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Strategies to Prevent (STOP) Spillover

Year 3 Semi-Annual Report

1 October 2022 – 31 March 2023



April 2023

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Strategies to Prevent (STOP) Spillover

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Cover photograph: Bats roosting in trees in Battambang Province, Cambodia.
Photo credit: Tetra Tech



*Live bird market in Dhaka, Bangladesh
Photo credit: icddr,b*

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*Civet farmer, Dong Nai province, Viet Nam
Photo credit: VOHUN*

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ACRONYMS AND ABBREVIATIONS

AFROHUN	Africa One Health University Network
BFD	Bangladesh Forest Department
CoV	Coronavirus
DARD	Department of Agriculture and Rural Development
DLS	Department of Livestock Services
DNCC	Dhaka North City Corporation
DOH	Department of Health
FAO	Food and Agriculture Organization
FGD	Focus Group Discussion
IEDCR	Institute of Epidemiology, Disease Control and Research
IPC	Institut Pasteur du Cambodge
IPCI	Institut Pasteur de Côte d'Ivoire
IRB	Institutional Review Board
KII	Key Informant Interview
KPIs	Key Performance Indicators
LANADA	National Laboratory for Agriculture Development Support
LBM	Live Bird Market
LWSC	Liberia Water and Sewer Corporation
MERS	Middle East Respiratory Syndrome
NGO	Non-Governmental Organization
NPHIL	National Public Health Institute of Liberia
OH-DReaM	One Health-Design Research and Mentorship
OHS	One Health Secretariat
OM	Outcome Mapping
PDAFF	Provincial Department of Agriculture, Forestry and Fisheries
PHD	Provincial Health Department
PPE	Personal protective equipment
SARS	Severe Acute Respiratory Syndrome
SARS-CoV-2	Severe Acute Respiratory Syndrome Coronavirus 2
SBC	Social and behavior change
SOP	Standardized Operating Procedure
STOP Spillover	Strategies to Prevent Spillover USAID Program
TIPs	Trials of Improved Practices
UNMC	University of Nebraska Medical Center
USAID	United States Agency for International Development
UVRI	Uganda Virus Research Institute
VOHUN	Viet Nam One Health University Network

EXECUTIVE SUMMARY

Strategies to Prevent Spillover (STOP Spillover) is a five-year, U.S. Agency for International Development (USAID)-funded cooperative agreement supporting seven priority countries in Asia and Africa to strengthen their capacities to identify, assess, and monitor risk associated with emerging zoonotic viruses and to develop and introduce risk-reduction measures. Focusing on prioritized zoonotic viruses – Ebola, Marburg, Lassa, Nipah, animal-origin coronaviruses (including SARS-CoV, SARS-CoV-2, and MERS-CoV), and animal-origin zoonotic influenza viruses – STOP Spillover promotes a multisectoral, One Health approach to addressing emerging zoonotic viruses before they pose an epidemic or pandemic threat.

Sustainability is a critical aspect of STOP Spillover, with the project specifically designed to ensure local sustainability and inclusion, capacity strengthening, and stakeholder engagement through a deep understanding of the context-specific spillover ecosystem in each country. The selection of interventions to reduce the risk of viral spillover – and aligned studies to fill knowledge gaps to support intervention design – is informed by Outcome Mapping (OM), a participatory process that engages a broad range of traditional and non-traditional stakeholders to collaboratively identify and map desired outcomes. If OM is the beginning of the journey in each STOP Spillover country to sustainably reduce risk of spillover in high-risk communities, One Health-Design Research and Mentorship (OH-DReaM) working groups are the engines and architects of change that drive the process. OH-DReaM working groups are inclusive, diverse, and engage government, civil society, and other influencers from the community whose endorsements can be essential to successful intervention outcomes. STOP Spillover is committed to the time-consuming, one-on-one work required to organize, motivate,

and empower OH-DReaM working groups. It is their best thinking that will yield innovative interventions that are owned, refined, and sustained by the community after STOP Spillover has concluded.

Project Year 1 (October 1, 2020 - September 30 2021) focused on identifying target countries, staffing country teams and hosting participatory stakeholder engagement workshops in initial target countries, including Uganda, Bangladesh, Viet Nam, Cambodia and Liberia. Cambodia, Sierra Leone and Cote d’Ivoire joined in Project Year 2. Project Year 2 (October 1, 2021 through September 30, 2022) focused on designing interventions and aligned studies to fill knowledge gaps to support intervention design, establishing OH-DReaM working groups, and finalizing country-level work plans. This report documents progress made during the first half of Project Year 3, from October 1, 2022 through the end of March, 2023.

Highlights from this reporting period include the submission of 12 reports from STOP Spillover teams in Viet Nam, Bangladesh and Liberia documenting results from key activities, and the implementation of field research in Cambodia, Uganda and Sierra Leone. Côte d’Ivoire, the last STOP Spillover country targeted, organized stakeholder engagement workshops and OM workshops. OM reports for all seven countries supported by STOP Spillover are available on the STOP Spillover website (stopspillover.org/resources).

During this reporting period, multiple country teams were actively engaged in formative research projects that generated baseline and contextual knowledge of the targeted spillover ecosystems. This work directly informs the design and implementation of innovative and effective interventions to reduce zoonotic transmission risks.

For example, in Vietnam the country team assessed individual and community level knowledge, attitudes and practices that put wildlife value chain stakeholders in Dong Nai province at risk for zoonotic disease transmission. Key findings from surveys and discussions with more than 300 individual stakeholders are that most farmers lack sufficient knowledge on biosafety, biosecurity, and zoonotic disease control. Wildlife health services are also lacking, and wildlife are excluded by law from the livestock slaughter and inspection process. These gaps create substantial risks on individual farms and all along the wildlife value chains for different farmed species. Stakeholder interest in and readiness to implement improvements provide clear opportunities. Implementation of Trials of Improved Practices (TIPs) for on-farm waste management and improved biosafety and biosecurity practices, and disease surveillance interventions are underway (see Vietnam Activity 2.2.2.1).

Highlights from other work completed during this reporting period include the following:

- Bangladesh: A comprehensive scoping review mapped all previous interventions at live bird markets and explored factors contributing to their failures and success to inform the development of evidence-based interventions.
- Cambodia: A national risk assessment workshop prioritized additional high-risk bat-human interfaces and locations for future work beyond the initial focus at bat guano farms in Kampong Cham.
- Uganda: 314 households and 240 community members provided information on risky bat-human interactions, including their consumption and use in traditional medicine.

- Sierra Leone: Completed data collection on risks of exposure to the rodent hosts of Lassa Fever Virus (244 respondents) and Ebola virus spillover risks along the wild meat value chain (284 respondents), to inform risk reduction interventions in Q3.
- Liberia: 15 stakeholders validated the wildlife disease surveillance framework developed in Year 2 and finalized a wildlife disease surveillance situational analysis.
- Cote d'Ivoire: Completed interface level Outcome Mapping with 53 participants in District des Montagnes.
- All countries: A total of 11 local journalists across all seven STOP Spillover received grants and mentorship and published or broadcast stories in mainstream media about the risks of zoonotic spillover and how to prevent it.

STOP Spillover faced several challenges in the first half of Project Year 3, including the start of a Corrective Action Plan, departure of the Project Director and establishment of an interim leadership team, and uncertainty due to the shift in the funding process from allocation by USAID Washington to allocation by Country Missions. STOP Spillover is implementing positive, results-oriented solutions to address these and other challenges and ensure success.

Tufts University and the STOP Spillover consortium are fully committed to the success of this critical work to build government and stakeholder capacity in priority Asian and African countries to identify, assess, and monitor risks associated with priority zoonotic viruses and to develop and introduce proven and novel risk reduction measures.

INTRODUCTION



Strategies to Prevent Spillover (STOP Spillover) is a five-year, U.S. Agency for International Development (USAID)-funded cooperative agreement to support priority countries in Asia and Africa to strengthen their capacities to identify, assess, and monitor risk associated with emerging zoonotic viruses and to develop and introduce proven and novel risk-reduction measures. STOP Spillover builds on more than 15 years of USAID investments in promoting a multisectoral, One Health approach to addressing emerging zoonotic viruses before they pose an epidemic or pandemic threat. Led by Tufts University, STOP Spillover is a global consortium of 14 partner organizations with expertise in human, animal, and environmental health who will take the next step in understanding and addressing the risks posed by known zoonotic viruses that have the potential to spill over and cause pandemic crises.

STOP Spillover focuses on prioritized zoonotic viruses – Ebola, Marburg, Lassa, Nipah, animal-origin coronaviruses (including SARS-CoV, SARS-CoV-2, and MERS-CoV), and animal-origin zoonotic influenza viruses. In each STOP Spillover host country, the specific viruses to be addressed and the prioritized high-risk interfaces are determined with in-country stakeholders. By implementing locally designed interventions in each country over the life of the project, and evaluating the social, gender, economic, and environmental acceptability and effectiveness of each intervention, participating countries will strengthen their capacity to develop, validate, and

implement interventions to reduce spillover of prioritized zoonotic viruses.

STOP Spillover currently supports seven USAID priority countries. The goal of STOP Spillover is **an enhanced understanding and reduced risk of zoonotic viral spillover, amplification, and spread**. In support of this goal, STOP Spillover has three objectives (Figure 1). Objective 1 focuses on understanding the risk of spillover of zoonotic viruses at specific high-risk animal-human interfaces, while Objective 2 focuses on utilizing that improved understanding to develop and test interventions that reduce the risk of

OBJECTIVE 1	OBJECTIVE 2	OBJECTIVE 3
Strengthen country capacity to monitor, analyze and characterize the risk of priority emerging zoonotic viruses spilling over from animals to people	Strengthen country capacity to develop, validate, and implement interventions to reduce risk of priority emerging zoonotic viruses spilling over from animals to people	Strengthen country capacity to mitigate amplification and spread of priority zoonotic diseases in human populations
EXPECTED RESULTS		
<p>Up to 10 countries are able to update risk assessments and identify key knowledge gaps related to risk of spillover, amplification, and spread of priority emerging zoonotic viruses in animal and human populations.</p> <p>Up to 10 countries have strengthened capacity to address these key knowledge gaps.</p> <p>Up to 10 countries are able to monitor, analyze, and characterize the gender and sex-specific risks associated with high-risk, animal-human interfaces through their gender-sensitive applied research and testing/validating intervention strategies.</p>	<p>Up to 10 countries are able to use available information to test and validate the effectiveness of interventions to reduce spillover of priority emerging zoonotic viruses from animals to humans.</p> <p>Up to 10 countries are able to implement interventions, policies, and regulations to reduce spillover of priority emerging zoonotic viruses from animals to humans.</p> <p>Up to 10 countries can develop, analyze, validate, and implement gender-responsive and culturally appropriate interventions relevant to women, girls, men, and boys to limit direct contact with animals and animal products.</p> <p>Up to 10 countries are able to implement interventions and are working towards implementing policies and regulations to reduce spillover of priority emerging zoonotic viruses from animals to humans.</p>	<p>Up to 10 countries have the capacity to understand risk and plan an appropriate response to contain amplification and spread of zoonotic disease events originating from wildlife.</p> <p>High-risk communities, workers, and health facilities in up to 10 countries can rapidly recognize and respond to suspect zoonotic disease events originating from wildlife.</p> <p>Up to 10 countries have the ability to integrate research findings and best practices into risk mitigation efforts to directly impact gender and sex-specific risks.</p>

Figure 1. STOP Spillover objectives and expected results.

spillover at the community level. Recognizing that it will not be possible to prevent all spillover events from wildlife, Objective 3 focuses on assisting countries to limit the impact of spillover events should they occur.

Knowing what to do to reduce the risks of spillover from animals to humans is not enough. To truly prevent the next pandemic, we must institutionalize knowledge in local communities and governments and work together as teams to develop, test, and implement contextually adapted and appropriate, innovative interventions. Locally led approaches are fundamental to STOP Spillover. In each target country, STOP Spillover is led by a country team composed of in-country personnel. Local stakeholders are engaged through Outcome Mapping (OM) – a participatory engagement methodology – to prioritize the viral pathogen(s) of focus, the high-risk interfaces at which to focus efforts, key stakeholders to engage, potential interventions to mitigate the risk of viral spillover, and gaps in knowledge that need to be addressed in order to design appropriate

and effective interventions. Figure 2 shows the specific viral pathogens and high-risk interfaces prioritized by in-country stakeholders through the OM process in each STOP Spillover target country. Once priority pathogens, high-risk interfaces and potential interventions have been identified by local stakeholders through OM, One Health-Design, Research and Mentorship (OH-DReaM) working groups are established to design, implement and evaluate interventions to reduce the risk of viral spillover. Each OH-DReaM working group includes in-country representatives chosen specifically for the intervention, interface and activity of interest. Each OH-DReaM working group is overseen by a country team member and supported by subject matter experts and mentors from global-level STOP Spillover technical resource hubs.

STOP Spillover began in October 2020. This report describes STOP Spillover’s work from the beginning of Project Year 3 on October 1, 2022, through the end of the first half of the fiscal year on March 31, 2023.

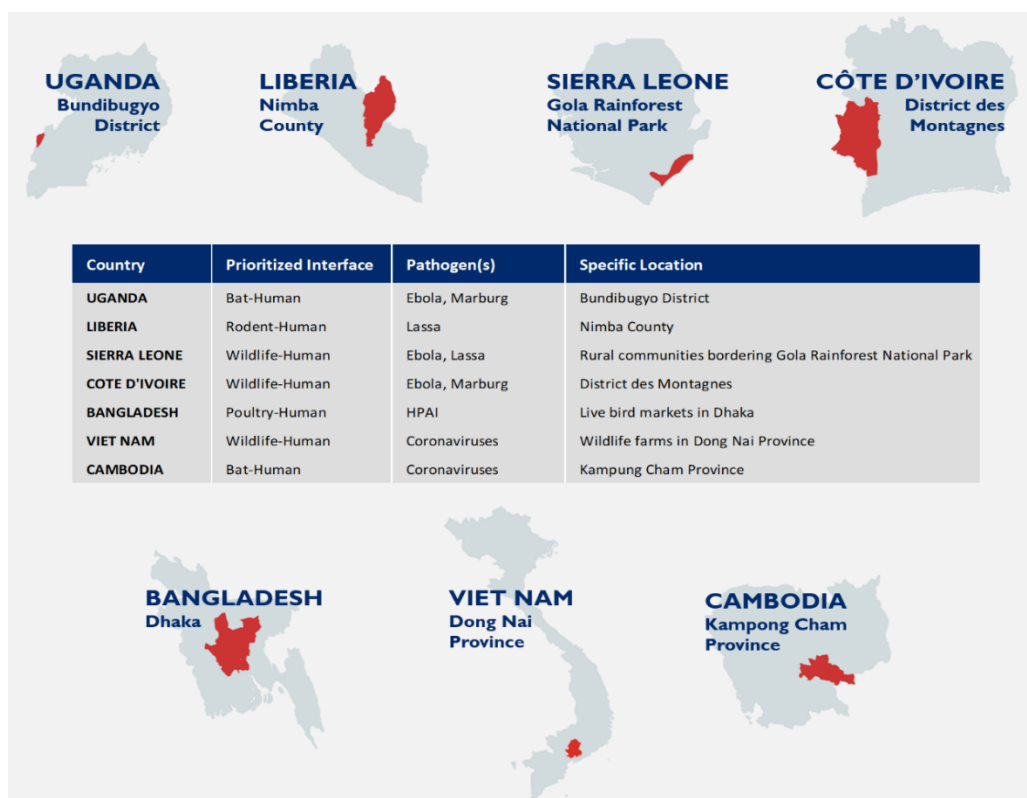


Figure 2. Prioritized interfaces and pathogens in STOP Spillover countries.

