health.enabled

Effective Design, Implementation, Integration, and Evaluation of Digital Health Systems to Enhance the Strategic Use of Data for Immunisation Programming

District Health Information Software 2 (DHIS2) & Immunisation

Country Case Study: Ghana

Conducted by Lilian Nabunnya, HealthEnabled
Queries, please contact Patricia Mechael, PhD MHS – patty@healthenabled.org

Acknowledgement

HealthEnabled is grateful to the Ghana Health Services (GHS) for allowing us to study and document their experience in the use of DHIS2 immunisation applications. Producing this case study would not have been possible without the expertise and experience from the GHS team at the National, regional, district, sub district and health facility levels. These included Dr. Anthony Ofosu, Dominic Atweam, Afua Jonah, Frank Mensah, Hanna Konadu, Ignatius Aklikpe, Mathew Quianoo and Patrick Quianoo. We would also like to thank Kimberly Frost from University of Oslo, Dr. Edem Kossi from HISP West Africa and Raphael Girod from MAHA for their input during the interview and draft case study review processes. In addition, HealthEnabled would like to thank Carine Gachen, Cyril Nogier, Gustavo Caetano, Mariana Madeo from Gavi, The Vaccine Alliance for their cooperation throughout the process.

Table of Contents

Introduction

HealthEnabled is engaged in a collaboration with Gavi, The Vaccine Alliance to strengthen and complement the work of Ministries of Health (MoH) alongside Gavi Core Data Partners to "ensure continuous data strengthening and sustainably improve coverage and equity (C&E)" by assessing the current use of digital health systems to support and exceed Gavi's Data Strategy and M&E Plan Targets. Through this effort HealthEnabled has been commissioned to conduct an assessment of DHIS2 for immunisation modules. This assessment aims to assess and document DHIS2 immunisation experiences and lessons learned.

As part of this process, Ghana has been prioritised as a good country for the development of a country case study for DHIS2 for immunisation. During the "DHIS2 Experience sharing and Learning in the use of DHIS2 Immunisation App in the WHO African Region" workshop in Kigali, Rwanda in January 2020 - Ghana was identified as a country that had successfully managed the transition from DVDMT to DHIS2 providing a good learning opportunity for other countries that are struggling with this transition. Ghana had also successfully deployed and scaled the DHIS2 Immunisation tracker fully within four (4) regions and partially in three (3) regions in the country. Because of the COVID-19 pandemic, HealthEnabled used a virtual approach to conduct the assessment in Ghana through desk review and key informant interviews with the Ghana Health Service (GHS) teams at the national, regional, district, sub district and health facility levels as well as partners, including Gavi, WHO, UiO and HISP that are supporting the implementation of DHIS2 across countries.

This DHIS2 country case study contributes to a broader effort aimed at strengthening and packaging DHIS2 for more effective adoption within national immunisation efforts across settings based on use cases and functionality.

Immunisation service delivery in Ghana

Provision of immunisation services in Ghana is a responsibility of the Expanded Programme on Immunisation (EPI). It aims to contribute to the overall poverty reduction goal of the government by decreasing the incidence and prevalence of 13 vaccine-preventable diseases through immunisation. The MoH / GHS adopted the Reaching Every District / Child (RED/REC) as a strategy for routine immunisation services. This requires all health facilities in Ghana to provide immunisation services as part of their daily routine to infants, children and pregnant women. These services are delivered through 1) hospitals, polyclinics, health centres, clinics and Community-Based Health Planning and Services (CHPS) compounds; 2) outreach services offered through home visits, pre-school and defaulter tracing; 3) mop-up vaccination for areas with low vaccination coverage; and 4) camp outs in hard to reach areas.

