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2019 EVALUATION OF MYCHILD SOLUTION IN THE GAMBIA

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EXECUTIVE SUMMARY

This report contains the results of the 2019 evaluation of MyChild Solution in the Gambia. MyChild Solution is an innovative health management information system (HMIS) based on Smart Paper Technology (SPT). SPT relies on the use of smart paper forms that can be filled out at the point-of-care and scanned at regional scanning centres for automatic digitisation of immunisation data. This allows high quality individual-level data to be electronically available, while maintaining a paper-based system at the point-of-care, thus ensuring data collection is not affected by electricity outages or internet connectivity issues. MyChild Solution was first introduced in The Gambia in 2016. At the time of this evaluation, MyChild Solution was scaled up to 19 fixed and 48 outreach health service delivery points across Western Region 1 (WR1) and Western Region 2 (WR2). The goal of this evaluation is to follow-up on the external evaluation of pilot facilities in 2018 and report on the readiness of the solution for national scale-up. The current evaluation investigates five key dimensions: 1) the quality of data produced by the MyChild system, 2) the use of MyChild Solution data and tools by health workers, 3) the administrative time efficiency afforded by the solution, 4) the sustainability of the solution in terms of both cost of ownership and work process transfer, and 5) the perceptions of and the experiences with the solution of health workers, caregivers and key stakeholders. The conventional HMIS system used in The Gambia was used as the standard comparison. Qualitative methods including checklists and semi-structured interviews as well as quantitative methods involving data and costing analyses were employed to answer research questions. Based on the positive feedback collected and the higher quality of data found to be generated by the system, the evaluation team strongly recommends national scale-up of the solution. The evaluation team believes the solution has great potential for improving immunisation coverage and quality of Expanded Programme on Immunization (EPI) services. A list of key recommendations for consideration during the scale-up process are provided at the end of the report.



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Evaluators Robert Ninson and Maria Isabella Gariboldi with data collectors Samba Bah, Alieu Jallow, Ismaila Kasseh and Ousman Bah and project coordinator Kaw Yorro Cham at Sibamor clinic.



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LIST OF ABBREVIATIONS

- AAITG - ActionAid International The Gambia
- ANC - Ante-Natal Card
- BCG - Bacillus Calmette–Guérin
- CUG - Closed User Group
- DHIS-2 - District Health Information System version 2
- DHS - The Gambia Demographic and Health Survey 2013
- DQR - Data Quality Review
- D4A - Data for Action
- EPI - Expanded Program on Immunization
- EPI ROO (or ROO) - EPI Regional Operations Officer
- Gavi - The Vaccine Alliance
- HMIS - Health Management Information System
- IDSR - Integrate Diseases Surveillance and Response
- IWC - Infant Welfare Card
- KPIs - Key Performance Indicators
- LMIS - Logistics Management Information System
- MoH - Ministry of Health of The Gambia
- OPB - Oral Polio Vaccine
- PDF - Portable Document Format
- PHO - Public Health Officer
- PKS - Swedish Postcode Foundation
- RI - Routine Immunisation
- SMS - Short Messaging Service
- SOP - Standard Operating Procedures
- SPT - Smart Paper Technology
- WHO - World Health Organization
- VVM - Vaccine Vial Monitor
- VVS - Vaccine Visibility Study
- UNICEF - United Nations Children’s Fund
- USD - United States Dollar(s)
- RHD - Regional Health Directorate
- ToR - Terms of Reference
- USAID - United States Agency for International Development
- WR1 - Western Region 1
- WR2 - Western Region 2



CHAPTER 1: INTRODUCTION

HEALTH MANAGEMENT INFORMATION SYSTEMS (HMIS)

Lippeveld et al. (2000) summarise health information systems (subsequently referred to as “health management information systems” or HMIS) as systems that “integrate data collection, processing, reporting, and use of the information necessary for improving health service effectiveness and efficiency through better management at all levels of health services”. HMIS need not be designed merely as data collection and reporting tools through which data flows up the healthcare chain, but as systems that enable data-driven decision-making. This necessary transformation has been described as shifting health information systems from “data-led” to “action-led” (Latifov and Sahay, 2013). In order to achieve this, data has to be provided in a context-appropriate manner to all players in the healthcare value chain and feedback loops must be integrated to empower lower levels of the healthcare system with data to inform their actions. Further, designing HMIS must integrate continuous user feedback to ensure the usability and utility of the platform is maximised.

MYCHILD SOLUTION

Shifo Foundation’s MyChild Solution is an innovative HMIS designed to generate high quality electronic data for mothers and children in low-resource settings. The solution relies on Smart Paper Technology (SPT), a technology based on SPT forms that can be scanned to automatically digitise medical records. This allows the production of real time indicators to track continuous quality improvement of care, while maintaining the versatility and reliability of paper at the point-of-care. It also produces individual-level data that enables follow-up with defaulters compared to the aggregate data outputted by the conventional HMIS. Digitising data after scanning should diminish the administrative burden on health workers and ensure high quality data, while the use of paper at the point-of-care would ensure that issues with internet or mobile connectivity or power cuts do not affect recording activities. Further, a paper-based solution presumably results in higher sustainability, lower operational costs and a lower need for technical support than a completely digital platform. Full integration of this system in the national healthcare system should ensure the availability and accessibility of high quality health data at different levels of the healthcare system.

MyChild Solution has currently been optimised for use in preventative child care, specifically in Expanded Programme on Immunisation (EPI) applications. Its use to keep track of vaccinations has been extended to some extent to LMIS applications, by allowing automated stock management of vaccines, for example, by automatically sending requisition notes.

MYCHILD SOLUTION IN THE GAMBIA

IMPLEMENTATION

MyChild Solution was first introduced in The Gambia in 2016. The system was piloted in four fixed and 14 outreach healthcare service delivery points in Western Region 1 (WR1) and Western Region 2 (WR2) in 2017. The implementation was supported by the Ministry of Health of The Gambia (MoH), ActionAid International The Gambia (AAITG), The Vaccine Alliance (Gavi), IKARE, Swedish Postcode Foundation (PKS), af Jochnick Foundation and Shifo Foundation. In 2018, an external evaluation of the data quality and operating costs was carried out showing the promise of the solution. Following this evaluation, the solution was scaled up starting in July 2018 in 19 fixed and 48 outreach health service delivery points in WR1 and WR2. This involves all public health facilities in the regions except for Brikama District Hospital and private clinics.

HMIS AND MYCHILD SOLUTION IN THE GAMBIA

MyChild Solution relies on SPT forms to be used by health workers at the point-of-care. SPT forms are scanned and digitised, producing high quality data for various applications. In order to better understand how MyChild Solution and the conventional HMIS system operate, the following sections address each system in terms of its fundamental elements, its daily and monthly processes at the health facility level, and its monthly processes at the Regional Health Directorate (RHD) level.

CONVENTIONAL HMIS SYSTEM

CONVENTIONAL HMIS SYSTEM DATA COLLECTION TOOLS

The current HMIS relies on different paper-based forms for collection of immunisation and Vitamin A and deworming data. A brief description of the key tools follows:

- 1. Infant Welfare Card (IWC)** is a record kept by the caregiver in which all services received by a child at a health facility are tracked.
- 2. Immunisation, Vitamin A and Deworming Registers** are used to register children and record vaccines, Vitamin A, and deworming services they received. These registers are also used to identify immunisation defaulters and replace IWCs when they are lost.

3. **Daily Tally Sheets** are used to record vaccines, Vitamin A, and deworming doses given during each immunisation session. These sheets are used at the end of the month when preparing the Monthly Returns to aggregate the number of doses of each vaccine, Vitamin A and deworming tablet administered.
4. **Monthly Returns** are forms that aggregate monthly data at the health facility. The forms are sent to the regional office for verification and entry into District Health Information System version 2 (DHIS-2).
5. **Vaccine and Other Supplies (Dry Stock) Ledgers** are used to manage supplies such as vaccines and diluents.
6. **Combined Requisition and Issue Notes** are used to request vaccines and other supplies from the relevant level (regional or national).

These forms are also used for monitoring and evaluation purposes. Processes associated with the conventional HMIS can be divided into processes at the health facility level and those at the regional level.

CONVENTIONAL HMIS SYSTEM PROCESSES AT HEALTH FACILITIES

The conventional HMIS system requires the following processes to be carried out at health facilities:

1. **Infant Registration:** During the first visit to a clinic, children are given an IWC.
2. **Infant Visit:** Each time a child receives a vaccine, Vitamin A supplementation or deworming tablet, services are recorded both in the IWC and in the relevant register. Each dose of vaccine, Vitamin A or mebendazole (deworming) that is administered is also recorded in daily tally sheets.
3. **Daily Administrative Tasks:** Before each clinic session, health workers record the number of each vaccine or supply taken in the vaccine and other supplies ledgers. They record at the end of the immunisation session how many were consumed and returned of each supply.
4. **Monthly Administrative Tasks:** Health workers are required to physically count the remaining supplies at the end of the month and update the vaccines and other supplies ledgers based on these counts. This information is also inputted in the vaccine management section of the Monthly Return. Vaccine doses are aggregated based on daily tally sheets and aggregated numbers are used to fill in the immunisation section of the EPI Monthly Return and HMIS Comprehensive Facility Summary. These completed forms are sent to RHDs for verification and entry into DHIS-2. A carbon-copy of the Monthly Return form is also kept at health facilities.

CONVENTIONAL HMIS SYSTEM PROCESSES AT THE REGIONAL AND NATIONAL LEVEL

The conventional HMIS requires the following processes to be carried out at the regional and national level:

- 1. Monthly Verification and Entry into DHIS-2:** Monthly Returns are first checked by the Expanded Program on Immunisation Regional Operations Officer (EPI ROO) for completeness and consistency. They are then sent to the regional data entry clerks for entry into DHIS-2. Numbers from Monthly Returns are also inputted into the EPI Summary Sheet, which is then shared with the national level.
- 2. Periodic Monitoring and Evaluation:** Periodic evaluations of performance of health facilities are carried out by the RHD and national EPI team to assess data quality (mainly completeness and consistency) across different paper-based forms (immunisation registers, daily tally sheets and Monthly Returns) as well as other performance indicators. This form of monitoring and evaluation is quite resource intensive as it requires personnel to be physically present at health facilities and involves manual counting.
- 3. Paper Form Supply Management:** Forms and ledgers are printed at the national level and distributed to RHDs annually or on a needs basis. RHDs keep a stock of the forms and supply them to health facilities on a needs basis.

MYCHILD SOLUTION

MYCHILD SOLUTION DATA COLLECTION TOOLS

MyChild Solution relies on the following SPT forms for data collection at the point-of-care:

- 1. MyChild Birth Record** is a form used to register the personal information of newborns. The form comes with a unique pre-printed ID that will be associated with the child for future visits.
- 2. MyChild Birth Records Update** is a form used to update the electronic records of children when information changes occur involving, for example, names or telephone numbers.
- 3. MyChild Health Records** is a form used to record the vaccines and services received by a child during any given visit.
- 4. MyChild Monthly Return - Vaccine Management and Data for Action** is used at the end of the month to record the vaccine stock received and balance for each antigen, functional cold chain equipment, any cancelled or rescheduled sessions and any vaccine closed vial wastage. The Data for Action (D4A) portion of this form is for reporting any actions taken to improve Key Performance Indicators (KPIs).

MYCHILD SOLUTION AUTOMATED OUTPUTS

Thanks to the digitised information available through the use of SPT forms, a number of features and outputs are automatically available through MyChild Solution to support HMIS and Logistics Management Information System (LMIS). These include:

1. **DHIS-2 integration** of electronic records ensures that data captured through MyChild Solution is accessible through national health information systems.
2. **Reports** including HMIS reports, daily tally sheets, monthly summaries, monitoring and evaluation reports and customised reports based on KPIs of interest are automatically generated by the system.
3. **The EPI Performance Dashboard** facilitates performance monitoring at the regional level and provides a centralised platform for report access at the health facility and regional levels.
4. **Electronic registers and de-identified registers** are automatically generated by the system. Electronic registers containing the names of children and caregivers are accessible to RHDs and specific people at health facilities, whereas de-identified registers are available as a portable document format (PDF) to all health workers. Health workers can also access the electronic registers and other monthly reports through the Dashboard using health facility-specific log-in details.
5. **Immunisation, Vitamin A and deworming defaulters lists** are automatically generated based on information available in the electronic registers.
6. **Requisition notes** are generated based on vaccine demand forecasts and the available stock of each health facility.
7. **The Vaccines and Supplies Management Report** includes the opening balance, received, administered, used/consumed, wasted and closing balance of vaccines as well as cold chain temperature information.
8. **SMS (Short Messaging Service) reminders** can be used to remind caregivers of upcoming immunisation due dates.
9. **KPI SMSs** are sent on a monthly basis to health workers with performance values for each KPI being tracked. These KPI performance values are plotted by health workers on provided run charts, allowing them to monitor their own performance on key indicators related to data quality, coverage and vaccine wastage, among others.

MYCHILD SOLUTION PROCESSES AT HEALTH FACILITIES

MyChild Solution requires the following processes to be carried out at health facilities:

1. **Infant Registration:** On their first visit to the clinic, children are registered using the MyChild Birth Record form. Each form is connected to a unique ID, which is written onto the child's IWC. In some cases where IWCs are not available or to ensure a backup of the ID is present, a child's MyChild ID may also be recorded on a mother's

Ante-Natal Card (ANC). If the registration information needs to be updated, the MyChild Birth Record Update form can be employed.

- 2. Infant Visit:** Every time a child receives vaccines or other services such as deworming or Vitamin A supplementation, the IWC is used to determine which vaccines and services are needed. Received services including immunisations are recorded both on the IWC and through the MyChild Health Records form.
- 3. Daily Administrative Tasks:** Vaccines and other supplies ledgers are used as outlined in the conventional HMIS section, but paper-based registers and tally sheets are no longer necessary. If the IWC is lost, health workers can search through PDF copies of the de-identified register offline, log into the online electronic register, or contact the RHD or project coordinator through WhatsApp or Closed User Group (CUG) lines.
- 4. Monthly Administrative Tasks:** Health workers physically count balances of vaccines and other supplies at the end of the month. This information is recorded in the Monthly Return - Vaccine Management and Data for Action form, which is then taken to the RHD for scanning. This form should also be used by health workers to note which actions they took to improve target KPIs. Monthly Returns and vaccine and other supply requirements for the following month are automatically generated and sent via e-mail on the 5th of every month. The project coordinator also forwards these forms through WhatsApp or other CUG lines. KPIs are shared with health workers every month via SMS. Health workers are expected to plot the KPI values on run charts and use these charts to track their performance and inform their actions.

MYCHILD SOLUTION PROCESSES AT THE REGIONAL AND NATIONAL LEVEL

MyChild Solution requires the following processes to be carried out at the regional and national level:

- 1. Scanning and data recognition:** When health workers bring SPT forms to the scanning coordinator (EPI ROO), a document (the Delivery Registration form) is signed to confirm the delivery and receipt of forms. The scanning coordinator then should check the forms for completeness before scanning. After scanning the forms, text and ticks are automatically digitised and unrecognised fields, for example due to illegible handwriting or poor marking, are sent for data verification. All scanned forms are archived at the RHD.
- 2. Data and Master Verification:** Unrecognised fields are sent for Data Verification with the Verification Officer. Unrecognised fields are checked against original document images of the scanned forms and errors are rectified based on these original document images. Fields that cannot be rectified through routine Data Verification processes are sent to Master Verification. Data digitisation errors that cannot be rectified at this stage are sent to “Exceptions” and tackled by Shifo Foundation.

3. **Periodic Monitoring and Evaluation:** RHD and EPI staff can monitor health facilities performance and national EPI staff can monitor RHD performance directly through the Dashboard. The Dashboard provides data quality metrics including session completeness and the number of children vaccinated per session. Additional monitoring is carried out in line with conventional HMIS protocols.
4. **Paper Form Supply Management:** Printing and distribution of SPT forms to the RHD is currently carried out by AAITG. This work process should eventually be transferred to the MoH if and when national scale-up occurs. Forms are collected from the RHD by health workers on a needs basis.

GOAL OF THE EVALUATION AND REPORT STRUCTURE

The goal of this evaluation is to assess the success of the initial scale-up in WR1 and WR2 and to gauge the readiness of the solution for national scale-up. This comprehensive evaluation used interviews to gain insights from health workers, caregivers, and various stakeholders interacting with MyChild Solution as well as data analysis to measure different aspects of the data quality and cost. The evaluation has been divided into five components that reflect the structure of this report:

1. Data quality;
2. Data use;
3. Administrative time efficiency;
4. Total cost of ownership and transition of work processes;
5. Perceptions of and experiences.

An introduction, methodology used, results obtained and conclusion is provided for each of the components in the following chapters. For ease in reading, a brief discussion has been integrated in the results sections. A more general discussion relating to all components as well as recommendations can be found at the end of the report.



CHAPTER 2: CLINIC SELECTION

METHODOLOGY

Different sampling methods (random and purposive sampling) were employed depending on the research methods as follows:

- **Health Worker Interviews and Time-and-Motion Studies:** Qualitative methods, including interviews and observational checklists, as well as time-and-motion studies were carried out in clinics selected through purposive sampling by keeping into account the clinic region, its size, its presence in the pilot and its distance from the scanning station. Clinics were stratified as small, medium or large in size depending on both the average monthly Bacillus Calmette–Guérin (BCG) doses (using the average of the last three or four available months in MyChild Solution) and the annual surviving infants Routine Immunisation (RI) targets. Both size definitions were included as the stratification was not found to necessarily match when using the two variables. Average monthly BCG doses were prioritised in stratification. Two out of the three clinics classified as far from scanning stations (Sibanor and Sintet) were included to ensure representation of their unique perspective. All clinics present in the pilot were also included to ensure comparability of results with the pilot evaluation.
- **Caregiver Interviews:** Caregiver interviews were carried out in Serrekunda, Sukuta, Polyclinic, Sibantor and Gunjur.
- **Data Consistency and Data Accuracy:** The data quality analysis was carried out in randomly selected clinics or in whole population samples over a certain time period depending on the specific indicator in accordance with the WHO Data Quality Review (DQR) Toolkit guidelines. Namely, data consistency and data accuracy were analysed for Serrekunda, Sukuta, Fajikunda, Polyclinic, Gunjur and Sibantor. To increase the sample size for data accuracy, Brufut was later added to the sample.

The selected clinics for each method are summarised in **Table 2.1** in the following page.

Health Worker Interviews and Time-and-Motion Studies	Caregiver Interviews	Consistency and Accuracy	Clinic	Region	Average BCG Doses per Month	Size Classification based on BCG Doses	RI Targets (Annual Surviving Infants)	Size Classification based on RI Targets	Session Types (S = Static, O = Outreach)	Pilot?	Far from Scanning Station?
✓			Bundung	WR1	377	Large	5143	Large	S		
✓	✓	✓	Sukuta	WR1	318	Large	2850	Large	O/S	Yes	
		✓	Fajikunda	WR1	280	Large	3421	Large	O/S		
			Old Jeshwang	WR1	234	Large	541	Small	S		
✓	✓	✓	Serrekunda	WR1	230	Large	3288	Large	S	Yes	
			Banjulinding	WR1	176	Large	2464	Large	O/S		
✓			Sanyang	WR2	154	Medium	1158	Medium	O/S	Yes	
✓	✓	✓	Polyclinic	WR1	145	Medium	724	Small	S		
✓	✓	✓	Gunjur	WR2	129	Medium	2430	Large	O/S	Yes	
✓		✓*	Brufut	WR1	86	Medium	1183	Medium	O/S		
			Bwiam	WR2	76	Medium	776	Medium	O/S		Yes
✓	✓	✓	Sibanor	WR2	64	Medium	928	Medium	O/S		Yes
			Farato	WR2	58	Medium	1200	Medium	O/S		
			Kafuta	WR2	57	Small	1728	Medium	O/S		
			Bakau	WR1	40	Small	1301	Medium	O/S		
			New Jeshwang	WR1	36	Small	394	Small	S		
✓			Sintet	WR2	29	Small	372	Small	O/S		Yes
✓			New Yundum	WR1	26	Small	724	Small	S		
✓			Leman Street	WR1	11	Small	290	Small	S		

Table 2.1. Clinic selection summary. Clinics were stratified by size according to both the average of the last few months of BCG doses available through MyChild Solution and RI Targets for annual surviving infants. Clinics for health worker interviews and caregiver interviews were selected through purposive sampling, whereas clinics for data consistency and data accuracy evaluations were selected through random sampling.

