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Effects of Economic Growth on Health Outcomes: A Panel Data Study of Sub-Saharan Africa

Ajak Michael Bul & Ogeto Robert Moracha

Abstract:
This paper takes an extra look at the debate of economic growth as a trendy issue in the world and predominantly a deep-rooted distress of Sub-Saharan Africa and Africa (SSA) as a whole. The study investigates the effect of economic growth on health in Sub-Saharan Africa with data from 1991-2015 using pooled OLS and two-ways fixed effect method as captured by infant mortality rate, fertility rate, and life expectancy total, (years) with other explanatory variables. The result shows that economic growth and health outcomes have a statistically strong negative significant relationship. The analysis showed that economic growth decreases infant mortality rates and fertility rate through the provision of healthcare services and improves life expectancy as well. In addition, other variables including agriculture, services, and population significantly affects health outcomes, while per capita income (GDPPC) unveils more effect on health in SSA. The findings of this study recommend that economic growth remains a vital determinant in improving health outcomes in Sub-Saharan African countries, though SSA is characterized by an unstable trend of economic growth and poor health facilities.

Keywords: Economic growth, Health, Sub-Saharan Africa, panel data study.

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About Author (s)

Ajak Michael Bul, (Corresponding Author), Renmin University of China, School of Economics, Beijing.
Ogeto Robert Moracha, University of International Business and Economics, Beijing, 100029 China.

INTRODUCTION

This paper takes an additional look at the debate of economic growth as an in-vogue issue in the world and transcendently as deep-rooted distress of Sub-Saharan Africa and Africa as an entirety. Precisely, this paper covered 28 selected Sub-Saharan Africa countries as a case in order to determine its economic growth effects on health. Sub-Saharan Africa destitute economic growth performance and the consequential high level of health have subjugated economic debates for many decades inside both Africa and the whole world. In this way, economic growth is viewed as a key leading factor that advances individuals' welfare through living standard change, income increment by the individuals in the country among others. Economic growth and development, on the other hand, offer assistance in diminishing destitution sticky in that health are indirectly improved and individuals can effectively access health well-being or health services. Haller. A-P (2012) established that economic growth has been and will be a changeless dread of a human being and a continuously modern topic of logical debate. Concurring to Balcerowicz (2015), economic growth is a process of quantitative, qualitative and basic changes, with a positive impact on the economy and on the population's standard of life, whose propensity take after a ceaselessly ascendant direction. Similarly, the term "growth" is composite. Gould (1972) argues the economic growth as a concept, which compact three elements: sustainability, the real term technique, and per capita income. Growth implies a sustained increment in real per capita incomes.

Among the few economists who endeavored to clearly portray economic growth were the likes of Schutz (2001) who defined growth as the sustained rise in quantity and/or quality of the goods and services an economy produced. He argued that within the late 1950s, the economic-growth theory advanced quickly into two particular eras of models; firstly (exogenous-growth models) the era of growth models inspired by the neoclassical model. However, with exogenous sources of long-term growth, dominating the literature until the late 1960s when the focus shifted to inflation and unemployment as growth determinants, secondly (the new growth models or endogenous-growth models) the era of growth models progressed with the theory of (Romer, 1986). These models focus on the economic growth rate of ideal and optimal agent's behavior, and the basic characteristics of the economy and macroeconomic approach. Like many economists, researchers, and policy analysts have given substantial attention to economic growth, in which they alluded Africa to be on the nib of surprising alter by various international business eyewitnesses and, in the way authors named it as "the future economic growth engine of the world." To get a handle on the economic insights of the Sub-Saharan region, Sub-Saharan Africa economic engender more beneficial strongly in 2010, buttressed by both the global regaining and growths on the domestic front. The projection has risen up by 4.7 percent in 2010 up from the 1.7 percent in 2009 truthful bashful of its 5 percent pre-crisis 2000-2008 average growth. Sub-Saharan Africa GDP growth in 2010 calculable at 5.8 percent, up from 3.8 percent in 2009, and on top its pre-crisis average growth of 5.6 percent. However, many research institutions such as, the World Bank's Global Economic Prospects report uncovers that, in January 2018, apparently economic growth in sub-Saharan Africa rose to 3.2 percent all through the continent with over one third of Sub-Saharan Africa nations posting 6% or higher growth rates, and another 40% developing between 4% to 6% per year. The Sub-Saharan Africa countries' economies have had an unstable "growth-history" like many developing countries in South and East Asia, Latin America and Caribbean's countries, the Middle East and Europe. The Sub-Saharan Africa (SSA) turning point for the later economic growth started within the mid-1990s. It, however, has not been uniform over the region. There are countries that have experienced sustained

high growth, equaling those of rapid-growth, developing economies in Asia. On the other hand, more than one-third of the countries in Africa still endure low economic growth, and their economies remain fragile. For instance, Augustin et al. (2014) discovered that since the 1960s, the economic performance of Sub-Saharan Africa (SSA) has considerably slaked behind that of other regions of the world, appearing small progress in normal real income per capita. Sub-Saharan Africa remains one of the poorest regions within the world, with nearly 41 percent of the populace living on less than US$1 per day. The growth recorded in the Sub-Saharan Africa region is sensibly strong solid normal with yearly GDP growth of 5.0 percent over a period of around one and half decades from 1960, with commitments from a huge number of nations likely Africa. It was not until the late 1990s that growth started to pick up adequately within the region.

This paper points to explore the effect of economic growth on health in Sub-Saharan Africa from 1991-2015 using pooled OLS and two-ways fixed method as captured by infant mortality rate, fertility rate, and life expectancy total, (years) with GDPPC (measure, constant 2010 USD), POPn (total population) AGRI (Agriculture measure as % share of GDP) SERV (service measure as % share of GDP) as explanatory variables. The paper is schematized into chapters as takes after: Chapter 1 explains insight of introduction and background on economic growth and health status in Africa and Sub-Saharan Africa, statement of the problem, questions, and objectives of research; Chapter 2 gives a brief analysis of the effect of economic growth on health within the literature, determinant of economic growth, economic growth on health and health on economic growth if need be. In Chapter 3, provides the estimation procedure of the econometric model, data, and the sources. Chapter 4 discusses the results, and Chapter 5 brings out the conclusion and recommendations of the study.

Economic growth and health status in Africa and Sub Saharan Africa

This sub-section of the paper briefly displays background data of economic growth and health in Sub-Saharan Africa countries edifying on their nature, structure, and patterns over the period of (1991-2015) with conceivable emphasis on components that could be driving this slant.

Sub Saharan Africa and Africa Economic Growth

Economic growth across African countries has been comparatively doing well in recent years **(see Table 1**). On average, GDP in Sub-Saharan Africa averaged about 6% between 1995 and 2009 hence, started shooting up in 2010 and 2014, with a most elevated of over 8% in 2015. Correspondingly, per capita GDP averaged about 4% between 1995 and 2009 with a peak of over 10% amid the period of 2010-2014 with a few decreases in a few countries in 2015. In spite of great economic performance, growth in SSA countries still fell distant brief of the yearly GDP average compared to that of East Asia and South Asia countries. In any case, numerous Africa countries enlisted positive GDP growth rates as different from the predominant negative growth rates in the past a long time. In the midst of this period, African countries economic performance can be categorized into clusters as good performers[1] (those with 5% average and above), fair performers[2] (those with growth rate between 3% and 4.99%), low performers[3] (those with growth between 1% and 2.5%) and poor performance[4] (less than 1% and negative growth). Apparently, from this basic grouping, it is very

[1]Uganda, Sudan, Cape Verde, Namibia, Senegal, Benin, Botswana, Burkina Faso, Cameroon, Chad, Ghana, Mozambique, Nigeria, and Tanzania

[2] The Gambia, Madagascar, Niger, South Africa, Gabon, and Zambia.

[3], Guinea, Guinea-Bissau, Malawi, and Togo.

[4] Cote d'Ivoire, Comoros, Sierra Leone, and Zimbabwe.

conceivable to determine which countries lead the growths within the Sub-Saharan Africa region and Africa as a whole. Noticeable among these are Uganda, Sudan, Cape Verde, Namibia, Senegal, Benin, Botswana, Burkina Faso, Cameroon, Chad, Ghana, Mozambique, Nigeria, and Tanzania, all of which recorded average of over 6% growth rates during this period. It is comprehensible within the already specified list that nearly Africa nations are resource-dependent economies. This persistent growth in economic performance of Africa region traits to numerous components such as expanding global market prices of resources, state-oriented policies, well-established institutions, external economic environment, improvement in governance, and lessening in civil and armed conflicts. Then again, the foremost stressing issue to Africa growing economic is how it is supported due to rampaging financial and economic crisis stunning the global economy with uncontainable implications for African countries. This crisis is unfavorably affecting African and especially economic extension in Sub-Saharan Africa (SSA) reflecting the combined impacts of troublesome global conditions and domestic challenges. The region's commodity exporters particularly oil producers such as Sudan, South Sudan, Nigeria, and Angola, and also producers of minerals and metals, such as Botswana and Congo DRC are seeing difficulties to growth. In a few cases, growth woes, such as in South Africa and Zambia, are compounded by domestic factors, notably power supply bottlenecks.

