

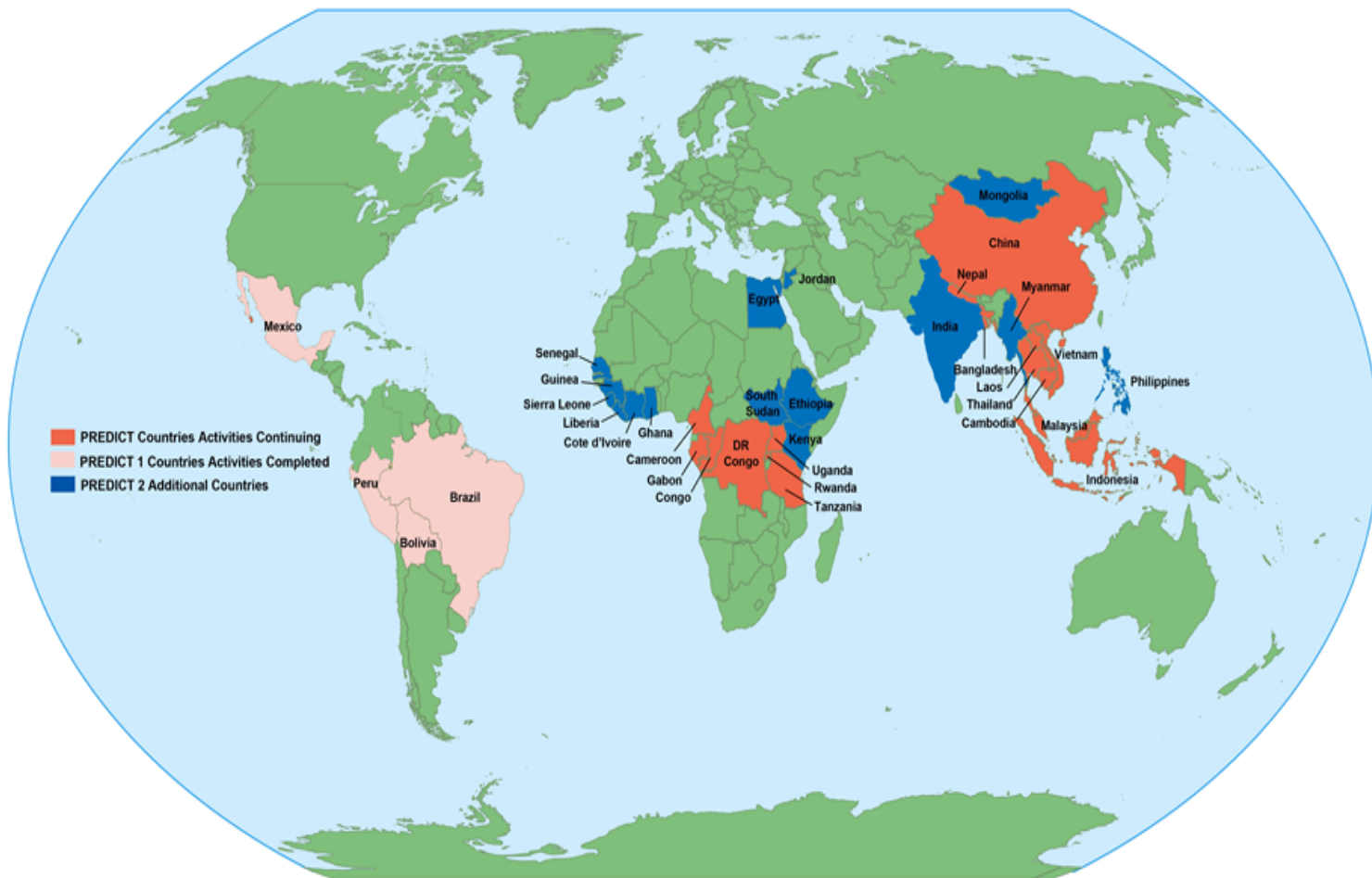
Surveillance for Five Viral Families of Public Health Importance and Investigation of Human Behaviors at Wildlife/Human Interfaces in Viet Nam with High Risk For Zoonotic Disease Transmission

