Strathmore UNIVERSITY

EDUCATION ADVANTAGES IN HEALTH: EXPLORING THE FACTORS INFLUENCING BETTER HEALTH FOR THE EDUCATED IN EAST AFRICA

ARTHUR BOERA KABURI-099801

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Strathmore Institute of Mathematical Sciences Strathmore

University Nairobi, Kenya

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DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the Research Proposal contains no material previously published or written by another person except where due reference is made in the Research Proposal itself.

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ARTHUR BOERA KABURI ..... [Name of Candidate]

..... [Signature]

15th February 2021 ..... [Date]

This Research Proposal has been submitted for examination with my approval as the Supervisor.

Dr. Helen Osiolo ..... [Name of Supervisor]

..... [Signature]

15th February 2021 ..... [Date]

School of Finance and Applied Economics Strathmore University

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Abstract

The East African region (Kenya, Uganda, Tanzania, Burundi, and Rwanda) faces several country-specific stumbling blocks that hamper socio-economic growth within the borders, common across the region is the advancements in health and education over the years. This study contributes to the literature interlinking education and health by applying new estimation techniques and panel causality testing using data from five Eastern African countries from 1989 to 2018. Employing a concentrated approach for East Africa, deviating from Westernized datasets. Using the variables Life Expectancy at Birth as representative of the dependent variables and Primary School Enrolment for the independent variable, there is considerable evidence of education insignificantly contributing to the Health of individuals in East Africa. Primary School Enrolment is not consequential to influence a panel granger-causality for the dependent variable. These results are of specific importance to proposed policy amendments to Education and Health policies across the five states.

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND INFROMATION

The East African region is grappled with below par advancements in health across the five countries compared to World averages regarding prevention of easily communicable diseases and deaths caused by a lack of information (Ogundari & Awokuse, 2018). Studies have shown that an investment in education brings with it advantages in health as they established a causality relationship between health and education variables and inferred an improvement in economic growth (Lleras-Muney, 2005; Cowell, 2006; Arendt 2005 & 2008; Adams, 2002; Well, 2007; Silles, 2009; Şen, Kaya & Alpaslan, 2018; Korkmaz & Kulunk, 2016; Ogundari et al., 2018; Zimmerman, Woolf & Haley, 2015). However, education also lags behind world averages with school enrolment in Secondary Schools falling below 50% in Uganda (2016), Tanzania (2018), Burundi (2018) and Rwanda (2018). Kenya (2013) surpasses the 50% mark but fails to reach the world average of 76% according to the World Bank (2018).

The causes of this delayed development in education and health may be attributable to a host of factors including environmental challenges, marginalization, and lack of proper legislation (Cairns, Witter & Hou, 2018; Zaman, Ahmad, Hamzah & Yusoff, 2016; Briggs, 2003). However, with these causes in mind a number of researchers have highlighted an interlink that seeks to bring closer the control of health to the people through education (Lleras-Muney, 2005; Cowell, 2006; Arendt 2005 & 2008; Adams, 2002; Well, 2007; Silles, 2009).

Identification of the causality effect of an improved education on advancements in development in healthcare has been alluded to in Western countries and the conclusion that education causes health directly has already been adopted across African countries. However, the same has not been identified in research work in the same respect in the African context and establishing at what magnitude the changes in education can influence developments in health and healthcare. The governments of East Africa, with respect to Kenya, Uganda and Rwanda have developed and implemented policies with regards to this causal relationship that are focused on child health and education, while at school. The adult population has been exposed to health education and community health perspectives with this interlink in mind from Local Health Practitioners Non-

Governmental Organisations. The causality causes have not yet been studied in the African context, thus improving education alone may not be a guarantee of improved healthcare. Misidentification of the interlink reduces savings on budgetary allocations along with prolonged states of poor health with advancements in education as seen from Ogundari et al. (2018), education and health should be treated in the same respect regarding policy creation in that they influence GDP growth via human capital expansion and thus investing in one has a ripple effect on the other in Sub Saharan Africa.

East African countries have not viewed the interlink between education and health policies (Tanzania and Burundi), or otherwise reviewed the policies that address the interlink (Kenya, Uganda & Rwanda). Although, there are various studies that have addressed the interlink by examining variables in education and health that may be representative of the question of causality (Cutler & Lleras-Muney, 2006; Silles, 2009; Lleras-Muney, 2005; Adams, 2002; Lindeboom, Llena-Nozal & van Der Klaauw, 2009; Thomas, Strauss & Henriques, 1991; Arendt, 2005; Albouy & Lequien, 2009) and also studies that have identified the causality to be indirectly influenced by other variables (Cowell, 2006; Diener, Sandvik, Seidlitz & Diener, 1993; Ross & Wu, 1995). The studies have looked at the direct relationship between education and health from the glossary of westernized datasets. Ross et al. (1995) categorizes the links between education and health into three categories; work and economic conditions, social-psychological resources, and health lifestyle, as highlighted to be trickle down effects on improved education. This study considers model creation to compare the explanatory power that variables endogenous to an increase in education fair in comparison with education variables in explaining the developments in health under a panel data analysis of five East African countries. Thus, addition of other variables endogenous to education will guide policy improvement and development to better capture the effect of education and health (Zimmerman et al. 2015).

1.1.1 Education effects on development of health in EAC

Education and health are impacted independently across East African countries. In Kenya education has increased literacy levels since the inception of free primary education in January 2003 and the country witnesses the highest level of education in the region at 82 (World Bank, 2018). However, with these developments, education has encountered a number of challenges in the country with access, equity and regional and gender disparities being the most related to health developments (Kenya Yearbook, 2018). Health developments as of 2018 have seen a reduction in mortality rates per 1,000 live births (approximate average decline of 42%) and an increase in immunization levels (approximate average growth of 24%) and Life Expectancy at Birth (approximate average growth of 25%) from 2004 to 2018 (World Bank, 2018).

In Uganda, likewise, health developments cannot be directly linked to an improvement to an education across the health sector as some of the developments were linked to an improvement in legislation and fast tracking of the country's Millennium Development Goals as at 2017/18, the major areas of success reported include maternal and child mortality rates which fell from 438/1000 people to 336/1000 people and 54/1000 people to 43/1000 people from the fiscal year 2015/2016 to 2017/2018 respectively (World Health Organization, 2018; Uganda Health Sector Development Plan, 2015/16 – 2019/20). However, education in Uganda is staggering behind the developments in health with a declining primary school enrolment in the last ten years (World Bank, 2018).

In Tanzania, health and education are seen to be below par in comparison to the countries under this study according to the World Bank (2018). In recent years, Tanzania has made gains in human development, with reduced under-five mortality, an increase in the average number of years of schooling for its youth, and improved adult survival (World Bank, 2019). However, developments in education are limited as the primary school enrolment increased from 85% in 2015 to 94% in 2018, after a downward trend the previous years (World Bank, 2018).

Burundi's developments in education as compared to the other countries in this study has an unpredictable pattern with increases and decreases witnessed in every decade. Primary School Enrolment is seen to have been decreasing from 2010 to 2018 by approximately 20% (World Bank, 2018). Burundi's stride for developments in education is spearheaded by the following strategies offering free education, making it compulsory and supporting it politically. Burundi's health system suffers from a lack of adequate infrastructure and human resources to meet urgent community health needs (USAID, 2020).