In other cases, political and social pressures are taking a toll on economic activities like in the case of (Burundi, Congo DRC, and South Sudan). Nonetheless, a few countries, such as Côte d'Ivoire, Mozambique, and Tanzania, are bucking the weakening regional trend and proceeding to post vigorous growth. Once more, on the external side, for instance, the end of the commodity price super-cycle, FDI inflows, international trade activities, remittances, aid inflows and the slowdown of growth in China. However, if this crisis not hastily handled, this may deteriorate all the improvements African countries made over the last few years, and economic growth could return to another decade of breakdown as Sub-Saharan Africa's growth previously anticipated deceleration in 2015 in the midst of weak global economic conditions. Whereas some countries, in any case, will continue posting strong economic development (see Calderon et al., 2015). In the midst of the 1970s towards 1980s and prior 90s it was recorded to be a period of most noticeably awful economic growth ever seen by African nations and considered as misplaced decades for the region particularly at structural problems associated with the countries in the region. Moreover, the results of convictions of the development strategies based on unfulfilled guarantees of the European Community within the First and Second Yaoundé Conventions had failed dismally, invoking untold negative shock on African development efforts. In addition to this, Europeans unsuccessful promises, some Africa home-based plans, and independent initiatives were developed purposely to correct the apparent structural imbalance. On the other hand, to avoid the impediment of economic woes, Monrovia Declaration of Commitments, Lagos Plan of Action, and Final Act of Lagos were presented to help the economic situations in Africa in spite of the fact that, slender financial resources failed the implementation of these programs.

At the time Africa economies were at a nib of collapsing in the 1980s, the World Bank studies found that African economies suffered structural problem (see World Bank, 1981). However, neo-liberal reasoning approach was set up for usage overall in African countries to rebuild the economic downfall as the basis for the World Bank/IMF intervention. This policy welcomed diverse suppositions from scholars on its results on the economic performance of

African countries. In this case, some scholars disbelieve and others believed that the program enlisted a few levels of accomplishments.

Table 1: Economic Growth for 28 Selected SSA Countries and Other Developing Regions (%)

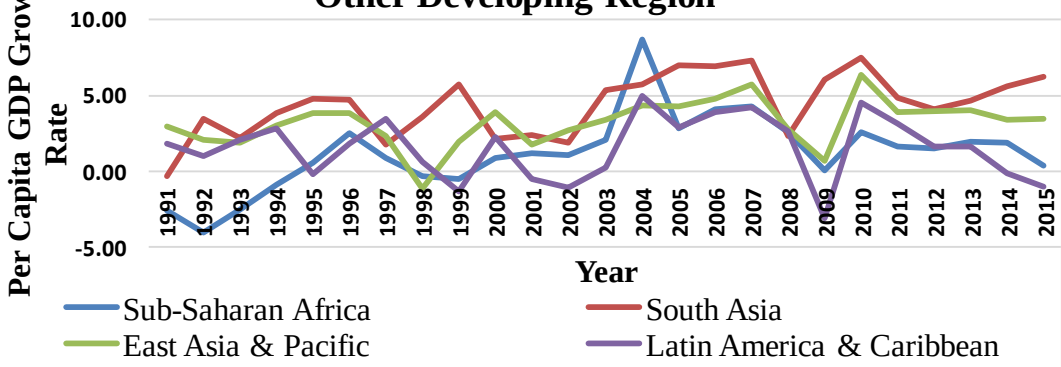
	GDP per capita						Gross Domestic Product					
	1991-94	96-99	00-04	05-09	10-14	2015	1991-95	96-00	01-05	06-10	11-14	2015
Benin	-2.84	7.88	8.16	6.62	3.66	-16.9	4.8	5.06	4.52	3.76	4.7	2.1
Burkina Faso	-0.72	6.76	7.74	8.62	5.08	-18.4	2.7	7.52	5.04	5.58	6.32	3.9
Cape Verde	6.26	5.78	8.34	10.74	0.6	-15.2	3.86	8.42	6.22	5.9	1.6	1.0
Cote d'Ivoire	-6.96	6.1	3.98	5.48	5.18	-8.6	-0.28	5.18	-0.78	2.16	5.2	8.8
Ghana	-1.04	4.8	2.82	9.88	7.32	-7.0	3.96	4.54	4.64	6.1	8.5	3.8
Guinea	1.46	-2.18	-0.02	5.42	3.36	-0.4	3.82	4.36	2.98	2.92	4.66	3.8
Niger	-8.38	1.08	5.54	9.54	3.28	-15.7	0.02	2.54	3.4	7.22	7.06	4.3
Nigeria	34.32	5.78	14.92	15.88	10.58	-15.4	3.26	2.38	9.34	7.32	6.44	2.7
Senegal	-5.88	3.76	7.26	7.28	1.04	-12.8	0.88	4.54	4.22	3.84	3.92	6.4
Gambia	2.92	0.26	-4.18	5.54	-5.92	5.6	2.02	4.1	4.4	3.16	2.34	5.9
Togo	-6.48	4.38	3.36	4.86	3.62	-11.0	-0.06	3.96	1.86	1.28	6.2	5.7
Guinea Bissau	10.02	-3.26	3.72	7.42	3.7	-2.8	4.06	2.6	0.74	3.3	3.06	6.1
Sierra Leone	-1.22	-6.14	4.04	8.26	13.12	-16.9	-2.48	-12.3	12.86	5.08	10.42	-20.5
Botswana	1.38	3.06	9.84	7.9	8.28	-12.8	3.6	6.2	3.14	3.96	6.9	-1.7
Cameroon	-7.68	-0.94	7.88	5.7	3.92	-13.9	-3.76	4.5	4.72	4.9	4.66	5.7
Chad	-4.6	2.74	20.96	7.96	5.12	-24.2	3.88	2.66	13.52	3.88	7.04	1.8
Comoros	-0.4	2.06	8.54	5.62	2.46	-16.6	1.18	1.92	2.24	1.74	2.56	1.0
Gabon	-0.52	0.46	7.18	7.14	5.4	-23.2	3.14	1.78	0.66	0.6	5.72	3.9
Madagascar	1.46	2.02	1.34	12.16	1.76	-11.1	0.02	3.24	2.64	3.82	2.08	3.1
Malawi	-2.68	10.32	0.22	9.44	-1.52	2.9	1.3	7.0	1.92	6.7	4.92	3.0
Mozambique	0.98	13.36	3.18	7.86	6.0	-14.7	3.48	11.9	7.5	7.86	7.1	6.6
Namibia	3.02	-2.02	14.86	4.9	6.14	-9.7	3.26	3.64	4.54	3.04	5.64	6.1
South Africa	4.76	-1.96	11.9	4.16	2.62	-10.9	0.2	2.58	3.62	3.6	2.56	1.3
Sudan	3.14	11.8	17.06	14.22	5.12	3.0	3.42	6.58	7.32	4.14	-2.08	3.0
Tanzania	-5.64	23.28	3.24	10.22	6.28	-8.3	2.5	4.02	6.28	6.14	6.74	7.0
Uganda	-5.14	1.72	3.36	13.86	4.3	-14.3	5.72	6.9	6.36	8.72	5.2	5.7
Zambia	-6.24	-3.3	10.28	18.66	10	-24.1	-2.52	3.44	5.52	8.1	6.66	2.9
Zimbabwe	-6.32	7.38	-4.22	1.44	8.94	-0.9	2.68	2.14	-6.98	-4.66	10.68	1.4
Sub-Saharan Africa	-2.644	0.6122	2.234	2.659	2.045	0.191	0.734	3.355	5.526	5.346	4.695	2.936
South Asia	2.318	4.127	3.514	5.935	5.334	6.231	4.525	6.188	5.373	7.587	6.790	7.610
East Asia & Pacific	2.493	2.173	3.237	3.651	4.340	3.464	3.835	3.312	4.146	4.796	4.544	4.165
Latin America & Caribbean	1.748	1.155	1.171	2.126	2.175	-0.98	3.162	2.938	2.663	3.414	3.362	0.084

***Source*:** World Bank / IMF (2009)

Contrariwise, it is very clear that the policy did not thrive as anticipated nor did it have the imagined effect on the Africa economies in spites of these disagreeing views. This view is assumed to have conceived from macroeconomic data, particularly the growth of African countries during this period. Applying our earlier grouping technique many African countries almost 60% fell under the low and poor performance categories. In addition, highlights of basic issues exceptionally still being illustrated nowadays by Africa nations. So far, in view of all discussions, one may hypothetically get to know that African economies outlook in recent years has registered some significant shift in the structural reforms. Mainly infrastructure development and in the projection of real output growth (GDP) most African countries are appraised 3.6 percent in 2017, up from 2.2 percent in 2016, and hastened to 4.1 percent in 2018 and 2019. However, African Economic Outlook recorded a momentous shift away from many economic sectors such as agriculture toward services in most countries and toward industry in the case of a few countries, notably Mauritius. Noticeably, in SSA, shows services (49.3%) as the largest share of GDP, industry (47.7%) and agriculture (19.3%) (See AFDB, 2018). In contrast to some years ago like 2000 in which the relative shares of agriculture, manufacturing, and services were low. SSA economy underperformance was compensated by

an increase in mineral and oil output in the resource-endowed countries. As evidenced above, all economic sectors in SSA showed better growth with services leading, manufacturing and followed by agriculture. Comparing other emerging economies like South and East Asia and Pacific, Latin America and Caribbean countries in the world with SSA, SSA economic growth performance has not been steadily lagging behind other developing regions as being commonly presumed. The Per capita GDP growth is fairly good compared to other developing regions as from 1994, and much far better than all other regions in 2004 until about 2008 (see Figure 1). It was worse and shaky downward pattern at commencing of 2009 which visibly seen with growth rates remaining nearly to negative throughout. Then a sluggish recover sets in from 2010 to 2014 and decelerated instantly in 2015 due to anticipated global economic meltdown presenting the risk to African countries growth sustainability. There is at present a yearned need by the world and African countries to take action globally to lessen this economic risk and recuperate it back to a maintainable growth path.

