Public Policy and Administration Research
ISSN 2224-5731(Paper) ISSN 2225-0972(Online)
Vol.16, No.2, 2026

Assessing the Relationship between Income, Out of Pocket Expenditure, Government Health Expenditure and Health Outcome Towards Policy making in Saudi Arabia

Yusuf Opeyemi Akinwale (Corresponding author)
College of Business Administration, Imam Abdulrahman Bin Faisal University
PO box 1982, Dammam, Saudi Arabia
E-mail: yoakinwale@iau.edu.sa

Abstract

The increasing nature of health expenditure and the under exploration of research on out-of-pocket (OOP) expenditure are becoming a great concern to healthcare policy makers and other stakeholders in the sector. This research investigates the association between income per capita, domestic government health expenditure, OOP expenditure and health outcome. The research utilises Johansen cointegration and vector error correction model (VECM) to analyse the study, and the outcomes confirm a long run relationship between the concerned variables and health outcome (life expectancy), and it also reveals a positively significant effect of income, government health expenditure and OOP on health outcome. Meanwhile, government health spending has a greater effect on health outcome than out-of-pocket expenditure. The results of the VECM reveal that income, government health expenditure and OOP expenditure predict life expectancy in the long- and short-run periods. This suggests that policy makers should improve health spending, and also create a good framework for health insurance that will capture individual health spending to decrease the economic burden associated with out-of-pocket health spending by the individuals.

Keywords: health outcome, vector error correction model, health expenditure, out-of-pocket expenditure, Saudi Arabia

DOI: 10.7176/PPAR/16-2-03
Publication date: April 30th 2026

1. Introduction

Healthcare has recently become a significant issue that calls for attention due to the various diseases and pandemics affecting the economic productivity of different countries (Akinwale and AboAlsamh, 2023). Health, as a multifaceted concept, is influenced by a myriad of elements, including income disparities, epidemiological, demographical, physiological and social considerations as well as the accessibility of healthcare services (Alghannam and Alharbi, 2026; Raeesi et al., 2018). Acknowledging healthcare as a strategic investment in human capital, countries allocate a substantial portion of their aggregate income to foster the well-being of their populations, anticipating positive repercussions on overall economic growth (Akinwale, 2022). Healthcare is one of the sustainable development goals which plays great emphasis on given everyone access to sound healthcare services with little or no exposure to financial difficulty (Rouf et al., 2025; Callender et al., 2019).

Many nations continuously invest in human capital to attain economic development and sustainable growth (Mhlanga, 2025; Balkhi et al., 2021). Healthy and energetic people are known to be more productive at whatever they do, and as a result, they contribute positively towards economic growth (Akinwale and Grobler, 2023). In recent decades, ever-increasing healthcare expenditure has become a global phenomenon; and the Gulf region, including Saudi Arabia, is not exempted from this trend (Akinwale, 2020). Factors such as the high cost of health technology, heightened health awareness, and lifestyle changes contribute to the rising healthcare costs, placing significant challenges on the healthcare systems (Hajjar et al., 2013). Rapid population growth, an increasing elderly population, and a rise in chronic, non-communicable diseases compound the demand for healthcare services. Government of most countries are overwhelmed by this demand for healthcare and the associated cost; hence, they now seek to improve the healthcare services available to people and at the same time decreasing the associated fiscal burden on the government. This leads to the witness of an increasing out-of-pocket (OOP) payment across the globe (Al-Hanawi and Njagi, 2022; Krůtilová et al., 2021). OOP health expenditure indicates the entire payments paid directly by an individual on medical and associated nonmedical costs including consultation fees, medicine, diagnosis, laboratory, radiology, admission and transportation to and from hospitals (Al-Hanawi, 2021). Few studies have shown that OOP costs have contributed positively to the improvement of

health outcomes. However, it is expected that a nation which is not economically stable (or low-income individuals) will most likely suffer slow economic growth (or bear a great economic and health burden) when health expenses are out-of-pocket (Balkhi et al., 2021).

