

CAPACITY BUILDING

for One Health disease surveillance and viral discovery

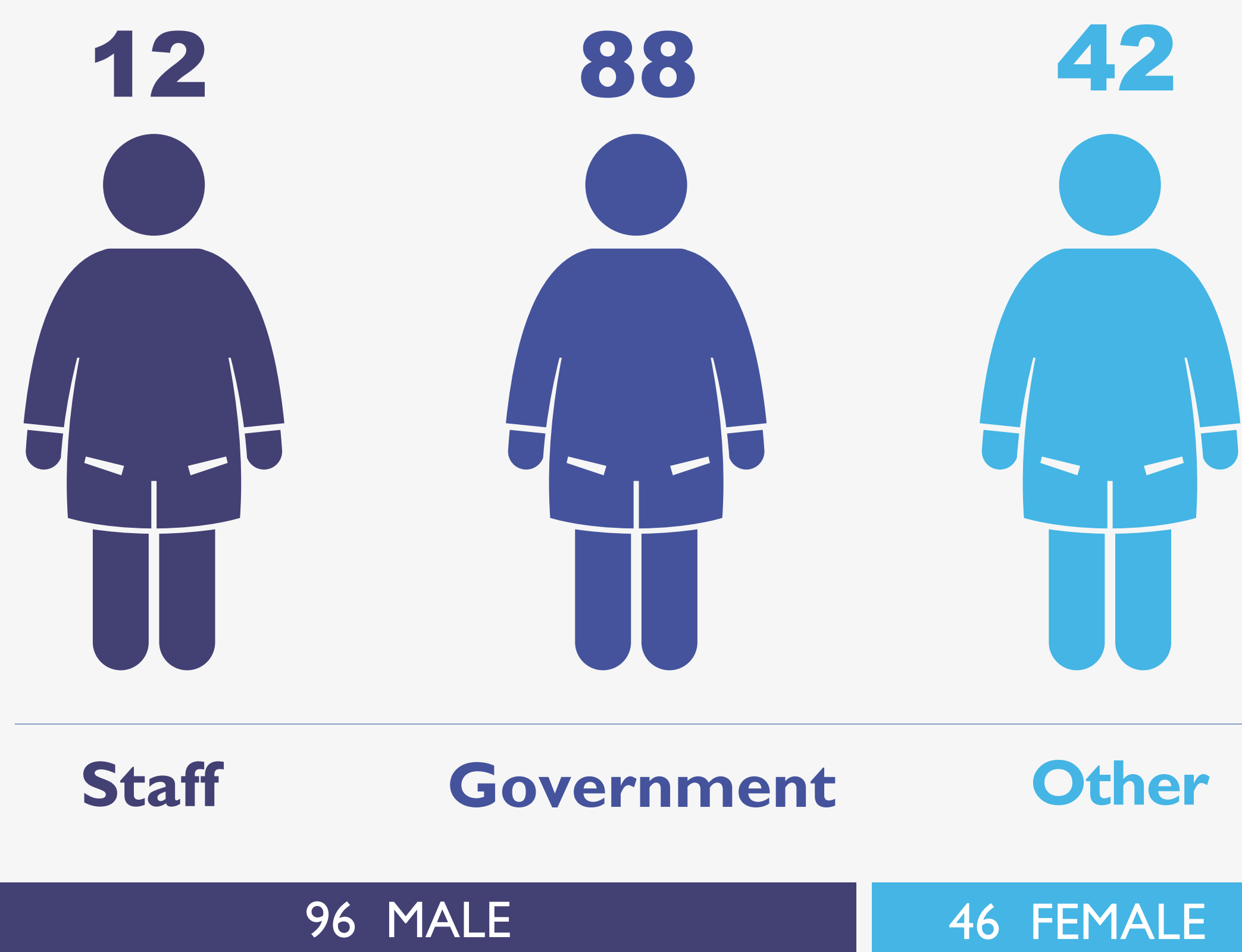
OBJECTIVES

PREDICT 2 is working with EPT and other partners to operationalize One Health surveillance and strengthen functional technological capacities in local, national, and regional contexts for surveillance system design, field sampling, laboratory techniques, behavioral risk characterization, information management, public data dissemination, and data analytics and forecasting. PREDICT's capacity building objectives are to support the development of the core skills and capabilities required by One Health professionals today. Training and capacity building activities conducted in Viet Nam have included biosafety; safe animal capture, handling, and sampling; human surveillance and sampling; safe sample transport and shipping; ethics; field epidemiology and surveillance; data and information management; laboratory safety and viral detection; social sciences and behavioral risk investigations; and modeling and analytics.

ACHIEVEMENTS

PREDICT has provided refresher and in-service trainings designed to enhance the skills of the existing health workforce. PREDICT has focused on increasing capacity within the animal and public health sector, especially with a focus on biosafety and safe sample collection with small mammals, such as bats and rodents, which represent the highest risk for viral spillover and spread to people. PREDICT in Viet Nam has trained a total of **142 individuals (32% female)**, including **88 government staff** working on the frontlines of disease surveillance and detection, and **17 local and international students** who are the future One Health workforce.

