Evaluation of the Weekly Disease Surveillance System in Matabeleland South Province, Zimbabwe, 2018

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ABSTRACT

Background: The weekly disease surveillance system (WDSS) acts as an early warning of potential threats to public health. In 2018, the reporting rates in Matabeleland South Province were below the 100% target, with overall timeliness of 61.7% and completeness of 67.3%. Low reporting rates may imply late detection of outbreaks in the province. The study was conducted to evaluate the WDSS in Matabeleland South province. **Methods:** We conducted a descriptive cross sectional-study using updated Centers for Disease Control guidelines for evaluating public health surveillance systems. Interviewer administered questionnaires and key informant interviews were used to collect data from the health workers. Resource availability was assessed using checklists. Epi Info 7™ was used to generate frequencies, medians and proportions. **Results:** Fifty health workers were interviewed, 28 (56%) of whom were females. The majority of the health workers 41 (82%) were nurses. Thirty-two (64%) respondents knew the timelines for submission of data to the next level whilst only 16 (32%) knew the objectives of the WDSS. Eight (16%) respondents were trained on operating the WDSS. Forty-two (84%) respondents reported analyzing the information of the WDSS and willingness to continue participating in the WDSS was indicated by 46 (92%) respondents. Six (85%) health facilities indicated experiencing problems with the District Health Information System. **Conclusion:** The WDSS was found to be simple, acceptable and flexible. However, it was unstable and untimely. We recommend training of health care workers on the Integrated Disease Surveillance and Response in the province.

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Background

Public health surveillance is the ongoing systematic collection, analysis and interpretation of data; and the dissemination of information to those who need to know in order that action may be taken [1]. A functional public health surveillance system is important to address the high disease burden in Africa. Effective disease surveillance, notification and reporting have been a serious challenge to developing countries especially in Africa [2].

The weekly disease surveillance system (WDSS) was introduced in the health facilities in Zimbabwe in 1992 [3]. The WDSS forms a core component of national health system notification and response plans. The surveillance system acts as an early warning of potential threats to public health by monitoring trends of diseases under surveillance weekly. The WDSS was also set up to maintain and improve communication between various levels of health facilities as well as to improve the analysis, interpretation and dissemination of the available information [4].

To date, seventeen diseases and public health events that include non-specific diarrhoeal diseases, cholera, maternal deaths, snake and dog bites are reported through the system [5]. The Public Health Act (Chapter 15:17) regulates the reporting of the diseases in order to effect adequate disease prevention and control activities [6].

The quality and accurate collection of data is of paramount importance in the surveillance system. The key indicators that have a bearing on the quality of the data are completeness of the reporting i.e. the percentage of sites that report out of the total number of the sites that are supposed to report and the timeliness with which the reporting is carried out. Timeliness is a key surveillance system attribute and should be periodically evaluated. Improved timeliness allows for control and prevention activities to be initiated earlier in an epidemic [7-9].

In 2017, the WDSS reporting rate across Matabeleland south province was below 50%, with an overall timeliness of 32.4% and a completeness of 41.1%. The low reporting rates continued into 2018 below the national target of 100%, with overall timeliness of 61.7% and completeness of 67.3% from January to June 2018. The province experienced a malaria outbreak in 2017, which was detected late. With the low reporting rates of the weekly disease surveillance, there is a high risk of detecting outbreaks late within the province. Furthermore, there was no documented evidence that the WDSS in the province had been evaluated before.

An evaluation of the weekly disease surveillance system in Matabeleland South province was therefore carried out for the period January to December 2018. The study assessed usefulness of the WDSS, the system´s attributes, health care worker knowledge levels, the cost of running the system and the reasons for low reporting rates.

Methods

Flow of information

The reporting week of the WDSS starts on Monday 0001 hours ending on Sunday 2400 hours. At the rural health centre, the nurses fill in a T3 tally form on daily basis. By Monday, this information is summarized and is sent to the district health information office (DHIO) by phone or mail. The district then aggregates all reports and submits to the provincial level through the District Health Information System (DHIS) 2 by Tuesday.

