Analysis of Causal Relationship Between Health Expenditure and Pandemic Deaths

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BY

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DECLARATION

I declare that the present thesis entitled “Analysis of Causal Relationship between Health Expenditure and Pandemic Deaths” is a consolidation of an original work which has been carried out by me under the guidance of Dr. P.K. Sudarshan, Professor in Economics, Goa Business School, and the same has not been submitted to any other university or institution for the award of any other degree, diploma or other such titles.

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CERTIFICATE

This is to certify that Mr. Asif Mohammad Sheikh has worked on the thesis entitled "Analysis of Causal Relationship between Health Expenditure and Pandemic Deaths" under my supervision and guidance. This dissertation is being submitted to Goa University, Taleigao Plateau, Goa, for the award of the degree of Masters in Economics, it is a record of an original work carried out by the candidate himself and has not been submitted for the award of any degree, diploma, a scholarship or fellowship of this or any other university.

Dr. P.K. Sudarshan

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CHAPTER 1

INTRODUCTION

1.1 Background

The healthcare sector is said to be one that comprises of several provisions made through businesses, such as medical services, manufacture of medical drugs and equipment, and it even extends up to provisions of medical insurance to extend quality healthcare to the people. Healthcare in India dates back to the ancient times where Ayurveda or the "science of life" was the prominent source of medical knowledge and services, which have survived the changing times and is practiced till date. Post this period in history, with the various invasions and foreign rules new methods and treatments also added to the existing flourishing healthcare industry of the time in India. Modern medicine, as we know it today, however, was brought in by the Portuguese and the hospital structures were eventually built by the British and French in India. Since then there has been a huge surge in the organization, training and establishment of a fully functioning and competitive medically structured healthcare sector in India, with the government accepting Ayurveda, Homeopathy, Allopathy, Naturopathy, Yoga, Unani and Siddha as valid medicine approaches.

It would be fair to say that India truly has come a long way through its long and celebrated history of healthcare. Today, India witnesses its healthcare to be one of its largest sectors in the economy, both in terms of employment and subsequent revenue through various hospitals, clinics, medical outsourcing, health insurance, medical equipment and so on. The two major sections within this sector has been the contributions of the public and private healthcare services. While private medical institutions provide a major part of the secondary, tertiary and quaternary care, they are mostly located in metropolitan cities and large commercial towns. They also have a high fees and charges making them rival and excludible in nature. The public medical institutions like government hospitals and public healthcare centers (PHCs) are under the government welfare domain and do not share in a majority in the secondary and tertiary care institutions, however it they are mostly located in rural areas to bridge the discrepancies left by the private sector, to ensure everyone has

access to healthcare services. The fees and charges are also subsidized and minimal in most of these pubic healthcare institutions. India has observed a comparative advantage in its large assortment of well-trained medical professionals. The cost of surgery in India is also said to be about one tenth than that of the United States of America and Western Europe. These factors have also led to an increase in the medical tourism of the country, where people from all over the world prefer to find treatment in India, not only for its affordability but also for its expertise and well placed healthcare sector.

In a 2017 report by the World Bank and the World Health Organization, we witnessed that at least half of the world's population couldn't have access to essential healthcare services. This brings in the question of what are the factors acting as a hindrance and/or a prohibition in this case? To a great extend the answer lies in the development levels of the nations, the national income of the nations and the overall preparedness and medical infrastructure on the global scale. These factors determine whether the people of the nation will have access, facilities, treatment, etc. of the essential healthcare services, may it be in general, in times of emergencies, or in the face of a global pandemic as observed with the Corona virus pandemic, which put the existing global healthcare structure to the ultimate test.

Whether developed, developing, high income, upper middle income, lower upper middle income, or low income- all countries had to face the brunt of the deadly pandemic which put unforeseen pressure on the healthcare systems of the world. The varied incomes, infrastructure, investments in medicine, etc. determined the strengths of these international healthcare systems. Where although the developed and higher income countries where assumed to be better equipped and prepared compared to the developing and lower income based countries whose healthcare institutions would be under immeasurable stress and pressure, the powerful nations also showed a lag and thus calling upon urgent needs for medical infrastructure updating, changes in the structure of the healthcare services and better overall preparedness among all nations regardless. This may primarily be because of the fact that the pandemic was unforeseen or even underestimated to quite an extend globally. However, the wealth of a country is an important factor which ultimately decides several important healthcare components like insurance, access to treatment,

and even lifestyles. Healthcare, in general is an important sector in every country to ensure the safety and wellbeing of the world's citizens.

However, in recent trends it has been observed that change in technology and lifestyle has brought with it a lot of new changes in the medical needs of the people. Healthcare is also seen as an important tool in eradicating world poverty and enhancing the productive efficiency of all citizens. Thus this gives an incentive to developing countries to invest more in medical infrastructure and for the developed countries the aim lies in maintaining the quality of medical services provided. The healthcare system truly is an indispensable aspect of the society. But even then Covid-19 was a wakeup call to every nation about their prevailing healthcare sector. It was learned that although this sector was undeniably important and essential, it was not sufficient in the modern day life. It was thus necessary to make several reforms and transformations, invest and even allocate higher budgetary sanctions to the healthcare sector for the well-being of the society as a whole and also to reduce the unnecessary stress put upon this sectors professionals in the unfortunate times of a global pandemic.

It was found that many "COVID Warriors", as the medical professionals were called, were exhausted and were facing a physical and mental burnout. This was a problem as it could have long term implications on the people working in that sector, as well as the people's perspective towards it. However, it was observed over the last two years that while the entire world's attention was on the healthcare sector as the pandemic unfold, many investors too were seeking to invest in this sector as the demand drove its worth upwards. As the first and second waves hit the nations of the world there was an increasing scarcity not only in the supply chains of the daily necessities, but it also pushed the healthcare sector past its breaking point. The shortage of ventilators, oxygen cylinders, hospital beds, etc. led to a lot of people to lose their lives. With the growing helplessness, it was only the place the citizens of the world would turn towards with hope was the healthcare sector, not just to provide the services but to also find the appropriate cure or vaccination against the virus. The also sought the advice and knowledge of healthcare professionals to avoid misinformation and rather educate themselves through the pandemic about the virus- its strains, mutations, symptoms, etc. It is thus fair to say that it took a global

pandemic to acknowledge the healthcare sector that was always perceived to be important, but no heed was paid to it being insufficiently advanced to keep up with the changing times around the world. This paradoxical nature of this essential sector led to its neglect and thus was finally being noticed and transformed through the Covid-19 pandemic. In 2021, the World Health Organization revealed in the second round of their "pulse survey" that the Covid-19 pandemic had caused large disruptions wherein about 90% of all the countries showed that these disruptions persisted in the healthcare sector even after a year of its existence. The countries have thus called for mitigations over these disruptions but there still seems to be discrepancies and have thereby stepped up in their efforts to improve and enhance the healthcare sector. Even then, about 66% of the nations have reported health workforce related reasons casing service disruptions and about 43% of the nations cited financial disruptions as causes for challenges in service utilization, among many other disruptions. This has been a huge hindrance in the medical services and has therefore led to millions of people all around the world to miss out on quality healthcare. What is immensely disheartening to know is that lifesaving surgical care, emergency actions and so on are still facing disruptions in the world today, post the peak of the pandemic. It really makes one wonder then what the advancements or the changes that were made to transform this lagging medical sector. There has been a huge surge in telehealth services where people could use digital media to consult and seek treatment in the times of a pandemic. This led to many new innovations in the field which was a big boon to many. There were a lot of policy changes that were brought on by the governments of the world to not only improve the overall healthcare but to also incentivize the healthcare providers to maintain the quality and motivation. People were also made aware about the necessity to invest in health insurance and how it had been beneficial to so many in times of such an emergency of that magnitude. There was also a growing consciousness for the need of better surveillance systems and data analysis to track infectious diseases to stop them in its roots from turning into an epidemic or eventually a pandemic, disrupting all life on Earth. The need for developing scientific research for better cooperation, research and medical crisis management was also stressed upon. This objective was not only going to help lead to discoveries which would solve modern problems like vaccines and other medicines, but would also prevent the same history to repeat anytime in

the future. Thus, it took a great deal of rethinking, reallocation and redistribution of resources towards the healthcare sector trying to contribute to the efforts of transforming the scale of services to better the preparedness and functionality for the present and the future.

1.2 Statement of the Research Problem and the Research Question.

Health care is the most important sector of a nation. Improvement of healthcare sector is important as there is technological advancement which will help nation to become strong or powerful. Healthcare system differ from countries to countries. Health care can contribute to its countries economy and development etc. In this paper we are trying to analyses the relationship between the health expenditure of before this pandemic and death caused due to this pandemic. In this analysis this is what we aim to observe in this paper. The general impression is that higher the health care expenditure, lower the impact of any kind of pandemic including the death. This study tries to understand whether this assumption has worked in the case of Covid-19. The specific research question is what is impact of Covid-19 on countries with different levels of health care expenditure.

1.3 Objectives

1. To classify the factor determining health expenditure of selected countries.
2. To examine nature of casual relation between COVID-19 deaths and Government expenditure on health.

1.4 Data and Variables

The two major sources of data are

- World Health Organization (WHO)
  The variables like death per million, total number of cases, case per million, age above 65-year-old were downloaded through this website

- World Bank.
  Other macroeconomic indicator like health expenditure, population, GDP, were collected from World Bank sources

1.5 Methodology

In the analysis, we have used secondary data. The data was collected through The World Bank for the time period of 2000 till 2018, 40 different income level group

countries are considered, the classification of income level group is given by the World Bank. The macroeconomic indicator like GDP, Health expenditure and population was extracted through World Bank website and the other variables like death per million, total number of cases, total number of cases per million, age above 65, were extracted from WHO website for the time period of 2019 to 2022 during pandemic. Further, we aligned data into two forms panel data and Cross-sectional data. We have used graphical representation in this analysis, Bar graph shows average health expenditure, total number of death related to COVID, total number of COVID cases and GDP per capita of all the groups of income level Later we performed ANOVA test to check the difference between the average health expenditure of different income level group of countries was conducted with help of spread sheet. In Panel data there are three types of model. Pooled OLS, Fixed Effect Model and Random effect model. To select from this this 3 three model we had to go under certain test like f-test to select between Pooled OLS and Fixed Effect Model, Chi-square test to select between Pooled OLS and Random Effect Model, After finding Fixed and Random Effect Model valid we had to go under H-Test/Haussmann test to select between this model after H- test we found that Random Effect Model is suitable for this analysis we conducted all the test with the help of Gretl software to test what are the factors determining average health expenditure of different income level groups, factor determining deaths per million and total number of cases this particular variable observation was derived with the help of Multiple Regression model and cross-sectional data was used for the analysis

1.6 Scope and Significance

The scope of study is to analyze the factors determining health expenditure in different income group level of countries. In addition to establish relationship between health expenditure and deaths caused due to the pandemic. The study has lot of significance in the counteracting the impact of pandemic in future. The study would reveal the importance of health care expenditure in compacting the pandemic. If the countries increase their share of their health care expenditure, perhaps, they would be able to control the pandemic easily.

CHAPTER 2

LITERATURE REVIEW

This chapter would provide the existing literature on the relationship between health care expenditure and the impact of pandemic. Since COVID-19 is a recent phenomenon, not many studies exist as of now. The purpose of this review is to understand the kind of studies carried out by different researchers in this area, the data and methodologies used by them and to identify the gap in the existing literature.

