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Ten years after the Ebola outbreak: Lessons, progress, and preparedness and response in West Africa

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Abstract

Introduction: The 2014 Ebola virus disease (EVD) outbreak in West Africa was the largest in history, exposing critical weaknesses in surveillance, health systems, and cross-border coordination. A decade later, regional institutions have implemented numerous initiatives to strengthen preparedness and response capacities for Ebola and other viral hemorrhagic fevers (VHFs). This paper reviews progress, lessons learned, and ongoing challenges in VHF preparedness and response across West Africa, based on the outcomes of a regional workshop organized by the West African Health Organization (WAHO) and the World Health Organization (WHO) in July 2024.

Methods: A qualitative thematic analysis of workshop proceedings was conducted, encompassing country presentations, panel discussions, and group work sessions with representatives from 15 West African countries, the WHO, Africa CDC, UNICEF, Médecins Sans Frontières, the World Bank, and other key regional stakeholders. Data were analyzed to identify common themes related to achievements, gaps, challenges, and strategic priorities for strengthening regional preparedness and response.

Results: Key lessons highlighted the importance of resilient health systems, early detection, cross-border collaboration, community engagement, and sustainable financing. Progress over the past decade includes the establishment of Public Health Emergency Operations Centres (PHEOCs), expanded surveillance and laboratory networks, capacity-building initiatives, and deployment of Ebola vaccines. Nonetheless, significant challenges remain, including limited laboratory capacity in rural areas, inadequate treatment centres, weak cross-border coordination, and dependency on external funding.

Conclusions: Ten years after the West Africa Ebola outbreak, substantial gains have been made in preparedness and response capacities, but critical gaps persist. Sustained investments in laboratory systems, community engagement, and cross-border collaboration, supported by predictable domestic and regional financing, are essential to build resilient health systems and prevent future outbreaks.

Keywords: Ebola, Viral Hemorrhagic Fevers, Preparedness, Response, Cross-border Collaboration, Public Health Emergency Operations Centres, West Africa

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Introduction

The Ebola Virus Disease (EVD) outbreak in West Africa, declared by the World Health Organization (WHO) on March 23, 2014, marked the largest and most complex Ebola epidemic recorded in the region in history, primarily affecting Guinea, Liberia, and Sierra Leone [1,2]. Over two years, the outbreak resulted in more than 28,000 cases and over 11,000 deaths, with a case-fatality rate approaching 45% [3]. Beyond its significant human toll, the epidemic placed unprecedented strain on healthcare systems, economies, and the social fabric of the affected countries [2,4].

The outbreak revealed critical weaknesses in global health security, including gaps in surveillance, emergency response, and health system resilience, particularly in cross-border areas with high population mobility [5,6]. In response, the WHO, national Ministries of Health, and international partners implemented a range of measures to control the epidemic and strengthen health systems [7]. These efforts included enhancing disease surveillance, establishment and expansion of Field Epidemiology and Laboratory Training programs(FETPs), expanding laboratory capacity, training healthcare workers in infection prevention and control (IPC), and promoting community engagement and education [8].

Research and analyses stemming from the outbreak have deepened understanding of EVD transmission dynamics and underscored the importance of community-led interventions, such as contact tracing and safe burial practices, which were pivotal in containing the epidemic [9-11]. Trust, social mobilisation, and active community participation emerged as key determinants of effective outbreak response [12].

A decade after the initial outbreak, the West African Health Organization (WAHO), in collaboration with WHO, convened a regional workshop to reflect on lessons learned, assess progress in public health preparedness and response, and identify persistent gaps. This manuscript reviews the findings from the workshop and discusses strategic steps taken to strengthen regional preparedness and response against Ebola and other viral hemorrhagic fevers (VHFs).

Methods

This study employed a qualitative descriptive design, utilizing data generated during the Joint WHO–WAHO Regional Workshop on Scaling Up the Implementation of Viral Hemorrhagic Fever Preparedness and Response Plans in West Africa. The workshop was held in Conakry, Guinea, from 17 to 19 July 2024.

Data collection

Data were derived from a comprehensive set of workshop proceedings, including:

1. Country presentations from all 15 ECOWAS member states, detailing their national experiences, progress, and challenges in VHF preparedness and response since 2014.

