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Article

Level of Community Health Worker's Involvement in Yellow Fever Surveillance in the North West Region of Cameroon

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Abstract: Yellow fever surveillance is essential for early outbreak detection and timely interventions. Community health workers (CHWs) are critical to this effort, yet their participation remains underexplored in the North West Region of Cameroon. This study aimed to assess the involvement of CHWs in yellow fever surveillance from 2021 to 2024, focusing on health districts in the region. Data from surveillance reports, notification forms, and interviews with health personnel (HPs) and CHWs were analyzed using descriptive statistics and geographic mapping. Of 427 suspected yellow fever cases, 419 were reported by HPs and only 8 by CHWs, indicating a 2% community involvement rate. These findings highlight an underutilization of CHWs in surveillance efforts, underscoring the need for better integration, training, and support to enhance community-level disease monitoring. Strengthening CHW participation could improve the effectiveness of yellow fever surveillance and outbreak response in the region.

Keywords: Community Health Worker, Health Personnel, Yellow fever Surveillance, North West Region, Cameroon.

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1. Introduction

Yellow fever remains endemic in sub-Saharan Africa and South America, the yellow fever virus has periodically stricken human and nonhuman primates' populations, its urban and jungle hosts, when epidemics and/or epizootics are registered, respectively [1]. The World Health Organization (WHO) estimates that yellow fever causes about 84,000–170,000 severe cases with about 60,000 deaths globally every year, of which more than 90% occur in Africa [2]. Control strategies include effective and timely yellow fever surveillance, strengthening laboratory services; high-coverage yellow fever routine immunization; fast and comprehensive response to yellow fever outbreaks including easy access to vaccines for mass vaccination campaigns, improved and timely supportive management of cases, social mobilization, communication and effective vector management [3].

Over the past 40 years, many African countries have witnessed a series of yellow fever outbreaks [4]. The most recent large outbreak of yellow fever in Africa started in Viana Municipality, Luanda Province, Angola, in December 2015. According to the WHO yellow fever situation report of September 23rd, 2016, there have been 6890 reported cases and 492 deaths of yellow fever since the onset of the outbreak. Of this, 960 were confirmed

cases with 137 deaths among the confirmed cases [5]. The Angolan outbreak spread extensively to the Democratic Republic of Congo (DRC) with other countries such as China receiving infected travelers which were the first yellow fever cases reported in China. The 2016 yellow fever outbreak linked two urban yellow fever outbreaks - in Angola and DRC. The epidemic created an urgent need for more than 28 million doses of yellow fever vaccines which exhausted the existing global vaccine supply [6].

In July 2016, there were reports of ongoing autochthonous (reintroduction of yellow fever into areas where it can survive, having been previously eliminated) outbreaks of yellow fever which included 68 cases and seven deaths in Uganda, 22 cases and five deaths in Ethiopia and four cases in Ghana [7]. Public health surveillance is typically defined as the ongoing, systematic collection, analysis, interpretation, and dissemination of data regarding a health-related event for use in public health action to reduce morbidity and mortality and improve health. The establishment of effective community-based surveillance is an essential objective of all disease surveillance systems [8]. In response to the frequent outbreaks of preventable diseases in the African Region, the Integrated Disease Surveillance and Response (IDSR) strategy was endorsed by Member States in September 1998. The Integrated Disease Surveillance and Response framework forms the cornerstone of efficient and effective disease control strategies globally [9]. However, successful implementation of IDSR requires extensive community involvement to ensure timely reporting, surveillance, and response to disease outbreaks.

Dr. Franklin Asiedu-Bekoe, Head of the Disease Surveillance Department, discussed the history of community-based surveillance in Ghana and its impact on disease elimination. He highlighted the challenges, including sustainability and lack of clear structures, and proposed steps to strengthen CBS, such as updating the volunteer roster and defining a list of priority diseases for surveillance. Dr. Mireille Randria, Chief of Epidemiological Surveillance, provided an overview of the challenges facing Madagascar in terms of epidemiological surveillance. These challenges include low-performance indicators due to weak leadership and governance resulting from frequent changes in the organizational structure of the Ministry of Health. This has made it difficult for the entities responsible for epidemiological surveillance to establish effective leadership. Additionally, there is weak integration, with several specific directorates and programs operating within the surveillance sector. Other challenges include a lack of trained personnel, geographical isolation, and limited means of communication.

