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SUMMARY REPORT

Operational Research

Exploring the Effectiveness and Efficiency of Biometric and Non-biometric Enabled Workflows and Gender Dynamics in the Delivery of Vaccines for Maternal and Child Healthcare in Ghana

February 2023

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List of Abbreviations

ANC	Antenatal Care
CHW	Community Health Worker
FGD	Focus Group Discussion
GAVI	The Vaccine Alliance
GHS	Ghana Health Service
KII	Key Informant Interview
MCH	Maternal and Child Health
MCHRB	Maternal and Child Health Record Books
Simprints	Simprints Technologies Ltd
SSL	Secure Socket Layer (SSL)
WHO	World Health Organisations

Executive Summary

Tracking Routine Immunisation with Biometrics in Maternal and Child Health Services project is a partnership between Simprints Technologies Ltd (Simprints) and the Ghana Health Service (GHS) and with funding from the the Vaccine Alliance (GAVI). The project aims to prepare and roll out biometric technology for vaccine delivery at scale. The project, which started in 2021 is divided into three phases: 1. An initial phase, when Simprints identified the GHS led vaccine delivery programme, and prepared biometrics through integration with the existing digital health system, 2. A proof-of-concept phase to demonstrate the effectiveness of biometrics in Ghana's health care delivery system starting with the maternal and child health (MCH) service delivery followed by 3. A scale-up phase ending in February 2024.

In November 2022, Simprints commissioned exploratory research to examine user uptake of the biometrics and how gender dynamics impact the roll out of biometrics. The methodology consisted of qualitative and quantitative methods. Qualitative data was collected through Key Informant Interviews with the users and supervisors and Focus Group Discussions with caregivers of children under two years old. Quantitative data was focusing on time usage to register and identify patients and data entry on service provision of different workflows (e.g. through the paper-based systems versus e-tracker and biometrics systems). 16 health facilities were visited for data collection.

Key Findings

- Key informants unanimously agreed that biometrics technology has improved effectiveness and efficiency of service delivery by saving time in registering client records and identifying client details. The research observed that CHWs were able to register and identify clients **on average 3 times faster through biometric authentication compared to paper-based manual search.**
- Exit interviews with caregivers showed that biometric system improved data quality, **it is 12.5% more accurate in comparison to paper-based system.** Interviews with the CHWs confirmed that **biometrics had fully eliminated duplication of records by verifying the clients through their unique biometric details.** As reported by CHWs, data is more reliable since it eliminates the errors and data is stored in a secure manner.
- Biometric technology allows health workers to retrieve client's information in other locations and ensures the continuity of services provided to children and promotes immunisation service uptake.
- **Community members have high acceptance of biometric technology since it is considered as an advancement of the healthcare delivery** which leads to their confidence in the healthcare system. Caregivers have higher acceptance of fingerprints in comparison to facial recognition. **There are no gender differences** in acceptance of biometric technology or CHWs uptake of the digital system.

- The key challenges related to biometrics uptake is related to poor quality of devices, **insufficient number of tablets and scanners** available for some health centers, electricity and internet connection related issues that prevent data sync and charging of the devices, **high workload of CHWs since they have multiple responsibilities** and double work related to reporting statistics based on paper-based system.

Several recommendations have been developed based on the findings of the research including: i) the need for continuous collaboration with GHS to upgrading e-trackers to capture all the relevant data needed to calculate the indicators for monthly reporting by the health facilities and move towards full digitalization; ii) community sensitisation on benefits of the biometrics including focus on raising digital literacy; iii) Ensuring identification and verification of the clients at any facility of the district with biometrics, which in turn will lead to sustainable technological solution of the health service delivery.

Introduction

Tracking Routine Immunisation with Biometrics in Maternal and Child Health Services project is a partnership between Simprints Technologies Ltd (Simprints) and the Ghana Health Service (GHS) and with funding from GAVI. The project aims to prepare and roll out biometric technology for vaccine delivery at scale. The project which started in 2021, is divided into three phases: an initial phase, a proof-of-concept phase (ending in January 2023) and a scale-up phase (ending in February 2024).

