Heath Service Monitoring in South Sudan

Routine Health Information Systems
Policy Brief 2/5

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Key Points – Brief #2

o Over the past two years, the roll out of District Health Information System 2 (DHIS2) in South Sudan has accelerated under the leadership of the Ministry of Health (MOH) and with sustained donor support.
o However, an estimated 20 percent of facilities are still not participating, and stakeholders have widespread concerns about both the quality and use of the data being reported. In particular, there is a persistent lack of timeliness, completeness, and accuracy in the data being reporting, which is limiting the ability of many stakeholders – the government, implementing partners, and health facilities – to use them in their decision-making.
o Key recommendations for strengthening the implementation of DHIS2 in South Sudan include: (1) conducting a root cause analysis of the persistently low DHIS2 reporting rates, including a facility census; (2) strengthening the MOH's Department of Monitoring and Evaluation; (3) building the capacity of county health departments; (4) exploring the feasibility of piloting facility-level DHIS2 data entry by hospitals; and (5) supporting a multi-faceted approach to improving the quality and increasing the use of routine data, including decentralizing supervision and supporting both bottom-up and top-down data flows in the system.

Introduction

o Routine health management information systems (HMIS) enable the regular or periodic reporting of data on health services. Examples include facility-based or district-based health information systems, as well as surveillance networks for communicable diseases. These can be paper-based or electronic.
o HMIS are one of the six building blocks of functioning health systems as cited by WHO and have emerged as a key focus of health system strengthening efforts in low and middle-income countries (LMICs).
o They are intended to provide timely and reliable information on the needs and performance of health systems. They can also strengthen the stewardship capacity of governments by increasing country ownership of data collection and analysis.
o HMIS in LMICs have historically been plagued by systemic problems with data collection, storage, and reporting, which has resulted in the reported data being incomplete, inaccurate, and delayed, thus limiting their use in decision-making and planning.

Heath Service Monitoring in South Sudan

Routine Health Information Systems
Policy Brief 2/5

Health, Nutrition
and Population

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- o Over the past decade, more LMICs around the world have developed their own health managements information systems, notably through the expansion of DHIS2, a web-based, open-source platform for data reporting, analysis, and visualization. First implemented in 2008, it is now used by more than 50 LMICs as their primary system for collecting routine health information.
- o Many LMICs have reported improvements in their data reporting and service delivery following their adoption of DHIS2,[1] but they often face challenges in implementing the system due to infrastructure, institutional, and technical barriers.[2]

DHIS2 Rollout in South Sudan

- o In 2010, South Sudan piloted an early version of DHIS (v1.4) in Jonglei and Upper Nile states, supported by donors including the World Bank. Prior to this pilot, health information systems in South Sudan were essentially non-existent (World Bank, 2012), apart from a handful of reporting mechanisms for specific diseases (such as polio and guinea worm).
- o There were numerous challenges involved in implementing the pilot. As one health official described it: "[DHIS1] was a good system but had many limitations. It couldn't get real-time data. It had limited indicators – only 47 – but there were so many more indicators we wanted to monitor. So there was a parallel system because it couldn't accommodate all the needs of the partners." This parallel system led to inefficiencies and redundancies in data reporting.
- o In 2017, the MOH and health partners began discussing how to transition to DHIS2, the newer version of DHIS. After extensive planning, DHIS2 was rolled out by the MOH (supported by donors) in 2018-2019, and a strategic decision was made to implement it at the county health department (CHD) level. Although DHIS2 was originally developed as a facility-based tool, country planners felt that most health facilities lacked the necessary infrastructure (such as hardware and personnel) to implement it whereas CHD offices would.

