



9th Health Informatics in Africa Conference (HELINA 2014)

Peer-reviewed and selected under the responsibility of the Scientific Programme Committee

Peer-performance review as a strategy for strengthening health information systems: a case study from Ghana

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Background and Purpose: The Ghana Health Service (GHS) in 2012 embarked on an ambitious programme to improve its health information system (HIS) in order to improve upon healthcare delivery and also to meet the health related millennium development goals (MDGs). This resulted in nation-wide implementation of the District Health Information Management System (DHIMS2), software based on the District Health Information Software (DHIS2), in all its facilities and some private and quasi government health facilities. The DHIMS2 is the Ghanaian version of the global DHIS2 software developed by the University of Oslo.

Methods: As part of its mandate the GHS holds periodic peer reviews meetings at different levels of its structure as a mechanism for measuring service performance in order to identify service gaps that will lead to interventions to improving the coverage and quality of service to its client. This paper is a qualitative assessment of the DHIS2 software based on specified criteria from some of these review meetings in selected regions towards achieving the set goals. The paper will look at the status quo with respect to infrastructure, resources in general, human resource, stakeholder involvement, data quality and data use since the implementation of the DHIS2 project in Ghana. Data collection and analysis was qualitative using participant observation, focused group discussions, semi-structured interviews and document analysis.

Results: Our research has shown that the GHS has successfully implemented an integrated and sustainable web-based HIS. Data quality in all aspects has been improved through institutional arrangements such as peer-performance reviews using DHIS2 data and establishment of data quality assurance teams at all levels. This implicitly has promoted data use for decision making. The online system has also ensured data transparency and accessibility. 'Break-downs' in the system such as lack of funds, faulty equipment, lack of adequate and skilled human resource for data management is seen as some major challenges to data quality. Such 'break-downs' may also be seen as opportunity for system strengthening and sustainability as end-users are compelled to use personal resources for managing data. Through institutionalized peer-performance review processes using data from the DHIS2 is improving the quality of health service data for planning and decision making.

Conclusions: This research has demonstrated that with the right technology, policy and collaboration from interested stakeholders it is possible to implement a sustainable HIS in developing countries such as Ghana. We have also shown that institutionalized arrangements for data use has significantly improved the quality of service data generated which will aid planning and decision-making

Keywords: Health information system, Data quality, Data use, Peer review

1 Introduction

In 2011 the Ghana Health Services (GHS) adopted the web based and open source DHIS2 software developed by the global HISP network and coordinated by the University of Oslo [1] With technical support from the university of Oslo and financial support from stakeholders, the GHS in 2012 successfully implemented DHIS2 dubbed District Health Information Management System (DHIMS2) nation-wide. The software is now being used in all districts offices, government, some private, faith based

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and quasi government hospitals. The system requires a computer, a browser and internet connection to implement. Country-wide implementation has been made possible due to telecommunication boom in Ghana especially mobile telecommunication and taking a cue from similar implementation strategy by Kenya which was the first country in Africa [2] to have implemented HMIS online.

As part of its mandate all GHS facilities and Budget Management Centres (BMCs) are expected to account for their stewardship at half year and annual reviews. Administratively new districts have been created from existing ones giving a total number of 216 districts as against about 160 at the onset of the project. In this article we describe and discuss the DHIS2 implementation in Ghana focusing on the summary findings of the review meetings and the use and evaluation of DHIS2 data during this process.

2 Materials and methods

This project was conceived as a node in the HISP global network. The research tradition among the HISP Global Infrastructure (GI) group to which the authors belong, draw on the Scandinavian Action Research (AR) tradition in information systems (IS) development where user participation, evolutionary approaches, and prototyping are cornerstones. By definition AR is a qualitative research method where the researcher is actively involved in solving a real-world problem by introducing change in an organization, while at the same time contributing to knowledge and theory [7, 8, 9, 12, and 13]. AR is embedded with cyclical process model that encapsulate project management and system development cycle. The steps in developing a client system infrastructure (i.e.DHIS2) under canonical AR include diagnoses of perceived problem, action planning, action taking, (monitoring) evaluation and knowledge specification [8]. The cycle is repeated for knowledge refinement, otherwise it is exited.

