




Muhammad Khizar Hayat<sup>1</sup>, Ahmar Jamshaid<sup>2</sup> & Neelam Sultana<sup>3</sup>

<sup>1</sup>Lecturer, Department of Economics, Thal University, Bhakkar, Punjab, Pakistan

<sup>2</sup>Lecturer, Department of Business Administration, Thal University Bhakkar, Pakistan

<sup>3</sup>Visiting Lecturer, Department of Economics, Thal University, Bhakkar, Punjab, Pakistan

KEYWORDS	ABSTRACT
An Investigation Factors, Health Care Expenditures, Pakistan	<p>In order to complete this study on factors affecting health care expenditures, we collected the annual data from 1972 to 2020 in order to assess the factors affecting health care expenses. The time series data frequently have unit root problem, which is present in data utilized in this study. It was scientifically proven by Eigen value test results that there is a causal relationship between health expenditures and the factors affecting those expenses. The Johansen co-integration approach has been used to examine long-term relationship between the variables. The study's conclusion is that access to health care in Pakistan is both a need and a luxury. Health care costs in Pakistan are being significantly impacted by urbanization. The number of doctors and hospital beds per 1000 people has a beneficial impact on health care costs. People under the age of ten and those who are older are more vulnerable and are having a favorable impact on health costs. The results offered the significant information in reaching the conclusion and offering suggestions to the policy makers and future researchers.</p> <p> 2023 Journal of Social Research Development</p>
<b>Correspondence</b>	Muhammad Khizar Hayat
<b>Email:</b>	<a href="mailto:theeagletsbkr@gmail.com">theeagletsbkr@gmail.com</a>
<b>DOI</b>	<a href="https://doi.org/10.53664/JSRD/04-02-2023-11-352-371">https://doi.org/10.53664/JSRD/04-02-2023-11-352-371</a>

## INTRODUCTION

Health is basic human need and regarded as one of pillars of human capital. Modern Development Economists focused on importance of human capital. They are of the view that human capital along with labor and capital is definitive of production process (Bilgili, Kuşkaya, Awan & Türker, 2021). In this linking, health is not only essential goal of development, but a major contributor to societal and economic progress. Mushkin (1962) has stressed how health care spending affects GDP growth. Mushkin (1962) argues that health care spending is crucial for increasing people's capabilities and,

by extension, for boosting economic growth. [Grossman \(1972\)](#) agreed that health care spending was crucial, and he argued that health care was a form of capital that needed to be properly treated in order to spur economic development. Many empirical evidences advocate health led growth. Thus, [Somasunda, Ranathunga, Dissanayake, Silva and Katulanda \(2020\)](#) explored that pitiable health infrastructure and disease reduced life spans of the workers and ultimately reduced their life time incomes. Consequently, [Schultz \(1999\)](#) claimed good health has favorable impact on the children ability which ultimately transferred in decrease in the dropout rate and higher educational returns. Higher educational attainment amplifies effectiveness of human capital formation. [Somasunda et al. \(2020\)](#) divulges that the effective human resources through improved health make up eventual base for economic prosperity.

The primary focus of the health economics was on how healthcare funds were allotted nationally. Pakistan's economy has flourished since its independence. Still, performance of Pakistan in terms of health status i.e., under five mortality rate, infant mortality rate and longevity. When [Newhouse, 1977](#)) presented his groundbreaking research upon the factors that determine health care costs, he concluded that income was only factor among those studied and accounted for 90% of variance in health care costs. [Çetin and Bakirtaş \(2019\); Okunade and Karakus \(2001\); Payne et al. \(2015\)](#) all of whom are of the view that there are number of social and economic factors which affect the health expenditures. Stated that health care costs are determined by variety of social and economic factors in addition to income. The theoretical foundation for this issue is provided by the increase in health and education stocks ([Somasunda, Ranathunga, Dissanayake, Gamage, Silva & Katulanda, 2020](#)). The relationship between healthcare spending and output levels can be viewed from two primarily distinct angles. First, healthy workers are more productive workers. Since they don't have to spend as much time getting treated, they can work more. In addition to preferring to recruit the healthy people, employers also think that a worker's family members' health will have an adverse effect on their productivity. Also included in the definition of "costs" are medical expenses ([Shahzad, Jianqiu, Hashim, Nazam & Wang, 2020](#)).

Health and medical expenses are greatly influenced by socioeconomic determinants, as shown by ([Abbas & Hiemenz, 2011; Yaqoob et al., 2018](#)) argues that per capita spending is one of the main determinants of health care prices along with Income Inequality Indicator, Gross Domestic Product, the proportion of public to private consumer expenditures. Health care expenses in Pakistan can be partially explained by the factors other than GDP per capita, according to ([Bashir & Kishwar, 2021; Panezai et al., 2017](#)) social and political variables are impacting health expenditures. The standing of economic considerations in affecting health expenditure is confirmed by different investigators like ([Bashir & Kishwar, 2021](#)). In the past three decades, economists have shown a growing interest in financial investments in the human resources. The intention of this investigation is to examine the short- and long-term effects of the health spending. Income has been the primary objective of many empirical research since of its obvious relationship to health care costs ([Shahzad, Jianqiu, Hashim, Nazam & Wang, 2020](#)). Many aspects of a society's economy, including its level of urbanization, its health status (measured by things like life expectancy) and its level of age dependency (measured by proportion of its population that is either younger than 10 or older than 60), determine health

care spending. The government's focus on health is reflected in health spending on a per capita basis (Yaqoob et al., 2018).

## LITERATURE REVIEW

### Socioeconomic Profile of Pakistan

Economy has done well since independence, but human resource development has been ignored. The economy grew at rate of over 5% annually over the time frame. Over that time period, nominal per capita GDP expanded by the factor of three (Saleem et al., 2021). The health care industry, like many others, was underdeveloped when country gained independence. There were about a third as many birthing clinics as there were hospitals (292 vs. 722). The country's health care system, like its physical infrastructure, was understaffed, with only one midwife, four LHVs, eighty-eight RNs, and over thirteen hundred MDs. According to country health statistics, Pakistan physical infrastructure has grown significantly since independence. Different health metrics in Pakistan have improved due to Pakistan's performance in medical health facilities mainly in infrastructure. In comparison to other emerging countries, not even South Asian countries, progress is not adequate (Panezai et al., 2017). Public health system in Pakistan is struggling to keep up with needs of growing population. Health spending as percentage of GDP in Pakistan has never gone above 1%. Low emphasis given to health sector and deficient financial allocation for stated sector are reasons for the slow progress in various health metrics.

Difficulty getting to medical care is a major issue in Pakistan. The research by the National Institute of Health in 2017 found that nearly half of country's population did not make use of any medical institution at all. One of greatest barriers to accessing these health treatments is the long distance from which one must go. The government's focus was on expanding the quantity of structures, but not the quality of those structures' underlying services. There is a dearth of both financial means and access to medical treatment for the poor. Large hospitals are often located in the major metropolitan areas, while the major proportion of the population of country lives in rural areas (Shahzad et al., 2020). While the World Health Organization recommended \$34 per person, Pakistan only spends \$4.2 per person on health care. Despite the rising problems including poverty, inequality, and poor health, Pakistan has failed to satisfactorily invest in its human resources (Cheema et al., 2020). In short, Pakistan's health care system is a highly unequal, western-oriented curative care paradigm that fails to meet needs of an overwhelming majority of Pakistanis (Zaidi). Pakistan has done well on several health measures, its recital is not up to standard when compared to that of its South Asian neighbors (Sana et al., 2020).

