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Tracking Future Trends of Adolescent Fertility for Cabo Verde Using the Artificial Neural Network Approach

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***Abstract* - This research paper employs annual time series data on adolescent fertility rate for Cabo Verde from 1960 to 2020 to predict future trends of adolescent fertility rate over the period 2021 to 2030. The forecast evaluation criteria of the applied model indicate that the ANN (12, 12, 1) model is stable. The neural network model projections revealed that adolescent fertility will decline throughout the out of sample period. Therefore, the government of Cabo Verde should implement strategies such as scaling up awareness campaigns among communities, promote girl child education, protect women's rights and fund empowerment programs for youths.**

Keywords: ANN, Forecasting, adolescent fertility rate.

I. INTRODUCTION

Adolescent pregnancy is an important public health challenge of our time (Papri *et al.* 2016; Lawlor *et al.* 2004; Johnson*et al.* 2001). Low and middle income countries are reporting higher teenage pregnancy rates when compared with the developed world (Sedgh *et al.* 2015). Previous studies revealed teenage pregnancy can be associated with adverse sexual and reproductive outcomes (Sserwanja *et al.* 2021; Sserwanja & Kawuki, 2020; Berthelon & Kruger, 2017; Ayanaw *et al.* 2017;Fall *et al.* 2015). Anemia in pregnancy, obstetric hemorrhage, pregnancy induced hypertensive disorders, preterm delivery, low birth weight and sepsis are among the problems that are encountered by pregnant mothers (Envuladu, 2014; Uwaezuoke *et al.* 2004). Multiple factors have been found to increase the risk of falling pregnant among teenagers such as poverty, poor parental care, peer pressure, alcohol and substance abuse, inadequate SRH knowledge and non-use of modern methods of contraception (Ayanaw *et al.* 2017). According to the World Bank adolescent fertility in Cabo Verde dropped gradually from 117 births per 1000 women aged 15-19 years in 1960 to 71 births per 1000 women aged 15-19 in 2020. This shows that teenage pregnancy is still a huge problem in this country.

The objective of this paper is to forecast adolescent fertility in Cabo Verde using a machine learning algorithm. The results of this paper are envisioned to highlight the future burden of adolescent fertility in the out of sample period. This will facilitate policy making, planning and allocation of resources to teenage pregnancy prevention programs in the country.

II. METHODOLOGY

The Artificial Neural Network (ANN) approach, which is flexible and capable of nonlinear modelling; 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 adolescent fertility rate for Cabo Verde.

Data Issues

This study is based on annual adolescent fertility rate in Cabo Verde 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.

III. FINDINGS OF THE STUDY

ANN Model Summary

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Table 1: ANN model summary

Variable	H
Observations	49
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	0.007951
MSE	0.207301
MAE	0.328828

