The Effect of Government Health Expenditure on Infant Mortality Rates in the SADC Region: A Case of Four Countries

Christian Nghiyoonanye Haikali[1*], Lusia Ndateleela Kanhalelo[2]

[1]School of International Development and Cooperation, University of International Business and Economics, Beijing 100029, People's Republic of China.

[2]Department of Education, Andhra University, Visakhapatnam 53003, Andhra Pradesh, India.

***Corresponding Author**

DOI: https://doi.org/10.47772/IJRISS.2025.91200312

Received: 28 December 2025; Accepted: 03 January 2026; Published: 17 January 2026

ABSTRACT

This study aimed to examine the effect of Government Health Expenditure (GHE) on Infant Mortality Rates (IMR) in the Southern African Development Community (SADC) region, focusing on four countries, namely:

Botswana, Eswatini, Namibia, and South Africa. Rooted in the Grossman Theory of Health Demand and the Wagstaff Model, the research employed a quantitative, longitudinal research design using panel data from

2010 - 2022. Data was sourced from the World Bank's development indicators and an Ordinary Least Squares (OLS) regression model was utilised to analyse this data using STATA statistical software.

The findings of this study indicate that increased GHE significantly reduces IMR in the SADC region, with the results showing that a 1% increase in GHE (as % of GDP) reduces IMR by approximately 4.83 deaths per 1,000 live births. The mediating variables, namely: Maternal Education (ME) and Access to Clean Water (CW), have also shown a statistical significance in amplifying the effect of GHE on IMR in this region. Results indicate that a 1% increase in spending on each of the two mediating variables, ME and CW, resulted in reductions in IMR of 0.492 and 0.518 deaths per 1000 live births respectively.

These finding support the hypotheses that GHE has a significant negative effect on IMR in the SADC region; and that both ME and CW have a significant negative effect on IMR and thus act to complement the effect of GHE on reducing IMR in the SADC region. In light of this study's findings, the researchers therefore urge the policymakers and their respective governments in the SADC member states to ensure increased and sustained GHE; increased and sustained investment in female education; increased funding of clean water and sanitation infrastructure expansions; as well as an adoption of integrated, multi-sectoral approaches to help achieve sustainable improvements in infant health outcomes in the Southern African region.

Keywords: Government Health Expenditure, Infant Mortality Rate, Maternal Education, Access to Clean Water, SADC region.

INTRODUCTION

Background

Infant Mortality Rate (IMR) is a critical indicator of a nation's health system performance and socio-economic development, often bringing to light an individual country's general health, maternal care, as well as overall living conditions. IMR can be defined as the number of deaths in children under 1 year of age per 1000 live births in the same year (Reidpath & Allotey, 2003). The Southern African Development Community (SADC) region, despite having some upper-middle-income country, continues to experience high IMR compared to other regions with similar economic status (Lee, 2025).

A significant and primary response to this problem which has been adopted by African governments in general and those in the SADC in particular, has been that of increasing Government Health Expenditure (GHE), given its proven record of playing a crucial role in improving healthcare infrastructure, maternal and child health services, and access to essential medicines (Mhango, 2018). However, the extent to which increased GHE translates into reductions in infant mortality remains under-researched in the SADC region, hence the need to carry out this study.

This study is also necessitated by the findings of recent researchers, such as those revealed by Dinga (2024) who stated that while recent extant statistics demonstrates that maternal mortality decreased by 2.9 percent during the period of 2000 to 2017, while neonatal mortality declined by 2.9 percent between the period of 2000 and 2019, IMR remains high in Africa in general. The IMR situation might even be deemed dire in the subSaharan African (SSA) region, under which the SADC region falls, because 66% of maternal deaths worldwide occur in SSA (Dinga, 2024).

This study therefore seeks to quantitatively examine the relationship between GHE and IMR, providing evidence-based insights for policymakers. The countries selected for this quantitative study to represent the SADC region are such as Botswana; Eswatini (formerly known as Swaziland); Namibia; as well as South Africa, whose data on this topic is often readily available online and is usually easy to access.

Problem Statement

The Southern Africa region continues to experience high levels of IMR compared to other regions of similar economic and developmental status across the globe. Although SADC governments have been pouring significant financial resources into their respective health care systems, the extent to which GHE help reduce IMR remains under-researched and thus unclear. Big financial numbers on paper might very well mean little if funds vanish, get mismanaged, and or does little deliver tangible results in the health sectors.