A study was conducted wherein the world economy was compared before COVID-19 and During COVID-19 by Alan et al (2021) in this study the author looks at four different perspectives: 1. Impact on the United States with respect to marginalized population. 2. Psychosocial impact. 3 healthcare facilities of US. 4. Global impact on healthcare facilities. The data source was gathered from different report like Asian pacific policy and planning council, Global market research and Public opinions (IPSOS), Centers for Disease Control (CDC), WHO. They have compared the data set of 2019 till 2021 by using Real GDP annual percentage of world, ASEAN, Low and Middle Income countries. The major findings of this studies were low and middle income countries were affected more due to lack of healthcare facility, Low earning Income group of workers were negatively affected in the US, Women were the one who were affected due to work from in US, Due COVID-19 there was increasing in cost and loss of revenue, In China's GDP there was shrink of 6.8% in first four months, China is the biggest exported to the other countries due to ban on travel the importing countries faced loss. Lack in health sector affected the world. Supply of worker in healthcare sector were in short.

Similar kind of study was done at a country level wherein the focus was more towards the healthcare sector and Welfare program scheme. Gopalan et.al. (2020) tried to understand the healthcare and national health programs with respect to India due to pandemic.The objective of this paper was to analyze the economic impact and socio-cultural impact. In addition, the author has also analyzed effect on health sector and national health programs. The author has compared Real GDP for the

time period of 2019 to 2020, which was estimated by RBI. To measure the socio-cultural data, they have compared based on economic and emotions with South Asian Countries like Pakistan and Bangladesh for the time period of 2019 to 2020, data source Ministry of health care and welfare of India, RBI. In this study the author found that financial loss occurred due to national lockdown, the health care programs were also affected, Real GDP has been fallen from 1.3% to 4.8%, India has more crowed living which was another cause of rapid spread of COVID-19.

In addition to this a cross-countries study was conducted wherein 50 countries were included (Tandon et al., 2020). The author assessed increased public spending on education and health. The study used indicator like public spending and social indicator for 50 transition countries. The statistical results indicate that, in education, both the overall level of public spending and intrasectoral allocation matter, in particular, shifting spending toward primary and secondary education, is associated with improvements in widely used measures of education attainment. In the health sector, increased overall health spending is associated with reduced infant and child mortality rates

Gupta et al., (2002) published a paper on the Academia Journal, assessing the effectiveness of government spending on health and education in developing economies. The objective of this study was to assess if rising public expenditure on health and education matters using cross sectional data including social indicators and public spending for 50 progressing economies. Data for this analysis was drawn from IMF's Government Finance Statistics, World Bank's Poverty Assessments, Public Expenditure Reviews, Recent Economic Development Reports, UNESCO, World Development Indicators, and GFS databases. Authors used various regression models in this analysis such as 2 STAGE LEAST SUARE MODEL, ORDINARY LEAST SQUARE MODEL, LOG LOG and LINEAR functions. A nonlinear relationship between health and income was estimated using Log-Log specification. The results showed that total health spending was statistically significant in all regressions, it was found that increased health expenditure reduced child and infant mortality rates.

Fan et al., (2012) conducted a study on Health Financing Transition it was published on the Results for development institute journal, the objective of this paper is to

analyze health financing to provide a conceptual framework with public policy and health market. In this analysis the author used 15 years of data, 126 countries data were examined in this study for the time period 1995 to 2009.Different econometric tools were used like fixed effect model and also cross-sectional dependence, serial correlation, and unit roots.

B.A Sethi et al.(2020) Impact of Coronavirus disease (COVID-19) pandemic on health professional this paper was published in Pak j Med Science journal, the main focus of the study was to examine the impact on healthcare professional along with the challenges, Methods used in this paper are A descriptive cross-sectional qualitative survey was conducted from March-April 2020. Thematic analysis of the qualitative data. Two category of Participants included health professionals both private and public -sector institutions of Pakistan. Data source was primary. Findings of this analysis was that private clinic hospital was affected, there was overload work in Public sector hospital, there was shortage of healthcare worker, it was found that due huge pressure and work load affected the health of the healthcare working force.

Another study was conducted in the United States analyzing the trends in health expenditure during the pandemic (Rhyan et al 2020) tracking the U.S. health sector: the impact of the COVID-19 pandemic. This paper was published in National association of Business Economies Journal, The main focus in this paper is to Track the health expenditure for the time period February 2020 to August 2020, the data used in this study is secondary and the source of data was Centers for Medicare and Medicaid Services (CMS), and represent the U.S. government's official accounting, They have compared health expenditure with COVID-19 Pandemic and the Great recession and also the trends in the monthly expenditure during COVID-19. It was observed that no matter how bad the economy is suffering people tend to consume healthcare facility irrespective of Great depression or a pandemic. COVID-19 recession was greater than the Great depression. Personal health care spending fell by 25% during COVID-19 recession, Health expenditure has been increased faster than GDP of US, around 18% of GDP is spend of healthcare during the COVID-19 recession.

A study was conducted with a different perspective: to understand the healthcare pressure during COVID-19 and Natural disaster, (Sohrabizadeh et al. 2021) A

systematic review of health sector responses to the coincidence of disasters and COVID-19 published on BMC journal, the paper discusses about the pandemic and coincidence of disaster took place during pandemic in addition it also sees how the health sector respond to it.

CHAPTER 3

ANALYSIS

FACTORS DETERMINING THE HEALTH EXPENDITURE

3.1 Introduction

All expenses for health services, family planning activities, nutrition activities, and emergency help targeted for health are included in health expenditures, but drinking water and sanitation are excluded. Health financing is an important aspect of health care systems. Health financing is an important aspect of health care systems. National health accounts provide a wide range of metrics based on expenditure data collected within a globally accepted framework. These accounts represent a synthesis of the finance and spending flows recorded in the operation of a health system, from funding sources and agents to the allocation of cash among providers and health system tasks. “Ensure that all people of all ages live healthy lives and promote well-being.

Countries having per capita incomes of more than $12,475 are classified as high-income (68.3 percent of global income). They account for 12% of global population. Regional comparisons are inherently flawed because even countries within those regions differ are known has High Income Countries or nations.

Upper Middle Income Countries: Per capita income of greater than $4,125, as measured by the World Bank Atlas technique. But not more than $12,736 High-income High-income economies have a GNI per capita of $12,736 or more, according to the World Bank Atlas approach.

Lower Middle Income countries: where the per capita GNI falls between $1,026 and $3,955.

3.2 Methodology of Grouping Countries

The selection of countries was done based on random selection. There are 4 different classification of Income level group of countries (High, Upper Middle, Lower Middle and Low Income Countries)

Table 3.1 Countries

High Income	**Low Income**	**Lower middle income**	**Upper middle income**
ANDORRA	BURUNDI	BENIN	CHINA
UAE	NIGER	BANGLADESH	ARGENTINA
AUSTRALIA	UGANDA	GHANA	ARMENIA
AUSTRIA	BURKINA FASO	INDONESIA	BRAZIL
BELGIUM	CENTRAL AFRICA	INDIA	COLOMBIA
BAHRAIN	GUINEA	IRAN	CUBA
CANADA	CONGO	KENYA	ALBANIA
USA	ERITREA	NEPAL	MEXICO
GERMANY	LIBERIA	MYANMAR	MALAYSIA
DENMARK	GAMBIA	MOROCCO	TURKEY

3.3 Tools of Analysis

1. Graphical Analysis

We used several distinct sorts of data representation tools in this chapter. To begin, we've utilized Data visualization is an appealing means of displaying numerical data that aids in the visual analysis and interpretation of quantitative data. A graph is a type of chart in which data is shown as variables over an axis. There are various types of graphs, and in our study, we used a Bar Graph to depict our data. We show three variables (average health spending, total number of COVID deaths, and total number of COVID cases) for 40 nations by World Bank income groups (High Income countries, Upper middle income countries, Lower middle income and low income countries)

2. ANOVA Test

One-way analysis of variance is a statistical approach for determining whether the means of two samples are significantly different. When you have a single independent variable, or factor, and you want to see if variations or various amounts of that factor have a detectable effect on a dependent variable, you should utilize one-way ANOVA. We grouped average health expenditures for 40 countries by income groups as defined by the World Bank (High Income countries, Upper Middle Income Countries, Lower Middle Income Countries, and Low Income Countries) total number of COVID cases) for 40 countries by income groups as defined by the World Bank (High Income countries, Upper Middle Income Countries, Lower Middle Income Countries, and Low Income Countries).

3. Panel Data Regression

Panel data and longitudinal data are both multi-dimensional data requiring measurements over time in statistics and econometrics. Panel data is a subset of longitudinal data in which the same subjects are observed repeatedly. Time series and cross-sectional data can be thought of as one-dimensional special examples of panel data (one panel member or individual for the former, one-time point for the latter).A longitudinal or panel study is a research project that employs panel data.

Classification of banks (High Income countries, Upper middle income countries, Lower middle income countries and Low income countries)

There are three types of panel data model

A) Pooled OLS Model

B) Fixed Effect Model (FEM)

C) Random Effect Model (REM)

Furthermore, the data for the study is collected from World Bank Sources. A Panel Data of 38 countries has been considered for the study. A Random Effect model is developed and estimated to identify the factors that determine the Health Expenditure.

Random and Fixed effects model

We estimated the factor determining the health expenditure with the help of Random Effect Model (REM) before we could conduct our analysis we had to go through certain test for choosing between the 3 models, to choose between Fixed Effect Model and Pooled OLS we conducted F-Test, after finding Fixed Effect Model Significant. Moreover we conducted Haussmann test/ H-Test wherein we compare Fixed Effect Model and Random Effect Model, the result were in the favor of REM. In this analysis we have used REM model to estimate factors determining health expenditure.

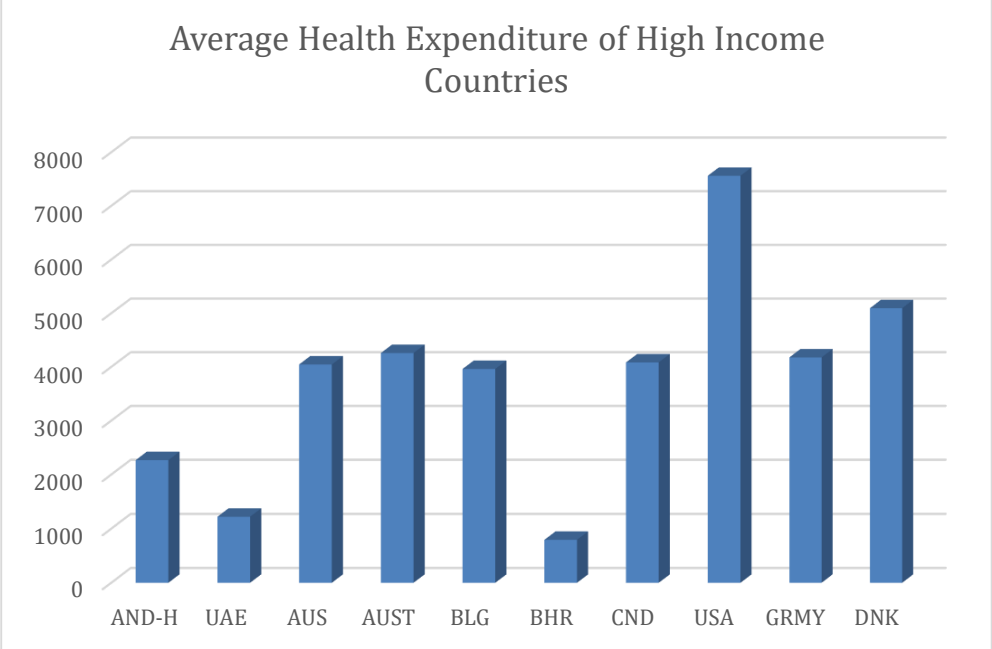
Methods of Analysis:

1. **Graphical analysis**
2. **ANOVA Test**
3. **Panel Regression by Income groups**

1. Graphical Analysis

Under graphical analysis average health expenditure, total number of COVID cases, total number of COVID deaths and average GDP per capita are analyses and references are drawn.

