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Health and long run Economic Growth

in African Union Countries:

Panel data Analysis from 1995-2018

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Panel data Analysis from 1995-2018

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By

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ABSTRACT Health and long run Economic Growth

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Panel data Analysis from 1995-2018

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"At the beginning of the 20th century, average global life expectancy at birth was below 40 years and the per capita Gross Domestic Product (GDP) was less than sixth of its recent". This study will investigate the association between health on one hand and productivity and incomes on the other hand, in African countries.

"Africa began to experience its first positive per capita income growth around 1995, a trend that would accelerate through the first decade of the twenty-first century" (Michael P.Todaro, 2012). The literature also showed that "health is one of the most important components of human capital and it can affect the production level of a country in many ways.

Ensuring healthy lives is at the heart of both the global and Africa's Agendas"(Ibrahim, 2015). Agenda 2063 recognizes that investing in human capital development through quality education and health services will be a cornerstone of the development of the African continent. Under Aspiration number one, which envisions a prosperous Africa built upon inclusive growth and sustainable development, Goal number three focuses on increasing citizens' access to good health and nutrition. "Indeed, income growth rates have varied greatly in different developing regions and countries, with rapid growth in East Asia, slow or even no growth in sub-Saharan Africa, and intermediate levels of growth in other regions where 24 out of 31 (77.41%) countries are low income, 21 out of 47 (44.68%) countries are low middle while 8 out of 60 (13.33%) are in upper income economic"(Ibrahim, 2015).

However, recent studies which conducted "descriptive analysis of health indicators with focus on income groups around the world have shown that, high-income countries have health than people in developing countries. Therefore, health is one of the important components of human capital. This can affect the level of production of a country in different ways". This brings up the idea of looking for what about African countries.

This research "studied the link between health and per capita GDP growth income in African nations by applying a granger prediction test". Unbalanced panel set during the year 1995 until 2018 was used. The life expectancy and fertility rate were used as indicators of health status. Current health spending, domestic private health spending, economic explanatory variables for inflation while high school enrollment were used as explanatory variables

for education. The results of all regression models were seen to be highly significant with 0.1% significance level. The coefficient is 0.2279695, 0.3150284 and 0.2521377 respectively, which means that adding one percent to the education budget will automatically increase income growth with 0.22, 0.31 and 0.25 percent respectively. These results indicate that in increasing 1 percent of current health expenditure increases per capita GDP growth by 0.0759655 (7.60%). Fertility rate negatively affects economic growth in all regression model's coefficient for fertility is equal to -0.5053267 as first regression demonstrated. "Health and Economic Growth in African countries means that one percent increase (decrease) in fertility results in 0.50 percent decrease (increase) in per capita GDP growth. Similarly" (Lopez, 2007) and (Barro, 1996) found that fertility negatively affects economic growth. The results showed that the proportion of fertility negatively impact per capita GDP growth. Granger's prediction test revealed that "per capita GDP growth and current health expenditure, enrollment secondary school and inflation have bidirectional connectivity relationships" (Granger, 1969). The previous studies on health indicators from both developed and developing countries of the world indicated that high-income countries are better off in terms of Health. Thus, it is very important to improve health policies in income developing countries.

Keywords: Health, long run economic growth and African Union.

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한국어 초록

아프리카 연합 국가의 건강 및 장기 경제

성장:1995-2018 년 패널 데이터 분석

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"20 세기 초,출생 평균 글로벌 기대 수명은 40 년 미만이었고 인당 국내 총생산량(GDP)은 최근 6 위 미만이었습니다." 이 연구는 아프리카 국가에서 한 손으로 건강과 생산성과 다른 한편으로는 소득 사이의 연관성을 조사 할 것입니다. "아프리카의 경험하기 시작했다는 그것의 첫번째 긍정적인당 국민 소득 증 1995 년,트렌드는 것을 가속화를 통해 첫번째 십년간의 twenty-first century"(Michael P.Todaro,2012). 문헌을 보였는"건강은 하나의 가장 중요한 요소는 인간의

자본과에 영향을 미칠 수 있는 생산 수준의 국가에서 많은 방법이 있습니다. 건강한 삶을 보장하는 것은 글로벌 및 아프리카의 의제"(이브라힘,2015)의 핵심입니다. 일정 2063 인식하는 것에 투자하는 인적 자본 개발을 통해 양질의 교육과 의료 서비스의 초석이 될 것입의 개발의 아프리카 대륙입니다. 아래 포부 숫자 중 하나는 계획의 번영 아프리카에 내장 포괄적 인 성장과 지속 가능한 개발,목표를 세 번에 초점을 맞추고 증가하는 시민들의 접근을 좋은 건강과 영양을 공급합니다. "사실,소득 증가율이 크게 변화하에서 다른 발전 지역 및 국가들과 함께 빠른 성장 동아시아에서,느려지거나 심지어 성장에 사하라 사막 이남의 아프리카 및 중급 수준의 성장이 다른 지역에서는 24 31 일(77.41%)국가 낮은 소득,21 47(44.68%)국가 낮은 중간 동안 8 의 60(13.33%)에 위 소득한 경제"(이브라힘,2015).

그러나,최근의 연구를 실시"설명하는 분석의 건강지표로에 초점을 소득 그룹 전 세계의는,소득이 높은 국가들이 건강보다 사람들은 개발도상국의 국민입니다. 따라서 건강은 인적 자본의 중요한 구성 요소 중 하나입니다. 이 영향을 미칠 수 있는 수준의 생산의 국가에서 다른 방법으로". 이 아프리카 국가에 대해 무엇을 찾고의 아이디어를 제공합니다.

이 연구는"공부하 사이의 링크를 건강과 인당 GDP 성장률은 소득에서 아프리카 국가에 적용하여 그 예측 테스트"입니다. 1995 년까지 2018 이 사용 된 기간 동안 균형이 잡히지 않은 패널 세트. 기대 수명과 불임율은 건강 상태의 지표로 사용 하였다. 현재의 건강을 지출,국내 개인 건강을 지출,경제의 설명변수에 대한 인플레이션하는 동안 고등학교 입학했으로 사용 설명변수에 대한 교육입니다. 모든 회귀 모델의 결과는 0.1%중요도 수준으로 매우 중요한 것으로 나타났습니다. 계수는 0.2279695,0 입니다.3150284 및 0.2521377 각각 어떤 의미는 하나 추가%증가의 교육 예산이 자동으로 증가 소득 증 0.22.0.31 과 0.25%로 각각합니다.

v

이러한 결과는 인당 현재 건강 지출 증가의 1%가 0.0759655(7.60%)에 의해 GDP 성장의 증가를 나타냅니다. 출산율에 부정적 영향을 미치는 경제적 성장이 모든 회귀분석 모델의 계수를 위한 다산과 동일하 -0.5053267 첫 번째로 회귀 증명하고 있습니다. "아프리카 국가의 건강과 경제 성장은 불임의 1%증가(감소)가 0 을 초래한다는 것을 의미합니다.인당 GDP 성장의 50%감소(증가). 마찬가지로"(로페즈,2007)와(Barro,1996)불임은 경제 성장에 부정적인 영향을 미치는 것으로 나타났습니다. 결과는 불임의 비율이 인당 GDP 성장에 부정적인 영향을 것으로 나타났다. 그의 예측 테스트 밝혔는"인당 GDP 성장 그리고 현재 건강을 지출,등록등학교과 인플레이션 양방향 관계를 연결"(Granger,1969). 이전 연구에의 건강지표로서 선진국과 개도국의 세계를 표시하는 높은 소득 국가는 건강의 관점에서. 따라서,소득 개발 도상국의 건강 정책을 개선하는 것은 매우 중요합니다.

키워드:건강,장기 경제 성장과 아프리카 연합.