Immunisation services are integrated into the public health system and form part of the overall child health care services at the regional, district and sub-district levels[1]. With the decentralisation policy in place, these levels have the autonomy to plan and budget for service delivery including immunisation services. At the regional level, the Regional EPI Coordinators ensure EPI program management while the director for health services ensures program

[1] Ghana EPI Review Report 2019

implementation at the district level. In-charges at the sub-district and facility levels ensure implementation of EPI activities at these levels with immunisation performance being an integral part of the performance assessment of health managers at all levels. In Ghana, there are three levels of performance monitoring. These include:

a) District level: At this level, health managers are supposed to conduct quarterly reviews with sub-districts, support supervision and monitoring visits and provide monthly data validation and feedback.
b) Regional Level: Managers at this level monitor immunisation results primarily through DHMIS2 and send feedback to the district level; provide technical guidance to all districts through quarterly monitoring visits and conduct quarterly and annual performance reviews.
c) National Level: At this level, managers conduct quarterly MoH / health partners' joint monitoring; bi-annual and annual reviews; quarterly technical visits to regions and districts; health summits to assess sector performance; and quarterly meetings to report progress made in implementing EPI annual programme of work as well as other development partner intervention support.

DHIS2 for Immunisation in Ghana

In Ghana, DHIS2 is used countrywide as the sole data repository for health service data. The country has successfully transitioned from the use of multiple information systems to DHIS2. They are also using the immunisation dashboards to display data on various immunisation indicators that are being tracked. They have also implemented the e-Tracker for over three years both at the National and Regional level and in some parts of the country at facility level.

Transition to a single system

Understanding the country's data needs and direction was critical in Ghana's decision to transition from using both DVDMT and DHMIS2 to DHIS2. Redundant data was being collected through DVDMT. The DVDMT system could not be accessed by most data consumers as one officer put it, "*DVDMT was a one-man system installed on the EPI officer's computer with limited access to others beyond the EPI Officer."* The EPI programme used this system to report to WHO Afro after manually populating the monthly EPI vaccination report from the district and regions. It was also noted that this same report was routinely entered into DHMIS2 at the district by all health facilities offering EPI services. This led to double reporting and duplication of efforts. In addition, when EPI data was updated within DHMIS2, most districts did not bother to update the data captured within DVDMT and vice versa. This then led to different figures being reported for the same services at all levels. It was to address these issues that GHS engaged various stakeholders to integrate these two tools. DHMIS2 was a more comprehensive tool than DVDMT as illustrated in the table below.

Area	DHMIS2	DVD-MT
HMIS	Provides a comprehensive HMIS solution for all GHS service data based on data warehousing principles, easily customizable to the needs of different health systems at various levels	Is a siloed system (only for EPI) with other data elements on surveillance, disease control and other program data captured in DHMIS2
Data capture	Collects all health service aggregated monthly data including EPI data at the district and lower levels	Captured EPI monthly data output at the regional level
Data Quality	Provides tools for data validation, improvement of data quality, automated reports, analysis reports, flexibility for user defined reports	No in-built tools for data quality control
Data Visuals	Dashboards for monitoring and evaluation of health programs, generation and analysis of indicators and data quality analysis	Used for dynamic colour visualisation of only EPI indicators
System management	System management functions to manage hierarchy of organisation units, addition / deletion / modification of data elements	No system management functions

Table 1: DHMIS2-DVDMT system comparison

To effectively manage this transition, the following tasks were undertaken in three phases.

Phase I:

- DVDMT-DHMIS2 integration: both platforms were reviewed to identify service data for manual export from DHMIS2 to DVDMT
- Separation of service data from logistics and other data that was then added to EPI monthly reporting forms
- Development of datasets to capture logistics data among regional cold chain stores and district cold chain stores to allow for validation of reported facility logistics data

Phase II:

- Worked with GHS local consultant, DHMIS2 technical team and EPI Programme to develop scripts that allowed regional, districts and sub district EPI staff to generate aggregate data from DHMIS2 to DVDMT automatically and dynamically on the user interface
- Did trial tests at the regional and national level for consolidated DVDMT data
- Trained district counterparts on how to automatically generate aggregate data from DHMIS2 to DVDMT
- Conducted regional and national trainings

Phase III:

- Conducted regional and national orientation meetings

The following lessons were learned through this harmonisation and transition process.

