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LIBERIA PARTICIPATORY PLANNING USING OUTCOME MAPPING:

Summary Report

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September 2022

STOP Spillover

September 2022

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STOP SPILLOVER

Strategies to Prevent Spillover (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 collaborative context-specific process, spillover ecosystem stakeholders (both traditional and non-traditional) will be empowered to identify and reduce zoonotic spillover risks at the human-animal-environment interface and develop an outcome-oriented project action plan. This report outlines the details of the OM workshop activities in Liberia.

Acronyms

AFROHUN	Africa One Health University Network
CAHW	Community Animal Health Worker
CCP	Critical Control Points
CDC	Centers for Disease Control and Prevention
CEBS	Community Event-based Surveillance
CFA	Case Fatality Rate
CHA	Community Health Assistant
CHS	College of Health Sciences
CHT	County Health Team
CHV	Community Health Volunteer
CLTS	Community-led Total Sanitation
CSO	Civil Society Organization
DIDE	Division of Infectious Disease and Epidemiology
EPA	Environmental Protection Agency
FDA	Forestry Development Authority
FAO	Food and Agriculture Organization
HACCP	Hazard Analysis and Critical Control Points
IDSR	Integrated Disease Surveillance and Response
IPC	Infection Prevention and Control
ISSP	Intervention Study Selection Process
LF	Lassa Fever
MIA	Ministry of Internal Affairs
MOA	Ministry of Agriculture
MOE	Ministry of Education
MOH	Ministry of Health
NEPRC	National Emergency Preparedness and Response Committee
NPHIL	National Public Health Institute of Liberia
OH	One Health
OM	Outcome Mapping
SBC	Social and Behavior Change
USAID	United States Agency for International Development
WASH	Water Sanitation and Hygiene
WHO	World Health Organization

Key Terms

Critical (boundary) partner: In OM, boundary partners are stakeholders or social actors with whom a project will work or whom the project will support or influence to achieve the project's vision. (STOP Spillover uses the label critical partners as a more readily understood alternative). These may be individual organizations, groups, or institutions (e.g., local cultural or religious leaders, government agents, partner organizations, business entities, or other societal actors). It is through them that the project expects to influence change in the wider society toward the agreed-upon 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 (OM): 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 (the 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 that a project hopes to encourage in a given context. It is one or several statements and paragraphs that describe the economic, political, social, environmental, and relevant broad behavioral changes in selected critical partners.

Introduction

In recent years, Liberia has experienced several outbreaks of emerging and re-emerging diseases, including Ebola (2014–2016), COVID-19, and repeated, sporadic outbreaks of Lassa fever (LF). Subsistence farming and land expansion, especially in rural communities, have increased human and livestock interaction with wildlife. The Sapo National Park provides protection for wildlife, all of which are surrounded by intensive animal agriculture and populated human communities. As Liberia faces shifting health threats due to human population growth, economic development, climate change, and human migration, the multisectoral nature of public health challenges arising from interactions among humans, animals, and the environment requires a holistic One Health (OH) approach.

On September 30, 2020, the United States Agency for International Development (USAID) awarded the STOP Spillover project to a Tufts University-led consortium. The five-year project supports Liberia 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).

Outcome Mapping Process

Outcome Mapping focuses on changes in targeted actors and in the spillover ecosystem as project outcomes to be influenced by the STOP Spillover project. Through participatory workshops, stakeholders identify and prioritize high-risk interfaces and critical control points (CCP) and describe current opportunities and knowledge gaps in zoonotic spillover risk pathways.

In Liberia, OM activities commenced with stakeholder engagement meetings at the national and county levels to discuss and seek concurrence on why, where and how STOP Spillover would focus its preliminary activities on LF in Nimba County. This was followed by an internal meeting held by Liberia country team members and the STOP Spillover consortium. The meeting, labeled the Lassa Summit, was held on February 18, 2022. It provided an opportunity for STOP Spillover global staff to learn more details about the country context and ongoing initiatives in the country and for the country team to learn from the consortium members' knowledge and experiences of LF.

The outcome mapping planning workshop was held in Nimba County between February 23 and 25, 2022. The purpose of this in-person, interface-level workshop was to identify the risks associated with direct rodent-human interactions, and risk-reduction outcomes to be supported by an appropriate range of research and interventions. Following these interactions, the STOP Spillover global and country teams prioritized project interventions for Year 2 through an Intervention/Study Selection Process (ISSP). Figure 1 illustrates the sequence of those planning activities.