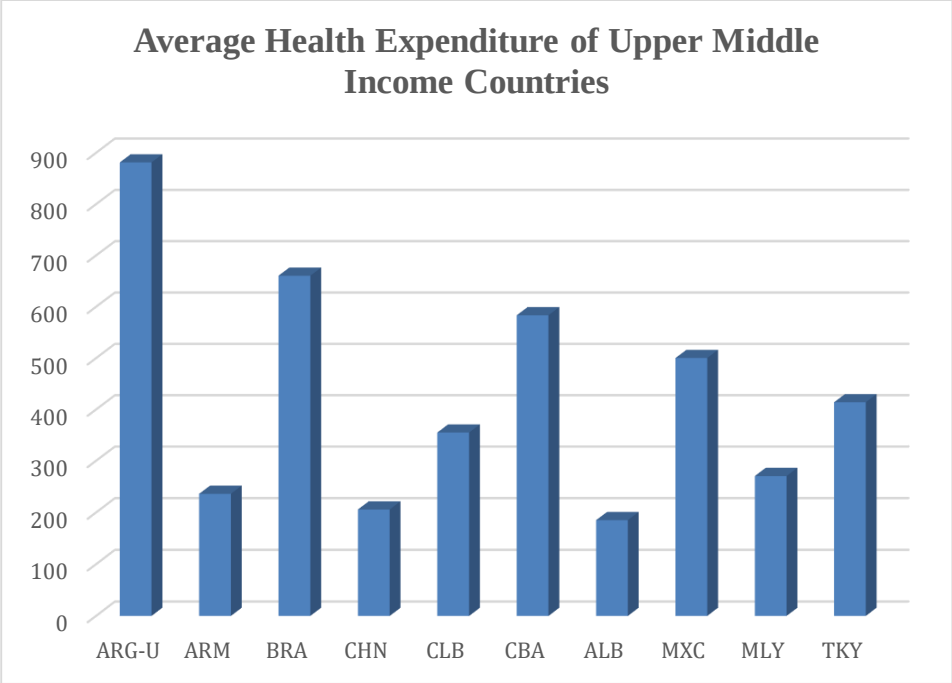
Graph 3.1 Average Health Expenditure of High Income Countries



Source: Secondary data from World Bank

The above graph represents the average health expenditure of high income countries. The graph shows that average health expenditure of Andorra is 2267.78 million dollars whereas UAE has 1221.47million Dollar, Australia's average health expenditure is 4046.77 million dollar , Austria's average health expenditure is 4260,09 and Belgium average health expenditure is 3963.21million dollar more than 3000 million dollars, It was found that Bahrain average health expenditure is 793.53 million dollar, Canada's 4084.89 million dollars and Germany's average health expenditure is 4178million dollar, Denmark's average health expenditure 5095.34 million dollar . USA has the highest average health expenditure is 7561.68 million dollars. In our group we found that USA has the highest average health expenditure and the lowest average health expenditure is Bahrain.

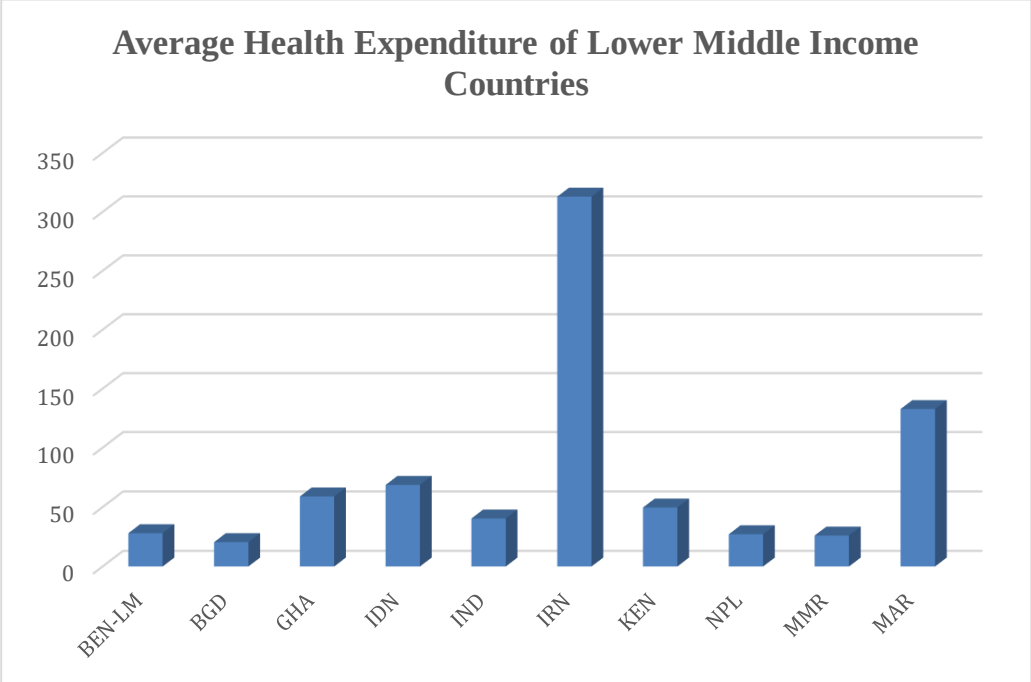
Graph 3.2 Average Health Expenditure of Upper Middle Income Countries



Source: Secondary data from World Bank

The above graph represents the average health expenditure of Upper Middle income countries. The graph shows that average health expenditure of Argentina is 881.39 million dollars whereas Armenia has 236.19 million Dollar, Brazil's average health expenditure is 660.68 million dollar , China's average health expenditure is 205.90 million dollar and Colombia's average health expenditure is 355.14 million dollar, Cuba's average health expenditure is 583.58 million dollar, Albania's 185.22 million dollars and Mexico's average health expenditure is 500.35 million dollar, Malaysia's average health expenditure 270.57 million dollar . Turkey average health expenditure is 414.12 million dollars. In our group we found that Argentina has the highest average health expenditure and the lowest average health expenditure is in Albania.

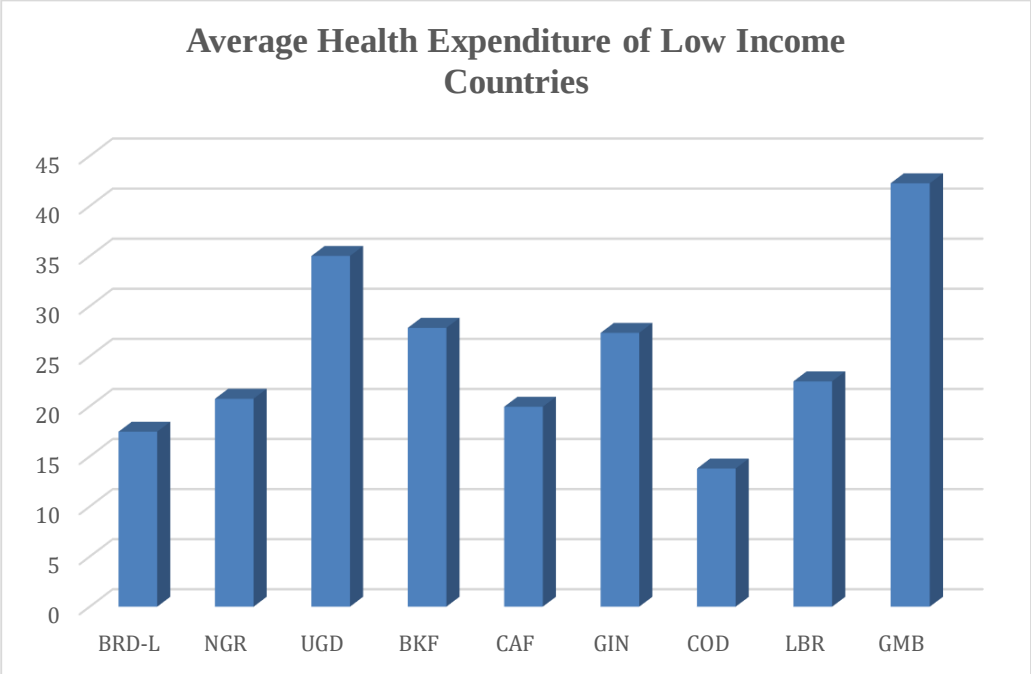
Graph 3.3 Average Health Expenditure of Lower Middle Income Countries



Source: Secondary data from World Bank

The above graph represents the average health expenditure of Lower Middle income countries. The graph shows that average health expenditure of Benin is 28.02 million dollars whereas Bangladesh has 20.51 million Dollar, Ghana's average health expenditure is 58.19 million dollar , Indonesia's average health expenditure is 68.71 million dollar and India's average health expenditure is 40.42 million dollar, Iran's average health expenditure is 313.01 million dollar, Kenya's 49.60 million dollars and Nepal's average health expenditure is 27.35 million dollar, Myanmar 's average health expenditure 26.03 million dollar . Morocco's average health expenditure is 132.71 million dollars. In our group we found that Iran has the highest average health expenditure and the lowest average health expenditure is in Bangladesh.

