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Public health emergency management capacity building in Guinea: 2014–2019

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Abstract

Before the Ebola virus disease (EVD) outbreak of 2014–2016, Guinea did not have an emergency management system in place. During the outbreak, Global Health Security Agenda (GHSA) 2014-2019 funds made it possible to rapidly improve the country's capacity to manage epidemics through the development of public health emergency operation centres (PHEOCs) at the national and district levels. Since the end of the response, the infrastructure, staff, and systems of these PHEOCs have been further reinforced and well-integrated in the daily activities of Guinea's National Agency for Health Security, the entity responsible for the management of epidemics. The development of PHEOCs as emergency management tools for epidemics in Guinea would not have been possible without a strong endorsement within the Ministry of Health. Guinea's PHEOC network is well-positioned to serve as a model of excellence for other Ministries in Guinea and Ministries of Health of other countries of West Africa.

Keywords

emergency management; EOC; emergency operation centre; West Africa Ebola response; capacity building; GHSA; Global Health Security Agenda; Guinea; Ebola virus disease; incident management system

1 Introduction

The 2014–2016 Ebola virus disease (EVD) epidemic in West Africa started and finished in Guinea (Borchert et al., 2014; World Health Organization, 2015, 2017a, 2017b; République de Guinée, 2015, 2016a; Dixon and Schafer, 2014). Before the end of 2014, the United States (US) Congress appropriated $603 million to the US Centers for Disease Control and Prevention (CDC) for international response activities, and $597 million for global health security capacity building in 17 priority countries, including Guinea, one of the three countries most heavily affected by the EVD epidemic (République de Guinée, 2016a). CDC used these funds to reinforce countries' capacity in four main areas: workforce development, laboratory, epidemiology, and emergency management.

In Guinea, the 2014 Congressional funding made it possible for the CDC to provide over 300 deployments of personnel, establish a CDC country office, and fund implementing partners through Global Health Security Agenda (GHSA) Cooperative Agreements (CoAgs) to support the country's efforts in the above-mentioned four technical areas (Standley et al., 2020).

The area of public health emergency management (PHEM) is an area of attention worldwide because of its potential to serve as a coordinating tool for increasingly complex emergencies involving a greater and more varied response workforce in an interconnected world (Daniel et al., 2017). Emergency management is the managerial function charged with creating the framework within which mitigation, preparedness, response, and recovery activities are performed to protect communities against disasters (FEMA, 2020). This paper describes the process by which Guinea developed its PHEM capacity between April 2014 and July 2019 through the establishment of a national public health emergency operation centre (PHEOC) network. It highlights the contribution from CDC and its implementing partners under the five-year GHSA initiative.

1.1 Emergency management in Guinea prior to 2014

The importance of having a coordinating structure in place for emergencies had already been recognised in Guinea prior to 2014. In 1983, following a deadly earthquake in Koumbia District, an *ad hoc* committee was put in place to deal with the consequences of the disaster (United Nations, 2007; Republique de Guinee, 2016b). In 1992, the United Nations (UN) established an Interagency Permanent Committee (*Comité Permanent Interagence* – COPIA in French) at the Ministry of Territorial Administration and Decentralisation to serve as a coordination mechanism for humanitarian aid related to complex emergencies, including epidemics. In 1996, law L009 of the National Assembly attempted to give legitimacy to the committee. The committee did not have a formal Emergency Management (EM) structure and was never funded to a level that allowed functionality. COPIA's activities were suspended in 2014 at the beginning of the EVD epidemic. In 2007, a National Crisis Committee was created by a presidential decree within the Ministry of Health to oversee all public health-related emergencies (United Nations, 2007) but the committee was never funded or rendered operational.

1.2 Emergency management during the EVD epidemic

None of the previously created committees had the capacity or structure to manage the EVD epidemic. In April 2014, a month after confirmation of the first case of EVD in Guinea, President Alpha Conde appointed Dr. Sakoba Keita as Ebola coordinator. Following the WHO International Declaration of the EVD epidemic in August 2014, Dr. Sakoba was further appointed as head of the newly created National Coordination for the Fight Against Ebola (*Coordination Nationale de Lutte contre Ebola* – CNLEB in French). Dr.Sakoba, a medical doctor and epidemiologist who had proven his leadership and capacity to manage epidemics during previous cholera outbreaks and one of our co-authors, answered directly to the President.

Numerous partners recognised the gap in the country's PHEM capacity and attempted to provide assistance. For example, the Africa Governance Initiative deployed a technical assistant to strengthen the writing and implementation of key response strategies and protocols, and provided support for the writing of minutes for the daily coordination meetings held at the CNLEB. In addition, the United Nations Mission for Ebola Emergency Response (UNMEER) was put in place by the United Nations from September 2014 to July 2015 to coordinate the activities of the different UN agencies participating in the response (United Nations, 2015a). This included the coordination of transport of cargo by the World Food Program and of more than 11,000 aid workers by the UN Humanitarian Air Service (United Nations, 2007). The Office for the Coordination of Humanitarian Affairs also provided operational and technical support for contingency planning (United Nations, 2015b). The French government offered the assistance of a French military advisor to assist the CNLEB in the management of the response and funded emergency response teams called ERARE (at the regional level) and EPARE (at the district level).

Shortly after the creation of the CNLEB, the then CDC director, Tom Frieden, and the United Nations special envoy, David Nabarro, visited Guinea and proposed to put in place a PHEOC network using an incident management system (IMS) and unified command to help coordinate the response (Dahl et al., 2016). These were new and much needed concepts to Guinea. Using GHSA funds, CDC established CoAgs with George Washington University (the team later transitioned to Georgetown University, GU) and the International Organization for Migration (IOM), to support the development of the government's emergency management capacity. The Public Health Agency of Canada (PHAC) also made a strong contribution to the EM activities by deploying EM experts to Guinea to assist the CNLEB.