ACTIVITIES AND ACCOMPLISHMENTS



*Bats flying in Battambang province, Cambodia.
Photo credit: Tetra Tech*

Activities conducted on STOP Spillover’s three objectives during this reporting period can be broken down into the following categories: OM; studies at prioritized interfaces; surveillance; risk-reduction interventions at prioritized interfaces; supporting activities; media capacity strengthening; and outbreak response scenario planning (Figure 3). This section reports on the activities conducted under these categories from October 1, 2022 through March 31, 2023 (see Annex 1 for overview of the status of Project Year 3 work plan activities in each country).

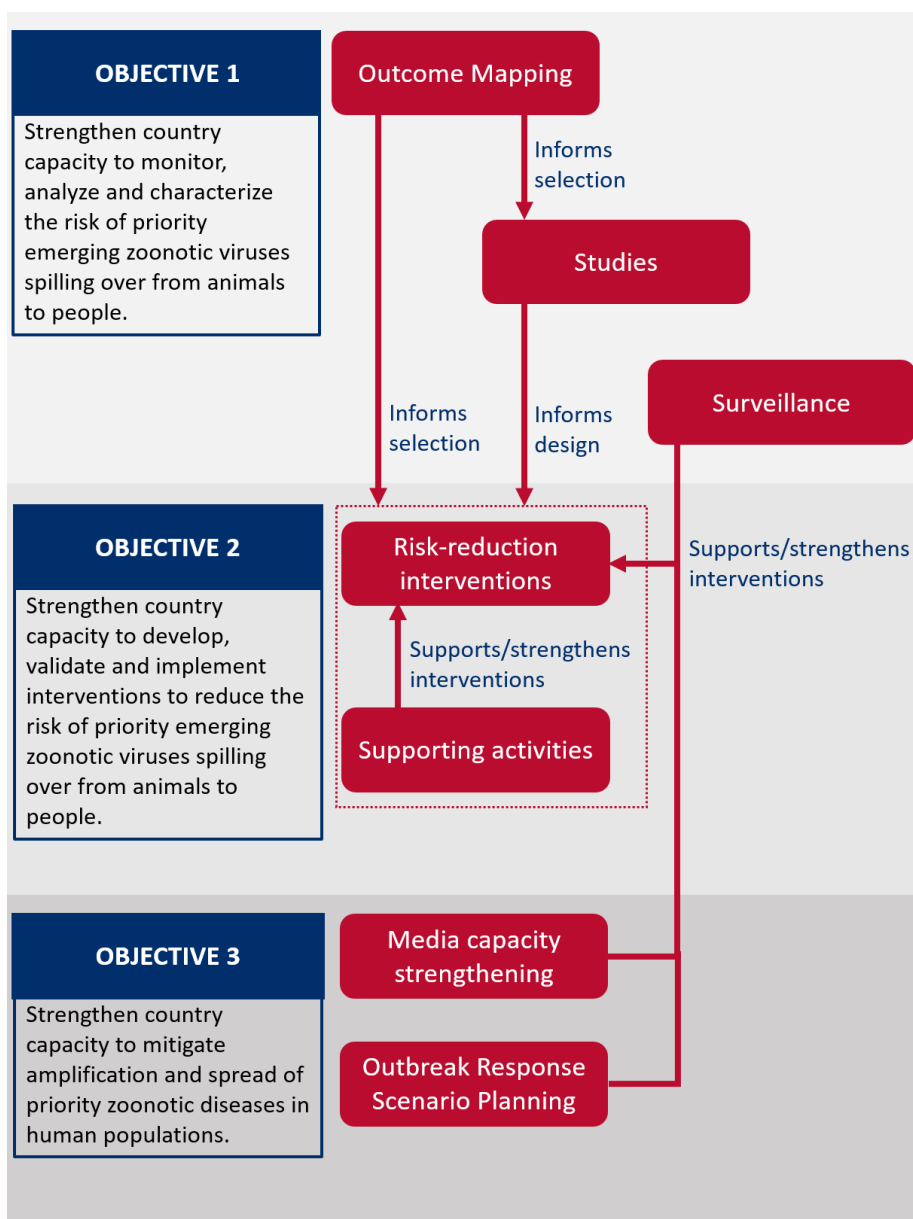


Figure 3. Categories of activities conducted across STOP Spillover’s three objectives during the current reporting period.

OBJECTIVE I

Objective 1 focuses on assisting countries to improve their understanding of how priority zoonotic viruses spill over from animals to people. Improved understanding of risk directly feeds into and supports Objectives 2 and 3, including the development of risk-reduction interventions. This section outlines STOP Spillover's achievements and accomplishments for Objective 1 during the first half of Project Year 3.

Outcome Mapping

Through OM, STOP Spillover works with a diverse range of stakeholders to ensure that we include relevant actors to enhance national and local capabilities to locate potentially new and emerging high-risk interfaces. STOP Spillover's OM process is built around participatory workshops. The nature and number of participatory workshops are adapted for each country context, but the overall goals and outputs of the process are the same: STOP Spillover works with relevant actors to identify specific risks at prioritized interfaces, understand knowledge gaps and barriers to intervention design, brainstorm potential interventions contextualized to the needs for specific interfaces to reduce the risk of spillover, and identify actions that critical stakeholders need to take for the interventions to achieve the desired outcomes.

OM was finalized in all STOP Spillover countries, except one, by the end of Project Year 2. The remaining country – Côte d'Ivoire – initiated the process in Project Year 2, but completed interface-level OM workshops in the opening weeks of Project Year 3. All seven OM summary reports are available on the STOP Spillover website (stopspillover.org/resources).

Outcome Mapping in Côte d'Ivoire

Interface-level Outcome Mapping workshop:

Côte d'Ivoire conducted a national stakeholder engagement meeting, combined with a STOP Spillover launch event, in the closing days of Project Year 2. This combined event, conducted in Abidjan on September 29, 2022, served as a national-level OM workshop to prioritize pathogens, interfaces, and intervention sites. Subsequently, Côte d'Ivoire conducted a three-day interface-level OM workshop in Man, the capital of *District des Montagnes* (the region prioritized through discussions at the national-level OM workshop as a focus for STOP Spillover activities), between October 11 and 13, 2022. Fifty-three participants attended the in-person event. Stakeholders from national, district and local levels were present, including the governor of *District des Montagnes*, the prefect of Danané, the mayor of Man, and representatives of the local and central Ministries of Health, Water and Forests, and Animal Resources, the local Ministry of Environment, non-governmental organizations (NGOs), funders, universities, research institutions, and local communities and organizations. The interface-level OM workshop provided an opportunity for participants to discuss opportunities, gaps and barriers for the management of zoonotic spillover risks, to identify critical partners essential for mitigating spillover risks of Ebola and Marburg viruses (the pathogens prioritized at the national-level OM workshop), and to propose potential interventions for reducing the risk of spillover of Ebola and Marburg viruses.

Following the interface-level OM workshop, the STOP Spillover team reviewed and packaged risk-reduction activities and aligned studies identified by stakeholders into distinctly implementable activities for funding in the country-level work plan. An initial work plan was submitted to USAID in December 2022 and discussions to revise and finalize the work plan are ongoing.



Breakout discussion during the interface-level OM workshop in Man, Côte d'Ivoire.

Photo credit: AFROHUN

Studies at Prioritized Interfaces

Objective 1 focuses on assisting countries to improve their understanding of risk associated with spillover of priority viruses from animals to people. Applied research addressing a set of strategic research questions is crucial for generating the evidence needed to develop and test interventions that reduce risk to populations at specific high-risk animal-human interfaces. To design effective interventions to reduce the risk of spillover, a deep understanding of the country context and the drivers of behaviors that put communities at risk of infection at a specific interface is needed. Interventions – and/or strategies to reinforce behavioral change – won't work if they are not responsive to local needs (see Annex 2 for how studies inform the design of risk-reduction activities – interventions and supporting activities – across STOP Spillover countries).

Studies in Uganda

Study 1 - Investigate bat host ecology and human behavioral risk factors associated with human-bat interactions (Uganda work plan activity 1.2.6.1):

The goal of this study is to fill knowledge gaps about bat biology, ecology, and community interactions with bats in order to identify where humans are exposed to bats and associated potential risk factors for Marburg and Ebola transmission. This study informs the development of a community-driven participatory bat monitoring program for zoonotic spillover early warning and response (Uganda's supporting activity 2 – work plan activity 2.2.2.3), and supports a second study investigating behavioral, sociocultural, gender-specific, and economic risk factors associated with human-bat interactions (Uganda's study 2 – work plan activity 1.2.6.2).

A key component of this study is a systematic literature review of bat-human interactions to identify available evidence and knowledge gaps. Work on this literature review commenced during this reporting period, and is expected to be finalized and submitted to USAID by June, 2023.

Another key component of this activity is capacity-strengthening for spatial modeling. Spatial modeling will support integrated risk analysis across the STOP Spillover risk-reduction activities in Uganda, notably work plan activities 2.2.2.1 and 2.2.2.2. A training on spatial data and spatial modeling was conducted from November 10-15, 2022. The multi-day training event was a hybrid of physical and online sessions facilitated by local and international experts. Online sessions were facilitated by Dr. Luca Nelli from STOP Spillover partner University of Glasgow. Thirteen participants, drawn from each of the five OH-DReaM working groups that have been established in Uganda to support STOP Spillover activities, were trained on spatial modelling and data analysis. The objective of the training was to enable participants to acquire knowledge and skills for model development using existing data. At the end of the course, participants were able to develop species distribution models for mapping areas of likely bat presence in Uganda. Participants developed basic skills for ecological modeling and learned about incorporating different formats for GIS data, which are critical for developing maps of wildlife distribution.

Study 2 - Investigate behavioral, sociocultural, gender-specific, and economic risk factors associated with human-bat interactions (Uganda work plan activity 1.2.6.2):

The goal of this study is to better understand individual, social, and cultural factors that influence behaviors that put people at risk of spillover of Marburg and Ebola viruses. This study informs the development of social and behavior change (SBC) messages and approaches for engaging communities to keep bats out of

households (Uganda’s supporting activity 1 – work plan activity 2.2.2.1a), and, ultimately, supports the promotion of safe practices for protecting food and water resources at the household and communal level (Uganda’s intervention – work plan activity 2.2.2.1b).

This study focuses on three Bundibugyo sub-counties (Burondo, Harugale, and Ntandi town council). Across these three sub-counties, 314 households were surveyed during this reporting period to characterize the types and frequencies of bat-human interactions, bat consumption, the use of bats in traditional medical practices, and other common interactions between humans and bats. Twenty-four focus group discussions (FGDs) were conducted with 240 community members (120 male and 120 female) who have experienced a variety of interactions with bats, along with four key informant interviews (KIIs) targeting stakeholders including community leaders, health care workers, park rangers, hunters and traditional healers. Results from this study will be shared with USAID in quarter 3 of Project Year 3, and presented to key stakeholders in Uganda during Uganda close out meetings in May/June 2023.

Studies in Viet Nam

Study 1 – Conduct a behavioral risk assessment to characterize risk associated with the wildlife farming value chain in Dong Nai province (Viet Nam work plan activity 1.2.6.1):

The goal of this study is to understand individual and community level knowledge, attitudes and practices that put stakeholders involved in the wildlife value chain in Dong Nai at risk for zoonotic disease transmission. This study informs the design of approaches to improve biosafety practices at wildlife farms (Viet Nam’s intervention – work plan activity 2.2.2.1).

The field work and data collection for this study was conducted during Project Year 2 (May –

August, 2022), with the current reporting period focusing on data analysis and using that data to inform the choice of biosafety practices to take forward to the Trials of Improved Practices (TIPs) process (see box *Trials of Improved Processes*). A comprehensive report documenting the findings from the behavioral risk assessment was submitted to USAID in March, 2023. Some of the key findings from this report include:

- 23.2% of 267 respondents farm a single species of wildlife (considered low risk); 25.0% farm two species (wildlife and domestic; considered medium risk); and 51.8% farm three or more species (considered high risk).
- Almost all actors lack sufficient knowledge on zoonotic disease control and biosecurity. Although many farms demonstrated good hygiene standards, others exhibited poor hygiene with no barriers to entry of pests or free-ranging wildlife.
- Moderate use of personal protective equipment (PPE) was reported but was sporadic and often ill-matched to the hazards involved. PPE was reported to be used only 20% to 40% of the time for the catching and handling of animals, and about 10% of the time during slaughter. Women reported a greater use of PPE than men. The main drivers for PPE use appear to be injury prevention and cleanliness rather than prevention of infection. There is no clear guidance on practical, effective practices regarding the use of PPE.
- 61.6% of 255 respondents use low-risk water sources (including covered drilled wells, water taps, and filtered water) on farms; 38.4% use medium-risk (including covered rainwater and covered dug wells) and high risk water sources (including uncovered dug wells, uncovered rainwater, and ponds or rivers).
- 94.3% of respondents follow waste disposal processes that are considered medium risk (e.g. collection of waste into a bag or cesspit and applying to crops without any

Trials of Improved Practices (TIPs)

TIPs is a formative research technique suitable for testing and refining potential interventions on a small scale before promoting them more broadly. The procedure consists of a series of visits in which the interviewer and the participants analyze current practices, discuss what could be improved, and together reach an agreement on one or a few solutions to try over a trial period; and then assess the trial experience together at the end of the trial period. The results are moved directly into intervention design.

treatment) and high risk (e.g., directly applying waste to crops or feeding waste to fish).

- 19.1% of 110 respondents reported eating – or sharing with friends, family, or neighbors for the intent of consumption – wildlife that died on the farm.
- Wildlife farms do not have access to wildlife health services as veterinarians do not currently have capacity in this area and wildlife products are excluded by law from livestock slaughter and inspection processes. Robust peer networks are the primary source of information on production and health care of wildlife.
- Since wildlife products are excluded from the regulated slaughter facilities, there is no food safety inspection or pathogen surveillance. There are no barriers to entry of unsafe products into the market and a weak ability to trace the source of unsafe products in the event of an outbreak or adverse event.

Study 2 – Conduct a rapid assessment of biosafety training programs previously implemented in Dong Nai province to understand factors that limit the adoption of biosafety practices (Viet Nam work plan activity 1.3.1.1):

The goal of this study is to understand the barriers that actors face in adopting biosafety practices, and what might motivate or constrain them to change risky behaviors, which will inform the design of SBC messages and approaches to improve biosafety practices at wildlife farms (Viet Nam’s intervention – work plan activity 2.2.2.1).

