



## Activity 1.2.6.2: Wild Meat Value Chain Study

### STOP Spillover Sierra Leone

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## LIST OF ABBREVIATIONS

CDC	U.S. Centers for Disease Control and Prevention
CHW	community health worker
FGD	focus group discussion
IED	information, education, and communication
IPC	infection prevention and control
KII	key informant interview
GRNP	Gola Rainforest National Park
DHMT	District Health Management Team
OHDReaM Working Group	One Health Design Research and Mentorship Working Group
OM	outcome mapping
PPE	personal protective equipment
SBC	social and behavior change
STOP Spillover	Strategies to Prevent Spillover
USAID	United State Agency for International Development
WASH	water, sanitation, and hygiene

## EXECUTIVE SUMMARY

To design effective approaches to mitigate transmission risk from wild meat consumption and trade, the team from the Strategies to Prevent Spillover (STOP Spillover) project, funded by the United States Agency for International Development (USAID), collected qualitative data to describe the local wild meat trade and value chain. This rapid research effort identified the types of species traded or consumed and the frequency of exposure to potential hazards (contact with animal species known or suspected to be Ebola virus hosts) along the wild meat value chain. The STOP Spillover team used focus group discussions (FGDs), key informant interviews (KIIs) and direct observation to identify the critical control points along the wild meat value chain, social drivers and determinants of wildlife hunting and consumption, and specific behaviors by value chain actors which may be associated with an increased risk of zoonotic spillover.

The study was conducted in four chiefdoms around Gola Rainforest National Park (GRNP) in Kenema district in Sierra Leone. Two forest-edge communities were selected in each chiefdom where active wild meat hunting, trade, and consumption occur. The main wild meat market in Kenema district was also included in the study.

Research findings revealed that wild meat trade and wild meat consumption are widely practiced in Kenema district within a complex value chain structure that varies between rural and urban communities. Key actors in the wild meat trade include hunters, transporters, traders, processors, chop-bar operators, retailers, and consumers. The hunting and processing nodes along the value chain were identified as the two highest risk contact points due to the frequency and nature of human contact with animal fluids including blood, feces, and urine. Hunters and wild meat transporters are mostly young men, while wild meat retail traders and processors (both at the community level and in the wild meat market) are predominantly women. The gendered roles and norms related to wild meat hunting and processing impact intervention design and target audiences.

Reports from the U.S. Centers for Disease Control and Prevention (CDC) indicate that contact with various animal bodily fluids (e.g., feces, urine, blood, saliva, and intestinal components) can lead to zoonotic spillover because these fluids can contain a high viral load if an animal is infected. Therefore, actors along the wild meat value chain, from hunting through processing and sale of wild meat, who come in contact with these fluids are at a high risk of zoonotic spillover. This risk increases with frequency of contact or duration of exposure. Actors with the greatest risk of exposure are hunters, traders and processors because they handle live animals and butcher and handle raw meat. The majority of respondents stated that they do not use any protection while working with wild meat. Given this limited use of personal protective equipment (PPE), risk of spillover is considered high. Reasons for the limited use of PPE include low perceived disease transmission risk, lack of disease knowledge and awareness, traditional

customs and practices, and economic factors. There are no biosafety practices promoted or enforced in local markets that facilitate PPE use.

Research indicated that hunting and availability of wild meat varies between seasons. More animals are hunted in the rainy season (May-October) than during the dry season (November-April). Wildlife is easier to access during the rainy season when they are more active along the forest periphery. Animals migrate deeper into the forest during the dry season, making hunting more difficult. The scarcity of animals in the dry season also means that prices are higher. It may be more economical to adopt improved biosafety practices in the dry season when margins are higher; however, PPE surveillance and use needs to be strengthened in the rainy season when human-animal contact increases.

Hunters and key informants confirmed that there are fewer wild animals now than before as a result of deforestation and increased human and hunting activity, population, demand, forest patrol surveillance, and hunting restrictions. This could mean that human contact with wild animals is less frequent than before, but it could also drive hunters deeper into the forest to find wild animals to hunt. There is no indication that people are spending more time hunting now than in the past, but all hunters said they are less successful hunting now than in the past, and that more people are hunting now than before, due to the commercialization of wild meat sales in towns and cities.

The types of species that are hunted, consumed, and traded along the value chain are diverse and include deer, duikers, primates, rodents, grasscutters (cane rats), rabbits, porcupine, snakes, groundhog, buffalo, bats, and squirrels. Some species are not consumed due to cultural or religious traditions, or are used mostly for medicinal purposes. For example, deer horn is used to protect children from evil spirits, porcupine intestines are used to cure stomach aches, and the Islamic faith prohibits the consumption of primates and bush pigs. These social norms impact interventions designed to improve biosafety throughout the wild meat value chain. STOP Spillover will focus interventions on hunting, transporting or processing known or suspected Ebola virus reservoirs. However, a more holistic approach may be more effective to promote the adoption of risk reduction behaviors across the wild meat value chain.

The most important drivers of wild meat hunting and trade are cultural and influenced by socio-economic factors. Wild meat is an important source of protein in all communities surveyed. Wild meat is also used for medicinal purposes and during initiation processes into the Poro and Bondo secret societies. Wild meat hunting has shifted over the years from subsistence hunting for food and gifts, to hunting for profit. Hunting is a major source of income in hunting households. Hunting revenue is used for various household needs including school fees. It is important to recognize these cultural and economic factors when designing interventions to reduce spillover risk. For example, the availability and affordability of alternative protein sources and alternative income

generating activities will be needed to reduce wild meat consumption. Interventions that reduce spillover risks and human-wild meat exposure will need to consider traditional ceremonies and secret societies as well as medicinal uses of wild meat products, and the influence of associated social norms.

Findings from this research reveal zoonotic spillover risks along the wild meat value chain and provide insights into the types of interventions that might succeed in reducing Ebola virus zoonotic spillover risk. Possible interventions include improving infection prevention and monitoring measures at critical control points such as markets and trade zones, improving hygiene and sanitation and food safety measures in wild meat markets, and strengthening health promotion through increased understanding of risks from wild meat contact. Engaging local leaders and traditional societies will be critical to the design, promotion, and implementation of interventions to reduce zoonotic spillover risks.



# 1. INTRODUCTION

## 1.1 BACKGROUND

Wild meat hunting for household consumption and income is a widely practiced socio-economic activity in Sierra Leone (7, 17, 18, 19). Porcupines, squirrels, groundhogs, rabbits, grasscutters (cane rats), deer, bush pigs, monkeys, duikers, and chimpanzees are frequently hunted, traded, processed and consumed along the value chain. Wild meat consumption and trade are associated with the spillover of zoonotic pathogens such as Ebola from animals to humans (8-11, 23). Studies have shown that the trade and consumption of wild meat continues in Sierra Leone and other West African countries, despite the 2014 – 2016 Ebola outbreak in the region (17). A study conducted during an Ebola outbreak in the Southeastern region of Nigeria showed that local wild meat trade and consumption patterns were unaffected by the outbreak (17). Another study showed that decreases in wild meat consumption observed during the active phase of the Ebola outbreak in Liberia were largely among affluent households rather than the rural poor (25). These findings are consistent with a BBC News report that showed people in rural areas of Sierra Leone engaged in wild animal hunting, trade, and consumption during the Ebola outbreak despite a ban on the wild meat trade imposed by the central government (19). This is in part a result of peoples' limited perceived risk from the wild meat trade (25).

The wild meat value chain includes various actors such as farmer-hunters, commercial hunters, wholesalers, market traders, and chop bar operators. Farmer-hunters live and work in rural areas, and they capture wild animals using traps, dogs, nets, and guns. Commercial hunters depend entirely on wild meat for their livelihoods, whereas farmer-hunters sell wild meat to supplement their income (7). The types of species consumed or traded along the value chain are diverse and include primates, rodents, ungulates, and reptiles.

The wild meat value chain is complex, which is reflected in the diversity of actors, wildlife species, methods of capture, and cultures, as well as in socio-economic factors such as occupation and income. This complexity influences zoonotic spillover risk. For example, a study conducted in Sierra Leone on zoonotic disease risk and the wild meat trade reported that wild meat butchers are more likely than hunters to accidentally cut themselves with sharp tools and that women are at a higher risk of spillover when processing wild meat for consumption (8-11).

Limited information exists on patterns and types of wildlife-human contact in most communities that practice wild meat hunting behavior (20). As a result, more studies on the wild meat value chain, social drivers, and associated risk factors of zoonotic disease spillover are needed to fill this gap. This research is critical to identifying and

characterizing wildlife-human interactions along the wild meat value chain and to understanding which potentially high-risk behaviors are exhibited by specific actor groups along the value chain. These data will provide critical insights into the zoonotic spillover risk that these actors, as well as the general population, may be facing and will inform development of interventions to mitigate this risk.

### 1.2 AIM

The aim of the study was to understand the nature of the wild meat trade in the high-risk interface in Eastern Sierra Leone, identify the wildlife species traded or consumed, and identify and characterize the type and frequency of exposure to potential hazards (contact with animal species known or suspected to be Ebola hosts) along the wild meat value chain.

### 1.3 RESEARCH QUESTIONS

- How is the wild meat value chain structured and operated from the source to the final point of sale?
- Which species are hunted, consumed, and traded along the value chain, and are there changes in species frequency by season?
- What are the types (e.g., bites, bodily fluids, cooked meat) and frequency of contact that actors in the wild meat value chain have with wildlife?
- How do wild meat hunters and traders work, what tools are used, how do they package and transport products, and do they use PPE?
- Which drivers (socio-cultural beliefs, knowledge, and practices) are associated with contact (occurrence, frequency, type) with wildlife known or thought to be filovirus hosts?
- How have wild meat hunting, handling, and trading practices changed over time (historical analysis) and why?
- What is the role and importance of wild meat hunting in local livelihoods and food security, how might changes in wild meat hunting and handling practices be perceived and accepted, and how would these changes impact livelihoods and food security?

