type and sources

The study examined the causal relationship between health financing measured by private and public health expenditure and health outcome proxy by under-five mortality rate, life expectancy at birth, and maternal mortality ratio by primarily using secondary data from World Bank, AFDB, and WHO online database. The data for the study are cross-sectional data set for 25 sampled Sub-Saharan African countries spanning between 2000 and 2015. The time frame of the dataset is relevant for the study since it captures the start and the end of the implementation of the millennium development goals, and the 2008 global financial crisis which affected most economies in the world, including the Sub-Saharan African economy. The variables used in the analysis are presented in Table 2

Table 2: Definition of variables and sources

Variable	Definition	Data Source
Public health expenditure	It is an indicator that measures health expenditures that are funded from public sources for health. Its expressed as a percentage of current health expenditure.	WDI
Private health expenditure	It is a measure of the proportion of current health expenditure funded from private domestic sources such as households, corporations, and non-profit organizations	
Maternal mortality ratio	It is a measure of the number of maternal death per a given period. It is expressed as per100,000 live birth for the same given period.	WHO
Under-five mortality rate	It presents the probability of a new-born infant dying before its fifth birthday. It is expressed as per 1000 live birth.	WDI
Life expectancy birth	It is a measure that represents the number of the year a new-born will live if existing patterns of mortality were to be the same throughout its life.	WDI
Young dependency ratio	It is a measure of the proportion of younger dependents of people less than age 15yrs to the working population of those between age 15 and 64. It is expressed as the ratio of dependents per 100 working population	WDI
Old dependency ratio	It measures the proportion of older dependents of people greater than 64yrs to the working population above age 64. It is also expressed as the ratio of dependents per 100 working population.	WDI
Primary school enrolment	It is a measure that indicates the number of children provided with basic reading, writing, and mathematical skills in addition to elementary under the understanding of other subjects. It is expressed as a percentage of gross enrolment.	WDI
Secondary school enrolment	It represents the number of people that have completed the provision of basic education, which starts at the primary level and aims at building a foundation for long-life learning and human development. It is expressed as a percentage of gross school enrolment.	WDI
Gross national savings	It is a measure of the difference between final consumption expenditure and disposable income. It's the sum of personal savings, business savings, and government savings, but does not include foreign savings. It is expressed as a percentage of GDP.	AFDB

Note. WDI: World Development Indicators; AFDB: African Development Bank; WHO: World Health Organization.

Source: Author(s) own construction

3.2 Estimation of Method

The study investigated the causal relationship between health financing and health outcomes by employing Partial Least Square(PLS) Structural Equation Modelling, a multidimensional estimation method developed by Swedish Econometrician, World [20]. This estimation method is meant to examine complex causal relationships between the variable of interest by combining principal component analysis and ordinary least square regression to estimates the structural model partially. The PLS-SEM method is appropriate for this study since the study aims to test a theoretical model and predict based on the theoretical framework. Again, since the distribution of the dataset used is unknown, the PLS-SEM is found suitable, since it does not impose distribution on the dataset [21; 22]. The study will examine the causal relationship between the variables of interest, using a reflective path model. Therefore, the study will evaluate both the measurement or outer model and the structural or inner model. The measurement model will be assessed using the indicator loadings, Cronbach's alpha and composite reliability meant for the internal consistency reliability of the measurement model. In our case, the composite reliability will be used instead of Cronbach's alpha as suggested by [23; 24]. The average variance and discriminant validity which measures the convergent validity of the model will be used to evaluate our measurement model. The study will also evaluate the structural model by using the path coefficient size and effect, the coefficient of determination ($\mathbf{R^2}$),predictive validity($\mathbf{Q^2}$)**,** and effective size ($\mathbf{f^2}$)**.** Thepath coefficient size and effect will be estimated using the bootstrapping of the PLS algorism, whiles Q^2 and f^2 will be estimated using the blindfolding algorithm of the smartPLS software. The latent construct and their indicators are present in Table 3.

Table 3: Latent construct and indicators

Latent construct	**Indicators**
Health financing	Public health expenditure
	Private health expenditure
Health outcomes	Under-five mortality rate
	Maternal mortality rate
	Life expectancy at birth
Demographic dividend	Young dependency ratio
	Old dependency ratio
Educational attainment	Primary school enrolment
	Secondary School enrolment
Savings	Gross savings

IV. Results and Discussion

The result in Table 4 presents the VIF and Tolerance values on all the indicators used in the study. A critical observation of the results shows none of the indicators is suffering from multicollinearity. Thus they are not highly correlated with each other. The VIF values for the indicators are not greater than 5 and their tolerance value is greater than 0.2.