1. GHS leadership: Having the same immunisation data duplicated in two different and unconnected systems led to reduced accuracy of the immunisation data in the country hence GHS's decision to use a single system for HIS that matched its needs. The EPI department was thoroughly engaged and provided valuable input into managing the transition.
2. GHS collaborated with WHO Afro who required the country to report on immunisation using DVDMT. WHO HQ, GHS programme staff from EPI and HMIS were also engaged to define the requirements of the single system needed; adapt DHMIS2 and find solutions to any functionality that couldn't be addressed within the online DHMIS2.
3. As GHS worked on transitioning into a single system, they also worked on integrating both systems. Currently, DHMIS feeds some immunisation data into DVDMT after the development of agreed minimum outputs for EPI reporting.

DHIS2 Immunisation Tracker

In 2016, Ghana deployed the DHIS2 Immunisation Tracker (e-Tracker), which is an extension platform within DHIS2 that provides for collection, management and analysis of transactional, case-based data at the individual level with built-in reminders for tracking and following up defaulters. In Ghana, the immunisation tracker is integrated with maternal and child health and TB services. In an effort to support its implementation at various levels, Regional EPI coordinators, data managers and health workers were trained on how to use it.

The e-Tracker is currently deployed in seven out of sixteen regions in the country. Using the approved standard operating procedures (SOPs) that guide different health programs on how to have their indicators tracked within DHMIS2, the EPI team had a set of indicators approved for tracking with its data parameters officially included in the immunisation registers. These include absolute numbers of monthly and cumulative vaccination conducted by type and level; monthly and cumulative coverage for selected antigens by all levels; monthly and cumulative vaccine coverage and stock vaccines by health facility among others. Regular onsite support is provided by the technical teams at the national and district level to ensure good quality, timely and accurate data capture by the health workers at the health facility level.

DHIS2 Immunisation Dashboards

Ghana is also using the DHIS2 Immunisation Dashboards at the national, district and sub district levels. They have been very useful in displaying data on indicators that are being tracked. Due to poor internet connectivity particularly at the health facility level, the district health information officer (DHIO) often downloads / prints out dashboard data and sends it to community health officers (CHO) to effectively plan for immunisation activities. According to one DHIO, "*Due to internet challenges at the health facility level, health workers cannot access immunisation data in real time. I therefore ensure that at least every month or as and when their requests come through, I make the data available for them to use.*"

DHIS2 Immunisation Analysis App

Ghana has the immunisation analysis app configured and ready to be rolled out at the regional level. This effort has however been hampered by the lack of funds to strengthen the capacities of regional EPI coordinators and managers to be able to use the application. Efforts have been made by GHS to engage potential partners to support its scale up and deployment but this has been unsuccessful.

DHIS2 Immunisation Data Flow

At the health facility, CHOs use paper-based immunisation registers and a tablet provided by GHS to capture the required data. They completely fill out the immunisation register and then enter this data into the offline e-Tracker application on their tablets. Since the e-Tracker was integrated with other health services at the health facility level, other tools that are used to collect data include the Child Welfare Card particularly for children under 5, the consortium book at the outpatient department, antenatal care register, family planning register and tuberculosis (TB) registers in addition to the immunisation registers.

Using the monthly paper-based registers ensures that all data parameters are completed before entering data into the e-Tracker application on the tablets. In case of any errors in the data submitted, reference is made back to the paper-based register to correct the errors. Due to internet challenges at this level, most health officers cannot immediately submit their data into the e-Tracker and have to use "internet network spots'' or travel to the district capital or give their tablet immunisation data that has been entered to a colleague travelling to the district capital where they can get internet access to synchronise data into the system. Immunisation data is collected once every month because immunisation sessions for child welfare clinics or outreach are conducted once every month with data submission done every 5th of the month as stipulated in the SOP.