Strong public sector leadership, investments in health information systems, equity-driven policies, and the use of foreign aid to invest in local capacity helped Rwanda achieve greater health gains compared to Burundi (Iyer, Chukwuma, Mugunga, Manzi, Ndayizigiye & Anand, 2018). Rwanda has made remarkable socioeconomic progress in the past decade with real GDP growth averaging 8.2% annually. This has translated into improvements in the health situation (WHO, 2018). Thus, developments in health are attributable to legislation and resource allocation to the sector. Primary school enrolment in Rwanda similar to Burundi has been facing unprecedented interruptions thus an uneven growth and decline pattern despite both countries advocating for free primary school in the past two decades (World Bank, 2018).

1.1.2 Existing polices on education with health developments in EAC

The Government of Kenya has highlighted the importance of uniting education and health focus as one by implementation of the National School Health Strategy Implementation Plan of 2011-2015 This plan is aimed at improving the health of all school going children. The policy is formulated with the identification of the school environment as a key setting for promoting children's environmental health. Thereby the policy's interlink for education and health is through health education and improvement of the health infrastructure in all levels of public schooling. The policy is seen to improve eight thematic areas: Values and life skills, Gender issues, Child rights, child protection and responsibilities, Special needs, disability and rehabilitation, Water, sanitation and hygiene, Nutrition, Disease prevention and control and School infrastructure and environmental safety.

The country has also placed emphasis on promotion of good health practice and availing resources that promote health for children in the Primary level of education in Kenyan Schools in its Sessional Paper no. 1 of 2019 on Reforming Education and Training for Sustainable Development in Kenya. Education and Health are also seen to be represented in the country's millennium development goals in their Vision 2030 (Sessional Paper No. 10 of 2012) and Medium-Term Goals as the Big Four Agenda of 2017. Where, in the former education and health are viewed in the social pillar and improvements in both are set to be impacted independently, while in the latter Universal Healthcare as being one of the agendas, seeks to increase health funding, health coverage from 36% to 100% and improved health insurance by 2022.

The Government of Rwanda has implemented the National School Health Strategic Plan that seeks to improve the health of all school going children by improving the school health environment over a five-year period. The policy's thematic ideas revolve around: Health promotion, disease prevention and control, HIV, AIDS and other STIs, Sexual Reproductive Health and Rights, Gender and GBV issues, Environmental health, School nutrition, Physical education and sports, Mental health, and related needs. Rwanda however has managed to complete its Millennium Development Goals of the year 2000, attributable to performance based renumeration for health workers, localization of health centres, improved Community Health Awareness, and affordable health insurance (Abbott, Sapsford & Binagwaho, 2017). According to the Economic Development and Poverty Reduction Strategies (EDPRS I & II) for Rwanda, education has also seen improvements from the year 2000, with a growth of 34% to 2012 and had a goal set for 100% by the year 2015, it stood at 98.25% as at 2018 (2018 Education Statistics. Ministry of Education, Rwanda).

Uganda has implemented the Uganda School Health Policy that seeks to work in improving the health of children while at school highlighting the significance of this implementation as children spend approximately 75% of their active hours in school. As was with Kenya and Rwanda the Policy is aimed at health education, physical education, safety and security measures, sanitation, and safe water, creating conducive psycho-social environment, promoting health lifestyles, and provision of good healthcare and good nutrition. Uganda has also made strides through its Millennium Development Goal for 2015 of 100% primary school enrolment by marking an

approximated average of 83.75% from 2002 to 2013. The country's Strategic Plan, Uganda Vision 2040, highlights the following areas for revised improvement with regards to education and health; inclusion of education as a right for all children, development of universal health insurance for its citizens, household-based health system that brings healthcare facilities closer to the community and Private-Public Partnerships to ease the cost and aid in professionalism and infrastructure creation in healthcare.

Tanzania has implemented policies that seek to alienate education and health independently (Child Development Policy of 1996 & National Health Policy of 2007), they have also included in their National Development Vision 2025 of 1999, the goal of inculcating a learning and educated society. Tanzania's Health Strategic Plan III seeks to employ health education as one of the many mechanisms to grow improvements in Health.

Burundi managed to implement their Millennium Development Goals for Education, advocating for 100% enrolment rate for its children by 2015, however it stood at 92.5% as at 2018. Burundi has set in place the Medium-Term Transitional Education Plan For 2018-2020 which seeks to push for the acquisition of free basic primary education for all. Burundi's Health sector has been captured in the country's national health policy 2005-2015, The National Health Development Plan and their strategic plan The Burundi Vision 2025. The National Health Development Plan seeks to further the efforts made in the strife to achieve the country's Vision 2025 to better education and in turn help develop the health sector.

1.2 PROBLEM STATEMENT

Education is critical to health. Key in reducing the inequalities is an improvement on the focus of education as a key factor that drives health improvements. The African region carries 11% of the world's population and carries over 24% of the global disease burden (Akhmat, Zaman, Shukui, Javed & Khan, 2014). With a limitation of just 1% of the global expenditure on healthcare and accounting for only 3% of the world's healthcare workers (Akhmat et al., 2014). The region is also plagued with holding almost half of the world's infant mortality for children below 5 years of age, the highest maternal mortality and disease burdened by HIV/AIDS, Malaria and Tuberculosis (Akhmat et al., 2014).

The East African region faces several country-specific stumbling blocks that hamper socio-economic growth within the borders, common across the region is the advancements in health and education over the years. Statistics on life expectancy show an average of 64 years for the countries of Kenya, Uganda, Tanzania, Burundi and Rwanda, the World's average stood at 72 in 2018 (World Bank, 2018). Statistics on infant mortality also fall off world average and with Rwanda being the only country surpassing the world average. In education, the average East African has an educational attainment average of up to Primary School level at 74% of the total population (World Bank, 2018). Studies have evidenced that the educated have higher probabilities of self-reported health, physical impairment, and symptoms of illness (Ross et al., 1995).

Despite the importance on improvements on education on health, studies undertaken on this subject are largely from developed countries than developing countries (Lleras-Muney, 2005; Cowell, 2006; Arendt 2005 & 2008; Adams, 2002; Well, 2007; Silles, 2009). To add to this, the limited studies available are based on extrapolated data from developing countries that provide biased estimates (Cairns et al., 2018; Akhmat et al., 2014; Ogundari et al., 2018). Further, estimates provided are not accurate, because of measurement errors which arise due to use of weak instruments when modelling.

The East African region is chosen for this research due to the differences in health and education infrastructure across the five countries. Data used in this study is based on panel data sources from the World Bank.

1.3 RESEARCH QUESTIONS

1. How has education affected the developments in healthcare across East Africa?
2. How can policy makers influence the contribution of education on health in the East African Community?

1.4 RESEARCH OBJECTIVES

The overall objective of this study is to identify the effects of educational attainment in East Africa. Subsequently other objectives are:

1. Investigate the effects of education on health in the East African Community.
2. To evaluate how policy makers may influence the contribution of education on health in the East African Community.

1.5 JUSTIFICATION OF THE STUDY

This study's overall objective is to interlink the influence of education on health, with empirical testing for a possible causality of educational attainment on better healthcare using a panel data analysis from five Eastern African countries. The benefits of this study to policy makers are to gain a better glimpse of the relationship between education and health so as to better understand the dynamics and differences of each of the countries under study, for better policy creation and revision for developments in both health and education.

This study is beneficial to the government as the implications of a causality of education on health implies the fiscal allocations can be reduced and the effect of funding education can have spill over effects on health. This is specifically important for developing countries as budgetary funding is limited. This study is also quite useful for Non-Governmental Organizations and donors that support aid in these developing countries in East Africa, more so as it helps to direct donations into long-term solutions for Communal Knowledge Enhancement and Healthcare Provision.

