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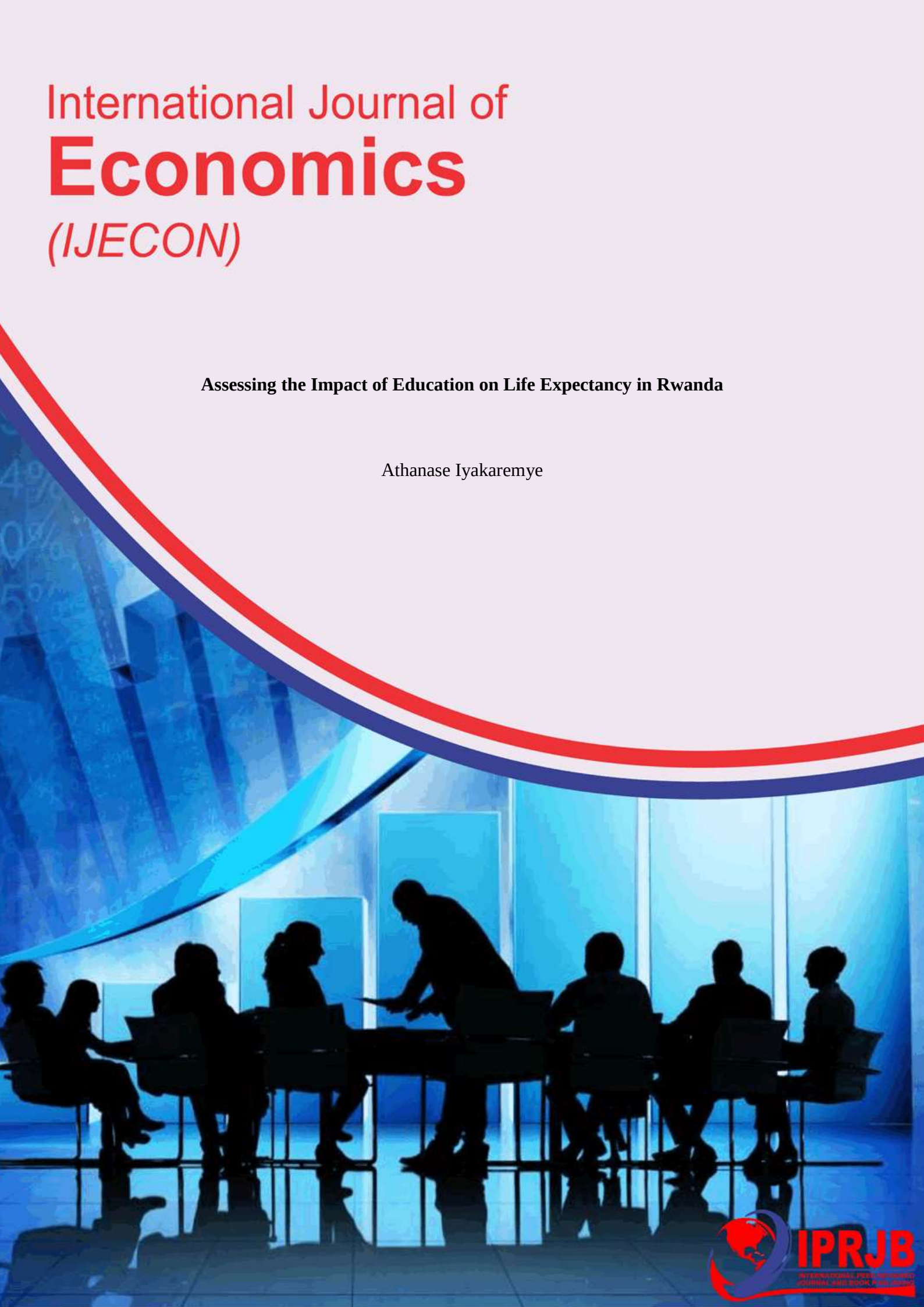

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Abstract

Purpose: Education's impact on life expectancy is a crucial area of study, particularly in nations undergoing rapid demographic and epidemiological transitions like Rwanda. This research examines the intricate relationship between education and life expectancy in Rwanda, considering the nation's advancements in education and healthcare. Despite progress, challenges persist in ensuring equitable access to quality education.

