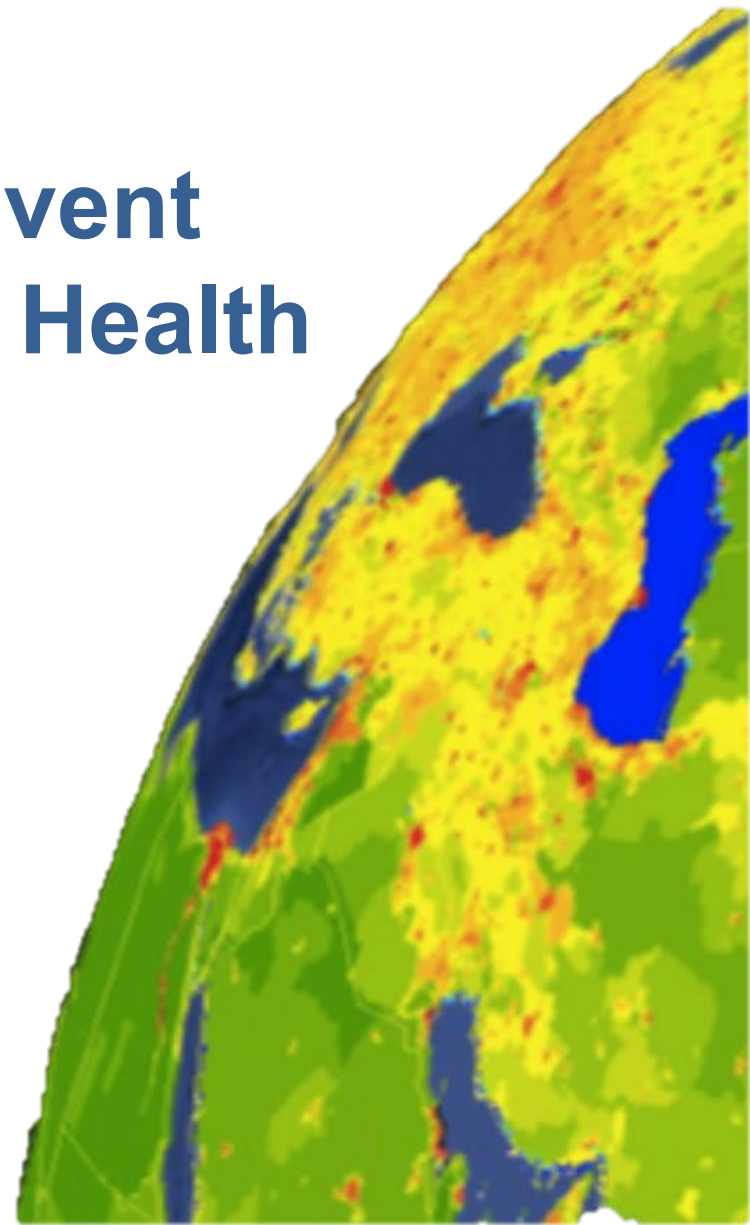


PREDICT:

Building capacity to prevent
pandemics using a One Health
approach



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PREDICT

The Challenge

Pre-empt or combat, at their source, the first stage of emergence of zoonotic diseases that pose a significant threat to public health (potentially pandemic infections)



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Emerging Infectious Diseases



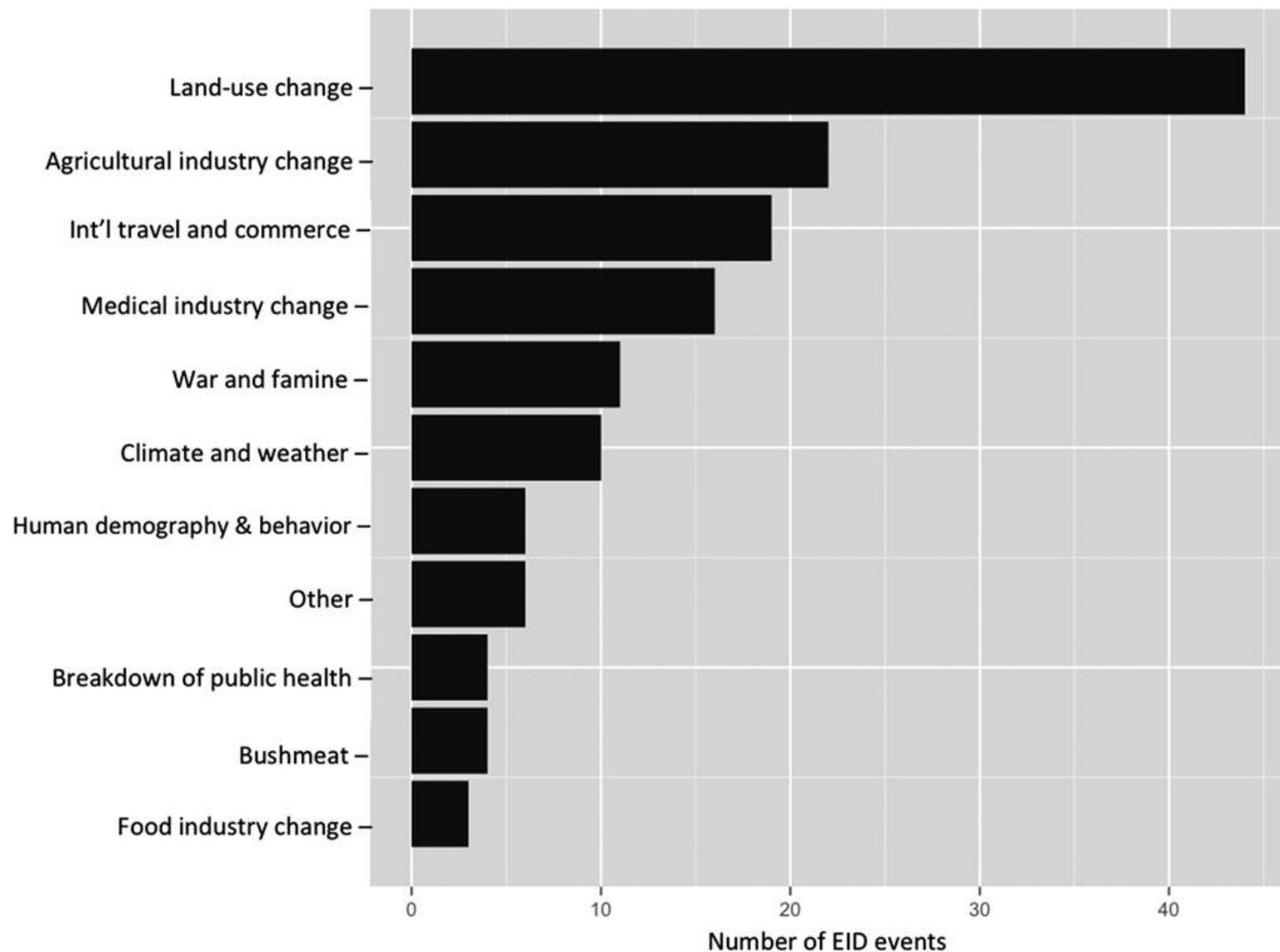
- Majority are of animal origin (zoonotic)
- **75% of emerging zoonoses have wildlife origins**
- Human activities at the interface are linked to EIDs (Nipah virus, SARS, Ebola)
- Annual population growth among highest in buffers to protected areas near wildlife



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Emerging Infectious Diseases