1.2.1 Infrastructure

1.2.1.1 National level: Shortly after Dr. Sakoba's designation as Ebola coordinator, President Conde provided a physical space for the CNLEB in a state-owned building. Funds from the CDC Foundation were used to renovate the space that included what would become the first Guinean national PHEOC. The infrastructure included a large meeting room that could accommodate the 70–80 partners attending the situation updates, which took place daily during the acute phase of the EVD response. The room had air conditioning, microphones, a projector, and internet that facilitated the sharing of information. In addition, two smaller conference rooms and about 30 offices were renovated with air conditioning. The offices were used by CNLEB staff and international partners participating in the response. The plumbing, electricity, and elevator of the building were repaired and bathrooms were installed.

1.2.1.2 District level: Following guidelines from the GHSA, plans for the development of Guinea's PHEM capacity included the establishment of a network of decentralised PHEOCs at the district level that would coordinate activities with the national EOC. In early 2015, with funding from the United States Agency for International Development Office of Foreign Disaster Assistance (USAID/OFDA), IOM renovated and equipped a PHEOC in 28 of the 38 districts of Guinea (see Figure 1), covering the districts most impacted by the

epidemic. The district PHEOCs were established within the existing Direction of District Health (*Direction Préfectorale de Santé* – DPS in French). Each office was renovated to ensure the PHEOC had electricity and internet, back-up power through generators and solar panels, and basic equipment such as tables, chairs, computers, a projector, and a printer. The renovated spaces were convenient meeting places for partners and epidemiological investigation teams during the epidemic. The co-location of the DPS with the district PHEOCs provided multiple benefits, as the upgrades for the DPS were much needed resources that also supported routine epidemiological surveillance work.

1.2.2 Staff training

1.2.2.1 National level—Even if the large meeting room of the CNLEB filled a crucial need in meeting space, the CNLEB did not have staff trained to manage a response in accordance to PHEM principles for hazard and risk assessment, planning, prevention and mitigation, incident management, resource management, communication operations, training, and evaluation (Rose et al., 2017). To rapidly fill the gap, French-speaking PHEM experts from PHAC were deployed to Guinea via the WHO's Global Outbreak Alert and Response Network (GOARN) to develop the national PHEOC system and mentor Guinean staff. Efforts were made to expose CNLEB staff to the different functions of a PHEOC and to the drafting of emergency management documents. This involvement helped the CNLEB staff develop an appreciation for the use of PHEM principles. Nevertheless, due to the urgent needs of the response, a formal training program could not be put in place at the time. Furthermore, some of the national staff was only temporarily assigned to the CNLEB for the epidemic. Therefore, by the end of the epidemic in 2016, the CNLEB lacked the capacity and staff to lead the future development of its PHEM capacity.

1.2.2.2 District level—At the district level, by early 2015, each DPS of the Ministry of Health had identified permanent staff that could be mobilised to fill the emergency management functions of communication, liaison, security, planning, logistics, operations, and finance and administration during an emergency. CDC, PHAC, and GU rapidly designed and administrated a needs assessment to identify the capacity and needs of the 38 district PHEOCs' staff.

The assessments, carried out throughout 2015, revealed a general absence of basic knowledge of PHEM principles. Under technical oversight from CDC and PHAC, with funding support from both CDC and OFDA, GU and IOM developed a foundational PHEM training curriculum for district PHEOC staff. In January 2016, IOM led the implementation of a training of trainers' workshop to develop a cadre of nine national experts that would be responsible for delivering the curriculum throughout the rest of the country. In February, the nine trainers piloted the training in the five districts of the Boke region. Five representatives from each Boke district and three from the regional level attended the training. The group of 28 included health directors, doctors in charge of prevention and control of diseases (*Médecins Chargés de Maladies* – MCM in French), hospital directors, pharmacists, and logisticians. Average knowledge of PHEM principles increased from 30.4% to 88.6% from the pre to the post-test. By the end of 2016, the curriculum was updated to include participants and trainers recommendations, and was used to train PHEOC staff of the

remaining six regions of the country. Overall, over 200 district and regional level health staff were trained, establishing a baseline of PHEM competencies at the sub-national level throughout Guinea.

1.2.3 Systems

1.2.3.1 National level—During the EVD epidemic, an initial organisational chart based on IMS functions was proposed by American and Canadian PHEM specialists. The chart was modified numerous times over the course of the two year-span of the outbreak to address the particularities of the Guinean context. With assistance from CDC and PHAC staff, distribution lists, a staff rhythm, situational reports, job action sheets, mission orders, and a draft of an Ebola response plan were developed. Electricity was sporadic, but a back-up battery system provided power to a projector, allowing meetings to proceed. Nevertheless, the CNLEB PHEOC lack of reliable internet and network connectivity hampered the consolidation and sharing of documents kept on individual computers.

1.2.3.2 District level—While the CNLEB PHEOC developed foundational systems and documents at the national level, these were still inexistent at the district level. Nevertheless, the district PHEOCs were provided with a contact list, and having internet and electricity, even without additional systems and documents, was new and helped coordination efforts.

1.3 Emergency management post-Ebola

1.3.1 Legislative and policy support for EM—In June 2016, with financial support from the United Nations Development Program (UNDP), the COPIA committee was reinstated. Although efforts were made to formalise COPIA's role through a conventional agreement between the United Nations and the Guinean government, as of August 2019, it had yet to be operationalised (Republique de Guinee, 2016b).