This study seeks to fill only a small void in the East African region, as regards to this line of research, it should open up research ideas on better analysis of the health and education impediments for Researchers and Academicians.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

There is significant literature across the world that interlink education and health, this study takes them into account in provision of resourceful guidance and foundation to better understand and further the topic under study.

2.2 THEORETICAL REVIEW

Health promotion is identified as the process of enabling an increase of control over health determinants to individuals and communities to improve their health. Health promotion follows centre stage in the plight to identify the various factors affecting health. Notably health promotion within the Eastern African Region emphasizes in collection of Community information and policy change to workout suitable action to devise healthy behaviour choices.

There are four models and theories, in which this study is based on, that govern the research works around health education and health promotion that aid to implement the research objectives. They include in part; the rational model, the health belief model, the extended parallel process model, and the theory of planned behaviour (Hou, 2014).

2.2.1 The Rational Model

The rational model idealizes that an individual once presented with adequate information as concerning a critical choice, has the rational to make the correct choice. The model is grounded on advancing unbiased information in health promotion initiatives and participants in this process can carry out needed due diligence retrospectively and make a good choice, thus the model is also termed as the "knowledge, attitudes, practices" model (Hou, 2014). The model idealizes that the only hindrance to an individual to not act normally is a lack of knowledge and hence ignorance.

This model manifests the interlink that this study's objective is hinged upon, and that with advancements in education, an East African citizen can rationally influence their reaction and behaviour towards health extremities. This model, however, presents drawbacks in that knowledge advancements have been seen not to influence healthy behaviour as smokers having

adequate information about the dangers of smoking continue smoking (Hou, 2014), thereby incorporation of other models for improvement is necessary.

2.2.2 The Health Belief Model

The health belief model was one of the earliest health promotion models presented in the 1950s by Psychologists in the United States' Public Health Service (Hochbaum, 1958; Rosenstock, 1960, 1974; Champion & Skinner, 2008) and has grown with its use in finding solutions to practical problems (Rosenstock, 1974). The model advocates that the viewpoint to which people perceive the severity of a disease and whether or not they may be susceptible to it is influenced on how willing they would be to take preventive action (Hou, 2014). It is based on six constructs: perceived susceptibility, benefits and barriers, severity, cues to action and self-efficacy. Important to this study is how education and its advantages define the interpretation at all stages of these constructs. Thus, the influence gained in health from education as a possible cause (or factors endogenous to education) of health behaviour, through an improved self-efficacy (Rosenstock, Strecher & Becker, 1988). Also, key to this model is the behaviour attained by social factors and thus what may be viewed as good by the community can influence the cease of one's bad action (Janz & Becker, 1984).

2.2.3 The Extended Parallel Process

The usefulness of the Health Belief Model is how best it can be combined with other models (Champion et al., 2008) and thus the inception of the Extended Parallel Process Model to this research. This model argues that individuals once faced with a health risk, identify the next cause of action by, evaluating their susceptibility to the risk and whether the risk is severe. This paper seeks to understand through the research objectives the influence that education has on the cognitive capabilities of individuals in identifying their susceptibility to health risk and influence on the next cause of action. The grounds of this model are based on the Health Behaviour Model (Hou, 2014). Witte (1992) argues that threat directly influences the level of response and efficacy (ability to produce a desired or intended result) influences the nature of response. Any changes that need to be impacted in health promotion needs a thorough evaluation of the populations' perceptions of severity, susceptibility, self-efficacy, and the response (Muthusamy, Levine &

Weber, 2009; Nabi, Roskos-Ewoldsen & Carpentier, 2008; Popova, 2012), this will guide the effective strategies in which to present information.

2.2.4 Theory of Planned Behaviour

The final theoretical background for this study is the theory of planned behaviour, which dictates that the intention or action is not only influenced by personal behaviour but also by the comprehension of social norms (Hou, 2014). Where social norms indicate the influences of other's opinions and the compliance thereof of the influence thus externally acquired. The theory relies on four key concepts: behavioural intention, attitude, subjective norm, and perceived behavioural control (Hou, 2014). Ajzen (2011) emphasizes that the model in itself can be improved to include such variables as social support that can influence behavioural change, while Parker, Manstead & Stradling (1995) identified personal normative influence as important in shaping behavioural intention. The model is seen to be effective in identifying Community initiated programs to influence health behavioural change (Armitage & Conner, 2001; Terry, Hogg & White, 1999). This theory influences the justification that Communities have a significant role in alienating health ailments and thus an educated community can in turn form a social support buffer that hinders the uneducated from acting in certain ways that expose them to health risks.

2.3 EMPIRICAL REVIEW

There is a world of literature as noted that derive and analyse the various ailments in healthcare around the world. It is important to note that a majority of these works are empirical by selection and give important insight on the direction of this study both quantitatively and qualitatively.

2.3.1 Education and Health

Thomas et al., (1991) find that there is a significant influence of maternal education on child mortality and is comparable to availability of community services and this indicates that education and health services are substitutes. Borrowing from data on the Brazilian Demographic Health Survey containing data on mothers' education, literacy, and access to information. The analysis is carried out using OLS and TSLS jointly as estimation parameters, while regressing child height conditioned by age and sex, on an array of child, parental and community characteristics.

Lleras-Muney (2005) investigates the influence of education on mortality for the adult population in the United States. Findings are that there is a large causal effect of education on mortality in the United States. The study advocates for a better identification of the influences garnered from education and their respective influences on health, however, this scope is beyond the study's considerations. Using data from the U.S census data of 1960, 1970 and 1980 containing the variables for white adults collected when the respondents were 14 years of age between 1914 and 1939. The groupings are tracked across time and their death rates are recorded. The changes in compulsory education laws form the explanatory variables for mortality after and before the legislation on child labour laws was passed. The models run under the research were based on Mixed Two Stage Least Squares estimation for model estimates as GLS and OLS had observed heteroskedasticity.

Arendt (2005) discusses the causality of education on better health using a panel data analysis from a Danish School Reform for identification. He adds to the growing literature that ascribes to the notion that social-economic benefits of education influence health, most especially job opportunities and income. However, noted was the influence of education on knowledge enhancement on healthy living and in part improved lifestyle choices. Using survey data of

Danish Workers interviewed in two periods (1990 and 1995). There model choice was governed under the specifications as outlined by Hahn et al. (2002) for weak variable estimation in their panel data analysis, with the variables Self-Reported Health (SRH) and Body Mass Index (BMI) representing health, and Wage and Education representing the explanatory variables.

Cutler et al. (2006) in their study that seeks to identify the theories and evidence of education on health emphasize that there is a causal effect of education on health at lower levels of schooling, this relationship, however, has not been fully analysed and thus helps in identification of adult-related indicators for testing in this study. The data used are from various years of the National Health Interview Survey (NHIS) in the United States. They use this data to formulate a linear model that seeks to identify the causal relationship between health behaviour and years of completed education with dummy variable specifications for marginalised groups. They also emphasize the need for analysis in the subject of research in this study and others investigating the same to delve deeper on populations that seek to gain more from the results drawn from this research. Thus, with an ailing healthcare and educational attainment, East Africa would benefit from this research by creating better policies and setting the foot onto current healthcare approaches most notably inclusion of Information Technology in healthcare provision.

