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BRIDGING HUMAN, ANIMAL, AND ENVIRONMENTAL HEALTH FOR SUSTAINABLE DISEASE CONTROL IN WEST AFRICA

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ABSTRACT

This study examined the dynamics of zoonotic disease control in West Africa, with a focus on integrating human, animal, and environmental health through the One Health framework. A narrative literature review was employed, synthesizing data from outbreak reports, peer-reviewed studies, and policy documents published between 2000 and 2023. Findings revealed that zoonotic diseases accounted for one-third of public health emergencies in the region between 2001 and 2022, with Lassa fever and Ebola constituting the most critical threats. Lassa fever remained endemic, with 1,615 confirmed cases reported in 2021. The Ebola outbreak between 2013 and 2016 led to 28,652 confirmed cases and 11,325 deaths. Key drivers of disease emergence included deforestation, livestock intensification, wildlife trade, migration, and weak cross-border surveillance. Regional initiatives, such as the Regional One Health Coordination Mechanism, enhanced preparedness but were hampered by fragmented governance, limited workforce capacity, and resource constraints. The findings suggested that sustainable disease control required multisectoral collaboration, climate-sensitive forecasting, and strong community engagement. Embedding One Health within national and regional policies was identified as an urgent priority to strengthen health security, build resilience, and reduce the socio-economic burden of future epidemics.

Keywords: Zoonotic Diseases, One Health, Public Health Emergency, Sustainable Disease Control, Multisectoral Collaboration, Health Security

INTRODUCTION

The Economic Community of West African States (ECOWAS), comprising fifteen member states, has long faced the heavy burden of zoonotic diseases. Human–animal interactions were every day, and livestock production accounted for about 40% of the region's GDP, varying between 10% and 80% depending on the country (Balehegn et al., 2021). People in rural areas, especially hunters, often come into contact with wild animals, increasing the risk of diseases spreading from animals to humans.

Between 2012 and 2022, zoonotic outbreaks increased by 63% compared with 2001–2011, and from 2001 to 2022, such outbreaks accounted for 33% of public health emergencies in the region (Moyo et al., 2013). The impact was profound, with fatalities among humans and animals, increased morbidity, economic disruption, and heavy burdens on fragile health systems. Emerging and re-emerging zoonotic diseases, Ebola, Lassa fever, yellow fever, monkeypox, and rabies posed major health threats, including Rift Valley fever, malaria, tuberculosis, and trypanosomiasis. Lassa fever, an acute viral hemorrhagic fever, has become endemic across West Africa, causing up to 500,000 cases annually and an estimated 5,000 deaths (Sogoba et al., 2012). The persistence of the disease was linked to *Mastomys natalensis*, the primary reservoir host, and was intensified by migration and possible airborne transmission (ECDC, 2016; Danny et al., 2019).

The 2013–2016 Ebola outbreaks was even more devastating, impacting Guinea, Liberia, Sierra Leone, Mali, Senegal, and Nigeria. The outbreak resulted in 28,652 confirmed cases and 11,325 deaths, including 518 healthcare workers (Ohimain & Silas-Olu, 2021). It also had a significant economic impact, resulting in a $2.2 billion decline in GDP in 2015 and total costs of approximately $54 billion between 2014 and 2016 (Onyekuru et al., 2023). These crises exposed severe weaknesses in health systems and underscored the need for integrated frameworks to enhance disease preparedness and response. This paper explored how the One Health approach, integrating human, animal, and environmental health, could provide sustainable solutions to these persistent challenges.

MATERIALS AND METHODS

This study employed a narrative literature review to analyze zoonotic disease control in West Africa. The review synthesized academic publications, official outbreak reports, and regional and global policy documents, with priority on works published between 2000 and 2023. The sources included peer-reviewed journals listed in PubMed, Scopus, and Web of Science, as well as reports from organizations such as the WHO, FAO, OIE, ECOWAS, Africa CDC, and the World Bank. The review process targeted four main thematic areas:

i. Epidemiology and burden of zoonotic diseases in West Africa.
ii. Drivers of disease emergence and transmission.
iii. Institutional frameworks and health system responses.
iv. The conceptual and operational relevance of the One Health approach.