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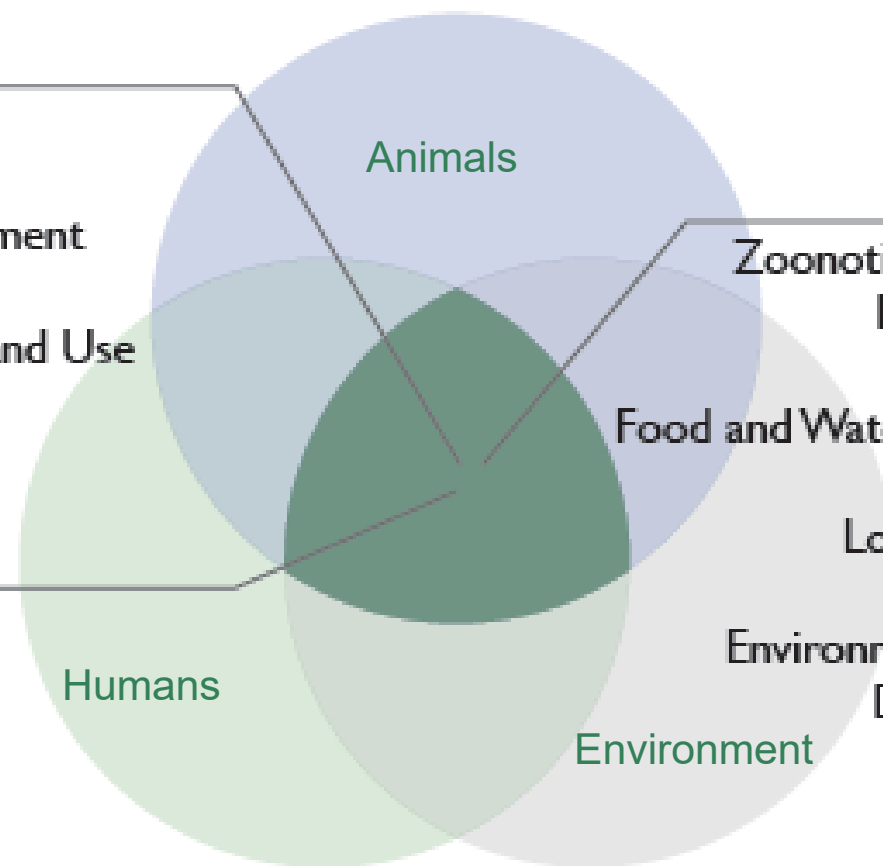
One Health Approach

Drivers

Land Use
Climate Change
Economic Development
Globalization
Energy Extraction and Use
Migration

Influences

Culture
Economics
Policy
Behavior
Education



Problems

Zoonotic Disease Emergence
Pathogen Distribution
Health Disparities
Food and Water Safety and Security
Poverty
Loss of Biodiversity and
Wildlife Habitat
Environmental Contamination
Diagnostic Limitations



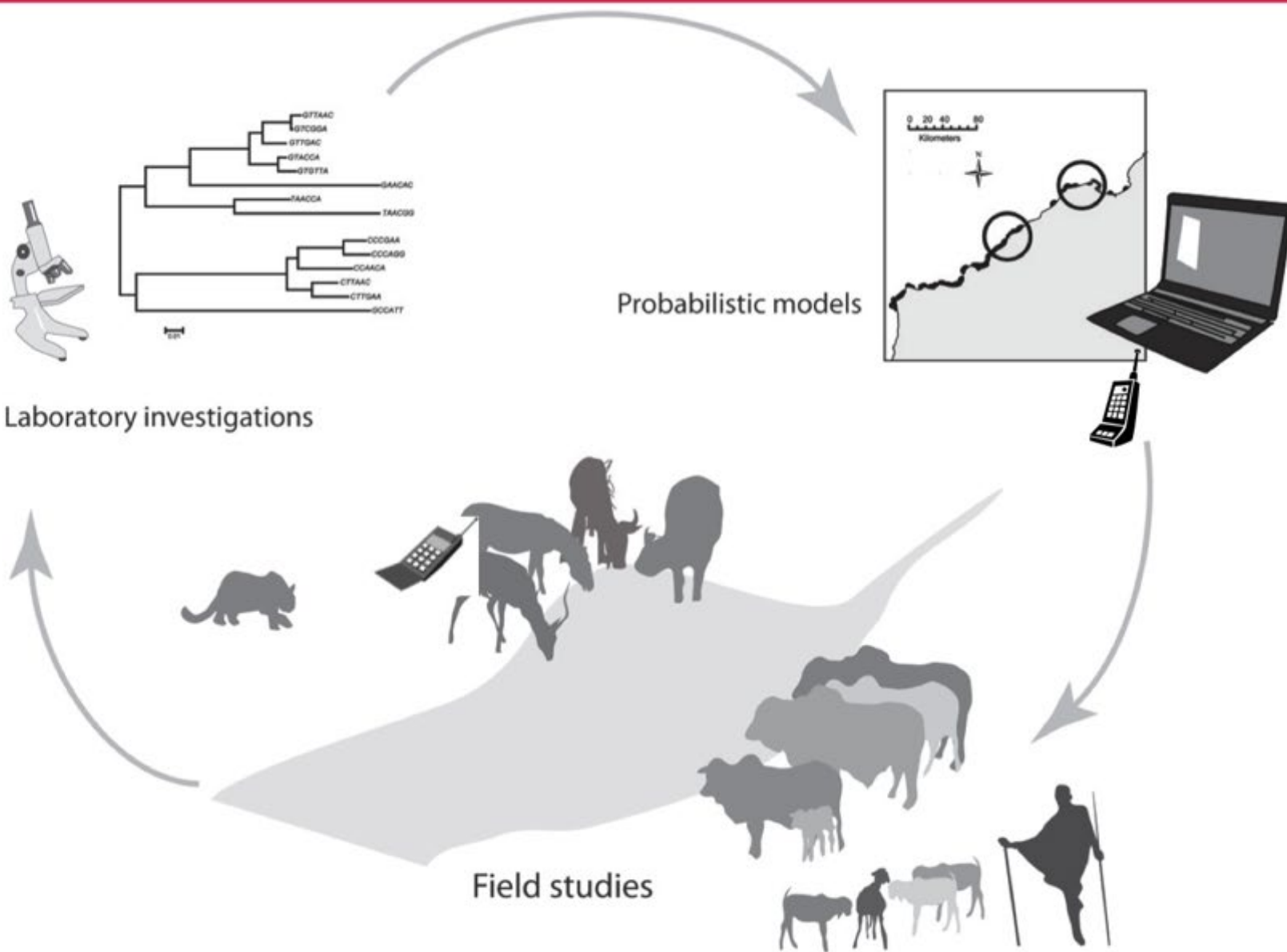
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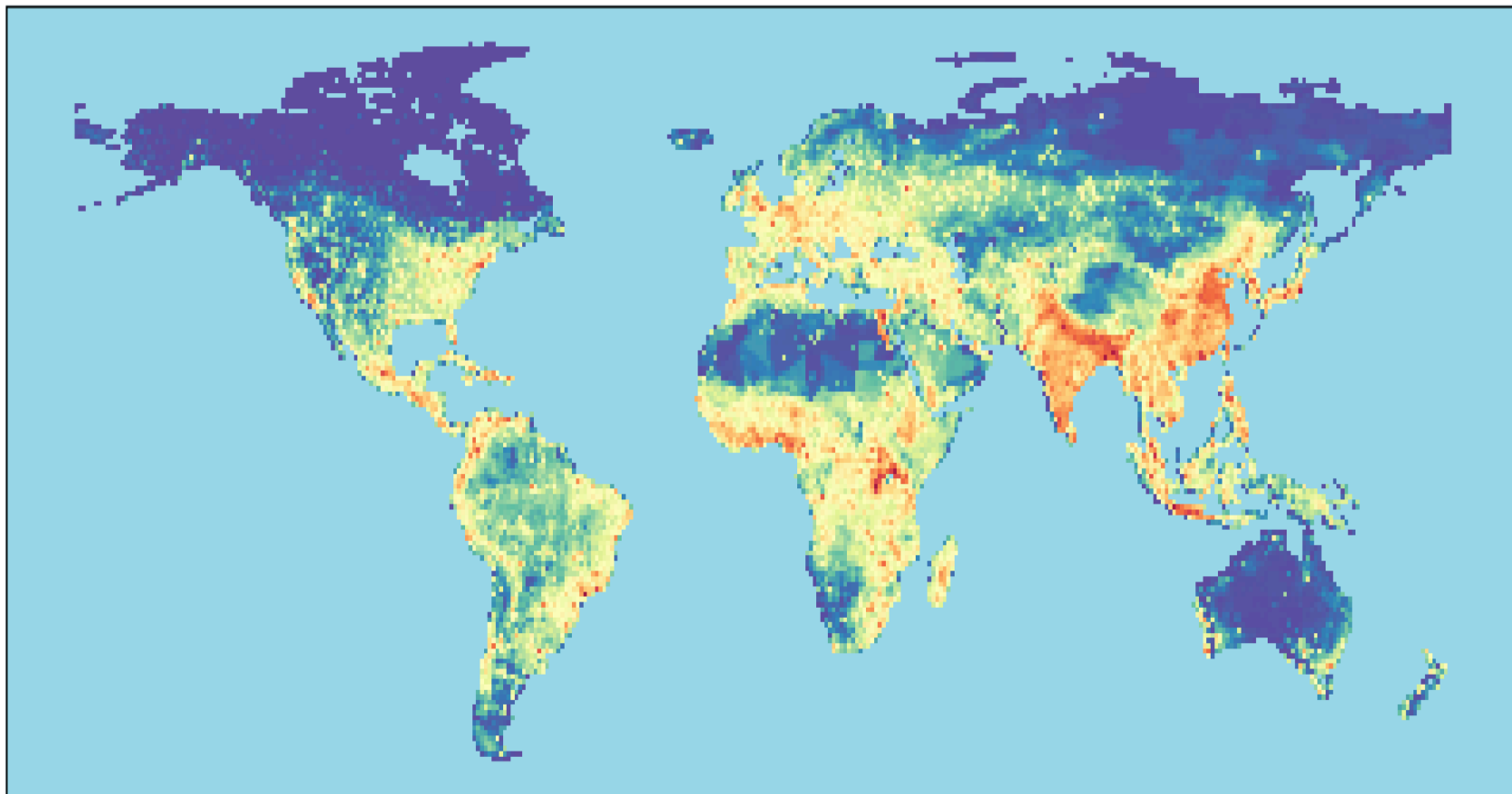
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PREDICT



