MediaTrend 20 (1) 2025 p. 97-108
Media Trend
Berkala Kajian Ekonomi dan Studi Pembangunan
http://journal.trunojoyo.ac.id/mediatrend

GDP Per Capita Impact on Infant Mortality Rate: Southeast-Asia Lower Middle-Income Countries 2005-2019

Kenang Gusti Bramantyo[1*], Estro Dariatno Sihaloho[2]

[1,2] Department of Economics, Padjadjaran University

Article Information

History of article:
Received November 2023
Approved March 2025
Published March 2025

A B S T R A C T

Infant mortality Rate (IMR) is one of the main indicators of the socioeconomic development and the health status of a country. Despite how significant the impact of reducing the infant mortality rate to a country, countries in Southeast Asia, especially the lower middle-income few, still have a relatively high number of Infant mortality rate. Studies have been conducted on the impact of few variables that determine the number of Infant mortality rate. In this paper, the aim is to analyze a few socioeconomic variables such as GDP per Capita, health care expenditure as a share of GDP, total fertility rate and female participation in the labor force on infant mortality rate of lower middle-income countries in Southeast Asia. This research adds to literature of studies in regards to economic growth and its impact on a country's health status indicators. There are limitations in this study that could be addressed in future research. First, the research is limited by the availability of data time period past 2019 (at the time of writing) due to COVID 19, and also the completeness of available data of other variables or indicators that can add deeper explanation into the issue. This study found that GDP per Capita and health care expenditure as a share of GDP have a significant and negative impact on infant mortality rate during the study period. While as Total fertility rate have a significant and positive impact on infant mortality rate, and there is no significant effect of female labor force participation rate on infant mortality rate in the studied countries during the study period.

Keywords: *Infant Mortality Rate, Lower Middle-income Countries, Southeast Asia, GDP per Capita*
JEL Classification Code: *I15, O180*

Author correspondence:
E-mail: kenang19001@mail.unpad.ac.id

DOI: http://dx.doi.org/10.21107/mediatrend.v20i1.22963

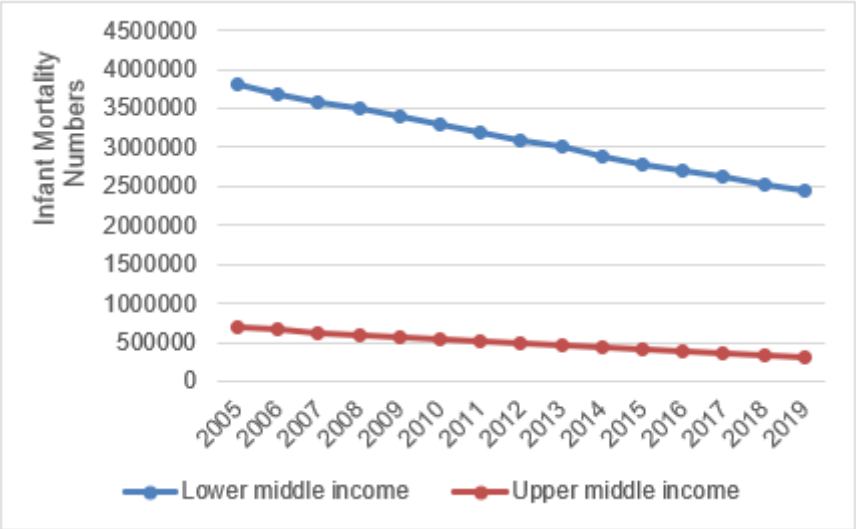
INTRODUCTION

The vast majority of newborn deaths take place in low and middle-income countries (WHO, 2024). In Southeast Asia alone, about 52% of deaths under five years of age are deaths that occur in the neonatal period. The most common cause of this death is complications in the premature period, Asphyxia birth and neonatal infection (WHO, 2022).

In 2020 alone, as many as 2.4 million newborns died because the first month after birth in human life is the most vulnerable period in a child's life (WHO, 2024) Today, nearly half (47%) of all deaths under age 5 occur in the new period of birth (first 28 days of life), an increase from 1990 (40%).

