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Research Article

Determinants of Under Five Mortality Rate: An Empirical Evidence from Selected Developing Economies

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Abstract

Under-five mortality is a key indicator of child health and overall national development. This study investigates the major factors influencing under-five mortality rates in developing countries. Using panel data and treating the under-five mortality rate as the dependent variable, the authors applied a random effects model to assess the impact of immunization coverage, access to safe drinking water, urban population size, and economic growth. The findings reveal that higher immunization rates, improved access to safe drinking water, and increased urbanization are associated with reductions in under-five mortality. Additionally, economic growth appears to contribute to further declines in child mortality. Based on these results, the study recommends that governments in developing countries enhance healthcare services and invest in public health infrastructure. Furthermore, policies promoting economic growth and improved living standards are essential for better health outcomes among children.

Keywords: Under-5 mortality, Economic growth, Health outcomes.

Introduction

Under-five mortality is the most important indicator of children's health and in general progress of a nation, because it is a sign of the communal, financial, and ecological circumstances in which children and people of the community survive, including their health care. The under-five mortality rate has improved from 1.2% per year between 1990 and 1995 to 3.9% per year between 2005 and 2012. Despite this considerable fall in worldwide child mortality rate, approximately 6.6 million children are dying each year before their fifth birthday internationally, which means 18,000 under-five children pass away every day (UNICEF, 2013). There are enormous differences in child death amongst low and middle-income nations and the manufacturing globe, with Sub-Saharan Africa and South East Asia having the highest rate of under-five mortality (You et al., 2014; Rahman et al., 2010).

Rapid urbanization and inequitable health inequity are two important occurrences in the current developing world (CSDH, 2008; Leon, 2008). Urban and countryside regions have two dissimilar authenticities in a state in each feature of life (Evans et al., 2001; Galea & Vlahov, 2005). Urban population being in the front position of a civilization with additional contemporary amenities and services get pleasure from improved financial chances, good education, and health care in comparison with persons having rural background (Galea & Vlahov, 2005). Child mortality indices are the main indicator of inhabitants' health and happiness. For that reason, there are a lot of indicators of child mortality which were being utilized for determining stages and

tendency of inhabitants' health, as well as the neonatal and post-neonatal, infant, child, and under-5 mortality rates (Claeson et al., 2000). The under-5 mortality rate has been chosen as a major gauge of child mortality because it presents the best concept of capturing mortality risks during the vulnerable childhood duration (Ahmad et al., 2000). Due to the significance of dropping under-5 mortality rate for communities, it is one of the United Nations' 2015 Millennium Development ambition aims (Ram et al., 2013).

This work has focused on the impact of health facilities, such as immunization and safe drinking water facilities, along with urban population and economic growth, on the under-5 mortality rate in developing economies. The existing work also offers suggestions for future research.

Significance of the Study

Much of the literature points out the determinants of the under-5 mortality rate. These are such as CO_2, population growth, labor force participation rate, financial development, and social infrastructure, etc. However, we have focused on the significant role of immunization, people using safe drinking water supply, urban population, and economic growth on the under-5 mortality rate in developing economies, which is very important for the additional growth of developing economies.

Research Hypothesis

The hypotheses of the work are given as:

H1: There is a negative association between immunization and under-5 mortality rate in developing economies.

H 2: The Higher the people using safe drinking water facilities, the lower the under-5 mortality rate.

H 3: Urban population is negatively related to the under-5 mortality rate.

H 4: There is a negative relationship between economic growth and the under-5 mortality rate.

Literature Review

A lot of studies highlight the importance of population growth, institutions, energy consumption, inflation, number of doctors, infrastructure, etc., in affecting the under-5 mortality rate in developing and developed nations. But this work highlights the role of the most important factors affecting the under-5 mortality rate in developing countries.

Buor and Bream (2004) focused on the impact of population on high maternal mortality rates in 28 sub-Saharan African economies. Results showed that gross national product per capita and health expenditure, and provision of skilled delivery personnel affected maternal mortality. The study recommended more provision of expert delivery personnel for high health outcomes. Houweling et al. (2005) emphasized the issue of under-5 mortality, which is the result of socio-economic, political, and health care factors in underdeveloped nations. The regression results indicated that higher national incomes resulted in lower under-5 mortality rates. Moreover, public expenditure on health caused less under-5 mortality. The study concluded that growth was linked with wide poor–rich inequalities in under-5 mortality. Hanf et al. (2013) found the determinants of under-5 mortality rates with a large set of determinants by using data from 2000 to 2009. The results revealed that mortality was influenced by GDP, access to improved water sources and sanitation facilities, public health expenditure per capita, HIV prevalence, perceived levels of corruption and violence, and the average number of years of schooling among women of reproductive age.

