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Perceived drivers of the Ebola virus disease outbreak in Mubende and Kassanda districts, Uganda: a qualitative study

Lesley Rose Ninsiima ,[1] Siobhan M Mor,[2,3] Javier Sánchez Romano,[4] Lydia Nabawanuka Namakula,[5] Clovice Kankya,[6] Joseph Kungu,[1] Lawrence Mugisha,[7,8] Jörn Klein,[9] Luke Nyakarahuka[1]

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For numbered affiliations see end of article.

Correspondence to
Dr Lesley Rose Ninsiima; lninsiima04@gmail.com

ABSTRACT

Introduction During the most recent Ebola virus disease (EVD) outbreak in Uganda, a cluster of community deaths with epidemiological linkages to the first reported case were identified to have occurred in Mubende, Kassanda and Kampala districts in September 2022. This study aimed to explore perceived drivers of EVD outbreak among affected communities in Mubende and Kassanda districts, Uganda.

Methods We conducted a descriptive qualitative and participatory epidemiology study using focus group discussions (n=4), in-depth interviews (n=12), key informant interviews (n=12) and participatory landscape mapping. The subcounties of Madudu (Mubende district) and Kikandwa (Kassanda district) were purposively selected within each district because Ebola cases were known to have occurred within these areas. The community expressed their own understanding and perceptions of the drivers of Ebola virus outbreak within these subcounties. Qualitative data were analysed using thematic content analysis in Nvivo V.12 software. Data were analysed using both inductive and deductive approaches, where codes, subthemes and themes in the data were merged with global themes. The results were interpreted in the context of the broader literature on the topic using the social-ecological model and the epidemiological triad using the specific experiences and insights of the study participants. Participant responses were categorised in terms of their themes.

Results A total of five themes were identified which described the perceived drivers of Ebola virus outbreaks. These included (1) individual: knowledge about EVD (source of the disease and fear due to death of some suspected cases); (2) interpersonal: perceived sources of Ebola virus spillover (ecological, anthropogenic, environmental and cultural); (3) community: impact of EVD to the community (economic loss and survivors lack of support from the government); (4) organisational: health system challenges in outbreaks (delayed laboratory results, poor recording and reporting systems in the facilities and poor surveillance); and (5) policy: recommendations (use of One Health approach and continuous sensitisation).

Conclusions This study underscores the complex interplay of factors shaping the dynamics of EVD. Understanding Ebola requires not only scientific knowledge but also an appreciation of sociocultural contexts and systemic vulnerabilities within health systems. We therefore recommend comprehensive approaches which integrate scientific expertise with community participation, strengthen health systems and foster collaboration across sectors to mitigate the impact of future outbreaks to address these challenges effectively. Additionally, raising awareness, sensitising the public and safeguarding natural habitats are crucial steps to mitigate the risk of future disease outbreaks.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Previous research has highlighted that Ebola virus disease (EVD) outbreaks are influenced by a combination of sociocultural practices, ecological factors and health system weaknesses. However, there is limited understanding of how communities perceive these drivers within their local contexts. This study was needed to capture community perspectives to inform tailored outbreak response strategies.

WHAT THIS STUDY ADDS

⇒ This study reveals that communities view EVD outbreaks as being driven not only by environmental and health system factors but also by sociocultural beliefs and local practices. By combining the epidemiological triad with the social-ecological model, this approach illustrates how complex interactions among agent, host and environmental factors can inform more effective community-based responses to disease outbreaks.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ The study's findings suggest the need for more community-driven research to understand local perceptions of disease drivers. It informs policy by advocating for culturally sensitive interventions, improved health system responses, and stronger community engagement in outbreak preparedness, potentially leading to more effective prevention and control strategies.

INTRODUCTION

Ebola virus disease (EVD) is a severe illness that poses a significant threat to public health due to its high fatality rates and rapid spread in affected regions.[1] As of 2022, Uganda had recorded six outbreaks of EVD. The first outbreak was documented in 2000 in the Northern district of Gulu, followed by subsequent occurrences in 2007 in the Western region, 2011 in Luweero district, 2012 in Kibaale district, 2013 in Luwero and Kampala districts, and the most recent in September 2022 originating from Mubende District. Four of these outbreaks have been attributed to *Orthoebolavirus sudanense* (previously known as Sudan ebolavirus, SUDV),[2] including the most recent occurrence. However, an initial investigation revealed a group of 19 community fatalities with epidemiological linkages to the first identified case.[3] Overall, 142 confirmed cases of *O. sudanense* were reported, of which 55 died (CFR: 39%), and 87 recovered. In addition, 22 deaths among probable cases were reported in individuals who died before samples could be taken (overall CFR: 47%). At least 19 healthcare workers were infected, of whom seven died. These deaths occurred in Mubende, Kassanda and Kyegegwa districts in August and September 2022.[3] These probable cases were found to have connections to individuals working in or around local mines where bats are known to inhabit.[3]