* For the Data Accuracy evaluation only.



GOOD POSTNATAL CARE
REDUCES COMPLICATIONS



SLEEP UNDER BED NET
TO PREVENT MALARIA





CHAPTER 3: DATA QUALITY

INTRODUCTION

The most basic requirement for an HMIS to be useful in routine activities and decision-making, is to guarantee the provision of high quality data. The three most important dimensions of data quality are completeness, timeliness and consistency. These dimensions were previously evaluated at the pilot stage (Sowe et al., 2018) and should be routinely assessed and reported as part of a quality assurance process. The pilot and regional scale-up phases had considerable differences in the level and providers of external support and capacity-building. For this reason, it was especially important to reassess data quality and establish if the same levels of quality were maintained at the regional scale.

While the methodology for the assessment of data quality has largely been kept the same as the pilot evaluation to ensure comparability of results, the current data quality evaluation also comprises a comparative analysis with the conventional HMIS system as well as the additional dimension of data accuracy. Measuring data accuracy ensures that the data captured in the electronic system is consistent with records held by caregivers, namely IWCs. A thorough evaluation of data quality was conducted in accordance with the Data Quality Review (DQR) Toolkit (2017). This toolkit was developed by the World Health Organization (WHO), The Global Fund, Gavi, and the United States Agency for International Development (USAID)/MEASURE Evaluation in 2017 (WHO et al., 2017). Its purpose is to guide periodic independent assessments of data that is reported at the facility level and is available through health information systems. Various adaptations were made to the DQR methodology, when required, based on the specific scale and nature of the project, as detailed in the methodology section.

METHODOLOGY

EVALUATION FRAMEWORK

The WHO DQR Toolkit (2017) promotes a unified approach to assessing reported data quality from the health facility to the national level. It proposes several data quality indicators (metrics) that are grouped into four dimensions, namely:

1. Dimension 1: completeness and timeliness of data;
2. Dimension 2: internal consistency of reported data;

3. Dimension 3: external consistency – i.e. agreement with other sources of data such as surveys;
4. Dimension 4: external comparisons of population data – i.e. a review of denominator data used to calculate rates for performance indicators.

All possible metrics under the DQR Toolkit were considered for use in assessing the quality of data generated using MyChild Solution. Dimension 4 could not be evaluated for reasons explained in the designated section below. MyChild Solution was compared to the existing HMIS for all possible metrics. MyChild Solution data quality results from this evaluation were also compared to those from the previous evaluation for all metrics that were measured in the first evaluation. The data quality evaluation also included questions (indicators) that could not be best answered using the DQR Toolkit's framework. These indicators were therefore assessed outside the DQR Toolkit. For most of the data quality indicators evaluated, data over a 12-month period (March 2018 - February 2019), including all the health facilities in the two regions using MyChild Solution, was used.

DIMENSION 1: COMPLETENESS AND TIMELINESS

Reporting completeness compares the number of reports received from an entity to the expected number of reports from that entity over a specified time period. Timeliness of reporting measures whether the reports were received by a predefined deadline. The acceptability threshold for both completeness and timeliness is 75% according to the DQR Toolkit. Completeness and timeliness are usually measured for districts (regions in the case of The Gambia) and health facilities. However, we did not measure completeness and timeliness of regional level reporting because MyChild Solution is currently implemented in two of the seven regions of the country and not all the health facilities in those regions are implementing the solution. Further, MyChild Solution automatically generates all the reports, after which they are sent out to their respective recipients the same day. Therefore, assessing these metrics would yield the same results as assessing the completeness and timeliness of health facility reporting for MyChild Solution. Consistency of reporting over time was also not measured because it requires data over a three-year period, which was not possible to obtain from MyChild Solution because its implementation has spanned less than three years.

Data over a 12-month period is required to measure the metrics under the completeness and timeliness dimension. The rolling 12 months preceding the evaluation (the evaluation started in March 2019) were used for MyChild Solution and the last rolling 12 months before the implementation of MyChild Solution in the same health facilities were used for assessing the existing HMIS. Only four health facilities had 12 months worth of data using MyChild Solution. We therefore used the months that were applicable. The following completeness and timeliness metrics were evaluated:

- 1. Completeness of health facility reporting:** This was measured as the proportion of expected monthly reports received in MyChild Solution and the existing HMIS.
- 2. Timeliness of health facility reporting:** This was measured as the proportion of expected reports received on time for each of the two systems.
- 3. Completeness of indicator reporting:** This was defined as the proportion of Penta 3 antigen doses with non-missing values in the submitted Monthly Returns for both the existing HMIS and MyChild Solution.
- 4. Completeness of clinic sessions captured:** This was measured by comparing the number of immunisation sessions actually conducted in three randomly selected months against the number of immunisation sessions that were captured in MyChild Solution for the same months.

DIMENSION 2: INTERNAL CONSISTENCY

This dimension examines coherence of evaluated data through several metrics. In this dimension, we did not evaluate one indicator — consistency over time — because it requires data over a three-year period and MyChild Solution’s implementation has been for less than three years. All other metrics were evaluated as follows:

- 1. Presence of outliers:** This was measured as the number and proportion of health facilities in which one or more of the monthly Penta 3 values over the course of one year was a moderate ($\pm 2-3$ standard deviations from the mean) or extreme ($\pm >3$ standard deviations from the mean) outlier for MyChild Solution and the existing HMIS. Four health facilities in WR1 and WR2 had used MyChild Solution for 12 months during the evaluation. Therefore, data from those four health facilities was used to assess the presence of outliers for both MyChild Solution and the conventional HMIS. Monthly Returns from March 2018 to February 2019 were used for MyChild Solution and those of the last 12 months before the implementation of MyChild Solution were used for the existing HMIS.
- 2. Consistency between related indicators:** This was measured by calculating Penta 1 to Penta 3 dropout for both the existing HMIS and MyChild Solution. This metric examines whether the expected relationship between Penta 1 and Penta 3 exists in the reported data - that is that the dropout should not be negative. January to December 2018 was used for calculating this indicator for the existing HMIS and all data up to February 2019 was used for MyChild Solution. The analysis included all health facilities using MyChild Solution at the time of the evaluation.
- 3. Verification of reporting consistency:** This was measured using two metrics as follows:
 - A. Verification of reporting consistency through facility survey:** This was done by measuring verification factors between different data sources. Consistency was

checked using electronic tally sheets, the electronic register, Monthly Returns, and DHIS-2 values in MyChild Solution, and tally sheets, immunisation registers, Monthly Returns, and DHIS-2 values in the existing HMIS. Tally sheets and immunisation register values were compared to values in Monthly Returns and Monthly Return values were then compared with DHIS-2 values. A verification factor of 1.0 means perfect consistency, less than 1.0 indicates over-reporting, whereas more than 1.0 indicates under-reporting. The acceptable values as per the DQR Toolkit are between 0.9 and 1.1. Six health facilities currently using MyChild Solution were randomly selected for this metric. Six health facilities were chosen because the total number of health facilities currently using MyChild Solution is less than what would constitute an ideal sample size based on calculations derived from the DQR Toolkit. Several options were weighed considering time limitations. Finally, it was thought feasible to select six health facilities and increase the number of months to be verified. A stratified (by pilot and newly added facilities) random selection strategy was used to select a total of six health facilities from WR1 and WR2. The selected health facilities are Serrekunda, Sukuta, Fajikunda, Polyclinic, Gunjur, and Sibanor health centres. Three months (December 2018, January 2019, and February 2019) were selected for verification. The same months preceding the implementation of MyChild Solution in the selected health facilities were used for the existing HMIS. The reason for selecting the most recent months in the same period is to increase the chance of finding all the required documents in the existing HMIS. The same months in different years were selected to avoid biases that may result, for example, by selecting a month in one system during which students are sent out on practicals at health facilities, as the presence of students on practical may influence data quality. Therefore, we selected similar time periods that excluded months during which students are generally sent on practicals (July and August).

- B. **Consistency between vaccine doses recorded in SPT Forms and electronic records:** In MyChild Solution, SPT forms filled at the point-of-care are scanned and digitised. Hence, there is a need to assess how well the system recognises filled in SPT forms. This was estimated as the number and proportion of children with vaccine doses recorded on SPT forms that were correctly recognised by the MyChild Solution system. Forty-two documents containing 1,527 visits were randomly selected using all document numbers in the system for the period of 12 months. The following parameters were used to calculate the minimum sample size using Raosoft's Sample Size Calculator: margin of error of 0.5%, confidence level of 95%, response distribution of 99%, and total population of 72,199. This metric was not calculated for the existing HMIS as it does not apply.

DIMENSION 3: EXTERNAL CONSISTENCY

External consistency of evaluated data compares the value of a selected indicator in the system being evaluated against the value of the same indicator as measured by another information source. The threshold for the acceptable difference between two sources of data for the same indicator is 33% according to the DQR Toolkit. External consistency is measured using two metrics. One is a comparison between HMIS and program values and the other is a comparison between HMIS and survey values. The comparison between program and HMIS values was not made because it is more of a data quality comparison between program (EPI data) and national HMIS data than an examination of the actual quality of data generated through MyChild Solution. The comparison between routine coverage of a selected indicator (in this case Penta 3) and survey coverage of the same indicator was carried out for both MyChild Solution and the existing HMIS. Our unit of analysis was the regional level because this is the lowest level at which the Demographic and Health Survey (DHS) is aggregated.

DIMENSION 4: EXTERNAL COMPARISON WITH POPULATION DATA

This dimension of data quality evaluates congruence between two population data sources. The dimension has three metrics, none of which were measured in this assessment. The reason for not measuring each metric is explained below.

- 1. Consistency of population projections:** This is a measure of the ratio of population projections of live births from The Gambia Bureau of Statistics to a United Nations projection of live births for the country. This metric could not be measured because MyChild Solution is not yet implemented nationally. United Nations population projections are made nationally and are therefore not comparable.
- 2. Consistency of denominator between program data and official government population statistics:** This is measured as the ratio of population projections for selected indicator(s) from census values to values used by the program. This indicator was not measured because it would be best measured when MyChild Solution is implemented in at least all health facilities offering immunisation services in a region/local government area. This is because official statistics exist at the local government area level and estimating this at least at the regional level would minimise the possibility of biasing estimates due to people living in one geographical area (for example a given district) and receiving immunisation services in another.
- 3. Consistency of population trends:** This is a measure of the ratio of population values for selected indicator(s) from the current year to the predicted value from the trend in population values in up to three preceding years. We did not include this metric because the implementation of MyChild Solution has been for less than three years.

OTHER DATA QUALITY INDICATORS EVALUATED

Other useful data quality indicators not included in the DQR Toolkit were evaluated as follows:

- 1. Incidence of recording errors:** We checked two types of recording errors using electronic register data spanning March 2018 to February 2019:
 - A. Children recorded as having received multiple doses of the same antigen during different visits:** This was assessed by estimating the number and proportion of children recorded as having received BCG multiple times during different visits. The motivation for choosing BCG is that a child is expected to be vaccinated with the BCG vaccine only once.
 - B. Children recorded as having received multiple doses of the same vaccine during the same visit:** This was evaluated by measuring the number and proportion of children recorded as having received multiple doses of a vaccine during the same visit. This error was checked for Oral Polio Vaccine (OPV), Penta, Rota, Pneumococcal Vaccine, and Measles-Containing Vaccine because a child is required to receive multiple doses of each one of them before completing the immunisation schedule.
- 2. Incomplete indicator level data and implausible dates:** We checked for recording errors including not recording the date of birth or gender of a child, implausible dates such as dates of birth that are in the future relative to recorded session dates, children that are more than five years old at registration, and incomplete dates of birth. These errors were checked on data outputs after applying MyChild Solution's validation rules.
- 3. Frequency and amount of manual intervention:** This refers to the amount and frequency of time spent on manually verifying data in MyChild Solution on a national scale. It was measured using October 2018 to February 2019 verification time logs of all health facilities using MyChild Solution retrieved from the system. Expected average verification time per visit, average total verification time per month, and average total verification time per year on a national scale were estimated. Extrapolation to the national level was done using the national live births target, average monthly visits of health facilities implementing MyChild Solution, the expected number of health facilities to deliver immunisation services, and timings calculated from the verification time logs retrieved from the system.
- 4. Comparison between fixed and outreach immunisation sessions:** Data quality between fixed and outreach immunisation sessions was compared using two indicators:
 - A. Completeness of immunisation sessions captured in MyChild Solution for fixed and outreach immunisation sessions.**
 - B. Incidence of recording errors in fixed and outreach immunisation sessions.**

5. Data accuracy: Data accuracy was measured as the number and proportion of IWCs for which vaccine doses received during selected immunisation sessions were correctly reflected in the electronic immunisation register. Vaccine doses considered were BCG, Penta 1, Penta 3, Measles 1, Measles 2, and OPV booster. Due to the relatively small number of health facilities implementing MyChild Solution, we decided to compute the sample size based on the number of children registered (IWCs) instead of the number of health facilities. Three-hundred-and-nineteen (319) IWCs were photographed for comparison with the electronic register data. Of the 319 cards, 290 were eligible for inclusion based on the services received. The 29 excluded mostly (n = 27) comprised of children that received no vaccine doses or received vaccine doses not part of those selected for the study. The minimum sample size was 246 based on Raosoft’s Sample Size Calculator. It was calculated using the following parameters: a margin of error of 5%, a confidence level of 95%, a response distribution of 80%, and a population of 72,199. Seven health facilities were selected – five from WR1 and two from WR2. The sampling strategy was implemented in a way that ensured representation of both pilot and recently added health facilities and fixed and outreach sessions. In WR1, the two pilot health facilities were automatically included and the three remaining health facilities were randomly selected from the list of health facilities implementing MyChild Solution. For WR2, one health facility was randomly

Indicator number - Indicator name Definition	Target
OI 1.1 - Proportion of system generated electronic reports available to key actors on a timely basis (data timeliness)	99%
OI 1.2 - Proportion of fixed sessions performed that are captured in the electronic reports (fixed session data completeness)	99%
OI 1.3 - Proportion of outreach sessions performed that are captured in the electronic reports (outreach session data completeness)	99%
OI 1.4 - Proportion of child immunisation records that accurately reflect the right child and the right vaccines received in Electronic Immunisation Register (data accuracy)	98%
OI 1.5 - Proportion of the immunisation records collected on Smart Paper Forms digitised correctly (internal data consistency)	99%
OI 1.6 - Proportion of health facilities reporting data without outliers (internal data consistency)	95%
RI 1.2 - Incidence of data recording errors (recording error rate)	2%

Table 3.1. Every Child Counts Performance Framework data quality related targets for 2019.

selected from the pilot health facilities and another was randomly selected from the more recently added health facilities. The rationale for the proposed number of health facilities selected in each region was guided by the distribution of health facilities currently implementing MyChild Solution in the two regions and their monthly EPI targets.

6. **Progress towards Performance Framework Targets:** The project through which MyChild Solution is currently implemented in The Gambia (Every Child Counts) has a Performance Framework including project targets related to data quality indicated in Table 3.1. Performance towards these targets was assessed by comparing current data quality indicators against the current year targets of the project.

RESULTS

DIMENSION 1: COMPLETENESS AND TIMELINESS

System	Expected Number of Reports	Submitted Number of Reports (n (%))	Reports Submitted on Time (n (%))	Penta 3 Data Complete (n (%))
MyChild Solution (current evaluation)	146	146 (100%)	146 (100%)	146 (100%)
MyChild Solution (previous evaluation)	8	8 (100%)	8 (100%)	8 (100%)
Existing HMIS	228	228 (100%)	228 (100%)	228 (100%)

Table 3.2. Health facility reporting completeness, timeliness, and completeness of indicator data for MyChild Solution (present and pilot evaluation) and the existing HMIS.

Session	Fix Clinic Sessions			Outreach Clinic Sessions			Total
	18-Apr	18-Dec	19-Feb	18-Apr	18-Dec	19-Feb	
Actually Conducted	43	181	157	17	53	59	510
Captured in MyChild Solution	43	181	157	17	53	59	510
Completeness	100%	100%	100%	100%	100%	100%	100%

Table 3.3. Completeness of immunisation sessions captured in MyChild Solution.

Table 3.2 shows that all (100%) expected reports were submitted and on time for both MyChild Solution and the existing HMIS system. The agreed deadline for timely submission of Monthly Returns between the MoH and Shifo Foundation is the 5th of the subsequent month. Penta 3 data was also 100% complete in both systems. **Table 3.3** shows that all fixed and outreach immunisation sessions conducted in April 2018, December 2018, and February 2019 were captured in MyChild Solution resulting in 100% completeness of captured immunisation sessions.

DIMENSION 2: INTERNAL CONSISTENCY

Neither of the two systems had a health facility with moderate or extreme outliers. SPT forms and electronic records were more than 99% consistent in both the current and previous evaluations. Penta 1 - Penta 3 dropout rate was 3.5% in the existing HMIS, and 15.8% and 16.1% in MyChild Solution's present and pilot evaluations respectively. Dropout rates for both systems are in the expected direction (i.e. not negative). However, MyChild Solution's dropout rates are higher than that of the existing HMIS. The main reason is that they use different methods for calculating the dropout. MyChild Solution uses the actual number of children who received Penta 1 and are due for Penta 3 but did not receive it as the numerator, whilst the existing HMIS uses aggregate Penta 1 minus aggregate Penta 3 values as a numerator. The presence of outliers was not evaluated in the previous evaluation and the SPT forms and electronic records consistency cannot be measured for the existing HMIS because it does not apply (the system does not use SPT forms and individual electronic records). These results are illustrated in **Table 3.4**.

Metric	Existing HMIS	MyChild Solution (Current Evaluation)	MyChild Solution (Previous Evaluation)
Health facilities with moderate or extreme outliers (n (%))	0 (0%)	0 (0%)	Not calculated
Penta 1 - Penta 3 dropout rate	4%	16%	16%
SPT forms and electronic records consistency	Not Applicable	100%	100%

Table 3.4. Presence of outliers, related indicators consistency, and electronic records and SPT forms consistency for the existing HMIS and MyChild Solution (current and pilot evaluation).

In MyChild Solution, tally sheets and Monthly Returns are perfectly consistent for the selected months in the selected health facilities as shown in **Table 3.5a**. In Sukuta, Fajikunda, and Polyclinic, there are fewer total doses in the immunisation registers than in

Month/Comparison	Verification Factors by Health Facility					
	Serrekunda	Sukuta	Fajikunda	Polyclinic	Gunjur	Sibanor
December 2018						
Tally sheets and Monthly Returns	1	1	1	1	1	1
Register and Monthly Return*	1	0.99	0.99	0.93	1	1
Monthly Return and DHIS-2	1.6	1.04	0.98	1	1	1
January 2019						
Tally sheets and Monthly Returns	1	1	1	1	1	1
Register and Monthly Return*	1	0.97	0.97	0.93	1	1
Monthly Return and DHIS-2	1.21	1	1.32	1.01	4.62	2.5
February 2019						
Tally sheets and Monthly Returns	1	1	1	1	1	1
Register and Monthly Return*	1	0.97	0.98	0.97	1	1
Monthly Return and DHIS-2	1	1	1	1.03	1.01	1

Table 3.5a. Verification factors of total Penta 3 doses between different immunisation data sources using MyChild Solution.