Data from outbreak records (e.g., Africa CDC, WHO situation reports, ECOWAS surveillance summaries) were compiled to highlight morbidity, mortality, and geographic distribution as observed across the fifteen (15) ECOWAS nations illustrated in the west African map below (Fig 1). A qualitative approach was used to identify common themes and system-wide challenges, while case studies on Ebola (2013–2016) and Lassa fever (2016–2021) added detailed context.

Figure 1: Map of West Africa

RESULTS AND DISCUSSION

Zoonotic diseases were confirmed as a significant source of public health emergencies in West Africa. Table 1 presented the findings between 2001 and 2022, these events accounted for one-third of all crises, with reported outbreaks increasing by 63% between 2012 and 2022 compared to the previous decade (Moyo et al., 2013).Lassa fever remained a persistent problem, with Nigeria recording a total of 2787 confirmed cases and 516 deaths reported in Nigeria from December, 2016 to September, 2020. Increase in number of cases and deaths were observed with 298, 528, 796 and 1165 confirmed cases and 79, 125, 158 and 158 deaths in 2017, 2018, 2019 and 2020 respectively (Table1 below) (Africa CDC, 2021; Mba et al., 2020). The disease spread widely because the rodent *Mastomys natalensis* is common, and the absence of effective vaccines and treatments worsened the situation.

Table 1: Trends in Zoonotic Disease Outbreaks and Lassa Fever Cases in West Africa (2001–2022)

Year Range	Share of Total Public Health Crises	Increase in Outbreaks (%)	Key Zoonotic Disease Example (Nigeria)
2001–2011	—	Baseline	Lassa fever (578 confirmed cases in 2019)
2012–2022	≈33% of all crises	+63%	Lassa fever (1,615 confirmed cases in 2021)

Sources: Moyo et al. (2013); Africa CDC (2021); Mba et al. (2020)

The Ebola epidemic of 2013–2016 represented the most severe outbreak in the region's history as revealed in the Table 2. The outbreak affected six countries, resulting in more than 11,000 deaths, including those of healthcare workers, and severely impacted national economies (Ohimain & Silas-Olu, 2021; Onyekuru et al., 2023). It also revealed severe weaknesses in disease monitoring, preparedness, and response, leading to the establishment of global systems, such as the WHO Health Emergencies Program.

Table 2: Progressive Increase in Morbidity and Mortality Rates of Ebola & Lassa Fever in West Africa

Country (Region)	Disease / event (period)	Reported confirmed cases (Cumulative)	Reported deaths
Guinea (West Africa)	Ebola (2014–2016)	3,800 (WHO/CDC aggregated country reporting part of the 28,600-regional total).	2,500 deaths (country figure from country reports; part of 11,325 region total).
Liberia (West Africa)	Ebola (2014–2016)	10,600 (country cumulative as reported during the outbreak; part of regional total).	4,800 deaths (country cumulative).
Sierra Leone (West Africa)	Ebola (2014–2016)	14,000 (country cumulative; part of the 28,600-regional total).	3,900 deaths (country cumulative).
Nigeria (West Africa)	Lassa fever (2017)	298 confirmed cases	79 deaths
	Lassa fever (2018)	528 confirmed cases	125 deaths
	Lassa fever (2019)	796 confirmed cases	158 deaths
	Lassa fever (2020)	1165 confirmed cases	158 deaths

Furthermore, the 2021 report of the African CDC revealed that both morbidity and mortality rate from 2016 – 2021 concerning cases of Emerging and re-emerging zoonotic diseases, Lassa fever, yellow fever, monkeypox, rabies, Rift Valley fever, malaria, and tuberculosis in the west African region particularly in Nigeria, has been at its all-time high with almost 1200 confirmed cases of zoonotic related ailment and 200 death recorded in the year 2020 alone.