This is a critical gap that should be addressed since ignoring it could lead to a lack of understanding on reasons why significant investments in public health often ends up not yielding the expected health outcomes, thereby leaving potential problematic factors, which are to blame for this problem, such as inefficiencies allocation of funds, poor governance, and other socio-economic issues unaddressed. It is therefore against this background that an empirical investigation is required to help quantify the relationship that exists between GHE and IMR in SADC region. Doing this would help provide actionable insights on this problem, which can be implemented, thereby ensuring that increased government health spending finally translates into meaningful and concrete improvements in infant health outcomes.

Research Objectives

The primary objectives of this study are such as to examine the impact of GHE (% of GDP) on IMR in Southern Africa; to assess the role of control variables, namely: Maternal Education (ME) and Access to Clean Water (CW), in influencing infant mortality; as well as to provide policy recommendations for improving infant health outcomes through optimized health expenditure.

Research Questions

This study was mainly guided towards its objectives by two important questions. These questions are: a) Does an increase in GHE (% of GDP) lead to a significant reduction in IMR in the SADC region?; and b) How do Maternal Education(ME) levels and Access to Clean Water (CW) moderate the relationship between health spending and infant mortality?

Research Gap

The SADC region, despite having a relatively good economic stability and a good the presence of uppermiddle-income countries, continues to experience high infant mortality rates compared to other regions with similar economic status across the world. The chosen countries shared unique socio-economic and healthcare structures warrant a dedicated study. The region also lacks adequate research on the significance of the role played by GHE in IMR reductions.

Significance of the Study

This study is significant because of various reasons. These reasons are such as that it contributes to the empirical literature on health economics in Southern Africa; it informs policymakers on the effectiveness of health spending in reducing infant mortality; and it also identifies key areas, for example ME and sanitation that may require additional investment alongside health expenditure to reduce IMR.

Limitations of the Study

The limitations this study faces are such as data availability constraints existing due to inadequacy in the dissemination of data by SADC member states for public use; the study's primary focus on macro-level data, thereby not account for regional disparities within the chosen countries; as well as the possible existence of external factors such as disease outbreaks and economic shocks which might have influenced the results.

To counter these limitations, a mean imputation strategy was used in this study to compensate for some of the missing values, particularly in the data on females' primary education completion. Additionally, the four chosen target countries (sample) are among the top countries with readily available data in the SADC region and a time frame of 2010 – 2022 was chosen to ensure access to as much available data as possible and to avoid data with too many missing values which exist in many of the years which preceded the chosen period.

Hypotheses

This research is guided by a set of formal hypotheses which were derived from the theoretical framework as well as the study's research questions. The primary null hypothesis ($H_0 1$) of this study states that GHE has no significant effect on IMR in the SADC region. The corresponding alternative hypothesis ($H_a 1$) to this null hypothesis states that GHE has a significant negative effect on IMR in the SADC region. Additionally, taking into account the potential role played by the mediating factors, a second null hypothesis ($H_0 2$) posits that the mediating variables, namely: ME and CW have no significant effect on IMR and do not therefore amplify the relationship between GHE and IMR. The corresponding alternative hypothesis ($H_a 2$) to this states that both ME and CW have a significant negative effect on IMR and thus act to complement the effect of GHE on reducing IMR in the SADC region.

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Literature Review

Government Health Expenditure and Infant Mortality in Africa

Several studies have explored the relationship between GHE and infant mortality in Africa. A study covering 47 African countries between 1999 and 2004 found that health expenditures have a statistically significant effect on infant mortality and under-five mortality. Finding in this study revealed that a 10% increase in per capita total health expenditure reduces IMR by 22% while a 10% increase in per capita public health expenditure leads to a reduction of 21% in IMR (Anyanwu & Erhijakpor, 2007). This significant effect underscores the importance of sustained government investment in healthcare systems in African countries.

Some recent studies carried out across Sub-Saharan Africa (SSA) also revealed crucial findings on GHE's effect on IMR. According to Kiross et al. (2020), a study carried out in SSA revealed that public health expenditures significantly reduce infant mortality by 0.025% per 1% expenditure increase. These findings indicate that increased government health spending helps improve access to maternal and child health services, immunization coverage, as well as skilled birth attendance, thereby reducing infant deaths (Kiross et al., 2020).

Similar findings were also echoed by Novignon et al. (2012) who indicated that in a study examining the effect of both public and private health expenditure on IMR in SSA, the results revealed that public health expenditure has a stronger and more consistent impact on decreasing IMR in comparison to private expenditure. Researchers in this study concluded that government health spending plays a significant redistributive role, especially for poor households who depend on publicly funded healthcare services (Novignon et al., 2012).