* Register and Monthly Return totals now have a verification factor of 1.0 (100% consistent) across all health facilities and months. The acceptable difference between the two data sources was caused by a technical issue that has been detected and corrected.

the Monthly Returns, though within the acceptable limits of $\pm 10\%$ (0.9 – 1.1). This small and acceptable difference was due to a technical issue that has been identified and fixed. Total doses in the immunisation register are now perfectly consistent with those in the Monthly Returns: they have a verification factor of 1.0. There was serious under-reporting from the Monthly Returns to DHIS-2 for Serrekunda in December 2018, and Serrekunda, Fajikunda, Gunjur, and Sibantor in January 2019. The analysed months were prior to the

DHIS-2 integration being routinely used. Given the very recent full routine integration of MyChild Solution with DHIS-2, such under- or over-reporting should be zero for MyChild Solution because monthly vaccine dose totals would automatically be transferred to DHIS-2 from MyChild Solution.

Month/ Comparison	Verification Factors by Health Facility					
	Serrekunda	Sukuta	Fajikunda	Polyclinic	Gunjur	Sibanor
December before the implementation of MyChild Solution						
Tally sheets and Monthly Returns	1.00	1.00	0.98	1.00	1.05	NA
Register and Monthly Return	0.03	0.02	0.08	0.90	0.28	0.87
Monthly Return and DHS 2	1.00	1.01	1.00	1.26	1.00	NA
January before the implementation of MyChild Solution						
Tally sheets and Monthly Returns	1.00	1.01	1.01	1.00	0.91	1
Register and Monthly Return	0.02	0.05	0.15	0.96	0.27	0.72
Monthly Return and DHS 2	1.00	1.00	1.00	1.00	1.00	NA
February before the implementation of MyChild Solution						
Tally sheets and Monthly Returns	1.00	0.97	1.00	1.00	0.97	1
Register and Monthly Return	0.08	0.00	0.15	0.82	0.35	0.84
Monthly Return and DHS 2	1.00	1.00	0.90	1.00	1.00	NA

Table 3.5b. Verification factors of total Penta 3 doses between different immunisation data sources using the existing HMIS. NA means data was not available for at least one of the data sources used for the comparison.

Table 3.5b summarises verification factors of total Penta 3 doses for the existing HMIS. Although most (33/54) of the verification factors are within the DQR Toolkit's acceptable

limits, a significant (21/54) number of them are outside the limits or not ideal. Inconsistency between immunisation registers and Monthly Returns (16/54) had the highest occurrence, followed by missingness (NA) in one of the data sources (4/54), and the lowest occurrence was for inconsistencies between Monthly Returns and DHIS-2 values (1/54). Immunisation registers were not consistently updated when the selected health facilities were using the existing HMIS.

DIMENSION 3: EXTERNAL CONSISTENCY

Figure 3.1 shows Penta 3 coverage from different sources. All the coverages are within 33 percentage points of each other, thus within the acceptable limits set by the DQR Toolkit.

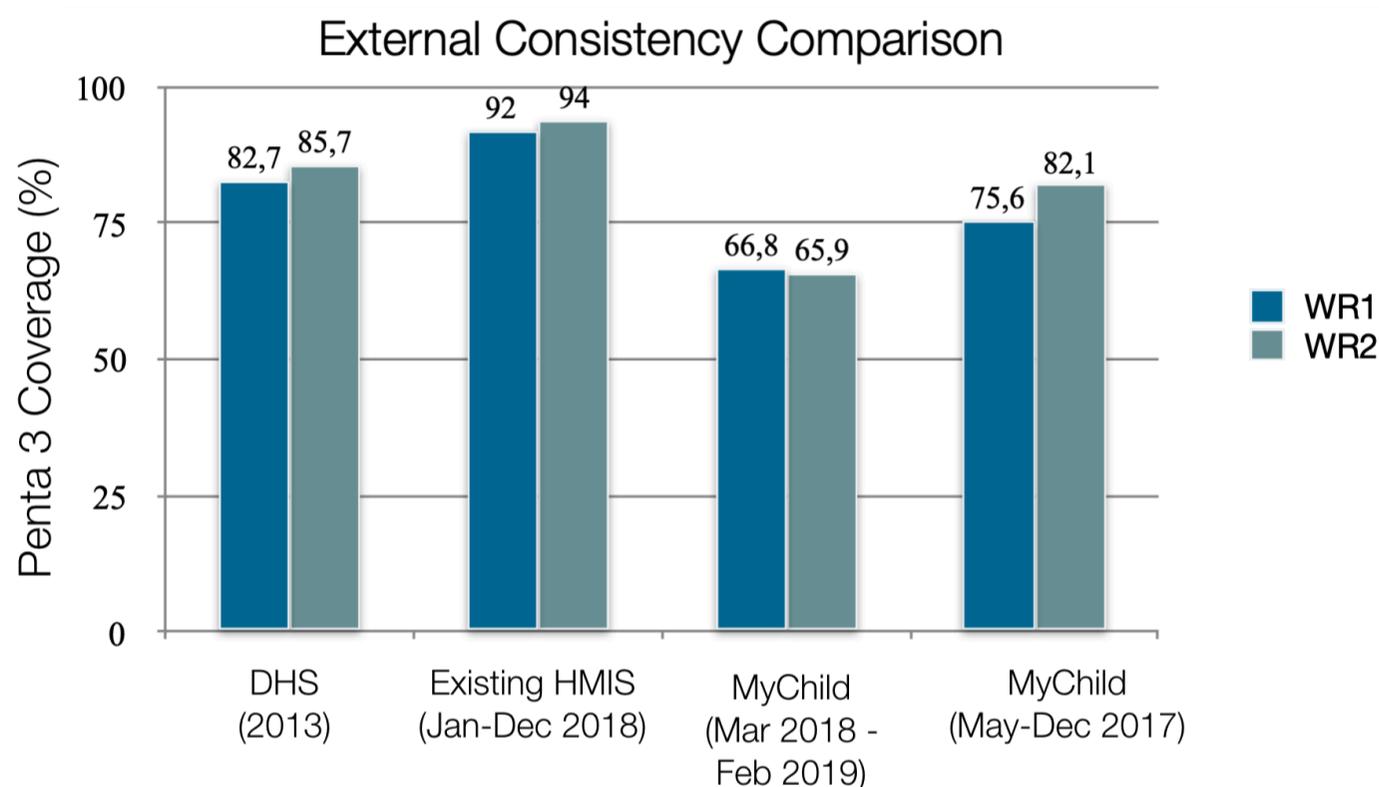


Figure 3.1. Penta 3 coverage consistency using different data sources: MyChild Solution, the existing HMIS and The Gambia Demographic and Health Survey (DHS) 2013.

OTHER DATA QUALITY INDICATORS EVALUATED

Table 3.7a summarises incidences of recording errors in the pilot and current evaluations. The current evaluation seems to have a higher proportion (1.5% versus 1.1%) of children recorded as having received multiple doses of BCG during different visits compared to the pilot evaluation. Please note that this statistic is specific to BCG, so children recorded as having received multiple doses of any vaccine is expected to be higher. However, the two evaluations have the same proportion of children for multiple doses of OPV, Penta, Rota, Pneumo and Measles vaccines during the same visit.

The proportion of children recorded as having received more than one dose of BCG in different visits appears to be higher in fixed than outreach immunisation sessions ($P <$

0.001). However, the proportion of children recorded as having received multiple doses of the same antigen in one visit is the same for both.

Incidence of Recording Errors	Current Evaluation %	Previous Evaluation %
Children recorded as having received multiple doses of BCG during different visits.	2%	1%
Children recorded as having received multiple doses of OPV, Penta, Rota, Pneumo, and Measles vaccines during the same visit.	0%	0%

Table 3.7a. Incidences of recording errors in the current and previous evaluations of MyChild Solution.

Incidences of Recording Errors	Fixed %	Outreach %
Children recorded as having received multiple doses of BCG during different visits.	2%	1%
Children recorded as having received multiple doses of OPV, Penta, Rota, Pneumo, and Measles vaccines during the same visit.	0%	0%

Table 3.7b. Incidence of recording errors in the current evaluation by immunisation session type.

Item (Population = 65261)	Incidence (n (%))
No gender recorded	3781 (5.93%)
No actual birth date recorded	684 (1.05%)
No actual or estimated birth date provided.	60 (0.01%)
Date of birth in the future*	922 (1.41%)
Children more than 5 years at registration**	115 (0.18%)
Total (missing gender and implausible dates)	1721 (2.64%)

Table 3.8. Incomplete indicator level data and implausible dates.

* Birth dates were considered to be in the future if they post-dated the clinic date. This could reflect both an inaccurate recording of the birth date or an inaccurate recording of the clinic date.

** Children might be registered over five if receiving vitA or deworming services.

In **Table 3.8**, one can see that the most common form of incomplete indicator level data and implausible dates is not recording the gender of the child followed by birth dates in the future, defined as birth dates being later than clinic dates. Please note that this metric aggregates both incorrect birth dates and incorrect clinic dates. The proportion of children without dates of birth decreased from 1.05% to 0.01% after the system’s validation rules were applied. The children without birth dates after the system’s validation rules were applied are children that were registered but were not recorded as having received any antigen dose or other services that could be used to estimate the child’s date of birth.

Month	Number of Health Facilities	Number of Visits	Verification Time	
			Seconds	Hours : Minutes
October	19	15061	140068	38:54
November	19	17461	209740	58:18
December	19	17997	167144	46:24
January	19	20520	142731	39:36
February	19	18732	86304	24:00
Average per facility per month		945	7852	2:12
Average verification time per visit in seconds			8	

Table 3.9a. Average frequency of manual verification time per month and per visit.

Average verification time per visit	Average visits per health facility	Number of health facilities	Monthly verification time	Annual verification time
8	945	76	159 hours, 36 minutes	1915 hours, 12 minutes

Table 3.9b. Estimated average national verification time based on the average verification time per visit, the monthly average visits of the 19 implementing health facilities, and the number of health facilities offering immunisation services nationally.

From **Tables 3.9a** and **3.9b**, one can observe that the expected average verification time per health facility per month is 2 hours, 12 minutes and the expected verification time per visit is 8 seconds. On a national scale, the average annual verification time is thus

estimated to be 1915 hours, 12 minutes. This means that it would take one Verification Officer 48 weeks (about 1 year) to verify data from all 76 health facilities per year. This could be viewed as the solution requiring one employee working full time (40 hours per week) to verify data when the solution is scaled nationally. The verification time per region would be much less if each region verified SPT forms for its health facilities.

Data generated using the solution is very accurate, with an accuracy score of 99.0% (287/290). This is one percentage point better than the target for data accuracy set in the Performance Framework Targets. Records for three children did not reflect what was actually in their IWCs - two are already in the system but no visits were recorded for them in the days the clinic cards were photographed and one was registered in the day the photograph was taken but no vaccines were recorded for the child. This is likely due to health workers forgetting to record visits in the MyChild Health Records form.

Performance Framework Targets for the period evaluated have all been met as shown in **Table 3.9** below.

Indicator Number - Indicator Name Definition	Target	Achieved
OI 1.1 - Proportion of system generated electronic reports available to key actors on a timely basis (data timeliness)	99%	100%
OI 1.2 - Proportion of fixed sessions performed that are captured in the electronic reports (fixed session data completeness)	99%	100%
OI 1.3 - Proportion of outreach sessions performed that are captured in the electronic reports (outreach session data completeness)	99%	100%
OI 1.4 - Proportion of child immunisation records that accurately reflect the right child and the right vaccines received in Electronic Immunisation Register (data accuracy)	98%	99%
OI 1.5 - Proportion of the immunisation records collected on Smart Paper Forms digitised correctly (internal data consistency)	99%	100%
OI 1.6 - Proportion of health facilities reporting data without outliers (internal data consistency)	95%	100%
RI 1.2 - Incidence of data recording errors (recording error rate)	2%	2%

Table 3.9. Progress towards Performance Framework Targets.

CONCLUSIONS

MyChild Solution produces high quality data as per the WHO DQR Toolkit. DHIS-2 has only recently been completely integrated in routine work processes. This integration should have in fact eliminated inconsistencies between DHIS-2 values and Monthly Returns as the immunisation data should be automatically fed into the DHIS-2 platform. The manual intervention time associated with MyChild Solution is reasonable. The system has outperformed all the Performance Framework Targets related to data quality set for the current implementation timeframe. Findings from the current evaluation are in agreement with those from the pilot evaluation.

The incidence of recording errors for MyChild Solution was found to be 2.64%. While the HMIS counterpart cannot be measured for comparison as data is not individual-level, this incidence is high enough to warrant further investigation. It is important to ensure these errors are continuously monitored and that actions are taken to minimise the incidence of errors.



CHAPTER 4: DATA USE

INTRODUCTION

MyChild Solution allows access to high quality data to aid health workers in their routine service delivery and reporting. This data comes in different forms, accessible through tools such as online immunisation registers, de-identified offline immunisation and Vitamin A and deworming registers, vaccine requisition notes, Monthly Returns, and tally sheets. All these tools are accessible for both individual facilities and regions through the Dashboard, which also allows to track individual sessions and their attendance from RHDs. Health facilities are also able to monitor their performance through KPIs (automatically generated by the system), that they receive via SMS on a monthly basis. For each of the 16 KPIs, physical run-charts set on the monitoring board are provided on which performance can be plotted and tracked each month as shown in **Figure 4.1** below.

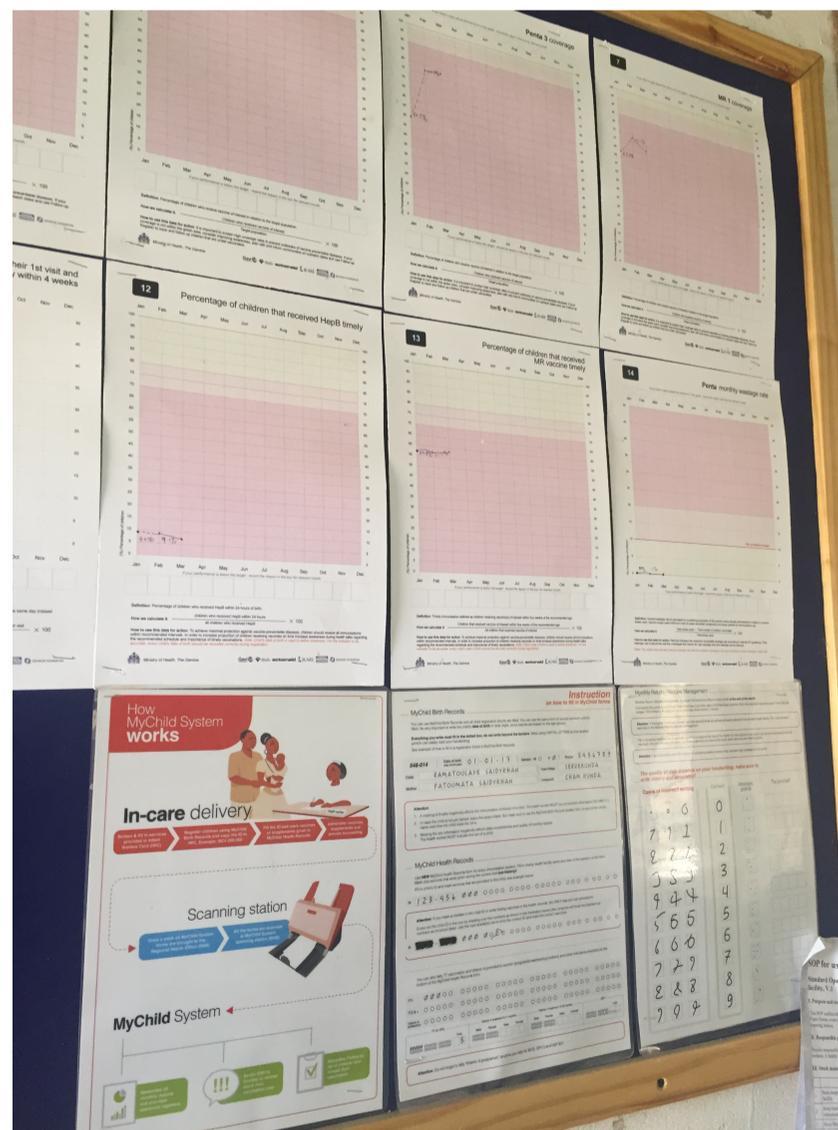


Figure 4.1. Example run charts with KPI performance plotted for three months. Coloured areas in the chart help interpret performance levels for different indicators.

Monthly Returns filled out by health workers include a section in which actions taken to improve specific indicators can be reported to communicate decisions towards continuous quality improvement. This set of tools is termed “Data for Action” (D4A) and their goal is to improve the availability and accessibility of data to enable its use for decision-making with the hope to foster a culture of continuous quality improvement. Future extensions of this initiative may include extending and adapting this framework to the regional and national level and establishing feedback loops between the different levels to facilitate feedback and long-term planning.

The goal of this component of the current evaluation is to determine to what extent all the key elements of the D4A toolkit are present and utilised at the health facility level as well as gaining feedback from health workers on the solution’s usefulness in terms of data-driven decision-making and of any improvements or extensions that could enhance its effectiveness.

METHODOLOGY

The evaluation of data use was based on an observation checklist and semi-structured interviews with health workers to understand their use of and feedback about the solution and its data tools. Additional information to confirm and complement findings was gathered through the country project coordinator and through Shifo Foundation.

OBSERVATION CHECKLIST

An observation checklist was developed and used to measure to what extent the different components of the D4A solution are implemented at health facilities. Checklist items included the implementation of different aspects of the D4A solution, including SMSs with KPIs, KPI plots and Monthly Return SPT forms. Reasons for insufficient or incorrect implementation were collected through comments. The same health workers participating in the interviews were asked to provide evidence of the various checklist items, where possible.

SEMI-STRUCTURED INTERVIEWS

Semi-structured interviews were carried out with health workers covering topics including their use of registers, their use of data for decision-making and sources of data other than MyChild Solution. Participants were encouraged to provide anecdotes of how they used data provided through MyChild Solution to make decisions. Interviews were transcribed for content analysis.

INTERVIEW ANALYSIS

Content analysis was carried out in two phases. Because of the length of the interviews and the wide variety of topics covered, the first phase consisted in parsing interview sections according to the topic of discussion using the codes provided below. These codes were developed based on the research questions guiding the study.

Code	Definition
Sources of Data	Participants discuss sources of data that help them in their functions including routine healthcare delivery and reporting.
Uses of Data	Participants discuss ways they interact with or make use of the data provided by MyChild Solution.
Mentions of Indicator Performance	Participants provide specific examples of KPIs and their performance.
Reasons for Low KPI Performance	Participants explain reasons for why indicators are not performing well.
Actions Taken/Decision-Making	Participants provide anecdotes relating to ways they used the data provided by MyChild Solution to make decisions or establish actions to be taken.
Data Communication	Participants talk about ways in which data is discussed, formally or informally, through meetings or conversations, within the facility or with other units or entities, including RHDs.
Advantages/Positive Views of MyChild Solution	Participants mention ways in which MyChild Solution is positive or helpful to them.
Challenges/Issues with MyChild Solution	The passage contains explicitly mentioned or implicitly inferred challenges experienced by participants related to MyChild Solution.
Comparisons to the Existing HMIS	Participants explicitly compare MyChild Solution to the pre-existing system.
Feedback on MyChild Solution	Participants provide feedback for how MyChild Solution could be improved, or for how issues not specific to MyChild Solution affect their use of MyChild Solution.
Monthly Return D4A Section	Participants discuss whether and/or how they fill in the D4A section of the Monthly Return SPT form.
Benefits of Scale-Up	This code reflects benefits of scale-up or topics that are mentioned or implied as issues by interviewees that would be resolved in case of scale-up.

