

Aid Disbursement, Disease and School Enrolment in Sub-Saharan Africa: An Empirical Evaluation

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Abstract

This paper analyzed the significance of education-tied external aid, and the role of disease on school enrolment in Sub-Saharan Africa. In particular, the analysis focused extensively on primary, secondary and tertiary school enrolment over a period of 2010 and 2019 for 42 selected countries in the region. After controlling for income per head, maternal mortality, employment, and the previous school enrolment level, vital in the GMM regression results estimated among the school levels is a common phenomenon of a significant positive impact of external aid disbursed to education, and a negative effect of disease, particularly malaria, on school enrolment in Sub-Saharan Africa. In essence, primary, secondary and tertiary school enrolment increases with a growth in education aid and decreases as malaria disease spreads in the region.

Keywords: *External aid, Education, School enrolment, Malaria.*

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Introduction

Why should school enrolment be of great concern? Development Economists long predict education as an essential source of economic growth and development vis-a-vis its contribution to the formation of human capital. Lewin (2009) arrived at a conclusion that education positively drives economic development. Motivated by the past research findings, it is apparent that the positive contribution of education to economic development is continually gaining global recognition and acceptance. Countries with high school enrolment have high literacy rate, more educated and are able to compete globally, create and attract investment and substantially exploit the benefits of the global market to improve the welfare of the citizens. Schoolings matter for social inclusion, personal development, health status improvement, labor market prospects, and countries economic performance in general.^{1,2} The significance of schooling is seen in the concurrent appearance of education in the MDGs, and SDGs agendas.

In Sub-Saharan Africa (SSA), schooling is becoming more appreciated as indicated by a rise in the level of school enrolment over the last three decades in the region. As an example, the mean value of gross primary school enrolment rose from 74.71 per cent between 1989 and 1998 to 89.55 per cent and 98.42 per cent between 1999 and 2008, and 2009 and 2018 in the SSA respectively. Also, on average, gross secondary school enrolment increases from 23.79 per cent and 30.27 per cent to 42.17 per cent while gross tertiary school enrolment improves from 3.63 per cent and 5.65 per cent to 8.72 per cent within the same period.³ However, the concern is not necessarily on whether school enrolment is rising in the region but understanding the factors motivating the extent to which such increment raise over time relative to one's expectation. Drawing insight from the World Bank data, school enrolment is growing quite slowly in sub-Saharan Africa compared to in the high-income economies. The gap between the school enrolments in high-income economies and sub-Saharan Africa is wide, and wider as the level of education advance from the primary to secondary and tertiary education.

Averagely, the gap in school enrolment between the high-income economies and sub-Saharan Africa is up to 69.71 per cent between 1999 and 2008, and 62.19 per cent between 2009 and 2018 for secondary education and 57.42 per cent over 1999 and 2008, and 65.95 per cent between 2009 and 2018 for tertiary education.⁴ Besides, looking inwardly, many school enrollees in Sub-Saharan Africa find it difficult to proceed from a lower level of education to higher one. This has resulted to low school enrolment at the

higher levels of education. Consequently, what motivates school enrolment in the region? Much gesture had been on factors such as diseases (HIV/AIDS, Tuberculosis, COVID-19, Ebola, etc), high indirect educational cost, gender bias and funding gap. It is quite unfortunate that there is no empirical evidence on most of these factors particularly how external aid disbursement (necessitated by the funding gap in the educational system) and epidemics affect school enrolment in sub-Saharan Africa. In this paper, these two important factors are investigated.

1.1 External Aid Inflows for Schooling

Is external aid allocation vital to schooling? External aid is one of the most controversial and frequently debated development strategies.⁵ Its development dates back to the era of Colonial, rooted in the British Colonial Development Act of 1929. The target of the donors for which aid, usually loans and grants to the colonial governments, were made at the time was for planning.⁶ In 1980s, aid had taken the form of financial programme assistance and debt relief in place of the direct loans and grants given in the colonial period. With the rising of the NGOs, the focus of the donors shifted to macroeconomic reform. In 2000s, the Organization for Economic Cooperation and Development (OECD), European Union, Commission for Africa, International Monetary Fund, World Bank and others became the major aid donors with a focus on MDGs/poverty mitigation, health and water and education development.⁷ The need for better external resources mobilization for development and its effective usage is stressed in the Monterrey Consensus of the International Conference on Financing for Development, the initiatives of Multilateral Financial Institutions, the Development Assistance Committee of the Organization for Economic Cooperation and Development (DAC-OECD) and the 2005 Paris Declaration.⁸