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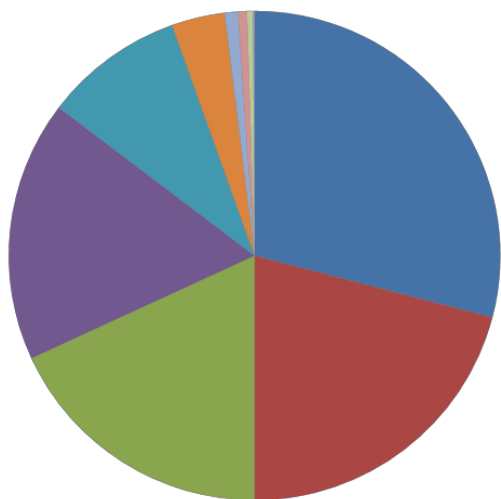


PREDICT Countries



PREDICT-1's focus on **Wildlife Surveillance** at High Risk Interfaces for Zoonotic Disease Transmission

Number of Animals Sampled by Interface



- Wild animal farm (597)
- For sale in restaurant (430)
- For sale in large market (>20 vendors) (372)
- In or near human Dwellings (354)
- Private sale (189)
- Rehabilitation center (72)
- Zoo (18)
- Contact during religious activities (12)
- Private wildlife collection or pet (2)
- Sanctuary (8)

	Total
Number of Surveillance Events	90
Number of Animals Sampled	2,054
Number of Specimens Collected	6,854
Number of Diagnostic Tests Run	16,334

Evidence of risk of disease emergence along the wildlife trade chain

- Corona, Rhabdo, Herpes, Paramyxo and Influenza viruses infecting several different species of wildlife
- Wildlife farms – multi-species farming (wild and domestic animals) in close proximity to human populations with evidence of bat corona viruses circulating in farmed rodents.

Viral Family/ Genus	Known/Novel	Animal	Interface
Herpes viruses	2 novel	Common Palm Civet and Asiatic Black Bear	Civet in restaurant; bear rescued from trade in wildlife rescue center
Influenza A	1 known	Rhizomyinae subfamily of bamboo rats	For sale in restaurant
Paramyxo viruses	1 known & 5 novel	Rats,bats	For sale in restaurant, for sale in the large market or near human dwellings
Rhabdo viruses	15 novel	Rhizomyinae subfamily of bamboo rats, rats, bats and non-human Primate	For sale in restaurant, in or near human dwellings and Wildlife farms
Corona viruses	2 novel	Bats	Contact during religious activities, in or near human dwellings

Table 1. Viruses detected during PREDICT-1 in Vietnam

Early disease detection and response through concurrent surveillance in humans and



One Health approach to understanding the dynamics of zoonotic virus evolution, spillover from animals to people, amplification, and spread to inform prevention and control

PREDICT 2 Objectives

- Conduct concurrent surveillances targeting “high-risk” interfaces between wildlife/ domestic animal and humans in order to **investigate** and **detect** potential emerging zoonotic diseases;
- Characterize risk factors associated with zoonotic diseases by Human Behavior surveillance
- Build local capacity for surveillance & laboratory diagnostics

PREDICT 2 Partners

Ministry of Agriculture and Rural Development:

- Forest Protection Department,
- Department of Animal Health,
- Regional Animal Health Office No. 6 & 7
- Vietnam National University of Agriculture

Ministry of Health:

- National Institute of Hygiene and Epidemiology



Sites of animal surveillance

Concurrent surveillance:

- **Bac Giang:** Humans and bats
- **Hanoi (Thach That District):** Humans and rodents
- **Dong Nai:** Humans and wild animals



Sites of human surveillance

Independent surveillance:

- **Ninh Binh:** Wild animals
- **Dak Lak and Dak Nong:** Wild animals
- **Dong Thap:** Bats and rodents





Concurrent Surveillance

Human surveillance:

- People with occupational risk for zoonotic disease transmission: Farmers, hunters, sellers, butchers, consumers
- Patients in hospitals:
 - Fever of Unknown Origin (FUO)
 - Influenza-like illness (ILI) unknown origin
 - Severe Acute Respiratory Infections (SARI) unknown origin
 - Acute Encephalitis Syndrome (AES) unknown origin
- * Epidemiological factors: contact with animals (wildlife and/or domestic) and duration

