Lassa Fever Formative Research Report

Activity 2.3.1.1 Lassa SBC Activity Deliverable #2

A Report from STOP Spillover Sierra Leone

September 2023

ABOUT STOP SPILLOVER

Strategies to Prevent Spillover (or "STOP Spillover") enhances global understanding of the complex causes of the spread of a selected group of known priority zoonotic viruses from animals to humans. The project builds government and stakeholder capacity in seven Asian and African countries to identify, assess, and monitor risks associated with these viruses and develop and introduce proven risk reduction measures. "Spillover" refers to an event in which an emerging zoonotic virus is transferred from a non-human animal host species (livestock or wildlife) to another animal species, or to humans. STOP Spillover is a five-year project (2020 – 2025) funded by the United States Agency for International Development (USAID).

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Photo Caption: Grain Storage in Lalehun Village (GRNP/ Kenema)(STOP Spillover)

ACKNOWLEDGEMENTS

Strategies to Prevent Spillover (or STOP Spillover), in collaboration with the Sierra Leone One Health Risk Communication Technical Working Group (OHRC TWG), and the One Health Design Mentorship Working Group (OH-DWG) conducted qualitative research interviews to identify social norms and external factors (cultural factors, behaviors, policy, economic factor, political, power dynamic etc.) that affect or influence the adoption of Lassa behaviors in Sierra Leone. We acknowledge those listed below for their assistance in conducting and completing this work.

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LIST OF ABBREVIATIONS

AIV	Avian Influenza Viruses
BCC	Behavior Change Communication
BSL	Biosafety Level
CAHW	Community Animal Health Worker
CHW	Community Health Workers
CoV	Coronavirus
COVID-19	Coronavirus Disease 2019
DHMT	District Health Management Team
DLO	District Livestock Officer
EOC	Emergency Operations Center
FGD	Focus Group Discussion
FWA	Food, Water, Air, Climate, Livelihoods Hub
GRNP	Gola Rainforest National Park
GHSA	Global Health Security Agenda
GoSL	Government of Sierra Leone
HP	Health Post
HCW	Health Care Worker
IEC	Information, Education, Communication
IHR	International Health Regulations
JEE	Joint External Evaluation
KII	Key Informant Interview
LF	Lassa Fever
LASV	Lassa virus
MoA	Ministry of Agriculture
MoE	Ministry of Environment
MOHS	The Ministry of Health and Sanitation
NGO	Nongovernmental Organizations
OHRC TWG	One Health Risk Communication Technical Working Group
OH-DReaM	One Health-Design Research and Mentorship Working Groups
OHS	One Health Secretariat
PDO	Personal Direct Observation
PPE	Personal Protective Equipment
RAC	Risk Analysis and Communication Hub
SBC	Social and Behavior Change

EXECUTIVE SUMMARY

This report provides a summary of research findings on social norms and behaviors that affect or influence Lassa spillover risks in Kenema District, Sierra Leone. Specific research questions focused on local practices, beliefs or social norms that either contribute to or mitigate Lassa spillover risks; the identification of high risk populations and high risk groups for Lassa spillover; traditional cultural norms, beliefs and practices that influence spillover risk; and trusted sources of information. This information will be used to design interventions to reduce Lassa spillover risks, and to develop social behavior change (SBC) approaches to support intervention success.

This qualitative study used Focus Group Discussions (FGDs), Key Informant Interviews (KIIs) and Direct Observations (DOs) to collect information about the drivers of Lassa Fever spillover from rodents to humans in four chiefdoms in eastern Sierra Leone. Eight communities were selected from the four chiefdoms (two communities per chiefdom). Five FGDs and three KIIs were conducted in each community. FGDs included women (focusing on their role in the home), women farmers (focusing on their roles in agricultural production systems), men farmers, male youth (18-35 years), and female youth. KIIs included traditional chiefs (predominantly men), Community Health Workers (CHWs; male and female), and experienced farmers (all elderly men) who live around the Gola Rainforest National Park (GRNP) in Kenema district. In total, 301 people (56% women) participated in these formative research FGDs and KIIs.

Research findings revealed that many community members (both male and female) between the age 18 and older are aware that rats are the reservoir for Lassa fever. Community members mentioned that eating leftover food or water contaminated by rats, poor community or household hygiene, or touching live or dead rats could lead to Lassa fever. Contact with Lassa Fever patients was also identified as a risk factor. However, some FGD participants said that while they have heard about Lassa fever, they do not have specific knowledge of the causes, symptoms, and sources of transmission as there haven't been cases in their communities. All study participants had heard of Lassa and were familiar in some way with the disease.

The study revealed that contact with rats and rat consumption are most widely practiced by male youth (18-35 years) who hunt, kill and eat rats, as well as women who process and cook rats for home consumption. Women and CHWs were frequently cited as those most at risk for Lassa because of their care giving roles in the community. Children were also found to be an at risk group because they play in the dirt and eat whatever they find.

Focus Group participants (men and women) consistently indicated that CHWs, traditional chiefs, religious leaders, and mammy queens (women leaders) influence the behaviors of community members at risk, and are the most effective, trusted channels and sources of information. Radio

discussion programs, CHWs and nurses were described as trusted sources of health information. Male and female youth also mentioned mobile phones as important sources of information.

Findings from this research were used to develop personas that the STOP Spillover team will use to develop a social behavior change (SBC) strategy and tools to support the adoption of behaviors needed to reduce Lassa spillover risks in target communities.