Table 1 Comparison of Health Indicators among Asian Countries

Country	Crude Birth Rate/1000	Crude Death Rate/1000	IMR /Per 1,000 Live Births	Life Expectancy at Birth	TFR/Woman CB/Woman
Pakistan	26.538	6.785	56.888	67.64	3.300
Sri Lanka	14.840	7.021	6.665	77.39	2.144
Nepal	18.705	6.264	24.287	71.45	1.826
India	16.420	7.380	27.695	70.19	2.159
Bangladesh	17.067	5.820	22.614	73.29	1.954

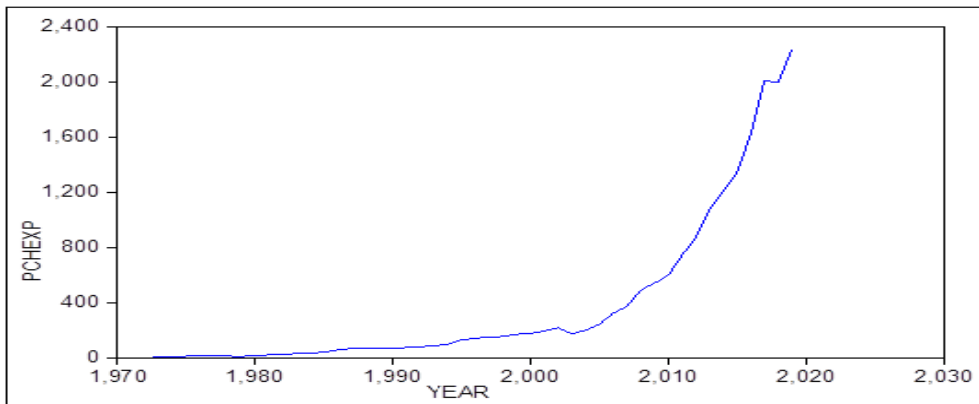
Maldives	12.551	2.800	5.568	79.61	1.795
----------	--------	-------	-------	-------	-------

Source: World Development Indicators (2022)

**Per Capita Health Expenditures**

Pakistan's health care system has historically been underfunded, making it one of the country's most neglected areas. Per Capita Health Expenditures increases over time from 4.06 Rupees in 1972 to 2000 Rupees in 2022. The country has observed overall increasing trend but 2007-2010 there is a declining trend in per capita health expenditures and again after 2010 required per capita health expenditures go up.

Figure 1 Handbook of Statistics (Per Capita Health Expenditures)

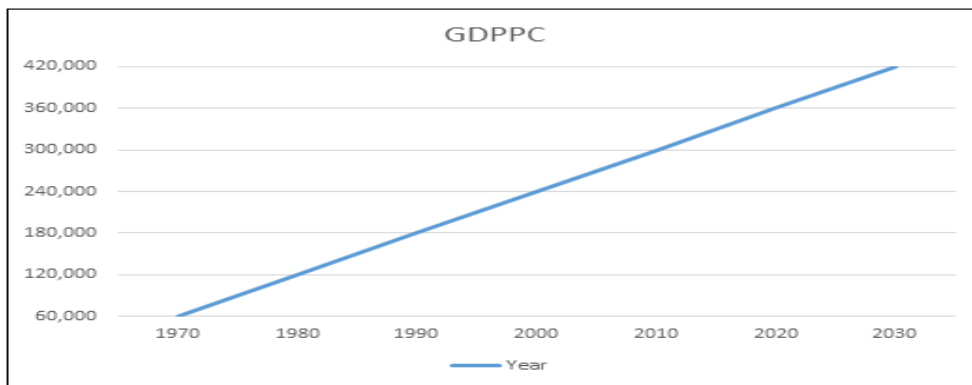


Source: Handbook of Statistics, State Bank of Pakistan

**Gross Domestic Product Per Capita**

GDP per capita in country experienced an increasing trend in Pakistan. Pakistan has observed well in GDP growth rate over time and eventually end up in enhancement of Gross Domestic Product per Capita over time. Per capita gross domestic product increased from 1972 to 2000 at decreasing rate and after 2000 this rate is of an increasing rate.

Figure 2 Handbook of Statistics (Gross Domestic Product)

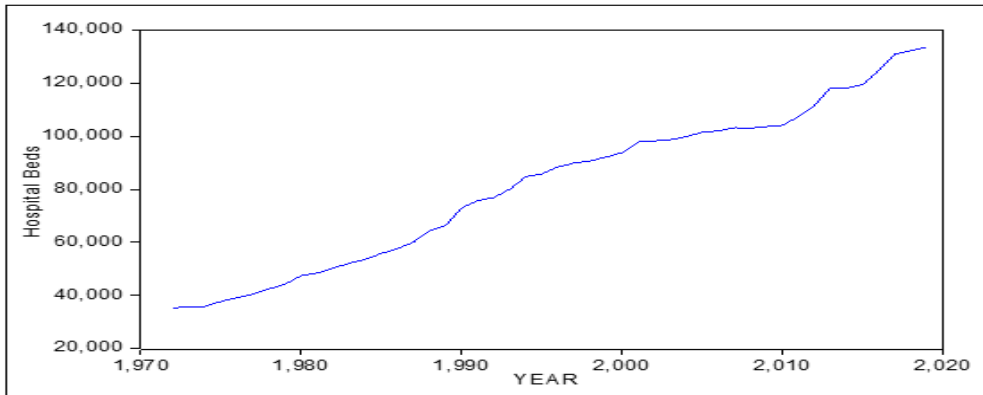


Source: Handbook of Statistics, State Bank of Pakistan

### Hospital Beds in Pakistan

Provision of health facilities are one of the basic responsibilities of state. Hospital Beds represents health infrastructure in Pakistan. The following chart illustrates the general upward trend in ratio of hospital beds to the population throughout time.

Figure 3 Handbook of Statistics (Hospital Beds)

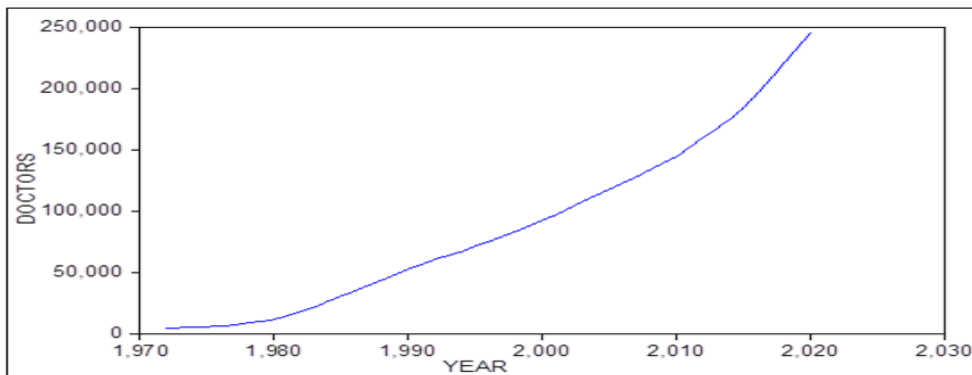


Source: Handbook of Statistics, State Bank of Pakistan

### Doctors (Health Personnel)

Doctors play vital role in facilitating health care. Country's doctor population has grown throughout time. Figure indicates that number of doctors in country increased steadily up to 1984. Researchers found sharp increase in country physician workforce after 1984. Total medical professionals in the country have already surpassed 0.2 million.