Silles (2009) investigates the causal relationship between education and health in the United Kingdom and gives a positive relationship that is consistent to Lleras-Muney (2005) and Adams (2002) in the United States. Using the General Household Survey for England, Scotland, and Wales from 1980 to 2004, she describes a two-equation model for the analysis using Two Stage Least Squares and Ordinary Least Squares for model estimates. The first equation describes the Health of an individual from the explanatory variable of Years of Schooling, the second equation describes the Years of Schooling with the implemented School Reforms of 1947 and 1973. The results are that there is a positive relationship between Years of Schooling and Health.

Lindeboom et al. (2009) in their study based on data from the National Child Development Study in Great Britain suggest that increasing the school leaving age of mothers by one year had little effect on the health of their offspring. They also draw on the advantages that going to school had on the mothers by lowering difficulties in income. They use surveys to collect data from mothers

who had new-borns between 3rd to 9th March 1958 and track their progress across the years to 1999 from uneven selected intervals that form the cross sections for analysis. Their three-part linear model describes the relation of the father and mother's age, year of school completion, region of residence and parity, to identify the health characteristics of the children thus born. The other 2 models identify the influence if any of the school reforms of 1943 had on the year of schooling of the father and the mother, respectively.

However, Albouy et al. (2009) analyse the effect of compulsory education on mortality and unlike the previous research conclusions, find no significant causality of education on health. Their model was based on data from the Echantillon Démographique Permanent (EDP), a longitudinal dataset on a sample of 1% of the French population. They perform regress discontinuity designs in their model with the variables being survival rates at the ages of 50 and 80 representing health while the years of schooling being the explanatory variable.

2.3.2 Education, Health and Economic Growth

Bhargava, Jamison, Lau & Murray (2001) model the effects of health on economic growth using a panel data analysis for several countries from 1965 to 1990, with Adult Survival Rates and GDP growth as indicators. They find that there were positive effects of Adult Survival Rates on GDP growth rates in low-income countries.

Well (2007) estimates the effect of health on individual outcomes to map out the influence of health on economic growth. Using data from 80 countries from 1960 to 2000 with variables on GDP per worker and Adult Survival, the finding was that controlling for health disparities across countries would reduce the variance in log GDP per worker by 9.9 percent. The panel data analysis introduces new methodologies for effect mapping useful for this study's analysis with education's effects on health.

Anyanwu & Erhijakpor (2009) drawing from data on 47 African countries from 1999 and 2004 investigate the influence of health expenditure on health outcomes using a panel data analysis. The findings from their empirical analysis were that health expenditure had a significant effect on health outcomes, they also draw on micro-level factors such as an increase in medical

physicians in a given location and female literacy significantly reduce health outcomes. They introduce the aspect of maternal education's influence on health, this shades light on a greater need to evaluate the effect, if any, of the effect(s) of an increase in education levels for both genders in Africa, on Health Education. They adopt Robust Ordinary Least Squares (ROLS) model as the baseline estimation technique, Robust Two-Stage Least Squares (R2SLS) for endogeneity and reverse causality and Fixed-Effect Estimators for measurement error and autocorrelation control.

Korkmaz et al. (2016) investigate the relationship between life expectancy, education and economic growth in the Organisation for Economic Co-operation and Development (OECD) member countries. They assess education and health as one of the significant inputs to the human development index. Using panel data from 2007 to 2013 of 10 OECD countries with the variables in high school enrolment, Life Expectancy at Birth, and economic growth as the lead variables for a panel causality test. Their conclusion is that there is unidirectional causality from economic growth to education to health.

Şen et al. (2018) study the causality of health expenditure, education expenditure and economic growth. Using data from eight selected developing countries from1995 to 2012 (Argentina, Brazil, Chile, India, Indonesia, Mexico, South Africa, and Turkey). They use the Bootstrap Panel Granger Causality test for their empirical analysis. Their findings suggest that Brazil and Mexico have a significant and positive causality, running from health and education expenditure to economic growth. They also found that Indonesia had a negative causality for the variables on education and health expenditure, and economic growth. There was however no causality for the other countries in these variables. The above study highlights the uniqueness in panel data and is thus useful for highlighting the deficiencies in generality. Thus, a similar causality can be witnessed for education and health within the East African countries under study.

Ogundari et al. (2018) investigate the effect of human capital on economic growth with specific identification of education and health as measures of human capital. Using System Generalized Method of Moments (SGMM) for their model estimation and a panel data covering 35 countries from 1980–2008. Their study's results highlight that education and health have a positive effect

on economic growth with health having a bigger influence than education. Their finding highlights the importance of education and health in driving economic growth and that neither can substitute each other as measures of human capital, this highlights the importance of integrating education and health improvements to drive growth, and with a possible causality this could be beneficial for fiscal allocations.

2.3.3 Education on Health Behaviour

Diener et al. (1993) try to study the relationship between income and subjective well-being as either absolute or relative using data on 18,032 college studies in 39 countries and another longitudinal data spanning 10 years in a probability sample of 4,942 American adults. There findings are that there was no evidence for the influence of relative standards on income and that income produced the same level of satisfaction in poorer and richer areas of the United States, there study lays grounds for a better identification of the influence of income on other factors as they affirmed that the only derivation from a better income was among others better healthcare. Their analysis involved digressing the various responses presented by the sample population in answering the question, does an increase in income, increase their well-being in any way, with variables including Happiness and Satisfaction.

Cowell (2006) using panel data from a behavioural survey on the American Youth aged 14 and 22 years from 1979 to 1994, seeks to investigate the influence of education on health behaviour with 2SLS used for model and variable specification. Results suggest that future opportunity costs influence the decisions of the youth today. Thereby career trajectories help map out the decisions the youth would take part in, with regards to health, in particular, smoking and binge drinking.

Arendt (2008) studies the causal impact of education on hospitalization. Being an improvement on his previous work, introducing a larger data set (of a sample of administrative register data from Denmark from 1990 to 2000) and efficient estimation methods. The variables that represent health are now represented by hospitalization from the Danish National Register of Patients while education includes the Highest Level of Educational Attainment, in place of, Number of Years of Schooling. The results suggest that the relationship between education and the

probability of hospitalization was substantial for women and only significant for men with specific lifestyle related diagnoses.

The extent and breadth of these papers adds depth on the capabilities of research work on the influences of health most notably for low-income countries. This paper brings in views from European and American datasets to model the case for East Africa. Analysing with use of improved model testing for weak instruments and variables (Hann & Hausman, 2002).

2.4 OVERVIEW OF THE LITERATURE

The incorporation of the four identified theories is beneficial in this study, as they emphasize on knowledge acquisition for health promotion (The Rational Model), Subjective norms that govern how people act (The Health Belief Model & The Extended Parallel Process Model) and the role of the communes in influencing the responses of people towards health risk (Theory of Planned Behaviour), all important in establishing the role of education as a means in influencing all these models.

It is worth noting that a majority of the literature that try to map out education on health are related to datasets in Europe and the United States. The papers in relation to health and education in Africa come independent and these variables are not measured in the same models as a possible causality or correlation in a panel data analysis.

Pertinent questions that arise from this research is whether education, has any effect on the health prospects of an individual with an analysis on the effects of one's mortality. The effect of an increase in a year of schooling on one's health, categorically the implications associated with school dropouts per level of schooling. The education curriculum's engagement on health education in the countries of interest and its benefit whatsoever on the health of the individual. Assessments on the benefits of educated individuals on the general health of communities across the rural, urban, and semi-urban areas associated with the East African countries.

