excerpts from
Reducing Pandemic Risk, Promoting Global Health

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OPERATIONALIZING ONE HEALTH
Recent examples of emerging zoonoses, such as H1N1 pandemic influenza, H5N1 and H7N9 avian influenza, Ebola virus disease, SARS, and MERS, serve as a reminder that the health of humans, animals, and ecosystems are interconnected and that early detection and response to emerging zoonotic pathogens requires a coordinated, interdisciplinary, collaborative, and cross-sectoral approach at local, regional, and global levels.

In addition to the burden on human and animal health, the economic impacts associated with emerging and pandemic pathogens can be catastrophic, including costs associated with decreased commerce, travel, and tourism as well as those incurred from treatment and control efforts (Karesh et al. 2012). The One Health approach – an interdisciplinary collaborative effort to attain optimal health for people, animals, and our environment (Figure 1) – has gained popularity since the emergence of SARS and H5N1 highly pathogenic avian influenza A in Asia, which demonstrated the critical need for a coordinated interdisciplinary strategy for disease recognition, prevention, and control (World Bank 2012). As our world becomes increasingly connected through global trade and travel, emerging diseases pose a greater threat to the global community, requiring collaboration between ministries of health and institutions involved in health, trade, agriculture, and the environment (Karesh et al. 2012). The One Health approach presents important opportunities to reduce the impact of emergence events and also to prevent future emergence through improved knowledge and coordination.

Despite increasing endorsement of One Health by agency officials and policy makers globally, the lack of cross-sectoral and transboundary collaboration coupled with siloed resources have limited widespread implementation of the approach (Murray and Aviso 2011). However, with the growing international support for One Health, as illustrated by a recent tripartite organization (World Health Organization (WHO), Food and Agriculture Organization (FAO), and World Organization for Animal Health (OIE)) joint action plan to address health risks at the human-animal-ecosystem interface (FAO, OIE, WHO 2010), the value of an integrated approach to global surveillance and disease control and prevention is increasingly being realized.

One Health in Action

Through integrated efforts to promote health, effective natural resource management, and development, the PREDICT project, along with other partners under USAID’s EPT program, have advanced One Health capacity and infrastructure in over 20 countries considered hotspots for zoonotic disease emergence. PREDICT worked cooperatively with a wide range of government ministries, scientific institutions, local organizations, and other stakeholders to further local and global One Health initiatives by enabling a structure for effective collaboration across disciplines and geographic boundaries. Utilizing a One Health approach, PREDICT
focused its efforts on strengthening surveillance and diagnostic laboratory capacity to detect known zoonotic and novel pathogens at the wildlife-human interface, monitoring human-wildlife interactions for the potential spillover of pathogens posing a health threat (Figure 2), and investigating ecological drivers of pathogen spillover into people with the ultimate aim of improved prevention of zoonotic disease emergence. By emphasizing the links among human, animal, and environmental health, PREDICT enabled and supported integrated efforts to promote public health, effective natural resource management, and development. Examples include:

- **Training:** PREDICT and its partners trained 2,522 local individuals, including 842 women, on biosafety, surveillance, laboratory techniques, and outbreak investigation. Participants included government officials, physicians, veterinarians, resource managers, laboratory technicians, hunters, and students. Training in One Health approaches were also implemented during disease outbreak response and investigations, such as for Ebola virus disease in Uganda and DRC, influenza A virus in China, and Nipah virus outbreaks in Bangladesh.

![Diagram](image-url)

**Figure 1.** The One Health concept recognizes the interrelationship between animal, human, and environmental health (top) and promotes interdisciplinary collaborations to solve complex health problems (bottom). Adapted from Mazet et al. *in press.*
• **Integrated Approaches:** PREDICT countries developed mechanisms for overcoming geographic and disciplinary constraints. Multidisciplinary collaboration enabled targeted and sustainable advancements, including sharing and interpretation of surveillance results across ministries, as well as partner-driven implementation of PREDICT surveillance and testing protocols. Partners frequently participated in or co-organized PREDICT surveillance and diagnostic efforts, and PREDICT team members were invited to serve on national task forces and to provide technical assistance for disease response and prevention efforts.

