USAID
FROM THE AMERICAN PEOPLE

(b)(6)

September 29, 2014

[redacted]
Professor and Executive Director
School of Veterinary Medicine
University of California
One Health Institute
Davis, California 95616

(b)(6)

Subject: Cooperative Agreement No. AID-OAA-A-14-00102 for PREDICT-2

Dear [redacted]

Pursuant to the authority contained in the Foreign Assistance Act of 1961, as amended, the U.S. Agency for International Development (USAID) awards to University of California, School of Veterinary Medicine, Davis, CA, hereinafter referred to as the "Recipient", the sum of $100,000,000 to provide support to the PREDICT-2 project as described in the Schedule of this award and in Attachment B, entitled "Program Description."

This Cooperative Agreement is effective October 1, 2014 and the obligation shall apply to expenditures made by the Recipient in furtherance of program objectives during the period of performance, beginning with the effective date 10/01/2014 and ending 09/30/2019. USAID will not be liable for reimbursing the Recipient for any costs in excess of the obligated amount or outside of the period of performance.

This Cooperative Agreement is made to the Recipient, on condition that the funds will be administered in accordance with the terms and conditions as set forth in Attachment A (Schedule), Attachment B (Program Description), and Attachment C (Branding Strategy and Marking Plan) and Attachment D (Standard Provisions) and Attachment E (Initial Environmental Examination), all of which have been agreed to by your organization.

Please sign this letter, where indicated on the second page, to acknowledge your receipt of the Cooperative Agreement, and return to the Agreement Officer at your earliest convenience.

(b)(6)

Sincerely yours,

[redacted]
Agreement Officer
USAID

U.S. Agency for International Development
1300 Pennsylvania Avenue, NW
Washington, DC 20523
www.usaid.ov

Attachments:

A. Schedule
B. Program Description
C. Branding Strategy and Marking Plan
D. Standard Provisions
E. Initial Environmental Examination
F. Table of Acronyms

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ACKNOWLEDGED:

BY: [redacted]
TITLE: Executive Director, Research Administration
DATE: September 30, 2014

[redacted]
Executive Director, Research Administration
Office of Research, Sponsored Programs
University of California, Davis
1850 Research Park Drive, Suite 300
Davis, CA 95618
[redacted] FAX (530) 754-8229

(b)(6)

[redacted]

9/30/2014

A. GENERAL

1. Amount Obligated this Action: $13,600,000.00
2. Total Estimated USAID Amount: $100,000,000.00
3. Total Obligated USAID Amount: $13,600,000.00
4. Cost-Sharing Amount (Non-Federal) (b)(4)
5. Activity Title: PREDICT-2
6. USAID Technical Office: GH/HIDN/PIOET
7. Tax I.D. Number: (b)(4)
8. DUNS No.: 04-712-0084
9. LOC Number: (b)(4)

B. SPECIFIC

Account ID	1
Account Template	GH-HN Program Funds
BBFY	2014
EBFY	2015
Fund	GH-C-AI
OP	GH/HIDN
Program Area	A11
Dist Code	936-4002
Program Elem	A050
BGA	997
SOC	4100201
Obligated Amount	$13,600,000
Fund Type	Appropriated
Treasury Account Symbol	19-1031-000
Payment Office	M/CFO/CMP
Requisition Number	REQ-GH-14-000122

C. PAYMENT OFFICE

The USAID M/FM office prefers to receive invoices via email. When submitting invoices to USAID FM, in addition to the required submission to the Agreement Officer Representative (AOR), please send to:

Vendor invoices: loc@usaid.gov
Point of Contact: LOC Team Leader (b)(6)
Phone:
FAX: (202) 567-5264

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ATTACHMENT A – SCHEDULE

A.1 PURPOSE OF AWARD

The purpose of this Cooperative Agreement is to provide support for the program described in Attachment B to this Cooperative Agreement entitled "Program Description."

A.2 PERIOD OF AWARD

1. The effective date of this Cooperative Agreement is October 1, 2014. The estimated completion date of this Cooperative Agreement is September 30, 2019.

2. Funds obligated hereunder are available for program expenditures for the estimated period beginning the effective date of the Agreement through completion date as shown in the Agreement budget below.

A. 3 AMOUNT OF AWARD AND PAYMENT

1. The total estimated amount of this Award for the period shown in A.2.1 above is $100,000,000 not including required cost share of $3,697,810.

2. USAID hereby obligates the amount of $13,600,000 for program expenditures during the period set forth in A.2 above. The Recipient will be given written notice by the Agreement Officer if additional funds will be added. USAID is not obligated to reimburse the Grantee for the expenditure of amounts in excess of the total obligated amount.

3. Payment will be made to the Recipient by Letter of Credit in accordance with procedures set forth in 22 CFR 226

4. Additional funds up to the total amount of the Cooperative Agreement stated in A.3.1, above may be obligated by USAID subject to the availability of funds, satisfactory progress of the project, and continued relevance to USAID programs.

A. 4 AWARD BUDGET

The following is the Award Budget, including local cost financing items, if authorized. Revisions to this budget shall be made in accordance with 22 CFR 226.

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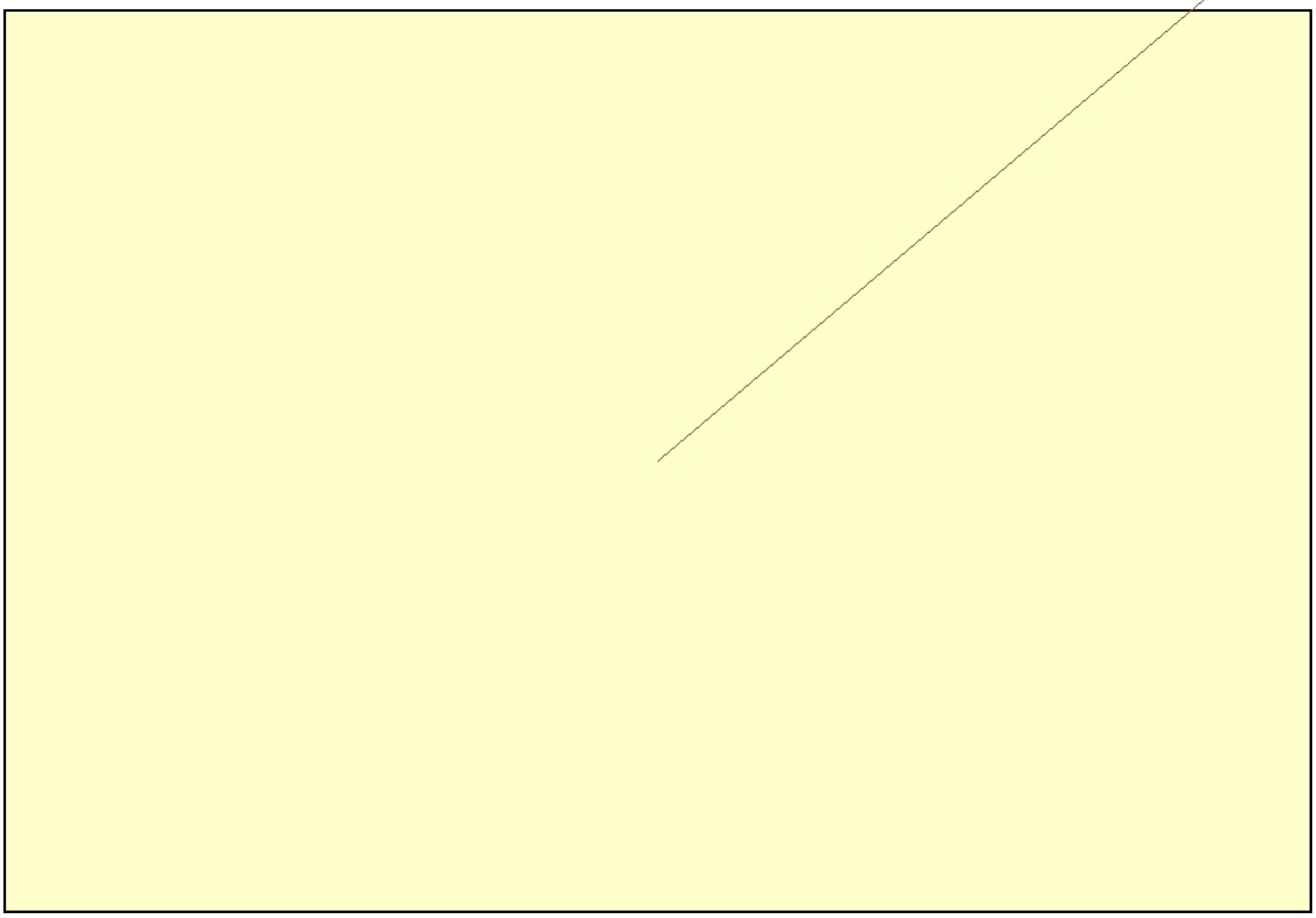
Categories	USAID funding
Total Federal Share	**$100,000,000**
Cost Share	
Total Program Amount	

A.5 INDIRECT COST RATE

(b)(4)



Base of Application

Modified total direct costs, consisting of all salaries and wages, fringe benefits, materials, supplies, services, travel and subgrants and subcontracts up to the first $25,000 of each subgrant or subcontract (regardless of the period covered by the subgrant or subcontract) . Modified total direct coats shall exclude equipment, capital expenditures, charges for patient care, student tuition remission, rental costs of off-site facilities, scholarships, and fellowships as well as the portion of each subgrant and subcontract in excess of $25,000.

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(1) Primate Center - The California National Primate Research Center (CNPRC) Non-Core Federal rate [redacted] is applied only to the direct research costs of Federally sponsored awards excluding the National Center for Research Resources (NCRR) Core Grant. All recoveries from application of this rate represent university F&A expenditures allocated to the CNPRC [redacted] and CNPRC-specific F&A expenditures (31.7).

(2) Intergovernmental Personnel Act Agreements.

(3) Use the same rates and conditions as those cited for fiscal year ending June 30, 2018.

A.6 TITLE TO PROPERTY

Property Title will be vested with the Recipient.

A.7 AUTHORIZED GEOGRAPHIC CODE

The authorized geographic code for the procurement of services and commodities for the cooperative agreement is 937.

A.8 COST SHARING

The Recipient agrees to expend cost share in an amount not less than $3,697,810 under this agreement. All cost sharing contributions shall be in accordance with 22 CFR.226.23 and Standard Provisions on Cost Sharing or Matching and are subject to audit.

A.9 PROGRAM INCOME

The Recipient shall account for Program Income in accordance with 22 CFR 226.24 (or the Standard Provision entitled Program Income for non-U.S. organizations). Program Income earned under this award shall be added to the total estimated amount of the program.

A.10 SUBTANTIAL INVOLVEMENT

Substantial involvement during the implementation of this Agreement must be limited to approval of the elements listed below:

1. Approval of all annual implementation plans, budgets, and all modifications which describe the specific activities to be carried out under the Agreement, subawards, and progress reports;

2. Approval of key personnel to include the following positions:
    a. Project Director
    b. Operations Manager
    c. Senior Biological and Ecological Surveillance Coordinator
    d. Senior Behavioral Surveillance Coordinator
    e. EPT-2 Liaison

3. Approval of Monitoring and Evaluation Plans - USAID involvement in monitoring progress toward achievement of the Objective and Expected Results during the course of the Agreements and in monitoring financial expenditures;

4. Collaboration or joint participation of USAID with the Recipient in accomplishing specific elements in the program description; where there are specific elements in the Program Description for which USAID's technical knowledge would benefit the Recipient's successful accomplishment of stated program objectives, to include:

a. Concurrence on the substantive provisions of sub-awards, including work plans, monitoring and evaluation plans, budgets, timelines, personnel, reporting (programmatic and financial), and any modifications.

b. Collaborative involvement in the selection of sub-awardees, grantees, and other partners.

c. USAID will be involved in the substantive direction/re-direction of inter-relationships with other projects as described in section D.3., USAID Management.

5. As appropriate, other monitoring as described in 22 CFR 226.

A.11 REPORTING REQUIREMENTS

a. Initial Work Plan to be submitted within 60 days of signing the cooperative agreement and Annual Work Plans for subsequent years to be submitted 30 days prior to the start of the new year.

b. Semi-annual reports shall be due 30 days after the reporting period. Annual Reports shall be submitted 90 calendar days after the award year in accordance with 22 CFR 226.51(b).

c. Final Evaluation Report: to be submitted 90 calendar days after the expiration or termination of the award which is in accordance with 22 CFR 226.51(b).

d. Financial Reporting: in accordance with 22 CFR 226.52, the SF 425 and SF 272 will be required on a quarterly basis.

A.12 SPECIAL PROVISIONS

A.12.1 SUBAWARD BUDGET APPROVAL

The subaward budget for Metabiota, Inc. is not pre-approved and AO approval post award is required. While the subaward to Metabiota doesn't need to be competed, the detailed budget, and budget notes have to be submitted to the Administrative AO within 60 days from the award date of this agreement. This budget approval will not be delegated to the AOR.

A.12.2 COUNTRY-BY-COUNTRY BREAKDOWN OF EXPENDITURES

The quarterly expenditure reports shall be sent to the AOR, no later than 45 calendar days after the end of each quarter. The quarterly expenditure report shall include, at minimum, obligations to date, the approved budget, expenditures to date, accruals to date, and the balance remaining. The report shall be broken down by country and core funds. Both field support and core funds must be tracked by program directive. In some cases, there will be multiple sources of funding for an activity, but the implementer must be able to demonstrate in the budget, expenditures and balances the flow of the money from multiple sources. The budget line items should include the major categories.

The recipient should list each country, included in the program, and the total amount expended for each country under the award for the reporting period in the “remarks” block on the “Federal

Financial Report" forms SF 425 or SF 425a, or on a separate sheet of paper with the "Request for Advance or reimbursement" SF270.

A.12.3 ENVIRONMENTAL COMPLIANCE

An Initial Environmental Examination (IEE) has been approved for the PREDICT-2 Project (see Attachment E). The IEE covers activities to be implemented under this cooperative agreement. USAID has determined that a **Negative Determination with conditions** applies to one or more of the proposed activities. This indicates that if these activities are implemented subject to the specified conditions, they are expected to have no significant adverse effect on the environment. The recipient shall be responsible for implementing all IEE conditions pertaining to activities performed under this award.

1. As part of its initial Work Plan, and all Annual Work Plans thereafter, the recipient, in collaboration with the USAID Agreement Officer's Representative (AOR) and Mission Environmental Officer or Bureau Environmental Officer, as appropriate, shall review all ongoing and planned activities under this cooperative agreement to determine if they are within the scope of the approved Regulation 216 environmental documentation.
2. If the recipient plans any new activities outside the scope of the approved Regulation 216 environmental documentation, it shall prepare an amendment to the documentation for USAID review and approval. No such new activities shall be undertaken prior to receiving written USAID approval of environmental documentation amendments.
3. Any ongoing activities found to be outside the scope of the approved Regulation 216 environmental documentation shall be halted until an amendment to the documentation is submitted and written approval is received from USAID.

Unless the approved Regulation 216 documentation contains a complete environmental mitigation and monitoring plan (EMMP) or a project mitigation and monitoring (M&M) plan, the recipient shall prepare an EMMP or M&M Plan describing how the recipient will, in specific terms, implement all IEE and/or EA conditions that apply to proposed project activities within the scope of the award. The EMMP or M&M Plan shall include monitoring the implementation of the conditions and their effectiveness.

When the approved Regulation 216 documentation is (1) an IEE that contains one or more Negative Determinations with conditions and/or (2) an EA, the recipient shall integrate a completed EMMP or M&M Plan into the Initial Work Plan or the subsequent Annual Work Plans, making any necessary adjustments to activity implementation in order to minimize adverse impacts to the environment.

End of Attachment A

ATTACHMENT B – PROGRAM DESCRIPTION
PREDICT-2

Technical Approach

In recognition of the realized and forecasted costs of emerging infectious diseases in both lives lost and dollars spent on response, treatment, and control, our consortium proposes to partner with USAID to continue to shift the prevention and surveillance paradigm upstream to: identify and better characterize pathogens of known epidemic and unknown pandemic potential; recognize animal reservoirs and amplification hosts of human-infectious viruses; and efficiently target intervention action at human behaviors which amplify disease transmission at critical animal-animal and animal-human interfaces in hotspots of viral evolution, spillover, amplification, and spread. To achieve these objectives, we will operationalize effective One Health platforms by increasing knowledge and functional technological capacity in local, national, and regional contexts. Critical capacity improvements will be attained in cross-sectoral communications and engagements for surveillance system design, field sampling, laboratory techniques, behavioral risk characterization, information management, public data dissemination, and data analytics and forecasting (e.g. viral ecology, geospatial analysis, pathogen and behavioral risk assessment, integrated pandemic risk analyses, risk communication). Instead of the broad approach needed in EPT-1, we propose to focus efforts on the highest risk locations and interfaces, where animals and people share changing landscapes, and diseases of unknown origin continue to take a significant toll.

Building on the surveillance activities and data made publically available in PREDICT-1, high-risk animal-to-animal and animal-to-human disease transmission interfaces have been integrated here into three major pandemic risk pathways: land conversion for commercialization, intensification of animal production systems, and animal value chains (see figure at right depicting the three major pathways that drive viral emergence in EPT-2 countries that we propose to target in PREDICT-2 and the associated hypothetical change in zoonotic emergence risk). We will use an epizonal approach to target these disease emergence and transmission pathways, characterizing the whole geographic, ecological, and sociological space, from pre-spillover conditions that drive viral evolution, through transmission of zoonoses, to circumstances of pathogen amplification and spread. This approach will facilitate the shaping and optimization of policies and practices that can reduce disease transmission risk through sound, science-based risk mitigation interventions at the community and industrial scale.

Objective 1: Biological and ecological risk characterization
Our consortium is well positioned to enhance the in-country and regional operational platforms, partnerships, and knowledge of best practices in field sampling and data collection recently gained from advances in zoonotic pathogen surveillance at high-risk animal-human disease transmission interfaces. For PREDICT-2, we propose a strategic, highly focused approach to identify the biological and ecological drivers and host-pathogen dynamics at high-risk interfaces within **three**

critical pathways of disease emergence and spread in Asia and Africa.

1.1. Targeted monitoring of zoonotic viruses with pandemic potential at specific high-risk interfaces Surveillance for zoonotic viruses, implemented together with in-country and EPT-2 partners, such as CDC, WHO, and FAO, will be prioritized at field sites most reflective of the processes underlying pathways for viral evolution, spillover, amplification, and spread.

1.1.a. Biological surveillance: to the extent feasible, data sets collected at all field sites will include:

i) Standardized, concurrent, and selectively longitudinal sampling of wildlife, livestock, and at-risk human populations with high levels of contact with animals, with special focus on influenza-like illness (ILI), severe acute respiratory infection (SARI), and fever of unknown origin (FUO) patients.

ii) Standardized collection of data on human movements, behaviors, and practices and the ecological conditions governing these aspects of human ecology (see Obj. 2).

iii) Detection and characterization of pathogens and evidence of infectivity and transmissibility among animal hosts and people.

iv) Analyses of key viral characteristics in combination with data collected on hosts, ecological drivers, human behaviors and practices, exposure rates, and ecological conditions for more precise ranking of high-risk interfaces and identification of key processes influencing the evolution, spillover, amplification, and spread of viral threats.

v) Establishment of collaborative platforms and national partnerships for longitudinal monitoring of viral threats at high-risk interfaces in conjunction with EPT partners and projects. Our intention is to facilitate wildlife, livestock, and human biological surveillance at all targeted high-risk disease emergence pathways (see 1.1.b. below). An initial scoping effort will be necessary on a country-by-country basis to identify sites for sampling activities based on potential to inform on disease emergence pathways and location within an epidemiological zone. Once locations are selected, we will assess feasibility for using existing in-country platforms and collaborating with in- country government partners, CDC, FAO, etc. on sampling activities.

vi) Simultaneous collection of human, livestock, and wildlife samples, as well as environmental and behavioral data, across the pathways described below (1.1.b.) in all intensive countries and most, if not all, less intensive countries. We will partner with in-country ministries, universities, and NGOs to achieve this goal in addition to fully coordinating sampling with FAO, CDC, and WHO in countries where they are actively collecting data for EPT-2. In some countries, the PREDICT-2 team will likely lead sample collection for people and all animals, while in others one or more of our partners may lead a section of the collection. In either scenario, we intend to collect human and animal samples aligned in time and space. In addition, we plan to test samples from livestock and humans using the successfully designed and employed platform used on wildlife samples in PREDICT-1.

1.1.b. High-risk pathways for disease emergence and spread:

i) **Land conversion for commercialization:** We propose focused, standardized biological surveillance for pathogens in rapid and dramatically changing landscapes under circumstances that bring potentially immunologically stressed or naïve individuals into contact with potential spillover organisms.

- New settlements and vulnerable human populations due to extractive industry growth,

conflict, economic hardship, and developing tourism: We will sample in temporary settlement communities in high biodiversity areas that constitute hotspots for disease emergence, as well as in the source communities of workers and their food animals. Sudden incursion into previously pristine areas and settlements with poor infrastructure are frequently associated with new exposure to animal reservoirs, subsequent introduction of infectious diseases, and movement of infected people through local and long-range travel.

- Sampling activities and viral characterization will target wild and domestic animals and people in new settlements with ongoing land-use change (such as mining/oil extraction camps, refugee/migrant worker camps, urban slums, and high-risk ecotourism sites) and vulnerable and highly mobile human populations at these sites within transboundary epizones connected by migration and human travel.
- Key pandemic risk factors identified through previous work will be further characterized by quantifying viral sharing among hosts and determining whether viral diversity and number of new viruses in animals and humans (disaggregated by gender) are higher at sites with new settlements, as well as evaluation of whether geographic distribution of viruses is associated with measures of animal and human mobility, resulting in high-risk epizones and heightened potential for global spread.

- Agricultural conversion in biodiversity hotspots: Cultivated systems cover one quarter of the earth's land surface, and conversion to cropland has been identified as one major driver of emerging infectious disease (EID) events. Agricultural intensification and subsistence farming is a high-risk interface common to all EPT-2 target countries. Crops are commonly raided by wildlife; peri-domestic animal populations (e.g. rodents) often exploit these niches; workers and consumers (including livestock) are exposed to zoonotic diseases in contaminated crops; and amplification and point source spread of disease occurs through shared food sources.
  - In coordination with EPT partners, standardized animal and human sampling activities and viral characterization will target agricultural land adjacent to highly biodiverse regions, such as palm oil plantations, and sentinels for likely routes of spread through transport and trade of agricultural products.
  - Surveillance results will be compared with baseline data from a small number of pristine and light-use sites to identify how rapidly this pathway increases EID risk.

ii) **Intensification of animal production systems:** We propose expanded biological surveillance along a continuum from rural pastoral settings to large-scale animal production systems with varying biosecurity, which facilitate frequent direct human-livestock contact and intermingling with wildlife species.

- Sampling activities and viral characterization will target wild and domestic animals and at-risk people (disaggregated by gender) in a range of production systems that are regionally connected by animal transport within epizones.
- Key pandemic mechanisms identified through previous work will be further characterized in this pathway, including the use of viral traceback and genetic approaches to determine whether co-mingling of wild and domestic animals in low biosecurity systems across the epizone leads to broader viral sharing and expanded host ranges, higher probability of human-to-human transmissibility, and geographic spread.

iii) **Animal value chains:** Collaborative work with FAO, CDC, and others has examined the routes and magnitude of the $350B wildlife trade which provides opportunities for pathogen transmission among domestic animals and co-mingling wild animals transported for consumption, medicinal uses, or to be kept as pets. We propose to focus our biological

surveillance activities along the wildlife and domestic animal value chains from remote naturally biodiverse regions to densely populated urban areas actively trading in varied animal species and products.

- We will characterize known and novel animal and human viruses and high-risk communities, describe animal and human mobility, identify high-risk nodes in the value chain using network analyses, and combine ecological and behavioral risk data (disaggregated by age, culture, and gender) to identify risk factors associated with viral evolution, spillover, amplification, and spread.
- We will also map out local and global trade routes to predict the spread of pathogens and, combined with our knowledge of pathogen diversity in wildlife hosts globally, predict the likelihood of a new pathogen spreading through value chains within an epizone and globally.

1.2. Characterization of climate and ecological factors

We propose the collection of standardized data at regular intervals on climatic and ecological factors identified as important drivers of pandemic risk via their effects on viral evolution, spillover, amplification or spread, including common measures of weather (temperature, precipitation), climatic envelopes, specific land cover, and anthropogenic land-use change activities at field sites prioritized for surveillance as above.

1.2.a. Climate, land use change, and niche modeling: We will integrate host and viral ecological niche model projections with viral and host phylogeographic analyses and current and future land use change scenarios to identify sites of future epizones where reservoir hosts will potentially co-exist based on climate and land conversion projections, flagging areas of concern for virus emergence.

1.2.b. Characterizing ecological risk and predicting spillover: We will continue to advance knowledge of ecological changes, including conversion of land from forest to crops and changes in human population density, that are recognized drivers for disease emergence. Employing geospatial analytical tools we will map and quantify high- risk ecological and behavioral data along our primary pathways of emergence. We will then integrate this spatial risk information with our host and pathogen databases and the phylogenetic and life-history predictors of zoonotic risk, creating a spatially-explicit, macroecological and behavioral framework to model the drivers of viral evolution, spillover risk, amplification, and spread, enabling us to compare pandemic risk within and between specific epizones. Here, life- history refers to the specific characteristics of different host species that affect their demographics and can influence their ability to harbor zoonotic agents. For example, some animal host species have higher reproductive rates, and this can lead to rapid population growth, heightened transmission of viruses, and increased risk of spillover to people. In PREDICT-1, we gathered information on these characteristics, as well as information about the viral diversity in different wildlife species. In PREDICT-2, we propose to analyze how host life history and viral diversity, as well as environmental change and human risk behavior, influence the likelihood of heightened viral evolution, spillover, amplification, and spread.

1.3. Longitudinal monitoring of viruses to track changes in geographic and host distribution, genetic sequences, transmissibility, infectivity, and viral evolution

1.3.a. Viral detection and discovery: Virus detection across high-risk interfaces within the specified pathways for emergence will be performed using a combination of consensus PCR (cPCR) and high through-put sequencing (HTS), a strategic approach to combine high

sensitivity with broad reactivity to discover novel viruses from many different hosts and sample types. Consensus PCR permits the "universal" amplification of viruses within a given viral family or genus, and the subsequent discernment of strains (both known and new). To guard against the potential of cPCR to miss viruses that are divergent or not among the initial targeted viral families, the application of the more inclusive but less sensitive HTS allows for the capture of a very broad diversity of viruses because it amplifies all viral nucleic acids present in the sample. We plan to use cPCR as our main discovery tool in all countries for biological surveillance (humans, wildlife, and domestic animals) on selected sample types based on interface and contact (i.e. potential for exposure) between animals and people and apply HTS to a subset of these samples for more detailed characterization. Serological assays will also be developed for targeted screening of prior exposure to selected, key pathogens and pathogen clades and will be used to identify previous and potentially ongoing spillover in animal and human populations at high-risk interfaces and amplification zones (see 1.3.c.).

1.3.b. Target viral families: In PREDICT-1 the list of target families/genera was necessarily broad and included families that, despite their (perceived) lower pandemic risk, had sufficient abundance and diversity in wildlife to act as useful targets for laboratory capacity building and successful training using the PREDICT protocols. If the successful bidder for PREDICT-2, we propose to focus our activities on viral families of potential pandemic (Tier 1) or epidemic (Tier 2) significance, as well as those with previous association with ILI, SARI, FUO, and hemorrhagic disease. Tier 1 will include viral families, such as corona-, paramyxo- and influenza viruses, and testing for these families will be conducted on selected, longitudinally-collected samples based on interface and type of contact with humans, wildlife, and domestic animals (performed in coordination with local partners, CDC, WHO, and FAO) in all target epizones. Tier 2 will include viral families, such as retro-, arena-, filo-, flavi-, bunya-, reo-, rhabdo-, picorna-, alpha-, adeno-, and pox- viruses, and will be conducted along with Tier 1 families in intensive-engagement regions; however, not all of these families will be applied equally to all samples. Selection of families from this list (for Tier 2 testing) and additions to Tier 1 testing will be adaptive in both high and low intensive countries and will depend on several criteria, including:
(1) the need to have consistent data across pathways for emergence; (2) high-risk interface; (3) need for knowledge on a particular viral family in a given region/epizone; (4) presence of undiagnosed human disease for which a given family might reasonably include an etiologic agent; and (5) resource availability after formal priority setting.

1.3.c. Serology to characterize exposure in human and animal populations and detect spillover: Because viral infections are often self-limiting in a host, PCR tests directed at detecting viral shedding and the potential for active transmission usually reveal lower numbers of positives than serological tests which may identify up to 100% of individuals previously exposed to a virus. Once key pathogens are identified in a particular epizone, we will, on a selective basis, develop serological assays to screen populations of people and animals (both livestock and wildlife) at high-risk interfaces to determine whether pathogen sharing has occurred. Serological assays may also be used to trace novel pathogens found in acutely ill human subjects back to potential animal reservoirs and amplification hosts. Serology may be used to characterize the frequency of host jumping within specific amplification zones, such as on farms and in markets, by screening animal populations that are in close contact at high density. We will develop in- country capacity to utilize serological assays developed under this

project, focusing on platforms that are readily available and practical to use in partner countries (e.g. ELISA assays).

1.3.d. Mapping viral diversity and evolution: We will integrate host-pathogen evolutionary and ecological data and viral phylogenies into analyses of global viral diversity and viral phylogeography using publically available data from PREDICT-1, longitudinal and other data collected during PREDICT-2, and the published literature. This activity will allow us to better understand how viruses evolve within the three emergence pathways and which viral clades are more likely to spillover in which host species assemblages (e.g. in wildlife/livestock markets) to answer key questions on the rules governing pandemic viral risk.

1.4. Expanded characterization of viruses to better understand pandemic potential, geographic and host distribution, and genetic diversity

Viruses detected from Tier 1 families that have a wider range of hosts, are related to known pathogens, are detected in new or unusual host species, or cluster with known pathogens found in other host taxa will be targeted for further characterization. Full genome sequencing and virus isolation will allow for accurate taxonomic placement, characterization of virus-host cell receptor interactions, improved understanding of host diversity and the evolutionary processes that shape viral diversity (e.g. reassortment/recombination), and the design of assays to investigate human exposure to these agents. Viruses from Tier 2 families may be similarly characterized if they have high host plasticity, are novel or related to a known pathogen, found at high frequencies at high-risk interfaces, and/or detected in species with known exposure to people with clinical disease.

1.5. Characterization of pathogens for Influenza-Like Illnesses (ILI), Severe Acute Respiratory Infections (SARI), and Fevers of Unknown Origin (FUO)

The study of diseases of unknown origin (DUO) provides an important tool for the identification of new and previously undetected pathogens that have the capacity to infect and potentially spread in human populations. Laboratory examination of syndromic surveillance samples are needed to identify novel agents in association with ILI, SARI, FUO, as well as other syndromes, such as hemorrhagic fever and encephalitis. In addition to the viral detection approaches described above, cPCR targeting conserved genes (e.g. 16s) will be used when appropriate to identify the full range of bacterial pathogens in specimens from DUO patients. As with our viral testing, we will adopt a tiered approach (described below) that will utilize the equivalent of viral family-level PCR with follow up characterization to identify new bacterial agents in the DUO specimens.

Consensus PCR for 16s rRNA: Unlike viruses, all bacteria share a conserved RNA called 16s rRNA. The presence of 16s in all bacteria means they can all be readily detected using PCR primers that target this gene. This removes the need to test for many different families or genera one after the other (as we do with viruses), or in the event of resource constraints, to have to choose which families to include/exclude from our testing strategy. This approach saves on resources and time and also prevents sample exhaustion because all bacteria are considered in one assay (important if we are also considering viral agents). That said, this 'universal amplification' also makes the 16s approach extremely vulnerable to false positives because of frequent sample contamination. Bacteria commonly found in the environment, on skin, in lab reagents (buffers, enzymes), or equipment are all known to contaminate diagnostic samples readily and often lead to false positives. Very careful sample collection and laboratory processing protocols must be followed in order to reduce the number of false positive results. We have already established laboratory procedures for handling samples for bacterial diagnostics (including sterile handling

practices, UV sterilization of equipment and tubes, filtration of buffers, and the inclusion of numerous extraction and PCR controls), and part of our resource allocation in PREDICT-2 will include training and implementation of these protocols in PREDICT-2 labs.

Follow-up of 16s rRNA positives: While the 16s approach will identify the presence of bacteria in a given sample and identify the family to which that bacteria belongs, the sequence obtained is rarely sufficient to distinguish down to the species or strain level. The ability to resolve the taxonomy of bacteria is particularly important because several families contain some species/strains that are common in the environment and others that are capable of causing human disease. Distinguishing between an innocuous environmental/commensal bacteria and a potential pathogen will (often) therefore require additional targeted testing. We have already designed assays capable of rapidly identifying all of the major human bacterial pathogens and plan to implement these assays in the event of a 16s positive sample to confirm the specific species present. In the event that these species-specific assays are all negative (suggesting a novel pathogen), we will move to deep-sequencing and possible culture to further characterize the bacteria present.

Characterization and association with disease: Understanding the role of bacteria in the disease state observed is also an important consideration; however, demonstrating causation for bacterial agents can be problematic. Bacterial infections can often occur as a secondary response to a primary viral infection (e.g. *Steptococus pneumoniae* associated with influenza infections), so combining bacterial testing on DUOs with our viral testing strategy will be important in our interpretations. Equally, many of the approaches we would use to demonstrate causation for viruses (such as immunohistochemistry, in-situ hybridization, copy number analyses) are not appropriate for bacteria because of their (mostly) extracellular biology and their potential for rapid overgrowth in the event of poor sample collection. In the event that additional work to demonstrate causation is required, we will use serology and (where possible) pathology and epidemiologic tools to establish this link.

We will also collaborate with established surveillance networks, such as the CDC, Department of Defense (DOD/DTRA), and the WHO/GISRS, to assist with etiological identification of new agents that may pose epidemic threats in the targeted disease emergence pathways, as well as other identified hotspots of human disease. Along with EPT partners, we will identify clinical settings for new studies where prospective samples can be collected in parallel with animal samples (domestic and wild) to detect novel viruses associated with these syndromes. These data will be analyzed in conjunction with behavioral questionnaires and extensive travel histories to assist in understanding human behaviors and practices that underlie the risk of emergence and spread. This work will align pathogen presence across the human-animal interface to better characterize pathogen sharing in time and space. We will compare novel agents detected in people with diseases of unknown origin to novel animal agents to assess animal hosts and regions of heightened risk for potential spread, which will also feed into identifying behaviors and practices (disaggregated by sex, age, social/ethnic group, livelihood strategy) that have the potential to mitigate disease emergence.

The PREDICT consortium has approval for human subjects research (including human biological sampling) in China, Malaysia, Rwanda, Uganda, Cameroon, and DRC. We also have a US exemption (from UCD) for IRB review that allows our team to: 1) perform diagnostic testing on archived human samples in DRC, Cameroon, Gabon, Malaysia, and Indonesia; 2) interview human subjects regarding their occupational and recreational contact with animals in Uganda, Tanzania, Nepal, and Malaysia; and 3) interview human subjects during outbreak response activities to obtain

data on health and contact with animals that may inform on the outbreak in all EPT-1 countries.

Once study design and field logistics are finalized for PREDICT-2, we anticipate 2-6 weeks start-up time may be needed for additional UCD IRB approvals and 2-12 months time for in-country approvals for biological and behavioral sampling of human subjects, with the latter varying substantially from country-to-country. As mentioned above, we will rely on existing in-country platforms that match our biological surveillance design whenever feasible. As necessary, we will implement surveillance platforms and lead field activities to ensure that sampling of wildlife, domestic animals, and humans is aligned in space and time along targeted disease emergence pathways. Regardless of which partner leads surveillance efforts, we will ensure the activities are collaborative and conducted with the appropriate global and in-country ethical clearances, in addition to guaranteeing that data and key findings are shared across in-country and international partners in a timely manner.

1.6. Mainstreaming PREDICT testing protocols and comparing speed and cost-effectiveness of viral screening approaches with standard methods

To ensure that our discovery strategy is both economically and scientifically robust, we will continue to evaluate the ability of our assays to detect diverse viruses by partnering with the CDC, WHO, FAO, and OIE reference labs around the world to compare the performance of our approach to commonly-used assays, including those for detecting specific influenza subtypes, as was performed in China during the H7N9 outbreak. For example, we already have commitments from FAO to partner on pilot projects in National Veterinary laboratories (e.g. beginning in Vietnam, Indonesia, Cameroon, and Malaysia) to test livestock samples with PREDICT viral screening protocols. Results obtained will enable assessments of the ability of these protocols to detect known and new viral pathogens in livestock samples in high-throughput labs (through PREDICT-1 we have shown the utility of these protocols in samples collected from wildlife and people) and will be compared with results found in other surveillance groups (animals and people) in the same areas. We anticipate conducting similar activities in National Public Health Laboratories in collaboration with the appropriate ministries, the WHO, and CDC.

As mentioned above, in PREDICT-1 we performed a small pilot project in China with the Guangdong Centers for Disease Control and Prevention and Guangdong Provincial Institute of Public Health to compare the cost and effectiveness of analysis between the WHO H7N9 real time assay and influenza diagnostic platforms with PREDICT pan-influenza A PCR protocols during the H7N9 outbreak. In PREDICT-2, we expect to expand this comparison by partnering with national laboratories to perform follow-up testing with PREDICT pan-influenza A PCR protocols on samples that tested negative using traditional influenza diagnostic platforms (i.e. only H1N1 and H5N1 screening that occurs routinely in most countries) to detect additional subtypes that may be circulating and assess the utility of a broader approach for screening. Pilot projects such as these are planned in National Veterinary Laboratories, such as at the National Animal Health Centre in Laos. Diagnostic protocols will also be shared with all EPT-2 partners or other agencies/organizations as requested and approved by USAID, and facilitated discussions will help to bring in new ideas and lessons learned from all partners to develop and optimize strategies. The proposed Pathogen Detections Leads (T. Goldstein, S. Anthony) will be responsible for ensuring these projects are piloted and will work closely with the proposed Director (J. Mazet), laboratory teams, and proposed EPT Liaison (W. Karesh).

We will also work with national and international partners to establish new approaches to

coordinated sampling and investigations for zoonotic diseases of pandemic potential by developing strategies which combine simultaneous sampling of humans (both biological and behavioral data), livestock, and wildlife at key interfaces or points of potential contact along the value/production chains outlined above. Both the ongoing and optimized sampling/investigation protocols and diagnostic approaches will be shared with the OHW and P&R projects for integration into pre-service and in-service training and hence, will facilitate adoption into standard practices by in-country professionals and curricula for future public health and animal health professionals. Data will also contribute to One Health analyses described in Obj. 4.

1.7. Technical support for viral surveillance and laboratory testing

Technical support will build on platforms and partnerships developed under EPT-1, with emphasis on further increasing capacities in collaborating laboratories and expanding collaborations with national laboratories and those testing livestock and human samples in coordination with FAO, OIE, CDC, and WHO. We have an established system of regional and global multidisciplinary communications and supply chains and will continually optimize feasible and cost effective strategies for procurement of field and laboratory supplies, as well as best practices in areas such as personal safety and ethical treatment of animals and humans involved in field investigations. These same communication lines enable regular and highly effective two-way transfer of knowledge between local and world-renowned experts in medicine, epidemiology, animal health, virology, ecology, comparative pathology, and social science, which can contribute to the efforts of the EPT PREPAREDNESS AND RESPONSE project (P&R) and ONE HEALTH WORKFORCE project (OHW). Together, we will continue to advance technology and improve local efficiencies and capabilities by harnessing our collective procurement, communication, and training strengths in support of the surveillance, laboratory, and outbreak activities proposed here.

1.8. Assistance to host country partners in outbreaks

Outbreaks in people and animals (domestic and wild) are real-world, real-time viral events that present unique opportunities for assisting collaborating country governments and applying animal sampling, pathogen discovery, hazard mitigation, and risk communication strategies under realistic scenarios and timelines. Furthermore, they are excellent scenarios under which the strengths and strategies of PREDICT-2, as well as P&R and OHW, can be demonstrated and tested. We will build upon previous outbreak experience to better understand the biological and ecological drivers, as well as the human behaviors and practices that contribute to virus evolution, spillover, amplification, and spread. Our teams will be trained, equipped, and supplied in a constant state of preparedness for contributing technically and substantively to focused outbreak response, including employing human-animal contact survey activities. Outbreak response synergies will result from strong ministerial linkages and institutional collaborations already in place (or built as needed), positioning PREDICT-2 teams for invitation by in-country governments from the outset, and allowing for close coordination with FAO, CDC, DOD/DTRA, and WHO partners. Data gained in conducting targeted surveillance during and between disease outbreaks will inform on new or modified policies and practices for outbreak preparedness and response, which will form the basis for coordinating with EPT P&R and OHW partners on recommendations to national task forces, One Health platforms, and the plans and activities of the Global Health Security Agenda (GHSA) partners and others.

Objective 2: Behavioral risk characterization

Human behaviors and practices are key risk components for pathogen spillover, amplification, and

spread. High-risk behaviors of people living and working in close contact with domestic and wild animals directly influence their zoonotic disease risk. We will characterize the type and frequency of contact among people, domestic animals, and potential wildlife reservoirs and investigate the correlation of specific human behaviors and zoonotic disease risk across sites, combining qualitative and quantitative methodologies to more deeply understand the behavioral mechanisms of high-risk pathways for disease emergence and spread. We will identify potential control points and behavior change options, field-piloting strategies to gauge individual and community willingness and uptake potential in order to determine which behavioral change interventions might be taken to scale**.** We will also focus on high-risk behaviors outside these pathways when and where there is specific evidence for pandemic risk identified through biological surveillance and qualitative research.

Activities characterizing behavioral risk will be disaggregated by age, sex, social/ethnic group, and livelihood strategy, and paired with wildlife, domestic animal, and human viral surveillance in each high-priority epizone. These investigations will fill a global need for more data and analyses on the diversity of high-risk activities, occupational risks, and age- and gender-specific hazards that will inform realistic and practical intervention strategies to support EPT and GHSA goals.

2.1. Standardized approach to study human behavioral risk

We will combine quantitative and qualitative research methods to identify and monitor behaviors, attitudes, practices, and socio-cultural norms and conditions that facilitate animal-human and animal-animal contact and influence the spillover, amplification, and spread of zoonotic pathogens. Risky behaviors and practices will be characterized through standardized surveys and observation of contact events (defined by direct and indirect transmission modalities). We will use extensively field-piloted surveys to initially characterize behavioral risk. A combination of quantitative household surveys, human- animal contact questionnaires, direct participant observation (focal follows), qualitative structured interviews, ethnographic observation, and participatory focus groups with people living or working in sites within defined high-risk pathogen emergence and transmission pathways will be conducted.

2.1.a. Overall approach: We have brought together a talented team with extensive experience in behavioral studies. In addition to the advantage realized by the training and expertise of the new members, the whole team will benefit from the experience gained during PREDICT-1, in which behavioral studies were designed directly in concert with the novel work of zoonotic viral detection and the identification and characterization of spillover and further transmission risk from wildlife. Our approach is designed to be iterative and begins with targeted ethnographic assessments and observations conducted in natural settings at biological and ecological surveillance sites. These provide a framework to gain rapid understanding of human-animal interactions and the actions/meanings surrounding these interactions, as well as for the exploration of unanticipated knowledge, such as the presence and rationale for taboos on certain human-animal interactions. These data in combination with the knowledge base already developed by in-country teams during PREDICT-1, will directly inform the development of detailed surveys with a consistent and systematic approach across countries for all three pathways but with specifics tailored for successful administration in each country and culture.

Alignment of the behavioral studies will coincide with the biological surveillance to maximize the understanding of risk and reconcile information gathered on transmission risk with the actual presence of potentially zoonotic pathogens. Timing will roughly coincide across countries, so that training and initial work is completed in the first 18 months, full surveys will

begin in year 2, analyses will be conducted in year 3, and in-depth potential intervention point surveys will continue in years 3, 4, and 5. Triangulated analyses that incorporate ethnographic, observational, and behavioral and biological survey data will be used to identify very high-risk potential intervention points. This process will be used to garner a greater understanding of the potential intervention points, as well as to inform directions for activities and evaluations of pilot interventions.

Country Coordinators will oversee the work. However, they will not be completely responsible for the design and supervision of the activities. Work will be undertaken by local teams, which may include small subawards to local experts, such as anthropologists and social scientists at local universities. We do anticipate hiring at least one employee under the Country Coordinator to be the local Point of Contact (PoC) for the behavioral studies in each country who ideally has some training in this area. These PREDICT-2 behavioral risk PoCs will be recommended by local partners, vetted by the Country Coordinators, and jointly interviewed and hired by the Country Coordinator and the Senior and/or Deputy Behavioral Risk Coordinators. Just as was done in PREDICT-1 for biological surveillance, training modules will be developed by the globally-based Behavioral Risk Team in conjunction with local partners to ensure quality and consistency across countries and to facilitate training of all local teams. Also similar to PREDICT-1, global personnel from the Behavioral Risk Team will travel to each country to deliver tailored training on the developed protocols specific to the needs of the in-country personnel and partners.

2.1.b. Building upon previous behavioral studies: In PREDICT-1, we systematically conducted behavioral risk characterization in three countries for the Deep Forest project, only two of which are within the geographic focus of PREDICT-2: Malaysia and Uganda. These household surveys were conducted along only one of the pathways (land conversion) proposed for PREDICT-2, not along animal production or trade pathways. We will therefore build upon these two studies by: 1) adding the other proposed approaches (e.g. ethnography and qualitative work described below); 2) conducting larger, deeper surveys (e.g. including children because their behavior is likely to be different and important for zoonotic risk); and 3) conducting surveys along the two other pathways for emergence. While these activities are resource-intensive, we will balance the resource needs by being more focused in our locations and scope of questions and having a better estimate of required sample sizes (based on our Deep Forest experience). This effort will validate the data generated from the surveys as well as account for recall error and biases. For instance, from preliminary Deep Forest data on human-animal contact, we know that self-reported data on hunting can be less reliable in countries where it is explicitly illegal and laws are enforced. In PREDICT-2, the focal follows, ethnographic, and observational studies described below will allow us to collect data on the frequency of contact with different animals and specific behaviors that may be associated with both increased risk and avoidance of detection by authorities.

2.1.c. Structured surveys and ethnographic data collection: Standardized surveys, open-ended interviews, focus groups, and focal follows will be conducted to characterize behavioral risk in all intensive countries. Data collection will involve quantifying the frequency, type, and duration of observed or reported contact events with wildlife and domestic animals. Data will be collected on zoonotic risk behavior and risk perception pertinent to regional beliefs and practices, for example behaviors associated with bushmeat hunting, butchering, and market visitation in the Congo Basin and wet market practices in Southeast Asia. A standardized subset of questions will be included in all surveys administered across pathways and epizones to generate comparative data on

behavioral risk. Special attention will be given to contact with animals identified through biological surveillance as potential zoonotic pathogen reservoirs (i.e. wildlife) or intermediate or amplifying hosts (e.g. pigs, poultry, cattle, camels). Data will be disaggregated by age, sex, social/ethnic group, and livelihood strategy. Sub-populations identified as having high rates of contact will be targeted for viral surveillance if not already included in the biological surveillance strategy. For example, because many animal handling practices (raising, butchering, selling in markets) are socially and culturally circumscribed to women, women will be considered a particularly important sub-population, and gender roles will be explored in-depth to gauge relative zoonotic risk within communities. Comparative data that will emerge from these surveys include: (1) types of animals contacted; (2) the frequency, duration, and type of encounter with key animals and potentially infective fomites; (3) characterization of indirect contact (i.e. contaminated food or environment); (4) how contact may vary by ethnicity, gender, livelihood strategies, and other socio-economic factors; (5) activities associated with high levels of contact with key animals; (6) livestock abundance and interactions with wildlife and people; (7) economic incentives that drive high-risk activities; (8) perceptions and awareness of disease transmission; and (9) economically-viable alternatives to high-risk activities. Findings will be informative for training in EPT OHW and for providing technical and operational assistance during outbreak investigations. In addition, to assess the mobility of populations within emergence and transmission pathways and across epizones, we will use a standardized occupancy survey to spatialize human occupancy and further characterize contact risk.

2.1.d. High-risk Pathways for disease emergence and spread:

i)**Land conversion for commercialization:** Particularly intense land use change in tropical regions supports behavioral drivers that may directly facilitate contact between potentially susceptible hosts and novel pathogenic microbial communities, especially where primary forest is opened up for mining, logging, plantation development, oil and gas extraction, encampments, and developing tourism.

- Focal follows*:* This method has previously been used by social scientists interested in assessing foraging patterns and human-animal interactions, including pathogen transmission between humans and non-human primates. Focal subject follows involve observing a particular individual for up to 24 hours and recording the specific activities in which the individual is engaged. Since self-reported data on hunting and other particularly high-risk activities can be unreliable, we will supplement data by following high-risk focal individuals during daily activities, using trained observers from within the local communities.
- Ecotourism/recreation surveys and global travel: Within this pathway and in many countries where wildlife populations are diverse and charismatic, ecotourism and other recreational activities bring an added risk for pandemic emergence, bringing travelers into contact with wildlife and people who contact animals frequently. We will target travelers and the workers that support them to examine their contact with wildlife and their health at the time of exposure to evaluate the overall epizonal risk and likelihood of global spread. In addition, broader surveys of travelers will assess willingness of individuals to travel in different health states to PREDICT-2 countries and will be used in combination with publically available travel data to continue to refine the risk of global spread of EIDs.
- Occupancy survey for human migration/mobility: Additional survey effort will be employed at high priority sites using a randomized point or transect survey design to get an unbiased estimate of the number of people occupying and moving through landscapes with varying characteristics. We will use geographic information systems (GIS) to develop spatial models

from these surveys that will use environmental and geographic covariates to produce an overall human occupancy map for each appropriate epizone. These data will complement currently available human population density maps that are frequently used in associative analyses of disease emergence, providing a more accurate picture of human occupancy by accounting for human population movement, rather than relying on the usual method of fixed household data censuses. Results will support EPT P&R efforts and local WHO programs.

ii) **Intensification of animal production systems:** To characterize behavioral risk in domestic animal farming systems and build upon the work conducted to date by FAO, we propose to implement a targeted occupational health study to identify specific behaviors and practices that could increase risk of cross-species transmission, viral amplification, and spread. We will also use observational studies (as described above) to characterize livestock production systems across an intensity gradient (rural systems, intermediate/peri-urban systems, large intensive farms) following FAO frameworks. We expect that zoonotic virus amplification in livestock production systems will increase with the degree of intensification primarily due to increased host animal density (as reported for H5N1 influenza) and also by facilitating novel interactions among species that may have had no prior contact (as reported for Nipah virus in Malaysia). In conjunction with FAO, we will support work examining how intensification also encourages greater frequency of movement of people and vehicles on and off farms for animal exchange and export to market, which may further increase the risk of pathogen spread.

- Occupational Health Study: In cooperation with our in-country teams, local health and agricultural agencies, FAO, and other agencies where appropriate, we will implement a standardized survey to identify people with exposure to domestic animals (and farmed wildlife). We will recruit participants for biological sample donation to correlate viral infection with specific behaviors and practices that may increase risk of exposure, including collaboration with local hospitals receiving individuals when presenting with symptoms. In conjunction with our biological surveillance in intensive countries, we will implement longitudinal cohort surveys with highly exposed farmers, transporters, and market workers. We will use serological tests for viral exposure in the longitudinal cohorts, as well as viral-family PCR screening for people when they are ill. We will thus be able to monitor past exposure and circulating viruses and potentially identify spillover in cohabiting human/animal populations, as well as identify emerging diseases of unknown origin.
- Observational studies: In conjunction with FAO and using existing data to target study sites, we will characterize the three levels of intensification in domestic animal farming systems including measures of animal abundance; type of enclosure; number of enclosures on the farm; approximate size; and general observations on farm structure, conditions, and hygiene (fecal matter in enclosure, mixed species, number of animals, open/ventilated, etc.). We will also assess other risky practices such as slaughtering, butchering, close contact with animals in high-density production (closed spaces), and other biosecurity risks.

iii) **Animal value chains:** Identified by some as the highest risk setting for the emergence of pandemic threats, animal value chains may present the best targets for pandemic prevention and strategic intervention. Therefore, we will investigate human behaviors that contribute to risk in this pathway.

- Systematic behavioral studies will employ standardized survey and observational methodologies described above to assess risk in animal value chains in selected countries at key locations within identified epizones. Specific data to be collected include species composition in markets, origins and types of products, volume, length of time in market, condition of animal meat, market size, market structure, proximity of live animals to one another, sanitary conditions, and human-animal contact type and frequency.
- Consumer surveys and market observations: In collaboration with FAO where feasible, we will determine which factors drive food preference, purchase, and consumption. Data from market and consumer surveys will be used to inform policy by evaluating and communicating the relative contribution to market disease risk by: variety and volume of taxa sold in markets, rate of animals turnover, sources of animals sold, location and method of slaughter, ethnocultural and socioeconomic influences on consumption decisions, and the revenue generated from live or butchered animals at each stage of the value chain.
- Wildlife farm surveys: We will conduct behavioral contact surveys and in-depth structured interviews of wildlife farmers and workers and economic analyses of wildlife farming to assess the risks and viability of alternatives to wild-origin trade in parallel with in-depth viral characterization of animals and people on farms.

2.2 Incorporating behavioral data into predictive models

We will measure key indicators of high-risk contact (e.g. frequency of contact, type of contact) among demographic groups (gender, ethnicity, age, location, religion, etc.) in order to identify subpopulations at high risk. We will use multivariate analyses to determine the relationship between high-risk contact indicators and land development index (for pathway 1), farming system change data (for pathway 2), and animal product demand data (for pathway 3), as well as metrics of ethnicity, gender, age, religion, socioeconomic status, knowledge, and attitudes, to understand the factors that influence different types and frequencies of contact. Specific high-risk contact behaviors commonly reported and associated with increased risk based on biological surveillance data will be targeted for further in-depth study to advise on suitable intervention approaches.

Quantitative data on human-animal contact generated from the surveys will be combined with biological and ecological surveillance data and used to predict spillover risk across targeted landscapes. Data from the behavioral surveys will inform on two components of our spillover risk model: 1) the probability of contact and 2) the probability of transmission. These data will be integrated with the biological and ecological surveillance data to evaluate risk among the three different disease emergence pathways (land conversion, animal production systems, and animal value chains) to identify key targets for disease control and behavior change. Contact rates will be extrapolated by combining survey population data on particular behaviors (consuming wildlife, butchering animals, working in markets, etc.) with demographic-specific population density data to arrive at population level behavior and exposure estimates.

2.3. Identification of potential intervention points

We will integrate data from biological surveillance, behavioral risk characterization, and economic and anthropologic studies using a dynamic analytical framework to identify potential targets for intervention to reduce the risk of viral amplification and spread. The framework builds on analytical approaches described elsewhere in this proposal, including extrapolating risk to the landscape and comparing the relative risk of similar systems in different countries. The framework is dynamic

because it can be used in combination with data on sampling and testing, as detailed above, to assess rapidly- evolving situations (e.g. a new wildlife farming system or a newly reported wildlife trade market chain) in a timely manner. We will use micro and macro-level behavioral and socioeconomic analyses for each pathway to identify the incentives for high and low-risk behaviors and the likely acceptability and cost-effectiveness of potential alternatives. This activity will be conducted with governments, experts in the field, and other EPT-2 partners to help identify and pilot evidence-based intervention points at the population level and determine topic areas where zoonotic risk-reduction interventions might be taken to scale at a regional level to support EPT P&R and OHW and for consideration by in-country governments and USAID for additional uses.

Objective 3: Global surveillance networks and analysis

Access to accurate, comprehensive, and timely biological surveillance and behavioral risk data is critical to predicting and responding to emerging diseases. Efficient data sharing and exchange is maximized through the use of user-friendly and standardized data organization platforms and ensures that information collected by disparate parties can be seamlessly integrated for detection of early warning signals, as well as for multi-national analyses across epizones. Our integrated consortium will use an internal data storage and sharing platform that will improve the ease of collection, synthesis, storage, access, and dissemination of relevant animal and human (age- and sex-disaggregated), spatially-explicit epidemiological, and ecological data that will help countries comply with IHR and OIE reporting obligations.

3.1. Standardized data collection

3.1.a. Standardized human and animal data management:

We have created an internal information networking system that has facilitated data collection in over 20 countries across disparate ecological, cultural, and linguistic situations and facilitated sharing of those data with country governments, international organizations, and the general public. Together with our partners at HealthMap, who implemented field data collection tools in the aftermath of the 2010 Haiti earthquake (OutbreakMD) and the 2010 Deepwater Horizon oil spill (GulfMedic), we will further refine our system to develop and deploy new field data collection tools to improve the data entry interface. Specifically, we will adapt these tools to optimize collection of standardized data on human and animal hosts and pathogens; behaviors and risks of disease emergence; and drivers, ecological conditions, and transmission interfaces (as well as other critical epidemiological information) during standard surveillance and outbreak situations. Deployment of improved data collection tools will reduce the time associated with data collection and curation, as improved point-of-entry validation tools will reduce the need for labor- intensive data cleaning and verification. We will improve our current data entry temporal standards (e.g. within 2 weeks of data collection) by using tools that reduce the need for recording data on paper and subsequent transcription (i.e. allowing electronic entry of data at time of sample collection). We propose to align standardized data collection approaches for both known and novel viral detection and influenza monitoring activities, across the three pathways, so as to construct longitudinal datasets and allow insight into ILI, SARI, FUO, and their underlying etiologies. We will work to develop the capacity for these databases to be hosted and managed locally, yet enable controlled sharing globally.

3.1.b. Biosurveillance data collection:

To further add to the world's understanding of novel disease emergence events (beyond EPT-2 activities) and help target PREDICT-2 surveillance strategies, publicly available information

(ProMED and HealthMap) on emerging diseases will be collected, filtered, geo-referenced, and integrated with human and animal field surveillance data.

i)HealthMap alerts are reports of disease outbreaks, collected by HealthMap's automated process. Updating 24/7/365, the system monitors, organizes, integrates, filters, visualizes, and disseminates publicly available information about these priority diseases. PREDICT-2 surveillance data will be provided to host-country governments as test results are finalized and interpreted and, combined with HealthMap alerts, will deliver near real-time intelligence on a range of emerging pathogens to governments for near real-time intelligence to inform on disease surveillance and mitigation actions, before public release authorization is given by the government. The process of internal (government) circulation of data is at the discretion of our ministry partners and does not preclude eventual public release of data. We will work with our government partners to reduce the time it takes for public release of data, with a goal of eventual "near real-time" public release of data, with the caveat that this release is always at the discretion of our government partners. Because the HealthMap alerts are derived from publicly available information (e.g. news stories, blogs, press releases etc.), they do not require data sharing authorization. As in PREDICT-1, we will continue to work with ProMED and HealthMap to optimize the digital searches to report improved public data on the HealthMap PREDICT interface.

ii) In addition to tracking disease events reported digitally, we have developed a low-cost local media surveillance program and tools for tracking rumors (e.g. the Vaccine Sentimeter, http://www.healthmap.org/viss/) that we propose to adapt to track and distinguish between "good" (reliable) and "bad" (unreliable) outbreak rumors. Our process for distinguishing "good" and "bad" rumors (i.e. distinguishing signal from noise in remotely sensed, digital media) involves a multi-stage process wherein reports are evaluated based on source reliability, report redundancy, or repetition (e.g. are there multiple sources for the report?), language on certainty in the report (e.g. suspected versus confirmed), as well as likelihood of the report given our epidemiological understanding. Validated reports will then be integrated into the PREDICT public data site (www.healthmap.org/predict) and used along with other data sources to provide information to host-country governments, USAID, EPT partners, and other partners on developing epidemiological situations as they arise. For example, during the Ebola outbreak in Uganda in 2011, daily summaries of validated media reports were provided to USAID and PREDICT staff who participated in the Zoonotic Disease National Task Force.

iii) We also plan to employ biosurveillance platforms to move beyond the reporting of events to increase pre-event awareness. Building on the success of the wildlife trade surveillance tool (healthmap.org/wildlifetrade), we propose to develop an experimental "outbreak sensitization" tool that maps real-time alerts on known disease drivers and integrates them with hotspot data to provide information to local health stakeholders and EPT OHW and P&R in order to sensitize them to the potential for disease events. EPT partner staff in PREDICT-2 countries will be trained in the use and management of these data, linking to better response and contributing to countries meeting IHR standards.

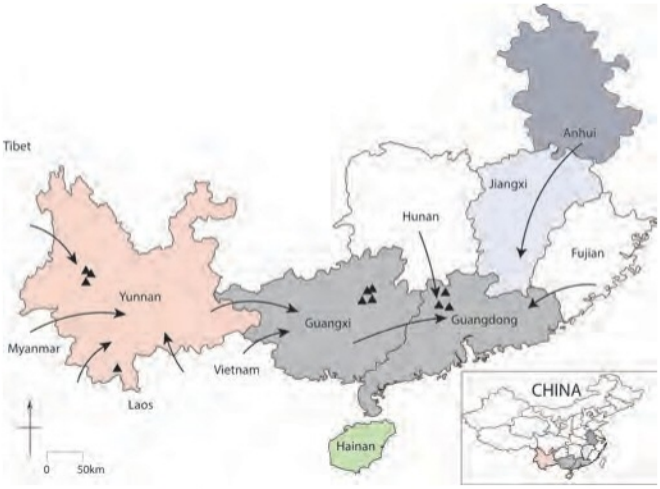
3.2. Global data synthesis

We will build on and extend the Global Animal Information System (GAINS) to create a new secured and internal globally accessible database to house aggregated (anonymized) human behavioral risk, biological surveillance, and outbreak information. Once approved for release by participating country governments, data will be made freely available through the public facing side

of PREDICT-2's dissemination tools (see 3.3 below), along with novel analytic and visualization tools.

3.2.a. PREDICT-2 database: In order to meet national and international privacy regulations and local country government requirements for data collection and release, we will use an internal database for the consortium that will provide the access and integration capabilities necessary for biological, ecological, and behavioral risk characterization, as well as tracking for progress on project deliverables and for annual data reviews (Obj. 6). Linkages will be created to allow national governments to link local databases to the PREDICT-2 database for integration of PREDICT-2 data collected in their country into national systems. Specifically, we will expand the current internal PREDICT database, the Global Animal Information System (GAINS), which currently includes data on animal hosts and associated diagnostic testing, to house additional data to enable examination of broader epidemiological dimensions of disease emergence. Thus as we move forward, for all sampling sites and events we will be able to include data on the animal hosts sampled, anthropogenic drivers and interfaces, and human behavior risk factors for analysis in the context of the pathogens present. This enhanced system will allow us to combine and examine data as needed for presentation by PREDICT staff to host-country governments, USAID, and EPT and other partners in a manner that provides a comprehensive view of the processes of disease spillover and amplification.

3.2.b. Development of an open access database on global respiratory pathogens: Publicly releasable data collected during PREDICT-2 will be integrated with influenza monitoring databases (e.g. EpiFlu). In addition, a specimen-information repository will be developed to allow researchers and public health officials to deposit and exchange metadata on respiratory illnesses to facilitate specimen exchange, matching those with specimens to those with the diagnostic capabilities to determine etiologies. Measures to protect data sharing agreements between providers and diagnostic laboratories will be implemented. These data will be integrated with formal and informal data on respiratory cases obtained via web-mining of HealthMap and curation by ProMED.



3.2.c. Identifying and characterizing changing epizones for viruses with known pandemic potential: As described above, we will employ an epizonal approach that encompasses geographic, ecological, and sociological space, from pre-spillover conditions through transmission of zoonoses to circumstances of pathogen amplification and spread. Thus, data collection, organization, and integration tools will be critical for ongoing identification and characterization of active epizones. For example, the epizone for SARS-CoV includes the wildlife markets of Guangdong where it amplified and spread, but also the whole wildlife trade along Southern China back to Yunnan Province, where we identified an unusually diverse cluster of bat SARS-like CoVs capable of infecting

human cells (see figure at left). We will use global data extractable from our platforms to conduct combined phylogeographic, ecological, and epidemiological analyses to better define and recognize epizones for known and novel viruses and identify regions within these epizones where viral evolution is enhanced and pandemic potential increased.

3.2.d. Actionable surveillance improvements and risk mitigation strategies will be developed throughout the PREDICT-2 project. We will use modeling and other analytics to evaluate optimal surveillance strategies for biological and behavioral data collection. As the results of PREDICT-1 are being analyzed now, we anticipate honing our surveillance strategies even further than proposed here based on the most productive data sources in PREDICT-1 (interfaces, locations, prioritized viral families, etc.), just as we have done with sample size estimates and sample type and host selection throughout PREDICT-1. Modeling platforms are constructed as concepts of pathogen risk develop within and outside of the EPT team, and modeling outputs are generated regularly (weekly to monthly), as the platforms are optimized and new data become available. There was a disconnect in this process during PREDICT-1 because of the necessary time lag needed to build sampling and laboratory capacity. The capacity building in those areas now being successful, we anticipate more real-time adaptive management of the surveillance arm of the project using modeling and analytics. That said, these adaptive changes have always occurred and will continue – what will primarily be different is the communication with USAID on how we are using the data and models in order to base internal decisions. We do not anticipate a dramatic change in the pace at which modeling activities are generating information for a broader, public audience. The most appropriate use of PREDICT-2 models will be to improve surveillance strategies and generate further hypotheses regarding pathogen emergence, amplification, and spread. We do, however, anticipate testing those hypotheses and validating the generated models with PREDICT-1 and -2 data on an on-going basis throughout PREDICT-2. We will also generate intervention and control scenarios and analytically evaluate probabilities for best investments using mathematical models. These will be run on an on-going basis, first based on likely assumptions and then refined as appropriate data are generated by PREDICT-2 and the collaborating EPT partners.

3.3. Global data dissemination

Ultimately, data are of use in disease forecasting, prevention, response, and mitigation strategies only if available to the stakeholders that require them for decision-making. Local authorities will be provided with PREDICT-2 results for policy use, response, and meeting IHR and OIE reporting obligations either via PREDICT-2 country coordinator communications or directly via linkages between the PREDICT-2 database and national systems. PREDICT-2 data released for public access by governments will be distributed using a globally accessible public portal www.healthmap.org/predict. We will also incorporate processed risk-characterization data, coupled with clearly documented cross-cutting forecasting of risk resulting from the characterization process.

3.3.a. Specific types of data and information that we will make accessible through this portal or that our website will include:

i)**PREDICT-2 standardized biological surveillance data**, including potential pathogens

detected.

ii) **Database on influenzas and other respiratory pathogens**, including a repository of metadata on available human respiratory illnesses of unknown origin and PREDICT-2 surveillance data on zoonotic viruses of known and unknown pandemic potential. This database will include analytic, forecasting, and visualization tools. Role- based security will be implemented so as to allow health officials access to surveillance data collected in their countries before data are approved for general public release, as necessary.

iii) **Digital disease alerting data** from systems such as HealthMap and ProMED. We will also provide push alerts so that stakeholders can be immediately notified of disease alerts and new samples collected.

iv) **Baseline risk information** developed through ongoing analyses, such as hotspot forecasting.

v) **Training materials and tools for real-time data collection and management during outbreaks** (e.g. the PREDICT data collection tool described above, Epi Info, NovaModeler etc.) shared with EPT partners.

vi) **Protocols and guides** for conducting biological surveillance and behavioral risk characterization (made available in multiple languages upon request) and shared with EPT OHW, P&R, and other EPT partners.

3.3.b. Global data dissemination goal: Facilitate sharing and integration of PREDICT-2 and other host country data on behaviors related to disease risk and surveillance and test results into global data streams to support IHR, OIE, and GHSA goals of data sharing. Training on how to access and utilize the data and project findings will be conducted in several ways. First, as a readily available online resource, written guides and protocols developed in PREDICT-1 and -2 will be shared to provide detail to in-country teams for working with the data sets and platforms. Additionally, webinars and workshops for interactive training will be offered to introduce end-users to key aspects of the data sets and platforms while providing a forum for them to also ask questions. Specific training sessions may be provided to focus on the basic skills needed to manage and analyze data such as bioinformatics, epidemiologic analyses, and risk mapping. The goal is to build intellectual capacity and enhance the abilities of stakeholders to appropriately interpret and analyze data. As the training gaps and most useful platforms are identified across EPT partners over time (see above), our training materials and workshops will be updated to address the current needs of end-users in an effort to facilitate science-based management. We anticipate that even more useful to many decision makers than the data themselves will be the syntheses and interpretations that our expert in-country project teams will produce in the form of regular project updates, reports, and publications. These products will be shared with stakeholders and ministries as they become available, and meetings will be held to discuss the findings, train on interpretation and implications, and foster dialogue to move towards science-based policy development that enhances cross-sectoral collaborations and helps to prevent disease emergence.