While under the realms of Health Education this paper seeks to understand the boosted effect of an increase in power to the communities across countries in East Africa by empirically testing and analysing the benefits if any that an increase in education has on the health of the people in these countries. Israel, Checkoway, Schulz & Zimmerman (1994) outline that the fundamental conditions and resources for health are peace, shelter, education, food, income, a stable ecosystem, sustainable resources, social justice, and equity. Theoretically this paper seeks to study the identified theories systematically with a glossary of previous work done to analyse refinements and other suggestions from other researchers. This focuses the analysis to a more structured approach instead of a misinformed empirical analysis that fails to unite theoretical evidence and regression analysis.

Table 1: Literature Review

Author(year)	Country	Title	Variables	Methodology (Estimated models)
Diener et al. (1993)	39 countries	The relationship between income and subjective well-being: Relative or absolute?	• Happiness • Satisfaction • Income	Cross Sectional Analysis
Thomas et al. (1991)	Brazil	How Does Mother's Education Affect Child Height?	• Child height • Mothers' education, • Mother's literacy • Mother's access to information	Ordinary Least Squares Two Staged Least Squares
Bhargava et al. (2001)	125 countries	Modelling the effects of health on economic growth	• Adult Survival Rate • GDP Growth Rate	Panel Data Analysis
Lleras-Muney, A. (2005)	United States	The Relationship Between Education and Adult Mortality in the United States	• Adult Mortality • Educational Reforms (Change in the number of years of schooling).	Mixed Two Stage Least Squares
Arendt, J. N. (2005)	Denmark	Does education cause better health? A panel data analysis using school	• Educational Reforms (Change in the number of years of schooling). • Wage • Self-Reported Health	Panel Data Analysis

		reforms for identification	• Body Mass Index	
Cowell, A. J. (2006)	United States	The relationship between education and health behaviour: some empirical evidence	• Smoking • Binge Drinking • Level of Education	Panel Data Analysis Two Staged Least Squares
Well, D. N. (2007)	80 countries	Accounting for the effect of health on economic growth	• Height • Adult survival rates • Age at menarche • GDP per worker	Panel Data Analysis
Arendt, J. N. (2008)	Denmark	In sickness and in health till education do us part: Education effects on hospitalization.	• Hospitalization • Highest Educational Attainment	Time Series
Silles, M. A. (2009)	United Kingdom	The causal effect of education on health: Evidence from the United Kingdom	• Years of Schooling • Self-Reported Health	Ordinary Least Squares Two Staged Least Squares
Anyanwu et al. (2009)	47 African countries	Health Expenditures and Health Outcomes in Africa	• Infant Mortality Rates • Under-Five Mortality Rates • Per Capita total	Panel Data Analysis

			• Government Health Expenditures • Per Capita Income	
Lindeboom et al. (2009)	United Kingdom	Parental education and child health: Evidence from a schooling reform	• School Leaving Age of Mother • Child's Health	Cross Sectional Analysis
Albouy et al. (2009)	France	Does compulsory education lower mortality?	• Adult survival rates • Years of Schooling	Cross Sectional Analysis
Korkmaz et al. (2016)	10 OECD countries	Granger causality between life expectancy, education and economic growth in OECD countries	• High school enrolment • Life Expectancy at Birth • Economic growth	Panel Data Analysis
Şen et al. (2018)	Argentina, Brazil, Chile, India, Indonesia, Mexico, South Africa, and Turkey	Education, Health, and Economic Growth Nexus: A Bootstrap Panel Granger Causality Analysis for Developing Countries	• Health expenditure • Education expenditure • Economic growth	Panel Granger Causality

Ogundari et al. (2018)	35 countries	Human capital contribution to economic growth in Sub-Saharan Africa: does health status matter more than education?	• Human Capital (Education and Health) • GDP growth	System Generalized Method of Moments

CHAPTER 3: METHODOLOGY

3.1 INTRODUCTION

This chapter presents the case for the approach this study follows to answer the objectives as set out. Under the rational model of health education as the lead conceptual framework for the study, and that guides the implications for the empirical model.

3.2 CONCEPTUAL FRAMEWORK

The rational model as presented by Hou (2014) identifies that there are theoretical relations identified in health and knowledge enhancements. The theory's underpinnings are that individuals once presented with relevant information as regards to health risks, have the cognitive capabilities to make the correct choice.

The above model thus directly implies that with an increase in information there is a definite increase in health awareness and cumulative health behaviour, and the vice versa holds true for a decrease in information. Thus, theoretically infers that information causes better health, which is the overall objective of this paper. This forms in part the main theoretical foundation for this paper with a consideration of education representing knowledge, and advancements in health being represented by the longevity of individuals.

The relationship above has the following equation that seeks to give further identity of the relationship between education and health:

$$H_{it} = \alpha_i + \beta E_{it} + \varepsilon_{it} \qquad (1)$$

Where H_{it} represents the health outcome for country i at time t and E_{it} represents the educational variable for country i at time t and α_i is a country specific pre-determined effect that captures the idea that there may be unobserved factors that arrived prior to changes in education and that distorts the country in study to either high or low health. ε_i is assumed to be a disturbance term.

3.3 EMPIRICAL MODEL

The econometric model, being a linear relationship from the theoretical model, the relationship between the variables in this study that represent education and health can be written as:

$$H_{it} = \alpha_i + \beta E_{it} + \gamma GDP_{it} + \delta GNI_{it} + \pi ER_{it} + \omega HE_{it} + \varepsilon_{it} \quad (2)$$

$$\Delta H_{it} = \alpha_i + \beta \Delta E_{it} + \Omega \Delta GDP_{it} + \lambda \Delta GNI_{it} + \pi \Delta ER_{it} + \omega \Delta HE_{it} + \varepsilon_{it} \quad (3)$$

Where H_{it} is represented by Life Expectancy at Birth which captures the health outcome for country i at time t and E_{it} is represented by Primary School Enrolment, the educational variable for country i at time t. GDP_{it} represents the variable Gross Domestic Product Per Capita, whereas GNI_{it} represents the variable Gross National Income Per Capita. Δ represents the changes in the variables, respectively. ER_{it} represents the variable Employment Ratio, while HE_{it} represents the variable Healthcare Expenditure, all variables are represented for country i at time t. αi is assumed to be a constant country specific factors, such factors can be disruptions in health systems and citizens general wellbeing, as with HIV/AIDS occurrence (Arendt, 2005). ε_{it} is assumed to be random.

The Empirical Model for this study is a linear regression model, to model School Enrolment on Life Expectancy with panel analysis using Fixed and Random Effect parameter estimation. Hausman (2002) tests on the efficiency of both estimation techniques in explaining the relationship of the variables chosen to represent Education and Health (if any). However, part of this study is to identify the explanatory power of education in explaining changes in health. Thus, with added tests for omitted variables bias and R^2 (explained variation from Education over the total Variation in the Health outcome).

Diagnostic Tests

Diagnostic tests for variable appropriateness like non-linearity, multicollinearity, and overall model heteroskedasticity is tested, in accordance with the OLS assumptions for accurate regression results. Residual testing for the model including normality and non-constant variance of the residuals precedes all regressions and analysis of model results.

