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ASSESSING THE ATTRIBUTES AND EFFECTIVENESS ON THE IMPLEMENTATION OF ELECTRONIC CASE-BASED SURVEILLANCE SYSTEM FROM 2018-2020 IN BOMBALI DISTRICT, SIERRA LEONE.

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ABSTRACT

During the EVD 2014 outbreak, Sierra Leone lacked an effective infectious disease reporting system. To address this challenge, Sierra Leone introduced the electronic Case-Based Disease Surveillance (eCBDS) in 2018 as a tool for early notification and response to outbreaks and public health concerns. However, there is limited knowledge of the effectiveness of eCBDS system. We, therefore, evaluated the system's performance in line with its objectives. We conducted a mixed qualitative and quantitative descriptive cross-sectional study in Bombali District using the updated CDC guidelines for evaluating surveillance systems. We purposively selected 23 stakeholders and 10 health facilities. A semi-structured questionnaire adapted from updated CDC guidelines was used for data collection through face-to-face interviews and record reviews for the period 2018 to 2020. The major qualitative findings were narrated and summarized based on their contents to determine usefulness, simplicity, flexibility, acceptability, stability, and representativeness of the surveillance system. The quantitative findings were summarized into frequencies, proportion, median, and range using Microsoft Excel. All 23 (100%) respondents indicated that the eCBDS is useful for timely detection of epidemic diseases. Most of the staff 20 (87 %) indicated that the eCBDS is simple, easy to input data, to do timely reporting. None of the facilities were doing descriptive analysis by person, place, or time. There was a lack of internet data in one facility. Two (20%) of 10 facilities reported faulty device and disappearance of the application on the tablet have interrupted the full operation of the eCBDS. Our evaluation of the eCBDS system in the Bombali district shows that the system is simple, useful, and acceptable to users. The stability was affected by lack of internet data and faulty devices have interrupted the full operation of the system. Therefore, we recommend that the DHMT orientate staff in troubleshooting the devices and data analysis.

Keywords: eCBDS early, notification, prompt response.

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INTRODUCTION

Globally, countries continue to face serious public health threats with emerging and re-emerging diseases. These public health emergencies are overwhelming the fragile health systems, especially in African countries (Bloom and Cadarette, 2019). This is because, African countries lack the infrastructure and appropriate tools for proper reporting systems, from the peripheral health unit (PHU) up to the national level (Oleribe *et al.*, 2019). A public health surveillance system should be able to timely detect, report, and appropriately respond to outbreaks to reduce the morbidity and mortality rate. So, countries need to build effective and sustainable disease surveillance systems and appropriate tools for timely reporting at all levels of the health system (Isere, Fatiregun and Ajayi, 2015).

The Global Health Security Agenda (GHSA) urges countries to have the ability to prevent, detect, and respond to public health threats by strengthening surveillance systems based on the International Health Regulations (IHR) (World Health Organization, 2008). Surveillance is a process of ongoing, systematic collection, analysis, interpretation, and dissemination of data about a health-related event for use in public health actions to reduce morbidity and mortality and improve health systems (Nsubuga *et al.*, 2006). Surveillance data can be used to prevent and control diseases and other public health events. Surveillance is also essential for the planning, implementation, and evaluation of public health practices (Soto *et al.*, 2008).

In 2004, Sierra Leone adopted the Integrated Disease Surveillance and Response (IDSR) strategy for surveillance of priority diseases, conditions, and events (World Health Organization (WHO) Regional Office for Africa (AFRO), 2010). IDSR promotes the integration of surveillance and response activities for reportable priority diseases, conditions, and other events of public health importance.

The 2014/15 Ebola virus disease (EVD) outbreak in West Africa demonstrated weaknesses in the public health surveillance and response system. If Sierra Leone had an effective infectious disease reporting system during the Ebola outbreak, that might have helped to minimize the burden of the epidemic (*Sierra Leone (IDSR) (GHSA) in Action*, 2021). Despite the introduction of the Integrated Disease Surveillance and Response (IDSR) strategy in 2003 (Fall *et al.*, 2019), the surveillance system in the country was not effective and the strategy was not implemented in all health facilities. Several gaps were observed, including a lack of adequate

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reporting tools, difficulties with transmitting data, and limited access to laboratory information on priority diseases (Vetter *et al.*, 2016). These challenges resulted in late detection, inadequate response to, and control of public health events (Vetter *et al.*, 2016).

