ANIMAL AND PANDEMIC INFLUENZA

A Framework for Sustaining Momentum

Fifth Global Progress Report
July 2010

United Nations

The World Bank

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UN SYSTEM INFLUENZA COORDINATION &
THE WORLD BANK

United Nations

The World Bank

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Foreword

While there has been progress towards pandemic preparedness in recent years, continued vigilance and investments are critical for global health security, people's livelihoods and economic development. There have been three major epidemiological events in the first decade of this century: Severe Acute Respiratory Syndrome, H5N1 Highly Pathogenic Avian Influenza (HPAI) and Influenza Pandemic (H1N1) 2009. They demonstrate that we face continuing threats of pandemic influenza and other infectious diseases. The risk would appear to be increasing. Pandemics of both known and – as yet – unknown infectious diseases threaten people and economies of all countries. Developing countries are likely to be the hardest hit.

There have been intense efforts to address H5N1 HPAI since the early outbreaks of disease in poultry in 2003. They have resulted in significant reductions in the number of countries affected since 2006. This trend could easily be reversed if focus is not maintained and resources are not allocated as part of the routine business of ministries of health and agriculture. There are three priorities.

First – continued joint working by governments, communities and industry, both for multi-hazard disaster preparedness and for bio-secure animal rearing. Joint efforts are needed to prevent and control H5N1 HPAI, to ensure that control and response systems tackle a broad range of emerging and existing disease threats and to improve coordination between animal, human and environmental health disciplines. This One Health approach is necessary to ensure that countries are ready to detect, assess and respond to pandemics.

Second – long-term investments in animal and human health. Experience from the global responses to SARS, H5N1 HPAI, and pandemic (H1N1) 2009 provide lessons for the future, moving away from emergency measures to longer term sustained disease prevention, the development of capacities to respond to incursions and, where appropriate, to eradicate disease. There will always be a need for improvement in the forecasting and monitoring of disease emergence, spread and potential impact. This will aid the management of risks and consequences, and lead to better capacity for tackling problems at source before they become regional, continental or global threats. The One Health approach will greatly facilitate development of these capacities.

Third – well-functioning animal and human health delivery systems. Effective responses to animal and pandemic influenza are best implemented locally. Therefore, all countries should aim to have strong, practical and predictable delivery systems for animal and human health, including emergency and contingency planning systems that reflect global standards and legal frameworks such as the OIE veterinary standards and the WHO International Health Regulations.

World leaders at the International Ministerial Conference on Animal and Pandemic Influenza (IMCAPI) 2010 indicated their political support for these priorities through The 'Hanoi Declaration' and backing for the 'Framework for Sustaining Momentum' – two documents that feature prominently within this report.

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Acronyms

ADB	Asian Development Bank
AfDB	African Development Bank
AHI	Avian and Human Influenza
AHIF	Avian and Human Influenza Facility (multidonor trust fund)
AI	Avian Influenza
AIDS	Acquired Immune Deficiency Syndrome
ALive	African Partnership for Livestock Development, Poverty Alleviation and Sustainable Growth (AU-IBAR)
APEIR	Asian Partnership for Emerging Infectious Disease Research (China and South East Asia)
ARI	Acute Respiratory Infection
ASEAN	Association of South East Asian Nations
AU-IBAR	African Union/Inter-African Bureau for Animal Resources
AusAID	Australian Agency for International Development
BANF	Business Advisory Network for Flu (UK)
BCP	Business Continuity Plan
BSE	Bovine Spongiform Encephalopathy
CFR	Case Fatality Rate
CIDA	Canadian International Development Agency
DMMU	Disaster Management and Mitigation Unit
DZC	Danish Zoonosis Centre
EC	European Commission
ECDC	European Centre for Disease Prevention and Control
ECTAD	Emergency Centre for Transboundary Animal Diseases (FAO)
EID	Emerging Infectious Disease
EIN	Emerging Infectious Diseases Network
EMPRES	Emergency Prevention System (FAO)
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FETPV	Field Epidemiology Training Program for Veterinarians
GAVI	Global Alliance for Vaccines and Immunization
GDP	Gross Domestic Product
GEIS	Global Emerging Infections Surveillance and Response System (US Army and Naval locations/laboratories in Thailand, Kenya, Egypt, Indonesia and Peru)
GETS	Gathering Evidence for a Transitional Strategy (Viet Nam/FAO/USAID)
GIS	Geographic Information Systems
GLEWS	Global Early Warning and Response System for Major Animal Diseases (FAO, OIE and WHO)

GNI	Gross National Income
GOARN	Global Outbreak Alert and Response Network (WHO)
GPHIN	Global Public Health Intelligence Network (Canada)
H1N1	Pandemic Influenza A
H5N1	Avian Influenza A
HIV	Human Immunodeficiency Virus
HPAI	Highly Pathogenic Avian Influenza
HPED	Regional Cooperation Program on Highly Pathogenic and Emerging and Re-emerging Diseases (European Union)
ICAO	International Civil Aviation Organization
IDP	Internally Displaced Person
IDRC	International Development Research Center (Canada)
IDRL	International Disaster Response Laws
IEC	Information, Education and Communication
IFRC	International Federation of Red Cross and Red Crescent Societies
IHR	International Health Regulations
ILI	Influenza-like Illness
ILO	International Labour Organization
IMCAPI	International Ministerial Conference on Animal and Pandemic Influenza
IMF	International Monetary Fund
IOM	International Organization for Migration
ISDR	International Strategy for Disaster Reduction
IVPI	Intravenous Pathogenicity Index
IZSV	Istituto Zooprofilattico Sperimentale delle Venezie
KAP	Knowledge, Attitudes and Practices
LSHTM	London School of Hygiene and Tropical Medicine (UK)
MBDS	Mekong Basin Disease Surveillance
MDB	Multilateral Development Bank
MDG	Millennium Development Goals
MOPH	Ministry of Public Health (Thailand)
MRSA	Methicillin-resistant Staphylococcus Aureus
M & E	Monitoring and Evaluation
ND	Newcastle Disease
NGO	Non-governmental Organization
OECD	Organisation for Economic Co-operation and Development

OFFLU	OIE-FAO Network of Expertise on Animal Influenza
OIE	World Organization for Animal Health
OWOH	One World One Health
PDR	People's Democratic Republic (Lao)
PDSR	Participatory Disease Surveillance and Response (Indonesia)
PHAC	Public Health Agency of Canada
PHEIC	Public Health Emergency of International Concern
PHRD	Japan Policy and Human Resource Development Fund (World Bank)
PIC	Pandemic Influenza Coordination
PPP	Private Public Partnership
ProMED	Program for Monitoring Emerging Diseases
PVS	Performance of Veterinary Services (OIE)
RAHC	Regional Animal Health Centre
REMESA	Mediterranean Animal Health Network (FAO/OIE)
RESOLAB	West and Central African Veterinary Laboratory Network for Avian Influenza and other Transboundary Diseases
SAR	Special Administrative Region (Hong Kong, China)
SARS	Severe Acute Respiratory Syndrome
SMS	Short Message Service
SOP	Standard Operative Procedures
SSAFE	Safe Supply of Affordable Food Everywhere
TERN	Tourism Emergency Response Network
TWGPPR	Technical Working Group on Pandemic Preparedness and Response (ASEAN)
UNCAPAHI	United Nations System and Partners Consolidated Action Plan for Animal and Human Influenza
UNDP	United Nations Development Programme
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
UNOCHA	United Nations Office for the Coordination of Human Affairs
UNSIC	United Nations System Influenza Coordination
UNWTO	World Tourism Organization
USA	United States of America
USAID	United States Agency for International Development
USCDC	US Centers for Disease Control and Prevention
WAHID	World Animal Health Information Database (OIE)
WAHIS	World Animal Health Information System (OIE)
WB	World Bank
WFP	World Food Programme
WHO	World Health Organization

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Executive summary

Global efforts continue to work towards ensuring a world capable of preventing, detecting and responding to animal and public health risks attributable to zoonoses and animal diseases. At the 7th International Ministerial Conference on Animal and Pandemic Influenza (IMCAPI) held in Hanoi, Viet Nam, 19-21 April 2010, approximately 500 representatives from over 70 countries met to reaffirm global commitment to addressing these issues.

Drawing on achievements and experiences of the past five years, the Fifth Global Progress Report was produced to support these discussions and to provide a record of key outcomes from IMCAPI. This executive summary presents key findings and recommendations.

H5N1 Highly Pathogenic Avian Influenza (HPAI)

H5N1 HPAI remains a threat to both animal and public health. It impedes healthy poultry production, which in turn impacts the livelihoods of millions of people. It is a disease that – though rare, has a high case fatality rate in humans. Along with other animal influenza viruses (such as subtypes H2, H5, H6, H7 and H9) it is a potential pandemic influenza threat. A network of systems to improve surveillance, and an ongoing analysis of threats posed by influenza and other emerging viruses are both essential for limiting the national and global risks posed by these threats.

Despite an intensive and generally successful effort to control the spread of H5N1 HPAI, the virus continues to circulate and is entrenched in domestic poultry in parts of Bangladesh, China, Egypt, Indonesia and Viet Nam. Other countries continue to be affected sporadically with poultry outbreaks reported recently in Bhutan, Cambodia, India, Israel, Lao PDR, Myanmar, Nepal and Romania. Since 2003, there have been over 499 confirmed human cases and 295 deaths reported in 15 countries. Almost all human cases have occurred in countries where the H5N1 viruses were detected in wild birds or poultry, and there is a close correlation between seasonal occurrences of H5N1 in poultry and incidence of human cases. While the overall number of reported outbreaks and countries affected has declined dramatically since 2006, the situation remains dynamic and continues to evolve with an increase being observed in 2010. The number of confirmed human cases of H5N1 Avian Influenza (AI) in 2009 was almost double that of 2008.

There has been significant progress in efforts to improve biosecurity in poultry production systems and vigilance for disease outbreaks within animal health systems. This helps explain the decline in the number of affected countries since 2006. Most countries have improved surveillance capacity and countries have reported significant animal health events promptly to the OIE World Animal Health Information System (WAHIS). The sharing of information between FAO/OIE laboratories, namely through the OIE/FAO Network of Expertise on Animal Influenza (OFFLU) has continued to improve, along with early warning systems and the implementation of the International Health Regulations (IHR) 2005. This has led to better capacity for detection, assessment, notification and response to public health threats.

Despite these achievements, much needs to be done to bring veterinary services up to standard in many countries and to improve biosecurity in poultry production chains. Animal health legislation is often outdated and inadequate, and too little funding is available for veterinary staff, operating costs and laboratory diagnostics. The quality of communication to the general public about the risks associated with H5N1 HPAI and other diseases with pandemic potential is highly variable, and needs sustained investment within countries and at the regional level. OIE's standards and programmes for improving veterinary services are helping to redress such problems, but it is clear that if investments in animal health systems are not sufficient, the risk of further disease outbreaks will greatly increase. A standardized indicator-based system for the quantitative analysis of progress is urgently needed.

Policy makers increasingly recognize that a high proportion of infectious diseases in humans come from animals, that these zoonotic diseases have high economic costs (especially for countries that export livestock and meat products), and that outbreaks that do occur – such as SARS, H5N1 HPAI and pandemic influenza A (H1N1) 2009 – have major political, economic and health consequences. They appreciate that the threats are likely to increase in frequency and magnitude over the coming decades. During the past three years they have called for science-based decision-making to minimize potential economic and trade impacts on affected countries and maximize trans-sectoral and multidisciplinary working to address disease threats that emerge at the animal-human-ecosystem interface. During the last two years several countries have started to implement such One Health approaches.

The key challenge – now – is to turn promising beginnings of stronger cross-sector working into institutionalized, sustained and holistic approaches. Most countries have still to develop in-country institutional frameworks to tackle the root causes of disease emergence, to respond to diseases as they emerge, and to maintain public and political interest in the face of ever-changing perceptions and needs.

Pandemic preparedness

The response to pandemic (H1N1) 2009 has revealed substantial world-wide progress with pandemic preparedness between 2005 and the present day, as reported at previous International Ministerial Conferences. Most countries have recently developed and / or updated pandemic preparedness plans. The expansion and strengthening of international partnerships for pandemic preparedness has continued and new partnerships have been established. Civil society, private entities, militaries, research groups and different sectors of government are increasingly involved in enhancing awareness of disease spread and preparedness for future outbreaks. These partnerships have had a significant impact on hygiene and continuity planning within service providers, schools, community centres and residential institutions. They have underlined the value of effective trans-sector, multicountry and coordinated working, based on trust and supported by effective communications.

Continued global vigilance for infectious disease outbreaks and pandemics is of critical importance for health security and well-being. To this end, disease surveillance systems have been strengthened and in many countries integrated across the human and animal health sectors. Increased emphasis is being given to reliable and rapid forecasting, with surveillance and early warning systems that predict disease emergence through a better understanding of drivers. Some countries seek ways to mainstream and strengthen pandemic preparedness by integrating it within multihazard disaster planning and the Hyogo Framework for Action (2005). The best preparedness plans involve a range of sectors and services and collaboration with civil society organizations and the private sector, and ensure that the needs and interests of vulnerable groups, such as refugees and migrants, are adequately covered. Regular simulation exercises help to strengthen readiness, test planning assumptions and establish resource needs.

International financing of Avian and Pandemic Influenza action

The World Bank's analysis of contributions by bilateral and multilateral donors indicates that between 2005 and end-December 2009, US$4.3 billion in pledges was reported, against which US$3.9 billion has been committed (of which US$2.7 billion has been disbursed). Approximately 40 percent (US$1,560 million) of committed funds went directly to support country programmes and 29 percent (US$1,140 million) supported country efforts and global functions through international organizations.

New commitments for countries have increased in the past year (after a gradual decline since the peak in late 2005 / early 2006); composition of financing has changed with loans becoming the dominant form of assistance. There has been an increase in the proportion of funds contributing to human public health systems and pandemic preparedness, with a reduction in the proportion directed to avian influenza and other animal health issues. This reflects the international response to challenges posed by pandemic (H1N1) 2009.

Long-term funding for the strengthening of animal health services and combating the drivers of animal diseases, including those with pandemic potential, is still of vital importance.

Sustaining the momentum and incentives for continued action

This report demonstrates the strong worldwide momentum behind the effort to tackle H5N1 HPAI, to strengthen capacity to fight disease threats at the animal-human-ecosystem interface and to prepare for pandemics. Governments, international organizations, private enterprises and civil society increasingly appreciate the challenge of sustaining the momentum.

There is a continuing need – within all countries – to engage community groups, work closely with private entities, establish public-private partnerships, and ensure that animal and human health services are compliant with IHR and OIE standards. The institutional arrangements and legislative frameworks that support these efforts must be kept under continuous review to ensure whole of society trans-sectoral action, and integration of pandemic specific actions into multihazard disaster planning.

The support provided to national entities through regional political groups (e.g. ASEAN, APEC and the African Union) and international agencies, through research networks and results-focused collaborations, also continues to be invaluable.

A significant outcome of the April 2010 IMCAPI was the adoption of the 'Hanoi Declaration', which reaffirms the importance of international and regional cooperation, national political commitment and intersectoral collaboration (See Annexes 3 and 4). It also emphasizes the importance of timely and transparent communication and capacity building for health systems capable of addressing emerging threats and ensuring effective pandemic readiness and response across different sectors. The Declaration calls for increased efforts to strengthen early detection of, and preparedness for, future pandemic events through cross-sectoral understanding with a focus on least developed countries, vulnerable groups and the role of local communities.

The way forward: A Framework for Sustaining Momentum

This report presents a Framework for Sustaining Momentum (See Chapter 6) which was agreed by delegates at the April 2010 IMCAPI. The Framework offers three streams of work that need sustained attention by national, regional and global authorities despite the inevitable waning of public interest in pandemic-related issues.

The three work streams are (a) prevention and control of HPAI, (b) adoption of One Health approaches, and (c) readiness for response to influenza pandemics. For each, the Framework envisages two expected outcomes and identifies the actions which contribute to these expected outcomes. It identifies the incentives and institutional arrangements needed to sustain momentum, highlights systems for monitoring progress, and spells out investment priorities – particularly to support institutions and systems in the least developed countries.

To realize these goals, policy makers are moving away from tackling avian and pandemic influenza through emergency projects or special initiatives. Instead they aim for longer term capacity building through pursuit of effective strategies within existing programmes, and the mainstreaming of pandemic readiness skills. The right incentives to achieve this transformation need to be identified and used, backed with strategic political and financial support, novel institutional arrangements, and easily applied monitoring systems.

Overview of the animal and pandemic influenza situation

1

"We must continue to prevent and respond to bird flu (H5N1 Highly Pathogenic Avian Influenza), to tackle the ongoing H1N1 influenza pandemic and to prepare for other diseases that move from animals to humans. In Viet Nam's experience this calls for good human and animal health services, excellent communications and whole of society responses."

Dr. Bui Ba Bong, Vice-Minister of Agriculture and Rural Development, Government of Viet Nam. Statement from IMCAPI 2010.

1.1 Introduction

This chapter reviews the current situation regarding H5N1 HPAI, pandemic (H1N1) 2009 and other influenza viruses of concern. It examines current threats posed by these viruses, their impacts, and the status of international support for responses to them (response capacity and areas requiring further development, current levels of support and political commitment to do more).

The first section provides an overview of the animal and pandemic influenza situation for H5N1 HPAI in animals and humans. Since 2003, 63 countries have reported H5N1 HPAI disease events, and 15 countries have confirmed 498 human cases with 294 deaths.

The second section reviews the emergence of a new virus of animal origin – pandemic (H1N1) 2009 – which first appeared in Mexico and the US in April 2009, and then rapidly spread to over 120 countries within six weeks. Over 214 countries and territories around the world have since reported laboratory-confirmed cases including over 18,114 deaths. While the full impacts of pandemic (H1N1) 2009 will not be known until the pandemic is over, impacts have been noted in the health, agriculture, tourism and trade sectors.

A third section considers threats posed by a number of influenza virus strains that have, or are believed to have, the potential to impact on animal and human health.

The final section outlines progress since 2008 with regard to strengthening of national and regional capacities for responses to animal and pandemic influenza, as well as areas that need further development.

1.2 H5N1 Highly Pathogenic Avian Influenza (HPAI) in animals: global overview 2003-2010

Various forms of H5N1 HPAI viruses may have been circulating in the Asia region since 1996[1]. H5N1 was first seen in a farmed goose in China in 1996, and then in poultry and people in Hong Kong SAR, China in 1997. An outbreak of H5N1 was reported in domestic poultry in late 2003 in the Republic of Korea[2]. Over the next three years H5N1 HPAI then spread widely across three continents from eastern and southern Asia, to southern Russia, the Middle East, Europe and Africa[3]. By 2006, 56 countries had reported infections in birds, 38 of which were reported in domestic poultry[4].

In 2007, 2008 and 2009, the number of reported outbreaks and number of newly infected countries declined. Overall 31 countries reported outbreaks in 2007, reducing significantly to 23 countries in 2008 and to 12 in 2009 (See Figure 1-1).

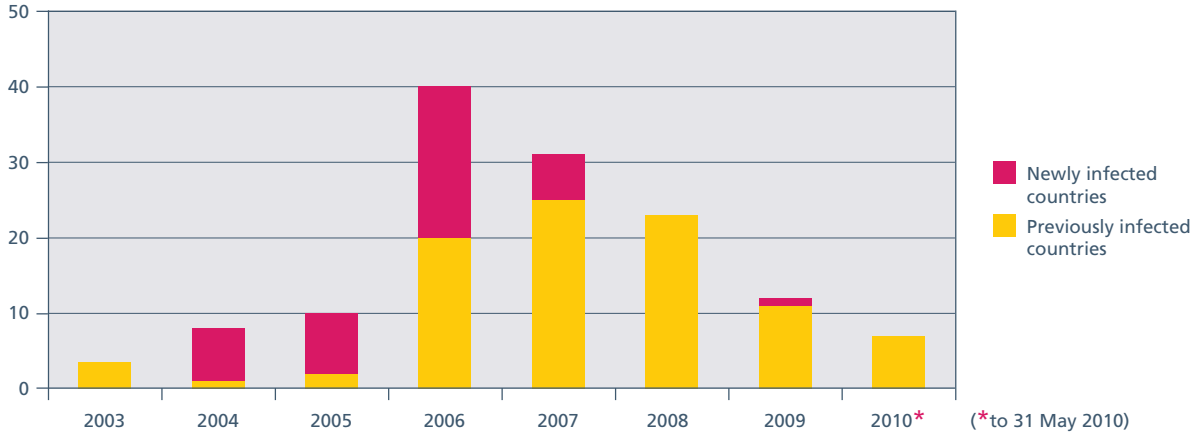

Figure 1-1: Number of H5N1 HPAI newly infected countries since 2003

Source: FAO EMPRES-I

In total, 63 countries have experienced disease events of H5N1 HPAI since the beginning of the panzootic in 2003[5].

Significant progress has been made, evidenced by the decreasing magnitude of seasonal outbreaks and a reduction in the number of newly infected countries reporting highly pathogenic avian influenza outbreaks since 2005-06, although an increase is being observed in 2010. H5N1 HPAI does remain entrenched in various poultry production sectors in parts of Asia (Bangladesh, Indonesia, Viet Nam, and China) and Africa (Egypt) with a persisting risk that human infections will occur.

Update on H5N1 HPAI in domestic poultry and wild birds since 2008

With twelve countries in Asia, Europe and Africa having experienced disease events during 2009, the number of countries reporting outbreaks was lower than the three preceding years (See Figure 1-1). Nepal was the only newly infected country in 2009.

In 2010, the number of affected countries between January and May 2010 (15) already surpasses the number of affected countries for the whole of 2009. Israel, Lao People's Democratic Republic (Lao PDR), Myanmar and Romania have reported outbreaks, although they had not experienced any H5N1 HPAI activity in over a year. Cambodia also reported outbreaks of H5N1 HPAI in ducks in January and April 2010. Bhutan is the most recent newly affected country with a number of outbreaks reported in February and March 2010. Wild bird cases were reported in China in March and May 2010 and in Mongolia in May 2010. In summary, from January to May 2010, there have been outbreaks/cases reported in Bangladesh, Bhutan, Bulgaria (wild birds), Cambodia, China (wild birds), Egypt, Israel, India, Indonesia (poultry and one wild bird), Lao PDR, Mongolia (wild birds), Myanmar, Nepal, Romania, and Viet Nam.

Almost all of the five countries with significant ongoing outbreaks in poultry and occasional human cases have large poultry (including duck) populations. H5N1 infections in poultry and humans have been caused by many different H5N1 clades that have evolved since 1996, and viral evolution is ongoing[6].

H5N1 HPAI has recently re-surfaced in several countries where the disease was believed to have been eliminated (without vaccination). It is still too early to evaluate whether these recently reported outbreaks were due to re-introduction, or whether the virus was circulating undetected by surveillance programmes. In Bangladesh and India, which had reported no outbreaks in the second half of 2009, a new wave of outbreaks has been observed since the beginning of 2010, which is still on-going in Bangladesh, but has been under control in India since January 2010.

Figure 1-2 shows data relating to H5N1 outbreaks in Europe, Asia and Africa from previous years. From this it can be seen that seasonal peaks occur generally during the months January to March.

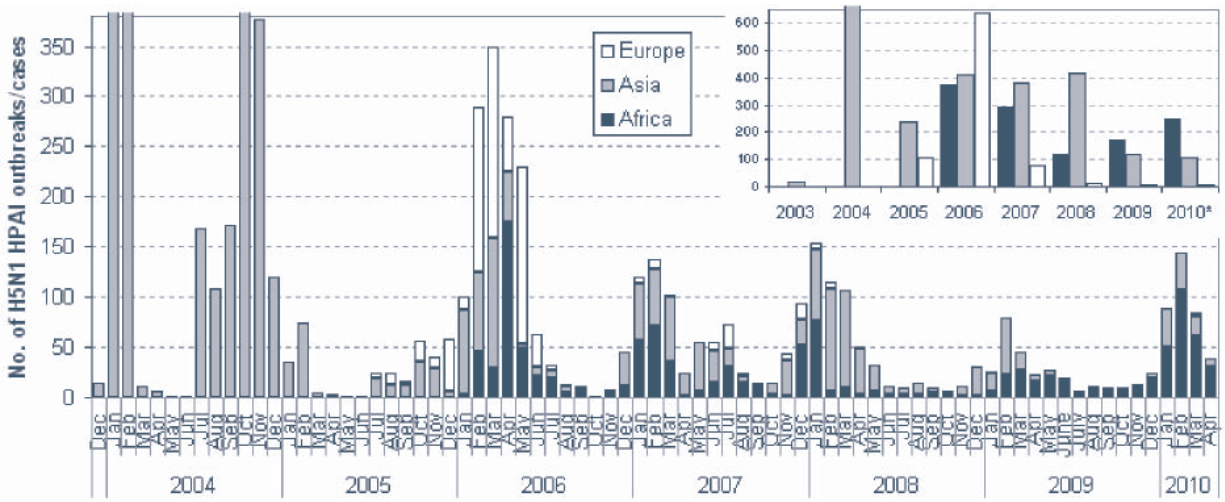

Figure 1-2: Number of H5N1 HPAI events by continent, by month since December 2003

Source: FAO EMPRES-I

Note 1: Indonesia data are not included, because the epidemiological unit definition for the PDSR data was modified from household level to village level in May 2008 and is not comparable.

Note 2: Months with more than 380 outbreaks (Jan 2004: 1,311, Feb 2004: 1,175 and Oct 2004: 741), and years with more than 650 outbreaks (2004 in Asia: 4,189) have been truncated so that the rest of the graph is not distorted.

The continued decline observed since 2004 in the number of HPAI events reported worldwide, and in the total number of countries affected has been interrupted with the increase in both parameters during 2010[i]. This is mainly explained by the higher contribution of Africa (Egypt).

Although disease awareness has increased, H5N1 HPAI events are still likely to be under-reported in some regions. The total number of outbreaks/cases of H5N1 HPAI reported is highly influenced by a number of variables, such as the case definition used, awareness levels, limitations with surveillance, outbreak investigations and the absence or weakness of compensation schemes[7].

Confirmed cases of H5N1 AI infection have been reported in wild birds in Bulgaria, China, Indonesia, Mongolia, Romania, Russian Federation and Germany since July 2008 (See Figure 1-3). More detailed information and analysis on H5N1 HPAI outbreaks in poultry, wild birds and other animals is provided in Chapter 3.

[i] The decrease in reported outbreaks/cases may not equal a decrease in actual outbreaks/cases; epidemiological data for Indonesia is not included.

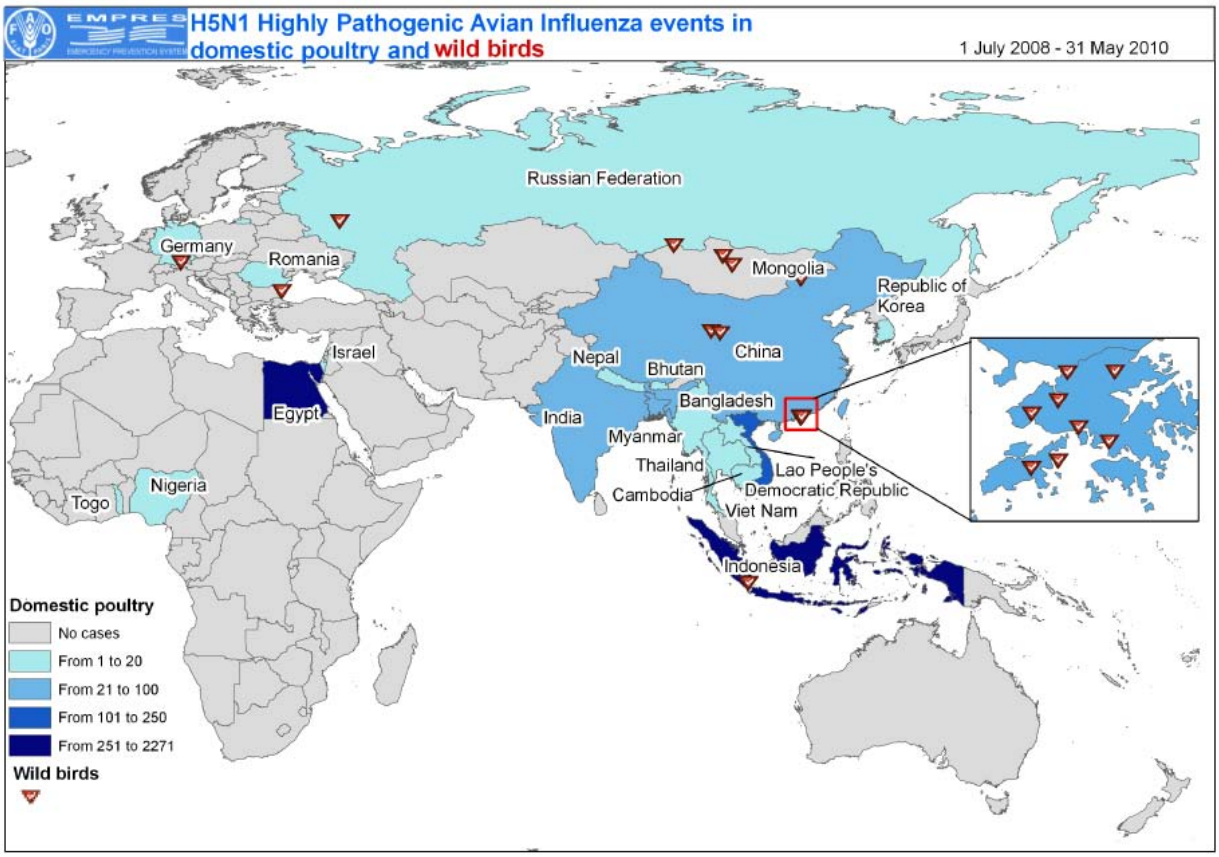

Figure 1-3: H5N1 HPAI outbreaks in domestic poultry and wild birds

Source: FAO EMPRES-I

1.3 H5N1 Avian Influenza (AI) in humans: global overview 2003-2010

Since 2003, the widespread ongoing epizootic of avian influenza A (H5N1) among poultry and birds has resulted in human H5N1 avian influenza cases in 15 countries. The number of human cases peaked in 2006 (with 115 infected and 79 deaths), with an inconsistent decline since that time.

In 2003 – 2004, two cases of H5N1 AI virus infection occurred among members of a Hong Kong family that had travelled to China. It has not been determined how or where they were infected. In late 2003 and early 2004, severe and fatal human infections with H5N1 AI viruses were associated with widespread poultry outbreaks in China, Thailand and Viet Nam. Most cases had pneumonia and many had respiratory failure. Additional human H5N1 cases were reported during mid-2004, and late 2004. Most cases appeared to be associated with direct contact with sick or dead poultry. Overall, 50 human H5N1 cases with 36 deaths were reported from those three countries during this two year period[8].

In 2005, 98 human H5N1 AI cases with 43 deaths were reported in the five countries of Cambodia, China, Indonesia, Thailand and Viet Nam, where severe and fatal human infections with H5N1 were associated with the ongoing H5N1 epizootic among poultry. In 2006, Azerbaijan, Cambodia, China, Djibouti, Egypt, Indonesia, Iraq, Thailand and Turkey experienced fatal human infections with H5N1 viruses. While most of these cases occurred as a result of contact with infected poultry, in Azerbaijan the most plausible cause of exposure to H5N1 in several instances of human infection is thought to be contact with infected dead wild birds (swans). Overall, the number of infected people grew to 115 human H5N1 AI cases with 79 deaths reported in nine countries[9].

In 2007 – 2008 Cambodia, China, Egypt, Indonesia, Lao PDR, Myanmar, Nigeria, Pakistan and Viet Nam experienced human fatalities due to H5N1 AI in association with poultry outbreaks. In addition during 2007, Nigeria, Lao PDR, Myanmar, and Pakistan confirmed their first human infections with H5N1 AI. Overall nine countries reported a total of 88 human cases with 59 deaths in 2007[10] and six countries – Indonesia, Egypt, Viet Nam, China, Bangladesh and Cambodia – reported a declining total of 44 human cases and 33 deaths in 2008.

Update on H5N1 AI influenza in humans since 2008

During 2009, 73 laboratory-confirmed cases and 32 deaths of human infection with H5N1 AI virus were reported to the World Health Organization (WHO) from five countries, namely from Cambodia (1 case), China (7 cases), Egypt (39 cases), Indonesia (21 cases), and Viet Nam (5 cases). All of these countries had previously reported human cases of H5N1 AI virus infection. In 2009, this represents **almost double the number of confirmed cases** in comparison to 2008 data (44 cases, 33 deaths), mainly due to reported cases in Egypt.

Almost all human cases of H5N1 AI infection have occurred in countries with ongoing circulation or reintroduction of H5N1 viruses in poultry. There is a close correlation between seasonal occurrences of H5N1 in poultry and incidence of human cases (See Figure 1-4)[11].

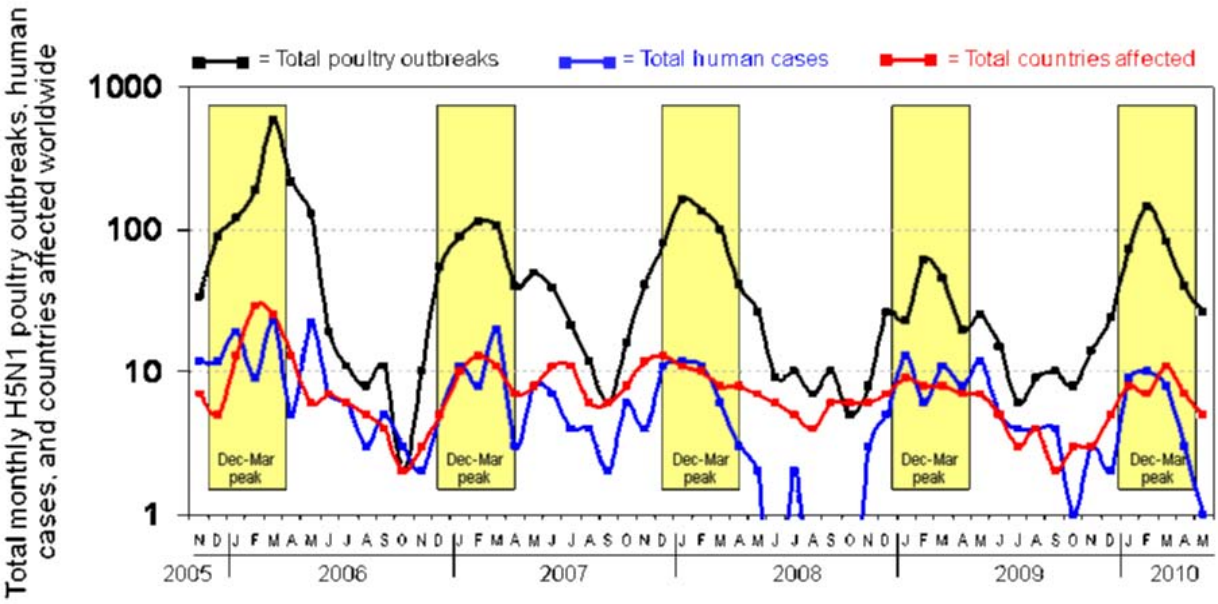

Figure 1-4: H5N1 poultry outbreaks, human cases and affected countries by month since 2005

Source: OIE, WHO, FAO reports through 17 June 2010, (data from Egypt contain active surveillance since 2009)

Note: poultry outbreak totals do not include data from Indonesia (after Sep. 2006), but Indonesia included in number of countries affected. Figure prepared by USAID.

By the end of 2009, 468 confirmed human cases and 282 deaths had been reported to WHO (See Figures 1-5 and 1-6). Between January and June 2010 five countries (Cambodia, China, Egypt, Viet Nam and Indonesia) reported a further 31 human cases and 13 deaths. As in previous years[12], increased case counts have been reported during the winter and spring in the northern hemisphere (See Figure 1-7). By 8 June 2010, a total of 499 confirmed human cases and 295 deaths had been reported to WHO.

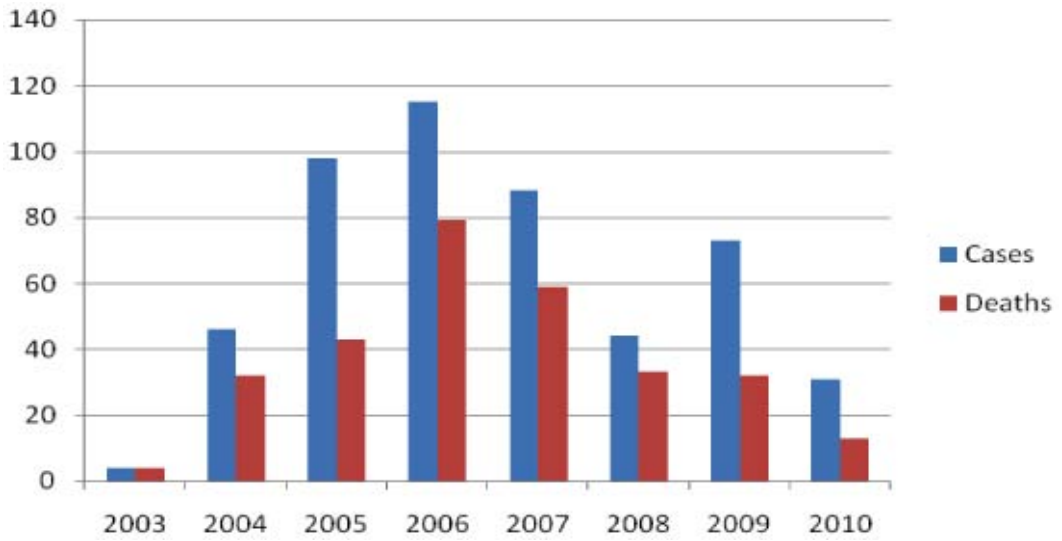

Figure 1-5: Number of confirmed H5N1 AI human cases since 2003

Source: WHO, Updated 8 June 2010[13]

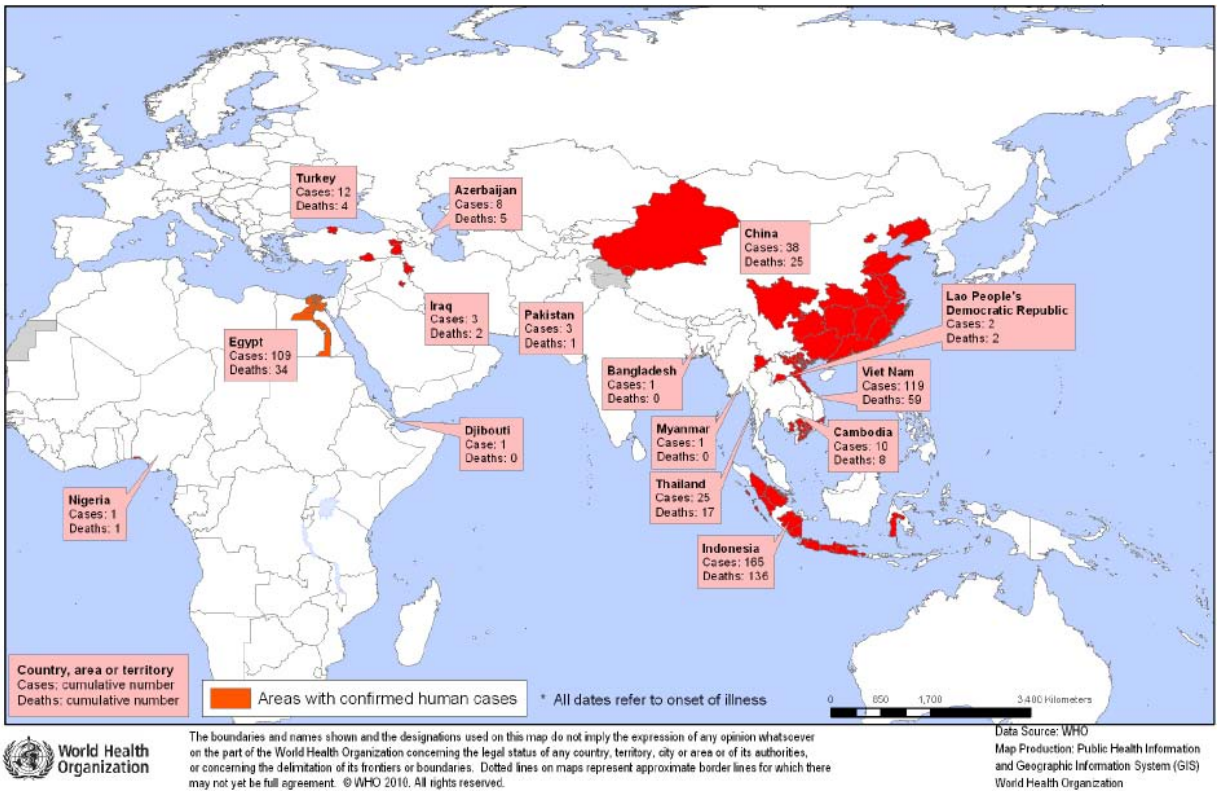

Figure 1-6: Areas with confirmed human cases of H5N1 AI since 2003

Source: WHO

Note: status as of 6 May 2010, latest available update

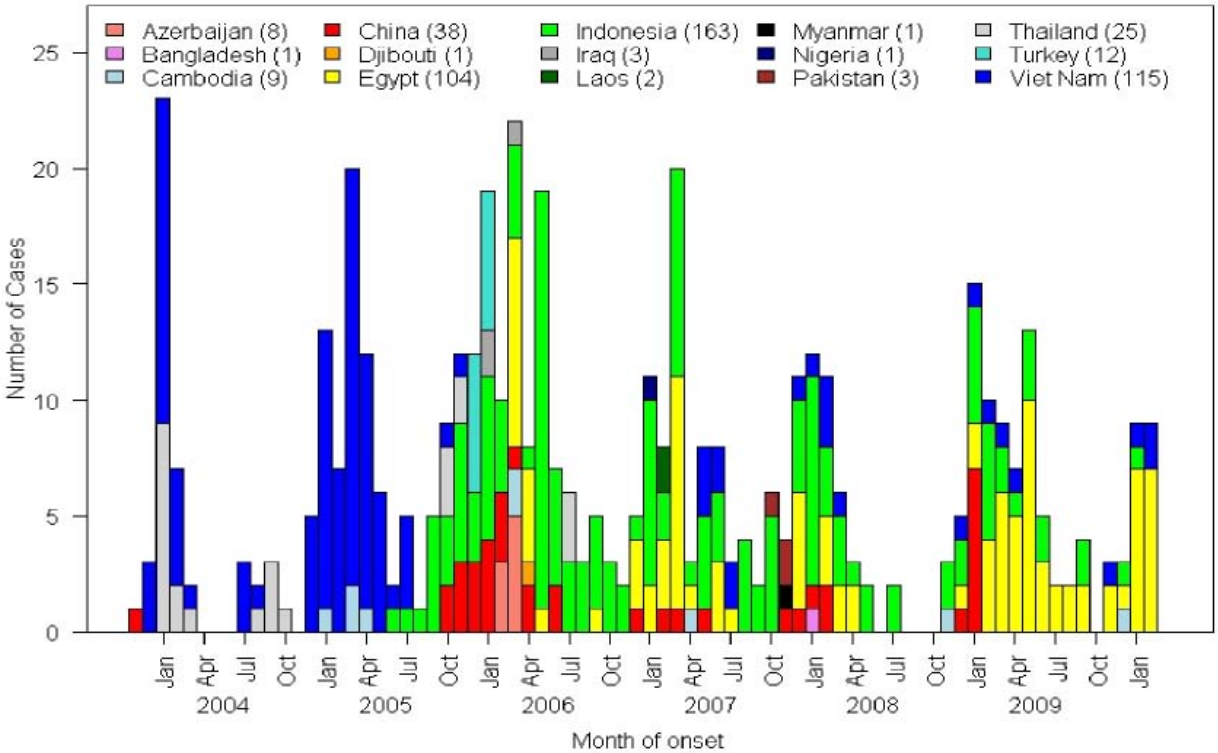

Figure 1-7: Number of confirmed cases of human infection with H5N1 AI from November 2003 to February 2010

Source: WHO

While the numbers of males and females infected with H5N1 AI have been similar in most countries, Indonesia has reported twice as many female H5N1 infections, and a higher number of female than male deaths. Globally the age of infected persons ranged from six months to fifty-seven years, with a median age of five years. A disproportionate number of young cases were reported from Egypt in 2009 (when 79 percent of all infected individuals were younger than ten years old). The overall case fatality ratio (CFR) for 2009 was 44 percent, lower than the preceding two years, but similar to what was observed in 2005. CFRs varied between countries: Indonesia has reported 83 percent and Egypt 33 percent. Recent analysis suggests that the CFR in Egypt further decreased to 10 percent in 2009, however the CFR so far in 2010 has again been higher[14].

H5N1 HPAI is an avian virus that is not effectively transmitted from human-to-human. Human infections remain rare. Three clusters of human infection, each involving two family members and with no sustained human-to-human transmission were documented in 2009.

1.4 Overview of pandemic (H1N1) 2009

In April 2009 a novel Influenza A (H1N1) virus[i] emerged in Mexico and the US. On 25 April 2009, the Director General of WHO announced that the emergence and rapid spread of the novel virus constituted a Public Health Emergency of International Concern. On 11 June 2009 WHO declared that the pandemic alert level had risen to Phase 6, meaning that an influenza pandemic was underway. Influenza A (H1N1) 2009 subsequently spread globally with the virus reported in all continents in less than six weeks.

[i] See Annex 2 for details of the host and lineage origins for the gene segments of the 2009 A(H1N1) virus.

Early transmission in the temperate zone of the northern hemisphere

The widespread detection of the pandemic (H1N1) 2009 virus coincided with the end of the usual northern hemisphere influenza season in mid May 2009. Out-of-season transmission of the pandemic virus was subsequently observed in many countries of the temperate northern hemisphere, notably North America and Western Europe. This early transmission was characterized by large, localised outbreaks in some instances involving entire cities. Transmission continued throughout 2009 in Mexico (peaking in late April and again in late June), Canada (peaking in early June), the US (peaking in late June), and UK (peaking in mid July). Continental Western Europe also experienced large community outbreaks during this period but not to the same degree as in the UK. In all of these countries, transmission and health system impact was not uniform, with many areas not being severely affected by the virus.

Winter transmission in the temperate zone of the southern hemisphere

Pandemic virus introduction was observed in most countries of the temperate southern hemisphere by June 2009 coinciding with the start of the usual winter influenza season. As winter transmission accelerated, pandemic (H1N1) 2009 virus rapidly became the predominant influenza virus in nearly all countries, with South Africa a notable exception. During late June and early July 2009, Argentina and Chile experienced peak transmission, followed by peaks in activity in Australia and New Zealand during mid July 2009 with the period of active transmission lasting approximately 12-14 weeks in each country. South Africa, in contrast, experienced an early winter influenza season with a seasonal subtype, influenza A (H3N2). As the influenza season in South Africa reached its peak in early to mid June and began to decline, pandemic (H1N1) 2009 appeared and became the predominant strain, resulting in a second period of influenza during winter which peaked during early August 2009.

Autumn/Winter transmission in the temperate zone of the northern hemisphere

By late August and early September 2009, several northern hemisphere temperate countries, most notably the US, Mexico, and Japan, began to experience a resurgence of pandemic virus transmission coinciding with the beginning of the school season. Transmission in this second wave was much more intense and widespread than in the summer season and represented an unusually early start to the autumn and winter influenza season. Peak activity occurred in October in North America and lasted approximately 10-15 weeks and the intensity of transmission as measured by levels of influenza-like activity, exceeded those seen during the past decade.

By late September, Europe was also experiencing increasing influenza activity beginning in the west and spreading eastward, peaking first in Western Europe, then in Northern Europe, far Eastern Europe, central and Southern Europe, and finally in South-Eastern Europe. The overall Europe infection rates peaked during early November 2009, but active transmission persisted in areas of Central, Eastern, and South-Eastern Europe as of January 2009. In January 2010, pandemic (H1N1) 2009 was the predominant circulating influenza virus worldwide. It accounted for more than 99 percent of influenza A virus detections (See Figure 1-8). In many countries in Europe, rates of influenza illness matched or exceed those observed over the past 5-10 years.

In Central Asia, the available data suggest that the autumn transmission period began in late October and early November 2009, and peaked during late November 2009. The peak of activity was intense but short lived, lasting approximately six weeks.

Within East Asia, early autumn transmission in Japan and in Northern and Southern China began during August 2009 and accelerated during September and early October 2009. No country in the region had experienced significant springtime transmission prior to this period. In Japan, the autumn and winter influenza season arrived unusually early with intensity higher than that observed in all but one of the past 10 years; peak activity occurred during mid November 2009, and persisted through January 2010. In Northern and Southern China, the emergence of pandemic virus coincided with a summertime peak of seasonal H3N2 activity. Overall transmission of pandemic virus peaked in mid November 2009 in both Northern and Southern China, but in both regions active transmission persisted during January 2010.

Tropical zone

Tropical regions of the world, which typically experience year-round transmission of influenza viruses with peak transmission at different and often multiple times in a year, reported the arrival of the pandemic virus and peak transmission rates at varying times. The surveillance data needed for pandemic monitoring are not available in most countries.

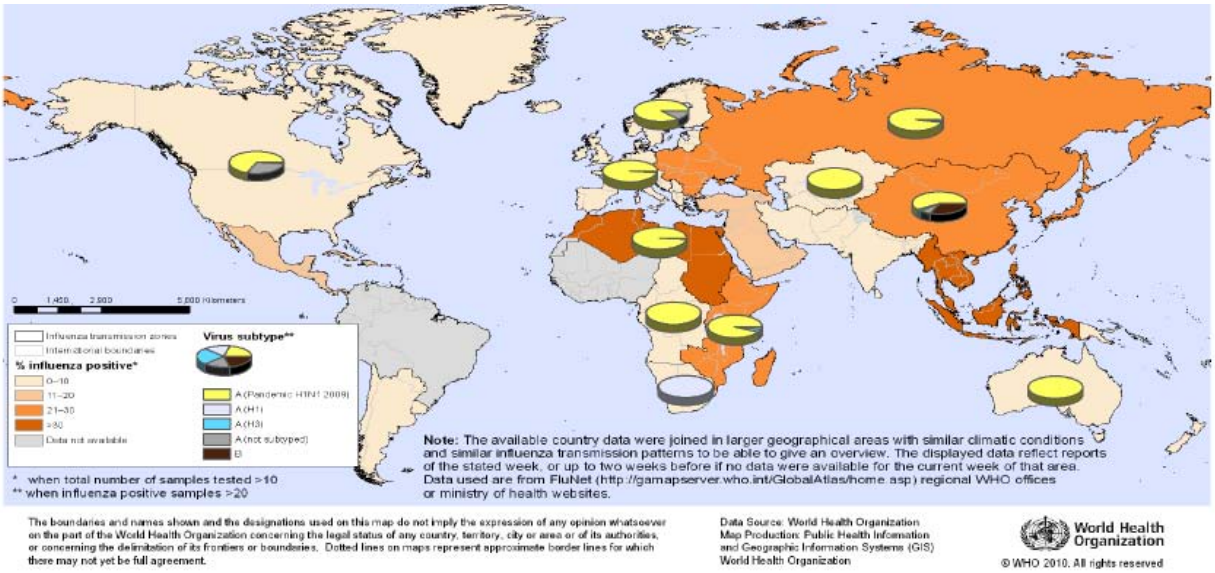

Figure 1-8: Percentage of human specimens tested positive for influenza subtypes as of January 2010

Source: WHO

Note: status as of week 01 03-09 January 2010

Current global distribution and intensity of circulation of influenza viruses, April 2010

Pandemic (H1N1) 2009 has now been confirmed in almost all countries and territories. As of 23 May 2010, at least 214 countries and territories had reported laboratory confirmed cases, including at least 18,114 deaths reported from 135 countries and territories[15].

These numbers refer to laboratory confirmed cases and deaths: they are an underestimate of actual human infections because most of those reporting symptoms are not subject to laboratory testing. Rates of influenza infection are currently on the decline. However, further transmission and outbreaks are expected in West Africa.

1.5 Pandemic (H1N1) 2009 situation in animals

Since April 2009, the pandemic (H1N1) 2009 virus has been confirmed in seven different animal species. In swine, infection has been confirmed in commercial herds in 21 OIE members and territories, including Argentina, Australia, Canada and Serbia (See Figure 1-9). In most cases, the occurrence in swine is linked to H1N1-infected humans. It is possible that the virus has also spread to other swine holdings through movement of incubating, sick or virus-shedding pigs. Given the mild signs in swine, only those countries with active surveillance systems and laboratory testing have detected and reported the infection in commercial piggeries; surveillance programmes have not targeted backyard pigs.

To date, the virus has also been confirmed in turkeys, with outbreaks reported in Chile, Canada, France and USA; ferrets in the USA; cats in France, Italy and the USA; skunks in Canada, dogs in China and the USA, and a cheetah in a zoo in California, USA. Deaths associated with pandemic (H1N1) 2009 infection have been reported in skunks[i] and feline species. To date the virus has caused only mild clinical signs in most animals.

The genetic sequences of influenza virus isolates from animals show a strong genetic homology with those of human strains of pandemic (H1N1) 2009 influenza occurring in the same locations, suggesting that transmission between species is through close contact. Epidemiological investigations have shown that, so far, animals play a negligible role in the spread of pandemic (H1N1) 2009 in humans.

[i] Skunks should now be regarded as a potential source of influenza A virus according to a recent study from USCDC (http://www.cdc.gov/eid/content/16/6/1043.htm).

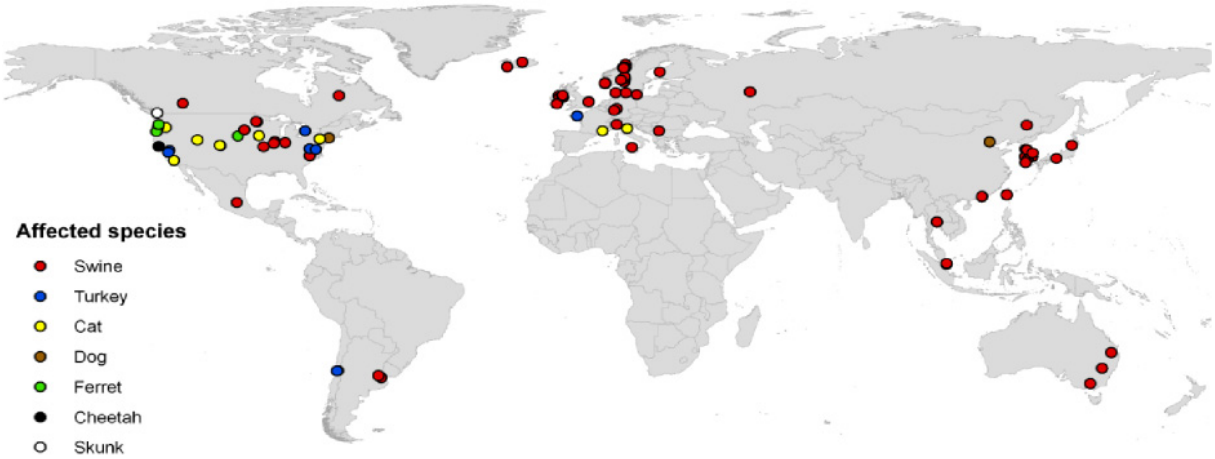

Figure 1-9: Confirmed animal cases with confirmed pandemic (H1N1) 2009 virus

Source: OIE (WAHIS) and FAO EMPRES-I

Note: situation as of 31 May 2010

Since the novel pandemic (H1N1) 2009 virus was first identified in humans, the OIE has encouraged all of its members to intensify their surveillance for potential influenza virus infections in swine or other animals, particularly in cases with a potential link between illness in animals and illness in humans. The OIE's recommendations are being followed: twenty-eight Immediate Notifications have been submitted to the OIE since the outbreak began in April 2009.

1.6 Pandemic (H1N1) 2009: overview of impacts

The pandemic is still underway and the WHO has initiated a review of pandemic (H1N1) 2009 within the context of the IHR. A comprehensive assessment of the pandemic's impact will only be possible over time; reliable mortality and morbidity data are only likely to become available one or two years after the pandemic subsides.

An early analysis of the impacts of pandemic (H1N1) 2009 on levels of mortality and on the health, education, agriculture, transport and tourism sectors, as well as on vulnerable groups and communities, has been undertaken within the context of preparations for this report.

Impact on mortality

Asia and the Americas regions, and Europe/Eurasia regions have reported the highest number of confirmed cases and deaths. Anecdotal reports from many countries indicate significant numbers of fatalities in persons **suspected** of being infected with pandemic influenza who died without being tested. Many of those who were infected may well have died without being diagnosed as suffering from influenza (even with seasonal influenza as many as 75 percent of deaths are not recognized as being influenza related).

However, one consistent finding is that the cumulative numbers of deaths from pandemic influenza in people under the age of 24 has thus far been significantly higher than in any previous influenza season for which there are data, including the 1968 pandemic.

To date the highest rates of deaths in the current pandemic have occurred in the working age population adults (median 35-51) – in stark contrast to seasonal influenza where around 90 percent of deaths occur in the frail elderly, who often suffer from one or more chronic medical condition. A recent study of the mortality burden of pandemic (H1N1) 2009 in the US estimated the number of 'years of life lost' and concluded that the pandemic had a substantial burden, with the impact as severe as the 1968 pandemic when taking into account the markedly young age distribution of influenza-related deaths (See Figure 1-10)[16].

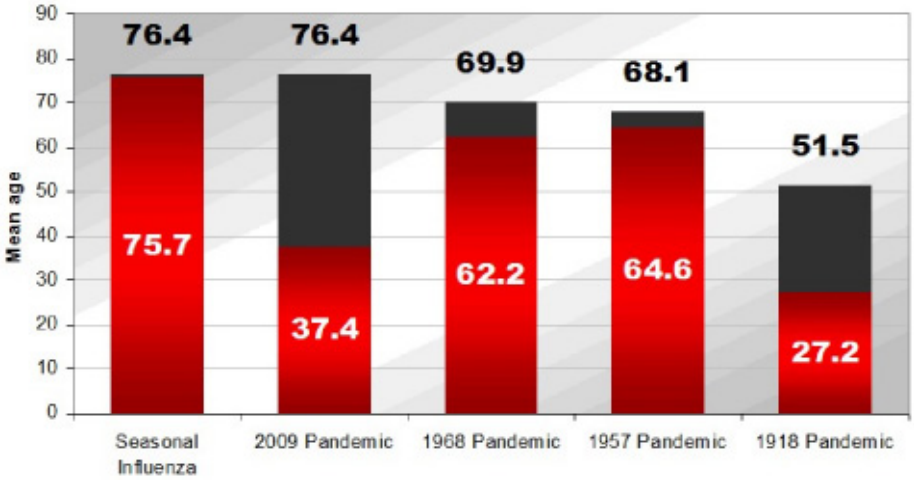

Figure 1-10: Mean age of death from influenza in the USA compared with the average life expectancy at the time of the pandemic

Source: PLoS Currents: Influenza[17]

Only very limited data on the number of deaths in least resourced countries are currently available. A recent study by the UK Health Protection Agency indicated that populations in sub-Saharan Africa could be disproportionately impacted by pandemic (H1N1) 2009[18].

Impact on health care systems

There are several well-documented accounts of the pandemic's impact on health care delivery systems. The impact on outpatient care has been variable: it is influenced by public concern and management decisions of the respective national Ministry of Health. Some countries reported that outpatient service providers and hospital inpatient services were much busier than in a usual influenza season. WHO reported that rates of hospitalizations during the pandemic significantly exceeded universal rates seen during recent previous influenza seasons in all age groups, except for persons more than 65 years of age.

There has been a substantial impact on intensive care units. A much higher than usual proportion of intensive care unit beds was occupied by pandemic influenza patients: special arrangements were often made to transport patients to other areas where resources were available.

Over 45 countries reported that the pandemic led to moderate strain on health services between July and December 2009. The majority were least developed countries. Eleven countries reported that the pandemic placed a severe strain on their health services (Albania, Barbados, El Salvador, Georgia, Kazakhstan, Kyrgyzstan, Ukraine, Republic of Moldova, Mongolia, Saint Lucia, and Sri Lanka), with demand exceeding capacity[i].