Objective 4: Validation of One Health approaches

Our team assisted in developing the World Bank's report "People, pathogens, and our planet: the economics of one health", which explored country investments in One Health infrastructure and the potentially realized cost efficiencies. It documented continued keen interest from country governments and international organizations for implementation of One Health strategies but highlighted that a concerted, coordinated, and comprehensive valuation of the benefits of and best

practices for adopting a One Health approach has not been formally conducted. Building on the One Health practices operationalized in EPT-1 countries and at global levels, we propose to undertake a systematic and dedicated effort for validating One Health approaches by gathering and evaluating data and presenting One Health case studies. EPT lessons learned will be utilized along with comparative data available from other national and regional activities to evaluate the utility of One Health approaches using all available evidence.

4.1. Promoting policies and practices that reduce the risk of virus evolution, spillover, amplification, and spread

4.1.a. Multidisciplinary and inter-ministerial best practices: We believe that One Health approaches can assist in the development of more integrated high-level interventions for the reduction of risk from emerging pathogens. Working with EPT partners (locally and internationally), we will develop the evidence base to support the strategic application of these policy approaches, as well as their institutionalization.

i) Case studies: We will compile and create case studies for situations in which a One Health approach has been used, backed with economic analyses (when available), as well as outcome measures (e.g. DALYs, incidence, mortality, joint multi-departmental, multi-sectoral training or surveillance activities; qualitative data, etc.) to provide evidence-based support for One Health strategies. In-country government partners, as well as partners from other EPT-2 projects, FAO, WHO, CDC, World Bank, and other local, regional, and intergovernmental entities will be engaged in prospective and retrospective assembly of information to validate the use of One Health approaches, complemented by findings from literature and external data that can be applied to EPT-2 contexts.

ii) Gender equality and integration of under-represented populations: We will gather and analyze data on gender equality and integration to elucidate how comprehensive representation contributes to a more successful One Health approach, noting that unique determinants may influence gender-specific risks, as well as the success of risk mitigation and prevention strategies. We will work with P&R to help determine and encourage best practices for overcoming gender bias in One Health efforts, as well as provide information to P&R, OHW, and other EPT partners on populations that could be further integrated into One Health approaches (e.g. economically, culturally, and occupationally).

4.1.b. Support for national One Health platforms and outbreak response: Through assessment and validation of approaches that facilitate broad and sustained engagement, including data sharing, sufficient workforce development, improved technical capacity, and harmonization of disease surveillance systems, we will contribute to overcoming the obstacles of disciplinary silos at local levels that have impeded public health progress. Working with EPT partners at local levels and in the context of meeting IHR and OIE reporting obligations, we will support efforts to more effectively utilize One Health platforms.

4.2. EPT-2 Partner coordination

4.2.a. The EPT Liaison: Because of the scope and complexity of the EPT Program, we propose the inclusion of an EPT Liaison at the Key Personnel level (see Staff section below). The PREDICT-2 EPT Liaison will promote strong communication and data sharing opportunities that support One Health approaches throughout the EPT-2 programs themselves and in partner countries and international forums. Together, we believe our efforts in close

coordination with other EPT-2 partners and stakeholders (especially FAO, CDC, WHO, OHW, and P&R) will demonstrate the value of adopting One Health approaches for biological surveillance, capacity building, and outbreak response, in terms of indicators such as cost, time efficiency, and health outcomes, as well as investments in One Health training and curricula development. The EPT Liaison will manage the processes of disseminating information and best practice guidance (see 4.2.d. below) to policy makers, increasing the likelihood of adoption of One Health-promoting policies and practices for national preparedness and prevention efforts. The impact will be further broadened by engagement with policy processes and policy-making institutions (including private sector) at local, national, regional, and international scales. For example, at country levels, coordination will be promoted with EPT-2 program partners, including local agencies representing health, livestock, and wildlife, and local implementing representatives of USG agencies and global organizations, including FAO and WHO, to jointly share One Health validation findings and best practice recommendations. Concurrently, efforts will also occur at global levels, by collaboratively engaging with leadership of EPT-2 and GHSA partners and intergovernmental organizations to broaden support and resources for One Health approaches.

i)The PREDICT-2 EPT Liaison will promote strong communication and data sharing opportunities that support One Health approaches throughout the EPT-2 programs themselves and in partner countries and international forums. His focus will be on communications with the FAO, CDC, WHO, OHW, and P&R, as well as making sure that the country coordinators are making all efforts to maintain active and productive communications with in- country partners, especially USAID Missions and host-country ministries. The EPT Liaison will manage the processes of disseminating information and best practice guidance, including dissemination of the following through in-person, electronic, and conference call communications:

- Annual Global Key Findings Review meetings with USAID and EPT-2 Partners
- Organized quarterly or semiannual conference calls or webinars on topical areas, such as behavioral studies, surveillance, analytics, gender equity, etc.
- PREDICT-2 quarterly reports (or sections of reports indicated by USAID)
- Quarterly country-level reports or written briefings (similar to bulleted country-specific Quarterly Partner Updates in PREDICT-1)
- Country Coordinator updates on activities and findings at quarterly or monthly country-level meetings as determined by the USAID local Mission
- Monthly or biweekly telephone updates with USAID for key PREDICT-2 staff
- Public posting of results from human, livestock, and wildlife testing on the PREDICT-2 public website (through HealthMap) as soon as approved by government authorities
- Updated protocols and guides for conducting biological surveillance and behavioral risk characterization

ii) In addition, the PREDICT-2 EPT Liaison will examine One Health case studies within the PREDICT-2 countries and begin to amass a case for implementing One Health approaches if the data continue to support the paradigm shift. He will draft messages for policy makers, increasing the likelihood of adoption of One Health-promoting policies and practices for national preparedness and prevention efforts. The impact will be further broadened by engagement with policy processes and policy-making institutions (including private sector) at local, national, regional, and international scales. If possible, the capacity for achieving articulation with the policy process will be developed with the Country Coordinators through

hands-on training and webinars. Concurrently, efforts will also occur at global levels via the EPT Liaison and other PREDICT-2 Key Personnel collaboratively engaging with leadership of EPT-2 and GHSA partners and intergovernmental organizations to broaden support and resources for One Health approaches.

iii) On an *ad hoc* or requested basis, we will also provide to USAID and other EPT Programs (as indicated by USAID):

- Immediate notification of findings of urgent public or animal health significance
- Activities and findings from participation in emergency response activities
- Analyses and graphical interpretations of key findings as agreed upon with USAID and PREDICT-2 staff (similar to quad charts developed at the end of PREDICT-1)
- PowerPoint presentations developed on project findings
- Briefing Sheets on specific topics, findings, or trends
- Updated risk information developed through ongoing analyses, such as interface characterization and hotspot forecasting
- Case studies on One Health approaches, backed with economic analyses and outcome measures (e.g. DALYs, incidence, mortality, etc.) to provide evidence-based support for One Health strategies, as described above
- Meetings with USAID and other EPT program personnel to collaborate on efforts stemming from project findings or trends
- Peer-reviewed publications to increase awareness in the public health community and drive pandemic prevention strategies globally

4.2.b. Surveillance and outbreak response: Through ongoing coordination with partners, we will monitor where One Health approaches are being utilized in surveillance and outbreak response situations for comparison with other contemporary (single-silo) outbreak responses to determine differences in effectiveness, using indicators such as frequency of outbreaks, length of time to outbreak containment, morbidity and mortality, and identification of animal host species involvement. Where identified, the costs of disease outbreak response and control measures will be compared to costs of implementation of One Health strategies to calculate and demonstrate potential savings from prevention obtained through One Health approaches. Given its health and economic impacts, cross-species transmission potential, and viral evolution dynamics, influenza will provide ample opportunity to investigate this objective and will offer common ground for working closely with FAO and WHO in gathering information. Additionally, official reports submitted to the OIE will provide further insight on species and numbers of animals affected by reportable diseases to feed into assessments of impacts of influenza and other diseases as part of the evaluation of One Health approaches.

4.2.c. Advancing socioeconomic arguments: In year three, we propose to organize a workshop with the World Bank in collaboration with USAID and other EPT-2 and World Bank stakeholders. The workshop will conduct an evaluation of new information at the five-year mark of the World Bank's report on One Health investments (published in 2012) and be designed to yield information for the production of a number of audience-targeted documents with evidence-based guidance on where One Health approaches are highly suited to assist in the prevention and control of emerging pandemic threats. We will also conduct global scale analyses of the economics of pandemic mitigation vs. adaptation policies directly applied to the World Bank/FAO One World, One Health capacity building plan.

4.2.d. Sharing of lessons learned among EPT projects: We will use information acquired

and best practices developed in the implementation of biological surveillance and behavioral risk characterization to help identify core competencies that can be proposed for incorporation into curricula for the One Health Workforce (OHW). Specifically, insight gained about the type and structure of cost-effective investments in a One Health workforce, as well as the multidisciplinary sectors represented and associated core competencies, will be shared with the OHW project on an ongoing basis and at the annual data sharing meetings. Additionally, evidence-based strategies will be validated for their use in support of effective One Health platforms and shared accordingly with the P&R program to inform best practices and activities being implemented at national levels. Tools developed by PREDICT-2, including mechanisms for promoting gender equity in risk assessments and population-based interventions, sampling and testing protocols, human-animal contact surveys, and outbreak response planning practices, will be shared with the P&R project and other EPT partners for utilization in national preparedness plans for public health events. Additional support for hands- on training and curriculum development is described below.

Objective 5: Overall capacity strengthening

We plan to add depth and scope to trans-disciplinary One Health platforms using a systems approach to classify and track biological surveillance and behavioral risk characterization advances, thereby strengthening the capacities of the surveillance systems in each PREDICT-2 country and region. An adaptive management style will be utilized to assess progress and set capacity building priorities on an annual basis so that the most current information can be used in response to key opportunities and challenges. Activities will build on and support all strategic areas of focus for EPT-2; however, key areas of emphasis will include increasing technological capacities in collaborating laboratories and expanding to include more human and national laboratories in coordination with FAO, CDC, and WHO, as well as enhancing information management and data analysis through technology transfer and training for in-country collaborators and host country governments.

5.1. Systems approach to capacity building for wildlife, livestock, and human surveillance

We will focus on continued training for field sampling and survey design, advanced laboratory training, information management, and technology transfer to address all areas from managing field data to tracking laboratory samples and results. In addition, introductory sequence analysis and epidemiologic data analysis, risk assessment, and cross-sectoral collaboration strengthening will be introduced. Within each PREDICT-2 country, five core components will be evaluated and tracked over time:

i) Biological Sampling and Behavioral Survey Design: Continued protocol refinements for animal and human sampling and behavioral surveys will be made and distributed in multiple languages. Similarly, we will continue to improve cold chains and transportation infrastructure to increase the quality and quantity of samples being collected and tested from remote field sites. PREDICT-2 activities will supplement currently available resources and training activities, especially in systematic survey design, and as needed in newly added EPT countries. Additional protocols will be developed and standardized for collection of behavioral and risk mitigation data at field sites.

ii) Laboratory Testing: We will continue to strengthen local laboratory capacity in basic cPCR protocols, as well as for use of serological assay protocols using our pathogen detection and discovery framework (see Objective 1 above). Focused areas for additional training for pathogen discovery and characterization include specific training for Tier 1 viral families in all

countries where capacity does not already exist and the additional training for Tier 2 families in countries targeted for intense engagement. It also includes the need to expand our activities (and where required, training) to include human and national laboratories in all countries. More emphasis and training will be provided on appropriate specimen selection based on pathway of emergence and spread among people, wildlife, and domestic animals; biosafety and biosecurity (e.g. appropriate handling of samples during extraction and storage); trouble- shooting viral family PCR protocols; and the interpretation of results. Introductory training in basic pathogen sequence analysis and bioinformatics will also be provided, as well as training in PCR assay design to facilitate rapid local outbreak response where necessary, and to ensure the persistence of skills that protect the long-term viability of this diagnostic platform. Additionally, reference panels will be developed and deployed to all participating laboratories to perform quality control and assessments of laboratory analytical procedures. Training will include opportunities in US- based laboratories when possible, as well as instruction by visiting laboratory technicians. Materials will also be made available to assist with and provide content for developing curricula by OHW programs to train the next generation of laboratory diagnosticians.

iii) Information Management: The use of digital data collection and databases is common practice in developed countries but is not yet a standard approach in many developing countries. In PREDICT-2, we aim to train key personnel from PREDICT teams, laboratories, and ministries in target countries to better manage field data, track laboratory sample and results data, interpret data, and analyze results by providing training resources and common best practices so that countries may enhance their abilities to manage and work with large datasets.

iv) Risk Assessment: An understanding of patterns of risk factors and disease transmission informs risk management and disease control strategies. The ability to describe, map, and model data is therefore imperative for all surveillance activities. PREDICT-2 activities will include providing training on basic data analysis tools, spatial mapping, and disease modeling to key constituents and training programs in the target countries so that they can understand and engage with our global disease modeling and analytics teams to inform new models of refined risk and disease control potential at key interfaces around the world.

v) Cross-sectoral Collaborations: Institutionalizing One Health approaches to disease surveillance, control, behavioral risk characterization, and outbreak response requires horizontal as well as vertical integration into government ministries and stakeholder organizations. We aim to support One Health Platform activities by fostering dialogue and providing data to inform on policy across disciplines and sectors at local and national levels through meetings, workshops, and coordinated field activities.

5.2. Coordinated capacity development across EPT projects

We will coordinate with other EPT-2 projects, such as OHW and P&R, to identify and assist with needs for training the next generation at universities and ministries associated with One Health networks, especially OHCEA and SEAOHUN, to better prepare the future workforce for positions in laboratories, ministries, and other organizations and to successfully maintain surveillance systems. Similarly, Field Epidemiology Training Programs may benefit from interactions with PREDICT-2 personnel and projects as part of developing the next generation of One Health professionals. Coordinated training activities across the EPT program may range from short, intensive workshops to provisional fellowships to long- term on-the-job training or academic degree endeavors, depending on the target audience and competencies.

Opportunities for practical field experiences will be provided for appropriate EPT trainees based on

fit and EPT project alignment.

Our consortium has extensive training experience that ranges from developing new curricula to implementing short- and long-term trainings in classroom, laboratory, and field settings. Depending on the identified needs and gaps in training, we are prepared to contribute to pre-service training in coordination with the One Health Workforce that may involve: 1) developing protocols and curricula, 2) virtual and in-person training sessions on topics related to the PREDICT-2 scope, and 3) field activities that provide real-life experience for trainees to practice skills and enrich competencies. Training topics include surveillance strategies, wildlife management, field veterinary services, laboratory diagnostics, epidemiologic outbreak investigation and response, research methods, information management, risk assessment, medical anthropology, public health, environmental health, and policy development. During PREDICT-1 we tailored our trainings depending on the needs of individuals and organizations, and whereas classes and workshops worked well for some audiences, longer-term internship placements at field and laboratory sites served as the formative experiences for other trainees. In the past, we have also utilized mock scenarios and interactive online case studies to foster real-time and globally networked team thinking that gives trainees virtual experiences as preparation for what they may deal with in their daily activities throughout their careers. We will closely coordinate with the OHW team to identify needs and develop a plan for our participation in pre-service training for the One Health networks. The convening and coordination will be the responsibility of the PREDICT EPT Liaison with finalization of plans and implementation then falling under the responsibility of the Capacity Strengthening Lead.

Objective 6: Assisting in the organizing of annual data review meetings for USAID's PIOET program In close coordination with other EPT-2 projects and partners (including FAO, CDC, WHO, etc.), we will organize annual data reviews to optimize and refine ongoing and future activities. The data review meetings will serve to improve global databases, flow of information, and pace of data sharing, and thus will promote the overall success of the PIOET program. Enabling collaborative, focused and ongoing data sharing and associated communication among EPT-2 program stakeholders will also assist in avoiding duplication and maximizing synergies across projects. This objective is especially important for optimizing EPT-2's potential, given the breadth of data collected across partners and the implications of ongoing information yielded by iterative analyses that build on prior findings, as demonstrated in EPT-1.

6.1. Meeting participants and content

By bringing together EPT-2 projects and partners, the meetings will build on data from EPT-1 and EPT-*plus* to facilitate progress in compiling robust and targeted longitudinal data sets. Collaboration with CDC and FAO will be a key component. The involvement of EPT-2 projects, as well as international organizations and other stakeholders, allows for compilation of a variety of data, including information yielded from on-the-ground efforts, as well as those collected through global reporting systems. The data review meetings will facilitate the examination of available data for population-based analyses and will allow a platform for identifying state of the art practices, sharing of key findings, and strengthening of partnerships that could inform risk-reductive policies and practices. Selected country-level discussions will be used to strengthen One Health platforms and produce recommendations to be utilized by EPT P&R around sustained cross- sectoral collaboration, including data sharing. Review of data collected related to investments in the One Health workforce will be vital to compiling lessons learned and developing and advancing

curricula. Finally, meetings will be key for compiling and improving global data sets of influenza and other respiratory pathogens (benefitting from coordination with FAO, CDC, WHO, and others) and exploring optimized ways to link bio-surveillance data to response through "IT portals" (including crucial input gained from CDC and WHO's well-established systems) that advance global networks for real-time biosurveillance. The meetings will also serve to explore ideas for additional or potential data sets that would help advance EPT-2 projects' and partners' contributions to the goals of the PIOET program.

6.2. Ensuring appropriate representation

To ensure gender equity is promoted in the data review process, including for development and testing of data collection tools, participants themselves will be balanced across sectors and gender and will be requested to bring sex-, age-, and culture-disaggregated data sets to facilitate analyses and sharing of disaggregated data as appropriate. The data reviews will guide recommendations for programmatic adjustments, such as broadening research and intervention focus to more effectively integrate specific high-risk and/or underserved or underrepresented populations (e.g. to overcome gender, age, socio-economic, and other biases).

6.3. Frequency and agenda development

At least one annual global key findings review meeting will be held, with participation from key stakeholders, including representatives from PREDICT-2, P&R, OHW, FAO, WHO, CDC, as well as other in-country participants and external partners identified by USAID. In close consultation with USAID staff and PREDICT-2 Key Personnel, PREDICT-2's EPT Liaison will coordinate and develop the agenda(s), incorporating topics and opportunities identified during ongoing collaborations and communications with EPT-2 partner points of contacts and key stakeholders in order to synthesize input and identify key issues to be addressed. In addition, we will leverage opportunities for using EPT-2 regional and country- level meetings to conduct targeted country and region-specific data review, as well as provide agenda inputs, identify data sharing needs, and prepare data frameworks for the annual global data review meetings. Summaries of key discussions and findings and recommended programmatic adjustments as approved by USAID will be compiled and distributed following each annual meeting.

Monitoring and Evaluation

We will use a robust monitoring and evaluation (M&E) plan to track progress on PREDICT-2's goals of identifying and characterizing pathogens of known epidemic and unknown pandemic potential; classifying animal reservoirs and amplification hosts of human-infectious viruses; and targeting intervention action at human behaviors which amplify disease transmission at critical animal-animal and animal-human interfaces in hotspots of viral evolution, spillover, amplification, and spread. Our project indicators, detailed in the Monitoring and Evaluation Table below, will quantitatively assess how well the proposed PREDICT-2 objectives contribute to the desired goals and end of project results presented by USAID in RFA-OAA-14-000019. This proposed M&E plan will be implemented in conjunction with USAID to track project progress in close coordination with other EPT-2 projects, as well as with in-country and international partners. We believe these indicators will also aid us in effectively managing the project for timely achievement of project targets and provision of results. During the first 30 days of project implementation, PREDICT-2 Key Personnel will work with USAID to further refine the proposed M&E plan. Once finalized, measurable progress towards indicators will be assessed semi- annually with USAID and annually

with external advisers to hone activities and adapt work plans to ensure targeted end- of-project results are met.

To this end and in addition to evaluations prescribed by USAID or in compliance with guidance provided by other US Government agencies/initiatives, we will establish a two-tiered evaluation system consisting of semi-annual assessment of progress on our M&E plan by the key personnel, consortium leads, and USAID and an annual assessment, estimated at three intensive days of effort, by an External Advisory Panel (PREDICT-2 EAP) managed by the PREDICT-2 EPT Liaison. The PREDICT-2 EAP members will be selected based on their experience conducting successful US government projects and their in-depth knowledge of USAID monitoring and evaluation. The initially proposed members provide a range of multidisciplinary experience and knowledge across the entire spectrum of emerging disease issues facing humans, domestic animals, and wildlife. We intend to keep the EAP to a limited number of highly qualified individuals and therefore have chosen to initially invite [redacted] (WHO), [redacted] (Emory University and formerly of CDC), [redacted] (FAO), and [redacted] the George Washington University and formerly of WHO, CDC, and USAID). Qualifications of our proposed PREDICT-2 EAP members are provided in their resumes (Annex A).

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In evaluation of progress on each activity, we will assess the scope and quality of partner engagement, especially in- country ministries, FAO, CDC, WHO, OHW, and P&R. Also critical will be the measurement of gender representation in each activity and the provision of capacity building in core competencies and skills in disease surveillance, response, prevention, and control as described above. To the extent applicable, we will use US Centers for Disease Control and Prevention “Updated guidelines for evaluating public health surveillance systems” (MMWR 50 (RR13);1-35) to evaluate the effectiveness and impact of our surveillance activities and capacity building, particularly as they relate to the viruses detected, quality of the data collected, presentation of data and key findings to national and international partners, timeliness of reporting activities, and representativeness of the key interfaces and epizones targeted for surveillance.

We have designed our monitoring and evaluation plan and indicators to target major goals and impacts for each PREDICT-2 objective. These objectives were designed to contribute to each new EPT-2 strategic area of focus by establishing longitudinal datasets for understanding drivers and human behaviors needed to inform on policies to reduce the risk of zoonotic virus emergence and strengthening real-time biosurveillance and preparedness for public health events, while investing in One Health workforce and platforms. In the table below, we show sample indicators of success, their corresponding suggested timeframe, along with key project outcomes and data sources.

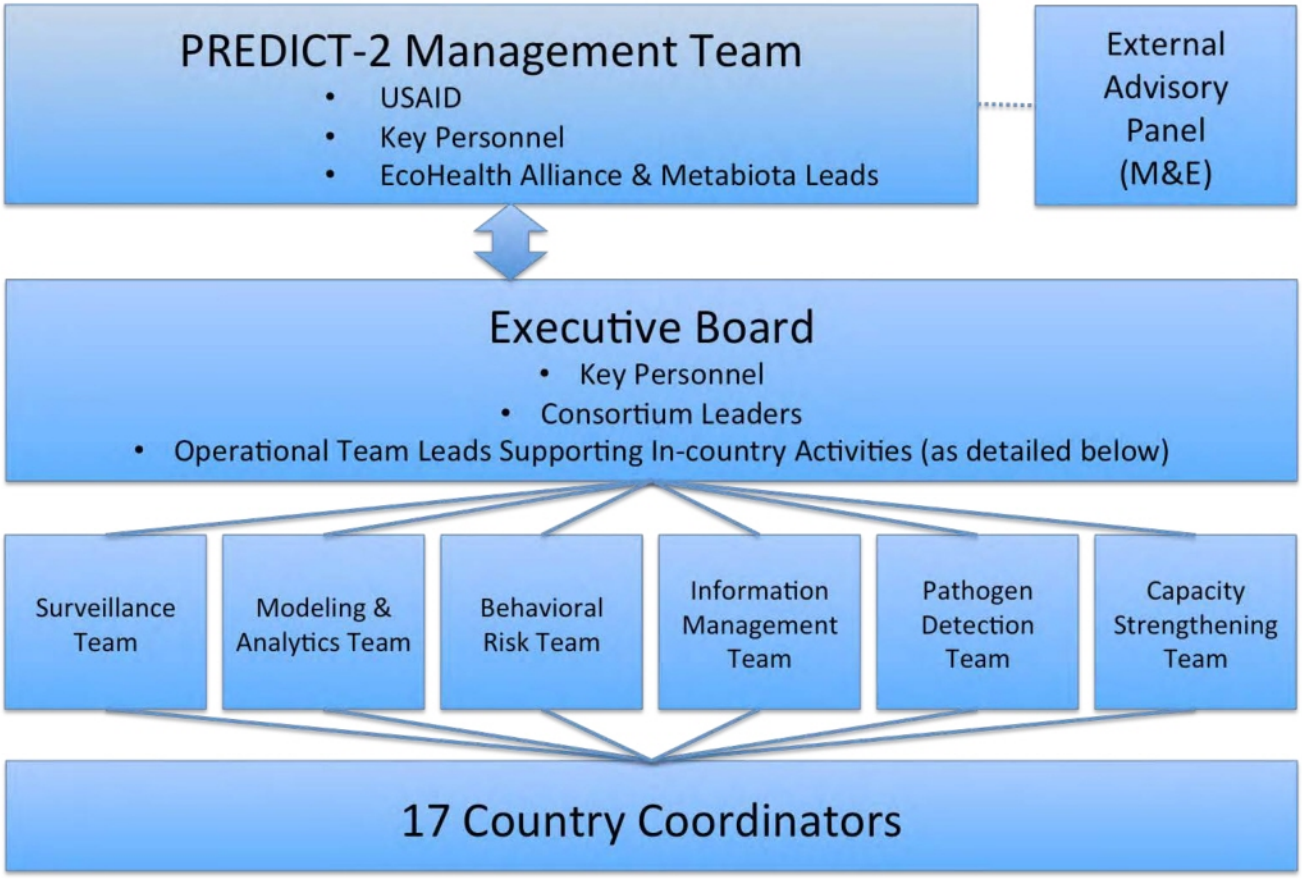
PREDICT-2 Monitoring and Evaluation Table

Objective & Activity	Indicators with Timeframe	Outcomes and End-of-Project Results with Data sources
Objective 1: Biological and ecological risk characterization		
Identify epizones and collect longitudinal data for at least one priority family of zoonotic viruses with known pandemic potential	Percent of PREDICT-2 countries conducting surveillance in epizone(s) and collecting longitudinal data on at least one pathogen of known pandemic capacity Timeframe: initiate epizone surveillance in all intensive countries by end of Year 1 and all less countries by middle of Year 2; semi-annual/annual assessment of country progress	Enhanced in-country disease surveillance, laboratory and data synthesis capability for detection and response to zoonotic diseases, biological strengthening of transdisciplinary teams skilled in One Health approaches to disease surveillance, and identification and more precise ranking of high-risk interfaces and key epidemiologic zones involved in disease amplification and spread Data sources: wildlife, domestic animal, and human pathogen detection data; ecological data; risk characterization for animal-to-animal and intensive animal-to-human transmission; results from phylogeographic and ecological analyses; and key findings from longitudinal monitoring
Identify high-risk interfaces and ecological and climatic conditions facilitating transmission of viruses from animals to people	Percent of PREDICT-2 countries conducting analysis of risk factors associated with virus evolution, spillover, amplification, and spread Timeframe: initiate in all intensive countries by end and all less intensive countries by middle of Year 2; semi-annual/annual assessment of country progress	Enhanced in-country capacity to synthesize biological, ecological, and behavioral data to evaluate risk factors influencing virus evolution, spillover, amplification, and spread; strengthening of transdisciplinary teams skilled in One Health approaches to disease surveillance, identification and more precise ranking of high-risk interfaces and key epidemiologic zones involved in disease amplification and spread Data sources: biological surveillance data, niche models, and host-virus ecologic analyses, and of Year 1 characterization of viruses for zoonotic and pandemic potential in wildlife, domestic animals, and people, including high-risk human cohorts and ILI, SARI, FUO patients with measured animal contact data
Objective 2: Behavioral risk characterization		
Identify behaviors and practices facilitating animal-animal and animal-human contact	Percent of PREDICT-2 countries conducting surveys of animal-animal and animal-contact Timeframe: initiate in all intensive countries by end Year 1 and all less intensive countries by middle Year 2; semi-annually/annual assessment of progress	Enhanced in-country behavioral risk monitoring and data synthesis capability for identification of behaviors, practices, and conditions that facilitate animal-animal and animal-human contact, standardized dissemination of information on risk of zoonotic human diseases, ranking of key intervention points, and validation of interventions to reduce risk of zoonotic disease evolution, spillover, amplification, and spread Data sources: standardized structured household of surveys, occupational surveys, consumer surveys, of and focal follows data across the range of risk country settings to generate comparative data on human-animal and animal-animal contact
Objective 3: Global surveillance networks and analysis		

Utilize data management systems for collection and dissemination of standardized biological and behavioral surveillance and outbreak data	Percent of PREDICT-2 countries contributing biological and behavioral data to PREDICT-2 data management systems Timeframe: targeting all countries by end of Year 1; semi-annual/annual assessment of country progress	Improved global disease datasets, information networking and data sharing, enhanced rapid dissemination and integration of biological surveillance, behavioral, and outbreak data, to inform pandemic preparedness Data sources: PREDICT-2 database for animal and human biological, ecological, and behavioral data; data collection tools for surveillance and outbreak response; outbreak monitoring systems in coordination with Global Health Security Initiative Early Alerting and Reporting Project
Objective 4: Validation of One Health approaches		
Gather data and conduct analyses to evaluate One Health approaches	Percent of PREDICT-2 countries quantitatively evaluating One Health Approaches Timeframe: initiate in all intensive countries by end of Year 2 and all less intensive countries by middle of Year 3; semi-annual/annual assessment of country progress	Evidence generated for policy makers and partners on effectiveness and economic benefits of One Health approaches and workforce Data sources: One Health case studies; measures of stakeholder and organizational participation; integration of animal, human, and ecological surveillance and risk characterization; gender equity in One Health workforce; costs savings and cost mitigation; DALYs in outbreaks; time to detection, response, control of outbreaks; dissemination of information and tools generated by PREDICT-2; sustained One Health programs; and global One Health policies
Objective 5: Overall capacity strengthening		
Strengthen training of in-country staff	Percent of PREDICT-2 countries with government personnel participating in training in field sampling, information management, laboratory techniques and assay development, and risk characterization Timeframe: targeting all intensive countries by end of Year 2 and all less intensive countries by middle of Year 3; semi-annual/annual assessment of country progress	Enhanced in country trans-disciplinary skills, competencies, and knowledge in One Health approach to biological surveillance and risk characterization Data sources: semi-annual reports characterizing and summarizing number of individuals cross trained in One Health trans-disciplinary approaches in biological surveillance, laboratory testing, information management, data analysis, and risk characterization; quality control and assessment of laboratory analytical procedures and assay development in collaborating laboratories
Objective 6: Assisting in the organizing of annual data review meetings for USAID's PIOET program		
Coordinate effective data review meeting(s) with other EPT partners and USAID and engage EPT partners in data sharing and data review	Number of annual data review meetings engaging key national and international organizations and EPT partners in data sharing and data review Timeframe: at least one annual meeting initiated at end of Year 1; consider needs for additional or regional meetings annually	Evidence shared among EPT partners and national and international partners for key findings from biological, ecological, and behavioral risk characterization, training of in-country staff, and benefits of One Health approaches Data sources: PREDICT-2 semi-annual reports, meeting agendas, and key findings shared

Organization and Management

1. PREDICT-2 ORGANIZATIONAL CHART



2. MANAGEMENT PLAN

Our consortium is a functionally collaborative and fully integrated working team that benefits from the experience of world leaders in zoonotic disease surveillance, epidemiology, disease ecology, and behavioral risk characterization. Building upon existing personnel resources from UC Davis (UCD), EcoHealth Alliance (EHA), Metabiota (MB), the Smithsonian Institution (SI), Wildlife Conservation Society (WCS), and other global health leaders, the *Director* will facilitate the efficient accomplishment of all PREDICT-2 objectives, as well as careful monitoring, evaluation, and adaptive project management, through the organizational structure (Organizational Chart) depicted above. The implementation of previous and ongoing, collaborative and complex zoonotic pathogen projects has allowed the consortium to test the function and feasibility of this working group and optimize the productivity of the team using this structure. The Management Team, made up of USAID representatives, the Key Personnel (detailed above, pending approval by USAID), and the EHA and MB organizational leads, will meet by teleconference twice per month to track the progress of PREDICT-2 activities and make operational adjustments to assure management functionality and achievement of project goals and end-of-project deliverables. To guarantee fiscal responsibility and responsiveness to the needs of the program, the Director will review and approve budgets to ensure they are appropriate to the work proposed, consistent with applicable rules and guidelines, and are committing sufficient resources to achieve in-country objectives. The Director will conduct periodic reviews with the Operations Manager to assess ongoing budgetary needs and will include the

Management Team in financial decisions needed to adaptively manage the project successfully.

As discussed in the Monitoring and Evaluation section above, external guidance will be provided to the Management Team by an External Advisory Panel (EAP). In addition to assessing PREDICT-2 progress according to USAID-approved M&E, this group of distinguished scientists will review activities and plans and advise on priorities, strategic focus, and broader partner collaboration. All have extensive experience in leadership and management of large agencies and projects or programs with operations in developing countries. We will also benefit from the EAP's knowledge, experience, and extensive contacts, which will facilitate achieving the objectives of the project.

An Executive Board, consisting of the Key Personnel, the most senior representative of the core consortium (EHA, MB, WCS, SI), and the Operational Team Leads will shape the management of all activities and ensure that all 17 countries are receiving the support needed to achieve the in-country objectives according to their approved work plans. The Executive Board will meet at least monthly to review country activities, identify programmatic gaps, determine progress toward objectives, and coordinate capacity-building and training plans. To respond to emergencies or unforeseen needs, additional conference calls will be convened by the Director or at the request of any of the Executive Board members. In addition to regular conference calls, there will be at least two face-to-face meetings annually of the Executive Board, as well as an approximately annual meeting of the Executive Board with the Country Coordinators and leaders of the PREDICT-2 laboratories for the purpose of information exchange, lessons learned-sharing, and coordination.

All consortium partners will have representatives on each of the operational teams illustrated in the organizational chart above. For example, the Behavioral Risk Team will be led by [redacted] from EcoHealth Alliance, and she will be supported by a deputy – [redacted] of Metabiota, [redacted] of UCD, [redacted] of the Smithsonian, and [redacted] of the Wildlife Conservation Society. Others involved in the behavioral risk work and in the team as needed and appropriate include: the Country Coordinators (n = 17); Country Behavioral Risk leads, including [redacted] (Indonesia), [redacted] (Malaysia), [redacted] (Tanzania), [redacted] (Uganda), and other PoCs (sometimes contracted to local universities as in the focused work during PREDICT-1, approx. 17); [redacted] (EHA); [redacted] (EHA); [redacted] (EHA); [redacted] (UCD); [redacted] (UCD) [redacted] (UCD); [redacted] (MB); [redacted] (SI). In addition, the PREDICT-2 Operational Teams (in conjunction with PREDICT-2 and USAID leadership) will reach out to and contract with appropriate in-country and global teams as needed to complete the work most excellently and expeditiously. For this behavioral risk example, our consortium has been offered partnership by the teams led by [redacted] of Stanford, [redacted] FHI 360, [redacted] of Another Option, and [redacted] currently consulting for the World Bank, among others. We will enthusiastically engage partners, such as these and others as appropriate, in targeted implementation of the project and in other activities, like the evaluation of behavioral interventions.

Day-to-day management of the project and implementation of activities to achieve objectives will be the responsibility of each of the 17 Country Coordinators with the support of the personnel and structure described above. Country Coordinators will be in almost constant (electronic) contact with the Operational Team Leads to ensure consistent work plan implementation. Almost all Country Coordinators are citizens of the PREDICT-2 countries with extensive experience in project management and implementation of surveillance (see Resumes in Annex E). In many cases, they are embedded in local organizations (ministries, universities, or NGOs), as those organizations have aligned missions with PREDICT-2 activities and are likely to help build the support for continuing country activities at the end of PREDICT-2. The duties of the Country Coordinators include:

- Plan and coordinate local biological surveillance and behavioral risk characterization activities and ensure that written standardized protocols are implemented;
- Coordinate field teams and supervise data collection, handling, and tracking from collection to the laboratory or centralized database;
- Coordinate and organize in-country capacity assessment, trainings, and meetings with ministry officials, local partners, and trainees to disseminate information and improve interpretation of surveillance data;
- Facilitate equipment and supply acquisition and distribution;
- Coordinate diagnostics with laboratory personnel including sample processing, testing, and tracking and delivery of data into the PREDICT-2 database;
- Manage data entry, including quality assurance;
- Identify, recruit, and track in-country trainees, including OHW pre-service and P&R in-service candidates;
- Produce and disseminate reports, as required, that document country activities and findings;
- Assess development of local capacity for sustainable surveillance, risk characterization, intervention acceptance, and outbreak response;
- Liaise with local governments and stakeholders to improve information sharing and facilitate approval of data release to the general public; and
- Liaise with local OHW, P&R, CDC, WHO, and FAO personnel to ensure cross-cutting activities.

Because of the complexity of a project that involves many partners working in over 17 countries, and a budget of $100 million, some specialized staff will be required for implementation, especially to ensure cost-effective administration of activities. Our staffing plan is based on previous experience administering international programs and our knowledge that excellent surveillance and behavioral risk characterization through a distributed management structure requires adequate staffing and diligent supervision to guarantee success. We will adaptively manage the PREDICT-2 project to ensure that staffing and staff placement is appropriately matched to the level of project activities.

End of Attachment B

ATTACHMENT C – BRANDING STRATEGY AND MARKING PLAN
PREDICT-2

I. BRANDING STRATEGY

Estimated Costs

All estimated costs associated with branding and marking the PREDICT program are included in the Budget Table below. Items such as stickers were procured in PREDICT 1 and the program maintains some inventory; items to be used at USAID funded meetings such as banners (when necessary) are budgeted at an estimated $9,000 per year across the program's countries' supplies line items in the estimated PREDICT 2 budget. Communications materials (see item 4 below) are primarily developed at UC Davis by our program staff and Content Manager, as described in the estimated budget; those costs are included in salary line items.

Budget Table

Item and use	Cost
Banners and signs: USAID, UC Davis, and sub-grantees branded banners with graphic identities to be displayed prominently at all USAID funded meetings, gatherings and presentations.	$9,000, budgeted within supply costs in countries anticipating meetings
Stickers: Branded as described below to be used for marking of equipment.	No additional cost – procured in PREDICT 1
Reports and Training Materials: USAID branding incorporated as specified below.	No additional cost
Website and UC Davis promotional publications: Inclusion as a Partner and acknowledgement as donor (at no cost).	No additional cost – budgeted in communication salaries

Intended Name of the Program

Name of Program: PREDICT

Where appropriate, the name is accompanied by USAID Graphic Identity, UC Davis Logo, Sub-grantee logos. See attached proposed logo and letterhead to be used as necessary and appropriate.

Audiences

Primary Audience: Members of the national, state, and local governments; community-based leaders; local community members; and civil society organizations where the PREDICT project is active. Focus will be on stakeholders, involving both genders, ranging from local individuals to highest levels of government.
Communication materials for these target groups will range from posters to reports and media such as TV, radio, and press presentations. In addition, regular correspondence with multiple units of USAID (including mission offices in countries of operation), appropriate US Government offices (as recommended and approved by the USAID AOTR), and international health organizations with which PREDICT will operate collaboratively (e.g. WHO, OIE, FAO).

Secondary Audience: International community, governments, bi-lateral and multi-laterals donors, international NGOs, and others working on emerging infectious diseases from wildlife sources.

Planned Communication

Main Program Message: *Building capacity to detect zoonotic pathogens; identifying drivers of transmission; and reducing the risk for spillover, amplification and spread, thereby protecting human health and minimizing threats from pandemic disease.*

Training materials, pamphlets, etc.: Similar to our communications efforts in PREDICT-1, we will make training manuals available to the public and keep and maintain both a website with program information and pamphlets or handouts for individual country activities and impacts. Examples of these works can be found at http://www.vetmed.ucdavis.edu/ohi/predict/index.cfm

Press and Promotional Activities: In all USAID-funded and related activities, the PREDICT Program, our collaborators, and sub-grantees will consistently undertake the following steps to highlight USAID's collaboration and support:

TEXTUALLY: UC Davis and sub-grantees and their partners will include references to USAID support in press releases, websites, and fact sheets relating to PREDICT Program Activities.

VERBALLY: UC Davis and sub-grantees and their partners will ensure that USAID is publicly credited in speeches, public presentations, training workshops, and community meetings when referencing project activities.

VISUALLY: The USAID identity will be prominently displayed on all written reports and training and program materials regarding PREDICT activities. The USAID graphic identity will always be equal to or more prominent than the logos of UC Davis, its sub-grantees or implementing partners. UC Davis will provide graphical templates to be used for PREDICT letterhead and for graphic identity blocks on UC Davis and sub-grantee communications and materials in the implementation of PREDICT. These graphical templates will be reviewed and approved by the USAID AOTR and Communications Officer prior to use. In PREDICT regions and countries, activities may be implemented by UC Davis and one or more sub- grantees. Approved graphical templates will be provided to the individual sub-grantees in the instances where using the general template with all sub-grantees represented may be inappropriate. USAID, UC Davis, and sub-grantees will be included as follows: the USAID graphic identity will be prominently displayed, and UC Davis and sub-grantee logos will be displayed to the right or below the USAID graphic identity. English versions of the USAID graphic identity will be used on reports, publications, and materials. Materials produced will be pre-reviewed by the USAID Communications Officer as required. If pre-review is not possible, the communications disclaimer will be placed clearly as outlined in the USAID Branding policy.

IN MEDIA: USAID will be notified of all public events, workshops, and activities. USAID will be acknowledged at all media events and reporting on the activities of the project. Media coverage of the work may include local radio, local TV, international TV, film, webcasts and reporting, magazines, and radio.

PHOTOS and STORIES: USAID and UC Davis jointly-approved press releases and captioned digital photos will be provided at each official media event. Noteworthy or especially interesting stories and photos will be sent to the USAID punctually. Materials produced will be pre-reviewed by USAID, as required. If pre-review is not possible, the communications disclaimer will be placed clearly as outlined in the USAID Branding policy.

Governments and/or Ministries

UC Davis and sub-grantees will acknowledge USAID on all publications. UC Davis and sub-grantees will also acknowledge local governments and their ministries as appropriate (i.e. ministries of environment, health, agriculture, wildlife conservation, tourism, etc.) as they collaborate in implementation of the various project activities.

Other Groups

UC Davis and sub-grantees will acknowledge local partners, that may include universities and public or private research institutions, that are instrumental in the local or regional implementation of the PREDICT program. UC Davis and sub-grantees will co-brand jointly-produced materials and activities where appropriate and consistent with USAID and local government requirements. UC Davis will acknowledge other donors for jointly funded activities and materials.

UC Davis will acknowledge other institutions for jointly-implemented, -funded, and -produced materials as appropriate. Other organizations with whom we have been engaged in selected activities will be acknowledged.

USAID will always receive prominence on materials and activities.

II. MARKING PLAN

Program Deliverables To Be Marked

Consistent with the detail provided above, UC Davis and its sub-grantees will mark all of the following with the USAID Graphic Identity as described:

Public Communications
Reports
Public Service announcements
Promotional Materials
Information Products

Events
Training workshop materials
Events supported by USAID and PREDICT-supported personnel, such as conferences, seminars, etc…

Commodities
Equipment (non-administrative), Program Materials (non-administrative)

Program Deliverables

Description of communications, commodities, and program materials	How Marked	When and Where Marked	Exceptions to Labeling
Equipment	USAID identity, UC Davis or sub-grantees identity and inventory number	Upon receipt, USAID prominently displayed and UC Davis or sub-grantees to the right or below the USAID graphic identity.	none

Selected Infrastructure	Signs with USAID identity, UC Davis or sub-grantees identities and local government	As appropriate, USAID, UC Davis, and sub-grantees prominently and together.	none
Final programmatic report	USAID identity, UC Davis, and sub-grantees identities	At publication, USAID upper or lower left and UC Davis and partner graphic identities displayed to the right or below the USAID graphic identity.	none
Specific activity reports	USAID, UC Davis, and sub-grantees	At publication, USAID upper or lower left and partner logos displayed to the right or below the USAID graphic identity.	none
Training materials	USAID, UC Davis, and sub-grantees	At publication, USAID upper or lower left, and partner logos displayed to the right or below the USAID graphic identity.	none
Project website	USAID identity, UC Davis, and sub-grantees	At publication, USAID listed with other partners and donors (i.e. UC Davis and sub-grantees) same size text	none
Program Deliverables not planned to mark with the USAID Identity	N/A – there are no deliverables that fit this category; however, the instructions required inclusion in the table	N/A – there are no deliverables that fit this category; however, the instructions required inclusion in the table	N/A

Presumptive Exception Requests

No exceptions are currently requested; however, we reserve the right to request such exceptions should extraordinary circumstances warrant them.

Proposed Logo and Letterhead Examples

USAID FROM THE AMERICAN PEOPLE | PREDICT

USAID FROM THE AMERICAN PEOPLE · UCDAVIS VETERINARY MEDICINE One Health Institute · WILDLIFE CONSERVATION SOCIETY · EcoHealth Alliance · METABIOTA · Smithsonian Institution

End of Attachment C

ATTACHMENT D – STANDARD PROVISIONS FOR U.S. NONGOVERNMENTAL ORGANIZATIONS

I. MANDATORY STANDARD PROVISIONS FOR U.S. NONGOVERNMENTAL ORGANIZATIONS

M1. APPLICABILITY OF 22 CFR PART 226 (MAY 2005)

a. All provisions of 22 CFR 226 and all Standard Provisions attached to this agreement are applicable to the recipient and to subrecipients which meet the definition of "Recipient" in part 226, unless a section specifically excludes a subrecipient from coverage. The recipient must assure that subrecipients have copies of all the attached standard provisions.

b. For any subawards made with Non-U.S. subrecipients the recipient must include the applicable "Standard Provisions for Non-US Nongovernmental Organizations." Recipients are required to ensure compliance with monitoring procedures in accordance with OMB Circular A-133.

[END OF PROVISION]

M2. INELIGIBLE COUNTRIES (MAY 1986)

Unless otherwise approved by the USAID Agreement Officer, funds will only be expended for assistance to countries eligible for assistance under the Foreign Assistance Act of 1961, as amended, or under acts appropriating funds for foreign assistance.

[END OF PROVISION]

M3. NONDISCRIMINATION (JUNE 2012)

No U.S. citizen or legal resident shall be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination on the basis of race, color, national origin, age, disability, or sex under any program or activity funded by this award when work under the grant is performed in the U.S. or when employees are recruited from the U.S.

Additionally, USAID is committed to achieving and maintaining a diverse and representative workforce and a workplace free of discrimination. Based on law, Executive Order, and Agency policy, USAID prohibits discrimination, including harassment, in its own workplace on the basis of race, color, religion, sex (including pregnancy and gender identity), national origin, disability, age, veteran's status, sexual orientation, genetic information, marital status, parental status,

political affiliation, and any other conduct that does not adversely affect the performance of the employee.
In addition, the Agency strongly encourages its recipients and their subrecipients and vendors (at all tiers), performing both in the U.S. and overseas, to develop and enforce comprehensive nondiscrimination policies for their workplaces that include protection for all their employees on these expanded bases, subject to applicable law.

[END OF PROVISION]

M4. AMENDMENT OF AWARD (JUNE 2012)

This award may only be amended in writing, by formal amendment or letter, signed by the Agreement Officer (AO), and in the case of a bilateral amendment, by the AO and an authorized official of the recipient.

[END OF PROVISION]

M5. NOTICES (JUNE 2012)

Any notice given by USAID or the recipient is sufficient only if in writing and delivered in person, mailed or e-mailed as follows:

(1) To the USAID Agreement Officer, at the address specified in this award; or

(2) To the recipient, at the recipient's address shown in this award, or to such other address specified in this award.

[END OF PROVISION]

M6. SUBAGREEMENTS (JUNE 2012)

a. Subawardees and contractors have no relationship with USAID under the terms of this award. All required USAID approvals must be directed through the recipient to USAID.

b. Notwithstanding any other term of this award, subawardees and contractors have no right to submit claims directly to USAID and USAID assumes no liability for any third party claims against the recipient.

[END OF PROVISION]

M7. OMB APPROVAL UNDER THE PAPERWORK REDUCTION ACT (DECEMBER 2003)

Information collection requirements imposed by this award are covered by OMB approval number 0412-0510; the current expiration date is 04/30/2005. The Standard Provisions containing the requirement and an estimate of the public reporting burden (including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information) are

Standard Provision	Burden Estimate
Air Travel and Transportation	1 (hour)
Ocean Shipment of Goods	.5
Patent Rights	.5
Publications	.5
Negotiated Indirect Cost Rates - (Predetermined and Provisional)	1
Voluntary Population Planning	.5
Protection of the Individual as a Research Subject	1

22 CFR 226	Burden Estimate
22 CFR 226.40-.49, Procurement of Goods and Services	1
22 CFR 226.30 -.36, Property Standards	1.5

Comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, may be sent to the Office of Acquisition and Assistance, Policy Division (M/OAA/P), U.S. Agency for International Development, Washington, DC 20523-7801 and to the Office of Management and Budget, Paperwork Reduction Project (0412-0510), Washington, DC 20503.

[END OF PROVISION]

M8. USAID ELIGIBILITY RULES FOR GOODS AND SERVICES (JUNE 2012)

a. This provision is not applicable to commodities or services that the recipient provides with private funds as part of a cost-sharing requirement, or with Program Income generated under this award.

b. Ineligible and Restricted Commodities and Services:

(1) Ineligible Commodities and Services. The recipient must not, under any circumstances, procure any of the following under this award:

(i) Military equipment,
(ii) Surveillance equipment,
(iii) Commodities and services for support of police or other law enforcement activities,
(iv) Abortion equipment and services,
(v) Luxury goods and gambling equipment, or
(vi) Weather modification equipment.

(2) Ineligible Suppliers. Any firms or individuals that do not comply with the requirements in Standard Provision, "Debarment, Suspension and Other Responsibility Matters" and Standard Provision, "Preventing Terrorist Financing" must not be used to provide any commodities or services funded under this award.

(3) Restricted Commodities. The recipient must obtain prior written approval of the Agreement Officer (AO) or comply with required procedures under an applicable waiver, as provided by the AO when procuring any of the following commodities:

(i) Agricultural commodities,
(ii) Motor vehicles,
(iii) Pharmaceuticals,
(iv) Pesticides,
(v) Used equipment,
(vi) U.S. Government-owned excess property, or
(vii) Fertilizer.

c. Source and Nationality:

Except as may be specifically approved in advance by the AO, all commodities and services that will be reimbursed by USAID under this award must be from the authorized geographic code specified in this award and must meet the source and nationality requirements set forth in 22 CFR 228. If the geographic code is not specified, the authorized geographic code is 937. When the total value of procurement for commodities and services during the life of this award is valued at $250,000 or less, the authorized geographic code for procurement of all goods and services to be reimbursed under this award is code 935. For a current list of countries within each geographic code, see: **http://www.usaid.gov/ads/policy/300/310**.

d. Guidance on the eligibility of specific commodities and services may be obtained from the AO. If USAID determines that the recipient has procured any commodities or services under this award contrary to the requirements of this provision, and has received payment for such purposes, the AO may require the recipient to refund the entire amount of the purchase.

e. This provision must be included in all subagreements, including subawards and contracts, which include procurement of commodities or services.

[END OF PROVISION]

M9. DEBARMENT, SUSPENSION, AND OTHER RESPONSIBILITY MATTERS (JUNE 2012)

a. The recipient agrees to notify the Agreement Officer (AO) immediately upon learning that it or any of its principals:

(1) Are presently excluded or disqualified from covered transactions by any Federal department or agency;

(2) Have been convicted within the preceding three-year period preceding this proposal; been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, receiving stolen property, making false claims, or obstruction of justice; commission of any other offense indicating a lack of business integrity or business honesty that seriously and directly affects your present responsibility;

(3) Are presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph a.(2); and

(4) Have had one or more public transactions (Federal, State, or local) terminated for cause or default within the preceding three years.

b. The recipient agrees that, unless authorized by the AO, it will not knowingly enter into any subagreements or contracts under this award with a person or entity that has an active exclusion on the System for Award Management (SAM) (www.sam.gov). The recipient further agrees to include the following provision in any subagreements or contracts entered into under this award:

DEBARMENT, SUSPENSION, INELIGIBILITY, AND VOLUNTARY EXCLUSION (JUNE 2012)

The recipient/contractor certifies that neither it nor its principals is presently excluded or disqualified from participation in this transaction by any Federal department or agency.

c. The policies and procedures applicable to debarment, suspension, and ineligibility under USAID-financed transactions are set forth in Subpart C of 2 CFR Section 180, as supplemented by 2 CFR 780.

[END OF PROVISION]

M10. DRUG-FREE WORKPLACE (JUNE 2012)

a. The recipient must comply with drug-free workplace requirements in subpart B (or subpart C, if the recipient is an individual) of 2 CFR 782, which adopts the Government-wide implementation (2 CFR part 182) of sec. 5152–5158 of the Drug-Free Workplace Act of 1988 (Pub. L. 100–690, Title V, Subtitle D; 41 U.S.C. 701–707).

[END OF PROVISION]

M11. EQUAL PARTICIPATION BY FAITH-BASED ORGANIZATIONS (JUNE 2012)

a. Faith-Based Organizations Encouraged.

Faith-based organizations are eligible to compete on an equal basis as any other organization to participate in USAID programs. Neither USAID nor entities that make and administer subawards of USAID funds will discriminate for or against an organization on the basis of the organization's religious character or affiliation. A faith-based organization may continue to carry out its mission, including the definition, practice, and expression of its religious beliefs, within the limits contained in this provision. More information can be found at the USAID Faith-Based and Community Initiatives Web site: http://www.usaid.gov and 22 CFR 205.1.

b. Inherently Religious Activities Prohibited.

(1) Inherently religious activities include, among other things, worship, religious instruction, prayer, or proselytization.

(2) The recipient must not engage in inherently religious activities as part of the programs or services directly funded with financial assistance from USAID. If the recipient engages in inherently religious activities, it must offer those services at a different time or location from any programs or services directly funded by this award, and participation by beneficiaries in any such inherently religious activities must be voluntary.

(3) These restrictions apply equally to religious and secular organizations. All organizations that participate in USAID programs, including religious ones, must carry out eligible activities in accordance with all program requirements and other applicable requirements governing USAID-funded activities.

(4) These restrictions do not apply to USAID-funded programs where chaplains work with inmates in prisons, detention facilities, or community correction centers, or where USAID funds are provided to religious or other organizations for programs

in prisons, detention facilities, or community correction centers, in which such organizations assist chaplains in carrying out their duties.

(5) Notwithstanding the restrictions of b.(1) and (2), a religious organization that participates in USAID-funded programs or services

(i) Retains its independence and may continue to carry out its mission, including the definition, practice, and expression of its religious beliefs, provided that it does not use direct financial assistance from USAID to support any inherently religious activities,

(ii) May use space in its facilities, without removing religious art, icons, scriptures, or other religious symbols, and

(iii) Retains its authority over its internal governance, and it may retain religious terms in its organization's name, select its board members on a religious basis, and include religious references in its organization's mission statements and other governing documents.

c. Construction of Structures Used for Inherently Religious Activities Prohibited. The recipient must not use USAID funds for the acquisition, construction, or rehabilitation of structures to the extent that those structures are used for inherently religious activities, such as sanctuaries, chapels, or other rooms that the recipient uses as its principal place of worship. Except for a structure used as its principal place of worship, where a structure is used for both eligible and inherently religious activities, USAID funds may not exceed the cost of those portions of the acquisition, construction, or rehabilitation that are attributable to eligible activities.

d. Discrimination Based on Religion Prohibited. The recipient must not discriminate against any beneficiary or potential beneficiary on the basis of religion or religious belief as part of the programs or services directly funded with financial assistance from USAID.

e. A religious organization's exemption from the Federal prohibition on employment discrimination on the basis of religion, set forth in Sec. 702(a) of the Civil Rights Act of 1964, 42 U.S.C. 2000e–1 is not forfeited when the organization receives financial assistance from USAID.

f. The Secretary of State may waive the requirements of this section in whole or in part, on a case-by-case basis, where the Secretary determines that such waiver is necessary to further the national security or foreign policy interests of the United States.

[END OF PROVISION]

M12. PREVENTING TERRORIST FINANCING -- IMPLEMENTATION OF E.O. 13224 (AUGUST 2013)

a. The recipient must not engage in transactions with, or provide resources or support to, individuals and organizations associated with terrorism, including those individuals or entities that appear on the Specially Designated Nationals and Blocked Persons List maintained by the U.S. Treasury (online at: **http://www.treasury.gov/resource-center/sanctions/SDN-List/Pages/default.aspx**) or the United Nations Security designation list (online at: **http://www.un.org/sc/committees/1267/aq_sanctions_list.shtml**).

b. This provision must be included in all subagreements, including subawards and contracts issued under this award.

[END OF PROVISION]

M13. MARKING AND PUBLIC COMMUNICATIONS UNDER USAID-FUNDED ASSISTANCE (AUGUST 2013)

a. The USAID Identity is the official marking for USAID, comprised of the USAID logo and brandmark with the tagline "from the American people." The USAID Identity is on the USAID Web site at **www.usaid.gov/branding**. Recipients must use the USAID Identity, of a size and prominence equivalent to or greater than any other identity or logo displayed, to mark the following:

(1) Programs, projects, activities, public communications, and commodities partially or fully funded by USAID;

(2) Program, project, or activity sites funded by USAID, including visible infrastructure projects or other physical sites;

(3) Technical assistance, studies, reports, papers, publications, audio-visual productions, public service announcements, Web sites/Internet activities, promotional, informational, media, or communications products funded by USAID;

(4) Commodities, equipment, supplies, and other materials funded by USAID, including commodities or equipment provided under humanitarian assistance or disaster relief programs; and

(5) Events financed by USAID, such as training courses, conferences, seminars, exhibitions, fairs, workshops, press conferences and other public activities. If the USAID Identity cannot be displayed, the recipient is encouraged to otherwise acknowledge USAID and the support of the American people.

b. The recipient must implement the requirements of this provision following the approved Marking Plan in the award.

c. The AO may require a preproduction review of program materials and "public communications" (documents and messages intended for external distribution, including but not limited to correspondence; publications; studies; reports; audio visual productions; applications; forms; press; and promotional materials) used in connection with USAID-funded programs, projects or activities, for compliance with an approved Marking Plan.

d. The recipient is encouraged to give public notice of the receipt of this award and announce progress and accomplishments. The recipient must provide copies of notices or announcements to the Agreement Officer's Representative (AOR) and to USAID's Office of Legislative and Public Affairs in advance of release, as practicable. Press releases or other public notices must include a statement substantially as follows:

"The U.S. Agency for International Development administers the U.S. foreign assistance program providing economic and humanitarian assistance in more than 80 countries worldwide."

e. Any "public communication" in which the content has not been approved by USAID must contain the following disclaimer:

"This study/report/audio/visual/other information/media product (specify) is made possible by the generous support of the American people through the United States Agency for International Development (USAID). The contents are the responsibility of [insert recipient name] and do not necessarily reflect the views of USAID or the United States Government."

f. The recipient must provide the USAID AOR with two copies of all program and communications materials produced under this award.

g. The recipient may request an exception from USAID marking requirements when USAID marking requirements would:

(1) Compromise the intrinsic independence or neutrality of a program or materials where independence or neutrality is an inherent aspect of the program and materials;

(2) Diminish the credibility of audits, reports, analyses, studies, or policy recommendations whose data or findings must be seen as independent;

(3) Undercut host-country government "ownership" of constitutions, laws, regulations, policies, studies, assessments, reports, publications, surveys or audits, public service announcements, or other communications;

(4) Impair the functionality of an item;

(5) Incur substantial costs or be impractical;

(6) Offend local cultural or social norms, or be considered inappropriate; or

(7) Conflict with international law.

h. The recipient may submit a waiver request of the marking requirements of this provision or the Marking Plan, through the AOR, when USAID-required marking would pose compelling political, safety, or security concerns, or have an adverse impact in the cooperating country.

(1) Approved waivers "flow down" to subagreements, including subawards and contracts, unless specified otherwise. The waiver may also include the removal of USAID markings already affixed, if circumstances warrant.

(2) USAID determinations regarding waiver requests are subject to appeal by the recipient, by submitting a written request to reconsider the determination to the cognizant Assistant Administrator.

i. The recipient must include the following marking provision in any subagreements entered into under this award:

"As a condition of receipt of this subaward, marking with the USAID Identity of a size and prominence equivalent to or greater than the recipient's, subrecipient's, other donor's, or third party's is required. In the event the recipient chooses not to require marking with its own identity or logo by the subrecipient, USAID may, at its discretion, require marking by the subrecipient with the USAID Identity."

[END OF PROVISION]

M14. REGULATIONS GOVERNING EMPLOYEES (AUGUST 1992)

(The following applies to the recipient's employees working in the cooperating country under the agreement who are not citizens of the cooperating country.)

a. The recipient's employees must maintain private status and may not rely on local U.S. Government offices or facilities for support while under this grant.

b. The sale of personal property or automobiles by recipient employees and their dependents in the foreign country to which they are assigned are subject to the same limitations and prohibitions which apply to direct-hire USAID personnel employed by the Mission, including the rules contained in 22 CFR 136, except as this may conflict with host government regulations.

c. Other than work to be performed under this award for which an employee is assigned by the recipient, employees of the recipient must not engage directly or indirectly, either in the individual's own name or in the name or through an agency of another person, in any business, profession, or occupation in the foreign countries to which the individual is assigned. In addition, the individual must not make loans or investments to or in any business, profession, or occupation in the foreign countries to which the individual is assigned.

d. The recipient's employees, while in a foreign country, are expected to show respect for its conventions, customs, and institutions, to abide by its applicable laws and regulations, and not to interfere in its internal political affairs.

e. In the event the conduct of any recipient employee is not in accordance with the preceding paragraphs, the recipient's chief of party must consult with the USAID Mission Director and the employee involved, and must recommend to the recipient a course of action with regard to such employee.

f. The parties recognize the rights of the U.S. Ambassador to direct the removal from a country of any U.S. citizen or the discharge from this grant award of any third country national when, in the discretion of the Ambassador, the interests of the United States so require.

g. If it is determined, either under e. or f. above, that the services of such employee should be terminated, the recipient must use its best efforts to cause the return of such employee to the United States, or point of origin, as appropriate.

[END OF PROVISION]

M15. CONVERSION OF UNITED STATES DOLLARS TO LOCAL CURRENCY (NOVEMBER 1985)

(This provision applies when activities are undertaken outside the United States.)

Upon arrival in the cooperating country, and from time to time as appropriate, the recipient's chief of party must consult with the Mission Director who must provide, in writing, the procedure the recipient and its employees must follow in the conversion of United States dollars to local currency. This may include, but is not limited to, the conversion of currency through the cognizant United States Disbursing Officer or Mission Controller, as appropriate.

[END OF PROVISION]

M16. USE OF POUCH FACILITIES (AUGUST 1992)

(This provision applies when activities are undertaken outside the United States.)

a. Use of diplomatic pouch is controlled by the Department of State. The Department of State has authorized the use of pouch facilities for USAID recipients and their employees as a general policy, as detailed in items (1) through (6) below. However, the final decision regarding use of pouch facilities rest with the Embassy or USAID Mission. In consideration of the use of pouch facilities, the recipient and its employees agree to indemnify and hold harmless, the Department of State and USAID for loss or damage occurring in pouch transmission:

(1) Recipients and their employees are authorized use of the pouch for transmission and receipt of up to a maximum of .9 kgs per shipment of correspondence and documents needed in the administration of assistance programs.

(2) U.S. citizen employees are authorized use of the pouch for personal mail up to a maximum of .45 kgs per shipment (but see a.(3) below).

(3) Merchandise, parcels, magazines, or newspapers are not considered to be personal mail for purposes of this standard provision and are not authorized to be sent or received by pouch.

(4) Official and personal mail pursuant to a.(1) and (2) above sent by pouch should be addressed as follows:

Name of individual or organization (followed by
letter symbol "G")
City Name of post (USAID/_____)
Agency for International Development
Washington, DC 20523-0001

(5) Mail sent via the diplomatic pouch may not be in violation of U.S. Postal laws and may not contain material ineligible for pouch transmission.

(6) Recipient personnel are NOT authorized use of military postal facilities (APO/FPO). This is an Adjutant General's decision based on existing laws and regulations governing military postal facilities and is being enforced worldwide.

b. The recipient is responsible for advising its employees of this authorization, these guidelines, and limitations on use of pouch facilities.

c. Specific additional guidance on grantee use of pouch facilities in accordance with this standard provision is available from the Post Communication Center at the Embassy or USAID Mission.

[END OF PROVISION]

M17. TRAVEL AND INTERNATIONAL AIR TRANSPORTATION (AUGUST 2013)

a. PRIOR BUDGET APPROVAL

Direct charges for travel costs for international air travel by individuals are allowable only when each international trip has received prior budget approval. Such approval is met when all of the following are met:

(1) The trip is identified by providing the following information: the number of trips, the number of individuals per trip, and the origin and destination countries or regions;

(2) All of the information noted at a.(1) above is incorporated in the Schedule of this award or amendments to this award; and

(3) The costs related to the travel are incorporated in the budget of this award.

The Agreement Officer (AO) may approve, in writing, international travel costs that have not been incorporated in this award. To obtain AO approval, the recipient must request approval at least three weeks before the international travel, or as far in advance as possible. The recipient must keep a copy of the AO's approval in its files. No other clearance (including country clearance) is required for employees of the recipient, its subrecipients or contractors. International travel by employees who are not on official business of the recipient, such as rest and recuperation (R&R) travel offered as part of an employee's benefits package, must be consistent with the recipient's personnel and travel policies and procedures and does not require approval.

b. TRAVEL COSTS

All travel costs must comply with the applicable cost principles and must be consistent with those normally allowed in like circumstances in the recipient's non-USAID-funded activities. Costs incurred by employees and officers for travel, including air fare, costs of lodging, other subsistence, and incidental expenses, may be considered reasonable and allowable only to the extent such costs do not exceed reasonable charges normally allowed by the recipient in its regular operations as the result of the recipient organization's written travel policy and are within the limits established by the applicable cost principles.

In the absence of a reasonable written policy regarding international travel costs, the standard for determining the reasonableness of reimbursement for international travel costs will be the Standardized Regulations (Government Civilians, Foreign Areas), published by the U.S. Department of State, as from time to time amended. The most current Standardized Regulations on international travel costs may be obtained from the AO. In the event that the cost for air fare exceeds the customary standard commercial airfare (coach or equivalent) or the lowest commercial discount airfare, the recipient must document one of the allowable exceptions from the applicable cost principles.

c. FLY AMERICA ACT RESTRICTIONS

(1) The recipient must use U.S. Flag Air Carriers for all international air transportation (including personal effects) funded by this award pursuant to the Fly America Act and its implementing regulations to the extent service by such carriers is available.

(2) In the event that the recipient selects a carrier other than a U.S. Flag Air Carrier for international air transportation, in order for the costs of such international air transportation to be allowable, the recipient must document such transportation in accordance with this provision and maintain such documentation pursuant to the Standard Provision, "Accounting, Audit and Records." The documentation must use one of the following reasons or other exception under the Fly America Act:

(i) The recipient uses a European Union (EU) flag air carrier, which is an airline operating from an EU country that has signed the US-EU "Open Skies" agreement (http://www.state.gov/e/eb/rls/othr/ata/i/ic/170684.htm).