The case-based surveillance system at the time was paper-based and reporting was through telephone, fax, e-mail, radio, and follow-up was done through written reports of a case-based form (Ministry of Health and Sanitation, 2008).

In 2018, the electronic case-based disease surveillance (eCBDS) system developed on District Health Information System 2 (DHIS2) platform was introduced (World Health Organization, 2019). The eCBDS system aims to enhance prompt case detection, recording, and reporting— for outbreak detection. According to WHO, Sierra Leone has become the first country in the African region to apply the electronic-based disease surveillance system in all public health facilities (World Health Organization, 2019). Currently, the country is conducting electronic case-based disease surveillance on 21 epidemic-prone diseases, vaccine-preventable diseases, prioritized zoonotic diseases or events, and diseases identified for global elimination.

Despite the implementation of the eCBDS in all 16 districts in Sierra Leone. The system has never been evaluated through a critical analysis of its attributes. Here, this study aimed to describe the structure and operation of the system and assess its attributes to see if it meeting its set objective.

METHODS

Study design

We conducted a mixed-method study in Bombali District, using the updated CDC guidelines for evaluating surveillance systems (*Updated Guidelines for Evaluating Public Health Surveillance Systems*, no date), from November 2018 to December 2020Study setting

The study was conducted in Bombali District, located in the Northern Province of Sierra Leone. The district has 679,779 people (census, 2015) with a total area of 7,985 km^2 and comprises twelve chiefdoms. The district borders, Karene District to the north, Port Loko and Tonkolili Districts to the south, and Koinadugu District to the east. It has one district health management team (DHMT) and 91 health facilities. The DHMT oversees surveillance and response activities in the district. Each health (Figure 1).

Sampling technique and sample size

A mixed method was used in this study. This study was conducted in 10 purposively selected health facilities, and the district health management team, specifically the surveillance

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unit. A total of 23 stakeholders (20 from health facilities, and three from DHMT) were selected.

Data Collection Tools and technique

Data were collected using a semi-structured questionnaire adapted from the updated CDC guideline for evaluating public health surveillance systems through interviews of stakeholders and record review from 2018-2020 (*Updated Guidelines for Evaluating Public Health Surveillance Systems*, no date). The questionnaire was designed with various sections including the availability of human resources, communication, and reporting, availability of surveillance tools, data analysis, outbreak detection and response, feedback, knowledge assessment, and training, as well as questions on surveillance system attributes. The record reviews included case-based notification forms, electronic case-based forms (Mobile Android tablet), and registers. Attributes assessed included data quality, timeliness, completeness, sensitivity, usefulness, flexibility, simplicity, acceptability, representativeness, and stability (*Updated Guidelines for Evaluating Public Health Surveillance Systems*, no date).

Data quality assurance

The investigators participated in data collection to minimize the subjectivity of responses from interviews. All responses were verified through cross-checking with surveillance records such as registers and reports to increase the accuracy of the collected data. Observation was used to confirm the availability of guidelines, standard case definitions, reporting formats, and data analysis. Activity reports, meeting minutes, and weekly bulletins were used to ascertain feedback mechanisms.

Data management and analysis

Data was reviewed and cleaned, and qualitative findings were summarized based on thematic areas. Epi-info 7.2, DHIS2 and MS Excel were used (*Windows | Epi Info™ | CDC*, 2021) to calculate frequencies, proportions, median, and range, and to generate charts and tables.

Definition of attributes and assessment methods

Usefulness

The usefulness of the surveillance system refers to the relevance of the system to generate data for public health action. We interviewed stakeholders about the use of the collected data, and what public health actions were taken based on the surveillance data.

Flexibility

Flexibility is defined as the ability of the system to adapt to changes when needed, such as the

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addition or removal of a new variable or disease. Flexibility was assessed by interviewing stakeholders if any changes were made and the system was able to adapt without affecting its operation.

Simplicity

Simplicity refers to the structure of the system and the ease of operation. We assessed simplicity by looking at the proportions of health workers who could easily understand and use the standard case definition and who could easily complete the case-based notification form. Health workers were also asked if there were no unnecessary steps in the system.

Acceptability

Acceptability defined as the willingness of stakeholders to implement the system and expressed by their active participation in surveillance activities. Acceptability was measured through reporting rate, completeness, and timeliness of reporting.

Representativeness

Representativeness is defined as the ability of the system to accurately describe the occurrence and distribution of all reported cases in terms of person, place, and time. We assessed representativeness by looking at the coverage of eCBDS in the district and the reported cases in terms of person, place, and time.