Table 2: **Diagnostic Testing**

Diagnostic Test for:	**Definition**	**Interpretation & Application**	**Testing**
Cointegration	It is when two or more time series processes (or variables) have possible correlation properties across time.	When two or more time series variables are cointegrated, it influences the causality and/or correlation of the dependent variable on the independent variables, thus improved model specification.	Testing follows from Kao (1999), Pedroni (2004) and Westerlund (2007) essential works in cointegration testing, where the null hypothesis for these tests is no cointegration. The null is rejected with a p-value of less than 0.05.
Fixed and Random Effects	The random effect assumes that sub-group specific effects are uncorrelated with the independent regressors while fixed effects assumes that sub-group specific effects correlate with the independent regressors.	When fixed effects is presented as the best estimator, sub-group specific effects are predominant and influence regression inferences, whereas with Random effects regression inferences are assumed free of omitted variable bias.	The Hausman (2002) test for Fixed or Random effects is the preferred test, where the null of the test is that the difference in coefficients is unsystematic (thus random effect). The null is rejected with a p-value of less than 0.05.
Multicollinearity	It is when two or more explanatory variables in a model with multiple	The model becomes biased as the independent variables are no longer independent and thus	Testing for this is made easier with the Variance Inflation Factor (VIF). With a VIF of less than 10 as the threshold for a

	regression are highly correlated.	creating problems in estimation and interpretation.	lack or reduced multicollinearity.
Stationarity	It is when a time series process (or variable) records no changes over time.	It is specifically important to maintain stationarity in univariate time series testing, (Autocorrelation and Moving Average) and the opposite (non-stationarity) is needed in cointegration testing	The testing for stationarity is done using the Augmented Dickey-Fuller Test for unitroot. The null hypothesis is that unit root (non-stationarity) is present in the time series variable. The null is rejected with a p-value of less than 0.05.

3.4 DEFINITION OF VARIABLES

The variables of choice are Life Expectancy and School Enrolment, Primary (% gross). Where School Enrolment percentage gross is calculated by dividing the number of students enrolled at the primary level disregarding age by the population of the age-group that corresponds to the primary school level of education and multiply the result by 100.

The variable Life Expectancy (measured in years), representing health, is used as it encompasses the effect of education on adult longevity and thus, a better identification of the effects of schooling in the long run (Lleras-Muney, 2005). School Enrolment at the Primary School Level is used as the variable to represent education as seen from this paper, the average East African has an education attainment average of Primary School level (World Bank, 2018).

Causality of Education and Health

Table 3: Definition of Variables (Dependent)
Dependent Variable(s)

Variable	Definition	Scale of Measurement	Expected relationship with independent Variables (+/-)	Authors (Year)
Life Expectancy at Birth	Life Expectancy at Birth	Years	Positive	Korkmaz et al. (2016)

Table 4: Definition of Variables (Independent)
Independent Variables

Variable	Variable Definition	Variable Measurement	Expected relationship with Dependent Variable (+/-)	Authors (Year)
Primary School Enrolment	Primary School Enrolment	Calculated by dividing the number of students enrolled at the primary level disregarding age by the population of the age-group that corresponds to the primary school level of education and multiply the result by 100.	Positive	None
GNI per capita	Gross national income divided by mid-year population	The GNI per capita is the dollar value of a country's final income in a year, divided by its population. It should be reflecting the average before tax income of a country's citizens	Positive	Arendt (2005); Anyanwu et al. (2009)
GNI per Capita Growth	Growth in GNI per Capita	Measured as the change in the Gross National Income per Person from current period less previous period	Positive	Arendt (2005); Anyanwu et al. (2009)
Employment to Population Ratio	Employment to Population Ratio	Percentage of Employed Individuals ages 15 and over in the entire population.	Indirectly through human capital	Ogundari et al. (2018)

3.5 DATA TYPES AND SOURCES

Using data from the World Bank Data Repository on Economy and Growth, Education, Human Capital, Social Development, Social Protection & Labour and Health Indicators as a panel (6.13% of missing data on overall variables collected for this study) ranging from 1989 to 2018.[1]

3.6 DATA ANALYSIS

The empirical model's overall objective being to identify the magnitude of the influence of education on health, to ensure that all estimation measures for this interlink be exhaustively used in order to better identify the significance of the estimates, other estimation measures are to be used other than Ordinary Least Squares.

This research takes on works from Lopez & Weber (2017) to infer Panel Granger Causality tests on the variable representing education on Health, so as to capture not only correlation but also causality tests.

[1] The interpolation fitting methods of choice were the stata command *pchip* by Cox (2012), that averages non-missing values of the dependent variable with missing values and using piecewise cubic Hermite interpolation of missing values of the dependent variable given a dependent variable that is balanced (Time is used in this case) and *idw* interpolation technique that uses a weighted average of non-missing values, the weights being reciprocals of the powered distance between values, the power being zero or positive.

CHAPTER 4: RESULTS AND ANALYSIS

4.1 INTRODUCTION

This chapter covers four sections: 4.2 on descriptive statistics, 4.3 Diagnostic Tests Results, 4.4 Regression Results and 4.5 Limitations of the Study

4.2 DESCRIPTIVE STATISTICS

Summary descriptive statistics for the variables under study are presented in Table 5. The key dependent variable Life Expectancy at Birth has a mean of 53.508 years (or rounded up to 54 years) for the 5 countries under study. The key independent variables used in this study include School Enrolment (Primary), Growth in Gross National Income per Capita and Employment to Population Ratio and had means equal to 100.162%, 1.879% and 77.801, respectively.

The variable Life Expectancy at Birth has a maximum and minimum value of 69 years and 26 years rounded off respectively, Primary School Enrolment with a maximum and minimum value of 149.271 and 38.418 respectively, Growth in Gross National Income per capita with a maximum and minimum value of 38.587 and -47.393 respectively and Employment to Population Ratio with maximum and minimum values of 90.849 and 63.285, respectively.

The skewness results indicate that the variables; School Enrolment (Primary), Employment to Population Ratio, GNI per Capita Growth (annual) and Life Expectancy at Birth are skewed to the left as negative skewness is commensurate to skewness to the left, indicative of a lack of asymmetry.

The kurtosis of the dataset indicates the tail length of the statistic frequency, variables with kurtosis greater than 3 have a high kurtosis, with GNI per Capita Growth (annual) experiencing excess kurtosis, due to the lack of repetitiveness of the observations in these variables thus frequencies of less than two are predominant. The variable Life Expectancy at Birth has mild kurtosis as its value was 4.114, thus the tail length of the observations is spread out indicating a higher frequency of maximum and minimum values. The Variables Primary School Enrolment and Employment to Population ratio are platykurtic, meaning their distributions produce a lower number of extreme outliers than would be witnessed in a normal distribution.

Table 5: Summary Statistics

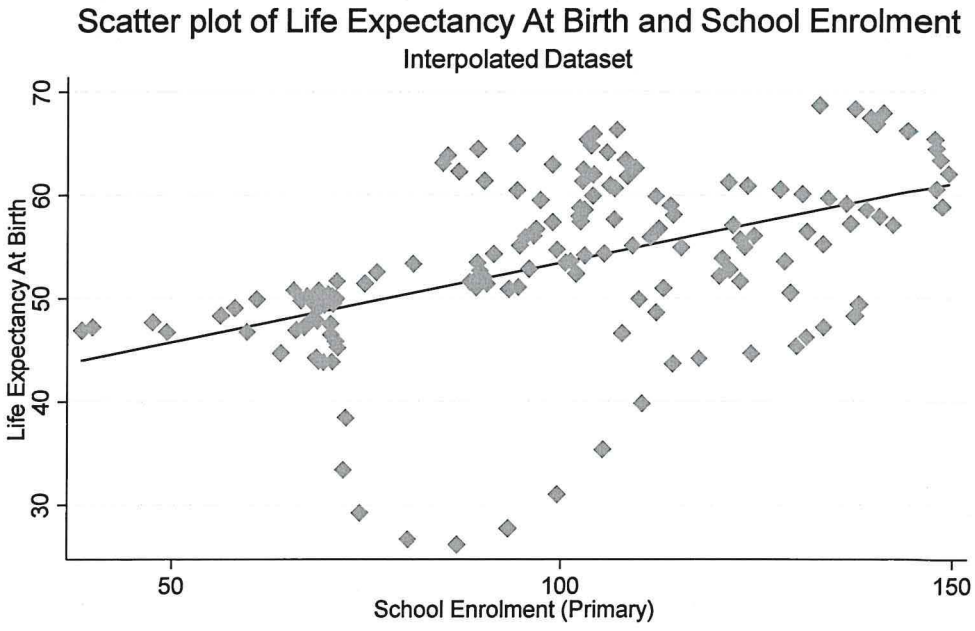
Variables	Obs	Mean	SD	Min	Median	Max	Skew.	Kurt.
Life Expectancy at Birth	150	53.508	8.456	26.172	53.540	68.700	-0.771	4.114
School Enrolment (Primary)	150	100.162	26.446	38.418	102.247	149.271	-0.027	2.195
GNI per Capita Growth (annual)	150	1.879	5.885	-47.393	2.061	38.587	-2.278	43.695
Employment to Population Ratio	150	77.801	7.660	63.285	79.722	90.849	-0.169	1.5