> *"For now, we can't completely go paperless because data from some health facilities still has errors which they are required to correct. Having a reference document gives them a chance to refer back and enter accurate data." - DHIO*

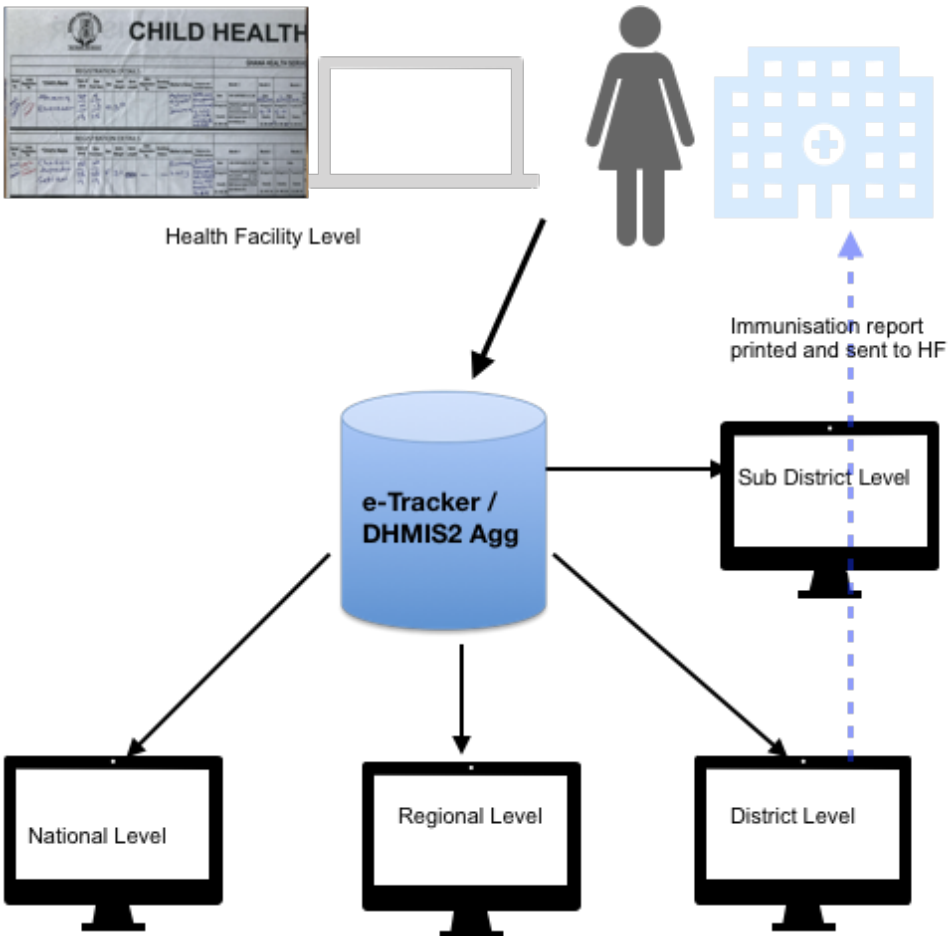

Figure 1: DHIS2 Immunisation Data Flow

Once the data is synchronised in e-Tracker by the CHO or the in-charge of a child welfare clinic, it is then reviewed and verified by the sub-district head within DHIS2 to ensure accuracy and completeness. In case of any errors, the health worker at the health facility level is immediately asked to correct errors and re-submit. Health facilities have a 5-day window within which they are required to synchronise their data within DHIS2 and are advised to always do this at least 3 days before the submission deadline.

After verification by officers at the sub-district level, the DHIO further reviews, validates and approves the data by the 15th of every month. At this stage, immunisation reports can be generated. The final approval is done by the Regional Health Information Officer by the 25th of every month before the data is used at the national, regional, district and health facility level for various purposes. The quality of data collected is good with the exception of a few facilities that still report inconsistencies with completeness and accuracy.

Achievements

Notable achievements from using DHIS2 for Immunisation in Ghana have manifested from the use of data at all levels as seen in the figure below.

