



Republic of Liberia

Integrated Disease Surveillance and Response (IDSR)



Semester Bulletin

Volume 1 Issue 1

January – June 2017

Contents

Editorial 1

I. IDSR Performance..... 2

A. Reporting Coverage..... 2

 i. Health facility level..... 2

 ii. Health district level..... 2

 iii. County level..... 2

B. IDSR Health Facility Supervision.... 4

II. Trend of Suspected Cases of Selected IDSR Immediately Reportable Diseases and Conditions..... 6

III. Selected Disease Outbreaks and Health Emergencies..... 9

A. Lassa fever..... 9

B. Pertussis..... 10

C. Meningococcal disease..... 11

D. Cholera..... 12

IV. Other Diseases of Public Health Importance..... 14

A. Malaria..... 14

V. Laboratory and Public Health Diagnostics..... 15

A. Overview..... 15

B. Specimen Transport Pathway... 16

C. Feedback and Turn-around Time..... 16

D. Situational context..... 16

Annex 1: List of Outbreaks Reported..... 17

2996

IDSR Suspected Cases Reported

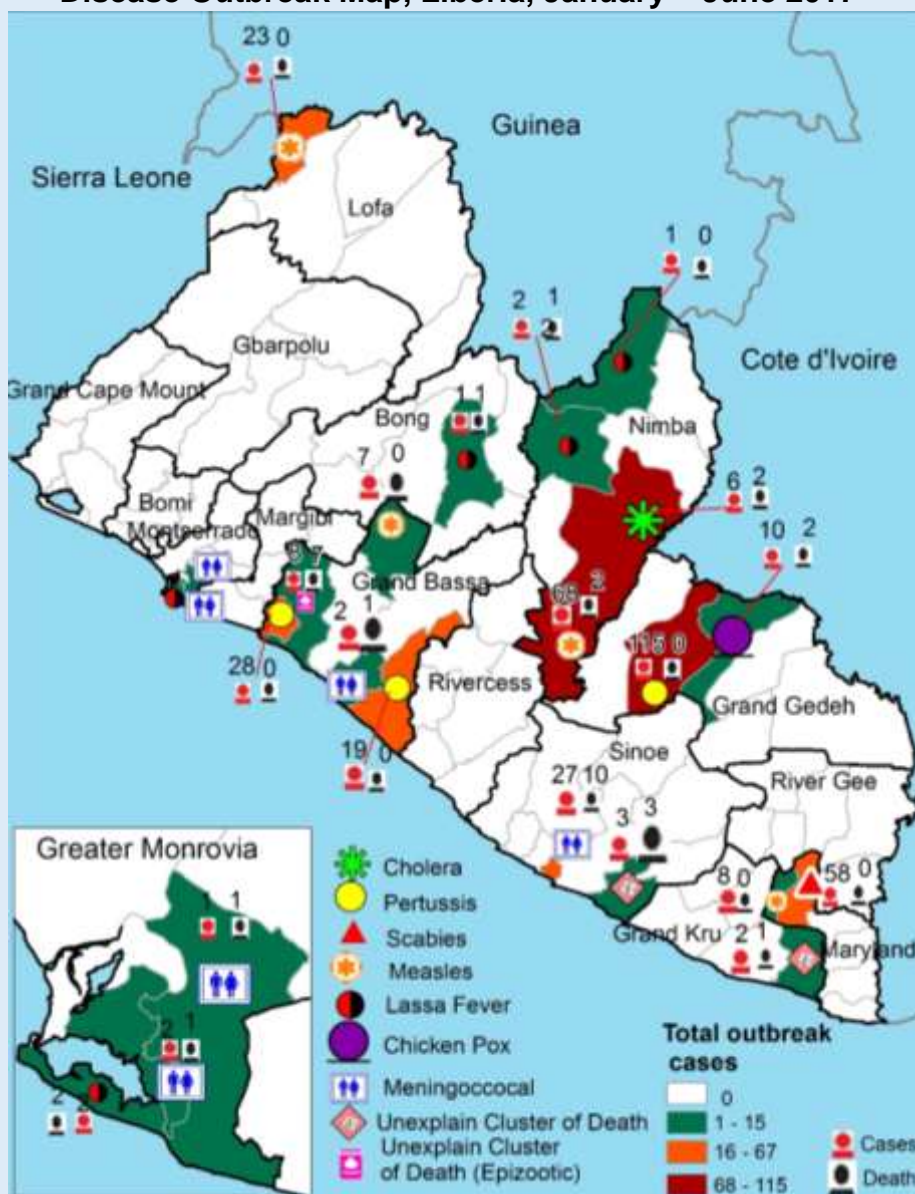
20

Outbreaks Reported

603959

Confirmed Malaria Cases Reported

Disease Outbreak Map, Liberia, January – June 2017



Editorial

The Ebola Virus Disease (EVD) outbreak response led to improvements in Liberia's public health sector and the robust implementation of Integrated Disease Surveillance and Response (IDSR) in Liberia. As part of the implementation of the National Investment Plan to build a resilient health system, the National Public Health Institute of Liberia (NPHIL) has been established with a mandate to ensure prevention and control of public health threats by promoting healthy outcomes.

The country has also successfully adapted the second edition of the IDSR National Technical Guidelines and trained surveillance officers at national, county, and district levels in 2016.

Within NPHIL, the Department of Infectious Disease Epidemiology (DIDE) has developed this first edition of the semester bulletin in order to communicate information on the implementation of IDSR including public health threats that have been monitored and controlled.

What is presented in this bulletin?

This semester bulletin for IDSR covers twenty-six (26) epidemiological weeks from January to June 2017. The focus is on five key areas of IDSR implementation: performance monitoring, trend of selected suspected cases reported, outbreaks and public health emergencies, other diseases of public health importance, and laboratory and public health diagnostics. The objective of this bulletin is to highlight the robust implementation of IDSR across Liberia, provide contextual analysis, as well as proposed interventions.

The first section details reporting coverage by providing a summary of the methods and processes of reporting IDSR data to the next higher level as well as reporting performance of each level of the health system. An analysis of health facility supervision is also presented in this section.

The second section focuses on the alerts of selected IDSR immediately reportable diseases and conditions reported from the beginning of 2017 to epidemiological week 26 of 2017. A comparison of the total number of alerts for each disease and condition during semester I of 2016 and 2017 respectively is provided.

The third section presents outbreaks and public health emergencies recorded during the semester. A summary analysis of key performance indicators for measuring timely detection, reporting, and response is presented. Four disease outbreaks (Lassa fever, Pertussis, Meningococcal, Cholera) were selected for discussion based on their distinct mode of transmission and control measures. For each disease outbreak, a brief description of the event is provided, followed by public health responses and a situational analysis aimed at reviewing the circumstances of the event and proposing processes to prepare and respond to future incidence.

The fourth section focuses on Malaria, one of the diseases of public health importance under passive surveillance. The trend of Malaria is presented in this section due to the high burden of disease across the country.

The fifth section looks at the role of the laboratory and public health diagnostics in the implementation of IDSR in Liberia. A description of the testing capacities of the public health laboratories and specimen transport mechanism is provided, followed by an analysis of the turn-around-time from sample collection to testing.

Summary of key findings

- a. The cumulative IDSR reporting completeness and timeliness for health facility, district, and county levels were above the target of 80%. However, two health districts fell below the target for completeness and four health districts were below the target for timeliness.
- b. Health facility supervision occurs routinely in all counties. Cumulatively, the availability of data collection tools was the highest performing category.
- c. A total of 20 outbreaks were detected, reported, and responded to.
- d. The average time for initial response to outbreaks was less than 48 hours, suggesting a marked improvement in the rapid response to public health events.
- e. Outbreak investigation reports were submitted to the national level for 18 (90%) of the 20 outbreaks. This is a marked improvement compared to the first semester of 2016 when only 53% of expected outbreak investigation reports were submitted to the national level.
- f. Seventy-six percent (76%) of total malaria deaths occurred in children below 5 years of age.
- g. There is in-country public health diagnostic capacity for seven of nine immediately reportable diseases: Ebola, Measles/Rubella, Yellow fever, Bloody diarrhea (Shigella), Cholera, Lassa fever, and bacterial meningitis. Specimens for cases of Acute Flaccid Paralysis (Polio) and Rabies are sent to international laboratories for testing. Confirmatory testing for Lassa fever is done at Kenema Hospital Laboratory in Sierra Leone.
- h. A total of 60 couriers from Riders-for-Health are transporting specimens from 302 health facilities across the country to the public health laboratories.
- i. A total of 1837 specimens were collected for laboratory testing for 8 of the 9 immediately reportable diseases. All specimens received laboratory diagnosis and results shared with stakeholders.

Other aspects of IDSR implementation

It also is important to note that much work is ongoing in the areas of electronic disease surveillance, training, epidemic preparedness, point of entry screening, and community event-based surveillance, among others. There is an electronic platform for AFP surveillance called Auto-visual AFP Detection and Reporting (AVADAR) that is currently being piloted in Montserrado County. A new eIDSR platform has been designed and is expected to be piloted in the coming months. A 9-month Intermediate Field Epidemiology Training Program was launched, and training is underway for surveillance officers.

It is our hope that this first edition will provide the relevant insight into IDSR implementation in Liberia and will serve as an invaluable resource for reference.

I. Integrated Disease Surveillance and Response (IDSR) Performance

A. Reporting Coverage

i. Health Facility Level

A total of seven hundred sixty-one (761) health facilities submitted weekly IDSR data during the semester.

The National Technical Guidelines for IDSR requires each health facility to submit weekly summary data of immediately reportable diseases, conditions and events to the district level, which is the next higher level, by 17:00 GMT every Saturday.

IDSR ledgers for collating weekly data are placed in each health facility and filled in at the end of each day by the health facility surveillance focal points. A copy of the weekly summary of daily data is submitted to the District Surveillance Officer (DSO) at the end of each week.

The weekly average for health facility reporting completeness and timeliness was calculated to determine the trend during the semester. The national trend for health facility completeness and timeliness was above the target of 80% for all weeks except for epidemiological week 23 (Figure 1 & 2). The drop in week 23 is attributed to administrative challenges, which were subsequently resolved.

ii. Health District Level

There are 90 health districts in Liberia. The National Technical Guidelines for IDSR requires each DSO to receive and collate weekly IDSR data from health facilities within the district and submit a summary of the data to the County level by 17:00 GMT every Sunday.

Each DSO has a summary ledger of weekly IDSR data of health facilities and submit a hard copy of the weekly report to the County Surveillance Officer (CSO). In four counties: Montserrado, Nimba, Margibi, and Bong, the DSOs compiled excel-based electronic copies of weekly data and sent to the CSO through email. However, in some instances, weekly reports were communicated through text messages or mobile phone calls.

A total of 88 health districts met or surpassed reporting completeness of 80% and 86 health districts reporting timeliness of 80%. From week 1 – 26, two health districts in Maryland County (Barrobo Whojah, and Barrobo Farjah) had less than 80% completeness of reporting. There were also four health districts (3 in Maryland and 1 in Margibi) below the 80% target for timeliness (Figure 3).

It was observed that while reporting was mainly paper-based, strong commitment of surveillance officers both at health facility and at district levels contributed to high rate of completeness and timeliness of IDSR reports. Those health districts below the target are being supervised and encouraged to improve during the next semester.

iii. County Level

Each of Liberia's fifteen counties is required by the National Technical Guidelines for IDSR to submit weekly IDSR reports through the CSO to the national level by 17:00 GMT every Monday. This report reflects a summary of IDSR data obtained from health facilities and district levels for the previous week. All county weekly IDSR reports were compiled in excel spreadsheet and transmitted to the national level by email. In few instances

when there was an internet disruption, the data were transmitted to the national level through mobile phone call or text messages. All 15 counties met the cumulative target of 80% for completeness and timeliness respectively during the semester.

In spite of internet challenges, we have noted very strong commitment from county level surveillance officers to submit complete and timely reports to the national level. An reporting platform is under development for electronic reporting.