Meanwhile, the CNLEB and its PHEOCs had established themselves as coordinating structures at the national and district levels. As the response drew to an end, efforts were made by the Ministry of Health, the CNLEB, and their partners to capture the lessons learned, ensure the sustainability of the PHEOC structures, and capitalise on the learning and systems that had been developed.

In July 2016, the National Agency for Health Security (*Agence National de Sécurité Sanitaire* – ANSS in French), developed in the image of the CNLEB, was created through a Presidential decree under the authority of the Minister of Health as a permanent structure for the management of epidemics for all priority diseases (Dixon and Schafer, 2014). The new agency was given substantial financial and programmatic autonomy and had access to sufficient funds and expertise to develop Guinea's PHEM capacity. The ANSS benefited from CDC's support through:

- CDC subject matter experts deploying to the country
- in-country CDC's implementing partners with some expertise in PHEM and funded through GHSA

- a strong relationship with PHAC EM experts who continued to support the country after the end of the EVD epidemic.

The ANSS also benefited from remaining EVD response funds from diverse agencies and countries.

As PHEM gained in popularity, different governmental entities claimed coordination responsibility for emergencies, requiring a clarification of duties and responsibilities among them. The legal obligations and authority of the ANSS were clarified through a legal document review conducted by GU for EM in general and PHEM in particular. Gaps and overlaps in legal authority and responsibilities were identified. Findings and needed actions were presented to, and approved by the Guinean government. While amending legal documents to de-conflict responsibilities was foreseen to be a lengthy process, there was enough consensus on the responsibilities of the ANSS to continue efforts for the institutionalisation of a PHEOC network at the national and district level under the leadership of the ANSS.

1.3.2 Raising awareness and endorsement of emergency management principles—Following the end of the EVD epidemic in West Africa, targeted efforts were made by CDC and its partners to raise awareness and endorsement of emergency management principles by the senior leadership of the ANSS and promote the continued development of the PHEM system at the national and district level. First, in August 2016, CDC funded a visit to the CDC-Atlanta EOC for the director of the ANSS. Dr. Sakoba met with PHEM experts to discuss the advantages and challenges of creating a PHEOC network, and with Dr. Frieden who reiterated CDC's commitment to support the development of PHEM capacity in Guinea.

Following the visit, the ANSS director hired six full-time staff for its national EOC and agreed to allow the ANSS EOC staff to attend one to four-month trainings abroad. In November 2017, the ANSS director and his newly appointed EOC Operations Chief travelled to the province of Quebec, Canada to meet with PHAC, the Ministry of Health of Quebec, and the Ministry of Social Security PHEM specialists. The two ANSS staff discussed with fellow Francophone colleagues their strategy to develop their PHEM capacity and potential future support from French-Canadian technical experts.

Simultaneously, CDC's CoAg partners IOM and GU, with technical expertise from CDC-Atlanta and PHAC, continued to provide short awareness trainings in PHEM to the ANSS and to district PHEOC staff to further develop endorsement, and counter staff turn-over. The introduction of the PHEM concepts continued to be well received at the district level but met with some opposition with some new senior managers at the national level. In response, the ANSS national PHEOC director was invited to visit an established PHEOC in Uganda. The PHEOC director joined a Sierra Leone Ministry of Health mission to visit Uganda's national PHEOC, which had been established in 2013 (Borchert et al., 2014). The director learned about and observed Uganda's PHEM Program including its infrastructure, the training of staff, and its systems. His interactions with Ministry of Health staff from Uganda and Sierra

Leone provided him with a better understanding of the application of PHEM concepts to the Guinean context.

The CDC country director, a Federal Emergency Management Agency (FEMA) Certified Emergency Manager, in collaboration with the English-speaking regional CDC EM expert (both authors on this paper), held numerous short sessions with the ANSS director and his senior leadership to clarify concepts, answer questions, and address concerns. The CDC country director also met on two occasions with the Minister of Health to provide basic information on the progress made and ensure endorsement at the highest level of the Ministry.

1.3.3 Infrastructure

1.3.3.1 National Level: At the national level, the ANSS used its financial and operational independence to maintain the infrastructure that had been established during the EVD epidemic. The ANSS did not make substantial changes to the national PHEOC in the two years following the end of the EVD epidemic but focused on improving the country's capacity at the district level.

1.3.3.2 District level: By 2017, the ANSS had implemented a plan to improve the functionality of existing district PHEOC structures and create new ones in the 10 prefectures where there were none. The plan was developed and implemented with the assistance of one of CDC's implementing partners. IOM provided solar panels for six district PHEOCs, as well as chairs, file cabinets, and a wall screen for information display to all 38 district PHEOCs. Systems provided by IOM included internet connectivity and the provision of electricity through a combination of solar panels and generators.

1.3.4 Staff training

1.3.4.1 National Level: In July 2016, with support from CDC GHSA CoAg funds, two Guinean IOM staff participated in the four-month Public Health Emergency Management Fellowship (PHEMF) offered by the CDC headquarters in Atlanta. The PHEMF program covers core EM functions such as operations, planning, risk communication, and logistics, and teaches participants how to use exercises to test response capacity (Daniel et al., 2017). The program provides opportunities to visit EOCs at the city, county, and state level, in the USA. Participants learn about the PHEM system of other participating countries, evaluate their own country's PHEM system, and develop an improvement plan for implementation upon return to their country. IOM staff, rather than ANSS staff, were selected for the training because staff of the ANSS were still too involved in the EVD response to be allowed to leave Guinea, and few of them possessed the required English language skills. Upon return to Guinea, the IOM trained staff worked full-time in the ANSS PHEOC to continue to reinforce the ANSS' capacity. In addition, IOM, GU, and CDC translated, adapted, and delivered basic and advanced trainings in PHEM to key PHEOC staff at the national level to develop their capacity to train others at the district level.