Figure 4 Handbook of Statistics (Health Personnel)



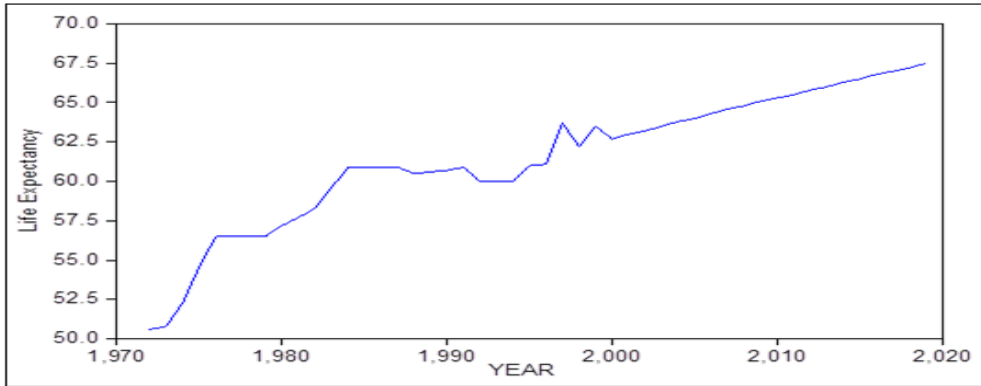
Source: Handbook of Statistics, State Bank of Pakistan

### Life Expectancy at Birth

Health is regarded as integral part of human capital and investment in health is regarded as basic human right and which will end in improved human life. When investments are made in health sector it will result in improvement in health status of people. Life Expectancy at birth is regarded

as a proxy variable for the health status of people. It is apparent from the figure below that Pakistan has experienced a considerable improvement in life expectancy at birth due to provision of better health facilities. Although country has experienced well in terms of health status yet it is behind neighboring countries.

Figure 5 Handbook of Statistics (Life Expectancy at Birth)

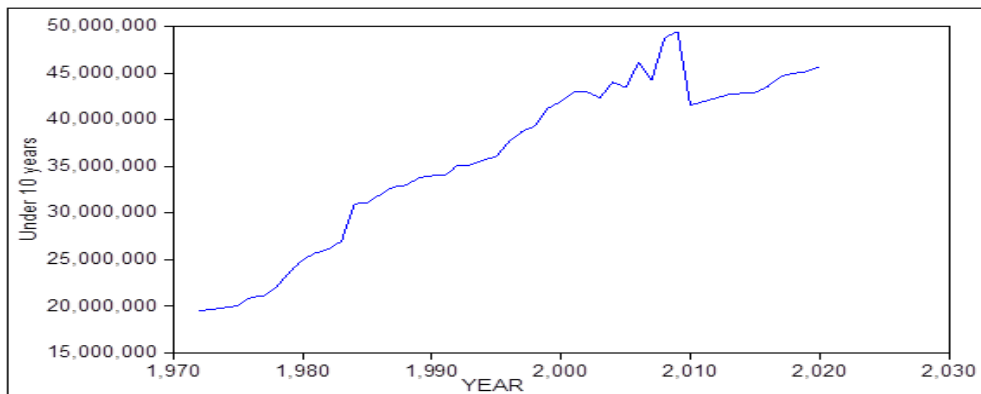


Source: Handbook of Statistics, State Bank of Pakistan

### Population Below 10 Years of Age

Pakistan is one of the populous countries of the world. Still, we are experiencing a high birth rate in spite of many attempts made by the Government. Near about twenty one percent of the population fall below ten years of age group and facing health problems in Pakistan. The provision of medical health facilities for children is essential and therefore we have observed an increase in government health care spending for children.

Figure 6 Handbook of Statistics (Population)



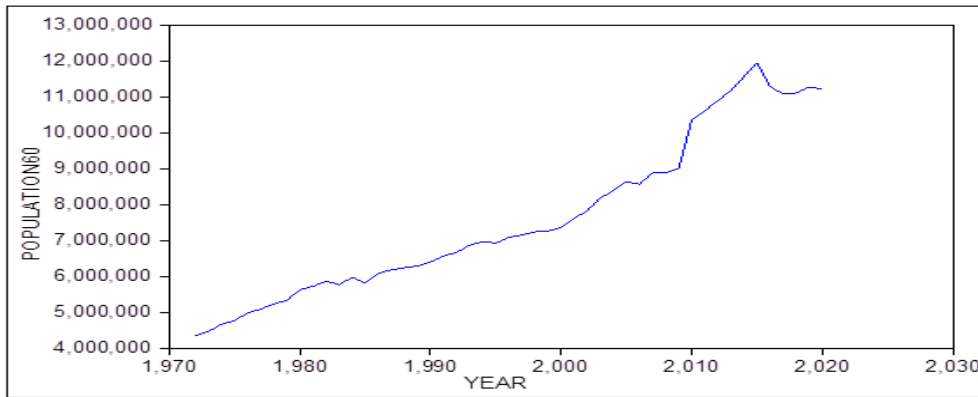
Source: Handbook of Statistics, State Bank of Pakistan

### Population above 60 Years of Age

Due to the improved health facilities aging population in Pakistan is increasing. Like infants and children old age people face many health problems. Old people are easy victim of the disease. This

segment of the country needs more health facilities for survival. Figure below shows that population above 60 years of age is on an increasing trend. Figure below shows that till year 2010 there is an increase in population above sixty years of age.

Figure 7 Handbook of Statistics (Population)

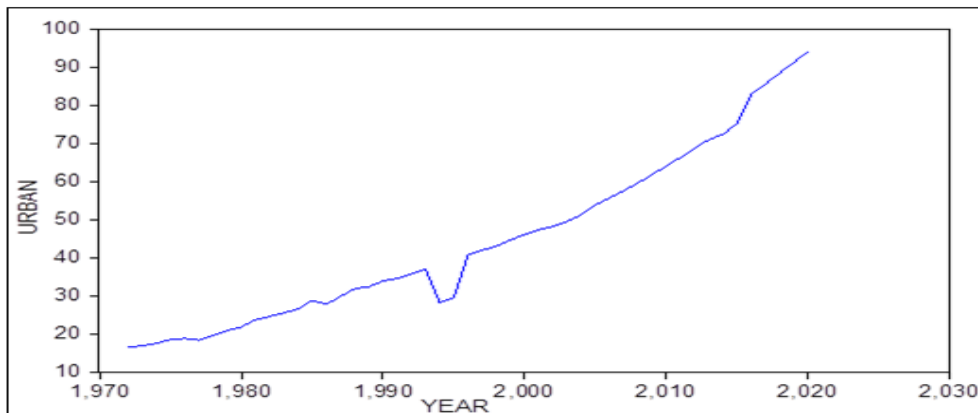


Source: Handbook of Statistics, State Bank of Pakistan

### Urbanization

The term "urbanization" refers to percentage of a country's population that resides in urban areas. Urban population has better choices to seek health facilities. Urbanization on other hand can have unfavorable pollution effects and lead to health problems. Figure below shows an increasing trend in urbanization. There was a decline in 1995 in urban population.