4.3 DIAGNOSTIC TESTING

Using multicollinearity testing on the variables, a combination of independent variables that had the lowest Variance Inflation Factors (less than 10) and Conditional Index (less than 30) were selected and used in this study comprising of: School Enrolment and Growth in Gross National Income and Employment to Population Ratio are chosen.

Before regression analysis it was important that we identify the relationship of the key variables using a scatterplot. Life Expectancy at Birth was seen to have a positive relationship with Primary School Enrolment as inferred in the Figure 1. The scatterplots give an outline of the expectations in the panel data regression about the causal relationship (if any) that education has on health. Changes in Primary School Enrolment directly affect changes in Life Expectancy at Birth.

Figure 1: Scatter plot Life Expectancy at Birth



Source: Author's estimation

The unit root tests conducted for identifying the set of unitroot datasets for cointegration are displayed in Table 6. All variables are non-stationary apart from Growth in Gross National Income per capita. Transformations for stationarity are of integrations of order 1. Taking first differences (change over time) also removes unit root.

Table 6: Stationarity Testing of Variables Under Study

Variable Name	Statistic	P-Value	Integration Order	Results
Life Expectancy at Birth	9.5566	1.0000	1	Unit Root Present
School Enrolment (Primary)	0.5299	0.7019	1	Unit Root Present
GNI per Capita (annual)	8.2079	1.0000	1	Unit Root Present
Employment to Population Ratio	-0.7726	0.2199	1	Unit Root Present

Testing for cointegration requires that the variables be non-stationary. Cointegration tests in the dataset (after unitroot tests affirm that all variables of Life Expectancy at Birth, Gross National income per capita, Employment to Population Ratio and Primary School Enrolment indeed have unitroot) indicates that there was no cointegration between or among the variables for any sample subgroup (countries). The tests follow from Kao (1999), Pedroni (2004) and Westerlund (2007) essential works in cointegration testing.

Ho: No cointegration

Ha: Some panels are cointegrated

P-value* = 0.4562

The Hausman (2002) test for the effectiveness of either the Fixed Effect or Random Effect models was applied on the regression. The null hypothesis being that there is no panel effect and random effect should be used. The p-value arrived at was significant to reject the null and thus fixed effect was preferred. The model used in this study therein was selected from the Hausman test, a fixed effect regression of changes in Life Expectancy at Birth on the changes on the regressors Primary School Enrolment, Gross National income per capita and Employment to Population Ratio.

Test: Ho: difference in coefficients not systematic

Prob > chi2 = 0.0296

4.4 REGRESSION RESULTS

4.4.1 Fixed Effects Estimation

The Life Expectancy at Birth model was regressed with fixed effects and controlling for serial correlation of error terms to ensure they remain independent and uncorrelated to the regressors. The results showcased in table 7 of the fixed effect estimation, indicate that the variable representing education, Primary School Enrolment was not significant to explain the changes in Life Expectancy at Birth. The variables having been transformed to signify changes in accordance with the variable Growth in Gross National Income per capita which represents growth, thereby creating a balance by eliminating imbalances seen by regressing a growth variable against constants. The variable Employment to Population Ratio was also not conclusively interlinked with the changes in Life Expectancy at Birth. Growth in Gross National Income per capita was, however significant in explaining the changes in Life Expectancy at Birth.

Regression results indicate that a one-unit shift in Growth in Gross National Income per capita induces a positive shift in Life Expectancy at Birth by 0.03 units holding all other variables constant. Regression results for Primary School Enrolment indicate that a one-unit shift in the variable induces a positive shift in Life Expectancy at Birth by 0.015 and a one-unit shift in Employment to Population Ratio induces a positive shift in Life Expectancy at Birth by 0.146, all variables held constant, respectively. The above results infer a positive relationship between all variables and it therefore means that the variables Primary School Enrolment, Growth in Gross National Income per capita and Employment to Population Ratio are directly correlated to Life Expectancy at Birth. However, the variable Growth in Gross National Income per capita being the only significant variable at the ninety five percent significance level.

Given that the model estimator was a Fixed Effect estimation, the F statistic on the significance of the random effect in the overall model deviations (error term) was rejected narrowly at the ninety percent significance level. This statistic however minimal, highlights that there exist country specific effects on the relationship specified in the model. Controlling for volatility clustering and robust standard errors does not seem to reduce this effect, as the portion of the

volatility explained by the random effect u_i was maintained at 5.6% on the overall residual variance ε_i.

Table 7: Life Expectancy at Birth Regression Analysis

Regression Results for Life Expectancy at Birth
Fixed Effects

VARIABLES	(1) Life Expectancy at Birth Fixed Effect
Change in School Enrolment (Primary)	0.015
	(0.016)
GNI per Capita Growth (annual)	0.030**
	(0.009)
Change in Employment to Population Ratio	0.146
	(0.168)
Constant	0.516***
	(0.020)
Observations	145
R-squared	0.039
Number of Countries	5
F stat ($u_i = 0$)	0.1761

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

Source: Author's estimation

4.4.2 Panel Granger Causality Testing

Panel Granger Causality testing was done on the dataset, the null hypothesis considered under this, was that Primary School Enrolment does not Granger Cause the dependent variable Life Expectancy at Birth. The testing was done under a thousand bootstrap replications for a more detailed analysis of the relationship (if any). The results fail to reject the null hypothesis that Primary School Enrolment does not Granger Cause Life Expectancy at Birth.

H_0: Primary School Enrolment does not Granger-cause Life Expectancy at Birth.

H_1: Primary School Enrolment does Granger-cause Life Expectancy at Birth for at least one panelvar (Country).

P-value* = 0.1520, 95% critical value = 3.9565

Causality is however identified for Growth in Gross National Income per capita and Life Expectancy at birth, the null hypothesis considered under this, was that Growth in Gross National Income per capita does not granger-cause the dependent variable Life Expectancy at Birth. The results reject the null hypothesis that Growth in Gross National Income per capita does not Granger Cause Life Expectancy at Birth.

H_0: Growth in Gross National Income per capita does not Granger-cause Life Expectancy at Birth.

H_1: Growth in Gross National Income per capita does Granger-cause Life Expectancy at Birth for at least one panelvar (Country).