Methodology: The study utilizes quantitative research methods, employing descriptive, correlation, and causal-comparative approaches, alongside econometric analyses like co-integration tests and vector error correction models. Data covering the period from 1965 to 2020 were collected from the World Bank Database.

Findings: Findings indicate a significant effect of education on fertility rates, with higher education levels associated with lower fertility. Additionally, forecasts project an increase in life expectancy across educational groups, albeit less pronounced for the less educated. Gender disparities persist, with the rate of decrease in life expectancy differences between males and females slower than in previous decades. Increasing prediction intervals highlight growing uncertainty over time.

Unique Contribution to Theory, Practice and Policy: The research contributes to understanding the complex interplay between education and life expectancy in Rwanda, offering insights for policy interventions to enhance population health outcomes and promote sustainable development. This study underscores the imperative for targeted strategies to mitigate educational barriers and advance inclusive development, addressing existing gaps in empirical evidence within the Rwandan context.

Keywords: *Impact, Education, Life, Life Expectancy, Rwanda*

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INTRODUCTION

Education is widely acknowledged as a pivotal factor influencing both health and overall well-being, with significant ramifications for life expectancy across diverse populations. As societies advance, the role of education in shaping health outcomes becomes increasingly evident, especially in low- and middle-income countries experiencing rapid demographic and epidemiological transitions. In Rwanda, notable advancements in education reform and healthcare delivery in recent decades underscore the crucial need to comprehend the intricate connection between education and life expectancy (WHO, 2010).

Extensive research has delved into the correlation between education and health outcomes, unveiling strong associations between educational achievement and various health metrics, encompassing mortality rates, disease prevalence, and overall life expectancy (Cutler & Lleras-Muney, 2006). Elevated levels of education frequently correlate with healthier lifestyles, improved access to healthcare services, and heightened awareness of preventive health measures, collectively contributing to extended life expectancy (WHO, 2014).

The intersection of education and health in Rwanda emerges as a compelling area for investigation, given the nation's ambitious endeavors to enhance educational accessibility, quality, and relevance in recent years (UNESCO, 2020). Following the profound impact of the 1994 genocide, Rwanda has embarked on a comprehensive reform agenda aimed at rebuilding its societal fabric and fostering sustainable development across various sectors, including education and healthcare (Republic of Rwanda, 2018).

Despite notable strides in broadening educational opportunities and achieving nearly universal primary school enrollment, challenges persist in ensuring equitable access to quality education, particularly at the secondary and tertiary levels (Rwanda Basic Education Board, 2020). Additionally, disparities in educational attainment across gender, socioeconomic status, and geographic regions underscore the imperative for targeted interventions to mitigate educational barriers and advance inclusive development (UNICEF, 2019).

Against this backdrop, investigating the influence of education on life expectancy in Rwanda holds significant implications for public policy formulation, resource allocation, and program design aimed at enhancing population health outcomes. By elucidating the pathways through which education shapes health and longevity, policymakers and practitioners can devise evidence-based strategies to optimize the health dividends of educational investments and foster comprehensive development (Sudfeld et al., 2020).

This research endeavors to contribute to the expanding body of literature exploring the intricate relationship between education and health by conducting a thorough evaluation of the impact of education on life expectancy in Rwanda. Through rigorous empirical analysis and theoretical synthesis, this study seeks to illuminate the underlying mechanisms driving this relationship and offer insights into potential avenues for policy intervention and programmatic initiatives aimed at advancing health equity and sustainable development within Rwanda and beyond.

The impact of education on life expectancy is a multifaceted issue, influenced by various socio-economic and demographic factors. Research indicates a complex relationship between educational attainment, fertility rates, and health outcomes, particularly in the context of demographic and epidemiological transitions (Cervellati and Sunde, 2015). Studies suggest that higher levels of education are associated with increased life expectancy and improved health outcomes, attributed to factors such as healthier lifestyles, enhanced access to healthcare, and greater awareness of preventive measures. Furthermore, education is seen as a key

determinant of economic development, influencing individuals' earning potential and overall well-being (Shahbaz et al. 2019). However, the causal mechanisms underlying the education-life expectancy nexus remain subject to debate, with scholars highlighting the importance of considering contextual factors and heterogeneity across populations. In Rwanda, education is recognized as a cornerstone of the government's development agenda, with initiatives aimed at achieving universal access to quality education and literacy. Understanding the interplay between education and life expectancy is therefore essential for informing policy interventions and promoting sustainable development in Rwanda (Ling et al., 2017).

