HARNESSING DATA FOR DECISION MAKING BY BUILDING LOCAL CAPACITY IN DHIS2 MANAGEMENT

INTRODUCTION

In low-resource settings, where healthcare systems struggle with data management due to limited infrastructure, the District Health Information System 2 (DHIS2) has emerged as a transformative tool for improving health data collection, analysis, and decision-making. As an open-source, flexible, and scalable platform, DHIS2 enables real-time or near-real-time data reporting, reducing the reliance on cumbersome paper-based systems that frequently lead to delays and inaccuracies. Its offline functionality allows health workers in remote areas to capture and store data, which can be synced once an internet connection becomes available. By streamlining data collection, enhancing monitoring, and improving access to timely and reliable health information, DHIS2 strengthens healthcare delivery, facilitates evidence-based decision-making, and ultimately contributes to better health outcomes in resource-constrained environments.

The head nurse at a health center in Kalonda Oest uses the computer at the central office of the health zone to enter data into DHIS2.

IMA WORLD HEALTH PAVES THE PATH TO DIGITISED ROUTINE DATA

IMA World Health embarked on its mission to digitise routine health data in 2006, playing a pivotal role in transitioning the Democratic Republic of Congo (DRC) from a paper-based system to the digital Health Information System Management (GESIS). However, GESIS faced significant limitations, including rigid restrictions that prevented modifications to health zones, population data, and evolving health indicators. These inefficiencies, combined with its inability to generate rapid, high-quality data, led to a decline in adoption. A decade after its launch, GESIS was implemented in only 35% of the country, signalling the need for a more adaptable solution.

Recognising these challenges, IMA World Health introduced the District Health Information System (DHIS) 1.4 in 2009. As an open-source, globally recognised software now used in 73 countries, DHIS provided a more flexible and scalable solution. Within six months, the IMA-led Integrated Health Services Project (Project AXxes, 2006 - 2010) successfully customised DHIS1.4 to align with the DRC's National Health Information System (SNIS), installing it across South Kivu's 28 health zones. The rapid processing of data, ease of implementation, and improved data quality made DHIS1.4 a widely accepted and transformative tool for health data management.

Building on this success, IMA World Health supported DHIS2 use in 52 health zones as part of the Access to Primary Health Care (ASSP) Project. By 2015, the entire country had transitioned to DHIS2, thanks to a consortium led by IMA World Health. This large-scale implementation connected health centres to the internet through VSAT satellite transmission and 3G mobile networks, equipping hundreds of health zone offices with computers and training thousands of health workers on data entry and reporting. The nationwide adoption of DHIS2 marked a significant milestone in strengthening the DRC's health information system, enabling real-time data collection and more informed decision-making across all health zones.

PIONEERING DHIS2 IMPLEMENTATION THROUGH OUR SUITE OF HEALTH SYSTEMS STRENGTHENING PROJECTS

To support the transition from GESIS to DHIS2, IMA implemented a pilot phase under the ASSP project, started in 2013. The pilot phase played a crucial role in laying the groundwork for an effective DHIS2 implementation. It began with the procurement and allocation of essential infrastructure investments, including two computers per site, the installation of VSAT for internet connectivity in remote areas, and the deployment of solar panels to ensure power sustainability. To build capacity, IMA launched a strategic training programme known as the "Long Strategy," which unfolded over eight months in three distinct phases. The first phase focused on

providing basic DHIS2 training to equip participants with foundational skills. The second phase, conducted over three to six months, centred on data encoding, allowing users to manage and store essential health information efficiently. The final phase emphasised data analysis, empowering staff to interpret and utilise health information for informed decision-making.

Despite its many achievements, the pilot phase uncovered significant challenges and critical lessons that shaped future implementation efforts. DHIS had primarily been used in English-speaking countries, which meant significant work was needed to adapt to a francophone context. IMA technical staff had to rewrite much of the code and even faced a false start—initially implementing the system, only to encounter too many errors, which forced a refinement. In February 2017, IMA successfully rolled out the second version, which remains in use today.