Figure 1. Weekly trend of Health Facility IDSR Reporting Coverage, Liberia, Epi week 1 – 26, 2017

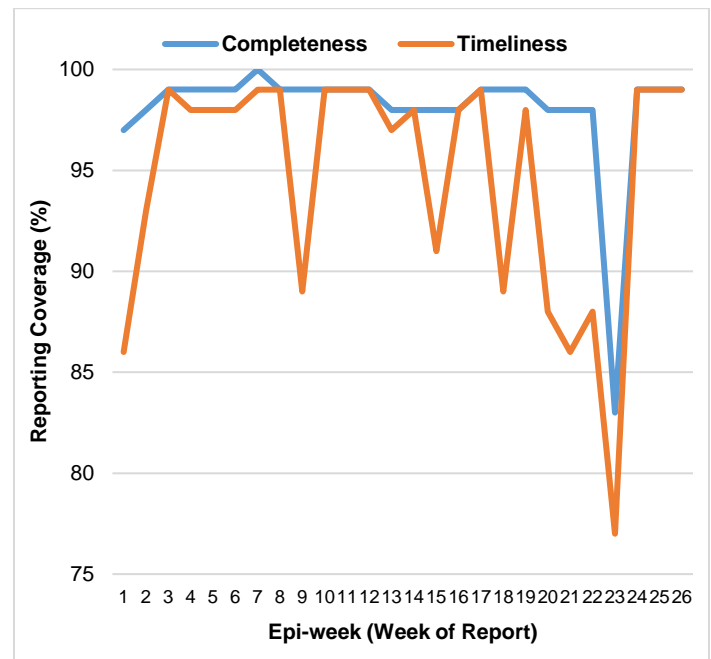


Figure 2. IDSR Reporting Coverage by County, Liberia, Epi week 1 – 26, 2017

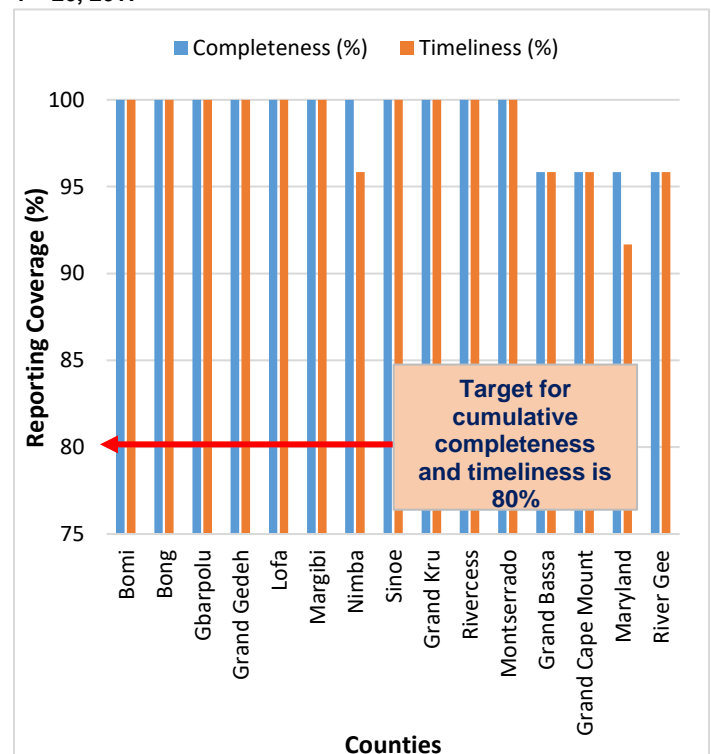


Figure 3. Weekly Health District IDSR Reporting Coverage, Liberia, Epi-week 1 – 26, 2017

County	Health district	Epidemiological Week																										Total Expected Reports	Total Sent	Total sent on time	Completeness (%)	Timeliness (%)			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26								
Bomi	Senjeh																											26	26	26	100	100			
	Klay																												26	26	26	100	100		
	Dewoin																												26	26	26	100	100		
	Suehn Mecca																												26	25	25	96	96		
Bong	PantaKpaai																												26	26	26	100	100		
	Sanoysa																												26	26	26	100	100		
	Fuamah																												26	25	25	96	96		
	Salala																													26	26	26	100	100	
	Kokoyah																													26	26	26	100	100	
	Suakoko																													26	26	26	100	100	
	Jorquelleh																													26	26	26	100	100	
Zota																													26	26	25	100	96		
Gbarpolu	Belle																												26	25	23	96	88		
	Bokomu																													26	26	26	100	100	
	Bopolu																													26	26	24	100	92	
	Gbarma																													26	26	24	100	92	
Grand Bassa	Kongba																													26	25	23	96	88	
	District # 1																													26	25	25	96	96	
	District # 2																														26	25	25	96	96
	District # 3 A&B																														26	25	25	96	96
Grand Cape Mount	District # 3C																													26	25	25	96	96	
	District # 4																														26	25	25	96	96
	Buchanan																														26	25	24	96	92
	Owensgrove																														26	25	25	96	96
Grand Gedeh	Campwood																													26	25	25	96	96	
	Robersport																														26	25	25	96	96
	Garwula																														26	25	25	96	96
	Gola Konneh																														26	25	25	96	96
Lofa	Tewor																														26	25	25	96	96
	Porkpa																														26	25	25	96	96
	Bhai																														26	26	25	100	96
	Gbao																														26	26	25	100	96
Margibi	Cavalla																														26	26	25	100	96
	Tchien																														26	26	25	100	96
	Putu																														26	26	25	100	96
	Konobo																															26	26	25	100
Maryland	Voinjama																														26	26	26	100	100
	Zorzor																														26	26	26	100	100
	Foya																														26	26	26	100	100
	Salayea																														26	26	26	100	100
River Gee	Kolahun																														26	26	26	100	100
	Vahun																														26	26	26	100	100
	Mamba Kabah																														26	26	26	100	100
	Kakata																															26	25	24	96
Sinoe	Firestone																														26	25	17	96	65
	Gibi																														26	25	24	96	92
	Harper																														26	26	26	100	100
	Plebo																															26	22	21	85
Montserrado	Karlway #1																														26	21	19	81	73
	Karlway #2																														26	21	21	81	81
	Barrobo Whojah																														26	19	15	73	68
	Barrobo Farjah																															26	19	16	73
Grand Kru	Saclepa-Mah																														26	26	26	100	100
	Tapita																														26	26	26	100	100
	Yarwin M ehsonnoh																														26	26	26	100	100
	Zoe-Geh																														26	26	26	100	100
Bong	Gbhlay-Geh																														26	26	26	100	100
	Sanniquelle-M ah																														26	26	26	100	100
	Gbeapo																														26	26	26	100	100
	Potupo																														26	26	26	100	100
Rivercess	Sarbo																														26	26	26	100	100
	Webbo																														26	26	26	100	100
	Greenville																														26	25	25	96	96
	B utaw																														26	25	25	96	96
Montserrado	Tarsue																														26	25	25	96	96
	Gblonee																														26	25	25	96	96
	Tarjuwon																														26	26	26	100	100
	Pyne																															26	25	25	96
Montserrado	Jedapo																														26	26	26	100	100
	Jaadae																														26	26	26	100	100
	Dugbe River																														26	25	25	96	96
	Kpanyan																															26	26	25	100
Montserrado	Barclayville																																		

B. IDSR Health Facility Supervision

Supervisory visits to health facilities were conducted in each county by the DSOs. All high priority facilities, which include hospitals and health centers, were visited at least once a week to conduct supportive supervision and mentorship of the health facility staff. Those considered medium priority were visited bi-weekly and the low priority facilities were supervised at least once a month. The priority level of health facilities are determined by a combination of factors such as patient load, accessibility, availability of human and other resources.

During each supervisory visit, a health facility supervision checklist was administered by the DSO to assess eight components of the surveillance system. These components included data collection tools, analysis and reporting, supervision and feedback, epidemic preparedness and response, safe and dignified burial, administration, community event-based surveillance, and investigation and confirmation of cases.

Analysis of the findings from the supervisory reports for January to May 2017 showed that availability of data collection tools is the highest performing component of the surveillance system. Over 90% of the health facilities reportedly had all data collection instruments such as weekly IDSR ledger, monthly HMIS reporting forms, and the IDSR case alert and lab submission forms.

The second best performing component was analysis and reporting. About 90% of the health facilities were found to have regularly submitted weekly IDSR reports and on time. These reports included reports of zero cases from the health facilities. Additionally, the display of IDSR data of immediately reportable diseases on notice boards' was found consistently in over 85% of health facilities supervised monthly.

The lowest performing component accounting for a cumulative score of close to 60% was investigation and confirmation of cases. Majority of health facilities supervised consistently reported challenges associated with pick-up of specimens and the timely receipt of laboratory results (Figure 5).

Figure 4. National staff along with DSO and WHO field officer conducting supportive supervision in Margibi County, Liberia, 2017



Figure 5. Cumulative Performance of Key IDSR Components, Health Facility Supervisory Visits, Liberia, January – June 2017

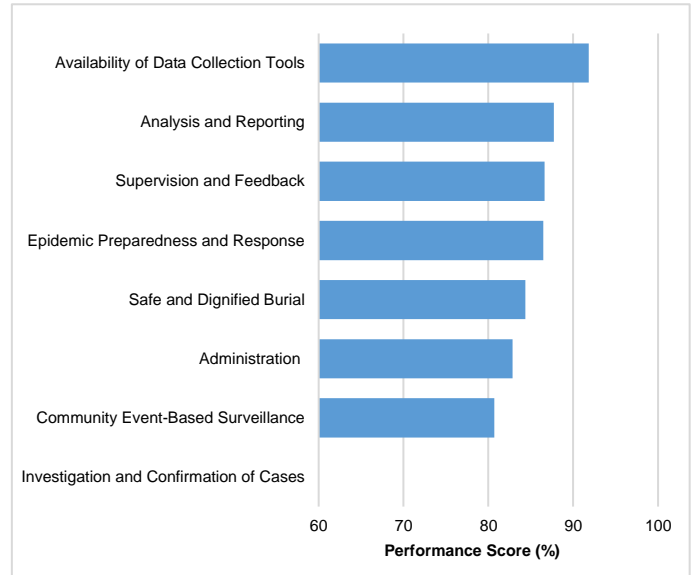


Figure 5a. IDSR Health Facility Supervisory Report on Data Collection Tools, Liberia, January – June 2017

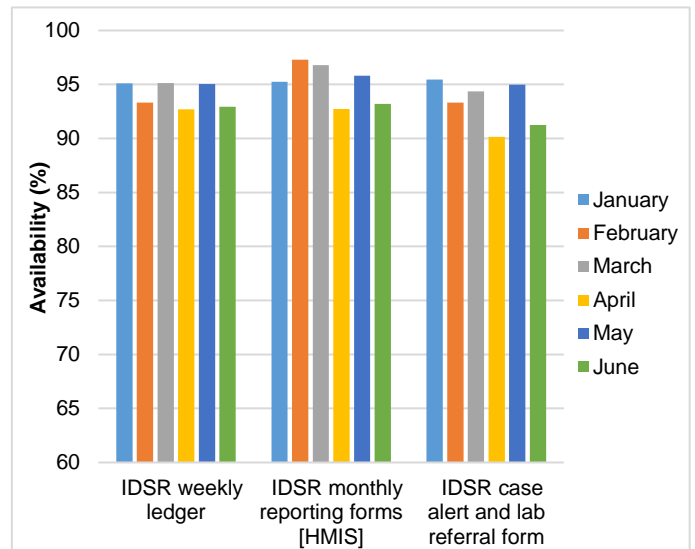


Figure 5b. IDSR Health Facility Supervisory Report on Analysis and Reporting, Liberia, January – June 2017

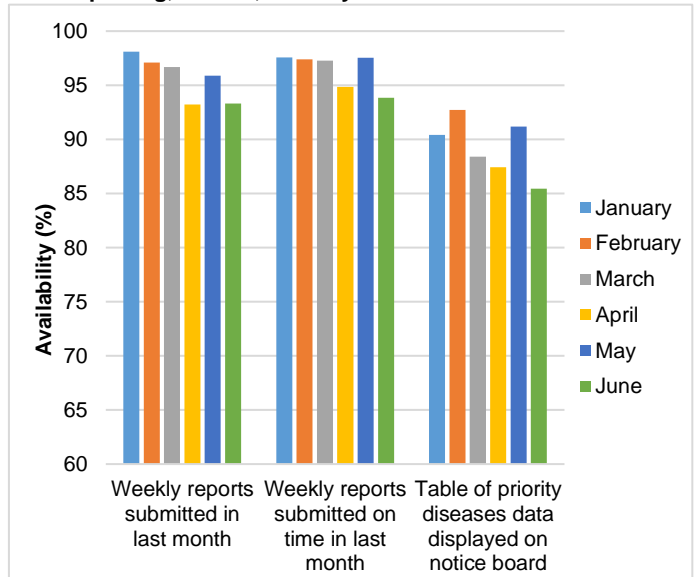


Figure 5c. IDSR Health Facility Supervisory Report on Supervision and Feedback, Liberia, January – June 2017

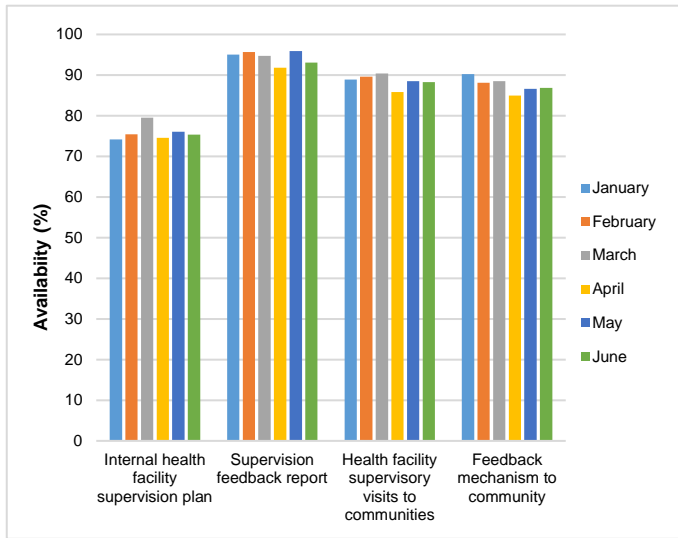


Figure 5d. IDSR Health Facility Supervisory Report on Epidemic Preparedness and Response, Liberia, January – June 2017