Table 4: VIF and Tolerance values

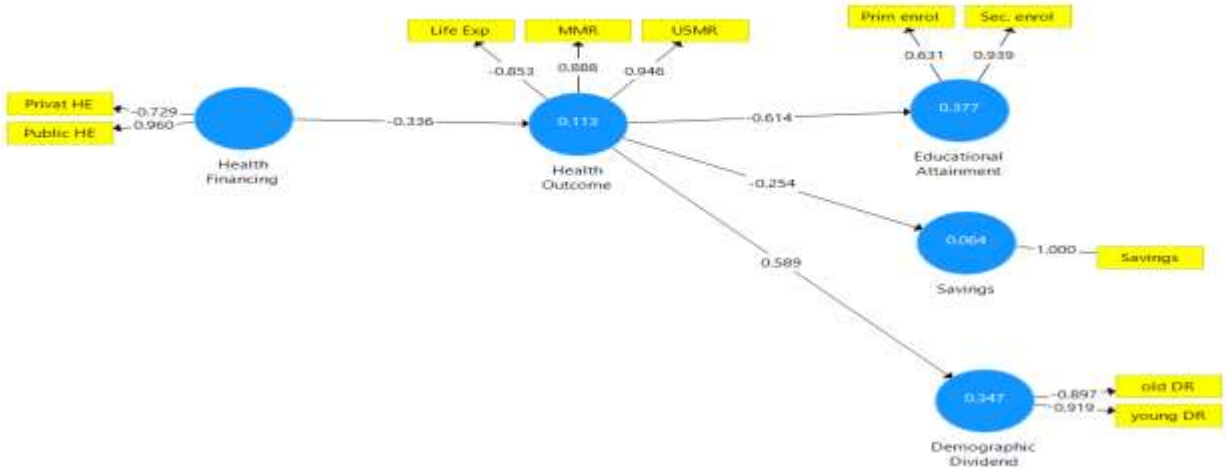
Variable	**VIF Value**	**Tolerance**
Life Exp	2.66	0.282
MMR	2.187	0.380.
Prim enrol	1.119	0.745
Privat HE	1.349	0.779
Public HE	1.349	0.572
Savings	1.000	0.734

Sec. enrol	1.119	0.245
U5MR	3.720	0.215
Old DR	1.731	0.426
Young DR	1.731	0.284

Source: Author(s) own estimation using SPSS version 25

Note. Life Exp.: life expectancy at birth; *MMR*: maternal mortality ratio; *Prim enrol*: primary school enrolment; Sec.enrol: secondary school enrolment; Privat HE: private health expenditure; Public HE: public health expenditure; U5MR: under-five mortality rate; Old DR: old dependency ratio; Young DR: young dependency ratio

Figure 3: Final Model for analyzing the causal relationship and effect of Health financing and Health Outcomes in Sub-Saharan Africa



Source: Author(s) own estimation using SmartPLS version 3

Table 5 represents the composite reliability and Average variance which measure the fitness of our final model. The composite reliability is used to measure the reliability, and also test the validity of our measurement model, instead of the Cronbach's alpha as suggest by [23; 24]. The composite reliability values for our model are greater than 0.6 showing that the internal consistency of our reflective latent variables is reliable [25; 26]. The average variance value greater than 0.7 reported in Table 5 also confirms that the convergent and divergent validity of our measurement model exists [27].

Table 5: Indicators for the adjustment of the validity of the SEM model

Latent Construct	**Composite Reliability**	**Average Variance**
Demographic Dividend	0.710	0.824
Educational Attainment	0.774	0.640
Health Financing	0.890	0.726
Health Outcomes	0.720	0.803
Savings	1.000	1.000

Source: Author(s) own estimation using SmartPLS version 3

The discriminant validity of our measurement model is assessed using the Fornell–Larcker criteria [28]. The validity of our measurement model is assessed by finding the square root of the average variance of the latent constructs, Demographic Dividend, Educational Attainment, Health Financing, Health Outcome, and Savings. The square root of the average variance for each construct is greater than the absolute correlation coefficient of each column. The results presented in Table 6 shows that the discriminant validity of our measurement model exists

Table 6: Discriminant Validity of the SEM Model

	Demographic Dividend	**Educational Attainment**	**Health Financing**	**Health Outcome**	**Savings**
Demographic Dividend	0.908				
Educational Attainment	-0.565	0.800			
Health Financing	-0.341	0.210	0.552		
Health Outcomes	0.589	-0.614	-0.336	0.896	
Savings	-0.222	0.297	0.270	-0.254	1.000