International support to reduce health system strain was received by Argentina, Bolivia, Chile, Ecuador, Egypt, El Salvador, Guatemala, Haiti, Jamaica, Lao PDR, Malaysia, Mexico, Nicaragua, Panama, Paraguay, Peru, the Philippines and Uruguay[ii]. There was no evidence that a change had occurred in the virulence of the pandemic virus. The severe impact appeared to be primarily related to limitations in health care delivery capacity. It therefore appears that even though the impact of this pandemic has been classed as 'moderate', there is – particularly in countries with limited resources for health care – high potential for the pandemic to put significant strains on health services leading to demand exceeding the care that is available.

[i] WHO definitions of health system strain:
Low = demands on health services are not above usual levels
Moderate = demands on health services causing some stress to systems above usual levels but still below maximum capacity
Severe = demands on health care services exceeding capacity

[ii] Support was provided through WHO Global Outbreak Alert Response Network (GOARN)

Impact on schools and the education sector

In response to pandemic (H1N1) 2009, many governments and communities attempted to contain the virus through temporary school closures. Direct and indirect effects as a result of school closures include potential adverse effects on students' education, days of education lost, child nutrition and safety. There are also potential negative impacts on household income (and job security) due to absenteeism arising from working parents or guardians who have to stay home to take care of their children. Studies estimate that as a result of school closures in some countries, up to 16 percent of the workforce may be absent, in addition to normal levels of absenteeism[19]. UNICEF reported that special attention has also been given to ensuring that no children or families are discriminated against as a result of their health or H1N1 status.

Impact on specific groups

Several groups have emerged during the course of pandemic (H1N1) 2009 as high risk for severe complications and death from pandemic influenza. Those most at risk include younger age groups; people with chronic illness, pregnant women and recent post-partum women, and indigenous people.

Age: One of the striking features of this pandemic has been the degree to which younger age groups are affected. Most mild disease has occurred in individuals between the ages of fifteen and forty-nine years, however, children under the age of five years have the highest risk of severe disease requiring hospitalization. The rate of hospitalization in this group appears to be at least two to three times higher than the next highest age group. Of children under the age of five years, those under the age of one year are at even higher risk of severe disease. Many of these hospitalized severe cases occurred in previously healthy infants. In contrast, the highest rate of death is in the group from fifty to sixty-five years old. It is expected that the impact on health care infrastructure will be higher in countries with younger populations.

Chronic illness: The pattern of association between severe illness and chronic medical conditions is similar to that observed with seasonal influenza. Conditions that have been associated with hospitalization and death include chronic pulmonary disease, asthma, diabetes and severe immune deficiencies.

Obesity was not previously recognized as a risk factor for severe disease but has been described in a high proportion of severe cases in some institutions. This has not been a universal finding, however, and the degree to which this association occurs varies from place to place. In addition, it is difficult to separate the independent risk associated with obesity from the risk associated with underlying medical conditions such as diabetes which are common in obese individuals.

It is notable that approximately 40 percent of hospitalized cases do not have previously recognized risk factors and appear to have been previously healthy before developing their influenza related illness. This varies significantly by country and in some areas, particularly poorer developing countries, the proportion of severe hospitalized cases with no recognizable underlying risk conditions may be as high as 70 percent.

Pregnancy: Pregnancy was previously recognized as a high-risk condition for seasonal influenza and in previous pandemic influenza strains. In the current pandemic, most institutions have reported that severe cases in pregnant women occur five times more than in the general population. The risk increases the more advanced the pregnancy, and is highest in the third trimester. In a recent study from California, researchers concluded that postpartum women who had given birth within the previous two weeks were also at a higher risk of severe influenza complications[20].

Indigenous peoples: There are few structured **sources of data** available to assess the impact of pandemic (H1N1) 2009 on indigenous populations globally. Based on one recent study from Canada, Australia and New Zealand, rates of hospitalization and deaths per 100,000 population were significantly higher for indigenous populations than for non-indigenous groups[21] (See Case Study 1-1).

In Canada and the US, indigenous populations represent less than 5 percent of the population, however, in Canada, indigenous groups accounted for 17.6 percent of hospitalized cases of pandemic (H1N1) 2009 and in Arizona (US) 17.5 percent. Variations also existed within these groups. Incidence of severe acute respiratory illness in Amerindians in Brazil was 4.5 times higher than in the rest of the population. Australian indigenous populations account for 2.5 percent of the total population, but accounted for 16.4 percent of all people hospitalized in Australia with pandemic (H1N1) 2009 during the first wave of the pandemic, and 11.5 percent of all deaths from pandemic (H1N1) 2009. Indigenous populations appear to have an approximately three to six fold higher risk of developing severe disease and of dying, than non-indigenous populations.[22]

During the first wave of the pandemic in Canada, First Nation people accounted for just under one fifth of all patients hospitalized with pandemic (H1N1) 2009. Aggressive interventions to promote hygiene, treatment with antivirals and immunization against pandemic (H1N1) 2009 in First Nation populations were rapidly implemented. During the second wave the percentage of hospitalized cases of pandemic (H1N1) 2009 in Aboriginal peoples dropped to six percent of all cases.

In Australia targeted interventions were introduced to protect the most vulnerable populations from pandemic (H1N1) 2009 during the first wave of the pandemic. An integrated government response to pandemic (H1N1) 2009 that included Federal, State and Territorial governments, health professionals and Indigenous organizations was developed to strengthen services and to ensure that antivirals would be readily available in all Aboriginal and Torres Strait Islander populations.

Case Study 1-1: Reducing the impact of H1N1 on indigenous communities

Source: La Ruche and Tarantola et al.[24], Zarychanski and Stuart et al[25], Johnson[26]

Indigenous peoples and other disadvantaged ethnic groups have previously been recognized as having increased risk of severe disease associated with seasonal influenza. The exact reasons for this are unclear but several have been proposed. Indigenous populations tend to have greater prevalence of underlying health conditions such as obesity, diabetes and chronic respiratory diseases[23]. Many of these groups have more limited access to care. Early treatment of high-risk individuals appears to result in better outcomes, and this could decrease the risk of severe disease in these groups. However, studies in Australia and the U.S. indicate that there is an increased risk associated with being a member of a disadvantaged minority that is independent of the presence of an identifiable risk condition.

Impact on animal health and the agriculture sector

The major impact of pandemic (H1N1) 2009 on animal health, agriculture and the environment occurred with the initial apportioning of blame to swine and use by the media of the term 'swine flu', which affected trade of pork meat and pork products worldwide. In countries reporting outbreaks, there were severe drops in demand for pork products, with a consequent accumulation of supplies. Flow-on impacts negatively affected market prices and thus affected producers' bottom-lines.

Currently, 'classic' swine influenza is characterized as a respiratory illness caused by influenza viruses circulating in pig populations and is capable of routinely spreading within and among pig populations. Pandemic (H1N1) 2009, however, is still occurring as a sporadic disease in swine (See Figure 1-9). It is not yet clear if pig infections with pandemic (H1N1) 2009 will become routine, and whether this influenza strain will become established in the swine populations. The OIE continues to work with its Members to better understand the occurrences of this new pandemic virus in pigs, and with influenza experts to understand the disease epidemiology associated with these occurrences.

Pandemic (H1N1) 2009 underscored the importance of human and animal health authorities working closely together when new events occur to ensure there is science-based decision making by regulatory bodies and to discourage arbitrary imposition of trade restrictions on swine or other animal products. For example, with the case of pandemic (H1N1) 2009, messages to the public should have been agreed and clearly identified the negligible risk to humans of consuming processed pork or other food products derived from pigs. Influenza viruses are not known to be transmissible to people through eating processed pork or other food products derived from pigs[27]. Contingency planning should also take account of human to animal transmission and potential impacts.

Impact on transport and tourism

The tourism and travel industry remains particularly vulnerable to the effects of a pandemic because it is heavily dependent upon public perceptions. This sector was significantly affected by pandemic (H1N1) 2009. The business travel and Meetings, Incentives, Conventions and Exhibitions (MICE) tourism segments of the travel and tourism sector were especially affected, in part because business meetings were often not scheduled due to uncertainty over developments with the pandemic. Nonetheless, much effort was put into mitigating the effects of the pandemic on this sector by WHO and the World Tourism Organisation (UNWTO).

Consistent, well-coordinated and properly communicated health measures at the national level have been highlighted by the UNWTO as being crucial for helping to limit the impacts of the 2009 H1N1 pandemic on the travel and tourism sector (See Case Study 1-2). Immediately following WHO's 25 April 2009 declaration of a public health emergency of international concern, the Tourism Emergency Response Network (TERN) network was mobilized. As a 'network of networks', TERN is composed of 30 leading global travel and tourism associations whose goal is to make travel safe for tourists and to reduce negative impacts on the travel and tourism sector. Through TERN the UNWTO, in close collaboration with WHO and International Civil Aviation Organization (ICAO), was able to coordinate joint efforts and develop common messages to address the pandemic as it evolved. As a result, tourists were provided with timely information regarding the pandemic to promote safe travelling behaviour, uniformity in information sharing was enhanced, and practical response strategies and recommendations for the tourism and travel sector were developed. One example of such a strategy was the initiative by some cruise liners to offer credits for passengers who were sick, thus mitigating the economic impacts of the pandemic while simultaneously encouraging healthy travel.

In the midst of the pandemic (H1N1) 2009 outbreak, UNWTO conducted two regional Review and Preparation Exercises to identify the needs of the travel and tourism sector under pandemic circumstances, in an effort to adjust planning, and best prepare for the months to come. Thirty one countries from Africa, Europe, Middle East and Americas regions were represented and the participants included personnel from Ministries of Health, Ministries of Tourism and Aviation, Departments of Immigration and Embassies. UN agencies and private sector organizations involved in travel and tourism also participated.

In both the Madrid and Bahamas exercises, topics for discussion included experiences and lessons learned, key challenges for the months to come, and strategies and actions to help limit the impact of pandemic (H1N1) 2009 on the travel and tourism sector. As a result, recommendations for the global travel and tourism sector were reached to improve overall pandemic preparedness procedures and business continuity plans for the travel and tourism sectors. Countries that are economically dependent on tourism need to avoid travel restrictions and border closures, increase preparedness, consistent and timely action, and ensure regular and timely exchange of information. Conclusions from the Bahamas exercise also highlighted the high dependency of many countries on travel and tourism, thus, the need for an appropriate pandemic response. The conclusions and recommendations were widely applied and implemented by respective Members of UNWTO, and in some cases, UNWTO assisted directly with implementation.

Case Study 1-2: UNWTO 2009 international review and preparation exercises: Madrid and the Bahamas

Source: UNWTO[28 29]

With more than two billion passengers travelling every year on scheduled air operations alone, the civil aviation environment also poses particular challenges regarding the potential for disease to be transported from one region to another. Whilst public health experts are normally responsible for a national preparedness plan, with respect to planning in the aviation sector both public health and aviation expert assistance is required. The interface between public health and aviation sectors has therefore been especially important. One of the main thrusts of work by the ICAO to mitigate the impacts of a pandemic on the aviation industry has been to strengthen the link between the public health and aviation sectors. One such effort has been through the November 2009 revision of the Airport and Air Traffic Emergency guidelines, which introduced public health emergencies into scenario planning. Further planning for systematic simulation exercises is needed to test plans and track progress.

Finance sector impact

IMF research indicates that globally, pandemic (H1N1) 2009 had a limited impact on financial sectors. It is recognized, however, that precautionary measures were taken in major financial centres and in the banking system prior to the pandemic partially due to H5N1 preparations, which helped them to ensure a measured response.

1.7 Other pathogenic influenzas of concern

Waterbirds form the natural host reservoir of Influenza A viruses and are at the origin of Influenza A viruses that have adapted to mammal species, including humans. Of the 16 hemagglutinin subtypes, the H2, H5, H6, H7 and H9 viruses are those currently considered to have pandemic potential[30]. Poultry outbreaks caused by HPAI and LPAI viruses of the H7N1, H7N2, H7N3, H7N4, and H7N7 have taken place in recent years, affecting more than 75 million birds[31]. Subtypes H7, H9, H1 and H3 have sporadically infected humans or have the potential to do so (See Annex 6: Confirmed avian influenza A viruses infections of humans).

Influenza A subtype H7 viruses have resulted in over 100 cases of human infection since 2002 in Canada, Italy, the Netherlands, the UK and the US. Clinical illness ranges from conjunctivitis to mild upper respiratory illness to pneumonia and death[32].

For example, in 2003 the Netherlands reported outbreaks of **highly pathogenic avian influenza (H7N7)** virus among poultry on multiple commercial farms. Overall, 89 people were confirmed to have H7N7 infections associated with the outbreak. Most infections were mild conjunctivitis (eye infections), however five cases also had influenza-like illness with cough, fever and muscle aches; one death occurred in a veterinarian who visited one of the farms and developed complications from H7N7 virus infection, including acute respiratory distress syndrome. Dutch authorities also reported three possible instances of human-to-human H7N7 virus transmission from poultry workers to family members[33].

Recent studies indicate that some newer H7N7 subtype strains appear more adapted for human infection, and may present an increasing risk to humans. Increased isolation of subtype H7 from poultry and the ability of this virus to cause severe human disease warrant continued surveillance and characterisation of these viruses[34].

Influenza A H9 has only been identified in low pathogenicity form. H9N2 viruses are endemic in poultry populations in parts of Asia and the Middle East, and several H9 infections have been reported in humans. To date there has been no evidence of human-to-human transmission[35]. H9 vaccines have been used in several countries including China, Iran, Pakistan and other countries in the Middle East[36].

A recent example of novel influenza viruses occurring at the animal-human interface is the outbreak of **Influenza A (H3N2)** in October 2009 in mink fur farms in Denmark. It involved 26 outbreaks on the continental part of the country affecting 547,550 susceptible minks. The mortality in minks averaged 0.8 percent in the affected holdings, while the morbidity has averaged approximately 25 percent (ranging from less than 1 percent to 97 percent). While no human infections associated with this particular viral strain have been reported to date, investigations are continuing to evaluate the virus's potential for infecting humans[37]. It should be noted that H3N2 viruses have been responsible for human pandemics (for example, the 1968 Hong Kong influenza; (See Chapter 4, Figure 4-1) and animal disease in swine in Europe and North America for decades.

With subtype H5N1 viruses now endemic in countries in Asia and Africa, and subtype H7 viruses continuing to circulate across Europe and North America, future human infection with viruses of both subtypes will likely continue to occur. The study of H5N1 HPAI viruses has greatly improved the understanding of avian viruses. Application of this knowledge and improved surveillance will strengthen assessment of other HPAI and LPAI viruses with pandemic potential, improving ability to respond to and reduce the severity of future pandemics, regardless of virus subtype[38].

1.8 Overview of progress with political commitment and collaboration for animal and pandemic influenza since 2008

Political commitment

Since 2008, much work has been done to address pandemic preparedness and response priorities at international, regional, national and local levels. Participants at IMCAPI 2008 (Sharm el Sheikh) expressed determination to continue efforts for multisectoral, multilevel and multicountry pandemic preparedness, building upon the avian and pandemic influenza efforts to address risks associated with emerging diseases of animal origin. Governments, international agencies and other stakeholders at the recent IMCAPI 2010 in Hanoi demonstrated ongoing political commitment to sustaining momentum and building on the substantial preparedness and response measures developed so far. This resolve is clearly expressed in the Hanoi Declaration (See Annexes 3 and 4).

Efforts to expand and strengthen international partnerships are ongoing, several elements of which have been captured by the UN Secretary General Ban Ki-Moon's call for 'New multilateralism'[39]. This addresses global issues within the paradigm of prioritizing the provision of global public goods; applying integrated approaches to addressing complex challenges; supporting the most vulnerable; mobilizing broader forces, including the private sector, civil society and academia; and drawing upon the strengths of all nations of the world.

As a result of the current pandemic there has been an increased focus and significant budget contribution towards human health and pandemic preparedness along with, however, a reduced sense of urgency and funding for avian influenza and other animal health issues. There is an ongoing need to strengthen capacity for veterinary services in many parts of the world, and an increasing need to understand the drivers for the emergence of disease at the animal-human interface in an increasingly complex and interrelated world.

Political awareness of the risks of diseases and political commitment to containing them tends to rise when outbreaks first occur, but then fade over time after an outbreak has run its course and as other priorities such as financial crises or other health issues become more prominent. It is fortunate that pandemic (H1N1) 2009 did not seriously aggravate the global economic downturn. Had the incidence of the disease been more severe, effects on overall economic recovery could have been greater[i]. Despite this, some countries did suffer significant economic impacts. For example, Mexico's GDP is estimated to have been reduced by 0.3-0.5 percent in 2009. A drop in international tourism reduced external revenue by as much as US$1.5 billion. In some countries a lack of sustained attention has led to underinvestment in some areas of detection, prevention, preparedness and response capacity.

Collaboration – political, private sector, civil society and academic

The efforts by the international community and governments around the world to address pandemic (H1N1) 2009, demonstrated ongoing international commitment and collaboration to strengthen capacity for both the current and future influenza pandemics. The UN System and Partners Consolidated Action Plan for Animal and Human Influenza (UNCAPAHI) has provided ongoing international support for national planning and preparedness efforts to strengthen capacity across seven objectives: animal health and biosecurity, sustaining livelihoods, human health, coordination, communication, continuity under pandemic conditions and humanitarian common services support. International collaboration to progress One Health approaches (Winnipeg Technical Meeting, Canada, March 2009) with support from the Government of Canada and more recently with support from USCDC ('Operationalising One Health', Georgia, USA, May 2010) have also been notable steps forward since 2008.

Regional collaboration has progressed in several regions around the world. FAO has supported the establishment of regional epidemiology and laboratory networks in the African region, and the WB has supported the African Partnership for Livestock Development, Poverty Alleviation and Sustainable Growth (ALive). Political support in the Asia region has been achieved through ASEAN, exemplified by bodies such as the Technical Working Group on Pandemic Preparedness and Response (TWGPPR), Regional Cooperation Program on Highly Pathogenic and Emerging and Re-emerging Diseases (HPED) supported by the EU (December 2009), and the ASEAN Plus Three EID Programme supported by the Australian Government since 2003 (See Case Study 1-3). This has involved close engagement between governments and agencies including FAO, OIE, UNICEF and WHO as core partners for regional coordination and prioritisation of activities. Regional engagement has also extended to sub-regional initiatives such as the Mekong Basin Disease Surveillance Program (MBDS) for cross-border surveillance.

[i] The WB has estimated that a severe flu pandemic could reduce world GDP by 4.8 percent, or about $3 trillion. A mild flu pandemic would cost about 0.7 percent of GDP. See *Evaluating the Economic Consequences of Avian Influenza*, September 2008, available at www.worldbank.org/flu. The H1N1 flu pandemic has cost substantially less (so far).

In recognition of the human, economic, social, and security threats posed by communicable diseases, ASEAN Member States have worked over the past several years to implement integrated approaches in strengthening surveillance and response to emerging infectious diseases with a focus on multisectoral collaboration, information sharing and multicountry approaches.

ASEAN supports regional cooperation on pandemic preparedness between member states in a number of ways. A Technical Working Group on Pandemic Preparedness and Response was set up as a coordinating body to drive multisectoral cooperation in the region. This work is linked to a regional Agreement on Disaster Management and Emergency Response (2009). A project was also developed to stockpile antivirals and personal protective equipment, in the event of a pandemic.

Issues in the animal-human-environment interface are targeted specifically by the ASEAN Secretariat Working Group on One Health, which coordinates various health-related initiatives of the ASEAN Secretariat to maximize the use of resources and promote efficiency and integration.

Information sharing within the region is facilitated via the Emerging Infectious Disease (EID) Plus Three Countries Programme supported by AusAID, which aims to enhance regional preparedness and capacity through integrated approaches to prevention, surveillance and response to EIDs. A website (www.aseanplus3-eid.info) provides a portal for news surveillance and platform for information exchange across relevant sectors.

Other mechanisms for regional cooperation include multisectoral cross-border outbreak investigation, exercise management training programmes and coordination across laboratory networks through the ASEAN's Plus Three Partnership Laboratories.

Case Study 1-3: ASEAN's regional mechanisms in the midst of pandemic (H1N1) 2009: an example of regional cooperation and pandemic response

Source: ASEAN Secretariat

Public-private partnerships have also been further developed in some regions. For example, a new programme supported by USAID in Bangladesh, Egypt and Indonesia is strengthening private sector engagement in decision making processes for prevention, detection and control of HPAI through joint workshops and training initiatives (See Chapter 3, Case Study 3-10). FAO has also been working with the private sector in some countries to strengthen compensation frameworks for livestock losses.

An example of civil society engagement is the UNICEF and International Federation of Red Cross and Red Crescent Societies (IFRC) initiatives through schools to reduce childhood infections, strengthen community level awareness of disease spread and preparedness for future outbreaks. In some countries table top and simulation exercises have been conducted with village and migrant health volunteers to improve life skills and community risk management of pandemic influenza.

WHO recently hosted a global consultation on public health research for influenza (Geneva, November 2009) focusing on five research streams: reducing the risk of emergence of pandemic influenza; limiting the spread of pandemic, zoonotic and seasonal epidemic influenza; minimizing the impact of pandemic, zoonotic and seasonal epidemic influenza; optimizing the treatment of patients; and promoting the development and application of modern medical health tools[40]. European research on Pandemic and Avian Influenza has been financed since 2001 by the EU, with programmes engaging up to 120 laboratories across 21 European countries on issues relating to development of vaccines for avian species, improved diagnosis and early warning systems, the ecology and pathogenesis of avian influenza infections, migratory birds, and technology transfer[41].

There are also collaborative regional research initiatives underway, including the Asian Partnership for Emerging Infectious Disease Research (APEIR) supported by Canada's International Development Research Centre (IDRC). While it has not been possible to assess broader progress on research collaboration through this report, most agencies recognise the need for further strengthening of research collaboration, and see this as integral to future development of capacity across all sectors for animal and pandemic influenza.

1.9 Progress with capacity building for animal and pandemic influenza

The international community, governments and the private sector have continued efforts to strengthen capacity for responding to and preparing for animal and pandemic influenza. Of the commitments made at IMCAPI 2008, ongoing support is still required for many areas including the need to reduce inequities for disadvantaged populations and least resourced countries, achieve the MDGs, and eliminate H5N1 in domestic poultry. The seven key objectives of the UNCAPAHI provide a framework for an update of current status and contributions to avian and pandemic influenza over the last reporting period:

Animal health and biosecurity

Concerted national and international efforts are still required for countries and regions where H5N1 HPAI viral transmission persists, with a goal of elimination and eventual eradication of H5N1 in domestic poultry. FAO and OIE have worked with governments to strengthen capacity of veterinary services to respond to animal health concerns and the establishment of adequate biosecurity standards in small, medium and large poultry production systems worldwide. OIE member countries have provided timely reporting of events, and the level of networking and sharing of information across FAO/OIE laboratories has continued to increase, as have a range of capacity building activities.

The PVS Pathway which includes PVS evaluations and PVS Gap Analysis provides a long-term mechanism for improving animal health systems in a sustainable manner (for further details see Chapter 3, Section 3.12). However, to date, **veterinary systems remain weak** in many countries, and **the global level of biosecurity in the poultry chain remains low**. Several countries affected by H5N1 are currently adapting mitigating strategies with a focus on longer term sustainable approaches. Surveillance has improved in most countries though there is scope for improvement. Support has been provided for HPAI outbreak response in poultry and waterfowl, and more recently for animal surveillance efforts associated with the pandemic (H1N1) 2009 outbreaks.

In many countries **veterinary legislation is outdated and inadequate** to address the current challenges. As noted by the Maldives at the recent IMCAPI 2010, there is also a need to define the risks involved with imports of animals (including pet birds and other animals) and animal products across countries. This would enable countries to develop better policies, legislation and strategies for One Health approaches. This also relates to the ongoing need for all countries to follow international standards on animal trade[42].

Increased efforts are needed to strengthen prevention of emerging diseases at **the animal-human interface**; this was progressed at a technical level during 2009 (PHAC, Winnipeg) and in May 2010 (USCDC, Atlanta). Further research and development initiatives are also needed, with greater levels of multidisciplinary and cross-sectoral engagement.

There is **minimal funding available in many countries for laboratory diagnostics**, an area which is critical for effective surveillance measures. OIE has seven Laboratory Twinning Projects underway for Avian Influenza and Newcastle Disease, and two further projects will be implemented during 2010. These projects will actively improve capacity for early detection and rapid response for animal influenzas in areas that are currently under-represented in terms of expertise. One OIE Laboratory Twinning Project on avian influenza and Newcastle Disease has already been completed. Work is also continuing with OFFLU to strengthen the global animal influenza surveillance network.

Sustaining livelihoods

A significant shift in policy based on a **more judicious understanding of the role of poultry in rural life**, has resulted in changes to mitigation strategies for disease outbreaks. Several UN agencies, with the OIE and the WB, have helped establish mechanisms to protect and sustain livelihoods of those affected by avian influenza impacts through more dynamic and inclusive participatory approaches including stakeholder consultations. This work has included the investigation and development of an improved understanding of optimal mechanisms for compensating those who may lose birds and/or property through the application of control measures.

Human health

Under the aegis of WHO, agencies including UNICEF, ILO, IOM, and UNHCR have intensified their efforts to help countries build and maintain sound systems for safeguarding the health of human populations during a pandemic. **Early warning systems have been improved**, for example, through the WHO Influenza Laboratory network. Disease surveillance capacity has also been strengthened through the work of UNHCR in refugee camps in several different countries. Implementation of the IHR has also resulted in **improved national capacity to detect, assess, notify and respond to public health threats**. The IHR was an effective and instrumental tool to detect and monitor the pandemic (H1N1) 2009 outbreaks, and was a basis for the WHO Director General to declare the pandemic.

Coordination of national, regional and international stakeholders

The response to pandemic (H1N1) 2009 has also demonstrated strengthened **international collaboration** in the face of a global threat. Coordination efforts by OCHA, UNDP, UNSIC and WFP on animal and human influenza have been significant, and tangible improvements can be seen at country, regional and global levels, through **increasing use of integrated approaches** by governments. This work has formed a solid foundation, as evidenced by the stronger coordination in responding to the pandemic (H1N1) 2009 outbreak. Information sharing, at national, regional and international levels remains a critical area for further development, though experience with pandemic (H1N1) 2009 highlighted increased capacity to achieve transparent sharing of information.

One major area identified at IMCAPI 2008 for renewed attention is the **development, standardization and utilization of indicators** to enable more quantitative analysis of progress. This still requires development and commitment from all agencies, at all levels. The significant scale-up in global investments has not been matched by an equal commitment to evaluation, but implementation has lagged, so that there is as yet insufficient assessment of progress[43].

Communication: public information and supporting behaviour change

Communication remains an area which requires significant support across animal, human and environmental health stakeholders. Communications for behaviour change interventions at the community level have been able to generate knowledge and create awareness, but increased knowledge has not necessarily translated into permanent adoption of recommended behaviours and protective practices. Therefore these interventions need to be complemented by multiyear funding investments.

Outbreak communications for H5N1 and H1N1 in poultry and humans, and behaviour and social change communication improvements have led to **increased knowledge and promotion of the adoption of protective practices**. This has been a focus for several agencies over the past few years; particularly through UNICEF, FAO, OIE, WFP, ILO, IOM and UNHCR support. In most countries, evidence-based communication interventions and accurate messaging have contributed to the adoption of protective behaviours that helped reduce transmission of H1N1. For example in Egypt, following intensive and wide-scale communication interventions in 2007-2008 which used both mass-media and face-to-face communication, an Egyptian Demographic Health Survey indicated that 99 percent of the population knows about avian influenza[44]. Much of the work of the UN agencies targets vulnerable groups, for instance, UNICEF's work in Mexico following the H1N1 outbreak, where it supported the production of radio spots and the dissemination of materials in indigenous languages to promote hygiene practices in schools and community kitchens in three of the most affected states (See Case Study 1-4).

Several evaluations have shown that communication strategies have been effective in reaching out, raising awareness and improving knowledge of avian influenza, despite competing health and national emergency priorities. Continuing an evidence-based approach of working with communities by **understanding the socio-cultural drivers of change** will continue to be vital, especially for progress on the health-related MDGs.

Even with these successes, the global communication response still requires much more to be done to prevent the spread of H5N1 in poultry, and a society-wide approach is being advocated by FAO and OIE. The goal is to promote biosecurity as a professional norm along the whole production and marketing chain, as well as promoting community-based reporting and active public engagement in reporting and control measures.

In collaboration with UNICEF, the awareness raising campaign for avian influenza has been launched across the South Asia Region through various media, and community mobilization through schools and community groups. In Bhutan, the result of the Knowledge, Attitudes and Practice (KAP) survey in September 2009 indicates the level of awareness about avian flu is overall high across various groups. Notably, 83 percent of poultry farmers, one of the high risk groups, are aware of avian flu and this has helped in early detection and containment of their first outbreak in February 2010. It is extremely important for preventing and controlling outbreaks that high risk groups such as poultry traders and farmers are well aware of avian flu. In Nepal, the awareness campaign through TV and radio targeted high risk districts at border areas; a trans-border workshop for quarantine and security officers was conducted at the Nepal-India border. The multiple outbreaks in February and March 2010 in seven districts were successfully contained thanks to the intensive community campaign to prevent transmission, including effective media management through daily local briefings.

Afghanistan experienced more than 20 outbreaks in early 2007. A comprehensive communication strategy was prepared with UNICEF's assistance, based on the results of the KAP survey. Women backyard poultry owners were considered the primary target for the communication activities. They are often the poorest, most difficult to reach and least likely to own TV or radio, or to participate in public gatherings. In rural areas where literacy rates for women are around 11.2 percent[45], the project authorities ensured women-to-women awareness-raising by training women to lead and form communication emergency response teams (ERTs). Important messages were delivered by women's ERTs through schools, other institutions and house-to-house visits. Despite difficult security situations the women trainers reached out to approximately two million people in and around high risk provinces. A high level of coordination exists among the ministries in delivering preventive messages. The Ministry of Rural Rehabilitation and Development (MRRD) facilitated the provision of training through the Community Development Councils (CDCs) formed by the National Solidarity Project (NSP). In response to the pandemic (H1N1) 2009 outbreak in October 2009, there also was a high degree of collaboration with the Ministry of Religious Affairs (MORA) in raising H1N1 awareness among religious travellers. While the Bank project in Afghanistan ended in March 2010, the communication working group composed of seven ministries, WHO and UNICEF continues to work together, with the leadership of the Ministry of Public Health (MOPH).

Case Study 1-4: Communication strategies in Afghanistan, Bhutan and Nepal

Source: World Bank

Continuity under pandemic conditions and humanitarian common services support

Several of the participating UN agencies have provided assistance to governments to develop, test and advance their pandemic preparedness plans to prepare adequately for the economic, governance, societal and humanitarian impacts and to ensure the availability of functioning and effective common services. WFP provided support for logistics, to strengthen national capacities during a pandemic and ensure continuation of humanitarian services support.

Business Continuity Planning (BCP) is at the heart of the multisectoral whole-of-society approach to pandemic preparedness. It is also important that essential sectors are prepared for critical functioning during potential severe disruptions of inter-dependent services: health, energy, transportation, food, water and sanitation, law and order, defence, financial services and telecommunications. The pandemic (H1N1) 2009 has created an upsurge in national government and UN system preparedness activities to address the potential humanitarian impact caused by a pandemic. However, given that the H1N1 virus onset had a relatively low impact on societal sectors and services beyond health, **the level of progress in non-health preparedness continues to remain relatively low**[i].

Two main challenges that many countries face when addressing pandemic preparedness are: 1) the perception that pandemics only impact human health, and 2) a continuing lack of clarity of the necessity for holistic society-wide multisector preparedness planning. Pandemics can affect operational continuity of essential services, leading to disruption of services and supplies. This is often neglected.

Furthermore, the state of preparedness to respond to a severe pandemic is challenging in countries with fewer economic resources. Some countries are already coping with more immediately pressing challenges such as food security, access to water and other major issues.

[i] According to the summary data on 'operational continuity of vital infrastructures' extracted from the OCHA/PIC website (http://www.un-pic.org/PIC/pages/indicatorList.aspx?q=3), an estimated 13 percent of all national preparedness plans incorporate high level of multisectoral preparedness, while further 19 percent have a degree of medium preparedness. An estimated total of 68 percent of national plans have very little multisectoral preparedness developed or none at all.

Most **African** countries report inclusive coordination mechanisms incorporating key actors. However, lack of finance and resources has limited implementation of pandemic plans. Very few African countries have developed business continuity planning for key sectors to ensure continuity of essential services. At the same time, good progress was made in the *Africa Preparatory meetings for the ISDR Global Platform* meeting, identifying pandemic as one of the key disaster threats. The Government of Uganda provides a good example of a country in the region which has strengthened pandemic preparedness and disaster response through use of simulation exercises (See Case Study 1-5).

In October 2009, the Government of Uganda and the United States Africa Command conducted a table top exercise to further develop national and regional capacity in disaster response, focusing on a severe influenza pandemic. Supported by the US Center for Disaster and Humanitarian Assistance Medicine, this exercise worked on advancing dialogue among governments to build relationships and enhance modalities for better civil-military cooperation.

The exercise consisted of two forums (national and regional) for strategic coordination and international response. The exercise was divided into four sessions, with scenarios progressing through the phases of the disaster cycle to simulate a realistic sequence of events that could occur during a severe influenza pandemic. Key areas of focus included transportation, security, engineering, public health/medical, humanitarian assistance and communication.

While the outcomes are still being assessed, the exercise created an excellent opportunity for senior and mid-level military leaders to train with civil authorities in disaster management, pandemic preparedness and coordination. It assisted participating nations with understanding the potential roles of international organizations, NGOs, and regional entities in the management of a pandemic response, and enhanced the capability of host nations to respond to complex humanitarian emergencies.

Case Study 1-5: Pandemic preparedness exercise, Uganda 2009

Source: WFP

Latin America and the Caribbean report the necessity for increased involvement of sectors beyond health in national planning for pandemic preparedness. Different countries within the region are at varying stages of the inclusion of multiple sectors in terms of planning and implementation at local levels, including development of BCP for continuity of essential services.

Many countries of the **Asia and Pacific** regions report that they have strong, established and operational multisector coordination mechanisms. However, most countries have not yet addressed business continuity planning for essential services. In addition, implementation of pandemic plans has not yet reached sub-national or local levels or remote communities.

Europe and Central Asian countries report various levels of multisector preparedness across the region, with high levels of preparedness in the richer EU countries, moderate preparedness in the new EU and Accession States, through to low levels of preparedness in the resource-poor, typically The Global Alliance for Vaccines and Immunisation (GAVI)-eligible countries.

Middle East and North Africa countries report that they have established clear roles and responsibilities for key actors. The majority of national plans focus on addressing avian influenza, with a focus on preparedness activities in the human health sector. There is strong progress with health sector preparedness, but awareness of the importance of other sectors is significantly lacking.

Many countries across the globe recognise the importance of collaboration with civil society, NGOs and Red Cross/Red Crescent societies on community-based preparedness at provincial and district levels, ensuring that essential services and messages reach the most vulnerable populations at all levels.

Populations of humanitarian concern across all regions, including refugees, internally displaced persons, migrants, ethnic minorities, the poor, older people, people with disabilities and the homeless, are especially vulnerable to the impacts of pandemics and may be overlooked in government planning. Social mobilisation projects conducted by IOM in Senegal which support migrant workers and others provide an example of how governments can protect and build resilience in potentially vulnerable groups (See Case Study 1-6).

The West African country of Senegal maintains dynamic migration patterns, as it connects Sub-Saharan Africa, North Africa, and Europe, making it a transit country for many migrants. Senegal produces rice, sugar cane, seafood and other produce, attracting seasonal migrant workers as well as migrants en route to Europe. The International Organization for Migration (IOM) has implemented various social mobilization project activities to strengthen migrants' and border populations' knowledge and capacity to respond to pandemic influenza.

One such activity targeted the Saint Luis region of Senegal, which borders Mauritania, where there is daily movement of different categories of migrants. IOM's community social mobilization project centred on migrant friendly information, education and communication (IEC) material based on WHO and UNICEF key messages, promoting healthy practices to decrease the spread of pandemic influenza. To target different migrant groups, the information flyer was designed to be socially, culturally, and linguistically appropriate as well as gender sensitive.

In November 2009, the IOM worked in collaboration with UNOCHA and the Senegalese Red Cross to organize a community based exercise for the local government in Richard-Toll, Senegal, to raise awareness of the need for a pandemic preparedness plan. The exercise highlighted the potential impact of an influenza pandemic on both the health and non-health sectors and the need to plan a coordinated response to pandemic influenza, including addressing the needs of migrants and border communities. Participants included regional administrative authorities from departments of health, sanitary services, the fire department, civil protection, security and control border corps. Traditional leaders, community leaders, community organizations and civil society were fully engaged in this exercise to encourage a sense of ownership of pandemic planning. The multilingual dialogue focused on scenarios to identify solutions that were possible to implement in their communities, and at the end of the workshop, participants completed proposals for the development of a pandemic preparedness plan at the district and community levels.

Case Study 1-6: Migrant and border populations in Senegal

Source: IOM

1.10 Conclusions

H5N1 HPAI

- 63 countries have experienced disease events of H5N1 HPAI in domestic poultry and wild birds since 2003. In 2009 this was reduced to 12 countries with confirmed disease outbreaks, however this decline has been interrupted in 2010 with an increase in the number of events and 15 countries affected. Two new countries have reported outbreaks in 2009-2010.
- HPAI H5N1 remains entrenched in Indonesia, Southeast Asia, China, the Ganges River Delta and Egypt.
- Since 2003 there have been 498 human H5N1 HPAI confirmed cases, and 294 deaths reported in 15 countries. With almost double the number of confirmed human H5N1 AI cases reported in 2009 (73 confirmed cases/32 deaths, compared with 44 confirmed cases/33 deaths in 2008), and ongoing circulation of virus in certain poultry populations, it is clear that H5N1 remains both an animal and human public health concern.
- Almost all human cases of avian influenza A (H5N1) infection have occurred in countries with ongoing circulation or reintroduction of A (H5N1) viruses in domestic poultry.

Pandemic (H1N1) 2009

- On 25 April 2009, a novel influenza A (H1N1) virus emerged from Mexico and the US. As of 23 May 2010, at least 214 countries and territories have reported laboratory confirmed cases of pandemic (H1N1) 2009, including at least 18,114 deaths in 135 countries.
- Since April 2009, the pandemic (H1N1) 2009 virus has been confirmed in commercial swine herds in 21 countries, and appears to have been introduced to swine herds by infected humans. Seven different animal species have so far been infected by the virus.
- Assessment of the full impacts of pandemic (H1N1) 2009 on mortality and public health systems will likely take one to two years to complete.
- To date several groups have been identified as high risk for complications and death from pandemic (H1N1) 2009 including younger age groups, people with chronic illness, pregnant women, and indigenous groups. Targeted support for preventative health care services may reduce disproportional impacts of pandemic influenza and other public health threats on vulnerable groups.

- A number of countries, particularly those in low resource settings, have experienced strains on health services. Initial impacts on animal health and agriculture were related to public concerns about the safety of swine products and the role of swine in transmission of pandemic (H1N1) 2009 virus. However, to date swine have played a negligible role in the transmission of the virus to humans. There is a continuing need for science-based decision making by regulatory bodies to discourage arbitrary imposition of trade restrictions on swine and pork products, in the specific case of pandemic (H1N1) 2009. Transport and tourism sectors experienced negative impacts, with flow-on effects for economies in affected countries during 2009. The pandemic had limited impact on the financial sector, though precautionary measures were taken to reduce potential impacts.
- Recent experience with pandemic (H1N1) 2009 reaffirms that high impact diseases can arise unexpectedly at the animal-human interface at any time and in any place re-emphasizing the need for human and animal health authorities to work closely at all times to characterise and minimise the impacts of such events.

Other pathogenic influenzas of concern

- Waterbirds form the natural host reservoir of Influenza A viruses and are at the origin of Influenza A viruses that have adapted to mammal species, including humans. Other influenza viruses of animals with subtype H2, H5, H6, H7 and H9 viruses have sporadically infected humans and are considered to have pandemic potential. The importance of improved surveillance, as well as ongoing analysis of influenza and other emerging viruses remains critical to national and global risk reduction from pandemic threats.

Overview of progress with political commitment and collaboration for animal and pandemic influenza since 2008

- The past two years have seen ongoing engagement and collaboration through international and regional organizations towards pandemic preparedness and response. Strong ongoing political commitment was expressed by participants at IMCAPI 2010 to sustain momentum and build on the substantial progress made since 2008.
- The UNCAPAHI contributed to international collaboration for national planning and preparedness efforts in seven priority objectives. New public-private partnerships have been established, and civil society engagement has increased through schools and communities to enhance awareness of disease spread and preparedness for future outbreaks. Collaborative research initiatives have also progressed in some regions.
- An unprecedented level of global collaboration has and still is occurring as a result of the need for a rapid and coordinated response to pandemic (H1N1) 2009. This level of collaboration has been possible as a result of the large investment of resources and time in building networks and the international architecture over the past five years. The IHR has served as an important framework to support this collaboration.
- Further collaboration is needed between the international community and governments, research communities and civil society representatives to review efforts and learn from experiences of the past few years, particularly in response to H5N1, pandemic (H1N1) 2009 and other ongoing or emerging public health threats. This will help to identify and consolidate best practices and to mainstream successes at all levels.

Progress with capacity building for animal and pandemic influenza

- Concerted national and international effort is still required for countries and regions where H5N1 HPAI viral transmission persists, with a goal of elimination and eventual eradication of H5N1 in domestic poultry. OIE member countries have provided timely reporting of events, and the level of networking and sharing of information across FAO/OIE laboratories has continued to increase, as have a range of capacity building activities. Despite these achievements, veterinary services remain weak in many countries, the global level of biosecurity in the poultry production chain remains low, veterinary legislation remains outdated and inadequate in many countries, and there is minimal funding available for surveillance and laboratory diagnostic systems.
- There has been a significant shift in policies towards a better understanding of the role of poultry in rural life with a focus on sustaining livelihoods.

- Early warning systems have improved and enhanced implementation of the IHR 2005 has resulted in further capacity for detection, assessment, notification and response to public health threats. The response to pandemic (H1N1) 2009 has made it clear that significant global progress has been achieved with pandemic preparedness through the global response to H5N1. As a direct result of this investment the world was better prepared to respond to the current pandemic, and can continue to learn from pandemic (H1N1) 2009 for future preparedness.
- Coordination efforts at the international, regional and national levels on animal and human influenza have been significant, and tangible improvements can be seen at country, regional and global levels.
- Increased attention is required for the development, standardization and utilization of indicators, to enable more quantitative analysis of progress.
- Communication remains an area for significant improvement, particularly in assisting the prevention of animal-to-animal transmission of disease agents. FAO and OIE advocate a society-wide approach to promote biosecurity as a professional norm for the entire production and marketing chain, as well as a societal norm among the general public to reduce risk at the animal-human interface.
- Business continuity planning is an essential element of multisectoral whole-of-society pandemic preparedness. Progress with non-health sector preparedness remains low in many countries and requires continued efforts.
- Populations of humanitarian concern across all regions are vulnerable to the impacts of pandemics and remain important for government planning.

International financial and technical assistance

2

"We must continue to help countries develop essential human and institutional capacity. We must ensure that authorities have the resources to fulfil the responsibilities they have to their citizens, and to the world as signatories to the International Health Regulations and OIE International Standards for Animal Diseases".

Rakesh Nangia, Special Representative of the World Bank President to IMCAPI. Statement from IMCAPI 2010, Hanoi.

2.1 Introduction

Much has occurred over the past few years in the global response to avian and human influenza. In retrospect the January 2006 *Avian and Human Influenza: Multidonor Financing Framework and accompanying Avian and Human Influenza: Financing Needs and Gaps*[46] papers have served as the basis for a coordinated global response by the international community. They outlined a flexible three-year financing framework to channel donor funds for the immediate and short-term needs of the response. The analysis recommended that the coordinated global response should be based on a common vision for addressing three areas of activity: (a) preventing the next human influenza pandemic by controlling the highly pathogenic H5N1 virus in fowl and improving surveillance; (b) containing a human influenza pandemic through rapid detection and care of human cases, and preventing human-to-human transmission of the pathogen; and (c) preparing to react effectively when an influenza pandemic is suspected to mitigate its potential social, economic, and health impacts. This global response would be led by developing countries and would be guided by the leading technical agencies - FAO, OIE, and WHO, with support from the international donor community and international financial institutions.

A number of principles were seen as critical to the response: (a) the use of a multisectoral approach; (b) country commitment to integrated national avian and human influenza programmes and coordinated donor support for such programmes; (c) a balance between short and long-term actions; and (d) continuous evaluation of key interventions and actions as part of each programme. These principles were embodied in programmes prepared at the country level. The UN system's agencies went on to develop a combined strategy in December 2005 and produced their consolidated action plan in June 2006, in support of the global response.

The financing gap for country, regional and global activities was initially estimated at around $1.2 billion over three years[47]. These estimates were subsequently revised upward because of the rapidly growing number of H5N1 infected and at-risk countries during 2006 and 2007, and an increasingly pressing need to put in place adequate preparedness and response capacity, in particular in Africa. Despite strong donor support, most recent estimates showed a remaining financing gap equivalent to $600-750 million per annum for country programmes and a $325 million financing gap for international technical and other UN agencies.[48] In 2009-10, the H1N1 pandemic added to these financing needs: some $1.48 billion was estimated to be required for immediate actions in 95 least-resourced countries (of this amount, $1.14 billion was for H1N1 vaccines and other medicines). In addition, a number of middle-income countries (for example Argentina and Mexico) mounted pandemic response actions and sought external financing for them.

2.2 Pledges, commitments and disbursements

At the international conferences on avian and pandemic influenza in Beijing (January 2006), Bamako (December 2006), New Delhi (December 2007), and Sharm El Sheikh (October 2008) donors pledged a total of over $3 billion in financial support for the global fight against avian and human influenza and for pandemic preparedness. Figure 2-1 shows the evolution over time of pledges and donor engagement, as indicated by the number of donors pledging at each conference. As evident, total pledges have fallen short of needs as the number of contributing donors has declined over time from 35 at the Beijing conference, to 17 in Bamako, to nine in New Delhi, and further to four in Sharm El-Sheikh.

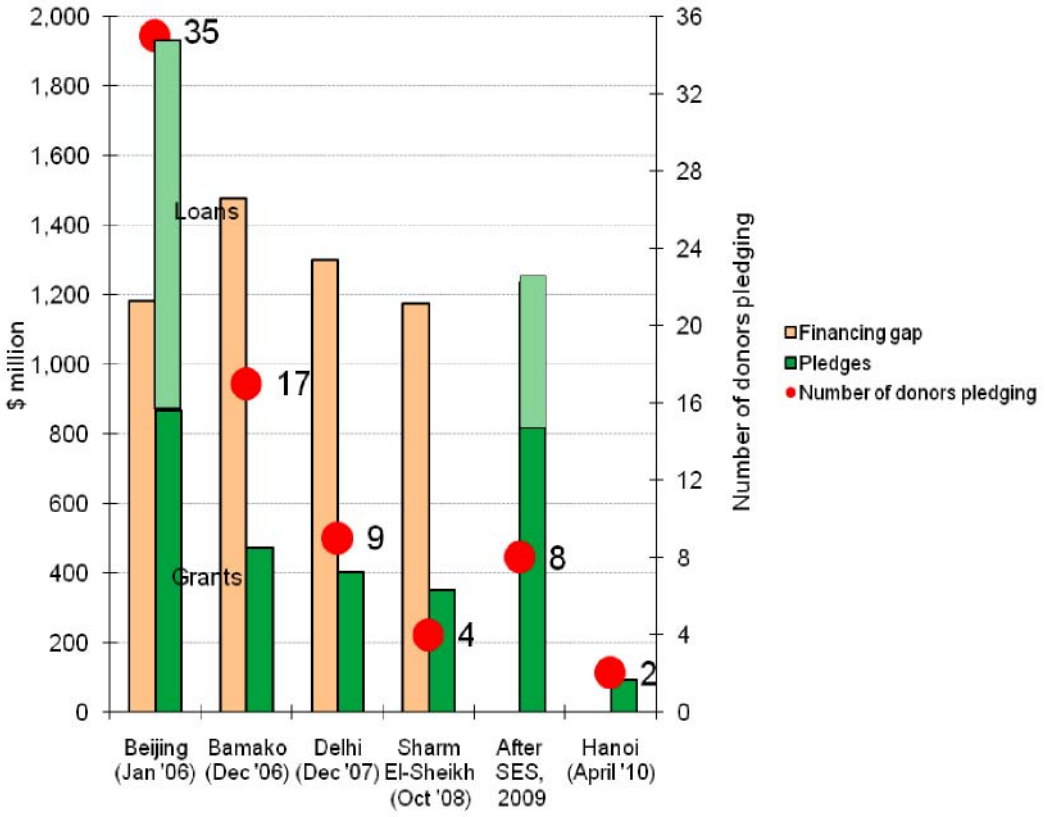

Figure 2-1: Volume of pledges and the number of donors pledging

Pledges of support have declined relative to gaps, but increased sharply in 2009 before dropping again in 2010.

Disbursements from the multilateral development banks (MDBs) have reached 24 percent of commitments because they largely finance medium-term programmes to strengthen capacity, in addition to providing funding for countries' emergency response, such as compensation funds, which do not disburse unless an emergency arises. Encouragingly, a review of disbursement performance of WB-financed AHI projects found that they disburse faster than other specific investment projects financed by the WB. This is an important indicator of the performance of the AHI project portfolio and its significant and relevant contribution to the global emergency response to AHI threats. Though After the Sharm El-Sheikh conference however, and pandemic (H1N1) 2009 occurred, a number of donors have increased their support to developing countries with particular emphasis on the response to the H1N1 pandemic. Eight donors report committing substantial resources – $1.2 billion – in 2009 in excess of amounts previously pledged (Australia, Belgium, Germany, Japan, UK, US, African Development Bank, and the WB).[i]

When these additional amounts are added to the cumulative pledges formally announced at the international ministerial conferences, the total support to avian/animal and pandemic influenza programmes between late 2005 and end-2009 stood at $4.3 billion. Since then, donor support continued its rapid decline as public interest in tackling avian and pandemic influenza diminished; at the conference in Hanoi in April 2010, two donors pledged a total of $92 million.[ii]

The multidonor flexible financing framework is designed to focus on coordination of donor activities and contributions, whilst allowing flexibility for donors to provide support under various terms (grants, loans, credits), and to channel their funds in various ways as per their preferences. The framework was also set out to be flexible enough to address funding needs as they emerge, and to be adaptable and sustainable over the longer term to support countries in priority activities that will take more time to implement.

In January-February 2010 the WB polled participating bilateral and multilateral donors on their progress on commitments and disbursements against their pledges as part of the overall monitoring of key results and outcomes, and to assist in preparations for the Hanoi International Ministerial Conference on Animal and Pandemic Influenza. The results of this polling exercise[iii] are reported in detail in the tables on the pledges, commitments, and disbursements (Annexed).[iv]

Table 2-1 summarizes the pledges, commitments and disbursements as of end-December 2009. Against pledges of $4.3 billion, donors reported commitments of $3.9 billion, of which $2.7 billion has been disbursed. Of this disbursement, 52 percent was in cash and 48 percent was in-kind (for example personal protective equipment (PPE), reagents, other supplies for emergency response capacity, and technical assistance). Commitments amount to 90 percent of the total pledged, while 70 percent of the committed amount has been disbursed. Such high commitment and disbursement rates within four years of the establishment of the financing framework clearly demonstrate the global commitment to the fight against avian and human influenzas and, based on WB experience with response to disasters, are higher than the commitment and disbursement rates of responses to major rapid-onset disasters.

Nearly all of the grant funding pledged by bilateral donors and the EC has been committed and moreover, much of it has been disbursed; only $22 million remains available for commitment. A number of donors have committed more than their cumulative pledges; as noted above this was the case especially in 2009 in response to the H1N1 pandemic. The MDBs, which provide financing primarily in the form of loans, have made commitments of $979 million, which leaves $408 million of their pledges uncommitted (primarily from the Asian Development Bank).

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[i] This is an underestimate because a number of donors did not update their data on AHI commitments and disbursements. Their data were thus not updated since the April 2008 polling exercise and are shown in black in Annex 5, Table 1.

[ii] Like the conferences in New Delhi and Sharm El-Sheikh, the Hanoi conference did not have a formal pledging session, though several donors announced additional support on each of these occasions. See Annex 5, Table 1.

[iii] Donor pledge, commitment and disbursement information is reflected as it was reported by individual donors to the WB. Minor discrepancies between the figures reported and amounts received by recipients may exist due to exchange rate differentials. The WB is not responsible for verifying that the funds reported by donors were indeed received by recipients. Where discrepancies exist between this report and the funds received, the WB would encourage recipient countries and organizations to seek clarification from the relevant donor.

[iv] Financial data collected is only for those countries which made an official pledge to fighting AHI at the international conferences. The WB recognizes that there are many other donors who are making a valuable contribution to fighting AHI which is not reflected in this analysis. If desired, these countries or institutions can contact the WB to have their commitment and disbursement data recorded.

	Cumulative Pledges	Commitments	Disbursements	% disbursed	Uncommitted
Donor	A	B	C	C/B	A-B
Australia	133	133	111	84%	–
Canada	99	99	79	79%	5
France	53	50	34	69%	4
Germany	88	88	62	70%	–
Japan	381	381	357	94%	–
Netherlands	21	34	12	36%	–
Russia	32	32	29	92%	–
United Kingdom	112	112	80	71%	–
United States	1,576	1,576	1,420	90%	–
Other EU countries[1]	59	53	31	59%	6
Other countries[2]	48	40	36	92%	8
Subtotal bilateral donors	**2,603**	**2,599**	**2,253**	**87%**	**22**
European Commission	**322**	**322**	**242**	**75%**	**–**
Asian Development Bank	468	74	57	77%	394
African Development Bank	21	7	1	15%	14
World Bank	898	898	174	19%	–
Subtotal MDBs	**1,387**	**979**	**232**	**24%**	**408**
Grand Total	**4,312**	**3,900**	**2,727**	**70%**	**430[3]**

Table 2-1: AHI pledges, commitments and disbursements as of 31 December 2009 (US$million)[4]

Notes:

1 Austria, Belgium, Cyprus, Czech Republic, Estonia, Finland, Greece, Hungary (which has retracted its pledge due to lack of response from recipient country), Ireland, Italy, Luxembourg, Slovenia, Spain and Sweden.

2 Iceland, Korea (Republic of), Norway, Saudi Arabia, Switzerland, Singapore and Thailand.

3 This number represents the portion of total donor pledges that remain uncommitted. As some donors have committed more than their pledged amounts, this number does not correspond to the difference between the total of column A (4,312) minus the total of column B (3,900).

4 Donors' reports of amounts committed and disbursed from calendar year 2005 to 31 December 2009. Uncommitted amounts are net of commitments in excess of pledges. Pledges include amounts committed in 2009 in excess of cumulative pledges at international conferences.

Commitment: The result of an agreement between the donor and recipient for designated purposes; a commitment is a firm decision that prevents the use of allocated amount for other purposes.

Disbursement: Actual budget transfer or release of funds to the recipient for an intended purpose.

Disbursements from the MDBs have reached 24 percent of commitments because they largely finance medium-term programmes to strengthen capacity, in addition to providing funding for countries' emergency response, such as compensation funds, which do not disburse unless an emergency arises. Encouragingly, a review of disbursement performance of WB-financed AHI projects found that they disburse faster than other specific investment projects financed by the WB. This is an important indicator of the performance of the AHI project portfolio and its significant and relevant contribution to the global emergency response to AHI threats. Though the overall WB disbursement rate may seem modest (19 percent), this is due to there having been no disbursements from a $491 million loan for Mexico's response to H1N1, which was approved in late November 2009; there were no disbursements yet from this loan by the December 31, 2009 cut-off date for this report. Excluding this single loan, WB disbursements were 43 percent of commitments overall and projects disbursed 65 percent of their commitment values, on average. The substantial disbursement rates are indirect indicators of robust progress in combating AHI at the country level; these disbursement rates occurred in the context of average project duration of five years (thus, after three years of implementation, investment projects would be expected to disburse 38 percent of commitments).

Among the highlights, the six largest donors (those pledging over $125 million) have reported significant progress:

- The United States has committed $1.6 billion, of which $1.4 billion has been disbursed. The US has been a very active donor, providing services and grants to over 80 countries and to regional and international organizations and programmes.
- Japan has disbursed $357 million of its total commitments of $381 million. Its contributions cover a wide range of countries and organizations at the regional and global levels. Through the Policy and Human Resources Development (PHRD) trust fund, Japan is also providing cofinancing for WB-financed operations under the Global Program for Avian Influenza Control and Human Pandemic Preparedness and Response.
- The EC disbursed $242 million out of its commitment of $322 million. The EC is the leading donor of the AHI Facility which provides financing to developing countries.
- Australia committed $133 million, of which $111 million has been disbursed to recipient countries, regional, and international organizations.
- The Asian Development Bank committed $74 million, including $34 million to WHO and FAO and the remaining amount to various national and regional projects in Asia.
- The WB has developed an extensive project portfolio under its Global Program for Avian Influenza Control and Human Pandemic Preparedness and Response (GPAI), and committed $896 million to support country responses to H1N1 pandemic influenza and AHI integrated country programmes; in addition it has committed $1 million to OIE and $88 million of AHI Facility resources for country projects and $1.5 million for regional projects.

Table 2-2 shows the distribution of commitments among the main recipients: $1,560 million, or 40 percent of the committed funds, is in support of country programmes, and $127 million, or 3 percent of the total, is channelled through the AHI Facility, primarily to support country programmes. The level of support directed to countries is thus modest; in particular, it is short of the levels indicated by the WB assessments of needs and gaps (which indicated that up to about 80 percent of total support was needed for country programmes).[49] The six largest sources of financing for country programmes are: the WB ($896 million, of which $172 million disbursed), the US ($447 million, of which $409 million disbursed), the AHI Facility ($88 million, of which $38 million disbursed), Australia ($54 million, of which $45 million disbursed), Japan ($41 million, of which $38 million disbursed), and the EC ($34 million, of which $32 million disbursed). Notably, support to countries is highly concentrated, with the US and the WB alone accounting for 86 percent of all financing commitments to countries.[i]

Commitments to international organizations, such as WHO, FAO, OIE, and UNICEF, have reached $1,145 million, or 29 percent of the total. A proportion of these funds is used in support of country programmes although a precise estimate of the amount is not available. The remaining funding is for regional organizations and 'other' allocations (details can be found in Annex Table 4b). The six largest donors to international organizations are: the US ($593 million), Japan ($121 million), UK ($83 million), Canada ($78 million), the EC ($65 million),

[i] Ten donors contribute to the AHI Facility (see Table 2-4).

Donors/ Financiers	Countries/ Territories	AHI Facility	Regional programmes	International organizations	Other	Total
Bilateral Donors	591	30	341	1,045	592	2,599
European Commission	34	97	45	65	81	322
Multilateral Dev't Banks	935		9	35		979
Total	**1,560**	**127**	**395**	**1,145**	**673**	**3,900**
Share	40%	3%	10%	29%	17%	100%

Table 2-2: Overview of AHI commitments by type of recipient ($ million)

and the Asian Development Bank ($34 million). Support to international organizations is thus more broad-based than support to countries: the two largest donors account for 62 percent of total financing for international organizations.

Bilateral donors are providing $2.6 billion, or two-thirds of total commitments. As Table 2-2 shows, the largest share of bilateral donor support goes to international organizations, followed by support to countries and territories. In contrast, the multilateral development banks channel the bulk of their financial support to recipient countries directly. Some bilateral agencies use the multidonor AHI Facility as a means to channel financing to countries. The EC provides important support to countries both directly and through its significant contribution to the AHI Facility.