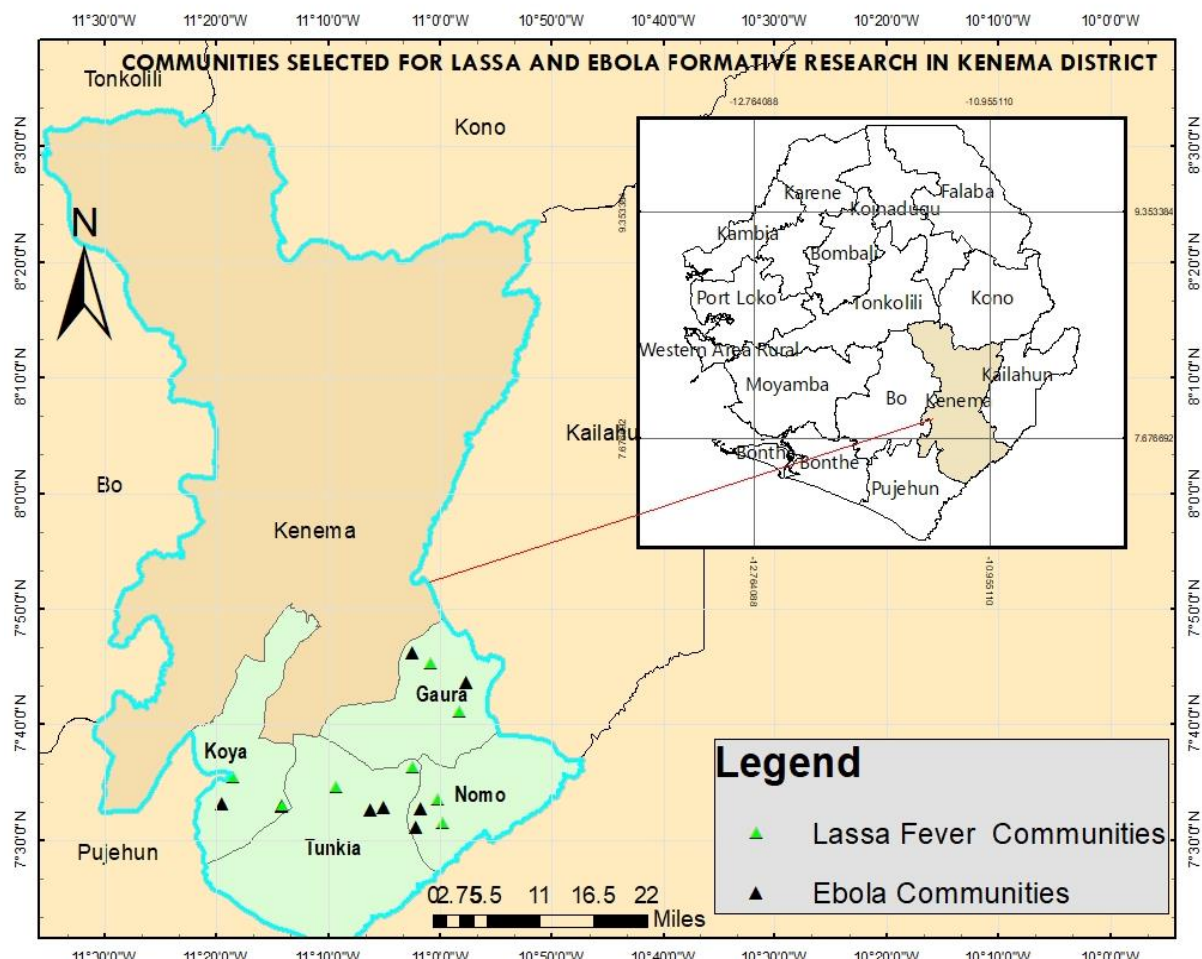
## 2. METHODOLOGY

### 2.1 RESEARCH DESIGN

STOP Spillover conducted an exploratory qualitative study using focus group discussions (FGDs), key informant interviews (KIIs), and direct observation to identify the main actors along the wild meat value chain, analyze their activities, identify social drivers and determinants of wildlife hunting and consumption, and assess specific behaviors which may be associated with an increased risk of zoonotic spillover.

### 2.2 STUDY SETTING

**Figure 1: Map of communities in the study area around the Gola forest**



The study was conducted in eight communities in four chiefdoms around Gola Rainforest National Park (GRNP) in Kenema district (Figure 1). Two forest-edge communities were selected in each chiefdom due to their active wild meat hunting,

trade, and consumption. The main wild meat market in Kenema district was also included since most of the wild meat sold there comes from communities around GRNP. The study included the following locations:

- Kenema City: Kingsway Corner Wild Meat Market
- Guara Chiefdom: Sandaru and Sembehun
- Nomo Chiefdom: Lorwoma and Baoma
- Tunkia Chiefdom: Kongonhun and Kwawuma
- Koya Chiefdom: Njaluahun and Mapuma

## 2.3 DATA COLLECTION

### 2.3.1 Data collection tools

STOP Spillover uses [One Health Research, Design, and Mentoring \(OHDReaM\) working groups](#) to bring together diverse stakeholders from multiple sectors to design and implement One Health activities in selected high-risk interfaces. OHDReaM working group members developed discussion guidelines for FGDs and KIIs (Annex 1). Specific guides were developed for each category of respondent (see 2.3.2) and included questions about the types of animals hunted, sold, and consumed; the methods of hunting; seasonal changes in animal availability; and the role of wild meat in the community. The guidelines were used to generate discussions about the structure and function of the wild meat value chain. Interviewers asked open-ended questions, allowing participants to explain in detail their activities along the wild meat value chain. Tools were developed in English and translated into Mende to ensure participants fully understood the questions and were able to adequately express themselves. Discussion guides were uploaded into KoboCollect on tablets to facilitate note taking. Sessions were recorded to facilitate data transcription.

### 2.3.2 Study respondents

Respondents were purposefully selected based on their activities along the wild meat value chain. In total, 59 interviews and discussions were conducted: 33 FGDs with 10 participants in each discussion across nine communities, and 26 KIIs in nine communities. The categories of FGDs and KII are listed below:

- 8 FGDs with hunters (all male, mostly youth)
- 8 FGDs with hunters' wives to explore food processing practices and consumption patterns
- 9 FGDs with traders and processors (including women in the Kenema wild meat market)
- 8 FGDs with wild meat consumers (both men and women)

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- 9 KIIs with transporters (including transporters in the Kenema wild meat market, who are predominantly male youth)
- 9 KIIs with traditional chiefs (eight men, including one chief in the Kenema wild meat market, and one women)
- 8 KIIs with traditional healers (predominantly men)

Table 1: Total number of study participants, by gender and type of tool

Type of Tool	Men	Women	Total number of people interviewed
FGD Hunters	64	-	64
FGD Hunters Wives	-	64	64
FGD Traders and Processors	-	65	65
FDG Wild meat Consumers	26	38	64
KII Transporters	9	-	9
KII Traditional Chiefs	8	1	9
KII Traditional Healers	9	-	9
TOTAL	122	162	284 (57% women)

### 2.3.3 Process

Before data collection occurred, the STOP Spillover team held community engagement meetings with male and female stakeholders in identified communities to request their participation in the study. The data collection team was led by the STOP Spillover Sierra Leone Wildlife, Livestock, and Epidemiology (WLE) specialist and assisted by the STOP Spillover Sierra Leone Surveillance, Mapping, and Modeling (SMM) specialist, five OHDRaM members (one supervisor, three male data collectors, and one female data collector), and the Kenema District Social Mobilization Coordinator from the District Health Medical Team (DHMT). Data was collected over a two-week period in February 2023, which included a four-day training of trainers for facilitators and note takers.

The study team held entrance meetings with community leaders to inform them of the purpose of the visit. In these meetings, community leaders assigned a knowledgeable local community member to be part of the study team to assist in mobilizing participants. Once KII and FGD participants were identified, the study team read and provided an informed consent letter before starting each interview. After giving their consent, participants were taken to a suitable convenient and private location for discussion. The

study team recorded each interview, and took notes in KoboCollect during the interview process. Data collectors took photos during direct observation exercises. Study participants were kept anonymous.

### **2.3.4 Data management**

Audio recordings were transcribed after data collection. Field notes were extracted from KoboCollect and used together with transcribed data for analyses. Data was shared via email and stored on STOP Spillover computers for analysis.

## **2.4 DATA ANALYSIS**

Participating OHDRaM working group members read through the notes on KoboCollect to familiarize themselves with and better understand the wild meat value chain. They also reviewed transcription notes to identify content not captured in KoboCollect. The study team used this information to answer specific research questions and identify emerging themes. Data clustering was conducted using themes by respondent categories. Key components were combined in a table and descriptive analyses used to identify findings.

## **2.5 LIMITATIONS**

The study team conducted direct observation in the wild meat market, the only location where wild meat activities occurred in the team's presence. The team did not observe any wild meat hunting or processing activities while in communities. All hunting and processing information is based on participant recall.

Data collected is qualitative and specific to forest communities around GRNP. It cannot be extrapolated to other parts of Sierra Leone or other potential interfaces. No assumptions should be made about the specific scale and scope of described practices. However, where participants describe practices as being common or rare, it can be safely assumed that the scale and scope of these practices are generally great (if common) or limited (if rare).

## **2.6 ETHICAL CONSIDERATIONS**

The study protocol conformed to the ethical guidelines of the Institutional Review Board (IRB) of Tufts University, who approved the study. Ethical approval was also granted by the Sierra Leone Ethics and Scientific Review Committee after a thorough review of the study protocol. All participants were taken through the informed consent process before the start of KIIs and FGDs, ensuring participant privacy and confidentiality.