Much literature has discussed health spending and health outcomes in various platforms and broad contexts. However, less devotion is given to the association between OOP, government health expenditure, and life expectancy as far as health is concerned (Liu & Zhong, 2022). Specifically, there is a dearth of study that examine the connection between out-of-pocket expenditure, government expenditure, income and health outcome in Saudi Arabia. This study seeks to explore the relationships among these important variables in Saudi Arabia. The remaining sections of this manuscript include section 2 which provides the literature of the study, section 3 and 4 discuss the methodology and results respectively, while section 5 concludes the study.

2. Literature Review

This section presents the past studies related to the linkage between income out-of-pocket expenditure, government health expenditure and health outcomes. In a study by Owumi and Eboh (2022) in Nigeria using data between 2000 and 2017, found that domestic general government expenditure and OOP expenditure positively impact life expectancy. Specifically, a 1% rise in the public spending on health resulted into 6% improvement in life expectancy, whereas a 1% growth in OOP health expenditure resulted into a greater improvement in life expectancy. The study also deduced that OOP health expenditure occupies a larger portion of country's health expenditure outlook. Meanwhile, Akintunde et al. (2024) found a positive and significant effect of financial inclusion on health outcome in both short- and long-term periods, but OOP expenditure has a positive but insignificant effect on health outcome in the long run. Sabra (2022) explored a disaggregated association between health spending, aggregate production, life expectancy, and mortality rate in certain middle-income MENA countries. The outcomes showed that public, private and external health spending significantly influence aggregate production with public health expenditure having a greater impact, and aggregate production also significantly influence health expenditures. Also, life expectancy has a positive association with health expenditures since the elderly needs more social, health and care for chronic diseases.

Anwar et al. (2023) assessed the nexus between government health spending and health outcomes among the OECD nations, and the outcomes showed that health spending negatively affect infant mortality but positively influence life expectancy. Also, income negatively influence mortality but positively impact life expectancy in the surveyed countries. Thus, the study advocates appropriate health strategies to raise capabilities in health technology and the proper utilization of health outlay among the studied countries. Another study by Roffia et al. (2023) among 36 OECD countries for the period 1999-2018 found that health care expenditure, OOP expenditure and GDP Significantly influence life expectancy. Swift (2011) also explored the nexus between life expectancy and GDP in 13 OECD nations for the period 1820–2001, and the result indicated that a unit increase in life expectancy led to 6-unit growth in GDP. Moreso, the results also indicate a substantial influence of aggregate output on life expectancy of most of the OECD countries surveyed. Also, Akinwale (2021) in his study using autoregressive distributed lag (ARDL) also confirmed the one-way movement from life expectancy and health expenditure to output growth in resource rich countries. The connection between life expectancy and GDP was also confirmed in another study among twenty-six European countries using data for the period between 1995 and 2014 (Blázquez-Fernández et al. 2018). The results indicate that income, in both absolute and per capita terms, has significant influence on the life expectancy of the European nations considered in their research. In other words, the outcome revealed that income inequality did not significantly affect health of the European countries.

In the study of Rahman et al. (2018) conducted on the region of South Asian (SAARC) and South East Asian (ASEAN) regarding expenses on health and health outcomes. The outcomes indicate that the government and private health spending decrease both mortality rates and increase life expectancy, whereas per capita income positively enhanced both of them. Meanwhile, the study further revealed that health spending directly by the people has a larger effect on health outcome than government spending. Dhrifi (2018) investigated government and private health spending on child mortality rate in both developed and developing nations using data between 1995 and 2012. The results from the 93 countries obtained revealed that health expense has a greater influence in decreasing child mortality rate for upper-middle- and high-income nations but it has no significant influence in low-income nations. Furthermore, public health expenses have larger impact on mortality rate than private health spending in lower developed nations, and vice versa for highly developed nations. Similarly, the results of Ray and Linden (2020) using a global dataset of 195 countries for the period 1995–2014 showed that government