Figure 8 Handbook of Statistics (Population)



Source: Handbook of Statistics, State bank of Pakistan

The first research on what factors affect the healthcare costs was provided by (Newhouse, 1977). He investigated the relationship between government expenditure on health care and fiscal health. He estimates that income accounts for nearly 90 percent of variance in healthcare costs. He reasoned that income is primary determinant of how much is spent on public health. In addition to per capita

income, there are numerous other factors that explain health care costs (Cheema et al., 2020). Many research efforts have been made to identify variables that influence health care costs. There are two distinct types of these studies: those that focus on a single country and those that compare multiple countries. In this connection, many investigators have carried out studies to investigate the factors that influence healthcare expenditure within the particular nations. Cantarero, Prieto, David, and Santiago (Sana et al., 2020) as well as (Lord et al., 2020) all examined this notion further in their own research. However, other researchers have used cross-national data to investigate what factors influence health care costs. In this linking, the objective of this research is investigating factors affecting health care expenditures in Pakistan therefore the focus of the study is to include studies focused on single country.

The factors that led to increases or decreases in health care spending in Pakistan were studied by (Siddique et al., 1995). According to results, health care spending is strongly correlated with both literacy rates and GDP per capita. In 1999, Noro et al. made an effort to learn what factors influence Finnish seniors' health service consumption and healthcare spending. The scientists discovered that the ageing population and higher incomes in Finland had a considerable and beneficial effect on health care spending. (Cicinelli et al., 2000) conducted an empirical analysis of the factors that influence health care costs using the Canadian time series data from 1975–1996. Thus, according to (Prasetyowati & Panjawa, 2022), a country's total expenditures on health care, labour force productivity, and gross capital formation are important catalogs of the country's economic health. The analysis found that government health transfers as the percentage of GDP per capita had a significant and beneficial effect on the health care costs (Lord et al., 2020).the study of (Shen et al., 2018), used OLS analysis on data from 1960 to 2001 in an effort to determine what factors influence healthcare spending in Singapore. The author observed that the health expenditure elasticity was 0.01 for the Medisave Scheme, 0.32 for the amount of government spending on health, and 0.69 for the GDP per capita.

Peeters et al. (2017) evaluated the factors of economic growth and health in 14 major Indian states using panel data from 1970-71 to 2015-16 and discovered two-way causalities between economic growth and health status. Health care expenditures in Portugal were analyzed using data from the National Health Surveys conducted by (Peeters et al., 2017). Health care spending can be partly explained by a variety of demographic factors, as the author discovered. The author also discovered the positive relationship between unemployment and health care spending (perhaps because the unemployed have more time to see a doctor). Razmi et al. (2012) investigated Iran from 1990 to 2009 using the OLS method and discovered significant positive association between government health expenditure and the human development index. Using time series data from Malaysia between (Edeme et al., 2017) used the co-integration method to analyses the factors influencing health expenditures. The author discovered a correlation between health care costs, GDP growth, and the number of people over the age of 65. Therefore, according to (Prasetyowati & Panjawa, 2022), a country's total expenditures upon health care, labor force productivity, and gross capital formation are important indices of the country's economic health. Economic development in the Nigeria, but the low worker health and life expectancy rate have an unfavorable effect on economic growth (Shahzad et al., 2020).



Edeme et al. (2017) demonstrated that when the ratio of health spending to GDP is less than ideal threshold of 7.5%, increasing health spending leads to improved economic performance in OECD nations from 1990 to 2009. The study of (Fadilah et al., 2018) validated econometrically in ASEAN7 panel data from 1990 to 2016 that there are long run causalities from GDP, HDI, and unemployment rate to health expenditure as percentage of GDP and short run causalities from health expenditure to GDP of the ASEAN-7 (Shahzad et al., 2020). According to (Prasetyowati & Panjawa, 2022), the country's total expenditures on health care, labour force productivity, and gross capital formation are important indices of the country's economic health. Health care expenditures in Portugal were analyzed using data from the National Health Surveys conducted by (Peeters et al., 2017). Using data collected from 1992-2015 in Spain, (Fadilah et al., 2018) investigates the factors that influence healthcare spending at the regional level. Similar to other developed nations, the author observed that the ratio of hospital acute for 1,000 people affected by healthcare costs was on the decline in Spain. Thus, the researcher discovered that health care spending in Spain was positively affected by the improved income per capita, the presence of the children and babies, and an older population (Fadilah et al., 2018).

**DATA & METHODOLOGY**

**Data**

The factors affecting health care expenditures in Pakistan have been explored in the context of the Pakistan for the period 1972-2020. Annual time series data of the health expenditures per capita, social, economic, demographic, health services, health infrastructure variables is used to investigate the said relationship. Data on all variables have been borrowed from Handbook of Statistics, State Bank of Pakistan.

**Model Specification**

Many macroeconomic studies have looked into what factors influence the health care spending by employing a demand function. The effect of various socioeconomic characteristics upon health care cost has been investigated.

$$HE = f(SEF) \text{----- (A)}$$

Health expenditures (HE) and social and economic determinants of health expenditures (SEF) are denoted in (A) above.

$$LPC\_HECXP = \alpha + \beta LGDPPC + \gamma LAGE + \delta LBED\_1000 + \lambda LDR\_1000 + \eta LLE + \psi LURBAN + \epsilon \text{----- (B)}$$

Wherein,

LPC\_HECXP = Log Per capita Health Expenditures, LGDPPC = log GDP per Capita, LBEDS\_1000 = log Beds/1000 population, LDRS\_1000 = log Doctors per 1000 population, LAGE= log Population above 60 years+ log population below 10 years of age, LLE = Log Life Expectancy, LURBAN = Log Urban, E = Error term.

**Econometric Methodology**

Researchers have employed time series data to probe the connection between health and economic development. Most economic, & notably macroeconomic, variables are often theorized to be linked

via long term relationships in economic theory. Short-term fluctuations in these variables are likely, but long-term stability will be maintained by market forces or government intervention. The study used multivariate time series analysis because of specifics of secondary data set and the time series format. Time series are considered stationary if they have constant mean and constant variance, with covariance varying only on the time lag between observations. The variance of stationary time series is finite and independent of passage of time. The unit root problem, as defined by (Dickey et al., 1986) refers to fact that mean and variance of most time series exhibit oscillation. Co-integration analysis consists of three stages.

**Adoption of Steps for DFM**

(1) The unit root test is used to establish the order of parameters' integration. The unit root issue can be detected using variety of tests. The unit root issue in time series has been found using augmented Dickey-Fuller method (Dickey et al., 1986). (2) To ascertain whether or not the variables have the long-term relationship, a co-integration analysis has been used. Johansen co-integration technique was used to do this analysis in the study (Dickey et al., 1986). (3) To learn more about the short-term dynamics, Error Correction Model analysis is performed. Rate of return to long-term equilibrium following an external flux can be estimated using the error correction model. How to determine whether or not a Unit Root Problem exists? If the test statistics are lower than the crucial threshold, we must accept the null hypothesis that there is no unit root problem. If the test results are higher than the critical threshold, the null hypothesis that there is no unit root problem should be rejected (Nasir & Morgan, 2023).