Figure 1: Per Capita GDP growth pattern in SSA and Other Developing Region



Source: *World Bank Data,* (1991-2015)

Sub Saharan Africa and Africa Health Status

As per the year's records of World Development Pointers, Sub-Saharan Africa region listed the poorest health results in the globe, conversely, in total, changes recorded between 1991 and 2015 (**see Table 2**). As an example, between 1991 and 2015, the region experienced continuous improvement in infant mortality rate (per 1000 Live births) from 64.2 to 11.2, Fertility Rate, total (births per woman) from7.8 to 2.5, Life Expectancy at Birth, total (Years) from 42.9 years to 66.8 years. Nevertheless, the pattern of health performance varies noticeably from country to country in the region in this period, making it conceivable to classify the countries as those that experienced changes in all the health results, those that experienced a decrease in all their health status, those that experienced small improvement in a few of the results and decay in others. A few countries that have done decently well on all the health variables such as; infant mortality rate (per 1000 Live births), Fertility Rate, total (births per woman) include Cape Verde, Namibia, South Africa, Gabon, Madagascar, Zimbabwe, and Botswana. Hitherto, the seething HIV/AIDS epidemic in a few of these nations expressly Southern African countries the like of Botswana, South Africa among others pose a severe threat to the sustainability of these performances. On the other hand, Life Expectancy at Birth, total (Years) reveal that few countries[5] can be classified as good performers, steadily recording higher life expectancy relative to the regional average. Among these countries, Cape Verde stands out as remarkable. According to Avert, Global information and education on HIV

[5] Cape Verde, Sudan, Ghana, South Africa, Madagascar, Gabon, Nigeria, Tanzania, and Comoros.

and AIDS clearly expressed that the HIV/AIDS in Africa and predominantly East and Southern Africa region is taking an outsized toll on lives and altogether lessening life expectancy within the region.

Table 2: Health Outcomes for 30 Selected Sub-Saharan Africa Countries

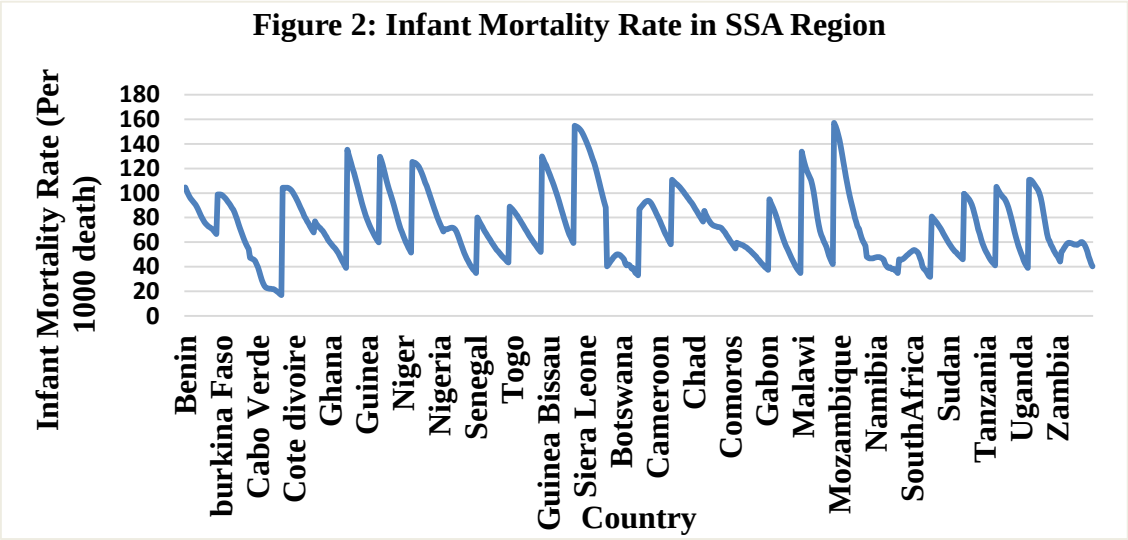
	Mortality Infant Rate (per 1000 Live Births)						Fertility Rate, total (births per woman)						Life Expectancy at Birth, total (Years)					
	1991	1995	2000	2005	2010	2015	1991	1995	2000	2005	2010	2015	1991	1995	2000	2005	2010	2015
Benin	104.6	42.4	40.1	36.2	35.2	33.7	6.677	6.364	5.962	5.632	5.362	5.048	54.366	5.203	53.391	57.355	59.319	60.639
Burkina Faso	98.9	43.8	41	36.3	30.7	26.6	6.979	6.844	6.592	6.265	5.868	4.436	49.409	49.45	50.49	53.31	57.096	59.927
Cape Verde	47.2	20	17.2	14.3	14.9	11.8	5.162	4.539	3.762	3.126	2.666	2.374	65.204	66.72	69.747	71.76	71.941	72.599
Cote Divoire	104.2	47.6	45.4	41.7	37.9	34.6	6.536	6.224	5.859	5.531	5.269	4.976	52.117	49.50	46.67	47.65	50.42	53.05
Ghana	76.9	38.9	36.3	33.4	30.9	26	5.499	5.168	4.826	4.49	4.273	4.042	57.16	57.50	56.99	58.666	60.924	62.448
Guinea	135.2	56.9	46.7	38.2	30	25	6.57	6.391	6.082	5.729	5.336	4.934	50.557	51.71	51.181	53.17	56.765	59.491
Niger	129.7	48.9	43.1	36.9	31.6	27.4	7.761	7.725	7.679	7.608	7.487	7.29	44.108	46.66	49.874	53.127	56.838	59.667
Nigeria	125.4	51	48.1	42.6	38	43.2	6.443	6.262	6.106	5.985	5.839	5.591	45.873	45.85	46.266	48.246	50.847	52.985
Senegal	70.5	39.5	38.2	32.1	26.1	21.8	6.426	5.995	5.471	5.161	5.063	4.84	57.43	57.41	57.796	60.541	64.177	66.784
Gambia	80.2	45.2	40.7	36.3	32.3	28.9	6.094	6.038	5.947	5.835	5.707	5.488	52.481	53.84	55.924	57.914	59.622	60.954
Togo	89	39.8	36.1	32.7	28.9	26.4	6.202	5.755	5.41	5.179	4.868	4.517	55.873	54.76	53.489	54.598	57.465	59.949
Guinea Bissau	129.9	61.2	55	51	44.9	39	6.582	6.294	5.82	5.389	5.049	4.71	49.441	50.97	52.27	53.357	55.055	57
Sierra Leone	154.9	52.6	50.5	46.9	41.3	35.4	6.711	6.608	6.319	5.863	5.202	4.561	36.746	35.73	38.702	43.624	48.224	51.423
Botswana	40.4	25	26.5	30.3	30.4	27	4.411	3.951	3.387	2.987	2.884	2.774	61.146	55.53	49.03	52.165	59.868	65.846
Cameroon	86.9	36.9	32.9	31.4	29.3	26.5	6.354	5.978	5.58	5.35	5.111	4.778	51.835	50.02	50.026	52.916	55.424	57.582
Chad	110.9	48.6	44.6	40.4	38.4	35.9	7.346	7.425	7.354	7.074	6.592	6.05	47.053	47.43	47.593	48.054	50.233	52.575
Comoros	85.2	42.5	40.9	40.1	36.9	33.1	6.291	5.835	5.384	5.042	4.754	4.42	57.168	58.72	59.46	60.126	61.862	63.473
Gabon	59.6	30	28.8	27.2	25	22.5	5.349	4.996	4.539	4.23	4.083	3.85	61.23	60.62	59.302	59.89	62.893	65.685
Madagascar	95	36.6	31.2	26.6	22.6	19.4	6.149	5.979	5.551	5.047	4.603	4.241	51.595	54.62	58.485	61.212	63.388	65.539
Malawi	133.7	45.5	39.4	31	28.5	24.1	6.798	6.424	6.149	5.903	5.308	4.646	46.627	46.59	46.45	49.846	57.263	62.661
Mozambique	157.1	52.8	44	36.4	31.7	28.1	6.167	5.964	5.818	5.736	5.562	5.305	43.293	45.49	48.348	51.362	54.7	57.714
Namibia	48	25	22.9	20.5	19.2	18.1	5.098	4.589	4.018	3.667	3.605	3.473	61.614	60.19	55.608	53.563	58.189	63.782
South Africa	46.1	19.8	17.8	15.7	13.1	11.2	3.525	3.11	2.829	2.677	2.588	2.485	61.614	60.19	55.608	53.563	55.888	60.993
Sudan	80.9	40	37.2	34.3	32.7	30.6	6.091	5.829	5.471	5.143	4.876	4.595	55.688	56.72	54.43	60.416	62.62	62.257
Tanzania	99.3	35.5	32.7	28	24.7	22	6.148	5.883	5.689	5.638	5.427	5.079	49.953	49.46	51.493	56.196	60.893	64.95
Uganda	105.1	34	29.4	26.3	24.7	21.6	7.082	7.018	6.865	6.583	6.154	5.682	45.058	44.22	47.077	52.64	57.153	59.575
Zambia	110.8	36.5	37.2	30.5	26.6	23.2	6.384	6.189	6.036	5.794	5.397	5.041	43.431	45.17	44.702	49.63	56.588	61.397
Zimbabwe	51.9	27.5	27.8	29.6	29.9	24.1	5.001	4.433	4.055	3.985	4.028	3.836	59.794	53.85	45.705	44.188	49.337	58.053

