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Article

The Impact of Communicable Diseases on the Economic Growth of the SADC Region

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Abstract

The prevalence of communicable diseases (also known as transmissible or infectious diseases) has been a significant health issue for sustainable development, hindering economic progress globally. Communicable diseases may affect economic development both directly (via the immediate effects of ill health on productive activities) and indirectly (through the effects of disease on intellectual capacity, mortality, morbidity, and fertility). This study examined the impact of communicable diseases on the economic growth of the SADC region between 2011 and 2024. The study utilised the two-step System-Generalised Method of Moments (GMM) to analyse the data. HIV prevalence and TB incidence served as proxies for communicable diseases, and GDP per capita served as a proxy for economic growth. The study took a comprehensive analytical approach by including variables such as current health expenditure and government expenditure on education as control variables. The findings reveal a significant positive correlation between HIV prevalence, TB incidence and economic growth of the SADC nations, and this is attributed to the fact that the economic growth of most SADC countries does not immediately translate to better healthcare access, as the poor often remain highly vulnerable. Current health expenditure and government expenditure on education negatively affected GDP per capita. This study therefore recommends harmonising the cross-border strategies, strengthening regional surveillance and integrating health into economic planning to ensure a productive workforce within the SADC region.

Keywords: HIV prevalence; TB incidence; economic growth; health expenditure; education expenditure

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1. Introduction

The prevalence of communicable diseases (also known as transmissible or infectious diseases) has been a significant health issue for sustainable development, hindering economic progress globally. Communicable diseases may affect the economic development both directly (via the immediate effect of ill health on productive activities) and indirectly (through the effects of ill health of the disease on intellectual capacity, mortality, morbidity, and fertility) [9]. These diseases, ranging from major killers such as tuberculosis (TB), HIV/AIDS, and malaria to lower-trait respiratory infections, represent a significant component of mortality in countries situated in the global south [21]. This is because infectious diseases not only harm human health but also endanger social and economic prosperity by increasing healthcare expenditures, leading to a high number of deaths per year, and, consequently, greater economic losses at the global scale [2].

Today, an increasingly interconnected world faces increasing threats from emerging infectious diseases, especially in developing nations, where managing the rapid spread of epidemics is a critical issue [60]. Developing nations have been characterised by a rising trend, in which socio-economic and demographic transitions impose greater constraints on managing the burden of infectious and non-infectious diseases in poor environments, often associated with underdeveloped health systems [6]. This is because the developing countries' essential sectors for sustainable development, such as

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education and health, have experienced major losses of qualified personnel to diseases such as the human immunodeficiency virus (HIV) / acquired immune deficiency syndrome (AIDS), tuberculosis (TB), and malaria, slowing down economic performance [17]. Many developing nations are at high risk of communicable diseases because they are located in low-latitude areas, where poverty increases contact between pathogens and individuals through multiple mechanisms [59]. Another critical issue regarding the prevalence of communicable diseases in the developing world is the poorly controlled use of antimicrobial drugs, which leads to the emergence of multidrug-resistant microorganisms [19].

Africa, within the developing world, has been known not only to be a home of emerging but also re-emerging infectious diseases, which have caused enormous public health burdens over the past decade within the continent. This is because African nations are often disadvantaged when it comes to coping with communicable diseases, especially when compared to the rest of the world. Economic insecurity, political instability, and mass population displacements, which have led to the collapse of numerous health systems responsible for managing these diseases, are among the factors contributing to this disadvantage [37]. Between 2001 and 2022, the World Health Organisation (WHO) African region recorded over 1,843 substantiated public events, of which 90% were infectious disease-related [58]. Similarly, infectious diseases account for over 227 million years of healthy life lost and result in an annual productivity loss of approximately $800 billion across the continent [36]. Among other infectious diseases, economic theory has predicted that HIV/AIDS decreases productivity, labour supply and the GDP of Africa by approximately 2-4% annually. Evidence also confirms that HIV/AIDS and TB have a negative impact on the continent's economic growth due to poor institutions [24]. These include healthcare systems that continue to fall behind those in other regions, such as the South African Development Community (SADC) [42].

