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| RESEARCH ARTICLE

Income Levels, Healthcare Spending, and Cancer Outcomes: A Cross-Country Econometric Analysis of 85 Countries

Md Alamin Islam[1] ✉ and Ariful Islam[2]
[1]Director, Accounts and Audit, International University of Business Agriculture and Technology -IUBAT
[2]Administrative Officer, International University of Business Agriculture and Technology- IUBAT
Corresponding Author: Md Alamin Islam, **E-mail**: malamin@iubat.edu

| ABSTRACT

This research is about the relationship between Income Level and cancer outcomes in developed and developing countries. It is hypothesized that the impacts of GDP per capita and health expenditure on cancer mortality would be different for developing and developed countries. It is predicted that developing countries have higher cancer mortality compared to developed countries. The independent variables are GDP per capita and current health expenditure per capita (current US$). And the dependent variable is the age-standardized cancer mortality-to-incidence ratio. The total number of samples is 85 countries; 28 are developed countries, and 57 are developing countries. It is used secondary sources to collect the data. The sources of data are the World Health Organization (WHO) and the World Bank (WB). A multivariate regression model is used to analyze the data. The result shows that when the rate of GDP per capita increases by one unit, then the cancer mortality rate decreased by 0.27 units in the developed countries. That means increasing GDP per capita can able to reduce cancer mortality in the developed countries. But the current health expenditure per capita of the developed countries cannot contribute to decreasing their mortality rate. And in developing countries, when the rate of GDP per capita increases by one unit, then the cancer mortality rate also increases by 0.065 units. That means GDP per capita cannot significantly contribute to reducing cancer mortality. This is because GDP per capita in developing countries is higher enough as like developed nations, to reduce cancer mortality. But when the current health expenditure per capita increases by one unit in the developing countries, then the cancer mortality rate decreased by 0.16 unit. That means the current health expenditure per capita of the developing countries can contribute to decreasing their mortality rate. Based on the result, it is suggested that if the government can increase economic growth and increase health expenditure, then the rate of cancer mortality can be reduced in these developing countries.

| KEYWORDS

Income Level, GDP per capita, Health Expenditure, Cancer Mortality, Econometric Analysis.

| ARTICLE INFORMATION

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1. Introduction

According to the World Health Organization, the number of deaths from cancer is higher than the number of deaths from all types of heart disease. It is observed that the number of cancer patients in different countries is constantly increasing, and now cancer is the second main cause of death in the world. As this number continues to grow, an estimated 200 million people worldwide will be diagnosed with cancer each year by 2030, and the higher

share will be in lower and middle-income countries. If this rate continues, the number of cancer patients will increase by 60 percent by 2030 (WHO, 2025).

According to the new data provided by WHO, the number of cancer deaths in third-world countries will increase rapidly by 2040. By 2040, 80 percent of deaths in third-world countries will be due to cancer. According to them, this is because most of the third-world countries do not have proper cancer treatment. There is also a lack of awareness in these countries. The economic condition of these countries is also responsible. Not only that, the incidence of cancer is increasing in these countries due to the excessive use of tobacco products. Because of these, cancer will become a pandemic in third-world countries in the next few years (WHO, 2025).

In developed countries, breast, prostate, lung, and colorectal cancers account for 50 percent of all cancers; while in middle- and low-income countries, lung, breast, stomach, colorectal, liver, and cervical cancers account for 54 percent of all cancers. Lung cancer among men still tops the list worldwide. In 1980, there were 660,000 new lung cancer patients worldwide. In 2022, it stood at 1.6 million (12.9% of total new patients). Lung cancer still tops the list, with 1.7 million new patients, which is 12.9% of the total new patients, compared to 1.8 million deaths, which is 19.4% of the total cancer deaths. In second place is breast cancer (1.6 million new patients accounting for 11.9% of total patients, total deaths 522,000 or 8.4% of total deaths) (WHO, 2024)

In developing countries, men have higher lung cancer (7, 51,000 patients) and liver cancer (4, 72,000 patients). Stomach cancer (4 lakh 56 thousand patients, of which 3 lakh 62 thousand died). These 3 cancers account for about 40% of all new patient deaths and 46% of cancer deaths. Breast cancer is at the top among women. The number of new patients in low- and middle-income countries is alarming (7, 94,000), higher than in developed countries (6, 83,000). Cervical cancer ranks second among low- and middle-income countries (445,000), compared to the eleventh (63,000) in the developed world (Bray et al., 2024).

In a report, the UN's health chief said that at least 6 million lives could be saved by 2030 if governments in various countries allocated enough money to cure cancer. According to the WHO, one in six people are at risk to develop cancer in their lifetime. The disease kills at least one million people worldwide each year. By giving a warning about the dangers of cancer WHO said if the current trend continues, the number of cancer patients will continuously increase soon. However, low and middle-income countries will suffer the most. Because of the weak infrastructure to prevent cancer, more than 60 percent of people in low- and middle-income countries will be affected by cancer (IARC, 2020).

Andrew Ebay, the World Health Organization's technical officer, said that large numbers of people in poor countries are dying because of cancer, as countries do not have the proper technology to prevent cancer. But in developed countries, the death rate is much lower because of the appropriate technology(Are et al., 2016). Referring to his research report, eBay said, if every government allocates money to cure cancer, it is possible to save the lives of at least 6 million people by 2028 (Siegel et al., 2024). In this case, it will cost $2.70 per person in lower-middle countries and $8.15 per person in middle-income countries. As a result, it is possible to take effective measures to prevent cancer. No one can die from cancer, as it is a preventable disease. Elizabeth Weatherpass, director of the International Agency for Research on Cancer, said there has been a lot of progress in cancer prevention and treatment; as a result, many cancer patients are recovering (IARC, 2020). According to the report, 25 percent of cancers are caused by smoking. If this bad habit can be controlled, it will be possible to save the lives of millions of people as well as prevent the wastage of billions of dollars. And with this amount of money, it is possible to cure cancer (Siegel et al., 2024). The World Health Organization (WHO) also says that a vaccine capable of preventing hepatitis B can cure liver cancer (Martins, 2020). Based on the above, it can be said that income level and health expenditure can influence the cancer death rate in developed and developing countries in the world (Anandasabapathy et al., 2024).