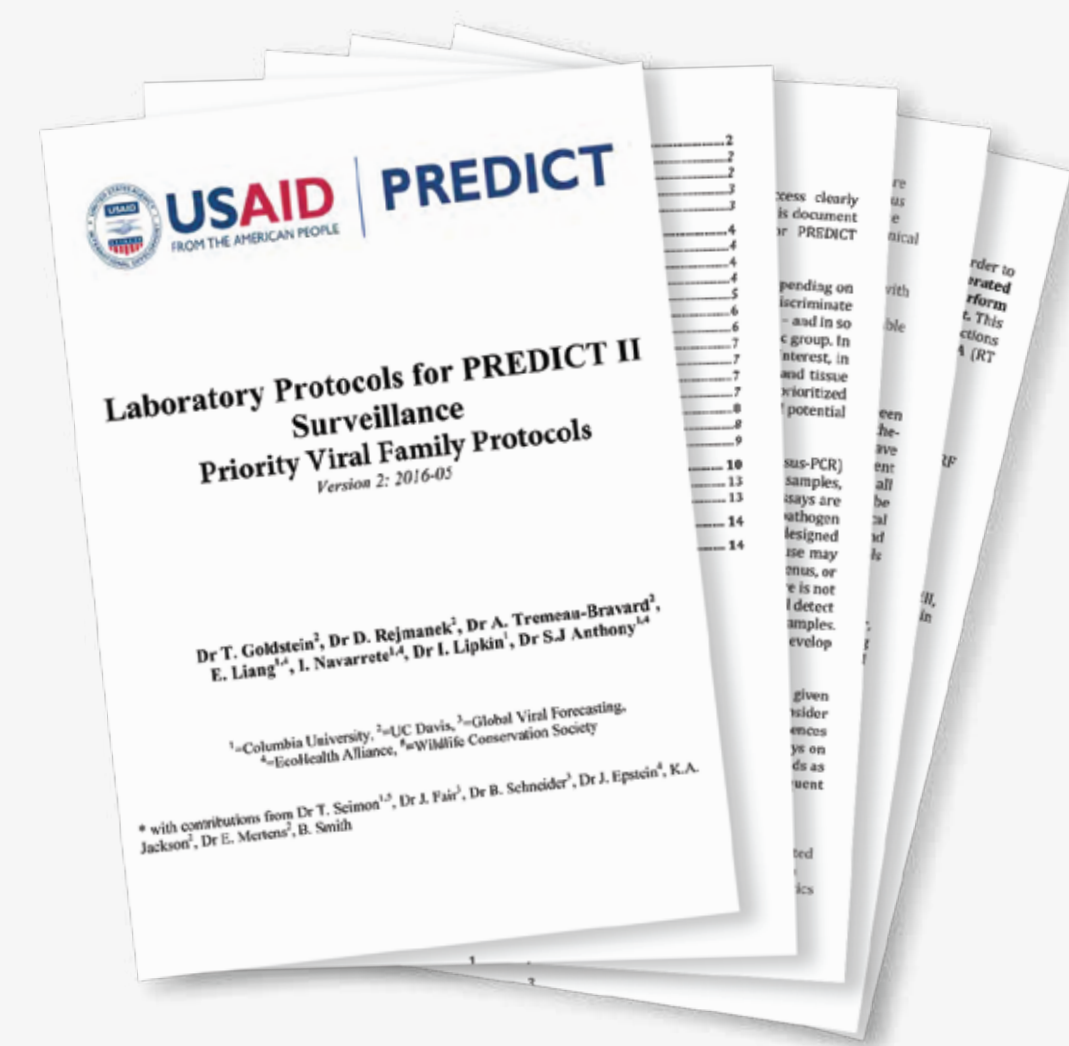
PREDICT-2/Viet Nam continued strengthening capacity with project partners and stakeholders



PREDICT has provided ongoing training to improve the quality of information on zoonotic disease transmission in Viet Nam by frequently updating partners on any changes to sample collection protocols and sharing techniques for improving data collection through administration of questionnaires to collect data on human risk behavior. PREDICT surveillance and laboratory protocols all incorporate best practices in biosafety and biosecurity.



PREDICT trains staff in national animal health and public health laboratories in molecular diagnostic techniques for viral discovery