The SADC countries have the highest number of people living with HIV/AIDS and TB among other communicable diseases, with an estimated number of 26 million people living with the disease in 2015 and a 578.8 average TB incidence per 100,000 people in 2021 [20,29]. Mining has been identified to be the key amplifier of HIV and TB within the Southern African nations [55]. Both these diseases have created a co-epidemic within the SADC, representing the highest regional burden globally. The crisis has reversed development gains, decreased life expectancy, and raised burdens on healthcare systems, with the region contributing to approximately one-third of global HIV cases and 44% of TB cases [46]. Similarly, both diseases have severely hampered economic growth in SADC nations by eroding human capital, reducing labour productivity, and raising costs for businesses and governments. They have reduced GDP growth by reducing the availability of skilled labour, increasing health expenditures, depressing investment, and slashing household income due to premature deaths within the region [13,47]. Projections for HIV and TB within the region show a sustained, increased burden crisis, with HIV exceeding 20% in many areas and TB/HIV co-infection driving mortality, threatening socio-economic growth. Despite increasing treatment coverage, the region remains a worldwide epicentre for both diseases, requiring intensified, targeted, and integrated cross-border health interventions [22,46,50].

Moreover, there has been a sustained increase in the prevalence of HIV and TB over the past 13 years (2011-2024) within the SADC region despite the modest increase in current health expenditure, as shown in Figure 1. It is also evident in Figure 1, which shows the correlation between current health expenditure, HIV prevalence, and TB incidence trends, that HIV prevalence and TB incidence are positively correlated: increases in one are associated with increases in the other. This is because HIV severely weakens the immune system by destroying the CD4 T-cells needed to combat TB bacteria. Individuals with HIV are therefore 16-20 times more likely to develop active TB disease, creating an enormous surge in infections where HIV prevalence is high [11]. This syndemic is driven by increased regional prevalence, overcrowding, poverty, and weak health systems, where TB acts as a leading cause of death among people living with HIV [18]. Another reason for this positive correlation between the prevalence of HIV and TB is that TB is an opportunistic infection (OI). OIs are infections that are more severe in individuals with weakened immune systems than in individuals with healthy immune systems, raising the risk of TB in individuals with HIV. Furthermore, among

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individuals with HIV/TB coinfection, the latent TB is more likely to advance to TB disease than in individuals without HIV. This is why TB disease is among the numerous life-threatening infections known as AIDS-defining conditions in individuals with HIV [25].

