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Case Report

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The Relationship Between Economic Growth and Life Expectancy in South Africa

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ABSTRACT
Life expectancy has significantly increased in most parts of the world. The global life expectancy has increased by more than six years between 2000 and 2019, from 66.8 years to 73.4 years. Improving life expectancy and overall health has become an essential goal for the United Nations and numerous national governments from both developed and developing countries. This study examined the impact of economic growth on life expectancy in South Africa from 1994 to 2022. This study took a comprehensive approach by including control variables namely health expenditure, innovation and telecommunications. These variables were integrated into the analysis to provide a more thorough understanding of their potential influence on life expectancy in the nation. The investigation begins with a bounds testing of their potential influence on life expectancy, followed by the application of the ARDL (Autoregressive Distributed Lag) estimation technique. Additionally, the granger causality provides further insights into the temporal correlations among variables. The analysis reveals a noteworthy relationship between the variables in both short and long-term contexts, except GDP per capita, which proves insignificant in both the short and long run. As a result, the study highly recommends improving the efficiency and targeting of healthcare expenditure, aligning technological innovation with public health needs and using telecommunications strategically for healthcare outreach for South Africa to transition towards a healthier economy.

Keywords: Economic Growth, Life Expectancy, Health Expenditure, Innovation and Telecommunications

Introduction

Life expectancy summarises a population's overall health and well-being. As such, a country's life expectancy reflects the socioeconomic conditions and the quality of its healthcare infrastructure [1,2]. Ho and Hendi (2018) argue that when there are no significant economic disruptions, such as wars or epidemics, lack of improvements in life expectancy indicate that there are potential issues in a country's public health and economic systems that need to be addressed [3].

According to Miladinov (2020), life expectancy is defined as a summary indicator of the overall mortality of a population and highlights the patterns of mortality across all age groups [4]. On the other hand, Gracia-de-Rentería, Ferrer-Pérez, Sanjuán and Philippidis (2022) define life expectancy as a summary metric that reflects improvements in health care, progression of responsible and sustainable lifestyles, healthy eating patterns and the development of other social services [5]. Studies such as those of He and Li (2018), Luo and Xie (2020), and Azam, Hafeez, Khan, and Abdullah (2021) have proven a positive relationship between life expectancy and economic growth [6-8]. However, some scholars believe life expectancy increases rapidly for people with higher education or income and decreases for those with less [9]. This is because people with higher education have better employment opportunities with health benefits such as insurance coverage [10].

Life expectancy has significantly increased in most parts of the world [11]. The global life expectancy has increased by more than six years between 2000 and 2019, from 66.8 years to 73.4 years, respectively, according to World Health Organisation Data (2024). Improving life expectancy and overall health has become an essential goal for the United Nations and numerous national governments from both developed and developing countries [12]. However, developing countries are still making strides in improving their life expectancy as their average life expectancy is still at 65 years (Statista, 2023), with South Africa

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amongst those countries having an average life expectancy of only 64.3 years [13].

Since the start of the 21st century, the global economy has reached unprecedented levels of economic growth and development, enhancing the well-being and progress of humanity. However, with the rapid economic growth, certain factors such as air pollution and technical improvements have posed significant threats to the life expectancy of humankind [14]. The global GDP per capita, which is an economic metric that breaks down a country's output into a per-person allocation has reached $12,688, a 3.02% increase in 2022 (Macrotrends, 2024) [15]. With this increase, South Africa had a $6,681 GDP per capita in 2022, according to Focus Economics (2024). Murthy, Shaari, Mariadas, and Abidin (2021) assert that life expectancy also tends to increase as economic growth increases. Hence, it cannot be denied that a rise in economic growth entails an increase in energy consumption accompanied by high CO2 emissions that impair life expectancy.

Economic growth refers to an increase in the size or the output of a country's economy over a period of time (Urbano, Aparicio, & Audretsch, 2019). According to Investopedia (2024), economic growth is an increase in the production of economic goods and services at the same time compared with a previous period. It can be measured in nominal or real terms. There are many indicators or measurements of economic growth, but the most commonly used is GDP per capita [16]. This is because GDP per capita provides a fundamental measure of the value of output per person in a particular country. Hence, growth in GDP and GDP per capita are considered broad measures of economic growth (worldbank, 2024) In recent literature, economic growth and life expectancy have gained attention from a limited number of researchers (Murthy, Shaari, Mariadas, & Abidin, 2021). However, the rapid increase in global economic growth in the 21st century and its impact on human life expectancy has prompted international and local researchers to investigate the relationship between the two phenomena [17]. It has been suggested that life expectancy is significantly influenced by government spending on health and overall economic growth [11]. He and Li (2018) conducted a panel analysis of the relationship between economic development and life expectancy [6]. They found that out of 65 countries, 53 had a positive correlation between economic development and life expectancy, proving that the relationship between the two phenomena is diverse.