Other researchers who echoed the significant role played by GHE in helping to reduce IMR in SSA include Vladimír (2022); and Nyamuranga (2016), who argue that public health spending in SSA significantly reduces infant mortality. These results align with Grossman's framework of input-output, whereby public spending on health systems yield measurable returns in population health metrics.

Mixed Findings in Individual Countries and Mediating Factors

Despite the consensus on this topic, certain country-specific studies have also reported mixed findings. An example in this regard is a time-series study done in Nigeria using an Autoregressive Distributed Lag (ARDL) model which found that GHE had a negative but statistically insignificant long-run effect on IMR in the country. This study indicates that in the short run, the relationship between the two variables was even positive, thereby suggesting inefficiencies in public health spending and inadequate fund allocation levels (Anokwuru & Chidinma, 2023).

The Nigerian situation was also echoed by Samuel (2024) who indicated that a study on the effect of GHE on IMR, carried out in Nigeria alone, focusing on data from 1980 to 2022, also found GHE to have a negative effect on IMR per expenditure increase. However, the effect in Nigeria was minimal, with the IMR remaining persistently high (at 91/1000 live births) despite increased budgets, suggesting that structural inefficiencies may hinder GHE effectiveness (Samuel, 2024).

These findings are a great indication that increased GHE does not automatically translate into significant successes in IMR reductions. These results instead suggest that the effectiveness of GHE depends not only on the amount funds spent but also on how efficiently the funds are utilised, and other mediating factors or variables such as governance quality, health workforce availability, and the levels of infrastructure development in the country among other factors.

Other studies have also highlighted the conditionality of the impact of GHE on IMR such as the aspect of institutional quality. For instance, according to Bokhari et al. (2007), studies incorporating governance indicators show that countries with stronger institutions have been found to experience larger reductions in IMR for the same level of health spending observed in underperforming countries. This suggests that corruption, poor accountability, and weak policy implementation can weaken the countries' potential of benefiting from increased GHE. Broader socio-economic factors which include female education, income levels, as well as urbanisation have also been found to be important variables which interact with GHE to influence IMR outcomes (Arthur & Oaikhenan, 2017).

The role played by other factors in mediating the effect of GHE on IMR has also been echoed by Shilongo (2019); and Gupta at al. (2003) who emphasised the crucial role played by public health spending in reducing IMR, while highlighting that non health variables such as access to clean water highly moderate the effect of GHE on IMR, thereby significantly interacting with GHE's effects on the reduction of IMR.

The reviewed literature affirms the position of two of the important theories attached to this study, namely: Grossman's and Wagstaff's theories, which posit that health expenditures function as significant contributions for improving population health outcomes. However, reviewed literature also revealed that the magnitude of GHE's effect on IMR may vary substantially across contexts, depending on governance quality, private sector dynamics, complementary investments in education and water access, as well as other socio-economic factors.

Theoretical Framework

The relationship between GHE and IMR has been extensively studied through various theoretical lenses. This study is particularly grounded in the Grossman Theory of Health Demand, which posits that health is a form of human capital influenced by investments such as healthcare spending (Grossman, 1972). Additionally, this research id also rooted in the Wagstaff Model, which suggests that public health expenditure improves health outcomes by enhancing healthcare access and quality (Wagstaff, 1993).

Grossman's 1972 model conceptualizes health as a form of human capital that depreciates over time but which can be maintained through investments. In this framework, GHE serves as a critical input in the health production function, as stated by Grossman (1972) and Samuel (2024). According to this model, increased health

expenditure should theoretically improve health outcomes by enhancing access to healthcare services, infrastructure, as well as skilled personnel. Similarly, Wagstaff (1993) also echoes this idea, emphasising in his theory that public health investments determine health outcomes, stressing that result even improve when public health spending is paired with investments from the private sector, particularly in developing countries, a notion also indicated in Shilongo (2019).

RESEARCH METHODOLOGY

Introduction to Research Framework

This study has its roots in a positivist research paradigm, utilising a deductive approach to test predefined hypotheses pertaining to the relationship existing between public spending and health outcomes. The study is grounded in two particular theoretical models, namely: the Grossman Theory of Health Demand, which perceives health as a form of capital that one can invest in, as well as the Wagstaff Model, which put emphasis on how public health spending enhances healthcare quality and access. These theories collectively provide a strong framework for analysing how GHE, alongside investments in vital areas such as infrastructure, and human capital, function as an vital input in the health systems of countries to help improve population health metrics, particularly IMR.

