Original Article

Evaluation of the reporting completeness and timeliness of the integrated disease surveillance and response system in northern Ghana

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SUMMARY

Objectives: The integrated disease surveillance and response (IDSR) and district health information management system II (DHIMS2) strategies were implemented in 2002 and 2012 respectively to improve surveillance data reporting and quality. The objective of this study was to evaluate the reporting completeness and timeliness of the IDSR system at the sub-national level in northern Ghana.

Methods: This was an observational study in Upper East Region (UER). Weekly and monthly disease surveillance reports on completeness and timeliness were downloaded and analysed for 2012 and 2013 from the DHIMS2 in UER, the two Kassena-Nankana districts and their nine health facilities representing public, private and mission providers. Comparison of paper-based and DHIMS2 reporting from the periphery health facilities were assessed.

Results: IDSR monthly reporting completeness and timeliness in UER increased by 9% and 37% respectively in 2013 compared to 2012 and weekly completeness and timeliness improved by 79% and 24% respectively in 2013. Similar reporting increases were seen in the districts and health facilities over the same period, except the Kassena-Nankana Municipal which showed decrease of 2% in monthly completeness for 2013. At the health facilities, the paper-based reporting completeness was 96% and timeliness 45% while DHIMS2 completeness was 83% and timeliness 18% in 2012. However, DHIMS2 reporting completeness and timeliness improved in 2013 reaching 100% and 61% respectively.

Conclusions: Disease surveillance reporting through DHIMS2 became more complete over time, but there remain problems with timeliness. Surveillance data need to be timely to enable rapid responses to disease outbreaks.

Keywords: disease surveillance, completeness, timeliness, health information system, Ghana.

INTRODUCTION

Despite increased efforts for strengthening health systems, many developing countries especially in sub-Saharan Africa (SSA) still fall short of the needed capacity.[1,2] Disease surveillance provides vital data for disease prevention and control programs.[3,4] Disease surveillance information is reported in a hierarchical order from the communities through districts and region to the national health system. At each sub-national level, the public health system contributes to the problems of completeness, timeliness and data quality.[4] To date, disease surveillance data reporting continues to be dominated by systems which tend to produce incomplete, untimely and unreliable information leading to poor quality data for planning and decision-making in SSA.[5,6,7,8]

These weaknesses are further compounded by disease-specific programs which continue to implement separate surveillance systems leading to overburdening of health personnel.[9] As a result, efforts to strengthen disease surveillance through implementation of new interventions such as the integrated disease surveillance and response (IDSR) are attracting increased attention.[5,10]

In 1998, the WHO Regional Office for Africa adopted the IDSR strategy and the goal of this strategy is to strengthen member countries capacities for disease surveillance. In 2002, Ghana implemented the IDSR strategy as a comprehensive nationwide intervention. After a decade of implementation, the strategy was revised in 2011 due to some epidemiological factors including social, economic, environmental changes and emerging and re-emerging infectious diseases.[11,12]

During the same time period, strategies to strengthen the health information system (HIS) were initiated. In 2007, the District-wide Health Information Management System (DHIMS) was implemented which aims to improve data reporting.[13] By 2011, a new system was developed and implemented to further strengthen health data reporting known as the District Health Information Management System II (DHIMS2) which is internet-based.[14] Since 2012, the IDSR data is reported using the DHIMS2 with the overall goal of reducing the reporting burden and to improve data quality and reliability.[14] The objective of this study was to evaluate the reporting completeness and timeliness of the IDSR system at the sub-national level in northern Ghana.

METHODS

Study setting

Ghana is located in West Africa and made up of ten administrative regions which are further divided into 216 districts. Administratively, the health system has five levels: national, regional, district, sub-district and community. The study covered the entire Upper East Region (UER) which is one of the poorest in Ghana and composed of thirteen (13) districts.[15] The region is characterized by savannah vegetation with a rainy reason from May to September. Subsistence agriculture is the main economic activity and the major crops cultivated are millet, maize, sorghum and rice.[16] The majority of the people live in rural settings and households are grouped into extended family units.[17,18,19]

The Kassena-Nankana districts are served by one hospital, six health centres, one private clinic, two mission clinics, several private chemists, and the Navrongo Health Research Centre laboratory.[16,17,19]

