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**Article**

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## GENERAL & APPLIED ECONOMICS | RESEARCH ARTICLE

# Public health expenditure and economic development: The case of South Africa between 1996 and 2016

Emeka A Ndaguba<sup>1\*</sup> and Anathi Hlotywa<sup>2</sup>

**Abstract:** A nation's financial commitment to health investment and expenditure has a corresponding effect on its economic growth and development. Understanding the interplay and underlying connection between health expenditure and national development is critical in forecasting the wellbeing of a nation, vis-à-vis health preparedness. In this paper, we explore the impact of public healthcare expenditure on economic development in South Africa between 1996 and 2016. The autoregressive distributed lag model, error-correction model and a time series panel were adopted in analysing this effect. Empirical findings demonstrate a positive relationship between PHE and HDI in South Africa. Further, health investment may increase the income of health workers and provide for better working conditions and facilities to save lives. In addition, the relationship between CPI and economic development is insignificant, however CPI mediates PG.

**Subjects:** Public Health- Medical Sociology; Development Studies; Development Policy; Economics; Business, Management and Accounting; Public Health Policy and Practice; Specialist Community Public Health Nursing

**Keywords:** Public health expenditure; economic development; gross domestic product and human development index

### ABOUT THE AUTHOR

Ndaguba is a researcher at the University of the Free State with interest in urban economics, sharing and gig economy, disruptive innovation, public health and development, public policy and administration Hlotywa is an economist formerly with the University of Fort Hare. Her interest is in public health, health governance, public debt and expenditure, economic development and transport economics.

### PUBLIC INTEREST STATEMENT

Government budget on public health investment and expenditure reflects its commitment to economic prosperity, social wellbeing and national integration and sustainability. Globally, there are two main goals why public health investment is critical. The first deals with enhancing the general wellbeing of its people and the second is to achieve economic growth, promote inclusiveness in development and engender sustainability in managing public finance. One of the ways to achieve this dual mission by the state is to increase public health investment, since investment in public health increases the chance of citizens wellbeing, economic growth and human capital development. Implicit in this discourse, a rise in health expenditure and investment may not necessarily lead to economic development, however it will improve life expectancy and create an atmosphere for flourishing in a nation. In that, an increase in public health investment leads to an improvement in the nation's human development index.

## 1. Introduction

Health can be a significant indicator in assessing standards of living, gauging the success or failure of a nation's national development plan and economic development (Ercelik, 2018; Rajeshkumar, 2014; Cole & Neumayer, 2006). The wellbeing of a country's population is devoid of the level of its economic and social growth models. Cole & Neumayer, (2006) argues that health is not just significant for development but is also critical for human capital development. World Health Organisation (WHO) (2019) statistical information posits a relationship between health expenditure and a country's level of development, where labour productivity is dependent on the both the health of the population and its level of education.

Government plays a significant role in health expenditure within a country, where human capital becomes accumulated. Human capital accumulation is imperative for endogenous growth, which is essential in raising capital accumulation for healthcare expenditure in a country (Gizem, 2018). Accordingly, stakeholder and governmental efficiency in healthcare expenditure is pivotal in providing quality health services in South Africa.

The South African government has implemented the National Health Insurance (NHI) scheme, which seeks to provide better access to health services that are of high quality to all citizens regardless of employment status (Parliamentary Monitoring Group, 2017). However, the functionality is dependent on government funding. The distribution and administration of healthcare funds are essential to ensure that impact corresponds with investment (Sorenson et al., 2008). If this is not the case, funds may be haphazardly disbursed leading to a more significant portion for urban areas rather than for rural healthcare.

Consequently, there are two main goals for health investment in a nation. The first ensures that people's general wellbeing is progressive, whilst the second focuses on economic growth that promotes inclusiveness in development and promotes sustainability in public financial management. Expenditure within health has been established as an avenue for development Rajeshkumar (2014) asserts that health and economic gauges at a country-specific level, by implication, countries with a high standard of living and a high life expectancy have higher income per capita invest more in the public health.

