# Setting the stage for Acute Febrile Illness Surveillance Network in West Africa: Report of a Regional Experts and Stakeholders Workshop in Accra, Ghana, April 2021

*Aishat Bukola Usman[&1], Muhammad Shakir Balogun[1], Moreen Kamateeka[1], Ernest Kenu[2], Virgil Loukossou[3], Ditu Kazambu[4], Simon Antara[4], Patrick Mboya Nguku[1]*

[1]African Field Epidemiology Network, Abuja Nigeria, [2]University of Ghana, Accra Ghana, [3]West African Health Organization, Abuja Nigeria, [4]African Field Epidemiology Network, Kampala Uganda

**KEYWORDS:** Acute Febrile Illness, Surveillance, West Africa

## ABSTRACT

A three-day regional workshop of stakeholders, partners, and experts from the West African countries was held from April 14 -16, 2021 in Accra, Ghana to conduct a situational analysis on the existing knowledge, expertise, previous accomplishments, and current activities in laboratory and syndrome based Acute Febrile Illness (AFI) surveillance that will guide a regional strategy for AFI surveillance. Technical presentations were made by participants from ministries of health, national public health institutes, West African Health Organization, Food Agricultural Organization, and the United States Centers for Disease Control and Prevention (USCDC) on existing AFI surveillance activities and infrastructure. In groups, the participants conducted Strength, Weaknesses, Opportunities and Threat (SWOT) analysis on AFI surveillance followed by a prioritization of actionable steps. Thirty-eight participants from 9 West African countries attended the meeting. The strengths recognized from the SWOT analysis include the existence and implementation of Integrated Disease Surveillance and Response (IDSR) within the region for priority diseases and a regional collaborative platform. However, there was inadequate information and data sharing platforms, non-availability of accurate diagnostic tools, knowledge gap on AFI and lack of harmonized framework. The opportunities that can be tapped into include supporting partners and global bodies, existing laboratory networks in Africa and infrastructure built during the COVID-19 pandemic. The meeting unveiled opportunities and challenges associated with establishing a regional AFI surveillance framework. It provided opportunity for stakeholders and experts to discuss the way forward on laying a foundation for a regional AFI surveillance system in the region.

**[&]CORRESPONDING AUTHOR**
Aishat Bukola Usman, 50 Haile Selassie Street Asokoro Abuja, Nigeria. ausman@afenet.net

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## Introduction

Acute febrile illness is said to occur when a fever develops suddenly; specifically, the body temperature rises above 37.5 degrees Celsius (99.5 degrees Fahrenheit) [1]. This can be with localizing symptoms (e.g., diarrhea, cough or other respiratory symptoms, neurological manifestations) or without localizing symptoms (undifferentiated AFI) and is a common manifestation of a variety of treatable and preventable infectious diseases. Some of the common diseases that can present as AFI include malaria, dengue, typhoid, chikungunya, leptospirosis, scrub typhus, influenza, encephalitis, histoplasmosis, enteric fever, rickettsiosis, Hantavirus, and many others.

In many low-income countries in sub-Saharan Africa (SSA) and other regions, AFI is a leading reason for medical consultation and hospital admissions [2]. Undifferentiated AFI is a common manifestation of a wide spectrum of treatable and preventable diseases that present with acute onset of fever, lacking any localizable organ or system-specific signs or symptoms. The frequency and underlying etiologies of AFI vary geographically as well as seasonally and can be impacted over time by factors such as vaccinations, environmental changes, and economic development. Given the diversity of potential etiologies of AFI (which include bacteria, fungi, viruses, and protozoa), definitive diagnosis presents a major challenge in settings with limited diagnostic capacity. Consequently, in such settings, cases of AFI are largely managed empirically and most often treatments given may be inappropriate, resulting in poor treatment outcomes, increased morbidity, and mortality as well as associated resource wastage. For example, in Nigeria, in 2019 alone, over 28 million cases of fever (among under 5 years old and adults) were reported. Only 31% of fever cases reported were tested by malaria rapid test (RDT) and yet over 18 million patients were treated with Artemisinin Based Combination Therapy (ACTs)[3]. A study conducted in Liberia among 246 patients admitted and treated for severe malaria reported 33% tested negative by rapid diagnostic test and blood smear for malaria. The case fatality rate was higher for the patients who tested negative for malaria (4.9%) versus those who tested positive (0.6%). Children who tested negative for malaria showed evidence of undiagnosed Salmonella typhi infection and dengue virus. These results suggest that malaria may be over-diagnosed and that the diagnoses of other infectious diseases, which present in a similar fashion, may be neglected [4]. It is also important to note that emerging and re-emerging epidemic prone infectious diseases usually present with non-specific symptoms, with typical sudden onset of fever, headache and malaise and may be managed as AFI without laboratory diagnosis. As such, infectious disease outbreaks may occur undetected and spiral out of control. The 2019 global corona virus disease (COVID-19) outbreak is a good case in point.

