Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Community-Based Surveillance in Uganda's Border Districts during the 2024 Mpox Outbreak: Enablers, Constraints, and Adaptive Responses

Claus Thomas

clausthomas2017@gmail.com

St. Francis University College of Health and Allied Sciences

Rawlance Ndejjo

Makerere University School of Public Health, Kampala, Uganda

Douglas Bulafu

Makerere University School of Public Health, Kampala, Uganda

Steven N. Kabwama

Makerere University School of Public Health, Kampala, Uganda

Anil Fastenau

University of Bremen

Rhoda K. Wanyenze

Makerere University School of Public Health, Kampala, Uganda

Research Article

Keywords: Mpox, Community-based surveillance, Cross-border surveillance, Outbreak preparedness, Key populations, Qualitative research, Uganda

Posted Date: November 6th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-11222933/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License

Additional Declarations: No competing interests reported.

Abstract

Background

Uganda's Integrated Disease Surveillance and Response framework designates community-based surveillance (CBS) as a core pillar of outbreak detection, yet how this pillar functions during a live, stigmatised, cross-border outbreak remains poorly understood. This study qualitatively examined CBS during the 2024 Mpox Clade Ib outbreak in Uganda's Kasese and Amuru border districts, focusing on the enablers, constraints, and adaptive responses shaping surveillance performance.

Methods

A qualitative descriptive design was employed, with data collected between June and August 2025 through 19 key informant interviews and 8 focus group discussions, engaging 100 participants across the two districts. Participants included Health-sector personnel, implementing partner staff, Community Health Workers (CHWs), and community members. Data were analysed thematically.

Results

Three interrelated themes emerged. Institutional memory and pre-existing infrastructure from prior outbreaks (Ebola, COVID-19, and the 2022 Mpox outbreak) strengthened clinical suspicion, reactivated standing response structures, and sustained community trust and partner support. Structural and social barriers, including delayed disbursement of funds, fragile specimen transport, limited staff, fragmented coordination, and stigma linked to both the sexualised transmission narrative and the confusion of Mpox with locally recognised skin conditions, drove concealment and care seeking outside the formal system. Communities responded with improvised adaptive mechanisms, including informal self-diagnosis, peer-based referral networks among key populations, informal cross-border resource-sharing and integration of Mpox screening into existing platforms such as antenatal and HIV/ART clinics.

Conclusions

Strengthening CBS in Uganda's border districts requires reliable financing, sustainable specimen transport, adequate staffing, locally appropriate risk communication, and formalised cross-border collaboration as a deliberate component of preparedness in high-mobility border settings.

Introduction

Mpox is a zoonotic disease caused by the monkeypox virus (MPXV), a double-stranded DNA virus of the *Orthopoxvirus* genus, endemic in the forested regions of West and Central Africa. The first human case of Mpox was recorded in the Democratic Republic of the Congo in 1970 [1]. Since 2022, the global Mpox

landscape has shifted from a largely West and Central African zoonosis into a multi-clade international public health concern. A newly identified sublineage of clade I, designated clade Ib, emerged in the mining regions of eastern DRC in 2023 and drove a rapidly escalating outbreak sustained by human-to-human transmission, including through sexual contact [2, 3]. By mid-2024, the outbreak had crossed into Burundi, Kenya, Rwanda, and Uganda, prompting the World Health Organization (WHO) to declare Mpox a Public Health Emergency of International Concern on 14 August 2024, a day after the Africa Centres for Disease Control and Prevention declared it a Public Health Emergency of Continental Security [2, 4]. Uganda confirmed its first clade Ib cases in Kasese District, bordering the DRC, in July 2024, following enhanced sentinel surveillance at the Bwera and Mpondwe border points of entry [3]. Within weeks, transmission had reached Amuru District in the north, along the border with South Sudan.

This rapid cross-border spread was followed by a substantial and geographically widespread national outbreak. By 22 January 2025, Uganda had reported 2,209 laboratory-confirmed cases and 13 deaths across 78 of the country's 146 districts (53%), with Kampala alone accounting for 55% of confirmed cases [5]. By February 2025, approximately three-quarters of Uganda's districts had experienced Mpox outbreaks, with sustained transmission concentrated in urban centres and towns [6]. The outbreak also produced considerable morbidity: a national study of patients admitted to Mpox treatment units found that 61% had severe disease, while children and adolescents experienced substantial disease severity and a case-fatality rate of 1.9% [7, 8].

Community-based surveillance (CBS) is a critical adjunct to facility-based disease surveillance, particularly where formal health infrastructure is thin, dispersed, or overwhelmed during acute outbreaks [9]. Defined by a WHO interagency working group as "the systematic detection and reporting of events of public health significance within a community by community members," CBS extends surveillance into households, informal settlements, and mobile populations that routine facility-based reporting often misses [9]. Evidence from the West African Ebola epidemic and subsequent outbreaks shows that community volunteers, village health teams, and informal social networks can materially shorten the interval between symptom onset and case detection, particularly where trust in formal health systems is limited [9, 10]. Reflecting this evidence, the WHO Regional Office for Africa embedded event-based and community-based surveillance as core pillars of the third edition of the Integrated Disease Surveillance and Response (IDSR) guidelines [11], which Uganda formally adopted in 2021 [12].

Despite this policy commitment, much of the empirical literature on CBS performance during outbreaks remains descriptive or quantitative, centred on alert volumes, positive predictive value, or system coverage, with comparatively little qualitative attention to how community actors themselves experience, adapt to, and sustain surveillance work under the resource, logistical, and social pressures of a live outbreak [9, 13–15]. Unlike Ebola or cholera, the current clade Ib outbreak has been shaped by a highly stigmatised narrative around sexual transmission, creating particular vulnerabilities for mobile populations such as long-distance truck drivers and marginalised groups such as female sex workers [2, 16]. This stigma appears to actively discourage formal care-seeking and complicate community-level

surveillance [2, 16], yet little qualitative work has examined how CBS actors navigate these dynamics in real time, particularly in low-resource, cross-border settings.