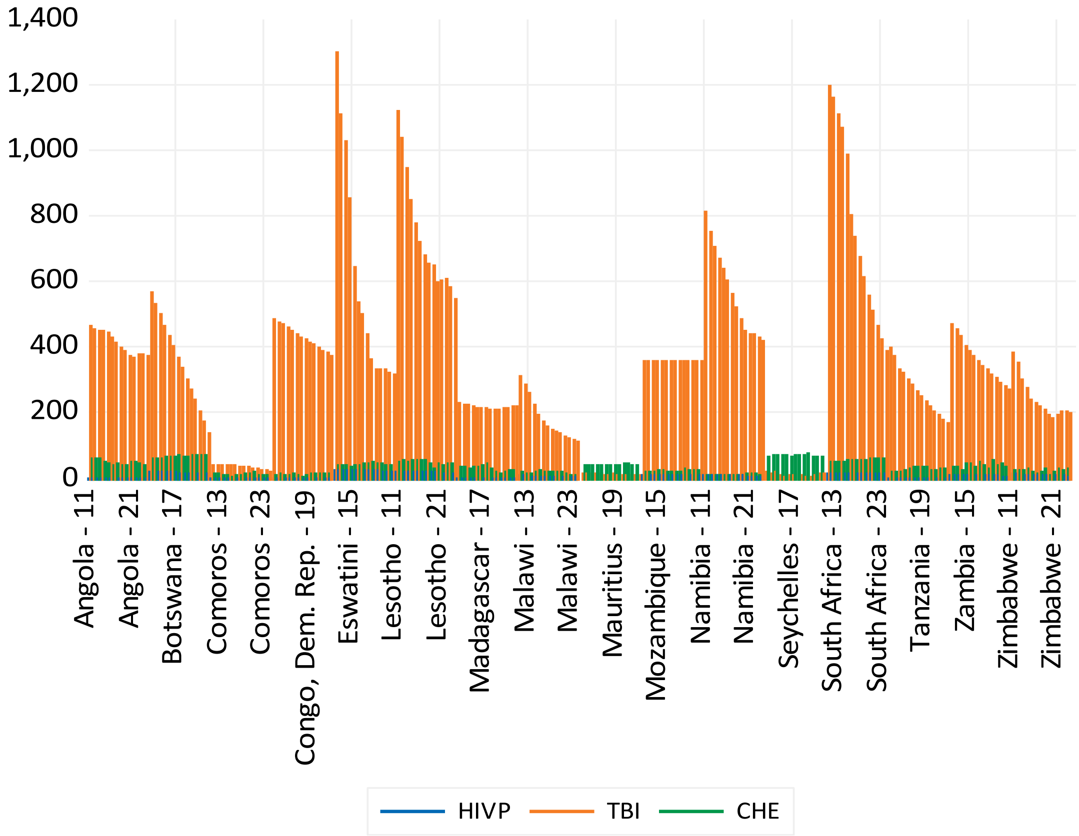

Figure 1. Trends in HIV prevalence, TB incidence, and Current Healthcare expenditures in the SADC region from 2011 to 2024. *Source: World Bank (2026).*

The SADC nations have implemented strategic, multi-sectoral policies focused on strengthening health systems, promoting prevention, and expanding treatment access to fight HIV and TB. These include key initiatives such as the SADC HIV and AIDS framework, the harmonised minimum standards for TB management, the protocol on health, Prevention of mother-to-child transmission (PMTCT), and voluntary male medical circumcision (VMMC), which focus on cross-border collaboration, surveillance, and care for vulnerable populations [44–46]. Despite reductions in AIDS related deaths and stabilised new infections, these interventions are deemed partially effective as the prevalence of these diseases continues to increase due to funding shortages and cross-border migration challenges that threaten long-term goals [43,46]. This study, therefore, examines the impact of communicable diseases on the economic growth of the SADC region, with a particular focus on the impact of HIV and TB and their influence on the region's output.

Using the Generalised Method of Moments (GMM) econometric technique, this study aims to provide more nuanced and practical insights into how the prevalence of communicable diseases, particularly HIV and TB, can be reduced, thereby increasing economic growth in the SADC region. It is important to note that the GMM is superior in econometric analysis as it offers consistent, asymptotically efficient, and robust estimates without requiring strict distributional assumptions (such as normality). It handles endogeneity, heteroscedasticity, and autocorrelation most effectively by using instrumental variables and moment conditions to model complex data. This study is therefore novel, as few studies in developing countries examine the relationship between communicable diseases and economic growth. This is because many studies focus only on non-

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communicable diseases, as evident in the literature. Furthermore, there are a notable limited studies that examine HIV and TB within the SADC region through the use of the GMM. This study, therefore, aims to contribute significantly to the empirical literature by offering knowledge that bridges the methodological, knowledge, and empirical gaps. Additionally, this study offers practical and applicable policy recommendations to the policy makers within the healthcare sectors of the SADC countries in order to boost economic growth and attain healthy populations while improving sustainable development in the context of the United Nations (UN) Sustainable Development Goals (SDGs), particularly goal 3: Good Health and Well-Being, which focuses on ensuring healthy lives and promoting well-being for all at all ages. Finally, it is important to note that this study provides unique and reliable knowledge that is not available in recent literature by providing current trends of government healthcare expenditure, HIV prevalence, and TB incidence in the SADC region, highlighting the role of IOs, HIV/TB coinfections, and the AIDS-defining conditions in individuals with HIV within the region. This is to assist health policymakers in the region in better understanding how these communicable diseases evolve in these nations amid health expenditures and increasing cross-border initiatives.

2. Literature Review

2.1. Theoretical Literature

This section of the study outlines the specific theories applied to the investigation to enhance our understanding of the relationship between communicable diseases and economic growth in SADC nations. At the core of the discussion lies the human capital theory (1960s), which holds that education, training, and health are investments that increase worker productivity. The theory also suggests that higher health expenditures improve economic growth. The endogenous growth theory (1980s) and the health-led growth hypothesis (1962) are also discussed, along with their relevance to this study.

2.1.1. The Human Capital Theory

The human capital theory developed by economists Theodore Shultz and Gary Becker in the 1960s emphasises the importance of human capital in improving productivity in numerous ways. One of these ways is investing in skills and education, which significantly contribute to labour productivity [40]. Through this increased labour productivity, benefits would accrue later in life through higher earnings in the labour market, a higher likelihood of employment, access to better jobs, and better health. This is because training and education often lead to improved health (e.g., exercising more often, smoking less, and eating healthy foods) and job stability [8]. In this regard, empirical evidence indicates that increased health expenditures improve economic performance [35]. By extending the work of Theodore Shultz (e.g., Schultz, 1973, 1974) and Gary Becker (e.g., Becker, 1993, 1994), Nobel Prize-winning economists Kilburn and Karoly (2008) devoted the theory's attention to children and investments in early childhood education. This is because investing in human capital, especially early childhood education, tends to focus on cognitive skills, which are often viewed as economically relevant and assessed through cost-benefit analysis, placing greater emphasis on outcomes such as productivity, income, earnings, and economic growth [16]. This, therefore, means that investing in early childhood education results in society members who are better acquainted with the necessary health knowledge for preventing communicable diseases such as TB and HIV, as these members would spend relatively more on their health. Nonetheless, this theory is particularly significant, highlighting the specific investments in human capital that the SADC region should make to reduce the prevalence of communicable diseases and improve economic performance across member states.