Potential interventions to reduce Lassa spillover risk include improved grain storage techniques to reduce rat infestations in homes where grains are currently stored, and improved community hygiene practices to reduce rat populations. SBC interventions will be designed to support adoption of these proposed interventions. Findings from this research will be validated in each chiefdom and used to inform the design of interventions targeting high risk groups and high risk practices to reduce Lassa spillover risks.

INTRODUCTION

Lassa fever (LF) is a viral zoonotic illness and a significant cause of morbidity and mortality in countries across West Africa, including Benin, Guinea, Liberia, Nigeria, and Sierra Leone. It is highly endemic in Sierra Leone, particularly in its Eastern Province, Kenema district. From 2016–2020, Sierra Leone experienced a gradual decline in annual Lassa fever cases; however, in 2021, cases doubled compared to 2020 (from eight total reported in 2020 to 16 total in 2021), (WHO, 2019; Shaffer et al., 2014). There is considerable concern in the public health community that people are less likely to go to health centers for Lassa diagnosis and treatment following the Ebola epidemic. Those concerns have only magnified since the COVID-19 pandemic. In addition, although the Lassa belt and Lassa cases have historically focused in and around Kenema district, there have been Lassa cases in almost every region of Sierra Leone. This indicates that human behaviors and beliefs may be driving an expansion of the traditional "Lassa belt".

The main reservoir for Lassa virus (LASV) is the multimammate mouse, *Mastomys natalensis*. Other rodent reservoirs (Mastomys erythroleucus and Hylomyscus pamfi) have been recently identified but their relative contribution to human infections is unknown. The *Mastomys* rodent commonly invades homes and villages where transmission to humans is thought to occur. Kelly and colleagues (2013) found that the risk of contracting Lassa virus was directly linked to factors that lead to increased rodent infestation in and around the home, which may put housewives, children, the elderly, and others who spend a lot of time at home at risk.

Transmission from rodents to humans occurs through direct exposure to rodent fluids such as urine, saliva, and blood, or indirect exposure via surfaces and foodstuffs contaminated by these fluids. Urine may present a particular risk for human infections as M. natalensis can shed LASV in urine at any age. LASV has been shown to be aerosolized under laboratory conditions. Secondary human-to-human transmission follows contact with human bodily fluids in the household or healthcare facilities, and is estimated to occur in 20 percent of LF cases. Risk factors for primary (zoonotic) transmission are unclear and possibly linked to hunting and consumption of rodents (Bonwitt et al., 2017). Consumption of rodents as food is a common practice in some rural parts of Sierra Leone (Bonwitt et al., 2016) and is a known mode of transmission of LASV. Less commonly, human to human transmission of LASV occurs when healthy persons come into contact with the bodily fluids of infected persons (Hallam et al., 2018). All of these transmission routes highlight the importance of human behaviors and beliefs to Lassa spillover risks.

Koch and colleagues (2021) indicated that few individuals in the Kenema Lassa Belt demonstrate health-seeking behaviors post-Ebola, despite many years of exposure to mass media campaigns and other social and behavior change efforts (SBC). They recommend exploring the utility of new tools and approaches for SBC that reflect local priorities for addressing risk.

A study by Kelly (2013) showed that in Kenema District, interventions to control Lassa fever and other rodent-borne diseases typically included education and awareness-raising campaigns to improve village hygiene. Sanitary officers used to go to communities, but these officers no longer make visits. Researchers concluded that this may be due to a lack of funding or competing priorities. Previous Lassa control interventions included the elimination of unprotected dumpsites, clearing vegetation around houses, and plugging holes that allow rodent entry. Efforts to counter Lassa Virus (LF) spillover, facilitate LF diagnosis and reduce LV transmission in Kenema District have included enhancing laboratory diagnostic capacity and creating outreach teams and zoology teams that investigate most confirmed Lassa fever cases. Despite these efforts, there are difficulties in case detection which have led to the under-detection of LF cases in Sierra Leone (Njuguna et al, 2022).

In November 2022 STOP Spillover organized an SBC Lessons Learned workshop with support from the One Health Risk Communication Technical Working Group and Breakthrough Action. Key lessons identified during the workshop included the efficacy of direct community engagement to promote social behavior change. In addition, engaging local traditional leaders, using local language communication channels including radio and jingles, rumor management and mitigation, and audience segmentation are considered critical best practices. Written materials including posters are less useful in community settings, but the national 117 hotline was identified as a positive platform upon which to build. The importance of community bylaws to changing risk-related behaviors was emphasized.

Workshop participants recommended that the STOP Spillover team focus on strengthening collaboration among One Health partners at the local level. They also identified key gaps in current SBC approaches, including the need to identify **barriers** related to the adoption of appropriate community hygiene and sanitation practices, food storage practices and ways to sustainably reduce the consumption of rats, bats and other wild animals that may serve as reservoirs of zoonotic diseases. Finally, community members and One Health actors alike decried the lack of effective, tailored and targeted information, education and communication (IEC) materials and the scarcity of Lassa and Ebola SBC actors working at the community level.

A recent study by Breakthrough Action (BTA), the flagship USAID-funded social and behavior change project, found that community members had a **high awareness** of Lassa fever but limited specific knowledge about the disease. There was **low risk perception** for Lassa fever among many participants (especially farmers and young boys who are at high-risk for Lassa fever). Eating food contaminated with rat waste was identified as a main risk behavior for exposure to Lassa fever. Study participants also identified **prevention behaviors** such as proper food storage and plugging up cracks and holes in homes, rat poison, keeping a cat at home, and personal and environmental cleanliness. Participants reported a preference for community level information sharing. CHWs (male and female) were cited as the main source for health information among community members. Other sources of health information mentioned included radio broadcasts, local NGOs, and social media (Johns Hopkins Center for Communication Programs 2023).