South Africa spends around 8 to 9% of its GDP on public healthcare, which is well above the WHO guidelines (National Treasury, 2024). However, the average life expectancy in 2022 was 64.63 years, below the global average of 73.33 years (Macrotrends, 2024). Despite this, South Africa's GDP (per capita) declined by 4.34% between 2021 and 2022, according to the World Bank (2024). This suggests South Africa's economic growth is failing to increase life expectancy.

South Africa has implemented various policies to increase economic development and improve life expectancy. These include the National Development Plan (NDP) 2030 and the National Health Insurance (NHI). The NDP outlines a long-term strategy for economic growth and development, and the NHI aims to provide universal health coverage to all South Africans [18]. However, these policies seem ineffective in the country [19].

Studies by Chen et al. (2021) [12], Malakoane et al. (2020) [20], and Burger and Christian (2020) [21] have investigated the relationship between economic development and life expectancy using various data sources such as panel data, provincial data, and primary data. However, these studies did not account for the effects of innovation and telecommunications, which can positively impact life expectancy by enhancing access to healthcare, fostering better disease management and promoting a healthy and more informed population [22]. This study, therefore, aims to include these variables and fill the methodological gap by examining the time series relationship between economic growth and life expectancy in South Africa. Since further research is needed to substantiate the link between economic growth and life expectancy as it may differ depending on the area of focus; this study aims to provide more valuable insights, shedding light on obstacles, strengths and opportunities to propel South Africa towards a healthy and economically developed environment [23].

Literature Review

Theoretical Literature

A theoretical review of economic growth and health status will be explored in this section. This includes theories such as human capital theory (1962, 1976), Solow-swan growth model (1956), endogenous growth theory (1986, 1986) and demographic transition theory (1929, 1945) and their relevance to this study.

Human Capital Theory

Initially formulated by Becker (1962) and Rosen (1976), the human capital theory posits that investments in health and education are critical for economic growth as they improve the capabilities and productivity of individuals (Rauch, 2001). Within the context of this study, by focusing on life expectancy, this theory suggests that a substantial increase in economic growth and development improves the well-being and health of individuals.

Solow-Swan Growth Model

The model was independently developed by Robert Solow and Trevor Swan in 1956, and it highlights the importance of capital accumulation, labour force growth and technological progress in driving economic growth (Spencer & Dimand, 2010). Within the context of this study, the model economic growth impacts life expectancy by improving living standards and access to healthcare. It also highlights the role of innovations and telecommunications in enhancing productivity and economic development.

Endogenous Growth Theory

Developed by Paul Romer (1986) and Robert Lucas (1988), the endogenous growth theory emphasises that economic growth is driven by internal factors such as human capital innovation and knowledge rather than external factors (Aghion & Howitt, 1998). Within this study, the theory emphasises that increased investments in innovation and education contribute to sustainable economic growth and subsequently improve life expectancy.

Grossman Model of Health Deaman Theory

Developed by Micheal Grossman in 1972, the Grossman model of health demand theory posits that people treat their health like a valuable asset. As such as income increases people tend to demand more health services and are better able to afford healthcare (Zweifel, 2012). Within the context of this study, the theory assumes that increased economic growth results in increased income which leads to improvements in life expectancy.

Empirical Literature

This section of the study presents empirical literature on economic development and life expectancy relationship. It is divided into three parts: evidence from developed and developing nations and evidence specific to South Africa.

