THE IMPACT OF HEALTH STATUS ON ECONOMIC GROWTH IN SRI LANKA

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Abstract

Health can be considered as a factor of economic growth. In Sri Lanka, the government is primarily responsible for health care. As a result, residents in Sri Lanka have access to free health care. The aim of this study is to examine how health stats impacts on economic growth in Sri Lanka. As health indicators, the study used government health spending as a percentage of GDP, life expectancy from birth (years), and mortality rate (per 1,000 live births). As a proxy for economic growth, the Gross Domestic Product per capita has been used. All the selected variables' data are available from 1960 in Sri Lanka. Therefore, the data was gathered over the period from 1960 to 2019.To determine the impact of independent factors on economic growth in Sri Lanka, this study used the Augmented Dickey Fuller (ADF) unit root test method, the Akaike Information Criterion (AIC), and multiple regression analysis. To study the causation between variables, the Granger Causality approach was applied. According to the study results, multiple regression analysis reveals that trade openness has a favorable impact on economic growth in Sri Lanka, whereas mortality rate has a negative impact. Granger causality studies revealed that GDP and health expenditure had a bidirectional causal relationship. Life expectancy and GDP, mortality rate and GDP, health expenditure and trade, health spending and life expectancy, health expenditure and mortality, life expectancy and trade, and life expectancy and mortality all have a unidirectional relationship.

Keywords: Economic Growth, Health Expenditure, Life Expectancy, Sri Lanka

INTRODUCTION

The relationship between health and economic growth

Human capital is a remarkable and inseparable linked component of economic growth. It includes several components such as spending on education, health, and training. The effect of human capital variables implies that the investment rate tends to increase as levels of education and health rise (Lopez, Rivera, & Currais, 2005). Until the second half of the 1990s, human capital was primarily associated with schooling. Raghupathi & Raghupathi (2020) have mentioned in their study that in the long run, the existence of a healthy population may be more significant than schooling for human capital. The report of the IBRD mission in 1951 on the economic development of Sri Lanka identifies the importance of the health status on the economic growth as;

"In the calculation of a country's resources for economic development, health is a primary factor…Economic improvement will be illusory if the health of the people is not improved… Although death rates remain obvious that there is a great deal of sickness in Ceylon and that the country continues to suffer a grave loss from consequent improvement of productivity."

The health indicator has been incorporated into a number of economic models. Traditional growth models are an example of such a model. According to health economics theories, health is a determinant of economic growth. Also, according to the literature, health has a direct and indirect impact on economic growth. The direct one is linked to the idea that better health status leads to increased production (Carla et. al., 2013). It indicates that a population that is more educated and healthier is more productive and contributes to a national income that is shared among a less disadvantaged population. Meanwhile, the indirect one suggests that better health status reduces the human capital depreciation, increases life expectancy, and so enhances economic growth by generating more investments (both in physical capital and education) (Carla et. al., 2013).

At the beginning of the 20th century, the average global life expectancy at birth was significantly below 40 years (Bloom et. al., 2018). In Japan, a child born today has an 82 years life expectancy; in Sierra Leone, the average life expectancy at birth is around 34 years (World Development Indicators, 2010). Under the Millennium Development Goals, there are three goals related to health. Those are reduced child mortality, improved maternal health, and combating HIV/AIDS, malaria and other diseases. Therefore, the importance of health as a key aspect of development and economic wellbeing of individuals and nations is increasingly being recognized in the world.

Some countries such as United States (16.88%) spend more than 15% of their GDP on healthcare, while some countries such as Bangladesh (2.34%), Indonesia (2.87%) spend less than 3%. In the case of Sri Lanka, health care spending in 2020 accounts 3.75% of the its GDP (world Bank Development Indicators). There are at least two techniques for explaining the link between healthcare spending and economic performance in a country. Healthcare spending is viewed as an investment in human capital in the first scenario. The buildup of human capital is then seen as a source of economic progress (e.g., via increased productivity). As a result, a rise in healthcare spending is likely to be linked to an increase in GDP. In the second scenario, a rise in healthcare spending can lead to more frequent health intervention (e.g., annual medical exams, preventive screenings, and so on), which are likely to improve labor and productivity, and thus GDP.