At the end of 2016, the presence of two IOM staff trained through PHEMF at the national PHEOC made it possible for two ANSS PHEOC staff to attend the PHEMF four-month

fellowship without jeopardising the functionality of the PHEOC. In 2017, the PHEOC Chief of Operations also attended the program. By the end of 2017, the three staff of the ANSS with sufficient knowledge of English had attended the training.

An agreement between IOM and PHAC gave the five ANSS PHEOC staff who did not have sufficient English knowledge the opportunity to attend a one-month intensive training in EM at the PHAC EOC in Canada in March 2017. Like the PHEMF program, the PHAC program included the teaching of basic concepts of PHEM functions such as operations, planning, risk communication, and logistics; discussed the use of exercises; and provided participants with the opportunity to visit various levels of EOCs. The ANSS staff brought with them plans, the concept of operations (CONOPS), and the job action sheets they had already developed to receive feedback from Canadian experts. At the end of 2017, PHAC announced it would not be in a position to continue offering assistance to Guinea.

In January 2018, the US Department of State expressed interest in the strengthening of the Guinean Ministry of Security and the Gendarmerie of the Ministry of Defense capacity to assist the Ministry of Health to respond to future epidemics. The CDC country director facilitated discussions between the US Department of State, the Guinean Ministries, IOM, and the Ministries of Health and of Security of the Province of Quebec. A few months later, a delegation composed of representatives from the three Ministries, IOM and CDC travelled to Quebec to discuss Guinea's PHEM needs in training and strengthening of its preparedness for future epidemics. Then, in February 2019, representatives from the Quebec government provided a one-week workshop in Guinea to staff from the Ministries of Health, Security, and Defense on EM. The objective of the training was to trigger discussions on the coordination of plans between sectors to prepare and respond to epidemics, and on the establishment of an overarching entity that could coordinate this multi-sectoral collaboration in complex emergencies.

In the second half of 2018, ANSS staff and partners benefited from opportunities to strengthen their simulation, communication, and logistic skills. In June 2018, WHO AFRO and ANSS PHEOC staff provided a five-day training on simulation exercises. The training was based on the WHO 2017 Simulation Exercise Guide (World Health Organization, 2017b). The training was attended by staff from the other four departments of the ANSS (Surveillance, Logistics, Case Management and Communication), by regional health directorate staff, and partners such as UNICEF, the Guinean Red Cross, the Ministry of Environment, and the Ministry of Livestock.

In July 2018, CDC conducted a three-day Crisis and Emergency Risk Communication (CERC) training for communication experts from the Ministries of Health, Livestock, Environment, and Communications. Participants also included communication experts from non-governmental organisations (NGOs), and the media. ANSS communication unit staff were provided trainers' materials and assisted the CDC trainers during group work activities. The training focused on six CERC principles:

- be first
- be right

- be credible
- express empathy
- promote action
- show respect (CDC, 2018).

Two days were also spent on developing the first draft of a national risk communication plan under the leadership of the ANSS communication unit with assistance from CDC.

Finally, in November 2018, experts from CDC's Division of Strategic National Stockpile (DSNS) provided a 5-day Medical Counter Measures/Supply Chain Management workshop. The workshop was attended by approximately 35 supply chain stakeholders and included representation from several agencies and directorates within the Ministry of Health, the Gbessia Conakry Airport, and United Nations partners. The workshop also provided the framework for the ANSS to develop a core planning group tasked with leading the development of a medical counter measures plan. The planning group relied heavily on the ANSS PHEOC staff to ensure that the plan was well integrated with the emergency response plan (ERP) of the ANSS.

1.3.4.2 District level: Between July and September 2017, IOM and ANSS staff, using the knowledge they had acquired through the CDC PHEMF program, trained 135 district health personnel nationwide on the use of the Threat and Hazard Identification and Risk Assessment (THIRA) process. THIRA assesses the impacts of the most catastrophic threats and provides capacity targets to manage them. The information can then be used to inform plan and SOP development as well as exercises (Homeland Security, 2018). Trainings were offered in Conakry, N'Zerekore, Mamou, Labe, and Kindia and included local officers from the Ministries of Health, Environment, Livestock, and Security, and representatives from the Guinean Red Cross.

Between December 2017and February 2018, trainings and technical assistance were provided to the 10 most recently established district PHEOCs to match the competence developed in the other 28 district PHEOCs. Additional trainings were also offered to all 38 district PHEOC staff on the IMS structure and planning for emergencies. District staff were also introduced to the newly developed District PHEOC Handbook.

1.3.5 Systems

1.3.5.1 National level: Following CDC's GHSA guidelines, the ANSS PHEOC, with minimal assistance from CDC and its technical partners, developed several key documents including its CONOPS and an all-hazards ERP. These were developed and validated under leadership from the ANSS staff, in a systematic and collaborative way with other Ministries and partners. The plans have been recently revised to include coordination with other sectors (i.e., Ministries of Livestock, Environment, and Security) in accordance with a One-Health approach which promotes a collaborative, multi-sectoral coordination that recognises the interconnection between people, animals, and their environment.

Similarly, following the CERC training in July 2018, a two-day workshop was held by the Communication staff of the ANSS to develop a Risk Communications Plan. A multi-sectorial communication working group was put in place. A first draft of a risk communication plan for epidemics was produced and further refined by the working group under the leadership of the ANSS in the following months. Simultaneously, ANSS staff developed a repository of messages, communication documents, and videos in French and local languages that could be used for future emergencies. The ANSS also developed a district level CERC training that was validated and implemented. In addition, following the DSNS MCM training, the ANSS developed a first draft of an MCM plan.