Jakovljevic, Timofeyev and Reshetnikov (2020) studied the real GDP growth and healthcare nexus in the G7 countries [24]. Their study employed the panel ARDL model to analyse the data. Their study found that Regression analysis demonstrated that, in the G7, real GDP growth had a positive impact on out-of-pocket expenditure, measured as a percentage of current health expenditure, expressed as a percentage of GDP. Using a correlation analysis, Raghupathi and Raghupathi (2020) explored the association between public health expenditures and economic performance and their contribution to life expectancy in the United States from 2003 to 2014 [10]. Their study used time series data, found a positive correlation between healthcare expenditure and economic performance, and significantly influenced life expectancy. Bayar, Gavriletea, Pintea and Sechel (2021) studied the impact of environment, life expectancy, and real GDP per capita on health expenditures in a sample of 27 EU member states over the 2000–2018 period through causality and cointegration analyses [11]. The cointegration analysis indicated that life expectancy and real GDP per capita significantly positively impacted health expenditures at the overall panel. Usman, Ma, Zafar, Haseeb and Ashraf (2019) investigated the impact of CO2 emissions on per capita government and private health expenditures in 13 emerging economies from 1994 to 2017. The study employed the Lagrange Multiplier (LM) bootstrap approach to investigate the presence of panel cointegration, and empirical results underscored the existence of cointegration among variables.

Cole (2019), using data from up to 134 developing countries between 1970 and 2015, investigated the effect of economic growth on health, focusing on infant mortality, life expectancy, and caloric consumption using panel analysis [25]. Their results show that fiveyear economic growth rates improve all three health outcomes, even after controlling for other important determinants and accounting for the possibility of reverse causality. Onwube, Chukwu and Ahamba (2021) studied GDP per capita, and level of education are essential determinants life expectancy from 2014 to 2019 in Nigeria using the ARDL approach [26]. Their study found a positive correlation between life expectancy, GDP per capita and level of education. Chirinda and Phaswana-Mafuya (2018) examined actors associated with happiness and estimated happy life expectancy for older people in South Africa in 2018 [27]. Their study used data from the first wave of the Study on Ageing and Adult Health (SAGE) survey, a nationally representative population-based survey with a sample of 3,840 individuals aged 50 years and above.

They found out that women demonstrated longer life expectancy and happy life expectancy, but also unhappy life expectancy compared to men across all ages.

Chirinda, Saito, Gu and Zungu (2019) examined the trends in gender differences in healthy life expectancy (HLE) for older people in South Africa from 2005–2012. Their study used data from three repeated cross-sectional surveys conducted in 2005, 2008, and 2012 [28]. They found that unhealthy life expectancy decreased over the period, while HLE and the proportion of life spent in good health increased more than total life expectancy in the same period. Gordon, Booysen and Josue (2020) studied the socioeconomic inequalities in health and healthcare using an integrated conceptual framework in South Africa [29]. Their study used the 2012 South African National Health and Nutrition Examination Survey (SANHANES-1), a nationally representative study that collected data on various questions related to health and healthcare. They found out that in terms of healthcare needs, good and ill health are concentrated among the socioeconomically advantaged and disadvantaged, respectively. The relatively wealthy perceived a greater desire for care than the relatively poor [30-56].

Methodology

This section presents the methodology applied to examine the link between economic development and life expectancy in South Africa.

Model Specification

The following model is adopted from a study by Onwube, Basil, Ahamba, Emenekwe and Enyoghasim (2021) about the Determinants of life expectancy in Nigeria: an autoregressive distributed lag approach [26]:

$$lifE_t = \beta_0 + \beta_1 InRGDP_t + \beta_2 InInFr_t + \beta_3 Inimports_t + \beta_4 InHC\exp_t + \beta_5 GC\exp_t + \beta_6 EXR_t + \varepsilon_t \quad (1)$$

Where: lifE denotes life expectancy, RGDP denotes GDP per capita, Infr is inflation, imports denote the imports, HCexp is household consumption expenditure, GCexp denotes government consumption expenditure all at time t. this model was modified as follows:

$$lifE_t = \beta_0 + \beta_1 RGDP_t + \beta_2 HE_t + \beta_3 I_t + \beta_4 TEL_t + \varepsilon_t \quad (2)$$

Where: Y_{it} denotes life expectancy at birth at time t, the primary explanatory variable is Gross Domestic product per capita in at time t, HE_{it} is the health expenditure, Iit is innovation, and TEL_{it} is the telecommunications and ε is the error term.

Estimation Techniques

This study will employed unit root tests to ascertain the non-stationarity of the time series and select the most appropriate model. The informal and formal unit root analysis are the two techniques that this study used to assess stationarity. The selection of the lag structure was done using the akaike information criterion (AIC). To investigate the possible long-run cointegration between economic development and life expectancy, this study will employed the autoregressive distributed lag (ARDL) bounds testing approach for cointegration analysis. The Granger causality test was used to examine the causality among the variables of interest. Lastly, other analytical tests of inferences, such as autocorrelation, diagnostic tests and stability tests, were carried out.