The figure 2 illustrated the trend of Lassa fever morbidity and mortality rates across selected West African countries between 2016 and 2021. The blue bars represented confirmed morbidity cases, while the orange bars indicated mortality (death) rates. Nigeria consistently recorded the highest number of confirmed cases and deaths throughout the period, with a remarkable surge in 2019 and a peak in 2020 when confirmed cases exceeded 1,000. Other countries such as Liberia, Benin, Guinea, and Sierra Leone reported

comparatively lower figures, showing sporadic occurrences of the disease. Overall, the figure showed that Lassa fever remained a persistent and growing public health concern in Nigeria and neighboring West African countries during the study period.

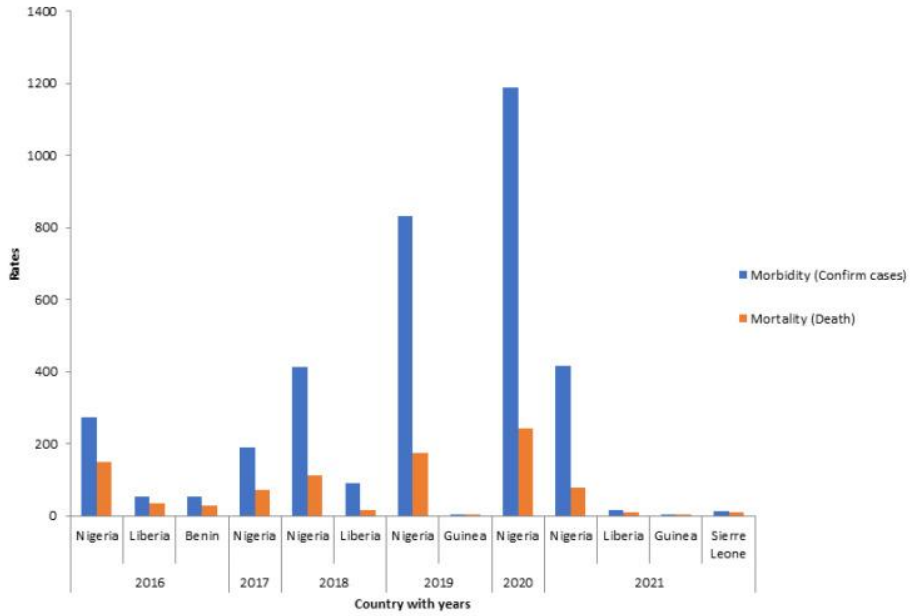

Figure 2: Morbidity and Mortality Rates of Lassa Fever in West Africa from 2016 to 2021

The results presented in Table 3 revealed that environmental, social, and economic factors played major roles in facilitating the spread of diseases from animals to humans. The table below provides a summary of these factors and their implications. In summary, the findings demonstrated that ecosystem disturbances, increased wildlife exploitation, and intensive farming practices jointly amplified the risks of zoonotic disease outbreaks across West Africa.

Table 3: Environmental, Social, and Economic Factors Influencing the Spread of Zoonotic Diseases

Factor Category	Key Description	Implications / Reference
Environmental Factors	Deforestation and land-use changes disrupted natural ecosystems, reduced biodiversity, and brought humans into closer contact with wildlife that carried infectious diseases.	Increased zoonotic spillover risks (Newbold et al., 2015; Gibb et al., 2020)
Social Factors	The expansion of the wildlife trade, which increased fivefold since 2005, intensified contact between humans and wild animals, increasing the potential for disease transmission.	Higher exposure to zoonotic pathogens (Scheffers et al., 2019)
Economic Factors	Intensive livestock farming and overcrowded farm environments facilitated the transmission of diseases between animal species and from animals to humans.	Enhanced cross-species transmission (Jones et al., 2013)

Urbanization and population growth heightened vulnerability by driving people into high-density settlements with poor sanitation and limited access to health services (Hui, 2006). According to the United Nations Department of Economic and Social Affairs (UN DESA, 2022), the urban population of West Africa had increased from 31% in 1990 to over 52% by 2020, representing more than 230 million people living in cities. This rapid and largely unplanned urban expansion placed tremendous pressure on basic infrastructure. In countries such as Nigeria, Ghana, and Sierra Leone, urban growth rates exceeded 4% annually—one of the highest in the world—while only about 60% of city residents had access to improved sanitation facilities (World Bank, 2021).