Quantitative Data

This study utilised quantitative panel data, belonging to the four selected SADC countries, namely: Botswana, Eswatini, Namibia, and South Africa. The data span a period of period 12 years, starting from, and including, 2010 to 2022. An Ordinary Least Squares (OLS) regression model was used to estimate the relationship between the variables, using STATA statistical software. To study the relationship existing between GHE and IMR, the researchers specified the models as follows:

$$IMR_t = \beta 0 + \beta 1 GHE_t + \beta 2 ME_t + \beta 3 CW_t + \epsilon t$$

Where IMR_t is the Infant Mortality Rate (per 1,000 live births), GHE_t is Government Health Expenditure (% of GDP), ME_t is Maternal Education (% of females who complete primary education), CW_t is people with Access to Clean Water (% of the total population), and ϵt is the Error term. The Infant Mortality Rate (IMR) is a dependent variable; Government Health Expenditure (GHE) is the independent variable; with the other two variables, namely: Maternal Education (ME); and Access to Clean Water (CW) serving as control variables.

Qualitative Data

This research did not plainly collect or analyse any primary qualitative data. Instead, the research design is mainly quantitative, largely focusing on numerical indicators to help test the hypothesised relationships between the stated variables. Although the discussion indicates the statistical result leaning towards the context of socio-economic issues such as quality of governance and efficiency in service delivery among other aspects, these contextual realities were drawn from the conducted review of existing related literature and not from the use of primary qualitative research data collection methods such as focus groups, interviews, and or case study narratives.

Secondary Data

All data used in the analysis of this study was obtained from a secondary database. The study primarily relied on data sourced from the World Bank's World Development Indicators (WDI), which is a reputable and widely used source, containing cross-national socio-economic and health statistics. Using this secondary data allowed the researchers to employ a longitudinal, multi-country analysis to carry out this study, an exercise which would have been challenging to carry out if data were to be collected from primary sources. However, the researchers acknowledge the limitation of the study’s dependency on the completeness and accuracy of data made available by the four sample SADC member states to the World Bank database.

Conceptual Framework

The conceptual framework in this study helped organise the theoretical model into an empirical relationship that is testable. In this research, it particularly places Infant Mortality Rate (IMR) as a dependent variable while the Government Health Expenditure (GHE) variable is the primary, independent, variable. Two vital mediating variables, namely: Maternal Education (ME) and Access to Clean Water (CW), are also incorporated as control variable, hypothesised to influence IMR directly and to amplify the effectiveness of GHE on IMR in the SADC region. The framework's position is that increased GHE, supplemented by higher levels of ME and CW, result in a reduction in IMR.

Hypotheses Testing

In this study, the testing of the hypotheses was conducted by using an Ordinary Least Squares (OLS) regression model, and the estimations where done with the help of STATA statistical software. The model in the study has been specified as: $IMR_t = \beta 0 + \beta 1 GHE_t + \beta 2 ME_t + \beta 3 CW_t + \epsilon t$. The significance of the coefficients (β1, β2, β3) was tested to test the stated hypotheses. A statistically significant negative GHE (β1) coefficient would mean an outright rejection of the H_o1 in favor of the H_a1. Similarly, if ME (β2) and CW (β3) were to produce statistically significant negative coefficients, this would mean there is strong evidence present to lead to a rejection of the H_o2, thereby supporting the H_a2, which is that these two factors significantly reduce IMR and amplify GHE in reducing IMR in the SADC.

CONCLUSION

Conclusively, the research methodology utilised a quantitative, longitudinal panel data design to extensively examine the effect of GHE on IMR in the SADC region. By utilising secondary data sourced from the World Bank database, and applying OLS regression analysis under a clear conceptual framework which is rooted in health economics theories indicated in this study, this research provides strong empirical foundation for testing its hypotheses. This approach helps facilitate the drawing up of vital evidence-based conclusions having to do with the effectiveness of public health spending, as well as the crucial role played by complementary investments in the vital areas of female education and clean water infrastructure in improving infant health outcomes. Table 1 below represents the summary statistics of the 2010 -2022 dataset.

Table 1: Summary Statistics of the 2010–2022 dataset

Variable	Obs	Mean	Std. dev.	Min	Max
IMR	52	43.07885	9.658814	24.5	62
GHE	52	4.099148	.6194731	2.739723	5.839629
ME	52	93.83956	5.336072	71.60997	102.6272
CW	52	83.05826	9.887918	62.0811	94.49209

FINDINGS AND ANALYSIS

Findings

The effect of GHE on IMR as well as how this effect is moderated by ME and CW is reflected in the following table, labelled: Table 2.