Kasese and Amuru, bordering the DRC and South Sudan respectively, offer an important setting for examining these dynamics: both are characterised by high cross-border mobility and trade activity typical of outbreak-prone border regions. While Uganda's IDSR framework formally designates CBS as a core pillar of outbreak detection and response [12], how this pillar functioned in practice during a live, stigmatised, cross-border outbreak remains poorly understood. Existing evaluations have largely reported system-level indicators such as case counts, reporting timeliness, and alert-to-response intervals [17, 18], with limited attention to the frontline experiences of CHWs, health-sector personnel, local leaders, and community members involved in reporting, risk communication, contact tracing, and home-based care.

This study addresses that gap by qualitatively examining CBS during the 2024 Mpox Clade Ib outbreak in Kasese and Amuru districts, focusing on the enablers and constraints shaping surveillance performance and the adaptive responses that emerged over the course of the outbreak. By examining two highly mobile border settings, this study provides insight into how community-based surveillance functions when formal health systems, administrative boundaries, and population movement do not align. We examined: (1) the factors enabling or constraining CBS performance in Kasese and Amuru, and (2) the adaptive responses that emerged when formal surveillance mechanisms were insufficient. The findings may inform the design of more resilient, community-centred surveillance systems in other resource-constrained and cross-border settings.

Methods

Study Setting

The study was conducted in Kasese and Amuru districts, two Ugandan border districts. Kasese is located in southwestern Uganda along the border with the Democratic Republic of the Congo (DRC) and according to National Population and Housing Census of 2024, had a total population of 853,831. Amuru, in northern Uganda, borders South Sudan and, per the 2024 census, had a population of 247,574 [19]. The Elegu–Nimule border corridor is an important route for cross-border movement between Uganda and South Sudan.

The districts were particularly relevant to Mpox surveillance because both reported Mpox Clade Ib cases during Uganda's 2024 outbreak. Kasese was the location of Uganda's first confirmed Mpox cases, detected at Bwera Hospital following enhanced surveillance at the DRC border in July 2024 [3]. Amuru subsequently reported cases, including cases associated with the Elegu border area [4]. The locations of the two study districts are shown in Fig. 1.

Figure 1. Map showing Uganda’s border districts of Kasese and Amuru

Study Design and Participants

This study employed a qualitative descriptive design to explore the enablers, constraints, and adaptive responses shaping CBS during the 2024 Mpox Clade Ib outbreak in Kasese and Amuru districts, Uganda. Data were collected between June and August 2025, approximately 10 to 13 months after the first confirmed cases in the respective districts, allowing participants to reflect on surveillance experiences during and following the outbreak.

Participants were purposively selected based on their involvement in, or experience with, community-based Mpox surveillance. Key informant interviews (KIIs) were conducted with Health-sector personnel, surveillance focal persons, laboratory and environmental health personnel, implementing partner staff, Community Health Workers (CHWs), and health-facility in-charges. Focus group discussions (FGDs) were conducted with community members, CHWs, and health workers to capture both community and frontline perspectives.

Overall, 100 participants were included: 19 KII respondents and 81 FGD participants across eight FGDs. Data collection continued until the research team judged that additional interviews and FGDs were yielding little new information relevant to the study questions. In Kasese, six KIIs and four FGDs were conducted, while Amuru contributed 13 KIIs and four FGDs. Four FGDs were purposively stratified by sex and age to facilitate open discussion of community experiences: an older female group (≥ 35 years; n = 9) and a younger male group (≤ 35 years; n = 11) in Kasese, and separate female (n = 10) and male (n = 12) community groups in Amuru. The remaining FGDs comprised CHW and health-worker groups in the two districts.

Data Collection Procedures

Trained data collectors with training in public health or social sciences and experience conducting qualitative interviews conducted the KIIs and FGDs in Kasese and Amuru Districts, following standardised study tools and procedures. Each interview or FGD lasted approximately 30–40 minutes and was conducted in a private setting to ensure confidentiality, with no individuals other than the participants and data collectors present during the sessions. Interviews and FGDs were audio-recorded with participants' prior consent, while field notes were taken concurrently to capture contextual information and key observations. Data collection instruments and informed consent forms were administered in the predominant local languages; *Lhukonzo* or *Acholi*, or in English where appropriate.

Data Collection Tools

The interview and FGD guides were developed specifically for this study and were piloted before data collection to assess their clarity, relevance, and applicability. Separate guides were used for different informant categories, including district health officials, CHWs, health workers, and community FGD participants, with questions tailored to their respective roles and experiences and to the factors that

enabled or constrained community-based Mpox surveillance and the adaptive strategies communities employed during the outbreak.

Data Management and Analysis

Audio recordings were transcribed verbatim by trained language and translation experts and, where interviews were conducted in local languages, transcripts were translated into English. Most health workers were conversant in English and were interviewed directly in English. Transcripts were reviewed and checked for completeness and accuracy against the original recordings. Participant information was de-identified to maintain confidentiality, and audio files and transcripts were securely stored with access restricted to the study team.

Data were analysed using NVivo software. Thematic analysis was conducted, guided by the framework of Braun and Clarke [20]. Two researchers independently reviewed an initial subset of transcripts to develop and refine the coding framework. Codes were compared and discussed within the research team, and discrepancies were resolved through discussion. The coding framework was iteratively revised as additional transcripts were analysed. One researcher subsequently applied the agreed framework across the dataset, with emerging themes regularly reviewed by the wider team. Analysis moved iteratively between coded data, candidate themes, and the full dataset. Coding was primarily inductive, allowing themes and patterns to emerge from participants' accounts, while the study objectives and research questions provided an overarching analytical framework. The coding process involved iterative review and refinement of codes and themes to ensure consistency with the data and the study objectives. The districts were analysed primarily as a combined case because the study sought to identify common mechanisms shaping CBS in high-mobility border settings rather than undertake a formal comparative case study; however, district-specific differences were retained where they materially influenced interpretation.