Data Flows

- o Under South Sudan's DHIS2 system, every month facility health workers are expected to transcribe data on a standardized set of indicators from facility registers into a monthly report that they submit to their CHD. These reports are typically hand-written on reporting forms and are physically delivered to the CHD office. They are due the first week of every month and should cover the whole of the preceding month.
- o At the CHD level, a county health official is expected to enter the facility reports into the DHIS platform, usually during the second week of the month. For counties that include many facilities, the data entry burden can be considerable.
- o At the state level, officials review the CHD reports and respond with feedback and requests for clarification. This verification process should occur during the third week of the month,

[1] Kiberu, V.M. et al (2014). *BMC Med Inform Decision Making*, 1:40.
[2] Begum, et al (2020). *BMC Health Services Research,* 20:465.

Heath Service Monitoring in South Sudan

Routine Health Information Systems
Policy Brief 2/5

Health, Nutrition
and Population

WORLD BANK GROUP

but firsthand accounts indicate that this timetable is being adhered to in areas with functioning CHDs but is lagging elsewhere.

o At the national level, the MOH reviews whether each state has completed the expected verification activities and certifies the reports, typically during the last week of the month.

o The data should then be made available (via a password protected site) to CHDs and partners for use and analysis. According to the MOH, CHDs are encouraged to use the data to project their staffing needs and demand for consumables/equipment, and health facilities are expected to use the data to monitor disease outbreaks and any changes in demand for health services.

o Most stakeholders agreed that DHIS2 data are more accessible today than a few years ago, but many expressed concern that there is no "culture of data use." particularly at the facility and lower administrative levels. This means that the blue arrows in Figure 1 representing the downstream flow of data from higher administrative echelons to lower ones and from the lower echelons to the facilities themselves are more theoretical than real.

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Figure 1. Idealized Data Flows in DHIS2
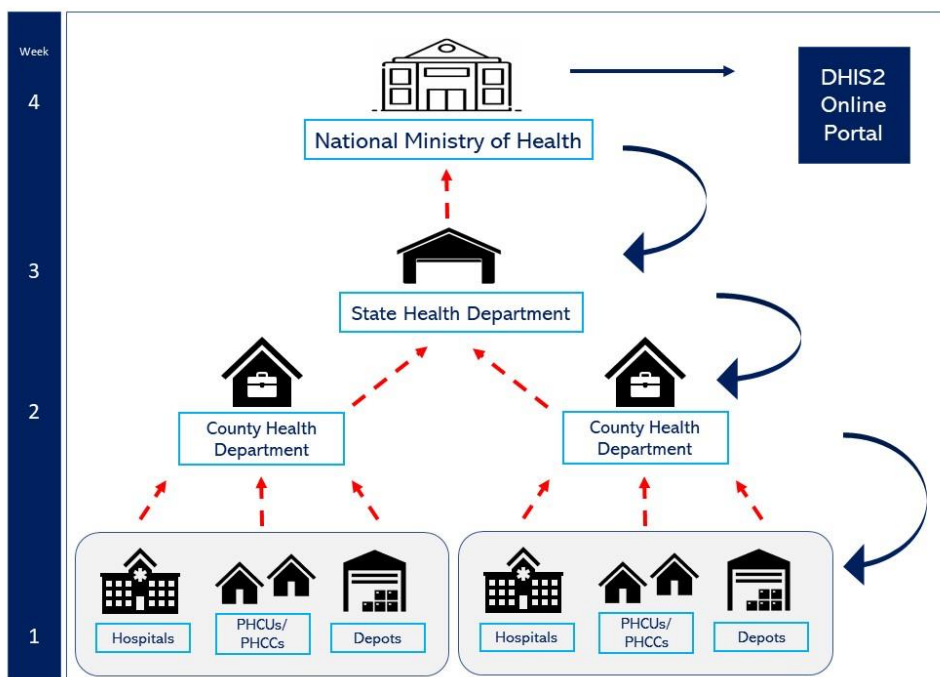
Note: Red arrows = bottom-up data reporting. Blue arrows = top-down feedback.

