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Effects of Economic and Population Factors on Health Expenditures: Special Case of Pakistan

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***Abstract*- This paper aims to explore the factors affecting the health care expenditures of Pakistan by employing the Multivariate techniques for the annual data series from 1960 to 2010 .The variables we considered are Gross Domestic Product (GDP) as an economic indicator, Population of age 65 and above (P≥65), Population of age 0 to 14 (P(0-14)), Life expectancy at Birth (LE), Crude Birth rate (CBR) and population growth rate (GR) as population indicator and Total Health Expenditure (THE) as an influencing factor. Multiple regression considering Total Health Expenditure (THE) is applied as dependent on the variables mentioned above. Since Variance Inflation Factor (VIF) for all independent variables are very high, the smallest VIF is around 11 goes up to 65. The results obtained by Principal components reveal the effect of population structure and the age factor effect oppositely on Total Health Expenditures (THE). Factor Analysis suggests that the behavior of Health Expenditures is common with Gross Domestic Product (GDP), population of age 65 and above (P≥65) and life expectancy at Birth (LE) in Pakistan while population of age 0 to 14 (P (0-14)), population growth rate (GR) and Crude Birth rate (CBR) are moving in opposite direction i.e. as GDP, P≥65 and LE of Pakistan increases P (0-14), GR and CBR will decreases.**

Keywords: Health care expenditure, principal Component Analysis, Factor Analysis.

I. Introduction

Since the seminal work of Joseph P. Newhouse [1] to explore the relationship between per capita health spending and per capita Gross Domestic Product (GDP) of 13 developed countries, the new horizon of research has been opened. Over the past few years the determinants of health expenditure have been an attractive topic for health economists. Inspiring by the numerous studies in this context this study attempts to study the effects of economic and population indicators on health expenditure for the emerging country Pakistan. As noted by khan et al. [2] the income elasticity with respect to health care expenditure is less than one thus in the developing countries health related aspects are seems to be necessity rather than luxury. The rising population and poor health facilitation provided by government may cause high mortality rate in Pakistan. Akram et al. [3] suggested that for sustainable economic growth the special attention must be given to health and education sectors of Pakistan.

In Pakistan health care is one of the most important issues of the country, but unfortunately the

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percentage of GDP invested in this particular problem is alarming. The special attention should be given to financing system of Pakistan towards health sector. Out of the five methods of financing the health care system, Pakistan only utilizes general tax revenue and out of pocket payments. According to WHO [4] Pakistan ranks at high number among the highest out of pocket expenditure as percentage of private expenditure on health. The Total health expenditure as percentage of GDP in India, Bangladesh and Malaysia recorded by WHO are 4.1, 3.4 and 4.4 in 2007 respectively and Pakistan has the minimum of all i.e. 2.7 percent in the same year.

The beginning of 20th century brings the developing countries into the healthy world by innovating the health facilities, improved food and nutrition, better health infra structure and developed technology. These all can make possible by allocating the large share of budget in health sector by government as well as implementing the sound strategies in the country by policy makers to ensure the facilities of health. This is the reason that voluminous literature has been focused to link the health expenditure and economic growth for emerging economy countries.

Growing population may be the additional factor for middle income countries like Pakistan to allocate the health care facilities uniformly among the population. Crude Birth Rates of more than 30 per 1000 are considered high and rates of less than 18 per 1000 are considered Low. Since the beginning of the 90's, Pakistan has battled between the two numbers, from being too close to the high crude birth rate at the start of the 90's, with 26 births per 1000 in a population; it saw a gradual decline in the rate. By the end of the decade, Pakistan had a Crude birth rate of almost 22, and the decade's average amounted to 23 births per 1000 people which indicate a substantial increase in the population of Pakistan.

At the start of the last decade of the 21st century, Pakistan had only diverted, on average, a mere 5% of its GDP to health care, and this trend continued throughout the 90's. However, at the beginning of the 21st Century, the GDP percentage for health was increased but that increase was nothing when compared to the mortality rates that plagued the country. In 2000, Pakistan allocated 5.22 percent of its GDP to health which quite simply not enough. As the decade progressed we can see an upward trend with the percentage rising to 5.44, 5.63, and 5.77 in 2001, 2002, and 2003, respectively. The years that followed saw an already inadequate percentage decline even further as it reached a dismal 5.65 percent within a 4-year period. When the economies were being strained by the Market Collapse in 2008, the percentage was remarkably increased and by the 2009 it had reached a record-breaking 6.32% in 2009. But unfortunately, where it took several year for it to reach that point, it didn't take long for it to move back down and within a 5-year period the percentage of health-care had declined to a mere 6 percent by the end of 2014.