**Cointegration Test**

When the order of integration (I (d)) for two or more time series is the same, we say that those series are co-integrated. While individual time series may not be stable, linear combination of time series will be, implying the existence of a long-run connection. Even if non-stationary time series leads to incorrect conclusions, if there is a long-run relationship between the variables, the errors will tend to wander from and return to zero, we may claim that I (0). This is true even if there is relationship between variables. When a variable only has one order of integration, I (1), this is the case that time series econometrics focuses on. Estimated coefficients using co-integration are "super consistent," which means they approach equilibrium more quickly than other methods (Kremers et al., 1992). If M and N are two nonstationary time series and the residuals derived from the regression are also nonstationary, then M and N are nonstationary.

$$M_t = \alpha_0 + \alpha_1 N_t + u_t \text{-----(1)}$$

When this occurs, we say that the two variables are co-integrated. The co-integration test verifies whether or not the linear combination of the aforementioned variables is stationary. When a long-term connection exists, the residuals series stabilises around zero. The general version of Johansen's co-integration equation looks like this. The Vector Auto Regressive criterion is used to generate this equation.

$$\Delta O_t = B_0 + B_1 \Delta O_{t-1} + B_2 \Delta O_{t-2} + \dots + B_p \Delta O_{t-p} + \epsilon_t \text{-----(2)}$$

Wherein,

$O = n \times n$  matrix of coefficients of variables,  $p =$  Autoregressive order,  $\varepsilon_t =$  Error term. So, specifying Johansen co-integration equation through VAR model for each model.

$$\Delta LPC\_HECXP_t = \alpha + \beta LGDPPC_t + \gamma LHE\_GDP_t + \delta LBED\_1000_t + \lambda LDR\_1000_t + \Omega LLE_t + \Psi LURBAN_t + \Upsilon \Delta LPC\_HECXP_{t-i} + \varepsilon_i \text{-----(3)}$$

( $i = 1, 2, 3, 4, 5$ ).

The duration of autoregressive lag is then calculated. Schwartz and Bayesian Criteria, abbreviated as SBC, define the length of the lag (Kremers et al., 1992).

### Hypothesis Testing

Null hypothesis

$H_0: \text{Beta} = 0$  (No Variable Co-integration), (Alternative hypothesis)  $H_1: \text{Beta} \neq 0$  (Co-integration link between variables), Where,  $\text{Beta} = \beta, \gamma, \lambda, \Omega, \Psi$ . These are the steps involved in Johansen's co-integration process, which Dickey et al. (1991) describe in further depth.

The first step is to determine the model's autoregressive order. The second step is to obtain the residual series by regressing  $Z_t$  on  $Z_{t-1}, Z_{t-2}, \dots, Z_{t-p+1}$ . A "Mt" series is what we've dubbed residuals. The third step is to obtain the residual series by regressing  $Z_{t-p}$  on  $Z_{t-1}, Z_{t-2}, \dots, Z_{t-p+1}$ . "Nt" refers to the residual series. The square of the correlation between "Mt" and "Nt" ( $t^2$ ) is calculated in the fourth step.

In the fifth step, we calculate the statistics for the trace test and the Eigen value test. These numbers are compared against thresholds afterward. Johansen and Juselius (1990) provide these values to test for the presence or absence of a long run relationship (co-integration) between the variables (Kremers et al., 1992).

How to Decide? If the trace statistics are smaller than the critical value, the null hypothesis, which claims that there is no co-integration, should be accepted. If the trace statistics are greater than the critical value, reject the null hypothesis that there is no co-integration.

### Error Correction Model

If there is a real long run relationship (co-integration) between time series, then an error-correction model, as developed by Engle-Granger, could depict the dynamic short-term interaction between these components. The Engle-Granger method is divided into two steps. First Step: Co-integration can be tested for after establishing a long-term connection between the variables. Second Step: The second stage entails creating a model for error correction. The co-integration process yields a series of residuals, and this series is what the error correction term represents. With the residual series, one lag is used. Meaning of phrase "error correction" cannot be emphasized. If this word is meaningful and negative, long-term equilibrium after short-term shocks shows model convergence. The phrase for error correction indicates the rate of change.

This portion of paper examines factors that influence Pakistan's overall health-care expenditures empirically. The Augmented Dickey Fuller (ADF) test, developed by (Dickey et al., 1986) is most well-known test for finding the unit root problem. ADF is utilized for any given level and starting differential time series.

**RESULTS & INTERPRETATION**

Table 2 Results of Augmented Dickey Fuller Test for Unit Root with Trend

Variable	ADF with Trend		ADF with Trend & Intercept		Order of Integration
	Level	First Difference	Level	First Difference	
LPC_HEXP	-2.015472	-4.302585	0.356603	-4.985402	I(1)
	-2.929734	-3.588509	-4.180911	-4.180911	
LGDPCC	-1.745392	-5.354557	-3.255337	-5.454679	I(1)
	-3.581152	-3.584743	-4.170583	-4.175640	
LURBAN	-0.935162	-7.749016	-4.175640	-4.654023	I(1)
	-3.588509	-3.588509	-4.502446	-4.180911	
LBEDS_1000	-1.732284	-4.892418	0.122717	-5.714309	I(1)
	-3.584743	-3.584743	-4.170583	-4.175640	
LDR_1000	-1.555352	-6.517918	-1.360510	-6.603993	I(1)
	-3.584743	-3.584743	-4.170583	-4.175640	
LAGE	-1.492689	-4.182117	-4.177348	-4.234972	I(1)
	-3.588509	-3.626784	-4.219126	-4.219126	
	-1.298013	-7.715899	-2.259667	7.793444	
LLE	-3.581152	-3.584743	-4.170583	-4.175640	I(1)

For Log per capita health expenditures, log gross domestic product per capita, LPC\_HEXP, LGDPCC, Log Age, Log Hospital beds per thousand population, log Doctors per thousand population, Log life expectancy and life Urbanization time series, null hypothesis unit root at level cannot be rejected. The time series, however, are stationary in first differences, implying that alternative hypothesis of a unit root is accepted at this stage. There are no time series that are not I (1). In the following part, we will perform unit root test on residual series to assess whether or not there is a long-term connection between variables.

**Unit Root Test for Residual Series**

Co-integration is an econometric concept that describes relationship between two non-stationary (but time-varying) time series. In study, it was discovered that all-time series are nonstationary at the trend and intercept levels. However, at initial difference, these series are stationary. The OLS approach is used to regress the initial difference series of the variables. To ensure that the residuals were stationary, the ADF test was utilized. If the ADF test statistics reject the null hypothesis of unit root, there is a long-run relationship between variables. As a result, the time series are cointegrated accordingly.