![Diagram of zoonotic pathogen transmission](image1)

![Diagram of forecasting and early detection](image2)

**Figure 2.** (Top) Transmission to and amplification of zoonotic pathogens in people (red) occurs after a pathogen from wild animals (pink) spills over into livestock (green) or people to cause an outbreak. Spillover arrows illustrate cross-species transmission. (Bottom) Forecasting and early detection and control efforts reduce disease incidence in animals (green) and people (red). Adapted from Karesh et al. 2012.
• **Stakeholder Engagement and Leadership:** In addition to engaging public health, environment, and agricultural ministries, PREDICT facilitated strong partnerships among other key stakeholders. The many partnerships include collaboration with development boards, extractive industries, wildlife farms, indigenous leaders, hospitals, hunters, and rural communities.

In addition to directly supporting local One Health advancement in EPT countries, PREDICT protocols, approaches, and scientific findings provided guidance for intergovernmental agencies, the research community, and other countries. PREDICT fostered regional collaboration and eagerly provided expertise and best practices as invited by international stakeholders. PREDICT outputs have enabled implementation of effective One Health strategies globally. Examples include:

• **Expertise Networks:** PREDICT enabled the efficient functioning of the IUCN Species Survival Commission Wildlife Health Specialist Group, a global network of over 300 multidisciplinary experts that serves as a first response to wildlife health concerns around the world. Through leadership of the OIE Working Group on Wildlife Diseases, and participation in regulation-setting sessions, PREDICT provided guidance on the role of wildlife in diseases of high priority to international trade and zoonotic disease emergence.

• **Technical Guidance:** PREDICT partners were frequently called upon to provide technical input on intergovernmental One Health strategies, including informing approaches for optimizing influenza A virus surveillance in wild birds (as requested by the FAO/OIE’s OFFLU), serving as an expert on the human-animal interface for the World Health Organization International Health Regulations, and collaborating with the Convention on Biological Diversity on health considerations related to biodiversity. PREDICT protocols were utilized for outbreak response and preparedness efforts outside of PREDICT countries, including in the Middle East Respiratory Syndrome (MERS-CoV), H7N9, and Ebola virus disease in Sierra Leone.

• **Capacity Building:** PREDICT widely supported the development of professionals engaged in One Health activities, enabling participation of both PREDICT team members and in-country partners at global scientific meetings, including the OIE Global Conference on Wildlife-Animal Health and Biodiversity and the International Congress on Pathogens at the Human Animal Interface. PREDICT supported WildHealthNet (WHN), an online, peer-to-peer African network being developed with African Union-InterAfrican Bureau for Animal Resources (AU-IBAR). In 2013 alone, WHN membership grew to over 130 members (representing 23 African nations), with approximately one third of these members being women.

• **Dissemination of Information:** To ensure information was widely disseminated and can be implemented beyond PREDICT countries, PREDICT partners presented findings and approaches at scientific meetings and published over 90 peer-reviewed papers (see [http://www.vetmed.ucdavis.edu/ohi/predict/predict_publications.cfm](http://www.vetmed.ucdavis.edu/ohi/predict/predict_publications.cfm)). In addition, PREDICT sampling data and test results were posted on the HealthMap interface (see [http://www.healthmap.org/predict/](http://www.healthmap.org/predict/)) to feed into global surveillance and remote sensing systems. PREDICT partners frequently provided key findings to major health related bodies and organizations such as WHO, FAO, OIE, the US Institute of Medicine, US Department of Homeland Security, US National Institutes of Health, and the US Centers for Disease Control and Prevention.
Future Opportunities for PREDICT Countries to Build on One Health Advancements:

• Creating national strategies for the sustainability and broadening of One Health initiatives, including systems for disease prevention and early detection;
• Engaging and training additional stakeholders, including representatives from additional ministries, health and industry sectors, and local at-risk communities;
• Documenting One Health approach success stories for proof of concept; and
• Boosting regional collaboration on pandemic prevention and preparedness.

Through its local and global One Health initiatives, PREDICT and its partners enabled a structure for effective collaboration across disciplines and geographic boundaries to promote global health through prevention of emerging zoonotic disease threats. This infrastructure can be built upon to include additional regions and stakeholders for further impact.

REFERENCES