Spillover events, marking the beginning of outbreaks of some infectious diseases and their possible human-to-human transmission, are influenced by an array of social and environmental factors.[4] Disease can act as a potent perpetuator of the poverty cycle, escalating vulnerability to illness.[5] Scientific investigations have concentrated on unravelling the multitude of factors catalysing EVD outbreaks, including socioeconomic conditions, community-based behaviours, confidence in governmental institutions and deeply ingrained sociocultural practices.[6] Studies have found that socioeconomic factors, including household wealth and education, wild game consumption, armed conflict, inadequate health systems and poverty, as well as eco-environmental factors such as the transition between wet and dry seasons and seasonal variation in bat abundance, have been reported to play a role in starting and spreading outbreaks.[7] Furthermore, cultural interactions may lead populations to adopt new practices and acquire additional risks.[8]

The interaction between human activities and the rise of infectious diseases has been widely acknowledged, particularly with the advent of the COVID-19 pandemic.[9] Despite the critical roles of wildlife management, conservation and land use in shaping pathogen dynamics, environmental drivers of outbreaks are often overlooked such as disease ecology, complicating conservation, tourism and public health efforts.[10 11] Increased global connectivity has facilitated pathogen transmission and global spread, emphasising the need for robust surveillance, though many epidemiological processes remain poorly understood and calls for research.[12] Community-based behaviours, such as handwashing and caregiving routines, persisted during and after the Ebola epidemic in Liberia, while mistrust in the government and denial of the outbreak were also observed. [13–15] Community perceptions are critical because they shape health-seeking behaviours, adherence to preventive measures and overall acceptance of response strategies.[16] In Sierra Leone, misconceptions, stigma and mistrust in health authorities lead to resistance against interventions, fueling further 2014–2015 EVD transmission.[17] Understanding these perceptions allows health officials to design culturally sensitive and effective communication strategies that promote cooperation, reduce fear and enhance the success of outbreak control efforts.[18] The social-ecological model (SEM) provides a valuable framework for understanding how multiple factors influence individual, interpersonal, community and societal interact to shape health behaviours and disease dynamics during outbreaks.[19]

The SEM illustrates the diverse array of multilevel factors shaping our health.[8] The EVD transmission can therefore be influenced by various factors across different levels of the SEM, including the virus itself, the reservoir and the social environment.[20] The epidemiological triad model can be situated within the framework of individual lifestyle factors, social and community networks, and socioeconomic, cultural and environmental factors. This model facilitates interventions targeting behavioural factors to mitigate transmission.[11] In this study, we used the SEM in combination with the epidemiological triad to explore perceived drivers of the EVD outbreak among affected communities in Mubende and Kassanda districts, Uganda.

METHODS

Study design

This study adopted a descriptive qualitative design and participatory epidemiology methods to investigate the underlying factors contributing to the outbreak of EVD in Mubende and Kassanda districts. The methodology used for the study was developed under the Dynamic Drivers of Disease in Africa Consortium.[21] The primary data were collected by means of key informant interviews (KIIs) with experts in the field and focus group discussions (FGDs) with local leaders and village health teams (VHTs) with a guided interview guide as shown in online supplemental material. In addition, in-depth interviews (IDIs) were conducted among survivors of EVD, and participatory landscape mappings were done by VHTs to identify the locations of the index cases and other EVD cases within the selected subcounties. Different people expressed their own perception and understanding on the drivers of EVD outbreak.