Foreign aid remains a key source of income mostly for low-income or developing economies of Asia, Africa and Latin America to help them achieve development.⁹ Many developing countries depend largely on external aid to improve sectors performance. Africa continent had been one of the most aid-dependent economies in the world with the Sub-Saharan Africa being the highly vulnerable region to external aid in the continent. Table 1 illustrates external aid to education disbursement by the DAC Countries to sub-Saharan Africa relative to Africa and the developing country as a whole. Note that although there are other categories of donors, DAC constitute the largest aid donor globally.

Table 1: DAC Education Aid, Total Gross Disbursement (US\$ million), 2012-2019

Region	2012	2013	2014	2015	2016	2017	2018	2019
Developing Countries	8,325	8,155	8,180	8,039	9,194	8,947	9,451	3,838
Africa	2,781	2,744	2,561	2,551	2,830	2,919	3,035	938
SSA	2736	2708	2526	2513	2785	2846	2974	850

Source: OECD/DAC (2020)

Table 1 shows the regional education targeted gross external aid disbursement. Although it generally dropped sharply in 2019, the amount of external aid to the developing countries had consistently been on a rise especially between 2015 and 2018. Even though the allocation to the developing countries reduces by 2.76% between 2016 and 2017, the share of sub-Saharan Africa in the total disbursement rose by 2.14%, higher than the past peak attained. A disaggregation of the disbursement based on the level of education is shown in Table 2 to 5.

Table 2: DAC Education Aid, Primary Education, Gross Disbursement (US\$ million), 2012-2019

Region	2012	2013	2014	2015	2016	2017	2018	2019
Developing Countries	750	848	974	821	1,010	1,053	1,146	566
Africa	346	298	335	314	465	395	442	184
SSA	335	291	329	311	459	386	425	166

Source: OECD/DAC (2020)

Despite the fact that the total education aid donated to the SSA improves between 2014 and 2015, in Table 2, the external aid disbursed for primary education development in the SSA shrunk between 2014 and 2015. But pick up between 2015 and 2016, declining again in 2017 and 2019. Similar trend is observed in the aid disbursed for the funding of basic education development, illustrated in Table 3. It is apparent that despite the dwindling level of aid disbursed, basic education received high proportion of the total amount disbursed compared to the primary education.

Table 3: DAC Education Aid, Basic Education, Gross Disbursement (US\$ million), 2012-2019

Region	2012	2013	2014	2015	2016	2017	2018	2019
Developing Countries	2,207	1,953	2,076	2,095	2,952	2,660	2,818	694
Africa	714	713	660	785	899	1,007	1,008	198
SSA	708	709	658	781	897	987	1004	176

Source: OECD/DAC (2020)

Table 4 shows the total share of the external aid to education received at the secondary education level from 2012 to 2019. The table suggests that secondary education attracts more external education assistance than the primary and basic education. It further shows that secondary education in sub-Saharan Africa receives an increased amount of the education assistance provided by the DAC countries continuously between 2014 and 2017.

Table 4: DAC Education Aid, Secondary Education, Gross Disbursement (US\$ million), 2012-2019

Region	2012	2013	2014	2015	2016	2017	2018	2019
Developing Countries	2,023	1,767	1,887	1,865	2,701	2,365	2,280	613
Africa	639	638	579	683	830	922	769	157
SSA	637	638	579	679	829	904	767	144

Source: OECD/DAC (2020)

In Table 5, the total external aid disbursed for post-secondary (tertiary) education development in sub-Saharan Africa noticeably increases throughout the period between 2014 and 2018. While the total disbursement to other education levels contracts in 2018, post-secondary education sustained an increase in the amount of the allocation received.

Table 5: DAC Education Aid, Post-Secondary Education, Gross Disbursement (US\$ million), 2012-2019

Region	2012	2013	2014	2015	2016	2017	2018	2019
Developing Countries	3,408	3,250	3,212	3,426	3,574	3,774	3,967	1,999
Africa	980	932	918	943	999	1,095	1,172	365
SSA	967	916	899	917	968	1,062	1,146	351

Source: OECD/DAC (2020)

A raise in the total aid disbursed for post-secondary education development across the developing countries, Africa and sub-Saharan Africa, in particular, is a reflection of the donors' priority on tertiary education in lieu of the lower education levels whose outcome may take a long time to impact the socioeconomic condition of the region. Who are the top recipients of the DAC education aid disbursement in the sub-Saharan Africa? Table 6 highlights the top 7 countries in the region between 2011 and 2019.

