

Assessment of the Feasibility of Achieving Substantial Reduction of Under Five Mortality in Bangladesh By 2030

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Abstract - This study uses annual time series data on under five mortality rate for Bangladesh from 1960 to 2020 to predict future trends of U5MR over the period 2021 to 2030. Residuals and model evaluation statistics indicate that the applied model is stable in forecasting under five mortality rate in Bangladesh. The ANN (12, 12, 1) projections revealed that U5MR will continue to decline over the out of sample period. Therefore, authorities in Bangladesh are encouraged to address various challenges encountered by under five children especially in the rural areas and marginalized communities where there are challenges in accessing quality healthcare services as a result of shortages of medical staff, inadequate medical supplies and poor health infrastructure.

Keywords: ANN, Forecasting, U5MR.

I. INTRODUCTION

In this era of sustainable development goals, low and middle income countries should strengthen their data ecosystems through use of modern technologies (UN, 2020; WHO, 2019; UNICEF, 2019; UNICEF, 2018; UN, 2016; UN, 2015). There should be visible coordination of statistical activities at national, regional and international levels. Quality and timeous data is critical for planning, decision making and allocation of resources. Availability of complete and accurate data makes the review and follow up processes very easy. Health data and monitoring & evaluation tools should meet international standards. Tracking progress towards achieving sustainable development goals (SDGs) heavily relies on this data (UN, 2015). Bangladesh has witnessed a downward trend in child mortality over the past decades (NIPORT *et al.* 2016). Over the period 1993-2014 neonatal mortality declined from 52 per 1000 live births to 28 per 1000 live births with neonatal deaths contributing 61% of all under five mortality (WHO, 2019). In line with vision 2030, this study applies the artificial neural network approach to predict future trends of under-five mortality in Bangladesh. The findings are expected to stimulate an appropriate health response to the problem of mortality among under five children.

II. LITERATURE REVIEW

Aghai *et al.* (2020) determined the gender differences in neonatal mortality, stillbirths, and perinatal mortality in south Asia using the Global Network data from the Maternal Newborn Health Registry. It was noted that the risks of stillbirths, and early neonatal mortality were higher among male infants than their female counterparts. However, there was no gender difference in mortality after 7 days of age. In another study, Khan *et al.* (2020) assessed the extent to which maternal histories of newborn danger signs independently or combined with birth weight and/or gestational age (GA) can capture and/or predict post second day (age > 48 hours) neonatal death. Prognostic multivariable models showed that maternally recalled danger signs, coupled to either birth weight or GA, can predict and capture post-second day neonatal death with high discrimination and sensitivity. Elida *et al.* (2019) analyzed the influence of maternal age, parity, and education to infant mortality in West Aceh Regency. The research was quantitative with case control design, a case group was 45 mothers whose babies died when they were under one years old and a control group was 45 mothers whose babies were alive when they were under one year old. The matching was done on the babies based on their age and sex. The Data analyzed by using univariate and bivariate analysis with Mc Nemar test, meanwhile, multivariate analysis with conditional logistic regression test at the significant level of 0.25. The Result of analysis in this research showed that maternal age and parity significantly influence of infant mortality. In the other hand, maternal education did not significantly influence infant mortality. The most significant variable which influences infant mortality was maternal age (OR=4.745). A comparison of Pakistan's under-five mortality, neonatal mortality, and postnatal newborn care rates with those of other countries was performed by Ahmed *et al.* (2017). Neonatal mortality rates and postnatal newborn care rates from the Demographic and Health Surveys (DHSs) of nine low- and middle-income countries (LMIC) from Asia and Africa were analyzed. Pakistan's maternal, newborn, and child health (MNCH) policies and programs, which have been implemented in the country since 1990, were also analyzed. The results highlighted that postnatal newborn care in Pakistan was higher compared with the rest of countries, yet its neonatal mortality remained the worst. Surpami *et al.* (2016) applied cox-proportional hazards regression to analyze the contribution of low birth weight on neonatal mortality in Indonesia. Data from the Indonesia Demographic and Health Survey (IDHS) conducted in 2012 were used in the analysis. A total of 18021 live births in the last five years preceding the survey

were reported from the mothers. Completed information of their children (14837 children) was taken for this analysis. Results of the study revealed that children born in a low birth weight and born from younger mothers had higher risk of neonatal mortality.

III. METHODOLOGY

The Artificial Neural Network (ANN) approach, which is flexible and capable of nonlinear modeling; will be applied in this study. The ANN is a data processing system consisting of a large number of highly interconnected processing elements in architecture inspired by the way biological nervous systems of the brain appear like. Since no explicit guidelines exist for the determination of the ANN structure, the study applies the popular ANN (12, 12, 1) model based on the hyperbolic tangent activation function. This paper applies the Artificial Neural Network (ANN) approach in predicting annual under five mortality rate for Bangladesh.