Residual Analysis for the Applied Model

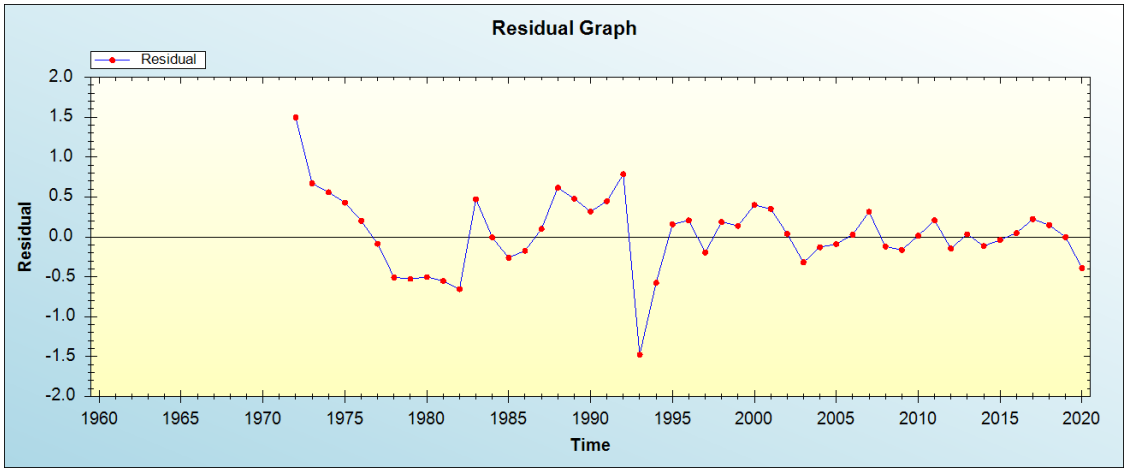

Figure 1: Residual analysis

In-sample Forecast for H

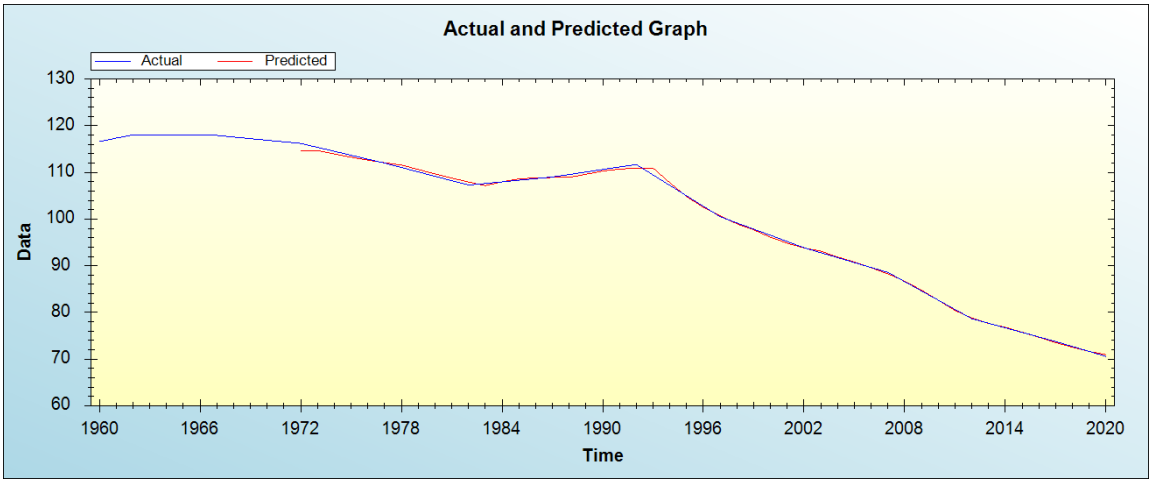

Figure 2: In-sample forecast for the H series

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

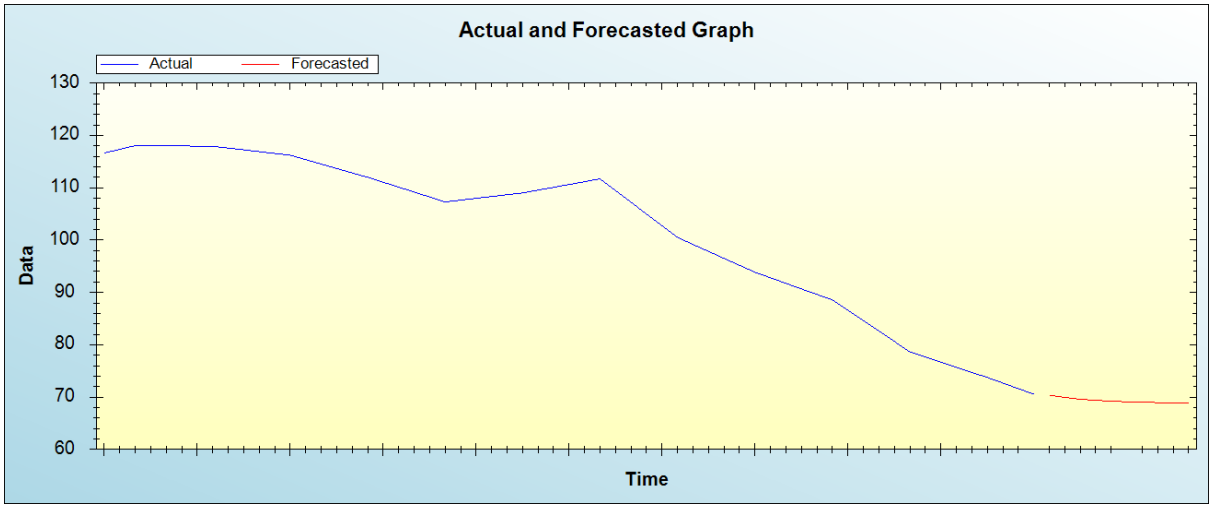

Figure 3: Out-of-sample forecast for H: actual and forecasted graph

Out-of-Sample Forecast for H: Forecasts only

Table 2: Tabulated out-of-sample forecasts

Year	Forecasted adolescent fertility rate
2021	70.3891
2022	69.9679
2023	69.6084
2024	69.4093
2025	69.2359
2026	69.1113
2027	69.0311
2028	68.9718
2029	68.9107
2030	68.8596

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 adolescent fertility will decline throughout the out of sample period.

IV. POLICY IMPLICATION & CONCLUSION

Adolescent pregnancy is an important public health challenge of our time. Anemia in pregnancy, obstetric hemorrhage, hypertensive disorders, preterm delivery, low birth weight and sepsis are among the problems that are experienced by pregnant teenagers. Multiple factors have been found to increase the risk of falling pregnant among teenagers such as poverty, poor parental care, peer pressure, alcohol and substance abuse, inadequate SRH knowledge and non-use of modern methods of contraception. Adolescent fertility in Cabo Verde declined gradually from 117 births per 1000 women aged 15-19 years in 1960 to 71 births per 1000 women aged 15-19 in 2020. This indicates that teenage pregnancy and births are still a huge problem in this country. This study applied a machine learning technique to forecast future trends of adolescent fertility for Cabo Verde. We established that adolescent fertility will continue to decline throughout the out of sample period. Therefore, we encourage the government to implement strategies such as scaling up awareness campaigns among communities, promote girl child education, protect women's rights and fund empowerment programs for youths.

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REFERENCES

