Evaluation of Data Quality and Effective Use of District Health Information Software 2 (DHIS2) In Monitoring Malaria and Vaccination Programs in Mali, 2024

***Cheick Abou COULIBALY[1], Safiatou SAMASSA[1], Ousmane LY[2], Salia KEITA[1], Oumar SANGHO[1], Cheick Oumar BAGAYOKO[1], Souleymane DIARRA[3], Hamadoun SANGHO[1]**

[1]Université des Sciences, Techniques et des Technologies de Bamako (USTTB)/FMOS Mali

[2]Agence Nationale de Télé Médecine (ANTIM)

[3]Institut Nationale de Santé Publique (INSP)

***Corresponding Author**

DOI: https://doi.org/10.51584/IJRIAS.2026.110200144

Received: 04 March 2026; Accepted: 09 March 2026; Published: 20 March 2026

ABSTRACT

Introduction: The District Health Information Software 2 (DHIS2) is a free open-source software platform for data collection, analysis, visualization, and sharing. It is the most widely used platform within the health information system worldwide. It is implemented in Mali for service delivery, monitoring, and evaluation of health programs. The aim is to assess data quality and the effective use of DHIS2 in monitoring malaria and vaccination programs. **Materials and Methods**: This is a secondary analysis of DHIS2 survey data from a mixed cross-sectional study conducted from September 2023 to September 2024. **Results**: The use of DHIS2 has improved data quality by enhancing completeness and timeliness to 91.7%. Internet connectivity issues were most frequently identified as a factor preventing the use of DHIS2 at 83.3%. The adoption of the DHIS2 allowed the identification of malaria cases in 30%. DHIS2 made it possible to identify community health centers with low vaccination coverage in 30% and to carry out activities in these districts to raise their level by 20%. It improved the archiving and securing of real-time data in 36.1% and saved time by 43%. **Conclusion**: The evaluation of DHIS2 made it possible to determine the level of DHIS2 performance and to identify some of its strengths and weaknesses.

Key words: DHIS2, Quality, Malaria, Vaccination, Mali

INTRODUCTION

DHIS2 (District Health Information Software 2 - DHIS2) is a free open-source software platform for the collection, analysis, visualization, and sharing of data. It is the most widely used platform within the health information system (HIS) globally [1]. To date, more than 80 countries, including many in developing regions, have adopted and implemented DHIS2 as the main information system for managing health information systems (HIS) in order to generate data to formulate, manage, plan, implement, monitor, and evaluate health services and programs effectively. Approximately 3.2 billion people live in these countries where DHIS2 is used. This open-source configurable platform provides tools to collect, analyze, visualize, share, and validate individual and aggregated data [1,2].

The DHIS2 software, as well as some of its modules and monitoring tools, is implemented in Mali for the EPI and programs to fight HIV, tuberculosis, and malaria for service delivery and program monitoring and evaluation. DHIS2 modules are used to improve the availability, quality, and use of program data and to enhance health systems and health outcomes through informed decision-making [3].

The Global Fund to Fight Malaria has invested to help countries use DHIS2 for aggregated reporting and is interested in using the DHIS2 tracker for individual-level data collection. More than 30 countries in Africa and

Asia have installed the WHO-recommended modules in their Health Information Management System (HIMS) to support their EPI and malaria programs. This system has made it possible to identify gaps in vaccination coverage, monitor malaria rates, reduce stock wastage, optimize cold chain management, and ensure follow-up of vaccination reports. In addition, the implementation of the DHIS2 tracker system has improved compliance with national vaccination schedules, supported campaign monitoring, ensured case management, and reduced dropout rates [1,4].

Malaria is a major public health problem, particularly in low-income countries such as Mali. Children under the age of 5 and pregnant women are the groups most affected by this disease, making it a priority of the national health policy. Thus, for several decades, numerous efforts have been made through the national strategy for malaria control, which focuses on prevention and case management [5]. Malaria is the leading cause of morbidity (37.7%) and mortality (24.4%) in Mali; globally, Mali is among the ten countries where the number of malaria cases and deaths is the highest. Mali accounts for 6% of malaria cases in West Africa [6].

Vaccination is an essential component of the human right to health and an individual, collective, and governmental responsibility, and must be recognized as such. It is estimated to prevent 2.5 million deaths each year. By being protected from vaccine-preventable diseases, vaccinated children can grow up under good conditions and fully realize their potential. These benefits are further enhanced by vaccinations during adolescence and adulthood [7]. The Expanded Program on Immunization (EPI), initiated by the WHO in 1974, aims to combat vaccine-preventable childhood diseases. The goal of the EPI is to make vaccines accessible to all children worldwide, and it is the most effective and least costly means to significantly reduce infant mortality [8].

Despite the perceived effectiveness of the DHIS2 implementation, there are many obstacles to the effective implementation of DHIS2, including the increased workload of health workers, the shortage of human resources, Information and Communication Technology (ICT) infrastructures and internet connectivity, system complexity, lack of support and budget, as well as low administrative interest [9,10]. The introduction and implementation of DHIS2 have led to different experiences and successes depending on the country. To our knowledge, few large-scale studies have been conducted to determine the effectiveness of DHIS2 and the use of data to improve the monitoring of vaccination and malaria programs.