Current Status of DHIS2

Heath Service Monitoring in South Sudan

Routine Health Information Systems
Policy Brief 2/5

Health, Nutrition
and Population

WORLD BANK GROUP

- o The MOH is the steward of DHIS2 and has espoused the clear goal of making it the single, unified reporting system for the whole country. Most of the financial support for the implementation of DHIS2 is provided by donors, including the Health Pooled Fund (HPF), the World Bank, and the UN. Even in the era of COVID-19, a DHIS2 technical working group of government and health partners convenes monthly to support its implementation.
- o All 80 counties in South Sudan are expected to report into DHIS2. While the number of facilities participating in DHIS2 has increased markedly since 2018, respondents to our key informant interviews estimated that about 20 percent of facilities are not participating either because of a lack of sufficient personnel or infrastructure or because the facilities themselves are non-functional, although there are no precise data on the latter situation.
- o As one respondent stated, "The plan was to target all of the facilities in the 80 counties. But it was not really possible to reach all the facilities...Some had been open but had [then] been closed for some time due to one reason or another – due to funding, roads, [or] human resources." As another noted, "The roll out is only about 80 percent complete because we still have facilities not utilizing. We are talking about 80 percent of 1,900 facilities in the country [using it]" – in other words, between 350 and 400 facilities are not participating.
- o Starting in 2020, the Ministry of Health piloted an expansion of DHIS2 at the facility level. Participating facilities received tablets and training on how to enter data directly into the DHIS2 system. This pilot involved 57 facilities in select areas (such as Lakes state) offering HIV services and was funded by the US Centers for Disease Control and Prevention and PEPFAR. The MOH is keen to expand this pilot, but currently no donors are willing to support it. Many respondents expressed reservations about rolling out DHIS2 at the facility level, citing the pressure of putting additional demands on already overburdened health workers as well as the lack of enabling infrastructure such as electricity and internet and phone access.

SWOT Analysis

- o Interviews with key informants identified critical strengths and weakness of the DHIS2 system, as well as opportunities for support or expansion. The resulting SWOT (strengths, weaknesses, opportunities, and threats) analysis is summarized in Table 1.
- o In terms of *strengths*, the respondents generally acknowledged that the DHIS2 rollout has progressed since 2018, thanks to the MOH's prioritization and the commitment from donors and IPs to encourage facilities to input data. Providing CHD officers with training has increased their capacity to enter data into the system. The respondents also complimented DHIS2 as an increasingly useful source of service delivery data.
- o In terms of *weaknesses*, respondents frequently mentioned concerns about the quality of the data being reported, particularly in terms of its timeliness, completeness, and accuracy. They also mentioned human resource problems, including high staff turnover, a lack of motivation, and a lack of capacity at the CHD level, and the limited use that is made of the collected data.
- o In terms of *opportunities,* the respondents identified strengthening the capacity of CHD officials, improving data quality through verification and enforcement, supporting the uptake

of new tools by facilities, and possibly piloting DHIS2 data entry in high-volume, well-capacitated facilities.

- o In terms of *threats,* the respondents cited uncertainty about donor funding, persistent issues with the physical accessibility of some facilities, a lack of access to reliable wifi/mobile networks, and a dearth of easy solutions to the challenges associated with human resources in health.