Kanmiki et al. (2014) examined mortality in a poor rural region of northern Ghana using survey data. Their logistic regression analysis showed that mortality was lower among individuals whose mothers had higher levels of education, who lived in households with co-wives, were older in age, and were married. Karyani et al. (2015) highlighted the determinants of the under-5 mortality rate in OECD countries by using data from 2010 to 2013. The result showed that health expenditure, GNI per capita, physician and nurses' density, female literacy, and decreased under-5 mortality. Gebretsadik and Gabreyohannes (2016) used survey data from 2006 and 2011 in Somalia to find out the causes of the under-5 mortality rate. The regression result showed that

preceding birth interval, family size, birth type, breastfeeding status, source of drinking water, and income of mother led to a decreased under-5 mortality rate. The study suggested breastfeeding. Chowdhury et al. (2020) discussed the role of the urban population in affecting the under-5 mortality rate in Bangladesh by using survey data from 1994 to 2014. Regression results showed that the under-five mortality rate was lower in cities. Children of uneducated mothers also died before the age of five. Birth interval also affects child mortality. Finally, under five-year mortality rate of the vaccinated children was lower.

Worku et al. (2021) also focused on the determinants of the under-5 mortality rate in regions of Ethiopia. The data was used in 2016. The regression result pointed out that multiple births, previous birth interval of 2–3 years or above 3 years, being twin, and having a prenatal care appointment through pregnancy determined the under-five mortality rate. Rachmawati et al. (2022) analysed the mortality rate for infants and children under five in Indonesia by using survey data from 2017. It was found that a mother's age at birth, birth weight resulted in a lower mortality rate. Moreover, the sex of the child, frequency of using the internet, residence, and birth interval also affected the under-five mortality in Indonesia. Considering the significance of the under-five mortality rate, Zakir and Phanindra (1999) found that infant mortality rates were significantly influenced by per capita GNP, fertility rates, and the level of female education.

Alemu (2017) used data for 33 African economies and showed that increased access to improved sanitation reduced infant mortality. It was also pointed out that declines in infant mortality rates were the result of improved education and economic growth. Mohamed (2024) also focused on the causes of the mortality rate in Sudan. The findings showed that the under-5 mortality rate was decreased because of access to sanitation, hygiene, and basic education, growth, and health care. Chiopris et al. (2024) explained that 3.3 million children in Sudan were affected by acute malnutrition from 2018 to 2019. The malnutrition of children in Sudan was affected by food insecurity, insufficient access to clean water and sanitation, restricted healthcare facilities, poverty, and conflicts.

Research Methodology

We have derived data from 2005 to 2020 and analysed the factors affecting the under-5 mortality rate in selected developing economies. Moreover, it is also found that how economic growth and immunization with other control variables affect the under-five mortality rate in some selected developing countries like Bangladesh, India, Indonesia, Iran, Jordan, Malaysia, Pakistan, the Philippines, and Sri Lanka. The under-5 mortality rate was taken as the dependent variable. However, we have used data on immunization, people using safe drinking water facilities, urban population, and economic growth. In this analysis, the random effect technique has been used to check the relationship between the dependent and independent variables.

The econometric model is presented in this regard.

$$UNRFM = \beta_0 + \beta_1 IMMUNit + \beta_2 PUSDWit + URBNP\,it + \beta_4 LGDPPCit + uit \quad (1)$$

UNDRFM= Under-5 mortality rate per 1000 live births

IMMUN= Immunization measles (% of children ages 12-23 months)

PUSDW= People using safe drinking water supply

Urbnp= Urban population % of total poplulation

LGDPPC= Log economic growth (GDP per capita)

$_{it}$ = (time trend)

ui_t= (error term)

Results and Empirical Analysis

In this section, a summary of the important factors has been given. It is shown that immunization and economic growth with other factors, affect the under-5 mortality rate in selected developing countries.

Table 1. Descriptive statistics of important factors affecting under-5 mortality rate.