The field work and data collection for this study was conducted during Project Year 2, with the current reporting period focusing on data analysis and using those data to inform the choice of biosafety practices to take forward to the TIPs process. In order to identify suitable and appropriate biosafety practices aimed at reducing Spillover for application on wildlife farms in Dong Nai province, an intervention selection process was developed in collaboration with wildlife farmers using their own practical criteria for adoption. The TIPs selection process used the following overarching criteria to evaluate biosafety practices:

- Potential for the reduction in risk of spillover of infectious diseases from captive wildlife (from scientific evidence and literature review)
- Community interest, willingness, and commitment of local beneficiaries
- Feasibility, including community readiness to implement, cost, duration of intervention, and required resources (human and financial)
- Availability of human resources, materials, techniques, and technology at the locality
- Sustainability, including potential for the practice to be expanded to neighboring wildlife farming households, and the farm owner maintaining the practice over time, and impact on zoonotic disease transmission risk.

The prioritization process resulted in the selection of two interventions to take forward to the TIPs process (see Viet Nam’s intervention – work plan activity 2.2.2.1). A report describing the planned TIPs and the rationale for their selection was submitted to USAID in March, 2023.

Studies in Bangladesh

Study 1 – Explore factors contributing to failures and success of previous interventions

to improve biosecurity in live bird markets (LBMs) (Bangladesh work plan activity 1.2.6.1):

The goal of this study is to understand factors that have contributed to the success or failure of interventions previously implemented, in particular, why prior interventions did not produce the desired outcomes. This study informs strategies for improving biosecurity and hygiene measures at LBMs (Bangladesh’s intervention – work plan activity 2.2.2.1).

A comprehensive scoping review was conducted to map all previous interventions that have been implemented in Bangladesh, and to explore factors contributing to the failures and success of those interventions. The scoping review found a total of 10 interventions on improving biosecurity of the LBMs in Bangladesh conducted over 18 years, from 2005 to 2022. The scoping review highlighted barriers and gaps that need to be overcome for the future development of holistic designs to improve LBM biosecurity. This “*Scoping Review of Interventions to Improve Live Bird Market (LBM) Biosecurity and Hygiene Measures in Bangladesh*” was submitted to, and approved by, USAID in February 2023. Some of the key findings from the scoping review include:

- The 10 interventions were implemented by different implementers, including government bodies, development partners, research organizations and NGOs.
- Some of the interventions included infrastructural solutions as well as behavior change communications, while others focused on raising awareness, changing behavior or mobilizing stakeholders.
- Interventions that only targeted awareness-raising or behavior change without providing any infrastructural solutions failed to improve LBM biosecurity conditions and hygiene practices in Bangladesh.
- Interventions that included extensive infrastructural changes were constrained by sustainability and monitoring issues.

- The lack of government initiatives and spending affected the sustainability of infrastructural changes and compliance with recommended practices, indicating a need for strong advocacy for the government partners by the One Health sector, as well as strong monitoring systems by the regulatory authorities and the LBM actors.

Since the poultry business is a major industry in Bangladesh, a comprehensive understanding of underlying political factors impacting these markets is key to the success of any intervention. A policy review was undertaken to identify publicly available policy documents related to the spread of avian influenza, specifically from LBMs in Bangladesh. The STOP Spillover Bangladesh country team is currently finalizing this policy review, and it is expected to be submitted to USAID early in the next project quarter.

Informed by findings from the scoping and policy reviews, nine FGDs and 20 KIIs with implementers and evaluators of previous interventions, as well as relevant experts, were conducted. In order to better understand compliance challenges and/or facilitators of previous interventions implemented at LBMs, two FGDs with LBM actors were also conducted. In addition to FGDs, informal observations were conducted in previously intervened LBMs to observe the current status of compliance to previous interventions, which included the use of infrastructure, PPE, handwashing and cleaning practices, as well as the condition of infrastructure and equipment that had been provided. Analysis of these data will help to inform a holistic, comprehensive intervention design to reduce the risk of zoonotic spillover of diseases at the selected high-risk interface (Bangladesh’s intervention – work plan activity 2.2.2.1).

Findings from the scoping review and preliminary data from the qualitative investigations were disseminated to nine national stakeholders – including representatives of the

Institute of Epidemiology, Disease Control and Research (IEDCR), Department of Livestock Services (DLS), Bangladesh Forest Department (BFD), and US Centers for Disease Control and Prevention (US CDC) – at a meeting at IEDCR on March 14, 2023. Feedback, comments and recommendations received from participants at this meeting include:

- A rigorous system should be developed to ensure successful implementation of future interventions.
- Consumers' feedback should be considered for designing and implementing future interventions.
- Interventions tested globally – not only in Bangladesh – should be explored to understand what interventions worked and how.
- To increase the involvement of government officials in the LBMs, annual performance plan should include tasks like LBM monitoring as their responsibility to ensure the sustainability of interventions.
- Advocacy should be done to the Ministry of Finance to allocate a budget to Economic Relations Department to develop LBMs. Field-level staff (veterinary officer/surgeon) of Dhaka North City Corporation (DNCC) should be included in future interventions for monitoring.
- Cultural perspectives of the consumers (e.g., checking live birds before buying) should be considered in intervention design.
- For sustainability, interventions should be aligned with government policies and acts
- Bringing perspectives of the government, policymakers, city corporations, market authorities, and all beneficiaries and implementers is necessary for intervention design. Involving policymakers in the interventions is necessary, as only they can make laws, acts, rules and regulations to make interventions sustainable.



*Visit to a live bird market in Dhaka identified through a scoping review that had previously implemented an intervention.
Photo credit: icddr,b*

Study 2 – Conduct a willingness-to-pay analysis to identify consumer considerations in relation to pricing, and a barrier analysis to identify barriers faced by stakeholders with regards to changing practices to improve biosecurity, biosecurity reporting, or prices changes (Bangladesh work plan activity 1.2.6.2):

The goal of this study is to understand barriers experienced by LBM stakeholders to change practices to improve biosafety and biosecurity, and evaluate consumer willingness to pay more for improved hygiene and safer poultry products. The study evaluates economic and sociocultural barriers to implementing, adopting and maintaining improved biosafety and biosecurity

practices. Understanding these factors will inform strategies for improving biosecurity and hygiene measures at LBMs (Bangladesh’s intervention – work plan activity 2.2.2.1).

This willingness-to-pay study is planned to be implemented in three phases: phase 1 - attribute elicitation (qualitative exploration with consumers); phase 2 - attribute ranking (rank consumer preferences using a quantitative survey); and phase 3 - discrete choice experiment (assess how much consumers are willing to pay for purchasing poultry from a LBM which follows a certain set of biosafety/biosecurity recommendations and hygiene measures). During this reporting period, qualitative data collection for attribute elicitation (phase 1) was completed by conducting 48 KIIs. In April, this data will be combined with biosecurity recommendations

from workshops planned as part of activity 2.2.2.1, and then ranked in the next phase of this activity.

Studies in Liberia

Study 1 – Investigate Lassa virus infection prevalence in rodents (Liberia work plan activity 1.2.6.1):

The goal of this study is to determine whether Lassa virus is present in areas where Lassa cases have not been historically reported in humans, and if present, to determine whether Lassa infection prevalence in rodents from these sites differs from sites where Lassa cases have been regularly reported in humans. Data from this study will inform the implementation of strategies for proper food and water storage in households and improved commercial and agricultural storage (Liberia’s intervention – work plan activity 2.2.2.2).

The three studies being conducted in Liberia (this study and studies 2 and 3 below) have significant overlap in terms of methodologies and logistics, so planning and implementation of these studies are being done in parallel. Much of the current reporting period focused on study design, implementation planning, supply procurement, and coordination of logistics (e.g., submission of ethical approvals and sampling permits).

Study 1 will be conducted in eight sites from Bong, Grand Bassa and Nimba counties. Of these eight sites, six are considered ‘Lassa’ sites, and two are considered ‘non-Lassa’ sites, based on whether or not they have had Lassa cases in humans reported in the last five years. The eight sites are categorized as urban (two sites), semi-urban (1 sites), and rural (five sites).

In March 2023, the team developed a number of documents in preparation for community engagement activities planned for April 2023. The purpose of the documents and community engagement activities are to request permission

from communities to conduct studies in their communities, and to provide them the opportunity to ask questions and raise any concerns. These documents included a concept note that explains the study in the context of the overall goals of STOP Spillover. Fieldwork for study 1 will begin in May 2023.

Study 2 – Study of the movement and contact patterns of the rodent reservoir hosts of Lassa virus (Liberia work plan activity 1.2.6.2):

The goal of this study is to understand the movement of rodents between communities and fields in Lassa and non-Lassa sites. Results from this study will support Liberia’s intervention (work plan activity 2.2.2.2) by informing the design of humane, evidence-based, effective rodent control measures for the Lassa virus reservoir host - *Mastomys natalensis* - and other rodents which may carry Lassa virus.

Study 2 will be conducted in the same eight sites as study 1. Fieldwork for study 2 will begin in May 2023.

Study 3 – Investigate behavior, practices and exposure to Lassa virus related to hunting, handling and consumption of rodents and household and environmental conditions that are risk factors for Lassa virus infection (Liberia work plan activity 2.2.2.1):

The goal of this study is to identify risk factors for Lassa virus spillover from rodents to humans, by better understanding the knowledge, activities, practices, and environmental conditions that facilitate Lassa spillover risks at household and community levels. This information will be used to inform strategies for proper food and water storage, and reducing rodent entry in households and commercial and agricultural storage facilities (Liberia’s intervention – work plan activity 2.2.2.2).

Twelve sites from Bong, Grand Bassa and Nimba counties were selected for this study. All of the sites at which study 1 and 2 will be conducted are also included in the sample plan

for study 3. Of the 12 sites, six are considered Lassa sites, and six are considered non-Lassa sites. The 12 sites are categorized as urban (two sites), semi-urban (two sites), and rural (eight sites).

In January 2023, questionnaires for FGDs and KIIs, and check-lists for direct participant observations were developed by the STOP Spillover Liberia country team and OH-DReaM working group members, with support from technical experts across STOP Spillover. Data collection will start in May 2023, and be completed by June 2023, after which data analysis and reporting will be conducted. Data will be used to design Liberia's intervention (Liberia work plan activity 2.2.2.2).

Studies in Sierra Leone

Study 1 – Investigate environmental variables, and sociodemographic and human behaviors and practices that increase the risk of exposure to *Mastomys* rodents (Sierra Leone work plan activity 1.2.6.1):

The goal of this study is to explore environmental determinants of household rodent abundance, and the connection between rodent abundance and the risk of zoonotic spillover of Lassa virus. Data from this study will be used to inform the design of activities to reduce human exposure to *Mastomys* rodents (Sierra Leone's supporting activity 1 – work plan activity 2.2.2.1).

In November, 2022, the STOP Spillover Sierra Leone team conducted a three-day workshop at which 45 OH-DReaM working group members developed data collection forms for FGDs with farmers, women, and youth; KIIs with experienced farmers, women, youth and traditional leaders; and direct participant observation of crop storage practices, farming practices and rat abundance for Lassa formative research. OH-DReaM working group members attending the workshop included representatives

from the Ministry of Health and Sanitation, the Ministry of Agriculture and the Ministry of Environment, as well as external partners such as Breakthrough Action and the Food and Agricultural Organization (FAO). Data collection forms were reviewed and refined in consultation with STOP Spillover partners and pilot tested in February 2023. Institutional review board (IRB) approval was received from Tufts University and the Sierra Leone Ethical Review Board in January/February 2023.

Following development of data collection forms, over a two-week period in February, 2023, the STOP Spillover Sierra Leone team and select members of the OH-DReaM working group established for this study conducted data collection in eight communities located around the Gola Rainforest National Park (GRNP) in Kenema District. Five FGDs, engaging 320 community members, and 3 KIIs, engaging 24 individuals, were conducted. The data was analyzed, and will form the basis of two reports – (1) a Lassa formative research report, describing the knowledge, attitudes, practices, beliefs and drivers of Lassa spillover in the high-risk interface, that will be used to design Lassa risk reduction interventions; and (2) a SBC report describing SBC approaches that could be used to support Lassa intervention adoption. These reports will be shared with USAID in May 2023, which is the one-year anniversary of the STOP Spillover Sierra Leone program. Some of the key findings from this study include:

- Rodent breeding is higher in the dry season than in the rainy season because of the availability of food and the favourable weather temperatures.
- Rats are abundant in barns, homes, and farms from October to March (late rainy and early dry seasons), which is the period when crops are harvested and stored in homes, which leads to increased rodent and human interactions.
- Knowledge of Lassa fever is low among community members.

- Methods used for drying and storing grains expose the grains to rats. Findings from these two reports will be shared back with target communities in quarter 3 of Project Year 3, and used to co-design interventions to reduce the risk of spillover of Lassa spillover in target communities (Sierra Leone’s supporting activity 1 – work plan activity 2.2.2.1), and accompanying SBC strategies encouraging communities to apply these interventions (Sierra Leone’s supporting activity 2 – work plan activity 2.3.1.1). Environmental data and data from rodent trapping exercises will be collected in quarter 3 and quarter 4 of Project Year 3, into Project Year 4, to support the validation of intervention efficacy and to identify potential variables that affect it.

Study 2 – Conduct a wild meat value chain analysis and characterize risk of spillover of Ebola virus along the value chain (Sierra Leone work plan activity 1.2.6.2):

The goal of this study is to identify and categorize high-risk contact points along the wild meat value chain that represent potential spillover risks for Ebola virus. Data from this study will inform the design and implementation of cost effective, culturally acceptable safety and prevention measures to reduce Ebola spillover

risks (Sierra Leone’s intervention – work plan activity 2.2.2.2).

In November 2022, the STOP Spillover Sierra Leone team conducted a three-day workshop at which OH-DReaM working group members developed data collection forms for FGDs with hunters, transporters, meat processors and wild meat traders; KIIs with hunters, transporters, meat processors, wild meat traders and traditional leaders; and direct participant observation of wild meat handling for Ebola formative research. The workshop was attended by 45 OH-DReaM working group members and representatives from Breakthrough Action and FAO. IRB approval was received from Tufts University and the Sierra Leone Ethical review board in January/February 2023.

In parallel to the data collection for study 1 which focused on Lassa virus, data for this Ebola-focused study was collected in eight communities around GRNP in Kenema District in February 2023 by the STOP Spillover Sierra Leone team and members of the OH-DReaM working group. Four FGDs and three KIIs were conducted in the eight targeted communities, with an additional FGD and two KIIs conducted at the wild meat market in Kenema. A total of 257 respondents participated in the five FGD, and 27 in in the four KIIs. Data was analyzed in March, and will form the basis of two reports –

FGD focusing on Lassa fever in Nyadehun, Kenema District, Sierra Leone. Photo credit: Tetra Tech



(1) an Ebola formative research report that describes the wild meat value chain in Kenema and identifies high-risk populations with the value chain, and (2) an SBC report which describes key knowledge, practices, beliefs and behaviors of high-risk actors in the value chain. The Ebola research report will be shared with USAID in May 2023. Some of the key findings from this study include:

- Hunting and availability of wild meat varies between seasons.
- More animals are hunted in the rainy season (May-October) when wildlife are more active along the forest periphery than during the dry season (November-April) when animals migrate deeper into the forest.
- There are fewer wild animals now than before because of deforestation and increased human and hunting activity, population, demand, forest patrol surveillance, and hunting restrictions.
- 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.
- The majority of transporters do not care about Ebola risks, but are willing to implement measures that will reduce their risk.