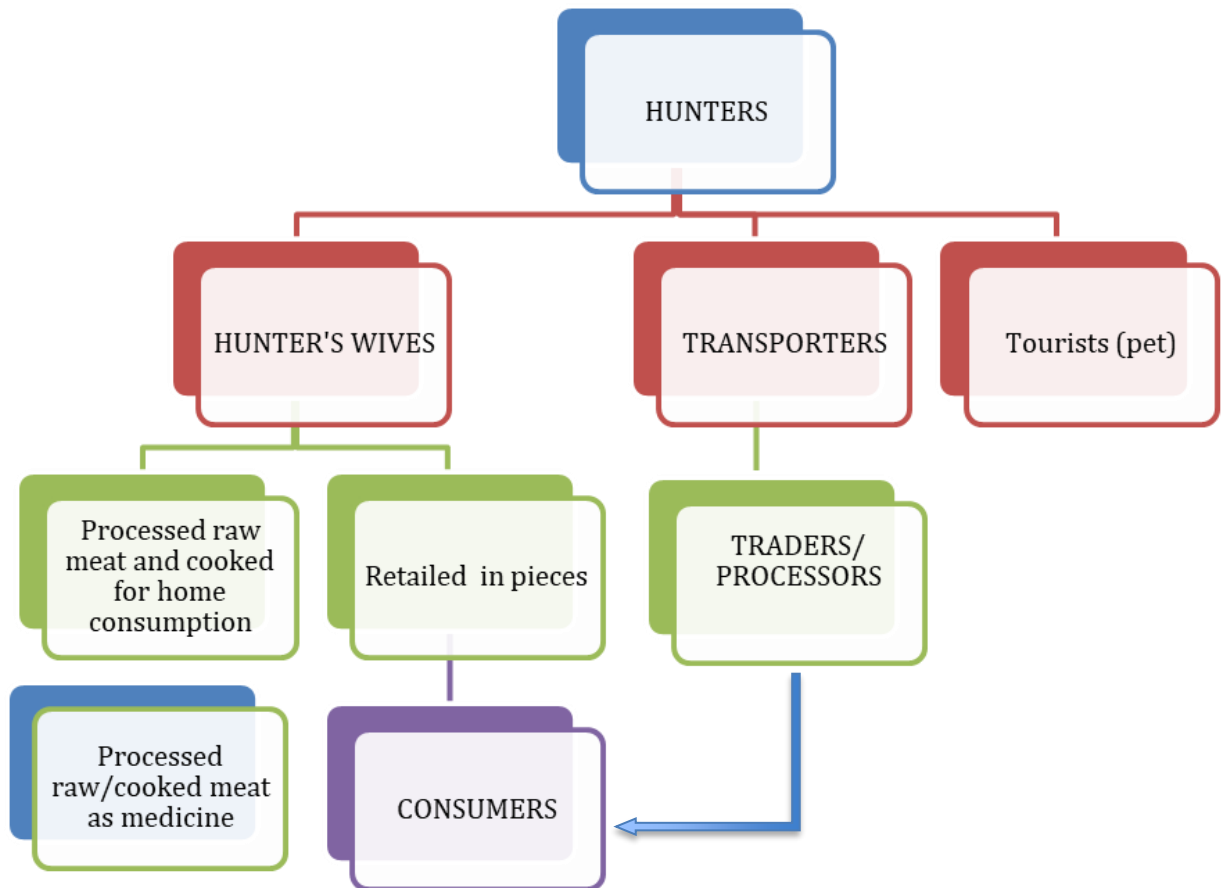
## 3. RESULTS

### 3.1 STRUCTURE OF WILD MEAT VALUE CHAIN

According to key informants and focus group participants, the wild meat value chain starts with hunters, who are mostly male youth, and ends with the consumer, who are both men and women. After animals are hunted and killed, they are either consumed as food at home, where they are processed by women, or sold for income. Motorbike riders, predominantly male youth, are key actors transporting animals to be sold. From the point of sale from hunters, animals are either transported by motorbike riders to a larger urban market in Kenema for sale, or are sometimes sold to local middlemen traders. Local traders sell animals in pieces. Local vendors, who are predominantly women, cook the meat in sauce and sell it for immediate consumption. Animals destined for home consumption are often divided into two portions: a part which is kept for household consumption and another part which is traded or sold locally. Women usually conduct local trading and selling.

The processing of wild meat varies by species and between urban and rural village areas. In the villages, processors buy animals directly from hunters and process (butcher) them for sale. For village sales, hair is removed from the animal skin either by roasting or use of hot water. The skin is also steamed and cooked for consumption. Meat destined for urban markets, such as Kenema, is packaged in plastic bags, rice bags, or jerry cans to hide it from police officers and forest guards. While most animals bought and sold are usually killed during the hunting process and sold by transporters, hunters and retailers sometimes sell living young animals, such as monkeys and chimpanzees, directly to tourists and affluent households to keep as pets. Figure 2 outlines the structure of the wild meat value chain in forest communities around GRNP in Kenema District, Sierra Leone.

Figure 2: Wild meat value chain structure in forest communities around GRNP, Kenema District, Sierra Leone



### 3.1.1 Drivers of wild meat hunting and consumption

Wild meat hunting is a common practice among communities living around the Gola Rainforest despite wildlife conservation regulations which apply to species protected by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). The main drivers of wild meat hunting among participants include the use of wild meat for food, traditional ceremonies and practices, medicine, employment/livelihood, and income generation. Hunters rely on the wild meat trade as their primary source of revenue and use it to pay for school fees and other household expenses. Many hunters mentioned that they give hunted meat as a gift to relatives and strangers as a gesture of goodwill. In the majority of communities, wild meat hunting and consumption is heightened during male Poro and female Bondo secret society initiation events, which highly value wild meat. Some respondents mentioned that they use wild meat during annual sacrifices/rituals to their ancestors and for other religious activities. One of the participating hunters emphasized that poverty is a key driver for wild meat hunting and trade, given that it is readily available and inexpensive: “*Poverty*



*is one of the reasons for doing wild meat trade. I was born during the war and I was unfortunate not to be educated. Therefore, wild meat hunting is the only trade I know.”*

Some of the beliefs that respondents reported as drivers of wild meat consumption included 1) eating wild meat makes them and their children smarter, 2) wild meat is more palatable than other meat, 3) wild meat has numerous health benefits and prevents sickness, and 4) it has been eaten by their forefathers for generations. These cultural beliefs need to be specifically recognized and addressed in the design of successful interventions to reduce potential Ebola spillover risks.

### **3.1.2 Role of wild meat**

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#### **3.1.2.1 WILD MEAT AS FOOD**

Wild meat plays a major role in the diet of all community members, and, for the majority, it is their main source of protein. It has been consumed for generations, and respondents stated that wild meat parts, especially the liver, brain and flesh, are good for the growth and health of children. There are also additional social benefits. A hunter's wife said, *“I feel happy when I cook and eat wild meat, it makes my skin glow, and my neighbors get jealous.”* Wild meat consumption increases during the rainy season when the supply is at its peak due to the abundant availability of wildlife. Wild meat consumption is perceived as a sign of good living.

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#### **3.1.2.2 CULTURAL AND TRADITIONAL USE**

Wild meat is very important in the cultural and traditional practices among respondents. Respondents use it as gifts to relatives, to receive blessings, and to welcome strangers. The skin of deer and duiker is used as leather to make shoes and local traditional drums. Some respondents mentioned using wild meat as a sacrifice/ritual to their ancestors.

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#### **3.1.2.3 MEDICINAL USES**

Parts of certain wildlife species play a significant role in traditional medicine and home remedies. For example, deer and duiker horn is used to protect children from evil spirits, and the duiker fur is used to cure sores. Porcupine parts are used for various medicinal purposes: the intestine is used for stomach aches, and the gallbladder is used to cure stomach pain and malaria and to kill worms. Male porcupine parts were highlighted as providing sexual benefits. Most respondents mentioned that they cook porcupine intestines as soup, while one hunter dried it in the sun and used it to chew on. Chimpanzee bones are tied to a string and hung on children's necks or waists because some respondents believe that, since chimpanzees are strong animals, their bones will help make children stronger. Buffalo blood is used as a medicine for deafness, and liver

is cooked and used as medicine for children’s teeth. The scales of certain animals are used to prevent infections from contaminated food.

All traditional healers interviewed, all of whom were male and mostly young, reported that they primarily use plant materials in their traditional medicine practices. In cases where animals are required, domesticated animals such as goats, sheep, and chickens are typically used. Traditional healers perform ceremonies, but animals are killed and processed by the patient or client seeking medication. One traditional healer reported using elephant fat acquired from Liberia.

### 3.1.3 Livelihood practices/alternative livelihoods

Wild meat is a primary source of income generation for hunters and traders/processors. Most family or household economic needs, such as school fees, books, and other expenditures, are covered by money acquired from wild meat sales. Other sources of income include farming (e.g., grains, fruits, roots, and vegetables), palm oil processing, selling wood, and fishing.

#### 3.1.3.1 EFFECT OF EBOLA OUTBREAK ON WILD MEAT HUNTING AND TRADING AS A LIVELIHOOD

Hunting and trading of wild meat was banned during the 2014 – 2016 Ebola outbreak. During STOP Spillover [outcome mapping](#) (OM) workshops, participants reported that massive sensitization occurred and local by-laws were enacted against wild meat consumption during the Ebola outbreak. These by-laws and sensitization efforts caused consumers to be afraid of eating wild meat, decreasing the demand for it. Although community leaders created bylaws against wild meat hunting and consumption, hunters and traders continued to sell wild meat clandestinely. Some respondents reported that their animals were thrown into the river when they were caught by police, and they had to shift to other sources of income. Once the Ebola epidemic ended, by-laws and education efforts also ended.

## 3.2 TYPES OF ANIMALS HUNTED AND CONSUMED

Table 2: Animal Species\* Hunted and Consumed

Commonly hunted animals	Less commonly hunted animals	Forbidden animals	
		Religion (Muslim)	Culture or Family
Deer	Monkey	Monkey	Lizard
Duiker	Chimpanzee	Chimpanzee	

Commonly hunted animals	Less commonly hunted animals	Forbidden animals	
		Religion (Muslim)	Culture or Family
Bushbuck	Snake	Bush pig	
Grasscutter	Snail		
Porcupine	Lizard		
Squirrel	Buffalo		
Groundhog	Mongoose		
Hedgehog	Bats		
Bush pig			
Rabbit			

*\*These are English translations of the animal names provided by respondents in Mende. They are not listed in order of frequency or preference, as responses varied by community.*

*Note: Based on information from respondents, everyone (all types of family members) consumes wild meat.*

Wild meat is consumed frequently by both men and women depending on its availability. During special occasions such as Christmas or secret society initiation events, wild meat consumption is common. Wildlife consumption can be prohibited by religion, family taboo, allergic reactions, and conservation policies. For example, Islam forbids the consumption of monkeys, chimpanzees, and bushpigs. Lizard consumption is taboo for some families because it reportedly causes allergic reactions. Buffalo is an endangered species in the Gola forest so there is a policy against hunting it. If a buffalo is destroying crops, farmers must involve forest guards and other government officials to deal with the problem.