Table 6: Top 7 recipients of DAC Education Aid in sub-Saharan Africa (2011, 2015 and 2019)

Country	2011	Rank	2015	Rank	2019	Rank
Burkina Faso	84.24	6	-	-	24.80	7
Cameroon	100.04	4	101.61	4	57.00	2

Ethiopia	256.63	1	165.33	1	66.74	1
Ghana	74.25	7	83.08	7	-	-
Malawi	-	-	-	-	31.28	6
Mali	97.61	5	-	-	-	-
Mozambique	136.90	2	99.52	5	33.34	5
Nigeria	-	-	86.07	6	49.75	3
Senegal	122.82	3	110.33	3	-	-
Tanzania	-	-	110.62	2	43.41	4

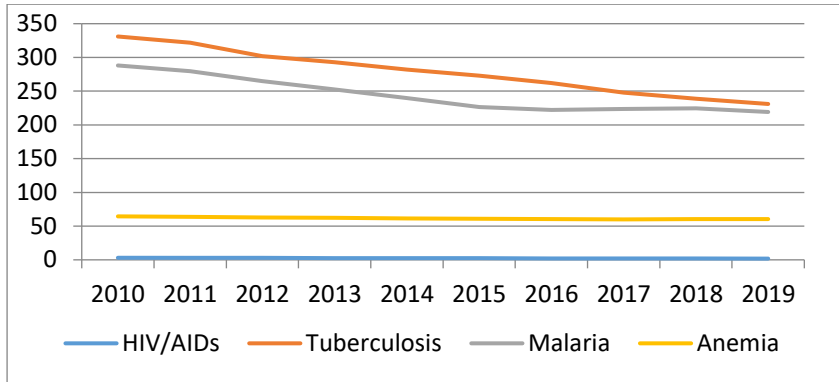
Source: OECD/DAC (2020)

In 2011 as depicted in Table 6, with about US\$256 million received, Ethiopia is ranked first among the top 7 recipients of the DAC education aid in sub-Saharan Africa, followed by Mozambique (US\$136 million) and Senegal (US\$122 million). The least DAC education aid recipient among the top 7 is Ghana which attracted approximately US\$74 million worth of external education aid. While Ethiopia remains the highest and Ghana the lowest recipient of DAC education aid in 2015, Tanzania overtook Senegal to emerge top 2 of the 7. In 2019, again, Ethiopia ranked first, Cameroon stood at number 2 while Nigeria settles for 3. Burkina Faso received the least among the top 7 aid recipient countries in SSA in 2019. In passing, substantial amount of aid has been channeled to the SSA for education revitalization and development. But how impactful is the aid?

1.2 Disease and Education

Disease is one of the biggest problems militating against the development of education. The global economy, starting with the first quarter of 2020, is experiencing massive negative shock in all sectors of the economy with over 215 countries shutting down schools and education centers owing to Coronavirus (Covid-19) disease.¹⁰ The Covid-19 outbreak has forced pupils and students out of school while potential school enrollees are suspended indefinitely. The negative impact of the disease on the educational system is more on sub-Saharan Africa and other developing regions since most of the developing countries lack a good capacity to take on online or distance learning. Though the Covid-19 disease is a global issue, diseases including Tuberculosis, Anemia, HIV/AIDS and Malaria are prominent epidemics cited to have debilitating effects on education in the sub-Saharan Africa. It is reported by UNICEF that in 2018, a total of 228 million malaria cases were recorded, most of which occurred in sub-Saharan Africa.¹¹ Malaria and its treatment costs trap families in a cycle of poverty, suffering, and illness which results to a low taste for education among households. Studies in Mali¹² and in Kenya¹³ have shown that malaria induces absenteeism and adversely affect schoolings. The HIV/AIDS are another terrible disease in point that has a negative consequence on education.

Figure 1 depicts trends in selected diseases in sub-Saharan Africa.