In late 2018, WHO funded and provided technical guidance to the ANSS for a nationwide strategic tool for assessing risk (STAR) and vulnerability risk assessment mapping (VRAM) in Guinea. The process used many of the principles and tools of THIRA. The process, recommended as a prelude to the development of a strategic plan for multi-hazard preparedness, was overseen by a multi-sectoral and multidisciplinary coordination committee headed by the national PHEOC chief of operations who was trained on THIRA. The committee included representatives from the Ministries of Health, Environment, Livestock, Security, Higher Education and Scientific Research, as well as international organisations, including representatives from the WHO African Regional Office and WHO headquarters. The two-day evaluation identified six major risks:

- Cholera
- floods
- civil unrest
- EVD
- yellow fever
- measles

Data was collected from the eight regional health directorates, entered into a database developed by IOM, and analysed. Results of the STAR/VRAM report were used to develop a national risk communication plan. In February 2019, the ANSS, with assistance from CDC (CDC-Guinea, CDC regional EM specialist, and DSNS experts) and IOM, also used the results to produce a first draft of a Medical Counter Measures plan. The STAR/VRAM report will also be used to develop a national level multi-hazard plan, a national risk reduction plan, and specific contingency and risk reduction plans at the regional level. STAR, VRAM, and THIRA use a risk-based approach to emergency planning that enabled the country to develop and tailor plans and standard operating procedures to the threats and vulnerabilities of each locality. This risk-based approach is evident in the ERP developed in 2018. That year, the ANSS, with assistance from IOM, also reinforced its internet capacity and put in place a server that can facilitate the sharing of information at the national level.

1.3.5.2 District level: The development of numerous key documents at the national level also resulted in the development of documents for the 38 district PHEOCs that address recommendations of the country's Joint External Evaluation mission conducted in April

2017 (World Health Organization, 2017a). Standard operating procedures were provided for activation and deactivation of district PHEOCs, and the role and functions of regional (ERARE) and district (EPARE) Rapid Response Teams, and Epidemic treatment Centers (CTEpi in French) managed by the ANSS. A handbook for district PHEOCs, aligned with WHO's Framework for PHEOCs (World Health Organization, 2015), was also provided and explained to the district PHEOC staff. The handbook provides a description of the local PHEOC Concept of Operations (CONOPS), an SOP for activation and deactivation, a description of the principles of IMS, and the operational relationship between the EOC and emergency response teams, the CTEpi, and pathogen specific sentinel surveillance.

To further reinforce PHEM at the border, in May 2018, the Mano River Union (MRU) and IOM conducted a Regional Border Health/EOC 5-day workshop in Freetown, Sierra Leone. The workshop focused on the EOC coordination of public health surveillance and communication between Guinea, Liberia, Côte d'Ivoire, and Sierra Leone. The workshop resulted in a draft of an information sharing agreement to be annexed to the MRU Health Protocol which was under development. In addition to the drafted agreement, the participants established a WhatsApp group that is used for cross-border information sharing.

1.3.6 Exercises—Exercises have been adopted by the ANSS as a common tool to assess staff learning, and the tools and systems put in place for the management of epidemics in Guinea. Because exercises are also a tool used by numerous partners such as WHO and UNDP, there have been numerous opportunities for cross-cutting collaborations for a variety of exercises such as drills, simulations, tabletops, and full exercises at the national and district levels. Lessons learned from each exercise were captured through an after-action review and report, and corrective actions based on WHO recommendations.

1.3.6.1 National level: In August 2018, with financial assistance from the Multi-Partner Trust Fund managed by UNDP, the office of the UN Systems in-country coordinator, and the Japanese Embassy, the ANSS national PHEOC led the development of a pilot simulation exercise to test the capacity of the districts to respond to epidemics. The simulation exercise included a joint table-top exercise (TTX) and a drill exercise using the scenario of a cholera outbreak in the westernmost part of Guinea. The scenario was chosen in accordance with the VRAM outcomes and WHO's 2017 Simulation Exercise Manual (République de Guinée, 2016a). Representatives from WHO, the World Food Program, UNICEF, the National Service for Humanitarian Affairs (*Service National des Affaires Humanitaires* – SENAH in French), the National Center for the Management of Environmental Catastrophes and Emergencies, the National Direction of Civil Protection, and the International Health Regulations (IHR) focal point within the ANSS served as exercise evaluators. The simulation provided an opportunity for the ANSS national PHEOC to test its activation/deactivation SOP, the CONOPS, the deployment of ERARE and EPARE, and the national Integrated Disease Surveillance and Response (IDSR) guide.

1.3.6.2 District level: Cholera outbreak simulation exercises were conducted in six districts (three in Conakry and three outside of Conakry). The TTX provided 48 participants from the ANSS; the district PHEOCs; the EPARE teams of Forecariah, Boffa, and the five districts of Conakry; and the Guinean Red Cross an opportunity to discuss the process for

managing a cholera outbreak using IMS principles. The drills, staged at the district level, enabled the PHEOC and ERARE teams of Forécariah, Boffa, and Conakry to demonstrate their ability to manage the outbreak. The simulation made it possible to evaluate the familiarity of the staff with: the PHEOC Handbook and SOP, the WHO IDSR guide, the ERARE/EPARE guides, the CTEpi protocol, and the epidemic prone disease case management protocol.