Empirical Results

Descriptive Statistics

The purpose of Table 1 is to summarise the statistical data that depicts the variables being examined in this study. The investigation found that all variables in the study have positive mean coefficients, indicating an upward trend over the series. Skewness values are mostly positive, with life expectancy and health expenditure having negative skewness. All the variables are mesokurtic, while life expectancy and health expenditure are platykurtic.

Table 1

	LEAB	GDPPC	HE	TI	TEL
Mean	59.94000	526.3079	385925.9	790.0000	2.740370
Median	60.65000	1.428937	410000.0	822.0000	2.720000
Maximum	66.17000	4172.54	510000.0	804.000	0.410000
Minimum	53.98000	-2.702156	170000.0	138.0000	1.668174
Std. Dev.	3.892071	2727.228	108566.2	302.6841	1.829573
Skewness	-0.128239	4.902900	-0.548256	0.691686	8.867249
Kurtosis	1.800808	25.03844	2.046634	6.691205	53.79070
Jarque-Bera	1.691823	654.5774	2.375148	17.48105	0.410000
Probability	0.429166	0.000000	0.304960	0.000160	0.000000
Sum	1618.380	14210.31	0420000	21330.00	73.99000
Sum Sq. Dev	393.8536	1.93E+08	3.06E+11	2382060.	72.35290
Observations	27	27	27	27	27

Notes: **5% significance level. Source: Author's own drawing. Results obtained from EViews 10

Correlation Test

Table 2 demonstrates the results obtained from this analysis.
Table 2 indicates that there exists a moderate positive correlation, with a magnitude of 0,122 between life expectancy (LEAB) and gross domestic product per capita (GDPPC). Conversely, there is a strong negative correlation, with a magnitude of -0.774, between life expectancy and health expenditure (HE). Another negative correlation is observed between life expectancy and technological innovation (TI), with a magnitude of -0.200, which is also weak. Furthermore, there is moderate positive correlation, with a magnitude of 0.259 between life expectancy and telecommunications (TEL). The variables exceeding a correlation of 0.7 suggest a high correlation while those below indicates a weak correlation. Therefore, all these variables indicate no presence of autocorrelation.

Table 2

	LEAB	GDPPC	HE	TI	TEL
LEAB	1.000000	0.122823	-0.774178	-0.200575	0.259456
GDPPC	0.122823	1.000000	-0.397171	0.669708	0.759407
HE	-0.774178	-0.397171	1.000000	-0.237291	-0.703952
TI	-0.200575	0.669708	-0.237291	1.000000	0.571340
TEL	-0.259456	0.759407	-0.703952	0.571340	1.000000

Source: Author's own drawing. Results obtained from EViews 10.

Formal Unit-Root Testing

The results are displayed in table 3 AND table 4. The investigation found that all series, except for telecommunications, are integrated of order 1, meaning they have a unit root at levels. telecommunications are stationary at levels with an integration order of 0. After the first differencing, all series showed stationarity in the ADF and PP tests.

Augmented Dickey-Fuller Test Results

Table 3

Variables	Model specification		t-statistic	Order of integration	p-value
LEAB	Trend intercept	and	-2.687	I(0)	0.2487
	Trend intercept	and	-3.212**	I(1)	0.0000
GDPPC	Trend intercept	and	-0.283	I(0)	0.3831
	Trend intercept	and	-3.245**	I(1)	0.0000
HE	Trend intercept	and	-1.652	I(0)	0.8963
	Trend intercept	and	-3.472**	I(1)	0.0006
TI	Trend intercept	and	-1.782	I(0)	0.5262
	Trend intercept	and	-4.426**	I(1)	0.0001
TEL	Trend intercept	and	-2.330**	I(1)	0.0000

Notes: **5% significance level. Source: Author's own drawing. Results obtained from EViews 10.

