USAID EPT-2
PREDICT PROJECT
Year 4 GHSA Workplan Narrative

October 2017-September 2018

Prepared by:
The PREDICT Consortium
http://consortium.predict.global

TABLE OF CONTENTS

PREDICT-2 GHSA country workplans for 2017-2018 are provided in the Excel workbook.

Overview

The PREDICT-2 team is currently working with the USAID AOR and Office of Acquisitions and Assistance to finalize funding levels for the remainder of the project. These funding levels have major implications on FY18 budgets and corresponding workplans, especially for Asia countries that are currently financed through PREDICT's EPT-2 core mechanism. In addition, budgets for the Ebola Host Project countries (Guinea, Liberia, and Sierra Leone) are awaiting finalization as we determine country specific funding levels within the overall Ebola Host Project ceiling.

As a result, we are only able to provide FY18 budgets for the following GHSA Phase1 Africa countries: Cameroon, Cote d'Ivoire, Ethiopia, Kenya, Senegal, Tanzania, and Uganda. Ebola Host Project (Guinea, Liberia, and Sierra Leone) and Asia region GHSA workplans (Bangladesh, India, Indonesia, and Viet Nam) are subject to change until the budget is finalized. All EHP and Asia country technical plans provided in the GHSA workbook and corresponding country narratives are to be considered drafts; activities presented will be implemented as budget allows.

CAMEROON
Year 4 (October 2017-September 2018)

Implementing Partners: Metabiota Inc. and Mosaic
Country Coordinator: Moctar Mouiche, Mosaic
Global Point of Contact: James Ayukekbong, Metabiota Inc.

Partners

- Ape Action Africa
- Centre Pasteur Cameroon
- Food and Agriculture Organization (FAO)
- Metabiota Cameroon
- Ministry of Defense (MINDEF)/ Military Health Research Center (CRESAR)
- Ministry of Environmental Protection and Sustainable Development
- Ministry of Forestry and Wildlife (MINFOF)
- Ministry of Livestock, Fisheries and Animal Production (MINEPIA)
- Ministry of Public Health (MINSANTE)
- National Program for the Control and Fight Against Emerging and Remerging Zoonoses (NZP)
- National Veterinary Laboratory (LANAVET)
- One Health Workforce (OHW)
- Preparedness Response (P&R)
- Researchers from the University of Douala and the University of Maroua
- South Cameroon Hevea (SUDCAM)*
- US Centers for Disease Control

*Partnership in development

Prevent and Detect Zoonotic Disease

PREDICT strengthens One Health partnerships and conducts zoonotic disease surveillance activities by sampling wildlife and people and conducting behavioral risk investigations at high-risk interfaces for zoonotic disease transmission. This work directly supports the national surveillance system, contributes to the development and implementation of the country GHSA roadmap, and provides opportunities to strengthen the mechanisms for responding to zoonotic diseases, including priority zoonotic diseases such as avian influenza virus, hemorrhagic fevers (Ebola, Marburg, etc.), and emerging viral threats. In addition, PREDICT supports the development of Cameroon's One Health workforce by training and engaging staff from the Ministries of Public Health, Livestock, Forestry and Environment in surveillance and disease detection activities.

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Where we work

PREDICT/Cameroon activities are implemented at three sites (Sangmelima, Meyomesala and Ebolowa) within the South region of Cameroon. The South region is bordered by the countries of Equatorial Guinea, Gabon, and the Republic of Congo. This area of the country is characterized by rivers, which encompass the Dja Reserve and form part of the Congo River basin. There are significant land conversion activities in the region, such as mining, logging, timber exploitation, and offshore drilling. Also, most of the population live in rural settings and are involved in subsistence farming, cattle rearing, hunting, and fishing. All three sites feature a prominent bushmeat value chain, including village areas where animals are hunted and traded, meats are consumed locally, and in some cases where meat is sold to restaurant owners and to traders for market in larger urban centers. PREDICT's zoonotic disease surveillance activities at these sites engage government staff through in-service training and provide opportunities for multisectoral coordination from district to national levels through One Health in action.

Zoonotic Disease Surveillance Sites

- **Sangmelima, South Cameroon** is situated along the Lobo River and is the capital of the Dja and Lobo division of the South region of Cameroon. There is large-scale landscape change with forested areas converted into industrial rubber plantations. This site also includes large-scale animal production farms, as well as movement of hunted animals through the value chain from neighboring villages to urban markets.
  - Sampling targets:
    - Wildlife: hunted animals in markets (rodents, non-human primates, and pangolins); bats and rodents in and around houses in rural areas
    - Syndromic surveillance of people at the Sangmelima District Hospital
    - Behavioral and community surveillance targeting individuals with high levels of occupational exposure to wildlife (hunters, trappers, butchers, market sellers, middle men, transporters)

- **Meyomesala, South Cameroon** is about 200km from Sangmelima within the Dja and Lobo division of the South region of Cameroon. There is significant landscape change due to modification of forest for construction of a hydroelectric dam (Mekin dam on the Dja River) and for an industrial rubber plantation (Hevea Sud). There is also increasing intensity of animal production in this area to supply a large population of rubber plantation workers.
  - Sampling targets:
    - Wildlife: Bats and rodents in and around houses, in villages and areas of landscape disruption
    - Syndromic surveillance of people at the Meyomesala District Hospital

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    - Behavioral and community surveillance targeting individuals with high levels of occupational exposure to wildlife (hunters, trappers, butchers, market sellers, middle men, transporters)

- **Ebolowa, South Cameroon** is the capital of the South region of Cameroon and covers an impressive rural-urban gradient. The bushmeat value chain at this site includes village areas where meats are consumed locally and sold to restaurant owners and to traders for transport and sale in large urban centers. The area includes large-scale animal production with poultry and swine farms, as well as farms with a mix of poultry, ducks, goats, sheep, and swine. There is also landscape change resulting from a hydroelectric dam construction project (Memve'ele).
    - Sampling targets:
        - Wildlife: hunted animals sold in markets (rodents, non-human primates and pangolins)
        - Behavioral and community surveillance targeting individuals with high levels of occupational exposure to wildlife (hunters, trappers, butchers, market sellers, middle men, transporters)

Strengthening Laboratory Systems

PREDICT engages and directly supports the national laboratory system in Cameroon through our primary partner lab at the Military Health Research Centre (CRESAR) in Yaoundé. CRESAR has existing capability to detect both priority zoonotic diseases and emerging viral threats. In addition, PREDICT is available to work closely with FAO and the National Veterinary Laboratory (LANAVET) to enhance disease detection capability in the animal health sector. PREDICT has provided training and technical support to LANAVET staff at CRESAR and will continue to examine opportunities for deployment of expertise and capacity strengthening in other laboratories, such as the Cameroon National Public Health Laboratory.

Animal and Human lab: CRESAR, Yaoundé

Workforce Development and Improving Real-time Surveillance

PREDICT provides training opportunities to strengthen One Health workforce capacity in Cameroon, as central, regional, and local ministry staff participate in zoonotic disease surveillance activities and use these opportunities to obtain in-service training in One Health skills and techniques. PREDICT also contributes technical expertise on zoonotic disease surveillance in weekly Ministry of Health epidemiological surveillance meetings and when requested by the government of Cameroon (and approved by the PREDICT Management Team) and continues to support outbreak response and preparedness. These investments are helping support the operationalization of the One Health approach in central and local

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administrations, providing critical linkages between ministries from the district to national levels. Data sharing and communication processes were established with the government through MINFOF, MINRESI, MINEPIA, MINSANTE, and MINEPDED further improving communications and information flows between animal and human health sectors. These efforts will continue to be expanded to integrate with the National Zoonoses Program and other government partners as appropriate with the goal of strengthening data platforms and improving the ease of dissemination of relevant animal, human, epidemiological, and ecological data.

COTE D'IVIORE
Year 4 (October 2017-September 2018)

Implementing Partners: EcoHealth Alliance (EHA), Institut Pasteur de Côte d'Ivoire (IPCI), Laboratoire d'Appui au Développement Agricole (LANADA)
Country Coordinator: Dr. Julien Kalpy Coulibaly, IPCI
Global Point of Contact: Dr. Peter Daszak, EHA

Partners

- Centre de Recherche en Ecologie (CRE)*
- Centre Suisse de Recherche Scientifique (CSRS)*
- Food and Agricultural Organization (FAO) of the United Nations
- Ivorian Office of Parks and Reserves*
- Ministry of Agriculture and Rural Development
- Ministry of Animal and Fish Resources
- Ministry of Health and Public Hygiene
- Ministry of Health, Environment and Sustainable Development
- Ministry of Water and Forests
- University Félix Houphouet Boigny, Department of Ethnosociology (UFHB)*

*Partnership in development

Prevent and Detect Zoonotic Disease

PREDICT builds the workforce, strengthens systems, and conducts zoonotic disease surveillance for priority zoonotic diseases and other emerging threats. In Cote d'Ivoire, PREDICT puts One Health in action through zoonotic disease surveillance, sampling wildlife and people and conducting behavioral risk investigations at high-risk human-animal transmission interfaces. This work directly supports the national surveillance system, contributes to the development and implementation of the country GHSA roadmap, and provides opportunities to strengthen mechanisms for responding to priority zoonotic diseases, such as highly pathogenic avian influenza, viral hemorrhagic fevers (Ebola, Marburg, etc.), and SARS and MERS Coronaviruses. In addition, PREDICT supports the development of Cote d'Ivoire's One Health workforce from the national to district level through field and lab-based training and engagement of staff from the Ministries of Health and Public Hygiene, Agriculture and Rural Development, Animal and Fish Resources, and Environment and Sustainable Development, as well as national research institutes, universities, and non-governmental organizations in surveillance and disease detection activities

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Where we work

Bouaflé (Marahoué National Park) and surrounding areas. Established in 1968, Marahoué National Park occupies an area of approximately 100,000 hectares and straddles the boundary between the Sudan-Guinea savannah and dense rainforest. With a unique geography and abundance of floral and faunal diversity, the area is a popular destination for tourists as well as contributor to local livelihoods through resource extraction, subsistence hunting, and poaching. The area immediately surrounding the park has seen an intensification of agricultural activities and animal husbandry, which have begun to infiltrate the park area, leading to increased human-wildlife interaction.

Zoonotic Disease Surveillance Sites

- **Bouaflé (Marahoué National Park):** agricultural intensification, land use change, deforestation
  - Sampling targets:
    - Wildlife: rodents in and around dwellings, bats, and non-human primates
    - Surveys (including in-depth behavioral risk investigations) of people living and working in and around the national park
    - Syndromic surveillance of people at the Centre de Sante Urbain de Bono, the referral hospital for the region

Strengthening Laboratory Systems

PREDICT directly supports the national laboratory system in Cote d'Ivoire and is developing an integrated One Health laboratory network by engaging the animal health lab at the Central Laboratory for Animal Diseases, Bingerville (LANADA) and the Institute Pasteur du Côte d'Ivoire (IPCI) lab for human testing. LANADA is the national lab responsible for outbreak testing and animal health surveillance activities and the ICPI lab provides critical outbreak and surveillance support to the Ministry of Health and Public Hygiene and the entire national laboratory system. At both labs, PREDICT strengthens capacity for detection of priority zoonotic diseases (e.g., highly pathogenic avian influenza, VHFs, SARS and MERS CoVs) and emerging threats. PREDICT's One Health laboratory network fosters communication and coordination between animal and human labs and ministries, provides joint training exercises and routine information exchanges among lab managers, technicians, and ministry focal points, communicates data and findings to inform surveillance, and works to transfer knowledge and capacity to other labs in the national system.

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Animal lab: Central Laboratory for Animal Diseases, Bingerville (LANADA)

Human lab: Institut Pasteur du Côte d'Ivoire (IPCI)

Workforce Development and Improving Real-time Surveillance

PREDICT provides training to strengthen One Health workforce capacity in Cote d'Ivoire, including on-the-job training for government veterinarians in One Health skills and safe wildlife capture and sampling during targeted sampling operations, as requested by the Ministry of Water and Forests. PREDICT puts One Health in action by coordinating triangulated surveillance and sampling strategies with FAO and the Government of Cote d'Ivoire. Through implementing partners IPCI and LANADA, PREDICT also strengthens the foundation for the One Health approach, encouraging multi-sectoral efforts to strengthen data platforms and improve communications and linkages across animal and human sectors and increasing in-country capacity for disease surveillance and outbreak response. PREDICT participates in the Government of Cote d'Ivoire GHSA coordination meetings and contributes to the GHSA surveillance technical working group, which has representation from MOH, Ministry of Animal Resources, CDC and their relevant implementing partners, and FAO. When requested by the government (and approved by the PREDICT Management Team) PREDICT also supports outbreak response and preparedness through field investigations, diagnostic testing, and epidemiological support.