[1] Sedgh G., Finer L.B, Bankole A (2015). Adolescent pregnancy, birth, and abortion rates across countries: levels and recent trends. J Adolesc Health. 56:223–30
[2] Berthelon M., and Kruger D.I (2017). Does adolescent motherhood affect education and labor market outcomes of mothers? A study on young adult women in Chile during 1990- 2013. Int J Public Health. 62:293–303.
[3] Fall C.H.D., Sachdev H.S, Osmond C (2015). Association between maternal age at childbirth and child and adult outcomes in the offspring: a prospective study in five low- income and middle- income countries. Lancet Glob Health. 3:e366–77.
[4] Lawlor D.A., and Shaw M (2004). Teenage pregnancy rates: high compared with where and when? J R Soc Med. 97:121–3.
[5] Johnson M., Myors K., and Langdon R(2001). Coping styles of pregnant adolescents. Public Health Nurs. 18:24–32.
[6] Papri F.S., Khanam Z., Ara S (2016). Adolescent pregnancy: risk factors, outcome and prevention. Chatt Maa Shi Hosp Med Coll J. 15:53–6.
[7] Ayanaw HabituY., YalewA., and Azale BisetegnT (2017). Prevalence and factors associated with teenage pregnancy, northeast Ethiopia, 2017: a cross- sectional study. J Pregnancy. 2018:1714527–7.
[8] Sserwanja Q., and Kawuki J (2020). Prevalence of underweight and associated factors among lactating women in Ethiopia: a mini- review. Journal of Advances in Medicine and Medical Research. 2020; 32:1–9.
[9] Sserwanja Q., Musaba M.W., and Mukunya D (2021). Prevalence and factors associated with modern contraceptives utilization among female adolescents in Uganda. BMC Womens Health 2021; 21:61.
[10] Envuladu E.A, Agbo HA, Ohize VA (2014). Determinants and outcome of teenage pregnancy in a rural community in Jos, Plateau State, Nigeria. Sub-Saharan Afr J Med. 1(1):48–52.
[11] Uwaezuoke A.I., Uzochukwu B.S, Nwagbo DF (2004). Determinants of teenage pregnancy in rural communities of Abia State, South East Nigeria. Int J Med Health Dev. 9(1):28–33.
[12] World Bank (2020). Adolescent fertility rate women aged 15-19 years.

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