This study undertakes empirical analysis to understand the patterns that how health expenditure, population indicators and economic indicator is related. Numerous studies have been focused to identify the determinants of health expenditure by using different statistical and economical

models; this study aims to observe that how population and economic indicators effect total health expenditure in Pakistan by applying the multivariate techniques to avoid the multi-collinearity and heteroscedasticity problems in time series data. The remainder paper is designed as follows: The second section explains brief overview of literature related to the study, remaining sections describes the data sources and summary statistics, methodology, Empirical results and discussion followed by conclusion.

II. Review of Literature

To access the relationship between Health Expenditures and Economic Growth in Middle East & North Africa (MENA) Countries, Panel cointegration technique is utilized by Mehrara et al. [5]. They collected the annual data for 13 MENA countries from various sources spanning from 1995 to 2005. After examining the time series properties of Health Expenditure and Gross Domestic Product they employed traditional Panel cointegration technique and shows the long run co integrating equilibrium relationship holds between Health Expenditure and Gross Domestic Product. Similarly, they also conclude that Health care is necessity rather than a luxury good.

AK [6] explores the relationship between health expenditures, economic growth (GNP) and life expectancy at birth for Turkey. The long term causality relationship between the said variables have identified by Johansen cointegration technique while short term dynamics have been investigated by employing error correction model. The study concludes the long run existence of relationship however short run relationship between the variables is not significant.

SAARC countries from 1995-2012 have been analyzed to examine the Health care expenditure and economic growth by Khan et al. [7]. They include Per capita income, labor force, literacy rate, and elderly population of age 65 and above as a set of independent with Health care expenditure as dependent variable respectively. Similar to various studies they investigate short run as well as long run relationship by introducing panel Dynamic Ordinary Least Square (DOLS) and Seemingly Unrelated Regression (SUR) techniques. The study reveals long run relationship while the short run bi-directional causality exists between the variables.

Hitris [8] studied the 10 EC member states: Belgium, Denmark, France, Germany, Greece, Italy, Ireland, the Netherlands, Spain and the United Kingdom. The annual data from 1960-1991 has taken for selected variables. The log-linear model was utilized to find the relationship of per capita health expenditure both private and public with per capita GDP, Population $\geq$ 65 share of health care expenditure in total public spending, the rate of inflation and dummy variable to account for differences in countries health service systems. The study concludes that health expenditure depends in different way for each country as GDP and health care system are different.

Chaudhry et al. [9] investigates the factors related to health effects the economic growth of

Pakistan. The data on variables like gross fixed capital formation, employed labor force, exchange rate, inflation rate, total number of beds in hospitals, health expenditures, total number of dispensaries and total number of registered doctors have collected from 1975 to 2010 and employed autoregressive distributed lag model (ARDL) to accomplish the required objective. The long run model concludes that in Pakistan economic growth is improving due to the improvement in health facilities similarly inflation rate increases as economic growth increases while in short run inflation and growth is significant but negatively related.

Haider and Butt [10] utilize the data of annual time series from 1972 up to 2005. Their main objective is to enquire the nature of relationship between health care spending and Gross Domestic Product (GDP). After applying the time series technique of vector auto-regression (VAR) and autoregressive distributed lag model (ARDL), they conclude that elasticity of demand of health care is greater than unity so health care is necessity instead of luxury for the emerging country like Pakistan and long run relationship is evident between the economic growth and health care spending.

The positive relationship between health and economic growth and negative relationship between life expectancy and economic growth of SAARC countries is observed in the study of Zafar [11]. Panel EGLS method is applied on the yearly data of SAARC countries extending from 1986 to 2010. Health, GDP, fertility rate, life expectancy is incorporated in the study and theoretically makes linkage among them and showing that when health increases life expectancy increases and mortality rate decreases, when life expectancy increases mortality rate decreases and human capital increases, similarly increase in production yields high exports and ultimately economy grows. Thus study concludes that in order to get stable economy, SAARC countries put efforts towards better health facilitation.

Devlin and Hansen [12] finds health care expenditure granger cause Goss Domestic Product (GDP) and inverse is also true for 20 OECD countries from 1960 till 1987. Highlighting the importance of misspecification in the model authors suggest special care should be taken for the selection of suitable exogenous and endogenous variable in order to find the relationship between health and economic growth. The study overall concludes the positive relationship among the two said variables and more theoretical and empirical research has been suggested by the authors.

By using the per capita GDP as dependent variable and age dependency, openness, population per bed, secondary school enrolment, life expectancy, mortality rate and health expenditure as an independent variable, Akram et al. [3] explore that health expenditure and per capita GDP are not related while other independent variables influence the dependent variable. The study reveals that there is no conitegration between health care expenditure and per capita GDP in Pakistan. The cointegration technique followed by Error correction model is studied to find long and short run analysis respectively. The study concludes that health influences economic indicator only in long run.

Ozturk and Topcu [13] investigate the relationship between health care and economic growth among G8 countries i.e. developed nations in the world. Panel error correction model is applied to the secondary data ranging from 1995 to 2012 for each country. The study concludes that in short run the uni-direction causality exists from health expenditure to economic growth while the opposite direction of causality reveals in long run.