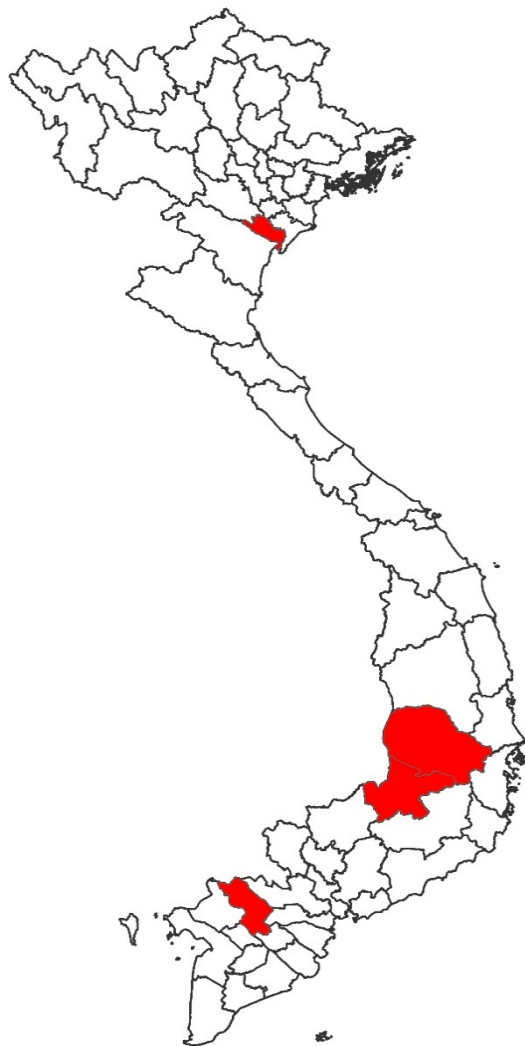
Animal surveillance: Collect samples in animal value chain, such wildlife farms, rat markets, bat guano collection sites

Concurrent Surveillance



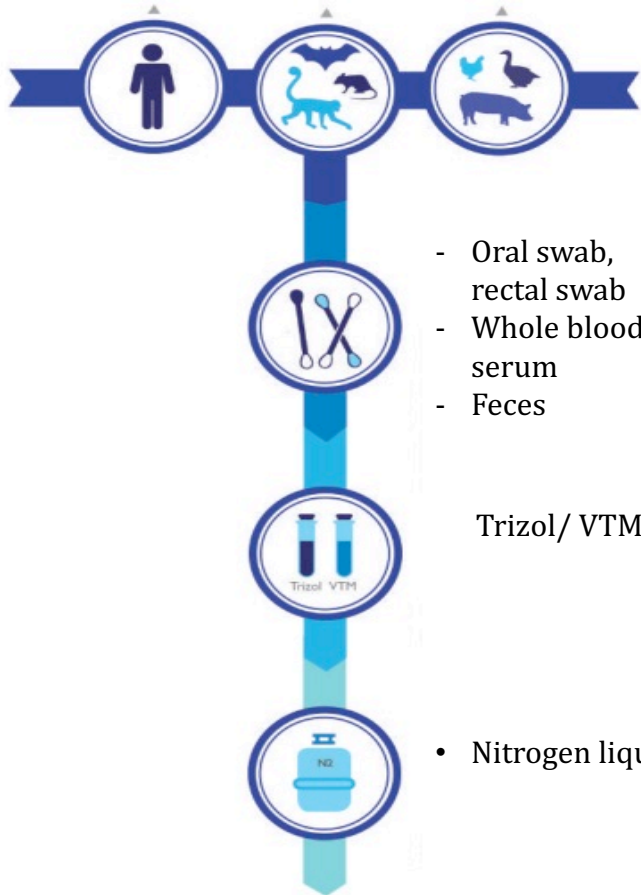
Province	Targets of sample collection	Sampling Complete (Individuals)	Number of specimens collected
Bac Giang	Human Community	30	150
	Wildlife (Bat)	200	400
Hanoi (Thach That District)	Human Hospital Syndromic	300	1500
	Human Community	300	1500
	Wildlife (Rodents)	300	1480
Dong Nai	Human Hospital Syndromic	300	1500
	Human Community	300	1500
	Wildlife (Rodents)	685	1516
	Wildlife (NHP)	158	268
	Wildlife (Carnivores)	300	600

Independent Surveillance



Province	Targets of sample collection	Sampling Complete (Individuals)	Number of specimens collected
Ninh Binh	Wildlife (confiscated from illegal wildlife trade)	373	1742
Highland area	Wildlife (confiscated from illegal wildlife trade)	41	93
Dong Thap	Wildlife (Rodents)	399	1632
	Wildlife (Bat guano collection)	435	880