Table 1. DHIS2 SWOT Analysis	
Strengths	
Visible stewardship by the MOH	"The whole system is managed by the ministry. The ministry puts pressure on the fund managers, and the fund managers put pressure on the IPs."
Strong commitment by donors and IPs	"DHIS2 is helping. It has worked very well because of the fund managers. The HPF, working with the implementing partners, are making sure that they are inputting [data] into DHIS2."
Increased uptake over time	"DHIS is a very good initiative. There has been tremendous change in past two years. More and more facilities are reporting."
Increased access to data	"If I want to have access to the DHIS2, I am allowed access. I can go in and navigate, but I can't input [data]. I can see how we are doing."
Evidence of data being used for decision-making	"We rely as much as possible on DHIS2. We try to report using DHIS, report all output indicators. We then use this information for decision-making and advocacy."
Weaknesses	
Adoption of new tools has been slow	"There are new HMIS tools – but about 50 percent of facilities have not switched to [using those] new tools."
Data quality is poor (See Table 2 for more detailed discussion)	"Timeliness is an issue. Since [DHIS2] is web based, locations that have access issues find it difficult to upload data on time." "We still ask IPs to submit to [us] directly because data submitted to DHIS2 is very delayed and we need data earlier to submit donor reports." "In itself, DHIS2 has some flaws, for example, sometimes facilities are misidentified as PHCCs [rather than] PHCUs. If a facility is labeled a hospital but is actually a PHCU, planning is going to be impacted."
Facility-level capacity for collecting data is limited	"Some facilities have high staff turnover and even county health departments have limited capacity. Even when there are staff, some are not qualified to do the job or are not computer literate." "At the health facility, the MOH brings in new people [who] may not be trained. In some places, health workers are not able to properly [transcribe information in] the registers printed in English."
CHD capacity is variable	"At the county health level, there is an issue with [high] staff [turnover]. Sometimes [the MOH] brings in people who may not [be able to do] proper data entry."
Lack of process and outcome measures	"DHIS2 just captures outputs in terms of service beneficiaries. It doesn't capture the processes or certain quality metrics."
Opportunities	
Build MOH capacity	"We want the ministry to become capable with its own staff entering the data."
Pilot hospital-level data entry to DHIS2	"If we introduce tablets, let's not go to everything from nothing. We have big state hospitals, and if they enter the data themselves, that would be a huge help." "What I would advocate is for the hospitals and PHCCs [to enter the data], but the PHCU level I don't think it's feasible. Some are not even facilities in terms of structures, some are huts."
Increase stakeholder buy-in to reporting	"We need a more complete DHIS2 system. EPI used to have their own separate management information system. It was very annoying to have a separate database for EPI, nutrition, etc. Now they are keen to join [DHIS2]."
Harmonize incentives	"The DFID and other donors are coming up with harmonized incentives [to support health staff]."
Threats	
Variable donor funding/IP presence	"If [DHIS2] is working now, it is because of the IPs. The IPs have to go and sit with the M&E officer of the county health departments so that the data are captured. They are taking the lead."

Heath Service Monitoring in South Sudan

Routine Health Information Systems
Policy Brief 2/5

Health, Nutrition
and Population

WORLD BANK GROUP

| Infrastructure barriers	"WHO has made efforts [to facilitate] offline [data] entry through mobile collection tools, but again the challenge is [ensuring access to] the internet, especially for data [that are] supposed to be submitted on a weekly basis."
Health workers' motivation	"How do we motivate the staff so that it's not just the IPs pushing for data entry? We want to have a motivated workforce at the county health department level, so those working to capture the data do not have to be forced [to do so]."
Constant training needs/Sustainability	"Even after [providing initial] training, we need to provide continuous training. There is always a need to provide continuous support to check whether data are collected properly."
Humanitarian partner cooperation	"If NGOs work with ministry facilities, then they enter data into DHIS2. If they operate their own facilities, they tend not to."

Data Quality

o Respondents frequently highlighted concerns about the quality of the data entered into DHIS2. Poor quality data may limit data usability and motivate stakeholders to seek out alternative data collection and monitoring approaches.

o Data quality generally encompasses three components: (1) completeness; (2) timeliness; and (3) accuracy. In other words, the data capture the concept that they are intended to measure. These constructs can be measured with varying degrees of stringency. One measure of completeness, for example, might be "the percentage of facilities for whom a monthly report is uploaded into DHIS2," whereas a stricter definition might examine whether every indicator in each report contains a value.

o As part of this review, the World Bank team analyzed aspects of data quality using published indicators and key informant perceptions. The team also reviewed the data available in the South Sudan DHIS2 password-protected portal (www.southsudanhis.org). These findings are summarized in Table 2.

