Annals of Social Sciences and Perspective

ISSN (Print): 2707-7063, ISSN (Online): 2788-8797
Volume 4, Number 1, January - June 2023, Pages 15-29
Journal homepage: http://assap.wum.edu.pk/index.php/ojs

A Step toward Sustainable Health: The Influence of Health Indicators, Paramedical Workers, and Health Expenditure on Economic Growth in Emerging Economies

Saeed ur Rahman [1*], Zia Ur Rahman [2], Maryam Ibrahim [3]

[1] Assistant Professor, Department of Economics, Ghazi University Dera Ghazi Khan
[2] Visiting Lecturer, Department of Economics, Ghazi University Dera Ghazi Khan. zia4939@gmail.com
[3] MPhil. Scholar, Department of Economics, Ghazi University Dera Ghazi. maryamibrahim12321@gmail.com
*Corresponding author's email address: srehman@gudgk.edu.pk

ARTICLE DETAILS

History:

Received: December 12, 2022
Accepted: December 30, 2022

Keywords:

Life Expectancy
Mortality Rate
Registered Doctors
Lady Health Visitor
Impulse Response Function

DOI:

10.52700/assap.v4i1.218

ABSTRACT

Worldwide, nations spend much of their budget on health to develop human capital, labor productivity, and growth. In developed countries, life expectancy, natural birth, and numbers of health care centers are high, and the availability of doctors and the paramedical staff-to-patient ratio are also very high. Therefore, emerging economies are also trying to allocate more finance to their health sector. To achieve the objective, data were collected (1961 to 2019) and analyzed with the assistance of modern econometric techniques. The study finds that health indicators, paramedical staff, and public health expenditures are significantly playing their role in influencing economic growth. It is seen that a one percent increase in health expenditures, number of hospitals, health indicators, and paramedical persons, growth rate influenced by 0.006, 0.0053, 1.0521, and 0.0003%, respectively. Moreover, the diagnostic test shows that the model's parameters are credible, stable, and reliable in the current form. Furthermore, if the health expenses are employed in the health care facilities and the establishment of new health centers, it will positively contribute to the growth process. The study also suggests that hospital management should be in the hands of management personnel, not doctors because a doctor may be good at diagnosing but in management control, they have no capacity.

1. Introduction

Developed countries are dedicating their share of their budget to the health sector to facilitate their people and avoid any chronic and unseen epidemic diseases. A well-established and modern health sector plays a fundamental role in the country's prosperity through labor productivity and efficiency (Adoesum & Faboya, 2020). It found that good health, development, and economic productivity are interconnected (Jha & Chowdhury, 2020; Adoesum and Faboya, 2020; Sharma, 2018). Sustainable growth promotes good health conditions, enables healthy persons in the population, permits the population to get healthy

food, and better procurements facilities besides advanced medical technology (Kurt, 2015). It observed that healthy labor is physically and mentally stronger than an unhealthy person. Better health increases life expectancy, so people invest more in education and also increase their savings. Thus, better people's health contributes to investments and human capital development (S. Kurt, 2015).

Jha and Chowdhury (2020) stress that affordable and accessible health facilities are indispensable for all groups of people, inclusive growth and development. They further elaborate that the disease burden is unpredictable and uncertain and can significantly impact the poor and deprived. However, Pakistan is facing many challenges in providing health sector facilities. According to WHO (2019), Pakistan's quality and health facilities are below the standard because it stands at 122 in a survey in which 190 countries participate. In addition, about 50% of countries from developing nations conveyed a lack of health and low life expectancy. However, according to the WHO (2020), developed countries enthusiasm a significant share of their total earnings to facilitate the health sector because healthy persons are crucial to achieving economic growth and promoting economic activities.

The World Health Organization sets a benchmark health expenditure, which is about 6% of the total GDP, but unfortunately, in Pakistan, the health sector is financed with very little money. It informed that in 2011-12 health expenditures as a percentage of GDP were 0.27, and in 2012-13. it was 0.56%, 0.69% in 2013-14, 0.72 in 2014-15, in the year 2015-16 it was 0.76, 1.0 in the year 2017-18 it was 1.2 %, and reduced in the year 2018-19 (Economic Survey, 2019-20). Moreover, per capita health expenditure in Pakistan is about 36$, which is very low to the benchmark set by WHO, i.e., 86$. The most crucial point to note in the scenario of Pakistan is that due to political interference and superfluous transfers, a lion-share of the budget devoted to the district-level health facility centers persists unexpended. However, the administration's regularity can check, and they are challenging to find more capital. While having a lot of money paid out is a big question (Badar, 2017). The funds should give to primary healthcare instead of recommencing the organization. The emerging countries mainly focused on labor-intensive techniques in production due to the large availability of labor (Badar, 2017).

On the contrary, the capital stock is already below the requirement. If developing economies do not focus on providing health facilities to their masses, it creates a gap between active and ill labor, which reduces productivity and overall growth in developing countries. As seen in this COVID-19 outbreak, the health of individuals and health expenditures are essential for emerging economies.

From the perspective of previous literature, it found that from the standpoint of health, very few studies are conducted, and they utilize different variables with old data sets. Still, this study employed a variety of variables that are missing in the literature in a single study. This work investigates the association of health pointers, paramedical personnel, health spending, and the number of hospitals with the growth rate scenario. In addition, if the government increases the health expenditures in paramedical persons and the number of hospitals, what will be the response to the growth rate? What will be the life expectancy, infant mortality, and natural birth rate if health-related facilities are readily available? Because COVID-19 lowers the life span, the world sees the disasters of ill health. This epidemic disease entirely affects the world and reduces productivity to a lower level. So, there is a need to give much more attention to the health sector because productivity and growth rate indirectly depend on its labor health. If labor is insecure in the workplace, there will be no economic activity, and the growth rate will be zero. Moreover, this study elaborates on the dynamic influence of health expenditures, hospitals, and all other variables on the growth rate, which assists in capturing the fluctuating response of the growth rate if some variables fluctuate. The

remaining paper comprises a literature review, theoretical framework, results and discussions, and a conclusion with suitable suggestions.