Stakeholder Engagement at the National and County Levels

Leading to the country's OM workshop, STOP Spillover's Liberia country team met with key government stakeholders at the national and county levels to discuss and seek concurrence on the STOP Spillover decision to focus its preliminary activities on LF in Nimba County. The team met the following agencies and ministry representatives: the

Figure 1: OM Activities in Liberia

head of the USAID Mission Global Health Security Agenda, the Minister of Health, the coordinator of the OH Platform, the vice president of the University of Liberia College of Health Sciences (CHS), the executive director of the Environmental Protection Agency (EPA), the director-general of the National Public Health Institute of Liberia (NPHIL) and her key collaborators, the chief veterinary officer of the Ministry of Agriculture (MOA), the Nimba County Health Team, and the Nimba County superintendent's office. The Liberia STOP Spillover country team further participated in the weekly meeting of the National Emergency Preparedness and Response Committee (NEPRC) to learn about the current epidemic situation in Liberia and share information about STOP Spillover. NEPRC meetings are organized by NPHIL and attended by representatives from various institutions, World Health Organization (WHO), USAID, Centers for Disease Control and Prevention (CDC), OH Platform, and other government agencies to share disease updates and activities.

All institutions that were engaged in the workshop welcomed STOP Spillover. They concurred with the decision to focus the project on LF in Nimba County as a starting point. In subsequent years, the project will consider other key interfaces of interest and sites for their interventions. They pledged to support and collaborate for the success of STOP Spillover and further agreed to participate in the participatory planning process that was to be held in Ganta, Nimba.

Why Nimba County?

Nimba County falls in the LF belt and the second-highest populous county in the country. It is one of the LF belt counties bordering two neighboring countries: the Republic of Guinea and the Republic of Côte d'Ivoire. It has been reported in West Africa that several cases of LF may be imported given the prevailing cross-country population movement. Data from the NPHIL Weekly Bulletin indicate that in the preceding five years, Nimba County had reported the second-highest number of LF cases and deaths (LF Sitrep # 2 Epi. Week 4 (January 24-30, 2022).

LF Summit

STOP Spillover Lassa Summit (held February 18, 2022) was an opportunity for STOP Spillover global experts to explore and learn about the drivers, ongoing efforts, and context of LF in Liberia, particularly Nimba County. The meeting was also an opportunity for STOP Spillover's Liberia country team to learn from consortium partners and other experts on experiences related to LF. Key points from this meeting were summarized in a risk framework that covered exposure and hazard impact mitigation. Exposure mitigation key points were discussed and included the LF viral modes of transmission (rodent-to-human, human-to-human, and human-to-the environment) as well as drivers of LF disease amplification and spread. Hazard impact mitigation key points covered aspects of prevention (vaccination), treatment, and laboratory diagnostics. A summary of this discussion was presented to participants of the OM planning workshop for consideration in intervention decision and project planning.

OM Workshop

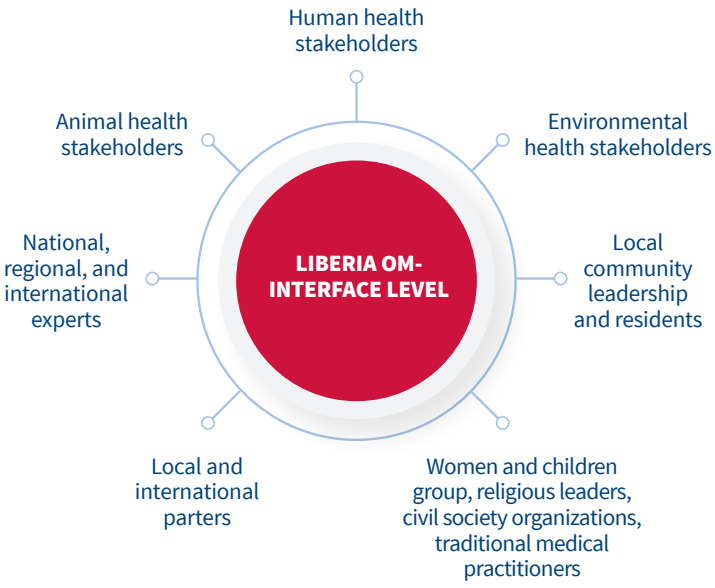
The purpose of this workshop was to bring together key individuals and institutions to describe current opportunities and knowledge gaps in zoonotic spillover risk pathways within the LF interface, identify actors and risk reduction changes (target outcomes), and the appropriate interventions for LF in Nimba County.

Workshop Participants

The workshop was attended by a diverse group of participants drawn from government and other institutions (Figure 2). These included the USAID Liberia Mission GHSA Senior Adviser, Ministry of Health (MOH), NPHIL, MOA, EPA, University of Liberia CHS, Nimba County Health Team, Ministry of Internal Affairs, civil society organizations (CSO), Water Sanitation and Hygiene (WASH) Commission, Forestry Development Authority (FDA), traditional and religious leaders, and medicine store chair. Other institutions included the Food and Agriculture Organization (FAO), Breakthrough Action, the International Rescue Committee, and global STOP Spillover technical experts.