Hot Spots 2

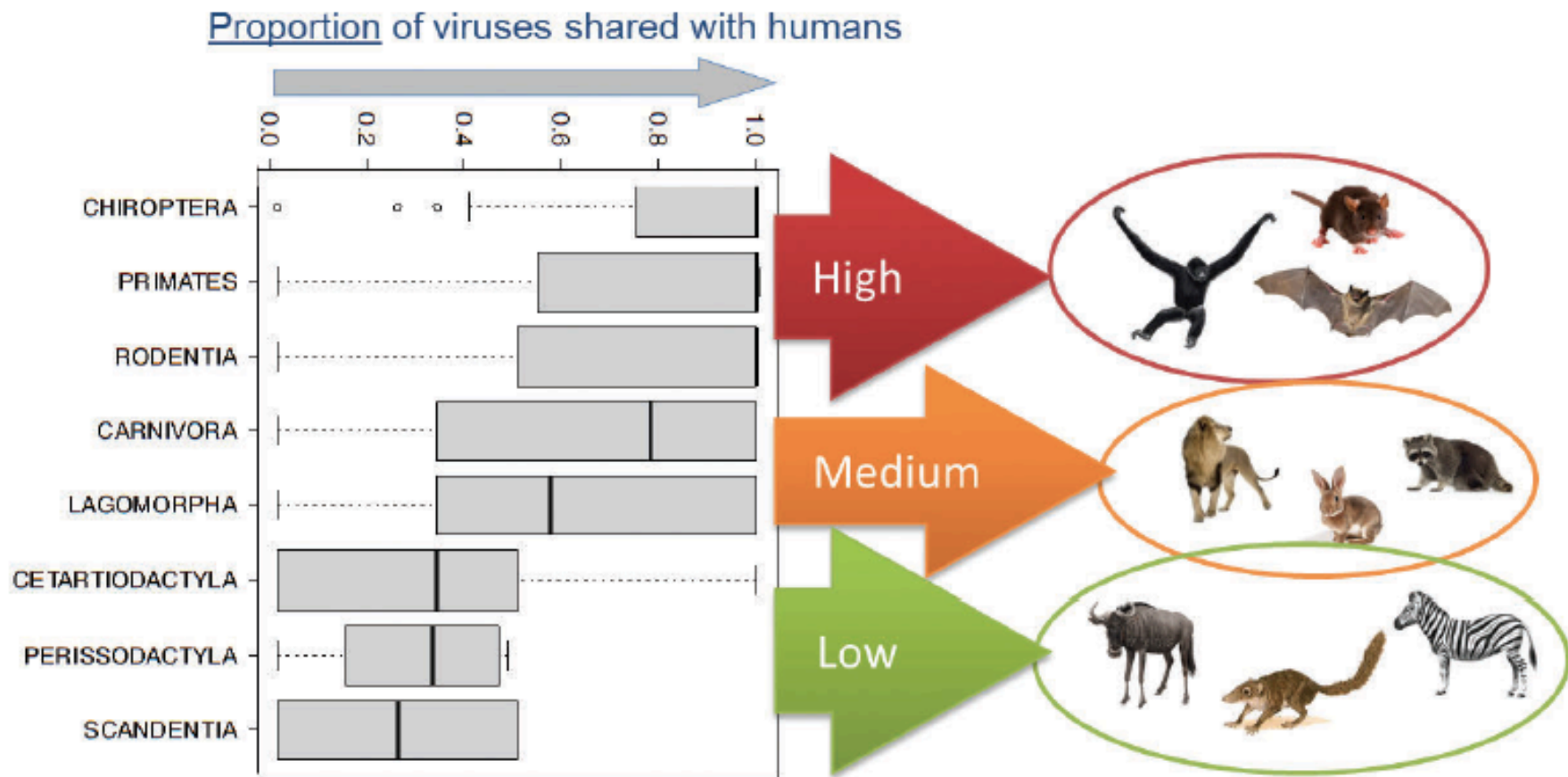
Predicted Relative Risk of Zoonotic EID Events



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Targeted, Risk-based Surveillance



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Targeted, Risk-based Surveillance