### ***3.2.1 Seasonal differences in the availability of animals***

Wild meat availability varies by season. During the rainy season, which starts in May and ends in October, it rains most days and farmers plant crops. Farmers harvest their crops early in the dry season, which starts in November and ends in April. According to

respondents, animals are more abundant during the rainy season because food and water are readily available close to communities. In the dry season, animals are more difficult to hunt because they forage deeper in the forest, and dry leaves make it difficult for people to walk without creating noise that scares wildlife. The most commonly hunted animals in the dry season are those that come to nearby rivers and streams in search of water. Wild meat prices are higher during the dry season since availability is limited.

Hunters were asked which animals are hunted, consumed and traded by season. Their responses are presented in Table 3. They are not listed in any particular order, as responses varied by community.

*Table 3: Animals hunted in different seasons*

Dry season	Rainy season	Animals hunted in both seasons
Bushpig	Bushpig	Bushpig
Deer	Deer	Deer
Monkey	Duiker	
Porcupine	Porcupine	Porcupine
Squirrel	Grasscutter	
	Groundhog	
	Snake	

### ***3.2.2 Preferred animal parts for food***

All wild animal parts are eaten by all family members; however, there are individual preferences for specific parts of each animal, depending on the species. Men eat the most wild meat, including the animal head because men are considered the head of the family. Liver is mixed with rice and given to children because women believe it promotes growth. In most households, the head, liver, and intestine are consumed at home and the rest of the animal is sold. In the Kenema market, intestines are given to younger

girls to cook into soup and sell. Focus Group Participants were asked which parts of wild animals they prefer and why. Their responses are summarized in Table 4.

*Table 4: Preferred animal parts by species*

Animal	Preferred parts for household consumption
Deer	Liver, head, stomach, leg
Grasscutter	Head, leg
Porcupine	Liver, leg
Squirrel	Brain, heart, head

### 3.3 METHODS OF HUNTING

Respondents reported that only men hunt, and hunters are generally young men. Respondents specified four main hunting methods: guns, traps, nets, and dogs. Someone hunting with a gun often does so alone and at night when animals are asleep and easier to stalk; the targets are mostly bigger animals like deer. Gun hunters are called “Kamajor,” but this practice is now uncommon because of firearm restrictions around the Gola Forest. Trapping is also an individual activity primarily done by male farmers who set traps around their farms to protect their crops from animals. In the dry season, they set traps in the riverine forest where most animals go for drinking water. Men, predominantly youth, set traps for two-to-three nights in one location and conduct regular checks. Hunting with nets or dogs occurs in groups of three or four males, predominantly youth. Hunters and dogs drive animals towards nets pitched in the forest or bush, where the animals are trapped, captured, and killed.

#### 3.3.1 Trends in wild meat hunting

Since 2010, there has been a decrease in wildlife available to hunt in communities surrounding the Gola Forest due to 1) an increase in human activity such as farming and deforestation, which has destroyed or altered wildlife habitats and forced animals to move deeper into the Gola Forest where hunting is not allowed; 2) the declaration making Gola Forest a national park and the institution of laws prohibiting wild meat

hunting in the park; 3) an increase in the demand for wild meat compared to ten or more years ago because of the shift in hunting purposes (from subsistence to more commercial uses); and 4) an increase in wild meat hunters and traders because of the profitability of hunting. Notably, hunting has shifted from an activity dominated by elderly men to one dominated by male youth.

### 3.4 HANDLING DEAD ANIMALS

Although most wild meat consumed in these communities is hunted, dead animals are seen as a gift from God and most communities will eat them. One community stated that animals found dead are forbidden (haram), especially for Muslim households, and they are not even allowed to touch them. This community gives animals that are found dead to their dogs, which is also a high-risk practice.

#### 3.4.1 *Hunting and processing tools*

Respondents reported using several tools along the wild meat value chain. For hunting, they use sticks, cutlasses, swords, guns, nets, knives, slingshots, nylon line, wire, pickaxes, rubber buckets, flashlights, dogs, black magic, and traditional herbs. During wild meat processing, conducted mostly by women, the most common tools included a clean sack on which to lay the animal for butchering, knives, cutlasses, bowls, and trays. Some people use banana leaves on the ground to cut the meat and cover the meat to protect it from flies. Processors and traders in the Kenema market are mostly women, and they lay cartons out on tables for butchering. When selling meat, which is conducted by women, meat is put on trays and covered with banana leaves. Most of the traders clearly stated that meat from different animals is kept separate because consumption of some animals is prohibited for certain people.

#### 3.4.2 *Transportation*

Respondents stated that generally, once a hunter decides to sell wild meat, they give the wild meat to transporters who convey it to traders at the Kenema market. Transportation is usually provided by young men on motorbikes, rarely using other types of vehicle. It often occurs during the early morning hours, but sometimes occurs late at night.

#### 3.4.3 *Packaging*

Most hunters stated that to evade police and Gola Rainforest guards, wild meat is generally disguised for transportation using rice or plastic bags placed in other bags or by hiding the wild meat in jerry cans and mixing it with other food items. When sold in the village, most respondents stated that wild meat is cut into pieces by women, placed on a tray, covered with banana leaves, and carried around for sale.

### **3.4.4 Waste management**

All respondents across all communities, including the Kenema market, reported that all parts of the animals are used except for the feces and fur. Meat is washed with water, and most respondents said that they throw the waste in their backyard. Some said that they dump waste into the latrine or the bush. In Kenema Market, people said they either dump waste in a drainage area that leads to a nearby stream or directly into the stream.

Some respondents reported using bile for medicinal purposes. Others believe bile makes dogs strong for hunting and so give it to them. A few respondents reported discarding bile.

## **3.5 EXPOSURE RISKS**

Hunters, traders, processors, and transporters confirmed that they come into physical contact with wild meat urine, feces, and blood. Some hunters reported getting bitten during hunting. Processors said that blood splashes on them when butchering. Respondents were unsure of the exact frequency of contact but said it ranged from every day, to once or twice a week, to twice a month depending on the season. According to hunters, clothes contaminated by spilled fluids are worn for less than an hour to up to seven hours, depending on the distance from the place of hunting to the place of sale or home. Processors reported washing fluids and feces off and changing their clothes once they finish processing.

### **3.5.1 Use of protection**

Most respondents believed that there was no risk to handling wild meat, and therefore they do not use any protection while working with it.

*“My only thought when transporting meat is for me to arrive and get paid and wash my hands. There are no health issues associated with transporting these animals.”* —Transporter

However, some processors said that they have dedicated clothes for the kitchen that they use for protection against animal blood and waste, and that they changed out of these clothes after butchering wild meat. Most reported washing their hands with soap and water after working with wild meat. Very few people reported using gloves when processing wild meat.

### **3.5.2 Managing injuries while processing wild meat**

Processors and hunters reported that when they accidentally cut themselves with knives when processing wild meat or if they are bitten by animals, they use salt, lime, or herbs as remedies to stop the bleeding. A few reported going to a hospital for severe injuries.

## 4. DISCUSSION

The purpose of this study was to understand the nature of the wild meat trade in the high-risk interface in Eastern Sierra Leone, in order to characterize the type and frequency of exposure to potential hazards (contact with animal species known or suspected to be Ebola hosts) along the wild meat value chain. Understanding how the wild meat value chain is structured, and what social, cultural and political drivers influence the wild meat value chain will help stakeholders identify community members who are at the greatest risk of zoonotic spillover, and to co-design interventions with them to reduce those risk factors.

Study findings confirmed that wild meat forms the main source of protein for communities living around the Gola Rainforest National Park. This is due to the limited availability of fish, chicken, and other animal protein sources, as well as culture and traditional practices and values. Wild meat also forms the main source of income for many community members, including hunters and hunters' wives, wild meat transporters and local retailers. It will be difficult to stop wild meat hunting if alternative sources of protein and income are not available at the community level, and if urban demand continues to grow. Possible alternative sources of protein suggested at meetings with OHDReaM working group members included encouraging small scale fish production, and promoting small stock such as rabbits and chickens, and other animals that could serve as affordable sources of protein. While some wild meat currently hunted is CITES protected, many species currently hunted and consumed are not endangered or CITES protected. Moreover, some wild meat species currently hunted and consumed are potential reservoirs for zoonotic diseases, such as bats, duikers, pangolin and non-human primates, others are not currently known reservoirs.

Wild meat hunting is done using guns, trapping and group hunting by chasing animals with sticks and dogs, and trapping them in nets. Hunters do not use any protective measures to reduce zoonotic spillover risks. Moreover, most hunters believe that Ebola does not come from wild animals, so hunters do not think they need any protection when handling wild animals. Hunters need to be supported through targeted behavior change interventions and risk reduction interventions so that they are incentivized and motivated to use appropriate biosafety materials to protect themselves while hunting and handling wild animals. The lack of perceived risk is the main factor limiting the use of protective gear while hunting.

People in communities around Gola Rainforest National Park come into contact with wild animals frequently – sometimes daily, sometimes weekly or monthly. They come into contact with blood, feces, urine and saliva. Contacts last one to four hours, depending on the season and animal. Communication efforts should focus on the



people who have the most contact with wild animals (male hunters and female processors), and occur during the time of year when contact is more frequent (generally during the rainy season, from May – November).

The riskiest part of the wild meat value chain is wild meat processing by hunters' wives or processors at the market, who are mainly women. Wild meat processing involves burning hair from the meat using fire, washing the meat in water, removing internal organs, and cutting the meat into smaller pieces for cooking or selling. The study confirmed that housewives and meat processors at the market perform these tasks with their bare hands using regular cloths. Butchering tables and tools are not disinfected after processing, placing traders and consumers at risk. To reduce potential spillover risks for hunters' wives, meat processors and consumers, there is a need to use effective biosafety materials. Unlike hunters, meat processors are aware of the need to use protective gear and they perceive potential risks in their work. However, they worry about the affordability and availability of appropriate protective gear. Testing different gear to explore their cost and benefits in reducing exposure to wild meat contaminants could help wild meat processors make appropriate decisions about which gear to use.

