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SIERRA LEONE PARTICIPATORY PLANNING USING OUTCOME MAPPING :

Summary Report

Jen Peterson, Tetra Tech

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STOP Spillover

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STOP SPILLOVER

Strategies to Prevent (STOP) Spillover enhances global understanding of the complex causes of the spread of a selected group of zoonotic viruses from animals to humans. The project builds government and stakeholder capacity in priority Asian and African countries to identify, assess, and monitor risks associated with these viruses and develop and introduce proven and novel risk reduction measures.

Through Outcome Mapping (OM), a structured participatory tool that uses a bottom-up collaborative process, spillover ecosystem stakeholders (both traditional and non-traditional) will be empowered to identify and reduce zoonotic spillover risks at human-animal-environment interface and develop an outcome-oriented project action plan. This report outlines the details of the OM workshop activities in Sierra Leone.

Acronyms

AFENET	Africa Field Epidemiology Network
ECTAD	Emergency Center for Transboundary Animal Diseases
CT	Country team
CDC	Center for Disease Control
DHMT	District health medical team
EBV	Ebola Virus
e-IDSR	Electronic Integrated Disease Surveillance & Response system
EPT	Emerging Pandemic Threats
FAO	UN Food and Agriculture Organization
GHSA	Global Health Security Agenda
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GoSL	Government of Sierra Leone
GRNP	Gola Rainforest National Park
HPAI	Highly Pathogenic Avian Influenza
IFRC	International Federation of Red Cross and Red Crescent Societies
JEE	Joint External Evaluation
LF	Lassa Fever
MDA	Ministries, Departments, and Agencies
NGO	Non-Governmental Organization
OH	One Health
OIE	World Organization for Animal Health
OKNP	Outamba-Kilimi National Park
OM	Outcome Mapping
RAC	Risk Analysis and Communications
SBC	Social Behavioral Change
STAR	Strategic Toolkit for Assessing Risks
STOP Spillover	Strategies to Prevent Spillover
USAID	United States Agency for International Development
VHF	Viral Hemorrhagic Fever
WHO	World Health Organization

Key Terms

Critical (boundary) partner: In OM, critical partners are stakeholders or social actors with whom a project will work, support, or influence to achieve its vision. These may be individual organizations, groups, or institutions (e.g., local cultural or religious leaders, government agents, partner organizations, business entities). It is through them that the project expects to influence change in the wider society toward the OM vision.

High-risk interface: A socio-economic, environmental, and biological area in which the transmission of infectious agents across species (human, livestock, and/or wildlife) is known to occur. This may include bat guano collection sites, wet markets, wildlife farms and restaurants, and tourist areas. Human behaviors in these zones are driven by livelihood and economic needs, cultural traditions, and norms that cause contact and thus transmission risk. Each STOP Spillover intervention focuses on a specific high-risk interface relevant to a targeted zoonotic disease.

High-risk interface node: A particular interactive space in an interface where there is potential for transmission of infectious agents across species (human, livestock, and/or wildlife).

Intervention: Action taken by the project or other organizations to help critical partners achieve their outcome targets (also referred to as 'outcome challenges').

Outcome Mapping: A program design and implementation strategy that targets transformation in stakeholders to guide implementation, adaptive management, and evaluation. It is guided by how targeted ecosystem actors react to a project's interventions.

Outcome target: An outcome target (or challenge) is a statement of change that describes how the behaviors, relationships, activities, or actions of each critical partner will change if the project achieves its vision. Outcome targets capture partner behavior as anticipated in the vision.

Spillover: For the purposes of this project, spillover is defined as an event in which an emerging zoonotic virus is transferred from one animal host species (livestock or wildlife) to another or to humans.

Vision: Conveys the large-scale development-related changes a project hopes to encourage in a given context. It is one or several statements that describe the economic, political, social, environmental, and relevant broad behavioral changes in selected critical partners.

Introduction

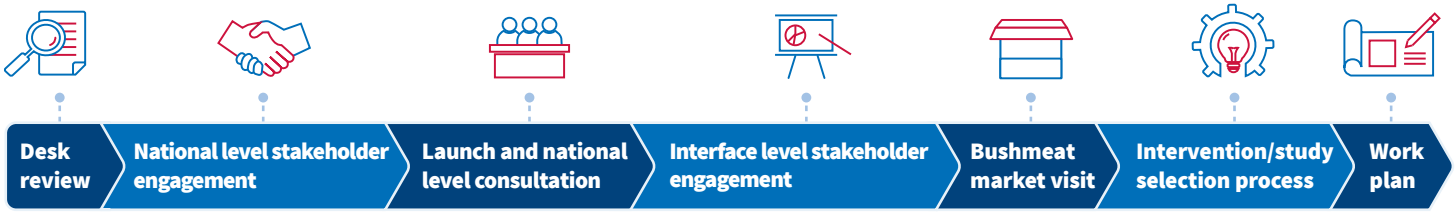
Sierra Leone has grappled with many challenges since the end of the civil war, including a cholera outbreak in 2012/2013, the Ebola virus crisis of 2014/2015, and the coronavirus pandemic starting in 2019/2020. Hunting and consumption of wildlife is widespread, with bats and rats hunted by young men and boys, cooked by women, and consumed in many rural households. This creates a risk of spillover for zoonotic coronaviruses, filoviruses, and other potential bat and rat-borne diseases. The highest priority zoonotic viruses in this ecosystem and within the remit of STOP Spillover are: 1) Lassa; 2) filoviruses (Ebola and Marburg); 3) zoonotic influenza A viruses; and 4) zoonotic coronaviruses. The basic features of Lassa and zoonotic influenza A viruses are well researched and key reservoir and bridging hosts have been identified. Nonetheless, there are significant challenges to designing and implementing effective and culturally relevant interventions that reduce the risk of viral spillover, amplification, and spread.

