International Research Journal of Innovations in Engineering and Technology (IRJIET)

ISSN (online): 2581-3048

Volume 6, Issue 7, pp 533-536, July-2022

https://doi.org/10.47001/IRJIET/2022.607119

Tracking the Future Trends of Under Five Mortality Rate in the UK Using a Machine Learning Algorithm

[1]Dr. Smartson. P. NYONI, [2]Thabani NYONI

[1]ZICHIRe Project, University of Zimbabwe, Harare, Zimbabwe
[2]Independent Researcher & Health Economist, Harare, Zimbabwe

***Abstract* - This study uses annual time series data on under five mortality rate (U5MR) for the United Kingdom (UK) from 1960 to 2020 to predict future trends of U5MR over the period 2021 to 2030. Residuals and forecast evaluation criteria indicate that the applied the ANN (12, 12, 1) model is stable in forecasting U5MR. ANN model projections revealed that annual U5MR will hover around 4.5 deaths per 1000 live births throughout the out of sample period. Therefore, health authorities in the UK must continue providing financial support to the maternal and child health (MNCH) program and addressing the various challenges being faced by socially disadvantaged ethnic minority groups.**

Keywords: ANN, Forecasting, U5MR.

I. INTRODUCTION

The death of under five children remains a global health challenge which requires various stakeholders to come together and share experiences, review progress and reconfigure strategies to effectively address the root causes of mortality among children below five years. Strategies to be implemented should attend to the different social, cultural and economic factors that drive mortality among under five children. The 2030 Agenda for sustainable development seeks to solve numerous complex global challenges that influence global population health including significant reduction of maternal, neonatal and under five children. Progress made on other sustainable development goals has a huge bearing on the achievement of the set targets for SDG3 (UN, 2020; UNICEF; 2018; UN, 2016; UN, 2015). Ending global challenges like poverty, hunger, inequalities, human rights abuses and wars is expected to create a good foundation for achieving universal health coverage and access to affordable high quality health care for all leaving no one behind (WHO, 2019; UNICEF, 2019). The purpose of this study is to forecast future trends of under-five mortality rate for the United Kingdom using the artificial neural network technique. The findings of this paper are envisioned to inform policy, planning and resource allocation to maternal and child health program in order to keep mortality among under five children under control.

II. LITERATURE REVIEW

Nath*et al.* (2020) examined the effect of extreme prematurity and early neonatal deaths on infant mortality rates in England. Authors used aggregate data on all live births, stillbirths and linked infant deaths in England in 2006–2016 from the Office for National Statistic. Infant mortality decreased from 4.78 deaths/1000 live births in 2006 to 3.54/1000 in 2014 (annual decrease of 0.15/1000) and increased to 3.67/1000 in 2016 (annual increase of 0.07/1000). This rise was driven by increases in deaths at 0–6 days of life. Wallace *et al*. (2020) investigated infant mortality among native-born children of immigrants in France for the period 2008–17. A nationally representative socio-demographic panel consisting of 296 400 births and 980 infant deaths for the period 2008–17 was used. Children of immigrants were defined as being born to at least one parent born abroad and their infant mortality was compared with that of children born to two parents born in France. Data was analyzed using multilevel logit models and the study results showed that there was a substantial amount of excess infant mortality among those children born to at least one parent from Eastern Europe, Northern Africa, Western Africa, Other Sub-Saharan Africa and the Americas, with variation among specific origin countries belonging to these groups. Zeitlin*et al. (*2020) investigated the patterns of stillbirth and neonatal mortality rates in Europe between 2004 and 2010. Data about live births, stillbirths and neonatal deaths by gestational age (GA) were collected using a common protocol by the Euro-Peristat project in 2004 and 2010. The study indicated that stillbirths and neonatal deaths declined at all gestational ages in countries with both high and low levels of mortality in 2004. A descriptive study was conducted by McNamara *et al.* (2018) to investigate intrapartum fetal deaths and unexpected neonatal deaths in Ireland from 2011 to 2014. Anonymised data pertaining to all intrapartum fetal deaths and unexpected neonatal deaths for the study time period was obtained from the national perinatal epidemiology centre. The findings of the study indicated that the corrected intrapartum fetal death rate was 0.16 per 1000 births and the overall unexpected neonatal death rate was 0.17 per 1000 live births.