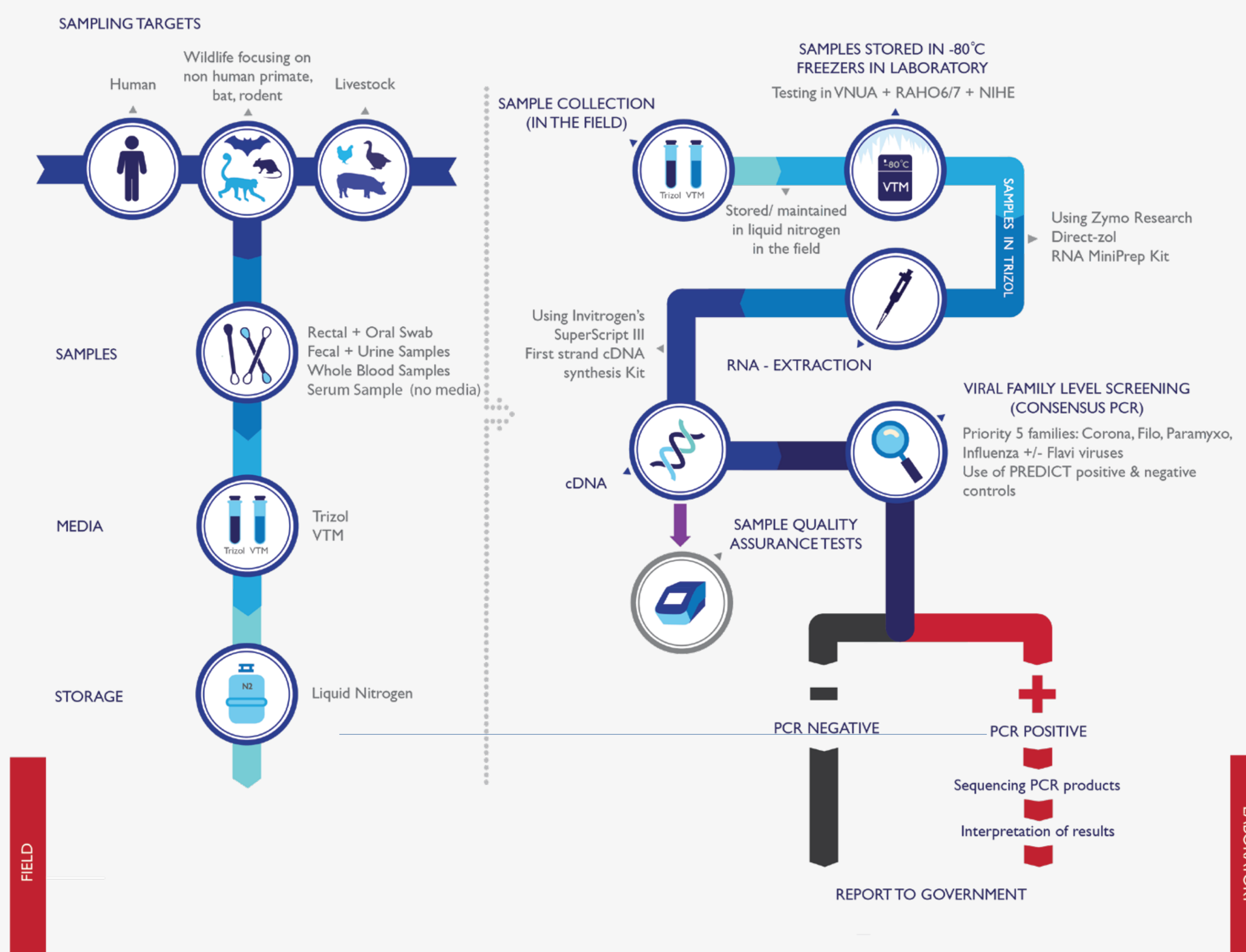


PREDICT protocols for laboratory testing and training manuals for One Health surveillance.

The main PREDICT partner laboratories in Viet Nam include:

- The Regional Animal Health Office No. 6 (RAHO6),
- The National Institute of Hygiene and Epidemiology (NIHE),
- The Viet Nam National University of Agriculture (VNUA),
- Additional partner laboratories: RAHO7 – trained to diagnostic wildlife samples using PREDICT protocols and Pasteur Institute in Ho Chi Minh City – shared protocols and universal controls.

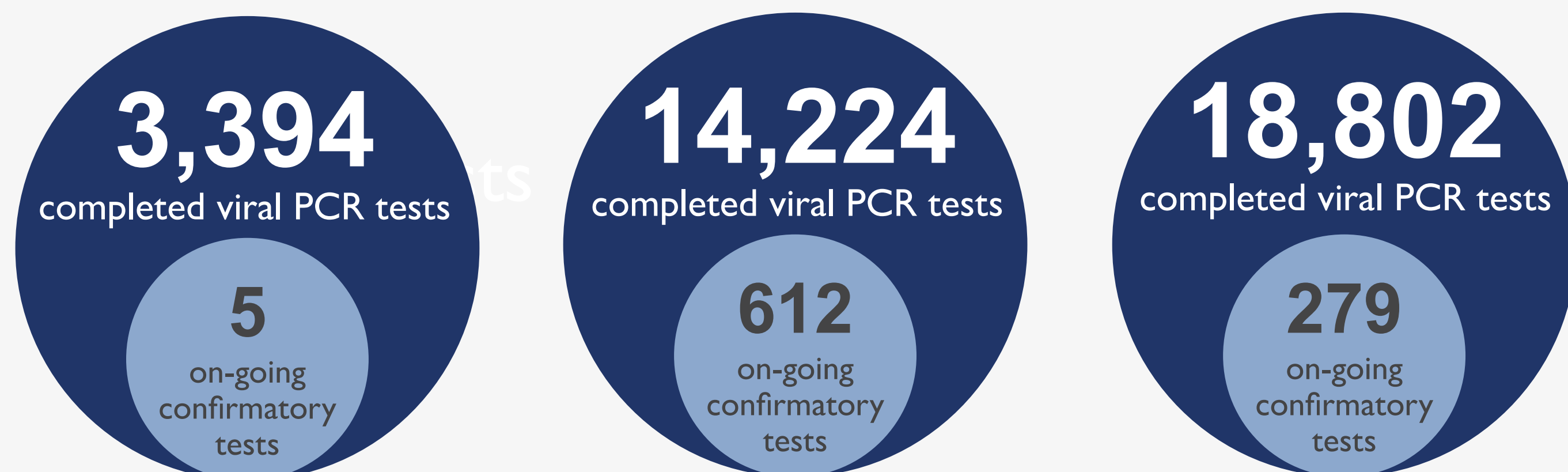
Diagram of the PREDICT project sample collection and testing protocols from the field to the laboratory



PREDICT has built capacity in Viet Nam's national animal health and public health laboratories for the application of consensus polymerase chain reaction (cPCR) as a method for detection of both known and novel viruses in a wide range of samples and host species. The advantages of this approach include:

1. An inexpensive testing method (cPCR) run on basic equipment, such as thermal cyclers for conventional PCR already available in animal and human health laboratories in Viet Nam and globally.
2. The "universal" amplification of viruses within a given viral family or genus.
3. Synthetic 'universal controls' that provide standardized control material without any danger of pathogen transmission.
4. Increased safety to laboratory workers as any microbes in the samples are killed during the PREDICT nucleic acid extraction steps so laboratory workers are not exposed to dangerous pathogens.
5. Ability to extend the PREDICT diagnostic strategy beyond the detection of viruses in wildlife to the diagnosis of mystery illnesses in medical hospitals or in solving an unknown disease outbreak in livestock or domestic animals.