Raghupathi and Raghupath (2020) have mentioned in their study that there is an iterative relationship between economic growth and health status; high economic growth leads to investments in human capital and health progress, while good population health leads to increased labor productivity and economic growth. Many studies have demonstrated that improving one's health has a positive impact on GDP per capita as a measure of economic growth and development because by increasing output. (Tekabe, 2012)

Raghupathi & Raghupathi (2020) have mentioned based on another study that looked at the impact of health status on economic growth in developing nations that a fall in birth rates positively impacted on economic growth. The study showed that health and income mutually impacted each other and concluded that problems affecting health care delivery caused a negative impact on economic growth. This study has proposed that an annual improvement of life expectancy increases economic growth by 4%. Further, Boachie (2015) reported based on another study that examined the impact on economic growth developed and developing countries from 1965 to 1990 that economic performance in developing countries increased significantly as a result of improvement of health indicators such as increased life expectancy and lower child mortality, have also been linked to a country's economic performance. A bi-directional association between health and growth or development was also discovered in that study. However, half of the divergence in economic growth between developing and developed countries is attributed to illness and poor life expectancy (Piabuo&Tieguhong, 2017).

The "Preston curve" was developed by Samuel H. Preston in 1975 to describe the relationship between health and economic growth. The Preston curve depicts a cross-sectional empirical relationship between life expectancy and real per capita income. It also reveals that nations with greater health status have higher income, while

countries with worse health status have lower income. The Preston curve is shown in Figure 1 for regions where statistics on life expectancy at birth (vertical axis) and per capita GDP in 2018 US dollars are available (horizontal axis).

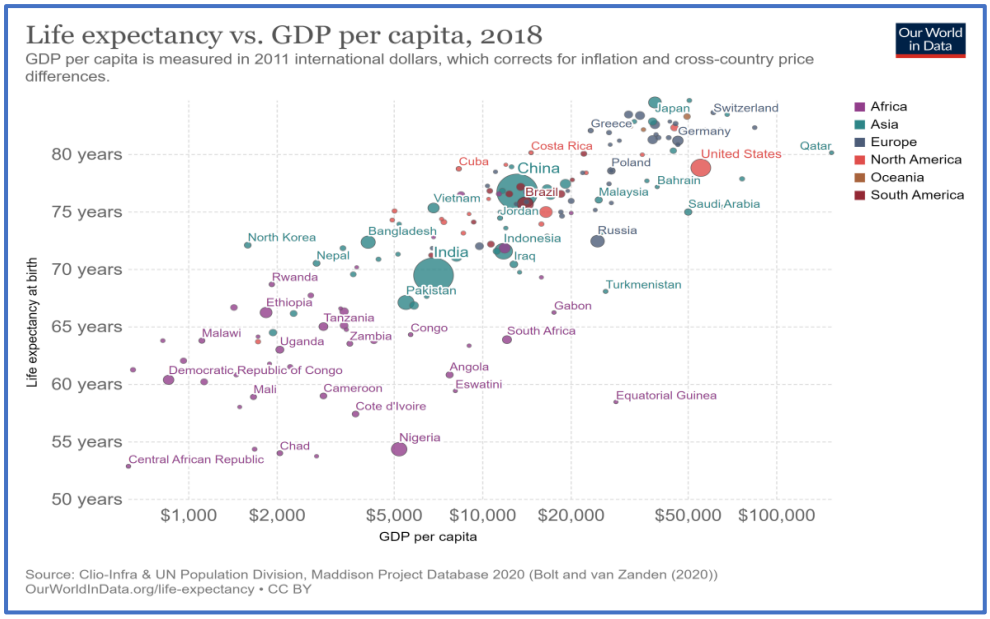

Figure 01: Life expectancy vs GDP per Capita of Countries in 2018
Source: Clio-Infra & UN Population Division, Maddison project Database 2020

Poverty is exacerbated by poor health. People become destitute as a result of serious disease because they drop out of the labor market. As a result, in order for a country to develop, its population's health must improve. When compared to countries in other regions, African countries' life expectancy is low due to their low nominal per capita GDP, as shown in the graph above.