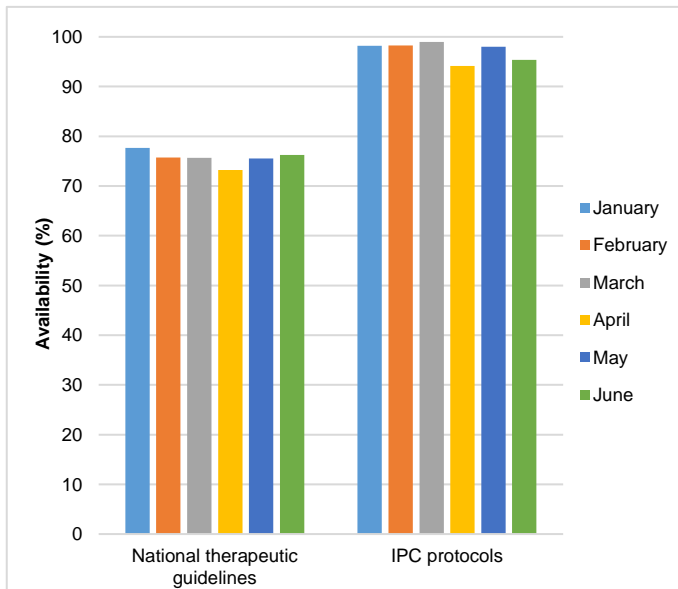


Figure 5e. IDSR Health Facility Supervisory Report on Safe and Dignified Burial, Liberia, January – June 2017

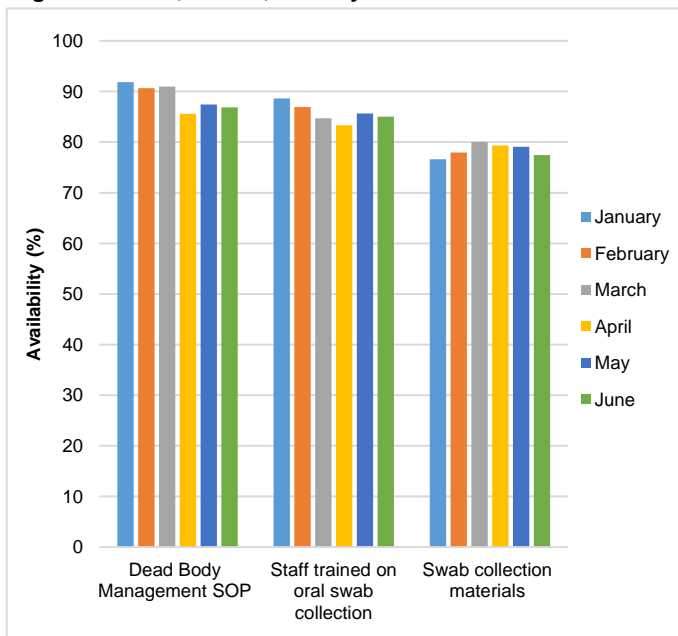


Figure 5f. IDSR Health Facility Supervisory Report on Administration, Liberia, January – June 2017

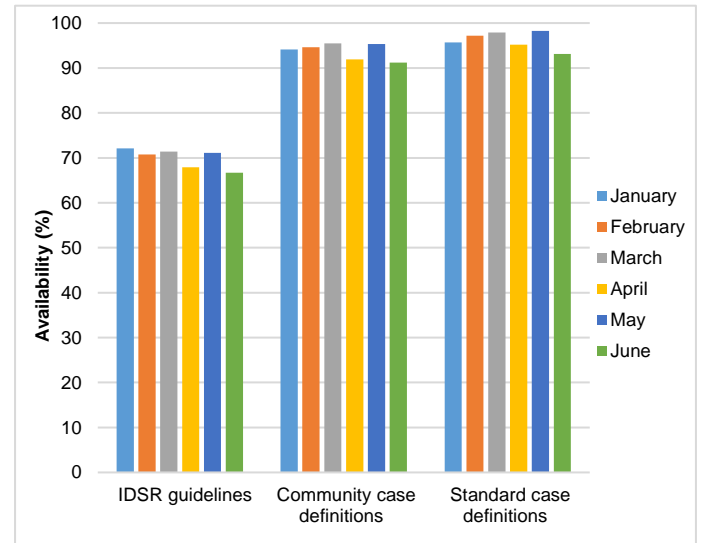


Figure 5g. IDSR Health Facility Supervisory Report on Community Event-Based Surveillance, Liberia, January – June 2017

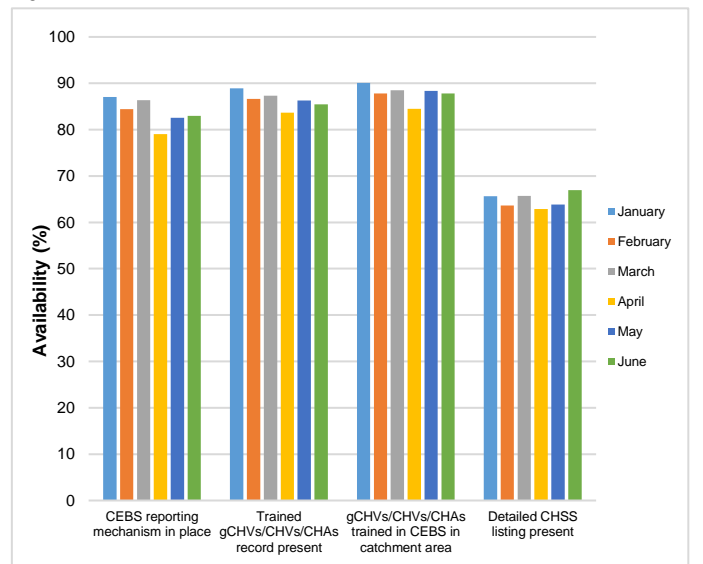
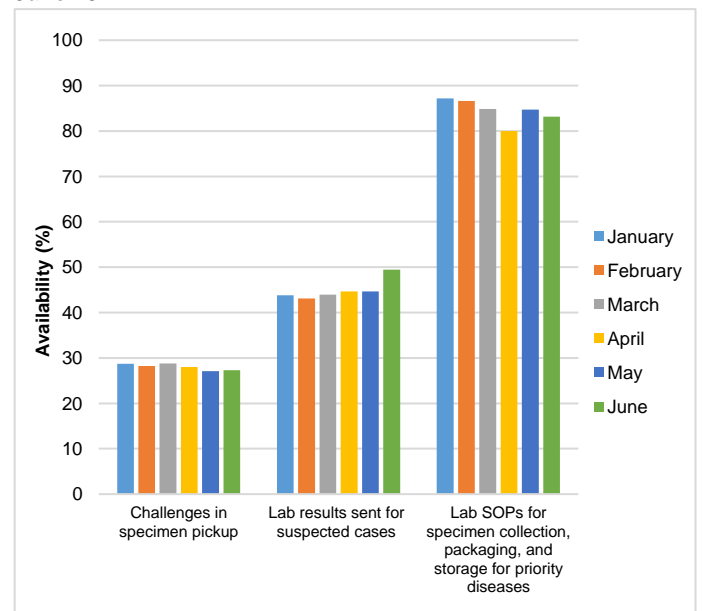


Figure 5h. IDSR Health Facility Supervisory Report on Investigation and Confirmation of Cases, Liberia, January – June 2017



II. Trend of suspected cases of Selected IDSR Immediately Reportable Diseases, Conditions and Events

IDSR operates on the early warning principles to detect outbreaks early through reporting of all suspected cases. A total of 2,996 suspected cases of IDSR immediately reportable diseases, conditions and events were reported in the first semester of 2017 compared to 26,693 in the same semester of 2016 (Figure 6). Ebola virus disease (EVD) alerts constituted 92% of the total suspected cases reported in 1st semester of 2016 but only 8% in 2017 (Figure 6a). In 2017, the highest number of suspected cases reported was for measles followed by cases of animal bites.

Excluding EVD alerts there were more suspected cases reported in 1st semester of 2017 compared to 1st semester of 2016 (Figure 6b,c,d,e,f,g,h). This may be due to training of health workers in case definition of IDSR immediately reportable diseases and also transitioning the focus from EVD response to integrated disease surveillance.

Figure 6. Comparison of suspected cases of selected IDSR immediately reportable diseases, conditions, and events in Liberia, Semester I, 2016 & 2017

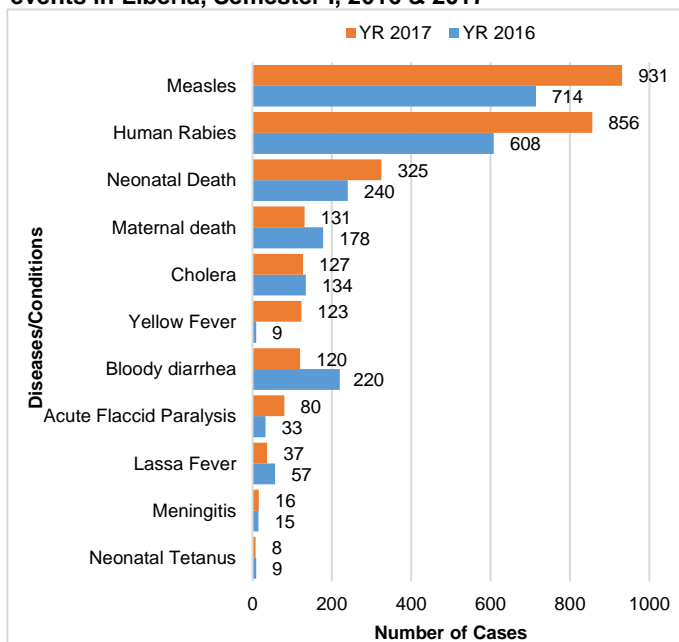


Figure 6a. Cumulative number of alerts of Ebola Virus Disease in Liberia, Semester I, 2016 & 2017

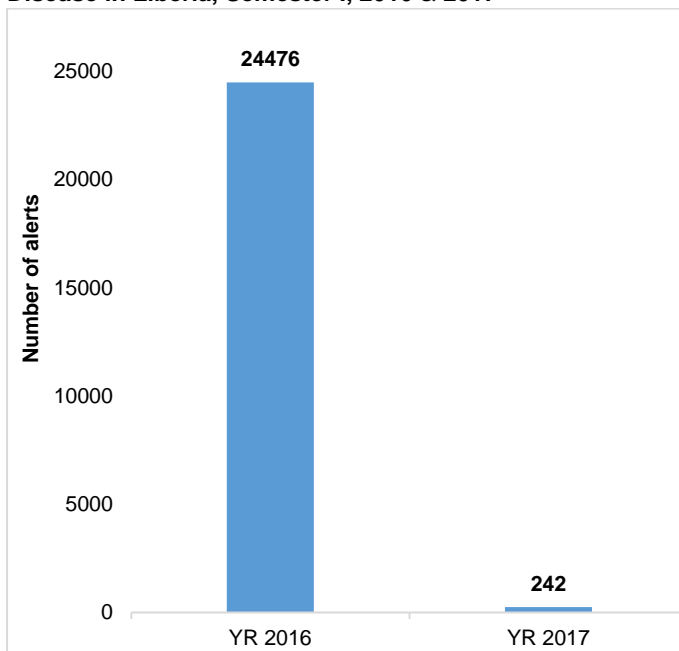


Figure 6b. Weekly trend of alerts of Ebola Virus Disease, Liberia, Epi week 1 – 26, 2016 & 2017

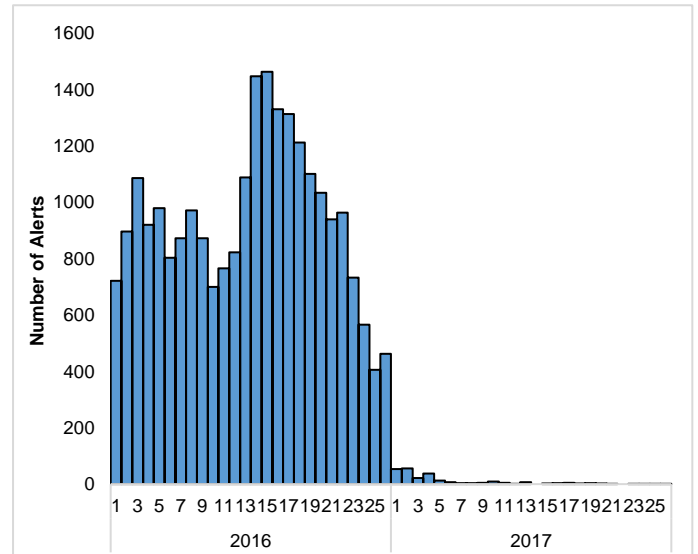


Figure 6c. Weekly trend of cases of Acute Flaccid Paralysis, Liberia, Epi week 1 – 26, 2016 & 2017