Reversing to the Old System?	This code is used specifically in reference to the question of whether health workers would prefer to remain with MyChild Solution or reverse back to the original HMIS system.
Functions of the RHD/Country Project Coordinator	This code is used in reference to functions or feedback specific to the RHD and the country project coordinator and relevant interactions.
Cell Phone Type	This code is used to survey what type of cell phone health workers possess.
Data Access	Participants discuss topics of relevance to data access.

Table 4.1. Codes used to classify passages in interviews on data use for the first phase of content analysis.

During the second phase of content analysis, specific topics of interest including sources of data, uses of data, advantages/positive views of MyChild Solution, challenges/issues with MyChild Solution and feedback on MyChild Solution were coded line-by-line to compile a comprehensive list of tools, feedback, advantages, and challenges, the most salient of which are reported in the Results section. A more comprehensive report with all feedback, including clinic-specific and minor feedback will be handed to the project team for internal use.

RESULTS

OBSERVATION CHECKLIST RESULTS

Overall, health facilities were found to have a good integration of data use tools and processes as indicated by the observation checklist results in **Table 4.2**. However, reporting and knowledge of actions taken to improve KPIs in the Monthly Return form was very low. Only one health worker could show he/she reported actions taken to improve selected KPIs on the Monthly Return forms. Only two clinics in the sample were confirmed by the project team as having reported actions taken to improve KPI performance on the Monthly Return form. Out of the two Monthly Return forms provided by the project team from these clinics, five out of six and four out of six KPIs respectively were selected for improvement by each clinic. In the first case, four out of five indicators selected had actions listed related to sensitisation (the remaining KPI selected for improvement being data quality). In the second case, all four KPIs had improvement actions indicated as “health talk”, i.e. actions directly related to sensitisation. The overall low use of this section, the high number of indicators selected as well as the vast majority of actions marked as being sensitisation (eight out of nine marked KPIs for the two clinics using the section) suggests that the form itself or training and SOPs pertinent to the form should be improved. Further, a better

understanding of what actions can practically be expected of clinics should be gained given the overwhelming dominance of sensitisation as an action listed.

	WR1	WR2	TOTAL
The health worker can demonstrate to have received an SMS with KPIs	4/7 (n/c = 2)	3/4 (n/c = 1)	7/11 (n/c = 3)
A notice board is set up in the health facility	7/7	4/4	11/11
KPI graphs are pinned to the notice board	6/7	4/4	10/11
KPI plots have been updated for the past 3 months	4/7	3/4	7/11
The facility has the most up-to-date version of the Monthly Return SPT form (Version 8)	5/7 (n/c = 1)	3/4 (n/c = 1)	8/11 (n/c = 2)
Meetings are conducted to discuss performance according to what the health worker says	4/7 (n/c = 2)	3/4 (n/c = 1)	7/11 (n/c = 3)
Health workers are reporting what actions are taken to improve KPIs in the D4A section of the Monthly Return, as observed by evaluator	0/7 (n/c = 1)	1/4 (n/c = 3)	1/11 (n/c = 4)
The health worker remembers which indicators they are improving based on the D4A section of the Monthly Return form	0/7 (n/c = 1)	4/4	4/11 (n/c = 1)
Health workers know who to contact in case of issues (project coordinator and/or RHD staff e.g. EPI ROO)	7/7	4/4	11/11

Table 4.2. Data use checklist regional and cumulative scores. Use of “n/c” reflects instances where items could not be checked due to insufficient fulfilment of the criteria or technical issues, such as lost phones, unavailable forms or no internet connectivity during the interview. Please note that the ongoing bed-net distribution campaign during the evaluation fieldwork likely affected scores due to focal people for MyChild Solution being offsite for the month in many clinics.

INTERVIEW ANALYSIS RESULTS

Analysis of interview data and observations are summarised below, with some relevant quotes. The challenges and feedback for improvement reported in these results are limited

to the feedback extracted directly from interviews with health workers, either as feedback and challenges explicitly reported by health workers or as feedback and challenges interpreted as such by evaluators based on the context. A list of more general feedback provided by the evaluators themselves can be found in the last chapter.

SOURCES OF DATA AVAILABLE TO HEALTH WORKERS

MyChild Solution constitutes the main source of immunisation data available to health workers. Additional sources of data include vaccine and dry stock ledgers (for daily stock tracking when removing and returning vaccines to fridges and related supplies such as syringes and safety boxes), daily temperature charts for cold chain equipment and requisition notebooks. Further immunisation data is obtained through Vaccine Vial Monitor (VVM), Vaccine Visibility Study (VVS) in some facilities and Integrated Disease Surveillance and Response (IDSR) under five and above five books that are used for both immunisation and disease surveillance.

Some parallel systems or aspects of tools that constituted parallel systems were found. For example, the EPI chart in **Figure 3.1** was found at all facilities and regional offices. This chart is used to track coverages based on targets, similarly to MyChild Solution run-charts. Users calculate monthly targets and relevant indicators for each month based on MyChild data. This chart, however, requires aggregating data for each month and thus necessitates additional calculations beyond what is provided by MyChild Solution.

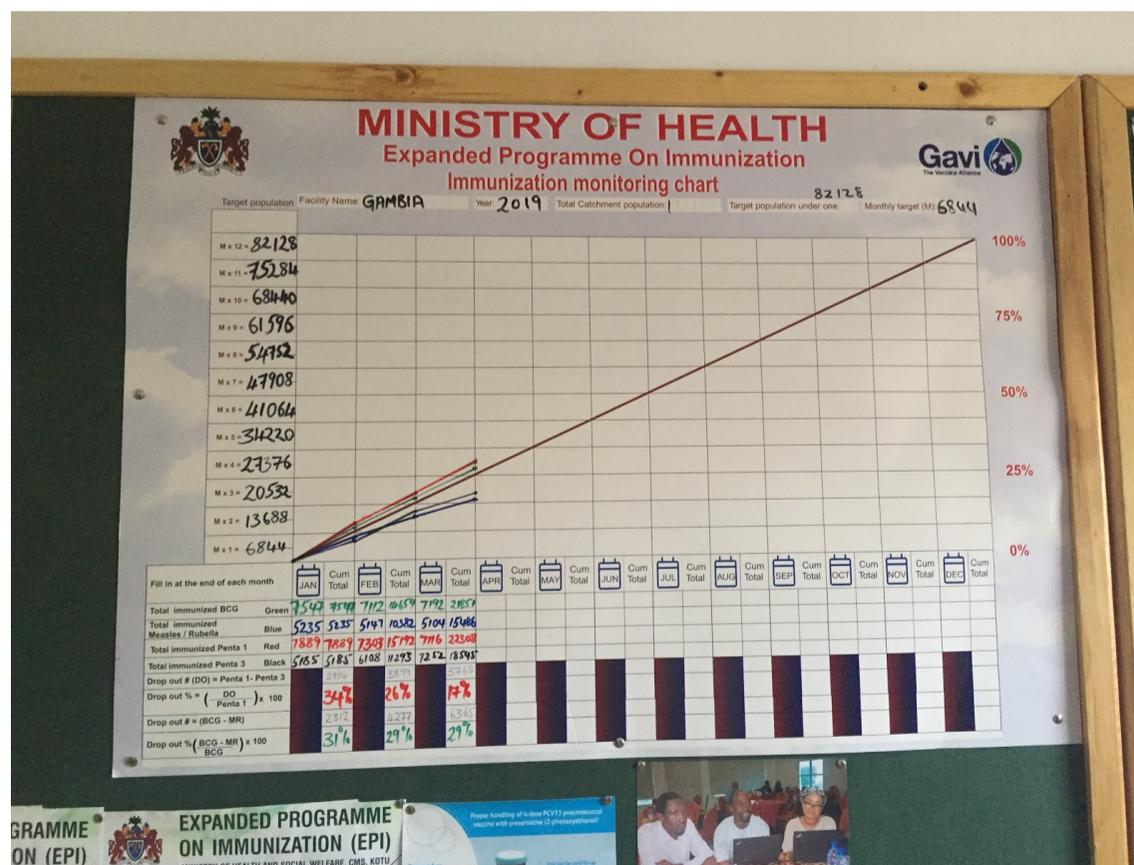


Figure 4.2. EPI chart used to track vaccine coverages provided by the MoH.

Various other data and information sources were mentioned that were related to activities such as surveillance and environmental inspections carried out by the same health workers but that were not specific to immunisation.

PERCEPTIONS OF THE DATA FOR ACTION SOLUTION

When asked if they would like to switch back to the conventional HMIS, all health workers reported they prefer MyChild Solution to the original system and would not like to switch back. Some of the specific advantages discussed in the interviews are listed below.

- Health workers appreciate that MyChild Solution allows for higher data reliability. This allows higher consistency within facilities that enables higher trust in trends over time.

“Before, you know, I can prepare the Monthly Return this month, the other one will prepare the other one. But now it's the same system that is preparing the Monthly Return. So it helps us discuss more. You know, the system doesn't make mistakes. Only us we make, we can make mistakes [...] at least now we know the quality is based on us, automatically, it's not like whoever is preparing the Monthly Return. Whatever we receive we know is our work”.

- Higher data reliability and consistency also allow comparability between facilities.

“Yeah we trust it and we can compare ourselves with other health centres. Before we cannot compare ourselves with other health centres because you can cook the data. You can also tally [...] less than what you do or more than what you do. But the MyChild, the amount of people that you immunise is what you're going to see. So at least you know the quality, [it] is giving us quality data. Yeah...”.

- MyChild Solution enables remote surveillance and support from the RHD, allowing for more agile decision-making.

“The RHD can even tell us what embark on without coming here or even burning their fuel because they already know what is happening in the health facility”.

- MyChild Solution allows easier data access and durability of the data without deterioration associated with paper-based records.

“Because the beauty of the MyChild is that any point in time you want to retrieve, any archiving information, it is readily and easily accessible compared with the previous flows. Because with the previous flow, it is, you know, manual. [...] if this particular page is worn off, if it is not properly, you know, sealed or properly archived again, you will not access it anymore. But with the MyChild system, [it] is electronic, even after 50 years, any point in time you want to retrieve any information, you can easily retrieve that information”.

- MyChild Solution not only provides more information, but it also allows to have an electronic back-up with a potential for long-term accessibility of data.

“Even you lost that file but you still have it in the system, you can just [...] get into the system, you still re-track it without going to the regional office or call the regional office or doing this and this [...]. If MyChild continues, if I need information five years or six years ago I am able to have it because it’s in the system...so, I think system is more effective than manual, yes”.

CHALLENGES AND FEEDBACK OF THE DATA FOR ACTION SOLUTION

As indicated in **Table 4.2**, health workers had access and could generally use data available through MyChild Solution. In some cases, health workers did not have direct access to MyChild Solution data and tools. However, the majority of health workers interviewed could access data without going through a second person. Health workers were able to retrieve vaccination history in case of lost IWCs. While most could use de-identified registers, some still contacted the RHD or project coordinator through WhatsApp to retrieve vaccination history in case of lost IWCs. Health workers generally preferred offline (PDF) de-identified registers, because they do not require cell phone credit for use and are available in areas with low internet coverage.

One commonly reported limitation related to data access is the need for health workers to buy their own credit to access or download data available through MyChild Solution. The need to subsidise cell phone credit used towards MyChild Solution was commonly reported as feedback. Besides few cases of temporary phones, all health workers had smartphones. Few health workers reported technical issues affecting data accessibility such as a stolen phone (requiring a temporary non-smartphone substitute), broken phones, low storage space and software (e.g. related to Google Play) issues.

Internet coverage was also reported as a common limitation to access online data. While some health workers provided feedback that laptops and printers would enhance their experience with MyChild Solution, this feedback should be considered in the context of widespread internet connectivity and reliability complaints.

The only case of a facility with no plots was the result of staff turnover timing. High staff turnover rates can result in health workers who are not trained in MyChild Solution. This is particularly problematic if a single health worker is responsible for immunisation at a given clinic. One health worker suggested that training for MyChild Solution could be integrated in the curriculum for Public Health Officers’ (PHO) academic training to ensure that every health worker graduating is able to effectively use MyChild Solution.

As in the previous evaluation, while the feedback for MyChild Solution was overwhelmingly positive, the high time intensity of registration was reported as an issue specific to the first months of implementation of MyChild Solution. This is because in the

first few months of implementation, every child that comes to the clinic must be registered in order to be captured in the system. This is particularly challenging for health workers managing immunisation activities alone. A recommendation was put forward by a health worker that a surge in human resources should be provided to facilities in the first few months of implementation.

A commonly reported issue, particularly by far away clinics, was delivering SPT forms to RHDs on time. RHDs close at 4:00 PM, which is the same time as the official closing of health clinics, requiring health workers to often leave health clinics and close early to make it on time to deliver forms at the RHD. This may affect the timeliness of SPT form delivery and consequently of report generation and timely data availability for the whole region, as SPT form delivery is likely to accumulate at the end of the month. Feedback relating to this issue included having SPT forms collected from clinics by RHD staff.

Various health workers complained that they do not consistently receive hard copies of Monthly Returns, particularly in WR2. This is problematic during surveillance visits, as clinics might be marked down for not having these documents available for quality assurance assessments. Health workers emphasised that this was not due to a lack of support or willingness on the part of the regional health staff, but rather due to a lack of resources such as printer cartridges or paper. One suggestion was put forward that having printers at the health facility could help. Given the high dedication of staff at the region, providing them with appropriate resources for printing is likely to be sufficient to solve this pressing issue.

Health workers reported receiving some of their data late, such as SMSs and Monthly Returns. This may be due to forms being turned in late. This feedback is in disagreement with results of timeliness analysis carried out in Chapter 3. This is most likely due to the fact that although reports may be generated on time by the system, they are manually sent through WhatsApp to health workers, which may result in delays. While Shifo Foundation also sends these reports directly to health facilities via email, emails might not be regularly accessed by health workers. Late reports and SMSs are problematic due to health workers' need to transfer immunisation data to the comprehensive facility HMIS return. In some facilities this resulted in HMIS returns being submitted late, while in others this resulted in HMIS returns being submitted on time but with immunisation data left blank. RHDs may be filling in this incomplete data upon receipt of Monthly Returns from MyChild Solution. This may no longer be problematic for national immunisation data reporting, however, since the very recent integration of MyChild Solution with DHIS-2. Establishing a standard procedure to leave this section blank given this new feature should be considered to avoid any confusions and unnecessary pressures on health workers.

All but two health facilities were found to leave the D4A section in the Monthly Return blank. Health workers reported that actions could not be reported before receiving an SMS with their past month's KPIs that would allow them to establish which KPIs required actions. This suggests that their understanding of this section is on a more month-by-month basis as opposed to as a long-term goal-setting exercise. Health workers that were probed as

to whether they would fill out a separate form later in the month for this section generally responded positively to the suggestion.

Some health workers reported that mothers often complain that they do not receive SMSs even if they provided a cell phone number. This is likely due to having supplied the wrong number. During observations of data verification processes at the regional level, for example, several cases of phone numbers that were too short were observed. One health worker suggested that mothers are often waiting for an SMS to go to the clinic, which may result in the opposite effect on coverage as mothers may not present to clinics if they are relying on SMS reminders.

Further, several health workers suggested that coverage and dropout indicators are problematic. Mothers moving location to give birth, demographic changes and the current exclusion of clinics like Brikama, private facilities (until very recently) and other regions from MyChild Solution affect their performance in relation to targets. This issue of “artificial defaulters” that lowers coverage is crucial when thinking of data use and continuous quality improvement.

REQUESTED EXPANSIONS OF MYCHILD SOLUTION

Based on their positive experience with MyChild Solution, various health workers urged the MoH, Shifo Foundation and its partners to extend MyChild Solution to other areas for which the same health workers are responsible. The most frequently proposed areas for direct extensions were disease surveillance and birth registration.

- **Disease Surveillance:** several health workers pointed out that disease surveillance and immunisation are two sides of the same coin. Integrating disease surveillance in MyChild Solution would allow a meaningful link between vaccination coverage in different areas and cases or outbreaks of vaccine-preventable diseases.
- **Birth Registration:** Many health workers involved in immunisation are also involved in birth registration. With the addition of few variables, such as the father’s name, to the registration forms, birth certificate generation and birth registration could be streamlined. Combining the two systems could also ensure that every child whose birth is registered is in the immunisation registry, potentially boosting coverage through defaulter tracing.
- **Community involvement activities such as environmental inspections:** One health worker suggested that MyChild Solution could be extended to other activities carried out by the same health workers such as environmental inspections and other community engagement activities. For example, it could help generate maps or target populations for specific locations using the electronic registry.

Besides proposing to expand to different areas of work carried out by health workers, several health workers stressed that MyChild Solution should be expanded in other ways as follows:

- **Scale MyChild Solution to other areas:** several health workers pointed out that non-participating clinics in the regions, namely Brikama and private clinics, and other areas of the country not having MyChild Solution affect the reliability of indicators such as coverage, artificially lowering them. Based on their positive experience with MyChild Solution, they urged to expand the solution to these clinics.
- **Ensure the durability of MyChild ID numbers:** other than expanding the reach of MyChild Solution in terms of areas of focus and geography, some health workers stressed that they hope to see the ID numbers of children being accessible and preserved in the long-term. They said this would be important when using ID cards and passports, as vaccination records are often requested later in life when travelling or studying abroad.

USES OF DATA

While the implementation of different aspects of the D4A solution were at different stages, as previously indicated, health workers had an overall good understanding of the data provided by the solution and reported success in its routine use. Use of data for longer-term continuous quality improvement through tools such as the Monthly Return D4A section were not well integrated at this stage. While some health workers still used WhatsApp to request immunisation records, the vast majority of health workers could successfully use registers to access immunisation data in the event of missing IWCs. When asked whether they preferred the offline de-identified registers or the online registers, overwhelming preference was given to the offline downloadable PDF versions because they don't require reliable connectivity and don't require cell phone data usage at their own cost to access. Some health workers reported making use of defaulter tracing lists and most interviewed health workers had time-points plotted on charts, although not all of them were updated to the latest month, possibly due to disruptions caused by the bed-net distribution campaign occurring during clinic evaluations. Example use of data available through MyChild Solution are reported below.

- Health workers explained their use of data to make decisions and gauge their performance, as in the example below:

"That [the Data for Action Solution] is excellent. The data for action will help us to monitor our achievements easily and we'll know where we need to improve and where we should not improve and where we achieved and where we are, like, not achievement for the months. So the data for action help us to take decision, [...] yeah it helped us to make decisions and accurate decisions, and positive decisions".

- Health workers also explained their use of data as a starting point to investigate possible reasons for low performance.

“Because if you have a problem in your coverage, you should try and then look at different areas. Whether the attribute of the staff, or whether there is social factors at the community, or a ceremony that... made womens not to attend clinics in that particular months... or maybe the person immunising always make a giving abscess to the children after immunisation, children are having abscess, abscess, abscess so mothers become fed up, so they become afraid. They say now - wo, instead of going to [PHO name and facility], let me go to [other clinic name] clinic. So we just have to follow those trend to see whether. So that is the reason of the chart... every chart will tell you what is happening”.

- An unexpected use of data was towards constructive competition with other health facilities, which results in pride in positive performance, as seen from KPIs, and motivation to improve KPIs or “win”.

“We normally discuss it [...], even informally, we joke with it. [...] like this month we knocked this health center and this health center, and they're bigger than us. So next month we want to be number one in the region, sometimes we discuss it. You have to come early in the morning [...] no joking now, we need to win this game. [...] We work as a team and we need to win. So this year we're going to be Manchester City. We worked till the last drop and we are going to win the league”.

