American Journal of Interdisciplinary Research and Innovation (AJIRI)

ISSN: 2833-2237 (ONLINE)

VOLUME 4 ISSUE 2 (2025)

PUBLISHED BY

E-PALLI PUBLISHERS, DELAWARE, USA

American Journal of Interdisciplinary Research and Innovation (AJIRI)

Volume 4 Issue 2, Year 2025
ISSN: 2833-2237 (Online)
DOI: https://doi.org/10.54536/ajiri.v4i2.4147
https://journals.e-palli.com/home/index.php/ajiri

The Impact of GDP Growth on Infant Mortality Reduction: Statistical Analysis Over 20 Years in 30 Countries

Fahimul Haque[1*], Sobayta Bintea Farid[2]

Article Information

Received: December 07, 2024

Accepted: January 05, 2025

Published: April 22, 2025

Keywords

Economic Growth, Health Disparities, Infant Mortality, Log GDP, Socioeconomic Inequality

ABSTRACT

Our study aimed to examine the relationship between the under-5 infant mortality rate and a nation's economic condition, as shown by log GDP. To investigate how economic growth affects child mortality rates in both rich and poor nations. Data from the World Bank Data covering the years 2001–2020 were used. The results demonstrate that there are notable differences in infant mortality rates between rich and poorer nations. Infant mortality and log GDP had a substantial inverse relationship, which was confirmed by Pearson correlation and linear regression analysis, indicating that greater infant mortality rates are linked to less economic progress. The results also show that growth in the economy has a greater effect on lowering infant mortality in low-income countries than in wealthy ones, as evidenced by the steeper decline in death rates. This implies that in areas of poverty, even small economic advancements might have a noticeable positive effect on health. The study concludes that lowering child mortality requires deliberate investments in maternal health initiatives, healthcare infrastructure, and preventive services. Economic growth is crucial to improving public health and promoting the welfare of future generations, so policymakers in low-income nations should give priority to these areas.

INTRODUCTION

This section presents the background, objectives, research questions and significance of the study.

Background

A significant health indicator that reflects the standard of healthcare and socioeconomic circumstances is infant mortality (Nursing School at the Federal University of Alagoas, Maceió, AL, Brazil, 2023). Infant mortality can reveal large inequalities in the quality of health care, socio-economic development, and basic requirements like sanitation, food, and medical care (Brainspec Educational Research, Ukpong-Umo, Frank, & University of Ibadan, 2023). In the last few decades, several countries could significantly improve infant mortality by enhancing medical technology, education of mothers, and accessibility to healthcare facilities and public health as well (Aizawa, 2021). Yet progress has been unequal, and rates of early death in low-income countries remain disproportionately high. Economic variables play a part in shaping healthcare outcomes and access, especially the country's economic level (Li *et al.*, 2024). Nations with increased Gross Domestic Product can allocate more to healthcare infrastructure, and medical research; in turn, reduce the infant mortality rate directly. On the other hand, in countries with a low GDP, there is not enough money to create an adequate healthcare system, which results in high rates of infant mortality (Kim *et al.*, 2024). Because of these economic differences, it is important to examine the relationship between a country's economy (specifically in terms of log GDP) and infant mortality rates. We seek to explore this relationship using data for high-income and low-income countries from 2000 through 2020.

Objectives

The paper's primary goal is to explore the association between log GDP, denoting economic status, and infant mortality rate. This study will compare the trends in infant mortality in high-income and low-income countries to better understand how economic factors impact levels of care. The study focuses on these changes over a 20-year period in an attempt to identify any trends or relationships that can explain the connection between infant mortality and economic development.

Research Questions

To achieve the above objectives, the study will answer some research questions:

1. The connection between a country's log GDP and infant mortality rates. Do wealthy countries have lower mortality rates of infants and is this relationship stable over time?
2. What is the difference in the rate of infant mortality between high-income and low-income countries for every year from 2000 to 2020? Trend comparisons between the two groups of countries can address this question.
3. What are the statistical differences in infant mortality between high-income countries and low-income countries? This question aims to discover if there are any significant changes between the two groups which will help us understand more about how economic divides affect health care outcomes.

[1] Industrial and Production Engineering, Bangladesh University of Engineering and Technology, Dhaka,1000, Bangladesh
[2] MBBS, Comilla Medical College, Comilla, 3500, Bangladesh
[*] Corresponding author's e-mail: fahimulhaq2001@gmail.com

4. Based on the economic–healthcare relationship observed in high-income countries, what type of policy interventions might be inferred for low-income countries? These findings on infant mortality in rich countries may provide insights into the type of policies and medical care investments that poorer countries might adopt to help develop their health systems with the aim of reducing infant deaths.

Significance of the Study

This work is significant since it could provide global public health and economic policy by presenting evidence on how economic development affects infant mortality. Despite numerous initiatives to reduce infant mortality, millions of newborns worldwide still pass away from preventable causes every year, especially in low-income nations. This research could lead to better policies and strategies to address these deaths, which should never happen, by exploring the role of economic drivers such as log GDP to implicate how they impact infant mortality rates. In addition, understanding the impact of economic development on health performance is necessary to inform global health priorities and resource allocation. The research provides useful evidence to policymakers and international health organizations to argue that more resources should be allocated to healthcare facilities. Finally, through a better understanding of the socio-economic causes of infant mortality, this research will add to the knowledge regarding the socioeconomic drivers of health inequalities and injustices. It may lay the groundwork for future research examining additional socio-economic determinants of infant health that could considerably broaden our understanding of this important aspect of global health.