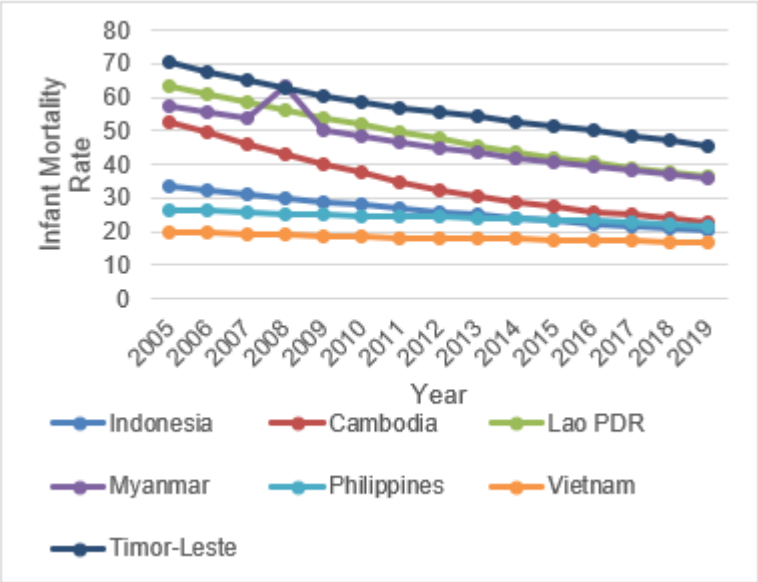
In 2021, child mortality in low-income countries had an infant mortality rate of 67 deaths per 1000 births, 14 times more likely to die before reaching age 5 compared to children born in high-income countries, where the under-5-year mortality rate was 5 deaths per 1,000 live births. (Hug et al., 2023) In 2005, lower-middle-income countries had a total infant mortality rate of 3,811,719, while upper-middle-income countries had only 18% of the total lower-middle-income countries, which was 695,958 infant mortality rates. Based on the chart, in 2019 the infant mortality rate in lower-middle-income countries was 2,441,441 people and upper-middle-income countries were only 309,734 people, only 12.68% of lower-middle-income countries. This shows that although the same has a downward trend both from 2 groups of countries with different incomes, the figure for lower-middle-income countries is still fairly high and still cannot reduce the distance with upper-middle-income countries, and this also applies to lower-middle-income countries in Indonesia, namely the Southeast Asian region.

Based on the targets set in the Sustainable Development Goals (SDGs), countries in the world expressed their commitment to improve welfare and achieve a better standard of living. One of the SDGs targeted to be achieved by 2030 is to reduce infant mortality to 12 deaths per 1000 births and improve the quality of basic health services. Based on the graph presented by figure 2, the lower middle-income countries in Southeast Asia have not



Source: World Bank

Figure 1.
Infant Mortality Rate in lower Middle-income countries and Upper middle-income countries 2005 – 2019



Source: Central Statistics Agency of DKI Jakarta

Figure 2.
Infant Mortality Rate (Per 1000 births) in lower Middle-income countries on Southeast Asia 2005 – 2019

reached this number, the country with the lowest number, namely Vietnam, still has a higher infant mortality rate than the desired target.

Karlsson & Dribe (2022) state that infant mortality's development is varied and affected by proximate determinants, which is the framework that are used by Mosley and Chen, according to this framework, there is a link between socio-economic factors and baby survival. In their research, Mosley & Chen stated that there is a broader framework for determining a baby's survival. The key to this framework is that socio-economic factors influence infant mortality/survival rates through several connecting variables, including maternal factors include age, the range of birth periods between babies. Environmental contamination: Air, water, contamination through skin & nails. Injury: either intentionally or accidentally Nutritional deficiencies: calories, vitamins & minerals. Control of personal diseases: prevention and treatment.

