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Nexuses between economic growth and health indicators: Evidence from Pakistan

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Abstract
The goal of this article is to look at how various health indices affect Pakistan's economic growth. To achieve this goal, error correction and co-integration methods were used by using time series data from 1990 to 2022. The goal of this research is to examine the short-run and long-term temporal connections between health and per capita GDP growth. In the long-run, there is a significant relationship between per capita GDP and economic health indicators, which are significantly affecting per-capita GDP. According to the results of short run, health indicators have no meaningful influence on per-capita GDP. While indicators of health have a considerable long-run influence in economic growth. It implies that the influence of health indicators can only impact economic growth in the long run. The study's main result suggests financial gain, through growing and raising the stock of healthy human capital, particularly if present stocks are at a low level. Improved health has a two-way interaction with the economic process. This research is to examine the short-run and long-term temporal connections between health and per capita GDP growth, using mistreatment Co-integration and Error Correction. Long-term health and economic process studies would be extremely valuable in determining the achievable magnitudes of the entire cumulative effects of health on economic process. Two key hypotheses would be examined; the first would be that 'health influences economic growth' might be a long-standing temporal development. Second, what role do health output and input factors play in per capita GDP growth?

Keywords: *Health Indicators, Economic Growth, Co-integration.*

JEL Classification: I10, I15, H51

1. Introduction
The health sector plays a vital role in any country's economy. Population is incredibly difficult issue for developing countries however on the opposite facet a healthy population raises human capital that is absolutely tributary in economic process and social development. If a country's labor is healthy, its productivity and economic process can mechanically improve so investment in health sector will have a protracted lasting result on its prosperity. The health services, regulation and coordination help the Pakistani health officials to enhance and maintain their health through universal access to low-cost, high-quality essential health services and a responsive health system, the country will be able to meet the Millennium Development Goals and fulfil its other global health commitments. The ministry of health service, rules and coordination dead for serving to the folks of Islamic Republic of Pakistan to keep up and perk up their health and create the population healthier (Ministry of National Health Services, 2016). The National Health Ministry has established the goals in order to improve the health of Pakistani society. The ministry provides provincial autonomy and diversity to improve

the Islamic Republic of Pakistan's health system and promote synchronization for commonality throughout worldwide news (United Nations, 2021). Facilitate cooperation for regulation, data collection, police investigation, and analysis for improved health systems provide a solid framework for charting and implementing SDGs in collaboration with other sectors (Ministry of National Health Services, 2016).

Pakistan, being a developing country, has struggled in various areas, including the health system, which ranks 122 out of 190 countries in a World Health Organization performance assessment (United Nations, 2021; WHO, 2020). Total no of hospitals virtually 1096 in Pakistan that square measure serving over 182 million of population. there's little doubt in spoken language that 7 million individuals are literally addicted to one hospital for his or her regular treatment per Ministry of health (2017) there square measure about one hundred seventy-five 300 registered doctors in Pakistan thus as per population one doctor must facilitate virtually one thousand individuals. Overall, the proportion spent on Health sector is barely a pair of the total GDP that is incredibly low. per the quality of World Health Organization (WHO), the quantitative relation of nurses and doctors ought to be 1:3, however it's reserved is that the case of Pakistan.

The study aims at investigating the issues of health sector in Pakistan and highlights the important link between heath indicator and economic growth. The number of hospitals is increasing. The overall achievement of health sector of Pakistan in last 16 years includes 1167 hospitals and 5695 dispensaries (Shabbir et al., 2022). It can improve the health sector and can have positive impact one economic growth. In Pakistan more than 70 million of the population is living below poverty line and people also don't have access to basic facilities such as clean drinking water and food in addition if they are sick then they do not get proper facilities of health care (Forman et al., 2022).

Health sector plays a vital role for any economy because healthy labor force is a key of development. Pakistan spends 3% of GDP on healthcare which is very low government needs to increase the percentage of GDP to improve healthcare as well as provide clean drinking water because unhygienic water is the main issue in Pakistan caused many water borne diseases, second main area which need improvement is poverty due to lack of resources, people especially in rural areas did not able to afford proper treatment of health care. We need more hospitals and doctors in order to improve health sector and economic growth. Growth economists that included human capital in their research were rewarded for paying close attention to the influence of education on economic growth, but were negligent in the case of human capital. It is not just in recent times that studies have begun to look at health and attempted to evaluate the link between health and economic growth. Thus, we summarize the objectives of study as:

- To determine the relationship of economic growth and health.
- To find out the particular problems of the lady doctors in carrying on their profession and their family interfering with job decision.