학생증 번호:2019-27833

Table of Contents

ABSTRACT	i
한국어 초록	iv
List of Tables	x
List of Figures	xiii
CHAPTER I. GENERAL INTRODUCTION	1
1.1 Background of the research	1
1.2 Statement of the Problem	2
1.3 Criticism of the existing research	2
1.4 The objectives of the research	7
1.4.1 General Objective	7
1.4.2 Specific Objectives	7
1.5 Research questions	7
1.6 Hypothesis	8
1.7 Anticipated Problems and Limitation	8
1.7.1 Problems	8
1.7.2 Limitations of the research	8
1.7.2.1 Limitation of existing studies	9
1.8 Significance of the research	9
1.9 Organization of the research	10
CHAPTER II. LITERATURE REVIEW	11
2.1 Theoretical framework	11
2.1.1 Health and Economic Growth	11
2.1.2 Prerequisite for an improved health Care	12
2.1.3 Health and poverty	13
2.1.4 Human capital indicators	14

2.2 Empirical Literature Review	18
2.3 Theoretical Models Presentation	21
2.3.1 Models	21
2.3.2 Theoretical framework	23
4.1.2 Health sector development in observed countries	26
4.1.2.1 Health Reform in Rwanda	27
4.1.2.2 Health reform in Italy	27
4.1.2.3 Health reform in Sweden	28
4.1.2.4 The four stages of reform in Sierra Leone	29
4.1.2.5 Health reform in Liberia	30
4.1.2.6 Health reform in South Korea	31
CHAPTER III. RESEARCH METHODOLOGY	32
1. Data and Measurements	32
1.1. Data source	32
1.2 Measurements	32
1.2.1 Dependent Variable (DV)	32
1.2.2 Independent Variables (IV)	33
A) Economic Variables	33
B) Social demographic variables	33
1) Health measurements	33
2) Education measurements	34
C) Region, income economies status and observed countries	35
1) Dummy variables by region	35
2) Dummy variables by income economies status	35
3) Dummy variables by observed countries	36
2. Methodology	36
2.1 Analysis Plan	36

2.2 Method	37
2.2.1 Observation analysis	37
2.2.2 Statistical tests	37
2.2.3 Linear regression Model	39
2.3 Method of estimation	39
2.3.1 Unit root test	39
2.3.2 Choice of countries for analysis	40
CHAPTER IV: FINDINGS AND INTERPRETATION	42
4. 1 Summary and descriptive statistics	42
4. 2 Comparative descriptive analysis of health measurements	43
4.2.1 The fertility for women	43
4.2.2 The trends of Life expectancy	45
4.2.3 Unit root test	48
4.2.4 Regression Results	48
4.4.5 Results discussion	51
4.5.1 Granger causality test	52
CHAPTER V: CONCLUSION AND RECOMMENDATIONS	54
5.1. Empirical findings	54
5.2. Policy Recommendation	55
5.3 Recommendation for further studies	56
5.4 Conclusion	56
REFERENCES	57

List of Tables

List of Tables	x
List of Figures	xiii
CHAPTER I. GENERAL INTRODUCTION 1.1 Background of the research	1
	1
1.2 Statement of the Problem	2
1.3 Criticism of the existing research	2
1.4 The objectives of the research	7
1.4.1 General Objective	7
1.4.2 Specific Objectives	7
1.5 Research questions	7
1.6 Hypothesis	8
1.7 Anticipated Problems and Limitation	8
1.7.1 Problems	8
1.7.2 Limitations of the research	8
1.7.2.1 Limitation of existing studies	9
1.8 Significance of the research	9
1.9 Organization of the research	10
CHAPTER II. LITERATURE REVIEW	11
2.1 Theoretical framework	11
2.1.1 Health and Economic Growth	11
2.1.2 Prerequisite for an improved health Care	12
2.1.3 Health and poverty	13
2.1.4 Human capital indicators	14
2.2 Empirical Literature Review	18

2.3 Theoretical Models Presentation	21
2.3.1 Models	21
2.3.2 Theoretical framework	23
4.1.2 Health sector development in observed countries	26
4.1.2.1 Health Reform in Rwanda	27
4.1.2.2 Health reform in Italy	27
4.1.2.3 Health reform in Sweden	28
4.1.2.4 The four stages of reform in Sierra Leone	29
4.1.2.5 Health reform in Liberia	30
4.1.2.6 Health reform in South Korea	31
CHAPTER III. RESEARCH METHODOLOGY	32
1. Data and Measurements	32
1.1. Data source	32
1.2 Measurements	32
1.2.1 Dependent Variable (DV)	32
1.2.2 Independent Variables (IV)	33
A) Economic Variables	33
B) Social demographic variables	33
1) Health measurements	33
2) Education measurements	34
C) Region, income economies status and observed countries	35
1) Dummy variables by region	35
2) Dummy variables by income economies status	35
3) Dummy variables by observed countries	36
2. Methodology	36
2.1 Analysis Plan	36
2.2 Method	37

2.2.1 Observation analysis	37
2.2.2 Statistical tests	37
2.2.3 Linear regression Model	39
2.3 Method of estimation	39
2.3.1 Unit root test	39
2.3.2 Choice of countries for analysis	40
CHAPTER IV: FINDINGS AND INTERPRETATION	42
4. 1 Summary and descriptive statistics	42
4. 2 Comparative descriptive analysis of health measurements	43
4.2.1 The fertility for women	43
4.2.2 The trends of Life expectancy	45
4.2.3 Unit root test	48
4.2.4 Regression Results	48
4.4.5 Results discussion	51
4.5.1 Granger causality test	52
CHAPTER V: CONCLUSION AND RECOMMENDATIONS	54
5.1. Empirical findings	54
5.2. Policy Recommendation	55
5.3 Recommendation for further studies	56
5.4 Conclusion	56
REFERENCES	57

List of Figures

igure 1: Status of per capita GDP growth in African and OECD countries 2018	
Figure 3: Preston curve	16
Figure 4: Fertility rate trends in Rwanda, Liberia and Zambia	
Figure 5: Fertility rate in Italy, Rwanda and Sweden	45
Figure 6: Life expectancy trends in Rwanda and Sierra Leone	46
Figure 7: Trends of Life expectancy in Japan, Rwanda and Korea Re	public 47

CHAPTER I. GENERAL INTRODUCTION

1.1 Background of the research

Economic growth is closely related to the improvement of human health and longevity. This relationship is intertwined because health affects the economic development and population as well. Health is considered an vital aspect of people's life and continued financial and public progress as well. Alma-Ata Declaration recognizes "that health would contribute to both better quality of life and global peace and security"(Pandey, 2018) . Bloom also mentioned that "Health has become equally important as all other economic and social concerns, such as unemployment, low wages and high cost of living" (Bloom D. E. Canning, 2004) and according to UNDP "the most basic human capabilities that are leading along life, being knowledgeable, and enjoying a decent standard of living"(UNDP, 1990), "and can be represented by health, education and income which are seen as the foundation of human development. In addition, health is always the priority among the basic needs people wish to have in life".

1.2 Statement of the Problem

According to World Bank, "African countries encounter different evidence on what to comes as priority to improve population health. These countries also face problems related to a poor economy where 26 out of 31, 20 out of 47 and 8 out of 60 African countries are classified in the groups of low, middle and upper middle income economies, respectively" (World Bank.2020).

The main economic and health problems are linked with below-average life expectancy, increase of under five years mortality rates, poor academic performance, absence of quality health care, poor governance, and poor health outcomes. A good number of studies suggest that investing in people will be required for better solutions to non-income poverty, and for enhanced skills for the new economy, opportunity for all to participate, and greater growth through higher levels of human capital once country's revenue is measured for. This shows that a "nation's level of economic development is what matters for population health" (Acemoglu, 2007), (Aghion, 2011), (S. Cervellati M., U, 2015a), (Bloom D., 2014), (Bloom D. E. Kuhn, 2015b), (Böhm S., 2017), (Bloom D. E., 2017).

1.3 Criticism of the existing research

Each of these researches in this field contributed to the understanding health and economic growth, but their respective explorations diverted due to diverse perceptions: on different samples of regional integration economic grouping, category of income countries classification and geographical countries (by region). Therefore, this research explored some important variables which were not looked at in the previous studies and findings brought new information which will be used in decision making of African economic development.

In particular, the current work (David E. Bloom, David Canning et al. 2019), in a comprehensive research on economic growth and health: merging both macro and micro results, proved that the results and their consistency with the micro-based method of assessing the return on health substantiate the claim that public health measures are an important lever for nurturing economic progress. Being financial secured is a general factor for health but it does not but it does not automatically assure full health of a human being.

In order to provide a more comprehensive analysis that builds on these researches, even though other researchers suggested that being economically stable does not guarantee improved health status, the research revealed that "the relationship of income and health is rather more complex and contradictory" (Tekabe, 2012). Moreover, (Tekabe, 2012). Researches carried out in chosen African countries and the findings of the health indicators in different world income groups showed that "developed countries have better health status, a more reliable research on health and economic development" (Tekabe, 2012) showed that "health has been a historically important source of cross-country income variation".