In South Africa, the Primary Health Care Re-Engineering Model, established in 2010, emphasizes community-based care, integrates healthcare with health promotion, and involves Ward-based PHC Outreach Teams (WBPHCOTs) to provide health promotion at the household and community levels [10]. The CHW's main focus is to promote health and support vulnerable individuals and families, emphasizing the importance of a healthy individual, family, community, and environment [11, 12]. Community involvement in health activities is a proven approach to addressing healthcare issues and has been long utilized in HIV prevention in the United States and the development internationally, in projects varying from sanitation to sanitation to child survival, clean water, and health infrastructure. However, the quality of participation varies from project to project.

Moreover, despite the failure of many health programs without the participation of the target communities, some professionals continue to question the value of community members' participation in program design, implementation, and evaluation [13]. Community-based surveillance (CBS) is defined by the WHO as: '…the systematic detection and reporting of events of public health significance within a community-by-community members [14]. Though CBS is often designed for the routine detection and reporting of infectious diseases, it is a potentially versatile and scalable intervention and has been used for the detection and reporting of non-communicable diseases [15].

Pandemics begin and end in communities, so to prevent and manage them, community engagement must be a priority [16]. CHWs like Maimuna have traditionally been utilized to improve community health initiatives and fill gaps within the health care system. They have historically been involved in disease eradication initiatives such as poliomyelitis and measles, programs for disease control (HIV/AIDS, Malaria, and Tuberculosis), and early warning systems and responses to public health emergencies. In Africa, one of the main lessons learned from the 2014-2016 Ebola virus disease outbreak is that communities have a key role to play in Global health security (GHS). During the outbreak, to contain the disease, the government of Sierra Leone, with support from the United Nations Population Fund and other partners, implemented responses at the community level.

The CHWs, like other prominent community leaders, such as teachers and faith leaders, often serve as trusted voices in the community and are well placed to detect and monitor health events in the community, mobilize community action, distribute health information during outbreaks and request national assistance and emergency resources to protect public health [17]. Community-based surveillance may improve early detection and response to disease outbreaks by leveraging the capacity of community members to carry out surveillance activities within their communities. In 2021, the WHO published a report detailing the evidence gaps and research priorities around community-centered approaches to health emergencies [18]. In this study, the drivers of success were found to map closely to principles of participatory community engagement with success factors reflecting high levels of acceptability, collaboration, communication, local ownership, and trust.

They suggested that investment in participatory community engagement more broadly may be a key surveillance preparedness activity [18]. In the study conducted in North America and Europe, in 2014, by adapting tick surveillance methodology to incorporate contributions and participation from community volunteers in response to local and individual interests and needs, they maintained useful submissions over a multi-year period [19]. Most importantly, the partnership between community members and researchers has proven a powerful tool in educating communities about the risk of tick-vectored diseases and in encouraging tick bite prevention. CHWs encounter challenges due to unclear job descriptions, lack of training and supervision, and an increased workload [20-26]. CHWs play a vital role in primary healthcare due to their proximity to households, communities, and the healthcare system. This study therefore set out to determine the level of community health workers' involvement in yellow fever surveillance in the West Region of Cameroon.

2. Materials and Methods

Study participants/Design

The study setting was in the North West Region of Cameroon involving all the 21 health districts in the region. Participants were CHWs and HPs involved in the surveillance of yellow fever in the different health districts of the North West Region of Cameroon. Since the study was to evaluate the effectiveness of CHWs and HPs in the surveillance of yellow fever in the North West Region of Cameroon and to determine the sensitivity of the surveillance system by identifying the initial reporters of yellow fever cases, we conducted a descriptive cross-sectional study. We collected secondary data collection from health district records. Following the Expanded Program on Immunization in Cameroon, once a case is notified, during investigation it is indicated who first saw the case. The person who first saw the case and alerted the hierarchy for investigation is what we considered to determine the sensitivity of the stakeholders involved.