Study setting

The study was conducted in Mubende and Kassanda districts, which are located in the central region of Uganda. Mubende and Kassanda Districts primarily

consists of agricultural land, with a significant portion dedicated to subsistence farming and mining. Mubende district is one of the largest districts in Uganda, with a total area of approximately 2713 km^2.[22] The total population of Mubende District as contained in the 2014 Population and Housing Census was 688 819 with 346 525 males and 342 294 females, and the projected to be 717 361 persons with a population density of 148 people/km^2 with an average growth rate of 3.0% per annum at the time of study.[23] In 2020, the projection of population in Kassanda district was 17 000 with an annual population density of 697.0 people/km^2 with annual population density change of 2.4%.[3] As of the most recent data available, the population of Kassanda District is estimated to be around 250 000 people.[23] Mubende Regional Referral Hospital has Ebola treatment capacity, while Kassanda relies on smaller, less-equipped facilities.[24] Mubende and Kassanda districts have under-resourced health systems as during the start of the outbreak, patients attended two separate private facilities in Madudu subcounty.[3] Specific subcounties within Mubende and Kassanda districts were purposively selected due to the presence of EVD cases from the 2022 outbreak and the availability of study participants in these areas.

Data collection

This study was done 1 year following after the index case was confirmed in September 2022. Four FGDs were conducted in the study communities with participants purposely recruited based on their involvement in the most recent EVD outbreak (2022) and lived in the subcounties where the study was done. Focus groups were made up of 6–8 individuals, lasted about 45 min, and took place indoors near community centres of each study site. Each participant was given a numerical identifier from one to eight, which they were asked to raise when they wished to contribute or respond. Two experienced research assistants were allocated to each FGD with one being a moderator and note taker, while the second had the role of leading interviewer. The research assistants were able to speak the local language. Research assistants were trained in a customised script, a document designed by the research team that standardised the way the study was introduced to participants, including ground rules and the sequence of questions and topics to cover during the discussion. The moderator would call them by number and the respondent would state their number again before speaking. This procedure allowed each participant to fully have the floor while expressing their thoughts, ensured confidentiality by not using names as identifiers, while it also served as a means to attribute participant numbers to each quote when referring to the transcript produced from the audio recording. The physical layouts of the community survivor's location were mapped on large sheets of paper on the ground by the FGD participants during the participatory landscape mapping. Participants were then asked to indicate settlement sites, local landscape features and types of land use activities on the map and Ebola case's location within each village. The aim of the mapping exercise was to locate all the major landmarks of the community and together with the roosting.

IDIs (n=12) were conducted with EVD survivors. The EVD survivors were included because of their lived experience and perspectives on what caused the outbreak which made them sick, hence giving deep insights. These participants were identified with the help of the surveillance focal person at the district who purposively selected the participants based on convenience. The surveillance focal person had locations (within Madudu and Kikandwa subcounties) of all the survivors and interviews were done based on convenience of research assistants' location. These unstructured interviews (allowing for open-ended conversation) which lasted for 45 min each and were conducted between August and September 2023 and gathered information on environmental, ecological, anthropogenic and social conditions that may have contributed to spillover events.

KIIs (n=12) were also held with heads of departments, doctors, nurses as well as chiefs and opinion leaders within the study communities of Madudu and Kikandwa subcounties and these lasted for 45 min each. The interviews aimed to understand the history of EVD outbreak in the communities. The data were collected from both subcounties and included one district from each subcounty that was specifically affected by the Ebola outbreak in September 2022. Data were collected to saturation which is believed to be at 12 participants. All FGDs, IDIs and KIIs participants provided a written consent to participate and record the audios as shown in online supplemental material.

Data management and analysis

Data from the FGD, IDIs and KIIs as well as notes from the participatory mapping were analysed qualitatively using thematic analysis. This involved identifying, analysing and reporting patterns (themes) within data.[25] On completion, the audio recordings were transcribed and translated from local languages into English transcripts. Qualitative data were merged and analysed using thematic analysis in Nvivo V.12 pro software. Data were analysed using both inductive and deductive approaches, which involves identifying patterns and themes in the data and using global themes from literature. The codes, subthemes and themes identified were exported to an excel sheet for exploration. The analysis was carried out by two research assistants under the supervision of the lead researcher, who was responsible for reviewing and approving the final codes, subthemes and themes. A sensitivity analysis was conducted to assess the robustness of the findings to different assumptions or potential biases in the data with all theme's values set to a value of 0.1, before each is increased and decreased by 10%, with all other factors held constant. Sensitivity analysis was done by re-evaluating themes, considering different coding strategies, and exploring how variations in participant

Table 1 Participants in a study on the perceptions of drivers of the EVD outbreak in Mubende and Kassanda districts, Uganda