Table 4

variables	Model specification		t-statistic	Order of integration	p-value
LEAB	Trend intercept	and	-1.356	I(0)	0.3663
	Trend intercept	and	-7.076**	I(1)	0.0000
GDPPC	Trend intercept	and	-0.062	I(0)	0.3039
	Trend intercept	and	-3.137**	I(1)	0.0000
HE	Trend intercept	and	-0.654	I(0)	0.8900
	Trend intercept	and	-4.341**	I(1)	0.0006
TI	Trend intercept	and	-0.414	I(0)	0.9999
	Trend intercept	and	-0.831**	I(1)	0.0002
TEL	Trend intercept	and	-0.299**	I(1)	0.0236

Notes: **5% significance level. Source: Author's own drawing. Results obtained from EViews 10.

ARDL Bounds Test for Co-Integration

The ARDL bounds test procedure was employed in the research paper, with the results showing that the F-statistic of 18.25367 exceeded the critical limits for both upper and lower bounds of I(1) and I(0). As a result, the null hypothesis of no cointegration was rejected, indicating the presence of a longterm connection among the variables under study.

Table 5

T statistic	Value	K
F Statistic	18.2536	4
Critical	value	bounds
(Actual sample size = 17)		
Significance	I(0)	I(1)

10%	2.45	3.52
5%	2.86	4.01

Source: Author's own drawing. Results obtained from EViews 10.

Long-Run Elasticities
Results for long run elasticities are presented in table 6

Table 6

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LEAB(-1)*	-0.313141	0.059445	-5.267722	0.0001***
GDPPC	0.000138	0.000127	1.083164	0.2930
D(HE)	-4.00E-05	1.33E-05	-3.012157	0.0075***
TI	-0.001110	0.000542	-2.048171	0.0554**
D(TEL)	-0.359659	0.276740	-1.299629	0.2101

Notes: ***1%, **5% significance level. Source: Author's own drawing. Results obtained from EViews.

The study suggests a negative relationship between life expectancy and the life expectancy of the past period, with an increase in life expectancy associated with a -0.31 decrease in the life expectancy of the past period. The probability value of 0.0001 is significant at the 1% level.

The findings also indicate a positive correlation between gross domestic product per capita and life expectancy, with a unit increase in gross domestic product resulting in an increase of 0.0001 units in life expectancy. With a probability of 0.29630 the variable is insignificant.

There exists a negative correlation between health expenditure and life expectancy, with an increase health expenditure resulting to a decrease in life expectancy by -0.00004 units. The variable is expressed in scientific notation (-4.00E-05) as it has many decimals. The probability value of 0.0075 is significant at 1% level.

The findings of the study suggest a negative correlation between technological innovation and life expectancy, with a unit increase in technological innovation leading to a decrease of -0.001 units in life expectancy. The probability value of 0.0554 is significant at 5% level.

A negative correlation exists between telecommunications and life expectancy. A unit increase in telecommunications will cause a decrease in life expectancy by -0.35 units. The probability value of 0.2101 is insignificant.

Short-Run Elasticities and Error Correction Model
Table 7 shows findings of the short run elasticities and the model's error correction properties (ECM)

Table 7

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDPPC	0.000441	0.000391	1.128114	0.2741
HE	-6.51E-05	8.57E-06	-7.597055	0.0000***
TI	-0.003544	0.001508	-2.349746	0.0304**
TEL	-3.680099	1.301268	-2.828086	0.0111**
ECM CointEq(-1)***	-0.313141	0.029649	-10.56173	0.0000***

Notes: ***1%, **5% significance level. Source: Author's own drawing. Results obtained from EViews.

There exists a positive correlation between gross domestic product per capita and life expectancy, with an increase in gross domestic product leading to a 0.0004 increase in life expectancy. The probability value of 0.2741 is insignificant. Considering the t-statistic (1.128114) which is greater than the critical value of 2 makes the variable is insignificant.

An increase in health expenditure by a unit result in an increase in life expectancy by 0.0000651 (expressed as a scientific notation of -6.51E-05). The t-statistic is (7.597055) is greater than the critical value of 2 and the probability is 0.0000 showing that the outcomes are statistically significant at 1% level.

Technological innovation leads to a decrease in life expectancy by -0.003544. considering the t-statistic (2.349746) which is above the critical value of 2 and the probability value of 0.0304 makes the outcomes significant at 5% level.

The results reveal that a unit increase in telecommunications leads to a decrease in life expectancy by -3.680099. with the t-statistic being (2.828086) and the probability being 0.0111, the outcomes is statistically significant at 5% level.

The error correction term is determined to be -0.313141 with a probability of 0.0000. According to statistical findings, the ECM is significant, suggesting that there is cointegration. Furthermore, the negative error term means that there is a need for correction. The error correction coefficient signifies that the series will quickly return to equilibrium because the speed of adjustment is 31%, which is closer to one than zero.