Figure 2-2 shows the evolution of commitments to the various types of recipients since the previous donor polling exercise (April 2008). Between April 2008 and December 2009, support for avian and human influenza programmes implemented by international organizations more than doubled, and support to countries also rose rapidly, while support to the AHI Facility and to regional programmes remained nearly unchanged.

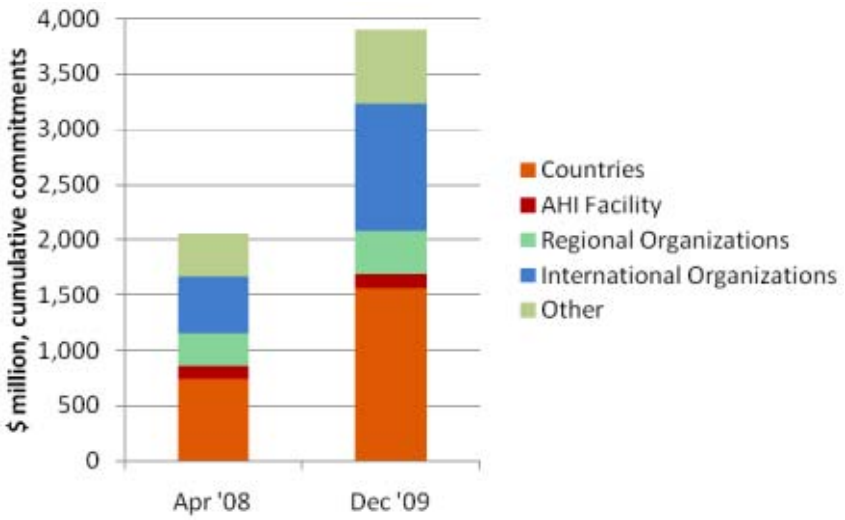

Figure 2-2: Commitments to international organizations and countries

Commitments to support country programmes were $1,668 million (comprising $1,560 million in direct support and $108 million from the AHI Facility as well as a contribution from Japan's PHRD Trust Fund). Countries received 20 percent of assistance in-kind, 25 percent as grants, and 55 percent as loans. The main recipients were Mexico ($562 million), Indonesia ($175 million), Viet Nam ($137 million), Nigeria ($60 million), Turkey ($48 million), India ($48 million) and Cambodia ($45 million). Table 2-3 lists countries and territories that received more than $30 million in cumulative commitments; only one of these countries (Nigeria) is in sub-Saharan Africa.

Country/ Territory	Commitments	Disbursements
Mexico	562	68
Indonesia	175	138
Viet Nam	137	103
Nigeria	60	53
Turkey	48	29
India	48	15
Cambodia	45	34
Romania	42	7
Bangladesh	41	19
Egypt	36	30
Lao PDR	35	27
Dominican Republic	32	0

Table 2-3: Countries and territories receiving $30 million or more in commitments ($ millions)

Figure 2-3 shows the regional distribution of support. Countries in Latin America & Caribbean received $630 million (of which $562 million for Mexico, primarily to respond to pandemic (H1N1) 2009 and strengthen its systems to deal with similar human health emergencies). East Asia and South Asia together received $610 million, or 37 percent of commitments to date; countries in Eastern Europe and Central Asia received $194 million, or 11 percent of total; and countries in Sub-Saharan Africa and the Middle East and North Africa received $233 million, or 14 percent of total commitments.

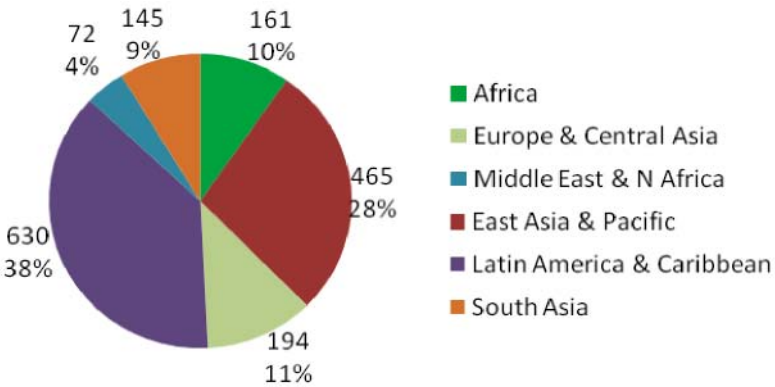

Figure 2-3: Global distribution of commitments by region ($ millions):
Latin American and Asian countries received the bulk of commitments ($ millions).

As reported in the Fourth Global Progress Report, the distribution of assistance among regions differs from that suggested by needs as indicated by H5N1 outbreak data – countries in Africa, Middle East and North Africa, and South Asia receive relatively less assistance than those in the East Asia and Pacific region. In addition, the Fourth Global Progress Report showed that 52 percent of the financing gap for country programmes was due to needs in Africa, while 35 percent of the gap was for country programmes in Asia. Assistance since then has not fully responded to this identified need as nearly all of the funding increase since 2008 went to H1N1 pandemic response in other regions (primarily Latin America and Caribbean).

While assistance to countries in terms of new commitments has increased sharply in the most recent reporting period (after a gradual decline since the peak in late 2005/early 2006), its composition has changed (Figure 2-4). Countries have borrowed substantially in 2006-2007 to finance their integrated country programmes, but in July 2007-April 2008 they received assistance primarily in-kind and as grants. In the last reporting period, loans became the dominant form of assistance to countries, primarily to finance their response to the H1N1 pandemic. Grants and in-kind assistance have remained about the same since in 2007-2009, equivalent to an annual average of $140-155 million, or less than half the level they were during the initial response period (until October 2006).

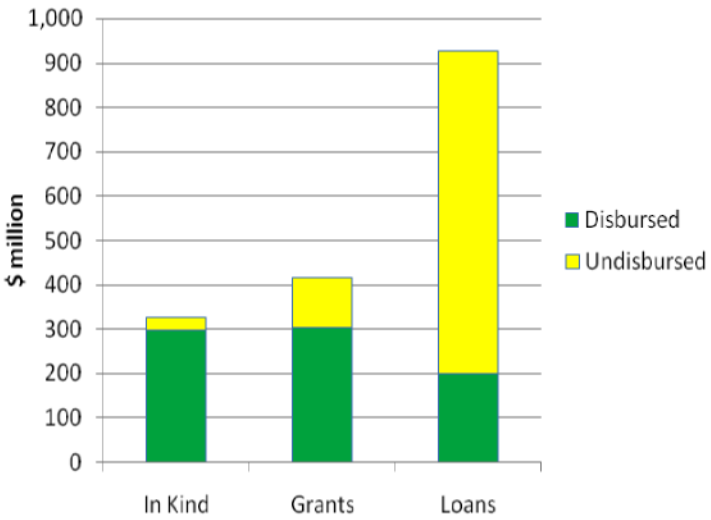

Figure 2-4: Composition of financing for countries is dominated by loans, rather than grants

An important financing source to support countries in implementing their Integrated National Action Plans is the Avian and Human Influenza (AHI) Facility, the multidonor financing facility conceived in January 2006 at the International Pledging Conference in Beijing. The AHI Facility was established five months later as a grant-making mechanism administered by the WB and supported by trust funds to which ten donors, led by the EC, presently contribute (see Table 2-4). Its specific goal is to help developing countries prepare and implement integrated country action plans that are designed to reduce the social and economic impact of avian and human influenzas and other zoonoses. As of end-December 2009, the Facility has provided grants totalling $88 million to more than 40 countries (See Annex 5, Table 2 for details).

Beyond providing direct support to countries, donors have also reported commitments of $1.1 billion to support global, regional and country-level actions through international agencies, of which $1.0 billion has already been disbursed. As can be seen in Figure 2-2, there was a noticeable increase in the funds received by international agencies after the Bamako conference, followed by a period of modest growth. The most recent increases are largely due to increased funding for WHO. The amounts which donors report as giving to various international organizations are shown in Table 2-5.[i] Of the total funding received by international organisations, WHO received 61 percent, much of it to enable its response to pandemic (H1N1) 2009. FAO and OIE received 17 percent and five percent respectively. As reported in the Fourth Global Progress Report, in the period to April 2008, FAO and OIE had together received 31 percent of total funding to international organizations.

[i] These data are those reported to the WB by donors. There have been instances in earlier reporting periods where donor reports of support to international organizations differed from support received by the organization. There are several possible sources of such differences (e.g. budget nomenclature and process, timing and exchange rates).

Donor	Pledge (currency)	Share of total
Australia	AU$10,500,000	6.68%
China	$2,000,000	1.57%
Estonia	€21,344	0.02%
European Commission	€70,930,000	76.46%
Iceland	$200,000	0.16%
India	$1,670,000	1.31%
Korea	$1,000,000	0.79%
Russian Federation	$3,000,000	2.36%
Slovenia	€30,000	0.03%
United Kingdom	£7,000,000	10.62%
Total	**$127 million (equivalent)**	

Table 2-4: Confirmed pledges to the AHI Facility

	Commitments	Disbursements
WHO	704	596
FAO	191	174
OIE	54	47
UNICEF	75	75
Other*	122	115
Total	**1,145**	**1,006**

Table 2-5 Commitments and disbursements made to international organizations (US$ million)

Source: Donor reports to the World Bank polling exercise as of December 31, 2009. Note that totals may differ slightly due to rounding – See Annex 5, Table 3.

* See Annex 5, Table 4a for details.

In addition to reporting on financing for the beneficiary countries and organizations, some donors also indicated the specific sectors targeted for support. Figures 2-5 and 2-6[i] provide an overview of the commitments per sector. Of total sectoral commitments reported, donor support for human health and pandemic preparedness (54 percent) was more than twice the support for animal health activities (22 percent), whereas support to these two sectors was about equal in the last polling exercise that captured information to end-April 2008.

The shares of information, education, communication activities and M&E, which represent key elements in the overall success of interventions in all sectors, also decreased and represent only 14 percent of total commitments. As can be seen in Figure 2-5, the reduced shares of animal health, information, education and communication, and M&E are due to the large increase of funding in support of human health in response to the H1N1 pandemic.

[i] The information reflected in these figures is based on a survey of donors. Those reporting AHI sectoral spending represent 62 percent of total AHI spending.

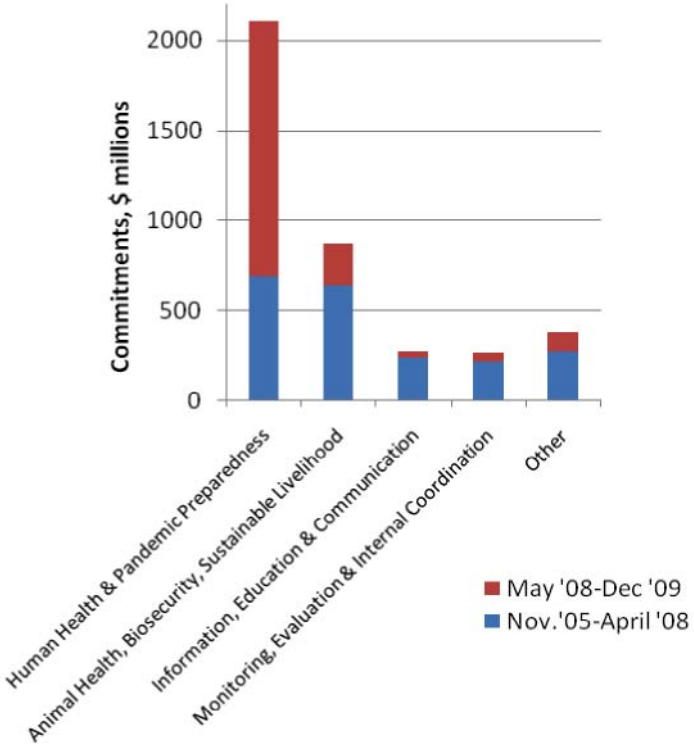

Figure 2-5: Sector composition has changed as funding for human health rose sharply
(Based on survey of donors providing 62 percent of total commitments)

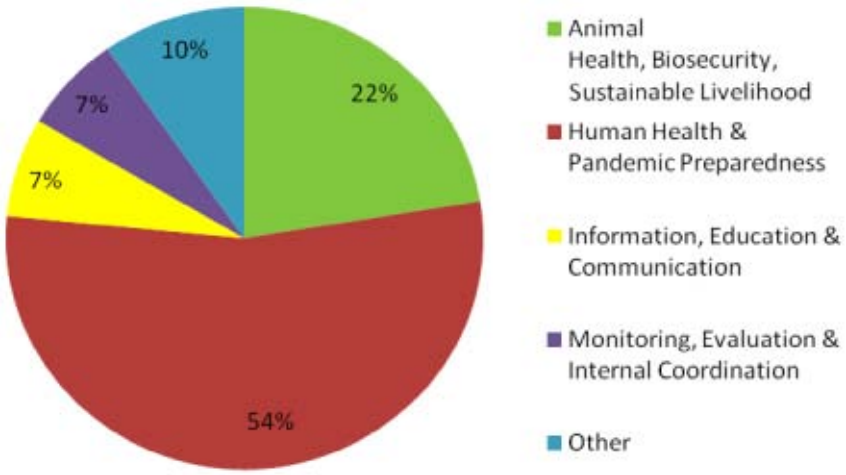

Figure 2-6: Sector composition of commitments (November 2005 – December 2009)

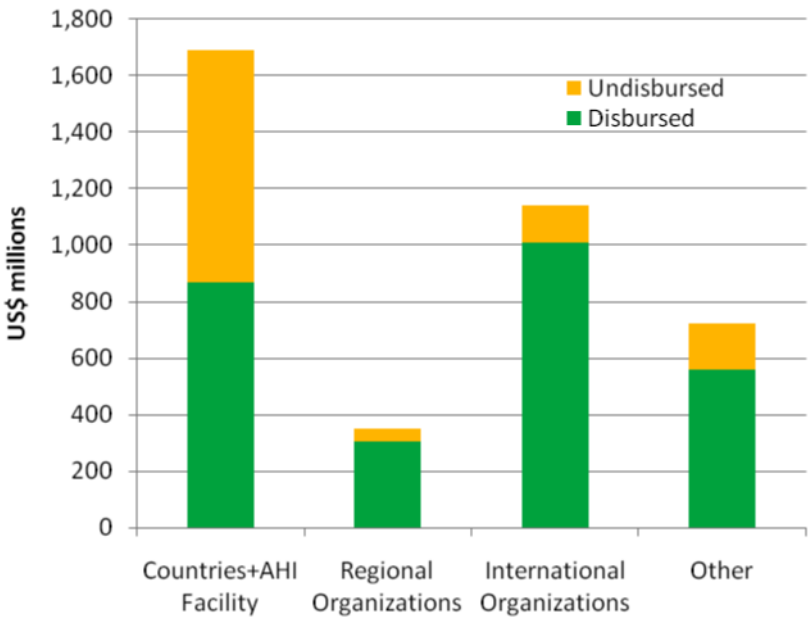

Figure 2-7: Disbursement of commitments to regional, international and other recipients

Nearly all commitments to regional, international and other recipients have been disbursed while half of commitments to countries remains available for disbursement.

Figure 2-7 shows the distribution of total committed and disbursed assistance to date among recipients. Regional organizations, international organizations and other recipients have expended nearly all the resources they have received, and their programs thus will not continue unless additional commitments are made. In contrast, half of commitments made to countries remain available for disbursement for avian influenza control and pandemic preparedness programs, so implementation of these programs will be able to continue in the near-term. As noted above, financing for country programs is, however, substantially below needs (on average and especially in Africa) and is dominated by loans. A higher level of support is warranted in the form of additional commitments to countries, preferably on grant terms, to augment implementation efforts in the near term and to sustain capacity building for disease prevention and control at the animal-human interface in the medium term.

2.3 Conclusions

- Financial assistance to countries in terms of new commitments has increased sharply in the most recent reporting period (after a gradual decline since the peak in late 2005/early 2006). However the composition has changed with loans becoming the dominant form of assistance.
- Donor funding allocations to specific sectors have changed over the reporting period, with human health and pandemic preparedness receiving more than twice the support for animal health activities. Information, education and communication, as well as monitoring and evaluation elements have received decreased support over the reporting period.
- Overall, there has been an increased focus and significant budget contribution towards human health and pandemic response, and a reduced sense of urgency and funding for control of avian influenza and other animal health issues. This is problematic given the ongoing need to strengthen capacity for veterinary services in many parts of the world, and the increasing need to understand the drivers for the emergence of disease at the animal-human interface in an increasingly complex and interrelated world.

Detailed H5N1 HPAI situation report and sustainable progressive control

3

"We should not forget that (H5N1 HPAI) has killed 292 humans, killed or forced the culling of more than 260 million birds, caused an estimated US$20 billion of economic damage across the globe and devastated livelihoods at the family-farm level. As long as (this disease) is present in even one country, there is still a public health risk to be taken seriously."

Dr Juan Lubroth, Chief Veterinary Officer, FAO, Rome. Statement from IMCAPI 2010, Hanoi.

3.1 Introduction

H5N1 HPAI continues to circulate in several regions of the world, straining healthy poultry production and impacting on the livelihoods of millions of people. It also remains a disease with a high case fatality rate in humans, and continues to represent a potential pandemic influenza threat.

This chapter provides a detailed analysis of progressive control and the challenges of H5N1 HPAI and emerging infectious diseases. It begins with a detailed report on the countries with entrenched H5N1 HPAI in domestic poultry, as well as providing an update on other affected countries, disease outbreaks in wild birds and other animal species. The H5N1 AI virus situation in humans is also reviewed based on recent statistical data from WHO. Decreasing virus circulation in poultry is critical to reducing the human impact of this influenza disease; data shows that human cases are more common in countries with poultry outbreaks.

Management of H5N1 requires a long term, sustained strategy – moving beyond emergency response tactics. This chapter examines progress with strengthening healthy poultry production, controlling the spread of H5N1 and mitigating its impacts, including through surveillance, laboratory networks, vaccination strategies, epidemiological analysis, biosecurity enhancement and understanding of socio-economic factors. In particular, the chapter considers sustained approaches for progressive control, what is different about progressive control and why it is important. It reviews barriers to progressive control and examines areas that require increased attention to help control and eliminate H5N1 (with ultimate eradication) from domestic poultry in the future, thereby minimising risks for human health.

3.2 Countries with continuing circulation of H5N1 HPAI in domestic poultry (2009-2010)

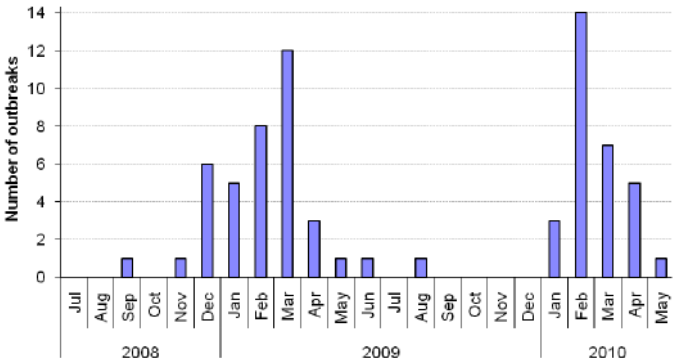

Figure 3-1: H5N1 HPAI Outbreaks in Bangladesh

Source: FAO EMPRES-I

In **Bangladesh** H5N1 HPAI is believed to be endemic with active circulation of the virus. During 2009, 31 outbreaks were reported and some 100,000 birds were culled (See Figure 3-1). This compares to 227 outbreaks reported during 2008. In 2010, the virus continues circulating at similar levels as in 2009. Active surveillance is currently being conducted in 150 sub-districts across the country, including the innovative use of the Short Message Service (SMS) gateway. Vaccination is currently prohibited.

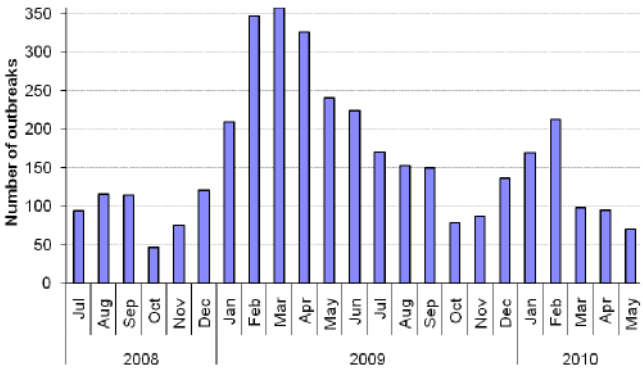

Figure 3-2: H5N1 HPAI Outbreaks in Indonesia

Source: FAO EMPRES-I

During 2009, **Indonesia** continued to report a high number of H5N1 HPAI outbreaks in poultry, as it had for the past years (See Figure 3-2). HPAI is confirmed to be endemic on the islands of Java, Sumatra and Sulawesi, and probably Bali, with sporadic outbreaks reported elsewhere in almost all of its 33 provinces. The high number of reports is partially explained by the implementation of the Participatory Disease Surveillance and Response (PDSR) programme that targets village poultry production systems (mainly backyard).

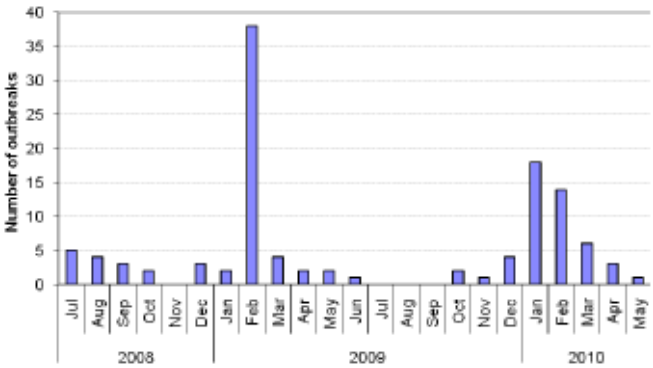

Figure 3-3: H5N1 HPAI Outbreaks in Viet Nam

Source: FAO EMPRES-I

In **Viet Nam** during 2009, 56 H5N1 HPAI outbreaks were reported in 18 of 63 provinces (29 percent), mostly on duck farms (88 percent) and in the small-scale commercial sector (73 percent of outbreaks in flocks with 50 to 1,000 birds) (See Figure 3-3). This compares to 82 outbreaks reported in 2008. In 2010, the virus continues circulating at similar levels as in 2009, although the Tet Period in February was much less pronounced. Surveillance was carried out in 16 target provinces and cities. However, outbreak investigations are not routinely undertaken on infected farms and it is difficult to understand the way the virus is spreading.

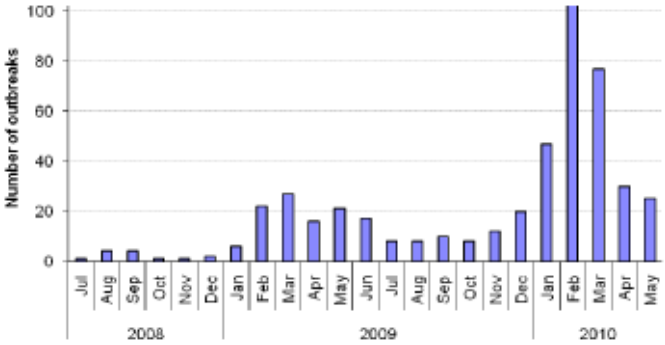

Figure 3-4: H5N1 HPAI Outbreaks in Egypt

Source: FAO EMPRES-I

Egypt, which reported its first H5N1 HPAI outbreak in February 2006, is considered enzootic with regular reporting of outbreaks in almost all of its 29 governorates. In 2009, 175 outbreaks were reported in poultry, mainly in backyard systems, as compared to 116 in 2008 (See Figure 3-4: H5N1 HPAI Outbreaks in Egypt). Detection has improved since the introduction of Community Animal Health Outreach (CAHO) programmes in ten governorates, which is reflected by the marked increase in the number of reported outbreaks during 2010.

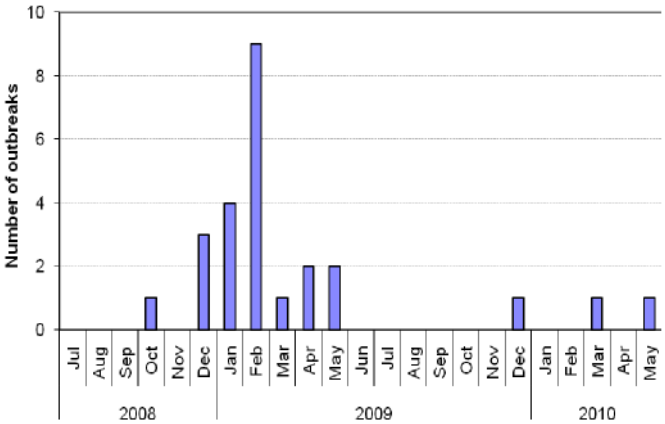

Figure 3-5: H5N1 HPAI Outbreaks in China

Source: FAO EMPRES-I

In **China** the H5N1 virus remains active in several parts of the country, including in locations where it has not previously been detected since the onset of the epidemic in 2004. No poultry outbreaks have been reported since April 2009 and the last wild bird case dates from May 2009 (See Figure 3-5). However, official surveillance programmes suggest that H5N1 HPAI viruses continue to circulate in poultry in many provinces.

3.3 The H5N1 HPAI situation in domestic poultry in other countries (2009-2010)

During February and March 2010, **Bhutan** reported the first five H5N1 HPAI outbreaks ever reported in the country, in free-range chickens in Chukha Province (See Figure 3-6 for Bhutan and other countries listed in this section).

During December 2008 and 2009, **Cambodia** reported one single human H5N1 case that was followed by the detection of an HPAI outbreak in backyard poultry. In January 2010, Cambodia confirmed H5N1 HPAI outbreaks in ducks in Takeo Province, and in April 2010, again a poultry outbreak followed the detection of a human case in Prey Veng Province.

In February and March 2010, **Myanmar** reported three H5N1 HPAI outbreaks in Yangon Municipal Area and Saigang; the last official outbreak had been reported in December 2007. It is possible that virus circulation in ducks goes in part unnoticed, as indicated by a serosurvey conducted across the country.

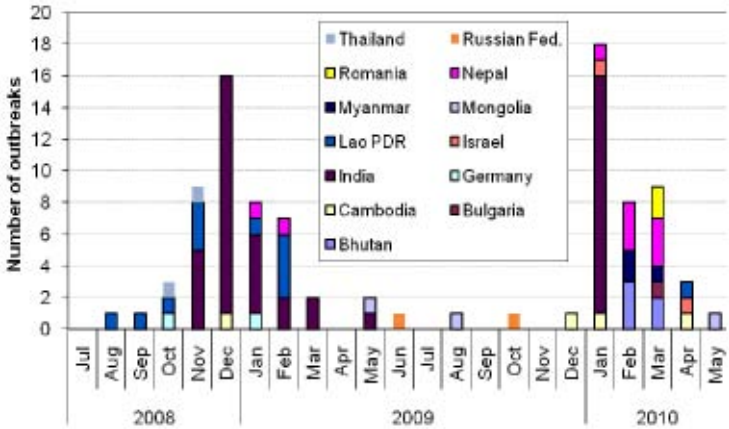

Figure 3-6: H5N1 HPAI outbreaks in non-endemic countries

Source: FAO EMPRES-I

Lao People's Democratic Republic (Lao PDR) reported five H5N1 HPAI outbreaks in 2009, in Phongsaly Province which had never been infected before. This compares to 13 poultry outbreaks reported in 2008. In April 2010 an outbreak was reported in Vientiane.

Thailand reported two outbreaks of H5N1 HPAI in backyard poultry during October and November 2008. No subsequent outbreaks have been reported.

During 2009 **India** experienced multiple outbreaks in poultry, mainly in the West Bengal area. India controls poultry infections with much rigour as it pursues an H5N1 freedom status. Another wave of outbreaks was observed in January 2010 in West Bengal, which was quickly controlled.

In January and February 2009, **Nepal** reported its first two H5N1 HPAI outbreaks, in backyard poultry in the south-eastern part of the country. A new wave of HPAI outbreaks was confirmed between January and March 2010.

In March 2010, two outbreaks in backyard poultry were detected in **Romania** in the Danube Delta, which were closely followed by the detection of H5N1 AI in a wild buzzard in **Bulgaria**. These were the first outbreaks in the countries since December 2007 and May 2006, respectively. In May 2009, August 2009 and May 2010, Mongolia reported two wild bird outbreaks. In **Russian Federation** in the Ovursky District (bordering Mongolia), 58 great crested grebes were found infected with H5N1 AI virus in June 2009. A rock dove was found sick with H5N1 AI in October 2009 in Moskovskaya Oblast, possibly related to the westward seasonal waterfowl migration.

In January 2010, **Israel** confirmed an H5N1 HPAI outbreak in a commercial breeder farm in Haifa Province followed by an outbreak in May 2010 in a mini-zoo with a variety of captive wild and poultry species. The source of infection is believed to be wild birds. The previous H5N1 outbreak in Israel dates from January 2008, when a pet-bird holding near to the current outbreak was infected. **Nigeria** did not report any outbreaks in 2009 despite active surveillance.

3.4 The H5N1 HPAI situation in wild birds (2009-2010)

Whilst the spread and transmission of H5N1 HPAI mostly relates to poultry production and trade, wild bird cases of H5N1 are expected to periodically occur. When H5N1 HPAI emerged in poultry, wild birds as known carriers of H5N1 and other influenza viruses were quickly blamed for the dissemination of the virus. To better understand the role of these species in the H5N1 HPAI outbreaks in poultry programmes and to support global wildlife disease surveillance, movement studies on wild bird populations were initiated. Utilizing satellite telemetry, this work demonstrated a direct link between H5N1 endemic areas in Bangladesh and India and deaths of wild birds in China and Mongolia. Wild birds can carry the H5N1 virus over long distances and across borders.

The overall incidence of H5N1 in wild birds slightly decreased in 2009, with 12 outbreaks or events reported (as compared to 23 in 2008), affecting China/Hong Kong, Germany, Mongolia and Russia. Compared with domestic poultry populations, infection in wild birds affects a restricted number of birds (See Figure 3-7). In 2010, so far there have been five wild bird events reported in China (2), Bulgaria, Indonesia and Mongolia. While this decrease is not very significant (given the presumed high number of unreported outbreaks in wild birds) none of the outbreaks were on the scale of thousands of wild birds as in spring and summer of 2005 in China and Russia.

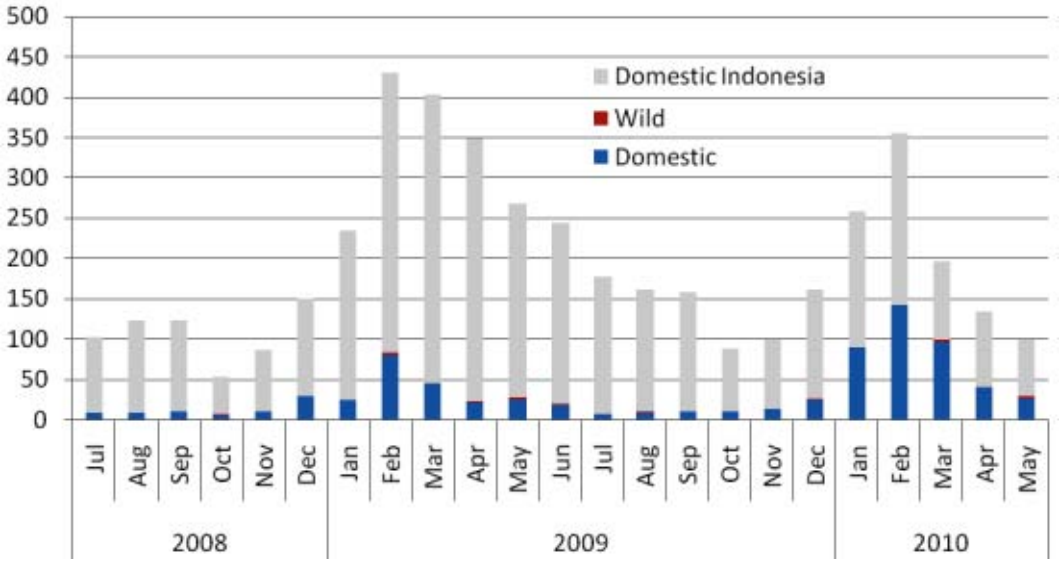

Figure 3-7: Number of H5N1 outbreaks in poultry and wild birds

Source: FAO EMPRES-I

Since 2004, over 90 species from 14 orders of bird have tested positive for H5N1. Surveillance systems are very strong in Hong Kong, and a high proportion of H5N1 birds are reported from Hong Kong SAR. It is likely that clade 2.3.2 viruses have become established in wild birds, posing a threat to poultry in areas where wild birds and poultry have contact[50].

3.5 H5N1 HPAI in other animal species

Various research studies have investigated transmission of H5N1 HPAI in other animals including domestic cats, tigers and leopards (felids), noting the extended host range of this virus. H5N1 virus is more virulent for felids than other influenza viruses[51]. In Indonesia, studies have shown a seroprevalence of H5 neutralizing antibodies of up to 20 percent in the cat population living near poultry markets where H5N1 virus has been circulating[52].

There is no evidence to suggest that H5N1 AI viruses are adapted to swine although there have been isolated incidents in which pigs were found to be positive. H9N2 avian influenza viruses have been detected frequently in pigs in China and theoretically pose as much of a threat to humans as H5N1 AI viruses since they have already adapted to infect a mammalian host[53]. Cases of HPAI infection have been recorded in several other animal species, both naturally and experimentally, including in laboratory mice, ferrets, civet, stone marten and dogs[54].

The expanded host range of H5N1 AI virus into felids in particular, has implications for wildlife conservation and influenza virus epidemiology and may threaten the survival of endangered felids, as has been shown recently for other emerging viruses in susceptible wildlife. The severity of this threat is increased because H5N1 virus may be transmitted horizontally between domestic cats. The role of felids in avian influenza epidemiology, both in humans and in poultry, may need to be re-evaluated. Finally, the confirmation of H5N1 virus infection as the probable cause of death in two other mammalian hosts besides humans implies that more species of mammals may be at risk of infection with this virus[55].

3.6 The H5N1 AI virus situation in humans (2009-2010)

Decreasing virus circulation in poultry is the most important step towards decreasing risk in humans. Although relatively rare, almost all human cases have occurred in countries with ongoing circulation or reintroduction of H5N1 HPAI viruses in poultry. According to recent data, 95 percent of total human cases worldwide have been reported in the five most affected H5N1 HPAI virus enzootic countries (Bangladesh, Egypt, Indonesia, Viet Nam and China)[i].

Figure 3-8 shows that **no new countries recorded human cases of avian influenza H5N1 infection in 2009**, representing a steady decline in the number of new countries recording human cases since 2006.

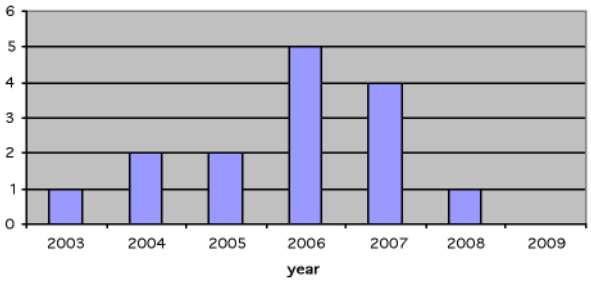

Figure 3-8: Number of new countries with human cases of avian influenza H5N1

Source: WHO

An analysis of detection times for poultry H5N1 outbreaks shows a 61 percent decrease in the number of days from event start to laboratory confirmation of H5 or H5N1 virus between 2005 and 2009[56]. The speed of detecting human infections in the most affected countries has remained unchanged. The average time between symptom onset and hospitalisation for human cases is approximately 5-6 days. This timeframe decreased in Egypt to approximately 2.5 days in 2009, though the average time so far in 2010 is much higher (See Figure 3-9)[57].

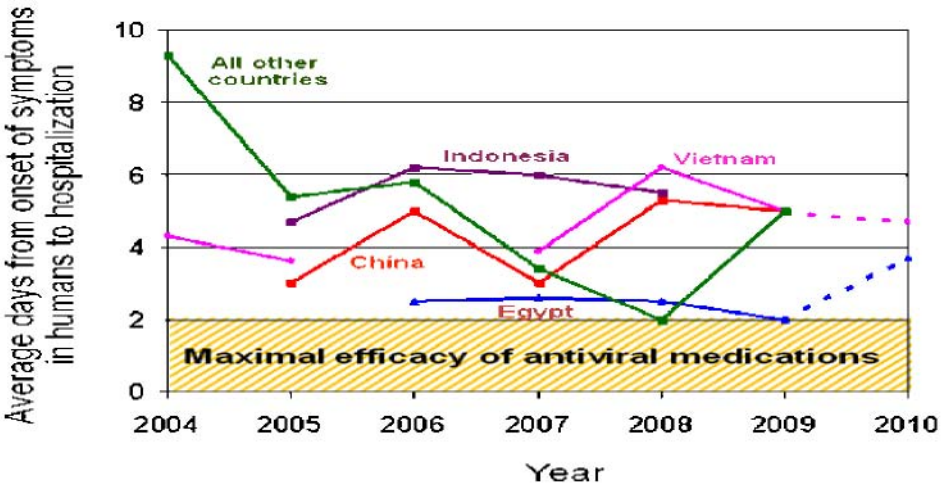

Figure 3-9: Speed of detecting* human Infections in affected countries (average days from onset of symptoms in humans to hospitalizations)

Source: USAID

* Based on WHO reports; since most samples are collected when suspect cases are hospitalised, it is presumed that time between symptom onset and hospitalisation is roughly equivalent to time between symptom onset and 'detection'. Cases may present to other health care facilities prior to being hospitalized.

[i] USAID analysis based on WHO, OIE reports to February 2010; data includes estimates of human cases in Indonesia for January-July 2009 since official reporting to WHO was not available after December 2008.

In most countries with H5N1 AI virus human cases, average CFRs have remained above 60 percent. In Egypt, average CFRs have significantly declined over time to 10 percent in 2009 (See Figure 3-10). This seems to be associated with faster access to treatment including oseltamivir. Approximately 73 percent of fatal cases have been reported in women over the age of 15 years, with indications that this group may have been slower to report to hospital for medical treatment than for males or other age groups[58].

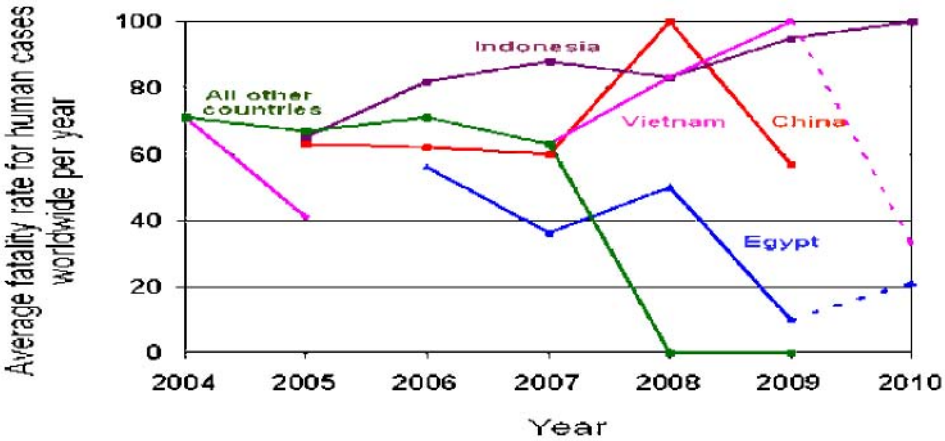

Figure 3-10: Progress with lowering human case fatality ratio

Source: USAID, based on WHO Reports March 2010

In summary, strengthened human disease surveillance and reporting is still required in most affected countries. In addition, the detection time for human cases needs to be reduced to produce further reductions in CFRs.

3.7 H5N1 virus evolution

HPAI has been known since before the industrialization of the poultry sector, and was first described in the late 19th century. There are confirmed incidences of outbreaks spreading through the movement of poultry as early as 1901. While the origins of these early viruses are not known, it is believed that HPAI was endemic in parts of Central Europe and Egypt in the 19th and 20th centuries, suggesting that outbreaks were not readily contained thus facilitating mutation from low to high virulence[59].

Influenza viruses continually change through mutation and exchange (reassortment) of genes in ways not yet fully understood. Evolutionary changes in the H5N1 viruses circulating globally have already been noted; however, to date there are no indications that these changes have impacted the epidemiology of the disease in animals or humans. There is an ongoing risk that the virus could mutate further and become an increased concern to animal health, to human health or to both. The likelihood of this change remains essentially the same as it has been over the past years.

Currently, three different groups of H5N1 viruses have been reported circulating among poultry (clade 1, clade 2 and clade 7 viruses) and at least three clade 2 H5N1 viruses, and possibly others, have infected humans to date.

There is also concern that circulating H5N1 AI or other viruses in animals could reassort with concurrently circulating viruses such as the current pandemic (H1N1) 2009 virus. Influenza viruses mutate constantly and vigilance should remain high. The risk of the H5N1 virus developing the characteristics, either through reassortment or through mutation, to start an influenza pandemic remains a threat (it currently only lacks the ability to spread efficiently and sustainably among humans). Given that few people have been infected by H5N1, an H5N1 AI pandemic would have serious consequences as there is limited natural protection against the virus in human populations.

3.8 Management of H5N1 mitigation efforts in endemic countries

Efforts to mitigate H5N1 disease impacts have been centred around early reporting, surveillance, laboratory networks, vaccination strategies, epidemiological analysis and biosecurity enhancement. Approaches are customised to the particular disease status and risks of individual countries. Several countries are currently adapting mitigation strategies with a focus on longer term sustainable approaches. Some of the major policy shifts have been related to a more judicious consideration of the role of poultry in rural life, and thus, the often deleterious impacts that culling has had on rural livelihoods. Increased awareness of the multiple inter-related factors contributing to the emergence of diseases has highlighted the importance of both public and private animal health systems for disease mitigation and control efforts. Vaccination strategies, compensation policies and cross border cooperation are three areas of particular importance for mitigation efforts:

Vaccination strategies

Much has been learned about poultry vaccination strategies since the H5N1 HPAI outbreaks began in 2003. While a number of commercial vaccines have the potential to reduce the level of circulating virus in poultry flocks, there are a number of challenges that impact vaccination strategies. For instance, in order to achieve significant reductions in circulating virus, a sufficiently high vaccination coverage level should be reached (50 percent to 90 percent immunization of at least 50 percent of all flocks at risk of infection) with a vaccine that protects against most circulating viruses. This proves difficult for technical, logistical and cost related reasons, and calls for careful targeting of vaccination spatially, temporally, and / or by production system to maximise its impact and cost-effectiveness. Effective targeting, however, requires sound risk assessments, for which data and expertise are often lacking. Strengthening of the epidemiological capacity of national animal health systems is a major prerequisite for large-scale use of vaccination in the control of HPAI (See Case Study 3-1).

Viet Nam has been practicing mass vaccination of poultry twice a year (October and April) since autumn 2005 to control epidemic H5N1 HPAI, with some considerable empirical evidence of success. However, it has been recognised that this control strategy is not sustainable over the whole country in the long term. Mass vaccination requires significant financial resources from the government and ties up human resources in the agriculture sector.

The GETS project has been established to assist the Government of Viet Nam in transitioning from mass vaccination of poultry to more cost effective and targeted measures for sustained control of HPAI in five high and low-risk provinces. The project uses a multidisciplinary approach to gather data consisting of a vaccine strategic intervention that incorporates public awareness, training and surveillance field activities, a cost effectiveness component, a sociological behavioural component and a policy analysis component. The results of the field data will be provided to the Ministry of Agriculture & Rural Development of Viet Nam to assist them in their choice of future vaccination strategy for HPAI.

Case Study 3-1: Gathering Evidence for a Transitional Strategy (GETS) for HPAI H5N1 vaccination in Viet Nam

Source: FAO

Compensation Policies

Progress in compensation has been guided by a renewed interest from countries after the initial push for developing compensation policies. This interest has been divided into four specific aspects:

1. Processes for integrating the compensation strategy within legal frameworks;
2. Development of specific Standard Operating Procedures to support the compensation strategy when implemented;
3. Development of sustainable compensation funds;
4. Understanding the linkages between disease control (culling, safe disposal and disinfection) and compensation and the ability to source financing.

Using a general framework and guiding principles of compensation, work has begun in some countries to develop policies that are context specific. This has been done through consultation with a variety of stakeholders including legal experts, the private sector and public sector ministries. Initial strategies have been developed for ministries of livestock/agriculture to support and guide them through the legal process.

To date, some of the main lessons learned concerning compensation have been the need for transparency, the importance of delinking disbursement and auditing, the relationship between compensation and increased reporting, and the need to harmonize compensation across borders to prevent animal (and thus disease) movement.

Cross-border cooperation

Previous and more recent experiences of EIDs across borders with far-reaching regional and global impacts, such as SARS, HPAI, Nipah virus, and dengue fever, have stimulated cross-border work and sub-regional and regional coordination. Given the transboundary nature of many of these diseases, such actions can improve reporting, surveillance and laboratory networks, epidemiological analyses and response systems, health support, and lead to better utilisation of pharmaceutical products. These networks can be supported by political regional institutions like ASEAN, technically by the UN specialized agencies such as WHO and FAO, as well as international partners (for instance, USAID and Rockefeller Foundation).

An example of cross-border collaboration is the MBDS which was established in 1999 among six countries: Cambodia, Yunnan Province of China, Lao PDR, Myanmar, Viet Nam and Thailand. The network aims to encourage sharing of information and biological materials on disease outbreaks and to develop the capacity to respond effectively. These efforts strengthen national and sub-regional capabilities in infectious disease surveillance and outbreak response for priority diseases (consistent with IHR 2005). Cross-border collaboration is being established in other regions, including the Mediterranean Basin (See Case Study 3-2).

Starting in October 2007 the FAO/Emergency Centre for Transboundary Animal Diseases Unit (ECTAD) of the FAO/OIE RAHC-NA (Regional Animal Health Center - North Africa) established a series of regional coordination mechanisms out of which the twice-a-year regional coordination meetings became a main event for cross-border discussion and information exchange between the veterinary services of the region.

During the Second Regional Coordination Meeting hosted by the Spanish Ministry of Agriculture in Avila in 2008, participants from North Africa and South Europe welcomed the initiative launched by FAO/OIE RAHC-NA to establish a Mediterranean Euro-Maghreb Animal Health Network (MAHN in English or REMESA in French/Spanish). This network promotes cross-border cooperation in animal health by: facilitating the coordination of the strategies for the prevention and control of transboundary animal diseases, joint efforts to strengthen the capacities of veterinary services, sharing experiences and a regular exchange of information on the zoo-sanitary situation. The network would facilitate access to information concerning ongoing animal health projects / activities in the region and available regional resources for disease prevention and control.

The REMESA annual Action Plan for 2010 has taken into consideration past and present animal health experiences and ongoing programmes in the region (bilateral cooperation among countries, regional projects, and previous experiences, in order to avoid duplication. The action plan links and enhances the existing FAO, OIE and WHO global programmes, networks, systems for Transboundary Animal Disease control such as Emergency Prevention Systems, Global Early Warning System for Major Animal Diseases, including Zoonoses (GLEWS) and OIE/FAO Network of Expertise on Animal Influenza (OFFLU) as well as the animal health networking activities developed by the EU and the bilateral projects funded by Spain, Italy, France and others.

Case Study 3-2: Regional and international organizations partnering to improve the surveillance of transboundary animal diseases in the Mediterranean Basin

Source: FAO/OIE

[i] The FAO survey was completed by FAO staff positioned in countries and therefore does not necessarily reflect views from other agencies or the governments. Thirty-four countries were included in the survey from Sub-Saharan Africa, South and South East Asia, Central Asia, North Africa and the Middle-East, Eastern Europe and the Caucasus.

3.9 Progress with strengthening healthy poultry production and vigilance in all countries

Since 2008, countries have continued working towards strengthened poultry production systems and increased vigilance for animal diseases. FAO conducted a field survey[i] in November 2009 which aimed to assess national capacities to prevent and control H5N1 and monitor progress made over the reporting period. The survey included assessment of surveillance capacity, laboratory diagnostics, veterinary legislation and biosecurity measures.

Surveillance capacity

Results from the FAO survey show that most countries have improved their surveillance capacity. As of December 2009, all countries surveyed had at least 'fair' surveillance capacity and 70 percent had a 'good' to 'excellent' capacity. Significant progress has been made in terms of human resources (availability and training) and funding (still predominantly from external sources), which has translated into efficient, active and passive surveillance in 95 percent of the countries.

However, further improvement can still be achieved. Notably, surveillance plans have three major weaknesses in terms of design: (i) they are not based on strong risk analysis (due to a lack of epidemiology capacity); (ii) engagement with the private sector is limited (poultry producers and private veterinarians); and (iii) insufficient surveillance is carried out at the domestic poultry/wild bird interface.

Laboratory diagnostics

Many developing countries have minimal funding available for maintenance of bio-safety equipment, or access to maintenance and calibration service companies. Ongoing training of existing and new staff may not always be possible. Laboratories need to be better integrated into overall animal disease prevention and control strategy and activities. This could be achieved through links between outbreak and virus information; contributions to molecular epidemiology studies; adapting laboratory detection to surveillance needs and vaccination context; monitoring vaccine efficacy, sharing virological material with the international community; and by developing international and regional collaborations on influenza viruses. Regional laboratory networks can facilitate laboratory capacity building, coordination of regional activities and catalysing regional collaborations (See Case Study 3-3).

The West and Central African Veterinary Laboratory Network for Avian Influenza and other Transboundary Disease (RESOLAB) was created by FAO in December 2007 and put under the coordination of the regional office of FAO - Emergency Centre for Transboundary Animal Diseases (ECTAD) at the OIE/FAO/AU Regional Animal Health Centre in Bamako, Mali. Its immediate objectives are to enhance the effectiveness and efficiency of the 23 national veterinary diagnostic laboratories of Western and Central Africa, improve communication between them and national and regional epidemiological networks, and stimulate improvement of avian influenza (AI) expertise and quality of laboratory diagnosis of animal diseases within the region. RESOLAB is technically supported by the Istituto Zooprofilattico Sperimentale delle Venezie (IZSV) of Padova - (OIE)/FAO reference laboratory for AI/ND (Newcastle Disease) - and institutions such as United States Department of Agriculture/Animal and Plant Health Inspection Service, the French Agricultural Research Center for International Development and the US Centers for Disease Control and Prevention.

Since its creation, the RESOLAB has organized the training of more than 200 laboratory technicians, including at IZSV. So far, 15 of the 23 laboratories in the region have undergone rapid assessment exercises. Facilities have been renovated in three laboratories. Reagents for AI testing as well as autopsy kits, sampling materials, and shipping boxes have been provided to all 23 laboratories. Two rounds of proficiency tests, under the umbrella of IZSV have been carried out in 2008 and 2009, involving all member laboratories.

To improve information exchanges, a website was developed that includes primary data and information (http://www.fao-ectad-bamako.org/), in addition to the collection and dissemination of technical information through an e-mailing list. Technical papers have been published, and annual coordination meetings held. The consolidation and sustainability of RESOLAB will depend on the recognition of its capacity to significantly contribute to the improvement of the diagnostic capacity of national veterinary laboratories, and on the support of Member States and their regional economic organizations. Thus, RESOLAB is a good example of international cooperation to improve diagnostics for better response to EIDs.

Case Study 3-3: RESOLAB, the West and Central Africa Laboratory Network

Source: FAO

The three countries that currently implement H5N1 AI vaccination on a wide scale (Egypt, Indonesia and Viet Nam) have the capacity to monitor the serological vaccination response with FAO support for provision of equipment and reinforcement of human resources.

All African countries surveyed by FAO, and to a lesser extent countries in Asia, are part of sub-regional veterinary laboratory networks with very positive results, but this is not yet in place for Eastern European or Central Asian countries. The level of networking and sharing of information, especially through regional laboratory networks, has continued to increase along with the overall technical capacities of laboratories in the last two years.

Challenges remain however, including persistent turnover of laboratory personnel and an absence of training in laboratory topics. Implementation of 'Good Laboratory Practices and Quality Assurance', including participation in annual or bi-annual proficiency tests, are priorities for most veterinary national laboratories in the coming years.

The proximity of outbreaks in neighbouring countries, coupled with a large volume of bird migrations, places West Bank and Gaza at a high risk. The first outbreak occurred in March 2006, affecting chickens and ducks, and with the recent H5N1 outbreak in Israel, the probability of repeated occurrence of the virus continues to be great. The Avian and Human Influenza Facility (AHIF), which receives contributions from ten donors led by the EC, is providing assistance.

In September 2006 a US$3 million AHIF grant was approved, with the goal to minimize threats posed to humans by avian influenza in domestic poultry, consistent with the priorities set out in the Palestinian Authority's 2005 National Plan for the Pandemic Influenza. This activity is being implemented by UNDP, and its key objective is to achieve a minimum level of spread of HPAI to humans through better preparedness, control, and response. The Grant was originally linked with a US$10 million WB-financed project. However, this initiative had to be closed on March 31, 2009 due to long delays in start-up and implementation difficulties.

After initial implementation and coordination delays that stemmed in large part from political instability, ongoing security challenges and low technical capacity, the Grant Agreement was amended in November 2009 to include new activities, as well as to reflect changes in project activities which took place due to evolving needs. These included: (a) the upgrading of a second veterinary laboratory in the West Bank to replace the work which could not be carried out in Gaza, (b) small upgrading works for specific regional veterinary laboratories and the equipping of other regional labs in the West Bank; (c) the inclusion of a Knowledge, Attitudes and Practices survey; and (d) a new category for training and workshops for information dissemination purposes to capture lessons learnt.

Due to the changed approach, the grant has now laid the groundwork for an effective national approach for dealing with the threat of HPAI in poultry and humans. Most of the planned grant activities have now been completed, with US$2.6 million disbursed, and the project will likely reach its objectives. UNDP as the implementing agency remains committed to achieving the grant's objective by working closely with and on behalf of the Ministry of Agriculture and Ministry of Health and collaborates with other UN agencies (WHO and FAO) as needed. The closing date of the grant has been extended to September 30, 2010 to allow for the planning and assessment of newly emerging needs, including in response to the changing context of infectious diseases globally.

Case Study 3-4: Avian influenza prevention and control in the West Bank and Gaza

Source: World Bank

Veterinary legislation

Veterinary legislation and proper governance are essential elements of the national infrastructure that enable Veterinary Authorities to carry out their key functions, including surveillance, early detection and control of animal diseases and zoonoses, animal production food safety and certification of animals and animal products for export. In the face of increasing global trade, climate change and the emergence and re-emergence of diseases that can rapidly spread across international borders, veterinary services must be effectively supported by legislation to meet the OIE criteria for performance of essential functions.

In many developing countries veterinary legislation is outdated and inadequate to address present and future challenges. Legislation and governance have been, or are being, developed and modernized in a range of countries to support animal health generally, and H5N1 prevention and control in particular, with support from OIE and FAO (e.g. through the publication of OIE guidelines on veterinary legislation and OIE missions to countries). However there is still a considerable way to go in implementing sound legislative, governance and compliance systems in many countries.

Biosecurity measures

Very few countries have established biosecurity measures since 2008, and the global level of biosecurity in the poultry chain remains low. In 52 percent of FAO-surveyed countries, there are no biosecurity measures at all in Sectors 3 and 4 (see Annex 1, Glossary of Terms), and where they do exist, the resulting level of biosecurity was rated poor or very poor in 67 percent of them. On the other hand, in Sectors 1 and 2, efficient measures are implemented in 80 percent of countries surveyed. Live bird markets received very little attention in terms of biosecurity, with no measures implemented in 51 percent of countries surveyed. All sectors included, Africa seems to be where most efforts have occurred for improving biosecurity.

Major constraints for instituting biosecurity measures include (i) in most countries there is neither a legal/regulatory act on biosecurity nor a mandatory poultry farm registration system in place, and therefore measures cannot be enforced; (ii) incentives to implement biosecurity measures, such as a compensation system, are non-existent (on the contrary, the price and constraints for implementing biosecurity on a daily basis is regarded as a disincentive); and (iii) the level of awareness of the benefit of such measures is low, notably in sectors 3 and 4. However, national biosecurity campaigns have recently been conducted with limited effects to date in most developing countries. FAO's support to the implementation of biosecurity measures at the country level has been limited to date; though FAO Guidelines have been recently produced and should support implementation of better practices on farms and at markets.

3.10 Progressive control of H5N1 in countries where it is persistent

Is eradication possible?

Complete eradication of Influenza A viruses is considered unlikely given the highly diverse gene pool of viruses circulating in wild water-bird reservoirs, human populations, and a range of other animals including domestic, agricultural, wild and marine species. However, given the risks AI viruses pose to human health and poultry production, it is both highly desirable and feasible to achieve elimination and control of H5N1 in domestic poultry production. This would reduce the incidence of H5N1 HPAI in areas where animal husbandry systems do not readily permit biosecurity separation between wildlife, poultry and domestic waterfowl production, such as rice-duck agriculture (See Case Study 3-5).

The persistence of H5N1 HPAI virus in Asia is in part linked to river deltas, plains or other wetland areas with irrigated rice production and high densities of domestic ducks. In Asia, ducks are often kept in rice paddies to feed on left-over rice grains immediately after the harvest. In some areas, ducklings are released also during the early stage of the rice growing cycle. Ducks also help control the golden apple snail, a local pest.

With most of the rice cropping taking place after the monsoon rains, most duck meat production occurs during the late autumn and early winter months. In Southeast Asia, meat duck production typically peaks during the month of January, just prior to the Chinese New Year. Given that layer ducks require year-round availability of feed in order to maintain the egg production, layer production is mostly confined to the irrigated rice cropping areas where there is always some harvesting taking place.

Duck flocks are continually rotated in accordance with the local harvest distribution. Duck egg production is mostly confined to areas such as river deltas and plains, where the local hydrology and irrigation that support rice crop cycles are outside the monsoon season. Most of the meat production takes place in these same areas because meat ducklings are released in large numbers and this requires a good local supply of eggs for hatching. Rice-duck agriculture is important in Bangladesh, China, Indonesia and Viet Nam; all of which are H5N1 enzootic countries.

Case Study 3-5: H5N1 HPAI persistence and rice-duck agriculture in Asia

Source: FAO

Most of the world's domestic duck congregations, particularly in Asia, present a permanent source of H5N1 viruses. Commercial broiler production, distribution and marketing facilitate H5N1 HPAI virus spread. Vaccination in ducks and chicken suppresses disease signs (but does not eliminate virus circulation in all cases). Providing necessary control measures and reducing incidence of the disease will not in itself result in eradication. The control systems for H5N1 in endemic situations needs long term sustainable efforts and national leadership with community-industry-public sector cooperation and coordination.

3.11 Why progressive control of H5N1 is somewhat different from measures initially recommended

Progressive control is based on the development of a long-term national strategy using knowledge gained about socio-economic factors, markets for different animal production and products (milk and dairy, eggs, meat, bones, offal, crate disposal or disinfection). It entails the mapping of progress using the 'discovered' critical points for intervention to improve the infection or disease status. This provides an effective monitoring and feedback mechanism that will assist guiding health authorities to either undertake additional measures or reinforce those that are being applied.

This stepwise evaluation of a country (or local) disease status is based on criteria that range from endemic to sporadic to disease-free. Progressive control requires fine tuning of activities to be undertaken, such as:

> 'Vaccination coverage over 50 percent; all events are investigated by health authorities and traceback studies conducted; central laboratory has a quality assurance scheme; tabletop simulation exercises conducted; live animal markets are registered …' to, '…vaccination coverage over 75 percent; all events are investigated by joint animal and human health authorities and traceback studies conducted; central laboratory has a quality assurance scheme and participates in regional or international proficiency testing; field simulation exercises conducted with public and private sectors; integration of wildlife surveillance; epidemiology unit uses GIS mapping for analysis; poultry making schemes developed for all sectors and validated periodically; key markets in the capital are closed one day for cleaning and disinfection…'.

Progressive control, when commenced and conducted in an environment that promotes self-evaluation becomes robust as the vision and activities required become clearer to all stakeholders, and self-evaluation of the process assists in future planning to improve and reach the next step.