Testing biosafety equipment should be coupled with targeted behavior change communication efforts focused on handwashing and hygiene during meat processing. The SBC study (Activity 2.3.1.2) showed the importance of involving local leaders, traditional societies and community health workers in efforts to promote risk reduction practices and behaviors.

Observations of meat processing practices at the wild meat market in Kenema confirmed that meats are usually placed on bare tables or in trays, without any covering. The sold meat is put into plastic bags for consumers. Most consumers touch wild meat with their bare hands and smell it before selecting the piece of meat they prefer. Consumers usually do not wash their hands after touching the meat. This practice places the consumer at risk of infection, that they may take to their homes and amplify. There is a need for interventions that target zoonotic disease spillover risks from consumers who touch meat with their bare hands. Interventions could include discouraging touching wild meat by consumers, promoting the use of forceps to pick up meat, and covering wild meat with transparent plastic. Meat pieces can be wrapped so that consumers do not touch the meat.

The study also revealed poor sanitary conditions in the market. There is no running water, poor garbage disposal practices, poor hygiene practices, no hand-washing station, tables are not covered to ease cleaning, no disinfection of tables and utensils used, and liquid waste is thrown indiscriminately into nearby streams. The poor sanitary state of the market coupled with poor hygiene practices by traders and poor waste disposal practices makes it a potential high-risk point for zoonotic spillover. To address

these issues, market actors should cover tables to facilitate disinfection, and tables should be cleaned regularly using disinfectant. Handwashing stations for traders and consumers need to be made available at the market. Regular garbage collection to remove wild meat waste from the market is needed. Storage pits to safely dispose of liquid waste generated from the market would improve hygiene and biosafety. To effect systemic change in local market practices, it is important to ensure effective multisectoral collaboration with various stakeholders including the water sector, Local Council administration, the wildlife unit of the Ministry of Agriculture, the Ministry of Health and Sanitation, and the trader's union. A systemic, multisectoral approach is required to improve the governance and management of the wild meat market, improve waste management systems and hygiene practices, and promote compliance with policies designed to protect producers and consumers. Market-based interventions should be integrated with well design SBC and communication interventions to promote and facilitate the adoption of these measures, and incentivize compliance.

Wild meat transportation is done mainly by young men using motorcycles, who often carry the meat together with other items, other animals and people, putting the rider and passengers at risk of spillover and amplification of zoonotic diseases. Motorcycle riders need to use gloves to prevent touching dead meat with their bare hands while packaging the meat. Transporters have multiple contacts with dead meat. Transporters should use sealed containers during transport to prevent spillage of animal liquid onto riders and passengers. Riders should also consider not carrying both wild meat and people at the same time.

The findings from the study are very useful for reducing potential spillover throughout the wild meat value chain. Biosafety and sanitation methods proposed should be coupled with targeted SBC to make interventions more systemic and sustainable.

## 5. RECOMMENDATIONS

During the data collection process and previous OM discussions, the STOP Spillover team and One Health Design Research and Mentorship Working Group (OHDReaM Working Group) members identified potential interventions and actions that could reduce Ebola spillover risks, including increased use of affordable, accessible, and practical PPE by high risk groups; increased knowledge sharing and community-level communication and community networking efforts targeted to specific high risk groups with tailored interventions and messages; and effective engagement with traditional leaders, religious leaders, and traditional healers in Ebola risk reduction efforts. The STOP Spillover team will discuss research findings with local communities and refine and co-design interventions in April 2023. Illustrative potential interventions based on OM discussions and these formative research findings are outlined below.

### POTENTIAL INTERVENTION I: IMPROVE WILD MEAT MARKET GOVERNANCE AND HYGIENE IN KENEMA

Kingsway Corner Market in Kenema city is the most popular wild meat market in the eastern region. However, it does not have the necessary infrastructure, hygiene and sanitation processes or governance systems to safely handle, process, and trade wild meat. For example, the market lacks clean butchering platforms, running water, and soak-ways or drainage to clean blood, urine, and feces after processing. There is no waste management system. Litter is present all around the market, and there are no water, sanitation, and hygiene (WASH) facilities.

To reduce wildlife-human zoonotic spillover risks, the STOP Spillover team should work with multiple local stakeholders to design and implement a comprehensive, integrated approach to reduce zoonotic spillover risks at this important regional market, which includes cross border ties to neighboring Liberia. STOP Spillover could (1) assist in the design of an improved wet market system, which includes easy-to-clean butchering or processing surfaces and dedicated butcher stations, a dedicated WASH facility, appropriate drainage, soak-way pits, and suitable waste management options; and (2) create separate areas specifically for the sale of wild meat in order to prevent cross-species contamination. Proposed measures align with stakeholders' desired outcomes identified during STOP Spillover OM workshops and could be implemented in collaboration with the wild meat sellers' association, the local city council, the DHMT, and the Ministry of Environment with support from external partners such as FAO.

## PROPOSED INTERVENTION II: PROMOTE PPE AND BIOSAFETY PRACTICES WITH HIGH RISK VALUE CHAIN ACTORS

Findings suggest that actors in the wild meat value chain are frequently exposed to animal bodily fluids that could be associated with a high risk of infection. Pretesting infection prevention and control (IPC) materials tailored to different groups of wild meat value chain actors to promote IPC measures would make measures more efficient in reducing contact with potentially infectious fluids and materials. Pretesting could be followed by a social behavior change assessment to determine whether actors adopted IPC practices and if not, why not (Activity 2.3.1.2). This should be conducted in parallel with community engagement events described in Proposed Intervention III.

## PROPOSED INTERVENTION III: PROMOTE THE ADOPTION OF EBOLA RISK REDUCTION BEHAVIORS

Although many people seemed generally aware of Ebola virus risks, few people felt that there was anything they could do to mitigate these risks, and some people did not feel that Ebola risks were necessarily linked to the wild meat value chain. Because hunting and wild meat consumption have been practiced for centuries before Ebola, not everyone feels that wild animals are a potential source of spillover. Traditional healers and traditional leaders, including religious leaders, seem well informed. Women also seemed to accept and agree that wild meat handling and processing represent a risk to themselves and their families. However, they also recognize many benefits from wild meat, including medicinal value for children and income used to pay for school fees. Wild meat is also important to many cultural ceremonies and is a major source of household protein.

Affordable, accessible, practical PPE and handwashing with soap could be additional tools women use to protect themselves and their family members. Regular community engagement to promote and facilitate knowledge sharing would benefit target communities. Information sessions should address practices such as consuming dead animals found in the environment, and leverage cultural and religious beliefs that prohibit such practices. Traditional healers, traditional leaders, and religious leaders can be mobilized to support these efforts. Efforts should focus on youth engagement (hunters and transporters) and address traditional societies who are important influencers of wild meat consumption practices. Moreover, efforts to improve the organization of the wild meat market in Kenema and to promote the adoption of PPE to reduce spillover risks require associated communication efforts to support adoption and behavior change. Communication efforts should be integrated into on-going health systems strengthening approaches and improved quality care practices, and should not be siloed or stand-alone.

## 6. CONCLUSIONS

The wild meat trade and wild meat consumption are widely practiced in the communities around the GRNP and are associated with a complex value chain that varies between rural and urban communities. Contact with animal feces and fluids (e.g., urine, blood, saliva, and intestinal contents) occurs throughout the value chain, from the point of hunting in rural areas to the processing and sale of wild meat in urban areas. The frequency and duration of contact with these fluids varies between actors and communities. Most study respondents stated that they do not use any protective gear while working with wild meat. There is no transportation or packaging of wild meat in local rural markets. However, transportation, primarily in the form of motorbikes, is used to deliver wild meat to urban markets.

Wild meat hunting, both subsistence and income, is driven by various social, cultural, and economic factors. Wild meat is a major source of protein, particularly in rural communities, and is believed to have medicinal value and cultural significance during traditional initiation processes. Because it is profitable, wild meat hunting and trade has shifted over the years from a focus on subsistence food and gifts to a commercial venture. Hunters and actors along the value chain use revenue from the wild meat trade for many household economic needs. Without alternate livelihoods, these communities will continue to be greatly impacted by changes in wild meat availability and demand due to climate change, deforestation, seasonality and policies. Supporting these communities to reduce real and perceived risks associated with the wild meat trade and helping them to identify less risky, legal (non-CITES protected) wild meat species and other animal source protein could substantially reduce zoonotic spillover risks.

# ANNEX 1: DATA COLLECTION TOOLS

## FOCUS GROUP DISCUSSIONS

(Hunters, Hunters' Wives, Wild Meat Traders and Processors and Wild Meat Consumers)

### Instruction for Facilitators and Note Takers:

Complete this form for each community selected for this research. Please meet with relevant community stakeholders and explain the purpose of your visit and get their permission before conducting the research. Please note that FGDs are iterative, and not all questions need to be asked and answered by each participant, or in each community. In some cases, responses from FGD participants will generate new questions, so not all FG discussions will be exactly alike.

**Introduction:** Hello! My name is .....I am working for STOP Spillover Sierra Leone, conducting a focus group on how to reduce risks from exposure to viruses in the wild meat value chain. In this regard, we would like to talk about your experiences and current work in wild meat, and any practices that may put you at risk of disease, and any safety practices and precautions you are taking to stay safe from viruses.

Welcome and thank for volunteering for taking part in this focus group discussion. You have been asked to participate as your point of view is important. I realize you are busy, and I appreciate your time. **REVIEW INFORMED CONSENT NOW**

### PART A

Name of Community:

Date of interview

Name of Facilitator

Name of Note Taker

GPS coordinates:

### PART B

#### General Information

1. Participants' age (average):.....Oldest: ..... Youngest: .....
2. Number of participants by gender:  Male.....  Female..... Other.....
3. Date.....
4. Start time.....End time.....

**Instructions:** Ask questions politely and engage participants in open and fun discussions. Allow participants to express their thoughts. Do not force them for answers. All answers are valid and should be reported. Do not express your own ideas or opinions. Please listen and seek to learn and understand each person's point of view.