2. Literature Review

Numerous research employed different factors, reducing the labor's health and productivity. From 1970 to 1980, Britain dedicated one-third budget to uplifting the health segment, food and nutrition, and health care centers to provide health facilities to their public for active participation in production (Fogel, 1994). Because it noted that if per capita income is low, the person demands insufficient medical attention (Preston, 1975). Therefore, an increase in the per capita will enhance health awareness, and people will spend on health or adopts a healthy lifestyle. So, if the growth rate increases, countries pay more attention or devote their budget to the different sectors of the economy in which health is prominent (Preston, 1975).

To determines the interlink between health indicator (adult survival rate as proxy) and economic growth and report a positive association. Still, it shows the same results when replaced with life expectancy. However, returning the adult survival rate with fertility found a negative connection with economic growth. Thus, an increase in population decreases the growth rate applying pressure on inadequate resources. Under the consideration of ten industrial countries, Arora (2001) utilized the different age groups of 5.10,15 and 20 years of life expectancy to inspect the connection between the health segment and economic development, conduct a workshop, and conclude that good health increases productivity by about 30-40 percent. He also conveyed that developing countries are backward due to their insignificant devotion to fitness, health facilities, and nutrition.

Bloom et al. (2004) employed schooling, life expectancy, and GDP to determine their association and affirmed a positive association among them. They also say that with an increase in health, capital accumulation is enhanced and promotes growth. Further, if life expectancy increases by one year, it will improve productivity by four percent.

Gyimah (2004) claims a positive and significant association between human capital, child mortality rate as a proxy of investment, and health expenditure. Investing in the health sector of the developing country will increase the growth ratings and enhance the per capita income of the masses (Gyimah, 2004). In comparison, Jamison (2003) states that health, investment in physical capital, and education remarkably promote growth, based on the male's survival rate between 15 to 60 (age) with production, and informed that good health enhances the growth rate by approximately 11%. Lorentzen et al. (2005) utilized the fertility and adult death rate investment in physical and human capital, affirming that the mortality rate vastly influences the growth rate.

Malik (2005) utilized three factors (such as crude health, life expectancy, and infant mortality ratio) as the proxy of the growth GNI per capita, employing the OLS approach. It found no association, but the technique changes with 2SLS affirmed their strong association and reported that health indicators strongly influence the growth process. Akram et al. (2006) employed varied econometric approaches to analyze the causality, short and long-run association between economic growth and numerous health indicators and affirmed a long-run affiliation among them. Moreover, life expediency, trade openness, and health expenditure positively affect the GDP per capita, though age reliance, death, and population per bed adversely influence the growth rate.

Mayer et al. (2008) and Muysken (2008) described that a person with good health and actively participating in production influences economic growth. Therefore, this influence becomes more significant if education is replaced with health. On the contrary, an increase in life expectancy increase the expectation of economic growth (Sunde and Matteo, 2009). While implementing the modern endogenous growth theory in the OECD countries, Aghion

et al. (2011) say that growth is expected to boost if mortality rates under 40 years decrease. Chen et al. (2013) applied the multivariate Beveridge-Nelson decomposition framework for China and explained that health expenditures have a pro-cyclical relationship with the growth rate. Wang (2008) uses the Grossman human capital demand model and the Arrow-Romer production function technique to argue for a positive correlation between economic growth and healthcare spending. However, they were concerned about the results of a long overdue spending boost.

Fatemeh (2015) says nations have a high human development index positively influenced by health expenses. Eggoh et al. (2015) state that if the country has less human development, the index is affected by health expenditures but negatively by the growth rate. While Li et al. (2017) informed that the attention of medical persons and per capita health expenses deliberately promote a country's growth rate. They further say that the number of hospitals cannot enhance the growth; we should spend to increase staff effectiveness to increase their efficiency. Sharma (2018) utilized the unbalanced panel data of 17 advanced countries from 1870 to 2013. The results say that population health with the proxy of life expectancy positively affects real incomes per capita and growth.

Numerous works are accessible, employing variables like life expectancy, mortality, human index, and health expenditure. The stated literature affirms that an increase in the health indicators leads to an increase in the growth ratio because labor working hours increases. However, this study employed numerous variables to capture the association and impact of these variables on the growth rate and the shock if some variable fluctuates from its balanced position. Because COVID-19 explains the importance of the health sector in the growing process of the economy; without health security, there will be no productivity either in developed or developing countries.

3. Theoretical Framework, Data, and Methodology

To determine the fluctuating influence of the government's health indicators, paramedical staff, and health expenses enthusiastic about stimulating the growth rate. For this purpose, time-series data is collected from the Handbook of Statistics and Economic Survey of Pakistan, extending from 1961 to 2019, in Table 01.