2.1.2. Endogenous Growth Theory

This theory was developed in the mid-to-late 1980s as an extension of neoclassical growth models, given their limitations. Pioneered by economists Paul Romer (1986) and Robert Lucas (1988), the theory merged to describe long-run growth through factors such as human capital, innovation, and knowledge spillovers [51]. The main feature of the theory is the establishment of new technological ideas endogenously by the private and public sector choices within an economic system (endogenous growth) rather than outside (exogenous). This means that the level of technology within an "endogenous growth" economy would be advanced by private and public investments, such as research and development expenditures and increases in human capital [10]. While communicable diseases act as negative shocks to human capital by decreasing the supply and productivity of labour and decreasing the economic growth of nations, advances in medical technologies and investments in healthcare (vaccines and treatment), endogenously by the private and public sectors, foster sustained, long-term economic growth, according to this theory [28,33]. However, since the SADC countries face funding shortages for initiatives to reduce communicable diseases and improve economic growth, this results in a lack of investment by the private and public sectors within each member state, accompanied by limited technological advances. While health technologies are very important for diagnosing, preventing, and treating diseases, developing countries are still making strides in advancing and adapting these technologies [53].This thus makes endogenous growth difficult in the developing world, such as the SADC economies, requiring external intervention, hence the cross-border initiatives between the member states.

2.1.3. The Health-Led Growth Hypothesis (HLGH)

The health-led growth hypothesis emphasises that increased investment in healthcare enhances population health, increases human capital and labour productivity, and ultimately improves economic performance. The framework suggests that better health status leads to higher economic growth, aligning with endogenous growth theory, which treats health as a productive capital investment [3]. In this study, controlling communicable disease prevalence is a driver of economic development according to the HLGH. The reason behind this is that reducing infectious diseases such as HIV and TB increases workforce participation, improves long-term economic prosperity, and decreases the economic drag caused by high mortality rates [41]. Evidence confirms that GDP per capita and health expenditure are cointegrated, indicating a long-term correlation in which health is treated as a necessary, non-discretionary, or even a luxury good, depending on a nation's level of development [28]. In support of this, a good example would be South Africa among the SADC countries, which has implemented initiatives such as the National Health Insurance (NHI), which is a centralised and publicly funded health system aimed at offering universal, free-at-the-point-of-care, quality and equitable healthcare to all its residents, regardless of socio-economic status [12]. Nonetheless, studies in the SADC region have yielded mixed results, with some revealing negative long-term effects, suggesting an urgent need for improved resource management [31,38]. Regarding the validity of the HLGH in Sub-Saharan African countries, evidence suggests bidirectional causality between current health expenditures and economic growth, as well as between governmental health expenditures and economic growth [14]. This theoretical framework is therefore particularly significant in the context of SADC economies, underscoring the importance of economic growth driven by increased healthcare investments.

2.2. Empirical Evidence

This section conducts an empirical investigation across relevant studies, employs methodologies, and assesses gaps in the literature. These include studies such as those by Qoko, Sibanda, and Senzangakhona [42], which revealed a significantly negative correlation between health expenditure and economic growth within the SADC region. This is because the SADC region is globally known to have the highest level of HIV prevalence rate among other diseases, and the most affected group is women between the ages of 15 and 24. This has been shown to affect productivity and ultimately harm economic growth [32]. Nevertheless, Ismahene [27] used the FMOLS, DOLS, and VECM techniques to examine the existence of a long-term relationship between infectious diseases and trade and economic growth across 88 countries. The study revealed that infectious diseases cause the most harm to economic growth and trade in developing countries than in developed countries. One reason is that infectious diseases negatively affect human capital and economic growth [20].