Disease surveillance reporting procedures

The disease surveillance reporting follows a hierarchical order from community level to the national level of the health system. At the periphery level, surveillance activities are conducted by community volunteers who are trained using simple case definitions and report their observations to the periphery health facilities.[11] Then at the health facility level, the data are differentiated including information from out-patient, in-patient, consulting room and laboratory registers into daily summary sheets and IDSR reporting forms. The data is then sent to the district health directorate (DHD) as immediate, weekly, monthly or quarterly reports. The reports are received at the DHD by the district disease control or health information officers who enter the data from the paper-based forms into the electronic DHIMS2, which has the capability to automatically aggregate the information, reported from the periphery health facilities into district level data.[11] The aggregated data sent from the district to the regional level using the DHIMS2are merged into regional datasets.[20,21] The periphery, district and regional levels have specified times for IDSR reports submission and electronic transmission as shown in Table 1. The system automatically determines the number of reports submitted as against the number expected. It also indicates the number of reports which are submitted on time (due date).

Table 1 Deadlines for IDSR reports to reach the next higher level of the health system in Ghana

Level	Immediate	Weekly	Monthly	Quarterly
Community	Within 24 hours	Not applicable	Health facility to collect report 4th day of the following month	Not applicable
Health Facility	Within 24 hours	Tuesday of the following week	5th day of the following month	5th day of the month following the end of the quarter
District	Within 24 hours	Thursday of the following week	15th day of the following month	15th day of the month following the end of the quarter
Region	Within 24 hours	Friday of the following week	25th day of the following month	25th day of the month following the end of the quarter
National	Within 24 hours	Monday of the second week	5th day of the second month after the end of the month	5th day of the 2nd month following the end of the quarter

Source: Adopted from the Ghana IDSR technical guidelines. (WHO-AFRO and CDC, 2011)

Study design

A quantitative study design was used to evaluate IDSR system reporting completeness and timeliness at the sub-national level. UER, the two Kassena-Nankana districts and their nine health facilities were chosen for convenience and because of its remoteness. The downloading of the weekly and monthly disease surveillance reports available on the DHIMS2 network was conducted between October 2013 and February 2014.

Study procedure and data collection

The quantitative methods were structured according to the IDSR reporting system. At the region and the two districts, the following IDSR monthly and weekly reports were downloaded from the DHIMS2 network (see table 2 below) for reporting completeness and timeliness.

- 24 IDSR monthly reports from region and each district for 2012 and 2013

- 104 IDSR weekly reports from region and each district for 2012 and 2013

Table 2 Number of weekly and monthly IDSR reports downloaded from DHIMS2 in Upper East Region (2012 and 2013)

Health system level	Number of reports per year		
	2012	2013	Total
Upper East Region			
Monthly reporting completeness and timeliness	**12**	**12**	24
Weekly reporting completeness and timeliness	**52**	**52**	104
Kassena-Nankana Municipal			
Monthly reporting completeness and timeliness	**12**	**12**	24
Weekly reporting completeness and timeliness	**52**	**52**	104
Kassena-Nankana West			
Monthly reporting completeness and timeliness	**12**	**12**	24
Weekly reporting completeness and timeliness	**52**	**52**	104

At the periphery health facilities, IDSR monthly reports were downloaded from the DHIMS2 for eight health facilities because the private clinic was not reporting surveillance data and thus excluded from reporting completeness and timeliness (see Table 3):

- 24 monthly IDSR reports from each of the eight health facilities for 2012 and 2013.
- 12 monthly paper-based reports from each of the eight health facilities for only 2012.

Data analysis

The data was entered in Epi data 3.1 and analysed in Stata 12. Reporting completeness is described in this study as the proportion of all expected IDSR summary reports (weekly or monthly) that were actually submitted on the DHIMS2. Reporting timeliness is described as the proportion of all expected IDSR summary reports (weekly or monthly) that were actually submitted on the DHIMS2 on time (due date).

Ethical considerations

Ethical approval was obtained from the Institutional Review Board of Navrongo Health Research Centre (NHRCIRB155) and the Ethics Commission of Medical Faculty, University of Heidelberg (S-215/2013). Permission and access to the data was obtained from the Ghana Health Service in the UER.