Different important studies, (Acemoglu D., 2007) showed that "1% increase in life expectancy leads to a 1.7-2% increase in the population size but it raises aggregate GDP

to a lesser extent". Therefore, based on the results, "a better health condition of the population reduces income per capita". (Aghion, 2011) but (Bloom D., 2014) disagreed with the previous evidence (Acemoglu, 2007). "Countries with lower initial health status have greater potential for health improvement, but at the same time have lower economic growth potential. Include initial life expectancy as an indicator of initial health in regressions". (Bloom D., 2014) show that there is a positive causal effect of better health on economic growth.

According to (WB, 2020) "mortality is also extremely high, and in Mali there are 102 deaths per 1,000 live births". These evidence could have possibly shown any reduction in African population rates, but the family planning problem led it to the opposite result. In addition, according to the report on African Governance, (Ibrahim, 2015) showed that at the continental level, "citizens ' dissatisfaction with basic health services has increased over the past decade". According to available data, "there are 17 qualified health workers per 10,000 people in Africa, compared to more than 117 per 10,000 in the United States (USA)".

The researchers noted such problems, but none of them revealed results in all African countries. It should be noted that the "How" analysis becomes more meaningful as the differences take into account conditions between African countries. For example, the "What" analysis shows that high health spending, life expectancy is much greater in advanced countries. In addition, a study found that narrowing health gaps between countries between the mid-20th century and 1990 was an important source of income

convergence. "While good health be a form of human capital that has a positive impact on productivity, income should also influence health in a positive way. Thus, this research will attempt to see the relationship between health variables and per capita income using a granger causality test and see whether the relationship for the sampled groups is bidirectional or not. It will analyze the impact of Health on per capita GDP growth income by taking health of life and economic growth in African Union (AU) countries: Cross-data on fertility and life expectancy rate as health indicators. The model also included other variables that had to be determinants of economic growth, such as economic and social demographics to make the population healthier. Based on the model of Barro's study on the determinant of economic growth" (Barro, 1996).

In the following figure showed that GDP growth of African states is poor terms while in OECD member countries are better.



Figure 1: Status of per capita GDP growth in African and OECD countries 2018

Source: World Development Indicators, 2018

1.4 The objectives of the research

1.4.1 General Objective

The core objective of this study is to explore the link between GDP per capita income and health in African Union countries.

1.4.2 Specific Objectives

One important specific objective of this research is to reveal if per capita income growth is affected by health. Though there are other analysis which have been conducted in line with health indicators and how they affect economic growth, this study will emphasize if the relationship really exists.

1.5 Research questions

Considering the problem statement and the research objectives, at the conclusion of this research, the next queries were answered:

1. What are the relationships between health on the one hand, and productivity and income on the other?

2. What explains the extreme differences between developing and developing countries in terms of development results?

3. What needs to be done to achieve economic development and make people healthier?

1.6 Hypothesis

Null Hypothesis (H₀): β_1 , β_2 , β_3 , β_4 , β_5 ... β_{κ}

The level of per capita GDP growth might be influenced by current health expenditure, inflation, life expectancy, fertility and secondary school enrollment rates can influence economic growth and make the population healthier.

Alternative Hypothesis (H₁):

At least one of them is β_j different from zero.

1.7 Anticipated Problems and Limitation

1.7.1 Problems

This study has one key limitation which is missing and inaccurate data for some of the target countries. The fact that this study used secondary data, it has some incomplete information from some countries which can led to false analysis and conclusion.

1.7.2 Limitations of the research

In this research secondary data for 54 countries was pulled out from trustworthy international and they were analyzed using panel analysis. One of the limitations is that the data may be old and out of date. The second is that within the selected countries, some data were missing.

1.7.2.1 Limitation of existing studies

The different studies done in the same areas have had the following limitations:

- Focused on the African regional integration economic groupings for include ECOWAS for Western Africa, COMESA for countries South and East of the Sahara in, Eastern, Central and Southern Africa- SADC, which involves some country members of COMESA and the EAC, which also draws some members from COMESA and SADC. Arabic connection belongs to Arab Maghreb Union (AMU). IGAD covers the horn of Africa (Kenya, Uganda, Somalia, Djibouti, and Ethiopia) and SACU involving the Republic of South Africa and its neighboring states (Botswana, Namibia, Lesotho and Swaziland). Some of the countries are also members of OPEC (Oil producing countries) and the Organization for Islamic Countries (OIC).
- The studies concentrated efforts on classifying African countries according to their categories of income.
- The studies focused on geographical location where available data is only for Sub-Saharan countries.

1.8 Significance of the research

Africa is one of the developing continent likely to economically develop because of its economic potential. To be able to do this, there is a need to identify its strength and areas of improvement to succeed and contribute to the economic and development goals by allocating appropriate resources in health sector and investing in human resources to be able to have more healthy and productive human capital. Therefore, this research was is chosen to clearly highlight the link between GDP growth rate and health in African Union countries, so that countries can work on factors that can improve their economic performance.

The contribution of this research is to provide empirical evidence or conclusions that help decision makers solve the health and economic policy problems of African countries. This research will generate new information, which could help in the identification and selection of appropriate means to reach goals defined by African countries on economic development. The findings will be useful during formulation and implementation of development policies. The findings of the research will contribute to a better understanding of the benefits of investing in health. This appreciative is very important for economic policymaking and should contribute to human and socioeconomic progress. Academically, the findings will be useful as a contribution to the ongoing studies on health and economic development.

1.9 Organization of the research

This research is organized as follows: the first chapter gives the general introduction, The second part covers a review of the literature in which some academic and experimental research, defines different concepts, chapter three includes methodology and data analysis, followed by chapter four on findings and interpretation of results. The chapter five which include empirical findings, policy recommendation as well as conclusion of the study.

CHAPTER II. LITERATURE REVIEW

2.1 Theoretical framework

2.1.1 Health and Economic Growth

From the beginning of 1990s, several researches have tried to explore the determinants of economic development using few variables to give its explanation and health is one. "Sustained growth depends on the levels of human capital whose stocks are increasing due to better education, higher levels of Health and new learning and training procedures. The effect of human capital variables implies that the investment rate tends to increase as educational levels rise and health rise" (Lopez, 2007). "Up to the second half of the 1990s, the role of human capital was mainly related only to education. Few authors have recognized the importance of other factors such as health and nutrition to impact per capita GDP growth. (Barro, 1996) was one of the economic analyst who studied the association between health and economic growth., and this served as an inspiration to further studies and health. (Lopez, 2007) pointed out that good health is a critical part of complete wellbeing. Built on economic arguments, good health boosts levels of personnel, which positively results into good yields and contributes to economic development". Healthier population increases labor performance by improving effectiveness, and reducing the time wasted for sick leave. Moreover, employees who are in good health feel both mentally and physically energetic. Thus, effectiveness of the work force. In developing countries, the result of poor labor market is stronger due to the fact that a high number of workforce is more involved in manual work than in

developed countries. "By improving population health and its indicators, individuals will also be encouraged to save and work towards improving the mortality rate and increase life expectancy which will of course increase labor force and boost economic growth" (Weil, 2005). Having a clear picture of the relationship of wealth and health is crucial. "Though influences productivity but also income has an influence on health status. Getting better income will contribute to the use of the healthier goods like medicine and food" (Lopez, 2007).There is also a hope of improving standards of living and efficiency at place of work. The impact of health on economic development is either caused by external factors like rate of technological advancement and saving rates or knowledgebased economy, that is, investment in human capital and innovation. Thus, it is worthwhile to cautiously examine their relationship.

2.1.2 Prerequisite for an improved health Care

In 2003, "a world report was published emphasizing that the gap on life expectancies between developing and developed countries was expanding. A Japan child had a life expectancy of 82 years, whereas a child born in Sierra Leone had an average life expectancy of about 34 years, and of which more than 16 percent was spent in ill health" (WDI, 2020). It was the same case in Angola and Afghanistan as well. "Whilst AIDS is the death leading disease in Africa, coronary artery disease and other non-infectious diseases are destroying taking countless lives in the world" (Lopez, 2007). "To get away from poverty, the LDCs should invest in health. "Public health and epidemiological programs will help to quicken the vicious circle features of poverty and poor health

creating complementarities within other forms of human capital, such as education or sustainable fertility rates for families. In Fact, parental decisions of investing in their children's education increases life expectancy by decreasing the expected deaths from infant mortality".