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ETHIOPIA
Year 4 (October 2017-September 2018)

Implementing Partners: University of California, Davis & Addis Ababa University (AAU) Aklilu Lemma Institute of Pathobiology
Country Coordinator: Nigatu Kebede, AAU
Global Point of Contact: Dr. Woutrina Smith, UC Davis

Partners

- Centers for Disease Control and Prevention (CDC), Addis Ababa
- Ethiopian Public Health Institute (EPHI), Ministry of Health (MOH)
- Ethiopian Wildlife Conservation Authority (EWCA)
- Food and Agricultural Organization (FAO) of the United Nations
- Ministry of Agriculture and Natural Resources (MoANR)
- Ministry of Livestock Development and Fisheries (MoLDF)
- National Animal Health Diagnostics and Investigation Center (NAHDIC)
- USAID
  - EPT One Health Workforce
  - EPT Preparedness and Response
  - Feed the Future Innovation Lab for Livestock Systems
  - USAID/Ethiopia

Prevent and Detect Zoonotic Disease

PREDICT builds the workforce, strengthens systems, and conducts surveillance for priority zoonotic diseases and other emerging threats. In Ethiopia, PREDICT puts One Health in action by sampling bats and non-human primates and conducting behavioral risk investigations along the animal value chain for camel trade. Through these activities PREDICT improves in-country capacity to detect, prevent, and respond to zoonotic diseases that may be transmitted from wildlife to livestock and humans and strengthens animal and public health system infrastructure and preparedness. PREDICT is initiating human syndromic surveillance at zoonotic disease surveillance sites as budgets and permissions allow.

Where we work

Awash Region: The Awash region is located along the Awash River and Awash National Park in central Ethiopia, where camels, wildlife, and humans reside and interact regularly. In Awash, PREDICT is continuing to conduct zoonotic disease surveillance targeting humans, bats, and non-human primates along the camel animal value chain.

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Bati Region: The Bati region is in the Wollo area of Amhara Regional State in Ethiopia and borders the Mile Serdo Wildlife Reserve. The Bati region contains a camel holding ground that is part of the region's camel and livestock value chain. In Bati, PREDCIT will conduct zoonotic disease surveillance and sample bats, non-human primates, and humans.

Zoonotic Disease Surveillance Sites

- **Awash Region located along the Awash River and Awash National Park in central Ethiopia:** Animal Value Chain
  - Sampling targets:
    - Wildlife: bats and non-human primates in and around pastoralist communities at camel markets, water sources, and grazing points surrounding and within the Awash National Park
    - Syndromic surveillance of patients at the Awash Health Center (Afar) who present with symptoms of acute respiratory illness and/or fever, and with frequent exposure to camels or wildlife

- **Bati Region located in Amhara State of Ethiopia:** Animal Value Chain
  - Sampling targets:
    - Wildlife: bats and non-human primates around intensifying camel production systems and holding grounds at camel and livestock markets
    - Syndromic surveillance of patients at health centers who present with acute respiratory illness and/or fever, and who have frequent exposure to camels and wildlife

Strengthening Laboratory Systems

PREDICT directly supports the national laboratory system in Ethiopia and a developing and integrated One Health laboratory network by engaging animal health labs at the Aklilu Lemma Institute of Pathobiology (ALIPB – University) at Addis Ababa University and the National Animal Health Diagnostics and Investigation Center (NAHDIC), along with the public health lab at the Ethiopia Public Health Institute (EPHI). Through PREDICT, ALIPB has gained capacity to detect priority zoonotic diseases and emerging threats, a critical step as the ALIPB lab is a training center for the animal health sector and provides reference support to the national surveillance system. PREDICT's One Health laboratory network fosters communication and coordination between animal and human labs and ministries; provides routine information exchanges among lab managers, technicians, and ministry focal points; communicates data and findings to

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inform surveillance; and works to transfer knowledge and capacity to other labs, in the national system.

Animal labs: AAU Aklilu Lemma Institute of Pathobiology, with training and transfer of protocols for the National Animal Health Diagnostic and Investigation Center (NAHDIC) for livestock samples

Human labs: AAU Aklilu Lemma Institute of Pathobiology in coordination with the Ethiopian Public Health Institute (EPHI)

Workforce Development and Improving Real-time Surveillance

PREDICT provides critical hands-on and on-the-job training to strengthen One Health workforce capacity in Ethiopia for government staff from national to subnational levels, university staff and students, research institutes, and local communities. By providing opportunities to put One Health in action across the full spectrum of skills required for safe and effective zoonotic disease surveillance, PREDICT strengthens Ethiopia's capacity to sample animals and people, investigate behaviors associated with zoonotic disease transmission, detect priority zoonotic diseases and emerging threats, and perform data analyses to understand zoonotic disease risks. In addition, PREDICT works across ministries and sectors helping build a One Health platform in Ethiopia, improving communications and linkages across animal and human sectors as project data and findings on zoonotic diseases and enabling behaviors underlying transmission are shared and discussed. When requested by the government (and approved by the PREDICT Management Team) PREDICT also supports outbreak response and preparedness through field investigations, diagnostic testing, and epidemiological support.

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GUINEA *(Ebola Host Project country)*
Year 4 (October 2017-September 2018)

Implementing Partners: University of California, Davis and Laboratoire de Fièvres Hémorragiques en Guinée (Viral Hemorrhagic Fever Laboratory of Guinea)
Country Coordinator: Dr. Alpha Camara, Laboratoire de Fièvres Hémorragiques en Guinée (Viral Hemorrhagic Fever Laboratory of Guinea)
Global Point of Contact: Dr. Corina Monagin, UC Davis

Partners

- Institute de Recherche en Biologie Appliqué
- Institute National de Santé Publique (INSP)*
- Institute Superior des Sciences et de Medicine Veterinaire de Dalaba
- Laboratoire de Fièvres Hémorragiques en Guinée
- Ministry of Environment, Water and Forests
- Ministry of Health and Public Hygiene
- Ministry of Higher Education and Research
- Ministry of Livestock and Animal Production
- USAID EPT One Health Workforce
- USAID EPT Preparedness and Response
- USAID/Guinea

*Partnership in development

Plans subject to change as the budget is finalized; activities presented will be implemented as budget allows.

Prevent and Detect Zoonotic Disease

PREDICT builds the workforce, strengthens systems, and conducts zoonotic disease surveillance for priority zoonotic diseases and other emerging threats. In Guinea, PREDICT is working with EPT, GHSA and local partners to implement the Ebola Host Project (EHP), an ambitious initiative seeking to discover the animal origins and spillover of Ebola virus (*Ebola zairevirus*) in Guinea, Liberia, and Sierra Leone. EHP is the most detailed investigation of this devastating public health threat of international concern ever attempted. Through EHP, PREDICT provides Guinea's growing One Health workforce on-the-job training opportunities in the full spectrum of activities required for safe surveillance and detection of priority zoonotic disease threats and conducts surveillance and behavioral risk investigations targeting animals and humans at key high-risk interfaces for Ebola virus transmission. As part of the EHP, surveillance activities in the upcoming year are restricted to sampling wildlife to identify species that may act as reservoir or transmission hosts for Ebola virus by working with ministry and EPT-2 partners to sample at prioritized sites with previously high levels of Ebola virus disease and high human-animal contact in varying ecological zones and conducting longitudinal sampling to capture seasonal

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variations at high-risk sites to span key environmental time-periods among target taxa (e.g., dry season, wet season, and breeding season). In concert with sampling activities, PREDICT plans to collect in-depth, standardized, quantitative data using a targeted questionnaire (where feasible) on human activities and behaviors that may enable zoonotic disease transmission and spread among at-risk populations. There are no plans to collect biological samples from humans or domestic animals and livestock in the upcoming year.

Where we work

Between 2013-2016, West Africa experienced the largest Ebola virus epidemic in history, with more than 28,000 cases and 11,000 deaths recorded before the outbreak was finally brought under control. The unprecedented geographic spread of Ebola virus among human populations across multiple countries raised the prospect that the virus could have not only "spilled over" from wildlife but also "spilled back" from people into previously unaffected animal populations—wildlife, companion animals, and livestock—resulting in a broader geographic distribution of the virus. **The Forest Region,** the primary focus of PREDICT's Ebola Host Project activities in Guinea, is considered the epicenter for Ebola virus emergence in the recent outbreak**.** The Guinean Forest Region, a lowland forest stretching across West Africa and through Guinea, is a biodiversity hotspot containing an estimated quarter of all of Africa's mammalian fauna. Human encroachment into forested areas has reduced this once vast system to a patchwork forest-agriculture mosaic, putting pressure on wildlife habitat and increasing opportunities for contact and zoonotic disease spillover from wildlife to people, as evidenced by the recent spillover of Ebola virus in December 2013. PREDICT has evaluated various prefectures within the Forest Region and identified specific sites where human-wildlife contact with potential reservoirs and hosts of Ebola is at highest risk. In selecting sites, PREDICT also considered areas with a high number of cases of Ebola during the epidemic (both deaths and survivors).

Zoonotic Disease Surveillance Sites

**Specific sites and activities subject to change based on resource availability*

- **Kissidougou Prefecture: Missira (urban), Sangardo:** Animal production, crop production, and market and value chain
  - Sampling targets:
    - Wildlife: sampling of bats and rodents in and around human dwellings and agricultural fields; pristine forest areas; markets and road-side stands selling live and butchered wildlife

- **Guéckédou Prefecture: Houndonin (urban), Meliandou (rural), Kassadou:** Animal production, crop production, market and value chain

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  - Sampling targets:
    - Wildlife: sampling of bats and rodents in and around human dwellings and agricultural fields; pristine forest areas; markets and road-side stands selling live and butchered wildlife

- **Macenta Prefecture: Patrice (urban), Djomankoidou (rural), Oremai:** Animal production, crop production, market and value chain
  - Sampling targets:
    - Wildlife: sampling of bats and rodents in and around human dwellings and agricultural fields; pristine forest areas; markets and road-side stands selling live and butchered wildlife

- **N'Zérékoré Prefecture: Nyen (urban), Koropara (rural), Soulata:** Animal production, crop production, extractive industry, market and value chain
  - Sampling targets:
    - Wildlife: bats, rodents, and non-human primates in and around human dwellings and agricultural fields; pristine forest areas; markets and road-side stands selling live and butchered wildlife

Strengthening Laboratory Systems

PREDICT directly supports the national laboratory system in Guinea by engaging the Laboratoire de Fièvres Hémorragiques en Guinée (VHF) as the main laboratory partner for collaboration and capacity strengthening in Guinea. At the lab, PREDICT strengthens capacity for detection of Ebola and other hemorrhagic fevers, which are nationally recognized priority zoonotic diseases. Through this lab, PREDICT also works in collaboration ministry partners and the National Veterinary Lab to explore opportunities for training and the transfer of zoonotic disease detection knowledge, skills, and technologies, helping to foster linkages between sectors to strengthen Guinea's One Health laboratory network. To achieve Ebola Host Project objectives, an ambitious scope of work with extremely high volume of samples has been employed. Tests are conducted at both VHF (as capacity is developed) and the University of California Davis.

Animal labs: Laboratoire de Fièvres Hémorragiques en Guinée, with training and to include members of the National Veterinary Laboratory; University of California, Davis

Workforce Development and Improving Real-time Surveillance

PREDICT provides critical hands-on and on-the-job training to strengthen One Health workforce capacity in Guinea for government staff from national to subnational levels, research institutes, and local communities. By providing opportunities to put One Health in action across the full spectrum of skills

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required for safe and effective zoonotic disease surveillance, PREDICT strengthens Guinea's capacity to sample animals, investigate behaviors associated with zoonotic disease transmission, detect Ebola and emerging threats, and perform data analyses to understand zoonotic disease risks. National governmental focal points and local government are involved in field surveillance activities, and we will continue to engage them to ensure the operationalization of the One Health approach. In addition, PREDICT participates in monthly USAID GHSA and Ministerial One Health Platform meetings and works with partners and across ministries and sectors helping to build and operationalize the newly formed national One Health Platform, and to improve communications and linkages across animal and human sectors by sharing data and findings on zoonotic diseases. Finally, PREDICT will continue to participate in MoH epidemiological surveillance meetings (district and national level).

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KENYA
Year 4 (October 2017-September 2018)

Implementing Partners: Smithsonian Institution (SI), Institute of Primate Research (IPR)
Global Point of Contact: Drs. Dawn Zimmerman and Suzan Murray, SI
Country Coordinator: Dr. Joseph Kamau, IPR

Partners

- Central Veterinary Investigatory Laboratory (CVIL) at the Directorate of Veterinary Services (DVS)
- Community Health Africa Trust (CHAT)
  - Mpala Clinic
  - Ol' Jogi Clinic
- Cottage Hospital, Nanyuki
- Emergency Operation Center (EOC), Ministry of Health *(Currently Suspended)*
- Food and Agricultural Organization-Kenya (FAO-KE)
- International Centre of Insect Physiology and Ecology (ICIPE)
- International Livestock Research Institute (ILRI)
- Kenya Medical Research Institute (KEMRI)
- Kenya Wildlife Service (KWS)
- Ministry of Agriculture, Livestock and Fisheries
- Mpala Research Center (MRC)
- One Health Central and East Africa (OHCEA)
- University of Nairobi
  - One Health Centre, University of Nairobi
  - Veterinary College, University of Nairobi
- USAID EPT One Health Workforce
- USAID EPT Preparedness and Response
- USAID/Kenya
- Zoonotic Disease Unit (ZDU)

Prevent and Detect Zoonotic Disease

PREDICT builds the workforce, strengthens systems, and conducts surveillance for priority zoonotic diseases and other emerging threats. In Kenya, PREDICT puts One Health in action by integrating animal and human health sectors from the national to district level through the collection and testing of samples from wild animals, livestock, and humans at high-risk interfaces for zoonotic disease transmission. PREDICT focuses surveillance activities on the priority zoonotic diseases influenza and hemorrhagic fevers (e.g., Ebola, Marburg, etc.) and emerging threats, such as Middle East Respiratory Syndrome (MERS) Coronavirus. PREDICT supports the development of Kenya's One Health

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workforce from the national to district level through field and lab-based training and engagement of national staff, university and NGO partners, and students in surveillance and disease detection activities.