2. Transcripts of panel discussions focused on lessons learned, gaps in regional preparedness and response, and the critical roles of community engagement and cross-border collaboration.

3. Synthesized reports from group work sessions, which were organized along linguistic lines (Anglophone, Francophone, and Lusophone) to review and refine a draft regional VHF preparedness and response framework.

4. Participants included representatives from the ministries of health of the 15 ECOWAS countries, as well as technical and financial partners from WHO country offices, WAHO, Africa CDC, UNICEF, Médecins Sans Frontières (MSF), Institut Pasteur, and the World Bank.

Data analysis

Data were extracted from verbatim transcripts of panel discussions, narrative country presentations, and breakout session summaries, allowing rich qualitative insights into operational challenges and country experiences. Thematic analysis was conducted following the systematic approach outlined by Braun and Clarke [13]. The process involved the following phases:

- **Familiarisation:** Two study authors (VL and AU) independently read and re-read all transcribed proceedings and reports to gain a deep familiarity with the data.

- **Initial coding:** The authors then generated initial codes manually across the entire dataset. Examples of initial codes included “PHEOC establishment,” “rural laboratory gaps,” “donor dependency,” and “community mistrust.”

- **Searching for themes:** The initial codes were collated and sorted into potential themes. The authors discussed and refined these potential themes, focusing on grouping codes that formed a coherent pattern. This process led to the identification of six candidate themes, such as “Strengthening Health Systems” and “Sustainable Financing.”

- **Reviewing themes:** The candidate themes were then reviewed at two levels. First, in relation to the coded extracts, to ensure they accurately represent the data. Second, in relation to the entire dataset, to ensure they

Table 1. Examples of Documented Progress in VHF Preparedness Across ECOWAS Countries (Based on Workshop Evidence)

Preparedness Domain	Country Example	Evidence Presented During Workshop
PHEOC Activation & Coordination	Nigeria	Subnational PHEOCs were activated in 26 states during the 2023 Lassa fever outbreak; improved coordination and reduced reporting delays.
	Liberia	National PHEOC used during the 2022 meningitis cluster; streamlined partner coordination.
Laboratory & Surveillance Capacity	Senegal	Rapid PCR testing capacity for Ebola, Marburg, and Lassa established at Institut Pasteur de Dakar; turnaround time under 24 hours.
	Côte d'Ivoire	Decentralization of sample transport networks leading to faster diagnostics for suspected VHFs.
Cross-border Collaboration	Guinea, Liberia, Sierra Leone	Joint outbreak investigation and border community surveillance teams were activated in 2023.
Community Engagement	Sierra Leone	Expansion of community-based surveillance and rumor-tracking using local radio networks.
Workforce Development (FETP)	Ghana	Frontline, Intermediate, and Advanced FETP tiers producing more than 300 graduates integrated into district surveillance teams.
Domestic Financing Initiatives	Senegal	Government allocation for emergency stockpiles and creation of a national preparedness fund are under review.

formed a coherent and telling narrative. Discrepancies in thematic organization were resolved through discussion until consensus was reached.

- **Defining and naming themes:** Each theme was clearly defined and given a descriptive name. The essence of each theme and its significance to the overall research aim were articulated.
- **Validation:** To enhance credibility, the final thematic framework and supporting data were cross-checked against official WAHO workshop summary reports to ensure consistency and accuracy in representing the collective discussions.

Ethical consideration

The analysis relied exclusively on aggregated, non-attributable data from official workshop proceedings. No individual-level data were collected or analyzed. Therefore, formal ethical approval was not sought. The confidentiality of all participants was maintained, and findings are presented in a synthesized format that prevents the identification of any individual or country-specific commentary.

Results

The thematic analysis of the workshop proceedings yielded six central themes that directly address the study's aim of assessing progress, lessons, and gaps in VHF preparedness and response. These themes collectively illustrate the key areas of advancement since the 2014 outbreak, while also delineating the persistent challenges that require further action. The findings are structured below according to these emergent themes.