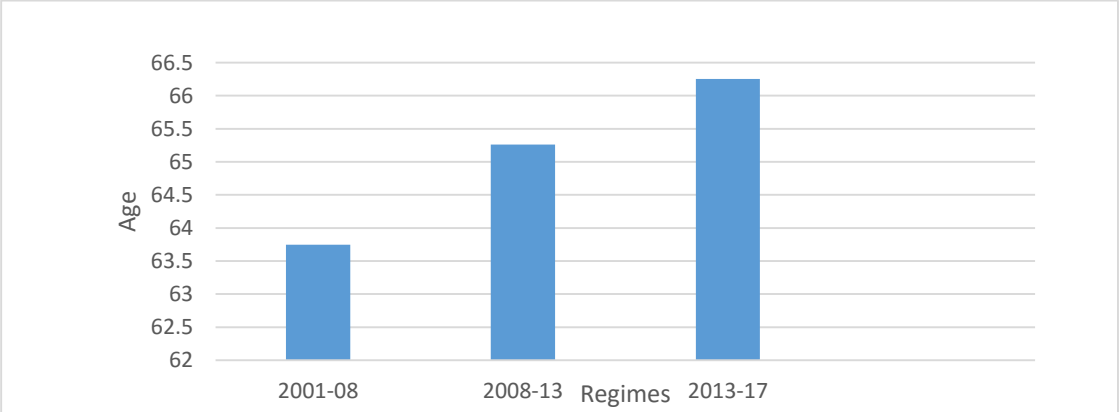
Pakistan has made great strides in its fight to eliminate polio. The national polio eradication campaign has made significant progress in immunizing youngsters across the country. The current polio epidemiology is encouraging. Cases decreased from 306 in 2014 to 54 in 2015, 20 in 2016, 8 in 2017, and 12 in 2018 (Sultan, 2022). In 2019, fifteen instances have been documented thus far. In figure 1 polio cases are shown which has decreasing trend because the population increases arithmetically, and resources (facilities) increases geometrically.

There were two new polio cases reported in 2018. In October 2018, about 1.6 million children were immunized at 402 prominent transit points (PTPs). Currently, four new instances of poliovirus have been detected, and 2 million children were vaccinated in March 2019 at 403 Permanent Transit Points (PTPs) located around the country. Oral polio vaccine was administered to 20.5 million children.

Abbreviations: cVDPV2 = circulating vaccine-derived poliovirus type 2; WPV1 = wild poliovirus type 1.

An increase in life expectancy is a positive signal that the health sector is improving day by day. As per figure 1, the life expectancy rate starts to increase in 2001 and so on. A health policy was announced "health for all" in 2001 which aimed to protecting the nationals from harmful diseases. Then Government took serious steps to improve the health sector in order to look after the public's health. In 2015 under the guidance of Prime minister a National Health Program was launched by ministry of National Health Services, Regulations and Coordination. The program helps millions of poor to access quality health care services for example free vaccination facilities for children. The life expectancy or average age of Pakistan's population was 63.5 in 2015-16 and now it is 66.5. After viewing all above scenario life expectancy has increasing trend, this trend has positive impact on economic growth. Whenever life expectancy increases, it has direct and positive impact on human's capital productivity. Individual can work for longer hours because a healthy body has a healthy brain and thus gives more productivity by helping the individual's mind and body to work for longer time thus a healthy nation leads to wealthy nation.

Figure 1: Average life expectancy in different time periods



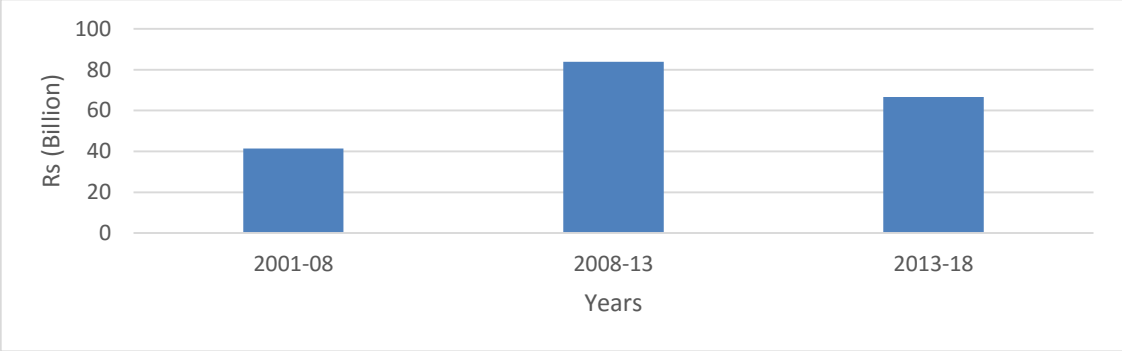
There is an increase in life expectancy throughout the previous three regimes. In Military era (2001-08) the Government implemented and worked on two programs. First with the name of National Health Survey and second was Health for all. By implementing these programs life expectancy increased from 62.9 to 64.5 in Military era. In Democratic era (2008-09) the ministry of health conducted a second National Health Survey, due to this the health management and information system uplift the health status of public. There is an increase in life expectancy throughout the regime of these three governments. In the results of these programs health sector a facility improves, that cause an increase in life expectancy in previous regimes.