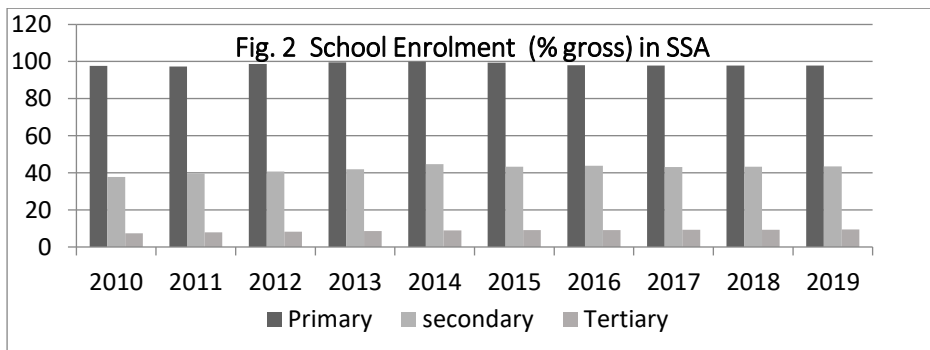


Source: Data from World Bank (2020)

In Figure 1, the incidence of HIV/AIDS slightly trended up between 2010 and 2011 with a downward movement between 2012 and 2019. In the case of malaria, although the trend suggests a decline typically between 2011 and 2014, the incidence of malaria consistently rose between 2015 and 2017 with a little evidence of a decline in 2018 and a rise, again, in 2019. The trends for Anemia and Tuberculosis suggest a relative constant rate of growth of these diseases. Figure 1 further implies that malaria disease is likely to be the major challenge among these diseases in SSA.

1.3 Trend in School Enrolment in SSA

The school enrolment trend in sub-Saharan Africa between 2010 and 2019 is illustrated in Fig.2 where primary education has the highest percentage of enrollees and the least being the tertiary education. The primary education enrolment initially increases between 2010 and 2012 and steadily decline between 2015 and 2019. Similarly, the secondary education enrolment rate rose between 2010 and 2014 and stagnated afterward. Tertiary education enrolment rate marginally rose throughout the period.



Source: Data from World Bank (2020)

The large gap among the primary, secondary and tertiary education enrolment rate as shown in figure 2 means that good numbers of pupils who

enrolled in the primary school did not go beyond the level, only small fraction made it to the secondary school. This is also the case in which many of the secondary school enrollees failed to enroll at the tertiary level. At this juncture, critical at hands is whether the trending pattern of the school enrolment rate in SSA is borne out disease outbreak and how well the escalation of foreign aid improves the current level of school enrolment in the region.

As a roadmap, the remainder of this paper is as follows: section 2 is the literature review, the methodology is in section 3 while section 4 presents result and discussions. Section 5 presents the conclusion of the paper.

2. Review of Literature

The “two-gap model¹⁴” had consistently being reckoned on in the literature as an analytical model that provide a rationale for external aid. Crucial in the model is the identified gap between what is required and the amount of domestic resources available for use. Such a gap can be filled with external resources. In the spirit of the model, thus, a shortfall in the domestic resources required to attain a certain level of development can be augmented by foreign aid. Reference has also been made to the “Big-Push ideology” as a reason for external aid. In recent time, the quest to meet the Sustainable Development Goals (SDGs) has serves as a motivating factor for many developing countries to pull home external aid. Regrettably, many researchers or economic commentators have questioned the importance of external aid in the recipient economies. For instance, in Austria¹⁵ that remained stagnated at the end of World War II despite the high per capita aid received. Nevertheless, recalling his trip to Ethiopia, some studies cited how a particular water Aid in Ethiopia reduces the numbers of day children are keep out of school in the course of colleting a polluted river water some miles away.¹⁶

Aid specific projects are mostly critical in determining school enrolment. But others have also shown that aid does not promotes school enrolment especially at the secondary and tertiary education level.¹⁷ On the other hand, studies have shown that income or wealth and epidemics like HIV/AIDs and malaria control the level of education and school enrolment.¹⁸ Also, the then UN head Kofi Annan in his speech affirmed that HIV/AIDs disease can force children out of school and subject them to deeper poverty with their own children unlikely to attend school¹⁹. Citing the total expenditure spent to curtail HIV/AIDs in Botswana, United Nations lamented that such resources would have been used to increase school’s capacity. But the resources are no longer there. Hence, access to school cannot be increased.