An IMA staff member installs a VSAT dish in Kananga during IMA World Health's ASSP Project in 2014, connecting the central office of the health zone to the internet for the first time.

Another issue was the inconsistency of internet connectivity, as VSAT equipment or solar panels frequently experienced failures. Bandwidth constraints hindered the ability to run reports effectively once the volume of encoded data increased. The use of a single canvas, which was heavy and inadequately parameterised with numerous non-applicable fields, led to inefficiencies, including the encoding of irrelevant data in over 90% of instances. The strategy's slow rollout further impacted DHIS2 coverage across provinces, and a strong dependence on external support presented hurdles for system maintenance. Lastly, encoding data at the health area level limited traceability, preventing detailed tracking of data produced at individual health facilities. These challenges provided invaluable insights that informed the refinement of DHIS2 processes and strategies going forward.

Key Contributions

1. Capacity Building and Training

- IMA has been the primary organisation conducting DHIS2 training in Maniema, Nord-Ubangi, Kasai Central, and Kasai provinces.
- Training-of-trainers programmes have been rolled out to ensure sustainability and local ownership of DHIS2 knowledge.
- Service providers, IT specialists, and DSNIS (Division du Système National d'Information Sanitaire) personnel have been equipped with the skills to use and maintain DHIS2.

2. Technical and Financial Support

- IMA has provided essential technical assistance for adapting DHIS2 dashboards and indicators to meet project, and health system, needs.
- IMA has supported data entry and management at the zone, provincial and national levels.
- Continuous updates and refinements to the system ensure that data remains relevant and actionable for decision-making.

3. Infrastructure Development

- To facilitate DHIS2 operations, IMA has supplied critical IT equipment, including computers and tablets.
- Internet connectivity has been ensured through the installation of VSAT satellite connections and financial support for subscriptions.
- Solar panels have been deployed in areas with unreliable electricity, ensuring consistent access to DHIS2.

Extension Phase: Expanding and Strengthening DHIS2 Implementation

The extension phase of DHIS2 implementation focused on four key components: securing multi-donor funding, integrating DHIS2 in additional provinces, accelerating training efforts, and simplifying SNIS for improved functionality.

- **HMIS Multi-donor Project Funding (2015-2017):** Donor contributions led to expanded DHIS2 support across various provinces and health zones. DFID/FCDO, the Global Fund, the World Bank, and GAVI collectively contributed over $26 million

USD to enhance health information systems. This funding facilitated infrastructure improvements such as VSAT installations and ensured continued technical support.

- **Integration of DHIS2 in Remaining Provinces:** A hybrid approach using both VSAT and 3G connectivity enabled rapid expansion. Training programmes were shortened and streamlined to cover data entry, quality control, and analysis, ensuring efficient adoption across targeted provinces.

- **Accelerated Training of Nationals in DHIS2:** Organisations such as BAO, HISP South Africa, and ASLO were engaged to provide frequent workshops and training sessions. Study trips and participation in DHIS2 Academies further strengthened national capacity.

- **Integration of Specialised Programmes in DHIS2:** The inclusion of programme-specific data within DHIS2 enhanced data specificity and interoperability, allowing for better-informed decision-making across various health sectors.

Project Pilots Use in Vaccination Campaigns

IMA continued to support the use of DHIS2 in more complicated settings. The project initiated a pilot to assess the feasibility of using DHIS2 for digitising vaccination campaign data collection and transmission in DRC. Traditionally, vaccination campaigns rely on manual tally sheets, leading to delays and inconsistencies in data reporting. The DHIS2 pilot aimed to address these challenges by enabling real-time or near-real-time data entry and transmission, allowing for more efficient monitoring and decision-making.