- One example of innovative uses of data provided by MyChild Solution was the use of individual-level immunisation data to inform surveillance activities and predict areas with higher likelihood of incidences or outbreaks of vaccine-preventable diseases.

“Now you see that you know that this one are not vaccinated, these ones don't take all the antigens. [...] And from that you can do your defaulter tracing mechanism. Through that also, you can also know the number of children that are not vaccinated in that cohort. And there, your mind of surveillance will come in because we say that surveillance is the data collection that you are doing. [...] And you see that children are not being vaccinated which can be a risk for the general population in the near future. Then you will see to it that these people need to be vaccinated and you take action before there will be an outbreak of that disease”.

CONCLUSION

Overall use of data tools provided by MyChild Solution was good, with the exception of reporting of actions taken to improve KPIs through the D4A section of the monthly report. Key challenges reported by health workers were the need to use their own cell phone credit to access data, issues of internet connectivity and human resource turnover, among others. Health workers stressed their higher trust in the data and the better accessibility of the data

provided by MyChild Solution compared to the conventional HMIS system. Expansions of MyChild Solution were requested, particularly in the areas of disease surveillance and birth registration. Further, scaling up to non-participating clinics would ensure indicators are more reliable as they would not be affected by artificial defaulters, which currently affect the reliability of coverage and dropout metrics generated by the system.



CHAPTER 5: ADMINISTRATIVE TIME EFFICIENCY

INTRODUCTION

Besides improved quality, availability and accessibility of data, one of the primary advantages of MyChild Solution from health workers' perspective is presumably the administrative time savings. With less time required to fill out tedious paper forms involved in conventional HMIS systems, health workers would presumably have more time to spend on activities that improve the quality of healthcare delivery such as patient counselling and education, and outreach. Based on these assumed benefits, the Results Framework features administrative time saving as an indicator (OI 1.9), with the goal of reducing the administrative time burden by 30% by April 2020 and by an additional 30% by 2022.

Time-and-motion studies require making observations and tracking time taken to complete identified sub-tasks using stopwatches, with the same sub-tasks being observed multiple times to produce statistically meaningful data of time recordings. This methodology is widely used to evaluate changes in time utilisation, with many specific examples from the healthcare setting (Pizziferri et al., 2005; Hendrich et al., 2008). The 2018 pilot evaluation found that MyChild Solution resulted in considerable time savings, with an estimated time saving of 60% per fully vaccinated child that received all Vitamin A and deworming doses, of 55% for vaccination procedures alone, and of 64% for Vitamin A and deworming procedures alone. Administrative time savings for monthly reporting were of 97%, whereas those for end-of-day administration tasks were of 26% (Sowe et al., 2018).

METHODOLOGY

TIME-AND-MOTION STUDIES

Administrative time efficiency was evaluated using a time-and-motion study. A time-and-motion study involves breaking down processes into their constituent tasks and observing and recording the time taken to complete each task repeatedly. Data collectors working with the evaluation team made observations and tracked the time taken to complete identified sub-tasks using stopwatches. The methodology was based on the previous evaluation methods to ensure comparability. Baseline controls for the conventional

MyChild Solution	Existing HMIS
First Visits	
<ul style="list-style-type: none"> • <u>Fill in MyChild Birth Record</u> • <u>Issue and fill in the IWC or ANC</u> • Fill in MyChild Update form if needed • Screen the IWC or ANC if new to MyChild but not registered • <u>Fill in MyChild Health Record</u> • Administer vaccines • Provide vitamins/deworming • Individual counselling 	<ul style="list-style-type: none"> • <u>Issue and fill in the IWC or ANC</u> • <u>Fill in Tally Book</u> • Register child and fill in provided vaccines in the Vaccination Register • <u>Register child and fill in the VitA and Deworming Register</u> • Administer vaccines • Provide vitamins/deworming • Individual counselling
Follow-up Visits	
<ul style="list-style-type: none"> • <u>Screen and fill in the IWC</u> • <u>Fill in MyChild Health Record</u> • Fill in MyChild Update Form if needed • Administer vaccines • Provide vitamins/deworming • Individual counselling • Special case: retrieve information from MyChild system when an IWC is lost 	<ul style="list-style-type: none"> • <u>Screen and fill in the IWC</u> • <u>Fill in the Tally Book</u> • <u>Find child and fill in the Vaccination Register</u> • Update the Vitamin A and Deworming Register • Administer vaccines • Provide vitamins/deworming • Individual counselling • Special case: retrieve information from the Vaccination Register when an IWC is lost
Daily Reports	
<ul style="list-style-type: none"> • <u>Fill in/update the Vaccine and Other Supplies Ledgers</u> • Count vaccine balances • Revise forms for data entry issues 	<ul style="list-style-type: none"> • <u>Sum up the Tally Sheet</u> • Calculate wastages • Count vaccine balances • <u>Fill in/update the Vaccine and Other Supply Ledgers</u> • Prepare daily or weekly summaries
Monthly Reports at the Health Facility	
<ul style="list-style-type: none"> • Revise daily/weekly summaries (if applicable) • <u>Fill in the Monthly Return Part I (Stock Management, Safety Boxes Sent for Incineration, Temperature, Shortage of Any of the Following)</u> • <u>Fill in the Monthly Return Part II (Functional Cold Chain Equipment, Cancelled Sessions and all of page 2)</u> • Physical counts • Facility level meeting (if applicable) • Transfer immunisation data to the HMIS Comprehensive Facility Return 	<ul style="list-style-type: none"> • Revise daily/weekly summaries (if applicable) • <u>Prepare Monthly Return</u> • <u>Prepare combined Requisition and Issue Note</u> • Physical counts • Prepare a follow-up list (defaulter list) from the existing Vaccination Register • Facility level meeting (if applicable) • Transfer immunisation data to the HMIS Comprehensive Facility Return

Table 5.1. Sub-task descriptions for each category of tasks for both MyChild Solution and the conventional HMIS. Tasks identified as administrative tasks based on the previous evaluation are underlined for both systems.

HMIS system were used from the previous evaluation. Data collection was carried out by four data collectors (Samba Bah, Ismaila Kasseh, Ousman Bah and Alieu Jallow) who were trained by the evaluation team based on the forms developed for this study by the evaluation team with feedback from Shifo Foundation. Participating clinics were the same clinics participating in interviews, which were selected through purposive sampling as seen in **Table 2.1** (in Chapter 2). As many time measurements as could be collected in one session were collected for each process. One additional time-and-motion study was carried out in Brikama District Hospital for the conventional HMIS system. While this trial alone was not enough to have a statistically meaningful representation of the conventional HMIS system, it served as a baseline reference control. Sub-tasks that were identified for both MyChild Solution and the conventional HMIS system can be found in the **Table 5.1**.

ANALYSIS

The administrative time spent to fully immunise a child was considered as the sum of the administrative time of one vaccination first visit plus that of six vaccination follow-up visits, with timed administrative tasks outlined in **Table 5.1**. The administrative time spent to fully provide Vitamin A and deworming to a child was calculated as the administrative time of ten visits. The administrative time spent to fully provide Vitamin A, deworming and vaccination per child was calculated as the sum of the administrative time spent to fully immunise a child and the administrative time spent to fully provide Vitamin A and deworming to a child.

RESULTS

Administrative time efficiency results can be found in **Table 5.2**. Time savings to fully immunise a child, fully provide Vitamin A and deworming to a child and fully provide vitamin A, deworming and vaccination for a child are respectively of 54%, 63% and 59%. According to these results, the target in the Results Framework of reducing the administrative time burden by 30% by April 2020 has been met. Results are generally in agreement with the previous evaluation. It is important to note that the results for the different systems stem from two separate evaluations and have been collected from different data collectors. Time savings results must therefore be considered quite limited in scope and not used beyond the internal purposes of this evaluation. Further, daily and monthly tasks had particularly low sample sizes (one measurement per clinic) and a high variability, resulting in poor generalisability of these results. New baselines could not be obtained due to the scarcity of non-implementing clinics in WR1 and WR2 and the issue that many non-implementing clinics were either private or included integrated birth registration processes, which would result in non-comparable results. It is recommended to more systematically collect baseline data for time-and-motion studies during the process of national scale-up for more reliable results.

	Existing HMIS (2018 baseline)	MyChild Solution (2019 evaluation)	% Time Saved (2019 evaluation)	% Time Saved (2018 evaluation)
Vaccination first visit	4:10	2:29	40%	42%
Follow-up vaccination	1:24	0:33	61%	62%
VitA/ deworming first visit	2:24	0:33	77%	78%
VitA/ deworming follow-up visit	1:24	0:33	61%	62%
Administration at the end of the day	4:44 (16:51)*	9:41	-105% (57%)*	26%
Reporting at the end of the month	2:21:52	9:31**	93%	97%
Time spent to fully immunise a child (7 visits)	12:34	5:47	54%	55%
Time spent to fully provide vitA/ deworming to a child (10 visits)	15:00	5:30	63%	64%
Time spent to fully provide VitA, deworming and vaccination per child	27:34	11:17	59%	60%

Table 5.2. Time-and-motion study results for the conventional HMIS collected in the previous evaluation and for MyChild Solution collected in the current evaluation.

* Values in parentheses are calculated using the time measurements from the baseline control trial conducted in one facility for the current evaluation. The higher value for both MyChild Solution and baseline control data in this evaluation for daily administration tasks suggest that data collectors might have collected data in different ways for what regards daily administration tasks.

** Since physical counts were erroneously timed as part of the filling out of the first part of the Monthly Return form, the average time for physical counting as recorded separately was subtracted from the Monthly Return time-and-motion averages.

Administration at the end of the day was found to be increased in MyChild Solution compared to the previous evaluation baseline. This was surprising based on the fact that filling in and updating the vaccine and other supplies ledgers should be conducted in both systems, with the added time of having to sum up tallies at the end of the day in the conventional HMIS system. However, when comparing this number to the baseline control carried out during this evaluation at Brikama, a higher amount of time was accounted for in daily tasks compared to the baseline in the previous evaluation (16:51 minutes recorded in Brikama this evaluation versus 4:44 minutes in the previous baseline study). This is most likely due to differences in data collection in the current evaluation. For example some

health workers may be conducting physical counts at the end of the day which may have not been included in the previous measurements. When comparing MyChild Solution administrative time to Brikama District Hospital as timed in the current evaluation, time savings were of 57% for end-of-day administration.

	Pilot Facilities	New Facilities
First Visits		
Fill in MyChild Birth Record	1:12 ± 0:19	1:14 ± 0:24
Issue and fill in IWC/ANC	0:39 ± 0:28	1:24 ± 0:36
Fill in MyChild Health Record	0:11 ± 0:03	0:26 ± 0:23
Follow-Up Visits		
Screen and fill in IWC	0:15 ± 0:06	0:22 ± 0:10
Fill in MyChild Health Record	0:12 ± 0:05	0:15 ± 0:06
Daily Processes		
Fill in the vaccine and other supply ledgers	10:11 ± 1:20	9:03 ± 5:19
Monthly Processes		
Filling in Monthly Return Part I (Stock management, safety boxes sent for incineration, Temperature Mark if there was a shortage of any of the following)	9:24 ± 5:18	15:26 ± 14:42
Filling in Monthly Return Part II (Functional cold chain equipment, cancelled sessions and all of Page 2)	11:00 ± 18:58	8:46 ± 4:11

Table 5.3. Comparison of time-and-motion results between pilot facilities (Sukuta, Serrekunda, Gunjur and Sanyang) and new implementing facilities (Sibanor, Sintet, New Yundum, Leman Street, Polyclinic, Bundung and Brufut) in the data collection sample. Uncertainty values reflect standard deviations.

Comparisons between the pilot and newly implementing facilities can be found in Table 5.3. High variability and relatively small sample sizes, especially for daily and monthly processes, leads to high uncertainty in values. High uncertainties might also be the effect of differences between observed health workers. The nature of observations may also limit the reliability of data as health worker performance may be affected by the knowledge of being

observed. However, no significant differences can be established between pilot and implementing facilities considering uncertainties. Some differences, such as for issuing and filling in IWCs or ANCs, are more likely due to random error than to actual differences, particularly given how short this particular process timing is.

Interviews revealed that in some cases, when clinics were very busy under the conventional HMIS system, registers may not have been updated consistently resulting in lower administrative time compared to MyChild Solution in these cases. However, in general, when all required processes are taken into account, MyChild Solution is perceived as partly alleviating the administrative burden on health workers. In considering how time saved is being employed, however, one must consider that health workers are responsible for many other areas besides immunisation, such as disease surveillance, environmental inspections, education and awareness activities as well as birth registration. Based on this, it is not possible to conclude a direct benefit specifically to immunisation-related quality of care based on time savings alone. Further, it is not possible to assume this direct benefit considering that in some cases, health workers *de facto* do not save time as they might have not been updating registers consistently in the conventional HMIS system. A more targeted, systematic study taking into account all health workers' activities and with a more comparable baseline would have to be carried out to better assess assumptions related to administrative time savings.

Further, the definition of “administrative tasks” has been used from the previous evaluation. This does not take into account lengthy processes such as physical counts and other tasks that could be considered administrative in either or both systems (Table 5.1). Further, other immunisation related tasks such as updating the VVM, the VVS, the EPI monitoring chart, and plotting KPIs have not been taken into account. The definition of “administrative tasks” should be carefully revised or a more holistic study should be carried out to understand what percentage of health workers' tasks consists in administrative tasks under this definition. While administration is undoubtedly a burden on health workers, it is important to understand what fraction of their time is actually employed in administration as opposed to other tasks to understand time savings in the wider context of their daily activities.

CONCLUSIONS

Overall, preliminary results suggest that MyChild Solution saves health workers substantial time for the measured administrative tasks related to delivering immunisation services. Administrative task definitions from the previous evaluation were used to ensure data comparability, but these may need to be revised for future time savings evaluations. Time savings should be viewed under the assumption that all the right procedures, such as updating required data collection tools, are done in both systems. Relying on different data collectors for the evaluation compared to the baseline as well as limited sample sizes for daily and monthly tasks limit the statistical significance and generalisability of results.



CHAPTER 6: TOTAL COST OF OWNERSHIP AND TRANSITION OF WORK PROCESSES

INTRODUCTION

The cost of ownership for MyChild Solution and how it compares to that of the conventional HMIS, are key factors in determining the long-term sustainability of the solution and the feasibility of its national scale-up. While the previous evaluation of pilot sites of MyChild Solution in 2018 included a cost analysis component (Sowe et al., 2018), not all costs were considered. For example, costs relating to training on data quality and the use of tools for both the conventional HMIS and MyChild Solution were assumed to be the same and therefore not included. The cost analysis presented in this report, aims to build on the previous one and provide a more comprehensive assessment of costs.

In sharing our costing strategy with various stakeholders, we found that there were different cost definitions that could be applied as lenses when building an incremental cost model. Various questions emerged regarding whether to account for time savings or whether monitoring and surveillance of data quality from the regional level should be expected to change based on the higher data quality performance offered by MyChild Solution. Further, we learned that costs relating to EPI under the HMIS vary from year to year based on funding availability from external partners as opposed to following predetermined yearly budgets. For this reason, two different scenarios were taken into account with different cost definitions as follows:

1. **Current implementation strategy:** This is based on how the existing HMIS and MyChild Solution are currently implemented;
2. **Ideal scenario:** In this scenario, we included costs of additional materials or activities that would be incurred in the event that more funds were available.

To provide a different perspective from the total operational incremental costs of the two scenarios mentioned above, costs were further disaggregated into capital and incremental costs for each scenario. More details on these scenarios and their application can be found in the Methodology section.

When comparing MyChild Solution to the conventional HMIS, one must differentiate between the different data outputs generated by the two systems. MyChild Solution yields

individual-level electronic data that allows monitoring KPIs as opposed to aggregate-level data available exclusively through a paper-based system. The differences in their costs must therefore be considered in context, while maintaining a clear perspective of the differences in the benefits they offer.

METHODOLOGY

COSTING APPROACH

The costing procedure was guided by the WHO Guide for Standardization of Economic Evaluations of Immunization Programmes (WHO, 2008). In line with the guide, an incremental costing analysis was used to identify costs for both the existing HMIS and MyChild Solution. In this approach, only costs that differ between the two systems are calculated. The WHO guide recommends using an ingredients approach to costing because it presents a clearer picture of quantities and their prices. In line with this approach, the total quantity of each cost item and its unit cost are presented and then multiplied to get the total cost for that item. As mentioned above, two costing approaches were used: 1) based on the current implementation strategy of the two systems, and 2) based on an ideal scenario. To give another perspective on the incremental costs, costs were further analysed by presenting capital and recurrent costs. Costs lasting longer than one year, such as equipment costs, were classified as capital costs, and those lasting for one year or less, for example printing and data verification costs, were grouped into recurrent costs (WHO, 2002). The ideal scenario perspective was premised on the scenario that there are adequate resources to fund additional costs. All costs were viewed from the MoH's perspective.

COSTS IDENTIFICATION, MEASUREMENT, AND VALUATION

Incremental operating costs for the two systems were identified by reviewing available documents (e.g. MyChild Solution's SOPs), and by consulting with the national EPI Office and Shifo Foundation on the processes associated with each system. We also used our knowledge of the country's health system. Costs were systematically identified following the immunisation data flow hierarchy in The Gambia, starting from the health facility level and moving upwards.

MyChild Solution costs were estimated using project receipts provided by Shifo Foundation whilst costs for the existing HMIS were obtained from the United Nations Children's Fund (UNICEF) The Gambia Country Office. UNICEF has been procuring services for the printing of EPI-related existing HMIS tools. Data used to estimate the quantities of cost items required at a national scale per year was obtained from the national EPI Office of the MoH and Shifo Foundation. All costs were converted to USD using average March 2018 – February 2019 OANDA historical conversion rates (OANDA, 2019).

Administrative time savings were also costed but not included in the costing model given that time savings are calculated with the assumption that health workers were carrying out all required administrative tasks under the existing HMIS, which was not understood to be the case. Further, including time savings in the costing model does not make sense as health workers presumably operate under time saturation in the current scenario, based on the wide range of duties they fulfil besides immunisation. A multi-way sensitivity analysis was conducted by varying the cost of scanners by 1%, 5%, and 10%. Measurement and valuation procedures for each cost for the existing HMIS and MyChild Solution are described in the following sections.

HEALTH FACILITY LEVEL COSTS

PRINTING COSTS

Printing cost items identified for the existing HMIS are costs for printing immunisation registers, Vitamin A and Deworming Registers, immunisation tally books, and Monthly Return forms. For MyChild Solution, costs identified are printing costs for MyChild Birth Records, MyChild Health Records, MyChild Monthly Returns, and MyChild Birth Records Update forms. The quantity of each item required per year was estimated using one or more of the following: the number of health facilities offering immunisation services, the frequency of immunisation sessions per health facility, RI targets, past distributions, and consumption patterns obtained from the national EPI office and Shifo Foundation. The annual sum for each of the cost items was then multiplied by its unit cost valued using invoices from the current funder of that cost.

COST SAVINGS DUE TO ADMINISTRATIVE TIME SAVINGS

MyChild Solution saves health workers time spent on administrative tasks - see Chapter 5. The time saved was converted to hours and valued using the average hourly wage (derived from the monthly salary) of a PHO working at a health facility. The PHO cadre is the cadre that mostly delivers immunisation services in The Gambia.

