

USING TECHNOLOGY TO IMPROVE FORECASTING OF MATERNAL HEALTH AND FAMILY PLANNING COMMODITIES



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Introduction:

Historically, within public health programs within the Ministry of Health in Kenya, forecasting has relied on manual or semi-manual methods, which are time-consuming, subjective, and prone to human error. However, the use of technology offers opportunities to enhance accuracy, efficiency, and robustness in the quantification process. Artificial Intelligence (AI) algorithms can analyze large datasets quickly and accurately predict anticipated commodity needs based on identified trends, patterns, and correlations. AI can also uncover seasonal patterns, thereby advancing the understanding of historical data and aiding informed-decision making.

Motivation:

The current forecasting process typically takes about a month using a Microsoft Excel-based tool. Users spend up to 7 days downloading and cleaning data from the Kenya Health Information System (KHIS) to enter into the tool, which then generates forecasts. However, the tool has intrinsic challenges, namely that it is time-consuming to use, tiresome, isn't flexible, doesn't easily recognize patterns or trends, and is prone to user errors and misinterpretations of the data. The tool also lacks robust data quality checks, leading to skewed forecasts when outliers are present. Addressing outliers manually is time-consuming and potentially error-prone. Thus, the forecasting process usually uses limited data, which is aggregated either annually or by geography. The maternal Health (MH) and Family Planning (FP) quantification teams recognized the need to automate data extraction to save time and effort.

Methodology:

Our approach aimed to streamline the forecasting and quantification process for Maternal Health (MH) and Family Planning (FP) commodities through two key strategies. Firstly, we sought to automate the labor-intensive tasks of manual data extraction and data cleaning/quality checks that are typically involved in MH forecasting processes. By implementing advanced technological solutions, we aimed to streamline these essential steps, reducing the time and effort required while improving accuracy and reliability. By harnessing the power of innovative tools and methodologies, we aimed to generate accurate and timely forecasts for FP supplies, ensuring that the necessary resources are available to meet the demands of individuals and communities.

Two quantification approaches, service-based and consumption-based, were employed for forecasting. Data extraction from KHIS, identification of unusual data variations for reviewing the data quality as well as adjusting for non-reporting were crucial steps in the workflow. An initial analysis was performed to gain insights into its distribution, trends, and patterns and visualize these patterns to stakeholders. With the cleaned data, R, an open-source technology known for its machine learning capabilities, was utilized to fit a machine learning model and generate predictions based on specified future horizons.

Results:

These technology-driven approaches successfully enhanced the forecasting of MH and FP commodities. Automation streamlined the data extraction process, saving the team more than half of the working session's time when compared to manual data extraction. Additionally, the automated approach significantly reduced the time required for generating county-specific and nationwide forecasts. The manual process using MS Excel was time-consuming, requiring significant amounts of time and effort. However, with the implementation of our automated approach, the execution of the R code now takes only 3 to 5 minutes, providing a remarkable time-saving advantage of approximately 1 to 2 hours.

The technology-driven approach changed the forecasting process for FP commodities by effectively taking into consideration the adjustment for non-reporting and outliers. Additionally, this approach gave users an opportunity to

tune the model parameters quickly and without error based on their knowledge of the historical data and obtain the most likely accurate forecasts.

For example, users agreed that some commodities didn't have any seasonal patterns, they could tell the model not to reflect seasonality in the projection, thus enhancing the decision-making process in picking the forecast outputs from the web interface. The deployment of the model through a user-friendly web interface resulted in a significant improvement in user satisfaction compared to using Excel sheets.

All stakeholders unanimously agreed to adopt the automated approach outputs for MH commodities where service and consumption-based methods were deployed, and the AI approach for FP commodities. This widespread acceptance and agreement among stakeholders demonstrates the appetite for more efficient, robust approaches to forecasting, supported by technology and where users are included throughout the process.

Interpretation:

The methodology employed automation, AI (Machine Learning) by use of R Library that utilizes a form of automatic machine learning to determine the best model parameters and optimize a forecasting process. This served to provide decision-makers with powerful tools for forecasting. Implementing these approaches has the potential to significantly improve planning, resource allocation, and maternal health/family planning outcomes. More accurate forecasts that account for seasonality and other patterns decrease the likelihood of experiencing supply constraints which ultimately reduce disruptions in services and improve maternal and child health outcomes. Additionally, the automation reduces the time and resources needed for a quantification exercise, enabling greater focus on analyzing, interpreting, and using data. Areas of improvement include expanding the forecasting approach to sub-national or even more granular levels, such as county-level forecasting, to capture localized variations and trends.