- Human
- Rodents
 - Bats
 - Non-human primate
- Domestic livestock



- Oral swab, rectal swab
- Whole blood, serum
- Feces

Trizol/ VTM

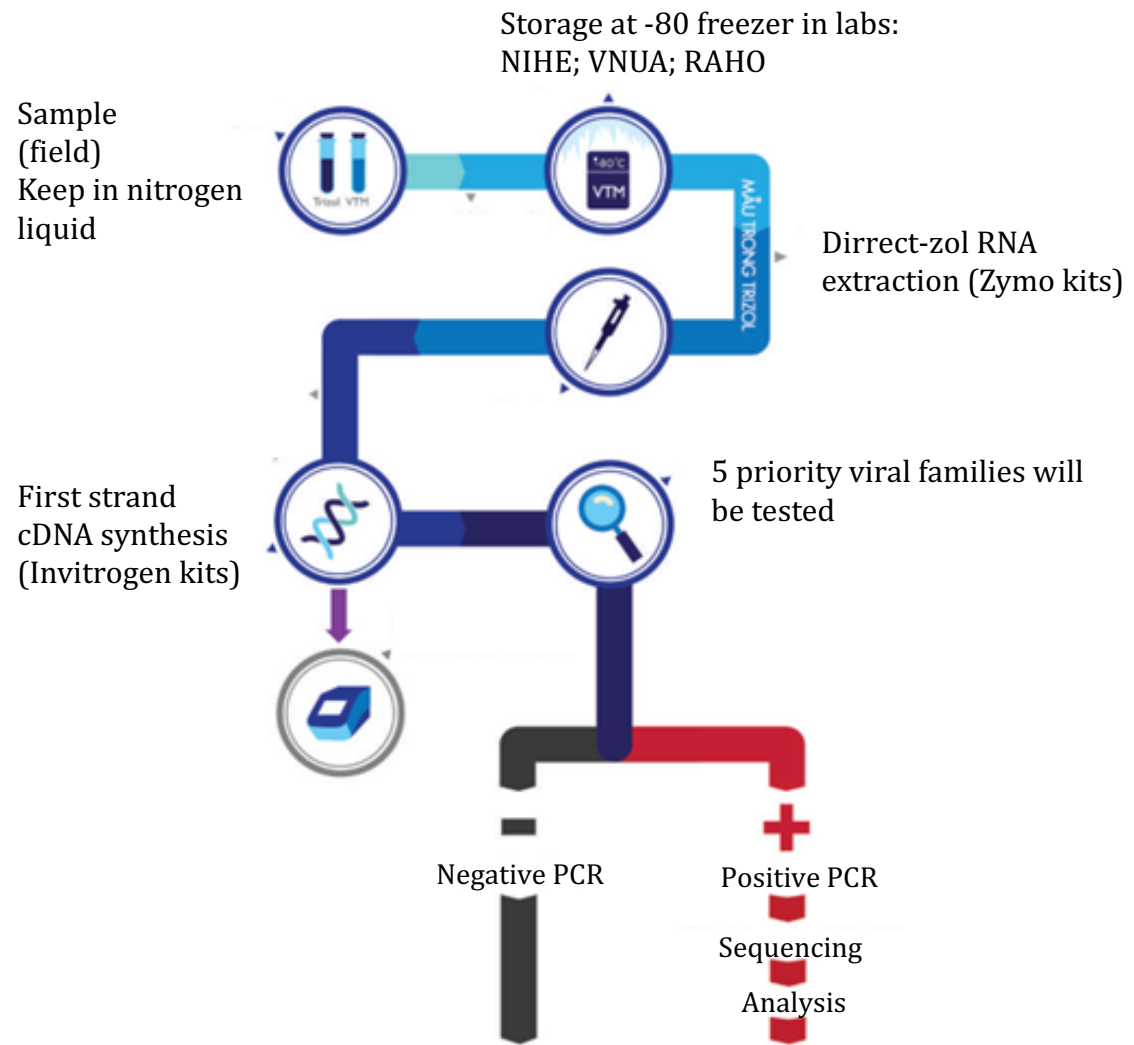
- Nitrogen liquid

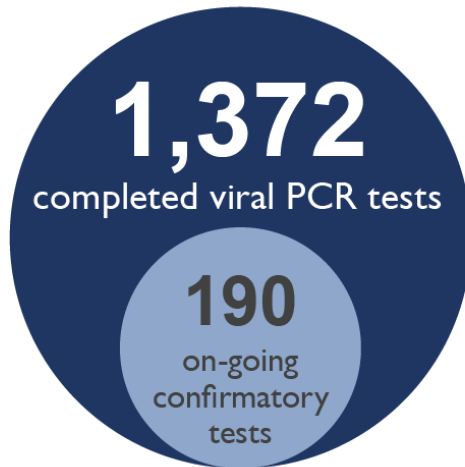
- PREDICT organized training course for local staffs on how to collect samples and interview participants following IRB.
- Samples has been kept in cold chain before transferring to laboratories for viral testing