Source: Author(s) own estimation using SmartPLS version 3

The fitness of our structural model is measured by $\mathbf{Q^2}$ which assesses the validity of our model, $\boldsymbol{f^2}$the effect size of our model, and finally, R^2 known as the coefficient of determination which measures the overall effect size of our structural model. The predictive validity values of 0.258, 0.218, 0.069, and 0.35 for the latent variables Demographic Dividend, Educational attainment, Health outcome, and savings respectively indicate that predictive validity of our inner or structural model is accurate and acceptable as suggest by [29]. The measurement of the usefulness of our proposed model to the adjustment of the construct also shows that Demographic Dividend and Educational Attainment have a large effect, whiles Health outcome and Savings have a small effect (Hair, 2014). The results in Table 7 also shows that Demographic Dividend accounts for 34.7% of the variations in the model, Educational attainment accounts for 37.7%, and savings 6.4%. The results also indicate that the latent variable, health outcomes account for 11.3% of the variations in the latent constructs Demographic Dividend, Educational attainment, and savings respectively. TheR^2 values in Table 7 show that Demographic Dividend and Educational attainment have a large effect on the model compared to Health Financing and Savings with a small effect [30]. The model fit criteria results discussed, as represented in Table7 show that our structural model fits the data.

Table 7: Values for the validity and effective predictive size of the SEM model

Latent Construct	**Validity($\mathbf{Q^2}$)**	**Effect size($\boldsymbol{f^2}$)**	**R Square**
Demographic Dividend	0.258	0.532	0.347
Educational Attainment	0.218	0.606	0.377
Health Financing	-	-	
Health Outcomes	0.069	0.127	0.113
Savings	0.035	0.069	0.064

Source: Author(s) own estimation using SmartPLS version 3

The path coefficients size and significance of our structural model is tested using the bootstrapping procedure of the SmartPLS software. The sub-sample used for the bootstrapping in this case is 5000. This is based on the criteria of [31]. The results in Table 8 shows the that effect of Health Outcome on Educational Attainment (0.614) is the strongest, followed by the effect of Health outcome on Demographic Dividend (0.589), Health Financing on Health Outcome (0.336), and Health Outcome on Savings respectively. The results further indicate a negative and statistically significant path relationship between Health Outcome and Educational Attainment. This result implies that improvement in educational levels will improve health outcome indicators such as the under-five mortality rate(U5MR), the maternal mortality rate(MMR), and life expectancy at birth(LEB) in Sub-Saharan Africa. The results support the argument by [8], thus highly educated individuals are expected to be a more efficient producer of health, in other words, healthier than less educated people. The results also support the findings of previous studies [32; 33; 34]. These results could be interpreted in regression terms as a

percentage increase in primary and secondary enrolment in Sub-Saharan Africa will reduce health outcome indicators such as U5MR, IMR, and LEB by 0.614 units. There is also a positive and statistically significant path relationship between Health outcomes and Demographic Dividend, which is measured by the young dependency ratio and old dependency ratio. Thus poor health outcomes will increase both the old and young dependency ratio.[8] and [9] are of the view that poor health outcome which is contributed by low health financing will lead to a high dependency ratio. The results of our findings show that poor health outcomes as a result of poor health financing through both private and public health expenditure will increase the dependency ratio in Sub-Saharan Africa. The results support the findings of studies conducted by [35; 36]. The study further established a negative and a statistically significant path relation between health financing and health outcome, and finally a positive and statistically significant relationship between health outcomes and savings. The negative relationship between health financing measured by public and private health expenditure implies that investment in health will improve health outcomes. This will reduce U5MR and MMR, and further increase LEB in Sub-Saharan Africa. According to Grossman investment in health will improve health outcomes. These results support the arguments by Grossman and also the finding of previous studies on the relationship between health financing and health outcome [37; 38; 39; 40; 41]. The positive and statistically significant path relationship between health outcomes and saving also implies that improving health outcomes through high investment in health will increase savings in Sub-Saharan Africa. This result means that a unit change in health outcome will increase savings by 0.25units. This result also supports the arguments by [8] and [9]. The study further found that poor health outcomes in the region will also contribute to a high dependency ratio, that is both young and older generations. This will also affect saving and will lead to school dropout, and also affect both primary and secondary school enrolment. These findings have been confirmed in previous studies. The Grossman theory also argues on this path. This calls for the need for both the government and private investors in the area of health in the region to see it as a need to increase investment in the health sector to reduce the high level of maternal mortality and Under-five mortality and also improve life expectancy at birth. The study also revealed that health financing has both direct indirect effects. This calls for the need to see health investment as important in the improvement of health outcomes in the region.