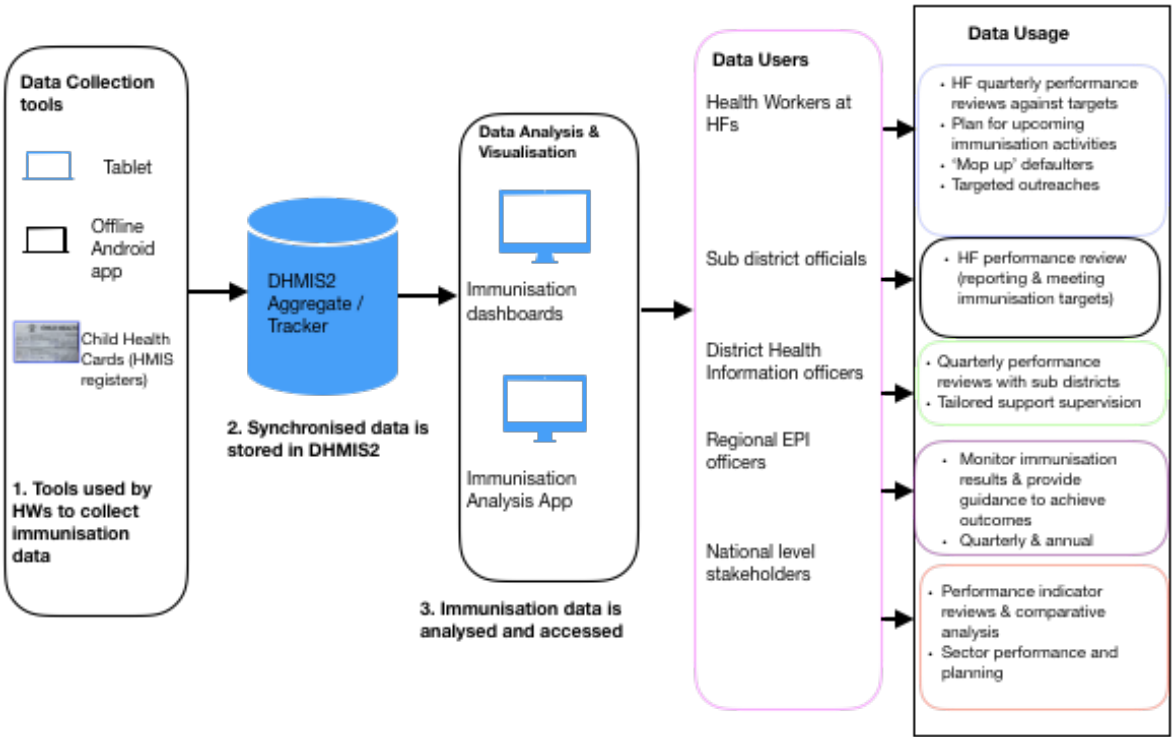

Figure 2: DHIS2 Immunisation data use

Accessing Individual patient data at the health facility level has been crucial in 'mopping up' defaulters, planning for logistics and supplies and upcoming immunisation events including targeted outreach. Use of immunisation data for performance review and improvement was evident at all levels. Other notable achievements include decision making; reporting disease outbreaks and enhanced technology skills of health workers. These are good achievements so far in a short period of implementation as compared to other countries implementing the DHIS2 immunisation applications.

Performance review and improvement: The Sub-district Officer consistently uses the e-Tracker data first to identify the health facilities that have submitted their reports and those that have not and immediately reaches out to those that have not. Second, he or she verifies the data submitted to ensure accuracy and in case of errors, a health officer who submitted it is contacted immediately to crosscheck with the paper-based register data to rectify errors. Third, this data is used to review the performance of health facilities for reporting and meeting set targets for a particular period of time. EPI Regional coordinators use this immunisation data to monitor immunisation results achieved in each region and provide technical guidance on achieving set immunisation outcomes.