STOP Spillover's formative research builds on the strong foundation of the BTA report, but differs from BTA's work in several key ways:

- BTA consulted health care workers (15) at the Lassa fever ward of Kenema hospital, and conducted in-depth interviews with community members and health care workers in Kenema (15) and Tonkolili (15). STOP Spillover targeted eight communities in four rural chiefdoms bordering GRNP, and interviewed 301 people (8 CHWs) in gender and age specific focus groups. STOP Spillover's study focused on farmers and farming communities.
- STOP Spillover explored specific farming practices that bring men and women into contact with rodents, including social and gender norms and environmental factors that contribute to increased human exposure to rats. BTA focused on knowledge, perceptions and behaviors related to Lassa fever from a public health perspective. STOP Spillover focused on agricultural and environmental practices that contribute to Lassa spillover risks, and social beliefs and behaviors that inform agricultural and environmental practices.
- BTA's report suggested improved grain and food storage practices as priority Lassa prevention behaviors. STOP Spillover's formative research builds on BTA's findings by exploring community willingness to test new storage practices, and factors that might induce them to do so, including potential costs and benefits of different grain storage and food storage options. STOP Spillover also explored potentially effective and successful traditional food storage models that could serve as "positive deviants" or examples to inspire change.
- STOP Spillover FGDs explored the motivations and external factors that drive male youth to hunt and consume rats, using youth-only focus groups to dig deeper into this issue (building on the excellent analysis in BTAs report identifying male youth as a high risk group).
- STOP Spillover identified high-risk groups including male youth, CHWs, women and young children, and developed typologies based on local beliefs, behaviors and risk factors; and social and gender norms and practices that influence risk.

Overall Research Goal:

The goal of this formative research is to support Lassa risk reduction interventions (STOP Spillover Activity 2.2.2.1) by providing data to inform the design of an effective evidence-based SBC

strategy to reduce Lassa spillover risks. The SBC strategy will be informed by a rapid review of past SBC efforts (from November 2022) and this formative research.

Specific Objectives:

1. To conduct formative research to better understand the influencing factors (political, economic, cultural and environmental factors) and social and gender norms that facilitate or impede behavior change in the high-risk interface.
2. To use these findings to design and implement an SBC strategy to reduce spillover risk and improve the adoption of STOP Spillover risk reduction interventions (Activity 2.2.2.1).

Research Questions

This activity will provide answers to the following research questions:

1. What farming, food storage, hygiene and livelihood practices bring people into contact with rodents and their feces/urine? How can those practices be adopted or adapted to reduce human-rodent contact?
2. Who is most at risk for Lassa fever spillover at this high risk interface and why? What livelihoods and behaviors make them most at risk, and what drives those behaviors?
3. What cultural practices put people at risk for Lassa Fever infection in the study sites and how are they put at risk? What informs these cultural practices and who leads them?
4. What religious, traditional, or cultural beliefs support the consumption of rats or interactions with rats in the study sites?
5. Who are the major influencers of cultural practices and behaviors in the study sites?

STOP Spillover Lassa SBC formative research focused on understanding the social norms and external factors (cultural factors, behaviors, policies, economic factors, political practices, and local power dynamics) that affect and influence human interaction with rodents, and the adoption of appropriate preventive behaviors. The results of this research, along with findings from a previous STOP Spillover lessons learned workshop on Lassa Fever, and complementary research studies on Lassa Fever will be used to co-design SBC support to improve community hygiene, farming, food production and related food safety practices (STOP Spillover 2.2.2.1). STOP Spillover will engage communities in the high-risk interface to reduce contact with rodents and promote safer food storage and farming practices.

1. METHODOLOGY

2.1 Research Design

This qualitative study made use of the following data collection tools: Focus Group Discussions (FGDs), Key Informant Interviews (KIIs) and Direct Observations (DOs) to collect information about the drivers of Lassa Fever spillover from rodents to humans in four chiefdoms in eastern Sierra Leone. The study was conducted in four Chiefdoms around Gola Rainforest National Park (GRNP) in Kenema district. Two forest edge communities were selected in each chiefdom. The four chiefdoms include Nomo, Tunkia, Guara and Koya. In total eight communities (Faama, Gbandalahun, Belebu, Gbegbema, Lalehun, Nyadehun, Njaluahun and Gbogbuabu) were selected from the four chiefdoms with two communities selected per chiefdom (Figure 1). Five FGDs and three KIIs were conducted in each community. Each FGD lasted approximately 45 minutes, while the duration of KIIs averaged 35 minutes. FGDs targeted women in the community, women farmers, men farmers, male youth, and female youth in separate discussions. KIIs were conducted with traditional chiefs (male & female), CHWs (male & female), and older experienced farmers (all male).