Reflexivity

The research team combined perspectives from public health, microbiology, and epidemiology. Data collectors had no established clinical or supervisory relationship with participants. Participants were informed of the researchers' roles and the purpose of the study before interviews began. The team discussed how disciplinary backgrounds and assumptions about outbreak response could influence interpretation during iterative analysis. None of the authors were directly involved in the Mpox response in Kasese or Amuru, which supported an outsider perspective during data collection and interpretation. Coding and theme development were discussed iteratively within the team to guard against any single author's assumptions dominating the analysis.

Ethical Considerations

Ethical approval

was granted by the Makerere University School of Public Health Research and Ethics Committee (SPH-2025-870) with national clearance from the Uganda National Council for Science and Technology (HS6025ES). The study was conducted in accordance with the Declaration of Helsinki. Written informed consent, using approved forms in *Lhukonzo*, *Acholi*, or English, was obtained from all participants before data collection; participants who could not read or write consented by thumbprint. Given the Mpox-related stigma, particular care was taken to protect participants from key populations, especially female sex workers and long-distance truck drivers. Participant identities were protected throughout data collection, analysis, and reporting through de-identified, role-based labels.

Results

Characteristics of study participants

A total of 100 participants took part in the study, comprising 19 key informants and 81 FGD participants across eight FGDs. Participants represented district and facility health personnel, CHWs, implementing partner's staff, and community members. Participant characteristics are summarized in Table 1.

Table 1
Summary of study participants by district and participant group

District	Participant group	Male	Female	Total
Kasese	Key informant interviews (KIIs)	4	2	6
	Community FGD – older females (≥ 35 years)	0	9	9
	Community FGD – younger males (≤ 35 years)	11	0	11
	CHW and health-worker FGDs	11	9	20
Amuru	Key informant interviews (KIIs)	8	5	13
	Community FGD – females	0	10	10
	Community FGD – males	12	0	12
	CHW and health-worker FGDs	7	12	19
Total	**Both districts**	**53**	**47**	**100**

Table 1. **Summary of study participants by district and participant group**

Community-based surveillance during Mpox outbreak

Guided by the study's focus on enablers, constraints, and adaptive responses shaping CBS, three interrelated themes emerged and were analysed. The first, institutional memory and pre-existing infrastructure as foundations of surveillance capacity, highlights the outbreak experience, reporting

structures, trust, partner support, and diagnostic capacity for the Mpox response. The second, structural barriers and care avoidance, captures the resource, logistical, coordination, staffing, and stigma-related constraints limiting effective surveillance. Third, improvised community agency, complementary informal surveillance pathways operating beyond formal surveillance, describes the peer-based support, informal case recognition, cross-border collaboration, and use of existing community platforms through which communities extended case reporting, referral, and care.

Enablers of community-based surveillance

This theme addresses why the surveillance system mobilised as it did. Five enabling conditions recurred: accumulated outbreak experience, established reporting structures, community trust, partner investment, and diagnostic capacity, each reflecting capacity built for prior emergencies, or for other purposes entirely, and repurposed for the Mpox response rather than built from scratch.

Institutional memory from prior outbreaks.

Both districts had accumulated outbreak experience, Kasese through Ebola and COVID-19, Amuru through COVID-19 and the 2022 Mpox outbreak which translated into faster detection and response in three ways: it raised health workers' and CHWs' clinical suspicion, prompting immediate rather than delayed reporting; it left standing response infrastructure that could be reactivated rather than rebuilt, such as Kasese's trained isolation team and existing sample-transport arrangement; and it supplied ready-made protocols for home-based care and coordination, with Amuru health workers applying COVID-era IPC practices and reactivating prior alert and notifying channels for Mpox.

“Kasese has had several outbreaks way back, Ebola and COVID-19. So, we are always vigilant in terms of the CHWs, but also the increased index of suspicion of health workers. When they see anything strange, they are always having vigilance.” (Health sector personnel, KII)

In Amuru, one of the Health sector personnel also, described how COVID-era practice was reused rather than reinvented:

"...like the old times of COVID, you can do it, isolate from home basically... at least COVID taught us a few things on infection prevention and control." (*Health sector personnel*, KII)

Pre-existing reporting structures. A multi-tiered task force structure, district, sub-county, and health sub-district already existed in Kasese before the Mpox outbreak, providing a coordination backbone the response could plug into rather than build from scratch. Onto this existing structure, the district layered Mpox-specific components: CHWs were trained and given formal representation at sub-county task force meetings (held bi-weekly, later weekly, as the outbreak progressed), and a toll-free hotline was created specifically for reporting Mpox-related rumors and suspected cases. The Health sector personnel also described this.

“We trained the CHWs, went to their different communities. They would meet during the sub-county task force meetings every two weeks. The communities are represented by the CHWs, and we get those sub-county leaders coming to our meetings and telling us their views.” (Health sector personnel, KII)

Trust and familiarity. CHWs’ knowledge of households, languages, and community norms was a key enabler of detection and follow-up. In Amuru, one recovered index case became a community ambassador and independently reported new suspected cases.

"...He was having a lot of trauma and mental breakdown. He then escaped from follow-up. All in all, he recovered well. And at the end, he became our ambassador there. He was now the one reporting suspected cases because of the experience. We did a lot of contact tracing and follow-up. Unfortunately, he was moving from one lodge to another; he didn’t have a fixed place to stay. So, we followed up with the people working in the lodges where he stayed, identifying and following them as contacts through the contact-tracing process because they had potentially been exposed to him.” (*Health sector personnel, KII*).