LITERATURE REVIEW

The findings of this investigation align with a significant amount of research indicating that one of the best measurements of health outcomes, including infant mortality, is national income. A study from 2019 provided empirical evidence on the connection between infant mortality rates and real GDP per capita. It showed that with an increase in income, a reduction in the rates of infant mortality can be found. In particular, it finds that a 10 percent increase in per capita GDP results in a decline of nearly 0.2 percent in infant mortality, which reflects the significance of economic growth on health outcomes (Tang, 2019). Another researcher observed that infant mortality is influenced by GDP, therefore economic development is essential for health and consequent life or death (Hatice Türkan *et al.*, 2020). The log-linear relationship between GDP and infant mortality was established by (Bourne, 2012), which highlighted the importance of examining infant mortality rates with economic indicators. The study conducted on the SAARC-ASEAN regions found an important connection between economic factors and health outcomes by showing that improvements in sanitation and economic growth, along with public and private health expenditures, all lead to a decline in infant mortality (Rahman *et al.*, 2018). Ward and Viner (2017) examined not only the connection between income equality (as measured by the Gini coefficient) and mortality but also showed the crucial role that GDP plays in determining health outcomes, particularly for vulnerable populations like infants. A study from 1999 identified a strong inverse correlation between a country's infant mortality and its gross national product (GNP), which indicated that the infant mortality rate tends to decline as GNP rises. This correlation implies that infant health outcomes are generally better in rich nations (Hales *et al.*, 1999). Infant mortality and GDP growth have an inverse connection, which is vital for policymakers who aim to enhance health outcomes and economic performance at the same time (Islam *et al.*, 2023).

Steady economic growth enables developing countries to invest in healthcare infrastructure, improving the coverage of immunization services and the provision of maternal health care. It contributes to the drastic decline in infant mortality. Research showed improving health access and quality leads to dramatic decreases in infant mortality with increasing GDP per capita. In Nigeria, a 1% increase in per capita GDP reduces infant mortality by 26% (Abdulganiyu & Paul, 2021). In a similar way, maternal health and healthcare spending have considerable effects on infant mortality rates in Latin America (Passarelli-Araujo, 2024). Improved healthcare infrastructure and social welfare which are necessarily linked to economic development greatly affect infant mortality rates in disadvantaged areas (Taylor-Robinson *et al.*, 2019). Results showed that economic development through better healthcare infrastructure significantly decreased infant mortality rates (Cesur *et al.*, 2017). Improvements in healthcare services and infrastructure are essential for lowering infant mortality, especially among the poor, as indicated by a study. It revealed the differences in immunization coverage and healthcare access between different socioeconomic classes in South Africa (Nkonki *et al.*, 2011). Brown (2013) supported the claim that increased accessibility to maternal health services and a better healthcare infrastructure which are often a direct result of economic development are crucial for minimizing infant mortality in developing countries. A systematic review found that interventions in low-income communities can reduce health risks. Which also indicated that as economic development proceeds, the availability of healthcare facilities and maternal health services may become important determinants for lower infant mortality rate rates in less developed countries (Sellström & Bremberg, 2006). Based on data from South Africa over the past few decades, some researchers showed that both foreign direct investment and economic growth influence child health outcomes, especially the Infant Mortality Rate (IMR). Thus giving additional emphasis to the important role played by enhanced healthcare infrastructure and services that increase with an increasing GDP in developing countries (Salahuddin

et al., 2020).

The slower decline in infant mortality in richer countries indicates that once a country achieves a certain level of GDP, the reduction of infant mortality rate from further growth diminishes. A research from 2015 suggested that further growth in the economy may have diminishing gains in terms of health outcomes. This is consistent with the concept of the Preston curve, which proposes that advances in health measures such as infant mortality become less noticeable above a particular economic development level (Genowska *et al.*, 2015). Another study conducted in Nepal indicated that once a certain wealth threshold is reached, other determinants such as birth intervals and healthcare access become more crucial in lowering infant mortality rates (Lamichhane, 2023). The same result was obtained in a different study conducted in countries in Sub-Saharan Africa (Aderounmu *et al.*, 2023). Increasing economic growth may only partially improve health outcomes if a certain wealth threshold is crossed (Khadka *et al.*, 2015). To further lower mortality rates, focused interventions addressing maternal education, socioeconomic position, and rural living situations may be needed after a certain point of economic development in Nigeria (Ezeh *et al.*, 2015). This may also be explained by the fact that most infectious diseases and other preventable causes of infant mortality are already within control in wealthy nations. This finding suggests that economic development may have distinct influences on infant mortality. The much steeper slope in the regression for poor countries indicates that significant improvements in infant health are more highly tied to economic growth. A similar result was founded by (Chakroun, 2024), though the relationship between economic factors and infant health was nonlinear. This finding is consistent with the claim that for lower-income countries a steeper slope between economic growth and reductions in infant mortality exists because their healthcare systems are more sensitive to increases in health expenditure (Kiross *et al.*, 2020). Another research showed that the harmful effects of economic downturns on maternal and infant mortality are larger in poorer countries, indicating that poorer nations may have a steeper slope of the effect of fluctuations in economic growth on health outcomes as they start from a lower level of healthcare services infrastructure (Ensor *et al.*, 2010). Nishiyama (2011) provided a detailed analysis of data from 83 developing countries over a period of four decades to demonstrate that, economic growth is usually associated with declining mortality rates. However, the impact between the two factors is strongly asymmetric, and healthcare infrastructure appears crucial in poorer countries. A sharper slope was seen in low-income countries. The same result was pointed out by (Titaley *et al.*, 2008) which was conducted in Indonesia. When GDP rises in poor countries, it provides more money for constructing hospitals and undertaking vaccination campaigns as well as offering prenatal and postnatal care. Better national public health systems (i.e. sanitation, water access, and food security) can also immediately scale down the prevalence of diseases that affect infants disproportionately. According to Lu *et al.* (2020), higher GDP in poor nations significantly improves food security, sanitation, and healthcare facilities, which in return reduces infant mortality rates. Improved healthcare infrastructure and public health operations such as campaigns for vaccinations and greater sanitation, have a direct connection to improved health outcomes, including decreased infant mortality, as GDP rises (Jakovljevic *et al.*, 2020). Wang (2015) noted that, when healthcare spending is optimal, it can improve public health by lowering infant deaths through enhanced healthcare infrastructure and services when GDP rises. Higher-income levels may result in improved healthcare infrastructure and public health programs, which can significantly reduce infant mortality (Bedir, 2016).

MATERIALS AND METHODS

This section describes the data sources, statistical methods that were used and data preprocessing techniques.

Data Sources

The data was collected from the World Data Bank for the period from 2001 to 2020. As for the study, we wanted to understand the links between economic status measured in terms of the logarithm of GDP and infant mortality under the age of 5 by applying it to poor and rich countries. Log GDP is the natural logarithm of gross domestic product and is measured in US dollars.