International Research Journal of Innovations in Engineering and Technology (IRJIET)

ISSN (online): 2581-3048

Volume 6, Issue 7, pp 533-536, July-2022

https://doi.org/10.47001/IRJIET/2022.607119

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 the UK.

Data Issues

This study is based on annual total under five mortality rate in the UK 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	Y
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	0.015669
MSE	0.098704
MAE	0.263448

Residual Analysis for the Applied Model

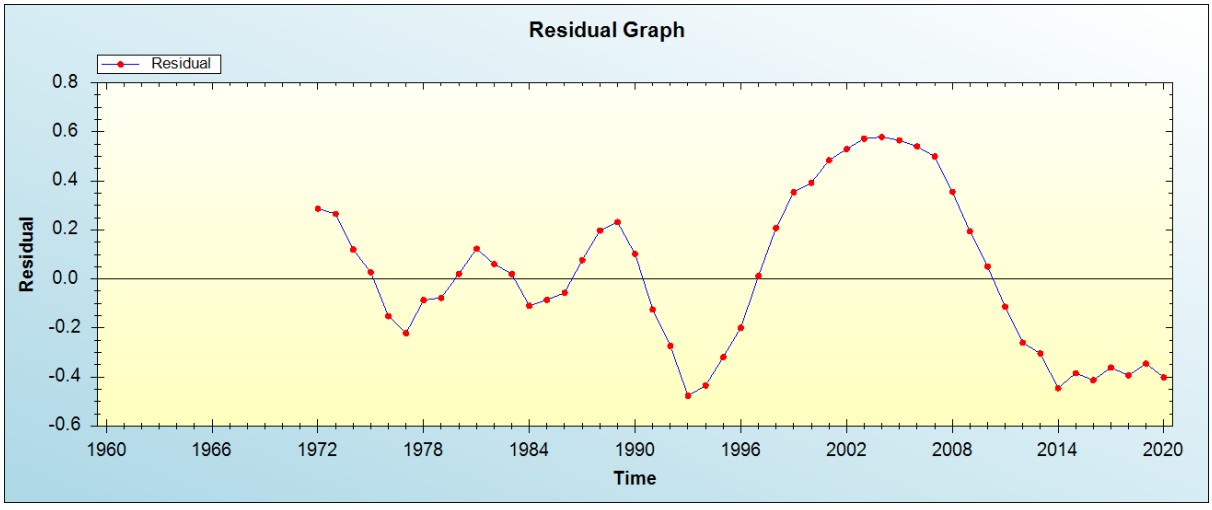

Figure 1: Residual analysis

International Research Journal of Innovations in Engineering and Technology (IRJIET)
ISSN (online): 2581-3048
Volume 6, Issue 7, pp 533-536, July-2022
https://doi.org/10.47001/IRJIET/2022.607119