Problem Statement

This section revolves around the need to understand the relationship between education and health outcomes in the context of Rwanda's evolving socio-economic landscape. Despite significant strides in educational reform and healthcare delivery, Rwanda still faces challenges related to health disparities and inequities in educational access. The problem lies in the lack of comprehensive empirical evidence on how educational attainment influences life expectancy in Rwanda specifically. This knowledge gap hinders effective policymaking and program planning aimed at improving population health outcomes and fostering sustainable development. Moreover, existing research predominantly focuses on global or regional contexts, neglecting the unique socio-cultural and economic dynamics of Rwanda. Therefore, there is a pressing need for research that systematically examines the impact of education on life expectancy within the Rwandan context. Addressing this gap will not only contribute to the academic literature but also inform evidence-based interventions to promote health equity and enhance overall well-being in Rwanda.

METHODOLOGY

Research Design

The following quantitative research methods were employed such as descriptive research (it requires a very large sample size and is used to describe a population), correlation research (it explores the relationship between two or more variables), and causal-comparative (it seeks to establish the difference in variables between groups). The methodological approach adopted the descriptive and econometric approaches. The Gross National Income (GNI) per capita is presented as a function of life expectancy and other control variables such as education, mortality, and fertility (Acemoglu and Johnson, 2007).

The time series were indulged with the unit root problem that makes the error of the time series nonstationary. Co-integration test plays a big role in finding the relationship between variables (Juselius,1990). The vector error correction model (VECM) was used to investigate the effect of fertility on life expectancy in Rwanda from 1965 to 2020. The general assumption in the suggested model is that there is at least one long-run co-integration vector for the variables and the value of the dependable variable can be meant as a function of past values of the dependent variable, past values of the independent variable, and error term.

Population and Sample

The life expectancy indicator mostly relies on the number of years of life expectancy at birth. For instance; among the past studies conducted, employed the life expectancy at birth, utilized the total number of years that an individual has to live in a country to gauge the life expectancy variable. The researcher used the number of years of life expectancy at birth (total in men and

women) to measure life expectancy in Rwanda. To obtain this measure and annual GDP growth rate, data were collected from the World Bank Database (Ngangue and Manfred, 2015).

Data Collection Procedures

The data were retrieved from The World Bank's World Development Indicators from 1965 to 2020. The data on fertility were used to test the co-integration and causality relationship between life expectancy and fertility in panel data. The researcher used the variable of life expectancy as an indicator of health and employed real per capita GDP as a criterion of economic growth. The study used the annual data and covers the period from 1965 to 2020. The logarithms of variables were employed for empirical analyses.

The researcher adopted an empirical specification that allows for different effects of life expectancy on population. To figure out problems of reverse causality and to investigate the causal effect of fertility on life expectancy. The base sample was relevant to the predicted fertility instrument and life expectancy. In further investigations of the human capital, the channel was tracked based on the population share without schooling and on the average years of schooling in the population of working age constructed by (Cohen and Soto, 2007).

Data Analysis

The researcher used the following regression covering the years 1965 to 2020 to examine the relationship between life expectancy and education:

Education $c_r = \alpha + \beta_{LE15} + \lambda_r + \gamma_c + \zeta_{cr} + e_{cr}$, (2)

Where c refers to 5-year birth cohorts and r refers to Rwanda. Education is the average schooling by cohort. LE15 is the average number of years 15 years old is expected to live when the cohort is 5 to 15 years old. The choice of good average life expectancy between ages 5 to 15 is to count for the fact that education decision is made during school-going age not afterward. A woman 30 years old who experiences an increase in life expectancy will not increase her education because she is beyond the age to invest and the change in life expectancy will affect the investment in education for her children.

RESULTS

Effect of Education on Fertility

Education has a significant effect on fertility rates, with higher levels of education often associated with lower fertility. This relationship has been extensively studied, as evidenced by research such as the work by Bleakley (2006) and Şentürk and Amjad (2021) analyzing exogenous changes in adult life expectancy and their impact on fertility.