Health sector in Sri Lanka

In Sri Lanka, health care is provided by the government, the private sector, and the non-profit sector to a limited extent. The Sri Lankan health system is made up of various medical systems. Traditional, Western, Ayurvedic, Unani, Sidha, Homeopathy, and Acupuncture are among examples. All Sri Lankans have free access to public-sector health care. Addressing the epidemiological shift primarily driven by

demographic and socioeconomic factors, the role of the state and the nature of its evolving partnership with the private sector, human capital constraints, improving access to specialized care, and promoting appropriate, affordable health insurance

across all segments of society are among the key issues facing healthcare providers in Sri Lanka (The health sector in Sri Lanka- Embassy of the Kingdom of the Netherlands, 2014). In Sri Lanka, healthcare spending has an impact on per capita income. The trend of those two variables is depicted in the graph below.

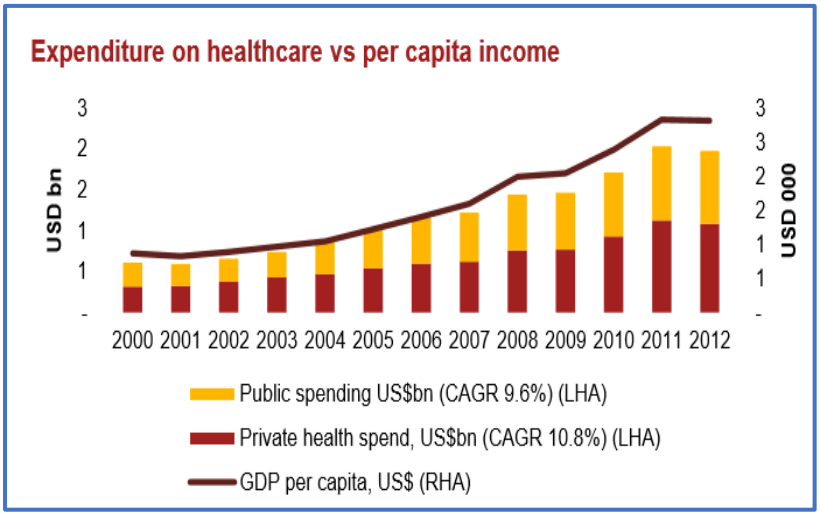

Figure 02: Expenditure on Healthcare vs Per Capita Income
Source: The Health Sector of Sri Lanka Report, 2014

LITRATURE REVIEW

Maitra and Mukhopadhyay (2012) investigated the effectiveness of public investment on education and health care in raising GDP in the Asia-Pacific area. The data used in this study over the years 1981 to 2011. Different results were discovered for different countries using time series data analysis approaches such as unit-root tests (ADF tests), co-integration, and estimation of error correction models, unconstrained vector autoregressive models, and variance decomposition analysis. The co-integrating relationship between GDP, education, and health-care spending was validated for Bangladesh, Kiribati, Malaysia, Maldives, the Philippines, and the Republic of Korea. Therefore, the vector error correction (VEC) model was used to investigate the impact of education and health-care spending on GDP. The impact of health-care spending on GDP growth in Fiji has been determined to be statistically insignificant. Both education and health-care spending are important contributors to GDP growth in Nepal. The findings in Nepal regarding education and health-care spending on GDP are similar to those in the case of Sri Lanka.In the presence of lagged GDP in the VAR equation, statistically significant estimates of (lagged) education and health-care spending imply that both education and health-care spending Granger affect GDP growth in Singapore throughout the research period. Estimates of health-care spending at lags 1 and 5 show a strong beneficial impact on

GDP growth in Sri Lanka. In conclusion, health-care spending in Sri Lanka contributes to GDP growth over both short and long time horizons. Tonga's GDP growth was shown to be statistically negligible as a result of health-care spending. Furthermore, in Vanuatu's economy, two-period delayed education spending aided GDP growth, whereas one-period lagged health-care spending slowed GDP growth.