Stability

Stability is the availability of the resources needed to operate the system without any failure. Stability was assessed by observing if there was no interruption of the system due to various reasons such as a breakdown of the system, internet accessibility issues, unavailability of human resources and surveillance tools.

Sensitivity

Sensitivity is defined as the system's ability to generate analysis reports on disease trends for monitoring changes in the number of cases over time. The sensitivity of the system was assessed by comparing the number of cases reported through the system to the total number of all cases in health facilities registers that met the case definition.

Timeliness

Timeliness is the rate at which data is reported between different levels in the surveillance system. Timeliness was determined by looking at the time interval between the case detection at the facility and the time of reporting to the next level within 24 hours.

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Data Quality

Data quality is the reliability and credibility of the collected data. It was assessed based on the completeness of the reporting forms and the validity of the collected data.

Ethical considerations

This is part of routine surveillance activities, so therefore the study did not require permission from the Sierra Leone Ethical and Scientific Review Committee. Permission was granted by the District Medical Officer of Bombali District. Written informed consent was delivered and filled by each study participant and voluntary participation was ensured. Confidentiality was maintained and information was only available to the main investigators. No information that could identify the participants was used in the questionnaire.

RESULTS

Structure and function of the eCBDS system

The eCBDS system operates as a passive and active surveillance system. Partners including the United States, Centers for Disease Control and Prevention (US CDC), Africa Field Epidemiology Network (AFENET), World Health Organization (WHO), eHealth Africa, and German Development Agency (GIZ) were providing technical and financial support towards the implementation of eCBDS in the district. The District Medical Officer supports and monitors the performance of the eCBDS system in the district. Peripheral health unit (PHUs) staff are responsible for the registration of cases and a notification through a short text message (SMS) or email sent to the District Surveillance Officers (DSO) and the National Surveillance program staff. District Surveillance Officers investigate and fill out the paper case investigation form and input data into the electronic disease-specific investigation form. Similarly, the DSO also fill out the laboratory requests form for sample analysis and laboratory confirmation. Moreover, they fill out the contact tracing event form for some communicable diseases, follow up, and give feedback to the health facilities.

Laboratory personnel collect samples and send them for analysis at a reference laboratory. They also capture laboratory results in the eCBDS. The National Public Health Agency (NPHA) and/or Ministry of Health (MoH) is responsible for the data monitoring, analysis, and sharing of the information with the Ministry of Health and other allied ministries and partners.

In Bombali District, out of 91 health facilities, 87(95.6%) were trained on electronic case-based information on epidemic-prone diseases

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(Figure 1). The eCBDS is operated by trained personnel at PHU, DHMT, and national levels. When an epidemic-prone disease is detected, it is reported within the context of the IDSR strategy within 24 hours. At the health facility level, data is collected using the case-based notification form, which is accessed electronically on a mobile Android tablet with a DHIS2 capture Android app. The DSO provides feedback to facilities either during in-charge meetings, supportive supervision, weekly report submission, or immediately by phone calls. The health facility in-charge holds weekly meetings with their staff and other stakeholders in the community to discuss the IDSR weekly data (Figure 1).

Assessment of availability of Surveillance guideline documents, registers, and forms

All health facilities had surveillance documents and tools including integrated disease surveillance and response technical guidelines, standard case definition, case-based notification form, line listing form, and a mobile Android tablet. Only 2/10 (20%) of the health facilities had a rumor logbook.

Data analysis and training assessment

Lack of routine data analysis was observed in the majority of the visited health facilities. Only 4/10 (40%) health facilities were doing partial data analysis. Analysis by person, place, and time was missing in all assessed facilities. The evaluation found that 12/23 (52.1%) staff interviewed reported that they did not analyze data due to a lack of knowledge. Other reasons for the lack of data analysis included a lack of skilled personnel, where 8/10 (80%) facilities reported a poor understanding of how to use surveillance data in planning. There were also shortages in the basic equipment such as maker, and van card. The trend analysis varied depending on the disease, but it was more frequently observed for malaria in the facilities.

Outbreak detection and response

Seven out of the 10 facilities had case definitions for priority diseases posted on a wall. Of 23 stakeholders interviewed, 20 (87%) knew when to report epidemic-prone diseases, 19 (83%) had limited knowledge of the five listed diseases (Acute Flaccid Paralysis, Neonatal Tetanus, Ebola Virus Disease, Measles, and Cholera). A total number of 303 cases were detected, reported through the system and investigated. Of these cases, 301 (99.3%) had samples collected, 98 were

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confirmed by laboratory, and 303 cases were investigated including 4 circulating Vaccine Derived Polio Virus (cVDPV) and 94 COVID-19 cases.