This features as crucial in the case of South Africa, given that Government Health Expenditure (GHE) as a percentage of total public health expenditure (PHE) increased from 39.9% in 2006 to 48.4% in 2013. It is worth noting that by 2015 this figure stood at US\$23 billion, representing about 8.6% of GDP (Department of Health, 2016) despite increases in health expenditure. Riley (2016) has established that South Africa appears to struggle to raise annual growth rates towards the 5% or 6% mark, which is the standardised stipulation as described by MDGs in addressing chronic problems of a high structural unemployment in the economy (Ndaguba & Hanyane, 2018; Ndaguba & Ijeoma, 2019; Ndaguba et al., 2016). The argument that higher unemployment rates corresponds with lacklustre healthcare performance suggests a severe challenge to the South Africa Government. With unemployment above 24%, the disparity in joblessness ratio between whites and non-whites is symptomatic of the health preference and healthcarelessness or decay of health sectors in rural South Africa.

Given the level at which the South African government supports public health care expenditure and the situation within the country, whilst its approach demonstrates urgency, it also shows that the nation lacks solutions for addressing this wicked problem. According to Elmi and Sadeghi (2012), healthcare is at the core of human capital development. Further, human capital development is at the centre of a nation or organisation's success or failure, putting the wellbeing of the individual at the centre of development. Thus, there is a vertical relationship between public healthcare investment and human development, and by extension, human capital development. Governments at all levels' should embrace modalities that advance liveability in urban and rural areas across a country. According to Murthy and

Okunade (2009), healthcare spending can be credited for an increase in life expectancy and the reduction of morbidity and infant mortality rates. Moreover, poverty, lack of access to medical care, lack of health insurance coverage, rising costs, and an outdated reimbursement system have all led to a crisis in healthcare and economic development in South Africa, particularly related to public health challenges like the burden of AIDS and TB (Ndaguba and Ijeoma, 2019). There has been a decline of human capital investment at the local and national level despite population growth (Jobson, 2015).

This paper contributes to literature on the impact of public healthcare expenditure on economic development globally, by specifically investigating the case of South Africa within the timeframe of 1996–2016. By analysing its relationship to population growth and partly unemployment, the paper assists in filling gaps by demonstrating that public healthcare expenditure in South Africa does not have a causal effect with economic development, and more importantly, while there is a positive relationship between PHE and HDI, it demonstrates that unemployment has a negative correlation with economic development. However, there is also a positive relationship between population growth and economic growth, where the study will show a statistically insignificant relationship between CPI and economic development.

In this paper, we explore the relationship between healthcare expenditure and economic development in South Africa. The paper begins by reviewing specific literature crucial for understanding the complexity and relationship between these phenomena. Following this, the paper applies empirical model specification, using estimation techniques such as VECM, VARS, OLS, and ADRL and Phillips-Perron (PP); however, the literature review section takes precedent.

### **1.1. Literature review**

The literature review in this paper provides an argument from various perspectives towards establishing a relationship between healthcare expenditure and economic development in South Africa

According to P. Wang (2015), an increase in healthcare expenditure has a corresponding effect on economic growth. Wang used panel regression to statistically estimate the extent of the relationship between healthcare expenditure as the dependent variable, and economic growth as the independent variable. The results demonstrated a linear relationship between health expenditure and economics. However, for countries with low levels of growth, an increase in health expenditure may not translate into economic growth. Mehrara et al. (2015) have explored the long-run association between economic growth and public health expenditure in countries in North Africa and the Middle East between 1995 to 2005. Their results demonstrated that public health expenditure possessed a negative relationship with GDP, where as levels of public health investment are lowered, GDP increases. What may account for the differences between P. Wang (2015) and Mehrara et al. (2015) studies is the value each nation places on healthcare as well as how culture and religion can play a pivotal role in findings.

Kurt (2015) has statistically tested the direct and indirect effects of health expenditure on economic growth, utilising the Feder-Ram model to aggregate outcomes in manufacturing industries. The study applied certain variables, such as total output, total government health expenditure, general government care and pharmaceutical product health expenditure, as well as general government medicine and health expenditures in Turkey between 2006 and 2013. The study employed times series data, where seasonality was adjusted using an entire month of data. The results established how government health expenditures had a directly positive and significant impact on economic growth in Turkey, where the indirect effect is negative but also significant.