### FGD for Hunters

#### Tell us about Wild meat hunting in this community

- Which wild meat animals are hunted, consumed, and traded in your community? List them all (including bats if applicable).
- Do you see changes in the frequency of animals hunted by season? (Ranking most common animals hunted each season)?
- Do you hunt every day, every week, every month, or more seasonally?
- How have wild meat hunting, handling and trading practices changed over time (from 2010 to date)? Why?
- How do you organize wild meat hunting in this community? Is it individual, in groups? How are groups organized? How do you decide where and when to hunt? Who goes hunting (men, youth, girls, boys, elders, traditional healers, etc.)?
- What tools are used for hunting in this community?
- How do you package and transport wild meat products for sale in the market?

#### Exposure risks

- And what is the frequency of your contact with wild animals? Is it every day, or every week, or once or twice per month, or less often? (This is KEY!)
- What are the types of contact you have with wild animals, including bats? (e.g., bites, exposure to bodily fluids, blood, feces, urine or any other animal tissue or fluid)? Is most of your contact with wild animals that are dead or alive?
- What is the intensity of your contact with wild animal fluids? Is it for more than 1 hour, or a few minutes, or a few seconds?
- What precautions or preventive measures do you take to reduce your exposure to wild animal bodily fluids? How do you protect yourself?
- What do you do when you see a sick or dead wild animal (including bats) in your environment?
- What precautions are taken during wild meat handling and processing?

- What happens when you cut yourself while hunting or butchering wild meat? What do you do?

### **Hunting as a Livelihood: Why are you interested in hunting wild meat?**

- How important is wild meat hunting to your overall income (relatively speaking)? Most important (> 75% of income), important (>50% of income), moderately important (25% - 50%), somewhat important (10 – 24%) or not very important (less than 10%)
- What alternative livelihoods do you have besides hunting?
- What other benefits do you associate with hunting besides income generation (cultural, traditional, religious, etc.)?
  - How important is wild meat hunting to your personal food supply? How often do you eat wild meat? (daily, weekly, monthly)?
- What are the other uses of wild meat besides eating?
- How did the Ebola outbreak affect your livelihoods, and how did it affect wild meat hunting practices in your community?

### **Ebola risk perceptions**

- What do you know about Ebola? What are its root causes? And how is the disease transmitted from one to another?
- In your opinion, what types of people are at risk of EVD? What are the high-risk groups or behaviors?
- What measures do you know to prevent Ebola or reduce Ebola risks? Which ones do you practice, and why? Are there practices you know would reduce your Ebola risk, but that you don't practice? Why not?
- What factors affect your attitudes towards Ebola and/or result in changing your Ebola risk reduction behavior? Whose opinions matter most to you with regards to Ebola risk reduction, and why?
- Are there any practices or approaches you would like to try to reduce your Ebola spillover risk? Which ones?

*This is the end of the interview. Thank you very much for your participation! Do you have any questions and comments for us?*



## Hunters' wives

### Wild meat consumption (15 – 20 minutes)

- What is the main source of protein consumed in your household? How often does your family eat animal-sourced protein? How often do they eat wild meat? (daily, weekly, monthly, seasonally, special events, etc.)
- Is the animal alive or dead when you acquire it? If alive, who slaughters the animal and how?
- Kindly explain step by step how you process and prepare wild meat for consumption in your household.
- Which other members of your household are involved in the processing and preparation of wild meat for consumption?
- Which parts of the animal do you prefer? Why? What about children, men, and the elderly?
- What are the other uses of wild meat besides eating?
- How do cultural norms or traditional beliefs influence wild meat handling and processing in this community?

### Exposure risks (15 – 20 minutes)

- What is the frequency of your contact with wild animals? Is it every day, or every week, or once or twice per month, or less often? (this is KEY!)
- What are the types of contact you have with wild animals, including bats? (e.g., bites, exposure to bodily fluids, blood, feces, urine or any other animal tissue or fluid)?
- What is the intensity of your contact with wild animal fluids? Is it for more than 1 hour, or a few minutes, or a few seconds?
- What precautions or preventive measures do you take to reduce your exposure to wild animal bodily fluids? How do you protect yourself?
- What precautions are taken during wild meat handling and processing? What happens when you cut yourself while hunting or butchering wild meat? What do you do?
- What do you do when you see a sick or dead wild animal (including bats) in your environment?
- What personal protective equipment and hygiene practices do you use before, during and after processing and cooking meat, and why? What kind of precautions do you take to reduce your exposure to wild animal fluids? How often do you use protective gear or take precautionary measures? During which tasks? Why?
- What tools do you use during processing? Do you use the same tools and precautions as your husband? If different, what were the types of protective equipment or materials you use vs. your husband, and why?

### **After processing wild meat, what do you do with the leftover products? (10 minutes)**

- Are there any parts of the animal that you don't use or throw away? If so, which parts? What do you do with them?
- Do you use water when butchering, processing or packaging wild meat? What do you do with that water after you are finished with it? Where does it go? How is it used afterwards?
- How do you clean or store any tools used in wild meat butchering, processing and packaging?

### **Ebola risk perceptions (10 minutes)**

- What do you know about Ebola? What are its root causes? And how is the disease transmitted from one to another?
- In your opinion, what types of people are at risk of EVD? What are the high-risk groups or behaviors?
- What measures do you know to prevent Ebola or reduce Ebola risks? Which ones do you practice, and why? Are there practices you know would reduce your Ebola risk, but that you don't practice? Why not?
- What factors affect your attitudes towards Ebola and/or result in changing your Ebola risk reduction behavior? Whose opinions matter most to you with regards to Ebola risk reduction, and why?
- Are there any practices or approaches you would like to try to reduce your Ebola spillover risk? Which ones?

*This is the end of the interview. Thank you very much for your participation! Do you have any questions and comments for us?*

## **Wild meat traders and processors (men and women)**

### **How is wild meat processed and traded? (15 minutes)**

- What kind of wild meat do you usually trade? Which animals bring the most revenue, or are in highest demand? Why? Are there seasonal differences in wild meat sales and trade?
- Do you sell animals alive or dead, whole, or cut up? If live, who slaughters the animal and how? What tools are used to cut wild meat, and who cuts it?
- How do you package and sell wild meat products?
- How do you manage your wild meat waste? What kinds of things are disposed of and how?

### **Wild meat and livelihoods (5 minutes)**

## STOP Spillover Wild meat Value Chain Analysis in Sierra Leone

- Can you please tell us which other alternative livelihood you have besides wild meat trading? List them.
- To what extent does wild meat trading contribute to your overall income (relatively speaking)? (high, medium, low)

### **Exposure risks (15 – 20 minutes)**

- What is the frequency of your contact with wild animals? Is it every day, or every week, or once or twice per month, or less often? (this is KEY!)
- What are the types of contact you have with wild animals, including bats? (e.g., bites, exposure to bodily fluids, blood, feces, urine or any other animal tissue or fluid)?
- What is the intensity of your contact with wild animal fluids? Is it for more than 1 hour, or a few minutes, or a few seconds? How many animals do you process in a week?
- What precautions do you adopt while handling and trading bush meat?
- Did you and your family members use any personal protection gear while processing meat? If yes, what types and for which tasks? If not, why not?
- What changes would you like to see to improve the safety of your livelihood and reduce risk of illnesses from animals to humans?

### **Cultural norms (15 – 20 minutes)**

- What cultural norms, beliefs or practices are associated with wild meat trading?
- Are there any norms/culture/tradition/religion practices that discourage or encourage (promote) bush meat trading? How are wild meat traders perceived in the community?
- Who are the major influencers who promote wild meat trading in your community?
- What are the cultural (religious, ethnic, traditional) practices that put you at risk for EVD infection?
- In your opinion, what social activities might put you at risk for EVD infection
- Does wild meat trading have other importance to your life besides income (cultural, traditional, religious, etc.)?

*This is the end of the interview. Thank you very much for your participation! Do you have any questions and comments for us?*

## Wild meat consumers

### Why do you prefer Wild meat to other forms of protein? (15 – 20 minutes)

- How often do you consume wild meat? (daily, weekly, monthly, seasonally or for special occasions)
- Do you have a preferred animal and/or a preferred part of the animal you most love to eat? Which one and why?
- Are there seasonal differences in your preferences? If so, why?
- Do you buy wild meat whole or cut up, alive or already dead?
- If you buy wild meat alive, who slaughters it and how?
- Are there cultural, social, traditional, or religious beliefs associated with the consumption of wild meat? If so, what are they?
- Do you come into contact with wild meat fluids, such as blood, saliva, urine or feces? If so, how often, and what do you do about it? Do you take any precautions or use any special tools to reduce your contact with these fluids?

### Waste Management (10 minutes)

- What do you do with the leftover wild meat waste or packaging from buying wild meat? What is leftover, and where does it go? Who takes it away?
- What do you do with any water used for processing and packaging wild meat? Where does it go?
- How do you manage the tools or materials used to butcher, process and consume or store wild meat?

### Cultural norms (15 – 20 minutes)

- What cultural norms, beliefs or practices are associated with wild meat consumption?
- Are there any norms/culture/tradition/religion practices that discourage or encourage (promote) bush meat consumption? How is wild meat consumption perceived in the community?
- Who are the major influencers who promote wild meat consumption in your community?
- What are the cultural (religious, ethnic, traditional) practices that put you at risk for EVD infection?
- In your opinion, what social activities might put you at risk for EVD infection?
- Does wild meat consumption have other importance to your life besides food (cultural, traditional, religious, etc.)?

*This is the end of the interview. Thank you very much for your participation! Do you have any questions and comments for us?*

## KEY INFORMANT INTERVIEW FOR TRADITIONAL HEALERS

### Instructions for Facilitators and Note Takers:

Complete this form for each key informant selected for this risk assessment exercise. Please meet with community leaders and key informants and explain the purpose of your visit, and get their permission before conducting the interview. Please note that KIIs are an iterative process, and not all questions need to be asked and answered by each participant. In some cases, the response from the Key Informant will generate its own questions, so that not all informational interviews are exactly alike.

**Introduction:** Welcome and thank for volunteering for taking part in this focus group discussion. You have been asked to participate as your point of view is important. I realize you are busy, and I appreciate your time.