Partner support. Implementing partners including UNICEF, WHO, and Baylor Uganda provided material and technical support: UNICEF funded CHW training and sensitisation in Amuru, while Baylor Uganda supported ART clinic-based screening and Kasese’s toll-free hotline.

“Then we had also UNICEF coming in to help with some aspects of the response, specifically the risk communication aspect and surveillance." (*Health sector personnel*, KII).

“We are working with Baylor Uganda in the STI clinics. They screen for M-pox in those ART clinics. So, especially when they come, when people come for HIV services, we screen..." (*Health sector personnel*, KII)

Diagnostic turnaround time. Deployment of a mobile laboratory at Bwera General Hospital reduced specimen turnaround time from days to hours. The Health sector personnel described the impact.

“For us, getting the results takes just one to two days. When the results come early, it reduces the pressure on contact tracing because you will find that the contacts are within the vicinity when they have not moved far.” (Health sector personnel KII)

Barriers to community-based surveillance

This theme explains why, despite the enabling factors described above, the community-based surveillance system struggled to identify, report, retain, and adequately support a substantial proportion of affected individuals. The first was structural, resource and financial constraints, rigid disbursement mechanisms delaying the release of funds to the districts (in Amuru, a UGX 51 million, Ministry of Health grant for surveillance activities took several months to become accessible because of bureaucratic release procedures), a fragile single-channel specimen transport system that depended on a single donor funded network of motorcycle "hub riders" with no backup route once that funding lapsed, limited and thinly stretched staffing, and fragmented multi-sectoral coordination. Respondents described these constraints as limiting timely detection, reporting, and follow-up, particularly for individuals seeking care

through private clinics and drug shops. The second was social and economic, whereby stigma, financial hardship, and the costs associated with formal care-seeking were reported to discourage engagement with formal surveillance and health-care services, contributing to concealment and care-seeking through informal channels.

Resource and Financing Constraints

Both districts faced chronic shortages of Personal Protective Equipment (PPE), specimen collection materials, and operational fuel. Furthermore, isolation-unit health workers went unpaid and patients received no food.

"…As a district, you don't have this budget line that is waiting for things like that to happen. You need extra money. Resources are not available. The best Gulu Regional Referral can offer is technical guidance. When you want money for operationalisation, it's a little tricky." (District Health Respondent, KII)

Procedural Delays

In Amuru, the Ministry of Health had disbursed a UGX 51 million grant for Mpox surveillance activities, but respondents reported that the funds remained inaccessible for several months because of district-level release procedures. A CHW described this disconnect:

"*The 51 million Uganda shillings sent by the Ministry for surveillance took months to be accessible due to bureaucratic delays. So, we had to implement activities without funding." (CHW, KII)*

Logistical transport challenges. Specimen transport was a critical bottleneck in both districts. In Amuru, the specimen-transport system depended heavily on a network of motorcycle 'hub riders' supported by USAID. Respondents reported that this service stopped after USAID-supported funding ended, with no alternative transport arrangement immediately available. Laboratory personnel subsequently transported specimens themselves to Atiak Health Centre IV.

The same USAID-funded hub-rider system also served Kasese's mobile laboratory at Bwera Hospital, where its withdrawal similarly delayed sample collection for a period during the outbreak.

"There have been delays due to long distances, lack of cool storage, and high temperatures here in Elegu. These conditions can compromise sample integrity, leading to false negatives." (Health sector personnel KII)

Insufficient staffing and redistribution of health workers. In Amuru, surveillance activities were largely dependent on a single district surveillance focal person, who coordinated response efforts across the entire district. Understaffing at Elegu Port Health necessitated pulling personnel from health centres, further depleting service capacity.

A Health sector personnel from Amuru linked this shortfall directly to the absence of a dedicated staffing structure at the border point of entry:

“The government should get designated staff at the point of entry not us pulling staff from these facilities and taking them there. We don’t have a structure at the point of entry where the government says we need this cadre here.” (Health sector personnel KII)

Fragmented coordination. While both districts activated multi-sectoral task forces, coordination deteriorated as the outbreak progressed. In Amuru, task force meetings became irregular and eventually ceased in some phases, which respondents linked to the lack of funds to facilitate attendance, transport and allowances for members travelling from geographically dispersed sub-counties, particularly around Elegu and the resulting decline in participant morale as the response wore on. In Kasese, communication between the district and the regional level was sometimes bypassed, with direct district-to-national contact being the norm. Respondents described direct district-to-national communication as common in Kasese, particularly during periods of high-level national attention to the outbreak.

“*Governance challenges included irregular meetings and poor coordination... Meetings were irregular, and community engagement was poorly funded. Information flow was inconsistent, especially from the district to the health facilities and the community.*" (*Health sector personnel-KII).*

Stigma and concealment. Both communities exhibited misconceptions that constrained surveillance. The most prevalent was conflation of Mpox with locally known skin conditions referred to as *ebithole* (boils) or *gwenyo ma dongo* (large boils or swollen skin), leading individuals to seek care at private clinics or drug shops rather than designated facilities. Stigma, particularly around the sexually transmitted presentation of Mpox, caused concealment of illness, delayed care-seeking, and avoidance of health facilities. Key population members in Amuru described fear of discrimination as a major barrier:

“If a driver says he has Mpox, everyone avoids him. There is fear and stigma.” (Male Community FGD)

A CHW also described this concealment further from the surveillance side:

“The sex workers, when they find that they are now affected, they hide themselves until the condition is out of control. By the time we came to realise, it was now four days.” (CHW FGD)

Community-based surveillance adaptation mechanisms

This theme describes how community actors adapted when formal surveillance and response mechanisms were constrained. Rather than waiting for formal systems to address emerging needs, communities adapted by using existing social networks, relationships, and community platforms. These adaptations included informal self-diagnosis, peer-based support, cross-border collaboration, and the integration of Mpox activities into existing community structures.

