USAID PREDICT PROJECT

Surveillance for emerging zoonotic disease threats and behavioral risk characterization in high-risk communities in Bangladesh.

The primary goal of USAID 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). In addition, PREDICT-2 aims to improve the characterization of associated biological, behavioral, and ecological risks 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. Critical elements of this work and USAID's mission, include: building local capacity; evidence-based decision making and translating research into practice by leveraging science to inform the development of behavioral risk mitigation interventions that can move health, save lines and reduce costs associated with mortality and morbidity. The topics and locations for behavioral risk investigation are mentioned below:

Objectives:

- To detect and characterize new and known viruses of epidemic and pandemic potential in human and animals at high-risk communities
- To identify biological, behavioral, and ecological factors influencing the risk of viral spillover, amplification, and spread
- To determine potential targets for intervention based on high-risk human behaviors and practices that amplify disease transmission in hotspots for viral evolution, spillover, amplification, and spread.

Along with our specific goals, further objectives include, gaining knowledge about interactions with animals, animal health and animal perceptions and knowledge, determining if any sanitation or hygiene factors play a role in zoonotic disease spillover and understanding the potential of human mobility and movement to contribute to disease spread.

Methods:

PREDICT-2 is geographically focused on 'hot spots' (areas where a confluence of risk factors may contribute to disease emergence) and on high-risk sites within these hot spots. As a part of the larger PREDICT project, surveillance of animal (macaque, bat, rodents) and high-risk human populations is ongoing. Behavioral risk surveillance is conducted through Community based Behavioral survey and Hospital based Syndromic Surveillance. PREDICT study sites: Dhaka, Madaripur, Faridpur and Dinajpur are prioritized by identifying areas considered high-risk for contact with multiple taxonomic groups known to be associated with zoonotic viral diversity and with ecological and epidemiological conditions associated with disease emergence.

A questionnaire is being administered to human participants which covers a number of pertinent topics including behaviors that can impact the risk of zoonotic virus transmission. These quantitative questionnaire data will be complemented with qualitative in-depth behavioral risk investigations in the form of ethnographic interviews, focus group discussions, and participant

observation. In quantitative method, participants were sampled for a range of biological materials, including oral, nasal, urine, fecal and blood. For selected animal species from the concurrent sites, oro-pharyngeal, urine, rectal/fecal, blood samples were collected.