The other major variable is infant mortality under 5, which reflects the number of infant deaths under 5 years of age per 1000. In particular, we worked with a sample consisting of 15 rich and 15 poor countries, which allowed performing the cross-national analysis. The rich countries presented in the sample are the United States, Germany, Switzerland, Japan, Canada, the United Kingdom, France, Australia, the Netherlands, Sweden, Norway, Denmark, Finland, the Republic of Korea, and Belgium. It was decided based on the fact that those countries have significant economic capacity. The countries that are identified as poor are Bangladesh, India, Nigeria, Kenya, Pakistan, Ethiopia, Uganda, Cambodia, Nepal, Afghanistan, Sudan, Zimbabwe, Madagascar, Chad, and Tanzania. The economic resources of these states are significantly poorer, and infant mortality often remains critical.

The data set includes twenty years of data, allowing for an analysis of progress in the two indicators over time. It helped to make a conclusion concerning the influence of economic status on infant mortality among children in rich units compared to poor ones. The data was first cleaned and pre-processed to ensure its consistency and reliability, with missing values and any other anomalies appropriately dealt with. All subsequent statistical analysis is based on the dataset.

Statistical Methods

The following major statistical methods were used in the Python analysis.

Pearson Correlation

It evaluates how strongly and in which direction the two variables have a linear relationship. The value is from -1 which is the perfect negative correlation and +1 is the perfect positive correlation (Weisburd *et al.*, 2020). It was used to test the degree and the direction of correlation between log GDP and infant mortality rates in both rich and poor countries.

Linear Regression

A statistical model that looks at how one or more independent variables relate to the dependent variable so that projections can be made using those independent variables (Dombrowsky, 2023). The model was important to evaluate the trend for infant mortality as in log GDP.

ANOVA

It stands for analysis of variance and it compares the means of 3 or more groups to see if there are any significant differences between them (Dugard *et al.*, 2022). The means of infant mortality rates in rich and poor nations were compared during a 20-year span. The results of this test are used to evaluate the statistical importance of the observed group.

T-test

It looks for significant variations between two groups by comparing their means (Ewens & Brumberg, 2023). The significance of the difference in infant mortality between the two groups was tested using this test. The purpose of this statistical test was to verify whether there is a substantial long-term variation in the death rates between rich and poor nations.

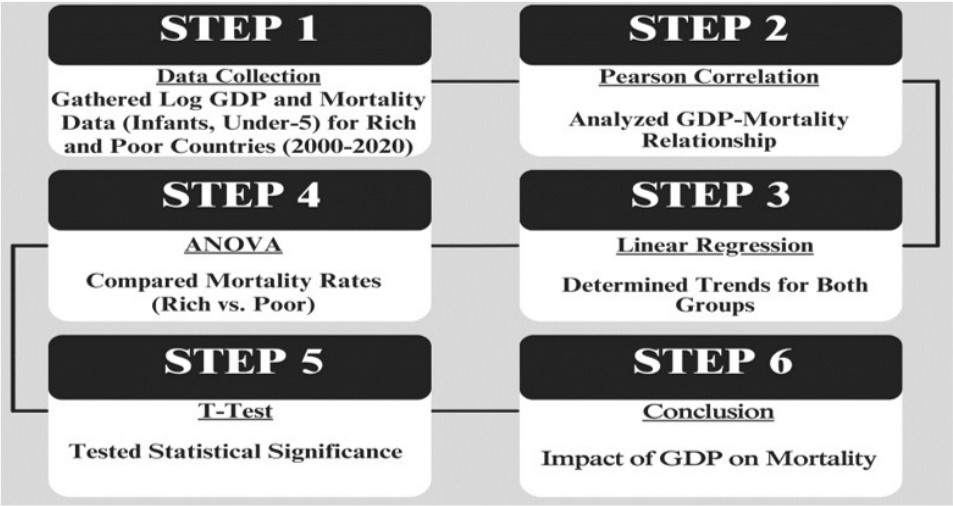

Figure 1: Flowchart of the Analysis

Figure 1 shows the sequential steps of the analysis. First, data was collected, focusing on the Log GDP and infant mortality rate under 5. After collecting the data, the Pearson correlation was done to establish the correlation between an infant mortality rate and GDP. The regression was thereafter done to establish the trend in the poverty mortality rates of the infant in both rich and poverty-stricken countries. An ANOVA test was done to compare the mortality rate in rich and poor countries. Finally, a T-test was done to test the significance of the result reached.

Data Preprocessing

Before beginning any statistical analysis, the dataset was cleaned to ensure accuracy. The following actions were taken:

1. Any empty, incomplete, or missing data points were removed from the dataset.
2. The values of GDP for each country were converted into their logarithmic form, which made their distribution more linear and directly comparable.
3. The values of infant mortality were normalized to a "per 1,000 live births" metric.

RESULTS AND DISCUSSION

Pearson Correlation

The Pearson correlation coefficient of log GDP and infant mortality for poor countries is -0.992, with a P-value of 7.08e-18. The correlation is inverse and very strong; as a poor country's log GDP rises, the infant mortality rate decreases, and the relationship is significant. The coefficient for rich countries is -0.922, with a P-value of 7.27e-09. The relationship is also inverse and significant, but it is slightly less strong than in poor countries as the influence of log GDP has already reduced infant mortality rates to relatively low levels.

Linear Regression

The linear regression equation for poor countries is: y=-32.41x+868.87 . This indicates that the infant mortality

rate drops by 32.41 per 1,000 live births for every unit increase in log GDP. The model's R2 score was 0.985, which implies that it suited the data extremely well. It suggests poor countries have a significant impact on the economic status of infant mortality because it indicates a steep slope. The linear regression equation for rich countries is: y=-2.39x+70.81 . The infant mortality rate is therefore reduced by 2.39 per 1,000 live births for every unit rise in log GDP. The model's R2 value was 0.8509, indicating a fairly decent fit to the data- not as strong as in poor nations. Compared to poor countries, the number is small and this might be because rich countries already have lower infant mortality rates.