At the province, the provincial health information officer compiles all the data from the districts, generates weekly bulletin, which is circulated among provincial health executive members, District Medical Officers and DHIOs. Data in the DHIS 2 from all provinces is analyzed at the Epidemiology and Disease Control (EDC) - national health information section. A national weekly report on epidemic prone diseases and public health events is then issued to all health facilities, data collectors and data users in the country. The flow of information in the surveillance system is shown in Figure 1.

Study design

We conducted a descriptive cross-sectional study using the CDC updated guidelines for evaluating public health surveillance systems.

Study Setting

The study was conducted in Matabeleland South Province, which is divided into seven administrative districts comprising three urban and four rural districts. The province is situated in the southern part of Zimbabwe bordering with South Africa (South) and Botswana (South-West) and the economy is largely centered on subsistence and livestock farming. Droughts and lack of economic opportunities have resulted in widespread poverty in the region and frequent migration to neighbouring countries. The province has a population of 700 000 projected from the population census national report (2012). The province has 19 mission and government hospitals and 133 primary health facilities. The public health importance of this surveillance system in the province is attributed to the high risk for epidemic prone diseases due to the highly mobile population.

Study Population

The study population was; District health information officers, environmental health officers and nurses involved in the surveillance system. The Provincial Health Information Officers, District and Provincial Health Executive members were key informants. We also reviewed WDSS forms, graphs and charts.

Sample size

Using a cross sectional study by Kambondo et al (2011) where the prevalence of health care workers using WDSS information to monitor disease trends was 86%, the required confidence level at 95% and at 80% power, the minimum sample size calculated using Dobson´s formula was 50 [10].

Sampling

All the seven districts in the province were included into the study. The province has 106 health workers involved in the surveillance system. Stratified proportionate sampling was used to obtain the sample size of study participants for each district hospital based on the number of health workers involved in the WDSS at each hospital. Health workers from the pediatric, ante-natal care, outpatients, health information and environmental health departments at each hospital were then purposively recruited into the study.

Data Collection

We used interviewer-administered questionnaires to assess the knowledge levels of the health workers on the WDSS; to assess the system attributes and the challenges faced in the operation of the system. We reviewed WDSS forms and charts and used checklists to assess the resources required to operate the WDSS.

Data Analysis

We captured and analysed data using Epi Info 7.2.2.6™ (CDC, 2012). We generated frequencies, medians and proportions using the software. Checking for accuracy and completeness of records was done manually.

Measurement of variables

Among the variables we studied were usefulness, health worker knowledge, and system attributes (simplicity, data quality, acceptability, timeliness, and stability).

Usefulness

Usefulness was measured by asking the respondents´ perceptions on the usefulness of the WDSS, assessing achievement of systems objectives, assessing public health actions carried out based on the findings from data collected by the surveillance system.

Knowledge

Knowledge was measured by means of a battery of five questions. A 3-point Likert scale was used to assess knowledge levels, where the participants who get less than 3 points were rated as poor, those who got 3-4 points as fair and those who get greater than 4 points were good.

Data Quality

The data quality was measured as a percentage of completed fields on the WDSS forms.

Simplicity

Simplicity was measured by asking the respondents perceptions on the simplicity of the surveillance system.

Acceptability
Acceptability was measured by asking the respondents´ perceptions on the acceptability of the WDSS. Assessing the timeliness of the system and completeness of the WDSS forms was also used to measure acceptability.

Timeliness
Timeliness was measured by determining the proportion of reports that were submitted on time according to the time limits.

Stability
Stability was measured by assessing the number of trained staff and adequacy of resources for response to common WDSS problems.

Ethical Consideration
We obtained written informed consent from all participants. Confidentiality was maintained by excluding the names of the individuals during data capture, analysis and reporting. Privacy was maintained when conducting the interviews by interviewing each respondent separately.

