

Analysis of a Panel Data on Expenditure for Health Care on economic growth

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ABSTRACT

A good healthcare system is mandatory and a right for any citizens of different countries in this world. So to ensure that many diplomatic steps should be taken, I believe that the key to happiness and success is to be healthy and fit both physically and mentally, And thus the consequence will fall on his/her daily life, which eventually leads to the country's economy. If a certain person is healthy then his/her outcome will be positive and eventually has a good impact on the economy, through his/her work for earning to maintain the standard of living.

Good and stable health is one of the biggest wealth one can have. Better health stability need better and extra care for it, but now important thing is that a good amount of expenses and spending is needed for taking care of this health. I will try to writhe and collect data regarding this topic and find out the final outcome of this thesis.

Key Word: Health care expense, Regression, Current US dollar, Economic growth, Correlation, Ordinary Least Square.

Introduction

Back from eighteenth and nineteenth century, economists have been discussing the concept of a country's economic growth. Economic growth is an development in an economy capacity for sometimes provide the services and the goods. Both minor and major terms can be used to compute it. Typically, accumulated GNP national product, accumulated product of domestic, or per GDP capita are used to measure economic growth.

According to Paul Romer, economic enhancement is like arranging to the need for resources in ways that are beneficial. In a metaphor, the metaphorical elements are combined according to the recipe, but the economic cooking produces undesirable effects. If economic growth could be boosted by producing more of the same kind of food, there would eventually be a shortage of raw resources and people would have to put up with an unreasonable quantity of rubbish and mess. In addition, a number of factors play a role in whether the economy is doing well or not. The one this article will concentrate on health spending and its affects on typical economic growth while concurrently factoring in other variables. The major goal of this essay is to show how a single issue

can help or hurt the economy, particularly the related countries, and how the government might respond to potential changes. This analysis is not a complete bundle of solutions, but it will aid in forecasting one step farther. The estimated amount spent on health in 2019 was 2.41 percent of GDP, with Venezuela spending just 1.4 percent and America spending the most at 17.0 percent. Working with growth leads us to an important aspect that every country must consider because the economy is the basic foundation of a country. Economists have developed a number of growth theories, including the theory of the Malthusian, growth for classical, and growth for Endogenous, with theory of growth of unified with others.

There are a lot to concern about relationship in between medical costs and financial expenditure economic enhancement in growing. In general, although well being care spending varies by different counties with time period, also so many countries view the health care spending as the type of means of advertising social and logical economic of growth. The regular life expectance with the social goodness and regular security of the regular society. Honestly speaking regarding this, people who are healthy can give work more time to efficiently work and that is for longer period of time pointing that investing in health really can improve all people health situation and lead to an increase in productivity. Additionally the overall improvement of the productivity should help to promote the overall regular economy. But however while economic growth can help increase health careness spending is also it can also help improve the regular stable health of those in need. As the economy grows, people will increasingly want high quality of life, which will lead to an increased demand for medical services. Health care spending is generally higher in countries with higher per capita incomes. This is likely due to increased incomes leading to increased spending on health services. Rapid economic growth may also be contributing to this trend. Here I will try to give a good portrait of the regular health expenditure and exepenses and overall economic growth with effects that are relevant. I will also try to show some graphical data that will even make it more understandable and easy to grasp. This paper will review previous literature and analyze those outcomes and findings, that will add some extra clearance and understanding. Then I will try to talk more regarding the method and how the model is put to exact work, with defined variables including summary tables and graphs. And lastly I will end the paper with an appropriate

Conclusion where it will illustrate the related scopes boundaries with opportunities that are relevant.