o In general, respondents to the key informant interviews felt that the quality of routine data has improved over the past two years. In addition to the MOH making the roll-out of DHIS2 as a policy priority, many respondents credited IPs and donors with constantly putting pressure on facility health workers to collect data and share it with the CHDs. As one respondent put it, "There are checks and balances now. IPs are the primary contact; they have to make sure things are right." Others noted that reporting rates for facilities supported by donors have increased much more rapidly than non-supported facilities.

o Others also credited TPM for providing oversight and verification of DHIS2 data reporting, e.g. by comparing submissions between DHIS2 and programmatic reports, and holding meetings with IPs and health officials to discuss findings and encourage follow up.

o On the other hand, many respondents raised concerns about the durability of the commitment of CHDs and ministry officials to ensuring data quality. As one said, "People change regularly at the CHD. You don't see a system where there is worry about the quality of data, analyzing the data, asking, 'Why is the [utilization] for the service low?' The push is from the IP. I'm not saying it's not there at all, but the ownership has to go down to the CHD. Otherwise it cannot be sustained."

o The World Bank team's review of the DHIS2 portal found that no data at all were available for some indicators and for others, the data were sometimes outdated and incomplete.

Heath Service Monitoring in South Sudan

Routine Health Information Systems
Policy Brief 2/5

Health, Nutrition
and Population

WORLD BANK GROUP

For example, under maternity indicators, data for deliveries attended by skilled birth personnel were available for only one county in 2020, while the data for other indicators were from 2018. Even when data are available, the lag appears to be at least several months, if not longer. Data completeness may also vary by category or source. For example, the indicators for the Boma Health Initiative appear to be much more complete than others.

Figure 2. Screenshot of DHIS2 Dashboard with Maternity Indicators
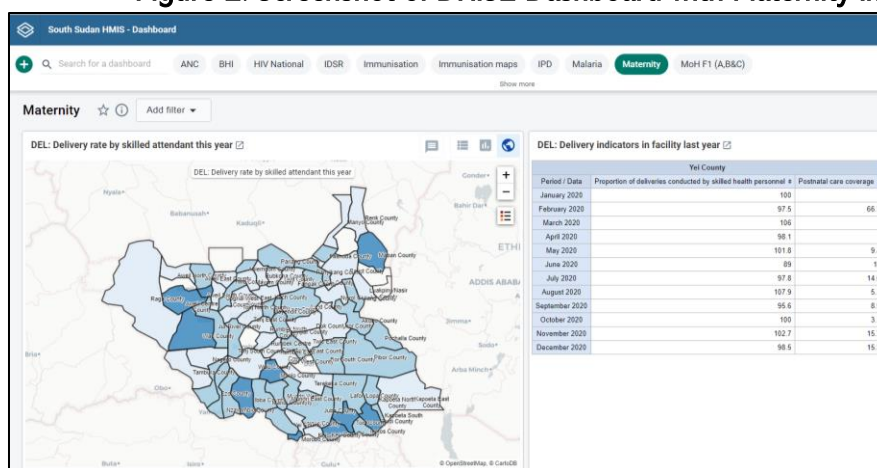
Note: The data in the map on the left are from 2018, while the data in the chart on the right are from 2020 but are available for only one county.

Table 2. Summary of DHIS2 Data Quality		
Construct	**Definition**	**Findings**
Completeness	Percentage of facilities uploading a monthly report uploaded into DHIS2	o The completeness DHIS reporting rates in South Sudan has historically been weak. In 2017, only 49 percent of health facilities in Sudan reported data into DHIS on a monthly basis. This rate was the lowest among 14 Sub-Saharan African countries examined by Maiga et al.[3] Not a single state had more than 90 percent of facilities routinely reporting, which was also the lowest among the countries examined in the study. o For 2020, completeness had increased to 57 percent in Q3, compared to 32.7 percent in the same quarter in the previous year, according to interviews. o 20 percent of health facilities have yet to participate in DHIS2, reflecting accessibility and staffing issues as well as questions about the functionality of some facilities. o 50 percent of facilities have yet to adopt the newly revised data collection tools because of the need to provide further training or support, which has resulted in data gaps for some indicators. o Some respondents raised concerns that DHIS2 does not adequately capture community-level data. As one respondent noted, "What we have is facility-level data. The community-level information is missing." Although efforts have been made to incorporate Boma Health Initiative (BHI) indicators into DHIS2, several stakeholders felt that community-level data remains a weak point.