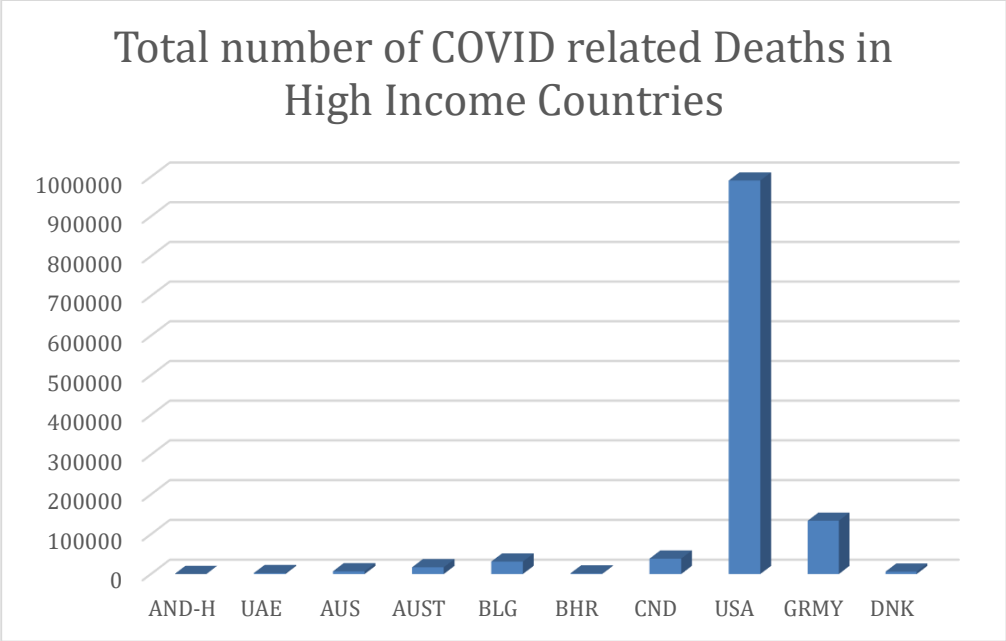
Graph 3.4 Average Health Expenditure of Low Income Countries



Source: Secondary data from World Bank

The above graph represents the average health expenditure of Low income countries. The graph shows that average health expenditure of Burundi is 17.47 million dollars whereas Niger has 20.75 million Dollar, Uganda's average health expenditure is 35.02 million dollar, Burkina's average health expenditure is 27.84 million dollar and Central Africa's average health expenditure is 19.96 million dollar, Guinea's average health expenditure is 27.34 million dollar, Congo's 13.79 million dollars and Liberia's average health expenditure is 22.49 million dollar, Gambia 's average health expenditure 42.27 million dollar. In our group we found that Gambia has the highest average health expenditure and the lowest average health expenditure is in Congo.

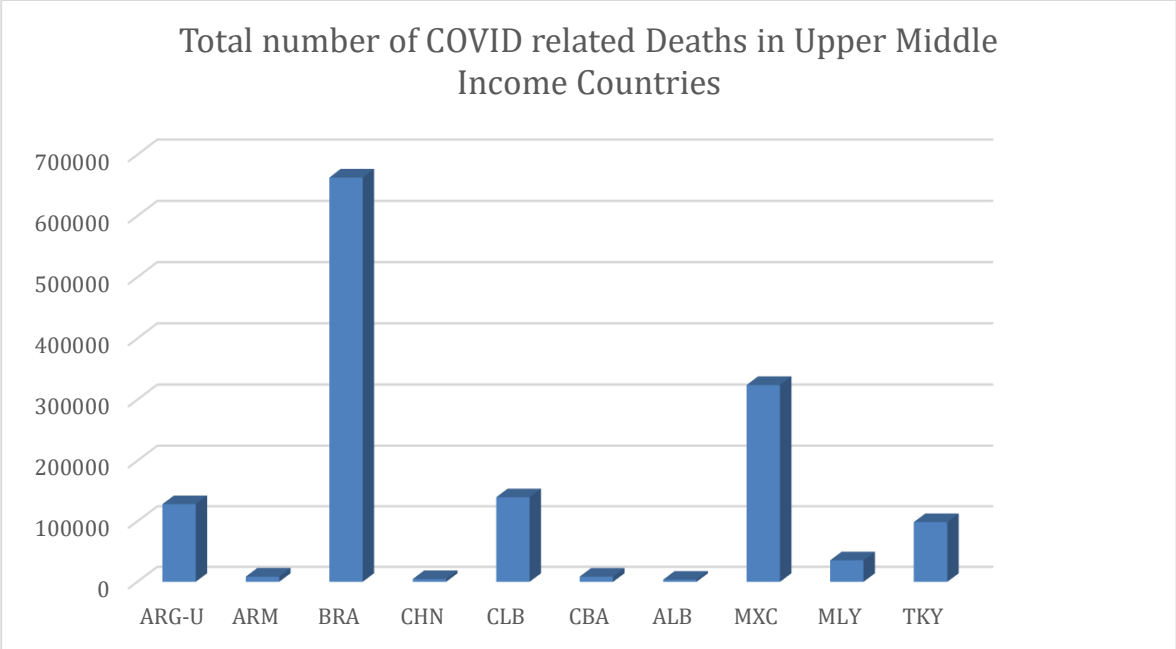
Graph 3.5 Total number of COVID related Deaths in High Income Countries



Source: Secondary data from World Health Organization

The above graph represents the Total number of COVID related deaths in High income countries. The graph shows that total number of COVID related deaths of Andorra is 153 whereas UAE it is 230, Australia's total number of COVID related deaths is 6939, Austria's total number of COVID related death is 170 and Belgium total number of COVID related death 3131, It was found that Bahrain total number of COVID related death is 1475, Canada's is 38667 and Germany's total number of COVID related death 133921, Denmark's total number of COVID related death 6047 , USA's total number of COVID related death is 990679. In our group USA has the highest total number of COVID related death and the lowest total number of COVID related death is in Andorra.

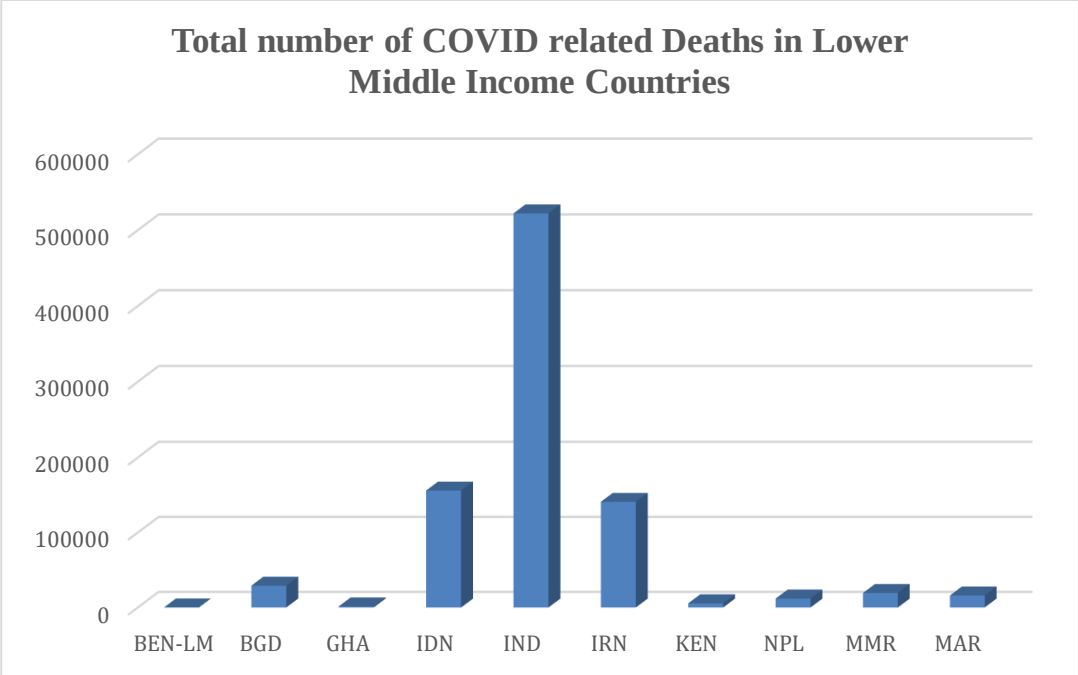
Graph 3.6 Total number of COVID related Deaths in Upper Middle Income Countries.



Source: Secondary data from World Health Organization

The above graph represents the Total number of COVID related deaths in Upper Middle income countries. The graph shows that total number of COVID related deaths of Argentina is 128344 whereas in Armenia it is 8622, Brazil's total number of COVID related deaths is 662751, China's total number of COVID related death is 4663 wand Colombia total number of COVID related death 139759, It was found that Cuba total number of COVID related death is 8522, Alania's is 3496 and Mexico's total number of COVID related death 324033, Malaysia's total number of COVID related death 35470 , Turkey's total number of COVID related death is 98645. In our group Brazil has the highest total number of COVID related death and the lowest total number of COVID related death is in Albania.

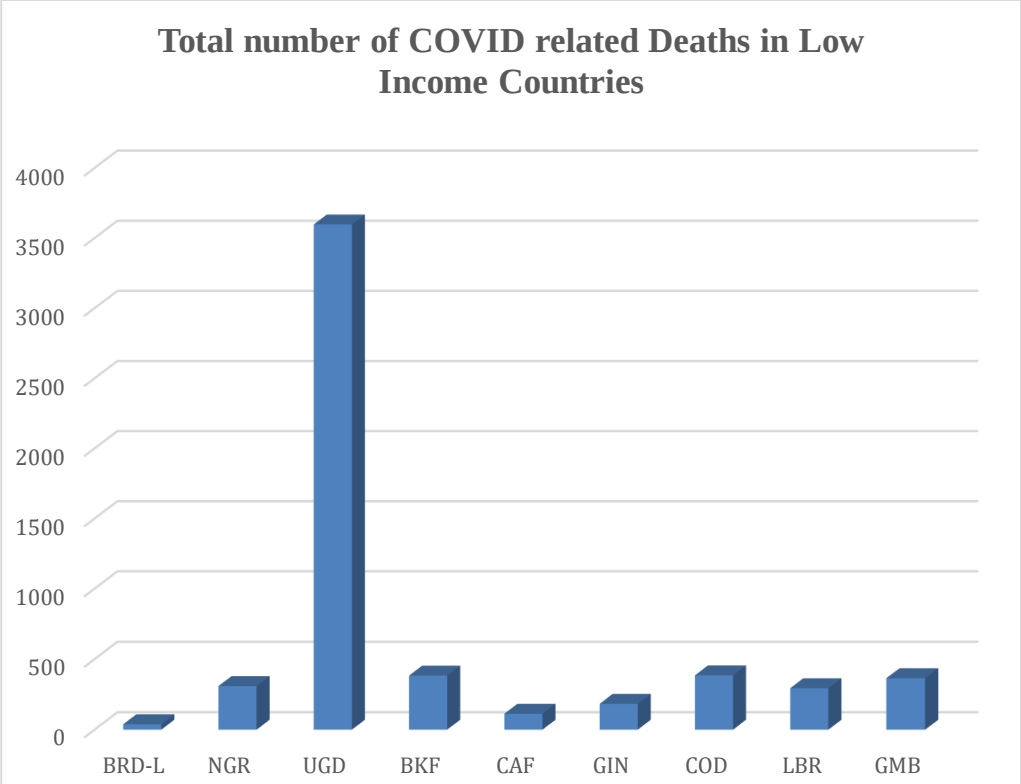
Graph 3.7 Total number of COVID related Deaths in Lower Middle Income Countries



Source: Secondary data from World Health Organization

The above graph represents the Total number of COVID related deaths in Lower Middle income countries. The graph shows that total number of COVID related deaths of Benin is 163 whereas in Bangladesh it is 29127, Ghana's total number of COVID related deaths is 1445, Indonesia's total number of COVID related death is 156015 and India's total number of COVID related death 522116, It was found that Iran total number of COVID related death is 140919, Kenya's it is 5649 and Nepal's total number of COVID related death 119151, Myanmar's total number of COVID related death19434, Morocco's total number of COVID related death is 16064. In our group India has the highest total number of COVID related death and the lowest total number of COVID related death is in Benin.