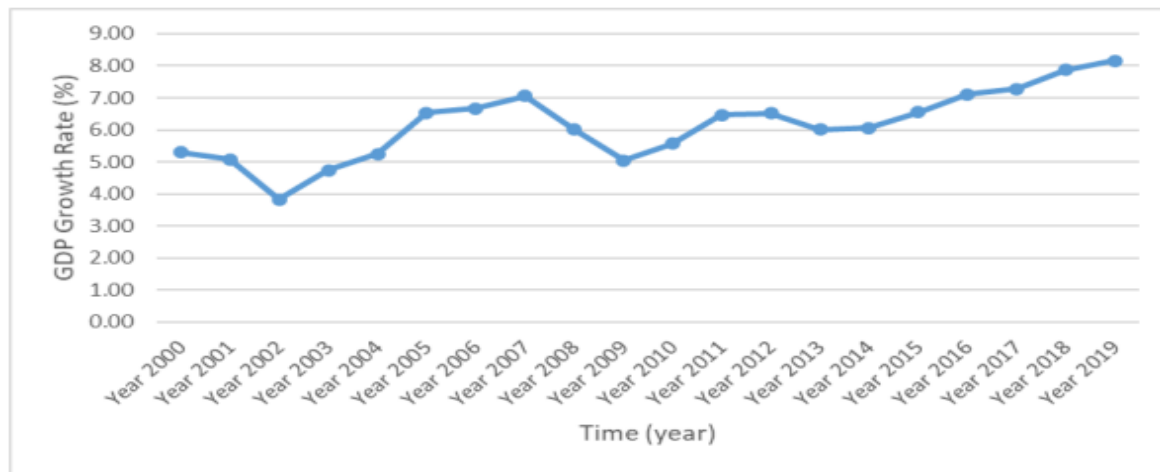


Figure 1: GDP growth rate (%) with Time

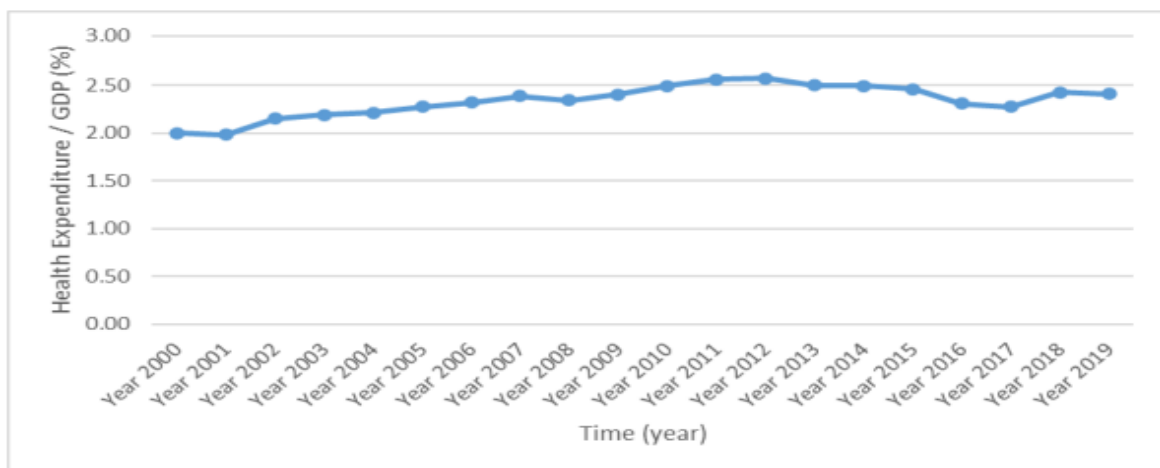


Figure 2: Health Expenditure / GDP (%) with Time

Here I have tried to give an graphical portrait of the GDP growth rate in percentage with time and the HealthCare Expenditures GDP percentage in time for a certain country. Here the least 3.8300 percent with year of 2002 including the high 8.4500 percentage with the recent has be in 2019 also increased by the with the positive of slope from the most of the breakeven 2013 year in important. This can also be mention as positive slope which directly indicates the increase of the return of the scale, and with the nation developing at a faster rate than before/before. Again, if we attempt to further analyze the entire health spending with GDP in the percentage with the regular

period of about 2000 - 2019 in line chart in graph of the regular same country that is separate from the year of the 2001 and the health expense has not fallen or shrined beneath under 2 % with an maximum of the 2.5700 % and least of the 199.00 %, which is good. Again, but also out this doesn't seems to very me to have an constant or consistence positive without negative trend which should be Unfortunately, there is no good news for its own people if there is any association between economic development, stability, and health spending. should be again in this positive situation which is also yet to be tested and examined in the future and next further part of portion of this the writing of the paper .

Literature Review

Better healthcare facilities and possibilities can lead to higher healthcare spending, which can then strengthen human capital and increase efficiency by including economic implementation. The following evaluations of literature go into greater detail about the issues, potential fixes, and resources that may be used while working with time series data from various countries.

There are a lot of previous studies have been done and many research work has been published regarding this Health care and the relation of different countries economical growth. Numerous earlier research have been carried out regarding this important topic including different aspect of facts and theory. Rapid industrialization in both developed and developing countries has resulted in significant advancements in technology for Healthcare sector. This is drawing attention to the human component of development, which has been shown to theoretically benefit nations' economies. Due to this, empirical study has been conducted to try to the enhance the overall

connection in between the Healthcare expenditure, GDP and economic growth is as well its importance.

In 2008 a study has been conducted by Naeem Akram, Ihtsham U Haq and Mohammad Khan. Focusing on the The Impact in long term of the Health care on Economic in Pakistan growth. Here they followed methodology and they followed was Cointegration and Granger Causality including the variables related to healthcare and economic factors, so they are the The relationship between health status and economic growth is also increasing per capita. GDP growth may be achieved through improving resource productivity . For analyze further term the connection between health and per capita of GDP. There main findings was to show in the study that the Health and the education both had the substantial influence on overall economic growth In addition, time period for this study was between 1960 to 2006 which is the data of almost 46 years approximately. And lastly the preferred country was Pakistan in this study.

Then in another study conducted by Christopher Jencks with Andrew Leigh, Timothy M. Smeedings at 2009 with the name of the paper was Health and Economic Inequality and their methodology was based on Quantative method including the important variables for Economic inequality and the GDP per capita health care expenses which are very important for this type of healthcare research. Their findings was a bit mixed compared to other research papers and the year of data they considered was a bit large and selective. They also preferred some selective and specific country which they thought that the research would create more appropriate outcome.

Another study to mention was in 2011 and the research was performed and collected different data by B Balaji and the name of the paper is the nexus in causal in four southern Indian states, there is a relationship between public health spending and economic growth. . The methodology he followed here was HDR, Granger and also the variables was Healthcare expenditure, GDP and overall Economic growth, poverty also per capita income and expenditure included in the paper. The main and most important findings was strong correlation between standard of the living which can be measured with the help of per capita of the income and expenditure on health. And the time period of this research was between 1960 to 2009 which is almost about 49 years approximately, focusing on the countries Southern Indian states, including Karnataka, Andhra Pradesh, Tamil Nadu, and Kerala and also Here the most of outcome are more authentic and understandable.