Table 1: Explanation of the Variables

Variables	Source
Health Indicators (HEI)	
Natural Increase Ratio (RNI) (Birth Ratio – Death Ratio)	Hand Book of Statistics, Economic Survey of Pakistan
Infant Mortality (IFM)	-do-
Life Expectancy (LXE)	-do-
Paramedical Personals (PEM)	
Registered Doctors (RGD)	Hand Book of Statistics, Economic Survey of Pakistan
Registered Nurses (RGN)	-do-
Registered Lady Health Visitors (LHVs)	-do-

Numbers of Hospitals (NOH)	-do-
Government Health Expenditures (HXP)	-do-
Growth Rate (GR)	-do-

4. Theoretical Framework

Romer (1990) and Barro (1991) stressed the need for human capital investment to achieve economic stability. As a result, numerous models were designed to account for the influence of health expenditures on growth. Even so, the Feder–Ram model is used in most studies (1983, 86). Whereas health indicators and expenses have been included in various models, Khan's growth rate is not one of them. Haq and Akram's (2015) model, we employ the model introduced by Piabuo and Tieguhong (2017) with some modifications.

$$\text{Growth Rate} = \alpha + \beta_1(\text{Health indicators}) + \beta_2(\text{Peramedical Persons}) + \beta_3\text{Health Expenditures} + \beta_4\text{Numbers of Hospitals} + \mu_t$$

Health indicators comprise natural increase, life expectancy, and infant mortality. The paramedical staff consists of registered doctors, registered nurses, registered lady health visitors, and health expenditures from the government and health care units. This study uses the substitute production function's constant elasticity (Li. Wu & Wu, 2017). Which introduced to capture the association between labor capital and technological growth in productivity, such as

$$TP = \lambda\,(\beta_1 X^{-\rho} + \beta_2 Y^{-\lambda\rho})^{1/\rho} \qquad X > 0 \quad Y > 0 \tag{3}$$

Whereas 'ρ' represents the infinity imminent zero and can be expressed in the Cobb-Douglas.

$$TP_{out} = T_o X^{\alpha} Y^{\beta} \mu \tag{4}$$

'TPout' denotes output, T0 for the technological progression, and "X" for capital, whereas "Y" for labor α, β respectively elaborates the elasticities of the money and the labor ($\alpha > 0$, $\beta > 0$). However, health participation would surely increase the total product, which will elevate the growth rate in the future (Li, Wu & Wu, 2017). The model is reported as,

$$TP_{out} = T_o H_o X^{\alpha} Y^{\beta} \mu \tag{5}$$

Here "TPout" for the growth rate, "Ho" is split into H1 "Health Indicators," H2 "Paramedical Personals," H3 "Health Expenditures of government," and H4 "Numbers of the Health care units." Therefore, eq 05 can be expressed.

$$TP_{out} = T_o H_1 H_2 H_3 H_4 X^{\alpha} Y^{\beta} \mu \tag{6}$$

However, regression was utilized to evaluate the effect of health contributions on development. Assuming that $\alpha + \beta = 1$, introducing the log on both sides.

$$\ln TP_{out} = \ln T_0 + \ln H_1 + \ln H_2 + \ln H_3 + \ln H_4 + \alpha \ln X + \beta \ln Y \tag{7}$$

If Δ

$$\ln To + \ln H_1 + \ln H_2 + \ln H_3 + \ln H_4 + \alpha \ln X + (1-\alpha) \ln Y \tag{8}$$

$$\ln TP_{out} - \ln Y = \ln T_0 + \ln H_1 + \ln H_2 + \ln H_3 + \ln H_4 + \alpha(\ln X - \ln Y) \quad (9)$$

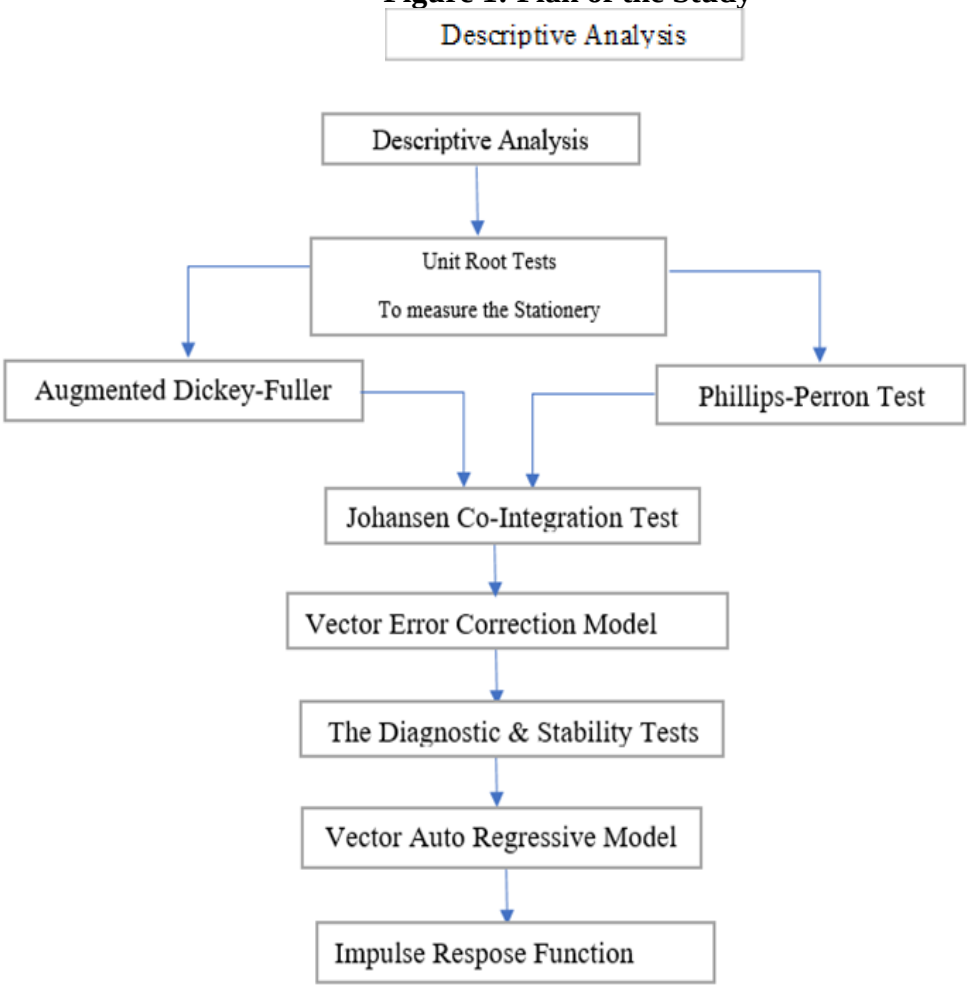
Finally, a simple regression model can report.