PREDICT-2/Viet Nam conducted tests at its key partner laboratories



Viet Nam National University of Agriculture

Regional Animal Health Office No.6

National Institute of Hygiene and Epidemiology

PREDICT has built capacity for novel virus detection and identification of potential zoonotic viral pathogens strengthening capacity in Viet Nam's national public health and animal health laboratories. The PREDICT's partner laboratories in Viet Nam are the trained in the full range of activities required for safely detecting zoonotic viruses, including biosafety and biosecurity, cold chain, safe sample storage, data management, safe sample transport and shipping, and molecular viral detection techniques.

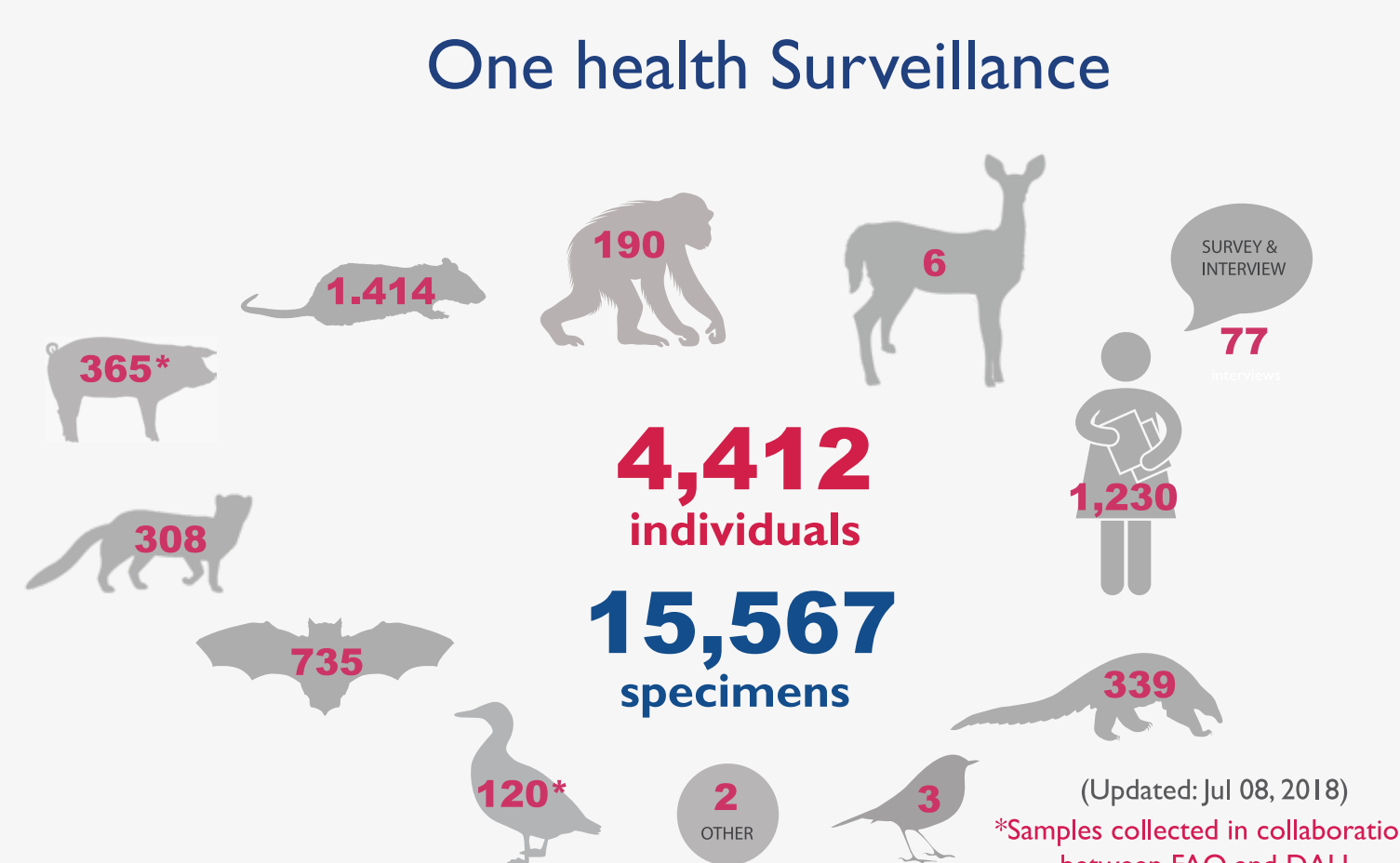
BIOLOGICAL SURVEILLANCE for Zoonotic Viruses with Pandemic Potential

OBJECTIVES

PREDICT works to improve global surveillance for pathogens that can spillover from animal hosts to people by building capacities to detect and discover viruses of pandemic potential. PREDICT's **biological surveillance** objectives are to better understand which geographic locations, 'epidemiological zones', animal-animal and/or animal-human interfaces, and environmental factors are most associated with the evolution, spillover, amplification, and spread of zoonotic viruses with pandemic potential to inform disease prevention and control strategies.