Moreover, another research paper by Zahra Mila Elmi and Somaye Sadeghi by the name of the paper Health-Care Expenses and Economic Growth in Developing Countries: Panel Co Integration and Causality and it was published in 2012 and the methodology they used was panel v statistic, panel p statistic, panel PP statistic, and panel ADF statistic, then group p statistic, group PP statistic, and finally group ADF statistic and VECM framework. Their variables was included with GDP for per capita and Health care spending's. Also lastly their finding was that there is no short-run causality between GDP and health-care spending, but there is no short-run causality between health-care spending and economic growth . The time period mention in the paper was about 1990-2009, approximately 19 years of data was analyzed by researchers focusing on the Developing countries.

David Mautin Oke, Ayoola Sunkanmi Odubunmi, Jimoh Olakunle Saka, and Ayoola Sunkanmi Odubunmi i writers and prominent researchers, published a study titled testing the Cointegration of Health Care Expenditure and Economic Growth in Nigeria . and it was published in the year 2012. The main methodology they utilized here was Hassen Parameter instability test to find out the result by the variables also includes the very relationship in link health-care costs and overall economic growth There findings

was the household out of pocket. The major source of funding for health care is still expenditures, which account about and the time frame of the data the researchers considered was between 1970 – 2009 which means around 39 years of data approximately was analyzed focusing on the country Nigeria

In a study titled SAARC Countries' Health-Care Spending and Economic Growth 1995-2012 Habib Nawaz Khan and his colleagues Nasrin Sarvghad, Afz'a Binti Sahfie, Gulap Shehzada, Katrina Lane Krebs, and Muhammad Arshad Khan all achieved fame. An analysis of panel causality that was released in 2015. The link The Dynamic Ordinary Least Squares method is used to investigate the relationship between health care expenditure (HCE) and economic growth, as well as the causality between HCE. Squares approach. Here, we discover a strong, long-term correlation between HCE and economic growth in South Asian countries. In addition, time period was in between 1995 to 2012, which is approximately 17 years of work and data. The country they focused on are the SAARC Countries.

In 2015, a report titled African Countries' Education, Health, And Economic Growth by the renowned scholars JUDE EGGOH, Gilles-Armand Sossou And Hilaire Houeninvo was released. They employed the Generalized Method of Moment (GMM), a conventional cross-section and dynamic panel technique, to analyze the link capital in between human and growth of the very economy. Their research showed that while indicators of the human capital stock have a marginally beneficial influence on economic growth, Government spending on health and education has a detrimental impact. According to empirical research, investing concerning health and education is complimentary. Period of the time that they considered this research and collected data is within the 1996 to 2010, which is approximately 14 years of information, which they analyzed. And their focus countries was the African countries

The title of the study was Government Health Expenditures and Economic Growth: A Feder-Ram Approach for the Case of Turkey. A research study written by an individual researcher by the name of Serdar Kurt. The work was released in 2015, and the approach used was the Feder-Ram model. His research found that while Government health spending has a considerable and negative indirect influence on Turkey's economic growth, but a good direct impact. His variables were health expenditures, economic growth, and GDP per capita. He didn't name a certain period of time, but he did take into account a lot of years and periods of data, which led to an excellent study of the article. Only Turkey was the subject of his attention. A study by Nadide Sevil Halc-Tülüce, Ibrahim Dogan, and Cüneyt Dumrul with the working title Significant Income for Spending on Health and Nexus Growth in Economic was conducted. Three outstanding individuals. 2015 saw the publication of that. They used cointegration approach in their study, and the following variables were included as part of their analysis: Their major goal is to determine that although public medical expenses has an reverse with statistically significant impact on economic advancement, private well health expenditures have a GDP impact which is negative and health care capita per the method. There time period they utilized here was in between 1995 to 2012 which was about 17 years worth of data and the focused countries was only developed countries, to get more accurate output of the results.

Another study by Serap Bedir, entitled 2016 saw the publication of Healthcare Expenditure and Economic Growth in Developing Countries. They used the Granger (1969) causality test and Dolado and Lütkepohl, which were both recommended in 1995 by Toda and Yamamoto (1996). His study concentrated on the correlation between rising GDP per capita and rising per capita health spending. His key factors were the GDP and health care costs per person. They looked at data and research over a period of around 18 years,

from about 1995 to 2013. Egypt, Hungary, South Africa, the Philippines, Poland Greece, United Arab Emirates, Indonesia, China and South Korean were the nations he concentrated on. which is really significant and trustworthy research.