Table 2: OLS Regression Results (Dependent Variable: IMR)

Source	SS	df	MS	Number of obs	=	52
				F(3, 48)	=	51.19
Model	3624.94852	3	1208.31617	Prob > F	=	0.0000
Residual	1132.97821	48	23.6037126	R-squared	=	0.7619
				Adj R-squared	=	0.7470
Total	4757.92673	51	93.292681	Root MSE	=	4.8584

IMR	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
GHE	-4.830645	1.606095	-3.01	0.004	-8.059915	-1.601375
ME	-.4924348	.1293032	-3.81	0.000	-.7524163	-.2324533
CW	-.5179766	.1009664	-5.13	0.000	-.7209831	-.31497
_cons	152.1125	12.57418	12.10	0.000	126.8304	177.3945

Significance levels: *p<0.01, *p<0.05, p<0.1*

Analysis

The results reveal that for the GHE, the coefficient (-4.831) is statistically significant (p = 0.004), indicating that a 1% increase in GHE (as % of GDP) reduces infant mortality by approximately 4.83 deaths per 1,000 live births. These results, showing a statistically significant negative GHE (β1) coefficient, are a clear rejection of the $H_0$1 in favor of the H_a1, supports the hypothesis that government health spending have a statistically significant negative effect on IMR in the SADC region.

The ME variable strongly complements GHE's effect on IMR. The outcome shows that every 1% increase in female primary education completion reduces IMR by 0.492 deaths per 1,000 live births. This illustrates the significant role education plays in empowering mothers with health knowledge, thereby indirectly amplifying the impact of government health spending on IMR in the SADC region.

CW has also proved to be statistically significant in amplifying the effect of GHE on IMR in the SADC region. Results indicate that every 1% improvement in clean water access helps reduce IMR by 0.518 deaths per 1,000 live births. This hugely highlights that improved access to clean water and sanitation is highly instrumental in complementing government healthcare investments in this context, by improving hygiene and preventing diarrhea as well as waterborne diseases which pose a huge danger to newborn babies' health. These findings on the two mediating factors in this study therefore indicate that there is strong evidence present in the results, enough to reject the $H_0$2, and support the H_a2.

Furthermore, the high R-squared of 0.762 suggests that the model explains 76.2% of the variation in infant mortality, a clear indication that all these three predictors significantly improve the explanatory power. All these predictors have been proven to be statistically significant in their influence on IMR reductions, and their respective statistical findings highly align with the theoretical expectations of this study.

RECOMMENDATIONS

In the light of these results, policymakers in the SADC member states are therefore expected to engage in initiating and improving transformative and progressive policies and actions, by paying particular attention to aspects of increasing health budgets strategically, with improved focus on maternal and child health programs; investing in female education to help improve health literacy and childcare practices; expanding clean water and sanitation infrastructure to help amplify both public and private healthcare investments effects; as well as to adopt integrated policies, which may include combining health, education, as well as Water, Sanitation, and Hygiene (WASH), in a bid to ensuring sustainable reductions in IMR in the region.

Furthermore, the findings in this study also illustrate the great need for a multi-sectoral collaboration within the individual SADC member states, as well as between these countries, to achieve the United Nations' Sustainable Development Goals (SDG) 3, 4 and 6, which are good health and well-being; quality education; as well as clean water and sanitation, respectively.

CONCLUSION

Conclusively, multiple studies carried out in Africa have revealed that increased public health spending plays a significant role in the reduction of infant mortality in several African countries. For this study in particular, the results confirm that GHE plays a significant role in reducing IMR in the SADC region, with the results showing that a 1% increase in GHE (as % of GDP) reduces IMR by approximately 4.83 deaths per 1,000 live births. The two control variables, namely: ME and CW, acting as critical mediators, have also proved their great importance in mediating the effect of GHE on IMR by showing that a 1% increase in each one of them leads to reductions in IMR of 0.492 and 0.518 deaths per 1,000 live births respectively. The significance of the coefficients (β1, β2, β3) demonstrated in the results means that all the null hypotheses got rejected while all the alternative hypotheses have been supported in this study.

However, despite the consensus on this topic, some studies carried in individual countries, such as in Nigeria, produced mixed results, revealing a negative, but a statistically insignificant effect GHE has on IMR. Findings such as this are a great indication that while GHE plays an instrumental role in reducing IMR in African countries, allocating public funds to the health sector does not automatically translate into significant IMR reductions.