Feedback

Only two of the 10 facilities (one private and one faith-based) did not receive regular feedback during the in-charges meeting. The private and faith-based health facilities got feedback only during supportive supervision or when there was a laboratory result to be communicated. However, government health facilities received feedback frequently from the higher levels either during supervision, in-charges meetings, and weekly during IDSR data submission.

Surveillance system attributes

Usefulness

The eCBDS system was found useful in determining the magnitude of the morbidity related to diseases under surveillance in the district. The system helped to detect as early as possible cases of epidemic-prone diseases. From November 2018 to October 2020, the system was used to detect and report 303 cases of epidemic-prone diseases on time. However, 13 cases from two hospitals were not captured in eCBDS (10 neonatal tetanus, one maternal death-, and two Meningococcal Meningitis-cases). Data from the system was used by the DHMT to hold community sensitization and engagement meetings with key stakeholders on the prevention and control of epidemic-prone diseases during outreach activities. The data was also used to conduct continuous staff mentorship and coaching on epidemic-prone disease detection and early reporting.

Simplicity

The eCBDS system was found to be easy to capture data and help the staff in timely reporting to the next level. Facility staff were getting data from the registers, community, community health workers, Laboratory, and traditional healers. The data was captured into the system without any difficulty. The tablets were accessible and available throughout the day to capture data. Staff spent between 5- 10 minutes filling out an electronic form and sending the report to the next level.

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Flexibility

The eCBDS allows the addition of new variables into the system. There has been a change in capturing the tracking number and the system has adapted easily. The COVID-19 investigation form, which was previously not in the system, was developed and introduced into the eCBDS system. It was easy to move from paper-based to electronic-based without difficulty.

Acceptability

The completion rate of the case-based reporting forms moved from 82% (468 of 576 forms completed) in 2018 to 96% (303 of 316 forms completed) in 2020.

Representativeness

The eCBDS system was implemented in 87 (95.6%) of 91 health facilities in the district. All the 12 chiefdoms in the Bombali district were covered by the system. The system is used to report diseases under surveillance in the whole district irrespective of demographic characteristics such as age, sex ethnic groups, regions, and other characteristics.

Stability

In the last 3 months before the study, 5/10 assessed facilities, the mobile android tablets were faulty, and they lacked internet data bundles for reporting. This interrupted the full operation of the eCBDS system.

Data Quality

The percentage of unknown or blank mandatory variables before the implementation of eCBDS was 18% (108 out of 576 variables). After the implementation of the eCBDS system, the mandatory variables became 100%, because the system cannot allow any submission with blank mandatory variables.

There was a discrepancy between reported cases (303) through the eCBDS system and cases found in registers (316). The cases that were missing in the eCBDS were commonly from outpatient, inpatient, and special baby care units.

In total, 303 cases of epidemic-prone diseases were reported through eCBDS. Of which 267 (88%) were COVID-19 cases, 14 (4%) were AFP, 9(2%) were measles, and 7 (2%) were acute viral hemorrhagic fever (AVHF) cases (Figure 2).

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Timeliness and Completeness

The eCBDS system improved the quality of reporting in terms of timeliness and completeness.

Timeliness of reporting notifiable diseases improved from 60% in 2018 to 95.1% in 2020, and completeness of reporting notifiable diseases improved from 70% in 2018 to 97% in 2020.

Of 303 cases detected by the system, 288 (95.1%) were reported on time, within 24 hours from November, 2018-December, 2020. The percentage of detection and reporting time of investigation increased from 60% to 95.1% and completeness from 70% to 90%. At the hospital level, 240 (93.7%) out of a total of 256 cases were reported on time, while 93.7% (240 out of 256) cases were reported within 24 hours, and at the PHUs level, it was 100%.

Sensitivity

Out of 316 cases found in the registers, only 16 (4.1%) were not captured in eCBDS, making a sensitivity of 95.9%.

DISCUSSION

The findings of this study indicated that the eCBDS system is simple and easy to capture data for real-time reporting at the health facility level. The eCBDS system was useful as it contributed to preventing and controlling health events and the performance of different indicators. The epidemic-prone diseases detected at the health facility level were reported immediately through this system.