The DHIS2 project is much more than a technical software project. It includes capacity building oriented towards specific requirements from the health sector that need to be incorporated into system development, end-user support and training in data quality assessment and data use for decision making. Many studies in HIS development have also emphasized on the need to also focus on the non-technical issues in system development cycle and long term system ‘life-cycle’ approach in order to ensure sustainability [18, 19, 20, and 21]. In the same vein the strategic objective of the HISP network and the DHIS2 project is to support the development and sustainability of a robust HIS that will enable health workers to generate and use health data for quality healthcare delivery [1, 2, 17].

Each of the authors have been fully involved at various stages of the implementation of this system, from its inception and design in 2010 through to the live nationwide rollout in 2012 and subsequent settling into the maintenance and evolution cycle of the production system. They have also participated in the review meetings at various levels and believe that by reviewing and assessing the challenges and successes they have experienced to get a web-based system functioning, useful lessons could be learnt for the success of similar efforts elsewhere in Africa.

Data collection was through participation in the annual review processes and other meetings, participant observations, discussions, interviews and analysis of documents. Interviews were interactive and were used in an attempt to have a deeper understanding of the phenomenon under study and to obtain information on the impact of DHIS2 implementation on the review processes with respect to provision of quality healthcare [3]. For the period of two years a total of 91 interviews and 4 focus group discussions were conducted. The participants in the interviews and focus group discussions included National Divisional/Programme Heads, District Directors of Health Services (DDHS), Regional Directors of Health Services (RDHS), health facility heads, Public Health Nurses (PHN), Disease Control Officers (DCO), Health Information Officers (HIO) and Biostatistics Officers (BSO). Informal discussions were also held with peers, stakeholders and national representatives regarding emerging trends in HMIS in the GHS.

3 Results

3.1 The Review Process

The annual review process starts at the level of BMC. This involves an internal review of BMC performance based on their annual plans, targets and achievement over the period. This is done at the facility, district, regional and national culminating in the Senior Managers' Meeting (SMM) within the first quarter of the ensuing year to review regional and national performance through a series of regional and divisional presentations. This forms the basis for the development of the GHS Annual Report. It was instructed that data from the DHIS2 should be used for the peer-performance reviews.

The assessment of the DHIS2 software was done at different levels taking into consideration certain key characteristics having direct impact on the quality of service data. Broadly speaking the assessment looked at sustainability of the DHIS2 project with respect to technical infrastructure, resources, human resources, stakeholder involvement, data quality and data use

3.2 Human Resource

Every health staff involved in managing data was trained during DHIS2 implementation. Traditionally it was the responsibility of the HIO or the statistician at a given BMC to see to all issues concerning data. With the introduction of DHIS2, programme officers were trained to enter their own data into the system. The rationale was that the disease control officer, public health nurse, nutrition officer, surveillance officer, etc. will make few mistakes when he keys in his own data because he understands his own data better than another person. It was observed that in districts where there has not been any change in the staff situation there has been remarkable improvement in all aspects of data quality in terms of completeness, accuracy, timeliness and consistency.

In some districts the situation is however different due to a number of reasons. Initially the DHIS2 was designed with a minimum number of datasets which has been increasing steadily over the years as other divisions/departments and stakeholders came on-board. In situations where only the HIOs were responsible for data management there were challenges with some aspects of data quality due to work load. It was also observed that for some districts data quality was affected due to either no HIO or data officers leaving for further studies with no replacement. When a DDHS was asked why there has not been a replacement of his HIO when he went to school the response was....

'the HIOs are simply not available....our HIOs training schools do not produce enough to satisfy their increasing demand in the service...it will take some time to bridge this very important gap..'

Another general concern identified was the lack of retraining on the DHIS2 new versions and more generally training on its data analysis functionality. Since the implementation and national training in 2011 to 2012, there has not been any serious retraining of data officers. Meanwhile new versions with completely new features are released every quarter. The reason for this gap was lack of funds as it requires huge amounts to do such national trainings. End users are therefore reluctant to explore the new features in the software for fear of corrupting the system. One public health nurse commented that...