- **Workflow 1:** Completion of paper records only (CHWs do not use the e-tracker system)
- **Workflow 2:** Initial completion of paper records at the point of service and subsequent data entry of client/patient details into the e-tracker at a later point in time
- **Workflow 3:** Client details and biometrics are entered into the e-tracker system at the point of service (when the client is present). This workflow is divided into two streams; 3a which uses fingerprint biometrics and 3b using face biometrics.

Research Objectives and Methodology

This exploratory research was designed to examine the effectiveness and efficiency of biometrics roll-out with the e-tracker system. The research thought to explore two intersecting factors more deeply:

1. **User uptake of the digital system** which includes exploring user (Community Health Worker) behaviour, implementation of alternative workflows within health facilities in particular user uptake of the e-tracker system itself and impact of the use of biometrics in the pilot facilities.

2. **How gender dynamics impact the roll-out of biometrics within the digital system** which includes exploring gender-related drivers and barriers to immunization and/or the use of technology in the delivery of MCH, and particularly how immunization services might affect experiences of male and female community health workers and beneficiaries.

Further sub research questions were developed along with a research matrix that guided the development of the methodology which is described below:

Desk Research: a comprehensive literature review was conducted to identify gender related drivers and barriers to access and use of technology alongside reviewing internal documents such as project design document, gender analysis guide, and more to inform study design, tools and analysis plan.

Primary Data Collection through Quantitative Methods: a non-participant observation of service provision was carried out for comparability analysis of the workflows. Time spent at each stage of the workflow was recorded to determine the total time spent to enrol and identify clients. The observations were conducted in 3 health facilities in Asuogyaman and Akyemansa districts. Overall, 24 caregivers were observed (12 in each district). In addition to observations, 18 different caregivers were sampled for exit interview, which measured the quality of data captured in different workflows. Data was cleansed and analyzed using statistical software.

Primary Data Collection through Qualitative Methods: 16 health facilities were visited for qualitative data collection. 16 CHWs and 12 supervisors were interviewed in addition to 6 FGDs (3 in each district) conducted with the caregivers of children under two years. Also, 3 Health Information Officers (HIOs) were interviewed. Data was compiled and analyzed using thematic and content analysis.

The research followed ethical protocols and GDPR guidelines in collecting, storing, and processing data.

Comparative Analysis of Biometrics Workflow

Effectiveness and efficiency in service delivery: Observations in health centers (3 centers 12 samples) observed in each site, showed that users were able to register and identify clients faster through biometric authentication in comparison to paper-based system that require a manual search of clients' details. On average, users were 3 times faster to register clients through fingerprint and 2 times faster through face recognition in comparison to manual processes (58 seconds compared to 87 and 205 seconds respectively). Even less time was needed to identify the details of the clients through biometrics and on average this was 3 times faster than manual search. All the key informants confirmed that the biometric system is more effective and efficient in processing clients' details, and it saves time to record the data, which in turn enables service provision to more clients and less waiting time. Out of all workflows, fingerprint was considered as faster, more convenient, and acceptable by the communities.

"With the fingerprint, identifying an old client is very easy and fast. Once the client puts their finger on the Vero scanner, the person's details come up immediately. The whole process can be done in about 1-3 minutes"-

-female CHW, Boso.

Improved data quality and accuracy: exit interviews with the caregivers showed that both the facial recognition and fingerprint biometrics were each 100% accurate while data captured through paper-based system was 87.5% accurate which means that data captured in the biometric system is 12.5% more accurate in comparison to paper-based system. CHWs also confirmed that data captured through biometric technology is more accurate and reliable since it eliminates any errors in data entry and registration. In addition to data accuracy, key informants reported that biometrics had fully eliminated duplication of records by verifying the clients through their unique biometric details. It was underlined that biometric technology has ensured data security since the system stores data in a safe, secure cloud unlike paper-based system where the records could be damaged, which leads to data security concerns.

"The biometric system helps us to report accurate data on our immunization services because it is enabled to aggregate some of the data we report at the end of the month, which gives more accurate data than what is generated by manually adding the data through the paper-based system, where the figures are sometimes either under-represented or over-represented due to oversight during the manual count"

-female supervisor, Akokoaso

They key informants emphasized the importance of accurate data for continuation of service. Biometric technology allows health workers to retrieve client's information in other locations and ensures the continuity of services provided and promotes immunisation service uptake.