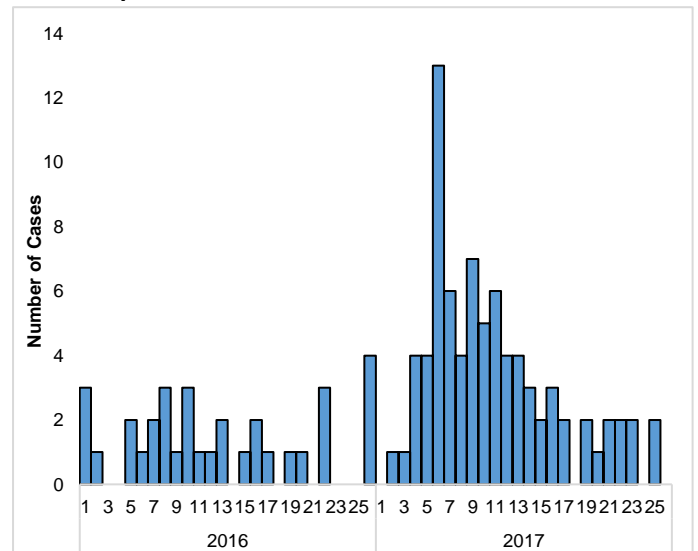


Figure 6d. Weekly trend of suspected cases of Measles, Liberia, Epi week 1 – 26, 2016 & 2017

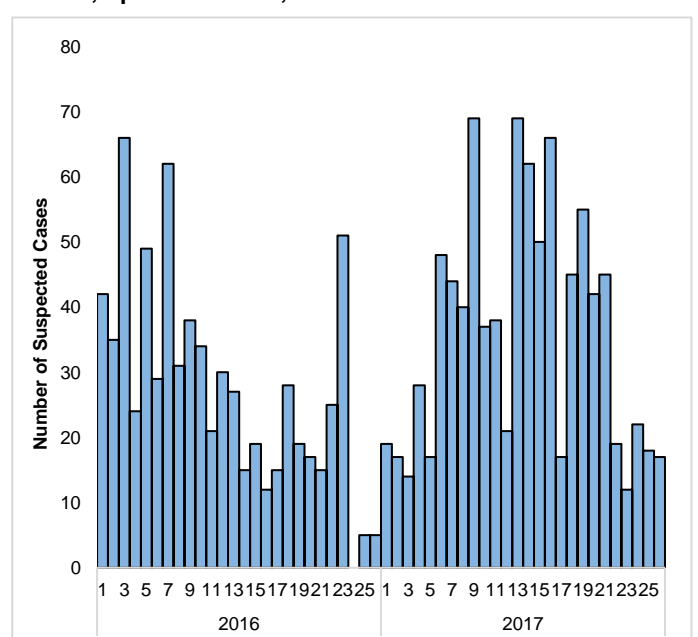


Figure 6e. Weekly trend of suspected cases of Lassa Fever, Liberia, Epi week 1 – 26, 2016 & 2017

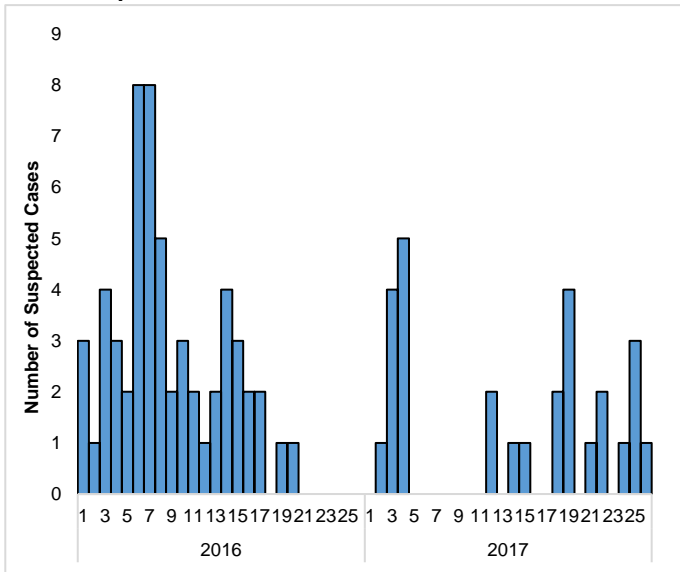


Figure 6h. Weekly trend of suspected cases of Acute Bloody diarrhea, Liberia, Epi week 1 – 26, 2016 & 2017

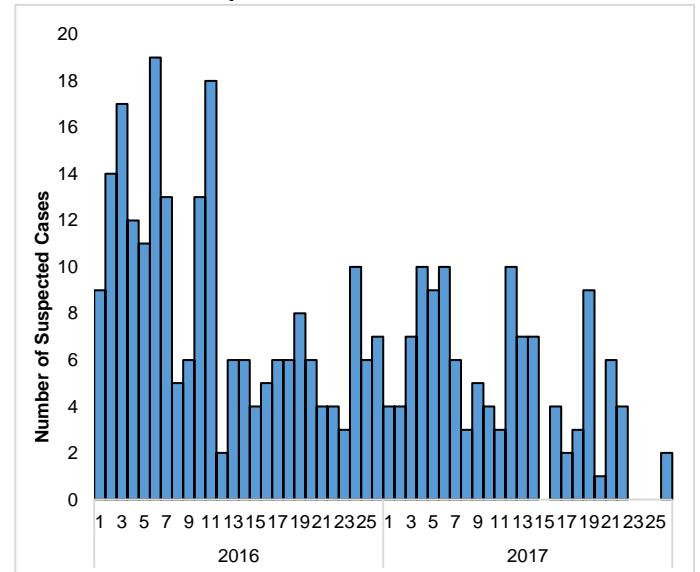


Figure 6f. Weekly trend of Maternal Deaths, Liberia, Epi week 1 – 26, 2016 & 2017

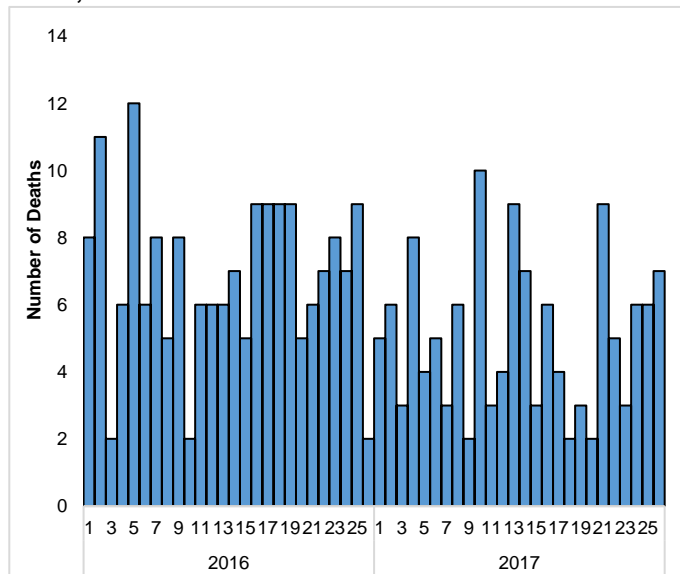


Figure 6i. Weekly trend of suspected cases of Yellow Fever, Liberia, Epi week 1 – 26, 2016 & 2017

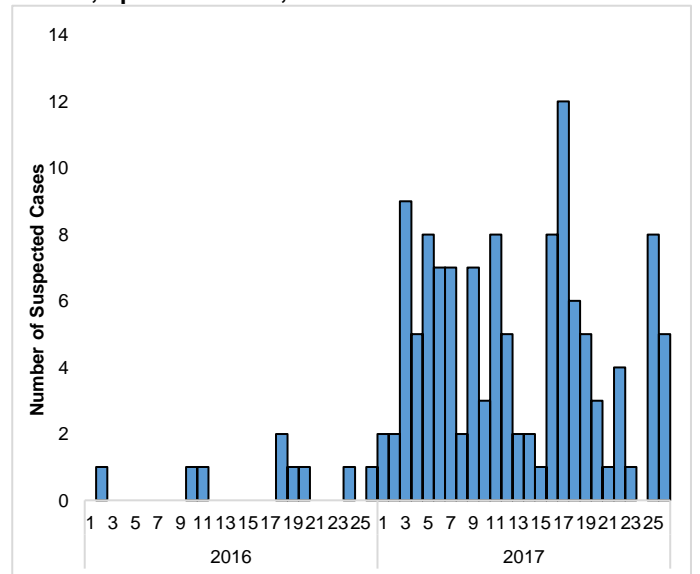


Figure 6g. Weekly trend of cases of Animal Bites, Liberia, Epi week 1 – 26, 2016 & 2017

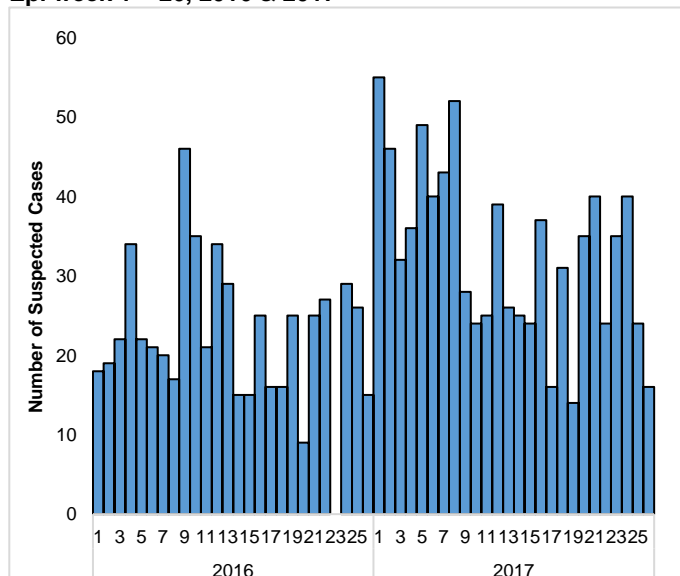
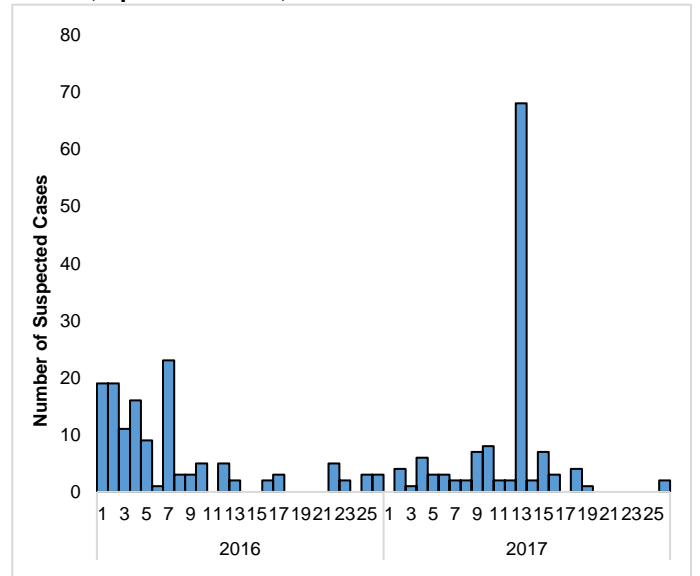


Figure 6j. Weekly trend of suspected cases of Cholera, Liberia, Epi week 1 – 26, 2016 & 2017



¹The x-axis for each of graphs reflect only odd numbers of the Epi week.

III. Disease Outbreaks and Health Emergencies

A total of 20 outbreaks were recorded during the first semester of 2017. Nine out of 15 counties reported disease outbreaks during the semester with the most frequent being Measles and Pertussis. Although each outbreak has been limited to few cases and deaths, the relative recurring frequency of outbreaks of some immediately reportable diseases and conditions is worth kept attention.

All outbreaks were managed at the county level except the outbreak of meningococcal septicemia in Sinoe County required additional support from the national level and international partners.

The average time for initiating investigation and response to outbreaks at the county level was two days with a range of less than 24 hours to 10 days (Table 1).

Outbreak investigation reports were submitted to the national level for 18 (90%) of the outbreaks. This is a marked improvement compared to the first semester of 2016 when only 53% of expected outbreak investigation reports were submitted to the national level. The lack of investigation reports for two of the outbreaks may have been attributed to delay in confirmation of these outbreaks.

After action review has been concluded for only one outbreak, meningococcal septicemia.

Table 1. Frequency of disease outbreaks reported in Liberia, January – June 2017

Diseases/ Events	Outbreak Freq.	Investigation Reports	Duration between HF notification & initial response		
			≤ 2 days	3 - 7 days	> 7 days
Measles	5	3	4	0	1
Pertussis	5	5	2	3	0
Lassa fever	3	3	2	1	0
Unexplained cluster of illness & death	2	2	2	0	0
Chickenpox	1	1	1	0	0
Cholera	1	1	1	0	0
Meningococcal septicemia	1	1	1	0	0
Scabies	1	1	0	0	1
Unexplained cluster (Epizootic)	1	1	1	0	0
Total	20	18	14	4	2

Figure 7. Rapid Response Team preparing to investigate a suspected outbreak of Yellow fever, Grand Kru, January 2017



A. Lassa Fever

Event Description

Lassa fever is endemic in Liberia with outbreaks reported annually. From January to June 2017, 37 suspected cases with 17 deaths have been reported from seven counties. Outbreaks have been confirmed in four counties namely, Montserrado, Nimba, Bong, and Grand Bassa counties. Of the 37-suspected

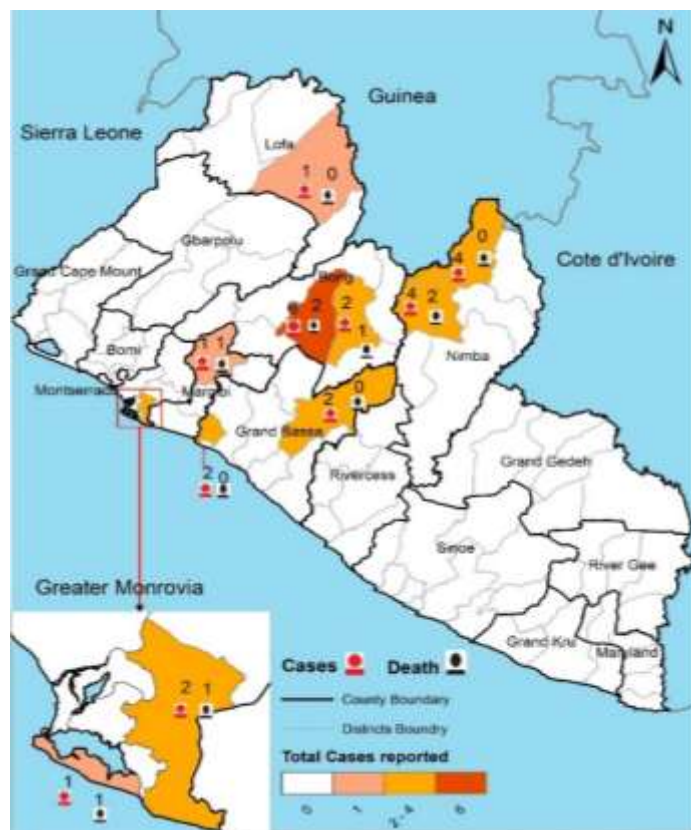
cases, seven have been confirmed by PCR and ELISA-antigen tests, 11 discarded due to negative PCR test, 15 pending PCR test, and four are suspected cases without samples received by the laboratory (Figure 8 & 9). The case fatality rate among confirmed cases is 57% (4 deaths).