Decision Making: Immunisation reports are used to guide decision making processes by the EPI department and the disease control units to identify met immunisation targets and also prioritise key targets and gaps. At the district and health facility levels, managers have been able to determine how close they are to achieving quarterly immunisation targets for the

population for each antigen. 'Mopping up' to track defaulters is a prioritised decision-making area to improve achievement of coverage targets. At the national level, immunisation data from the aggregate system has formed the basis for monthly feedback on Immunisation indicators. Senior managers including the Director General have access to an executive DHMIS2 dashboard enabling them to review performance indicators and also conduct comparative analyses of performance. This year's analysis for example indicated a drop-in immunisation coverage as compared to last year. The team is analysing this to draw conclusions and make decisions.

Planning: DHIS2 data is used to inform planning for vaccines and other logistical supplies by revealing the numbers that have been reached and those that have not been reached at various levels in preparation for upcoming immunisation events or campaigns. The e-Tracker data on upcoming immunisation events helps to generate the numbers of children expected to turn up for immunisation services, making the calculation or estimation of required vaccines and personnel to deliver the services easier.

Reporting Disease Outbreaks: Through the DHMIS2 IDSR, health facilities report on disease outbreaks for instance cholera, diarrhea, guinea worm on a weekly basis when they occur. Disease burdens are provided for within the forms on the e-Tracker and require health workers to immediately notify the district and above for immediate action. These disease outbreaks are still reported as part of the monthly reports with a notification already sent to the district at the time when they are detected.

Enhancing Technology Skills: Health officers have gained more skills in using computers, tablets and immunisation applications and online data. One health officer noted, "*Previously I was tallying my registers and completing the paper-based immunisation registers. However, the introduction of e-Tracker came with training in computer use, tablets and interaction with online data. Over time, I have gained experience and confidence in electronic data entry and can also help out my colleagues."*

Challenges

Despite the above notable achievements from using DHIS2 immunisation applications, Ghana has faced a number of challenges throughout the implementation of the system. These include among others internet connectivity, inconsistences in data completeness and accuracy from some facilities and staffing and workload. Worth noting is that the challenges highlighted are similar to those reported by other countries implementing DHIS2 immunisation applications within the African region.

Internet Connectivity: Only health facilities located within the district capital have access to internet connectivity. The other health facilities have no or limited internet connectivity which creates challenges with data synchronisation in DHIS2. Once they enter data in the offline app on their tablets, they then have to travel or send someone to the district capital to be able to access the internet and submit the data into e-Tracker. Additionally, it is challenging for health facilities to afford to buy internet data. Those facilities that generate some funds through the Out- patient Departments have been able to afford it, but those that

cannot generate their own funds, have had challenges and have had to rely on synchronisation of entered data in the district capital.

Data completeness and accuracy is still a problem for some health facilities. The sub district and district counterparts, however, have and continue to work with these facilities to ensure complete and accurate immunisation data.

Staffing and workload is a challenge especially at the health facility level. Some of them have one or two nurses at the health facility. On immunisation days, they become overwhelmed by the numbers they are supposed to attend to while at the same time ensuring that they enter data into the immunisation registers and other health facility registers. For some of the facilities that enter data directly into the tablets, understaffing increases waiting times for patients since data entry takes extra time. Using tablets to capture immunisation data has improved data capture at the health facility level. However, this is challenged by the limited number of tablets as compared to the number of health workers that are required to submit data on a monthly basis. Some devices have been damaged with no repairs done. There is also a high rate of staff turnover especially in instances where the CHOs leave work for further studies. This therefore calls for regular refresher training for the replacements to ensure that they can use the e-Tracker effectively. At times, regular refresher training is also challenged by limited or lack of resources to conduct them.