Permission
Permission to proceed was obtained from the Ministry of Health and Child Care and the Health Studies Office.

Results

Demographic characteristics of study participants
Fifty health workers were interviewed as primary study participants, 28 (56%) of whom were females. The majority of the health workers 41 (82%) were nurses. The median age of the respondents was 36 years (Q_1=33; Q_3=40) whilst the median number of years working in the province was 6.5 years (Q_1=4; Q_3= 11). The demographic characteristics of the respondents are shown in Table 1.

Health Worker Knowledge
Out of the 50 study participants, 32 (64%) knew the timelines for submission of data to the next level. Only 16 (32%) health workers knew the objectives of the WDSS. Twenty-four (48%) respondents had knowledge on the common diseases monitored by the system while 19 (38%) had knowledge on the uncommon diseases monitored by the WDSS. Overall, 11 (22%) respondents had good knowledge, 15 (30%) had fair knowledge and 24 (48%) had poor knowledge on the surveillance system (Table 2).

Usefulness
The majority of the respondents 45 (90%) reported the WDSS to be useful. Forty-two (84%) respondents reported analyzing the information of the WDSS but only three of the seven hospitals had updated graphs displayed. Twenty (40%) health workers indicated having taken public health action after analyzing information at district level. Thirty-seven (74%) respondents reported that they hold meetings to discuss surveillance information. However only four out of the seven district hospitals (57%) availed minutes of the WDSS meetings held. The majority of the study participants 28 (56%) indicated that they received feedback from the province and among these 18 (64%) reported using the feedback reports (Table 3).

Simplicity
The majority of the respondents 37 (74%) reported that it was easy to operate the WDSS whilst 10 (20%) respondents reported having ever failed to compile WDSS data. The reported average time taken to complete the WDSS form was 30 minutes.

Stability
Only eight (16%) health workers reported to have been trained on operating the WDSS. Four out of the seven (57%) district hospitals had functional computers for the surveillance system. Six of the seven hospitals (85%) indicated experiencing problems with the DHIS 2.

Data quality, Acceptability, Timeliness and Flexibility
The completeness of the district hospitals reporting in the WDSS was 57%. Of the 35 Weekly disease surveillance forms analysed, all the data fields on the forms were completed. All the 50 respondents interviewed completed all questions successfully without question refusal. Willingness to continue participating in the WDSS was indicated by 46 (92%) respondents. However, four (8%) respondents

reported it was not their duty to compile WDSS and were not willing to participate the WDSS data. The majority of the study participants 39 (78%) reported that they always submit their data on time. However, this does not seem to be the case as a review of the records showed an average timeliness of 63% on the data sent to the province from the districts. Thirty-seven (74%) health workers reported the WDSS form to be flexible in accommodating other health conditions.

Cost of operating the WDSS

Assuming a nurse´s basic salary of $300 per month, the total cost of running the system was $203.80. This was calculated from the time taken for data completion, notification and report writing which was assumed to be 30 minutes per report. The call charges are $0.09 per minute and a maximum of 20 minutes are required in communication with facilities and the provincial office. The cost of internet required for operating DHIS2 system and conveying reports through emails was assumed to be $89 per month.

Reasons for low reporting rates

The majority of the respondents 23 (46%) reported breakdown in the electronic reporting system to be the major reason for low reporting rates in the province. Fifteen (30%) respondents indicated work overload due to staff shortages to result in low reporting rates while nine (18%) health workers attributed the low reporting rates to lack of staff trained in the surveillance system. Three (6%) health workers reported electricity power cuts experienced at the health facilities to be contributing to low reporting rates in the province.

Discussion

In our analysis of the Weekly Disease Surveillance system in Matabeleland South province, the majority of the health workers had poor knowledge on the surveillance system. The low knowledge levels could be attributed to the lack of training of the health workers on the Integrated Disease Surveillance and Response. A study carried out by Maponga et al revealed that those trained in surveillance were more likely to report the diseases under surveillance than those not trained [11].