Boussalem et al. (Wang, 2009) have demonstrated the influence of health expenditure on development. Their study identified a significant relationship between health expenditure and growth. In another study, Rajeshkumar (2014) concurred that the influence of health expenditure on economic

development is significant in India. The concept of development is multidimensional because of its scope, such as social development, community development, economic development, political development and sustainable development. However, neither of these development perspective can be reached except where the model of healthcare investment and expenditure is consistently on the rise.

In a separate study, R.E. Mayer (2014) has assessed the impact of health expenditure on development in Latin American countries, observing a strong relationship between health expenditure and development. Gyimah-Brempong and Wilson (Gyimah & Wilson, 2015) conducted a similar study in Africa, examining the influence of health expenditure on development utilising the Solow growth model. Their generated results demonstrate that when per capita income is increased, human health capital increases as well. Ogungbenle et al. (2013) have argued that in Nigeria there is a corresponding relationship between the influence of health expenditure and economic and sustainable development in the country. In parallel with research by Odior (2011), these studies demonstrate a bidirectional relationship between public healthcare and economic growth, where the latter influences healthcare investment. This is contrasted to Wang (2015) and Summat (2013), whose research establishes limited relationship between healthcare expenditure, public investment and economic growth. Further, Summat (2013) analysed the relationship between health and economic growth in Malta, using the Granger causality test to determine the presence and direction of causality. The study proposes a model using four variables to exploit the possibilities of causality from 2000 to 2012. Economic growth was captured in the study by using seasonally adjusted and not seasonally adjusted GDP. Findings from the study established no causality and that economic growth and health expenditure are independent. Implicitly, the study suggest that a rise in health expenditure and investment does not trigger economic development (Summat, 2013).

On a separate study, Bedir (2016) utilised panel data from the World Development Indicators Database (2016), the author utilised the ordinary least square (OLS), fully modified ordinary least square (FMOLS) and dynamic ordinary least square (DOLS) as an econometric technique for analysing the relationship between phenomenons. The results of this study showed that health expenditure has a positive and significant effect on economic growth in both samples. The study used a modified version of the Granger (1969) causality test, proposed by Toda and Yamamoto (1995) and Dolado and Lütkepohl (1996), in markets in Europe and emerging markets in the Middle-East, Africa and Asian countries from 1995 to 2013, to assess the relationship between health expenditure and economic development. Analysis of the results establish that a bidirectional causality exists between the Czech Republic and the Russian Federation in Europe. Evidence from Egypt, Hungary, Korean Republic, South Africa, and the Philippines argue for the health view over the income view.

Contrastingly cases relating to Greece, Poland, United Arab Emirates, China, Indonesia, and the South Korea preface the income view over the health view. The empirical results indicate that income is an essential factor in explaining differences in healthcare expenditures amongst these countries. It is important to note here that income in their study mediated between health expenditure and economic growth. Abedir (2016) identified that a bidirectional relationship provided leverage for income, in that, economic growth suggests an increase in per capita in India, Nigeria and Africa to a large extent (B.K. Gyimah & Wilson, 2015; Odior, 2011; Ogungbenle et al., 2013; Rajeshkumar, 2014)

In South Africa (SA), some research papers have assessed the effect of healthcare expenditure on economic development. For instance, Paruk (2014) has argued that the 2% allocated for national health budget is far below its development trajectory. This may account for the more profound level of healthcare decay in rural areas. The results in the study demonstrate that the total SA health investment from the aggregated public, private and foreign sectors had increased steadily in real terms during recent years as judged by several metrics, but they appear to be short-term in focus.

Bidzha, Greyling, and Mahabir (2017) have argued from a different perspective, based on the effectiveness of public health expenditure in improving health outcomes in SA. Their study used panel estimation techniques across nine provinces in SA from 2005 to 2014. Their study observed that on an average, an increase in public health expenditure per capita led to improvement of under-five mortality rate and life expectancy at birth. However, public health expenditure was found to be not significant statistically to economic development. Control variables such as real GDP per capita, female literacy rate, immunisation coverage ratio, access to formal housing and HIV/Aids prevalence were established as important determinants of health outcomes in the country. The results of this study do not contradict existing literature on the relationship between healthcare investment and economic growth. However, they demonstrate that when other indicators regarding gender and maternity are brought into the discussion, life expectancy, a reduction in under-five mortality and female literacy, among others appears to be more significant. Further, Bidzha (2015) has assessed the effectiveness of South Africa's health programmes and applied evidence-based policy design and implementation. Results from the study show that on the average, an increase in public health expenditure per capita leads to improvement in health outcomes, particularly infant mortality rates and life expectancy at birth. The estimated gains are most significant with regard to the infant mortality rate, which has an elasticity of  $-0.368$ , whereas life expectancy at birth with an is smaller with an elasticity of  $0.059$ . These findings support the claim that public health expenditure improves health outcomes. HIV/Aids prevalence and female literacy rate were also estimated to be important determinants of health outcomes in South Africa.