Moreover, Wu *et al* [60] argue that urbanisation increases the speed at which new infectious diseases spread, as it facilitates the concentration and connectedness of people. However, the magnitude of the effect highly depends on national governments' budgetary responses [56]. On the contrary, Brown and Essi [9] found that HIV and TB have a statistically significant negative effect on GDP in low-income countries in their study, which used the Panel Ordinary Least Squares Model (POLS), Fixed Effects Model (FEM), and Random Effects Model (REM) to analyse the data. These findings are really significant as they highlight one of the most significant factors of economic growth, which is urbanisation, in facilitating the spread of communicable diseases. In support of all these arguments and findings, Anser *et al*. [2] emphasise that the lack of sanitation, shortage of healthcare resources, and population compactness result in an increase in communicable diseases. Most developing countries exhibit such characteristics. These include African countries where diseases such as HIV/AIDS, tuberculosis, malaria, diarrheal disease, and acute respiratory infections are causing high mortality rates despite the success of vaccination programs for polio and some childhood diseases [7]. Sajid *et al*. [48] support this notion, emphasising that developing countries should prioritise economic development and health spending to fight against pandemics in their study, where they examine the long-term interdependence of communicable disease spread, greenhouse gas emissions, government health expenditures, and economic prosperity in India's economy using a variance error correction (VEC) approach.

Using the mixed-frequency vector autoregression model, Sun *et al*. [57] found that economic fluctuations negatively affect mortality from infectious diseases. This finding is in line with those of Zhang and Jin [62], who found that the incidence rate of respiratory disease, pulmonary tuberculosis, was negatively correlated with economic performance. However, contrary to these findings, Kitole, Lihawa, and Mkuna [30] argue that non-communicable diseases have a greater impact on economic growth than communicable diseases. In contrast to the argument of Kitole, Lihawa, and Mkuna [30], Sanders [49] argues that infectious diseases remain the most common cause of death globally, asserting that HIV and the re-emergence of malaria and tuberculosis, driven by drug resistance, have hurt economic growth worldwide. While there are numerous arguments on the topic, Olivier and Luies [39] emphasise that HIV and TB continue to pose significant global health threats, with global reports highlighting the urgency of the issue. The scholars strongly emphasise that the HIV/TB co-infection prevalence has the highest numbers in the African region, with Southern African nations exceeding 50% of these cases, indicating a substantial gap in testing and treatment for co-infection cases. It is therefore important to note that these arguments underscore the increased burden of communicable diseases, specifically HIV and TB, within the Southern African nations, highlighting the urgent need to take necessary steps towards reducing them.

3. Methodology

3.1. Model Specification

To examine the impact of communicable diseases on the economic growth of the SADC region, this study argues the following empirical model, building upon the work of Solow [54] :

$$\%\ cahnge\ in\ GDPPC = f(GDPPC_{it-1}, HIVP, TBI, CHE, GEE)\ (1)$$

where GDPPC denotes gross domestic product (GDP) per capita, proxied by GDP per capita (constant 2015 US$), HIVP denotes human immunodeficiency virus (HIV) prevalence proxied by Prevalence of HIV, total (% of population ages 15-49), TBI denotes tuberculosis (TB) incidence proxied

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by Incidence of tuberculosis (per 100,000 people), CHE denotes current health expenditure proxied by Current health expenditure (% of GDP) and GEE denotes government expenditure on education proxied by Government expenditure on education, total (% of GDP). Nonetheless, Equation (1) is then specified as an aggregate production function by considering the generalised Cobb-Douglas form:

$$Y_{it} = A_{it}K^{\alpha}{}_{it}H^{\beta}{}_{it}L^{1-\alpha-\beta}{}_{it} \quad (2)$$

where Y_{it} denotes total output, K_{it} denotes physical capital, H_{it} denotes human capital L_{it} denotes labour and A_{it} denotes productivity (endogenous). This model then follows the foundations of the endogenous growth model. However, since productivity depends on institutions and health equation (2) is augmented as follows:

$$A_{it} = A_0 GEE^{\phi}{}_{it} HIVP^{\Theta_1}{}_{it} TBI^{\Theta_2}{}_{it} \quad (3)$$

where $\Theta_1 < 0, \Theta_2 < 0$ and $\phi > 0$. This, therefore, means that communicable diseases directly reduce productivity. Furthermore, since human capital depends on health expenditure, we have:

$$H_{it} = H_0 CHE^{\Upsilon}{}_{it} \quad (4)$$

where $\Upsilon > 0$. This, therefore, implies that health spending builds productive human capital. When substituting A_{it} and H_{it} into the original equation (2) we have:

$$Y_{it} = A_0 K^{\alpha}{}_{it} CHE^{\Upsilon\beta}{}_{it} GEE^{\phi}{}_{it} HIVP^{\Theta_1}{}_{it} TBI^{\Theta_2}{}_{it} L^{1-\alpha-\beta}{}_{it} \quad (5)$$