Table 1: Completeness of key variables in the case-based electronic surveillance form, Sierra Leone

No	Key Variable	Number of case-based forms	Number of missing Variables	% of Completeness
1	Name	12	0	100%
2	Age	12	0	100%
3	District	12	0	100%
4	Chiefdom	12	0	100%
5	Address	12	0	100%
6	Date of onset	12	4	66.7%
7	Date of seen at the facility	12	5	58.3%
8	Treatment given	12	0	100%
9	Travelling History	12	9	25%
10	Date of notification	12	7	41.7%
11	Date of specimen collection	12	5	58.3%
12	Reporting Facility	12	3	75%
13	Doses	12	7	41.7%
14	Admission date	12	4	66.7%
15	Type of specimen	12	4	66.7%
16	Date of investigation	12	2	83.3%

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According to our evaluation, there was a high feedback rate at the public health facility level, unlike for the government hospitals, faith-based, and private facilities where we observed limited feedback when reporting diseases or collecting samples. This may be because private facilities did not participate in the monthly in-charge meeting held by the DHMT, which provides feedback on health facilities' performance.

Our findings showed that healthcare workers were trained on electronic systems, where 87% of them received training on how to report notifiable diseases. This finding was similar to a study conducted in Nigeria, where training had a great impact on the detecting and reporting of epidemic-prone diseases (Bawa, Olumide and Umar, 2003). All visited facilities had both mobile Android tablets and case-based forms, but a rumor logbook was not found, which is considered a big challenge in these facilities, and may compromise the quality of the data.

Late reporting of cases was caused by improper functioning of the mobile tablet, inadequate data, absence of the DHIS2 application on tablets, and internet connection challenges. Delays in reporting suspected cases to the next level led to delays in the investigation and response processes, which might contribute to increased morbidity and mortality related to epidemic-prone diseases.

The reason for the poor data quality in health facilities could be attributed to a lack of routine data analysis due to a knowledge gap at the facility level. A similar finding was reported in a study conducted in Tanzania, where a lack of clear understanding of the purpose, users, and flow pattern of health data collection affected the health system and provided low-quality information for decision-making in the country (Nyamtema, 2010).

In our study, we found that the completion of forms was adequate and accurate at all levels. This might be attributed to the fact that electronic systems do not allow data submission unless mandatory data variables are completed. The eCBDS transmits information on priority diseases through electronic means as soon as they occur in the community, which reduces the waiting time from weeks to days or hours. The percentage of reports on time increased from 60% to 90% and completeness from 70% to 97%, which is above the national targets (≥90%) and WHO targets (≥80%) respectively (*Technical Guidelines for Integrated Disease Surveillance and Response in the African Region: Third edition*, no date). A similar study conducted in Peru observed an improvement in the

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reporting system in terms of timeliness and completeness when the electronic system was introduced (Soto *et al.*, 2008).

The eCBDS has a great impact on the improvement of the health system through early detection and reporting of infectious diseases thus reducing mortality. For instance, after the introduction of the eCBDS system, the number of Acute Flaccid Paralysis (AFP) cases increased from 3 to 6 cases within 3 months which is the district target for AFP cases. Four of these cases were confirmed as positive for poliovirus in 2019.

The ability of surveillance systems to collect, manage, and provide data without failure makes the system stable. However, the eCBDS stability was threatened by the lack of internet data bundles and malfunctioning of mobile Android tablets in specific health facilities which interrupted the full operation of the system in the district. More efforts are required to ensure the stability and sustainability of the system.

A considerable data discrepancy was observed between registers and mobile tablets which posed a challenge in the system use. These discrepancies degrade the accuracy and reliability of the data and may lead to low utilization of health system data for planning and decision-making. Discrepancies are likely caused by factors, including fear of change by the healthcare workers and lack of awareness of the eCBDS system, especially in the hospital setting, where healthcare workers did not receive enough training in the system.

Even though the performance of the surveillance system was not optimal, most of the stakeholders found the surveillance system to be useful and able to detect cases and the staff were well engaged in the eCBDS activities. There was a high completion rate of the forms and all cases detected by the staff met the case definition.

Limitation of the study: This evaluation was conducted in one district and may not represent the whole electronic surveillance system of Sierra Leone. Similar evaluations covering more districts may provide the performance of the electronic surveillance system of the country.