MATERIALS AND METHODS

This was a secondary analysis of data from a mixed cross-sectional study on DHIS2. It covered the period from September 2023 to September 2024. The population consisted of health center staff/community workers involved in data collection at the health center/district level (DTC, focal points, and SIS in charge). We used all the data in the database.

The data were collected from two sources: (1) DHIS2 data generated by the routine health information system; (2) qualitative data collected at the national level and at the 6 sub-national levels during a survey conducted as part of the project. The collected data were entered, processed, and analyzed using Excel software. The results were presented in tables and charts.

To address ethical considerations, the confidentiality and anonymity of the information collected were respected. The protection of the respondents will be ensured by the research team. An authorization letter will be obtained from the national-level health offices to interview participants of the same level or a lower level. Oral informed consent will be obtained from each study participant after informing them of the objective, the method, and the expected benefits.

RESULTS

The results are organized around three main areas: the frequency of DHIS2 use to improve the quality of data in malaria and vaccination health outcomes in Mali; the measurement of DHIS2 adoption and use and changes in health outcomes in Mali; the performance conditions of the DHIS2 system in Mali. We conducted a secondary analysis of data concerning 6 health districts in Mali. The districts of Kayes, Bafoulabe, Ségou, Niono, and Niéna

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue II February 2026

all have a completeness rate of 100% over the 5 years. The Ségou district almost reached this level of perfection with a rate of 99.2%. However, the Koutiala district shows lower performance compared to the others, with a rate of 78.8%. The districts of Kayes, Bafoulabe, Ségou, Niono, and Niéna show remarkable timeliness rates over the 5 years. The districts of Kayes and Bafoulabe have the highest rates, being respectively 91.7% and 79.7%.

Koutiala has the lowest timeliness rate at 6.5% (Table 2). The use of DHIS2 has modified the quality of data by improving these dimensions of completeness and timeliness to 91.7%. DHIS2 has allowed better identification of malaria cases in 30%, follow-up and improvement of outcomes in 30%, and adherence to treatments and coverage in 13%. Analysis, monitoring and evaluation, planning, and decision-making were the changes most observed in 33.3%. DHIS2 made it possible to identify community health centers with low vaccination coverage in 30% of responses and to target lower-performing districts and carry out activities in these districts to increase vaccination coverage and reduce the number of children with zero vaccine doses in 20%. The contribution of DHIS2 improved data archiving and security by 36.1%. And also brought changes in the availability and accessibility of real-time data in 30.5%.

Insecurity and lack of resources were the factors that affected the performance of DHIS2, at 25% and 16.6% respectively. The obstacles that affect the optimal adoption of the DHIS2 platform were marked by internet connection instability at 55.5%, platform disruption at 25% during its update, and insufficient computer tools at 14%.

Discussion / Comments On the frequency of DHIS2 use to improve data quality in malaria and vaccination health outcomes in Mali in our study, all health districts reached a completeness rate of 100% except for the districts of Ségou and Koutiala, which had 99.2% and 78.8% respectively, for an average of 96.33%. This result is higher than that of the national survey in 2018 (84%) [11], and Shama et al. in Ethiopia in 2021 (60%) [12], and lower than that of Traore B et al. in Mali [13], who found a completeness of 100%. This could be explained by the fact that their study only concerned the Tombouctou health district, whereas this study was national and concerned several regions.

Regarding timeliness, only the district of Bafoulabe had a satisfactory rate at 91% according to the national threshold. Timeliness is therefore considered good if the number of reports submitted on time out of the expected reports is greater than 80% [11]. With an average of 61.25%, our result is lower than those of Traore B et al., Shama et al., Kebede et al. in 2020 in Ethiopia and Burkina Faso in 2020, who found timeliness to be 92%, 93.7%, 72.2%, and 82% respectively [12–15]. And higher than the national level in 2018 (51%) [11]. This rate does not reflect good performance, which could be explained by the lack of mastery of primary data collection tools, the mobility of trained staff, and also the workload.

On the measures of adoption and use of DHIS2 and changes in health outcomes in Mali The adoption of DHIS2 led to better identification of malaria cases by 30%, with monitoring and improved outcomes in 30% and adherence to treatments and coverage by 13%. It also brought changes in analysis, monitoring and evaluation, planning, and decision-making in 33.3%. DHIS2 also enabled the identification of community health centers (CSCom) with low vaccination coverage in 30% of responses and the targeting of lower-performing districts and conducting activities in these districts to increase vaccination coverage and reduce the number of children with zero vaccine doses by 20%. DHIS2 improved archiving and data security in 36.1%. It also brought changes in the availability and accessibility of real-time data by 30.5%.