The Granger Causality Test
Granger causality test results are displayed bellow in table 8

Table 8

Null Hypothesis	Obs	F-statistic	Prob.
GDPPC does not Granger Cause LEAB	24	0.27572	0.7620
LEAB does not Granger Cause GDPPC		5.70870	0.0114**
HE does not Granger Cause LEAB	27	1.48900	0.2475
LEAB does not Granger Cause HE		0.14769	0.8635
TI does not Granger Cause LEAB	26	0.48092	0.6249
LEAB does not Granger Cause TI		0.39180	0.6807
TEL does not Granger Cause LEAB	27	15.0577	8.E-05***

LEAB does not Granger Cause TEL		2.16027	0.1391

Notes: ***1%, **5%, *10% significance level. Source: Author's own drawing. Results obtained from EViews.

Results indicate that GDPPC does not granger cause LEAB, with a probability of 0.76 which exceeds the threshold of 0.05, resulting in the null hypothesis not being dismissed. Similarly, LEAB does not granger cause GDPPC, the probability is 0.0114, which results in the null hypothesis being dismissed.

The findings reveal that HE does not granger cause LEAB, with a probability of 0.24 which exceeds the threshold of 0.05, resulting in the null hypothesis not being dismissed. Similarly, LEAB does not granger cause HE, the probability is 0.8635, which results in the null hypothesis not being dismissed.

The findings reveal that TI does not granger cause LEAB, with a probability of 0.62 which exceeds the threshold of 0.05, resulting in the null hypothesis not being dismissed. Similarly, LEAB does not granger cause TI, the probability is 0.6807, which results in the null hypothesis not being dismissed.

Results indicate that TEL does not granger cause LEAB, with a probability of 8.E-05 (0.00008) which does not exceed the threshold of 0.05, resulting in the null hypothesis being dismissed. Similarly, LEAB does not granger cause TEL, the probability is 0.1391, which results in the null hypothesis being dismissed.

Diagnostic Tests 4.10. Normality test

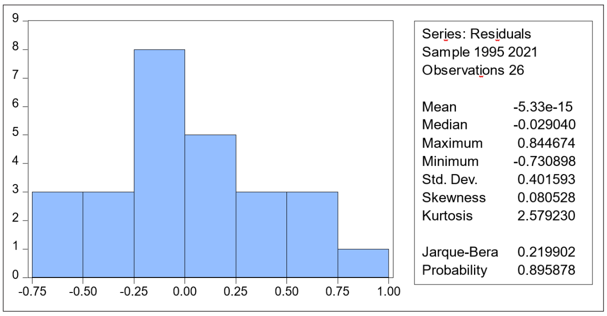

Figure 1: Jarque-Bera test

The outcomes indicate that the probability of the results is above the five percent significance level, suggesting that they are statistically insignificant. Consequently, we fail to reject that the null hypothesis that the residuals are in compliance with the normal distribution.

Serial Correlation

Table 9: displays the outcomes of the Breusch-Godfrey test

F Statistic	1.100988	Prob. F	0.4036
Obs*R Squared	7.794785	Prob.Chi-	0.3510

Source: Author's own drawing. Results obtained from EViews

The results conclude that the probability of 0.40, which is above the 5% significance level, is statistically insignificant. Consequently, the null hypothesis that presumes an absence of serial correlation within residuals is not rejected.

Table 10: ARCH Test for Heteroscedasticity

F-statistic	1.585136	Prob. F	0.2212
Obs*R-squared	1.613018	Prob.Chi-Square	0.2041

Source: Author's own drawing. Results obtained from EViews

The outcomes are statistically insignificant because the probability chi-squared is more than the 5% significance level. We accept the null hypothesis of no heteroscedasticity in residuals.