Where we work

Laikipia: Laikipia County is located along the Great Rift Valley and is rich in wildlife and livestock. It borders Samburu County to the north, Baringo to the west, Nyeri to the south, and Meru/Mount Kenya to the east. Ecotourism is a major activity in the county due to wildlife populations that are mainly found within livestock ranches. In addition to ranches, livestock are also kept by the pastoralist community and there is crop production to the south of the county. There is high overlap of wildlife with livestock and humans making this area an important interface for zoonotic disease surveillance.

Zoonotic Disease Surveillance Sites

- **Laikipia County, targeting Laikipia North, specifically Mpala, Loisaba and Suiyan conservancies.** Animal Production, Market and Value Chain, Human Dwellings and Natural Areas
  - Sampling targets:
    - Wildlife: Non-human primates (NHPs), rodents, and bats that interact with camels and livestock in the organized ranches and/or grazing lands, as well as with humans in and around dwellings and natural areas (within and around wildlife research center). The type and number of specimens collected and tested for each taxa will be determined based on budget and presence at interface
    - Community surveillance of people working within camel abattoirs/trade (herders, camel handlers, drivers, middle men, men/women milking or selling milk), in nearby communities, and within wildlife research center

Strengthening Laboratory Systems

PREDICT supports the development of an integrated One Health laboratory network by engaging the Institute of Primate Research (IPR) and the Kenya Medical Research Institute (KEMRI), both national research institutes in zoonotic disease surveillance and detection and active members in developing One Health activities and platforms in-country. IPR is the implementing partner for PREDICT/Kenya, and the lab is testing animal samples for priority zoonotic diseases and other emerging threats. As part of efforts to interlink animal and human laboratory systems, IPR lab staff have trained KEMRI lab technicians in preparation for initiation of human testing at KEMRI facilities. Additionally, PREDICT, in coordination with FAO, is strengthening animal laboratories for improved disease detection through workshops targeting laboratory technicians

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and staff from government and non-government organizations, including Kenya Wildlife service (KWS), Kenya Agricultural and Livestock Research Organization (KALRO), Directorate of Veterinary Service (CVIL-DVS), and several universities. Workshops provide training in laboratory safety, biosafety, and disease surveillance, including molecular techniques for advanced disease detection that are applicable to priority diseases such as Rift Valley Fever and rabies. Through the IPR lab, PREDICT is also providing a two-week intensive training to CVIL-DVS that will further enable this lab to test for priority zoonotic diseases and emerging threats.

Animal Labs: Institute of Primate Research (IPR) laboratory, with plans to transfer protocols and subset of samples for testing at Central Veterinary Investigatory Laboratory under the Directorate of Veterinary Services (CVIL-DVS)

Human Lab: Kenya Medical Research Institute (KEMRI) laboratory

Workforce Development and Improving Real-time Surveillance

PREDICT provides training opportunities to strengthen the One Health workforce in Kenya, as government staff from district to national levels are engaged in implementation of zoonotic disease surveillance and detection activities. PREDICT works closely with the USAID Preparedness and Response (P&R), One Health Central and East Africa (OHCEA), and the School of Veterinary Medicine and College of Health Sciences at the University Nairobi to strengthen One Health capacity in the country through short-term training, internships, and educational programs on One Health. Project data and findings on zoonotic diseases and enabling behaviors underlying transmission are shared and communicated through established channels across animal and human health sectors, strengthening data platforms and improving the ease of dissemination of animal, human, epidemiological, and ecological data. PREDICT participates in national initiatives to strengthen operationalization of One Health in-country, including the Joint External Evaluation, development of the national framework on zoonotic surveillance with FAO and DVS, and zoonotic disease-specific planning initiatives, such as MERS-COV surveillance and control. In addition, PREDICT partners with the Ministry of Agriculture, Livestock and Fisheries; Ministry of Environment and Natural resources (Kenya Wildlife Service), and the University of Nairobi to strengthen preparedness and response in the country and provides outbreak preparedness and response assistance (upon invitation and with approval from PREDICT Management Team) through provision of training materials and protocols, field investigation support, diagnostic testing, and epidemiological expertise, as evidenced during the avian influenza outbreak in neighboring Uganda in early 2017.

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LIBERIA *(Ebola Host Project country)*
Year 4 (October 2017-September 2018)

Implementing Partners: EcoHealth Alliance (EHA), The Society for Conservation of Nature of Liberia (SCNL)
Country Coordinator: Dr. Jim Desmond, EcoHealth Alliance
Global Point of Contact: Dr. Jon Epstein, EcoHealth Alliance

Partners

- Food and Agriculture Organization (FAO) Liberia, Monrovia
- Forestry Development Authority (FDA), Monrovia
- Liberian Institute for Biomedical Research (LIBR), Charlesville
- Ministry of Agriculture (MoA), Monrovia
- Ministry of Health (MoH), Monrovia
- National Public Health Institute of Liberia (NPHIL), Monrovia
- National Reference Laboratory (NRL), Charlesville
- USAID EPT One Health Workforce
- USAID EPT Preparedness & Response
- USAID/Liberia

Plans subject to change as the budget is finalized; activities presented will be implemented as budget allows.

Prevent and Detect Zoonotic Disease

PREDICT builds the workforce, strengthens systems, and conducts zoonotic disease surveillance for priority zoonotic diseases and other emerging threats. In Liberia, PREDICT is working with EPT, GHSA and local partners to implement the Ebola Host Project (EHP), an ambitious initiative seeking to discover the animal origins and spillover of Ebola virus (*Ebola zairevirus*) in Liberia, Guinea, and Sierra Leone. EHP is the most detailed investigation of this devastating public health threat of international concern ever attempted. Through EHP, PREDICT provides Liberia's growing One Health workforce on-the-job training opportunities in the full spectrum of activities required for safe surveillance and detection of priority zoonotic disease threats, and conducts surveillance targeting animals and humans at key high-risk interfaces for Ebola virus transmission. As part of the EHP, surveillance activities in the upcoming year are restricted to wildlife sample collection; there are no plans to collect biological samples from humans or livestock. In concert with sampling activities, PREDICT plans to collect in-depth, standardized, quantitative data using a targeted questionnaire (where feasible), on human activities and behaviors that may enable zoonotic disease transmission and spread among at-risk populations.

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Where we work

Between 2013-2016, West Africa experienced the largest Ebola virus epidemic in history, with more than 28,000 cases and 11,000 deaths recorded before the outbreak was finally brought under control. The unprecedented geographic spread of Ebola virus among human populations across multiple countries raised the prospect that the virus could have not only "spilled over" from wildlife but also "spilled back" from people into previously unaffected animal populations—wildlife, companion animals and livestock—resulting in a broader geographic distribution of the virus. In Liberia over 10,000 total cases or Ebola were reported during the outbreak and after declaring the country free of transmission in May 2015, two additional clusters of cases emerged before the country was declared free of transmission for a third time in January 2016. PREDICT targets five counties in Liberia to maximize the probability for identifying potential Ebola virus host species.

Lofa County, Foya, and Zorzor Districts. Both Foya and Zorzor districts are mixed habitats of natural forest surrounded by 'slash and burn' agricultural areas. Foya District was an area with a high incidence of human Ebola cases.

Montserrado County. Montserrado Country houses Monrovia, Liberia's capital and where there are several large, seasonal, urban bat colonies and people are highly exposed to excreta. Montserrado also contains areas subjected to recent deforestation near human dwellings and agricultural sites, and active bushmeat hunting which creates additional high-risk interfaces.

Nimba County. Nimba country houses Yekepa on the border with Guinea within the Arcelor Mittal mining concession. In Nimba PREDICT is targeting extractive industry interfaces and sampling animals in and around adits and forested areas in old exploratory mine shafts.

Grand Cape Mount. Grand Cape Mount has several areas with pristine forest in the Gola National Forest and other areas with mixed forest/agricultural landscapes. PREDICT has identified multiple sampling sites within this county that are expected to have high wildlife biodiversity and human-wildlife interfaces at agricultural and peridomestic sites.

Bong County. Bong Country houses Suakoko, Panta, and Kpai Districts and if resources allow, provides PREDICT with the opportunity to target areas with increasing land use change and the market and value chain.

Zoonotic Disease Surveillance Sites

**Specific sites and activities subject to change based on resource availability*

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- **Lofa County: Foya & Voinjama districts (Wenegizi Forest)**: Land use change, market and value chain
  - Sampling targets:
    - Wildlife: non-human primates, bats, and rodents in areas with recent deforestation near human dwellings and agricultural sites and the bushmeat value chain from hunting to sale to consumption, as a potential transmission pathway for Ebola virus

- **Montserrado County: Central Monrovia & St. Paul's River Districts**: Land use change, market and value chain
  - Sampling targets:
    - Wildlife: non-human primates, bats, and rodents in areas with recent deforestation near human dwellings and agricultural sites and the bushmeat value chain from hunting to sale to consumption, as a potential transmission pathway for Ebola virus

- **Nimba County: Yekepa in Yarmein District**: Extractive industry, land use change, market and value chain
  - Sampling targets:
    - Wildlife: non-human primates, bats, and rodents in areas with recent deforestation near human dwellings and agricultural sites and the bushmeat value chain from hunting to sale to consumption, as a potential transmission pathway for Ebola virus
    - Extractive industry: sampling of bat colonies dispersed by large iron ore mining concession (operated by Arcelor Mittal)

- **Grand Cape: Mount Tewor, Gola Konneh & Gowular Districts:** Land use change, market and value chain
  - Sampling targets:
    - Wildlife: non-human primates, bats, and rodents in areas with recent deforestation near human dwellings and agricultural sites and the bushmeat value chain from hunting to sale to consumption, as a potential transmission pathway for Ebola virus

Additional targeted sites (as resources allow)

- **Bong: Suakoko, Panta & Kpai Districts:** Land use change, market and value chain
  - Sampling targets:
    - Wildlife: non-human primates, bats, and rodents in areas with recent deforestation near human dwellings and agricultural sites and the bushmeat value chain from hunting to sale to consumption, as a potential transmission pathway for Ebola virus

UCDUSR0001753

- **Grand Bassa County (Buchanan District):** Land use change, market and value chain
  - Sampling targets:
    - Wildlife: non-human primates, bats, and rodents in areas with recent deforestation near human dwellings and agricultural sites and the bushmeat value chain from hunting to sale to consumption, as a potential transmission pathway for Ebola virus

Strengthening Laboratory Systems

PREDICT directly supports the national laboratory system in Liberia by engaging the National Public Health Institute of Liberia (NPHIL) for wildlife testing and through outreach to the Central Veterinary Diagnostic Laboratory and incorporation of Ministry of Agriculture staff for biosafety, biosecurity, and training in zoonotic disease detection. PREDICT strengthens capacity for detection of Ebola, a nationally recognized priority zoonotic disease, and other filoviruses (e.g., Marburg and other emerging threats). At NPHIL, PREDICT builds capacity by identifying equipment needs, assisting with necessary procurement, and training staff with experience from the Ebola outbreak on advanced disease detection techniques, which will include testing animal samples. PREDICT also works in collaboration with EPT-2, GHSA, and ministry partners to explore opportunities to transfer zoonotic disease detection knowledge, technologies, and in-service training opportunities to other laboratories in the national system, helping to foster linkages between sectors to strengthen Liberia's One Health laboratory network. To achieve Ebola Host Project objectives, an ambitious scope of work with extremely high volume of samples has been employed. Tests are conducted at both NPHIL (as capacity is developed) and the Columbia University Center for Infection and Immunity.

Animal lab: National Public Health Institute, Liberia (NPHIL) and Columbia University Center for Infection and Immunity

Workforce Development and Improving Real-time Surveillance

PREDICT provides critical hands-on and on-the-job training to strengthen One Health workforce capacity in Liberia for government staff from national to subnational levels, university staff and students, research institutes, and local communities. By providing opportunities to put One Health in action across the full spectrum of skills required for safe and effective zoonotic disease surveillance, PREDICT strengthens Liberia's capacity to sample animals, investigate behaviors associated with zoonotic disease transmission, detect Ebola and emerging threats, and perform data analyses to understand zoonotic disease risks. In addition, PREDICT works across ministries and sectors, helping to build and operationalize the national One Health platform. With Ministry of

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Agriculture (MoA), Ministry of Health (MoH), Forestry Development Authority (FDA), the National Public Health Institute of Liberia (NHPIL), the Liberian Institute for Biomedical Research (LIBR), National Reference Laboratory (NRL), and EPT-2 FAO and P&R partners, PREDICT is improving communications and linkages across animal and human sectors by sharing data and findings on zoonotic diseases and the enabling behaviors underlying transmission. Finally, PREDICT will continue to participate in monthly USAID GHSA and Ministerial One Health Platform meetings.