Enhancing the user experience through interface customization and incorporating user feedback can further improve the platform's efficiency and user satisfaction. Additionally, exploring advanced modeling techniques that consider population dynamics and contextual factors can enhance the accuracy and robustness of the forecasting models. One of the major challenges faced during the development of the predictive analytics approach was the limited time available. The time frame might not have allowed for a comprehensive incorporation of a population-based approach, which could have provided better comparisons of forecasts.

IMPROVING ACCESS TO QUALITY CONTRACEPTIVE METHODS FOR WOMEN AND GIRLS IN KENYA. A PHARMACY-BASED IMPLEMENTATION RESEARCH APPROACH



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Background

Approximately 57% of women of reproductive age in Kenya use a modern Family Planning (FP) method. However, a significant number of women (~15%) experience challenges accessing these methods. The barriers include provider bias, limited product availability, a lack of provider training on quality FP provision, limited awareness of the availability of DMPA SC, stockouts in the product supply chain, misconceptions and myths surrounding FP, and clients' inability to practice self-injection. A self-injectable formulation, subcutaneous depot-medroxyprogesterone acetate (DMPA-SC), was introduced to expand the range of FP methods available for women. The implementation and scale-up plan for DMPA-SC were officially launched in January 2020. The community pharmacy channel, as the first point of contact for primary health care for most Kenyans, has been under-utilized for FP access. As such, private retail pharmacies offer an opportunity to expand access and provide quality, discreet, and convenient advanced FP products and services for Kenyan women. In this regard, in Supply Health is conducting a cross-sectional study on the client's FP needs, their level of trust in the pharmacy staff's skills, and client satisfaction with acquiring FP services at the pharmacy. The study aims to document evidence on acceptability, safety, client-centeredness, cost, feasibility, and efficiency for both pharmacy professionals

and clients.

Objectives

The Market test project, through an implementation research approach, has three objectives. The first is to increase the number of women accessing quality FP products and services at pharmacies. The second is to document the value propositions for pharmacies to offer DMPA-SC for self-injection and other self-care products to customers, and the third is to expand the network of pharmacies implementing viable business models to provide quality counseling, training, and FP products, including DMPA-SC for self-injection as part of a larger basket of self-care products.

Methodology

The first approach involved providing capacity-building training and certification to 30 registered pharmacy practitioners on the MOH-approved FP training curriculum. This comprehensive training included theory and practicum sessions to equip participants with the necessary skills and expertise to deliver high-quality FP services. The second approach focused on qualitative data collection and analysis through interviews conducted with pharmacy practitioners and FP clients at the project-implementing pharmacies. The purpose was to gather valuable insights into FP and self-care service provision at these pharmacies. A total of **26** pharmacy personnel were interviewed to understand their experience with the business solutions, their comfort level in offering FP service, the time spent in counseling versus the cost of the service provided, and the viability of stocking FP products like DMPA SC and self-care products. Additionally, **31** FP clients were interviewed to gain an understanding of their preferences for accessing FP services at pharmacies as compared to public health facilities. The interviews also explored the credibility of pharmacies in providing FP services, the cost, interest in returning to the pharmacy for future services, and the clients' views on self-injecting DMPA SC.

Preliminary findings

Several solutions have proven effective in improving business for pharmacies and building trust among clients who view pharmacies as credible sources of family planning services. Pharmacies are gradually becoming the first choice for family planning services because of their reliability, privacy, confidentiality, and quality. 81.3% of the interviewed clients expressed comfort in returning to their pharmacy for guidance and support. The Client-centered approach is also evident, with 95% of clients reporting that pharmacies are meeting their needs and preferences regarding family planning. Safety is also a top priority for both the pharmacy and its clients, as 64.3% of clients confirmed receiving quality FP services. While cost remains a consideration, clients are willing to pay for services when assured of their safety. Approximately 40% of clients are comfortable paying Ksh. 500, while 60% are ready and willing to pay between Ksh. 100 - Ksh. 350 for accessing DMPA SC at the pharmacy. Efficiency is maintained through streamlined counseling and convenient scheduling of clients' appointments. Pharmacies are open to implementing different business solutions that align with their client's needs and provide profitability. Strategies such as client retention practices, creating safe spaces, and effective branding have proven to be profitable and ensure the continuity of FP service provision.

Conclusion

Optimizing the pharmacy channel by equipping pharmacies with the skills and capacity to provide quality FP services will unlock their full potential. This optimization will enable pharmacies to break the barriers that may hinder the expansion of FP methods of choice, ensuring client's needs are met effectively. The focus on providing quality care and ensuring client satisfaction is paramount in guaranteeing the continuity of FP methods and promoting overall reproductive health.