Informal surveillance and self-diagnosis. Reflecting on this pattern of adaptation, a community member described how prior outbreak experience had shortened the community’s response time:

“It helped us to pick ourselves up quickly. We are now adaptive to new measures. Whenever an outbreak comes, we are very ready and receptive to listen and follow the instructions.” (Community member FGD,

Kasese)

Beyond formally organised surveillance, community members described informal practices for recognising and sharing information about suspected Mpox cases. Community members described learning to recognise Mpox symptoms through personal illness, observation of family members and neighbours, and previous outbreak experience. In Amuru, female community members described learning to identify Mpox by comparing presentations with one another:

“We started learning by experience. Whereby someone would say, ‘I’m feeling this way.’ Then you compare with the rest. You just know, ‘Ah, this is what it is.’ Because when you go to the hospital, you take the sample but the result takes long time.” (Female Community FGD, Amuru)

Community Social Networks. In Kasese, community members utilised established social networks, including WhatsApp platforms among drivers’ associations and traders, to share information about Mpox symptoms and notify peers of suspected cases.

"*We used our WhatsApp platform and met in the office and I passed information from there... We also shared information in parking yards*." (Male Community FGD)

Peer-based task-sharing. Female sex workers and other key-population participants in Elegu described peer-to-peer sharing of information about Mpox risks, symptoms, testing, and available services. Female community members described informally directing one another toward testing and care. In Kasese, health workers working with key populations deployed peer educators to reach groups that formal messaging had not penetrated:

“We have the key population that has been aware; when they get a case, they also send the peer to our place and then we intervene.” (Health worker FGD, Kasese)

Informal cross-border cooperation. At the Elegu point of entry, community and port health actors described informal resource-sharing arrangements with counterparts in Nimule, South Sudan, including sharing PPE and medications and supporting outreach activities on both sides of the border.

“We work very, very well with our colleagues from South Sudan. They provide the resources. We have masks, sanitizers. We share. There are times when they support outreach activities on our side; there are times when we go to South Sudan’s side.” (Implementing Partner KII)

Community members in Elegu also independently used the nearer Nimule Hospital across the border in South Sudan for healthcare when local facilities were inaccessible, overstretched, or when they sought greater confidentiality

Integration into existing platforms. In both districts, community-based actors embedded Mpox surveillance into existing platforms such as religious gatherings, antenatal visits, HIV/ART clinic days and school health outreach.

“What we did was to train those cough monitors people who monitor people who are coughing at OPD by giving them knowledge about the signs and symptoms of Mpox, so that when there is a suspect, they can alert the health worker within the facility.” (Health sector personnel KII)

Similarly, in Amuru, facility personnel also incorporated Mpox information and case-identification activities into routine school health outreach.

“A few staffs visited different schools and, in that visit, they were able to identify teachers, talk to some teachers and in some cases, even a few students, take them through how to identify, how to report, signs and symptoms.” (CHW, KII)

Discussion

This study shows that resilience in community-based outbreak surveillance was not located solely within the formal health system. While institutional memory and pre-existing response infrastructure enabled rapid mobilisation, structural constraints, including financing delays, fragile specimen transport, understaffing, and stigma, limited the reach of formal surveillance. Communities responded by creating complementary pathways for detection, referral, information sharing, and cross-border care. These findings suggest that resilient CBS systems should recognise community adaptation not as an informal substitute for weak systems, but as a resource that can be deliberately incorporated into preparedness. The finding that both districts drew on infrastructure and relationships built for prior emergencies, rather than constructing Mpox-specific systems from scratch, is consistent with the broader observation that community-based surveillance functions best where it is layered onto pre-existing social and institutional capacity rather than introduced as a stand-alone vertical intervention [9, 21, 22]. The specific mechanisms reported here, the reactivation of Kasese's isolation team and sample-transport arrangement, and Amuru health workers' reuse of COVID-era infection prevention and control practice, illustrate one pathway through which that layering occurs: capacity persists in the health workforce as procedural memory and standing relationships even after the programme that originally created it has ended. What remains a reasonable but untested inference is whether this reuse pathway is systematically more resilient than purpose-built CBS capacity, a question that could be the subject of the future studies.

The trust-related enablers identified, particularly the case of a recovered Mpox patient who became a self-appointed ambassador reporting suspected cases in Amuru, echo findings from the 2014–2016 West African Ebola response, where survivors acting as informal peer educators were repeatedly identified as among the most trusted sources of outbreak information, more so than top-down public health messaging [23]. This suggests that survivor-led trust-building may be a naturally occurring resource in outbreak affected communities that formal CBS design has not yet deliberately incorporated, though this study's data speak to a single instance, and this pattern warrants further research to substantiate it.

The barriers identified in this study were predominantly structural and financial rather than informational, a pattern that mirrors post-Ebola experience with sustaining CBS in Sierra Leone, where cost drivers such as CHW training and stipends, alongside unsupported transport costs, were identified as the principal threats to system continuity once the acute emergency phase passed [13]. The procedural delay documented in Amuru, in which funds allocated by the Ministry of Health took months to become accessible because of bureaucratic disbursement procedures, is consistent with this broader pattern: it indicates that funding availability at the national level does not translate automatically into usable resources at the district level during a live outbreak, and that the binding constraint is often procedural rather than the volume of resources committed.

One barrier merits particular attention because of its contemporary relevance. Respondents attributed the interruption of the USAID-supported hub-rider specimen transport system in Amuru to the cessation of this funding, after which laboratory personnel had to transport specimens themselves to Atiak Health Centre IV. Recent analyses have raised concerns that reductions in external support for global health security may disrupt laboratory and surveillance functions across Africa [24]. Our findings provide a district-level example of how dependence on a single externally supported logistics mechanism can create immediate operational vulnerability when that support ends.