On September 30, 2020, the United States Agency for International Development (USAID) awarded STOP Spillover to a Tufts University-led consortium. The five-year project supports Sierra Leone in strengthening its capacity to reduce the risk of viral spillover from animal hosts to humans. Specifically, STOP Spillover will collaboratively design, implement, and assess risk reduction interventions by empowering local stakeholders to better understand and act to reduce key risks. STOP Spillover's scope is limited to the following priority viruses: Ebola; Marburg; Lassa, Nipah; animal-origin coronaviruses (including SARS-CoV, SARS-CoV-2, and MERS-CoV); and animal-origin zoonotic influenza viruses (such as highly pathogenic H5N1 avian influenza). Through its own activities and with support from the USAID Emerging Pandemic Threats (EPT) and PREDICT programs; the Global Health Security Agenda (GHSA); and the work of intergovernmental bodies such as the World Health Organization (WHO), Food and Agriculture Organization, (FAO) and World Organization for Animal Health (WOAH), the Government of Sierra Leone (GoSL) has embraced a One Health approach to combating risks posed by emerging viral zoonoses. Sierra Leone has established a One Health secretariat and a strategic framework for implementation but struggles to share animal, environmental and human health information across ministries and stakeholders for efficient and effective performance and interoperability across sectors. A core component of the STOP Spillover approach is Outcome Mapping (OM), a process that uses a collaborative, stakeholder-driven approach to engage a broad range of traditional and non-traditional stakeholders to identify and map desired outcomes. OM focuses on changes in targeted actors and in the spillover ecosystem as project outcomes to be influenced by a combination of interventions. Through participatory workshops, stakeholders identify and prioritize high-risk interfaces, describe current opportunities and knowledge gaps in zoonotic spillover risk pathways, and identify potential activities to reduce related risks.

OUTCOME MAPPING PROCESS

This section details how OM was adapted[1] for STOP Spillover in Sierra Leone. The OM activities started with a stakeholder engagement at the national level (May 3-17, 2022), followed by a one-day national level workshop (May 19, 2022) to identify and prioritize the top-ranked high-risk interfaces. This was followed by interface level engagements with various stakeholders (May 22-25, 2022), a bush meat market visit (May 24-25, 2022), an interface-level OM workshop, which was conducted in two phases. The first phase was conducted at the level of the district (May 26, 2022, followed by a second phase at the level of the community May 28, 2022). Figure 1

Figure 1. Timeline for OM Activities in Sierra Leone



1 OM was adapted to STOP Spillover needs as follows: the mission statement and organizational practices were left out. The vision statement is based on context opportunities, gaps, and barriers. 'Boundary partner' is referred to as 'critical partner,' and 'outcome target' is 'outcome challenge (Earl et al., 2001).' Earl, Sarah, Fred Carden, and Terry Smutylo. Outcome mapping: Building learning and reflection into development programs. IDRC, Ottawa, ON, CA, 2001.

shows the timeline for activities in these phases and the next steps in the OM process. Each stage is described in greater detail in subsequent subsections.

Stakeholder Engagement

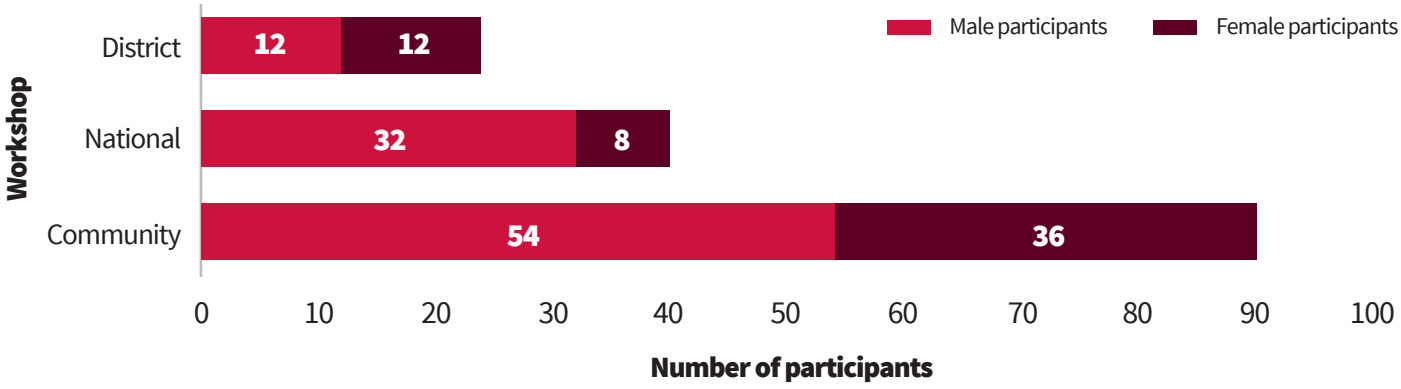
Stakeholder consultations preceded the OM meetings at both national and district levels. The goal was to learn about the One Health (OH) zoonotic disease intervention landscape; understand the diversity and geographical distribution of organizations working in the space; and introduce STOP Spillover as a complementary, value-adding project seeking to learn and share best risk reduction practices related to specific viral pathogens and interfaces. Twenty-two national stakeholder meetings were held between May 3 and 17, and helped corroborate findings from an earlier country desktop review of key zoonotic spillover gaps, barriers, capabilities, and opportunities. The discussions also helped to narrow the STOP Spillover priority pathogens from five to three (Ebola, Lassa, and highly pathogenic avian influenza (HPAI)), based on the diseases prioritized by the GoSL, and current and future opportunities for collaboration and coordination. Furthermore, the consultations provided an understanding of the status of human, animal, and environmental health laboratories researching the priority pathogens, to set a baseline for the project's intended surveillance activities (Annex 4).

District-level stakeholders were engaged after the one-on-one meetings at the national level, and the project launch and workshop held on May 19. The project was advised to start with the wildlife –human interface involving forest-edge communities in the Gola Rainforest National Park (GRNP) and those in the Lassa Belt in the Eastern Province. The team identified and met 17 subnational actors working in the three main OH sectors (Agriculture, Health, and Environment) to ascertain the status of interventions aimed at profiling and addressing Lassa and Ebola risks in vulnerable interface communities, identify active funders, evaluate previous interventions, and find opportunities for collaboration. Annex 5 lists all the stakeholders engaged at this level.

Workshop Participants

A total of 164 stakeholders participated in the meetings organized at the national, district, and community levels. More than one-third (34%) of the participants were women and almost all (97%) attended in person. There was a right mix of participants from respective sectors and interest groups, including the public service (local councils and field offices of the Ministries of Agriculture, Environment, and Health and Sanitation), informal community groups (e.g., bushmeat traders, traditional healers), women's groups, youth groups, and local non-governmental organizations (NGOs). The distribution of participants by OM activity level, gender, and mode of attendance, is presented in Figure 2 below.

Figure 2. Distribution of OM Participant



National-level Workshop Activities and Outputs

Workshop Objectives

The national OM workshop on May 19 entailed a formal project launch and sessions to determine priority pathogens and interfaces. It followed two weeks of meetings with national stakeholders who provided the country team (CT) with the information to determine who to invite to the launch and priority-setting sessions. The primary objective of the one-day national-level stakeholder engagement was to determine and prioritize pathogens and interfaces for STOP Spillover in Sierra Leone.