In our study, although the surveillance system was reported to be useful by the majority of the health workers, there was limited evidence of the usefulness of the system. Updated graphs showing analysis of data were displayed by less than half (40%) of the facilities. Failure to analyze data locally could be attributed to limited knowledge among health workers on the importance of analyzing surveillance data. Furthermore, feedback received from the provincial office was not being shared with all the departments. Improvements in the WDSS cannot be done unless the health workers implementing the system are consistently given feedback on the data they submit [10].

Our study noted the surveillance system in the province to be unstable. Constant breakdowns of the DHIS 2 were reported, as the software relies on internet connectivity, which is sometimes not available. In addition, power cuts especially in rainy season could also affect the communication system. Consistent with our findings, Mandyta et al (2017), noted instability of the surveillance system due to unreliable internet connectivity, especially with the electricity load-shedding [12]. Engaging information and communications technology (ICT) service providers would improve the system.

Acceptability of the system is shown by the majority of respondents (92%) reporting willingness to continue participating in the surveillance system. However, 8% of the health workers in our study placed the responsibility to participate on other health care workers other than themselves. Doyle et al. (2002) revealed one of the reasons for not notifying diseases in a surveillance system, to be the assumption by health workers that someone else will notify [13]. Furthermore, for all the health workers interviewed there was no question refusal and no dropouts hence implying the system was acceptable to the users.

The reasons for low reporting rates noted in our study include; breakdown in the electronic reporting system, work overload and lack of staff training.

Poor internet connectivity and network coverage interrupts the operation of the DHIS 2 system resulting in low reporting rates. Consistent with our findings, Adokiya et al (2015) noted inconsistencies in the electronic data system which could compromise the reporting rates in the surveillance system [14]. The work over load noted in our study could be attributed to the shortage of staff at the facilities, which results in health workers not prioritising compilation of reports.

The study had its own limitations. Primary health care facilities were not included in the study, which might limit generalizability of the results. Despite the limitation, our study provides important data and insights into the surveillance system, which contributes towards improvement in the performance of the weekly surveillance system in the province.

Conclusion

The WDSS was found to be simple, acceptable, flexible. However, it was found to be unstable and untimely. The reasons for low reporting rates noted in our study are breakdown in the electronic reporting system, work overload and lack of staff training. We therefore recommend training of health workers in Integrated Disease surveillance and response in the province. We also recommend prompt repair of breakdowns in the DHIS 2 central server. There is also need for data entry clerks to assist in compilation of reports to reduce the workload for the nurses.

What is known about this topic

- Disease surveillance system serves as an early warning for impending public health emergencies
- Improved reporting rates allow for control and prevention activities to be initiated earlier in epidemics

What this study adds

- The study demonstrates the potential reasons for low reporting rates as constant breakdown in the electronic reporting system and work overload.
- The surveillance system in the province was threatened by lack of health worker knowledge

Competing interests

The authors declare that they have no competing interests

Authors' contributions

TC, RC and NG: Conception, design, data collection, analysis, interpretation and drafting of manuscript. TJ, SC and GS: conception and reviewing of several drafts of the manuscript for intellectual content. MT had oversight of all stages of the research and critically reviewed the final draft. All authors read and approved the final manuscript.