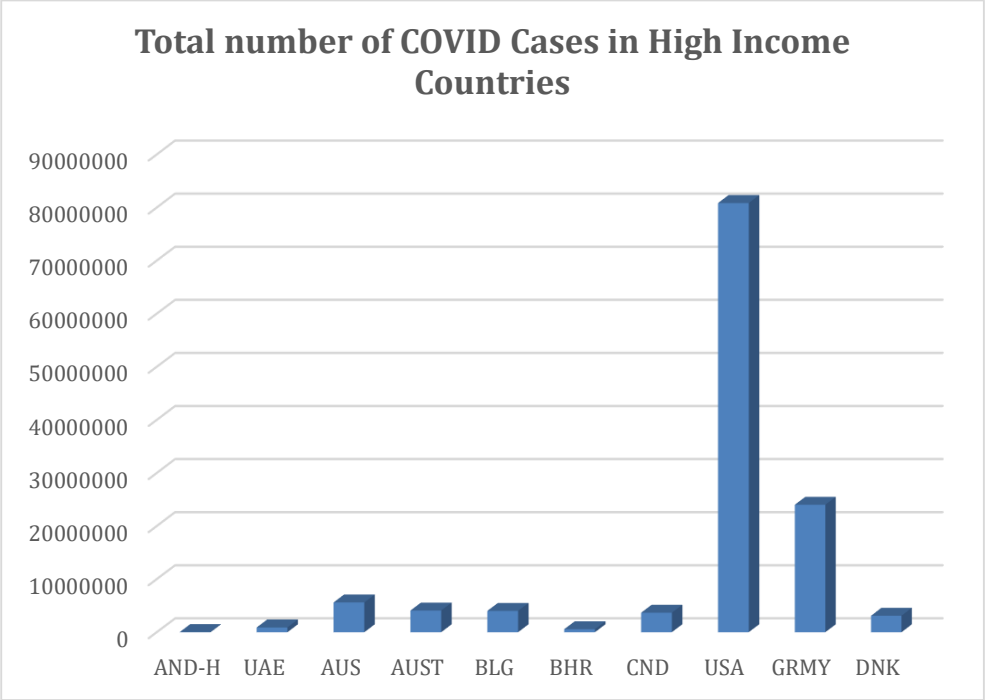
3.8 Total number of COVID related Deaths in Low Income Countries



Source: Secondary data from World Health Organization

The above graph represents the Total number of COVID related deaths in Low income countries. The graph shows that total number of COVID related deaths of Burundi is 38 whereas in Niger it is 309, Uganda's total number of COVID related deaths is 3597, Burkina's total number of COVID related death is 383 and Central Africa's total number of COVID related death 113, It was found that Guinea total number of COVID related death is 183, Congo's it is 385 and Liberia's total number of COVID related death 294, Gambia's total number of COVID related death 365. In our group Uganda has the highest total number of COVID related death and the lowest total number of COVID related death is in Burundi.

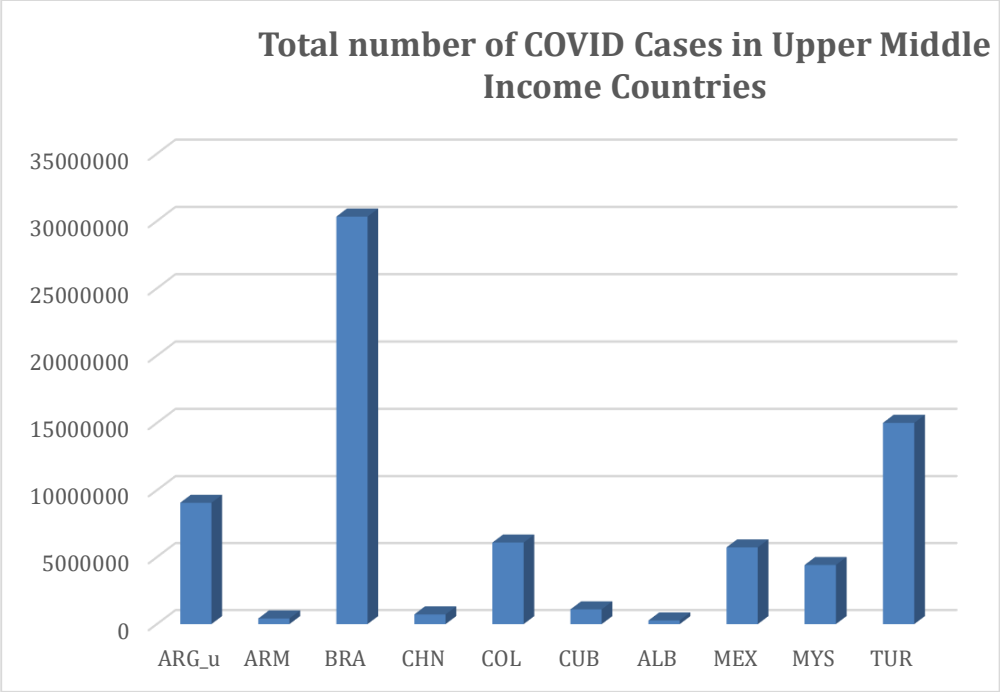
3.9 Total number of COVID Cases in High Income Countries



Source: Secondary data from World Health Organization

The above graph represents the Total number of COVID related cases in High income countries. The graph shows that total number of COVID related cases of Andorra is 153 whereas UAE it is 230, Australia's total number of COVID related cases is 6939, Austria's total number of COVID related death is 170 and Belgium total number of COVID related cases 3131, It was found that Bahrain total number of COVID related cases is 1475, Canada's is 38667 and Germany's total number of COVID related cases 133921, Denmark's total number of COVID related cases 6047 , USA's total number of COVID related cases is 990679. In our group USA has the highest total number of COVID related cases and the lowest total number of COVID related cases is in Andorra.

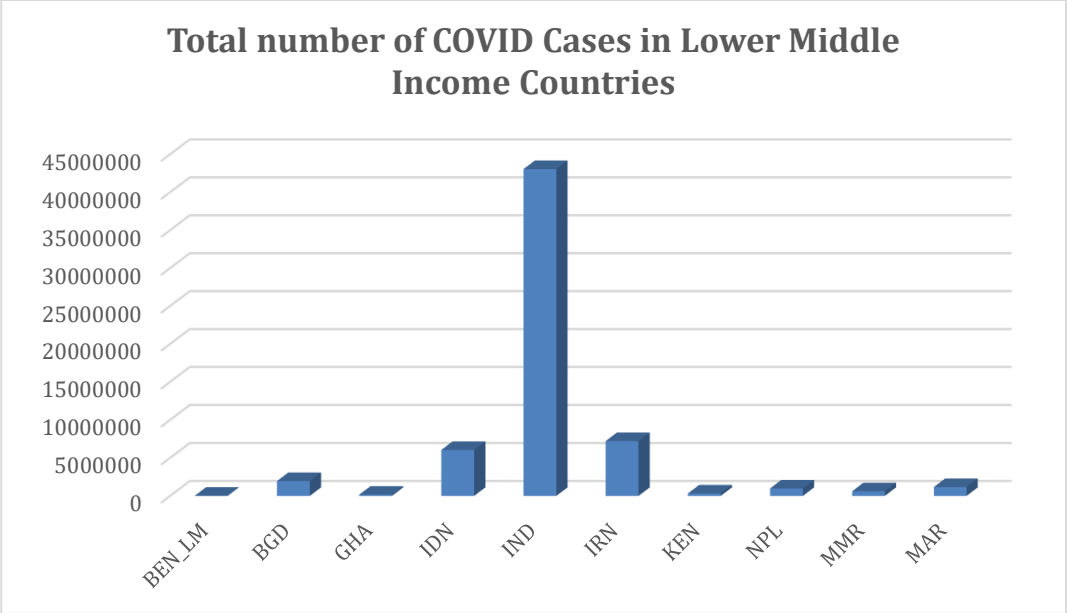
3.10 Total number of COVID Cases in Upper Middle Income Countries



Source: Secondary data from World Health Organization

The above graph represents the Total number of COVID related cases in Upper Middle income countries. The graph shows that total number of COVID related cases of Argentina is 9060923 whereas in Armenia it is 422805, Brazil's total number of COVID related cases is 30330625, China's total number of COVID related cases is 726911 and Colombia total number of COVID related cases 6090520, It was found that Cuba total number of COVID related cases is 1100938, Albania's is 274606 and Mexico's total number of COVID related cases 5731635, Malaysia's total number of COVID related cases 4415101 , Turkey's total number of COVID related cases is 15010718. In our group Brazil has the highest total number of COVID related cases and the lowest total number of COVID related cases is in Armenia.

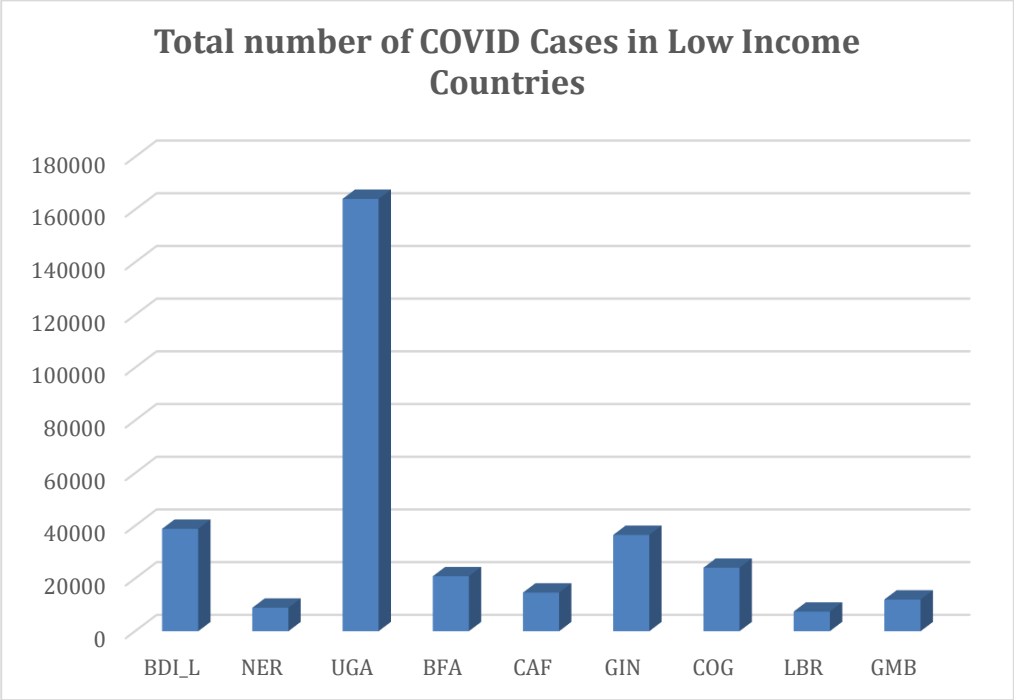
3.11 Total number of COVID Cases in Lower Middle Income Countries



Source: Secondary data from World Health Organization

The above graph represents the Total number of COVID related cases in Lower Middle income countries. The graph shows that total number of COVID related cases of Benin is 26952 whereas in Bangladesh it is 1952485, Ghana's total number of COVID related cases is 161124, Indonesia's total number of COVID related cases is 6042595 and India's total number of COVID related cases 43052425, It was found that Iran total number of COVID related cases is 7213808, Kenya's it is 323646 and Nepal's total number of COVID related cases 978705, Myanmar's total number of COVID related cases 612697, Morocco's total number of COVID related cases is 1164567. In our group India has the highest total number of COVID related cases and the lowest total number of COVID related cases is in Ghana.