1.1 Research questions and aim of the study

This paper analyzes the relationship between the income levels, health expenditure, and cancer mortality in developed and developing nations, with a specific emphasis on isolating the varying impacts of these variables on cancer in different economic situations.

Research questions are the following:

- How the level of income (GDP per capita) is related to cancer mortality in developed and developing countries?
- How does health expenditure per capita influence cancer mortality in developed and developing countries?
- Are the impacts of income level and health expenditure on cancer outcomes different in the developed and the developing economies?

2. Literature Review

Income level has been extensively studied on a global scale in the health and development literature, and there is increasing evidence that socioeconomic conditions are paramount to cancer incidence, mortality, and survival. Income level affects access to healthcare, the quality of medical infrastructure, and the adoption of preventive measures. Discrepancies in cancer care and outcomes have recently been shown to correlate significantly with levels of economic development and investment in healthcare resources globally (Bray et al., 2024).

At a global level, cancer is still one of the major causes of human death; 20 million new cases and 9.7 million deaths occur annually (Bray et al., 2024). But the burden of cancer is not uniform. Cancers are responsible for an overwhelming burden of mortality in low- and middle-income countries (LMICs) as a result of suboptimal healthcare systems that contribute to late diagnosis and treatment scarcity (Syrnioti et al., 2023). This underscores the importance of economic resources as a driver of health.

According to economic theory, increased income levels lead to better health through more investments in health sector infrastructure and services. This idea can be substantiated by empirical evidence, particularly in developed countries, where higher GDP per capita correlates with lower cancer mortality rates resulting from early detection and advanced treatment technologies (Torre et al., 2016). But this relationship is not one of linearity in developing countries. Due to structural inefficiencies in LMICs, the economic growth does include better outcomes for health (Bellanger et al., 2018).

Another important determinant of cancer outcomes is health expenditure. Implementing cost-effective, population-based cancer services, along with adequate healthcare expenditure, has been associated with improved survival rates (Martins, 2020). In developing countries like Indonesia, where gaps in accessibility create inequalities in cancer survival, increasing healthcare spending is paramount to improve both access to the overall health system as well as provide basic diagnostic and treatment resources that can significantly reduce mortality rates (Torre et al., 2016). On the other hand, in high-income settings, additional health expenditure can have diminishing returns, and already developed healthcare systems result in excess spending on expensive cutting-edge treatment rather than preventive measures (Syrnioti et al., 2023).

In addition to economic factors, social determinants of health, such as education, lifestyle, and environmental conditions, also play a significant role in the contributions to cancer disparities. For example, advanced tobacco use, unhealthy diets, and air pollution in lower-income populations are linked with elevated cancer risk (Bellanger et al., 2018). Moreover, the absence of proper diagnostic procedures and the scarcity/absence of screening programs in many developing countries often leads to diagnosis at late stages when survival rates are low (Islam, MM, 2025a).

The literature highlights that inequalities in cancer outcomes exist neither only between countries but also within countries. Even in high-income countries, low-income individuals experience the greatest cancer mortality from barriers to healthcare access, which is caused by a lack of insurance/financial means and distance (Cascelli et al.,

2025). The inequality of income — rather than low levels of income alone — was a major factor contributing to cancer outcome, the researchers say (Makamo et al., 2025).

Besides the health-related research, the findings of other socioeconomic research domains can be used to put the role of income and inequality into perspective. As an example, the study of disparities at the industry level brings out the impact of structural inequalities in economic systems contributing to uneven resource and opportunity distribution (Islam, MM, 2025b). Likewise, research on socioeconomic influences, including consumption culture and area inequalities, reveals the impact of income inequalities on health-related actions and results (Islam & Islam, 2018). Though these studies are not directly related to cancer, they give a more encompassing insight into how economic conditions influence human well-being (Shah & Chowdhury, 2020).

Furthermore, interdisciplinary research indicates that development approaches, such as rural development and ecotourism, may indirectly impact health outcomes by enhancing income status and resource availability in underserved regions. The individual behavior is also influenced by psychological and organizational factors, like self-efficacy and cognitive styles, which might indirectly influence the health outcomes by lifestyle choices (Islam, MM, 2025a). These approaches demonstrate the complexity of the interrelation between income and health.

In general, the literature is overwhelmingly in favor of the opinion that income level and health expenditure are key determinants of cancer outcomes. Nevertheless, the connection is ambiguous and is mediated by a variety of structural, social, and behavioral factors (Bray et al., 2024). Although with improved income and more expenditure on health, the populations are expected to experience improved outcomes, the benefits do not spread uniformly. To solve the issue of cancer disparities across the world, economic development is not sufficient, but specific policy interventions that would enhance access to health services, decrease inequalities, and encourage prevention are needed (XU et al., 2023).

3. Materials and Methods

3.1 Independent and Dependent Variables

In this study, independent variables are GDP per capita and current health expenditure per capita (current US$). And the dependent variable is the age-standardized cancer mortality-to-incidence ratio or mortality from cancer between the ages of 30 to 70 years.

3.2 Sample Size

The total number of samples is 85 countries. Among them, the number of developed countries is 28, and the number of developing countries is 57. The data regarding GDP per capita, current health expenditure per capita, and age-standardized cancer mortality-to-incidence ratio have been collected from these 85 countries.