Source: *World Bank Data (1991/2015)*

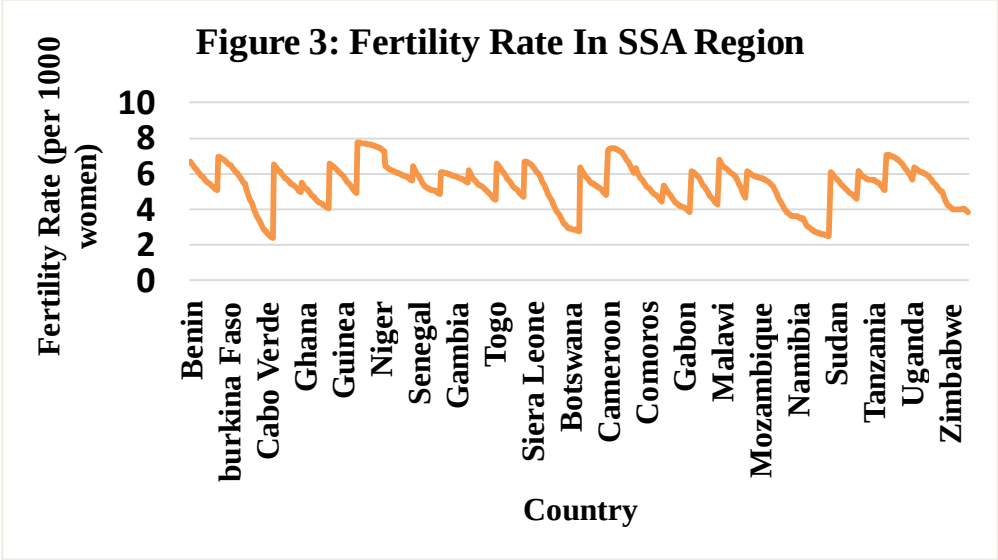
In Africa, HIV in West Africa and Central Africa is less predominant while HIV barely hit the East and Southern Africa region. Africa is home to 6.2% of the world's population but with over half of the whole number of individuals living with HIV in the world (19.6 million people). In 2017, there were 800,000 new HIV infections, approximately 43% of the global total, and 380,000 deaths recorded during the year as only 59% adults of the people living with the virus were receiving anti-retroviral treatment (UNAIDS, 2018). According to UNAIDS, (2017), South Africa accounts for one-third of the region's new infection and the other 50% happened in eight countries like; Ethiopia, Zambia, Uganda, Mozambique, Tanzania, Malawi, and Zimbabwe. Despite the severity of the plague, these countries within the region are still able to preserve life expectancy that is reliably higher than the regional average. All things considered, it is stressed that the number of people living with HIV in East and Southern Africa remains increasing, but access to antiretroviral treatment is improving as well, which gives hope that the situation will get better. In a comparable report by UNAIDS, Botswana ranks the third highest HIV/AIDS predominance in the world after Lethoso and Swaziland. This displays a really disheartening performance as a driving figure for the country falling behind the regional average in 2017 hence, the nation model of all-inclusive free antiretroviral treatment to individuals living with HIV/AIDS give quick salvaging which permits it to rise over the regional average in a short time. The evidence displayed in **Table 2,** hence far supports the idea that many African countries[6] performed pretty well on infant mortality rate (per 1000 Live births). These great several factors such as; simply getting access to healthcare services like anti-retroviral drugs for HIV/AIDS patients, enhanced maternal education, public interventions through vaccination enriched economic growth to increased earnings that make health spending more affordable. Several countries noticeably registered great records in infant mortality rate (per 1000 Live births) and Fertility Rate, total (births per woman) over this period of 1991-2015 despite the fact that some did not. To inference few, Cape Verde, South Africa, and Gabon are worth say here as the only countries within the region with generally good performance in all the indicators consistently higher than the regional average. This part shows commendable of impersonation by other countries like Chad, Guinea Bissau and Nigeria whose exhibitions are generally low the regional average.

In summary, it has been shown from this chapter (**sub-section1.2.2**) review that Sub-Saharan Africa health indicators do not show reliable patterns of health progress from country to country **(see Figure 2, 3 and 4).** This could be the case since economic growth pattern in nearly almost SSA countries is diverse due to present resources in each country that boost growth differently with its positive attributes to better health care, standards of living, and education. Since good economic growth and good health influence, each other in significant ways and each has major results on the other (Guillem et al., 2005). Nonetheless, other developing regions of the world, like South and East Asia and Latin America and Caribbean's nations, and others poor Europe's and the Middle East countries appears a much far improvement in both health and economic growth lagging SSA behind other developing regions. A shadowy and tormenting perception is that Sub-Saharan Africa's life expectancy positioned higher than that of East Asia in the 1960s but later in the mid-1991s to 2015 it is less. Nevertheless, East Asia almost multiplied the figure, recording above 71 years of life expectancy at birth. In the meantime, SSA has seen an addition of just 6 years over a period of 45 years. Often this hopeless performance needs instantaneous policy action in the region.

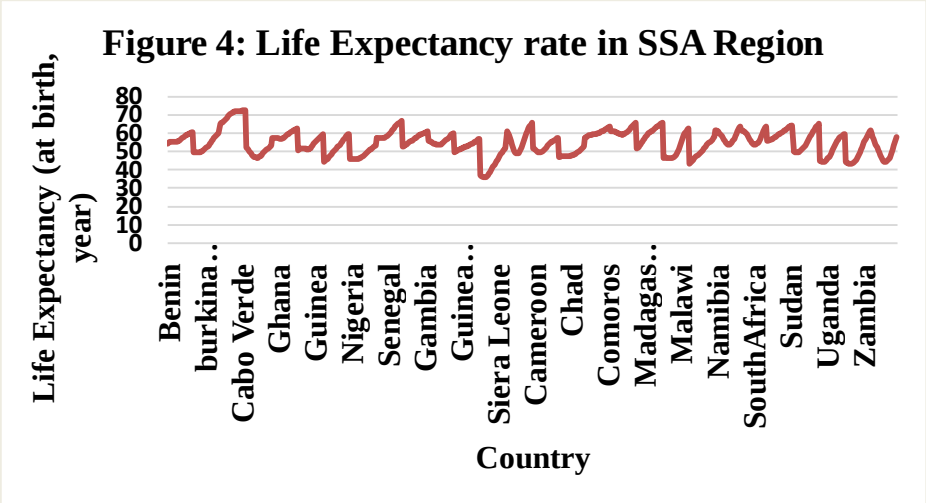
[6] Some of these countries include Botswana, Cameroon, Ghana, Madagascar, Senegal, South Africa, Sudan, Tanzania, Togo, Uganda, and Zimbabwe.



Source: *Africa Development Indicators 1991/2015,*



Source: *Africa Development Indicators 1991/2015*



Source: Africa Development Indicators 1991/2015

LITERATURE REVIEW

Determinants of Economic Growth

Economically, it has been argued that economic growth refers to changes in national income or a rise of real GDP or GDP per capita over one year that's measured in constant prices (see, Bucknall. K. (2013) and Denison (1962). Yet, previous studies establish that economic growth is controls by key six inter-locked determinants with four of them been classified undersupply determinants such as; natural resources, technology, capital goods, and human resources which have direct impacts on the values of goods and services supplied whilst other two are efficiency and demand. In this regards, distinct researchers perpetually provide different views on every determinant. This existing considerable amount of literature published on factors that verify economic growth in SSA, developing and different developed countries within the world thoroughly explain the most contribution of economic growth effects on health during this study. This study expressly reviewed these researchers' different econometric methodologies in their studies for instance; panel, single-country regressions, and cross-country regression. However, earlier analysis on neoclassical and endogenous growth models finding identified investment as a significant issue of economic growth as within the neoclassical model investment has an influence on the shift amount and therefore the endogenous growth models argue for effects that are additional permanent. Conversely, these theories have important attachment to investment that invited a mammoth amount of empirical studies examining the link between investment and economic growth (see Kormendi. R. and Maguire, 1985; De long & Summers, 1991; Levine and Renelt, 1992; Robert J. Barro and Sala-i-Martin, 1995; Easterly et al., 1997 ; Bond et al., 2001; Podrecca and Carmeci., 2001)Ulku (2004), Lichtenberg (1992) and Fagerberg (1987) in their empirical studies of innovation and/or R&D on economic growth, mentioned that economic growth rate is set by innovation and R&D activities through a rise in technology that aids the introduction of recent and superior processes and products within the economy rate of growth. Human capital refers mainly to workers' acquisition of skills and knowledge through education and coaching during which nearly several studies measured the standard of human capital using for instance; tests of mathematics, scientific skills, and school-enrolment rates as education proxies. Existing research acknowledges the essential role vie by human capital in economic growth each in neoclassical and endogenous growth models. To grasp the human capital imperative in growth (see Barro, 1991; Mankiw et al., 1992; Robert J. Barro and Sala-i-Martin, 1995; Brunetti et al., 1998; Hanushek & Kimko, 2000; Freire-Seren, 2002). On the other hand, some few scholars are questioning these findings and, thus, the status of human capital as a substantial issue of economic growth (see Levine and Renelt, 1992; Benhabib & Spiegel, 1994; Topel, 1999; Krueger and Lindahl, 2001; Pritchett, 2001; Ahmed et al., 2013).