**Results of Augmented Dickey Fuller Test for Unit Root of Residual Series**

Tables 3 ADF Test Statistic with Intercept (Resid01)

ADF Test Statistic	-4.675437	1% Critical Value*	-3.8972
		5% Critical Value	-2.8972
		10% Critical Value	-2.6728

\*MacKinnon critical values for rejection of hypothesis of a unit root

Source: Author's Calculation, using Eviews 8

**Results of Augmented Dickey Fuller Test for Unit Root of Residual Series**

Tables 4 ADF Test Statistic with Trend and Intercept (Resid01)

ADF Test Statistic	-4.328762	1% Critical Value*	-4.1987
		5% Critical Value	-3.2365
		10% Critical Value	-2.9909

MacKinnon critical values for rejection of hypothesis of a unit root

Source: Author's Calculation, using Eviews 8

Residual series is stationary at level, as shown by tables above. This validates long-run relationship and allows us to move on to the next step in approach, determining the ideal lag time.

**Co-integration Test**

Once optimal lag duration is determined, it is possible to investigate how many co-integrating vectors exist. Maximum Eigen Value is used to find number of co-integrating vectors. Based on the Maximal Eigen value, number of co-integrating vectors is represented by T.

Table 5 Unrestricted Cointegration Rank Test (Trace)

Eigenvalue	Trace Statistic	0.05 Critical Value	Probability**	Hypothesized No. of CE(s)
0.704620	157.5564	129.67873	0.0001	None *
0.550237	103.8987	96.98726	0.0122	At most 1 *
0.464875	68.74122	68.89272	0.0607	At most 2
0.384472	41.25004	46.78672	0.1815	At most 3
0.298041	19.87791	29.15625	0.4311	At most 4
0.091342	4.307167	16.87262	0.8773	At most 5
0.002101	0.092538	3.786252	0.7610	At most 6

Trace test indicates 2 cointegration equation(s) at the 0.05 level

\* Denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Source: Author's calculations using Eviews 8

Table 6 Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.704620	53.65768	47.78265	0.0068
At most 1	0.550237	35.15751	41.09827	0.1616
At most 2	0.464875	27.51118	33.23674	0.2370
At most 3	0.384472	21.35213	28.76253	0.2555
At most 4	0.298041	15.57075	22.09182	0.2509
At most 5	0.091342	4.214630	13.34627	0.8360
At most 6	0.002101	0.092538	4.00876	0.7610

Max-eigenvalue test indicates 1 cointegration equation(s) at the 0.05 level

\* Denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Consistent with prior research (Fulop & Reinke 1983; Kleiman 1986; Correa 1992), this analysis indicated that socioeconomic determinants play a crucial influence in influencing health care costs. Results showed health care costs were positively affected by all variables except for urbanization. Pakistan's potential degree of development is indicated by positive sign of GDP per capita. Health care spending in Pakistan is positively correlated with GDP per capita. (Bayer & Hanck, 2013; Jabeen et al., 2020), (Shakoor et al., 2021; Zhou et al., 2019) all found similar outcomes, therefore these findings are consistent with those of their predecessors. PCHEXP is more elastic than GDP per capita since of its elasticity of 0.15. Health care spending as a percentage of GDP is more sensitive to economic growth than is GDP per capita. Data show that health spending as percentage of GDP has a large and positive impact on health spending per capita. Pakistan's population growth rate has been declining, but the country's GDP per capita has been increasing.

As the country's population declines, health-care spending as a percentage of GDP rises, which is a positive indicator for country's per capita health-care spending. With an elasticity of 2.40, health-care expenses as a proportion of GDP are more elastic than health-care costs per capita. The rising costs of providing quality medical care in Pakistan have been related to the country's expanding urbanization. The inverse link between urbanization and health care spending could be attributed to fact that most people seek out unlicensed medical providers due to the low cost of their services, yet these visits are not counted in official health care spending. People in metropolitan areas may be less prone to illness because they are knowledgeable about health care and disease prevention. Metropolitan areas have lower public health expenditures due to easy access to healthcare services such as major hospitals and affordable modes of transportation. Indicators such as the number of doctors per 1000 people and the number of hospital beds per 1000 people can be used to assess the quality of health care in Pakistan.

Health-care spending has a favorable impact on GDP per capita. The fact that elasticity of doctors per 1000 people and hospital beds per 1000 people in response to per capita health expenditures are both less than one illustrates that health care is a necessity rather than a luxury. According to the study's conclusions, an increase in life expectancy would result in decreased health-care costs per person. This finding is consistent with previous research (Shahbaz et al., 2016) As population's average life expectancy rises, so do health-care costs. It's understandable that as the populations average lifetime increases, so will the quantity of health difficulties faced by the elderly. Health care spending as a percentage of GDP has increased as a result of people's attempts to better their health. Life expectancy is the most important factor in influencing health care expenditures when compared to the other elements in the model.

Table 7 Long Run Determinants of Health Expenditures (own calculations)

Variable	Coefficient	Standard Error	t-Statistics
GDP Per Capita	0.331719	0.12164	2.7271
Doctors per 1000 Population	0.305136	0.07293	4.1840
Beds per 1000 Population	0.429297	0.14029	3.0601
Population Below 10 Years	2.607389	0.22066	11.8163
Population Over 60 Years	2.323463	0.48954	4.7462
Ratio of Urban to T-Population	-1.945246	0.89563	-2.1719

The sign of GDP per capita is positive, showing a positive degree of development in Pakistan. Per capita GDP explains health costs positively and correctly. In Pakistan, healthcare is considered a normal good, as evidenced by the fact that the elasticity of health expenditures relative to GDP is less than one. The conclusions differ from (Bayer & Hanck, 2013; Fadilah et al., 2018) investigations. This low-income outcome denotes the unequal income distribution. The comparison of this study's elasticity estimate of income with other industrialized and OECD countries clearly demonstrates the government's insignificance in health sector. GDP per capita elasticity of health expenditures is 0.33, indicating that a one percent rise in income leads to a 0.33 percent increase in health care spending in Pakistan. It is apparent that public health system in Pakistan is poorly organized and fails to reach majority of country's population. This inadequacy in health-care delivery necessitates the establishment of private hospitals and clinics. The provision of private health services is beyond the population's purchasing power.

The availability of doctors and hospital beds for population reflects the country's overall health-care quality. Doctors per thousand population and hospital beds per thousand population have a beneficial effect. Responsiveness or elasticity of hospital beds and doctors per thousand people is less than one, showing that health is a necessity in Pakistan (Shahbaz et al., 2016). The positive sign for Population under 10 years old indicates that this age group is a contributing component in the determination of health care spending in Pakistan. The findings are comparable with those of (Bello et al., 2016) and (Shahbaz et al., 2016) In the event of a sickness or pandemic, the population in this age bracket is vulnerable. This age group takes more medications and makes greater use of health-care services. According to the study's findings, every 1% rise in the population under the age of ten results in a 2.60 percent increase in health-care spending. The sign of the Population over 60 years old coefficient is positive. Because they are in danger or at risk of disease, older adults require more medication than younger ones. Therefore, the findings are consistent with past research on health-care spending.

The sign of urbanization coefficient is negative, suggesting urbanization has a negative influence on health expenses. According to (Bello et al., 2016) residing in metropolitan settings allows people to have easily accessible health resources, which reduces health expenses. In metropolitan locations, public transport is less expensive and more readily available than in rural ones. As transportation is so inexpensive, health-care spending is reduced. People in metropolitan regions are more aware of health issues as a result of health care initiatives, and they employ preventative measures to avoid disease. Prevention is less expensive treatment. One factor for detrimental impact of urbanization could be people in cities seek medical care from legally unregistered doctors. These unregistered health care providers charge lower consulting fees than privately available certified and trained medical facility professionals. An error correction model is estimated to see the empirical analysis of the findings in the short run.