3.3 Collection of Data

In this study, it is used secondary sources to collect the data. The data has been collected from the World Health Organization (WHO) and the World Bank (WB). The data on GDP per capita has been collected from the WB, and age-standardized cancer mortality-to-incidence ratio and current health expenditure per capita data have been collected from WHO. For doing this study, it is collected data from the year 2024 (WHO, 2025).

3.4 Statistical Analysis

For analyzing the data, a multivariate regression model is used in the following study. Multivariate Regression is a strategy used to quantify the degree to which more than one free factor (indicator) and one ward variable are directly related. The technique is extensively used to anticipate the conduct of the reaction factors related to changes in the indicator factors when an ideal level of connection has been set up. The Multivariate Regression model relates more than one indicator and more than one reaction. Multivariate Regression is one of the most straightforward Machine Learning algorithms (Binder, 1985). It goes under the class of Supervised Learning Algorithms, i.e., when we are furnished with preparing datasets.

The multivariate regression model is usually better to use than a one-variable regression model, as every model has to take into account both the design and the level of measurement of the variables. Along with this, the level of measurement, remember, is whether a variable is nominal, ordinal, or interval. Within the interval, it is also needed to know if variables are discrete counts or continuous. It's vital that to know the level of measurement of each response and predictor variable because they determine both the type of information you can get from your model and the family of models that are appropriate (Binder, 1985).

The general form for a multivariate regression equation with 2 variables be:

$Y=a+b1X1+b2X2$

Y is the dependent variable. The dependent variable is the age-standardized cancer mortality-to-incidence ratio or mortality from cancer between the ages of 30 to 70 years.

X1 and X2 are two independent variables. The independent variables are GDP per capita and current health expenditure per capita (current US$).

X1= GDP per capita

X2= Current health expenditure per capita

a = the Y-intercept when the values of X1 and X2 all are equal to zero.

b1= change in the value of Y for a unit change in X1, when the other independent variables are controlled

b2 = change in the value of Y for a unit change in X2 when the other independent variables are controlled.

As the information we have increased (size of sample data), the knowledge we have about the underlying process increases. Hence, the uncertainty related to the process decreases, and the confidence level in our estimates increases. A small sample size doesn't provide high confidence levels. To discern the different groups existing in a population, the corresponding sample size should be as big as possible. If the sample size is small, the possibility of discerning the differences decreases. By taking into account this issue, it has been chosen a large sample size (Bhattacharyya, 2006).

3.5 Hypothesis

It is hypothesized that the impacts of GDP per capita and health expenditure on cancer mortality would be different for developing and developed countries. It is further assumed that a lower GDP per capita and lower current health expenditure per capita is positively related to higher cancer mortality in the developing countries. And higher per capita income in the developed countries can contribute to a decrease in cancer mortality. That means, developing countries have higher cancer mortality compared to developed countries.

4. Results

There are two sections to this part. The first part contains the results of the developed countries based on the 28 developed countries' GDP per capita, Health expenditure per capita, and age-standardized cancer mortality-to-incidence ratio.

4.1 Results of the developed countries

Table 1: Descriptive statistics

	GDP		HE		MR
Mean	49166.96	Mean	4522.404	Mean	0.108429
Standard Error	3881.126	Standard Error	423.651	Standard Error	0.003819
Median	48298.64	Median	4443.542	Median	0.1025
Mode	#N/A	Mode	#N/A	Mode	0.091
Standard Deviation	20536.99	Standard Deviation	2241.75	Standard Deviation	0.020209
Sample Variance	4.22E+08	Sample Variance	5025445	Sample Variance	0.000408
Kurtosis	1.804536	Kurtosis	1.166756	Kurtosis	2.366088
Skewness	1.082502	Skewness	0.929026	Skewness	1.514287
Range	90343.65	Range	8945.657	Range	0.086
Minimum	19109.31	Minimum	1300.482	Minimum	0.084
Maximum	109453	Maximum	10246.14	Maximum	0.17
Sum	1376675	Sum	126627.3	Sum	3.036
Count	28	Count	28	Count	28

Table 1 shows that in the developed countries, the mean values of GDP, HE, and MR are 49166.96, 4522.404, and 0.108429, respectively. Median values are 48298.64, 4443.542, and 0.1025. And the standard error is 3881.126, 423.651, and 0.003819, respectively. And the sample size is 28 for all the independent and dependent variables.