Figure 2 shows, all expenditures for health-related preventive, development, treatment, nutrition, and emergency response initiatives. Sustainable development goals cannot be met while there is a high prevalence of debilitating sickness and poverty, and population health cannot be sustained without a responsive health system. Expenditure on health has progressively increased during previous regimes and is likely to rise more in future regimes. Public expenditure is more preferable expenses to any sector of economy so the public expenses on health sector are also very important to improve the health sector in country. As we see in above graph the expenses in 2000-01 is too low which is less than 50 billion because the previous governments did not complete their tenure so it was difficult for military government to focus on all sectors of economy. The next government did not pay any attention toward health sector. In 2013 the government started focusing on health sector and increased the expenses on public health sector. At the end of last government, the expenses were made of approximately 400 billion of rupees as per 2018 (Sultan, 2022). During 2001-08, Global

Alliance provided grant assistance of 33 million dollars for the improvement of expanded program immunization and also provides 11 million dollars for injections safety.

As compared to previous three eras' the time period of 2008-13 was better than the other two. During 2008-13 aid is spent more on public health because it was the part of their motto to give people quality health services. In the other two regimes the acquired budget for health sector was low and the expenses were more than the budget.

Figure 2: Public Expenditure on Average



In terms of physical infrastructure and staff, public health activities have steadily risen. The number of physicians, dentists, and nurses has grown, as has the availability of one doctor, dentist, nurse, and one hospital bed per population. There are now 208,007 registered physicians, 20,463 registered dentists, and 103,777 registered nurses, for a total of 957 doctors per population, 9,730 dentists per population, and 1,580 patients per bed. Pakistan has 1201 hospitals, 5802 clinics, 731 maternity and child health facilities, and 347 TB treatment centers. There are 14 private hospitals in the federal government and 7 government hospitals in total. So, this study assesses the influence of health on Pakistan's economic growth.

2. Review of Literature

A lot of scholars undertook several studies to investigate the relationship between economic advancement and health. The following is a quick assessment of some recent research on the impact of health on economic growth. Shabbir et al. (2022) investigated the impact of sustainable health practices especially sustainable production and sustainable supplier management on supply chain performance. A survey of hundred firms was collected. Structure Equation Modelling and Exploratory Factor Analysis had been employed through AMOS. The findings of the study provided valuable and thought-provoking insights for use of sustainability.

As many other developing countries, Pakistan is also facing the problems in their health sector since the time of partition. Mir et al. (2015), in his paper he presents a clear view of the healthcare system of Pakistan. The healthcare system of our country is mixed system of public, private, formal, non-formal and modern with traditional medicines. Having all these objects in a healthcare system is itself a major issue, and he also highlighted the main issue of public and private sectors of health. Keeping in mind that the state is the custodian of health of the people of Pakistan, is unable to facilitate the public, private sector has filled this gap very efficiently. It is a big drawback of our economy as well as having many problems in it, for example, the high cost, untrained staff etc. However, the relation between public and private health sector has become indispensable.

Ahmed & Shaikh (2008), in their paper highlighted the issue of low budgeting on healthcare sector of Pakistan. Our neighbour countries are spending more of their GDP on health sector than the Pakistan. Pakistan spends 80% of its little health expenditure on tertiary care services, which are used

by just 15% of the population, and 5% on basic healthcare, which is used by 80% of the population. Policymakers must comprehend the public's need as well as their capacity and desire to pay for healthcare. For population, several methods of finance may be employed, such as earmarking, approaching external donors, taxing, user fees, and so on. Universal coverage can be accomplished by charging all users based on their capacity and desire to pay. Discussing health-related concerns in poor nations as well as in Pakistan. Health sector has always been a major concern of developing countries. Kruk et al. (2018), in their paper they discussed about the betterment of the health sector of developing economies, that how can they improve their public health sector. The facilities in the public sector hospitals are less than private hospitals.

Gilson & Mills (1995), in their study they considered the unequal distribution of resources between different health interventions and technical efficiency as the downfall of health sector in developing economies, and number of structural changes have been proposed to improve the efficiency, the most common is the decentralization of planning and management usually to the district level. As many other developing countries, Pakistan is also facing the problems in their health sector since the time of partition.