Pathogen Prioritization

The CT worked with the project's Risk Analysis and Communications (RAC) Hub Team to develop virus selection criteria. Ebola emerged as slightly more of a priority than Lassa (and Lassa as more of a priority than HPAI), although participants—including the director of health security and emergencies in the Ministry of Health and Sanitation (equivalent to GHSA advisor to the Government of Sierra Leone)—emphasized the importance of targeting both Ebola and Lassa.

The following aspects provide the rationale for targeting both Lassa and Ebola.

- Both pathogens have had social, economic, and political consequences
- There are significant knowledge gaps and potential local innovation to reduce spillover risks could emerge from further experimentation
- Both pathogens appear on the national list of priority zoonotic diseases
- Lassa detection has declined in recent years, although fatalities continue. While previously confined to the east, Lassa has been identified throughout the country except in Western Area
- Both pathogens present opportunities for working in the neglected wildlife sector, as both can be captured through research and practical interventions in the same geography or socio-ecological system, leading to outcomes across a larger geographic area

Proposed Interface Location

In accordance with the prioritized pathogens, human-forest interactions in the Gola Rainforest National Park in the Southwest where there are hotspots for selected pathogens, opportunities for collaboration and learning, and the potential for transboundary spillover, ranked highest. The prioritization was done following the criteria detailed below;

Interface Prioritization Criteria

CRITICAL AREA 1	**Areas where significant outbreaks have occurred in the past in Sierra Leone**
CRITICAL AREA 2	**Areas where drivers of spillover are increasing risk**
CRITICAL AREA 3	**Areas where there are partners willing to collaborate, coordinate and partner with STOP Spillover to solve key bottlenecks and overcome challenges**
CRITICAL AREA 4	**Areas where there are no current stakeholders working on a particular issue or risk factor**
CRITICAL AREA 5	**Areas with at risk populations**
CRITICAL AREA 6	**Areas for which little or no information is available on priority zoonoses**

District-level Workshop Activities and Outputs

The district-level workshop was held on May 26 to introduce OM use to district and chiefdom-level (sub-national) actors in Kenema District and around the Gola Rainforest National Park (GRNP). The meeting gave participants an opportunity to discuss how to apply key OM concepts and tools based on their roles and experience, and thereafter design interventions to understand and reduce risks associated with the two pathogens. Participants provided input to guide the design of the STOP Spillover team's research and interventions.

The key outputs of the interface OM process were the identification of gaps, barriers, opportunities, vision, critical partners, outcome targets, interventions, and progress markers. Each of these is presented in the next sections.

District-level OM participants; presentation by the SMM specialist in the CT

Photo: Sierra Leone Country Team

Key Gaps, Barriers, and Opportunities

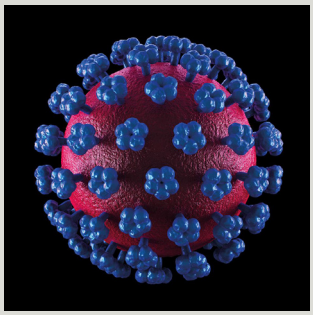
The barriers to risk reduction at the priority interfaces are summarized in Table 1. Lack of knowledge and awareness, and prevalent behaviors and practices were the top ranked challenges.

Table 1. Potential Barriers to Working at the Interface

Ebola	Lassa
• Limited risk awareness among traditional healers • Low community compliance (e.g., hand washing, social distancing) • Stigma • Poor road network; long patient waiting time • Denial • Lack of trained and qualified health staff • Poor standard of living • Poor living conditions of survivors • Lack of transportation (ambulances etc.) • No livelihood alternatives (to bushmeat) • Impact on women • No interventions targeting bushmeat traders • Strongly held cultural and religious beliefs • Increase in economic hardship because of a ban on some livelihood activities • Neglect of health centers for fear of contracting the disease	• Limited awareness • Lack of proper community engagement • Poor environmental health • Self-medication at the community level • Illiteracy • Poor deployment and late transfer of staff • Limited funding • Cultural belief (eating rats) • Poor/unsafe drinking water • Poor hygiene and sanitation practices at the community level • Health care staff not properly trained • No/limited health facilities • Low capacity of health workers to detect and make an early referral • Sickness (attitudes) • Poor training • Many organizations (conflicting mandates) • Local stakeholders not always involved • Poor food handling practices • Misdiagnosis • Complacency • Delay in care seeking

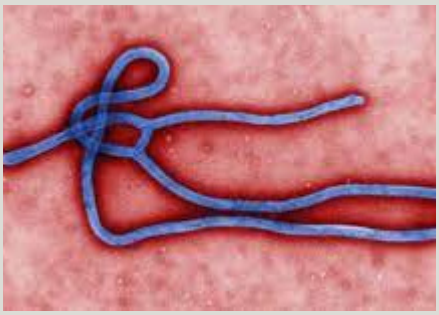
Figure 4. Potential Opportunities for Addressing Lassa and Ebola

LASSA



- Vaccine knowledge
- By-law compliance
- Increasing vaccine availability and uptake
- Fairly regulated bushmeat trade

EBOLA



- Research on Lassa
- Treatment for Lassa
- More health workers working on Lassa
- Increased sanitation performance in communities
- Community awareness of rodent danger
- Referral mechanism in place

CROSS-CUTTING

- Community awareness
- Vaccine development
- Surveillance structure
- One Health coordination
- Research institutions, programs
- Disease control programs
- Environment conservation
- International development agencies
- Women's programs
- Youth programs
- Functional district preparedness team

The main opportunities identified (Figure 4) include growing community awareness; functional governance structures (e.g., the district preparedness and surveillance teams); research activities conducted by different organizations; existence and effective application of by-laws; and gradual compliance among potential critical partners.

Stakeholders identified potential collaboration with universities, research institutions, government institutions, community, and chiefdom-level groups, and advocacy groups, shown in Table 2.