Table 8: Path coefficients size and significance

Path	Path Coefficients	Test Statistics	P-value
Health Financing →Health Outcomes	-0.336	2.999	0.003
Health Outcomes →Demographic Dividend	0.589	6.539	0.046
Health Outcomes →Educational Attainment	-0.614	12.779	0.000
Health Outcomes →Savings	0.254	2.724	0.007

Source: Author(s) own estimation using SmartPLS version 3

The results presented in Table 9 shows that health financing measured by private and public health expenditure has both direct and indirect effect, whiles health outcome has only a direct effect. The direct effect of the Health financing construct is greater than its indirect effect. The health financing construct has a negative and direct effect on a health outcome (β = -0.336, $p < 0.05$). This means that health financing, measured by private and public health expenditure affects health outcomes directly. Thus increasing health investment will reduce U5MR, IMR, and LEB in SSA. It also has a negative and indirect effect on Demographic Dividend construct measured by young and old dependency ratio (β = -0.198, $p < 0.05$), and savings (β = -0.336, $p > 0.05$). The indirect effect of the Health financing construct on savings is not statistically significant. The significant and indirect effect of Health financing on savings indicates that increasing health financing using improving health outcomes will affect dependency ratio negatively. The result further indicates that the health financing construct has an indirect and positive effect on Educational attainment measured by secondary and primary school enrolment (β = 0.206, $p < 0.05$). This also implies that improvement in health outcomes by investment in health outcomes will influence primary and secondary school enrolment positively in SSA. According to Table 9, Health outcome has only direct effect. These effects are on Demographic Dividend (β = 0.589, $p < 0.05$),

Educational Attainment (β = -0.614, p <0.05), and Savings (β = -0254, p <0.05). This direct effect shows the need to improve health outcomes since poor health outcomes will influence dependency ratio directly, thereby contributing to a decrease in both secondary and primary enrolment and savings in SSA. This results in the effect support the argument by [8] and [9] on the connection between health investment and health outcomes.

Table 9 Decomposed causal effect of the final model

Path	Direct	Indirect	Total
Health Financing→ Demographic Dividend		-0.198*	-0.198
Health Financing→ Educational Attainment		0.206*	0.206
Health Financing→Health Outcomes	-0.336*		-0.336
Health Financing→Savings		-0.085	-0.085
Health Outcomes→ Demographic Dividend	0.589*		0.589
Health Outcomes→Educational Attainment	-0.614*		-0.614
Health Outcomes→Savings	-0.254*		-0.254

*Note: *p<0.05*

Source: Author(s) own estimation using SmartPLS version 3

V. Conclusion and Policy Recommendations

There is no concrete conclusion on the relationship between health financing and health outcome in the existing literature, and also there is a gap in the literature that examines the direct and indirect effect of health financing and health outcome in Sub-Saharan Africa. The purpose of this study is to examine the relationship between health financing measured by private and public health expenditure and health outcome measures by U5MR, IMMR, LEF which are key in SSA. In addition to the relationship, the study also seeks to investigate the direct and indirect effects of health financing and health outcome in SSA. The study examined these relationships and effects by using the [8] theory and conceptual framework by [9] as theoretical background underpinning this study. The Partial Least Square(PLS) Structural Equation Modelling is used as the estimation method to investigate the relationship and effects of Health Financing and Health Outcomes. The investigation into these relationships and effects is appropriate since the region is confronted with high maternal mortality, under-five mortality, and low life expectancy, and also low health financing compared to other regions in the world. The fitness of the measurement and structural model is assessed. The final model certified the criteria for both the measurement and structural model. The results of the path model indicate that there is a negative and statistically significant relationship between health financing and health outcome in SSA. This implying that increasing health financing by both the government and private sector (i.e. Both domestic and foreign donors) accordingly will reducing maternal mortality by 0.336 units. This will be achieved if the Abuja Declaration signed in 2001 by members of the African Union is implemented by governments in the region. This result supports the theoretical arguments by [8] and [9], and previous studies on the relationship between health financing and health outcome [35; 36]. The study further found that poor health outcomes in the region will also contribute to a high dependency ratio, that is both young and older generations. This will also affect saving and will lead to school dropout and finally affect both primary and secondary school enrolment. These findings have been confirmed in previous studies. The Grossman theory also argues on this path. This calls for the need to increase health investment on the part of both the government and the private sectors since increasing investment in the health sector will go a long way to reduce the high level of maternal mortality and under-five mortality and also improve life expectancy at birth in SSA. The study also revealed that health financing has both direct and indirect

effects. This calls for the need to see health investment as important in the improvement of health outcomes in the region. High health investment will improve health outcomes which will also increase educational attainment, in this case, measured by primary and secondary school enrolment. Improvement in health outcomes will increase educational enrolment, saving, and finally, reduce the dependency ratio in SSA. The result on the effect of Health Outcome and Health outcome shows that these indicators are very important for the development of this region in the sense that a healthy population will contribute to high productivity which will intend increase growth output [8]. The findings of this study call on the government to increase their expenditure on health by implementing the Abuja declaration, which calls for 13% allocation of annul budget to the health sector and also channel all foreign donor funds meant for the development of the health sector without delay. The study also recommends to the government in the region to invest in health resources, such as medical supplies and logistics, training of health professionals, and also implement social health insurance policy at all level of our health care delivery system to assist reduce out-of-pocket expenditure on health, which is one of the contributing factors of the poor health outcome in the region.

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