MOBILE PHONES AND INTERNET COSTS

Based on the current implementation strategy, there is no need for additional equipment at the health facility level. Health workers use their own phones to visualise information sent to them such as Monthly Returns, immunisation defaulter lists, and electronic tally sheets. Considering that there are plans by Shifo Foundation to create a mobile phone application that health workers can use to access the electronic immunisation register and visualise analytics generated by MyChild Solution, there would be a need to purchase equipment for such purposes if the solution is rolled out nationally. Thus, mobile device costs were included in the ideal scenario costing analysis. The specifications of a

suitable mobile device for this purpose were obtained from Shifo Foundation. The number of mobile devices required was measured considering 76 health facilities delivering immunisation services nationally. The annual cost of a mobile phone was calculated using straight-line depreciation over a useful lifetime of three years. Considering the number of mobile phones to be used in an ideal scenario and the amount of data that would be needed for each phone per year, the annual sum to be spent on internet usage for the phones was estimated.

REGIONAL LEVEL COSTS

EQUIPMENT COSTS

The only additional equipment needed to implement MyChild Solution at the regional level is a scanner. The cost for scanners was obtained from receipts for the pilot phase scanners. The number of scanners to be purchased on a national scale was estimated based on the current implementation strategy of MyChild Solution of one scanner per health region. The straight-line depreciation method was used to estimate the annual cost of a scanner over a useful life of seven years - based on the manufacturer's information. Then, the total number of scanners was multiplied by the estimated annual cost of a scanner.

VERIFICATION TIME COSTS

The time required for manual verification of SPT forms was estimated using monthly verification time logs (see **Tables 3.9a** and **3.9b**) and valued using the salary of a regional data manager. The annual verification time in hours was divided by the civil service daily work hours and the result was then converted to months that were valued using an average regional data manager's salary.

COST SAVINGS DUE TO ADMINISTRATIVE TIME SAVINGS

In the existing HMIS, monthly immunisation returns are manually inputted into the DHIS-2 platform by regional data entry clerks. For MyChild Solution, data entry into the DHIS-2 is automated. The average time used to enter one monthly immunisation return into DHIS-2 was estimated, then valued using the pay grade of regional data managers.

NATIONAL LEVEL COSTS

DATA STORAGE AND BACKUP COSTS

MyChild Solution's annual data storage and backup costs were obtained from Shifo Foundation based on costs charged by the current storage and backup service provider. The data storage needs were calculated based on the current data storage needs of health

facilities in WR1 and WR2. The cost was then extrapolated to the national level annual data storage needs. The SPT continuous development cost was not included in the costing model as it is covered by Shifo Foundation through donations and will thus be free from the perspective of the MoH of The Gambia.

SMS COST

MyChild Solution has the possibility to send out customized messages to indicated phone numbers. Currently, two types of SMS messages are sent out. One is composed of KPIs that are sent to health workers at the end of each month and the other type reminds caregivers to take their children for vaccination when they are due to receive them. These SMS, especially the caregiver reminders, are not required for the system to work. However, they may be a useful component of it. We separated the cost based on the two types of messages sent. The cost for monthly KPIs was based on the number of SMS messages that would be sent per month and the cost per SMS based on the fee of current service provider. Similarly, the cost for SMS reminders was estimated using the expected number of children per year considering the national surviving infants target, the number of times SMS reminders expected to be sent per child, and the cost per SMS based on the cost charged current service provider.

ASSUMPTIONS

While estimating incremental operating costs for the existing HMIS and MyChild Solution, we assumed several costs are the same for both systems. Therefore, we decided to exclude them. These costs include:

1. Printing procurement and distribution processes;
2. Costs to deliver printed materials to the regions and health facilities (MyChild Solution will be using the same delivery strategy as the existing HMIS when rolled out nationally);
3. Costs to deliver forms from the health facility to the regional level (the same existing structures will be used);
4. Costs for storing printed materials at the health facilities and RHDs;
5. Electricity, computers, and internet access at RHDs;
6. DHIS-2 maintenance costs;
7. Time taken to scan SPT forms at the regional level (this is negligible as scanners can scan one sheet per second).

Another assumption we made worth mentioning is that a data verification officer would be employed. In the event that a data verification officer is not employed, data verification cost would not be incurred for MyChild Solution. This assumption may or may not be correct depending on the strategy taken by the MoH. Transfer of Work Processes Checklists

Checklists were developed for both the eleven health facilities and the two implementing RHDs to ensure that all necessary work processes were fully integrated at the time of the evaluation. Checklists were developed by first synthesising the standard operating procedures (SOPs) for key processes relating to MyChild Solution. Checklist items corresponding to these processes and relevant tools were produced. The perspective used when developing these checklist items was to consider only items whose absence would jeopardise the system. For example, signing of delivery notes upon SPT form delivery to RHDs was not included, despite being part of the SOPs, as the absence of this process would not compromise the functioning of the overall system.

REGIONAL INTERVIEWS ABOUT WORK PROCESSES

The key position interacting with MyChild Solution at the regional level are the EPI ROOs. While the health workers' and other regional stakeholders' experiences with MyChild Solution are captured in other components in Chapters 4 and 7, this section captures the ROOs' experiences specifically with work processes related to MyChild Solution. Interviews were carried out at RHDs and transcribed. Transcribed interviews were then coded and codes were aggregated into themes, as per standard thematic analysis.

RESULTS

TOTAL INCREMENTAL COSTS BASED ON THE CURRENT IMPLEMENTATION STRATEGY

Table 6.1a compares the annual incremental costs of the existing HMIS and MyChild Solution, which have total incremental costs of USD 2,862.91 and USD 3,566.62 respectively. MyChild Solution costs more than the existing HMIS by USD 703.29. The total annual operating incremental costs calculated in this evaluation are different from those found in the previous evaluation. There are two reasons for this: 1) printing costs for the existing HMIS in this evaluation were obtained from UNICEF, which procures printing through bidding, and printing is procured in bulk, which lowers the cost, and 2) the MyChild Solution engine continuous maintenance and update is made free for The Gambia.

If the administrative time savings of MyChild Solution were considered, the solution's cost would be greatly reduced. However, these were not formally included in the results as these savings are theoretical and not actual, given that they assume that all required

Item	Quantity per Year	Unit Cost (USD)	Existing HMIS (USD)	MyChild Solution (USD)
Immunisation register	250	4.51	1,128.60	-
Immunisation tally book	123	2.67	328.11	-
Vitamin A and deworming register	250	4.51	1,128.60	-
Monthly Return book	76	3.65	277.59	-
MyChild birth records form	5.931	0.04	-	219.07
MyChild health records form	35.568	0.02	-	583.88
MyChild Monthly Return form	912	0.01	-	9.36
MyChild birth records update form	7.296	0.02	-	119.77
Maintenance of scanners	7	50.00	-	350.00
Data storage and backup	1	273.16	-	273.16
Replacement of scanners	7	100.59	-	704.15
Data verification officer's salary	1,277.62	1	-	1,277.62
SMS to share KPIs with health facilities	1.824	0.02	-	29.18
Total (USD)			2,862.91	3,566.20

Table 6.1a. A comparison of the annual operating incremental costs of the existing HMIS and MyChild Solution based on their current implementation strategy on a national scale (76 health facilities).

System	Annual Operating Costs (USD)	Annual Cost per Child (USD)
Existing HMIS	2,862.91	0.03
MyChild Solution	3,566.20	0.04

Table 6.1b. Incremental annual operating costs and annual cost per child of the existing HMIS and MyChild Solution per their current implementation strategy.

processes take place under the conventional HMIS, which is not reasonably the case. Under this assumption, MyChild Solution would save about 21,648 administrative hours annually, which is equivalent to USD 23,595.53, when implemented nationally.

Item	Quantity per Year	Unit Cost (USD)	Existing HMIS (USD)	MyChild Solution (USD)
Immunisation registers	250	4.51	1,128.60	-
Immunisation tally book	123	2.67	328.11	-
Vitamin A and deworming register	250	4.51	1,128.60	-
Monthly Return book	76	3.65	277.59	-
Caregiver SMS reminders	492,762	0.016	-	7,884.19
MyChild birth records form	5.931	0.04	-	219.07
MyChild health records form	35.568	0.02	-	583.88
MyChild Monthly Returns form	912	0.01	-	9.36
MyChild birth records update form	7.296	16	-	119.77
Maintenance of scanners	7	50.00	-	350.00
Data storage and backup	1	273.16	-	273.16
Scanners	7	100.59	-	704.15
Data verification officer's salary	1,277.62	1	-	1,277.62
SMS to share KPIs with health facilities	1.824	0.02	-	29.18
Mobile phones	76	33.33	-	2,533.08
Mobile phone data usage	76	1.97	-	149.71
Total (USD)			2,862.91	14,133.17

Table 6.2a. An ideal scenario comparison of the incremental operating costs of the existing HMIS and MyChild Solution.

Data verification, scanners, and MyChild Health Record forms printing costs are the three biggest contributors to the total cost of MyChild Solution, whilst printing costs for registers are the most expensive component of the existing HMIS. Tally book and Monthly Return printing costs for the existing HMIS and MyChild Monthly Return forms and KPI SMSs for MyChild Solution are the lowest contributors to the system costs.

From a capital and recurrent costs perspective, MyChild Solution will incur a capital equipment cost of USD 4,929.04 (for the replacement of scanners every 7 years) and a recurrent cost of USD 2,862.05, consisting of all costs in **Table 6.1a** except for the replacement of scanners. When the cost for replacing scanners every 7 years was varied by 1%, 5%, and 10%, the capital equipment cost for MyChild Solution became USD 2,890.67, USD 3,035.20, and USD 3,338.72 respectively. For the existing HMIS, there is no capital incremental equipment cost. However, the recurrent incremental operating costs of the existing HMIS and MyChild Solution are similar (USD 2,862.91 versus USD 2,862.05).

TOTAL INCREMENTAL COSTS IN AN IDEAL SCENARIO

Table 6.2a shows the total annual incremental operating cost of MyChild Solution and the conventional HMIS in an ideal situation implementation. The annual incremental operating cost of the existing HMIS will be higher than that of MyChild Solution (USD 2,862.91 versus USD 14,133.17). When the costs are looked at from a per child per year perspective, the annual cost per child in an ideal situation is USD 0.03 for the existing HMIS and USD 0.16 for MyChild Solution.

Presenting the costs as capital and recurrent costs, MyChild Solution has a higher capital cost and recurrent cost than the existing HMIS in an ideal scenario. The costs for replacing scanners every seven years and buying tablets every three years constitute the capital equipment costs of MyChild Solution in an ideal scenario, whilst all other costs of the solution mentioned in **Table 6.2a** constitute its recurrent costs.

TRANSFER OF WORK PROCESSES

Table 6.3a and **6.3b** show checklist results for the transfer of health facility and regional work processes respectively. Overall, transfer of work processes was good. Several challenges limit the reliability of the transfer of work processes evaluation results. Firstly, health workers and ROOs were not always able to demonstrate processes or tools available through MyChild Solution due to lack of cell phone credit, unavailable or faulty cell phones or laptops in the case of regional processes (data verification software only being installed on one laptop) or lack of internet connectivity. Further, the Dashboard hosts all data tools

Item	WR1	WR2	TOTAL
SPT Form Management			
Sufficient stocks of empty SPT forms, as reported by health worker (few or no stock outs experienced)	7/7	4/4	11/11

SPT forms mostly delivered to scanning stations on time (on a monthly basis at worst, with the last batch being submitted the day after the last clinic at the latest if clinics run until the end of the month)	7/7	4/4	11/11
Vaccine Management form delivered on time (submitted the day after the last clinic at the latest if clinics run until the end of the month)	7/7	4/4	11/11
Filling in of MyChild Solution Forms			
IWCs contain MyChild number (observed or explained by health worker)	7/7	3/4 (n/c = 1)	10/11 (n/c = 1)
Birth Records forms observed to be filled out correctly (n/c indicates no Birth Records forms could be observed)	5/7 (n/c = 2)	1/4 (n/c = 3)	6/11 (n/c = 5)
Birth Records Update forms filled out correctly (n/c indicates no Birth Records Update forms could be observed)	5/7 (n/c = 2)	1/4 (n/c = 3)	6/11 (n/c = 5)
Health Records forms filled out correctly (n/c indicates no Health Records forms could be observed)	7/7	2/4 (n/c = 2)	9/11 (n/c = 2)
Monthly Return filled out correctly (n/c indicates no filled out Monthly Returns could be observed)	3/7 (n/c = 4)	1/4 (n/c = 3)	4/11 (n/c = 7)
Physical counts are being conducted according to the health worker	5/7 (n/c = 2)	3/4 (n/c = 1)	8/11 (n/c = 3)
Processes in Case of Lost IWC			
Health worker can explain how to successfully retrieve vaccine history (including through WhatsApp)	7/7	4/4	11/11
If IWC is lost, health worker explains he/she would issue a new IWC	7/7	4/4	11/11
If no health records are found, health worker explains he/she would be registering a child (n/c used when health workers send mother to other clinic where they might have records)	6/7 (n/c = 1)	3/4 (n/c = 1)	9/11 (n/c = 2)
Data Tools Accessibility			
Health worker can show a recent Monthly Return form (electronic or paper)	7/7	4/4	11/11
Health worker can show a recent tally sheet generated by MyChild (n/c reflects issues connecting or accessing specifically at the time of the evaluation visit)	6/7	2/4 (n/c = 2)	8/11 (n/c = 2)
Health worker can show a recent requisition note generated by MyChild	7/7	4/4	11/11

Health worker fills immunisation section of the facility Monthly Returns using the MyChild Monthly Return*	-	-	-
Health worker can show the de-identified immunisation register or a link to it.	6/7	2/4 (n/c = 1)	8/11 (n/c = 1)
Health worker can show the electronic infant immunisation register or a link to it**	3/7 (n/c = 2)	1/4 (n/c = 1)	4/11 (n/c = 3)
Health worker can show the Vitamin A and Deworming Register or link to it	6/7	4/4	10/11
Health worker can show the electronic or printed out follow-up list or a link to it	5/7 (n/c = 1)	3/4 (n/c = 1)	8/11 (n/c = 2)
Health worker can demonstrate access to the dashboard or a link to it**	3/7	3/4	8/11

Table 6.3a. Number of clinics with transferred work processes. “n/c” indicates that items could not be checked or that the requirement was only partially fulfilled.

* Because they might not receive Monthly Return on time to fill out the Comprehensive Facility HMIS Return, different approaches were taken including sending facility returns late or having them filled out at the RHD. Because of this variability in processes, this item was not evaluated.

** Some health workers had not received training yet on how to use the Dashboard or could not access it at the moment due to internet connectivity issues. Further, a system upgrade was occurring during the course of the evaluation, which prevented some tools from being accessible.

Item	WR1	WR2
Sufficient stocks of empty SPT forms at regions according to the ROO	✓	✓
Good printing quality of empty SPT forms as observed by the evaluator	✓	✓
Timely scanning of filled in SPT forms occurring according to the ROO	✓	✓
Data Verification is occurring correctly, as observed by the evaluator	✓	n/c (laptop with verification software not available)
Master Verification is occurring correctly, as observed by the evaluator	n/c (one person conducting both data and master verification)	n/c (laptop with verification software not available)
Regions can successfully retrieve vaccine information, as explained by the ROO	✓	✓

Monthly Returns are being regularly printed for collection by health workers according to the ROO	n/c (on an <i>ad hoc</i> basis, health workers are expected to ask for them)	n/c (recent issues due to printer cartridge supply)
Data produced through MyChild is fully integrated with DHIS-2, as observed by the evaluator	✓	✓

Table 6.3b. Transfer of regional work processes. “n/c” indicates that the process could not be checked or that the requirement was only partially fulfilled.

available through MyChild Solution. However, not all health workers had been trained in using the Dashboard at the time of the evaluation, so many had access but needed assistance from the evaluation team in understanding where to retrieve relevant documents. Last, system maintenance unexpectedly took place during the evaluation week for work processes transfer, resulting in various tools being unavailable during clinic visits by the evaluation team.

REGIONAL INTERVIEWS ABOUT WORK PROCESSES

Eight themes emerged from thematic analysis of the two ROO interviews (one for each region), as shown below.

1. Regional staff mirror some of the concerns in data accessibility brought up by health workers.

ROOs worried that health workers need to use their own credit to access health records and other data tools and that a smartphone is necessary for the system. One regional staff member brought up that desktop computers for facilities would improve accessibility and reduce waiting times for immunisation record retrieval in case of lost IWCs, as for now health workers rely on the project coordinator or the RHD staff to provide them with information. This information may take time to obtain if they are busy with other tasks. The fact that health workers still use WhatsApp to contact the RHD or project coordinator to access patient records, despite the availability of electronic and de-identified registers, suggests that they might be experiencing access issues due to internet connectivity issues or poor understanding of the Dashboard.

2. Some clinics struggle with timely SPT form submission.

One RHD staff suggested that this is mainly an issue for far away clinics and suggested these clinics could be provided with their own scanner, even if the Data verification process could still be carried out at the RHD. The other region iterated the same issue, but in

relation to health facility workers not always having motorbikes to transport the forms, which could make submitting SPT forms more challenging.

3. ROOs face some organisational issues that affect their work processes.

One ROO brought up that deadlines (for national immunisation data submission) are more problematic than work processes themselves, in that they are unnecessarily early. This results in the staff member having to work on weekends to meet deadlines, particularly if SPT forms are being turned in late, despite forms being verified and scanned immediately as they are received. Another issue reported was that the verification software is available only on one laptop, which requires carrying two laptops when doing verification offsite (the other laptop containing other software that is required for different work). One ROO also struggled with doing both Master and Data Verification tasks on one dongle, as the second dongle and person assigned to verification were not working towards this task. This resulted in the ROO having an excessive workload and not sufficient data on his/her internet dongle for his/her task. MyChild Solution is also not currently formally included in the Terms of Reference (ToR) of regional staff, meaning that it is not accounted for formally in their work processes. Bad handwriting, missing facility names, dates and person names along with late forms from few facilities, or forms being misplaced, were cited as the most common problems with health workers, with attitudes of individual health workers often affecting performance, according to one of the ROOs.

4. Minor issues exist with some indicators and data tools.

Some issues with indicators were discussed, including artificial defaulters emerging from non-participating clinics in MyChild Solution, which results in extremely long defaulter lists. Negative wastage was also brought up as a problematic parameter emerging from data. Negative wastages were previously shown as 0% on Monthly Returns, which resulted in a misinterpretation of wastage indicators as not problematic. The issue of negative wastage is thought to be related to physical counting, although other factors might be at play. This issue is particularly surprising in relation to single use vaccines such as Rota. Another example was made of clinics complaining they have the wrong immunisation target, which negatively affects their coverage performance, while hospitals might achieve astounding coverage rates far above 100%.

5. MyChild Solution could benefit immunisation campaigns but should not involve registration for this application.

ROOs believe that MyChild Solution could benefit immunisation campaigns by providing higher quality data and avoiding administrative time required for cleaning data as well as help with vaccine management and wastage, which currently require manual

processing. Using MyChild Solution would also ease the work of district and regional supervisors during immunisation campaigns. One region even showed that “mini-campaigns” are being carried out for defaulter tracing that show up as “unexpected” sessions on the Dashboard. These were said to be a defaulter tracing initiative. However, both regional participants agreed that campaigns are too hectic to account for time for registering children. Different forms should be developed that only require tallying antigens to both benefit from the system but avoid time-intensive registration processes.

6. DHIS-2 integration is fully functional but PHOs often leave Comprehensive HMIS Facility Returns blank.

DHIS-2 integration was said to work very smoothly. However, facilities often could not fill in the immunisation section of HMIS returns because they received Monthly Returns after the deadline to submit the Comprehensive HMIS Facility Returns. This was an issue before DHIS-2 was fully integrated with MyChild Solution. Further, one of the regions was not able to consistently provide hard copies of Monthly Returns to facilities because of printer cartridge issues.