Table 2. Potential Collaborators

Potential collaborators		
• Tulane University (Lassa fever control program) • Breakthrough Action • Gola Forest Program -biodiversity conservation/ surveillance • PREEMPT (UC Davis) • Metabiota • Chiefdom • Mano River Union Conservation Project • Women's Solidarity Community Action Group • Clean Kenema (waste management) • Youth in Action for Development	• SEND SL: provided Ebola/COVID relief • Kenema Women's Governance Network • Women's Empowerment Association for Progress • United Council of Imams (Women's Wing) • World Food Programme • Welthungerhilfe • Democracy and Human Rights • Sierra Leone Red Cross • Doctors Without Borders	• Task forces (Ebola) • Ministry of Health and Sanitation • Ministry of Youth • Ebola Survivors Association • Ministry of Environment • Ministry of Agriculture • Conservation Society of Sierra Leone • Green Africa • Traditional Healers' Association • Health for All Coalition

Identification of Critical Partners

Stakeholders identified 22 partners that the project could influence for relevant behavioral change, risk awareness, social learning, capacity building, and other means. These actors are significant for the project's proposed OM vision and objectives because of their roles (or potential roles) in increasing or reducing risks of Ebola and Lassa virus spillover and transmission at the community level. Based on the significance of their roles, and the high feasibility of achieving change through a STOP Spillover intervention, workshop participants narrowed the list of partners to the six most critical which included; traditional healers, community health workers, religious leaders, community leaders, farmers and hunters/bushmeat trader (Figure 5).

Defining Outcome Targets and Risk Reduction Interventions

For each critical partner, outcome targets and related progress markers were defined. Proposed interventions for each critical partner group to achieve its outcome targets were also outlined (Table 3).

Figure 5. STOP Spillover Critical Partners in Sierra Leone

Table 3. Proposed Risk Reduction Interventions

Critical partners	Outcome targets	Interventions
Community health workers (CHW)	• CHWs have increased capacity to respond to Lassa /Ebola risk behavior. • Skills and resources to engage community leaders/community members in prevention behaviors.	• Organize orientation/training sessions on Lassa fever and Ebola prevention. • Provide tools, data collection materials/equipment. • Support monitoring and supervision. • Organize monthly review meetings. • Support community engagement interventions.
Traditional healers	• Traditional healers establish a database of all traditional healers. • Enhanced understanding of Lassa fever/Ebola risk behaviors. • Understand and use the referral pathway for suspected Lassa fever/Ebola cases. • Adhere to guidelines on the dos and don'ts of traditional healers guidelines.	• Conduct mapping/identification of all traditional healers. • Organize training on the effects of Lassa fever/Ebola. • Organize monthly meetings for traditional healers and CHWs. • Support development of guidelines and cascade training on them.
Hunters/bushmeat traders	• Hunters and bushmeat traders are aware of the risks involved in bushmeat hunting. • Reduced hunting activities. • Increased adoption of risk reduction practices.	• Develop materials on the risks in hunting high-risk wildlife and processing meat. • Sensitization meetings, training, and radio discussions on the risk involved in hunting wild animals and handling bushmeat. • Demonstration farms to support an alternative source of livelihood for hunters. • Income support for bushmeat traders to engage in safer enterprises.

Critical partners	Outcome targets	Interventions
Farmers	• Farmers minimize use of slash and burn farming. • Increased knowledge on Lassa fever and Ebola. • Increased knowledge on the use of insecticides. • Reduced deforestation (through land use that ensures sustainable food systems).	• Training on agroforestry practices. • Training on livestock risk management. • Provide seed input and training for climate-smart agriculture to minimize forest clearing. • Training on regular use of insecticides.
Traditional/ community leaders	• Community/traditional leaders reinforce social mobilization roles and responsibilities.	• Training on the establishment and enforcement of by-laws. • Conversations on Lassa fever and Ebola prevention mechanisms. • Build capacity to promote hygiene and sanitation.
Religious leaders	• Able to counter misinformation on Ebola and Lassa fever. • Reinforce social mobilization roles and responsibilities.	• Training to promote basic personal hygiene. • Training to convey Lassa fever and Ebola risks.

The Bushmeat Market

The CT visited two major bushmeat markets in Kenema City to understand the perspectives shared by district-level stakeholders and rationalize future STOP Spillover research/ interventions to assess the risk of Ebola spillover along the commodity chain. The visit confirmed that bushmeat is harvested and traded in open markets for its nutritional and income value and use for cultural and medicinal purposes. Kenema's proximity to the Kambui Forest Reserve and the Gola Rainforest National Park makes it a regional trade center, with the commodity sourced from surrounding communities by hunters (mostly men) and sold in the markets by women (Table 4).

Table 4. Findings from the Preliminary Bushmeat Market Visit

Summary of findings
• More than 50 women sell bushmeat in the town (in two major markets). • Demand for bushmeat is higher than demand for livestock meat and fish. • Bushmeat is preferred because consumers believe it supplies essential nutrients. • The trade has gone on for more than 40 years, with incomes thought to have grown in this period. • Bushmeat is transported from forest-edge communities in Kenema, Kailahun, and Pujehun Districts to the market through motorbikes and commercial vehicles. • Whole animals are bought from hunters and sold in parts/pieces at the market. • Market sanitation and hygiene is poor. • Different species of bushmeat, including duikers, birds, reptiles, rodents (grasscutter and squirrel), antelopes, monkeys, wild cats, turtles, chimpanzees, porcupines, buffalos, hippopotami, and bats are traded. • Continued hunting and forest clearing by farmers and commercial loggers has curtailed flow to the market, although consumer demand remains high (some consumers pay before the meat is supplied). • Seasonality affects the trade (activities slump in the wet season when hunters must exclusively rely on traps rather than hunting dogs). • The ban initiated during the Ebola Virus Disease outbreak was not effective. Traders code-named the commodity 'crab' to trick health monitors. The trade continued at the height of the outbreak because there was no alternative livelihood activity. • Bushmeat prices vary between species and state (fresh vs smoked). A whole duiker sells for SLL 1 million (equivalent to $76), while a leg goes for SLL 150,000 ($12). A whole monkey also sells for SLL 150,000 ($12). This finding is inconsistent with claims that bushmeat is preferred to other meat types because it is cheap. • The trade is open and attractive because of the rising demand and profit.

Community-level Workshop Activities and Outputs

A community dialogue on May 28 intended as the second phase of interface-level OM process triangulated feedback from the district-level meeting, especially the challenges, opportunities, critical partners, and interventions. The participants reviewed the list of 16 high-risk Ebola and Lassa communities to select two case study communities for deeper insight into the issues raised and identify barriers to and facilitators of STOP Spillover interventions. The selected communities were Largo (a Lassa hotspot in the Kenema Lassa Belt) and Perrie (an Ebola hotspot in the Gola Rainforest). Two separate STOP Spillover teams with support from the district health medical team (DHMT) conducted the dialogue sessions. Participants were asked to propose interventions based on what is known, what has been done, and what communities would like (or that the project needs to learn from) to reduce spillover risks. Participants were asked to state who and what the interventions would change.