health expenditure are largely more health-promoting than private ones. Raeesi et al. (2018) in their study carried out on 25 countries for 15 years based on their health care system, the outcome showed varying results. Though public health spending, private health spending and income per capita significantly impacted on life expectancy but the magnitude of the impacts are varied in accordance with the health care system of such country. The outcome of private health spending on life expectancy is higher than that of government health spending in nations with mixed health care system. The research concludes that a country should select the best mix of government and private health spending as each of them has different magnitude of impact on health outcomes in different health care system. Ayipe and Tanko (2023) in their study conducted among low-income Sub-Saharan African (SSA) countries found that every additional domestic health spending leads to 5.3 units fall in under5-mortality rate. In an earlier study (Arthur and Oaikhenan, 2017) among 40 SSA, the results revealed that health spending is significant but inelastic in influencing health outcomes, improving life expectancy and decreasing mortality rates. While government health spending is more significant in reducing mortality rates, private spending is more significant in boosting life expectancy. Moreso, there is a robust correlation between private and public health spendings in SSA though that of public dominates. This study suggests increase in public health expenditures in order to reduce a burden arising from out-of-pocket cost. Moreso, a policy should be made to lessening the burden of private health spending on people through effective health insurance schemes. Meanwhile, in the study of Rana et al. (2018) across 161 nations of diverse income levels for the period 1995-2014, the ARDL showed that the connection between health spending and health outcome is stronger in lower-income nations than their higher-income counterparts. Also, the increasing health expenditure seems to significantly decrease child mortality unlike the insignificant effect it has on maternal mortality across income levels.

However, there are few other studies which could not found any connection between health spending and health outcomes (WHO, 2019, Lippi et al., 2016; Filmer and Pritchett, 1999, Thomton, 2002). For instance, the result of Balkhi et al. (2021) in the MENA Region could not establish a positive effect of health spending on health outcomes as some nations have high spending but shorter life expectancy. Ranabhat et al. (2018) in their multi-country cross sectional research, the study showed a negative effect of OOP spending on life expectancy but a positive effect of government spending on life expectancy. This leaves the assertion as to the inconclusiveness of the effects of private and government health expenditure on health outcomes, and which one has a greater impact. In fact, differing outcomes have been documented for different countries across different levels of income. Furthermore, government and private health expenditure have exhibited certain peculiarities in various countries. Moreso, out of pocket expenditure is gradually increasing across countries with government curtailing its expenditure on health, and this has attracted less research as expected. This research intends to explore the nexus between government health expenditure, OOP expenditure, income and health outcomes in Saudi Arabia.

Much literature has discussed health spending and health outcomes in various platforms and broad contexts. However, less consideration has been given to the connection between OOP expenditure, government health expenditure, and life expectancy as far as health is concerned (Liu and Zhong, 2022). Specifically, there is a dearth of study that examine the connection between OOP expenditure, government expenditure, income and health outcome in Saudi Arabia. This research seeks to fill the research gap in Saudi Arabia by exploring the relationships among these important variables in Saudi Arabia.

3. Methodology

The data utilized in this study are yearly series running for the period 2000-2021 in Saudi Arabia, and this is obtained from world bank development indicator (WDI) platform. This comprises GDP per capita at current USD which is used to proxy income, government health expenditure per capita at current USD as proxy for government health expenditure, OOP expenditure at current USD as proxy for out-of-pocket expenditure, life expectancy at birth and mortality rate (per 1,000 live births) as proxy for mortality rate. Both life expectancy and mortality rate will be considered as health outcome. This study is based on the assertion that income, government health expenditure (GHE) and OOP expenditure are important determinant of health outcome. Taking the natural log into consideration, the general equations could be written thus:

$$lHO = f(lINCOME, lGHE, lOPE)$$

Where *lHO*= log of health outcome; which could be split into two viz, life expectancy at birth and mortality rate

lINCOME= log of income which represents GDP per capita

lGHE= log of government health expenditure

lOPE= log of out-of-pocket expenditure

Before going further to conduct any investigation, there is a need to test for stationarity of the data so as to determine their reliability for quantitative analysis. Augmented Dickey Fuller (ADF) test is used to assess the unit root so as to determine the order of integration of each of the variable. If all the variables are of the same order after first differencing, the study will adopt Johansen cointegration and vector error correction model (VECM) method (Engle and Granger, 1987). However, if the variables are of different order of integration, then the study will consider ARDL model (Akinwale et al., 2026). However, any variable that is of higher order will not be considered for analysis as the variable does not seem reliable at second order. Afterwards, the Johansen cointegration test could then be used to examine the association between income, OOP expenditure, domestic government expenditure, life expectancy and mortality rate. Trace and maximum eigenvalue tests are used to determine the existence and number of cointegrating equation(s). In addition to this, the VECM is used to reveal the direction of causality between each of the variable and the other ones, and that of the variables in this study are stated thus:

$$\sum_{i=1}^{p}[\alpha_{1i}\Delta lnLB_{t-i} + \beta_{1i}\Delta lnINC_{t-i} + \psi_{1i}\Delta lnGHE_{t-i} + \lambda_{1i}\Delta lnOPE_{t-i}] + \theta_1 ECM_{t-1} + \varepsilon_{1t} \quad eq.2$$

$$\sum_{i=1}^{p}[\alpha_{2i}\Delta lnLB_{t-i} + \beta_{2i}\Delta lnINC_{t-i} + \psi_{2i}\Delta lnGHE_{t-i} + \lambda_{2i}\Delta lnOPE_{t-i}] + \theta_2 ECM_{t-1} + \varepsilon_{2t} \quad eq.3$$

$$\sum_{i=1}^{p}[\alpha_{3i}\Delta lnLB_{t-i} + \beta_{3i}\Delta lnINC_{t-i} + \psi_{3i}\Delta lnGHE_{t-i} + \lambda_{3i}\Delta lnOPE_{t-i}] + \theta_3 ECM_{t-1} + \varepsilon_{3t} \quad eq.4$$

$$\sum_{i=1}^{p}[\alpha_{4i}\Delta lnLB_{t-i} + \beta_{4i}\Delta lnINC_{t-i} + \psi_{4i}\Delta lnGHE_{t-i} + \lambda_{4i}\Delta lnOPE_{t-i}] + \theta_4 ECM_{t-1} + \varepsilon_{4t} \quad eq.5$$

Equation 2 to 5 above represent the VECM model, and each equation has lagged regressors which are the determinants of the dependent variables which comprises the lag of the dependent variable and that of the other determinants (Johansen, 1991). This means that prior value of the dependent series contributes to determining the current value of same variable. The coefficients of the lagged regressors are α, β, ψ *and* λ, meanwhile the joint significance of each of these coefficients indicate short run causality from a particular determinant to the dependent variable. However, the significance of the coefficient μ of the error correction term determines the long run effect and the speed of adjustment to the long run equilibrium.

4. Results Analysis and Discussion

The outcomes of the unit root test (as shown in Table 1) reveal that income, government health expenditure, OOP and life expectancy have unit root test at level and became stationary after first difference. However, mortality rate has unit root in both level and after first differencing, making the variable unreliable to be used for analysis. Since the four variables are stationary after first differencing except mortality rate, then Johansen cointegration test could be conducted. This study therefore dropped mortality rate as it fails the ADF unit root test, and used only life expectancy as the health outcome.

Table 1: ADF test

Variables	Levels	First Difference
lnLEB	-2.4915	-3.4792**
lnGDP	-1.0332	-3.9602***
lnGHE	-0.4404	-4.4057***
lnOPE	-0.2799	-3.5372**
lnIM	1.9790	-0.9789

*Note: * indicates significant at 5% level*

The finding of the Johansen cointegration test is shown in Table 2. The Table 2 reveals that while both trace statistic and maximum eigenvalue rejected the null hypothesis of 'no cointegration' at 5%, but the two tests could not reject the hypothesis of 'at most one cointegrating equation' at 5% level of significant. This indicates the presence of long run association among income, government health expenditure, OOP spending and life expectancy in Saudi Arabia. Meanwhile, the long run equation shows that income, GHE and OOP expenditure have a positive and significant effect on health outcome with corresponding coefficient values of 0.045, 0.048 and 0.027.