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SENEGAL
Year 4 (October 2017-September 2018)

Implementing Partners: University of California, Davis; Ecole Inter États Sciences et de Médecine Vétérinaires (Inter State School of Veterinary Science and Medicine of Dakar; EISMV) de Dakar; Université Cheikh Anta Diop de Dakar (Cheikh Anta Diop University; UCAD); Institut Sénégalais de Recherches Agricoles (Senegalese Institute of Agricultural Research; ISRA)
Country Coordinator: Dr. Ismaila Kane, EISVM
Global Point of Contact: Dr. Corina Monagin, UC Davis

Partners

- Cabinet du Premier Ministre, Sénégal (Prime Minister's Cabinet, Senegal), Dakar
- Defense Threat Reduction Agency/Cooperative Biological Engagement Program (DTRA/CBEP)*
- Direction des Parks Nationaux (DPN)
- Institut Pasteur de Dakar (IPD), Dakar*
- ISRA/*Laboratoire* National d'Elevage et de Recherches Vétérinaires (National Livestock and Veterinary Research Laboratory; LNERV), Dakar
- Ministère de l'Agriculture et de l'Equipment Rural (Ministry of Agriculture and Rural Equipment ; MAER), Dakar
- Ministère de l'Elevage et des Productions animales (Ministry of Livestock and Animal Production; MEPA), Dakar
- Ministère de l'Environnement et du Développement Durable (Ministry of the Environment and Sustainable Development; MEDD), Dakar
- Ministère de la Santé et de l'Action Sociale (Ministry of Health and Social Action; MSAS), Dakar
- Organisation des Nations Unies pour l'Alimentation et l'Agriculture (the Food and Agriculture Organization of the United Nations; FAO), Dakar
- Organisation mondiale de la Santé Sénégal (World Health Organisation Senegal), Dakar
- REDISSE (World Bank), Dakar*
- UCAD / Hôspital Aristide le Dantec (Dantec University Hospital), Dakar
- US CDC, Dakar*
- USAID EPT One Health Workforce

*Partnership in development

Prevent and Detect Zoonotic Disease

PREDICT builds the workforce, strengthens systems, and conducts zoonotic disease surveillance for priority zoonotic diseases and other emerging threats. In Senegal, PREDICT puts One Health in action through zoonotic disease surveillance sampling wildlife and people and conducting behavioral risk

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investigations at high-risk human-animal transmission interfaces. This work directly supports the national surveillance system, contributes to the development and implementation of the country GHSA roadmap, and provides opportunities to strengthen mechanisms for responding to priority zoonotic diseases, such as avian influenza and hemorrhagic fevers (Rift Valley, Ebola, Marburg, etc.). In addition, PREDICT supports the development of Senegal's One Health workforce from the national to district level through field and lab-based training and engagement of staff from the Ministries of Health, Agriculture, Livestock, and Environment, national research institutes, universities, and non-governmental organizations in surveillance and disease detection activities.

Where we work

Bandia, Sindia region: The Bandia area is a biodiverse private reserve Senegal and a major tourist attraction, receiving many national and international visitors that are exposed to non-human primates, rodents, and bats through informal contact at locations such as outdoor restaurants. In collaboration with government, GHSA, and EPT-2 partners, PREDICT is investigating risks for zoonotic disease transmission at several sites in the area due to the high potential for viral spillover at this important animal-human interface. Targeted sites include: **the Sindia district** (human surveillance activities), home to a frequented clinic of residents who live near the Bandia reserve and are regularly exposed to wildlife in their daily lives; and the **Bandia Bambara, Kofgoune, and Keniammbour villages** (rodent and bat surveillance activities), which are home to Bandia Reserve workers who live near the Bandia reserve and are regularly exposed to wildlife in their daily lives.

Zoonotic Disease Surveillance Sites

- **Sindia Health Center:** Land Conversion, Animal Value Chain, and Intensification of Animal Production Systems
  - Sampling targets:
    - Syndromic surveillance of patients at health posts/centers
    - Community surveillance of people with frequent exposure to wildlife.
    - Wildlife: rodents, and bats in and around the clinic and human dwellings

- **Bandia Reserve:** Land Conversion, Animal Value Chain, and Intensification of Animal Production Systems
  - Sampling targets:
    - Wildlife: rodents, bats, and non-human primates in and around protected areas with tourists and human dwellings
    - Community surveillance of people working in the reserve with frequent exposure to wildlife

UCDUSR0001757

- **Bandia Bambara:** Land Conversion, Animal Value Chain, and Intensification of Animal Production Systems
  - Sampling targets:
    - Wildlife: rodents, bats, and non-human primates in and around protected areas with tourists and human dwellings
    - Community surveillance of people with frequent exposure to wildlife

- **Kofgouye:** Land Conversion, Animal Value Chain, and Intensification of Animal Production Systems
  - Sampling targets:
    - Wildlife: rodents, bats, and non-human primates in and around protected areas with tourists and human dwellings
    - Community surveillance of people with frequent exposure to wildlife

- **Keniammbour:** Land Conversion, Animal Value Chain, and Intensification of Animal Production Systems
  - Sampling targets:
    - Wildlife: rodents, bats, and non-human primates in and around protected areas with tourists and human dwellings
    - Community surveillance of people with frequent exposure to wildlife

Strengthening Laboratory Systems

PREDICT directly supports the national laboratory system in Senegal and is developing an integrated One Health laboratory network by engaging the animal health lab at the Institut Sénégalais de Recherches Agricoles (ISRA), along with the human lab at the Université Cheikh Anta Diop de Dakar (UCAD). The ISRA Laboratoire National d'Elevage et de Recherches Vétérinaires (LNERV) is the national lab responsible for outbreak testing and animal health surveillance activities. The UCAD lab is the one selected by the MoH for PREDICT work and is the training center the human health sector. In addition, it provides critical reference support to the national surveillance system. At these labs, PREDICT strengthens capacity for detection of priority zoonotic diseases (e.g., zoonotic influenza viruses and VHFs - Ebola, Marburg, and Influenza) and other emerging threats and priority pathogens. PREDICT's One Health laboratory network fosters communication and coordination between animal and human labs and ministries; provides joint training exercises and routine information exchanges among lab managers, technicians, and ministry focal points; communicates data and findings to inform surveillance; and works to transfer knowledge and capacity to other labs in the national system.

Animal lab(s): Institut Sénégalais de Recherches Agricoles (Senegalese Institute of Agricultural Research ISRA)/Laboratoire National d'Elevage et de

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Recherches Vétérinaires (National Livestock and Veterinary Research Laboratory; LNERV), Dakar

Human lab: Université Cheikh Anta Diop de Dakar (Cheikh Anta Diop University; UCAD) / Hôpital Aristide le Dantec (Dantec University Hospital)

Workforce Development and Improving Real-time Surveillance

PREDICT provides training to strengthen One Health workforce capacity in Senegal, as central, regional, and local ministry staff participate in zoonotic disease surveillance activities. PREDICT engages the Ministry of Agriculture, the DPN, the GHSA Task Force, as well as the newly established COUS (Health Emergency Operation Center) at the Ministry of Health in efforts to strengthen national capacity for zoonotic disease surveillance, especially for the animal health sector by training DPN staff in One Health skills and safe wildlife capture and sampling during targeted surveillance operations. PREDICT also works with COUS and other GHSA partners to strengthen data platforms and improve communications and linkages across animal and human sectors, as project data and findings on zoonotic diseases and enabling behaviors underlying transmission are shared and discussed. PREDICT will continue to serve as a resource for the development and operationalization of Senegal's One Health Strategic Plan with local university, government, and research organization personnel. When requested by the government (and approved by the PREDICT Management Team) PREDICT also supports outbreak response and preparedness through field investigations, diagnostic testing, and epidemiological support.

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SIERRA LEONE *(Ebola Host Project country)*
Year 4 (October 2017-September 2018)

Implementing Partners: UC Davis, University of Makeni
Country Coordinator: Dr. Aiah Gbakima, UC Davis
Global Point of Contact: Dr. Brian Bird, UC Davis

Partners

- Central Animal-Veterinary Laboratory, (TEKO) Makeni, Bombali District
- Central Public Health Laboratory (CPHRL), Freetown*
- Ministry of Agriculture Forestry and Food Security (MAFFS)
- Ministry of Health and Sanitation (MOHS)
- Tacugama Chimpanzee Sanctuary, Freetown*
- University of Makeni (UNIMAK)
- USAID EPT One Health Workforce
- USAID EPT Preparedness and Response
- USAID/Sierra Leone

*Partnership in development

Plans subject to change as the budget is finalized; activities presented will be implemented as budget allows.

Prevent and Detect Zoonotic Disease

PREDICT builds the workforce, strengthens systems, and conducts zoonotic disease surveillance for priority zoonotic diseases and other emerging threats. In Sierra Leone, PREDICT is working with EPT, GHSA, and local partners to implement the Ebola Host Project (EHP), an ambitious initiative seeking to discover the animal origins and spillover of Ebola virus (*Ebola zairevirus*) in Sierra Leone, Guinea, and Liberia, as well as other priority zoonotic pathogens. EHP is the most detailed investigation of this devastating public health threat of international concern ever attempted. Through EHP, PREDICT provides Sierra Leone's growing One Health workforce on-the-job training opportunities in the full spectrum of activities required for safe surveillance and detection of priority zoonotic disease threats and conducts surveillance and behavioral risk investigations targeting animals and humans at key high-risk interfaces for Ebola virus transmission. As part of the EHP, surveillance activities in the upcoming year are restricted to wildlife sample collection; there are no plans to collect biological samples from humans or livestock. In concert with sampling activities, PREDICT plans to collect in-depth, standardized, quantitative data using a targeted questionnaire (where feasible), on human activities and behaviors that may enable zoonotic disease transmission and spread among at-risk populations. In addition, PREDICT is working with strategic GHSA partners to develop a zoonotic disease risk communication and outreach strategy focused on interventions for reducing the potential for viral transmission between bats and

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people.

Where we work

Between 2013-2016, West Africa experienced the largest Ebola virus epidemic in history, with more than 28,000 cases and 11,000 deaths recorded before the outbreak was finally brought under control. The unprecedented geographic spread of Ebola virus among human populations across multiple countries raised the prospect that the virus could have not only "spilled over" from wildlife but also "spilled back" from people into previously unaffected animal populations—wildlife, companion animals, and livestock—resulting in a broader geographic distribution of the virus. Sierra Leone, a small but ecologically diverse country with the highest recorded number of cases during the outbreak, has numerous settlements in urban and rural areas that are co-habited with bats and other wildlife, a rich animal-human interface with high potential for Ebola (and other zoonotic disease) transmission. PREDICT's EHP locations were selected to increase the opportunity to discover both the potential wildlife reservoir host of the virus (e.g., bats and rodents), along with other animals that may have been exposed to the virus through contact with infected people, contaminated materials, or fomites resulting in further spill-over of Ebola into previously unrecognized animal species. PREDICT collects samples from wildlife in a variety of sites, ranging from urban, semi-urban, and rural environments to deep primary forest sites in six districts of the country.

Zoonotic Disease Surveillance Sites

**Specific sites and activities subject to change based on resource availability*

- **Bombali District, Northern Province:** Animal production systems and market value chain
  - Sampling targets:
    - Wildlife: bats and rodents in and around human settlements, in areas of landscape disruption, and near agricultural sites, and hunted in the bushmeat market value chain

- **Western Areas, Freetown Area:** Animal production systems and market value chain, land conversion for commercialization
  - Sampling targets:
    - Wildlife: sampling of bats and rodents in and around peri-domestic livestock intensification operations in coordination with local private sector and government partners; sampling of animals in contact with domestic livestock animals or animal products destined for human consumption

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- **Kambia District, Northern Province:** Animal production systems and market value chain, land conversion for commercialization
  - Sampling targets:
    - Wildlife: sampling of bats and rodents in and around human settlements, in areas of landscape disruption, and near agricultural sites and hunted in the bushmeat market value chain.