ACHIEVEMENTS

HIGH-RISK INTERFACES FOR ZONOTIC DISEASE TRANSMISSION



PREDICT's One Health team worked with national, provincial, and district level veterinary and medical officers to extend Viet Nam's disease surveillance systems to target high-risk areas for zoonotic disease transmission including sites with high rates of wildlife trade and intensive farming of wildlife.

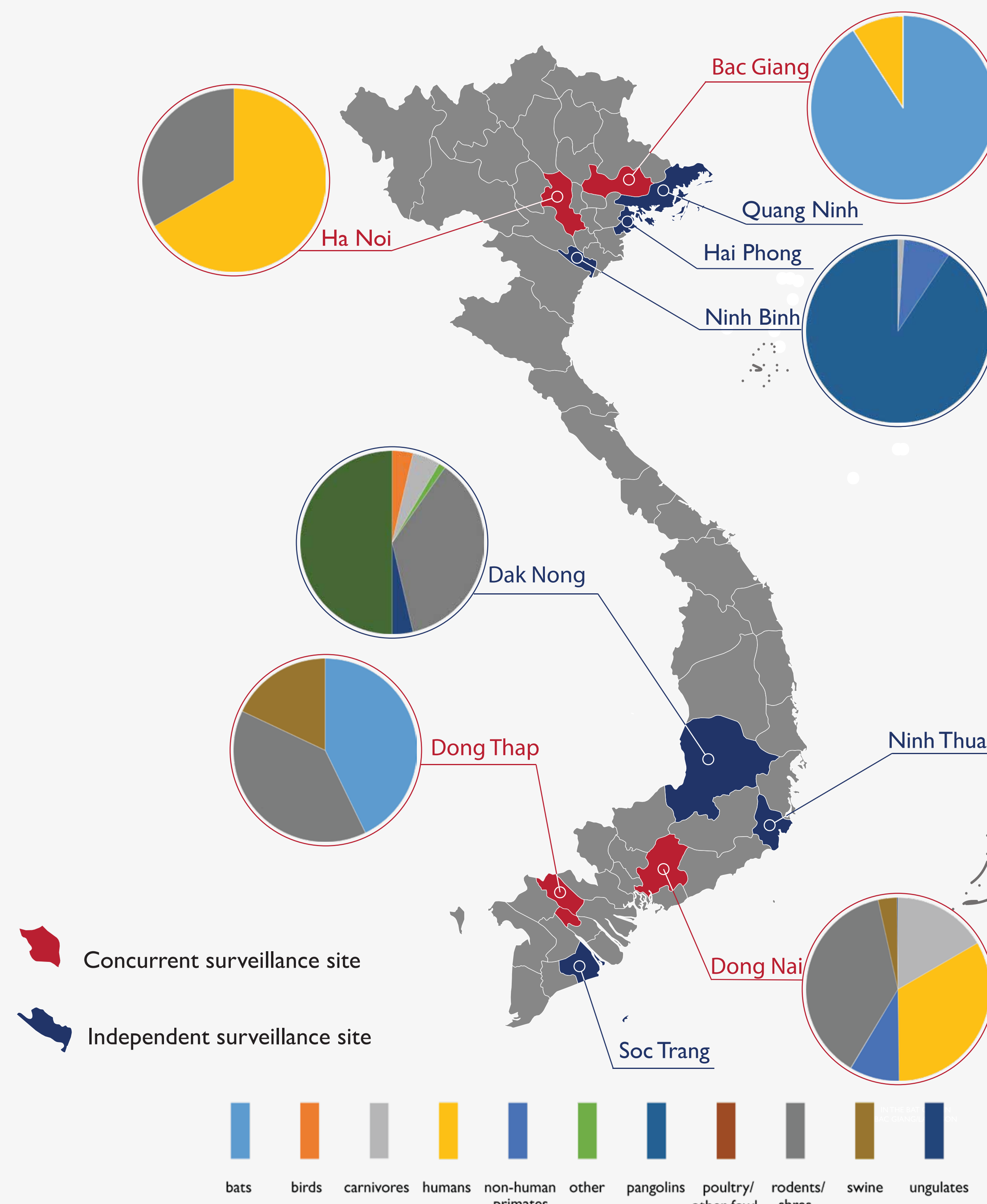
PREDICT biological surveillance has resulted in the detection of **28 novel viruses** and **8 known viruses** with PREDICT-2 testing still on-going. To date PREDICT-2 testing has confirmed **161 virus positive samples**.