Table 2: Cointegration Test

Hypothesized No of CE		**Test Statistics**				
Null	Alternative	Eigenvalue	Trace	0.05 Critical Value for Trace Stat	Max. eigenvalue	0.05 Critical Value for Max. eigenvalue Stat
R = 0	R > 0*	0.8932	67.6756*	47.8561	46.9847*	27.5843
R ≤ 1	R > 1	0.4477	20.6908	29.7970	12.4660	21.1316
R ≤ 2	R > 2	0.2550	8.22480	15.4947	6.18072	14.2646
R ≤ 3	R > 3	0.0928	2.04408	3.84146	2.04408	3.84146

*Note: * indicates significant at 5% level*

Since Johansen cointegration test has established that all the four variables are cointegrated and can move together, then VECM is conducted to examine the causal direction of the variables. The result of the long run as shown in Table 3 for equation 2 indicates that income, GHE and OOP expenditure Granger causes life expectancy. Similarly, the long run results as per equation 3 and 4 also revealed that the government health expenditure, OOP expenditure and life expectancy Granger causes income in equation 3. Moreso, income, OOP expenditure and life expectancy Granger causes government health expenditure in equation 4. However, there is no long run causality from any of the variables to out of pocket expenditure in equation 5.

Table 3: Granger Causality Test

	Long run	**Short run**
Causality	**Error correction term**	**Chi-square**
ΔLLEB equation	-0.7096*	
Δ lGDP		10.96*
Δ lGHE		12.35*
Δ lOPE		17.81*
ΔLGHE equation	-1.0344*	
Δ llEB		1.88
Δ lGDP		4.39
Δ lOPE		1.78
ΔLGDP equation	-18.9344*	
Δ llEB		10.96*
Δ lGHE		12.35*
Δ lOPE		1.17
ΔLOPE equation	-0.4661	
Δ llEB		0.16
Δ lGDP		0.14
Δ lGHE		0.74

*Note: * Significant at 5%*

Furthermore, Table 3 also shows the results of short run causality between the variables. The results reveal that income, GHE and OOP expenditure Granger causes life expectancy in the short run. Furthermore, GHE and life expectancy Granger causes income in the short run while there is no other causality from any of the other variables to either GHE and/ or OOP expenditure in the short run.

The results of the diagnostic test are presented in Table 4. The findings indicate that the residual of the model has no serial autocorrelation and no heteroskedasticity at 5% level of significance. This infers that the model is free from the problems of autocorrelation and heteroskedasticity. In addition to this, the result of the normality test also indicates that the residuals of the series are normally distributed. The implication of these three diagnostic tests is that the series are adequate and fit for the model.

Table 4: Diagnostic tests

Test	**Null**	**Values**	**P-values**
Auto Correlation LM Test	No serial correlation	15.4675	0.4907
Jarque-Bera (JB)	There is normality	3.7383	0.8799
Heteroscedasticity	No heteroscedasticity	182.85	0.4266

It has been documented that health and human capital are crucial to social, economic growth and development of a nation (López-Casasnovas et al., 2005). A country with a good healthcare system for her people will not only improve the consumption and production capabilities of her people in the short run, but also fosters sound education and high returns on investment and returns (Ray and Linden, 2020).

There is a long run connection among the variables as indicated from the Johansen cointegration result. A long run bidirectional causality between income, government health expenditure and life expectancy is established. However, there is a long run unidirectional causality from out-of-pocket expenditure to life expectancy at birth. This result reflects that each of income, government health expenditure and OOP expenditure granger causes life expectancy in the long run. This clearly shows the significant roles of each of these three variables on the health outcome in the long run (Awoyemi et al., 2023; Ray and Linden, 2020; Rahman et al., 2018). Also in the short run, the outcome reveals that each of income, government health expenditure and OOP expenditure granger

causes life expectancy at birth. Moreso, GHE and life expectancy Granger causes income in the short run. This further strengthens the assertion that income and government/ out of pocket spending contribute significantly to increase in longevity of life of people. Though both government spending on health and OOP expenditures have significant influence on the health outcome of the Saudi population, but government spending has higher effect than OOP spending. This result is in line with few other studies (Sabra, 2022; Ray and Linden, 2020; Novignon et al., 2012) but diverged from the outcome of Owumi and Eboh (2022). The outcome indicates that as income of Saudi citizens and residents increase, their life expectancy increases. Also, as government and individuals spend more on health, the health outcome of people tend to improve significantly. On the other hand, as life expectancy of people improves, this tends to increase their capacity to earn more income and at the same time increase both the government spending and out of pocket spending (Balkhi et al., 2021). This implies that as people live long, they will have more time to work and contribute to the country's wealth, which also requires more spending on healthcare from government and individual in order to maintain their health standard as they grow older. In addition to the causality from OOP cost to life expectancy, there is also a positive and significant effect of OOP cost on life expectancy. This outcome is in line with the studies of Grima et al. (2018) and Roffia et al. (2023), whereas other studies (Ranabhat et al., 2018; Moreno-Serra and Smith, 2014) established a negative effect of OOP expenditure on life expectancy. The negative influence by some studies could be as a result of the burden emanated from OOP payments which prevents access to health care and thereby affecting life expectancy. Meanwhile, the positive, significant influence and causality from OOP expenditure to life expectancy may be connected to the fact that Saudi Arabia is high income country, whereby large number of people are earning a relatively high income.