- **Koinadugu District, Northern Province:** Animal production systems and market value chain, land conversion for commercialization
  - Sampling targets:
    - Wildlife: bats and rodents in and around human settlements, in areas of landscape disruption, and near agricultural sites, and hunted in the bushmeat market value chain

- **Kono District, Eastern Province:** Animal production systems and market value chain, land conversion for commercialization
  - Sampling targets:
    - Wildlife: bats and rodents in and around human settlements, in areas of landscape disruption, and near agricultural sites, and hunted in the bushmeat market value chain

- **Pujehun District, Southern Province:** Animal production systems and market value chain, land conversion for commercialization, wildlife management and ecotourism
  - Sampling targets:
    - Wildlife: bats and rodents in deep pristine forest habitats; peridomestic animals in and around human settlements and areas of landscape disruption; hunted animals in villages for pet trade, and hunted in the bushmeat market value chain

Strengthening Laboratory Systems

PREDICT directly supports the national laboratory system in Sierra Leone by engaging the University of Makeni Infectious Disease Research Laboratory. At the lab, PREDICT strengthens capacity for detection of filoviruses (e.g., Ebola, Marburg, and other emerging threats), a viral family that causes viral hemorrhagic fever, which is a nationally recognized priority zoonotic disease. Through this lab, PREDICT also works in collaboration ministry partners from the MOHS and MAFFS to provide training for technical ministry staff and to explore opportunities to transfer zoonotic disease detection knowledge, technologies, and in-service training opportunities to other laboratories in the national system, such as the MAFFS Central Animal Laboratory TEKO and the MOHS Central Public Health Research Laboratory, helping to foster linkages between sectors to strengthen Sierra Leone's One Health laboratory network. To achieve Ebola Host Project objectives, an ambitious scope of work with extremely high volume of

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samples has been employed. Tests are conducted at both University of Makeni (as capacity is developed) and the University of California Davis.

Animal lab(s): University of Makeni Infectious Disease Research Laboratory and the University of California, Davis

Workforce Development and Improving Real-time Surveillance

PREDICT provides critical hands-on and on-the-job training to strengthen One Health workforce capacity in Sierra Leone for government staff from national to subnational levels, university staff and students, research institutes, and local communities. By providing opportunities to put One Health in action across the full spectrum of skills required for safe and effective zoonotic disease surveillance, PREDICT strengthens Sierra Leone's capacity to sample animals; investigate behaviors associated with zoonotic disease transmission; detect Ebola, priority zoonotic diseases, and other emerging threats; and perform data analyses to understand zoonotic disease risks. In addition, PREDICT works across ministries and sectors helping to build and operationalize the national One Health platform and improve communications and linkages across animal and human sectors by sharing data and findings on zoonotic diseases and the enabling behaviors underlying transmission. District-level staff are involved in field surveillance activities and will be engaged to ensure the operationalization of the One Health approach. PREDICT facilitates meetings of District-level One Health Platforms in Bombali, Western Area, and Kono and Koinadugu districts, and will continue to support these platforms, while also planning to assist in initial platform meetings in Kambia and Pujehun districts in coordination with other government and EPT partners. Dissemination of One-Health messaging and risk avoidance communications will be an integral part of these and other community engagement activities during the upcoming year. Finally, PREDICT will continue to participate in MoH epidemiological surveillance meetings (district and national level).

TANZANIA
Year 4 (October 2017-September 2018)

Implementing Partners: UC Davis, Sokoine University of Agriculture (SUA), Ifakara Health Institute (IHI)
Principal Investigator: Rudovick Kazwala, SUA
Country Coordinator: Zikankuba Sijali, SUA
Human Surveillance Coordinator: Grace Mwangoka, IHI
Global Point of Contact: David Wolking, UC Davis

Partners

- Central Veterinary Laboratory (CVL) and Regional and District Veterinary Offices
- FAO Tanzania, Dar es Salaam, Tanzania
- Kibondo District Council, Kibondo, Tanzania
- Kigoma Municipal, Kigoma, Tanzania
- Kyerwa District Council, Kyerwa, Tanzania
- Makerere University Walter Reed Project (MUWRP), Kampala, Uganda
- Ministry of Agriculture, Livestock and Fisheries (MALF), Tanzania
- Ministry of Health, Community development, Gender, Elderly and Children (MoHCDGEC), Tanzania
- Ministry of Natural Resources and Tourism (MNRT), Tanzania
- National Coordinating Unit One Health Steering Committee (OHSC) and Technical Working Groups (TWGs) in Research and Development and Surveillance, Tanzania
- National Institute of Medical Research (NIMR), Dar es Salaam, Tanzania
- One Health Central and Eastern Africa (OHCEA), Tanzania
- Tanzania National Parks (TANAPA), Tanzania
- *Tanzania National Health Laboratory (TNHL), Dar es Salaam, Tanzania
- Tanzania Veterinary Laboratory Agency (TVLA), Dar es Salaam, Tanzania
- Tanzania Wildlife Research Institute (TAWIRI), Tanzania
- USAID EPT One Health Workforce (OHW)
- USAID EPT Preparedness and Response (P&R)
- USAID/Tanzania
- US CDC, Dar es Salaam, Tanzania

*Partnership in development

Prevent and Detect Zoonotic Disease

PREDICT builds the workforce, strengthens systems, and conducts zoonotic disease surveillance for priority zoonotic diseases and other emerging threats. In Tanzania, PREDICT puts One Health in action by engaging animal and human health sectors from the national to district level in the collecting and testing of samples from wild animals and humans and in conducting behavioral risk

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investigations at high-risk interfaces for zoonotic disease transmission, identified by ministry partners as gaps in the national surveillance system. This work contributes to the development and implementation of the country GHSA roadmap and One Health Strategic Plan and provides opportunities to strengthen mechanisms for responding to priority zoonotic diseases, such as zoonotic influenza virus and Rift Valley Fever and other hemorrhagic fevers (Ebola, Marburg, etc.). In addition, PREDICT supports the development of Tanzania's One Health workforce from the national to district level through field and lab-based training and engagement of national staff, university and NGO partners, and students in surveillance and disease detection activities.

Where we work

Kibondo, Kigoma, Kigoma rural, and Uvinza Districts, Northwest Tanzania bordering Burundi, Moyowosi game reserve (wetland), and Gombe national park. Agriculture, livestock keeping (in free ranging practice), ecotourism, and fishing are commonly practiced in the area and non-human primates from Moyowosi game reserve and rodents frequently intrude into farms and cause crop destruction. Grazing livestock is also a common practice in the game reserve. Seasonal migratory fruits bats (*Eidolon helvum*) believed to originate from rain forests in the Democratic Republic of Congo have been observed roosting on the mango trees in the densely populated Kigoma town and frequently fly around at Ujiji municipal searching for fruit at night. There have been reported cases of dog bites and illegal hunting in villages surrounding the game reserve. Illegal hunting is believed to be exacerbated by presence of refugees fleeing violence in neighboring Burundi and DR Congo in Kibondo district. Moreover, Tanzania Ministry of Health communicated that this area reports more cases of fever of unknown origin than other areas of the country. PREDICT is targeting the villages in close proximity to the game reserve, park, and city municipal areas with high wildlife- livestock-human interaction. We are evaluating risk of zoonotic disease transmission through animal and human surveillance activities and behavioral risk investigations.

Kyerwa District, northern area of the Lake Zone bordering Uganda. This site is characterized by frequent transboundary movement of people and animals and is inhabited by agriculturalists and livestock keepers. *Rousettus aegypticus* fruit bats, a known reservoir for Marburg virus, are being sampled at a cave in Murongo village. Dogs in the area reportedly feed on this fruit bat species at night, and cases of dog bites and rabies are rampant. Rodents frequently raid farms and damage crops causing agricultural loses. Insectivorous bats have also been observed at numerous sites including schools, health centers, and homes, thereby exposing people to bat feces and urine. PREDICT is targeting the villages and bat roosting sites with high wildlife- livestock-human interaction and is evaluating risk of zoonotic disease transmission through animal and human surveillance activities and behavioral risk investigations.

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Zoonotic Disease Surveillance Sites

- **Kibondo, Kigoma, Kigoma rural, and Uvinza Districts**: Animal production, crop production, market and value chain, hunting
  - Sampling targets:
    - Wildlife: rodents, bats, and non-human primates in and around human dwellings and agricultural fields, and in and around protected areas where refugees and other community members dwell or pursue livelihood activities
    - People living and working in and around game reserves in Kibondo, an area in Kigoma with an increasing influx of refugees from neighboring Burundi and DR Congo where a pilot World Food Programme cash transfer project may be encouraging increased interaction between refugee and local populations and use of forested lands for livelihood and food security
    - Behavioral risk investigations of pastoralist and hunting communities surrounding game reserves to characterize zoonotic disease transmission risk
    - Syndromic surveillance of people with frequent exposure to wildlife presenting at the Ujiji Health Centre, which serves a densely populated urban area and surrounding rural communities in coordination with government partners

- **Kyerwa District:** Animal production, crop production, extractive industry
  - Sampling targets:
    - Wildlife: bats and rodents in forested areas and caves degraded by population growth, settlements, and movement of people and transboundary areas in coordination with government partners
    - Syndromic surveillance of people with frequent exposure to wildlife presenting at the Murongo Health Centre in coordination with government partners
    - Behavioral risk investigations to characterize zoonotic disease transmission risk

Strengthening Laboratory Systems

PREDICT directly supports the national laboratory system in Tanzania and is developing an integrated One Health laboratory network by engaging the animal health lab at the Sokoine University of Agriculture lab in Morogoro and the human health lab at the Ifakara Health Institute in Bagamoyo. SUA's lab, based at the College of Veterinary Medicine, is the primary training ground for technicians and professionals feeding the government laboratory network and provides critical referral services to the national animal health surveillance

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system. The IHI lab maintains strong linkages to the National Institute for Medical Research and the public health laboratory network and is integrated with the national surveillance system. At both labs, PREDICT strengthens capacity for detection of priority zoonotic diseases (e.g. zoonotic influenza viruses and VHFs – Ebola, Marburg, and Rift Valley Fever) and other viral threats and fosters coordination between human and animal sectors through joint training exercises and routine information exchanges, communication of data and findings to inform surveillance, and transfer of knowledge and capacity to other labs in the national system.

Animal lab(s): The Sokoine University of Agriculture (SUA) PREDICT lab with training and transfer of protocols to the Tanzania Veterinary Laboratory Agency (TVLA) lab in coordination with FAO

Human lab(s): Ifakara Health Institute (IHI), with training and transfer of protocols to the National Public Health Laboratory (NPHL) as appropriate

Workforce Development and Improving Real-time Surveillance

PREDICT provides training to strengthen One Health workforce capacity in Tanzania, as central, regional, and district ministry staff are engaged in zoonotic disease surveillance activities. PREDICT coordinates with ministry partners, especially the One Health Coordination Unit within the Livestock Ministry and the Ministry of Health, to strengthen national capacity for zoonotic disease surveillance, and directly bolsters capabilities of the animal health sector by training district veterinary officers in One Health skills and safe wildlife capture and sampling during targeted surveillance operations. PREDICT also works with EPT-2 and GHSA partners to strengthen data platforms and improve communications and linkages across animal and human sectors, as project data and findings on zoonotic diseases and enabling behaviors underlying transmission are shared and discussed. PREDICT will continue to serve as a resource for the development and operationalization of Tanzania's One Health Strategic Plan with government, university, and non-governmental organization partners. When requested by the government (and approved by the PREDICT Management Team) PREDICT also supports outbreak response and preparedness through field investigations, diagnostic testing, and epidemiological support.

UCDUSR0001767

UGANDA
Year 4 (October 2017-September 2018)

Implementing Partners: University of California, Davis, Gorilla Doctors/ Mountain Gorilla Veterinary Project (MGVP), Inc.
Country Coordinator: Benard Jasper Ssebide, MGVP, Inc.
Global Points of Contact: Kirsten Gilardi and Michael Cranfield, UC Davis

Partners

- Bwindi Community Hospital, Buhoma, Kanungu
- Food and Agriculture Organization (FAO) of the United Nations, Uganda, Kampala
- Kagando Hospital, Kasese*
- Makerere University – Uganda Virus Research Institute Center of Excellence for Infection and Immunity (MUII)
- Makerere University Walter Reed Project (MUWRP), Kampala
- Makerere University, College of Veterinary Medicine Animal Resources and Biosecurity (COVAB), Kampala
- Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), Kampala
- Ministry of Health, Kampala
- Mutolere Catholic Hospital, Kisoro*
- National Animal Disease Diagnostics and Epidemiology Center (NADDEC), Entebbe
- National One Health Platform/One Health Technical Working Group
- Uganda National Task Force on Epidemic Preparedness and Response, Kampala
- Uganda Viral Research Institute (UVRI), Entebbe
- Uganda Wildlife Authority, Kampala
- Uganda Wildlife Veterinary Network*
- USAID EPT One Health Workforce
- USAID EPT Preparedness and Response
- USAID Mission Uganda, Kampala

*Partnership in development

Prevent and Detect Zoonotic Disease

PREDICT builds the workforce, strengthens systems, and conducts surveillance for priority zoonotic diseases and other emerging threats. In Uganda, PREDICT puts One Health in action through zoonotic disease surveillance, sampling wildlife and people, and conducting behavioral risk investigations at high-risk human-animal transmission interfaces. This work directly supports the national surveillance system, contributes to the development and implementation of the country GHSA roadmap, and provides opportunities to strengthen mechanisms for responding to priority zoonotic diseases, such as zoonotic influenza and

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hemorrhagic fevers (Ebola, RVF, and Marburg). In addition, PREDICT supports the development of Uganda's One Health workforce from the national to district level through field and lab-based training and engagement of national staff, university and NGO partners, and students in surveillance and disease detection activities.