Mir et al. (2015), in his paper he presents a clear view of the healthcare system of Pakistan. Having all these objects in a healthcare system is itself a major issue, and he also highlighted the main issue of public and private sectors of health. Keeping in mind that the state is the custodian of health of the people of Pakistan, is unable to facilitate the public, private sector has filled this gap very efficiently. It is a big drawback of our economy as well as having many problems in it, for example, the high cost, untrained staff etc. However, the relation between public and private health sector has become indispensable. Ahmed & Shaikh (2008), in their paper highlighted the issue of low budgeting on healthcare sector of Pakistan. Our neighbor countries are spending more of their GDP on health sector than Pakistan. Pakistan spends 80% of its small health expenditure on tertiary care services, which are used by just 15% of the population, and 5% on primary care, which is used by 80% of the population. Policymakers must comprehend the public's need as well as their capacity and desire to pay for healthcare. For population, several methods of finance may be employed, such as earmarking, approaching external donors, taxing, user fees, and so on. Universal coverage can be accomplished by charging all users based on their capacity and desire to pay. Many health issues have effective intermediaries.

The major worry in low-income nations is health concerns; prices are rising and budgets are dwindling; nevertheless, Travis et al. (2004) state that part of the difficulty is to incorporate current and new information about more effective tactics into training. There is increased intervention to ensure that the best health systems are successful in producing improved health outcomes. Progress toward agreed-upon health targets continues to be bad. There are few consensuses on how to help them. The next Official Talks on Health Research aim to contribute to the development of a learning agenda for health systems. Because health-systems research has an image issue, the evidence foundation remains disproportionately poor. Significant progress will have been made in terms of eliminating system controls in order to achieve the MDGs. Leadership, vision, priority, and actions needed to achieve best goals in health sector. Still have time to change the health course of the country, and even meet the MDGs.

According to Beaglehole & Dal Poz (2003), the public health workforce is heterogeneous and comprises all people whose primary role is to provide essential public health activities, regardless of their organizational foundation. Pakistan is unprepared to deal with the diseases that have infiltrated its population. Some of the government officials believed that prime accountability is the facility of main public health activities, irrespective of their organizational base changes. When Jamison (2003) examines the contribution of health to economic growth. According to a study, developing countries frequently lack investment resources 490. On the other side, poor health condition hampers economic

growth for (Akram et al., 2008; Sheikh et al., 2022). Pakistan's federal structure has experienced significant modifications as a result of the 18th Constitutional Amendment. Although there have been some gains in health-system performance over the last 65 years, important health metrics continue to trail below those of comparable nations. Progress has been impeded by complex governance difficulties and underinvestment in health. With the devolution of the health mandate, an opportunity for health reform has arisen.

In this literature we conclude that how health sector is important for a country's economic development and growth where approximately 9% of the total employment is directly working in health sector. And the sustainable healthcare system has direct impact on labor force if workers are healthy then their efficiency has positive impact on every industry's production and profits, they reinvest their profits and ultimate impact on the growth of a country. Literature also highlights the issues Pakistan is facing in healthcare sector e.g., mixed system of healthcare, the discrimination of public and private sector, unequal distribution of resources etc. Different policies can be used to overcome these issues like contracting with non-government bodies, imposing fee, approaching external donors etc. Literature provides number of solutions to overcome the issues in health sector. Keeping in view the issues and possible reforms in the health sector discussed in literature, this study analyzes the policy and a reform in the health sector suggested by the current regime and also attempts to bring in the light the challenges that Pakistan has to face. The fertility rate, on the other hand, has a negative link with economic growth. Because infant mortality has a significant impact on life expectancy.

Workforce growth is generally slower than population increase. As a result, a high birth rate inhibits economic growth by placing an additional load on scarce resources. According to van Zon & Muysken (2001), excellent health is an essential requirement for people to be able to give labour services. According to the study, a rise in demand for health care due to an ageing population will have a detrimental impact on economic development. In this literature we conclude that how health sector is important for a country's economic development and growth where approximately 9% of the total employment is directly working in health sector. And the sustainable healthcare system has direct impact on labour force if workers are healthy then their efficiency has positive impact on every industry's production and profits, they reinvest their profits and ultimate impact on the growth of a country. According to the study, health human capital improves economic growth at a diminishing pace.

Osler (1991) worked on vocationally trained Doctor's employment experience. She tried to find out relationship between gender-based employments decisions of doctors and their career goals. She used questionnaires of 233 respondents who had practiced during 1981-87 and showed that more of women than men had changed their profession. One third of them were no longer in this profession while some of them left their career mainly due to marriage or childbearing/young child. Some of the women tried to work if they were allowed to have reduced work hours or if they were allowed to work in the daytime. Gender played a stereotype role, women as homemaker and men as breadwinners.