Weil (2014) examined the relationship between health and economic growth in countries. According to the study results, income and health are strongly correlated. When looking at the statistics of several countries, it showed that higher income per capita is correlated not only with life expectancy. It was also linked to a number of other factors. Further, this study found a strong correlation between an individual's place in the economic distribution and his or her health outcomes within a country. In underdeveloped countries, this within-country link is very high. There is a limited correlation between changes in income and changes in life expectancy in the short run.

Fernandez, et al. (2013) wanted to investigate the direct and indirect effects of health on economic growth via route results in infant mortality rates. This research was carried out in the Spanish areas. The results of an econometric panel data analysis in two steps, namely linear panel data model analysis and structural system analysis, to focus on the different channels through which economic growth occurred from 1980 to 2007 suggested that a higher risk of death is associated with higher levels of fertility and lower investment in physical and human capital, and that more health investments and better health status are essential for economic growth.

Raghupathi & Raghupathi (2020) examined the relationship between public health spending and economic performance in the United States. The data for economic performance and health indicators was gathered from the Bureau of Economic Analysis and the Bureau of Labor Statistics between 2003 and 2014. The results strongly suggested a positive correlation between healthcare expenditure and the economic indicators of income, GDP, and labor productivity in the United States, using the business intelligence tool Tableau for visualization, the R programming language for regression analysis, and SPSS Modeler for neural network analysis. Furthermore, personal healthcare spending has a negative impact on time spent shopping for products and services. Healthcare spending is inversely related to multi-factor productivity, it is positively related to labor productivity, personal spending, and GDP indicators. According to the findings, a rise in healthcare spending has a beneficial impact on economic performance.

In five low-income African nations south of the Sahara, Tekabe (2012) investigated the causal link between health and real GDP per capita income in low-income African

nations south of the Sahara; Ethiopia, Kenya, Rwanda, Tanzania, and Uganda.The mortality rate has a considerable and negative impact on real per capita income, according to an unbalanced panel data set from 1970 to 2009. The Granger causality test revealed a causal or bidirectional association between real GDP per capita and mortality rate.

On the other hand,real GDP per capita does not cause life expectancy; rather, life expectancy causes real GDP per capita. A comparative descriptive analysis of health indicators in different income categories around the world also revealed that countries with higher incomes have better health.

López-Casanovas, et al. (2005) aims to investigate the mechanisms through which a population's health status influences a country's economic performance in terms of economic growth and social development. According to the findings, micro and macro interventions aimed at improving health, growth, and poverty reduction are necessary to combat poorness. Boachie, M. K. (2015) aimed to see if improvements in health could help explain Ghana's economic growth. The data for this study was taken from the World Development Indicators (WDI) from 1982 to 2012. Real per capita GDP has taken the place of life expectancy at birth as a proxy for health and economic growth. Using the ARDL bounds test approach to co-integration, and controlling for the impacts of education, international trade, FDI, inflation, and physical capital accumulation, researchers found that health is a substantial driver of economic growth in both the short and long run. Improvements in health, physical capital accumulation, international commerce, and education were also found to have a substantial impact on Ghana's long-term economic growth during the research period.

Piabuo and Tieguhong (2017) conducted a comparative analysis on the impact of health expenditure between countries in the CEMACsub region and five other African countries that achieved the Abuja Declaration. The data for this study was taken from the World Development Indicators (2016) database. As an econometric technique of analysis, the panel ordinary least square (OLS), fully modified ordinary least square (FMOLS), and dynamic ordinary least square (DOLS) were used in this study. According to the study results, health spending has a positive and significant effect on economic growth in both samples. For the five additional African nations that meet the Abuja objective and for CEMAC countries, a unit change in health expenditure can possibly boost GDP per capita by 0.38 and 0.3 units, respectively, a substantial difference of 0.08 units between the two samples.