OLS between Fertility and GPI

GPI (P=0.0000) is a negative and statistically significant on fertility at 5% in the table above. The coefficient term tells the change in fertility for a unit change in GPI this means that if the fertility decreases by 1 unit, then GPI increases by 1.92. In other words, we need to implement interventions to increase the GPI rate in order to decrease fertility in Rwanda.

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Table 1: OLS between Fertility and GPI

Source	**SS**	**df**	**MS**	**Number of obs =52**		
F(1, 50)=53.35						
Model	0.94103	1	0.941	Prob > F=0.0000		
Residual	0.882	50	0.0176	R-squared=0.5162		
Adj R-squared =0.5065						
Total	**1.82303**	**51**	**0.0357**	**Root MSE =0.5065**		
Fertility	**Coef.**	**Std. Err.**	**t**	**P>t**	**[95% Conf.**	**Interval]**
GPI	-1.91533	0.2622345	-7.3	0.000	-2.442038	-1.388611
_cons	5.58129	0.2511679	22.22	0.000	5.076807	6.085778

Note: denote significance at 5%

Vector Autoregressive Model for Fertility and GPI

The autoregressive model in the table above has shown how each variable has an equation modeling its evaluation over time. The below equation includes the variables that lagged at one year such as fertility (p = 0.000) and GPI (p = 0.000). The prior knowledge required is a list of variables and covariates that can be hypothesized (Null and Alternative hypotheses) to affect each other over a period of time.

Table 2: Autoregressive Model Fertility and GPI

Sample: 1970 - 2020	Number of obs = 51			
Log likelihood = 320.4371	AIC = -12.33087			
FPE = 1.51e-08	HQIC = -12.24402			
Det (Sigma_ml) = 1.20e-08	SBIC = -12.10359			
Equation	**RMSE**	**R-sq**	**chi2**	**P>chi2**
fertility	0.005222	0.9993	70115.58	0.000
GPI	0.024733	0.8848	391.5494	0.000

Granger Causality Wald Tests for Fertility and GPI

Fertility **(p = 0.000)** does significantly cause GPI at 5% in the table above, while GPI **(p = 0.063)** does not cause fertility at 5% and 10%.

Table 3: Granger Causality Wald Tests for Fertility and GPI

Granger causality Wald tests				
Equation	**Excluded**	**chi2**	**df**	**Prob > chi2**
fertility	GPI	101.37**	1	0.000
GPI	fertility	0.13321	1	0.715

* p < .05 ** p < .01. Akaike Information Criterion was utilized to determine the optimal lag length.

Universal education significantly impacts family and community dynamics, influencing fertility trends. Mass education shifts societal norms towards nuclear family structures, reducing fertility rates. This shift is driven by increased investment in children's education and changing perceptions of childhood. Caldwell (1980) highlights education's role in altering social judgments and prioritizing immediate family over extended kin networks. Snopkowski

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and Kaplan (2014) emphasize mass education's effect on parental attitudes, advocating for widespread education, particularly for women, to accelerate this shift towards smaller family sizes and nuclear family ideals propagated through mass media.