Sadly, specific research on the significance of external aid on school enrolment is limited in the literature. However, many researchers have adventitiously examined this in the course of assessing human capital accumulation and foreign aid linkage through the measure adopted to capture human capital accumulation, in particular, the school enrolment. But, then, little on this is on the region of sub-Saharan Africa. Besides, the outcome of those studies came up contradictorily on the gain of external aid to the recipient country. This, however, does not mean that there are no studies that supported external aid for development in the benefiting economy. In the case of disease and school enrolment, previous macro studies are mostly on whether disease especially the HIV/AIDs mitigates economic growth, health challenge and school enrolment were left out of the ball court. Below is a summary of the major research in connection with external aid, disease and school enrolment. The impact of education aid on quality education and primary school enrolment in developing countries.²⁰ The study found evidence that external aid positively increases primary school enrolment. The causal impact of external aid allocation to education on lifelong learning among 53 countries in Africa over 1996 and 2010 has been investigated. In the result estimated, external aid has a positive impact on lifelong learning and primary school enrolment. However, aid has no significant impact on secondary and post-secondary school enrolments.²¹ Further to enrich a panel study found that the economic development impact of external aid depends critically on the role of institution.²²

Some studies employed panel data on 118 developing economies from 1971 to 2000 to examine the role of education expenditure on school enrolment. In the study, expenditure on education increases school enrolment.²³ The role of government spending on education on school (primary and secondary education) enrolment using panel data of Africa countries with a focus on Nigeria and other SANE countries (Nigeria, Algeria, Egypt, and South Africa). The study affirmed that government education spending promotes primary and secondary school enrolment in the region.²⁴ The effect of conflict and aid on human development on 94 developing countries between 1980 and 2000 was studied. The study suggests a statistically significant negative effect of aid and conflict on human development.²⁵

The study of Dreher, Nunnenkamp and Thiele found a positive effect of education aid on school enrolment in 96 low and middle-income countries. The study reported an increase in education by a per cent increases school enrolment between 2.2 per cent and 5 per cent on average.²⁶ In a cross-country study analysis integrated foreign aid receipts in the neoclassical

economic growth model to explain the significance of good economic policies as external aid effectiveness determinant. It was in the study that external aid is more effective in developing economies with good monetary, fiscal and trade policies.²⁷ Additionally, Rajan and Subramanian employed cross-country data but found that external aid inflows has no effect on national output, even under good economic policies.²⁸ Kemal and Jilani examine the effect of external aid on education in Pakistan. The study provides evidence of a positive effect of external aid on primary education enrolment. But this could was not the case for the secondary and tertiary school enrolment.²⁹ On the other hand, the study of Vitor-Silva, Reyes-Lecca, Pinheiro and Lacerda associated poor school performance to malaria in Brazilian Amazon.³⁰ Also, studies like Nankabirwa, Wandera, Thuilliez, Kiwanuka, Staedka, Kanya and Brooker have proven malaria disease to have a detrimental impact on wards' cognitive and education.³¹ Sede and Adediyani also found a negative impact of HIV/AIDs on economic performance.³²

3. Research Data and Methodology

Of the 48 countries in the region of Sub-Saharan Africa, 6 countries have no dataset on key variables of the model. Therefore, data collected were on 42 countries in the region from 2010 to 2019. All data were sourced from the World Bank Development Indicators database except data on external aid disbursed to education collected from OECD/Development Assistance Committee (DAC) Credit Reporting System (CRS).

3.1. Empirical Model

The study uses a simple semi linear-log model, represented in equation (1), where changes in school enrolment in the SSA is assumed to depend principally on external aid and disease.

$$S_{it} = \omega + \gamma \ln E_{A_{it}} + \alpha \ln D_{it} + \lambda Z_{it} + \mu_{it} \quad (1)$$

Where S_{it} implies the school enrolment ratio. It is made up of primary (S_P), secondary (S_S) and tertiary (S_T) school enrolment at time t for country i . $\ln E_{it}$ symbolizes log of external education aid disbursement. It is measured in US million dollars, 2018 constant price. $\ln D_{it}$ means log of disease proxy by malaria incidence. External aid to education and disease are the primary explanatory variables in the model. The Z_{it} indicates all the auxiliary control variables for country i at time t . Variables in Z are income proxy by GDP per capita (Y), employment-population ratio (E_P), maternal mortality ratio (M_m), and log of monetary policy ($\ln M_P$). ω , γ , α and λ are the parameter of the model.