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[3] Maiga et al (2019). *BMJ Global Health* (2019); 4.

Timeliness	Percentage of facilities uploading reports by a certain date each week or month.	o Timeliness of the data being reported is a commonly cited concern, although precise metrics are lacking. o Facility workers who do not have access to phones or wireless networks must physically take the datasheets to the CHD offices to be entered into DHIS2. This can be extremely time-consuming and burdensome. As one respondent said, "Facilities that are far away are not reflected in the reports because we do not receive these data in time." o Flooding, road impassibility, and conflict can also result in reporting delays. o IPs noted that timeliness issues make them hesitant to rely too heavily on DHIS2 data out of concern that they will miss their own reporting deadlines to donors.
Accuracy	Data submitted to DHIS2 matches facility registers and program reports	o Various "checks" are built into DHIS2 to assess for accuracy, but the degree to which these checks are actually being used is unclear. o The DHIS2 platform includes a data quality tool that is not currently functional. o IPs, donors, TPM agencies, and MOH officials perform site visits to assess whether indicators are being measured according to clinical standards. o IPs report that when funders provide oversight, this increases the accuracy of the data being reported. "We ensure that what is in the program document and what is fed into DHIS2 is matching; even if there is a small error, the HPF or UNICEF will come back to us and say there is a discrepancy, and we will check to make sure it matches."

Data Use

o Respondents gave a range of opinions about data use. The World Bank team's review of the use of data from the DHIS2 portal found that, in the first three months of 2021, weekly views of the portal's pivot table ranged from 891 to 3,021 views, suggesting that there is a steady interest in using the system's data.

o However, in interviews many stakeholders expressed concerns that, despite an increasing amount of data being collected and reported through DHIS2, the use of data from the DHIS2 are lagging. They gave several possible explanations, including:

   o **Delays in data availability:** Some stakeholders said that delays in DHIS2 data becoming available make them wary of relying too heavily on it. As discussed above, lags of many months (if not longer) appear to be common for many indicators. Given their reporting obligations to donors, stakeholders expressed concerns about getting their reports in on time if they were too dependent on DHIS2 data.

   o **Lack of trust in data accuracy**: Several respondents, while generally applauding the commitment to expanding DHIS2, conveyed concerns about the accuracy of DHIS2 data and, therefore, did not feel comfortable using them to drive planning or decision-making. Instead, some stakeholders said they preferred to use programmatic data, over which they feel they have more control and oversight.

   o **Lack of analytical capacity**: Several stakeholders noted that, in general, there is a lack of personnel with the appropriate skills to analyze the data coming through the system. They saw this as an issue not only in the MOH (at various levels but particularly in the CHDs) but also within NGOs, UN agencies, and other IPs who, because of limited budgets, may not be able to support M&E staff as well as in health facilities, which in many cases are staffed by only a few individuals, all of whom have many other duties.

o **Lack of a data use "culture:"** Similar to the point about analytical capacity above, several respondents commented that, particularly at the local level, there is a lack of experience with using health system data to drive decision-making. Several commented that more work needs to be done to gain "buy-in" at the local and facility level to the idea of using data to inform ongoing policies.

Recommendations

1. Conduct a root cause analysis for low DHIS 2 reporting rates, including a facility census. Despite improvements, a large portion of health facilities are still not reporting data regularly into DHIS2. Studies from other countries have found lags in reporting tend to be due to many different factors. In Kenya, for example, refresher training significantly increased reporting rates, but other factors, including a lack of budgetary support and a lack of payments to health workers for cellular airtime, continued to depress reporting rates.[4] Conducting an in-depth analysis of the reasons for reporting lags in South Sudan might yield useful findings that could be translated into policy actions. As part of this analysis, it would be useful (if not essential) to include a dedicated facility census to accurately identify all functional facilities in the country, in other words, that can be expected to report data into DHIS2. This analysis could also inform the MOH's recently launched DHIS2 System Review and Appraisal, the first of its kind in South Sudan.