2 Discussion

2.1 Successes

Much training have been provided and systems put in place at the national and district levels since 2014 to enable the country to better manage epidemics. In the five years of the GHSA project, the country established a physical PHEOC infrastructure at the national level and in the 38 districts of the country. Staff have been trained, essential documents have been developed at both the national and district level, and PHEOC staff have demonstrated their capacity to conduct exercises. While the country did not meet minimal requirements when the WHO-led Joint External Evaluation mission was conducted in 2017, it now fulfils both these and the minimal GHSA EOC standards, and has transitioned from being fully managed by partners to being managed by the local government. The national PHEOC and its 38 district PHEOCs all meet CDC's and WHO JEE EOC minimum requirements in staffing, equipment, and systems. These minimum standards include having dedicated and functional space at the national and district level, trained permanent staff, and operational plans and SOPs that are updated through exercises and real-life events. These minimal standards ensure that Guinea's PHEOC network can efficiently coordinate mitigation, preparedness, response, and recovery activities related to epidemic-prone diseases.

Since the establishment of physical structures in 2015, the national and district PHEOCs have been activated numerous times and used for managing vaccination campaign activities. In all cases, the PHEOCs were activated within 48 hours of notification as recommended by WHO and GHSA guidelines. A brief description of each activation is described in Table 1.

The use of EOCs to manage not only outbreaks but also the measles vaccination campaign, highlights the logistical and planning capacity of Guinea's PHEOC network for prevention as well as response activities. Using the PHEOCs for planned events as well as epidemic response will ensure that staff maintain their competence and systems remain functional. The decision to locate the PHEOCs inside the health department of each district and therefore integrating them to the day to day activities of the national and district offices responsible for the daily management of surveillance data ensures that the structure, equipment, and systems are maintained and usable during outbreaks.

The PHEM system in Guinea facilitated the development of relationships and coordinated preparedness efforts between the Ministry of Health and other Ministries (i.e., Livestock, Environment, Security, and Defense) for epidemic-prone disease outbreak response. The impact of the development of PHEM capacity in Guinea extends beyond the country's borders. ANSS EM specialists have been assisting other francophone West African countries with the development of their EM capacity by sharing documents that can be used by other

countries as models. Furthermore, the EM activities have promoted the sharing of data with other countries with whom Guinea shares borders such as Liberia and Sierra Leone. In 2019, ANSS EM specialists also provided training in THIRA and CERC to staff of the Ministry of Health of Mali.

2.2 Challenges

The progress of the past five years was not without challenges. Setting up an EM system is always a challenging process that was greatly exacerbated in the context of the EVD epidemic. While the epidemic provided access to funding and experts that would not have otherwise been available, it also interfered with having a due process for the selection of a strategic location for the national PHEOC, and the development of an organisation structure, training programs, and documents that take into account institutional and cultural norms. In regards to the location of the national PHEOC, its proximity to a fuel depot and a prison in a flood area was the subject of numerous discussions regarding a possible relocation of the PHEOC. In addition, the concept of assigning people to functions regardless of their placement in the hierarchy was a new concept. Department heads refused to be coordinated under an operational chief who, in his regular work, was not in a higher position than they were at the Ministry of Health. During the EVD response, all department heads insisted in answering directly to Dr. Sakoba. As all decisions, strategic and operational, needed Dr. Sakoba's approval, most partners also chose to coordinate directly with him rather than his subordinates, greatly overburdening his workload and creating a bottleneck for decision making. Nevertheless, since the end of the EVD response, gradual but substantial progress has been made towards developing a hierarchical chain of command and the delegation of decision power.

During the epidemic, the development of trainings and documents was greatly slowed down by difficulties in identifying French-speaking EM experts who were familiar with the chosen model, and who were available to assist Guinea with trainings and document reviews. It was also difficult to find trainings and documents, such as standard operating procedures and plans in French that could easily be adapted to the Guinean context. After the end of the epidemic, the departure of staff at the management and operational level made it necessary to renew promotional and training activities. In addition, many of the documents developed by PHAC and CDC partners during the response were heavily modified before they could be validated as the conditions of the response were not representative of the conditions under which Guinea is likely to respond to future epidemics.

2.3 Limitations

Trying to use the success of the Guinean efforts as a model might prove to be challenging for low-resource countries that might not benefit from funds on the scale of those available during the EVD response. Other elements that were specific to Guinea played an important role the country's successful implementation.

3 Conclusions and recommendations

The development of PHEM capacity is a challenging process that requires the long-term commitment of various governmental actors from the decision makers to the operational staff, and from the national to the district level. Resisting the urge to move rapidly forward with the development of documents and systems at the expense of ensuring sustained endorsement is important. In Guinea, much time, energy, and money were spent to develop this endorsement after the end of the Ebola epidemic of 2014–2016. The Ministry of Health's endorsement of emergency management concepts resulted in the creation of a permanent PHEOC network and of a new agency responsible for the management of all epidemics, the ANSS. The strong endorsement of the Ministry of Health and its ANSS, and their daily use of the PHEM capacity developed during and after the Ebola epidemic of 2014–2016, will be essential factors in the long-term sustainability and further development of this capacity.

Countries newly introduced to the concepts of EM will require time to develop an understanding of EM concepts before being able to develop the endorsement needed for sustainability. The new capacity should build on what already exists. Overtime, it should aim to be sustainable by the local government because emergency management capacity development is an endless process that must continually evolve to meet changing needs. For example, in Guinea, a strategic decision was made to decentralise the coordination of emergency responses from the national to the district level. Therefore, a PHEOC was developed in each of the 38 districts of the country. Nevertheless, many changes have been made in the past two years to also decentralise the management of surveillance data for epidemic-prone diseases. Previously, data collected at the district level was sent directly to the national level. Since 2019, the data from the district level is sent to the regional level for consolidation and analysis, and then sent from the regional level to the national level. Considering this new data management capacity at the regional level, and the existence of response teams at both the district (EPARE) and regional level (ERARE), it is likely that in the near future, the PHEM system will need to include PHEOCs at the regional level. In Guinea, the ANSS, with its permanent trained staff and established structures and systems is well-positioned to provide the sustainability of the PHEOC network if it can secure sufficient governmental funding for the years to come.