Raza, et al. (2013) investigated the issues of the health sector in Pakistan and found the strong link between health and economic growth. Health spending, fertility rates,

life expectancy, and infant mortality rates have all been used as the health indicators. The impact of health status on economic growth in Pakistan from 1980 to 2012 was investigated using the Ordinary Least Square (OLS) and Granger Causality tests. According to the findings of this study, life expectancy, fertility rate, and health-care investment all have a considerable impact on per capita GDP. Health spending has a positive impact on economic growth, whereas infant mortality rates and population per bed have a negative link with economic growth.

Since many studies have been conducted by researchers on the relationship between health status and economic growth, in Sri Lankan context there have been only few studies. Therefore, this study is going to fill up that research gap.

METHODS

Data Sources and variables

Many variables can be used to examine the impact of health status on economic growth. In this study, health spending, mortality rate, and life expectancy were used as health indicators, with trade openness serving as a control variable. The data sources are shown in the table below.

Table 01: Variables and the Data Sources

Variables	Measurement scale	Sources
GDP per capita	Annual Growth Rate (%)	Central Bank Report, 2019
Health Expenditure	As a % of GDP	Central Bank Report, 2019/2020
Trade Openness	As a % of GDP	World Development Indicators, 2020
Life Expectancy	From Birth (Years)	World Development Indicators, 2020
Mortality Rate	Per 1,000 Live Births	World Development Indicators, 2020

Source: Compiled by the author

GDP per capita is used as a proxy for economic growth, which is the study's dependent variable. The explanatory variables were health spending, trade openness, mortality rate, and life expectancy. All the selected variables' data are available from 1960 in Sri Lanka. Therefore, the annual time series data from 1960 to 2019 were used in this study. Except for health expenditure and trade openness, all variables are changed to natural logarithmic form.

Econometric Methodology

The study used the Augmented Dickey Fuller (ADF) unit root test method to assess the order of integration of variables and the Akaike Information Criterion (AIC) was used to identify the ideal lag length of each series. In addition, to determine the impact of health on economic growth in Sri Lanka, this study used multiple regression analysis and the Granger Causality test.

Multiple Regression

The impact of health status on economic growth in Sri Lanka was calculated using the equation below.

$$l_{gdp} = \beta_0 + \beta_1 trade + \beta_2 he + \beta_3 l_{morr} + \beta_4 l_{lifee} + \varepsilon$$

l_{gdp} = Gross Domestic Product Per Capita

$trade$ = Trade Openness

he = Government health expenditure as a % of GDP

l_{morr}= Mortality rate (per 1,000 live births)

l_{lifee}= Life expectancy from birth (years)

ε= Error term

Granger Causality

Granger Causality is a time series method for determining the causality between two variables. Clive Granger developed the Granger Causality notion in 1969. In research, this method is extensively used. The following model is used in this study to examine the causation link.

$$Y_i = \sum_{i=1}^{k} a_i \; x(t-i) \sum_{i=1}^{n} \beta_i \, y(t-i) + \delta(t)$$

$$X_i = \sum_{i=1}^{k} y_i \; x(t-i) \sum_{i=1}^{n} \rho_i \, y(t-i) + \epsilon(t)$$

Where δt and ϵt are two white noise series and kis the maximum number of lags.

In Granger Causality, there will be several kinds of casualties. Such as,

01. Neither variable granger causes other (X or Y)
02. Unidirectional causality from X to Y but not vice versa
03. Unidirectional causality from Y to X but not vice versa
04. Both variables cause each other

RESULTS & DISCUSSION

Results of Unit Root Test

The table 02 illustrates that all variables are stationary at the first difference, which is the first step in time series analysis. As a result, we reject the unit root null hypothesis at first difference.