Substituting Y_{it} with $GDPPC_{it}$ and dividing by L_{it} gives us:

$$GDPPC_{it} = A_0 K^{\alpha}{}_{it} CHE^{\Upsilon\beta}{}_{it} GEE^{\phi}{}_{it} HIVP^{\Theta_1}{}_{it} \quad (6)$$

where $K_{it} = K_{it}/L_{it}$. We would therefore refer to this as the health-augmented production function. Taking the natural logs and converting the model to a dynamic econometric model where HIV prevalence is the primary independent variable, TB incidence is a mediator variable and current health expenditure and government expenditure on education are control variables gives us:

$$lnGDPPC_{it} = plnGDPPC_{it-1} + \beta_2 lnHIVP_{it} + \beta_3 lnTB_{it} + \beta_4 lnCHE_{it} + \beta_5 lnGEE_{it} + u_i + \varepsilon_{it} \quad (7)$$

where u_i denotes the country-specific fixed effects (SADC) structural differences and ε_{it} denotes the idiosyncratic error term.

3.2. Variable Descriptions and Data Sources

Table 1. Variable descriptions and data sources.

VARIABLE NAME	SYMBOL	MEARSUREMENT	EXPECTED OUTCOME	SOURCE
Economic growth	GDPPC	GDP per capita (constant 2015 US$)	N/A	World Bank
HIV prevalence	HIVP	Prevalence of HIV, total (% of population ages 15-49	Negative	World Bank
TB incidence	TBI	Incidence of tuberculosis (per 100,000 people)	Negative	World Bank
Current health expenditure	CHE	Current health expenditure (% of GDP)	Positive	World Bank
Government expenditure on education	GEE	Government expenditure on education, total (% of GDP)	Positive	World Bank

3.3. Estimation Procedure

3.3.1. Generalised Method of Moments (GMM)

When analysing the effect of communicable diseases on the economic growth of the SADC region, the study employed the System Generalised Method of Moments (GMM) as it was deemed appropriate. The test was introduced by Lars Peter Hansen in 1982 and is a robust statistical method for estimating the parameters of econometric and economic models by matching theoretical moments (derived from assumptions) with sample moments. The assessment does not require complete

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knowledge of the data's distribution, which makes it flexible for handling heteroscedasticity, endogeneity, and non-linear models [23]. Evidence suggests a bi-causal relationship between economic growth and health outcomes, leading to endogeneity problems. A method effective in handling such issues is the GMM methodology [1]. The GMM technique addresses likely endogeneity by controlling for unobserved heterogeneity through time-invariant omitted variables. It is also suggested that cross-country variation be controlled for in the regressions, so that the GMM estimator corrects for biases associated with the differenced estimator. Additionally, the GMM methodology is best suited for panel data with a large number of cross-sections (countries) and a small number of periods (years), and it is also important to note that the number of instruments should be less than or at most equal to the number of cross-sectional units within the model. This is because, in that case, there are independent variables that are not strictly exogenous (endogenous regressors) and fixed effects [4]. The GMM estimator can be expressed as follows:

$$\widehat{\theta} = \arg min\,(Q_n(\theta)) \quad (8)$$

where $\widehat{\theta}$ denotes the estimated parameter vector $Q_n(\Theta)$ represents the criterion to be minimised, which is given by:

$$Q_n(\theta) = \left(\frac{1}{n}\sum_{i-1}^{N} g(W_i, \theta)\right)' w \left(\frac{1}{n}\sum_{i-1}^{N} g(W_i, \theta)\right) \quad (9)$$

where Θ denotes the parameter vector, W_i denotes data points, w denotes the weight matrix and $g(W_i, \Theta)$ denotes the moment conditions. The GMM's objective is to uncover the vector Θ which minimises the criterion function, ensuring that the sample moments of the data closely match the population moments. By optimising this criterion, the GMM provides consistent parameter estimates within the models. While the GMM estimator effectively addresses endogeneity in dynamic panel models, its efficiency depends strongly on the model specification, sample size, and instrument validity [15].