Table 1: Viruses detected during PREDICT 1 & 2 in Viet Nam (Updated on July 03, 2019)

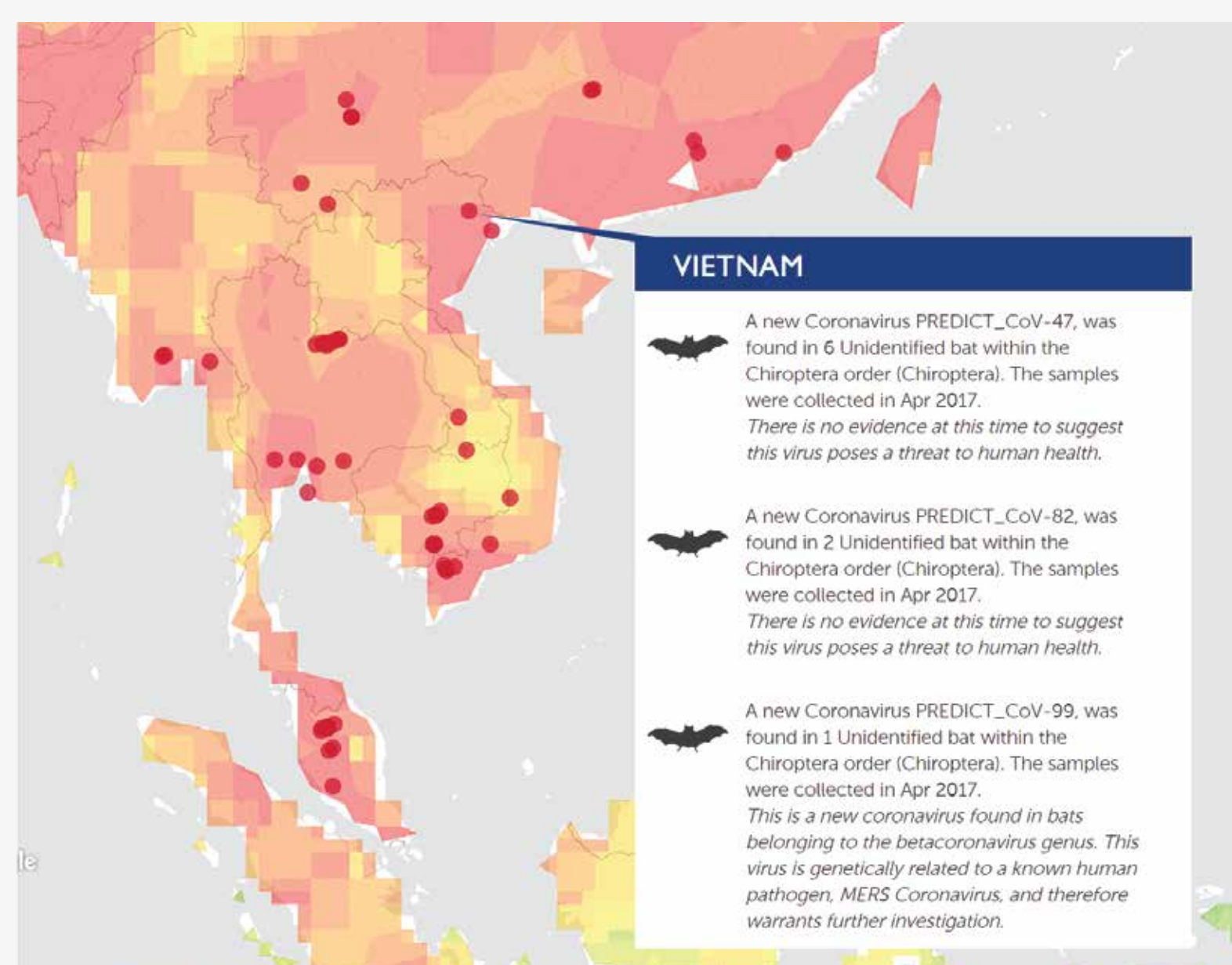
Viral Family/ Genus	Known/Novel	Animal	Interface
Herpesviruses	P1: 2 NOVEL	Common Palm Civet and Asiatic Black Bear	Civet in restaurant; bear rescued from trade in wildlife rescue center
Influenza A	P1: 1 KNOWN P2: 1 KNOWN	Rhizomyinae subfamily of bamboo rats; Domestic pigs	For sale in restaurant; farm
Paramyxoviruses	P1: 1 KNOWN & 5 NOVEL P2: 2 KNOWN	Rats; Bats; Red junglefowl; Domestic pigs	For sale in restaurant; For sale in the large market; In or near human dwelling(s); farm
Rhabdoviruses	P1: 16 NOVEL	Rhizomyinae subfamily of bamboo rats; ; Malayan porcupines; rats, bats and Non-human Primate	For sale in restaurant; In or near human dwelling(s) and Wildlife farms
Coronaviruses	P1: 6 KNOWN & 2 NOVEL P2: 3 KNOWN & 3 NOVEL	Bats, Rhizomyinae subfamily of bamboo rats; Malayan porcupines and rats, Red junglefowl; Domestic pigs	Contact during religious activities; In or near human dwelling(s); For sale in restaurant; For sale in the large market; Wildlife farms; and Domestic pig farms

PREDICT conducted concurrent (same time/place) surveillance for potential zoonotic viruses in wildlife, humans, and domestic animals at high-risk sites for zoonotic disease transmission to investigate factors associated with virus evolution, spillover, amplification, and spread. This work contributes to Viet Nam's syndromic surveillance of febrile patients at district and provincial hospitals, screening of people in the community with occupational risk to zoonotic diseases through wildlife trade and wildlife farming, and surveillance for pathogens of pandemic potential in livestock in collaboration with FAO and the Department of Animal Health (DAH) of the Ministry of Agricultural and Rural Development (MARD).

Map of concurrent and independent surveillance sites



PREDICT is working with governments to make important data on the distribution of viruses of pandemic potential available publically to inform disease prevention and control. Once approved by government for release, all PREDICT surveillance and test result data appears on HealthMap.