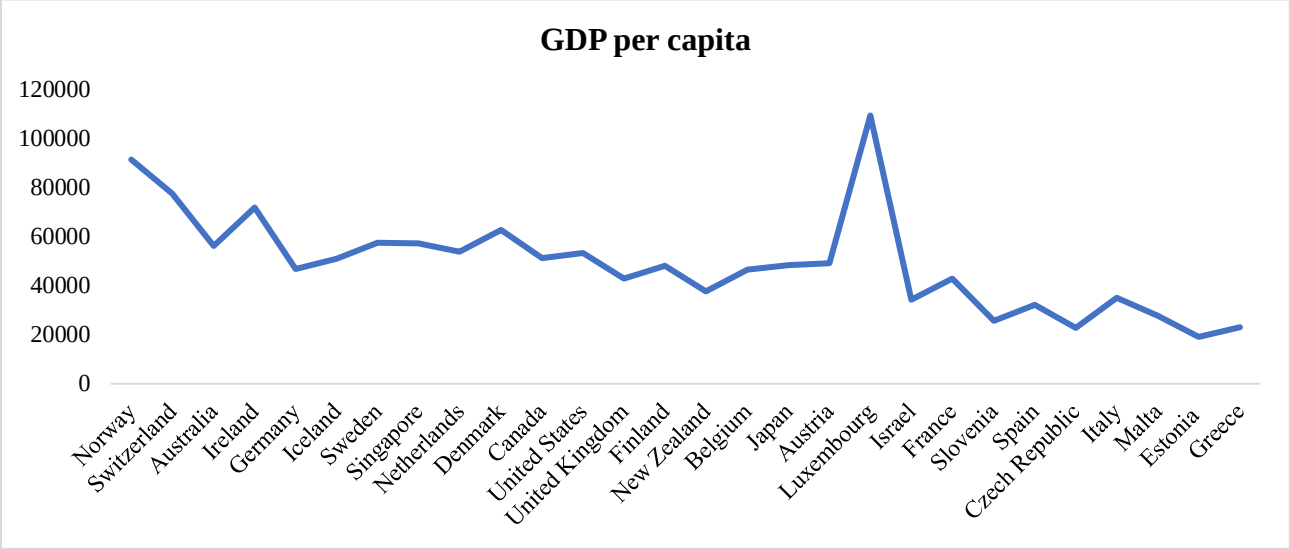

Figure 1: GPD per capita of the selected developed countries

GDP per capita of the selected 28 countries is shown in the figure 1 scatter diagram. The graph displays that GDP per capita is not the same for all the countries.

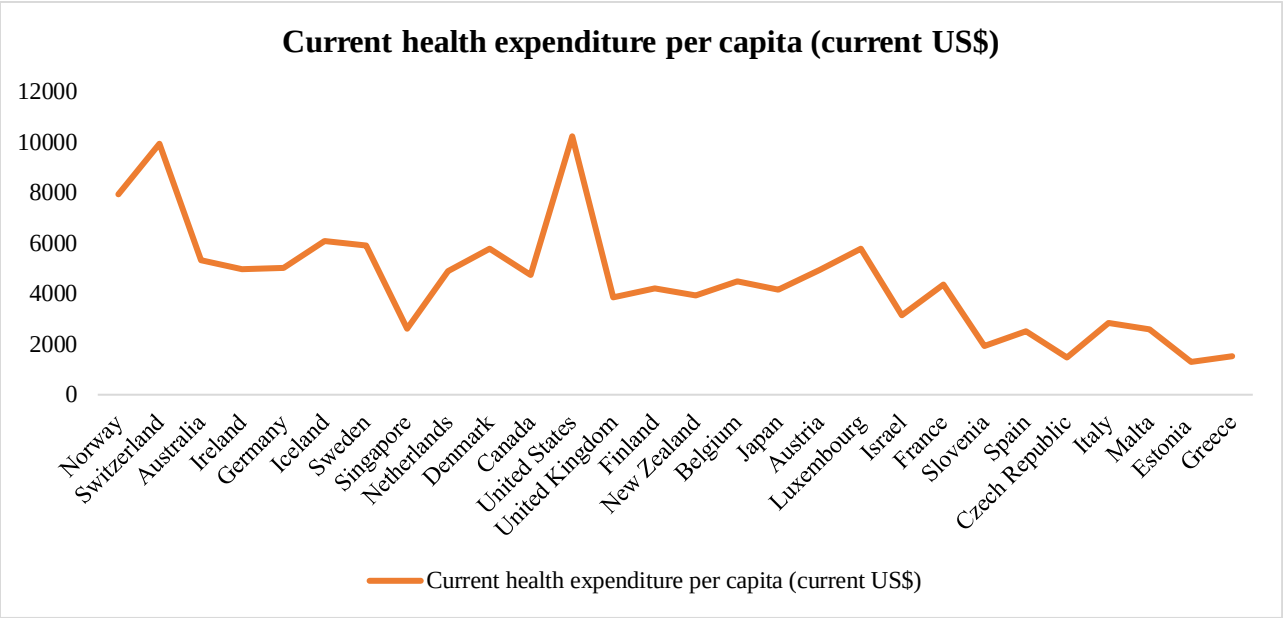

Figure 2: Current health expenditure per capita of the selected developed countries

Current health expenditure per capita data has been plotted in the figure 2 scatter diagram. Like the GDP per capita, HE is also different in these countries.