In Guinea, the usefulness of PHEOCs to manage public health responses as well as regular preventive activities such as vaccination campaigns has been noticed by other Ministries (E.g., Livestock, Environment and Security). Since 2018, they have received financial and technical support from the US government and other partners to learn about EM, improve their coordination with the Ministry of Health to respond to epidemics, and discuss the possibility of establishing an EM structure that could coordinate the EOCs of different ministries to manage complex emergencies. Even if the growing interest in EM in Guinea can be seen as a testament of the accomplishments of the past five years, much additional effort would be needed to ensure sufficient ministerial and presidential endorsement for the development and sustainability of this growing EM capacity.

The interest in EM is not unique to Guinea. In recent years, many countries in Africa have established PHEOCs to help with the management of epidemic-prone diseases. The existence of these PHEOCs in many countries opens numerous possibilities for collaboration between countries and for regional coordination. Monitoring and evaluation activities that provide analysis of the cost and benefits of these newly developed PHEM capacities in low-resource countries are needed to identify the minimal components of a functioning, low-cost, and sustainable system that meets the needs and challenges of the African context.

Biographical notes:

Lise D. Martel joined CDC in 2004. She holds a Master's of Public Health, a Master's of Education, and a PhD in Social Psychology with a focus on disaster management and humanitarian aid. She has provided emergency management technical assistance in over 30 countries. She participated in CDC's emergency responses to the Indian Ocean tsunami in Indonesia, Hurricane Katrina, Haiti hurricanes and earthquake, South Sudan measles outbreak, floods and cholera in Pakistan, and Ebola and COVID-19 in Guinea. Since 2015, she has served as the CDC Country Director in Guinea.

Michael Phipps joined CDC in 2015 and shortly thereafter deployed to Sierra Leone to work with the Ministry of Health and Sanitation and its public health emergency operations centre as part of the Ebola response. He has over 30 years of military and international emergency operations experience and currently serves as an Emergency Management Technical Advisor for Guinea, Liberia, Mali, Sierra Leone, and Vietnam. He holds a Master's in Human Relations and a Master's in Strategic Studies. Prior to joining the CDC, he was a US Army Military Intelligence Officer working in Emergency Operations Centers.

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Mohamed L. Soumah is a medical doctor with five years of experience in national and international public health, and emergency preparedness and response. He was the recipient of an International Visitor Leadership Program (IVLP) in Disaster Preparedness & Emergency Management and of a CDC Public Health Emergency Management fellowship. He worked in the Ebola responses of Guinea and the Democratic Republic of Congo (DRC).

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Appollinaire Lamah graduated with a medical degree from the Gamal Abdel Nasser University of Conakry. Since 2015, he has worked for the International Organization for Migration (IOM) in Guinea as a National Project Officer. Following his participation in CDC's 2016 Public Health Emergency Management Fellowship in Atlanta, he has been providing technical assistance to the Public Health Emergency Operation Centers of Guinea's National Agency for Health Security in Conakry and Forecariah.

Abdoulaye Wone is a medical epidemiologist with 12 years of experience in the management of public health programs. He served as the International Federation of Red Cross (IFRC) program manager for Humanitarian Pandemic Preparedness (H2P) and as health coordinator for the Senegalese Red Cross and the French Red Cross. From 2014 to 2016, during the Ebola crisis in Guinea, he served as Emergency Health Coordinator for IFRC, ensuring technical leadership for the implementation of community event-based surveillance, psycho-social support, community engagement, and safe and dignified burial. He is currently a Public Health Coordinator for IOMin Guinea.

Michael Asima holds a Master's in Environmental Science and Technology from Vrije University-Brussels, and a diploma in project management from Georgetown University. He has 15 years of experience in field operations, and socio-economic and humanitarian assistance in stable, post-conflict, and disaster environments. From 2015 to 2019, he worked as IOM's manager for the project "Capacity Building and Logistic Support for the Strengthening of Prefectural Emergency Operations Centers" in Guinea. Prior to this, he worked for four years with IOM Cote d`Ivoire following the 2010 post electoral crisis and with IOM Haiti following the 2010 earthquake.

Alpha M. Barry received his Master's of Public Health in Epidemiology & Biostatistics from Oklahoma University, and a PhD in Health Services Management from the University of Montreal. He has more than 20 years of experience in public health program management, focusing on capacity building, research, health promotion, community engagement and health project management in Guinea and more broadly in the West Africa region. He is a Professor of Research Methods in Public Health at the Faculty of Medicine of the Gamal Abdel Nasser University of Conakry.

Mahawa Berete is a State Medical Doctor who graduated from the Gamal Abdel Nasser University of Conakry. She holds a certificate in design and management of humanitarian projects from the BIOFORCE institute. She was the recipient of a training grant from the Public Health Agency of Canada on the Management of Health Emergencies and of Public Health Emergency Operations Centers (PHEOCs). She supported the establishment of PHEOCs in Guinea and has five years of experience in the management of health emergencies and disaster risk reduction, in training facilitation, and in development of normative documents.

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Antoine Morel-Vulliez is an expert in social protection and governance who has worked since 2016 as the head of the Social Protection Unit in Haiti for the United-Nations World Food Program (WFP). Prior to joining WFP, he worked in Guinea both for the International Organization for Migration and the Tony Blair's Africa Governance Initiative in the management of the Ebola response. He graduated in Political Sciences at the Institut d'Etudes Politiques in Paris and is a former student of the French National Institute of Oriental Civilizations and Languages where he studied African Civilizations and the Kiswahili language.