Table 3 Monthly IDSR paper-based and DHIMS2 reports for health facilities in Kassena-Nankana districts (2012 and 2013)

Sub-national health system	**Number of monthly reports per year**		
	2012 Paper-based	**2012 DHIMS2**	**2013 DHIMS2**
Kassena-Nankana Municipal			
War memorial hospital	**12**	**12**	**12**
Navrongo health centre	**12**	**12**	**12**
Kologo health centre	**12**	**12**	**12**
St Martin's clinic	**12**	**12**	**12**
Kassena-Nankana West			
Kandiga health centre	**12**	**12**	**12**
Paga health centre	**12**	**12**	**12**
Martyrs of Uganda clinic	**12**	**12**	**12**
Chiana health centre	**12**	**12**	**12**
Total	96	96	96

RESULTS

Table 4 shows a summary of IDSR monthly and weekly reporting completeness and timeliness in 2012 and 2013 in Upper East Region (UER). In each year, a total of 3,000 month reports were expected to be submitted from the periphery health facilities in the UER. The monthly completeness and timeliness increased in 2013 by nearly 9% (268/3,000 reports) and 37% (1,109/3,000 reports) respectively. In 2012 and 2013, respectively 4,940 and 4,628 weekly IDSR reports were to be submitted from the health facilities. Weekly completeness and timeliness witnessed improvements in 2013 by nearly 80% (3,660/4,628 reports) and 25% (1,127/4,628 reports) respectively.

For the Kassena-Nankana Municipal (KNM), in each year, a total of 252 monthly reports were to be submitted. There was a slight decrease in reporting completeness of 2% (4/252 reports) in 2013 while timeliness increased by 60% (149/252 reports). In 2012 and 2013, respectively 676 and 416 weekly reports were to be submitted. Weekly completeness and timeliness improved nearly by 53% (218/416 reports) and 50% (207/416 reports) respectively.

The Kassena-Nankana West (KNW), in both years, a total of 384 monthly reports were expected to be submitted. Respectively, completeness and timeliness improved in 2013 by nearly 40% (156/384 reports) and 40% (156/384 reports). For weekly completeness and timeliness, 468 reports were to be submitted each year.

In 2012, there was no information on timeliness on the DHIMS2. Weekly completeness improved in 2013 by 280 reports and timeliness by 10 reports.

Table 4 annual surveillance reporting completeness and timeliness in Upper East Region and Kassena-Nankana districts in 2012 and 2013

	2012 monthly reports			2013 monthly reports		
	Expected reports	**Completeness (%)**	**Timeliness (%)**	**Expected reports**	**Completeness (%)**	**Timeliness (%)**
Monthly reports						
Upper East Region	3,000	2,676 (89.20)	1,106 (36.87)	3,000	2,944 (98.13)	2,215 (73.83)
Kassena-Nankana Municipal	252	252 (100.00)	71 (28.17)	252	248 (98.41)	220 (87.30)
Kassena-Nankana West	384	228 (59.38)	10 (2.60)	384	384 (100.00)	166 (43.23)
Weekly reports						
Upper East Region	4,940	567 (14.48)	0 (0.00)	4,628	4,227 (91.34)	1,127 (24.35)
Kassena-Nankana Municipal	676	197 (29.14)	18 (2.66)	416	415 (99.76)	225 (54.09)
Kassena-Nankana West	468	0 (0.00)	0 (0.00)	468	280 (59.83)	10 (2.14)

Table 5 shows a summary reporting completeness of IDSR monthly reports from eight health facilities based on paper-based and DHIMS2. On the combined average, the paper-based reports completeness exceeded 95% (92/96 reports) while DHIMS2 reports was a little above 83% (80/96 reports) for the eight health facilities in 2012. Similarly, the combined average for paper-based reports timeliness was 45% (43/96 reports) verses DHIMS2reports timeliness of 18% (17/96) in 2012. In 2013, DHIMS2 reports completeness improved by 17% (19/96 reports) and timeliness improved by 44% (42/96 reports).

For the health facilities under KNM paper-based reports completeness was 100% (48/48) in 2012 and DHIMS2 reports completeness was also 100% (48/48) in 2012 and 2013. For monthly timeliness, paper-based was 50% (24/48 reports) in 2012, while DHIMS2 based timeliness was 35% (17/48 reports) in 2012 and 83% (40/48 reports) in 2013. Monthly timeliness improved by 33% (16/48 reports) in 2013 for KNM health facilities.

For the health facilities in KNW paper-based reports completeness was 92% (44/48) in 2012 and DHIMS2 reports completeness was 67% (32/48 reports) in 2012 and 100% (48/48 reports). This was an increase of 33% (16/48) reports completeness in 2013, while reporting timeliness on paper-based reports was 35% (17/48) in 2012. The DHIMS2 monthly reporting timeliness increased from no information in 2012 to 40% (19/48 reports) in 2013.