The findings from these reports will be shared back to community members in April 2023, to inform co-creation of interventions to reduce the risk of spillover of Ebola virus in the wild meat value chain in Kenema District (Sierra Leone’s intervention – work plan activity 2.2.2.2 and supporting activity 3 – work plan activity 2.3.1.2).



FGD focusing on Ebola in Korgohun, Kenema District, Sierra Leone. Photo credit: Tetra Tech

Studies in Cambodia

Study 1 – Research on bat ecology and the prevalence of pathogens carried by bats at bat guano farms (Cambodia work plan activity 1.2.6.1):

The goal of this study is to fill critical knowledge gaps by documenting the bat species at commercial bat guano farms and the viruses they harbor, and the scale of the bat guano industry in Kang Meas district, Kampong Cham province. Data from this study will inform the design of interventions to reduce the risk of spillover of zoonotic viruses amongst communities living on or near commercial bat guano farms

(Cambodia’s intervention – work plan activity 2.2.2.1).

This activity builds on a legacy of USAID investment in Cambodia regarding pandemic preparedness for global health security. Prior sampling events during the USAID-funded PREDICT project detected a range of pathogens, predominantly uncharacterized rhabdoviruses and alphacoronaviruses. No betacoronaviruses have been detected to-date at these sites, but sampling under PREDICT targeted only four farms over two years and the bat virome at these sites is still only partially described. Additionally, bat and guano sampling in the past has not been paired with a comprehensive set of contemporaneous environmental samples (see Cambodia’s study 2, work plan activity 1.2.6.2). This study is being conducted in partnership with Institut Pasteur du Cambodge (IPC).

The current reporting period involved setting up an OH-DReaM working group (established in December and submitted to USAID in March), getting IRB approval from Tufts and the National Ethics Committee for Health Research (in February), study design, implementation planning and procuring supplies. Field data collection will begin in April 2023 and continue through September 2023.

Study 2 – Food and water contamination assessment (Cambodia work plan activity 1.2.6.2):

The goal of this study is to understand practices and behaviors amongst community members that may increase the risk of contamination of their food and water. Data from this study will inform the design of interventions to reduce the risk of spillover of zoonotic viruses amongst communities living on or near bat guano farms (Cambodia’s intervention – work plan activity 2.2.2.1).



*Artificial bat roost, Kampong Cham province, Cambodia.
Photo credit: Tetra Tech*



Open water containers adjacent to an artificial bat roost in Kampong Cham province, Cambodia. Photo credit: Tetra Tech

During the current reporting period, STOP Spillover identified OH-DReaM working group members to participate in the study (submitted to USAID in March), submitted IRB requests and received approval from Tufts and the National Ethics Committee for Health Research (February 2023), developed a detailed action plan and budget, and procured supplies and equipment to support the study. Data collection will begin in April 2023, and will be completed in May 2023.

Study 3 – National risk assessment to prioritize high-risk bat-human interfaces throughout Cambodia (Cambodia work plan activity 1.2.6.3):

The goal of this activity was to bring together stakeholders for a national-level risk assessment to inform decisions regarding expanding STOP

Spillover activities at the bat-human interface beyond STOP Spillover’s initial focus at bat guano farms in Kampong Cham province.

During Cambodia’s national stakeholder engagement and OM workshop, conducted in Project Year 2 (the first year of project implementation in Cambodia), stakeholders prioritized bat guano farms using artificial roost in Kampong Cham province as an appropriate initial focus for STOP Spillover, building on previous work by PREDICT and IPC.

Stakeholders also identified other potentially high-risk locations in Cambodia where spillover risk could be reduced through STOP Spillover interventions. STOP Spillover organized a national-level risk assessment in March 2023 to assess and prioritize additional locations for

future work at the bat-human interface in Cambodia.

The objectives of the national-level risk assessment were to gather relevant experts from government, academia and NGOs to: (1) identify known bat-human interface locations in Cambodia with potential for spillover of priority zoonotic viruses; (2) select a subset of interface locations for in-depth discussion; (3) characterize the sites, including the ecological and socio-cultural context (e.g. cross-species contact, biodiversity, economic or cultural uses), key high-risk behaviors; and (4) prioritize a small number of candidate locations and potential future risk-reduction interventions. The assessment process was conducted in two parts: a one-day virtual workshop, followed by a one-day in-person workshop. The virtual workshop was convened on March 1, 2023, with five participants representing foreign researchers and NGO staff based in North America, Europe and Southeast Asia, all of whom had worked at bat-human interfaces in Cambodia. The in-person workshop took place on March 2, 2023, in Phnom Penh. Twenty participants represented key stakeholders from the national, provincial and district level, attended, including officials from the Communicable Disease Control Department (CDCD), General Directorate of Animal Health and Production (GDAHP), National Animal Health and Production Research Institute (NAHPRI), Provincial Health Department (PHD), Provincial Department of Agriculture, Forestry and Fisheries (PDAFF), and Forestry Administration of Battambang, Kampong Speu and Steung Treng provinces, as well as academic participants from the Royal University of Phnom Penh (RUPP), and NGOs including Wildlife Conservation Society, FAO and IPC. Findings from the virtual workshop were combined with those from the in-person workshop.

During the workshops, 35 sites were identified, 15 of which were identified by multiple working groups across both the in-person and virtual workshops. Six locations in Battambang and



Participants at the national-level risk assessment in Cambodia prioritizing potential locations for future STOP Spillover interventions at bat-human interfaces. Photo credit: Tetra Tech

Kampot provinces were selected for site visits by the STOP Spillover Cambodia team – which were conducted immediately following the workshop – to ground-truth collected information from the workshops to inform final site selection and intervention design.

Technical experts from across STOP Spillover were convened to refine and prioritize potential interventions and locations discussed during the workshops and field trips. STOP Spillover selected a final list of priority geographies and potential interventions using the following criteria:

- High expected risk reduction impact on STOP Spillover priority pathogens based on solid evidence base for both presence of hazard and exposure, as well as likely efficacy of the intervention in reducing risk
- Ready for implementation without an extended research phase
- Positive synergistic conservation impacts and partnership opportunities
- Potential for scalable impact to a larger audience than initial implementation
- Permissive enabling environment with few external barriers to success, and a high likelihood of support from local communities and key stakeholders.

A workshop report was submitted to USAID in late March, and potential interventions will be submitted to USAID in April as a potential

modification to Cambodia’s work plan for Project Year 3.

Surveillance

Designing, implementing and validating effective interventions to reduce the risk of spillover, amplification and spread requires supporting community-level surveillance. STOP Spillover surveillance activities are implemented in partnership with relevant in-country stakeholders, leveraging existing in-country capacity and reinforcing One Health approaches. Wastewater and liquid waste effluent surveillance has been shown to provide two-to-three weeks of ‘early warning’ for various pathogens, including viruses, and to help identify clusters of infection circulating in populations of animals and/or humans. In the context of STOP Spillover, water monitored for the presence of viruses can include, amongst others: wastewater downstream of population centers, effluent from livestock production facilities, wildlife game parks, and wild meat markets. During this reporting period, work on wastewater and liquid waste effluent surveillance focused on three countries: Uganda, Liberia, and Côte d’Ivoire. Future wastewater and liquid waste effluent surveillance may be included in other country work plans, pending results from Y3 surveillance work.

Surveillance in Uganda

Wastewater surveillance (Uganda work plan activity 1.4.6):

For sustainability, STOP Spillover will integrate its planned wastewater surveillance activities with surveillance activities already in place. STOP Spillover work on wastewater surveillance in Uganda is conducted in collaboration with the Expanded Program on Immunization (EPI) laboratory under the Uganda Virus Research Institute (UVRI), which currently carries out

polio wastewater surveillance. During this reporting period, STOP Spillover worked with UVRI to incorporate other priority zoonotic pathogens – notably, Ebola, Marburg, coronaviruses, and highly pathogenic avian influenza, into their surveillance strategy. STOP Spillover worked with UVRI to co-develop a standard operating procedure (SOP) for wastewater and surface water surveillance. An initial dry run (proof of concept) was conducted in February 2023 by the UVRI team in Bundibugyo. This involved collection of water samples from four sites that included hospital effluent, as well as selected surface water points, and the subsequent transport of collected samples to UVRI’s laboratory in Kampala. Collected samples were stored for testing, which is expected to be completed in quarter 3 of Project Year 2.

Surveillance in Liberia

Situational analysis for spillover surveillance and monitoring (Liberia work plan activity 1.4.10.1):

As part of broader surveillance strategies for Lassa virus, the STOP Spillover Liberia country team supported the development of a spillover surveillance and monitoring framework. STOP Spillover supported key stakeholders to develop a framework for wildlife surveillance, including specific actions to be undertaken, anticipated resource needs, and policy frameworks required to conduct a sustainable and effective country-led surveillance strategy for Lassa. The intention is to encourage and empower stakeholders to develop a comprehensive strategic plan for wildlife surveillance and monitoring.

At the end of Project Year 2, a workshop was convened in Nimba County to create consensus and a common vision on the need for surveillance at human-wildlife interfaces to detect known viruses such as Ebola, highly pathogenic avian influenza, SARS coronaviruses,

and Lassa virus, for prevention, early detection, and effective outbreak response. In December, 2022, a one-day follow-up session was held with 15 stakeholders to validate the framework. Based on these workshops, the STOP Spillover Liberia country team developed a wildlife disease surveillance situational analysis report, which was submitted to USAID in March.



Participants at a workshop in Monrovia, Liberia, to discuss surveillance at human-wildlife interfaces. Photo credit: AFROHUN

Wastewater and liquid waste effluent surveillance (Liberia work plan activity 1.4.6):

For sustainability, STOP Spillover will integrate its planned wastewater and liquid waste effluent surveillance activities with surveillance activities already in place. STOP Spillover's work on wastewater surveillance in Liberia is conducted in collaboration with the National Reference Laboratory (NRL) and the National Public Health Institute of Liberia (NPHIL), and the Liberia Water and Sewage Corporation (LWSC).

During this reporting period, STOP Spillover worked with NPHIL and LWSC to co-develop an SOP for sample collection, transport, storage, and analysis. This SOP was shared with USAID in March, 2023. Sites from which samples will be collected will be selected based on a risk

framework which will identify high-risk wastewater sites for human fecal shedding of filoviruses and SARS-CoV-2, as well as liquid waste effluent at wild meat markets where risk of filovirus transmission is elevated. Final decisions on waste water sample sites will be confirmed in the next reporting period (April - September 2023).

Surveillance in Côte d'Ivoire

Surveillance assessment (Côte d'Ivoire work plan activity 1.4.1.1)

The STOP Spillover Côte d'Ivoire country team initiated data collection on surveillance systems, laboratory capacity and initiatives focusing on the human-wildlife interface. The purpose of the surveillance assessment is to describe surveillance systems and processes in high risk human-wildlife interfaces in the intervention site (District des Montagnes) where STOP Spillover intends to conduct surveillance and risk monitoring activities, as well as interventions to prevent spillover, amplification and spread of dangerous pathogens.

Wastewater and liquid waste effluent surveillance (Côte d'Ivoire work plan activity 1.4.6):

For sustainability, STOP Spillover must integrate its planned wastewater and liquid waste effluent surveillance activities with surveillance activities already in place. STOP Spillover's work on wastewater and liquid waste effluent surveillance in Côte d'Ivoire is conducted in collaboration with the Côte d'Ivoire Ministry of Environment and Sustainable Development (MINEDD), Ministry of Water and Forests (MINEF), Ministry of Animal Resources and Fisheries (MIRAH), the Directorate of Veterinary Services, the National Laboratory of Agricultural Development Support (LANADA), Institut Pasteur de Côte d'Ivoire (IPCI), and other stakeholders.

Throughout this reporting period, STOP Spillover worked with IPCI to co-develop and refine an SOP for sample collection, transport, storage, and analysis. While IPCI is the only stakeholder in Côte d’Ivoire to have laboratory facilities suitable for handling Ebola and Marburg viruses, other laboratories, such as LANADA, will be involved in implementation for other viruses of interest, as appropriate. This SOP was shared with USAID in March 2023. Final decisions on surveillance sites will occur during the next reporting period (April - September 2023).

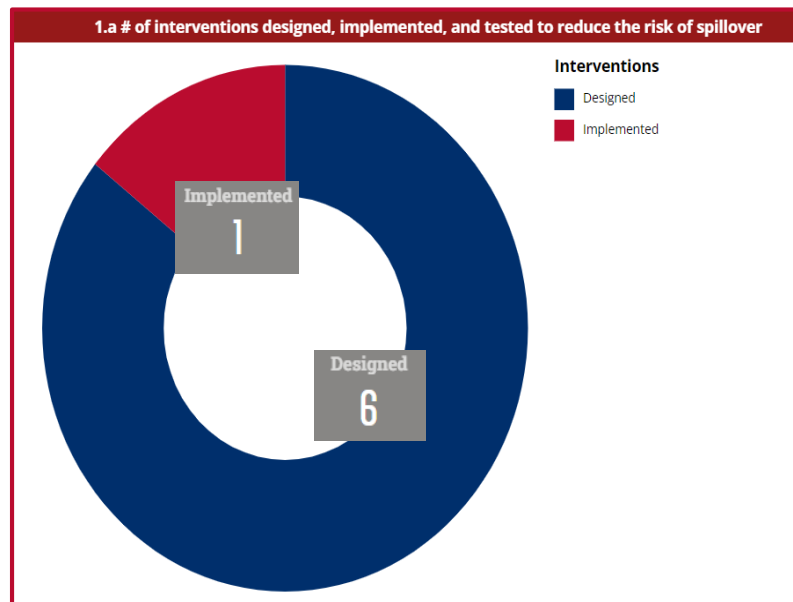
OBJECTIVE 2

Objective 2 focuses on assisting countries to design and implement interventions to reduce the risk of priority zoonotic viruses spilling over from animals to people. Risk-reduction activities implemented as part of STOP Spillover are informed by OM and research conducted under Objective 1. STOP Spillover works with country-level partners to design, implement, and validate interventions to reduce spillover. STOP Spillover’s validation process will focus on whether interventions are effective, low cost, sustainable, scalable, context appropriate, gender responsive and/or culturally acceptable. This section of the report outlines STOP Spillover’s achievements and accomplishments related to Objective 2 during the first half of Project Year 3.

Risk-Reduction Interventions at Prioritized Interfaces

Activities conducted under Objective 1 focus on understanding the risk of zoonotic spillover at specific high-risk animal-human interfaces. Activities conducted under Objective 2 focus on utilizing that improved understanding to develop and test interventions to reduce the risk of zoonotic spillover. Evidence-based interventions

contextualized to specific interfaces are needed to reduce zoonotic spillover risks. STOP Spillover prioritizes interventions that are most likely to be sustainable without external funding, using feedback from local stakeholders which is integrated into intervention design.



Risk-Reduction Interventions in Uganda

Intervention – Promote protection of household and communal water resources and food safety (Uganda work plan activity 2.2.2.1b):

Informed by findings from Uganda’s study 2, this intervention involves selecting practices designed to mitigate the risk of contamination of water and food by bat excreta. This intervention was designed to target mostly female household members, whose roles include collecting, storing, and protecting water and food; however, male household members are also targeted. The activity involves developing and testing simple, easy-to-use, and locally available tools using a TIPs approach.