Although AFI presents a significant burden to the health systems in West Africa, there is paucity of AFI epidemiologic data and there are no structured surveillance systems for this condition. Establishing an AFI surveillance system would build capacity for timely diagnosis of infectious etiologies of epidemic potential and generate important data to inform effective infectious disease prevention and control.

To this end, the US CDC supported African Field Epidemiology Network (AFENET) to leverage on existing country based AFI surveillance activities in the West African Region and improve surveillance and laboratory capacity to describe AFI etiologies, including the prevalence and active circulation of these etiologies, and other diseases of public health importance in the region. This work will serve as the foundation for the development of a coordinated AFI regional surveillance strategy in the West Africa Region using the lessons learned in individual country activities to coordinate the development of standardized protocol and harmonized methodologies to guide AFI surveillance implementation. A three-day regional meeting of stakeholders, partners, and experts in AFI surveillance from the West Africa Region countries was conducted to understand West Africa landscape regarding AFI surveillance; assess existing surveillance and laboratory capacities; conduct a situational analysis on the existing knowledge and expertise on AFI surveillance that will guide a regional strategy for AFI surveillance in the region.

## Meeting Structure

*Participants*

The meeting had thirty-eight participants from nine West African countries **Figure 1**. Participants for this workshop were selected based on their experience and expertise on Acute febrile illness and

disease surveillance. These included a unique combination of stakeholders, including Directors of Surveillance, AFI project coordinator/focal persons, researchers, and non-government organizations across targeted countries. The representatives from partners who had worked on Acute febrile illness and related activities in the region and were in attendance included the Ghana Health Service, Nigeria Centre for Disease Control, West African Health Organization, West African Centre for Cell Biology of Infectious Pathogens, Noguchi Memorial Medical Institute, African Field Epidemiology Network (Ghana, Nigeria and Uganda), NAMRU3, Food And Agricultural Organization, United States Centers for Disease Control and Prevention (Nigeria, Ghana and Atlanta).

*Technical presentations*

Eleven technical presentations were made physically and virtually at the workshop for a period of two days. Participants made presentations on the existing in-country surveillance structure, laboratory capacity and partnership for AFI surveillance and AFI research through power point presentations. The US CDC presented its experience supporting AFI surveillance in different regions of the world. The presentations were followed by a question-and-answer session during which points were clarified and further points made.

*SWOT analysis*

On the third day of the meeting, participants then worked in four groups (two Anglophones and two Francophones) based on the major languages in West Africa to list and explore the strengths, weaknesses, opportunities, and threats of AFI surveillance in the West African region. Every group had a note taker and lead. The process was aided with the use of flip charts and sticker notes. Post SWOT analysis, prioritization was done using a participatory approach by giving each person in the group-colored sticky dots and have them place the dots beside the options they considered most significant. Options with the highest number of dots were harvested in each group for strength, weakness, opportunity, and threats and combined into one.

Thereafter, these were presented during a plenary discussion which was rounded off with an outline of next steps.

**SWOT Analysis and Established Priorities**

**Table 1** shows the identified strengths, weaknesses, opportunities, and threats with regards for AFI surveillance in the region. The results from the SWOT analysis prioritized **Table 2** the following strengths: Existence of regional collaborative platform, implementation of integrated disease surveillance systems and response (IDSR) technical guideline with the list of diseases or events under surveillance within the region, existence of sentinel diagnostic laboratory, existence of sentinel surveillance system, some level technical expertise and expanded facility for molecular diagnostics. The weaknesses are lack of data sharing platform, inadequate regional capacity for the development and use of diagnostics tools, accurate diagnostic tools not available and those validated not accessible, language barrier across the region, poor integration of systems, lack of adequate trained personnel, inadequate diagnostic capacity, knowledge gap on AFI, inadequate information flow, poor storage facilities, unstable power supply, poor quality management systems in the laboratories, lack of harmonized framework and limited government support.

The opportunities that can be tapped into are supporting partners and global bodies, existing laboratory networks in Africa, infrastructure built during the COVID-19, political will for COVID-19 and networking, partnership, and collaboration. Some of the threats prioritized are overdependence on external funding, unstable power supply, competing priorities, political instabilities, high cost of diagnostics and poor health seeking behavior/self-medication among fever cases. The result of the prioritization is presented with the option with the greatest number of dots harvested as shown in **Table 2**.