In another investigation of economic growth in Sub-Saharan Africa (SSA) and Latin America and therefore the Caribbean (LAC) countries within the period 1970-1985. Applying cross-sectional regression, Stanley Fischer (1992) argues in his findings that, investment, a budget surplus and human capital have a positive and vital relationship to economic growth, whereas real GDP, inflation and dummy variables for SSA and Latin America and therefore the Caribbean (LAC) were negatively and considerably related to economic growth. He therefore, established that an inexpensive level of macroeconomic stability is necessary for sustained economic growth. Similarly, a panel study of each developed and developing 87 countries supported three cross-sectional growth regressions that covered the periods 1965-1975; 19751985; and 1985-1995 investigation the determinants of economic growth. During this studies, Barro (2003) declared that investment, average years of school attainment, trade

openness, and the rule of law, democracy, and terms of trade were all completely and considerably related connect to economic growth. Whereas the initial level of per capita GDP, life expectancy, fertility rate, government consumption, inflation rate, and landlocked were negatively and significantly related to economic growth. Chang and Mendy (2004) analyzed 36 African countries throughout the period 1980-2009 employing a panel fixed effects regression model in examining the empirical relationship between openness and economic growth. The results discovered foreign aid, exports, imports, labor used and trade openness was positively and considerably related to economic growth. Yet, alternatives variables as gross national savings, domestic investment, and foreign direct investment were negative and vital related to economic growth. He conjointly argued that foreign aid showed mixed leads reference to the region. Within the Middle and North Africa regions, foreign aid was positively and significantly related to economic growth; whereas within the West and East Africa regions, foreign aid was negatively and significantly associated with economic growth. Anyanwu (2014) applied associate empirical growth model with the application of cross-country panel data for African countries covering the period 1996-2010 along with time series data for the 1984-2010 period for China to analyzed factors affecting economic growth. In his studies, the findings showed that Africa had a higher secondary school entry, net official aid, metal price index; domestic investment, government effectiveness (governance) and urban population were positively and significantly related to economic growth. Whereas for China, using the identical set regressors, the study findings exhibited that trade openness and domestic investment were positively and considerably related to economic growth, contrariwise, official development aid, population growth, inflation, credit to the private sector, agricultural material price, and oil price indices were negatively and significantly associated with economic growth. Finally, throughout the period from 1970 to 2007 within the case of Bangladesh, Hassan and Bhaskara-Rao. (2011) studies adopted an econometric model of the Autoregressive Distributed Lag methodology. Their findings established that FDI, money supply, and trade openness were positively and significantly associated with economic growth whereas government expenditure and inflation were negatively and significantly related to economic growth.

Effect of Economic growth on health

Nowadays, there exists evidence of many studies each in developing countries (Sub-Saharan Africa (SSA), Latin America, and Caribbean's countries (LAC), South, and East Asia's countries) and within the developed countries concerning economic growth on health. This evidence suggests that existing analysis identifies the connection between economic growth and health as running from economic growth to health and of a conceivable two-way relation between them, economic growth improves health and at the identical time, improved health deeply augments economic productivity and growth. However, the earlier studies on this causality of economic growth to health give proof, (see Pritchett and Summers, 1996) who argues "wealthier is healthier", implying that the relationship ran from income to health. Noumba (2004) panel studies of 48 African countries and he discovered that wealthier African nations are not at all times healthier nations. Thus, he argues that a few of the affluent nations in Africa display feeble health outcomes. Yet, he finally established at the end that in spite of these findings, income remain a significant factor of health. In Filmer & Pritchett (1997) investigation of "Child mortality and public spending on health that preponderantly explained by GNP per capita. In their finding, they attributed this that the channel through which this occurred was a higher degree of female participation within the labor force, that in successively reduced the demand for children as a result of the higher cost of rearing children (Hojman, 1996). Studies like World health organization funded survey conducted by Creese

(1992) on "Health is wealth" but also wealth is health" bring into light that as income increases, a lot of resources become available to be used on basic desires such as; (safe water, medicines, medical care, safe streets and roads, and pollution stop, increasing expectancy and child survival rates. The author argues that higher income improves the physical environment, hygiene, and health well-being, implying that when once these basic preventive and curative health services are achieved, the additional cost of saving or prolonging life through sure intercessions will increases at an excessively quicker rate compared to health enhancements. He additional stressed that higher economic growth on the far side a specific level in some cases poses health hazards, like activity accidents, environmental harm, and speedy unplanned urban growth. Finally, another study on the impact of economic growth on childhood mortality Research on the impact of GDP on mortality in developed countries includes Deaton and Paxson, (2001, 2004), Ruhm, (2000) and Lindeboom et al (2003).

METHODOLOGY

Data Sources, Measurement and theoretical expectation

In this section, this study will deliberate on the variables that will measure the effects of economic growth on health in SSA. The variables chosen in this study will be measured in growth rates to remove the effects of trend and asymmetrical movements except for Infant Mortality rate, Fertility rate which is expressed in a number of deaths per 1000 live births and Life expectancy expressed in total (Years). Thus, the data I employed for this study are annual time series data covering the period from 1991 to 2015 for 28 selected countries of the 47 Sub-Saharan Africa Countries. The original data for the InMTYrate (Infant Mortality rate, (per 1000 Live births), FTYRate (Fertility rate, total (births per woman), LifeEXP (Life expectancy at Birth, total (Years), GDP per capita (constant 2010 USD) were sourced from the World Bank Database Especially World Development Indicators. Prior to our empirical literature review early in this study, GDP Per Capita (constant 2010 USD), POPn (total population), and AGRI (% share of GDP), SERV ((% share of GDP) will be controlled in this study to examine the effect of economic growth on health. However, GDP per capita (constant 2010 USD) measure per capita income is used to measure national economic growth. In Barrio's research as well as in many other scholars' studies used either infant mortality rate, (per 1000 Live births) and Life expectancy at Birth, total (Years) interchangeably as a proxy for health. This paper outcome will be guided by clear definitions of variables. Infant mortality rate (per 1000 Live births) is the number of deaths of children under one year of age per 1000 live births which often use as an indicator to measure the death toll of infant mortality rate (InMTYrate). This is reasonably clear that factors upsetting populations' health status similarly influence the mortality infant rate thus; this paper will use it as a measure to capture the health consequence of a population. Several studies have used longitudinal data to look at fertility rate, total (births per woman) as a pivotal proxy variable to measure health in Africa and primarily SSA countries. However, in this research paper fertility rate, total (births per woman) represents the number of children that will be given birth to a woman if she were to live to the end of her reproduction years and bear children in harmony with age-specific fertility rates of the required year (Sup Lee and Soong, 2010). Life expectancy at Birth, total (Years) is denoted as an average number of years a newborn is anticipated to live if mortality patterns at the time of its birth stay constant within the future (See World Development Indicator 2010). This study uses it as an appropriate indicator of health for countries, which may help the study to capture the effectiveness of necessary health services delivery to the population within the country. GDP Per Capita is a measure of the average income earned per person in a certain area in a specified year. Living

standards and quality of life and social welfare is a means of evaluating and measure of citizens accessed to the good life by people in different areas. Services, in this case, are outlined as services that are provided by public institutions however not restricted to value added of wholesale and retail trade, transport, and government, financial, skilled, and private services like education, health care, and real estate services. Additionally, enclosed are imputed bank service charges, import duties, and any statistical discrepancies noted by national compilers likewise discrepancies arising from rescaling. Moreover, to relate with this study all these services amount to economic growth in one way or another. Agriculture is a key economic sector that has includes forestry, hunting, and fishing, equally cultivation of crops and farm animal production. Thus, this share of GDP support in promoting and provision of employment opportunities henceforth increase the financial gain to the public enhancing their standards of living. The addition of these proxy variables to growth in the model will help to measure the degree to which economic growth could change with changes in the proportion of service and agriculture shares in the economy. In connection with economic theory, this study hypothetically bases its prior expectation that there is a negative relationship between Economics growth (GDP Per capita) and infant mortality rate, (per 1000 Live births), fertility rate, total (births per woman) and a positive relationship between Life expectancy at Birth, total (Years).

Data Analysis Tool

This study focused to answer its core objectives, "the effects of economic growth on health" for understanding on how GPPC influences people health. We employed the STATA (13) statistical package to analyze the data using a panel data model, which suits the data collected. However, panel data is useful in this research because it is both time series and cross-sectional information and it gives a large number of observations to increase the degree of freedom and reducing the co-linearity among explanatory variables (See Baltagi, 2008). Other studies were done on panel data regression analysis also revealed that panel data improves empirical analysis and it gives more flexibility for modeling the behavior of cross-sectional units than conventional time series analysis (See Greene, (2003), and Gujarati, (2004). In previous studies of (Barro & Sala 2003) and (Mankiw, Romer, & Weil 1992) based on the panel regression framework in which they used about 25-39 years data. They revealed that an increase in the number of observations helps to improve the empirical analysis. Similarly, this study will also take a panel of 28 selected Sub-Saharan Africa countries and long period data of 25 years to confirm the previously cited researcher's empirical studies.