During this reporting period, STOP Spillover conducted a workshop to gather critical information to inform the design of the

intervention. Specifically, the objectives of the workshop were: to identify current food and water safety practices among community members; to sensitize communities about the planned TIPs process and the importance of food and water safety practices; to select and co-design potential practices to test through the TIPs process; to identify motivators and barriers which influence food and water safety practices; and to identify households willing to participate in the TIPs process. A workshop was conducted in Bundibugyo, supplemented by three smaller workshops at the sub-country level (Burondo, Harugale and Ntandi), involving 75 participants in total. Participants represented at least 12 households from each of the three targeted sub-counties. Following this workshop, a TIP report was drafted which will be shared with USAID in quarter 3 of Project Year 3. Results will be shared with local partners and stakeholders for future use.

Risk-Reduction Interventions in Viet Nam

Intervention – Use trials of improved practices on demonstration farms to identify feasible biosafety improvements. Implement SCB interventions using communications materials and exchange visits to biosafety demonstration farms to disseminate results (Viet Nam work plan activity 2.2.2.1):

Informed by findings from Viet Nam’s studies 1 and 2, this intervention involves selecting practices designed to promote biosafety at wildlife farms and testing and adapting each using the TIPs methodology.

Three TIPs are planned in Viet Nam as part of this intervention. During Project Year 2, the first of the three TIPs was conducted. This first TIPs focused on promoting the use of PPE at sambar deer farms in Hieu Liem commune, Dong Nai province. During this reporting period, the STOP Spillover Viet Nam team, in collaboration with the Department of Agriculture and Rural



A sambar deer farm in Dong Nai province, Viet Nam, participating in a TIPs. Photo credit: VOHUN

Development (MARD) of Dong Nai province, conducted follow-up visits to sambar deer farms to monitor and evaluate PPE use. Monitoring visits utilized a mixture of face-to-face interviews, observational monitoring using checklists, and focus group discussions at 10 sambar deer farms in Hieu Liem commune. The initial phase of the first TIPs focused on sambar deer farms, but during this reporting period the promotion of PPE use was expanded to other types of wildlife farms. STOP Spillover conducted a practical guidance session at a porcupine farm in Vinh An town in March 2023, with the enthusiastic participation of representatives of 10 wildlife farms involved in bamboo rat, civet, and porcupine farming

During this reporting period, work for the second and third TIPs in Viet Nam focused on selecting the most appropriate biosafety practices to test. Rigorous analysis of data collected from studies 1 and 2 in Viet Nam culminated in the selection of the following TIPs:

- **A comprehensive approach to improving waste management, handling and processing on wildlife farms (priority focus on civet and bamboo rats:** STOP Spillover proposed a TIPs intervention including implementation of a comprehensive approach to improving wildlife farm waste management, handling and processing. Adopting an improved approach to animal waste treatment on

wildlife farms will lead to the following expected outcomes: reduced risk of zoonotic disease transmission from wildlife farm waste; reduced frequency of worker exposure to viral pathogens from animal waste due to handling dry waste instead of wet waste due to daily water-based cleaning; enhanced value of treated waste for fertilizing crops; reduced environmental contamination (air, soil, water) with zoonotic pathogens and other pollutants.

- **Improved biosafety and biosecurity through health care, disease control and disease surveillance for farmed wildlife:** STOP Spillover proposed a package of practices related to captive wildlife health management. Adopting these animal health management practices on wildlife farms will lead to the following expected outcomes:

improved health of captive wildlife; decreased risk of disease transmission from captive wildlife to humans; increased disease reporting on wildlife farms; and increased coordination and communication between human health and captive wildlife health institutions and stakeholders.

Implementation of these TIPs is set to begin as we enter the second half of Project Year 3. The TIPs process applied in Viet Nam leverages a peer educator approach that creates community champions to drive the process forward. Baseline research found that the wildlife-farming community has extensive peer networks for information and knowledge exchange that include social media platforms. The hypothesis is that investing in existing peer information sharing networks – including social media

Visiting a porcupine farm in Dong Nai province, Viet Nam. Photo credit: VOHUN



platforms – will result in sustained intervention adoption based on local informal institutions, as opposed to an external extension model such as demonstration farms.

Risk-Reduction Interventions in Bangladesh

Intervention – Develop a holistic, multi-pronged design for LBMs with improved biosecurity and hygiene measures that reduce the risk of spillover (Bangladesh work plan activity 2.2.2.1):

Informed by findings from STOP Spillover Bangladesh studies 1 and 2, this intervention involves working with international, national and local stakeholders to design infrastructural improvements, biosecurity and hygiene guidelines/SOPs, and biosecurity and hygiene compliance monitoring plans for LBMs.

A workshop conducted on March 30, 2023 brought together 15 national stakeholders to discuss additional research findings (see Bangladesh’s study 1 – work plan activity 1.2.6.1) and to advise on plans for a future workshop to design biosecure LBMs. During the discussion to plan a follow-up workshop to design biosecure LBMs – planned for April, 2023 – participants provided important feedback and recommendations on different components of LBM intervention design. Feedback, comments and recommendations received from participants at this meeting include:

- Implementers should be accountable to the government to ensure the sustainability of the intervention.
- The government should have an implementation policy and human resources to monitor the progress of the intervention implementation to ensure accountability.
- Social science or anthropological perspective is necessary for developing

awareness messages to change people's mindset and behavior.

- Hygienic market rules must be followed to design intervention.
- Processed meat must be prepared and sold according to Bangladesh Standards and Testing Institution (BSTI) regulations to ensure the quality of the meat.
- It is crucial to have a phase out strategy in future intervention designs.



National-level workshop to disseminate findings from STOP Spillover studies in Bangladesh and begin planning for the design of interventions at LBMs. Photo credit: icddr,b

Risk-Reduction Interventions in Liberia

Intervention – Promote proper food and water storage, and rodent-proofing households and commercial and agricultural storages (Liberia work plan activity 2.2.2.2):

Informed by findings from Liberia’s studies 1, 2 and 3, this intervention involves reducing rodent-human interactions by preventing rodents from entering space where humans live or store their food/water.

During this reporting period, work towards this intervention focused on the studies which will

inform the design of the intervention (see Liberia’s studies 1, 2 and 3 – work plan activities 1.2.6.1, 1.2.6.2 and 2.2.2.1).

Risk-Reduction Interventions in Sierra Leone

Intervention – Promote improved biosafety practices for actors involved in the wild meat value chain to reduce the risk of Ebola spillover associated with wild meat hunting, trading, and consumption (Sierra Leone work plan activity 2.2.2.2):

Informed by findings from Sierra Leone’s study 2, and supported by SBC strategies developed through Sierra Leone’s work plan activity 2.3.1.2, this intervention involves the promotion of safe wild meat handling practices to reduce the risk of Ebola virus transmission in the wild meat market in Kenema District.

In February 2023, the STOP Spillover Sierra Leone team, in collaboration with the Kenema District Health Management Team and District Livestock Officer, engaged wild meat traders, processors, and local chiefs in Kenema town. The purpose of this engagement was to obtain local-level buy-in and approval for testing biosafety practices at the main wild meat market. Stakeholders (largely women wild meat traders) approved an intervention focused on testing different kinds of PPE in the market. This engagement was an important first step in implementing interventions at the wild meat market. A control market in Bo District was also identified for validation and attribution of impact.

Biosafety interventions in the wild meat market will start in April 2023, with initial work focusing on establishing the evidence for the feasibility, acceptability, and sustainability of selected biosafety measures in the wild meat market. Processors and traders of wild meat will be supplied with PPE and materials, including

waterproof boots, face shields, elbow gloves, overall garments, and detergents. SBC efforts will be designed to support and sustain PPE adoption, using data from Sierra Leone’s study 2. The use of the biosafety materials is the first layer of a package of interventions that will be conducted at the wild meat market. The team will also target improvements of water, sanitation and hygiene (WASH) practices and facility at the market. The final report from this intervention will be available in June 2023.

Risk-Reduction Interventions in Cambodia

Intervention – Community-level risk-reduction interventions (Cambodia work plan activity 2.2.2.1):

Informed by Cambodia’s studies 1 and 2 on bat ecology and food and water safety, interventions will be designed, implemented and refined using TIPs methodology. This process will target effective risk reduction measures to the key sub-behaviors and roll out relevant SBC activities to improve hygiene and risk-reduction practices and behaviors of bat guano producers and neighboring households in bat guano farming communities in Kampong Cham province.

Between February 28 and March 3, 2023, the STOP Spillover Cambodia team, in collaboration with OH-DReaM working group members, conducted a mixed-methods survey to explore gaps and areas of uncertainty related to commercial bat guano producer behavior and risk factors. Research topics covered the drivers of zoonotic spillover risks, and current knowledge, attitudes, beliefs and practices of people related to social, behavioral, cultural, gender and economic risk factors. In addition, the survey identified food hygiene and water quality practices of bat guano producers and other members of their communities. 67 respondents (55% women) at 67 households were interviewed, and 20 households were observed in

order to understand local practices with regards to biosafety, risk reduction, and hygiene related to bat guano production. The research team also conducted three FGDs with bat guano producing men’s groups, women’s groups and non-bat guano producing groups, all residents of the same village. Five KIIs were conducted with important stakeholders: the commune chief, the commune committee for women and children, the head of the local health center and two representatives from the bat guano producers. This study identified behavior changes, barriers, influencers and key opportunities that will contribute to the design of interventions to reduce spillover risks at the bat-human interface in Kampong Cham. A report has been drafted and will be submitted to USAID in April 2023. Following these results, TIPs will be co-designed with bat guano producers in quarter 3, Project Year 3

Supporting Activities in Uganda

Supporting activity 1 – Engage communities through a social behavior change interventions strategy to keep bats out of households and promote safe practices (Uganda work plan activity 2.2.2.1a):

This activity involves rolling out an SBC strategy – developed based on findings from Uganda’s study 2 – for addressing practices, behaviors, and norms that put families and communities at risk of viral spillover. This SBC strategy will support and strengthen Uganda’s intervention to promote safe practices for protecting food and water resources at the household and communal level (Uganda’s intervention – work plan activity 2.2.2.1b).

During this reporting period STOP Spillover drafted an SBC strategy and plan for addressing practices, behaviors, and norms that put families and communities at risk, and promote sustainable, locally available ways to keep bats out of households, as well as safe practices around human interactions with bats. The strategy – currently in draft form – provides a roadmap outlining multiple prioritized interventions and channels at different levels to increase impacts, such as community dialogue, interactive radio programs, and interpersonal communication.

Between October 31 and November 9, STOP Spillover conducted a multi-day community engagement exercise, targeting communities from Harugale, Burondo and Ntandi town council in Bundibugyo. This activity was guided by earlier consultative stakeholders’ meeting and participatory assessments on human interactions with bats in Bundibugyo District with a focus on designing barriers and use of bat repelling plants to keep bats out of households and community buildings and promote practices to live safely with bats. Key outputs from this community engagement exercise included: identifying a list

Participants at a FGD in Cambodia. Photo credit: Tetra Tech



Supporting Activities at Prioritized Interfaces

The core focus of Objective 2 is the development and testing of interventions that reduce the risk of spillover. However, some activities conducted as part of Objective 2 are designed, not to directly interfere with transmission pathways of prioritized viral pathogens, but to strengthen and support core interventions.

of households, schools, women's groups, and places of worship where barriers will be tested; identifying local artisans to support the design of barriers preventing entry of bats into buildings; identifying key social and cultural barriers and motivators for living safely with bats; identifying local influencers and channels of communication for SBC; and identifying bat repelling plants to potentially test.

In addition to the community engagement activity, STOP Spillover conducted several other community meetings during this reporting period. Between December 5 and 10, 2022, the STOP Spillover Uganda team visited individual households and community buildings with bats to understand the barriers, needs, availability of locally available materials and reliable sources and cost of bat repelling plants (rosemary and mint). In February 2023, STOP Spillover trained 120 women from Harugale, Burondo and Ntandi on the planting and care of plants that repel bats. A flipchart to convey key messages for living safely with bats was pre-tested among women and village health teams. The purpose of this pre-test was to obtain feedback from the audiences about the illustrations, messages and layout to inform its adaptation for rolling-out to communities across Bundibugyo.

Results of this activity will be shared with local partners and stakeholders to inform future interventions.

Supporting activity 2 – Develop and evaluate a community-based bat-human interface monitoring program for zoonotic spillover early warning and response (Uganda work plan activity 2.2.2.2):

Informed by the findings from Uganda's study 1, this activity involves developing a participatory bat monitoring program centered around community-driven participatory mobile phone-based surveillance.

Between December 5 to 10, 2022, 15 bat monitoring agents and nine district and non-district staff were trained on basic bat ecology, mapping resources, and in the collection of data using Open Data Kit (ODK; getodk.org) tools for bat monitoring. The bat monitoring program has been operating since February 2023, with data collection occurring twice per month. STOP Spillover developed tools and SOPs, and trained 15 community members in participatory bat surveillance.

A key component of this activity is training and strengthening the capacity of local stakeholders to conduct participatory surveillance using participatory epidemiology methods. A 10-day

Launch of community-based bat monitoring program in Bundibugyo District, Uganda. Photo credit: AFROHUN



training was conducted between November 15-24, 2022. Nineteen participants from a range of One Health disciplines appropriate to address the mitigation of spillover risk from bats to man were selected to attend the 10-day training. Participants included veterinarians, bat ecologists, conservation biologists, social workers, medical personnel, environmentalists, public health practitioners and government administrators. Participants were drawn from local government officials at the interface district, OH-DReaM working groups, tour guides, park rangers, surveillance focal persons, Red Cross community surveillance volunteers, and parish administrators. Key outputs of this 10-day training included: an initial list and map of sentinel surveillance sites; a list of bat monitoring agents across different parishes and villages; a list of key informants across the bat-human value chain to be engaged; and a draft bat monitoring framework to guide the community bat-human monitoring program.

Supporting Activities in Viet Nam

Supporting activity 1 – Establish a coordination mechanism at the provincial level by developing implementation guidelines for coordinated action and establishing sub-level steering committees (Viet Nam work plan activity 2.1.1.1):

This activity involves creating coordination guidelines at the provincial level; developing SOPs to inform the function of these local level coordination mechanisms; and establishing sub-level zoonotic disease spillover steering committees to strengthen One Health partnerships.

During Project Year 2, STOP Spillover successfully oversaw the development of guidelines for how actors in the One Health sector should coordinate and collaborate, including SOPs for informing local level coordination. These guidelines were approved by



Workshop to disseminate guidelines for coordinated action for zoonotic diseases in Dong Nai province, Viet Nam.

Photo credit: VOHUN

Dong Nai Department of Health (DOH) and Dong Nai Department of Agriculture and Rural Development (DARD), on September 30, 2022. During the current reporting period, STOP Spillover focused on the dissemination of these guidelines to maximize their use.