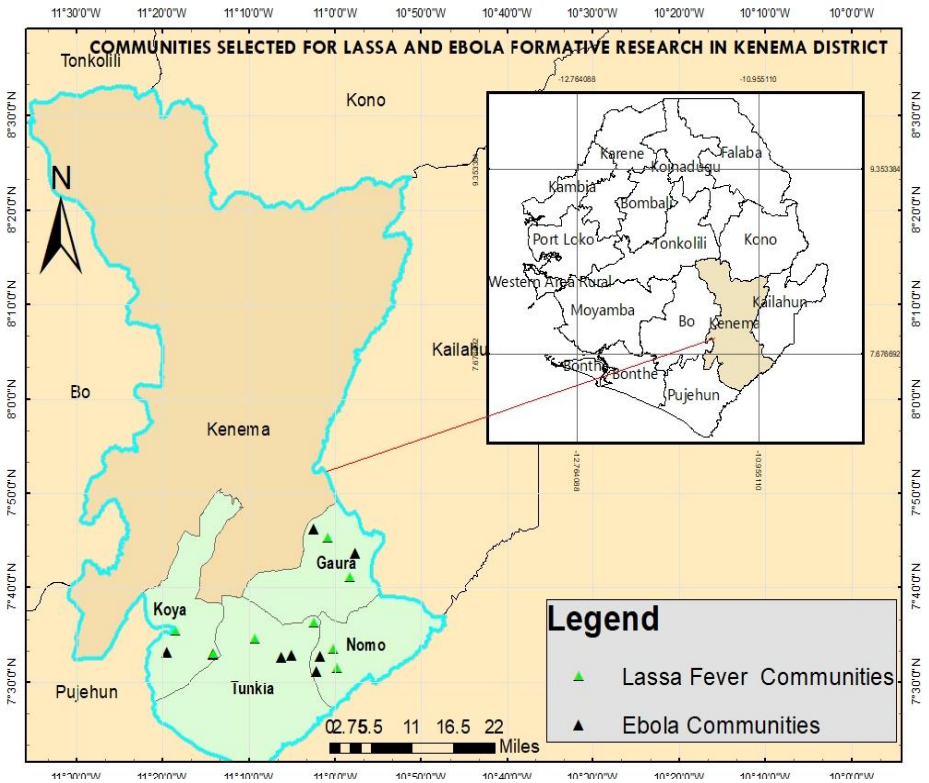

Figure 1: Map of target communities around the Gola Rain Forest

Chiefdoms and communities were selected based on the following criteria:

1. The community should be within one of the four chiefdoms (Koya, Gaura, Tunkia and Nomo) within the Gola Forest in Kenema District. The community should be a forest-edge community around the Gola forest reserve.
2. Community members should be predominantly farmers.
3. Priority is given to communities with previous cases of Lassa fever.

2.2 Data Collection

2.2.1 Tools

Data collection tools were designed and pretested to ensure that they were understood by intended respondents. Facilitators and note takers were trained so that they could thoroughly understand the underlying research questions, and accurately interpret and record respondent responses. Facilitators organized discussions using FGD and KII guides. Note takers used audio voice recorders and entered data directly into an electronic data collection tool (KoboCollect). Discussions focused on social norms and influencing factors (cultural factors, behaviors, policy, economic factor, political, power dynamics etc.) that affect or influence the adoption of protective behaviors.

2.2.2 Respondents

Study participants included adults 18 years of age and older, community members including women, women farmers, men farmers, male and female youth 15-24 years of age, traditional chiefs, CHWs, and older, experienced farmers living in selected communities around the GRNP. These study participants were selected based on recommendations from community leaders and community health workers and the DHMT coordinator. There were three male and one female data collector.

2.2.3 Process

To inform the design of contextually relevant and adapted interventions to reduce Lassa Fever spillover risks, the STOP Spillover team in collaboration with local stakeholders (11 male and 1 female) formed the One Health Design, Research and Mentoring (OH-DReaM) Working Groups (OH-DWGs). They developed the research tools as well as the training guide to train data collectors on how to conduct the formative research in the eight communities around the GRNP. Hard copies of FGD and KII guides were used by facilitators to interview study participants.

2.2.4 Data Management

Each day note takers uploaded responses obtained from FGD and KII sessions into KoboCollect for analysis. Two facilitators, two note takers, one OHDWG supervisor and STOP Spillover technical leads summarized the information collected each day in the field (key learnings and highlights) for recordkeeping purposes. Qualitative data were later transcribed into a template

and analyzed manually to identify key practices, high risk behaviors and trends, by community, and by gender and age.

2.3 Data Analysis

A data analysis team was formed to review the qualitative data that was collected from the field using a template designed by the STOP Spillover technical team to manually analyze this data to identify key practices, high risk behaviors and trends by different communities, as well as by gender and age. A finalized consolidated transcript was available for data analysis.

All digital field recordings as well as field notes that were uploaded on the KoboCollect app were later transcribed and translated from Mende into English by a team of translators. English transcripts were reviewed, spot checked for accuracy and saved into a password encrypted computer for data management and analysis by members of the STOP Spillover team.

A qualitative data analysis template was developed based on the study objectives and interview guide content. OHDWG data analysts reviewed findings from the study during a 10-day workshop in Freetown. Qualitative data were grouped and summarized by communities, categories of study participants, and by various themes that emerged from the data itself, taking into consideration key gender and age differences. The team used manual thematic coding to analyze all qualitative data collected in this study.

2.4 Limitations

The Gola Rainforest National Park (GRNP) covers seven chiefdoms that extend to Kailahun and Pujehun Districts. This research study was limited to four chiefdoms around the Gola Rainforest National Park (GRNP) in Kenema District. In addition, this data is qualitative and not meant to be representative of all people living in and around the GRNP.

2.5 Ethical Considerations

The study protocol conformed to the ethical guidelines of the Institutional Review Board of Tufts University who, after reviewing the protocol, gave approval before the study commenced. Ethical approval was also sought from the Sierra Leone Ethics and Scientific Review Committee by submitting the study protocol and approval was also granted. All participants were taken through the consent process before the start of the interviews and FGDs and ensured their privacy and confidentiality.

RESULTS

3.1. Knowledge of Lassa Fever infection, sources, and transmission

3.1.1. Overview

FDG and KIIs were asked to describe their farming practices, and what they know about Lassa Fever. Most community members had heard of LF and were aware that rats are the reservoir of Lassa Fever disease. Most participants believed that poor environmental sanitation, touching rats and eating rats contribute to Lassa risks.