Lessons Learned

The implementation of the DHIS2 Immunisation e-Tracker and Dashboards in Ghana has a potential to contribute to the attainment of immunisation outcomes. Health workers are committed to capturing data alongside delivering immunisation services. Devices are provided to ease data capture and submission. Trainings are given with regular support from the district and sub district to health facilities to ensure effective implementation. Implementation of the e-Tracker in Ghana provides a number of lessons for future scale up within the country as well as deployment and scale up in other countries. These include:

Data completeness and accuracy Although majority of health facilities are submitting good quality data, a few facilities still submit incomplete and inconsistent immunisation data. They need to regularly be supported in order to improve. As one officer put it, "*We created a WhatsApp group for all health workers within a particular sub district for health workers from both public and private facilities to regularly discuss data quality, completeness and accuracy issues before submission".* Additionally, regular data quality audits (DQAs) and routine integrated systematic data verification rules need to be enforced. Such efforts should be continued and/or introduced more broadly.

Research to link use of e-Tracker to immunisation outcomes It isn't easy for Information Officers to quickly point out the impact of the e-Tracker on immunisation outcomes hence a need for Ghana and other countries implementing DHIS2 for Immunisation Apps to conduct surveys or research to evaluate its impact on immunisation outcomes.

Internet Connectivity Although CHOs have an offline version of the app on their tablets, they are still required to travel (this takes between 30 minutes to 1 hour depending on the location of the health facility) to the district capital or to send tablets to be able to synchronise

immunisation data. Some health facilities generate funds to buy data bundles, but it is not standard practice across all facilities and/or sustainable. GHS therefore needs to engage the internet providers in an effort to try and address internet connectivity / coverage challenges.

Health Officers' workload challenges need to be addressed One officer suggested that GHS should consider recruiting a data officer who can be in charge of data entry at the health facility level so the nurses can focus on delivering health services.

Regular capacity building GHS and other implementers should plan for regular capacity building or refresher trainings particularly at the health facility level to address knowledge gaps. These gaps are as a result of staff turnover where some CHOs leave for further studies. Addressing this will ensure consistent immunisation data capture, entry and reporting.

Recommendations for Other Countries

The nine countries within the African region that participated in the WHO workshop in Kigali, Rwanda in January 2020 highlighted the following challenges to implementing DHIS2 immunisation apps: data use and system functionality; implementation of parallel systems; human resource; governance, coordination & integration; and funding. Learning from the Ghana experience, the following are the key recommendations that address some of these challenges.

Data use and system functionality To increase immunisation data demand and usage for decision making and other purposes, countries have to ensure that the e-Tracker produces good quality, accurate and complete data. Having good quality data is integral to provision of good health care services. The e-Tracker has the ability to improve data quality and at the same time, learning from Ghana's experience, the supervisors at sub district and district level regularly validate immunisation data before approval for use. In cases of inaccurate data, it is rejected and the CHOs are asked to check data against the registers and resubmit. Additionally, to improve data use at the health facility level, the DHIO regularly prints immunisation data from the dashboards and sends them to CHOs to help them plan for upcoming immunisation activities and calculate vaccine estimates for their health facilities. For countries where health facilities have good internet access, it is recommended that the capacity of health workers and managers are built to generate and use immunisation data at all levels. They should also be effectively and meaningfully engaged to improve data usage. Available literature examining the roll-out of DHIS2 immunization reporting systems emphasize the need for integrated training to build a positive sense of data ownership for improved decision-making at all levels (Sahay, 2011; Usifoh et al., 2019; Nisingizwe et al., 2014; Etamesor et al., 2018; Braa et al., 2012).

Integration of systems Many countries have and continue to adopt DHIS2 as a way of strengthening their national health information systems. Others on the other hand are still grappling with transitioning from parallel systems to a single system. Implementing parallel systems at times leads to duplication of data collection, lack of consistency, ineffective data collection and analysis among others hence the need for HIS integration. Ghana for example, transitioned from the use of DVDMT to DHIS2 by following a process that was guided by SOPs

from the GHS and the national DHIS2 Committee. Several meetings for monitoring and harmonisation of data aimed at managing data transfers were conducted. Other considerations included, training EPI managers and other users, roll out of DHIS2 and subsequent immunisation applications and eventually integration of DVDMT with DHIS2. This integration was done to enable managers to have quick access to immunisation data from immunisation apps even without DHIS2 user access rights.