Rich countries have lower infant mortality rates compared to their poor counterparts. The above result shows the linear regression slopes exhibit a decrease in infant mortality rates as log GDP increases. However, the effect of log GDP seems to be more pronounced in poor countries than in rich countries. As shown in the result, the slope for poor countries is -32.41 while it is -2.39 for rich countries.

ANOVA Test

According to the ANOVA results, the P-value is 2.44e-20 and the F-value is 330.39. Thus, it can be decided that there is a significant bias in the level of infant mortality between the poor countries relative to the rich ones. An F-value of 608.97 and a P-value of 5.38e-25 were obtained from the ANOVA test of the differences between the mean log GDP values for rich and poor nations. There is a highly significant difference in log GDP between groups.

T-test

The T-test of the differences between the mean values of infant mortality rates received t-statistics of -18.18 and a P-value of 2.44e-20. It can be interpreted that the differences in these indicators are highly significant. When comparing the mean log GDP values of rich and poor countries, the test produced a T-statistic of 24.68 and a P-value of 5.38e-25. This implies these groups' differences in log GDP are extremely large.

Table 1: Summary of Statistical Results for Log GDP and Infant Mortality in Rich and Poor Countries

Analysis Type	Poor Countries	Rich Countries
Pearson Correlation	-0.992 (P-value: 7.08e-18)	-0.922 (P-value: 7.27e-09)
Linear Regression	y = -32.41x + 868.87 (R^2 = 0.985)	y = -2.39x + 70.81 (R^2 = 0.8509)
ANOVA (Infant Mortality)	F-value: 330.39, P-value: 2.44e-20	
ANOVA (Log GDP)	F-value: 608.97, P-value: 5.38e-25	
T-test (Infant Mortality)	T-statistic: -18.18, P-value: 2.44e-20	
T-test (Log GDP)	T-statistic: 24.68, P-value: 5.38e-25	

The results of the statistical studies of the data from rich and poor nations are summarized in Table 1. The findings reveal that there are significant variations in the relationship between mortality and economic status (log GDP), with steeper regression slopes and a stronger inverse correlation in poorer countries. This suggests that economic growth has a greater effect on lowering infant mortality in low-income countries.

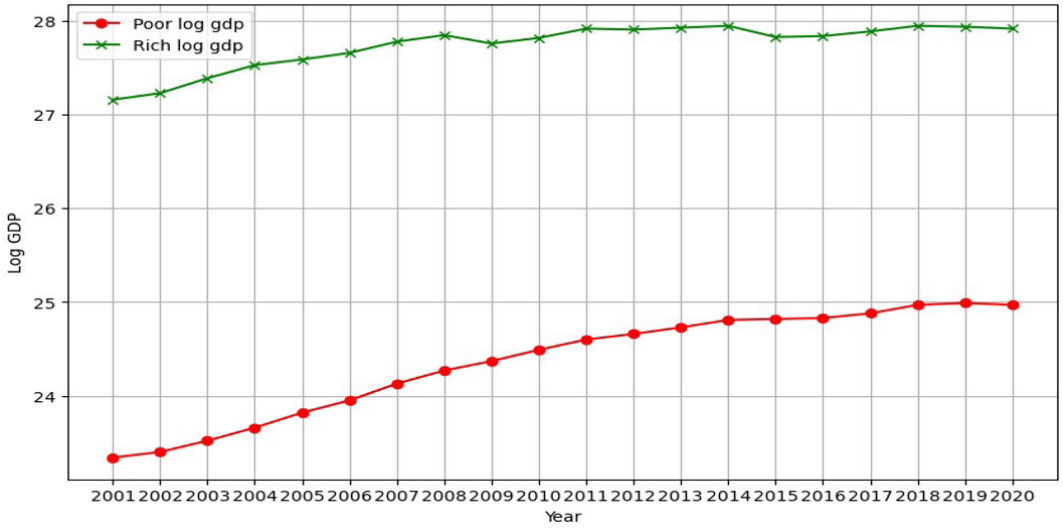

Figure 2: : Comparison of Log GDP for Rich and Poor Countries (2001-2020)

Figure 2 shows the evolution of log GDP over 2001–2020 for rich and poor countries. The green line with X-marks is the log GDP for rich countries, which gives us a more stable growth function with a few bumps in recent times. The red line with the circle captures the log GDP for poor nations, which has been rising consistently and acutely. This indicates that because of their lower starting GDP levels, poor countries developed faster than rich countries.

Table 2: Infant Mortality Rates and Average Log GDP for Rich and Poor Countries

Year	Rich countries average log GDP	Rich countries average mortality	Poor countries average log GDP	Poor countries average mortality
2001	27.16	5.65	23.34	113.95
2002	27.23	5.51	23.4	109.01
2003	27.39	5.37	23.52	104.25
2004	27.53	5.22	23.66	99.80
2005	27.59	5.07	23.82	95.61
2006	27.66	4.91	23.95	91.83
2007	27.78	4.77	24.13	88.20
2008	27.85	4.63	24.27	84.63
2009	27.76	4.51	24.37	81.19
2010	27.82	4.38	24.49	77.93
2011	27.92	4.28	24.60	74.85
2012	27.91	4.16	24.66	71.78
2013	27.93	4.08	24.73	69.03
2014	27.95	4.01	24.81	66.64
2015	27.83	3.98	24.82	64.47
2016	27.84	3.91	24.83	62.32
2017	27.89	3.86	24.88	60.33
2018	27.95	3.82	24.97	58.33
2019	27.94	3.75	24.99	56.55
2020	27.92	3.71	24.97	54.85

Table 2 contains the data for high-income and low-income nations in 2001-2020. For rich countries Log GDP, we can observe that it has a relatively stable trend and slightly increases with time. The log GDP started at 27.16 in 2001 and stood at 27.92 by the year 2020. On the other hand, infant mortality shows a consistent downward trend with time. In 2001, the infant mortality rate was 5.65 per 1,000 live births, decreasing to 3.71 by 2020. From the data, we can conclude that for wealthier countries with high log GDP, there will be a reduction in infant mortality with time due to a better living standard and healthcare. The log of gross domestic product in poor countries starts at 23.34 in 2001 to 24.99 by 2020. The infant mortality rates in poor economies have been reduced significantly from 113.95 in 2001 to 54.85 in 2020.