$$\ln \frac{T_{out}}{Y} = \ln T_0 + \ln H_1 + \ln H_2 + \ln H_3 + \ln H_4 + \alpha \ln \frac{X}{Y} \quad (10)$$

$$\ln y = \ln T_0 + \ln H_1 + \ln H_2 + \ln H_3 + \ln H_4 + \alpha \ln k \quad (11)$$

Whereas y denotes the increase in the growth rate, "k" for the health expenditures, and "α" is the co-efficient of the improvement. In figure 01, the study will express the method it follows.

Figure 1: Plan of the Study



For time series, it is a prerequisite to measure stationarity. For this objective ADF test (1979, 1981) and the PP test (1988) were employed, broadly known as unit root tests; three possible situations are expressed.

$$\Delta S_t = \rho S_{t-1} + \sum_{i=1}^{\sigma} \lambda_i \Delta S_{t-1} + \eta_t \quad \text{(None)} \quad (12)$$

$$\Delta S_t = \kappa_0 + \rho S_{t-1} + \sum_{i=1}^{\sigma} \lambda_i \Delta S_{t-1} + \eta_t \quad \text{(Intercept)} \quad (13)$$

$$\Delta S_t = \alpha_0 + T + \rho S_{t-1} + \sum_{i=1}^{\sigma} \lambda_i \Delta S_{t-1} + \eta_t \quad \text{(Trend and Intercept)} \quad (14)$$

Suppose all the concerning factors are integrated at I(1), then the study will employ the Johanson cointegration test for the long-run association of the two segments.

$$Joh_{tra}(m) = -S \overset{o^t}{\underset{i=m+1}{\beta}} \ln(1-\varphi_i) \quad (15)$$

$$Joh_{Max}(m+1) = -S \ln(1-\varphi_{n+1}) \quad (16)$$

Equations 15 and 16 show the trace statistics and max-Eigen values, respectively: where T is the sample, "defines "ith" length of series, and "n" is a cointegration equation. Further, the vector error correction approach is employed to determine the variables' short-run association.

$$\Delta GR_t = \alpha_0 - \beta_1 HEI_t - \lambda_2 PEM_t - \delta_3 NOH_t - \pi_4 HEP_t - \Delta GR_{t-1} - \beta_1 HEI_{t-i} - \lambda_2 PEM_{t-i} - \delta_3 NOH_{t-i} - \pi_4 HEP_{t-i} - \varepsilon_{1t} \quad (17)$$

$$\beta_1 HEI_t = \alpha_0 - \Delta GR_t - \lambda_2 PEM_t - \delta_3 NOH_t - \pi_4 HEP_t - \Delta GR_{t-i} - \beta_1 HEI_{t-1} - \lambda_2 PEM_{t-i} - \delta_3 NOH_{t-i} - \pi_4 HEP_{t-i} - \mu_{2t} \quad (18)$$

$$\lambda_2 PEM_t = \alpha_0 - \Delta GR_t - \beta_1 HEI_t - \delta_3 NOH_t - \pi_4 HEP_t - \Delta GR_{t-i} - \beta_1 HEI_{t-i} - \lambda_2 PEM_{t-1} - \delta_3 NOH_{t-i} - \pi_4 HEP_{t-i} - \mu_{3t} \quad (19)$$

$$\delta_3 NOH_t = \alpha_0 - \Delta GR_t - \beta_1 HEI_t - \lambda_2 PEM_t - \pi_4 HEP_t - \Delta GR_{t-i} - \beta_1 HEI_{t-i} - \lambda_2 PEM_{t-i} - \delta_3 NOH_{t-1} - \pi_4 HEP_{t-i} - \mu_{4t} \quad (20)$$

$$\pi_4 HEP_t = \alpha_0 - \Delta GR_t - \beta_1 HEI_t - \lambda_2 PEM_t - \delta_3 NOH_t - \Delta GR_{t-i} - \beta_1 HEI_{t-i} - \lambda_2 PEM_{t-i} - \delta_3 NOH_{t-1} - \pi_4 HEP_{t-i} - \mu_{5t} \quad (21)$$

Simply, it can be as.

$$ECM_t = \alpha - \Delta GR_{t-i} - \beta_1 HEI_{t-i} - \beta_2 PEM_{t-i} - \beta_3 HEP_{t-i} - \beta_4 NOH_{t-i} - \beta_5 \mu_{it} \quad (22)$$

In addition, a series of diagnostic approaches are utilized to investigate the model's auto-correlation, stability, normality, and specification. Moreover, the VAR method, in which no endogenous and exogenous variable exists, assists policymakers in experimenting and extracting the information hidden in the data.

$$Y_t = b + A_1 Y_{t-1} + ... + A_p Y_{t-p} + \varepsilon_t \quad (23)$$

Widely explain the outcomes of the VAR method. An impulse response function is employed, which shows that if a standard deviation shock of any variable is given to the equation system, then in what direction does the variable move and ultimately enhances the country's growth rate?