In-sample Forecast for Y

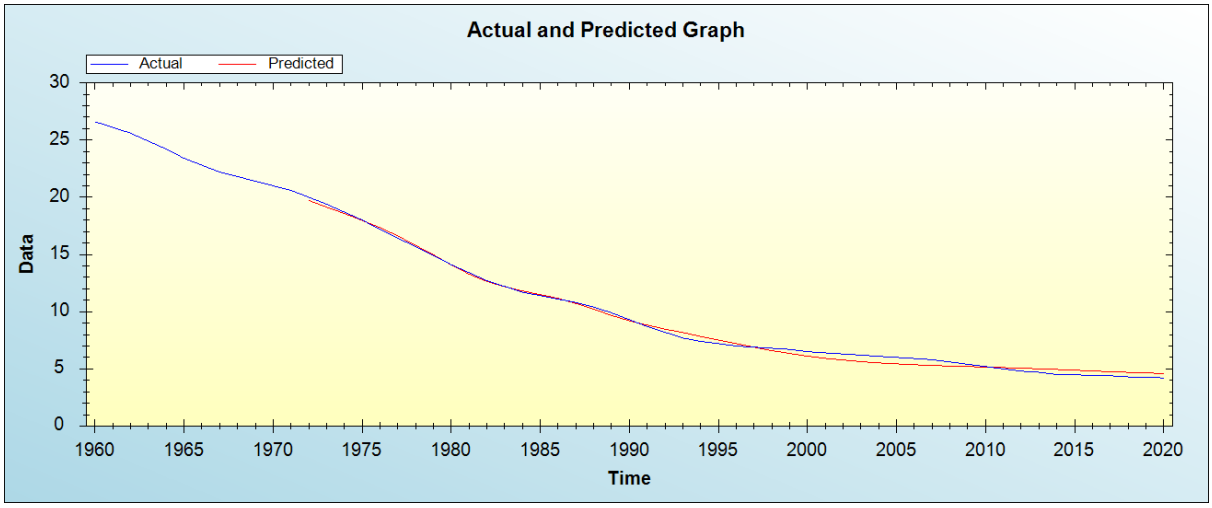

Figure 2: In-sample forecast for the Y series

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

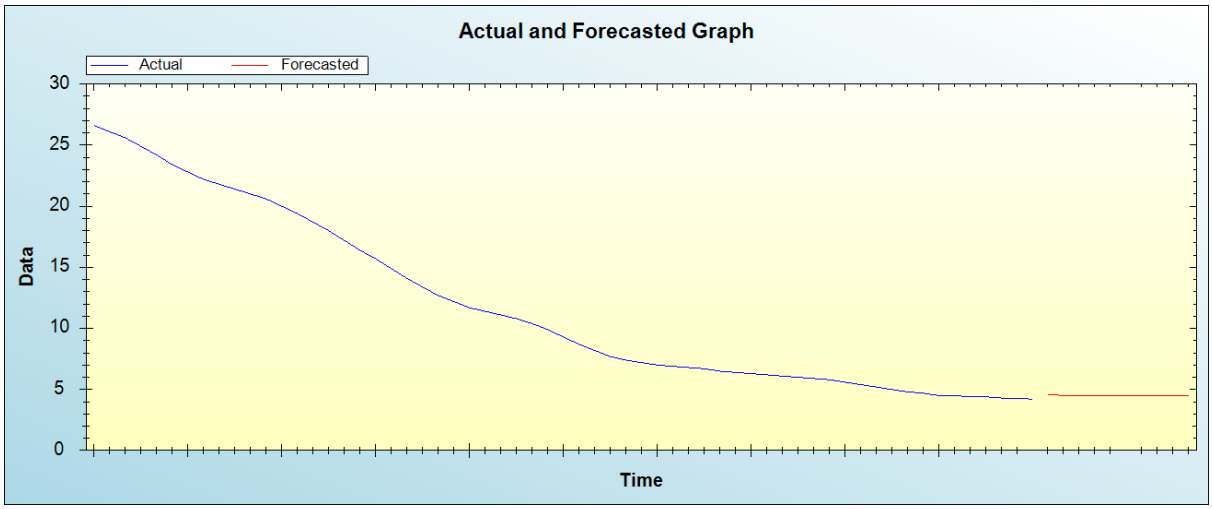

Figure 3: Out-of-sample forecast for Y: actual and forecasted graph

Out-of-Sample Forecast for Y: Forecasts only

Table 2: Tabulated out-of-sample forecasts

2021	4.5640
2022	4.5168
2023	4.4999
2024	4.4627
2025	4.4806
2026	4.4784
2027	4.4765
2028	4.4794
2029	4.4884
2030	4.4671

International Research Journal of Innovations in Engineering and Technology (IRJIET)

ISSN (online): 2581-3048

Volume 6, Issue 7, pp 533-536, July-2022

https://doi.org/10.47001/IRJIET/2022.607119

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 hover around 4.5 deaths per 1000 live births throughout the out of sample period.

V. POLICY IMPLICATION & CONCLUSION

The UK government has done very well in controlling under five mortality. Forecasting under five mortality rate will guide child health policies, decision making and allocation of resources. This study applied the ANN model to project the future path of under-five mortality rate. The results of the study indicate that annual U5MR will hover around 4.5 deaths per 1000 live births throughout the out of sample period. Therefore, the UK government must continue providing financial support to the maternal and child health program and address various challenges being faced by socially disadvantaged ethnic minority groups.

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/sustainabl development/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.

Citation of this Article:

Dr. Smartson. P. NYONI, Thabani NYONI, "Tracking the Future Trends of Under Five Mortality Rate in the UK Using a Machine Learning Algorithm" Published in *International Research Journal of Innovations in Engineering and Technology - IRJIET*, Volume 6, Issue 7, pp 533-536, July 2022. Article DOI https://doi.org/10.47001/IRJIET/2022.607119

****