(ii) Travel to or from one of the following countries on an airline of that country when no city pair fare is in effect for that leg (see http://apps.fas.gsa.gov/citypairs/search/):

a. Australia on an Australian airline,
b. Switzerland on a Swiss airline, or
c. Japan on a Japanese airline;

(iii) Only for a particular leg of a route on which no US Flag Air Carrier provides service on that route;

(iv) For a trip of 3 hours or less, the use of a US Flag Air Carrier at least doubles the travel time;

(v) If the US Flag Air Carrier offers direct service, use of the US Flag Air Carrier would increase the travel time by more than 24 hours; or

(vi) If the US Flag Air Carrier does not offer direct service,

a. Use of the US Flag Air Carrier increases the number of aircraft changes by 2 or more,

b. Use of the US Flag Air Carrier extends travel time by 6 hours or more, or

c. Use of the US Flag Air Carrier requires a layover at an overseas interchange of 4 hours or more.

d. DEFINITIONS

The terms used in this provision have the following meanings:

(1) "Travel costs'' means expenses for transportation, lodging, subsistence (meals and incidentals), and related expenses incurred by employees who are on travel status on official business of the recipient for any travel outside the country in which the organization is located. "Travel costs" do not include expenses incurred by employees who are not on official business of the recipient, such as rest and recuperation (R&R) travel offered as part of an employee's benefits package that are consistent with the recipient's personnel and travel policies and procedures.

(2) "International air transportation" means international air travel by individuals (and their personal effects) or transportation of cargo by air between a place in the United States and a place outside thereof, or between two places both of which are outside the United States.

(3) "U.S. Flag Air Carrier" means an air carrier on the list issued by the U.S. Department of Transportation at http://ostpxweb.dot.gov/aviation/certific/certlist.htm. U.S. Flag Air Carrier service also includes service provided under a code share agreement with another air carrier when the ticket, or documentation for an electronic ticket, identifies the U.S. flag air carrier's designator code and flight number.

(4) For this provision, the term "United States" includes the fifty states, Commonwealth of Puerto Rico, possessions of the United States, and the District of Columbia.

e. SUBAGREEMENTS

This provision must be included in all subagreements, including all subawards and contracts, under which this award will finance international air transportation.

[END OF PROVISION]

M18. OCEAN SHIPMENT OF GOODS (JUNE 2012)

APPLICABILITY: *This provision is applicable for awards and subawards for which the recipient contracts for ocean transportation for goods purchased or financed with USAID funds. In accordance with 22 CFR 228.21, ocean transportation shipments are subject to the provisions of 46 CFR Part 381.*

OCEAN SHIPMENT OF GOODS (JUNE 2012)

a. Prior to contracting for ocean transportation to ship goods purchased or financed with USAID funds under this award, the recipient must contact the office below to determine the flag and class of vessel to be used for shipment:

U.S. Agency for International Development,
Office of Acquisition and Assistance, Transportation Division
1300 Pennsylvania Avenue, NW
Washington, DC 20523-7900
Email: **oceantransportation@usaid.gov**

b. This provision must be included in all subagreements, including subwards and contracts.

[END OF PROVISION]

M19. VOLUNTARY POPULATION PLANNING ACTIVITIES – MANDATORY REQUIREMENTS (MAY 2006)

Requirements for Voluntary Sterilization Programs

(1) Funds made available under this award must not be used to pay for the performance of involuntary sterilization as a method of family planning or to coerce or provide any financial incentive to any individual to practice sterilization.

Prohibition on Abortion-Related Activities:

(1) No funds made available under this award will be used to finance, support, or be attributed to the following activities: (i) procurement or distribution of equipment intended to be used for the purpose of inducing abortions as a method of family planning; (ii) special fees or incentives to any person to coerce or motivate them to have abortions; (iii) payments to persons to perform abortions or to solicit persons to undergo abortions; (iv) information, education, training, or communication programs that seek to promote abortion as a method of family planning; and (v) lobbying for or against abortion. The term "motivate," as it relates to family planning assistance, must not be construed to prohibit the provision, consistent with local law, of information or counseling about all pregnancy options.

(2) No funds made available under this award will be used to pay for any biomedical research which relates, in whole or in part, to methods of, or the performance of, abortions or involuntary sterilizations as a means of family planning. Epidemiologic or descriptive research to assess the incidence, extent or consequences of abortions is not precluded.

[END OF PROVISION]

M20. TRAFFICKING IN PERSONS (JUNE 2012)

a. USAID is authorized to terminate this award, without penalty, if the recipient or its employees, or any subrecipient or its employees, engage in any of the following conduct:

(1) Trafficking in persons (as defined in the Protocol to Prevent, Suppress, and Punish Trafficking in Persons, especially Women and Children, supplementing the UN Convention against Transnational Organized Crime) during the period of this award;

(2) Procurement of a commercial sex act during the period of this award; or

(3) Use of forced labor in the performance of this award.

b. For purposes of this provision, "employee" means an individual who is engaged in the performance of this award as a direct employee, consultant, or volunteer of the recipient or any subrecipient.

c. The recipient must include in all subagreements, including subawards and contracts, a provision prohibiting the conduct described in a(1)-(3) by the subrecipient, contractor or any of their employees.

[END OF PROVISION]

M21. SUBMISSIONS TO THE DEVELOPMENT EXPERIENCE CLEARINGHOUSE AND PUBLICATIONS (JUNE 2012)

a. Submissions to the Development Experience Clearinghouse (DEC).

1) The recipient must provide the Agreement Officer's Representative one copy of any Intellectual Work that is published, and a list of any Intellectual Work that is not published.

2) In addition, the recipient must submit Intellectual Work, whether published or not, to the DEC, either on-line (preferred) or by mail. The recipient must review the DEC Web site for submission instructions, including document formatting and the types of documents to submit. Submission instructions can be found at: **http://dec.usaid.gov.**

3) For purposes of submissions to the DEC, Intellectual Work includes all works that document the implementation, evaluation, and results of international development assistance activities developed or acquired under this award, which may include program and communications materials, evaluations and assessments, information products, research and technical reports, progress and performance reports required under this award (excluding administrative financial

information), and other reports, articles and papers prepared by the recipient under the award, whether published or not. The term does not include the recipient's information that is incidental to award administration, such as financial, administrative, cost or pricing, or management information.

4) Each document submitted should contain essential bibliographic information, such as 1) descriptive title; 2) author(s) name; 3) award number; 4) sponsoring USAID office; 5) development objective; and 6) date of publication.

5) The recipient must not submit to the DEC any financially sensitive information or personally identifiable information, such as social security numbers, home addresses and dates of birth. Such information must be removed prior to submission. The recipient must not submit classified documents to the DEC.

b. In the event award funds are used to underwrite the cost of publishing, in lieu of the publisher assuming this cost as is the normal practice, any profits or royalties up to the amount of such cost must be credited to the award unless the schedule of the award has identified the profits or royalties as program income.

[END OF PROVISION]

M. 22 LIMITING CONSTRUCTION ACTIVITIES (AUGUST 2013)

APPLICABILITY: *In accordance with the policy at ADS 303.3.30, AOs must include this provision in all solicitations and awards. When no construction activities are contemplated under the award, the AO must insert "*Construction is not eligible for reimbursement under this award*" in section d) of this provision. If the award permits construction activities based on the policy above (or as authorized by waiver), the AO must insert the description and location(s) of the specific construction activities in section d) of this provision. The AO must not make a general reference to the Program Description. The AO must also ensure that there is a specific line item for construction activities in the award budget.*

LIMITING CONSTRUCTION ACTIVITIES (AUGUST 2013)

a) Construction is not eligible for reimbursement under this award unless specifically identified in paragraph d) below**.**

b) Construction means —construction, alteration, or repair (including dredging and excavation) of buildings, structures, or other real property and includes, without limitation, improvements, renovation, alteration and refurbishment. The term includes, without limitation, roads, power plants, buildings, bridges, water treatment facilities, and vertical structures.

c) Agreement Officers will not approve any subawards or procurements by recipients for construction activities that are not listed in paragraph d) below. USAID will reimburse allowable costs for only the construction activities listed in this provision not to exceed the amount specified in the construction line item of the award budget. The recipient must receive prior written approval from the AO to transfer funds allotted for construction activities to other cost categories, or vice versa.

d) Description
[*Type of construction and location(s)*]

e) The recipient must include this provision in all subawards and procurements and make vendors providing services under this award and subrecipients aware of the restrictions of this provision.

[END OF PROVISION]

M. 23 USAID Implementing Partner Notices (IPN) Portal for Assistance (July 2014)

USAID IMPLEMENTING PARTNER NOTICES (IPN) PORTAL FOR ASSISTANCE

For use in all solicitations and resulting awards. Please refer to **ADS 303, Section 303.3.31, "USAID Implementing Partner Notices (IPN) Portal For Assistance"** for additional guidance.

(a) Definitions

"USAID Implementing Partner Notices (IPN) Portal for Assistance ("IPN Portal)" means the single point where USAID posts proposed universal bilateral amendments for USAID awards, which can be accessed electronically by registered USAID recipients. The IPN Portal is located at **https://sites.google.com/site/usaidipnforassistance/**. Universal amendments are those which affect all assistance awards or a designated class of awards as specified in each amendment by the IPN Portal Administrator.

"IPN Portal Administrator" means the USAID official designated by the Director, M/OAA, who has overall responsibility for managing the USAID Implementing Partner Notices Portal for Assistance.

"Universal bilateral amendment" means those amendments with revisions or new requirements or provisions that affect all awards or a designated class of awards, as specified in the Agency notification of such revisions or new requirements.

(b) By submission of an application and execution of an award, the Applicant/Recipient acknowledges the requirement to:

(1) Register with the IPN Portal if awarded an assistance award resulting from this solicitation, and

(2) Receive universal bilateral amendments to this award and general notices via the IPN Portal.

(c) Procedure to register for notifications.

Go to **https://sites.google.com/site/usaidipnforassistance/** and click the "Register" button at the top of the page. Recipient representatives must use their official organization email address when subscribing, not personal email addresses.

(d) Processing of IPN Portal Amendments

The Recipient may access the IPN Portal at any time to review all IPN Portal amendments; however, the system will also notify the Recipient by email when the USAID IPN Portal Administrator posts a universal bilateral amendment for Recipient's review and signature. Proposed USAID IPN Portal amendments distributed via the IPN Portal are applicable to all awards, unless otherwise noted in the proposed amendment.

Within 15 calendar days from receipt of the notification email from the IPN Portal, the Recipient must do one of the following:

(1) (a) verify applicability of the proposed amendment for their award(s) per the instructions provided with each amendment; (b) download the amendment and incorporate the following information on the amendment form: award number, organization name, and organization mailing address as it appears in the basic award; (c) sign the hardcopy version; and (d) send the signed amendment (by email or hardcopy) to the AO for signature. The Recipient must not incorporate any other changes to the IPN Portal amendment. Bilateral amendments provided through the IPN Portal are not effective until the both the Recipient and the AO sign the amendment;

(2) Notify the AO in writing if the amendment requires negotiation of additional changes to terms and conditions of the award; or

(3) Notify the AO that the Recipient declines to sign the amendment.

Within 30 calendar days of receipt of a signed amendment from the Recipient, the AO must provide the fully executed amendment to the Recipient or initiate discussions with the Recipient.

[End of Provision]

[END OF MANDATORY PROVISIONS]

II. REQUIRED AS APPLICABLE STANDARD PROVISIONS FOR U.S. NONGOVERNMENTALORGANIZATIONS

RAA1. NEGOTIATED INDIRECT COST RATES - PREDETERMINED (APRIL 1998)

APPLICABILITY: *This provision is applicable to educational or nonprofit institutions whose indirect cost rates under this award are on a predetermined basis.*

NEGOTIATED INDIRECT COST RATES - PREDETERMINED (APRIL 1998)

a. The allowable indirect costs must be determined by applying the predetermined indirect cost rates to the bases specified in the schedule of this award.

b. Within the earlier of 30 days after receipt of the A-133 audit report or nine months after the end of the audit period, the recipient must submit to the cognizant agency for audit the required OMB Circular A-133 audit report, proposed predetermined indirect cost rates, and supporting cost data. If USAID is the cognizant agency or no cognizant agency has been designated, the recipient must submit four copies of the audit report, the proposed predetermined indirect cost rates, and supporting cost data to the Overhead, Special Costs, and Closeout Branch, Office of Acquisition and Assistance, USAID, Washington, DC 20523-7802. The proposed rates must be based on the recipient's actual cost experience during that fiscal year. Negotiations of predetermined indirect cost rates must begin soon after receipt of the recipient's proposal.

c. Allowability of costs and acceptability of cost allocation methods must be determined in accordance with the applicable cost principles.

d. The results of each negotiation must be set forth in an indirect cost rate agreement signed by both parties. Such agreement is automatically incorporated into this award and must specify (1) the agreed upon predetermined rates, (2) the bases to which the rates apply, (3) the fiscal year for which the rates apply, and (4) the specific items treated as direct costs. The indirect cost rate agreement must not change any monetary ceiling, award obligation, or specific cost allowance or disallowance provided for in this award.

e. Pending establishment of predetermined indirect costs rates for any fiscal year, the recipient must be reimbursed either at the rates fixed for the previous fiscal year or at billing rates acceptable to the USAID Agreement Officer, subject to appropriate adjustment when the final rates for the fiscal year or other period are established.

[END OF PROVISION]

RAA2. NEGOTIATED INDIRECT COST RATES - PROVISIONAL (Nonprofit) (APRIL 1998)

APPLICABILITY: *This provision is applicable to any nonprofit organizations whose indirect cost rates under this award are on a provisional basis.*

NEGOTIATED INDIRECT COST RATES - PROVISIONAL (Nonprofit) (APRIL 1998)

a. Provisional indirect cost rates must be established for each of the recipient's accounting periods during the term of this award. Pending establishment of revised provisional or final rates, allowable indirect costs must be reimbursed at the rates, on the bases, and for the periods shown in the schedule of the award.

b. Within the earlier of 30 days after receipt of the A-133 audit report or nine months after the end of the audit period, the recipient must submit to the cognizant agency for audit the required OMB Circular A-133 audit report, proposed final indirect cost rates, and supporting cost data. If USAID is the cognizant agency or no cognizant agency has been designated, the recipient must submit four copies of the audit report, along with the proposed final indirect cost rates and supporting cost data, to the Overhead, Special Costs, and Closeout Branch, Office of Acquisition and Assistance, USAID, Washington, DC 20523-7802. The proposed rates must be based on the recipient's actual cost experience during that fiscal year. Negotiations of final indirect cost rates must begin soon after receipt of the recipient’s proposal.

c. Allowability of costs and acceptability of cost allocation methods must be determined in accordance with the applicable cost principles.

d. The results of each negotiation must be set forth in a written indirect cost rate agreement signed by both parties. Such agreement is automatically incorporated into this award and must specify (1) the agreed upon final rates, (2) the bases to which the rates apply, (3) the fiscal year for which the rates apply, and (4) the items treated as direct costs. The agreement must not change any monetary ceiling, award obligation, or specific cost allowance or disallowance provided for in this award.

e. Pending establishment of final indirect cost rate(s) for any fiscal year, the recipient must be reimbursed either at negotiated provisional rates or at billing rates acceptable to the Agreement Officer, subject to appropriate adjustment when the final rates for the fiscal year are established. To prevent substantial overpayment or underpayment, the provisional or billing rates may be prospectively or retroactively revised by mutual agreement.

f. Failure by the parties to agree on final rates is a 22 CFR 226.90 dispute.

[END OF PROVISION]

RAA4. EXCHANGE VISITORS AND PARTICIPANT TRAINING (JUNE 2012)

***APPLICABILITY**: This provision applies to awards that contain funding for any exchange visitor activities or participant training, as defined in ADS 252 and 253, respectively, conducted or paid for by the recipient with USAID funds under this award.*

EXCHANGE VISITORS AND PARTICIPANT TRAINING (JUNE 2012)

For any Exchange Visitor, Participant Training or Invitational Travel activities, the recipient must comply with this provision.

a. **Definitions:**

(1) An **Exchange Visitor** is any host-country or third-country national traveling to the U.S., for any purpose, including Participant Training and Invitational Travel, funded by USAID in whole or in part, directly or indirectly.

(2) A **Participant** is a host-country or third-country national sponsored by USAID for a Participant Training activity taking place in the U.S., a third country, or in the host country.

(3) **Participant Training** is a learning activity conducted within the U.S., a third country, or in the host country for the purpose of furthering USAID development objectives. A learning activity takes place in a setting in which an individual (the Participant) interacts with a knowledgeable professional, predominantly for the purpose of acquiring knowledge or skills for the professional or technical enhancement of the individual. Learning activities may be formally structured, such as an academic program or a technical course, or they may be more informal, such as an observational study tour.

(4) **Invitational Travel** is a type of travel that USAID funds for non-U.S. Government employees. This type of travel may be approved for both U.S. and foreign citizens who are not employed by the U.S. Government (USG), not receiving any type of compensation from the USG for such travel, and only when it is determined that the functions to be performed are essential to the interests of USAID.

b. **Program Monitoring and Data Reporting:** The recipient must monitor Exchange Visitors' and Participants' progress during their program and ensure that problems are identified and resolved quickly.

(1) For U.S.-based activities, the recipient must use USAID's official Exchange Visitor and Participant Training information system, currently called "Training Results and Information Network – TraiNet" (see **http://trainethelp.usaid.gov/**), to report and manage Exchange Visitor and Participant Training data. The

recipient must also use the USAID Visa Compliance System – VCS (see http://trainethelp.usaid.gov/) to transfer required data for USAID Exchange Visitors to the Department of Homeland Security's Student and Exchange Visitor Information System (SEVIS).

(2) For all third-country activities, and for host-country activities of two consecutive days or 16 contact hours or more in duration, the recipient must use USAID's official Exchange Visitor and Participant Training information system, currently called "Training Results and Information Network – TraiNet" (see http://trainethelp.usaid.gov/), to report and manage Participant Training data.

c. **Health and Accident Insurance:**

(1) For Exchange Visitors traveling to the United States, the recipient must enroll Exchange Visitors in health and accident insurance coverage that meets or exceeds Department of State and USAID minimum coverage requirements as set forth in 22 CFR 62.14 and ADS 253.3.6.2. The requirements may be obtained from the Agreement Officer's Representative.

(2) For Participants traveling to a third country, the recipient must obtain health and accident insurance coverage for all Participants.

(3) For Participants traveling within the host country, the recipient must determine whether specific in-country participant training activities subject them to any risk of health and accident liability for medical costs. Participants may incur, and if so, take appropriate steps according to the local situation, including obtaining health and accident insurance coverage for Participants.

d. **Immigration Requirements:**

(1) For Exchange Visitors traveling to the United States, the recipient must ensure that all USAID-sponsored Exchange Visitors obtain, use, and comply with the terms of the J-1 visa, issued in conjunction with a USAID-issued Certificate of Eligibility for J-1 Visa Status (DS-2019).

(2) For Participants traveling to a third country or within the host country, the recipient must ensure that all Participants obtain, use, and comply with the terms of all applicable immigration, visa and other similar requirements.

e. **Language Proficiency:** The recipient must verify language proficiency. Exchange Visitors must possess sufficient English language proficiency to participate in a U.S.-based activity. Participants of third-country or host-country training must be proficient in the language of training at a sufficient level for participation, unless an interpreter has been arranged. Language competency can be verified through a variety of means including proficiency assessments of interviews, publications, presentations, education conducted in English, and formal testing.

f. **Pre-departure Orientation:** The recipient must conduct pre-departure orientation for U.S-bound Exchange Visitors and Participants of third-country training programs. Pre-departure orientation covers: program objectives; administrative and policy review; cultural aspects; and training/learning methods (see **http://pdf.usaid.gov/pdf_docs/PNADT444.pdf**).

g. **Conditions of Sponsorship:** The recipient must ensure that all Exchange Visitors read and sign the Conditions of Sponsorship for U.S.-Based Activities form (AID 1381-6). The recipient must also ensure that all Participants of long-term (six months or longer) third-country training read and sign the form Conditions of Sponsorship for Third-Country Training form (AID 1381-7). The recipient must report to the Agreement Officer any known violations by Exchange Visitors of visa or other immigration requirements or conditions.

h. **Exchange Visitor Security Risk and Fraud Inquiry:** Each USAID Mission has an established process for conducting a Security Risk and Fraud Inquiry (SRFI) for Exchange Visitors. The recipient must be prepared to assist Missions in conducting the SRFI, if requested. However, the recipient's role is contributive, and the Mission is ultimately responsible for conducting the SRFI.

i. **Fly America:** To the extent that participants travel by international air travel, the recipient must comply with the Standard Provision, "International Air Travel and Air Transportation of Property."

j. **Use of Minority Serving Institutions:** For U.S.-based Participant Training, the recipient must, to the maximum extent possible, maintain their use of Historically Black Colleges and Universities (HBCUs) and other Minority Serving Institutions (MSIs), including Hispanic Serving Institutions and Tribal Colleges and Universities, as training or education providers.

[END OF PROVISION]

RAA6. PROTECTION OF THE INDIVIDUAL AS A RESEARCH SUBJECT (APRIL 1998)

APPLICABILITY: *This provision is applicable when human subjects are involved in research financed by the award.*

PROTECTION OF THE INDIVIDUAL AS A RESEARCH SUBJECT (APRIL 1998)

a. Safeguarding the rights and welfare of human subjects involved in research supported by USAID is the responsibility of the organization to which support is awarded. USAID has adopted the Common Federal Policy for the Protection of Human Subjects, Part 225 of Title 22 of the Code of Federal Regulations (the "Policy"). Additional interpretation,

procedures, and implementation guidance of the Policy are found in USAID General Notice entitled "Procedures for the Protection of Human Subjects in Research Supported by USAID," issued April 19, 1995, as amended. USAID's Cognizant Human Subjects Officer (CHSO) in USAID/W has oversight, guidance, and interpretation responsibility for the Policy.

b. Recipient organizations must comply with USAID policy when humans are the subject of research, as defined in 22 CFR 225.102(d), funded by the grant and recipients must provide "assurance," as required by 22 CFR 225.103, that they follow and abide by the procedures in the Policy. See also Section 5 of the April 19, 1995, USAID General Notice which sets forth activities to which the Policy is applicable. The existence of a bona fide, applicable assurance approved by the Department of Health and Human Services (HHS) such as the "multiple project assurance" (MPA) will satisfy this requirement. Alternatively, organizations can provide an acceptable written assurance to USAID as described in 22 CFR 225.103. Such assurances must be determined by the CHSO to be acceptable prior to any applicable research being initiated or conducted under the award. In some limited instances outside the U.S., alternative systems for the protection of human subjects may be used provided they are deemed "at least equivalent" to those outlined in Part 225 (See 22 CFR 225.101[h]). Criteria and procedures for making this determination are described in the General Notice cited in the preceding paragraph.

c. Since the welfare of the research subject is a matter of concern to USAID as well as to the organization, USAID staff consultants and advisory groups may independently review and inspect research and research processes and procedures involving human subjects, and based on such findings, the CHSO may prohibit research which presents unacceptable hazards or otherwise fails to comply with USAID procedures. Informed consent documents must include the stipulation that the subject's records may be subject to such review.

[END OF PROVISION]

RAA7. CARE OF LABORATORY ANIMALS (MARCH 2004)

APPLICABILITY: *This provision is applicable when laboratory animals are involved in research performed in the U.S. and financed by the award.*

CARE OF LABORATORY ANIMALS (MARCH 2004)

a. Before undertaking performance of any grant involving the use of laboratory animals, the recipient must register with the Secretary of Agriculture of the United States in accordance with Section 6, Public Law 89-544, Laboratory Animal Welfare Act, August 24, 1966, as amended by Public Law 91-579, Animal Welfare Act of 1970, December 24, 1970. The recipient must furnish evidence of such registration to the Agreement Officer.

b. The recipient must acquire animals used in research under this award only from dealers licensed by the Secretary of Agriculture, or from exempted sources in accordance with the Public Laws enumerated in a. above.

c. In the care of any live animals used or intended for use in the performance of this grant, the recipient must adhere to the principles enunciated in the Guide for Care and Use of Laboratory Animals prepared by the Institute of Laboratory Animals Resources, National Academy of Sciences - National Research Council (NAS-NRC), and in the United States Department of Agriculture's (USDA) regulations and standards issued under the Public Laws enumerated in a. above. In case of conflict between standards, the higher standard must be used. The recipient's reports on portions of the award in which animals were used must contain a certificate stating that the animals were cared for in accordance with the principles enunciated in the Guide for Care and Use of Laboratory Animals prepared by the Institute of Laboratory Animal Resources, NAS-NRC, and/or in the regulations and standards as promulgated by the Agricultural Research Service, USDA, pursuant to the Laboratory Animal Welfare Act of 24 August 1966, as amended (P.L. 89-544 and P.L. 91-579). NOTE: The recipient may request registration of the recipient's facility and a current listing of licensed dealers from the Regional Office of the Animal and Plant Health Inspection Service (APHIS), USDA, for the region in which the recipient's research facility is located. The location of the appropriate APHIS Regional Office as well as information concerning this program may be obtained by contacting the Senior Staff Office, Animal Care Staff, USDA/APHIS, 4700 River Road, Unit 84, Riverdale, MD 20737-1234 and at **www.aphis.usda.gov/animal_welfare/index.shtml**.

[END OF PROVISION]

RAA9. COST SHARING (MATCHING) (FEBRUARY 2012)

APPLICABILITY: *This provision, along with 22 CFR 226, is applicable when the recipient has agreed or is required to cost share or provide a matching share.*

COST SHARING (MATCHING) (FEBRUARY 2012)

a. If at the end of any funding period, the recipient has expended an amount of non-Federal funds less than the agreed upon amount or percentage of total expenditures, the Agreement Officer may apply the difference to reduce the amount of USAID incremental funding in the following funding period. If the award has expired or has been terminated, the Agreement Officer may require the recipient to refund the difference to USAID.

b. The source and nationality requirements and the restricted goods provision established in the Standard Provision entitled "USAID Eligibility Rules for Goods and Services" do not apply to cost sharing (matching) expenditures.

[END OF PROVISION]

RAA10. PROHIBITION OF ASSISTANCE TO DRUG TRAFFICKERS (JUNE 1999)

APPLICABILITY: *This provision is applicable where performance of the award will take place in "Covered" Countries, as described in ADS 206.*

PROHIBITION OF ASSISTANCE TO DRUG TRAFFICKERS (JUNE 1999)

a. USAID reserves the right to terminate assistance to, or take other appropriate measures with respect to, any participant approved by USAID who is found to have been convicted of a narcotics offense or to have been engaged in drug trafficking as defined in 22 CFR 140.

b.

(1) For any loan over $1,000 made under this agreement, the recipient must insert a clause in the loan agreement stating that the loan is subject to immediate cancellation, acceleration, recall, or refund by the recipient if the borrower or a key individual of a borrower is found to have been convicted of a narcotics offense or to have been engaged in drug trafficking as defined in 22 CFR 140.

(2) Upon notice by USAID of a determination under section (1) and at USAID's option, the recipient agrees to immediately cancel, accelerate, or recall the loan, including refund in full of the outstanding balance. USAID reserves the right to have the loan refund returned to USAID.

c.

(1) The recipient agrees not to disburse, or sign documents committing the recipient to disburse, funds to a subrecipient designated by USAID ("Designated Subrecipient") until advised by USAID that: (i) any United States Government review of the Designated Subrecipient and its key individuals has been completed; (ii) any related certifications have been obtained; and (iii) the assistance to the Designated Subrecipient has been approved. Designation means that the subrecipient has been unilaterally selected by USAID as the subrecipient. USAID approval of a subrecipient, selected by another party, or joint selection by USAID and another party is not designation.

(2) The recipient must insert the following clause, or its substance, in its agreement with the Designated Subrecipient:

"The recipient reserves the right to terminate this [Agreement/Contract] or take other appropriate measures if the [Subrecipient] or a key individual of the [Subrecipient] is found to have been convicted of a narcotic offense or to have been engaged in drug trafficking as defined in 22 CFR 140."

[END OF PROVISION]

RAA11. INVESTMENT PROMOTION (NOVEMBER 2003)

APPLICABILITY: *The following clause is required for grants and cooperative agreements when the program includes gray-area activities or investment-related activities where specific activities are not identified at the time of obligation but could be for investment-related activities, as described in ADS 225 (see 225.3.1.8).*

INVESTMENT PROMOTION (NOVEMBER 2003)

a. Except as specifically set forth in this award or otherwise authorized by USAID in writing, no funds or other support provided hereunder may be used for any activity that involves investment promotion in a foreign country.

b. In the event the recipient is requested or wishes to provide assistance in the above area or requires clarification from USAID as to whether the activity would be consistent with the limitation set forth above, the recipient must notify the Agreement Officer and provide a detailed description of the proposed activity. The recipient must not proceed with the activity until advised by USAID that it may do so.

c. The recipient must ensure that its employees and subrecipients and contractors providing investment promotion services hereunder are made aware of the restrictions set forth in this clause and must include this clause in all contracts and other subagreements entered into hereunder.

[END OF PROVISION]

RAA12. REPORTING HOST GOVERNMENT TAXES (JUNE 2012)

APPLICABILITY*: This provision is applicable to all USAID agreements that obligate or subobligate FY 2003 or later funds except for agreements funded with Operating Expense, Pub. L. 480 funds, or trust funds, or agreements where there will be no commodity transactions in a foreign country over the amount of $500. Please insert address and point of contact at the Embassy, Mission, or M/CFO/CMP as appropriate under section (b) of this provision.*

REPORTING HOST GOVERNMENT TAXES (JUNE 2012)

a. By April 16 of each year, the recipient must submit a report containing:

(1) Contractor/recipient name.

(2) Contact name with phone, fax and e-mail.

(3) Agreement number(s).

(4) The total amount of value-added taxes and customs duties (but not sales taxes)

assessed by the host government (or any entity thereof) on purchases in excess of $500 per transaction of supplies, materials, goods or equipment, during the 12 months ending on the preceding September 30, using funds provided under this contract/agreement.

(5) Any reimbursements received by April 1 of the current year on value-added taxes and customs duties reported in (iv).

(6) Reports are required even if the recipient did not pay any taxes or receive any reimbursements during the reporting period.

(7) Cumulative reports may be provided if the recipient is implementing more than one program in a foreign country.

b. Submit the reports to: [insert address and point of contact at the Embassy, Mission, or M/CFO/CMP as appropriate, may include an optional "with a copy to"].

c. Host government taxes are not allowable where the Agreement Officer provides the necessary means to the recipient to obtain an exemption or refund of such taxes, and the recipient fails to take reasonable steps to obtain such exemption or refund. Otherwise, taxes are allowable in accordance with the Standard Provision, "Allowable Costs," and must be reported as required in this provision.

d. The recipient must include this reporting requirement in all applicable subagreements, including subawards and contracts.

[END OF PROVISION]

RAA13. FOREIGN GOVERNMENT DELEGATIONS TO INTERNATIONAL CONFERENCES (JUNE 2012)

***APPLICABILITY**: Include this provision in agreements funded from the following accounts:*

- *Development Assistance, including assistance for sub-Saharan Africa,*
- *Global Health Programs, and*
- *Micro and Small Enterprise Development Program Account.*

*Further information found in the Mandatory Reference for ADS 303, "Guidance on Funding Foreign Government Delegations to International Conferences," (**http://www.usaid.gov/ads/policy/300/350maa**).*

FOREIGN GOVERNMENT DELEGATIONS TO INTERNATIONAL CONFERENCES (JUNE 2012)

a. U.S. Government funds under this award must not be used to finance the travel, per diem, hotel expenses, meals, conference fees or other conference costs for any member of a

foreign government's delegation to an international conference sponsored by a multilateral organization, as defined below, unless approved by the Agreement Officer in writing.

b. Definitions:

(1) A foreign government delegation is appointed by the national government (including ministries and agencies but excluding local, state and provincial entities) to act on behalf of the appointing authority at the international conference. A conference participant is a delegate for the purposes of this provision, only when there is an appointment or designation that the individual is authorized to officially represent the government or agency. A delegate may be a private citizen.

(2) An international conference is a meeting where there is an agenda, an organizational structure, and delegations from countries other than the conference location, in which country delegations participate through discussion, votes, etc.

(3) A multilateral organization is an organization established by international agreement and whose governing body is composed principally of foreign governments or other multilateral organizations.

[END OF PROVISION]

RAA17. STANDARDS FOR ACCESSIBILITY FOR THE DISABLED IN USAID ASSISTANCE AWARDS INVOLVING CONSTRUCTION (SEPTEMBER 2004)

APPLICABILITY: *This provision must be included in solicitations (e.g., Requests for Applications (RFAs) or Annual Program Statements), and in awards involving construction.*

STANDARDS FOR ACCESSIBILITY FOR THE DISABLED IN USAID ASSISTANCE AWARDS INVOLVING CONSTRUCTION (SEPTEMBER 2004)

a. One of the objectives of the USAID Disability Policy is to engage other U.S. Government agencies, host country counterparts, governments, implementing organizations, and other donors in fostering a climate of nondiscrimination against people with disabilities. As part of this policy USAID has established standards for any new or renovation construction project funded by USAID to allow access by people with disabilities (PWDs). The full text of the policy paper can be found at the following Web site: pdf.usaid.gov/pdf_docs/PDABQ631.pdf.

b. USAID requires the recipient to comply with standards of accessibility for people with disabilities in all structures, buildings or facilities resulting from new or renovation construction or alterations of an existing structure.

c. The recipient will comply with the host country or regional standards for accessibility in

construction when such standards result in at least substantially equivalent accessibility and usability as the standard provided in the Americans with Disabilities Act (ADA) of 1990 and the Architectural Barriers Act (ABA) Accessibility Guidelines of July 2004. Where there are no host country or regional standards for universal access or where the host country or regional standards fail to meet the ADA/ABA threshold, the standard prescribed in the ADA and the ABA will be used.

d. New Construction. All new construction will comply with the above standards for accessibility.

e. Alterations. Changes to an existing structure that affect, the usability of the structure will comply with the above standards for accessibility unless the recipient obtains the Agreement Officer's advance approval that compliance is technically infeasible or constitutes an undue burden or both. Compliance is technically infeasible where structural conditions would require removing or altering a load-bearing member that is an essential part of the structural frame or because other existing physical or site constraints prohibit modification or addition of elements, spaces, or features that are in full and strict compliance with the minimum requirements of the standard. Compliance is an undue burden where it entails either a significant difficulty or expense or both.

f. Exceptions. The following construction related activities are excepted from the requirements of paragraphs a. through d. above:

(1) Normal maintenance, reroofing, painting or wall papering, or changes to mechanical or electrical systems are not alterations and the above standards do not apply unless they affect the accessibility of the building or facility; and

(2) Emergency construction (which may entail the provision of plastic sheeting or tents, minor repair and upgrading of existing structures, rebuilding of part of existing structures, or provision of temporary structures) intended to be temporary in nature. A portion of emergency construction assistance may be provided to people with disabilities as part of the process of identifying disaster- and crisis-affected people as "most vulnerable."

[END OF PROVISION]

RAA21. CENTRAL CONTRACTOR REGISTRATION AND UNIVERSAL IDENTIFIER (OCTOBER 2010)

APPLICABILITY: *This provision is required in accordance with 2 CFR 25, Award Term for Central Contractor Registration and Universal Identifier. Agreement Officers (AOs) must include this provision in all assistance solicitations and all awards, unless the AO exempts an organization from compliance with the provision under one of the following exceptions, from paragraph d. below:*

Exceptions. The requirements of this provision to obtain a Data Universal Numbering System (DUNS) number and maintain a current registration in the Central Contractor Registration (CCR) do not apply, at the prime award or subaward level, to:

(1) Awards to individuals

(2) Awards less than $25,000 to foreign recipients to be performed outside the United States (based on a USAID determination)

(3) Awards where the AO determines, in writing, that these requirements would cause personal safety concerns.

CENTRAL CONTRACTOR REGISTRATION AND UNIVERSAL IDENTIFIER (OCTOBER 2010)

a. **Requirement for Central Contractor Registration (CCR).** Unless you are exempted from this requirement under 2 CFR 25.110, you as the recipient must maintain the currency of your information in the CCR until you submit the final financial report required under this award or receive the final payment, whichever is later. This requires that you review and update the information at least annually after the initial registration, and more frequently, if required by changes in your information or another award term.

b. **Requirement for Data Universal Numbering System (DUNS) numbers.** If you are authorized to make subawards under this award, you:

(1) Must notify potential subrecipients that no entity (see definition in paragraph c. of this award term) may receive a subaward from you unless the entity has provided its DUNS number to you.

(2) May not make a subaward to an entity unless the entity has provided its DUNS number to you.

c. Definitions. For purposes of this award term:

(1) Central Contractor Registration (CCR) means the Federal repository into which an entity must provide information required for the conduct of business as a recipient. Additional information about registration procedures may be found at the CCR Internet site (currently at **www.ccr.gov**).

(2) Data Universal Numbering System (DUNS) number means the nine-digit number established and assigned by Dun and Bradstreet, Inc. (D&B) to uniquely identify business entities. A DUNS number may be obtained from D&B by telephone (currently 866-705-5711) or the Internet (currently at **fedgov.dnb.com/webform**).

(3) Entity, as it is used in this award term, means all of the following, as defined at 2 CFR 25, subpart C:

(i) A governmental organization, which is a State, local government, or Indian tribe;

(ii) A foreign public entity;

(iii) A domestic or foreign nonprofit organization;

(iv) A domestic or foreign for-profit organization; and

(v) A Federal agency, but only as a subrecipient under an award or subaward to a non-Federal entity.

(4) Subaward:

(i) This term means a legal instrument to provide support for the performance of any portion of the substantive project or program for which you received this award and that you as the recipient award to an eligible subrecipient.

(ii) The term does not include your procurement of property and services needed to carry out the project or program (for further explanation, see Sec. --.210 of the attachment to OMB Circular A-133, "Audits of States, Local Governments, and Non-Profit Organizations").

(iii) A subaward may be provided through any legal agreement, including an agreement that you consider a contract.

(5) Subrecipient means an entity that:

(i) Receives a subaward from you under this award; and

(ii) Is accountable to you for the use of the Federal funds provided by the subaward.

ADDENDUM (JUNE 2012):

a. Exceptions. The requirements of this provision to obtain a Data Universal Numbering System (DUNS) number and maintain a current registration in the Central Contractor Registration (CCR) do not apply, at the prime award or subaward level, to:

(1) Awards to individuals

(2) Awards less than $25,000 to foreign recipients to be performed outside the United States (based on a USAID determination)

(3) Awards where the Agreement Officer determines, in writing, that these requirements would cause personal safety concerns.

b. This provision does not need to be included in subawards.

[END OF PROVISION]

RAA22. REPORTING SUBAWARDS AND EXECUTIVE COMPENSATION (OCTOBER 2010)

APPLICABILITY: *This provision is required in accordance with 2 CFR 170, Award Term for Reporting Subawards and Executive Compensation. AOs must include this provision in all assistance solicitations and all awards expected to exceed $25,000, unless an exemption applies under paragraph d. of the provision or the exemptions listed below in this applicability statement. If the AO determines that an exemption applies, the AO must provide guidance to the recipient on reporting with generic information.*

Exemptions.

(1) The requirements to report under this provision do not apply to:

(i) Awards to individuals

(ii) Awards less than $25,000

(2) When the AO determines, in writing, that these requirements would cause personal safety concerns, reporting under this provision can be accomplished using generic information.

REPORTING SUBAWARDS AND EXECUTIVE COMPENSATION (OCTOBER 2010)

a. Reporting of first-tier subawards.

(1) Applicability. Unless you are exempt as provided in paragraph d. of this award term, you must report each action that obligates $25,000 or more in Federal funds that does not include Recovery funds (as defined in section 1512(a)(2) of the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5) for a subaward to an entity (see definitions in paragraph e. of this award term).

(2) Where and when to report.

(i) You must report each obligating action described in paragraph a.(1) of this award term to **www.fsrs.gov**.

(ii) For subaward information, report no later than the end of the month

following the month in which the obligation was made. (For example, if the obligation was made on November 7, 2010, the obligation must be reported by no later than December 31, 2010.)

(3) What to report. You must report the information about each obligating action that the submission instructions posted at **www.fsrs.gov** specify.

b. Reporting Total Compensation of Recipient Executives.

(1) Applicability and what to report. You must report total compensation for each of your five most highly compensated executives for the preceding completed fiscal year, if –

(i) The total Federal funding authorized to date under this award is $25,000 or more;

(ii) In the preceding fiscal year, you received—

(A) 80 percent or more of your annual gross revenues from Federal procurement contracts (and subcontracts) and Federal financial assistance subject to the Transparency Act, as defined at 2 CFR 170.320 (and subawards); and

(B) $25,000,000 or more in annual gross revenues from Federal procurement contracts (and subcontracts) and Federal financial assistance subject to the Transparency Act, as defined at 2 CFR 170.320 (and subawards); and

(iii) The public does not have access to information about the compensation of the executives through periodic reports filed under section 13(a) or 15(d) of the Securities Exchange Act of 1934 (15 U.S.C. 78m(a), 78o(d)) or section 6104 of the Internal Revenue Code of 1986. (To determine if the public has access to the compensation information, see the U.S. Security and Exchange Commission total compensation filings at **www.sec.gov/answers/execomp.htm**.)

(2) Where and when to report. You must report executive total compensation described in paragraph b.(1) of this award term:

(i) As part of your registration profile at **www.bpn.gov/ccr**.

(ii) By the end of the month following the month in which this award is made, and annually thereafter.

c. Reporting of Total Compensation of Subrecipient Executives.

(1) Applicability and what to report. Unless you are exempt as provided in paragraph d. of this award term, for each first-tier subrecipient under this award, you must report the names and total compensation of each of the subrecipient's five most highly compensated executives for the subrecipient's preceding completed fiscal year, if–

(i) In the subrecipient's preceding fiscal year, the subrecipient received—

(A) 80 percent or more of its annual gross revenues from Federal procurement contracts (and subcontracts) and Federal financial assistance subject to the Transparency Act, as defined at 2 CFR 170.320 (and subawards); and

(B) $25,000,000 or more in annual gross revenues from Federal procurement contracts (and subcontracts), and Federal financial assistance subject to the Transparency Act (and subawards); and

(ii) The public does not have access to information about the compensation of the executives through periodic reports filed under section 13(a) or 15(d) of the Securities Exchange Act of 1934 (15 U.S.C. 78m(a), 78o(d)) or section 6104 of the Internal Revenue Code of 1986. (To determine if the public has access to the compensation information, see the U.S. Security and Exchange Commission total compensation filings at **www.sec.gov/answers/execomp.htm**.)

(2) Where and when to report. You must report subrecipient executive total compensation described in paragraph c.(1) of this award term:

(i) To the recipient.

(ii) By the end of the month following the month during which you make the subaward. For example, if a subaward is obligated on any date during the month of October of a given year (for example, between October 1 and 31), you must report any required compensation information of the subrecipient by November 30 of that year.

d. Exemptions.

If, in the previous tax year, you had gross income, from all sources, under $300,000, you are exempt from the requirements to report:

(1) Subawards, and

(2) The total compensation of the five most highly compensated executives of any subrecipient.

e. Definitions.

For purposes of this award term:

(1) Entity means all of the following, as defined in 2 CFR 25:

(i) A governmental organization, which is a State, local government, or Indian tribe;

(ii) A foreign public entity;

(iii) A domestic or foreign nonprofit organization;

(iv) A domestic or foreign for-profit organization; and

(v) A Federal agency, but only as a subrecipient under an award or subaward to a non-Federal entity.

(2) Executive means officers, managing partners, or any other employees in management positions.

(3) Subaward:

(i) This term means a legal instrument to provide support for the performance of any portion of the substantive project or program for which you received this award and that you as the recipient award to an eligible subrecipient.

(ii) The term does not include your procurement of property and services needed to carry out the project or program (for further explanation, see Sec. __.210 of the attachment to OMB Circular A-133, "Audits of States, Local Governments, and Non- Profit Organizations").

(iii) A subaward may be provided through any legal agreement, including an agreement that you or a subrecipient considers a contract.

(4) Subrecipient means an entity that:

(i) Receives a subaward from you (the recipient) under this award; and

(ii) Is accountable to you for the use of the Federal funds provided by the subaward.

(5) Total compensation means the cash and noncash dollar value earned by the executive during the recipient's or subrecipient's preceding fiscal year and

includes the following (for more information see 17 CFR 229.402(c)(2)):

(i) Salary and bonus.

(ii) Awards of stock, stock options, and stock appreciation rights. Use the dollar amount recognized for financial statement reporting purposes with respect to the fiscal year in accordance with the Statement of Financial Accounting Standards No. 123 (Revised 2004) (FAS 123R), Shared Based Payments.

(iii) Earnings for services under nonequity incentive plans. This does not include group life, health, hospitalization, or medical reimbursement plans that do not discriminate in favor of executives, and are available generally to all salaried employees.

(iv) Change in pension value. This is the change in present value of defined benefit and actuarial pension plans.

(v) Above-market earnings on deferred compensation which is not tax-qualified.

(vi) Other compensation, if the aggregate value of all such other compensation (for example, severance, termination payments, value of life insurance paid on behalf of the employee, perquisites or property) for the executive exceeds $10,000.

[END OF PROVISION]

RAA23. PATENT REPORTING PROCEDURES (JULY 2012)

APPLICABILITY: *This provision is applicable whenever the agreement finances research activities, or patentable processes or practices.)*

PATENT REPORTING PROCEDURES (JULY 2012)

As incorporated by 22 CFR 226.36 and the standard provision "APPLICABILITY OF 22 CFR PART 226," the clause at 37 CFR 401.14 ("Patent Rights (Small Business Firms and Nonprofit Organizations)") is incorporated by reference into this award as if set forth in full text. The recipient must use the National Institutes of Health EDISON Patent Reporting and Tracking system (http://www.iedison.gov) to fulfill its disclosure obligations under 37 CFR 401.14(c)(1). The recipient must also submit reports on utilization of subject inventions annually to the Agreement Officer's Representative under 37 CFR 401.14(h), and the last report must be provided within 90 days of the expiration of the agreement.

[END OF PROVISION]

[END OF STANDARD PROVISIONS]

End of Attachment D

ATTACHMENT E – INITIAL ENVIRONMENTAL EXAMINATION
SUMMARY OF PROGRAMMATIC INITIAL ENVIRONMENTAL EXAMINATION (PIEE)
PREDICT - 2

PROGRAM/ACTIVITY DATA

IEE Number:	**XXX GH-13-39**
Program/Project Number:	AAD 936-4002
Country:	Global
Functional Objective:	Investing in People
Program Area:	Health
Program Elements:	Pandemic Influenza and Other Emerging Threats
Funding Period:	FY14 - FY18
Life of Activity Funding:	September 2014 through September 2019
Life of PIEE:	Five years from date of signing or at the time of any change/amendment to the Program.

(b)(6)

PIEE Amendment: Yes_____ No__X__ If yes, date of original IEE: _____

PIEE Prepared by: [redacted] GH/HIDN/PIOET

Current date: May 2013

ENVIRONMENTAL ACTION RECOMMENDED

Categorical Exclusion: _____
Negative Determination: _____
Negative Determination w/ Conditions: ____X____
Positive Determination: _____

SUMMARY OF FINDINGS

The purpose of this document is to review the overall activities and the potential environmental impact that will be undertaken by the recipient organization of the PREDICT 2 cooperative agreement. The PREDICT 2 Programmatic Initial Environmental Examination (PIEE) evaluates the potential impacts of the CBP activities and has determined that a **Negative Determination with Conditions** is appropriate for the actions described in the document. Other actions not described in this paper will require supplemental environmental analysis.

THRESHOLD ENVIRONMENTAL DETERMINATIONS

The overall environmental determination for PREDICT 2 is a **Negative Determination, with conditions**.

Pursuant to 22 CFR216.3(a)(2)(iii), a **Negative Determination with Conditions** is recommended for any PREDICT 2 activities that have potential for negative impact on the environment in the following categories, as presented in Table 3b in this document:

1) Procurement, storage, management and disposal of public health commodities, including laboratory supplies and reagents.
2) Actions that directly or indirectly result in the generation and disposal of hazardous or highly hazardous medical waste (e.g., laboratory diagnosis, wildlife surveillance, etc.)
3) Actions associated with establishing a wildlife surveillance capacity in selected countries and regions that target specific microbial agents.
4) Outbreak response planning and implementation.

SUMMARY OF MONITORING AND REPORTING MEASURES

1. **Agreement Officer Responsibilities**: USAID procurement should include consideration of the implementing partner's ability to perform the mandatory environmental compliance requirements as envisioned under the Program/ Project. The Agreements Officer (AO)/Contraction Officer (CO) shall include required environmental compliance and reporting language into each implementation instrument, and ensure that appropriate resources (budget), qualified staff, equipment, and reporting procedures are dedicated to this portion of the project.

2. **AOR Responsibilities:** The AOR and/or on-site manager or their representative of the Program/Project will undertake field visits, as possible, and consultations with implementing partners to jointly assess the environmental impacts of ongoing activities, and associated mitigation and monitoring conditions
    a. The AOR, in consultation with the mission activity managers and implementing partners, Mission Environmental Officers (MEO), Regional Environmental Officers (REO), and/or Bureau Environmental Officers as appropriate, will actively monitor and evaluate whether environmental consequences unforeseen under activities covered by this PIEE arise during implementation, and modify or end activities as appropriate. If additional activities are added at the primary award level that are not described in this document, an amended PIEE must be prepared.

3. **Supplemental Initial Environmental Examinations**: In the event that any new proposed activity differs substantially from the type or nature of activities described here, or requires different or additional mitigation measures beyond those described, an amendment to this PIEE will be prepared and the SIEE will reference the amended PIEE.

4. **Environmental Mitigation and Monitoring Plans**: It is expected that subsequent funds will either be core or field support funds awarded at the bi-lateral or the core level. For each major core and country activity under this program, an Environmental Mitigation and Monitoring Plan (EMMP) will be completed by the implementing partner and submitted to the AOR, the Global Health Bureau Environmental Officer (BEO), and the Mission Environmental Officer or the Regional Environmental Officer for their approval.
    a. The EMMP must be completed prior to the start of activities.
    b. Implementing partners will provide an Environmental Mitigation and Monitoring Plan (EMMP) for each for the primary award and a country specific EMMP.
    c. This EMMP will be a detailed implementation plan for the conditions prescribed in this document.

d. The EMMP will be reviewed and approved by the GH BEO prior to the commencement of activities. The mitigation measures and monitoring criteria found in the EMMP should be incorporated into pertinent Performance Monitoring Plans and Annual Workplans.
e. The implementing partners' Project Work Plan will identify those activities outlined in this PIEE that have potential impacts to the environment and discuss plans for environmental management, mitigation approaches, and monitoring measures. Implementing partners will be required to include Environmental Compliance Monitoring in their project work plan and monitoring and evaluation plan
f. An evaluation of the implementation of the EMMP must be part of the mid, and end of project evaluations.
g. Operating Units will ensure that implementing partners have sufficient capacity to implement and to complete mitigation and monitoring measures
h. The EMMP must be stored in project files

5. **Environmental Mitigation And Monitoring Report**: Implementing partners under this award will complete an annual environmental mitigation and monitoring report (EMMR) of all activities.
   a. The environmental monitoring report should be submitted to the AOR by November 1 of each year.
   b. The EMMR will record the environmental mitigation and monitoring measures outlined in the EMMP and will indicate the activities used to ensure that those measures were implemented.
   c. Based on the process outlined in the Project Work Plan, the implementing partners' annual reports to USAID will include brief updates on mitigation and monitoring measures being implemented, results of environmental monitoring, and any other major modifications/revisions in the development activities, and mitigation and monitoring procedures. The EMMR will also identify issues and challenges associated with the implementation of the EMMP.
   d. The EMMR must be stored in project files

6. **Sub-Agreements or Funds Transfers**: Any sub-agreements or fund transfers from the implementing partners to other organizations must incorporate provisions stipulating:
   a. Any sub agreement or funds transfer must include provisions that stipulate the implementation of conditions outlined in the SIEE for country level programs or an IEE for non-country level programs.
   b. The completion of an environmental mitigation and monitoring plan (EMMP) and annual report (EMMR), and submission to the implementing partner.
   c. Any activity to be undertaken will be within the scope of the environmental determinations and recommendations of this PIEE. This includes assurance that any mitigating measures required for those activities be followed.

7. Implementation will in all cases adhere to applicable host country environmental laws and policies.

(b)(6)

APPROVAL OF ENVIRONMENTAL ACTION RECOMMENDED:

Recommended By: [redacted] 6/14/13
Date
Director, Office of Health Infectious Disease and Nutrition

(b)(6)

Concurrence: [redacted] 6/14/13
Date
Global Health Bureau Environmental Officer

(b)(6)

Approved: [redacted]

Disapprove

Filename: PREDICT 2 PIEE

PROGRAMMATIC INITIAL ENVIRONMENTAL EXAMINATION (PIEE)

PREDICT 2

TABLE OF CONTENTS

ACRONYM LIST

AIDS	Acquired Immune Deficiency Syndrome
AO	Agreement Officer
AOTR	Agreement Officer's Technical Representative
BEO	Bureau Environmental Officer
CO	Contract/Grants Officer
EMMR	Environmental Mitigation and Monitoring Report
FAR	Federal Acquisition Regulation
FY	Fiscal Year
GH	Bureau for Global Health
HIV	Human Immunodeficiency Virus
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
HMIS	Health Management Information Systems
HRH	Human Resources for Health
LOE	Level of Effort
MCH	Maternal Child Health
M&E	Monitoring and Evaluation
MEO	Mission Environmental Officer
MNCH	Maternal, Newborn, and Child Health
MOH	Ministry of Health
NGO	Non governmental Organization
OP	Operating Plan
OAA	Office of Acquisition and Assistance
PIEE	Programmatic Initial Environmental Examination
PMI	Presidential Malaria Initiative
PR	Program Results
PRH	Population, Reproductive Health
REO	Regional Environmental Officer
RFA	Request for Application
SIEE	Supplemental Initial Environmental Examination
SLMG	Sustainable Leadership, Management, and Governance
TB	Tuberculosis
USAID	United States Agency for International Development
USG	United States Government
WHO	World Health Organization

PROGRAMMATIC INITIAL ENVIRONMENTAL EXAMINATION (PIEE)
PREDICT 2

PROGRAM/ACTIVITY DATA

IEE Number	**XXX**
Program/Project Number:	AAD 936-4002
Country:	Global
Functional Objective:	Investing in People
Program Area:	Health
Program Elements:	Pandemic Influenza and Other Emerging Threats
Funding Period:	FY 14 – FY18
Life of Activity Funding:	September 2014 through September 2019

Purpose and Scope of PIEE

The purpose of this document is to review the overall activities undertaken by the PREDICT 2 and provide threshold determinations of environmental impact and conditions for mitigation.

Section 1 of this document covers the categories of activities undertaken by the program; Section 2 is background information on the geographical coverage; Section 3 provides an evaluation of the potential environmental impacts of the Program activities; and Section 4 provides the threshold environmental determination for the Program activities and describes mitigation measures required for implementation.

SECTION 1: Background and Activity/Program Description

Overview of the PREDICT 2 Cooperative Agreement

Background

Explosive human population growth and environmental changes have resulted in increased numbers of people living in close contact with animals. Unfortunately, the resulting increased contact, together with changes in land use, have altered the inherent ecological balance between pathogens and their human and animal hosts, which increases the likelihood of zoonotic diseases—diseases that jump from animals to humans. In order to predict, respond to, and prevent the emergence of novel zoonotic diseases in humans, pathogens must be identified at their source. The PREDICT 2 Project is a follow-on cooperative agreement to the PREDICT project (ending September 29, 2014) and will continue to use a risk-based approach to focus efforts on activities that will increase a countries chances of locating pathogens that could potential harm human populations. In addition, PREDICT 2 will include a social science component that will research the different human/animal interfaces to add to global models of risk attribution and aid in the development and study of risk mitigation options.

Objectives

Objective I: Assess existing capacity and develop plans for the implementation of wildlife surveillance support.

The PREDICT project will assess the capability of each country/region to conduct wildlife surveillance and develop a plan of action that identifies the inputs needed from this project to achieve the other objectives described in the RFA.

This objective should result in a comprehensive understanding of the existing capacity in the countries and regions targeted through this project. It will describe the existing capabilities, their current utility, and any opportunities to use those capabilities for broader surveillance of diseases in wild animals that are of potential public health impact. Close coordination with the organizations that own, support, and/or operate these assets will help to understand the true potential for use in this wild animal surveillance project. Gaps in systems will be identified and options for solutions will be developed and presented. Barriers to implementation of a wild animal surveillance system will be identified and addressed.

Objective II: Develop models of disease occurrence and spread as well as determining specific areas at high risk.

This objective should produce computational models of disease occurrence and spread that will aid in the development of wild animal surveillance systems and risk-based forecasting for early disease events. Using existing data sets, historical information, scientific publications and other credible, relevant information, these models will identify geographic areas and animal species to target for surveillance activities, identify the factors and conditions most likely to influence the spread of disease from wild animals to domestic animals and/or humans, describe the strengths and weaknesses of differing levels of detection and reporting, and assess the potential impacts (e.g, health, social) of disease and disease control measures.

Objective III: Establish a wildlife surveillance capacity in selected countries and regions that targets specific microbial agents

Routine surveillance of disease occurrence and spread in wild animals, with a focus on rodents, bats and nonhuman primates will be developed and/or improved in pre-determined countries/regions.

Objective IV: Introduce new technologies where they are appropriate and sustainable.

Technological advances have extended the ability to conduct disease surveillance in developing countries. For example, disease reporting can occur through text messaging or SMS. Also, field diagnostic technology can help reduce logistical issues for specimen transport and laboratory backlogs. This project will capitalize on the practical, sustainable application of technology to support and streamline surveillance of targeted microbial agents among wild animals. It will focus on technologies that are proven effective, adaptable to low-resource countries, sustainable and promising for long-term use

Objective V: Improve the flow and handling of information, specimens and samples resulting from the surveillance activities.

This objective will develop the policy considerations around notification of emerging diseases and ensure timely, parallel flows of communication through animal and public health sectors so that timely decisions and actions can occur. It will also develop communication and feedback channels to support and strengthen wild animal surveillance systems.

Objective VI: Characterize and identify high risk human practices and populations that contribute to disease spillover and amplification at the human/animal interface.

Objective VII: Develop, validate and implement behavior change activities among high risk human populations that lower the risk of transmission of novel pathogens from animals to humans and between humans.

SECTION 2: Country and Environmental Information

Locations Affected and Local Environmental Regulations
USAID's PREDICT 2 programs are worldwide and may take place in any of the USAID mission countries or in countries covered by USAID Regional missions. The status of country level policies on environmental reviews varies. Procedures for disposal of waste are often detailed in national policies for injection safety and in Standard Operating Procedures of laboratories, and are typically based on the WHO Manuals "Laboratory Biosafety Manual, 3rd edition, 2004" and the WHO Manual "Safe Management of Wastes from Health Care Settings."

Location conditions: TBD

SECTION 3: Evaluation of Project/Program Issues

The activities under the Program/Project are numerous and complex. Many Program activities do not have direct adverse environmental impacts such as information, education, communication, community mobilization, planning, management, leadership, sustainable, and outreach activities. However, in the course of implementation of these activities, implementing partners should take advantage of opportunities to incorporate and improve means of addressing environmental health issues (like hazardous and infectious waste management) into health service delivery systems.

Certain activities supported by the program will directly or indirectly affect the environment, or have the potential to do so. Based on the analysis conducted by the AOR these activities could affect the environment in four ways:

1) Procurement, storage, management and disposal of public health commodities, including laboratory supplies and reagents.
2) Actions that directly or indirectly result in the generation and disposal of hazardous or highly hazardous medical waste (e.g., laboratory diagnosis and wildlife surveillance, etc.)

3) Actions associated with establishing a wildlife surveillance capacity in selected countries and regions that targets specific microbial agents.
4) Outbreak response planning and implementation.

The potential impact is discussed in detail below, and summarized in Table 3a towards the end of this section.

1) Procurement, Storage, Management and Disposal of Public Health Commodities

This activity includes procurement of laboratory supplies and wildlife surveillance equipment, such as personal protective gear.

Improper management of those public health commodities mentioned above, either during use or disposal, can have adverse effects on the environment by contributing to solid waste and/or contaminating soil and groundwater. Many countries do not have facilities to manage solid wastes other than uncontrolled burns. Plastics and other inorganic materials pose solid waste management issues for some countries. Those commodities that can contribute to hazardous waste will be addressed in the next section.

Information on solid waste management can be found in the Sphere Handbook at: http://www.spherehandbook.org/en/solid-waste-management/

2) Activities that directly or indirectly result in the generation and disposal of hazardous or highly hazardous medical waste or in techniques that have a direct or indirect environmental impact.

Small-Scale "one health" initiatives, such as laboratory and wildlife surveillance training provide important and often critical services to countries that would otherwise have little or no access to such services.

However, improper training, handling, storage and disposal of the waste generated in these facilities or activities can spread disease through several mechanisms. Transmission of disease through infectious waste is the greatest and most immediate threat from healthcare waste. If waste is not treated in a way that destroys the pathogenic organisms, dangerous quantities of microscopic disease-causing agents—viruses, bacteria, parasites or fungi—will be present in the waste. These agents can enter the body through punctures and other breaks in the skin, mucous membranes in the mouth, by being inhaled into the lungs, being swallowed, or being transmitted by a vector organism. Those who come in direct contact with the waste are at greatest risk. Examples include healthcare workers, cleaning staff, patients, visitors, waste collectors, disposal site staff, waste pickers, substance abusers and those who knowingly or unknowingly use "recycled" contaminated syringes and needles. Although sharps pose an inherent physical hazard of cuts and punctures, the much greater threat comes from sharps that are also infectious waste. Healthcare workers, waste handlers, waste-pickers, substance abusers and others who handle sharps have become infected with HIV and/or hepatitis B and C viruses through pricks or reuse of syringes/needles.

Contamination of water supply from untreated healthcare waste can also have devastating effects. If infectious stools or bodily fluids are not treated before being disposed of, they can create and extend epidemics. The absence of proper sterilization procedures is believed to have increased the severity and size of cholera epidemics in Africa during the last decade.

Healthcare wastes generally fall into three categories in terms of public health risk and recommended methods of disposal:

- ***General*** healthcare waste, similar or identical to domestic waste, including materials such as packaging or unwanted paper. This waste is generally harmless and needs no special handling; 75–90% of waste generated by healthcare facilities falls into this category, and it can be burned or taken to the landfill without any additional treatment.
- ***Hazardous*** healthcare wastes including infectious waste (except sharps and waste from patients with highly infectious diseases), small quantities of chemicals and pharmaceuticals, and non-recyclable pressurized containers. All blood and body fluids are potentially infectious.
- ***Highly hazardous*** healthcare wastes, which should be given special attention, includes sharps (especially hypodermic needles), highly infectious non-sharp waste such as laboratory supplies, highly infectious physiological fluids, pathological and anatomical waste, stools from cholera patients, and sputum and blood of patients with highly infectious diseases such as TB and HIV. They also include large quantities of expired or unwanted pharmaceuticals and hazardous chemicals, as well as all radioactive or genotoxic wastes.

If a project's training activities for professional health workers or community health workers involve techniques that would generate and require disposal of hazardous or highly hazardous waste, the Implementing Partners shall be required to include training in or ensure that the training curriculum covers best management practices concerning the proper handling, use, and disposal of medical waste, including blood, sputum, and sharps.

As appropriate, the implementing partners will work with facility, local, regional and/or national officials, to implement and apply appropriate best management practices which incorporate appropriate health and safety measures and environmental safeguards, including proper disposal of medical waste in accordance with international norms as spelled out by the WHO in "WHO's Safe Management of Wastes from Healthcare Activities." National policies and laws should also be considered, though most countries follow WHO Guidelines.

References for this section include:
http://www.who.int/water_sanitation_health/medicalwaste/167to180.pdf
http://www.bchealthguide.org/healthfiles/hfile29.stm
Safe management of wastes from health-care activities, edited by A. Prüss, E. Giroult and P. Rushbrook. Geneva, WHO, 1999,
http://www.who.int/water_sanitation_health/Environmental_sanit/MHCWHanbook.htm. English

EGSSAA Chapter 8, "Healthcare Waste: Generation, Handling, Treatment and Disposal" (http://www.encapafrica.org/EGSSAA/Word_English/medwaste.doc) for additional guidance on proper handling and disposal of medical waste.

3) Actions associated with establishing a wildlife surveillance capacity in selected countries and regions that targets specific microbial agents.

A key objective under the PREDICT 2 project is establishing a wildlife surveillance capacity in select countries were risk of disease spillover is high. In addition to informing global models on disease emergence, the information collected will help determine mitigation approaches and help countries develop policies to control human/animal interfaces in highest risk areas. To accomplish this objective, wildlife sampling is essential. Wildlife sampling includes taking blood, fecal matter, and sputum samples, from a range of species, with a particular focus on rodents, bats and nonhuman primates. Live animal specimens will be sampled and in certain situations, such as interactions with bushmeat hunters, samples will be taken from dead animals. Given that sampling requires direct contact between humans and animals, besides the generation of solid waste, some potential environmental impacts include:

- Removing an animal specimen from its native habitat
- Infecting a healthy animal specimen with a disease
- Harm or death to the animal specimen
- Damaging an ecosystem by impacting the distribution or population of a particular species

Further information can be found in the Guidelines On: The Care and Use of Wildlife by The Canadian Council on Animal Care, at:
http://www.ccac.ca/Documents/Standards/Guidelines/Wildlife.pdf

4) Outbreak response planning and implementation.

Response support and technical assistance should be conducted with consideration to potential impacts to the environment. Simple measures to manage the potential impacts can be built into the design of any response program and can be planned and implemented regardless of the response activity.

Some potential impacts include:

- Spread of infectious agents from persons or properties used during response efforts
- Destruction of sensitive habitats, short and long term impacts to threatened and endangered species due to untimely or invasive response actions
- Contamination of soil, sediment or groundwater due to the presence of infectious agents, chemicals etc at the response site.
- Contamination of persons, property and environment due to inadequate containment planning and implementation.