CONCLUSION

The eCBDS evaluation in Bombali district showed that the system is simple, representative, and acceptable to users. A high level of completeness of the key data variables was achieved, which demonstrated the high quality of the surveillance system in the district. However, there is a need to engage staff from

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the health facilities, whose detected cases were missing in the system. The eCBDS system improved timeliness and completeness and was able to detect epidemic-prone diseases. The Ministry of Health urges strengthening the eCBDS system to include other health facilities (private, faith-based) in the whole district and change the means of submission from internet data to SMS submission. We engaged the PHU workers about the importance of early detection and reporting on immediately reportable diseases through the electronic system as that will help early response. We also disseminate our findings to the DHMT on the gaps identified, so that they can initiate on-the-job training on how to capture the data into the system and basic data analysis at the health facility level.

This study evaluated the effectiveness of the electronic disease surveillance system based on key performance indicators. This study showed significant improvement of the system in timeliness and completeness. However, the study demonstrated high sensitivity of the system.

This study provided evidence that electronic surveillance systems can improve timely detection, notification and response to public health priority diseases and events in low-income countries including Sierra Leone.

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Authors contributions:

Conception and design of study: Gebrekrstos Negash Gebru, Jean Leonard Hakizimana, Salieu Jalloh. Acquisition of data and drafting manuscript: Salieu Jalloh, Jean Leonard Hakizimana. Revising the manuscript critically for important intellectual content: Adel Hussein Elduma, Gebrekrstos Negash Gebru, Umaru Sesay, Jean Leonard, James Squire, Bridget Magoba. all authors have read and agreed to the final manuscript.

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- facility has at least one IDSR focal person.

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Figure 1: Map of Bombali district showing the boundaries of the 12 chiefdoms in the district

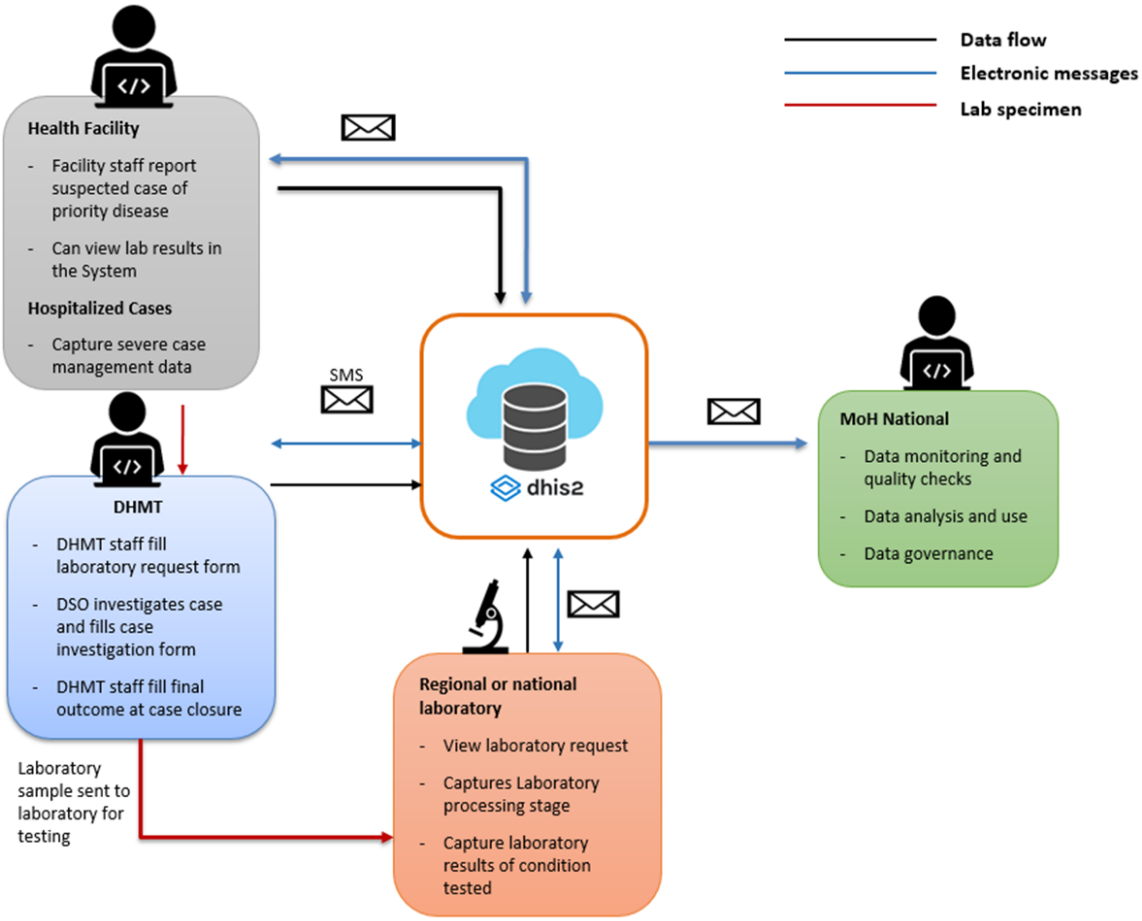

Figure 2: Electronic Case-Based Disease Surveillance System data flow diagram; Bridget M et al, 2024