In January 2023, STOP Spillover, in collaboration with DARD and DOH, collected baseline information on the current practices of coordination at local level. KIIs were conducted with 40 stakeholders, and an online questionnaire was used to collect information from more than 100 respondents. Additionally, STOP Spillover convened a three-day workshop from February 22-24, 2023 on the coordination mechanism guidelines on prevention and control of zoonotic diseases. The workshop introduced the approved coordination mechanism guidelines on the prevention and control of zoonotic diseases to implementers and relevant stakeholders from provincial and district level, provided detailed instructions on how to apply the guidelines in the actual work of implementers at provincial and district levels, and provided training of trainers on outbreak investigation and response - a key content of the guidelines. A framework and indicators for the monitoring and evaluation of guideline implementation were also discussed. Sixty participants attended the workshop, including key implementers from human health and animal health sectors at provincial and district levels. The event provided a platform for knowledge sharing and discussion among participants, facilitating effective coordination and collaboration in the prevention and control of zoonotic diseases. The dissemination workshop on the coordination mechanism guideline on

prevention and control of zoonotic diseases was a significant step towards achieving the goal of preventing and controlling zoonotic diseases in Dong Nai province. By providing implementers with the necessary skills and knowledge, the workshop aims to improve the effectiveness of zoonotic disease prevention and control efforts in the province.

Supporting activity 2 – Consolidate zoonotic disease monitoring data on wildlife farms with human health and livestock data and develop reporting procedures to improve data sharing and planning among sub-committee members (Viet Nam work plan activity 3.1):

This activity involves strengthening stakeholder capacity for evaluating risk at the interface level and promoting cross-sector sharing of data.

The field work and data collection for this study was conducted during Project Year 2, with the current reporting period focusing on data analysis and using that data to inform next steps. STOP Spillover developed a comprehensive report, approved by USAID in March 2023, highlighting the current status of zoonotic disease monitoring in Dong Nai. STOP Spillover’s report highlights some of the major difficulties and challenges in zoonotic disease data collection, management:

- Local veterinarians and officials at the district and commune levels have limited knowledge about zoonotic or wildlife disease in wild animals.
- There is limited coordination among relevant units in the province at all levels, especially between district and commune levels.
- There is no specific reporting guideline for zoonotic disease cases incidents in animals. In fact, farm owners rely solely on informal farmer networks to learn about treating wildlife diseases.
- The existing, specialized data management systems used by local sub-sectors are

limited and do not include capacity for reporting wildlife disease events.

- There are significant barriers to the management and sharing of zoonotic disease data. Zoonotic disease data is mainly for longitudinal reporting to line ministries of each department. Zoonotic disease data is not yet integrated among related sectors in the province.
- There is no common platform to update and manage zoonotic disease in wildlife and human populations.

The report identified several policy and technical recommendations for provincial and local governments to support data sharing and integration and overall operational coordination and integration between the sectors. Going forward, STOP Spillover’s contribution to data integration will focus on assuring the successful implementation of a comprehensive approach to coordination based on the coordination guidelines adopted by DOH and DARD in Project Year 2 of STOP Spillover, and future activities that facilitate the increased availability of wildlife health information.

Supporting Activities in Bangladesh

Supporting activity 1 – Establish an integrated, coordinated and sustainable platform for information sharing, advocacy, and co-designing, co-implementing, and co-monitoring of surveillance activities and interventions at the LBMs (Bangladesh work plan activity 2.2.2.2):

This activity involves supporting local stakeholders to develop coordinated and sustainable platforms for pathogen surveillance in LBMs. The activity focuses on two platforms: one is an integrated **data** sharing platform for surveillance and early detection activities; the other is a coordinated **information** sharing platform between different stakeholders for co-

designing, co-implementation and co-monitoring of surveillance and intervention activities.

During this reporting period, the STOP Spillover Bangladesh team conducted several workshops, group discussions and meetings with national stakeholders to co-develop plans for the creation/enhancement of integrated, coordinated and sustainable platforms.

For the integrated data sharing platform for surveillance and early detection, a group discussion was conducted with One Health experts at the IEDCR on October 27, 2022, to understand the common data sharing platforms that exist in Bangladesh for One Health/zoonotic disease surveillances, and the gaps that need to be addressed to enhance their functionality. Discussions also took place during a meeting of the One Health Secretariat (OHS) National Coordination Committee on December 8, 2022. From these meetings, STOP Spillover learned that there is no coordinated data-sharing platform for LBMs or avian influenza in Bangladesh, and experts from Bangladesh recommend that any data sharing platform for LBM or avian influenza be integrated within a general One Health platform sharing data for other zoonoses and One Health issues. The One Health Event Based Surveillance Enhancement and Data Visualization Dashboard, officially launched on 14 March 2022, is the only existing platform for sharing human and animal health surveillance data in Bangladesh.

For the coordinated information sharing platform, a group discussion was conducted with One Health experts at IEDCR on November 21, 2022, and further discussions took place during a meeting of the OHS National Coordination Committee on December 8, 2022. At the meetings, stakeholders highlighted two existing platforms – (1) OHS, the overarching supervisory body (currently consisting of representation from three government departments) for guiding and monitoring One Health activities in the country; and (2) One Health Bangladesh (OHB), a civil society forum

– that should be used as the common information-sharing platform(s), rather than developing a new platform. OHS was recommended as the most appropriate platform to maximize sustainability because it is an approved government body.

Based on the workshops and meetings on both the data sharing and information sharing platforms, and the planned STOP Spillover activities being implemented in Bangladesh, STOP Spillover agreed to support the recruitment/secondment of an IT staff member at OHS to support tasks related to STOP Spillover work plan activities 2.2.2.2 and 2.2.2.3 (Bangladesh's supporting activities 1 and 2), and to provide budgetary support for procuring equipment to support the tasks of the IT staff member.

Supporting activity 2 – Develop and support utilization of an app-based system to report poultry workers' health status and unusual mortality in poultry and wild birds in and around LBMs (Bangladesh work plan activity 2.2.2.3):

This activity involves developing a mobile phone app for workers at LBMs to report their health status or unusual mortality of poultry and wild birds in and near LBMs.

During this reporting period, the STOP Spillover Bangladesh team successfully engaged the final key stakeholders critical for the sustainability of this app: BFD and DNCC. Together with the endorsements obtained from the OHS, IEDCR and the Department of Livestock Services (DLS) at the end of Project Year 2, the team has now secured all required endorsements to initiate the activity. On January 29, 2023, the STOP Spillover Bangladesh team conducted an extended meeting with the market committee and all shop owners of a market to introduce the reporting system and get their feedback. An app developer was selected through an open selection process, and the app is currently in development.



Examples of the type of grain storage facilities (left) and houses (right) that will be targeted by STOP Spillover in Sierra Leone to reduce human exposure to rodent contaminants, thereby reducing the risk of spillover of Lassa virus to humans. Photo credit: Tetra Tech

Supporting Activities in Sierra Leone

Supporting activity 1 – Co-design and test rodent-proofing systems for household foods and stored grains to reduce human exposure to rodent contaminants (Sierra Leone work plan activity 2.2.2.1):

Informed by findings from study 1, this activity involves collaborating with local stakeholders, private sector actors and communities to develop locally-appropriate, cost effective and culturally acceptable improved grain storage systems to reduce rodent access to stored grains, thereby reducing the risk of human exposure to rodents potentially harboring Lassa virus.

The design of this activity is dependent on completion and analysis of findings from Sierra Leone’s study 1 (work plan activity 1.2.6.1). A draft report will be shared with USAID and a simplified report will be shared with participating communities in April 2023. Community consultations will result in co-designed interventions to improve grain storage systems to reduce rodent contamination, thereby reducing Lassa spillover risk.

Supporting activity 2 – Lassa SBC activity (Sierra Leone work plan activity 2.3.1.1) & Supporting activity 3 – Ebola SBC activity (Sierra Leone work plan activity 2.3.1.2):

The overall goal of these two supporting activities is to develop effective and evidence-based SBC strategies to facilitate the adoption of improved food safety and biosafety practices to mitigate the risk of spillover of Lassa (supporting activity 2) and Ebola virus spillover risks (supporting activity 3).

In November 2022, the STOP Spillover Sierra Leone team conducted a combined Lassa and Ebola SBC lessons learned workshop. The purpose of the workshop was to identify successful approaches and key lessons learned from previous work on Lassa and Ebola, setting the stage for formative research and the development of SBC strategies to encourage food safety practices to reduce Lassa spillover, as well as to promote biosafety practices that reduce Ebola spillover risks. The workshop was attended by 40 participants including members of the OH-DReaM working groups, partners working in the One Health space, including representatives from Breakthrough Action, GOAL, Njala University, University of Sierra Leone, Ministry of Agriculture and Forestry, Ministry of Environment, GRNP, the Ministry of Health and Sanitation, and members from communities targeted by STOP Spillover. Data and information collected from this workshop was combined with data obtained through Sierra

Leone’s studies 1 (Lassa) and 2 (Ebola). A workshop report will be shared with USAID in April 2023. Some of the key findings from this workshop include:

- Community Health Workers, traditional chiefs, religious leaders, mammy queens (women leaders), nurses and other district health officers were identified as the trusted sources of health information in the community.
- Wild meat plays an important role as food, medicine, and in spiritual activities in rural communities.
- Animal skins are used to make local drums.
- Most hunters do not consider the handling of dead meat as a risky behavior because they have been doing it for many years and as still alive.

Supporting Activities in Cambodia

Supporting activity – Coordination and capacity building of a local sentinel surveillance team (Cambodia work plan activity 2.2.2.2):

The overall goal of this activity is to activate the existing, but dormant, Zoonosis Technical Working Group and strengthen its capacity to oversee a new sentinel surveillance team at the community level to enable rapid detection of – and fast response to – a spillover event at the bat-human interface in Kampong Cham province. One Health surveillance targeted at high-risk animal-human interfaces has been identified as one of the most effective approaches globally to reduce the risk of pandemics because comprehensive surveillance of all wildlife origin viruses is impractical. This surveillance activity will be highly targeted both through syndromic case detection and interface site selection. In response to syndromic detections, the sampling protocols will rapidly reach back to the interface level to conduct human animal and environmental sampling quickly, rather than

waiting for detectable outbreaks, by which time the original spillover event has passed.

An OH-DReaM working group was created in December 2022 to support implementation of this activity, and IRB approval was received in February 2023. The design of this activity is underway with OH-DReaM working group members, and a high-level local consultant will be hired to facilitate co-creation with government stakeholders, which is necessary for the implementation of a sustainable sentinel surveillance system. Tufts University staff member Jeff Mariner will support participatory syndromic surveillance training for provincial, district and commune level staff in May 2023.

OBJECTIVE 3

Recognizing that it will not be possible to prevent all spillover events from wildlife, Objective 3 focuses on assisting countries to limit the impact of spillover events should they occur. Minimizing the amplification and spread of zoonotic viruses within a human population, and containing the spillover event as much as possible, will limit the public health impact. This section outlines STOP Spillover’s achievements and accomplishments for Objective 3 during the first half of Project Year 3 (note: up until this stage of implementation, STOP Spillover has placed greater emphasis on activities under Objective 1 and 2).

Media Capacity Strengthening

The role of STOP Spillover’s partner Internews is to work with local media organizations and networks to strengthen the capacity of local journalists, support their content production, and spread timely and accurate news and information about zoonotic spillover and how to prevent it. This aims to enhance local media and journalist understanding of risk, including specific risks

relevant to STOP Spillover priority pathogens and interfaces. Ultimately, communities at the prioritized interface and at risk of spillover benefit from improved access to information through media sources about the risk of spillover and ways to prevent it.

During the final quarter of Project Year 2, 11 local journalists across all seven STOP Spillover countries were selected through a competitive process to receive small grants and mentorship to publish or broadcast at least one story in a mainstream media outlet with a large audience base. This activity aimed to instill confidence in the grantees to report on spillover risks, and for them to serve as a resource for their organization to build skills for reporting related to infectious disease and health risks. During the first quarter of Project Year 3, mentors from Internews worked closely with the selected grantees, guiding them to produce locally relevant, informative and gender-balanced stories focused on viral zoonotic pathogens. Eleven articles, listed below, were published between December, 2022 and January, 2023.

Uganda:

- [Henipa virus -- a neglected time bomb in Uganda](#). Published January 8, 2023. tciju.org.
- [Fighting Ebola in Uganda](#). Published January 28, 2023. independent.co.ug.

Viet Nam:

- [Vaccination against bird flu in Vietnam: before the crossroads](#). Published December 26, 2022. tiasang.com.vn.

Bangladesh:

- [Avian influenza: Bangladesh should prepare to tackle future spillover events](#). Published January 3, 2023. bssnews.net.
- [One Health approach must to ease zoonotic diseases in Bangladesh](#). Published January 9, 2023. daily-sun.com.

Liberia:

- [A community program and a ban on hunting protected species is helping to protect Liberia against the next disease outbreak](#). Published January 11, 2023. thedaylight.org.

Sierra Leone:

- [Lassa fever, the other public health risk](#). Published December 16, 2022. politicosl.com.
- [Surviving Lassa fever in Sierra Leone](#). Published December 23, 2022. politicosl.com.
- [Hunters and butchers put Sierra Leone at risk of Ebola](#). Published December 21, 2022. politicosl.com.

Cambodia:

- [Facebook Watch video - avian influenza](#). Published January 14, 2023. Facebook page of Faculty of Veterinary Medicine, Royal University of Agriculture.

Côte d'Ivoire:

- [One year after Cote d'Ivoire's avian flu outbreak, poultry farmers reflect on lessons learned from the country's One Health approach](#). Published January 26, 2023. asca.africa.

Also in the first half of Project Year 3, Internews issued a call across all STOP Spillover countries soliciting applications for journalism capacity-strengthening projects that seek to train journalists and other communicators on coverage of zoonotic diseases and ways to prevent the spread of dangerous pathogens. Through this process, Internews selected grantees – three in total – from Sierra Leone, Côte d'Ivoire and Bangladesh. During the remainder of Project Year 3, these grantees will work under the supervision of Internews, and in collaboration with the STOP Spillover country teams, to deliver a media training project focused on One Health and pandemic prevention to journalists and communicators.

Outbreak Response Scenario Planning

Beginning towards the end of Project Year 2, and continuing into Project Year 3, STOP Spillover partner University of Nebraska Medical Center (UNMC) worked with selected country teams to draft country-specific exercise scenarios for use by in-country stakeholders involved in outbreak management preparedness and response activities. These exercise scenarios are intended to help stakeholders involved in outbreak management preparedness and response activities to collaboratively think through and discuss appropriate actions to take in the event of a potential or confirmed case of a priority viral disease, and to help plan for such events.

To serve as useful tools for in-country stakeholders involved in outbreak risk management, these scenarios need to be

contextualized. Through an iterative process, UNMC worked closely with STOP Spillover country teams in Bangladesh, Cambodia, Sierra Leone and Liberia – who, in turn, consulted relevant outbreak risk management stakeholders – to develop appropriately contextualized exercise scenarios. Liberia’s scenario was finalized and approved by USAID in March 2023, and was made available to relevant stakeholders as an exercise tool for pandemic preparedness. The scenarios for Bangladesh, Cambodia and Sierra Leone continue to be contextualized. Towards the end of Project Year 3, Cambodia and Sierra Leone will convene workshops focusing on outbreak risk management at which the scenarios will be employed as tools.