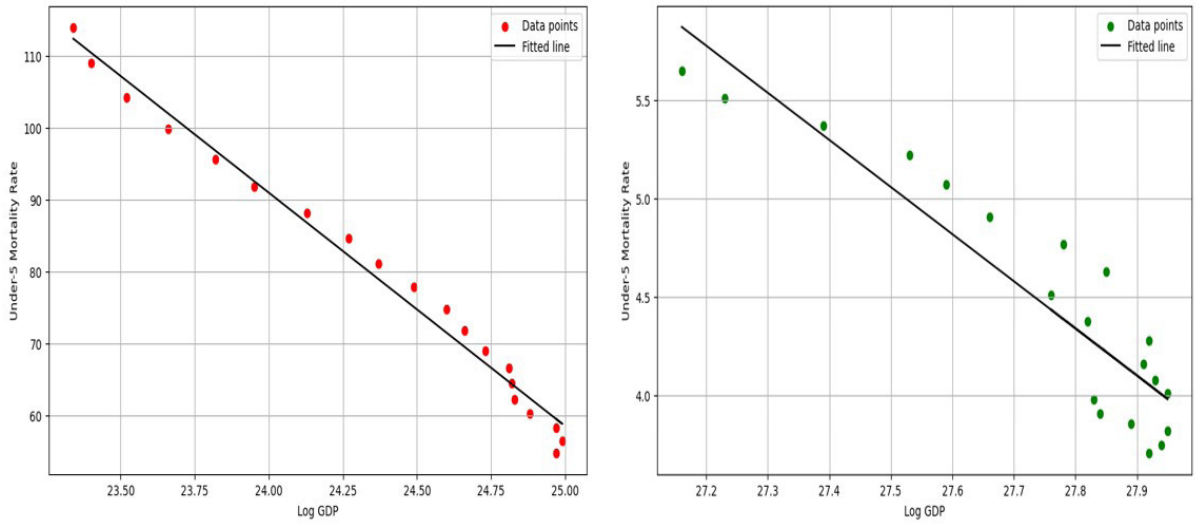

Figure 3: Linear Regression Analysis of Log GDP vs Under-5 Mortality Rate for Poor and Rich Countries

In Figure 3, we can observe how both rich and poor countries have decreased their infant mortality rates between 2001 and 2020. According to the left graph, infant mortality very steeply decreased from 113.95 in

2001 to the value of 54.85 in the year of 2020 for poor countries (in red). In the right graph, displaying rich countries (green), mortality decreased more modestly from 5.65 deaths per 1000 live births in 2001 to 3.71 in 2020. While the steeper drop in poor nations points to progress, mortality rates are still many times greater than those in richer countries.

Figure 4 shows the results of a linear regression study for both rich and poor countries. In the poorer countries, there is a steep negative slope of about -32.41, indicating a strong and inverse relationship. The mortality rate drops quickly with Log GDP. In contrast, the slope for wealthier countries is somewhat less steep (about -2.39) but still negative.

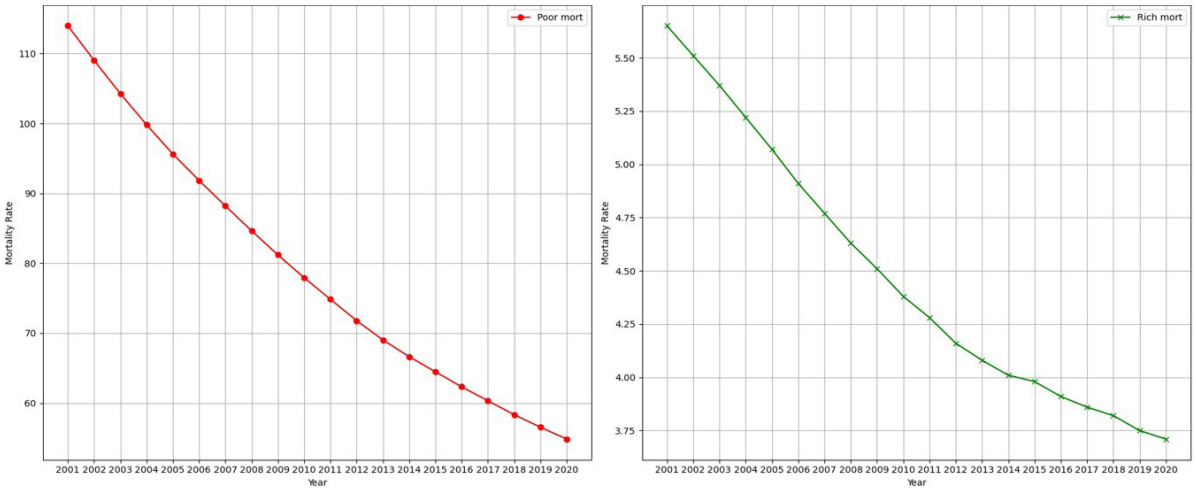

Figure 4: Infant Mortality Trends in Poor and Rich Countries (2001-2020)

Summary

The research investigated the relationship between economic factors (log GDP) and infant mortality for 30 countries split into two groups: rich and poor. Results also strongly support the hypothesis of a negative relationship between log GDP and infant mortality wherein higher infant mortality rates correspond to lower economic development supported by Pearson correlation as well as linear regression analysis. For poor countries, the Pearson correlation coefficient between log GDP and infant mortality was exceptionally strong -0.99, suggesting a strong relationship between economic expansion and a decrease in infant mortality in poor countries. The steep decline in the mortality rates is further emphasized by the linear regression equation: $y = m x + b$ (in this case, m=-32.41). In contrast, the slope of the regression line in rich countries ($m = -2.39$), indicates that infant death rates decline more slowly with increasing GDP. The correlation coefficient was still strong: $r = -0.92$. According to this, the difference indicates that a poor country's economic development will affect infant mortality significantly more than a wealthy nation's, where improvements are more marginal. According to a study from 2024, socioeconomic factors have a major impact on infant mortality rates, indicating that countries with lower incomes are more affected by economic development than those with higher incomes (Passarelli-Araujo, 2024). Furthermore, there were statistically significant differences between the death rates of rich and poor countries, as indicated by the ANOVA results (F-value: 330.39) and T-test results (T-test statistic: -18.18). These results confirm that economic status is an important indicator of health outcomes, especially when it comes to infant mortality. According to a study from 2017, infant mortality rates are correlated with lower per capita health expenditure in lower-income families, with infants from wealthier categories having a 20% reduced chance of dying (Yadav *et al.*, 2017). While higher income levels are usually linked with fewer deaths, Martens *et al.* (2010) also pointed out that the relationship is more complicated in developed countries. This corresponds with the lower slope for richer countries - so other things than income, like healthcare infrastructure, social services, and public health policies, tend to matter much more in reducing mortality. The expected negative link between infant mortality rates and GDP per capita in rich countries might be complicated by factors such as cultural norms and inequality (Schwartz *et al.*, 2023).