The samples are being screened for novel, high-consequence viral families (Coronaviruses, Filoviruses, Flaviviruses, Paramyxoviruses and Influenza-A viruses) using consensus PCRs.
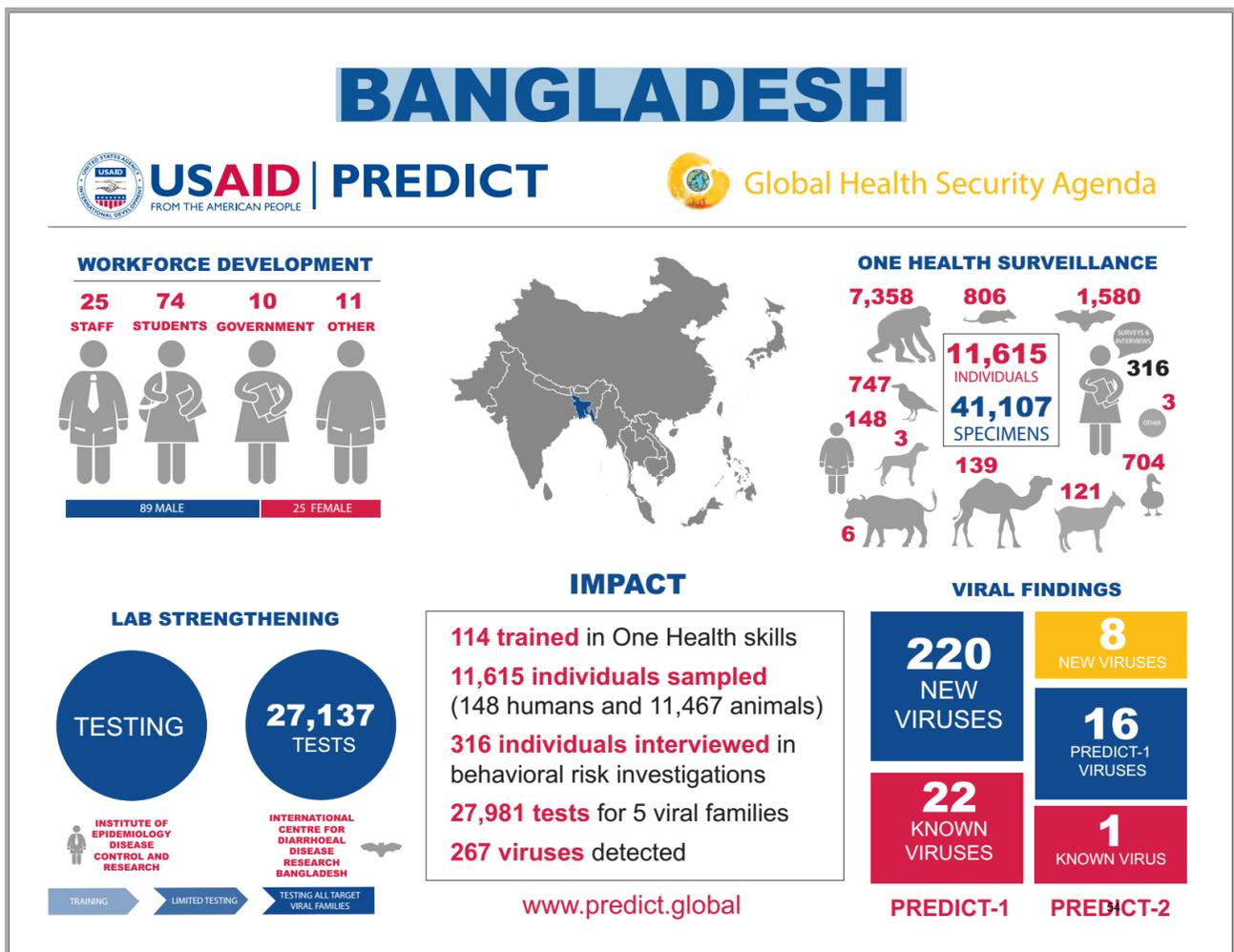

Figure 1: PREDICT-2 Project, Bangladesh activity overview until Oct, 2014- Sep, 2018

One Health Economic Analysis of Zoonotic Diseases in Bangladesh

Zoonotic diseases result in over one billion cases and more than one million deaths per year, and associated medical care costs may constitute significant expenditures for patients and households relative to income. There is very limited data on the multi-sectoral costs of individual zoonotic diseases in human and animal populations.

The objectives are to identify and characterize expenditures and secondary economic losses associated with Avian Influenza, Nipah, Rabies, and Anthrax among households, the private sector, the government, and the general public in Bangladesh; to estimate the cost to various economic sectors (e.g., health, livestock, and environment) and to society as a whole.

This study is a cross-sectional economic analysis of disease impacts, implemented through data surveys administered to the following populations:

1) *Households* with a confirmed or suspected case of diseases
2) *Local Businesses* with confirmed cases of animal disease as well as other businesses in the livestock value chain e.g.: farms, abattoirs, live bird markets, and animal feed sellers
3) *General population*- persons at markets selected in each district/town
4) *Public sector and non-governmental institutions* with mandates and budgetary authority covering human health, livestock health, and environment, as well as those experiencing potential impacts (negative or positive) from response measures.

The specific sampling districts/cities and towns identified for the study are:

- *Nipah:* Faridpur, Rajbari, Magura, and Manikgonj (pre-2019); all districts (2019)
- *Influenza A*: Gazipur, Dhaka - Dhamrai and Savar, Rajshahi, and Narsingdi
- *Anthrax:* Sirajgonj, Kushtia, Rajshahi, Meherpur
- *Rabies:* Madaripur, Dinajpur, Gazipur, and Narsingdi

This protocol was approved at December, 2018 and the data collection is ongoing.