2.1.3 Health and poverty

"International organizations such as IMF (International Monetary Fund), OECD (Organization for Economic Cooperation and Development), UN (United Nation) and WB (World Bank) have made the reduction of poverty one of their most important priorities" (WDI, 2020). "Among the seven international development goals, three of them are directly related to health. The first is to reduce the proportion of people living in extreme poverty by half between 1990 and 2015. By taking different macroeconomic indicators of health such as life expectancy, mortality of children under five years and prevalence of tropical and infectious diseases such as Malaria and HIV AIDS, industrialized countries with higher per capita income have lower mortality rates, and the prevalence of HIV in high income countries are as low as 0.3 percent" (WDI, 2020).

"Per capita GDP is an index for economic growth and well-being, we can say that wealth and health are positively related. According to the World Health Organization" (Website, 2020e), "Income (financial wealth) together with education is said to be a key determinant of health. Nutrition and child feeding practices improve higher levels of income. Moreover, sanitary hygiene such as hand washing, and disposal of feces are also positively correlated with per capita income of a country". "The poor people generally would postpone their medical needs because of money problems. The poor will not be able to public clinics simply because they cannot afford their health costs". "Higher income promotes accessibility to improved health facilities, better nutrition, clean water and sanitation, education and medical care" (Bloom D. E. Kuhn, 2015b). "Developing countries with low per capita income struggle with the prevalence of tropical diseases and HIV AIDS" (Bloom D. E. Canning, 2004), "some diseases such as malaria that may not have a high mortality effect might have more negative impact on the economy because of their high morbidity burden". More to that, "mortality due to HIV AIDS is said to have negative and significant indirect effect on long-term economic growth because deaths due to this disease are highly concentrated among youth adult men and women leading to higher dependency ratio. With all the positive benefits of growth in per capita income", (Bloom D. E. Canning, 2004) states, "improvement in health will prevail even if income remains fixed. Especially in developing countries, low cost tropical disease interventions bring large-scale returns in saving people lives".

2.1.4 Human capital indicators

"The fertility and mortality rates have been considered as a measure of health because of the accuracy in most previous studies. There are also other measurements such as, morbidity (illness) rates and disability days or sick leaves that can be useful for measuring health". "Life expectancy is usually used in many cross-country growth regressions and is generally found to be positive and significant on the rate of economic growth" (Bloom D. E. Canning, 2004). "The authors explain how human capital, such as a skilled labor force, is important for capital formation. For this, experience and technical innovations that take years of investment in research and development is important. (Preston, 1975), have shown an empirical cross-section relationship between life expectancy and per capita GDP growth income in his well-known 'Preston Curve'. Preston studied the relationship for the 1900s, 1930s and the 1960s and found the correlation coefficient between the logarithm of national income per head and life expectancy was 0.885 in the 1930s and 0.880 in the 1960s. The curve clearly shows the relationship between GDP per capita and life expectancy is positive''.

Figure 1: Preston Curve for GDP per capita and Life Expectancy

The Preston Curve below shown is the empirical cross section relationship between life expectancy and real per capita income (GDP per capita). It uses the function L (i) = $6.6354\ln(i) + 10.754$ to model the average life expectancy (i) given a countries real per capita income (GDP per capita) i.

Figure 2: Preston curve



Source: Wikipedia, 2020

The health improvement "leads to the reduction of Infant and maternal mortality which in turn will increase population number, which is believed to decrease fertility, stabilize population growth and generate demographic dividend through lowering of dependency among youth". "On the contrary, another argument for this can be the increase of population, especially in Africa south of the Saharan countries, where the large number of population is a problem. The benefit from better health may perhaps be offset by the decline of per capita income if the economy does not have the power to absorb the rising population. On the other hand, diseases that do not lead to death, but which greatly influences the health and performance of an individual will negatively influence productivity. If appropriate consideration and attention is not taken, HIV AIDS is an example for the previous statement because the disease can make a patient dependent on others. However, if People with HIV AIDS get appropriate medical treatment and sufficient diet, they can work, perform and produce" (Bloom D. E. Canning, 2004): "Even though the causal effect of health on individual productivity and economic growth is accepted, the argument for using health as an input depends on it being low-cost health intervention that can increase population health without first having a high income level". "There is, however, a higher number of such interventions that can be applied (Commission on Macroeconomics and Health.2001). Thus, African countries can start by having such kind of low-cost intervention to deal with such health issues. In most cases, higher education indicates better health. The model of Grossman indicates that education raises marginal product of the direct inputs for producing health, so it reduces the quantity required to produce a given amount of gross investment." Therefore, it is indicated that "health can be achieved at a very minor cost for knowledgeable people simply because they are more likely to make a better choice in regards to health food than people with less education" (Folland, 2010). According to (Bloom D. E. Canning, 2004), "a healthy child has better school attendance and a good learning capacity. Secondly, reduced deaths and longer life span will encourage individuals, family and communities to invest in human capital". Among the factors, influencing poor school attendance in less developed countries there is school drop out in developing countries which is caused by illness, lack of food and other poverty-related issues. Though in rural

areas a big number of families has now understood of school importance, they still don't send their children to school because of their poor living standards. The factors mentioned above do not only affect education but also income levels of African countries as well.

2.2 Empirical Literature Review

"After identifying the importance of human investment towards economic development, a number of scientists have conducted experimental studies on the subject of health and economic growth" (Barro, 1997) said "higher initial schooling and life expectancy, lower fertility, lower government consumption, better maintenance of rule of law, lower inflation and improvement of terms of trade enhance economic growth". He took "panels of 100 countries from 1960 to 1990, and he incorporated figures for Africa south of the Saharan countries". (Bloom D. E. Canning, 2004), intended to include "health in a wellspecified collective production function to experiment the presence of an outcome of health on labor productivity, and to determine its strength. They assessed a production function model of aggregate economic growth including work experience and health. They have used a panel of countries observed every 10 years over 1960–90. Their top result is that health has a positive and statistically significant impact on aggregate output of the labor force". It was concluded that "the life expectancy effect in growth regressions appears to be a real labor productivity effect and are not the result of life expectancy acting as a proxy for worker experience". "They suggested that a one-year improvement in a population's life expectancy contributes to a 4 percent increase in
output". (Kambiz, 2011), "analyzed the relationship between health and economic growth in Organization Islamic Conference (OIC) member states (i.e. Indonesia, Iran, Pakistan, Bangladesh, Burkina Faso, Saudi Arabia, Kirgizstan, Kuwait, Mali, Malaysia, Egypt, Somalia, Uzbekistan, Tajikistan and Turkey). They used panel data for the years of 2001-2009 using the framework of a Semi log regression model". :They followed the (Bhargava, Jamison, Lau, & Murray.2000) model where; economic growth is a factor of real gross domestic product, ratio of investment to GDP, openness degree of economy, life expectancy (in adults) and fertility rate". They omitted the ratio of investment to GDP and openness degree of economy because it is not effective in OIC member states. The result reveals that "increased life expectancy has enhanced economic growth in these countries". "They also found that fertility has a negative effect on economic growth (Hashmati, 2001), studied conditional convergence of OECD countries in gross domestic product (GDP) and Health Care Expenditure (HCE) per capita the paper is an extension of the augmented Solow model suggested" (Mankiw, 1992) "by using health expenditures as a proxy of health status in the growth function. He also considered the existence of causality relationship between GDP and Health Care Expenditure (HCE) and found that the relationship is one way from HCE to GDP". The results indicate that "OECD countries converge at 3.7 percent per year to their steady state level of income per capita, suggesting that health care expenditure has positive effect on the economic growth and the speed of convergence, but unlike" (Mankiw, 1992) "the inclusion of human capital is found to be insignificant in the growth model". (Mankiw, 1992), "also found the effects of human capital to be data specific and sensitive to the model

specification and estimation methods used". (Lopez, 2007) "estimated the relationship between health and growth of OECD member countries for the period of 1960-1990". They showed that countries "having more health expenditures leads to higher economic growth. They also pointed out that investing in health is an crucial element for economic output. They have concluded that "education is not the only effective factor in labor force performance and its productivity but also health". (Weil.2005) "performed microeconomic evaluations to examine the influence of health on economic growth. His aim was to measure the role of health in justifying income discrepancies between developed and developing countries and also to calculate the income benefits that would comet from an improved health of individuals from poor countries. He used data on three indicators of health: average height of adult men, the adult survival rate (ASR) for men, and age of menarche (onset of menstruation) for women". It was revealed that "eliminating health differences among countries would reduce the variance of log GDP per worker by 9.9 percent, and reduce the ratio of GDP per worker at the 90th percentile to GDP per worker at the 10th percentile from 20.5 to 17.9. This effect is economically significant, but substantially smaller than estimates of the effect of health on economic growth that derived from cross-country regressions". Barro (1996) has found that "10 percent of the increase in life expectancy will lead to almost 1/2 percent increase in economic growth". "His empirical finding for a panel of 100 countries states that growth is positively related and enhanced by higher initial schooling and life expectancy, lower fertility, lower government consumption and better maintenance of the rule of law, lower inflation and improvement of terms of trade". "From the literatures reviewed, most of the researcher substitute health with life expectancy, mortality rate or health expenditure per capita. Most of the studies found that good health raises human capital. Health also has a positive and significant impact on economic growth. Moreover, researchers have agreed that the causal relationship of health and per capita income must be investigated to clearly see their relationship. Some studies show that the relationship of per capita income and health variable has a bidirectional, but others found it to be just one way. Therefore, it is important to study not only the impact of health on economic growth but also the causal relationship of health and per capita GDP for low income countries such as; Ethiopia, Kenya Rwanda, Tanzania and Uganda. These countries are among the lowincome countries of the African continent and it would be useful to work on the improvement of their health sector to improve their economic growth".