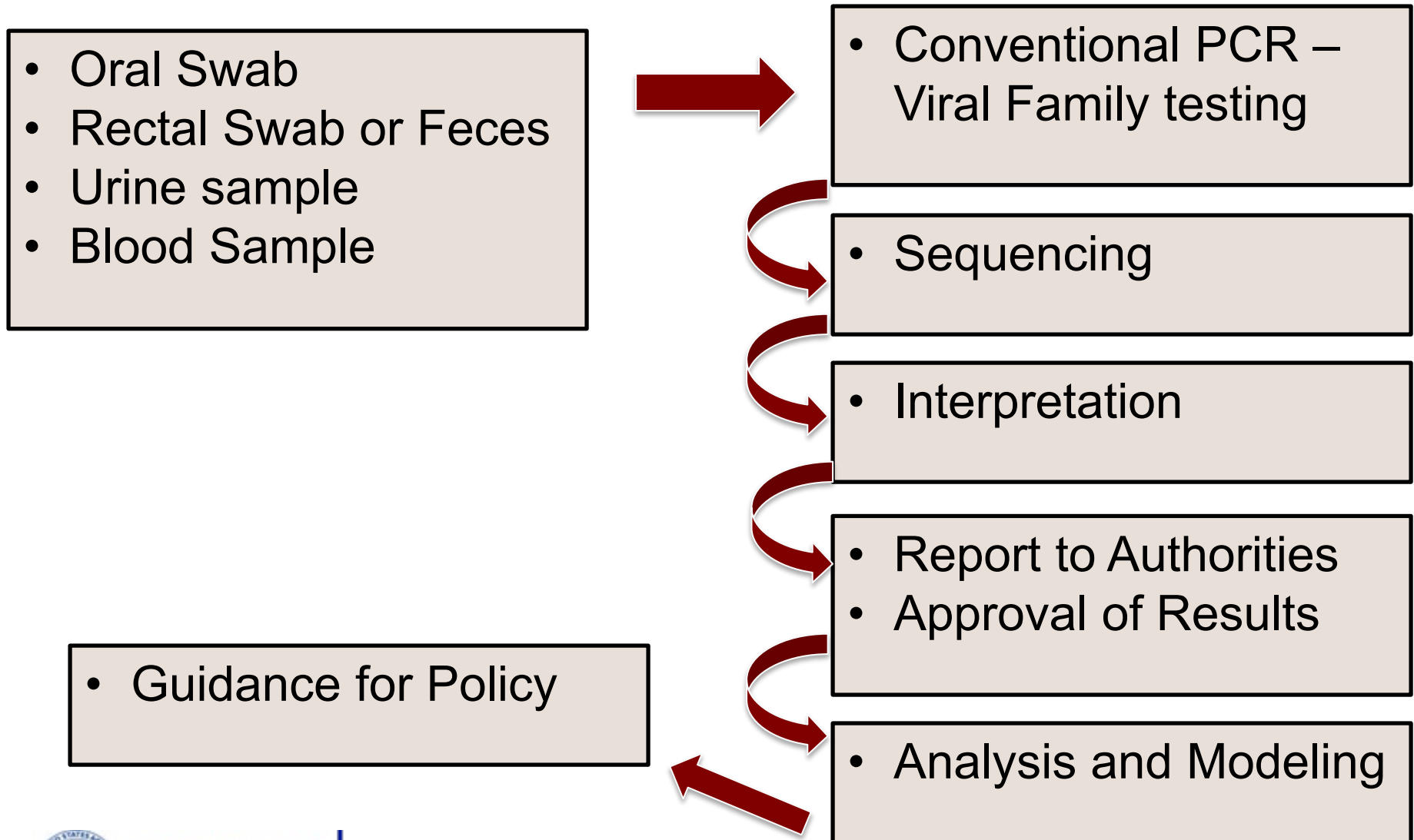
- **Primates**
- **Bats**
- **Rodents**
- **Birds**
- **Suids**
- **Carnivores**
- **Ungulates**
- **Humans**



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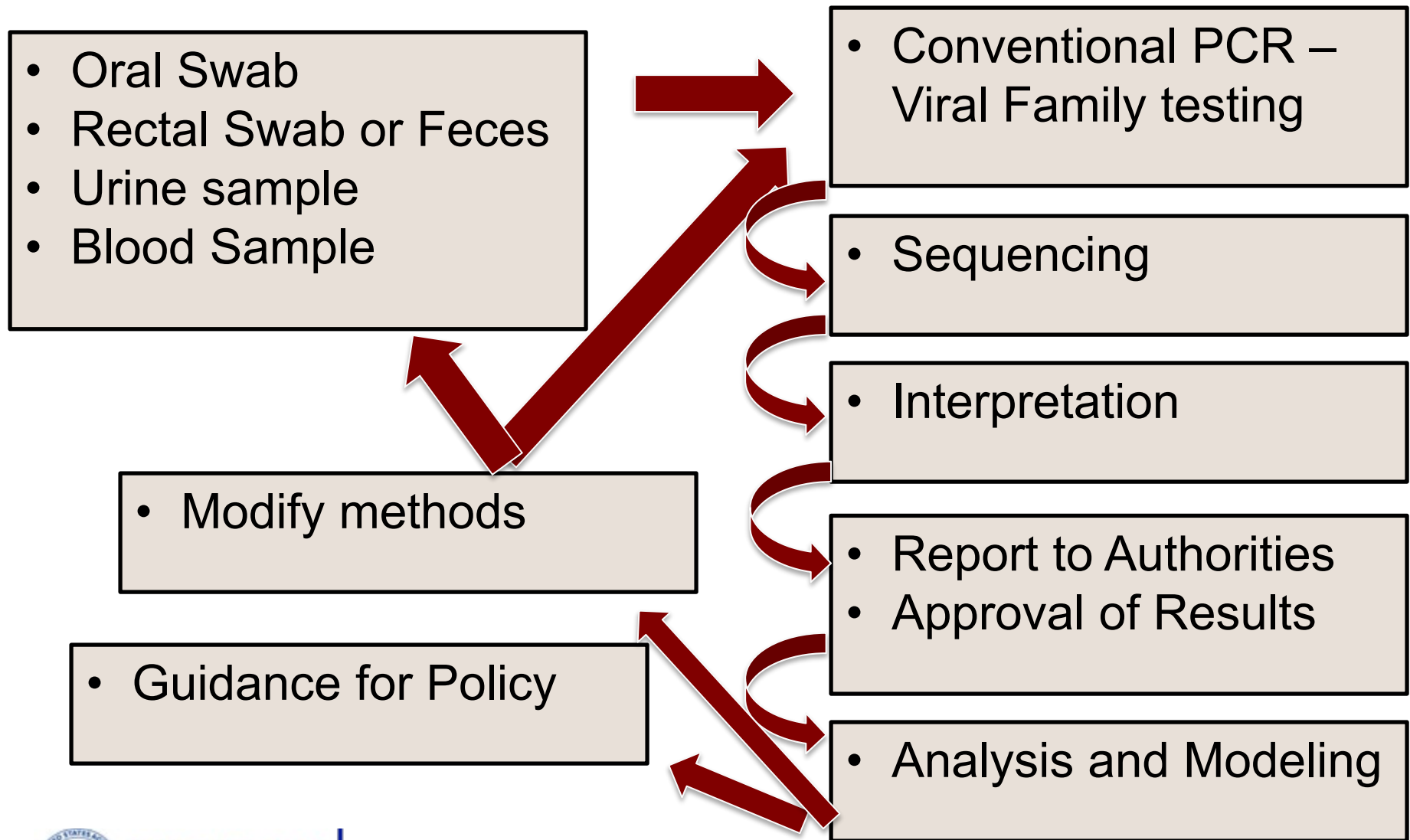
Work Flow



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Work Flow



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A blue horizontal banner with a faint, light-colored world map in the background. The map shows the continents and major lines of latitude and longitude.