### 1.2. Methodology and presentation results

According to Minoiu and Reddy (2009), two methodological approaches can primarily be used by researchers, qualitative and quantitative research methods. While qualitative methods are text-based, quantitative is statistically driven. This paper is focused on determinants of household debt in South Africa, where quantitative techniques were used to generate data for the analysis (Gizem, 2018).

#### Empirical model specification

The model specification of this study was modified from the model adopted by Li, Wu and Wu (2017), who adopt a constant elasticity of substitution production function. This study modifies Li et al. 's (2017) model by developing the model of the research presented in Equation (1) as:

$$\text{HDI} = f(\text{PHE}, \text{INF}, \text{UNMP}, \text{POPG}) \dots \dots \dots (1)$$

$$\text{HDI} = \beta_0 + \beta_1\text{PHE} + \beta_2 \text{INF} + \beta_3\text{UNMP} + \text{PG} + \epsilon \dots \dots \dots (2)$$

Where HDI is economic development measured by the Human Development Index, PHE is public health expenditure, INF is inflation, POPG is population growth, and UNMP is unemployment.

$\beta_0$  is constant.

$\beta_1, \beta_2, \beta_3$  and  $\beta_4$  are the coefficients of the predictors to be estimated.

The  $\epsilon$  represents the disturbance term.

#### Definition of variables and prior expectations

##### HDI- Human Development Index

The Human Development Index (HDI) gives a picture of the average achievement in the key performance dimensions of human development and economic and social welfare, such as life



expectancy, literacy rate, per capita income, gini coefficient and the standard of living. An increase in the investment on healthcare has a multiplier effect on the dimensions stated above.

#### **PHE**—Public Health Expenditure

This study expected to identify a positive relationship between public health expenditure and economic development. This variable was used as the primary independent variable. Rajeshkumar (2014) also used this variable.

#### **INF**—Inflation.

CPI—CPI is the consumer price index, which is the widely used measure of inflation in South Africa. CPI captures the price of a specific basket of goods and services, where these products can be used to observe the changes in inflation.

#### **UNMP**—Unemployment

Research has demonstrated that unemployment is a symptom of low economic development. When unemployment occurs, these people have either little or no income, which contributes to economic development negatively. As a result, a negative relationship can be expected. This variable was used in this study because literature exist demonstrating a negative relationship between unemployment and economic development. This is because where people are unemployed, their economic purchasing power is at its lowest and the dependency factor is on the rise.

#### **PG**—Population Growth

PG refers to the increases or decreases experienced within a given population over time. PG is measured in percentage form within this study.

## **2. Estimation techniques**

Several estimation techniques, such as VECM, VARS, OLS, and ADRL, have been employed within varied studies to analyse the determinants of household debts in different countries. This study has opted for an ARDL model because this technique is suitable for both small and finite sample sizes. According to Pesaran et al. (2001), the ARDL model was introduced to incorporate I(0) and I(1) variables in the same estimation, where if all variables are stationary I(0) then OLS is appropriate. If all variables are non-stationary I(1) then it is advisable to implement VECM (Johansen Approach). The ARDL technique has the advantage of not requiring specific identification of the order of the underlying data. Accordingly, in this study ARDL was employed. The study also used some diagnostic tests to determine the correctness of the model. Variance decomposition and impulse response were also used to complement the ARDL. Once the preconditions required for the implementation of ARDL were satisfied, it was possible to proceed with the ARDL model to determine whether or not a long-term relationship exists amongst the selected variables.