The managerial implication is that both the government and individuals are critical to the improvement of life expectancy of people in Saudi Arabia. While, government spending on health seems to have greater impact on health outcome, income and individual OOP spending are also crucial to improve the people's health outcome. The health care policy makers should ensure that government earmarks a reasonable share of her budget to healthcare and ensures that such is spent judiciously in a way that will significantly affect the low-income residents by given them access to quality and affordable healthcare service. Also, the policy makers should provide a wider coverage individuals through appropriate and efficient health insurance scheme. This scheme will encourage both individuals and the companies to gradually and consistently contributing certain amount on a regular basis, which will be utilised when there is an event of sickness by the individuals or worker of a company. This will reduce the amount of bullet out of pocket spending which ordinarily might be difficult to part with in case of no insurance.

5. Conclusion

Good health is no doubt an important metrics to human development index. Thus, the policy to drive good health outcome should be at the center of discussion in the economy. This research examines the association between income, health expenditure, OOP expenditure and health outcome in Saudi Arabia. The result of the Johansen cointegration test indicates a long run association between income, government health expenditure, out of pocket expenditure and health outcome. The outcomes of the study showed that health expenditure, OOP expenditure and income granger causes life expectancy in the long run. Also, a long run bidirectional relationship was found among the variables except out-of-pocket health spending which has a unidirectional causality to all the other variables. The results of the short run analysis showed that each of income, government health expenditure and OOP expenditure granger causes life expectancy. In addition to this, GHE and life expectancy Granger causes income in the short run.

This study shows that income per capital, GHE and OOP expenditure are all critical to the improvement of life expectancy at birth of Saudi citizens and residents both in the short run and long run. So, it is important for the government to increase health spending and appropriate it in the most effective way that is more beneficial for everyone especially the low-income earners. Also, a sound health policy which encourages individuals and companies' contribution towards life insurance should be formulated and implemented in order to reduce economic burden emanating from individuals' out of pocket spending.

The limitations of the study include the number of years considered for the dataset which was based on the number of years available from world bank development indicator. Also, life expectancy was used as the only variable for health outcome because the mortality rate series could not pass the unit root test. Future studies could also consider some other variables for health outcome.

References

Al-Hanawi, M. & Njagi, P. (2022), "Assessing the inequality in out-of-pocket health expenditure among the chronically and non-chronically ill in Saudi Arabia: a Blinder-Oaxaca decomposition analysis", *International Journal for Equity in Health*, 21, 192, 1-11

Alghannam, R. & Alharbi, A. (2026). Assessing the impact of government healthcare expenditure and life expectancyon economic growth in Saudi Arabia: an econometric time-series study (2000–2023). *Health Economics Review* (in press). https://doi.org/10.1186/s13561-026-00720-4

Al-Hanawi M. (2021), "Decomposition of inequalities in out-of-pocket health expenditure burden in Saudi Arabia,". *Soc Sci Med.*, 286,114322

Alwago, W. (2023), "The nexus between health expenditure, life expectancy and economic growth: ARDL model analysis for Kenya," *Regional Science Policy and Practice*, 15, 1064-1085

Akinwale, Y., Oladapo, I., Olaopa, O. & Gabbori, D. (2026), "Macroeconomic determinants of housing demand in Saudi Arabia: an autoregressive distributed lag approach", *International Journal of Housing Markets and Analysis*, 19 (2), 453-467.