Interviews (n)	Madudu subcounty, Mubende district (n)	Kikandwa subcounty, Kassanda district (n)
	Veterinary Officer (2)	District Veterinary Officer (1)
	District Health Education officer and Ebola focal person (2)	Ebola focal person (1)
	District Chief Administrative Officer (1)	Health in charges (3)
Key informant interviews (12)	Environment Officer (1)	Anthropologists (1)
In depth interviews (12)	Survivors (7)	Survivors (5)
	Village health teams (6–8 participants each) with one from each subcounty	
Focus group discussions (4)	Local council leaders (6–8 participants each) with one from each subcounty	

EVD, Ebola virus disease.

responses impact the overall interpretation of the data.[26] We then calculated the percentage increase and decrease in the output after each increment and decrement in values.[26] The results were interpreted in the context of the broader literature on the topic using the SEM and the epidemiological triad using the specific experiences and insights of the study participants. The epidemiological triad was used to categorise key factors such as agent, host and environment influencing disease transmission, while the SEM was used to frame these within broader social and ecological contexts. This integration helps to analyse how individual, community and environmental interactions contribute to disease dynamics and perceptions during the outbreak. Reporting of the qualitative findings was done with the guide of a Consolidated criteria for Reporting Qualitative research (COREQ). The criteria included in COREQ, a 32-item checklist, helped to report important aspects of the research team, study methods, context of the study, findings, analysis and interpretations.[27]

RESULTS

Participant characteristics

Participants in this study were from diverse occupations such as health inspectors, surveillance officers, veterinary officers, EVD survivors, in-charge and clinician at a health facility as shown in table 1. This diversity in backgrounds reflects a range of perspectives and experiences related to infectious diseases within the community.

The characteristics of IDI participants are shown in online supplemental table 1). The majority were from Madudu subcounty (n=7) and most were female survivors (n=8).

In the participatory landscape, mapping highlighted that most cases were in the urban setting, especially near the trading centres in both districts.

Perceptions regarding drivers of the EVD outbreak

A total of five themes were identified which described perceived drivers of the EVD outbreak. This included (1) individual: knowledge about EVD; (2) organisational: health system challenges in outbreaks; (3) interpersonal: perceived causes of Ebola virus (EV) spillover; (4) community: impact of EVD to the community; and (5) policy: recommendations.

Host

Individual factors: knowledge about EVD

Some of the survivors expressed uncertainty about the source of the disease, expressing scepticism about the existence of the disease. One of the survivors' responses is highlighted here:

> I also don't know how I acquired the disease, from nowhere I saw myself suffering from the disease. Truth be told, I took it like a joke at the beginning of the outbreak. First of all, I did not know about the disease, but after getting to know about it, I was in fear, worried and cautious about the disease. (IDI 2, D1)

The fear of EVD spread through communities as rumours and fear circulated with its approach, leading to reluctance in reporting cases. Fear was heightened by observing deaths and strict preventive measures. The lack of information among the population was identified as a factor contributing to the spread of EVD. As the outbreak progressed, respondents expressed a growing understanding of Ebola's severity and symptoms which included bloody eyes, high fever and vomiting. A respondent shared their emotional state on realising they had contracted the disease. Initial awareness about EVD included information about the disease's severity and transmission.

> We got a lot of fear when we heard about the disease in the neighboring community. The spill of Ebola, the causes first of all are our masses are not yet informed. (IDI 12, D2)

> After my wife had got contact with our grandchild who succumbed to the disease, now they were advertising the disease but when we heard about Ebola for the first time, we were worried since we were not aware of what exactly Ebola was. The first thing that I heard was that if you touch someone that has the disease, you are likely to get the disease as well. (IDI 6, D1)

Agent

Organisational factors: health system challenges in outbreaks

According to participants, healthcare workers lacked knowledge, training or support in the clinical management as they could not suspect the disease and were treating early EVD cases like normal fever. It was only after severe signs like vomiting blood appeared that healthcare professionals realised the severity of the situation. The lack of a strong surveillance system was highlighted. Perceptions were that the surveillance team was too late in detecting the first case. The possibility of the virus entering the community due to weak surveillance and trust of people from various areas was emphasised.

> My child, upon reaching the referral hospital, was initially treated as if she had malaria. This delay in recognizing Ebola allowed the virus to spread within the family before proper measures were taken. (IDI 1 D2)

Participants expressed concerns about the deterioration of health systems in Uganda, emphasising issues such as the neglect of inspections by health assistants and inspectors in disease-prone areas, particularly contributing to the prevalence of diseases like malaria. The suboptimal health system was attributed to low reporting levels by community members and inadequate community-based surveillance. Respondents also identified delays in healthcare responses, including the untimely administration of treatment leading to increased mortality. Delays in obtaining laboratory results further hindered prompt responses.