''My people, rats are my enemy in this community, they are very destructive. They make us sleepless at night, rats in our houses eat our food, destroy the books we buy for our children to go to school, destroy our grains and the worst of all, when I sleep at night, rats sometimes eat my feet and hands. I heard they said eating food contaminated by rats causes Lassa fever that leads to high fever, deaf and paralysis''- Female farmers, Njaluahun village, Kenema district .

A few participants claimed that mosquitoes are the reservoir of Lassa Fever, or that Lassa Fever can be transmitted sexually. Some CHWs and a few community members were able to identify correct symptoms of Lassa fever such as sore throat, fever, and vomiting.

''I heard they said eating rats causes Lassa fever but for me, I believed that it is not only rats but when a mosquito bites you it will cause malaria and Lassa fever. We have been informed by our CHW that when we keep food items at home uncovered and have an abundance of rats at home. Rats may eat the food items and urinate in the water sources that will be dangerous to our health'' — Female farmer, Nyadehun village, Kenema district.

''Lassa fever is caused by rats, and rats like to live in a dirty environment, if your place is very dirty, rats will come there. - Male youth, Lalehun village.

3.1.2. Gender differences

Most male study participants were more open to acknowledge eating of rats compared to women. In Sierra Leone domestic chores such as cooking and taking care of the home are traditionally considered a woman's duty. Participants revealed that men participate in plowing farms, loading grains into bags, hunting rats during bushfires, hunting and capturing rats during farm and swamp clearing (mostly male youth) and transporting grain, while women participate in weeding, crop harvesting and caregiving roles at home. Some young men and young women believed that Lassa Fever infection can be transmitted through sexual intercourse. Participants generally considered women to be at higher risk for Lassa Fever than men because they interact more often with infants who are exposed to Lassa Fever virus because of their behavior and feeding habits. According to the study participants, infants feed on anything they encounter (food).

"Men are more at risk of becoming infected with Lassa Fever disease because they tend to have multiple sex partners" said female participants during an FGD sessions.

3.1.3. Health Information Sources

Generally, this study revealed that male and female community members trusted CHWs as their main source for health information. Community members also mentioned that radio discussion programs, and face-to face community meetings conducted by CHWs, district health officers, NGOs, and their chiefs served as their trusted source of information. Other sources of information for youth included social media and councilors. Radio programs and face-to-face community meetings were frequently mentioned by male and female participants. Participants noted that the latter is the only time when they have an opportunity to ask questions and get immediate responses. This study finding is similar to the responses gathered from SBC actors and stakeholders during the SBC Lessons Learned workshop in Kenema. Other studies conducted by BBC Media Action also found that radio dominates the media sector in Sierra Leone.

3.1.4. Gaps in knowledge

Some young male and female participants (including a few CHWS) were unable to identify the correct reservoir of Lassa Fever virus, as well as its common signs and symptoms. Some community members (both male and female) during the FGD sessions identified mosquitoes as the reservoir of Lassa Fever (perhaps confusing it with malaria) while others claimed that the disease can be transmitted sexually. Some also claimed that Lassa Fever is an airborne disease that God descended to punish them.

''*Lassa fever can be transmitted through the air. Sometimes we exchange cigarettes which is a bad habit. Someone sick of LF can pass on the disease. I also believed that having multiple partners leads to contacting LF'' - male youth, Faama village.*

3.1.5. Reservoir of Lassa Fever infection

Rats were generally reported by most of the male and female study participants to be the reservoir of the Lassa Fever. This finding is similar to results from studies conducted in Bo district. Some study participants went even further to identify the specific rat species that is responsible for the transmission of Lassa Fever. According to some male and female participants, the rat species that is responsible for the transmission of Lassa Fever is the small rat with a pointed mouth and bad odor called "Tuli" in local dialect (Mende) which has been scientifically identified as a member of the genus Mastomys.

''There is a type of rat we called in our local dialect Mende (Tuli), we don't eat it because we know it causes Lassa fever, but apart from that we eat all kind of rats that comes around the town or the bush we kill it and eat them, but the only forbidden rats we don't eat is the Tuli its very small with a long mouth.'' A statement in one of the FGD sessions by a male youth farmer, Gbadalahun village.

''In this village, only a few people might eat rats in town. For me, I only eat the rats in the bush. Sometimes when we are clearing land, rats will come out, and we will kill them, and will give it to one child to carry to the house for our wives to cook'' — FGD male youth farmer, Faama village.

3.1.6. Lassa Fever disease transmission routes

Many male and female participants mentioned that eating rats, eating food or drinking water that has been contaminated by rats, or physically touching alive or dead rats were the main risk behaviors for exposure to Lassa fever transmission. This finding is similar to a finding from Usuwa et al.'s (2020) study in Nigeria. A few participants said that they eat leftover food because they have no choice. Food that has been nibbled by rats is removed and then they eat the unnibbled portion.

3.2. Groups identified at higher risk of Lassa Fever

From the study, it became clear that some community members are aware that everyone in their community is at risk of contracting Lassa Fever, irrespective of their age or sex because of the frequent encounters they have with rats in their homes or communities. Some community members specifically identified women, farmers, young boys, and children as groups who are at elevated risk for Lassa Fever. Study participants felt that women are more exposed and vulnerable because of the roles they play, including caring for children and the sick, traveling to markets with poor hygiene and sanitation, and processing and preparing food in the home. Male and female farmers, traditional healers (predominantly male), and male and female secret society leaders, on the other hand, were considered as primary contacts because of the nature of their job which placed them in direct contact with rats in their environment. According to community members interviewed, young children were believed to be at high risk for Lassa Fever because they tend to eat anything they lay their hands on, while male and female youth were said to be at high risk of Lassa Fever because of the practice of hunting rats for consumption and for fun. Bonwitt et al. (2016) concluded that young boys in Nigeria who commonly hunted and ate rodents were a high-risk group for Lassa fever.