2. Conduct a formal analysis of the quality of data on the DHIS2 web platform in coordination with the MOH and other partners. The World Bank team's brief review of the DHIS2 platform revealed gaps in the data (for example, no data for some indicators and other indicators with data from some but not all geographical areas), as well as what appear to be long time delays in reporting (from months to years). No recent analysis of the quality of DHIS2 data has been published, and given the interest in expanding DHIS2, a dedicated review of data quality could shed important additional light on what is working and what is not.

3. Strengthen the MOH's Department of Monitoring & Evaluation. Many respondents felt that, for DHIS2 to function not only as a reliable data collection tool but also as an effective monitoring tool, significant investments need to be made in strengthening the capacity of the MOH, particularly its M&E department. The key informant interviews highlighted that the department is poorly structured and currently lacks a cadre of highly skilled individuals with expertise in statistics and data analysis. Development partners could undertake a review of the department's assets and identify opportunities for them to contribute to strengthening MOH capacity. Opportunities to strengthen capacity through the DHIS technical working group could also be explored.

4. Build the capacity of the county health departments. Although DHIS2 is being implemented at the CHD level, respondents were critical of the skillset of CHD personnel. As one noted, "We don't have highly skilled people at that level. They are not able to use the information that is collected [as] they

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[4] Njeru et al (2020). *BMC Public Health,* 20:1101.

Heath Service Monitoring in South Sudan

Routine Health Information Systems
Policy Brief 2/5

**Health, Nutrition
and Population**

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have limited skillsets to do analysis." Challenges at the CHD level include high staff turnover, low motivation, low pay, and a lack of access to basic infrastructure such as reliable mobile networks. Strategies aimed at building CHD capacity will need to address these challenges and might start by examining the current renumeration arrangements and opportunities for training and skill acquisition. Other countries have addressed low motivation with incentives. For example, Bangladesh offers a public award to the district with highest completion rates.[5]

5. Explore the feasibility of piloting DHIS2 entry of facility-level data at the hospital level. Although the MOH and some stakeholders have expressed interest in having facilities perform their own data entry into DHIS2, many others feel that such a move would be premature, given the lack of appropriate infrastructure in PHCUs and PHCCs. Some respondents felt that making hospitals responsible for entering facility-level data into DHIS2, particularly busy hospitals with reliable internet networks, might be effective and would reduce the workload of the significantly overburdened CHD offices. The feasibility of this approach could be explored.

6. Support a multi-faceted approach to improving the quality of routine data and increasing its use, including providing facilities with supervisory support. Studies of DHIS2 implementation in other LMICs have repeatedly shown that improving the quality of routine data requires sustained commitment and multiple tactics, including providing continuous training, bolstering feedback mechanisms, increasing the supervisory presence in the field, and funding data verification activities. Some researchers have found that the heavy burden of providing training in DHIS data entry is frequently underappreciated.[6] Others have stressed the importance of holding regular facility and county-level staff meetings to review reports after they are submitted, which can increase their sense of ownership of the data.[7] In this regard, third-party monitoring may play a key role in strengthening routine health information systems not only by identifying quality gaps and providing clear feedback to "upstream" stakeholders but also by sharing those findings "downstream" with facilities. Donors and health officials can also promote a culture of data use by continuing to make DHIS2 data more widely available to stakeholders.

[5] Begum et al (2020). *BMC Health Services Research* 20:465.
[6] Begum et al (2020) *BMC Health Services Research* (2020) 20:465 and Poppe (2012).
[7] Bhattacharya et al (2019). *PLoS ONE* 14(1):e0211625.