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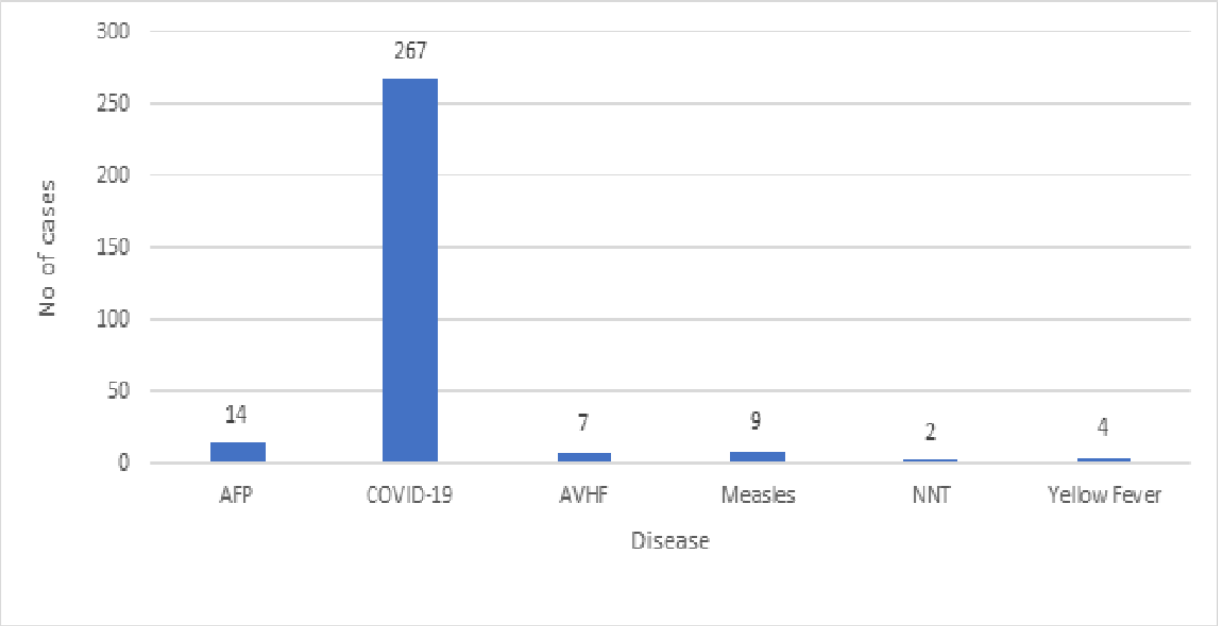

Figure 3: Notifiable disease Condition reported through the eCBDS

Table 1: Completeness of key variables in the case-based electronic surveillance form, Sierra Leone

No	Key Variable	Number of case-based forms	Number of missing Variables	% of Completeness
1	Name	12	0	100%
2	Age	12	0	100%
3	District	12	0	100%
4	Chiefdom	12	0	100%
5	Address	12	0	100%
6	Date of onset	12	4	66.7%
7	Date of seen at the facility	12	5	58.3%
8	Treatment given	12	0	100%
9	Travelling History	12	9	25%
10	Date of notification	12	7	41.7%
11	Date of specimen collection	12	5	58.3%
12	Reporting Facility	12	3	75%
13	Doses	12	7	41.7%
14	Admission date	12	4	66.7%
15	Type of specimen	12	4	66.7%
16	Date of investigation	12	2	83.3%

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Table 2: Comparing time of detection to the time of investigation			
Time Interval	**National Recommended Time**	**Done Recommended Time**	**Percentage (%)**
Between Detected and reporting	Within 24 Hours	303/319	95%
Between reporting and investigation	Within 48 hours	303/303	100%