Table 3a: PREDICT 2 Activities with Potential Negative Environmental Impacts

Investing in People: Health Program Areas	Procurement, Storage, Management and Disposal of Public Health Commodities	Direct or Indirect generation, and need for disposal of hazardous and highly hazardous medical waste (as defined in Section 3 of this IEE)	Actions associated with establishing a wildlife surveillance capacity in selected countries and regions that targets specific microbial agents	Outbreak response planning and implementation
	Laboratory reagents and supplies Wildlife surveillance equipment Personal Protective Gear	Generation of sharps Generation of hazardous and highly hazardous medical waste, including blood Generation of sputum and other waste	Harm or death to animals being sampled Negative impacts to the ecology of the area being sampled	Spread of infectious disease Contamination of soil Destruction of sensitive habitats/species

Table 3b: CONDITIONS FOR IMPLEMENTATION OF CATEGORIES OF PREDICT 2 ACTIVITIES	
Key Elements of Program/Activities	**Mitigation Conditions and/or Proactive Interventions**
PREDICT 2 activities that involve: Procurement, Storage, Management and Disposal of Public Health Commodities	Conditions: Consignees for all public health commodities procured under this funding will be advised to store the product according to the information provided on the manufacturer's Materials Safety Data Sheet (MSDS). These are supplied by the manufacturer, and can also be found on the internet by using the active ingredient and MSDS as search terms. If disposal of any of these commodities is required, due to expiration date or any other reason, the consignee will be advised that the preferred method of disposal is to return to the manufacturer. If this is not possible (for example if the expired or spoiled pharmaceuticals are considered hazardous and as such, if transferred across frontiers, become regulated and subject to the Basel Convention an the transfrontier shipment of hazardous wastes) then follow the guidelines in the WHO document *Guidelines for Safe Disposal of Unwanted Pharmaceuticals During and After Emergencies*, found at www.who.int/water_sanitation_health/medicalwaste/unwantpharm.pdf. At the request of the Mission, subject to available funding, the implementing partner will make all reasonable attempts to facilitate the disposal of expired commodities under this activity to mitigate the impact of medical waste. Implementing partners will work with the host country as appropriate on aspects of essential medicine supply chain management, including estimating demand, distribution, and storage issues of time and temperature. Commodities that, during use, become hazardous or highly hazardous waste are managed under the conditions in the following section "Activities that involve the collection, safe handling and disposal of hazardous and highly hazardous medical waste" Packaging and disposal of all other public health commodities will be treated using the guidelines provided in Environmental Guidelines for Small-Scale Activities in Africa (EGSSAA) 2nd Edition, Chapter 15: Solid Waste (http://www.encapafrica.org/EGSSAA/Word_English/solidwaste.doc) In addition, the following guidelines should be followed where appropriate: • USAID/PREDICT, Biosafety and PPE Use (English, French, Spanish) • USAID/PREDICT, Implementing a Cold Chain for Safe Sample Transport and Storage (English, Spanish)

PREDICT 2 activities that involve: Generation, storage, handling and disposal of hazardous or highly hazardous medical waste (as defined in Section 3 of this PIEE)	Conditions: For activities entailing training of professionals in methods that result in the generation and disposal of hazardous or highly hazardous medical waste, including blood or sputum testing, basic and emergency obstetric care techniques, and laboratory support, the implementing partner will include training in or ensure the training curriculum covers procedures to properly handle, label, treat, store, transport and properly dispose of blood, sharps and other medical waste, as applicable, and follows either WHO guidelines, in Environmental Guidelines for Small Scale Activities in Africa Chapter 8, "Healthcare Waste: Generation, Handling, Treatment and Disposal," and is consistent with national policy and procedure for medical waste. For all USAID-supported activities entailing service delivery, including blood testing and laboratory support, AORs will work with its implementing partners to assure, to the extent possible, that the medical facilities and operations involved have adequate procedures and capacities in place to properly handle, label, treat, store, transport and properly dispose of blood, sharps and other medical waste. This includes **annual completion of the Healthcare Waste Management Minimum Program Checklist and Action Plan (Annex 1)** for all facilities where implementing partners are directly providing services. Completion of this checklist should be included in the annual workplan. Healthcare waste is most appropriately identified by color-coding bags and containers. In addition, the following are well-established practices in the safe handling, storage, and transportation of health-care waste: • Sharps should be collected together (regardless of whether or not they are contaminated), and stored in puncture-proof, impermeable, and tamper-proof containers with fitted covers. If plastic or metal containers are unavailable, then containers made of dense cardboard are recommended. • Highly infectious waste should be immediately sterilized by autoclaving. • On-site collection of waste should be handled at frequent intervals to avoid accumulation, and an adequate supply of fresh collection bags/containers should be available for replacement. • Waste should be stored in an accessible room with adequate space and protection from sunlight. • In any area that produces hazardous waste - hospital wards, treatment rooms, operating theatres, laboratories, etc., three bins plus a separate sharps container will be needed to separate these types of waste. (If hazardous and highly hazardous waste will be disposed of in the same manner, they should not be collected separately.) • For hazardous waste and highly hazardous waste the use of double packaging, e.g. a plastic bag inside a holder or container is recommended for ease of cleaning. • To make separate collection possible, hospital personnel at all levels, especially nurses, support staff, and

	cleaners, should be trained to sort the waste they produce. See EGSSAA Chapter 8, "Healthcare Waste: Generation, Handling, Treatment and Disposal" (http://www.encapafrica.org/EGSSAA/Word_English/medwaste.doc) for additional conditions on proper handling and disposal of medical waste. Other important references to consult are "WHO's Safe Management of Wastes from Healthcare Activities" http://www.who.int/water_sanitation_health/medicalwaste/wastemanag/en/ In addition, the following guidelines should be followed where appropriate: • USAID/PREDICT, Safety Guide: Laboratory Operations (English, French, Spanish)
PREDICT 2 activities that involve: Actions associated with establishing a wildlife surveillance capacity in selected countries and regions that targets specific microbial agents	For activities under PREDICT 2, implementing partners shall conduct wildlife sampling in a humane and ethical manner, including practicing a "no kill policy" when possible. Proper training and management of wildlife sampling activities is essential and implementing partners will follow the ensuing USAID/PREDICT generated protocols and guidelines where appropriate (made available to implementing partner upon award of cooperative agreement): • Guide: For Safe Animal Capture and Sampling (English, French, Spanish) • Protocol: Small Carnivore Sampling Methods (English) • Protocol: Bushmeat Sampling Methods (English, French, Spanish) • Protocol: Bat and Rodent Sampling Methods (English, French, Spanish) • Protocol: Primates Sampling Methods (English) • Guide: Packing and Shipping Biological Samples (English, Spanish) In addition, PREDICT 2 implementing partners will follow all country specific laws and regulations with regards to wildlife capture, handling, and sample acquisition. Further information on wildlife handling can be found in the Guidelines On: The Care and Use of Wildlife by The Canadian Council on Animal Care, at: http://www.ccac.ca/Documents/Standards/Guidelines/Wildlife.pdf
PREDICT 2 activities that involve:	Response support and technical assistance should be conducted with consideration to the potential environment. Simple measures to manage the potential impacts can be built into the design of any response program and can be planned and implemented regardless of the response activity.

Outbreak response planning and implementation	The implementing partner will coordinate with local environmental experts, officials, NGOs and the MEO to understand the sensitive species and habitats in the region and to design procedures that ensure the protection of those habitats and species. The implementing partner will ensure that all USAID employees or USAID contractors or USAID trained personnel can visually identify any important habitat or species from the target species. This may include using identification cards, have a specialist on site or on call during the response etc. Some helpful information about solid waste management in response situations may be found in the Sphere Handbook at: http://www.spherehandbook.org/en/solid-waste-management-standard-1-collection-and-disposal/

SECTION 4: Recommended Determinations and Conditions for Implementation

4a. Determination

Based on the analysis presented in Section 3, this PIEE recommends threshold decisions and conditions for implementation of PREDICT 2 activities. USAID/GH acknowledges that the environmental screening and review procedures described here do not substitute for the recipient country's own environmental laws and policies.

The overall threshold determination for PREDICT 2 is a **Negative Determination, with conditions**. However, various classes of activities have been grouped into two different determinations. The conditions for implementation of the activities follow in Table 4a. If program activities are similar to the activities in Section 3, the conditions established must be implemented as part of the program design and implementation.

Activities presented in Section 4. Table 4 of this document

Pursuant to 22 CFR216.3(a)(2)(iii), a **Negative Determination with Conditions** is recommended for any Program activities that have potential for negative impact on the environment in the following categories, as presented in Table 2 in Section 3 of this document:

1) Procurement, storage, management and disposal of public health commodities, including laboratory supplies and reagents.
2) Actions that directly or indirectly result in the generation and disposal of hazardous or highly hazardous medical waste (e.g., laboratory diagnosis and wildlife surveillance, etc.)
3) Actions associated with establishing a wildlife surveillance capacity in selected countries and regions that targets specific microbial agents.
4) Outbreak response planning and implementation.

Table 4: Determinations for Activities Executed Under This Program

Activities	Recommended Threshold Determination and 22 CFR Part 216 citation
Activities not involving any biophysical interventions : ○ Document and information transfers e.g. dissemination of PREDICT 2 best practices materials ○ Controlled experimentation exclusively for the purpose of research and field evaluation and carefully monitored; ○ Analyses, studies, academic or research workshops and meetings ○ Studies, projects or programs intended to develop the capability of recipient countries and organizations to engage in development planning ○ Develop models of disease occurrence and spread as well as determining specific areas at high risk. ○ Improve the flow and handling of information, specimens and samples resulting from the surveillance activities. ○ Characterize and identify high risk practices and populations that contribute to disease spillover and amplification at the human/animal interface. ○ Develop, validate and implement behavior change activities among high risk populations that lowers the risk of transmission of novel pathogens from animals to humans and between humans.	Categorical Exclusion, per ○ 22 CFR 216.2 (c)(1)(iii), for research activities which may have an effect on the physical and natural environment but will not have a significant effect as a result of limited scope, carefully controlled nature and effective monitoring; ○ 216.2 (c)(2)(i), for all activities consisting of education, technical assistance or training programs, except to the extent such programs include activities directly affecting the environment (such as construction of facilities, etc.); ○ 216.2 (c)(2)(ii), for controlled experimentation exclusively for the purpose of research and field evaluation which are confined to small areas and carefully monitored ○ 216.2 (c)(2)(iii), for analyses, studies, academic or research workshops and meetings; ○ 216.2 (c)(2)(v), for document and information transfers; ○ 216.2(c)(2)(xiv), for studies, projects or programs intended to develop the capability of recipient countries to engage in development planning, expect to the extent designed to result in activities directly affecting the environment (such as construction of facilities, etc.)
Procurement, storage, management and disposal of public health commodities, including pharmaceutical drugs, immunizations and nutritional supplements, laboratory supplies and reagents.	Negative Determination with Conditions, 22 CFR 216.3 (a) (2) (iii) for activities involving procurement, storage, management and disposal of public health commodities
Actions that directly or indirectly result in the generation and	Negative Determination with Conditions, 22 CFR 216.3 (a) (2) (iii) for all

disposal of hazardous or highly hazardous medical waste (e.g., basic and emergency obstetric care techniques, administration of injectables, HIV or TB testing, disease diagnosis and treatment, etc)	the health activities directly or indirectly result in the generation and disposal of hazardous or highly hazardous medical waste
Actions associated with establishing a wildlife surveillance capacity in selected countries and regions that targets specific microbial agents.	Negative Determination with Conditions, 22 CFR 216.3 (a) (2) (iii) for activities involving direct interaction with wildlife
Outbreak response planning and implementation.	Negative Determination with Conditions, 22 CFR 216.3 (a) (2) (iii) for activities involving outbreak response planning and implementation

4b. Monitoring Conditions

1. **Agreement Officer Responsibilities**: USAID procurement should include consideration of the implementing partner's ability to perform the mandatory environmental compliance requirements as envisioned under the Program/ Project. The Agreements Officer (AO) shall include required environmental compliance and reporting language into each implementation instrument, and ensure that appropriate resources (budget), qualified staff, equipment, and reporting procedures are dedicated to this portion of the project.

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3. **Supplemental Initial Environmental Examinations**: In the event that any new proposed activity differs substantially from the type or nature of activities described here, or requires different or additional mitigation measures beyond those described, an amendment to this PIEE will be prepared and the SIEE will reference the amended PIEE.

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    a. The EMMP must be completed prior to the start of activities,
    b. Implementing partners will provide an Environmental Mitigation and Monitoring Plan (EMMP) for each for the primary award and a country specific EMMP.
    c. This EMMP will be a detailed implementation plan for the conditions prescribed in this document.
    d. The EMMP will be reviewed and approved by the GH BEO prior to the commencement of activities. The mitigation measures and monitoring criteria found in the EMMP should be incorporated into pertinent Performance Monitoring Plans and Annual Workplans.
    e. The implementing partners' Project Work Plan will identify those activities outlined in this PIEE that have potential impacts to the environment and discuss plans for environmental management, mitigation approaches, and monitoring measures. Implementing partners will be required to include Environmental

Compliance Monitoring in their project work plan and monitoring and evaluation plan

f. An evaluation of the implementation of the EMMP must be part of the mid, and end of project evaluations.
g. Operating Units will ensure that implementing partners have sufficient capacity to complete to implement mitigation and monitoring measures
h. The EMMP must be stored in project files

5. **Environmental Mitigation And Monitoring Report**: Implementing partners under this award will complete an annual environmental mitigation and monitoring report (EMMR) of all activities.
   a. The environmental monitoring report should be submitted to the AOR by November 1 of each year.
   b. The EMMR will record the environmental mitigation and monitoring measures outlined in the EMMP and will indicate the activities used to ensure that those measures were implemented.
   c. Based on the process outlined in the Project Work Plan, the implementing partners' annual reports to USAID will include brief updates on mitigation and monitoring measures being implemented, results of environmental monitoring, and any other major modifications/revisions in the development activities, and mitigation and monitoring procedures. The EMMR will also identify issues and challenges associated with the implementation of the EMMP.
   d. The EMMR must be stored in project files

6. **Sub-Agreements or Funds Transfers**: Any sub-agreements or fund transfers from the implementing partners to other organizations must incorporate provisions stipulating:
   a. Any sub agreement or funds transfer must include provisions that stipulate the implementation of an EMMP
   b. the completion of an annual environmental monitoring plan and report, and
   c. Any activity to be undertaken will be within the scope of the environmental determinations and recommendations of this PIEE. This includes assurance that any mitigating measures required for those activities be followed.

7. Implementation will in all cases adhere to applicable host country environmental laws and policies.

4c. The Environmental Mitigation And Monitoring Plan And Report (EMMP/R)

Operating Units for Associate Awards will use an annual Environmental Mitigation and Monitoring Plan (EMMP) to ensure programmatic compliance with 22 CFR 216. An EMMR will be completed annually so that the conditions specified and met in this PIEE and subsequent SIEE are shown to have been carried out under OEPA. The EMMPs and EMMRs are reviewed and approved by the mission activity manager and the Mission Environmental Officer.

The EMMP is described in the table below and should be filled out in detail in the prior to the start of activities. The specific mitigation measures identified in the EMMP must be integrated into the annual work-plan for the project and activities.

The Reporting Form, labeled EMMR is below. It should be submitted in the annual performance report.

PREDICT 2 Cooperative Agreement
Environmental Mitigation and Monitoring Plan (EMMP)

Category of Activity from Section 4 of PREDICT 2 IEE	Describe specific environmental threats of your organization's activities (based on analysis in Section 3 of PREDICT 2 IEE)	Description of Specific Mitigation Measures for these activities as required in Section 4 of PREDICT 2 IEE	Who is responsible for monitoring	Monitoring Indicator	Monitoring Method	Frequency of Monitoring
For instance: 1. Education, technical assistance, training etc.	No environmental impacts anticipated as a result of these activities	Education, technical assistance and training about activities that inherently affect the environment include discussion prevention and mitigation of potential negative environmental effects.		Discussion of environmental impact included in education, technical assistance, training and other materials	Review of materials	Annual
2. Public Health Commodities						

PREDICT 2
Environmental Mitigation and Monitoring Report (EMMR)

List each Mitigation Measure from column 3 in the EMMR Mitigation Plan (EMMR Part 1 of 2)	Status of Mitigative Measures	List any outstanding issues relating to required conditions	Remarks

Certification

I certify the completeness and the accuracy of the Environmental Monitoring and Mitigation Report (EMMR) compliance monitoring plan for PREDICT 2 COOPERATIVE AGREEMENT above (and covered by the PREDICT 2 PIEE) for which I am responsible:

_____ _____

Signature Date

_____

Print Name

_____

Organization

_____

BELOW THIS LINE FOR USAID USE ONLY

USAID Mission or Central Bureau Clearance of EMMR:

Agreement Officer's Representative:_____ Date:_____

Mission Environmental Officer:_____ Date:_____

Regional Environmental Advisor: _____ Date:_____

Bureau Environmental Officer:_____ Date: _____

Note: If clearance is denied, comments must be provided to applicant.

Annex 1. Healthcare Waste Management Minimal Program Checklist and Action Plan to be Included in Training Materials/Programs

Elements/Actions	*In Place?*	*Next Steps to be done*		
		What	*By Whom*	*By When*
Written plans and procedures				
1. *A written waste management plan* Describing all the practices for handling, storing, treating, and disposing of hazardous and non-hazardous waste, as well as types of worker training required.				
2. *Internal rules for generation, handling, storage, treatment, and disposal of healthcare waste.*				
3. *Clearly assigned staff responsibilities that cover all steps in the waste management process.*				
4. *Staff waste handling training curricula or a list of topics covered.*				
5. *Waste minimization, reuse, and recycling procedures.*				
Staff Training, Practices, and Protection*				
6. *Staff trained in safe handling, storage, treatment, and disposal.* Does staff exhibit good hygiene, safe sharps handling, proper use of protective clothing, proper packaging and labeling of waste, and safe storage of waste? Does staff know the correct responses for spills, injury, and exposure?				
7. *Protective clothing available for workers who move and treat collected infections waste* such as surgical masks and gloves, aprons, and boots.				
8. *Good hygiene practices.* Are soap and, ideally, warm water readily available workers to				

use and can workers be observed regularly washing.				
9. *Workers vaccinated* for against viral hepatitis B, tetanus infections, and other endemic infections for which vaccines are available.				
Handling and Storage Practices				
10. *Temporary storage containers and designated storage locations.* *11.* Are there labeled, covered, leak-proof, puncture-resistant temporary storage containers for hazardous healthcare wastes?				
12. *Minimization, reuse, and recycling procedures.* • Does the facility have good inventory practices for chemicals and pharmaceuticals, i.e.: ○ use the oldest batch first; ○ open new containers only after the last one is empty; procedures to prevent products from being thrown out during routine cleaning; and				
13. *A waste segregation system.* • Is general waste separated from infectious/hazardous waste? • Is sharp waste (needles, broken glass, etc.) collected in separate puncture-proof containers? • Are other levels of segregation being applied e.g. hazardous liquids, chemicals and pharmaceuticals, PVC plastic, and materials containing heavy metals ((these are valuable, but less essential)?				
14. *Temporary storage containers and designated storage locations.* • Are there labeled, covered, leak-proof, puncture-resistant temporary storage containers for hazardous healthcare wastes? • Is the location distant from patients or food?				
Treatment Practices				
15. Frequent removal and treatment of waste				

• Are wastes collected daily? • Are wastes treated with a frequency appropriate to the climate and season? ○ Warm season in warm climates within **24 hrs** ○ In the cool season in warm climates within **48 hrs** ○ In the warm season in temperate climates within **48 hrs**				
16. *Treatment mechanisms for hazardous and highly hazardous waste*. (The most important function of treatment is disinfection). • Are wastes being burned in the open air, in a drum or brick incinerator, or a single-chamber incinerator? • If not are they being buried safely (in a pit with an impermeable plastic or clay lining)? • Is the final disposal site (usually a pit) surrounded by fencing or other materials and in view of the facility to prevent accidental injury or scavenging of syringes and other medical supplies?				
17. If the waste is transported off-site, are precautions taken to ensure that it is transported and disposed of safely?				

* **Training should be conducted before starting activity implementation**

For more detailed checklists and guidance consult: *Safe management of wastes from health-care activities*, edited by A. Prüss, E. Giroult and P. Rushbrook. Geneva, WHO, 1999, http://www.who.int/water_sanitation_health/Environmental_sanit/MHCWHanbook.htm. English

Annex 2. Disposal and Treatment Methods Suitable for Different Categories of Healthcare Waste to be Included in Training Materials/Programs (EXAMPLE)

Method	Infectious Waste (laboratory cultures, excreta)	Sharps (needles, blades, broken glass)	Pharmaceutical Waste (expired pharmaceuticals, boxes contaminated by pharmaceuticals)	Chemical Waste (laboratory reagents, solvents)	Radioactive Waste (unused liquids from laboratory research)
Rotary kiln	✓	✓	✓	✓	✓[2]
Pyrolytic incinerator	✓	✓	✓[1]	✓[1]	✓[2]
Single-chamber incinerator	✓	✓			✓[2]
Drum or brick incinerator	✓	✓			
Chemical disinfection	✓	✓			
Wet thermal treatment	✓	✓			
Microwave irradiation	✓	✓			
Encapsulation		✓	✓	✓[1]	
Safe burial on hospital premises	✓	✓	✓[1]	✓[1]	
Sanitary landfill	✓		✓[1]		
Discharge to sewer			✓[1]		Low-level liquid waste
Inertization			✓		
Other			Return to supplier	Return to supplier	Decay by storage

1: Small quantities only
2: Low-level infectious waste

ATTACHMENT F – TABLE OF ACRONYMS

BSL	Biohazard Safety Level
CDC	United States Centers for Disease Control and Prevention
cPCR	Consensus Polymerase Chain Reaction
DALYs	Disability Adjusted Life Years
DOD	United States Department of Defense
DTRA	U.S. DOD/Defense Threat Reduction Agency
DUO	Diseases of Unknown Origin
EAP	External Advisory Panel
EHA	EcoHealth Alliance
EID	Emerging Infectious Disease
ELISA	Enzyme-linked Immunosorbent Assay
EPT	Emerging Pandemic Threats Program of
USAID FAO	The Food and Agriculture Organization
FUO	Fever of Unknown Origin
GAINS	Global Animal Information System
GHSA	Global Health Security Agenda
GIS	Geographic Information Systems
GISRS	WHO Global Influenza Surveillance and Response System
HTS	High Through-put Sequencing
IHR	International Health Regulations
ILI	Influenza-like Illness
INSERM	Institut National de la Sánte et de la Recherche Médicale
MB	Metabiota, Inc.
M&E	Monitoring and Evaluation
MERS	Middle Eastern Respiratory Syndrome
OFFLU	OIE-FAO Network of Expertise on Animal Influenza
OHCEA	One Health Central and East Africa University Network
OHI	One Health Institute
OHW	USAID One Health Workforce project
OIE	Organization for Animal Health
PIOET	USAID's Pandemic Influenza and Other Emerging Threats Program
PPE	Personal Protective Equipment
P&R	USAID Preparedness and Response project
SARI	Severe Acute Respiratory Infection
SARS-CoV	Severe Acute Respiratory Syndrome Coronavirus
SEAOHUN	Southeast Asia One Health University Network
SI	Smithsonian Institution
SOP	Standard Operating Procedure
SVM	School of Veterinary Medicine
USAID	United States Agency for International Development
UCD	University of California, Davis
UCG	United States Government
WAHIS	World Animal Health Information System
WCS	Wildlife Conservation Society

WHO	The World Health Organization
ZIPI	Zoonotic Infections Prevention Integration committee

End of Attachment F

Indicator 1C (Outcome Level)	Total # Labs Targeted for viral family screening (pull from Indicator 1.2a)	Is this country improving quality assurance and safety procedures? *Based on labs ability to 1) test for 1 viral family, 2) test for all 5 PREDICT prioritized viral families, 3) test for additional viral families	Notes	*Calculation for Reporting*	***Numerator**: Total # of ETD supported labs that improved QA and safety procedures in place in order to perform testing since the last reporting period.* ***Denominator**: Total # of ETD supported labs*
AFRICA					
Cameroon	2	1 (50%)	Now testing for 6 viral families		
Cote d'Ivoire	2	1 (50%)	Both labs now testing for one or two viral families		
DRC	1	1 (100%)	Now testing for 10 viral families		
Ethiopia	2	1 (50%)	5 viral families		
Ghana	2	2 (100%)	Both labs now testing for 4 viral families		
Guinea	1	1 (100%)	1 viral family		
Kenya	2	2 (100%)	Both labs now testing for 4 viral familes		
Liberia	1	0			
RoC	1	0			
Rwanda	2	1 (50%)	4 viral families		
Senegal	2	2 (100%)	Both labs now testing for 5 viral familes		
Sierra Leone	1	1 (100%)	1 viral family		
Tanzania	2	2 (100%)	5 viral families		
Uganda	1	1 (100%)	Now testing for 8 viral families		
ASIA					
Bangladesh	2	2 (100%)	Both labs now testing for 5 viral familes		
Cambodia	3	1 (30%)	Now testing for 9 viral families		
China	4	2 (50%)	Now testing for 6 viral families		
India	1	1 (100%)	Lab now testing for 5 viral familes		
Indonesia	3	2 (60%)	5 viral families		
Lao PDR	2	1 (50%)	5 viral families		
Malaysia	5	4 (80%)	4 Lab now testing for 5 viral familes		
Mongolia	1	1 (100%)	1 viral family		
Myanmar	2	2 (100%)	2 labs now testing for 4 viral familes		
Nepal	2	1 (50%)	5 viral families		
Thailand	2	2 (100%)	Now testing for 12 viral families		
Vietnam	5	3 (60%)	Now testing for 6 viral families		
MIDDLE EAST					
Egypt	1	1 (100%)	3 viral families		
Jordan	1	1 (100%)	4 viral families		
		40 labs improving quality assurance and safety procedures			

***for the period 10/1/17-9/30/18 ONLY**

New Indicator

Indicator 1.1a	#, list of countries with concurrent sampling (indicate Y/N)
Indicate Country, Region or Global	
Bangladesh	Y
Cambodia	Y
Cameroon	Y
China	Y
Cote d'Ivoire	Y
Democratic Republic of Congo	Y
Egypt	Y
Ethiopia	Y
Ghana	Y
India	Y
Indonesia	Y
Jordan	Y
Kenya	Y
Lao PDR	Y
Malaysia	Y
Myanmar	Y
Nepal	Y
Republic of Congo (RoC)	Y
Rwanda	Y
Senegal	Y
Tanzania	Y
Thailand	Y
Uganda	Y
Viet Nam	Y

*for the period 10/1/17-9/30/18 ONLY

100% of target achieved

Indicator 1.1b	# viral pathway models or maps developed, refined, analyzed and/or described	# bacterial pathway models or maps developed, refined, analyzed and/or described**	# disease risk pathway models or maps developed, refined, analyzed and/or described**	Provide a list and brief narrative description of each viral, bacterial or risk pathway model or map developed, refined, analzyed and/or described. If feasible, the maps or models should be attached.
WEST AFRICA (Regional)				
Burkina Faso (ASL2050 only)	2			29. country-level relative EID risk map, 61. province-level avian influenza epidemic risk map
Cameroon	1		1	1. country-level relative EID risk map, 31. country-level predicted zoonoses map
Cote d'Ivoire	1		1	2. country-level relative EID risk map, 32. country-level predicted zoonoses map
Ghana	1		1	3. country-level relative EID risk map, 33. country-level predicted zoonoses map
Guinea	1		1	4. country-level map for EID risk, 34. country-level predicted zoonoses map
Liberia	1		1	5. country-level relative EID risk map, 35. country-level predicted zoonoses map
Nigeria (ASL2050 only)	2			30. country-level relative EID risk map, 62. province-level avian influenza epidemic risk map
Senegal	1		1	6. country-level relative EID risk map, 36. country-level predicted zoonoses map
Sierra Leone	1		1	7. country-level relative EID risk map, 37. country-level predicted zoonoses map
EAST & CENTRAL AFRICA (Regional)				
DRC	1		1	8. country-level relative EID risk map, 38. country-level predicted zoonoses map
Ethiopia	1		1	9. country-level relative EID risk map, 39. country-level predicted zoonoses map
Kenya	2		1	10. country-level relative EID risk map, 40. country-level predicted zoonoses map, 59. Province-level avian influenza epidemic risk map
RoC	1		1	11. country-level relative EID risk map, 41. country-level predicted zoonoses map
Rwanda	1		1	12. country-level relative EID risk map, 42. country-level predicted zoonoses map
Tanzania	1		1	13. country-level relative EID risk map, 43. country-level predicted zoonoses map
Uganda	2		1	14. country-level relative EID risk map, 44. country-level predicted zoonoses map, 60. province-level avian influenza risk map
ASIA (Regional)			7	67-71. Regional risk of bat-pig outbreak, 74-75. Bat-harvester interactions
Bangladesh	1		1	15. country-level relative EID risk map, 45. country-level predicted zoonoses map
Cambodia	1		1	16. country-level relative EID risk map, 46. country-level predicted zoonoses map
China	5		2	17. country-level relative EID risk map, 47. country-level predicted zoonoses map, 63-66. bat coronavirus origin and cross-species transmission models, 72. pig population at risk of outbreak map
India	1		1	18. country-level relative EID risk map, 48. country-level predicted zoonoses map
Indonesia	1		1	19. country-level relative EID risk map, 49. country-level predicted zoonoses map
Lao PDR	1		1	20. country-level relative EID risk map, 50. country-level predicted zoonoses map
Malaysia	1		1	21. country-level relative EID risk map, 51. country-level predicted zoonoses map
Mongolia	1		1	22. country-level relative EID risk map, 52. country-level predicted zoonoses map
Myanmar	1		2	23. country-level relative EID risk map, 53. country-level predicted zoonoses map, 73. bat-palm sap overlap
Nepal	1		1	24. country-level relative EID risk map, 54. country-level predicted zoonoses map
Thailand	1		2	25. country-level relative EID risk map, 55. country-level predicted zoonoses map, 78. viral sampling site prioritization
Vietnam	1		1	26. country-level relative EID risk map, 56. country-level predicted zoonoses map
MIDDLE EAST (Regional)				
Egypt	1		1	27. country-level relative EID risk map, 57. country-level predicted zoonoses map
Jordan	1		1	28. country-level relative EID risk map, 58. country-level predicted zoonoses map
GLOBAL	4	4	4	76-77. Viral species accumulation per viral family 79. Global distribution of wild mammals in PREDICT countries 80. Aggregated global mammalian livestock density 81. Global map of land-use 82. Refined seasonal model of viral shedding in bats 83. Modeling the effect of reproduction on viral detection across three mammalian orders. 84. Spillover along land use gradients in Deep Forest countries 85-88. Distribution of antimicrobial disease emergence
TOTAL	**42**	**4**	**42**	

***for the period 10/1/17-9/30/18 ONLY**

	*Cumulative - indicate year			
Indicator 1.1c	Describe each risk factor/interface characterized that is associated with spillover, amplification, and/or spread (include information on risk factor/interface type and contribution/association with spillover, amplification and/or spread, also indicate animal/human vs animal/animal and country)	List Publication or reference if possible	Risk Factor or Risk Interface	Classify as: New characteriztaion/in progress/complete
icate Country or Glo	Risk factor/interface description			complete
China	Bats are host to a diverse array of viruses shed in feces (host risk factor linked to potential for animal to human spillover; based on PREDICT data) (Y1)		Risk Factor	complete
China	Rodents are host to a diverse array of viruses shed in feces (host risk factor linked to potential for animal to human spillover; based on PREDICT data) (Y1)		Risk Factor	complete
China	Contact with poultry is a risk factor for infection with Influenza A/H7N9 among children in 2013-2014 (host factor and high-risk interface linked to animal to human spillover, based on PREDICT data) (Y1)		both	complete
China	Contact with poultry feces, chopping/butchering boards, and cage surfaces is a risk factor for infection with Influenza A/H7N9 (host/environmental risk factor and high-risk interface linked to animal to human spillover, based on PREDICT data) (Y1)		both	complete
China	Small mammals are host to high prevalence of viruses in the hantavirus family (host risk factor linked to potential for animal to human spillover; based on PREDICT data) (Y2)	X-Y Ge, W-H Yang, H. Pan, J-H Zhou, X. Han, G-J Zhu, J.S. Desmond, P. Daszak, Z-L Shi, Y-Z Zhang. 2016. Fugong virus, a novel hantavirus barbored by the small oriental vole (Eothenomys eleusis) in China. Virology Journal 13:27. doi: 10.1186/s12985-016-0483-9	Risk Factor	complete
Bangladesh	Co-infections influence viral occurrence (agent risk factor linked to potential for spillover; based on PREDICT data) (Y1)		Risk Factor	complete
Bangladesh	Primates in an urban setting are host to a diverse array of viruses that are shed in feces (host risk factor and high-risk interface linked to potential for animal to human spillover; based on PREDICT data) (Y1)		both	complete
DRC	Human contact with primates in intensive conservation management situations facilitates disease transmisison between humans and primates (host/environmental risk factors and high-risk interface linked to anthropozoonotic spillover, based on PREDICT data) (Y1)		both	complete
Malaysia	Human contact with primates in intensive management to mitigate human-macaque conflict is a potential risk factor for spillover of macacine herpesvirus 1 (B virus) (host/environmental risk factors and high-risk interfaces linked to animal to human spillover, based on PREDICT data) (Y1)	Lee, M.H., Rostal, M.K., Hughes, T., Sitam, F., Lee, C.Y., Japning, J., Harden, M.E., Griffiths, A., Basir, M., Wolfe, N.D. and Epstein, J.H., 2015. Macacine Herpesvirus 1 in Long-Tailed Macaques, Malaysia, 2009–2011. Emerging infectious diseases, 21(7), p.1107.	both	complete
RoC	Butchering fruit bats is a significant risk factors for zoonotic spillover of henipavirus (host/environmental risk factors and high-risk interfaces linked to animal to human spillover, based on PREDICT data) (Y1)	Weiss, S., Nowak, K., Fahr, J., Wibbelt, G., Mombouli, J.V., Parra, H.J., Wolfe, N.D., Schneider, B.S. and Leendertz, F., 2012. Henipavirus-related sequences in fruit bat bushmeat,.	both	complete
Cameroon	Butchering fruit bats and living in areas undergoing deforestation are significant risk factors for zoonotic spillover of henipavirus (host/environmental risk factors and high-risk interfaces linked to animal to human spillover, based on PREDICT data) (Y1)	Pernet O, Schneider BS, Beaty SM, LeBreton M, Yun TE, Park A, Zachariah TT, Bowden TA, Hitchens P, Ramirez CM, Daszak P. Evidence for henipavirus spillover into human populations in Africa. Nature communications. 2014 Nov 18;5.	both	complete
RoC	Primates in intensive management are host to a diverse array of viruses that are shed in feces (host risk factor linked to potential for spillover; based on PREDICT data) (Y1)		Risk Factor	complete
Philippines (Placed	A range of bat species are host to Reston ebolavirus and pose a risk for spillover to humans (host risk factor linked to potential for animal to human spillover; based on PREDICT data) (Y1)	Jayme, S.I., Field, H.E., de Jong, C., Olival, K.J., Marsh, G., Tagtag, A.M., Hughes, T., Bucad, A.C., Barr, J., Azul, R.R. and Retes, L.M., 2015. Molecular evidence of Ebola Reston virus infection in Philippine bats. Virology journal, 12(1), p.107.	*Risk Factor*	complete
Thailand	A range of bat species are host to a diverse array of fecally shed coronaviruses that pose a risk for spillover to humans (host risk factor linked to potential for animal to human spillover; based on PREDICT data) (Y1)	Wacharapluesadee, S., Duengkae, P., Rodpan, A., Kaewpom, T., Maneeorn, P., Kanchanasaka, B., Yingsakmongkon, S., Sittidetboripat, N., Chareesaen, C., Khlangsap, N. and Pidthong, A., 2015. Diversity of coronavirus in bats from Eastern Thailand. Virology journal, 12(1), p.57.	Risk Factor	complete
Global	RNA viruses are more likely to spillover from animals to humans than DNA virus (agent risk factor linked to animal to human spillover, based on in-depth literature review of all known zoonotic viruses) (Y1)	Johnson, C.K., Hitchens, P.L., Evans, T.S., Goldstein, T., Thomas, K., Clements, A., Joly, D.O., Wolfe, N.D., Daszak, P., Karesh, W.B. and Mazet, J.K., 2015. Spillover and pandemic properties of zoonotic viruses with high host plasticity. Scientific reports, 5, p.14830.	Risk Factor	complete
Global	Viruses with high host plasticity (i.e. viruses able to infect hosts from a large number of taxonomic orders) are more likely to be transmissible human-to-human (agent risk factor linked to potential for amplification and spread, based on in-depth literature review of all known zoonotic viruses) (Y1)	Johnson, C.K., Hitchens, P.L., Evans, T.S., Goldstein, T., Thomas, K., Clements, A., Joly, D.O., Wolfe, N.D., Daszak, P., Karesh, W.B. and Mazet, J.K., 2015. Spillover and pandemic properties of zoonotic viruses with high host plasticity. Scientific reports, 5, p.14830.	Risk Factor	complete
Global	Wild animals are the documented source of 91% of zoonotic viruses recognized to date (host risk factor linked to spillover, based on in-depth literature review of all known zoonotic viruses) (Y1)	Johnson, C.K., Hitchens, P.L., Evans, T.S., Goldstein, T., Thomas, K., Clements, A., Joly, D.O., Wolfe, N.D., Daszak, P., Karesh, W.B. and Mazet, J.K., 2015. Spillover and pandemic properties of zoonotic viruses with high host plasticity. Scientific reports, 5, p.14830.	Risk Factor	complete
Global	Zoonotic viruses reported in domesticated species had higher host plasticity (agent/host risk factors linked to animal to animal amplification and spread, based on in-depth literature review of all known zoonotic viruses) (Y1)	Johnson, C.K., Hitchens, P.L., Evans, T.S., Goldstein, T., Thomas, K., Clements, A., Joly, D.O., Wolfe, N.D., Daszak, P., Karesh, W.B. and Mazet, J.K., 2015. Spillover and pandemic properties of zoonotic viruses with high host plasticity. Scientific reports, 5, p.14830.	Risk Factor	complete
Global	Vector-borne zoonotic viruses found in wildlife had higher host plasticity (agent risk factor linked to animal to animal and animal to human spillover and spread, based on in-depth literature review of all known zoonotic viruses) (Y1)	Johnson, C.K., Hitchens, P.L., Evans, T.S., Goldstein, T., Thomas, K., Clements, A., Joly, D.O., Wolfe, N.D., Daszak, P., Karesh, W.B. and Mazet, J.K., 2015. Spillover and pandemic properties of zoonotic viruses with high host plasticity. Scientific reports, 5, p.14830.	Risk Factor	complete
Global	Human direct contact with wild animals kept as pets, maintained in sanctuaries or zoos, and sold at markets, had higher host plasticity (host/environmental risk factors and high-risk interface linked to animal to human spillover and spread, based on in-depth literature review of all known zoonotic viruses) (Y1)	Johnson, C.K., Hitchens, P.L., Evans, T.S., Goldstein, T., Thomas, K., Clements, A., Joly, D.O., Wolfe, N.D., Daszak, P., Karesh, W.B. and Mazet, J.K., 2015. Spillover and pandemic properties of zoonotic viruses with high host plasticity. Scientific reports, 5, p.14830.	both	complete
Global	Human direct contact with wild animals in and around human dwellings and in agricultural fields (mainly rodent hosts as reported to date) has facilitated spillover of zoonotic viruses (host/environmental risk factors and high-risk interface linked to animal to human spillover and spread, based on in-depth literature review of all known zoonotic viruses) (Y1)	Johnson, C.K., Hitchens, P.L., Evans, T.S., Goldstein, T., Thomas, K., Clements, A., Joly, D.O., Wolfe, N.D., Daszak, P., Karesh, W.B. and Mazet, J.K., 2015. Spillover and pandemic properties of zoonotic viruses with high host plasticity. Scientific reports, 5, p.14830.	both	complete
Global	Human direct contact with wildlife by hunting and consumption facilitates spillover of viruses with human-to-human transmissibility (agent/environmental risk factors and high-risk interface linked to animal to human spillover and spread, based on in-depth literature review of all known zoonotic viruses) (Y1)	Johnson, C.K., Hitchens, P.L., Evans, T.S., Goldstein, T., Thomas, K., Clements, A., Joly, D.O., Wolfe, N.D., Daszak, P., Karesh, W.B. and Mazet, J.K., 2015. Spillover and pandemic properties of zoonotic viruses with high host plasticity. Scientific reports, 5, p.14830.	both	complete

Global	Zoonotic viruses in the arenaviridae and filoviridae families are more likely to be human-to-human transmissible (agent/environmental risk factors linked to animal to human spillover and spread, based on in-depth literature review of all known zoonotic viruses) (Y1)	Johnson, C.K., Hitchens, P.L., Evans, T.S., Goldstein, T., Thomas, K., Clements, A., Joly, D.O., Wolfe, N.D., Daszak, P., Karesh, W.B. and Mazet, J.K., 2015. Spillover and pandemic properties of zoonotic viruses with high host plasticity. Scientific reports, 5, p.14830.	Risk Factor	complete
Global	First emergence of viral diseases was most often reported as vector-borne transmission, followed by airborne transmission and then direct contact (agent risk factor linked to potential spillover or spread, based on in-depth literature review of past emerging disease events) (Y1)		Risk Factor	complete
Global	First emergence of zoonotic diseases were most commonly associated with land use change, agricultural industry change, and international travel/commerce (environmental risk factor linked to potential animal to human spillover or spread, based on in-depth literature review of past emerging disease events) (Y1)		Risk Factor	complete
Rwanda AND Uganda (Placed in both countries)	Primates in intensive management are host to viruses that are shed in saliva (host risk factor linked to potential for animal to human spillover; based on PREDICT data) (Y2)	T. Smiley Evans, K. Gilardi, P. Barry, B. Ssebide, J. Kinani, F. Nizeyimana, J. Noheri, D. Byarugaba, A. Mudakikwa, M. Cranfield, J.A.K. Mazet, C.K. Johnson. 2016 Detection of viruses using discarded plants from wild mountain gorillas and golden monkeys. American Journal of Primatology, doi: 10.1002/ajp.22576.	Risk Factor	complete
Global	Human direct contact with high volumes of wildlife from high-risk taxa by hunting and consumption and poor biosafety increases the potential for zoonotic pathogen presence and transmission (agent/environmental risk factors linked to animal to human spillover and spread, based on PREDICT data) (Y2)	Z.F. Greatorex, S.H. Olson, S. Singhalath, S. Silithammavong, A.E. Fine, W. Weisman, B. Douangngeun, W. Theppangna, L. Keatts, M. Gilbert, W.B. Karesh, T. Hansel, S. Zimicki, K. O'Rourke, D.O. Joly, J.A.K. Mazet. 2016. Wildlife trade and human health in Lao PDR: An assessment of the zoonotic disease risk in markets. PLOS One. doi: 10.1371/journal.pone.0150666	both	complete
Global	Bats are host to a diversity of viruses in the paramyxo-, adeno-, herpes-, astro-, and coronavirus families (host/agent risk factors linked to potential animal to animal or animal to human spillover, based on in-depth literature review of all known zoonotic viruses) (Y2)	C.C.W. Young, K.J. Olival. 2016. Optimizing Viral Discovery in Bats. PLOS One 11:2. doi: 10.1371/journal.pone.0149237	Risk Factor	complete
Global	Drivers of viral richness (host diversity and climactic variability) and transmission opportunity (human population density, bushmeat hunting, and livestock production) are associated with virus sharing between humans and bats (host/virus risk factor linked to animal to human spillover and spread; based on in-depth literature review of all known zoonotic bat viruses) (Y2)	L. Brierley, M.J. Vonhof, K.J. Olival, P. Daszak, K.E. Jones. 2016. Quantifying global drivers of zoonotic bat viruses: A process-based perspective. The American Naturalist, 187(2). doi: 10.1086/684391	Risk Factor	complete
Lao PDR, Cambodia	Bats are host to astroviruses shed in feces. Astrovirues are distributed widely and some have been identified as a cause of gastroenteritis in humans and other mammals. Wildlife species living close to human habitats could represent a risk for transmission of astroviruses to humans and domestic animals (agent/host risk factor linked to potential for spillover; based on PREDICT data) (Y3)	A. Lacroix, V. Duong, V. Hul, S. San, H. Davun, K. Omaliss, S. Chea, A. Hassanin, W. Theppangna, S. Silithammavong, K. Khammavong, S. Singhalath, A. Afelt, Z. Greatorex, A.E. Fine, T. Goldstein, S. Olson, D.O. Joly, L. Keatts, P. Dussart, R. Frutos, P. Buchy. 2017. Diversity of bat astroviruses in Lao PDR and Cambodia. Infection, Genetics and Evolution, 47: 41-50. doi: 10.1016/j.meegid.2016.11.013	Risk factor	complete
Lao PDR, Cambodia	Bats are host to a diverse array of coronaviruses (coronaviruses of animal origin were responsible for the Severe Acute Respiratory Syndrome [SARS] outbreak in 2003–2004 and the current epidemics of Middle Eastern Respiratory Syndrome [MERS] in the Arabian Peninsula and Korea). Findings are of importance for public health as Lao PDR and Cambodia have a high biodiversity of bats, often at high-risk interfaces in close proximity to people (agent/host risk factor linked to potential for animal to human spillover; based on PREDICT data) (Y3)	Lacroix, A., Duong, V., Hul, V., San, S., Davun, H., Omaliss, K., Chea, S., Hassanin, A., Theppangna, W., Silithammavong, S. and Khammavong, K. 2017. Genetic diversity of coronaviruses in bats in Lao PDR and Cambodia. Infection, Genetics and Evolution, 48, pp.10-18.	Risk factor	complete
China	Bats are hosts to novel filoviruses in China. Findings suggest that these viruses have been circulating in the 2 bat species and that densely populated bat caves provide opportunity for cross-species infection with different viruses. Considering their feeding habitats, fruit bats are often in close contact with domestic animals and human populations (host risk factor linked to potential for animal to animal or animal to human spillover; based on PREDICT data) (Y3)	Yang, X.L., Zhang, Y.Z., Jiang, R.D., Guo, H., Zhang, W., Li, B., Wang, N., Wang, L., Waruhiu, C., Zhou, J.H. and Li, S.Y., 2017. Genetically Diverse Filoviruses in Rousettus and Eonycteris spp. Bats, China, 2009 and 2015. Emerging Infectious Diseases, 23(3), p.482.	Risk factor	complete
Global	The expanding international wildlife trade combined with a lack of surveillance for key animal diseases in most countries represents a potential pathway for transboundary disease movement (host/agent risk factors linked to potential animal to animal or animal to human spillover, based on in-depth literature review of reports of OIE-listed terrestrial animal diseases in wild animals) (Y3)	Smith, K.M., Machalaba, C.M., Jones, H., Cáceres, P., Popovic, M., Olival, K.J., Ben Jebara, K. and Karesh, W.B., 2017. Wildlife hosts for OIE-Listed diseases: considerations regarding global wildlife trade and host–pathogen relationships. Veterinary Medicine and Science.	Risk factor	complete
Global	The number of declared wildlife shipments into the USA has doubled since 2000, illustrating continually increasing demand, which reinforces the need to scale up capacity for border inspections, risk management protocols and disease surveillance (host/agent risk factors linked to potential animal to animal or animal to human spillover, based on comprehensive data US Fish and Wildlife Services database) (Y3)	Smith, K.M., Zambrana-Torrelio, C., White, A., Asmussen, M., Machalaba, C., Kennedy, S., Lopez, K., Wolf, T.M., Daszak, P., Travis, D.A. and Karesh, W.B., 2017. Summarizing US Wildlife Trade with an Eye Toward Assessing the Risk of Infectious Disease Introduction. EcoHealth, 14(1), pp.29-39.	Risk factor	complete
Global	Bats are host to a diversity of viruses in the coronavirus (CoVs) family, and global diversity and distribution of CoVs in bats is non-random and is driven by variation in the biogeography of bats (host/agent risk factors linked to potential animal to animal or animal to human spillover; based on PREDICT data) (Y3)	Anthony, S.J., Johnson, C.K., Greig, D.J., Kramer, S., Wells, H., Hicks, A., Joly, D., Wolfe, N., Daszak, P., Karesh, W., Lipkin, W.I., Morse, S.S., PREDICT Consortium, Mazet, J.A.K., Goldstein, T., 2017. Global patterns in	Risk factor	complete
Bangladesh	Nipah virus was found in Indian flying foxes outside of the area currently recognized to be experiencing recurring outbreaks of Nipah virus in humans, suggesting spillover is possible wherever humans interact with Indian flying foxes. Human activities such as date palm sap harvesting, concurrent with viral circulation in local bat populations, are major drivers of human outbreaks in Bangladesh (host/agent risk factor and high-risk interface linked to potential animal to animal or animal to human spillover; based on PREDICT data) (Y3)	Epstein, J.H., Anthony, S.J., Islam, A., Kilpatrick, A.M., Khan, S.A., Ross, N., Smith, I., Barr, J., Zambrana-Torrelio, C., Tao, Y. and Quan, P.L., 2016. Nipah virus ecology and infection dynamics in its bat reservoir, Pteropus medius, in Bangladesh. International Journal of Infectious Diseases, 53, pp.20-21.	both	complete
Egypt	High MERS-CoV seroprevalence and the presence of active viral infection circulating in imported and resident camels are indications that MERS-CoV may have become ubiquitous in Egypt.Transport stress and close vicinity of imported camels during transport may precipitate disease dissemination, particularly in animals with latent infection and carrier animals (host/agent risk factor and high-risk interface linked to potential animal to human spillover) (Y3)	Ali M, El-Shesheny R, Kandeil A, Shehata M, Elsokary B, Gomaa M, Hassan N, El Sayed A, El-Taweel A, Sobhy H, Oludayo FF. Cross-sectional surveillance of Middle East respiratory syndrome coronavirus (MERS-CoV) in dromedary camels and other mammals in Egypt, August 2015 to January 2016. Eurosurveillance. 2017 Mar 16;22(11).	both	complete
Uganda/Global	MERS-related CoVs are highly associated with bats and are geographically widespread (host risk factor linked to potential for animal to human spillover) (Y3)	Anthony SJ, Gilardi K, Menachery VD, Goldstein T, Ssebide B, Mbabazi R, Navarrete-Macias I, Liang E, Wells H, Hicks A, Petrosov A. Further Evidence for Bats as the Evolutionary Source of Middle East Respiratory Syndrome Coronavirus. mBio. 2017 May 3;8(2):e00373-17.	Risk Factor	complete
Global	Risk of emerging infectious zoonotic disease is elevated in forested tropical regions experiencing land-use changes, especially where wildlife biodiversity (mammal species richness) is high (host/environmental risk factor and high-risk interface linked to animal to human spillover, based on global data) (Y3)	Allen, T., Murray, K. A., Zambrana-Torrelio, C., Morse, S. S., Rondinini, C., Di Marco, M., ... & Daszak, P. (2017). Global hotspots and correlates of emerging zoonotic diseases. Nature Communications, 8(1), 1124.	both	complete
Global	Cave-roosting bat species exhibit a greater likelihood of viral sharing within caves (host risk factor linked to potential for animal to animal or animal to human spillover, based on global data and PREDICT 1 data) (Y3)	Willoughby, A. R., K. L. Phelps, PREDICT Consortium & K. J. Olival. A Comparative Analysis of Viral Richness and Viral Sharing in Cave-Roosting Bats. (2017). Diversity, 9, 35;	risk factor	complete
Global	The proportion of known zoonotic viruses per species is predicted by phylogenetic relatedness to humans, host taxonomy (bats harbor a significantly higher proportion of zoonotic viruses than all other mammalian orders), and human population within a species range --which may reflect human–wildlife contact (host risk interface linked to potential for animal to human spillover, based on global data) (Y3)	Olival, K. J., Hosseini, P. R., Zambrana-Torrelio, C., Ross, N., Bogich, T. L., & Daszak, P. (2017). Host and viral traits predict zoonotic spillover from mammals. Nature, 546(7660), 646-650.	risk interface	complete

China	Swine acute diarrhoea syndrome coronavirus (SADS-CoV), responsible for a large-scale outbreak of fatal disease in pigs in China, was identified in horseshoe bats (Rhinolophus spp.) in Guangdong province during 2013–2016. Horseshoe bats (Rhinolophus spp.) are known reservoirs of SARS- and HKU-2 related CoVs. Viral sharing between bats and swine are host/agent risk factors linked to animal to animal spillover with potential for animal to human spillover. Geographical, temporal, and ecological settings similar to SARS outbreaks at high risk interfaces are noted (Y4).	Zhou, Peng, et al. "Fatal swine acute diarrhoea syndrome caused by an HKU2-related coronavirus of bat origin." Nature(2018): 1.	both	complete
Global	Human modification of the environment serves as an underlying driver in emerging infectious disease risk. Environmental change warrants consideration in surveillance and outbreak investigations to identify the origin of the disease and contribute to the development of effective actions to prevent, prepare for or reduce the risk of future events (risk interface linked to potential for animal to human spillover, based on literature review) (Y4).	Machalaba C, Karesh WB. Emerging infectious disease risk: shared drivers with environmental change. Revue scientifique et technique-office international des epizooties. 2017 Aug 1;36(2):435-44.	risk interface	complete
Global	Dromedary camels are bred domestically and imported into Bangladesh. In 2015, of 55 camels tested for Middle East respiratory syndrome coronavirus in Dhaka, 17 (31%) were seropositive, including 1 bred locally (host/agent risk factors linked to potential animal to animal or animal to human spillover; based on PREDICT data). Infected camels in urban markets could have public health implications and warrants further investigation (host risk interface linked to potential for animal to human spillover, based on global data) (Y4).	Islam A, Epstein JH, Rostal MK, Islam S, Rahman M, Hossain M, et al. Middle East Respiratory Syndrome Coronavirus Antibodies in Dromedary Camels, Bangladesh, 2015. Emerg Infect Dis. 2018;24(5):926-928.	both	complete
DRC	Bocaparvoviruses are members of the family Parvoviridae and human bocaviruses have been associated with respiratory and gastrointestinal disease. Bocavirus DNA was found in blood and tissues samples in 6 out of 620 non-human primates in the Democratic Republic of the Congo. All isolates showed very high identity (>97%) with human bocaviruses 2 or 3, suggesting cross-species transmission of bocaviruses between humans and NHPs (host/agent risk factors linked to potential animal to human spillover) (Y4).	Kumakamba C, Lukusa IN, Kingebeni PM, N'Kawa F, Losoma JA, Mulembakani PM, Makuwa M, Tamfum JJ, Belais R, Gillis A, Harris S. DNA indicative of human bocaviruses detected in non-human primates in the Democratic Republic of the Congo. Journal of General Virology. 2018 Mar 27.	risk factor	complete
China	Of 218 residents who live in close proximity to caves inhabited by large numbers of Rhinolophid bats (a major reservoir of SARSr-CoVs in China), 2.7% people showed seropositivity to SARS-like CoVs (host/environmental risk factors and high-risk interface linked to spillover, based on PREDICT data) (Y4).	Wang N, Li SY, Yang XL, Huang HM, Zhang YJ, Guo H, Luo CM, Miller M, Zhu G, Chmura AA, Hagan E. Serological evidence of bat SARS-related coronavirus infection in humans, China. Virologica Sinica. 2018 Feb 1;33(1):104-7.	both	complete
Uganda	Contact with duikers is a risk factor associated with exposure to Ebolavirus in humans in Southwestern Uganda. Hunting primates and contact with and/or eating cane rats are risk factors for exposure to the Sudan ebolavirus (host/environmental risk factors linked to spillover, based on PREDICT data) (Y4).	Smiley Evans T, Tutaryebwa L, Gilardi KV, Barry PA, Marzi A, Eberhart M, Ssebide B, Cranfield MR, Mugisha O, Mugisha E, Kellermann S. Suspected Exposure to Filoviruses Among People Contacting Wildlife in Southwestern Uganda. The Journal of Infectious Diseases. 2018 Jun 18.	risk factor	complete
Sierra Leone	Discovery of Bombali virus in two species of free-ranging bats provides strong evidence that bats serve as hosts for ebolaviruses, and that additional unknown ebolaviruses may exist in wildlife (host/environmental risk factors and high-risk interface linked to spillover, based on PREDICT data) (Y4).	Goldstein T, Anthony SJ, Gbakima A, Bird BH, Bangura J, Tremeau-Bravard A, Belaganahalli MN, Wells HL, Dhanota JK, Liang E, Grodus M. The discovery of Bombali virus adds further support for bats as hosts of ebolaviruses. Nature microbiology. 2018 Oct;3(10):1084.	both	complete

TOTAL **48**

Indicator 1.1d	Provide a list and brief description of each intervention point that has been prioritized to inform the development of risk mitigation approaches (information should describe the intervention point's characteristics, an explananation on how it was identified and why it was prioritized; include country information)
Indicate Country or Global	
Bangladesh	
Cambodia	
Cameroon	
China	
Cote d'Ivoire	
Democratic Republic of Congo	
Egypt	
Ethiopia	
Ghana	
Guinea	
India	
Indonesia	
Jordan	
Kenya	
Lao PDR	
Liberia	
Malaysia	
Mongolia	
Myanmar	
Nepal	
Republic of Congo (RoC)	
Rwanda	
Senegal	
Sierra Leone	
Tanzania	
Thailand	
Uganda	
Viet Nam	

***for the period 10/1/17-9/30/18 ONLY**

Indicator 1.2a	YEAR 4 DATA (10/01/17 - 03/31/18)						
	Total # Labs Targeted for PREDICT viral family testing	# of labs in the country obtaining training or preparing to test for the 4 priority viral family protocols	# of labs in the country with the ability to perform testing for the 4 priority viral family PREDICT protocols	Proportion of labs that can do viral family testing	# of tests performed (# of tests performed by lab, for each virus, viral family, prioritized pathogen and/or AMR/antimicrobial quality test	Notes	
AFRICA							126,384
Cameroon	2	1	1	50%	Total Number tests: 29153 Tests by Viral family: Corona - 9150 Paramyxo - 4577 Filo - 5120 Influenza - 9151 Flavi - 1155		
Cote d'Ivoire	2	2	0	100%	Total Number tests: 604 Corona - 276 Filo - 328	Both labs now testing for one or two viral families	
DRC	1	0	1	100%	Total Number tests: 12856 Tests by Viral family: Corona - 3960 Paramyxo - 1784 Filo - 1875 Flavi - 1419 Influenza - 3802 Arena - 2 Rhabdo - 2 Orthobunya - 12		
Ethiopia	2	1	1	50%	Total Number tests: 444 Tests by Viral family: Corona - 74 Filo - 74 Flavi - 74 Influenza - 148 Paramyxo - 74	One lab now testing for all 5 viral families	
Ghana	2	0	2	100%	Total Number tests: 360 Tests by Viral family: Corona - 444 Filo - 222 Paramyxo - 222 Influenza - 444	Both labs now testing for 4 viral familes	
Guinea	1	1	0	0%	Total Number tests: 16777 Tests by Viral family: Filo - 3392 Ebolavirus - 3392 Ebola Zaire - 6784 Other Ebola - 3209	NOTE: Current results from testing performed at UCD in USA; In-country lab is performing testing for filovirus family	
Kenya	2	0	2	100%	Total Number tests: 304 Tests by Viral family: Corona - 1716 Filo - 229 Paramyxo - 973 Influenza - 973	Both labs now testing for 4 viral familes	
Liberia	1	1	0	0%	Total Number tests: 12000 Tests by Viral family: Filo - 3000 Ebolavirus - 3000 Ebola Zaire - 6000	NOTE: Testing done at CII in USA ; In-country lab is training to perform testing for filovirus family	
RoC	1	0	0	0%	N/A	NOTE: Previous testing done at INRB in DRC, In-country training is planned	
Rwanda	2	1	1	50%	Total Number tests: 2957 Tests by Viral family: Corona - 876 Paramyxo - 438 Filo - 438 Influenza - 876 Flavi - 329	UCD is also performing testing to help meet goals	
Senegal	2	0	2	100%	Total Number tests: 3494 Tests by Viral family: Corona - 950 Paramyxo - 522 Filo - 419 Influenza - 1044 Flavi - 559	Both labs now testing for 5 viral familes	

Sierra Leone	1	1	0	0%	Total Number tests: 29160 Tests by Viral family: Filo - 5832 Ebolavirus - 5832 Ebola Zaire - 11664 Other Ebola - 5832	NOTE: Current results from UCD in USA; In-country lab is performing testing for filovirus family	
Tanzania	2	0	2	100%	Total Number tests: 14972 Tests by Viral family: Corona - 4314 Paramyxo - 2157 Filo - 2112 Flavi - 2120 Influenza - 4269		
Uganda	1	0	1	100%	Total Number tests: 3303 Tests by Viral family: Corona - 367 Paramyxo - 367 Filo - 367 Flavi - 367 Influenza - 734 Arena - 367 Rhabdo - 367 Orthobunya - 367	Lab now testing for 8 viral familes	
ASIA							**166,742**
Bangladesh	2	0	2	100%	Total Number tests: 31304 Tests by Viral family: Corona - 9345 Paramyxo - 4329 Filo - 4329 Flavi - 3844 Influenza - 9345 Other - 112	Both labs now testing for 5 viral familes	
Cambodia	3	2	1	33%	Total Number tests: 46344 Tests by Viral family: Corona - 9097 Paramyxo - 5735 Filo - 5306 Flavi - 5335 Influenza - 9324 Alpha - 1018 Orthobunya - 4118 Rhabdo - 3162 Hanta - 3249		
China	4	2	2	50%	Total Number tests: 12185 Tests by Viral family: Corona - 2437 Paramyxo - 2437 Filo - 2437 Flavi - 2437 Influenza - 2437		
India	1	0	1	100%	Total Number tests: 182 Tests by Viral family: Corona - 52 Paramyxo - 26 Filo - 26 Flavi - 26 Influenza - 52	Lab now testing for 5 viral familes	
Indonesia	3	1	2	67%	Total Number tests: 24214 Tests by Viral family: Corona - 5806 Paramyxo - 5423 Filo - 3342 Flavi - 3398 Influenza - 6245	Eijkman Lab is currently not testing for Flaviviruses	
Lao PDR	2	1	1	50%	Total Number tests: 5356 Tests by Viral family: Corona - 1816 Paramyxo - 658 Filo - 908 Flavi - 658 Influenza - 1316		

Malaysia	5	1	4	80%	Total Number tests: 11759 Tests by Viral family: Corona - 5255 Paramyxo - 2628 Filo - 2628 Flavi - 2628 Influenza - 5272	Four labs now testing for 5 viral familes	
Mongolia	1	1	0	0%	Total Number tests: 1600 Tests by Viral family: Influenza - 1600	Plan is only to perform influenza and the lab is doing so	
Myanmar	2	0	2	100%	Total Number tests: 7154 Tests by Viral family: Corona - 2205 Paramyxo - 1123 Filo - 1123 Flavi - 457 Influenza - 2246	Testing also done at UCD in USA, Two in-country labs now testing for 4 viral familes	
Nepal	2	1	1	50%	Total Number tests: 9695 Tests by Viral family: Corona - 2770 Paramyxo - 1385 Filo - 1385 Flavi - 1385 Influenza - 2770		
Thailand	2	0	2	100%	Total Number tests: 8379 Tests by Viral family: Corona - 1648 Paramyxo - 1536 Filo - 1536 Flavi - 1536 Influenza - 1536 Hanta - 484 Other - 103		
Vietnam	5	2	3	60%	Total Number tests: 8570 Tests by Viral family: Corona - 2460 Paramyxo - 1230 Filo - 1230 Flavi - 1228 Influenza - 2422		
MIDDLE EAST							**10,861**
Egypt	1	1	0	0%	Total Number tests: 3606 Tests by Viral family: Corona - 1202 Influenza - 2404 Flavi - 1202	Lab is currently testing for 3 viral families	
Jordan	1	0	1	100%	Total Number tests: 7255 Tests by Viral family: Corona - 2902 Paramyxo - 1451 Filo - 1451 Influenza - 1451	Lab is currently not testing for Flaviviruses	
							Total tests performed
TOTAL		**20**	**35**				**303,987**

***for the period 10/1/17-9/30/18 ONLY**

INDICATOR CHANGE: only 1 indicator for outbreaks

Indicator 1.2e	**QUALITATIVE INDICATOR: List/Description of outbreak support (include country, disease, human or animal, month and year based on sample collection date, important dates, type of support provided, any after action reviews) -** *qualitative context for numbers provided only*	*This indicator is Qualitative only so we do not report on cells B-G*
AFRICA		
Ghana	In February 2018, one person in the Greater Accra region developed symptoms consistent with viral hemorrhagic fever, presented to the hospital and later died. The patient was confirmed by laboratory testing as Lassa fever virus infection. PREDICT assisted in field investigation for reservoir sampling, and captured and sampled from a total of 52 *Mastomys* sp. rodents and *Crocidura* sp. shrews, as well as testing for five priority viral families for PREDICT. The PREDICT field team engaged in staff refresher training and potential trip planning at the time of notification of the event, and prepared logistics and sampling plans over the next four days. The team departed to the investigation site the following day.	
Liberia	In February 2018, 63 patients with mild to moderate diarrheal disease visited a local clinic in Margibi County. Epidemiological investigation suggested a point source event, and PREDICT provided logistical support to the Liberian Ministry of Health to transport outbreak investigators and supplies to the affected area. The PREDICT team provided logistical support to collaborators two days after they received notification and request for assistance for the event.	
Democratic Republic of the Congo	In November 2017, one person in Bas-Uele province presented with symptoms consistent with viral hemorrhagic disease, and was isolated and recovered. Later, another patient presented with similar symptoms in Kinshasa and deceased. PREDICT provided assistance with testing of specimens from both patients after specific pathogen rule-out testing for ebolaviruses and Marburg virus. All five priority families for PREDICT, as well as arenaviruses and rhabdoviruses tested negative. The PREDICT team initiated laboratory testing on the same day that they received the specimens.	
Democratic Republic of the Congo	In October to November 2017, an alert of cattle die-off was sent from the provincial Ministry of Agriculture, Fish and Livestock of Bas-Uele to the National Minister of Fishery and Livestock. More than 4000 cattle imported from outside of DRC died in Bas-Uele province with symptoms including diarrhea, weight-loss, swelling knees, chancroid, and loss of hair on the tail. PREDICT provided testing of ten field-specimens for orthobunyaviruses in addition to the five priority virus families following PREDICT protocols, all of which were negative. Response to this event was coordinated and carried out by a multidisciplinary team including PREDICT, Ministry of Fishery and Livestock, FAO, and LABOVET.	
Democratic Republic of the Congo	Two people from the same family developed symptoms consistent with viral hemorrhagic fever and died in Bas-Uelé province, Northern DRC. Following request from Institut National de Recherche Biomédicale (INRB), PREDICT tested clinical specimens using PREDICT priority virus family protocols. The PREDICT laboratory team completed testing two days after receiving the specimens.	
Democratic Republic of the Congo	Suspected cases of viral hemorrhagic fever, later confirmed as Ebola virus disease were reported in Equateur province, Western DRC. A total of 66 cases were notified from four health zones. PREDICT assisted with laboratory testing on patient specimens using the PREDICT viral family PCR protocols.	
Democratic Republic of the Congo	Suspected cases of viral hemorrhagic fever, later confirmed as Ebola virus disease were reported in North Kivu province, North Eastern DRC. As of December 4, 2018, approximately 440 confirmed cases and over 260 deaths have been reported. PREDICT supported partner organizations' outbreak activities by donating Personal Protective Equipment (PPE).	
ASIA		
Bangladesh	In February 2018, two people in Bogra district presented with symptoms consistent with encephalitis and later died. Both had a history of drinking raw date palm sap. The PREDICT field investigation team was deployed to the outbreak site and collected 89 urine and 93 feces specimens from *Pteropus* bat roosts, half eaten palm fruit, as well as ecological information from the site. Specimens were tested for five priority viral families for PREDICT. The field team was deployed one day after receiving request from the government.	
Bangladesh	In November 2017, the PREDICT field team observed neurological symptoms, diarrhea and unusual mortality in crows (*Corvus splendens*) in Dhaka city during their routine field work. In January and February in 2017, PREDICT investigated a crow mortality event at the same site. After receiving a request for outbreak support by the Government of Bangladesh, the PREDICT wildlife field team and the Department of Livestock Services collected samples from crows from two sites and provided technical advice to the Institute of Epidemiology, Disease Control and Research. The crow specimens were tested for five priority viral families for PREDICT. Routine work by the PREDICT field team resulted in early detection of unusual events in wildlife, prompting quick and coordinated action. The field team was deployed one day after receiving request from the government.	
Mongolia	Local veterinarians reported a die-off of more than 3000 wild birds including Mongolian gulls and common shelducks around Sangiin Dalai Lake in Govi-Altay province, Western Mongolia. No other taxa were affected. PREDICT provided technical assistance as part of regularly scheduled field surveillance activities.	