### Error Correction Model

An error correction model shows the short run dynamics and it also shows that how the convergence is made for long term equilibrium. After an external shock to the independent variable, the rate of adjustment of the dependent variable back to the equilibrium is measured by an error correction model.

For example

$$\Delta X_t = \alpha + \beta \Delta Y_{t-1} - \beta EC_{t-1} + \varepsilon_t \text{-----(Eq.1)}$$

Where EC = Error Correction Term. The error correction period regulates how quickly past model differences are addressed. ECM can be used to make estimates for the following.

- The Immediate Impact of N on M
- The Long-Term Impact of N on M
- The rate of adaptation after an initial exogenous shock, M eventually returns to equilibrium.

Tables 8 Results of Error Correction Model for Short Run Dynamics

Variable	Coefficient	Standard Error	t-Statistic
Constant	0.012401	0.022745	0.545225
Δ log GDP per capita	0.655585	0.106703	6.144036
Δ log Health expenditures as % of GDP	0.809698	0.057208	14.15351
Δ log Urban	-1.336361	0.854118	-1.564610
Δ log Beds per 1000 population	0.136262	0.300655	0.453217
Δ log Doctors per 1000 population	0.012279	0.037601	0.326557
Δ log Life Expectancy	8.882578	3.61858	2.454714
ECM (-1)	-0.591970	0.17566	-3.369978
R-squared	0.976035	F-statistic	82.60872

Source: Author's Calculations, using Eviews 8

It is desire of the researchers that expected sign of ECM must be negative. Because if the value of ECM is negative it will show pace at which model converge towards equilibrium and if this value has a positive sign, it will definitely result in divergence from equilibrium. Here in this analysis the sign for the error term is also negative. The error term's coefficient is likewise statistically significant. This year's value of the coefficient indicates that the severe disruption seen in all of the variables discussed last year has been reduced by around 59%. It's important to notice that the model's independent variables account for 96% of its variance. The F-Statistic of 82.6 is rather good and should be maintained. The short-term effect of all explanatory variables on health care spending is positive, except for urbanization. There is a significant correlation between health spending as a percentage of GDP, GDP per capita, and life expectancy. The positive determinants of health care spending, such as the number of hospital beds and physicians per thousand people, are statistically unimportant in the short run.

## DISCUSSION

In order to investigate type and direction of the causal relationship that exists between the various sets of data, the pair wise granger causality test is also utilized (Bilgili et al., 2021). There are a lot of different social and economic factors that go into explaining why healthcare is so expensive in Pakistan. As a result of previous study in which scientists attempted to investigate the factors that determine cost of health care, a number of different variables were selected for purpose of analyzing their influence on cost of health care (Xu et al., 2022). Significant pressure is being placed on the nation's healthcare system as a result of the country's fast increasing population as well as its high disease burden (Hammad et al., 2019; Shahzad et al., 2020). The high cost of healthcare in Pakistan



is due to a number of different variables. With a growing population and a high disease load, the healthcare system in this country is struggling to keep up (Shah et al., 2020). Additional strain on the system is caused by lack of proper health facilities and resources, which also results in increased expenses. Widespread absence of insurance for health coverage results in significant out-of-pocket expenses for medical services (Jabeen et al., 2020). Short spending by government on healthcare and restricted access to reasonably priced medications are further factors that contribute to rising costs (Rehman et al., 2020). Even if it may be useful, the implementation of cutting-edge medical technologies frequently results in financial burdens. There is a potential savings in healthcare expenditures that can realized via promotion of health education and preventative measures (Ali et al., 2021). Patterns of spending on healthcare in Pakistan are influenced not just by political and economic variables but also by social ones. For successful management and planning of healthcare expenses, it is essential to have solid understanding of these aspects and to take action accordingly (Bilgili et al., 2021; Xu et al., 2022).

### CONCLUSION

The study's major goal is to research empirically the factors that influence health care spending in Pakistan, a developing country. Many social and economic aspects contribute to the explanation of health-care costs in Pakistan. Based on earlier studies in which researchers attempted to examine health care expenditure determinants, a variety of variables were chosen to assess their impact on health care spending. Pakistan is a developing country, and the proportion of GDP spent on health, like that of other poor countries, is quite low. According to development agency figures, Pakistan spends less than 2% of GDP on health sector. Due to nature of data, the Johansen co-integration approach is used to empirically analyze factors that impact health spending in Pakistan. Time series data frequently confront a stationarity problem, which investigation also encountered. All of the variables studied in the research were nonstationary at beginning, but the first difference between they rendered them stationary, and the results derived from this analysis are not misleading. The Eigen value test statistic demonstrates the existence of a long run link between repressors and the dependent variable, health care expenditures. The pair wise granger causality test is also used to explore the nature and direction of causal relationship between different sets of data. According to study, urbanization had a negative impact on health care spending while per capita GDP, health care spending as a percentage of GDP, hospital bed availability, physician availability, and life expectancy had a positive impact.

### REFERENCES

- Abbas, F., & Hiemenz, U. (2011). Determinants of public health expenditures in Pakistan. *ZEF-Discussion Papers on Development Policy* (158).
- Ali, A., Audi, M., Bibi, C., & Roussel, Y. (2021). The Impact of Gender Inequality and Environmental Degradation on Human Well-being in the Case of Pakistan: *The American Statistician*, 38 (2), 22-36.
- Bashir, S., & Kishwar, S. (2021). Incidence and determinants of catastrophic health expenditures and impoverishment in Pakistan. *Public Health*, 197, 42-47.
- Bayer, C., & Hanck, C. (2013). Combining non-cointegration tests. *Journal of Time series analysis*, 34(1), 83-95.