During the 2014–2016 Ebola outbreak, densely populated urban centers such as Monrovia and Freetown reported transmission rates nearly twice as high as rural districts, underscoring how urban crowding and poor waste management accelerated the spread of infectious diseases (WHO, 2016). Migration, both planned and unplanned, further compounded these risks. The International Organization for Migration (IOM, 2020) estimated that intra-regional migration in West Africa involved over 9 million people annually, often through informal border crossings lacking adequate health screening. Porous frontiers—over 5,000 kilometers of largely unmonitored borders across the ECOWAS region—allowed the movement of people, animals, and goods without coordinated surveillance systems (ECOWAS, 2019).

Consequently, population pressure, inadequate sanitation, and unregulated migration collectively increased the likelihood of

cross-border disease spread, illustrating the complex human dimensions that underpinned zoonotic and epidemic vulnerabilities in West Africa.

Efforts to operationalize the One Health framework had gained significant momentum following the establishment of the Regional One Health Coordination Mechanism (R-OHCM) in 2017. The mechanism served as a pivotal platform for fostering cross-border collaboration among ECOWAS member states and for strengthening the collective capacity to manage zoonotic and emerging diseases. Through its coordinated structure, the R-OHCM enhanced information sharing, harmonized surveillance systems, and facilitated joint outbreak preparedness and response efforts.

In addition to its role in surveillance, the platform supported sustained capacity building through regional training programs, simulation exercises, and the development of joint strategic plans. It also advanced regional initiatives addressing antimicrobial resistance (AMR) and promoted coordinated control of trans boundary animal diseases such as *Peste des Petits* Ruminants (PPR) and Foot-and-Mouth Disease (FMD). These interventions collectively strengthened multi sectoral cooperation across human, animal, and environmental health domains, representing a major step toward institutionalizing the One Health approach in West Africa.

However, there were still major gaps in translating the One Health plans into sustained action across the region. Progress had been slowed by weak inter sectoral coordination, limited financial resources, and shortages of skilled personnel, particularly in veterinary and environmental health services (FAO, OIE & WHO, 2019). According to the World Bank (2018), fewer than 45% of ECOWAS member states had functional multi sectoral coordination frameworks linking human, animal, and environmental health. Many national One Health platforms existed largely on paper, with limited authority or dedicated budgets to implement regional strategies.

The Food and Agriculture Organization (FAO, 2020) reported that only six of the fifteen ECOWAS countries possessed fully equipped veterinary laboratories capable of conducting molecular diagnosis for zoonotic pathogens, while several relied on international reference labs for sample confirmation. This gap significantly delayed disease detection and response. Similarly, the World Organisation for Animal Health (OIE, 2021) found that fewer than 30% of laboratories in the region met minimum biosafety and biosecurity standards, reflecting systemic weaknesses in laboratory infrastructure and human resource development.

Advocacy and communication were also underdeveloped. A survey by Rwego et al. (2016) revealed that less than one-third of One Health stakeholders in West Africa reported regular cross-sectoral communication, while environmental health professionals remained largely excluded from national coordination mechanisms. The absence of standardized reporting tools further reduced data comparability and hindered evidence-based decision-making. Consequently, these structural and operational limitations collectively constrained the region's capacity to respond promptly and effectively to zoonotic and emerging disease threats.

This review showed that One Health approach can be the silver bullet that addresses disease risks (Destoumieux-Garzón et al., 2018). Fostering teamwork across different sectors, sharing knowledge, and engaging communities help address the environmental and social causes of diseases that pass from animals to people.

CONCLUSION

The complex and interweaved health challenges in West Africa demand a synchronized One Health strategy which integrates human, animal, and environmental health together in order to efficiently manage zoonotic and environmental diseases. Despite growing recognition of this approach, progress remains constrained by fragmented governance, weak monitoring systems, limited cross-sector collaboration, and inadequate resources. Achieving sustainable disease control requires targeted investment in local capacity building, intersectoral education, and the use of digital tools for real-time surveillance and environmental management. Embedding this integrated framework into national and regional health systems will strengthen preparedness, enable early detection, and enhance resilience against future pandemics ultimately reinforcing regional health security and advancing sustainable development across the continent.

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