The meetings sought to evaluate economic and non-economic (livelihood) activities around the community; investigate Lassa and Ebola incidence and general awareness of zoonotic diseases and the risk of spillover; note ongoing traditional practices to identify and manage risks including gendered perceptions and actions; identify previous and ongoing interventions and perceptions of their efficacy; and explore people's vision for reducing spillover risk and how the project can support this.

Discussion groups on Lassa and Ebola in Perrie Village

Photo: Jen Peterson, Tetra Tech

Interface OM Results (community-level) Key Gaps, Barriers, and Opportunities

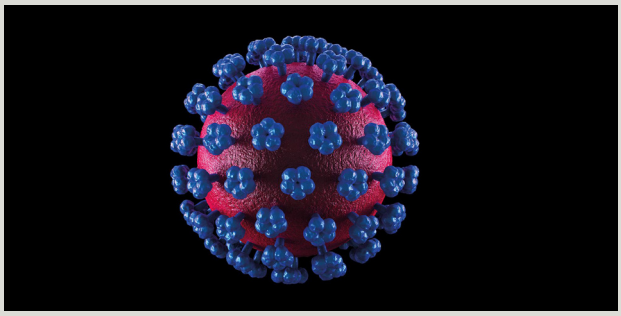
Table 5 summarizes the gaps and barriers for implementing the project in the communities. This feedback is in line with most of the insights provided by district-level stakeholders in the first phase of the interface OM meeting.

Table 5. Community Feedback on Barriers to Working at the Interface

Ebola	Lassa
• Rodents in houses during the harvest season because rice and other food products are stored in the house (to prevent theft). • Grain stores and barns are poorly constructed. • Rodent exposure increases in the rainy season because they shelter in houses. • Unclean homes and surroundings attract rodents. • Rodents are trapped and eaten by households. • Children do most of the hunting, and often play with live/dead rodents, while women process the catch. • There is no Lassa fever intervention. • Once they are sick, people refuse to seek medical care (they see traditional healers). • Health care facilities cannot treat Lassa fever. Cases are taken to the district hospital. • Limited knowledge to distinguish Lassa symptoms from the more common diseases of malaria and typhoid fever.	• Although the forest is protected, logging and hunting continue. • People consume and trade high-risk bushmeat (including bats). • Most people are farmers who are involved in significant levels of slash and burn. • No alternative (sustainable) farming techniques. • Traditional healers treat all types of illness. • Cases are initially mistaken for more common ailments, which increases the risk of transmission and spillover. • Limited risk awareness creates misinformation and encourages people to resist change. • No Ebola-focused intervention since the outbreak ended.

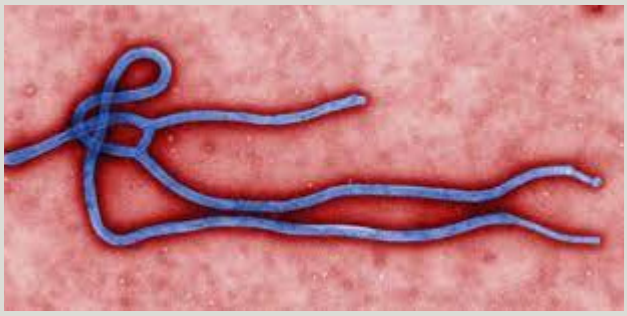
Figure 6. Opportunities for Lassa and Ebola Prevention at the Community Level

LASSA



- The host animal is known to the community.
- Individuals can differentiate the rodent from other rodents.
- Some awareness of the risks, including that people get infected when they eat contaminated food, drink contaminated water, or touch infected surfaces.
- Awareness of transmission mode and symptoms and how long they take to manifest.
- Rodents were trapped by the Pre-empt Project and human samples tested by Tulane University.
- There is a functional community task force.

EBOLA



- Bats are known to be the key hosts of the virus (based on information received during the Ebola outbreak).
- By-laws exist and their application helped to drastically reduce cases during the outbreak.
- Ebola survivors have an association.
- A task force is used for social mobilization.
- Handwashing and social distancing are still practiced at school.

Table 6. Community-level Risk Reduction Interventions

Critical partners					
Traditional leaders	Traditional healers	Farmers	Hunters/bushmeat traders	Health care workers	Religious leaders

Proposed intervention
• Training of trainers on the transmission/prevention/treatment of Lassa.
• Support the participatory design of by-laws for Lassa prevention.
• Promote hygiene and sanitation practices.
• Improve solid waste management.
• Train health care workers to identify and analyze risks and adopt safety practices.
• Protect watersheds at risk of wildlife contamination.
• Support local artisans to build climate-proof food storage systems.
• Conduct seroprevalence of Ebola along the bushmeat commodity chain.
• Improve surveillance through early warning systems.
• Train bushmeat traders in biosafety practices.
• Increase risk awareness among schoolchildren.
• Conduct regular community education sessions to increase risk knowledge of risk and mobilize local action
• Provide alternative livelihoods for farmers, bushmeat traders, and hunters.
• Support bushmeat traders and health care workers with personal protective equipment.
• Provide innovative drinking water storage options.
• Provide rodent traps and train community mobilizers on their use.
• Support demonstration farms to improve sustainable land management.
• Prepare a traditional healers' database.
• Conduct risk communication training for teachers and students

Identification of Critical Partners

Community stakeholders reviewed the short list of critical partners proposed at the district-level meetings and suggested significant actors for which the project should seek to influence in achieving or enhancing changes. These included teachers, traditional healers, hunters and bushmeat traders, health care workers, farmers, religious leaders, women, and children/youth. As any of the previously selected top six critical partners may be women or youth while children can be targeted through schools (with teachers identified as critical partners), the OM process resulted in a comparable list of significant actors for the project to work with. This list reinforces the information gathered at the district level on the key STOP Spillover outcome challenges.

Proposed Risk Reduction Interventions

Community stakeholders identified the risk reduction interventions by priority pathogen. These interventions generally match those proposed by district-level stakeholders in Table 3.