Policy Implication

Policymakers need to focus on strategies that promote sustainable economic development because this is the most direct way to positively influence public health, especially for vulnerable groups such as newborns (Iftikar & Ali, 2024). National development strategies should prioritize introducing healthcare services, increasing maternal health, and piping building. For example, investing in constructing hospitals and clean water systems. For wealthy nations, the priority should be making existing plans work better and ensuring that better medicine is widely available to all citizens at a reasonable cost. The availability of sophisticated medical technologies that can be lifesaving and related social determinants need to be considered in policy (Garçon *et al.*, 2016). Another important policy inference is that international aid and development assistance may speed

up health progress in poor countries (Kasper *et al.*, 2023). Given that economic growth affects infant mortality in these areas, focused investment and funding in health programs and healthcare facilities may accelerate mortality declines (Sheidaei *et al.*, 2024). Governments, international organizations, and private sector actors can work together to provide the funding and expertise required to enhance health outcomes in poor countries.

Limitations

Though our study offers important information about the connection between infant mortality and log GDP, it should be pointed out that it has a number of limitations. First, the study only looks at 30 countries, which would restrict how far the findings might be used. Further research should increase the sample size to include more nations, especially from underrepresented regions in our analysis, such as Africa and Latin America, even if these nations were chosen to reflect a variety of economic conditions. Second, while GDP is the study's main measure of economic progress, other factors could be crucial in impacting infant mortality. For example, political stability, access to clean water, maternal education, and healthcare expenditures per capita are all important variables that could influence infant mortality rates but were not considered in this study. Future works could provide a more thorough knowledge of the factors influencing infant mortality by including these variables. Third, since the study uses annual data, significant within-year variations in death rates may be overlooked. To better understand the dynamics and timing of changes in child mortality rates in response to economic expansion, future studies could examine monthly or quarterly data. The study's findings indicate a number of potential areas for further investigation. In order to determine which component has a greater direct impact on lowering infant mortality, future research should first examine the impact of healthcare spending in combination with GDP. This can involve looking at how economic growth and healthcare spending, both public and private, combine to affect health outcomes. Furthermore, longitudinal research that follows a single nation over time could shed more light on the specific laws and programs that have worked best to lower infant mortality in both wealthy and developing nations. Researchers could also look into the role of inequality inside countries, specifically in wealthy nations where mortality is not as impacted by GDP growth overall. Policymakers aiming to address inequalities within their own communities may find valuable insights by examining the connection between infant mortality rates and social safety nets, healthcare access, and wealth inequality. Future studies should additionally look at sociopolitical issues such as international aid programs, public health policy, and government stability in order to determine how they might affect infant mortality rates. These elements may significantly influence health outcomes and are frequently related to economic development, especially in low-income nations.

CONCLUSION

The purpose of this investigation was to look into the relationship between under-5 infant mortality rates in high- and low-income countries and economic growth as indicated by log GDP. The findings demonstrate a clear opposite relationship between infant mortality and GDP; however, the size of the effect differs greatly between wealthy and poor countries. Even minor economic growth can result in substantial drops in infant mortality in low-income nations, where access to public health services and basic healthcare is frequently restricted. The regression analysis's steep slope for these nations provides evidence of this, revealing that increases in economic conditions can result in considerable increases in child survival rates. Growth in the economy in these regions frequently results in increased funding for clean water, health campaigns, nutrition strategies, and healthcare infrastructure—all of which contribute to reducing the number of avoidable child fatalities. On the other hand, the correlation between GDP and infant mortality is considerably less steep in high-income nations. It indicates that the benefits of economic growth are more tangential, though it may still help lower infant mortality. Wealthy nations usually already have established healthcare systems, extensive access to sanitary facilities and clean water, and successful public health initiatives. Therefore, further expansion of GDP does not result in the same sharp declines in mortality that are observed in less developed countries. To further lower infant mortality in rich countries, additional elements including healthcare quality, access equity, social support networks, and medical developments probably matter more. The crucial role that economic policy can play in enhancing public health outcomes in low-income nations is one of the study's most significant conclusions. The governments of these countries should focus on measures that promote economic expansion while making sure that the benefits of such expansion are divided fairly, especially with vulnerable groups like women and children. Priorities should be set for increasing access to healthcare, funding maternal health initiatives, and improving facilities including clean water supplies, hospitals, and sanitary facilities. To sum up, the results of this study offer compelling proof that economic expansion lowers infant mortality, especially in low-income nations. Promoting sustainable economic growth is crucial for policymakers in these countries not only for general development but also for greatly enhancing public health outcomes, particularly for infants. In order to lower child death rates and improve the condition of upcoming generations, this research emphasizes the significance of making strategic investments in healthcare infrastructure, maternal health, and preventative care. It also proposes a dual focus on economic policy and healthcare system development. Global cooperation among states, international organizations, and non-governmental groups will be crucial to boosting the growth and well-being of the most vulnerable people on the entire globe.