Excluding the discarded cases, there were 15 (68%) males and 7 (32%) females among the cases confirmed and pending epidemiological classification. The average age among these cases is 27 years with a range of 11 months to 62 years. Only one case was less than 5 years.

Montserrado and Nimba Counties

The first confirmed case reported during the semester was a 67-year-old male who travelled from Ganta, Nimba County and presented at a hospital in Central Monrovia, Montserrado County, on 6 January 2017. Post-mortem laboratory results of the case was released as ELISA antigen positive on 15 January 2017. One week later, two other cases, a male and female aged 15 years respectively, from Nimba County developed symptoms and were confirmed. One of the two cases was from the same health district of the first case but no epidemiological link was established. Excluding the first case which was reported by Montserrado county, a total of 8 suspected cases, three of which have been confirmed, were reported from Nimba County. The case fatality rate among confirmed cases from Nimba County is 67% (2 deaths).

Figure 8. Geographical distribution of cases of Lassa fever confirmed, suspected and pending epidemiological classification, Liberia, January – June 2017



Bong County

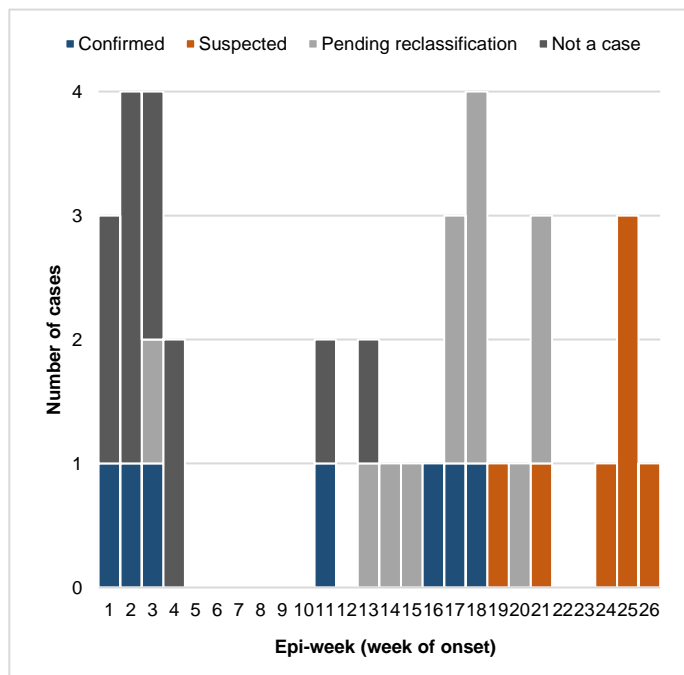
Bong county in central Liberia and bordering Nimba county has reported 10 suspected cases with five deaths. Two cases have so far been confirmed by PCR and ELISA – antigen tests, two were discarded due to negative PCR tests, four cases pending PCR test, and samples were not received by the Laboratory for two suspected cases. Case fatality rate among confirmed cases is 50%. All of the cases in Bong county have been reported from

Suakoko (8 with 1 confirmed) and Jorquelleh (2 with 1 confirmed) health districts.

Grand Bassa County

Grand Bassa county reported four suspected cases with no deaths during the semester, of which one has been confirmed by ELISA – antigen and three are pending PCR testing. The cases reported are from Owensgrove district (2 with 0 confirmed) and District #3 (2 with 1 confirmed).

Figure 9. Number of cases of Lassa fever by Epi-classification, Liberia, Epi-week 1 – 26, 2017



ii. Public Health Response

An investigation team involving Montserrado County Health Team and WHO field team was deployed immediately to conduct initial investigation upon receiving notification of the first case from the Hospital in Central Monrovia. Post-mortem cardiac fluid was collected to confirm the case through laboratory testing. Case investigation led to tracing and monitoring of 40 contacts of the case for 21 days. None of the contacts developed symptoms. Safe and dignified burial of the case was carried out. The Health Team in Nimba County, the county of residence of the case was notified to conduct active case search and contact tracing.

In Bong county, an isolation unit for suspected Lassa fever cases is established at Phebe Hospital in Suakoko district. All suspected cases were isolated and case management initiated with the administration of ribavirin and other supportive therapy. Five cases recovered and were discharged. Active case search and contact tracing were carried out for each report of a suspected Lassa fever case and community sensitization (Figure 10). Training of health workers in identification of cases of Lassa fever using the standard IDSR case definition have been ongoing.

In Nimba county, there are two isolation units established – Saclepea Comprehensive Health Center and Kpein Clinic. Enhanced surveillance in Nimba and Grand Bassa Counties led to the detection of suspected cases of Lassa fever and subsequent confirmation of some of the cases. Like the other counties, case management was initiated for each case followed

by active case search and contact tracing. Community sensitization has also been ongoing.

Figure 10. Community sensitization meetings on Lassa fever in Bong County, Liberia, June 2017



iii. Situation Analysis

Lassa fever is endemic in Liberia. In 2016, 69 suspected cases with 27 deaths were reported from 7 counties. Fourteen were confirmed by PCR and ELISA-antigen test with a case fatality rate of 35.7% among confirmed cases. Bong, Nimba, Lofa, Margibi, and Grand Bassa counties have been identified as constituting the Lassa belt due to yearly incidence of cases. Montserrado county has reported confirmed cases annually. However, cases reported from Montserrado over the past two years have been introduced from other parts of the country, particularly from those counties identified as constituting the Lassa belt.

It is important to note that concerted efforts have been made in recent years to strengthen active surveillance for Lassa fever through training of health workers in IDSR. Of note, no health facility or health worker infection has been recorded in the past two years, likely due to improvements in infection prevention and control practices as a result of numerous training after the Ebola outbreak in Liberia.

However, the relative high incidence and case fatality rate associated with Lassa fever in Liberia suggests the need for more actions aimed at sensitization, early detection and initiation of case management in order to reduce fatality. A national preparedness plan is needed for ensuring maintenance of essential stocks for case management, training of health workers in case detection and management, engagement of communities, and vector control of rodents, particular the mastomys rats, which is a known vector for the Lassa virus.

B. Pertussis

i. Event Description

One hundred eighty-seven suspected cases have been recorded from five separate outbreaks of pertussis reported from Grand Gedeh and Grand Bassa Counties. A total of 118 cases (63.1%) fell within the age group of five years and below and the above five-year age group constituted the remaining 69 cases (36.9%). Male to female ratio was 1.03:1. Vaccination status of the cases were as follows: Unvaccinated 89.9% (168 cases), fully vaccinated 1.6% (3 cases), partially vaccinated 1.1% (2 cases), and unknown 7.0% (13 cases) (Figure 12).

The national level was notified of the first outbreak on 11 January 2017 by the Grand Gedeh County Health Team. The outbreak involved 115 cases with zero deaths from five communities (Geewon, Zean, Pannewon, Zeagbeh and Chayee Towns) in Gbao district. Seventy-three cases were five years old and below and 42 cases were above five years of age. A total of 59 cases were female and 56 cases were male. All cases were reportedly not previously vaccinated. The attack rate was 56.3 per 1000 population.

On 22 January 2017 Grand Bassa County Health Team notified the national level of an outbreak of Pertussis. The index case was a 9-year old female from Bah Town, Owensgrove district who presented at Bokay Town clinic on 19 January 2017 and was diagnosed of pertussis. A rapid investigation conducted by the district team the next day led to the identification of 27 additional cases in Bah Town. In total, 28 cases were identified. None of the cases in the town were reported to have been previously vaccinated for pertussis. The town has a population of 69 persons. The attack rate in the town was 40 per 100 population.

Another outbreak unrelated to the first was reported to the national level by Grand Bassa County Health Team on 31 January 2017. The outbreak involved a total of 9 cases from Gueh Town, District #4. All of the cases in Gueh Town were reportedly not previously vaccinated. The town has a population of 246. The attack rate was 3.7 per 100 population.

The third outbreak in Grand Bassa County was reported from Garjay community, District #3C. The first case was a 19-year old male with symptom onset on 7 March 2017 who presented at the Desoe Town clinic on 17 March 2017 and was diagnosed of with pertussis. A rapid investigation conducted by the district team the next day in Garjay community led to the identification of 24 additional cases. In total, 25 cases were identified and reported. The national level was notified on 20 March 2017. A total of 20 cases (80%) were reportedly not previously vaccinated for pertussis. The community has a population of 250. The attack rate was 10 per 100 population.

The fourth outbreak was reported on 20 May 2017 to the National level by Grand Bassa County Health Team. The outbreak involved 10 cases from Buegbo Town, District #4. All cases had unknown vaccination status. The town has a population of 501. The attack rate was 2 per 100 population.

Figure 11. Distribution of outbreak cases of pertussis, Grand Gedeh and Grand Bassa Counties, Liberia, January – June 2017

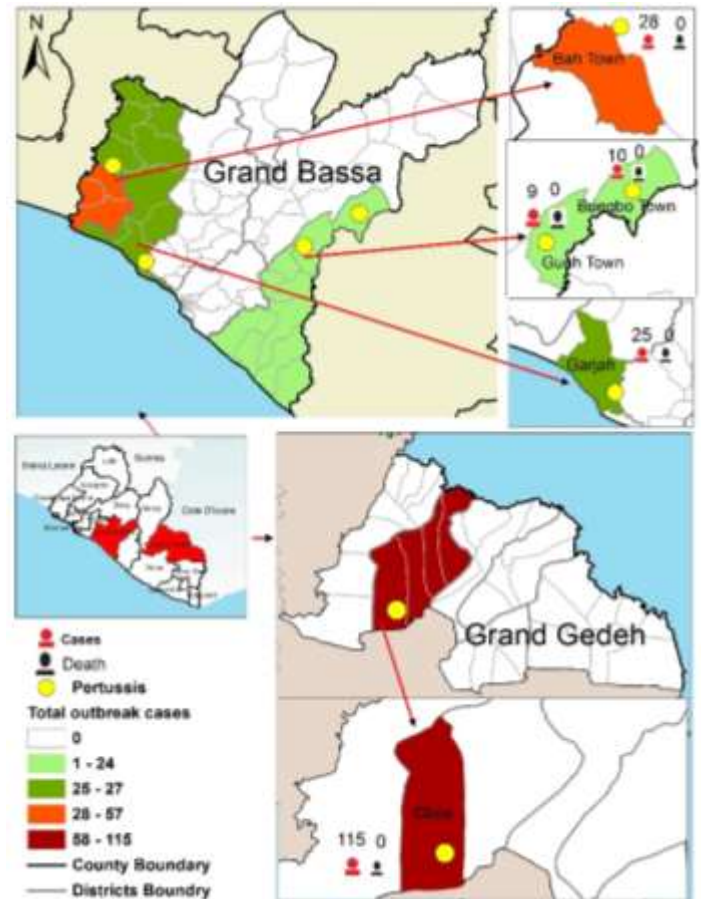
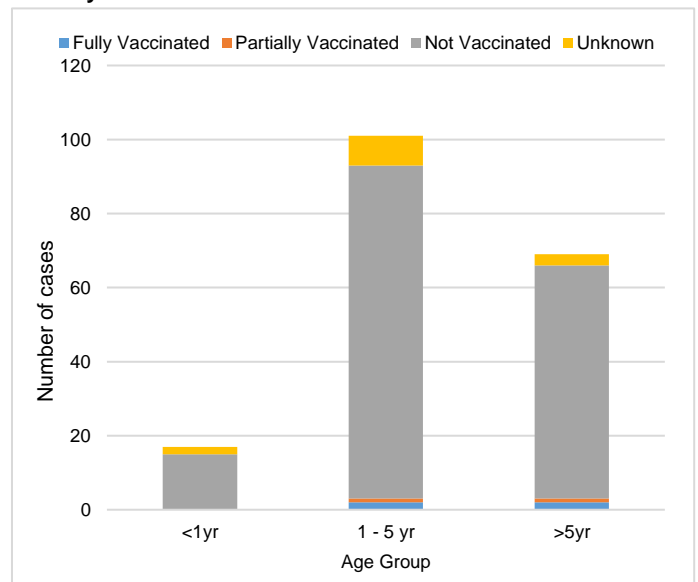


Figure 12. Distribution of pertussis outbreak cases by vaccination status and age group, Grand Bassa County, Liberia, January – June 2017



ii. Public Health Response

On 14 January 2017, a district response team was dispatched to the affected communities in Gbao district, Grand Gedeh to investigate and respond to the outbreak. A total of 115 cases were identified and line listed. All cases were treated and vaccination services were provided to 40 children less than one year old. Engagement with community residents was also conducted, during which sensitization on prevention and reporting of cases was emphasized.