A vast majority of respondents in a survey by Izumi et al. (2013) showed the behavior that women should continue to work even after having a child or during her childbearing stage, but they found further having that mentality even though more than one half of respondent had resigned previously from their career on full time basis due to childbearing. It was also explored that once female have resigned fully only one third of them joined again on full time basis. A small fraction of female doctors who did not resign from their career were seen to have faced too much difficulty in balancing family life and career effectively. Two reasons were found most prominent for resigning from full time employment i.e., child bearing and the poor working conditions i.e. inability to take paid holidays, long working hours and physical problems. An M-shape relationship has been found for

female labor force participation between age 20-40 (late 40s). Nomura et al. (2008) and Izumi et al. (2013)showed that working conditions such as frequent overnights and long working hours specially for physicians has seriously deteriorated over the years.

Table 1: Past data of life expectancy and infant mortality

Years	Life Expectancy at Birth, Total (Years)	Infant Mortality Rate (Per 1,000 Live Births)
1960	44	139
1970	49	120
1980	55	110
1985	57	105
1990	59	100
1995	61	93
2000	63	85
2005	65	79
2006	65	78

Source: Khan et al. (2021)

3. Data and Methodology

This data is collected by Economic survey, Ministry of Health, and World Development Indicator (WDI). The model's independent variable is GDP per-capita, an economic growth proxy. A summary of all the variables utilised in the study. The data for all variables is utilised from 1990 to 2022. Various health indicators are utilised to determine the association between health and economic growth. Health indicators are classified into two types: health input indicators and health output indicators. Health input indicators include expenditure on health services, the availability and quality of health care facilities, and so forth. While indices of health output include life expectancy, infant mortality rate, adult survival rate, fertility rate, and so on. Life expectancy and infant mortality are employed as health indicators depending on the availability of time series data. The most important output variable is health spending as a proportion of GDP. The model's independent variable is per capita GDP, which is used as a proxy for economic growth. There is one more explanatory variable. Data of per-capita GDP, age dependency, trade openness, life expectancy, infant mortality and investment is taken from World Bank while data of population per bed, secondary enrolment and expenditure on health are taken from State Bank of Pakistan's annual reports.

3.1 Theoretical Model:

A plethora of models have been created to account for the influence of human capital on economic growth. Human capital, according to Romer (1990) and Barro (1991), is the most essential component in determining economic progress. It is thought that the ability to convert health expenditure into health stock is reliant on the stock of health human capital. The health technology equation is as follows: = (H). The income growth equation is formed by substituting into the H equation and then into the production function.

This study investigates the hurdles faced by the female doctors in the context of their labor force participation (FLFP) decisions, while considering the role of family and their children. The analytical framework of this research study regarding the female labor force participation involves one of the responses for each respondent. That is, whether they are employed or not employed. Therefore, the dependent variable here (employment status) is a binary variable and take two values. The binary variable takes the value '1' if the female is employed, and '0' if the female is not participating in the labor force. Here the dependent variable is a binary variable, in such situation, analysis through the linear regression equation or model leads to inappropriate estimations. Because of which, two non-

linear models, that is logistic probability model (Logit model), and the normal probability model (Probit model) are preferred for further estimations as discussed in the study of Ahmad & Hafeez (2007).

The dependent variable (employment status) is determined by the current status of participation in the labor force. Currently, if the female doctor is employed or on service, the binary variable determined the value of 1, and 0 otherwise. The explanatory variables here we utilized for estimating are the age of the respondents, their residence, family type and size satisfaction with profession, gender equality in home, marital status, institute from which the responded studied, number of children, household income and finally the job challenge. These explanatory variables include, dummy variables or categorical variables, and also continuous variables, which are already discussed above. Hence, the equation in general form is given as follow.

$Y = f(\ fam\_typ, satis, ms, inst, child, hhi,)$ (1)

Where the variables are listed and defined as under.

Y = Employment status = 1 if employed and = 0 otherwise

fam_typ = Family type = 1 if joint and = 0 otherwise

$satis$ = Satisfaction with profession = 1 if satisfied and =0 otherwise

ms = Marital status = 1 if married and =0 otherwise

$inst$ = Type of institute = 1 if public-sector/government and = 0 otherwise)

$child$ = Number of children

hhi = Household income

Y" denotes the dependent variable (employment status of the respondent), "resid" represent the residence of the respondent, "fam_typ" denote family type, "satis" denotes satisfaction of the respondent from his/her profession, "ms" represent marital status of the respondent, "inst" denotes the institute from which the respondent completed degree, "child" denote the number of children of the female respondent, and lastly "hhi" denotes the household's income.