'I manage to get my data in the system so that my director will not tell me I am not working...for analysis I have a way of getting my data into excel where I can plot my graphs and draw my charts...'

This is a complete inefficient use of the software since it has all the basic modules for data analysis and the import is that this officer might not be alone in underutilizing the system.

3.3 Data Quality Improvement

An important objective of the DHIS2 project is to improve the quality of service data for decision-making. In addition to inbuilt system checks which are technically called validation rules, there are also institutional arrangements to ensure that all BMCs improve the quality of data captured. BMCs are expected to have functional data validation teams which meet monthly to validate the data generated before input into DHIS2. Compared to the previous year it was observed that BMCs are beginning to see the importance of validation meetings as evident from the statistics in their presentations and increases in coverages in targets set for the year i.e. 10-12 validation meetings in 2013 as compared to nil to below 5 meetings in 2012; average data completeness of above 70%, etc. as in Figure 1. Unlike in previous years where there were no validation teams in some BMCs or where they exist they were not functional, the observation was that currently most BMCs have a functional data validation teams.

REGIONS	PERCENTAGE TIMELINESS	REGIONAL POSTION	REGIONS	PERCENTAGE Average Completeness	REGIONAL POSTION
Brong Ahafo	54.7	1 st	Brong Ahafo	94.2	1 ST
Ashanti	50.2	2 nd	Upper East	88.6	5 th
Upper East	49.1	3 rd	Volta	93.1	3 rd
Volta	45	4 th	Western	86.1	8 TH
Eastern	40.1	5 th	Ashanti	82.9	9 TH
Western	38.1	6 th	Upper West	95.7	2 nd
Upper W	37.4	7 th	Central	87.3	7 TH
Central	35	8 th	Greater Accra	90.9	4 th
Greater Accra	28.9	9 th	Eastern	88.3	6 TH
Northern	27.3	10 th	Northern	71.8	10 TH
			GHANA	87.9	

Figure 1. Regional league table on aspects of data quality (timeliness and completeness)

Routinely regional validation teams meet every month to look at the regional data based on data completeness, timelines, accuracy and consistency. In addition technical supervisory visits that validate data in the DHIS2 and compares this to what is in the facility registers are also organized quarterly. These institutional arrangements have seen increases in coverages evident from three year trends in BMC presentations at the annual performance reviews attended. There has also been institutionalization of monthly to quarterly league table for districts for selected indicators thus fostering healthy competition among districts to endeavour to improve upon the quality of their data. It was however observed that districts were not able to foster such keen competition among facilities in their districts. When HIOs were asked why this was not possible the response was work overload in most cases and lack of HIOs in some of the districts.

3.4 Data Use

The GHS has established processes that promote data use. The half year and annual performance reviews strengthens data use by setting targets and making decisions. For example as shown in Figure 2 by institutionalizing peer-performance reviews, establishment of functional Data Quality Assurance (DQA) teams at all BMCs and quarterly integrated monitoring and support visits has led to significant improvement in all aspects of data quality.