Akintunde, T., Oladimeji, I. & Aribatise, A. (2024), "Effects of Financial Inclusion and out of Pockets Cost on Human Health (1990 - 2020)", *Studia Universitatis Babes-Bolyai, Oeconomica*, *69*(1), 21–36. https://doi.org/10.2478/subboec-2024-0002.

Akinwale, Y. & AboAlsamh, H. (2023), "Technology innovation and healthcare performance among healthcare organizations in Saudi Arabia: A structural equation model analysis", *Sustainability*, 15 (5), 3962

Akinwale, Y. & Grobler, W. (2023), "Research and technology innovation, food security and economic growth in Nigeria: Implications for agripreneurs and policymakers", *African Journal of Food, Agriculture, Nutrition and Development*, 23(4), 23220-23237

Akinwale, Y. (2022), "Towards understanding the triangular relationship between technology innovation, human capital and economic growth in South Africa", *International Journal of Learning and Change*, 14 (3), 258-272

Akinwale, Y. (2021), "Health expenditure, economic growth and life expectancy at birth in resource rich developing countries: A case of Nigeria and Saudi Arabia", *Journal of Economic Cooperation and Development*, 42(2), 14-36

Akinwale, Y. (2020), "Technology innovation and financial performance of MSMEs during Covid-19 lockdown in Dammam area of Saudi Arabia: A case of food and beverage sector", *International Journal of Technological Learning, Innovation and Development*, 12(2), 136-152

Anwar, A., Hyder, S., Mohamed Nor, N. & Younis, M. (2023), "Government health expenditures and health outcome nexus: a study on OECD countries", *Frontiers in Public Health* 11 11(23759), 1-7

Arthur, E. & Oaikhenan, H. (2017), "The Effects of Health Expenditure on Health Outcomes in Sub-Saharan Africa (SSA)", *African Development Review*, 29(3), 524–536

Awoyemi, B., Makanju, A., Mpapalika, J. & Ekpeyo, R. (2023), "A time series analysis of government expenditures and health outcomes in Nigeria", *Journal of Public Health in Africa*, 14 (1409), 1-6

Ayipe, F. and Tanko, M. (2023), "Public health expenditure and under-five mortality in low-income Sub-Saharan African countries," *Social Sciences and Humanities Open*, 8 (100570), 1-7

Balkhi, B., Alshayban, D., & Alotaibi, N. (2021), "Impact of healthcare expenditures on healthcare outcomes in the Middle East and North Africa (MENA) region: a Cross-Country comparison, 1995–2015," *Frontiers in Public Health*, *8*, 624962, 1-9. https://doi.org/10.3389/fpubh.2020.624962

Blázquez-Fernández, C., Cantarero-Prieto, D., & Pascual-Saez, M. (2018), "Does rising income inequality reduce life expectancy? New evidence for 26 European countries (1995–2014)", *Global Economic Review, 47*(4), 464–479.

Callander, E., Fox, H. & Lindsay, D. (2019), "Out-of-pocket healthcare expenditure in Australia: trends, inequalities and the impact on household living standards in a high-income country with a universal health care system", *Health Economics Review*, 9(1):1–8

Cremieux, P., Meillur, M., Quellette, P., Petit, P., Zelderm, M., & Potvin, K. (2005), "Public and private pharmaceutical spending as determinants of health outcomes in Canada", *Health Economics, 14,* 107–

116.

Dhrifi, A (2018), "Health-care expenditure, economic growth and infant mortality: evidence from developed and developing countries", *CEPAL Review*, 125, 69-91

Filmer, D. and Pritchett, L. (1999), "The impact of public spending on health: does money matter?", *Social Science and Medicine*, 49(10), 1309-1323

Grima, S., Spiteri, J. V., Jakovljevic, M., Camilleri, C., & Buttigieg, S. (2018), "High out-of-pocket health spending in countries with a Mediterranean connection," *Frontiers in Public Health, 6*(145), 1–11.