On 20 January 2017, an initial investigation was conducted in Bah Town, Grand Bassa County by the district response team during which 27 cases were identified and line listed (Figure 13 & 14). A two-day response mission involving the County Health Team and partners was conducted from 26 – 27 January 2017 in Bah Town during which mass treatment was initiated for all cases with the administration of erythromycin and other supportive therapy. Nine healthy children under 1 year old were also vaccinated.

A two-day integrated response mission was conducted in Gueh Town and surrounding communities from 3 – 4 February 2017. During the mission, all cases were treated. Forty-five people were treated for malaria. Additionally, thirty-eight pregnant women were provided ante-natal care services. Twenty-one children received a dose of pentavalent vaccine.

On 18 March 2017, an initial investigation was conducted in Garjay community by the district rapid response team during which 24 cases were identified and line listed. On 22 March 2017, an integrated response mission was conducted in the area during which all cases were treated. Sixteen cases of malaria were diagnosed and anti-malaria treatment was administered. There were also 19 people treated for acute respiratory infection.

From 20 – 21 May 2017, the district response team visited Buegbo Town and line listed 10 cases. All cases were treated. Additionally, 56 children were treated for other illnesses including malaria and acute respiratory infections.

Figure 13. Response Team conducts immunization session in Bah Town, Grand Bassa County, Liberia, January 2017



Figure 14. Integrating Response with administration of tetanus toxoid vaccines to women in Gueh Town, Grand Bassa County, Liberia, February 2017



iii. Situation Analysis

Pertussis, a vaccine-preventable disease, is potentially a life-threatening childhood illness. Liberia's routine immunization program offers pentavalent vaccines which provides immunity

against pertussis and four other disease for all children below 1 year. The national immunization schedule requires 3 doses to be administered to infants at weeks 6, 10, and 14. Pertussis is also one of Liberia's priority diseases and all health facilities are required to report monthly summary of cases to the national level through DHIS2. However, outbreaks of pertussis requires instant notification to the national level. In 2016, pertussis was the most frequent outbreak with a record 15 outbreaks reported from 9 counties.

Although efforts have been made to improve routine immunization coverage since the Ebola outbreak was declared over, there are still challenges especially in hard-to-reach areas. The average coverage for penta 3 vaccination from 2008 to the 1st quarter in 2017 is 75% according to Liberia's routine immunization statistics in DHIS2. Coverage below the average were noted in hard-to-reach areas. Immunization coverage in hard-to-reach terrains tend to be very low in most parts of the country. All affected towns are more than 5km away from the nearest health facility, thus posing impediment to access services. Logistical constraints and limited skilled and motivated human resources also affected implementation of outreach activities.

There is a need to continue to expand access to immunization services through financial and logistical support for intensification of outreach services. Engaging communities to improve health-seeking behavior and utilize available services provided routinely at health facilities must be mainstreamed into any plan seeking to prevent recurring outbreaks of pertussis.

C. Meningococcal disease

i. Event Description

On 25 April 2017, Sinoe County Health Team (SCHT) notified NPHIL and MoH of a cluster of 14 cases with 8 deaths of unknown etiology in Greenville City (Figure 15). The event started on 23 April 2017 when the index case, an 11-year old female, presented to FJ Grante hospital with signs and symptoms of diarrhoea, vomiting and mental confusion and died within one hour of admission. The following day (24 April 2017), the second case-patient, a 51 year old woman from Teah town, Greenville developed sudden onset of vomiting, abdominal pain and confusion. She was admitted to FJ Grante hospital on 25 April 2017 and died the same day. On 25 April 2017, a cluster of 13 case-patients from 5 communities in Greenville [Teah town - 6 cases, Congo town – 3 cases, Red hill - 2, Down town - 1, and Johnstone street - 1] developed similar acute onset illness. Seven of the 13 case-patients died the same day. From 23 – 30 April 2017, a total of 27 cases with 10 deaths were reported from Sinoe County. All cases reportedly attended funeral events (wake, burial, reposs) on 21 - 22 April 2017 in Greenville, Sinoe County.

Montserrado County reported a total of two cases with two deaths from 27 - 30 April 2017 related to the events in Sinoe County. One of the two cases, a 26-year old lady, thought to be the first secondary case, developed symptoms on 29 April and died a few hours later. This case did not directly participate in the funeral events, but reportedly attended to one of the cases from Sinoe.

Additionally, two cases with one death linked to the event in Sinoe were reported from Grand Bassa County from 4 – 7 May 2017. One of the two cases, a 40-year-old man, became ill on 1 May 2017, manifesting high fever, headache, cough, vomiting,

mental confusion, diarrhoea, abdominal pain, and profuse sweating. He was admitted on 7 May 2017. This case did not directly participate in the funeral events, but reportedly shared food with a person who attended the funeral.

In total, 31 cases with 13 deaths (case fatality rate of 41.9%) were reported from three counties from 23 April – 7 May 2017. No new cases and deaths related to the event were reported after 7 May 2017. Majority of the cases reportedly attended funeral events (wake, burial, reposs) on 21 - 22 April 2017 in Greenville, Sinoe County. However, there were two secondary cases, one from Grand Bassa and one from Montserrado who did not participate in the funeral events. A total of 14 cases were males and 17 were females. The affected age group range from 10 to 62 years with a median age of 15.

A total of 56 biological specimens (17 whole blood, 8 blood serum, 5 cardiac fluid, 9 oral swabs, 5 urine, 7 blood culture, 3 cerebrospinal fluid, 1 rectal swab, 1 stool) were collected from 26 patients for hematology, chemistry and microbiology analysis. *Neisseria meningitidis* serogroup C was confirmed by PCR in samples from 13 cases. Based on laboratory, pathological, and epidemiological investigations, it was concluded that the outbreak was due to meningococcal septicemia caused by *Neisseria meningitidis* serogroup C. On 16 May 2017, the outbreak was declared over by the National Public Health Institute of Liberia.

Figure 15. Distribution of outbreak cases of Meningococcal septicemia, Liberia, 25 April – 17 May 2017



ii. Public Health Response

The national and county epidemic preparedness and response committees were activated within 24 hours to coordinate response to the event.

A multi-disciplinary national rapid response team involving NPHIL, LFETP, WHO, and CDC was deployed to Sinoe County to conduct detailed outbreak investigation and support response

activities. WHO deployed an international pathologist to support with post-mortem investigation along with a team of experienced Epidemiologists. CDC-Atlanta deployed a team of experts to support laboratory investigation.

As part of active case search and contact tracing, a total of 110 funeral attendees from 6 counties (Sinoe, Montserrado, Maryland, Grand Gedeh, Grand Kru and Grand Bassa) and 207 contacts of cases in Sinoe (150), Montserrado (40) and Grand Bassa (17) were identified and followed-up on a daily basis for 15 days. None of these people became ill.

Case management of all patients in Sinoe County was done at the F.J. Grante Hospital. Two isolation facilities [Redemption Hospital (9 beds) and ELWA Hospital (4 beds)] with a total capacity of 13 beds were prepared for response in Montserrado county. All contacts of the cases, attendees of the funeral, and 87 health workers at-risk in Sinoe and Grand Bassa Counties received prophylactic treatment.

Infection prevention and control interventions were reinforced including hand hygiene practices, water points testing and safe burials.

County level advocacy meetings and community engagement were conducted in Sinoe County involving county authorities and residents to allay fear and panic. Mass public awareness and information dissemination was also conducted in affected counties. UNICEF supported 320 community volunteers in Sinoe County to conduct social mobilization activities.

iii. Situation Analysis

Meningococcal disease is an infection caused by the bacterium *Neisseria meningitidis*. There are 12 serogroups of *N. meningitidis* that have been identified, six of which (A, B, C, W, X and Y) can cause epidemics. This bacterium can cause serious and sometimes fatal diseases including meningitis (infection of the brain lining) and meningococcal septicemia (infection of the blood). The most common symptoms are a stiff neck, high fever, sensitivity to light, confusion, headaches and vomiting. A person with meningococcal septicemia may not have a headache, stiff neck, or neck pain. Septicemia infections almost always result in a rash. It is the most specific and most noticeable symptom of meningococcal septicemia, primarily because it does not fade under pressure.

The bacteria are transmitted from person-to-person through respiratory droplets or throat secretions from carriers. Close and prolonged contact – such as kissing, sneezing or coughing on someone, or living in close quarters (such as a dormitory) sharing eating or drinking utensils with an infected person a carrier – facilitates the spread of the disease. The bacteria can be carried in the throat and sometimes can overwhelm the body's defenses allowing infection to spread through the bloodstream to the brain. The average incubation period is four days, but ranges between two and ten days.

Meningococcal septicemia is rare and this is the first recorded outbreak in Liberia. The rare nature of the disease coupled with atypical presentation may have been a source of confusion in the clinical diagnosis of the event. It is also important to note that majority of the cases may have been exposed to the bacteria at the funeral events. A case control study showed that the odds of becoming a case was 22 times higher among those who

attended the wake compared to those who did not attend the wake ($P < 0.05$). Further analyses showed association with food served at the wake including tea, bread, and egg nog. The strongest association was with tea, with an Odds Ratio of 11.2 ($P < 0.05$). There was no significant association observed with other potential exposures.

The swift response of the county and national levels as well as partners to the event is commendable. The need to continue to educate health workers and build capacity for detection and response to future incidence must be given priority.

D. Cholera

i. Event Description

On 27 March 2017, Nimba County Health Team notified the national level about an outbreak of cholera in Gbor Clan, Tappita district, Nimba County (Figure 16). The first case, a 16-year old female presented at Diallah clinic on 25 March 2017 with symptoms of vomiting, diarrhea, and dehydration. From 26 – 29 March 2017, five other cases presented at the health facility with similar symptoms. In total, 6 cases with 2 deaths were reported. The case fatality rate is 33%. *Vibrio cholerae* was isolated from one of the two stool samples collected and tested at the regional laboratory at the Jackson F. Doe Regional Referral Hospital in Nimba County. All cases were residents of two communities in the Gbor clan. The attack rate in the area is 2 per 1,000 population. Five of the cases were females and one was male. Age range of the cases was from 10 – 24 years. The last case was treated and discharged on 31 March 2017. The cases were reportedly attending cultural rites in one of the communities in Gbor Clan and drank water from a nearby water source, Nenlah creek, possibly contaminated. Open defecation was observed due to lack of latrine in the area. There was also no functional hand pump in the area.

ii. Public Health Response

A county-level rapid response team involving the county health team and partners was dispatched to the area on 27 March 2017 to conduct initial response activities. All cases were transferred to the isolation unit at Jackson F. Doe Regional Referral Hospital for clinical management. Stool samples were obtained from two cases for laboratory testing.

An outbreak line list was developed by the investigation team and active case search involving community health assistants was initiated.

Daily messages on cholera awareness and prevention were aired on two community radio stations in the local dialects. The district health team also embarked on mass awareness in public places through distribution of fliers and community engagement meetings in the affected areas.

A hand pump was rehabilitated at Diallah clinic by AFRICARE, a non-governmental organization. Red Cross distributed buckets with faucets to 100 households in the affected area.

Safe and dignified burial was conducted for the dead and psychosocial counselling provided to the bereaved families.

The county epidemic preparedness and response committee was activated to coordinate outbreak response activities. With support from WHO and partners, Nimba County cholera contingency plan was finalized on 5 April 2017.

iii. Situation Analysis

Cholera is a diarrheal disease caused by the bacteria *Vibrio cholerae* type O1 and type O139. The disease has a fecal-oral transmission and *V. cholerae* attacks specifically the lower intestines leading to diarrhea and dehydration. All the age groups can be affected by cholera. Usually, the source of cholera outbreaks are contaminated water sources, since *V. cholerae* can survive for a long time or indefinitely in water. However, contaminated food can also be source of cholera outbreaks.