Moreover, regression models of this type have been used for decades, but in more recent times they have been shown to provide a very valuable vehicle for testing for the presence of long-run relationships between economic time-series (Johnston, 1984). The model is autoregressive, in the sense that  $y_t$  is explained (in part) by lagged values of itself. The model also has a distributed lag component, in the form of successive lags of the  $x$  explanatory variable. Sometimes, the current value of  $x_t$  itself is excluded from the distributed lag part of the model's structure. Given the presence of lagged values of the dependent variable as regressors, OLS estimation of an ARDL model can yield biased coefficient estimates. If the disturbance term  $\epsilon_t$  is autocorrelated, the OLS



is rendered an inconsistent estimator, where in this case the Instrumental Variables estimation has been generally used in applications of this model (Gujarati, 2004).

In addition to ARDL, the study utilised the diagnostic tests to calculate the correctness of the model. Variance decomposition and impulse response were also used to complement the ARDL. Once the required preconditions for the implementation of ARDL were satisfied, it was possible to proceed with the ARDL model to determine whether or not a long-term relationship exists amongst the selected variables. Accordingly, an appropriate number of lags was chosen for the model. A unique feature of ARDL is that it allows testing for the existence of a long-term relationship between integrated parameters using the bound test developed by Pesaran et al. (2001). As argued by Jayaraman, Choong, and Kumar (2011), given the limited availability of observations, the bound test is one of the methods used in determining long-run cointegration. Pesaran et al. (2001) argues that the upper and lower critical values are bounds of 1%, 2.5%, 5%, and 10%, constitute the levels of significance. The study used 5% as its respective benchmark throughout its empirical analysis. The upper bound critical values were considered to be of I (1) order while lower bounds critical values to be of I (0).

If the computed F-statistics are greater than 57 or  $< I(1)$  value, long-run cointegration amongst variables exists. However, if the F-statistics are smaller than  $I(0)$ , the model demonstrates a lack of long-run cointegration amongst variables. Likewise, if the F-statistics lie between  $I(0)$  and  $I(1)$ , the results are deemed inconclusive. Accordingly, “if the calculated F-statistics exceed the upper bound, the null hypothesis of no cointegration among the variables can be rejected. If the calculated F-statistics fall below the lower bound, the null hypothesis of no long-run relation cannot be rejected” (Kyophilavong et al., 2017:9).

If the bound test confirms the existence of a cointegrating relationship between variables, it is possible to calculate the Error Correction Term (ECT) and ultimately derive long-run results. The ECT is defined as the speed of adjustment at which the divergence in the short-run, results in shock or converges back to the long-run equilibrium. In order for the error correction term to have meaning and represent convergence to the long-run trend following shocks, the results are required to be I) significant, II) have a negative sign, and III) be less than 1. A statistically insignificant value, meaning a p-value greater than the significance level (5% in our case), denotes that there is a substantial likelihood that the obtained results are a result of chance or other factors not concerning the programmed model. The negative sign points to the stationarity of the system. Furthermore, the results are required to be less than one, where the variables are interpreted in percentage form. A value greater than one would otherwise mean a speed of adjustment of over 100%, which would be statistically unrealistic. Once the error correction term and the short-run dynamic of the model are determined, the next step is to observe long-term correlations.

#### Diagnostic tests

Gujarati (2004:516) argued that diagnostic testing is of great importance in estimating a model, which acts as guidance in indicating if the model is of a good fit. The Durbin-Watson d statistic should be statically significant by having an acceptable value (around 2); moreover, estimated coefficients should have the right sign in a model to be considered as a good fit. Most importantly, estimated coefficients should be statistically significant based on the t test, the F tests and the R-Squared value. Diagnostic checks are essential in a model because of its high importance to incorporate diagnostic testing in analysing an estimated regression. The reasons for this are that diagnostic checks assist in identifying problems in residuals from an estimated model; such problem dedicated is an indication of a non-efficient model. Problem indicated in residuals leads to biased parameter estimates. Tests that were conducted in this study included the serial correlation LM test, misspecification, heteroskedasticity tests, the Histogram and Normality test, and the Ramsey test.