Model and Theoretical Framework

For this study to undertake the correct empirical analysis, literature is consistently built on the specification of the model to allow for the identification of the channels through which economic growth affect health outcomes over time. Assuming health to be Y and economic growth given as X, a simple linear panel data model of health outcomes econometrically can be given by:

$$Y_{jt} = \beta_{0_{jt}} + \beta_1 X_{jt} + \mu_{jt} \; j = 1 \ldots n \quad \text{……………………………………………………. (1)}$$

Where Y_{jt} is health outcomes, j =1.....28 countries, at time t = given year (1991-2015) and X is a vector of independent variables influencing health outcomes, and β_0 represents the intercept term, while β_1 is a vector coefficient of the independent variables. μ_{jt} the error term, which assumed normally distributed with zero mean and constant variance. By taking the natural logarithm of these specific variables, the linear relationship between health and economic growth specified as:

$$LnHth_{jt} = \beta 0_{jt} + \beta_1 lnInMTYRate_{jt} + \beta_2 lnFTYRate_{jt} + \beta_3 lnLifeEXP_{jt} + \beta_4 lnGDPPC_{jt} + \beta_5 lnAGRI_{jt} + \beta_6 lnSERV_{jt} + \beta_7 lnPOPn_{jt} + \mu_{jt}$$

…… *(2)*

In this study as mentioned early in the literature, infant mortality rate, fertility rate, and Life expectancy at Birth, total (Years) are adopted correspondingly as proxy variables for health, equation (2) above is re-specified into three equations as:

$$LnInMTYRate_{jt} = \beta_{0_{jt}} + \beta_1 lnGDPPC_{jt} + \beta_2 lnAGRI_{jt} + \beta_3 lnSERV_{jt} + \beta_4 lnPOPn_{jt} + \mu_{jt}$$

…… *(3)*

$$LnFTYRate_{jt} = \beta_{0jt} + \beta_1 lnGDPPC_{jt} + \beta_2 lnAGRI_{jt} + \beta_3 lnSERV_{jt} + \beta_4 lnPOPn_{jt} + \mu_{jt}$$

…… *(4)*

$$LnLifeEXP_{jt} = \beta_{0jt} + \beta_1 lnGDPPC_{jt} + \beta_2 lnAGRI_{jt} + \beta_3 lnSERV_{jt} + \beta_4 lnPOPn_{jt} + \mu_{jt}$$……

…… *(5)*

Where Hth= health, in this case, represented by health outcomes. InMTYrate = Infant Mortality rates (measured by mortality rate neonatal per 1000 Live births), FTYRate = Fertility rates, (measured by fertility rate, total births per woman), LifeEXP = Life expectancy (measured by Life expectancy at Birth, total (Years), GDPPC= GDP per capita (measured as GDP per capita constant 2010 USD), AGRI = Agriculture (measured as share % of GDP), SERV = Service (measured as share % of GDP).

Estimation Techniques

Ordinary Least Square (OLS)

The multiple linear regression analysis will be conducted for this study, since the explanatory variables are more than ones, so as to show the magnitude at which they can explain the dependent variables.

Fixed Effect

The fixed effects assumption is that the individual specific effect correlates with the independent variables. Additionally, the fixed effect facilitates to exclude time-invariant factors from the model by taking the difference between every observation among cluster mean values so as to induce eliminate the individuals specific effect term α_i.

$$E\ (\alpha i\ |Xit, Zi)\ \neq\ 0$$…… *(6)*

Random Effect

To test for individual effects, the random effects assumed that the individual specific effects are uncorrelated with the independent variables. For the model to certify its assumptions, coefficients of all variables in the model, time-invariant and time-variant will be estimated. Random effects model assumes no fixed individual specific effect, and its equation is specified as:

$$E\ (\alpha i\ |Xit, Zi) = 0$$ …… *(7)*

Therefore, α_i and $\square_{it}$ can be combined together to form a new error term $\sum_{it} = \alpha_i + \square_{it}$.

Therefore, we do need to take differences and all variables, no matter their time variability, will be included in this model.

Hausman Test

In order to decide on the theoretical basis of the model to use after estimation of the above models of Fixed Effects and Random Effects model. The Hausman Test is significant to test to make a correct decision between a fixed effects model and a random effects model as in most cases many scholars trust the Hausman (1978) specification test (see Greene 2008, 208-209). Hausman Test is used in this study to ascertain a violation of the random effects demonstrating assumption that the descriptive variables are orthogonal to the unit effects.

However statistically, if there is no correlation between the independent variable(s) and the unit effects, then estimates of β in the fixed effects model (βˆ F E) should be similar to estimates of β in the random effects model (βˆ RE). Then, the Hausman test is statistically summarizes as; H is a measure of the difference between the two estimates:

$= (\beta\hat{}RE - \beta\hat{}FE)\,[Var\,(\beta\hat{}FE) - Var\,(\beta\hat{}RE)]^{1}(\beta\hat{}RE - \beta\hat{}FE)$..... *(8)*

In the case of the null hypothesis of orthogonality, H is distributed chi-square with degrees of freedom equal to the number of regressors in the model. A result that $p < 0.05$ is taken as an indication that, at predictable levels of significance, the two models are dissimilar adequately to reject the null hypothesis, and hence to discard the random effects model in favor of the fixed effects model. If the Hausman test does not indicate a significant difference ($p > 0.05$), conversely, it does not certainly follow that the random effects estimator is "carefully" free from bias, and therefore to be favored over the fixed effects estimator.

EMPIRICAL RESULTS AND DISCUSSIONS

Descriptive Statistics

In this sub-section of the study, we will first start my discussion with the descriptive statistical findings by first examining the basic statistical characteristics of the data, concentrating only on the variables of highest interest, such as growth and health indicators (see Table 3). The mean GDP per capita in the SSA countries over the periods of 1991-2015 was 1652.49%. This proves economic growth have positive effects on health in SSA during the period under investigation. Given a standard deviation of 2260, mean that growth in SSA improves health outcomes over the entire period. Nigeria, Cape Verde, South Africa, and Guinea Bissau in SSA countries recorded the highest GDP per capita of 10% and above in 1991 at the sluggish take-off of the Africa economy period. The same countries recorded the highest GDP per capita consistently over the time Africa economy experienced recuperation from the world financial crisis although there exists a prediction of decline in 2015.

Table 3: Summary of Descriptive Statistics

Variables	Obs.	Mean	Std.Dev.	Min.	Max.	Skewness	Kurtosis
MTInrate	700	73.38386	27.64573	16.9	157.1	.6160491	3.015162
FTYRate	700	5.367927	1.153392	2.374	7.761	-.4794969	3.061348
LiefEXP	700	54.75757	6.556448	35.705	72.599	-.4794969	3.061348
GDPPC	700	1652.492	2260.313	161.8338	11925.95	-.0080744	3.148086
POPn	700	1.57e+07	2.64e+07	26.2464	1.81e+08	3.745018	18.96575
AGRI	700	26.81672	14.27165	1.828381	61.41626	.2562572	2.578495
SERV	700	44.4352	11.77769	5.903916	77.02007	-.8645323	4.735555

Source: *author's calculation using STATA 13*

The mean infant mortality rate per 1000 live births was 73.38 for the 28 selected SSA countries. There is a descending decrease in infant mortality rates in SSA countries if you critically observe the data trend over the period of (1991-2015). Cape Verde, recorded the lowest result in 2014 with only 17 deaths per 1000 live births, follow by South Africa (31.8), Botswana (33.1), Namibia (34.1), and Senegal with (34.9) deaths per 1000 live births while Mozambique had the poorest records of 157.1 and Sierra Leone with 154 in 1991. The mean Fertility rate, total (births per woman) was 5.4. The number of children per woman has successively reduced in some SSA countries over the period due to the strong link of GDP Per Capita to fertility rate. Again, Cape Verde, recorded the best result in 2014 with only 2.37 total children per woman, follow by South Africa (2.4), Botswana (2.8), Namibia (3.6), total children per woman, while Niger had the highest records of total children per woman of 7.761 in 1991 and Chad with 7.426 in 1993 respectively. According to the descriptive

statistics outcome in the above table, the performance of life expectancy in SSA countries relatively had been poor. On the other hand, life expectancy is high for Southern African countries, though the present HIV/AIDS shattering the region has severely inverted this earlier strong performance. Cape Verde registered the highest total life expectancy amounting to 72.6 years in 2015. This shows that Cape Verde in SSA is performing well on these health indicators, having achieved 65.2 years and above of total life expectancy dated back in 1991 and insistently maintain this lead until now.

Sierra Leone itemized the worst performance of 35.7 years in 1994 and Chad with 47.7 years consistently as from the period of 1991 to 2009 due to army conflicts that swamped the country for more than 18 years or so. Nevertheless, the country has slowly overcome this political instability, reaching a total life expectancy of more than 50 years in 2011 to 2015. Consequently, otherwise, in this study other controlled variables are imperative and the play vital roles in the model to determine the behavior of GDP per Capita.