From the equation 1, our linear model for estimation is given as:

$$Empl_i = \beta_0 + \beta_1 fam_{type_i} + \beta_2 satis_i + \beta_3 ms_i + \beta_4 inst_i + \beta_5 child_i + \beta_6 hhi_i + \varepsilon i \quad (3)$$

Here, 'i' in the subscript represent the cross-sections. For brevity of the expression, we can write equation 2 into simpler form as $Empl_i = BX + \mu_i$.

3.2 Empirical Model

Linear Probability Model:

$$(p/1\text{-}p)_{\text{Empl(i)}} = BX + \mu_i$$

Probit model (Normal Probability model):

$$\left(\frac{p}{1} - p\right) Empl(i) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{BX} e^{\frac{-z^2}{2}} dz$$

Logit model (logistic probability model):

$$\left(\frac{p}{1} - p\right) Empl(i) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{BX} e^{\frac{-z^2}{2}} dz = \frac{1}{1+e^{-BX}} + \mu_i$$

The results are further estimated and discussed in section 5: results of empirical analysis.

4. Results and Discussions

The results of the study are given here. The overall form of the ADF exam is as follows in level and first difference form. As confirmed by ADF test, starting with Primary enrolment, Per Capita GDP, Health Expenditure, Investment, Life Expectancy, Mortality Rate and Primary enrolment are integrating at order one and Age Dependency and Population per bed are integrating of order zero.

This stationary test of variables is also satisfying the situation that there is no variable that is integrating of order two [I (2)] before applying the approach ARDL.

Table 2: Results of ADF Test

Variables	At Level		At 1st Difference		Conclusion
	T-statistics	Probability	T-statistics	Probability	
Per Capita GDP	-2.2493	0.1931	-10.173***	0.0000	I(1)
Age Dependency	-4.9390	0.0002	-7.5349***	0.0000	I(0)
Health Expenditure	-2.0018	0.28487	-5.8416***	0.0000	I(1)
Investment	-2.3273	0.1688	-6.5874***	0.0000	I(1)
Life Expectancy	-1.3168	0.6121	-5.8305***	0.0000	I(1)
Mortality Rate	0.3808	0.9790	-4.7280***	0.0006	I(1)
Openness	-2.2493	0.1931	-10.173***	0.0000	I(1)
Population per bed	-4.9390	0.0002	-7.5349***	0.0000	I(0)
Primary enrolment	-2.0018	0.28487	-5.8416***	0.0000	I(1)

Note: *** are given to 1 %, ** for 5 % and * for 10% ideally.
Source: Authors' own calculations

The result shows that some of the variables are non-stationary at the level, and some of the variables at first difference.

Co-integration:

The relationship between variables co-integration approach is used to determine the long run. There are two basic strategies for testing co-integration among variables: the Engle & Granger (2015) approach and the Johansen (1988) approach. The approach proposed by Johansen (1988) is used to assess co-integration among variables. This method is based on an in-depth examination of co-integration in the vector autoregressive (VAR) model. However, if the co-integrating vector is not unique, the condition is not addressed. Furthermore, it only looks at the dominating co-integrating vector between series.

Table 3: Rank Test Unrestricted co-integration (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None*	0.95	107.77	58.44	0.00
At Most 1*	0.87	71.37	52.37	0.00
At Most 2*	0.85	65.25	46.24	0.00
At Most 3*	0.86	55.87	40.08	0.00
At Most 4*	0.76	44.16	33.88	0.00
At Most 5*	0.55	28.67	27.59	0.03
At Most 6	0.46	19.75	21.14	0.07
At Most 7	0.36	13.47	14.25	0.06
At Most 8	0.07	1.38	3.85	0.24

Max-eigen value test indicates 6 co-integrating equations @ 5 % level.
*Denotes rejection of the hypothesis @ 5% level.

The results of trace static show that there are seven co-integrating vectors, however the results of highest Eigenvalue value show that there are six co-integrating vectors.

Table 4: Normalized Co-integrating Coefficients

Variable	Coefficient	Std. Error	t-Statistic
AGE_DEPENDENCY	–18494.47	5501.205	–3.361895*
OPENESS	118.7778	46.34173	2.563086*
HEALTH EXPENDITURE	2209.714	1324.95	1.667769
POPULATION_PER_BED	–12.98682	2.976037	–4.363799*
SECONDARY_ ENROLMENT	0.004666	0.001038	4.493965*
INVESTMENT	81.81509	77.32077	1.058126
LIFE_EXPECTANCY	526.8660	68.63043	7.676856*
MORTALITY_RATE	153.2179	74.95079	2.044246**
R-squared	0.989909		
Adjusted R-squared	0.987292		
S.E. of Regression	623.8845		
Sum Squared Reside	10509261		
Log Likelihood	–270.3802		

* and ** indicated significance @ 5 % level and a@ 10 % level respectively.