Key features of progressive control of H5N1 include the development of **long-term planning for sustainability**. This requires national leadership and the broadening of partnerships, particularly the public and private sectors, as well as the development and implementation of agreed strategies featuring common visions and approaches which can be amended in the light of experience. Awareness raising, vigilance and surveillance are essential components of such plans.

It also entails **political and industry commitments, supported by adequate resources**. Ensuring sufficient financial resources may require countries to take innovative approaches to sourcing funding. For example, in Egypt a public-private partnership is being developed to look at the possibility of co-funding an emergency fund. Meanwhile, several countries in West Africa are exploring the possibility of developing institutional arrangements for a fund that looks beyond avian influenza compensation to consider other diseases as well.

Efforts for progressive control also take into account broader dimensions of HPAI, such as **socio-economic impacts**. The poultry system is diverse with different products (broiler / layers / spent hens / eggs etc.) and different actors involved in poultry production and marketing. Poultry production is dynamic because the barriers to entering the value chain are small in developing and emerging economies and it has diverse production and marketing chains, which are often unregulated. People have very divergent drivers for being involved in poultry production, from providing a primary source of income to using it as an emergency source of cash or for cultural cohesion. Therefore, the impacts of the disease are widespread, from direct (on income from the loss of poultry) to indirect (downtime), from minor (a recurrent effect of Newcastle Disease) to major (closure of a whole sector), and from tangible (income loss) to intangible (loss in poultry for social functions) resulting in the need to develop more nuanced approaches to HPAI control.

The concept of risk as determined by economic and social drivers provides better appreciation of the approaches needed and the role people can play and are playing in disease containment and control. Understanding the opportunities and barriers to adoption of technical options, such as vaccination, culling, and surveillance, can be provided to governments and farmers through cost benefit analysis and livelihood studies (See Case Study 3-6). However, prioritizing focus on more vulnerable populations has been challenging. The three most vulnerable groups to HPAI and control are the traditional extensive producers, semi-intensive producers, and other small-scale stakeholders. Few reports have documented the impact of HPAI and short and long-term prevention and control policies on these disadvantaged groups.

For successful longer term efforts, **gender** should also be factored into planning. Women typically have the main role in managing backyard poultry production. Amongst many poor households where women's mobility, income earning opportunities and access to formal markets is restricted, poultry rearing is often amongst women's most important livelihood assets. This means that they and their families are more likely to suffer from loss of poultry and other HPAI-related impacts. With moves to intensive livestock production systems and improved processing arrangements, increasingly opportunities will arise for new forms of employment for both men and women which will require training and adaptation to new social circumstances (See Case Study 3-7).

At the request of the Egyptian National Supreme Committee of Avian and Human Influenza, the UN Resident Coordinator Office in Cairo (UNRC) and UNSIC organized and facilitated a joint assessment mission by a multidisciplinary team from FAO, UNICEF, and WHO from 6-16 December 2009. The team was asked to review and assess the measures taken by the Government of Egypt to prevent and control outbreaks of H5N1 HPAI, and to identify areas of concern and impediments to effective implementation.

The mission focused on reviewing strategies and mechanisms for the control of H5N1 HPAI in poultry and H5N1 infection in humans. Areas of concern and weakness were identified through the background reports and discussions with key programme managers and other stakeholders, and the team clarified these observations in-country and explored new strategies and mechanisms for controlling H5N1 influenza. In this way, the mission team was able to make clear operational recommendations that targeted mechanisms for multidisciplinary approaches, identifying opportunities for integration across disciplines and inclusion of affected communities in decision making.

The resultant report stressed the impact of the changing epidemiology of H5N1 HPAI, which has evolved from distinct outbreaks to a widespread, enzootic disease. Specific recommendations addressed strengthening the National Supreme Committee of Avian and Human Influenza, and reinvigorating the national committees for animal health and communication. A meeting and workshop was organized by FAO in February 2010 to revise the national strategy and plan for controlling HPAI. Using the conclusions and recommendations of the joint-UN mission, the ministries of health, agriculture and environment and their partner NGOs will work together to build sustainable, interdisciplinary approaches to controlling endemic H5N1 influenza in Egypt.

Case Study 3-6: Egypt H5N1 HPAI joint United Nations assessment mission, December 2009

Source: FAO

The spread of the HPAI virus has had important socio-economic repercussions, resulting in a reduction in the consumption of poultry meat and eggs, especially by children. Poultry production is a substantial contributor to food supply in Egypt and plays a decisive role in food security and income for millions of Egyptians. Poultry is the major and often the only animal protein source in low income segments of the population. In addition, poultry keeping contribution to household income is very high (44.5 percent Geerlings et al 2008 - compared with other countries, 5 percent in Viet Nam, McLeod, 2007) and it is one of the essential income earning activities available to landless women.

In the first wave of HPAI outbreaks, 30 million birds were culled resulting in a US$2-3 billion loss and the livelihoods of millions of Egyptian farmers were affected. Poultry production and consumption dropped, and the rise in prices of most commodities, including poultry, during the course of the disease, resulted in a large rise in the cost of meat, milk and eggs. Currently the price of eggs, cheese and other dairy and animal protein products is far above the reach of a substantial percentage of Egyptian families. The poorer sectors of society are particularly at risk as the families frequently cannot compensate for the loss of poultry meat. HPAI and the accompanying control measures, especially massive and indiscriminate culling, contributed to the vulnerability of households to food insecurity.

Case Study 3-7: Socio-economic impact of H5N1 HPAI in Egypt

Source: FAO

3.12 Key elements of sustainable progressive control

The nature of control systems for H5N1 HPAI is similar in countries whether outbreaks are isolated, extensive or endemic in nature, but can differ in terms of intensity and duration of effort. Countries also have different short and medium-term objectives. In China, for example, the primary objective is to achieve increased stability and growth in the poultry industry by reducing the frequency of overt outbreaks and allowing some growth in the export market by creation of disease-free export zones. Progressive control objectives in Viet Nam are to reduce the costs of control programmes whilst maintaining current levels of control and reducing the chance of further outbreaks (See Case Study 3-8); Indonesia's medium-term objective is to reduce the overall viral load through targeting the highest risk parts of the market chain. The development and implementation of agreed strategies in each country provides a common vision and approach for progressive control which can be amended in the light of experience.

Key considerations include assessing the risk of introduction and potential pathways for the disease; an understanding of poultry production and market chains; effective surveillance systems supported by competent laboratories for early detection; a capacity and authority to manage rapid response actions; and skills in epidemiological investigation to understand the progress of the disease and effectiveness of measures.

Community support and engagement is essential to support early detection and control of the disease, and matters of compensation and economic adjustments should be agreed and clearly understood. Therefore, ongoing awareness and communications strategies are critical success factors. In addition, private/public partnerships help to set standards and roles and responsibilities in the commercial sector, and engender overall support for programmes. Political support, leadership and the provision of adequate resources are necessary if control measures are to succeed.

In countries where the virus remains endemic, communication for behaviour and social change has been instrumental in promoting the adoption of some critical protective behaviours to contain avian influenza. However, important gaps remain, such as selective adoption of recommended protective practices by the population; lack of sustainability and low compliance and public engagement with the control measures.

Strengthening veterinary services is essential for the long-term progressive control of disease and to support close engagement with public health authorities, relevant sectors of government, industry, communities and other stakeholders. The OIE/FAO Global Program for Strengthening Veterinary Governance utilises the OIE PVS Pathway, includes PVS evaluation and PVS Gap Analysis components and provides comprehensive tools to enable countries to identify capacity requirements with a view to obtaining funding for priority needs (such as compliance with OIE international standards and guidelines). OIE is in the process of introducing more substantial elements focusing on improved collaboration between the Veterinary Services and public health. Tables 3-1 and 3-2 show that demand for veterinary services PVS Gap Analysis continues (particularly in Africa), and that further work is still urgently required to strengthen veterinary services capacity in all regions across the world.

OIE Regions	OIE Members	Initial PVS Evaluations: Requests Received	PVS Missions Completed	Reports Available for Distribution to Donors and Partners
Africa	52	46	41	31
Americas	28	20	17	15
Asia and Pacific	31	16	13	11
Europe	53	12	12	7
Middle East	12	12	10	3
TOTAL	176	106	93	67

Table 3-1: Continued demand for veterinary service evaluations

Source: OIE, June 2010

In December 2003, Viet Nam experienced its first cases of H5N1 HPAI. Within four months the disease had spread to 57 of 64 provinces, and 44 million poultry - 17 percent of the nation's stock - had died from the disease or been culled to prevent further outbreak. Veterinary health and disease surveillance systems were rapidly overwhelmed, and with 15 human deaths recorded in 2004, the spectre was raised of a potential pandemic.

Viet Nam's Avian Influenza Emergency Recovery Project (AIERP) was the world's first comprehensive HPAI emergency response operation. It was fully implemented in less than three years in the ten provinces worst-hit by the virus and helped enhance national disease surveillance and diagnostic capacity, strengthened mechanisms in the poultry sector to contain serious outbreaks, and safeguarded public health by raising awareness of risks and how to mitigate them. The project provided a platform for action, allowing the government to articulate and lead a concerted response with donors, international technical agencies and civil society. Complementary efforts supported by the Government of Japan helped low-income stakeholders recover from losses caused by the epizootic.

A core team - including experts on animal health, veterinary epidemiology, poultry vaccination and poultry production from FAO - worked alongside government counterparts to fashion measures to control the outbreak. Close attention was focused on ensuring that the response (for example, in designing, testing and monitoring a poultry vaccine) kept pace with the rapidly evolving threat, while enabling the government to craft a longer-term strategy through investments to upgrade capacity, institutions and key health systems.

Work has started on investments in critical systems to mitigate the threat of HPAI. Viet Nam's approach has informed the design of programmes underway in more than 50 countries under the Global Program for Avian Influenza Control and Human Pandemic Preparedness and Response. The project's focus on containing the disease at the source is the most effective way of reducing socioeconomic damage and the risk of widespread contagion among human populations.

Highlights of the programme include:

- Development and adoption in December 2005 of a national Emergency Contingency Plan which has become a model for many developing countries in containing a disease outbreak.
- Disease control measures have prevented direct losses in the poultry sector estimated at more than US$58 million, and improved veterinary services have yielded the added benefit of better controlling several other animal diseases.
- Regular joint supervision missions by the WB and FAO facilitated quick fine-tuning in the disease control strategy. For instance, around midterm, the project helped design and monitor the world's first large-scale poultry vaccination programme against the virus, coordinating some 100,000 vaccinators. Subsequently the strategy was adjusted to gradually replace blanket vaccination by ring vaccinations targeted to contain incipient outbreaks.
- Community-based early warning disease response systems were established in 30 districts of the 10 heaviest-hit provinces.
- Critical equipment and training provided to Viet Nam's key diagnostic laboratories, including the national veterinary laboratory and four regional facilities, enabled complex sample testing to be completed within a week of an outbreak.
- Biosecurity was upgraded in all 12 poultry-stocking facilities throughout the country.
- Public awareness and information campaigns were launched in 1,700 communes and reached 51,000 villagers in the provinces most affected by HPAI. Communications training for veterinary and livestock extension staff was provided at the central, provincial, district, commune and village levels.
- Under restocking operations supported through the Japan Social Development Fund, 8,366 poor households received 1.22 million poultry that were bred and raised in biosecure conditions and vaccinated against avian influenza and other diseases. The overall mortality of restocked poultry from delivery to market was 7.7 percent, versus a background mortality rate of 47 percent for backyard poultry.
- Using the project to expand dialogue on coordinating donor assistance, the WB in April 2006 coordinated a government-donor joint-assessment mission with 32 representatives from 11 bilateral and multilateral organizations as well as relevant ministries/agencies (including the Asian Development Bank, Denmark, France, Australia, New Zealand and the US).
- A follow-up donor meeting in Hanoi in June 2006, attended by representatives from 30 donor countries and international agencies, pledged more than US$60 million for a global avian influenza response in 2006-08.

The emergency project undertaken in the rush to cope with a rapidly evolving threat was designed as a pilot to develop and test a comprehensive strategy to control avian influenza in Viet Nam. The project achieved its goals and laid the ground for a broader follow-up effort in 2007, the Viet Nam Avian and Human Influenza Control and Preparedness Project (VAHIP) with an estimated cost of US$35 million. Close partnership between the government, the WB, and international agencies (primarily FAO and the WHO, as well as with OIE) will help ensure that successful interventions are sustainable. Successful implementation of the emergency response project also provided lessons for other countries' programmes, including those to respond to the H1N1 pandemic.

Case Study 3-8: Viet Nam's emergency response to Avian Influenza creates a model of resilience

Source: World Bank

OIE Regions	OIE Members	PVS Gap Analysis Missions: Requests Received	PVS Gap Analysis Missions Completed
Africa	52	27	14
Americas	28	8	2
Asia and Pacific	31	10	1
Europe	53	5	3
Middle East	12	3	2
TOTAL	176	53	22

Table 3-2: Continued demand for OIE PVS gap analysis

Source: OIE, June 2010

3.13 Endemic countries: key actions for sustained progressive control

HPAI in endemic countries requires long term political and industry commitments supported by adequate resources and gradual cultural change. With the ongoing threat of pandemic influenza, there is global consensus that continuous circulation or progressive increases in zoonotic influenza A viruses should be prevented in all domestic poultry. Early detection and response remains critical to the ongoing risk of potential novel re-assortment of viruses resulting from this collective evolution.

Most countries in which this virus is endemic are currently in the process of reviewing their strategy for H5N1 HPAI control and prevention, jointly with the international animal and public health agencies, taking into account that the emergency phase is past and that a broadening of the approach is now required in order to define lasting solutions in the medium to long term:

- **Broader partnerships:** The broadening of the approach entails a widening of the partnership and a more direct involvement of stakeholders beyond the core animal and public health authorities, in particular the private poultry sector;
- **Importance of collaboration between the animal and public health sectors:** Reports of outbreaks of H5N1 in animals and humans tend to increase simultaneously, and it is also notable that almost all human cases of H5N1 infection have occurred in countries with ongoing circulation or reintroduction of H5N1 viruses in poultry. Better management of poultry outbreaks in most countries has generally led to decreased virus circulation and a decreased risk for human exposure; overall there has been a progressive decline in the numbers of confirmed human infections globally since 2005-06. As such it is clear that close collaboration between human and public health sectors remains critical. This would include the strengthening of human and animal influenza surveillance to enable the timely detection of epidemiological, clinical, and virological changes, as well as the rapid sharing of information for quick and comprehensive assessments and global responses;
- **Focus on distribution and marketing of live poultry:** The broadening of the approach extends to the entire poultry value chain, with due emphasis on distribution and marketing of live poultry including across country boundaries;
- **Direct involvement of local communities, district officers and farmers** opens the door to customizing poultry husbandry practices in viable and sustainable ways, exploring local solutions tailored to the different sets of circumstances and engaging in planning and awareness activities;
- **Control and prevention will have to become more fully decentralized** in order to enable communities, municipalities, producer associations, vendors and all others in the poultry chain to progressively take direct responsibility for H5N1 elimination;
- **The critical role of health authorities** to monitor the progression in disease containment and elimination of disease and virus circulation remains high. The need for coordination and the orchestration of surveillance and lab activities is also increasing;

- As strong public engagement is critical for the success of containment efforts, **community-based initiatives** that promote dialogue and ensure feedback need to be implemented in order to build trust among the public, and the affected stakeholders in particular; and
- **Medium to long-term structural changes** in the poultry subsector may extend to a re-organisation of live bird markets, with disaggregation of old and new forms of poultry chains and of certain types of poultry.

3.14 Non-endemic countries: sustained vigilance and improvements in healthy poultry production

In non-endemic areas that remain at risk, different approaches are needed for sustained vigilance. Some countries have expressed interest in implementing market-based risk reduction strategies, including appropriate monitoring and traceability systems that could be strategically used to improve market-access for the rural poor and to improve sanitary standards of production units. These approaches not only abate disease, but also help alleviate poverty.

In non-endemic settings there is still a need to re-evaluate and improve the implementation of existing tools based on ongoing risk analysis along the poultry value chain. This process needs to go hand-in-hand with a clearer understanding of disease drivers coupled with long-lasting national investments. This not only supports H5N1 and H1N1 control efforts but also serves the purpose of maintaining healthy livestock and addressing other animal diseases of economic importance, among many other applications. It would be wrong however, to limit the focus to influenza viruses with so many other diseases still looming and threatening the livelihoods of rural farmers worldwide. Diseases such as foot-and-mouth disease, African swine fever, Rift Valley fever, brucellosis, peste des petits ruminants and rabies continue to have major impacts on human health, livelihoods and food security.

In practice, where the disease burden is low, actions need to emphasize **awareness raising, vigilance and surveillance**. Actions should remain focused on prevention through good animal health services, hygienic production measures and community support (such as village health workers, trained people (See Case Study 3-9); maintenance of good laboratory capacity and rapid access to reference laboratories, and contingency plans with regular conduct of simulation exercises. In addition, countries need to establish quarantine policies and a legal framework to support implementation and enforcement, as well as simple surveillance programmes to continue regular monitoring of potential disease niches and outbreaks.

The goal of the FETPV is to produce high quality graduates who are problem solvers and can provide science-based recommendations for government decision makers. A regional needs assessment identified key competencies and skills required by veterinary field epidemiologists. The training curriculum consists of interdisciplinary training modules including animal disease surveillance, outbreak investigation, data analysis, animal-human-environmental interface, geographic information systems, emergency preparedness and response and market chain analysis.

Since the initial level of training in epidemiology in various countries varies greatly, a one-month pre-requisite course is offered to narrow the gap among trainees from different countries. At least three trainees from the short course who best perform each year are invited to participate in the two-year FETPV programme that includes parallel training modules with medical doctors. With principles based on 'training through providing services', 75 percent of the trainees' time is spent in their home country conducting field studies. During the two-year programme, trainees must complete one secondary data analysis, one field research project and four outbreak investigations as principle investigator. Field mentors play a critical role in providing trainees sound skills, and include skilled epidemiologists from FAO.

Regional FETPV is enlisting its second cohort of three international and three Thai trainees in June 2010. The pre-requisite short course and two-year programme are fully supported by Chief Veterinary Officers in 12 participating countries in Asia (Cambodia, China, Lao PDR, India, Indonesia, Malaysia, Mongolia, Myanmar, Nepal, the Philippines, Thailand and Viet Nam). India and China are currently developing satellite FETPV training nodes that will collaborate closely with Regional FETPV. The regional FETPV exemplifies the One Health approach, which promotes and integrates human, animal and environmental health, both conceptually and practically.

Case Study 3-9: Field Epidemiology Training Programme for Veterinarians (FETPV)

Source: FAO

3.15 Why further work is needed

H5N1 HPAI remains a significant threat to human and animal health, both in terms of its direct effects (i.e. illness/death) and secondary impacts. HPAI causes significant losses in the agricultural sector globally, and continues to jeopardise agricultural productivity, food security and the livelihoods of farmers (and by extension, transporters, marketers, etc) in some of the world's poorest countries. Continued circulation of H5N1 HPAI in domestic poultry is limiting development and expansion of the poultry industry.

With almost double the number of confirmed H5N1 cases in humans reported in 2009, compared with 2008, it is clear that H5N1 also remains a public health concern. As noted earlier in this report, almost all human cases of avian (H5N1) infection have occurred in countries with ongoing circulation or reintroduction of (H5N1) viruses in poultry.

A major reason that H5N1 AI virus remains a high priority is that it can cross over to humans and still has the potential to spread rapidly in human populations. Influenza viruses continually change through mutation and exchange (re-assortment) of genes in unpredictable ways. Participants at IMCAPI 2010 confirmed that work needs to be expanded beyond progressive control to eventual eradication of H5N1, as well as to other influenza viruses and emerging pathogens including zoonoses. Current scientific evidence suggests that new animal diseases will continue to emerge, and governments need to factor this into domestic and international policy development, especially those concerned with safeguarding public health.

3.16 Areas for greater focus to achieve progressive control of H5N1 HPAI

Continued and enhanced interagency and multisectoral collaboration

Whilst substantial progress has been made, further work is needed to strengthen commitment for management of high impact diseases arising at the animal-human interface. An environment of continued interagency and multisectoral collaboration and cooperation needs to be supported at the international level of the UN, in regional organizations, and national level institutions.

In recognising this need, FAO, OIE and WHO have set a new strategic direction for managing and responding to risks relating to zoonoses and animal diseases with an impact on food security. Launched at the recent IMCAPI 2010, this tripartite agreement proposes 'a long term basis for international collaboration aimed at coordinating global activities to address health risks at the animal-human-ecosystems interfaces'. A complementary agenda and new synergies between FAO, OIE and WHO will include normative work, public communication, pathogen detection, risk assessment and management, technical capacity building and research development[60].

At local levels, participatory approaches need further support within the context of community cultural and social values and norms. In Papua New Guinea, for example, health care workers are trained to recognize sick poultry and how to take and transport a sample for testing. They are also trained in on ways to communicate the risks and the best response to the community.

Structures and systems still require substantial development

Systems and structures required (personnel, infrastructures, governance, legislation and policies) to prevent, detect and respond to the next pandemic or outbreak still need substantial development. Veterinary systems are notably weak in most countries around the globe in terms of the services they provide; their shortcomings are often due to poor governance, surveillance and diagnostic structures, low quality education, and poor gainful employment and remuneration. Animal production and marketing do not have the regulatory history to ensure proper practices and hygiene in most countries, and especially in remote areas. The interface between human and veterinary medicine at the local level rarely occurs and at the Ministerial level it may be referenced but not practiced and not adequately financed. The interface between natural resource management (including conservation and wildlife) and soil use and agriculture practices is an area of conflict, which requires common understanding and efforts for reconciliation.

Prevention systems are poorly funded at national and global level

Should the idea of 'tackling the disease at source' be held true, significant investment in disease intelligence, detection and early response is required. This includes robust systems for detection and reporting of events which may trigger disease spread or emergence. Donor support to regional and international agencies must develop a mid to long-term vision. This should be balanced with short-term emergency support which often requires inputs that do not guarantee sustainability, including capacity development for countries in need. Furthermore, the emphasis on a specific risk (i.e. H5N1 HPAI) in isolation of wider needs is short sighted for future emergency response and prevention measures. As a public good, the international community should continue to tackle the problem at source while assistance is also provided for local disease priorities (a two-pronged advocacy approach for health). In addition, a global approach is required to reduce the substantial and widespread consequences of animal diseases, especially in today's globalized world and interconnected markets.

Several pivotal economic studies commissioned by OIE on the prevention and control of animal diseases worldwide found that the **costs of preventing major animal diseases are significantly less than those associated with managing outbreaks** and the cost/benefit ratio of investing in prevention versus control is high[61; i]. Thus supporting development of veterinary services in developing /in-transition countries remains a high priority. A subsequent OIE/EU/WB study (the Cost of National Prevention Systems for Animal Diseases and Zoonoses, December 2009) found that variations in expenditures on prevention systems are clearly associated with differences in livestock population, and there is a close relationship between GDP and the total public expenditures for the National Prevention Systems[62; ii].

Effective public-private partnerships

The private sector plays a pivotal role in complementing public sector responsibilities. Effective public-private partnerships remain a critical element for achievement of progressive control of zoonotic diseases at the animal-human interface, leveraging comparative strengths between government, industry groups, NGOs and academia. Further dialogue is needed to explore possible mechanisms for partnerships. All countries currently affected by entrenched H5N1 HPAI have noted the critical importance of involving the private sector, as well as the immense difficulties in doing this. A critical component of future approaches will be creating a tight 'foursome' with **close collaboration between animal health, human health, the private sector and communities**. Discussions about how to ensure successful implementation have focused on establishing a 'common language' that all four actors can use, and alignment of incentives for each stakeholder[63]. One successful example from the food safety sector is the not-for-profit organization Safe Supply of Affordable Food Everywhere, Inc (SSAFE). Initiatives are underway in Bangladesh, Egypt and Indonesia to improve public-private partnerships – See Case Study 3-10.

Cohesion of overarching policy goals

A major consideration for international, regional and national level management (including public-private sector dialogue) will be to strengthen the cohesion of overarching policy goals. At present there are strong disparities between the policy goals for public health, agriculture food production systems and sustainable farming approaches, and economic development. Synergies across common global public good goals would enable more effective outcomes.

Building core communication capacities and a critical mass of practitioners

Communication interventions, if properly planned and responsive to people's needs, play a critical role not just in the dissemination of information and increase in knowledge, but above all in facilitating changes in attitudes and adoption of protective behaviours. In order to ensure sustainability of the individual and community behaviours, it is necessary to undertake an integral approach to communication interventions and consider them as a valuable and continual contributor to social wellbeing rather than merely as tools at hand to respond to emergencies.

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[i] International Conference co-organised by the WB and the OIE in collaboration with the FAO of the United Nations: 'Global Animal Health Initiative: The Way Forward', held in Washington DC at the WB Headquarters on October 9-11, 2007.

[ii] This study was commissioned by the OIE and co-funded by the WB and the EU. The views and recommendations presented in this study are those of the authors and do not necessarily represent the views of the OIE or one of the co-funding institutions.

In Bangladesh, Egypt and Indonesia, where HPAI has become endemic, FAO has identified the need for the formation of functional and efficient animal health systems based on strategic partnerships. These collaborative mechanisms aim to improve the dialogue between the public and private sectors through the creation of a trusting and respectful environment to discuss and share ideas, focus on shared interests such as biosecurity, vaccination, compensation, diagnosis and identify mutual benefits such as food safety, food security and consumer confidence. These public private partnerships offer unique opportunities to leverage comparative strengths between government, industry, NGOs and academia for enhanced prevention, detection and control of HPAI and other emerging animal diseases.

During the first phase of the Private-Public Partnership (PPP) programme (funded by USAID), the stakeholders from both the public and private sectors in three target countries were identified. Their capacity, roles and responsibilities and level of collaboration were assessed, described and mapped. Integration of the private sector in decision making processes was strengthened through joint workshops and on the job training, but there is still much work to do.

Experience gained in this project will enable replication of successful activities in other countries and for other emerging animal diseases. Examples of the PPP programme's activities:

- Development of national biosecurity guidelines for the commercial poultry industry in Bangladesh and Egypt.
- Development of a strategic plan for compensation of HPAI affected farms in Egypt.
- Harmonization and sharing of all available biosecurity training materials between training providers and agencies and conducting biosecurity training for input suppliers to small poultry producers in Bangladesh.
- The restructuring of live bird markets in the greater Jakarta area and supporting the establishment of a National Poultry Quality Improvement Plan in Indonesia.

Case Study 3-10: Public-private partnerships: a management tool for the prevention, detection and control of HPAI and other diseases

Source: FAO

Building core communication capacities and a critical mass of communication practitioners is another area which requires urgent and in-depth support for animal, human and environmental health stakeholders with clear linkages to urban planning sectors, trade and economic development decision-makers. Studies have shown that knowledge of H5N1 is relatively high, but that attitudes/risk perception behaviours are not adopted – partly due to the fact that human avian influenza is indeed rare. Successful efforts may need to refocus on areas where behaviour change is possible. Two examples include: a) effective communications between communities and health facilities to encourage appropriate early health care seeking behaviour coupled with improved access to antivirals; and b) in controlled occupational settings, strengthening occupational health and safety for all programmes involving the 'foursome' (noted above)[64]. The global communication response requires substantial improvement to prevent the spread of the H5N1 HPAI virus in poultry.

A unified and focused approach to rapidly building/strengthening core communication capacities among Ministries of Agriculture/Livestock, backed by the provision of hands-on technical assistance over the next five to seven years by the international community is an imperative to eliminate the disease. In countries where the disease has either already become, or could become entrenched, there is need for a shift from emergency communication campaigns, to the mid to longer-term communication approaches, which calls for significant investments in building communication capacities and competencies in the animal health sector. Additional resources for specific multidisciplinary research and analysis to inform the building of effective communication strategies will also be needed. Clear and internationally agreed indicators, benchmarks and pathways to strengthen these core communication capacities need to be established.

Mechanisms for long-term engagement and partnerships with the media, the commercial/private sector, small-scale poultry producers' associations, as well as civil society, are also seriously lacking, and have not been systematically and strategically addressed. Thus, among these important stakeholders, trust and confidence in national authorities' systems and processes and their policies remains tenuous.

Two crucial ideas also need to be systematically promoted society-wide through wide-scale public education interventions – over the long-term, but starting immediately:

i. Promoting appropriate bio-security as a professional **norm** along the whole production and marketing chain, to ensure safe livestock production and market practices (in commercial, semi-commercial, backyard systems).

ii. Promoting community-based reporting of suspect events and active public engagement in control measures as a social **norm**.

The avian influenza crisis has clearly demonstrated that communication specialists and practitioners also need to stop working in isolation – whether institutional, or in terms of their particular disciplines (media relations, crisis communication, behaviour change communication, advocacy, social mobilisation, participatory communication, etc.). Health threats emerging today are by their very nature complex, interconnected, and potentially large-scale phenomena, which cannot be dealt with in a naïve and fragmented manner, which pits media-focused crisis communication approaches using key messages against complex communication for social change processes. This gives primacy to the core principles of **participation**, **dialogue** and **empowerment**. Reducing risks/threats of a global nature calls for strategically re-thinking current communication practices, and building new approaches.

Gender analysis in livestock production and disease transmission

Further analysis and integration of socio-cultural factors is needed to strengthen livestock production and develop more sustainable and effective disease prevention, response and control. As women are frequently on the front lines of family health care and backyard poultry production, they can have a huge impact on reducing health risks for their families (and by extension, their communities), as well maintaining healthy poultry production and marketing. Making training and education available to women, as well as securing their access to and control over productive assets, are two examples of efforts that can be made on this front.

The principles outlined above also apply to management of other diseases beyond H5N1 and illustrate the importance of gender as part of a multidisciplinary approach to management of infectious diseases at the animal-human interface (See Case Study 3-11).

The relationship between gender and avian influenza (AI) has received increasing attention in recent years. Several programmes are addressing gender issues relating to AI actions, including the EC, UN Joint Programme in Avian Influenza in Viet Nam, the ADB Greater Mekong Sub-region Communicable Diseases Control Project, FAO research in Viet Nam, and the ASEAN +3 Emerging Infectious Diseases Programme.

In 2008, the EC completed a study concerning gender and AI in Lao PDR, Thailand and Viet Nam. The study found that many AI responses have not taken into account gender considerations, particularly the role of women and their possible contribution to responding to AI. Traditionally, men were considered farmers and the head of households, thus, men were usually invited to take part in training for AI control. However, women are also connected to livestock because of their considerable role in caring for small-scale backyard poultry. The results of the EC study highlight that women should be recognized as major stakeholders in dealing with AI, and that gender is a significant factor which can improve the effectiveness of AI achievements[65].

The ASEAN +3 Emerging Infectious Diseases Programme funded by AusAID completed a three-phase study in 2008 to generate information on gender impacts of dengue and AI in Cambodia, Indonesia, and Viet Nam. The goal was to support ASEAN +3 countries with gender integration in pandemic prevention and AI interventions. Based on a survey which targeted communities that had been affected by dengue and AI in the past two years, the survey highlighted issues related to gender differentials in economic and household exposure to disease. The study also demonstrated strengths, for example finding that most household members were aware of and used government health centres, had a high level of knowledge on modes of transmission, signs/symptoms, and prevention and management of avian flu for both genders, and both genders understood the risks of AI.

The results of the ASEAN +3 study offered policy and programme proposals for dealing with gender differences and achieving gender equitable results. Actions for preventing and managing emerging infectious diseases such as a needs assessment, incorporation of gender concerns, training for gender sensitive policy and monitoring, among other activities were also identified. The recommendations from the ASEAN +3 study included an advocacy plan to motivate policymakers, a social mobilization plan to raise community awareness and instruments for integrating gender in emerging infectious disease prevention and management programmes.

Case Study 3-11: Gender analysis and improving the effectiveness of Avian Influenza interventions

Source: ASEAN; EC

Strengthening links between veterinarians, biologists and environmental agencies

Coordination of activities such as surveillance in livestock, wildlife and human populations should be improved in order to improve efficiencies and sharing of data. Most importantly, this integrated coordinated system would be able to detect EIDs at the animal-human-ecosystem interface. Problematic experiences with diagnosis of diseases such as the West Nile and Nipah viruses, could have been substantially avoided with closer linkages between public health and veterinary surveillance and diagnostic systems[66].

The benefits of joint public-animal surveillance systems apply to all settings but are particularly relevant in remote and resource-poor areas. However, creating and sustaining such systems requires a legal framework and appropriate training with more emphasis on outbreak investigations, practical animal and public health measures, epidemiology and the wider effects of ecosystems and socio-cultural political aspects on human and animal health. In order for this collaboration to be effective and sustained, creation of appropriate institutional arrangements, technical assistance and a more reliable and sustained flow of financial resources needs to be established[67].

Applied research

Improved international research capacity is also needed to accelerate early detection and thus timely and effective control of disease. Achieving this will require a comprehensive approach that adopts multidisciplinary, multinational and multisectoral approaches. A better understanding of human interactions with animals, animal products, wildlife, and the natural environment could be established through applied research that addresses the complexity and multifactorial nature of EIDs. In South East Asia countries are working together to develop applied research capacity (See Case Study 3-12).

Overcoming major challenges to integrating human, animal and environmental health involves bridging institutional, disciplinary and conceptual barriers. Around the world, new knowledge and learning networks for multistakeholder participation and trans-disciplinary research are building such bridges across national boundaries and sectors.

The Asian Partnership for Emerging Infectious Disease Research (APEIR) includes multicountry, multiinstitutional teams from China, Thailand, Viet Nam, Cambodia, Lao PDR and Indonesia, and is guided by a committee of national science advisors and leading researchers. APEIR investigates issues of disease emergence, wildlife, agricultural practices, human health, economics and policy development.

The network is exploring the roles of wild birds and the ecological features of animal agriculture in the spread of epidemics; economic, cultural and policy influences on subsistence and commercial animal rearing and management of disease; social and economic impacts of disease and disease control; and, improving science and policy interactions.

The International Livestock Research Institute and Veterinarians without Borders / Vétérinaires sans Frontières – Canada recently initiated complementary programmes to promote research and build capacity in ecosystem approaches to health which will enable the consolidation and extension of APEIR. Much of this organizational development in Asia has been funded by Canada's International Development Research Centre (IDRC), CIDA and AusAID.

These networks are creating regional and global synergy among researchers, academics, private sector actors and government policy makers to make One Health a reality.

Case Study 3-12: A trans-disciplinary research network for EIDs

Source: Veterinarians without Borders/Vétérinaires sans Frontières- Canada; IDRC, Canada.

Priority research areas could include:

- understanding the epidemiology of EIDs including disease vector(s), geography of vectors, pathogens, host, habitats and climate;
- population vulnerability and the types of interactions (social and behavioural factors) that create opportunities for pathogens to 'jump' species;
- how to reduce risks;
- transmission dynamics;
- the role of wildlife ecosystems in global health and the triggers that affect the balance between different species in the same ecosystem;

- the link between international economic trends and changes in ecosystems; and
- resultant threats to populations leading to emergence of diseases and drivers of spread.

Further, applied research could be considered which addresses a better understanding of the barriers to preventing and controlling EIDs both in animals and humans; assessing the effectiveness of tools for detecting, forecasting the spread of EIDs; gaining a better understanding of the advantages of different intervention approaches and how communities can be engaged to more actively participate in animal and public health activities to reduce their vulnerability.

3.17 Conclusions

Detailed update of the global H5N1 HPAI situation (2009-2010)

- H5N1 HPAI remains entrenched in domestic poultry in several regions of the world, with Bangladesh, China, Egypt, Indonesia and Viet Nam remaining hotspots. Both Viet Nam and Egypt have experienced an increased number of outbreaks during 2009 compared with 2008. Other countries that continue to be affected by outbreaks include Cambodia, Lao PDR, India, and Nepal.
- While the spread and transmission of H5N1 HPAI mostly relates to poultry production and trade, there have been reduced numbers of wild bird outbreaks reported during 2009 (compared to 2008) in China, Mongolia, Germany and Russia.
- Almost all human cases have occurred in countries with ongoing circulation or reintroduction of H5N1 viruses in poultry. No new countries have recorded human cases of avian influenza H5N1 infection in 2009, reflecting a steady decline in the number of new countries recording human cases since 2006. The speed of detecting human infections in most affected countries has remained unchanged, with the exception of Egypt. Latest statistics indicate that detection times have however, been increasing again in Egypt during 2010. Strengthened human disease surveillance and reporting is still required in most affected countries to reduce CFRs for human cases.
- Influenza viruses continually change through mutation and reassortment in unpredictable ways. There is global consensus that understanding of the characteristics of circulating high and low pathogenic avian influenza viruses must be improved, to prevent a progressive increase in zoonotic influenza A viruses. There needs to be control and/or eradication of highly pathogenic avian influenza in domestic livestock, to minimise reservoirs in both humans and animals, and continued vigilance at all times.

Management of H5N1: mitigation efforts in endemic countries

- Mitigation strategies are moving from short-term emergency responses to longer-term sustained approaches and global understanding of the social, cultural, gender and economic consequences of both the disease and the interventions are improving.
- Much has been learned about vaccination strategies, and some countries are transitioning from mass vaccination of poultry to more targeted and cost effective measures based on multidisciplinary approaches. If large scale vaccination is used, strengthened epidemiological capacity is needed to ensure sound risk assessments and monitoring.
- Compensation policies have progressed towards more context specific policies, with closer collaboration between legal experts, the private sector and public sector ministries, as well as harmonising policies across borders.

Progress with strengthening healthy poultry production and vigilance in all countries

- Surveillance has improved in most countries, though further improvements including risk analysis (epidemiological capacity), stronger engagement with the private sector and greater levels of surveillance at the domestic poultry/wild bird interface are needed.
- Progress with laboratory capacity has been limited, largely due to limitations with funding for laboratory maintenance in many developing countries. Good progress has been made with sub-regional and regional laboratory networks in Africa; further work is required to strengthen networks in Central Asia and Eastern European countries.
- Veterinary legislation is an essential element for surveillance, early detection and control of animal diseases, animal production food safety and certification of animals and animal products for export. In many countries veterinary legislation remains outdated and inadequate to support animal health requirements.
- Very few countries have established biosecurity measures since 2008, and the global level of biosecurity in the poultry production chain remains low. Major constraints include a lack of legal/regulatory frameworks to enforcement of biosecurity measures, limited incentives and awareness of benefits.

Progressive control of H5N1 HPAI

- Progressive control features long-term planning and sustainability, political and industry commitments supported by national leadership, adequate resources, taking account of socio-economic and gender impacts, and understanding the opportunities and barriers for technical options. Short, medium and long-term objectives for progressive control vary for each country.
- Key elements of sustainable progressive control include evaluative assessments which: (a) take a risk-based approach to the development of interventions i.e. assess the risk of introduction based on potential pathways for the disease introduction and subsequent transmission and an understanding of poultry production and market chains; (b) ensure effective surveillance systems are supported by competent laboratories for early detection; (c) provide authority to manage rapid response actions – actions that are guided by community as well as expert decision making; (d) have communication and community engagement, public-private partnerships at the core of control activities; and (e) support strong veterinary services.
- Key actions for countries with endemic H5N1 include broader partnerships between sectors, and public-private interests, broader focus to include the entire poultry value chain – with particular emphasis on distribution and marketing, direct involvement of local communities, decentralised prevention and control, engagement of health authorities, and medium to long term structural change.
- In countries with entrenched H5N1, there is a need for a shift from emergency communication campaigns to longer-term communication approaches. This calls for investments in building communication capacities in communities and across the animal production and human health sectors.
- Long-term political and industry commitment needs to continue in endemic settings with ongoing assessments of risk, the implementation of flexible and customized arrangements to manage and promote society-wide awareness of risk.
- Key actions for non-endemic countries and areas that remain at risk include market-based risk reduction strategies, and ongoing awareness, vigilance particularly at the farm level and surveillance. This involves establishing a stronger understanding of disease drivers and long-lasting investments to maintain healthy livestock and address other important animal diseases.

Areas for greater focus to achieve progressive control of H5N1 HPAI

- Veterinary systems are particularly weak in many countries around the globe in terms of governance, surveillance and diagnostic structures, quality education and remuneration. Animal production and marketing do not have the regulatory frameworks to support proper practices and hygiene in many countries, and especially in remote areas. The interface between human and veterinary medicine remains weak and is inadequately financed.
- Prevention and control of a disease at its animal source is far less costly than tackling the ensuing epidemic in humans. Supporting development of disease detection, early response and strengthened veterinary services in developing/in-transition countries remains a high priority.
- There are strong disparities between the policy goals for public health, agricultural food production systems and sustainable farming approaches, and economic development. Improved synergies are needed to bridge these barriers.
- Long-term communication interventions are needed society-wide to promote:
  - appropriate biosecurity as a professional *norm* along the whole production and marketing chain, to ensure safe livestock production and market practices (in commercial, semi-commercial, backyard systems); and
  - community-based reporting of suspect events and active public engagement in control measures as a social *norm*.

  This requires establishment of core communication capacity and a critical mass of communication practitioners for animal health issues.
- Comprehensive research approaches that adopt interdisciplinary, multinational and multisectoral approaches are needed to ensure that human interactions with animals, animal products, wildlife and the natural environment are well studied through applied research that address the complexity and multifactorial nature of EIDs. Applied research in socio-economic and political spheres is also critical to understanding the influences on behaviour, incentives for change, risk reduction and priority-setting.

Preparedness for global health threats

4

"We have learned valuable lessons …(from pandemic (H1N1) 2009) …and there is still work to be done….(including to) incorporate early warning strategies into our surveillance systems for human and animal health that allow for a true foreseeing of health emergencies through comparative epidemiological indicators…acknowledge the essential importance of the human-animal health interface, by creating collaborative opportunities that identify the best way to deal with zoonotic diseases…realise that the risk of an avian influenza pandemic is not vanished by the current pandemic and therefore it is necessary to enhance the response and preparedness plans that already exist…breach the gaps that were made evident by the current pandemic with an inclusive approach of risks that are similar to influenza but also others as diverse as unknown and emergent pathogens…walk together with our communicators and health promoters all the way from the preparedness efforts to the post-event and recovery phases of an emergency…"

Dr. José Ángel Córdova Villalobos, Minister of Health, Mexico. Statement from IMCAPI 2010, Hanoi.

4.1 Introduction

The International Health Regulations (IHR) provide a global framework which enables all countries to strengthen protection against the international spread of epidemics and other public health emergencies. This chapter provides a brief overview of the IHR and recent public health threats such as plague and cholera epidemics, HIV/AIDS and influenza pandemics. Responses over recent decades provide an opportunity to build on current knowledge and strengthen preparedness for a more effective response in the future.

Some of the challenges include the establishment of reliable rapid forecasting and early warning systems to help predict disease emergence. This chapter discusses these and other challenges of mitigation, pandemic plans and simulation exercises based on experience from recent years.

The chapter also considers some of the priorities for building preparedness for future global health threats, ensuring that vulnerable and minority groups receive adequate protection, noting concerns with scarce resources and equity, and the need to reduce the socio-economic impacts of pandemics. Most countries have developed pandemic preparedness plans, however much work is still needed to adjust these plans for different public health scenarios, and to strengthen legislation and policies. Opportunities also exist to streamline preparedness through existing multihazard disaster response mechanisms such as the Hyogo Framework for Action 2005-2015.

4.2 Protecting global health through the IHR

The IHR provide a global framework for protection against the international spread of epidemics and other public health emergencies without unnecessary interference with international trade and travel. The underlying premise of these regulations is that preparation, early detection and response are necessary to protect against a 'public health emergency of international concern'. The regulations should be implemented in ways that are consistent with other international law and agreements. The IHR and OIE Standards provide necessary complementarities to support protection.

The revisions to the IHR in June 2007 require all 194 member states to meet core requirements within set timeframes for effective public health surveillance and response. Overall investment in strengthening capacity at global, national and local levels since the revisions became legally binding has contributed to improved surveillance and reporting capacity, and preparedness for a pandemic in many countries. However, many countries still lack core capacities to detect and respond to public health emergencies and further strengthening is still needed.

Public health threats – planning for the future

The world has experienced many major public health threats in the past century including influenza pandemics, outbreaks of plague such as Surat (1994), cholera in Peru (1991), HIV/ AIDS originating in Africa (~1930), Nipah Virus in Malaysia (late 1998), and SARS in the Asia region and Canada (2003). The most recent event, pandemic (H1N1) 2009 (originating in Mexico and the US) has heightened awareness of the need for preparedness for influenza pandemics. There is much to be learned from pandemic influenzas since 1885 (See Figure 4-1), and other major public health threats that regularly occur throughout the world.

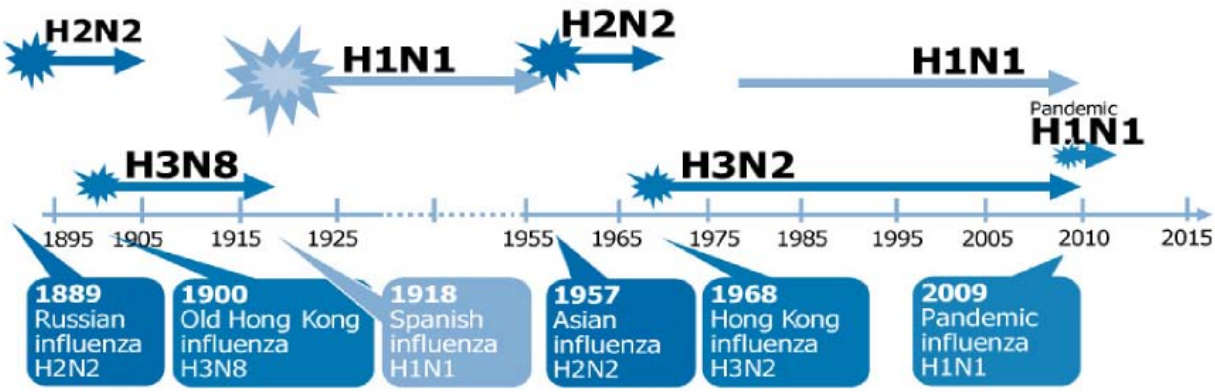

Figure 4-1: Recorded human pandemic influenzas since 1885

Source: Nicoll[68], European Centre for Disease Prevention and Control (ECDC) 2009.

4.3 Challenges for pandemic preparedness – early detection and response

Surveillance and early warning systems

Reliable and rapid forecasting and early detection systems are needed to ensure that there is as much early warning as possible. New approaches to surveillance and early warning systems need to be developed that predict determinants of factors associated with EIDs.

These approaches include mechanisms such as ecological mapping, forecasting of potential sources for disease emergence, and a better understanding of the drivers for disease emergence (See Chapter 5 for details of the drivers for disease emergence). Surveillance of potential niches for emerging disease, novel influenza strains and other zoonotic diseases in both animals and humans continues to be critical given the potential for virus reassortments and mutations. The OIE/FAO network of expertise on animal influenza (OFFLU; See Text Box 5-5) is central to sharing data and information among the world's leading laboratories to advance knowledge and build preparedness in this area.

Surveillance and information systems need to increase the reliability and availability of information to governments, technical agencies, and communities to enable informed interventions. Information should also be shared between animal and health sectors providing an early warning to significant changes in viral characteristics, and providing biological material and information for early preparation of human influenza vaccines that may protect against emerging virus strains. The OFFLU network is working to achieve this goal but further development is needed. Under the IHR, countries have an obligation to report potential public health emergencies to WHO within 24 hours after identification and assessment, though WHO may also consider unofficial reports from other sources including email or internet reports. In a similar manner, OIE Members, under Treaty obligations are required to report on animal diseases in accordance with defined rules.

Surveillance systems have been strengthened for case detection in many countries, but should be strengthened further to ensure they are fit for purpose and address the needs of all in an equitable manner. Surveillance needs to be integrated more purposefully across human and animal sectors, with more explicit meaning. For example, surveillance may be used for planning and coordination, or for laboratory systems across animal and human health sectors. Efforts to monitor the current pandemic (H1N1) 2009 influenza with epidemiological data are challenging due to continued constraints with surveillance capacity in many countries including parts of Sub-Saharan Africa.

Containment of novel infectious diseases

Rapid containment efforts are extraordinary measures taken to stop or slow the human-to-human spread of a novel influenza virus and international spread beyond initial outbreaks. This includes measures such as movement control and area quarantine along with active and intensive case-finding, treatment, contact-tracing and chemoprophylaxis of contacts and isolation and quarantine of patients[69].

The importance of aggressive early intervention has been assessed in simulation exercises of an emerging person-to-person transmissible avian influenza outbreak in South East Asia[70]. These simulations demonstrated that for effective containment at source, interventions with targeted distribution of anti-virals and social distancing measures had to be implemented within two weeks of the first case of human-to-human transmission. If this failed, the consequences would then be experienced more broadly very quickly for a highly transmissible disease. In the US, a simulation exercise for avian influenza identified that within two weeks of the incident case 1,000 people would be affected, and within 48 days 100,000 people would be affected. Some countries, including Canada, have identified the need for new emergency legislation to enable government authorities to respond rapidly if required[71].

Irrespective of simulation exercises, field studies have shown that containment approaches for infectious diseases may not be effective and, in many cases, may be logistically unfeasible. In developing countries with minimal resources this may be particularly true. Early warning and disease response need to be coupled with a high level of readiness to allow rapid action once a new event is detected.

Containment and response strategies that acknowledge operational limitations (which need to be better understood) and are focused on achievable goals are needed, specifically addressing the animal-human interface. A determination of gaps (including for surge capacity for public health emergencies or disaster response events) which enables strategically focused investment to cover all sectors is also important.

4.4 Challenges for pandemic preparedness and response – mitigating impacts

Disease mitigation and public health responses

Experience with responses to pandemic (H1N1) 2009 revealed significant challenges associated with effective containment, and the importance of a high level of readiness to mitigate the health, social and economic impacts of infectious disease events once they had occurred. A critical issue for disease mitigation is the need for explicit global, regional and national goals which are linked to a specific strategy. Weaknesses in health systems can permit emerging infections to amplify and spread, and can compromise care for patients. The documented experiences from major outbreaks such as SARS (2003) include increased risks to health workers (predominantly women), the need for surge capacity including facilities for isolation, and long periods of intensive and expensive care. New surveillance and reporting systems, data management, procedures for infection control and information mechanisms have been further developed in many countries to improve public health responses[72].

The aim of the public health response is to prevent, detect, treat and mitigate cases of illness associated with a disease event. This requires having a core capacity to respond including a preparedness plan developed and tested, a functioning surveillance system with laboratory capability to inform disease epidemiology. Outbreak response at hospital and community levels is also needed to prevent the spread of the disease and to reduce morbidity and mortality. At hospital level, infection control is critical. However, infection control measures that focus on hospitals only are not enough to ensure effective prevention and control of infections. Much of the disease spread may happen in a population long before a hospital case produces a notable outbreak[73].

All sectors need to be ready to work collaboratively to reduce the impact of infectious disease events, and this requires institutionalised systems and structures (See Chapter 5, Section 5-12 on institutional arrangements). Some sectors may experience a surge in demand for services along with a decline in ability to deliver services due to staff absenteeism. For agricultural sectors, there is a continuing need for science-based decision-making to avoid impacts on trade of animals or animal products. Alternatively some sectors, in particular travel, tourism and entertainment may experience a sudden fall in demand. All sectors, particularly education, travel, work place and health services, can contribute to the reduction in levels of disease transmission through coordinated planning and strategic communication approaches.

Education is an important sector for pandemic mitigation. Educational facilities can contribute to successful health education and social mobilisation interventions, and play a role in sustaining knowledge and awareness within communities to prepare and respond to future threats. Schools can be an important vector for transmission of disease within communities, and children potentially have higher levels of vulnerability to infection, hence the importance of good preparedness systems and health education.

Strategies need to be realistic and operational to mitigate the impact of the pandemic on human health in terms of mortality and morbidity, as well as social and economic impacts[74]. Significant effort has gone into strategic planning at international, regional and national levels, although top-down approaches for strategic planning may not take into consideration feasibility and local realities. During the early stages of pandemic (H1N1) 2009, WHO announced the change to phase 4 of the recommended Global Influenza Preparedness Plan and recommended that affected countries start mitigation measures including applying standard guidance on the management of influenza cases and outbreaks similar to those for seasonal influenza[75].

Pandemic (H1N1) 2009 was the first global test of the IHR and Global Influenza Preparedness Plans. WHO has initiated a review of the response to the pandemic within the context of the IHR, which will provide lessons learned and inform the international response to future outbreaks and major public health events. Several countries have also undertaken reviews of mitigation and public health responses and considered lessons learned to reassess approaches for major public health threats (See Case Study 4-1).

From September to December 2009, the Ministry of Public Health (MOPH), Thailand conducted, in collaboration with the World Health Organization, a joint assessment of H1N1 responses. The assessment aimed to review Thailand's response to the pandemic, document achievements, strengths and areas for further strengthening, and provide recommendations to address identified gaps and potential challenges.

International experts and MOPH officials established thematic review teams considering: 1) clinical management; 2) risk communication; 3) laboratory capacity; 4) operations and logistics; 5) surveillance; 6) control measures and 7) border and migrants. Each team spent around a week reviewing its strategic area, including interviews with relevant authorities, private organizations, schools, village health volunteers, community leaders and staff of temporary shelters for migrants. Briefings were conducted on the last day of the field assessments to the authorities and administrators.

Clinical, epidemiologic and laboratory findings have been applied in revising and updating the surveillance and control strategies, clinical management guidelines and standard operative procedures (SOPs) for first wave pandemic (H1N1) 2009 responses as well as for the subsequent waves. The preliminary outcomes of the joint assessment have been reported to MOPH war room and the national advisory committee and the recommendations communicated to concerned MOPH offices. A final report incorporating findings and recommendations will be made available. The lessons learned from the assessment will be taken into account in preparing the new national strategic plan for avian influenza and pandemic influenza (and potentially other EIDs) preparedness and response, replacing the current plan that is effective until the end of 2010.

Case Study 4-1: Joint assessment of H1N1 responses in Thailand by the Ministry of Public Health and WHO

Source: Ministry of Public Health, Thailand

Communication with the public, media, and stakeholders

International public health events over the past two decades have demonstrated the need for clear and consistent communication among and between all involved stakeholders in the management of public health threats. Communication, both internal and external, is a vital component of any crisis management plan. A range of communication channels should be used to convey messages to the public in general, as well as to high-risk groups. This includes using both mass media and social mobilization activities via different channels and regular press conferences from policy makers to ensure that the public has adequate information to prevent disease spread, avoid panic responses, and ensure that the community is kept as safe as possible. However, the extraordinary media coverage that accompanies any major public health threat may create expectations for information and action that are challenging to meet.

Economic epidemiology can be used to analyze impacts to understand the links between the epidemiology and dynamics of a disease, the behavioural responses of people in reaction to the disease, and the economic consequences that follow (as well as deaths and the illness itself). A recent study of the role of communications in economic impacts of infectious disease outbreaks showed that effects on the economy arise from the uncoordinated efforts of millions of private individuals to avoid becoming infected. Indeed, such impacts could account for 60 percent of the economic costs of a pandemic as in Hong Kong, Singapore and Taiwan from the 2003 SARS outbreak and could exceed the costs of illness, absenteeism, and death[76]. Costs of prevention are forefront, but effects are aggravated by public risk communications strategies and by trade and travel restrictions (occasionally excessive) imposed by governments in other countries[77].

Experience from both the plague outbreak in Surat (1994) and the Peru cholera outbreak (1991), demonstrated that due to a lack of adequate testing facilities authorities were not able to collect reliable data quickly enough to provide an authoritative source of public information in the early days of the outbreak. This allowed rumours and media to control reporting. In both cases lack of adequate diagnostic facilities also led to the use of excessively broad case definitions and inflated case numbers, which in turn contributed to panic among the public and excessive trade restrictions by trading partners[78].

The 2003 experience with SARS in China demonstrated that information about the disease spread quickly both inside and outside the country, and that communication has a key role in the level of impact of a major disease threat. The major impacts of the February 2003 SARS outbreak in China included large, though short-lived negative demand shocks (See Figure 4-2) induced by individuals to avoid becoming infected, leading to sharp reductions in foreign and domestic tourism, and reduced domestic demand for service sectors (retail stores, hotels, restaurants, transportation)[79].

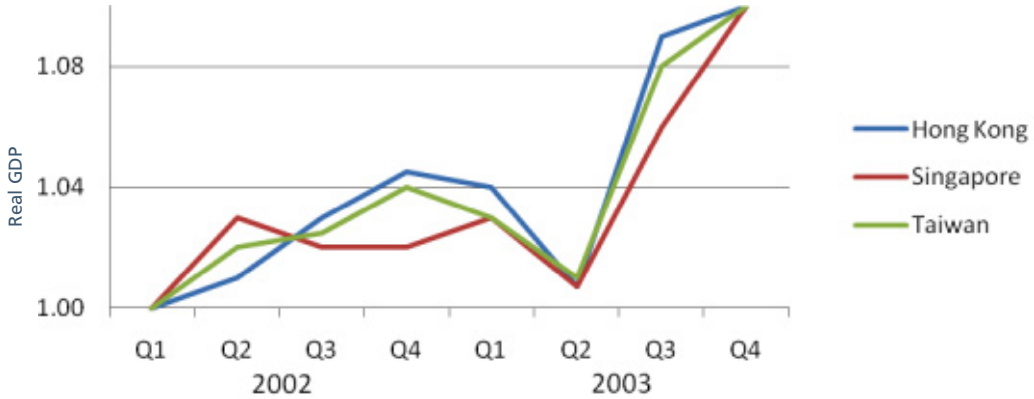

Figure 4-2: Economic impact of SARS in three economies, 2002-2003

Source: Brahmbhatt et al.

International coordination

The ability of pathogens to cross borders and spread rapidly around the globe requires highly coordinated public health responses that involve the cooperation of all levels of government in countries as well as intergovernmental agency cooperation at regional and international levels.

Results of a recent H5N1 HPAI impact assessment study undertaken by the EC noted that the policies and strategies developed by international organizations, individual countries and regional bodies had established successful coordination and partnership mechanisms at the international level[80]. Networks of expertise on animal and human influenza, strengthened data sharing and varying levels of emergency preparedness and capacity across countries at the national and regional levels had been established. The conclusions from this impact assessment were also, however, that international coordination is more complicated than expected.

As noted above, experience from several public health events in recent decades, including pandemic (H1N1) 2009, demonstrate that countries often implement travel and trade restrictions despite UN and other international specialized agencies recommendations. These measures are often not scientifically-based, may not stop or limit the spread of the diseases, and can cause unnecessary economic and social losses (See Case Study 4-2).

In mid-March 2009 health service providers in Mexico observed an unusual increase in patients presenting influenza-like symptoms. The rising incidence and an increased number of local outbreaks of seasonal influenza in late February and March (seasonal flu usually peaks in mid-January) as well as clusters of severe pneumonia in young adults compounded suspicions and led health officials to investigate the outbreaks. On April 16, the Ministry of Health published a press release announcing that there had been an unusual increase in seasonal flu cases.

On April 23, when laboratories confirmed that A/H1N1 was responsible for several influenza cases in Mexico, the Mexican Government began implementation of a series of activities aimed at containing the spread and mitigating the health impact of the epidemic. Schools, restaurants, museums and other venues in Mexico City were shut down for 10 days; non-essential businesses were closed for five days. The Ministries of Health and Education issued a joint statement saying that school closing was a preventive measure and that everyone should 'avoid popular or crowded places except when absolutely necessary'.

The influenza pandemic had a significant, though temporary, impact on the Mexican economy and especially on service-related sectors such as tourism and recreational activities. Though a counterfactual is always hard to establish, in particular at a time of an unprecedented global financial crisis and economic recession, current estimates of the downturn in economic activity in Mexico estimate an additional reduction of economic activity by 0.3-0.5 percent of GDP or between US$2.7 and US$4.5 billion. This estimate is based on the deviation of the service sector activity compared to the level of activity that would have been expected given the evolution of the rest of the economy. In terms of external finances, the drop in international tourism in the 2nd and 3rd quarters of 2009 led to a decrease of gross revenue by US$1.5 billion compared to the same period of the previous year and can be largely attributed to the influenza epidemic.