<https://www.healthmap.org/predict/>

BEHAVIORAL RISK SURVEILLANCE for Zoonotic Viruses with Pandemic Potential

OBJECTIVES

A primary goal of PREDICT-2 is to strengthen global capacity for the detection and discovery of viruses with pandemic potential, specifically those that can move between animals and people (zoonotic viruses). PREDICT's **behavioral risk surveillance** is designed to identify risk factors associated with zoonotic disease transmission to inform intervention recommendations for disease prevention. The objective of PREDICT's behavioral risk surveillance activities was to apply qualitative and quantitative approaches (ethnographic interviews, focus groups, and behavior risk surveys) to identify risk factors and behaviors most associated with the evolution, spillover, amplification, and spread of zoonotic viruses with pandemic potential.

ACHIEVEMENTS

PREDICT-2 conducted behavioral surveillance in human populations in Viet Nam at key animal - human interfaces potentially associated with the spillover, amplification, and spread of zoonotic viruses. The behavioral surveillance was coupled with biological surveillance and samples were collected from humans enrolled in the project for viral testing. Quantitative and qualitative research methods were used to identify risk factors for viral transmission and obtain descriptive accounts of human behaviors and perceptions to support the development of effective public health interventions. An example of a PREDICT behavioral surveillance output is the campaign picture book entitled "How to Live Safely with Bats".



"How to Live Safely with Bats" a campaign picture book translated into Vietnamese available to use with communities with occupational and other exposure to bats



PREDICT worked with the National Institute of Hygiene and Epidemiology (NIHE) to conduct surveillance for zoonotic viruses in humans in Ha Noi, Dong Nai and Bac Giang Provinces. The protocol approved by the NIHE IRB includes biological sample collection, viral family level testing, and administration of a human behavioral risk questionnaire. A total of **1,230 people** were surveyed and sampled, through community surveillance of people with occupational exposure to wildlife (**630 people**) and through syndromic surveillance of people with fevers of unknown origin in hospitals (**600 people**) at PREDICT-2 concurrent surveillance sites.

PREDICT worked with the Hanoi School of Public Health to conduct qualitative research to obtain descriptive, contextual accounts of human behaviors, perceptions, beliefs, and decision-making linked to zoonotic disease transmission. The qualitative behavioral surveillance included the ethnographic interviews and focus group discussions in Dong Nai Province. A total of **77 people** were enrolled in the qualitative research, with **40 ethnographic interviews**, and **4 focus group discussions** completed. The qualitative research methods used by PREDICT received the IRB approval from the Hanoi School of Public Health.

Below are quotes from PREDICT interviews at two key animal-human interfaces:

"I've only heard about zoonotic diseases from poultry. Such as chicken, pigeon and also other livestock. I brought civets here and then vaccinated them. In my opinion maybe there are zoonotic diseases that pass from civets to humans but my animals are vaccinated so I can have peace"