Bloom et al. [14] employs the production function approach to investigate the effect of health in labor productivity over the panel data of 104 countries for the time period from 1960 till 1990. Using the life expectancy as health indicator and applying the econometric approach of two stage least square they conclude that life expectancy and schooling are significant and positively influence on economic growth. Similarly, they also find that 4 percent of output is increasing due to the one-year enhancement in life expectancy.

Granger causality test is used to find the role of human capital in economic growth of Pakistan by Jangraiz Khan et al. [2]. For human capital they include research and development (R&D), education and health and for economic growth per capita GDP is incorporated in the analysis. The study reveals a unilateral causal relation between the variables while research and development has a causal relationship with economic growth. Furthermore, study concludes that life expectancy granger cause education.

III. Methodology

Principal component analysis (PCA) is one of the oldest techniques examined by Karl Pearson [15] while Hotelling [16] explains the mathematical procedure for computing it. It is the simplest technique to carry out as it does not require any particular assumption to fulfill before analyzing the data. The analysis required to take n variables

$x_1, x_2, x_3, \ldots\ldots\ldots\ldots x_n$

and search a composition of these variables to produce uncorrelated indices

$y_1, y_2, y_3, \ldots\ldots\ldots\ldots y_n$

These linear combinations are ordered in such a way that captures the highest amount of variation in it, captures the second highest mass of variation and so on. The objective of creating these linear combinations is to extract such components whose variances is large among all components, thus neglecting the low variance components we extract those one which effectively describe the variation in data set.

The procedure of principle component analysis consists of following steps; Starting with the set of n variables for p individuals, extract i^{th} principal components expressed as linear combinations of

original variables $x_1, x_2, x_3, \ldots\ldots\ldots\ldots x_n$

,

$$y_1 = b_{11}x_1 + b_{12}x_2 + b_{13}x_3 + \ldots\ldots\ldots + b_{1n}x_n$$

$$y_2 = b_{21}x_1 + b_{22}x_2 + b_{23}x_3 + \ldots\ldots\ldots + b_{2n}x_n$$

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.
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$$y_i = b_{i1}x_1 + b_{i2}x_2 + b_{i3}x_3 + \ldots\ldots\ldots + b_{in}x_n$$

These components varies as much as possible subject to the constraint that

$$b_{11}^2 + b_{12}^2 + b_{13}^2 + \cdots + b_{1n}^2 = 1$$

$$b_{21}^2 + b_{22}^2 + b_{23}^2 + \cdots + b_{2n}^2 = 1$$

.
.
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$$b_{i1}^2 + b_{i2}^2 + b_{i3}^2 + \cdots + b_{in}^2 = 1$$

These constraints must hold as to maintain that also that is uncorrelated to while is uncorrelated to and . The method also includes calculation of the eigenvalues of the symmetric sample covariance matrix i.e.

$$\mathbf{C} = \begin{bmatrix} c_{11} & c_{12} & \cdots & c_{1p} \\ c_{21} & c_{22} & \cdots & c_{2p} \\ \vdots & \vdots & & \vdots \\ c_{p1} & c_{p2} & \cdots & c_{pp} \end{bmatrix},$$

Where diagonal elements present the variances of original variables and off diagonal elements are covariance of variables. The eigenvalues are in fact variances of the principal components and they sorted as

$$\omega_1 \geq \omega_2 \geq \omega_3 \geq \cdots \geq \omega_i \geq 0$$

Now discard the components capturing low proportion of variation in the data i.e. extract those one holding 90% of the variation of the data set.

Spearrman [17] developed the idea of factor analysis by studying the correlations between the test scores of several types. There are three main stages required to perform factor analysis. Starting with the same aim of principal component analysis, n variables is taken for analysis and extracts p

provisional factor loadings and their uncorrelated linear combinations are constructed. In the second stage factor rotation is applied to make provisional factors in interpretable form, this rotation can be orthogonal or oblique. Orthogonal factor rotation that is mostly used is varimax rotation. Finding the factor scores leads the analysis to the final stage.

IV. Data Description And Summary Statistics

Annual data series spanning from 1960 till 2010 is examined. The data has been collected from various bulletins published by Economic Survey of Pakistan and State Bank of Pakistan. The variables Population of age 65 and above, (P≥65), Population of age 0 to 14 (P(0-4)), Life expectancy (LE), Crude Birth rate (CBR) and population growth rate (GR) are taken as the representative of population, Gross Domestic Product (GDP) as an economic indicator and Total Health Expenditure (THE) in Millions are included in the study.