In the case of the key variables of interest (external aid and disease), the relationship between school enrolment and external aid may be positive or negative. But disease i.e. malaria and school enrolment are expected to be inversely related because disease can lead households into a cycle of suffering, illness and poverty. Such poor households may not be able to afford schooling. Also, cost of treating and preventing disease gulps millions of dollars in SSA, such huge funds would have been used to scale-up provision of free education, off-setting indirect educational cost and others that will attract pupils-students into classrooms.

The employment variable in the model is expected to be positive especially in the tertiary school enrolment equation. Increase in the number of the population that is working is highly likely to induce out-of-school children to go back to school. For maternal mortality, a negative sign is expected. For instance, Case, Paxson, and Ableidinger observed that parents' mortality tends to reduce children school enrolment. This is true particularly at the primary and basic education levels. Monetary policy can be positive or negative depending whether it is expansionary or restrictive.³³

3.2. Method of model Estimation

This paper employs a dynamic System GMM approach. The method is beneficial in several ways. It introduces dynamism in the model i.e. it allows knowing whether the lag value of the dependent variable significantly contributes to its present value. It further helps to control dynamic endogeneity (i.e. omitted variable bias, corrected by incorporating the lagged value(s) of the dependent variable (predetermined) among the regressors). It equally fixes simultaneity bias through appropriate variable instrumentations) Additionally, the issue of the potential small sample bias found in difference estimator is overcome. One of the problems links to panel GMM is the issue of instrument proliferation. To address it, collapse option of Xtabond2 command is used to decrease the lag length of the instrument. Two important tests were done to ascertain the validity of the estimated model i.e. the Sargan over-identifying restriction test and Arellano and Bond (AB) autocorrelation test.

4. Empirical Findings

In Table 7, the standard deviation of tertiary school enrolment is the least among the levels of education which shows that it is more stable in the sample. Also, the mean value of education aid disbursed within the period of analysis is US\$38.98 million while the average incidence of malaria disease is around 174.

Table 7. Descriptive Statistic

Variables	Obs	Mean	Std. Dev.	Min	Max
S_P	418	80.33	47.03	0	148.23
S_S	420	28.88	29.75	0	109.44
S_T	417	6.06	8.02	0	40.60
E_A	419	38.98	44.39	0	283.90
D	418	174.17	162.02	0	585.54
Y	420	5134.29	6459.87	0	36671.36
E_P	420	61.99	14.48	0	87.82
M_m	418	372.48	303.63	0	1360
M_p	420	3.10e+12	5.89e+12	0	3.48e+13

Source: Authors' computations

The empirical findings on the role of disease and external aid to education on school enrolment are presented in Table 8. In the table, whilst model (1) (benchmark regression) combined the effect of external aid disbursement and disease on school enrolment, model (2) and (3) (auxiliary regression) are on the individual effects. Beginning with the primary school enrolment, in model (1) column 2, there is a statistical piece of evidence that primary school enrolment increases with the level of growth attained in the previous year. A high rate of school enrolment in the previous period leads to higher rate in the current period. The coefficient of external aid to education is positive and statistically significant which means that aid disbursement to education positively induce primary school enrolment. If other factors in the estimated model are zero, the size of the coefficient suggests that increment in primary school enrolment by a rate up to 0.08 requires a per cent increase in the amount of aid disbursed to education. As anticipated disease and primary school enrolment are negatively related. That is, primary school enrolment gets lower with high incidence of disease (malaria disease). For the sake of comparison, the effect of disease weighs more on primary school enrolment than the external aid variable. Holding constant other constraints, on average, if the incidence of disease declines by a percentage, primary school enrolment rate will go up by a rate approximately equal to 0.10. The negative effect of disease on primary school enrolment is statistically different from zero. The estimated coefficient of income is positive which indicate that primary school enrolment increases with an increasing income. But the income's coefficient is not statistically significant. Employment, on the other hand, contributes positively to growth in primary school enrolment. It is statistically significant. Lastly, the maternal mortality rate turns up with a positive sign in contradiction with expectation.