P-value* = 0.0020, 95% critical value = 2.7669

The regression results indicate a positive relationship between all the variables and the dependent regressor, this being the expected relationship from the scatterplot diagram in Figure 1. This means all changes respective to the variables Primary School Enrolment, Gross National income per capita and Employment to Population Ratio impact a positive change in Life Expectancy at Birth. The significance of the variables was found only on the variable Growth in Gross National Income per capita with a positive influence of only 0.03 units of change to the variable Life Expectancy at Birth with a one-unit change, all variables held constant.

Regression results for Primary School Enrolment indicate that a one-unit shift in the variable induces a positive shift in Life Expectancy at Birth by 0.015 and a one-unit shift in Employment to Population Ratio induces a positive shift in Life Expectancy at Birth by 0.146, all variables held constant, respectively. The cointegration results indicate no cointegration between and among the variables under study, the panel granger causality tests are commensurate to the cointegration findings and find no direct or indirect causality between variables as seen similarly by Albouy et al. (2009).

As observed by, Albouy et al. (2009) having analysed the effect of education on mortality, find no significant causality of education on health. Their model was based on data from the Echantillon Démographique Permanent (EDP), a longitudinal dataset on a sample of 1% of the

French population. They perform regress discontinuity designs in their model with the variables being survival rates at the ages of 50 and 80 representing health while the years of schooling being the explanatory variable.

Korkmaz et al. (2016) investigate the relationship between life expectancy, education and economic growth in the Organisation for Economic Co-operation and Development (OECD) member countries. They assess education and health as one of the significant inputs to the human development index. Using panel data from 2007 to 2013 of 10 OECD countries with the variables in high school enrolment, Life Expectancy at Birth, and economic growth as the lead variables for a panel causality test. Their conclusion is that there is unidirectional causality from economic growth to education to health.

This paper draws similarities with the above works most notably, Korkmaz et al. (2016) having analysed a similar set of variables (High school enrolment, Life Expectancy at Birth, and Economic growth) and find unidirectional causality between economic growth to education to health. This paper, however, corresponds with the earlier works of Albouy et al. (2009) (having used the variables Survival to age 50 and 80 and Years of Schooling) in identifying no causality between education and health.

This paper presents new methodological estimation techniques and the variable Primary School Enrolment to the research topic. The deviation to the East African dataset with unequal levels of development in education and health was made pivotal in identification of country specific effects and thus the use of Fixed Effects estimation which was not used before (Korkmaz et al. 2016). The expansion of the time span to 30 years from 1989 to 2018 also contributes to a more informative dataset especially for the Panel Granger Causality testing, and no causality was identified even for one panel variable (country) between education and health.

4.5 LIMITATIONS OF THE STUDY

This paper had its limitations among which macro variables being the biggest impediment to better analysis of the research study. Generalization of the variables under Education and Health loses a lot of information in data sorting and reporting. Zimmerman et al. (2014) instigate the need for Community Perspectives in tracking community identified ailments in either health or education, thus better research that is free from Western biases and redefining variable and information collection geared towards better econometric analysis and policy recommendations.

The underdevelopment of education in the region, highlighted the need to focus only on School Enrolment at Primary School level. However, with this in mind education was still insignificant in arriving at advantageous positions for the educated in East Africa. The lack of formal employment prospects in East Africa makes it needful for other non-formal sources, with limited backgrounds in education to be used in availing the necessary capital for healthcare within the family and greater community at large. Thereby, disparaging the data collected on the variables representative for this study.

Regressions run in accordance with the Hausman (2002) test indicate that for variables run under the Life Expectancy at Birth dependent variable, are favoured for the Fixed Effects estimation, highlighting the presence of country-specific random effects that may be omitted and that indeed play a bigger role in explaining Life Expectancy at Birth other than Primary School Enrolment and Employment to Population Ratio. Thus, panel effects are predominant in the analysis and hinder conclusive inferences.

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

5.1 CONCLUSION

Health advantages for the educated have been approved and formulated by policymakers by governments worldwide from research work done using Westernized datasets. However, this paper considers the gaps in research work by taking a more narrowed approach into East Africa. Using a panel data set of five East African countries (Kenya, Uganda, Tanzania, Rwanda, Burundi) from 1989 to 2018 we test out the above hypothesis with the addition of a new variable Primary School Enrolment and Random and Fixed Effect Estimation. The results from the Hausman specification test indicate that the models regressed under the dependent variable Life Expectancy at Birth are all preferred for Fixed Effects estimation indicative that there are country specific random effects that cannot be fully assumed away and that are important in explaining the changes in Life Expectancy at Birth as opposed to the desired variables Primary School Enrolment, Growth in Gross National Income per capita and Employment to Population Ratio.

All cointegration and causality testing dismiss any significant relationships in this study that are common to the variables that can induce causality or correlation, thereby Education is not significant in determining health outcomes in East Africa.

The results above highlight that School Enrolment changes have minimal significant influence on changes in overall health of individuals in Kenya, Uganda, Tanzania, Burundi, and Uganda. Educational advantages in healthcare are grossly represented through the changes in Growth in Gross National Income per capita, as a proxy of income changes per capita. Growth in Gross National Income per capita was almost largely significant to changes in Life Expectancy at Birth for increased and decreased time spans.

5.2 RECOMMENDATIONS

Having gathered the conclusions of the above paper it is evident that indeed educational advantages in healthcare are not significantly felt in East Africa, the advantages thereby only witnessed on the cumulative per capita Gross National Income. This being evident of greater need for researchers and policymakers to identify other avenues at arriving at greater healthcare development in the region.

This study's recommendation for researchers is the inclusion of "non-formal employment" variables that are key in explaining the drivers of income in Africa as Employment to Population Ratio was insignificant in as far as catering for the self-employed population of East Africa. Further research is needed in identifying other avenues of tracking developments in education throughout time in Africa and a more inclusive research process that will result in richer results and analysis. The influence of other variables other than education that drive changes in Healthcare across the five countries, especially digressing on factors that influence Gross National Income.

This study's recommendation to policy makers especially in the five states (Kenya, Uganda, Tanzania, Rwanda, and Burundi) is identifying ailments in health and education separately and combating them without joint interlinks. As seen on the influence of Gross National Income on Life Expectancy at Birth it is vital that pending research identifying the micro factors favouring this relationship, a new avenue to solve health inequalities to be sought that is pegged on income and economic growth in the region.

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APPENDIX

Table 8: Raw Summary Statistics

Variable Name	Obs	Mean	SD	Min	Median	Max
Pupil Teacher Ratio (Primary)	122	48.677	10.304	27.687	49.783	69.286
School Enrolment (Primary)	136	100.451	27.462	38.418	102.247	149.271
Current Health Expenditure	95	6.905	2.048	3.415	6.788	11.793
Employment to Population Ratio	140	77.581	7.497	63.285	79.206	90.447
GDP per Capita Growth (annual)	150	1.661	6.038	-47.503	2.014	37.536
GDP per Capita	145	1386.596	754.876	361.560	1268.656	4306.207
GNI per Capita Growth (annual)	138	1.999	6.113	-47.393	2.246	38.587
GNI per Capita	145	1367.724	741.965	360.000	1250.000	4240.000
Mortality Rate, Infants	150	68.977	26.107	27.300	65.450	120.200
Life Expectancy at Birth	150	53.508	8.456	26.172	53.540	68.700
Mortality rate (Adult Male)	150	412.689	111.291	216.342	393.882	688.960
Mortality rate (Adult Female)	150	341.618	99.155	161.590	334.455	614.383
Survival to age 65 (Female)	150	50.143	12.340	13.471	48.567	75.091
Survival to age 65 (Male)	150	41.902	12.297	9.841	41.008	66.901

Source: Author's estimation