MAJOR GLOBAL ACHIEVEMENTS

Safely Sampled More than 56,000 Animals



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Developed & Operationalized Diagnostic Platform

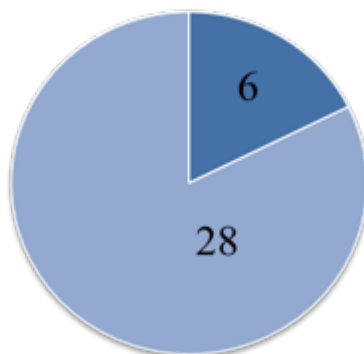


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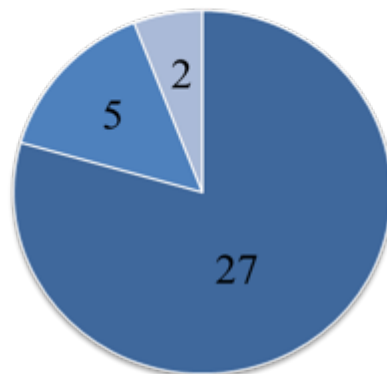
Emerging Pandemic Threats
Program 2 (EPT-2)

Laboratory Capacity Building

Baseline Laboratory Capacity Prior to PREDICT



Laboratory Capacity at the end of PREDICT



- **Trained 32 laboratories globally**
- **27 screening for targeted viral families**

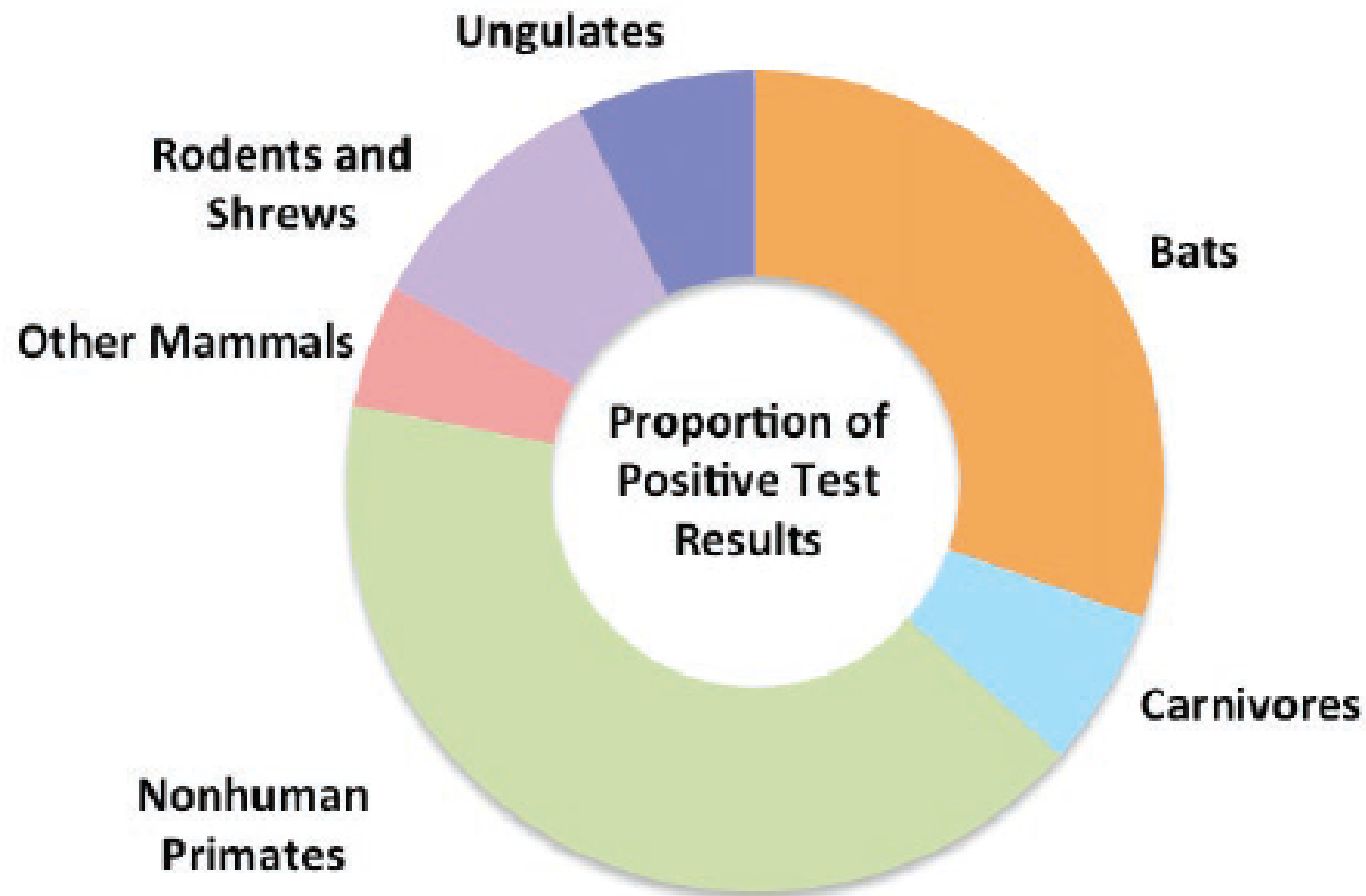
- Laboratories screening for target viral families
- Laboratories receiving training and beginning to screen for target viral families
- Laboratories on track to screen for target viral families



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**Emerging Pandemic Threats
Program 2 (EPT-2)**

Ran Over 400,000 Diagnostic Tests



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Viral Detection Success

Overall 984 known and new viruses:

- 812 novel and 147 known in animals
- 3 novel and 31 known in human pilot studies

	Bats	Nonhuman Primates	Rodents and Shrews	Humans	Other taxa**	TOTAL
Novel	431	234	143	3	9	820
Known	80	55	15	31	1	182
Total						1002*



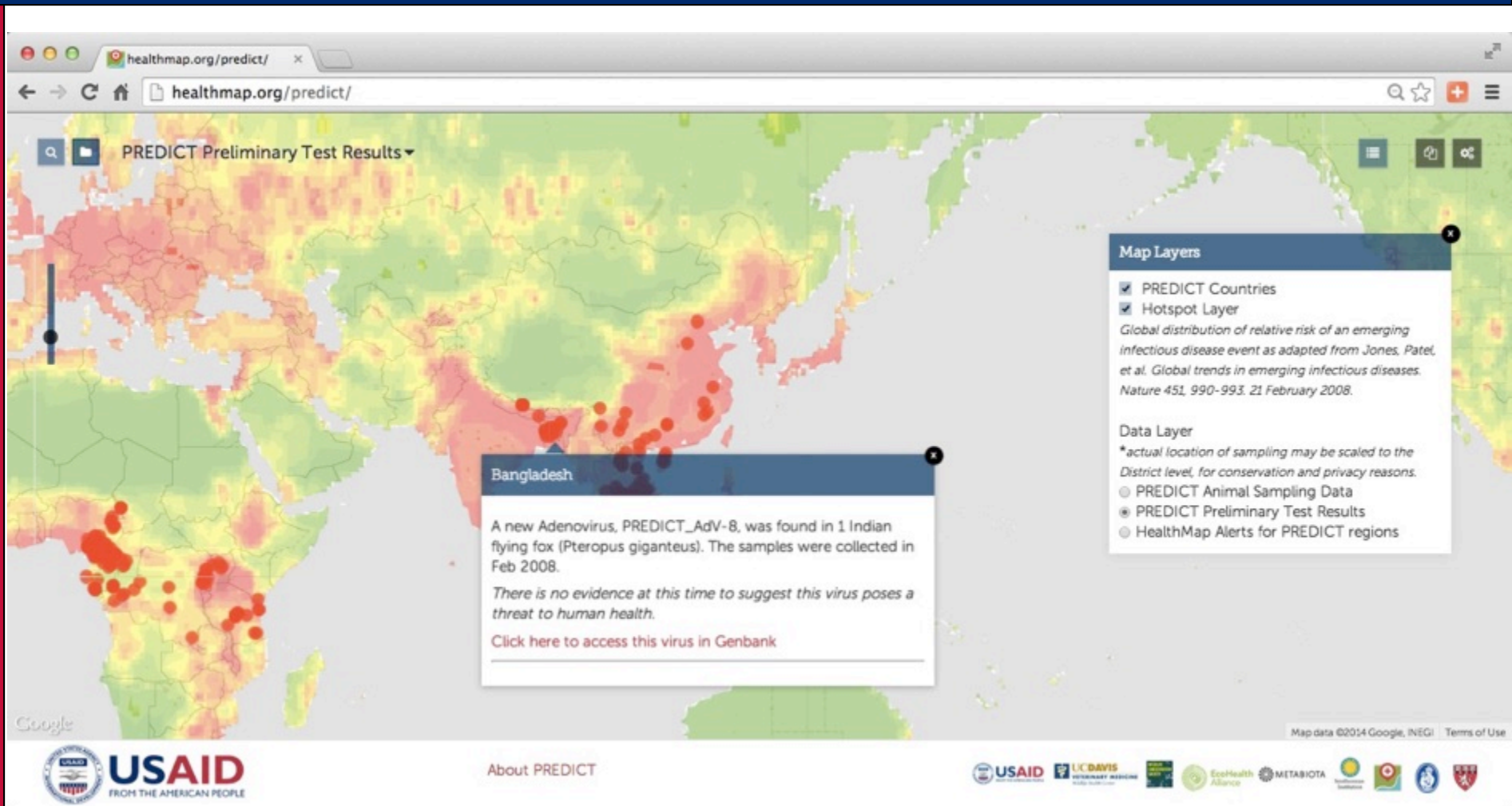
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Outbreak Investigations