Hello! My name is ..... I am working for STOP Spillover Sierra Leone, conducting research on how to reduce risks from exposure to viruses in the wild meat value chain. In this regard, we would like to talk about your experiences and work with wild meat as a traditional healer. **INFORMED CONSENT SPEECH HERE.**

### PART A

Name of Community:

Date of interview

Name of Facilitator

Name of Note Taker

GPS coordinates

### PART B

#### General Information

5. Participant's age:.....

6. Gender: .....  Male.....  Female..... Other.....

7. Date.....

8. Start time.....End time.....

**PART C**

***Tell me about your work as a traditional healer in this community. (25 minutes)***

***Please keep this question open; probing questions below are designed to help participants get started.***

1. How long have you been engaged in this work? How did you learn about traditional medicine? Is it your main income source, or are there others?
2. What types of diseases are you usually asked to cure? What are the most common diseases people come to you with?
3. Which animals do you use as medicine to heal people and why? Which part of the animal do you use as medicine and why? Where do you usually get these animals from, and how often?
4. What do you normally do when you process wild meat? How do you process it? Do you come into contact with animal blood, saliva and feces? Do you use any tools?
5. What do you do when you see a sick or dead animal in your home/environment? How do you dispose of animal waste and products?
6. How has the use of wild meat in traditional medicine changed over time in your community, and how has that affected your work?
7. What do you think can be done to reduce the risks traditional healers take when handling potentially disease infected animals?
8. What would be the benefits of these measures be to you, and to the community? Are you interested in trying out any new measures or practices to reduce your disease risks?

***Knowledge of infection source, transmission, and at-risk population for Ebola Virus Disease (EVD) (10 minutes)***

1. Have you noticed any health issues or illnesses among people in your community that may be associated with wild meat hunting, handling or consumption?
  - a. Probe: what were the health issues or illnesses?

2. What do you think about Ebola? What do you think causes Ebola?
3. In your opinion, who are the people that have the most exposure to Ebola risks, or who are most often infected and can transmit EVD and why?
4. Have you ever treated anyone in this community that was suspected of having EBOLA? If yes, what did you do? How did you treat them?
5. What do you do if you come across a strange sickness in your practice, or in your community?

**EVD cultural and social practices (10 minutes)**

1. How do community people interact with people who are thought to be infected with EVD? How do they interact with EVD survivors?
2. Are there any cultural practices that causes EVD infection? What motivates people to perpetuate cultural practices that lead to Ebola?
3. Who do you believe are the most influential people in your community that promote positive cultural practices that could reduce the spread of Ebola?
4. In your opinion, what are the social and cultural activities that place you at risk of EVD?

**Information, Education and Communication (10 minutes)**

1. Where do you hear about Ebola issues and outbreaks?
2. Where do you get trusted information about Ebola and other diseases?
3. What is your main source of information for traditional medicine?

## KEY INFORMANT INTERVIEW FOR WILD MEAT TRANSPORTERS

### Instructions for Facilitators and Note Takers:

Complete this form for each bush meat trader you interview. Please meet with community stakeholders and wild meat traders to explain the purpose of your visit and get their permission before conducting the interview. Please note that KIIs are an iterative process, and not all questions need to be asked and answered by each participant. In some cases, the response from the Key Informant will generate its own questions, so that not all informational interviews are exactly alike.

**Introduction:** Welcome and thank for volunteering for taking part in this interview. You have been asked to participate as your point of view is important. I realize you are busy, and I appreciate your time.

Hello! My name is .....I am working for STOP Spillover Sierra Leone, conducting research on how to reduce risks from potential exposure to viruses in the wild meat value chain. We would like to talk about your experiences and current work in the wild meat trade. INFORMED CONSENT SPEECH HERE.

### PART A

**Name of Community:**

**Date of interview**

**Name of Facilitator**

**Name of Note Taker:**

**GPS coordinates**

### PART B

#### General Information

1. Participant's age:.....
2. Gender: .....  Male.....  Female..... Other.....
3. Date.....
4. Start time.....End time.....



## PART C

**Tell me: How does wild meat transportation happen in your community? Who transports wild meat how, and how often? (30 minutes)**

(For example)

1. How often do you transport wild meat? (Number of times per day, week or month)
2. What type of transportation is used to move wild meat from hunter to market? (motorcycle, truck, car, taxi, etc.)
  - a. **Probe:** Is transportation used just for wild meat or mixed with other products?
3. What type of wild meat animals are frequently transported?
  - a. **Probe:** are wild meat animals sometimes transported along with human passengers?
  - b. **Probe:** are these wild meat animals mixed with other species like domestic animals?
  - c. **Probe:** are wild meat animals mixed with other food products?
  - d. **Probe:** where are these animals transported to and from?
4. How do you handle wild meat while transporting it? Do you come into direct contact with animal blood, saliva or feces? If so, what do you do about it?
5. What is your perception about the risks of transporting wild meat? Have there been any health issues or illnesses that may be associated with transporting wild meat?
  - a. **Probe:** If yes, what were the health issues or illnesses?
  - b. **Probe:** Did you see any different health issues or illnesses between drivers/riders that transport wild meat and those that do not?
6. Are there any laws around transporting wild meat?
7. Do you use any tools when transporting wild meat? (rope, plastic tarps, buckets, nets, baskets, etc.)?
8. How has wild meat transportation changed over time in your community? Why has it changed?
9. Is wild meat transport your main source of income? If not, what is?

**EVD preventive measures/perceived behavioral control**

1. What do you do when you see a sick or dead animal in your home or work environment?
2. What are some practices you use to prevent the potential spread of EVD transmission during transportation?
3. Are there other practices you would like to try, but haven't tried yet? If so, what has kept you from trying them?

**Knowledge of infection source, transmission, and at-risk populations for Ebola Virus Disease (EVD) (10 minutes)**

1. What do you think about Ebola? What do you think causes Ebola?
2. In your opinion, who are the people that are more exposed and infected and can transmit EVD and why?
3. How do community members associate with suspected EVD infected people? How do community members associate with EVD survivors?

**EVD cultural and social practices**

1. In your opinion, what social activities might place you at risk of EVD infection?
2. What cultural or traditional/religious practices might increase the risk of EVD infections?
3. Who do you believe are the most influential people in your community that could promote positive cultural practices to reduce the spread of Ebola? What might motivate these influencers to promote positive cultural practices to reduce Ebola spillover risks?
4. Have you ever visited a traditional healer (herbalist)? If yes, can you talk about it, including why you visited him/her?

**Information, Education and Communication**

1. What is the main source of information (news, health care information, community information) for your household?
2. Where do you go to hear and or get trusted information about Ebola and other diseases? Where did you first hear about Ebola?
3. What do you do and who do you notify if you notice a strange sickness in your household or in your community?

## KEY INFORMANT INTERVIEW FOR KII FOR HEALTH WORKERS (NURSES, CHW, CAHW, CHO)

### Instructions for Facilitators and Note Takers:

Complete this form for each Health Worker you interview. Please meet with community stakeholders and wild meat traders to explain the purpose of your visit and get their permission before conducting the interview. Please note that KIIs are an iterative process, and not all questions need to be asked and answered by each participant. In some cases, the response from the Key Informant will generate its own questions, so that not all informational interviews are exactly alike.

**Introduction:** Welcome and thank for volunteering for taking part in this interview. You have been asked to participate as your point of view is important. I realize you are busy, and I appreciate your time.

Hello! My name is ..... I am working for STOP Spillover Sierra Leone, conducting research on how to reduce risks from potential exposure to viruses in the wild meat value chain. We would like to talk about your experiences and current work in the wild meat trade. INFORMED CONSENT SPEECH HERE.

### PART A

**Name of Community:**

**Date of interview**

**Name of Facilitator:**

**Name of Note Taker:**

**GPS coordinates:**

### PART B

**General Information**

1. Participant's age:.....
2. Gender: .....  Male.....  Female..... Other.....
3. Date.....
4. Start time.....End time.....

## **PART C**

### **Knowledge of infection source, transmission, and at-risk population for Ebola Virus Disease (EVD) (15 minutes)**

1. Tell me a little bit about Ebola. What do you know about it? What has your experience been with it?
2. How would you diagnose and refer a potential Ebola case? What safety precautions would you take when handling a potential case? What should a person do if they think they have Ebola?
3. In your opinion, what people are more exposed, or vulnerable to Ebola, or most often infected and/ or can most easily transmit Ebola? Why?
4. Have there been any health issues or illnesses among the community that may be associated with wild meat? If yes, what were the health issues or illnesses? Do you see any different health issues or illnesses between men, women, girls, boys, hunters, and transporters? If yes, what were they?

### **Ebola Prevention/Perceived Behavioral Control Measures (15 minutes)**

1. What Ebola prevention and control measures do you carry out in your own day-to-day work?
  - a. **Probe:** What activities in your day-to-day work do you associate with Ebola prevention? Why? **Probe:** Do you consider the prevention and control of Ebola to be a priority in your day-to-day work? How do you address these priorities?
2. In your opinion, who is responsible for the prevention, control and management of Ebola in your community? Why?
  - a. **Probe:** Which areas of Ebola prevention and management receive the most attention within your community?

3. Are there specific messages related to Ebola infection prevention and management in your community?
  - a. **Probe:** Are there any messages for health facilities that you are aware of?
4. In your view, what are the main challenges to preventing and managing Ebola infections in your health facility and community?
5. What barriers prevent you from complying with recommendations regarding Ebola prevention and management?
  - a. **Probe:** Personal barriers?
  - b. **Probe:** Organizational barriers?
6. What factors, if any, would make it easier for you to prevent or manage Ebola infections? Can you think of specific examples?
7. How do you feel about encouraging your colleagues and community to comply with Ebola infection control practices? Can you think of any examples?

**Probe:** How would your attitude differ depending on the target audience (Seniors? Peers? Juniors? Trainees? Different professional groups?)

**Probe:** How would your attitude differ depending on the specific Ebola infection control measure recommended? (e.g., Bats eating prevention, handwashing, device management)
8. What would need to change to reduce the risk of Ebola infections in your community?