Table 8. GMM Estimates on the Effect of Aid and Disease on School Enrolment in SSA

Dependent Variable: School Enrolment

	Primary			Secondary			Tertiary		
	(1)**	(2)*	(3)*	(1)**	(2)*	(3)*	(1)**	(2)*	(3)*
$S_P(-1)$	0.205 (0.04)*	0.167 (0.09)**	0.190 (0.06)**						
$S_S(-1)$				0.469 (0.00)*	0.477 (0.00)*	0.426 (0.00)*			
$S_T(-1)$							0.502 (0.00)*	0.661 (0.00)*	0.517 (0.00)*
E_A	7.928 (0.04)*	10.045 (0.02)*		4.003 (0.01)*	8.132 (0.02)*		0.511 (0.02)*	0.712 (0.02)*	
D	-9.857 (0.02)*		-8.783 (0.01)*	-2.529 (0.07)**		-3.048 (0.06)**	-0.467 (0.01)*		-0.469 (0.01)*
Y	6.895 (0.35)	5.022 (0.03)*	4.803 (0.47)	-2.980 (0.12)	2.654 (0.15)	-4.554 (0.13)	0.796 (0.04)*	-0.772 (0.37)	0.638 (0.11)
E_P	0.704 (0.02)*	1.833 (0.01)*	0.999 (0.01)*	-0.170 (0.13)	-0.046 (0.75)	-0.267 (0.12)	0.013 (0.55)	-0.187 (0.12)	0.025 (0.29)
M_m	0.157 (0.05)**	0.074 (0.13)	0.141 (0.05)**	-0.001 (0.86)	-0.002 (0.86)	-0.099 (0.164)	-0.003 (0.01)*	-0.003 (0.03)*	-0.004 (0.00)*
M_P		-3.378 (0.06)**	-1.670 (0.20)		-6.405 (0.05)**	4.235 (0.01)*		0.071 (0.64)	0.099 (0.37)
C	-70.41 (0.46)	-436.24 (0.05)	-16.80 (0.82)	48.10 (4.66)	137.2 (0.06)	-45.90 (0.32)	-1.313 (0.8)	19.94 (0.16)	-2.967 (0.61)
$AR(1)$	-3.73 (0.00)	-4.53 (0.00)	-3.64 (0.00)	-3.40 (0.00)	-5.62 (0.00)	-3.38 (0.00)	-3.95 (0.00)	-4.37 (0.00)	-3.80 (0.00)
$AR(2)$	-0.99 (0.32)	-1.24 (0.21)	-0.73 (0.47)	0.24 (0.81)	0.13 (0.90)	0.16 (0.87)	0.09 (0.93)	-0.98 (0.33)	-0.11 (0.91)
Sargan	8.08 (0.23)	9.45 (0.15)	6.57 (0.36)	5.48 (0.14)	2.71 (0.26)	4.34 (0.23)	5.97 (0.11)	4.31 (0.12)	4.61 (0.20)
Instr. [‡]	22	22	22	19	18	19	19	18	19
Groups. [‡]	39	38	38	37	41	37	39	38	38
Obsn.	304	290	290	289	341	283	302	288	288

* means significant at 1%, 5% and 10%; ** significant at 10%. ** indicates primary/key model,

* Auxiliary model. S_P , S_S and S_T are primary, secondary and tertiary school enrolments.[‡] indicates number of instruments; [‡] is the number of groups.**Note:** that the coefficients of time effect are not reported.**Source:** Authors' computations

For the secondary school enrolment, in column 5, and similar to the estimate obtained for primary school enrolment, a lag of secondary school enrolment is positive and statistically significant in the model. Education aid positively and significantly contributes to growth in secondary school enrolment. But the intensity of the effect of aid on secondary school enrolment is lower than that of primary school. *Ceteris paribus*, one per cent rise in aid disbursement to education accelerates equivalently secondary school enrolment by 0.04 rates. The impact of disease on secondary school enrolment is a negative one and statistically different from zero, albeit, only at 10%. Hence, statistical evidence on the negative effect of disease on secondary school enrolment is weak. Income has a positive effect on secondary school enrolment but not statistically significant at any testable

level of significance. The coefficient of maternal mortality rate is negative but also not statistically significant.