The Visual display of population, economic indicators and Health expenditure as % of GDP and in million rupees has displayed in figure 4.1. The left panel (a) shows the annual GDP in Millions which indicates the gradual increase after the 1990's in Pakistan and it remains increasing at the end of sample period. Thus economic growth of Pakistan becomes stable after 2000.The right panel (b) of Figure 1 shows the Health Expenditure as % of GDP, indicating after 1985 it is declining and this pattern is observing till 2010. It can be seen from (c) that Crude Birth rate is in declining trend, since entering the 21st Century, this birth rate has been declining, a major reason for which is the increasing infant mortality rate rather than controlled births. With the dismal health care provided by the Government and a below-par medical service in the public sector, this crude birth rate had decreased even further and as the first decade of the 21st Century came to an end, Pakistan has come dangerously close to the Low-crude-birth-rate mark with the crude birth rate standing at an alarming 19 births per 1000 people while life expectancy of Pakistan is flourishing after entering into the 29th century. Young population (P (0-14)) is decreasing due to increment in mortality rates while old population (P≥65) is increasing as depicted in (e) and (f) respectively. Moreover, Population growth rate is declining as shown in (g), while (h) presents the Total Health Expenditure in million rupees indicating gradual increase as GDP increases after 1990.

The summary statistic of each variable is calculated and results are reported in Table1. It can be seen that GDP and THE showing leptokurtic behavior which can be also depicted in figure1 (a) and (h). Moreover, the mean and median of population structure i.e. P (0-14), P≥ 65, LEB, PGR and CBR are quite similar.