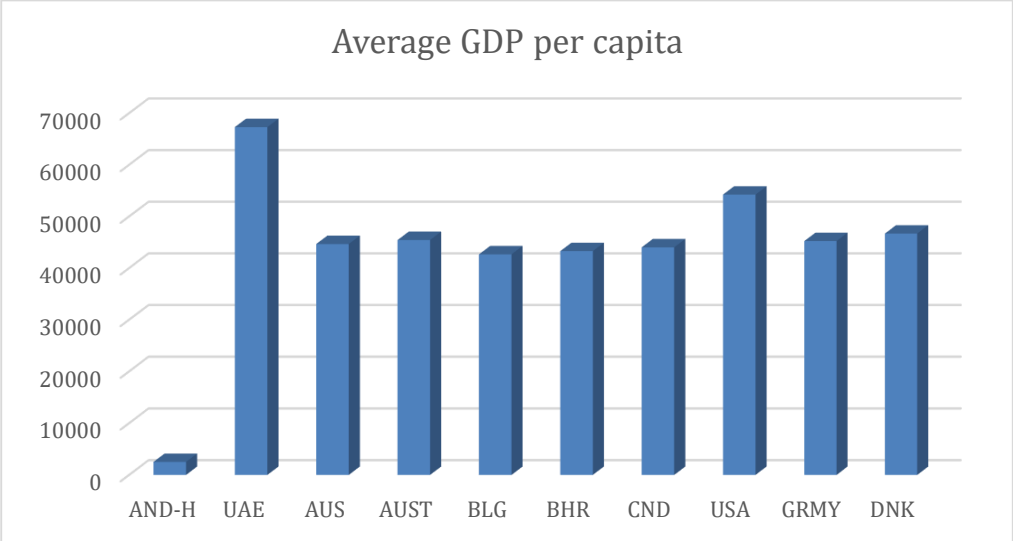
3.12 Total number of COVID Cases in Low Income Countries



Source: Secondary data from World Health Organization

The above graph represents the Total number of COVID related Cases in Low income countries. The graph shows that total number of COVID related Cases of Burundi is 38853 whereas in Niger it is 8908, Uganda's total number of COVID related cases is 164069, Burkina's total number of COVID related cases is 20865 and Central Africa's total number of COVID related cases 14649, It was found that Guinea total number of COVID related cases is 36540, Congo's it is 24079 and Liberia's total number of COVID related cases 7432, Gambia's total number of COVID related cases 11995. In our group Uganda has the highest total number of COVID related cases and the lowest total number of COVID related cases is in Niger.

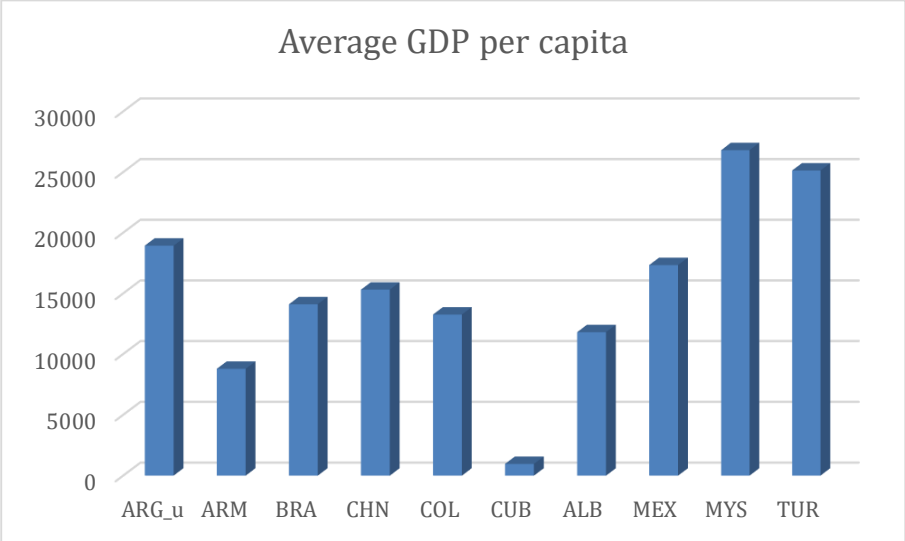
3.13 GDP per Capita of High Income Countries



Source: Secondary data from World Bank

The above graph represents Average GDP per capita in High income countries. The graph shows that Average GDP per capita of Andorra is 2505.15 million dollars whereas UAE it is 67293 million dollars, Australia's Average GDP per capita is 44648.71 million dollars, Austria's Average GDP per capita is 45436.686 million dollars and Belgium Average GDP per capita 42658.576 million dollars, Bahrain Average GDP per capita is 43290.705 million dollars, Canada's has 44017.591 million dollars and Germany's Average GDP per capita 4229.245 million dollars, Denmark's Average GDP per capita 46682.515 , USA Average GDP per capita is 54225.446. In our group UAE has the highest Average GDP per capita and the lowest Average GDP per capita in Andorra.

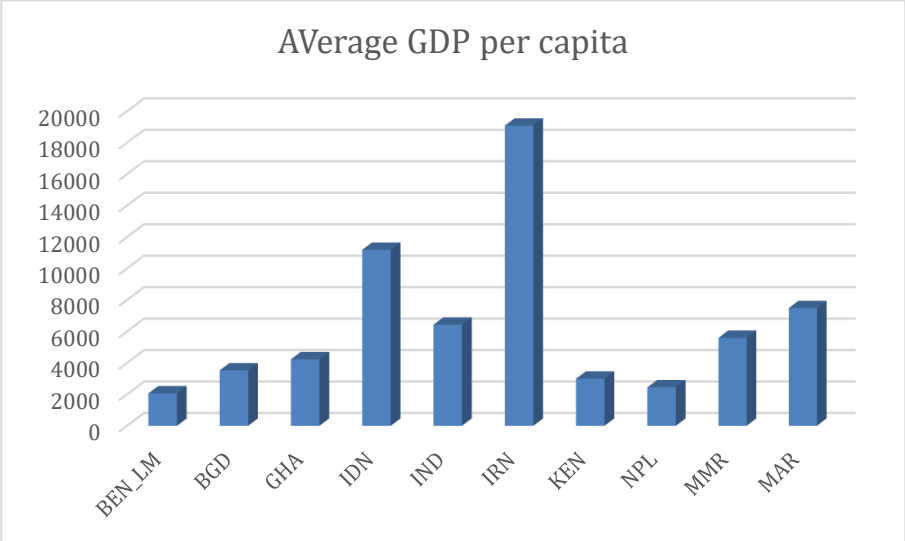
3.14 GDP per Capita of Upper Middle Income Countries



Source: Secondary data from World Bank

The above graph represents the Average GDP per capita in Upper Middle income countries. The graph shows that Average GDP per capita of Argentina is 18933.907 million dollars whereas in Armenia it is 8787.58 million dollars, Brazil's Average GDP per capita is 14103.452 million dollars, China's Average GDP per capita is 15308.7 million dollars and Colombia Average GDP per capita 13254.949 million dollars, It was found that Cuba Average GDP per capita is 964.976 million dollars, Albania's is 11803.43 million dollars and Mexico's Average GDP per capita is 17336.46 million dollars, Malaysia's Average GDP per capita 26808.164 million dollars , Turkey's Average GDP per capita is 25129.34 million dollars . In our group Malaysia has the highest Average GDP per capita and the lowest Average GDP per capita is in Cuba.

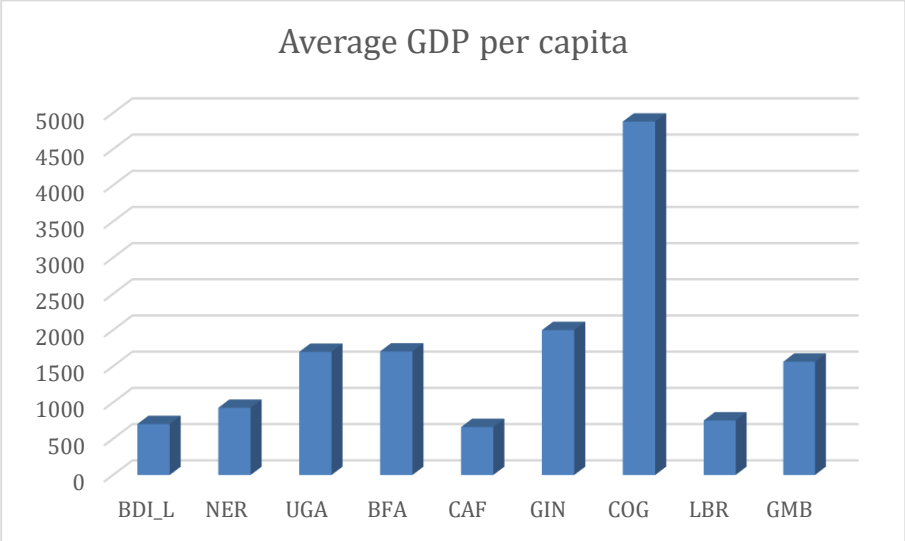
3.15 GDP per Capita of Lower Middle Income Countries



Source: Secondary data from World Bank

The above graph represents the Average GDP per capita in Lower Middle income countries. The graph shows that Average GDP per capita Benin is 2064.23 million dollars whereas in Bangladesh it is 3523.98 million dollars, Ghana's Average GDP per capita is 4227.65 million dollars, Indonesia's Average GDP per capita is 11188.744 million dollars and India's Average GDP per capita 6426.67 million dollars, It was found that Iran Average GDP per capita is 19082.62 million dollar, Kenya's it is 2993.02 million dollars and Nepal's Average GDP per capita 2442.80 million dollars, Myanmar's Average GDP per capita 5591.59 million dollars, Morocco's Average GDP per capita is 7485 million dollars. In our group Iran has the highest Average GDP per capita and the lowest Average GDP per capita is in Benin.

Graph 3.16 GDP per Capita of Low Income Countries



Source: Secondary data from World Bank

The above graph represents the Average GDP per capita in Low income countries. The graph shows that Average GDP per capita of Burundi is 702.2 million dollars whereas in Niger it is 926 million dollars, Uganda's Average GDP per capita is 1697.7 million dollars , Burkina's Average GDP per capita is 1703.1 million dollars and Central Africa's Average GDP per capita 661.24 million dollars, It was found that Guinea's Average GDP per capita is 1998.92 million dollars, Congo's it is 4881.40 million dollars and Liberia's Average GDP per capita 752 million dollars, Gambia's Average GDP per capita is 1561 million dollars. In our group Congo has the highest Average GDP per capita and the lowest Average GDP per capita is in Burundi.

2. ANOVA TEST

ANOVA Test is used to test differences in average health expenditure across nations with different income levels.

Hypothesis:

H_0: There is no significant difference between the mean health expenditure of nations with different income levels.

H_A: There is significant difference between the mean health expenditure of nations with different income levels.

Table 3.2 Average health expenditure across nations with different income levels.