Table 5 shows empirical evidence that, over time, age reliance has a negative and significant impact on per capita GDP. More people becoming idle due to age or other situations will surely have a detrimental influence on economic growth. Public health spending has a positive but minor impact on per capita GDP. This discovery reveals poor allocation and utilization of public health funding. It also shows that public health expenditures are so little that they have no influence on economic growth. Other health status variables, such as life expectancy, mortality rate, and population per bed, have a substantial influence.

Table 5: Error Correction Model

	Coefficient	Std. Error	t-Statistic	Probability
D(AGE_DEPENDENCY)	112965.4	43997.96	2.567515	0.0214
D(HELATH_EXPENDITURE)	960.1742	990.0141	0.969859	0.3475
D(OPENESS)	49.40765	31.80442	1.553484	0.1411
D(POPULATION_PER_BED)	–4.265212	2.434431	–1.752036	0.1002
D(SECONDARY_ ENROLMENT)	0.002938	0.001161	2.530879	0.0231
D(INVESTMENT)	–24.64672	73.67595	–0.334529	0.7426
D(LIFE_EXPECTANCY)	–41.1806	344.7947	–0.119435	0.9065
D(MORTALITY_RATE)	–389.4584	445.1464	–0.8749	0.3954
D(GDP_PER_CAPITA(–1))	0.277605	0.212884	1.304016	0.2119
D(AGE_DEPENDENCY(–1))	–115873.5	42775.77	–2.708858	0.0162
D(HELATH_EXPENDITURE(–1))	–387.314	1069.411	–0.362175	0.7223
D(OPENESS(–1))	–34.21279	36.27845	–0.943061	0.3606
D(POPULATION_PER_BED(–1))	1.093438	2.658591	0.411285	0.6867
D(SECONDARY_ ENROLMENT (–1))	0.000625	0.001467	0.426117	0.6761
D(INVESTMENT(–1))	–19.73265	77.5046	–0.2546	0.8025
D(LIFE_EXPECTANCY(–1))	–182.8239	455.2101	–0.401625	0.6936
D(MORTALITY_RATE(–1))	115.7301	435.1011	0.265984	0.7939
ECT(-1)	–0.684606	0.238475	–2.87077	0.0117
R-squared	0.736754	Mean dependent var		553.7899
Adjusted R-squared	0.438409	S.D. dependent var		475.5985
S.E. of Regression	356.4104	Durbin-Watson stat		2.352009
Sum Squared Reside	1905426	Log likelihood		–227.7262

It indicates that improvements in health status are the product of private sector investment, whereas governmental health spending is little and used in ways that have little impact on economic growth. These findings indicate the private sector's critical and considerable role in improving health outcomes. Because the governmental sector does not contribute to the provision of health facilities, it is the private sector that makes significant contributions to improving health status. Trade openness has a beneficial and considerable influence on economic growth. The population per bed has a detrimental impact on economic growth.

Table 6: Final Regression Results for Final Logit, Probit and Linear Models

Variable	**Logistic Model**	**Probit Model**	**Linear Model**
Intercept	-0.4133 (-1.09)	-0.2242 (-0.99)	0.4742175 (7.48*)
Family type	0.5064 (1.31)	0.30543 (1.39)	0.0943195 (1.57)
Satisfaction with profession	1.2311 (3.42*)	0.7271107 (3.57*)	0.2037027 (3.70*)
Marital status	-.8134 (-1.57)	-.474635 (-1.60)	-.133066 (-1.59)
Type of medical college/institute attended	1.12357 (3.30*)	.663126 (3.32*)	.2026607 (3.53*)
Number of children	.664907 (2.04**)	0.40112 (2.15**)	.081047 (2.08**)
Household income	2.10e-06 (1.08)	1.09e-06 (1.01)	2.32e-07 (0.98)
Pseudo R^2 (R^2 for Linear model)	0.1229	0.1244	0.1288
Chi-square statistics (F-Statistics for Linear model)	32.06 (0.00*)	32.46 (0.00*)	5.55

Notes: The t-statistics are presented in parentheses. The statistics significant at 1%, 5% and 10% levels of significance are indicated by *, ** and *** respectively. The values of R^2 reported for Logit and Prohibit models are the pseudo R^2 values.