Each of the components above has been proven to influence the survival of the baby both through its impact on the health of the baby and the health of the mother. These variables will link socio-economic factors to the baby's survival. These socio-economic factors are divided into 3 groups, namely individual level variables: individual productivity of each parent, traditions, beliefs and habits. Household level variables: wealth and possessions. Community level variables: environmental quality, health system. These socio-economic factors will later influence the survival of the baby through connecting variables, and the variables that are used in this paper are the real GDP of a country, with the control variable consisting of number of population and percentage of female that are in the labor force.

The role of the economy on health at this time has become very important because it raises awareness for how close the relationship between economic growth and health is. Health for childhood is one

of the important predictors of health and productivity in old age, infant mortality is an important indicator for the development of socioeconomic aspects of the country. Research on factors that determine high infant mortality rates worldwide found several factors that drive infant mortality, including environmental conditions where people live, economic zones and parents' education levels. At the same time, countries are currently prioritizing policy policies for health expenditure considering the fact that countries with higher health expenditure are the ones that associated with lower neonatal and infant mortality rates (Kiross et al., 2020).

Research on the effects of GDP per Capita and many other variables have on Infant mortality rate been conducted. One study in Indonesia done by Vidriza et al. (2020) show that GDP per capita has a negative impact on infant mortality, population figures affect infant mortality rates positively in the short term, but negatively in the long run. Women's education and women's participation rates in the workforce both have negative results in the short term but have positive effects in the long run. Other researches, such as (Byaro, 2021; Salahuddin et al., 2020; Sari & Prasetyani, 2021) have also found that GDP per Capita have a significant and negative impact on Infant mortality rate.

Studies has also been conducted about the effect of various determinants on Infant mortality rate. The main ones being health expenditure, total fertility rate, and the female participation in the labor force. A study was done on South Asian Association for Regional Cooperation (SAARC) nations over the period of 2000–2016 by Dutta et al. (2020) with the aim to examine distal determinants of Infant mortality. In this study GDP per Capita and public health expenditure was used as a function of Infant mortality rate, and it found that GDP per Capita have a significant effect on reducing infant mortality. A study by (Rewilak, 2021) on 86 countries in the span of 1995 – 2014 also found that increasing the average income of a country will have significant effect on reducing infant mortality.

Health expenditure has also been studied on the impact to Infant mortality rate, it has been found that health expenditure can reduce infant mortality rate (Ansarinasab & Bidmal, 2022; Byaro, 2021; Dutta et al., 2020; Lu et al., 2020). A number studies have also found that, in few regions and period of time, health expenditure have an insignificant to no impact in ASEAN countries during 2000 – 2017 (Sari & Prasetyani, 2021). one study examines the impact of health expenditure on under-five and infant mortality rates in 10 selected sub-Saharan African countries in the period 2000–2008. This study found that government health expenditure has a positive effect on under five mortalities. The reason for this relationship being that it is potential to increase the fund for health expenditure but it's not being translated well and impact health outcomes. According to (WHO, 2023), corruption and waste in health expenditure matters attributes to 140.000 child deaths annually.

Total fertility rate have also been found to have a significant positive impact on Infant mortality rate in various studies (Dutta et al., 2020; Sari & Prasetyani, 2021). (Islam et al., 2022) have found that there is a tendency to have short lengths between births, due to replacement effect, and where lower middle-income countries have a health care system that still needs to be developed, more births means greater chance for infants not being able to be get a proper care and medical procedure and increase in mortality, this study found that there is a two way relationship between fertility and infant mortality rate, and by having longer interval between the births of baby can reduce infant mortality rate significantly. This result also aligns with study done from Tüzün (2021) that found the total fertility rate of a country sig-

nificantly effect on infant mortality rate.

Women participation in labor force have been found to also have a significant impact on infant mortality rate. Women's higher participation have been linked to improve infant mortality rate, due to it increasing the socioeconomic development of women (Ortigoza et al., 2023). This study aligns with the result that Female labor participation and infant mortality possess a significant negative relationship (Zheng et al., 2024), But it is also found that in some cases that female labor force participation rate have a positive impact on Infant mortality rate, such as the study done by Sari & Prasetyani (2021).