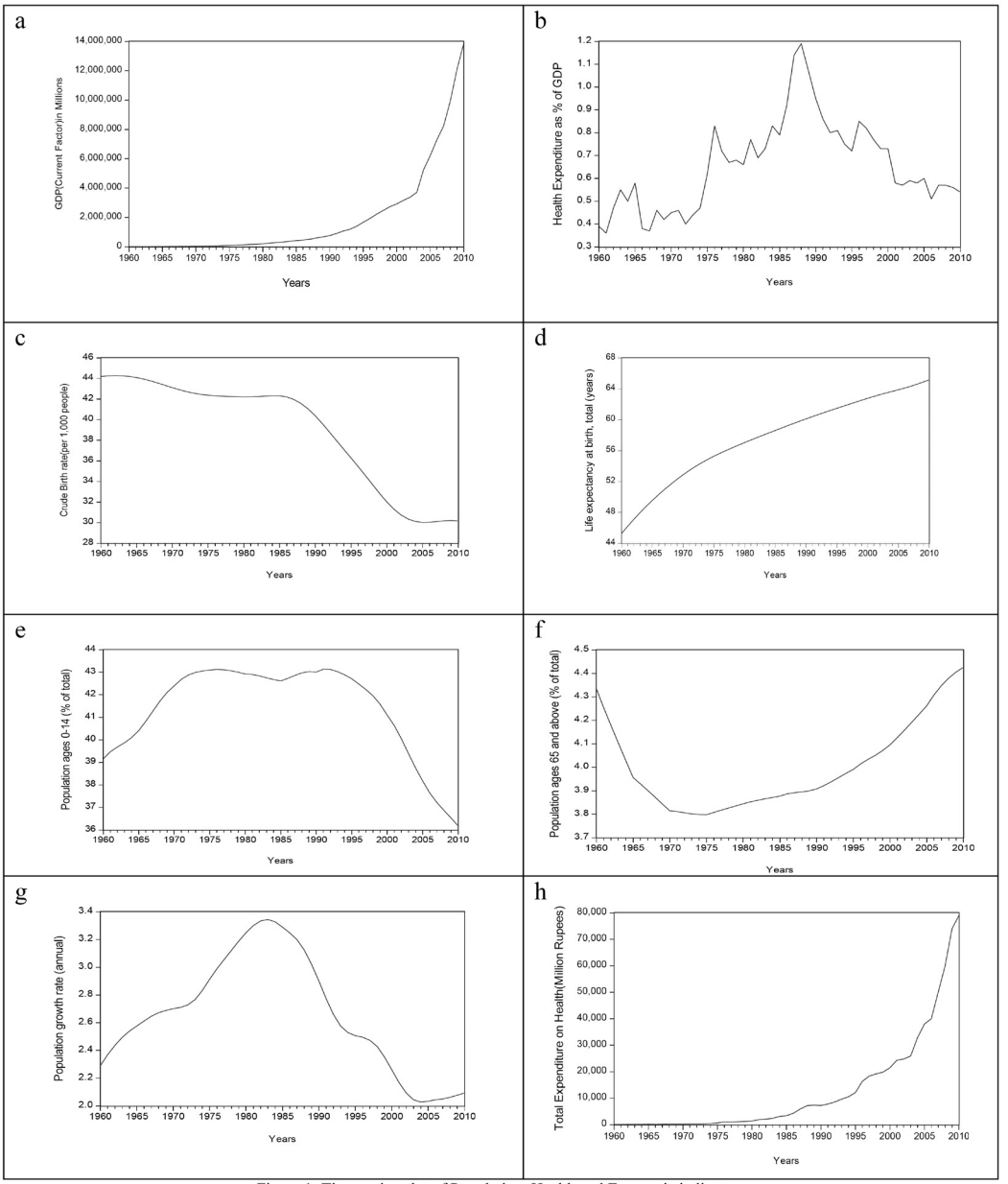

Figure 1: Time series plot of Population, Health and Economic indicators

TABLE 1
SUMMARY STATISTICS OF POPULATION AND ECONOMIC INDICATORS AND HEALTH EXPENDITURE

Statistic	GDP	THE	P (0-14)	P≥ 65	LEB	PGR	CBR
Mean	1916931.8	12663.64	41.39211	4.001226	57.66185	2.65543	38.96822
Standard Error	448341.18	2671.145	0.284789	0.02611	0.761007	0.058341	0.7365
Median	425064	3372.12	42.4761	3.92951	58.61807	2.646583	42.204
Standard Deviation	3201796.5	19075.79	2.033798	0.186464	5.434678	0.41664	5.259664
Sample Variance	1.025E+13	3.64E+08	4.136334	0.034769	29.53573	0.173589	27.66406
Kurtosis	5.0126998	4.005002	0.236251	-0.43154	-0.57262	-1.07688	-1.10773
Skewness	2.3017383	2.061201	-1.16388	0.874688	-0.60951	0.101011	-0.76088

To find the strength of relationship among the variables, correlations have obtained for the variables. Table 2 presents the results; absolute value of correlations between the variables varies from 0.27304 to 0.994874. The high negatively correlated pairs of variables are GDP with P (0-14), THE with P (0-14), P (0-14) with P≥ 65, THE with CBR, GDP with CBR, and CBR with LEB. Similarly, the high positively correlated variables are P≥ 65 with GDP, THE with GDP, P≥ 65 with THE, PGR with P (0-14).

TABLE 2
CORRELATIONS BETWEEN POPULATION AND ECONOMIC INDICATORS AND TOTAL HEALTH EXPENDITURE

Variables	GDP	THE	P (0-14)	P≥ 65	LEB	PGR	CBR
GDP	1						
THE	0.994874	1					
P (0-14)	-0.80579	-0.78319	1				
P≥ 65	0.79645	0.798556	-0.92965	1			
LEB	0.654691	0.700966	-0.1885	0.324059	1		
PGR	-0.65649	-0.66916	0.792999	-0.83112	-0.27304	1	
CBR	-0.82604	-0.86378	0.5967	-0.7052	-0.84556	0.723251	1

To analyze the more complete picture of relation between population and economic indicators with Total Health Expenditure (THE), scatter plots has drawn in Figure 2.