The pilot was successfully conducted in Kamina and Kabondo-Djanda, covering 44 health areas, and demonstrated significant improvements in data collection and management processes. By the end of the campaign, over 60% of health areas had submitted their data on time, showcasing enhanced efficiency in reporting. This timely availability of data enabled authorities to access and analyse information during coordination meetings, leading to more informed discussions and effective decision-making. The use of DHIS2 was positively received by provincial health teams, who recognised its potential to streamline operations and improve outcomes, highlighting a strong case for scaling up its implementation in future vaccination campaigns and broader health initiatives. Vaccination campaign digitization has proven successful to the point where other organizations, such as the Clinton Health Access Initiative, are partnering with IMA to lead this effort in collaboration with the Government of DRC's Expanded Programme on Immunization.

> *"In the campaign, the principle is that on the first day, you need to vaccinate, for example, more than 50% of children, so that on the second day, you can reach around 20-30%. On the third day, you finish. When you have the results at the same time, you can see that in a given area, they haven't vaccinated enough children, they're at 20% or 15%. You can directly, at the CPC level, make a decision to say, 'We need to support them, because such-and-such health area has underperformed, they haven't reached their target.'"* - **Jean Coco Tshibanda, DHIS2 Point Focal, SEMI Project**

Key Challenges in Manual Data Collection

- Vaccination campaigns rely on multiple forms for tracking vaccinated children, monitoring vaccine stocks, and managing waste, which results in complex paperwork.

- Delayed data transmission due to geographical remoteness and lack of communication infrastructure.

- Inconsistencies and inaccuracies in manually recorded data, making real-time decision-making difficult.

Implementation of the DHIS2 Pilot for Vaccination Campaigns

- **Real-Time Data Entry and Transmission:** Data was captured on mobile devices and transmitted instantly when a connection was available. In offline areas, data was stored and uploaded when internet access was possible.

- **Faster Decision-Making:** By the end of each vaccination day, teams could analyse data and adjust strategies as needed, significantly reducing reporting delays from a week to within 24 hours.

- **Improved Monitoring and Supervision:** DHIS2 facilitated real-time visibility into vaccination progress, allowing authorities to identify gaps and address issues promptly, contributing to reducing the number of under-immunized and zero dose children.

- **Comparison with Other Digital Systems:** Unlike routine supervision tools such as ODK (used for LLIN distribution campaigns), DHIS2 provided more immediate access to aggregated data, improving campaign management and oversight.

Challenges Encountered

- **Environmental Constraints:** Campaigns that took place during the rainy season suffered logistical challenges accessing health zones.
- **Connectivity Issues:** Lack of reliable power sources for charging mobile devices and unstable internet connectivity posed operational difficulties.
- **Resource Limitations:** Additional funding was required to support independent supervisors who transported data to areas with internet access for timely submission.

Conclusion and Recommendations for Use in Vaccination Campaigns

The DHIS2 pilot demonstrated that digital data collection can significantly enhance vaccination campaign efficiency, reduce reporting delays, and improve decision-making processes. Despite challenges related to infrastructure and resources, the pilot showcased the feasibility of integrating DHIS2 into vaccination campaigns. Future recommendations include:

- Expanding DHIS2 use for vaccination and other health campaigns.
- Investing in solar-powered charging stations and internet expansion to mitigate connectivity challenges.
- Conducting further training to strengthen data collection and reporting practices.

This pilot serves as a foundation for broader implementation, proving that DHIS2 can be a game-changer in health campaign management across the DRC.

TRANSFORMING HEALTH OUTCOMES

Today, health centres across the country—even in its most remote regions—are consistently submitting monthly reports through the DHIS2 system. Health workers nationwide are tracking key health indicators, including the number of births and birth complications, patient consultations, disease cases, malaria-related deaths, and the number of vaccines administered to children in their communities. As a result, hundreds of critical data points are now collected each month. By the end of the SEMI project, IMA's third UK-aid funded health systems strengthening project in the DRC, 100% of the 18 Health Zones in Kasai province achieved **90% completeness in DHIS2 data reporting each month.**

With DHIS2, health staff can respond to healthcare needs more rapidly than ever before. For the first time, under the SEMI project, maternal mortality is being tracked monthly, providing unprecedented insights into maternal health and top morbidities. One of the most profound indicators of progress is the case fatality rate for mothers within five days of childbirth, which is now reported nationwide through DHIS2. In the health zones where IMA has implemented its projects, this rate is, on average, 5% lower than in the rest of the country—demonstrating the tangible impact of IMA's efforts to strengthen the healthcare system.