3.3.2. Post-Estimation Diagnoses

The study conducts diagnostic assessments after applying the GMM framework. These include the serial correlation test to assess the overall validity of the variables, and the examination of the accuracy of GMM estimation using the coefficient of lagged regressors relative to the ordinary least squares (OLS) and fixed effects (FE) models. According to Bond [5], a good estimate of a lagged dependent variable should always lie between the OLS and within-group estimates; hence, the study conducted pooled OLS and fixed-effects analyses. Moreover, the study used the Arellano-Bond specification test to assess the GMM's consistency and detect serial correlation. A distinction is made between the first-order correlation (AR1) and the second-order correlation (AR2). Within the AR1, the null hypothesis should be rejected, confirming the presence of serial correlation; within the AR2, the hypothesis should not be rejected, confirming its absence, as the absence of AR2 is essential for the consistency of the GMM estimator.

4. Empirical Results

4.1. Summary Statistics

Table 2 presents summary statistics for the variables used in this investigation's data sets. Among the statistics presented are the measures of dispersion and central tendency. As such, the study has found that all variables, as shown in Table 2, have positive mean coefficients, indicating upward series. Variables such as HIVP, CHE, and GEE exhibit low deviations, indicating that their distributions are closely centred on the mean. Additionally, all the variables have positive skewness. Finally, all variables are platykurtic, with kurtosis values below 3, except for TBI, which is leptokurtic, with a kurtosis value above 3.

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Table 2. Summary statistics.

	GDPPC	HIVP	TBI	CHE	GEE
Maen	2392.840	10.99728	411.8639	36.40730	4.755571
Median	1321.250	11.50000	361.0000	35.45464	4.418240
Maximum	6951.732	29.40000	1300.000	75.65960	10.82655
Minimum	422.9243	0.100000	26.00000	9.949007	0.384771
Std.Dev.	2054.242	8.745088	242.2472	17.28532	2.274409
Skewness	0.810265	0.401692	1.342925	0.267446	0.644715
Kurtosis	2.219456	2.151413	5.318004	2.009846	2.625610
Jarque-Bera	19.81661	8.363844	77.09494	7.757392	11.04213
Probability	0.000050	0.015269	0.000000	0.020768	0.004002
Sum	351747.5	1616.600	60544.00	5351.873	699.0689
Sum Sq.Dev.	6.16E+08	11165.58	8567823.	43622.20	755.2485
Observations	147	147	147	147	147

Notes: ***1%,**5% and *10% significance level. Source(s): Authors' computation (2026).

4.2. Correlation Matrix

Table 3 shows the correlation analysis results of the investigation's series. The outcomes indicate no strong correlation, which can lead to multicollinearity among pairs of variables in the study. Nevertheless, there exists a moderate positive correlation between GDPPC and HIVP with a magnitude of 0.560739. Another moderate positive correlation is seen between GDPPC and TBI, with a magnitude of 0.550987. Finally, CHE and GEE positively correlate with GDPPC, with magnitudes of 0.580412 and 0.576504, respectively.

Table 3. Correlation coefficient matrix.

	GDPPC	HIVP	TBI	CHE	GEE
GDPPC	1				
HIVPC	0.560739	1			
TBI	0.550987	0.589696	1		
CHE	0.580412	0.509767	0.332467	1	
GEE	0.576504	0.662437	0.469428	0.290914	1

Notes: ***1%,**5% and *10% significance level. Source(s): Authors' computation (2026).

4.3. System GMM Estimation Results

Table 4 presents the outcomes of the two-step GMM system estimation. It is evident from the analysis that the coefficient (0.595440) of the Lagged GDPPC variable is less than the coefficient (0.987292) of the Lagged GDPPC variable of the fixed effects model (lower bound). This, therefore, necessitated the use of the system-GMM estimation technique.

Table 4. System GMM estimation results.

	System-GMM results		Fixed effects model results		Pooled OLS results	
Variables	Coefficients	t-value	Coefficients	t-value	Coefficients	t-value
Lagged GDPPC	0.595440***	57.85221	0.987292***	138.8013	0.781528***	6.955969
HIVP	12.92657***	5.133132	3.715660***	6.168820	7.582167	0.621466
TBI	0.252019***	6.507228	0.028814	0.747067	0.160232	1.193094
CHE	-3.430010***	-10.05468	-0.047289	-0.091494	1.207130	0.579199
GEE	-15.44188***	-6.430173	-2.760075	-0.655736	-5.842260	-0.883174
AR(1) *p-value*	0.0031***	-	-	-	-	-
AR(2) *p-value*	0.1928	-	-	-	-	-
R-squared	-	-	0.996320	-	0.996960	-
F-stat (Prob)	93.06(0.001024)	-	7.111.020	-	2149.835	-
No. of instruments	14	-	(0.000000)	-	(0.000000)	-

Notes: ***1%,**5% and *10% significance level. Source(s): Authors' computation (2026).