The correlation matrix presented in **Table 4** indicates a negative relationship between Economic growth and health. As estimated, health is negatively related to GDPPC and service. The correlation between health and agriculture is positive and so is the correlation between health and population. The matrix also displays that there's no serious multicollinearity drawback within the data.

Table 4 Correction Matrix

	LnInmrate	Lnftyrate	Lnlifeexp	Lngdppc	Lnagri	Lnserv	Lnpopn
LnInmrate	1.0000						
Lnftyrate	0.7723	1.0000					
Lnlifeexp	-0.8271	-0.5218	1.0000				
Lngdppc	-0.5929	-0.7383	0.4125	1.0000			
Lnagri	0.5100	0.6731	-0.3153	-0.6852	1.0000		
Lnserv	-0.0789	-0.0330	0.1686	-0.1186	-0.4363	1.0000	
Lnpopn	0.1664	0.1224	-0.2018	-0.0887	-0.0318	-0.0311	1.0000

Source: *author's calculation using STATA 13*

Pooled OLS Estimation

In this study, I will first estimate the following equation (2) above in the methodology using Pooled OLS with the Pooled Least square model to clear out the doubt of the methodology review on which model should I use. Subsequently, the Pooled OLS Model is run by taking the natural logarithm of variables of interest in a linear relationship between health and economic growth by specifying this equation below.

$$LnInmtRate_{jt} = \beta_{0jt} + \beta_1 lnFTYRate_{jt} + \beta_2 lnLifeEXP_{jt} + \beta_3 lnGDPPC_{jt} + \beta_4 lnAGRI_{jt} + \beta_5 lnSERV_{jt} + \beta_6 lnPOn_{jt} + \mu_{jt} \quad \text{..... (2)}$$

However, in this case, to discover out the impact of economic growth, I utilized three options measures for health including the natural logarithm values of infant mortality rate per 1000 live births, Fertility rate, total (births per woman) and life expectancy (total years) all are measured in absolute number. Table 4 below reports the results of the pooled OLS and all estimations include the year and country dummies. Standard errors are robust, as heteroscedasticity has been taken care of, eliminated by use of robust in the STATA command while regressing and clustered at the country level.

Table 5: Effects of Economic Growth on Mortality Infant Rate (Pooled OLS)

	(1) cd	(2) td
VARIABLES	lnmtrate	lnmtrate
Lnftyrate	0.966***	0.341
	(0.0523)	(0.301)
Lnlifeexp	-1.918***	-1.518***
	(0.0770)	(0.268)
Lngdppc	-0.0462**	-0.0624
	(0.0231)	(0.0598)
Lnagri	0.0531**	0.0322
	(0.0233)	(0.0646)
Lnserv	0.0774***	0.0506
	(0.0296)	(0.0762)
Lnpopn	-0.0136***	-0.00401
	(0.00493)	(0.00287)
Constant	10.52***	10.06***
	(0.366)	(1.049)
Country Dummy	Yes	No
Time Dummy	No	Yes
Observations	700	700
R-squared	0.961	
Number of id		28

Note: *one dependent variable used is the natural log of infant mortality rate denotes "health" (column 1 "cd" denotes country dummies & "td" denotes year dummies)."Lnftyrate" denotes (fertility rate), "lnlifeexp" denotes (life expectancy),"lngdppc" denotes per capita income (constant 2010 USD), "lnagri" denotes (agriculture %.of GDP), "lnserv" denotes (service % of GDP) and "lnpopn" denotes (total population). Robust standard errors in parentheses at the country level are presented in parentheses, and *** p<0.01, ** p<0.05, * p<0.1.*

Table 5 above shows the estimated results of Pooled OLS on the effects of economic growth on health. The two explanatory variables are negative and statistically significant to explain health. This explanatory variable of POPn exhibited different sign which did not rhyme the predicted sign stated early in the methodology. Meanwhile, SERV, AGRI, Life expectancy and Fertility rate are positive and statistically significant to explain health. In this manner, the empirical results are reliable with the prediction of the study in that the findings of the effect of economic growth on health in SSA concurs with Creese (1992) and Pritchett and Summers (1996) in which both argued that "wealth is health". The truth that GDPPC has the anticipated signs as a variable of interest within the pooled OLS model shows that it's negative and statistically significant implies that income is a critical determinant of health in SSA. For instance, individuals who earn more income live a great standard of living, easy health accessibility, and thus infant mortality rates will diminish.

Fixed Effects Estimations

Having estimate equation (2) and re-specified it into three equations (3, 4 & 5) using the two-way fixed effects model to exclude the time-invariants and determine the individual specific effects in the model for better results to meet required objectives of this study. However, I utilized two-way fixed effect panel regression model to control for the effect of time trend and all of the invariant characteristics of infant mortality rate, fertility rate, and life expectancy with respect to time, by regressing each health proxy variable against all economic growth proxies to look at the effects of economic growth on health in SSA. As at first itemized within the estimation technique, the Hausman test is applied to affirm that fixed effect specification

are preferred to random effects specification for my data and the clustered standard errors at the country level are used throughout.

Table 6: Effects of Economic Growth on Infant Mortality Rate (FE Panel Regression)

VARIABLES	FE LnInmtrate
Lngdppc	-0.671***
	(0.0342)
Lnagri	0.287***
	(0.0352)
Lnserv	-0.0274
	(0.0427)
Lnpopn	-0.0334***
	(0.00892)
Constant	8.524***
	(0.350)
Year Dummy	Yes
Country Dummy	Yes
Hausman Test	328.58
	(0.0000)
Observations	700
R-squared	0.527
Number of id	28

Note: one dependent variable used is the natural log of infant mortality rate (column 1)."Lngdppc" denotes per capita income (constant 2010 USD), "lnagri" denotes (agriculture %.of GDP), "lnserv" denotes (service % of GDP) and "lnpopn" denotes (total population). The control variables are the same as in Table 4. Robust standard errors in parentheses at the country level are presented in parentheses, and *** p<0.01, ** p<0.05, * p<0.1.

The results in **Table 6** above show a marginal effect of economic growth on infant mortality rate including year and country dummies. The findings show that GDPPC, POPn, and SERV are more negative and statistically significant to explain infant mortality rate, while AGRI appears to have a largely positive effect on infant mortality rate. This negative relationship of GDPPC, POPn, and SERV to infant mortality rate implies better economic growth translate to better living standards for people. However, this finding agrees with (Preston, 1975 & 2007) assumptions that higher income allows people to spend more money on health-related goods and services like housing, leisure, education, and food. This will, in turn, leads to better health services that lead to a reduction in infant mortality rate as women will easily access healthcare services such as neonatal care during pregnancy and birth. This, therefore, means the health population through access to health service boost up by economic growth. In recent changes in Africa traditional believed of loving many children to an era of education, birth or fertility control, affect the supply of living children through the provision of better health services in some SSA countries e.g. South Africa, Egypt and Cape Verde among others. Meanwhile, education nowadays also changes attitudes, values, and beliefs toward small comfortable family norms and childrearing that is relatively costly to parents in terms of both time and money (see Weinberger, 1987) Secondly, indifference view, an alternative argument exists which indicates that increasing infant mortality rates discourage childbirth. In other words, child death in SSA is commonly due to poor health provision, so, increasing infant mortality rates will result in decreasing, rather than any reasons increasing, total fertility rates (see Narayan, 2006; Narayan, P.K. and Peng, X., 2006)

A unit decrease in POPn leads to at most 0.0334% in infant mortality rate; this implies that in Africa and Sub-Saharan Africa as a whole decline infant mortality rate in relation to population may be understood in different dimensions. In association to other studies findings, the work of Zhang and Zhang, (2005) recognized, that mortality decline decreases fertility and increases the resources in schooling, thus rising economic growth. In contrast, a fall in infant mortality rate raises population more than capital, thus decreasing per capita GDP (see Acemoglu & Johnson, 2007 and Young, 2005). Nonetheless, a %1 unit decrease in SERV leads to at most 0.008% in infant mortality rate infers that provision of better services and access to healthcare services for women such as natal care leads to fewer children died at birth, thus, infant mortality rate reduces. Finally, a %1 increases in AGRI leads to at most 0.287 in infant mortality rate. This positive association of agriculture, mortality rate, implies an increasing population growth, which brings deterrent for development that brings a liability on public expenditure for education, housing, and health services (see Coale and Hoover, 1958).

Robustness Check

To provide more support to my results in the regression below in **table 7 and 8** robustness check was taken care of simultaneously together within the regression. Therefore, the core regression coefficient estimates of the effects of economic growth on fertility rate and life expectancy standard errors were found in all the expected results to be robust. In **table 7 and 8,** respectively show that GDPPC has a significantly negative impact on the changes in fertility rate as well as a significantly positive impact on the pattern changes of lifespan. Again, heteroscedasticity has been taken care of eliminated by use of robust in the STATA command while regressing and clustered at the country level.