Biometric technology integration into e-tracker system Study found that biometric technology encouraged the accurate use of e-tracker as the technology uptake provided resources such as training of users, provision of digital tools such as tablets, scanners, and internet bundles. Continuous support provision for accurate use of the systems contributed to renewal of e-tracker since some of the facilities were not using the system before biometric technology was introduced.

Client satisfaction and community acceptance Focus Group Discussions with the community and Key Informants with the CHWs confirmed that communities have a high acceptance of the biometric technology since it is considered as an advancement of the healthcare delivery which leads to their confidence in the healthcare system. Higher level of client satisfaction with the biometric was enabled by the fact that the records could be retrieved when a client forgets a card or visits another health facility. Follow-up calls and healthcare visits due to the e-tracker system further strengthened good relationships among CHWs and clients as it is seen as CHWs are interested in their well-being.

In terms of community preferences with the biometric modality, the study found that caregivers are usually excited about putting their finger on the fingerprint verification scanner while for facial recognition, caregivers are usually not comfortable with their pictures being captured into the system. However, CHWs noted that due to proper sensitisation of the communities there are less misconceptions about biometric technology.

"Maybe when there's an emergency and maybe you forgot your insurance or record card, if you have already been enrolled on the system, they can get your old records on the machine to use"

-female Community Member, Otereso

Gender Analysis

The study was limited to provide in-depth analysis of gender dynamics related to MCH service delivery as well as perceptions and usage of digital technology due to limited involvement of male community members and CHWs in child health care that hindered primary data collection. The study found a widespread misconception in the community about the interest of digital tools. It is considered that men are more interested in and have a higher capacity for digital tools, but this is because women have limited access to digital tools which leads to lower digital literacy. However, in the health centers, male and female users were equally accessing resources and their effective usage of e-tracker and biometrics was not determined by gender. Similarly, there were no gender differences observed among community members in acceptance of biometric systems.

Challenges that Limit the Use of Biometrics

Quality and quantity of devices: one of the mostly reported challenges by the CHWs were related to the poor quality and capacity of the tablets that CHWs had access to; the challenges included weak battery lives and in certain cases scanners have very slow processing times or are not functioning well which eventually might delay service provision. In certain health facilities with high client volumes, CHWs have a limited number of tablets available to record clients' details.

Electricity supply and internet issues: since tablets need frequent charging and power fluctuations prevent CHWs to charge the devices, in certain cases, they are not able to use the tablets. Another issue is related to access to internet connectivity which is limited in some areas that might hinder effective use of biometric devices since it might relate to data sync issues. CHWs are also concerned about the sustainability of internet data since if the project ends and Simprints is not able to provide support they might not be able to use digital tools.

Reliance of mother's biometric details: CHWs expressed concern that if the child's details were linked to mother's biometrics in certain situations mother might not be the one visiting the health facility which might hinder identification of the child with the registered biometrics of a mother.

CHW workload: CHWs workers have many responsibilities related to reporting and processing data that is beyond service delivery. They are also sensitising community members about the biometric technology and in certain cases, are unable to fill out e-tracker during the service provision. The burden also includes still maintaining paper-based system that is a requirement which increases their workload and might prevent them to give more priority and attention to biometric registration.

Recommendations

- **Community sensitization in scale up phase:** To counter misconceptions, reduce the burden on CHWs to sensitize clients during the service provision, effective community sensitization about the benefits of biometrics should be a priority in scale up phase this in turn will impact high level of community acceptance of both fingerprint and face recognition modalities. Sensitisation could include information brochures in literacy friendly format or posters and infographic flyers available at the health centers. Sensitisation should include gender considerations including raising digital literacy among female community members and CHWs.
- **Ensuring district-wide coverage of biometrics solution:** GHS and Simprints to ensure identification and verification of the clients at any facility of the district with biometrics rather than having both, biometrics and paper-based system used in all the facilities of the districts. This approach will drive sustainability of the technological solution to health service delivery.
- **Continued collaboration and advocacy with Ghana Health Service (GHS):** At the scale-up phase, it is important for Simprints and GHS to focus on full digitalization of the system so that facilities using the biometric technology (e-tracker with biometrics) are exempt from completing paper registers. Collaboration will enable biometrics-based performance reporting features on monthly indicators that will promote more active uptake of biometrics and encourage CHWs to use the system more effectively.

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