Case Study 4-2: Mexico: Response to and impact of pandemic (H1N1) 2009

Source: World Bank

Organizational architecture needs to enable swift, yet flexible and science-driven, responses to future pandemics. Special focus should be on ensuring the ability of the system to integrate across animal and health sectors. Internal institutional mechanisms including incentives and sanctions need to be implemented to encourage collaboration and coordination[81].

Scarce resources and equity

Issues of scarce resources and equity are of fundamental importance and need to be urgently addressed before the next pandemic threatens. Decisions need to be made about where limited resources should be placed to respond most effectively to needs. Discussions at the 62nd World Health Assembly meeting in May 2009 agreed that prevention measures should be taken at a global level and policies adopted with developing countries to forge a global chain of prevention for the pandemic (H1N1) 2009 virus.

Global access to vaccines and antivirals remains challenging, despite significant efforts to address distribution to least developed countries. In response to the 2009 pandemic, WHO established mechanisms to support least resourced countries with access to vaccines through contributions from developed countries and allocations of a percentage of production from vaccine companies[82]. There are significant challenges with deployment of vaccines including adequacy of financial, logistical and technical resources within national deployment plans[83]. On a global scale there are also limitations to current vaccine production technology, as well as limited geographic coverage of vaccine production capability. New vaccine technology is under development, and broader geographic capacity for vaccine production is being supported by WHO in India, Thailand, Indonesia and other countries[84]. Work continues to avoid possible delays with access in the future; the Bill and Melinda Gates Foundation has set out one such approach to this issue (See Text Box 4-1).

1. The global community should take steps to protect all populations, including those without resources to protect themselves.
2. Vaccination should be considered in the context of comprehensive pandemic preparedness and response efforts in all nations.
3. Developed countries and vaccine manufacturers should urgently agree upon a mechanism to ensure access to vaccine by developing countries.
4. Influenza vaccine manufacturers should identify strategies such as tiered pricing and donations to make pandemic vaccine more accessible to developing nations.
5. Pandemic vaccines allocated to developing nations should become available in the same time frame as vaccines for developed nations.
6. The global community should obtain data to help establish a consensus on the safety and efficacy of adjuvants, and efforts should be made to ensure the fullest use of this and other dose-sparing strategies.
7. All countries obtaining pandemic vaccine should ensure that mechanisms are in place to provide the vaccine to their populations, to ensure that this scarce resource is not wasted, and donors should be prepared to provide resources and technical assistance to help countries bolster these mechanisms.
8. WHO is uniquely positioned to lead the global response to a pandemic virus and should support governments and industry in their efforts to implement these principles.

Text Box 4-1: Principles to guide global allocation of pandemic vaccine

Source: Bill and Melinda Gates Foundation[85]

Resource mapping studies undertaken by the London School of Hygiene and Tropical Medicine (LSHTM) in Mekong countries (2009) highlighted resource shortages across areas such as numbers of medical staff, hospitals, beds etc, and provided information which could usefully address priority setting for strengthening public health systems, particularly with building capacity for surge responses[86]. Greater use of applied research can strengthen allocation of funding to address priority resource needs for countries with scarce resources.

Overcoming the constraints for a global framework which enables sharing of virus samples and their benefits also demands careful attention to political and legal considerations. The basis for such a framework, which could utilize the IHR, may come from:

- Increased and geographically diversified global influenza vaccine production capabilities;
- Increased and sustained inter-pandemic demand for seasonal influenza vaccines;
- Improved preparedness and response capabilities;
- Accelerated research collaboration on new vaccine manufacturing techniques and other scientific developments; and
- Clear 'triggers' for pandemic alert levels.[87]

Legal preparedness for emergency and pandemic response

One of the major requirements for IHR implementation is to update national legislation. Appropriate legal frameworks are vital in situations in which international assistance is needed, yet such frameworks often do not exist and, as a consequence, bureaucratic barriers are frequently noted as a problem in pandemic response. Delayed surveillance and notification procedures can impair a country's ability to rapidly identify and contain an outbreak. The importance of effective implementation of legal instruments is often overlooked and can result in delayed assistance, added expense and decreased efficiency.

The legal framework should: 1) facilitate performance of IHR activities in a more efficient, effective or otherwise beneficial manner, 2) institutionalize and strengthen the role of IHR capacities and operations within the country, as well as the ability to exercise certain rights contained in the Regulations, and 3) facilitate necessary coordination among the different entities involved in implementation and help to ensure continuity. Legislative frameworks remain outdated in many countries, though there are some promising initiatives underway in different regions including in Europe and South East Asia to address this (See Case Studies 4-3 and 4-4).

A 2007-2010 study by a consortium of European public health institutions examined whether public health laws across EU states plus Croatia, Turkey, Iceland, Liechtenstein and Norway were 'fit for purpose', whether laws were consistent with states' planned national preparedness plans, and whether inconsistencies should be considered public health concerns.

Although all states had laws in respect to communicable diseases, the study found significant differences in legislation across European states, including variation in the kind of interventions authorized by law, border movement during a pandemic, the use of emergency powers that may take priority over human rights, and access to healthcare for non-residents. These findings are noteworthy because cohesion of national health systems has been determined to be vital in contributing to pandemic control and public health challenges. The variances have been noted with some concern as they could negatively impact European strategies for pandemic control.

Participants of the study, comprised of law and public health experts, noted a considerable disconnect between public health law and pandemic preparedness. There were some measures clearly defined in advance while others were not determined until the need arose. Furthermore, when cohesive plans and laws were in place, there was little clarity regarding the organization and management of pandemic planning. These findings suggest the need for greater involvement of the EU and surrounding nations in establishing guidance for states' management of pandemic diseases. In addition, the study noted the need for public health law capacity to be strengthened if laws are to be coherent. Further strengthening of effective public health tools and the interface between research, law, policy and practice was also identified as a priority.

Case Study 4-3: European legislation for pandemic preparedness

Source: LSHTM[88]

The potential far-reaching impacts that a pandemic may have on a society highlight the need to implement and manage legal issues in advance, so a rapid response can take place. In recognition of this need, in 2007, the International Red Cross and Red Crescent Movement (IFRC) developed a set of guidelines for the Domestic Facilitation and Regulation of International Disaster Relief and Initial Recovery Assistance (IDRL Guidelines) to strengthen law, policies, and procedures in international disaster relief and recovery operations.

In an effort to review country specific legal frameworks in light of the emergence of the IDRL Guidelines, in 2008-2009 IFRC conducted studies in Cambodia, Lao PDR and Viet Nam which highlighted experiences of responding to pandemic emergencies. The goals of the studies were to identify good practice, identify gaps and recommend legal measures to encourage effective response to communicable diseases.

The studies found that within the legal framework in Cambodia and Lao PDR, many decrees and instruments were established to respond to a pandemic, and noted the efficiency of Lao technical bodies in dealing with early warning and disease surveillance. Viet Nam had established a Law on Communicable Disease Prevention and Control.

Recommendations from the case studies will help to strengthen legislative structures in these three countries, with suggestions including further development of laws on infectious disease control, designing a set of principles for managing communicable disease emergencies and addressing the legal arrangements for international aid, identifying operational linkages between government agencies, and defining the role and function of the National IHR Focal Points. Additional suggestions included creating special provisions for the entry and exit of humanitarian assistance (including personnel, goods and equipment), and considering further details for legal rights and freedoms during emergencies.

The IDRL Guidelines have led to impressive accomplishments in terms of new regulations and national rule-making in Indonesia, Panama, New Zealand and Norway, and are being used in many countries to strengthen legal policy. The Guidelines have been an effective tool for improving national laws for pandemic preparedness.

Case Study 4-4: IDRL Guidelines for strengthened legal frameworks in South East Asia

Source: IDRL

4.5 Challenges for pandemic preparedness – pandemic plans and simulation exercises

Anticipating different scenarios

In response to the H5N1 HPAI pandemic threat, pandemic plans for most countries are now in place, and have provided the basis for responses to pandemic (H1N1) 2009. For many countries the current (moderate) pandemic presented both an opportunity and a challenge as many plans were prepared for a severe pandemic scenario. Rapid revisions have been required to reassess pandemic planning approaches for a moderate scenario with an unanticipated set of target groups and circumstances.

Preparedness and response plans need to anticipate a wide range of scenarios for both clinical manifestations/ mortality and geographic/ecological epicentres. The 'concept' of preparedness needs to expand to prepare for new zoonotic diseases at the animal-human environment interface. It is also clear from the experience of responding to recent public health emergencies that local contexts including the economic, political and socio-cultural aspects should be taken into account when developing policy and operational responses. Standard guidelines are useful to set the principles of work but, for effective responses, these principles should be adapted to local settings[89]. Policy makers need to adjust policy in real time, for five critical areas: pandemic risk, vulnerable populations, available interventions, implementation possibilities and pitfalls, and public understanding.

Populations of humanitarian concern, including refugees, internally displaced persons, migrants, ethnic minorities, the poor, older people, people with disabilities, and the homeless, are particularly vulnerable to the impacts of pandemics and often overlooked by government planning. Governments should ensure that these groups are explicitly included in national planning and response strategies.

Strengthening and sustaining behaviour and social change communication

Behaviour and social change communication interventions are essential to ensure that communities have adequate information, are engaged in participatory and consultative processes and are mobilized to adopt recommended preventive actions to minimize the impact of the H5N1 HPAI pandemic threat. These non-pharmaceutical interventions are a key part of effective preparedness for and response to pandemic threats. These interventions can be low cost and can achieve durable impacts, and deserve proportional resourcing and investment.

Communication efforts have had a significant impact in building knowledge about the recommended behaviours and protective practices required to decrease the risks to human health of emerging diseases and pandemics. However, increased knowledge is not necessarily being reflected in the permanent adoptions of those behaviours. Motivating people to change habits and practices, deeply embedded in traditions, culture and social norms requires continuous awareness and proactive interventions guided by well-planned and locally appropriate communication strategies.

Community-level responses are critical for mitigating the impact of a severe pandemic wave. Countries and development partners should ensure sufficient preparedness to implement appropriate community-level interventions at national scale. Community based organisations play a critical role in service delivery and it is important to address policy and practical challenges for community-level preparedness and resilience.

Integrating plans into multihazard disaster planning

The Hyogo Framework for Action, endorsed in 2005, provides a structured approach to disaster risk reduction, underscoring the need for and identifying ways of, building the resilience of nations and communities to disasters. The framework encompasses disasters caused by hazards of natural origin and related environmental and technological hazards and risks. It reflects a holistic approach to disaster risk management and the relationship between multiple hazards, which can have a significant impact on social, economic, cultural and environmental systems[90].

Despite progress in many countries towards making multisectoral pandemic preparedness planning a priority, more resources are needed to enable systematic preparedness. In order to have sustainable mechanisms for preparing for pandemics, it is important to situate pandemics within the responsibilities of existing national disaster management institutions, plans and processes, because (i) much of the response to a pandemic is the same as response to other crises (ii) it is not cost-effective to have a separate silo for each disaster rather than a multihazard approach (iii) this helps to ensure that actors and sectors beyond the Ministry of Health recognise that pandemics will affect them and preparedness is essential.

Multisectoral pandemic preparedness

The scope of multisector pandemic preparedness needs to be broader, in order to strengthen the resilience of sectors and services to a wider range of future public health threats and crises. Much of the preparedness should have a multihazard approach and utility. Some governments, including the UK, have undertaken efforts to strengthen delivery of essential services in the event of a pandemic (See Case Study 4-5).

Business continuity management, in both the private and public sectors, plays an essential role in ensuring that normal life is maintained as far as possible during a pandemic. Yet, a 2009 survey sponsored by the UK Cabinet Office and the Chartered Management Institute indicated that before pandemic (H1N1) 2009 approximately 38 percent of businesses had no pandemic planning in place and a further 19 percent felt their plan was weak. Consequently, a significant focus was placed on improving business continuity arrangements within the private, public and voluntary sectors during the UK H1N1 response.

The Business Advisory Network for Flu (BANF) was set up in May 2009, in recognition that successful business continuity planning relies on organisations being able to access information and practical advice. This built upon existing networks and business links. The network operated both physically, with conferences and meetings, and virtually with an e-mail distribution list, mailbox and website (www.businesslink.gov.uk/swineflu) and provided a conduit for two-way communication, with Government providing up-to-date guidance and information as the situation developed and businesses sending queries and requests for advice.

The UK planning assumptions were also shared through BANF as well as with emergency planners, which enabled businesses to better understand the challenge facing the UK and adjust their plans alongside that of the Government. BANF was also used as a forum to consult businesses about issues which had direct implications for employers such as possible changes to sickness certification and requirements for regulatory relaxations. The responses received in these consultations will be used to inform preparations for future pandemics.

There were approximately 500 BANF members with over 150 attendees at each meeting, with many more receiving information directly from their sponsor Government department or trade organisation. Feedback to date has been positive, and a full review of its effectiveness will be carried out as part of the UK Review of the response to the H1N1 pandemic.

Case Study 4-5: Working with business to ensure robust and proportionate business continuity planning in the United Kingdom

Source: UK Government

More effort needs to be made to ensure that essential services are in place for a severe pandemic or major public health disaster. As a severe pandemic would particularly threaten vulnerable groups, governments must ensure that their planning incorporates special consideration to protecting the rights, needs and interests of groups such as refugees, internally displaced persons and others.

Governments should also increase the involvement of NGOs, civil society, Red Cross/Red Crescent and private sector in their pandemic planning, as these actors have a critical role in delivery of services to vulnerable groups. A crisis across many countries at the same time will exceed the capacity of the international humanitarian system, and a pandemic will disrupt traditional international supply and transport chains: local response capacity will therefore be critical.

Despite the fact that pandemic (H1N1) 2009 was not as severe as feared, the air travel and tourism sectors were negatively impacted in some countries. Given that, governments should be encouraged to better link public health with aviation and tourism, and to incorporate these industries into their multisectoral whole-of-society planning efforts.

Operationalising of pandemic preparedness and extending to sub-national levels

For most effective operationalisation of pandemic plans, regular conduct of simulation exercises helps to strengthen readiness, test planning strategies and identify resource needs. Many simulation exercises undertaken before pandemic (H1N1) 2009 were focused on containment in developing countries[91]; a significant and severe pandemic was viewed as unmanageable (and not played out in many scenarios).

A range of simulation exercises has been undertaken by countries in recent years, from discussion-based orientation or table-top exercises to functional or full scale exercises. The latter require significantly increased levels of planning, timeframes and resource investments[92]. A range of scenario predictions for simulation exercises – planning for known and unknown scenarios – including a better understanding of ecological niches and climate change impacts are also needed. Planning and operationalizing pandemic planning (including evaluation and review) needs to take place at both the local and national levels (See Case Study 4-6).

In 2008, the US Centres for Disease Control and Prevention launched a National Inventory of Core Capabilities for Pandemic Influenza Preparedness and Response, a tool that has subsequently been used in more than 40 countries to create a baseline of select human health capabilities and track progress toward enhanced preparedness over time. The tool complements WHO guidelines by providing information to guide ongoing investment in preparedness and response; inform strategic and programme planning across pandemic phases; review logistic and operational needs; and use sound information to identify and address deficiencies according to available resources. The capabilities reflect composite progress in distinct domains of preparedness and response, and the format of the tool and data collection process allow for measurement in diverse settings (for example, low resource and middle-income). In many cases, participating countries incorporated the National Inventory into their own system for monitoring and evaluation of preparedness and response activities. Several country and regional examples illustrate application of this tool:

1). **Mongolia** participated in the first wave of data collection in 2008. Following data collection at the national level, Mongolia recognized the utility of expanding data collection and consequently developed a complementary tool for assessment of the country's Influenza Pandemic Preparedness Plan at the sub-national level. The National Inventory was amended to include indicators of cross-sector collaboration, veterinary sector pandemic response, emergency sector pandemic response, and family clinic preparedness. In March 2009, with support from the WB, Mongolia conducted the assessment countrywide. The final report (including the data collection instrument and raw data) is available online via the National Influenza Centre, and it includes specific recommendations for action based on findings at the national and sub-national levels.

2) **Lao PDR** also participated in the first wave of data collection in 2008. Less than a month later, the same group completed a retrospective analysis to determine progress to date in preparedness and response capabilities. Participants focused the assessment on January 2006 – a point in time prior to an influx of funding and technical assistance for preparedness and response activities. In short, Lao PDR was able to document a 3.9 fold increase in total score, and significant progress in the areas of laboratory capacity, rapid response, and communications for avian and pandemic influenza. Following the model established in Lao PDR, six additional countries conducted retrospective assessments to document progress in preparedness and response capabilities, as well as opportunities for continued investment of resources. In each case, going back approximately two years, participants identified a point in time prior to an influx of funding or technical assistance. Data collected were used to show meaningful progress in preparedness and response capabilities in each country.

3) **WHO's Western Pacific Region Office** and the USCDC established complementary data collection activities in the region. The National Inventory was expanded to include key indicators relevant to the Asia Pacific Strategy for Emerging Diseases (APSED) – a common regional strategic framework for the generic capacity building required for Emerging Infectious Diseases, including pandemic influenza. For example, recognizing the need for a collaborative mechanism including information sharing between animal and human health sectors, WPRO added indicators on zoonoses. Existing indicators relevant to surveillance and response, infection control, laboratory, and risk communication were amended to best reflect regional priorities. WPRO used the combined instrument for data collection throughout the region. In countries where USCDC provides bilateral support for influenza activities, WPRO and USCDC jointly administered the tool. The collaborative effort resulted in a single, high-quality instrument for monitoring and evaluation, and enhanced consistency in data collection across the region.

4) **African** representatives from Angola, Cote d'Ivoire, Democratic Republic of Congo, Ethiopia, Ghana, Kenya, Nigeria, Rwanda, South Africa, Tanzania, and Uganda participated in a workshop on monitoring and evaluation in Dar es Salaam, Tanzania in May 2008. Following the workshop, the Tanzania Ministry of Health graciously allowed the 10 countries to observe the assessment process in Tanzania, including dialogue on each indicator and identification of levels of capability. The two-day meeting provided a forum for clarification of the content of the tool and implementation process prior to data collection in the other 10 countries. Immediately following data collection in Tanzania, representatives of the 10 countries returned home with USCDC colleagues to complete data collection in their own countries.

Case Study 4-6: Developing core capabilities for pandemic preparedness and response, including at sub-national levels

Source: USCDC

Monitoring and evaluation of pandemic preparedness and response capacities
Regular reporting and assessment of progress with pandemic preparedness is needed at national, regional and international levels. Mainstreaming pandemic preparedness monitoring into the Hyogo Framework for disaster preparedness will strengthen and streamline assessment capabilities for non-health sectors.

4.6 Conclusions

- The IHR provide a global legal framework for protection against the international spread of epidemics and other public health emergencies. Progress has been made to strengthen core capacities for surveillance and response though further development is still required.
- The world has experienced multiple public health threats in the last century. International, regional and national level agencies need to compile and synthesize lessons learned from recent public health threats, including pandemic (H1N1) 2009, from multisector and multidisciplinary perspectives to improve pandemic readiness addressing the fundamental questions of 'what works, where, why and how'.

Challenges for pandemic preparedness – early detection and response

- Reliable and rapid forecasting and early detection systems are needed, including new approaches to surveillance and early warning systems that predict disease emergence through a better understanding of drivers.
- Surveillance and science-based information systems are an important tool to increase the reliability and availability of information to governments, technical agencies and communities to enable informed decision-making and strategic interventions. Surveillance systems have been strengthened for case detection in many countries, but need to be strengthened further to ensure they are fit for purpose and that sharing of information between sectors is possible.
- Containment of infectious diseases is likely to become more challenging in an ever increasingly interconnected world. Reliable science-based information is needed to support decision-makers when determining the most appropriate course of action in the event of an emerging threat/disease outbreak. Early warning and disease response needs to be coupled with a high level of readiness to allow rapid action once a new event is detected.

Challenges for pandemic preparedness and response – mitigating impacts

- Along with human and animal health sectors, other essential sectors need to be ready to work collaboratively to reduce the social, economic and humanitarian impact of infectious disease events.
- International public health events over the past two decades have demonstrated the need for clear and consistent communication among and between all involved stakeholders in the management of public health threats. Communication has a major effect on the social and economic impacts of a pandemic or major public health event. Accurate information needs to be provided in a timely way.
- The ability of pathogens to cross borders and rapidly spread globally requires highly coordinated public health responses that involve the cooperation of all levels of government in countries as well as intergovernmental cooperation at regional and international levels.
- Means of addressing the complex issues related to scarce resources and equity will require careful consideration and multiparty engagement. Global access to vaccines and antivirals remains challenging, despite significant efforts to address distribution to least developed countries.
- Non-pharmaceutical interventions are a key part of effective preparedness for, and response to, infectious disease threats and should be given equal priority for action.
- Different interventions are appropriate depending on the severity of a pandemic wave. Response activities should be differentiated based on the impact of the disease, so as to ensure an appropriate response.
- One of the major requirements for IHR implementation is to update national legislation; this is being tackled by some governments with assessments of current frameworks and plans to strengthen legislation for pandemic preparedness and emergency response.

Challenges for pandemic preparedness – pandemic plans and simulation exercises

- In response to the H5N1 HPAI pandemic threat, pandemic plans for most countries are now in place, and have provided the basis for responses to pandemic (H1N1) 2009. In light of recent experiences it is likely that many countries will undertake reviews to enable varied responses to different public health threat scenarios to be incorporated into planning in the future and to take into account local economic, political and socio-cultural contexts and learning.
- To sustain momentum and ensure continual readiness for major events, many countries may consider integrating parts of pandemic preparedness into other multihazard disaster planning. The Hyogo Framework provides a structured approach to disaster risk reduction underscoring the need for, and identified ways of, building the resilience of nations and communities to disasters.
- Likely areas of focus for future development include: optimising learning; building capacity to assess and predict situations more accurately; enhancing cross-sector decision-making; improving communication about risks, supporting the adoption of protective behaviours, and strengthening of response capacity of all sectors.
- Likely areas for strengthened partnerships include: government/civil society and public/private sector to ensure that planning protects the rights, needs and interests of vulnerable groups, such as refugees, IDPs and other vulnerable groups.
- Absenteeism in a severe pandemic could lead to significant economic, humanitarian and social impacts. A severe pandemic could disrupt provision of essential services to vulnerable people. Business continuity plans to mitigate the impact of absenteeism on the effective provision of services are therefore important.
- For most effective operationalisation of pandemic plans, regular simulation exercises help to strengthen readiness, test planning strategies, and identify resource needs. Regular reporting and assessment of progress with pandemic preparedness is needed at national, regional and international levels.

Overview of One Health 5

"We believe the risk of emergence and re-emergence of dangerous diseases on the African continent is higher now than ever before. The increase in human populations, impacts of climate change on vector ecology and the ecosystem in general, changing patterns of land use, unprecedented intensity of game trade, including in bush meat and faster global travel have all made it easy for diseases to emerge and spread. Additionally, many important diseases have remained neglected on the continent due to a combination of a lack of resources as well as prioritisation to tackle them. These include brucellosis, tuberculosis, rabies…Urgent measures are necessary to tackle these diseases on a continuing basis to assure our people, and indeed, the global village, better health security and productivity."

H.E. Mme Tumusiime Rhoda Peace, Commissioner for Rural Economy and Agriculture, African Union Commission. Statement from IMCAPI 2010, Hanoi.

5.1 Introduction

This chapter provides an overview of One Health approaches, encompassing different disciplines in human, animal and environmental health as well as across research and programme development. The chapter examines why the approach is needed, and outlines other high burden diseases of concern, matters relating to scarcity of resources, global interconnectedness and the global burden of disease. It also illustrates drivers for disease emergence across three environmental settings: human environments, food and agriculture systems, and natural ecosystems. Factors such as increased density and mobility of animal and human populations, decreased diversity of ecosystems and agriculture intensification can pose increased risk for animal and human health.

One Health approaches highlight the need for multisectoral collaboration for priority setting, revised education programmes, strengthened veterinary services and public-private partnerships. Some of the key One Health approaches for early detection, control, and preparedness include strengthened surveillance systems, predictive modeling to enable rapid response, improved communication, and a stronger focus on multisectoral business continuity planning to ensure societal readiness.

Governments should be at the centre of the One Health structure by providing direction and assuming responsibility for the One Health approach. The Hanoi IMCAPI meeting encouraged key actions including strengthening of data collection and the evidence base, strengthening communication in all its forms and shapes, and better integration of the Paris principles. Furthermore, as part of the MDG acceleration to address poverty reduction and sustainable development with equity, this includes supporting the most vulnerable and marginalized populations.

Key measures for sustaining momentum include political and technical leadership and commitment, institutionalization and expansion of the coordination bodies that were established for the H5N1 response in many countries. One Health approaches can ensure that local/national/regional/international levels are working together and expanding networks to facilitate capacity building and training.

5.2 One Health approaches: origins and new paradigms

From the early origins of human culture there has been recognition that the health of human populations, other animals and ecosystems are inextricably linked. Evidence of this goes back 2,500 years ago when Hippocrates urged physicians to consider all aspects of a patient's life including environment, lifestyle and diet. This early integrative thinking was lost when medical science considered that it had conquered infectious diseases through development of modern technology and advancing scientific knowledge. There has also been an unprecedented level of specialisation of disciplines and increasingly reductionist approaches to scientific enquiry[93].

Interestingly, there has been a revival of One Health conceptual thinking in recent years, emphasizing epidemiology and public health, and the interrelatedness of human, animal and environmental health. These interrelated domains are central to zoonotic diseases, the magnitude of these threats, and the need for more purposeful consultation between medical and veterinary health. Scientists and policy makers have been motivated to establish closer collaboration.

Early collaboration in practice grew out of local, community-based initiatives of health promotion movements or geographically regional efforts such as the International Joint Commission of the Great Lakes, and WHO-led malaria, rabies and tropical disease programmes. Various One Health approaches have emerged over the past three decades including the development of ecosystem approaches to health (International Development Research Centre, Canada)[94], international Communities of Practice for Ecosystem Approaches to Health (CoPEHs)[95] and the International Association for Ecology and Health[96]. From the environmental management perspective, global networks have been established to address the complexities of social-ecological systems (the Resilience Alliance)[97].

The world has reached a pivotal moment in history moving towards an integrative agenda at new levels of policy and global practice. The interactive agenda is progressing through various names including (but not restricted to) 'One Health', 'One World One Health' and 'Ecohealth', with each term having slightly different emphases by a range of international organisations[98].

One Health is used to refer to a more integrated or holistic approach to human, animal and ecosystem health. It represents the collaborative efforts of multiple disciplines to understand the links between human and animal health and the health of the ecosystems they inhabit. The zoonoses arise at the interfaces between domestic animal, human and wildlife domains in an intensely interrelated system with one domain impacted by events or system changes in other domains (See Figure 5-1).

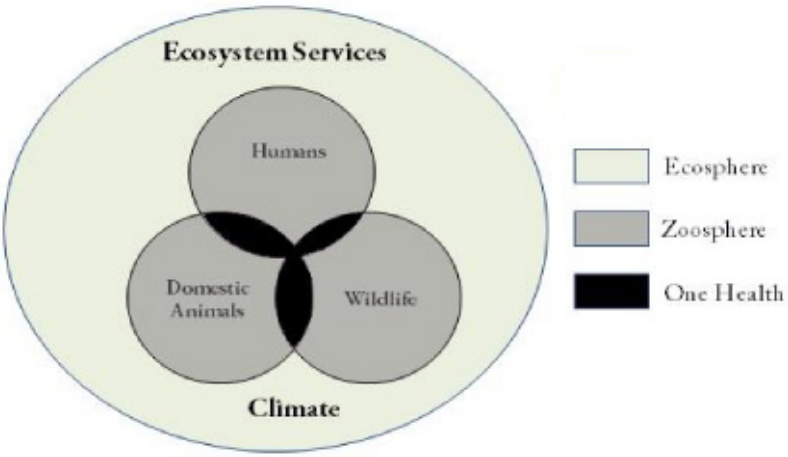

Figure 5-1: Interacting health domains

Source: World Bank

The diseases of primary importance for the One Health approach are those that have potential to jump species – between wild or domestic animals and humans[99]. Diseases targeted by this approach generally include EIDs, which are infections that have newly appeared in the population or have existed but are rapidly increasing in incidence or geographical range[100]. Increases in transmissibility of a microorganism, a shift in virulence or development of characteristics (such as microbial resistance), or a species shift are all considered to be emerging diseases. Examples of these emergent diseases include HPAI, Nipah/Hendra viruses, SARS, Monkeypox and Hanta viruses. Emergent (or re-emergent) diseases also include neglected/endemic zoonosis such as Rabies, Rift Valley Fever and Q Fever. Food borne zoonoses such as brucellosis and anthrax can be categorised as emergent, but also neglected/endemic zoonoses (See Figure 5-2).

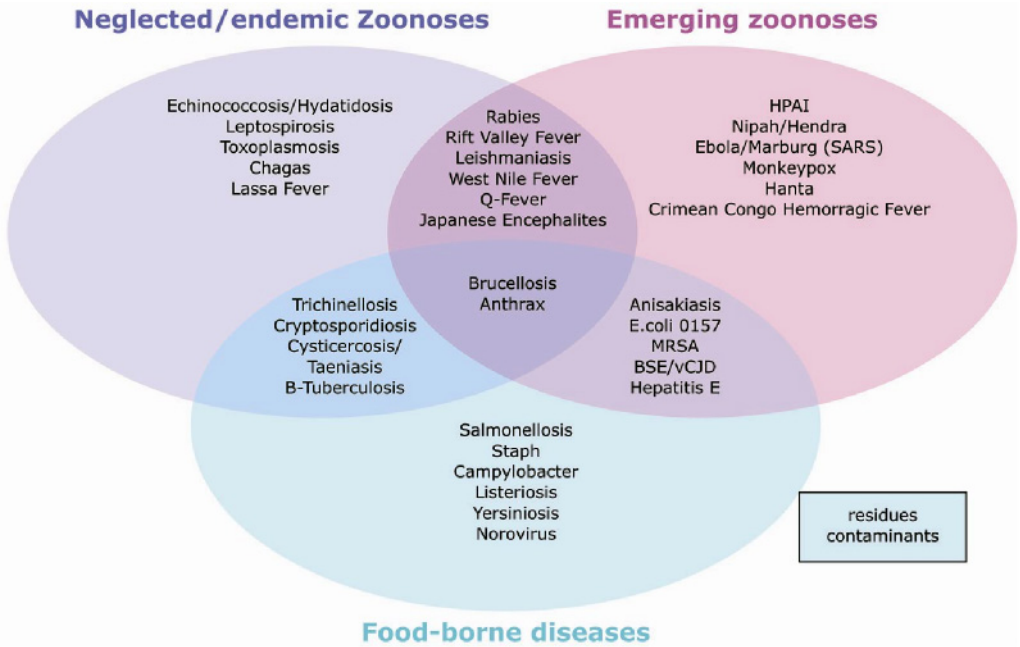

Figure 5-2: FAO approach to zoonotic diseases

Source: FAO

This paradigmatic shift to One Health approaches is based on a transition from emergency activities to more strategic approaches that take longer timeframes and apply multidisciplinary understanding and approaches.

5.3 Recent initiatives for development of the One Health Concept

The complexity of applying One Health approaches in an interrelated world has represented a challenge for policy-makers and practitioners. The re-emergence of HPAI in 2003 and subsequent concern over a potential pandemic threat prompted the international community into action, galvanizing international resolve and initiating unprecedented global collaboration. A series of international meetings brought countries and international organizations together to produce the groundwork and relationships necessary for effective responses (See Annex 8: Timeline of international meetings: avian and pandemic influenza contributions to One Health).

In 2004, the One World One Health (OWOH) movement of the Wildlife Conservation Society developed the Manhattan Principles, which reflect the need for inter-system collaboration (See Annex 9: Manhattan Principles). Six international organizations (FAO, OIE, WHO, UNSIC, UNICEF, and the WB) subsequently used the Manhattan Principles to further the thinking in regard to pandemic influenza risk, preparedness and response, producing a landmark document '*Contributing to One World One Health. A Strategic Framework for Reducing Risks of Infectious Diseases at the Animal-Human-Ecosystem Interface*'[101].

Consultation on OWOH during an international technical expert meeting sponsored by the Public Health Agency of Canada (Winnipeg, March 2009) unanimously agreed with the need to take a One Health approach forward. The Winnipeg conference emphasized the key actions required to progress the objectives of the Strategic Framework (See Text Box 5-1).

- Foster political will
- Support partnership and collaboration
- Encourage data sharing and integration
- Build capacity (infrastructure and skills)
- Develop communication strategies and plans
- Provide incentives for reporting adverse events
- Encourage stakeholder and community engagement
- Develop supra-country approaches

Text Box 5-1: Key actions for One Health, Winnipeg 2009

Source: Public Health Agency, Canada.

The need for enhanced interagency collaboration was also recognized by the tripartite FAO-OIE-WHO agreement (April 2010) providing the long term basis for addressing One Health approaches at the animal-human-ecosystems interfaces (also noted in Chapter 3, Section 3.16).

As a follow-up to Winnipeg, technical experts met at Stone Mountain (Georgia, USA) in May 2010 to define the policy actions needed to implement a One Health approach. Seven critical enabler initiatives were identified for further development: One Health training and curriculum development, establishment of a global network, an information clearing house, a needs assessment process, capacity building activities, a proof of concept research study, and development of a business case to promote donor support. These initiatives will be progressed through representatives from EU, FAO, OIE, UNICEF, USCDC, WHO, the Wildlife Conservation Society, Wildlife Trust, the WB and various academic institutions[102].

Many challenges exist in implementing One Health goals, including a number of institutional and administrative constraints and difficulties with effective collaboration between human and animal health sectors and line ministries. Political and financial commitment to address EID issues is often lacking, and in many least resourced countries there are limited human resources to support prevention, detection and response approaches. Difficulties in engaging the private sector can also exacerbate problems. However these challenges are being overcome in a progressive manner at the global, regional and country levels in recognition of the fact that One Health approaches are essential long term measures to support zoonotic disease prevention and control.

At the national level, many countries have responded by developing human-animal health interface organizations such as the Canadian Science Centre for Human and Animal Health, the Danish Zoonotic Centre, the USCDC National Centre for Zoonotic, Vector Borne and Enteric Diseases (now with the proposed title of National Center for Emerging and Zoonotic Diseases), the Australian Biosecurity Centre for Research, and the New Zealand National Centre for Biosecurity and Infectious Diseases.

5.4 Zoonotic diseases: what has been learned from H5N1 for other diseases?

Significant experience has been gained over the last decade from disease outbreaks such as SARS in China (2003), and H5N1 HPAI mainly in South East Asia, but also in Africa and Europe (2004 to 2010). These experiences can be used as building blocks for improvements and adaptation of practices. The culling campaigns for H5N1 HPAI in South East Asia for example, have brought to light the impacts of measures on rural livelihoods as well as the realization that in endemic situations the gamut of approaches needs to be context-based and flexible, rather than prescription-driven.

There is a common narrative weaving through this experience that provides evidence to the success of the H5N1 response and which can be built upon as preparedness for other animal disease threats (and even other disasters), namely: multidisciplinary, cross-cutting approaches, inter-agency and inter-ministerial collaborations, capacity-building, risk communication, trust-building, cohesion, and the importance of well-equipped veterinary laboratories. Challenges remaining to be resolved are related to addressing the weaknesses and gaps in local disease control approaches, establishment of international standards for animal trade, improving dialogue between governments and people, and moving emphasis from pathogens to more people-centred views.

Several actions can help achieve this common vision for zoonotic diseases, including:

- Increased emphasis on disease drivers and ecological landscapes for improved prevention, mitigation, and risk management.
- Continuous re-evaluation of strategies for prevention and control of H5N1 HPAI to detect areas of improvement and discontinue redundant or inconsequential actions.
- Improved availability and distribution of resources, tools and systems to circumvent the impact of these zoonotic disease challenges.
- Targeted approaches and information management strategies for a better spatial and temporal understanding and management of risks at international and local level and to measure progress. The OFFLU model (see Text Box 5-5) can be applied and expanded to other emerging threats.
- Assessment of epidemiological risk and economic drivers for transboundary management (market movements or pastoralist needs) with improved hygiene through awareness at the production and trade levels to avert zoonotic risks.
- Broader multidisciplinary partnerships that include partners outside of classical medicine (veterinary or human) to be incorporated into One Health approaches; this should include socio-anthropologists, communicators, macro-economists, conservationists, wildlife specialists and legislators.

5.5 Other high burden animal and human diseases of concern

Emerging diseases are increasing, intensifying, and moving into or spreading to new populations for the first time, and it is predicted that new pathogens will continue to emerge within domestic and wild animal populations at the rate of at least two per year (See Figure 5-3)[103]. Over 60 percent of new diseases arising between 1940 and 2004 were zoonotic diseases, and of these more than 75 percent came from wild animals[104]. In tropical settings the disease burden is higher than that in temperate climates; and with the forecast climate changes, disease burdens, pathogen encroachment, or agent or vector translocation and establishment will become more common[105]. To support the notification of emerging diseases in animals OIE has recently enhanced the World Animal Health Information System (WAHIS) to include wildlife diseases (See Text Box 5-2).

In addition to the potential impacts on human life and health, the economic losses associated with zoonotic diseases are significant. Examples of economic impact from zoonotic outbreaks in the last decade include bovine spongiform encephalopathy (BSE) with economic losses of US$10-13 billion in the UK alone[106]. Direct costs from these outbreaks include public and animal health service costs, compensation for lost animals, and production and revenue losses to the livestock sector, as well as broader economic losses to affected countries. Indirect costs affect other parts of the animal market chain, as well as trade and tourism.

Other zoonotic diseases, of which there are many, result in significant human and economic loss. They include rabies, human tuberculosis induced by the bovine tubercle bacillus *Mycobacterium bovis*, echinococcosis/hydatid disease (Case Study 5-1), and brucellosis, which are major causes of morbidity and mortality among predominantly poor people and which are also under-reported. Another emerging disease of concern with wide ranging hosts is Q fever (Case Study 5-2). Rabies is one of the 'neglected' and re-emerging diseases killing more than 55,000 people every year, with about 95 percent of these deaths occurring in Asia and Africa. A large proportion of victims are children from poor communities.

Brucellosis causes indirect losses such as decreased milk yield and poor fertility in cattle. It can result in undulant fever in humans, particularly farmers and abattoir workers, which if not treated promptly can lead to personality disorders. *Brucella melitensis* in goats can lead to Mediterranean fever in children and adults through the consumption of unpasteurized milk or cheese.

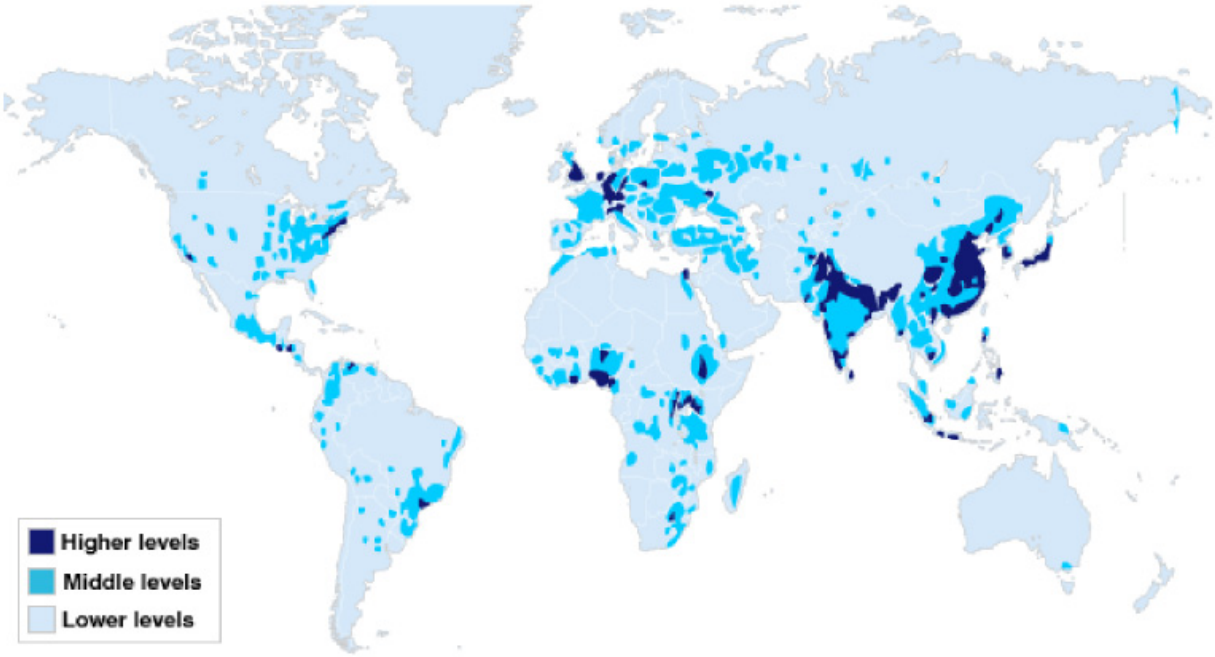

Figure 5-3: Infectious diseases transmissible between animals and humans

Source: Nature

OIE Members have the obligation to immediately notify animal health events of epidemiological significance to the OIE Headquarters, including the occurrence of OIE listed diseases as well as any emerging disease with significant morbidity/mortality or zoonotic potential. The requirement to report emerging diseases among animals based on the zoonotic potential – a parameter that is not directly related to the presentation and severity of the disease in animals – is a key feature in the OIE's ability to identify diseases or pathogens that may pose a risk to humans before animal-human transmission, and thereby reduce the risk of transmission to humans.

To support the notification of cases of the main animal diseases (including zoonoses) and the subsequent analyses of these data, the OIE developed and supports the WAHIS. This internet-based computer system processes data on animal diseases and then informs the international community by means of 'alert messages' of relevant epidemiological events in OIE Member countries. Given the role of wildlife in emerging diseases as source of pathogens for animal diseases and/or human diseases the OIE recently enhanced WAHIS through development of WAHIS-Wild, to support improved reporting of OIE listed diseases and emerging diseases occurring in wildlife species.

Text Box 5-2: World animal health disease notification system, including 'emerging diseases'

Source: OIE

HIV/AIDS also originated as a zoonosis, and has spread globally with major public health impacts. Global estimates for HIV in 2008 indicated that approximately 33.4 million people were living with HIV, with almost 2.7 million new HIV infections registered that year. There were approximately two million deaths due to AIDS in 2008.

Food borne diseases such as *Escherichia coli*, Campylobacteriosis, and Salmonellosis caused 1.8 million deaths in 2005 according to WHO reports. Economic impacts of these food borne pathogens were estimated to be up to US$35 billion in 1997 in medical costs and lost productivity in the US. Recent WB studies of direct and indirect costs from food-borne diseases in Viet Nam estimate that it could be up to US$1 billion per year.

Echinococcosis, also known as hydatid disease, is caused by a tapeworm found in domestic and wild dogs and other canids, who shed the parasite's eggs in their faeces. It can affect many animals, including wildlife, livestock and humans (human exposure generally occurs when exposed to either canine faecal matter or to the parasite's eggs on animal fur; people at high risk are usually vets, hunters and others in close contact with wild or domestic dogs). In dogs, the parasite has no discernable effect; however in humans it can be debilitating and potentially fatal if left untreated. However, there are several ways to prevent hydatid disease in humans, including hand washing after animal handling.

Hydatid disease occurs worldwide though the impacts vary considerably among regions and countries, largely dependent on the control, treatment, attitudes toward and interactions with dogs, general animal rearing and slaughtering practices. These practices are embedded in cultural, ecological, and economic systems, which vary from place to place. After more than a century of aggressive control programmes in countries such as Iceland, New Zealand, Argentina and Chile, the disease appears to be making a come-back in many parts of the world and is also spreading to new areas.

In the 1990s, after reports of a 20 percent case-fatality rate of patients presented for surgery with hydatid disease, an intensive research and community development project was initiated in Kathmandu, Nepal. In the 1980s, various independent research and development activities targeted at improving slaughtering practices and investigating the disease dynamics generated a wealth of sometimes contradictory knowledge, such as the realization that dogs served as community police as well as sources of disease, and livestock generated both solid waste and economic wealth. Given these complexities, no changes occurred until community members, business leaders, medical and veterinary specialists, anthropologists, local politicians and community organizers were mobilized into an integrated ecohealth initiative. With facilitation by two Nepalese nongovernment organizations – the National Zoonoses and Food Hygiene Research Centre, and Social Action for Grassroots Unity and Networking – and the University of Guelph, community-led transformation included changing slaughter facilities and practices, improved environmental hygiene, increased public awareness and better management of street dogs. Economic and social benefits thus extended well beyond the cost of the disease itself.

In 2008, a young girl in a northern Canadian aboriginal community was diagnosed with cerebral hydatid disease. Subsequent investigations revealed that free-roaming dogs, and hunting of wild moose and deer, were common in the community. Unused portions of hunted animals, including those infected, were often left in places where dogs could scavenge them. Although the disease is rare in Canada, the conditions in this community are not unusual among remote indigenous communities; and programmes to address the issue must encompass not just infection in people and wild and domestic animals, but also the variety of ecological and cultural conditions that characterize their interactions and livelihoods. As in many economically disadvantaged and remote communities, this disease is one of many problems associated with free-roaming dogs, which also serve positive roles as waste scavengers and companions. Again, given the rarity of the disease, control programmes must encompass multiple outcomes if they are to succeed. Currently a range of nongovernmental and governmental organizations, including those representing First Nations, are working to develop sustainable strategies to resolve these complex issues.

Case Study 5-1: Parasites, people, dogs and livelihoods – community mobilizations and One Health approaches for Hydatid disease in Mongolia and Canada

Source: D. Waltner-Toews, Veterinarians without Borders/ Vétérinaires sans Frontières- Canada[107]

Social consequences of global health threats include the effects on economic resources and opportunities available to people in a community, changes in family and social networks and support systems, and also on educational development. Children represent a particularly vulnerable group to the impacts of the close interaction of growing human and animal populations. Demographic pressure and its economic consequences are reflected in higher poverty rates especially in the less advantaged segments of the population, with its direct adverse effect in the levels of health and nutrition of households. In addition, changes in the environment represent a fertile soil for the emergence or re-emergence of infectious diseases, spread of vector-borne diseases, higher incidence of water and food-borne illnesses that in this context tend to be disproportionately concentrated on children.

The world's increasingly fragile environment may contribute to the emergence of infectious diseases as well as negatively impacting nutrition, food and water security, gender and cultural inequities and poverty. These issues demand consideration in all aspects of research and planning.[113; 114; 115] Examination of origins of human disease such as SARS Corona virus and Nipah virus (See Case Study 5-3) demonstrates the effect of environment and people activity in driving wild viruses into urban hosts[116; 117; 118].

Q fever is a zoonosis caused by the bacterium *Coxiella burnetii*. It is one of the most infectious diseases known since inoculation with a single bacterium can give rise to disease, although such low doses are rarely fatal. C. burnetii is found all over the world and is resistant to high temperatures, drying, and common disinfectants, making it very resilient[108]. The natural reservoir is small ruminants, mainly goats and sheep. In animals it causes spontaneous abortions, typically in the late stages of pregnancy. Transmission occurs between animals through contact with infected animals which shed bacteria in urine, faeces, milk and birth fluids[109]. Humans acquire Q fever mainly by inhalation of infected aerosols, and other modes of transmission include consumption of infected dairy products. It results in subclinical infection, flu-like symptoms followed by an abrupt onset of fever, pneumonia or hepatitis.

Outbreaks of Q fever were first noted in the Netherlands in 2007, following an unusual increase in the number of pneumonia cases in the province of Noord-Brabant, an area of high agricultural activity and large populations of ruminants. As of late November 2009, 2,293 human cases have been confirmed including six deaths. Factors such as intensive farming and weather conditions (dry and windy) are believed to play a role in the role of Q fever outbreaks. Despite efforts to contain the disease through vaccination of small ruminants, outbreaks happened in 2008, with particularly high numbers in 2009 leading to a mass culling of 34,000 pregnant goats and 1,200 male goats in 2009 alone[110]. To give an idea of the problem, the culling accounts for more than half the total livestock in most of the farms affected. Vaccination was made mandatory in April 2009 which should reduce the abortion waves caused by *C. burnetii* in the upcoming years.

Worryingly, the geographic area of the epidemic appears to be expanding[111]. Worldwide outbreaks have occurred since 2007 in the UK, Slovenia and Australia, making this a global threat. The full involvement of ecologists and environmental scientists is needed in all countries to better understand the underlying social-ecological drivers that link infection in livestock and disease in humans.

Case Study 5-2: Q Fever outbreaks in the Netherlands – an emerging zoonosis of global concern.

Source: ECDC; Veterinarians Without Borders/Vétérinaires Sans Frontières[112]

Encephalitis causing Nipah virus amongst pigs and pig farmers was first recognized in Malaysia in late 1998. In the initial outbreak, 103 of 261 suspected human cases were fatal and many of the remaining had long-term neurological damage. In response, over 1.1 million pigs were culled. The outbreak, which cost the Malay government $US500 million, was traced to fruit bats which had migrated into pig farming areas due to increasing urbanization and change of habitat. The pig was an intermediate host.

There have been 12 outbreaks of Nipah virus since 1998, all in Asia, with 477 human cases and 248 deaths, and there is evidence of human-to-human transmission in Bangladesh and India. This disease is considered to be a major potential pandemic threat.

Understanding the behaviour, ecology and infection status of fruit bats and their direct/indirect interactions with humans has been critical to developing effective responses to this threat. Managing some of the complex social and ecological interactions that led to initial outbreaks requires integrated policy development – with changes in animal husbandry, landscape alterations with fire, forestry or agriculture, and sharing of human and animal medical data quickly across jurisdictions. In developing solutions to these complex problems, consideration needs to be given to short and long term socioeconomic effects of responses on survivors, families and community members – and reducing potential for unintended consequences.

Case Study 5-3: Impact of Nipah virus in Malaysia

Source: Epstein et al[119]; Mackenzie[120]; Veterinarians Without Borders/Vétérinaires Sans Frontières[121]

5.6 Scarcity of resources

Prevention of highly contagious disease is a global common good which provides economic benefits to each nation. However, financial constraints, particularly in low income countries, limit the ability to reduce domestic (and therefore global) risk; hence the importance of significant and sustained multilateral coordination to combat highly contagious zoonotic diseases, with cost sharing based on economic loss aversion and targeting based on cost-effective risk reduction.

Cost efficiency benefits can be further enhanced through the simultaneous surveillance of disease, joint epidemiological public and animal health studies, including joint laboratory diagnosis and communication (See Case Study 5-4). Benefits could include reductions in time to detect emerging zoonoses and accelerate control and prevention.

The concept of maximizing efficiency through joint human/animal vaccination initiatives has been effective for nomadic communities in Chad, where animal vaccination campaigns were expanded to include human vaccinations. Previously, cattle were largely vaccinated because of compulsory campaigns, though children and women were not receiving immunizations. In 2002, pilot programmes in two provinces brought together equipment and transport logistics for veterinary and health personnel, and this merger resulted in a 15 percent reduction of costs and a 30 percent increase in childhood vaccination.

Since early 2000, 10 out of 14 vaccination campaigns have been jointly conducted with animal and human health teams. These programmes demonstrated the organizational and technical feasibility of joint animal and human vaccination, with clear benefits for public health and veterinary services at the district level. This may be a useful model for other governments to consider when planning animal and human health service coverage for endemic and epidemic diseases in remote livestock communities.

Case Study 5-4: Maximizing efficiency and learning through joint animal and human vaccination campaigns in Chad

Source: Zinsstag et al.[122]; Schelling et al.[123]

5.7 Global burden of disease and efforts to address the Millennium Development Goals

Projections based on global populations show that disease impacts disproportionately on the poor. The Global Burden of Disease Project, published in 1996, projected 1990 data to forecast disease trends through 2030. Lifestyle diseases were listed as leaders of burden of disease into the next (now current) millennium. Researchers note that 'the excess mortality of the poorest population is mostly due to the higher incidence of communicable disease, 77 percent of excess deaths' and further find that 'a faster overall decline in communicable diseases would decrease the poor/rich gap in 2020'.

FAO is in the process of clarifying how disease burdens in animals affect the food security and livelihood of rural communities. For this approach, analysis of the disease prevalence of livestock production systems of smallholders is considered to assess the relative importance of collective animal diseases across locally prevailing production systems to livelihood and wellbeing. Animal diseases may be related to other development constraints, and can be measured to assist health workers with identification of priority One Health initiatives in local communities.

It is clear that in this ecological transition point, the global community needs to look beyond the current data and previous norms, to examine emergent disease as a symptom of a world under a myriad of changing inter-relationships. All of these changes impact on future health and the attainment of the Millennium Development Goals (Text Box 5-3).

1. Eradicate extreme poverty and poverty (halve between 1990 and 2015 the proportion of people who suffer from hunger)
2. Achieve universal primary education
3. Promote gender equality and empower women
4. Reduce childhood mortality
5. Improve maternal health
6. Combat HIV/AIDS, malaria, tuberculosis and other diseases
7. Ensure environmental sustainability
8. Develop a global partnership for development

Text Box 5-3: Millennium Development Goals

Source: UN Millennium Development Goals

Health inequities need to be addressed through the non-health sectors as well, including through education, food security, employment, water and sanitation. These non-health sectors address the demand side of health and greatly contribute to the preventive aspects of health, important for improving health equities. The Interim Statement of the Commission on Social Determinants of Health affirms that interventions aimed at reducing disease and saving lives succeed best when taking social determinants of health adequately into account[124]. Through better application of institutional economics and cultural epidemiology, health systems' effectiveness could be improved for populations with limited access whilst also reducing the transmission of zoonotic disease.

5.8 Drivers for disease emergence

Factors that drive the emergence of new diseases can be classified into those that occur in one of three domains: 1) the environment in which humans live, 2) the food and agriculture system, or 3) natural ecosystems (Figure 5-4).

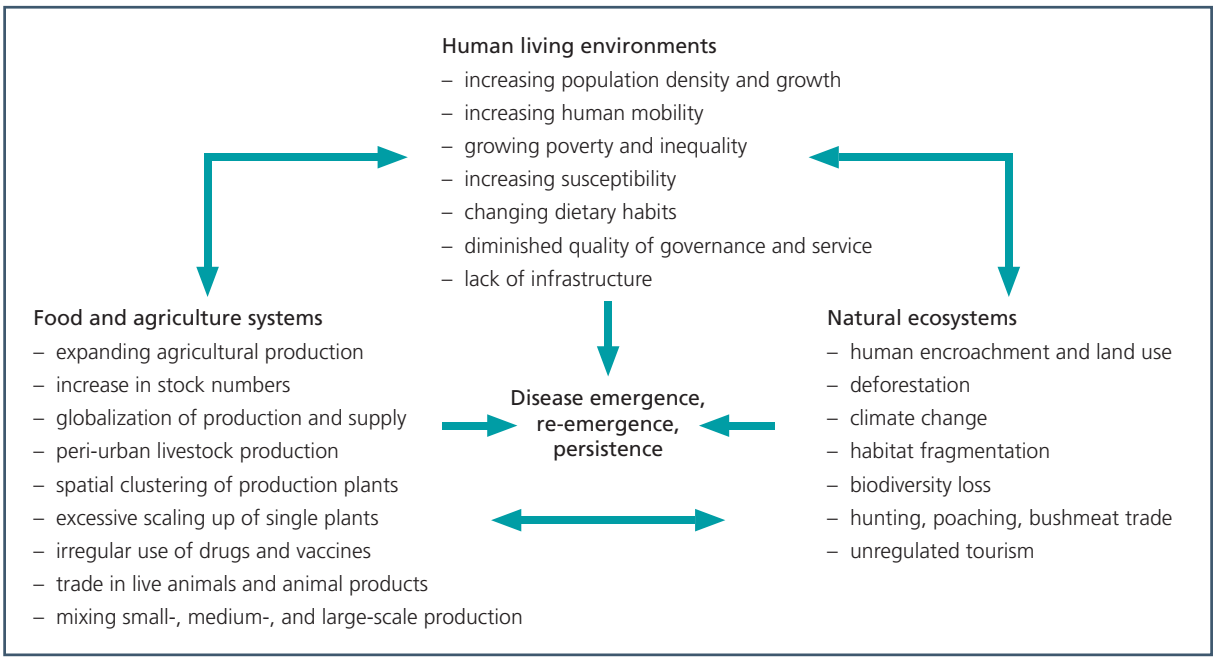

Figure 5-4: Interplay of three host health domains

Source: World Bank, 2010 (Adapted from Institutes of Medicine 2009).

1) Drivers in human living environments

Urbanization and human and animal population density

Population density is increasing with more than 50 percent of the global population now living in urban areas. In many urban and peri-urban areas, people raise and share dwellings with livestock and pets. This level of proximity between humans and animals is a critical risk factor for zoonotic disease. Many of these cities are in humid areas, and many have little or no sanitation services or available means to dispose of wastewater or organic material. People often buy their meat at outdoor wet markets, where animals are not inspected before slaughter. Public awareness of hygiene measures that can substantially reduce the risk of diseases in these settings is often very limited.

Changing demographics

Factors such as aging populations, the prevalence of HIV/AIDS, the proportion of the population that is undernourished (notably the number of pregnant or lactating women) – in short, any demographic development that increases the number of people who are immuno-compromised fosters a favourable environment for the emergence and spread of infectious diseases, among which zoonoses are generally prevalent.

Mobility

Populations are becoming more mobile as incomes rise, and this dramatically facilitates the spread of diseases that are transmitted between people. International tourist arrivals are estimated to reach 1.6 billion by 2020, and internal and international displacements of populations are high, with an estimated 12 million displaced people in Africa alone[125]. Outbreaks of infectious diseases that remained isolated to specific localities in the past are more likely to spread. This mobility also implies the mobility of culture, health beliefs, food preferences, and hence epidemiological factors[126].

Culture

People who have become used to recurrent disasters and living with infectious diseases have deeply embedded understandings of risks and resilience that ultimately influence the way they respond to threats. These social and cultural contexts may sometimes be at odds with classical medical and veterinary perspectives and approaches. Social, cultural and livelihood dimensions must be carefully examined and made central to bring people, with their incentives and motivations, back into the spotlight.

Poverty

Poor, food-insecure people are more vulnerable to both emerging and lingering zoonotic diseases. Impoverished people are less likely to visit a health provider, thus reducing the chance for early detection of a new disease. In some areas poverty leads to greater reliance on bushmeat, which represents one of the most direct risks of contracting a zoonotic disease.

Deteriorating government public health services

Stagnating public health and veterinary budgets in many countries have seriously limited disease surveillance and other preventive operations[127].

2) Drivers in food and agriculture systems

Food and agriculture systems constitute a major artificial domain in which diseases can emerge or re-emerge. Many food supply chains involving animals and animal products have become increasingly globalized, and the transport of animals and animal products has become so extensive that food safety hazards and emerging infectious disease risks can travel rapidly and widely.

The number of livestock

Livestock numbers are increasing rapidly in order to meet rising demand for animal source products. FAO estimates that the number of food animals including poultry being processed each year will increase from approximately 21 billion currently to about 28 billion in 2030. The increasing demand for food production is illustrated through the increases in poultry, livestock mammal and human populations (See Figure 5-5). There is a positive correlation between poultry, human and livestock population growth from 1960 to 2020. This quantitative evidence supports the published literature that rapidly rising incomes and urbanization, combined with underlying population growth, are driving demand for meat and other animal products in many developing countries.

The spatial concentration of livestock production

The increase in animal numbers has led to a significant restructuring of how production is organized spatially, perhaps most notably in peri-urban areas, and particularly with respect to pig and poultry production (see Figure 5-6). The scale of large commercial farms has increased dramatically, and has become concentrated in relatively small areas. For example, in Brazil, 85 percent of hens and 56 percent of pigs are concentrated in 5 percent of the country's area. When transport facilities are poor, these large farms typically concentrate in peri-urban areas. With improved transport, large farms tend to move away from large cities to areas with abundant feed supplies.