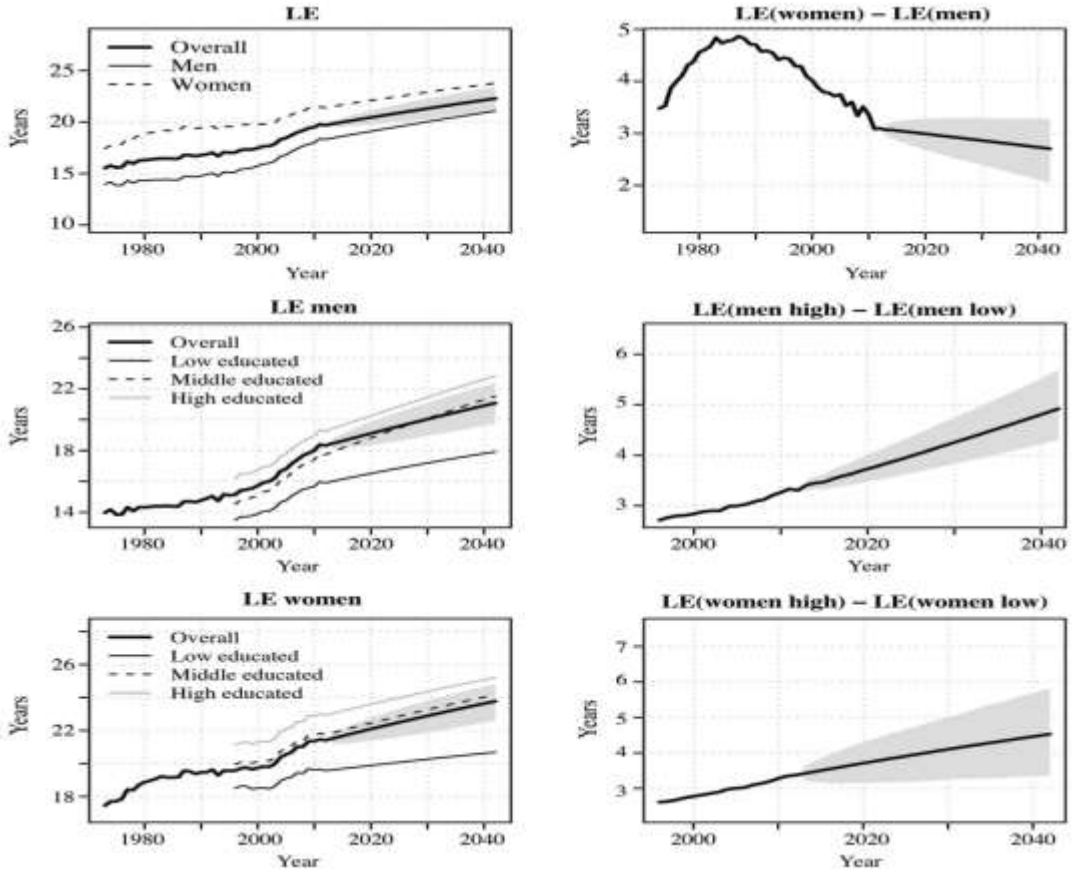

Figure 1: Forecasts Projections of Life Expectancy (LE) in Rwanda

Forecasts Projections of life expectancy (LE) in Rwanda at age 65 for the overall total population (upper (top left graph) panel) and different subgroups, including 95 percent prediction intervals, and forecasts projections of differences in LE at age 65 between different subgroups. Forecasts subgroups. Projections of LE at age 65 for the different education educational groups (middle left and bottom left graphs for men and women, respectively). Forecasts of Predict differences in LE at age 65 between men males and women (upper females (top right graph), high panel), high- and low educated low-educated men (middle right graph), (middle-right panel), and high - and low educated low-educated women (bottom right graph) panel), including 95 percent prediction intervals.

The above figure shows trends and forecast projections of LE (left-hand graphs) (left panels) and differences in LE between different subgroups (right-hand graphs). (right panels). From this figure, it can be seen that LE is predicted projected to increase for all educational classes and levels of education for both men and women, but that LE increases less for the less educated. The difference in LE gap between the higher and the less educated increases educated is increasing at the same pace as the rate observed in the period 1980 -2020 for both men and women. Furthermore, women over the period 1980 -2020. Furthermore, although LE differences in LE between men males and women females are expected to decrease, the rate of

this decrease is slower than has been observed in over the last past decade. Also noteworthy of note are the increasing prediction intervals that increase intervals over time and the fact that the trends in the subgroups are rather quite similar as a result of modeling by modeling the common time temporal trends.

CONCLUSION AND RECOMMENDATIONS

Conclusion

The findings of this research underscore the profound impact of education on both fertility rates and life expectancy in Rwanda. Through rigorous quantitative analysis, it has been established that higher levels of education are significantly associated with lower fertility rates, a relationship well-documented in existing literature. Moreover, universal education initiatives have contributed to shifting societal norms towards smaller family structures, thereby influencing fertility trends and family dynamics. In parallel, education emerges as a pivotal determinant of life expectancy in Rwanda, with forecasts projecting an overall increase in life expectancy across educational groups. However, disparities persist, with the less educated experiencing comparatively slower increases in life expectancy. Notably, gender differentials persist, with the rate of decrease in life expectancy differences between males and females slower than observed in previous years.

The widening gap in life expectancy between higher and lower educated individuals suggests the need for targeted interventions to address health disparities and promote inclusive development. While educational reforms have made significant strides in enhancing educational accessibility and quality, challenges remain, particularly in ensuring equitable access to education at all levels.