Table 5 Annual surveillance reporting completeness and timeliness of paper-based and DHIMS2reports in 8 health facilities in Upper East Region (2012 and 2013)

		Health facilities monthly disease surveillance reporting					
		2012 paper-based data		2012 DHIMS2 data		2013 DHIMS2 data	
	Expected reports	**Completeness (%)**	**Timeliness (%)**	**Completeness (%)**	**Timeliness (%)**	**Completeness (%)**	**Timeliness (%)**
Kassena-Nankana Municipal							
War memorial hospital	12	12 (100.00)	1 (8.33)	12 (100.00)	5 (41.67)	12 (100.00)	10 (83.33)
Navrongo health centre	12	12 (100.00)	7 (58.33)	12 (100.00)	4 (33.33)	12 (100.00)	10 (83.33)
Kologo health centre	12	12 (100.00)	4 (33.33)	12 (100.00)	4 (33.33)	12 (100.00)	10 (83.33)
St Martin's clinic	12	12 (100.00)	12 (100.00)	12 (100.00)	4 (33.33)	12 (100.00)	10 (83.33)
Kassena-Nankana West							
Kandiga health centre	12	12 (100.00)	8 (66.67)	8 (66.67)	*	12 (100.00)	3 (25.00)
Paga health centre	12	10 (83.33)	5 (41.67)	8 (66.67)	*	12 (100.00)	6 (50.00)
Martyrs of Uganda clinic	12	11 (91.67)	3 (25.00)	8 (66.67)	*	12 (100.00)	5 (41.67)
Chiana health centre	12	11 (91.67)	3 (25.00)	8 (66.67)	*	12 (100.00)	5 (41.67)
Total	96	92 (95.83)	43 (44.79)	80 (83.33)	17 (17.71)	96 (100.00)	59 (61.46)

DISCUSSION

This study addresses an important aspect of public health system strengthening in SSA. The implementation of the DHIMS2 in 2012 has shown some improvements in IDSR data reporting at the sub-national level, which supports similar findings from SSA of progress in reporting completeness and timeliness associated with either IDSR system or DHIMS2 implementation.[1,5,6,14,22,23] These increases in completeness and timeliness are likely due to the internet-based reporting

and reports submission through personal mobile phone call reminders in the DHIMS2 as it has been reported from other countries.[3,24,25]

In spite of the observed improvements, the overall reporting completeness and timeliness remains insufficient and varies greatly according to weekly and monthly schedules. Besides, there are still problems of transmitting data from the periphery levels to the districts with the potential for error introduction. The DHIMS2 has only been rolled out to the district level as a nationwide strategy, allowing periphery health facilities to continue to report health data using the paper-based forms. Although, Kiberu et al. argued that such challenges seem to have been resolved through the use of DHIS in Uganda, the Ghanaian situation shows otherwise.[5] Though, the continuous use of paper-based reporting is helpful particularly at the periphery level of the health system due to inadequate capacity and resources, it also creates other problems such as duplication of reporting, overburdening of health workers and increased potential for mistake. Moreover, the parallel systems also come with additional financial cost to the overall national health system.

The study also revealed particularly challenges of low and varied levels in the reporting timeliness of both weekly and monthly reports across the periphery, districts and regional levels. This is in line with previous studies which reported that low timeliness is still common from periphery facilities.[4,26,27,28,29] The possibility of missing outbreaks and delays in contact tracing and public health action due to untimely reporting appears to be a real challenge in the Ghana health system. In reality, the DHIMS2 appears to be still in its early stages of implementation and will need attention and support to reach its full potential. At the moment, continued training of disease surveillance and health information officers in addition to routine validation of paper-based reports can help improve completeness, timeliness, data quality and accuracy of reporting. In the long term, plans should be initiated to scale-up the data entering into DHIMS2 to the periphery health system such as health centres, clinics and community-based health planning and services (CHPS) compounds to address other aspects of data accuracy. Further research to improve reporting completeness and timeliness of surveillance data is needed especially to address the substantial variations between periphery, district and regional levels.

The study has some limitations. The findings are not representative of the overall Ghana health system since it was conducted in limited area of the country. Besides, the findings are based on a short duration of the DHIMS2 implementation and may change with time.

In conclusion, disease reporting through DHIMS2 became more complete over time, but there remain problems with the timeliness of reporting. Surveillance data need to be timely to enable rapid responses of the health system to infectious disease outbreaks such as the recent Ebola outbreak. Disease surveillance needs to be urgently strengthened in West Africa.

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