5. Results and Discussion

Descriptive statistics provide a summary of the study factors, and the results are presented in Table 01, comprising 1961- 2019. The result elaborates that in Pakistan, on average,

22318.77 million rupees were given to the health sector ranging from 109867 (maxi) to 90.1 million rupees (mini). The mean value of GR is estimated at 5.10, which lies between the range of 11.35 to 0.46, respectively. Further, the mean value of RD, RN, LHVS, HOS, IM, LE, and RONI figured out 61019.62, 26288.67, 4191.90, 707.65, 92.3, 60.3, and 2.54, respectively. However, Figure 02 illustrates the periodical trend of the data from 1961 to 2019.

Table 1: Descriptive Overview of the Variables

Description	GR	RNI	LXE	IFM	RGD	RGN	LHVs	HXP	NOH
Mean	5.1	2.54	60.3	92.3	61019.6	26288.6	419.9	22318.7	707.6
Median	4.9	2.6	62.5	85	42862	14015	2697	7218	710
Maximum	11.35	3.3	66.2	136	184711	94766	15325	109867	1172
Minimum	0.46	0.96	50	64.6	7255	2067	114	90.1	345
Std. Dev	1.35	0.48	1.14	0.20	0.6538	0.9123	0.643	1.893	2.003
Skewness	0.23	-0.61	-0.97	0.65	0.74	1.09	1.16	1.53	0.07
Kurtosis	2.88	3.27	2.58	2.42	2.27	2.91	3.28	4.01	1.91
Jarque - Bera	0.55	3.6	7.11	4.63	6.34	8.98	8.54	4.04	2.73

Source: Author(s) calculations

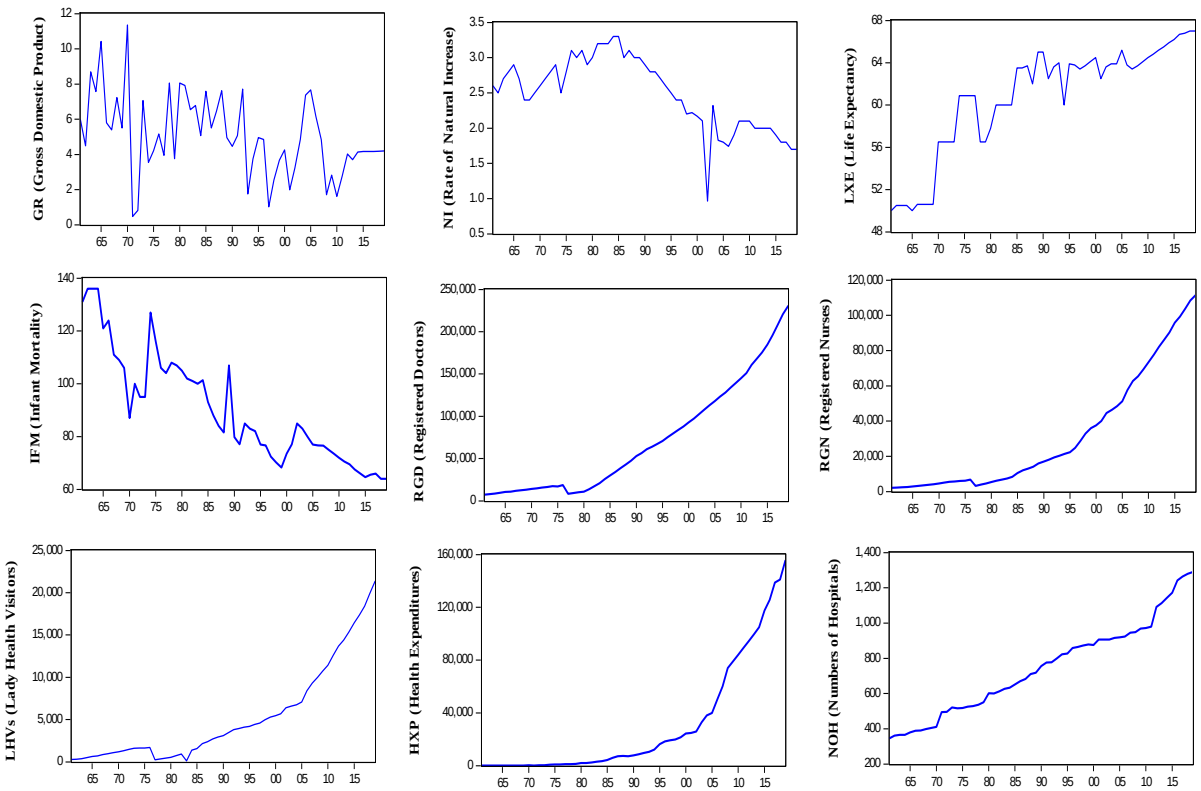


Figure 2: Periodic Trend of the Variables

Source: Author(s) calculations

Whenever time series is employed, first check the stationarity. Then, either data has zero mean and constant variance or not. For this purpose, the ADF and PP tests are used to detect the data's zero mean and constant variance and assist in determining each series's integration order. The results are articulated in Table 2.