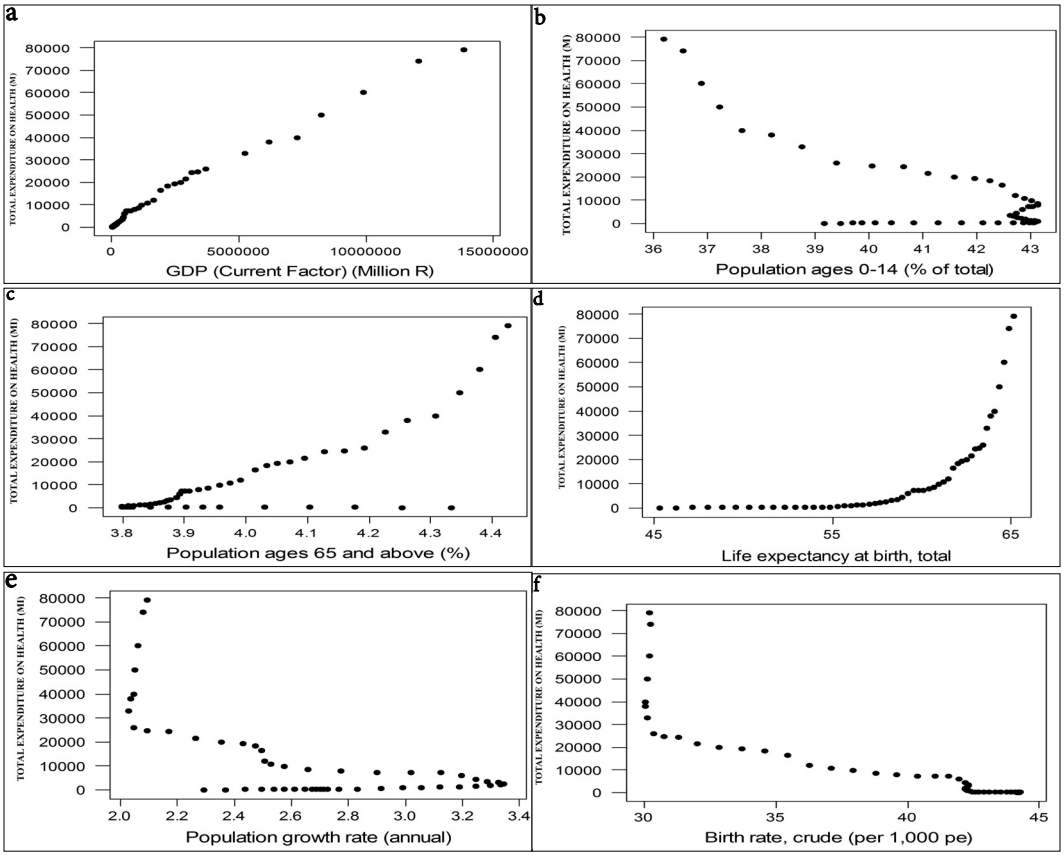

Figure 2: Time series plot of Population and Economic indicators Vs Health Expenditure

The figure 2 above clearly show the linear and positive relationship between old population (P≥65), and Gross Domestic Product (GDP) with Total Health Expenditure (THE). An exponential behavior is observing among Life Expectancy (LE) and Total Health Expenditure (THE).

V. Result And Empirical Analysis

To accomplish the required objective, the principal component analysis and Factor analysis on underlined variables is applied.

A. Principal Component Analysis

The first overview of the result has been obtained by excluding the total health expenditure and analyzes the behavior of variables. Table 3 presents the results in which the values less than 0.4 has been ignored. The Eigen values and their proportion also incorporate at the bottom of the table. We considered three PC's as they explain 97.7% of total variance of the observable data.

TABLE 3
PRINCIPAL COMPONENT ANALYSIS OF ECONOMIC AND POPULATION INDICATORS

Variables	**PCI**	**PCII**	**PCIII**
GDP	0.444	-	-0.523
P (0-14)	-0.415	-0.408	-
P≥ 65	0.437	-	-
LEB	-	-0.732	-
PGR	-0.408	-	-0.713
CBR	-0.433	-	-
Eigen value	4.379	1.1575	0.3248
Proportion	0.73	0.193	0.054
Cumulative	0.73	0.923	0.977

The first PC can be represented, approximately, by the following equation,

$$PCI = .4[(GDP+P\ (0\text{-}14)-(Pop\geq 65 + Growth\ Rate + CBR)]$$

The above expression represents contrast between GDP and young population with old population and growth of population. If young population and GDP (YPGDP) of the nation are moving together but the older population and causes of growth of population (OPGP) goes on the opposite direction of YPGDP. It explains 73% of variation.

$$PCII= 0.4[P\ (0\text{-}14) + 0.73(Life\ Expectancy)]$$

It is showing the factor of young population and life expectancy. This component contributes 19.3% of the total variation in the manifest data. We can code PCII as YPLE. We may conclude that 19.3% of variation in data structure is due to the fact of young population and life expectancy, therefore we are of the opinion that as young population increases the life expectancy is also increasing in Pakistan.

$$PCIII=0.523GDP+0.713Growth\ Rate$$

This component contributes only 5.4% of the total variation; we consider it because this is peculiar factors that GDP and growth rate moves along same direction. We code this PC as GDPGR. Similarly, we can see that the first three factors contain 97.7% of information.

These three principal components are considered as three independent variables and we will regress them on Total Health expenditure. This we are doing because when we regressed the observable variables GDP, P (0-14), P≥ 65, LE, PGR and CBR on Total Health expenditure the

value of R squared is very high i.e. 99.6% but variance inflation factor (VIFs) of the variables varies from 10.9 to 67.2. This makes the model redundant.

The following table 4 displays the result of regression analysis obtained by regressing the total health expenditure on the three extracted principal components named as YPGDP, YPLE and GDPGR respectively.

TABLE 4
ESTIMATION RESULTS OF REGRESSION OF TOTAL HEALTH EXPENDITURE AND EXTRACTED PCS

Predictor	Coef	StDev	T-Stat	P-value	VIF
Constant	12663.6	459.8	27.54	0	
YPGDP	8572.8	221.9	38.63	0	1
YPLE	-2936.1	431.7	-6.8	0	1
GDPGR	-8219.2	814.9	-10.09	0	1

We can see the results are quite robust now and the coefficients of PCs are highly significant and values of Variance Inflation Factor (VIF) are also in control mood. The following figure 3 portrays the plot between the obtained PCs.

