Time series analysis of consumption and short term forecasting of female contraceptives in the Kenyan public health sector

Perpetua Karanja, Levi Mbugua, James Riungu, Mercy Mulaku, Faith Okalebo

Abstract

Background: Contraceptive security is crucial in ensuring access to family planning services and improving the contraceptive prevalence rate. This requires proper forecasting and procurement of contraceptives. It is therefore important to study consumption patterns and apply forecasting techniques so as to adjust for any changes in the choice of contraceptives over a given time period.

Objectives: The objectives of this study were to analyze trends, identify any seasonal or cyclic patterns in consumption of contraceptives, compare service point and consumption data, forecast consumption for six months and determine optimal models for forecasting contraceptives.

Methods: Data on consumption of implants, injectables, pills, and Intrauterine Contraceptive Devices (IUCDs) were extracted from the Kenya District Health Information System for the years 2014-2018. An exploratory analysis was done and the data decomposed to evaluate the trends and seasonal components. Service point and consumption data of contraceptives were compared. Short-term forecasting using the Autoregressive Integrated Moving Average (ARIMA) and the Exponential Smoothing (ES) models was done. The optimal model for forecasting was determined and the models validated using actual facility consumption data for 2018.

Results: The consumption of pills, injectables, and IUCDs declined while that of implants increased significantly across the 4 years. There were differences in the data reported for consumption and service point data for injectables, implants, and IUCDs. The ES models recorded the least error when forecasting consumption of all contraceptives except for one-rod implants in which the ARIMA model had the least errors.

Conclusion: There was a general shift towards the use of long-acting reversible methods especially implants in Kenya. The difference in the reporting of consumption and service point data for injectables, implant, and IUCDs showed gaps in the documentation and reporting of contraceptives. The ETS models were generally superior to the ARIMA models for predicting consumption of contraceptives.

Keywords: Contraceptives, consumption, forecasting, time series, trends

References

Douglas-Durham E, Blanchard K and Higgins S (2015). Contraceptive Stockouts: A review of the published and grey literature. Belgium, Reproductive Health Supplies Coalition. doi: 10.1007/s13398-014-0173-7.2.

Hyndman RJ and Athanasopoulos G. (2018) Forecasting: principles and practice, 2nd ed. OTexts, Melbourne, Austraria.

Kenya National Bureau of Statistics. Kenya 2014 demographic and health survey. https://dhsprogram.com/pubs/pdf/fr308/fr308.pdf (Accessed: 17 May 2017).

Kenya Urban Reproductive Health Initiative, Measurement Learning & Evaluation of the Urban Reproductive Health Initiative, Kenya National Bureau of Statistics. The Kenya Urban Reproductive Health Initiative (Tupange) endline findings for Kisumu. www.urbanreproductivehealth.orgwww.tupange.or.ke (Accessed 24 March 2018)

Kenya Urban Reproductive Health Initiative, Measurement Learning & Evaluation of the Urban Reproductive Health Initiative, Kenya National Bureau of Statistics. The Kenya Urban Reproductive Health Initiative (Tupange) endline findings for Machakos. www.urbanreproductivehealth.orgwww.tupange.or.ke (Accessed 24 March 2018)

Kenya Urban Reproductive Health Initiative, Measurement Learning & Evaluation of the Urban Reproductive Health Initiative, Kenya National Bureau of Statistics. The Kenya Urban Reproductive Health Initiative (Tupange) Endline Findings for Mombasa. www.urbanreproductivehealth.orgwww.tupange.or.ke (Accessed 24 March 2018)

Mbuthia WF (2014). Intrauterine device uptake among women seeking family planning services at mbagathi and Mama Lucy Kibaki Hospitals in Nairobi County [Masters Thesis]. Kenyatta University, Nairobi, Kenya.

Merck Sharp and Dohme. Access to Reproductive Health – MSD Responsibility. https://www.msdresponsibility.com/access-to-health/womens-health/access-to-reproductive-health/ (Accessed: 6 July 2018).

Ministry of Health Kenya. PMA2016/KENYA-R5 Indicators for access, equity, quality and choice sample design. www.gatesinstitute.org/sites/default/files/KER5-2PG-FP-Indicator-Brief-v13-2017-07.14.sed_.pdf (Accessed: 3 July 2018).

Ministry of Health Kenya. www.familyplanning.nascop.org/home/national-method-mix (Accessed: 3 July 2018).

Sedgh G and Hussain R. (2014). Reasons for contraceptive nonuse among women having unmet need for contraception in developing countries. Stud. Fam. Plan. 45:151-69.

Sergison JE, Stalter RM, Callahan RL, Rademacher KH and Steiner MJ (2017). Cost of contraceptive implant removal services must be considered when responding to the growing demand for removals. Glob. Health Sci. Pract. 5: 330–332.

Shitsinzi RS (2015). Influence of industrial action on provision of medical services by nurses in public hospitals: a case of Rift Valley Provincial General Hospital, Nakuru County, Kenya. [Masters Project]. University of Nairobi, Nairobi, Kenya.

United Nation Foundation .Family Planning 2020. www.familyplanning2020.org/entities/77/commitments (Accessed: 3 July 2018).

World Health Organization. Family planning contraception, facts sheet. www.who.int/mediacentre/factsheets/fs351/en/ (Accessed: 2 June 2017).