## Heteroskedasticity

Heteroskedasticity refers to a process in which the variance/covariance of the errors is continuously changing over time. Studenmund (1992) saw heteroskedasticity as a violation of the classical linear regression model (CLRM) assumption, which states that the observations of the error terms are drawn from a distribution that has a constant variance over time. Heteroskedasticity takes several different forms, and econometricians use different tests for heteroskedasticity like the Goldfeld–Quandt test, the Breusch–Pagan test and the White test. In this study, the widely used White test (1980) was implemented. The White test, being rated the best test, does not have several assumptions on any form of heteroskedasticity but only assumes that the estimated regression model is standard linear. Heteroscedasticity has the following problems:

- „While heteroscedasticity does not cause bias in the coefficient estimates, it does make them less precise. Lower precision increases the likelihood that the coefficient estimates are further from the correct population value.
- Heteroscedasticity tends to produce p-values that are smaller than they should be. This effect occurs because heteroscedasticity increases the variance of the coefficient estimates, but the OLS procedure does not detect this increase. Consequently, OLS calculates the t-values and F-values using an underestimated amount of variance. This problem can lead the researcher to conclude that a model term is statistically significant when it is not significant „ (Frost, 2020).

## Normality test

Although there are many normality tests, the Jarque-Bera (JB) test is one of the commonly used tests for normality. The JB normality test statistic is a test for large samples and is based on ordinary least squares (OLS) residuals in determining whether the system is usually distributed or not. The test measures the skewness and kurtosis of a series and determines whether they match into a normal distribution. In large samples, the JB test statistic is formulated under a null hypothesis which states that there is normal distribution; skewness and excess kurtosis are zero.

## Autocorrelation—LM tests

Gujarati (2004) defined autocorrelation as a correlation between variables over a while. Autocorrelation more often occurs in time-series studies due to the orderliness required. The Lagrange Multiplier (LM) tests for parameter consistency against the alternative hypothesis that a parameter follows a random walk. In this study, the Lagrange multiplier comprised multivariate test statistics for residual serial correlation up until the specified lag order. In a VAR model, the value of  $R^2$  is used and considered to be important when having a higher order of autocorrelation. If one or more coefficients in an equation are statistically significant, then the value of  $R^2$  for that equation will be relatively significant, while if none of the variables is significant,  $R^2$  will be relatively low.

## 2.1. Result and discussion

### Stationarity

The Phillips-Perron (PP) was used to ascertain the order of integration that was appropriate for the ARDL modelling technique. The use of more than one unit root test is to ensure the robustness of the results. Table 1 below reports the results of the PP in levels and first difference.

In applying the Phillips-Perron (PP) test in table 5.2, the CPI, UN, PHE, HDI were found to be stationary after first-differencing, and only the PP is found to be stable at levels.

**Table 1. Stationary results of the Phillip-Perron Test**

Variable		Phillips Perron Test			
		Intercept Levels 1 <sup>st</sup> diff		Trend and intercept Levels 1 <sup>st</sup> diff	
CPI		-1.940273	-5.742329	-2.048733	-5.714630
HDI		-1.678496	-6.775313	-2.116841	-6.771519
PHE		-0.991629	-3.857900	-2.395972	-3.854541
PP		-1.561288	17.10786	-4.124989	-
UN		0.89356	6.4563	1.02456	4.52369
Critical Values	1%	-3.544063		-4.118444	
	5%	-3.910860		-3.486509	

**Bounds test approach to cointegration**

The study employed the ARDL bounds test to test whether there is a long-run relationship among variables. In the ARDL bounds testing approach, if the calculated F-statistic exceeds the upper critical bound (UCB), the series is considered to be cointegrated. If it is below the lower critical bound (LCB), the series is not considered to be cointegrated (Shahbaz & Islam, 2011).

Test statistic value (4.048877) is higher than the I1 bound tabulated values, hence the null hypothesis of no long-run relationship is rejected.

The results from the Table 2 show that the t-statistic is higher than the I(1) bound. Hence, there is a long-run relationship between the variables. The unique link identified by the bound test leads to the estimation of a long-run equilibrium relationship between the variables.

**ARDL results (Long-run relationship)**

Though there was a presence of cointegration, it was necessary to estimate the long-run ARDL to calculate the elasticities. The long-run ARDL was assessed, and the results presented in Table 3 below.