CHALLENGES AND SOLUTIONS



*Lotus nuts drying next to an artificial bat roost, Kampong Cham, Cambodia
Photo credit: Tristan Burgess*

STOP Spillover has faced several challenges to date in Project Year 3 and is focused on results-oriented solutions.

Challenge: In October 2022, USAID requested a corrective action plan (CAP).

Solution: USAID approved STOP Spillover's CAP in March 2023. The CAP is focused on successful delivery of Objective 2 intervention activities in Liberia, Sierra Leone, and Viet Nam.

Challenge: In March 2023, the STOP Spillover Project Director stepped down.

Solution: The project is currently led by an interim team of three experienced Tufts University professors with recruitment for a new Project Director underway.

Challenge: In March 2023, USAID requested closeout of activities in Uganda.

Solution: Closeout plan approved April 17, 2023, to be completed by June 30, 2023. Data collected thus far will be analyzed and reported. Where applicable, activities will be transferred to Uganda government counterparts.

Challenge: During Year 1 and Year 2, the implementing partner for STOP Spillover in Cambodia was the Southeast Asia One University Network (SEAOHUN) who contracted with CAMBOHUN through a tertiary agreement. Due to circumstances beyond the control of STOP Spillover, SEAOHUN has withdrawn as a Tufts University Consortium member.

Solution: In December 2022, management of the STOP Spillover program in Cambodia transitioned from the Cambodia One Health

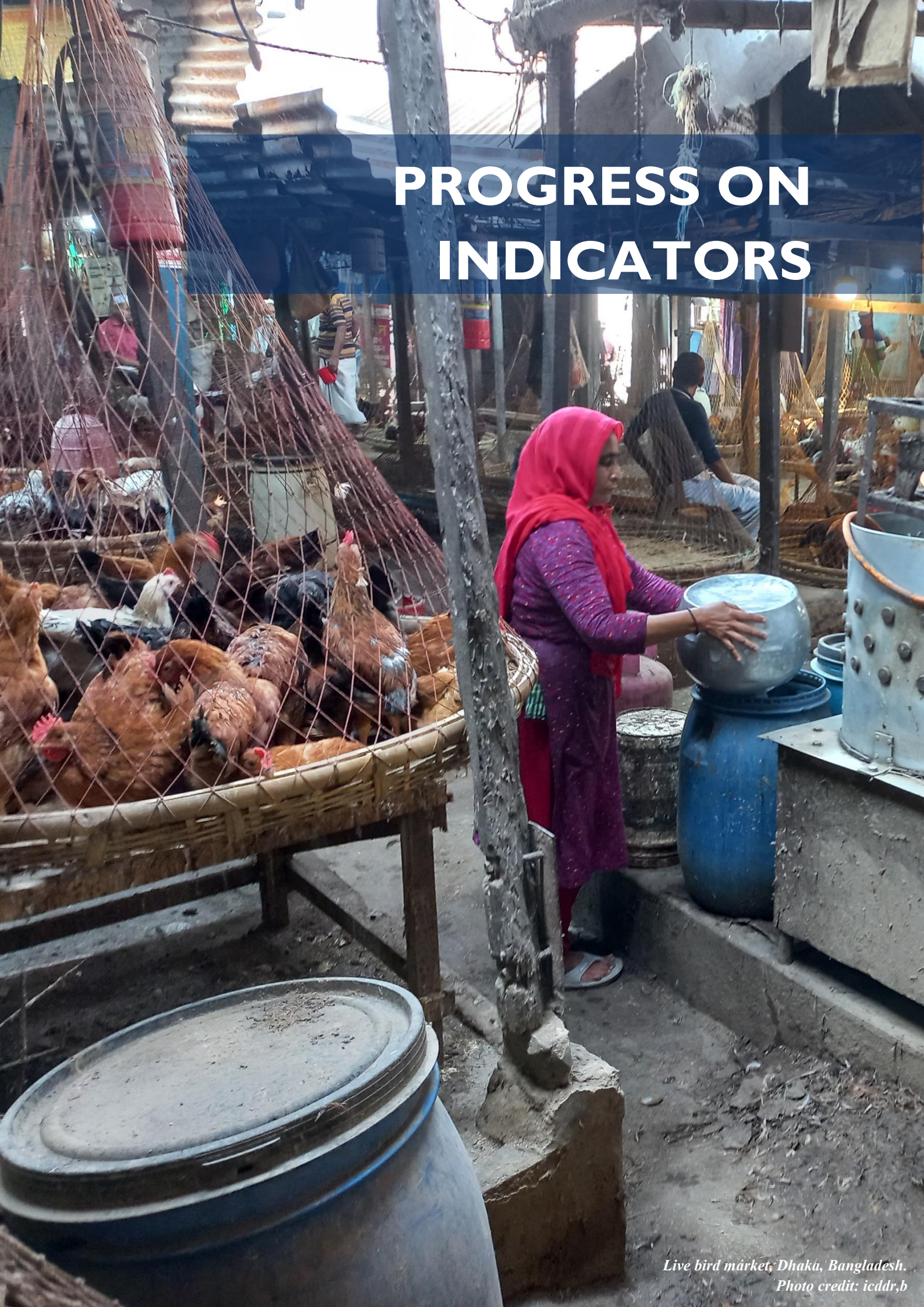
University Network (CAMBOHUN) to Tetra Tech. STOP Spillover is confident that the new arrangements with Tetra Tech will benefit the project in various ways, including reducing administrative costs and burden.

Challenge: Anticipated funding shifts in Global Health Security Agenda (GHSA) programs and a transition to Mission funding from USAID Washington funding have created uncertainty about the timing and level of funding for STOP Spillover Project Year 4.

Solution: Modeling and forecasting scenarios to align future workplans and budgets with anticipated funding obligations are being evaluated.

Tufts University and the STOP Spillover consortium is fully committed to the success of the project, and the critical work to build government and stakeholder capacity in priority Asian and African countries to identify, assess, and monitor risks associated with priority zoonotic viruses and to develop and introduce proven and novel risk reduction measures.

PROGRESS ON INDICATORS



STOP Spillover’s Activity, Monitoring, Evaluation, and Learning Plan (AMELP) defines a set of key performance indicators (KPIs) for the project. Progress on KPIs is shown in Table 1. Tracking of more indicators will increase as activities continue to be implemented.

Table 1. Progress on STOP Spillover’s KPIs, Progress to date in Project Year (PY) 3 is shown in the PY3 column. Progress updates are only included if implementation commenced for a given activity and data collection began during Project Year 3. Bangladesh (BN); Cambodia (CA); Liberia (LB); Sierra Leone (SL); Uganda (UG); Viet Nam (VN).

#	Indicator	Definition	Data Source/ Method	Data Collection Frequency	Data Reporting Frequency	Dis-aggregations	Type of Result (output, outcome, impact)	PY1	PY2	PY3	Notes
1.a	# of interventions designed (D), implemented (I), and tested (T) to reduce the risk of spillover	Number of interventions designed, implemented and tested to reduce the risk of spillover	Action Plans, Staff reporting	Quarterly	Semi-Annual	Stage (Design, Implement, Test), Type of intervention, Country	Output	-	D: 3	D: 6 I: 1 T: 0	Intervention implementation started in PY3. Updated indicator to combine # of interventions designed, implemented, and tested all under one indicator D: BN 1, CA 1, LB 1, SL 1, VN 1, UG 1 I: VN 1
1.b	# of individuals trained	Number of individuals trained	Training and community-level participant rosters	Quarterly	Semi-Annual	Sex Subject of training (PCR, CRISPR, Journalists, participatory surveillance, etc.) Type of trainee (in-service professionals, community members)	Output	-	-	282	LB: 17 SL: 15 UG: 187 VN: 63
1.b.i	% of trainees who report use of new knowledge and skills	Percentage of trainees who reported use of new knowledge and skills and the total trainees that participated in training.	Post-training assessments	Quarterly	Semi-Annual	Sex Subject of training (PCR, CRISPR, Journalists, participatory surveillance, etc.) Type of trainee (in-service professionals, community members)	Outcome	-	-	-	Follow-up with training participants will occur in the next reporting period.

#	Indicator	Definition	Data Source/ Method	Data Collection Frequency	Data Reporting Frequency	Dis-aggregations	Type of Result (output, outcome, impact)	PY1	PY2	PY3	Notes
1.c	# of laboratories supported	Number of laboratories supported by the project	Project documentation	Quarterly	Semi-Annual	Type of support (diagnostics, biosecurity, SOPs) Country Lab type (human, animal, private, university, government) Biosafety level	Output	-	-	4	CDI: 2 LB:1 UG: 1
1.d	# of papers produced	Number of papers produced by the project	Project documentation	Quarterly	Semi-Annual	Peer-reviewed (yes, no) Publication status (published, under review, in preparation) Nationality of first author Nationality of last author	Outcome	-	-	-	Papers will be produced once interventions are tested and other activities are completed.
1.e	# of wastewater surveillance activities to capture signals of zoonotic pathogens	Number of wastewater surveillance activities to capture signals of zoonotic pathogens	Wastewater surveillance data	Quarterly	Semi-Annual	Country Matrix (sewage, farm drain-off, wastewater treatment facility, water source) Target virus (IAV, Ebola, Lassa, Nipah, Coronaviruses)	Outcome	-	-	1	Uganda Wastewater Surveillance dry run
1.f	# of OM related activities engaging national and community stakeholder knowledge, priorities, and perspectives	Number of OM related activities engaging national and community stakeholder knowledge, priorities, and perspectives.	Activity documentation; OM journals	Quarterly	Semi-Annual	Region, country, location	Output	6	14	1	OM was finalized in all countries, except CDI, by the end of PY2. CDI initiated OM process in PY2 but completed interface-level OM workshops in the opening weeks of PY3.
1.f.i	# of unique stakeholders engaged through OM process	Number of unique stakeholders engaged through OM process	Internal project records, OM workshop reports	Quarterly	Semi-Annual	Region, country, sector, gender	Output	214	594	53	OM was finalized in all countries, except CDI, by the end of PY2. CDI initiated OM process in PY2 but completed interface-level OM workshops in the opening weeks of PY3.
1.g	# of research studies designed and implemented to inform interventions	Number of research studies designed and implemented to inform interventions	Project documentation	Quarterly	Semi-Annual	Stage (Designed, Implemented) Country	Output	-	-	14	BN: 2 CA: 3 LB: 3 SL: 2 UG: 2 VN: 2

#	Indicator	Definition	Data Source/ Method	Data Collection Frequency	Data Reporting Frequency	Dis-aggregations	Type of Result (output, outcome, impact)	PY1	PY2	PY3	Notes
1.h	# of laboratory and field-based sampling activities that incorporate innovative assay technology for detection of known zoonotic viruses in animals	Number of laboratory and field-based sampling activities that incorporate innovative assay technology for detection of known zoonotic viruses in animals.	Project documentation	Quarterly	Semi-Annual	Type of activity (lab-based, field-based) Type of innovative assay (multiplex qPCR, CRISPR-based, other)	Output	-	-	-	
1.i	# of community members engaged in community-based surveillance activities that monitor spillover ecosystems, including humans, animals, and the environment	Number of community members engaged in community-based surveillance activities that monitor spillover ecosystems, including humans, animals, and the environment	Community-based surveillance documentation	Quarterly	Semi-Annual	Type of stakeholder (community member participant, farmer, government worker, etc.) Area of increased capacity (intervention focus)	Output	-	-	15	Uganda bat monitoring
1.i.i	# of community stakeholders that have increased capacity to implement interventions, practices, policies, and regulations to reduce spillover of priority emerging zoonotic viruses	Number of community stakeholders that have increased capacity to implement interventions, practices, policies, and regulations to reduce spillover of priority emerging zoonotic viruses	Post-engagement survey or phone follow-up	Quarterly	Semi-Annual	Type of stakeholder (community member participant, farmer, government worker, etc.) Area of increased capacity (intervention focus)	Outcome	-	-	-	
1.j	# and type of biological sampling activities being implemented	Number and type of biological sampling activities being implemented	Biological sampling database	Quarterly	Semi-Annual	Host (rodents, bats, dogs, wild birds, domestic birds, etc.) Country Target virus (IAV, Ebola, Lassa, Nipah, Coronaviruses)	Output	-	-	-	

#	Indicator	Definition	Data Source/ Method	Data Collection Frequency	Data Reporting Frequency	Dis-aggregations	Type of Result (output, outcome, impact)	PY1	PY2	PY3	Notes
1.k	# of participants reporting increased capacity to mitigate risks and plan an appropriate response to contain amplification and spread of zoonotic disease events originating from wildlife	Number of participants reporting increased capacity to mitigate risks and plan an appropriate response to contain amplification and spread of zoonotic disease events originating from wildlife.	All Objective 3 activity post-surveys	Quarterly	Semi-Annual	Type of stakeholder (community member participant, farmer, government worker, etc.) Area of increased capacity (intervention focus)	Outcome	-	-	-	

Annex I: Status of Year 3 Work Plan Activities

Work Plan Activity #	Activity (study, risk-reduction intervention, supporting activity, surveillance, media capacity strengthening, outbreak response)	IRB approvals	Data collection	Data analysis	Reporting
Uganda					
1.2.6.1	Investigate bat host ecology and human behavior risk factors associated with human-bat interactions (study)	Completed	NA	NA	Two reports in development
1.2.6.2	Investigate behavioral, sociocultural, gender-specific, and economic risk factors associated with human-bat interactions (study)	Completed	Initiated	Not yet started	Not yet started
1.4.6	Wastewater surveillance (surveillance)	NA	Not yet started	Not yet started	SOP in development
2.2.2.1.a	Engage communities through a social behavior change interventions strategy to keep bats out of households and promote safe practices (supporting activity)	Completed	Completed	On-going	SBC strategy in development
2.2.2.1.b	Promote protection of household and communal water resources and food safety (risk-reduction intervention)	Completed	Completed	On-going	In development
2.2.2.2	Develop and evaluate a community-based bat-human interface monitoring program for zoonotic spillover early warning and response (supporting activity)	Completed	In progress	In progress	Not yet started
3.3.3	Strengthen media capacity to prepare and disseminate information about zoonotic spillover and how to prevent it (media capacity strengthening)	NA	NA	NA	Two published articles approved by USAID
Viet Nam					
1.2.6.1	Conduct a behavioral risk assessment to characterize risk associated with the wildlife farming value chain in Dong Nai province (study)	Completed	Completed	Completed	Final report approved by USAID
1.3.1.1	Conduct a rapid assessment of biosafety training programs previously implemented in Dong Nai province to understand factors that limit the adoption of biosafety practices (study)	Completed	Completed	Completed	One report approved by USAID; one report submitted for approval
2.1.1.1	Establish a coordination mechanism at the provincial level by developing implementation guidelines for coordinated action and establishing sub-level steering committees (supporting activity)	NA	Completed	Completed	One report approved by USAID; one report submitted for approval
2.2.2.1	Use trials of improved practices on demonstration farms to identify feasible biosafety improvements. Implement SCB interventions using communications materials and exchange visits to biosafety demonstration farms to disseminate results (risk-reduction intervention)	NA	Started for TIP1; not yet started for TIP2 and TIP3	Not yet started	Not yet started
3.1	Consolidate zoonotic disease monitoring data on wildlife farms with human health and livestock data and develop reporting procedures to improve data sharing and	NA	Completed	Completed	Final report approved by USAID