Studying the relationship between economic growth and child mortality can provide a deeper understanding of whether a country's economic growth that can improve the quality of life of its people can also be effective in improving the quality of children's health. The results of this relationship analysis can help in planning policies to reduce mortality which will have both short- and long-term benefits. This research contributes to existing research in several aspects. This study is the first to examine specific variables that examine the effects of GDP per capita, a country's health expenditure, women's participation in the Labor force, and birth rates on infant mortality in the context of lower-middle-income countries in Southeast Asia. To the writer's knowledge, there have not been research that study infant mortality rate with lower middle-income scope in Southeast Asian Countries, hopefully this study can be used as a reference for countries with similar socioeconomic development stage to improve on reducing the infant mortality rate. The purpose of this study is to analyze whether GDP per Capita affects infant mortality rates in lower-middle-income countries in Southeast Asia for the period 2005 – 2019.

METHODOLOGY

This research uses quantitative methods. The quantitative analysis method used is an econometric model Data Panel which is processed using stata 17.0 in order to produce output in the form of numbers. The output figures will be used to analyze the effect of GDP per Capita, Health Expenditure, Women's Fertility Rate and women's participation rate in the Labor force on infant mortality over the 15-year period from 2005 – 2019 in lower-middle-income countries in Southeast Asia with a classification of 2019 (Indonesia, Cambodia, Myanmar, Philippines, Timor Leste, Laos and Vietnam). This period was used due to the 15 years period contains various global economic events such as recession and contains a period which can describe the pattern of each country on their own, the last year of the data period which is 2019 is chosen due to the availability of data and it was the last year before the COVID 19 strikes. The set of selected countries are used to represent the situations of infant mortality rate especially in lower middle-income and developing countries as it is the place which is most prone to high number of infant mortalities.

These selected variables were selected after literature review and based on availability of data, and this paper used log-log model to determine if these variables affect infant mortality rate in lower-middle-income countries in Southeast Asia. In this model, the coefficient shows how a 1 % percentage change in explanatory variables affect the Infant mortality rate in these countries. Hhat are used in this paper is as follows:

$$\mathrm{INFM}_{it} = \beta_0 + \beta 1\mathrm{GDP}_{it} + \beta_2\mathrm{Hexp}_{it} + \beta_3\mathrm{Flabor}_{it} + \beta_4\mathrm{Ferrit} + \varepsilon_{it}$$

where INFM is infant mortality rate in the period 2005 - 2019, β_0 is constant
βi is Variable coefficient of i, GDPis GDP per capita (current US$), Hexp is health expenditure as a percentage of GDP, Flabor is women's participation rate in the la-

bor force, Ferr is female fertility rate, ε is error term, i is cross section of countries and t is time period.

Panel data regression analysis is a statistical technique used to analyze datasets that observe multiple entities over time, such as individuals, companies, or countries across several periods. This method allows researchers to control for unobserved heterogeneity—factors that vary across entities but remain constant over time—by incorporating both cross-sectional and time series dimensions. The two most commonly used models in panel data regression are the Fixed Effects (FE) model, which controls for entity-specific characteristics by allowing each entity to have its own intercept, and the Random Effects (RE) model, which assumes these entity-specific effects are randomly distributed and uncorrelated with the explanatory variables. The choice between these models is typically guided by the Hausman test, which assesses whether the unique errors are correlated with the regressors. Panel regression is particularly useful in economics and social sciences because it improves the efficiency of econometric estimates and provides more informative data, more variability, and less collinearity among variables (Baltagi, 2008). This approach enhances the ability to detect and measure effects that are not visible in purely cross-sectional or time-series data.

RESULTS AND DISCUSSION

In this study, Chow test and Hausman test are conducted to determine the best model used in the panel regression. The Chow Test which shows Prob>F have the value of 0.000 shows that fixed effect model is used. And the Hausman test result is Prob>Chi2 which have the result of 0.4187 which suggests that random effect model is used over fixed effect model.