**Presentations and Discussion**

The technical presentations started with the overview of AFI. The presentation highlighted AFI as common cause of hospitalization and causes of severe AFI are numerous, and account for most preventable deaths in low-income countries, particularly in children. It also described the local disease prevalence globally and in West Africa. Common causative organisms of AFI in the region

can be of bacterial, viral, and parasitic origin. This was followed by a presentation was on the inventory of AFI surveillance in West Africa and highlighted the inventory process to identify published article on AFI surveillance in the region, map AFI focal persons/coordinators across the region and review available AFI surveillance protocol and guidelines. In all 51 articles were screened for the desk review and only 19 were included in the review based on the selection criteria. The 19 articles were from seven countries within the region. The countries with the most publications are Nigeria, Ghana, and Senegal. Some of the identified challenges from the countries who have implemented AFI project are delayed procurement of reagents and consumables due to difficulty in identifying vendors/distributors in the African region and Limited sampling scope/coverage and screening of targeted pathogens due to lack of funds and logistics/procurement constraints. The presentation also highlighted lessons learnt from the projects such as some emerging pathogens are circulating in children and the need for Identification and availability of national or local experts with great knowledge in TaqMan Array Card qPCR activities which include primer/probe design for specific pathogens, analysis of false positives/negatives, validation tests for the cards, and equipment troubleshooting.

After the background presentations about AFI globally and in West Africa, countries presented their experiences on AFI surveillance. Some of the countries have participated or currently implementing AFI surveillance (Mali, Liberia, Nigeria and Senegal) while some countries have not started anything on AFI. For countries currently implementing the overall goal was to characterize blood borne and respiratory borne infectious etiologies of Acute Febrile Illness (AFI) among children and adults through a hospital-based sentinel surveillance study of any patient ≥2years with documented measured axillary, rectal or oral temperature of ≥37.5 ℃ OR history of self-reported fever that had persisted for 2-7 days without an identified source. The diagnostic tool used was AFI TaqMan®Array Card (TAC) customized with acute febrile illness assays to detect pathogens (viral, bacterial, and parasitic) through real-time Polymerase Chain Reaction as prioritized by each country. More than half of these studies were fully funded by USCDC.

The U.S. CDC made a presentation on their experience and activities on AFI surveillance. The presentatation highlighted the CDC support on AFI surveillance globally and the impact of AFI surveillance for detecting emerging diseases and guiding clinical care. Presented an example of success story of Regional AFI surveillance in Central America as the first multi-country platform in Central America to combat emerging global public health threats with the identification of causes of illness previously not recognized in the region. The review of literature (2005-2020) within the Africa region shows clearly that gap still exists in terms of number of literatures from the West Africa region. Some of the CDC next steps for AFI surveillance were to support currently engaged countries to implement AFI surveillance, build capacity, and analyze and use data. Expand ongoing AFI surveillance activities to monitor and understand COVID-19 including variants (sequencing) and vaccine effectiveness. Identify countries and regions for future AFI surveillance work, securing funding and sustainability.

The existence of regional collaborative platform, existence of surveillance system that can be leveraged on, presence of academic resource, existence of improved laboratory capacity and some expertise on AFI surveillance in some countries in the region with coordination from WAHO makes AFI surveillance doable in the region to prepare and identify potential emerging and re-emerging diseases. From the discussions at the meeting, participants recognized AFI surveillance as an important component of health security architecture which should be aligned with the components of the National Action Plans for Health Security (NAPHS) such as surveillance, laboratory, workforce, AMR, One health - zoonotic hazards.

However, there is lack of data sharing platform among countries for AFI surveillance which is very crucial.

Data generated from AFI surveillance must be linked to the national data platform of each country by using available existing structure for data collection, e.g., Surveillance Outbreak Response Management and Analysis (SORMAS) as it is being used in Nigeria and Ghana.

Lack of accurate diagnostic tools, poor quality management systems in the laboratories and lack of adequately trained personnel have been identified as weaknesses. Standard laboratories with diagnostic capacities for AFI surveillance within the region is very important as laboratory is the backbone of AFI surveillance in terms of diagnosis of etiologic pathogens for AFI. Some standard laboratories within the region should be recognized and developed into centres of excellence.