In total, the workshop was attended by 56 participants in person and 9 via Zoom. A complete list of participants is provided in Annex II.

Figure 2. Key Stakeholders



Workshop Activities and Outputs

The three-day OM workshop opening remarks were from the STOP Spillover director, a USAID Mission representative, a University of Liberia CHS representative, the Africa One Health University Network's (AFROHUN) chief executive officer, and the Nimba County superintendent's representative. The Superintendent officially opened and closed the workshop. The detailed agenda of the workshop is presented in Annex 1.

Workshop Design

This participatory planning workshop was designed around OM design concepts, augmented by disease risk analysis and hazard analysis and critical control points (HACCP) to frame and operationalize STOP Spillover's three objectives:

. Strengthen the country's capacity to monitor, analyze, and characterize the risk of priority emerging zoonotic viruses spilling over from animals to people

. Strengthen the country's capacity to develop, test, and implement interventions to reduce the risk of priority emerging zoonotic viruses spilling over from animals to people

. Strengthen the country's capacity to mitigate the amplification and spread of priority zoonotic diseases in human populations

Based on a basic risk model, risk is a function of exposure and the hazard (danger) impact:

RISK = EXPOSURE X HAZARD

In order to successfully achieve the above STOP Spillover objectives and control of LF in Nimba County, the project intends to address issues related to exposure and/or to the hazard (Lassa Virus) and its environmental and socio-economic impacts. Table 1 summarizes the CCPs for exposure and hazard impact mitigation. From these points, specific CCPs were to be selected based on their effectiveness and other factors (for example the need for STOP Spillover to operate within a specific niche in the country).

To ground STOP Spillover activities in Nimba County, the health district was adopted as the unit for project operationalization. The county's population of about 600,000, has 19 administration districts divided into six health districts: Saclepea-Mahn, Sanniquellie-Mahn, Zoegeh, Yarwein Mehnsonnoh, Tappita, and Gbehlay-Geh. The workshop participants were divided into the six health districts for the planning discussions (see Annex III).

Table 1: Exposure and hazard mitigation potential CCPs

EXPOSURE MITIGATION	HAZARD MITIGATION
Lassa Virus transmission 1. Rodent-to-human (housing, commercial/agricultural storage, rodent consumption) 2. Human-to-human (health facility, home care, burial practices) 3. Human-to-animal/environment (open defecation)	**LF prevention** 1. Vaccination
LF amplification 1. Waste management failure 2. Agricultural production 3. Mining excavation	**LF treatment** 1. Health facilities 2. Home care/Pharmacy shops 3. Healers and prayer houses
LF spread (at point of entry) 1. Infected rodent population movement 2. Infected human population movement	**LF laboratory diagnostic** 1. Efficient sample collection, transport, and results retrieval 2. Lassa Virus testing at point of care 3. Wastewater testing (early-warning surveillance system)

Note: The CCP in Table I can be expanded or subdivided into more control points. They are structured here based on STOP Spillover's risk-focused objectives.

The three-day workshop went through specific themes for each day. Day 1 was focused on presentations of LF situation in Liberia and Nimba County, particularly, the identification of potential CCPs in each health district. During Day 2, participants identified risk management gaps, barriers, and the desired vision. On Day 3, participants focused on identifying stakeholders, critical partners in each health district and target outcomes, and supporting interventions.

LF in Liberia

Presentations on LF in Liberia and Nimba County were delivered by NPHIL and the Nimba County Health Office, respectively. These were followed by related perspectives by the MOA, the University of Liberia, and EPA. Key highlights from the director of the NPHIL's Division of Infectious Diseases and Epidemiology included the fact that LF is endemic and that there is an increased case-fatality rate (CFR) observed in key counties (60% CFR) despite government efforts in risk communication, community engagement, vector and environmental management, and case management. The director pointed out the challenges included delays in LF testing and highlighted the government of Liberia's intentions to: 1) increase index of suspicion for LF at the health facility levels; 2) improve treatment outcomes; 3) improve sanitary conditions for affected communities; 4) decrease risk of viral transmission from rodents to humans; 5) promote behaviors that prevent such transmission; and 6) improve coordination between drugstore operators and health facility staff for referral of unresponsive malaria cases.