2.3 Theoretical Models Presentation

2.3.1 Models

""The Solow-Swan exogenous growth model has been a benchmark for subsequent growth models. This model was published based on the Cobb-Douglas production function and equation of capital accumulation. The main assumptions behind the model are; the existence of diminishing returns in the factor of production (capital and labor) and accepts the constant returns to scale and there is a constant proportion of saving from household income". Therefore, "the production side determines output when firms maximize profit taking as given the constant proportion of output that is saved by households and used for capital accumulation"(Thanasis, 2009). "By acknowledging human capital as an vital tool for long lasting growth, the Solow model was also broadened to bring in human labor as an important element for economic growth" (Mankiw, 1992) added human capital to the Solow model and came up with a humancapital extended Solow-swan model. "Human capital is believed to directly contribute to production in the extended model. For endogenous, growth theorist's economic growth is primarily the result of endogenous variables such as human capital, innovation and knowledge". "These variables are significant contributors to economic growth" (Romer, 1992). The Schumpeterian perspective states that "the basic idea of endogenous growth theory is that technological progress is the driving force behind long run growth. Endogenous growth models are useful to understand why advanced economies and the world as a whole can continue to grow in the long run despite the workings of diminishing returns in the accumulation of physical and human capital" (Barro, 1996). "The simplest form of endogenous growth model is that output per capita is a function of capital and technology (AK model), where; K - includes both physical and human capital and it represents the volume of capital".

A - is a level of technology which is positive and constant.

"Thus, the model assumes a positive constant level of technology k and capital, which includes human capital. This model did not make an explicit distinction between capital accumulation and technological progress. To estimate the effect of health on economic growth, health is considered as a component of human capital in aggregate production function". This is in line with the augmented Solow model, used by (Mankiw, 1992). "Endogenous growth theory differs from neoclassical theory in emphasizing that technological progress is itself an economic process, with economic determinants much like the process of capital accumulation". Lucas model also stated, "health status of a population as a determinant of the supply of healthy labor force" "so health will influence the accumulation of knowledge by improving learning capacity. Barro, who was a Neoclassical economist, considered health as a human capital because health is a capital productive asset and an input for economic growth. Among his contributions, the Economic Growth model was one of them". Barro focused on "human capital as a determinant of economic growth. i.e. Education, Health and social capital are considered to be Human Capital". (Grossman, 1972), also developed a model showing that "illness prevents work so that the cost of ill health is lost labor time". Human capital theory of Grossman states, "Individuals invest in themselves through education, training and health to increase earnings." Therefore, "health can be analyzed as a capital good similar to consumption and investment goods. He also pointed out that a higher wage yields a higher optimal level of health stock. The return of being healthy is greater for higher wage workers, so increased wages will increase health capital" (Folland, 2010).

2.3.2 Theoretical framework

"Within the stream of Neoclassical growth model or exogenous growth model, Solow studied economic growth by assuming a neoclassical production function with decreasing returns to capital, the rate of saving and population growth considered as exogenous. In Solow's model, the rate of saving and population growth determine the level of per capita income across countries" (Hashmati, 2001). Solow's model indicates that "countries with higher savings will have higher per capita income holding other things constant and long-term economic growth is taken to be constant". It was concluded that "there is no long-term growth but the introduction of exogenous technological progress can bring long term growth".

The model is as follows:

 $Q = AK^{\alpha}L^{\beta}$

And:

Q stands for Total production

A stands for Total factor productivity

K stands for Capital inputs

L stands for labor inputs

 α and β are the output elasticity of labor and capital.

He also pointed out that "an increase in capital input would increase both output and labor productivity, an increase in total factor productivity would increase labor productivity. However, an increase in labor input (corrected by the rate of technological progress and the rate of depreciation) would decrease labor productivity because of diminishing returns to scale. Even though the Solow growth model is a good starting point for explaining growth, it does not take into account other determinants of growth such as human capital" (Hashmati, 2001), "presented the human capital augmented Solow growth model by including variables such as educational attainment. The addition of human capital into the model Health and Economic Growth in selected low-income countries of African south of the Sahara: Cross Country Evidence is said to help to explain the differences in output levels across countries. That is, countries that invest more in education are anticipated to be in a better position regarding their income level than countries that do not invest in education".

The following is the basic version of Solow model which includes human capital.

$$Q = AK(t)^{\alpha} H(t)^{\beta} [A(t)^{\alpha} L(t)^{\beta}]^{1-\alpha-\beta}$$

Q=Output K (t)= Capital at time t

H (t)= Health at time t

"A(t) L(t) = productivity augmented labor Where $\alpha,\beta \in (0,1)$ and $\alpha+\beta \in (0,1)$ and t denotes time. This implies that the production function exhibits constant returns to scale in its three factors: physical capital (K), human capital (H), and productivity-augmented labor (AL). The above function is the motivation for the model of this research". "The model is further extended by including variables that are expected to affect long run economic growth in the selected African member countries". Economic theories and previous researchers such as (Barro, 1996) and (Folland, 2010) suggested that "factor accumulation: physical capital, labor and human capital; technological progress; institutions are the components potential source of economic growth. Based on economic grounds, good health raises levels of human capital, and this has a positive effect on individual productivity and economic growth rates" (Lopez, 2007). "Better health increases labor force productivity by reducing incapacity, weakness, and the number of days lost to sick leave. Moreover, healthier workers are physically and mentally more energetic and thus effective on the labor market. The effect of having less productive labor is stronger in developing countries, because a higher proportion of the workforce is engaged in manual labor than industrial countries"(Lopez, 2007). In addition, countries with high income tend to increase their spending on health care because health country because health is one of the determinants of quality life. Thus, when income increases, it influences the increase of health care and health expenditure. There is no evidence that per capita income and health have two-way relationship. A big number of high income countries have more advanced health care systems in place while developing countries have high fertility rate and low life expectancy. There is another argument of high population in African countries which make the economy incapable to accommodate the increase population.

4.1.2 Health sector development in observed countries

This research shows case studies of Italy, Korea Republic, Sweden, Liberia, Rwanda and Sierra Leone. Both developed and developing countries understand that health is an important factor for economic growth. From six countries three among them are developing countries and rest are developed countries. The three of Africa continents have similarity of some explanatory variables from the initial year of research. In this case, initial year of this research was from 1995 until 2018. Liberia, Rwanda and Sierra

Leone had similar information on mortality rate of children under five and fertility at initial research but in 2018 were declined very sensibly. However, there is a vast difference among the three one in terms of their level of health and economic development. Sweden is most advanced followed by Korea Republic, Italy, Rwanda, Liberia and Sierra Leone.

4.1.2.1 Health Reform in Rwanda

"After the 1994 Genocide against the Tutsi, the Rwandan health system was characterized by a high degree of centralization and free provision of health services and many important reforms have taken place. Rwanda is among the few countries to have achieved universal health coverage due to its vision of inclusiveness, equity, and comprehensive and integrated quality service delivery, with a focus on primary health care (PHC). Rwanda's health sector has made tremendous progress in improving the health status of the population. These improvements are mirrored by the improvements in access to health care services and utilization of those services. According to Rwanda annual health statistics, the PHC utilization rate increased from 0.81 to 0.94 visits per inhabitant from 2009 to 2013" (Website, 2020e).