Table 2: ADF and PP Test

Variable	Augmented Dickey-Fuller		Philip - Perron		**Integration Order**
	t stat.	prob.	t stat.	prob.	
GR	-7.46	0.001	-26.53	0.005	I(1)
RNI	-11.20	0.002	-12.43	0.004	I(1)
LXE	-7.71	0.003	-9.20	0.003	I(1)
IFM	-8.71	0.004	-10.25	0.002	I(1)
RGD	-4.26	0.005	-5.48	0.001	I(1)
RGN	-4.56	0.006	-5.51	0.002	I(1)
LHVs	-8.41	0.002	-7.44	0.002	I(1)
HXP	-4.23	0.012	-4.07	0.012	I(1)
NOH	-7.86	0.001	-7.77	0.004	I(1)

Source: Author(s) calculations

The ADF and PP test outcomes show that all the variables have zero mean and constant variance at integrated level one I(1). However, the lag values of the variable significantly influence the future trend. Therefore, the study utilized different methods to regulate the appropriate number of lags. The outcomes are stated in Table 3.

Table 3: Lag Length Criteria

Lag	**Log L**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
1	-19.20	NA	3.40e-10*	3.71*	6.69*	4.86*

Source: Author(s) calculations

The lag length criterion comprises many other measures, such as Sequential modifies LR; Final. prediction error. Akaike information criteria. Schwarz. information. Lastly Hannan-Quinn information criterion. But here, we will follow AIC criteria, which define that one lag will be appropriate for further examination. For the association of variables in the long- run, the Johanson cointegration method is applied, which has two parts, i.e., trace value and maximum eigenvalues. The outcomes are offered in Tables 4 and 5.

Table 4: Trace Statistics

H0	**H1**	**Eigen Value**	**Trace Statistic**	**5% Critical. Value**	**prob.**	**Hypothesized No. of CE(s)**
U_0: t = 0	U_1: t = 1	0.83	301.41	196.38	0.00	None *
U_1: t ≤ 1	U_1: t = 2	0.75	204.32	158.53	0.00	At most 1*
U_1: t ≤ 2	U_1: t = 3	0.61	130.51	124.62	0.02	At most 2*
U_1: t ≤ 3	U_1: t = 4	0.37	81.37	96.76	0.32	At most 3

Source: Author(s) calculations

Table 5: Maximum Eigen-Values Statistics

H0	H1	Eigenvalue	Max-Eigen Statistic	5% Critical Value	prob.	Hypothesized No. of CE(s)
U_0: t = 0	U_1: t = 1	0.83	96.12	58.45	0.00	None *
U_1: t ≤ 1	U_1: t = 2	0.75	76.73	52.37	0.00	At most 1*
U_1: t ≤ 2	U_1: t = 3	0.61	49.23	46.22	0.03	At most 2*
U_1: t ≤ 3	U_1: t = 4	0.37	24.91	40.08	0.85	At most 3

Note: Author(s) calculations

Table 6: Normalization Equation

Normalized cointegrating coefficients (standard error in parentheses)

GDP	GR	RNI	LXE	IFM	RGD	RGN	LHVs	HXP	NOH
1.000000	0.0006	5.6094	1.0521	0.0671	0.0003	-0.0005	-0.0053	0.0006	0.0053
	(0.0002)	(3.6664)	(0.4151)	(0.0658)	(0.0002)	(0.0003)	(0.0013)	(0.0002)	(0.0231)

Source: Author(s) calculations

The result denotes that all concerning variables have a positive influence except RGN and LHVs because there is no job permission after marriage in many areas of Pakistan. However, the outcome elaborates that all variables are integrated into the long term. Therefore, for the short-run association, VECM is appropriate, a driven strategy used to determine the affiliation of one time series with another. Besides, it also shows how much a variable converges toward equilibrium. The outcomes are offered in Table 7.

Table 7: Vector Error Correction Result

Error Correction	D(GR)	D(RNI)	D(LXE)	D(IFM)	D(RGD)	D(RGN)	D(LHVs)	D(HXP)	D(NOH)
	-0.36	-0.03	-0.22	-0.38	0.01	0.01	0.02	0.012	0.011
CointEq1	(0.149)	(0.016)	(0.105)	(0.586)	(0.003)	(0.003)	(0.007)	(0.007)	(0.003)
	-2.45	-1.99	-2.12	-0.65	3.51	3.35	3.63	1.62	0.87

Source: Author(s) calculations

Short-term findings show that all variables tend to converge to equilibrium, and the outcomes support this. While the Wald test was employed to determine the significance of explanatory variables, reported in Table 8.

Table 8: Wald Estimations

Test- Stat.	**value**	**df**	**prob.**
F statistic.	2.29	(1,33)	0.01

Source: Author(s) calculations

The outcome defines that explanatory variables significantly and cumulative affect the growth rate. Moreover, to determine the model's specification, normality, stability, and auto-correlation. Various diagnostic tests are presented in Table 9.

Table 9: Diagnostic Test

ARCH Test		
F-Stat	Df	Prob.
6.67	(1,45)	0.03
Brusch.-Godfrey Serial Correlation LM Test		
X^2- Stat	Df	**Prob.**
	1	0.03
Ramsey RESET Test		
F-Stat	**Df**	**Prob.**
1.62	(1,45)	0.02
Jarque.- Bera Test		
F-Stat	**Df**	**Prob.**
1.24	(1,54)	0.05

Source: Author(s) calculations

The outcomes of ARCH affirm that there is no issue of heteroskedasticity. Brush-Godfrey test state that there is no serial correlation. While Ramsey insists the model's functioning is proper. Moreover, Jarque–Bera stat that the model is normally distributed. However, to extract the information from the data Sims (1980) introduced the vector autoregressive approach, which deals with all the variables on the same ground. The point to be noted here is that policymakers use this approach to observe the variables' behavior and direction. The outcomes are offered in Table 10.