### **Ebola Cultural and Social Practice (10 – 15 minutes)**

1. What are the cultural, traditional, and religious practices that might facilitate EVD infection?
2. Who do you believe are the most influential people in your community that could promote positive cultural practices that would reduce Ebola risks? What might motivate these influencers to promote these positive cultural practices?
3. In your opinion, what social activities place you at risk of Ebola infection?

### **Information Education and Communication (10 – 15 minutes)**

1. What is the main source of information for your household?
2. Where did you hear and get trusted information about Ebola?

3. In your opinion, what is the most effective way of receiving information relating to Ebola infection prevention and management?
4. In your time in this community/health facility, have you seen any communication materials about Ebola infection control? What do you think about them? Are they effective, or not? If yes, why? If no, why not? How would you rate the effectiveness of these materials and the messages they promote?
  - a. Probe: Effective channel
  - b. Probe: Effective message?

## KEY INFORMANT INTERVIEW FOR TRADITIONAL CHIEFS

### Instructions for Facilitators and Note Takers:

Complete this form for each bush meat trader you interview. Please meet with community stakeholders and wild meat traders to explain the purpose of your visit and get their permission before conducting the interview. Please note that KIs are an iterative process, and not all questions need to be asked and answered by each participant. In some cases, the response from the Key Informant will generate its own questions, so that not all informational interviews are exactly alike.

**Introduction:** Welcome and thank for volunteering for taking part in this interview. You have been asked to participate as your point of view is important. I realize you are busy, and I appreciate your time.

Hello! My name is ..... I am working for STOP Spillover Sierra Leone, conducting research on how to reduce risks from potential exposure to viruses in the wild meat value chain. We would like to talk about your experiences and current work in the wild meat trade. INFORMED CONSENT SPEECH HERE.

### PART A

**Name of Community:**

**Date of interview**

**Name of Facilitator**

**Name of Note Taker:**

**GPS coordinates**

## **PART B**

### **General Information**

1. Participant's age:.....
2. Gender: .....  Male.....  Female..... Other.....
3. Date.....
4. Start time.....End time.....

## **PART C**

### **Please tell me about the wild meat value chain in this community (30 minutes)**

1. Which animals are hunted, consumed, and traded in your community? What type of people hunt? Are they rich, poor, powerful, or from a specific or religious ethnic group? Do they live in certain parts of the village?
2. Do you see changes in the frequency of animals hunted by season? (Ranking most common animals hunted each season)
3. How have wild meat hunting, handling, and trading practices changed over time (from 2010 unto now)?
4. How is wild meat hunting organized in this community? Do people go alone or in groups? Do youth hunt wild meat?
5. How important is the wild meat value chain to incomes and to protein consumption in your community? Is it a principle source of income, or are other income sources more important? RANK AND SORT income sources and protein sources for families in the community.
6. What tools are used for hunting, trading and butchering wild meat in this community?
7. What do you do when you see a sick or dead animal in your environment? How is it disposed of?

### **Ebola Response Questions (20 minutes)**

1. What do you know about Ebola? What are the causes of Ebola? How is the disease transmitted from one person or animal to another?

## STOP Spillover Wild meat Value Chain Analysis in Sierra Leone

2. What measures do you know about to prevent Ebola? Which preventive measures did your community institute during the Ebola outbreak? Were they effective? Why or why not?
3. In your opinion, what group of people are most at risk of EVD and why?
4. What factors affect your behavior related to Ebola risks?
5. What factors encourage you to practice Ebola risk reduction behaviors? Probe: What factors discourage you from practicing these behaviors?



## Informed Consent Form for Key Informant Interviews (KII)

### Wild meat value chain analysis and risk assessment

You are being invited to take part in a research study being done by Dr. Edward Magbity and the STOP Spillover team in Sierra Leone and Dr. Deborah Kochevar from Tufts University (USA). You are being invited because of your livelihood activities and your position as stakeholder in the community.

If you decide to participate in the study, you will be invited to a Key Informant Interview (KII). This interview will help us learn from you about the potential risk of zoonotic spillover along the bushmeat value chain. Four KIIs will be conducted in each community. We will interview Bushmeat Transporters, Traditional Healers, Traditional Leaders, and Community Health Workers. Each KII will last for at most 1 hour.

Your participation in this study is completely voluntary. You can skip questions that you do not want to answer or stop participating at any time with no penalty to you.

With your permission and consent, we may take photographs during our interviews. In addition, we may not get everything during our discussions and we would like to audio record our interview if that is ok. All audio recordings, photographs, and other study-related records will be stored on password-protected Tufts-encrypted computers until the end of the Stop Spillover project.

There is a risk of loss of confidentiality, meaning your private information could be seen by someone outside of the research team. Your name and phone number will be taken only for administrative purposes, and no one will be able to link your answers back to you. Please do not include your name or other information that could be used to identify you in your responses.

There are no direct benefits to you from taking part in this research. We cannot promise any benefits to others from your taking part in this research. However, possible benefits include a better understanding of how biosecurity practices can improve your livelihoods and reduce the risk of zoonotic spillover. You will not be paid for your participation.

If you have questions, concerns, or complaints, or think the research has hurt you, please contact Dr. Edward Magbity on +23278434267, Alpha Jabbie at +232636167, or Dr. Deborah Kochevar at [Deborah.Kochevar@tufts.edu](mailto:Deborah.Kochevar@tufts.edu).

If you have questions about your rights as a research study subject, call the Sierra Leone Ethics and Scientific Review Committee at +23278366493 or Tufts Medical Center and Tufts University Health Sciences Institutional Review Board (IRB) at (617) 636-7512. This study has been reviewed by the Tufts Health Sciences IRB and Sierra Leone Ethics and Scientific Review Committee.

## ANNEX 2: KEY RESEARCH FINDINGS AND POTENTIAL INTERVENTIONS

**RESEARCH GOAL:** To sufficiently describe the wild meat value chain at the high-risk interface, so that OHDREAM working group members and local communities can develop socially, culturally, and economically effective and sustainable interventions to reduce wild meat value chain actors' exposure to zoonotic spillover risks.

FINDINGS	INTERVENTIONS
<p><b>Hunters:</b></p> <ul style="list-style-type: none"> <li>• Predominantly male youth, seldomly older men</li> <li>• Firearms and local tools used for hunting</li> <li>• Package and haul wild meat to point of collection by transporter or to community for food</li> <li>• Handles the dead wild meat without IPC measures</li> <li>• Wild meat hunting is the main livelihood</li> </ul>	<ul style="list-style-type: none"> <li>• Design SBC and BCC strategies to engage and empower youth</li> <li>• Reduce risks associated with wildlife hunting and trading/transporting through use of biosafety materials (PPE/IPC)</li> <li>• Promote regular community engagement and by-laws related to wild meat hunting and handling hygiene practices.</li> <li>• Promote alternative livelihoods and animal sourced protein such as inland aquaculture and poultry, goat, or sheep farming</li> </ul>
<p><b>Hunters' wives:</b></p> <ul style="list-style-type: none"> <li>• Elderly and young women actively engage in wholesale and retail trading of wild meat</li> <li>• No IPC/hygiene practices observed during processing of wild meat for consumption.</li> <li>• Main source of protein</li> <li>• Main means of livelihood</li> </ul>	<ul style="list-style-type: none"> <li>• Design SBC and BCC strategies that reach, benefit and empower women of all ages</li> <li>• Reduce risks associated with wildlife handling through use of biosafety materials (PPE/ IPC)</li> <li>• Promote regular community engagement and by-laws related to wild meat processing and handling hygiene practices.</li> <li>• Promote alternative livelihoods and animal sourced protein such as inland aquaculture and poultry, goat, or sheep farming</li> </ul>
<p><b>Wild meat consumer:</b></p> <ul style="list-style-type: none"> <li>• Wild meat is a main source of protein at the community level</li> <li>• No protective gear is used during processing meat sold in the market</li> <li>• Few hygiene measures are used while processing meat for consumption</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce risk associated with poor hygiene practices through regular community engagement on zoonotic diseases and hygiene.</li> <li>• Reduce risks by promoting wildlife meat inspection at retail points and promote the use of biosafety practices</li> </ul>
<p><b>Wild meat traders/processors:</b></p> <ul style="list-style-type: none"> <li>• Predominantly women engaged in the processing of wild meat</li> </ul>	<ul style="list-style-type: none"> <li>• Promote use of PPE</li> </ul>

FINDINGS	INTERVENTIONS
<ul style="list-style-type: none"> <li>• No use of protective gear</li> <li>• No hygiene measures followed during processing</li> <li>• No alternative source of livelihood</li> <li>• No running water facility in the market</li> <li>• No designated platform for processing wild meat</li> </ul>	<ul style="list-style-type: none"> <li>• Promote improved hygiene and sanitation practices and services</li> <li>• Design drainage and soak-away pits for disposal of wastewater</li> <li>• Support Ebola wastewater surveillance around the wild meat market</li> </ul>
<p><b>Wild meat transporters:</b></p> <ul style="list-style-type: none"> <li>• Predominantly men</li> <li>• No use of IPC measures and/or use of protective gear</li> <li>• Limited knowledge risk reduction measures; wild meat is not separated from other products during transportation</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce risks associated with transporting wild meat with PPE and packaging of wild meat</li> <li>• Use SBC to promote the use of PPE</li> </ul>
<p><b>Traditional healers:</b></p> <ul style="list-style-type: none"> <li>• Predominantly men, both young and old, involved in treating people using of herbs and domestic livestock products;</li> <li>• Infrequent use of wild meat products.</li> <li>• Well-informed about the risk of Ebola and other infections from wild meat trade and consumption activities</li> </ul>	<p>Reduce risks associated with contacting sick people by educating them on disease symptoms and transmission risks</p> <p>Create zoonotic disease certification programs for traditional healers</p> <p>Design SBC efforts to minimize or eliminate contact with raw wild meat.</p>
<p><b>Traditional chiefs:</b></p> <ul style="list-style-type: none"> <li>• Well-informed about wild meat hunting activities</li> <li>• Primary influencers and decision makers in their communities</li> </ul>	<p>Engage them in SBC efforts as role models and trusted voices</p> <p>Support them to design, implement and enforce new bylaws to reduce spillover risks</p>

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