***for the period 10/1/17-9/30/18 ONLY**

supported 10 outbreaks in 5 countries

INDICATOR CHANGE		
Indicator 2B (Outcome Level)	**Evidence of application of OH trainings and sensitization in the workforce (qualitative)**	
AFRICA		
Cameroon	1. PREDICT provided technical assistance to FAO and the Ministry of Livestock (MINEPIA) in April 2018, training 24 government staff from the Ministry of Wildlife (eco-guards) and the Ministry of Livestock (animal disease surveillance network) in wildlife disease surveillance. Training included classroom and field components, covering core One Health skills required by professionals engaging in zoonotic disease surveillance: biosafety and biosecurity, PPE use, safe capture and sampling of wildlife, cold chain, safe sample transport, and sampling protocols. 2. PREDICT, alongside P&R, FAO, and OHCEA, worked to sensitize the heads of the Universities of Cameroon, and senior officials from the Ministry of Higher Education (17th July 2018) and Ministry of Environment (17th August 2018) to the importance of the One Health approach and multisectoral collaboration to respond to infectious zoonosis disease.
Cote d'Ivoire	activities. The first step to achieve a One Health approach is to motivate these persons to understand each other's view point and work together. The PREDICT team participates in meetings held by the Technical Secretariat of GHSA, the institution in Côte d'Ivoire in charge of the coordination of the One Health task force. In November 2017, in order to better understand how the One Health approach and response is implemented and how PREDICT can contribute, the PREDICT CIV Country Coordinator organized meetings with principal actors and visiting Global lead staff. The delegation met with county authorities responsible for organizing the response and other relevant actors in the field (ministries, agencies and directions such as the Ivoirian Office of Parks and Reserves, Ministry of Fauna and Game Resources, the Direction o Veterinarian's Services, FAO, and P&R). PREDICT/CIV collaborated with the Direction of Fauna and Game Resources,and the Direction of Veterinarian Services to help increase the capacity of the national surveillance system using a One Health approach. PREDICT is currently working with in-country USAID partners to define how to work together to promote the One Health approach. These meetings with USAID Partners take place quarterly; the last two meetings were held in December 2017 and March 2018. PREDICT/CIV also contributed expertise to the creation of the National Sanitary Security Plan. 2. The PREDICT/CIV project has carried out a training and awareness session to contribute to the application of "One Health" in Côte d'Ivoire. 3. From April 16th to April 28th , 2018, PREDICT/CIV staff, associated with external LANADA and IPCI staff members, were trained by PREDICT associated Columbia University researchers in viral screening techniques according to the PREDICT SOPs and protocols with a "One Health" perspective. 4. From May 22nd to May 26th, 2018, twenty-six people from Ivorian government laboratory, institutions and ministries (IPCI, LANADA, the Directorate of Veterinary Services, the Directorate of Wildlife and Fisheries, the Abidjan Zoo) attended an exhaustive PREDICT surveillance training given by PREDICT scientists. The objective of this training session was to allow people from different institutions involved in "One Health" activities and research to meet and brainstorm around outbreak response and sampling protocols while being trained on all major PREDICT SOPs. 5. PREDICT/CIV participated as a founding member in the creation of the Technical Working Group on Animal Health (GTTSA) in Côte d'Ivoire in Abidjan. During this meeting various invited parties including USAID worked on the developing the framework. PREDICT/CIV was invited as a founding member to participate in a workshop organized by the DSV on 3rd May 2018 with the aim of validating the texts of the GTTSA and reflecting on its action plan. Another meeting of the GTTSA was held on 25th September 2018 and PREDICT/CIV attended. The objective of the technical working group is to contribute to the strengthening of animal health management procedures as part of the "One Health" approach. 6. On July 5th 2018, at the National Institute of Public Hygiene in Abidjan, the coordination meeting of the Global Health Security Agenda (GHSA) was held with the participation of PREDICT/CIV. The GHSA is coordinated in Côte d'Ivoire by the GHSA Technical Secretariat (ST-GHSA). The purpose of this meeting was to review the various health interventions in a "One Health" context and also to share experiences. 7. From 8th to 11th August 2018, PREDICT/CIV participated in the "One Health" Workforce meeting (OHW) - objectives were to review the current status of the implementation of the "One Health" paradigm in terms
Democratic Republic of Congo	1. The PREDICT/DRC laboratory team, located at the Institut National de Recherche Biomédicale (INRB), has been leading practical One Health training sessions for physicians, veterinarians and biologists enrolled in the Field Epidemiology Laboratory Training Program (FELTP) Masters program since 2016, providing integral molecular biology training for detection of zoonotic viral diseases. Since October 2017, PREDICT/DRC has provided training to 18 FELTP students, as well as 6 biologists from the Institute of Sciences and Medical Technologies of Kinshasa, and 4 physicians from the Department of Medical Biology at the University of Kinshasa. PREDICT protocols for sample collection and laboratory analysis, and mentorship provided by the PREDICT/DRC team, prepare FELTP graduates to be DRC's front line for outbreak investigations. This training provided by PREDICT/DRC strengthens DRC's capacity to respond to zoonotic diseases with a One Health approach, building the skills of those involved in initial field investigations, as well as developing professional capacity in the animal and human health sectors involved in laboratory analysis and response activities. 2. PREDICT/DRC provided an internship to Dr. Grace Muyembe, a medical doctor with specialization in microbiology from the University of Kinshasa. Since March 2018, Dr. Muyembe has been mentored in PREDICT protocols, and gained valuable experience implementing consensus PCR for detection of zoonotic viruses. Dr. Muyembe's PREDICT training strengthens One Health capacity for disease detection in DRC, and supports a professional who will continue to mentor future members of the laboratory workforce in DRC. 3. PREDICT/DRC provided laboratory diagnostics training to 20 Field Epidemiology Training Program (FELTP) students May 25-June 3, 2018. These graduate students were trained in PREDICT protocols for detecting viruses using consensus PCR, increasing DRC's capacity to implement disease surveillance and respond to outbreak events. 4. As a very specific but highly One Health-relevant precaution, in response to the current EVD outbreak in North Kivu Province, refresher biosafety training was conducted for five Gorilla Doctors/PREDICT staff and four National Veterinary Laboratory staff in Goma. After the training, PREDICT established hand washing/sanitizing stations at the Lab's entry gate and at all main entrances to the offices (jointly occupied by PREDICT and the Government of DRC). All laboratory employees were also encouraged to set up hand washing/sanitizing stations in their homes: PREDICT provided kits for Gorilla Doctors employees, and the Goma Laboratory supplied their staff.
Ethiopia	PREDCT/Ethiopia together with other EPT-2 partners and beyond participated in the establishment of OHSM. Ministry of Health; Ministry of Livestock and Fisheries; Ministry of Forestry, Environment and Climate Change and Ministry of Culture and Tourism (where Ethiopian Wildlife Conservation Authority is part of it) are stakeholders. The MoH (represented by EPHI), and a partner on PREDICT work in Ethiopia) was elected chairman and MoLF is the secretary of the OHSM establishment.
Ghana	1. PREDICT/Ghana contributed to the investigation around a case of Lassa Fever in Ghana in March, 2018. In collaboration with the Ghana Health Service, the PREDICT Ghana team personnel from the Wildlife Division, Ministry of Land and Natural Resources and Veterinary Services Directorate, Ministry of Food and Agriculture conducted the field investigations, safely capturing and sampling rodents around two locations where the deceased patient resided during the four week period leading up to his illness and conducted human questionnaires in the local community. The team assisted the Ghana Health Service and the School of Public Health, University of Ghana with community sensitization and education on Lassa Fever. In total, the team captured 52 rodents in total and submitted the samples to the laboratory for testing using Lassa Fever specific molecular assays. PREDICT/Ghana provided the enhanced capacity for safe rodent capture and sampling as well as assessment of risk factors for exposure through application of the PREDICT human questionnaires. The government of Ghana views this effort as a One Health success story where personnel representing the three ministries worked collaboratively to investigate the circumstances of this case, including assessing rodent reservoirs of the virus around the residences of the deceased patient, and evaluating potential human practices and other risk factors that could put this community at greater risk of exposure. The team also worked closely with the Ghana Health Service and the School of Public Health to educate the community on Lassa Fever and strategies for reducing their risk. The One Health approach to this investigation served as the motivation for the PREDICT Ghana team members to network with institutions in other countries in West Africa to explore collaborations on Lassa Fever research. 2. ISAVET Pre-Training Meeting ,11th October 2018 organized by the Food and Agriculture Organization of the United Nations (FAO), the Institute for Infectious Animal Diseases (IIAD), Texas A&M University, and partners are initiating a Frontline level In Service Applied Veterinary Epidemiology Training (ISAVET), to address endemic, emerging infectious and transboundary animal diseases in 14 countries of West, Central and East Africa. The pilot training is being implemented through the Global Health Security Agenda (GHSA) initiative with support from the United States Agency for International Development (USAID). Given the need to ensure relevance of trainee field projects to the country animal health needs, a pre-meeting was held to bring together trainees, mentors and other relevant country-level stakeholders. The objectives of the meeting were: • For trainees, mentors, and other stakeholders to meet face-to-face before commencement of the planned Regional Pilot ISAVET training In Kampala, Uganda, • To identify a field project topic relevant to the country's animal health needs and, • To prepare a field project work plan for on-time delivery of the field project PREDICT/Ghana was invited to participate. The PREDICT Ghana Country Coordinator discussed PREDICT'S work on surveillance within the context of the One Health Agenda and discussed the project's capacity building activities in Ghana, including PREDICT's training on disease surveillance and virus detection. The coordinator also discussed the projects efforts on community engagement with local stakeholders at surveillance sites. 3. PREDICT Ghana held an in-service training workshop for 4 staff members working at the Accra Veterinary Lab at the Veterinary Services Directorate, Ministry of Food and Agriculture on PPE and biosafety, Basic Laboratory Safety, and PREDICT viral detection protocols. 4. Information Sharing on Risk Assessment of Lassa Fever in Ghana. In playing the key role in the investigation of the suspected Lassa fever event in Ghana, PREDICT/Ghana worked together with the Ghana Health Service (Ministry of Health) and the School of Public Health at the University of Ghana on community education and outreach on zoonoses and how to reduce exposure to rodents in/around the household, while conducting sampling of rodents in the areas surrounding the ill patient's residences.
Guinea	community engagement meetings have increased the understanding of the importance of the animal-human interface, an essential key to preventing outbreaks of zoonotic disease. National stakeholders are invited to participate in these community engagement meetings. Their engagment in the PREDICT One Health approach influences national sureillance and health strategies. For example, they have reported back to the Department of Public Health the need of mass canine vaccination campaigns to control rabies in Guinea. A recent workshop (26-30 March 2018) to establish, "One Health approach to cost-effective rabies control in Guinea" put forth recommendations for veterinary surveillance of rabies and laboratory submission of reports of suspected animal cases to the department of Public Health for management of potential human exposures and for veterinarians to adopt appropriate measures towards animals in contact with a suspected animal case. 2. May 14, 2018: PREDICT/Guinea participated in the National Forum on Learning for Resilience and Sustainable Development at the Noom Hotel in Conakry. The Forum, organized by USAID / Guinea, brought together partners from USAID, the Guinean government, beneficiaries, donors, civil society and the private sector to share lessons learned and generate concrete solutions that will enable to move towards sustainable development. The specific objectives of the forum were to: • Present the results, impact and lessons learned from post-Ebola recovery programs in the health, agriculture, democracy and governance sectors, and how they contributed to national development plans; • Generate actionable recommendations; • Ensure that commitments are taken into account in country-specific solutions for achieving sustainable development. PREDICT Guinea contributed to the Forum through an innovative exhibition to present the results of the filovirus surveillance activities in Guinea. Pr. Jonna Mazet (Principal Investigator of PREDICT at UC Davis), Prof. Alpha Oumar Camara, Dr. Jaber Belkhiria, Dr. Douokoro Kalivogui all participated and contributed to the work of in-depth, interactive and specific groups for the health sector in general and especially at GHSA 3. April 16-17, 2018: PREDICT/Guinea participated in the national workshop on zoonotic disease surveillance using the "One-Health" approach and field epidemiology. The workshop was held at the Institute of Veterinary Medicine of Dalaba and brought together the faculty of the Institute, the PREDICT/Guinea project, the FAO, the CDC, the ministries of livestock, environment, and Health. Prof. Alpha Oumar Camara, Country Coordinator of the PREDICT/Guinea project had the privilege of presenting the PREDICT surveillance activities in Guinea. This presentation served as a framework for the workshop. 4. May 16, 2018: PREDICT team members from HQ (Dr. Belkhiria) and Guinea (Dr. Kalivogui), joined the USAID / Guinea mission to visit the FAO's EPT-2 field activities in Kindia, a town located at 135 km from Conakry. This visit was an opportunity for PREDICT/Guinea to learn from other partners and to improve its strategies among the beneficiary communities of the project. 5. August 8-12, 2019: PREDICT/Guinea sent two field agents to Liberia (Monrovia) to participate in training in the administration of the behavioral questionnaires. These agents are now deployed in the field to collect data on community behaviors in the Animal-Human-Environment interface. The data collected will be analyzed and the results obtained will contribute to the characterization of the risks of zoonotic diseases to which the Guinean communities are exposed. 6. 31 July -2 August 2018: PREDICT/Guinea participated in the workshop held in Kindia to draft the One Health Strategic Plan. On the sidelines of this workshop, PREDICT/Guinea made a presentation on its

Kenya	simulation to learn how to approach an outbreak investigation using PREDICT biosecurity, biosafety protocols. A total of 37 participants attended, drawn from University of Nairobi and Moi University postgraduate students and their faculty mentors, veterinarians at both the national and county (Laikipia) level, Kenya Wildlife Services, Laikipia County health officers and members of the local community. The students observed first-hand a defined high-risk interface, learning about the different drivers and human behavioral risk factors that contribute to the emergence and/or spread of pathogens. In addition, the students learned how to apply the One Health concept to mitigate some of the problems the local community were experiencing (frequent diarrhea and flu-like symptoms). 2. PREDICT/Kenya has ongoing participation in the development of a curriculum that teaches a One Health approach to camel medicine, welfare, and husbandry, as well as proposed courses in zoonotic disease. These courses will be offered at the University of Nairobi, School of Veterinary Medicine and will be offered as part of a One Health certificate to undergraduate and postgraduate students, and also as part of continuous professional development (CPD) to practicing veterinarians. PREDICT/Kenya also continues to train interns on biosurveillance strategies and PREDICT protocols. In year 4, PREDICT continued to work with two MSc and one PhD student, who were trained and immersed in field and laboratory methodologies. 3. In the first quarter of Y4, PREDICT/Kenya continued to capacity build the national government laboratories by organizing a one-week advanced training in Molecular Laboratory Diagnosis to allow capability of detecting and identifying different viral families, including novel viruses, during routine surveillance and monitoring and in case of an outbreak. Participants were from two government national laboratories: the Central Veterinary Laboratory (CVL) and the Food and Mouth Disease (FMD) Laboratory. The two labs are referral labs and handle most of veterinary diagnostics within Kenya. 3. The PREDICT/Kenya CC, Dr. Kamau, participated in a FAO-organized training workshop in Nakuru between January 16-20th focused on a HPAI simulation. Dr. Kamau presented on the link between the health of wildlife and the environment with that of humans, and the importance of a multidisciplinary/multisectoral One Health approach to the investigation of a disease outbreak. 4. In January, the PREDICT/Kenya CC participated in a Kenya MERS-CoV Technical Working Group meeting (TWG), including an update on research and preliminary results release by FAO to partners. The meeting was held at the DVS boardroom and attended by DVS, USAID representatives, P&R, ZDU, FAO and P2. 5. In February, PREDICT/Kenya, jointly with OHW/OHCEA, FAO and USAID P&R conducted a One Health training event at Mpala Research Centre in Laikipia, Kenya (site of PREDICT testing). During the training, participants were taken through a pandemic simulation to learn how to approach an outbreak investigation using PREDICT biosecurity, biosafety protocols. A total of 37 participants drawn from University of Nairobi and Moi University postgraduate students and their faculty mentors, veterinarians at both the national and county (Laikipia) level, Kenya Wildlife Services, Laikipia County health officers and members of the local community. The students observed first-hand a defined high-risk interface, learning about the different drivers and human behavioral risk factors that contribute to the emergence and/or spread of pathogens. In addition, the students learned how to apply the one health concept to mitigate some of the problems the local community were experiencing (frequent diarrhea and flu-like symptoms).
Republic of Congo (RoC)	1. PREDICT/RoC successfully assisted in the implementation of a multi-sectoral One Health (EPT) consortium in 2017 involving: MoD, MoH, Ministry of Agriculture, Ministry of Forestry and Wildlife, Ministry of Environment, Ministry of Scientific Research, Ministry of Finance, Homeland Ministry, WHO, and FAO. 2. PREDICT/RoC project has carried out a training session to contribute to the application of "One Health" in Republic of Congo. From September 17nd to 25th , 2018, twenty people from government laboratory, institutions and ministries (LNSP, the Army Medical Hospital, the Faculty of Sciences and Technology at National Marien Ngouabi University, the General Director of Livestock and representatives from the Ministry of Water and Forestry) attended a PREDICT surveillance training given by a PREDICT EcoHealth Alliance scientist. The objective of this training session was to allow people from different institutions involved in "One Health" activities and research to meet and brainstorm around outbreak response and sampling protocols while being trained on all major PREDICT SOPs.
Rwanda	1. PREDICT/Rwanda participated and contributed expertise in a One Health SMART workshop convened by the One Health Workforce team to prioritize zoonotic diseases and develop a strategy for joint surveillance. 2. PREDICT/Rwanda participated in instruction of the University of Rwanda's Rift Valley Fever Outbreak Response training and workshop held in June 2018. PREDICT/Rwanda participated in the Government of Rwanda's One Health Steering Committee meetings, which served to gauge progress on achieving One Health goals for capacity strengthening. As well, PREDICT/Rwanda hosted veterinary student interns at Gorilla Doctors' headquarters in Musanze, Rwanda: students gained first-hand experience with zoonotic disease surveillance.
Senegal	1. In an effort to strengthen Senegal's laboratory networks and capacity for rapid detection of priority zoonotic diseases, a GHSA priority, PREDICT/Senegal held laboratory trainings on PREDICT protocols at UCAD and ISRA. This training was conducted by Dr. Alexandre Tremeau-Bravard from the University of California, Davis from 14-25 August, 2017. During this training period, PREDICT successfully provided an overview of general laboratory safety and sample handling including RNA extraction, cDNA synthesis, RNA quality check and consensus PCR for Filoviruses, Coronaviruses, Influenzas and Paramyxoviruses. UCAD and ISRA, critical nodes in Senegal's animal and human surveillance and laboratory networks, are now more skilled and working to advance Senegal's capabilities for detecting priority zoonotic diseases. As a result of the training the laboratories of UCAD and ISRA are now performing viral detection on animal and human samples collected by the PREDICT project. 2. PREDICT/Senegal held a training from 5-7 June 2018, for EISMV Wildlife Masters Students. 11 students were trained in PREDICT One Health protocols which incuded biosafety, biosecurity, safe animal sampling, data entry, and sample transport.
Sierra Leone	1. PREDICT/SL attended and presented at the World One Health day celebration on Friday November 3rd, 2017, organized by the USAID Preparedness and Response (P&R) project in coordination with the Ministry of Health and Sanitation (MOHS) and the Ministry of Agriculture, Forestry, and Food Security (MAFFS). The meeting was attended by government representatives and several key partners (PREDICT, CDC, USAID Mission, FAO, WHO, and Njala University) to raise awareness and provide updates for ongoing One Health projects in Sierra Leone. PREDICT was highlighted as an example of One Health in action. 2. PREDICT/SL held multiple OH sensitization sessions focusing on the "Living Safely with Bats" book over a 3 month period (April - June 2018). April 8th, 15th, 22nd, 29th May 6th, 13th, 20th, 28th June 3rd, 10th, 17th, 24th Locations: Bombali, Kono, Pujehun, Koinadugu, Western Area Rural districts, and Kambia PREDICT/SL engaged over 400 community stakeholders at district, chiefdom and community levels in our operational districts (Kambia, Bombali, Kono, Koinadugu, Western Area rural, and Pujehun). The community meetings focused mainly on zoonotic disease risk and messages on safe living with animals and healthy practices using the bat book. 3. Engagement meetings -Bombali virus discovery with Government and OH stakeholders Dates: June 1st, July 25th, August 2-3rd, 2018 Locations: Freetown, Makeni (for government, OH stakeholders), Robuya, Rosanda and Yeli Sanda communities PREDICT/SL held engagement meetings with ~50 national government and one health stakeholders to communicate the Bombali virus discovery in Freetown and Bombali district. We also visited the 3 communities where the positives bats were caught, to discuss the findings and how to safely live with the animals to prevent zoonotic disease transmission.
Tanzania	1. PREDICT/Tanzania Country Coordinator coordinated a group of 70 UGs and organized a session discussing PREDICT's One Health approach to surveillance. Postgraduates at SUA, took part in a training with OHCEA and 4 sessions on PREDICT. At IHI, the Director of sciences gave a presentation on PREDICT focusing on One Health. These sessions serve to increase the understanding and importance of One Health in Tanzania's future workforce. 2. The relationships PREDICT and GHSA are fostering between animal and human health sectors are helping build the foundation for a unified future workforce in Tanzania and are providing critical opportunities for institutionalization of emerging One Health networks. PREDICT/Tanzania is actively working together with government health professionals at the subnational level to train and strengthen the capacity of Tanzania's health professionals in areas at-risk for zoonotic disease emergence and spread. This period, PREDICT/Tanzania worked closely with a District Veterinary Officer, Zonal Veterinary Offices staff, and Livestock Field Officers, clinicians and nurses at sites in the Lake Zone where PREDICT/Tanzania is conducting zoonotic disease surveillance. Our aim is to build a One Health team at the district level where different departments and sectors learn and work together, share data and information, and actively participate in field-based surveillance activities to better conduct surveillance for zoonotic disease threats and prepare for potential outbreaks. In depth trainings this period involved a Livestock Field Officer from Ujiji municipal and covered biosafety and PPE use, safe animal capture and sampling, emergency preparedness, and safe sample storage and shipment. PREDICT/Tanzania also trained government health care staff in Ujiji Municipal and Kyerwa Districts at the Ujiji and Murongo Health Centres. These clinic-based trainings included the clinicians, lab technicians, and nurses and covered research ethics, biosafety and human syndromic surveillance, safe sample collection procedures, processing and storage. As a result, trained government and PREDICT/Tanzania staff are working together in the field and at both clinics where febrile patients enrolled, interviewed, and tested for zoonotic viral pathogens. 3. In July 2018, PREDICT/Tanzania Project staff contributed as both instructors and participants in the Rx One Health Summer Institute which aims to provide a "prescription" for advanced students and early career professionals to prepare them for immediate engagement in global health careers that will demand effective problem-solving skills, cross-disciplinary engagements, and solid foundations in field and laboratory activities. We had a cohort of 21 students represent the fields of veterinary and human medicine, public health, social science and laboratory technology and hail from 5 different countries, including the United States, Nigeria, Tanzania, Denmark, and Vietnam. PREDICT staff had an opportunity to share knowledge and experiences gained through involvement in One health surveillance, training, lab testing, community engagement, biosafety and biosecurity.
Uganda	1. PREDICT/Uganda trained four veterinary students attending Makerere University's College of Veterinary Medicine, Animal Resources and Biosecurity (COVAB) in the classroom on PREDICT modules and protocols for zoonotic disease, biosecurity, and animal handling and sampling. These students then obtained in situ experience with wildlife field surveillance activities, where they gained hands-on skills in safely and humanely capturing and sampling bats and rodents in and around people's farms and dwellings. 2. This year PREDICT/Uganda received and is training two final-year veterinary student interns from Makerere University College of Veterinary Medicine. The training focuses on safe animal capture and sampling in addition to personal protection (PPE) and safe transportation of samples to the laboratory. As well, students gained first-hand experience with PREDICT field surveillance.
ASIA	

Bangladesh	The crow mortality event was identified at a regular PREDICT wildlife surveillance site. The investigation was led by the Institute of Epidemiology, Disease Control and Research (IEDCR) in collaboration with PREDICT, the Bangladesh Livestock Research Institute (BLRI) and the Government of Bangladesh (GoB) Department of Livestock Services (DLS). Through the One Health Secretariat, PREDICT/Bangladesh collaborated with a team from the DLS during sample collection for this outbreak, as DLS has not participated in a crow outbreak previously, to increase the capacity of DLS to respond to crow mortality events. PREDICT/Bangladesh and DLS were both involved in GoB meetings to discuss the One Health outbreak response and regularly updated the One Health Secretariat. This is the first joint outbreak response for DLS and the PREDICT/Bangladesh team through the One Health Secretariat, which reflects the institutionalization of One Health and workforce capacity development among Government of Bangladesh partners. 2. Investigating Bat Population Near Human Viral Incident February 7th-12th, 2018, the PREDICT/Bangladesh team was requested to participate in a One Health investigation of bats roosting near a suspected Nipah virus outbreak in people of Bagura, Bangladesh. 3. January 29th – 31st, 2018, a PREDICT/Bangladesh team member participated in the Prince Mahidul Award Conference in Thailand. The participant presented a poster on PREDICT's One Health activities in Bangladesh. 4. PREDICT/Bangladesh is continuing to build a network of One Health professionals through increased presence in the scientific community by participating and presenting research findings at numerous international conferences. - PREDICT/Bangladesh had two oral presentations accepted and one poster presentation at the 15th International Scientific Conference (ISCon XV) of Chittagong Veterinary and Animal Sciences University (CVASU) held during 12-13 May 2018; - At the 5th International One Health Congress in Canada 22 - 25 June 2018, and the PREDICT/Bangladesh team had four scientific posters presented and the coordinator was invited to speak in a plenary session. The PREDICT/Bangladesh coordinator was also invited to submit an article in the One Health Communicator on "Nipah in Bangladesh: when epidemics become endemic," which was featured in the One Health Platform magazine and given to every conference participant; PREDICT supported the director of IEDCR to present on behalf of the PREDICT Bangladesh team. The director presented the following: "One Health Secretariat: A Formalized coordinating Entity for Operationalizing One Health in Bangladesh" in the Science Policy Interface session. - PREDICT/Bangladesh presented on One Health Economics at a conference organized by the Bangladesh Society for Veterinary Education and Research, part of a symposium on the 'Economic Impact of Prioritized Zoonotic Diseases' and included representatives from the ministries of wildlife, livestock and disease control and FAO. 5. PREDICT/Bangladesh approach to building inter-regional and international relationships in the One Health community and beyond as well as between networks is establishing connections for information and data sharing that will help the global community in the detection of priority zoonotic diseases. PREDICT has briefed the ministry partners and university students on the details of the One Health approach to surveillance for
Cambodia	1. PREDICT/Cambodia conducted training to update team members on protocols for surveillance in bats and rodents, livestock and humans, laboratory safety and sample handling and storage. The team included local national PREDICT staff, staff from the National Animal Health and Production Institute (NAHPRI), the Forestry Administration (FA), the Cambodian CDC and veterinary and bioscience students from the Royal University for Agriculture, and the Royal University of Phnom Penh. Following the training this team participated in coordinated sampling efforts using a One Health approach at a rodent trade hub on the border with Vietnam and in a bat guano harvesting community in cooperation with district animal and human health officials. By extending training to include government and University individuals, PREDICT/Cambodia is contributing to increasing the understanding of One Health as well as the Cambodia work force. 2. Building on training in previous years, additional local Cambodian staff from IPC (the National Influenza Reference Laboratory for Cambodia and an important training laboratory for national staff) and three veterinary students were trained in Year 4 of PREDICT 2 to use PREDICT protocols: Basic Laboratory Safety - 5 Biosafety and PPE - 4 Bat Sampling - 3 Rodent Sampling- 3 Emergency Preparedness - 2 Human Syndromic Surveillance - 2 Human Sampling - 1 Livestock Sampling - 12 Outbreak Response - 9 Policies and Plans - 3 Qualitative research - 1 staff from IPC in Safe Animal Capture and Sampling - 5 Safe Sample Transport and Storage - 3 All trainings were conducted in November 2017, except for the Livestock Sampling trainings which were conducted in February 2018.
Indonesia	1. In-service One Health training during PREDICT/Indonesia field surveillance activities with local partners from universities, ministerial offices of animal and public health, hospitals and primary health care centers. 2. In collaboration with the South East Asia One Health University Network (SEAOHUN), PREDICT/Indonesia hosted a fellow from the University of Malaya, Kuala Lumpur, an instance of cross-boundary workforce development efforts. 3. SEAOHUN awarded an internship to Ms. Tengku Idzan Nadzirah, who worked with PREDICT-Indonesia's two laboratory partners (PRC-IPB in Bogor and EIMB in Jakarta) for three months, an opportunity for both professional mentorship and skill development. Based on the success of this mentorship, SEAOHUN is planning to allocate two candidates for their fellowship program in 2018 to work with PREDICT-Indonesia's laboratory partners. 4. PREDICT/Indonesia conducted a half-day seminar on "Virus Surveillance in Wildlife for Preparedness of Potential Future Pandemic Diseases" in collaboration with Primate Research Center IPB, on 5 April 2018. Thirty-one (31) participants attended the seminar from various institutions, among others: USAID-Indonesia, Bogor Agriculture University, Center for Veterinary Research (BBLitvet), Veswick-Indonesia, Indonesian Institute of Sciences (LIPI), Center for Agricultural Quarantine, Animal Sanctuary Trust Indonesia (ASTI), Primate Research Center, as well as some from private companies.
Lao PDR	In October 2017, PREDICT/Lao PDR coordinated a meeting in Vientiane that brought together staff from the National Animal Health Laboratory (NAHL) and the National Center for Laboratory and Epidemiology (NCLE), providing a valuable opportunity for professionals from animal and human health sectors to develop working relationships, to discuss common goals in the context of PREDICT and to continue open lines of communication between national-level organizations. In the two weeks following this meeting, 2 NAHL staff (1 female) and 3 NCLE staff (1 female) took part in hands-on refresher sessions in PREDICT diagnostics and training in preparation of samples for viral sequencing, strengthening capacity in both animal and human health labs for zoonotic viral detection in Lao PDR. Shared protocols and collaboration of human and animal health laboratory professionals is integral to the PREDICT project in Lao PDR, and more importantly, aligns organizations for successful implementation of the One Health approach and allows Lao PDR to strengthen its capacity to detect and respond to zoonotic disease threats. During March 2018, six in-service professionals (1 doctor, 2 nurses [1 female], 1 lab technician, and 2 hospital administrative staff [1 female]) at Khong District Hospital in Champasack Province, Lao PDR, were trained in the following: PREDICT policies; protocols for biosafety and PPE; emergency preparedness; basic laboratory safety; provision of assistance during a disease outbreak or health event; human syndromic surveillance; and ethics for human subject research. This training strengthens the foundation of a One Health approach in this rural region by educating human health professionals on the risk of zoonotic disease and strengthening skillsets to enable involvement of these professionals in data collection to support development of interventions to mitigate the risk of spillover and spread of zoonotic viruses. This training marks the expansion of PREDICT's scope in Lao PDR, adding human biological sampling and increasing human behavioral surveillance in a geographic region where wildlife and livestock have been concurrently sampled by PREDICT and FAO since 2016. Improving this community's capacity for concurrent surveillance of zoonotic viruses in animals and humans with the aim to mitigate risks that originate at the interface between humans and animals lays important groundwork for growth of the One Health approach in Lao PDR. In November 2017, PREDICT conducted training for Khong District Hospital staff on ethical considerations for human research, how to perform ethnographic interviews and facilitate focus group discussions, sensitizing these health workers on risks associated with animal contact and zoonotic virus transmission. These training groups included 6 people (2 women) from the Khong District Hospital and the Champasack Provincial Health Office
Malaysia	Council. PREDICT/Malaysia Country Coordinator briefed them on PREDICT and IDEEAL work and the important role of Sabah Wildlife Department's Wildlife Rescue Unit (WRU) and Wildlife Health Unit (WHU) in this work and its One Health approach. The Country Coordinator highlighted the impact that this work is having both on wildlife and human health. Minister agreed that Ministry of Plantation Industries and commodities will continue to provide financial support to MPOC to fund WRU and WHU. The One Health aspect of the WRU and WHU work was one of the main reasons the Minister approved further funding as their work is not just benefiting conservation but public health as well. 2. 6 – 8 December 2017 - PREDICT/Malaysia arranged through the US Embassy using DTRA funding for 2 vets from Sabah Wildlife Department / WRU to attend the 4th Joint International Tropical Medicine Meeting held in Bangkok. Each year, the Faculty of Tropical Medicine host this event, giving researchers, policy-makers, doctors, scientists, public-health professionals, and students the opportunity to meet and learn from one another, for the improved health of people living in, and traveling through, the Tropics. The theme this year was ""Tropical Medicine 4.0 Effective Collaboration for an Impact on Global Health."" The meeting program covered a large range of tropical diseases, especially those endemic to Asia, to include: malaria, dengue, helminthic infections, bacterial, viral, fungal and parasitic diseases, and the fields of disease epidemiology, drug development, education, and biology. Attending this conference helps the vets think about their role from a One Health perspective and how their activities directly impact on One Health agenda. 3. 13 March: In preparation for PREDICT/Malaysia's next round of Orang Asli concurrent sampling one new staff member from the Gua Musang District Health team was trained in PREDICT protocols including presentations on One Health and zoonosis. 4. 26 March: In preparation for next round of PREDICT/Malaysia Orang Asli concurrent sampling four new staff member from the Kuala Lipis District Health team were trained in PREDICT protocols including presentations on One Health and zoonosis. These trainings increase the capacity of Malaysia's workforce to implement One Health surveillance. 5. 15-18 May 2018: PREDICT rodent and bat sampling SOP training for 1 UMS PhD student. Important to start next generation of One Health workforce thinking more about One Health, zoonosis and how to work safely. 6. 18 May: Training on handling and storing Trizol for 2 EHA staff and 5 PERHILITAN staff. The more individuals involved with lab and field work who understand the risks of working with Trizol and have been trained to work with Trizol safely makes an accident less likely, and in the event of an accident more likely that it will be correctly dealt with. 7. 30 May: Trained 5 DHO Kuala Kangsar and 1 DHO Kuala Lipis staff on Orang Asli study methods, biosafety & PPE and lab safety. District Health Staff have few opportunities for this kind of training. This is a great opportunity to remind them of the risks involved in their day to day activities so they can work more safely but also to refresh them on skills they would need during an outbreak. 8. 31 May – 8 June 2018: BioPlex capacity training conducted at NWFL (PERHILITAN) with students and staff from the Department of Wildlife and National Parks (DWNP), EcoHealth Alliance (EHA), National Public Health Lab (NPHL), Universiti of Malaysia (UM), Universiti Putra Malaysia (UPM) and Department of Veterinary Services (DVS). Seven individuals who received training in Year one participated in refresher training during this time. In total, Year Two training included staff from DVS/VRI (four), DWNP (four), EHA (six), UPM (two), UM (three), and NPHL (two). This training increased the number of staff from DVS, MoH and DWNP who have been trained to use BioPlex which will be useful for research, disease surveillance and outbreak diagnostics. 9. 24 May: TriZol handling, spills and first aid training for 2 WHU rangers. The more individuals involved with lab and field work who understand the risks of working with Trizol and have been trained to work with
Mongolia	PREDICT/Mongolia contributed to the one-Health approach in Mongolia through workforce strengthening on activities: 1. Continue training health (veterinary, zoonotic disease and protected area) specialists through Avian Influenza surveillance in wild birds at key targeted areas of Mongolia in 13 provinces including 6 province veterinary laboratory professionals, 3 protected area rangers and 3 province zoonotic disease center professionals on working as a team for surveillance, reporting outbreaks and responding, sending samples to the State Diagnostic Veterinary Laboratory 2. Continue to support State Central Veterinary Laboratory staff on workforce training though better disease detection, outbreak response and communication with environmental and health Ministries and officers for urgent communication and information sharing. 3. PREDICT/Mongolia supported establishment of Saiga PPR working Group to address wildlife disease outbreak issues among livestock health, environmental agency and national emergency management agencies and continue to educate professionals on One-health approach and need during various disease outbreaks among livestock wildlife and human health sectors. 4.One Health professionals have been trained in field surveillance and monitoring. In 2018 the PREDICT avian influenza field surveillance team, consisting of 4 veterinarians from 4 provincial veterinary laboratories, 5 protected area rangers, and 1 provincial zoonotic disease center professional, worked together as one team while collecting guano samples and investigating mortality among wild migratory birds. This surveillance team collected samples, but the activity also helped create professional partnerships and connections among the different organizations that act as hubs for One Health. These PREDICT-trained and immersed

Myanmar	1. PREDICT/Myanmar team joined the consultation meeting of SEAOHUN which aimed to review and incorporate One Health related curricula and projects in the invited universities of Myanmar. University of Medicine 1, Yangon volunteered to initiate One Health related intervention for its undergraduate and postgraduate programs. PREDICT/Myanmar was able to provide expertise and guidance on One Health surveillance, biosafety and biosecurity and other topics. 2. PREDICT/Myanmar team continued its capacity building in operationalization of laboratory analysis in laboratories in Department of Medical Research and Livestock Breeding and Veterinary Department. To operationalize the lab analysis, further capacity needs, technical consultations with UC Davis and procurement of reagents were supported to partners laboratories through Year 4. PREDICT/Myanmar team conducted two orientation sessions on MSDS by using product safety data sheets from Fisher Sciences (Delta Science company) for each products and reagents which are using for lab analysis in two laboratories. 3. The PREDICT/Myanmar team continued providing capacity building surveillance training to Township LBVD officials, animal handlers from Hlawga Nation Park, basic health staff and community health workers in Hpa-an, Hmawbi and Oakkan, Taikkyi, Yangon both in dry and wet season samplings of Year 4. A remarkable impact of the capacity building was seen with the community health workers in that they could apply the knowledge they received from the P2 surveillance training into identifying new potential sites of human wildlife interface. With their observation and risk identification, the P2 team could expand 3 new villages with potential high risk of disease interface in Yangon and Hpa-an, expecting to receive more efficient data and information. 4. PREDICT/Myanmar team organized two feedback meetings with DMR, Yangon and with LBVD in Naypyitaw in May 2018 and presented the progress and findings of P2 implementation in Myanmar to officials from Central Epidemiology Unit, Forestry Department, Myanmar Medical Association, Yangon City Cancer Project, University of Medicine 1, Yangon and P2 partners. In these meetings, Asst Director, CEU and LBVD sought some technical clarifications on research methodology related to site selection, operational definition of risk population and study period. Director from MONREC requested to include capacity building for MONREC staff especially staff from the zoo, sanctuaries and natural areas for safe animal handling, awareness raising and personal protection. The trainings for MONREC staff are planning to conduct in Year 5.
Nepal	1. PREDICT/Nepal conducted trainings for the local workforce on utilizing a One Health approach with community engagement (June 2018) 2. PREDICT/Nepal trained the global workforce on a One Health approach for disease surveillance and research through presentations on One Health, visits in community and hospital surveillance sites and engagement in PREDICT related activities in Nepal. Students from Touro University, California, Michigan state university, Michigan in USA and Mcmaster University in Canada visited PREDICT sites to observe one health research implementation on site.
Thailand	1. PREDICT/Thailand hosted training for one Malaysian scientist from the 2017 SEAOHUN Fellowship Program on October 9-15, 2017. The scientist received training in biosafety and field bat sampling. 2. PREDICT/Thailand organized the "Global One Health Day 2017: One Health Challenges in Thailand 4.0 Era Conference" in collaboration with the Department of Disease Control on November 27, 2017. Thailand's Country Coordinator presented PREDICT/Thailand's progress as part of the One Health mission in Thailand. 3. Hosted training for two Chinese scientists from the Wuhan Institute of Virology on May 17-20, 2018. The trainees received training in field bat sampling. 4. PREDICT Thailand and global team conducted the training workshop on "PREDICT Behavioral Risk Surveillance and Intervention Development-Quantitative and Qualitative Methods" for staff from Loei hospital on May 2, 2018 and for staff from the Ratchaburi Office of Disease Prevention and Control on May 4, 2018.
Vietnam	1. Through partnership with PREDICT/Viet Nam, the Hanoi School of Public Health (a Viet Nam One Health University Network - VOHUN member) has increased capacity in conducting qualitative research as part of a One Health approach to addressing behavioral risk associated with zoonotic disease. PREDICT/Viet Nam provided training in One Health approaches to qualitative research to 11 female and 5 male members of the junior faculty or recent graduates of the HSPH. The teams in turn have been involved in conducting ethnographic interviews and facilitating focus group discussions on behavioral risks associated with animal/wildlife handling and contact. 2. PREDICT/Vietnam participated in the Annual One Health Forum organized on May 30, 2018, in Hanoi. The meeting was attended by a total of 84 representatives from various agencies and international organizations, including the Ministry of Agriculture and Rural Development (MARD), the Ministry of Health (MoH), the French Organization for Agriculture Research and Development (CIRAD), the Oxford University Clinical Research Unit (OUCRU), FAO, WHO, US CDC, USAID and WCS/PREDICT. The aim of this forum is to review the implementation progress of the National One Health Strategic Plan (OHSP, 2016-2020) as well as enhance policy development for focus sectoral issues and strengthen international cooperation in One Health activities. During the event, PREDICT contributed comments and ideas and shared relevant experience and lessons learned in support of One Health collaborative partnerships. 3. PREDICT/Vietnam participated in The One Health Assessment for Planning and Performance (OH-APP), chaired by the Deputy Director of the General Department of Preventive Medicine in Ninh Binh Province, on August 14 – 15, 2018. A total of 30 participants from the MoH, the Department of Animal Health (DAH), USAID, the National Institute of Hygiene and Epidemiology (NIHE), Vietnam National University of Agriculture (VNUA), CIRAD, the National Institute of Veterinary Research (NIVR), P&R, and PREDICT attended this meeting. The purposes of the OH-APP are to assess the maturity of Vietnam's One Health coordinating mechanisms, and to provide data for decision-making that would enhance organizational capacity and One Health performance for the country. PREDICT and its study results were introduced and contributed during the meeting. 4. WCS attended and introduced PREDICT to the Training Program on Adjudication of Cases Relating to Crimes Against Protected Wildlife Under the 2015 Penal Code, organized on August 23-24, 2018. Forty-seven participants, working in the Supreme People's Court and People's Court of 18 Provinces of Southern Viet Nam attended the training. PREDICT provided a lecture during the training focused on the potential risk of disease transmission along the illegal wildlife trade network to increase awareness of the different government agencies responsible for wildlife trade law enforcement.
MIDDLE EAST (Regional)	
Jordan	PREDICT/Jordan, in collaboration with USAID/Jordan, is actively engaging veterinarians and laboratorians in southern Jordan in One Health capacity-building activities, including improving diagnostic capabilities for zoonotic pathogens. Trainings in diagnostic laboratory techniques and implementing a One Health approach for government officials and veterinarians/laboratorians from Southern Jordan are currently in preparation to be held later this year. Southern Jordan does not have the same One Health capabilities as Middle and Northern Jordan, which is why these trainings will help bridge the gap.

***for the period 10/1/17-9/30/18 ONLY**

23 countries

Indicators 2.1a	Total # of faculty members that received OH training or professional development	Females	Males	Animal Health Field	Human Health Field	Other
AFRICA (Regional)						
Cameroon	22	6	16			22
Cote d'Ivoire	11	5	6			11
DRC	13	3	10		4	9
Ethiopia	5	1	4			5
Ghana	3		3			3
Guinea			0			0
Kenya	10	3	7	7		3
Liberia	20	7	13			20
RoC	4	1	3			4
Rwanda			0			0
Senegal	4		4			4
Sierra Leone	19	6	13			19
Tanzania	43	29	14			43
Uganda			0			0
ASIA (Regional)			0			0
Bangladesh	17	8	9			17
Cambodia	12	5	7			12
China	12	4	8			12
India	11	3	8			11
Indonesia	26	14	12	7		19
Lao PDR	3	2	1			3
Malaysia	18	9	9	4		14
Mongolia	3	1	2			3
Myanmar	10	4	6	4		6
Nepal	12	5	7			12
Thailand	18	12	6			18
Vietnam	15	12	3	9		6
MIDDLE EAST (Regional)			0			0
Egypt			0			0
Jordan	12	3	9			12
GLOBAL	26	22	4			26
	349.00	***165.00***	***184.00***	***31***	***4***	***314***

Faculty are defined as those within a University/academic research institute that report as not being a student; participant can report multiple fields of health area

***for the period 1/1/17-3/31/18 ONLY**

TOTAL

***for the period 1/1/17-9/3/18 ONLY**

INDICATOR TITLE CHANGE: List of publicly available educational, training, and/or implementation resources developed and shared

Indicators 2.1b	Total # of educational materials developed	OH Modules	Case Studies	Training Manuals	Textbooks	Other (including PPT's)	*Educational Materials refer to instructional course or training modules/materials (including course packets, instructor guidelines, quizzes, standard operating protocols), stand-alone textbooks or case studies, FETPV materials*
AFRICA (Regional)							***for the period 10/1/17-9/30/18 ONLY**
Cameroon	1					1	*Living Safely with Bats*
Cote d'Ivoire	1					1	*Living Safely with Bats*
DRC	1					1	*Living Safely with Bats*
Ethiopia	0						
Ghana	1					1	*Living Safely with Bats*
Guinea	2					2	PREDICT Guinea made flyers for public information, communication and Education; *Living Safely with Bats*
Kenya	0						
Liberia	0						
RoC	1					1	*Living Safely with Bats*
Rwanda	1					1	PREDICT participated in Gorilla Doctors' production of tourist outreach materials (video and signage) now permanently on display at Volcanoes National Park headquarters and at all gorilla tourist embarkation points, including a ranger posts, which educate tourists as to the risk of disease transmission among gorillas and people, and reminds tourists about tourism rules which help limit the risk of disease transmission. This effort was US Embassy RWANDA-funded, but benefitted from the input and credibility of our PREDICT Rwanda team.
Senegal	1					1	*Living Safely with Bats*
Sierra Leone	1					1	*Living Safely with Bats*
Tanzania	2					2	PREDICT posters and outreach materials developed for the launch of the Tanzania National One Health Platform in February 2018. *Living Safely with Bats*
Uganda	0						
ASIA (Regional)							
Bangladesh	1					1	*Living Safely with Bats*
Cambodia	1					1	*Living Safely with Bats*
China	0						
India	0						
Indonesia	1					1	*Living Safely with Bats*
Lao PDR	1					1	*Living Safely with Bats*
Malaysia	2					2	5 December 2017 - A documentary titled "The Amazon of the East – Balancing the scales" focusing on the Deep Forest Project in Kinabatangan aired on the Animal Planet Chanel (South East Asia). *Living Safely with Bats*
Mongolia	0						
Myanmar	0						
Nepal	1					1	*Living Safely with Bats*
Thailand	1					1	*Living Safely with Bats*
Vietnam	1					1	*Living Safely with Bats*
MIDDLE EAST (Regional)							
Egypt	0						
Jordan	0						
GLOBAL	3			3			Revision of global training materials for animal samling
Total	*24.00*	*-*	*-*	*3*		*21*	

***for the period 10/1/17-3/31/18 ONLY**

NEW INDICATOR

Indicators 2.2a	Total # of future professionals trained	SEX			AFFILIATION		
		Male	Female	Undeclared	Animal Health Field	Human Health Field	Other
AFRICA (Regional)							
Cameroon	18	7	11				18
Cote d'Ivoire (EHA)							
Côte d'Ivoire (IP)							
Côte d'Ivoire (IP/EHA)	6			6			6
DRC							
Ethiopia	2	2					2
Ghana	4			4			4
Guinea	1	1					1
Kenya	5	1	4		1		4
Liberia							
RoC	5	2	3				5
Rwanda							
Senegal	1	1					1
Sierra Leone							
Tanzania	10		1	9	0	1	9
Uganda	4			4	1		3
ASIA (Regional)							
Bangladesh	1	1					1
Cambodia	3	1	2				3
China	2	2					2
India	1	1					1
Indonesia	1		1				
Lao PDR							
Malaysia	21	12	9		4		17
Mongolia							
Myanmar	1			1			1
Nepal	1		1		1		
Thailand	2	1		1			2
Vietnam	3	1	2		1		2
MIDDLE EAST (Regional)							
Egypt	9	4	5				9
Jordan							
GLOBAL	3	1	2				3
TOTALS	104	38	41	25	8	1	94

Future professionals = Individuals enrolled in certificate/degree programs at member universities, regardless of whether were once in the workforce or not. This classification is based on self-identification by the participant on OHW training rosters. For P2, students are self-identified during training sessions.

***for the period 1/1/17-3/31/18 ONLY**

This indicator captures individuals who classify themselvs as students.

***for the period 1/1/17-3/31/18 ONLY**

NEW INDICATOR								
		SEX			AFFILIATION			
Indicators 2.2b	**Total # of OH fellows placed**	**Male**	**Female**	**Undeclared**	**Animal Health Field**	**Human Health Field**	**Other**	*Fellowship includes temporary placement in an approved One Health organization/activity; Fellows include students and early-career professionals*
AFRICA (Regional)								
Cameroon								
Cote d'Ivoire (EHA)								
Côte d'Ivoire (IP)								
Côte d'Ivoire (IP/EHA)								
DRC								
Ethiopia	2	2				1	1	
Ghana								
Guinea	4				1	1	2	
Kenya	2	2			1	1		
Liberia								
RoC								
Rwanda								
Senegal								
Sierra Leone								
Tanzania	1		1					
Uganda								
ASIA (Regional)								
Bangladesh	1		1		1			
Cambodia								
China								
India								
Indonesia	2	2		2		1	1	
Lao PDR								
Malaysia								
Mongolia								
Myanmar								
Nepal	1		1					
Thailand	1	1			1			
Vietnam	3	1	2		2	1		
MIDDLE EAST (Regional)								
Egypt								
Jordan								
GLOBAL	1		1		1			
TOTAL	18	8	6	2	7	5	4	***Students are captured in Indicator 2.2a**
***for the period 10/1/17-3/31/18 ONLY**								

*Note to M&E team: Fellows includes students from EIDITH for each country **and/or** includes country-reported fellows from Word questionairre. Group trainings were not included due to fellowship being defined as a **placement**.*

Indicator 2.2c		By Sex			Affiliation		
	Total # of current professionals trained	Male	Female	Undeclared	Government	Academia/Research	Other
AFRICA							
Cameroon	27	18	9				27
Cote d'Ivoire	28	21	7		18	10	
DRC	17	15	2				17
Ethiopia	9	7	2		5		4
Ghana	10	8	2		5	3	2
Guinea	38	32	6				
Kenya	3	3				3	
Liberia	23	17	6				22
RoC	8	7	1		6		2
Rwanda	6	6					6
Senegal	13	9	4			10	3
Sierra Leone	19	14	5			3	16
Tanzania	29	14	15		9	16	4
Uganda	3	2	1				3
ASIA							
Bangladesh	21	14	7		1	5	15
Cambodia	11	6	5			5	6
China	14	10	4			11	3
India	4	3	1			2	2
Indonesia	21	10	11			16	5
Lao PDR	20	11	9		8		12
Malaysia	75	43	32		57	1	17
Mongolia	4	3	1		1		3
Myanmar	5	4	1				5
Nepal	28	19	9			1	27
Thailand	44	30	14		24	16	4
Vietnam	6	5	1				6
MIDDLE EAST							
Egypt	13	8	5		13		
Jordan	12	9	3			6	6
Global Team	57	17	40				57
TOTAL	568	365	203		147	108	274

*for the period 10/1/17-9/30/18 ONLY

Current professional: all project staff (including faculty, lab and veterinarians, and administrative/support staff who work on the PD project).

Note to M&E team: Current professionals for this year includes trainees marked as active in EIDITH. Does not include trainees whom are grandfathered in... (i.e Jonna Mazet , Woutrina Smith, Matt Lebreton, Peter Daszak, etc.). Active status captures current professionals whom may have not needed to take a refresher quiz during Y4

Indicator 3B (Outcome Level)	QUALITATIVE INDICATOR: List/Description of global, regional or country (lab, surveillance, workforce, OH, AMR) strategies under implementation *include title of strategy, brief description of focus/topic of strategy, if the strategy was endorsed and by whom	*Includes evidence of Improved coordination of the national focal points with sub-national and community levels; multi-ministry or multi-sectoral teams on the ground (for example, in outbreak investigations).*
Indicate Country, Region or Global		
Bangladesh	PREDICT/Bangladesh attended the following meetings and contributed One Health expertise: October 27th, 2017: The PREDICT team participated in a One Health economic meeting at the World Bank office in Dhaka, organized by the World Bank Bangladesh office. The following partners were included: One Health Bangladesh, IEDCR, DLS, and P&R. On the 4th of December 2017, PREDICT participated in a meeting held by the National Technical Committee on Avian Influenza, organized by DLS. On the 19th of December 2017, the team participated in a workshop on the Transmission of Avian influenza from wild to domestic birds, which was organized by the IUCN. PREDICT actively supports the Government of Bangladesh's One Health Secretariat and has contributed and advised to further development of the national One Health platform, particularly regulations discussions and plans for the creation of policy related to data dissemination and sharing, as well as national viral priority setting, emerging threats and addressed critical issues towards increased One Health capacity.	
Cambodia	PREDICT/Cambodia attends and provides expertise for the Cambodian government's Zoonotic Technical Working Group	
Cameroon	PREDICT/Cameroon participated in multi-sectoral meetings to develop strategic surveillance plans for priority zoonoses (rabies, anthrax, and avian influenza), and to evaluate the epidemiological surveillance networks for animal diseases in Cameroon (RESCAM) using the FAO Surveillance Evaluation Tool (SET). This evaluation used a One Health approach to identify gaps and weaknesses in the animal disease surveillance system in Cameroon. To address current JEE and RESCAM (animal disease surveillance network) assessments and workforce insufficiencies, the future One Health workforce also depends on the development of strategic education programs to ensure ongoing and improved capacity for wildlife disease surveillance. PREDICT/Cameroon is participating in curriculum development for a Master of Science degree in Wildlife Health, with intake planned to begin in 2019 at the University of Buea, located in the Southwest Region of Cameroon.	
Cote d'Ivoire	National Sanitary Security Plan in CIV. Providing expertise in One Health surveillance, viral detection, and multi-sectoral information sharing at workshops. Upon invitation from the Coordinating Unit, PREDICT/CIV contributed to the One Health approach to surveillance for priority zoonosis and emerging threats by supporting working groups in preparation for the workshops. The PREDICT/CIV team reviewed the pathogen classification system and evaluated the prioritization of microorganisms during a workshop at IPCI on December 17, 2017. Developing an integrated surveillance system for zoonosis. On December 2, 2017, PREDICT/CIV was invited to take part in a workshop on monitoring systems of animal biodiversity and integrated surveillance of zoonosis, organized by the FETP-Frontline. The workshop was aimed at developing an integrated surveillance system for zoonosis within the framework of a One Health approach, following the recommendations of the Joint External Evaluation and the prioritization of zoonotic diseases to be monitored in Côte d'Ivoire (anthrax, salmonellosis, rabies, highly pathogenic avian influenza, bovine / human tuberculosis, hemorrhagic fever, brucellosis, echinococcosis, cysticercosis, and Rift Valley fever). PREDICT CIV participated in 3 workshops to draft (12-14th June 2018, Abidjan), pre-validate (9-11th July 2018, Grand-Bassam) and validate (25-26th September 2018, Azalai Hotel Abidjan) the "One Health Strategic Plan for Côte d'Ivoire". The "One Health" National Strategic Plan, which is a fundamental policy document, will articulate the vision, organization, measures, accountability mechanisms and monitoring and evaluation as part of the implementation of the "One Health" approach in Côte d'Ivoire. This document has been validated by the Technical Secretariat of the Global Health Security Agenda (ST-GHSA) members and the "One Health" stakeholders in Côte d'Ivoire. The final document will be transmitted to the Ivorian government for information. The signature of the decree establishing the "One Health" platform is still awaited.	
DRC	PREDICT/DRC participates in strategic planning and execution at the provincial level through a collaborative effort with the Provincial Division of Health in the Epidemio-Surveillance program. PREDICT/DRC participates in bi-weekly meetings where current disease situations are discussed among attending physicians, veterinarians, and public health personnel. Since the 2018 EBOLA outbreak was declared, PREDICT has been participating on the crisis coordination committee, contributing in particular to epidemio-surveillance information sharing and planning, and on laboratory-based surveillance.	
Ethiopia	In December 2017, the PREDICT/Ethiopia Country Coordinator attended the "Ethiopia National One Health Strategic Plan Validation, Organizational Structure Development and MoU Review Workshop," organized by USAID Preparedness and Response. The purpose of the workshop was to review and validate the draft National One Health Strategic Plan, agree on the Organizational Structure of the National One Health Platform and review and agree on the inter-sectoral collaboration, Memorandum of Understanding. In January 2018, PREDICT/Ethiopia participated in OH Steering Committee Meetings where the National One Health Strategic Plan (2018-2022) for Ethiopia was endorsed. Also in December 2017, the PREDICT/Ethiopia Country Coordinator attended a workshop organized by FAO ECTAD and the National One Health Steering Committee (NOHSC). The aim of the workshop was to initiate the establishment of a multi-stakeholder and inter-sectoral National One Health Communication Network (OHCN), in Ethiopia in collaboration with the Government Communication Affairs Office. The attendants of the workshop were the Government Communication Affairs Minister, Livestock and Fishery State Minister, Ethiopian Wildlife Conservation Authority General Director and FAO Representative to Ethiopia as well as delegates from Government Ministry offices, NGOs, academic and research institutions, professional associations, donors, development partners, organizations, and the media. PREDICT/Ethiopia contributed in the revision of Public Health Emergency Management (PHEM) guidelines of Ethiopia.	

Ghana	PREDICT/Ghana played a leadership role in the national GHSA One Health Zoonotic Disease Prioritization Workshop in March 2018. The workshop identified 31 zoonotic diseases in Ghana. Participants identified a list of six priority zoonotic diseases, including anthrax, rabies, zoonotic tuberculosis, zoonotic avian influenza, hemorrhagic fevers, and trypanosomiasis. Dr. Richard Suu-Ire, the wildlife veterinarian at the Wildlife Division of the Ministry of Land and Natural Resources and the lead coordinator for wildlife disease surveillance for PREDICT in Ghana was invited to deliver a presentation entitled "Environmental Dimensions of Health Security –Strategies and Partnerships from Ghana" at the International Stakeholder Consultation on National Health Security and Pandemic Influenza Preparedness Planning in Ghana in December 2017. The objectives of the stakeholder consultation were to strengthen collaboration and coordination regarding the implementation of the national and global action plans of influenza pandemic preparedness and response with multi-sectoral stakeholders, including FAO and OIE; finalize the strategies and priorities with partners for influenza pandemic preparedness and response; share the status of country influenza pandemic preparedness, identify gaps and challenges and prioritize actions at national, regional and global level; align efforts among key stakeholders to address prioritized gaps and implement the WHO pandemic preparedness plan, within the framework of national action plan for health security. Through his presentation, Dr. Suu-Ire stressed the importance of the involvement of wildlife/environmental sector in the action plans for influenza preparedness as capacity in that sector is needed to address HPAI threats. PREDICT/Ghana is also a key partner in Ghana's One Health strategy for canine rabies control that is being championed by Rabies in West Africa (RIWA), whose lead person is PREDICT'S Wildlife Coordinator, Dr. Richard Suu-Ire. Dr. Suu-ire and the Country Coordinator, Dr. Bel-Nono conducted community outreach and education on rabies control during community canine vaccination programs in September and October 2018. PREDICT/Ghana is strongly involved in the Ghana One Health Platform, which is coordinating and advocating for a national policy for One Health in Ghana. So far, the PREDICT Country Coordinator in collaboration with the EPT national coordinator at FAO, have briefed the Chief Directors of the Ministries of the Environment, Food and Agriculture, and Water and Sanitation on One Health and discussed One Health approaches in Ghana. Upcoming visits to the Ministry of Health and the planning unit of Government are planned in 2019.	
Guinea	PREDICT/Guinea played an active role in the development of the Guinean One Health Platform's Strategic Plan. They continue to provide consultation to the One Health platform on using a One Health approach to disease control, specifically influencing the Guinean national zoonotic disease surveillance network.	
Kenya	PREDICT/Kenya Country Coordinator participated and offered technical expertise in the Community Leaders' Consultative Meeting on Climate Change and its Effect on Social-Ecological Systems within Different Land Use Sysetms in Laikipia County, Kenya.	
Lao PDR	PREDICT/Lao PDR worked closely with Lao PDR Government's Department of Communicable Diseases Control and Department of Livestock and Fisheries, USAID, US CDC, DTRA, WHO, and FAO during 30 July – 03 August 2018 in Savannakhet province, to provide technical support for a cross-border table-top exercise on novel influenza viruses. This joint exercise aimed to strengthen multi-sectoral cross-border preparedness and response mechanisms for novel avian influenza viruses between Lao PDR, Cambodia, and Thailand, to improve communication and information sharing, and to identify priority actions and opportunities for effective coordinated responses.	
Liberia	The PREDICT/Liberia team has been involved in several national level discussions including: The drafting and finalization of the National One Health Platform governance manual, the National Action Planning for Health Security, and development of a national surveillance plan for monkey pox. The National One Health Platform has been established with several line ministries consisting of the steering committee with the Vice-President as chair. In addition, PREDICT/Liberia has recently been involved with developing a national NGO One Health forum that will align NGOs with government One Health activities and fit within the existing structure of the National One Health Platform. PREDICT/Liberia has been involved in several high level meetings related to development and implementation of the One Health Platform and associated technical working groups, in the development of a national strategy for rabies control and for Lassa fever surveillance. PREDICT/Liberia has also begun piloting the Word Bank's One Health Assessment tool in Liberia. This work is ongoing. PREDICT's presence at the weekly National Epidemic Preparedness, Response and Control meetings has led to better coordination and information sharing across the health sectors. Capacity building within Liberia's laboratory network is being coordinated by PREDICT along with FAO, MoA and NPHIL.	
Malaysia	The PREDICT/Malaysia Laboratory Manager attended the International workshop on molecular diagnosis for Elephant endotheliotropic herpesviruses (EEHV) infection at Faculty of Veterinary Medicine, Kasetsart University, Thailand with Wildlife Rescue Unit veterinarian Laura Benedict as part of the effort to help Sabah Wildlife Department to establish EEHV surveillance for Sabah.	
Mongolia	PREDICT/Mongolia and FAO/OIE are supporting the National strategy on PPR Eradication, pushing for wildlife friendly FMD control strategies. The PREDICT team in Mongolia has contributed to the National Peste des Petits Ruminants (PPR) Eradication Strategy which will be endorsed by the FAO/OIE and the Mongolian Government by the end of 2018. The work in Mongolia around PPR focused on addressing the disease at the livestock and wildlife interface using a One Health approach.	
Myanmar	In May 2018, the PREDICT/Myanmar team participated in the "Partner meeting of P2" which was organized by USAID RDMA and Burma mission in Yangon, and presented "the current status of P2 implementation in Myanmar". FAO and WHO team shared the progress and experiences of P2 project at this meeting to all partners. PREDICT actively contributes technical expertise to Myanmar government through in-person consultations and meetings and team continues to supporting capacity enhancements for the animal and human health sectors.	
Nepal	PREDICT/Nepal provided expertise to assist in building the One Health Network for South Asia at "The second One Health International Conference 2017" in Thailand. As a result, Nepal is a member of the One Health Network for South Asia and will be contributing to building strong collaboration in the region for One Health activities. PREDICT participated in the "Regional workshop on surveillance and cross-border collaboration on transboundary animal disease and zoonoses in South Asia", organized by the Food and Agriculture Organization in Bangkok, Thailand. This regional conference and workshop focused on establishing a network of various stakeholders to use One Health as a platform to tackle zoonotic diseases within country and between countries of South Asia. PREDICT/Nepal has been leading various aspects of zoonotic disease research and prevention through a One Health approach.	
Republic of Congo (RoC)	The RoC IHR committee is chaired by the Director General of Epidemiology and Disease Control and Response (DGELM). Within this framework, PREDICT RoC supported the last Monkeypox epidemic in the North zone in 2017. PREDICT/RoC contributed to the validation of the committee and its importance towards supporting One Health outbreak response activities.	
Rwanda	PREDICT/Rwanda plays an important role in implementation of the Government of Rwanda's national One Health Strategy, as an active member of Rwanda's One Health Steering Committee, which identifies surveillance for wildlife zoonotic pathogens as a priority for the country. PREDICT/Rwanda also set up and maintains the country's only wildlife virology laboratory.	
Senegal	PREDICT/Senegal participated in a National One Health meeting organized by the COUS (Center of Emergency Operations), Ministry of Health in February 2018. The purpose of this meeting was to validate and map the major health risks in Senegal. PREDICT/Senegal contributed expertise in the discussion of mapping Senegal's health risks by region as well as identifying next steps towards further identification and reduction of health risks in the country. PREDICT/Senegal participates in the One Health Task Force for elaboration of national strategy according to the GHSA action packages/themes (coordination, prevention, detection, response, non-infectious risks, personal development, biosecurity, and research). This Task Force brings together representatives from several national sectors involved in GHSA activities. Thematic groups are responsible for developing documents whose synthesis contributes to the national strategy under the GHSA.	

