2022-08

Integrated machine learning based quality measurement model for maternal, neonatal and child health services in Tanzania

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INTEGRATED MACHINE LEARNING BASED QUALITY MEASUREMENT MODEL FOR MATERNAL, NEONATAL AND CHILD HEALTH SERVICES IN TANZANIA

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**A Thesis Submitted in Fulfilment of the Requirements for the Degree
of Doctor of Philosophy in Information Communication Science and Engineering of the
Nelson Mandela African Institution of Science and Technology**

Arusha, Tanzania

August, 2022

ABSTRACT

The high maternal and neonatal mortality rate has remained a challenge for most developing countries. Scholars link the high death occurrences to the poor quality of health services provided to pregnant women and children. It is further revealed that most deaths could be prevented if women and children could access high-quality maternal, neonatal and child health services. Quality measurement, a process of using data to evaluate healthcare plans and performance, is essential in improving the quality of health services and reducing mortality rates. However, most developing countries and Tanzania lack effective approaches to measure and report the quality of Maternal, Neonatal and Child Health services provided. The Lack of an effective quality measurement approach limits the quality measurement processes and may jeopardize the quality measurement results. Additionally, failure to establish the quality of health services hampers healthcare plans and governance of healthcare supplies and other resources. The available quality measurement approaches require trained data collectors, dedicated datasets and the physical presence of quality measurement personnel at each health facility; therefore, labour intensive and resource inefficient. This study proposed and developed an integrated machine learning-based quality measurement model for maternal, neonatal and child health services in Tanzania. The study employed a machine learning technique, a K-means clustering algorithm, and a dataset selected from the national health information system and data warehouse: "District Health Information System (DHIS 2)". The developed model clustered the Maternal, Neonatal and Child Health (MNCH) dataset into two groups (clusters), and cluster analysis was performed to discover the knowledge about the quality of health services in each cluster formed. The study also performed model validation to establish the usefulness of the developed integrated machine learning-based model for quality measurement in MNCH. This study brings to the body knowledge an integrated machine learning-based quality measurement model for maternal, neonatal and child health services and a list of important indicators for quality measurement, the essential inputs for an effective quality measurement process. The current quality measurement model requires only data to measure the quality of health services readily available in DHIS 2, making the quality measurement model resource-efficient and ideal for quality measurement in resource-constrained countries such as Tanzania.