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Tables and figures

Table 1: Demographic Characteristics of Respondents in Matabeleland South Province, 2018

Table 2: Health Worker Knowledge on the Weekly Disease Surveillance System in Matabeleland South Province, 2018

Table 3: Usefulness of the Weekly Disease Surveillance System in Matabeleland South Province, 2018

Figure 1: Flow of information in the Weekly Disease Surveillance System

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Table 1: Demographic Characteristics of Respondents in Matabeleland South Province, 2018

Variable	Category	Frequency	Percentage
Sex	Male	22	44
	Female	28	56
Designation	Nurse	41	82
	Health Information Officer	5	10
	Environment Health Officer	4	8
Median years in service	6.5 (Q_1=4; Q_3= 11)		
Median age of respondent (years)	36 (Q_1=33, Q_3=40)		

Table 2: Health Worker Knowledge on the WDSS in Matabeleland South Province, 2018

Variable	Frequency	Percentage
Correct definition of WDSS	39	78
Knowledge on the timelines for submission of data to next level	36	72
Knowledge of forms filled in WDSS	31	62
Knowledge on the objectives of WDSS	23	46
Knowledge of all diseases monitored by the WDSS	19	38

Table 3: Usefulness of the WDSS in Matabeleland South Province, 2018

Variable	Frequency	Percentage
Find system useful	45	90
Analyse information	42	84
Take action after analysis	20	48
Hold meetings to discuss surveillance information	37	74
Receive feedback from next level	28	56
Use feedback information	18	64

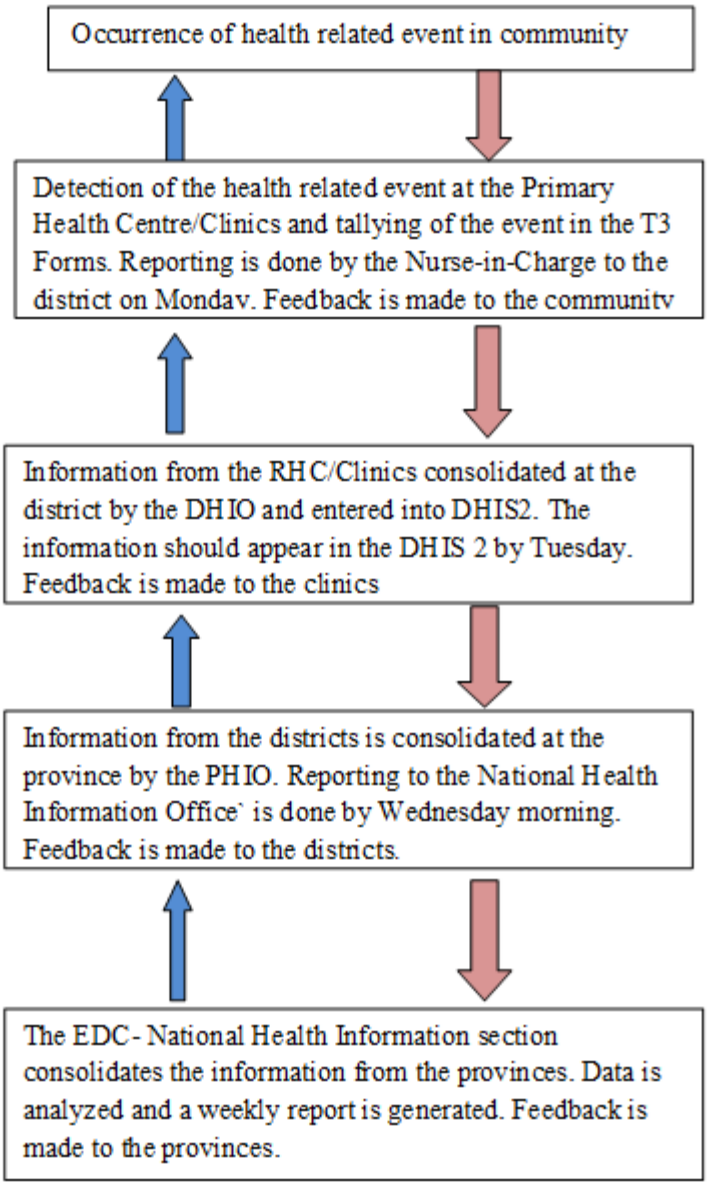

Figure 1: Flow of information in the Weekly Disease Surveillance System