Sierra Leone	PREDICT/SL participated as observers and advisors in the zoonotic disease prioritization workshop held in Freetown by DAI USAID Preparedness and Response Project from November 15- 17, 2017. Six Zoonotic Diseases were prioritized for multi-sector collaboration in the country: Viral Haemorrhagic Fevers (Ebola/Lassa), Rabies, Zoonotic Influenza (Avian, Swine), Salmonella, Anthrax, and Plague. PREDICT/SL participated in the GHSA/IHR/JEE five-year strategic activity planning for the country in October 2017, organized by the Ministry of Health and Sanitation (MOHS) with support from WHO. This meeting determined the top disease priorities for health sector development in Sierra Leone. PREDICT/SL participated and provided technical support to the Government in the REDISSE project (sponsored by World Bank) review activity and prioritization and planning process, which took place in November and December 2017 in Freetown and Makeni, respectively.	
Tanzania	PREDICT/Tanzania country coordinator actively contributes technical expertise to the National One Health platform, through in-person consultations and implementing GHSA trainings for outbreak prepardness particuarly in transboundary areas near the Ebola outbreak zone in DRC. The PREDICT/Tanzania team continues to actively supporting capacity enhancements for the animal and human health sectors.	
Thailand	PREDICT/Thailand actively contributes towards improving national surveillance capacity. PREDICT-1 enterovirus PCR protocols have been implemented at the Thai Red Cross Emerging Infectious Diseases Health Science Centre (PREDICT lab) for testing patient specimens from the Ministry of Public Health (MOPH) under the National surveillance program for hand, foot, and mouth disease. PREDICT protocols (human sampling and PCR) have been implemented as national guidelines by the Bureau of Epidemiology, Department of Disease Control, MOPH to collect and test the samples from the soccer team trapped in the Tham Luang cave and rescuers. The specimens were tested at PREDICT lab and partner labs.	
Uganda	PREDICT/Uganda was requested to attend the 4th High-Level GHSA Ministerial meeting in Kampala on October 25-27, 2018 joining Uganda EPT partners in updating USAID GHSA leadership on its One Health approach to better understanding zoonotic viral spillover from wildlife into people. PREDICT/Uganda has been a consistent participant in coordinating efforts for GHSA Implementation, sharing information about PREDICT surveillance activities and findings (once government-approved for public release). PREDICT/Uganda equips the Uganda Virus Research Institute with protocols and reagents to support zoonotic pathogen screening of wildlife and human samples at UVRI.	
Vietnam	As a member of the One Health Partnership for Zoonosis in Viet Nam, PREDICT/Viet Nam contributed to the development of the Viet Nam One Health Strategic Plan for the period 2016 to 2020, led by the Ministry of Agriculture and Rural Development together with the Ministry of Health. PREDICT/Viet Nam contributions included providing guidance on research, surveillance and laboratory approaches designed to detect potential emerging zoonotic threats. PREDICT/Viet Nam was engaged in strategizing how to implement and meet targets outlined in the national strategy entitled, "Viet Nam One Health Strategic Plan for Zoonotic Diseases 2016-2020", that has been approved by the Ministry of Agriculture and Rural Development, since December 2016. The goal of the strategy is to reduce the health and other impacts of zoonotic diseases and diseases of animal-origin, through a number of objectives, including strengthening One Health capacity for prevention and control of all zoonotic diseases, enhancing preparedness for a human emergency of animal origin, and applying One Health principles to limit the public health impact of current priority zoonotic diseases. PREDICT/Viet Nam has participated in discussing almost all focus areas of the strategy, including One Health capacity building, managing human disease emergencies of zoonotic origin, zoonotic agents with pandemic potential that are yet to emerge, managing zoonotic influenza viruses with pandemic potential, and managing other priority zoonotic diseases.	
	23 countries	

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Indicator 3.2a	Total # evidence-based information al resources developed	# policy briefs	# research papers	# situational analysis/risk assessment	# zoonotic prioritization resources	#Other	Provide a list and brief description of each resource: include a summary of the subject/topic, include country/region
WEST AFRICA (Regional)							
Cameroon							
Cote d'Ivoire (EHA)							
Côte d'Ivoire (IP)							
Côte d'Ivoire (IP/EHA)							
Ghana							
Guinea							
Liberia							
Senegal							
Sierra Leone	1		1				T. Goldstein, S.J. Anthony, A. Gbakima, B.H.Bird, J. Bangura, A. Tremeau-Bravard, M.N. Belaganahalli, H.L.Wells, J.K.Dhanota, E.Liang, M.Grodus, R.K.Jangra, V.A.Belessu,G.Lasso, B.R.Smith, A. Jambai, B.O. Kamara, S. Kamara, W. Bangura, C. Monagin, S. Shapiro, C.K.Johnson, K.Saylors, E.M. Rubin, K. Chandran, W.I.Lipkin, J.A.K.Mazet. **The discovery of Bombali virus adds further support for bats as hosts of ebolaviruses**. *Nature microbiology*. August 2018.
EAST & CENTRAL AFRICA (Regional)							
DRC	1		1				Charles Kumakamba, Ipos Ngay Lukusa, Placide Mbala Kingebeni, Frida N'Kawa, Joseph Atibu Losoma, Prime M. Mukembakani, Marie Makuwa, Jean-Jacques Muyembe Tamfum, Raphaël Belais, Amethyst Gills, Stephen Harris, Anne W. Rimoin, Nicole A. Hoff, Joseph N. Fair, Corina Monagin, James Ayukekbong, Edward M. Rubin, Nathan D. Wolfe, Christian E. Lange. **DNA indicative of human bocaviruses detected in non-human primates in the Democratic Republic of the Congo**. J Gen Virol. 2018 Mar 27. doi: 10.1099/jgv.0.001048
Ethiopia							
Kenya							
RoC							
Rwanda							
Tanzania							
Uganda	1		1				T. Smiley Evans, L. Tutaryebwa, K.V. Gilardi, P.A. Barry, A. Marsi, M. Eberhardt, B. Siebide, M. R. Cranfield, O. Mugisha, E. Mugisha, S. Kellermann, J.A.K. Mazet, and C. K. Johnson. 2018. **Suspected Exposure to Filoviruses Among People Contacting Wildlife in Southwestern Uganda**. The Journal of Infectious Diseases. 218 (5), 22 November 2018. DOI: 10.1093/infdis/jiy251 [Preprint June 2018]
ASIA (Regional)							
Bangladesh	6		6				1. Ariful Islam, Jonathan H. Epstein , Melinda K. Rostal, Shariful Islam, Mohammed Ziaur Rahman, Mohammed Enayet Hossain, Mohammed Salim Uzzaman, Vincent J. Munster, Malik Peiris, Meerjady Sabrina Flora, Mahmudur Rahman, and Peter Daszak. **Middle East Respiratory Syndrome Coronavirus Antibodies in Dromedary Camels, Bangladesh, 2015**. Emerging Infectious Diseases Volume 24, Number 5. May 2018 2. Ariful Islam, Md Lutfar Rahman, Shariful Islam, Premanondo Debnath, Mahabub Alam, and Mohammad Mahmudul Hassan. (2017). **Sero-prevalence of visceral leishmaniasis (VL) among dogs in VL endemic areas of Mymensingh district, Bangladesh.** Journal of Advanced Veterinary and Animal Research, 4 (3): 241-248. 3. Rahman, Mohammed Z., Nazmul Haider, Emily S. Gurley, Sadia Ahmed, Mozaffar G. Osmani, Muhammad B. Hossain, Ariful Islam et al. **Epidemiology and genetic characterization of Peste des petits ruminants virus in Bangladesh**. Veterinary Medicine and Science (2018). 4. Md. Kaisar Rahman, Shariful Islam, Jinnat Ferdous, Md. Helal Uddin, Muhammad Belal Hossain, Mohammad Mahmudul Hassan and Ariful Islam. **Determination of hematological and serum biochemical reference values for indigenous sheep (Ovies aries) in Dhaka and Chittagong Districts of Bangladesh.** Veterinary World Volume 11, Issue 8, Pages 1089-1093. August 2018. 10.14202/vetworld.2018.1089-1093 5. Mizanur Rahman, Shariful Islam, Md. Masuduzzaman, Mahabub Alam, Mohammad Nizam Uddin Chowdhury, Jinnat Ferdous, Md. Nurul Islam, Mohammad Mahmudul Hassan, Mohammad Alamgir Hossain and Ariful Islam. **Prevalence and diversity of gastrointestinal helminths in free-ranging Asian house shrew (Suncus murinus) in Bangladesh.** Veterinary World. 11(4), 549-556. April 2018. 10.14202/vetworld.2018.549-556 6. Ariful Islam. **Nipah in Bangladesh: when epidemics become endemic. Emerging Infectious Diseases.** August 2018.
Cambodia							
China	5		5				1. Zhou, P., Fan, H., Lan, T., Yang, X. L., Shi, W. F., Zhang, W., ... & Zheng, X. S. (2018). **Fatal swine acute diarrhoea syndrome caused by an HKU2-related coronavirus of bat origin.** Nature, 1. 2. Wang, N., Li, S. Y., Yang, X. L., Huang, H. M., Zhang, Y. J., Guo, H., ... & Hagan, E. (2018). **Serological evidence of bat SARS-related coronavirus infection in humans, China**. Virologica Sinica, 1-4. 3. Luo, Y., Li, B., Jiang, R. D., Hu, B. J., Luo, D. S., Zhu, G. J., ... & Shi, Z. L. (2018). **Longitudinal Surveillance of Betacoronaviruses in Fruit Bats in Yunnan Province, China During 2009–2016.** Virologica Sinica, 1-9. 4.Hu, B., Zeng, L. P., Yang, X. L., Ge, X. Y., Zhang, W., Li, B., ... & Luo, D. S. (2017). **Discovery of a rich gene pool of bat SARS-related coronaviruses provides new insights into the origin of SARS coronavirus.** PLoS pathogens, 13(11), e1006698. 5. C. Monagin, B. Pascha, N. Liang, S. Trufan, H. Zhou, G. Wu, B.S. Schneider, A. Chmura , Epstein, P. Daszak. 2018. **Serologic and behavioral risk survey of workers with wildlife contact in China**. PLoS ONE 13(4): e0194647. DOI: 10.1371/journal.pone.0194647 6. C.M. Luo, N. Wang, X-L. Yang, H. Z. Liu, W. Zhang, B. Li, B. Hu, C. Peng, Q-B. Geng, G-J. Zhu, F. Li, Z-L. Shi. 2018. **Discovery of Novel Bat Coronaviruses in South China That Use the Same Receptor as Middle East Respiratory Syndrome Coronavirus**. Journal of Virology. Jun 2018, 92 (13) e00116-18. DOI: 10.1128/JVI.00116-18.
India							
Indonesia	1		1				Ulik Prayitno, Uus Saepulloh, Ni Luh Putu Ika Mayasari, Faisal Faisal, Ellis Dwi Ayuningsih, Joko Pamungkas Pamungkas. **IDENTIFICATION AND MOLECULAR CHARACTERIZATION OF BOVINE HERPERVIRUSES (BoHV) DNA TERMINASE PARTIAL GENE IN ACEH CATTLE**. Jurnal Kedokteran Hewan. Volume 11, Issue 4. December 2017. 10.21157/j.ked.hewan.v11i4.8024
Lao PDR							
Malaysia	1		1				Salgado Lynn, M.; William, T.; Tanganuchitcharnchai, A.; Jinlaworn, S.; Thaipadungpanit, J.; Lee, M.H.; Jalius, C.; Daszak, P.; Goossens, B.; Hughes, T.; Blacksell, S.D. **Spotted Fever Rickettsiosis in a Wildlife Researcher in Sabah, Malaysia: A Case Study.** Trop. Med. Infect. Dis. 2018, 3, 29.
Mongolia							
Myanmar							
Nepal							
Thailand	11		11				1. Wacharapluesadee S, Duengkae P, Chaiyes A, Kaewpom T, Rodpan A, Yingsakmongkon S, Petcharat S, Phengsakul P, Maneeorn P, Hemachudha T. Longitudinal study of age-specific pattern of coronavirus infection in Lyle's flying fox (Pteropus lylei) in Thailand. Virol J. 2018 Feb 20;15(1):38. 2. Chaiyes, A., P. Duengkae, S. Wacharapluesadee, N. Pongpattanurak, K.J. Olival, T. Hemachudha. 2017. Assessing the distribution, roosting site characteristics, and population of Pteropus lylei in Thailand. Raffles Bulletin of Zoology. 3. Fooks AR, Cliquet F, Finke S, Freuling C, Hemachudha T, Mani RS, Müller T, Nadin-Davis S, Picard-Meyer E, Wilde H, Banyard AC. Rabies. Nat Rev Dis Primers. 2017 Nov 30;3:17091 4. Mulvaney SP, Fitzgerald LA, Herndan LJ, Ringeisen BR, Petersen ER, Compton JR, McAuliff NL, Leski TA, Taitt CR, Stenger DA, Myers CA, Hansen E, Ricketts M, Hoegberg C, Homdayjanakul K, Ansumana R, Lamin JM, Bangura U, Lahai J, Baio V, Limmathurotsakul D, Wongsuvan G, Hantrakun V, Wacharapluesadee S, Mayxaimitang A, Putcharoen O, Yatoom P, Kruthakool K, Hontz RD, Mores C, Siles C, Morrison A, Mayo M, Currie BJ, Jacobsen KH, Quinn K, Blutman J, Amariei F, Hannan J. **Rapid design and fielding of four diagnostic technologies in Sierra Leone, Thailand, Peru, and Australia: Successes and challenges faced introducing these biosensors**. Sensing and Bio-Sensing Research. Sensing and Bio-Sensing Research. 2018 Sep; 20: 22–33. 10.1016/j.sbsr.2018.06.003 5. Nosotsin P, Pongpirul T, Suankratay C, Bartonella. **Bartonella henselae infective endocarditis with dissemination: A case report and literature review in Southeast Asia.** IDCases. Volume 13. August 2018. 10.1016/j.idcr.2018.e00441 6. Limotai C, Damlertchaikul C, Saraya AW, Jirasakuldej S. **Predictive values and specificity of electroencephalographic findings in autoimmune encephalitis diagnosis**. Epilepsy Behav. Volume 84, P. 2930. July 2018. 10.1016/j.yebeh.2018.04.007 7. Narong Nilatpattana, Yves Moné, Markadej AR Gouith, Kumchol Chaiyo, Yutthana Jeyjinda, Supoth Ratchakum, Supaporn Wacharapluesadee, Sutee Yoksan, Thiravat Hemachudha, Francisco Veas, Tom Vincent, and Jean-Paul Gonzalez. **Genetic Diversity of Dengue-4 Virus Strains Isolated from Patients During a Single Outbreak of Dengue Fever, Thailand**. Journal of Fever. Volume 2, issue 1009.
Vietnam							
MIDDLE EAST (Regional)							
Egypt							
Jordan	1					1	PREDICT Jordan also authored an article for the Association of American Veterinary Medical Colleges (AAVMC)'s Council for International Veterinary Medical Education (CIVME) Newsletter titled, "PREDICTing the Next Pandemic: How One Health Scientists Are Changing the Way We Fight Infectious Diseases." The article appeared in the Fall 2017 issue and was authored by Patrick Dawson of EcoHealth Alliance. The article features the work of the PREDICT/Jordan team and quotes from various PREDICT/Jordan team members. URL: http://myemail.constantcontact.com/CIVME-News.html?soid=1104802974357&aid=5YQhkJyT7SE
GLOBAL	17	3	12			2	1.Carroll, D., P. Daszak, N.D. Wolfe, G.F. Gao, C.M. Morel, S. Morzaria, A. Pablos-Méndez, O. Tomori, J.A.K. Mazet. 2018. **The Global Virome Project.** *Science*. doi: 10.1126/science.aap7463 2. Carroll, D., B. Watson, E. Togami, P. Daszak, J.A.K. Mazet, C.J. Chrisman, E.M. Rubin, N. Wolfe, C.M. Morel, G.F. Gao, G. L. Burci, K. Fukuda, P. Auewarakul & O. Tomori. 2018. **Building a global atlas of zoonotic diseases.** Bulletin of the World Health Organization. doi: 10.2471/BLT.17.205005. 3. Schar, D., C.M. Machalaba, G. Yamey, W.B. Karesh. 2018. **A framework for stimulating economic investments to prevent emerging diseases.** Bulletin of the World Health Organization.doi:10.2471/BLT.17.199547 4. Legall, F., C.M. Machalaba, W.B. Karesh, et al. 2018. **Operational framework for strengthening human, animal and environmental public health systems at their interface.** World Bank Report. 5. CITES Working Group. **Simplified Procedures for Permits and Certificates:** Report of the Working Group. SC70 Doc. 36. Submitted for the 17th Meeting of the CITES Standing Committee, 2018.
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***for the period 10/1/17-9/30/18 ONLY**

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Machalaba C, Salerno RH, Barton Behravesh C, Berthe F, Karesh WB et al., **Institutionalizing One Health: from Assessment to Action**. *Health Security*. May 2018.
Evan A. Eskew, Kevin J. Olival. **De-urbanization and zoonotic risk**. *EcoHealth*. August 2018.

Indicator 3.2b	#, list of community OH events coordinated *include title of event, date of event, brief description of the event including topic focus, geographic location (city/village/locale) and country in which it took place
Indicate Country, Region or Global	
Bangladesh	**2 events** 05 Nov 2017. One Health Day Celebration 2017. Sher-E Bangla Agricultural University and Jhenidah Government Veterinary College. PREDICT/Bangladesh, along with P&R and One Health Bangladesh, organized a collaborative essay competition for students and future One Health practitioners on the eve of the One Health Day celebrations. The program included a rally and a One Health talk to encourage medical and veterinary students to participate in One Health. On March 25th, 2018 PREDICT Bangladesh co-organized a Symposium on Priority Zoonotic Diseases and their Economic Impacts. PREDICT/Bangladesh has also helped coordinate and implement a One Health Economic analysis of the cost efficiency of One Health approaches to disease surveillance and outbreak response.
Cote d'Ivoire	**2 events,** Oct 2017. Risky Interfaces. PREDICT/CIV's behavioral team led discussions with restaurant owners, butchers, bushmeat vendors, and animal resource officers to discuss their work and the One Health approach to risky interfaces in the Bouaflé region and in Marahoué National Park. This interaction was an opportunity to highlight risks associated with their business and how to work together to avoid risk. Jan 2018. Villager Meetings, Focus Groups, and 3-day Visit in Asproa. Villager meetings in Asproa, focus groups in Sergent Konankro, and three-day visits of subsites (Boguekro and Djhakro) that allowed for sensitization of the population to work done by PREDICT/CIV, with discussions on the risk of bat-man-livestock exposure.
Ethiopia	**1 event,** 26-27 Mar 2018. Consultation to Awash human and animal health service providers on emerging zoonotic viral diseases of great importance to human health
Ghana	**3 events**, Nov 2017. Nkoranza North District. Training workshop for the human disease surveillance component of thePREDICT project. A three day event combined with community engagement at the surveillance sites including questionnaire administration and outreach on the PREDICT project with education on zoonotic diseases and One Health. PREDICT/Ghana held a durbar of chiefs and opinion leaders as well as health staff in the two communities of Boabeng and Fiema in November 2017 to conduct education and outreach on viral zoonoses and One Health approaches and to provide an update on PREDICT Ghana's activities and plans for the upcoming year. PREDICT/Ghana is also a key partner in Ghana's One Health strategy for canine rabies control that is being championed by Rabies in West Africa (RIWA), whose lead person is PREDICT'S Wildlife Coordinator, Dr. Richard Suu-Ire. Dr. Suu-ire and the Country Coordinator, Dr. Bel-Nono conducted community outreach and education on rabies control during community canine vaccination programs in September and October 2018.
Guinea	**Multiple events,** PREDICT/Guinea organized Community Engagement Meetings in each of the villages where the team works in the Forest Region of Guinea (4 Prefectures). These meetings were held before, during and after animal sampling in a village to encourage a communication loop for local knowledge throughout the PREDICT project, enable reflective and systematic examination of previous sampling sessions, and to sensitize and mobilize the community to raise people's awareness of the role of the animal-human interface in viral transmission, an essential key to preventing outbreaks of zoonotic disease. Meetings attendants included representatives from the Ministry of Health, Ministry of Environment, Water and Forestry, Ministry of Livestock and Animal Resources, and community members. A minimum of 25 people attended each one of the meetings. PREDICT/Guinea continues to coordinate One Health meetings at the community level to discuss activities, and communicate/educate for living safely with wildlife/bats.
India	**Multiple events,** Community outreach programs were undertaken during all field visits where the PREDICT/India team explained the dynamics of transmission of zoonotic infections, risk factors that promote these and possible mitigation actions to the local communities.
Indonesia	**Multiple events**, PREDICT/Indonesia facilitated several small community meetings and outreach events with village heads prior to the implementation of human community surveillance activities in North Sulawesi. Meetings were aimed at informing community leaders about zoonotic disease and explaining the goals of PREDICT surveillance.
Kenya	**2 events**, One Health Training Event, 01 - 04 Feb 2018, Mpala PREDICT/Kenya jointly with OHW/OHCEA, FAO, and USAID P&R conducted a One Health training event at Mpala. During the training, participants were taken through a pandemic simulation to learn how to approach an outbreak investigation using PREDICT biosecurity and biosafety protocols. A total of 37 participants drawn from University of Nairobi and Moi University postgraduate students and their faculty mentors, veterinarians at both the national and county (Laikipia) level, Kenya Wildlife Services, Laikipia County health officers and members of the local community. The students observed first-hand a defined high-risk interface, learning about the different drivers and human behavioral risk factors that contribute to the emergence and/or spread of pathogens. In addition, the students learned how to apply the One Health concept to mitigate some of the problems the local community were experiencing (frequent diarrhea and flu-like symptoms). PREDICT, in collaboration with OHCEA, provided infectious disease field training to 36 students from University of Nairobi and Moi University at a high risk interface site in Amboseli (an OHCEA demo site). Training included biosecurity, PPE, and safe animal handling (livestock and rodents). Students represented various fields of study (medical, nursing, public health, environmental health, agriculture and range management, wildlife, veterinary, engineering, and journalism). The students worked with and within the community to identify potential health risks.
Lao PDR	**Multiple events** Village meetings in Na Pa Kieb and Soth, 19-20 Feb 2018 PREDICT/ Lao PDR expanded the reach of its stakeholder engagement and risk mitigation communications, continuing to hold meetings in Na Pa Kieb and initiating additional village meetings in nearby Soth village. Stakeholders were updated on PREDICT surveillance activities & risk mitigation strategies to reduce risk of zoonotic virus transmission. Subjects included handwashing, avoiding animal body fluids, and cooking meat thoroughly.
Liberia	**Multiple events** PREDICT was instrumental in organizing and implementing a World Rabies Day campaign (28 Sept 2017). The PREDICT team was critical to the success of the event having already been trained in humane animal restraint and vaccinated for rabies. The event was a great collaboration between PREDICT/Liberia, the National Public Health Institute of Liberia, Ministry of Agriculture, Ministry of Health, Food and Agriculture Organization of the U.N. Nearly two hundred dogs were vaccinated at two locations. In March 2018, PREDICT/Liberia along with the organizations previously mentioned conducted a rabies vaccination campaign in the neighborhood surrounding the Embassy at the request of the USAID Mission in Liberia. PREDICT/Liberia participated in several community One Health events. The team routinely conducts community engagement with each field trip to educate the local community on the role of the project and the importance of wildlife and their role in the environment. Furthermore, PREDICT/Liberia has played an important role with the National Public Health Institute of Liberia on One Health Day, World Food Day, and at the US Embassy Health Fair.

Includes community-engagement and outreach, faculty/student clubs, trainings of community members/workers (e.g., farmers poultry handlers), risk communication events targetd at the community, and community/civil society stakeholder engagement (FAO, OHW) such as village meetings, Rabies day campaign, communication events, etc.

Malaysia	**Multiple events** One Health Student Introduction (3 Feb 2018): PREDICT/Malaysia conducted a presentation focusing on One Health related issues, careers in One Health, and the introduction of the PREDICT project in Malaysia to undergraduate students during the Borneo Eco Film Festival. Introduction to zoonosis and safe methods to prevent zoonotic infections. 14 Mar 2018. Meeting with village leaders to introduce zoonosis and our human study in Kampung Redip (Pos Hau), Gua Musang District, & Kelantan. Introduction to zoonosis and safe methods to prevent zoonotic infections. 21 Mar 2018 Meeting with village leaders to introduce zoonosis and our human study in their community, Pos Sinderut Health Clinic, Kuala Lipis District, Pahang. Introduction to zoonosis and safe methods to prevent zoonotic infections. 29 Mar 2018. Meeting with village leaders to introduce zoonosis and the PREDICT human study in their community, Pos Yum, Kuala Kangsar District, Perak. 28 June 2018: PREDICT conducted community meeting for around 200 villagers at Pos Hau to introduce the idea of One Health to the Orang Asli community, to increase their awareness of the risk of zoonotic diseases transmission, the risks posed by contact with wildlife and how to minimize these risks. Health leaflets were distributed to villagers, village leaders and the school to help educate villagers. 24 July 2018: PREDICT conducted community meeting for around 200 villagers at Pos Yum to introduce the idea of One Health to the Orang Asli community, to increase their awareness of the risk of zoonotic diseases transmission, the risks posed by contact with wildlife and how to minimize these risks. Health leaflets were distributed to villagers, village leaders and the school to help educate villagers. 15 August 2018: PREDICT conducted community meetings for around 150 villagers at Pos Sinderut to introduce the idea of One Health to the Orang Asli community, to increase their awareness of the risk of zoonotic diseases transmission, the risks posed by contact with wildlife and how to minimize these risks. Health leaflets were distributed to villagers, village leaders and the school to help educate villagers. 4 September 2018: PREDICT conducted community meeting for around 200 villagers at Pos Tohoi to introduce the idea of One Health to the Orang Asli community, to increase their awareness of the risk of zoonotic diseases transmission, the risks posed by contact with wildlife and how to minimize these risks. Health leaflets were distributed to villagers, village leaders and the school to help educate villagers.
Myanmar	**3 events** In Year 4, the PREDICT/Myanmar team organized two community engagement meetings in 2 concurrent sites, which coincided with surveillance activities. The objective of this meeting was to provide feedback on the analysis of risk characterization, daily practices of the sampled respondents and their experiences of flu-like sicknesses. A total of 27 participants attended in the meeting in Hpa-an (concurrent site 1), which was chaired by State Health Director. Invitees were officials from State & Township health departments, State LBVD, State Forestry departments, general administrative department, local health staff, community health volunteers and the community leaders from the survey villages. Community leaders and health staff raised questions related to potential risks of wildlife, especially bats in the caves, and how to prevent disease transmission. The State health director and the PREDICT team explained the preventive measures and practices that can be used to protect the community including hand washing, PPE and safe animal handling practices. In Hmawbi, concurrent site 2, Township Medical Officer took a lead for the discussion on feedback and progress of PREDICT surveillance and preliminary findings. As this coincided with monthly meeting of Township Health Department, about 80 midwives, 2 trained nurses, 3 Health Assistants and 4 Community Health workers attended. Participants actively participated and raised some questions related to zoonotic diseases and possible ways of transmission.
Nepal	**Multiple events** Community Health Screening. 13-19 Mar 2018. Jadibuti, Kathmandu, Nepal. As part of PREDICT/Nepal human surveillance activities, the team engaged communities sharing information on the program. Health Camp. 29 Mar–1 Apr 2018. Silinge, Makwanpur, Nepal. As part of PREDICT/Nepal human surveillance activities, the team engaged communities sharing information on the program. During one health research implementation in communities, focused group discussions were organized among the residents to create awareness on the risk of zoonotic diseases transmission between and among humans and animals. In addition to this, PREDICT/Nepal offered general health check up services and provided sanitary kit to encourage proper personal hygiene practices.
Senegal	**2 events,** Community Sensitization: At the community level, sensitization of the populations of the villages of Sindia, Bandia and Kiniabour was carried out by the PREDICT/Senegal One Health team composed of medical doctors, veterinarians and community health workers. The aim of these sessions was to engage the community for increased project commitment in addition to mitigating the risks of zoonotic pathogens through education and sensitization. Community engagement at Sindia surveillance site with (1) school teachers and students, (2) farmers, and (3) administrative and municipal authorities: Raising the awareness of primary school teachers and students about the objectives of PREDICT, living safely with wildlife, and the risks of contact and handling of wildlife and how to prevent these risks (23-25 April 2018)
Sierra Leone	**Multiple events** PREDICT/Sierra Leone engaged district, chiefdom, and community level stakeholders in the six operational districts (Kambia, Bombali, Kono, Koinadugu, Western Areas). This involved government district officers in the Ministry of Health and Agriculture and local level meetings with key stakeholders to provide updates on surveillance visits. PREDICT/SL conducted community engagement sessions at every field sampling visit in all of our operational districts (Kambia, Bombali, Kono, Koinadugu, Western Area rural, and Pujehun) focusing mainly on One Health risk mitigation and promoting healthy living in the communities.
Tanzania	**Multiple events** **17** community engagement events: 6 in Kibondo, 3 in Uvinza, and 8 in villages in Kyerwa. Attendees include village Executive Officers, village council (chairperson and other leaders), and community members. In Kyerwa, the ward council was included. World Rabies day celebration took place on 28th September, 2018 in Southern Highlands Zone Njombe Iringa Mgodechi village, Ramadhani ward. The PREDICT/Tanzania team participated in World Rabies Day activities in collaboration with Government Veterinary Investigation Centre partners in the southern highland zone of Tanzania. PREDICT/Tanzania talked to community members about how to live safely with wildlife such as bats, a known reservoir host for Rabies virus, as well as other animals known as hosts for zoonotic viruses. PREDICT/Tanzania veterinary team had the opportunity to train five animal health professionals and one medical officer in biosafety and biosecurity measures and proper use of personal protective equipment (PPE). In addition, PREDICT/Tanzania vets helped administer vaccine to 51 dogs in Mgodechi village, and enabled the broader vaccination of 200 dogs by providing medical supplies (PPE and syringes) to regional animal health professionals.

Thailand	**Multiple Events** 1) Rabies Prevention and Control. 20 Mar 2018. Bangkok Conducted a press conference for medical staff, media and the general public at Chulalongkorn Hospital. 2) Rabies Prevention at the Community Level. 17 Dec 2017. Bangkok Provided training at the Girls Scout Training Center in Bangkok, as part of One Health activity organized by the Thai Red Cross Society. 3) Rabies Prevention at the Community Level. 7 Nov 2017. Bangkok Provided training for improving medical knowledge of employees in a private company. Emerging Infectious Disease Preparedness, Prevention & Response in Thailand. 31 Jan 2018. PREDICT/Thailand Organized community outreach and health practitioner's participation in a One Health demonstration at Wat Luang sub-district as part of the PMAC Field Trip. Conducted press conference on "Soccer team and Tham Luang cave: Lesson Learnt and Thailand EID preparedness" for medical staff, media and public at Chulalongkorn Hospital, on August 3, 2018.

***for the period 10/1/17-9/30/18 ONLY**

17 countries

Indicator O1	Total # of in-country staff	Total # of in-country staff who are from the host country	Total # of in-country staff who are from the region (but not host country)	Total # of in-country staff who are not local or from the region	Proportion of in-country staff who are from the host country	Proportion of in-country staff who are from the region (but not host country)	Proportion of in-country staff who are not local or regional
AFRICA (Regional)							
Cameroon	10	9	0	1	90%	0%	
Côte d'Ivoire (IP/EHA)	8	8	0	0	100%	0%	
DRC	8	7	0	1	88%	0%	
Eastern DRC	2	2	0	0	100%	0%	
Ethiopia	8	8	0	0	100%	0%	
Ghana	11	11	0	0	100%	0%	
Guinea	23	23	0	0	100%	0%	
Kenya	3	3	0	0	100%	0%	
Liberia	23	22	0	1	96%	0%	
RoC	4	4	0	0	100%	0%	
Rwanda	3	3	0	0	100%	0%	
Senegal	10	10	0	0	100%	0%	
Sierra Leone	28	26	1	1	93%	4%	
Tanzania	13	13	0	0	100%	0%	
Uganda	3	3	0	0	100%	0%	
ASIA (Regional)							
Bangladesh	27	27	0	0	100%	0%	
Cambodia	7	7	0	0	100%	0%	
China	17	17	0	0	100%	0%	
India	2	2	0	0	100%	0%	
Indonesia	8	8	0	0	100%	0%	
Lao PDR	2	2	0	0	100%	0%	
Malaysia	14	13	0	1	93%	0%	
Mongolia	3	3	0	0	100%	0%	
Myanmar	2	2	0	0	100%	0%	
Nepal	21	21	0	0	100%	0%	
Thailand	6	6	0	0	100%	0%	
Vietnam	4	3	0	1	75%	0%	
MIDDLE EAST (Regional)							
Egypt	0	0	0	0	0%	0%	
Jordan	1	1	0	0	100%	0%	
TOTAL	**271**	**264**	**1**	**6**	**97.42%**	**0.37%**	

TOTAL

***for the period 10/1/17-9/30/18 ONLY**

*"**In-country staff:** people employed by implementing partner staff to work on EPT-2 projects in EPT-2 countries.*
**Include only full-time or "most-time" staff (i.e., exclude part-time staff 49% FTE or less, short term consultants)*
**Regions include: East and Central Africa – DRC, Egypt, Ethiopia, Jordan, Kenya, ROC, Rwanda, Tanzania, Uganda; West Africa – Cameroon, Cote d'Ivoire, Ghana, Guinea,*

New Characterization
In Progress
Complete

New Indicator

Indicator 1A (Outcome Level)	Provide a list and brief description of recommended risk mitigation approaches implemented and/or scaled up *please include viral family if relevant
Indicate Country, Region or	
Bangladesh	
Cambodia	
Cameroon	
China	
Cote d'Ivoire (EHA)	
Côte d'Ivoire (IP)	
Côte d'Ivoire (IP/EHA)	
Democratic Republic of Congo	
Egypt	
Ethiopia	
Ghana	
Guinea	
India	
Indonesia	
Jordan	
Kenya	
Lao PDR	
Liberia	
Malaysia	
Mongolia	
Myanmar	
Nepal	
Republic of Congo (RoC)	
Rwanda	
Senegal	
Sierra Leone	
Tanzania	
Thailand	
Uganda	
Viet Nam	

*for the period 10/1/17-3/31/18 ONLY

New Indicator

Indicator 1C (Outcome Level)	Total # Labs Targeted for viral family screening (pull from Indicator 1.2a)	Is this country improving quality assurance and safety procedures? *Based on labs ability to 1) test for 1 viral family, 2) test for all 5 PREDICT prioritized viral families, 3) test for additional viral families	Notes	*Calculation for Reporting*	***Numerator:** Total # of ETD supported labs that improved QA and safety procedures in place in order to perform testing since the last reporting period. **Denominator**: Total # of ETD supported labs*
AFRICA					
Cameroon	2	1 (50%)	Now testing for 6 viral families		
Cote d'Ivoire	2	1 (50%)	5 viral families		
DRC	1	1 (100%)	Now testing for 10 viral families		
Ethiopia	2	1 (50%)	5 viral families		
Ghana	2	1 (50%)	4 viral families		
Guinea	1	0			
Kenya	2	1 (30%)	4 viral families		
Liberia	1	0			
RoC	1	0			
Rwanda	2	1 (50%)	4 viral families		
Senegal	2	0			
Sierra Leone	1	1 (100%)	1 viral family		
Tanzania	2	2 (100%)	5 viral families		
Uganda	1	1 (100%)	1 viral family		
ASIA					
Bangladesh	2	1 (50%)	5 viral families		
Cambodia	3	1 (30%)	Now testing for 9 viral families		
China	4	2 (50%)	Now testing for 6 viral families		
India	1	0			
Indonesia	3	2 (60%)	5 viral families		
Lao PDR	2	1 (50%)	5 viral families		
Malaysia	5	3 (60%)	Now testing for 8 viral families		
Mongolia	1	1 (100%)	1 viral family		
Myanmar	2	0			
Nepal	2	1 (50%)	5 viral families		
Thailand	2	2 (100%)	Now testing for 12 viral families		
Vietnam	5	3 (60%)	Now testing for 6 viral families		
MIDDLE EAST					
Egypt	1	1 (100%)	3 viral families		
Jordan	1	1 (100%)	4 viral families		

***for the period 10/1/17-3/31/18 ONLY**

New Indicator

Indicator 1D (Outcome Level)	List countries that participated in a HUMAN outbreak response (Pull from Indicator 1.2e)	List country that participated in an ANIMAL outbreak response (Pull from Indicator 1.2e)	Does this country have improved capacity to conduct outbreak investigations? *Improved capacity as defined by improved reporting and coordination between government partners.
AFRICA			
	Democratic Republic of the Congo	Democratic Republic of the Congo	YES
	Ghana		YES
	Liberia		YES
ASIA			
	Bangladesh	Bangladesh	YES
MIDDLE EAST (Regional)			

*for the period 10/1/17-3/31/18 ONLY

Calculation for Reporting	***Numerator**: # of ETD countries that have improved capacity in conducting outbreak investigations; **Denominator**: total # of ETD countries that reported to have outbreaks in the reporting period*	4//4	100%

	*Cumulative - indicate year			
Indicator 1.1a	**Describe each risk factor/interface characterized that is associated with spillover, amplification, and/or spread (include information on risk factor/interface type and contribution/association with spillover, amplification and/or spread, also indicate animal/human vs animal/animal and**	**List Publication or reference if possible**	**Risk Factor or Risk Interface?**	**Classify as: New characteriztaion/in progress/complete**
icate Country or Glo	**Risk factor/interface description**			complete
China	Bats are host to a diverse array of viruses shed in feces (host risk factor linked to potential for animal to human spillover; based on PREDICT data) (Y1)		Risk Factor	complete
China	Rodents are host to a diverse array of viruses shed in feces (host risk factor linked to potential for animal to human spillover; based on PREDICT data) (Y1)		Risk Factor	complete
China	Contact with poultry is a risk factor for infection with Influenza A/H7N9 among children in 2013-2014 (host factor and high-risk interface linked to animal to human spillover, based on PREDICT		both	complete
China	Contact with poultry feces, chopping/butchering boards, and cage surfaces is a risk factor for infection with Influenza A/H7N9 (host/environmental risk factor and high-risk interface linked to animal to human spillover, based on PREDICT data) (Y1)		both	complete
China	Small mammals are host to high prevalence of viruses in the hantavirus family (host risk factor linked to potential for animal to human spillover; based on PREDICT data) (Y2)	X-Y Ge, W-H Yang, H. Pan, J-H Zhou, X. Han, G-J Zhu, J.S. Desmond, P. Daszak, Z-L Shi, Y-Z Zhang. 2016. Fugong virus, a novel hantavirus barbored by the small oriental vole (Eothenomys eleusis) in China. Virology Journal 13:27. doi: 10.1186/s12985-016-0483-9	Risk Factor	complete
Bangladesh	Co-infections influence viral occurrence (agent risk factor linked to potential for spillover; based on PREDICT data) (Y1)		Risk Factor	complete
Bangladesh	Primates in an urban setting are host to a diverse array of viruses that are shed in feces (host risk factor and high-risk interface linked to potential for animal to human spillover; based on PREDICT		both	complete
DRC	Human contact with primates in intensive conservation management situations facilitates disease transmisison between humans and primates (host/environmental risk factors and high-risk interface linked to anthropozoonotic spillover, based on PREDICT data) (Y1)		both	complete
Malaysia	Human contact with primates in intensive management to mitigate human-macaque conflict is a potential risk factor for spillover of macacine herpesvirus 1 (B virus) (host/environmental risk factors and high-risk interfaces linked to animal to human spillover, based on PREDICT data) (Y1)	Lee, M.H., Rostal, M.K., Hughes, T., Sitam, F., Lee, C.Y., Japning, J., Harden, M.E., Griffiths, A., Basir, M., Wolfe, N.D. and Epstein, J.H., 2015. Macacine Herpesvirus 1 in Long-Tailed Macaques, Malaysia, 2009–2011. Emerging infectious diseases, 21(7), p.1107.	both	complete
RoC	Butchering fruit bats is a significant risk factors for zoonotic spillover of henipavirus (host/environmental risk factors and high-risk interfaces linked to animal to human spillover, based on PREDICT data) (Y1)	Weiss, S., Nowak, K., Fahr, J., Wibbelt, G., Mombouli, J.V., Parra, H.J., Wolfe, N.D., Schneider, B.S. and Leendertz, F., 2012. Henipavirus-related sequences in fruit bat	both	complete
Cameroon	Butchering fruit bats and living in areas undergoing deforestation are significant risk factors for zoonotic spillover of henipavirus (host/environmental risk factors and high-risk interfaces linked to animal to human spillover, based on PREDICT data) (Y1)	Pernet O, Schneider BS, Beaty SM, LeBreton M, Yun TE, Park A, Zachariah TT, Bowden TA, Hitchens P, Ramirez CM, Daszak P. Evidence for henipavirus spillover into human populations in Africa. Nature communications. 2014 Nov 18;5.	both	complete
RoC	Primates in intensive management are host to a diverse array of viruses that are shed in feces (host risk factor linked to potential for spillover; based on PREDICT data) (Y1)		Risk Factor	complete
Philippines (Placed i	A range of bat species are host to Reston ebolavirus and pose a risk for spillover to humans (host risk factor linked to potential for animal to human spillover; based on PREDICT data) (Y1)	Jayme, S.I., Field, H.E., de Jong, C., Olival, K.J., Marsh, G., Tagtag, A.M., Hughes, T., Bucad, A.C., Barr, J., Azul, R.R. and Retes, L.M., 2015. Molecular evidence of Ebola Reston virus infection in Philippine bats. Virology	*Risk Factor*	complete
Thailand	A range of bat species are host to a diverse array of fecally shed coronaviruses that pose a risk for spillover to humans (host risk factor linked to potential for animal to human spillover; based on PREDICT data) (Y1)	Wacharapluesadee, S., Duengkae, P., Rodpan, A., Kaewpom, T., Maneeorn, P., Kanchanasaka, B., Yingsakmongkon, S., Sittidetboripat, N., Chareesaen, C., Khlangsap, N. and Pidthong, A., 2015. Diversity of coronavirus in bats from Eastern Thailand. Virology	Risk Factor	complete
Global	RNA viruses are more likely to spillover from animals to humans than DNA virus (agent risk factor linked to animal to human spillover, based on in-depth literature review of all known zoonotic viruses) (Y1)	Johnson, C.K., Hitchens, P.L., Evans, T.S., Goldstein, T., Thomas, K., Clements, A., Joly, D.O., Wolfe, N.D., Daszak, P., Karesh, W.B. and Mazet, J.K., 2015. Spillover and pandemic properties of zoonotic viruses with high host plasticity. Scientific reports, 5, p.14830.	Risk Factor	complete
Global	Viruses with high host plasticity (i.e. viruses able to infect hosts from a large number of taxonomic orders) are more likely to be transmissible human-to-human (agent risk factor linked to potential for amplification and spread, based on in-depth literature review of all known zoonotic viruses) (Y1)	Johnson, C.K., Hitchens, P.L., Evans, T.S., Goldstein, T., Thomas, K., Clements, A., Joly, D.O., Wolfe, N.D., Daszak, P., Karesh, W.B. and Mazet, J.K., 2015. Spillover and pandemic properties of zoonotic viruses with high host plasticity. Scientific reports, 5, p.14830.	Risk Factor	complete
Global	Wild animals are the documented source of 91% of zoonotic viruses recognized to date (host risk factor linked to spillover, based on in-depth literature review of all known zoonotic viruses) (Y1)	Johnson, C.K., Hitchens, P.L., Evans, T.S., Goldstein, T., Thomas, K., Clements, A., Joly, D.O., Wolfe, N.D., Daszak, P., Karesh, W.B. and Mazet, J.K., 2015. Spillover and pandemic properties of zoonotic viruses with high host plasticity. Scientific reports, 5, p.14830.	Risk Factor	complete
Global	Zoonotic viruses reported in domesticated species had higher host plasticity (agent/host risk factors linked to animal to animal amplification and spread, based on in-depth literature review of all known zoonotic viruses) (Y1)	Johnson, C.K., Hitchens, P.L., Evans, T.S., Goldstein, T., Thomas, K., Clements, A., Joly, D.O., Wolfe, N.D., Daszak, P., Karesh, W.B. and Mazet, J.K., 2015. Spillover and pandemic properties of zoonotic viruses with high host plasticity. Scientific reports, 5, p.14830.	Risk Factor	complete
Global	Vector-borne zoonotic viruses found in wildlife had higher host plasticity (agent risk factor linked to animal to animal and animal to human spillover and spread, based on in-depth literature review of all known zoonotic viruses) (Y1)	Johnson, C.K., Hitchens, P.L., Evans, T.S., Goldstein, T., Thomas, K., Clements, A., Joly, D.O., Wolfe, N.D., Daszak, P., Karesh, W.B. and Mazet, J.K., 2015. Spillover and pandemic properties of zoonotic viruses with high host plasticity. Scientific reports, 5, p.14830.	Risk Factor	complete
Global	Human direct contact with wild animals kept as pets, maintained in sanctuaries or zoos, and sold at markets, had higher host plasticity (host/environmental risk factors and high-risk interface linked to animal to human spillover and spread, based on in-depth literature review of all known zoonotic viruses) (Y1)	Johnson, C.K., Hitchens, P.L., Evans, T.S., Goldstein, T., Thomas, K., Clements, A., Joly, D.O., Wolfe, N.D., Daszak, P., Karesh, W.B. and Mazet, J.K., 2015. Spillover and pandemic properties of zoonotic viruses with high host plasticity. Scientific reports, 5, p.14830.	both	complete
Global	Human direct contact with wild animals in and around human dwellings and in agricultural fields (mainly rodent hosts as reported to date) has facilitated spillover of zoonotic viruses (host/environmental risk factors and high-risk interface linked to animal to human spillover and spread, based on in-depth literature review of all known zoonotic viruses) (Y1)	Johnson, C.K., Hitchens, P.L., Evans, T.S., Goldstein, T., Thomas, K., Clements, A., Joly, D.O., Wolfe, N.D., Daszak, P., Karesh, W.B. and Mazet, J.K., 2015. Spillover and pandemic properties of zoonotic viruses with high host plasticity. Scientific reports, 5, p.14830.	both	complete
Global	Human direct contact with wildlife by hunting and consumption facilitates spillover of viruses with human-to-human transmissibility (agent/environmental risk factors and high-risk interface linked to animal to human spillover and spread, based on in-depth literature review of all known zoonotic viruses) (Y1)	Johnson, C.K., Hitchens, P.L., Evans, T.S., Goldstein, T., Thomas, K., Clements, A., Joly, D.O., Wolfe, N.D., Daszak, P., Karesh, W.B. and Mazet, J.K., 2015. Spillover and pandemic properties of zoonotic viruses with high host plasticity. Scientific reports, 5, p.14830.	both	complete
Global	Zoonotic viruses in the arenaviridae and filoviridae families are more likely to be human-to-human transmissible (agent/environmental risk factors linked to animal to human spillover and spread, based on in-depth literature review of all known zoonotic viruses) (Y1)	Johnson, C.K., Hitchens, P.L., Evans, T.S., Goldstein, T., Thomas, K., Clements, A., Joly, D.O., Wolfe, N.D., Daszak, P., Karesh, W.B. and Mazet, J.K., 2015. Spillover and pandemic properties of zoonotic viruses with high host plasticity. Scientific reports, 5, p.14830.	Risk Factor	complete
Global	First emergence of viral diseases was most often reported as vector-borne transmission, followed by airborne transmission and then direct contact (agent risk factor linked to potential spillover or spread, based on in-depth literature review of past emerging disease events) (Y1)		Risk Factor	complete
Global	First emergence of zoonotic diseases were most commonly associated with land use change, agricultural industry change, and international travel/commerce (environmental risk factor linked to potential animal to human spillover or spread, based on in-depth literature review of past emerging		Risk Factor	complete

Rwanda AND Uganda (Placed in both countries)	Primates in intensive management are host to viruses that are shed in saliva (host risk factor linked to potential for animal to human spillover; based on PREDICT data) (Y2)	T. Smiley Evans, K. Gilardi, P. Barry, B. Ssebide, J. Kinani, F. Nizeyimana, J. Noheri, D. Byarugaba, A. Mudakikwa, M. Cranfield, J.A.K. Mazet, C.K. Johnson. 2016 Detection of viruses using discarded plants from wild mountain gorillas and golden monkeys. American Journal of Primatology, doi: 10.1002/ajp.22576.	Risk Factor	complete
Global	Human direct contact with high volumes of wildlife from high-risk taxa by hunting and consumption and poor biosafety increases the potential for zoonotic pathogen presence and transmission (agent/environmental risk factors linked to animal to human spillover and spread, based on PREDICT data) (Y2)	Z.F. Greatorex, S.H. Olson, S. Singhalath, S. Silithammavong, A.E. Fine, W. Weisman, B. Douangngeun, W. Theppangna, L. Keatts, M. Gilbert, W.B. Karesh, T. Hansel, S. Zimicki, K. O'Rourke, D.O. Joly, J.A.K. Mazet. 2016. Wildlife trade and human health in Lao PDR: An assessment of the zoonotic disease risk in markets. PLOS One. doi: 10.1371/journal.pone.0150666	both	complete
Global	Bats are host to a diversity of viruses in the paramyxo-, adeno-, herpes-, astro-, and coronavirus families (host/agent risk factors linked to potential animal to animal or animal to human spillover, based on in-depth literature review of all known zoonotic viruses) (Y2)	C.C.W. Young, K.J. Olival. 2016. Optimizing Viral Discovery in Bats. PLOS One 11:2. doi: 10.1371/journal.pone.0149237	Risk Factor	complete
Global	Drivers of viral richness (host diversity and climactic variability) and transmission opportunity (human population density, bushmeat hunting, and livestock production) are associated with virus sharing between humans and bats (host/virus risk factor linked to animal to human spillover and spread; based on in-depth literature review of all known zoonotic bat viruses) (Y2)	L. Brierley, M.J. Vonhof, K.J. Olival, P. Daszak, K.E. Jones. 2016. Quantifying global drivers of zoonotic bat viruses: A process-based perspective. The American Naturalist, 187(2). doi: 10.1086/684391	Risk Factor	complete
Lao PDR, Cambodia	Bats are host to astroviruses shed in feces. Astrovirues are distributed widely and some have been identified as a cause of gastroenteritis in humans and other mammals. Wildlife species living close to human habitats could represent a risk for transmission of astroviruses to humans and domestic animals (agent/host risk factor linked to potential for spillover; based on PREDICT data) (Y3)	A. Lacroix, V. Duong, V. Hul, S. San, H. Davun, K. Omaliss, S. Chea, A. Hassanin, W. Theppangna, S. Silithammavong, K. Khammavong, S. Singhalath, A. Afelt, Z. Greatorex, A.E. Fine, T. Goldstein, S. Olson, D.O. Joly, L. Keatts, P. Dussart, R. Frutos, P. Buchy. 2017. Diversity of bat astroviruses in Lao PDR and Cambodia. Infection, Genetics and Evolution, 47: 41-50. doi: 10.1016/j.meegid.2016.11.013	Risk factor	complete
Lao PDR, Cambodia	Bats are host to a diverse array of coronaviruses (coronaviruses of animal origin were responsible for the Severe Acute Respiratory Syndrome [SARS] outbreak in 2003–2004 and the current epidemics of Middle Eastern Respiratory Syndrome [MERS] in the Arabian Peninsula and Korea). Findings are of importance for public health as Lao PDR and Cambodia have a high biodiversity of bats, often at high-risk interfaces in close proximity to people (agent/host risk factor linked to potential for animal to human spillover; based on PREDICT data) (Y3)	Lacroix, A., Duong, V., Hul, V., San, S., Davun, H., Omaliss, K., Chea, S., Hassanin, A., Theppangna, W., Silithammavong, S. and Khammavong, K. 2017. Genetic diversity of coronaviruses in bats in Lao PDR and Cambodia. Infection, Genetics and Evolution, 48, pp.10-18.	Risk factor	complete
China	Bats are hosts to novel filoviruses in China. Findings suggest that these viruses have been circulating in the 2 bat species and that densely populated bat caves provide opportunity for cross-species infection with different viruses. Considering their feeding habitats, fruit bats are often in close contact with domestic animals and human populations (host risk factor linked to potential for animal to animal or animal to human spillover; based on PREDICT data) (Y3)	Yang, X.L., Zhang, Y.Z., Jiang, R.D., Guo, H., Zhang, W., Li, B., Wang, N., Wang, L., Waruhiu, C., Zhou, J.H. and Li, S.Y., 2017. Genetically Diverse Filoviruses in Rousettus and Eonycteris spp. Bats, China, 2009 and 2015. Emerging Infectious Diseases, 23(3), p.482.	Risk factor	complete
Global	The expanding international wildlife trade combined with a lack of surveillance for key animal diseases in most countries represents a potential pathway for transboundary disease movement (host/agent risk factors linked to potential animal to animal or animal to human spillover, based on in-depth literature review of reports of OIE-listed terrestrial animal diseases in wild animals) (Y3)	Smith, K.M., Machalaba, C.M., Jones, H., Cáceres, P., Popovic, M., Olival, K.J., Ben Jebara, K. and Karesh, W.B., 2017. Wildlife hosts for OIE-Listed diseases: considerations regarding global wildlife trade and host–pathogen relationships. Veterinary Medicine and	Risk factor	complete
Global	The number of declared wildlife shipments into the USA has doubled since 2000, illustrating continually increasing demand, which reinforces the need to scale up capacity for border inspections, risk management protocols and disease surveillance (host/agent risk factors linked to potential animal to animal or animal to human spillover, based on comprehensive data US Fish and Wildlife Services database) (Y3)	Smith, K.M., Zambrana-Torrelio, C., White, A., Asmussen, M., Machalaba, C., Kennedy, S., Lopez, K., Wolf, T.M., Daszak, P., Travis, D.A. and Karesh, W.B., 2017. Summarizing US Wildlife Trade with an Eye Toward Assessing the Risk of Infectious Disease	Risk factor	complete
Global	Bats are host to a diversity of viruses in the coronavirus (CoVs) family, and global diversity and distribution of CoVs in bats is non-random and is driven by variation in the biogeography of bats (host/agent risk factors linked to potential animal to animal or animal to human spillover; based on PREDICT data) (Y3)	Anthony, S.J., Johnson, C.K., Greig, D.J., Kramer, S., Wells, H., Hicks, A., Joly, D., Wolfe, N., Daszak, P., Karesh, W., Lipkin, W.I., Morse, S.S., PREDICT Consortium, Mazet, J.A.K., Goldstein, T., 2017. Global patterns in coronavirus	Risk factor	complete
Bangladesh	Nipah virus was found in Indian flying foxes outside of the area currently recognized to be experiencing recurring outbreaks of Nipah virus in humans, suggesting spillover is possible wherever humans interact with Indian flying foxes. Human activities such as date palm sap harvesting, concurrent with viral circulation in local bat populations, are major drivers of human outbreaks in Bangladesh (host/agent risk factor and high-risk interface linked to potential animal to animal or animal to human spillover; based on PREDICT data) (Y3)	Epstein, J.H., Anthony, S.J., Islam, A., Kilpatrick, A.M., Khan, S.A., Ross, N., Smith, I., Barr, J., Zambrana-Torrelio, C., Tao, Y. and Quan, P.L., 2016. Nipah virus ecology and infection dynamics in its bat reservoir, Pteropus medius, in Bangladesh. International Journal of Infectious Diseases, 53, pp.20-21.	both	complete
Egypt	High MERS-CoV seroprevalence and the presence of active viral infection circulating in imported and resident camels are indications that MERS-CoV may have become ubiquitous in Egypt.Transport stress and close vicinity of imported camels during transport may precipitate disease dissemination, particularly in animals with latent infection and carrier animals (host/agent risk factor and high-risk interface linked to potential animal to human spillover) (Y3)	Ali M, El-Shesheny R, Kandeil A, Shehata M, Elsokary B, Gomaa M, Hassan N, El Sayed A, El-Taweel A, Sobhy H, Oludayo FF. Cross-sectional surveillance of Middle East respiratory syndrome coronavirus (MERS-CoV) in dromedary camels and other mammals in Egypt, August 2015 to January 2016. Eurosurveillance. 2017 Mar	both	complete
Uganda/Global	MERS-related CoVs are highly associated with bats and are geographically widespread (host risk factor linked to potential for animal to human spillover) (Y3)	Anthony SJ, Gilardi K, Menachery VD, Goldstein T, Ssebide B, Mbabazi R, Navarrete-Macias I, Liang E, Wells H, Hicks A, Petrosov A. Further Evidence for Bats as the Evolutionary Source of Middle East Respiratory Syndrome Coronavirus. mBio. 2017 May 3;8(2):e00373-17.	Risk Factor	complete
Global	Risk of emerging infectious zoonotic disease is elevated in forested tropical regions experiencing land-use changes, especially where wildlife biodiversity (mammal species richness) is high (host/environmental risk factor and high-risk interface linked to animal to human spillover, based on global data) (Y3)	Allen, T., Murray, K. A., Zambrana-Torrelio, C., Morse, S. S., Rondinini, C., Di Marco, M., ... & Daszak, P. (2017). Global hotspots and correlates of emerging zoonotic diseases. Nature Communications, 8(1), 1124.	both	complete
Global	Cave-roosting bat species exhibit a greater likelihood of viral sharing within caves (host risk factor linked to potential for animal to animal or animal to human spillover, based on global data and PREDICT 1 data) (Y3)	Willoughby, A. R., K. L. Phelps, PREDICT Consortium & K. J. Olival. A Comparative Analysis of Viral Richness and Viral Sharing in Cave-Roosting Bats. (2017). Diversity, 9, 35;	risk factor	complete
Global	The proportion of known zoonotic viruses per species is predicted by phylogenetic relatedness to humans, host taxonomy (bats harbor a significantly higher proportion of zoonotic viruses than all other mammalian orders), and human population within a species range --which may reflect human–wildlife contact (host risk interface linked to potential for animal to human spillover, based	Olival, K. J., Hosseini, P. R., Zambrana-Torrelio, C., Ross, N., Bogich, T. L., & Daszak, P. (2017). Host and viral traits predict zoonotic spillover from mammals. Nature, 546(7660), 646-650.	risk interface	complete
China	Swine acute diarrhoea syndrome coronavirus (SADS-CoV), responsible for a large-scale outbreak of fatal disease in pigs in China, was identified in horseshoe bats (Rhinolophus spp.) in Guangdong province during 2013–2016. Horseshoe bats (Rhinolophus spp.) are known reservoirs of SARS- and HKU-2 related CoVs. Viral sharing between bats and swine are host/agent risk factors linked to animal to animal spillover with potential for animal to human spillover. Geographical, temporal, and ecological settings similar to SARS outbreaks at high risk interfaces are noted (Y4).	Zhou, Peng, et al. "Fatal swine acute diarrhoea syndrome caused by an HKU2-related coronavirus of bat origin." Nature(2018): 1.	both	complete
Global	Human modification of the environment serves as an underlying driver in emerging infectious disease risk. Environmental change warrants consideration in surveillance and outbreak investigations to identify the origin of the disease and contribute to the development of effective actions to prevent, prepare for or reduce the risk of future events (risk interface linked to potential for animal to human spillover, based on literature review) (Y4).	Machalaba C, Karesh WB. Emerging infectious disease risk: shared drivers with environmental change. Revue scientifique et technique-office international des epizooties. 2017 Aug 1;36(2):435-44.	risk interface	complete
Global	Dromedary camels are bred domestically and imported into Bangladesh. In 2015, of 55 camels tested for Middle East respiratory syndrome coronavirus in Dhaka, 17 (31%) were seropositive, including 1 bred locally (host/agent risk factors linked to potential animal to animal or animal to human spillover; based on PREDICT data). Infected camels in urban markets could have public health implications and warrants further investigation (host risk interface linked to potential for animal to human spillover, based on global data) (Y4).	Islam A, Epstein JH, Rostal MK, Islam S, Rahman M, Hossain M, et al. Middle East Respiratory Syndrome Coronavirus Antibodies in Dromedary Camels, Bangladesh, 2015. Emerg Infect Dis. 2018;24(5):926-928.	both	complete

DRC	Bocaparvoviruses are members of the family Parvoviridae and human bocaviruses have been associated with respiratory and gastrointestinal disease. Bocavirus DNA was found in blood and tissues samples in 6 out of 620 non-human primates in the Democratic Republic of the Congo. All isolates showed very high identity (>97%) with human bocaviruses 2 or 3, suggesting cross-species transmission of bocaviruses between humans and NHPs (host/agent risk factors linked to potential	Kumakamba C, Lukusa IN, Kingebeni PM, N'Kawa F, Losoma JA, Mulembakani PM, Makuwa M, Tamfum JJ, Belais R, Gillis A, Harris S. DNA indicative of human bocaviruses detected in non-human primates in the Democratic Republic of the Congo. Journal of General	risk factor	complete
China	Of 218 residents who live in close proximity to caves inhabited by large numbers of Rhinolophid bats (a major reservoir of SARSr-CoVs in China), 2.7% people showed seropositivity to SARS-like CoVs (host/environmental risk factors and high-risk interface linked to spillover, based on PREDICT data) (Y4).	Wang N, Li SY, Yang XL, Huang HM, Zhang YJ, Guo H, Luo CM, Miller M, Zhu G, Chmura AA, Hagan E. Serological evidence of bat SARS-related coronavirus infection in humans, China. Virologica Sinica. 2018 Feb 1;33(1):104-7.	both	complete

Indicator 1.1b	# viral pathway models or maps developed, refined, analyzed and/or described	# bacterial pathway models or maps developed, refined, analyzed and/or described**	# disease risk pathway models or maps developed, refined, analyzed and/or described**	Provide a list and brief narrative description of each viral, bacterial or risk pathway model or map developed, refined, analzyed and/or described. If feasible, the maps or models should be attached.
WEST AFRICA (Regional)				
Burkina Faso (ASL2050 only)	0		1	29. country-level relative EID risk map
Cameroon	1		1	1. country-level relative EID risk map, 31. country-level predicted zoonoses map
Cote d'Ivoire	1		1	2. country-level relative EID risk map, 32. country-level predicted zoonoses map
Ghana	1		1	3. country-level relative EID risk map, 33. country-level predicted zoonoses map
Guinea	1		1	4. country-level map for EID risk, 34. country-level predicted zoonoses map
Liberia	1		1	5. country-level relative EID risk map, 35. country-level predicted zoonoses map
Nigeria (ASL2050 only)	0		1	30. country-level relative EID risk map
Senegal	1		1	6. country-level relative EID risk map, 36. country-level predicted zoonoses map
Sierra Leone	1		1	7. country-level relative EID risk map, 37. country-level predicted zoonoses map
EAST & CENTRAL AFRICA (Regional)				
DRC	1		1	8. country-level relative EID risk map, 38. country-level predicted zoonoses map
Ethiopia	1		1	9. country-level relative EID risk map, 39. country-level predicted zoonoses map
Kenya	2		1	10. country-level relative EID risk map, 40. country-level predicted zoonoses map, 59. Province-level avian influenza epidemic risk map
RoC	1		1	11. country-level relative EID risk map, 41. country-level predicted zoonoses map
Rwanda	1		1	12. country-level relative EID risk map, 42. country-level predicted zoonoses map
Tanzania	1		1	13. country-level relative EID risk map, 43. country-level predicted zoonoses map
Uganda	2		1	14. country-level relative EID risk map, 44. country-level predicted zoonoses map, 60. province-level avian influenza risk map
ASIA (Regional)			1	61. Regional overlap of Rhinopholus spp. and pigs
Bangladesh	1		1	15. country-level relative EID risk map, 45. country-level predicted zoonoses map
Cambodia	1		1	16. country-level relative EID risk map, 46. country-level predicted zoonoses map
China	1		1	17. country-level relative EID risk map, 47. country-level predicted zoonoses map
India	1		1	18. country-level relative EID risk map, 48. country-level predicted zoonoses map
Indonesia	1		1	19. country-level relative EID risk map, 49. country-level predicted zoonoses map
Lao PDR	1		1	20. country-level relative EID risk map, 50. country-level predicted zoonoses map
Malaysia	1		1	21. country-level relative EID risk map, 51. country-level predicted zoonoses map
Mongolia	1		1	22. country-level relative EID risk map, 52. country-level predicted zoonoses map
Myanmar	1		1	23. country-level relative EID risk map, 53. country-level predicted zoonoses map
Nepal	1		1	24. country-level relative EID risk map, 54. country-level predicted zoonoses map
Thailand	1		1	25. country-level relative EID risk map, 55. country-level predicted zoonoses map
Vietnam	1		1	26. country-level relative EID risk map, 56. country-level predicted zoonoses map
MIDDLE EAST (Regional)				
Egypt	1		1	27. country-level relative EID risk map, 57. country-level predicted zoonoses map
Jordan	1		1	28. country-level relative EID risk map, 58. country-level predicted zoonoses map
GLOBAL	2		3	62. Viral species accumulation per viral family 63. Global distribution of wild mammals in PREDICT countries 64. Aggregated global mammalian livestock density 65. Global map of land-use 66. Refined seasonal model of viral shedding in bats
TOTAL	**32**		**34**	

Indicator 1.1c	Provide a list and brief description of each intervention point that has been prioritized to inform the development of risk mitigation approaches (information should describe the intervention point's characteristics, an explananation on how it was identified and why it was prioritized; include country information)
Indicate Country or Global	
Bangladesh	
Cambodia	
Cameroon	
China	
Cote d'Ivoire (EHA)	
Côte d'Ivoire (IP)	
Côte d'Ivoire (IP/EHA)	
Democratic Republic of Congo	
Egypt	
Ethiopia	
Ghana	
Guinea	
India	
Indonesia	
Jordan	
Kenya	
Lao PDR	
Liberia	
Malaysia	
Mongolia	
Myanmar	
Nepal	
Republic of Congo (RoC)	
Rwanda	
Senegal	
Sierra Leone	
Tanzania	
Thailand	
Uganda	
Viet Nam	

***for the period 10/1/17-3/31/18 ONLY**

Indicator 1.2a	YEAR 4 DATA (10/01/17 - 03/31/18)					
	Total # Labs Targeted for PREDICT viral family testing	# of labs in the country obtaining training or preparing to test for the 4 priority viral family protocols	# of labs in the country with the ability to perform testing for the 4 priority viral family PREDICT protocols	Proportion of labs that can do viral family testing	# of tests performed (# of tests performed by lab, for each virus, viral family, prioritized pathogen and/or AMR/antimicrobial quality test	Notes
AFRICA						
Cameroon	2	1	1	50%	Total Number tests: 10355 Tests by Viral family: Corona - 3686 Paramyxo - 1688 Filo - 1660 Influenza - 3315 Flavi - 3 Other - 3	
Cote d'Ivoire	2	1	1	50%	Total Number tests: 0	NOTE: Previous testing done with prevous lead, in-country training/testing has begun again
DRC	1	0	1	100%	Total Number tests: 5220 Tests by Viral family: Corona - 1560 Paramyxo - 753 Filo - 818 Flavi - 508 Influenza - 1565 Arena - 2 Rhabdo - 2 Orthobunya - 12	
Ethiopia	2	1	1	50%	Total Number tests: 370 Tests by Viral family: Corona - 74 Filo - 74 Flavi - 74 Influenza - 148	
Ghana	2	1	1	50%	Total Number tests: 360 Tests by Viral family: Corona - 120 Filo - 60 Paramyxo - 60 Influenza - 120	
Guinea	1	1	0	0%	Total Number tests: 891 Tests by Viral family: Filo - 358 Ebolavirus - 358 Other Ebola - 175	NOTE: Current results from testing performed at UCD in USA; In-country lab is training to perform testing for 1 viral family
Kenya	2	1	1	33%	Total Number tests: 304 Tests by Viral family: Corona - 76 Filo - 76 Paramyxo - 76 Influenza - 76	
Liberia	1	1	0	0%	Total Number tests: 1982 Tests by Viral family: Filo - 991 Ebolavirus - 991	NOTE: Testing done at CII in USA
RoC	1	0	0	0%	Total Number tests: 1 Tests by Viral family: Corona - 1	NOTE: Previous testing done at INRB in DRC, in-country training/testing has not
Rwanda	2	1	1	50%	Total Number tests: 498 Tests by Viral family: Corona - 166 Paramyxo - 83 Filo - 83 Influenza - 166	Lab is not testing for Flaviviruses
Senegal	2	2	0	0%	N/A	

Sierra Leone	1	1	0	0%	Total Number tests: 7500 Tests by Viral family: Filo - 3000 Ebolavirus - 3000 Other Ebola - 1500	NOTE: Current results from UCD in USA; In-country lab is performing testing for 1 viral family
Tanzania	2	0	2	100%	Total Number tests: 3073 Tests by Viral family: Corona - 878 Paramyxo - 439 Filo - 439 Flavi - 439 Influenza - 878	
Uganda	1	1	0	0%	Total Number tests: 127 Tests by Viral family: Flavi - 127	1 viral family
ASIA						
Bangladesh	2	1	1	50%	Total Number tests: 18908 Tests by Viral family: Corona - 2779 Paramyxo - 2483 Filo - 2575 Flavi - 2483 Influenza - 2859 Other - 5734	
Cambodia	3	2	1	33%	Total Number tests: 8939 Tests by Viral family: Corona - 1364 Paramyxo - 1199 Filo - 784 Flavi - 1199 Influenza - 470 Alpha - 1199 Orthobunya - 946 Rhabdo - 1001	
China	4	2	2	50%	Total Number tests: 3005 Tests by Viral family: Corona - 601 Paramyxo - 601 Filo - 601 Flavi - 601 Influenza - 601	
India	1	1	0	0%	N/A	
Indonesia	3	1	2	67%	Total Number tests: 7708 Tests by Viral family: Corona - 2008 Paramyxo - 1848 Filo - 879 Flavi - 1330 Influenza - 1643	Eijkman Lab is currently not testing for Flaviviruses
Lao PDR	2	1	1	50%	Total Number tests: 5205 Tests by Viral family: Corona - 1630 Paramyxo - 815 Filo - 815 Flavi - 565 Influenza - 1380	
Malaysia	5	2	3	60%	Total Number tests: 11759 Tests by Viral family: Corona - 3349 Paramyxo - 1711 Filo - 1711 Flavi - 1546 Influenza - 3436 Arena - 2 Hanta - 4	
Mongolia	1	1	0	0%	Total Number tests: 800 Tests by Viral family: Influenza - 800	Plan is only to perform influenza and the lab is doing so

Myanmar	2	2	0	0%	Total Number tests: 3199 Tests by Viral family: Corona - 914 Paramyxo - 457 Filo - 457 Flavi - 457 Influenza - 914	NOTE: Testing done at UCD in USA, in-country testing is beginning
Nepal	2	1	1	50%	Total Number tests: 2954 Tests by Viral family: Corona - 844 Paramyxo - 422 Filo - 422 Flavi - 422 Influenza - 844	
Thailand	2	0	2	100%	Total Number tests: 12410 Tests by Viral family: Corona - 2357 Paramyxo - 2357 Filo - 2357 Flavi - 2357 Influenza - 2357 Hanta - 597 Other - 28	
Vietnam	5	2	3	60%	Total Number tests: 4081 Tests by Viral family: Corona - 1166 Paramyxo - 583 Filo - 583 Flavi - 583 Influenza - 1166	
MIDDLE EAST						
Egypt	1	1	0	0%	Total Number tests: 3606 Tests by Viral family: Corona - 1202 Paramyxo - 1202 Filo - 1202	Lab is currently testing for 3 viral families
Jordan	1	0	1	100%	Total Number tests: 2010 Tests by Viral family: Corona - 804 Paramyxo - 402 Filo - 402 Influenza - 402	Lab is currently not testing for Flaviviruses
TOTAL		29	26		115,265	