REFERENCES

Abdulganiyu, S., & Paul, J. (2021). Economic fluctuations and child health: How well children's health needs are met in Nigeria. *Journal of Economics, Management and Trade, 21,* 21–28. https://doi.org/10.9734/jemt/2021/v27i130319

Aderounmu, B., Awofiranye, A., & Oni, O. E. (2023). Environmental quality, infant morality, and economic growth in selected sub-Saharan African countries. *Comparative Economic Research: Central and Eastern Europe, 26*(2), 149–162. https://doi.org/10.18778/1508-2008.26.17

Aizawa, T. (2021). Decomposition of improvements in infant mortality in Asian developing countries over three decades. *Demography, 58*(1), 137–163. https://doi.org/10.1215/00703370-8931544

Abdulganiyu, S., & Paul, J. (2021). Economic fluctuations and child health: How well children's health needs are met in Nigeria. *Journal of Economics, Management and Trade, 21,* 21–28. https://doi.org/10.9734/jemt/2021/v27i130319

Bedir, S. (2016). Healthcare expenditure and economic growth in developing countries. *Advances in Economics and Business, 4*(2), 76–86. https://doi.org/10.13189/aeb.2016.040202

Brainspec Educational Research, Ukpong-Umo, R., & Frank, I. (2023). Social determinants of infant and child mortality. *International Journal of Advanced Studies in Economics and Public Sector Management, 11*(1), 91–106. https://doi.org/10.48028/iiprds/ijasepsm.v11.i1.08

Brown, D. W. (2013). A review of target population estimates and implied infant mortality rates from national immunization programmes during 2000–2010. *The Open Public Health Journal, 7*(1), 6–10. https://doi.org/10.2174/1874944501306010006

Cesur, R., Güneş, P. M., Tekin, E., & Ulker, A. (2017). The value of socialized medicine: The impact of universal primary healthcare provision on mortality rates in Turkey. *Journal of Public Economics, 150,* 75–93. https://doi.org/10.1016/j.jpubeco.2017.03.007

Chakroun, M. (2024). Health and economic growth: New evidence from a panel threshold model. *Cogent Economics & Finance, 12*(1), 2331010. https://doi.org/10.1080/23322039.2024.2331010

da Silva Mendonça, K., da Silva Rocha, A. C., de Melo Marques, K. S. C., da Silva Bispo, L. V., do Nascimento, R. Z., & Costa, C. R. B. (2022). Infant mortality due to preventable causes. *Revista Uningá, 59*, eUJ4394-eUJ4394. https://doi.org/10.46311/2318-0579.59.eUJ4394

Dombrowsky, T. (2023). Linear regression: A beginner's guide for nursing research. *Nursing, 53*(9), 56–60. https://doi.org/10.1097/01.NURSE.0000946844.96157.68

Dugard, P., Todman, J., & Staines, H. (2022). Analysis of variance (ANOVA). In P. Dugard, J. Todman, & H. Staines (Eds.), *Approaching multivariate analysis* (2nd ed., pp. 13–54). Routledge. https://doi.org/10.4324/9781003343097-2

Ensor, T., Cooper, S., Davidson, L., Fitzmaurice, A., & Graham, W. J. (2010). The impact of economic recession on maternal and infant mortality: Lessons from history. *BMC Public Health, 10*(1), 727. https://doi.org/10.1186/1471-2458-10-727

Ewens, W. J., & Brumberg, K. (2023). Tests on means. In W. J. Ewens & K. Brumberg (Eds.), *Introductory statistics for data analysis* (pp. 173–203). Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-28189-1_13

Garçon, L., Khasnabis, C., Walker, L., Nakatani, Y., Lapitan, J., Borg, J., Ross, A., & Velazquez Berumen, A. (2016). Medical and Assistive Health Technology: Meeting the Needs of Aging Populations: Table 1. *The Gerontologist, 56*(Suppl 2), S293–S302. https://doi.org/10.1093/geront/gnw005

Genowska, A., Jamiołkowski, J., Szafraniec, K., Stepaniak, U., Szpak, A., & Pająk, A. (2015). Environmental and socio-economic determinants of infant mortality in Poland: An ecological study. *Environmental Health, 14*(1), 61. https://doi.org/10.1186/s12940-015-0048-1

Hales, S., Howden-Chapman, P., Salmond, C., Woodward, A., & Mackenbach, J. (1999). National infant mortality rates in relation to gross national product and distribution of income. *The Lancet, 354*(9195), 2047. https://doi.org/10.1016/S0140-6736(99)03763-0

Hatice Türkan, A., Erdugan, F., & Aldemir, S. (2020). Spatial patterns of infant mortality in Turkey between 2011 and 2016. *International Review for Spatial Planning and Sustainable Development, 8*(4), 1–15. https://doi.org/10.14246/irspsd.8.4_1

Iftikar, M., & Ali, H. (2024). Public health impacts on economic growth in developing countries: An analytical review of research. *Pakistan Journal of Humanities and Social Sciences, 12*(2). https://doi.org/10.52131/pjhss.2024.v12i2.2291

Islam, M. M., Mondal, M. N. I., & Khoj, H. (2023). Effects of health factors on GDP growth: Empirical evidence from Saudi Arabia. *Sustainability, 15*(11), 8732. https://doi.org/10.3390/su15118732

Jakovljevic, M., Timofeyev, Y., Ranabhat, C. L., Fernandes, P. O., Teixeira, J. P., Rancic, N., & Reshetnikov, V. (2020). Real GDP growth rates and healthcare spending: Comparison between the G7 and the EM7 countries. *Globalization and Health, 16*(1), 64. https://doi.org/10.1186/s12992-020-00590-3

Kasper, T., Yamey, G., Dwyer, S., McDade, K. K., Lidén, J., Lüdemann, C., Diab, M. M., Ogbuoji, O., Poodla, P., Schrade, C., Thoumi, A., Zimmerman, A., Assefa, Y., Allen, L. N., Basinga, P., Garcia, P. J., Jackson, D., Mwanyika, H., Nugent, R., … Benn, C. (2023). Rethinking how development assistance for health can catalyse progress on primary health care. *The Lancet, 402*(10418), 2253–2264. https://doi.org/10.1016/S0140-6736(23)01813-5

Khadka, K. B., Lieberman, L. S., Giedraitis, V., Bhatta, L., & Pandey, G. (2015). The socio-economic determinants of infant mortality in Nepal: Analysis

of Nepal Demographic Health Survey, 2011. *BMC Pediatrics, 15*(1), 152. https://doi.org/10.1186/s12887-015-0468-7