The random effect model assumes that each cross-section data has a different intercept, with intercepts that can be random or stochastic variables. The random effect model estimates that the error term variable may have a relationship from period to period. According to the World Bank, the infant mortality rate is the number of infant deaths that have not reached the age of 1 year per 1000 births which is one of the Millennium Development Goals (MDGs), which was chosen to be one of the targets and high goals to continue to be improved because it has significance and close relevance to a country's growth performance. (Rewilak, 2021) Emphasize that infant mortality is one of the main indicators of human growth and one of the challenges that need to be solved to be able to provide good quality health.

Table 1.
Table of Variable used

	Variable	Calculation	Source
1	Infant Mortality Rate	Number of Baby	World Bank
2	GDP per Capita	USD	World Bank
3	Health Expenditure as a share of GDP	Percentage	World Bank
4	Total Fertility Rate	Live	World Bank
5	Female Labor Force participation	Percentage	World Bank

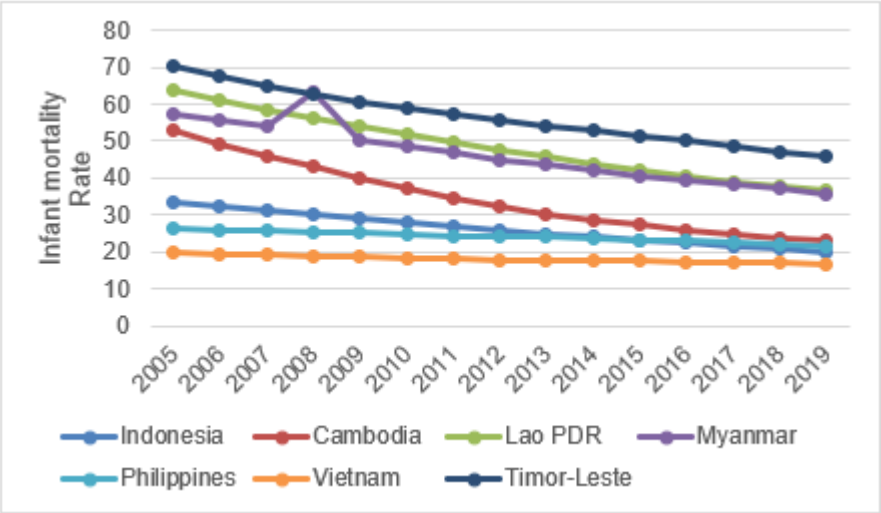
Based on the figure 3, it can be seen that the lower middle-income countries in Southeast Asia all have a downward trend from 2005 – 2019. Timor-Leste had the highest rate at the beginning and end

Table 2.
Chow Test Result

Test Summary	Prob.
Prob>F	0.000

Table 3.
Hausman Test Result

	Coef.
Chi-square test value	3.907
P-value	0.419



Source: World Bank

Figure 3.
Infant Mortality Rate (Per 1000 births) in lower Middle-income countries on Southeast Asia 2005 – 2019

of the observation year, where in 2005 it had an infant mortality rate per 1000 births of 70.5 babies and decreased to 45.7 in 2019. Ranked second highest in lower middle-income Southeast Asian countries is Laos which had an infant mortality rate of 63.7 deaths per 1000 births in 2005 and declined steadily until 2019 where they had a 36.6 infant mortality rate. The country with the third highest infant mortality rate is Myanmar, which in 2005 had an infant mortality rate of 57.3 infant deaths per 1000 births, then decreased until 2007 to 53.9 and increased rapidly to 63.4 in 2008. Cambodia has a sharp decline in the infant mortality rate from 52.9 infant deaths per 1000 births to 23 infant deaths in 2019. This significant decrease came from the program implemented by the Cambodian government and ministry. Among these programs are improving the quality of vaccinations, programs to improve maternal health and breastfeeding knowledge, services for the period before and after childbirth, and the provision of maternal training programs are also implemented. The country with the next infant mortality rate is Indonesia, with an infant mortality rate of 33.6 in 2005 and a steady decline every year to 20.1 in 2019. The Philippines, which was below Indonesia in 2005 with a rate of 26.1 infant mortality rate per 1000 births, also decreased although not as significant as other countries, in 2019 had an infant mortality rate of 21.6, only decreased by 4 infant deaths in a period of 15 years. Then the last country is Vietnam which has an infant mortality rate of 20 per 1000 births, and has a stable rate declining until 2019 where Vietnam has an infant mortality rate of 16.1.