> …Limited access to healthcare in the initial outbreak area resulted in delayed detection, initially misattributed to witchcraft. As the virus spread to other regions, its true nature was recognized, enabling more accessible and available treatment with increased attention and daily checkups for patients as cases multiplied. (KII4, D1)

Community factors: Impact of EVD to the community

Most survivors shared the perceived causes of the Ebola outbreak and its impact on economic activities, particularly in relation to the socioeconomic status of individuals. The respondents shared poignant experiences, expressing the profound negative effects of the outbreak on their businesses. The majority of the survivors highlighted the significant economic losses, including theft of property and the need to discard items due to chemical spraying during the response efforts. The economic aftermath was marked by debt, making it challenging to recover and expand their businesses. The survivors expressed frustration with the lack of tangible assistance from those inquiring about their situation, emphasising the need for meaningful support. In addition, respondents described the impact on personal well-being, the isolation and disruptions caused within their home. Respondents also shared their concerns about the health of Ebola survivors, stating,

> We were told that Ebola takes 2–6 weeks to be cured after the onset of symptoms. However, some Ebola patients who have been treated and cured are still undergoing treatment even up to now. These survivors of Ebola do not look so healthy as they were before. The doctors say that full recovery may take several months, with health issues like fatigue, joint pain, and vision problems still affecting them. (FGD-LL1, D2).

> My body lost its vigor and energy. ……My children living within and those in Mubende municipality were highly isolated for an entire year since my family had registered cases for the disease. (IDI 6, D1)

With the lockdown, the respondents faced economic challenges with business closure and some highlighted social isolation.

> … as we had a lot of economic challenges here… few that are commercial, so a peasant farmer dealing in perishable items and you are locked down for a period of around three to four months, you know what that means. I was unable to earn any money, and my goods got spoilt so I ended up making a big loss and it also affected my family since we had no food as you see my place now still recovering. (IDI 8, D1)

> I was isolated by the community members, and my business was closed for one (1) month as they were not willing to support me. (IDI 2, D2)

Respondents emphasised the challenges the community faced highlighting fear, lack of awareness and the proximity to infected individuals led to heightened vigilance and preventive measures. The negative consequences of the disease's presence in the community were outlined, including the spread of Ebola through medical facilities, and a survivor added,

> Ebola came with a lot of challenges within the community as the cases increased, it caused fear. What I know is that the disease was with us, and we suffered from it and cured, but currently I have not heard of any case. (FGD-VHT 2, D2)

Environment

Interpersonal factors: perceived sources of EV spillover

During the FGDs, participants conveyed their understanding that health professionals had mentioned that the EV could be transmitted from humans to animals.

Health workers reportedly educated them that animals like monkeys, bats and pigs could spread EV. The presence of bats, particularly in homes, was emphasised, and some participants suggested that bats could transmit the virus through both air and droppings. Different activities like hunting, particularly for bats, were linked to the outbreak, suggesting a need for monitoring and regulation.

> The role of bats in transmission was emphasized, and the belief that bats could transmit diseases during specific seasons or through contaminated food was expressed. (FGD-VHT 1, D2)

The community observed the presence of bats, particularly in houses with ceilings, noting their activity in the

evenings. Concerns were expressed about how bats might contribute to the spread of diseases. There was uncertainty regarding whether bats or monkeys were responsible for the initial spillover of the disease. Some respondents speculated that contact with animals from Sudan might have triggered the disease. Additionally, there were mentions of people from various origins, such as Congolese, consuming bats. Respondents also identified wild animals like monkeys as potential sources of EV, suggesting transmission through the fruits these animals consumed.

Diverse viewpoints emerged regarding the activities surrounding EV transmission. While some participants pointed to a potential link between economic activities, like the roasting and selling of goat meat, and the spread of EV, others were sceptical about directly associating specific economic activities with the disease. They emphasised the challenges of tracing spillover events in such contexts. The role of activities such as grazing in the forest and hunting for wild animals was also discussed as potential factors for contact with wildlife, sparking concerns about disease spillover from animals to humans. However, perceptions varied, with some participants expressing limited awareness of these activities.