Kim, J., Eom, Y. J., Ko, S., Subramanian, S. V., & Kim, R. (2024). Problems accessing health care and under-5 mortality: A pooled analysis of 50 low- and middle-income countries. *Journal of Public Health, 46*(3), 315–325. https://doi.org/10.1093/pubmed/fdae053

Kiross, G. T., Chojenta, C., Barker, D., & Loxton, D. (2020). The effects of health expenditure on infant mortality in sub-Saharan Africa: Evidence from panel data analysis. *Health Economics Review, 10*(1), 5. https://doi.org/10.1186/s13561-020-00262-3

Lamichhane, B. B. (2023). Association between mental health literacy and stigma: A review. *AMC Journal, 4*(1), 53–66. https://doi.org/10.3126/amcj.v4i1.63834

Li, L., Wang, P., Li, Q., Huang, Z., & Wang, Y. (2024). Economic growth and gender dynamics: Analyzing socio-economic influences on infant mortality in China. *Frontiers in Business, Economics and Management, 14*(2), 135–139. https://doi.org/10.54097/z5xpzx80

Lu, Z., Bandara, J. S., & Paramati, S. R. (2020). Impact of sanitation, safe drinking water, and health expenditure on infant mortality rate in developing economies. *Australian Economic Papers, 59*(1), 13–33. https://doi.org/10.1111/1467-8454.12167

Martens, P., Akin, S. M., Maud, H., & Mohsin, R. (2010). Is globalization healthy: A statistical indicator analysis of the impacts of globalization on health. *Globalization and Health, 6*(1), 16. https://doi.org/10.1186/1744-8603-6-16

Nishiyama, A. (2011). Economic Growth and Infant Mortality in Developing Countries. *The European Journal of Development Research, 23*(4), 630–647. https://doi.org/10.1057/ejdr.2011.17

Nkonki, L. L., Chopra, M., Doherty, T. M., Jackson, D., & Robberstad, B. (2011). Explaining household socio-economic related child health inequalities using multiple methods in three diverse settings in South Africa. *International Journal for Equity in Health, 10*(1), 13. https://doi.org/10.1186/1475-9276-10-13

Passarelli-Araujo, H. (2024). Estimating the effect of socio-economic factors on infant mortality rates in Latin America between 2000 and 2019: A panel data analysis. *Public Health, 227,* 232–238. https://doi.org/10.1016/j.puhe.2023.12.018

Rahman, M. M., Khanam, R., & Rahman, M. (2018). Health care expenditure and health outcome nexus: New evidence from the SAARC-ASEAN region. *Globalization and Health, 14*(1), 113. https://doi.org/10.1186/s12992-018-0430-1

Salahuddin, M., Vink, N., Ralph, N., & Gow, J. (2020). Effects of economic growth, foreign direct investment and internet use on child health outcomes: Empirical evidence from South Africa. *Development Studies Research, 7*(1), 1–17. https://doi.org/10.1080/21665095.2020.1717362

Schwartz, A., Franco, J. R., Campbell, J., Null, N., Null, N., & Null, N. (2023). The effects of GDP per capita on infant mortality rates. *John Heinrichs Scholarly & Creative Activities Day*. https://doi.org/10.58809/AUOW3636

Sellström, E., & Bremberg, S. (2006). Review Article: The significance of neighbourhood context to child and adolescent health and well-being: A systematic review of multilevel studies. *Scandinavian Journal of Public Health, 34*(5), 544–554. https://doi.org/10.1080/14034940600551251

Sheidaei, A., Rezaei, N., Sharafkhah, M., Poustchi, H., Mobinizadeh, M., Mohammadshahi, M., Naghavi, M., Olyaeemanesh, A., Malekzadeh, R., Delavari, A., & Sepanlou, S. G. (2024). Exploring the impact of health expenditure and its allocation on neonatal and child mortality at national level across 188 countries from 2000 to 2019: Insights from the Global Burden of Disease Study. https://doi.org/10.1101/2024.02.29.24303584

Tang, C. F. (2019). Determinants of Infant Mortality Rate in Malaysia: Evidence from Dynamic Panel Data Study. *Journal of Health Management, 21*(4), 443–450. https://doi.org/10.1177/0972063419884393

Taylor-Robinson, D., Lai, E. T. C., Wickham, S., Rose, T., Norman, P., Bambra, C., Whitehead, M., & Barr, B. (2019). Assessing the impact of rising child poverty on the unprecedented rise in infant mortality in England, 2000–2017: Time trend analysis. *BMJ Open, 9*(10), e029424. https://doi.org/10.1136/bmjopen-2019-029424

Titaley, C. R., Dibley, M. J., Agho, K., Roberts, C. L., & Hall, J. (2008). Determinants of neonatal mortality in Indonesia. *BMC Public Health, 8*(1), 232. https://doi.org/10.1186/1471-2458-8-232

Wang, F. (2015). More Health Expenditure, Better Economic Performance? Empirical Evidence From OECD Countries. *INQUIRY: The Journal of Health Care Organization, Provision, and Financing, 52,* 0046958015602666. https://doi.org/10.1177/0046958015602666

Ward, J. L., & Viner, R. M. (2017). The impact of income inequality and national wealth on child and adolescent mortality in low and middle-income countries. *BMC Public Health, 17*(1), 429. https://doi.org/10.1186/s12889-017-4310-z

Weisburd, D., Britt, C., Wilson, D. B., & Wooditch, A. (2020). Measuring Association for Scaled Data: Pearson's Correlation Coefficient. In D. Weisburd, C. Britt, D. B. Wilson, & A. *Wooditch, Basic Statistics in Criminology and Criminal Justice* (pp. 479–530). Springer International Publishing. https://doi.org/10.1007/978-3-030-47967-1_14

Yadav, J., Yadav, A. K., Gautam, S., & Singh, K. J. (2017). Trends and determinants of infant mortality in Emp. *IOSR Journal of Humanities and Social Science, 22*(1), 107–121. https://doi.org/10.9790/0837-220103107121