With Governments: Making Data Available to the Public



PREDICT

THE WORLD'S MOST COMPREHENSIVE
ZOOTIC DISEASE SURVEILLANCE &
CAPACITY DEVELOPMENT PROGRAM

TRAINED 2,500 government personnel, physicians, veterinarians, resource managers, laboratory technicians, hunters, and students on biosafety, surveillance, lab techniques, and disease outbreak investigation.



SAMPLED 56,000+ nonhuman primates, bats, rodents, and other wild animals (including bushmeat samples) at human-wildlife interfaces with high-risk and opportunity for viral spillover from wildlife hosts to humans.



DEVELOPED & OPTIMIZED low-cost viral family level consensus PCR methods and synthetic controls for the detection and discovery of new viruses from the target viral families in 32 labs in 20 developing countries around the world.

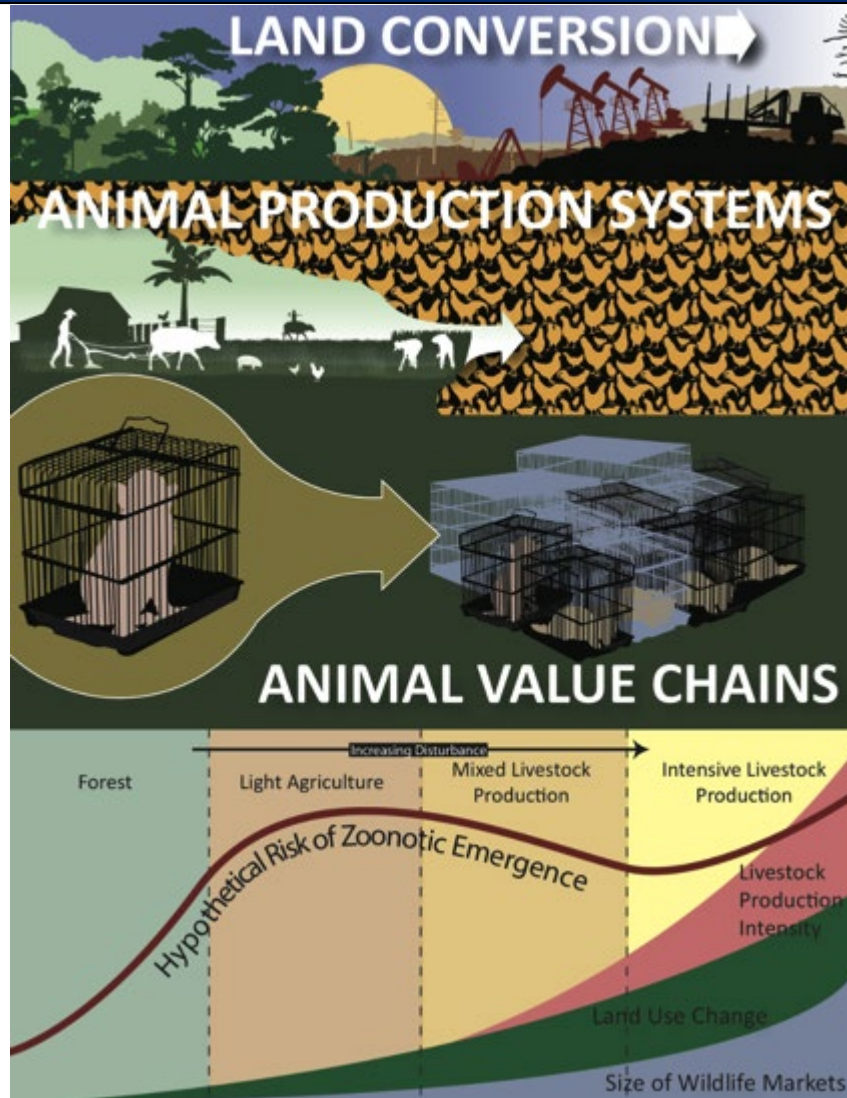


DETECTED a total of 984 unique viruses in wild animals and humans: 815 novel viruses and 169 known viruses – the most comprehensive viral detection and discovery effort to date.

815 NOVEL

169 KNOWN

PREDICT-2 Focus



Identify large-scale trans-boundary ecological processes underlying human activities at high-risk interfaces

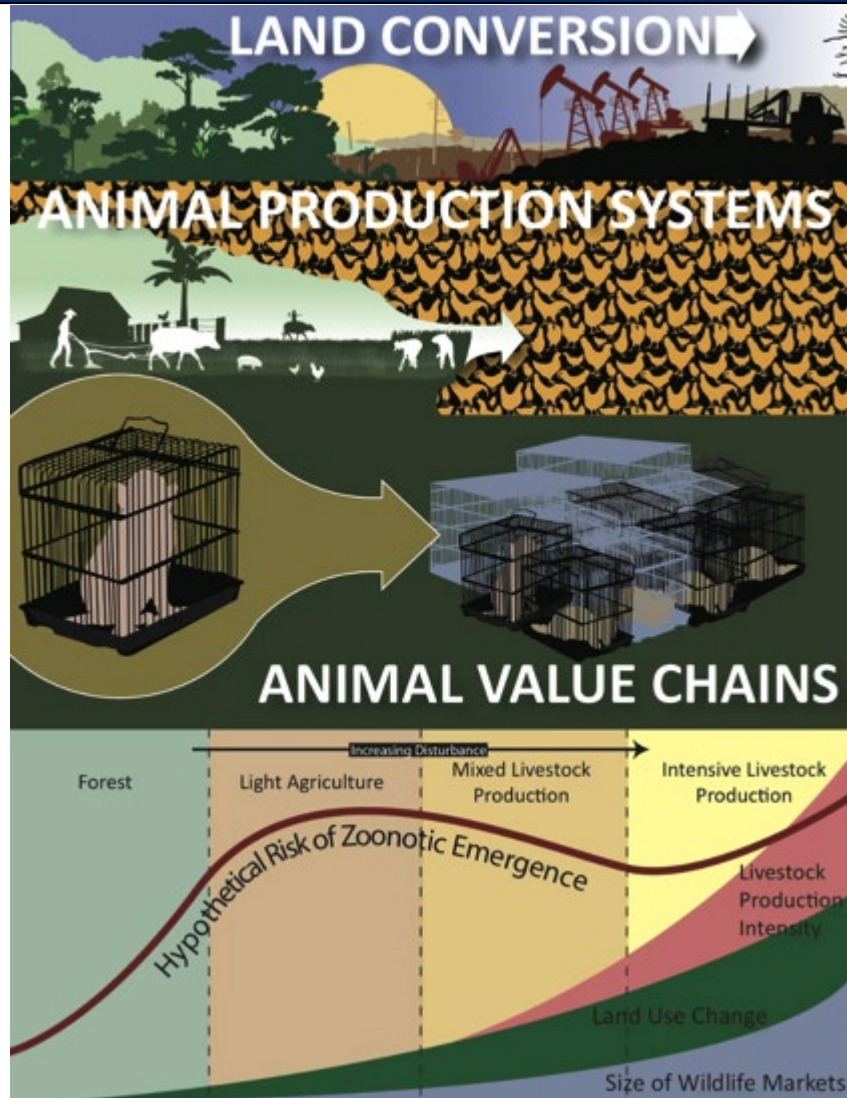
Characterize pathways for disease emergence