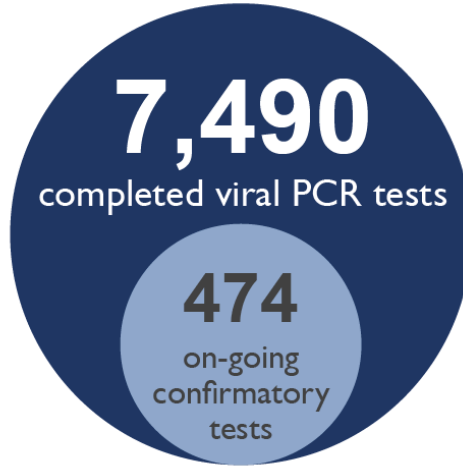
PREDICT 2 Viral Testing Strategy

- Virus detection will be performed using consensus PCR (cPCR) and supplemented with high through-put sequencing (HTS)
 - Degenerate or consensus primers that allow to detect both known and novel viruses
 - Low cost diagnostic approach by using conventional PCR machines
 - Universal control – synthetic construct: no risk of infectious transmission
- Five priority viral families will be tested on all samples from all host taxa (humans, wildlife, livestock) and include the following:
Corona, Filo, Paramyxo, Influenza, Flavi viruses

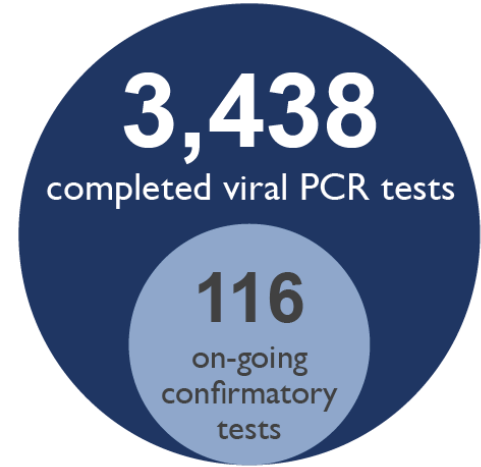




**Viet Nam National
University of Agriculture**



**Regional Animal
Health Office No.6**



**National Institute of
Hygiene and
Epidemiology**

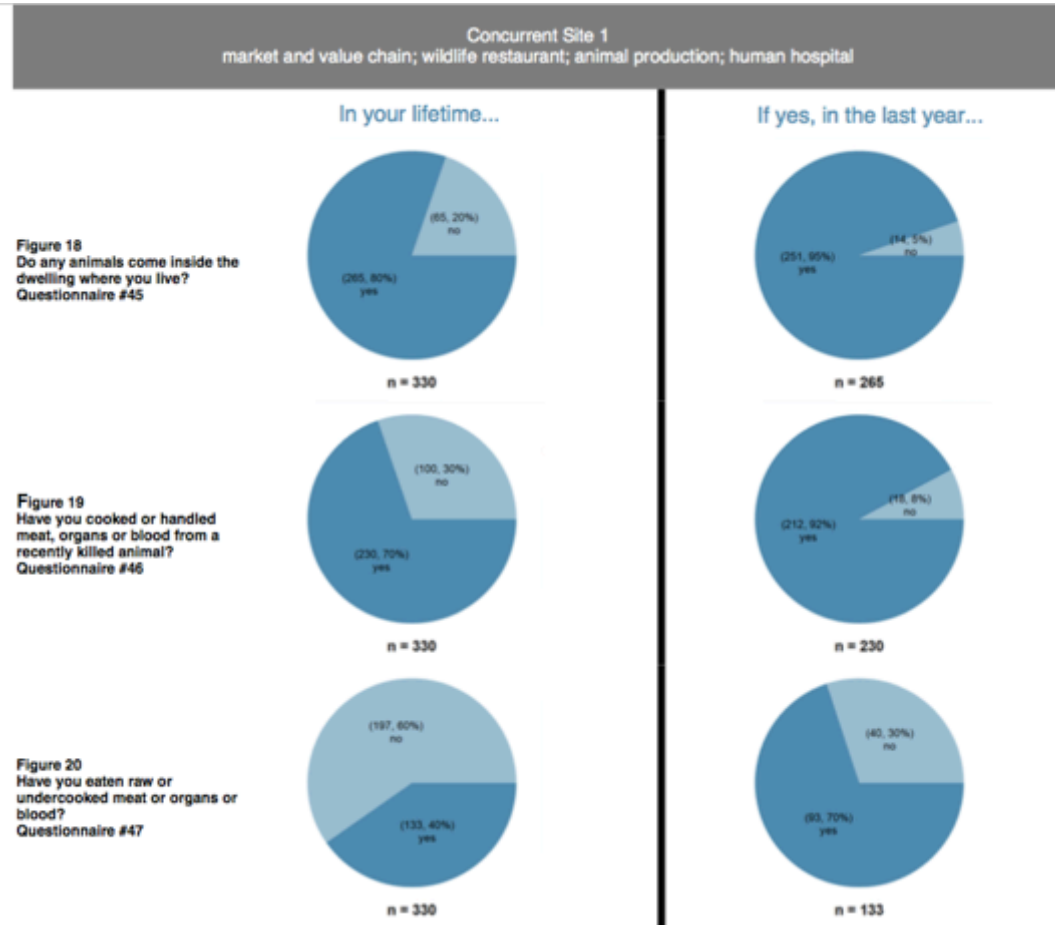