4.1.2.2 Health reform in Italy

In the past, the "National Health Service has been targeted by a number of policies aimed at containing or even reducing health expenditure without reducing the provision of health services to patients. To date these efforts have been largely successful in that regional deficits are now under control and health services continue to be delivered according to the prescribed national benefit package. However, with current fiscal constraints putting a strain on health services, Italy also faces a number of entrenched health system challenges like the relationship between politics and top management and primary care as well". Currently, "most regional policies seem to have returned to integration, namely through the reattribution of some independent hospitals to local health authorities, the concentration of purchasing activities in regional or supra-organizational entities and the enlargement of the size of local health authorities" (Website, 2020a).

4.1.2.3 Health reform in Sweden

Swedish healthcare is decentralized, and the regional councils have its full responsibility. "The role of the central government is to establish principles and guidelines, and to set the political agenda for health and medical care. Swedish policy states that every regional council must provide residents with good-quality health and medical care, and work to promote good health for the entire population". "Costs for health and medical care as a percentage of Sweden's Gross Domestic Product (GDP) is stable and on par with most other European countries. In 2018, health and medical care represented around 11 percent of GDP. The bulk of health and medical costs in Sweden are paid for by regional and municipal taxes. Contributions from the national government are another source of funding, while patient fees cover only a small percentage of costs" (Website, 2020b).

4.1.2.4 The four stages of reform in Sierra Leone

"Sierra Leone's Health Sector Reform started in mid 1992 and moved through four distinct stages: 1. The Health Sector Seminar and the development of the National Health Policy 2. The development and adoption of the National Health Action Plan (NHAP) 3. Adjustment of the NHAP and the development of the Core Program 4. The Social Sectors Donors Meetings The process and outcome of each of these stages are examined next".

Stage 1: "The Health Sector Seminar and the National Health Policy which aims at providing adequate manpower both in number and quality for the effective delivery of health care services throughout the country".

Stage 2: "The Development and Adoption of the National Health Action Plan which, through a technical support grant held in trust by the World Bank, supported a series of participative trainings and specific consultancies necessary for the development of the National Health Action Plan (NHAP)".

Stage 3: "The Core Program to ensure that the reform would achieve a significant part of its impact. The Core Program was developed based on the highest priority programs in the NHAP, and the overall cost was approximately a half of the full NHAP". Stage 4: "The Donors Meetings: in May 1994, a meeting was held and the Department of Health presented Sierra Leone's National Health Policy, the National Health Action Plan, the Core Program, and detailed financial plans for the NHAP and the Core Program, together with a proposed Implementation Program. The Social Sectors Meeting of October 1995 This meeting took the same format as the one 18 months earlier, and allowed participants to review progress in the reform's implementation and set the agenda for work over the following year".

4.1.2.5 Health reform in Liberia

"Liberia has 4 million people and a life expectancy at birth of 60 years (male) and 63 years (female). Its health, economy had population were affected by civil wars and Ebola. With the highest number of reported Ebola deaths among the affected countries" (4,244, MoH situation report March 2015)," Liberia was declared Ebola-free in June 2016 and has been tackling the disease's socio-economic impact". To support the country to recover from the crisis and rebuild the health system, the Universal Health Coverage was introduced. "An essential package of health services is prominent in the current National Health and Social Welfare Policy 2011-2021. The plan also emphasizes strong partner coordination through mutually reinforcing measures at national and sub-national levels, leading to the country compact in 2017 as a core step towards improved aid effectiveness" (Website, 2020d).

4.1.2.6 Health reform in South Korea

"Before 1977, Korea had only voluntary health insurance. In 1977, President Park Chung-Hee and the legislature approved a law that officially obliged medical insurance for personnel and their dependent relatives in large firms with more than 500 employees and later it was extended to various groups in the community. Clearly, South Korea had adopted Japan's health insurance system as a model which was in three areas: (1) the administrative structure of the system, (2) the choice about who would be covered, and (3) the policy for mobilizing financial resources for the system".

The arithmetic of health care reform in South Korea was that "the battleground between those for medical insurance union and those against it has encompassed three policy discussions. The first one talks about the decline of income disparity between rich and poor. Those for unification insist that unification will reduce the income inequalities that exist between industrial employees and the self-employed.

The second policy debate centers around the issue of government financial assistance to the NHI system. Kim Dae-Jung, once a political prisoner and then a Nobel Peace Laureate, when he became Korea's president, used the issue of NHI administration to consolidate his power. President Kim chose unification not because he agreed with its policy objectives, but because he felt that it would more effectively empower the political base of his government. The third policy debate involves how to equitably impose insurance premiums on the workforce throughout the nation. Korean workers are represented by two different labor organizations, which take opposite positions in this debate"(Website, 2020c).

CHAPTER III. RESEARCH METHODOLOGY

1. Data and Measurements

1.1. Data source

This research used mainly secondary data collected from 1995-2018 from different sources. Note that the poor-quality data in healthcare with dimensions of inaccuracies and inconsistencies data are due to the information reported by providers influenced by political power or international donors that play a big role in African countries health sector.

1.2 Measurements

1.2.1 Dependent Variable (DV)

"Economic growth is the dependent variable of this research and it will be measured by per capita GDP growth rate from world development Indicators" (WDI, 2020). As defined by the World Development Indicators (WDI, 2020) "GDP growth rate at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products".

1.2.2 Independent Variables (IV)

A) Economic Variables

Current health expenditure (% of GDP): "Level of current health expenditure expressed as a percentage of GDP. Estimates of current health expenditures include healthcare goods and services consumed during each year. This indicator does not include capital health expenditures such as buildings, machinery, IT and stocks of vaccines for emergency or outbreaks" (WDI, 2020).

Inflation, consumer prices: "Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The Laspeyres formula is generally used" (WDI, 2020)

B) Social demographic variables

Country income differences are historically based on health. In 1900, "before the largest declines in mortality took place, health variation accounted for almost 20 percent of income inequality" (Daniel.Gallardo-Albarrán, 20018). Fertility was chosen as it is the top indicator to measure health condition. In addition, they are other factors associated with the population's health in general. The following points will be focused on the health measurements.

1) Health measurements

"Fertility **rate and Life Expectancy** are taken as indicators for health status. Barro's research and other studies interchangeably use either life expectancy child mortality rate

as an indicator for health. In this research, life expectancy and mortality are taken as proxies for health because the data are more comprehensive".

Life expectancy at birth "indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life"(WDI, 2020).

Fertility rate, (total births per woman): Some studies define fertility rate as "an important variable for economic growth especially for African countries. Total fertility rate represents the number of children that would be born to a woman if she were to live to the end of her childbearing years and bear children in accordance with current age specific fertility rates" (WDI, 2020).

2) Education measurements

No country has ever developed without having hard working citizens. When people do not work, obviously, there is no productivity. However, good leadership with an efficient coordination will always be a driving force to the development. For example, when we say quality education it is more of problem-solving skills, learning from others and relating several things to benefit from them. Education of children should start from conception. Children who get better education at an early age, have school readiness skills and fully prepared to learn with diverse social skills. Therefore, we include school enrollment in primary as a necessary control variable. "There is some evidence that healthier children are also better able to take advantage of schooling, for example, through reduced absenteeism and greater mental alertness while at school"(Bleakley, 2007).

Secondary school enrollment, (gross percentage): Education is key in terms of human labor growth. "Gross enrollment ratio is the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown. Secondary education completes the provision of basic education that began at the primary level and aims at establishing sustainable learning and human development, by presenting more subject or competency-based instruction using more specialized teachers" (WDI, 2020).

C) Region, income economies status and observed countries

1) Dummy variables by region

Regional figures capture a large share of the variation in geography. The ones used here are by World Development Indicators: Sub-Saharan Africa (SSA), South Asia (SOA), East Asia & Pacific (EAP), Latin America & Caribbean (LAC), Middle East &North Africa (MENA), North America (NA), Europe & Central Asia (ECA), none Sub-Saharan Africa and World. In addition to regional dummies population density will be identified as an important control variable in improving better health as outcome.

2) Dummy variables by income economies status

Income Economies status, by region information and observed countries are dummies that capture a large share of the variation in health and economic status. The ones used here are by World Development Indicators: High Income, low income, low-middle income and Upper income economies were considered as dummy variables during the research.

3) Dummy variables by observed countries

The countries selected during this research are Italy, Sweden, Korea Republic, Rwanda, Liberia and Sierra Leone.

2. Methodology

2.1 Analysis Plan

The following elements will be considered:

- Summary and descriptive statistics calculated: standard deviation, mean minimum and maximum calculations was done to describe the characteristics of data in African countries.
- Bivariate analysis: A bivariate analysis was conducted to determine association between variables.
- Multivariate analysis: multivariate analysis was performed to check the strength of the association between health and economic growth variables. The following table shows the statistical description of all variables including dummies variables. It was calculated by using STATA software. It shows the overall information about the variables.