On the performance conditions of the DHIS2 system in Mali The obstacles affecting DHIS2 were the absence and instability of the internet connection in 55.5% of cases; this result is lower than that of Traore B et al. and the national level in 2018 (at 67% and 69% [11,13]) and higher than that of Shama et al. at 31% [12]. These difficulties in accessing the internet in our context can be explained by network instability, power outages, failures of solar panels and generators, thereby disrupting the network quality. Despite these difficulties in accessing the internet, health workers were able to submit reports to the hierarchical level and enter data regularly, most often on time.

Insecurity was one of the factors affecting DHIS2 performance at 25%; this result is lower than that of Traore et al., which was 37% [13].This insecurity can be explained by the fact that there is terrorism, conflicts, and inter- and intra-community tensions in the country, especially in the central and northern parts, and Traore et al.'s study was in a northern region (Timbuktu). Insecurity can be the cause of the mobility of residents and also the lack of access to primary data by the agents. The lack of resources is also one of the factors affecting the performance of DHIS2 at 16.6%; this can be explained by the lack of computer equipment or computer equipment in poor condition, as well as the insufficient number of qualified personnel for SIS management.

CONCLUSION

The evaluation of DHIS2 made it possible to determine the level of DHIS2 performance and to highlight some of its strengths and weaknesses. Apart from the completeness and timeliness of the reports, secondary data analysis did not allow us to analyze other dimensions of quality such as: consistency, comprehensiveness, integrity, and confidentiality.

BIBLIOGRAPHIC REFERENCES

1. Aperçu du DHIS2 [Internet]. DHIS2. [Cité 4 juin 2024]. Disponible sur : https://dhis2.org/fr/overview/
2. Farnham A, Loss G, Lyatuu I, Cossa H, Kulinkina AV, Winkler MS. A roadmap for using DHIS2 data to track progress in key health indicators in the Global South: experience from sub-saharan Africa. BMC Public Health. 31 mai 2023 ;23(1) :1030.
3. USAID, MEASURE E, Ministère de la Santé. L'Expérience du Mali dans le déploiement du DHIS2. Mali;
4. DHIS2+and+Immunization+Resource+Guide_June2020_Final.pdf [Internet]. [Cité 4 juin 2024]. Disponible sur : https://s3-eu-west-1.amazonaws.com/content.dhis2.org/general/DHIS2+and+Immunization+Resource+Guide_June2020_Final.pdf
5. Enquête sur les Indicateurs du Paludisme au Mali [Internet]. [cité 4 juin 2024]. Disponible sur : https://dhsprogram.com/pubs/pdf/MIS40/MIS40.pdf
6. Mali [Internet]. Severe Malaria Observatory. [cité 4 juin 2024]. Disponible sur : https://www.severemalaria.org/fr/countries/mali
7. gvap-introduction-and-immunization-landscape-today-fr.pdf [Internet]. [cité 5 juin 2024]. Disponible sur: https://cdn.who.int/media/docs/default-source/vaccines-and-immunization/gvap-introduction-and-immunization-landscape-today-fr.pdf?sfvrsn=a8ef32aa_2
8. Programme Élargi de Vaccination(PEV) – CNIECS [Internet]. [cité 4 juin 2024]. Disponible sur: https://cniecs.sante.gov.ml/programme-elargi-de-vaccinationpev/
9. Miyazaki K, Nozaki I. Introduction of District Health Management Information Software System Version 2: a literature review. 2019;34(2):93-8.
10. Dehnavieh R, Haghdoost A, Khosravi A, Hoseinabadi F, Rahimi H, Poursheikhali A, et al. The District Health Information System (DHIS2): A literature review and meta-synthesis of its strengths and operational challenges based on the experiences of 11 countries. Health Inf Manag J. 1 mai 2019 ;48(2) :62-75.
11. Évaluation de la performance du système local d'information sanitaire au Mali (2018) — MEASURE Evaluation [Internet]. [Cité 22 août 2024]. Disponible sur : https://www.measureevaluation.org/resources/publications/gr-20-112-fr.html
12. Shama AT, Roba HS, Abaerei AA, Gebremeskel TG, Baraki N. Assessment of quality of routine health information system data and associated factors among departments in public health facilities of Harari region, Ethiopia. BMC Med Inform Decis Mak. 19 oct 2021;21(1):287.
13. Traore BM, Traore A, Kebe AT, Dabou K, Kassogue D. La gestion des données du système d'information sanitaire de routine en période de crise sécuritaire dans le district sanitaire de Tombouctou, au Mali en 2023. Pan Afr Med J [Internet]. 11 avr 2024 [cité 21 mai 2024] ;47(180). Disponible sur : https://www.panafrican-med-journal.com/content/article/47/180/full
14. Kebede M, Adeba E, Chego M. Evaluation of quality and use of health management information system in primary health care units of east Wollega zone, Oromia regional state, Ethiopia: BMC Med Inform Decis Mak. 12 juin 2020;20(1):107.

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume XI Issue II February 2026

15. Evaluation de la performance du système d'information sanitaire de routine du Burkina Faso — MEASURE Evaluation [Internet]. [Cité 22 août 2024]. Disponible sur : https://www.measureevaluation.org/resources/publications/tr-20-420-fr.html