Variables	Observations	Mean	Standard deviation	Minimum	Maximum
UNDRFM	144	32.48611	3.92223	7.4	99.8
IMMUN	144	87.67361	11.98474	56	99
PUSDW	144	91.47117	6.338958	80.31999	145.4573
URBNP	144	45.96064	18.31105	18.196	91.418
GDPPC	144	10025.8	6631.617	6631.617	28176.4

It is found that on average, unde-5 mortality is 32.4861 percent in the nations being studied here. This index ranges from 7.4 to 99.8 percent in these economies. On average, IMMUN across countries is 87.6736 percent. In the same way, differences have been noticed in PUSDW from 80.3199 to 145.4573 along with other factors. On average, URBNP is 45.96064 percent in developing economies.

Table 2 reveals the results of the random effect technique. Here, the value of Chi2 is 9.78 and the probability value is 0.21, which suggests random effect outcomes.

Table 2. Random effect results, dependent factor is under-5 mortality rate.

Variables	Coefficients, Standard Errors and Z-values
IMMUN	-0.7400* 0.07692 (-9.62)
PUSDW	-0.3627 * 0.0946 (-3.83)
URBNP	-0.1403* * 0.0589 (-2.38)
GDPPC	-0.0010 * * 0.0002 (-4.70)
C	0.8608 0.2886 (2.98)
Wald chi2 Probability R2 Within R2 Between R2 Overall	215.01 0.000 0.60 0.71 0.69

Z-values are in parentheses; ** p<0.05, * p<0.1 and ***p< 0.01.

The random effect results are being highlighted in Table 2. Immunization is a significant variable influencing the under-5 mortality rate in developing economies. The mortality can be reduced due to the proper utilization of immunization. And it will have good effects on health outcomes, and the children may survive longer. It is found that a unit increase in immunization results in reduced the under-5 mortality rate by 0.7400 percent in selected developing nations. The result is favoured by Chiopris et al. (2024). People using safe drinking water supply is also a noteworthy factor in affecting the under-5 mortality rate in developing economies. By using these facilities, the health of children will be improved, and they will survive longer. Much utilization of better facilities will improve the health of the children. Findings indicated that a one-unit increase in people using water supply facilities will lead for less the under-five mortality rate by 0.367 percent in the concerned nations. The finding is supported by Chiopris et al. (2024). Urban population results in much growth and development in developing economies. The majority of the urbanized people are engaged in urban employment in industries in urban areas. All this increases investment, production, employment, income, and living standard. The result shows that a one percent increase in urban population decreased the under-5 mortality rate by 0.1403 percent. The result is consistent with Chowdhury et al. (2020). High economic growth and development will contribute much to reducing the under-5 mortality rate in developing economies. People have earnings, employment, and improved living standards. The result showed that a one percent increase in growth will lead to a reduction in the under-5 mortality rate by 0.0010 percent in developing nations. The result is supported by Mohamed (2024).

Conclusions

In this research, we have investigated how factors such as immunization, people using safe drinking water facilities, urban population, along with economic growth influence the under-5 mortality rate in developing nations. We have made use of data from 9 developing countries for the sake of analysis. By taking the under-5 mortality rate as the dependent variable, we have checked the effect of economic growth with another control variable as an independent factor on the under-5 mortality rate. Random effect results reveal that immunization and people use of safe drinking water facilities reduced the under-5 mortality rate. Moreover, urbanization and economic growth also led to a reduced under-5 mortality rate in developing countries. The study concluded that more health facilities will improve health outcomes and will also boost growth. Based on findings, it is suggested that the Government should provide more free-of-cost health facilities to the general public so that health outcomes can be improved. In this way, the under-5 mortality rate must be reduced. There should be provided more earning chances to the people so which is why they may improve their living standard. Finally, the urban population must play a positive role in increasing earnings and improving the living standard of the population for their welfare.

References

Ahmad, O. B., Lopez, A. D., & Inoue, M. (2000). The decline in child mortality: a reappraisal. Bulletin of the World Health Organization, 78, 1175-1191.

Alemu, A. M. (2017). To what extent does access to improved sanitation explain the observed differences in infant mortality in Africa? African Journal of Primary Health Care and Family Medicine 9 (1), 271–273.

Buor, D., & Bream, K. (2004). An analysis of the determinants of maternal mortality in sub-Saharan Africa. Journal of Women's Health, 13(8), 926-938.