Community Visit

To aid understanding of the risk factors and conditions identified as critical to the spread of the diseases, the CT took a quick walk with community representatives around the communities to confirm some of the feedback received, including the proximity of houses to the forest, health care capacity, and the hygiene and sanitation conditions. The visit corroborated the district-level feedback that the communities were hotspots for Lassa and Ebola. It also helped the CT triangulate some of the feedback from the interface OM (district and community-level) meetings, including that the communities are more exposed to the risk of Lassa and Ebola virus spillover and transmission. Overall, the observation walk confirmed the following aspects about the communities:

- High population density, with new opportunities for trade and increasing pressure on forestlands for farming and logging. Perrie, for instance, has 3,990 inhabitants in 357 households (indicating the dense population).
- Have poor housing conditions, which makes homes easier for rodents to invade.
- Store grains and other crops in the open, increasing people's exposure to health risks.
- Partake of behaviors (e.g., hunting, handling, trading, and consuming high-risk meat) that increase exposure to Lassa and Ebola.
- Have poor sanitation conditions because of poor waste management.
- Are located at the edge of a forest reserve and a national park.
- Primarily farm (slash and burn) to make a living, which results in the clearance of large swathes of land, and land uses that endanger food systems and increase zoonotic risk.
- Partake of behaviors (e.g., hunting, handling, trading, and consuming high-risk meat) that increase exposure to Lassa and Ebola.

Intervention/Study Selection Process

The purpose of the Study Selection Process (ISSP), is to engage and leverage the technical expertise across STOP Spillover to make informed programmatic decisions regarding selected interventions – and studies needed to inform interventions – that emerge from OM. Because the proposed interventions were numerous and some beyond STOP Spillover mandate, country team members and lead advisors synthesized the information collected to select the most appropriate interventions and studies. The first step entailed identifying convergences in the two proposals and ruling out repetition. Next, a strategy grid was used to group the remaining interventions into two categories – high-need/high-feasibility, and high-need/low feasibility based on the following criteria:

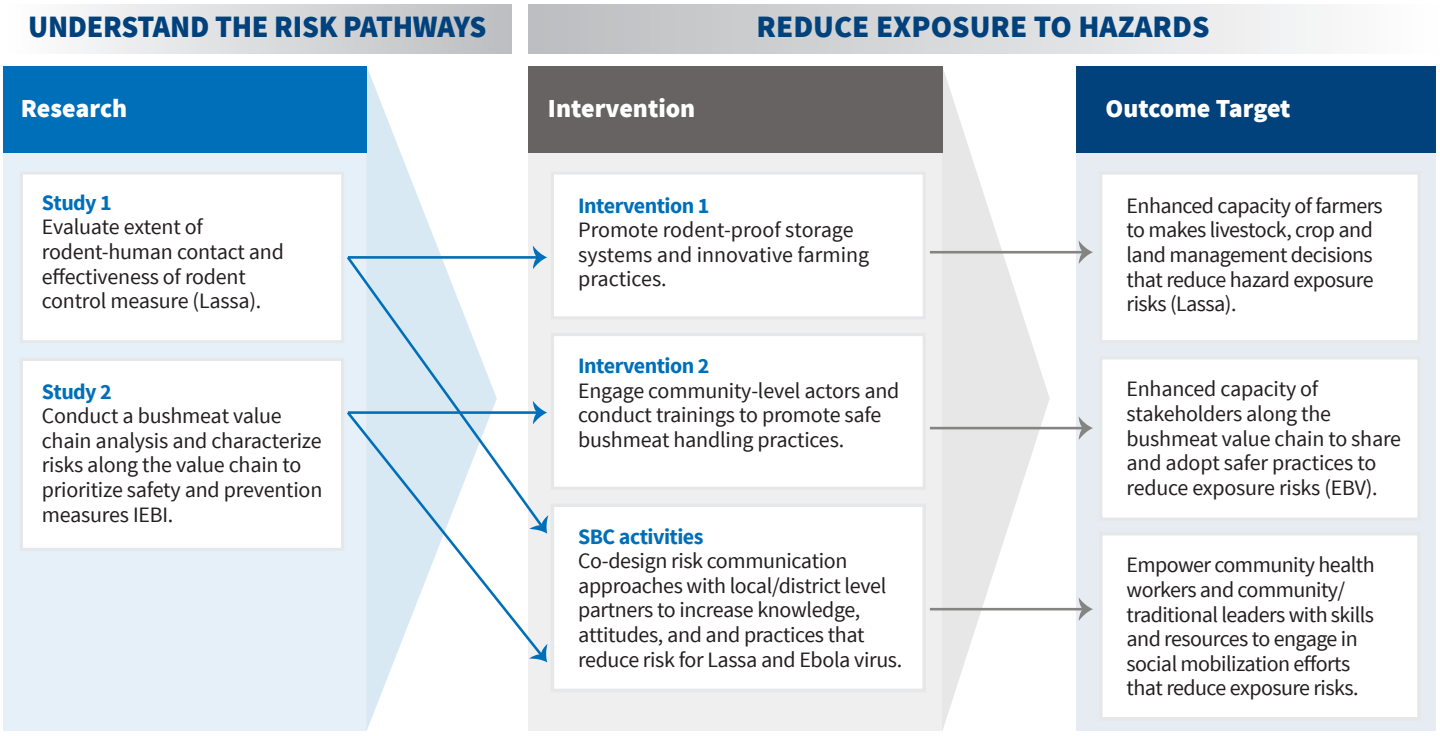
- Potential to reduce exposure to one or more hazards.
- Potential to result in a health benefit.
- Evidence of scientific coherence.
- Feasibility in terms of cost and availability.
- Acceptability to stakeholders.
- Potential to meet community needs and interests.

Then, a list of high need/high feasibility interventions was generated and used to formulate the prioritized activities.

The list of activities was presented to the wider consortium members during the ISSP for the team to provide technical insights in the prioritization of interventions and studies. The activities were organized across three strategic approaches. The rationale of the three research activities is to investigate issues critical to understanding and reducing spillover and transmission of Lassa and Ebola viruses. The STOP Spillover team ultimately identified two studies and three interventions:

- **Study 1:** Evaluate the effectiveness of rodent control measures at the household level (includes planned wildlife sampling).
- **Study 2:** Conduct a bushmeat value chain analysis and characterize risks. Include sero-prevalence surveillance.
- **Intervention 1:** Promote rodent-proof storage systems and innovative farming practices, including local capacity building and social and behavior change (SBC).
- **Intervention 2:** Engage community level actors and conduct trainings to promote safe bushmeat handling.
- **Intervention 3:** co-design risk communication approaches with local/district level actors.