LF in Nimba County

The Nimba County health officer presented the LF situation in the county. She highlighted the resources available to its population of 605,342 (through the six health districts) as 91 Integrated Disease Surveillance and Response (IDSR) health facilities, of which 89 are functional. She informed participants that the county health service's current efforts are focused on LF, measles, and COVID-19. The county has 14 LF hotspot communities, with the Sanniquellie-Mahn health district reporting 76% of cases and an overall CFR of 49%. Among the activities implemented are community clean-up campaigns in the hotspot communities.

The MOA indicated that LF is among the zoonotic diseases included in its surveillance activities. The EPA explained its environmental regulatory role and the resources they have for sample testing. Both institutions expressed interest in cross-sectoral collaboration to tackle the LF challenge. The University of Liberia representative presented their portfolio of LF-related research at the institution and highlighted the promising status of ongoing Lassa vaccine clinical trials. The Broad Institute also presented its work on Lassa assays being optimized for several matrices and their research on point-of-care LF testing.

Risk Analysis

The workshop participants, grouped into the six health districts of the county, identified and geographically located exposure nodes driving Lassa Virus transmission and amplification and spread in their respective regions. Table 2 lists key findings presented by the groups. All exposure

Table 2: Exposure nodes reported by district workshop groups

EXPOSURE PATHWAYS	DISTRICT FINDINGS
Lassa Virus transmission	**Rodents-to-human:** All groups reported that this occurred due to the presence of rodents in homes (kitchens, storerooms, warehouses, shops, and farmhouses), during deforestation, bush burning, and in unprotected homes. The exposure was also from ingestion of contaminated food and water due to inadequate storage, poor solid waste management, and the use of contaminated utensils. The exposure also occurred through rodent meat consumption and rodent bites. **Human-to-human:** The groups explained that this occurred during care of infected patients (by family members, health care workers), through poor infection prevention and control (IPC) practices in health facilities, poor medical and domestic waste management, traditional practices (e.g., bathing an infected dead body), religious beliefs, and practices, traditional healers, cross-border movement and trade, medicine store, medicine street peddlers (black baggers), poor hygiene, and transporting of an infected person.
Lassa Virus amplification	The groups showed that amplification of the Lassa Virus was mainly through the multiplication of the vector through poor management of agriculture farms, improper storage of food in homes and warehouses, poor harvest management, and transportation of food from one location to another.
Lassa Virus spread	The groups reported that the most common ways for Lassa to spread was through human and rodent co-migration, transportation of sick people, and the use of public transport facilities. Viral spread may also occur through open defecation and poor management of domestic and medical waste.

Figure 3: Gaps and barriers

nodes were deemed important in all the health districts; no prioritization was done. Participants discussed the basis of possible management and control interventions.

Gaps and Barriers

Several risk management and control gaps and barriers were identified (Figure 3). Examples of gaps included limited intersectoral collaboration, lack of information about LF in school health curricula, limited community involvement, and inadequate/lack of human resources for animal health. For amplification, the gaps identified were a lack of continuous community engagement and limited media involvement (print and electronic communication). Other gaps were porous borders, a limited number of port health officers, trade-driven migration, limited knowledge for early detection, poor adherence to IPC practices by health care workers, a lack of qualified county-level laboratories for Lassa Virus testing, a lack of waste management and disposal sites in communities, frequent stock-outs of data collection tools at points-of-entry, and inadequate latrine facilities in communities.

Additional barriers listed were poor health-seeking behavior in communities, poor maintenance of emergency operation centers, the absence of isolation facilities at some health facilities, frequent stock-outs of ribavirin (the drug used in managing LF), inadequate dissemination of health promotion and awareness messages, transboundary movement (human, animal), community resistance to health programs, inadequate testing capacity for animal samples, weak enforcement of legislation and regulations, a lack of motivation for community health workers, and a lack of sample transport system (for animal samples to veterinary labs).

Identification of Critical Partners

From a long list of stakeholders, eight critical partners were identified for the project. These included individuals (households and local community members), the OH platform, county health agents, local and community leaders, transporters, environmental sector agents, agricultural sector agents, and schools and training institutions. The collective efforts of these critical partners (as STOP Spillover's target outcomes) were considered significant in mitigating the spread of LF in Nimba County.

Outcome Targets and Interventions

During Day 3, workshop participants developed a list of possible project outcome targets for the partners and interventions that would achieve these targets. The results are presented in Table 3 below.