A article by Julius Chupezi Tieguhong and Serge Mandiefe Piabuo, two of the top researchers, is titled An analysis of the research on health spending and economic expansion is conducted, along with comparison of CEMAC and a few other African nations. The publication year, as stated in the paper, was 2017. They employed the Panel ordinary least squares, panel completely modified ordinary least squares panel co-integration test, Granger causality test, and panel dynamic ordinary least squares as their methodology they discovered that healthcare spending significantly and favorably affects economic expansion. Between 1960 and 2005, and their main variables were GDP per capita and healthcare costs. , which means it is more that 45 years of data and analyze to find the required and authenticated results. It's really impressive that they considered a huge amount of data together to perform the research. The focuses countries was mainly the African countries

Health Care Spending and Economic Growth in the OECD and Major Developing Countries: A Nonlinear Granger Causality Analysis is a study conducted by renowned researchers Liping Ye and Xinpeng Zhang. It was published in 2018 and used nonlinear granger causality testing as well as the HDF test for unit root and a vector auto regression model as its methodology. To determine the conclusions of Relationship between Sustainable economic enhancement and Improving efficiency of Health Costs, they have used the variables as indicated GDP for per capita and Care of Health Spending of the per capita. Time frame covered years 1995 to 2013, or around 18 years of data and analysis. They mostly worked on the nations of Australia, Austria, UK, Ireland, South Korea, Portugal, and India South Africa, Brazil, Spain, Finland, Iceland, Canada, Finland, New Zealand, Belgium, Mexico, USA, Japan and China.

Between 1980 and 2015, Gizem ERELK, a Turkish researcher, conducted study titled the link between Turkey's economic growth and health spending. "He employed Granger causality as his approach, and the report was published in 2018. Per capita(PC) with GDP and per capita were the factors that were mentioned. In order to determine the results of the ARDL-based correlation between healthcare spending as the% of GDP also GDP (PC) per capita, "35 years of data, roughly spanning the years 1980 to 2015, were taken into consideration. Turkey, the researcher's own country, was the target nation.

A study paper titled Economic Growth and Health Care Costs in Nigeria published in 2018 in care of two well-known authors, Sylvester Alor Favor Udeorah and Obayori Joseph. Here, economic growth was taken into account as variable of dependent, with care of health spending serving main, spending acting as a check regressed for the increase in model's capacity for explanation. Their research showed that although education investment had a significant beneficial impact on economic growth., spending on health care had no significant impact at all. The time period covered was from 1980 to 2016, or around 36 years of data. Nigeria was the nation they were after.

A 2019 finding the causality relationship between health expenditure and economic growth, an application to E7 countries was written by two well-known Turkish researchers, Hasan DNER and Serhat YÜKSEL. The study paper's approach was decided upon using the GMM, ARDL, and cointegration tests. A long-term connection for economic growth and gross health expenses and public wellbeing expenditure was examined, but one between the very private medical care expenditure and economic enhancement was found to be ineffective. The variables were per capita health care spending and with the GDP.. They considered time period of the 1996 to 2016, which is approximately 20 years of data. The countries they considered was E7 Countries

A study titled Insights From Selected MENA Countries on Health Expenditure, Institutions, and Economic Growth was released in 2021 and was written by a group of outstanding scholars that included. Mohammad Rumzi Tausif, Umar Faruk, Mohammad Imdadul Haque, and Md. Riyazuddin Khan. The Granger Causality test, OLS, FMOLS, and DOLS were the methods they employed, and the variables they examined were the connection the relationship between economic development and health spending, as well as the role of institutions to health spending promotion of the very growth. Conclusion that was made was that the health spending did not directly fell affect economic overall growth. They took into account statistics from around 2000 to 2017, or approximately 17 years. Most significantly, they focused on the MENA countries for their research.

This century's most brilliant researcher, SUCHIT ARORA, wrote a study titled long term economic growth, human productivity, and wellbeing. This approach used co-integration between Engle and Granger. The 19th century neoclassical forecasts held true in terms of health, human productivity and long-term economic excrecence. Australia, Denmark, Finland, and France were the primary nations of focus.

The influential work Impact of Aging on China's Health carefulness Expenditure and Economic Growth examined healthcare spending and associated data using a quantitative methodology. Bayesian-VAR (B-VAR) models were used as the technique. The factors compared health outlay to individual per person to person per GDP, and results showed health factors are required to improve the quality of life for the aging population in order for the economy to grow sustainably. They focused on China since it has a large population and is a source of a lot of data, which would undoubtedly provide clear explanations of the research's findings and information.

Methodology

A developed country's health spending looks very different from a developing one when comparing a healthy ratio of input to output. The emphasis has remained on the different countries health spending and economic growth rate, specifically how a country's "health expenditure" might affect that country's economic development. The terms GDP is in per capita or else economic overall performance might be also used to describe economic growth in this context.

Now, the performance could be good or bad. According to the real data analysis.

$$y = \beta_0 + \beta_1 h_1 + \beta_2 h_2 + \dots + \beta_n h_n + \varepsilon_x$$

Where log y stands for per capita GDP, β_0 for the intercept, β_i for each explanatory variable's coefficient, 'X' stands for the error term, which contains additional independent variables not included in the model, and 'h's' stands for the factors affecting GDP explanatory variables.

Related to the data:

Because it takes less time, working with a single region has its advantages. However, more observation might result in more meaningful results. But from 2000 to 2019, the dependent and explanatory variables are monitored and collected from Macrotrends, an additional data source launched in 2010. The components listed here are looked at: Healthcare Spending (%), GDP Growth Rate (%), and Per Capita GDP (US Dollars)

Model that is used in this research is given: We consider it as our general model.

$$GDP\ per\ capita_{it} = \alpha + \beta_1 Capital\ Health\ Expenditure\ in\ percentage_{it} - \beta_2 Current\ Health\ Expenditure_{it} + \beta_3 Domestic\ general\ government\ Health\ Expenditure_{it} + \beta_4 Domestic\ general\ Private\ Health\ Expenditure_{it} + u_{it}$$

Here, i = No. of countries

t = time period

The empirical model is calculated from the 7 different countries in Asian continent. And they are Afghanistan, Bangladesh, Bhutan, China, India, Maldives and Myanmar.