2.2 Method

2.2.1 Observation analysis

The analysis of per capita income and health by regions will be done using an excel graph. The idea is to draw lessons that could guide the future formulation and implementation of development policies in country members Africa Union. The observed countries for this research are six (Rwanda, Italy, Sierra Leone, Liberia, Sweden and South Korea) among member states to represent a regional. The countries identified for inclusion in the research on the basis of the following criteria: (1) similarity on high performance and low performance countries on initial of fertility rate, life expectancy at birth, mortality rate and Unemployment for female adult & youth; (2) These countries are considered as role model in developing and developed countries member of "50-30" club; (3) secondly similarity of policy development plans, (4) the success of economies story and lastly their geographical location.

2.2.2 Statistical tests

To agree with the analysis and to focus on the main objective of the study, STATA was used to perform statistical analysis. (Baltagi, 2008), stated that "panel data is useful to utilize both time series and cross sectional information and it gives large numbers of observations, increasing the degree of freedom and reducing the collinearity among explanatory variables". "Panel data improves empirical analysis, and it gives more flexibility for modeling the behavior of cross sectional units than conventional time series analysis" Gujarati, 2004). "They used long year data (about 20-39 years data) to increase the number of observations and to improve their empirical analysis" (Mike Allen, 2017). This research will also take panels of all African countries during a period of 23 years (from 1995 to 2018) in order to generalize findings at African continental level. Univariate analysis will be used to present variables using descriptive analytical methods (mean, standards deviation, Minimum and maximum). Bivariate analysis was analyze the relationship between dependent variables and different applied to independent variables. Chi-square, P-Value and the confidence interval at 95% will be calculated consequently to each variable to decide and to reveal if there is a significance the relationship. Multivariate analysis will also be used to determine the strength in of the relationship between GDP per capita growth rate and other independent variables. All independent variables will be put together to test the relationship between them. The social demographic variables were considered during research are total life expectancy at birth, total fertility, and School enrollment secondary. Furthermore, region, income economies and observed countries were used as dummy variables in this research of health and economic growth of African countries.

2.2.3 Linear regression Model

Linear regression Model: This model is very usable for numeric continuous variables

and we will use the beta regression model for rates.

 $Y = \beta_{0+} \beta_1 \chi_{1+} \beta_2 \chi_{2+} \beta_3 \chi_{3+} \beta_4 \chi_{4+} \beta_5 \chi_5 \dots \beta_{\kappa} \chi_{\kappa+} \varepsilon$

Where,

Dependent variable: Y

Independent (or control/explanatory) variables: xi

Dummy variable: χ_d

Coefficient: β_1 , β_2 , β_3 , β_4 , β_5 ,..., β_{κ}

Constant term (Intercept): β_0 and then Error term: ϵ

The standard linear regression will be performed to test the model and for estimation and granger test will be used to test the relationship between per capita GDP income and health variables.

2.3 Method of estimation

This research will first explore the statistical characteristics of the data collected before estimating the econometric models. The test below will be used to validate the dataset.

2.3.1 Unit root test

In this research, statistical test were used to test. "It is an important step to test for stationary of the data to avoid a false regression that would lead to inaccurate conclusion.

Among the available panel unit root tests" (Im–Pesaran–Shin, 2003), and (Fisher-type, 2016) tests are undertaken "because these tests allow for unbalanced panels". "Both the Im-Pesaran-Shin and Fisher-type tests relax the restrictive assumption of Levin-Lin-Chu".

2.3.2 Choice of countries for analysis

The observed analysis of health and economic growth by income groups or regions will be done using an excel graph. The main point is to learn from this analysis and take some lessons that could guide the future design and execution of development policies of Africa Union country members. The selected countries for this research are six (Rwanda, Italy, Sierra Leone, Liberia, Sweden and South Korea) among member states to represent the region. The countries identified for inclusion in the research on the basis of the following criteria: (1) similarity on high performance and low performance countries on initial of fertility rate, life expectancy at birth, mortality rate and Unemployment for female adult & youth; (2) These countries are considered as role models in developing and developed countries member of "50-30" club; (3) secondly similarity of policy development plans, (4) the success of economies story and lastly their geographical location.

Variables	Italy	Korea,	Sweden	Liberia	Rwanda	Sierra
	U	Rep.				Leone
Current health expenditure	7.58	4	7.4	4.02	4.26	11.52
Fertility rate, total (‰)	1.19	1.63	1.73	6.16	6.17	6.61
Per capita GDP growth rate	2.89	8.47	3.45.		37.54	-7.88
Life expectancy at birth, total	78.17	73.7	78.74	48.31	31.04	37.08

Table 1: Similarity and dissimilarity of indicators in observed countries at initial period (1995)

CHAPTER IV: FINDINGS AND INTERPRETATION

This chapter discusses the results of the research and interpret the results to be able to respond to the research questions and then if the null hypothesis will be accepted or rejected.

4. 1 Summary and descriptive statistics

Variables stationary tested	Obs	Mean	Std. Dev.	Min	Max
Year	2,425			1995	2018
Life expectancy at birth, total	2,425	1.75	0.45	0.02	3.24
Fertility rate, total	2,425	4.23	0.14	3.67	4.45
School enrollment, secondary	2,425	4.27	0.50	1.82	5.10
Current health expenditure	2,425	1.75	0.45	0.02	3.24
Per capita GDP growth	2,425	0.86	1.10	-6.35	4.80
Inflation, consumer prices	2,425	1.19	1.20	-5.07	18.33
By region	2,425	0.007	0.074	0.00	1.00
By income economies	2,425	0.005	0.069	0.00	1.00
By Observed countries	2,425	0.01	0.07	0.00	1.00

Table 2: Data description

Source: Researcher elaboration, 2020

Notes: This table is composed by both economic and social demographic variables and it shows that the data are normally distributed because mean standard deviations are closed.

4. 2 Comparative descriptive analysis of health measurements

4.2.1 The fertility for women

This research revealed that per capita income is also affected by high fertility rate. (Barro, 1996) found that fertility negatively affect per capita GDP.

The figure below shows that the fertility of Rwanda, Gambia, Liberia and Zambia from initial year was around 6.1%, but with good health sector policy done by different countries.



Figure 3: Fertility rate trends in Rwanda, Liberia and Zambia

Source: Researcher elaboration, 2020

The figure shows that the countries like Rwanda, Liberia and Zambia had been converged in health sector. In the context of developed countries, Rwanda performed well on this variable against Italy and Spain as the Countries member of club of "50-30".



Figure 4: Fertility rate in Italy, Rwanda and Sweden

Source: Researcher elaboration, 2020

4.2.2 The trends of Life expectancy

The life expectancy in countries, which are similar like Rwanda at the initial research period, was Sierra Leone with LE around 31-37 years. Now Rwanda has reached at 68 while Sierra Leone's Life Expectancy was at 54 years in 2018.



Figure 5: Life expectancy trends in Rwanda and Sierra Leone

In 1995 South Korea had 73 of life expectancy against 31 of Rwanda. In 2018, South Korea was 82 while Rwanda was at 68. These two countries went extra miles to improve life expectancy of the population.



Figure 6: Trends of Life expectancy in Japan, Rwanda and Korea Republic

Note: This figure showed that Unemployment for youth in Rwanda, Pakistan and South Korea at initial period was 0.63%, 1.04% and 6.01% while in 2018 it was 1.69%, 7.69% and 10.40% respectively.

Source: Researcher elaboration, 2020

4.2.3 Unit root test

Table 3: Unit root test

Variables stationary tested	Coef.	Std. Err.	t	P>t
Lag Life expectancy at birth, total	0.72	0.24	3.02	0.00
Lag total Fertility rate	-0.81	0.25	-3.26	0.00
Lag School enrollment, secondary level	-0.43	0.19	-2.23	0.03
Lag Current health expenditure	-0.49	0.07	-6.94	0.00
Lag Per capita GDP growth	0.19	0.05	3.92	0.00
Lag Inflation, consumer prices	0.06	0.02	2.27	0.02

Notes: p < 0.05, ** p < 0.01, ***

"The above variables have turned out to be stationary with different significance levels". Thus, demonstrated by augmented Dickey Fuller test through intercept, trend and intercept and then none at the level of 1% and 5% (Mackinnon, 1998). A stationary process has the property that the mean, variance and autocorrelation structure do not change over time" (Wooldridge, 2002).