> A man who was selling goats meat in the market center in Mubende district is believed to have been the source of the infection. He came with all the signs of the disease which might have infected other people in the village. (FGD-VHT1, D1)

Participants mentioned how changes in land use, such as clearing forests, might contribute to the spillover of diseases from animals like bats and monkeys to humans. In addition, the impact of climate change on farming practices and migration was also highlighted as a potential factor influencing the occurrence and human to human transmission of diseases. Political instability was considered a potential factor in the occurrence and spread of EV in the neighbouring countries causing the movement of refugees. The movement of different people from different countries seeking employment, transportation of goods and globalised economic activities were identified as contributing factors.

> Movement of people, including hawkers and businesspeople, played a role in spreading the disease. There was a trader who came with goats from the neighbouring countries and sold them here and the person who got them was the first case of Ebola virus… (FGD-LL 2, D1)

Increased population and urbanisation were highlighted as contributing factors to the human-to-human transmission of diseases stating that this has caused overcrowding, poor urban planning and increased interactions among people hence increase in the number of infected people. The topography, location and environment were discussed in relation to the attractiveness of the area for various activities which leads to many people coming in hence increase in the number of infectious diseases like EVD.

> The location of Kassanda district which is near Mubende district was a major factor since these are neighbouring each other contributed to the spread of EVD to another district. (FGD-LL 2, D2)

> …. communities have grown with many people leading to overcrowding in these towns which are not planned. Therefore, people are not protected for example some people are in towns, yet they do not have anywhere to go for short and long call and when it rains, runoff is drained into the water sources which are not inspected to take water samples for analysis to check whether it's safe. (KII 2, D1)

Respondents highlighted various cultural and human behavioural factors contributing to the spread of EV. Cultural practices, such as the washing of dead bodies, were identified as potential sources of infection, with individuals handling the sick or participating in rituals accelerating the disease's transmission. The respondents also noted that the rapid spread of Ebola was influenced by cultural beliefs, misinformation and resistance to change within the community.

> There were diverse range of cultural and behavioral factors shaping the dynamics of Ebola transmission in the community. Within the communities, religious practices, like closing oneself in worship places without precautions, promoted the spread of the virus at a high speed. (IDI 4, D1)

Policy factors: recommendations

The interviews underscore the necessity of fortifying the One Health approach through the integration of many vocations within the healthcare industry. It was suggested that VETs and VHTs create and consider reporting mechanisms and maintain community involvement even after disease control.

> The government aim of improving disease management could be achieved by stationing an epidemiologist, fortifying the District Task Force within the districts that were affected. In addition to all this, community-based surveillance, nutrition, sanitation, and hygiene be emphasized. (KII 6, D1)

Respondents suggested refining and monitoring refugees in one location to stop the spread of disease. There is a need for sensitisation campaigns both within and cross borders. In addition, most respondents highlighted the need to have screening services at entry points and setting up a local hospital for immediate response. Key informants from this study suggested incorporating emergency response teams and physicians in the management of outbreaks would strengthen the multidisciplinary team.

DISCUSSION

This study applied a qualitative research approach to comprehensively examine the contributing factors to the EVD outbreaks in Mubende and Kassanda districts, contextualising our findings within the critical period of 1 year following the index case (September 2022). Our findings reveal complex community perceptions of the

drivers and experiences of EVD survivors in a Ugandan healthcare system. Collective insights gleaned from these discussions offer a deeper understanding of the drivers of the EVD outbreak and provide a need for targeted, community-informed interventions to effectively address these drivers and improve survivor support, with five themes identified from KIIs, IDIs and FGDs in this study.

EVD symptoms, especially in the early state of the illness, are unspecific and can easily be confounded with malaria or other diseases presenting with fever.[28] Our findings showed that the participants did not have knowledge of the disease until the first death occurred, as the health facilities first diagnosed it as malaria. This result is similar to the information displayed in other studies in Uganda and Sierra Leone,[29] where many of the participants showed a desire to understand the difference between the symptoms of Ebola and other tropical diseases such as malaria, typhoid fever and cholera, which are relatively more prevalent in sub-Saharan Africa.[30] In Uganda, agropastoral community respondents were able to identify the major signs and symptoms of EVD such as fever, vomiting, bleeding and diarrhoea, since educational and communication material were available in the community health centres and public spaces.[31]