And after running the data set through Stata we get the following model:

$$GDPPC = 625.88 + 522.37 CAHE - 49.93 CPHE + 60.05 DGGHE + 64.07 DGPHE$$

Here, GDPPC = Gross Domestic Product Per Capita

CAHE = Capital Health Expenditure,

CPHE = Current Health Expenditure per capita in \$

DGGHE = Domestic General Govt. Health Expenditure

DFPHE = Domestic General Private Health Expenditure

<u>Name of the Total Countries</u>
Afganistan
Bangladesh
Bhutan
China
India
Maldives
Myanmar

Here the time period starts from the year 2000 to 2020 for all of the countries, so in total there is 20 years of study and data in this research paper

Variable description

GDP per capita: The ratio of the GDP or Gross Domestic Product to the population is known as the GDP per person. GDP represents the sum of all resident directors' gross value added to the market, plus any product charges, less any allocations that are not reflected in the value of the goods. It is assessed without accounting for the deterioration and decrease of natural resources or the deterioration of manufactured assets. The figures are displayed in dollars which is in current United States \$.

Capital Health Expenditure: Health wellbeing costs include all expenditures related to the provision of emergency services, nutrition, family planning, and health medical assistance, but excludes the allocating of drinking water supply and hygiene care backing is an important element of the system of health care. National wellbeing account provides number for pointers grounded

on information on spending collected within an internationally honored frame. These accounts are the connection of the inflow of finances and expenditures recorded in the operation of the health system, from backing sources and agents to the distribution of finances between providers and health system functions. It also reflects SDG 3 “insure healthy lifestyles and the promotion of universal wellbeing periods”. Health spending growth and GDP growth are appreciatively associated, meaning that in general terms an increase or drop in one of them follows the other. Overall health spending growth and profitable performance can explain how important countries spend on health care over time. Capital has been an decreasingly important factor of product of health services over recent decades, as reflected for illustration by the growing significance of individual and remedial outfit or the expansion of information and dispatches technology(ICT) in health care.

Current Health Expenditure in per capita in dollar of United States: Health spending per person in the U.S. was \$945 in 2020, which was over \$,000 more precious than any other high-income nation. The average quantum spent on health per person in similar countries(\$,736) is roughly partial that of the U.S. The information is shown according to the service type, funding sources, and guarantors. In 2020, the United States spent 4.1 trillion dollars, or \$1,530 per person, on health care, an increase of 9.7%. Health expenditures were estimated to account for 19.7% of the country's GDP. See below for up-to-date information. Public health expenditures per capita show the typical cost per person to various payers for a range of services in the medical field.

Domestic in General Govt. Health of care Expenditure: The share current government of general domestic coffers used to fund health expenditures as a share of the frugality as measured by GDP. Domestic profit as internal transfers and subventions, transfers, subventions to beneficiaries of voluntary health insurance, NPISH or enterprise backing programs, as well as forced repayment and social health insurance benefits, are examples of public sources. These transfers and subventions are all examples of public health resources that show how much the government supports health generally. percentage of GDP attributable to domestic health spending by the general government

Domestic General Expenditure on Health in Private: percentage of recent health spending that is financed by private means. The percentage of domestic private health spending that is made up of all current health spending shows how significant domestic private funding is. Private sector financial resources come from households, investments, and nonprofit organizations. Similar costs may be paid directly to healthcare providers or reimbursed through optional health insurance. According to this measure, the private sector provides support for healthcare in comparison to the governmental sector or outside sources.

Methods and results

Panel Data set:

Panel data were used in this paper's research. Our goal in using panel data is to provide us the ability to control variables that we cannot observe or quantify. On instance, cultural considerations or a desire for whether or not to pursue schooling. This is a result of the fact that we have nations represented from varied cultural backgrounds and continents, where each person's choice varies. Panel data takes into account individual heterogeneity in this situation where we could only include measurable factors but also include unobservable intangible characteristics that would introduce bias.

Pooled OLS Model	
Dependent Variable	
GDP Per Capita	-
Independent Variable	
Capital Health Expenditure of GDP	522.3734**
	213.2396
Current health per capita GDP	-49.92072**
	15.53617
Domestic general government health expenditure	60.63553**
	15.61661
Domestic general private health expenditure	64.67083**
	15.9518
R ² value	0.8886

Here we can see that the 95% of the significance in the random effect model, which tells us that our result outcome is good. Our GDP per person is a dependent variable, whereas the other factors are independent. are capital HE of GDP, Current H per capita GDP, Domestic general govt. HE, and Domestic general private HE. But result tells us that overall performance is good. Also to mention that the current health per capita is at negative figure against the GDP per capita, where else the rest of the result are positive and had a good relationship at the overall fact. The domestic

general private health expenditure is the best rate it has, and then the domestic general government health expenditure which is showing a good relation and outcome.

Regressor coefficient. Calculate how much Y alters when X goes up one unit. Coefficients are difficult to interpret because they include both within-unit and between-unit effects. For TSCS, the data represent the average effect of X and Y when X varies by 1 unit across countries over time.

