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Projection of Total Fertility Rate (TFR) in Djibouti

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Abstract - In this piece of work, the ANN approach was applied to analyze TFR in Djibouti. The employed annual data covers the period 1960-2018 and the out-of-sample period ranges over the period 2019-2030. The residuals and forecast evaluation criteria (Error, MSE and MAE) of the applied model indicate that the model is stable in forecasting TFR in Djibouti. The results of the paper indicated that annual total fertility rates in Djibouti are likely to slightly drop over the out-of-sample period. Therefore, authorities in Djibouti are encouraged to focus on improving access to sexual and reproductive health (SRH) services among adolescents and young adults.

Keywords: ANN, Forecasting, Total fertility rate (TFR).

I. INTRODUCTION

Conflict affected regions in Africa and other parts of the world are defined by human rights violations particularly the rights of women and children. War and conflict are some of the negative impacts of uncontrolled population growth. Rapid population growth characterizes some of the developing countries due to high birth rates, high infant mortality and low contraceptive prevalence rate. Massive displacement and gender based violence against women and children is rampant in developing countries especially in conflict zones. The programme action of the international conference on population and development recognized the specific sexual and reproductive health needs and rights of vulnerable groups in the society (UN, 1994). Adolescent girls and women have the right to access information on family planning services. Adequate resources must be availed to buy medical supplies and family planning commodities (FP2020, 2013). In 2020, Djibouti recorded contraceptive prevalence rate of 19.7% among all women and the unmet need for family planning was 27.9% for married women (Djibouti FP 2020, 2020). Djibouti reported a decline in fertility over the years from 6.8 births per woman in 1975 to 2.8 births per woman in 2020. Infant and under five mortality rates are also on downward trajectory. In 2020 the recorded an infant mortality rate of 29.0 infant deaths per 1000 live births and under five mortality rate of 43.8 deaths per 1000 live births (Worldometer, 2020). This reflects the government's commitment to improve maternal and child health outcomes in the country. There are limited studies in the region that have focused on examining fertility trends. In this article we shall mention relevant papers. Barrow (2020) employed a community-based descriptive cross-sectional study to determine the women's proportion of contraceptive uptake and knowledge of FP methods for 643 women of reproductive age (15-49 years) from the selected clusters in rural Gambia through a multistage sampling technique. A pretested structured interview questionnaire was used to collect data. The study revealed a moderately low contraceptive uptake. Mac-Seing et al (2019) examined the relationships between equity-focused legislation and policy and the utilization of SRH services by vulnerable populations in sub-Saharan Africa. We searched nine bibliographic databases for relevant articles published between 1994 and 2019. Thirty-two studies, conducted in 14 sub-Saharan African countries, met the inclusion criteria. They focused on maternal health service utilization, either through specific fee reduction/removal policies, or through healthcare reforms and insurance schemes to increase SRH service utilization. Findings across most of the studies showed that health-related legislation and policy promoted an increase in service utilization, over time, especially for antenatal care, skilled birth attendance and facility-based delivery. Muanda et al (2018) examined adolescents' and young people's insights on their cultural norms, practices and attitudes towards SRH services. Fourteen focus group discussions were conducted with a total of 224 adolescents and young people aged 15-24 years in urban and rural areas of the DRC. The topics discussed and age groups of participants differed somewhat in the urban and rural areas. Data were analyzed to identify themes in the participants' discussion of their attitudes towards SRH. The study revealed that there is critical need for information and services for young people in both urban and rural areas. Curry et al (2015) described lessons learned during the first 2.5 years of implementing the ongoing Supporting Access to Family Planning and Post-Abortion Care in Emergencies (SAFPAC) initiative, led by CARE, which supports government health systems to deliver family planning services in 5 crisis-affected settings (Chad, Democratic Republic of the Congo, Djibouti, Mali, and Pakistan). The authors concluded that despite the constraints in crisisaffected countries, such as travel difficulties due to security issues, they have been able to extend access to a range of contraceptive methods, including long-acting reversible contraceptives.

The aim of this study is to project TFR in Djibouti using a machine learning approach. The findings of this study are expected to highlight the likely fertility trends in the out of sample period. This will assist in planning and responding to the future health, education and employment needs of the people in Djibouti.



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II. 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 total fertility rates in Djibouti.

Data Issues

This study is based on annual total fertility rate (births per woman) in Djibouti for the period 1960 - 2018. The out-of-sample forecast covers the period 2019 - 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

Table 1: ANN model summary

	-
Variable	D
Observations	47 (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	0.084991
MSE	0.035671
MAE	0.153225

Residual Analysis for the Applied Model



Figure 1: Residual analysis



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In-sample Forecast for D



Figure 2: In-sample forecast for the D series





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

Out-of-Sample Forecast for D: Forecasts only

Year	Forecasts
2019	3.0227
2020	2.9502
2021	2.9735
2022	2.9616
2023	2.9968
2024	2.9141
2025	2.9671
2026	2.9220
2027	2.9506
2028	2.8416
2029	2.8720
2030	2.8095

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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 total fertility rates in Djibouti are likely to slightly drop over the out-of-sample period.

IV. CONCLUSION & RECOMMENDATIONS

Adolescent fertility rates have remained high in Africa due to various reasons such as child marriages, sexual abuse of women and lack of female education in some religious sects. In this paper we employed an artificial intelligence technique to project total fertility rates in Djibouti. The ANN model projections suggested that annual total fertility rates in Djibouti are likely to slightly drop over the out-of-sample period. Therefore, the government should focus on improving access to sexual and reproductive health (SRH) services among adolescents and young adults.

REFERENCES

- [1] Worldometer (2020). Djibouti demographics. https://www.worldometers.info
- [2] United Nations (1995). Report of the International Conference on Population and Development: Cairo, 5–13 September 1994 New York. Available from: http://www.unfpa.org/ sites/default/files/event-pdf/icpd_eng_2.pdf
- [3] Family Planning 2020 (FP2020) (2013). FP2020 partnership in action 2012–2013. Available from: http://advancefamilyplanning.org/sites/default/files/ resources/FP2020_PartnershipInAction_2012-2013_lores.pdf
- [4] International Planned Parenthood Federation (IPPF) (2013). New IPPF/UNFPA initiative on family planning announced. Available from: http://www.ippf.org/news/NewIPPFUNFPA-Initiative-Family-Planning-announced.

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