Most Ebola cases and survivors were indicated to be staying in the urban areas on the participatory maps of Mubende and Kassanda districts. These findings differ from a study that Ebola haemorrhagic fever is an emerging zoonotic viral disease that historically has occurred in rural areas of Central Africa, with isolated cases identified elsewhere.[32] Similarly, rural-to-urban migration and growth in the affected countries have significantly increased the proportion of people living in urban environments, where EBOV outbreaks have focused in West Africa.[33 34]

The fear of cured patients might partially be explained by the fact that community acceptance of survivors was not part of the initial set of Ebola health messages in Uganda and this increases the stigma within the communities. Future health awareness activities, especially in areas that have been affected by the outbreaks might benefit from emphasising the signs and symptoms of Ebola, addressing fears about seeking treatment and placing additional focus on counties and communities where incidence of Ebola is low as a preparedness measure. In developing countries like Uganda, healthcare systems face significant weaknesses and are severely short of resources. Disease surveillance, infection prevention and control, and clinical care are all strained as a result of these deficiencies.[35] This study has underscored the inadequacies in EVD suspicion, as many cases were initially mismanaged as malaria, with poor recording and reporting of cases in healthcare facilities, along with delayed laboratory results, potentially contributing to the disease's spread. In situations involving unfamiliar diseases like Ebola, patients may turn to traditional intervention when conventional medicine proves ineffective. Seeking assistance from traditional healers during Ebola outbreaks could stem from poverty (as hospital care may be perceived as too costly) and distrust in health authorities or systems (due to the requirement of advance payment for treatment). The study has also pointed out delays in laboratory processes, leading to an increase in cases, potentially due to a lack of awareness that could prolong the delivery of healthcare services to affected individuals, leading to fatal outcomes. Therefore, it is imperative to strengthen Uganda's healthcare system and enhance its resilience to effectively respond to future crises. Initiatives to address socioeconomic challenges are also essential.[36]

The spread of infectious diseases is closely intertwined with human mobility. The initial cases were identified in the Mubende District, primarily among residents in proximity to a gold mine. The mobility of gold traders has been suggested as a potential factor in transmitting the virus beyond the initial outbreak site.[3] Intercountry borders between districts are especially pertinent in understanding disease transmission dynamics. The findings of this study echo previous research, highlighting the persistence of unauthorised movements irrespective of ongoing epidemics, thereby heightening the risk of disease spread across different districts and boarders as a potential risk disease transmission.[37]

Studies have shown utilisation of bushmeat was identified as the primary pathway for EBOV spillover from wildlife reservoirs to humans; however, further research is being carried out to assess the validity of this.[38] The rapid influx of people into urban areas has heightened the demand for food production, leading to increased trading and consumption of bushmeat as an affordable protein source.[31] Findings align with previous research indicating that the consumption of bushmeat could contribute to infection, since the majority of respondents associated the transmission of EVD with the consumption of bats, monkeys and bushmeat.[39] Epidemiological data also support these findings, revealing instances of disease in game hunters while no cases were documented in individuals who consumed properly cooked game meat. Wildlife biltong, a popular dried-meat delicacy in Africa and beyond, may present unique challenges, since the virus can remain viable for over 50 days when dried and stored at 4°C.[34] Therefore, findings from this study recommend more awareness on the safe handling and cooking practices for bushmeat to reduce risks of disease spillovers from wild reservoirs.

Cultural practices, such as the washing of dead bodies, were identified as potential sources of infection, with individuals handling the sick or participating in rituals accelerating the disease's transmission. Our findings support that Ebola outbreaks are not only medical challenges but also sociocultural challenges. To grasp the implications of Ebola as a sociocultural issue, it is crucial to recognise that the medical response to Ebola disrupts local customs, such as caring for the sick, burial rituals and washing the dead bodies. The cultural practice varies between region and country but shows a combined effect

of cultural practices with increase in disease outbreaks. This study findings are similar to a study in Guinea where a well-known male Guinean midwife assistant who regularly performed circumcision which is a cultural practice in the community died probably due to Ebola, but the cause of his death was unknown during the funeral, and this was linked to an outbreak.[1] Despite several outbreaks of EVD in Uganda, to date, communities are still misinformed to the extent that some dead bodies were exhumed after safe and dignified burials leading to further infection transmission in the community.[40] According to Guinea's Ministry of Health report from August 2016, 60% of cases in the country were attributed to traditional burial and funeral practices.[41] Similarly, WHO staff in Sierra Leone estimated in November 2014 that 80% of cases in that country were associated with these practices.[40]