Where we work

Bwindi/Mgahinga Conservation Area (BMCA). Bwindi Impenetrable and Mgahinga Gorilla National Parks are biodiversity hotspots, with thousands of visitors coming from around the world to view habituated primates (mountain gorillas). This region is among the most densely populated in all of continental Africa, with human communities dependent on subsistence agriculture and commercial crop production (e.g. tea), utilizing land that directly abuts park boundaries. Bwindi was relatively recently annexed as a protected area by the government of Uganda, resulting in the migration of hunting-based communities out of the forest and into towns and villages at the park boundaries. As well, this site is on the international border with the Democratic Republic of Congo, with significant movement of Congolese into the region. Wildlife, including non-human primates, exit protected areas frequently to raid crops and enter human dwellings and public buildings (e.g., Bwindi Community Hospital where PREDICT is conducting syndromic surveillance activities). As well, bat populations in the greater BMCA are known carriers of Marburg virus, a priority zoonotic disease.

Queen Elizabeth Conservation Area (QECA). The QECA is a 1,978 km² UNESCO Man and Biosphere Reserve encompassing several national parks and wildlife reserves in the districts of Kasese, Rubirizi, Rukingiri, Kanungu, and Kamwenge in western Uganda. Fishing and salt extraction are primary sources of income for more than 20,000 people living in 11 settlements within the QECA, while the dense populations living just outside the QECA engage in cattle ranching and crop production. QECA is known for its diverse wildlife including many species of non-human primate. In addition to its popularity as a savannah wildlife tourism destination, bat cave tourism in the Maramagambo forest and chimpanzee tracking in the Kyambura Gorge and Kalinzu Forest are increasing. As well, the Uganda Wildlife Authority is developing a BSL 2+ laboratory in Queen Elizabeth National Park, which will bring in additional opportunities for research in diseases transmission dynamics at this human-wildlife interface.

Zoonotic Disease Surveillance Sites

- **Bwindi/Mgahinga Conservation Area in Kabale, Kisoro and Kanungu Districts:** Land conversion for commercialization
  - Sampling targets:

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    - Wildlife: bats and rodents in and around human settlements and areas of land conversion or disruption; human-habituated primates inside and outside park in contact with people and livestock
    - Syndromic surveillance of patients (including park workers) presenting to Bwindi Community Hospital and Ruhija, Byumba and Rubuguri Health Centers who report contact with wildlife
    - Behavioral risk investigations with people living adjacent to the park (human questionnaires only without biological sampling)

- **Queen Elizabeth Conservation Area:** Land conversion for commercialization, animal value chain
    - Sampling targets:
        - Wildlife: Non-human primates bats and rodents in and around human settlements and areas of land conversion or disruption; primates inside and outside park in contact with people and livestock
        - Syndromic surveillance of patients (including park workers) presenting to Kagando Hospital and associated community health centers who report contact with wildlife

Strengthening Laboratory Systems

PREDICT directly supports the national laboratory system in Uganda by engaging the Uganda Virus Research Institute (UVRI), a critical node for outbreak response and surveillance support, for both animal and human testing. Laboratory staff at UVRI are highly experienced in techniques required for zoonotic disease detection and are in communication with our global One Health laboratory network for technical assistance as needed. Through PREDICT capacity building, the Makerere University Walter Reed Project laboratory also maintains capacity to detect priority zoonotic diseases and emerging threats and train the animal health sector. In addition, PREDICT maintains a safe and secured biobank facility at the Makerere University College of Veterinary Animal Resources and Biosecurity (COVAB). In collaboration with EPT and government partners, PREDICT fosters communication and coordination between animal and human labs and ministries; provides joint training exercises and routine information exchanges among lab managers, technicians, and ministry focal points; communicates data and findings to inform surveillance; and works to transfer knowledge and disease detection capacity to other labs in the national system (e.g., the National Animal Disease Diagnostics and Epidemiology Center, Entebbe).

Animal labs: Uganda Virus Research Institute (UVRI), with potential training and transfer of protocols (in collaboration with EPT partners and FAO) to MAAIF's National Animal Disease Diagnostics and Epidemiology Center (NADDEC)

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Human lab: Uganda Virus Research Institute (UVRI)

Workforce Development and Improving Real-time Surveillance

PREDICT provides critical hands-on and on-the-job training to strengthen One Health workforce capacity in Uganda for national One Health focal points, government staff from national to subnational levels, university staff and students, research institutes, and local communities. By providing opportunities to put One Health in action across the full spectrum of skills required for safe and effective zoonotic disease surveillance, PREDICT strengthens Uganda's capacity to sample animals and people, investigate behaviors associated with zoonotic disease transmission, detect priority zoonotic diseases and emerging threats, and perform data analyses to understand zoonotic disease risks. In addition, PREDICT works across ministries and sectors helping to build and operationalize the national One Health platform and improve communications and linkages across animal and human sectors by sharing data and findings on zoonotic diseases and the enabling behaviors underlying transmission. PREDICT supports the National Task Force (when approved by PREDICT management team) for outbreak preparedness and response.

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BANGLADESH
Year 4 (October 2017-September 2018)

Implementing Partners: EcoHealth Alliance (EHA)
Country Coordinator: Ariful Islam, EcoHealth Alliance
Global Point of Contact: Jon Epstein, EcoHealth Alliance

Partners

- Bangladesh Forest Department (BFD)
- Chittagong Veterinary and Animal Science University (CVASU)
- Department of Livestock Services (DLS)
- Dhaka Medical College Hospital *
- Dinajpur Medical College Hospital *
- Faridpur Medical College Hospital *
- FAO-ECTAD
- Institute of Epidemiology, Disease Control and Research (IEDCR)
- International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b)

*Partnership in development

Plans subject to change as the budget is finalized; activities presented will be implemented as budget allows.

Prevent and Detect Zoonotic Disease

PREDICT builds the workforce, strengthens systems, and conducts surveillance for priority zoonotic diseases and other emerging threats. In Bangladesh, PREDICT puts One Health in action through zoonotic disease surveillance, sampling of wildlife and people, and conducting behavioral risk investigations at high-risk human-animal transmission interfaces. This work directly supports the national surveillance system, contributes to the development and implementation of the country GHSA roadmap, and provides opportunities to strengthen mechanisms for responding to priority zoonotic diseases, such as highly pathogenic avian influenza, Nipah virus, and other emerging threats. In addition, PREDICT supports the development of Bangladesh's One Health workforce from the national to district levels through field and lab-based training and engagement of national staff, university and NGO partners, and students in surveillance and disease detection activities. In addition to One Health surveillance activities at targeted sites, PREDICT collects non-invasive rhesus macaque samples as part of a longitudinal investigation aimed at understanding how anthropogenic and domestic animal pressure on macaque populations affects likelihood of aggressive contact with people, along with individual animal viral load, viral shedding rates, and subsequent zoonotic disease transmission risks.

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Where we work

Madaripur is one of the locations in Bangladesh where macaques are protected. In recent years, the Government of Bangladesh (GoB) ceased feeding the macaques. People and livestock living in this area have regular and frequent contact with macaques here due, in part, to competition for food. The human-macaque contact at this site is often aggressive in nature. PREDICT behavioral risk investigations indicate that contact with macaques occurs frequently, making this an important site to investigate zoonotic disease transmission risks between wildlife, livestock, and people. PREDICT continues to conduct surveillance of urban wildlife and people along with in-depth behavioral risk investigations to characterize disease transmission risk at this important interface.

Dhaka. PREDICT zoonotic disease surveillance sites in the Dhaka districts were selected to understand how anthropogenic and domestic animal pressure on macaque populations affects likelihood of aggressive contact with people, viral load and viral shedding rates of individual animals, and subsequent zoonotic disease transmission risk to people. The urban site in Old Dhaka is a semi-private fenced-in factory lot where macaques are fed by staff, supporting a large troop of macaques in a populous area.

Danipur District is located at the border with India, where people move livestock across national boundaries. PREDICT sampling locations in this area were selected based on known livestock movement from India into Bangladesh. We are collaborating with FAO to identify specific market locations for concurrent sampling of wildlife and livestock around markets. Collectively, the team plans to also evaluate the feasibility of tracking livestock at cross-border markets.

Faridpur District in south-central Bangladesh is home to intensifying agriculture, livestock production, and homestead forests that include vast numbers of date palm, the sap of which is harvested and consumed and has been associated with multiple zoonotic disease outbreaks of Nipah virus. PREDICT is targeting bats and other wildlife in Faridpur for surveillance while exploring collaborations with the Government of Bangladesh and US CDC for syndromic surveillance of patients at the Faridpur Medical College Hospital.

Zoonotic Disease Surveillance Sites

- **Madaripur District**: Land Conversion Gradient (urban-rural gradient)
  - Sampling targets:
    - Wildlife: Rhesus macaques, bats, and rodents. Zoonotic disease surveillance at this site is a continuation of a “longitudinal” study;

sampling will be conducted along the gradient at six sites within this region (including sites in Dhaka below)
- Community surveillance targeting people living in close contact with macaques and at local clinics/pharmacies
- Behavioral risk investigations of people with routine or occupational exposure to wildlife to characterize risk factors for disease transmission

- **Dhaka District**: Land Conversion Gradient & Intensification of Animal Production Systems
  - Sampling targets:
    - Wildlife: Rhesus macaques, bats, and rodents at urban sites along the urban to rural gradient as part of continuing longitudinal zoonotic disease surveillance of macaque and other urban wildlife populations
    - Livestock: Camels at the only known camel farm and seasonal camel market system in Bangladesh with sampling during the religious festival season annually in August and September
    - Behavioral risk investigations of people living in close contact with macaques, along with farm, market workers, and camel handlers
    - Syndromic surveillance at Dhaka Medical College Hospital, the catchment hospital for the region (includes patients from the Madaripur sites)

  - **Dinajpur District**: Livestock Trade (Animal Value Chain)Sampling targets:
    - Wildlife: Bats and rodents in and around livestock markets
    - Livestock: Cattle, goats, pigs, and buffalo (sampling by FAO)
    - Community surveillance of people working with/in livestock trading, including the traders, drivers, middle men, and others assisting with handling
    - If feasible, syndromic surveillance may be established at the District Hospital(s) at Dinajpur

- **Faridpur District**: Land-use Gradient (rural to urban; wildlife-human contact)
  - Sampling targets:
    - Wildlife: Bats and rodents in close contact with people involved in date palm sap harvest and consumption
    - If feasible, syndromic surveillance at the Faridpur Medical College Hospital (regional hospital that also serves Madaripur) of meningo-encephalitis patients in collaboration with GoB, ICDRRB, and US CDC; communication and coordination with ICDDRB and CDC to ensure synergy and not duplication of efforts in progress

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Strengthening Laboratory Systems

PREDICT directly supports the national laboratory system in Bangladesh by engaging the International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b) and Institute of Epidemiology, Disease Control and Research (IEDCR, Ministry of Health and Family Welfare) labs for animal and human sample testing, respectively. Both the ICDDRB and IEDCR labs are critical nodes for outbreak response and surveillance support. In collaboration with FAO, PREDICT's icddr,b lab also works with GoB partners (Central Disease Investigation Laboratory of Department of Livestock Services and Bangladesh Livestock Research Institute Laboratory) to strengthen capacity for disease detection in the national animal health system. Laboratory staff at both icddr,b and IEDCR are highly experienced in techniques required for zoonotic disease detection, and are in communication with our global One Health laboratory network for technical assistance as needed. Together with EPT and government partners, PREDICT fosters communication and coordination between animal and human labs and ministries; provides joint training exercises and routine information exchanges among lab managers, technicians, and ministry focal points; communicates data and findings to inform surveillance; and works to transfer knowledge and disease detection capacity to other labs in the national system.

Animal lab(s): icddr,b (virology laboratory), Central Disease Investigation Laboratory (CDIL) of Department of Livestock Services (DLS), and Bangladesh Livestock Research Institute Laboratory (BLRI)

Human lab(s): IEDCR (virology laboratory)

Workforce Development and Improving Real-time Surveillance

PREDICT provides critical hands-on and on-the-job training to strengthen One Health workforce capacity in Bangladesh for government staff from national to subnational levels, university staff and students, research institutes, and local communities. By providing opportunities to put One Health in action across the full spectrum of skills required for safe and effective zoonotic disease surveillance, PREDICT strengthens Bangladesh's capacity to sample animals and people, investigate behaviors associated with zoonotic disease transmission, detect priority zoonotic diseases and emerging threats, and perform data analyses to understand zoonotic disease risks. Staff from the Bangladesh Forest Department are involved in field surveillance activities and will continue to be engaged to ensure the successful operationalization of the One Health approach. PREDICT works across ministries and sectors, helping to build and operationalize the national One Health platform through the One Health Secretariat, improve communications and linkages across animal and human sectors by sharing data and findings on zoonotic diseases and the enabling behaviors underlying transmission, and support the Government of Bangladesh

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(when approved by PREDICT management team) for outbreak preparedness and response.