ANOVA: Single Factor					
Summary					
Groups	*Count*	*Sum*	*Average*	*Variance*	
High Income Nations	10	37472.76	3747.27	3817679.663	
Low Income Nations	10	264.198	26.41	85.943	
Lower Middle Income Nations	10	765.19	76.51	7995.268	
Upper Middle Income Nations	10	4293.18	429.31	51608.374	
ANOVA					
Source Of Variation	*SS*	*Df*	*MS*	*F*	*P-Value*
Between Groups	96543453.59	3	32181151	33.198	0.0000
Within Groups	34896323.25	36	969342.3		
Total	131439776.8	39			

Source: Calculated using secondary data from World Bank

Results: The mean health expenditure of High income countries was 3747.27. The mean health expenditure of Low income countries was 26.41. The mean health expenditure of Lower middle income countries was 76.51. The mean health

expenditure of Upper middle income countries was 429.31. The F statistic was 33.198 with a p-value of 0.000 and was significant at the 1 percent level of significance. We thus reject the null hypothesis, concluding that there is a significant difference average health expenditure across nations based on Income levels.

3. Panel Regression Analysis

The result of Panel data regression analysis is provided in study sector separately for high income, upper middle income, lower middle income and low income countries.

3.3 Panel Data Regression Analysis of High Income Countries.

Summary statistics

Variable	Mean	Median	S.D.	Min	Max
CHPC	3630.00	3790.00	2320.00	2.32	10500.00
Population	40400000.00	9910000.00	89300000.00	65400.00	327000000.00
GDPpC	40400.00	41700.00	12200.00	12900.00	68200.00

Source: Generated using GRETL for World Bank data

Explanation: The mean of Health expenditure was 3630 with standard deviation of 2320. The minimum value of health expenditure was 2.32 and maximum was 10500. The mean of Population was 40400000 with standard deviation of 89300000. The minimum value of health expenditure was 65400 and maximum was 327000000. The mean of GDP per capita was 40400 with standard deviation of 12200. The minimum value of health expenditure was 12900 and maximum was 68200.

Model 1:

$$Hlt\_Exp = \beta_0 + \beta_1 Pop + \beta_2 GDP_{pc} + \varepsilon$$

Where:

$Hlt\_Exp_{pc} Hlt\_Exp_{pc}$ = Average Current Health Expenditure Per Capita

$PopPop$ = Average Population

$GDP_{PC} GDP_{PC}$ = Average GDP Per Capita

Model 1: Random-effects (GLS), using 190 observations
Included 10 cross-sectional units
Time-series length = 19
Dependent variable: CHPC

	Coefficient	*Std. Error*	*z*	*p-value*	
Const	−1988.47	499.719000	−3.979	<0.0001	***
Population	0.000035	0.000004	8.877000	<0.0001	***
GDPpC	0.103619	0.002884	35.930000	<0.0001	***

Mean dependent var	3625.45		S.D. dependent var	2320.28
Sum squared resid	1080000000.00		S.E. of regression	2397.79
Log-likelihood	−1747.231		Akaike criterion	3500.46
Schwarz criterion	3510.20		Hannan-Quinn	3504.41
rho	0.73		Durbin-Watson	0.46
Between' variance = 1682410				
'Within' variance = 92554.2				
theta used for quasi-demeaning = 0.946269				
Joint test on named regressors -				
Asymptotic test statistic: Chi-square(2) = 1670.83				
with p-value = 0.0000				

Source: Generated using GRETL for World Bank data

The results of random effect is given in the intercept of the model has a coefficient of (-) 1988.47 with a p values of 0.0000. Population Coefficient is 0.000035 and is significant at 1% level of significance. It indicates that if population increases by roughly one lakh than the health expenditure I these nations would increase by 35 million dollars. Similarly, GDP per capita has a coefficient of 0.10 and is significant at 1% level, If GDP Per Capita increases by 1 million dollars than health expenditure will increase by 0.103619 million dollars.

The Health expenditure was 3625.45 with a standard deviation of 2320.28. The Between variance was 1682410 and the within variance was 92554.2. The overall model is highly significant with a Chi-square value of 1670.83 with a p value of 0.0000.

3.4 Panel Data Regression Analysis of Upper Middle Income Countries.

Summary statistics

Variable	Mean	Median	S.D.	Min	Max
CHPCI	379.00	362.00	239.00	26.10	1030.00
POP	200000000.00	44800000.00	406000000.00	2870000.00	1400000000.00
GDPPC	6840.00	7020.00	3340.00	959.00	14600.00

Source: Generated using GRETL for World Bank data

Explanation: The mean of Health expenditure was 379 with standard deviation of 239. The minimum value of health expenditure was 26.10 and maximum was 1030. The mean of Population was 200000000.00 with standard deviation of406000000.00. The minimum value of health expenditure was 2870000.00 and maximum was 1400000000.00. The mean of GDP per capita was 6840.00 with standard deviation of 3340.00. The minimum value of health expenditure was 959.00 and maximum was 14600.00.

Model 2:

$$Hlt\_Exp = \beta_0 + \beta_1 Pop + \beta_2 GDP_{pc} + \varepsilon$$

Where:

$Hlt\_Exp_{pc} Hlt\_Exp_{pc}$ = Average Current Health Expenditure Per Capita

$PopPop$ = Average Population

GDP_{PC} = Average GDP Per Capita

Model 1: Random-effects (GLS), using 190 observations
Included 10 cross-sectional units
Time-series length = 19
Dependent variable: CHPC

	Coefficient	Std. Error	Z	p-value	
Const	−13.8822	69.00	−0.2012	0.84	
POP	−2.17976e-08	0.00000014	−0.1505	0.88	
GDPPC	0.0581	0.0025	22.98	<0.0001	***

Mean dependent var	379.09	S.D. dependent var	238.64
Sum squared resid	5926611.00	S.E. of regression	187.27
Log-likelihood	−1136.396	Akaike criterion	2278.79
Schwarz criterion	2288.22	Hannan-Quinn	2282.62
Rho	0.84	Durbin-Watson	0.28

'Between' variance = 33609.7
'Within' variance = 7419.22
theta used for quasi-demeaning = 0.892833
Joint test on named regressors -
Asymptotic test statistic: Chi-square(2) = 538.198
with p-value = 0.0000000

Source: Generated using GRETL for World Bank data

The intercept of the model has a coefficient of (-) 13.8822 with a p values of 0.84. Population Coefficient is (-) 2.17976e-08 and it is not significant. The negative sign indicates that if population increases than health expenditure decreases. Similarly, GDP per capita has a coefficient of 0.0581and is significant at 1% level, If GDP Per Capita increases by 1 million dollars than health expenditure will increase by 0.0581 million dollars.

The Health expenditure was 379.08 with a standard deviation of 238.63 The Between variance was 33609.7 and the within variance was 7419.22. The overall model is highly significant with a Chi-square value of 538.198 with a p value of 0.0000.

3.5 Panel Data Regression Analysis of Lower Middle Income Countries.

Summary statistics

Variable	Mean	Median	S.D.	Min	Max
CHPCI	76.50	42.50	101.00	4.34	531.00
Pop	183000000.00	48000000.00	352000000.00	6870000.00	1350000000.00
GDPPC	1590.00	1140.00	1450.00	128.00	7930.00

Source: Generated using GRETL for World Bank data

Explanation: The mean of Health expenditure was 76.50with standard deviation of 101.00. The minimum value of health expenditure was 4.34and maximum was 531.00. The mean of Population was 183000000.00with standard deviation of352000000.00. The minimum value of health expenditure was 6870000.00 and maximum was 1350000000.00. The mean of GDP per capita was1590.00 with standard deviation of 1450.00. The minimum value of health expenditure was 128.00and maximum was 7930.00.

Model 3:

$$Hlt\_Exp = \beta_0 + \beta_1 Pop + \beta_2 GDP_{pc} + \varepsilon$$

Where:

$Hlt\_Exp_{pc} Hlt\_Exp_{pc}$ = Average Current Health Expenditure Per Capita

$PopPop$ = Average Population

GDP_{PC} = Average GDP Per Capita

Model 3: Random-effects (GLS), using 190 observations
Included 10 cross-sectional units
Time-series length = 19
Dependent variable: CHPCI

	Coefficient	Std. Error	Z	p-value	
Const	−7.64651	10.90	−0.7014	0.4830	
Pop	−0.0000000379	0.00	−1.521	0.1283	
GDPPC	0.06	0.00	22.93	0.0000	***

Mean dependent var	76.51976	S.D. dependent var	101.1020
Sum squared resid	310319.0	S.E. of regression	40.62798
Log-likelihood	−972.4398	Akaike criterion	1950.880
Schwarz criterion	1960.621	Hannan-Quinn	1954.826

'Between' variance = 783.916
'Within' variance = 875.245
theta used for quasi-demeaning = 0.764412
Joint test on named regressors -
Asymptotic test statistic: Chi-square(2) = 525.874
with p-value = 0.000

Source: Generated using GRETL for World Bank data

The intercept of the model has a coefficient of (-) 7.64 with a p values of 0.4830. Population Coefficient is (-) 0.0000000379 and it is not significant. The negative sign indicates that if population increases than health expenditure decreases. Similarly, GDP per capita has a coefficient of 0.06and is significant at 1% level, If GDP Per Capita increases by 1 million dollars than health expenditure will increase by 0.06 million dollars.

The Health expenditure was 76.51976with a standard deviation of 101.1020Thebetweenn variance was 783.916and the within variance was 875.245.

The overall model is highly significant with a Chi-square value of 538.198 with a p value of 0.0000

3.6 Panel Data Regression Analysis of Low Income Countries.

Summary statistics

Variable	Mean	Median	S.D.	Min	Max
CHPCI	26.90	23.30	14.40	4.65	73.50
POP	17300000.00	10500000.00	19100000.00	1320000.00	84100000.00
GDPPC	478.00	464.00	214.00	114.00	955.00

Source: Generated using GRETL for World Bank data

Explanation: The mean of Health expenditure was 26.90with standard deviation of 14.40. The minimum value of health expenditure was 4.65and maximum was 73.50. The mean of Population was 17300000.00with standard deviation of 19100000.00. The minimum value of health expenditure was 1320000.00and maximum was 84100000.00. The mean of GDP per capita was478.00 with standard deviation of 214.00. The minimum value of health expenditure was 114.00and maximum was 955.00

Model 4:

$$Hlt\_Exp = \beta_0 + \beta_1 Pop + \beta_2 GDP_{pc} + \varepsilon$$

Where:

$Hlt\_Exp_{pc} Hlt\_Exp_{pc}$ = Average Current Health Expenditure Per Capita

$PopPop$ = Average Population

GDP_{PC} = Average GDP Per Capita

Model 4 Low Income: Random-effects (GLS), using 171 observations
Included 9 cross-sectional units
Time-series length = 19
Dependent variable: Current Health Expenditure

	Coefficient	*Std. Error*	*z*	*p-value*	
const	3.59	2.97	1.21	0.23	
Pop	−0.0000178	0.00	−1.835	0.07	*
GDPpc	0.05	0.00	15.17	<0.0001	***

Mean dependent var	26.86	S.D. dependent var	14.39
Sum squared resid	14396.10	S.E. of regression	9.23
Log-likelihood	−621.6642	Akaike criterion	1249.33
Schwarz criterion	1258.75	Hannan-Quinn	1253.15
Rho	0.80	Durbin-Watson	0.39

'Between' variance = 44.3501
'Within' variance = 52.8571
theta used for quasi-demeaning = 0.75705
Joint test on named regressors -
Asymptotic test statistic: Chi-square(2) = 244.854
with p-value = 0.00000

Source: Generated using GRETL for World Bank data

The intercept of the model has a coefficient of 3.59 with a p values of 0.23. Population Coefficient is (-) 0.0000178 and it is significant at 10% level of significance. The negative sign indicates that if population increases by 1 million than health expenditure decreases by 0.0000178. Similarly, GDP per capita has a coefficient of 0.05and is significant at 1% level, If GDP Per Capita increases by 1 million dollars than health expenditure will increase by 0.05 million dollars.