Table 7: Effects of Economic Growth on Fertility Rate (FE Panel Regression)

VARIABLES	FE Lnftyrate
Lngdppc	-0.257***
	(0.0156)
Lnagri	0.141***
	(0.0161)
Lnserv	-0.00857
	(0.0195)
Lnpopn	-0.00750*
	(0.00408)
Constant	3.122***
	(0.160)
Country Dummy	Yes
Time Dummy	Yes
Hausman Test	328.58
	(0.0000)
Observations	700
R-squared	0.461
Number of id	28

Note: one dependent variable used is the natural log of fertility rate (column 1)."Lngdppc" denotes per capita income (constant 2010 USD), "lnagri" denotes (agriculture %.of GDP), "lnserv" denotes (service % of GDP) and "lnpopn" denotes (total population). The control variables are the same as in Table 5. Robust standard errors in parentheses at the country level are presented in parentheses, and *** p<0.01, ** p<0.05, * p<0.1.

The results of the fixed effect model on the effect of economic growth on Fertility rate in **Tables 7** above including year and country dummies for SSA countries show that GDPPC, POPn, and SERV were still more negative statistically significant to explain fertility rate and AGRI remain positive and statistically significant as well. The main findings indicate that a %1 decreases in GDPPC leads to at most 0.257% in fertility rate. This negative relationship implies that better economic growth translates better living standards for people. In other words, the negative relationship of GDPPC to fertility rate in SSA can be ascribed to an increase in income through women participation in workforces; family planning, female schooling, for instance, an increase in the female education level is predictable to shrink fertility rates. (See Narayan, 2006, Brewster & Rindfuss, 2000; Lehrer and Nerlove,1986). In recent changes from Africa traditional believed of loving many children to an era of education, birth or fertility control, affect the supply of living children through the provision of better health services in some SSA countries e.g. South Africa, Egypt among others. Meanwhile, education nowadays also changes attitudes, values, and beliefs toward small comfortable family norms and childrearing that is relatively costly to parents in terms of both time and money (see Weinberger, 1987) Secondly, indifference view, an alternative argument exists which indicates that increasing infant mortality rates discourage childbirth. In other words, child death in SSA is commonly due to poor health provision, so, increasing infant mortality rates will result in decreasing, rather than any reasons increasing, total fertility rates (Narayan, 2006; Narayan, P.K. and Peng, X., 2006) A unit decrease in POPn leads to at most 0.007% decreases in fertility rate; this implies that in Africa and Sub-Saharan Africa as a whole decline in fertility rate, in relation to population. Within the work of Zhang and Zhang cited before remained relevant here that infant mortality rate decline decreases fertility and will increase the resources in schooling, therefore rising economic growth. Nonetheless, a %1 unit decrease in SERV results to at most 0.027% in fertility rate, this infers that provision of higher services and access to healthcare services for women like birth preventing, therefore, reduces fertility rate as an example, girls access to education, birth health services like data concerning birth prevention could encourage tries to regulate childbearing via a wide good range of contraceptive (Narayan, 2006). If women participation will increase within the share of the labor force is additionally seemingly to possess a negative impact on fertility rates (Brewster & Rindfuss, 2000; Lehrer and Nerlove,1986). Finally, a %1 increases in AGRI leads to at most 0.14% increase in fertility rate. This positive association of agriculture, fertility rate implies an increasing population growth, which brings an obstacle for development that brings liability to public expenditure for housing, health, and education.

Table 8 underneath reports the regression results of the economic effect on life expectancy I estimated the health equation (6) by different explanatory variables using two-way fixed estimation methods for 28 countries. However, the findings show that GDPPC, POPn, and SERV have a strong positive and statistically significant impact on life expectancy, while AGRI has a statistically negative significant effect on life expectancy. This indicates that a %1 increase in GDPPC leads to at most 0.19% increase in life expectancy total years. This positive relationship between GDPPC and Life expectancy agreed with (Preston, 2007) studies in which he applied a logistic model to depict the relationship between income per capita and life expectancy at birth for many countries all over the world in three consecutive periods of 1900, 1930, and 1960. According to him, he reasoned that life expectancy is empowered by factors like living standards, vaccines, and antibiotics. In connection to the cited studies, this paper argued that in spite of the fact, few countries in SSA are classified under third

developing world of middle-income per capita countries they may at some point do have high life expectancy like Cape Verde with about 80 years.

Table 8: Effects of Economic Growth on Life Expectancy (FE Panel Regression)

VARIABLES	FE Lnlifeexp
Lngdppc	0.196***
	(0.0118)
Lnagri	-0.0508***
	(0.0122)
Lnserv	0.0503***
	(0.0148)
Lnpopn	0.00654**
	(0.00309)
Constant	2.523***
	(0.121)
Year Dummy	Yes
Country Dummy	Yes
Observations	700
R-squared	0.419
Number of id	28

Note: one dependent variable used is the natural log of life expectancy (column 1)."Lngdppc" denotes per capita income (constant 2010 USD), "lnagri" denotes (agriculture %.of GDP), "lnserv" denotes (service % of GDP) and "lnpopn" denotes (total population). The control variables are the same as in Table 4. Robust standard errors in parentheses at the country level are presented in parentheses, and *** p<0.01, ** p<0.05, * p<0.1

This implies that increment growth deduces better access to housing, education, health services, and other things, which tend to improved health, lower rates of mortality and higher life expectancy, moreover concurred with the findings of (Preston, 1975) of his reprinted studies on "The Changing Relation between Mortality and Level of Economic Development" On the other hand, absence of violence and presence of political solidness in some SSA countries, for instance, Algeria, Senegal, Morocco, and Cape Verde permit access to basic health services hence increased life expectancy total years. A % 1 increase in POPn leads to at most 0.006% life expectancy total years; however, population increase in developing countries like SSA can be understood in labor viewpoint which normally reflected by a bigger increase in the younger population. This increase labor productivity leading to increased economic growth, which sees an increase in the provision of basic amenities to people and this will lead to a decline of fertility rate. However, the above explanation agrees a few researcher's findings (see Feng et al, 2013) and Ross, 2004), they identified that working-age population increase contributes to the labor force that's act as a condition that drives economic growth. Nevertheless, a %1 increase in SERV leads to at most 0.05% in life expectancy total years means better services access, for instance, healthcare, good sanitation, and education, which defined a reduction in mortality rate and infertility henceforth, long live. Population health is impacted as it were by the economic well-being of people and families but moreover by the civic and economic imperativeness of their communities. Finally, a %1 decreases in AGRI leads to at most 0.05% decrease in life expectancy total years. This decreased in life expectancy should be trace from the viewpoint of agricultural labor, which implies that agricultural activities in Sub-Saharan Africa are labor-intensive. To

increased agricultural output means, more hours of labor and this could have a negative impact on the health of people hence leading to shorter life spans. Although, there are other related factors such as shortages of foods, children's malnutrition in SSA contribute to poor health reducing life expectancy total years.

CONCLUSIONS AND RECOMMENDATION

This paper anticipated that the literature that studies the effects of economic growth on health is rising. Thus, the objective of this study is to contribute to the current literature from the perspective that economic growth determines health services in Sub-Saharan Africa. The underlying variables employed in this study are GDPPC, POPn, AGRI (% share of GDP), SERV (% share of GDP) as economic growth proxies and MTInrate (Infant Mortality rate, (per 1000 live birth), FTYRate (Fertility rate, total (birth per woman), LifeEXP (Life expectancy at birth, total (years) as health proxies. The variables are chosen primarily based upon a review of existing literature and used to elucidate health in SSA using the Pooled OLS model and two-way fixed effects procedure on health in the three-regression test to determine the direction of their relationship.

The results show that nearly all designated variables have statistically significant negative effects on health over the period of this study. The general findings of this study show that GDPPC has a robust negative impact on mortality infant rates, fertility rate and positive sturdy positive effect on life expectancy. These effects of GDPPC is much negatively strong on health in a sense that a better economic growth translates better living standards for people that result in a reduction in infant mortality rate as women can easily access healthcare services like infant care throughout pregnancy and at birth. Moreover, GDPPC negative relationship to fertility rate in SSA is associates to income upsurge due to women participation in workforces; birth prevention, female schooling, for example, rise within the female education level is anticipated to scale back fertility rates as they take longer in studies and career development. Consistent with this study finding, Population is negatively associated to each infant mortality rate and fertility rate; this suggests that in Africa and Sub-Saharan Africa, as a full decline in infant mortality rate in respect to population reduces fertility and it should end up in will increase the resources in schooling, therefore rising economic growth. Additionally, services negatively influence infant mortality rate and fertility rate. This infers that provision of higher services like healthcare services for women such as natal care ends up in fewer children died at birth, thus, reducing the infant mortality rate. While, as an example, women access to education, birth health services like data regarding birth prevention might encourage tries to regulate childbearing via a good vary of contraceptive. Again, if women participation will increase within the labor force have a negative impact on fertility rates. The positive relationship between agriculture, infant mortality rate, fertility rate, might imply a rising increase that brings associate obstacle for development that brings problem on public expenditure for health services, education, and housing. Moreover, the negative association between agriculture and life expectancy implies that in Sub-Saharan Africa agriculture activities are labor-intensive. To extend agricultural output mean that a lot of hours of labor and this might have a negative impact on the health of individuals reducing life spans. Although, different factors like foods shortages, children's malnutrition in SSA contributes to poor health, which will cut back, lifespan total years.

This study concluded that economic growth has strong negative effects on health outcomes in SSA and so, it will remain an important determinant to improve and rising health standard in

Sub-Saharan Africa countries, though SSA is, characterize with the unstable trend of economic growth and impoverished health facilities.

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