3.2.1 **Traditional / cultural beliefs, practices, and social norms**

Study participants revealed that rats were previously used for ritual sacrifices, such as to make children walk at an early age. They also said that rats were ground with herbs and used as medicine for pregnant women. The said these practices no longer exist. A few people mentioned that soup cooked with rats can cure colds.

Most men admitted they eat rats because it tastes like any other animal irrespective of its size, but they hold no beliefs about the practice. Some said they eat rats both from the community and the field but do not eat the small red and pointed mouth rat because of the odors and belief

it carries LF. Even though many eat rats, some are afraid of eating rats because they have heard from religious leaders and CHWs that it causes Lassa fever.

3.2.2 Drivers of cultural practices/influencers

Study participants mentioned traditional chiefs, religious leaders, secret society leaders (poro for male society and bondo for female society), healthcare workers, mammy queens (women leaders), youth chairman and chair ladies, as their major influencers in their community. CHWs, traditional chiefs and religious leaders (male and female) are key influencers in the community because of their roles in promoting positive health behaviors and development. Genders of these influencers are listed below:

- Traditional chiefs (Predominantly male and a few female)
- Secret society (Male and female)
- Religious leaders (predominantly male and a few female)
- Traditional healers (predominantly male and a few female)

3.2.4 Social risk factors

Some participants in the study mentioned traditional cultural dances (poro or bondo), community disco dances, and football games as the main social activities in which they participated in their community. They said that these activities might lead them to contract Lassa Fever, due to an infected person spreading the disease through bodily contact.

3.2.5 Perceived control measures to prevent Lassa Fever

Many participants described what they do to reduce the population of, and encounters with, rats. Many identified keeping cats as home pets, proper storage of food and grains, blocking wall cracks and holes in homes, practicing personal and environmental cleanliness, including proper disposal of garbage and waste, rat trapping and rat poisoning. These preventive practices align with WHO recommendations for preventing Lassa fever (2017) based on good community hygiene, which discourages rodents from entering homes. Using appropriate food storage practices, disposing of garbage far from the home, household cleanliness, and keeping cats are also effective measures and were mentioned by community members. Other participants mentioned using metal traps, environmental sanitation and personal hygiene practices, and physically killing rats with sticks as ways to control rodents. Community members have identified community solutions to safely store their harvest and ensure environmental sanitation to combat the increased presence of rats in their community.

‘’*I heard others mention rat poison. For me, I think it is not good. We live with our children at home and therefore it is not advisable to use rat poison to kill rats because our children are very careless, and they tend to eat anything they lay their hands on’’. A statement by a women farmer during a FGD session in Lelehun community, Kenema District.*

"I once placed rat poison (in my barn) and killed over 400 rats, which shows the amount of rats that destroy crops in storage" – Village Chief (male)

"I only believe in my cat. I don't even believe in English medicine it's only my cat that I trust" – Experienced Farmer (male)

"We clean our environment. There's a law for dirty here." – Village Chief (male)

Key Findings from Direct Observations

Direct observation provided a unique opportunity to observe activities, behaviors and physical realities without having to rely completely on people's recollection and honesty.
Through direct observation in study communities, the team observed that most houses are made of mud thatch, food is dried on tarps on the ground, crops are largely stored at home, trash pits are located close to individual houses, and there were no visible rat control practices observed. Although there are toilets in many communities, open defecation is still practiced.

DISCUSSION

Farmers in these high risk communities are aware of Lassa, and they know rodents are the reservoir of the disease. It is, however, exceedingly difficult to differentiate between the Mastomys rodent (Thuli) and a regular forest or house mouse. Farmers are aware of Lassa signs and symptoms, although occasionally they confuse Lassa symptoms with symptoms for other diseases (HIV, COVID, Ebola, etc.). All focus groups mentioned hygiene and sanitation practices as important drivers of Lassa spillover and as preventive measures to reduce Lassa spillover risks. Many people mentioned rat infested food or water as a source of potential contagion, and community trash management and household hygiene as important prevention measures.

Despite this knowledge and awareness, however, male youth still eat rodents. Rat consumption was much less popular with female youth, who seemed more concerned about getting Lassa from sexual intercourse. Women and CHWs were often thought to be most at risk for Lassa, because of their care giving roles (despite the fact that they don't eat as many rodents as male youth). Young children were also identified as a high risk group for Lassa because they play on the ground and don't really know about or understand Lassa risks. However, because there are (thankfully) so few cases, many people don't take Lassa very seriously and don't perceive any Lassa risks in their community or livelihoods. Risk awareness – potentially through sharing of survivor cases or case studies – could help improve compliance with identified prevention measures.

Farmers in these communities come into contact with rodents on a daily basis, especially during harvest season. Farmers said that rats follow their crops to their homes, especially when rice is stored there. Covering food and water, keeping cats and cleaning the community were the most common suggestions to reduce rodent contact. Almost all of the older farmers said they no longer eat rats due to awareness raising by medical personnel.