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PREDICT-2 Focus



*Target Biological
Sampling on:
Wildlife
Livestock
People*

*Behavioral Risk
Assessment*

In support of mitigation



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Behavioral Risk Surveillance Strategy

- GOAL: To identify drivers of specific behaviors/practices that lead to viral spillover and potential targets for mitigation
- How accomplished?
 - Rapid, targeted 4-8 week in-depth qualitative research in DRC, Cameroon, Uganda, Indonesia, China, Bangladesh
 - Fill in knowledge gaps
 - Inform behavioral survey for higher data quality
 - Develop behavioral risk survey
 - Informed by qualitative data, EPT-1 research and published manuscripts
 - Pilot tested in countries with no in-depth qualitative research
 - Administered in as many countries as possible
 - Concurrent biological sampling and behavioral risk survey/rapid questionnaire (Interim tool to be used first)
 - Focus on highest risk sites for risk mitigation

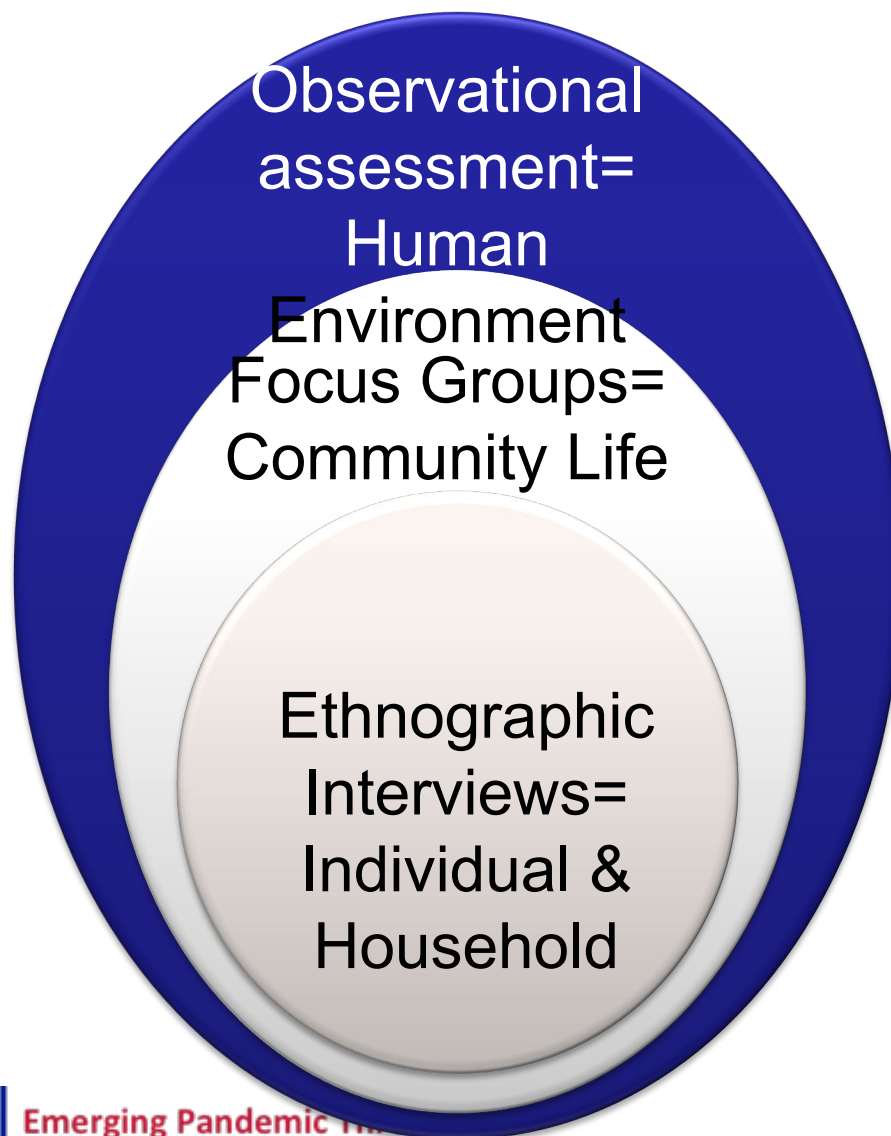
Pending discussion with local partners and authorities



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Qualitative Research



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Targeted, Risk-based Training & Surveillance



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Targeted, Risk-based Surveillance

- **Camels**
- **Bats**
- **Humans**



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Scientific Strategy: Viral Families

- Coronaviruses
 - Influenza's
 - Parainfluenza's
 - Filoviruses
 - Others if possible
-
- SARI – ILI - FUO

Scientific Strategy: Virus Risk

Expanded characterization of viruses with epidemic and unknown pandemic potential combined with risk assessment

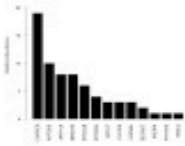
**VIRUS-INDEPENDENT
TRAITS**



**GEOGRAPHIC
HOTSPOTS FOR
EMERGENCE**



**HOST SPECIES TRAITS,
GEOGRAPHIC RANGE,
RELATEDNESS**



HOST ABUNDANCE

% pos

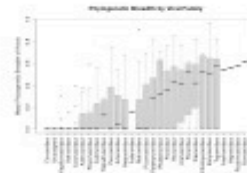
**VIRAL PREVALENCE
IN HOST**

+

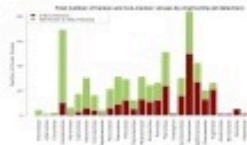
**VIRUS-SPECIFIC
TRAITS**

=

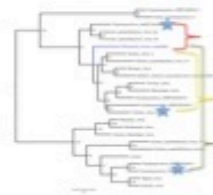
*Spillover risk
Pandemic risk*



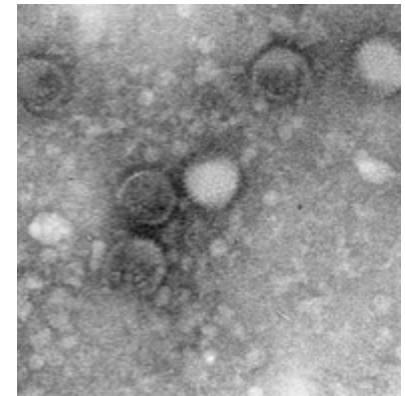
**HOST BREADTH/
PLASTICITY**



**PROPORTION
KNOWN ZOOANOSES
IN VIRUS FAMILY**



**PHYLOGENETIC
RELATEDNESS TO
KNOWN ZOOANOSES**



One Health Policies/Practices

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

- **Collaboration with The World Bank – building an evidence base for One Health**
- **Proposal to hold ‘Phase II’ workshop in partnership with World Bank (likely in a future year)**
- **Oriented toward policy change**
- **One Health assessment and investment criteria**