Table 3: Outcome targets and proposed interventions

Who (Critical Partner)	Outcome Target	Proposed Interventions
OH Platform and its agents: • NPHIL • MOH • MOA • EPA • FDA • Ministry of Education (MOE) • National Disaster Management Agency • WASH Commission • Ministry of Internal Affairs (MIA) • University of Liberia	• The OH Platform decentralizes the testing platform to the district and county levels. The platform decentralizes the electronic IDSR platform to the district level. • NPHIL provides effective surveillance of LF and supports community-led total sanitation (CLTS) and solid waste management. • The OH institutions ensure the provision of quality curative services and case management and improve IPC through improved community engagement.	• Support c**oordination mechanisms** among OH partners. • **Support training** (community and county) on existing guidelines (e.g., IDSR, third edition; Animal Disease Surveillance and Response; etc.). • Support **research on wastewater and drinking water screening** for LF on other zoonotic diseases, refresher training for the community events–based surveillance (CEBS) program staff (community health assistants [CHA], CHVs). The program **supports the surveillance of wastewater** for the potential presence of viral particles. • Support the provision of **LF IPC materials**.

Who (Critical Partner)	Outcome Target	Proposed Interventions
County health agents: • CHT • CHAs • CHVs, and • Community animal health workers (CAHW) • Breakthrough action • Nimba County Medical Store Association	• The county health agents intensify CEBS, LF community case definition, and early detection for referral. • Medical stores serve patients based on prescriptions.	• **Support training** in early detection and prompt reporting of all public health-related cases. • Establish Lassa assays for differential diagnosis. Develop the capacity of local leaders to implement CEBS. Support the development of CHA, CHV, and CAHW reporting tools for all public health events. • Collaborate with NPHIL, MOH, CHT, and WHO to conduct **training for medicine dispensers** *and* support the distribution of LF messaging and flyers at various medicine stores. Support the strengthening of the community referral pathway. • Work with CHAs, CHVs, and CAHWs in educating communities to take ownership of **health-seeking behavior**.
Local leaders and communities: - Including CSOs, youth and women leaders, town chiefs, commissioners, traditional healers, and religious and cultural leaders	• The leaders and communities support health program implementation at the subnational level through enforcement of health policies at the county, district, and community levels. The agents support effective CLTS and waste management strategies.	• Support awareness and **referral pathway** systems through religious structures and systems for effective engagement and participation of communities and related social and behavior change (**SBC)**. • Support programs that build the capacity and functions of community leaders on zoonotic diseases risk management, especially LF, and ensure program delivery in the local dialect. This includes activities by community-based organizations, youth groups, and school health clubs. • Support dissemination programs targeting or used by communities for CLTS and waste management.
Transporters: - Those engaged in the transportation of patients, cadavers, and samples; they include all public transporters and their unions and Riders for Health.	• Transporters have the requisite knowledge of related transport of LF patients, cadavers, and samples. • They ensure the timeliness of sample delivery and reporting. • They use a system for reporting LF cases to health authorities.	• Support **capacity strengthening** for the transporters and the implementation of effective reporting they can use for cases, conditions, and events. • Collaborate with Riders for Health to increase their number and the number of pickup points.
Environmental sector agents: - EPA, - FDA, - The City Cooperation, - NPHIL - WASH Commission - MOA)	• These agents clean the city and effect adequate waste management. • They ensure there is compliance with monitoring and enforcement of environmental protection laws and regulations while engaging communities to protect forests and wildlife.	• Support the establishment and functioning of regular **environmental sampling and testing** (wastewater and solid and liquid waste). • Strengthen the agents' capacity in surveillance at various ports of entry and central veterinary lab testing of wildlife specimens.
Agricultural sector agents: - MOA - CAHWs - County animal surveillance officer, - National Fisheries & Aquaculture Authority	• While working to ensure and improve the country's and county's food security, these agents conduct effective surveillance on animal diseases. • They collaborate with the MOH and EPA for the promotion and effective functioning of the OH system.	• Strengthen the (national/central) veterinary laboratory's capacity to test for LF in wildlife (e.g., rodents) and related sample transport systems. • Support the agents in establishing hotlines for reporting animal/zoonotic disease cases. • Support MOA to **promote and establish community (alternative) livelihood and protein sources** (e.g., fish farming, livestock breeding) to minimize human-rodent contact or consumption.
Schools and training institutions: - The University of Liberia - MOE	• The University continues and expands its LF fever research for risk management • Schools are aware of LF-related risks. The institutions support youth groups to serve as peer educators to mitigate negative impact related to hunting, handling, and consumption of rodents.	• Support health education on LF among school-going children. Identify schools to establish health clubs and projects on alternative protein sources. Provide training to members of the clubs along with teachers.

Intervention/Study Selection Process

The country team synthesized the information from the OM planning meetings and grouped the proposed interventions according to the HACCP model. The stakeholders identified 14 interventions on transmission and amplification, 13 interventions on treatment, six interventions on laboratory and diagnostics, and 10 cross-cutting. The proposed interventions were numerous and some of them beyond STOP Spillover's mandate and scope. The program conducted an Intervention/ Study Selection Process (ISSP) to synthesize the information collected during the OM workshops and facilitate decision-making for the most appropriate interventions and studies. The following criteria were used to prioritize interventions and research areas from the proposed list (Table 3).