The empirical results show that there is a positive relationship between PHE and HDI. In that, an increase in government expenditure leads to a rise in economic development in South Africa. The results are consistent with other studies such as Riayati (2016) who examined the effects of health expenditure on development in Malaysia, and P. Wang (2015) for several African countries. These

**Table 2. Bound testing**

T statistic	Value	K
F Statistic	4.048877	2
Critical value bounds		
Significance	I0 Bound	I1 Bound
10%	2.1	3.13
5%	2.43	3.54
2.5%	2.74	3.61
1%	3.12	4.54

Source: Author's computation based on Eviews 9

**Table 3. ARDL results**

Variable	Coefficient	Standard errors	t-statistic	p-value
PHE	0.1236	2.044272	2.92821	0.0380
UN	-1.4256	3.2546	-3.1256	0.0214
PP	2.7895	1.2352	1.1236	0.9872
CPI	-0.191989	0.7895	-1.4567	0.6789

Source: Author's computation based on Eviews 9

results are also in line with the apriori expectation and the Mushkin's health-led growth hypothesis. The hypothesis points out that health is a type of capital. Therefore, investment in health can increase income and lead to overall economic development. The model does also suggest that investment in health expenditure can affect economic development through human and physical capital accumulation, which is also consistent with Elmi and Sadeghi (2012) and Murthy and Okunade (2009).

The empirical results also reveal that there is a negative relationship between unemployment and economic development in South Africa. These findings are consistent with the apriori expectations and economic reasoning. When there is unemployment, income levels decrease, and this causes economic development to decrease. High unemployment levels have been causing poverty in South Africa, and this has caused a deterioration in the socio-economic conditions. Kingdon and Knight (2007) argue that some of the economic and social implications of unemployment in a nation may result in the erosion of human capital, social exclusion, protests, increased crime rates and morbidity. Unemployment is a significant contributor to widespread poverty and income inequality.

Results also showed that there is a positive relationship between population growth and economic development. However, this relationship was not significant. According to Mackenzi (2016), there is a conflict between population growth and economic development. In that, it can act both as a stimulus and as an impediment to growth and development. Mackenzie (2016) states that an increasing population means an increase in the number of the working population who can function as active participants in the process of economic growth and development. It is to be noted that labour, assisted by necessary tools and implements, was always and still is the greatest productive asset of nations. A growing population leads to an increase in total output.

Furthermore, the results demonstrate that there is a statistically insignificant relationship between CPI and economic development. CPI was seen to be having a negative relationship with economic development. The results are consistent with Carvahlo's findings. Carvahlo (2018) studied the relationship between economic development and level of inflation and found a statistically significant inverse correlation between them. The panel comprised data for 65 countries between 2001 and 2011 and revealed that inflation levels are affected by development-related factors. Results indicate that our theoretical model adequately portrayed the problems at hand, whereby expected signs were all vindicated by empirical tests, namely: the persistence of inflation, GTT, degree of openness to trade were positively related to inflation, whereas heightened levels of economic prosperity (per capita income), of the share of high-tech exports and of unemployment growth corresponded to lower inflation rates. The error correction term was determined. Results are shown in Table 4 below.

ECM regression

**Table 4. Error correction**

Variable	Coefficient	Standard errors	t-statistic	p-value
PHE	0.1370	0.0440	3.1116	0.0035
UN	0.001	0.0008	1.2718	0.2109
PP	-0.0033	0.0011	-2.8414	0.0076
CPI	-1.9202	0.3361	-057774	0.0000
CointEq (-1)	-0.623	0.11509	5.41384	0.0000

Unrestricted constant and no trend

The error correction term that was obtained from the model was  $-0.623$ . The probability of the error correction term was  $0.000$ , and this shows that it is significant. It can thus be said that the model has a  $62.3\%$  speed of adjustment to the equilibrium. This indicates that there is a better adjustment.

**2.2. Conclusion**

This paper aimed to examine the impact of public healthcare expenditure on economic development in South Africa, which was realised. We demonstrated that the wellbeing of a nation could not be separated from the nation’s development. In that, health is a significant and critical input towards achieving human capital development, which is critical for a nation. Results in this paper demonstrated that there is a positive relationship between PHE and HDI and that government expenditure and investment has a positive effect on economic development. More so, mediating variables like inflation, unemployment and economic development have a negative relationship. We argued that there is a positive relationship between population growth and economic development, but CPI has a statistically insignificant relationship with economic development; thus, inflation does not affect economic development.

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