7. Regional staff recognise the potential for improved data use with MyChild Solution.

Regional staff highlighted the usefulness of data tools both at the health facility and the regional level. Defaulter lists and the Dashboard for tracking clinic performance were examples of positively viewed features of MyChild Solution. Both regions pointed out they do not have regional graphs and KPIs, which would be useful. One region reported using the Monthly Return as a data tool to track performance and aid supervision, for example to investigate the common issue of negative wastages.

8. ROOs expressed positive views on MyChild and its superiority to the conventional HMIS system.

Even if MyChild Solution might add some administrative time, for example by forcing health facility workers to carry out all required processes such as registering children even on busy days, the system ensures quality data is produced that cannot be manipulated. They stressed that the initial registration-intensive phase was tedious, but that now people are enjoying the benefits of MyChild Solution. ROOs highlighted the benefits in terms of defaulter tracing. One ROO expressed particularly positive feedback on the Dashboard, which helps with monitoring. The other region had not fully implemented the Dashboard at the facility level due to delays in training, but suggested it would reduce dependency on the project coordinator and the ROO for vaccination record retrieval.

CONCLUSION

The total incremental cost of MyChild Solution and how it compares with that of the existing HMIS depends on the costing perspective employed and the classification of costs. According to both costing scenarios used in this evaluation, MyChild Solution costs more than the existing HMIS. MyChild Solution has a higher capital cost but a similar annual recurrent cost to the existing HMIS in both the current implementation and ideal scenario models. However, MyChild Solution also comes with a lot of added value that could not be costed, for example improved data quality, improved data availability and accessibility, increased data use, and enhanced supervision/performance monitoring. Work processes were generally well transferred, with some limitations to the evaluation results due to incomplete trainings that were scheduled for the near future and disruptions due to system maintenance.



CHAPTER 7: PERCEPTIONS AND EXPERIENCES

INTRODUCTION

Users' perceptions and experiences assessment was carried out in April 2018 for the pilot phase evaluation (Sowe et al., 2018). Evaluators used semi-structured interviews with open-ended questions to gain feedback from health workers and RHD staff. Some of the insights gained through the pilot evaluation included the ease of application of the new system, the clear visibility of its advantages to the users, such as the reduction in administrative time, and its perceived effect of improving user performance, for example by allowing better data analysis and management at health clinics. The evaluation also brought to light some of the challenges and aspects of the technology that require improvement to accelerate integration in the existing health ecosystem. One example of this reported by health workers was the difficult registration process for new children and the potential need for data rectification processes at the health facility level.

As pointed out by the report written by researchers conducting the pilot phase evaluation (Sowe et al., 2018), given the high time and resource investment, including a considerable amount of support from AAITG, during the implementation phase in pilot clinics, the context of the pilot phase evaluation and therefore the environment in which these interviews were conducted is to be considered "ideal". Based on this observation, it is crucial to gather additional feedback on perceptions and experiences of MyChild Solution as the solution is scaled, with clinics receiving less targeted support from external stakeholders. This evaluation of perceptions and experiences of health workers, caregivers and key stakeholders aims to capture a comprehensive picture of the perspectives surrounding MyChild Solution at different levels of the healthcare system.

METHODOLOGY

SEMI-STRUCTURED INTERVIEWS

Semi-structured interviews were conducted with caregivers, health workers, RHD staff and various stakeholders. Health workers were interviewed in the eleven clinics selected through purposive sampling as shown in **Table 2.1**. Fourteen caregiver interviews were conducted by data collectors (Samba Bah, Ismaila Kasseh, Ousman Bah and Alieu Jallow)

based on guiding questions developed by the evaluation team in the appropriate local language in Serrekunda, Sukuta, Polyclinic, Sibanor and Gunjur health clinics. Regional staff that directly interacts with MyChild Solution work processes interview results can be found in Chapter 6 results. Perceptions and experiences results more specifically related to data use can be found in Chapter 4. For the purpose of this evaluation, other key stakeholders besides caregivers and health workers were defined as people whose work is related to MyChild Solution, but who might not be directly interacting with its features, such as the Dashboard. Interviewed key stakeholders interact with MyChild Solution through the following organisations: UNICEF (one stakeholder), AAITG (four stakeholders), EPI/MoH (three stakeholders) and RHDs (five stakeholders). Stakeholder interviews were conducted at their offices.

DATA ANALYSIS

Interviews were analysed using thematic content analysis. Interview codes were grouped into themes for each interview category (health workers, caregivers and other stakeholders). Caregiver interviews were translated and summarised by data collectors with specific knowledge of the local languages.

RESULTS

Health worker interviews were found to not contain any additional findings from the ones reported in the data use chapter (Chapter 4) and in the caregiver and stakeholder interviews below. To avoid redundancy, themes emerging from health worker interviews were excluded from this Results section.

CAREGIVER INTERVIEWS

A total of 14 caregivers were interviewed in five health facilities in WR1 and WR2. Caregivers were all women. Excluding three women whose ages were not collected, their ages ranged from 20 to 41 years, with a mean age of 26.6 years. The education background for three women was not collected. Three were educated in Arabic, and the rest through English schools. Of the eight educated in English schools, three had primary education, four had secondary education, and one had post-secondary education. Three of the caregivers were housewives, four were engaged in business, two in farming, one in hotel work, and one in teaching. All 14 exit interviews were conducted in health facilities after women had received due services for the clinic sessions.

Three themes emerged from the caregiver interviews. MyChild Solution is perceived by caregivers as providing added value to their experience because the solution cuts down waiting times during immunisation clinic sessions, it makes it possible to easily retrieve immunisation history of children when their IWCs are lost, it sends out SMS reminders to

caregivers when vaccinations are due, and it creates room for question and answer sessions with health workers. Caregivers are now able to do things that were hard for them before the introduction of MyChild Solution, such as proceeding to the market and shop for lunch at the end of a clinic session. Another benefit of shorter waiting times is the reduction in quarrels between caregivers during immunisation sessions. These perceived practical benefits of MyChild Solution made caregivers like the solution and wish that it continues to be used. The three key themes emerging from caregiver interviews along with specific related aspects and relevant quotes can be found below.

1. SMS reminders are useful.

Although not all the caregivers interviewed acknowledged receiving SMS reminders, those who did, stated that SMS reminders are useful because they remind them to take their children for vaccinations.

- SMSs remind caregivers to take their children for vaccinations.

The following responses were examples given when caregivers were asked whether they receive SMSs and whether they find them useful:

“Yes, I receive SMSs. I did not know what the SMSs meant initially until my daughter read them and told me that I should take my child for vaccination. So, from that time, anytime I see a text message with from that number I call someone to read it and tell me the message. So, it helps keep me not miss immunisation clinic days”.

“Yes, it prevents me from missing my children’s immunisations”.

Some caregivers mentioned that they did not receive SMSs such as in the answer below:

“No, I am not aware of any SMS delivered to me on my phone”.

Other caregivers might have received messages without their knowledge as could be deduced from the following extracts.

“I never received a text message because the number I gave is my husband’s number. It may be sent without my husband notifying me”.

“No, I never received an SMS. Maybe they are delivered without my knowledge since I hardly check my mobile for text messages”.

2. MyChild Solution has practical benefits for caregivers.

Caregivers stated several practical benefits they realised after the introduction of MyChild Solution.

- MyChild Solution shortens waiting times.

“Recently [referring to after the introduction of MyChild Solution] you can come to the clinic then later proceed to the market to do the shopping for your lunch”.

“The waiting time is now favourable because if I compare now with waiting times during my child before this one, now is faster than before”.

“[...] people use to queue for long and there used to be quarrels”.

- Children’s vaccination history can be retrieved if the IWC is lost.

“[...] I can get back my child’s immunisation records even if I lose my card”.

- MyChild Solution reminds caregivers to take their children for vaccinations.

“[...] we will be reminded of clinics which makes life easy for us”.

- MyChild Solution creates room for questions and answers.

“The interview and questions I asked were not possible before this project. Now I have an opportunity to ask questions and get answers”.

3. Caregivers’ wishes.

This theme captures concerns raised by caregivers. These concerns are general and not necessarily related to MyChild Solution.

- Increasing clinic sessions.

“I am requesting for assistance so that the community can be separated into two clinic sessions [per month] because there are many people scheduled for the same clinic session day”.

- Wish for continuity of MyChild Solution.

“My wish is for this thing [MyChild Solution] to continue. It will be helpful in making sure our kids do not miss their clinic schedules”.

We assessed caregivers’ perceptions of MyChild Solution specifically focusing on the usefulness of SMS reminders and on whether they experienced any differences in service delivery between the existing HMIS and MyChild Solution. We extracted three themes. Two themes were more directly related to the research questions and the third one captured feedback from the interviewees that could be used to improve overall service quality and utilisation.

Caregivers that receive SMS reminders expressed positive views about them. The main positive attribute caregivers connect with the SMS reminders is that they are notified whenever their children are due for vaccinations. Caregivers stating they are not receiving SMS reminders on their phones is not necessarily due to a technical failure by MyChild Solution but more probably due to wrong numbers being recorded, caregivers giving numbers belonging to other people, a lack of interest or not reading text messages, or some caregivers’ inability to read. One health worker reported that not receiving SMSs if they are relying on them may result in caregivers not showing up for clinics:

“sometimes if they don’t get the SMS they don’t come for clinic, they will still wait for the SMS”.

Caregivers mentioned two issues they think that if solved would improve their immunisation session attendance experience. One of these is to increase the number of clinic sessions assigned to large community units to decongest immunisation clinic sessions. In The Gambia, usually a community unit or a cluster of communities is assigned a specific weekday per month during which they bring their children for vaccinations. This does not mean caregivers cannot bring their children for vaccinations during other days, but it is far more common for children to be brought for immunisation during their assigned clinic days. Like many countries, The Gambian population is concentrated in urban areas. Therefore, immunisation sessions are expected to be heavier in urban areas than in rural areas. Consequently, waiting times are longer in urban areas as compared to rural areas (Cassel et al., 2006).

STAKEHOLDER INTERVIEWS

Interviewed stakeholders were related to MyChild Solution through the following organisations: UNICEF, AAITG, EPI/MoH and RHDs. Perceptions and experiences with MyChild Solution were generally positive, with the following five themes emerging. Relevant quotes are reported for each identified sub-theme.

1. MyChild Solution eases work for health workers and their supervisors.

Stakeholders have many positive views about MyChild Solution that they think ease the work of health workers and their supervisors as can be seen below.

- MyChild Solution reduces health workers' workload.

“It [MyChild Solution] reduces staff workload because it reduces the number of recordings [paper-based forms] that used to be done [filled]”.

- MyChild Solution eases vaccine consumption monitoring.

“MyChild Solution automatically calculates vaccine wastage rate consumption. So, even if a facility has a high wastage rate it will be noticed immediately”.

- MyChild Solution generates defaulter lists.

“[...] generates a list of defaulters and we had a very practical example [of using the defaulters list]. You know we are celebrating the Africa Vaccination Week and one of the activities is to promote second year of life vaccination. So, we realise that a facility... they generated a list for a particular village with the support of RHD and they went to visit individuals that defaulted”.

- MyChild Solution eases clinic session monitoring.

“[...] when I look at the Dashboard, it tells me a lot. whether they have cancelled a clinic/missed a clinic and whether they have compensated a [missed] clinic or whatsoever or [the] number of children immunised. So, the Dashboard helps me monitor [health] facilities”.

- The D4A solution encourages data use and guides decisions.

“it [MyChild Solution] ensures that people use the data that they generate and this will definitely guide them to make correct decisions and then ... if a health facility is able to see their own dropout, that will trigger them to see [find out] what is happening”.

- MyChild Solution enhances/eases supervision of health facilities.

“They are very comprehensive [referring to indicators on the Dashboard] because it will give you your performance and it will help you in monitoring the health facilities at [the] lower level without using much resource in going down to the facility level. It will help to know which clinic session is cancelled or ongoing. Based on that, it will help the Regional Health Directorates to [know what is happening at the health facilities and] call if there is concern”.

“I used the Dashboard last week. It is so impressive. At least you can have a better understanding of what is happening in the field [health facilities]. The Dashboard will show you a lot [of important information].”

- MyChild Solution encourages doing things right.

“... it is forcing them [health workers] now to update their vaccine ledgers on a daily basis because it is like anytime you take vaccines from the fridge you need to record it. ... if you do not, you will have a discrepancy in your data. So, this [updating ledgers] has definitely improved”.

2. “MyChild Solution suits the local context”.

- MyChild Solution is flexible and user-friendly.

“I like the system because of its flexibility. Each time we have feedback from the field [requiring adjustments to the system], we engage the Shifo team to correct or make adjustment. So far, we [have] made progress in so many areas [due to its flexibility]”.

“I think its user friendly and that is demonstrated by how fast the users are able to understand and work using it at the lower level. ... it is easy to use the system. There is not a big radical change from what they were doing. It has just reduced their paperwork because it just takes a few minutes to fill the paper. So, it is very much user friendly”.

- “MyChild Solution suits the local context”.

“... we all know that internet connection is a problem in this country and in West Africa at large [in general] ... having a solution that takes care of the issues of using limited internet [does not need the internet at the service delivery point] is very, very positive. I think MyChild Solution is definitely there to solve that problem”.

3. Desire to scale-up and include more service areas.

- Extend MyChild Solution to immunisation campaigns and other services.

“[...] when we have [immunisation] campaigns, we should also use it”.

“Birth registration is also very important. The world is going digital”.

“Any service [all preventative services] a child receives at the service point should be captured”.

- Scale-up MyChild Solution to cover other health facilities.

“[...] it should be rolled out to other health facilities”.

4. MyChild Solution enhances immunisation data quality.

“It helps in [ensuring] the quality of the data. You cannot manipulate the data [generated]. I think that is the most beautiful part of it”.

5. Issues to consider.

- The initial registration is hectic

“at the beginning of the process it was tedious because you need to register every child [that is supposed to be immunised, or dewormed, or supplemented with Vitamin A]”.

- The defaulters list is very long.

“[...] we need to definitely set a cut off point [definition for a defaulter] before it can generate a defaulter list. ... like after two months if you don't see a particular patient [child] you term that individual as a defaulter or after three months or whatever. But like after 28 days [of not seeing the child], you generate a list. It will be a long, long list and it will definitely be difficult for a healthcare worker to follow-up all those people”.

- Long-term storage of scanned forms at the regional level.

“[...] the other challenge is that the system is generating a lot of papers which might be difficult to handle in the long run”.

- Location of scanners.

“The barrier that I am foreseeing when it goes for national scale-up is going to be the location of the scanners. Like if you have health facilities very far from the regional directorate [and] they [regional level] don't have resources that they can [use to] move from one point to another. This means that they are going to rely on their monthly in-service meetings to sending in [their MyChild forms]. Sometimes, the monthly in-service meeting will be [or occur] in the middle of the month or at the end of the [subsequent] month which will be a big challenge [- late submission]”.

CONCLUSIONS

Semi-structured interviews were used to explore the perceptions and experiences related to MyChild Solution of health workers, caregivers and key stakeholders. No additional findings related to health workers' perceptions emerged other than those reported in Chapter 4. Three themes emerged from caregiver interviews: the usefulness of SMS reminders, the practical benefits of MyChild Solution for caregivers, and caregivers' wishes related to immunisation activities overall. Themes emerging from stakeholder interviews included the easing of work by MyChild Solution for health workers and their supervisors, the suitability of MyChild Solution for the local context, the desire to scale-up the solution and include more service areas, the improved data quality the solution provides and additional issues for consideration moving forward.



CHAPTER 8: DISCUSSION

Based on the positive feedback gathered from interviews conducted with health workers, key stakeholders and caregivers, the high quality of data produced, and its potential to improve immunisation coverage in The Gambia, the evaluation team strongly recommends scaling-up MyChild Solution to produce an individual-level, national electronic immunisation registry. A summary of high-level findings, limitations and future considerations for each of the aspects evaluated can be found below.

DATA QUALITY

We assessed the quality of routine immunisation data generated using MyChild Solution, a SPT based electronic immunisation register. All data quality indicators evaluated using the WHO DQR Toolkit (2017) were found to be within the recommended routine immunisation data quality thresholds. Data quality targets set in the project's Performance Monitoring Framework to be achieved by the time of this evaluation have been met. MyChild Solution's data accuracy, measured by comparing information in children's IWCs with data in the electronic register, is also within the acceptable limits of consistency between different data sources stated in the WHO DQR Toolkit (2017).

MyChild Solution generates more consistent data across data sources than the existing HMIS and has the capability to eliminate inconsistencies between Monthly Returns and DHIS-2 values based on its integration with DHIS-2. Most of the inconsistencies in the existing HMIS are due to not updating immunisation registers, followed by missingness in a data source. The frequent non-recording of vaccinations in the immunisation register in the existing HMIS poses not just a data quality issue but also a challenge in accurately retrieving immunisation history of children when cards are lost or during surveys. MyChild Solution has several validation rules. One such rule that was clearly tested is the ability of MyChild Solution to detect recording errors in IDs and correct those that do not meet specific criteria. During the data accuracy analysis, it was found that wrong recordings such as mistakes in one digit or switching two digits were detected and corrected using a checksum. This feature of the solution is very useful in minimising entry errors.

As found in the pilot evaluation (Sowe et al 2018), there is a lot of variation in the amount of time needed to verify data. It was observed that verification time is higher when MyChild Solution is newly implemented in health facilities. With time, it tends to reduce significantly. This observation is likely due to the fact that health workers become more proficient with the SPT forms over time. Therefore, when the system is implemented

nationally, total verification time might significantly differ from our estimates depending on the number of health facilities delivering immunisation services and staff retention versus turnover.

DATA USE

We assessed the use of data at the health facility level. D4A tools were generally well integrated with the exception of Monthly Return forms, where actions taken for improving KPIs were not widely reported. Health workers complained that they did not receive SMSs on time to fill out these forms, despite forms being meant to capture past actions taken. This response reflects a more month-by-month interpretation of data use for decision-making. Future efforts towards data use strengthening should focus on improving the decision-making aspect of data use, perhaps by encouraging goal setting behaviour. Key challenges reported by health workers were the need to use their own cell phone credit to access data tools, issues of internet connectivity and human resource turnover, among others. Health workers had an overall preference for offline tools compared to online tools, due to their easier accessibility. This demonstrates the need to maintain robust offline systems, which represent the core advantage of MyChild Solution, even as the solution develops in the future.

Further work should also focus on better outlining what kinds of actions can reasonably be carried out by health workers to improve KPIs. Of the few actions that were reported, the vast majority were related to sensitisation raising questions on the utility of data for decision-making. Various health workers suggested that MyChild Solution be expanded to other areas of work, with most common requests being for disease surveillance and birth registration. Integration of these areas would result in emergent advantages by allowing linking the surveillance of vaccine-preventable diseases to vaccination coverages in different areas as well as ensuring that all children whose birth is registered are accounted for in vaccination registries.

ADMINISTRATIVE TIME EFFICIENCY

Administrative time efficiency results were found to be generally similar to those of the pilot evaluation, with significant time savings observed. The time spent to fully immunise a child (7 visits) was found to have a 54% time saving with MyChild Solution compared to the existing HMIS (versus 55% during the pilot evaluation). The time spent to fully provide Vitamin A and deworming to a child (10 visits) was found to result in a 63% time saving (versus 64% in the pilot evaluation), and the time spent to fully provide Vitamin A, deworming and vaccinations per child was found to have a 59% time saving (versus 60% in the pilot evaluation).