Table 10: VAR Estimations

	GDP	RNI	LXE	IFM	RGD	RGN	LHVs	HXP	NOH
GR	-0.74	0.31	-1.83	-0.22	0.05	0.11	0.21	0.84	0.04
(-1)	(-1.47)	(-0.14)	(-1.01)	(-5.43)	(-0.03)	(-0.04)	(-0.09)	(-0.01)	(-0.03)
	[-0.52]	[2.24]	-1.80]	[-0.40]	[1.45]	[2.74]	[2.18]	[8.10]	[1.27]

Source: Author(s) calculations

Using VAR analysis, we can determine that all of the variables are interconnected, and we can also extrapolate future behavior from this data. For this purpose, this study applies the impulse response function (hereafter IRF). For example, if a standard deviation shock is given, then the response passes through the whole system of equations and affects all the factors available in the system in the future. The outcomes of IRF are demonstrated in Figure 02.

Source: Author(s) calculations

The results of IRF elaborate that with the increase in the growing ratio, the health indicators improve, and the number of paramedical staff positively affects the growth rate and increases health expenditures. Moreover, an increase in the growth rate also enhanced the quantity of fully functional healthcare units in the economy.

However, the IRF also states that if a standard deviation shock of natural increase is given to all variables; all the factors move positively except the registered doctors because in Pakistan, there is a large gap between the available number of doctors and the required number of doctors. While if life expectancy, infant mortality, and an increased number of registered nurses and lady health visitors fluctuate from their equilibrium position, then it positively affects all the variables. While due to the increase in the number of hospitals and health indicators influenced paramedical staff negatively because, in Pakistan, there is a lack of medical personnel. Additionally, the result explains that an increase in health expenditures, health indicators, paramedical staff, and growth rate positively influenced because the government has more capital to devote to the health sector.

This work analyzes the short-term and long-term relationship between the health indicators, paramedical personnel, number of hospitals, health expenditures, and growth rate in Pakistan. Because Pakistan devotes a specific budget yearly, the health sector still suffers many problems. For this purpose, this study arranged the rate of natural increase, infant mortality, life expectancy, registered numbers of doctors, registered nurses, registered lady health visitors, hospitals, government health expenditures, and growth rate of the economy. After fulfilling the prerequisite condition of time series, the results of Johansen and VECM affirm the short and long-term association of all the variables. It means that all the variables are

interconnected and affect the fluctuation in the growth rate. Therefore, all the variables cumulatively influence the growth rate. However, the results of this study are in line with Bhargava et al. (2001), Arora (2001), Bloom et al. (2004), Jamison (2003), Akram et al. (2006), Taban (2006), Mohapatra and Mishra, 2011, Sunde and Matteo (2009), Aghion et al. (2011), Chen et al., (2013), M. Fatemeh (2015), Eggoh et al. (2015), Sussex et al., (2016), Li, et al. (2017), and Sharma (2018).

The result also elaborates that if the number of hospitals increases in the economy of Pakistan, there is a natural increase in population, decrease in infant mortality, and increase in life expectancy, which indirectly increases the economy's growth rate. Moreover, if it facilitates the medical personnel, it will also promote the growth rate and health awareness and reduce the leaves from jobs.

6. Conclusion and Suggestions

There is a famous quotation: "Health is Wealth" Once the country's people are healthy. Their contribution to the manufacturing process enhanced the long hours. In other words, their increased labor hours and active participation in production positively influenced the economy. Therefore, if we talk about emerging economies, they are rich in labor.

Healthcare providers may increase their sector's growth rate to fund much-needed infrastructure upgrades. That's why this project is structured to allow us to examine how many factors, such as the availability of hospitals, government spending, and the number of paramedical workers, affect health outcomes. This work aims to fill a void left by prior research that ignored the contributions of paramedical personnel in saving and bettering the lives of the general public.

Firstly, the study applied the unit root to find the zero mean and constant variance. After that, the study used the Johansen test for cointegration and the VECM approach for long and short-term affiliation, respectively. Both techniques affirm their respective relationship among the stated variables. Explanatory variables are substantial, the model is normal, the functionality is appropriate, and there is no auto-correlation problem, as determined by the diagnostic tests.

While the impulse response shows that all factors have a favorable impact on the growth rate since a significant share of the budget is spent on renovation instead of hospital treatment range. Moreover, an increase in the growth rate positively affects all study variables while the infant mortality rate declines. Because of the rise in the growth rate, the State devotes a large amount of capital to the health sector, which thoroughly reduces the sector's drawbacks.

Based on the estimate, the study concludes that the government should expand the hospital facilities on the ground base because a significant share of the budget remains unutilized, but the admin demands more money. In addition, the latest equipment is available but is part of the garbage in the store room. So, diagnosing a disease became a big problem. Most significantly, a management expert, not a doctor, should be in charge of the hospital since the latter may be competent in performing its clinical functions but inefficiently run the business side of things. That's why the performance of the health sector is minimal. This study can expand while employing all possible factors of health indicators, all types of medical personnel and including the private medical facilities centers, and imposing some restrictions on adopting SVAR techniques. It provides the facility of limitation on some variables, then measures the influence after restricting other variables and analyzes the response of all the other variables. This way, a suitable and effective policy can be designed based on SVAR results to enhance the growth rate significantly.

References:

Adeosun, O. T., & Faboya, O. M. (2020). Health care expenditure and child mortality in Nigeria. *International Journal of Health Care Quality Assurance*.

Arora, S. (2001) Health, Human Productivity, and Long-term Economic Growth. *The Journal of Economic History,* 699–749.

Aghion, P., Howitt., P., Murtin, F. (2011), The relationship between health and growth: when Lucas meets Nelson-Phelps. *Review of Economics and Institutions,* 2(1), 1-24.

Barro, R. (1991) Economic Growth in a Cross-section of Countries. *Quarterly Journal of Economics* 106(2), 403–443.