Ethical considerations

Approval to carry out this study was obtained from the Institutional Review Board (IRB) of the University of Bamenda (Ref No 2024/0006H/UBa/IRB). Administrative clearance was obtained from the Regional Delegation of Public Health for the North West Region (Ref No 349/ATT/NWR/RDPH/BRIGAD). Written informed consent was obtained from all the district medical officers, the head of the unit for surveillance at the Regional delegation, and the personnel for the center of collection of biological specimens. To ensure confidentiality all data was anonymized to protect the privacy of individuals involved.

Data collection procedure

The data for this study was meticulously gathered by the principal investigator along with four trained field surveyors. The team utilized a structured questionnaire, which was rigorously pre-tested and subsequently refined to ensure its suitability for this study. The questionnaire was administered at both the district health services and the surveillance units of the Regional Delegation of Health for the North West Region, Cameroon

The data Collection Process involved:

1. Field Visits:
    a. Data collectors conducted field visits to gather information from the reports submitted by health units to the district level.
    b. At the regional level, data was extracted from the reports submitted by the districts to the regional health authorities.
2. Source of Data:
    a. The data was derived from investigation forms that are submitted whenever a case is suspected.
    b. These forms include detailed records of the initial notification of the case, specifying whether the notifier was a community health worker or a health personnel.
3. Data Extraction and Tallying:
    a. During the field visits, data collectors tallied the individuals who first notified the suspected cases, categorizing them as either community health workers or health personnel.
    b. This process ensured accurate and comprehensive data collection, facilitating a thorough analysis of the notification patterns.

To maintain the integrity and reliability of the data, the structured questionnaire underwent a pre-testing phase. Feedback from this phase was used to make necessary modifications, ensuring the questionnaire was well-tailored to the study's objectives

Statistical analysis

The collected data were first screened using Excel to remove incomplete or poorly filled questionnaires. Then, the data were coded and entered into a pre-designed and tested data template in SPSS version 25 to facilitate analysis. Frequency distribution tables were used to summarize descriptive characteristics and categorical variables. Additionally, measures of central tendency and dispersion, such as the Interquartile Range (IQR) and Standard Deviation (SD), were calculated to provide a deeper understanding of the data distribution. Statistical significance was assessed using p-values, with a threshold of 0.05 to determine significant differences or associations within the data.

3. Results

Total number of suspected cases of yellow fever notified by community health workers and Health Personnel from 2021 to 2024 in the North West Region.

Table 1 below, summarizes the number of suspected yellow fever cases reported by HPs and CHWs, along with the Interquartile Range (IQR), Standard Deviation (SD), and P-values for the years 2021 to 2024. The interquartile range (IQR) shows the variability of suspected yellow fever cases within each year: 2021: IQR of 6 indicates moderate variability, 2022: IQR increased to 8, suggesting greater variability, 2023: IQR remained at 8, consistent with 2022 and 2024: IQR decreased to 4, showing reduced variability.

The standard deviation (SD) measures how spread out the suspected cases are around the mean: 2021: SD 6.9 shows considerable dispersion, 2022: SD increased to 7.5, reflecting higher variability, 2023: SD decreased to 5.6, indicating reduced dispersion and 2024: SD further decreased to 3.2, showing much lower variability. P-values help determine the statistical significance of differences observed between consecutive years: 2021 vs 2022: P=0.05, a significant increase in suspected cases, 2022 vs 2023: P=0.01, highly significant change in suspected cases and 2023 vs 2024: P=0.03, a significant reduction in suspected cases.

Table 1. Yellow Fever suspected cases notified by CHW and HP in NWR 2021

Year	HP Cases	CHW Cases	IQR	SD	P-value (compared to previous year)
2021	96	0	6	6.9	-
2022	146	3	8	7.5	0.05
2023	117	3	8	5.6	0.01
2024	60	2	4	3.2	0.03

HP: Health personnel, CHW: community health workers

Total suspected cases of Yellow Fever notified by community health workers and Health Personnel 2022 in the North West Region.