Many methodological limitations, however, need to be considered. Most importantly, baseline data was based on the previous evaluation results, with little opportunity to replicate this data, besides one study in Brikama District Hospital, due to the high penetration of MyChild Solution in the area of the evaluation and the slightly different nature of the clinics and procedures (e.g. integrated birth registration) in the remaining non-participating clinics. This results in sources of unreliability including a different set of data collectors. For this reason, for more reliable data, it is imperative that a higher quality baseline be collected with the same health workers being timed before and after MyChild Solution processes are fully integrated or for a randomised control trial to be carried out. It is also important that due to the high variability in task timings, as seen in pilot versus newly implementing clinic results, that this variance be taken into account in future studies. Based on the wide variety of tasks carried out by health workers both within the realm of immunisation and beyond, these tasks including but not being limited to disease surveillance, environmental inspections and education and awareness activities, one cannot assume that administrative time savings directly impact the quality of immunisation services without a more targeted study.

This is particularly true since the most significant time savings are observed for monthly processes (93% for the current evaluation). Further, for particularly busy clinics during which registers might not be updated anyways under the conventional HMIS, time savings for routine services might not be as significant as when the assumption that all required processes are carried out holds. Future studies should also reassess what tasks are considered administrative and consider timing non-administrative immunisation tasks.

TOTAL COST OF OWNERSHIP AND TRANSITION OF WORK PROCESSES

We evaluated the total cost of ownership of MyChild Solution in comparison with that of the existing HMIS using an incremental costing approach. In addition to presenting the total annual incremental and annual per child costs of the two systems using two scenarios, current implementation strategy and an ideal scenario, we also presented capital and recurrent costs for both systems in both scenarios to further the understanding of how the two systems compare.

From their current implementation strategy costing scenario, MyChild Solution's total annual incremental operating cost is higher (by USD 340) than that of the existing HMIS and consequently its annual cost per child is also higher. MyChild Solution's annual cost per child of USD 0.04 (excluding administrative time savings) is on the lower side in comparison with the annual cost per beneficiary of other electronic registers in other countries. For example, the annual costs per child of the Boston Immunization Information System in the USA (McKenna et al., 2002) and the Information and Communication Technology Continuum of Care Services in Bihar in India (Borkum et al., 2015) were

estimated at USD 5.45 and USD 3.62 respectively. Each of these two systems is more than 50 times more expensive per beneficiary than MyChild Solution is, irrespective of the costing perspective used. Their implementation also requires the use of electronic equipment to register beneficiaries at service delivery points, unlike MyChild Solution. MyChild Solution's use of SPT, unlike the electronic registers mentioned, creates the possibility of using the system to record beneficiaries' information at service delivery points without the need for an electronic device or electricity. In the ideal scenario, the existing HMIS is more costly than MyChild Solution due to the addition of an estimated annual data quality improvement cost.

The existing HMIS has no capital cost. MyChild Solution's capital costs are due to equipment that need to be purchased. The current implementation strategy of MyChild Solution requires the purchase of scanning equipment. The scanners used in The Gambia are estimated to last seven years as per manufacturer's information. Therefore, scanners are expected to be changed every seven years. In an ideal scenario, an additional capital cost for buying mobile devices that will be used to browse through the electronic register, visualise analytics, and receive reports is also included. Personal mobile phones are generally estimated to last around three years. So, this capital cost should be expected every three years. However, since the mobile phones to be purchased are not personal phones but should be strictly used for their specified purposes, they may last longer than three years. In terms of recurrent costs, the existing HMIS has a higher cost, mainly due to the difference in printing costs between the two systems.

Given the assumptions and limitations underlying administrative time savings calculations (in Chapter 5), time savings were considered excessive and therefore were costed separately. However, the ability of MyChild Solution to save health workers administrative time creates an opportunity that health workers can theoretically utilise to improve routine immunisation services. Activities they can engage in include strengthening sensitisation and health education of caregivers during immunisation sessions, immunisation defaulter tracing, vaccine and cold chain monitoring, and strengthening community health activities.

We would like to put forward some caveats in relation to our costing analysis that we think readers should be aware of. The costs presented should be viewed as estimated incremental operating costs but not as full implementation costs or exact costs to be incurred. Costs could vary based on market price changes, population served, and the implementation strategy used. Administrative time saving costs should not be interpreted as direct financial savings (for example by employing fewer health workers) but more as the worth of free time availed to health workers delivering immunisation services that they can use to improve KPIs or engage in other health education or promotion activities.

PERCEPTIONS AND EXPERIENCES

Themes emerging from caregiver interviews were 1) the usefulness of SMSs in reminding caregivers to take their children for vaccinations, 2) the practical benefits of MyChild Solution for caregivers, namely the shorter waiting times, the easier accessibility of children's vaccination history in case of lost IWCs and the time for more questions and answers during healthcare delivery, and 3) caregiver's wishes, namely to increase clinic sessions and for MyChild Solution to continue. Stakeholders were interviewed with relations to MyChild Solution from organisations including UNICEF, AAITG, EPI/MoH and RHDs. Five themes emerged from the interviews: 1) MyChild Solution eases work for health workers and their supervisors, 2) MyChild solution is appropriate for the local context, 3) the desire to scale-up and extend MyChild Solution to additional services such as immunisation campaigns and other preventative services, 4) MyChild Solution enhances immunisation data quality and 5) issues to consider including the initial registration burden, the lengthiness of the defaulter list, the long-term storage of scanned forms at the regional level and the location of the scanners, which is problematic for far away clinics and may become increasingly an issue as the solution is extended to more remote areas. As the nature of clinics outside WR1 and WR2 is very different, as the interested areas are less urban, they are likely to face different challenges, presumably more similar to those faced by the more remote clinics in the Fonis. It is thus suggested that additional interviews be carried out during the scale-up process to ensure that potential issues are being accounted for as they emerge.

The evaluation team reasonably believes that data saturation was achieved because of the similar patterns observed across different interviews. Two of the evaluators and all the data collectors are very familiar with The Gambia's health system. This provided the evaluation team with a good insider's perspective. Although an insider's perspective could be a strength, it could equally be a challenge if the evaluators are not aware of it and take steps to address it. To address this in our analysis, we used a line-by-line coding approach with an open mind so that our foreknowledge of the system would not dictate the direction of our results. One of the evaluators, who was not familiar with The Gambia before the evaluation, was requested to go through the analysis and provide feedback.



CHAPTER 9: RECOMMENDATIONS

The evaluation team would like to put forward a set of recommendations outlined below. Feedback directly emerging from health worker interviews relating to data access and data use can be found in Chapter 4.

SYSTEM ROBUSTNESS AND SUSTAINABILITY

- **Providing health workers with cell phone credit.** It is vital to ensure that the accessibility of MyChild Solution tools are not limited by cell phone credit and that health workers are not absorbing any costs for MyChild Solution. Cell phone credit could be provided in several ways, such as:
 - **Monthly top-up based on estimated costs.** This solution however does not guarantee that credit will be used for the intended purposes and that it will be available when needed to access MyChild Solution tools.
 - **Agreements with cell phone providers.** Some cell phone providers allow separating and covering costs for specific mobile applications (apps). Once an app is developed, an agreement could be reached to ensure that all cell phone data used through the app is free for health workers and covered by MyChild Solution.
- **Ensuring PHOs have usable smartphones.** While most health workers had smartphones, in few cases, tools obtained through MyChild Solution could not be accessed during observations due to software issues, limited storage capacity or phones being stolen resulting in a temporary non-smartphone substitute. While this might not happen frequently, a system should be in place that ensures another device or a phone (perhaps a loaner) is available to health workers in the event that one cannot use a personal phone. If a system or procedure is not in place, the solution might completely cease to work at a facility in a similar case if a single health worker is responsible for immunisation.
- **Maintaining a robust offline system.** While online systems such as the Dashboard are certainly useful and were very appreciated amongst health workers and stakeholders, health workers expressed a preference for offline systems given limited connectivity in many areas and the issue of cost absorption of cell phone data. For this reason, as the app is developed and internet connectivity penetration across facilities

increases, it is important to still maintain robust offline systems so that the key benefits of SPT are not undermined.

- **Ease SPT form delivery to RHDs, particularly for faraway clinics.** Health workers brought up issues with SPT form delivery. This was particularly problematic for far away clinics, such as Sintet, which is about 100 km away from the RHD in Brikama. Issues include that health workers may not have motorbikes to carry SPT forms and that RHDs close at 4:00 PM, meaning they would have to close clinics early if working alone to deliver SPT forms. Some health workers suggested that SPT forms could be collected from them. However, this may result in additional costs and organisational issues. Some suggested solutions are provided below:
 - **Introduce additional scanning stations.** Scanning stations could be added more strategically as some far away clinics are clustered (e.g. in the Fonis in WR2). Health workers could then be trained to use them in these areas and data verification could occur at the RHD after scanning.
 - **Provide secure SPT form drop-boxes.** Closing times of RHDs are very constraining. Building clearly labeled drop-boxes where health workers can drop off SPT forms at any convenient time may ease the process of SPT form delivery. These drop-boxes would have to be outside of the gated area of RHDs, and of course be secure and rain-proof.
 - **Scanning through the App.** A long-term solution to this issue could be reached by adding scanning functionality to the app. Scanning has already been established as a feature in smartphones through apps such as Adobe Scan and CamScanner. Directly scanning SPT forms through cell phone cameras would eliminate the challenges of delivery altogether and also allow SPT forms to be directly stored at health facilities, eliminating the need to transport them to the RHD and back.
- **Establish how original forms should be stored after scanning.** Transporting and storing large quantities of paper with potentially sensitive information must be done with care. National policies and guidelines must be followed regarding health record storage, where such exist. The evaluation team suggests that project partners should jointly produce and/or update guidelines and SOPs specific to SPT forms and MyChild Solution processes.
- **Develop SOPs to measure recording errors, investigate possible reasons for their recurrence and take action.** The data quality review undertaken demonstrated a non-negligible rate of incorrect recordings, most likely due to human error. SOPs should be put into place to routinely evaluate these occurrences and take action. Procedures should include routine feedback provision to facilities and tailored trainings during supportive supervision visits.

- **Consider incentives and laptops.** A common feedback provided was that laptops and allowances should be provided to people working with the MyChild Solution system. This request must be taken into consideration in the context that this may be the result of common practice from similar projects as opposed to a real need. However, it may be considered in the form of cell phone data or laptops, which may provide useful backup tools for data access and incentivise data analysis. While this is not strongly recommended by the evaluation team, it is included based on the high incidence of this suggestion.

INTEGRATING AND HARMONISING

- **Updating deadlines and SOPs.** While the data quality review found that timeliness of the system was perfect, some health workers complained that they receive their Monthly Returns too late to fill in Comprehensive HMIS Facility Returns. As previously discussed, there was not a unified approach on procedures in this case. One specific RHD staff also admitted to having to work on weekends to verify forms when they were turned in too close to the deadline. However, these deadlines for regional reporting are, from the evaluators' point of view, unnecessarily early in some cases given national reporting deadlines. For this reason, adjusting reporting deadlines to ensure they are not unnecessarily early, which results in needless pressure on health workers and regional staff, is recommended. Further, ensuring SOPs exist for all processes, including unexpected cases, is important. For example, given DHIS-2 integration, it is recommended that health workers should not be required to fill in immunisation sections of Monthly Returns. If paper records are required for surveillance purposes, it is recommended that Monthly Returns simply be attached to comprehensive facility returns to avoid redundant processes and forms. If printing is not possible due to cartridge shortages, comprehensive facility returns can be filled in manually separately on original forms at RHDs and carbon copies at health facilities using electronic versions of the Monthly Return. A similar approach to SOP generation, that takes into account common issues and avoids redundant tasks, is recommended as other aspects of MyChild Solution become further integrated into the EPI system.
- **Harmonising Monitoring and Evaluation, and HMIS processes.** Given MyChild Solution is not operating nationally yet, many routine processes are not harmonised at this stage. A simple example is surveillance. Quality control under the conventional HMIS system requires tally books to be checked against Monthly Returns. These processes may be irrelevant given the current system but must undergo careful revision if MyChild Solution is scaled nationally. For example, should SPT form tallies be checked against Monthly Returns? If this is the case, should SPT forms be returned to health clinics instead of stored at RHDs? All data outputted by MyChild Solution is

expected to be consistent (e.g. Monthly Returns and automatically generated tally sheets). Checking outputted documents against each other would be redundant and thus unnecessary. Based on a careful revision of current surveillance processes, new SOPs and guidelines for archiving and monitoring should be developed. One important consideration is reported below.

- In considering which surveillance processes may have become superfluous, one question remains whether one can assume that MyChild Health Records are perfectly captured in MyChild Solution system. While SPT forms were found to be more than 99% consistent with electronic records, this metric must be interpreted as an evaluation of MyChild Solution but also of data and master verification processes, whose performance is specific to the people conducting these tasks. Because of this, the evaluation team recommends that SPT form consistency with electronic records not be taken for granted and be routinely checked to ensure data quality is maintained in the long run.
- **Track and harmonise parallel systems.** Several processes and tools which may be classified as parallel systems were spotted during evaluations. These include, but may not be limited to, the VVM and EPI charts for tracking progress towards EPI targets. Many of these systems, such as the VVM, require similar indicators to be calculated that are not quite the same as those outputted by MyChild Solution. In the spirit of avoiding an additional administrative burden on health workers, it is recommended that these systems be better understood and harmonised with MyChild Solution.
- **Engage all partners to agree on how to best calculate indicators.** While the ability of MyChild Solution to harness individual-level data to calculate indicators such as vaccination dropout offers a more realistic representation of a given cohort, this method does not yield comparable results to those produced through the traditional EPI method. For this reason, a recommendation is put forward for partners to jointly discuss the best way forward to calculate indicators such as coverage and dropout. This may likely be to produce indicators as calculated through both methods to make the most of individual-level data, while ensuring data is comparable such that trends can be observed over time.

SCALE-UP, IMPLEMENTATION AND FURTHER RESEARCH

- **Surge in human resources for the first three months of implementation.** As in the first evaluation, the initial months of implementation were described as being challenging by many health workers due to the large number of registrations. A surge

in human resources is recommended for these months, which could be implemented through a step-wise scale-up with additional human resources moving as the system is scaled-up.

- **Centralising MyChild Solution training by integrating it in the academic curriculum for PHOs.** One health worker suggested that to avoid issues related to high staff turnover, sometimes resulting in untrained staff taking over MyChild Solution processes at health clinics, training for MyChild Solution could be centralised by providing it as a seminar or module in the educational system for PHOs, thereby ensuring all health workers are at least familiar with the solution.
- **Collect more comprehensive and higher quality baseline data.** In planning scale-up, it is important to think ahead of what questions one would like to answer after a national implementation is in place. For example, tracking whether MyChild Solution has resulted in measurable programmatic improvements, establishing how much time is saved by the system, uncovering how health workers' time use differs based on probable time savings are all questions that require obtaining higher quality baseline data. One particularly problematic area found through this evaluation is administrative time savings and its extrapolation to cost savings and programmatic improvements. Some important questions must be answered to better understand how MyChild Solution affects health workers activities:
 - What percent of health workers' time is spent in immunisation, compared to other activities such as disease surveillance, birth registration, environmental inspection and community engagement activities? This would require observation studies of health workers beyond immunisation activities.
 - What percent of their time do health workers spend on administrative versus non-administrative tasks? The relevance of administrative time savings is only meaningful in the context of how much time is actually employed in administrative tasks relative to other tasks. Saving 10% of time on a task that employs 10% of a worker's day will be different from saving the same percent of time on a task that takes up 80% of a worker's day.
 - How is administrative time under the conventional HMIS affected when clinics are very busy? Interviews suggest that when clinics are very busy, some tasks such as register updating may be dropped. It is crucial to understand how clinics operate under time saturation to provide better estimates of actual versus theoretical time savings.
 - How do health workers preferentially spend time saved? Given the wide range of areas of focus and tasks that health workers perform and that presumably saturate their time, it is crucial to understand what tasks they would prioritise given extra time is afforded thanks to the solution. This would be useful to understand both

in terms of their stated intentions and in terms of their actions. Better understanding these priorities may reveal what programmatic improvements can be expected and should be tracked, which may or may not be related to immunisation but may be improving quality of care nonetheless.

- **Better understanding the role of SMS reminders.** Many health workers reported that caregivers often complain that they don't receive SMSs. This is likely due to caregivers providing incorrect numbers as opposed to a technical failure. One health worker suggested SMS reminders may backfire, as relying on reminders that may not be received if an incorrect number is given, as is frequently the case, may result in caregivers not showing up. Further, SMS reminders are not sent based on clinic days and may therefore cause confusion as a week may pass between the precise due date of a child and the next available clinic date. The role of SMS reminders should be better explored through randomised controlled trials. Measures such as SMS confirmations, adjusting reminders to clinic dates and defaulter tracing through phone calls, among others, should be compared. Since SMS reminders for caregivers are also costly, the cost effectiveness in terms of cost per additional vaccinated child should be established for different interventions.
- **Formalising preventative measures to mitigate the risk of confusion due to SMS reminders.** While several caregivers reported that SMS reminders are useful, some health workers expressed concerns relating to caregivers relying on SMS reminders. Caregivers should be informed that whether or not they receive SMS reminders, they should take their children for vaccination when they are due. Several health workers reported doing this already. However, it is important to formalise this in the form of an SOP for health workers, as this is crucial to mitigating the risk of relying on SMS reminders.
- **Long-term expansion of MyChild Solution.** While the benefits of MyChild Solution for immunisation are undeniable and clearly appreciated by health workers and caregivers alike, additional benefits would emerge through lateral expansion of MyChild Solution to other areas of work. The evaluation team recommends considering the daily duties of health workers when expanding MyChild Solution to ensure maximal integration. Health workers specifically asked for disease surveillance and birth registration to be integrated in MyChild Solution. Integrating these systems with MyChild Solution would also benefit immunisation itself. Birth registration integration would ensure every child whose birth is registered is in the immunisation registry, improving denominator accuracy and defaulter tracing, whereas disease surveillance integration could help better identify and target areas of probable low coverage based on cases of vaccine-preventable diseases.

DATA USE

- **Focus on decision-making and redesign the D4A section of the Monthly Return.** Based on its insufficient use, redesigning the D4A section of the Monthly Return is recommended. Health workers seem to interpret actions to report on a more month-by-month basis as opposed to a long-term strategy, which is why they would like to see their KPIs before filling out this section. Strengthening training around this section or redesigning the form so that it encourages long-term goal setting or guides them, for example by asking for reasons for why KPI performance may be low, could help improve data-driven decision-making.
- **Providing forums for facilities to share experiences on D4A.** Some health workers had truly innovative uses of data and talked about their performance in relation to other health clinics. One health worker showed a WhatsApp thread where performances were compared and discussed collectively as a region and another suggested that meetings could be held for health workers to present their data, share experiences and discuss actions. Similar in person or online forums should be encouraged for health workers to share experiences in using data.
- **Establish a precise definition for defaulters.** Many health workers praised MyChild Solution's defaulter tracing feature. Some feedback was provided that defaulter lists, however, can be extremely long, especially due to non-participating clinics. The precise definition for defaulters is also not clear in terms of the threshold of time before considering someone a defaulter. One consideration should be to examine how defaulter list lengths would vary when changing the definition of defaulter in order to balance effectiveness and time-intensity of defaulter tracing. Stratifying the list by urgency or probability of response based on average behaviour should also be considered.
- **Create a “menu” of possible actions.** Current interviews contain anecdotes of using data to make decisions. These should be analysed to create a list of actions taken by health workers. Focus groups and more targeted interviews could also be carried out with health workers and other stakeholders for this purpose. As discussed in Chapter 4, the vast majority of actions reported by clinics in the few cases in which health workers actually filled out the D4A section of the Monthly Return were based on sensitisation. Since caregiver sensitisation is recommended anyways, this begs the question of what actions can practically be expected of or are available to health workers. Sensitisation is not the only action they can take, but if it is the only action they think they are in the power of taking, all the data they receive is not particularly useful. Better understanding what actions health workers could be taking and what

resource limitations may stand in the way is crucial for strengthening the D4A framework and training on it.



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