To avoid overgeneralization, the thematic findings are presented with illustrative examples drawn from country presentations and panel discussions, which are described in detail under each thematic area below. These examples highlight both areas of progress and persistent gaps across countries and contexts. Tables 1 and 2 provide a consolidated summary of documented advances and remaining challenges in viral hemorrhagic fever preparedness and response across ECOWAS Member States. To enhance clarity, Tables 1 and 2 summarise specific examples of progress and persistent gaps as documented during the workshop.

1. **Strengthening Health Systems and Emergency Coordination**
   The Ebola outbreak exposed the fragility of national health systems, highlighting the need for more resilient structures to manage large-scale health emergencies. In addition to the establishment of PHEOCs, most ECOWAS countries now operate broader national coordination mechanisms that guide preparedness and response. These include National Public Health Emergency Committees, Incident Management Systems (IMS), multisectoral One Health coordination platforms, and high-level ministerial or presidential task forces activated during major outbreaks. Although structures vary by country, these mechanisms ensure political oversight, resource mobilisation, and coordinated action across health, agriculture, interior, immigration, security, and local government sectors.

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In response, most ECOWAS member states established Public Health Emergency Operations Centres (PHEOCs) to coordinate multisectoral responses. These centres have since improved coordination, decision-making, and resource mobilisation during outbreaks. Countries also developed or updated their national contingency and response plans for viral hemorrhagic fevers (VHFs), guided by regional frameworks and WHO standards. However, challenges persist in maintaining functionality and staffing at subnational levels.

2. **Enhancing Surveillance and Laboratory Capacity**
Participants reported major advances in surveillance and laboratory diagnostics. Early warning and real-time reporting systems have been introduced in most countries, supported by integrated data platforms that enable faster case detection and information sharing. Laboratory networks have expanded, with several countries now equipped to diagnose VHFs domestically. The establishment of the Regional Centre for Surveillance and Disease Control (RCSDC) under WAHO has further improved coordination for laboratory-based surveillance. Despite these gains, gaps remain in rural coverage, supply chain management, and turnaround time for results, especially during peak outbreaks[14].

3. **Cross-border Collaboration and Information Sharing**
Cross-border spread was a defining feature of the 2014 epidemic. Since then, significant progress has been made in regional coordination. Cross-border health committees now facilitate joint outbreak investigations, surveillance, and information exchange between neighbouring countries. WAHO has also developed a Cross-border Surveillance and Points of Entry Strategic Plan (2025-2029) to harmonise regional response mechanisms[15]. However, the implementation of these frameworks remains uneven due to logistical constraints and limited financial resources.

4. **Community Engagement and Risk Communication**
Community mistrust during the 2014 outbreak hindered containment efforts. Workshop participants emphasised the improved integration of community-based surveillance, risk communication, and social mobilization strategies into preparedness and response planning. Countries have increasingly adopted culturally sensitive approaches, leveraging traditional and religious leaders to build trust. Nevertheless, mistrust and misinformation remain challenges in some rural and border communities, particularly where government presence is weak.

5. **Infodemic and social media lessons and impact**
Participants reported persistent infodemic challenges, particularly amplified through social media platforms such as WhatsApp and Facebook. Several countries noted that misinformation undermined trust in response measures, including vaccination and case management. Sierra Leone and Liberia described the use of real-time rumour tracking systems adapted from COVID-19 response tools to monitor and counter misinformation. Nigeria highlighted the activation of infodemic management teams during Lassa fever outbreaks to coordinate risk communication and address circulating rumors.

6. **Capacity Building and Workforce Development**
Capacity-building initiatives were identified as one of the most significant areas of progress. Thousands of health workers have received training in infection prevention and control (IPC), case management, and risk communication. Regional initiatives such as the FETPs have strengthened human resource capacity for outbreak detection and response. (FETPs across West Africa operate in three tiers; Frontline (three months), Intermediate (nine months), and Advanced (two years). This tiered system strengthens capacities at different levels of the health system: Frontline FETPs support early detection and reporting at district and facility levels; Intermediate tiers enhance analytical and supervisory skills, while Advanced FETPs produce experts capable of leading national surveillance and outbreak response systems.