***for the period 10/1/17-3/31/18 ONLY**

Indicator 1.2e	**QUALITATIVE INDICATOR: List/Description of outbreak support (include country, disease, human or animal, month and year based on sample collection date, important dates, type of support provided, any after action reviews) -** *qualitative context for numbers provided only*	*This indicator is Qualitative only so we do not report on cells B-G*
AFRICA		
Ghana	In February 2018, one person in the Greater Accra region developed symptoms consistent with viral hemorrhagic fever, presented to the hospital and later died. The patient was confirmed by laboratory testing as Lassa fever virus infection. PREDICT assisted in field investigation for reservoir sampling, and captured and sampled from a total of 52 *Mastomys* sp. rodents and *Crocidura* sp. shrews, as well as testing for five priority viral families for PREDICT. The PREDICT field team engaged in staff refresher training and potential trip planning at the time of notification of the event, and prepared logistics and sampling plans over the next four days. The team departed to the investigation site the following day.	
Liberia	In February 2018, 63 patients with mild to moderate diarrheal disease visited a local clinic in Margibi County. Epidemiological investigation suggested a point source event, and PREDICT provided logistical support to the Liberian Ministry of Health to transport outbreak investigators and supplies to the affected area. The PREDICT team provided logistical support to collaborators two days after they received notification and request for assistance for the event.	
Democratic Republic of the Congo	In November 2017, one person in Bas-Uele province presented with symptoms consistent with viral hemorrhagic disease, and was isolated and recovered. Later, another patient presented with similar symptoms in Kinshasa and deceased. PREDICT provided assistance with testing of specimens from both patients after specific pathogen rule-out testing for ebolaviruses and Marburg virus. All five priority families for PREDICT, as well as arenaviruses and rhabdoviruses tested negative. The PREDICT team initiated laboratory testing on the same day that they received the specimens.	
Democratic Republic of the Congo	In October to November 2017, an alert of cattle die-off was sent from the provincial Ministry of Agriculture, Fish and Livestock of Bas-Uele to the National Minister of Fishery and Livestock. More than 4000 cattle imported from outside of DRC died in Bas-Uele province with symptoms including diarrhea, weight-loss, swelling knees, chancroid, and loss of hair on the tail. PREDICT provided testing of ten field-specimens for orthobunyaviruse in addition to the five priority virus families following PREDICT protocols, all of which were negative. Response to this event was coordinated and carried out by a multidisciplinary team including PREDICT, Ministry of Fishery and Livestock, FAO, and LABOVET.	
ASIA		
Bangladesh	In February 2018, two people in Bogra district presented with symptoms consistent with encephalitis and later died. Both had a history of drinking raw date palm sap. The PREDICT field investigation team was deployed to the outbreak site and collected 89 urine and 93 feces specimens from *Pteropus* bat roosts, half eaten palm fruit, as well as ecological information from the site. Specimens were tested for five priority viral families for PREDICT. The field team was deployed one day after receiving request from the government.	
Bangladesh	In November 2017, the PREDICT field team observed neurological symptoms, diarrhea and unusual mortality in crows (*Corvus splendens*) in Dhaka city during their routine field work. In January and February in 2017, PREDICT investigated a crow mortality event at the same site. After receiving a request for outbreak support by the Government of Bangladesh, the PREDICT wildlife field team and the Department of Livestock Services collected samples from crows from two sites and provided technical advice to the Institute of Epidemiology, Disease Control and Research. The crow specimens were tested for five priority viral families for PREDICT. Routine work by the PREDICT field team resulted in early detection of unusual events in wildlife, prompting quick and coordinated action. The field team was deployed one day after receiving	

***for the period 10/1/17-3/31/18 ONLY**

New Indicator	
Indicator 2B (Outcome Level)	**List/Description of application of OH approaches in the workforce (include country, OHUN if relevant, and description of the application of the OH approach)**
AFRICA	
Cameroon	
Cote d'Ivoire	PREDICT/CIV outreach aims at raising awareness in public health staff, but also in villagers, chiefs, technicians, wildlife rangers and persons working at risky transmission interfaces during daily, routine activities. The first step to achieve a One Health approach is to motivate these persons to understand each other's view point and work together. The PREDICT team participates in meetings held by the Technical Secretariat of GHSA, the institution in Côte d'Ivoire in charge of the coordination of the One Health task force. In November 2017, in order to better understand how the One Health approach and response is implemented and how PREDICT can contribute, the PREDICT CIV Country Coordinator organized meetings with principal actors and visiting Global lead staff. The delegation met with county authorities responsible for organizing the response and other relevant actors in the field (ministries, agencies and directions such as the Ivoirian Office of Parks and Reserves, Ministry of Fauna and Game Resources, the Direction o Veterinarian's Services, FAO, and P&R). PREDICT/CIV collaborated with the Direction of Fauna and Game Resources,and the Direction of Veterinarian Services to help increase the capacity of the national surveillance system using a One Health approach. PREDICT is currently working with in-country USAID partners to define how to work together to promote the One Health approach. These meetings with USAID Partners take place quarterly; the last two meetings were held in December 2017 and March 2018. PREDICT/CIV also contributed expertise to the creation of the National Sanitary Security Plan.
Democratic Republic of Congo	Cross Discipline/Functional Efforts The PREDICT/DRC laboratory team, located at the Institut National de Recherche Biomédicale (INRB), has been leading practical training sessions for physicians, veterinarians and biologists enrolled in the Field Epidemiology Laboratory Training Program (FELTP) Masters program since 2016, providing integral molecular biology training for detection of zoonotic viral diseases. Since October 2017, PREDICT/DRC has provided training to 18 FELTP students, as well as 6 biologists from the Institute of Sciences and Medical Technologies of Kinshasa, and 4 physicians from the Department of Medical Biology at the University of Kinshasa. PREDICT protocols for sample collection and laboratory analysis, and mentorship provided by the PREDICT/DRC team, prepare FELTP graduates to be DRC's front line for outbreak investigations. This training provided by PREDICT/DRC strengthens DRC's capacity to respond to zoonotic diseases with a One Health approach, building the skills of those involved in initial field investigations, as well as developing professional capacity in the animal and human health sectors involved in laboratory analysis and response activities. Established OHSM
Ethiopia	PREDCT-2 together with other EPT-2 partners and beyond participated in the establishment of OHSM. Ministry of Health; Ministry of Livestock and Fisheries; Ministry of Forestry, Environment and Climate Change and Ministry of Culture and Tourism (where Ethiopian Wildlife Conservation Authority is part of it) are stakeholders. The MoH (represented by EPHI), and a partner on PREDICT work in Ethiopia) was elected chairman and MoLF is the secretary of the OHSM establishment.
Ghana	PREDICT/Ghana contributed to the investigation around a case of Lassa Fever in Ghana in March, 2018. In collaboration with the Ghana Health Service, the PREDICT Ghana team personnel from the Wildlife Division, Ministry of Land and Natural Resources and Veterinary Services Directorate, Ministry of Food and Agriculture conducted the field investigations, safely capturing and sampling rodents around two locations where the deceased patient resided during the four week period leading up to his illness and conducting human questionnaires in the local community. The team assisted the Ghana Health Service and the School of Public Health, University of Ghana with community sensitization and education on Lassa Fever. In total, the team captured 52 rodents in total and submitted the samples to the laboratory for testing using Lassa Fever specific molecular assays. PREDICT provided the enhanced capacity for safe rodent capture and sampling as well as assessment of risk factors for exposure through application of the PREDICT human questionnaires. The government of Ghana views this effort as a One Health success story where personnel representing the three ministries worked collaboratively to investigate the circumstances of this case, including assessing rodent reservoirs of the virus around the residences of the deceased patient, and evaluating potential human practices and other risk factors that could put this community at greater risk of exposure. The team also worked closely with the Ghana Health Service and the School of Public Health to educate the community on Lassa Fever and strategies for reducing their risk. The One Health approach to this investigation served as the motivation for PREDICT Ghana team members to network with

Guinea	Surveillance, Education, and Prevention Efforts From November 2016 to the present, PREDICT/Guinea has been engaging and educating community members about zoonotic diseases and the risks of viral spillover at the animal-human interface. The community engagement meetings are being used as channel for sensitizing. These community engagement meetings have increased the understanding of the importance of the animal-human interface, an essential key to preventing outbreaks of zoonotic disease. Consequently, representatives of the national stakeholders, who attended the community engagement meetings have reported to the Department of Public health the need of mass canine vaccination campaigns to control rabies in Guinea. A recent workshop (26-30 March 2018) to establish, "One Health approach to cost-effective rabies control in Guinea" put forth recommendations for veterinary surveillance of rabies and laboratory submission of reports of suspected animal cases to the department of Public Health for management of potential human exposures and for veterinarians to adopt appropriate measures towards animals in contact with a suspected animal case.
Kenya	One Health Community Education PREDICT/Kenya, jointly with OHW/OHCEA, FAO and USAID P&R conducted a One Health training event at Mpala between February 1st - 4th, 2018. During the training, participants were taken through a pandemic simulation to learn how to approach an outbreak investigation using PREDICT biosecurity, biosafety protocols. A total of 37 participants attended, drawn from University of Nairobi and Moi University postgraduate students and their faculty mentors, veterinarians at both the national and county (Laikipia) level, Kenya Wildlife Services, Laikipia County health officers and members of the local community. The students observed first-hand a defined high-risk interface, learning about the different drivers and human behavioral risk factors that contribute to the emergence and/or spread of pathogens. In addition, the students learned how to apply the One Health concept to mitigate some of the problems the local community were experiencing (frequent diarrhea and flu-like symptoms).
Republic of Congo (RoC)	Collaborative Efforts PREDICT/RoC successfully assisted in the implementation of a multi-sectoral One Health (EPT) consortium in 2017 involving: MoD, MoH, Ministry of Agriculture, Ministry of Forestry and Wildlife, Ministry of Environment, Ministry of Scientific Research, Ministry of Finance, Homeland Ministry, WHO, and FAO.
Rwanda	Zoonotic & Joint Surveillance Strategies PREDICTRwanda participated and contributed expertise in a One Health SMART workshop convened by the One Health Workforce team to prioritize zoonotic diseases and develop a strategy for joint surveillance.
Senegal	Animal - Human Analysis In an effort to strengthen Senegal's laboratory networks and capacity for rapid detection of priority zoonotic diseases, a GHSA priority, PREDICT/Senegal held laboratory trainings on PREDICT protocols at UCAD and ISRA. This training was conducted by Dr. Alexandre Tremeau-Bravard from the University of California, Davis from 14-25 August, 2017. During this training period, PREDICT successfully provided an overview of general laboratory safety and sample handling including RNA extraction, cDNA synthesis, RNA quality check and consensus PCR for Filoviruses, Coronaviruses, Influenzas and Paramyxoviruses. UCAD and ISRA, critical nodes in Senegal's animal and human surveillance and laboratory networks, are now more skilled and working to advance Senegal's capabilities for detecting priority zoonotic diseases. As a result of the training the laboratories of UCAD and ISRA are now performing viral detection on animal and
Sierra Leone	PREDICT attended and presented at the World One Health day celebration on Friday November 3rd, 2017, organized by the USAID Preparedness and Response (P&R) project in coordination with the Ministry of Health and Sanitation (MOHS) and the Ministry of Agriculture, Forestry, and Food Security (MAFFS). The meeting was attended by government representatives and several key partners (PREDICT, CDC, USAID Mission, FAO, WHO, and Njala University) to raise awareness and provide updates for ongoing One Health projects in Sierra Leone. PREDICT was highlighted as an example
Tanzania	PREDICT/Tanzania Country Coordinator coordinated a group of 70 UGs and organized a session discussing PREDICT's One Health approach to surveillance. Postgraduates at SUA, took part in a training with OHCEA and 4 sessions on PREDICT. At IHI, the Director of sciences gave a presentation on PREDICT focusing on One Health. These sessions serve to increase the understanding and importance of One Health in Tanzania's future workforce.
Uganda	PREDICT trained four veterinary students attending Makerere University's College of Veterinary Medicine, Animal Resources and Biosecurity (COVAB) in the classroom on PREDICT modules and protocols for zoonotic disease, biosecurity, and animal handling and sampling. These students then obtained in situ experience with wildlife field surveillance activities, where they gained hands-on skills in safely and humanely capturing and sampling bats and rodents in and around people's farms and dwellings.
ASIA	

Bangladesh	Collbaorative Epidemiological Investigating Effort November 28 to December 4, 2017, the PREDICT/Bangladesh team was requested by the Government of Bangladesh to use a One Health approach to investigate a crow mortality event in Dhaka City. The crow mortality event was identified at a regular PREDICT wildlife surveillance site. The investigation was led by the Institute of Epidemiology, Disease Control and Research (IEDCR) in collaboration with PREDICT, the Bangladesh Livestock Research Institute (BLRI) and the Government of Bangladesh (GoB) Department of Livestock Services (DLS). Through the One Health Secretariat, PREDICT/Bangladesh collaborated with a team from the DLS during sample collection for this outbreak, as DLS has not participated in a crow outbreak previously, to increase the capacity of DLS to respond to crow mortality events. PREDICT/Bangladesh and DLS were both involved in GoB meetings to discuss the One Health outbreak response and regularly updated the One Health Secretariat. This is the first joint outbreak response for DLS and the PREDICT/Bangladesh team through the One Health Secretariat, which reflects the institutionalization of One Health and workforce capacity development among Government of Bangladesh partners. Investigating Bat Population Near Human Viral Incident February 7th-12th, 2018, the PREDICT/Bangladesh team was requested to participate in a One Health investigation of bats roosting near a suspected Nipah virus outbreak in people of Bagura, Bangladesh. January 29th – 31st, 2018, a PREDICT/Bangladesh team member participated in the Prince Mahidul Award Conference in Thailand. The participant presented a poster on PREDICT's One Health activities in Bangladesh.
Cambodia	Collaborative OH Surveillance & Sampling Effort PREDICT/Cambodia conducted training to update team members on protocols for surveillance in bats and rodents, livestock and humans, laboratory safety and sample handling and storage. The team included local national PREDICT staff, staff from the National Animal Health and Production Institute (NAHPRI), the Forestry Administration (FA), the Cambodian CDC and veterinary and bioscience students from the Royal University for Agriculture, and the Royal University of Phnom Penh. Following the training this team participated in coordinated sampling efforts using a One Health approach at a rodent trade hub on the border with Vietnam and in a bat guano harvesting community in cooperation with district animal and human health officials. By extending training to include government and University individuals, PREDICT/Cambodia is contributing to increasing the understanding of One Health as well as the Cambodia Collaborative Efforts
Indonesia	In-service One Health training during PREDICT/Indonesia field surveillance activities with local partners from universities, ministerial offices of animal and public health, hospitals and primary health care centers. - In collaboration with the South East Asia One Health University Network (SEAOHUN), PREDICT/Indonesia hosted a fellow from the University of Malaya, Kuala Lumpur, an instance of cross-boundary workforce development efforts. SEAOHUN awarded an internship to Ms. Tengku Idzan Nadzirah, who worked with PREDICT-Indonesia's two laboratory partners (PRC-IPB in Bogor and EIMB in Jakarta) for three months, an opportunity for both professional mentorship and skill development. Based on the success of this mentorship, SEAOHUN is planning to allocate two candidates for their fellowship program in 2018 to work with PREDICT-Indonesia's laboratory partners.
Lao PDR	In October 2017, PREDICT/Lao PDR coordinated a meeting in Vientiane that brought together staff from the National Animal Health Laboratory (NAHL) and the National Center for Laboratory and Epidemiology (NCLE), providing a valuable opportunity for professionals from animal and human health sectors to develop working relationships, to discuss common goals in the context of PREDICT and to continue open lines of communication between national-level organizations. In the two weeks following this meeting, 2 NAHL staff (1 female) and 3 NCLE staff (1 female) took part in hands-on refresher sessions in PREDICT diagnostics and training in preparation of samples for viral sequencing, strengthening capacity in both animal and human health labs for zoonotic viral detection in Lao PDR. Shared protocols and collaboration of human and animal health laboratory professionals is integral to the PREDICT project in Lao PDR, and more importantly, aligns organizations for successful implementation of the One Health approach and allows Lao PDR to strengthen its capacity to detect and respond to zoonotic disease threats. During March 2018, six in-service professionals (1 doctor, 2 nurses [1 female], 1 lab technician, and 2 hospital administrative staff [1 female]) at Khong District Hospital in Champasack Province, Lao PDR, were trained in the following: PREDICT policies; protocols for biosafety and PPE; emergency preparedness; basic laboratory safety; provision of assistance during a disease outbreak or health event; human syndromic surveillance; and ethics for human subject research. This training strengthens the foundation of a One Health approach in this rural region by educating human health professionals on the risk of zoonotic disease and strengthening skillsets to enable involvement of these professionals in data collection to support development of interventions to mitigate the risk of spillover and spread of zoonotic viruses. This training marks the expansion of PREDICT's scope in Lao PDR, adding human biological sampling and increasing human behavioral surveillance in a geographic region where wildlife and livestock have been concurrently sampled by PREDICT and FAO since 2016. Improving this community's capacity for concurrent surveillance of zoonotic viruses in animals and humans with the aim to mitigate risks that originate at the interface between humans and animals

Malaysia	14 October 2017 – PREDICT/Malaysia Country Coordinator met with YB Datuk Seri Mah Su Keong, Minister of Plantation Industries and commodities and YB Datuk Dr Kalayan Sundram, Director Malaysian Palm Oil Council. PREDICT/Malaysia Country Coordinator briefed them on PREDICT and IDEEAL work and the important role of Sabah Wildlife Department's Wildlife Rescue Unit (WRU) and Wildlife Health Unit (WHU) in this work and its One Health approach. The Country Coordinator highlighted the impact that this work is having both on wildlife and human health. Minister agreed that Ministry of Plantation Industries and commodities will continue to provide financial support to MPOC to fund WRU and WHU. The One Health aspect of the WRU and WHU work was one of the main reasons the Minister approved further funding as their work is not just benefiting conservation but public health as well. 6 – 8 December 2017 - PREDICT/Malaysia arranged through the US Embassy using DTRA funding for 2 vets from Sabah Wildlife Department / WRU to attend the 4th Joint International Tropical Medicine Meeting held in Bangkok. Each year, the Faculty of Tropical Medicine host this event, giving researchers, policy-makers, doctors, scientists, public-health professionals, and students the opportunity to meet and learn from one another, for the improved health of people living in, and traveling through, the Tropics. The theme this year was ""Tropical Medicine 4.0 Effective Collaboration for an Impact on Global Health."" The meeting program covered a large range of tropical diseases, especially those endemic to Asia, to include: malaria, dengue, helminthic infections, bacterial, viral, fungal and parasitic diseases, and the fields of disease epidemiology, drug development, education, and biology. Attending this conference helps the vets think about their role from a One Health perspective and how their activities directly impact on One Health agenda.
Mongolia	13 March: In preparation for PREDICT/Malaysia's next round of Orang Asli concurrent sampling one new staff member from the Gua Musang District Health team was trained in PREDICT protocols including presentations on One Health and zoonosis. 26 March: In preparation for next round of PREDICT/Malaysia Orang Asli concurrent sampling four new staff member from the Kuala Lipis District Health team were trained in PREDICT protocols including presentations on One Health and PREDICT/Mongolia contributed to the one-Health approach in Mongolia through workforce strengthening on activities: 1. Continue training health (veterinary, zoonotic disease and protected area) specialists through Avian Influenza surveillance in wild birds at key targeted areas of Mongolia in 13 provinces including 6 province veterinary laboratory professionals, 3 protected area rangers and 3 province zoonotic disease center professionals on working as a team for surveillance, reporting outbreaks and responding, sending samples to the State Diagnostic Veterinary Laboratory 2. Continue to support State Central Veterinary Laboratory staff on workforce training though better disease detection, outbreak response and communication with environmental and health Ministries and officers for urgent communication and information sharing. 3. PREDICT/Mongolia supported establishment of Saiga PPR working Group to address wildlife disease outbreak issues among livestock health, environmental agency and national emergency management agencies and continue to educate professionals on One-health approach and need during various disease outbreaks among livestock wildlife and human health sectors.
Myanmar	PREDICT/Myanmar team joined the consultation meeting of SEAOHUN which aimed to review and incorporate One Health related curricula and projects in the invited universities of Myanmar. University of Medicine 1, Yangon volunteered to initiate One Health related intervention for its undergraduate and postgraduate programs. PREDICT/Myanmar was able to provide expertise and guidance on One Health surveillance, biosafety and biosecurity and
Nepal	PREDICT/Nepal contributed to the development of a one health workforce in Neoal by training in-service field personal, laboratory technicians and hospital staff on the One health concept and PREDICT protocols. Biosafety & Field Sampling Training
Thailand	1.PREDICT/Thailand hosted training for one Malaysian scientist from the 2017 SEAOHUN Fellowship Program on October 9-15, 2017. The scientist received training in biosafety and field bat sampling. 2. PREDICT/Thailand organized the "Global One Health Day 2017: One Health Challenges in Thailand 4.0 Era Conference" in collaboration with the Department of Disease Control on November 27, 2017. Thailand's Country Coordinator presented PREDICT/Thailand's progress as part of the One Health mission in Thailand.
Vietnam	Training & Capacity Building to Address Zoonotic Related Behavioral Risk Through partnership with PREDICT in Viet Nam, the Hanoi School of Public Health (a Viet Nam One Health University Network - VOHUN member) has increased capacity in conducting qualitative research as part of a One Health approach to addressing behavioral risk associated with zoonotic disease. PREDICT/Viet Nam provided training in One Health approaches to qualitative research to 11 female and 5 male members of the junior faculty or recent graduates of the HSPH. The teams in turn have been involved in conducting ethnographic interviews and facilitating focus group discussions on behavioral risks associated with animal/wildlife handling and contact.
MIDDLE EAST (Regional)	
Jordan	Capacity Building, Government OH Efforts PREDICT/Jordan, in collaboration with USAID/Jordan, is actively engaging veterinarians and laboratorians in southern Jordan in One Health capacity-building activities, including improving diagnostic capabilities for zoonotic pathogens. Trainings in diagnostic laboratory techniques and implementing a One Health approach for government officials and veterinarians/laboratorians from Southern Jordan are currently in preparation to be held later this year. Southern Jordan does not have the same One Health capabilities as Middle and Northern Jordan, which is why these trainings will help

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NEW INDICATOR

Indicators 2.1a	Total # of faculty members that received OH training or professional development	Females	Males	Animal Health Field	Human Health Field	Other
AFRICA (Regional)						
Cameroon	33	12	21	13	17	
Cote d'Ivoire	22	4	10	3	8	
DRC	18	4	14	4	12	
Ethiopia	7	2	5	4	2	
Ghana				1	5	
Guinea	2	2	0	0	2	
Kenya	19	3	3	6	8	
Liberia	6	1	5	2	5	
RoC	0	0	0	0	0	
Rwanda	0	0	0	0	0	
Senegal	4			4	1	
Sierra Leone	19	6	13	2	17	
Tanzania	33	15	18	11	28	
Uganda	0	0	0	0	0	
ASIA (Regional)						
Bangladesh	1	0	1	1	0	
Cambodia	12	5	7	5	8	
China	2	2	0	1	1	
India	11	0	2	5	4	3
Indonesia	26	15	11	1	26	
Lao PDR	16	8	8	8	0	
Malaysia	67	18	49	40	27	
Mongolia	3	0	3	3	0	
Myanmar	33	12	21	2	31	
Nepal	8	3	5	5	3	
Thailand	0	0	0	0	0	
Vietnam	23	9	14	6	8	
MIDDLE EAST (Regional)						
Egypt	3	0	3	2	1	
Jordan	0	0	0	0	0	
GLOBAL	12	11	1	3	8	
TOTAL	380	132	214	132	222	3

Faculty are defined as those within a University/academic research institute that report as not being a student; participant can report multiple fields of health area

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NEW INDICATOR

Indicators 2.1b	Total # of educational materials developed	OH Modules	Case Studies	Training Manuals	Textbooks	Other (including PPT's)
AFRICA (Regional)						
Cameroon						
Cote d'Ivoire						
DRC						
Ethiopia						
Ghana						
Guinea						
Kenya						
Liberia						
RoC						
Rwanda						
Senegal						
Sierra Leone						
Tanzania						
Uganda						
ASIA (Regional)						
Bangladesh						
Cambodia						
China						
India						
Indonesia						
Lao PDR						
Malaysia						
Mongolia						
Myanmar						
Nepal						
Thailand						
Vietnam						
MIDDLE EAST (Regional)						
Egypt						
Jordan						
GLOBAL	3			3		

Educational Materials refer to instructional course or training modules/materials (including course packets, instructor guidelines, quizzes, standard operating protocols), stand-alone textbooks or case studies, FETPV materials

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NEW INDICATOR

		SEX			AFFILIATION		
Indicators 2.2a	**Total # of future professionals trained**	**Male**	**Female**	**Undeclared**	**Animal Health Field**	**Human Health Field**	**Other**
AFRICA (Regional)							
Cameroon	11	6	6		1		24
Cote d'Ivoire	2	2	2		1		7
DRC							
Ethiopia							
Ghana							
Guinea	1	1					2
Kenya	3	3					6
Liberia							
RoC							
Rwanda							
Senegal							
Sierra Leone							
Tanzania	2	2	2		1		7
Uganda							
ASIA (Regional)							
Bangladesh							
Cambodia	1				1		2
China	2	2					4
India							
Indonesia							
Lao PDR							
Malaysia	1	1					2
Mongolia							
Myanmar							
Nepal							
Thailand							
Vietnam	4	2	2		2		10
MIDDLE EAST (Regional)							
Egypt	9	4	5		4		22
Jordan							
GLOBAL	1		1		1		3
TOTALS	37	23	18		11		89

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Future professionals = Individuals enrolled in certificate/degree programs at member universities, regardless of whether were once in the workforce or not. This classification is based on self-identification by the participant on OHW training rosters. For P2, students are self-identified during training sessions.

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NEW INDICATOR							
		SEX			AFFILIATION		
Indicators 2.2ba	**Total # of OH fellows placed**	**Male**	**Female**	**Undeclared**	**Animal Health Field**	**Human Health Field**	**Other**
AFRICA (Regional)							
Cameroon	8			8			
Cote d'Ivoire (EHA)							
Côte d'Ivoire (IP)							
Côte d'Ivoire (IP/EHA)	6			6			
DRC	28			28			1
Ethiopia							
Ghana							
Guinea							
Kenya	3	3			3	2	
Liberia							
RoC							
Rwanda							
Senegal	10			10			
Sierra Leone							
Tanzania	9			9	0		1
Uganda	4			4	1		
ASIA (Regional)							
Bangladesh	1			1			1
Cambodia							
China							
India							
Indonesia	1		1				
Lao PDR							
Malaysia							
Mongolia							
Myanmar	1			1			
Nepal	1			1	1		
Thailand	1			1			
Vietnam							
MIDDLE EAST (Regional)							
Egypt							
Jordan							
GLOBAL							
TOTAL	73	3	1	69	5	2	3

Fellowship includes temporary placement in an approved One Health organization/activity; Fellows include students and early-career professionals

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Indicator 2.2c		By Sex			Affiliation			*Current professional: all project staff (including faculty, lab and veterinarians, and administration/support staff who work on the FO project).*
	Total # of current professionals trained	Male	Female	Undeclared	Government	Academia/Research	Other	
AFRICA								
Cameroon	44	26	18		2	10	23	
Cote d'Ivoire	14	12	4		6	9	1	
DRC	18	14	4				18	
Ethiopia	7	5	2			2	5	
Ghana	6	6			2		4	
Guinea	1	1					1	
Kenya	9	4	5		5	3	1	
Liberia	6	5	1				6	
RoC								
Rwanda								
Senegal	1	1				1		
Sierra Leone	19	13	6			3	16	
Tanzania		35	16	19	13	18	4	
Uganda								
ASIA								
Bangladesh	1	1					1	
Cambodia	13	7	6			4	9	
China	4	4				4		
India	5	2		3		1	4	
Indonesia	26	11	15		4	19	3	
Lao PDR	16	8	8		8		8	
Malaysia	83	49	19		69		14	
Mongolia	3	3			2		1	
Myanmar		33	21	12	24		9	
Nepal		8	5	3			8	
Thailand								
Vietnam	23	14	9		12	6	9	
MIDDLE EAST								
Egypt	12	7	5		12			
Jordan								
Global Team	13	1	11				13	
TOTAL	324	270	155	37	159	80	158	

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New Indicator

Indicator 3A (Outcome Level)	QUALITATIVE INDICATOR: List/Description of national/regional coordination mechanisms showing improved capacity *include national/regional mechanism that has shown improvement, evidence of improvement (how/why coordination mechanisms has shown improvement)	*...points with sub-national and community levels; multi-ministry or multi-sectoral teams on the ground (for example, in outbreak investigations).*
Indicate Country, Region or		
Bangladesh	Between January 2nd – 7th, 2018, the PREDICT Bangladesh Team, jointly with FAO, conducted a "Four-Day Training on Cross Border Livestock Animal Movement Associated Disease Study" in the northwestern border district of Dinajpur Bangladesh. The aim of this work is to investigate the trans-boundary animal value chain between Bangladesh and India. In this training, the following topics were discussed: personal safety; animal welfare; sampling procedures; and sample storage, processing, and shipment.	
China	PREDICT/China team coordinated the 1st International Workshop on Biosafety Laboratory Management and Experimental Techniques at Wuhan Institute of Virology on 18-28 October, 2017, where PREDICT/China in-country staff from Thailand, as well as 20 other participants from Asian and African countries were invited to attend and receive trainings on laboratory practice for high-level biosafety laboratories.	
Cote d'Ivoire	PERSONNEL TRAINING, MONITORING SYSTEMS, COMMUNICATION EFFORTS. PREDICT/CIV activities have contributed to improvements in the research capacity of investigators at select sites. PREDICT/CIV team members have trained nurses, community agents, and forestry and wildlife rangers, thereby raising awareness in villagers. The PREDICT/CIV team has helped the Direction of Veterinarian Services and the Direction of Fauna and Game Resources build their surveillance systems. PREDICT.CIV staff have fostered better communication between ministries, institutions, leaders, coordinators, and people working in the field. PREDICT/CIV contributed to capacity improvement attending and contributing to the workshops and the activities of the Technical secratariat, responsible for coordination of the GHSA in Côte d'Ivoire.	
Democratic Republic of Congo	PREDICT DRC actively participated in the Joint External Evaluation (JEE) of the International Health Regulations in the Democratic Republic of Congo from March 16-20, 2018 in Kinshasa. DRC government and national experts, technical experts from Benin, France, Mauritania, Morocco and Senegal, and experts from international organizations (PATH, CDC, WHO, etc.) came together to assess the country's ability to prevent, detect and respond quickly to threats to public health, using the One Health approach. PREDICT/DRC played a contributory role in the laboratory subgroup during this evaluation process, providing explanations and clarifications regarding zoonotic diseases, and the PREDICT/DRC laboratory manager continues to be active in the JEE laboratory breakout group where priority objectives and activities are being identified as part of a national action plan to improve DRC's capacity to respond to public health threats.	
Ethiopia	PREDICT-2 Ethiopia contributed in the improvement of disease diagnostic capacity through provision of training to laboratory technicians in the Aklilu Lemma Institute of Pathobiology, the Ethiopian Public Health Institute, and graduate students at Addis Ababa University.	
Ghana	IMPROVED SURVEILLANCE & LAN ANALYSIS PREDICT/Ghana personnel from the Wildlife Division, Ministry of Land and Natural Resources; Veterinary Services Directorate of the Ministry of Food and Agriculture; and Noguchi Memorial Institute for Medical Research were actively involved in the One Health Zoonotic Disease prioritization workshop in Ghana organized by FAO under the guidance of CDC in April 2018. PREDICT/Ghana and its partner institutions played key leadership roles in identifying the list of priority zoonotic diseases for the country. Through cross-sectoral engagement of partners, including Ghana Health Service; Veterinary Services Directorate, Ministry of Food and Agriculture; Wildlife Division, Ministry of Land and Natural Resources, the Noguchi Memorial Institute for Medical Research at the University of Ghana, and the Ghana Armed Forces, coordination among the three ministries and with the university has greatly improved as they work together on the surveillance and laboratory analyses for PREDICT/Ghana and participate in GHSA activities. This enhanced capacity in coordination is evidenced by the request for the Wildlife Division and Noguchi Memorial Institute to champion the investigation of the Lassa Fever case in Ghana in collaboration with the Ghana Health Service.	
Guinea	Strengthening of national laboratory and surveillance systems To support strengthening national laboratory networks in Guinea for rapid detection of filoviruses, PREDICT/Guinea organized a general training on testing of samples using the PREDICT protocols. The training was conducted by Dr. Alexandre Tremeau-Bravard from the University of California Davis. It provided an overview of the whole process including general laboratory safety and sample handling from RNA extraction, cDNA synthesis, RNA quality check and consensus PCR for Filoviruses. A total of 12 Laboratory staff from the Viral Hemorrhagic Fever Laboratory, Central Veterinary Diagnostic Laboratory and Laboratory of National Institute of Public Health participated in the training. These laboratories, all critical nodes in Guinea's animal and human surveillance and laboratory networks, are now more skilled and working to advance Guinea's capabilities for detecting known and novel viral threats. " PREDICT/Guinea participates in the monthly GHSA-One Health Committee Meeting. Participating Groups include Ministers of Health,	
Kenya	Disease reporting/surveillance: PREDICT/Kenya participated and gave suggestions on the need to include wildlife reports if any to support the complete picture on the ground. PREDICT/Kenya underscored the importance to capture wildlife data in the same way as in livestock by requesting that DVS considers training the KWS vets/ wardens/those people working closely with wildlife. PREDICT has participated in such meetings where FAO in conjunction with DVS had organized training on disease reporting targeting Counties and Sub-counties.	
India	On 17 January, 2018, the PREDICT India Field Coordinator attended the Annual Review Meeting of GHSA in India, held in New Delhi. The review panel included Secretaries and Director Generals (DGs) of Ministry of Health and Family Welfare (MoH&FW), Government of India (GoI) – Ms Preeti Sudan (H&FW), Prof K VijayRaghavan (Department of Health Research; DHR, and DG-Indian Council of Medical Research; ICMR) and newly appointed Dr B D Athani (DG-Health Services) – among others. Ms MaryKay Loss Carlson, Deputy Chief of Mission, Dr Kayla Laserson, Country Director, Centre for Disease Control and Prevention (CDC) and Mr Mark A White, Mission Director, US Agency for International Development (USAID) were also in attendance from US Embassy, New Delhi. This meeting focused on a comprehensive review of all GHSA activities in country, and fosters multi-sectoral cooperations and collaborations.	
Indonesia	Personnel Training, Biosafety Preparedness PREDICT/Indonesia organized a training and introduction of Biosafety and Good Clinic Practices in Biomedical Research in Health Facilities Settings, conducted at Noongan Hospital on 31 January – 1 February 2018. The training was well-attended by 66 participants (48F, 18M). The seminar participants included clinicians and laboratory staff from 13 Puskesmases within the District of Minahasa, from 14 Puskesmases within the District of Southeast Minahasa (Minahasa Tenggara), Noongan District Referral Hospital in Minahasa, representatives from North Sulawesi Provincial Health Office, Minahasa District Health Office, and Southeast Minahasa (Minahasa Tenggara) District Health Office. The topic of the training included: the improvement of biosafety aspects toward the health facilities accreditation; general biosafety procedures in health facility settings; good laboratory practices; and basic good clinical practices in biomedical research involving human subjects at health facilities. Participants commented positively that the training helped to prepare each Puskesmas for an upcoming accreditation program as required by the Ministry of Health. The training was taken as preparation toward the accreditation. PREDICT/Indonesia provided biosafety starter kits to all participants. The workshop was funded jointly by USAID's PREDICT and PRESTASI III programs.	

Jordan	In 2016, PREDICT-/Jordan initiated a PREDICT-2 Focal Point Committee including focal points from the Ministry of Health, Ministry of Agriculture, Ministry of Environment, World Health Organization (WHO), Food and Agriculture Organization of the United Nations (FAO), World Organisation for Animal Health (OIE), Royal Scientific Society (RSS), and Hashemite Fund for Development of Jordan Badia. This committee continues to meet regularly to update all partners about the PREDICT-2 project and also serves as a platform for implementation of the One Health approach in Jordan. Since the initiation of this committee, there have been marked improvements in communication among ministry focal points regarding One Health topics in Jordan. It has also led to inclusion of focal points and PREDICT Jordan in activities such as a tabletop simulation to test and update the National Pandemic Influenza Preparedness and Response Plan and implementation of the National Action Plan for Health Security developed with WHO.	
Malaysia	Increased Sampling Collaboration PREDICT/Malaysia has an ongoing collaboration with the Ministry of Health, Department of Veterinary Services and Department of Wildlife and National Parks (PERHILITAN), as well as coordinating with these three government agencies to conduct concurrent sampling on wildlife, domestic / livestock, and at-risk human populations with high levels of contact with animals at Orang Asli villages on Peninsular Malaysia. In Sabah PREDICT/Malaysia has similar engagement with Sabah Wildfire Department and Sabah State Health Department. Through this engagement PREDICT continues to see an improvement in collaboration and coordination between these agencies. There is an improved exchange of information, greater coordination and increased willingness to share resources and work together. PREDICT results are being approved quicker for release and more widely discussed between all parties and across Peninsular Malaysia and Sabah. 16 March 2018: the new molecular zoonosis laboratories at PERHILITAN's National Wildlife Forensic Laboratory were re-certified as a BSL- 2 laboratory according to the Biosafety in Microbiological and Biomedical Laboratories (BMBL) 5th Edition (December 2009), the United States standard for laboratory specifications after its first year of operation. PREDICT/Malaysia has played an active role in helping to manage this facility and has been asked by PERHILITAN to now become an official part of the management	
Mongolia	Personnel Training - Monitoring, Surveillance, Outbreak Investigation PREDICT/Mongolia continue to assist with training and capacity building of key professionals from 6 province veterinary laboratory, 3 protected area rangers and 3 province zoonotic disease center professionals on various topics including outbreak response and investigation, One Health monitoring and surveillance, personal protective equipment, and wild bird identification.	
Myanmar	Personnel Training PREDICT/Myanmar participated in an ongoing wild elephant collaring study, training with veterinarians of the Myanmar Timber Enterprise (MTE) of the Ministry of Natural Resources and Enviornmental Conservation (MONREC) in Ngapudaw, Ayarwaddy region in collaboration with WWF. Altogether 10 vet officials, vet assistants and elephant trainers were trained for PPE, biosafety, implementation of cold chain and storage and transportation of samples, according to the PREDICT protocols in the elephant camp, MTE, Ngapudaw, Ayarwaddy region. Dr Soe Thu, vet officer, LBVD participated in fruit bat catching in Oakkan & Taikkyi, Yangon. He was s trained by PREDICT in PPE & biosafety, sampling methods and sample packaging and transportation. This training contributed to increasing Myanmar's workforce capacity. PREDICT/Myanmar team joined the One Health International Conference in Bangkok, in December 2017, increasing communication and collaboration potential with regional One Health partners.	
Nepal	Coordination Mechanism Established PREDICT/Nepal established a coordination mechanism among Food and Agriculture organization (FAO), Nepal and Central veterinary laboratory (CVL) under Ministry of livestock development (MoLD) to plan and operate joint One Health research in urban communities.	
Republic of Congo (RoC)	Through the multi-sectoral One Health (EPT) Consortium, the PREDICT/RoC Country Coordinator led advocacy at the national level, particularly at the level of the Ministry of Health and WHO, for the establishment of an EPT Consortium as part of the dynamic "One Health." This was done through the establishment of an IHR (International Health Regulations) Committee which, in the Congo, acts not only as an EPT Consortium (One Health) but also as an inter-sectoral or multi-sectoral committee for preparedness and response to disease outbreaks. This committee is chaired by the Director General of Epidemiology and Disease Control and Response (DGELM). This IHR Committee is one of the success stories to be put to the credit of PREDICT/RoC. It is within this framework that PREDICT/RoC supported the last Monkeypox	
Rwanda	Improved Surveillance, Personnel Training, PREDICT/Rwanda continues to strengthen capacity for laboratory-based surveillance for emerging infectious pathogens of wildlife origin. PREDICT/Rwanda has trained laboratory technician's in the Ministry of Health's Rwanda Biomedical Center's National Reference Laboratory to apply pcr viral family testing protocols to biological samples collected from febrile patients, in order to document infection with viruses of zoonotic potential. Furthermore, the National Reference Laboratory is also applying these same PCR viral family testing protocols to biological samples from wildlife that are pre-processed at the Ministry of Agriculture/Rwanda Agriculture Board (RAB) Wildlife Virology Laboratory, demonstrating inter-ministry coordination that has occurred as a result of PREDICT/Rwanda surveillance. During this reporting period, 95 human and 45 bat specimens have undergone laboratory testing, and more than 250 wildlife samples have undergone pre-	
Senegal	Personnel Training PREDICT/Senegal principal investigator and country coordinator participated in the ""One Health Skills Integration"" workshop. The objective of the workshop was to provide One Health skills to current professionals to increase the capacity to understand and respond to health threats in the animal, human and environmental fields. This workshop brought together veterinarians, medical doctors, biologists, environmentalists, and military personnel. PREDICT/Senegal was able to share expertise on One Health surveillance including biosafety and biosecurity, collaboration between animal and human health partners, and safe sample transport, ultimately contributing to strengthening	
Sierra Leone	Personnel Training & Refresher PREDICT/Sierra Leone successfully conducted a 10 day multi-national continuing education and refresher update training on biosafety and biosecurity (personal protection during field and laboratory work), field data collection and quality control, and animal sampling (bats and rodents) for 14 PREDICT Sierra Leone staff, 8 PREDICT Guinea staff, and 3 PREDICT Senegal staff at the University of Makeni Sierra Leone (October 1st – 10th , 2017).	
Tanzania	PREDICT/Tanzania attended and supported the launch of the National One Health Platform in February 2017.	
Thailand	Government Collaboration, Personnel Training PREDICT/Thailand contributions include: Sharing surveillance and test results with governmental coordinators such as 1) Bureau of Emerging Infectious Diseases, Department of Disease Control, Ministry of Public Health, 2) Department of National Parks, Wildlife and Plant Conservation, Ministry of Natural Resources and Environment, and 3) Bureau of Disease Control and Veterinary Services, Department of Livestock Development, Ministry of Agriculture and Cooperatives. Sharing specimen sampling techniques and the PREDICT protocol concept with the Bureau of Epidemiology, DDC, at meetings titled "Sample Collection and Specimen Transferring for Diagnoses of Avian Influenza Virus in Suspected Cases" on October 18, 2017, "Sample Collection and Testing Methods for Diagnosis of Emerging Infectious Pathogens and Training on Specimen Collection and Handling" on November 30, 2017, and "Training on the Necropsy Technique for Collecting Brain and Lung Tissue Specimens for Laboratory Investigation" on December 20, 2017.	

Uganda	Collaborative Drafting of National Surveillance Plans PREDICT/Uganda contributed expertise in wildlife zoonotic disease surveillance, prevention and response in a governmental workshop to draft Uganda's National Surveillance Plans for Brucellosis and Anthrax, held in Mukono, Kampala November 27 - December 1, 2017, organized by EPT2/FAO and attended by the Uganda Ministry of Agriculture staff and Uganda EPT2/GHSA partners. As well, PREDICT/Uganda participated in several workshops that advanced Uganda's preparedness for outbreak response and surveillance: the Uganda One Health stakeholders titled Mapping and After Action Review of Avian Influenza Outbreak, on December 12-14, 2017 in Kampala; a workshop for developing the Uganda National Surveillance Plan for Rabies and Highly Pathogenic Avian Influenza in Jinja January 29 - February 2, 2018, facilitated by FAO; a workshop to draft the Communication Strategy for the National One Health Platform and the launch of the National One Health Strategic Plan on February 14-15, 2018, in Kampala; and a workshop on Strengthening the National Epidemiosurveillance Networks and Outbreak Response to Priority Zoonotic Diseases, held February 26 - March 2,2018, in Masaka, facilitated by FAO.	
Vietnam	LISN Initiaive for Surveillance & Testing PREDICT/Viet Nam contributed to efforts to coordinate surveillance for influenza and emerging pathogens through the LISN initiative in Viet Nam. The LISN initiative includes PREDICT, FAO, WHO, USAID, and the Government of Viet Nam through the Ministry of Agriculture and Rural Development and the Ministry of Health. FAO influenza surveillance in poultry and swine, WHO SARI and ILI surveillance in hospitals and clinics, and PREDICT surveillance have been coordinated to expand testing of surveillance samples by applying PREDICT protocols for Filo, Flavi, Corona, and Paramyxo viruses in addition to the influenza surveillance already conducted in livestock and syndromic humans in Viet Nam. The coordination covers the timing of field surveillance, protocols for sample collection and laboratory testing, and the joint analysis of surveillance data across the animal and public health sectors.	

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New Indicator

Indicator 3B (Outcome Level)	QUALITATIVE INDICATOR: List/Description of global, regional or country (lab, surveillance, workforce, OH, AMR) strategies under implementation *include title of strategy, brief description of focus/topic of strategy, if the strategy was endorsed and by whom	*points with sub-national and community levels; multi-ministry or multi-sectoral teams on the ground (for example, in outbreak investigations).*
Indicate Country, Region or		
Bangladesh	PREDICT/Bangladesh attended the following meetings and contributed One Health expertise: October 27th, 2017: The PREDICT team participated in a One Health economic meeting at the World Bank office in Dhaka, organized by the World Bank Bangladesh office. The following partners were included: One Health Bangladesh, IEDCR, DLS, and P&R. On the 4th of December 2017, PREDICT participated in a meeting held by the National Technical Committee on Avian Influenza, organized by DLS. On the 19th of December 2017, the team participated in a workshop on the Transmission of Avian influenza from wild to domestic birds,	
Cambodia	PREDICT/Cambodia attends and provides expertise for the Cambodian government's Zoonotic Technical Working Group	
Cote d'Ivoire	National Sanitary Security Plan in CIV. Providing expertise in One Health surveillance, viral detection, and multi-sectoral information sharing at workshops. Upon invitation from the Coordinating Unit, PREDICT/CIV contributed to the One Health approach to surveillance for priority zoonosis and emerging threats by supporting working groups in preparation for the workshops. The PREDICT CIV team reviewed the pathogen classification system and evaluated the prioritization of microorganisms during a workshop at IPCI on December 17, 2017. Developing an integrated surveillance system for zoonosis. On December 2, 2017, PREDICT/CIV was invited to take part in a workshop on monitoring systems of animal biodiversity and integrated surveillance of zoonosis, organized by the FETP-Frontline. The workshop was aimed at developing an integrated surveillance system for zoonosis within the framework of One Health approach, following the recommendations of the Joint External Evaluation and the prioritization of zoonotic diseases to be monitored in Côte d'Ivoire (anthrax, salmonellosis, rabies, highly pathogenic avian influenza, bovine / human tuberculosis, hemorrhagic fever, brucellosis, echinococcosis, cysticercosis, and Rift Valley fever).	
Ethiopia	In December 2017, the PREDICT/Ethiopia Country Coordinator attended the "Ethiopia National One Health Strategic Plan Validation, Organizational Structure Development and MoU Review Workshop," organized by USAID Preparedness and Response. Also in December 2017, The purpose of the workshop was to review and validate the draft National One Health Strategic Plan, agree on the Organizational Structure of the National One Health Platform and review and agree on the inter-sectoral collaboration, Memorandum of Understanding. In January 2018, PREDICT/Ethiopia participated in OH Steering Committee Meetings where the National One Health Strategic Plan (2018-2022) for Ethiopia was endorsed. Also in December 2017, the PREDICT/Ethiopia Country Coordinator attended a workshop organized by FAO ECTAD and the National One Health Steering Committee (NOHSC). The aim of the workshop was to initiate the establishment of a multi-stakeholder and inter-sectoral National One Health Communication Network (OHCN), in Ethiopia in collaboration with the Government Communication Affairs Office. The attendants of the workshop were the Government Communication Affairs Minister, Livestock and Fishery State Minister, Ethiopian Wildlife Conservation Authority General Director and FAO Representative to Ethiopia as well as delegates from Government Ministry offices, NGOs,	
Ghana	PREDICT Ghana played a leadership role in the national GHSA One Health Zoonotic Disease Prioritization Workshop in March 2018. The workshop identified 31 zoonotic diseases in Ghana. Participants identified a list of six priority zoonotic diseases, including anthrax, rabies, zoonotic tuberculosis, zoonotic avian influenza, hemorrhagic fevers, and trypanosomiasis. Dr. Richard Suu-Ire, the wildlife veterinarian at the Wildlife Division of the Ministry of Land and Natural Resources and the lead coordinator for wildlife disease surveillance for PREDICT in Ghana was invited to deliver a presentation entitled "Environmental Dimensions of Health Security –Strategies and Partnerships from Ghana" at the International Stakeholder Consultation on National Health Security and Pandemic Influenza Preparedness Planning in Ghana in December 2017. The objectives of the stakeholder consultation were to strengthen collaboration and coordination regarding the implementation of the national and global action plans of influenza pandemic preparedness and response with multi-sectoral stakeholders, including FAO and OIE; finalize the strategies and priorities with partners for influenza pandemic preparedness and response; share the status of country influenza pandemic preparedness, identify gaps and challenges and prioritize actions at national, regional and global level; align efforts among key stakeholders to address prioritized gaps and implement the WHO pandemic preparedness plan, within the framework of national action plan for health security. Through his presentation, Dr. Suu-Ire stressed the importance of the involvement of wildlife/environmental sector in the action plans for influenza preparedness as capacity in	
Kenya	PREDICT/Kenya Country Coordinator participated in the Community Leaders' Consultative Meeting on Climate Change and its Effect on Social-Ecological Systems within Different Land Use Sysetms in Laikipia County, Kenya.	
Liberia	National One Health Platform Governance Manual; National Action Planning for Health Security; National Surveillance Plan for Monkey Pox The PREDICT/Liberia team has been involved in several national level discussions including: The drafting and finalization of the National One Health Platform governance manual, the National Action Planning for Health Security, and development of a national surveillance plan for monkey pox. The National One Health Platform has been established with several line ministries consisting of the steering committee with the Vice-President as chair. In addition, PREDICT/Liberia has recently been involved with developing a national NGO One Health forum that will align NGOs with government One Health activities and fit within the existing structure of the National One Health Platform.	
Malaysia	Established EEHV surveillance for Sabah. The PREDICT/Malaysia Laboratory Manager attended the International workshop on molecular diagnosis for Elephant endotheliotropic herpesviruses (EEHV) infection at Faculty of Veterinary Medicine, Kasetsart University, Thailand with Wildlife Rescue Unit veterinarian Laura Benedict as part of the effort to help Sabah Wildlife Department to establish EEHV surveillance for Sabah.	
Mongolia	Wildlife Friendly FMD Control Strategies PREDICT/Mongolia and FAO/OIE are supporting the National strategy on PPR Eradication, pushing for wildlife friendly FMD control strategies.	
Nepal	PREDICT/Nepal provided expertise to assist in building the One Health Network for South Asia at the "The second One Health International Conference 2017" in Thailand. As a result, Nepal is a member of the One Health Network for South Asia and will be contributing to building strong collaboration in the region for One Health activities.	
Republic of Congo (RoC)	The RoC IHR committee is chaired by the Director General of Epidemiology and Disease Control and Response (DGELM). Within this framework, PREDICT RoC supported the last Monkeypox epidemic in the North zone in 2017. PREDICT/RoC contributed to the validation of the committee and its importance towards supporting One Health outbreak response activities.	
Senegal	Mapping Health Risks PREDICT/Senegal participated in a National One Health meeting organized by the COUS (Center of Emergency Operations), Ministry of Health in February 2018. The purpose of this meeting was to validate and map the major health risks in Senegal. PREDICT/Senegal gave expertise in the discussion of mapping Senegal's health risks by region as well as identifying next steps towards further identification and reduction of health risks in the country.	
Sierra Leone	GHSA/IHR/JEE five-year strategic activity; REDISSE project (sponsored by World Bank) review, prioritization, and planning process PREDICT participated as observers and advisors in the zoonotic disease prioritization workshop held in Freetown by DAI USAID Preparedness and Response Project from November 15- 17, 2017. Six Zoonotic Diseases were prioritized for multi-sector collaboration in the country: Viral Haemorrhagic Fevers (Ebola/Lassa), Rabies, Zoonotic Influenza (Avian, Swine), Salmonella, Anthrax, and Plague. PREDICT participated in the GHSA/IHR/JEE five-year strategic activity planning for the country in October 2017, organized by the Ministry of Health and Sanitation (MOHS) with support from WHO. This meeting will determine the top disease priorities for health sector development in Sierra Leone. PREDICT participated and provided technical support to the Government in the REDISSE project (sponsored by World Bank) review activity and prioritization and planning process, which took place in November and December 2017 in Freetown and Makeni, respectively.	
Thailand	PREDICT-1 enterovirus PCR protocols, Thai Red Cross PREDICT-1 enterovirus PCR protocols have been implemented at the Thai Red Cross Emerging Infectious Diseases Health Science Centre (PREDICT lab) for testing patient specimens from the Ministry of Public Health (MOPH) under the National surveillance program for hand, foot, and mouth disease.	
Uganda	Understanding zoonotic viral spillover from wildlife into people PREDICT/Uganda was requested to attend the 4th High-Level GHSA Ministerial meeting in Kampala on October 25-27, 2018 joining Uganda EPT partners in updating USAID GHSA leadership on its One Health approach to better understanding zoonotic viral spillover from wildlife	

Vietnam	Vietnam One Health Strategic Plan As a member of the One Health Partnership for Zoonosis in Viet Nam, PREDICT/Viet Nam contributed to the development of the Viet Nam One Health Strategic Plan for the period 2016 to 2020, led by the Ministry of Agriculture and Rural Development together with the Ministry of Health. PREDICT/Viet Nam contributions included providing guidance on research, surveillance and laboratory approaches designed to detect potential emerging zoonotic threats.	

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NEW INDICATOR

Indicator 3.2a	**#, list of high-level multisectoral and/or multilateral events coordinated *include list of countries/regional involved and/or sectors represented, title and topic of event, date(s) of event, and key outcomes/deliverables of the event**
Indicate Country, Region or	
Bangladesh	1) One Health Day. 5 Nov 2018. Sher-e-Bangla Agricultural University (SAU), Dhaka. Participating Groups: Sher-e-Bangla Agricultural University, Shaheed Suhrawardy Medical College and Hospital, Forestry Department, Directorate General of Health Services (DGHS), EcoHealth Alliance, Preparedness and Response (P&R); and USAID. Celebration of One Health activities. 2) 24th BSVER Annual Scientific Conference. 24-25 Mar 2018. Bangladesh Agricultural University, Mymensingh, Bangladesh. Multi-sectoral groups included: University Grants Commission (UGC), Bangladesh Agricultural University, Mymensingh, Krishi Gobeshona Foundation (KGF); ECTAD, FAO, One Health Bangladesh, and EcoHealth Alliance. At this conference, the PREDICT/Bangladesh Country Coordinator presented on "One Health Economic Analysis of Important Zoonotic Diseases in Bangladesh".
Jordan	One Health Focal Points Committee. Participating Groups: Ministry of Health, Ministry of Agriculture, Ministry of Environment, World Health Organization (WHO), Food and Agriculture Organization of the United Nations (FAO), World Organisation for Animal Health (OIE), Royal Scientific Society (RSS), and Hashemite Fund for Development of Jordan Badia.
Malaysia	National Wildlife Forensic Lab Meeting. 13 Feb 2018 Participating Groups: Indonesia Dr. Diah Iskandriati (Scientific Advisor, IPB-STP) and colleagues from Bogor Agricultural University (IPB) Science Techno Park (IPB-STP) Dr Dadang Syamsul Munir, MM, Director and Dr. Meika Syahbana Rusli, & President Director of IPB-STP. PREDICT/Malaysia visited PERHILITAN's National Wildlife Forensic Laboratory to learn about the lab design and discuss future collaborations. IPB-STP is in the process of building an integrated laboratory facility to support its function with some funding from the Indonesian government. One of its purposes will be to provide laboratory service for wildlife. At the moment Indonesia doesn't have one centralized and standardized laboratory to support analysis for pathogen detection, genetics and forensics. The purpose of this visit was to learn about laboratory services for wildlife from the established wildlife laboratory in the region (the NWFL being one of the best examples) to apply to their facility, as well as explore the possibility of future collaborations.
Myanmar	"Wildlife surveillance and coordination for outbreak response in line with Draft One Health Plan". Participating Groups: Central Epidemiology Unit (CEU). Team actively participated in the development and final reviews of One health plan, PIP and Influenza guidelines.
Senegal	Regional Meeting. Mar 2018. Participating Groups: EPT2 FAO in Abidjan on Biosafety and Biosecurity in Laboratories. Participating Countries: Cameroon, Chad, Congo Brazzaville and Congo Kinshasa, Mali, Guinea, Burkina Faso, Mali, Togo, Cote d 'Ivoire, Senegal, and Benin. PREDICT/Senegal discussed PREDICT activities and how they contribute to increasing biosafety and biosecurity the lab and field, as well as to the laboratory network as a whole of Senegal.
Thailand	Global One Health Day 2017: One Health Challenges in Thailand 4.0 Era Conference. 27 Nov 2017. Participating Groups: 8 One Health organizations, 7 ministries, and Thai Red Cross. Key outcomes: progress updates on One Health activities from each organization, and networking amongst ministries and organizations. Hosted the Bat-associated Pathogen and Ecology Research Network (BPERNet) Planning Meeting. 30 Jan 2018. Participating Groups: US DTRA and the Global BPERNet steering committee. Key outcomes: Update and Research plan for the network "Emerging Infectious Disease Preparedness, Prevention & Response in Thailand", PMAC Field Trip (Site No. 4). 31 Jan 2018. Chonburi. Participating Groups: Global participants from PMAC2018. Key outcomes: Demonstration of PREDICT One Health triangulated surveillance to a diverse audience of country level to global participants.

Only include events coordinated by PREDICT; high-level include senior-level government officials, private sector executives, decision-makers in OH-related institutions, university presidents or rectors or deans, etc; multiple sectors can be from one single scountry or multiple countries; multi-lateral refers to the involvement of two or more country governments

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Indicator 3.2b	Total # tools for implementation and operationalization developed	Provide a description of each tool: summary of topic and purpose of tool developed (include country)
WEST AFRICA (Regional)		
Cameroon		
Cote d'Ivoire		
Ghana		
Guinea		
Liberia		
Senegal		
Sierra Leone		
EAST & CENTRAL AFRICA (Regional)		
DRC		
Ethiopia		
Kenya		
RoC		
Rwanda		
Tanzania		
Uganda		
ASIA (Regional)		
Bangladesh	4	PREDICT-2 developed One Health Economics surveys for 1) Households; 2) Local businesses; 3) General Public; and 4) Public Sector, Organizations and Industry Groups to provide finer-scale information on economic impact of zoonotic diseases across different sectors.
Cambodia		
China		
India		
Indonesia		
Lao PDR		
Malaysia		
Mongolia		
Myanmar		
Nepal		
Thailand		
Vietnam		
MIDDLE EAST (Regional)		
Egypt		
Jordan		
GLOBAL	**4**	**PREDICT-2 developed a Quick Guide to One Health Evaluation to assist countries in assessing and identifying value-added applications of One Health; PREDICT-2 provided key input for the development of the Tripartite (FAO/OIE/WHO) Guide to Taking One Health Approaches to Address Zoonotic Diseases in Countries, including operational guidance for two sections (risk reduction chapter and financing and One Health economics section); PREDICT-2 developed a Primer on One Health economics (slide set) to assist countries in communicating on and conducting economic evaluation of One Health approaches.**
TOTAL	**8**	

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Regular information, education, and communication materials such as t-shirts, posters, flyers, leaflets, brochures, fact sheets are not counted under this indicator.

Indicator 3.2c, 3.2d	Total # evidence-based information al resources developed	# policy briefs	# research papers	# situational analysis/risk assessment	# zoonotic prioritization resources	#Other	Provide a list and brief description of each resource: include a summary of the subject/topic, include country/region
WEST AFRICA (Regional)							
Cameroon							
Cote d'Ivoire (EHA)							
Côte d'Ivoire (IP)							
Côte d'Ivoire (IP/EHA)							
Ghana							
Guinea							
Liberia							
Senegal							
Sierra Leone	1					1	the West African Health Research Network 3rd annual scientific conference in Cotonou, Benin. He presented an an oral abstract on PREDICT related activities in Sierra Leone.
ST & CENTRAL AFRICA (Regional)							
DRC	1		1				Joseph Atibu Losoma, Prime M. Mulembakani, Maria Makuwa, Jean-Jacques Muyembe Tamfum, Raphaël Belais, Amethyst Gillis, Stephen Harris, Anne W. Rimoin, Nicole A. Hoff, Joseph N. Fair, Corina Monagin, James Ayukekbong, Edward M. Rubin, Nathan D. Wolfe, Christian E. Lange; **DNA indicative of human bocaviruses detected in non-human primates in the Democratic Republic of the Congo.** J Gen Virol. 2018 Mar 27. doi: 10.1099/jgv.0.001048
Ethiopia							
Kenya							
RoC							
Rwanda							
Tanzania	1					1	PREDICT posters and outreach materials developed for the launch of the Tanzania National One Health Platform in February 2018.
Uganda							
ASIA (Regional)							
Bangladesh	3		3				Ziaur Rahman, Mohammed Enayet Hossain, Mohammed Salim Uzzaman, Vincent J. Munster, Malik Peiris, Meerjady Sabrina Flora, Mahmudur Rahman, and Peter Daszak. **Middle East Respiratory Syndrome Coronavirus Antibodies in Dromedary Camels, Bangladesh, 2015.** Emerging Infectious Diseases Volume 24, Number 5, May 2018 2. Ariful Islam, Md Lutfar Rahman, Shariful Islam, Premanondo Debnath, Mahabub Alam, and Mohammad Mahmudul Hassan. (2017). **Sero-prevalence of visceral leishmaniasis (VL) among dogs in VL endemic areas of Mymensingh district, Bangladesh.** Journal of Advanced Veterinary and Animal Research, 4 (3): 241-248. 3.Rahman, Mohammed Z., Najmul Haider, Emily S. Gurley, Sadia Ahmed, Mozaffar G. Osmani, Muhammad B. Hossain, Ariful Islam et al. **Epidemiology and genetic characterization of Peste des petits ruminants virus in Bangladesh.** Veterinary Medicine and Science (2018).
Cambodia							
China	4		4				(2018). **Fatal swine acute diarrhoea syndrome caused by an HKU2-related coronavirus of bat origin.** Nature, 1. 2. Wang, N., Li, S. Y., Yang, X. L., Huang, H. M., Zhang, Y. J., Guo, H., ... & Hagan, E. (2018). **Serological evidence of bat SARS-related coronavirus infection in humans, China.** Virologica Sinica, 1-4. 3. Luo, Y., Li, B., Jiang, R. D., Hu, B. J., Luo, D. S., Zhu, G. J., ... & Shi, Z. L. (2018). **Longitudinal Surveillance of Betacoronaviruses in Fruit Bats in Yunnan Province, China During 2009–2016.** Virologica Sinica, 1-9. 4.Hu, B., Zeng, L. P., Yang, X. L., Ge, X. Y., Zhang, W., Li, B., ... & Luo, D. S. (2017). **Discovery of a rich gene pool of bat SARS-related coronaviruses provides new insights into the origin of SARS coronavirus.** PLoS pathogens, 13(11), e1006698.
India							
Indonesia							
Lao PDR	1					1	PREDICT/Lao PDR presented a poster at the Prince Mahidol Award Conference 2018 on Jan 30- Feb 3 entitled: "Ongoing PREDICT 2 work in Laos - Synchronized Surveillance between PREDICT and FAO at Wildlife-Livestock-Human Interface.
Malaysia	3		1			2	1.5 December 2017 - A documentary titled "The Amazon of the East – Balancing the scales" focusing on the Deep Forest Project in Kinabatangan aired on the Animal Planet Chanel (South East Asia). 2.Salgado Lynn, M.; William, T.; Tanganuchitcharnchai, A.; Jintaworn, S.; Thaipadungpanit, J.; Lee, M.H.; Jalius, C.; Daszak, P.; Goossens, B.; Hughes, T.; Blacksell, S.D. **Spotted Fever Rickettsiosis in a Wildlife Researcher in Sabah, Malaysia: A Case Study.** Trop. Med. Infect. Dis. 2018, 3, 29. 3.Jonathan H. Epstein, Tom Hughes, Frankie Sitam, Eric Laing, Latiffahhassan, Sazaly Abu Bakar, Khebir Veesakib, Ramlan bin Mohamed, Jeffrine Rovie Ryan Japning,and Christopher Broder. Serological Biosurveillance for Spillover of Henipaviruses and Filoviruses at Agricultural and Hunting Human-Animal Interfaces in Peninsular Malaysia. Prince Mahidol Award Conference 2018. Poster presentation.
Mongolia							
Myanmar	2					2	1.Presented the process, documentation, and preliminary findings from surveillance at PMAC conference: "RISK ASSESSMENT FOR THE TRANSMISSION OF EMERGING ZOONOTIC VIRUSES IN MYANMAR" on Feb 2, 2018 in the panel discussion 3.4, PMAC 2018. Authors: Ohnmar Aung, M.B.B.S, M.A. (PRESENTER), Kyaw Yan Naing Tun, B.V.Sc., Marc Valitutto, V.M.D., Suzan Murray, D.V.M., D.A.C.Z.M. 2.Contributed to abstract for presentation at the ATBC 2018 in Borneo: "Emerging Bat Pathogens in Myanmar: Road Map for Surveillance of Potential Spillover Related to Cave Utilization/Regional scale analysis of bat-virus associations in South and East Asia to support One Health surveillance". Authors: Heather S. Davies, M.S., M.S., (PRESENTER), Alexis C. Garretson, B.S., Kathryn Hogan, M.S., Megan E. Vodzak, M.S., M.P.H., Marc Michael von Fricken, Ph.D., M.P.H., Ohnmar Aung, M.B.B.S, M.A., Kyaw Yan Naing Tun, B.V.Sc., Marc Valitutto, V.M.D., Suzan Murray, D.V.M., D.A.C.Z.M., and Dawn Zimmerman, D.V.M., M.S. A. Alonso Aguirre, D.V.M., M.S., Ph.D., and Michael von Fricken, Ph.D., M.P.H.
Nepal							
Thailand	3		3				1. Wacharapluesadee S, Duengkae P, Chaiyes A, Kaewpom T, Rodpan A, Yingsakmongkon S, Petcharat S, Phengsakul P, Maneeorn P, Hemachudha T. **Longitudinal study of age-specific pattern of coronavirus infection in Lyle's flying fox (Pteropus lylei) in Thailand.** Virol J. 2018 Feb 20;15(1):38 2. Chaiyes, A., P. Duengkae, S. Wacharapluesadee, N. Pongpattanasurak, K.J. Olival, T. Hemachudha. 2017. **Assessing the distribution, roosting site characteristics, and population of Pteropus lylei in Thailand.** Raffles Bulletin of Zoology. 3. Fooks AR, Cliquet F, Finke S, Freuling C, Hemachudha T, Mani RS, Müller T, Nadin-Davis S, Picard-Meyer E, Wilde H, Banyard AC. **Rabies.** Nat Rev Dis Primers. 2017 Nov 30;3:17091
Vietnam							
MIDDLE EAST (Regional)							
Egypt	1					1	18th International Congress on Infectious Diseases in Buenos Aires, Argentina in March 2018. The presentation was titled, "Identifying Behavioral Risk Intervention Points to Prevent Zoonotic Spillover at Animal Markets, Farms, and Abattoirs in Egypt." Patrick Dawson gave the presentation during the "Zoonoses and One Health" session. The research is coauthored by Patrick Dawson and William B. Karesh of EcoHealth Alliance and Ahmed Kandeil, Amira Sayed, Mohamed A. Ali, and Ghazi Kayali of Egypt National Research Centre, the PREDICT Egypt implementing partner.
Jordan	2					2	the 2018 Prince Mahidol Award Conference in Bangkok, Thailand titled, "Social and Cultural Difficulties Facing One Health Implementation: MERS-CoV Experience – A Success Story from Southern Jordan." The poster was coauthored by Ehab Abu-Basha and Zuhair Bani Ismail of Jordan University of Science and Technology, the PREDICT Jordan implementing partner, and Maysa Al-Khateeb of USAID/Jordan. 2.PREDICT Jordan also authored an article for the Association of American Veterinary Medical Colleges (AAVMC)'s Council for International Veterinary Medical Education (CIVME) Newsletter titled, "PREDICTing the Next Pandemic: How One Health Scientists Are Changing the Way We Fight Infectious Diseases." The article appeared in the Fall 2017 issue and was authored by Patrick Dawson of EcoHealth Alliance. The article features the work of the PREDICT/Jordan team and quotes from various PREDICT/Jordan team members. URL: http://myemail.constantcontact.com/CfV/ME-News.html?soid=1104002974357&aid=5YQlkJyT7SE
GLOBAL	8	3	4			1	Méndez, D. Tomori, J.A.K. Mazet. 2018. **The Global Virome Project.** *Science*. doi: 10.1126/science.aap7465 2. Carroll, D, B. Watson, E. Togami, P. Daszak, J.A.K. Mazet, C.J. Chrisman, E.M. Rubin, N. Wolfe, C.M. Morel, G.F. Gao, G. L. Burci, K. Fukuda, P. Auewarakul & D. Tomori. 2018. **Building a global atlas of zoonotic diseases.** Bulletin of the World Health Organization. doi: 10.2471/BLT.17.205005. 3. Schar, D., C.M. Machalaba, G. Yamey, W.B. Karesh. 2018. **A framework for stimulating economic investments to prevent emerging diseases.** Bulletin of the World Health Organization.doi:10.2471/BLT.17.199547 4. Legall, F., C.M. Machalaba, W.B. Karesh, et al. 2018. **Operational framework for strengthening human, animal and environmental public health systems at their interface.** World Bank Report.
TOTALS	30	3	16			11	

***for the period 10/1/17-3/31/18 ONLY**

Global Research Papers:

Altizer, S., D.J. Becker, J.H. Epstein, K.M. Forbes, T.R. Gillespie, R.J. Hall, D.M. Hawley , S.M. Hernandez, L.B. Martin, R.K. Plowright, D.A.Satterfield. 2018. **Food for contagion: synthesis and future directions for studying host–parasite responses to resource shifts in anthropogenic environments.** *Philosophical Transactions of the Royal Society B*. doi: 10.1098/rstb.2017.0102

Allen, T., K.A. Murray, C. Zambrana-Torrelio, S.S. Morse, C. Rondinini, M. Di Marco, K.J. Olival, P. Daszak.2017.**Global hotspots and correlates of emerging zoonotic diseases.** *Nature Communications*. doi: 10.1038/s41467-017-00923-8.