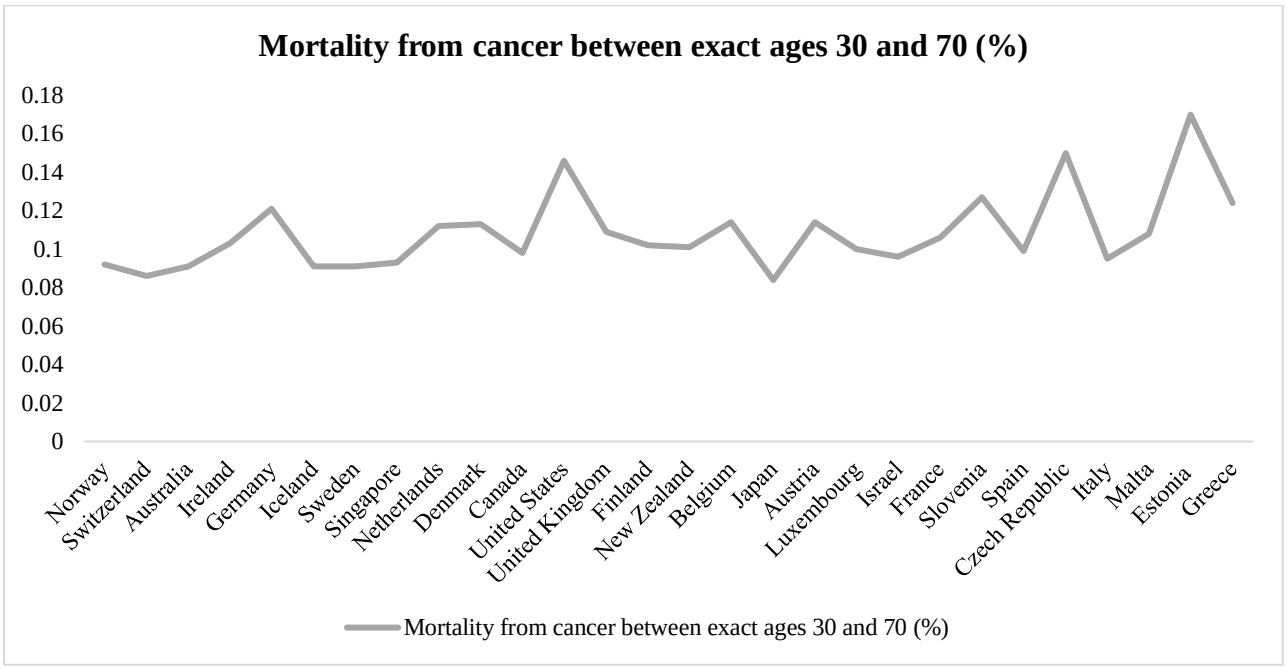

Figure 3: Mortality from cancer between exact ages 30 and 70 (%)

It is seen in this figure 3 that mortality from cancer differs from country to country.

Table 2: Regression result of the developed countries

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.890306
R Square	0.806755
Adjusted R Square	0.743695
Standard Error	0.144185
Observations	28

ANOVA

	df	SS	MS	F	Significance F
Regression	2	0.263886351	0.131943	6.346717	0.005901042
Residual	25	0.519730003	0.020789		
Total	27	0.783616353			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	0.423819	0.197484871	2.146083	0.049802	-1.21863201	2.06627	-1.218632	2.06626967
Ln(GDP)	-0.2764	0.130114011	-2.1243	0.043714	-0.54437547	-0.00843	-0.544375	-0.0084258
Ln(HE)	0.036555	0.012674912	2.880943	0.022979	0.17345059	0.24656	0.173450	0.24656136

Null Hypothesis: Ho: There is no relationship between GDP per capita and mortality from cancer between the ages of 30 to 70 years in developed countries.

Alternative Hypothesis: Ha: There is a positive or negative relationship between GDP per capita and mortality from cancer between the ages of 30 to 70 years in developed countries.

Y=a+b1X1+b2X2

Y=0.42-0.27X1+0.037X2

Result Analysis: It is found in the table that one unit increase in GDP per capita leads to a decrease in mortality rate in the developed countries. The result shows that in the developed countries, when the rate of GDP per capita increases by one unit, then the cancer mortality rate decreased by 0.27 units. That means there is a negative relationship between these two variables.

It is also observing that cancer mortality is positively related to the current health expenditure per capita of these countries. When the current health expenditure per capita increases by one unit, then the cancer mortality rate also increases by 0.036 units. That means the current health expenditure per capita of the developed countries can't contribute to decreasing their mortality rate. In the above regression result of the developed countries, the value of

R2 is 0.806755. This indicates that 80.67% of the variation of the cancer mortality rate (dependent variable) is explained by the GDP per capita and health expenditure per capita (independent variables). In the above, $p<.05$ indicates the result is statistically significant. That means the null hypothesis is rejected and the alternative is accepted. So, GDP per capita leads to a decrease in mortality rate in the developed countries.

4.2 Results of the developing countries

Table 3: Descriptive statistics

	GDP		HE		MR
Mean	5566.2	Mean	378.217	Mean	0.20693
Standard Error	679.024	Standard Error	54.51487	Standard Error	0.00695
Median	4211.447	Median	259.935	Median	0.214
Mode	#N/A	Mode	#N/A	Mode	0.249
Standard Deviation	5126.519	Standard Deviation	411.5783	Standard Deviation	0.052468
Sample Variance	26281197	Sample Variance	169396.7	Sample Variance	0.002753
Kurtosis	4.922591	Kurtosis	7.367205	Kurtosis	-0.57797
Skewness	1.821776	Skewness	2.28348	Skewness	-0.17064
Range	27121.47	Range	2259.802	Range	0.228
Minimum	371.1088	Minimum	23.27233	Minimum	0.078
Maximum	27492.58	Maximum	2283.075	Maximum	0.306
Sum	317273.4	Sum	21558.37	Sum	11.795
Count	57	Count	57	Count	57

Table 3 shows that the mean value of GDP, HE, and MR are 5566.2, 378.217, and 0.20693, respectively, in the developing countries where in the developed countries, the mean value of GDP, HE, and MR were 49166.96, 4522.404, and 0.108429, respectively. That means GDP per capita, health expenditure per capita are far lower in the developing countries compared to developed countries. And the mortality from cancer between the ages of 30 to 70 years in the developing countries is around double compared to developed countries. And the sample size is 57 developing countries for all the independent and dependent variables.