When the population per bed grows, individuals have fewer health-care options, which has a long-term impact on economic growth. Secondary education is extremely important, suggesting that more educated people are more likely to adapt to current technology and contribute to economic progress. Contrary to theory, gross capital formation has not had a major influence on economic growth in the long run, but the link is favorable. The findings show that in the long run, indices of human capital, such as health and education, have a major influence on economic growth. As a result, we may state that governments should try to increase health and education levels in order to achieve long-term economic growth. Because public health spending has no substantial influence on economic development, health policies should be oriented in such a manner that they provide more incentives to the private sector to invest in health facilities. If a long-run connection exists between multiple parameters, an error correcting process is also going place. The speed of adjustment towards the long run equilibrium following a short run shock is shown by the error correction model. To test the error correlation.

The estimated lagged error correction component is negative and significant, showing that the model is correcting errors. The feedback coefficient (Error Correction term) is -0.68, meaning that around 68 percent of the disequilibrium from the previous year is corrected in the current year. Other calculated components show that only age dependency and secondary education have a significant impact on per capita GDP in the short run. There are no health indicators that have a significant impact on economic growth. It illustrates that the effect of health is only a long-run phenomenon, with no relevant relationship between health characteristics and short-term economic growth. We present the marginal effects or rate of reaction in the likelihood of getting employed to explanatory factors for a better understanding because non-linear regression parameters are not given the same obvious interpretation as linear regression parameters. These effects, also known as probability derivatives, do not have fixed values as parameters and instead depend on all of the model's explanatory components. As is customary, we will investigate the marginal effects of various explanatory variables on labor force participation as assessed at the sample statistics. This would be done to acquire a better understanding of the relationships since we will be able to determine the impact of changes of explanatory factors just on chance of hiring a lady doctor. When all independent variables are assigned, values equal to the corresponding sample averages, the marginal impact of a continuous variable (such as household income) tells how much the likelihood of being employed fluctuates in response to a unit change in the independent variable. The marginal impact of a dummy variable tells how much the likelihood of employment is increased or decreased (that whether marginal effect was either positive or negative) in families where the dummy variable is equal to one compared to households where the dummy variable is set to zero.

Since the table estimated marginal effects are quite similar, we will interpret the results of Logit model only. The most significant variable satisfaction with profession. The marginal effect of this variable is about 0.21, which shows that on average the lady doctors who are satisfied with their profession are 21 percent more likely to be employed as compared to those who are not satisfied. In other words, the proportion of lady doctors who are currently employed are 21 percentage points higher among those who are satisfied with their jobs. The next similarly significant variable is the type of educational institute of the respondent and its effect is also positive. The marginal effect of this variable is also quite high, somewhere close to 0.19. This estimate shows that the lady doctors who have acquired their professional degree from a public-sector institute are 19% more likely to be employed. This is a substantial difference and there could be various reasons to explain it. Public sector students are generally fond to be more focused on their profession and are keen to start working immediately after completing their education. They are also preferred by employers because their expectations about earning are pragmatic, while the doctors completing their education from private institutes have spent a lot of money on education and expect to get similarly high wages in the market. The number of children is another significant variable, and its marginal effect is quite large. The result show that each additional child is associated with about 11%. So, if a typical lady doctor has two children, she will on average be 22% more likely to be employed as compared to someone having no children.

5. Conclusions and Policy Implications

The primary goal of this research is to examine the short- and long-range effects of health on economic growth. The achievement of the goal of co-integration. While Error Correction approaches is used in conjunction. Findings demonstrate that dependence of age, openness of trade, per bed population, enrollment in secondary schools, life expectancy, and death rate all have an impact in per capita GDP, but health spending has no effect.

The findings show that health is a crucial factor in predicting economic growth in the long run. Because all indicators of health had a substantial influence in the long-term growth. However, the

Error Correction model results show that the indicator of health has little effect on economic growth for the near run. While it implies that the influence of health indicators is only a phenomenon of long-run, and that there was no meaningful association of health factors with economic growth in the short term. The study's policy implications include those countries like Pakistan may reach high levels of income per capita if expanded and strengthened the stock of capital of healthy human, especially if existing stocks were at the low end. Furthermore, analysis shows that public health expenditure plays a relatively minor effect in influencing per capita GDP. According to study's findings, healthy human capital can be incorporated in equation of growth since it was a significant component of healthy human capital. Furthermore, there was an urgent need for research that examines the dynamics for health throughout Pakistan, as such research has been neglected for many years. Similarly, comparative research on the function of private and public health care facilities in strengthening health human capital is required. Lady physicians are primarily determined by three factors: job happiness, type of medical college/institute attended, and number of children. The findings indicate that the chance of employment is much greater among female doctors who are content with their professions, have finished their professional education at a public sector institute, and have fewer children.

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Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Disclosure statement

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