Finally, like in the previous estimates, in column 8, a lag of tertiary school enrolment positively and statistically determines tertiary school enrolment current rate. Education aid also positively determines tertiary school enrolment with a sensitivity rate of about 0.01 per percentage change in education aid disbursed over the sample period. The coefficient of disease is negative and statistically significant. Additionally, change in income positively and statistically determine school enrolment. In model (2) and (3) on primary, secondary and tertiary school enrolment respectively, the same result estimated when the effect of external aid and disease were considered in a single equation is obtained, i.e. the impact of external aid is positive, and a negative impact of disease on school enrolment. For the diagnosis tests presented at the bottom of Table 8, it is clear that the estimated models have no second order autocorrelation. Also, the p-value of Sargan test in each of the models implies that the instruments used are valid. Since there is no second order autocorrelation and the number of instruments is less than the group number as well as the models satisfying the Sargan instruments restriction condition, they are fit for policy analyzes.

5. Discussion of Findings

The escalating incidence of disease and education funding gap in sub-Saharan Africa motivate this paper. It is a research on whether external education aid disbursed by the respective donors and disease outbreak, with a reference to malaria, determine the degree of school enrolment in primary, secondary and tertiary education level in sub-Saharan Africa. The results obtained while in part are as anticipated, in several instances, did not conform to expectation. It is a common phenomenon in the results estimated that a lag of school enrolment in each of the levels of education significantly increases the current value. The importance attached here is the dependent of the future value of school enrolment on the current level. That is, school enrolment across the 3 levels of education in sub-Saharan Africa will be high in the future if a concerted effort is made to raise the current rate. Also, aid disbursement and primary, secondary and tertiary school enrolment are significantly positively related. The positive impact of aid disbursed on school enrolment in each of the levels of education signifies the vitality of aid as a developmental tool through which school enrolment can be increased in SSA.

This finding contradicts Kemal and Jilani³⁴ that aid has no beneficial impact on school enrolment. The disparity in findings may be as a result of how external aid is measured (commitment or disbursement) and whether

it is education targeted aid or for general projects. Another pertinent finding peculiar to the primary, secondary and tertiary school enrolment in the estimated results is the negative impact of malaria disease. Possible explanation is as given by the Centers for Disease Control and Prevention that the cost of malaria disease includes a loss of income and an entrapment of individuals and families in poverty. This suggests that poor households will have a reduced number of wards in school resulting to a low school enrolment. However, findings on the impact of employment, income and maternal mortality on primary, secondary and tertiary school enrolment differs. For primary education, the coefficient of income is positive but not significant. The implication here is that increased income per head may not stimulate primary school enrolment as a result that at the primary school level, the cost of education is free or quite minimal in most countries. Also, it is increasingly becoming a duty of parents to provide at least a basic education for their wards. Thus, even when income changes primary school enrolment may not change. Primary school enrolment rises with an increase in employment. Because such employment may be in terms of addition to both teaching and non-teaching staff which contributes to quality education, and induce more enrollees.

For the secondary school, the effect of income, employment and maternal mortality is negative. The negative impact of income may be as a result of a preference for overseas schooling as the level of income rises. Given a high level of income, lots of individuals in Sub-Saharan Africa prefer to migrate to places like Canada and Australia for schooling leading to a reduced school enrolment in the region. Further, there is no clear indicator that maternal mortality lessens secondary school enrolment. Lastly, at the tertiary level, income positively drives school enrolment. Because, the costs of education at higher school level are usually borne by individuals. Consequently, more income motivates individual to increase demand for schooling. Employment has no statistical impact on tertiary school enrolment which suggests increasing employment is unlikely to promote school enrolment in SSA. Contrarily, a high rate of maternal mortality will decrease tertiary school enrolment in the region.

5.1. Policy Recommendation

- a. More external aid should be disbursed to sub-Saharan Africa for education development by aid donors. It will help to boost school enrolment in the region.
- b. Spread of disease particularly malaria must be curtailed in sub-Saharan Africa to foster school enrolment.

- c. To achieve rapid school enrolment in the future in Sub-Saharan Africa, effort be made to increase the present level.
- d. Depending on the level of education, change in income, employment and maternal mortality rate can be used to control school enrolment in Sub-Saharan Africa.

6. Conclusion

In conclusion, contrary to the view that external aid has no beneficial impact on education or school enrolment, in sub-Saharan Africa, aid significantly promotes school enrolment at primary, secondary and tertiary education level, and the influence of disease on school enrolment is harmful at all levels of education. Consequently, among others, it is suggested that while it is necessary to increase education funding through external aid to raise school enrolment in sub-Saharan Africa, disease spreading, especially malaria, must be stopped.

Endnotes

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