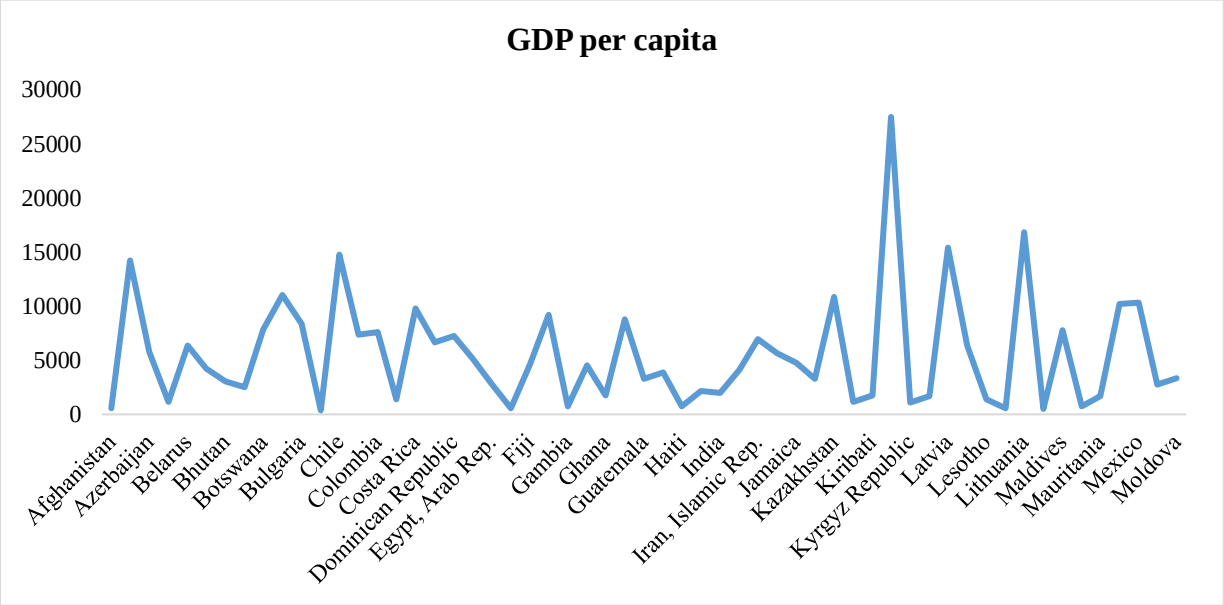

Figure 4: GDP per capita of the developing countries

GDP per capita of the selected 57 developing countries is shown in the above figure 4 scatter diagram. The graph displays that GDP per capita is not the same for all the countries.

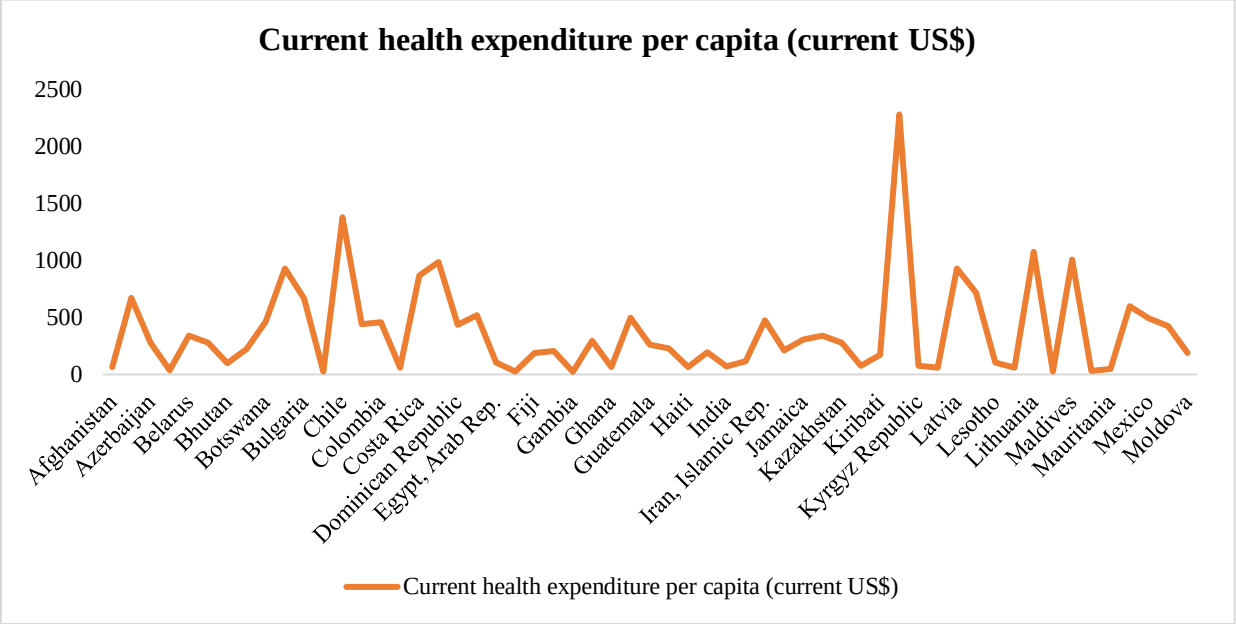

Figure 5: Current health expenditure per capita of the developing countries

Like the GDP per capita, HE is also different in the developing countries, that is shown in the figure 5.