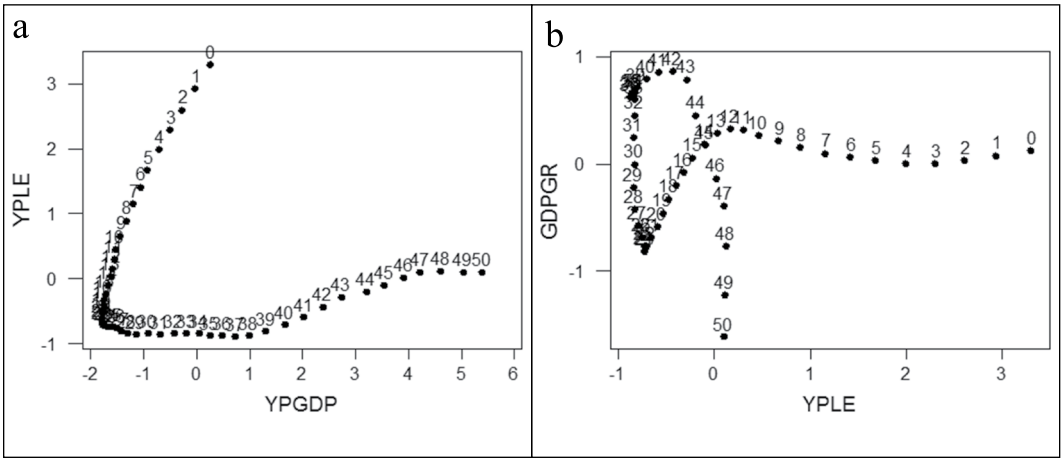

Figure 3: Plot of extracted Principal Components

The numbers showing on the plot represents the years starting from 0 as 1960 till 50 as 2010. The left panel (a) of figure 3 shows the Plot between First Principal component named as YPGDP and second component YPLE while the right panel (b) is showing the plot between YPLE, the second component and GDPGR the third component respectively.

The results extracted by adding the Total Health Expenditure in the analysis following output has been obtained.

TABLE 5
PRINCIPAL COMPONENT ANALYSIS OF ECONOMIC, HEALTH AND POPULATION INDICATORS

Variables	**PCI**	**PCII**	**PCIII**
GDP	0.414	-	-0.432
THE	0.418	-	-
P (0-14)	-0.373	-0.43	-
P≥ 65	0.391	-	-
LEB	-	-0.7	-
PGR	-	-	-0.682
CBR	-0.396	-	-0.387
Eigen value	5.2853	1.1807	0.3766
Proportion	0.755	0.169	0.054
Cumulative	0.755	0.924	0.978

By analyzing the results presented in Table 5 we found that the first three PC's explains 97.8% of information after adding the Health Expenditure, thus we figure out the first three PC's and exclude the coefficients less than 0.35. The first PC can be represented by following expression;

$$PCI=0.4[(GDP+THE+ Pop\geq 65)-[P\ (0\text{-}14) + CBR)]$$

The above expression is showing the contrast between old age population i.e. Pop≥65 (OP), Gross Domestic Product (GDP), Total Health Expenditure (THE) and Young population i.e. P (0-14) (YP), Crude Birth Rate (CBR). We named this PC ac OPGDPTHE. The second PC can be written as;

$$PCII=0.4\ [P\ (0\text{-}14)] + 0.7[(Life\ Expectancy)]$$

The above expression of PCII is similar to the PCII obtained previously showing that as young population i.e. P (0-14) and Life Expectancy(LE) both moves on the same direction, one increases the other also increases. We quote this PC as YPLE.

Following is the third PC which we got;

$$PCII=0.4[(GDP+CBR)] + 0.6\ Growth\ Rate$$

This explains the combination of Gross Domestic Product (GDP), Population growth rate (GR) and Crude Birth rate (CBR), thus we call this PC as GDPGRCBR. This component contributes 5.45% of the total variation in the observed variables.

Following Table 6 shows the regression results by regressing the total health expenditure on the three extracted principal components named as OPGDPTHE, YPLE and GDPGRCBR respectively.

TABLE 6
ESTIMATION RESULTS OF REGRESSION OF TOTAL HEALTH EXPENDITURE AND EXTRACTED PCS

Predictor	Coef	StDev	T	P	VIF
Constant	12663.6	306.6	41.31	0	
OPGDPTHE	7977.5	134.7	59.24	0	1
YPLE	-2456.9	284.9	-8.62	0	1
GDPGRCBR	-6496.7	504.5	-12.88	0	1

We can see from the estimated results that first pc (OPGDPTHE) effects positively on Total Health Expenditure (THE) while second (YPLE)and third effects (GDPGRCBR) negatively on Total Health Expenditure (THE).

B. Factor Analysis

The factor analysis has been analyzed first by taking all variables and the results have gathered in the Table 7.We consider the first three factors as they captures 97.8% of the total information contains in the observed data.

TABLE 7
ROTATED FACTOR LOADINGS OF ALL VARIABLES

Variables	FI	FII	FIII
GDP	0.774	-0.57	-
THE	0.728	-0.619	-
P (0-14)	-0.842	-	-0.516
P≥ 65	0.725	-	0.607
LEB	-	-0.988	-
PGR	-	-	-0.883
CBR	-0.396	0.795	-0.497
Eigen value	2.6444	2.4017	1.7965
% of Var	0.378	0.343	0.257

Results present the loadings of three extracted factors. The first factor model explains very well most of the original variables describing the overall economic and population indicators along with the health expenditure. The second factor is negatively related to Gross Domestic Product (GDP), Total Health Expenditure (THE) and Life Expectancy (LE) and positively related to Crude Birth Rate (CBR). The third factor is related mainly to the population indicators i.e. Young population (P (0-14)), Old population (P≥ 65), Population Growth Rate (GR) and Crude Birth Rate (CBR). Analyzing the scatter plot of first two factors, we find that young population, population growth rate and crude birth rate are moving together while the remaining variables somehow are on same path.