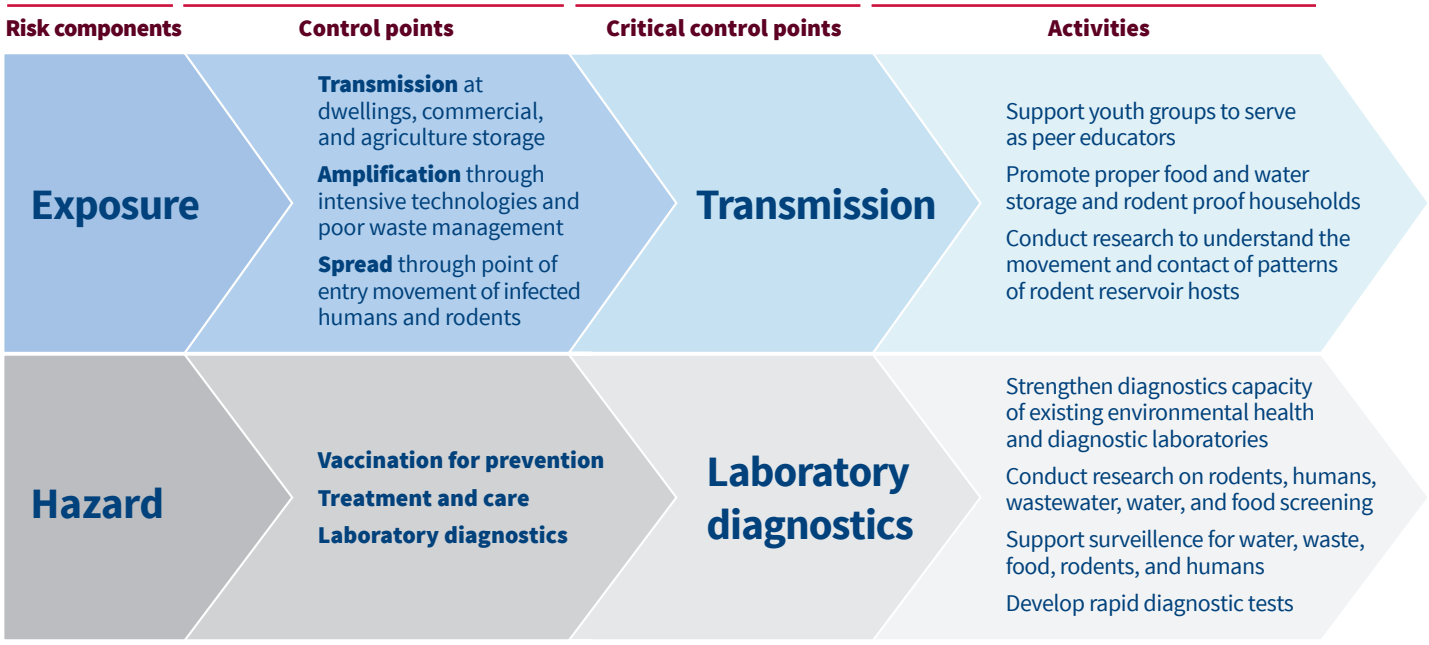
- Aligned with local needs and priorities
- Aligned with STOP Spillover's scope, remit expertise, and timelines
- Evidence of scientific coherence
- Perceived level of risk reduction

Two CCPs were selected based on the existence of effective interventions and the need to identify a niche for STOP Spillover. Based on these two criteria, Rodent-to-human transmission was selected on the exposure side of the risk equation. Laboratory diagnostics was selected on the side of LF virus impact mitigation. All interventions and research related to other potential CCP were dropped. Remaining interventions and research from the two CCPs were further bundled as appropriate. USAID Mission concurrence was sought on the interventions and research studies described further below.

Interventions

- Supporting youth groups to serve as peer educators for practices that decrease the risk of rodents to humans Lassa Virus spillover.
- Promoting proper food and water storage and rodent-proof households.
- Strengthening the diagnostic capacity of existing environmental health and diagnostic laboratories engaged in Lassa Virus surveillance.
- Developing specific rapid diagnostic LF tests.

Figure 4: Liberia work plan with risk-based HACCP framework for Lassa Virus



Note: The CCPs were selected based on the availability of effective interventions and the need to create a value-added niche for STOP Spillover in Liberia. Interventions were endorsed by the USAID Mission and generated through the OM workshop and various related stakeholder engagements.