This year, as part of global efforts to validate One Health approaches through the development of an evidence base and case studies that inform policies for risk reduction, a One Health Economics Fellow based at IEDCR will examine economic impacts of past and prospective emerging infectious disease events in Bangladesh by assessing effects on different sectors and examining resource flows. This project seeks to determine how to optimally allocate resources to address pandemic threats, whether devising strategies to mitigate the underlying causes or providing the necessary knowledge for individuals, businesses, and society as a whole, to minimize economic damages in the event of a pandemic.

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INDIA
Year 4 (October 2017-September 2018)

Implementing Partners: EcoHealth Alliance (EHA), Sanjay Gandhi Postgraduate Institute of Medical Sciences (SGPIMS)
Country Coordinator: Dr. Rajesh Bhatia, EHA
Global Point of Contact: Jon Epstein, EcoHealth Alliance

Partners

- Food and Agricultural Organization of the United Nations
- Forest and Wildlife Department, Government of Uttar Pradesh (UP), Lucknow
- *Indian Veterinary Research Institute, Izatnagar, UP
- Ministry of Environment, Forest and Climate Change, Government of India, New Delhi
- *National Institute of High Security Animal Diseases, Bhopal, Madhya Pradesh
- *National Institute of Virology, Pune, Maharashtra
- *Society for Advancement of Villagers Education & Rural Assistance, Kushinagar, UP
- UP Pt. Deen Dayal Upadhyaya Pashu Chikitsa Vigyan Vishwavidyalaya Evam Go-Anusandham Sansthan, Mathura, UP
- USAID EPT One Health Workforce
- USAID/India
- Wildlife Institute of India, Dehradun, Uttarakhand

*Partnership in development

Plans subject to change as the budget is finalized; activities presented will be implemented as budget allows.

Prevent and Detect Zoonotic Disease

PREDICT builds the workforce, strengthens systems, and conducts surveillance for priority zoonotic diseases and other emerging threats. In India, PREDICT puts One Health in action through zoonotic disease surveillance by sampling wildlife and people and conducting behavioral risk investigations at high-risk human-animal transmission interfaces. This work directly supports the national surveillance system and provides opportunities to strengthen mechanisms for responding to priority zoonotic diseases. In addition, PREDICT supports the development of India's One Health workforce through field and lab-based training and engagement of national staff, university and NGO partners, and students in surveillance and disease detection activities.

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Where we work

Maharajganj District is located in the state of Uttar Pradesh in northern India and shares its northern border with Nepal, an area with frequent transboundary livestock movement. In Maharajganj, PREDICT zoonotic disease surveillance focuses on two sites with impoverished frontier villages where people, wildlife, and domestic animals live in close association, presenting opportunities for zoonotic disease transmission and spread. Nichlaul and Bhabnauli are rural, mostly agrarian areas within a matrix of highly disturbed forest fragments that harbor key taxonomic groups for viral spillover and spread, including macaques, bats, and rodents, which commonly live in and around villages.

Zoonotic Disease Surveillance Sites

- **Nichlaul**
  - Sampling targets:
    - Wildlife: Rodents, rhesus macaques, and bats in frequent contact with both macaques and people
    - Livestock: sampling limited to village-based domestic animals, if warranted, during community surveillance activities
    - Community surveillance of people working within livestock trade (traders, drivers, middle men, and others assisting with handling)
    - Syndromic surveillance of patients living in close contact with wildlife and presenting at local clinics close to sampling sites
    - Syndromic surveillance of patients presenting with severe acute respiratory disease (SARI), encephalitis of unknown origin and hemorrhagic fevers, and admitted to the Community Health Centre and the district hospital

- **Bhabnauli**
  - Sampling targets:
    - Wildlife: Rodents, rhesus macaques, and bats in frequent contact with both macaques and people
    - Livestock: sampling limited to village-based domestic animals, if warranted, during community surveillance activities
    - Community surveillance of people working within livestock trade (traders, drivers, middle men, and others assisting with handling)
    - Syndromic surveillance of patients living in close contact with wildlife and presenting at local clinics close to sampling sites
    - Syndromic surveillance of patients presenting with severe acute respiratory disease (SARI), encephalitis of unknown origin and hemorrhagic fevers, and admitted to the Community Health Centre and the district hospital

UCDUSR0001778

Strengthening Laboratory Systems

PREDICT supports the national laboratory system in India by engaging the Sanjay Gandhi Postgraduate Institute of Medical Sciences (SGPIMS) for both animal and human testing. Laboratory staff at SGPIMS are highly experienced in techniques required for zoonotic disease detection and are in communication with our global One Health laboratory network for technical assistance as needed. PREDICT is currently formalizing linkages with national reference labs including the diagnostic labs at National Institute of Virology (NIV) and Indian Veterinary Research Institute (IVRI) to provide further characterization of project samples. In collaboration with EPT and government partners, PREDICT also fosters communication and coordination between animal and human labs and ministries; provides joint training exercises and routine information exchanges among lab managers, technicians, and ministry focal points; communicates data and findings to inform surveillance; and works to transfer knowledge and disease detection capacity to other labs in the national system.

Animal and human lab: Sanjay Gandhi Postgraduate Institute of Medical Sciences (SGPIMS)

Workforce Development and Improving Real-time Surveillance

PREDICT provides critical hands-on and on-the-job training to strengthen One Health workforce capacity in India for professional staff from human health, livestock health, and wildlife agencies at federal and state levels, university staff and students, research institutes, and local communities. By providing opportunities to put One Health in action across the full spectrum of skills required for safe and effective zoonotic disease surveillance, PREDICT strengthens India's capacity to sample animals and people, investigate behaviors associated with zoonotic disease transmission, detect priority zoonotic diseases and emerging threats, and perform data analyses to understand zoonotic disease risks. In addition, PREDICT works across ministries and sectors, helping to build and operationalize the national One Health platform, improve communications and linkages across animal and human sectors by sharing data and findings on zoonotic diseases and the enabling behaviors underlying transmission, and support the Government of India across federal and state levels (when approved by PREDICT management team) for outbreak preparedness and response.

UCDUSR0001779

INDONESIA
Year 4 (October 2017-September 2018)

Implementing Partners: EcoHealth Alliance (EHA) with the Primate Research Center of the Institut Pertanian Bogor (PRC-IPB) and Eijkman Institute for Molecular Biology (EIMB)
Country Coordinator: Dr. Joko Pamungkas, PRC-IPB
Global Point of Contact: Dr. Kevin Olival, EHA

Partners

- Animal Disease Investigation Center at Maros, South Sulawesi Province, at Denpasar, Bali Province, and at Banjarbaru, South Kalimantan Province
- FAO ECTAD Indonesia
- Gorontalo State University, Gorontalo
- Kawangkoan Primary Health Clinic (Puskesmas Kawangkoan), Minahasa District, North Sulawesi
- Local offices of Livestock and Animal Health Services at Southeast Sulawesi Province (both provincial and district levels)
- Local offices of Livestock and Animal Health Services at West Sulawesi Province (both provincial and district levels)
- Minahasa District Health Office (Dinas Kesehatan Kabupaten Minahasa)
- Ministry of Agriculture
- Ministry of Environment and Forestry
- Ministry of Health, National Institute of Health Research and Development
- Noongan Hospital (Rumah Sakit Umum Daerah Noongan), Minahasa District, North Sulawesi
- Provincial Health Office in North Sulawesi and Gorontalo Provinces (Dinas Kesehatan Provinsi Sulawesi Utara dan Gorontalo)
- Sam Ratulangi University, Manado, North Sulawesi
- USAID EPT-2 One Health Workforce
- USAID EPT-2 Preparedness and Response
- USAID-Indonesia

Plans subject to change as the budget is finalized; activities presented will be implemented as budget allows.

Prevent and Detect Zoonotic Disease

PREDICT builds the workforce, strengthens systems, and conducts surveillance for priority zoonotic diseases and other emerging threats. In Indonesia, PREDICT puts One Health in action through zoonotic disease surveillance by sampling wildlife and people and conducting behavioral risk investigations at high-risk human-animal transmission interfaces. This work directly supports the national surveillance system and provides opportunities to strengthen mechanisms for responding to priority zoonotic diseases. In addition, PREDICT supports the

UCDUSR0001780

development of Indonesia's One Health workforce from the national to district levels through field and lab-based training and engagement of national staff, university and NGO partners, and students in surveillance and disease detection activities.

Where we work

Indonesia is a vast and ecologically diverse country and a global biodiversity hotspot. PREDICT activities are centered at several sites on **the Island of Sulawesi**, the fourth largest island in Indonesia. While considered only one of many high-risk areas in Indonesia, Sulawesi is an important site for the wildlife trade and is undergoing rapid land conversion and exploitation of its local fauna. PREDICT surveillance sites in North Sulawesi and Gorontalo provinces were targeted to capture high-risk animal-human interfaces along the wildlife value chain pathway of zoonotic disease emergence, as bats, rodents, non-human primates, and other species are extensively traded for food across this region. These sites capture different stages of the wildlife value chain, from wild source populations of animals, to hunters and middle men, to urban wildlife markets. At these sites, PREDICT conducts concurrent zoonotic disease surveillance of wildlife, domestic animals (in collaboration with FAO-ECTAD partners) and people along with behavioral risk investigations in communities, such as the North Sulawesi markets where live and butchered wildlife are sold for human consumption and from rural and other sites where wildlife hunting and trading from source populations is occurring. Concurrent sampling of domestic animals by FAO-ECTAD overlaps with PREDICT surveillance in Gorontalo, North Sulawesi, and West Sulawesi, though not in the same geographic areas. Finally, PREDICT plans to conduct syndromic surveillance of patients with acute febrile and respiratory illness in local hospitals and clinics within a catchment area that overlaps with animal surveillance activities.

Zoonotic Disease Surveillance Sites

- **North Sulawesi and Gorontalo provinces:** wildlife trade
  - Sampling targets:
    - Wildlife: wild animals captured for trade and human consumption, primarily bats and rodents with opportunistic sampling of macaques in markets when available
    - FAO-led sampling of domestic animals with PREDICT-assisted testing at regional Disease Investigation Center (Maros, Denpasar, and Banjarbaru)
    - Syndromic surveillance of patients with acute febrile and respiratory illness at Noongan Hospital (Rumah Sakit Umum Daerah Noongan) and the Kawangkoan Primary Health Care Center (Puskesmas Kawangkoan)

UCDUSR0001781

    - Behavioral risk investigations with healthy individuals that have occupational exposure from working with wildlife and livestock
    - Community surveillance of people at high-risk interfaces

- **West Sulawesi, Majene**: wildlife trade
    - Sampling targets:
        - Wildlife: wild animals, primarily bats captured for trade and human consumption and rodents in and around dwellings, fields, or other areas with likely contact with people
        - Behavioral risk investigations with individuals involved in wildlife trade
        - FAO-led sampling of domestic animals with PREDICT-assisted testing at regional Disease Investigation Center (Maros, Denpasar, and Banjarbaru)

- **Southeast Sulawesi, South Konawe**: wildlife trade
    - Sampling targets:
        - Wildlife: wild animals, primarily bats captured for trade and human consumption and rodents in and around dwellings, fields, or other areas with likely contact with people
        - Behavioral risk investigations with individuals involved in wildlife trade

Strengthening Laboratory Systems

PREDICT supports the development of the national laboratory system and One Health laboratory network in Indonesia by engaging the Primate Research Center at Institut Pertanian Bogor as the primary laboratory for wildlife sample testing and the Eijkman Institute for Molecular Biology for human testing. Both labs provide critical support to the national surveillance and outbreak response system, and laboratory staff are highly experienced in techniques required for zoonotic disease detection, including detection of emerging viral threats, and maintain capability to conduct additional tests for other viral panels and serological assays upon request and as budget allows. Through this network, and in collaboration with FAO, PREDICT provides training in biosafety and zoonotic disease detection to local laboratory staff and strengthens the laboratory capacity of the Ministry of Agriculture's Animal Disease Investigation Center (DIC), especially at Maros, Denpasar, and Banjarbaru, where PREDICT techniques are actively engaged in livestock and domestic animal surveillance. PREDICT, in collaboration with EPT and government partners, also fosters communication and coordination between animal and human labs and ministries; provides joint training exercises and routine information exchanges among lab managers, technicians, and ministry focal points from national to subnational levels; communicates data and findings to

UCDUSR0001782

inform surveillance; and works to transfer knowledge and disease detection capacity to other labs in the national system (e.g., the DICs).