The results of factor analysis by excluding Total Health Expenditure (THE) are obtained in the following Table 8.

TABLE 8
ROTATED FACTOR LOADINGS

Variables	FI	FII	FIII
GDP	-0.765	0.596	-
P (0-14)	0.913	-	-
P≥ 65	-0.813	-	-0.479
LEB	-	0.993	-
PGR	0.508	-	0.830
CBR	-	-0.798	0.463
Eigen Values	2.4867	2.0716	1.3031
% of Var	0.414	0.345	0.217

After the preliminary examination three factors has extracted. Using the threshold of 0.4, we neglect the factor loadings lower than the 0.4. The first factor corresponds to population indicators i.e. young population (P (0-14)), old population (P≥ 65) and population growth rate (PGR). The second factor seems to be positively related to Gross Domestic Product (GDP) and Life expectancy (LE) and negatively related to Crude Birth Rate (CBR). The third factor combines old population (P≥ 65), population growth rate (PGR) and crude birth rate (CBR).

Figure 4 presents the scatter plot of three extracted factors. The left panel (a) of figure 4 drawn between Factor I and Factor II showing that Gross Domestic Product (GDP) and old population (P≥ 65), Crude Birth Rate (CBR) and Population growth rate (GR) is moving together respectively. While the right panel (b) of figure drawn between Factor II and Factor III displaying that Population growth rate (GR) and Crude Birth Rate (CBR), old population (P≥ 65), Life expectancy (LE) and Gross Domestic Product (GDP)lies in the same line.

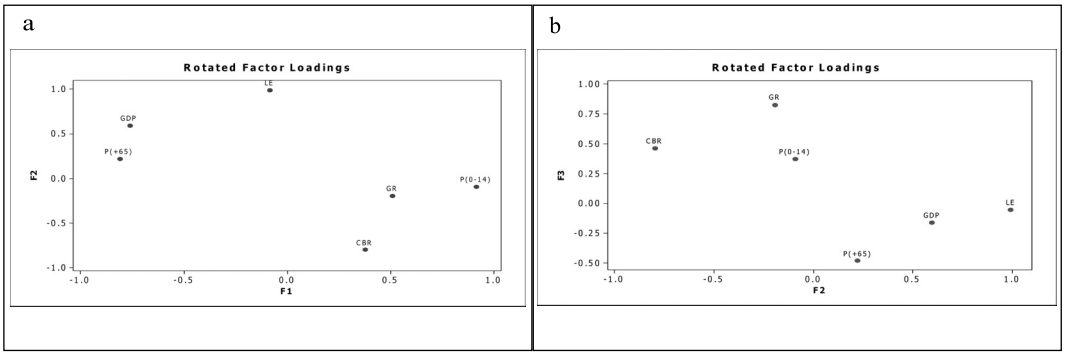

Figure 4: Rotated Factor Loadings plot

VI. Conclusion

The strength of development for any country hides behind its economic growth and the economic growth as presented by Chaudhry et al. [9] is influenced by the health sector. By considering the population indicators along with Gross Domestic Product (GDP) and Total Health Expenditure (THE), annual time series of the selected variables has taken to employ Principle Component Analysis (PCA) and Factor Analysis (FA). In developing countries where people engaged more in labor work, they require healthier mind and body to maintain their hourly wages as healthy worker perform in better way. Bloom et al. [14] emphasizes to improve the health status of country in order to improve the economic condition as healthier person can do more work as compared to an ill person.

Results from PCA reveal that the effect of population structure, Gross Domestic Product (GDP) and Total health expenditure (THE) comprises together in the same direction indicating that the special attention should be given towards health sector as to improve economic stability and also to maintain the population structure of the country. Factor Analysis suggests that the behavior of Health Expenditures is common with Gross Domestic Product (GDP), population of age 65 and above and life expectancy in Pakistan while population of age 0 to 14, population growth rate and Crude Birth rate are moving in opposite direction i.e. as GDP, P≥65 and LE of Pakistan increases P (0-14), GR and CBR will decreases.

This study can further be extended by adding the per capita income of Pakistan in order to see the broader picture while discrimination of health facilities between urban and rural areas must be incorporated to visualize the real status of health in Pakistan. Economist and policy makers should take immediate steps to enhance the health sector in Pakistan not only by establishing hospitals or increasing the number of doctors but also emphasize on creating awareness regarding the health problems of an individual.

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