CHALLENGES AND RECOMMENDATIONS

The successful implementation of DHIS2 in the DRC hinges on the accuracy and reliability of health data collected at the facility level. While DHIS2 serves as a robust tool for data management, the primary challenge lies in the initial data collection process carried out by healthcare providers, particularly nurses and midwives. Ensuring the integrity of reported data is critical for effective health system monitoring and decision-making.

Health workers from across Bosobolo Health Zone in Nord Ubangi province gather at the central officer for a training session.

Key Challenges in Data Collection and Reporting

1. Inconsistent Data Recording Practices

- Nurses and midwives often fail to complete essential data collection tools, such as maternity registers and partograms, leading to incomplete records.
- Delays in updating registers result in discrepancies between recorded and actual events, undermining data reliability.
- In some cases, financial incentives influence reporting practices, with providers omitting records to avoid scrutiny or to monetise free services.

2. Impact on DHIS2 Data Integrity

- DHIS2 relies on data input from frontline health workers; however, incomplete or inaccurate entries compromise the system's effectiveness.
- Encoders work with available data but often encounter missing information, making it difficult to generate actionable insights.
- While DHIS2 includes data validation rules, manual intervention is required to identify inconsistencies and verify accuracy.

3. Human Factor in Data Management

- Data quality issues stem primarily from the individuals who are handling data at various levels rather than the DHIS2 platform itself.
- Supervisory visits often reveal discrepancies, such as registers pre-filled for future dates or missing entries, indicating a lack of adherence to proper data collection protocols.
- Mid-level data users play a crucial role in validating records, yet their capacity to detect errors and enforce data accuracy remains a challenge.

Recommendations for Strengthening Data Quality

• Enhance Training and Accountability

- Conduct continuous training for healthcare providers on the importance of accurate data recording and its impact on health outcomes.
- Establish accountability mechanisms to ensure compliance with data entry protocols.

• Improve Supervision and Monitoring

- Increase the frequency of supervisory visits to validate register entries and ensure real-time data updates.
- Implement cross-checking mechanisms where supervisors compare reported data with actual service delivery records.

• Leverage Data Validation Features in DHIS2

- Utilise DHIS2's built-in validation rules to flag inconsistencies and enforce data accuracy at the point of entry.
- Strengthen the capacity of data encoders and mid-level users to analyse and rectify discrepancies before submission.

CONCLUSION

The challenge of ensuring data quality in the implementation of DHIS2 in the DRC is not rooted in system flaws but in human factors. Addressing issues in data collection, enhancing supervision protocols, and fostering accountability are pivotal steps toward improving the reliability of health information. By prioritising capacity building and enforcing robust data management practices, DHIS2 can continue to serve as an effective tool for evidence-based decision-making and can positively impact health outcomes across the country. These efforts will ensure that the potential of DHIS2 is fully realised in driving data-driven healthcare solutions.

IMA World Health has played a critical role in embedding DHIS2 as a foundational tool for managing health data in the DRC. Through targeted training, infrastructure support, and technical expertise, the organisation has facilitated the successful integration of DHIS2 across numerous provinces. However, maintaining these achievements will require sustained efforts in capacity building, retention strategies to mitigate knowledge loss, and the cultivation of strong partnerships. Securing long-term support will also be essential to safeguarding DHIS2 as a centrepiece of healthcare decision-making, ensuring continued progress toward strengthening the DRC's health systems.

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