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Figures and Tables

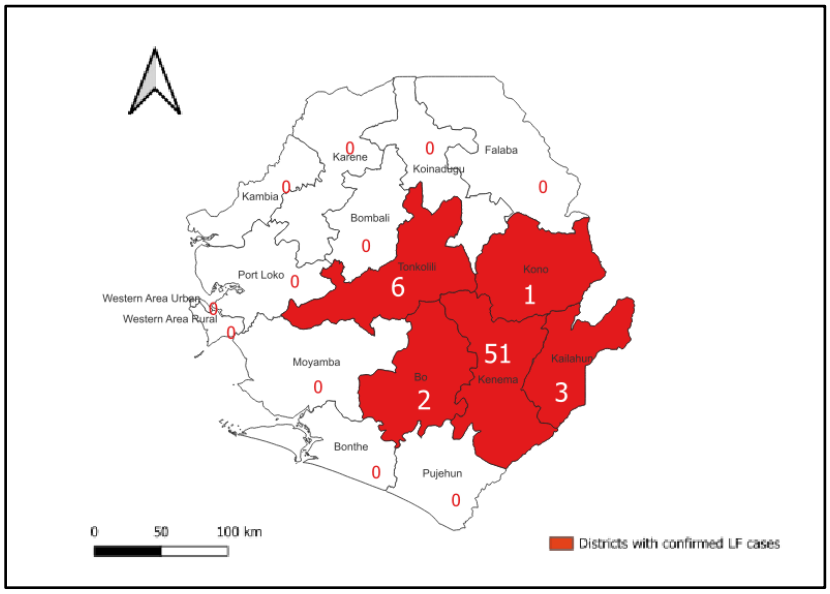

Figure 1: Distribution of Lassa fever cases by district, Sierra Leone, 2018 – 2022

Table 1: Incidence of Lassa fever by age group, Sierra Leone, 2018-2022

Age group in years	Confirmed	Population	Incidence/100,000 Population
≤ 9	26	2,396,432	1.1
10 – 19	3	1,817,146	0.2
20 – 29	20	1,426,576	1.4
30 – 39	7	1,023,812	0.7
40 – 49	3	668,874	0.4
50 – 59	2	399,220	0.5
≥ 60	2	389,605	0.5

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Total	**63**	**8,121,665**	**0.8**

Table 2: Lassa fever case fatality rate by age group in Sierra Leone, 2018 – 2022

Age group in years	Confirmed	Deaths	CFR (%)
≤ 9	26	18	69
10 - 19,	3	1	33
20 – 29	20	14	70
30 – 39	7	4	57
40 – 49	3	1	33
50 – 59	2	1	50
≥60	2	1	50
Total	**63**	**40**	**63**

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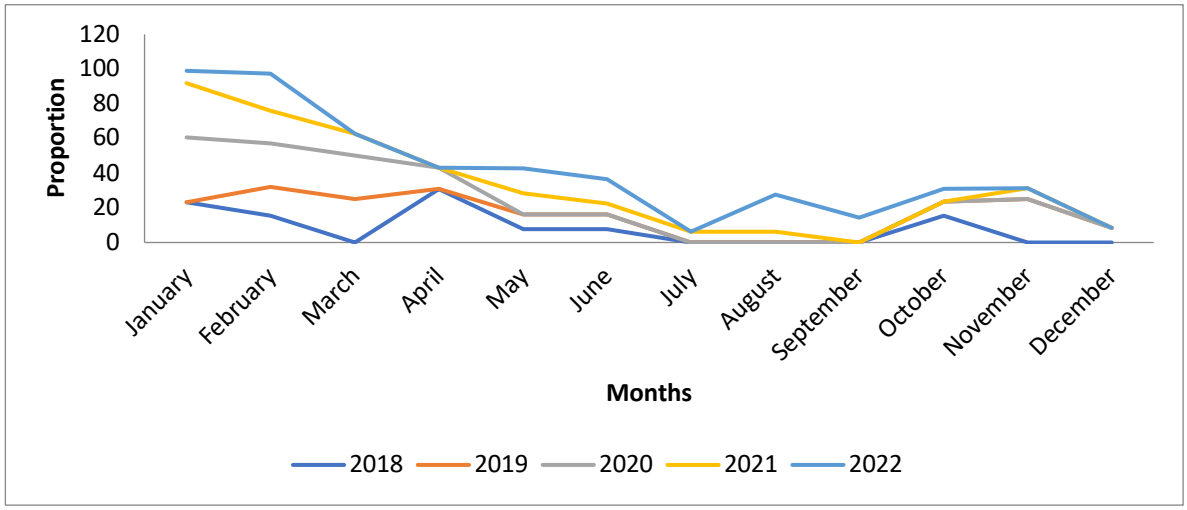

Figure 2: Lassa fever cases by month and year, Sierra Leone, 2018 to 2023