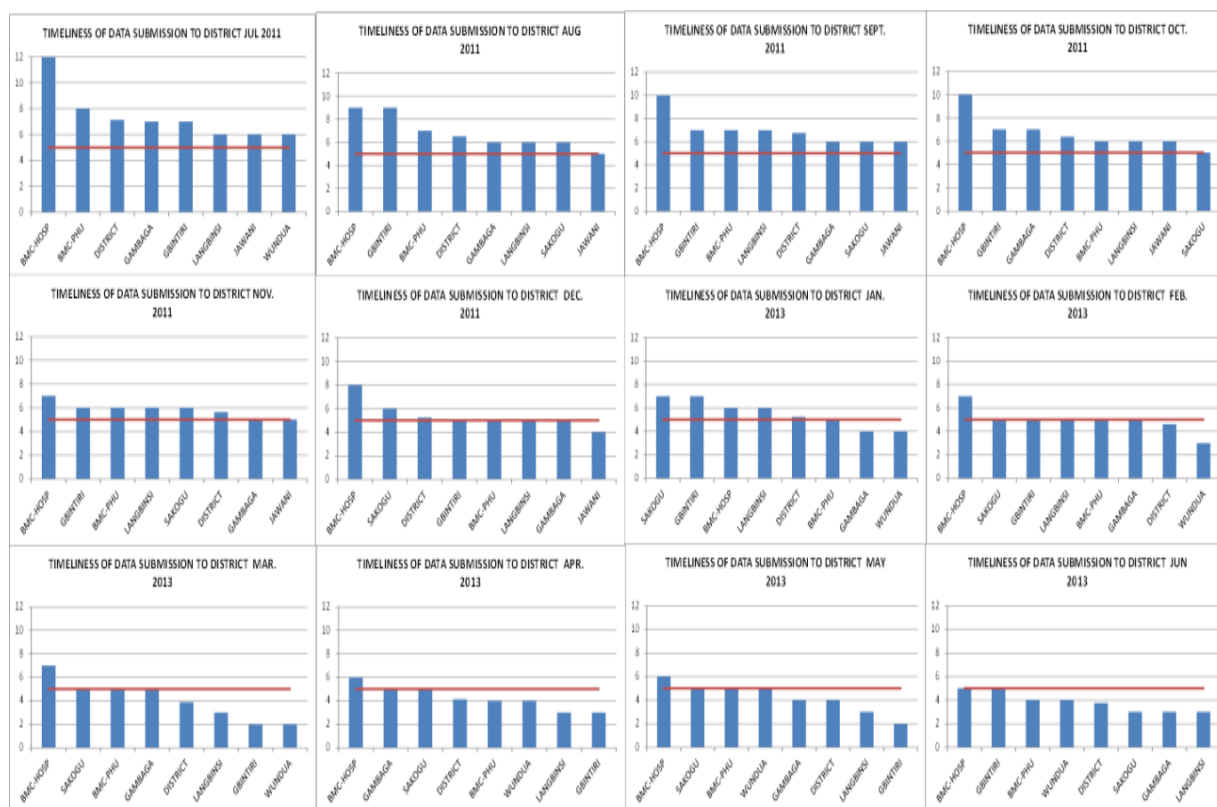


Figure 2. A three year trend (2011-2013) of timeliness of data submission. The red line is the target of which either equal to or below signify timely submission of data by districts.

Across all levels league tables are often used to show the performance of BMCs on components of data quality (completeness, timeliness, accuracy and consistency) or the performance of selected indicators at some level. Figure 1 for instance shows a national league table comparing the average rate of submission of all datasets in the DHIS2 by regions and the average rate of data completeness in terms of expected number of datasets to be reported on against the actual by regions. In the same vein Figure 3 also shows a trend line for percentage accuracy of ANC 4th visits in selected health facilities. Accuracy is calculated from the number of ANC 4th visits on either the summary sheet or in the DHIS2 against the number in the ANC Register which is the original source. As clearly shown in the graph reporting on ANC 4th visits in the selected health facilities have significantly improved towards the golden standard (100%) since the implementation of the DHIS2.

It is also mandated that all BMCs under the GHS use DHIS2 data at peer-performance reviews and for planning. Initially it was difficult to enforce such a policy due to the existence of parallel systems owned by well-resourced and powerful programmes such as TB, HIV/AIDS, Malaria, etc. From the recent reviews attended it was clear that the situation is changing since almost all these special programmes are now part of the DHIS2 project, at least with their aggregated data. It was interesting to see peers challenging each other as to the source of any spurious data if the data presented does not correspond to that in the DHIS2 which was instantly quoted or projected for all to see.