Table 02: Results of ADF test

Variables	Intercept	Intercept and Trend	None
L_gdp	-7.645288	-7.744748	-3.566828
	(0.0000)	(0.0000)	(0.0006)
trade	-6.648122	-6.660065	-6.708591
	(0.0000)	(0.0000)	(0.0000)
he	-8.142077	-8.154715	-8.181347
	(0.0000)	(0.0000)	(0.0000)
L_morr	-8.284784	-8.367681	-1.486064
	(0.0000)	(0.0000)	(0.1272)
L_lifee	-1.908005	-2.007085	-1.443868
	(0.3263)	(0.5840)	(0.1373)

Note: (Parenthesis shows probabilistic values)
Source: Compiled by the authors

Results of Lag Selection

Akaike Information Criteria (AIC) suggested the use lag length as 4 to analyze the causality relationship.

Table 03: Lag Length Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1013.388	NA	8.33e+09	37.03228	37.21476	37.10285
1	-584.7097	763.8262	3526.471	22.35308	23.44799*	22.77649
2	-546.4563	61.20538	2228.490	21.87114	23.87847	22.64739
3	-511.8074	49.13854	1664.670	21.52027	24.44002	22.64936
4	-464.6537	58.29903*	836.2921*	20.71468*	24.54686	22.19662*
5	-441.0072	24.93639	1078.153	20.76390	25.50850	22.59867

Source: Compiled by the authors

Results of Multiple Regression

The multiple regression analysis reveals that trade openness and economic growth in Sri Lanka have a significance and negative relationship. Furthermore, in Sri Lanka, the mortality rate has a negative and significant relationship with economic growth. There is no significant relationship between health expenditure and economic growth.

Table 04: Results of Multiple Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TRADE	-0.011719	0.002417	-4.849228	0.0000
HE	0.043895	0.037438	1.172478	0.2461
LMORR	-1.132014	0.131310	-8.620920	0.0000
LLIFEE	3.331238	1.314224	2.534756	0.0141
C	-3.605861	5.916357	-0.609473	0.5447

Source: Compiled by the authors

Results of Granger Causality Test

The table 05 shows that GDP and health-care spending have a bidirectional causal relationship. Life expectancy and GDP, mortality rate and GDP, health expenditure and trade, health expenditure and life expectancy, health spending and mortality, life expectancy and trade, and life expectancy and mortality, all have a unidirectional link.

Table 05: Granger Causality Test

Null Hypothesis	Obs	F-Statistic	Prob.	Direction of Causality Relationship
HE does not Granger Cause L_GDP	56	4.49329	0.0065	Health expenditure
L_GDP does not Granger Cause HE		2.27833	0.0869	→GDP GDP per capita →Health expenditure
TRADE does not Granger Cause L_GDP	56	1.85444	0.1476	No relationship
L_GDP does not Granger Cause TRADE		1.05967	0.3955	
L_LIFEE does not Granger Cause L_GDP	56	2.96516	0.0375	Life expectancy→ GDP
L_GDP does not Granger Cause L_LIFEE		0.97296	0.4385	
L_MOR does not Granger Cause L_GDP	56	1.14778	0.3555	Mortality rate →GDP
L_GDP does not Granger Cause L_MOR		3.74265	0.0151	
TRADE does not Granger Cause HE	56	1.13507	0.3611	Health expenditure →Trade
HE does not Granger Cause TRADE		2.25370	0.0896	
L_LIFEE does not Granger Cause HE	56	7.23133	0.0004	Life expectancy →Health expenditure
HE does not Granger Cause L_LIFEE		1.39834	0.2611	
L_MOR does not Granger Cause HE	56	1.00929	0.4200	Health expenditure →Mortality rate
HE does not Granger Cause L_MOR		6.45351	0.0009	
L_LIFEE does not Granger Cause TRADE	56	2.95723	0.0379	Life expectancy →Trade
TRADE does not Granger Cause L_LIFEE		0.50453	0.7327	

L_MOR does not Granger Cause TRADE	56	0.79906	0.5364	No relationship
TRADE does not Granger Cause L_MOR		0.42799	0.7871	
L_MOR does not Granger Cause L_LIFEE	56	1.22587	0.3232	Life expectancy →Mortality rate
L_LIFEE does not Granger Cause L_MOR		2.38997	0.0757	

Source: Compiled by the authors

Results of Graphical Relationship between GDP per capita and Health Expenditure

The graph below shows the relationship between health care spending as a percentage of GDP and GDP per capita. It has a positive relationship but it is not a strong relationship because the coefficient of determination is 37 percent.