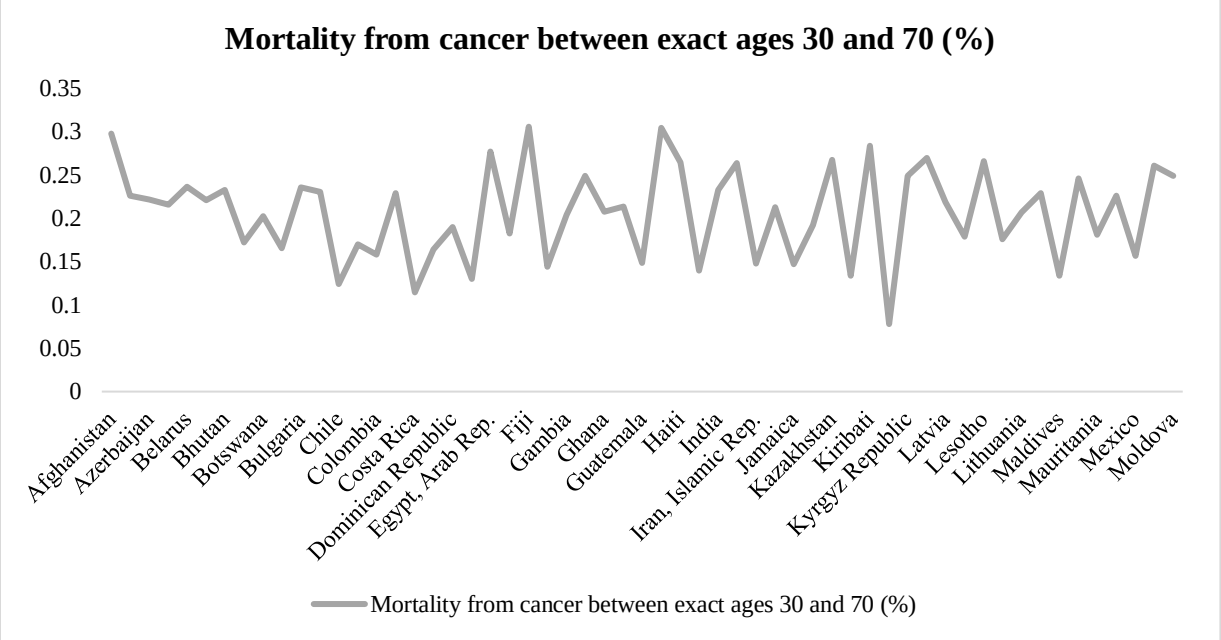

Figure 6: Mortality from cancer in the developing countries

The mortality from cancer in developing countries differs a lot from country to country, as shown in the figure 6.

Table 4: Regression result of the developed countries

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.8607982
R Square	0.812335
Adjusted R Square	0.8831622
Standard Error	0.2527097
Observations	57

ANOVA

	df	SS	MS	F	Significance F
Regression	2	0.929646489	0.464823	7.278533	0.001589
Residual	54	3.448559648	0.063862		
Total	56	4.378206136			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-1.279473	0.349618547	-3.65963	0.000575	-1.98042	-0.57853	-1.980416	-0.578530 2
Ln(GDP)	0.0654962	0.023249929	2.81705	0.024872	-0.10141	0.232402	-0.10141	0.232402 3
Ln(HE)	-0.161721	0.07454935	-2.16932	0.034479	-0.31118	-0.012259	-0.311184	-0.012258 6

Null Hypothesis: Ho: There is no relationship between GDP per capita and mortality from cancer between the ages of 30 to 70 years in developing countries.

Alternative Hypothesis: Ha: There is a positive or negative relationship between GDP per capita and mortality from cancer between the ages of 30 to 70 years in developing countries.

Y=a+b1X1+b2X2

Y=-1.28X1+0.065-0.16X2

5. Analysis

One unit increase in GDP per capita leads to an increase in the mortality rate of cancer. The result in the table 4 shows that in the developing countries, when the rate of GDP per capita increases by one unit, then the cancer mortality rate also increases by 0.065 units. That means there is a positive relationship between these two variables. This is because GDP per capita in these developing countries is not increasing as in developed nations. The increasing portion is very lower which indicates not impacting the cancer mortality sufficiently.

It is also observing that cancer mortality is negatively related to the current health expenditure per capita of these developing countries. When the current health expenditure per capita increases by one unit, then the cancer mortality rate decreased by 0.16 units. That means the current health expenditure per capita of these developing countries can contribute to decreasing their mortality rate.

In the above regression result of the developing countries, the value of R2 is 0.812335. This indicates that in the developing countries, 81.23 % of the variation of the cancer mortality rate (dependent variable) is explained by the GDP per capita and health expenditure per capita (independent variables). The value of p is less than 0.5, i.e., $p<.05$ which indicates the result is statistically significant. So, the null hypothesis is rejected, and the alternative is accepted.

6. Discussion

6.1 The relationship between countries' Income level and Cancer death in selected 85 countries

Cancer is becoming a worldwide problem as the incidence of cancer and the mortality rate is increasing at an alarming rate. Cancer incidence and mortality vary from region to region and also vary in different countries. The income of the countries also plays an important role in cancer occurrence, mortality, and morbidity. More than 6 million people worldwide die each year from cancer, half of whom die early. The picture of death from this disease in developing countries is also alarming. Most of the developing countries have not yet been able to create enough and advanced cancer treatment facilities. In these countries, there is a shortage of skilled doctors, nurses, and technologists. And this is why the number of cancer deaths is constantly increasing in these countries compared to developed countries (Martins, 2020).

From this study, it is found that GDP per capita, health expenditure per capita are far lower in the developing countries compared to developed countries. It is seen that the mean value of GDP and HE are 5566.2, 378.217 respectively, in the developing countries where in the developed countries, the mean value of GDP and HE are 49166.96, 4522.404 respectively.

It is found in the result that mortality to Incidence Ratio (MIR) of cancer in high-income countries (developed countries) is significantly lower when compared with low-income countries (developing countries). From this study, it is found its reality. It is observed that the mean value of mortality from cancer between the ages of 30 to 70 years is 0.20693 in a developing country, where it is 0.108429 in developed countries. However, the incidence of cancer was high in developed countries when compared to developing countries, but there was a significant increase in the rate of cancer.

Access to adequate radiation therapy, chemotherapy, and a multidisciplinary approach in cancer care of developed nations decreases the rate of mortality when compared with low-income countries, where radiation therapy is given as palliative care. It is found that Australia had a high incidence of cancer, followed by the United States, New Zealand. In Europe, Eastern Europe had a high cancer rate when compared with Western Europe. Asia continent recorded a low incidence of cancer, while half the number of cancer cases from Asia came from China (Torre et al., 2016). The mortality rates were 13.3 deaths per 1000 person-years when it came to low income countries and 3. 4 deaths per 1000 person-years in high-income countries. This proves that there is a relationship between countries' income levels and cancer death in the selected 85 countries.

6.2 The reasons for higher cancer death in developing countries compared to developed countries

Based on the result, it can be said that cancer mortality has become an important challenge in developing countries compared to developed countries. There are several reasons behind that. Demographic and lifestyle changes in developing countries are one of the reasons. In low and middle-income countries, demographic and lifestyle changes, longer expectancy, accelerated urbanization leads to an increase in the incidence of lung, breast, and colorectal cancer (Dey, 2018). In developing countries, people do not much care about cleanliness, whether it is a food item or water. One-fifth of the population dies of cancer due to malnutrition in developing countries. High-calorie intake, alcohol abuse, tobacco consumption leads to several forms of cancer. Lack of public awareness leads

to the growth of cancer deaths in such countries, as people don't bother with regular health checkups. Non-communicable diseases are highly prevalent in developing countries. Infections, undernutrition are the prime causes of cancer in developing countries. Poverty is also a cause of cancer deaths in developing countries, as there is much unemployment in such countries and people have not many resources to catch up and spend on the treatment of this disease (Chowdhury, 2020).