Most of the countries that have conducted AFI surveillance were supported by donors and sustainability was identified as a major threat considering that the cost of TaqMan® array card which is presently being used for identification of AFI pathogens is high at around 450 USD each. The need was recognized to look for alternative diagnostics for AFI surveillance. Some of the options include the use of digital diagnosis for AFI, such as the use of a chip with a drop of blood or urine to diagnose AFI, which may be a cost-effective method. The mass production of the chip may be less than five USD. Others include the use of bead based multiplex immunoassay. The value of a general cost and cost effectiveness evaluation of the available diagnostic strategies for AFI surveillance to inform decisions on the selection of sustainable effective options was recognized.

Even though AFI surveillance systems are typically used to better understand common causes of fever. They may also be effectively leveraged to monitor activity associated with SARS-CoV-2 virus infection as fever may be part of the clinical presentation of COVID-19. In addition, AFI is an umbrella syndrome that, depending on the case definition in use, can envelop a sub-set of the surveillance population presenting with influenza-like illness (ILI) or severe acute respiratory infection (SARI), two syndromes traditionally associated with surveillance of respiratory diseases are like COVID-19.

**Next Steps**

Because of the importance of data for decision making, it was decided to conduct a baseline assessment of each country using for example the generic tools developed by the CDC.

It was decided that there is need to develop a harmonized protocol for the region with clear terms and methodologies, adopt the sentinel model for AFI surveillance in the region, and develop a monitoring and evaluation framework for this AFI regional initiative to track progress.

It was decided that WAHO should take an integral role in coordinating the regional initiative while leveraging on the existing platforms in the region. However, for the full implementation of AFI surveillance in the West African region, it was agreed that political support was critical, and it was decided that advocacy be conducted to leadership of West African countries and policy makers so that each country can take ownership of AFI surveillance.

## Conclusion

The meeting was first of its kind in the region. The meeting unveiled opportunities and challenges associated with developing regional AFI surveillance based on research and evidence. It provided opportunity for stakeholders and experts to discuss way forwards on how to have a regional surveillance system for AFI.

## What is known about the topic

- Acute febrile illness (AFI) is associated with substantial morbidity and mortality worldwide, yet an etiologic agent is often not identified.
- Acute Febrile Illness (AFI) surveillance systems are typically used to better understand common causes of fever.

## What does this study add

- The meeting unveiled opportunities and challenges associated with developing regional AFI surveillance
- It provided opportunity for stakeholders and experts to discuss way forwards on how to have a regional surveillance system for AFI

## Competing interests

The authors declare no competing interests.

## Authors' contributions

AB, MS, VL, EK, DK, MK and SA organized and helped facilitate the meeting. All authors attended the meeting in Accra and conceived the idea for this publication. AB drafted the paper, supervised by MS and PN. All authors contributed to writing the paper, read and approved the final manuscript.


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## Tables and figures

**Table 1:** SWOT analysis for AFI Surveillance in West Africa, 2021

**Table 2:** Established Priorities from the SWOT analysis

**Figure 1:** Countries represented at the regional meeting

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| **Table 1:** SWOT analysis for AFI Surveillance in West Africa,2021 | | | |
|---|---|---|---|
| **PURPOSE** | | | |
| To identify and enumerate the internal and external factors that can be leveraged upon or needed to be addressed to implement a regional AFI surveillance network | | | |
| | **STRENGTHS** | | **WEAKNESSSES** |
| 1 | Existing regional collaborative platform such as ECOWAS, WAHO, IST, Regional OH, AMR platforms and AFENET | 1 | Lack of a regional data sharing platform |
| 2 | Presence of WAHO for coordination | 2 | Inadequate regional capacity for the development and use of diagnostics tools. |
| 3 | Existence of improved laboratory capacities across member countries | 3 | Lack of accurate diagnostic tools |
| 4 | Expertise in AFI surveillance in selected countries within the region | 4 | Inaccessibility of validated tools |
| 5 | Existing surveillance systems that can be leveraged on | 5 | Language barrier across the region |
| 6 | Presence of technical expertise | 6 | Poor integration of systems |
| 7 | Institutional capacity | 7 | Lack of adequately trained personnel |
| 8 | Expanded facility for molecular diagnostics | 8 | Inadequate diagnostic capacity |
| 9 | Presence of academic resource and vast area for research | 9 | Knowledge gap on AFI |
| | | 10 | Inadequate information flow |
| | | 11 | Poor storage facilities |
| | | 12 | Unstable power supply |
| | | 13 | Poor quality management systems in the laboratories |
| | | 14 | Lack of harmonized framework |
| | | 15 | Limited government support |
| | | | |
| | **OPPORTUNITIES** | | **THREATS** |
| 1 | Supporting partners and global bodies (e.g., WHO, US CDC) | 1 | Dependence on external funding |
| 2 | REDISSE funding (World Bank credit) | 2 | Lack of country ownership of exiting systems |
| 3 | Improved political will from COVID-19 pandemic. | 3 | Poor allocation of funds to the health sector due to competing priorities. |
| 4 | Improved community awareness on health | 4 | High cost of diagnostic systems |
| 5 | Access to procurement and distribution networks | 5 | Impact of COVID-19 on world economies |
| 6 | Existing laboratory networks in Africa (e.g., ASLM) | 6 | Weak partner coordination mechanisms |
| 7 | Infrastructure built during the COVID-19 | 7 | Insecurity |
| 8 | Existence of networking, partnership, and collaboration | 8 | Poor sample transportation |
| 9 | Training capacity | | |
| 10 | Availability of some research grants | | |
| 11 | Integration with existing sentinel surveillance systems | | |