Data Issues

This study is based on annual under five mortality rate in Bangladesh for the period 1960 – 2020. The out-of-sample forecast covers the period 2021 – 2030. All the data employed in this research paper was gathered from the World Bank online database.

IV. FINDINGS OF THE STUDY

ANN Model Summary

Table 1: ANN model summary

Variable	D
Observations	49 (After Adjusting Endpoints)
Neural Network Architecture:	
Input Layer Neurons	12
Hidden Layer Neurons	12
Output Layer Neurons	1
Activation Function	Hyperbolic Tangent Function
Back Propagation Learning	
Learning Rate	0.005
Momentum	0.05
Criteria:	
Error	0.000275
MSE	0.393809
MAE	0.418588

Residual Analysis for the Applied Model

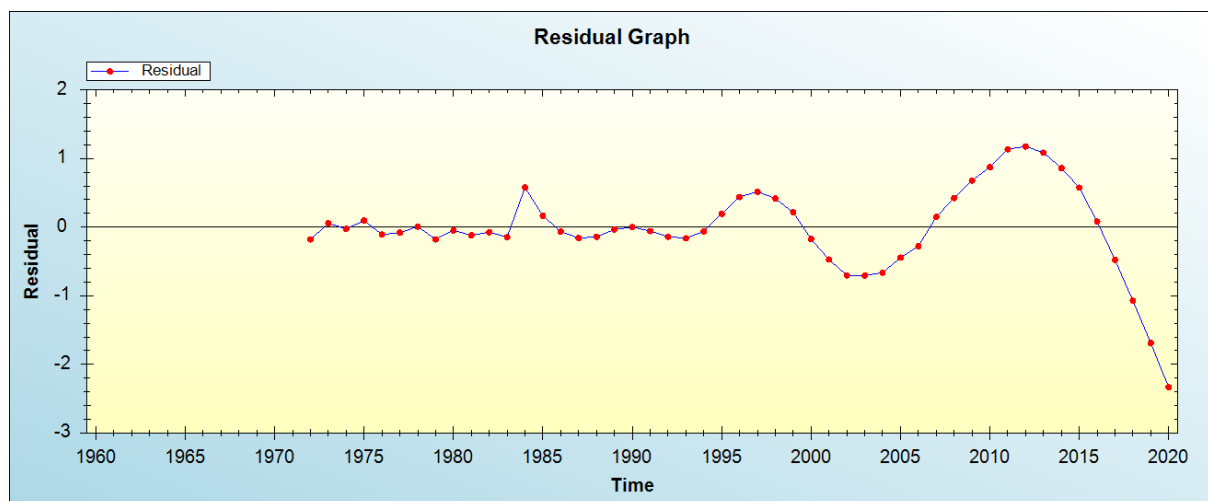


Figure 1: Residual analysis

In-sample Forecast for D

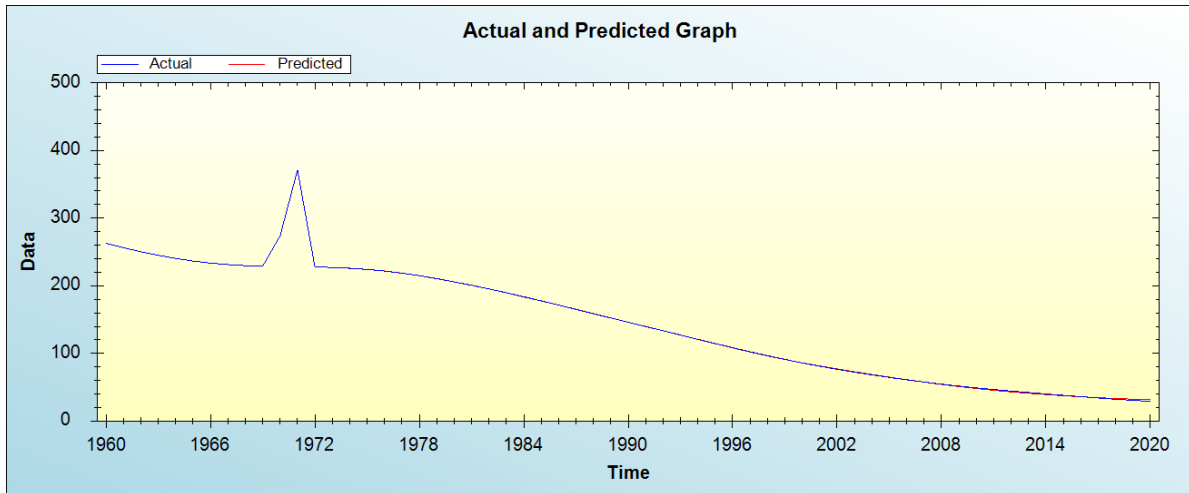


Figure 2: In-sample forecast for the D series

Out-of-Sample Forecast for D: Actual and Forecasted Graph

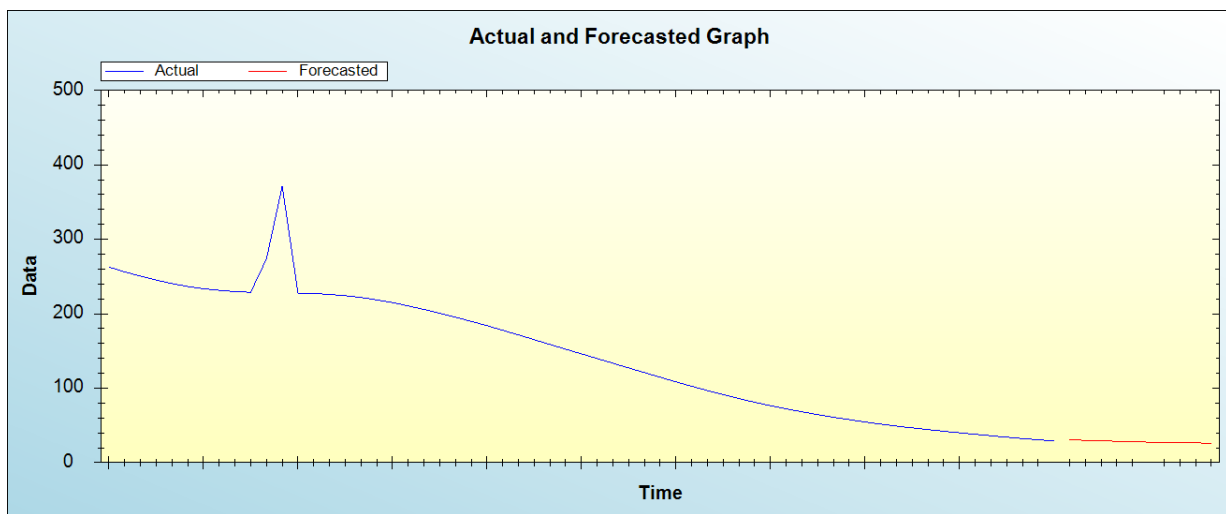


Figure 3: Out-of-sample forecast for D: actual and forecasted graph

Out-of-Sample Forecast for D: Forecasts only

Table 2: Tabulated out-of-sample forecasts

2021	30.5777
2022	29.9904
2023	29.4214
2024	28.7145
2025	28.0065
2026	27.6323
2027	27.2432
2028	27.0021
2029	26.5298
2030	26.3097

The main results of the study are shown in table 1. It is clear that the model is stable as confirmed by evaluation criterion as well as the residual plot of the model shown in figure 1. It is projected that annual U5MR will continue to decline over the out of sample period.

V. POLICY IMPLICATION & CONCLUSION