The development of GDP has an important role because with the development of living standards, the quality of

health also develops. As the economy grows, the portion and amount of health spending will also increase, and health programs will expand, and access to health will become easier. The development of GDP has an important role because with the development of living standards, the quality of health also develops. As the economy grows, the portion and amount of health spending will also increase, and health programs will expand, and access to health will become easier.

The infant mortality rate is one of the main indicators in determining the level of socioeconomic development of a country and is generally used to evaluate the level of well-being of a population. and based on the high mortality rates of lower-middle-income countries in Southeast Asia, the aim of this study was to evaluate the impact of GDP per capita, health expenditure, maternal fertility rates and women's participation in the labor force on infant mortality rates in lower-middle-income countries in Southeast Asia from 2005 – 2019. It is hoped that the results of this study can help policy enforcers in the Southeast Asia region understand what factors influence infant mortality rates in lower-middle-income countries in Southeast Asia and take strategic steps to reduce trends in infant mortality rates.

Based on the descriptive statistics, the average for Infant mortality rate in lower middle-income of South east Asian countries in the period of 2005 – 2019 is 36,41 deaths per 1000 live birth, with the lowest being held by Vietnam in 2019 with 16.8 and the highest infant mortality is held by Timor Leste in 2005. The average of GDP per Capita is 1710.184 in current US dollars, with the lowest GDP per capita was held by

Myanmar in 2005 with 221.86 US Dollars and the highest was Indonesia with 4151.22 US Dollars in 2019. Health expenditure as a share of GDP in the observed country during the 2005 – 2019 have an average of 4.39% with the lowest percentage in the observed country being held by Myanmar in 2011 with only 1.927%, and the highest was Timor Leste in 2013. The average female labor participation rate was 43.77% with the lowest number held by Indonesia on 2005 with 35.785% and the highest is Vietnam in 2005 with 49.001%. Fertility rate in lower middle-income countries tend to be higher and this is also the case with South East Asian countries. The average for fertility rate in the period of 2005 – 2019 is 2.865 babies per lifetime. The highest number is 5.705 which is held by Timor Leste on 2005, and the lowest is Vietnam in 2010 with 1.895 total fertility rate. It can be seen from the 2019 data that the average of fertility rate for the observed country is 2,49 which is still higher than average and could lead to more infant mortality rate.

The level of productivity of a country which will later affect the ability of a country to improve its welfare and the productivity of a country's population starting from the stage of infants and children. In reducing this infant mortality rate, income is an important factor that needs to be considered because with higher incomes, a family can improve its standard of living and access to adequate health services. Based on the

Table 4.
Descriptive Statistics of variables

Variable	Obs	Mean	Std. Dev.	Min	Max
infm	105	36.414	14.899	16.8	70.5
gdpcus	105	1710.184	1013.559	221.866	4151.228
hexpgdp	105	4.379	1.722	1.927	8.532
fLabor	105	43.477	4.123	35.785	49.001
fert	105	2.865	.848	1.895	5.705

results of regression that has been carried out it was found that GDP per Capita has a significant negative influence on the infant mortality rate with a coefficient of -0.0035 which indicates that every addition of 10 US Dollars in a country's GDP per Capita, will reduce infant mortality by 0.035 deaths significantly. The results of this analysis are in line with numerous studies conducted around the world Salahuddin et al. (2020) found that there is a significant impact of GDP per Capita in selected African countries. Sari & Prasetyani (2021) found in their study of Indonesia on 2000-2017 that GDP per Capita would significantly reduce infant mortality rates. The health expenditure used in this study is health expenditure as a share of GDP which can provide an indication of the level of resources channeled to health compared to other uses. Owusu et al. (2021) found that as health spending increases, infant mortality and maternal mortality rates decrease. In a study of health expenditure and the results of health indicators for the period 1995–2005 for OECD countries, his findings show the significant impact of health spending on reducing infant mortality rates, and increasing life expectancy (Byaro, 2021; Lu et al., 2020).