The table below presents the reported cases of Yellow Fever (YF) across various districts, categorized by notifications from Health Personnel (HP) and Community Health Workers (CHW). The district of Wum reported the highest number of cases (24), with some involvement of CHWs (1 case). Bamenda and Bamenda 3 also had high numbers of cases, 20 and 18 respectively, but no CHW involvement. Districts like Bafut, Kumbo East, and Nkambe reported moderate numbers of cases, all managed solely by HP. Several districts, including Ako, Bali, Ndop, and Ndu, reported low numbers of cases with no CHW involvement. Notably, Misaje reported no cases. Tubah had a moderate number of cases (5) with some CHW involvement (2 cases). Overall, the total number of cases reported by HP was 146, while CHWs reported 3 cases. This distribution highlights the varying levels of Yellow Fever incidence and the roles of HP and CHWs in different districts.

Table 2. Yellow Fever suspected cases notified by CHW and HP in NWR 2022

SN	District	Total Yellow fever cases notified	
		HP	CHW
1	Ako	2	0
2	Bafut	10	0
3	Bali	1	0
4	Benakuma	4	0
5	Batibo	6	0
6	Bamenda	20	0
7	Bamenda 3	18	0
8	Fundong	3	0
9	Mbengwi	6	0
10	Kumbo East	16	0
11	Kumbo West	6	0
12	Ndop	2	0
13	Nwa	4	0
14	Njikwa	1	0
15	Nkambe	12	0
16	Ndu	2	0
17	Misaje	0	0
18	Oku	3	0
19	Tubah	5	2
20	Santa	1	0
21	Wum	24	1
	TOTAL	**146**	**3**

HP: Health personnel, CHW: community health workers

Total suspected cases of Yellow Fever notified by community health workers and Health Personnel 2023 in the North West Region.

In the table below, the total number of cases reported by HP is 117, while CHWs reported 3 cases. Kumbo East has the highest number of cases reported by HP (18) and also the highest involvement of CHWs (3 cases). Bali and Bamenda 3 also reported high numbers of cases, with 14 and 13 cases respectively, but no CHW involvement. Districts like Mbengwi and Tubah reported moderate numbers of cases, 10 and 11 respectively, managed solely by HP. Several districts, including Ako, Bafut, Benakuma, Batibo, Bamenda, Fundong, Kumbo West, Ndop, Nwa, Njikwa, Nkambe, Oku, and Santa, reported low numbers of cases with no CHW involvement. Notably, Ndu and Misaje reported no cases.

Table 3. Yellow Fever suspected cases notified by CHW and HP in NWR 2023

SN	District	Total Yellow fever cases notified	
		HP	CHW
1	Ako	1	0
2	Bafut	2	0
3	Bali	14	0
4	Benakuma	3	0
5	Batibo	6	0
6	Bamenda	3	0
7	Bamenda 3	13	0
8	Fundong	6	0
9	Mbengwi	10	0
10	Kumbo East	18	3
11	Kumbo West	8	0
12	Ndop	2	0
13	Nwa	2	0
14	Njikwa	3	0
15	Nkambe	1	0
16	Ndu	0	0
17	Misaje	0	0
18	Oku	1	0
19	Tubah	11	0
20	Santa	2	0
21	Wum	11	0
	TOTAL	**117**	**3**

HP: Health personnel, CHW: community health workers

Total suspected cases of Yellow Fever notified by community health workers and Health Personnel 2024 in the North West Region.

In the table below, a total of 60 Yellow Fever cases were reported across all districts. Out of these, 2 cases were reported by Community Health Workers (CHW). The Districts of Ako, Benakuma, Batibo, Ndop, and Misaje reported no case. Districts of Bafut, Njikwa, Nkambe, Oku, and Santa reported 1 case each, Bali, Mbengwi, and Tubah reported 5 cases each, Fundong, Nwa, and Ndu 2 cases each, Kumbo West reported 3 cases, Wum reported 4 cases, Kumbo East reported 9 cases, with 1 case reported by a CHW, Bamenda, and Bamenda 3 reported 9 cases.