Parameter Stability Tests

Cusum Test

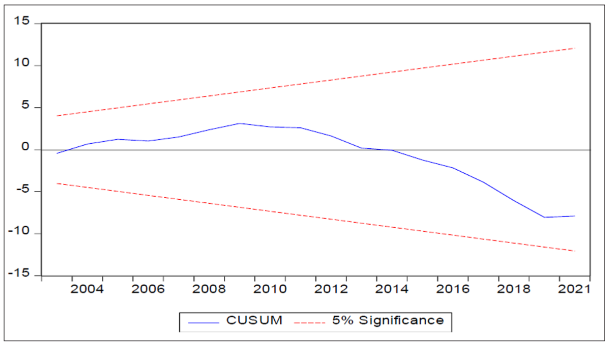

Figure 2: The blue line in the graph denotes the value of CUSUM, which is set against the 5% level of significance shown by the red lines. This indicates that there are no anomalies or inconsistencies in the coefficients, ultimately suggesting that the series or model examined is stable and consistent.

Cusum of Squares Test

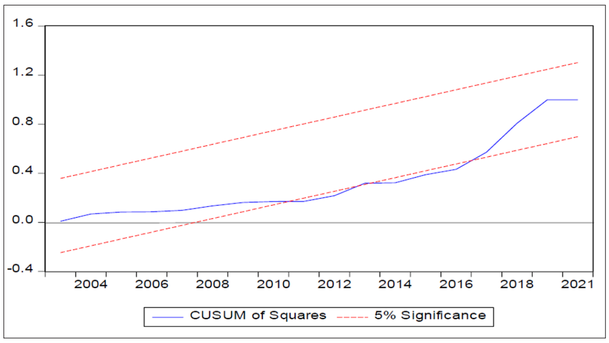

Figure 3: The CUSUMQ, indicated by the blue line in the graph, has values that fall within the red lines and has a slight overlap and eventually returns back to normal representing the 5% significance level. This shows that the coefficients have no instability or irregularity. In conclusion, the model being assessed is deemed stable based on this test.

Conclusion

The main purpose of this study was to examine the impact of economic growth on life expectancy in South Africa. According to the findings from the ARDL bounds test all the variables have an impact on life expectancy except for GDP per capita, however the granger causality test proves that life expectancy causes GDP per capita. All were discovered to impact life expectancy except GDP per capita in South Africa over the long term, which contradicts the null hypothesis of no significant impact. Hence, we can conclude that there is a significant correlation between economic growth and life expectancy in South Africa.

Policy Implications and Recommendations

This study underscores the significant influence of economic growth on boosting life expectancy in South Africa, emphasising the urgent need for comprehensive and transformative healthcare policies to address the nation's health challenges. Drawing from the study's findings increased health expenditures, technological innovations and telecommunications could propel the country towards a healthier economy.

Improve The Efficiency and Targeting of Healthcare Expenditure

Since health spending is negatively correlated with life expectancy, this may mean that there are inefficiencies or misallocation of resources therefore implementing strict monitoring and evaluation systems to track health outcomes related to spending could boost and correct misallocations in healthcare spending. Additionally, funds must be redirected from administrative overheads to frontline services especially in rural areas communities. Lastly healthcare spending must be focused on preventive care and community health services rather than just treatment.

Aligning Technological Innovation with Public Health Needs

Since there is a negative correlation between technological innovation and life expectancy this suggests that innovation is not being applied effectively in health systems therefore there should be direct innovation efforts towards accessible and inclusive health technologies such as low-cost diagnostics and rural telemedicine. There must be increased investments in training health professionals to adopt and implement tech tools meaningfully. Lastly government should increase the support innovation hubs that work on solving real challenges related to healthcare especially for vulnerable populations.

Using Telecommunications Strategically for Healthcare Outreach

The negative correlation between telecommunications and life expectancy may be due to unequal access or underuse in healthcare services. Therefore, government must promote digital literacy and affordable access to telecom services across all income groups. Additionally, there must national strategies developed to use telecoms health education, public health campaigns and appointment scheduling even in public hospitals. Lastly there must be increased regulation in telecom pricing to ensure broad participation in digital healthcare programs.

Areas for Further Research

In this study, a linear autoregressive distributed lag model was utilized. However, recent research suggests that the relationship between life expectancy and its determinants may not be linear. Hence, the researcher suggests that future studies should also explore the non- linear and asymmetric relationship between the variables by employing the nonlinear autoregressive distributed lag (NARDL) model.

Limitations of the Study

The study's aim is constrained by some features, such as the examination period chosen, which only considers data from 1994 to 2022. Potentially relevant events outside this period may have occurred that could have affected the study outcome. Furthermore, other variables could have been utilized instead of life expectancy at birth to measure life expectancy, but this study adopts this approach. South Africa is the primary focus of this research because previous studies have predominantly concentrated on Asian and European economies.

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