Recommendations for Action

The government of Rwanda has to put efforts to focus on improving educational accessibility, quality, and relevance, particularly for marginalized populations such as women and those in rural areas. There is a need of community-based health promotion by engaging communities in health promotion activities can facilitate behavior change and improve health outcomes. Community-based interventions should prioritize health education and awareness-raising initiatives, with a focus on preventive measures and healthy lifestyle behaviors.

Integration of education and health policies is essential for addressing the complex interplay between education, fertility, and life expectancy. Multisectoral approaches should be adopted to ensure that policies and programs are coordinated and aligned towards achieving common health and development goals. Further research is needed to deepen our understanding of the mechanisms through which education influences fertility rates and life expectancy in Rwanda. Knowledge sharing platforms should be established to facilitate the dissemination of research findings and best practices in education and health promotion.

REFERENCES

Acemoglu, D., Johnson, S., 2007. Disease and development: the effect of life expectancy on economic growth. Journal of political Economy 115, 925–985.

Bleakley, H., 2006. Disease and development: comments on Acemoglu and Johnson (2006). remarks delivered at the NBER Summer Institute on Economic Fluctuations and Growth.

Caldwell, 1980, Life history evolution: successes, limitations, and prospects. Naturwissenschaften 87, 476–486.

Cervellati, M., Sunde, U., 2015. The effect of life expectancy on education and population dynamics. Empirical Economics 48, 1445–1478.

Cohen, D., Soto, M., 2007. Growth and human capital: good data, good results. Journal of economic growth 12, 51–76.

Cutler, D. M., & Lleras-Muney, A. (2006). Education and Health: Evaluating Theories and Evidence. NBER Working Paper Series, No. 12352. Retrieved from https://www.nber.org/papers/w12352

Juselius,1990. Health Policies and Programs in Rwanda: A Case Study on Raising Fertility Rate. Asian Journal of Social Sciences and Management Studies, 6(3), 89-97.

Ling, C.H., Ahmed, K., Muhamad, R., Shahbaz, M., Loganathan, N., 2017. Testing the social cost of rapid economic development in Malaysia: the effect of trade on life expectancy. Social Indicators Research 130, 1005–1023.

Ngangue, N., Manfred, K., 2015. The impact of life expectancy on economic growth in developing countries. Asian Economic and Financial Review 5, 653–660.

Republic of Rwanda. (2018). National Strategy for Transformation (NST1) 2017/18-2023/24. Retrieved from https://www.primature.gov.rw/fileadmin/user_upload/NST1_Booklet_21_06_2018.pd

Rwanda Basic Education Board. (2020). Annual Statistical Yearbook 2020. Retrieved from https://www.reb.rw/fileadmin/user_upload/statistics/Annual_Statistical_Yearbook_2020.pdf

Şentürk, İ., Amjad, A., 2021. Socioeconomic Determinants of Gender-Specific Life Expectancy in Turkey: A Time Series Analysis. Sosyoekonomi 29, 85–111.

Shahbaz, M., Shafiullah, M., Mahalik, M.K., 2019. The dynamics of financial development, globalisation, economic growth and life expectancy in sub-Saharan Africa. Australian Economic Papers 58, 444–479.

Snopkowski and Kaplan, 2014, Exploring evidence for disrespect and abuse in facility-based childbirth. Boston: USAID-TRAction Project, Harvard School of Public Health 3.

Sudfeld, C. R., McCoy, D. C., Danaei, G., Fink, G., Ezzati, M., Andrews, K. G., & Fawzi, W. W. (2020). Linear Growth and Child Development in Low- and Middle-Income Countries: A Meta-Analysis. Pediatrics, 145(4). doi:10.1542/peds.2019-1694

UNESCO. (2020). Education for Sustainable Development Goals: Learning Objectives. Retrieved from https://unesdoc.unesco.org/ark:/48223/pf0000367338

UNICEF. (2019). State of the World's Children 2019: Children, Food and Nutrition. Retrieved from https://www.unicef.org/media/60806/file/SOWC-2019.pdf

WHO. (2010). Rwanda Health Profile. Retrieved from https://www.who.int/gho/countries/rwa.pdf

WHO. (2014). World Health Statistics 2014. Retrieved from https://www.who.int/gho/publications/world_health_statistics/2014/en/