Pooled OLS regression:

After the pooled OLS regression we saw that only one variable capital health expenditure percentage of GDP, only this have no significant impact on GDP per person. But other significant collision upon per capita of GDP. Also, we can see that the relationship between current health spending and GDP is adverse or unfavorable per capita, which was not suppose to happen. But rest of the variables, each and every individual has a positive relation with GDP per capita, and according to the P value the relation is very much significant with the rest of the variable for GDP per capita. Again the R square (R^2) is very good, and here almost 89% (0.8886) of the variation in Y is explained by all the explanatory variables. Also Adjusted R^2 Square is also good which is almost 89% (0.8850). Root mean square error is better fit if it is small in number but again the F statistic is showing us that the overall significant is quite well. As the significant is good so we do not need to give big thought about it right away.

As we get to run panel data analysis, we can have the opportunity to perform some important test that are quite important and required to the panel data research analysis. So we can now start with ta pooled OLS regression and this is for because that the pooled OLS provide us the accurate F statistics to observe the overall related significance of our model. This can help us to grasp the understand of the thought that how accruable and acceptable is our model. Where the t 0.05 it represent that our required model is quite significant. We can here also able to deduce that the t – value and the p – value test represents the very explanatory variables of its own significance. And the R^2 (R square) helps us to hold the understand the goodness of fitness. Here the 95 percent of the current situation of the health care expenses is quite explained by the independent variables.

As we are modeling the panel data analysis, that means there might be more appropriate model than pooled OLS. For that, we need to find out by using other model test. For example models with Fixed Effects and Random Effects.

Model of Fixed Effect:

A using a fixed effect model, dissect the variables' impact that may vary over time. Fixed goods help us to identify those unobserved factors which change over time. Fixed effect exploration investigates the relationship between outgrowth and predictor within a single reality country. Each reality has characteristics that may or may not impact the predictor variables. The ficed effect model removes the time steady predictors so that we can assess the final result of the predictor about the outgrowth factor.

The results are showing a favorable correlation with the dependent variable and independent variable without the capital health expenditure and current health per capita GDP

Fixed effect model	
Dependent variable	
GDP per capita	-
Independent variable	
Capital Health Expenditure of GDP	-89.12571 193.8998
Current health per capita GDP	-21.9811 12.50383
Domestic government general of health expenditure	33.71116 12.62102
Domestic private general of health expenditure	44.30049 13.03589
sigma_u	1150.8973
Sigma_e	591.75533
Rho	.79090808
R² (Overall)	0.8705

Sigma-u: 1150.8973 explains departure from the mean for the residual within groups

Sigma – e : 591.75533 explains standard deviation of residual of overall error term

rho : 79 %. The difference between the panels accounts for of the variation.

Corru(u_i, Xb) = - 0.6671 here is correlation

R^2 (square) : Within = 0.8825

Between = 0.8941

Overall = 0.8705

If this figure is less than 0.05, then this model is sound. This test (F) determines if each coefficient in this very model is nonzero.

29.7% of the variance is by the difference between panel. And interclass correlation is denoted as "rho."

Two-sided The hypothesis that each coefficient is nonzero is tested using p-values. The p-value must be less than 0.05 in order to reject it. In this instance, we may conclude that the variable significantly affects y. The t-values investigate whether each coefficient is greater than zero. The t-value needs to be higher than 1.96 (95% confidence) in order to be rejected. In this instance, we may conclude that the variable significantly affects the dependent variable (y). The t-value increases as more relevant variables.

Current health expenditure is negative that we got in pooled OLS, as same as the random effect model. And we also found out that the value is similarly negative in fixed effect model. The reason might be that, for some certain reason the relationship with current healthcare costs and per-capita GDP is negative, reason might be for the negative is just because of the data and current healthcare costs and GDP per person, that we hold understand that the government is spending in the current time in the health care, and this is all in capita, which means per person health expenditure is how much. But we can see in the test that, the per person health expenditure if increase then GDP per capita is decreasing, and the reason might be that if we allocate a significant portion of our income for the health care purpose than at the end we can see that our income might decrease and other allocation of expenses might get effected, which will eventually have effect on our daily life and thus country's economy. So, the more I spend for health care the more my income decrease financially. If we invest more in micro level then overall income will decrease even more to maintain the allocation. The other reasons might be that there are some other economic crisis or the inflation might play a significant role here by devaluating the value of money. Or the people is facing difficult time to maintain a standard health care measuring there income level. However, our result and analysis did find this, and we hope it might carry a significant value for the paper.

Areg has two benefits even if its affair is less instructive than retrogression with clear dummy factors. It expedites exploratory work and provides immediate feedback on whether a method using ersatz variables is beneficial. Second, adding dummies for every value of the variable of interest might result in an excessive number of variables or a huge model.

Model of Random effect:

Unlike models with fixed effects and random effects mean that changes between entities are unrelated to the independent or predictive variables in the model, and random. Because of the fixed effects model, we can see that.

Random effect model	
Dependent variable	
GDP per capita	
Independent variable	
Capital Health Expenditure of GDP	46.90941
	204.1222
Current health per capita GDP	-21.26465
	13.48249
Domestic government of general health expenditure	32.73929
	13.59245
Domestic general private of health expenditure	39.3399
	13.93264
sigma_u	340.47492
sigma_e	591.75533
rho	.24871011

Sigma-u: 340.47492 explains the residual within-groups standard deviation.