The mixed results in these studies instead suggest that the GHE does not work in isolation. The effectiveness of GHE depends on how efficiently the funds are utilized, as well as on other mediating factors such as governance quality, health workforce availability, and the levels of infrastructure development, access to clean water, as well as the provision of education to the citizens, particularly women.

These findings therefore greatly underscore the need for policy makers and governments of SADC member states to pay detailed attention to aspects of ensuring increased and sustained GHE, increased and sustained investment in female education, increased public funding on clean water and sanitation infrastructure expansions, as well as an adoption of integrated, multi-sectoral approaches to help achieve sustainable improvements in infant health outcomes.

REFERENCES

1. Anokwuru, G., & Chidinma, C. (2023). Public health expenditure and infant mortality rate in Nigeria. International Journal of Scientific Research and Management, 11(12), 5674–5686. DOI: 10.18535/ijsrm/v11i12.em14
2. Anyanwu, J. C., & Erhijakpor, A. E. O. (2007). Health Expenditures and Health Outcomes in Africa. (Economic Research Working Paper No. 91). https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/26820442-FR-ERWP-91.PDF
3. Arthur, E., & Oaikhenan, H. (2017). The Effects of Health Expenditure on Health Outcomes in SubSaharan Africa (SSA): The Effects of Health Expenditure. African Development Review, 29(3), 524-536. DOI:10.1111/1467-8268.12287
4. Bokhari, F. A. S., Gai, Y., & Gottret, P. (2007). Government health expenditures and health outcomes. Health Economics, 16(3), 257–273. https://doi.org/10.1002/hec.1157
5. Dinga, G.D., Mah, G., & Mosikari, T. (2024). Government Health Expenditure and Maternal Mortality: The Moderating Role of External Debt. Healthcare (Basel), 12(20), 2030. doi: https://doi.org/10.3390/healthcare12202030
6. Grossman, M. (1972). On the concept of health capital and the demand for health. Journal of Political Economy, 80(2), 223-255.
7. Gupta, S., Verhoeven, M., & Tiongson, E. R. (2003). Public Spending on Health Care and the Poor. Health Economic, 12(8), 685-696. http://dx.doi.org/10.1002/hec.759

8. Kiross, G. T., Chojenta, C., Barker, D., & Loxton, D. (2020). The effects of health expenditure on infant mortality in sub-Saharan Africa: Evidence from panel data analysis. Health Economics Review, 10(5), 1-https://doi.org/10.1186/s13561-020-00262-3
9. Lee, S. (2025). Understanding Infant Mortality Rates: A Comprehensive Guide to Social Demographic Factors. https://www.numberanalytics.com/blog/ultimate-guide-infant-mortality-social-demography
10. Mhango, C.T. (2018).Government health expenditure and health outcomes in Malawi: Does governance matter? https://www.researchgate.net/publication/328743439_Government_health_expenditure_and_health_outc omes_in_Malawi_does_governance_matter
11. Novignon, J., Olakojo, S.A. & Nonvignon, J. (2012). The effects of public and private health care expenditure on health status in sub-Saharan Africa: new evidence from panel data analysis. Health Economic Review, 2(22), 1-8. https://doi.org/10.1186/2191-1991-2-22
12. Nyamuranga, C. (2016). The effect of public health expenditure on childhood mortality in Southern Africa (SADC) [Master dissertation, KDI School of Public Policy and Management].
13. Reidpath, D. D. & Allotey, P. (2003). Infant mortality rate as an indicator of population health. Journal of Epidemiology and Community Health 57 (5), 344–346. DOI:10.1136/jech.57.5.344
14. Samuel, T. (2024). Dissecting the effect of public health expenditure on infant and maternal mortality: A case of Nigeria. International Journal of Social Science and Human Research, 7(12), 88188829. https://doi.org/10.47191/ijsshr/v7-i12-05
15. Shilongo, H. (2019). The impact of government health expenditure on health outcomes in southern Africa (MPRA Paper No. 99738). https://mpra.ub.uni-muenchen.de/99738/
16. Vladimír, B. (2022). Impact of Health Expenditures on Infant Mortality in Africa. [Master dissertation, Charles University]. https://dspace.cuni.cz/bitstream/handle/20.500.11956/175652/130344453.pdf?sequence=1&isAllowed=y
17. Wagstaff, A. (1993). The demand for health: An empirical reformulation of the Grossman model. Health Economics, 2(2), 189-198.