Chiopris, G., Chiopris, C., Valenti, M., & Esposito, S. (2024). Determinants of undernutrition among children admitted to a pediatric hospital in Port Sudan, Sudan. Nutrients, 16(6), 787.

Chowdhury, A. H., Hanifi, S. M. A., & Bhuiya, A. (2020). Social determinants of under-five mortality in urban Bangladesh. Journal of Population Research, 37(2), 161-179.

Claeson, M., Bos, E. R., Mawji, T., & Pathmanathan, I. (2000). Reducing child mortality in India in the new millennium. Bulletin of the World Health Organization, 78(10), 1192-1199.

CSDH. (2008). Closing the gap in a generation: Health equity through action on the social determinants of health. Final report of the commission on social determinants of health. Geneva: World Health Organization. https://www.who.int/social_determinants/final_report/csdh_finalreport_2008.pdf.

Evans, T., Whitehead, M., Diderichsen, F., Bhuiya, A., & Wirth, M. (2001). Challenging inequities in health: From ethics to action. New York: Oxford University Press.

Galea, S., & Vlahov, D. (2005). Urban health: Evidence, challenges, and directions. Annual Review of Public Health, 26, 341–365.

Gebretsadik, S., & Gabreyohannes, E. (2016). Determinants of under-five mortality in high mortality regions of Ethiopia: An Analysis of the 2011 Ethiopia demographic and health survey data. International Journal of Population Research, (1), 1602761.

Hanf, M., Nacher, M., Guihenneuc, C., Tubert-Bitter, P., & Chavance, M. (2013). Global determinants of mortality in under 5s: 10 year worldwide longitudinal study. The BMJ, 347, f6427.

Houweling, T. A., Kunst, A. E., Looman, C. W., & Mackenbach, J. P. (2005). Determinants of under-5 mortality among the poor and the rich: a cross-national analysis of 43 developing countries. International journal of epidemiology, 34(6), 1257-1265.

Kanmiki, E. W., Bawah, A. A., Agorinya, I., Achana, F. S., Awoonor-Williams, J. K., Oduro, A. R., & Akazili, J. (2014). Socio-economic and demographic determinants of under-five mortality in rural northern Ghana. BMC international health and human rights, 14, 1-10.

Karyani, A., Kazemi, Z., Shaahmadi, F., Arefi, Z., & Meshkani, Z. (2015). The main determinants of under 5 mortality rate (U5MR) in OECD countries: A cross-sectional study. International Journal of Pediatrics, 3(1.2), 421-427.

Leon, D. A. (2008). Cities, urbanization and health. Oxford: Oxford University Press.

Mohamed, E. S. E. (2024). Contribution of water, sanitation, hygiene and basic education to reduce under-five mortality in Sudan. Journal of Water, Sanitation and Hygiene for Development, 14(8), 616-632.

Rachmawati, P. D., Kurnia, I. D., Asih, M. N., Kurniawati, T. W., Krisnana, I., Arief, Y. S., & Arifin, H. (2022). Determinants of under-five mortality in Indonesia: A nationwide study. Journal of Pediatric Nursing, 65, e43-e48.

Rahman, S., Salameh, K., Bener, A., & El Ansari, W. (2010). Socioeconomic associations of improved maternal, neonatal, and perinatal survival in Qatar. International journal of women's health, 2, 311-318.

Ram, U., Jha, P., Ram, F., Kumar, K., Awasthi, S., Shet, A., & Kumar, R. (2013). Neonatal, 1–59 month, and under-5 mortality in 597 Indian districts, 2001 to 2012: estimates from national demographic and mortality surveys. The Lancet Global Health, 1(4), e219-e226.

UNICEF. (2013). Levels and trends in child mortality. http://www.who.int/maternal_child_adolescent/documents/levels_trends_child_mortality_2013.pdf?ua=1.

Worku, M. G., Teshale, A. B., & Tesema, G. A. (2021). Determinants of under-five mortality in the high mortality regions of Ethiopia: mixed-effect logistic regression analysis. Archives of Public Health, 79, 1-9.

You, D., New, J. R., & Wardlaw, T. (2014). Report on Levels and trends in child mortality, the United Nations Inter-agency Group for Child Mortality Estimation. http://www.scribd.com/doc/128742911/Levels-and-Trends-in-Child-Mortality

Zakir, M., & Wunnava, P. V. (1999). Factors affecting infant mortality rates: evidence from cross–sectional data. Applied Economics Letters, 6(5), 271-273.