The results of regression of women's fertility rates had a positive and significant impact of 1% on infant mortality rates in the study period. The coefficient of total female fertility is 10.45 which indicates that every increase of 1 child birth per woman in a country, will increase the infant mortality rate by 10.45 deaths. Dutta et al. (2020) In their research stated that the fertility rate of women is one of the main factors that have an impact on infant mortality rates. Lower-middle-income countries in Southeast Asia have a downward trend in total female fertility rates, but still have relatively high rates, and with health services still needing to improve, increase the probability of increasing infant mortality rates in low-income countries.

Table 5.
Random Effect Regression Test Results

infm	Coef.	Std. Err.	t-value	p-value	[95% Conf	Interval]
GDPCUS	-0.0035***	0.001	-5.64	0	-0.005	-0.002
hexpgdp	-1.239**	0.497	-2.49	0.013	-2.214	-0.264
fLabor	1.179**	0.469	2.51	0.012	0.259	2.098
fert	10.45***	1.13	9.25	0	8.238	12.669
Constant	-33.304	20.82	-1.60	0.11	-74.11	7.502
Mean dependent var		36.414	SD dependent var			14.899
Overall r-squared		0.614	Number of obs			105
Chi-square		270.402	Prob > chi2			0.000
R-squared within		0.741	R-squared between			0.584

The variable percentage of health expenditure as a share of GDP in regression has a negative and significant impact at a significance level of 5%, with a coefficient of 1.23 indicating that every 1% increase in the percentage of health expenditure from a country's GDP can reduce the infant mortality rate by 1.23 deaths. These results are in line with research conducted by Owusu et al. (2021)which found that increasing the percentage of health spending would reduce infant mortality rates and maternal mortality rates significantly. This study was conducted in 177 countries with a research period of 2000 – 2015. Ac-

cording to Owusu, the increase in health spending has a greater impact in developing countries when compared to high-income countries. This could be because as health spending grows and increases, countries that previously had low awareness, quality of health care and knowledge will increase to be higher so that it will reduce infant mortality rates more than those of high-income countries that previously had adequate health services and knowledge.

The last variable is women's participation in the labor force which have the coefficient of 1.179 which means that every 1% increase in the participation of female in labor force will increase infant mortality rate by 1.179. This result aligns with studies from (Sari & Prasetyani, 2021) that found in ASEAN countries female participation in the Labor force will increase infant mortality. This can be due to the fact that many of the lower middle-income countries have an occupation that are focused on agriculture that takes a lot of physical tolls and can leads to fatigue and an increased chance in infant mortality rate.

CONCLUSIONS

This study aimed to analyze whether GDP per Capita, Total fertility rate, health care expenditure as a share of GDP, and female participation in labor force have an impact on infant mortality in lower middle-income countries on Southeast Asia over a 15-year period (2005 – 2019). In this study, the GDP per Capita and healthcare expenditure as a share of GDP have a significant and negative impact on infant mortality rate. Total fertility rate and female labor force participation rate have a positive and significant impact effect on infant mortality rate. Hopefully, this result and study can be used as reference for policy makers about which aspect of development needs to be prioritized and adjusted to continue reduce Infant Mortality Rate.

According to the results of this study, there are a few recommendation and key takeaways. Economic development which has been signified by GDP per Capita have a significant impact on infant mortality rate, strategies need to be developed to ensure that along with the rise of GDP per Capita, equality should also follow, because the one who suffers the most in this phenomenon are people with low income and low access to healthcare.

Strategic and plans also needs to be developed to ensure that all elements and groups of people from all income classes are provided with accessible and affordable healthcare. Priority also needs to be put on increasing the awareness regarding women's education, maternal, pregnancy and infant care whether through government program or educational curriculum involvement.