Asian and Sub-Saharan African countries are lagging behind in SDG progress. They continue to report high absolute numbers of under five deaths as a result of various reasons. However, under five deaths are largely preventable, hence health authorities should channel more resources to maternal and child programs in order to substantially reduce under five mortality to as low as 25 deaths per 1000 live births by 2030. The findings of this study revealed that U5MR will continue to decline over the out of sample period. Therefore, authorities in Bangladesh are encouraged to direct more resources to child health programs specifically targeting disadvantaged under five children in the rural areas and marginalized communities.

REFERENCES

- [1] UNICEF. (2019). Levels and trends in child mortality: report 2019. Estimates developed by the UN Inter-agency Group for child mortality estimation. New York: UNICEF.
- [2] United Nations. (2015). transforming our world: The 2030 agenda for sustainable development, A/RES/70/1. New York: UN General Assembly.
- [3] UN (2020) sustainable development goals. <https://www.un.org/sustainabledevelopment/development-agenda>
- [4] UNICEF (2018). Every Child alive. New York: UNICEF
- [5] World Health Organization (WHO) (2019). SDG 3: Ensure healthy lives and promote wellbeing for all at all ages.
- [6] United Nation. Transforming our world: The 2030 agenda for sustainable development 2016.
- [7] National Institute of Population Research and Training (NIPORT), Mitra and Associates, and ICF International (2016). Bangladesh Demographic and Health Survey 2014. Dhaka, Bangladesh and Calverton, Maryland, USA: Mitra and Associates, and ICF International.

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