Funding and infrastructure Ghana like most countries implementing DHIS2 for immunisation largely depend on international donor funding to deploy and use DHIS2 Immunisation Apps. However, to ensure sustainability, countries need to adopt self-financing strategies to health information management systems beyond donor funding. Governments need to begin including a budget to support health information system implementation rather than overly relying on donors and partners.

Workforce In most countries, Ghana inclusive, it is the responsibility of a health worker to collect and enter data into the e-Tracker at the health facility level. However, they are usually poorly staffed with high workload. As revealed in some of the studies on facility-level and point-of-service data collection systems for immunisation, there are improvements in data quality but with an increased burden of data-entry duties, conflicting priorities and a need for special attention to local work flow and training (Adaletey, 2017; Moyo et al. 2015; Anderson et al., 2014; Clarke et al., 2019).

Conclusion

Use of the e-Tracker and immunisation dashboards has presented an opportunity for Ghana to achieve their immunisation targets. These applications have facilitated the availability of good quality immunisation data that has in some instances been used for decision making, planning, immediate notification on disease outbreaks and performance reviews at various levels. However, to fully realise the benefits of the DHIS2 immunisation applications, the identified challenges need to be addressed. Internet connectivity has proven to slow down data submission and also adds a burden to health workers to look for internet services to be able to synchronise data. Districts and sub districts should continue to support health facilities to improve data completeness and accuracy to ensure that health managers demand for and use immunisation data. Regular capacity building should be provided to health facilities to address the knowledge gaps as a result of staff turnovers. During this assessment work, HealthEnabled noted the need for research that can contribute to the evidence base on the impact of DHIS2 immunisation applications on immunisation outcomes.

References

Adaletey, D.L. 2017. Leveraging on Cloud Technology for Reporting Maternal and Child Health Services at the Community Level in Ghana. Journal of Health Informatics in Africa. 4(2).

Anderson, R., Perrier, T., Pervaiz, F., Sisouveth, N., Kumar, B., Phongphila, S., Rahman, A., Dhiman, R. and Newland, S. 2014. Supporting immunization programs with improved vaccine cold chain information systems. In IEEE global humanitarian technology conference (GHTC 2014): 215-222.

Braa, J., Heywood, A. and Sahay, S. 2012. Improving quality and use of data through data-use workshops: Zanzibar, United Republic of Tanzania. Bulletin of the World Health Organization. (90) 379-384.

Clarke, K.E., Chibawe, C.P., Essiet-Gibson, I., Mwansa, F.D., Jacenko, S., Rhee, C., Kwendakwape, M., Kashoka, A. and MacNeil, A. 2019. Strengths, pitfalls, and lessons learned in implementing electronic collection of childhood vaccination data in Zambia: The SmartCare experience. International journal of medical informatics. 129:146-153.

Etamesor, S., Ottih, C., Salihu, I.N. and Okpani, A.I. 2018. Data for decision making: using a dashboard to strengthen routine immunisation in Nigeria. BMJ global health. *3*(5): e000807.

Moyo, C., Nkhonjera, T. and Kaasbøll, J. 2015. Assessing the use of mobile technology to improve timeliness of HMIS reports in Malawi. In 2015 IST-Africa Conference: 1-9.

Nisingizwe, M.P., Iyer, H.S., Gashayija, M., Hirschhorn, L.R., Amoroso, C., Wilson, R., Rubyutsa, E., Gaju, E., Basinga, P., Muhire, A. and Binagwaho, A. 2014. Toward utilization of data for program management and evaluation: quality assessment of five years of health management information system data in Rwanda. Global health action. 7(1): 25829.

Sahay, S., 2011. Assessment of the ability of the health management information system in India to use information for action. Master's thesis, The University of the Western Cape.