In most ECOWAS countries, FETPs are housed within National Public Health Institutes (e.g., Nigeria, Liberia, Sierra Leone), which strengthens alignment with national surveillance and response priorities. In a few settings, FETPs operate in collaboration with universities (e.g., Ghana), where academic accreditation supports professional advancement. Embedding FETPs within NPHIs ensures closer integration into national surveillance systems, improves government ownership, and reduces vulnerability to fluctuations in donor funding. , Retention of trained field epidemiologists remains a persistent challenge. Workshop participants emphasized that formal integration of field epidemiology cadres into national civil service schemes, complete with career pathways, promotion grades, and remuneration, would significantly improve retention and ensure sustainable public health intelligence capacity. Participants emphasized that formal integration of field epidemiology cadres into national civil service schemes would improve retention and sustainability.

7. **Sustainable Financing and Resource Mobilization**
While donor-supported programs have strengthened preparedness and response, most countries continue to rely heavily on external funding. Participants underscored the need for national epidemic preparedness and response funds to ensure predictable

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Table 2. **Examples of Persistent Gaps in VHF Preparedness (Workshop-Derived Evidence)**

Gap Identified	Countries Referenced	Specific Evidence Presented
Limited rural diagnostic coverage	Mali, Guinea-Bissau	Inability to test suspected cases outside capitals; delays of 2–5 days for sample transport.
Weak cross-border implementation	Several land-border countries	Joint frameworks exist, but "not operationalized due to lack of logistics and funding" (quote from participant).
Dependence on external funding	Most ECOWAS states	Preparedness activities halt when donor projects end; no sustained domestic budget lines.
Shortages in trained epidemiologists	Burkina Faso, Niger	FETP graduates leave positions due to a lack of career paths or civil service integration.
Community mistrust in border areas	Guinea, Liberia	Persistent misinformation about Ebola vaccines was reported during the 2023 preparedness period.

and sustained financing for emergency response. The establishment of such mechanisms was seen as critical for maintaining gains achieved over the past decade and reducing dependence on external support.

Discussion

Ten years after the 2014–2016 West African Ebola virus disease (EVD) outbreak, this study highlights measurable progress alongside persistent vulnerabilities in regional preparedness across ECOWAS Member States. Drawing on multi-country workshop evidence and key informant perspectives, the findings demonstrate that investments made in the aftermath of Ebola have strengthened coordination mechanisms, surveillance structures, and workforce development, while also revealing enduring gaps that continue to threaten health security in the region.

Improved regional coordination and leadership emerged as a central achievement. The establishment of structured cross-border collaboration mechanisms and clearer roles for regional institutions reflects lessons learned during Ebola, when fragmented coordination significantly delayed response efforts [16–18]. The findings reinforce earlier evaluations showing that regional platforms are critical for harmonizing preparedness and ensuring timely information sharing during transboundary outbreaks [19–20].

Progress in surveillance and laboratory capacity reflects sustained post-Ebola investments in integrated disease surveillance, diagnostic infrastructure, and field epidemiology training. Expansion of laboratory networks and improved case detection capacities mirror trends reported in prior regional and continental assessments [21–22]. However, variability in functionality and coverage across countries suggests that gains remain uneven and vulnerable to system shocks, consistent with earlier post-Ebola reviews [23].

Despite these advances, operational and digital system weaknesses persist. Participants highlighted challenges related to logistics, supply chain reliability, and fragmented digital reporting systems, constraints that were also evident during Ebola and subsequent outbreaks [10,24]. These findings underscore that technological adoption without parallel investments in governance, interoperability, and workforce skills limits system effectiveness.

Workforce development, particularly through FETPs, has contributed substantially to preparedness, aligning with evidence that trained field epidemiologists were pivotal during Ebola and COVID-19 responses [25–26]. Nonetheless, disparities in access to advanced training and retention of skilled personnel remain unresolved, echoing longstanding human resource challenges in the region [27].

Finally, the study highlights growing recognition of infodemic management as a preparedness priority. Persistent misinformation and community mistrust reported by participants reflect patterns observed during Ebola, where inadequate risk communication undermined response effectiveness [28]. This reinforces calls for integrating social science, community engagement, and digital communication strategies into preparedness frameworks.

Overall, the findings suggest that while the Ebola outbreak catalyzed meaningful structural improvements, preparedness in West Africa remains a work in progress. Progress has been real but incomplete, and sustaining gains will require deliberate institutionalization, financing, and continuous learning.