Testing all target viral families: Paramyxovirus, Coronavirus, Influenza, Flavivirus and Filovirus





- Qualitative & Quantitative Data

- Questionnaires on risk behaviors administered to community members and hospital patients
- Ethnographic interview and focus groups conducted
- A mixed analysis is used to assess behaviors associated with risk of zoonotic disease transmission

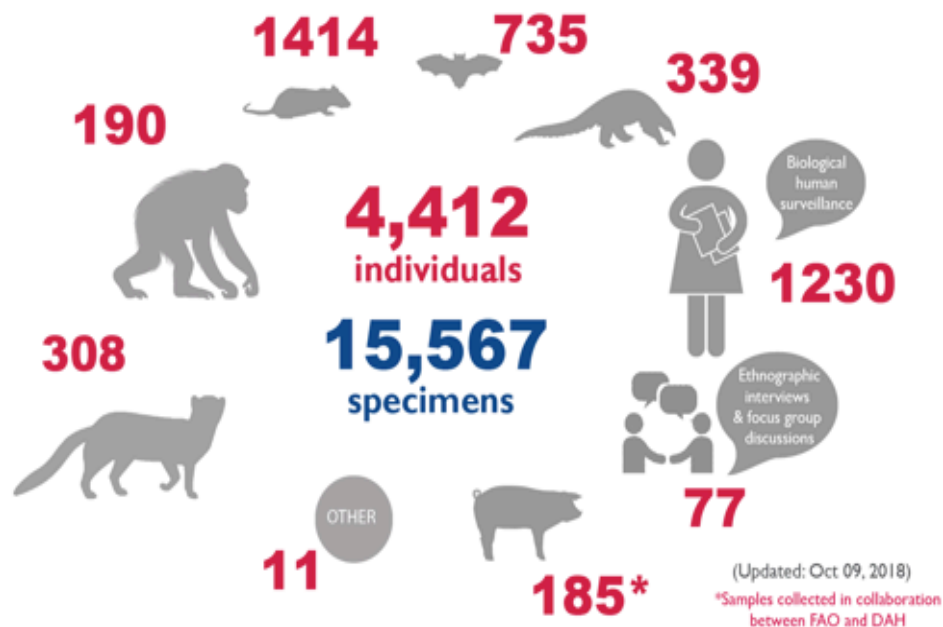


A “snapshot” of data collected through behavioral risk questionnaires.

Preliminary Results & Next Steps

- All surveillance (biological sample collection and behavioral risk data) completed
- Viral family testing, cloning and sequencing on-going
- Interpretation of results >> submission to government for approval >> public release

PREDICT Surveillance Summary



Data of samples and test results:
<https://www.healthmap.org/predict/>



PREDICT



EcoHealth Alliance



METABIOTA



Smithsonian Institution