The study highlighted the negative impact on the survivors and the community as fear, stigmatisation and economic losses due to restrictions, such as movement restrictions or shortened trading hours for public markets. Participants recognised that some survivors could not return to their normal livelihoods due to health challenges and/or stigma, potentially leading to health, economic and social implications that can ripple out to their families and communities. These results are consistent with other published research that revealed that the Ebola outbreak had a pernicious economic impact on households, leading to high unemployment and income loss.[42] In most cases, Ebola survivors are rejected by their communities, their belongings burned and are not allowed to share common amenities. Data from the 2001 Ugandan outbreak showed that female survivors experienced more stigmatisation than male survivors.[43] Stigmatisation can reach beyond the immediate family, as for example in Uganda, where relatives of survivors and the deceased were also stigmatised once the names were publicly released.[34] This is a call for the government that in a post-Ebola setting, survivors' needs and community engagement efforts that promote social inclusion should be prioritised. In addition to the significant toll on human health and healthcare systems, EVD outbreaks lead to restrictions on movement of people and animals in affected areas, as well as disruption of the food supply chain, impeding the transportation of food from farms to consumers.[29]

In the recent outbreak, effective risk communication and community engagement played a vital role in early detection, contact tracing and sustaining prevention and management efforts. However, there are still gaps that need to be addressed. This study emphasises collaboration between various health professions to enhance a holistic approach to outbreak control, establish effective reporting mechanisms for veterinary doctors and maintain ongoing community engagement to sustain awareness. Strengthening primary healthcare systems, enhancing community engagement and mobilising social support are crucial for improving the effectiveness and sustainability of programmes and activities for affected populations and Ebola survivors.[28 43]

Continuous health risk education is crucial for promoting behavioural changes and establishing sustainable zoonosis prevention practices, particularly among high-risk groups. To maintain the effectiveness of postoutbreak initiatives, it is essential to strengthen the District Task Force, enhance community-based surveillance and prioritise hygiene, sanitation and nutrition education. Engaging medical professionals and well-equipped emergency response teams can further reinforce government support. Implementing regulations and awareness campaigns to reduce the consumption of high-risk wild animals and establish screening measures at entry points, while using local hospital facilities for rapid disease response will in turn prevent future zoonoses like EVD.[44] In addition, having integrated strategies, like the 'One Health' approach, while incorporating socioeconomic and cultural factors to ensure inclusive solutions will strengthen the capacity of the health system in order to fight future outbreaks with all views in mind.[45] Generating local knowledge through participatory methods is vital to addressing the needs of various socially differentiated groups.[46] Additionally, recognising and fairly compensating VHTs are essential to sustain their critical role in outbreak response and community health education.[47]

There are some limitations to this study which should be mentioned. Although the participants were recruited from the entirety in Mubende and Kassanda districts and our findings are likely illustrative of widely held beliefs of other districts that were affected, the findings may not accurately represent the entire population.

CONCLUSIONS

This study underscores the complex interplay of factors shaping the dynamics of EVD. Understanding Ebola requires not only scientific knowledge but also an appreciation of sociocultural contexts and systemic vulnerabilities within health systems. We therefore recommend comprehensive approaches which integrate scientific expertise with community participation, strengthen health systems and foster collaboration across sectors to mitigate the impact of future outbreaks to address these challenges effectively. Additionally, raising awareness, sensitising the public and safeguarding natural habitats are crucial steps to mitigate the risk of future disease outbreaks.

Author affiliations
[1]Department of Biosecurity, Ecosystems and Veterinary Public Health, Makerere University, Kampala, Uganda
[2]University of Liverpool, Liverpool, UK
[3]International Livestock Research Institute, Addis Ababa, Ethiopia
[4]Department of Medical Biology, The Artic University of Norway, Tromsø, Norway
[5]Department of Disease Control and Environmental Health, Makerere University, Kampala, Uganda
[6]Department of Biosecurity Ecosystems and Veterinary Public Health, Makerere University College of Veterinary Medicine Animal Resources and Biosecurity, Kampala, Uganda

[7]Department of Wildlife and Aquatic Animal Resources, Makerere University, Kampala, Uganda
[8]Conservation and Ecosystem Health Alliance, Kampala, Uganda
[9]University of South-Eastern Norway, Porsgrunn, Uganda

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ORCID iD
Lesley Rose Ninsiima http://orcid.org/0000-0003-3771-0527

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