Hajjar, R., Atli, T., Al-Mandhari, Z., Oudrhiri, M., Balducci, L., & Silbermann, M. (2013), "Prevalence of aging population in the Middle East and its implications on cancer incidence and care", *Annals of Oncology*, *24*(7), 11-24. https://doi.org/10.1093/annonc/mdt268

Krůtilová, V., Bahnsen, L. & De Graeve, D. (2021), "The out-of-pocket burden of chronic diseases: the cases of Belgian, Czech and German older adults", *BMC Health Service Research*, 21(1):1–13.

Lippi, G., Mattiuzzi, C. & Cervellin, G. (2016), "No correlation between health care expenditure and mortality in the European Union", *European Journal of Internal Medicine*, 32 (13-14), 1-7.

Liu, H. & Zhong, K. (2022), "Relationship between health spending, life expectancy and renewable energy in China: A new evidence from the VECM approach," *Frontiers in public health*, *10*, 993546. https://doi.org/10.3389/fpubh.2022.993546

López-Casasnovas, G., Rivera, B., & Currais, L. (2005), "*Health and economic growth: Findings and policy implications"*, Cambridge: MIT Press.

Mhlanga, M. (2025), "The Relationship between Economic Growth and Life Expectancy in South Africa", *Applied health economics and health policy*, 1-20. Available at SSRN: https://ssrn.com/abstract=5454074 or http://dx.doi.org/10.2139/ssrn.5454074

Moreno-Serra, R., & Smith, P. (2014), "Broader health coverage is good for the nation's health: Evidence from country level panel data", *Journal of the Royal Statistical Society, 178*(1), 101–124.

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 Economics Review, 2*(1), 1–8

Owumi, B. and Eboh, A. (2022), "An assessment of the contribution of healthcare expenditure to life expectancy at birth in Nigeria", *Journal of Public Health: From Theory to Practice,* 30, 2113–2121. https://doi.org/10.1007/s10389-021-01546-6

Ray, D and Linden, M. (2020), "Health expenditure, longevity, and child mortality: dynamic panel data approach with global data", *International journal of economics and Management*, 20, 99-119

Raeesi, P., Harati-Khalilabad, T., Rezapour, A., Azari, S., & Javan-Noughabi, J. (2018), "Effects of private and public health expenditure on health outcomes among countries with different health care systems: 2000 and 2014", *Medical Journal of The Islamic Republic of Iran*, *32*(1), 205-209. https://doi.org/10.14196/mjiri.32.35

Rahman, M., Khanam, R. and Rahman, M. (2018), "Health care expenditure and health outcome nexus: new evidence from the SAARC-ASEAN region", *Globalisation and Health*, 14(113), 1-11

Rana, R., Alam, K. & Gow, J. (2018), "Health expenditure, child and maternal mortality nexus: a comparative global analysis", *BMC International Health and Human Rights,* 18(29), 1-15

Ranabhat, C. L., Atkinson, J., Park, M. B., Kim, C. B., & Jakovljevic, M. (2018), "The influence of universal health coverage on life expectancy at birth (LEAB) and healthy life expectancy (HALE): A multi-country cross-sectional study", *Frontiers in Pharmacology, 9*, 960.

Roffia, P, Bucciol, A. & Hashlamoun, S. (2023), "Determinants of life expectancy at birth: a longitudinal study on OECD countries", *International Journal of Health Economics and Management*, 23(2), 198-212

Rouf, A., Sadaf, T., Rana, N. & Raza, W. (2025) "Impact of Health Expenditures on Economic Growth: Evidence from South Asian Countries", *Journal of Economic Impact*, 7(2), 154–166. doi: 10.52223/econimpact.2025.7207.

Sabra, M. (2022), "Health expenditure, life expectancy, fertility rate, CO2 emissions and economic growth: Do public, private and external health expenditure matter?", *Theoretical and Applied Economics,* 29 (3), 89-

102

Swift, R. (2011), "The relationship between health and GDP in OECD countries in the very long run", *Health Economics, 20*(3), 306–322

Thomton, J. (2002), "Estimating health production for the US: some new evidence", *Applied Economics*, 34, 59-62.

WHO (2019), "Countries are Spending More on Health, But People are Still Paying Too Much Out of Their Own Pockets", Available online at: https://www.who.int/news/item/20-02-2019-countries-are-spending-more-on-health-but-people-arestill-paying-too-much-out-of-their-own-pockets.