The Health expenditure was 26.86with a standard deviation of 14.39. The Between variance was 44.3501and the within variance was 52.8571. The overall model is highly significant with a Chi-square value of 244.854with a p value of 0.0000.

CHAPTER 4

FACTORS AFFECTING THE COVID CASES AND DEATHS: ROLE OF SOCIO ECONOMIC FACTORS

4.1 Introduction

The pandemic has devastated almost all countries of the world. However, the extend of impact of pandemic differ between countries. The number of cases impacted and the number of deaths varied widely between the countries. The important research question is why the different countries affected differently in terms of cases and deaths during the pandemic and what are the sources of it.

An attempt to make in this chapter to trace the factors determining the number of affected cases and deaths.

4.2 Methodology

The data for the study is collected from World Bank Sources. A cross section of 38 countries has been considered for the study. A multiple regression model is developed and estimated to identify the factors that determine the pandemic cases and death.

Table 4.3 Results of the model factors determing Pandemic deaths.
Dependent variable: Total_Deaths_Per_Million
Summary statistic

Summary Statistics					
Variable	Mean	Median	S.D.	Min	Max
Total_Deaths_Per_Million	957.00	430.00	1040.00	3.10	3100.00
Total_Cases	6710000	979000	15100000	7430	80900000
Aged_65_Older	7.99	5.90	5.89	1.14	21.50
Chpc	1360.00	391.00	2270.00	19.50	9740.00
Population	124000000	29700000	314000000	77400	144000000

Source: Generated using GRETL for World Bank and WHO data

Explanation: The mean of Total number of deaths per million was 957.00 with standard deviation of 1040.00. The minimum value of Total number of deaths per

million was 3.10 and maximum was 3100.00. The mean of total number of cases was 6710000.00 with standard deviation of 15100000.00. The minimum value of total number of cases was 7430.00 and maximum was 80900000.00. The mean of Aged65 above was 7.99 with standard deviation 5.89. The minimum value of Aged_65 was 1.14 and maximum was 21.50. The mean of Current health expenditure was1360.00 with standard deviation of 2270.00. The minimum value of health expenditure was 19.50 and maximum was 9740.00.

The mean of Population was 124000000.00 with standard deviation of 314000000.00. The minimum value of Population was 77400.00and maximum was 1440000000.00.

Model 1:

$$Total\ deaths\_PM = \beta_0 + \beta_1\ total\ cases + \beta_2\ Age\_65 + \beta_3\ CH\_PC + \beta_4\ Pop + \mu$$

Where:

Total deaths_PM= Total number of deaths per million

Total Cases = Total Cases

CH_PC = Current Health Expenditure per capita

Pop= Population

	Coefficient	*Std. Error*	*T-Ratio*	*P-Value*	
Const	−28.4246	193.856	−0.1466	0.8843	
Total_Cases	4.82113e-05	1.11794e-05	4.313	0.0001	***
Aged_65_Older	146.359	43.0865	3.397	0.0018	***
Chpc	−0.280614	0.125973	−2.228	0.0328	**
Pop	−1.32936e-06	4.16059e-07	−3.195	0.0031	***

Mean dependent var	930.3163	S.D. dependent var	1041.903
Sum squared resid	18674367	S.E. of regression	752.2566
R-squared	0.535068	Adjusted R-squared	0.478712
F(4, 33)	3.363804	P-value(F)	0.020477
Log-likelihood	−302.9161	Akaike criterion	615.8322
Schwarz criterion	624.0202	Hannan-Quinn	618.7454
No of observations=38			

Source: Generated using GRETL for World Bank data and WHO

In the table 4.3, the adjusted R-square is 0.47 which indicates that 47% of variation takes place in the dependent variable. Total number of cases is highly significant at level 0.01 shares positive relation between total deaths_pm, if there is increase in positive cases by 1 person then the Total deaths per million will increase by 4.82

Similarly, Aged _65 is highly significant at level 0.01 older also shares positive relation wherein if there is increase by1 person in aged-65 older than the total Death per million will increase by 146.35. Current health expenditure is highly significant at 0.05 level and negatively related to Total deaths per million, if health expenditure increase by 1$ then total deaths per million will decrease by -0.28, In addition population also shares negative relation and its highly significant at 0.01 level, if population increases by 1 then the total deaths per million will decrease by -1.32

Table 4.6 Results Of Multiple Regression Model Factors Determing cases per million.

Dependent variable: Total_Cases_Per_Million

Summary statistic

Variable	Mean	Median	S.D.	Min	Max
Total_Cases_Per_Million	116000.00	44000.00	149000.00	354.00	534000.00
Population	124000000	29700000	314000000	77400.00	1440000000
Aged_65_Older	7.99	5.90	5.89	1.14	21.50
Diabetes_Prevalence	7.30	7.14	4.03	0.99	17.30

Source: Generated using GRETL for World Bank and WHO data

Explanation: The mean of Total number of cases per million was 116000.00 with standard deviation of 149000.00. The minimum value of Total number of cases per million was 354.and maximum was 534000.00. The mean of Population was 124000000.00 with standard deviation 314000000.00. The minimum value of Population was 77400.00 and maximum was 1440000000.00. The mean of Aged65 above was 7.99 with standard deviation 5.89. The minimum value of Aged_65 was 1.14 and maximum was 21.50. The mean of Diabetes Prevalence was 7.30 with standard deviation of 4.03. The minimum value of Diabetes Prevalence was 0.99 and maximum was 17.30.

Model 2:

Total Cases_PM= $\beta_0+\beta_1$ Age_65+ β_2 Pop+β_3 diabetes prevalence + μ

Where:

Total cases_PM= Total number of cases per million

Aged_65_older = Aged 65 and above

Pop = Population

Diabetes_Prevalence = Diabetes Prevalence

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
Const	−74698.7	18081.10	−4.131	0.00	***
Aged_65_Older	16870.00	3498.56	4.82	0.0001	***
Population	-0.0000009	0.00	−2.826	0.01	***
Diabetes_Prevalence	7920.86	4341.73	1.82	0.08	*

Mean dependent var	105254.30	S.D. dependent var	134833.40
Sum squared resid	235000000000.00	S.E. of regression	83112.55
R-squared	0.65	Adjusted R-squared	0.62
F(3, 34)	14.17	P-value(F)	0.00
Log-likelihood	−482.2685	Akaike criterion	972.54
Schwarz criterion	979.09	Hannan-Quinn	974.87

Source: Generated using GRETL for World Bank data

In the table 4.6, the adjusted R-square is 0.62 which indicates that 62% of variation takes place in the dependent variable. Similarly, Aged _65 is highly significant at level 0.01 older also shares positive relation wherein if there is increase by1 person in aged-65 older then the total Cases per million will increase by 16870. Diabetes Prevalence e is highly significant at 0.10 level and positively related to Total cases per million, if Diabetes Prevalence increase by 1person then total cases per million will increase by 7290, In addition population shares negative relation and its highly significant at 0.01 level, if population increases by 1 then the total cases per million will decrease by -0.0009.

CHAPTER 5

CONCLUSION

5.1 Findings

In graphical analysis the results shows that USA has the highest average health expenditure and Bahrain has the lowest average health expenditure in high income level groups. Argentina has the highest average health expenditure and Albania has the lowest average health expenditure in upper middle income groups. Iran has the highest average health expenditure and Bangladesh has the lowest lower middle income groups. Gambia has the highest average and Congo has the lowest in health expenditure in low income groups. Furthermore the result also shows that USA has the highest total number of COVID related death and Andorra has the lowest total number of COVID related death high income level groups. Brazil has the highest total number of COVID related death and Armenia has the lowest total number of COVID related death in upper middle income groups. India has the highest total number of COVID related death and Ghana has the lowest total number of COVID related death lower middle income groups. Uganda has the highest total number of COVID related death and Niger has the lowest total number of COVID related death in low income group of countries. Lastly the analysis highlighted GDP difference among the countries as follows, UAE has the highest Average GDP per capita and Andorra has the lowest Average GDP per capita in high income groups. Malaysia has the highest Average GDP per capita and Cuba has the lowest Average GDP per capita in upper middle income group. Iran has the highest Average GDP per capita and Benin has the lowest Average GDP per capita in lower middle income group. Congo has the highest Average GDP per capita and Burundi has the lowest Average GDP per capita in low income group.

The result obtain through ANOVA Test shows a significance difference between the means of different income level group. The Panel data analysis Random effect model of high income show's that population and GDP per capita both determine the health expenditure wherein Upper Middle income and Lower Middle income show's that population doesn't not determine the health expenditure only GDP

per capita helps to determine health expenditure, more further we observe that Low income group of countries show's population and GDP per capita both determine health expenditure.

To obtain our main objective in the analysis we used multiple regression model OLS, Multiple Regression Model revealed that countries with higher age group 65 and above has higher death level, Current health expenditure plays a key role in controlling the deaths, and moreover countries with high dense Population has higher chances of death

Second Multiple Regression Model revealed that the cases per million will increase if the countries has higher age group people, here also we found that more dense Population higher chances of getting infected and people already suffering from other diseases especially, Diabetes Prevalence has higher chance to get infected easily .

5.2 Limitations

- The study has restricted to 40 countries only
- The countries are not selected according to their geographical structure
- The outcome of analysis is restricted to income level group of nation.
- We have considered only 2 variables that determine Current health expendit

5.3 Conclusion

The result derived from the graphical analysis shows that country with higher expenditure on health has still suffered more than those countries which have lesser current health expenditure compared to upper middle income, lower middle income and low income group. The death rates were high in those countries whose population high, the number of cases were also dependent on the population. Countries with high income level have higher level of average GDP per capita even after having higher level of average GDP per capita still high income countries suffered more compared to other groups.

From the graphical representation we can conclude that having higher average expenditure and GDP per capita is not enough there are other factors need to be taken into consideration.

The ANOVA test helped to figure out the difference between the average health expenditure of different income level group.

The Random Effect Model help us to understand that in high income level group population and GDP per capita plays an important role in determining health expenditure wherein Upper Middle income group and Lower Middle Income group indicates that population doesn't determine health expenditure but GDP per capita determines health expenditure in this groups moreover population and GDP per capita plays an important role in determining health expenditure in Low Income groups.

The Conclusion derived from Multiple regression model is that population, current health expenditure, Aged65 and total number of case helps to determine the deaths If a nation wants to reduce the death rate caused due to pandemic then it should focus in this four area because 47% death are caused by this variables, similarly in the 2nd regression model the cases per million depends upon population, aged65 and diabetes prevalence.. The results shows that spreading of virus is mainly because of these three variables. In future any kind of pandemic occur this are the sector wherein government of all nation should take into consideration and try to take necessary measure to boost this area. Moreover the study also shows that even though the virus began to spread from China still they were the ones who are least affected country.

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