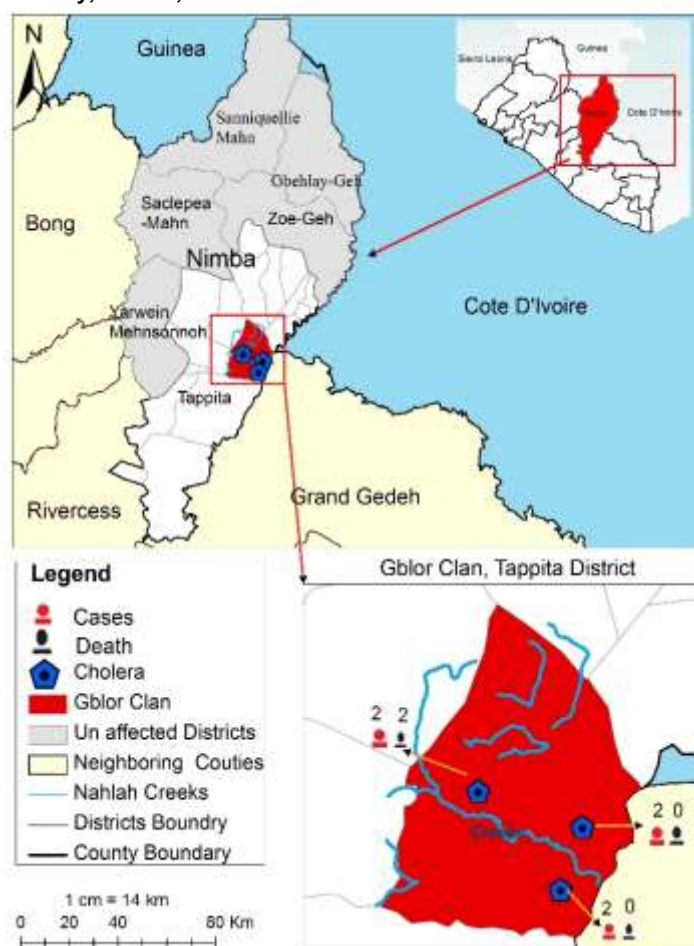
Prior to the outbreak in Nimba, the last confirmed outbreak of cholera in Liberia was in Epi-week 29, 2012 when Montserrado County reported 19 cases. The last reported outbreak of cholera in Nimba County was in 2008 involving 6 cases from 3 communities in Sanniquellie-Mah district.

This outbreak may have been driven by a number of factors including the mass gathering of community members who had assembled to attend cultural rites, the use of unsafe water from the Nenlah Creek for drinking, open defecation, and lack of functional hand pump in the area.

The swift response of the County Health Team and the effective coordination and collaboration among partners contributed to control of the outbreak.

Because of the high case fatality associated with cholera outbreaks, efforts should be directed at ensuring early detection and treatment of cases and availability of needed supplies including cholera kits for rapid deployment when outbreaks are suspected or confirmed.

Figure 16. Distribution of Cholera Outbreak Cases in Nimba County, Liberia, March 2017



IV. Other Diseases of Public Health Importance

A. Malaria

A total of 603,959 confirmed cases (RDT positive and microscopy positive) with 457 deaths have been recorded from January to June 2017. The case fatality rate is 0.08%. This is a 4% decrease in the number of confirmed malaria cases reported compared to the same period in 2016 when a total of 629,090 cases with 658 deaths were recorded (Figure 17). The number of deaths also decreased by 30.5% (Figure 18). The cumulative national incidence rate of malaria per 100,000 population from January – June 2017 is 13,807. Bomi County accounts for the highest incidence rate of 23,612 per 100,000 population while Grand Bassa County has the lowest incidence rate of 2,815 per 100,000 population (Table 2). On the overall, 11 out of 15 counties show slight decrease in incidence rate compare to the same period in 2016.

Figure 17. Comparison of confirmed malaria cases reported by county, Liberia, January - June 2016 & 2017²

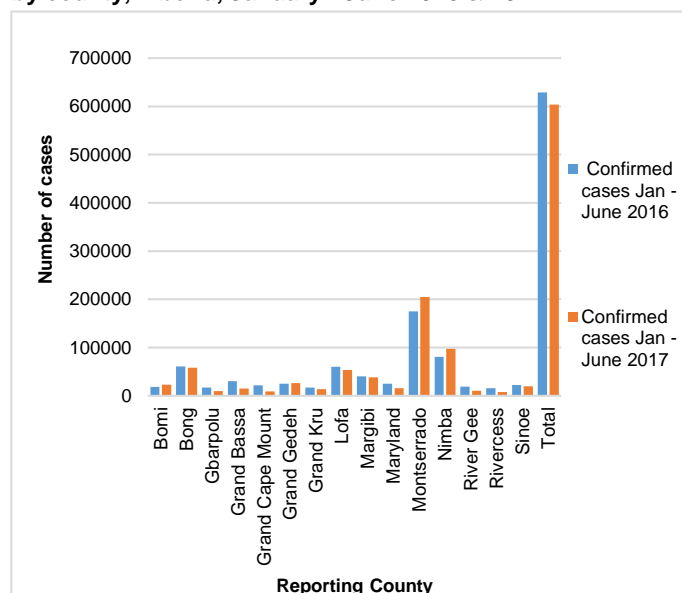


Figure 18. Comparison of deaths due to malaria reported by County, Liberia, January - June 2016 & 2017

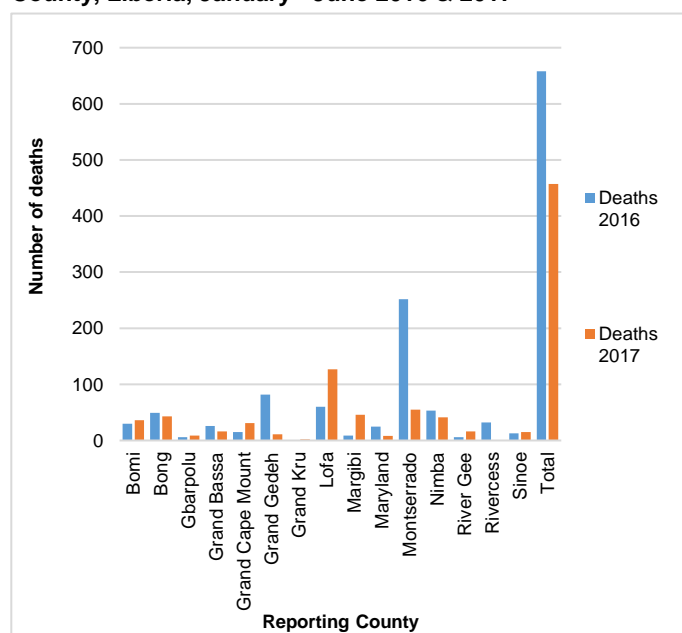


Table 2: Malaria Incidence rate per 100,000 population by county, Liberia, January – June 2017

County	Cumulative Cases	Cumulative Deaths	% of total cases	% of total death	Cumulative Incidence rate per 100,000 population	Trend of incidence in 2017 compare to 2016
Bomi	23,087	36	3.8	7.9	23612	↓
Bong	58,047	43	9.6	9.4	14437	↑
Gbarpolu	9,949	9	1.6	2.0	10059	↑
Grand Bassa	14,857	16	2.5	3.5	2815	↑
Grand Cape Mount	9,338	31	1.5	6.8	6111	↑
Grand Gedeh	26,348	11	4.4	2.4	17311	↓
Grand Kru	13,660	2	2.3	0.4	19563	↑
Lofa	53,633	127	8.9	27.8	14956	↑
Margibi	38,431	46	6.4	10.1	15184	↑
Maryland	15,842	8	2.6	1.8	9832	↑
Montserrado	205,179	55	34.0	12.0	16473	↓
Nimba	97,254	41	16.1	9.0	17232	↓
River Gee	10,773	16	1.8	3.5	11574	↑
Rivercess	8,021	1	1.3	0.2	10070	↑
Siноe	19,540	15	3.2	3.3	16631	↑
Total	603,959	457	100.0	100.0	13807	↑

↑ Increase ↓ Decrease

The National Malaria Control Program (NMCP) has scaled up interventions since 2008 through two major grants (USAID-President's malaria Initiative and the Global Funds to fight AIDS, TB and Malaria (GFATM)). These interventions include the social marketing of Malaria diagnosis and treatment in accredited medicine stores and private pharmacies, the implementation of testing and treatment in hard to reach communities for children under five years of age through the integrated Community Case Management strategy, the distribution of long lasting insecticide treated nets through nationwide routine and mass distribution among others. These interventions began yielding desired results as shown by the consistent downward trend of the national malaria prevalence and rising increase in other key indicators (NMCP-MIS 2005, 2009 & 2011). However, these gains were interrupted during the Ebola Virus Disease outbreak. The decrease in the incidence of malaria in 2017 compared to the same period in 2016 is worth noting. Of particular significance is the decrease in the number of deaths however, these deaths need to be verified. Also, there are quality issues with the HMIS data especially at the source level. Data verification conducted by the NMCP documented a couple of quality issues. These issues include partial recording of health facilities routine records as a result of inadequate data collection tools, recording and entry errors at both health facility and county levels, weak supply chain of malaria drugs and supplies among others. The number of health facilities reporting through the HMIS continues to fluctuate. Of note, new health facilities' are emerging especially in the private sector. These new facilities impact on the reporting system is numerically insignificant given the outstanding of monthly reports from older private health facilities which continue to weigh the reporting system down. Montserrado county, which leads the emergence of new health facilities is challenged regularly with delinquent monthly reports from many private health facilities. These issues need to be resolved in order to clearly determine the actual malaria disease burden.

The National Health Management Information System is finalizing the roll-out of newly standardized national tools for routine data collection and reporting. This activity which is preceded by complete training is expected to impact the quality of data at a considerable degree when operationalized.

² Data source: National Malaria Control Program, Ministry of Health

V. Laboratory and Public Health Diagnostics

A. Overview

Public Health Laboratory testing in Liberia occurs at three major laboratories across the country including: National Reference laboratory (NRL), Phebe hospital laboratory and Jackson F Doe hospital laboratory. These laboratories provide diagnostic services aimed at supporting the control of immediately reportable diseases as well as aiding surveillance and research. Additional testing occurs at selected sites as indicated in Table 3.

Table 3. Public health diagnostic capacity for laboratories in Liberia, January – June 2017³

Laboratory	Testing capacity	Testing method
National Reference Laboratory (NRL)	Acute Bloody Diarrhea	Culture & DST
	Hemorrhagic fever (EVD)	RT-PCR; GeneXpert
	Lassa Fever	RDT, PCR
	Measles/rubella	Serology (ELISA)
	Meningitis	Culture & DST; RT-PCR
	Severe Acute Watery Diarrhea	Culture & DST
	Yellow fever	Serology (ELISA)
Jackson F Doe hospital	Acute Bloody Diarrhea	Culture & DST
	Hemorrhagic fever (EVD)	RT-PCR, GeneXpert
	Meningitis	Culture & DST
	Severe Acute Watery Diarrhea	Culture & DST
Phebe hospital	Hemorrhagic fever (EVD)	RT-PCR; GeneXpert
Redemption hospital	Hemorrhagic fever (EVD)	GeneXpert
ELWA III ⁴	Hemorrhagic fever (EVD)	GeneXpert
Veterinary	Rabies screening	Immuno-fluorescent microscopy

Nine of the fourteen IDSR immediately reportable diseases and conditions require laboratory diagnosis for confirmation. As indicated in Table 4, seven⁵ of the nine diseases are tested in country. AFP and Rabies specimens are referred for international testing. Lassa fever specimens are referred for international confirmatory testing, as are Measles and Yellow fever specimens for external quality control. Additional capacity for Rabies testing is available at the Ministry of Agriculture veterinary laboratory.

Liberia has established arrangements with international accredited laboratories to provide additional testing capacity that is not available in-country, for immediately reportable diseases.

Table 4. Laboratory Testing Capacity for IDSR Implementation in Liberia, January – June 2017

In-Country diagnostic capacity	Referral for international testing
1. Acute Bloody Diarrhea	1. Acute Flaccid Paralysis 2. Lassa fever - confirmatory testing 3. Rabies
2. Hemorrhagic fever (EVD)	
3. Lassa Fever	
4. Measles/rubella	
5. Meningitis	
6. Rabies (screening) ⁵	
7. Severe Acute Watery Diarrhea Yellow fever	

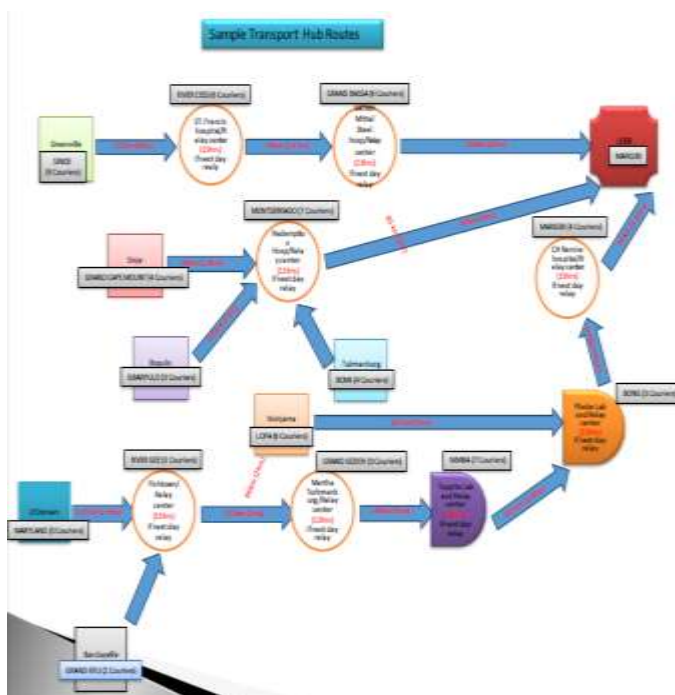
B. Specimen Transport Pathway

Specimen transportation within the country is conducted by Riders for Health (Riders). Riders has 60 couriers covering 302 pick-up sites in all 15 counties. Using a linked pathway (Figure 19) specimens from pick-up sites are delivered to the respective testing laboratories. County Health Teams (CHTs) and partners

support transportation of specimens from remaining peripheral facilities to the pick-up sites for onward transportation by Riders.