4.2.4 Regression Results

The following table shows how the regression model 1 was performed to check the significance of the variable relationship.

Regression 1: Per capita income= f (current health expenditure, inflation, school enrollment, life expectancy and fertility rate).

Regression 2: Per capita GDP growth= f (current health expenditure, inflation, school enrollment and fertility rate).

Regression 3: income growth = f (current health expenditure, inflation, school enrollment and dummies variables).

In this research, fertility rate is expected to negatively affect per capita income while current health expenditure, life expectancy, inflation and school enrollment are seen to positively affect per capita income in African countries by principal of right sign and significance results.

Independent variables	Regression 1		Regression 2		Regression 3	
	Coef.	P>t	Coef.	P>t	Coef.	P>t
Current health	0.07***	0.00	0.07	0.00	0.07***	0.00
expenditure	(8.86)		(8.76)		(8.05)	
Inflation	0.08***	0.00	0.08***	0.00	0.07***	0.00
	(4.31)		(4.18)		(3.87)	
Life expectancy	0.01	0.17	-	-	-	-
	(1.39)					
Total Fertility	-0.51***	0.00	-0.48***	0.00	-	-
	(-6.18)		(-6.03)			

 Table 4: Regression results (dependent variable: Per capita GDP growth)

School Enrollment,	0.23***	0.00	0.32***	0.00	0.25***	0.00
Secondary	(3.51)		(17.89)		(17.62)	
Constant	0.39***	0.00	0.46***	0.00	0.49***	0.00
	(4.98)		(5.15)		(5.23)	
By Selected countries	-	-	-	-	-0.02	0.48
					(0.10)	
By Income Economies	-	-			-0.19	0.31
					(-0.48)	
By Region	-	-	-	-	-0.08	0.31
					(-0.75)	
World	-	-	-	-	-0.14 5	0.5
					(-0.68)	
N	2,425	2,425		2425		
R-Squared	0.4198	0.4194			0.4089	
Adjusted R-Squared	0.4184		0.4182	0.4079		
F-Statistic	(6, 2419)	(:	5, 2420)	(4, 2421)		
Prob (F_ Statistic)	0.000		0.000	0.000		

<u>Notes:</u> p < 0.10, * p < 0.05, ** p < 0.01, *** p < 0.001

4.4.5 Results discussion

The three models of regression showed that R^2 and adjusted R^2 values are about 41.98%, 41.94% and 40.89% for R^2 and 41.84%, 41.82 and 40.79% for adjusted R^2 respectively. In the first regression, independent variables like current health expenditure, inflation, life expectancy and school enrollment rates are positively significant while fertility rate is negatively significant.

In the second model, the regression was only performed on independent variables that were positively significant in the first model. The regression showed that the remaining variables were still positively significant with R^2 and adjusted R^2 of 41.94 and 41.82 percent respectively.

In the third model, was considered the independent variables, which were positively significant in the second model. Therefore, the regression shows that current health expenditure, inflation and secondary school enrollment rates became all positively significant with R^2 and adjusted R^2 equal to 40.89 and 40.79 percent.

It indicates that the descriptive analysis of the current expenditure, fertility, inflation, school enrollment and life expectancy variables that the explanatory variables, namely current health expenditure, inflation, life expectancy, fertility and school enrollment on average varies form 41-40 on per capita income growth for the time assessed (1995-2018) and the other variation is described by other factors outside the model.

All regression models run showed that fertility rate affects economic growth. When other variables are hold constant and time effect is controlled, the coefficient of the fertility remains to -0.5053267. "Health and Economic Growth in African countries means that one percent increase (decrease) in fertility results in 0.50 percent decrease (increase) in per capita GDP growth. Similarly" (Lopez, 2007) and (Barro, 1996) found that fertility negatively affects economic growth.

The results of the performed regression models showed that there is a significant relationship between education and economic growth. One percent increase in education enrollment affect income increases per capita. This is in line with the studies of (Barro, 1996).

4.5.1 Granger causality test

Per capita income and health relationship is two-way which means that health is affected by economic growth but also income is affected by health. "Some literature use involved variables for health to compact through the problematic; others carry out causality analysis to define the direction of the relationship between the Health proxies and GDP per capita. Granger prediction test is a common test to show causal relationship as proposed"(Granger, 1969). The H₀ assumes that X does not affect Y and this is assessed by regressing Y on its values and on additional variable X. Granger tests will be performed to confirm the existence between health and economic development variables by performing regressions and record both the restricted and unrestricted the remaining sum of squares. (Granger, 1969). According to the results, one percent of health expenditure leads to the increase of per capita income growth by 0.0759655 (7.60%). Furthermore, increasing 1 percent of consumer prices rises income growth by 0.0795022 (7.95%).

Per capita GDP growth = $\beta_0 + \beta_1 Chexp + \beta_2 Inflat + \beta_3 Fert + \beta_4 LE + \beta_5 Ssenrolt + \epsilon$

First regression Y (Per capita GDP growth) =

(0.39)Cons+(0.76)Chexp+(0.08)Inflat+(0.01)LE+(-0.51)Fert)+(0.23)Ssenrolt+ ϵ

Second regression Y (Per capita GDP growth) =

(0.39)Cons+(0.76)Chexp+(0.08)Inflat+(-0.51)Fert)+(0.23)Ssenrolt+ ϵ

Third regression Y (Per capita GDP growth) =

(0.49)Cons+(0.07)Chexp+(0.07)Inflat+(0.25)Ssenrolt+ ϵ

CHAPTER V: CONCLUSION AND RECOMMENDATIONS

5.1. Empirical findings

This research has looked at the link between per capita income and health in African countries. Linear regression models are explored to check the effects of one of the two variables on another using granger causality test. Different researchers have studied health and economic growth with a focus on high income countries by regions and by income economies. This research looks at per capita income and health within African countries using panel analysis. It has used the secondary data from 1995 to 2018 to explore relationship of health and per capita GDP in African countries. The test used revealed that health and economic development have two-way relationship; better health positively affects economic development while poor health has a negative effect on economic development of a country, and on a different hand, GDP growth is also affected by unemployment and life expectancy. One can explain the relationship between health and per capita DGP by saying that health affects productivity and in turn income also affects health. "Earning higher income will increase the consumption of health-related goods such as adequate food and medicine" (Lopez, 2007). With increased income, people will improve their standards of living and this will positively affect efficiency at work, which will continue to contribute to the production.
5.2. Policy Recommendation

Looking at the results of this research showed factors that the following factors play a key role in increasing per capita growth:

Current health expenditure (% of GDP): The results of this research indicate that GDP per capita is also influenced by the current health expenditure. It simply means that once the government allocates sufficient fund to health, it positively affects the economic growth. Thus, allocating more resources to primary healthcare will contribute to the increase and sustainable economic development.

School enrollment: Education is one of the key aspects of boosting economic growth because of its role in enhancing human capital thus productivity which in turn has positive effects on per capita GDP. Conclusion drawn from this study is that school enrollment influences economic growth. So, increase in school enrollment will positively affect the economic development outcomes.

Fertility rate: the current research revealed that GDP per capita income is affected per fertility rate among other factors. It means that if there is low rate of people enrolled for school, it negatively affects the per capita DGP. There is also a tendency of giving birth to more children, which impedes a country's economy of African countries.

Recommendations.

- Common policy mobilizing funds for all government resources and effective use of available resources by involving other partners and increase ownership, transparency, and integrity of African countries authorities.
- Common African government policy to increase education expenditure to allow everyone child to enroll for school.
- 3. Common policy related to fertility and mobilization on use of contraceptive methods among men and women of reproductive age.

5.3 Recommendation for further studies

Diverse studies on the impact of health and economic development have been done but still there are several elements to be explored. The recommendation from this research is for researchers to do further studies on other factors apart from health, which affect per capita GDP in African countries by using mixed research methods.

5.4 Conclusion

In conclusion, fertility rate affects per capita growth income in African countries. It simply means that a country with better aspects mentioned above will improve its per capita income. These results are supported by different researchers like (Hashmati, 2001), (Bloom D., 2014), (Mankiw, 1992) (Bloom D., 2014; Mankiw, 1992) and (Barro, 1996) by other side explanatory variables such life expectance inflation domestic private health expenditure are also statistically significant (S. U. Cervellati M., 2011) and (Bloom D., 2014) also stated that health status affects economic development, equally the descriptive analysis revealed that developed countries have improved health.

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