Figure 7. Summary of Proposed Priority Interventions and Studies



Conclusion

Figure 7 summarizes the interventions and research studies. Overall, we achieved the objectives of stakeholder engagement through OM dialogue. Workshop participants prioritized Lassa virus and Ebola virus as the top high-risk pathogens in Sierra Leone and identified gaps, barriers, and critical partners to reduce the risk of spillover and prioritized the wildlife and rodent-human interface focusing on Ebola and Lassa viruses. The top research gaps for the selected interface are: 1) the extent of human-rodent interaction and effectiveness of rodent control measures at the household level; 2) the analysis and characterization of risks along the bushmeat value chain. Proposed STOP Spillover support for the selected critical partners includes: 1) promoting rodent-proof storage systems and innovative farming practices including local capacity building and SBC; 2) determining and prioritizing cost-effective, culturally acceptable biosafety and spillover prevention measures to promote safe bushmeat handling practices including SBC; and 3) co-designing risk communication approaches to increase knowledge, attitudes, and practices that reduce the risk of Lassa virus and Ebola virus spillover and transmission.

ANNEX 1. NATIONAL PARTICIPANTS

NAME	ORGANIZATION	DESIGNATION
Suna Tucker	STOP Spillover Sierra Leone	FWA specialist
Noelina Nantima	UN Food and Agriculture Organization	Animal health advisor, Emergency Center for Transboundary Animal Diseases (ECTAD)
Amara Leno	Ministry of Agriculture	Animal health surveillance lead, Directorate of Livestock and Veterinary Services
Rene Bessin	UN Food and Agriculture Organization	Team lead, ECTAD
Alhaji Njai	University of Sierra Leone	Assoc. professor (infectious diseases)
Joseph Bunting-Graden	Ministry of Health and Sanitation	One Health technical coordinator
Dorothy Peprah	USAID STOP Spillover, Project Management Team, Washington, DC	Senior GHSA advisor, USAID
Fatma Bockarie	USAID/Breakthrough Action	Senior officer
Anthony Koroma	Ministry of Environment	Wildlife officer, Forestry Division
Mary Rogers	Ministry of Gender and Children's Affairs	Technical coordinator
Amadou Traore	GIZ	Health programs manager
Roland Suluku	Njala University	Professor (animal science)
Abdul Bangura	National Disaster Management Officer	Disaster risk reduction officer
Medlin Tucker	World Health Organization	One Health consultant
Ahmed Kallon	Chemonics International	GHSA consultant
Tina Dickenson	USAID/Breakthrough Action	Deputy chief of party
Alieu Tommy	Ministry of Health and Sanitation	
Mukeh Fambulleh	Ministry of Health and Sanitation	Emergency preparedness and response manager
Saidu Kanu	Ministry of Agriculture	
Daniel Forbie	Africa Young Voices Television	Journalist
Lily Kainwo	STOP Spillover Sierra Leone	Surveillance, modeling, and mapping specialist
Mohamed Squire	Ministry of Health and Sanitation	Head of surveillance
Lahai S. Keita	Ministry of Environment	Deputy director, Environment
Momojah Jabbie	STOP Spillover Sierra Leone	Risk analysis and communications specialist
Mohamed Vandi	Ministry of Health and Sanitation	Director, Health Security and Emergency
Alpha Jabbie	STOP Spillover Sierra Leone	Wildlife and livestock epidemiology specialist
Dauda Sowa	Africa Field Epidemiology Network	Surveillance advisor
Moses Clarkson	STOP Spillover Sierra Leone	Finance and administrative manager
Momoh Massaquoi	Ministry of Environment	Wildlife officer
Mo-Bash Idriss	Environment Protection Agency	Director, Environmental Health and Safety
Jen Peterson	Tetra Tech	Project manager, STOP Spillover, Sierra Leone
Swaray Lengor	International Federation of the Red Cross	Program manager
Abu-Bakar S. Massaquoi	STOP Spillover, Sierra Leone	CT lead
James Bangura	Metabiota	Country Lead, Metabiota
Ronald Monrovia	Africa Young Voices Television	Journalist
Bruno Chavez Ghersi	STOP Spillover, Tufts University	Post-doctoral fellow

ANNEX 2. DISTRICT PARTICIPANTS

NAME	ORGANIZATION/AFFILIATION/DESIGNATION
Hawa Dumbuya	Civil society organization
Ibrahim Feika	Civil society organization
Alie Vaboey	Traditional Healers Association
Alhaji Yayah Swaray	Youth ambassador
Mohamed S.N Mattia	Ministry of Agriculture
Julius Sama	District forestry officer, Ministry of Environment
Ibrahim Bockarie	Environmental and social officer, Kenema District Council
Charles Lebbie Jr.	Regional communications officer, Environment Protection Agency
Mania T. Lahai	District nutritionist, Ministry of Health and Sanitation, District Health Medical Team
Mariama Juana	MANDIHU
Sesay B. Ansumana	Journalist, Kamboi Radio
Jeneba R. Menjor	Community development officer, Gola Rainforest Conservation Program
Victoria T. Lappia	Community development officer, Gola Rainforest Conservation Program
Mattia H. Jusu	Executive director, WEAP
Josephus Campbell	District coordinator, community health workers, Ministry of Health and Sanitation, DHMT
Francis A. Suma	District social mobilization officer, Ministry of Health and Sanitation, DHMT
Fatmata Dassama	Coordinator, Kenema Women Advocacy Group
Satta Kanneh	Coordinator, Metima Women's Organization
Fanta Batty	Bushmeat trader
Bendu Kamara	Bushmeat trader
Mohamed Koroma	District surveillance officer, Ministry of Health and Sanitation, DHMT
Umaru Dabor	Kenema District Council

ANNEX 3. COMMUNITY MEMBERS PARTICIPANT LIST

	ATTENDEE NAME	SEX	COMMUNITY
1	Community Member	M	Largo
2	Community Member	M	Largo
3	Community Member	M	Largo
4	Community Member	F	Largo
5	Community Member	M	Largo
6	Community Member	M	Largo
7	Community Member	M	Largo
8	Community Member	M	Largo
9	Community Member	M	Largo
10	Community Member	M	Largo
11	Community Member	M	Largo
12	Community Member	M	Largo
13	Community Member	M	Largo
14	Community Member	M	Largo
15	Community Member	M	Largo
16	Community Member	F	Largo
17	Community Member	M	Largo
18	Community Member	M	Largo
19	Community Member	M	Largo
20	Community Member	M	Largo
21	Community Member	M	Largo
22	Community Member	M	Largo
23	Community Member	M	Largo
24	Community Member	F	Largo
25	Community Member	F	Largo
26	Community Member	F	Largo
27	Community Member	F	Largo
28	Community Member	F	Largo
29	Community Member	F	Largo
30	Community Member	F	Largo
31	Community Member	M	Largo
32	Community Member	F	Largo
33	Community Member	F	Largo
34	Community Member	M	Largo
35	Community Member	F	Largo