Way Forward: Strategic Actions for Strengthening Regional Preparedness

Building on the findings, three interrelated strategic pillars are proposed to consolidate progress and address persistent gaps.

Pillar 1: Institutionalizing Regional Coordination and Governance

Regional coordination mechanisms should be formally embedded within national preparedness architectures to ensure continuity beyond emergency periods. Strengthening mandates for regional bodies, clarifying coordination protocols, and aligning national plans with ECOWAS frameworks are essential to sustaining collective

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action [16,20].

Pillar 2: Strengthening Systems and Digital Foundations

Targeted investments are needed to modernize surveillance, laboratory, and logistics systems, with particular emphasis on interoperable digital platforms. Enhancing data governance, connectivity, and workforce digital literacy will improve real-time situational awareness and response efficiency [10,24–26].

Pillar 3: Sustaining Workforce Capacity and Community Trust

Expanding equitable access to FETPs and continuous professional development will help address workforce gaps, while integrating infodemic management and community engagement into preparedness plans will strengthen public trust and compliance during future outbreaks [28].

Conclusions

A decade after the 2014 Ebola outbreak, West Africa has transformed its epidemic preparedness and response architecture through coordinated regional and national reforms. The establishment of Public Health Emergency Operations Centers strengthened surveillance and laboratory networks, and the integration of community-based approaches represents major milestones in building resilience against viral hemorrhagic fevers (VHFs). However, persistent challenges, particularly in sustainable financing, cross-border coordination, and equitable laboratory capacity, continue to constrain full operational readiness.

The West African experience underscores that preparedness and response is both a technical and political process. Sustained leadership, predictable domestic investment, and institutionalized mechanisms for collaboration are crucial for maintaining the progress achieved since 2014. As the region aligns with the Africa CDC's New Public Health Order and the International Health Regulations (IHR 2005), consolidating these gains will be essential for safeguarding the health security of over 400 million people in the ECOWAS region.

Lessons from other regions show that preparedness and response cannot depend solely on donor funding or episodic crisis responses. Instead, regional solidarity, multisectoral partnerships, and community ownership must anchor epidemic preparedness and response strategies. By embedding these principles into national and regional frameworks, West Africa can serve as a model for resilience and collective health security in Africa and beyond.

What is already known about this topic

- The 2014–2016 Ebola Virus Disease (EVD) outbreak in West Africa was the largest in history, exposing critical weaknesses in surveillance systems, laboratory capacity, and cross-border coordination.
- Several evaluations and reports following the outbreak highlighted the need for stronger national public health institutions, resilient health systems, and community engagement to prevent future epidemics.
- Regional bodies such as the West African Health Organization (WAHO), WHO, and Africa CDC have since implemented initiatives to improve preparedness and response for viral hemorrhagic fevers (VHFs), but comprehensive regional assessments of progress and remaining gaps have been limited.

What This Study Adds

- This study provides the first multi-country qualitative assessment of VHF preparedness and response in West Africa, synthesizing insights from 15 ECOWAS member states and key regional partners a decade after the Ebola outbreak.
- It documents tangible progress in the institutionalization of emergency coordination through Public Health Emergency Operations Centers (PHEOCs), expansion of surveillance and laboratory networks, and the integration of community engagement strategies into preparedness and response plans.
- The analysis identifies persistent bottlenecks, particularly weak cross-border implementation, inequitable laboratory coverage, and dependence on external financing, and proposes actionable recommendations for sustainable, regionally coordinated epidemic preparedness and response.
- By framing lessons learned within the context of the Africa CDC's New Public Health Order, the study offers evidence to guide policy reforms and strengthen collective health security across the ECOWAS region.

Conflict of Interest Statement

The authors have no relevant financial or non-financial interests to disclose.

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Authors' contributions

VL contributed to the conceptualization, methodology, writing review, and editing, and workshop coordination; AU was responsible for formal analysis, investigation, writing original draft, and data curation; OO contributed to writing original draft and data curation; IS participated in writing review and editing, and supervision; and MA contributed to validation, review, and editing, and supervision. All authors read and approved the final manuscript.

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