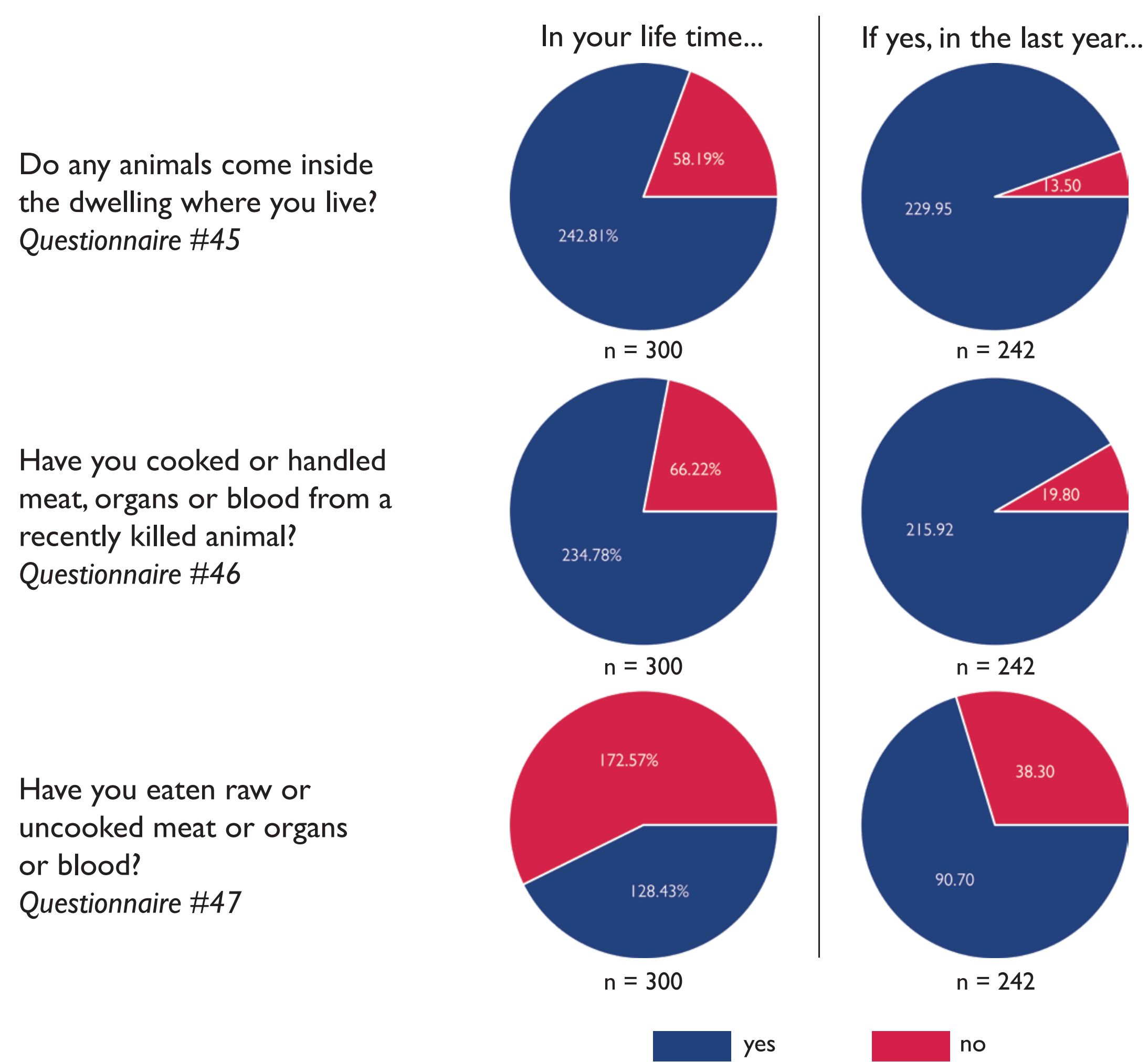
_ a civet farm owner _

"My father told me when I was a child, whenever I was bitten by snake and rat or when I got cut, just suck the blood. He taught me that."

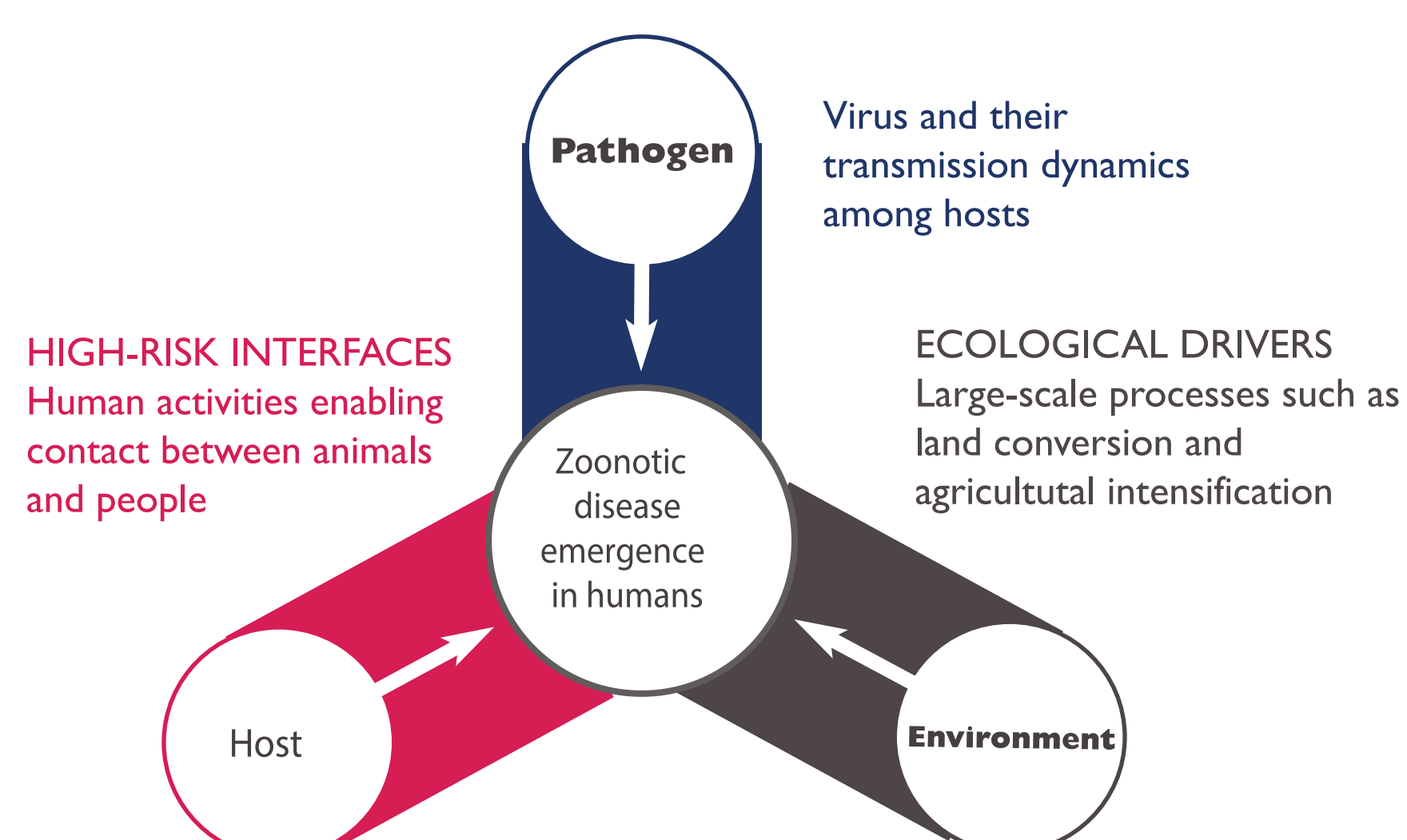
_ a rat hunter _

Preliminary Data Analysis to Inform Intervention Recommendations

Behavior: Questions
Concurrent Site I
market and value chain; wildlife restaurant; animal production



Mechanisms underlying emergence and spread of zoonotic disease



Viet Nam: Animal contact behaviors (past year)

Base on questionnaire responses from 1230 individuals