Mixed biosecurity regimes

Livestock producers vary widely in their capacity to protect livestock from disease and to manage disease risk at the farm level. Much of this variation relates to the size of the enterprise, the scale of production, and the amount of capital that is available to its operators. Larger commercial producers can generally afford to invest in more sophisticated forms of biosecurity than small producers, who continue to operate with little if any biosecurity. Little attention has been given to innovations that can help small producers meet their biosecurity needs in their resource-poor circumstances. The coexistence of modern and traditional production, often in close proximity to one another, poses mutual risk. Pathogens that are endemic remain a persistent threat to both[128].

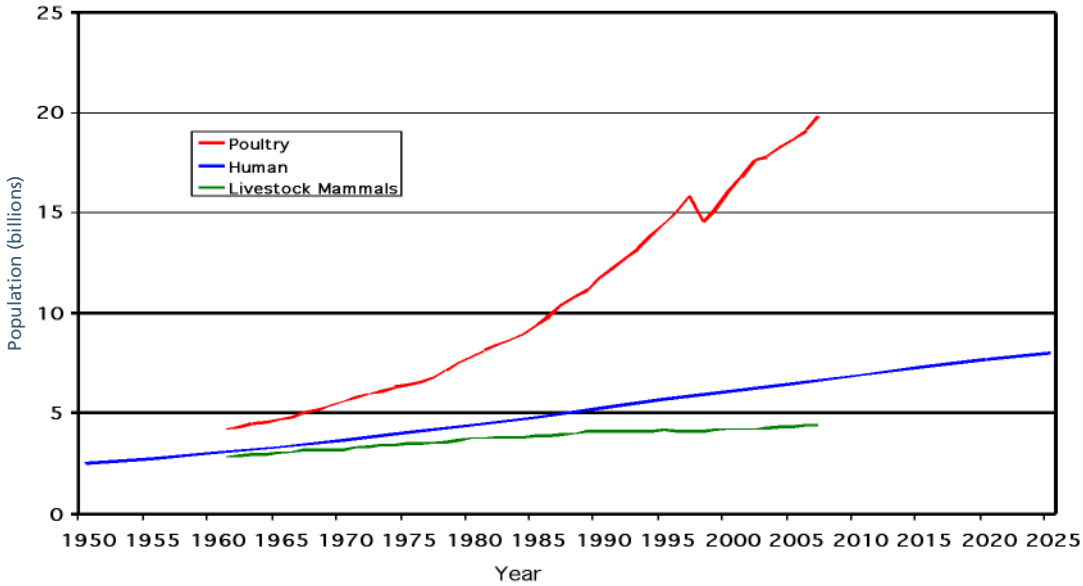

Figure 5–5: Poultry, human and livestock mammal population growth

Source: FAOSTAT and UN Population Division

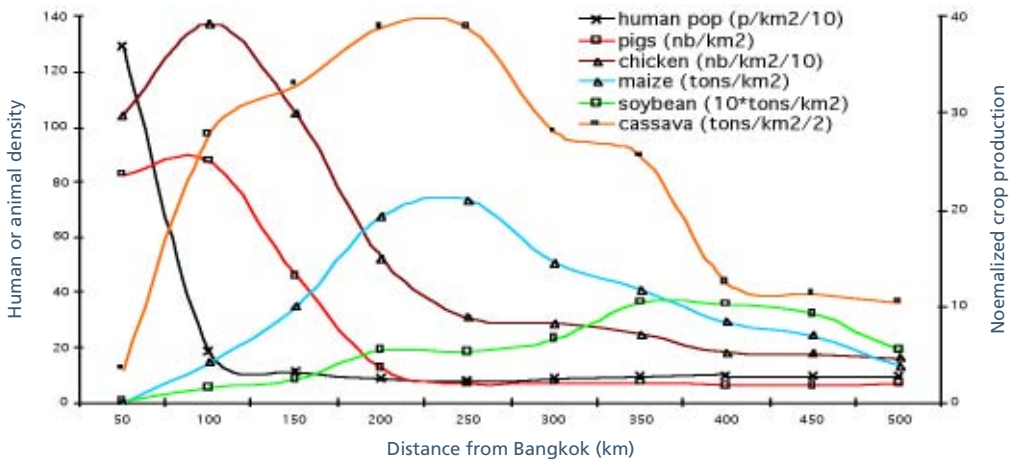

Figure 5-6: Human population, crop and livestock densities, Thailand

Distance from the megapolis of Bangkok and crop and livestock densities.

The proximity of people and animals is conducive for pathogen exchange. The emergence of potential zoonotic pathogens of wildlife origin would likely be detected in the livestock production areas and not necessarily in humans.

Export of animal source products

Export has grown faster than production, as global trade has expanded by 6 percent per year and now constitutes about 13 percent of total food export, reaching US$37 billion in fresh and frozen meat and US$20 billion in live food animals[129]. Potential trade-related diseases include Hendra, Lassa and West Nile viruses[130].

Inappropriate vaccination and drug use

The inadequacy of health systems causes gaps in vaccination coverage and suboptimal use of drugs, leading to drug resistance and hence increased risk of newly emerging pathogens. Adding antibiotics to livestock feed for non-therapeutic purposes is another cause of induced resistance to antibiotics in animal source foods. Methicillin-resistant *Staphylococcus aureus* (MRSA), circulating in pigs and calves and now a major threat in hospitals, is an example of the results of inappropriate drug use[131].

Exploitative farming systems

Settings in which working conditions and animal housing conditions are poor and prone to hazardous interactions between livestock and humans, and between livestock and wild species, are well suited not only for the flare-up of novel agents, but also for the persistence of existing agents, adding to the endemic disease burdens that are already in place. The interplay of complex factors provides opportune environs in which many pathogens co-circulate. Most emerging disease events take place in these unregulated conditions, characteristic of production throughout much of the developing world. Once isolated, these hot spots are today increasingly connected to the larger world through trade and human traffic in the context of globalization.

3) Drivers in natural ecosystems

In natural ecosystems, pathogens are natural elements of biological diversity, balance and resilience. The impacts of human encroachment on the system can introduce new disease agents or present existing agents with opportunities to 'escape' the habitat they are a natural part of. A variety of human activities may generate ecological vacuums that are filled by invasive predators or parasites that may carry diseases for which indigenous species lack immunity[132].

While human and domestic animal diseases do sometimes affect wildlife, pathogens that are transmitted from wildlife to humans, often through domestic animals, are considerably more numerous[133]. These include HIV, Ebola, SARS, H5N1, Nipah and hantaviruses, Lyme disease, Crimean-Congo hemorrhagic fever, tick encephalitis, and West Nile virus. A number of pathogens have also been transferred from wild species to domestic animals in recent years. A diverse reservoir of influenza viruses also circulates in wild birds, and contacts between these birds and domestic poultry and pigs are common. These contacts lead to human exposure and to the exchange of viruses and genetic material between humans and animals.

The pandemic risk these materials pose varies by type. RNA viruses, for instance, are known for their built-in instability, and their tendency to undergo replication errors gives them greater potential to invade any novel host niches that may be available. Arthropod-borne viral infections are prominent among the group of emerging disease agents, sometimes becoming manifest at medium-to-high latitudes. Insects, bats and birds, as well as humans are renowned spreaders of disease agents between continents.

Major changes in land use and agricultural intensification

The rapidly growing livestock sector has been a principal driver in the conversion of natural habitats into pastures and cropland. More land was converted for the growing of crops between 1950 and 1980 than in the preceding 150 years[134]. The intensification of agriculture with ever-increasing use of inorganic fertilizer, together with increasing livestock density, has been a major source of water pollution, and often provides favourable environments for the emergence of novel pathogens.

Land use change, deforestation, habitat fragmentation and biodiversity loss

Major land-use changes, including intensification and deforestation, lead to a variety of impacts on ecosystems, including pollution, fragmentation of habitats, and changing host-pathogen dynamics. Deforestation in tropical regions is advancing at the rate of about 130,000 square kilometres annually, driven by cattle ranching and feed production in Latin America, by tree crop (palm oil) plantations in South East Asia, and by smallholder farming in Africa. Degraded ecosystems with diminished biodiversity tend to favour opportunistic or generalist species, many of which are disease reservoirs. For instance, the effects of habitat fragmentation on host-pathogen dynamics were evidenced in the epidemiology of the Nipah virus in South East Asia.

Increased hunting, poaching and bushmeat trade

It is estimated that 4.5 million tons of bushmeat are extracted from the Congo basin each year. This meat is often consumed only partially cooked, thus bringing the principal source of a potential zoonotic pathogen in direct contact with human beings[135]. Both legal and illegal trade in live animals has increased rapidly over the last decades and is a major factor in the spread of diseases. While exact total figures are not available, the Institute of Medicine (2009) puts the figure at several billion US dollars[136].

Climate change and variability

Changes in long-term and seasonal weather patterns will have major effects on disease behaviour such as spreading patterns, diffusion range, and introduction and persistence in new habitats. The extension of vector habitats will be a major factor in the impact of climate change on the spread of infectious diseases, as, for example, shown by the expansion of Rift Valley fever in East Africa. It might lead also to the emergence of novel pathogens and vectors such as the recent outbreaks of bluetongue disease among sheep in Europe that was caused by a virus carried by a small African midge known as Culicoides imicola. The vector appeared in southern Europe in 2000 and led to the infection of novel Culicoides species that also transmit the bluetongue virus. The spread of the virus into more temperate zones was very likely facilitated by the warming trend in the region's climate.

Combinations of drivers – population increases, urbanization, increasing income and livestock production

Driven by increasing income, urbanization and population growth, demand for animal source foods is rapidly increasing in the developing parts of the world. As per capita consumption is still relatively low in the developing as compared with the developed countries (31kg versus 82kg of meat and 50kg versus 207kg of milk), demand is likely to continue to grow rapidly in the former countries. In response to this rapidly growing demand, livestock production is rapidly growing (See Figure 5-7).

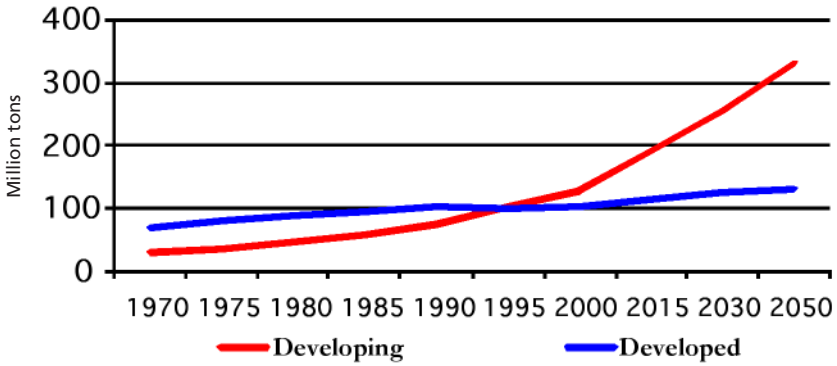

Figure 5-7: Meat production 1970-2050 in the developed and developing world

Source: World Bank

The rising demand for poultry and poultry products in particular provides a powerful financial incentive for private sector producers of all sizes to supply as much product at competitive prices to satiate this nascent animal protein hunger. The accompanying poultry industry growth and development may be guided by current concepts of avian production, animal health, sustainability, hygiene, biosecurity, and food safety on behalf of national and international health agencies. Particular attention needs to be paid to how global public health threats – and their accompanying fears – impact economic progress, human development and national security.

5.9 Who needs to be involved in One Health approaches?

One Health approaches require input from all disciplines in society including animal and human health professionals, anthropologists, agronomists, ecologists, economists, engineers and town planners. Such approaches also need to go beyond technical disciplines, incorporating skilled coordinators, communicators, monitoring and evaluation specialists, risk analysts and strategic planning expertise. Approaches need to incorporate One Health considerations (and research) at all levels from the community to international level, and require high level political support and empowerment. Major players include key international agencies, key governmental and national agencies, health, veterinary and agricultural institutes, private sector organizations and foundations, academic institutions, communities and civil society organizations.

"Individuals and organizations need to change their thinking" from "What am I responsible for?" to "What needs to be done?"[139]

The bringing together of six international organizations, FAO, OIE, WHO, UNSIC, UNICEF and the WB, in determining a pathway for action through the document '*Contributing to One World One Health: A Strategic Framework for Reducing Risks of Infectious Diseases at the Animal-Human-Ecosystem Interface*.' is an illustration of breaking down insular roles to achieve horizontal communication and linkages that are needed for an effective One Health approach.

5.10 One Health Approaches for prevention and risk reduction

Prevention and risk reduction actions at the local, national, regional and international policy spheres include continued interagency and multisectoral collaboration, investments in research, the need for further gender analysis in livestock production and disease transmission, as well as strengthening links between vets, biologists and environmental agencies (highlights in Text Box 5-4).

Key actions for prevention and risk reduction of H5N1 HPAI are: (a) ensuring an appropriate and sustainable response, and (b) building on the model to strengthen management of high burden diseases at the animal human environment interface. These include:

1. Continued and enhanced interagency and multisectoral collaboration
2. Structures and systems still require substantial development
3. Better funding of prevention systems
4. Effective public-private partnerships
5. Cohesion of overarching policies
6. Building core communication capacities and a critical mass of practitioners
7. Gender analysis in livestock production and disease transmission
8. Strengthening links between veterinarians, biologists and environmental agencies
9. Applied research

Text Box 5-4: Summary of key actions for prevention and risk reduction of H5N1 HPAI from Chapter 3

Capacity building at all levels is a necessity; this may require a variety of inputs, such as renewed efforts by international organizations to collaborate and share policies and resources; integration of new/different sectors into planning; addition of resources (such as skills and equipment), and changes in national legislation. Capacity development for One Health includes development of holistic approaches to thinking and understanding across different disciplines and viewpoints. An imperative for success is the need for dedicated and sustained political and financial commitment to prevention and risk reduction capacity building as interest in the current pandemic wanes.

Predicting future trends in drivers for disease outcomes

Novel methodologies for understanding disease drivers have been developed by the Foresight Programme in the UK. A recent study based in China is taking new steps to address groups of societal drivers to predict trends in drivers, and developing anticipatory approaches to reduce risk of infection and emergence of disease in at-risk populations (See Case Study 5-5)[137].

These approaches are increasingly important to understand the causes of disease emergence, enabling urban planners, development agencies, agriculture and public health ministries to better establish prevention strategies through improved prediction and analysis.

The Foresight China Project Group devised a simple but novel methodology for identifying possible future trends in infectious diseases in animals and humans in China, a priority concern of the Chinese authorities (Results published in July 2009). It used a model of disease drivers (social, economic, biological or environmental factors that affect disease outcomes by changing the behaviour of diseases, sources or pathways) devised for the Foresight Programme in the UK. Nine families of drivers were adapted to Chinese circumstances, and matrices were constructed to identify the likely relationship of single infectious diseases or families of diseases to the drivers.

The likely future trends in China were determined by interviews with 36 independent Chinese experts. These trends included potentially adverse animal and human movements as well as opportunities for innovative surveillance methods, more use of hospitals, antimicrobials and vaccines. The results suggested a number of areas where the Chinese authorities may experience difficulties in the future, such as rising numbers of healthcare-associated infections, zoonoses and other emerging diseases and sexually transmitted infections (including HIV). This work identified priority disease groups requiring surveillance and consideration of countermeasures, and recommended strengthening basic surveillance and response mechanisms for unanticipated zoonoses and other emerging disease threats.[138]

Case Study 5-5: Identifying future trends in infectious disease and animals in China – examining the drivers

Source: Foresight China Project Group; ECDC

Further work is also needed to strengthen and encourage interagency and multisectoral collaboration for the management of high impact diseases arising at the animal-human interface. An example of enhanced collaboration is the 'One Health Hub' concept being established in South Asia, with WB support (See Case Study 5-6).

South Asian countries are at high risk of Avian and Human Influenza (AHI), as the H5N1 virus actively circulates in Bangladesh, India, Nepal and Bhutan. Since end-2003, there have been more than 510 outbreaks in animals in the region. In collaboration with WHO, FAO, OIE and UNICEF, the WB operate eight projects in South Asia at a total cost of $76 million, which includes a new initiative, 'Regional Training Programme in Epidemiology and Biosecurity.' Benefiting seven countries in the Region – Afghanistan, Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka – the regional training programme seeks to (i) provide a total of 70 animal and human health specialists with on-line training at Masters level in epidemiology and (ii) establish One Health hubs or centres of excellence in epidemiology in the seven countries by strengthening existing national epidemiology institutions. The programme is financed by the Avian and Human Influenza facility (AHIF) – funded by the European Commission and seven other donors and implemented by Massey University in New Zealand.

As avian influenza is becoming endemic in Bangladesh, India and Nepal, the Regional Training Programme is one attempt to support a mid to long-term strategy to prevent and manage AHI and other zoonoses by building local capacity and a regional network. The ongoing projects have helped contain outbreaks in South Asia; however, countries are now faced with a need to shift from emergency operations to mid to long-term local capacity development in an effort to manage emerging and re-emerging zoonoses. The Regional Training Programme brings animal and human specialists together with an emphasis on the interface, while providing the trainees with specialized courses. The trainees participated in the launch workshop in Singapore in June 2010, where the network of regional practitioners is developing. There will be two further opportunities to share country experiences and lessons learned during the course. The 70 specialists will play a key role in establishing and managing One Health hubs in their respective countries.

Case Study 5-6: Establishing One Health hubs in South Asia

Source: World Bank

Joint planning is recognized to be a crucial element at, and between, all levels. International, regional and national level management can be strengthened through increasing the cohesion of overarching policy goals (See Case Study 5-7). International animal and human health experts are working closely through OFFLU which provides important collaborative networking of laboratories (See Text Box 5-5).

5.11 One Health approaches for early detection and disease control

At the March 2009 'One World One Health: from ideas to action' meeting hosted by the Public Health Agency of Canada, several key actions were developed to help the One Health approach progress (See Text Box 5-1). These included several critical issues for a One Health approach to surveillance:

- An enhanced knowledge of information and understanding at community level;
- The willingness and ability for reporting through community to national levels, taking into account such factors as disincentives, skills and equipment;
- Encouraging similar communications and reporting for surveillance systems, enabling them to 'talk' to one another;
- Development of a systematic method for carrying out wildlife surveillance;
- Establishment of laboratory networks that allow for simple tests at the front lines or in resource-poor areas, with more sophisticated laboratories providing support including communication and mentorship;
- Shared laboratory testing and quality assurance to determine validity of tests; and
- Training in a wide range of skills that cross the human, animal and environmental health domains.

Prior to the mid-1990s, surveillance and control of zoonotic diseases in food production in Denmark was carried out by a number of institutions, resulting in fragmented communication and coordination. An increase in cases of zoonoses in humans, increased awareness of zoonotic pathogens in meat products in Denmark, and the requirement to implement the 1992 EU Zoonosis Directive saw the need for a coordinating body to integrate data on reported zoonoses in animals, humans and food products, resulting in the creation of the Danish Zoonosis Centre (DZC). The DZC was charged with activities involving aspects of the entire food production chain and evaluating its impact on consumer health, research and monitoring national food safety.

As a result of the interdisciplinary work carried out by medical, veterinary and political fields, surveillance of zoonoses in Denmark has shown a marked improvement[140], resulting in lower zoonosis incidence in both humans and animals. For example, Salmonella incidence and prevalence decreased significantly in poultry, beef and pork, most likely due to the introduction of serologic Salmonella monitoring in 1997[141]. Salmonella incidence in people has also decreased, which may be linked to lower levels of Salmonella in meat products from Denmark[142; 143].

Case Study 5-7: Danish Zoonosis Centre: an example of One Health integration

Source: World Bank

When H1N1 was first reported in 2009, the OFFLU network was strong and flexible enough to expand within a matter of days to include swine expertise. OFFLU immediately changed its scope and name to the OIE-FAO Network of Expertise on Animal Influenza.

OFFLU and WHO gathered international experts for a first WHO/OFFLU teleconference on H1N1 at the human-animal interface on 4 May 2009. Subsequent teleconferences on diagnostics, surveillance and diagnostic testing algorithms for the emergent virus in the animal health sector were held. A variety of documents were produced to assist animal health laboratories with identification of the emergent virus such as: a list of laboratories for international shipment of H1N1-suspicious samples/isolates, and guidance on the shipment of suspicious samples, an algorithm for laboratory detection, guidance on sampling pigs for influenza diagnostic tests. The OFFLU network was also established and respected enough to be asked by WHO to represent the animal health sector (in conjunction with OIE and FAO) in addressing two specific questions – the name of the virus, and specific issues regarding its origin – in high-level WHO teleconferences.

A secondary benefit of these discussions was increased communication about swine influenza viruses in general among public and animal health experts and those new to the field. Gaps in available information on swine influenza viruses were immediately noted during the joint discussions on origin, composition and other characteristics of the pandemic (H1N1) 2009 virus. Recognition of the information gaps resulted in further discussions on virological surveillance and information sharing and scientists posted additional swine influenza virus sequences (about 150) in the weeks after these discussions were initiated. OFFLU keeps updates of validated protocols and primers and probes and shares this information widely with national laboratories through regional laboratory networks.

Text Box 5-5: OFFLU support to pandemic (H1N1) 2009

Source: OIE, FAO

Current surveillance systems are almost universally human or animal based, with few mechanisms for direct communication or reporting. At local, national, regional and international levels the following options may be considered:

Local surveillance systems: Local systems could conduct investigations and establish databases for monitoring unusual animal and human health events or ongoing current disease outbreaks in animal or human populations. Sentinel systems may be set up to monitor diseases known to become prevalent in certain seasons.

National surveillance systems: National surveillance systems vary considerably; some countries have compulsory notification while others have rudimentary systems which only reflect diseases of national interest. Strengthened national surveillance of disease burden and potential disease outbreaks or niches would strengthen management of the broader burden of disease, in addition to emerging events. There is a need for improved commitment at international and national levels for increased disease surveillance of livestock traded nationally, regionally and internationally – and identification of mechanisms /standards agreements etc to achieve this – linked to global frameworks for monitoring and reporting of disease.

Regional/Cross Border surveillance systems: The development of regional surveillance systems reflects the utility and potential in systems that cross borders. Examples include the Eurosurveillance system, the Pacific Public Health Surveillance Network and the Mekong Basin Disease Surveillance Programme.

International surveillance systems: There is a considerable number and diversity of surveillance systems at the international level (several examples of which can be found in Annex 10). While additional effort is still needed to fully address the human, animal, environment interface, some of these have been developed to become multidisciplinary, such as the FAO, OIE (WAHIS) and WHO joint Global Early Warning and Response System for Major Animal Diseases, including Zoonoses (GLEWS), which combines the alert mechanism of the three bodies to assist with the prediction, prevention and control of animal disease threats, including those capable of transmission to humans.

Predictive modelling and foresighting

Predictive modelling is a useful and developing tool to support decision making. Recent developments in computer software (including GIS systems) have been helpful in anticipating emergence and spread of new pathogens. For example, the Wildlife Trust has developed a risk surveillance programme with an emerging disease database for point of origin and human interface hotspots.

Predictive modelling has also been used to target interventions to minimize global impacts of an infectious disease. For instance, modelling based on airline activity from Mexico during the H1N1 outbreak gave a reasonable prediction of where outbreaks would occur (See Case Study 5-8)[144]. The Wildlife Trust added an additional variable of national healthcare spending over the previous year to account for the likelihood that a particular country would report an outbreak – results with rigorous probability emerged. In the event of future outbreaks these predictive models could be used for targeting of resources to countries that receive a high volume of travellers and also have low healthcare budgets - thus where cases are less likely to be detected or reported quickly without additional support[145].

Other techniques such as foresighting – the rapid analysis of and distribution of disease reports in association with intelligence gathering – can provide valuable support to an understanding of emerging diseases. A comprehensive understanding of the demographic, cultural, economic, environmental, climatic, evolutionary and social factors that contribute to the emergence and intensification of infectious diseases is essential for this process[146]. This critical information support activity must be provided by people in country (local villagers and communities) along with interdisciplinary collaboration hence the need for training and rapid reporting of unusual circumstances.

Early detection and disease control systems

Early detection and disease control systems coupled with early reaction capacity to swiftly tackle diseases at, or close to, source are also needed before spread surpasses a critical threshold (as noted in Chapter 4, Section 4.3). This requires domestic multisectoral institutional readiness, along with appropriate financial, technical and human resources. The private sector plays a catalytic role by embracing biosecurity and fostering collaboration with national public entities[147].

As the world's population approaches seven billion people and more than two billion passengers travel via commercial flights every year, there appears to be growing potential for local infectious disease threats to transform rapidly into global epidemics. The science behind how the global community is interconnected via commercial air travel and consequently interdependent with respect to global infectious disease threats is evolving.

Based out of the University of Toronto, a multidisciplinary group of physicians and scientists with expertise in infectious diseases, public health, epidemiology, statistics, geographic sciences, mathematical modelling, economics and computer sciences has been collaborating on the bio.DIASPORA Project (www.biodiaspora.com) – a scientific venture to understand global air travel and its role as a conduit for the international spread of infectious diseases. Upon first hearing of clusters of severe influenza-like illnesses in Mexico in April 2009, this team predicted with remarkable accuracy (greater than 92% sensitivity and specificity) which countries in the world would be affected by the pandemic (H1N1) 2009 virus during its initial epidemic wavefront. This analysis offered proof of principle that knowledge of air travel could potentially be applied to protect global cities from emerging infectious disease threats.

Looking to the future, bio.DIASPORA continues to seek novel ways to harness and apply this knowledge by i) generating actionable intelligence in real-time, ii) thinking preventatively by facilitating earlier detection and response to local infectious disease threats with pandemic potential, iii) conducting research into mass gatherings, and iv) offering greater clarity on if and when border screening of passengers during an international infectious disease epidemic may have public health value.

Case Study 5-8: The bio.DIASPORA Project: leveraging knowledge of global air travel to promote and protect global health, security and prosperity

Source: Kamran Khan, St. Michael's Hospital, University of Toronto

5.12 One Health approaches for preparedness

It is imperative that early detection and disease control is complemented with emergency preparedness plans at national, regional and international levels. One Health approaches for pandemic preparedness (as outlined in Chapter 4) may take account of recent reviews and evaluations undertaken by academic groups, governments and international agencies.

More emphasis is needed on developing multisectoral preparedness at the **local level** that is contextually appropriate and effective. Regular local capacity building exercises (training, simulations, workshops, stakeholder consultations) and established systems for rapid mobilisation of international support are important[148]. Additionally, to improve accurate surveillance and timely reporting, adequate systems for compensation need to be established for farmers to provide incentives for reporting a disease outbreak. The risks of non-reporting lead to potential rapid disease spread and further impacts on the broader community (such as absenteeism, which in turn impacts other sectors including finance, food, public order and transport).

Improved surveillance systems (which create a solid knowledge base) will also support the strengthening of communication strategies. Given the number of sectors that can be impacted by EIDs, interdisciplinary approaches for communication strategies should be utilized, thus facilitating horizontal as well as vertical reporting. Different sectors at multiple levels (particularly locally) need to be informed so that they can properly plan and respond. For example, ensuring that public health professionals are alerted when there are H5N1 outbreaks in poultry flocks, given the potential implication for human health.

Beyond animal and public health sectors, preparedness planning is essential across all sectors, and must involve a One Health approach (see Text Box 5-6).

Business Continuity Planning (BCP) activities have been stimulated by the pandemic agenda and the projected risks of H5N1. It is recognised that the robust multihazard BCPs serve as a generic disaster preparedness tool, enabling communities, organisations and societies to better mitigate the impact of a range of possible future threats and crises. In this context, planning and capacity-building using BCP processes, which are in line with whole-of-society ideas support strengthening the resilience to a range of emerging infectious diseases with pandemic potential.

The discussion of the whole-of-society approach has promoted the involvement of non-health sectors in planning and preparedness for responding to health threats. This work heavily promotes the participation of civil society and vulnerable groups, which further contributes towards a comprehensive approach in effectively addressing health issues, especially newly emerging threats that might require a closer cooperation of different sectors.

Whilst some donors and academics recognise the importance of preparing for new emerging global infectious disease threats with pandemic potential at the animal-environment-human interface, due to other more pressing emergencies and health threats, as well as funding constraints, this is not high on the agenda of many governments from developing countries.

Text Box 5-6: Whole of society pandemic preparedness as a One Health approach

Source: UNOCHA Pandemic Influenza Coordination

5.13 Bringing it together – institutional arrangements to support implementation of One Health approaches for prevention, management and preparedness

The central role of governments

The role of governments in providing direction and assuming responsibility for One Health approaches is central to the success of prevention, management and preparedness strategies for diseases at the animal-human interface. There are several guiding principles which can be usefully applied including establishment of shared goals, principles and strategies; allocation of work in accordance with comparative advantage; retention of identity and relative autonomy; transparency and accountability; trust; and the sharing of information.

Effective partnership arrangements are the key to success and should be encouraged and progressively implemented, taking into account existing One Health arrangements as models. Strengthening partnerships, particularly at the in-country level, to combat EIDs is a complex task and requires strong efforts at consensus building between political, technical, NGO, development agencies and other stakeholders. The level of inter-agency and multisectoral collaboration between animal and human health sectors that arose from response to the H5N1 HPAI outbreaks has been unprecedented. This can be built on to support cultural change and a progressive and sustainable approach for One Health ideas.

Institutional arrangements to implement One Health approaches

Strengthening institutional arrangements for implementation of One Health approaches involves support at the international, regional, national and local levels:

At the international level, options include the establishment of a global alliance or executive level body which includes representation from governments and international agencies, regional bodies and academia to provide foresight, strategic guidance and high level advocacy for One Health.

Linked to the above, development of a mechanism with overarching responsibility for a range of functions to support strategic oversight such as:

1. a repository of One Health knowledge, that is readily available to all stakeholders at international, regional and national levels;
2. a strategic research framework for applied research addressing global concerns at the animal-human interface;
3. monitoring and review capacity, and responsibility for establishment of indicators to measure progress; responsibility for development of M&E capacity; maintenance of baseline data, regular collection, collation and synthesis of data on global progress;

4. risk forecasting and global risk assessment; and
5. reporting functions to international agencies and governments.

There is also a need for strengthened collaborative international support to:

1. promote government and private sector preparedness for emergency animal disease response;
2. develop further incentives for both public and private sectors to increase focus on risk reduction and increase resilience to shocks from emerging health threats at the animal-human-environment interface;
3. provide rapid, coordinated and strategic support to governments and the private sector responding to animal disease emergencies;
4. facilitate action planning with governments and the private sector for development of joint three- to six-month plans for disease prevention and control with private sector investment; and
5. build technical capacity, competency, leadership, and a critical mass of regionally networked epidemiology, surveillance and laboratory, communication and social science specialists as a strategic imperative for the efficient and effective management of classical and novel animal diseases.

At the regional level, options include establishing and supporting One Health forums that encourage information exchange, identify common areas of interest, and strengthen results-based collaborations between different sectors. Further developing regional surveillance and laboratory networks will provide information for use in assessing the total disease burden, early warning of emergence of new pathogens or changes in behaviour of known pathogens; and information to assist with forecasting and risk analysis. In addition, identification of regionally important issues for a research framework that addresses policy and practice in timely and feasible ways would enhance regional policy development and priority setting.

At the national level, many governments have established coordinating authorities as a function of an executive office holder (such as a prime minister or deputy minister) who is supported by an advisory committee that operates with his or her authority. Other options include establishment of special One Health national government teams, composed of representatives of the human, animal, and ecosystem institutions, with particular responsibility for diseases at the animal-human-ecosystem interface. This would include responsibility for working closely with local level government representatives (e.g. The Philippines is establishing a multidisciplinary Council on Zoonoses).

Governments can also ensure greater focus on strengthening public sector capacity to:

1. integrate private sector ideas and suggestions in decision making processes through joint collaborations, interactive workshops and training;
2. lead in decision-making processes through technical and leadership training programmes;
3. improve dialogue and collaboration between the public and private sectors for better disease prevention, detection and control of animal diseases;
4. increase engagement of civil society and community stakeholders in decision making and development of locally-based approaches for One Health at the animal-human interface; drawing on local knowledge for planning and risk management; and
5. develop applied research programmes with co-ownership of research through public/private partnerships.

The creation of an independent agency with responsibility for public health, including zoonoses and food safety has also been proposed and developed in some countries (e.g. The Danish Zoonosis Centre). Others are of the view that structural changes, or the fusion of organizational elements, are not the best way to proceed: rather functional cooperative approaches with cultural change are appropriate for their circumstances.

For pandemic preparedness a permanent body that coordinates the preparation and regular update of contingency plans to deal with the eventuality of an outbreak could be established. The coordination function might take place through the exchange of memoranda of agreement among the different sector agencies concerned. The body itself may consist of or be served by a number of working groups. In some countries this has already been established, as part of the disaster management and response authority (e.g. ASEAN Technical Working Group on Pandemic Preparedness and Response).

At local levels, local government operational planning structures could include One Health responsibilities by working closely with communities to identify diseases of local concern – assessing and monitoring the 'total burden' of zoonotic and other animal diseases, or forming communities of practice, with local groups taking responsibility for promoting healthy livestock initiatives (e.g. Animal Health Club, Sierra Leone) and advocating One Health approaches. Systematic planning and regular conduct of simulation exercises through local government, community and private sector agencies may also strengthen One Health implementation.

5.14 Conclusions

- One of the most salient changes in recent years has been an increasing focus on factors predisposing to disease and risk. This paradigm shift is based on a transition from emergency activities to more strategic approaches that take longer timeframes and apply multidisciplinary understanding and approaches to human, animal and ecosystem health.
- Diseases targeted by the approach generally include emerging infectious diseases, in particular, zoonotic diseases that have potential to jump species from animals to humans.
- High burden animal and human diseases of concern include rabies, human tuberculosis induced by bovine bacillus Mycobacterium bovis, echinococcosis/hydatidosis and brucellosis. Emerging diseases such as Nipah virus and SARS Corona virus are also among those with pandemic potential.

Why is a One Health approach needed?

- Emerging and re-emerging diseases are increasing incrementally, with over 60 percent of human pathogens being zoonotic arising at the interface between domestic animal, human and wildlife domains within the context of the overall environment. Over the last decade about 75 percent of emerging diseases have been zoonotic in origin.
- Existing high burden animal and human diseases (some of which have been listed above) often affect the most vulnerable and marginalised people.
- Understanding and managing the complexities of social and ecological interactions between humans and animals requires integrated policy development. Prevention of disease is based on broader multidisciplinary partnerships beyond the animal and human health sectors, examining broader health, environmental and economic impacts.
- Challenges needing resolution relate to the weakness and gaps in local disease control approaches, establishing international standards for animal trade, improving dialogue between governments and people, and shifting emphasis from pathogens to more people-centred views.
- Scarcity of resources and financial constraints indicate the need for improved cost efficiency and collaboration. Joint vaccination campaigns, laboratory diagnosis, communication and surveillance programmes across sectors are a few examples of how this could be achieved. Non-health sectors can also contribute to improved animal and human health outcomes through education, food security, water supply and sanitation.

Drivers for disease emergence

- Factors that contribute to the emergence of disease can be classified into three host health domains: human living environments, food and agriculture systems, and natural ecosystems. Key drivers for the emergence of disease include increased density and mobility of animal and human populations, decreased diversity of ecosystems, intensification of agriculture, trade, people movement, global warming and/or variability, and environmental degradation.
- A better understanding of the drivers is needed, along with the development of practical means through which the root causes of disease emergence can be addressed.

One Health approaches for prevention and risk reduction, early detection and control, and preparedness

- Managing the increased level of risk associated with complex combinations of drivers requires a multisectoral systems approach. Stakeholders from a range of disciplines need to be involved in One Health approaches: disciplines include animal and human health, sociology, anthropology, ecology, conservation, town planning and law; beyond disciplines there is a need for skilled coordinators, communicators, monitoring and evaluation specialists, risk analysts, and strategic planners; major players also include local to national governments, international agencies, private sector and communities.
- Key actions for adopting a One Health approach include: multisectoral collaboration for priority setting, novel approaches to surveillance that predict potential disease niches through ecological mapping and determination of factors associated with the emergence of diseases; revised curriculum and education programmes; strengthened veterinary systems and public private partnerships; research investment; well regulated systems for livestock transfer, tracing, slaughter, processing and marketing.
- Key actions for early detection and disease control include: establishment of local, national, regional and international surveillance systems to enhance disease intelligence, surveillance and emergency response; predictive modelling and foresighting to enable rapid response to emerging disease events.
- Additionally there is a need for improved commitment at international and national levels for increased disease surveillance of livestock traded nationally, regionally and internationally – and identification of mechanisms/standards/agreements etc to achieve this – linked to global frameworks for monitoring and reporting on disease.
- For existing high burden human and animal diseases, multisectoral solutions need to be promoted to amend, improve and strengthen the systems already in place.
- Given the complexity of animal and public health threats, a One Health research agenda is needed to inform, in a systematic manner, pressing policy and practice questions faced by international and regional organizations, national governments, and communities.

Bringing it together – institutional arrangements to support implementation of One Health approaches for prevention, management and preparedness

- The role of governments is central to providing direction and responsibility for One Health approaches for prevention, management and preparedness strategies with diseases at the animal-human interface.
- Institutional mechanisms need to be strengthened at international, regional, national, and local levels to implement One Health approaches. Despite the accomplishments so far, there is common agreement that more is needed to address diseases arising at the animal-human-environment interface, and that sustained economic support is fundamentally warranted.
- Comprehensive disease risk management requires multisector expertise and insights from sources such as veterinarians, physicians, ecologists, wildlife biologists, epidemiologists, economists, anthropologists and communication specialists.
- Strategic mechanisms at global, regional and national levels are needed to provide a repository of One Health knowledge; a strategic research framework for applied research addressing concerns at the animal-human interface; monitoring and review capacity; risk forecasting and risk assessment; global advocacy and reporting functions for international agencies, and governments.
- Governments should support local government operational planning structures with One Health responsibilities, including identifying diseases of local concern and assessing and monitoring the 'total burden' of zoonotic and other diseases. The assessment of emerging disease risk (as well as other disaster-related risks) should be an integral part of planning approval for new land usage, and tools developed, adopted and integrated into urban and rural planning and development processes.
- Ongoing and strengthened collaborative international support is needed to: promote government and private sector preparedness for emergency animal disease response; increase resilience to shocks from emerging health threats at the animal-human-environment interface; build technical capacity, competency, leadership, and a establish a critical mass of regionally networked epidemiology, surveillance and laboratory, communication and social science specialists.

The way forward: A Framework for sustaining momentum

6

"…there are three vital priorities for the way forward...Priority one: Maintaining what has been done already, focusing on three areas: control of H5N1 Highly Pathogenic Influenza, capacity to respond to pandemic threats, and collaboration between animal and human health sectors… Priority two: Building on what has been done to achieve greater success, backing our work with high quality science employing the best practices available, and using funds as efficiently as possible…Priority three: Developing the institutions, professional capacities, and systems so they can take this work on…"

David Nabarro, United Nations System Influenza Coordinator. Statement from IMCAPI 2010, Hanoi.

6.1 Introduction

The starting point for this Framework is the achievements that have occurred over the past five years in addressing H5N1 HPAI, preparing governments and communities to be able to respond to an influenza pandemic and bringing sectors together to work more effectively on reducing disease risks that arise at the animal-human-ecosystem interface.

At the same time, H5N1 HPAI remains a significant threat to animal and human health and livelihoods in a number of countries and more recently pandemic (H1N1) 2009 is the dominant influenza virus currently affecting humans throughout the world. While these are among the disease threats that persist, other diseases will emerge. Indeed, the frequency of disease threats emerging at the animal-human interface is likely to increase in the future given our changing environment and expanding domestic animal and human populations.

The challenge is to find means for taking this work forward in the face of competing priorities.

Sustaining momentum will require a strategic use of resources and a move away from emergency response driven projects and special, single focus initiatives, to longer-term capacity-building programmes. Incorporating capacities within existing programmes and mainstreaming skills are important to moving this work forward and maintaining momentum. Finding and using the right incentives will be critical.

This Framework suggests six expected outcomes for sustaining momentum through the strategic use of resources and the transitioning of initial, emergency-focused programmes into sustainable, integrated areas of work. These must be supported by the appropriate institutional arrangements, resources and monitoring processes to ensure continued work towards reducing the threats posed by animal and pandemic influenzas as well as other diseases, known and unknown, arising at the animal-human-ecosystem interface.

6.2 Expected outcomes for progressive control approaches and maintaining vigilance for H5N1 HPAI

Summary of achievements to date and future challenges

Despite the continued presence of H5N1 HPAI in domestic poultry in some parts of the world, there have been significant **achievements** with the control and response of H5N1 HPAI since 2006. The increased collaboration between animal and human health sectors at international, regional, national and local levels has led to improvements in early detection of disease in animals and the streamlining of responses to outbreaks. Heightened vigilance by national authorities around the world and rapid response to incursions have helped to prevent wider entrenchment of the virus occurring. Increased awareness of the risk factors is likely to have contributed to limiting the number of human infections that have occurred to date.

Recently a better understanding of the social, cultural, gender and economic consequences as well as stronger integration of communities in the decision making process has led to more effective and flexible approaches to disease prevention and control than those adopted at the onset of the response. Promotion of healthy poultry production and a focus on improving livelihoods has resulted in higher levels of community engagement with progressive control programmes. And finally, the response to H5N1 HPAI provides a paradigm for international coordinated action to promote adoption of One Health approaches.

Many **challenges** remain though, including the fact that H5N1 HPAI remains enzootic in birds in several countries. H5N1 HPAI disproportionately affects the poor – and especially women – as they are heavily dependent on incomes from, and consumption of, poultry. Controlling outbreaks effectively, without negatively impacting communities and the poor, remains a challenge in many areas. As strong public engagement is critical for the success of containment efforts, community-based initiatives that promote dialogue and ensure feedback need to be strengthened in order to build trust among the public, and the affected stakeholders in particular. The international community needs to sustain vigilance for possible changes in the behaviour of this virus and other animal influenza viruses of concern – which may present an increasing challenge as interest wanes and highly visible outbreaks that serve as a reminder of the importance of vigilance become less apparent.

There are two **expected outcomes** for countries and the international community that derive from the need to build on the achievements of the last few years and overcome challenges. Pursuit of these outcomes would lower the risk that H5N1 HPAI poses to communities, countries and the world:

- **Expected Outcome 1: Progressive control of H5N1 HPAI – with the aim of its eventual elimination (and ultimate eradication) from domestic animal populations**
- **Expected Outcome 2: Maintaining vigilance for H5N1 HPAI and other influenza viruses that have pathogenic potential in humans**

Key actions to achieve these outcomes include the promotion of healthy poultry production and trade, rapid response to outbreaks in poultry, early warning and early treatments, effective communications to assist adoption of protective practices, and applied research.

National goal setting – particularly for highly impacted countries

In light of experience and increased knowledge, it is recommended setting short-, medium- and long-term goals that are aligned with the global expected outcomes. Goal setting is likely to be most effective if it is undertaken as a cross-government partnership with the private sector, civil society and affected communities. It will often be appropriate to aim for objectives such as progressive control of H5N1 HPAI, the development of healthy, sustainable poultry production and trade, and improving the resilience of livestock-dependent livelihoods. Strategies can build on specific interests of stakeholders (such as the reduced risk of disease, expanded opportunities for trade, etc.). Actions to limit transmission can be implemented in a manner that minimizes the economic and nutritional impact on the affected community. The facility to ensure adequate and timely compensation for culled animals as part of disease-control measures is also an important component.

Maintaining and strengthening vigilance and detection systems – in all countries

Vigilance for human infections, for incursions into previously unaffected poultry flocks and for significant changes in the behaviour of H5N1 HPAI or other influenza viruses is critical. It is important to maintain investment and continual improvements in surveillance systems and laboratory capacity, coupled with timely information sharing between sectors and a high level of awareness – and willingness to report – between human and animal health practitioners and those working and living with poultry. Availability of timely and adequate compensation is essential in promoting willingness to report outbreaks.

Promoting healthy poultry production and trade – in all countries

Biosecurity throughout the full production chain, from farm to fork, is key for healthy poultry production. It prevents the introduction of H5N1 HPAI and other pathogens and reduces the risk of transmission from one area to another, and from poultry to humans. Integrating strong biosecurity across the production chain is likely to assist in developing sustainable trade and to improve the livelihoods of those living and working with poultry.

Because the success of disease control and prevention programmes depends critically on the behaviour of farmers and others, it is important to strengthen community engagement and effective communication capacity. Clear linkages need to be built between stimulating healthy poultry production, rural and urban planning, and trade and economic development sectors. Multidisciplinary research is also useful, particularly if it includes local researchers, to enhance understanding of the ecological, socio-cultural, political, economic and communication aspects needed to support healthy poultry production in different settings.

Sustaining momentum

Community and industry involvement

Two measures that could help sustain momentum in community and industry involvement are (a) the adoption of appropriate institutional arrangements to ensure participation of communities, poultry workers, and the local and international private sector in designing, supporting and regularly reviewing improvements for healthy poultry production and (b) engendering effective communication to support household behaviour change and the adoption of healthy poultry raising practices. Community and industry involvement will do much to ensure continued progressive control of H5N1 HPAI, protection from infection, and sustained community-led control of H5N1 HPAI in highly impacted areas.

National

In line with the approach to date, countries will be taking the lead in contributing to the international effort aimed at the goals proposed in this Framework. Country responses should therefore, remain the main focus of external technical and financial assistance. Many countries need to strengthen animal and human health services to ensure progressive control. In addition, continued vigilance is needed, which will require investment, oversight and supportive institutional arrangements. Multisector collaboration across different levels of government and disciplines, and enhanced public-private partnerships are needed to support healthy poultry production, continued vigilance and progressive disease control.

Regional and international organizations

Regional and international organizations should support countries with technical assistance and other advice. This support can take the form of further development and sharing of knowledge, collating and analyzing information from current regional and international research initiatives, and further strengthening technology and knowledge transfer systems. Possible areas for research could include: poultry vaccination strategies to maximize their effectiveness in different settings, practical ways to strengthen biosecurity in low-resource settings and development of low-cost means to achieve safer marketing of poultry.

International and regional organizations also play an important global role. In particular, regional and international surveillance and laboratory networks could be further developed to ensure continued vigilance for changes in H5N1 HPAI or other animal influenza viruses of concern. Policies and regulations can help build a healthy global poultry industry able to cope with the likely increasing demands for protein-rich food without compromising safety or inadvertently increasing the risks of infectious diseases. FAO and OIE in partnership with WHO, UNICEF and global and regional development banks are well-placed to continue to provide support to countries for sustaining momentum.

6.3 Expected outcomes to ensure that control and response systems can tackle a broad range of emerging and existing disease threats through operating a One Health approach

Summary of the current situation

The unknown

It is predicted that new pathogens will continue to emerge within domestic and wild animal populations at the rate of at least two per year, with increased risks of emergence in specific regions of the world. 75 percent of new infectious diseases in humans have come from animals. In addition to the potential impacts on human life and health, the economic losses associated with zoonotic diseases can be significant; direct losses due to zoonoses such as SARS, BSE, and H5N1 HPAI over the past decade are estimated at $10 billion, with indirect costs estimated at $200 billion. H5N1 HPAI and pandemic (H1N1) 2009 are just two of the many new diseases to have emerged in recent years.

Several forces are increasing inter-species mixing and allowing greater opportunities for pathogens to move between species. These include intensified farming and concentration of animals and humans, encroachment of humans into previously uninhabited lands and the increasing global movement of people, animals, and animal products. These forces have combined to exert evolutionary pressures on pathogens that present an expanding array of risks.

These risks may, in turn, be exacerbated by increasingly complex trading patterns, migration and global warming. These drivers are likely to increase, not decrease in coming years and the likelihood of diseases emerging is therefore likely to increase as populations grow and pressures mount.

The known

A range of existing, high-impact diseases such as rabies and brucellosis occur at the animal-human interface and significantly impact, year-on-year, on animal health, human health and livelihoods, with often a disproportionate impact on the poor and most vulnerable groups. The control of these diseases could be assisted greatly by more effective interdisciplinary collaboration at the animal-human interface, particularly building on the experiences and learning from H5N1 HPAI. In addition, resources should be directed to amend, improve and strengthen existing systems to address both emerging and known disease threats. Continuing to build the capacity to control known diseases will further enhance our ability to respond to events that may arise in the future.

Achievements and challenges

Recent experiences with SARS, H5N1 HPAI and pandemic (H1N1) 2009 have resulted in a major **achievement**. Policy-makers and experts have concluded that a coordinated approach is needed that encourages multisector, multidisciplinary working, and that optimizes the use of existing systems and skills to address the known and the unknown.

It has also been recognized that emerging disease threats arising at the animal-human-ecosystem interface will likely increase in frequency, and possibly also magnitude, over the coming decades and that their impact will probably be disproportionately felt by the poor and the most vulnerable. There has been a failure however to recognise the high burden that some existing animal-human diseases are placing on society. These so called neglected zoonotic diseases remain unfortunately mostly just that - neglected by the international community.

The many **challenges** include ensuring that the recognition of the potential threat of more and greater emerging diseases is translated into concrete action to address the diverse and multisector drivers or root causes of disease emergence. This means maintaining public interest in emerging diseases given ever-changing perceptions of global needs. It is also important to ensure that specific population groups such as children, pregnant women, indigenous, migrant and refugee populations, who are particularly vulnerable to the impact of the close interaction between human and animal populations, are adequately identified and protected. Above all though, the key challenge will be how to turn the promising beginnings of stronger cross-sector working into a programme that can be institutionalized and sustained as a holistic approach. Such a programme will likely increase in importance as demographic pressure and its economic consequences are reflected in higher poverty rates, adverse impacts on health and nutrition of households, and increased vulnerability to emerging threats.

There are two **expected outcomes** that merit consideration by the international community:

- **Expected Outcome 3: Reduce the likelihood that infectious diseases like H1N1 cross species barriers at the animal-human-ecosystem interface through evidence-based work on drivers of disease emergence**
- **Expected Outcome 4: Build systems to limit the impact of diseases arising at the animal-human-ecosystem interface: the One Health approach**

The **key actions** needed to achieve these expected outcomes fall into two areas. First, the human, animal and environmental health foundations have to be strong, so strengthening these systems remains a priority for many countries. Second, national authorities and the international community would be well served if they moved towards adopting and promoting multisector, interdisciplinary approaches to working at the animal-human-ecosystem interface. These actions will make it possible to address the root causes of emergence, ensure strong surveillance, reduce the burden of existing diseases, and prepare for future events.

Developing multisector surveillance

Comprehensive, effective and efficient national, regional and global surveillance networks are key to monitor the drivers of disease, to track existing diseases and to detect as early as possible emerging diseases at the animal-human-ecosystem interface. To achieve this, further and more consistent investment in these systems (animal, human and ecological) and the means of linking and sharing information is recommended, as is the development and sharing of better and easier tools to support diagnosis, information analysis and forecasting. One promising initiative is the One Flu proposal to bridge the gaps between medical and veterinary scientists, monitor virus evolution and epidemiology, and utilise investments in capacity building.

Putting prevention high on the agenda – multisector approach to addressing the root causes of disease emergence

Depending on country circumstances, the issues to be addressed may include migration, changes in land use, pressures on food availability, changes in animal husbandry practices and climate change. These factors influence, to a greater or lesser extent, the likelihood of pathogens moving between species and emerging as new threats to animal and human health, livelihoods and development. Multisector action that is informed, notably, by broader disaster-reduction programmes, is likely to be useful along with simple and practical ways to reduce the opportunities for pathogens to move between species (particularly between wildlife, domestic animals and humans). Integrating these approaches into relevant husbandry, housing and health development projects would ensure both short and long term gains in addressing the root causes of disease emergence.

Preventing emergence is important and to this end a range of other actions may be considered including (a) novel approaches to surveillance that predict potential disease niches through ecological mapping and determinations of factors associated with the emergence of diseases, (b) a robust and well-researched legal framework that reflects local needs and interests, (c) good communication strategies, (d) incentives for good animal husbandry, (e) properly functioning and governed veterinary services, (f) structures for the involvement of ecologists, social scientists and political economists to contribute to analysis and decision making, and (g) well-regulated systems for livestock transfer, tracing, slaughter, processing and marketing. In addition, for sustained progress in the long term, an assessment of the emerging disease risk (as well as other disaster-related risks) should form an integral part of all planning approval for new land usage. Tools to do this need to be developed, adopted and integrated into urban and rural planning and development processes.

Drawing attention to the true cost of existing diseases with particular support for the most vulnerable and marginalised people

Stronger economic rationale is needed for disease prevention and control efforts for the so-called 'neglected diseases' and others that already exist at the animal-human interface. This should include analyses of the potential human, societal and financial costs of failing to invest in efforts to control these diseases, including for the most vulnerable and marginalised people. Zoonotic diseases cause adverse effects on rural livelihoods, food safety, nutrition and livestock production. Countries and international organizations may wish to consider using the methodology that the WB has developed to assess the costs of brucellosis and other zoonoses in the Europe and Central Asia region. The findings of such analysis need to be communicated to decision makers throughout the public, private and civil society sectors.

Learning to work as one – making multisector, multidisciplinary work a reality

Experience of the response to H5N1 HPAI suggests that zoonotic disease control requires effective joint efforts among professionals and communities working and living at the animal-human-ecosystem interface. Functioning systems which provide incentives to professionals in these distinct sectors to work effectively together at all levels and engage with affected communities are key to encouraging collaboration. Strengthening institutional mechanisms to support integrated approaches and enhancing multisector expertise may also be required.

Sustaining momentum for One Health approaches

Empowering communities

Efforts should be made to involve communities in identifying diseases or threats of local concern, assessing the 'total' burden in their community and determining how best to address and monitor them. These activities need to be supported with the appropriate institutional arrangements and set in the context of achieving improvements in livelihoods and development.

National level

Robust and well-governed public and animal health systems compliant with the WHO IHR and OIE international standards, should be systematically built in all countries. Countries and communities can explore and provide incentives for the public and the private sectors to increase their focus on risk reduction and increase their resilience to shocks from emerging health threats at the animal-human-ecosystem interface.

One Health approaches will benefit from strong inter-professional networks supported by structures and processes that facilitate information exchange, joint education programmes, joint responses and, as appropriate, shared technical and financial resources. There is also a need for multisector governance which can be achieved by bringing together at government level, biosecurity, wildlife conservation, food safety, and human and animal health concerns. The arrangements should facilitate, encourage and ensure adequacy of an agreed range of joint working practices. Such joint approaches are most likely to be effective if they engage commercial livestock production and wildlife conservation entities, other private entities engaged in both trading and retailing, as well as consumer and tourism groups.

Regional and international engagement

Regional and international organizations should support developing countries in designing and implementing One Health approaches. There is a particular need for the international bodies (including FAO, OIE, WHO, UNICEF, the regional development banks and the WB) to foster One Health approaches through information exchange forums, identification of common areas of interest and development of effective, results-focused collaborations between sectors.

International bodies should support further development of regional and international surveillance and laboratory networks to provide information for use through a One Health approach to assess disease burden; to provide early warning of emergent (or changing) pathogens; to assist with forecasting and risk analysis and to help establish good operational practice. Finally they should also promote research that enables timely and context-relevant decisions around optimal policies and practices.

6.4 Expected outcomes for readiness to detect, assess and respond to influenza pandemics

Summary of the current situation

A comprehensive review of how ready the world is now for the next event will only be possible over the coming months. Countries need to take stock of the lessons learnt so far from pandemic (H1N1) 2009 and assess to what extent systems have been strengthened as a result of the sustained activation in response to pandemic (H1N1) 2009. It is likely that revised matrices for stocktaking and future monitoring of progress will need to be developed to take into account what has been learnt from pandemic (H1N1) 2009 and the likely need for increased flexibility and adaptability of systems in the future.

Experience with recent major public health threats, including pandemic (H1N1) 2009 has heightened awareness of the importance of preparedness including the need for all sectors to plan, the need for strong coordination mechanisms to support multisector, multicountry collaboration and the importance of effective communications.

Pandemic plans have been established by most countries and many countries now plan to revise these in light of recent experience and evaluation processes. Progress with business continuity planning for non-health sectors continues to be relatively slow, though there has been a recent upsurge in preparedness activities as a result of pandemic (H1N1) 2009.

As noted in Section 6.2, the threat of another pandemic from either H5N1 HPAI or indeed any one of a range of other influenza viruses has not diminished and, as highlighted in Section 6.3, the drivers of disease emergence are increasing, not decreasing. Continued work to strengthen readiness for influenza pandemic is therefore still required.

Achievements and Challenges

The world was certainly much more ready for pandemic (H1N1) 2009 than it would have been a decade ago. Sustained and intense investment and attention over the last five years as a result of interest stimulated by concerns related to H5N1 HPAI reaped many benefits – faster detection and response, more coordinated actions, and greater cross sector involvement. Communication efforts have had a significant impact in building knowledge for decreasing the risks to human health from emerging diseases and pandemics. However, as the reviews over the coming months to years will likely indicate, significant areas for improvement remain, and the work to build a sustainable system ready and able to respond to the complex needs associated with pandemic influenza is most certainly not complete.

The greatest challenge though is likely to be sustaining interest in preparedness because there is a growing perception that the pandemic risk has declined in recent months as many believe that 'the pandemic' has happened and, to date, H5N1 HPAI remains a predominately animal disease. In addition, many also believe that systems have already been developed and fared reasonably well during recent events so little more is needed at this stage. However, the likelihood of a severe pandemic occurring in the future is unchanged by recent events and although much has been achieved, response capacities and capabilities are likely to decline rapidly if they are not maintained. Continued attention on maintaining and building systems is therefore still needed.

Expected Outcomes for improved readiness to detect, assess and respond to a pandemic requires working towards the following:

- **Expected Outcome 5: Realise standards set out within the IHR 2005 regulations and OIE International standards through developing local, national and global capacities for responding to pandemics**
- **Expected Outcome 6: Incorporate capacity for multisector and inter-country pandemic responses within multihazard disaster preparedness and response strategies**

Based on the experience of the past five years including the response to date to pandemic (H1N1) 2009, **key actions** in the following five areas are likely to need continued attention at national, regional and international level in the coming years in order to achieve these expected outcomes.

Optimizing learning from pandemic (H1N1) 2009 and continued research and evaluation of pharmaceutical and non-pharmaceutical interventions

The H1N1 pandemic provided a real-life test of preparedness of systems at the international, country and community levels. Learning from this experience should be based on robust science-based evaluations at all levels involving all sectors, partners and the community. Results of these evaluations should inform further investments in preparedness and readiness capacities and capabilities. Continued research and evaluation of pharmaceutical and non-pharmaceutical interventions will provide useful insights into durable and effective options. A useful result of the evaluations will be to revise planning assumptions and ensure that a range of scenarios is included. The revised plans should provide for the ability to adapt to meet potentially unforeseen challenges as an integral part of future preparedness.

Building capacity to assess and predict situations

Decision makers require regular, timely information from all sectors, using diverse types of data in order to effectively assess the likely and felt impact of a pandemic or other major health event. Decision making is best served by ensuring that a 'composite' assessment of the health, societal and economic risks posed to the 'whole of society' is coupled with an understanding of different and / or disproportionate risks to specific populations. Such assessments should be made available in a timely fashion. Further development of systems that can collate information from multiple sources and analyze diverse types of data is therefore likely to be an important part of future preparedness activities.

Enhancing cross-sector decision making and strengthening preparedness beyond the health sector with explicit commitment for vulnerable populations

Pandemics and other major infectious disease events that affect groups of countries will, by their very nature, have an impact, in some shape or form, across all sectors of societies. Populations of humanitarian concern, including refugees, internally displaced persons, migrants, ethnic minorities, the poor, older people, people with disabilities and the homeless, are particularly vulnerable to the impacts of pandemic. BCP is key to preparing essential sectors for critical functioning during severe disruptions of inter-dependent services: health, energy, transportation, food, water and sanitation, law and order, defence, financial services and telecommunications. Strengthening the capacities at local, sub-national and national levels to prioritize (and adjust priorities) across and within sectors is recognized to be a critical competency. Private and voluntary sectors and other parts of civil society play a key role in the response to any major events. Response planning would therefore benefit from including and making transparent how all essential sectors would (or would not) be included in decision making during the response to a high-impact epidemic.