Stigma was an important barrier to timely care-seeking, mainly because Mpox was associated with sexual transmission. Similar concerns have been reported elsewhere in Africa, where stigma has contributed to concealment of symptoms and delayed care-seeking, particularly among already marginalised groups [2, 3]. Another challenge was that some community members confused Mpox with familiar skin conditions and therefore sought care from private clinics and drug shops rather than the formal health system. This reflects findings from a community health worker study in neighbouring Gulu and Pader districts, where the lack of a locally recognised name for mycetoma also hindered early identification and referral [25]. These findings show that differences between community and biomedical understanding of skin conditions can hinder outbreak surveillance. Addressing these differences through clear community education and communication could help reduce confusion and improve early detection in future outbreaks.

The adaptive responses identified in this study are consistent with broader evidence that communities affected by outbreaks often use existing social networks and local infrastructure to support detection, referral, and care when formal systems are constrained [10, 26]. In this study, these adaptations included peer-based information sharing and referral, informal symptom recognition, cross-border resource-sharing, and the integration of Mpox activities into existing community and health-service platforms. What this study adds is evidence of how such adaptations operate in a highly mobile, cross-border Mpox context, particularly through drivers' associations, peer networks among sex workers, and informal cooperation between Elegu and Nimule. These findings suggest that community-generated surveillance pathways may complement formal CBS structures where administrative and service boundaries do not align with population movement.

These findings have direct implications for strengthening CBS in Uganda and similar border settings. Improving surveillance may depend less on additional community sensitisation alone and more on addressing delayed financing, transport constraints, and staffing gaps at points of entry. At the same time, locally recognised illness terms and stigma-sensitive messaging should be incorporated into CHW training and risk communication materials.

The informal sharing of resources between community and port-health actors at Elegu and their counterparts at Nimule, together with cross-border care-seeking, highlights a mismatch between the movement of people and the administrative boundaries of formal surveillance systems. Strengthening CBS in similar settings should therefore include formal mechanisms for cross-border communication, referral, and resource-sharing, building on cooperation that already exists between communities and health actors on both sides of the border.

Study Limitations

This study has several limitations. First, data were collected approximately 10 to 13 months after the first confirmed cases in the two districts, introducing potential recall bias regarding the timing and sequence of events. Second, purposive recruitment may have favoured participants who were more engaged with outbreak-response structures, while individuals with limited contact with formal surveillance may be underrepresented. Third, findings are based on two border districts and should not be assumed to represent all Ugandan districts or other outbreak settings. Fourth, the unequal distribution of key informant interviews between Kasese and Amuru may have influenced the relative depth of district-specific findings. Fifth, analysing the two districts primarily as a combined case may have obscured some contextual differences. Finally, because Mpox and sexual transmission are stigmatised topics, social-desirability bias may have influenced participants' accounts. Nevertheless, triangulation across community members, CHWs, health workers, district actors, and implementing partners provided multiple perspectives on surveillance performance.

Conclusion

This study found that community-based surveillance during the 2024 Mpox outbreak in Kasese and Amuru benefited from existing outbreak experience, health-system infrastructure, community networks, and established relationships that could be rapidly adapted to a new threat. However, surveillance was constrained by delayed access to funds, limited staffing, disrupted specimen transport, weakening coordination, stigma, and confusion of Mpox with familiar skin conditions. When formal surveillance systems were unable to meet community needs, communities developed their own informal pathways for information sharing, reporting, referral, and care-seeking.

The findings suggest that strengthening community-based surveillance in Uganda, particularly in border districts, should focus not only on community sensitisation but also on reliable financing and timely disbursement, sustainable specimen transport, adequate staffing, locally appropriate risk

communication, and stronger links between community and formal surveillance systems. Given the extent of population movement across borders, formalising cross-border collaboration between communities and health authorities should also be considered an important component of surveillance preparedness.

Abbreviations

ART Antiretroviral Therapy

CBS Community-Based Surveillance

CHW Community Health Worker

DRC Democratic Republic of the Congo

FGD Focus Group Discussion

HIV Human Immunodeficiency Virus

IDSR Integrated Disease Surveillance and Response

IPC Infection Prevention and Control

KII Key Informant Interview

MPXV Monkeypox Virus

OPD Outpatient Department

PPE Personal Protective Equipment

STI Sexually Transmitted Infection

UBOS Uganda Bureau of Statistics

UGX Ugandan Shilling

UNICEF United Nations Children's Fund

VHT Village Health Team

WHO World Health Organization

Declarations

Ethics approval and consent to participate

Ethical approval was granted by the Makerere University School of Public Health Research and Ethics Committee (SPH-2025-870), with national clearance from the Uganda National Council for Science and Technology (HS6025ES). The study was conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from all participants before data collection; participants who could not read or write consented by thumbprint.

Consent for publication

Not applicable. The manuscript contains no individual person's identifying data; all quotations are reported using de-identified, role-based labels.

Availability of data and materials

De-identified excerpts supporting the findings are presented within the manuscript. Full transcripts cannot be shared publicly because they contain potentially identifying information about participants, including members of stigmatised key populations. De-identified data are available on reasonable request from the Makerere University School of Public Health Research and Ethics Committee (healthsciences.irb@gmail.com) for researchers who meet the criteria for access to confidential data.

Competing interests

The authors declare that they have no competing interests.

Funding

This research was funded by the Government of Uganda, through the Makerere University Research and Innovations Fund (MakRIF-&) [grant number]. The funder had no role in the design of the study, data collection, analysis and interpretation of data, or writing of the manuscript.

Acknowledgements

The authors gratefully acknowledge the Centre of Excellence in Response to Pandemics and Shocks at Makerere University School of Public Health for its invaluable support of this study and for facilitating access to the data.