Animal lab(s): Primate Research Center at Institut Pertanian Bogor, Bogor with support (in collaboration with FAO) to the Ministry of Agriculture's Animal Disease Investigation Centers (DICs)

Human lab (s): Eijkman Institute for Molecular Biology (EIMB), Jakarta

Workforce Development and Improving Real-time Surveillance

PREDICT provides critical hands-on and on-the-job training to strengthen One Health workforce capacity in Indonesia for government staff from national to subnational levels, including individuals from the Ministry of Environment and Forestry, Ministry of Health, and Ministry of Agriculture, university staff and students, research institutes, and local communities. By providing opportunities to put One Health in action across the full spectrum of skills required for safe and effective zoonotic disease surveillance, PREDICT strengthens Indonesia's capacity to sample animals and people, investigate behaviors associated with zoonotic disease transmission, detect priority zoonotic diseases and emerging threats, and perform data analyses to understand zoonotic disease risks. This year, PREDICT plans to conduct a workshop on safe wildlife sampling for veterinarians and/or veterinary paramedics who work in the Ministry of Environment and Forestry. The workshop will be organized in coordination with USAID-Indonesia's PRESTASI program and will include a hands-on training for the collection of specimens from bats and rodents in the field. Additional on-site trainings on biosafety and biosecurity, zoonotic disease detection, and bioinformatics analysis are planned with government and medical faculty and staff from laboratories in the region, and a collaborative workshop in disease risk mapping is being planned with FAO partners to support Kemenko PMK's developing risk analytic and mapping capabilities.

PREDICT works across ministries and sectors, helping to build and operationalize the national One Health platform, and improves communications and linkages across animal and human sectors through data sharing and communications on zoonotic diseases and the enabling behaviors underlying transmission. When approval by the Government of Indonesia authorities is obtained, PREDICT findings are disseminated to all other relevant partners. PREDICT also works closely with EPT's P&R and the Coordination Ministry for Human Development and Cultural Affairs (Kemenko PMK) to support activities with local government agencies in North Sulawesi. In addition, PREDICT supports the Government of Indonesia as requested (when approved by PREDICT management team) in outbreak preparedness and response.

UCDUSR0001783

VIET NAM
Year 4 (October 2017-September 2018)

Implementing Partners: Wildlife Conservation Society (WCS)
Country Coordinator: Nguyen Thi Thanh Nga, WCS; Nguyen Van Long, WCS
Global Point of Contact: Amanda Fine, WCS

Partners

- Cat Ba Langur Conservation Program, Cat Ba National Park
- Department of Animal Health (DAH), Ministry of Agriculture and Rural Development (MARD)
- Hanoi School of Public Health (HSPH)
- National Institute of Hygiene and Epidemiology (NIHE), Ministry of Health (MoH)
- Oxford University Clinical Research Unit (OUCRU)
- Pasteur Institute Ho Chi Minh City (PI-HCMC)
- Regional Animal Health Office No. 6 (RAHO6) and Regional Animal Health Office No. 7 (RAHO7), DAH
- Save Vietnam's Wildlife (SVW) and Endangered Primate Rescue Center (EPRC), Turtle Conservation Center (TCC), Cuc Phuong National Park
- The Carnivore and Pangolin Conservation Program, Cuc Phuong National Park
- Viet Nam National University of Agriculture (VNUA), Ministry of Agriculture and Rural Development (MARD)

Plans subject to change as the budget is finalized; activities presented will be implemented as budget allows.

Prevent and Detect Zoonotic Disease

PREDICT builds the workforce, strengthens systems, and conducts surveillance for priority zoonotic diseases and other emerging threats. In Viet Nam, PREDICT puts One Health in action through zoonotic disease surveillance by sampling wildlife and people and conducting behavioral risk investigations at high-risk human-animal transmission interfaces. This work directly supports the national surveillance system, contributes to the development and implementation of the country GHSA roadmap, and provides opportunities to strengthen mechanisms for responding to priority zoonotic diseases. In addition, PREDICT supports the development of Viet Nam's One Health workforce from the national to district levels through field and lab-based training and engagement of national staff, university and NGO partners, and students in surveillance and disease detection activities. This year, PREDICT is continuing to evaluate opportunities for expansion of in-depth targeted and longitudinal zoonotic disease surveillance in animal and human populations.

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Where we work

Dong Nai Province, South Viet Nam near Ho Chi Minh City: A high number of wildlife farms are located in Dong Nai Province. The wildlife farms are stocked with wild animals sourced from captive and wild populations. Government agencies, including the Provincial Forest Protection Department and Sub-Department of Animal Health, support PREDICT's surveillance activities in the wildlife farms and adjacent domestic animal farms. Zoonotic disease surveillance and testing is beyond the mandate of these agencies, and PREDICT has prioritized wildlife farms and nearby livestock for surveillance activities due to the close and frequent human-wildlife contact.

Bac Giang/Lang Son Province, in Northern Viet Nam: Bac Giang/Lang Son is a large cave that provides roosting habitat to migratory bats. The guano produced by the bats is collected by individuals to use as plant fertilizer. Inside the cave, the bat guano harvesters and cave owners are exposed to overhead droppings and regularly walk through piles of feces with bare feet. PREDICT is investigating zoonotic disease spillover risk at this natural site and at constructed bat guano farms where bat guano is collected and harvested by hand (Dong Thap Province). Through in-depth behavioral risk investigations, PREDICT has characterized the guano collection process and identified the roles of individuals within the value chain. Subsequently, we confirmed guano collection, as well as adjacent domestic animal holdings, as priorities for human, bat, and domestic animal surveillance activities.

Ha Noi Metropolitan Area: Ha Noi, population 7.7 million people, is located on an important wildlife trafficking route in Southeast Asia and is an urban site for the field rat market trade (Animal Value Chain) with numerous people engaging in these activities. Domestic animals also move through the same markets and restaurants. PREDICT has confirmed Ha Noi as a priority for human, domestic animal, and wildlife surveillance activities and is planning to conduct surveillance on trafficked animals, as well as rodents, which have been listed as high-risk taxa for zoonotic pathogens.

Quang Ninh Province (LISN site): Quang Ninh is an international border crossing between Viet Nam and China for wildlife trafficking and other cross-border trade (Animal Value Chain) activities for wild and domestic animals. This is one of two sites where PREDICT is closely coordinating with the LISN project for joint surveillance activities.

Dong Thap Province (LISN site): Dong Thap shares a border with Cambodia and is a province with established bat guano production/use (Intensification of Animal Production Systems) and field rat trade activities (Animal Value Chain). In this region, bat guano production involves use of man-made bat roost structures, which can sit in close proximity to intensive livestock production operations. This

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is the second of two sites where PREDICT is closely coordinating with the LISN project for joint surveillance activities.

Opportunistic confiscation locations in the wildlife trade (multiple provinces): The illegal wildlife trade or wildlife trafficking (Animal Value Chain) is an important interface zoonotic disease surveillance. PREDICT has established relationships with partners with knowledge of confiscation events, which may involve a variety of wild animal taxa at destination, source, or transit sites throughout the country. Therefore, as opportunities are available and feasible, our teams conduct surveillance activities on confiscated wildlife and with humans exposed to wildlife in the trade.

Zoonotic Disease Surveillance Sites

- **Dong Nai Province, South Viet Nam near Ho Chi Minh City:** Wildlife farms (Animal Value Chain/Intensification of Animal Production Systems)
  - Sampling targets:
    - Farmed wildlife: rodents, carnivores, ungulates, non-human primates, birds, etc. present on wildlife farms and moving through the trade in urban and peri-urban sites. Focus on rodents and non-human primates and additional taxa as funds allow
    - Livestock: swine and poultry in close proximity to wildlife farms; sampling and testing by FAO
    - Community surveillance of people with occupational risk working on or near wildlife farms (caretakers, animal handlers)
    - Syndromic surveillance of patients presenting in local health clinics and hospitals with febrile illnesses in Dong Nai Province

- **Bac Giang/Lang Son Province, in Northern Viet Nam:** Bat guano production/use (Intensification of Animal Production Systems)
  - Sampling targets (as budget allows):
    - Wildlife: insectivorous bats using limestone karst caves near villages with livestock production facilities
    - Livestock: poultry and pigs on farms in close proximity to bat guano collection caves; sampling and testing by FAO. Additional livestock species in close proximity to bat guano collection caves as funds allow.
    - Community surveillance of people in close contact with bats and engaged in bat guano production
    - Syndromic surveillance of patients presenting in local health clinics and hospitals with febrile illnesses

- **Ha Noi Metropolitan Area:** Wildlife trafficking and field rat market trade (Animal Value Chain)
  - Sampling targets (as budget allows):

UCDUSR0001786

    - Traded wildlife: Wildlife present in restaurants and sold live in markets with a focus on rodents. Sampling/testing of carnivores, ungulates, pangolins, non-human primates, and birds as funds allow
    - Livestock: domestic species traded with wildlife through the same markets/restaurants and trade routes; sampling and testing by FAO
    - Community surveillance of people in close contact or with frequent exposure to wildlife
    - Syndromic surveillance of patients presenting in local health clinics and hospitals with febrile illnesses

- **Quang Ninh Province, International border crossings between Viet Nam and China (LISN site - PREDICT as technical laboratory partner only):** Wildlife trafficking & cross-border trade (Animal Value Chain)
    - Sampling targets:
        - Wildlife: PREDICT will provide outbreak response support if requested by the Government of Viet Nam
        - Livestock: swine and poultry in close proximity or sharing trade routes with wildlife; all sampling and testing by FAO
        - Syndromic surveillance of patients presenting in local health clinics and hospitals with severe acute respiratory illness (SARI); all sample collection and testing by WHO
        - Community surveillance of people in close contact or with frequent exposure to wildlife by LISN/PREDICT as funds allow

- **Dong Thap Province, sharing border with Cambodia (LISN site – PREDICT as technical laboratory partner and leading bat and rodent surveillance):** Bat guano production/use (Intensification of Animal Production Systems) and field rat market trade (Animal Value Chain)
    - Sampling targets:
        - Wildlife: insectivorous bats using artificial roost structures (bat guano farms) erected in villages near intensive livestock production facilities and markets; and field rats in trade or for sale in live markets/restaurants
        - Livestock: swine and poultry in close proximity to artificial roost structures and local markets and restaurants where live rats are sold; all sampling and testing by FAO
        - Syndromic surveillance of patients presenting in local health clinics and hospitals with febrile illnesses and SARI; all sample collection and testing by WHO
        - Community surveillance of people in close contact with bats and rats, such as engaging in bat guano production and in rodent hunting, trade, and sale by LISN/PREDICT as funds allow

- **Potential provinces with opportunistic confiscation locations:** Wildlife trafficking (Animal Value Chain)
    - Sampling targets (as budget allows):

UCDUSR0001787

- Wildlife: confiscated/rescued wildlife moving through the wildlife trade. Focus on pangolins (target 300+ individuals) and additional sampling of rodents, carnivores, ungulates, non-human primates, birds, etc. moving through the trade (markets, restaurants, wildlife farms, and in transit) in urban and peri-urban sites as well as national border crossings as funds allow.

Strengthening Laboratory Systems

PREDICT directly supports the national laboratory system and development of an integrated One Health disease detection network in Viet Nam by engaging two animal health labs, RAHO6 (national diagnostic lab) and the Viet Nam National University of Agriculture (VNUA) lab, and two public health labs, the National Institute of Hygiene and Epidemiology (NIHE) and National Influenza Center of the Pasteur Institute of Ho Chi Minh City (PI HCMH). Through PREDICT, both RAHO6 and VNUA labs have capacity to detect priority zoonotic diseases and other emerging threats. In addition, PREDICT plans to strengthen disease detection capacity at another Department of Animal Health Lab, RAHO7, located in Dong Thap Province in the Mekong Delta region of southern Viet Nam, where PREDICT is conducting surveillance activities. For human sample testing, the NIHE lab is also capable of detecting priority zoonotic diseases, and PREDICT is working with the PI HCMH to facilitate testing of human samples collected in Dong Thap province through the LISN initiative. In collaboration with EPT and government partners, PREDICT's lab network fosters communication and coordination between animal and human labs and ministries; provides joint training exercises and routine information exchanges among lab managers, technicians, and ministry focal points; communicates data and findings to inform surveillance; and works to transfer knowledge and disease detection capacity to other labs in the national system.

Animal labs: Livestock and wildlife: Regional Animal Health Office No. 6 & 7 (RAHO6, RAHO7) - Department of Animal Health; Viet Nam National University of Agriculture (VNUA)

Human labs: National Institute of Hygiene and Epidemiology (NIHE) and Pasteur Institute Ho Chi Minh City (PI HCMC)

Workforce Development and Improving Real-time Surveillance

PREDICT provides critical hands-on and on-the-job training to strengthen One Health workforce capacity in Viet Nam for government staff from national to subnational levels, university staff and students, research institutes, and local communities. By providing opportunities to put One Health in action across the full spectrum of skills required for safe and effective zoonotic disease

UCDUSR0001788

surveillance, PREDICT strengthens Viet Nam's capacity to sample animals and people, investigate behaviors associated with zoonotic disease transmission, detect priority zoonotic diseases and emerging threats, and perform data analyses to understand zoonotic disease risks. Through our work, PREDICT also promotes training and education with all stakeholders regarding the potential role of wildlife trade and consumption as a driver of zoonotic disease emergence. In addition, PREDICT works across ministries and sectors, helping to build and operationalize the national One Health platform, and improves communications and linkages across animal and human sectors by sharing data and findings on zoonotic diseases and the enabling behaviors underlying transmission. PREDICT also supports the Government of Viet Nam (when approved by PREDICT management team) for outbreak preparedness and response for potential zoonotic disease in wildlife and for human outbreaks in which wildlife involvement is suspected.

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