Sigma-e: 591.75533 explains the total error term's residual standard deviation

rho: 25 % of the variation is caused by the variation between the panels.

Corr (u_i, X_b) = - 0 here is correlation

Your model is sound if this number is less than 0.05. This test (F) determines if all model coefficients are nonzero.

29.7% of the variance is by the difference between intraclass correlation is referred to as "rho" in panels.

Two-sided the hypothesis that each coefficient is nonzero is tested using p-values. When the p-value is less than 0.05, which is required to reject the hypothesis, we may conclude that the variable significantly affects y.

The t-values investigate whether each coefficient is greater than zero. The t-value needs to be higher than 1.96 (95% confidence) in order to be rejected. In this instance, we may conclude that

the variable significantly affects the dependent variable (y). The variables are more meaningful when the t-value is larger. Areg has two benefits even if its affair is less instructive than retrogression with clear dummy factors. It expedites exploratory work and provides immediate feedback on whether a method using ersatz variables is beneficial. Second, constructing dummies for each value of the variable of interest might result in an excessive number of variables or a model that is too big.

Hausman Test:

This test will tell me that in my panel data set, which model is more appropriate / explainable. Is it either a random effect model or a fixed effect model . So, this is very vital for our research. Because these 2 models are designated model for the panel data set. These two model will not be appropriate for my research, but thanks to hausman test that it will help me to understand to find out which explains and appropriate for this findings.

The coefficients and the difference from the Fixed Effect to the Random Effect			
Variables	Fixed (FE)	Random (RE)	Difference between FE and RE
CAHE	-89.12571	46.90941	-136.0351
CRHEPERCAP	-21.9811	-21.26465	-0.7164575
DGGHEPERCA	33.71116	35.73929	0.9718751
DGPHEPERCA	44.30049	39.3399	4.960586

Current health expenditure is negative that we got in polled OLS, as as same as the random effect model. And we also found out that the value is similarly negative in fixed effect model. The reason might be that, for some certain reason the relationship with current healthcare costs and per-capita GDP is negative, reason might be for the negative is just because of the data and current healthcare costs and GDP per person, that we hold understand that the government is spending in the current time in the health care, and this is all in capita, which means per person health expenditure is how much. But we can see in the test that, the per person health expenditure if increase then GDP per capita is decreasing, and the reason might be that if we allocate a significant portion of our income for the health care purpose than at the end we can see that our income might decrease and other allocation of expenses might get effected, which will eventually have effect on our daily life and thus country's economy. So, the more I spend for health care the more my income decrease financially. If we invest more in micro level then overall income will decrease even more to maintain the allocation. The other reasons might be that there are some other economic crisis or the inflation might play a significant role here by devaluating the value of money. Or the people is facing difficult time to maintain a standard health care measuring there income level. However, our result and analysis did find this, and we hope it might carry a significant value for the paper.

Formerly we have conducted both the random effect and fixed effect models for this particular scrutiny we've to look for the stylish model. The Hausman test is used to carry out comparison contrasting the fixed effect model with the random effect model and which one is applicable grounded on the data set. So now then we show that.

H₀: RE model is appropriate
H_A: FE model is appropriate
If $P < 0.05$ then we reject H₀
Test statistics: $\text{Chi } (\chi)^2 = 31.39$
P = 0.0000

Here, due to the order we need to select between null and the alternative hypothesis which is, Null hypothesis shows the alternative theory demonstrates that the Fixed effect model is acceptable while the effect random model is suitable.. Again, $P = 0.0000$ which tells us that we reject the H₀, showing that fixed effect (FE) is acceptable. Now, we reject Null hypothesis which is Random effect model, and for that we came to the understanding that for our model we accept alternative hypothesis which is Fixed effect model, according to the calculation.

So, we can say that for out data fixed effect model is appropriate.

Diagnostic test

Modified wald test for Heteroscedasticity:

This test is performed to watch whether or whether not the very model contains or hold the error terms and variance here. We will try to decide whether or whether not Homoscedasticity has been through breach the violation. Which we will eventually know. Apparently the decision will be taken if P value is lass then 0.05.

H₀ : There is Homoscedasticity in the Model
H_A : There is Heteroscedasticity
IF P < 0.05 Then We Reject H₀
P = 0.0000

We accept the H_A alternative theory while rejecting the null hypothesis put forward by H₀. And we have the heteroscedasticity in our model. And it is not a thing to worry about. So do accept the result of Heteroscedasticity.

Apparently the homoscedasticity is being broken and the heteroscedasticity does exist. So, therefore we can say that the amount of the error term varies across all the values of an independent variable.

Woolridge test for Autocorrelation:

Here the auto correlation is usually conducted on a time series method since it is responsible to reveal the degree to which the exact values of the same are comparable to one another variable across subsequent intervals of the very time. We know that,, since our panel data analysis in the research period starts from 2000 to 2020 it extent, and we can say that it is quite lengthy study. We will now try to determine whether or whether not the Autocorrelation is present in our study.

H₀ : There Is No First Order Autocorrelation
H_A : There Is First Order Autocorrelation
IF P < 0.05 Then We Reject H₀
P = 0.0058

Woolridge only detect first order autocorrelation, it might be higher order autocorrelation is there but this test is designed to detect first order autocorrelation. So, our hypothesis is set accordingly to the concept of detect first order autocorrelation.