- Bello, O., Teodoriu, C., Yaqoob, T., Oppelt, J., Holzmann, J., & Obiwanne, A. (2016). Application of artificial intelligence techniques in drilling system design and operations: a state of the art review and future research pathways. *SPE Nigeria Annual International Conference and Exhibition*,
- Bilgili, F., Kuşkaya, S., Khan, M., Awan, A., & Türker, O. (2021). The roles of economic growth and health expenditure on CO<sub>2</sub> emissions in selected Asian countries: a quantile regression model approach. *Environmental Science and Pollution Research*, 28(33), 44949-44972.
- Çetin, M. A., & BAKIRTAŞ, İ. (2019). Does urbanization induce the health expenditures? A dynamic macro-panel analysis for developing countries. *Dumlupınar Üniversitesi Sosyal Bilimler Dergisi*, 61), 208-222.
- Cheema, A. R., Zaidi, S., Najmi, R., Khan, F. A., Kori, S. A., & Shah, N. A. (2020). Availability does not mean utilisation: analysis of a large micro health insurance Programme in Pakistan. *Global Journal of Health Sciences*, 12(10), 1-4.
- Cicinelli, E., de Ziegler, D., Bulletti, C., Matteo, M. G., Schonauer, L. M., & Galantino, P. (2000). Direct transport of progesterone from vagina to uterus. *Obstetrics & Gynecology*, 95(3), 403-406.
- Dickey, D. A., Bell, W. R., & Miller, R. B. (1986). Unit roots in time series models: Tests and implications. *The American Statistician*, 40(1), 12-26.
- Edeme, R. K., Emecheta, C., & Omeje, M. O. (2017). Public health expenditure and health outcomes in Nigeria. *American Journal of Biomedical and Life Sciences*, 5(5), 96-102.
- Fadilah, A., Ananda, F., & Kaluge, D. (2018). A panel approach: how does government expenditure influence human development index? *Jurnal Ekonomi dan Studi Pembangunan*, 10(2), 130-139.
- Grossman, M. (1972). On the concept of health capital and the demand for health. *Journal of political economy*, 80(2), 223-255.
- Hammad, H. M., Ashraf, M., Abbas, F., Bakhat, H. F., Qaisrani, S. A., Mubeen, M., Fahad, S., & Awais, M. (2019). Environmental factors affecting the frequency of road traffic accidents: a case study of sub-urban area of Pakistan. *Environmental Science and Pollution Research*, 26, 11674-11685.
- Jabeen, G., Yan, Q., Ahmad, M., Fatima, N., Jabeen, M., Li, H., & Qamar, S. (2020). Household-based critical influence factors of biogas generation technology utilization: a case of Punjab province of Pakistan. *Renewable Energy*, 154, 650-660.
- Kremers, J. J., Ericsson, N. R., & Dolado, J. J. (1992). The power of cointegration tests. *Oxford bulletin of economics and statistics*, 54(3), 325-348.
- Lord, F., Pyne, D. B., Welvaert, M., & Mara, J. K. (2020). Methods of performance analysis in team invasion sports: A systematic review. *Journal of Sports Sciences*, 38(20), 2338-2349.
- Mushkin, S. J. (1962). Health as an Investment. *Journal of political economy*, 70(5, Part 2), 129-157.
- Nasir, M. A., & Morgan, J. (2023). The methodological problem of unit roots: stationarity and its consequences in the context of the Tinbergen debate. *Annals of Operations Research*, 1-18.
- Newhouse, J. P. (1977). Medical-care expenditure: a cross-national survey. *The journal of human resources*, 12(1), 115-125.

- Okunade, A. A., & Karakus, M. C. (2001). Unit root and cointegration tests: timeseries versus panel estimates for international health expenditure models. *Applied Economics*, 33(9), 1131-1137.
- Panezai, S., Ahmad, M. M., & Saqib, S. E. (2017). Factors affecting access to primary health care services in Pakistan: a gender-based analysis. *Development in practice*, 27(6), 813-827.
- Payne, J. E., Anderson, S., Lee, J., & Cho, M. H. (2015). Do per capita health care expenditures converge among OECD countries? Evidence from unit root tests with level and trend-shifts. *Applied Economics*, 47(52), 5600-5613.
- Peeters, S. A., Engelen, L., Buijs, J., Chaturvedi, N., Fuller, J. H., Jorsal, A., Parving, H.-H., Tarnow, L., Theilade, S., & Rossing, P. (2017). Circulating matrix metalloproteinases are associated with arterial stiffness in patients with type 1 diabetes: pooled analysis of three cohort studies. *Cardiovascular diabetology*, 16(1), 1-9.
- Prasetyowati, H., & Panjawa, J. L. (2022). Teknologi Dan Distribusi Pajak Mendukung Kualitas Pembangunan Manusia. *Transekonomika: Akuntansi, Bisnis Dan Keuangan*, 2(2), 23-36.
- Razmi, M. J., Abbasian, E., & Mohammadi, S. (2012). Investigating the effect of government health expenditure on HDI in Iran. *Journal of Knowledge Management, Economics and Information Technology*, 2(5).
- Rehman, H., Moazzam, D. A., & Ansari, N. (2020). Role of microfinance institutions in women empowerment: A case study of Akhuwat, Pakistan. *South Asian Studies*, 30(1).
- Saleem, A., Cheema, A. R., Rahman, A., Ali, Z., & Parkash, R. (2021). Do health infrastructure and services, aging, and environmental quality influence public health expenditures? Empirical evidence from Pakistan. *Social Work in Public Health*, 36(6), 688-706.
- Sana, A., Rida, F., Tayyaba, I., Masooma, M., Ayesha, Z., & Kalsoom, A. (2020). Willingness to pay for community-based healthcare insurance schemes in developing countries: a case of Lahore, Pakistan. *Ethiopian Journal of Health Sciences*, 30(1).
- Schultz, W. (1999). Changing behavior with normative feedback interventions: A field experiment on curbside recycling. *Basic and applied social psychology*, 21(1), 25-36.
- Shah, A. A., Ye, J., Shaw, R., Ullah, R., & Ali, M. (2020). Factors affecting flood-induced household vulnerability and health risks in Pakistan: The case of Khyber Pakhtunkhwa (KP) Province. *International Journal of Disaster Risk Reduction*, 42, 101341.
- Shahbaz, M., Loganathan, N., Mujahid, N., Ali, A., & Nawaz, A. (2016). Determinants of life expectancy and its prospects under the role of economic misery: A case of Pakistan. *Social Indicators Research*, 126, 1299-1316.
- Shahzad, K., Jianqiu, Z., Hashim, M., Nazam, M., & Wang, L. (2020). Impact of using information and communication technology and renewable energy on health expenditure: a case study from Pakistan. *Energy*, 204, 117956.
- Shakoor, U., Rashid, M., Baloch, A. A., Husnain, M. I. u., & Saboor, A. (2021). How aging population affects health care expenditures in Pakistan? A bayesian VAR analysis. *Social Indicators Research*, 153, 585-607.
- Shen, M., Tastet, L., Bergler-Klein, J., Pibarot, P., & Clavel, M.-A. (2018). Blood, tissue and imaging biomarkers in calcific aortic valve stenosis: past, present and future. *Current Opinion in Cardiology*, 33(2), 125-133.

- Siddique, A., Akram, K., Zaman, K., Laston, S., Salam, A., Majumdar, R., Islam, M., & Fronczak, N. (1995). Why treatment centres failed to prevent cholera deaths among Rwandan refugees in Goma, Zaire. *The lancet*, 345(8946), 359-361.
- Somasunda, N. P., Ranathunga, I., Dissanayake, A., Gamage, K., Silva, L., & Katulanda, P. (2020). The impact of SARS-Cov-2 virus infection on the endocrine system. *Journal of the Endocrine Society*, 4(8), bvaa082.
- Xu, X., Yang, H., & Li, C. (2022). Theoretical model and actual characteristics of air pollution affecting health cost: a review. *International Journal of Environmental Research and Public Health*, 19(6), 3532.
- Yaqoob, T., Bibi, R., & Siddiqui, J. S. (2018). Effects of economic and population factors on health expenditures: special case of Pakistan. *Pakistan Journal of Engineering, Technology & Science*, 6(2).
- Zhou, D., Shah, T., Ali, S., Ahmad, W., Din, I. U., & Ilyas, A. (2019). Factors affecting household food security in rural northern hinterland of Pakistan. *Journal of the Saudi Society of Agricultural Sciences*, 18(2), 201-210.