Transportation of specimens for international testing is conducted through international courier agencies including DHL, World courier, among others.

Figure 19. IDSR Sample Transportation Hub in Liberia, January – June 2017



C. Specimen Turn-around Time

During the semester, a total of 1837 samples were collected across all 15 counties for laboratory testing for 8 of the 9 immediately reportable diseases requiring laboratory confirmation, including: EVD, Meningitis, SAWD, ABD, Measles/Rubella, Yellow fever, Lassa fever, and Acute Flaccid Paralysis (Polio).

Overall, 36% and 65% of alerts received laboratory testing (results) within four days and seven days of alert notification, respectively (Figure 20).

Eighty-two percent (82%) of all the specimens collected from alerts reached the respective laboratories within 72 hours from the time of specimen collection (Figure 21). A proportion of specimens from some counties in the southeast, namely; Grand Gedeh and River Gee, took longer to reach the testing laboratories mainly due to longer distance to the testing laboratories as well as very challenging road conditions.

Nine percent and 41% of specimens received at the laboratories were tested within 24 hours and 72 hours of receipt, respectively (Figure 22). AFP testing as well as Lassa fever confirmation are conducted at international laboratories hence the long testing turn-around-time. During the semester, there was batching of yellow fever and measles specimens, hence the prolonged turn-around-time. Bacteriology (ABD, SAWD & Meningitis) testing normally takes 2-5 days to yield results, hence the prolonged turn-around-time.

³ There are eight other laboratories with capacity for EVD diagnosis using GeneXpert and serve as back up for surge capacity in case it is ever needed

⁴ ELWA III laboratory was a mobile laboratory established to support enhanced EVD testing during heightened EVD surveillance in Liberia. It was closed on 31st March 2017

⁵ The Rabies testing capacity available at the Ministry of Agriculture is for screening purposes, therefore, specimens have to be referred to international laboratories for diagnosis.

Figure 20. Overall turn-around-time for laboratory confirmation of IDSR alerts by County, Liberia, January – June 2017⁶

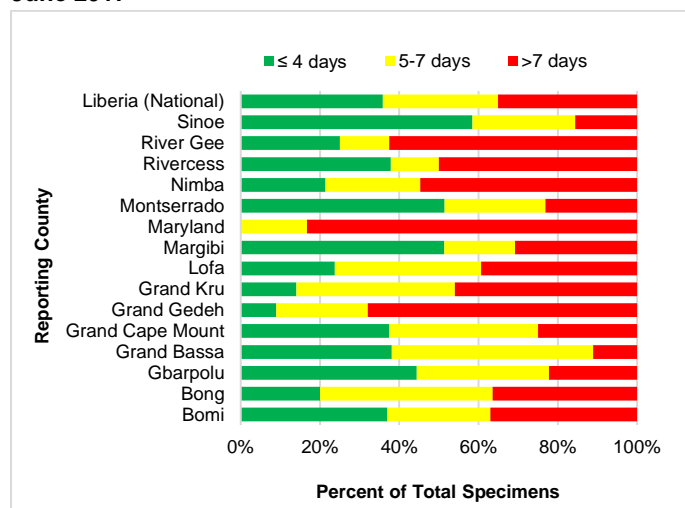


Figure 21. Turn-around-time of specimen delivery to laboratories from the time of collection, by County, Liberia, January – June 2017⁶

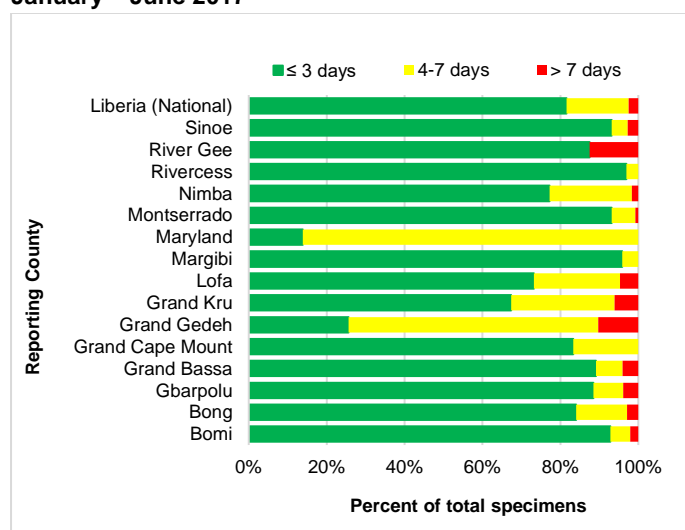
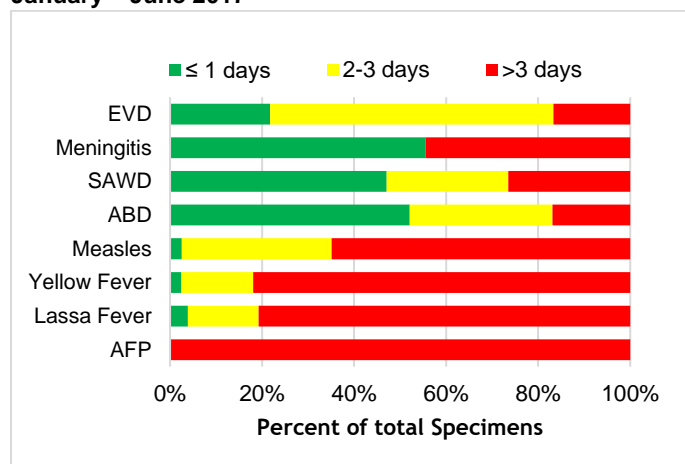


Figure 22. Turn-around-time of specimen testing from the time of reception at the laboratory by specimen type, Liberia, January – June 2017⁶



D. Situational context

The 2014 – 2016 Ebola epidemics in Liberia highlighted the weakness of the country's healthcare system and exposed the

limitations of the diagnostic capacity. In addition, the large scale epidemic affected down the basic diagnostic capacity that existed prior.

As part of the response to the epidemic as well as healthcare system strengthening post epidemic, efforts were and continue to be made to improve laboratory capacity in Liberia. With donor and partner support, interventions including procurement of essential equipment, reagents and consumables; human resource expansion and development through personnel recruitment and training; deployment of new robust and rapid diagnostic platforms, as well as deployment of international human resources to support capacity development, have been implemented, at both clinical and public health laboratories.

These interventions have facilitated restoration and expansion of previously existing diagnostic capacity, as well as improved coordination of specimen referral, thereby improving the overall efficiency of the laboratory system. This has supported timely epidemic confirmation and contributed to improved efficiency of the disease surveillance system.

Great progress has been made especially with public health diagnostic capacity, however, there are gaps that still need to be addressed to further improve the efficiency of the system, especially with respect to human resource development to create a resource that can maximally utilize, maintain and manage the robust technologies developed to-date, and efficiently manage the system under establishment.

With over 70% of personnel in clinical laboratories being of low cadre (46% laboratory aides⁷ and 25% laboratory assistants⁸) clinical diagnostic capacity development needs more efforts to ensure capacity to conduct, monitor and sustain essential basic clinical diagnostics, in addition to malaria, HIV and TB diagnostics, to support adequate patient management.

In addition, the poor road network in remote areas negatively impacts on timely specimen referral for testing, especially during the rainy season.

More efforts to address gaps in laboratory management, quality, supply chain and human resource capacity will greatly aid in further development and improvement in efficiency of the laboratory system in Liberia.

⁶ All laboratory data is still undergoing data cleaning and harmonization. Analysis results may shift over time as a result.

⁷ A laboratory aid in Liberia is one who learns specific laboratory tasks on-job, without formal laboratory training, with or without a high school certificate.

⁸ A laboratory assistant in Liberia undergoes basic formal laboratory training for a duration of approximately two months

Annex

List of Outbreaks Reported in Liberia, January – June 2017

No.	Disease/Condition	County	District	Communities	No. of cases	No. of deaths	CFR (%)	Date of initial case investigation	Date Reported to National Level	Status (Ongoing, Contained)
1	Lassa fever	Montserrado	Central Monrovia	Catholic community	1	1	100	13-Jan-17	15-Jan-17	Contained
2	Unexplained cluster of illness and death	Sinoe	Dugbe River	Nana Kru	3	3	100	11-Jan-17	11-Jan-17	Contained
3	Unexplained cluster (Epizootic)	Grand Bassa	District #1	Workden	8	7	87.5	14-Jan-17	15-Jan-17	Contained
4	Pertussis	Grand Gedeh	Gbao	Gboe	115	0	0	17-Jan-17	20-Jan-17	Contained
5	Pertussis	Grand Bassa	Owengrove	Bah's Town	28	0	0	22-Jan-17	22-Jan-17	Contained
6	Lassa fever	Nimba	Sanniquellie Mah, Saclepea Mah	Doumpa, Blagay Town	2	1	50	24-Jan-17	24-Jan-17	Contained
7	Chickenpox	Grand Gedeh	Cavalla	Tojillah	10	0	0	20-Jan-17	20-Jan-17	Contained
8	Pertussis	Grand Bassa	District #4	Gueh Town	9	0	0	26-Jan-17	31-Jan-17	Contained
9	Measles	Maryland	Barrobo Whojah District	Tugbaken community	8	0	0	28-Jan-17	30-Jan-17	Contained
10	Cholera	Nimba	Tappita	Diallah	6	2	33.3	27-Mar-17	27-Mar-17	Contained
11	Measles	Grand Bassa	Campwood	Garno town	7	0	0	1-Apr-17	3-Apr-17	Contained
12	Measles	Lofa	Foya	Karpee town, Kimbalo town	23	0	0	29-Mar-17	31-Mar-17	Contained
13	Measles	Montserrado	Commonwealth		10	0	0			Contained
14	Lassa fever	Bong	Jorquelleh	Iron Gate Community	1	1	100	21-Mar-17	27-Mar-17	Contained
15	Measles	Nimba	Tappita	Tappita City	68	0	0	17-Apr-17	27-Apr-17	Contained
16	Meningococcal disease	Sinoe, Montserrado, Grand Bassa	Greenville, Central Monrovia, Buchanan	Greenville (Teah Town, Congo Town, Down Town, Red Hill); Monrovia (Police Academy, Baptist Seminary); Buchanan (New Barrack, pearchuzohn)	31	13	41.9	25-Apr-17	25-Apr-17	Contained
17	Pertussis	Grand Bassa	District #4	Buegbo town	10	0	0	18-May-17	20-May-17	Contained
18	Unexplained cluster of illness and death	Grand Kru	Trehn health district	Behwan community	2	1	50	27-May-17	27-May-17	Contained
19	Scabies	Maryland	Barrobo Farjah	Rock town community	58	0	0	19-May-17	29-May-17	Contained
20	Pertussis	Grand Bassa	District #3C	Garjay community	10	0	0	17-Mar-17	20-Mar-17	Contained

National Public Health Institute of Liberia (NPHIL)

PURPOSE

In collaboration with the Ministry of Health, NPHIL strengthens existing infection prevention and control efforts, laboratories, surveillance, infectious disease control, public health capacity building, response to outbreaks, and monitoring of diseases with epidemic potential.

OUR MISSION

To prevent and control public health threats by promoting healthy outcomes and serving as a source of knowledge and expertise.

GOALS

- Contribute to the development and sustainability of the public health workforce
- Develop, enhance, and expand the surveillance and response platform
- Develop and strengthen the laboratory system and public health diagnostics
- Develop, enhance, and expand process and structures to protect environmental and occupation health
- Expand, conduct, and coordinate public health and medical research to inform Liberian public health policies
- Ensure sustainable financing and operations of the NPHIL

Writing Team

Trokon O. Yeabah, NPHIL
Lasee Colee, NPHIL
Albertha Corvah, NPHIL
Lafayette Hall, NPHIL
Himiede W. Wilson, NPHIL
Musand M. Kromah, NPHIL
Kwuakuan Yealue, WHO
Gertrude Jeh, WHO
Jeremy Sesay, WHO
George Sie Williams, WHO
Victoria K. Nyanzi, WHO
Suzanne Friesen, CDC

GIS

Mohammed Kromah, WHO

Editorial Team

Thomas K. Nagbe, NPHIL
Roseline George, NPHIL
Advertus N. Mianah, NPHIL
Trokon O. Yeabah, NPHIL
George Sie Williams, WHO
Victoria K. Nyanzi, WHO
Mulbah Reed, CDC
Emily Kainne Dokubo, CDC

Data Sources: The data were provided by County Surveillance Officers, WHO Field Offices, and Public Health Laboratories through weekly IDSR reports, outbreak situation reports, and laboratory results. The data on Malaria was obtained from the National Malaria Control Program of the Ministry of Health.

Contact:

Thomas K. Nagbe, Director
Division of Infectious Diseases and Epidemiology
National Public Health Institute of Liberia
tnknue31112@gmail.com / dpcepireport@gmail.com
+231 (0) 886937386 / 777442444