Research

- Conducting research to understand the movement and contact patterns of rodent reservoir hosts of LF.
- Conducting research to assess Lassa Virus infection of rodents and humans and Lassa Virus contamination of waste, water, and food.
- Supporting surveillance for priority pathogen viral RNA in water, waste, food, rodents, and humans.

In addition, a risk-based hazard analysis model was developed to depict a "big picture" of the STOP Spillover project in Nimba County, showing the interplay among proposed interventions and research activities and their contributions to reducing exposure and hazard-related risks (Figure 4). The diagram was generated using information from stakeholders at both the national and local levels to visualize the pathway of the Lassa Virus and various CCPs for probable intervention.

CONCLUSION

Lassa Virus was identified as the priority pathogen in Liberia. Through the various engagements, stakeholders identified exposure pathways (rodent-to-human, human-to-human, and human-to-rodent), virus amplification and spread drivers, hazard impact mitigation activities, gaps, barriers, and critical partners and control points for the interventions. Research gaps that require addressing for the human-to-rodent interface included: 1) health-seeking behavior assessment related to culture, economics, and gender; 2) community knowledge on Lassa Virus transmission, behavioral risks, and perception; 3) rodents' ecology and viral ecology (e.g., habitats, population, migration patterns, and species interactions); 4) a review/update of existing and formulation of new policies and protocols, and 5) cross-border human population and animal movements. Suggestions of STOP Spillover support by critical partners were identified and included capacity strengthening, enhancement of surveillance through collaborative research studies, mentorship, and dialogue facilitation to enhance stakeholder collaboration and SBC initiatives for practices that will reduce risk from rodent contact.

Annex 1. Workshop Participants

	NAME	ORGANIZATION/TITLE
	IN- PERSON PARTICIPANTS	
	USAID	
1	Dr. Fatima Soud	USAID Senior GHSA Advisor
2	Yah Zolia	USAID Health System Strengthening Technical Lead
	USAID partners	
3	Tendra Tenwah-Gweh	International Rescue Committee-European Civil Protection and Humanitarian Aid Operations Project Coordinator
4	Mahamat Ougal	FAO
5	Jeremiah B. Kyne	Breakthrough Action
	STOP Spillover Consortium	
6	Julius Nyangaga	Right Track Africa
7	Dr. Diafuka Saila-Ngita	STOP Spillover Co-lead SMM Hub; Liberia OM lead facilitator; Tuffs University
8	Doreen Birungi	STOP Spillover Country Team lead, Uganda
9	Mildred Bembo Harris	STOP Spillover Country Team lead
10	K. Vivian Lymas Tegli	Wildlife, Livestock, Epidemiology, Behavior Change, and Gender Hub officer
11	Tracy Pency	Risk Analysis and Communication Hub officer
12	Alex D. Mulbah	Surveillance Mapping and Modeling Hub officer
13	Boakai S. Morris	Country administrator
	University of Liberia CHS	
14	Dr. Joseph Sieka	University of Liberia CHS faculty
	MOH	
15	Chester Smith	Director for Health Promotion
16	S. Olasford Wiah	Director of Community Health
	MOA	
17	Roland P. Varpkeh	Animal health
18	Sampson G. Quedan	County animal health surveillance officer
19	N. Samuel Kehbay	County agricultural coordinator
20	Eddie M. Farngalo	Director for Epi-surveillance
21	Watta Anthony	Central Veterinary Laboratory Director
	FDA	
22	Parker Jimmy	Wildlife
23	Joseph G. Duolupeh	Governance
	NPHIL	
24	Fahn Taweh	National Reference Laboratory Director
25	Amos T. Gborie	Environmental and Occupational Health Director
26	Bode I. Shobayo	Deputy Director
27	Philip Bema	Monitoring and Evaluation Director
28	Dr. Ralph W. Jetoh	DIDE Director