We also thank the team of researchers including Dr. Jovin Tibenderana and Dr. Majani Edward who reviewed the write up, participated in the data collection, and dissemination workshop of this project; their contributions are highly appreciated.

The first author acknowledges support from the African Research Universities Alliance (ARUA) through its Early Career Research programmes, funded by the Andrew Carnegie Foundation and the Mastercard

Foundation.

Authors' contributions

CT: Conceptualization (lead), Methodology, Formal analysis, Writing original draft

DB, SK: Methodology, Validation, Writing review & editing

AF: Formal analysis, Writing, review & editing

RN, RW: Conceptualization, Supervision, Writing, review & editing

All authors read and approved the final manuscript.

References

1. Bunge EM, Hoet B, Chen L, Lienert F, Weidenthaler H, Baer LR, et al. The changing epidemiology of human monkeypox—A potential threat? A systematic review. PLoS Negl Trop Dis. 2022;16:e0010141. https://doi.org/10.1371/journal.pntd.0010141.
2. Foláyan MO. Mpox, stigma and the Public Health Emergency of Continental Security declaration: addressing public health challenges in Africa. J Public Health Afr. 2024;15:757. https://doi.org/10.4102/jphia.v15i1.757.
3. Bbosa N, Nabirye SE, Namagembe HS, Kiiza R, Ssekagiri A, Munyagwa M, et al. Case reports of human monkeypox virus infections, Uganda, 2024. Emerg Infect Dis. 2025;31:144–8. https://doi.org/10.3201/eid3101.241269.
4. World Health Organization. Disease Outbreak News: Mpox – African Region. 22 August 2024. Geneva: World Health Organization; 2024.
5. World Health Organization Regional Office for Africa. Mpox outbreak in Uganda situation update – 22 January 2025. Brazzaville: WHO Regional Office for Africa; 2025 [cited 2026 Sep 23]. Available from: https://www.afro.who.int/countries/uganda/publication/mpox-outbreak-uganda-situation-update-22-january-2025
6. Mutesi C, Migisha R, Kwesiga B, Gidudu S, Bulage L, Lukabwe I, et al. SWOT analysis of Mpox surveillance in high-burden districts in Uganda, February–March 2025. One Health Outlook. 2026;8:13. https://doi.org/10.1186/s42522-025-00163-7.
7. Mutesi C, Migisha R, Okello EO, Mfitundinda E, Lubega JK, Kwizera P et al. Epidemiology, clinical features, and outcomes of Mpox in children and adolescents in Uganda, August 2024–January 2025. IJID Reg. 2026:100838.
8. Namakula LO, Migisha R, Kobusingye JO, Mfitundinda E, Nalwanga J, Okiror Okello E, et al. Epidemiological profile of the early cases of Mpox in Uganda, June 2024–January 2025. J Int AIDS Soc. 2025;28(Suppl 4):e26518. https://doi.org/10.1002/jia2.26518.

9. Ratnayake R, Tammaro M, Tiffany A, Kongelf A, Polonsky JA, McClelland A. People-centred surveillance: a narrative review of community-based surveillance among crisis-affected populations. Lancet Planet Health. 2020;4:e483–95. https://doi.org/10.1016/S2542-5196(20)30221-7.
10. Ali SH, Fallah MP, McCarthy JM, Keil R, Connolly C. Mobilizing the social infrastructure of informal settlements in infectious disease response – the case of Ebola Virus Disease in West Africa. Landsc Urban Plan. 2022;217:104256.
11. WHO Regional Office for Africa. Technical guidelines for integrated disease surveillance and response in the African Region. 3rd ed. Brazzaville: WHO Regional Office for Africa; 2019.
12. Ministry of Health, Republic of Uganda. National technical guidelines for integrated disease surveillance and response. 3rd ed. Kampala: Ministry of Health; 2021.
13. Mergenthaler C, van den Broek A, Tromp N, et al. Feasibility and challenges in sustaining a community based surveillance system in post-Ebola Sierra Leone. Confl Health. 2024;18:69. https://doi.org/10.1186/s13031-024-00618-0.
14. Sanou H, Korbéogo G, Meyrowitsch DW, Samuelsen H. How community-based health workers fulfil their roles in epidemic disease surveillance: a case study from Burkina Faso. BMC Health Serv Res. 2024;24:1372. https://doi.org/10.1186/s12913-024-11853-9.
15. Zalwango JF, Naiga HN, Nsubuga EJ, et al. Understanding the delay in identifying Sudan Virus Disease: gaps in integrated disease surveillance and response and community-based surveillance to detect viral hemorrhagic fever outbreaks in Uganda, September 2022. BMC Infect Dis. 2024;24:754. https://doi.org/10.1186/s12879-024-09659-5.
16. Adebisi YA, Ezema SM, Bolarinwa O, Bassey AE, Ogunkola IO. Sex workers and the Mpox response in Africa. J Infect Dis. 2024;230:786–8. https://doi.org/10.1093/infdis/jiae435.
17. Impouma B, Roelens M, Williams G, Flahault A, Codeço C, Moussana F, et al. Measuring timeliness of outbreak response in the World Health Organization African Region, 2017–2019. Emerg Infect Dis. 2020;26:2555–64. https://doi.org/10.3201/eid2611.191766.
18. Nansikombi HT, Kwesiga B, Aceng FL, et al. Timeliness and completeness of weekly surveillance data reporting on epidemic prone diseases in Uganda, 2020–2021. BMC Public Health. 2023;23:647. https://doi.org/10.1186/s12889-023-15534-w.
19. Uganda Bureau of Statistics, Main I. The National Population and Housing Census 2024 – Final Report. Kampala: UBOS; 2024.
20. Braun V, Clarke V. Reflecting on reflexive thematic analysis. Qual Res Sport Exerc Health. 2019;11:589–97. https://doi.org/10.1080/2159676X.2019.1628806.
21. Stone E, Miller L, Jasperse J, Privette G, Diez Beltran JC, Jambai A, et al. Community event-based surveillance for Ebola virus disease in Sierra Leone: implementation of a national-level system during a crisis. PLoS Curr. 2016;8. https://doi.org/10.1371/currents.outbreaks.d119c71125b5cce312b9700d744c56d8.
22. Aceng JR, Ario AR, Muruta AN, Makumbi I, Nanyunja M, Komakech I, et al. Uganda's experience in Ebola virus disease outbreak preparedness, 2018–2019. Global Health. 2020;16:24.

https://doi.org/10.1186/s12992-020-00548-5.