Aylanoa, E., P. Mayor, P. Mendoza, E.A. Morales, J.G. Perez, M. Bowler, C. Gonzalez, J.A. Ventocilla, G.C. Baldeviano, A.G. Lescano. 2017. **Molecular Epidemiology of Trypanosomatids and Trypanosoma cruzi in Primates from Peru.** *EcoHealth*.doi:10.1007/s10393-017-1271-8

Rostal, M.K., N. Ross, C. Machalaba, C. Cordel, W.B. Karesh. 2018. **Benefits of a one health approach: An example using Rift Valley fever.** *One Health*. doi:10.1016/j.onehlt.2018.01.001

New Indicator

Indicator 3.2e	#, list of community OH events coordinated *include title of event, date of event, brief description of the event including topic focus, geographic location (city/village/locale) and country in which it took place
Indicate Country, Region or	
Bangladesh	05 Nov 2017. One Health Day Celebration 2017. Sher-E Bangla Agricultural University and Jhenidah Government Veterinary College. PREDICT Bangladesh, along with P&R and One Health Bangladesh, organized a collaborative essay competition for students and future One Health practitioners on the eve of the One Health Day celebrations. The program included a rally and a One Health talk to encourage medical and veterinary students to participate in One Health.
Cote d'Ivoire	Oct 2017. Risky Interfaces. PREDICT/CIV's behavioral team led discussions with restaurant owners, butchers, bushmeat vendors, and animal resource officers to discuss their work and the One Health approach to risky interfaces in the Bouaflé region and in Marahoué National Park. This interaction was an opportunity to highlight risks associated with their business and how to work together to avoid risk. Jan 2018. Villager Meetings, Focus Groups, and 3-day Visit in Asproa. Villager meetings in Asproa, focus groups in Sergent Konankro, and three-day visits of subsites (Boguekro and Djhakro) that allowed for sensitization of the population to work done by PREDICT/CIV, with discussions on the risk of bat-man-livestock exposure.
Ethiopia	26-27 Mar 2018. Consultation to Awash human and animal health service providers on emerging zoonotic viral diseases of great importance to human health
Ghana	Nov 2017. "PREDICT PROJECT- Surveillance for emerging zoonotic disease threats and behavioral risk characterization in high-risk communities". Nkoranza North District. Training workshop for the human disease surveillance component of the project. A three day event combined with community engagement at the surveillance sites including questionnaire administration and outreach on the PREDICT project with education on zoonotic diseases and One Health.
Guinea	PREDICT/Guinea organized 8 Community Engagement Meetings in (6) Villages of the Forest Region of Guinea. These meetings were held before starting animal sampling in a village to encourage a feedback loops for local knowledge throughout the project (PREDICT), Enable reflective and systematic examination of previous sampling sessions, to sensitize and mobilize the community to raise people's awareness of the role of the animal-human interface in viral transmission, an essential key to preventing outbreaks of zoonotic disease. Meetings attendants included representatives from the Ministry of Health, Ministry of Environment, Water and Forestry, Ministry of Livestock and Animal Resources, and community members. A minimum of 25 people attended each one of the meetings.
Indonesia	PREDICT/Indonesia facilitated several small community meetings and outreach events with village heads prior to the implementation of human community surveillance activities in North Sulawesi. Meetings were aimed at informing community leaders about zoonotic disease and explaining the goals of PREDICT surveillance.
Kenya	One Health Training Event, 01 - 04 Feb 2018, Mpala PREDICT/Kenya jointly with OHW/OHCEA, FAO, and USAID P&R conducted a One Health training event at Mpala. During the training, participants were taken through a pandemic simulation to learn how to approach an outbreak investigation using PREDICT biosecurity, biosafety protocols. A total of 37 participants drawn from University of Nairobi and Moi University postgraduate students and their faculty mentors, veterinarians at both the national and county (Laikipia) level, Kenya Wildlife Services, Laikipia County health officers and members of the local community. The students observed first-hand a defined high-risk interface, learning about the different drivers and human behavioral risk factors that contribute to the emergence and/or spread of pathogens. In addition, the students learned how to apply the one health concept to mitigate some of the problems the local community were experiencing (frequent diarrhea and flu-like symptoms).
Lao PDR	Village meetings in Na Pa Kieb and Soth, 19-20 Feb 2018 PREDICT/ Lao PDR expanded the reach of its stakeholder engagement and risk mitigation communications, continuing to hold meetings in Na Pa Kieb and initiating additional village meetings in nearby Soth village. Stakeholders were updated on PREDICT surveillance activities & risk mitigation strategies to reduce risk of zoonotic virus transmission. Subjects included handwashing, avoiding animal body fluids, and cooking
Liberia	World Rabies Day, 28 Sep 2017 PREDICT was instrumental in organizing and implementing a World Rabies Day campaign. The PREDICT team was critical to the success of the event having already been trained in humane animal restraint and vaccinated for rabies. The event was a great collaboration between PREDICT/Liberia, the National Public Health Institute of Liberia, Ministry of Agriculture, Ministry of Health, Food and Agriculture Organization of the U.N. Nearly two hundred dogs were vaccinated at two locations. US Embassy Health Fair, 2 Mar 2018 The PREDICT/Liberia along with the organizations previously mentioned conducted a rabies vaccination campaign in the neighborhood surrounding the Embassy at the request of the USAID Mission in Liberia.
Malaysia	One Health Student Introduction. 3 Feb 2018. PREDICT/Malaysia conducted a presentation focusing on One Health related issues, careers in One Health, and the introduction of the PREDICT project in Malaysia to undergraduate students during the Borneo Eco Film Festival. Introduction to zoonosis and safe methods to prevent zoonotic infections. 14 Mar 2018. Meeting with village leaders to introduce zoonosis and our human study in Kampung Redip (Pos Hau), Gua Musang District, & Kelantan. Introduction to zoonosis and safe methods to prevent zoonotic infections. 21 Mar 2018 Meeting with village leaders to introduce zoonosis and our human study in their community, Pos Sinderut Health Clinic, Kuala Lipis District, Pahang. Introduction to zoonosis and safe methods to prevent zoonotic infections. 29 Mar 2018. Meeting with village leaders to introduce zoonosis
Myanmar	One Health Day at Hlawga National Park. Nov 2017. PREDICT/Myanmar team and a local elephant conservation organization coordinated the first-ever One Health day event in Myanmar as part of a greater national and global effort to promote the driving concept behind One Health. Approximately 80 participants joined in two separate sessions, with the general visitors and staff of Hlawga National Park; an 800-acre wild animal park where patrons have an opportunity to interact with wildlife including primates, elephants, and bears. Guests learned about PREDICT activities in the country as well as disease transmission between animals and humans. Methods of prevention and overall awareness were shared through a dynamic lecture that involved large photos, posters, and interactive games.
Nepal	Community Health Screening. 13-19 Mar 2018. Jadibuti, Kathmandu, Nepal. As part of PREDICT/Nepal human surveillance activities, the team engaged communities sharing information on the program. Health Camp. 29 Mar–1 Apr 2018. Silinge, Makwanpur, Nepal. As part of PREDICT/Nepal human surveillance activities, the team engaged communities sharing information on the program.
Senegal	Community Sensitization: At the community level, sensitization of the populations of the villages of Sindia, Bandia and Kiniabour was carried out by the PREDICT/Senegal One Health team composed of medical doctors, veterinarians and community health workers. The aim of these sessions was to engage the community for increased project commitment in addition to mitigating the risks of zoonotic pathogens through education and sensitization.
Sierra Leone	Oct - Dec 2017 (multiple events) PREDICT/Sierra Leone engaged district, chiefdom, and community level stakeholders in the six operational districts (Kambia, Bombali, Kono, Koinadugu, Western Areas). This involved government district officers in the Ministry of Health and Agriculture and local level meetings with key stakeholders to provide updates on surveillance visits.

Includes community-engagement and outreach, faculty/student clubs, trainings of community members/workers (e.g., farmers poultry handlers), risk communication events targetd at the community, and community/civil society stakeholder engagement (FAO, OHW) such as village meetings, Rabies day campaign, communication events, etc.

Tanzania	17 community engagement events: 6 in Kibondo, 3 in Uvinza, and 8 in villages in Kyerwa. Attendees include village Executive Officers, village council (chairperson and other leaders), and community members. In Kyerwa, the ward council was included.
Thailand	4 EVENT(S) 1) Rabies Prevention and Control. 20 Mar 2018. Bangkok Conducted a press conference for medical staff, media and the general public at Chulalongkorn Hospital. 2) Rabies Prevention at the Community Level. 17 Dec 2017. Bangkok Provided training at the Girls Scout Training Center in Bangkok, as part of One Health activity organized by the Thai Red Cross Society. 3) Rabies Prevention at the Community Level. 7 Nov 2017. Bangkok Provided training for improving medical knowledge of employees in a private company. Emerging Infectious Disease Preparedness, Prevention & Response in Thailand. 31 Jan 2018. PREDICT/Thailand Organized community outreach and health practitioner's participation in a One Health demonstration at Wat Luang sub-district as part of the PMAC Field Trip.

***for the period 10/1/17-3/31/18 ONLY**

Indicator O1	Total # of in-country staff	Total # of in-country staff who are from the host country	Total # of in-country staff who are from the region (but not host country)	Total # of in-country staff who are not local or from the region	Proportion of in-country staff who are from the host country	Proportion of in-country staff who are from the region (but not host country)	Proportion of in-country staff who are not local or regional
AFRICA (Regional)							
Cameroon	8	8	0	0	100%	0%	0%
Cote d'Ivoire (EHA)	6	6	0	0	100%	0%	0%
Côte d'Ivoire (IP)	3	3	0	0	100%	0%	0%
Côte d'Ivoire (IP/EHA)	6	6	0	0	100%	0%	0%
DRC	5	5	0	0	100%	0%	0%
Ethiopia	5	5	0	0	100%	0%	0%
Ghana	13	13	0	0	100%	0%	0%
Guinea	17	16	1	0	94%	6%	0%
Kenya	1	1	0	0	100%	0%	0%
Liberia	21	20	0	1	92%	0%	8%
RoC	4	2	2	0	50%	50%	0%
Rwanda	5	4	0	1	80%	0%	0%
Senegal	10	10	0	0	100%	0%	0%
Sierra Leone	28	27	0	1	96%	0%	4%
Tanzania	11	11	0	0	100%	0%	0%
Uganda	3	3	0	0	100%	0%	0%
ASIA (Regional)							
Bangladesh	13	13	0	0	100%	0%	0%
Cambodia	5	5	0	0	100%	0%	0%
China	14	14	0	0	100%	0%	0%
India	1	1	0	0	100%	0%	0%
Indonesia	11	11	0	0	100%	0%	0%
Lao PDR	2	2	0	0	100%	0%	0%
Malaysia	15	14	0	1	83%	0%	17%
Mongolia	3	3	0	0	100%	0%	0%
Myanmar	2	2	0	0	100%	0%	0%
Nepal	17	17	0	0	100%	0%	0%
Thailand	7	7	0	0	100%	0%	0%
Vietnam	4	3	0	1	75%	0%	25%
MIDDLE EAST (Regional)							
Egypt	0	0	0	0	0%	0%	0%
Jordan	1	1	0	0	0%	0%	0%
GLOBAL							
TOTAL	241	233	3	5			

***for the period 10/1/17-3/31/18 ONLY**

In-country staff: *people employed by implementing partner staff to work on EPT-2 projects in EPT-2 countries.*
****Include only full-time or "most-time" staff*** *(i.e., exclude part-time staff 49% FTE or less, short term consultants)*
****Regions include:*** *East and Central Africa – DRC, Egypt, Ethiopia, Jordan, Kenya, ROC, Rwanda, Tanzania, Uganda; West Africa – Cameroon, Cote d'Ivoire, Ghana, Guinea,*

***for the period 10/1/17-3/31/18 ONLY**

New Characterization
In Progress
Complete

USAID EPT-2
PREDICT PROJECT
Year 1 Semiannual Report
October 2014-March 2015

Prepared by:
UC Davis, EcoHealth Alliance,
Metabiota, Inc., Smithsonian Institution,
and Wildlife Conservation Society

PREDICT YEAR 1 SEMIANNUAL GLOBAL REPORT (October 2014-March 2015)

Objective 1. Managing and Coordinating Operations

Establish and maintain collaborative and adaptive management of program operations and ensure compliance with agency policies and procedures.

- Generated, submitted, and obtained approval for EPT-2 workplans and budgets.
- Initiated and/or fully executed subawards with consortium and international partners.
- Established financial and technical monitoring and reporting procedures.
- Provided guidance on administration and compliance questions with subawardees.
- Drafted and prepared Environmental Management and Monitoring Plans and Reporting frameworks for submission.
- Operationalized communications with Management Team and Executive Board and information flows with operational teams and implementing partners.
- Renewed and amended IACUC protocols for continuation of animal sampling activities under revised scope of work.
- Convened a consortium-wide IRB working group, held meetings with the Director of the UC Davis IRB administration, and established guidelines for a Master IRB protocol for all human subjects research, along with process and procedures required for ethical clearance and coverage at global and local levels. Process will also allow UCD to extend coverage for human subjects research to consortium partners.

Objective 2: Characterizing Biological and Ecological Risk

Identify the biological and ecological drivers and host-pathogen dynamics at high-risk interfaces within three critical pathways of disease emergence and spread in Asia and Africa.

Activity 2.1. Targeted monitoring for zoonotic viruses with pandemic potential at specific high-risk interfaces

- Held biweekly surveillance calls with operational leads and regional surveillance leads to provide guidance and support for surveillance operations.
- Identified high priority disease emergence pathways, targets for concurrent sampling, and proposed sites for focused surveillance activities in 17 countries.
- Initiated coordination with FAO on livestock sampling at EPT partner meetings and implemented tracking of in country livestock sampling

priorities and opportunities for collaboration on surveillance team conference calls.
- Held regular partner-wide transdisciplinary meetings to develop surveillance data collection needs and standardized forms for site characterization, event data, and specific modules for high-risk interfaces and disease emergence pathways.
- Coordinated with the Behavioral Risk and Information Management teams to create the Ecological Assessment Tool that will be used to collect standardized site information and characteristics.
- Refined sample collection protocols for field sampling of host taxa to optimize RNA virus detection; working with field and lab teams to implement changes.

Activity 2.2. Characterizing Risk

- Conducted Modeling and Analytics (M&A) team planning meetings and developed work plan to prioritize activities and overarching goals.
- Finalized 'What-if" scenario models and developed 2-page summaries for: Do wildlife markets drive EID risk?, GB virus (Bangladesh), MERS-like coronavirus (spread from slaughtering imported camels in Egypt), Hantavirus (Yunnan, China), Herpes B, novel bat Paramyxovirus (Indonesia), and MERS-like Coronavirus from bat guano (Thailand).
- Completed MERS-epizone spatial spillover risk model, combining geographic range of potential bat reservoir host and national data on dromedary camel densities.
- Examined demographic factors (e.g. number of cases at detection, regional population density) associated with historical Ebola virus outbreaks to identify any unique factors that may have contributed to spread of West Africa outbreak.
- Conducted spatial analysis of PREDICT 1 global site data (including spatial extent of named sites, pairwise distances between sites per country, and frequency of sampling at each site) to refine analyses and contribute to strategy for site definitions under PREDICT 2.
- Revised algorithm (PubCrawler) for more accurate geographic bias measure used in EID Hotspot analyses and developed a program using a computational linguistic approach to mine location data from publications.
- Conducted epidemiologic analysis of test results to date to evaluate high-risk wildlife hosts and common animal-human interfaces along with sample types and animal conditions yielding positive samples for viral families tested. These data are driving site and interface sampling targets within epizones for PREDICT 2 in continuing countries.
- Identified the number of known zoonotic viruses reported in wildlife and domestic animal species and evaluated the relationship between species abundance and species propensity for hosting a higher number of zoonotic viruses, while adjusting for data deficient animal species.

Activity 2.3. Viral detection and discovery, and longitudinal monitoring of viruses to track changes in geographic and host distribution, genetic sequences, transmissibility, infectivity, and viral evolution

- Refined sample collection and laboratory methods to align with PREDICT focus on RNA viruses.
- Began developing and optimizing cPCR protocols for improved detection of Bunya, Filo, and Flavi viruses.
- Initiated analysis of PREDICT virus data to refine sample selection for testing.

Activity 2.4 Advancing pathogen characterization through refinement and development of new diagnostic tools and mainstreaming testing protocols

- Established Laboratory Implementation Team as a forum to ensure consistency for sample handling, testing viral detection, and providing feedback and information to labs.
- Completed full genome sequence of a MERS-like coronavirus found in Uganda; noted changes in the spike protein with consequences for host range and began exploring the utility of immune assays and 3-D structural analysis of the spike protein.
- Completed full genome sequence of a bat influenza virus from Bolivia; genetic analysis showed that most genome segments separated 20 years ago from a bat strain found in Peru; manuscript is being completed and currently undergoing internal review.
- Completed examination of the viral diversity in Macaques in Bangladesh; discovered 184 viruses and conducted ecological analyses to show that viral communities are structured in largely predictable ways; manuscript is in revision following review for publication in Nature Communications.
- Identified PREDICT Influenza and Corona viruses for deep sequencing in order to develop primer sets for PCR characterization of genomes in country, should funding be adequate to transfer this technology to countries for full genome sequencing capabilities.

Activity 2.5. Assisting host country partners in outbreaks

- Initiated Ebola capability evaluation for Western Africa region, including a review of findings from assessments conducted in 2014 through WHO International Preparedness Strengthening missions in 14 priority countries in Africa; formulating plans for more detailed evaluations to identify gaps for Ebola response and preparedness capability strengthening in PREDICT countries.

- Initiated redesign of outbreak data collection forms and integration of data into EIDITH to facilitate data analyses and reporting.
- Participated in national and regional Ebola outbreak preparedness planning and trainings (Cameroon, Uganda) and in Ebola response efforts including human and wildlife sampling (DRC).

Objective 3: Characterizing Behavioral Risk

Characterize contact among people, livestock, and potential wildlife reservoirs; investigate the correlation of human behavior and zoonotic disease risk to understand the behavioral mechanisms of high-risk pathways for disease emergence and spread; identify potential control points and behavior change options; and field pilot strategies to evaluate behavior change interventions that can be taken to scale.

Activity 3.1. Standardizing approaches to study human behavioral risk

- Established the Behavioral Risk team across partners.
- Completed preliminary analysis of Deep Forest Human Contact survey data.
- Collated and reviewed all PREDICT and PREVENT protocols, guides, and reference materials relating to behavioral research to prevent duplication of effort.
- Identified priority countries for qualitative behavioral risk work to likely include Bangladesh, Cameroon, China, DRC, Indonesia, Uganda, and Vietnam.
- Drafted qualitative behavioral risk protocols and guides for observational research, focus groups, and ethnographic interviews.
- Pilot tested observational guide and ethnographic interview materials in live animal markets in New York City and Yunnan China.
- Created standardized training materials for all three qualitative behavioral risk data collection methodologies: observational research, focus groups, and ethnographic interviews; materials were piloted to train four people in New York City and 15 people in Yunnan, China, of which, 11 people were from three different administrative levels of local government CDCs.
- Established and/or re-engaged partnerships in Bangladesh, Malaysia, Indonesia, and China for the coordination of observational and behavioral research.
- Coordinated with the Surveillance and Information Management teams to draft the Interim Behavioral Questionnaire for review and pilot testing by select Country Coordinators.
- Conducted initial observational research in Dhaka, Bangladesh and in Guangzhou, Guangxi and Yunnan Provinces in China.
- Initiated planning and development for globally-standardized qualitative research activities for submission to UC Davis IRB in April 2015.

- Established local IRB approvals in China and Malaysia for the conduct of behavioral research; initiated negotiations for local IRB approvals in Bangladesh and Indonesia.

Objective 4: Improving Global Surveillance Networks

Strengthen internal data storage and sharing platforms to improve the ease of collection, synthesis, storage, access, and dissemination of relevant animal and human spatially explicit epidemiological and ecological data.

Activity 4.1. Standardizing data collection

- Updated the information management system from the GAINS platform to a new system EIDITH (Emerging Infectious Disease Information Technology Hub).
- Initiated development of a web-based data collection application for the input and collection of all data, including animal and human sampling, testing, human behavior, and outbreak response into the EIDITH database. This new application will enable quality control and screening before data is imported to EIDITH, resulting in optimal data quality. Features include:
  - Streamlined data collection app with mobile device capability.
  - Multiple forms customized by data type with local data storage capability in a local database on the mobile device until an Internet connection is available.
  - Automated data upload, when Internet is available, to a staging area for quality control followed by integration with EIDITH.
- Initiated evaluation of OMR (optical mark recognition) tools (bubble forms), which can be scanned and imported into EIDITH, allowing use of paper forms when web-based data entry is not possible but with the advantages of electronic data collection.

Activity 4.2. Synthesizing global data

- Initiated plans for collation and storage of PREDICT 1 and PREDICT 2 data in the new EIDITH database for analogous data extractions and reporting.
- Began optimization of EIDITH to provide user-friendly robust data extraction tools, allowing PREDICT staff the ability to quickly extract data for analyses and to enable data availability through an API (application program interface) for easy access for real-time data reviews.
- Coordinated with operational teams to begin development of a suite of reporting tools for future semi-annual reports and other program needs.

Activity 4.3. Disseminating global data

- Expanded the EIDITH platform with the potential for advanced data visualization and data extraction.
- Continued to interpret PREDICT sequences and provided government results reports, as well as data provision through healthmap.org/predict.
- Developed PREDICT Bioproject in GenBank for deposition of all viral sequences.

Objective 5: Validating One Health Approaches

Conduct a systematic and dedicated effort to validate and evaluate the utility of One Health approaches using all available evidence.

Activity 5.1. Promoting policies and practices that reduce the risk of virus evolution, spillover, amplification, and spread

- Drafted a structural framework for assessing cost-effectiveness of One Health interventions and initiated pilot evaluations of Nipah virus prevention and response activities in Bangladesh; the framework utilizes direct cost measures where available, as well as other quantitative and qualitative indicators and incorporates evaluation of inclusion of vulnerable populations (e.g. efforts to overcome gender bias and other determinants of inequity).
- Created a format for One Health case studies to present examples that have yielded cost-effective outcomes; the case studies will also be utilized to inform development of One Health best practices.
- Initiated the development of comparative descriptors for early warning/preventive and reactive public health system attributes (using existing standard definitions where available) for use in One Health case studies.
- Began a literature review for compilation of examples where One Health practices have been operationalized.
- Identified data parameters for potential prospective collection by EPT-2 partners to allow for expanded and consistent inputs and precision in cost-effectiveness analysis of One Health approaches.
- The EPT Liaison was appointed to the 4-person OFFLU Steering Committee and assigned to lead the OFFLU wildlife/wild bird influenza surveillance technical activity, established to provide a platform for discussion, coordination, and data sharing between key wildlife experts involved in influenza surveillance and research.
- Published the following articles on research and surveillance activities using a One Health approach (see Appendix 2 for details):
  - An article in *EcoHealth* entitled “Merging economics and epidemiology to improve the prediction and management of infectious disease”.
  - An article in *PNAS* entitled “Economic optimization of a global strategy to address the pandemic threat”.

- An article in *PLoS* One entitled “Evaluation of local media surveillance for improved disease recognition and monitoring in global hotspot regions”.
- A paper on the integration of invasion and disease in the risk assessment live bird trade in Diversity and Distributions: *A Journal of Conservational Biogeography*

Activity 5.2. Improving cross-sectoral collaboration and coordination with EPT-2 partners

- Held quarterly coordination calls with P&R and OHW.
- Generated an activity list to support the One Health Workforce workplan, including training, One Health case studies, protocols, and technical advising resources.
- Held coordination meetings and calls with FAO and initiated discussion with CDC on EPT-2 scope of work.
- Began discussing collaboration with The World Bank for a follow-up phase of their “People, Pathogens, and Our Planet” report on the economics of One Health, as well as broad areas of integration on policy-oriented outputs of One Health cost-effectiveness analysis.
- Discussed priority sites for targeted influenza surveillance with FAO.
- Developed a guidance document for the OIE as a resource to assist member countries in implementing wildlife disease surveillance; the document includes a budget planning template and highlights the importance of capacity for information sharing.
- Provided input on One Health approaches to emerging infectious disease prevention at the UNEP Convention on Biological Diversity 12th Conference of the Parties in October 2014 (non-PREDICT travel).
- Provided an overview of EPT-2 and an update on wildlife diseases at the Steering Committee meeting of the Global Framework for the Progressive Control of Transboundary Animal Diseases meeting, organized by the FAO and OIE, in October 2014.

Objective 6: Strengthening Capacity

Add depth and scope to transdisciplinary One Health platforms using a systems approach to classify and track biological surveillance and behavioral risk characterization advances, thereby strengthening surveillance system capacities.

Activity 6.1. Systems approach to capacity building for wildlife, livestock, and human surveillance

- Held monthly Capacity team coordination teleconference meetings.
- Began testing online platforms for distance learning and training activities.

- Provided revised sample collection guidelines for incorporation into updated field sampling protocols for all taxa and new protocols for human sampling.
- Continued updating field sampling protocols for wildlife (bats, rodents, primates,), livestock (camels, cattle, small ruminants), and humans, as well as for environmental sampling.
- Conducted a review of outbreak-related protocols for updating and coordination across partners and field activities and began refining the guide for providing assistance during zoonotic disease outbreaks.
- Started planning for information management updates and trainings.
- Completed a QGIS spatial mapping training module for partner review.
- Began updating laboratory safety training modules (in particular to address chemical handling and waste, as a result of protocol changes).
- Continued to provide technical support to in-country laboratories.

Activity 6.2. Coordinating capacity development across EPT projects
Support the training of the next generation of the One Health professionals through coordinated activities with EPT and inter-agency partners.

- Began discussions with partner groups about timeline and process for coordination across EPT projects and sharing of capacity strengthening resources including protocols, experiences, and training opportunities.
- Coordinated with FAO to compare viral family testing with traditional diagnostics of livestock samples.

Objective 7: Assisting Organization of Annual Data Review Meetings

In close coordination with USAID and other EPT-2 projects and partners (including FAO, CDC, WHO, etc.), organize annual data reviews to optimize and refine ongoing and future activities.

- Provided an overview of the objective to FAO colleagues in Rome (March 2015).
- On coordination calls with OHW and P&R, discussed opportunities to optimize the Annual Data Meeting to support EPT-2 collaboration (e.g. for Year 2-5 work planning to align project activities).

PREDICT Y1 SEMIANNUAL COUNTRY REPORTS

AFRICA REGION

CAMEROON

Highlights and Success Stories:

- Assisted MoH, WHO, and CPC (Pasteur Center in Cameroon) with two Viral Hemorrhagic Fever workshops and led two training sessions on personal protective equipment; other trainers included medical doctors from the MoH; participants (trainees) included physicians and laboratory technicians from 10 different regions of Cameroon.
- Published an article in *Nature Communications* entitled “Evidence for Henipavirus spillover into human populations in Africa”.

Summary of Surveillance and Field Activities for the Period Oct. 2014-March 2015:

- Worked to identify priority sites most suitable for concurrent sample collection at areas within the three main pathways.
- Created a draft site selection document summarizing opportunities for surveillance and held discussions via phone, Skype, and email with WCS Cameroon and government officials from different regions to collect information on surveillance targets.

Summary of Laboratory Testing for the Period Oct. 2014-March 2015:

- Performed follow-up sequencing for confirmation, better identification, and phylogenetic placement of viruses detected previously through PREDICT, including Real time and conventional PCR performed on a *Cercopithecus Ascanius* sample from the Congo basin to a validate previous finding results that were obtained (putative positive for monkeypox); sample tested negative.
- Conducted deep sequencing in order to obtain more information on a monkey pox and rodent pox virus identified during PREDICT 1; some reads were obtained for the pox genome, but additional analyses are ongoing to increase coverage.
- Collected samples from a Patas monkey and a baboon that died with respiratory signs and muscle wasting at Limbe Wildlife Center for testing using PREDICT protocols.

Other Activities this Period*:*

- Attended weekly epidemiological meetings organized by the MoH; discussions included Henipavirus research and outbreak response coordination.
- Attended a CEEAC (Central Africa States Economic Community) meeting and discussed strategies to fight or prevent the Ebola virus epidemic.

- Received approval for the release of the last set of PREDICT 1 results from the MINDEF (Ministry of Defense), MINFOF (Ministry of Wildlife and Forestry), and the MINEPDED (Ministry of Environment); still awaiting approval from other ministries (Ministry of Health, Ministry of Scientific Research, and Ministry of Livestock).
- Provided technical assistance for USG/Government of Cameroon (GoC) initiatives for training and strategic planning for Ebola preparedness and response and for emergency operations training and an Ebola scenario workshop.
- Attended the EPT/One Health meeting in January with WHO, MoH, MINEPIA, MINEPDED, MINFOF, the National Program for the prevention and fight against emerging and re-emerging diseases, and Centre Pasteur Cameroon.
- Presented results from a Henipavirus publication to the Director of Veterinary Services, the Director of the IMPM, and to the weekly epidemiological meeting at the MoH.
- Initiated a review of all existing laboratory SOPs, including editing of existing and drafting of new SOPs.
- Began a literature review for topics directly linked to PREDICT 1 viral findings to facilitate a presentation for laboratory staff; this review will also facilitate follow-up publication preparation.
- Met with Dr. Hermann Unger from International Atomic Energy Association (IAEA)/FAO joint office to discuss potential collaborations with IAEA initiatives in Biosafety & Security, Ebola preparedness, and Ebola reservoir surveillance.
- Provided shipping materials and advice to CDC Cameroon to facilitate export of the putative monkeypox sample from the outbreak that occurred in June 2014.
- Liaised with Limbe Wildlife Centre and Smithsonian staff to coordinate transfer of Great Ape Heart Project samples, currently stored in Limbe, and with the Limbe Wildlife Centre on WildLab progress and recruitment of a lab manager.
- Met with DTRA representatives in country.
- Attended the LANAVET (Cameroon National Veterinary Laboratory) annual board meeting lunch.
- Met with CDC and with MoH (DLMEP) to discuss roles of Ebola rapid intervention teams and to prepare training with Public Health England for intervention teams.
- Provided technical assistance for PHE/CDC/GoC initiative for training of Ebola rapid intervention teams and provided supervision for PHE/CDC/GoC Ebola simulation.
- Gave a presentation on Ebola reservoirs and origins for Cameroon Biological Safety Association at the Ministry of Livestock.
- Provided feedback/advice to CDC Cameroon (FELTP) on draft MoH document describing roles of Ebola rapid intervention teams.
- Held discussions with LANAVET and the Director of the Institute for Novel and Emerging Infectious Diseases at the Friedrich-Loeffler-Institute (FLI)

about potential collaborations between the LAVANET, the Institute, and PREDICT through the project lab on RVF and HNV.

COTE D'IVOIRE

Planning & Other Activities this Period*:*

- Held meetings with regional teams in Cameroon, RoC, and DRC to begin exploration of a regional approach to surveillance.
- Began exploring options for potential implementing partners and collaborators.

DEMOCRATIC REPUBLIC OF CONGO

Highlights and Success Stories:

- Prepared three genome sequences of the Ebola virus detected during the Boende Outbreak in DRC (2014) in collaboration with UCSF lab and submitted the sequences to GenBank (KP271018-KP271019-KP271020).
- Briefed the North Kivu Provincial Environment Minister in Goma.
- Briefed the Provincial Inspector of Human Health (the point of contact in DRC for OHCEA) and the Laboratory Director for the National Animal Health Diagnostic Laboratory in Goma (responsible for provincial animal agriculture inspection) to lay the ground work to select human health centers around Virunga National Park for participation in surveillance.
- Held quarterly meetings with the Director and Chief Park Warden of Virunga National Park (PNVi) and the PNVi health department in Goma and in Rumangabo (PNVi headquarters) to inform on planning.

Summary of Surveillance and Field Activities for the Period Oct. 2014-March 2015:

- As requested by the Government of DRC (GDRC), traveled to the Boende Territory, where the Ebola virus Disease (EVD) outbreak occurred in 2014 to collect wildlife samples (41 bats, 2 rodents; 255 samples).
- Upon PNVi request, investigated a respiratory disease outbreak in a human-habituated group of mountain gorillas in the park where 24 gorillas were observed with clinical signs (coughing and anorexia) and opportunistically collected fecal samples from 14 animals.
- Also upon request, investigated a respiratory disease outbreak in captive chimpanzees held at the Lwiro Wildlife Rehabilitation Centre located adjacent to Kahuzi-Biega National Park in South Kivu province where 26 of 42 chimpanzees were affected; samples from four sick animals with close human contact were opportunistically collected.

Summary of Laboratory Testing for the Period Oct. 2014-March 2015:

- Performed follow-up testing and sequencing for confirmation of results obtained previously through PREDICT including samples from rodents and non-human primates from DRC and RoC for which host species confirmation was needed for better identification and phylogenetic placement of the virus sequences.

Other Activities this Period*:*

- Participated in EVD outbreak response in Boende, Equateur province:
  - Assisted in the testing of human samples received from the field before the set up of the mobile field laboratory.
  - Two team members actively participated as members of the Boende Ebola Outbreak Laboratory and Research commission and regularly updated the project team.
- Participated in the preparation of training manuals for EVD outbreak response, intended for use in the EVD outbreak in West Africa in collaboration with WHO, UNICEF, and the DRC MoH.
- INRB Laboratory manager presented a poster on the clinical complications of human monkeypox at the ASTMH conference in New Orleans, USA.
- Attended meetings of in-country implementing partners and mission.
- Met with key in-country partners, INRB and Kinshasa School of Public Health (KSPH), to prepare work plan.
- Prepared and submitted a ONE HEALTH Platform document listing all in-country organizations involved in One Health activities on a national and regional level.
- Obtained a one-year scientific permit to collect samples from wildlife, including protected species, from the “Kinshasa Coordination for Environment and Sustained Development”.
- Received approval from the GDRC to release results from PREDICT 1.
- Gave four presentations at the 30th anniversary INRB Conference on: diagnostic characterization during the Boende Ebola outbreak, occurrence of herpes viruses in non-human primates, diagnostic characterization of Enteroviruses in captive chimpanzees, and inclusion of local community members in disease surveillance.
- INRB Laboratory manager attended a training workshop organized by WHO on the shipment of biological materials in Brazzaville.
- Discussed potential collaboration for biological and ecological risk characterization activities with ongoing and developing partners.
- Granted new laboratory space at the INRB, which is currently under renovation that will allow the team to separate pre-PCR and PCR/serology activities.
- Submitted two abstracts summarizing results from PREDICT to the upcoming “American Society of Tropical Medicine and Hygiene” (ASTMH) 64th annual meeting (October 25-29, 2015) in Philadelphia, PA.
- Initiated a potential partnership with the University of Graben Faculty of Veterinary Medicine for student training and capacity building through field training opportunities.

EGYPT

Planning & Other Activities this Period*:*

- Facilitated introductions with FAO staff members to begin coordinating activities.

GABON

Planning & Other Activities this Period*:*

- Finalized work and surveillance plans including a timeline for implementation.
- Held meetings with regional teams in Cameroon, RoC, and DRC to continue to support a regional approach to surveillance.

KENYA

Planning & Other Activities this Period*:*

- Discussed camel MERS sampling scoping trip planned for May with SI partners in Kenya and Kenya Wildlife Services (KWS).
- Initiated conversations with KWS laboratory diagnostic personnel.

REPUBLIC OF CONGO

Highlights and Success Stories:

- Conducted a visit to Brazzaville and signed a Memorandum of Understanding with the Directorate of Military Health at the Ministry of Defense to allow PREDICT a permanent office in Brazzaville to support administrative and programmatic management with full-time staff.
- Met with in-country partners, including the National Public Health Lab (LNSP) and the National Veterinary Lab in Brazzaville (LNVB) to explore options for project activities.
- Published an article in *PLoS One* entitled “Adenovirus and herpesvirus diversity in free-ranging great apes in the Sangha Region of the Republic of Congo”.

Summary of Surveillance and Field Activities for the Period Oct. 2014-March 2015:

- Developed an implementation plan including an estimated timeline for field and laboratory activities.

- Began working with local government authorities and stakeholders on collecting information necessary for identification of strategic high-risk sites for inclusion in sampling plans.
- Developed maps for identifying areas of high-risk human-wildlife interfaces to inform on the locations for potential sampling activities, including extractive industry sites.

Summary of Laboratory Testing for the Period Oct. 2014-March 2015:

- Renewed the agreement between the INRB (Institut National de Recherche Biologique) of Kinshasa and the LNSP (Laboratoire National de Santé Publique) of Brazzaville to continue to facilitate technical assistance for the analysis of project samples.

Other Activities this Period*:*

- Representative from the National Veterinary Laboratory attended the weekly technical committee meetings on epidemic management and shared information with project staff.
- Began to perform a laboratory capacity evaluation of LNSP and LNVB.
- Confirmed the process for government authorization of data release and publication and worked with government authorities to establish a communication system.

RWANDA

Highlights and Success Stories:

- Helped draft a One Health Work Plan under the Government of Rwanda's One Health Strategic Plan 2014-2018; identified activities for which PREDICT will be able to provide technical support.
- Introduced EPT-2 plans to the USAID Mission, the Rwanda One Health Steering Committee, and other government partners, including the Rwanda Development Board, Rwanda Agriculture Board, Rwanda Biomedical Center (Ministry of Health), and the Government Ministerial Social Cluster, as well as the University of Rwanda Schools of Veterinary Medicine and Public Health.
- Published an article in *Emerging Infectious Diseases* entitled "Human herpes simplex virus type 1 in confiscated gorilla".

Summary of Surveillance and Field Activities for the Period Oct. 2014-March 2015:

- Developed a work plan for wildlife and human surveillance in consultation with government partners; visited potential surveillance sites to assess opportunities and feasibility for concurrent wildlife and human sampling.
- At the request of the Rwanda Development Board, assessed an on-going primate-human conflict situation in East Province for future surveillance.

- Alerted by the Rwanda Development Board to the first ever report of respiratory disease affecting wild human-habituated chimpanzees in Nyungwe National Park; opportunistically collected fecal samples and forage material from sick chimpanzees in contact with people.

Summary of Laboratory Testing for the Period Oct. 2014-March 2015:

- Distributed a fourth Test Results Report to the Government of Rwanda on March 17 summarizing PREDICT findings from 534 samples collected from 360 animals (188 primates and 172 bats); thirteen (13) viruses were detected in 101 animals, of which nine are known viruses and four are new (previously unknown) viruses.

Other Activities this Period*:*

- Invited to participate in the Government of Rwanda's weekly briefings on Ebola alertness and preparedness.
- Asked by the Rwanda Agriculture Board to assess wild ungulate-livestock contact outside Akagera National Park during a suspected Foot and Mouth Disease outbreak affecting cattle.

TANZANIA

Highlights and Success Stories:

- Developed surveillance plans and implementation strategies in conjunction with the global team.
- Provided information to the mission for Global Health Security Agenda (GHSA) meetings in in Dar es Salaam.

Summary of Surveillance and Field Activities for the Period Oct. 2014-March 2015:

- Distributed the final test results report to the Government of Tanzania summarizing PREDICT findings from samples collected from 225 animals (135 bats, 113 rodents and shrews, and 7 other taxa); nine viruses were detected in 143 animals, of which four are known and five are new (previously unknown).
- Extracted and shipped 50 bushmeat samples collected from the participatory bushmeat surveillance network in the Ruaha Ecosystem for viral testing at the UC Davis lab.

Other Activities this Period*:*

- Trained 14 international veterinary students and one human medical student in the One Health Approach to disease surveillance, specifically human-wildlife contact in Kilombero Valley.
- Shared PREDICT final report with mission and other stakeholders.
- Conducted site visits at human-wildlife interfaces (Udzungwa and Ruaha Ecosystems), held meetings, and distributed the Tanzania country report

to park wardens, ecologists, veterinary officers, and medical officers from health facilities as part of surveillance site assessments.
- Made progress on a manuscript for publication on Arenaviruses in rodents in Tanzania showing that eight of 632 sampled rodents captured in rural villages near Ruaha National Park were shedding an Arenavirus in secretions; including a novel Arenavirus and strains of the known viruses Mopeia and Morogoro virus.

UGANDA

Highlights and Success Stories:

- Briefed the mission on previous and planned PREDICT activities; attendees included representatives from USAID and US CDC.
- Met with Makerere University Walter Reed Project (MUWRP) to plan for continued sample testing at MUWRP Influenza Research laboratory at the College of Veterinary Medicine, Makerere University, Kampala.
- Met with the Chief-of-Party for EPT Preparedness and Response and his staff in Kampala to discuss One Health networks and platforms and to provide an overview of successes and plans.
- Discussed public health risks that human-primate contact poses and the overall purpose and objectives of the project in a briefing to the State House in Entebbe during a government-led monkey sampling exercise.
- Met with the National Animal Disease Diagnostic and Epidemiology Center (NADDEC) of the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) in Entebbe to discuss potential collaboration.
- Invited to participate in a Bwindi Mgahinga Conservation Area partners meeting to discuss potential collaborations on animal health issues.
- Published an article in *EcoHealth* entitled “Early detection of emerging zoonotic diseases with animal morbidity and mortality monitoring”.

Summary of Surveillance and Field Activities for the Period Oct. 2014-March 2015:

- Developed workplan for wildlife and human surveillance in consultation with government partners; visited potential surveillance sites to assess opportunities and feasibility for concurrent wildlife and human sampling.
- Hired a Field Veterinarian to support field surveillance activities.
- Invited by the Uganda Wildlife Authority and the Uganda Wildlife Education Center to collect samples from vervet monkeys that were being trapped and translocated from sites in Entebbe where the level of monkey contact with humans had reached nuisance levels; collected approximately 340 samples from 68 vervet monkeys.

Other Activities this Period*:*

- Participated in the Queen Elizabeth National Park ecosystem research and development partners’ meeting in Kasese to identify research and

development priorities and set up strategic collaboration in the QENP ecosystem.

- Requested by Queen Elizabeth National Park to provide on-ground technical assistance with investigation of a goat disease outbreak involving 17 goat mortalities now believed to have been the result of cyanide poisoning.

PREDICT Y1 SEMIANNUAL COUNTRY REPORTS

ASIA REGION

BANGLADESH

Highlights and Success Stories:

- Held coordination meetings with the Department of Livestock Services, Forest Department, and Ministry of Health and Family Welfare.
- Participated in a One Health coordination meeting.
- Met with the mission and discussed PREDICT plans.
- Met with government stakeholders and discussed proposed activities.
- Organized the One Health Bangladesh Conference with other partners and presented PREDICT 1 achievements and future directions.

Summary of Laboratory Testing for the Period Oct. 2014-March 2015:

- Tested 452 throat swabs from rodents and shrews for six viral families with positives detected for adenovirus, influenza, and rotavirus-A.

Other Activities this Period*:*

- Reinforced partnerships with the Institute of Epidemiology, Disease Control and Research (IEDCR), and Chittagong Veterinary and Animal Sciences University (CVASU) by developing and signing a MOU.

CAMBODIA

Summary of Surveillance and Field Activities for the Period Oct. 2014-March 2015:

- Identified options for sampling sites for Year 1 with a focus on:
  - Bat guano value chain: targeting sampling of bats, guano, and humans at harvest purchasing and trade sites.
  - Sites where large areas of forest have been converted by the agro-industry: targeting wild rodents and humans working in agro-industry and living in proximity to the sites.
  - Planning to discuss coordination with FAO-Rome for livestock sampling.
- Began to explore the potential for sampling at cross-border trade sites of rodents and livestock between Vietnam and Cambodia.

Summary of Laboratory Testing for the Period Oct. 2014-March 2015:

- Submitted the third PREDICT diagnostic test report to the Cambodian government and received approval for release of results on the PREDICT public site through HealthMap.
- Prioritized specimens for further characterization of Coronavirus sequences, should budget be available.

Other Activities this Period*:*

- Met with MOH's Communicable Disease Control Department (CDC), the US CDC, and WHO to discuss coordination for human sampling and capacity building for National Institute of Public Health technicians.
- Met with the National Veterinary Research Institute, the Deputy Director of the Department of Animal Health and Production, and local FAO representatives to discuss coordination for implementation of livestock sampling and laboratory training for testing.
- Met with the Vice Director for International Relations and the Dean of the Faculty of Veterinary Medicine from the Royal University of Agriculture to discuss continued capacity building for students and potential for support through the One Health Workforce project.

CHINA

Highlights and Success Stories:

- Received acceptance for and published the following articles:
  - An article in *Journal of General Virology* entitled "Detection of diverse novel astroviruses from small mammals in China".
  - An article in *PLoS One* entitled "Scrub typhus, a disease with increasing threat in Guangdong, China".
  - An article in *Pediatric Infectious Disease Journal* entitled "Mild influenza A/H7N9 infection among children in Guangdong province".

Summary of Surveillance and Field Activities for the Period Oct. 2014-March 2015:

- Collected samples from 459 bats.
- Continued acute syndromic human sample collection in Guangdong Province for patients with Hemorrhagic fevers (five hospitals), encephalitides (three hospitals), influenza-like respiratory illness (three hospitals), fever with rash (two hospitals), and diarrheal disease (two hospitals).
- Scouted hospitals in Yunnan, China to identify Infectious Disease Departments with the capability, interest, and population relevant to implement a hospital passive surveillance case control study design.
- Visited and identified concurrent human-wildlife sampling locations in Yunnan, Guangxi, and Guangdong Provinces.

Summary of Laboratory Testing for the Period Oct. 2014-March 2015:

- Tested human samples (serum, CSF, and nasopharyngeal swabs) from 94 people for Alpha, Bunya, Corona, Entero, Filo, Flavi, Hanta, Henipa, Paramyxo, Phlebo, Rhabdo, and Seadorna viruses.

Other Activities this Period*:*

- Translated ethnographic interview guides, focus group guides, and observational protocols, along with all training materials and presentations from English to Chinese.
- Trained 10 Yunnan CDC and two other personnel or ethnographic interview, focus group, and observational protocols for qualitative surveillance.
- Evaluated the potential of three Yunnan Province hospitals to participate in passive hospital surveillance case control study.
- Met with collaborators from Oklahoma University to discuss plans for avian influenza sampling and human surveillance in Jiangxi Province.
- Began finalizing manuscript summarizing PREDICT Surveillance.
- Reviewed result release approval process with in-country partners.
- Participated in China CDC's National Vector-borne Disease Surveillance Workshop in Xiamen.
- Participated in the 6th Emerging Viral Diseases Symposium in Wuhan.
- Reviewed acute syndromic sampling workplan to prioritize acute hospital human surveillance at high-risk interfaces and to identify valuable hospital sites for sampling.
- Initiated discussions with Guangdong CDC for hospital-based prospective study in Guangdong Province.

INDONESIA

Highlights and Success Stories:

- Presented findings to the Directorate of Biodiversity Conservation, Directorate General of Forest Protection, and Nature Conservation-Ministry of Forestry; Country Coordinator collaboratively edited and finalized the Guidelines on Prevention and Control of Wildlife Diseases.
- Initiated discussion for collaborations with the Faculty of Medicine, Lambung Mangkurat University and Rumah Sakit Umum Daerah (RSUD) Ulin Hospital both in Banjarmasin, South Kalimantan regarding hospital-based surveillance; currently preparing a MOU between these partners.

Summary of Laboratory Testing for the Period Oct. 2014-March 2015:

- Began prioritizing samples for characterization should funding be available.
- Tested 168 samples (serum, CSF, and nasal, rectal, and throat swabs) from 145 people for Adeno, Arena, Boca, Corona, Entero, Filo, Hanta, Henipa, Herpes, Orbi, Paramyxo, Polyoma, Rhabdo, and Seadorna viruses.
- Tested 42 samples (nasal, rectal, and throat swabs) from another 31 people for Adeno, Herpes, and Paramyxo viruses.

Other Activities this Period*:*

- Presented oral and poster presentations at the Third International One Health Congress, Amsterdam, Netherlands.

- Participated in the TEIN4 Next Generation Sequencing Training at Perdana University, Kuala Lumpur, Malaysia.
- Joined the EPT-2 Indonesia Internal Planning and Preparation Meeting and the EPT-2 Launch, Jakarta, Indonesia; built a consensus on priorities and objectives for EPT-2, clarified workplans and linkages with other programs and partners in-country.
- Held coordination meeting with US-based PREDICT staff; discussed workplan and coordination of surveillance activities to increase capacity for concurrent sampling.
- Attended a coordination meeting with partners from the Padjadjaran University in Bandung to discuss reporting of results, the Coxsackievirus B3 manuscript, and future collaboration.
- Submitted a manuscript to *EID* for review entitled "Coxsackievirus B3: An Etiologic Agent of Acute Febrile Illness in Bandung, Indonesia".
- Participated in Ebola contingency plan for Indonesia workshop held by the Indonesian national disaster agency.
- Presented at the Fourth National Scientific Conference on Epidemiology organized by Directorate General of Disease Control and Environmental Health, MoH.
- Participated in discussion to build an Information System for Zoonoses and EIDs with National Commission on Zoonosis Control, Coordinating Ministry for Human Development and Culture.
- Held a coordination meeting with the Institute of Vector and Reservoir Control Research and Development.
- Participated in the EPT-2 planning workshop with FAO and the Directorate General of Livestock and Animal Health, MoA.
- Presented at the Virology & Biosafety Workshop 2015, Jakarta.
- Assisted with training workshops on good laboratory practices in molecular virology conducted in Banjarmasin, South Kalimantan and Tomohon, North Sulawesi and conducted on-site trainings for PREDICT field clinicians and laboratory personnel on biosafety while handling clinical samples, proper sample collection, timing of sample collection, proper storage condition, and basic molecular techniques.
- Initiated discussions on collaborations with Faculty of Medicine, Warmadewa University, Bali, RSUD Sanjiwani, Gianyar Hospital, and RSUD Wangaya Denpasar Hospital regarding hospital-based surveillance of patients with diseases of unknown origin.

LAO PDR

Summary of Surveillance and Field Activities for the Period Oct. 2014-March 2015:

- Began discussions with in-country collaborators to identify sites for concurrent sampling.

Summary of Laboratory Testing for the Period Oct. 2014-March 2015:

- Continued planning to increase laboratory capacity for in-country testing.

Other Activities this Period*:*

- Participated in the Lao Inception Meeting with the RDMA, discussed the future scope of work and coordination with EPT-2 partners in-country and regionally; representatives from PREDICT China were present at the meeting to facilitate regional and epi-zonal collaboration for sampling.

MALAYSIA

Peninsular Malaysia:

Highlights and Success Stories:

- Assisted PERHILITAN with construction of their new National Wildlife Forensic Laboratory, which includes ISO 17025 standards for forensic work and BSL2 disease diagnostic capabilities.
- Received notice that the MoH is interested in comparing the PREDICT protocols with traditional testing at the National Public Health Laboratory (NPHL) for incorporation into their SOP for patients with unidentified diseases.

Summary of Laboratory Testing for the Period Oct. 2014-March 2015:

- Upon request of NPHL and MoH, began comparison on 54 human samples from patients with acute febrile illness to better understand the results obtained through different testing modalities (i.e. virus isolation versus consensus PCR).

Other Activities this Period*:*

- Met with all in-country partners to discuss project aims.
- Received agreement from MoH to modify human surveillance protocols to conform to future aims; also agreed with PERHILITAN to conduct concurrent wildlife and human sampling in Orang Asli villages pending ethical review and IRB approval; MoH will provide Orang Asli samples from hospital patients with unidentified disease.
- Received a request from NPHL for training assisstance for designing PCR primers and oligos, molecular cloning, bioinformatics, and sequence analysis.
- Discussed concurrent livestock testing with Department of Veterinary Severics, MoA.
- Trained 23 wildlife officers on PPE and Powered Air Purifying Respirator use and conducted N95 and P100 mask fit tests.
- Trained 20 wildlife officers in biosafety containment levels, risk assessments for field and lab work, sample handling and required PPE, disinfection, contamination and laboratory waste management.

- Received acceptance from *EID* for the publication "Macacine Herpesvirus 1 (B virus) in Wild-caught Long-Tailed Macaques (*Macaca fascicularis*) Following Capture and Transport in Malaysia".

Sabah:

Highlights and Success Stories:

- Presented on the project to the UN Special Rapporteur.

Summary of Surveillance and Field Activities for the Period Oct. 2014-March 2015:

- Collected samples from 15 bats and 22 animals of other taxa.

Summary of Laboratory Testing for the Period Oct. 2014-March 2015:

- Performed follow-up testing and sequencing for confirmation of results obtained previously through PREDICT, including samples from rodents, bats, and non-human primates for which host species confirmation was needed for better identification and phylogenetic placement of the virus sequences.
- Tested remaining samples collected previously, including 116 samples from 55 non-human primates, 297 samples from 99 rodents, and 112 samples from 68 bats for Corona, Herpes, and retro viruses.

Other Activities this Period*:*

- Discussed the project with the Director and Deputy Director of Sabah Forestry Department.
- Attended the Heart of Borneo Conference.
- Discussed continued collaboration with the new Director of Sabah Wildlife Department (SWD) and received approval to release updated results (orangutan and elephant testing) on HealthMap.
- Received confirmation that SWD will provide significant support for the PREDICT-established Wildlife Health, Genetic, and Forensic Laboratory (WHGFL), a move towards sustainability.
- Discussed capacity building, sampling, and testing with SWD, Danau Girang Field Centre (DGFC), and the Department of State Health.
- Trained 35 wildlife department, Lok Kawi Wildlife Park, and Sepilok Orangutan Rehabilitation Centre personnel in zoonoses, PPE, safe animal capture and handling, risk asssessment, and lab safety; conducted N95 and P100 mask fit tests with 34 individuals.
- Trained one student in PPE usage and biosafety training during necropsies.
- Revised WHGFL SOPs with SWD and DGFC for WHGFL re-certification.
- Conducted emergency drills and generator procedures at WHGFL.
- Submitted poster abstract on viral diversity in NPHL from Peninsular and Sabah for 2015 Wildlife Disease Association Conference.

MYANMAR

Planning & Other Activities this Period*:*

- Conducted a scoping visit to meet with USAID, Embassy, Myanmar government, and non-government stakeholders to introduce and launch the project and received positive response, support, and enthusiasm for the project and potential partnering.
- Held meetings with EPT-2 partners in-country (WHO and FAO) and introduced project objectives.
- Visited laboratory facilities at the National Veterinary Diagnostic Lab (MoA) and National Health Lab (MoH) to preliminarily assess capacity for viral screening; laboratories in general were well equipped with knowledgeable staff, but there were opportunities to add value and assist with previously undiagnosed illnesses in the human population.

NEPAL

Summary of Surveillance and Field Activities for the Period Oct. 2014-March 2015:

- Developed work and tiered implementation plans for wildlife and human surveillance with a focus on:
  - Longitudinal monitoring of high-risk wildlife taxa with direct contact with people in urban settings in Kathmandu.
  - Screening for clinical human cases of Fever of Unknown Origin (FUO) in Kathmandu Valley clinics and sentinel hospitals near Chitwan National Park within the Chepang ethnic subgroup.
  - Animal value chains to determine high-risk cross border animal movements in southern Nepal.

Other Activities this Period*:*

- Received extension of research permits through the Ministry of Forestry and Soil and ongoing permission and support for animal sampling activities from Kathmandu Valley Temple Authorities.
- Played a supporting role to the One Health Alliance Nepal network through meeting participation and facilitation of interactive programs.
- Distributed reports summarizing PREDICT findings and activities to the mission and government partners (MoH, MoA, and the Ministry of Forestry and Soil).
- Interviewed candidates and identified three field veterinarians for protocol training to support surveillance activities and hired additional project support personnel.
- Provided two days of training on wildlife sample collection and post mortem necropsy examination techniques to field veterinarians in Chitwan.

THAILAND

Highlights and Success Stories:

- Received acceptance from *Virology* for an article entitled "Diversity of Coronavirus in Bats from Eastern Thailand".

Summary of Surveillance and Field Activities for the Period Oct. 2014-March 2015:

- Coordinated Year 1 surveillance plans with partners at EPT-2 planning meeting in Bangkok, Jan 20-21, 2015.
- Discussed selection of longitudinal animal sampling sites in geographic concordance with existing human surveillance efforts with US CDC; planned for continued testing of human specimens using PREDICT laboratory protocols.

Summary of Laboratory Testing for the Period Oct. 2014-March 2015:

- Optimized a Spike gene PCR assay for expanded genetic characterization of Coronavirus-positive specimens.
- Began selection of specimens for additional characterization, should funding be available.

Other Activities this Period:

- Presented poster on One Health surveillance in Thailand at 3rd International One Health Congress, 15-18 March 2015, Amsterdam, Netherlands.

VIET NAM

Highlights and Success Stories:

- Received the "best poster" award for the presentation "Advancing wildlife disease surveillance in Viet Nam through cross sector collaboration" at the 7th annual meeting of the Asian Society of Zoo and Wildlife Medicine in Tam Dao.
- Presented project accomplishments, including the capacity for wildlife surveillance and the results of laboratory diagnostic work, at the "3rd National One Health Conference: Infectious disease risks at the human-animal-ecosystem interface in Viet Nam" in Hanoi; the conference was led by the Ministry of Agriculture and Rural Development (MARD) and co-chaired by the MoH and representatives of the international community with WCS co-chairing the thematic session on the human/wildlife interface with the Viet Nam CITES Management Authority.

Summary of Surveillance and Field Activities for the Period Oct. 2014-March 2015:

- Assessed opportunities to study the wildlife trade animal value chain and to carry out biological and behavioral surveillance along this disease emergence pathway in Binh Phuoc Province at the southern border of Cambodia where the majority of wildlife and wildlife products originating from Cambodia, including wild meat, are marketed through restaurants and trade points.

Summary of Laboratory Testing for the Period Oct. 2014-March 2015:

- Completed testing 46 common palm civet samples collected previously from wildlife farms at the Vietnam National University of Agriculture (VNUA) lab; the samples were screened for Flavi, Rhabdo, and Corona viruses using PREDICT protocols.
- Continued testing 459 rodent samples collected previously from wildlife farms at the Regional Animal Health Office No.6 (RAHO6) for Arena, Bunya, Hanta, Paramyxo, and Rhabdo viruses.
- Tested 22 non-human primate samples collected previously from wildlife farms at UC Davis for Alpha, Arena, Bunya, Corona, Filo, Hanta, Henipa, Influenza A, Paramyxo, and Rhabdo viruses; detected two novel Rhabdoviruses from samples from two crab-eating macaques.
- Tested bat samples originally screened at RAHO6 for additional viral families at UC Davis for additional viral families (Arena, Bunya, Corona, Filo, Henipa, Influenza, Rhabdo, and Seadorna viruses).

Other Activities this Period*:*

- Attended the 'USAID Avian Influenza (AI) and EPT Partner Meeting' at the mission in Hanoi and presented on PREDICT test results approved for public release; AI and EPT partners shared preliminary workplans and discussed opportunities for collaboration.
- Attended a meeting of the 'One Health Communication Network' organized by the Pandemic Avian and Human Influenza Secretariat; other attendees included PREVENT, FAO, WHO, Vietnam One Health University Network (VOHUN), VNUA, CITES, Department of Animal Health (DAH), Vietnam Farmers Union (VNU), and MoH.
- Attended the EPT-2 Asia Regional Launch in Bangkok.
- Attended PREVENT's "A Market Chain Analysis of the Cross-Border Rat Trade in Vietnam and Cambodia: Research Findings Dissemination and Stakeholder Workshop" in Ho Chi Minh City and presented (with Oxford University Clinical Research Unit) on surveillance activities and findings from rats for viruses of pandemic potential and known zoonotic pathogens; the meeting convened participants directly involved in the rat trade (venders, traders, and transporters) and the local management agencies, such as the provincial sub-DAH offices.
- Attended the DAH "Veterinary Law Consultation Meeting" in Ho Chi Minh City and provided comments on provisions related to wildlife health, biosecurity on wildlife farms, and the general importance of collaboration

between the animal health and forestry/wildlife sectors in carrying out wildlife disease surveillance.

- Attended the 'EPT-2 Vietnam Launch and Work Planning Meeting' organized by USAID Vietnam and focused on identifying priorities for EPT-2 activities and clarifying opportunities for linkages and collaboration among partners; all EPT partners joined the meeting, including MoH, MARD, FAO, WHO, UNDP, OHW, P&R, PAHI, and representatives from VOHUN, VNUA, DAH, and CITES.

APPENDIX 1 – TRAINING (October 2014-March 2015)

Country	Total # Trained	# Women Trained	Trainings covered various combinations of topics
Africa			
DRC	70	36	Principles of molecular biology; Best laboratory practices; Lab techniques; Biosecurity: Handling and Shipping Infectious Substances and Biological Specimens; Decontamination, disinfection and sterilization; Biological waste disposal
Tanzania	15	15	One Health Approach to disease surveillance
Uganda	3	1	Biosafety and PPE use; Safe animal capture and handling; Sample packing and shipping.
Asia			
China	15	4	Qualitative behavioral research methods: observation, focus groups, and ethnographic interview modules
Indonesia	1	0	Introduction to next generation sequencing (NGS) data mining and analysis, NGS computational analysis, bioinformatics and sequence analysis; Multinomics approach to big data analysis
Malaysia	112	27	Biosafety containment levels; Field and lab sample handling and required PPE; Disinfection, contamination, and laboratory waste management; Respirator fit test; Zoonoses and human safety during animal capture; Sample storage and lab safety
North America			
USA	4	2	Qualitative behavioral research methods: observation, focus groups, and ethnographic interview modules.
Total Trained	**220**	**85**	

APPENDIX 2 – PUBLICATIONS (October 2014-March 2015)

Bisson, I., B. Ssebide, and P.P. Marra. 2014. Early detection of emerging zoonotic diseases with animal morbidity and mortality monitoring. *EcoHealth* November.

De, W., K. Jing, Z. Huan, Z.H. Qiong, C. Monagin, Z.J. Min, H. Ping, K.C. Wen, and L.J. Yan. 2015. Scrub typhus, a disease with increasing threat in Guangdong, China. *PLoS One* 10(2): e0113968.

Gilardi, K., K. Oxford, D. Gardener-Roberts, J.F. Kinani, L. Spelman, P. Barry, M. Cranfield, and L. Lowenstine. 2014. Human herpes simplex virus type 1 in confiscated gorilla. *Emerging Infectious Diseases* 21(11): 1883-1886.

Hu, B., A.A. Chmura, J. Li, G. Zhu, J.S. Desmond, Y. Zhang, W. Zhang, J.E. Epstein, P. Daszak, and Z. Shi. 2014. Detection of diverse novel astroviruses from small mammals in China. *Journal of General Virology* 95:2442-2449.

Limachi-Quinajo, R., R. Nallar-Gutierrez, and E. Alandia-Robles. 2014. Gastrointestinal parasites in free-ranging tayassu pecari and pecari tajacu from the pilon lajas biosphere reserve and indigenous territory, Beni-Bolivia. *Neotropical Helminthology* 8(2): 269-277.

Machalaba, C., S.E. Elwood, S. Forcella, K.M. Smith, K. Hamilton, K.B. Jebara, D.E. Swayne, R.J. Webby, E. Mumford, J.A.K. Mazet, N. Gaidet, P. Daszak, and W.B. Karesh. 2015. Global avian influenza surveillance in wild birds: A strategy to capture viral diversity. *Emerging Infectious Diseases* 21(4): e141415.

Mandl, J.N., R. Ahmed, L. Barreiro, P. Daszak, J.H. Epstein, H.W. Virgin, and M.B. Feinberg. 2015. Reservoir host immune responses to emerging zoonotic viruses. *Cell* 160(1-2): 20-35.

Olival, K.J., K. Dittmar, Y. Bai, M.K. Rostal, B.R. Lei, P. Daszak, and M. Kosoy. 2015. Bartonella spp. in a Puerto Rican bat community. *Journal of Wildlife Diseases* 51(1): 274-278.

Pernet O., B.S. Schneider, S.M. Beaty, M. LeBreton, T.E. Yun, A. Park, T.T. Zachariah, T.A. Bowden, P. Hitchens, C.M. Ramirez, P. Daszak, J.A.K. Mazet, A.N. Freiberg, N.D. Wolfe, and B. Lee. 2014. Evidence for Henipavirus spillover into human populations in Africa. *Nature Communications* 5(5342).

Perrings, C., C. Castillo-Chavez, G. Chowell-Puente, P. Daszak, E.P. Fenichel, D.C. Finnoff, R.D. Horan, A.M. Kilpatrick, A.P. Kinzig, N.V. Kuminoff, S.A. Levin, B. Morin, K.F. Smith, and M. Springborn. 2014. Merging economics and epidemiology to improve the prediction and management of infectious disease. *EcoHealth* 11:464-475.

Pike J., T.L. Bogich, S.E. Elwood, D.C. Finnoff, and P. Daszak. 2014. Economic optimization of a global strategy to address the pandemic threat. *PNAS* 11(52): 18519-18523.

Rosenbaum, M., B. Ghersi, A.P. Mendoza, A. Perez-Brumer, N. Carvero, A. Westmark, M.R. Kasper, S. Montano, J. Zunt, A.K. Wilbur, and L. Jones-Engel. 2014. Detection of mycobacterium tuberculosis complex in captive nonhuman primates in Peru. *EcoHealth* December.

Schwind J.S., D.J. Wolking, J.S. Brownstein, PREDICT Consortium, J.A.K. Mazet, and W.A. Smith. 2014. Evaluation of local media surveillance for improved disease recognition and monitoring in global hotspot regions. *PLoS One* 9(10): e110236.

Seimon, T., S. Olson, K. Lee, G. Rosen, A. Ondzie, K. Cameron, P. Reed, S. Anthony, D. Joly, D. McAloose, and W.I. Lipkin. 2015. Adenovirus and herpesvirus diversity in free-ranging great apes in the Sangha Region of the Republic of Congo*. PLoS One* 10(3): e0118543.

Springborn, M., R.P. Keller, S. Elwood, C.M. Romagosa, C. Zambrana-Torrelio, and P. Daszak. 2014. Integrating invasion and disease in the risk assessment live bird trade. *Diversity and Distributions: A Journal of Conservational Biogeography* 21(1): 101-110.

Suzán, G., G.E. García-Peña, I. Castro-Arellano, O. Rico, A.V. Rubio, M.J. Tolsá, B. Roche, P.R. Hosseini, A. Rizzoli, K.A. Murray, C. Zambrana-Torrelio, M. Vittecoq, X. Bailly, A.A. Aguirre, P. Daszak, A.H. Prieur-Richard, J.N. Mills, and J.F. Guégan. 2015. Metacommunity and phylogenetic structure determine wildlife and zoonotic infectious disease patterns in time and space. *Ecology and Evolution* 5(4): 865-873.

Wacharapleusadee, S., P. Duengkae, A. Rodparn, T. Kaewpom, P. Maneeorn, B. Kanchanasaka, S. Yinsakmongkon, N. Sittidetboripat, C. Chareesaen, N. Khlangsap, A. Pidthong, K. Leadprathom, S. Ghai, J.H. Epstein, P. Daszak, K.J. Olival, P.J. Blair, M.V. Callahan, and T. Hemachudha. 2015. Diversity of coronavirus in bats from Eastern Thailand. *Virology Journal* 12(57).

Zheng, X., W. Mai, B. Shu, L. Yi, J. Lu, T. Song, H. Zhong, H. Xiao, D. Guan, J. Wu, L. Liang, C. Monagin, X. Zhang, and C. Ke. 2015. Mild influenza A/H7N9 infection among children in Guangdong province. *Pediatric Infectious Disease Journal* 34(1): 104-107.