	NAME	SEX	COMMUNITY
36	Community Member	F	Largo
37	Community Member	F	Largo
38	Community Member	M	Largo
39	Community Member	M	Largo
40	Community Member	M	Largo
41	Community Member	F	Largo
42	Community Member	F	Largo
43	Community Member	F	Largo
44	Community Member	F	Largo
45	Community Member	F	Largo
46	Community Member	F	Largo
47	Community Member	F	Largo
48	Community Member	F	Largo
49	Community Member	F	Largo
50	Community Member	M	Largo
51	Community Member	F	Perrie
52	Community Member	M	Perrie
53	Community Member	M	Perrie
54	Community Member	M	Perrie
55	Community Member	M	Perrie
56	Community Member	M	Perrie
57	Community Member	M	Perrie
58	Community Member	M	Perrie
59	Community Member	F	Perrie
60	Community Member	M	Perrie
61	Community Member	M	Perrie
62	Community Member	F	Perrie
63	Community Member	M	Perrie
64	Community Member	M	Perrie
65	Community Member	F	Perrie
66	Community Member	M	Perrie
67	Community Member	M	Perrie
68	Community Member	M	Perrie
69	Community Member	F	Perrie
70	Community Member	F	Perrie

ANNEX 3. COMMUNITY MEMBERS PARTICIPANT LIST

	NAME	SEX	COMMUNITY
71	Community Member	M	Perrie
72	Community Member	F	Perrie
73	Community Member	M	Perrie
74	Community Member	M	Perrie
75	Community Member	M	Perrie
76	Community Member	M	Perrie
77	Community Member	M	Perrie
78	Community Member	F	Perrie
79	Community Member	M	Perrie
80	Community Member	M	Perrie
81	Community Member	F	Perrie
82	Community Member	M	Perrie
83	Community Member	M	Perrie
84	Community Member	M	Perrie
85	Community Member	M	Perrie
86	Community Member	M	Perrie
87	Community Member	M	Perrie
88	Community Member	F	Perrie
89	Community Member	F	Perrie
90	Community Member	M	Perrie
91	Community Member	F	Perrie
92	Community Member	M	Perrie
93	Community Member	M	Perrie
94	Community Member	M	Perrie
95	Community Member	M	Perrie
96	Community Member	M	Perrie
97	Community Member	F	Perrie
98	Community Member	M	Perrie
99	Community Member	M	Perrie
100	Community Member	M	Perrie

ANNEX 4. NATIONAL* STAKEHOLDERS CONSULTED

	DATE (2022)	NAME	DESIGNATION, ORGANIZATION
1	May 3	Mohamed Bah	Director, Livestock and Veterinary Services Division, Ministry of Agriculture
2	May 4	Doris Harding	Public health lab manager, Ministry of Health and Sanitation
3	May 4	Mohamed Vandi	Director, Health Security and Emergency
4	May 4	Joseph Bunting-Graden	One Health technical coordinator
5	May 4	James Riak	Country director, GOAL
6	May 5	Mo-Bash Idriss	Director, Environmental Health and Safety, Environment Protection Agency
7	May 5	Zikan Koroma	Laboratory manager, Ministry of Health and Sanitation
8	May 5	Alhaji Njai	Researcher (zoonotic diseases), University of Sierra Leone
9	May 6	Thomas Lebbie	Director, Risk Reduction and Preparedness, National Disaster Management Agency
10	May 6	Joseph Sam Kanu	Deputy surveillance manager, Ministry of Health and Sanitation
11	May 9	Harold Thomas	Risk communications lead, Ministry of Health and Sanitation
12	May 10	Esther Gegba	Project coordinator, China CDC Lab
13	May 10	Ahmed Kallon	GHSA consultant, Chemonics International
14	May 10	Sarah Bell	Country representative, Plan Verus
15	May 11	Anita Caulkool	Food Safety Unit, Ministry of Health and Sanitation
16	May 11	Swaray Lengor	Community Epidemic and Pandemic Preparedness Project, IFRC
17	May 11	James Fofana	Chief of party, Breakthrough Action
18	May 11	Tina Dickensen	Deputy chief of party, Breakthrough Action
19	May 12	Anthony Koroma	Wildlife officer, Forestry Division, Ministry of Environment
20	May 16	Nolina Nantima	Animal health advisor, FAO
21	May 17	Dauda Sowa	Technical advisor, AFENET

*All stakeholders are based in Freetown

ANNEX 5. DISTRICT STAKEHOLDERS CONSULTED

	DATE (2022)	NAME	DESIGNATION, ORGANIZATION	LOCATION
1	May 23	Francis Massaquoi	Head, Gola Rainforest Conservation Program	Kenema
2	May 23	Amadu Jusu	Community development superintendent, Gola Rainforest Conservation Program	Kenema
3	May 23	Philip Conteh	District agriculture officer, Ministry of Agriculture	Kenema
4	May 23	Julius Sama	District forestry officer, Ministry of Environment	Kenema
5	May 23	Paul Ngegba	District livestock officer, Ministry of Agriculture	Kenema
6	May 23	Mohamed Mattia	District livestock surveillance officer, Ministry of Agriculture	Kenema
7	May 23	Charles Lebbie	Communications officer, Environment Protection Agency, Eastern Region Office	Kenema
8	May 23	Prof. Roland Suluku	Dean, Animal Science Department, Njala University	Njala
9	May 23	Dr Ibrahim Bakarr	Head, Wildlife Department, Njala University	Njala
10	May 23	Ibrahim K. Foday	Senior lecturer, Biological Sciences Department, Njala University	Njala
11	May 24	PC Kapuwa	Paramount chief, Nongowa Chiefdom	Kenema
12	May 24	Donald Grant	Medical officer, DHMT	Kenema
13	May 24	Suma	Social mobilization officer, DHMT	Kenema
14	May 24	Lansana Kanneh	Surveillance officer DHMT, and coordinator, Lassa Fever Project/Tulane Univ.	Kenema
15	May 24	Mohamed Koroma	Surveillance officer, DHMT	Kenema
16	May 24	Mania Lahai	Nutrition officer, DHMT	Kenema
17	May 24	John Sandy	Agriculture lead, Kenema VHF Lab	Kenema

Tufts University

Africa One Health University Network

Southeast Asia One Health University Network

icddr,b

Right Track Africa

JSI Research & Training Institute, Inc.

Tetra Tech

University of Washington

University of Glasgow

University of California, Los Angeles

Broad Institute

University of Nebraska Medical Center

Humanitarian OpenStreetMap Team

Internews

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