6.3 Low economic development is related to higher cancer mortality

The regression result shows that when the rate of GDP per capita increases by one unit, then the cancer mortality rate also increases by 0.065 units in the developing countries. That means GDP per capita in the developing countries cannot significantly contribute to decreasing the mortality rate. Based on the results, it can be said that low economic development is related to higher cancer mortality because low economic development reflects various indicators that can increase the possibility of the rate of cancer mortality. If there is low economic development in the economy, then it is not easily possible to provide adequate medical facilities those are the requirements for the treatment of cancer (Lunt, 2023).

The cancer mortality is directly related to the medical expenditure from the side of developing countries' governments, and in the absence of medical welfare, the support services of the government for the middle class or poor class people are not able to handle or manage the cancer treatment. If there are no medical facilities, then support from the government is required up to a certain level. Therefore, it is important to consider the welfare part of the government regarding the medical facilities. If the economic development is low, then it becomes very difficult for the government to provide medical facilities to the citizens of the country. It is found that cancer mortality is positively related to the current health expenditure per capita of the developed countries. When the current health expenditure per capita increases by one unit, then the cancer mortality rate also increases by 0.036 unit. That means the current health expenditure per capita of the developed countries can't contribute to decreasing their mortality rate. And cancer mortality is negatively related to the current health expenditure per capita of the developing countries. When the current health expenditure per capita increases by one unit, then the cancer mortality rate decreased by 0.16 units. That means current health expenditure per capita of the developing countries can contribute to decreasing their mortality rate (Tfayli et al., 2025).

Economic development and health expenditure are also related to the development of education policies and a good cancer institute where one can get cancer specialized doctors at a reasonable package. But in the absence of economic development and proper health expenditure, developing countries are bound to import medical equipment and treatments which costs huge amount for the economy. It is very difficult for low-income people to afford it, therefore economic development plays a direct role in cancer treatment. There is a direct relation between poor economic development policies with higher cancer mortality in the developing countries' economies (Bellanger et al., 2018). Therefore, it is necessary for the government to ensure proper economic development and to manage a good growth rate in the economy, especially in the sector of education and in the medical facilities. It is recommended that if the government can provide a good infrastructure for improved economic development and increase the health expenditure, then the rate of cancer mortality can be reduced in these developing countries, else lower economic development shall cause higher cancer mortality in these countries (Duggan et al., 2021).

7. Conclusion

This paper has analyzed how income level, health expenditure, and cancer outcomes in both developed and developing nations are related in a cross-country regression framework. The results give valuable information on the influence of economic and healthcare determinants in cancer death patterns worldwide. The findings show that the higher the GDP per capita in developed countries, the lower the rate of cancer deaths, which is due to the advantages of the developed healthcare systems, early detection systems, and availability of treatment. Conversely, in the developing world, GDP per capita increases do not consistently result in decreases in cancer mortality, but instead the impact is weak or even positive, implying that economic development is not enough to enhance health outcomes without proper development of institutional and healthcare systems.

Moreover, the analysis shows that health spending is more important in causing cancer mortality in developing countries than in developed countries. Greater healthcare expenditure in the developing world has been linked to enormous positive changes in cancer outcomes, which points to the need to invest in fundamental healthcare infrastructure, early detection, and treatment centers. Conversely, the correlation between spending on health and mortality in developed nations is less significant, which could be explained by the weakening returns to scale in the well-developed healthcare systems.

On the whole, the research shows that differences in cancer mortality between developed and developing countries are strongly influenced by differences in financial development and healthcare investment. Nevertheless, the relations are not direct and are mediated by more structural variables, including the accessibility of healthcare, its efficiency in resource application, and social determinants of health. As such, the design of policy interventions to minimize cancer mortality cannot be limited to solely targeting economic growth, but this should also be accompanied by effective healthcare expenditure and balanced access to medical services.

7.1 Limitations

Although it has made contributions, this study has a number of limitations. First, the analysis is based on cross-sectional data within one year, which does not allow us to capture dynamic changes and long-term trends in cancer outcomes. Second, using aggregate country-level data can obscure within-country inequalities, including regional or socioeconomic inequalities. Third, it has only two major explanatory variables (GDP per capita and health expenditure), and other related variables (education, environmental conditions, lifestyle behaviors, and healthcare quality) are not clearly stated in the model. Also, some of the possible problems that can influence the soundness of the results include measurement errors in secondary data and omitted variable bias (Bhattacharyya, 2006).

7.2 Future Research

The limitation of this study ought to be overcome in future research by the incorporation of panel data analysis of the temporal changes and causal relationships of economic factors on cancer outcomes. The addition of other variables, e.g., education levels, quality indicators of healthcare services, and risk factors in behaviors, would give a more detailed picture of the determinants of cancer mortality. Additionally, the next round of research can focus on inequalities within a country using micro-level or regional data that can more adequately represent inequalities in access and outcomes in healthcare. Lastly, more complex econometric methods, including instrumental variable methods or causal inference models, would be used to enhance the credibility of the results and make more solid policy suggestions (Bray et al., 2024).

To sum up, global cancer mortality needs a complex solution, including economic growth and specific healthcare investments, in combination with efficient policy implementation. In particular, developing nations should focus on improving healthcare infrastructures and enhancing effective health spending in order to make significant changes in cancer outcomes.

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