Table 4. Yellow Fever suspected cases notified by CHW and HP in NWR 2024

SN	District	Total Yellow fever cases notified	
		HP	CHW
1	Ako	0	0
2	Bafut	1	0
3	Bali	5	0
4	Benakuma	0	0
5	Batibo	0	0
6	Bamenda	9	0
7	Bamenda 3	9	0
8	Fundong	2	0
9	Mbengwi	5	0
10	Kumbo East	9	1
11	Kumbo West	3	0
12	Ndop	0	0
13	Nwa	2	0
14	Njikwa	1	0
15	Nkambe	1	0
16	Ndu	2	1
17	Misaje	0	0
18	Oku	1	0
19	Tubah	5	0
20	Santa	1	0
21	Wum	4	0
	TOTAL	**60**	**2**

HP: Health personnel, CHW: community health workers

4. Discussion

The data reveals a critical gap in CHW involvement in disease surveillance across the different districts of the North West. The stark contrast between the number of yellow fever cases notified by HPs and CHWs highlights a significant underutilization of this vital human resource. While HPs are essential for providing healthcare services, CHWs are uniquely positioned to gather data on disease in the community, prevalence, risk factors, and community health needs.

Fluctuations in the number of cases notified by HP and CHWs:

The number of HPs varied significantly over the years, showing a general decrease from 2021 to 2024. This could be attributed to factors such as changes in health policies,

funding, or resource reallocation. The involvement of CHWs was inconsistent and minimal, indicating challenges in maintaining community-based surveillance efforts. The limited and fluctuating number of CHWs suggests that while there is an attempt to integrate them into the health system, their role and impact may still be evolving.

District-Specific Insights:

Kumbo East: This district exhibited a consistent increase in CHWs from 2023 onwards, demonstrating a growing reliance on community-based surveillance. The introduction of CHWs in 2023 (3) and their increase in 2024 (1) indicate a positive trend towards strengthening community health systems.

a. Tubah: CHWs were introduced in 2022 but their numbers did not increase in subsequent years. This may reflect challenges in retaining CHWs or effectively integrating them into the health system.
b. Wum: Had a high number of HPs in 2022 and introduced CHWs, but both numbers decreased in the following years. This suggests potential issues with sustainability and the need for continuous support and resources to maintain effective surveillance.

Districts such as Bamenda, Bamenda 3, and Kumbo East demonstrated high reporting activity by HPs, with Bamenda reporting 28 cases in 2021 and 20 cases in 2022, and Kumbo East reporting 18 cases in 2023. However, the involvement of CHWs remained minimal across all districts, with only Kumbo East showing some engagement from CHWs in 2023 and 2024. The surveillance system's sensitivity, as measured by the initial reporting of yellow fever cases, appears to heavily rely on HPs. The data suggests that HPs are the primary reporters of yellow fever cases, contributing the majority of the reports each year. The limited involvement of CHWs indicates a potential gap in the surveillance system that could be addressed to improve overall sensitivity and early detection of yellow fever cases. The findings highlight the crucial role of HPs in monitoring yellow fever in the North West Region of Cameroon. However, the underutilization of CHWs represents a missed opportunity to enhance the surveillance system's effectiveness.

Implications for Yellow Fever Surveillance:

Resource Allocation: The decrease in HPs across most districts suggests a potential reallocation of resources or a shift in health service delivery models. This could be due to budget constraints, policy changes, or strategic shifts towards more community-based health interventions.

Role of CHWs: The limited and fluctuating number of CHWs indicates that while there is an effort to integrate them into yellow fever surveillance, their involvement remains limited and inconsistent. Effective yellow fever surveillance requires sustained community engagement and adequate training and support for CHWs. Health Service Delivery: The data highlights the need for consistent monitoring and evaluation of health service delivery points and the integration of CHWs to ensure effective health coverage and accessibility.

5. Conclusion

The study aimed to assess the effectiveness of CHWs and HPs in monitoring yellow fever in the North West Region of Cameroon from 2021 to 2024. The data shows a notable difference in reporting activities between HPs and CHWs. Over the four years, HPs consistently reported a higher number of yellow fever cases compared to CHWs. Specifically, HPs reported a total of 96 cases in 2021, 146 cases in 2022, 117 cases in 2023, and 60 cases in 2024. In contrast, CHWs reported no cases in 2021, three cases in 2022, three cases in 2023, and two cases in 2024. While HPs have been effective in reporting yellow fever cases, there is significant potential to enhance the surveillance system by increasing the involvement of CHWs. Addressing this gap could lead to a more robust and sensitive

surveillance system, ultimately improving the early detection and control of yellow fever in the North West Region of Cameroon.

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