Improving communications about risks and actions needed

Communication is critical to all aspects of a response to a major infectious disease event. Whether the event is mild or severe, the way in which the risks are framed and how the actions needed are explained can change the impact of the event dramatically. Strengthening communications capacity across the whole of society and within all sectors of the community is a critical area for further preparedness activities.

Strengthening the response capacity of all systems and integrating pandemic preparedness into multihazard disaster planning

Countries need to continue to prepare critical sectors for continuity of their essential functions and services and to avoid the disruptions caused by high staff absenteeism due to the impact of a pandemic. The failure of one or more critical service can have economic and social consequences, as well as an impact on other essential services. Although infectious disease events present some unique challenges such as the need for social distancing and potential for simultaneous multicountry or global impacts, much of the current multisector response planning could be integrated into generic efforts to reduce and respond to disasters. Developing a more multihazard approach could help to optimize investments and ensure sustainability and compatibility between command and communications systems.

Sustaining momentum for pandemic preparedness

Empowering communities

Integrating pandemic preparedness into other community-level disaster reducing and planning programmes is likely to assist in sustaining interest and investment. Where possible, this is a sensible policy to pursue and should be accompanied by supportive processes, such as periodic testing of plans and provision of resources for the planning. Implementation of 'bottom up' approaches to preparedness planning for any major health event can help enhance community-level resilience.

Sustaining effective structures and processes at national level

Processes are likely to be needed at a national and sub-national level to help governments and the public to learn from recent events, to capture lessons and to rapidly transform these lessons into implementable programmes of work.

In light of recent experience, some countries may consider reviewing current institutional arrangements and legislative frameworks to assess how well they support whole of society responses, cross-sector analysis of information and cross-government decision making. Integration of current pandemic-specific arrangements into institutional structures that support multihazard disaster preparedness and response may be an appropriate means of achieving sustainable readiness and continual improvement.

Regional and international engagement

Timely, transparent and effective processes are needed to optimize global learning through capturing lessons and translating knowledge into actionable guidance. International and regional institutions can play a valuable role in ensuring that such guidance is made available to developing countries.

Given its importance, the infrastructure for early warning also needs further development. The incentives and support for countries, particularly those affected early in a pandemic, need to be made more robust so that the first affected countries can warn others without fear of suffering negative repercussions. There must be adequate assistance on hand to gather the critical information needed to enable rapid forecasting of the impact of the pandemic across the whole of society.

Many countries may also need continued support to strengthen core capacities and integration of relevant aspects of preparedness for infectious disease events into other multihazard disaster reduction and response programmes. The IHR, Hyogo Framework of Action and OIE international standards should be both used to guide international arrangements to support continued work on multisector pandemic preparedness.

6.5 Incentives

Much of the public and media attention to date to address H5N1 HPAI and to prepare for pandemics has occurred as the result of fear that a severe pandemic could occur in the near future. Recognizing the importance of public sentiment as well as the objective threat from H5N1 HPAI, public policy makers devoted substantial resources to mounting a response. However H5N1 HPAI has not, to date, evolved into a virus that can easily transmit between humans and the impact of pandemic (H1N1) 2009 has not, so far, been as severe as the extreme scenarios for which some were planning. Statistically the chances of a severe pandemic occurring in the future have not changed as a result of recent events – H5N1 HPAI could still evolve, pandemic (H1N1) 2009 might mutate and other influenza viruses could emerge and threaten human health as well as economic growth – around the world. But this concern – on its own – is unlikely to motivate investments in the future or provide all the incentives necessary to sustain activities and build further critical surveillance and response capacities. Other incentives will therefore need to be given greater prominence if the momentum that has been generated over the past few years is to be sustained and the investments to date optimized.

One key incentive for continued action on H5N1 HPAI in all countries is the development of sustainable, healthy poultry production and trade as discussed in Section 6.2. Participation in local, national, regional and international trade can be used to motivate efforts to achieve and sustain disease-free status for H5N1 HPAI and other livestock diseases. The international standards developed under the auspices of the OIE for animal health and zoonoses are essential reference tools in the area of improving animal health and welfare worldwide through the application of science-based, democratically adopted global standards on animal diseases, including zoonoses. These standards, as well as other relevant trade, ecosystem and human health standards are powerful incentives for sustained action. Monitoring of progress towards meeting these will provide both additional incentives and a means to ensure regular evaluation of progress.

The key motivator for the public, for staff and for decision makers to continue action to prepare for pandemics will most likely come from seeing capacities and capabilities being used on a day-to-day basis to treat patients and to respond to other major events. Mainstreaming of capacities into existing health system strengthening programmes and integration of planning and response preparedness into multihazard disaster planning may be useful to sustain momentum. Articulating more explicitly the significant co-lateral benefits that pandemic preparedness has delivered will help to enhance support.

A number of other specific incentives may be needed to ensure that the root causes of disease emergence are addressed and that existing diseases arising at the animal-human-ecosystem interface are afforded the right level of attention. Analysis is needed to calculate the current and likely costs of existing and emerging diseases – and this needs to be translated into effective communications to encourage multisector action. Without increased attention being drawn to these issues, some important existing diseases are likely to remain 'neglected' and the practical means to reduce the likelihood of disease emergence at the animal-human-ecosystem interface will not be found or implemented. Calculating and showing the true costs of these threats and demonstrating the cost effectiveness of actions is key to motivating and sustaining future action. It is also important that incentives to report outbreaks at local, national and international levels are in place; further work is likely needed to create and align incentives and to reduce barriers and disincentives, particularly economic ones.

Finally, duty to future generations should be used to incentivize the timely and transparent capturing of learning from recent experiences. The experience of responses to pandemic (H1N1) 2009 should be documented and assessments should be made available to all countries and preserved as a resource for generations to come. The next pandemic may be just around the corner – or it may take many decades before such an event occurs again. It is therefore important to document what civil society, countries and international bodies have learnt and to ensure that this knowledge will be available whenever another such event occurs.

6.6 Measuring progress for global programmes

Monitoring at the local, national and global levels

A global programme that will continue into the long term requires an adapted monitoring mechanism that is fully integrated into the regular work of the relevant national and international agencies. In light of recent experiences, it may be necessary to develop revised matrices that reflect new priority areas for capacity building. As noted above, it is proposed that pandemic preparedness (especially for non-health sectors) be mainstreamed into disaster preparedness, and regular reporting on progress at the national and global levels should take place in that context, as noted in the Hyogo Framework.

It is important that efforts to control H5N1 HPAI and One Health system initiatives are closely monitored and continuously examined. As a substantial part of this function would take place at the community and national levels, where programmes are managed and implemented, it would be important to integrate monitoring into everyday practice to ensure that the results are useable and useful at a local level. Some countries may require support to develop and integrate effective review processes in local work programmes.

At the global level, it would be appropriate for the concerned international bodies to regularly report to their governing bodies on the risks from diseases at the animal-human-ecosystem interface, and on the adequacy of actions being taken to reduce these risks. These reports could track how robust and well-governed human, animal and environmental health systems are, whether they comply with the WHO IHR framework and OIE international standards, and how far the development of a One Health approach is progressing. As has been the practice on other inter-sectoral issues, this effort could be best supported by an international advisory group which would establish a review mechanism based on multidisciplinary technical expertise (including health systems, ecological, economic, anthropological, sociological, organizational and political expertise) to inform the evolution of the work. Such an approach would require discussion and endorsement at the OIE World Assembly of Delegates, World Health Assembly and FAO Conference.

6.7 International financial and technical assistance estimates for animal and pandemic influenza

A systematic approach to delivering a global public good

Reducing the enormous risks posed by the existing, emerging and re-emerging diseases at the animal-human-ecosystem interface is an important public good. It will require, as a prerequisite, an adequate capacity to predict, prevent and control such diseases. The vast majority of developing countries do not currently have all the institutional and system capabilities to meet this challenge.

The integrity of a global disease prevention and control capacity depends on a minimum capability of each member of the community. The 'chain is only as strong as its weakest link' so a collective effort is required to help developing countries make the necessary investments to strengthen their animal and human health systems and to support multisector, multidisciplinary approaches to prevention, protection, detection, preparedness and response. Estimates of what this will cost are presented below. Adequate funding will also be required to ensure the contributions of the international agencies to global efforts to predict, prevent, and control highly infectious diseases, including zoonoses.

Since late 2005, donors have provided US$3.9 billion in international assistance to avian and human influenza programmes in developing countries. Taking into account the commitments provided, the unmet funding needs (based on a three-year programme) are about US$800 million, of which about half is for countries in Sub-Saharan Africa (see Chapter 2 for details).

Estimating costs of enhanced global capacity

The report *Contributing to One World, One Health: A Strategic Framework for Reducing Risks of Infectious Diseases at the Animal-Human-Ecosystem Interface (2008)* presented an assessment of the costs of a global network to support One Health approaches. In its section on tailoring monitoring and control systems, the document acknowledged that 'producing an estimate of the global financing needs to implement is an art, not a science,' owing to the complexities of estimating costs in relation to 'the level of risk deemed acceptable to the global community'. More detailed individual country cost studies will clearly be required but the estimates presented here give an indicative order of magnitude of resources that will be needed.

The cost estimates used in the framework document, and hence in this paper, are based on the figures for unit costs presented at the Bamako ministerial conference in 2006[149]. Individual countries were used as the basic unit. These cost estimates are based on human health and livestock populations and distributed over the costs of developing and maintaining infrastructure. They take account of the previous investments already carried out and were calculated for each country for human health, veterinary, and communication services.

The figures were adjusted for the country's income level (differentiating the funding needs between low-income, and middle-income developing countries; OECD countries were excluded); the economies of scale in surveillance and early response costs (with a progressive decrease in per-animal unit cost); the economies of scale in surveillance costs for wildlife disease monitoring (assuming declining financial requirements as livestock density increases); characteristics of the country with higher levels of intensity in wildlife disease monitoring if a country was considered a hot spot; and cost of completing the current campaign resulting from a considerable number of already prepared Integrated National Action Plans (140 by September 2008).

Total cost estimate

Applying these assumptions, total external financing requirements would be about US$1.3 billion annually, on average, over the next decade (Table 6-1). Owing to the poor state of animal and human health systems in low-income countries, funding needs in those countries are estimated to be much higher than those in middle-income countries.

	49 low-income countries	All 139 eligible countries
Public health services	1,264	3,083
Veterinary services	3,286	5,476
Wildlife monitoring	1,495	2,495
Communication	583	1,167
International organizations	3,180	3,475
Research	420	420
Total	**10,228**	**16,116**
Average per year	852	1,343
Average per country for the period	208	116*

Table 6-1: Estimated cost of funding the One Health Framework to 2020 (US$ million)

* US$65 million per country for the middle-income countries only

Source: Adapted from Contributing to One World, One Health: A Strategic Framework for Reducing Risks of Infectious Diseases at the Animal-Human-Ecosystem Interface. 2008.

Breakdown of costs among programmes

As shown in Table 6-1, most of the requirements – about 80 percent – are in low-income developing countries, with the largest needs to develop health systems (public, veterinary and ecosystems). Country programmes to address these needs will have to be prepared and costed country-by-country, drawing on assessments of capacities such as PVS, PVS Gap Analysis, and analysis of ability to implement the IHR (2005). The resulting financing needs will differ from the averages presented in Table 6-1. Such costed country programmes should receive a high priority in donors' assistance programmes to ensure that country needs, such as those for animal and human health system strengthening, do not remain unfunded (as was the case for some countries during the AHI response).

Because the One Health approach envisages greater collaboration among the many international organizations in coordinating the various regional and global tasks and in delivering effective assistance to countries, these organizations will need funding,[i] which would amount to about 20 percent of the total. As for the research agenda, some contributions would be made by the private sector, but a large part of this work needs to be in the public domain and publicly funded.

Funding responsibilities

How financial responsibilities are divided between international and national public sources requires considerable deliberation. The responsibility for funding an activity or function is in principle determined by whether the good that is provided through that activity is global, national, local or private in scope. Owing to their transboundary nature, protection from infectious zoonotic diseases with pandemic potential is a global public good. Control of these diseases clearly fulfils the criteria that are defined by the International Task Force on Global Public Goods (International Task Force on Global Public Goods 2006)[ii]. Support to countries in their efforts to control these diseases falls firmly within the mandates of international institutions; both country activities and support to them from international agencies should be eligible for funding by international sources where these activities deliver a global public good.

National and local public goods

The control of diseases that affect specific countries but do not represent direct and indirect threats to human health on a global scale is less likely to be eligible for international support. The control of less infectious and more local diseases such as brucellosis or bovine tuberculosis yields benefits that are mostly local public goods and private goods but in many cases there are also regional repercussions including impact on trade. The responsibility for funding may then rest with the national authorities, local levels of government and private individuals. But there is an important caveat. While neglected zoonotic diseases may fall short of being global public bads, they do have significant impacts on poverty and undermine growth, often the most in the poorest countries. These impacts have been shown to fall disproportionately and sometimes overwhelmingly upon the poor and vulnerable. Such diseases – though not in themselves objects of global action – do assume far more than local significance in terms of achieving the poverty- and health-related Millennium Development Goals – which, of course, are global public goods.

Disease coverage

While control measures are generally disease specific, surveillance systems monitor all categories of diseases – existing, emerging, and re-emerging. These considerations are reflected in Table 6-2.

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[i] The distribution of tasks and funds among international and regional organizations will depend on refinements of the institutional arrangements as implementation progresses. The 'Consolidated Action Plan for Contributions of the UN System and Partners' provides insight into the present international agency needs for funds to fight H5N1 HPAI (US$339 million in 2008). The calculation above assumed that this amount would decrease (as H5N1 HPAI is brought under control), but will be increased to address other diseases. see http://www.undg.org/index.cfm?P=52

[ii] The Task Force definition of 'global public goods' is included in Annex 1.

Activity	Disease of low human epidemic potential	Disease of moderate to high human epidemic potential
1. Preparedness		
Risk analysis	Global	Global
Preparedness plan	National/regional	Global
Animal vaccine development	Private[i]	Global
2. Surveillance		
Public health, veterinary and wildlife	Global	Global
Diagnostic capacity	Global	Global
Managerial and policy arrangements	National	Global
3. Outbreak control		
Rapid response teams	National/regional	National/global
Vaccination	National/regional/private	Regional/global
Cooperation among human, veterinary, and wildlife services	National	Global
Compensation schemes	National/private	Global
4. Eradication plans	National/regional/private	Global
5. Research	National/regional/private	Global

Table 6-2: Activities for the prevention and control of diseases at the animal-human-ecosystem interface and their status as a public good

Source: UN and World Bank, 2008. '*Contributing to One World, One Health: A Strategic Framework for Reducing Risks of Infectious Diseases at the Animal-Human-Ecosystem Interface*'.

[i] This may also be a global public good depending on diseases and context.

6.8 A Framework for sustaining momentum for animal and pandemic influenza

EXPECTED OUTCOMES	KEY AREAS FOR ACTION	REVIEWING PROGRESS AND NEEDS
Stream 1: Prevent and Control H5N1 Highly Pathogenic Avian Influenza		
Expected Outcome 1: Progressive control of H5N1 HPAI – with the goal of eventual elimination (and ultimate eradication) from domestic animal populations **Expected Outcome 2:** Maintain vigilance for H5N1 HPAI and other influenza viruses that have pathogenic potential in humans	• National goal setting (goals, objectives, modus operandi, timelines) – particularly in highly impacted countries • Maintaining and strengthening vigilance and detection systems – in all countries • Promoting healthy poultry production and trade – in all countries	Using and developing further as needed the indicators based on OIE standards Establish a broader set of indicators in partnership with the private sector to assess progress and evaluate biosecurity levels for sustainable, healthy poultry production in an expanding and diversifying industry setting
Stream 2: Ensure that control and response systems can tackle a broad range of emerging and existing disease threats through operating a One Health approach		
Expected Outcome 3: Reduce the likelihood that infectious diseases like H1N1 emerge at the animal-human-ecosystem interface through evidence-based work on drivers of disease emergence **Expected Outcome 4:** Build systems to limit the impact of diseases emerging at the animal-human-ecosystem interface: the One Health approach	• Developing multisector surveillance • Putting prevention high on the agenda and taking a multisector approach to addressing the root causes of disease emergence • Drawing attention to the true cost of existing diseases with particular support for the most vulnerable and marginalized people • Promoting multisectoral solutions to amend, improve and strengthen the systems already in place for existing diseases • Learning to work as one – making multisector, multidisciplinary work a reality	Develop core indicators of progress for governance, inter-sectoral collaboration and community engagement to assist with tracking of progress and regular identification of priority areas for additional action
Stream 3: Being ready to detect, assess and respond to influenza pandemics		
Expected Outcome 5: Realize standards set out within the IHR 2005 and the OIE international standards through developing local, national and global capacities for responding to pandemics **Expected Outcome 6:** Incorporate capacity for multisector and inter-country pandemic responses within multihazard disaster preparedness and response strategies	• Optimizing learning from pandemic (H1N1) 2009 and continued research and evaluation of pharmaceutical and non-pharmaceutical interventions • Building capacity to assess and predict situations • Enhancing cross-sector decision making and strengthening preparedness beyond the health sector with explicit commitment for vulnerable populations • Improving communications about risks and actions needed • Strengthening the response capacity of all systems and integrating pandemic preparedness into multihazard disaster planning	Monitor core requirements of the IHR, Hyogo Framework for Action and OIE international standards Establish a composite or new set of matrices, based on lessons learnt, to allow tracking of progress and review of critical areas into the future

Annexes

Annex 1: Glossary of terms as used in this document

Biosecurity: Biosecurity is a strategic and integrated approach that encompasses the policy and regulatory frameworks (including instruments and activities) that analyse and manage risks in the sectors of food safety, animal life and health, and plant life and health, including associated environmental risk. Biosecurity covers the introduction of plant pests, animal pests and diseases, and zoonoses, the introduction and release of genetically modified organisms (GMOs) and their products, and the introduction and management of invasive alien species and genotypes. Biosecurity is a holistic concept of direct relevance to the sustainability of agriculture, food safety, and the protection of the environment, including biodiversity[150].

Emerging Infectious Diseases (EID): EIDs are generally defined as infections that have newly appeared in the population or have existed but are rapidly increasing in incidence or geographical range (WHO). Increase in transmissibility of a microorganism, a shift in virulence or development of characteristics such as microbial resistance, or a species shift are all considered as emerging diseases (FAO).

Endemic: The constant presence of a disease or infectious agent within a given geographic area; it may also refer to the usual prevalence of a given disease within such area.

Enzootic: A disease (can either be high or low morbidity) that is endemic in an animal community.

Epidemic: The occurrence in a community or region of cases of an illness (or outbreak) with a frequency clearly in excess of normal expectancy.

Epidemiology: The brand of science that deals with the incidence, distribution, and control of disease in a population; the sum of the factors controlling the presence or abundance of a disease or pathogen.

Epizootic: The occurrence in an animal population of cases of an illness (or outbreak) with a frequency clearly in excess of normal expectancy.

Global Outbreak Alert Response Network (GOARN): A technical collaboration of existing institutions and networks that pool human and technical resources for the rapid identification, confirmation and response to outbreaks of international importance. The Network provides an operational framework to link this expertise and skill to keep the international community constantly alert to the threat of outbreaks and ready to respond.

Global Public Goods: Issues that are broadly conceived as important to the international community, that for the most part cannot or will not be adequately addressed by individual countries acting alone and that are defined through a broad international consensus or a legitimate process of decision making. The benefits of controlling infectious diseases are not exclusive to any particular country and therefore fulfil the non-exclusion principle (e.g. everyone benefits from a streetlight). Moreover, by benefitting from the control of these diseases, one country does not diminish the benefits that other countries enjoy (this is called non-rivalry).

Interdisciplinary approaches: A field of study that crosses traditional boundaries between academic disciplines or schools of thought, as new needs and professions have emerged; involves connections and integration of several academic schools of thought, professions or technologies in the pursuit of a common task.

Mekong Basin Disease Surveillance Group: The Mekong Basin is home to six countries: Cambodia, China, Lao PDR, Myanmar, Viet Nam, and Thailand. In 1999, delegates from these countries agreed to start disease surveillance collaborations under the name Mekong Basin Disease Surveillance (MBDS).

Multidisciplinary approaches: Approaches which draw from multiple disciplines to redefine problems outside of normal boundaries and reach solutions based on a new understanding of complex situations; multidisciplinary approaches draw on systems-thinking for complex problem solving.

Multisectoral: responses by different functional or sectoral ministries or agencies.

One Health: The expression 'One Health' is used to refer to a more integrated or holistic approach to human, animal and ecosystem health. It represents the collaborative efforts of multiple disciplines to understand the inextricable links among human and animal health and the health of the ecosystems they inhabit. The diseases of primary importance are those that have potential to jump species – between wild or domestic animals and humans.

Pandemic: A pandemic is the worldwide spread of a new disease. An influenza pandemic occurs when a new influenza virus emerges and spreads around the world, and most people do not have immunity. Viruses that have caused past pandemics typically originated from animal influenza viruses.

Pathogen: A specific causative agent (such as bacterium or virus) of disease.

Pathogenicity: Reflects the ongoing evolution between a parasite and host, and disease is the product of a microbial adaptive strategy for survival.

Prevalence rate: The total number of persons sick or portraying a certain condition in a stated population at a particular time or during a stated period of time, regardless of when that illness or condition began, divided by the population at risk of having the disease or condition at the point in time midway through the period in which they occurred.

Sector 1: Industrial integrated system with high level biosecurity and birds/products marketed commercially (e.g. farms that are part of an integrated broiler production enterprise with clearly defined and implemented standard operating procedures for biosecurity). (FAO Categorization of Farmers into Four Sectors)

Sector 2: Commercial poultry production system with moderate to high biosecurity and birds/products usually marketed commercially (e.g. farms with birds kept indoors continuously; strictly preventing contact with other poultry or wildlife). (FAO Categorization of Farmers into Four Sectors)

Sector 3: Semi-commercial poultry production system with low to minimal biosecurity and birds/products usually entering live bird markets (e.g. a caged layer farm with birds in open sheds; a farm with poultry spending time outside the shed; a farm producing chickens and waterfowl). (FAO Categorization of Farmers into Four Sectors)

Sector 4: Village or backyard production with minimal biosecurity and birds/products consumed locally. (FAO Categorization of Farmers into Four Sectors)

Surveillance: The continuing scrutiny of all aspects of occurrence and spread of a disease that is pertinent to effective control.

Transdisciplinary approaches: Cooperative approaches that transgress boundaries between scientific disciplines and between science and other societal fields; transdisciplinary approaches include deliberation about facts, practices and values and represent a unity of knowledge beyond disciplines towards more holistic approaches.

Vaccine: A biological preparation that improves immunity to a particular disease. A vaccine typically contains an agent that resembles a disease-causing microorganism, and is often made from weakened or killed forms of the microbe. The agent stimulates the body's immune system to recognize the agent as foreign, destroy it, and 'remember' it, so that the immune system can more easily recognize and destroy any of these microorganisms that it later encounters.

Virulence: The degree of pathogenicity of an organism as evidenced by the severity of resulting disease and the organism's ability to invade the host tissues.

Virulence factors: The properties (i.e. gene products) that enable a microorganism to establish itself on or within a host of a particular species and enhance its potential to cause disease.

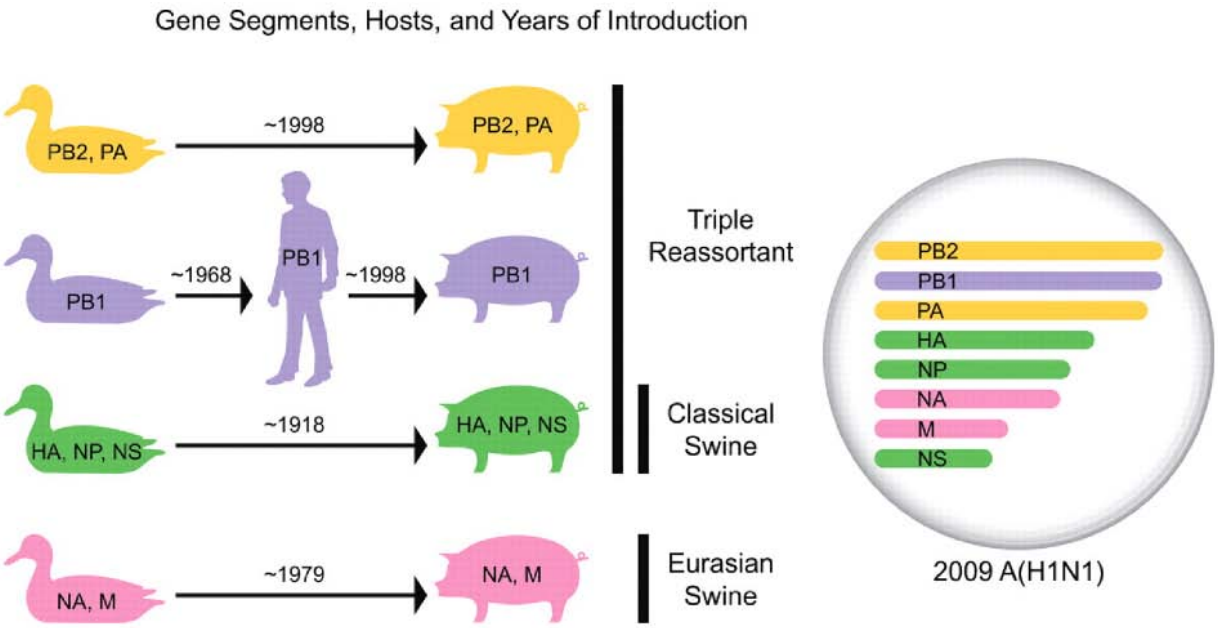
Virus: A small infectious agent that can only replicate inside the cells of another organism. Viruses are too small to be seen directly with a light microscope. Viruses infect all types of organisms, from animals and plants to bacteria and achaea.

Zoonosis or zoonotic disease: Infection of animal origin that causes disease in human populations; may be enzootic or epizootic.

Zoonotic pool: The population of animals infected with nonhuman microbes that present a potential threat of transmission to humans.

Annex 2: Host and lineage origins for the gene segments of the 2009 A (H1N1) virus

The host and lineage origins for the gene segments of the 2009 A (H1N1) virus are: PB2, polymerase basic 2; *PB1*, polymerase basic 1; *PA*, polymerase acidic; *HA*, hemagglutinin; *NP*, nucleoprotein; *NA*, neuraminidase; *M*, matrix gene; and *NS*, non-structural gene. The colour of gene segment in the circle indicates the host. For an explanation of determination of the lineage see Garten et al., SCIENCE 325:197 (2009)[151]. (Reproduced with permission).



Annex 3: The International Ministerial Conference: Animal and Pandemic Influenza: The Way Forward, 'Hanoi Declaration', 19-21 April 2010.

PREAMBLE

The International Ministerial Conference on Animal and Pandemic Influenza was convened in Hanoi, Viet Nam, on 19 - 21 April 2010. Hosted by the Government of Viet Nam, in coordination with the EU and the US, with the support of the UN System Influenza Coordination and international organizations, the conference was attended by representatives of 71 countries and regional bodies around the world and representatives of international technical organizations, development banks and other stakeholders within the development community. The conference convened only a few days after the Eyjafjallajökull volcano eruption in the north of Europe, which disrupted global air travel. Nevertheless, great spirit on the part of both delegates and organizers, the use of technologies, and support from diplomatic corps assured representation to the fullest extent possible. This conference built on a series of preceding international ministerial conferences and senior officials meetings since 2005, which have provided a platform for an unprecedented coordination in planning and action to respond to highly pathogenic avian influenza (HPAI) caused by the A/H5N1 strain, to prepare for a possible influenza pandemic and to strengthen jointly animal and human health systems on a long term basis.

In addition, the conference noted the emergence of the first pandemic of the 21st century, caused by a new subtype of the A/H1N1 influenza virus, regretting the suffering and deaths caused by pandemic (H1N1) 2009, noting in particular the impact on young adults and pregnant women, young children, indigenous peoples, people with chronic conditions, and those with limited access to health care. The conference identified and discussed lessons learned from pandemic (H1N1) 2009.

The global experience with H5N1 HPAI and pandemic (H1N1) 2009 has reaffirmed the importance of international and regional cooperation, national political commitment, inter-sectoral collaboration, timely and transparent communication, and capacity building as essential to build a health system which is capable of addressing emerging threats, such as animal and human influenza, and ensuring effective pandemic readiness and response across different sectors. National experiences during pandemic (H1N1) 2009 have reinforced the need for sustained, well-coordinated, multisector, multidisciplinary, community-based actions to address high impact disease threats that arise at the animal human-environment interface.

The continued threat of H5N1 HPAI to animal health, livelihoods, and human health in affected communities illustrates that despite progress in controlling influenza, the potential remains for influenza viruses to become more virulent through mutations or exchanges of genetic material. This may result in a severe pandemic. The ongoing pandemic (H1N1) 2009 demonstrates the capacity for rapid global spread of influenza viruses, and still has the potential to become more pathogenic. Additional animal and human health policies for early detection systems and control measures will need to be developed and sustained at national and international levels for the foreseeable future. Moreover, effective metrics and policy analysis for evaluating such actions need to be developed and consistently applied.

The majority of high impact infectious diseases that have recently affected humans have arisen at the animal-human-environment interface. A number of existing diseases which emerge from this interface significantly burden animal and human health, livelihoods, and development. The effort to control HPAI and to prepare for pandemics can serve as a useful example of the way forward not only for controlling such diseases, but also for building stronger and more responsive human and veterinary health systems and better aligning those sectoral policies in ways that encourage socio-economic development.

Recent experience of H5N1 HPAI and pandemic (H1N1) 2009 has confirmed the need for a sustained cross-sectoral policy and coordination to deal with serious threats that arise at the animal-human-environment interface. This approach, often referred to as 'One Health', was addressed at the IMCAPI in New Delhi in 2007 and further promoted by Ministers at the IMCAPI in Sharm el-Sheikh in 2008. One Health is a first step towards improving health outcomes through incorporating human and animal health policies in all relevant sectors.

The surge in demand for health care services associated with pandemic (H1N1) 2009 has strained the health sector in many countries, especially in countries that face the dual challenge of limited resources and highly vulnerable populations, and negatively affected agriculture, business, education, travel, and tourism in some countries. This experience highlights the importance of understanding the cross-sectoral determinants of good health and a global commitment to fundamental, long-term, and systematic approach to building public health capacity, including surveillance, detection, and reporting, as well as reinforcing economic resilience. It highlights the importance of non-pharmaceutical interventions in pandemic preparedness and response. The experience with pandemic (H1N1) 2009 also demonstrates the importance of planning for proportionate, differentiated responses to allow for flexibility in responding to different scenarios in terms of virulence, geographic spread, and other factors. It reinforces the importance of including continuity planning for critical services and of addressing potential impacts in national disaster management plans.

Effective advocacy and communications at all levels need to be strengthened to better support decision making, to ensure resource commitment, to promote understanding and appropriate assessments of the risks in animals and humans, and to enable effective engagement at the community level through behaviour changes and the adoption of protective practices.

The new challenge of the 21st century, 'live again with infectious uncertainty and strengthen systems so they can respond to unpredictable health risks', calls for a thorough and carefully planned effort of sensitization and education.

WE, THE PARTICIPANTS IN THE CONFERENCE

1. Take note of the progress that has been achieved in global coordination and cooperation since the end of 2005 in the global response to highly pathogenic avian influenza (H5N1), and of the positive conclusions presented at this conference, and in independent evaluations of the overall H5N1 response.
2. Commend the ongoing consultations at all levels, as exemplified in particular by the technical meeting undertaken as part of this conference, to identify, inform, and promote efforts to improve global health.
3. Recognize the concerted efforts of the international community, including agencies of the United Nations system and other relevant international and regional organizations, countries, development and technical agencies, nongovernmental organizations, foundations, communities, the private sector, and other partners to prepare for and respond to the threat of pandemic influenza; emphasize the need to continue to enhance coordination at the international level and encourage countries and international partners to further promote information exchange on experiences, policies, guidelines, clinical data, and other aspects bilaterally, regionally and globally.
4. Express satisfaction that commitments first made by participants at the January 2006 Beijing conference, and reaffirmed at subsequent conferences, have had significant results, including: the development and implementation of national integrated action plans within the strategic framework of the WHO, the FAO and the World Organization for Animal Health; and the establishment of strategic partnerships between the international community and the countries affected or at risk of H5N1 HPAI.
5. Renew our commitment to continue and reinforce this long-term partnership, by working within the United Nations system and through global, regional, and intercountry networks to increase our capacity and cooperation on surveillance systems, epidemiological research, antiviral and vaccine research and development, health and veterinary systems strengthening, as well as safe and resilient systems for food production, and to evaluate periodically our preparedness and action plans for pandemics.
6. Recognize that despite substantial progress in controlling H5N1 HPAI globally, the virus continues to circulate in domestic poultry in a number of countries, and to result in human infections and deaths.
7. Encourage countries and international partners, including agencies of the United Nations system, to remain vigilant and continue to share information with respect to emerging threats such as H5N1 HPAI, pandemic (H1N1) 2009, and other influenza viruses and to continue their efforts towards the control and elimination of H5N1 HPAI, while working to strengthen jointly human and animal public health systems and to evaluate such efforts by effective metrics.

8. Recognize that global preparations for H5N1 HPAI influenza largely contributed to coordination of the response to pandemic (H1N1) 2009.
9. Recognize the critical importance of learning lessons from the responses to H5N1 HPAI and pandemic (H1N1) 2009, including lessons from important learning events hosted by a number of countries and institutions as well as reviews and assessments that were shared at the conference, appreciate the risks associated with these viruses, and commit ourselves to considering further actions to avert H5N1 HPAI and increasing efforts to review pandemic preparedness plans using, where relevant, guidance and tools provided by the international technical agencies and the multilateral development banks; these country strategies should be aligned nationally and regionally to address the global One Health challenges.
10. Recognize that there is a need for the international community, led by the international technical agencies and development banks, to address the fundamental gaps in public health and animal health systems so as to reduce the impact of zoonoses, avert potential pandemics of animal origin, and mainstream investments and capacity in country health systems.
11. Call for increased efforts to strengthen early detection of, preparedness for, and rapid reporting of future events, by understanding the cross-sectoral nature of any threat, with particular focus on the health systems' capacity for rapid interdisciplinary action and coordination in line with the requirements outlined in IHR 2005 and the OIE standards on quality of Veterinary Services, with special attention devoted to develop and sustain such capacity in the least developed countries, to the needs of vulnerable groups, and to encourage the role of local communities as part of disease prevention and control programmes.
12. Call for the development of national strategies, plans and interventions to stimulate whole-of-society, multisector, multidisciplinary, and community-based actions when addressing disease threats that arise at the animal-human environment interface, stress the importance of business continuity planning in critical sectors, encourage all stakeholders to strengthen institutional and practical mechanisms to support cooperation and collaboration, and work to improve risk communication at all levels, in particular at the community level.
13. Underline the importance of implementing science-based public health measures and food safety international standards to minimize the potential economic and trade implications, and encourage countries to rapidly report disease outbreaks.
14. Reaffirm the critical role of communication, while reviewing the challenges in communications on pandemic (H1N1) 2009; enhance the efforts to better communicate with our populations, including the media, health services and specific communities, to promote understanding of the risk, policy direction and necessary prevention measures, and to promote behaviour change, where necessary, through effective communication.
15. Call for constructive cooperation between governments and the private sector, as well as academia, on innovations leading to improved surveillance, prevention and treatment, including on diagnostic reagents, vaccines, and medicines, always working within the relevant policy frameworks established by competent national authorities and WHO and OIE.
16. Finally, call for concerted worldwide efforts by all countries and relevant agencies of the United Nations system, and other international and regional partners, to better understand the emergence of disease threats at the animal-human-environment interface through multisectoral actions, and to develop appropriate and sustainable means to reduce such threats.

Annex 4: Participating countries at IMCAPI, Hanoi, 19-21 April 2010[i]

Africa	Americas	East Asia and Pacific	Europe and Central Asia	Middle East and Northern Africa
Angola Burkina Faso Cameroon Eritrea Gambia (the) Ghana Guinea Guinea-Bissau Kenya Lesotho Mali Namibia Niger (the) Nigeria Rwanda Seychelles Sierra Leone Tanzania Uganda Zimbabwe	Canada Cuba Mexico Panama United States of America (the) Venezuela (Bolivarian Republic of)	Australia Bangladesh Bhutan Brunei Darussalam Cambodia China India Indonesia Japan Lao PDR Malaysia Maldives Mongolia Myanmar Nepal Pakistan Philippines (the) Singapore Sri Lanka Thailand Timor-Leste Viet Nam	Bosnia and Herzegovina Bulgaria Czech Republic (the) Finland France Germany Ireland Italy Kyrgyzstan Malta Moldova Netherlands (the) Poland Spain Sweden Switzerland Tajikistan Ukraine United Kingdom of Great Britain and Northern Ireland (the)	Egypt Iraq Kuwait Qatar Saudi Arabia Sudan (the) United Arab Emirates (the)

[i] The list of participant countries is based on registered attendees for IMCAPI, Hanoi.

Annex 5: Financial Commitments and Disbursements

Table 1: Commitments and Disbursements Summary by Donor

Table 2: Details by Recipient Country

Table 3: Details by Recipient International Organisations

Table 4a: Detailed Breakdown of Support by Donor to Countries, Regional Organisations and International Organisations

Table 4b: Detailed Breakdown of Support by Donor to the Avian and Human Influenza Facility and Other Recipients

Annex 5 Table 1: Commitments and Disbursements Summary by Donor as of December 31, 2009

AHI Pledge Results as of April 2010 – As Reported by Donors (US$ millions)

	Pledges						Commitments and Disbursements												
	Beijing	Bamako	Delhi	Sharm El Sheikh/ After	Cumulative Pledges as of Dec.	Hanoi April 2010,	Countries		AHI Facility		Regional		International Organizations		Other		Uncommitted Pledges to December	Total	Total
Donor	Pledges	Increased	Increased	Increased	2009	Increased	Commt.	Disb.	Commt.	Disb.	Commt.	Disb.	Commt.	Disb.	Commt.	Disb.	31, 2009	Commt.	Disb.
Australia	55.91	55.10		22.25	133.25		53.90	45.26	8.49	8.49	39.66	28.73	31.20	28.93	0.00	0.00	0.00	133.25	111.41
Austria	1.24				1.24		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.24	0.00	0.00
Belgium	3.11			16.66	19.77		0.00	0.00	0.00	0.00	0.25	0.25	19.52	2.64	0.00	0.00	0.00	19.77	2.89
Canada	0.00	87.05	12.29		99.40		0.00	0.00	0.00	0.00	4.73	4.73	78.00	65.84	16.67	8.13	0.00	99.40	78.71
China	10.00				10.00		0.00	0.00	2.00	2.00	0.00	0.00	1.00	1.00	0.00	0.00	7.00	3.00	3.00
Cyprus	0.03				0.03		0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.00	0.00	0.00	0.03	0.03
Czech Republic	0.20				0.20		0.20	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.20
Estonia	0.04			0.03	0.07		0.04	0.01	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.04
Finland	3.36	6.59			9.95		8.08	8.08	0.00	0.00	0.00	0.00	1.87	1.87	0.00	0.00	0.00	9.95	9.95
France	31.09	9.95	7.25	5.03	53.32		0.37	0.37	0.00	0.00	0.00	0.00	33.31	26.31	16.08	7.64	3.56	49.76	34.32
Germany	28.61	8.33	4.27	46.83	88.03		16.25	9.31	0.00	0.00	1.18	1.18	32.62	32.62	37.98	18.77	0.00	88.03	61.88
Greece	0.75		0.43		1.18		0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.38	0.00	0.00	0.80	0.38	0.38
*Hungary	*0.04				0.04		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00
Iceland	0.40				0.40		0.00	0.00	0.20	0.20	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.40	0.20
India			2.00		2.00		0.00	0.15	1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67	0.15
Ireland	1.24			2.16	2.16		0.30	0.30	0.00	0.00	0.00	0.00	1.86	1.86	0.00	0.00	0.00	2.16	2.16
Italy	6.96				6.96		0.00	0.00	0.00	0.00	0.00	0.00	4.50	0.00	0.00	0.00	2.46	4.50	0.00
Japan	155.00	67.00	69.10	90.32	381.42	34.58	40.55	38.05	0.00	0.00	90.70	90.70	120.62	120.62	129.55	107.83	0.00	381.42	357.19
Korea, Republic of	5.71				5.71		2.80	2.80	1.00	1.00	0.00	0.00	1.29	1.29	0.04	0.04	0.58	5.13	5.13
Luxembourg	1.24	0.25			1.49		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.49	0.00	0.00
Netherlands, The	13.68	6.97			20.64		14.45	3.75	0.00	0.00	0.00	0.00	1.40	1.40	18.20	7.00	0.00	34.05	12.15
Norway	7.90	3.40	1.75	1.00	14.05		0.00	0.00	0.00	0.00	0.00	0.00	14.04	14.04	0.00	0.00	0.01	14.04	14.04
Russia	23.70	8.16			31.86		4.86	2.80	3.00	3.00	0.00	0.00	0.00	0.00	24.00	23.48	0.00	31.86	29.28
Saudi Arabia	1.00				1.00		0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	1.00	1.00
Singapore	0.60		0.90		1.50		1.50	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.80
Slovenia	0.04				0.04		0.00	0.00	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.04
Spain	2.98	0.58			3.56		0.00	0.00	0.00	0.00	0.00	0.00	3.56	2.98	0.00	0.00	0.00	3.56	2.98
Sweden	9.37	3.35			12.72		0.00	0.00	0.00	0.00	0.00	0.00	12.72	12.58	0.00	0.00	0.00	12.72	12.58
Switzerland	4.76	1.03			10.38		0.50	0.50	0.00	0.00	0.00	0.00	9.88	9.88	0.00	0.00	0.00	10.38	10.38
Thailand	2.50				2.50		0.00	0.00	0.00	0.00	2.50	1.59	0.00	0.00	0.00	0.00	0.00	2.50	1.59
United Kingdom	36.36	18.18	10.21	47.61	112.37	57.66	0.00	0.00	13.49	13.49	0.00	0.00	83.10	54.28	15.77	12.45	0.00	112.36	80.23
United States	334.00	100.00	195.00	946.55	1,575.55		447.17	409.04	0.00	0.00	201.74	171.52	592.88	557.83	333.76	281.70	0.00	1,575.55	1,420.09
European Commission	124.36	83.33	111.46	2.85	322.00		34.12	31.62	97.15	80.73	45.07	29.26	64.54	42.70	81.12	57.92	0.00	322.00	242.24
African Dev't Bank	0.00	15.00		5.50	20.50		7.00	1.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.50	7.00	1.03
Asian Dev't Bank	468.00				468.00		32.24	29.64	0.00	0.00	7.52	2.88	34.10	24.35	0.00	0.00	394.14	73.86	56.86
**World Bank	500.50			397.80	898.30		895.82	172.31	0.00	0.00	1.48	0.81	1.00	1.00	0.00	0.00	0.00	898.30	174.12
GRAND TOTAL	1,834.64	474.26	414.66	1,584.58	4,311.59	92.24	1,560.15	756.02	127.07	108.98	394.83	331.65	1,144.61	1,005.43	673.17	524.96	424.83	3,899.83	2,727.03
Memo items (subtotals)																			
Bilateral donors	741.78	375.93	303.20	1,178.43	2,602.78		590.98	521.42	29.92	28.25	340.76	298.70	1,044.96	937.37	592.05	467.04	17.19	2,598.67	2,252.79
European Commission	124.36	83.33	111.46	2.85	322.00		34.12	31.62	97.15	80.73	45.07	29.26	64.54	42.70	81.12	57.92	0.00	322.00	242.24
Multilateral Dev't Bank	968.50	15.00	0.00	403.30	1,386.80		935.05	202.97	0.00	0.00	9.00	3.69	35.10	25.35	0.00	0.00	407.65	979.15	232.01

Total Committed (US$ million) :	3,899.83
Total Disbursed (US$ million) :	2,727.03

Updated in May 2010.

* Hungary has retracted their pledge due to lack of response from recipient country. 'Bamako increased' includes new contributions and commitments in excess of pledged amounts as of December 2006.

** The commitment amount under World Bank regional column ($1.48 million) is funded from AHIF, and not by World Bank. It was placed here due to space limitations.

For pledges in currencies other than US dollars, commitment and disbursement amounts were converted at the 3-month average exchange rate for the period ending December 31, 2009.

Donors shown in red have updated their information, and the data shown are those reported as of December 31, 2009 for the fifth polling exercise in advance of the Hanoi conference.

The column "Sharm El-Sheikh/After Increased" shows $350 million of pledges made in Sharm El-Sheikh, by United States ($320 million), Japan ($24 million) and by two European donors ($6.03 million).

Other amounts shown are (i) commitments made after the Sharm El Sheikh conference that are in excess of cumulative recorded pledges and (ii) adjustments for exchange rate changes.

Annex 5 Table 2: Details by Recipient Country

AHI Pledge Results as of December 31, 2009 – As Reported by Donors (US$ millions)

Region	Recipient Country/ Territory	Donor	Committed a/ In Kind	Committed b/ Grants	Committed c/ Loans	Disbursed a/ In Kind	Disbursed b/ Grants	Disbursed c/ Loans	Total Commt.	Total Disb.
		AHIF	0.00	5.00	0.00	0.00	0.65	0.00		
		ADB	0.20	0.00	0.00	0.20	0.00	0.00		
		US	2.79	2.85	0.00	2.70	2.64	0.00		
		World Bank	0.00	0.00	8.00	0.00	0.00	2.61		
SAR	Afghanistan	Total	2.99	7.85	8.00	2.90	3.29	2.61	18.84	8.80
		PHRD	0.00	0.80	0.00	0.00	0.51	0.00		
		US	1.10	0.00	0.00	1.10	0.00	0.00		
		World Bank	0.00	0.00	5.00	0.00	0.00	3.79		
ECA	Albania	Total	1.10	0.80	5.00	1.10	0.51	3.79	6.90	5.40
		US	0.00	1.82	0.00	0.00	1.57	0.00		
AFR	Angola	Total	0.00	1.82	0.00	0.00	1.57	0.00	1.82	1.57
		US	0.00	1.80	0.00	0.00	1.35	0.00		
		World Bank	0.00	0.00	14.50	0.00	0.00	8.45		
LCR	Argentina	Total	0.00	1.80	14.50	0.00	1.35	8.45	16.30	9.80
		AHIF	0.00	2.00	0.00	0.00	1.99	0.00		
		PHRD	0.00	0.80	0.00	0.00	0.73	0.00		
		Russia	0.38	0.00	0.00	0.00	0.00	0.00		
		US	2.56	1.78	0.00	2.56	1.43	0.00		
		World Bank	0.00	0.00	6.84	0.00	0.00	4.80		
ECA	Armenia	Total	2.94	4.58	6.84	2.56	4.15	4.80	14.35	11.50
		ADB	0.05	0.00	0.00	0.05	0.00	0.00		
		Japan	0.00	0.44	0.00	0.00	0.44	0.00		
		Russia	0.54	0.00	0.00	0.36	0.00	0.00		
		US	3.89	0.00	0.00	3.89	0.00	0.00		
		World Bank	0.00	0.00	5.15	0.00	0.00	5.07		
ECA	Azerbaijan	Total	4.48	0.44	5.15	4.30	0.44	5.07	10.07	9.81
		AHIF	0.00	2.00	0.00	0.00	0.45	0.00		
		Japan	1.40	0.00	0.00	0.92	0.00	0.00		
		US	8.00	8.68	0.00	7.80	7.55	0.00		
		World Bank	0.00	0.00	21.04	0.00	0.00	2.35		
SAR	Bangladesh	Total	9.41	10.68	21.04	8.73	8.00	2.35	41.12	19.08
		Russia	0.54	0.00	0.00	0.36	0.00	0.00		
ECA	Belarus	Total	0.54	0.00	0.00	0.36	0.00	0.00	0.54	0.36
		AHIF	0.00	0.50	0.00	0.00	0.00	0.00		
LCR	Belize	Total	0.00	0.50	0.00	0.00	0.00	0.00	0.50	0.00
		AfDB	0.00	0.50	0.00	0.00	0.05	0.00		
AFR	Benin	Total	0.00	0.50	0.00	0.00	0.05	0.00	0.50	0.05
		AHIF	0.00	3.70	0.00	0.00	1.30	0.00		
SAR	Bhutan	Total	0.00	3.70	0.00	0.00	1.30	0.00	3.70	1.30
		US	0.43	0.00	0.00	0.43	0.00	0.00		
LCR	Bolivia	Total	0.43	0.00	0.00	0.43	0.00	0.00	0.43	0.43
		US	0.40	0.00	0.00	0.40	0.00	0.00		
		World Bank	0.00	0.00	5.00	0.00	0.00	1.30		
ECA	Bosnia-Herzegovina	Total	0.40	0.00	5.00	0.40	0.00	1.30	5.40	1.70
		US	0.02	1.40	0.00	0.02	1.15	0.00		
		World Bank	0.00	0.00	2.10	0.00	0.00	0.00		
LCR	Brazil	Total	0.02	1.40	2.10	0.02	1.15	0.00	3.52	1.17
		US	1.02	0.00	0.00	1.02	0.00	0.00		
ECA	Bulgaria	Total	1.02	0.00	0.00	1.02	0.00	0.00	1.02	1.02
		AfDB	0.00	0.50	0.00	0.00	0.05	0.00		
		US	0.20	0.00	0.00	0.20	0.00	0.00		
AFR	Burkina Faso	Total	0.20	0.50	0.00	0.20	0.05	0.00	0.70	0.25
		US	0.00	0.00	0.00	0.00	0.00	0.00		
AFR	Burundi	Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		ADB	0.09	0.00	9.00	0.09	0.00	8.00		
		AHIF	0.00	2.00	0.00	0.00	0.30	0.00		
		Australia	0.00	1.73	0.00	0.00	1.73	0.00		
		Germany	0.00	0.00	0.00	0.00	0.00	0.00		
		US	16.93	6.57	0.00	16.88	5.57	0.00		
		PHRD	0.00	3.00	0.00	0.00	0.55	0.00		
		World Bank	0.00	0.00	6.00	0.00	0.00	0.96		
EAP	Cambodia	Total	17.02	13.30	15.00	16.97	8.15	8.96	45.32	34.08
		AHIF	0.00	1.27	0.00	0.00	0.79	0.00		
		AfDB	0.00	0.50	0.00	0.00	0.05	0.00		
		US	0.21	0.00	0.00	0.21	0.00	0.00		
AFR	Cameroon	Total	0.21	1.77	0.00	0.21	0.84	0.00	1.98	1.05
		AfDB	0.00	0.50	0.00	0.00	0.05	0.00		
		US	0.00	0.00	0.00	0.00	0.00	0.00		
AFR	Chad	Total	0.00	0.50	0.00	0.00	0.05	0.00	0.50	0.05
		US	0.03	0.00	0.00	0.04	0.00	0.00		
LCR	Chile	Total	0.03	0.00	0.00	0.04	0.00	0.00	0.03	0.04

Annex 5 Table 2 (continued)

Region	Recipient Country/ Territory	Donor	Committed a/ In Kind	Committed b/ Grants	Committed c/ Loans	Disbursed a/ In Kind	Disbursed b/ Grants	Disbursed c/ Loans	Total Commt.	Total Disb.
		AHIF	0.00	2.65	0.00	0.00	2.11	0.00		
		Australia	0.00	0.45	0.00	0.00	0.45	0.00		
		Netherlands	0.00	0.04	0.00	0.00	0.04	0.00		
		US	4.16	12.96	0.00	3.66	12.21	0.00		
EAP	China	Total	4.16	16.11	0.00	3.66	14.82	0.00	20.27	18.48
		US	0.11	0.00	0.00	0.11	0.00	0.00		
LCR	Colombia	Total	0.11	0.00	0.00	0.11	0.00	0.00	0.11	0.11
		US	0.23	1.41	0.00	0.23	1.24	0.00		
		France	0.00	0.24	0.00	0.00	0.24	0.00		
AFR	Congo (DRC)	Total	0.23	1.65	0.00	0.23	1.48	0.00	1.88	1.70
		AHIF	0.00	1.00	0.00	0.00	0.59	0.00		
		US	0.00	1.40	0.00	0.00	0.35	0.00		
AFR	Congo (ROC)	Total	0.00	2.40	0.00	0.00	0.94	0.00	2.40	0.94
		US	0.00	0.00	0.00	0.00	0.00	0.00		
		World Bank	0.00	0.00	0.40	0.00	0.00	0.40		
LCR	Costa Rica	Total	0.00	0.00	0.40	0.00	0.00	0.40	0.40	0.40
		AfDB	0.00	0.50	0.00	0.00	0.00	0.00		
		EC	0.00	0.89	0.00	0.00	0.44	0.00		
		US	0.05	1.98	0.00	0.05	1.57	0.00		
AFR	Cote D'Ivoire	Total	0.05	3.36	0.00	0.05	2.02	0.00	3.42	2.07
		US	0.53	0.00	0.00	0.53	0.00	0.00		
ECA	Cyprus	Total	0.53	0.00	0.00	0.53	0.00	0.00	0.53	0.53
		AfDB	0.00	0.50	0.00	0.00	0.05	0.00		
		AHIF	0.00	2.11	0.00	0.00	1.19	0.00		
		US	0.10	0.00	0.00	0.10	0.00	0.00		
		World Bank	0.00	0.00	0.43	0.00	0.00	0.11		
MNA	Djibouti	Total	0.10	2.61	0.43	0.10	1.24	0.11	3.14	1.45
		AHIF	0.00	1.00	0.00	0.00	0.13	0.00		
		US	0.03	0.00	0.00	0.03	0.00	0.00		
		World Bank	0.00	0.00	30.50	0.00	0.00	0.00		
LCR	Dominican Republic	Total	0.03	1.00	30.50	0.03	0.13	0.00	31.53	0.16
		Australia	0.00	4.54	0.00	0.00	4.54	0.00		
		US	0.88	0.00	0.00	0.88	0.00	0.00		
EAP	East Timor	Total	0.88	4.54	0.00	0.88	4.54	0.00	5.42	5.42
		US	0.05	0.00	0.00	0.05	0.00	0.00		
LCR	Ecuador	Total	0.05	0.00	0.00	0.05	0.00	0.00	0.05	0.05
		AfDB	0.00	0.50	0.00	0.00	0.13	0.00		
		AHIF	0.00	7.14	0.00	0.00	3.11	0.00		
		PHRD	0.00	0.00	0.00	0.00	0.00	0.00		
		US	24.44	1.30	0.00	23.00	1.30	0.00		
		Korea, Republic	0.00	0.00	0.00	0.00	0.00	0.00		
		World Bank	0.00	0.00	3.10	0.00	0.00	2.90		
MNA	Egypt	Total	24.44	8.94	3.10	23.00	4.53	2.90	36.48	30.44
		US	0.03	0.00	0.00	0.03	0.00	0.00		
LCR	El Salvador	Total	0.03	0.00	0.00	0.03	0.00	0.00	0.03	0.03
		EC	0.00	1.18	0.00	0.00	1.03	0.00		
		US	0.00	0.00	0.00	0.01	0.00	0.00		
AFR	Eritrea	Total	0.00	1.18	0.00	0.01	1.03	0.00	1.18	1.04
		Ireland	0.00	0.15	0.00	0.00	0.15	0.00		
		US	2.88	1.60	0.00	2.88	1.30	0.00		
AFR	Ethiopia	Total	2.88	1.75	0.00	2.88	1.45	0.00	4.63	4.32
		AHIF	0.00	1.60	0.00	0.00	1.57	0.00		
		PHRD	0.00	1.40	0.00	0.00	0.45	0.00		
		US	1.83	2.28	0.00	1.56	1.65	0.00		
		World Bank	0.00	0.00	7.00	0.00	0.00	2.79		
ECA	Georgia	Total	1.83	5.28	7.00	1.56	3.67	2.79	14.10	8.02
		AfDB	0.00	0.50	0.00	0.00	0.05	0.00		
		EC	0.00	4.21	0.00	0.00	4.12	0.00		
		US	2.65	0.00	0.00	2.30	0.00	0.00		
AFR	Ghana	Total	2.65	4.71	0.00	2.30	4.17	0.00	7.36	6.48
		US	0.15	0.00	0.00	0.15	0.00	0.00		
ECA	Greenland	Total	0.15	0.00	0.00	0.15	0.00	0.00	0.15	0.15
		US	1.22	1.10	0.00	1.22	1.10	0.00		
LCR	Guatemala	Total	1.22	1.10	0.00	1.22	1.10	0.00	2.32	2.32
		AHIF	0.00	1.00	0.00	0.00	0.00	0.00		
		US	0.10	0.00	0.00	0.10	0.00	0.00		
		World Bank	0.00	0.00	1.56	0.00	0.00	0.35		
LCR	Haiti	Total	0.10	1.00	1.56	0.10	0.00	0.35	2.66	0.45
		AHIF	0.00	0.30	0.00	0.00	0.05	0.00		
		US	0.01	0.00	0.00	0.01	0.00	0.00		
LCR	Honduras	Total	0.01	0.30	0.00	0.01	0.05	0.00	0.31	0.06

Annex 5 Table 2 (continued)