Balaji, B. (2011). Causal Nexus between Public Health Expenditure and Economic Growth in Four Southern Indian States. IUP *Journal of Public Finance,* 9(3), 7-22.

Bhargava, A., D. T. Jamison, L. J. Lau, and C. J. Murray (2001) Modeling the Effects of Health on Economic Growth. *Journal of Health Economics,* 423–440.

Bhorat, H., Cassim, A., &Tseng, D. (2016). Higher Education, Employment and Economic Growth: Exploring the Interactions. *Development Southern Africa,* 33(3), 312-327.

Bloom, D. E., D. Canning, and J. Sevilla (2004). The Effect of Health on Economic Growth: A Production Function Approach. *World Development,* 1–13.

Boussalem, F., Boussalem, Z., & Taiba, A. (2014). The relationship between public spending on health and economic growth in Algeria: Testing for Co-integration and Causality. *International Journal of Business and Management*, 2(3), 25.

Cao, F. (2012). Research on the Relation between Expenditure on Education and Economic Growth in Ethnic Autonomous Areas (in Chinese). Master Dissertation, Inner Mongolia University.

Chen, G., Inder, B., Lorgelly, P., &Hollingsworth, B. (2013). The Cyclical Behavior of Public and Private Health Expenditure in China. *Health Economics*, 22(9), 1071-92.

Dauda, R.O. (2001). Investment in Education and Economic Growth in Nigeria: An Empirical Evidence. *International Research Journal of Finance and Economics,* 55:158-169.

Dong, X. H., Wang,X., &Li, C. (2008).Review of Research on Cobb -Douglas Production Function Theory (in Chinese). *Productivity Research*, 3, 148-150.

Eggoh, J., Houenivo, H., & Sossou, G. A. (2015). Education, Health and Economic Growth in Africa Countries. *Journal of Economic Development,* 40(1), 93-111.

Fu, S.Y., Sun, S., & Xing, H. (2012). Research on Contribution of Higher Education to Regional Economic Growth in Liaoning Province Based on Cobb-Douglas Production Function (in Chinese). *Journal of Shenyang University of Technology (Social Science Edition),* 5(2), 132-136.

Ge, Y. (2015). From Demographic Dividend to Human Capital Dividend (in Chinese). Master Dissertation, Shanghai Academy of Social Science.

Engle, R. F. and C. W. Granger (1987) Co-integration and Error Correction: Representation, Estimation, and Testing. *Econometrica* 55, 251–276.

Fogel, R. W. (1994) Economic Growth, Population Health and Physiology: The Bearing of Long-term Processes on the Making of Economic Policy. *American Economic Review* 84, 369–395.

Gallup, J. L. and J. D. Sachs (2001) The Economic Burden of Malaria. *The American Journal of Tropical Medicine and Hygiene* 85–96.

Gyimah- Brempong, K. and M. Wilson (2004) Health Human Capital and Economic Growth in Sub-Saharan African and OECD Countries. *The Quarterly Review of Economics and Finance,* 296–320.

Jamison, D. T., L. J. Lau, and J. Wang (2003) Health's Contribution to Economic Growth in an Environment of Partially Endogenous Technical Progress. (Disease Control Priorities Project Working Paper No. 10).

Jha, G. K., & Chowdhury, S. R. (2020). Health Sector Scenarios in Pakistan: Policy Priorities and Challenges Ahead. *In Trade in Health Services in South Asia* (pp. 77-87).

Johansen, S. (1988) Statistical Analysis of Co-integration vectors. *Journal of Economic Dynamics and Control*, 231–254.

Liu, Y. C. (2014). Empirical Research on the Impact of Demographic Change on Economic Growth in China (in Chinese). Master Dissertation, Capital University of Economics and Business.

Li, L., Wu, M., & Wu, Z. (2017, September). The Impact of Public Health Expenditure on Economic Development-Evidence from Prefecture-level Panel Data of Shandong Province. In International Conference on Transformations and Innovations in Management (ICTIM 2017). Atlantis Press.

Lorentzen, P.J. McMillan, and R. Wacziarg (2005) Death and Development. (NBER Working Paper 11620).

Malik, G. (2006). An Examination of the Relationship between Health and Economic Growth. (ICRIER Working Paper No. 185).

Romer, P. M. (1990) Endogenous Technical Change. *Journal of Political Economy, 71– 102*.

State Bank of Pakistan (Various Issues) SBP Annual Reports. Karachi: State Bank of Pakistan.

Tallinn (2006) The Economic Consequences of Ill-health in Estonia. PRAXIS Centre for Policy Studies.

Razmi, M. J., & Ahmadi, F. (2015). The Effect of Health Expenditure on Economic Growth in Four Very High, High, Medium and Low Human Development Countries. Proceedings of the Multidisciplinary Academic Conference, 1-22.

Sharma, R. (2018). Health and economic growth: Evidence from dynamic panel data of 143 years. PloS one, 13(10).

Subhalaxmi, M., & Padmaja, M. (2011). Composition of Public Expenditure on Health and Economic Growth: A Co-integration Analysis and Causality Testing. *IUP Journal of Public Finance*, 9(2), 30-43.

Sun, H., &Jiang, X. K. (2014). Research on the Impact of Scientific and Technological Talents on Regional Economic Development-Based on Comparative Analysis of East China, Central China and West China (in Chinese). *Guangdong Social Sciences*, 2, 15-21.

Yang, H., &Wang, F. H. (2015). Discussion on Influence Factors of Economic Growth in Sichuan Province Based on Krongan Function (in Chinese). *Times Finance, 15.*