THE WORLD BANK



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**Emerging Pandemic Threats
Program 2 (EPT-2)**

Objective 5: Validating One Health Approaches

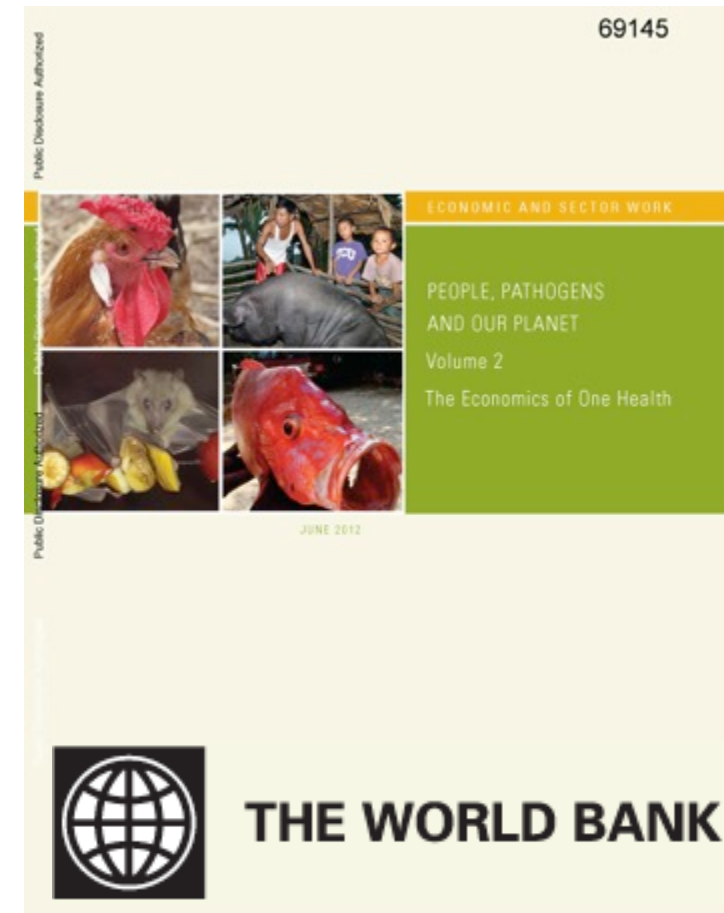
One Health Policies/Practices

Validating One Health Approaches

TABLE 5.3: Funding of Wildlife Health Services

ITEM	INVESTMENT	OPERATING COSTS
Average annual wildlife budget per country (US\$) for:	US\$3.3 million	US\$5.0 million
• Disease surveillance		US\$9,700
• Disease diagnostics		US\$11,200
• Disease control		US\$4,300
• Other aspects of ecosystems health (pollution, etc.)		US\$9,300

2011- 2012 Workshop and Report



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Objective 5: Validating One Health Approaches

One Health Policies/Practices

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

Preventive/Early Warning

Monitoring/early detection: \$

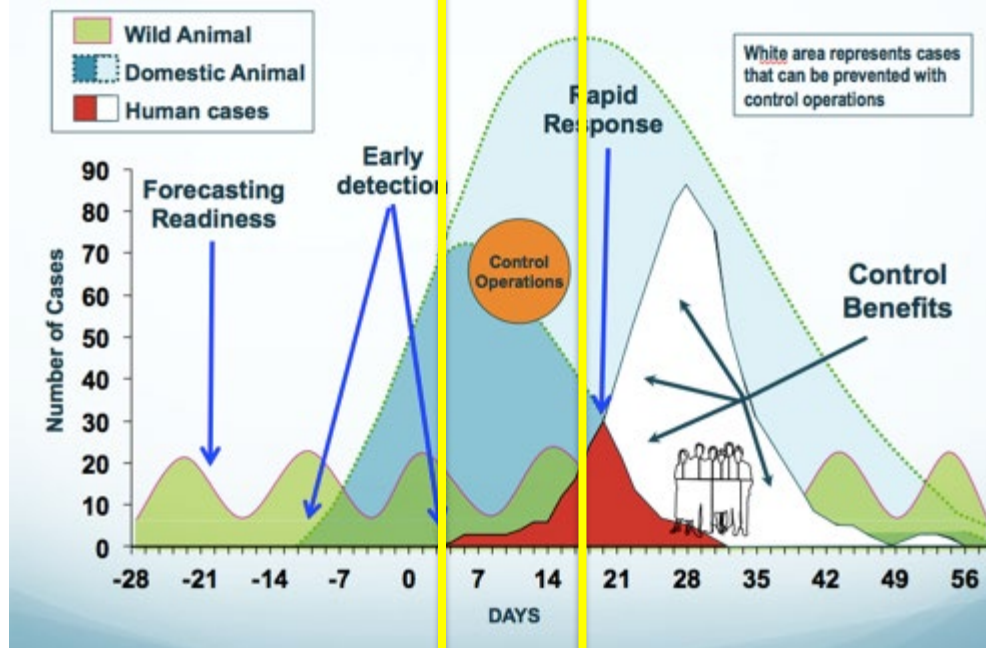
Health burden:
DALYs

Deaths: 49

Duration: <90 days

Perceptions:
Confidence in
preparedness
infrastructure

Operations: Multidisciplinary;
inclusive (all gender, income)



Reactive

Response/Control: \$\$\$

Health burden:
DALYs

Deaths: 9,500+

Duration: >460 days

Perceptions:
Vulnerability fears and
lack of predictive value

Operations:
Sole-discipline; limited
population integration



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Program 2 (EPT-2)

Objective 5: Validating One Health Approaches

WHERE we are working

Geographic Focus

Asia*

Bangladesh
Cambodia
China
Lao PDR
India
Indonesia
Nepal
Malaysia
Mongolia
Myanmar
Philippines
Thailand
Vietnam

Africa*

Cameroon
Cote d'Ivoire
DR Congo
Egypt
Ethiopia
Gabon
Ghana
Guinea
Kenya
Liberia

Africa*

Republic of Congo
Rwanda
Senegal
Sierra Leone
Sudan
South Sudan
Tanzania
Uganda

M.E.*

Jordan



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*In-country locations TBD based on identification of target epizones and transmission pathways

PREDICT-2 Partners

Consortium Partners:

EcoHealth Alliance, Metabiota, Smithsonian Institution, UC Davis, Wildlife Conservation Society

Global Partners:

CDC, EPT One Health Workforce, EPT Preparedness & Response, FAO, WHO, DTRA, Columbia University, HealthMap, UC San Francisco

Implementing Partner Examples (in addition to consortium partners):

Africa: Institut National de Recherche Biomedical, Mountain Gorilla Veterinary Project, Inc., Sokoine University of Agriculture

Asia: Center for Molecular Dynamics Nepal, Chulalongkorn University, East China Normal University, ICCDR-B, Institut Pertanian Bogor, Institut Pasteur du Cambodge

Host country and regional partner Examples:

Ministries of Agriculture, Health, Livestock, Wildlife, and associated Departments; USAID missions; and relevant host country laboratories, universities, and research institutes (e.g. Institut Pasteur, Wuhan Institute of Virology, local CDCs, etc.)



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PREDICT - 2

**The Ministries of Health, Agriculture & Environment and
Implementing University and NGO Partners in 31 Countries**