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Looking at the results of the system-GMM, it can be noted that there is a positive correlation of 0.595440 between past and present economic growth (GDPPC). Furthermore, HIV prevalence is positively associated with economic growth, with a magnitude of 12.92657. This positive correlation is due to urbanisation, increased population mobility, infrastructure development, and, paradoxically, economic growth, as well as high levels of income inequality. These factors are facilitating the rapid spread of the virus through social disruption and increased sexual network density in the SADC region. Another factor contributing to the positive correlation between economic growth and HIV prevalence in the SADC region is the improved healthcare systems in some member states that prolong life expectancy, despite the increasing prevalence of the virus. The finding is statistically significant at the 1% level, with a t-statistic of 5.133132, which exceeds 2. Furthermore, TB incidence is also positively associated with economic growth, with a magnitude of 0.252019. This is mainly due to industrialisation and urbanisation, along with the associated social, environmental, and behavioural risks [52]. Another reason for the observed positive relation between economic growth and the incidence of TB is the "vicious cycle" or "poverty-disease-trap" which occurs when economic growth concentrates poverty-related risks in urban areas, leading to a higher spread of the disease. The finding is statistically significant at the 1% level, with a t-statistic of 6.507228 exceeding the critical value of 2. Nevertheless, an increase in current health expenditure is associated with a decrease in economic activity by a magnitude of -3.430010 within the SADC nations. This is consistent with the findings of Yang [61], who found that low human capital levels lead to a significant negative correlation between health expenditure and economic growth, and asserted that investments in human capital greatly affect how individuals allocate resources to their health. Hu and Wang [26] support this notion, as they also found that public health expenditure was negatively correlated with economic growth across OECD economies. This finding is particularly significant, as it reflects inefficiencies in spending, crowding-out effects, and reactive spending, in which increases in expenditures are mainly due to higher disease burden. The study's outcome is statistically significant at the 1% level, with a t-statistic of -10.05468. Finally, government expenditure on education is negatively associated with economic growth by a magnitude of -15.44188. This may mainly be due to inefficiencies in public health spending, which may be associated with poor-quality education, corruption, and a mismatch between the skills taught and market needs. High spending without improved productivity often leads to inequality, brain drain, or a "poverty trap" in which investments fail to yield returns [1].

Post-Estimation Diagnoses Results

The serial correlation test, as depicted in Table 3, reports the results of the Arellano-Bond test for autocorrelation, where the p-value for AR1 is less than the 5% significance level, necessitating rejection of the null hypothesis of no first-order autocorrelation in the idiosyncratic error term. Furthermore, the p-value of 0.1928 fails to reject the null hypothesis of an AR2 model, indicating that the model is theoretically sound and valid. Additionally, robustness checks, including pooled ordinary least squares (OLS) and fixed effects (FE) models, indicate that the model is robust. This is because the coefficient of the lagged variable of GDPPC (economic growth) of the two-step system GMM lies between the coefficients of the fixed effects and pooled OLS estimates, i.e. $0.987292 < 0.595440 < 0.781528$. Lastly, it is important to note that the GMM analysis includes 14 instruments, fewer than the number of cross-sectional units, suggesting no instrument proliferation in the model.

5. Conclusion and Policy Recommendations

The main aim of this investigation was to examine the impact of communicable diseases on the economic growth of the SADC region, focusing on the effects of HIV prevalence and TB incidence on GDP per capita across member countries. The study used the two-step system GMM to analyse the data from 2011 to 2024. Through the empirical findings, a positive and significant correlation was revealed between HIV prevalence, TB incidence and economic growth. The positive correlation between HIV prevalence, TB incidence and economic growth are particularly significant as they defied expected outcomes as well as logical and intuitive expectations. Health expenditure and education expenditure were found to significantly influence economic growth in SADC nations. Based on these outcomes, this study therefore recommends harmonising the cross-border strategies, strengthening regional surveillance and integrating health into economic planning to ensure a productive workforce. The study further recommends increased investments in childhood education, a major factor in individual health. Additionally, the study strongly recommends developing strategies and policies to manage the rapid spread of communicable diseases, especially in urban areas. Another important recommendation is to strengthen migration policies to regulate the spread of infectious diseases.

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