Table 1: Research Questions, Key Findings and SBC responses

Key Question	Finding	SBC response
What farming, food storage, hygiene and livelihood practices bring people into contact with rodents and their feces/urine? How can those practices be adopted or adapted to reduce human-rodent contact?	Rodents live with people because people store grains in their homes. Rodents contaminate food and water left uncovered.	Promote grain storage options that prevent rat entry, or grain storage away from the home to reduce human-rodent contact.(women) Promote covering of food and water (women)
Who is most at risk for Lassa fever spillover at this high risk interface and why? What livelihoods and behaviors make them most at risk, and what drives those behaviors?	Women, children and young men are most at risk, because of social norms and behaviors related to care giving and hunting.	Use peer educators to reach and engage male youth to reduce rodent consumption. (men) Integrate Lassa fever sensibilization into ANC sessions for pregnant women (women) Create children's stories about Lassa to increase risk awareness (youth)
What cultural practices put people at risk for Lassa Fever infection in the study sites and how are they put at risk? What informs these cultural practices and who leads them?	Secret societies should be leveraged to promote Lassa risk reduction behaviors.	Engage secret society leaders to support Lassa risk reduction campaigns (i.e. community clean up campaigns)(youth)
What religious, traditional, or cultural beliefs support the consumption of rats or interactions with rats in the study sites?	Religious practices and norms do not promote rodent consumption, and could act as a positive force for change.	Engage imams and other religious leaders to dispel Lassa myths and promote positive Lassa risk reduction behaviors (cleanliness is next to godliness; washing before prayer time, love thy neighbor by keeping your trash far from the village, etc.).
Who are the major influencers of cultural practices and behaviors in the study sites?	Chiefs, Youth Leaders, Women's group leaders, Religious leaders, Radio, Social Media (for youth)	Engage all influencers in efforts to change grain storage practices and improve community hygiene/solid waste management.

Tables 2 shows the main actors or people who are at higher risk of Lassa fever based on their role or job, current practices, and their key influencers.

Table 2: High risk groups, risk factor, current practices, key influencers, and trusted sources of information.

Priority Audience	Risk Factors	Current practices	Key Influencers	Where do they get trusted information from
Women Farmers	• Weeding • Harvesting of crops • Caregiving role of women at home • Drying food on bare floor • Storage of food in dwelling houses • Poor hygiene practice at home	• Store grains in a jerry can. • Store crops in barns erected in kitchen ceilings. • Dry food crops on plastic sheets, old clothing, etc. • Dig trenches at the back of their houses to dump waste. • Use traditional methods like leaves with sharp blades to prevent rats from eating their crop.	• Traditional chiefs • CHWs • TBAs • Experienced farmers • Chairlady • Secret society leader (Sowei) • Ward Councilor • Men (husbands)	• CHWs • community meetings • District radio programs for health news and other topics (some are interactive call-in programs) • Phone call from district health officers.
Male Youth Farmer	• Hunt, kill and consume meat. • Brush farm, swamp and plowing farms. • Load grains into bags. • Hunt rats during bushfires. • Hunt and capture rats during swamp brushing. • Transport grains.	• Fence and set traps around farms. • Kill rats using home poison. Set traps at home to reduce rats.	• Traditional chiefs • CHWs, • Experienced farmers • Men Secret society Leader • Ward Councilor • Male youth leader	• CHWs • community meetings • Radio • Phone call from district health officers.
Female Youth Farmer	• Key processors of rats. • Weeding • Harvesting of crops • Caregiving role of women at home. • Drying food on bare floor, • Storage of food in dwelling houses, • Poor hygiene practice at home,	• Dry food crops on plastic sheets, old clothing, etc. • Dig trenches at the back of their houses to dump wastes.	• Traditional chiefs • CHWs • TBAs • Experienced Farmers • Chairlady • Secret society Leader (Sowei) • Men (Husbands) • Ward Councilor	• CHWs • Barry meetings • Radio • Phone call from district health officers.

Priority Audience	Risk Factors	Current practices	Key Influencers	Where do they get trusted information from
Male Farmers	● Brush farm, swamp and plowing farms. ● Load grains into bags ● Hunting rats during bushfire ● Hunting and capturing rats during swamp brushing. ● Transporting of grains.	● Fence and set traps around farms. ● Set traps at home to kill rats. ● At home poison are used to kill rat	● Traditional chiefs ● CHWs ● Experienced Farmers ● Men Secret society Leader ● Ward Councilor	● CHWs ● Barry meetings ● Radio ● Phone call from district health officers.

4.1 Lassa Fever High risk personas

Using information from FGDs and KIIs, the data collection and analysis team created "personas" that summarize the characteristics of key stakeholders and actors of high risk groups. Identifying specific high risk group cultural and traditional beliefs, social norms, and knowledge, attitudes, and practices related to Lassa Fever and the frequency of rodent contact allows STOP Spillover staff and partners to develop targeted interventions designed to address the specific spillover risks faced by each at-risk group. Understanding the socio-economic and political drivers of zoonotic spillover risk allows the STOP Spillover team and stakeholders to design interventions and approaches that address these systemic issues and are more likely to have sustained impacts. The personas ultimately inform both the design of *risk reduction interventions* and the design of effective, tailored and targeted *SBC efforts* to support those interventions.

Male Youth in all communities visited self-identified as a high risk group for LF because they are most likely to hunt, kill and consume rats. They frequently come into contact with rodents at home, in the kitchen, at their farms, when clearing swamp land or bush. They are often involved in alternative livelihoods like motorbike transport, subsistence farming, and mining. Hunting is done with firearms, nets, traps, and/or dogs. Rodents are hunted live or gathered when found dead in the forest and carried without any protection or concern about contact with body fluids including saliva, urine, blood, and feces. Youth believe that rodent hunting and consumption have been a way of life since their ancestors, with no associated sickness. However, they are also aware that it is a potential source of Lassa. Measures to prevent Lassa infections include community cleaning, garbage bits away from homes, improved grain storage, cats and rat poisons.