For the order to select in between null hypothesis and alternative hypothesis, we must observe the probability value and here it is P = 0.0000 for that we have to accurately reject H₀ Null hypothesis.

So, for that action the Autocorrelation, there is 1st order autocorrelation, indicating that the consecutive errors are very much connected here.

Cross sectional Dependence: (BPLN test)

Cross sectional Dependence
H₀ : There isn't a cross-sectional Dependence
H_A : There is cross-sectional Dependence
P < 0.05 = Then Reject H₀
P = 0.0000 < 0.05

Here H₀ the null hypothesis is rejected, and accept H_A alternate hypothesis. And no cross sectional dependency exists. So, test of diagnostic saying that we have a cross sectional dependence data problem, and it is very common in panel data, nothing to worry about it.

Here we mostly run this test based on Breusch Pagan LM test. This test can also be run by Pasaran CD test which will also give the similar results.

Breusche Pagan LM test: According to Baltagi, cross-cutting dependencies are a macropanel problem with long time series spanning 20-30 years. This is not a big problem with several years of micropanel and a large number of cases. The hypothesis of the null, for BP/ L M independence that test is the residuals between system are uncorrelated. BPLM usually helps us to find the difference between simple OLS regression and the random effect models.

Pasaran CD test: As, cross-section dependence is a bigger issue for macropanels with long time series spanning 20-30 years than for micropanel. The Pasaran CD cross-section to determine if the residuals are associated across entities, apply the dependency test. Crosscutting dependencies introduce test-result bias, also known as co-correlation. The null hypothesis claims that there is no correlation in the residuals.

According to the **pesaran CD test** our model has really have a cross section dependence. The possible reason of this cross sectional data is that we have chosen the South Asian countries and for that the geographic or by nation they are same, so for that we are repeatedly getting the cross section data problem which have a similarity and homogeneous unit to some extent as they are all

Asian country, for that the cross section dependence is being created. As if more than one unite then if the unites are heterogeneous there might not be that much cross section data, but if the data are homogeneous like same income level or same high income countries or other indicators are similar.

Cross-sectional time-series FGLS regression: Through this we need to solve the problem of auto correlation and the coefficients will be generalized least squares method.

<u>Independent variables</u>	<u>Values</u>
CAHEOFGDP	522.3734
	209.0986
CRHEPERCAPITAGDP	49.92072
	15.23447
DGGHEPERCAPITAGDP	60.63553
	15.31334
DGPHEPERCAPITAGDP	64.67083
	15.64203

There is no autocorrelation and the panels are homoscedastic with coefficients of generalized least squares. By this we solve the problem. The P values have improved a lot than before.

Conclusion:

The research sought to understand the economy and health care costs are correlated growth utilizing secondary data coming out of 2000 to 2020 using regression analysis.

Effect on the GDP per capita has been shown to be rather obvious, and statistical analysis reveals that the result is considerable. In other words, this study might be thought of as the exterior shell because this research hasn't delved too deeply within.

However, additional variables and observations must be taken, along with a preference for avoiding secondary data, in order to determine the ideal amount at which Bangladesh should invest in its people's health. However, the information gained from this study will be useful for a number of parameters, including those that affect economic growth, such standard of the health of the public, the rate of birth, and maternal mortality.

Study asked whether there was any influence of healthcare spending on economic growth, and the answer is yes, although it varies depending on the circumstances. Even if population healthcare costs rise, concluding analyses using accessible data show that this does not necessarily result in sound economic performance. According to World Bank data, health care and GDP per capita have a positive and negative connection in high cost nations. This might have ramifications for the healthcare industry in the future. People in certain nations are experiencing financial difficulties as a result of a lack of healthcare. Regarding the other independent variables, such as domestic general government health expenditure, it performs well in high income nations since job variety is larger, as is the quantity of excellent wages and spending on the healthcare sector. As a result, it is fantastic to have an overall positive the impact of healthcare spending on economies for the most and many nations.

Reference

Erçelik, G. (2018). The relationship between health expenditure and economic growth in Turkey from 1980 to 2015. *Journal of Politics Economy and Management*, 1(1), 1-8.

Bakare, A. A., & Olubokun, S. (2011). Health care expenditure and economic growth in Nigeria: An empirical study. *Journal of emerging trends in economics and management sciences*, 2(2), 83-87.

Akram, N., Ihtsham ul Haq Padda, & Khan, M. (2008). The long term impact of health on economic growth in Pakistan. *The Pakistan development review*, 487-500.

Arora, S. (2001). Health, human productivity, and long-term economic growth. *The Journal of Economic History*, 61(3), 699-749.

Kurt, S. (2015). Government health expenditures and economic growth: a Feder-Ram approach for the case of Turkey. *International Journal of Economics and Financial Issues*, 5(2), 441-447.

Leigh, A., Jencks, C., & Smeeding, T. M. (2011). Health and economic inequality.

O'Donnell, O., Van Doorslaer, E., & Van Ourti, T. (2015). Health and inequality. In *Handbook of income distribution* (Vol. 2, pp. 1419-1533). Elsevier.

DİNÇER, H., & YUKSEL, S. (2019). Identifying the causality relationship between health expenditure and economic growth: An application on E7 countries. *Journal of health systems and policies*, 1(1), 5-23.

Balaji, B. (2011). Causal nexus between public health expenditure and economic growth in four southern Indian states. *IUP Journal of Public Finance*, 9(3), 7.