| **Table 2:** Established Priorities from the SWOT analysis |
|---|
| **ACTION ITEMS & GOALS BASED ON PRIORITY** |
| ***Which opportunities should we pursue? How can we use our strengths to help us succeed?*** |
| With the coordination of WAHO, we will leverage on the existing partnerships with the WHO, US CDC, AFENET, the existing laboratory networks in Africa (e.g., ASLM), the infrastructure quickly developed since the COVID-19 response started, riding on the current political will for COVID-19, to develop the framework and implement a regional network for AFI surveillance. |
| ***Which weaknesses can be worked on to help maximize success?*** |
| We will have to build the capacity of clinical and laboratory personnel as well as surveillance officers to successfully implement an AFI surveillance system across the region. We will need to conduct advocacy for increased funding for surveillance and laboratory diagnostic capacity for AFI pathogens from leadership of West African countries. We will also need to develop a regional data sharing platform to facilitate collaboration. |
| ***What strategies can we put into place to be prepared for threats?*** |
| Sustainability is a major threat. We decided to conduct advocacy to policy makers and political leaderships to prioritize AFI surveillance, own it and provide funding for it and reduce dependence on external donors. We will explore more cost-effective alternatives for the laboratory diagnosis of AFI. |

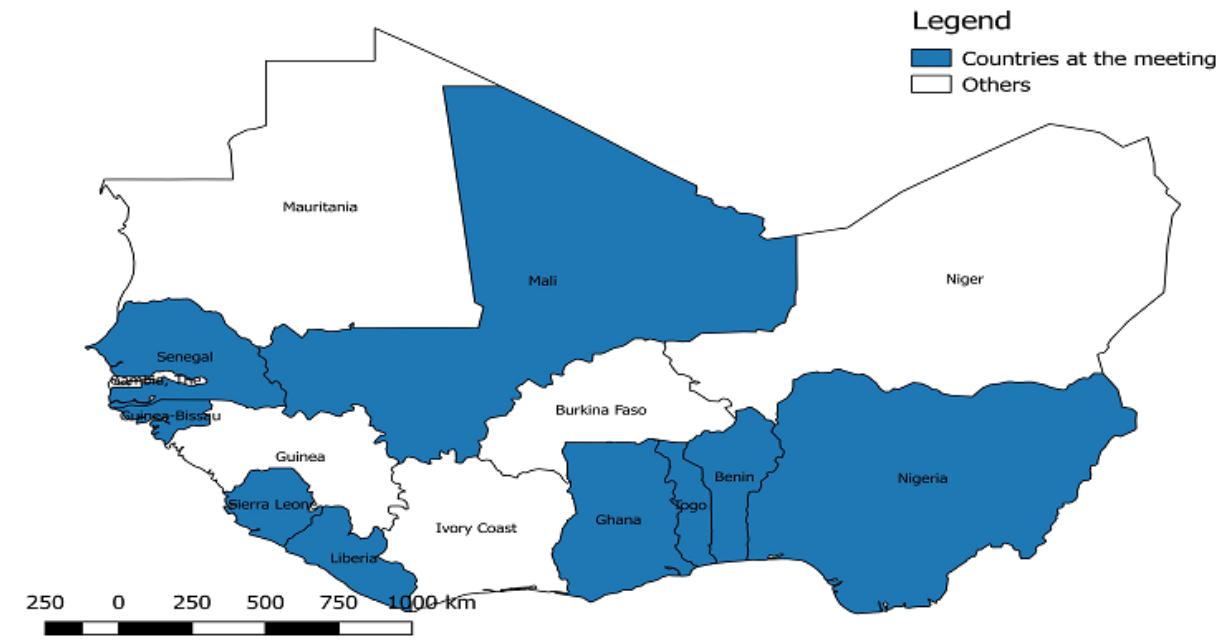


**Figure 1:** Countries represented at the regional meeting