Rodent hunter and consumer (Idrissa)

As a young man, Idrissa works many different jobs to support his family, including hunting rodents, subsistence farming, motorbike transport, and mining. When hunting, Idrissa does not typically use any form of protection (e.g., gloves, masks or special clothing) when transporting or processing animals. Despite being exposed to the bodily fluids from these animals, Idrissa does not feel he is at risk of contracting any disease. People have been hunting wild animals for years.

Women farmers are engaged in petty trading and selling wild meat in the community. They are also farmers. They handle dead wild animals hunted by their husbands and touch wild animal blood, saliva, and feces without any precautions. They believe handling wild meat is a potential risk for Ebola infection, but they have few options. The use of gloves or other protective clothing while handling wild meat, avoiding handshakes, and frequent handwashing with soap

are seen as effective prevention measures. They would be willing to use protective clothing to reduce the risk of infection if it were affordable and locally available. They mentioned many medicinal benefits of wild meat for their children.

Woman farmer (Fatima)

As the wife of a wild meat hunter, Fatima is frequently involved in trading, processing, cooking and selling wild meat door to door in her community. In this role, she handles dead animals and frequently comes into contact with their bodily fluids. Unlike her husband, Fatima believes that handling and consuming these animals puts her at risk for contracting Ebola. However, she continues to do so because wild meat is often the only source of protein in her home, and hunting wild meat is the primary source of income for her family. Fatima is very willing to use gloves and protective clothing when handling wild meat but is concerned about the availability and, most importantly, the affordability of protective equipment.

Traditional chiefs are mostly elderly men, 60 years of age (ranging from a low of 38 and a high of 80). Most of them (3/4) are also farmers. Some of them are new to their position (8 months), but others have been chief for many years (37 years). The average chief has held his position for 14 years. Traditional chiefs are the primary influencers in terms of decision making and creating and enforcing local bylaws. They believe that handling and eating rats is a possible source of disease, and that community sanitation is important to reduce rodent populations. They mentioned preventive measures including policies and bylaws that communities should observe like community clean up days, avoiding rat consumption, household hygiene, and reporting people suspected of having a disease to the chief. Their main source of information is CHWs and radio. They collaborate closely with other types of village leaders including Quarter Heads, Women's Group leaders, Youth leaders, Head men, Paramount Chiefs, Section chiefs, family heads, the town crier, the Council of Elders, Sub chiefs, Chairladies, and nurses. They are well connected and have deep ties within the community they serve.

Traditional Chief (Saidu)

As an elder and traditional chief, Saidu has a major influence over decision making and bylaw enforcement within his community. When he was young, he probably hunted and ate rats. Now he knows that handing and consuming rats puts his community at risk of contracting disease. He has heard about Lassa cases in other places, but he has never had a case in his community. For Saidu, the best preventative measures to reduce the risk of Ebola are policies and bylaws that his community should observe, including avoiding rat consumption, practicing good household and personal hygiene, and community sanitation. He acknowledges that rodents cause significant crop losses, in addition to carrying disease.

Community Health Workers: Many (75%) rural CHWs are male, with a mix of old (50 years of age) and young (27 years of age) CHWs. The average CHW is around 37 years of age. Two out of eight CHWs had encountered or heard of a Lassa case in the past, and they are all aware of the causes and consequences of Lassa Fever. They know they should separate and refer all potential cases to Kenema, and that they should use PPE when interacting with suspect cases (high fever, red eyes, etc.). CHWs believe there are not many good messages to share to the community, and few recorded cases. The distance to town makes it hard to report and respond to potential cases, and they don't have medicine to treat Lassa. Because so few people in their community have experienced Lassa, it is hard to get people to take it seriously. People are too busy with farm work and don't have time for meetings and messages.

Community Health Worker (Alusine)

Alusine is a community health worker who has spent many years treating people in his village for a wide variety of ailments. He believes that eating rats, contaminated food and drinking infected water are Lassa transmission routes. Alusine has been trained in Lassa identification and referral, even though he has never seen a Lassa patient. He is aware of a pregnant woman who got Lassa and became deaf. He believes rats cause Lassa when they enter the home and feed on food stored there. He believes good sanitation and hygiene are key to Lassa prevention.

RECOMMENDATIONS AND CONCLUSIONS

Despite some inconsistencies and irregularities related to Lassa symptoms, male and female respondents in the high risk interface had sufficient knowledge regarding Lassa Fever hosts, symptoms, and modes of transmission. Consumption of rats among male participants, food storage and grain storage practices (managed by women), and solid waste management (managed by local leaders) were mentioned as key Lassa spillover risks. The study revealed many risk factors (Table 2) and practices that represent pathways for zoonotic transmission, and provided insights into the social norms and behaviors that contribute to these risks.

The STOP Spillover team will use these Lassa risk factors and transmission pathways, promote sustainable and effective solutions to reduce Lassa spillover risks (for example through improved grain storage options and community clean up days and sanitation bylaws) and leverage community level personas to tailor SBC approaches and messages to achieve the most impact. Findings from this report (Activity 2.3.1.1) combined with findings from the formative research report related to environmental variables that influence rodent abundance (Activity 1.2.6.1) will be used to design Lassa risk reduction interventions (Activity 2.2.2.1) at the community level that strengthen community capacity to address future zoonotic spillover risks. Moreover, the focus on agriculture, livelihoods and the environment will give additional OH actors such as MECC and MOFS the opportunity to participate in and contribute to OH efforts at the community level. It is only by understanding who people are, the roles they play, and what they care about, that effective SBC strategies can be developed and implemented. Data from this study contributes directly to that process.

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