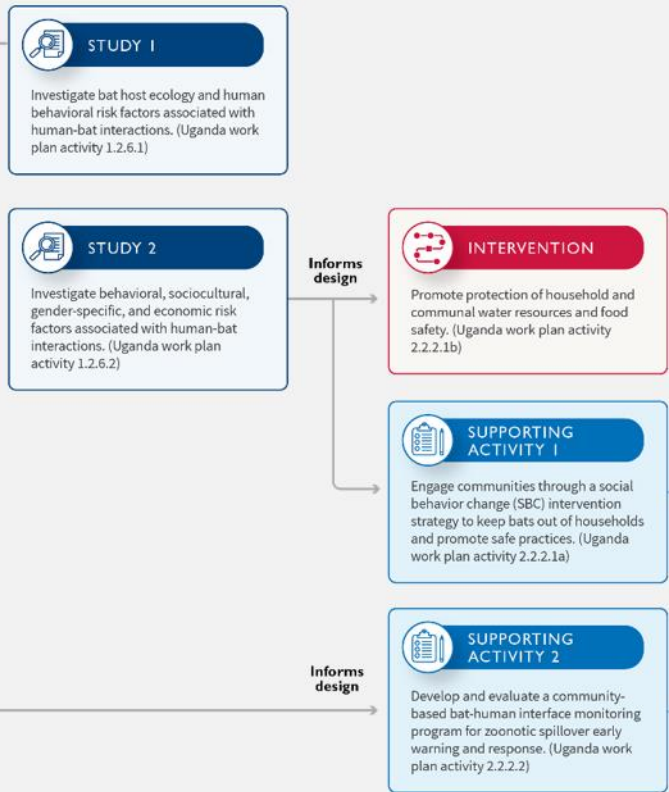
Work Plan Activity #	Activity (study, risk-reduction intervention, supporting activity, surveillance, media capacity strengthening, outbreak response)	IRB approvals	Data collection	Data analysis	Reporting
	planning among sub-committee members (supporting activity)				
3.3.3	Strengthen media capacity to prepare and disseminate information about zoonotic spillover and how to prevent it (media capacity strengthening)	NA	NA	NA	One published article approved by USAID
Bangladesh					
1.2.6.1	Explore factors contributing to failures and success of previous interventions to improve biosecurity in live bird markets (LBMs) (study)	Completed	Completed	Completed	One report approved by USAID; one report submitted for approval
1.2.6.2	Conduct a willingness-to-pay analysis to identify consumer considerations in relation to pricing, and a barrier analysis to identify barriers faced by stakeholders with regards to changing practices to improve biosecurity, biosecurity reporting, or prices changes (study)	Completed	Completed	On-going	Not yet started
2.2.2.1	Develop a holistic, multi-pronged design for LBMs with improved biosecurity and hygiene measures that reduce the risk of spillover (risk-reduction intervention)	Completed	In progress	Not yet started	Not yet started
2.2.2.2	Establish an integrated, coordinated and sustainable platform for information sharing, advocacy, and co-designing, co-implementing, and co-monitoring of surveillance activities and interventions at the LBMs (supporting activity)	Completed	Completed	Completed	Two reports submitted to USAID for approval
2.2.2.3	Develop and support utilization of an app-based system to report poultry workers' health status of unusual mortality in poultry and/or crows in and around LBMs (supporting activity)	NA	NA	NA	Not yet started
3.3.3	Strengthen media capacity to prepare and disseminate information about zoonotic spillover and how to prevent it (media capacity strengthening)	NA	NA	NA	Two published articles approved by USAID
3.5.2	Scenario development for practice of outbreak risk management (outbreak response)	NA	NA	NA	Under revision
Liberia					
1.2.6.1	Investigate Lassa virus infection prevalence in rodents (study)	Pending	Not yet started	Not yet started	Not yet started
1.2.6.2	Study the movement and contact patterns of the rodent reservoir hosts of Lassa virus (study)	Pending	Not yet started	Not yet started	Not yet started
1.4.6	Wastewater and liquid waste effluent surveillance (surveillance)	NA	Not yet started	Not yet started	SOP in development
1.4.10.1	Situational analysis for spillover surveillance and monitoring (surveillance)	NA	Completed	Completed	Final report approved by USAID

Work Plan Activity #	Activity (study, risk-reduction intervention, supporting activity, surveillance, media capacity strengthening, outbreak response)	IRB approvals	Data collection	Data analysis	Reporting
2.2.2.1	Investigate behavior, practices and exposure to Lassa virus as related to hunting, handling and consumption of rodents and household and environmental conditions that are risk factors for Lassa virus infection (<i>study</i>)	Pending	Not yet started	Not yet started	Not yet started
2.2.2.2	Promote proper food and water storage, and rodent-proofing households and commercial and agricultural storages (<i>risk-reduction intervention</i>)	Pending	Not yet started	Not yet started	Not yet started
3.3.3	Strengthen media capacity to prepare and disseminate information about zoonotic spillover and how to prevent it (<i>media capacity strengthening</i>)	NA	NA	NA	Two published articles approved by USAID
3.5.2	Scenario development for practice of outbreak risk management (<i>outbreak response</i>)	NA	NA	NA	Approved by USAID
Sierra Leone					
1.2.6.1	Investigate environmental variables, and sociodemographic and human behaviors and practices that increase the risk of exposure to Mastomys rodents (<i>study</i>)	Completed	On-going	On-going	Report in development
1.2.6.2	Conduct a wild meat value chain analysis and characterize risk of spillover of Ebola virus along the entire value chain (<i>study</i>)	Completed	Completed	Completed	Report in development
2.2.2.1	Co-design and test rodent-proofing systems for household foods and stored grains to reduce human exposure to rodent contaminants (<i>supporting activity</i>)	Completed	Not yet started	Not yet started	Not yet started
2.2.2.2	Promote improved biosafety practices for actors involved in the wild meat value chain to reduce the risk of Ebola spillover associated with wild meat hunting, trading, and consumption (<i>risk-reduction intervention</i>)	Completed	Not yet started	Not yet started	Not yet started
2.3.1.1	Lassa SBC Activity (<i>supporting activity</i>)	NA	Completed	Completed	Report in development
2.3.1.2	Ebola SBC Activity (<i>supporting activity</i>)	NA	Completed	Completed	Report in development
3.3.3	Strengthen media capacity to prepare and disseminate information about zoonotic spillover and how to prevent it (<i>media capacity strengthening</i>)	NA	NA	NA	Three published articles approved by USAID
3.5.2	Scenario development for practice of outbreak risk management (<i>outbreak response</i>)	NA	NA	NA	Under revision
Cambodia					
1.2.6.1	Research on bat ecology and the prevalence of pathogens carried by bats at bat guano farms (<i>study</i>)	Completed	Begin in April 2023	Not yet started	Not yet started
1.2.6.2	Food and water contamination assessment (<i>study</i>)	Completed	Begin in April 2023	Not yet started	Not yet started

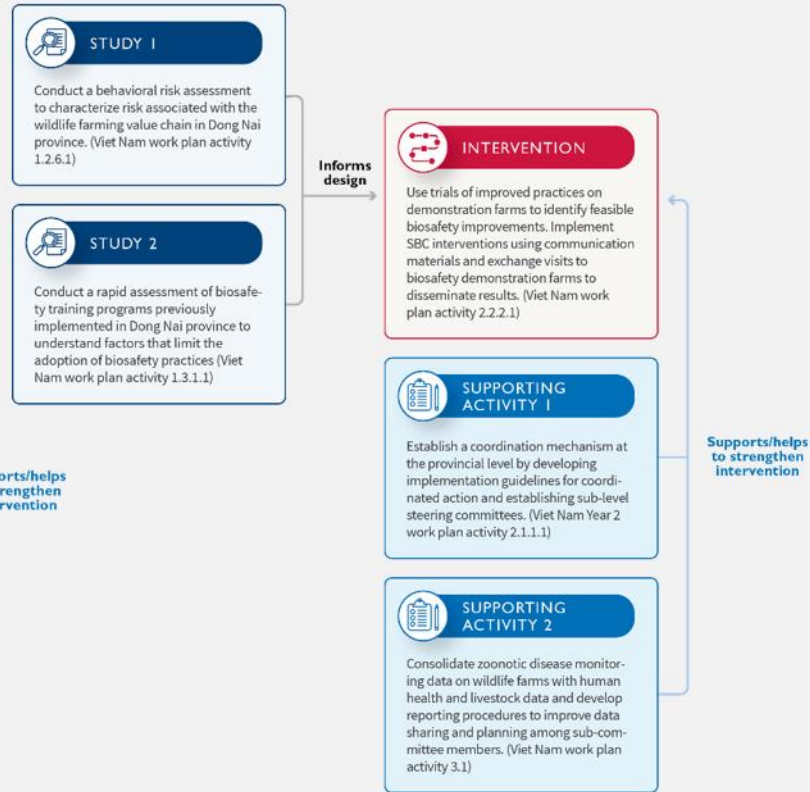
Work Plan Activity #	Activity (study, risk-reduction intervention, supporting activity, surveillance, media capacity strengthening, outbreak response)	IRB approvals	Data collection	Data analysis	Reporting
1.2.6.3	National risk assessment to prioritize high-risk bat-human interfaces throughout Cambodia (study)	Completed	Completed	Completed	Final report submitted to USAID; Concept note for proposed interventions in development
2.2.2.1	Community-level risk reduction interventions (risk-reduction intervention)	Completed	Completed	Completed	In development
2.2.2.2	Coordination and capacity building of sentinel surveillance team (supporting activity)	Completed	Not yet started	Not yet started	Not yet started
3.3.3	Strengthen media capacity to prepare and disseminate information about zoonotic spillover and how to prevent it (media capacity strengthening)	NA	NA	NA	One published article approved by USAID
3.5.2	Scenario development for practice of outbreak risk management (outbreak response)	NA	NA	NA	Under revision

Annex 2: How Studies Inform Risk-Reduction Activities, by Country

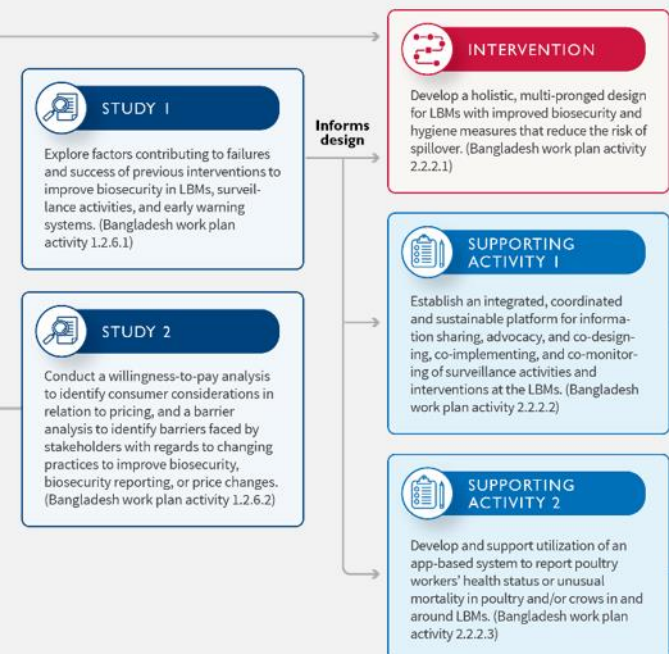
Uganda



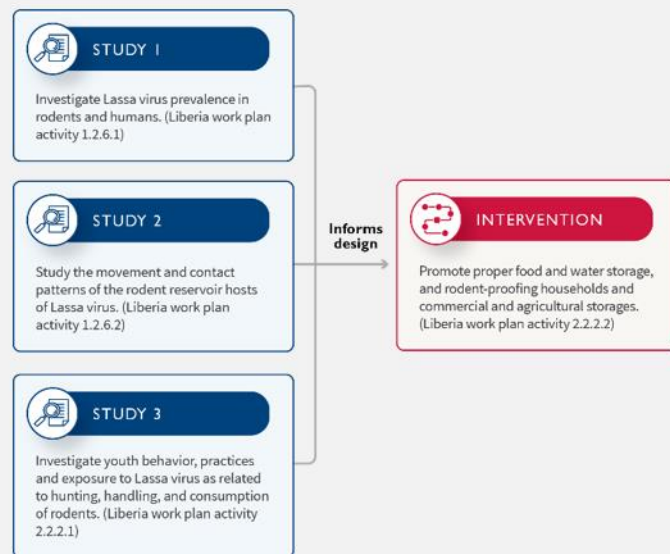
Viet Nam



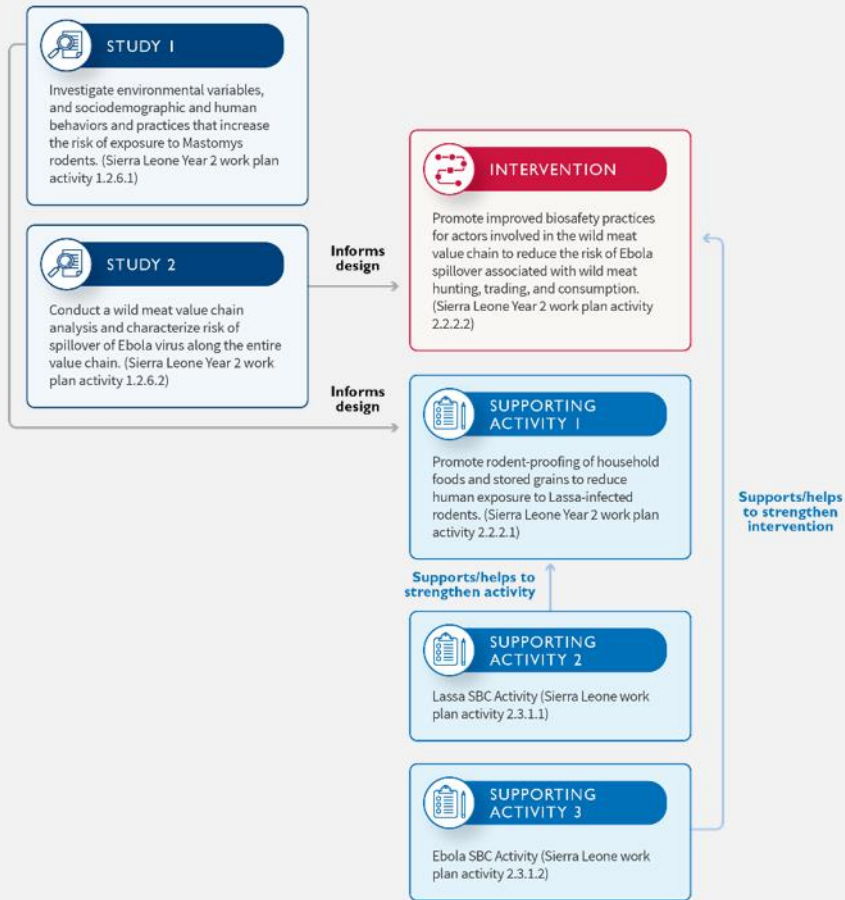
Bangladesh



Liberia



Sierra Leone



Cambodia