Sakoba Keita holds a doctorate in medicine from the University of Cuba and a Master's in Public Health from the Regional Institute of Public Health of Ouidah, Benin. He serves as director of the National Agency for Health Security (ANSS in French) since 2016. From 2014–2016 he was Guinea's national coordinator for the Ebola response. He was the head of the Disease Prevention and Control Division (DPLM), held various clinical physician positions, and served as regional director for the Health and Leprosy Control Program. He has 30 years of experience in leading responses to epidemics in Guinea.

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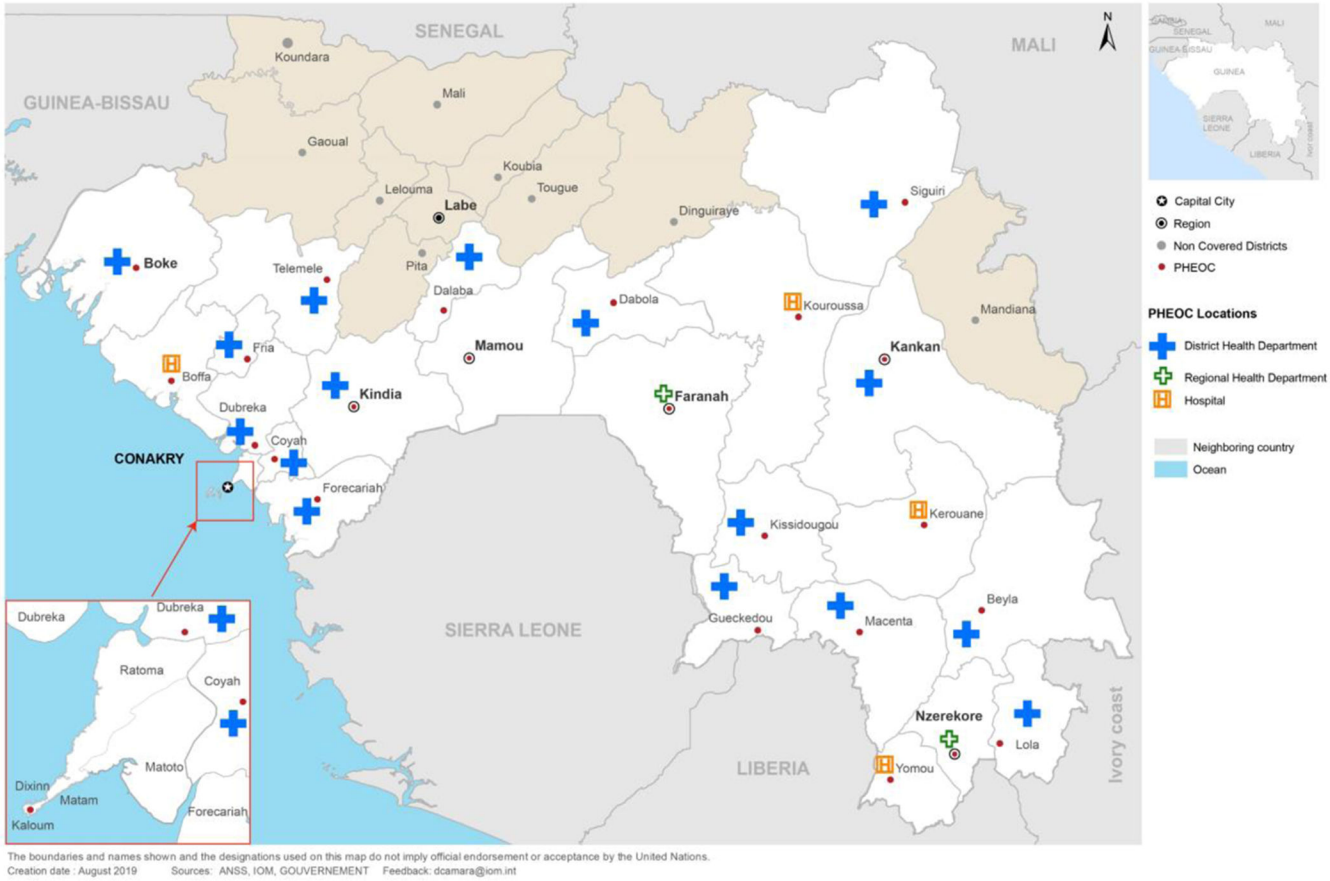

Figure 1.

Map of public health emergency operation centres (PHEOC) in 28 health districts (see online version for colours)

Table 1

Guinea's EOC activations between January 2015 and March 2019

Event	PHEOC activated	Activation period	Actions
Yellow fever outbreak in Gaoual, Boke district	National and Boke	11/2016 to12/2016	ERARE deployed
2017 Yellow fever outbreak in Boke, Gaoual, Telimele, Siguiri	National	01/2017 to 02/2017	ERARE deployed
Measles vaccination campaign in the five districts of Conakry	DSVCO	02/07 to 02/17/2017	ERARE of Conakry deployed
Polio vaccination campaign	Forecariah, Boffa, and Boke	09/07 to 09/11/2018	Logistical support and daily SitRep
Lassa fever case	National PHEOC activated Kissidougou and Mamou in alert mode	02/02 to02/25/2019	EPARE deployed, daily SitRep and coordination of meetings
Anthrax cases	Koubia	2/22to 4/19/2019 (end of contact tracing)	EPARE with lead agents from the Ministries of Environment and Livestock
EPI national mass Tetanus vaccination campaign in Lélouma and Koubia	Labe	01/29 to 02/03/2019	Logistical support and communication with vaccination teams
Measles cases	Labe	02/15/2019, ongoing	EPARE deployed and daily SitRep