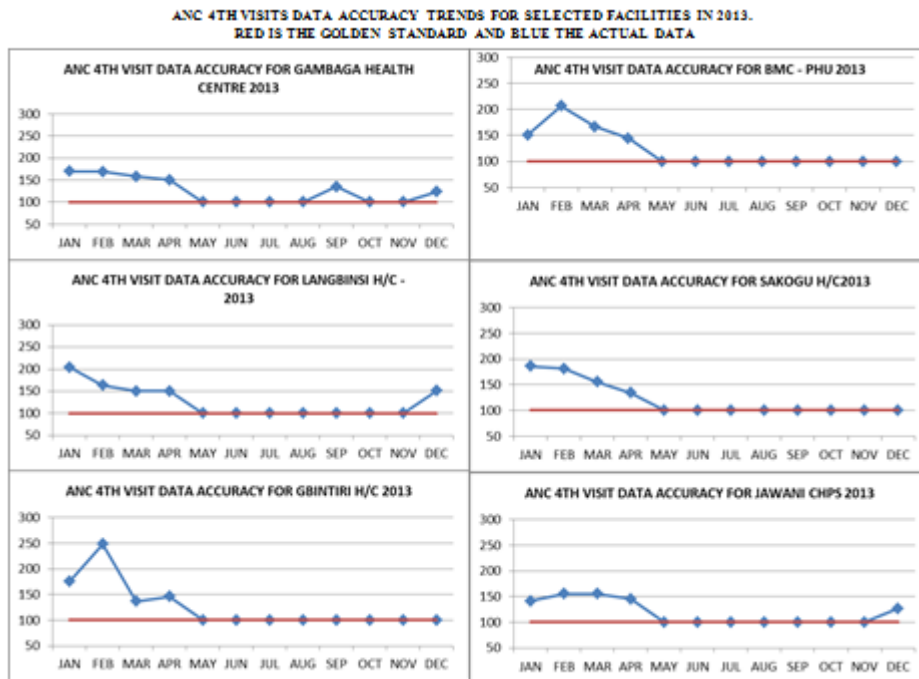


Figure 3. Trend analysis of data accuracy for selected health facilities in 2013

3.5 Resources and Challenges

As remarked by one DDHS... *'It takes resources to collect data to generate information for decision making...without resources how is one expected to work?'* This sums up the situation two years after the implementation of the DHIS2. Before the project started the GHS and its stakeholders ensured that all districts offices and hospitals were equipped with the requisite resources to enable them collect and manage health service data, i.e. computers, mobile modems, funds for data packages, etc. The observation has been that some of this equipment has broken down and have not been repaired or replaced due to unavailability of funds. Where the equipment is functioning it is becoming increasingly difficult to purchase data packages or pay for internet services for data management. Many officers we interviewed complained bitterly for using their own resources both financially and materially to collect and manage service data.

Administratively new districts have been created from existing ones giving a total number of 216 districts as against about 160 at the onset of the project. It was noted that some of these newly created districts have not been adequately resourced to enable them collate, analyse and report on service data. Affected districts have to either rely on national or regional/provincial or neighbouring districts for support leading to gaps in their respective data. One district officer remarked...

'since we were created as a district we have not been given any resources to run the district office....I use my own lap top for data entry and analysis ...otherwise I will have to take my returns to the regional office for input which also incur transportation cost which nobody will pay for..'

4 Discussion

The study findings have demonstrated that reporting rate and timeliness have improved after the implementation of the online DHIS2 system. The study has also shown that active use of data from the DHIS2 during the review process both at district and regional levels as well as the increase in data validation activities documented at the BMC level, demonstrate that the use of data is increasing. Increase

in data use and local validation will necessarily also lead to increased data quality. The online data system has drastically improved the access to data, which again has led to improved data use.

The process of developing and implementing information systems in developing countries is a challenging task [4] [5] [6] due to poor technical infrastructure, inadequate skilled human resources and lack of funds. This study has shown that similar challenges are also found in Ghana. Lack of funding for training, airtime and data packages for internet connection and replacement of broken equipment represent real challenges. We have also seen that the answers to such challenges have been, for example, end-users using their own equipment, money for internet packages and transport to central locations in order to access the system. This is indicative that the end-users find the system useful and that a sense of 'ownership' is being developed, which again may help ensure sustainability.

Acknowledgements

We would like to express our profound gratitude and appreciation to the Ghana Health Service for offering us the opportunity to participate in their peer-performance review process which has resulted in the conduct of this study. In the same vein will also like to thank our colleagues in the Global Infrastructure Group and the HISP network who through many discussions has contributed to the material in this study.

Statement on conflicts of interest

The authors would like to state that there have not been any conflicts of interest in the conduct of this study.

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