23. Collier KM, Klein EK, Sevalie S, et al. Ebola virus disease sensitization: community-driven efforts in Sierra Leone. J Community Health. 2024;49:108–16. https://doi.org/10.1007/s10900-023-01265-x.
24. Nwofe JO, Ojo EA, Owolagba FE, et al. U.S. withdrawal from WHO and aid programs: implications and opportunities for Africa's global health security. Global Health. 2026;22:19. https://doi.org/10.1186/s12992-026-01189-w.
25. Kibone W, Semulimi AW, Kwizera R, Bongomin F. Community-based mycetoma surveillance in Uganda: identifying knowledge gaps and training of community health workers to improve case detection. PLoS Negl Trop Dis. 2024;18:e0012572. https://doi.org/10.1371/journal.pntd.0012572.
26. O'Keeffe J, Takahashi E, Otshudiema JO, et al. Strengthening community-based surveillance: lessons learned from the 2018–2020 Democratic Republic of Congo (DRC) Ebola outbreak. Confl Health. 2023;17:41. https://doi.org/10.1186/s13031-023-00536-7.

Figures

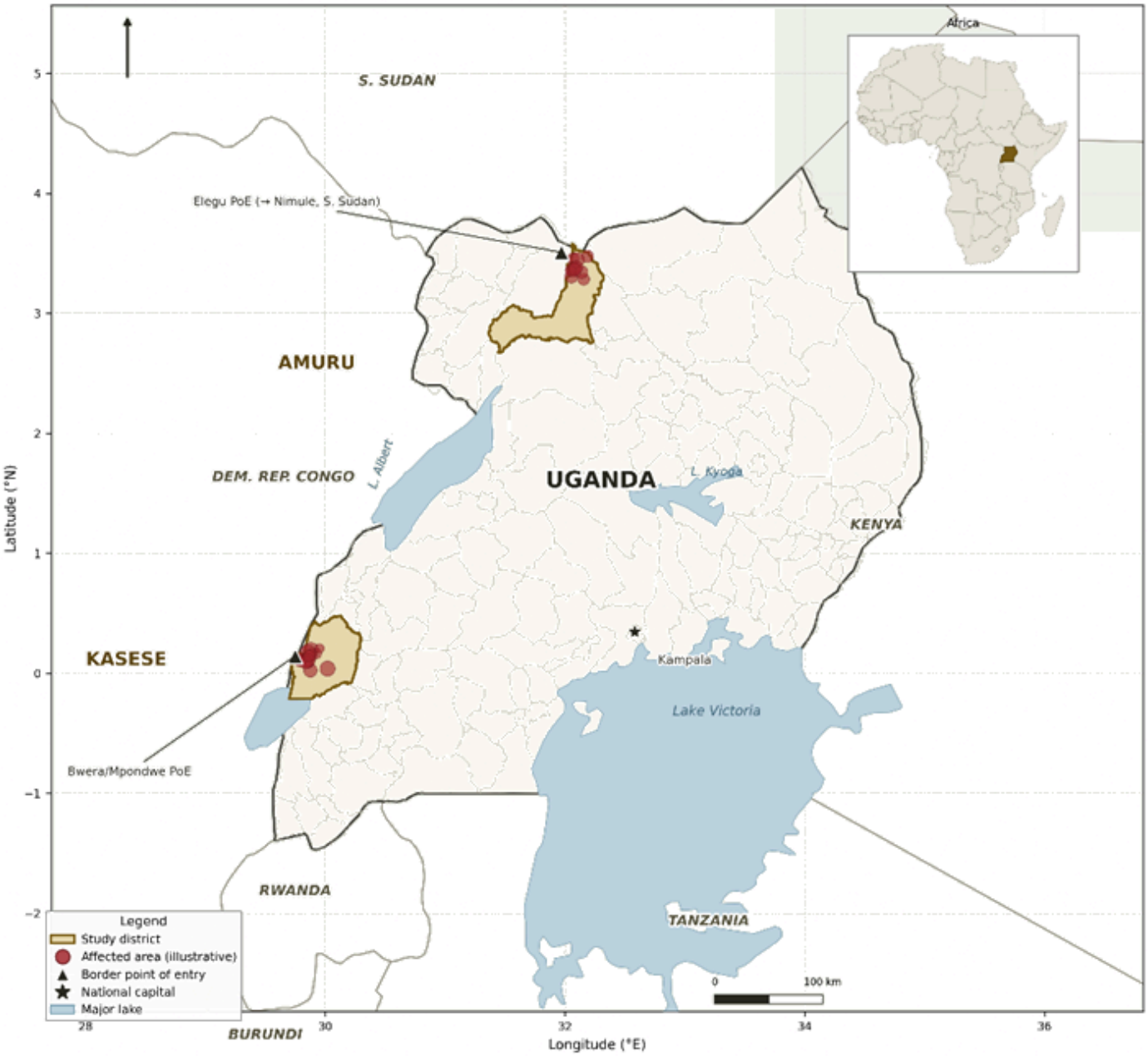


Figure 1

Map showing Uganda's border districts of Kasese and Amuru