	NAME	ORGANIZATION/TITLE
	IN- PERSON PARTICIPANTS	
	EPA	
29	Levi Z. Piah	Environmental health focal point
	Private Organizations/Nongovernmental Organizations	
30	Prince M. Dolo	Youth Peer Health PE Executive Director
31	Jackson Yormie	Church leader
32	Lekolea Dolo	Ganta City Corporation youth chair
33	Steve N. Quoi	National Civil Society Council
34	Dahnetta Dahn	Women Group chairperson
35	Paul Kingsley	National WASH Commission
36	Uriah W. Flomo	Nimba County Medicine Store Association president
	Local Government and County Health Team	
37	Kingston G. David	EPA county inspector
38	Dr. Netty Joe	County health officer
39	C. Paul Nyanzee	Community health department director
40	Albert N. Goodluck	Community health worker
41	Bernard T. Lakpor	Community health assistant
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43	Cooper Karnue	District health officer
44	Frank E. Howard	Environmental health technician
45	George B.W. Goteh	Epidemiologist
46	J. Gonleyan Dahn	Monitoring and evaluation officer
47	Alphonso B. Nuah	Community health services supervisor
48	Robert Gono	Emergency operation center coordinator
49	Rancy K. Larkpor	District health officer
50	Aaron S. Glay	District health officer
51	Freeman M. Behn	District surveillance officer
52	Hilary Ziangbay	District health promotion focal person
53	Africanus S. Dolo	County superintendent representative
54	Mercy Mussah	Ganta City mayor representative
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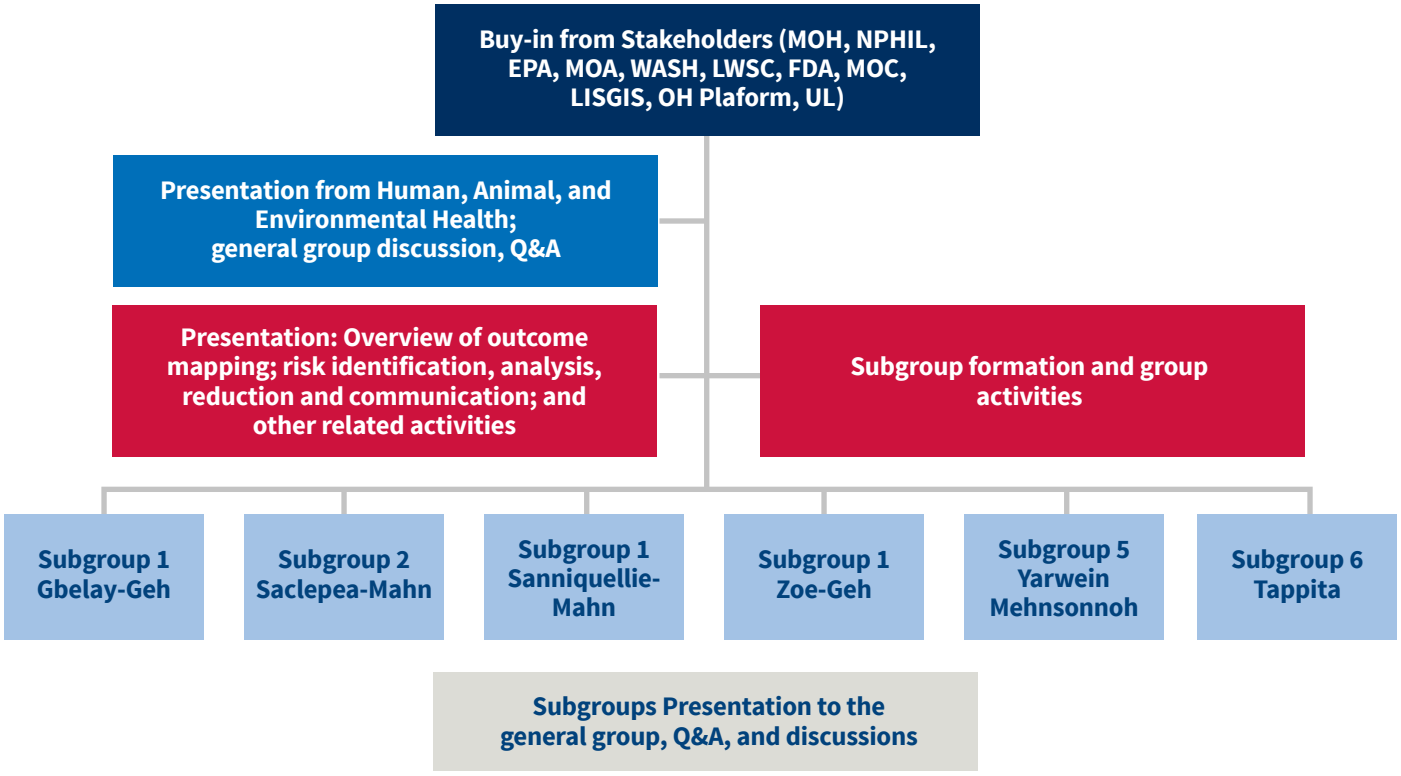
Annex 2. OM Process and Group Work Organization During the OM Workshop



LWSC – Liberia Water and Sewer Corporation; MOC – Ministry of Commerce; LISGIS – Liberia Institute for Statistics and Geo-Information Services

Tufts University

Africa One Health University Network

Southeast Asia One Health University Network

icddr,b

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Tetra Tech

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Broad Institute

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Internews

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