REFERENCE

Ansarinasab, M., & Bidmal, N. (2022). Globalization and infant and child mortality in ECO member countries. *Payesh*, 21(4), 333–342. https://doi.org/10.52547/payesh.21.4.333

Byaro, M. (2021). Effects of health expenditure on infant mortality in sub-Saharan Africa: evidence from panel data analysis. *Health Economics Review*, 11(1), 1–9. https://doi.org/10.1186/s13561-021-00310-6

Dutta, U. P., Gupta, H., Sarkar, A. K., & Sengupta, P. P. (2020). Some Determinants of Infant Mortality Rate in SAARC Countries: an Empirical Assessment through Panel Data Analysis. *Child Indicators Research*, 13(6), 2093–2116. https://doi.org/10.1007/s12187-020-09734-8

Hug, L., Liu, Y., Nie, W., Sharrow, D., You, D., Cao, B., Ma Fat, D., Ho, J., Retno Mahanani, W., Strong, K., Wang World Bank Group Emi Suzuki, H., Butler, D., Dorion, C., Gerland, P., Hertog, S.,

Kamiya, Y., Kantorova, V., Kyaw Lay, K., Lattes, P., … Guillot, M. (2023). The Demographic and Health Surveys (DHS) Program, ICF.

Islam, M. Z., Billah, A., Islam, M. M., Rahman, M., & Khan, N. (2022). Negative effects of short birth interval on child mortality in low and middle-income countries: A systematic review and meta-analysis. *Journal of Global Health*, 12. https://doi.org/10.7189/jogh.12.04070

Karlsson, O., & Dribe, M. (2022). Maternal height and child health and schooling in sub-Saharan Africa: Decomposition and heterogeneity. *Social Science and Medicine*, 315(April), 115480. https://doi.org/10.1016/j.socscimed.2022.115480

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). https://doi.org/10.1186/s13561-020-00262-3

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

Ortigoza, A., Braverman, A., Hessel, P., Di Cecco, V., Friche, A. A., Teixeira Caiaffa, W., & Diez Roux, A. V. (2023). Women's empowerment and infant mortality in Latin America: evidence from 286 cities. *Cities and Health*, 7(1), 93–101. https://doi.org/10.1080/23748834.2021.1908794

Owusu, P. A., Sarkodie, S. A., & Pedersen, P. A. (2021). Relationship between mortality and health care expenditure: Sustainable assessment of health care system. *PLoS ONE*, 16(2 February 2021), 1–15. https://doi.org/10.1371/journal.pone.0247413

Rewilak, J. (2021). Should we increase average income, or the poor's income to reduce infant and child mortality? *Journal of Economic Studies*, 48(2), 392–412. https://doi.org/10.1108/JES-03-2020-0107

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

Sari, V. K., & Prasetyani, D. (2021). Socioeconomic determinants of infant mortality rate in Asean: A panel data analysis. *Journal of ASEAN Studies*, 9(1), 73–85. https://doi.org/10.21512/JAS.V9I1.7280

Tüzün, H. (2021). Factors Related to Infant Mortality Rate and Under-Five Mortality Rate in Turkey: An Ecological Study with Provincial Data. *Çocuk Dergisi / Journal of Child*, 21(3), 221–230. https://doi.org/10.26650/jchild.2021.993630

Vidriza, U., Bachtiar, N., & Sofyardi, &. (2020). Analysis of socio-economic factors affecting infant mortality rate in Indonesia. *Jurnal SDGs*, 2020(1), 1–9.

WHO. (2022). Newborn Mortality. https://www.who.int/news-room/fact-sheets/detail/levels-and-trends-in-child-mortality-report-2021#:~:text=There are approximately 6700 newborn,to 2.4 million in 2020.

WHO. (2023). Tackling corruption to move towards universal health coverage and health security. https://cdn.who.int/media/docs/default-source/universal-health-coverage/who-uhl-technical-brief-anti-corruption.pdf?sfvrsn=a9a746f2_3

WHO. (2024). Newborn mortality. https://www.who.int/news-room/fact-sheets/detail/newborn-mortality

Zheng, Y., Gong, Z., Ajayi, E. O., & Aderemi, T. A. (2024). Female labour participation and infant mortality in Nigeria: implication for the sustainable development goal 3. *African Journal of Reproductive Health*, 28(3), 30–37. https://doi.org/10.29063/ajrh2024/v28i3.4