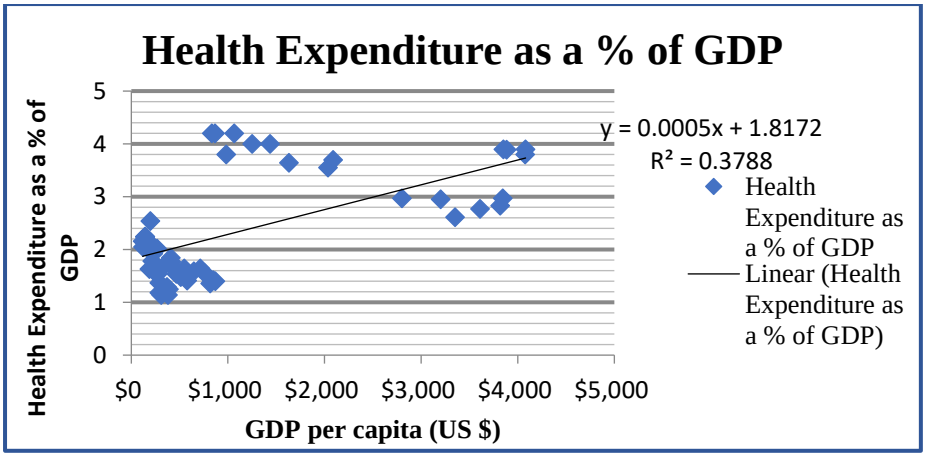

Figure 06: Health Expenditure as a % of GDP
Source: Compiled by the authors

CONCLUSION

Many studies in the literature concluded that health capital may lead to positive effects on economic growth. Hence, the main objective of this study is to investigate the impact of health on economic growth in Sri Lanka. To achieve the objective, granger causality method has been used by using time series data over the period from 1960 – 2019.

In general, healthy people can work hard and due to that, they can learn more in school. And also people live longer when their health increases. Therefore, we can

expect that better health can cause economic growth. And also, in other aspects, higher income allows individuals or governments to better health. According to multiple regression analysis it shows that there is a positive and significant relationship between economic growth and trade openness and there is a negative and significant relationship between economic growth and mortality rate. The granger causality result shows that health expenditure and GDP per capita has a bi-directional causality relationship. But, the relationship is not that much stronger. It shows that life expectancy and mortality rate has a unidirectional causality relationship with GDP per capita.

The policy implications of this study are that by increasing the health facilities like health expenditure, life expectancy of people can increase the GDP per capita. The impact of education and health-care spending on GDP is not uniform. In the case of 9 of the 12 countries, education spending has been found to exert a positive impact on GDP. These countries are Bangladesh, Fiji, Kiribati, Maldives, Nepal, Singapore, Sri Lanka, Tonga and Vanuatu. In Bangladesh, Nepal, the Philippines, Singapore and Sri Lanka the impact of health-care spending on GDP was found to be positive and significant. (Maitra and Mukhopadhyay, 2012).Therefore, the health sector in Sri Lanka should improve. Government should increase the health expenditure as a % of GDP.

As policy implications, need to increase health investments to improve health conditions. For that, public health programs, construction of new health facilities, training of healthcare personnel, and improved medical supplies in hospitals will help achieve this goal. And also, by increasing taxes on products such as cigarettes and other products can increase the health as well. Policy makers implement appropriate macroeconomic level policies targeted at public health expenditure and economic development.

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