Region	Recipient Country/ Territory	Donor	Committed a/ In Kind	Committed b/ Grants	Committed c/ Loans	Disbursed a/ In Kind	Disbursed b/ Grants	Disbursed c/ Loans	Total Commt.	Total Disb.
		US	0.00	0.00	0.00	0.00	0.00	0.00		
ECA	Hungary	Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		US	2.58	12.36	0.00	2.58	10.59	0.00		
		World Bank	0.00	0.00	32.63	0.00	0.00	1.60		
SAR	India	Total	2.58	12.36	32.63	2.58	10.59	1.60	47.57	14.77
		ADB	0.40	0.00	0.00	0.40	0.00	0.00		
		AHIF	0.00	10.00	0.00	0.00	2.25	0.00		
		Australia	0.00	31.34	0.00	0.00	24.06	0.00		
		Germany	10.34	0.00	0.00	5.76	0.00	0.00		
		Japan	2.64	20.02	0.00	1.53	20.02	0.00		
		Korea, Republic	0.25	0.00	0.00	0.25	0.00	0.00		
		Netherlands	12.00	0.00	0.00	2.20	0.00	0.00		
		PHRD	0.00	5.00	0.00	0.00	1.76	0.00		
		Singapore	0.60	0.90	0.00	0.60	0.20	0.00		
		US	70.79	11.00	0.00	69.73	9.63	0.00		
EAP	Indonesia	Total	97.03	78.26	0.00	80.47	57.91	0.00	175.29	138.38
		World Bank	0.00	0.00	6.35	0.00	0.00	6.35		
MNA	Iran	Total	0.00	0.00	6.35	0.00	0.00	6.35	6.35	6.35
		Korea, Republic	0.86	0.00	0.00	0.86	0.00	0.00		
		US	1.38	0.20	0.00	0.84	0.10	0.00		
MNA	Iraq	Total	2.24	0.20	0.00	1.70	0.10	0.00	2.44	1.80
		US	0.02	0.00	0.00	0.02	0.00	0.00		
LCR	Jamaica	Total	0.02	0.00	0.00	0.02	0.00	0.00	0.02	0.02
		US	0.12	0.00	0.00	0.12	0.00	0.00		
MNA	Jordan	Total	0.12	0.00	0.00	0.12	0.00	0.00	0.12	0.12
		Russia	0.86	0.00	0.00	0.86	0.00	0.00		
		US	1.05	0.73	0.00	1.05	0.52	0.00		
ECA	Kazakhstan	Total	1.91	0.73	0.00	1.91	0.52	0.00	2.64	2.43
		AfDB	0.00	0.50	0.00	0.00	0.13	0.00		
		US	1.66	7.11	0.00	1.66	6.28	0.00		
AFR	Kenya	Total	1.66	7.61	0.00	1.66	6.41	0.00	9.26	8.06
		Australia	0.00	0.73	0.00	0.00	0.73	0.00		
		EC	0.00	0.00	0.00	0.00	0.00	0.00		
		Korea, Republic	1.27	0.00	0.00	1.27	0.00	0.00		
EAP	Korea, DPR	Total	1.27	0.73	0.00	1.27	0.73	0.00	2.00	2.00
		US	0.00	0.63	0.00	0.00	0.48	0.00		
EAP	Korea, Republic of	Total	0.00	0.63	0.00	0.00	0.48	0.00	0.63	0.48
		World Bank	0.00	0.00	3.00	0.00	0.00	1.32		
ECA	Kosovo	Total	0.00	0.00	3.00	0.00	0.00	1.32	3.00	1.32
		AHIF	0.00	1.15	0.00	0.00	0.70	0.00		
		PHRD	0.00	1.00	0.00	0.00	0.73	0.00		
		Russia	0.38	0.00	0.00	0.00	0.00	0.00		
		US	0.10	0.00	0.00	0.10	0.00	0.00		
		World Bank	0.00	0.00	5.00	0.00	0.00	3.83		
ECA	Kyrgyzstan	Total	0.48	2.15	5.00	0.10	1.43	3.83	7.63	5.36
		ADB	0.05	0.00	6.25	0.05	0.00	6.00		
		AHIF	0.00	4.40	0.00	0.00	1.77	0.00		
		Germany	0.00	0.00	0.00	0.00	0.00	0.00		
		Korea, Republic	0.00	0.22	0.00	0.00	0.22	0.00		
		PHRD	0.00	2.00	0.00	0.00	1.01	0.00		
		US	11.87	6.55	0.00	11.52	4.96	0.00		
		World Bank	0.00	0.00	4.00	0.00	0.00	1.82		
EAP	Lao PDR	Total	11.92	13.17	10.25	11.57	7.96	7.82	35.34	27.35
		Ireland	0.00	0.15	0.00	0.00	0.15	0.00		
AFR	Lesotho	Total	0.00	0.15	0.00	0.00	0.15	0.00	0.15	0.15
		AHIF	0.00	0.09	0.00	0.00	0.09	0.00		
AFR	Liberia	Total	0.00	0.09	0.00	0.00	0.09	0.00	0.09	0.09
		US	0.01	1.35	0.00	0.01	1.25	0.00		
MNA	Libya	Total	0.01	1.35	0.00	0.01	1.25	0.00	1.36	1.26
		US	0.00	0.60	0.00	0.00	0.60	0.00		
AFR	Madagascar	Total	0.00	0.60	0.00	0.00	0.60	0.00	0.60	0.60
		AHIF	0.00	1.00	0.00	0.00	0.20	0.00		
		US	0.60	0.00	0.00	0.60	0.00	0.00		
AFR	Malawi	Total	0.60	1.00	0.00	0.60	0.20	0.00	1.60	0.80
		ADB	0.40	0.00	0.00	0.40	0.00	0.00		
		US	0.02	1.31	0.00	0.02	0.96	0.00		
EAP	Malaysia	Total	0.42	1.31	0.00	0.42	0.96	0.00	1.72	1.37
		AfDB	0.00	0.50	0.00	0.00	0.20	0.00		
		EC	0.00	2.96	0.00	0.00	2.96	0.00		
		US	0.26	0.00	0.00	0.26	0.00	0.00		
AFR	Mali	Total	0.26	3.46	0.00	0.26	3.16	0.00	3.71	3.41

Annex 5 Table 2 (continued)

Region	Recipient Country/ Territory	Donor	Committed a/ In Kind	Committed b/ Grants	Committed c/ Loans	Disbursed a/ In Kind	Disbursed b/ Grants	Disbursed c/ Loans	Total Commt.	Total Disb.
		AHIF	0.00	0.03	0.00	0.00	0.03	0.00		
AFR	Mauritania	Total	0.00	0.03	0.00	0.00	0.03	0.00	0.03	0.03
		AHIF	0.00	1.70	0.00	0.00	0.00	0.00		
		Japan	0.23	0.86	0.00	0.23	0.86	0.00		
		US	32.78	10.11	0.00	32.70	8.04	0.00		
		World Bank	0.00	0.00	516.67	0.00	0.00	25.67		
LCR	Mexico	Total	33.01	12.67	516.67	32.94	8.90	25.67	562.35	67.51
		AHIF	0.00	1.00	0.00	0.00	1.00	0.00		
		PHRD	0.00	0.50	0.00	0.00	0.49	0.00		
		Russia	0.38	0.00	0.00	0.00	0.00	0.00		
		US	1.51	0.60	0.00	1.51	0.60	0.00		
		World Bank	0.00	0.00	8.00	0.00	0.00	6.02		
ECA	Moldova	Total	1.89	2.10	8.00	1.51	2.09	6.02	11.99	9.62
		ADB	0.00	0.00	0.35	0.00	0.00	0.00		
		AHIF	0.00	4.66	0.00	0.00	2.17	0.00		
		Korea, Republic of	0.00	0.00	0.00	0.00	0.00	0.00		
		US	0.94	3.05	0.00	0.95	2.45	0.00		
EAP	Mongolia	Total	0.94	7.71	0.35	0.95	4.62	0.00	9.00	5.57
		AHIF	0.00	0.89	0.00	0.00	0.00	0.00		
		US	0.50	3.64	0.00	0.00	3.19	0.00		
MNA	Morocco	Total	0.50	4.53	0.00	0.00	3.19	0.00	5.03	3.19
		AHIF	0.00	0.10	0.00	0.00	0.10	0.00		
		US	0.68	0.00	0.00	0.68	0.00	0.00		
AFR	Mozambique	Total	0.68	0.10	0.00	0.68	0.10	0.00	0.78	0.78
		AHIF	0.00	1.32	0.00	0.00	0.29	0.00		
		Australia	0.00	2.73	0.00	0.00	2.18	0.00		
		EC	0.00	0.00	0.00	0.00	0.00	0.00		
		Japan	0.00	0.18	0.00	0.00	0.18	0.00		
		US	2.21	0.00	0.00	2.14	0.00	0.00		
EAP	Myanmar	Total	2.21	4.23	0.00	2.14	2.65	0.00	6.43	4.79
		US	2.20	0.60	0.00	2.20	0.60	0.00		
		World Bank	0.00	0.00	18.20	0.00	0.00	6.92		
SAR	Nepal	Total	2.20	0.60	18.20	2.20	0.60	6.92	21.00	9.72
		US	0.21	0.00	0.00	0.21	0.00	0.00		
		World Bank	0.00	0.00	5.00	0.00	0.00	0.00		
LCR	Nicaragua	Total	0.21	0.00	5.00	0.21	0.00	0.00	5.21	0.21
		AfDB	0.00	0.50	0.00	0.00	0.05	0.00		
		US	0.20	0.00	0.00	0.20	0.00	0.00		
		France	0.00	0.13	0.00	0.00	0.13	0.00		
		World Bank	0.00	0.00	4.50	0.00	0.00	1.64		
AFR	Niger	Total	0.20	0.63	4.50	0.20	0.18	1.64	5.33	2.02
		AfDB	0.00	0.50	0.00	0.00	0.05	0.00		
		Japan	0.00	0.73	0.00	0.00	0.73	0.00		
		Korea, Republic of	0.00	0.20	0.00	0.00	0.20	0.00		
		US	5.43	2.71	0.00	5.43	1.96	0.00		
		World Bank	0.00	0.00	50.00	0.00	0.00	45.11		
AFR	Nigeria	Total	5.43	4.14	50.00	5.43	2.94	45.11	59.57	53.48
		US	0.10	0.00	0.00	0.00	0.00	0.00		
MNA	Oman	Total	0.10	0.00	0.00	0.00	0.00	0.00	0.10	0.00
		US	2.98	5.06	0.00	2.83	4.02	0.00		
SAR	Pakistan	Total	2.98	5.06	0.00	2.83	4.02	0.00	8.04	6.86
		US	0.15	0.00	0.00	0.15	0.00	0.00		
LCR	Panama	Total	0.15	0.00	0.00	0.15	0.00	0.00	0.15	0.15
		Australia	0.00	5.54	0.00	0.00	4.91	0.00		
EAP	Papua New Guinea	Total	0.00	5.54	0.00	0.00	4.91	0.00	5.54	4.91
		US	0.00	0.60	0.00	0.00	0.60	0.00		
LCR	Paraguay	Total	0.00	0.60	0.00	0.00	0.60	0.00	0.60	0.60
		US	0.61	2.68	0.00	0.61	2.08	0.00		
LCR	Peru	Total	0.61	2.68	0.00	0.61	2.08	0.00	3.28	2.68
		ADB	0.40	0.00	0.00	0.40	0.00	0.00		
		Australia	0.00	0.48	0.00	0.00	0.48	0.00		
		US	1.73	3.31	0.00	1.73	2.61	0.00		
EAP	Philippines	Total	2.13	3.79	0.00	2.13	3.09	0.00	5.92	5.22
		EC	0.00	0.74	0.00	0.00	0.74	0.00		
		Germany	0.00	0.00	0.00	0.00	0.00	0.00		
		US	2.51	0.63	0.00	2.51	0.00	0.00		
		World Bank	0.00	0.00	37.70	0.00	0.00	3.47		
ECA	Romania	Total	2.51	1.36	37.70	2.51	0.74	3.47	41.57	6.71
		US	1.90	0.45	0.00	1.90	0.00	0.00		
ECA	Russia	Total	1.90	0.45	0.00	1.90	0.00	0.00	2.35	1.90
		US	0.10	1.41	0.00	0.10	1.41	0.00		
AFR	Rwanda	Total	0.10	1.41	0.00	0.10	1.41	0.00	1.51	1.51

Annex 5 Table 2 (continued)

Region	Recipient Country/ Territory	Donor	Committed a/ In Kind	Committed b/ Grants	Committed c/ Loans	Disbursed a/ In Kind	Disbursed b/ Grants	Disbursed c/ Loans	Total Commt.	Total Disb.
		US	0.00	0.00	0.00	0.00	0.00	0.00		
MNA	Saudi Arabia	Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		EC	0.00	2.94	0.00	0.00	2.66	0.00		
		US	0.96	0.30	0.00	0.59	0.30	0.00		
AFR	Senegal	Total	0.96	3.24	0.00	0.59	2.96	0.00	4.20	3.55
		US	0.45	0.00	0.00	0.45	0.00	0.00		
ECA	Serbia& Montenegro	Total	0.45	0.00	0.00	0.45	0.00	0.00	0.45	0.45
		AHIF	0.00	0.09	0.00	0.00	0.08	0.00		
AFR	Sierra Leone	Total	0.00	0.09	0.00	0.00	0.08	0.00	0.09	0.08
		US	3.15	6.49	0.00	3.15	4.76	0.00		
AFR	South Africa	Total	3.15	6.49	0.00	3.15	4.76	0.00	9.64	7.91
		AHIF	0.00	1.43	0.00	0.00	0.71	0.00		
		US	0.91	0.60	0.00	0.91	0.60	0.00		
		World Bank	0.00	0.00	2.00	0.00	0.00	1.69		
SAR	Sri Lanka	Total	0.91	2.03	2.00	0.91	1.31	1.69	4.94	3.91
		AfDB	0.00	0.50	0.00	0.00	0.13	0.00		
		EC	0.00	8.87	0.00	0.00	7.39	0.00		
		US	0.20	0.00	0.00	0.20	0.00	0.00		
AFR	Sudan	Total	0.20	9.37	0.00	0.20	7.51	0.00	9.57	7.71
		AHIF	0.00	1.32	0.00	0.00	0.00	0.00		
MNA	Syrian Arab Republic	Total	0.00	1.32	0.00	0.00	0.00	0.00	1.32	0.00
		US	0.06	0.04	0.00	0.06	0.04	0.00		
EAP	Taiwan, China	Total	0.06	0.04	0.00	0.06	0.04	0.00	0.10	0.10
		AHIF	0.00	1.50	0.00	0.00	1.49	0.00		
		Russia	0.38	0.00	0.00	0.00	0.00	0.00		
		US	0.30	0.00	0.00	0.30	0.00	0.00		
		World Bank	0.00	0.00	5.00	0.00	0.00	4.14		
ECA	Tajikistan	Total	0.68	1.50	5.00	0.30	1.49	4.14	7.18	5.93
		US	0.97	1.64	0.00	0.82	1.32	0.00		
AFR	Tanzania	Total	0.97	1.64	0.00	0.82	1.32	0.00	2.61	2.15
		Netherlands	0.00	0.10	0.00	0.00	0.10	0.00		
		US	4.78	10.59	0.00	4.12	9.35	0.00		
EAP	Thailand	Total	4.78	10.69	0.00	4.12	9.45	0.00	15.47	13.57
		US	0.50	0.00	0.00	0.50	0.00	0.00		
ECA	The FYR of Macedonia	Total	0.50	0.00	0.00	0.50	0.00	0.00	0.50	0.50
		US	0.02	0.00	0.00	0.02	0.00	0.00		
LCR	Trinidad & Tobago	Total	0.02	0.00	0.00	0.02	0.00	0.00	0.02	0.02
		AfDB	0.00	0.50	0.00	0.00	0.05	0.00		
		World Bank	0.00	0.00	0.56	0.00	0.00	0.29		
AFR	Togo	Total	0.00	0.50	0.56	0.00	0.05	0.29	1.06	0.34
		AHIF	0.00	0.65	0.00	0.00	0.10	0.00		
		US	0.00	0.00	0.00	0.00	0.00	0.00		
MNA	Tunisia	Total	0.00	0.65	0.00	0.00	0.10	0.00	0.65	0.10
		EC	0.00	12.34	0.00	0.00	12.28	0.00		
		Japan	0.11	0.00	0.00	0.11	0.00	0.00		
		US	1.09	0.33	0.00	1.09	0.33	0.00		
		World Bank	0.00	0.00	34.40	0.00	0.00	15.23		
ECA	Turkey	Total	1.20	12.66	34.40	1.20	12.60	15.23	48.26	29.04
		AHIF	0.00	1.97	0.00	0.00	1.32	0.00		
		US	0.10	0.00	0.00	0.10	0.00	0.00		
ECA	Turkmenistan	Total	0.10	1.97	0.00	0.10	1.32	0.00	2.07	1.42
		AHIF	0.00	2.10	0.00	0.00	0.09	0.00		
		US	1.87	1.86	0.00	1.87	1.13	0.00		
		World Bank	0.00	0.00	10.00	0.00	0.00	0.00		
AFR	Uganda	Total	1.87	3.96	10.00	1.87	1.22	0.00	15.83	3.10
		Estonia	0.00	0.04	0.00	0.00	0.01	0.00		
		Russia	0.86	0.00	0.00	0.86	0.00	0.00		
		US	5.66	2.76	0.00	5.66	1.86	0.00		
ECA	Ukraine	Total	6.52	2.80	0.00	6.52	1.87	0.00	9.32	8.39
		US	0.00	0.00	0.00	0.00	0.00	0.00		
		World Bank	0.00	0.00	0.50	0.00	0.00	0.03		
LCR	Uruguay	Total	0.00	0.00	0.50	0.00	0.00	0.03	0.50	0.03
		AHIF	0.00	2.96	0.00	0.00	2.94	0.00		
		Russia	0.54	0.00	0.00	0.36	0.00	0.00		
		US	0.30	0.35	0.00	0.30	0.35	0.00		
ECA	Uzbekistan	Total	0.84	3.31	0.00	0.66	3.29	0.00	4.15	3.95

Annex 5 Table 2 (continued)

Region	Recipient Country/ Territory	Donor	Committed a/ In Kind	Committed b/ Grants	Committed c/ Loans	Disbursed a/ In Kind	Disbursed b/ Grants	Disbursed c/ Loans	Total Commt.	Total Disb.
		ADB	0.05	0.00	15.00	0.05	0.00	14.00		
		AHIF	0.00	11.46	0.00	0.00	4.40	0.00		
		Australia	0.00	6.36	0.00	0.00	6.19	0.00		
		Czech Republic	0.20	0.00	0.00	0.20	0.00	0.00		
		Finland	0.00	8.08	0.00	0.00	8.08	0.00		
		France	0.00	0.00	0.00	0.00	0.00	0.00		
		Germany	5.91	0.00	0.00	3.55	0.00	0.00		
		Japan	4.01	9.93	0.00	3.10	9.93	0.00		
		Netherlands	2.31	0.00	0.00	1.41	0.00	0.00		
		PHRD	0.00	5.00	0.00	0.00	2.16	0.00		
		Switzerland	0.00	0.50	0.00	0.00	0.50	0.00		
		US	31.21	11.02	0.00	31.06	7.69	0.00		
		World Bank	0.00	0.00	25.69	0.00	0.00	10.96		
EAP	Vietnam	Total	43.69	52.35	40.69	39.36	38.95	24.96	136.73	103.27
		AHIF	0.00	3.00	0.00	0.00	2.57	0.00		
		US	0.50	0.00	0.00	0.50	0.00	0.00		
		World Bank	0.00	0.00	10.00	0.00	0.00	0.34		
MNA	West Bank & Gaza	Total	0.50	3.00	10.00	0.50	2.57	0.34	13.50	3.41
		AHIF	0.00	1.14	0.00	0.00	0.16	0.00		
		US	0.00	0.00	0.00	0.00	0.00	0.00		
MNA	Yemen	Total	0.00	1.14	0.00	0.00	0.16	0.00	1.14	0.16
		AHIF	0.00	0.84	0.00	0.00	0.84	0.00		
		US	0.15	8.21	0.00	0.00	6.18	0.00		
AFR	Zambia	Total	0.15	9.05	0.00	0.00	7.02	0.00	9.20	7.02
	Grand Total		326.07	415.23	926.41	296.68	304.80	200.31	1,667.71	801.79

a/ In Kind may include technical assistance, supplies, equipment, commodities, workshops, training, etc.
b/ All bilateral commitments and disbursements are in the form of **Grants** whereas ADB and WB amounts are **Loans and Credits**.
c/ ADB and WB amounts mainly include Loans and Credits.
d/ **AHIF** is a multidonor trust fund facility administered by the World Bank. Ten donors, led by the European Commission, contribute to this Facility. **PHRD** is primarily a Japanese trust fund administered by the World Bank. Both facilities allocate resources to AHI projects implemented by recipients, and the amounts are not included in World Bank contributions.

Total Committed excluding AHIF and PHRD (US$m	1,560.14
Total Disbursed excluding AHIF and PHRD (US$m)	755.87

AHIF Committed (US$m) :	88.07
PHRD Committed (US$m) :	19.50
AHIF Disbursed (US$m) :	37.53
PHRD Disbursed (US$m) :	8.39

Annex 5 Table 3: Details by Recipient International Organizations

AHI Pledge Results as of December 31, 2009 — As Reported by Donors (US$ millions)

	WHO		FAO		OIE		UNICEF		a/ Other		Total	Total
Donor	Commt.	Disb.	Commt.	Disb.	Commt.	Disb.	Commt.	Disb.	Commt.	Disb.	Commt.	Disb.
Australia	18.30	18.11			8.27	6.18			4.63	4.63	31.20	28.93
Belgium	17.03	0.15	2.96	2.96							19.98	3.10
Canada	33.11	21.62	10.41	10.41	10.41	10.41	10.97	10.97	13.10	12.44	78.00	65.84
China	0.50	0.50	0.50	0.50							1.00	1.00
Cyprus	0.03	0.03									0.03	0.03
Finland	1.87	1.87									1.87	1.87
France	4.77	4.43	8.81	7.86	3.65	3.31			16.07	10.71	33.31	26.31
Germany	22.25	22.25	10.37	10.37							32.62	32.62
Greece	0.19	0.19	0.19	0.19							0.38	0.38
Iceland	0.20										0.20	0.00
Ireland	1.86	1.86									1.86	1.86
Italy	1.50		3.00								4.50	0.00
Japan	23.16	23.16	11.38	11.38	15.88	15.88	62.10	62.10	8.10	8.10	120.62	120.62
Korea, Republic of	1.29	1.29									1.29	1.29
Netherlands, The			1.00	1.00	0.20	0.20			0.20	0.20	1.40	1.40
Norway	2.88	2.88	3.71	3.71					7.45	7.45	14.04	14.04
Saudi Arabia			1.00	1.00							1.00	1.00
Spain	2.49	2.49	1.07	0.49							3.56	2.98
Sweden	2.68	2.68	10.04	9.90							12.72	12.58
Switzerland	5.52	5.52	3.86	3.86					0.50	0.50	9.88	9.88
United Kingdom	59.26	31.51	8.65	8.65	1.31	0.82			13.88	13.31	83.10	54.28
United States	454.20	419.34	80.80	80.61	2.53	2.53	1.50	1.50	53.85	53.85	592.88	557.83
European Commission	28.08	20.23	22.14	12.69	10.34	6.24			3.99	3.55	64.54	42.70
Asian Development Bank	22.96	16.36	11.14	7.99							34.10	24.35
World Bank					1.00	1.00					1.00	1.00
GRAND TOTAL	704.12	596.46	191.02	173.57	53.58	46.55	74.57	74.57	121.77	114.74	1,145.07	1,005.89

a/ See Annex 5 table 4a for details

Data shown are commitments and disbursements as reported by donors to the World Bank. The figures shown may differ from amounts received by the organizations, for example because of different reporting conventions and differences in exchange rates used.

Total Committed for International Org. (US$m):	1,145.07
Total Disbursed for International Org. (US$m):	1,005.89

Annex 5 Table 4a: Financing for Countries, Regional Organizations/Programs and International Organizations (Detailed Breakdown by Donors)

AHI Pledge Results as of December 31, 2009 – As Reported by Donors (US$ millions)

	Countries					Regional Organizations and Regional Programs					International Organizations				
		Committed		Disbursed			Committed		Disbursed			Committed		Disbursed	
Donor	Recipient	a/ In Kind	b/ Grants / Loans	a/ In Kind	b/ Grants / Loans	Recipient	a/ In Kind	b/ Grants / Loans	a/ In Kind	b/ Grants / Loans	Recipient	a/ In Kind	b/ Grants / Loans	a/ In Kind	b/ Grants /Loans
Australia	Cambodia	0.00	1.73	0.00	1.73	ASEAN	0.00	4.63	0.00	4.05	WHO (6.89 US$m to H1N1)	0.00	18.30	0.00	18.11
	China	0.00	0.45	0.00	0.45	(APEC) Asia Pacific Economic Cooperation	0.00	9.08	0.00	6.55	OIE	0.00	8.27	0.00	6.18
	East Timor	0.00	4.54	0.00	4.54	Regional Assistance- Asia Pacific Island Nations (0.18	0.00	18.50	0.00	11.60	UNDP	0.00	0.45	0.00	0.45
	Indonesia	0.00	31.34	0.00	24.06	USD million to H1N1)	0.00	7.45	0.00	6.53	WFP	0.00	2.91	0.00	2.91
	Korea, DPR	0.00	0.73	0.00	0.73						IFRC	0.00	0.91	0.00	0.91
	Myanmar	0.00	2.73	0.00	2.18						UNOCHA	0.00	0.36	0.00	0.36
	Papua New Guinea	0.00	5.54	0.00	4.91										
	Philippines	0.00	0.48	0.00	0.48										
	Vietnam	0.00	6.36	0.00	6.19										
	Total	0.00	53.90	0.00	45.26	Total	0.00	39.66	0.00	28.73	Total	0.00	31.20	0.00	28.93
Austria	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00
Belgium						ADB	0.00	0.25	0.00	0.25	WHO	16.70	0.33	0.00	0.15
											FAO	0.00	2.49	0.00	2.49
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.25	0.00	0.25	Total	16.70	2.82	0.00	2.64
Canada						ADB	0.00	4.73	0.00	4.73	WHO (Indonesia)	0.00	4.73	0.00	4.40
											WHO (8 countries in SE Asia)	0.00	0.95	0.00	0.95
											UNDP (Vietnam)	0.00	2.08	0.00	2.08
											UNICEF (Indonesia)	0.00	7.19	0.00	7.19
											UNDP (UNSIC)	0.00	4.73	0.00	4.73
											WHO (WHO-FAO-OIE Tripartite Coordination)	0.00	13.72	0.00	8.23
											WHO HQ (AI CAN$8.5, H1N1 pandemic CAN$6m)	0.00	13.72	0.00	8.04
											UNICEF (HQ)	0.00	3.78	0.00	3.78
											OIE	0.00	10.41	0.00	10.41
											FAO	0.00	10.41	0.00	10.41
											IFRC	0.00	1.89	0.00	1.89
											UNHCR	0.00	0.95	0.00	0.95
											UN-OCHA	0.00	0.47	0.00	0.47
											PAHO	0.00	2.98	0.00	2.32
	Total	0.00	0.00	0.00	0.00	Total	0.00	4.73	0.00	4.73	Total	0.00	78.00	0.00	65.84
China											WHO	0.00	0.50	0.00	0.50
											FAO	0.00	0.50	0.00	0.50
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	0.00	1.00	0.00	1.00
Cyprus											WHO	0.00	0.03	0.00	0.03
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	0.00	0.03	0.00	0.03
Czech Republic	Vietnam	0.20	0.00	0.20	0.00										
	Total	0.20	0.00	0.20	0.00	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00
Estonia	Ukraine	0.00	0.04	0.00	0.01										
	Total	0.00	0.04	0.00	0.01	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00
Finland	Vietnam	0.00	8.08	0.00	8.08						WHO	0.00	1.87	0.00	1.87
	Total	0.00	8.08	0.00	8.08	Total	0.00	0.00	0.00	0.00	Total	0.00	1.87	0.00	1.87

Annex 5 Table 4a (continued)

Donor	Countries					Regional Organizations and Regional Programs					International Organizations				
		Committed		Disbursed			Committed		Disbursed			Committed		Disbursed	
	Recipient	a/ In Kind	b/ Grants / Loans	a/ In Kind	b/ Grants / Loans	Recipient	a/ In Kind	b/ Grants / Loans	a/ In Kind	b/ Grants / Loans	Recipient	a/ In Kind	b/ Grants / Loans	a/ In Kind	b/ Grants /Loans
France	Congo	0.00	0.24	0.00	0.24						WHO	1.04	3.73	0.70	3.73
	Niger	0.00	0.13	0.00	0.13						FAO	2.09	6.72	1.39	6.47
	Vietnam	0.00	0.00	0.00	0.00						OIE	1.04	2.61	0.70	2.61
											Institute Pasteur Network in Asia	0.00	15.55	0.00	10.36
											Agronomes & Veterinaires Sans Frontieres (AVSF)	0.52	0.00	0.35	0.00
	Total	0.00	0.37	0.00	0.37	Total	0.00	0.00	0.00	0.00	Total	4.70	28.61	3.14	23.17
Germany	Cambodia	0.00	0.00	0.00	0.00	ILRI / AU-IBAR	1.18	0.00	1.18	0.00	FAO (Rome CMC)	0.00	2.81	0.00	2.81
	Indonesia	10.34	0.00	5.76	0.00						FAO (Cambodia)	0.00	3.84	0.00	3.84
	Laos	0.00	0.00	0.00	0.00						FAO (Laos)	0.00	3.55	0.00	3.55
	Romania	0.00	0.00	0.00	0.00						FAO (Romania)	0.00	0.18	0.00	0.18
	Vietnam	5.91	0.00	3.55	0.00						WHO (for H1N1 2009)	0.00	22.25	0.00	22.25
	Total	16.25	0.00	9.31	0.00	Total	1.18	0.00	1.18	0.00	Total	0.00	32.62	0.00	32.62
Greece											WHO	0.00	0.19	0.00	0.19
											FAO	0.00	0.19	0.00	0.19
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	0.00	0.38	0.00	0.38
Hungary															
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00
Iceland											WHO	0.00	0.20	0.00	0.00
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	0.00	0.20	0.00	0.00
Ireland	Lesotho	0.00	0.15	0.00	0.15						WHO	0.00	1.86	0.00	1.86
	Ethiopia	0.00	0.15	0.00	0.15										
	Total	0.00	0.30	0.00	0.30	Total	0.00	0.00	0.00	0.00	Total	0.00	1.86	0.00	1.86
Italy											WHO	0.00	1.50	0.00	0.00
											FAO	0.00	3.00	0.00	0.00
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	0.00	4.50	0.00	0.00
Japan	Azerbaijan	0.00	0.44	0.00	0.44	ASEAN	0.00	46.80	0.00	46.80	WHO	0.00	23.16	0.00	23.16
	Bangladesh	1.40	0.00	0.92	0.00	ADB	0.00	10.00	0.00	10.00	FAO	0.00	11.38	0.00	11.38
	Indonesia	2.64	20.02	1.53	20.02	ECOWAS	0.00	0.05	0.00	0.05	OIE	0.00	15.88	0.00	15.88
	Mexico	0.23	0.86	0.23	0.86	(ASEF) Asia Europe Foundation	0.00	31.85	0.00	31.85	UNICEF	0.00	62.10	0.00	62.10
	Myanmar	0.00	0.18	0.00	0.18	(IDB) Interamerican Development Bank	0.00	2.00	0.00	2.00	UNHCR	0.00	5.00	0.00	5.00
	Nigeria	0.00	0.73	0.00	0.73						WFP	0.00	1.10	0.00	1.10
	Turkey	0.11	0.00	0.11	0.00						IOM	0.00	1.00	0.00	1.00
	Vietnam	4.01	9.93	3.10	9.93						OCHA	0.00	1.00	0.00	1.00
	Total	8.40	32.15	5.89	32.15	Total	0.00	90.70	0.00	90.70	Total	0.00	120.62	0.00	120.62
Korea, Republic of	Egypt	0.00	0.00	0.00	0.00						WHO	0.00	1.29	0.00	1.29
	Indonesia	0.25	0.00	0.25	0.00										
	Iraq	0.86	0.00	0.86	0.00										
	Korea, DPR	1.27	0.00	1.27	0.00										
	Lao PDR	0.00	0.22	0.00	0.22										
	Mongolia	0.00	0.00	0.00	0.00										
	Nigeria	0.20	0.00	0.20	0.00										
	Total	2.58	0.22	2.58	0.22	Total	0.00	0.00	0.00	0.00	Total	0.00	1.29	0.00	1.29
Luxembourg															
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00
Netherlands, The	China	0.00	0.04	0.00	0.04						FAO	0.50	0.50	0.50	0.50
	Indonesia	12.00	0.00	2.20	0.00						OIE	0.20	0.00	0.20	0.00
	Thailand	0.00	0.10	0.00	0.10						UN	0.20	0.00	0.20	0.00
	Vietnam	2.31	0.00	1.41	0.00										
	Total	14.31	0.14	3.61	0.14	Total	0.00	0.00	0.00	0.00	Total	0.90	0.50	0.90	0.50

Annex 5 Table 4a (continued)

Donor	Countries					Regional Organizations and Regional Programs					International Organizations				
		Committed		Disbursed			Committed		Disbursed			Committed		Disbursed	
	Recipient	a/ In Kind	b/ Grants / Loans	a/ In Kind	b/ Grants / Loans	Recipient	a/ In Kind	b/ Grants / Loans	a/ In Kind	b/ Grants / Loans	Recipient	a/ In Kind	b/ Grants / Loans	a/ In Kind	b/ Grants /Loans
Norway											FAO	0.00	3.51	0.00	3.51
											FAO (Korea DPR)	0.00	0.20	0.00	0.20
											WHO (Korea DPR)	0.00	0.53	0.00	0.53
											WHO	0.00	2.35	0.00	2.35
											UN Appeal	0.00	1.55	0.00	1.55
											UN Central Fund for Influenza Action	0.00	3.62	0.00	3.62
											UNSIC	0.00	1.35	0.00	1.35
											WFP	0.93	0.00	0.93	0.00
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	0.93	13.11	0.93	13.11
Russia	Armenia	0.38	0.00	0.00	0.00										
	Azerbaijan	0.54	0.00	0.36	0.00										
	Belarus	0.54	0.00	0.36	0.00										
	Kazakhstan	0.86	0.00	0.86	0.00										
	Kyrgyzstan	0.38	0.00	0.00	0.00										
	Moldova	0.38	0.00	0.00	0.00										
	Tajikistan	0.38	0.00	0.00	0.00										
	Ukraine	0.86	0.00	0.86	0.00										
	Uzbekistan	0.54	0.00	0.36	0.00										
	Total	4.86	0.00	2.80	0.00	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00
Saudi Arabia											FAO Global Program	0.00	1.00	0.00	1.00
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	0.00	1.00	0.00	1.00
Singapore	Indonesia	0.60	0.90	0.60	0.20										
	Total	0.60	0.90	0.60	0.20	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00
Slovenia															
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00
Spain											WHO	0.00	2.49	0.00	2.49
											FAO	0.00	1.07	0.00	0.49
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	0.00	3.56	0.00	2.98
Sweden											WHO	0.00	2.68	0.00	2.68
											FAO	0.00	10.04	0.00	9.90
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	0.00	12.72	0.00	12.58
Switzerland	Vietnam	0.00	0.50	0.00	0.50						WHO	0.00	0.63	0.00	0.63
											WHO(for H1N1)	0.00	4.90	0.00	4.90
											FAO	0.00	3.86	0.00	3.86
											UNSIC	0.00	0.50	0.00	0.50
	Total	0.00	0.50	0.00	0.50	Total	0.00	0.00	0.00	0.00	Total	0.00	9.88	0.00	9.88
Thailand						ACMECS (Cambodia, Lao PDR, Myanmar)	2.50	0.00	1.59	0.00					
	Total	0.00	0.00	0.00	0.00	Total	2.50	0.00	1.59	0.00	Total	0.00	0.00	0.00	0.00

Annex 5 Table 4a (continued)

	Countries					Regional Organizations and Regional Programs					International Organizations				
		Committed		Disbursed			Committed		Disbursed			Committed		Disbursed	
Donor	Recipient	a/ In Kind	b/ Grants / Loans	a/ In Kind	b/ Grants / Loans	Recipient	a/ In Kind	b/ Grants / Loans	a/ In Kind	b/ Grants / Loans	Recipient	a/ In Kind	b/ Grants / Loans	a/ In Kind	b/ Grants /Loans
United Kingdom											WHO (for H5N1)	5.71	7.84	5.71	7.84
											WHO (for H1N1)	0.00	45.71	0.00	17.96
											FAO (for H5N1)	0.00	8.65	0.00	8.65
											OIE (for H5N1)	0.00	1.31	0.00	0.82
											IFPRI/FAO/ILRI Research into pro-poor methods of disease control (for H5N1)	0.00	6.53	0.00	6.20
											CFIA (Technical Support for Avian Influenza) (for H1N1)	0.00	0.72	0.00	0.72
											IFRC (International Federation of Red Cross) (for H5N1)	0.00	0.82	0.00	0.82
											IFRC (International Federation of Red Cross) (for H1N1)	0.00	2.45	0.00	2.45
											PIC OCHA (for H5N1)	0.00	1.47	0.00	1.22
											PIC OCHA (for H1N1)	0.00	0.91	0.00	0.91
											UNSIC (for H5N1)	0.00	0.33	0.00	0.33
											UNSIC (for H1N1)	0.00	0.65	0.00	0.65
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	5.71	77.39	5.71	48.57
United States	Afghanistan	2.79	2.85	2.70	2.64	CARE Latin America	0.13	1.30	0.00	1.30	WHO	433.09	21.11	398.23	21.11
	Albania	1.10	0.00	1.10	0.00	DOD Research COAG	0.00	0.77	0.00	0.77	FAO	78.42	2.38	78.23	2.39
	Angola	0.00	1.82	0.00	1.57	NAMRU 2 (Indonesia)	4.80	0.42	3.90	0.42	OIE	0.00	2.53	0.00	2.53
	Argentina	0.00	1.80	0.00	1.35	NAMRU 3 (Egypt)	3.75	1.66	3.25	1.66	UNSIC	4.33	0.00	4.33	0.00
	Armenia	2.56	1.78	2.56	1.43	NMRCD South and Central America	0.00	3.19	0.00	3.19	Institute Pasteur Network	3.74	0.00	3.74	0.00
	Azerbaijan	3.89	0.00	3.89	0.00	(SPC) Secretariat of the Pacific	1.00	1.41	0.60	1.41	UNICEF	1.50	0.00	1.50	0.00
	Bangladesh	8.00	8.68	7.80	7.55	Almaty Regional Platform (Kazakhstan)	1.64	0.00	1.19	0.00	UNDP	27.00	0.00	27.00	0.00
	Bolivia	0.43	0.00	0.43	0.00	REDI Center (Singapore)	3.46	0.00	2.68	0.00	IFRC	18.33	0.00	18.33	0.00
	Bosnia-Herzegovina	0.40	0.00	0.40	0.00	Gorgas Institute (Panama)	5.79	0.16	4.58	0.16	Contracted travel and technical assistance	0.45	0.00	0.45	0.00
	Brazil	0.02	1.40	0.02	1.15	Regional Programs	86.71	0.00	82.59	0.00					
	Bulgaria	1.02	0.00	1.02	0.00	Regional Disease Detection Site (China)	12.61	0.00	11.14	0.00					
	Burkina Faso	0.20	0.00	0.20	0.00	Regional Disease Detection Site (Egypt)	7.66	0.00	7.16	0.00					
	Burundi	0.00	0.00	0.00	0.00	Regional Disease Detection Site (Guatemala)	10.52	0.00	8.67	0.00					
	Cambodia	16.93	6.57	16.88	5.57	Regional Disease Detection Site (Kazakhstan)	1.77	0.00	1.77	0.00					
	Cameroon	0.21	0.00	0.21	0.00	Regional Disease Detection Site (Kenya)	15.13	0.00	13.43	0.00					
	Chad	0.00	0.00	0.00	0.00	Regional Disease Detection Site (Thailand)	21.50	0.00	19.06	0.00					
	Chile	0.03	0.00	0.04	0.00	Regional Disease Detection Site (India)	0.08	0.00	0.08	0.00					
	China (incl. Hong Kong)	4.16	12.96	3.66	12.21	Asia Pacific Economic Cooperation (APEC)	0.16	0.00	0.16	0.00					
	Colombia	0.11	0.00	0.11	0.00	Pre-positioning of stockpile - Asia	0.30	0.00	0.30	0.00					
	Congo (DRC)	0.23	1.41	0.23	1.24	European CDC (personnel only)	0.92	0.60	0.62	0.60					
	Congo (ROC)	0.00	1.40	0.00	0.35	CDC International Research Projects	3.89	10.45	0.00	0.84					

Annex 5 Table 4a (continued)

		Countries				Regional Organizations and Regional Programs					International Organizations				
		Committed		Disbursed			Committed		Disbursed			Committed		Disbursed	
Donor	Recipient	a/ In Kind	b/ Grants / Loans	a/ In Kind	b/ Grants / Loans	Recipient	a/ In Kind	b/ Grants / Loans	a/ In Kind	b/ Grants / Loans	Recipient	a/ In Kind	b/ Grants / Loans	a/ In Kind	b/ Grants /Loans
United States	Costa Rica	0.00	0.00	0.00	0.00										
	Cote D'Ivoire	0.05	1.98	0.05	1.57										
	Cyprus	0.53	0.00	0.53	0.00										
	Djibouti	0.10	0.00	0.10	0.00										
	Dominican Republic	0.03	0.00	0.03	0.00										
	East Timor	0.88	0.00	0.88	0.00										
	Ecuador	0.05	0.00	0.05	0.00										
	Egypt	24.44	1.30	23.00	1.30										
	El Salvador	0.03	0.00	0.03	0.00										
	Eritrea	0.00	0.00	0.01	0.00										
	Ethiopia	2.88	1.60	2.88	1.30										
	Georgia	1.83	2.28	1.56	1.65										
	Ghana	2.65	0.00	2.30	0.00										
	Greenland	0.15	0.00	0.15	0.00										
	Guatemala	1.22	1.10	1.22	1.10										
	Haiti	0.10	0.00	0.10	0.00										
	Honduras	0.01	0.00	0.01	0.00										
	Hungary	0.00	0.00	0.00	0.00										
	India	2.58	12.36	2.58	10.59										
	Indonesia	70.79	11.00	69.73	9.63										
	Iraq	1.38	0.20	0.84	0.10										
	Jamaica	0.02	0.00	0.02	0.00										
	Jordan	0.12	0.00	0.12	0.00										
	Kazakhstan	1.05	0.73	1.05	0.52										
	Kenya	1.66	7.11	1.66	6.28										
	Korea, ROK	0.00	0.63	0.00	0.48										
	Kyrgyzstan	0.10	0.00	0.10	0.00										
	Laos	11.87	6.55	11.52	4.96										
	Libya	0.01	1.35	0.01	1.25										
	Madagascar	0.00	0.60	0.00	0.60										
	Malawi	0.60	0.00	0.60	0.00										
	Malaysia	0.02	1.31	0.02	0.96										
	Mali	0.26	0.00	0.26	0.00										
	Mexico	32.78	10.11	32.70	8.04										
	Moldova	1.51	0.60	1.51	0.60										
	Mongolia	0.94	3.05	0.95	2.45										
	Morocco	0.50	3.64	0.00	3.19										
	Mozambique	0.68	0.00	0.68	0.00										
	Myanmar	2.21	0.00	2.14	0.00										
	Nepal	2.20	0.60	2.20	0.60										
	Nicaragua	0.21	0.00	0.21	0.00										
	Niger	0.20	0.00	0.20	0.00										
	Nigeria	5.43	2.71	5.43	1.96										
	Oman	0.10	0.00	0.00	0.00										
	Pakistan	2.98	5.06	2.83	4.02										
	Panama	0.15	0.00	0.15	0.00										
	Paraguay	0.00	0.60	0.00	0.60										
	Peru	0.61	2.68	0.61	2.08										
	Philippines	1.73	3.31	1.73	2.61										
	Romania	2.51	0.63	2.51	0.00										
	Russia	1.90	0.45	1.90	0.00										
	Rwanda	0.10	1.41	0.10	1.41										
	Saudi Arabia	0.00	0.00	0.00	0.00										
	Senegal	0.96	0.30	0.59	0.30										

Annex 5 Table 4a (continued)

Donor	Countries					Regional Organizations and Regional Programs					International Organizations				
		Committed		Disbursed			Committed		Disbursed			Committed		Disbursed	
	Recipient	a/ In Kind	b/ Grants / Loans	a/ In Kind	b/ Grants / Loans	Recipient	a/ In Kind	b/ Grants / Loans	a/ In Kind	b/ Grants / Loans	Recipient	a/ In Kind	b/ Grants / Loans	a/ In Kind	b/ Grants /Loans
United States	Serbia& Montenegro	0.45	0.00	0.45	0.00										
	South Africa	3.15	6.49	3.15	4.76										
	Sri Lanka	0.91	0.60	0.91	0.60										
	Sudan	0.20	0.00	0.20	0.00										
	Taiwan, China	0.06	0.04	0.06	0.04										
	Tajikistan	0.30	0.00	0.30	0.00										
	Tanzania	0.97	1.64	0.82	1.32										
	Thailand	4.78	10.59	4.12	9.35										
	The FYR of Macedonia	0.50	0.00	0.50	0.00										
	Trinidad & Tobago	0.02	0.00	0.02	0.00										
	Tunisia	0.00	0.00	0.00	0.00										
	Turkey	1.09	0.33	1.09	0.33										
	Turkmenistan	0.10	0.00	0.10	0.00										
	Uganda	1.87	1.86	1.87	1.13										
	Ukraine	5.66	2.76	5.66	1.86										
	Uruguay	0.00	0.00	0.00	0.00										
	Uzbekistan	0.30	0.35	0.30	0.35										
	Vietnam	31.21	11.02	31.06	7.69										
	West Bank/Gaza	0.50	0.00	0.50	0.00										
	Yemen	0.00	0.00	0.00	0.00										
	Zambia	0.15	8.21	0.00	6.18										
	Total	277.43	169.74	270.25	138.79	Total	181.78	19.96	161.17	10.35	Total	566.85	26.02	531.81	26.02
European Commission	Eritrea	0.00	1.18	0.00	1.03	ACP Africa	0.00	0.74	0.00	0.74	FAO (Chad)	0.00	5.91	0.00	5.88
	Ghana	0.00	4.21	0.00	4.12	EDF -for African ACP countries		44.33		28.52	FAO (Gabon)	0.00	1.48	0.00	1.48
	Ivory Coast	0.00	0.89	0.00	0.44						FAO (Korea DPRK)	0.00	1.48	0.00	0.66
	Korea DPR	0.00	0.00	0.00	0.00						FAO (Nigeria)	0.00	1.15	0.00	0.95
	Mali	0.00	2.96	0.00	2.96						FAO (Zambia)	0.00	0.30	0.00	0.30
	Myanmar	0.00	0.00	0.00	0.00						FAO	0.00	11.82	0.00	3.43
	Romania	0.00	0.74	0.00	0.74						UNDP (Cameroon)	0.00	3.99	0.00	3.55
	Senegal	0.00	2.94	0.00	2.66						WHO (Indonesia)	0.00	20.69	0.00	16.89
	Sudan	0.00	8.87	0.00	7.39						WHO (Myanmar)	0.00	1.48	0.00	1.37
	Turkey	0.00	12.34	0.00	12.28						WHO	0.00	5.91	0.00	1.97
											OIE	0.00	10.34	0.00	6.24
	Total	0.00	34.12	0.00	31.62	Total	0.00	45.07	0.00	29.26	Total	0.00	64.54	0.00	42.70

Annex 5 Table 4a (continued)

Donor	Countries					Regional Organizations and Regional Programs					International Organizations				
		Committed		Disbursed			Committed		Disbursed			Committed		Disbursed	
	Recipient	a/ In Kind	b/ Grants / Loans	a/ In Kind	b/ Grants / Loans	Recipient	a/ In Kind	b/ Grants / Loans	a/ In Kind	b/ Grants / Loans	Recipient	a/ In Kind	b/ Grants / Loans	a/ In Kind	b/ Grants /Loans
African Development Bank	Benin	0.00	0.50	0.00	0.05										
	Burkina Faso	0.00	0.50	0.00	0.05										
	Cameroon	0.00	0.50	0.00	0.05										
	Chad	0.00	0.50	0.00	0.05										
	Côte d'Ivoire	0.00	0.50	0.00	0.00										
	Djibouti	0.00	0.50	0.00	0.05										
	Egypt	0.00	0.50	0.00	0.13										
	Ghana	0.00	0.50	0.00	0.05										
	Kenya	0.00	0.50	0.00	0.13										
	Mali	0.00	0.50	0.00	0.20										
	Niger	0.00	0.50	0.00	0.05										
	Nigeria	0.00	0.50	0.00	0.05										
	Sudan	0.00	0.50	0.00	0.13										
	Togo	0.00	0.50	0.00	0.05										
	Total	0.00	7.00	0.00	1.03	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00
Asian Development Bank	Afghanistan	0.20	0.00	0.20	0.00	ASEAN	0.00	0.76	0.00	0.39	WHO	0.00	22.96	0.00	16.36
	Azerbaijan	0.05	0.00	0.05	0.00	Emergency Fund for Developing Countries (ADB)	0.00	6.76	0.00	2.49	FAO	0.00	11.14	0.00	7.99
	Cambodia	0.09	9.00	0.09	8.00										
	Indonesia	0.40	0.00	0.40	0.00										
	Lao PDR	0.05	6.25	0.05	6.00										
	Malaysia	0.40	0.00	0.40	0.00										
	Mongolia	0.00	0.35	0.00	0.00										
	Philippines	0.40	0.00	0.40	0.00										
	Vietnam	0.05	15.00	0.05	14.00										
	Total	1.64	30.60	1.64	28.00	Total	0.00	7.52	0.00	2.88	Total	0.00	34.10	0.00	24.35

Annex 5 Table 4a (continued)

	Countries					Regional Organizations and Regional Programs					International Organizations				
		Committed		Disbursed			Committed		Disbursed			Committed		Disbursed	
Donor	Recipient	a/ In Kind	b/ Grants / Loans	a/ In Kind	b/ Grants / Loans	Recipient	a/ In Kind	b/ Grants / Loans	a/ In Kind	b/ Grants / Loans	Recipient	a/ In Kind	b/ Grants / Loans	a/ In Kind	b/ Grants /Loans
World Bank	Albania	0.00	5.00	0.00	3.79	AHIF funding - Southern Agricultural Council (CAS)	0.00	0.50	0.00	0.43	OIE	0.00	1.00	0.00	1.00
	Argentina	0.00	14.50	0.00	8.45	AHIF funding - (MECIDS) Middle East Consortium on Infectious Disease Surveillance	0.00	0.98	0.00	0.38					
	Afghanistan	0.00	8.00	0.00	2.61										
	Armenia	0.00	6.84	0.00	4.80										
	Azerbaijan	0.00	5.15	0.00	5.07										
	Bangladesh	0.00	21.04	0.00	2.35										
	Bosnia-Herzegovina	0.00	5.00	0.00	1.30										
	Brazil	0.00	2.10	0.00	0.00										
	Cambodia	0.00	6.00	0.00	0.96										
	Costa Rica	0.00	0.40	0.00	0.40										
	Djibouti	0.00	0.43	0.00	0.11										
	Dominican Republic	0.00	30.50	0.00	0.00										
	Egypt	0.00	3.10	0.00	2.90										
	Georgia	0.00	7.00	0.00	2.79										
	Haiti	0.00	1.56	0.00	0.35										
	India	0.00	32.63	0.00	1.60										
	Iran	0.00	6.35	0.00	6.35										
	Kosovo	0.00	3.00	0.00	1.32										
	Kyrgyzstan	0.00	5.00	0.00	3.83										
	Lao PDR	0.00	4.00	0.00	1.82										
	Mexico	0.00	516.67	0.00	25.67										
	Moldova	0.00	8.00	0.00	6.02										
	Nepal	0.00	18.20	0.00	6.92										
	Nicaragua	0.00	5.00	0.00	0.00										
	Niger	0.00	4.50	0.00	1.64										
	Nigeria	0.00	50.00	0.00	45.11										
	Romania	0.00	37.70	0.00	3.47										
	Sri Lanka	0.00	2.00	0.00	1.69										
	Tajikistan	0.00	5.00	0.00	4.14										
	Togo	0.00	0.56	0.00	0.29										
	Turkey	0.00	34.40	0.00	15.23										
	Uganda	0.00	10.00	0.00	0.00										
	Uruguay	0.00	0.50	0.00	0.03										
	Vietnam	0.00	25.69	0.00	10.96										
	West Bank/ Gaza	0.00	10.00	0.00	0.34										
	Total	0.00	895.82	0.00	172.31	Total	0.00	1.48	0.00	0.81	Total	0.00	1.00	0.00	1.00
Total	Total	326.27	1,233.88	296.88	458.99	Total	185.46	209.37	163.94	167.71	Total	595.79	548.81	542.49	462.94

a/ In Kind may include technical assistance, supplies, equipment, commodities, workshops, training etc.
b/ All bilateral commitments and disbursements are in the form of Grants whereas ADB and WB amounts mainly include Loans and Credits.

Total Committed Annex 5 table 4a + 4b (US$ million):	3,899.83
Total Disbursed Annex 5 table 4a + 4b (US$ million):	2,726.88

Annex 5 Table 4b: Financing for the AHI Facility and Other Recipients (Detailed Breakdown by Donors)

AHI Pledge Results as of December 31, 2009 (US$ millions)

	AHI Facility					Other					Unallocated (uncommitted pledges)	
		Committed		Disbursed			Committed		Disbursed			
Donor	Recipient	a/ In Kind	b/ Grants / Loans	a/ In Kind	b/ Grants / Loans	Recipient	a/ In Kind	b/ Grants / Loans	a/ In Kind	b/ Grants / Loans	Recipient	Inkind / Grants / Loans
Australia	AHI Facility	0.00	8.49	0.00	8.49						Unallocated	0.00
	Total	0.00	8.49	0.00	8.49	Total	0.00	0.00	0.00	0.00	Total	0.00
Austria											Unallocated	1.24
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	1.24
Belgium											Unallocated	0.00
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	0.00
Canada						IDRC	0.00	3.78	0.00	0.16	Unallocated	0.00
						CARE-ID	0.00	12.89	0.00	7.97		
	Total	0.00	0.00	0.00	0.00	Total	0.00	16.67	0.00	8.13	Total	0.00
China	AHI Facility	0.00	2.00	0.00	2.00						Unallocated	7.00
	Total	0.00	2.00	0.00	2.00	Total	0.00	0.00	0.00	0.00	Total	7.00
Cyprus											Unallocated	0.00
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	0.00
Czech Republic											Unallocated	0.00
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	0.00
Estonia	AHI Facility	0.00	0.03	0.00	0.03						Unallocated	0.00
	Total	0.00	0.03	0.00	0.03	Total	0.00	0.00	0.00	0.00	Total	0.00
Finland											Unallocated	0.00
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	0.00
France						Diagnostic in Africa	0.00	0.97	0.00	0.97	Unallocated	3.56
						AI research in epidemiology (Asia and Africa)	0.00	4.48	0.00	1.49		
						AI research in virology and genetic resistance	0.00	5.70	0.00	1.90		
						Researchers	4.93	0.00	3.28	0.00		
	Total	0.00	0.00	0.00	0.00	Total	4.93	11.15	3.28	4.36	Total	3.56
Germany						Vaccination Development Project	0.00	14.78	0.00	14.78	Unallocated	0.00
						Supra-regional Task Force on HPAI	5.91	0.00	3.99	0.00		
						Bilateral support (technical assistance) to developing countries for pandemic preparedness incl. H1N1 (2010-2012)	17.29					
	Total	0.00	0.00	0.00	0.00	Total	23.20	14.78	3.99	14.78	Total	0.00
Greece											Unallocated	0.80
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	0.80
Hungary											Unallocated	0.04
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	0.04
Iceland	AHI Facility	0.00	0.20	0.00	0.20						Unallocated	0.00
	Total	0.00	0.20	0.00	0.20	Total	0.00	0.00	0.00	0.00	Total	0.00
India	AHI Facility		1.67	0.00	0.00							
	Total	0.00	1.67	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	0.00
Ireland											Unallocated	0.00
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	0.00

Annex 5 Table 4b (continued)

Donor	AHI Facility					Other					Unallocated (uncommitted pledges)	
		Committed		Disbursed			Committed		Disbursed			
	Recipient	a/ In Kind	b/ Grants / Loans	a/ In Kind	b/ Grants / Loans	Recipient	a/ In Kind	b/ Grants / Loans	a/ In Kind	b/ Grants / Loans	Recipient	Inkind / Grants / Loans
Italy											Unallocated	2.46
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	2.46
Japan						Program of Funding Reserch Centers for Emerging and Re-emerging Infectious Diseases, Ministry of Education,Sports,Science and Technology, Japan	0.00	106.69	0.00	86.94		
						World Bank (through PHRD)	0.00	19.50	0.00	19.50	Unallocated	0.00
						Joint research with institutes, paid in yen (3.86 billion a year)	0.00	0.00	0.00	0.00		
						JICA Regional Trainings	3.35	0.00	1.39	0.00		
	Total	0.00	0.00	0.00	0.00	Total	3.35	126.19	1.39	106.44	Total	0.00
Korea, Republic of	AHI Facility	0.00	1.00	0.00	1.00	Technical Cooperation	0.04	0.00	0.04	0.00	Unallocated	0.58
	Total	0.00	1.00	0.00	1.00	Total	0.04	0.00	0.04	0.00	Total	0.58
Luxembourg											Unallocated	1.49
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	1.49
Netherlands, The						Al-firebrigade	1.60	0.00	0.50	0.00	Unallocated	0.00
						UN organizations, OIE	1.00	2.10	1.00	2.10		
						Technical assistance projects	13.50	0.00	3.40	0.00		
	Total	0.00	0.00	0.00	0.00	Total	16.10	2.10	4.90	2.10	Total	0.00
Norway											Unallocated	0.01
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	0.01
Russia	AHI Facility	0.00	3.00	0.00	3.00	Establishment of the WHO collaboration centre in Russia	0.00	24.00	0.00	23.48	Unallocated	0.00
	Total	0.00	3.00	0.00	3.00	Total	0.00	24.00	0.00	23.48	Total	0.00
Saudi Arabia											Unallocated	0.00
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	0.00
Singapore											Unallocated	0.00
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	0.00
Slovenia	AHI Facility	0.00	0.04	0.00	0.04						Unallocated	0.00
	Total	0.00	0.04	0.00	0.04	Total	0.00	0.00	0.00	0.00	Total	0.00
Spain											Unallocated	0.00
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	0.00
Sweden											Unallocated	0.00
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	0.00
Switzerland											Unallocated	0.00
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	0.00
Thailand											Unallocated	0.00
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	0.00

Annex 5 Table 4b (continued)

Donor	AHI Facility					Other					Unallocated (uncommitted pledges)	
		Committed		Disbursed			Committed		Disbursed			
	Recipient	a/ In Kind	b/ Grants / Loans	a/ In Kind	b/ Grants / Loans	Recipient	a/ In Kind	b/ Grants / Loans	a/ In Kind	b/ Grants / Loans	Recipient	Inkind / Grants / Loans
United Kingdom						Global Pandemic Influenza Action Plan ?	0.00	3.27	0.00	3.27		
						Govt of Malawi Health SWAp - AHI reprioritisation	0.00	0.16	0.00	0.16		
						ICDDR Bangladesh	0.00	0.41	0.00	0.41		
	AHI Facility	0.00	13.49	0.00	13.49	Investment in AI World Reference Laboratory, VLA Weybridge	5.39	0.00	5.39	0.00	Unallocated	0.00
						MoH South Africa	0.00	0.26	0.00	0.26		
						National Institute of Biological Standards and Control (on vaccine development)	1.14	0.00	1.14	0.00		
						Research by Medical Research Council; some goes into collaboration with WHO centers	4.90	0.00	1.63	0.00		
						St Helena Government	0.00	0.15	0.00	0.09		
						Wilton Park Conference	0.00	0.10	0.00	0.10		
	Total	0.00	13.49	0.00	13.49	Total	11.43	4.34	8.16	4.29	Total	0.00
United States						CARE HQ	0.00	0.05	0.00	0.00		
						FDA Training and Capacity-Building	0.26	0.00	0.00	0.00		
						Global wild bird surveillance	7.54	0.00	7.54	0.00	Unallocated	0.00
						Global communications & outreach	14.18	0.00	14.18	0.00		
						HHS HQ / International coordination	9.84	0.00	7.43	0.00		
						Stockpile (non-pharmaceuticals)	88.59	0.00	88.59	0.00		
						International technical assistance	21.96	0.00	21.96	0.00		
						Humanitarian assistance	8.17	0.00	8.17	0.00		
						International Cooperation	17.86	0.00	17.76	0.00		
						National Institutes of Health Activities	73.84	0.00	49.56	0.00		
						U.S. Centers for Disease Control and Prevention Activities	86.11	4.83	61.15	4.83		
						Vaccine Research FDA	0.55	0.00	0.55	0.00		
	Total	0.00	0.00	0.00	0.00	Total	328.89	4.88	276.87	4.83	Total	0.00
European Commission	AHI Facility	0.00	97.15	0.00	80.73	6 th Framework Programme - DG Research	0.00	41.37	0.00	35.91	Unallocated	0.00
						7 th Framework Programme - DG Research	0.00	39.75	0.00	22.02		
	Total	0.00	97.15	0.00	80.73	Total	0.00	81.12	0.00	57.92	Total	0.00
African Development Bank											Unallocated	13.50
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	13.50
Asian Development Bank											Unallocated	394.14
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	394.14
World Bank												0.00
	Total	0.00	0.00	0.00	0.00	Total	0.00	0.00	0.00	0.00	Total	0.00
Total		0.00	127.07	0.00	108.98	Total	387.94	285.23	298.64	226.32	Total	424.83

a/ In Kind may include technical assistance, supplies, equipment, commodities, workshops, training, etc.
b/ All bilateral commitments and disbursements are in the form of **Grants** whereas ADB and WB amounts mainly include **Loans and Credits**.

Total Committed Annex 5 Table 4a + 4b (US$ million):	3,899.83
Total Disbursed Annex 5 Table 4a + 4b (US$ million):	2,726.88

Annex 6: Confirmed Avian Influenza A Virus infections of humans 1996-2007[152]

LOCATION	YEAR	SUBTYPE	IVPI	NO. HUMAN INFECTIONS	SYMPTOMS
UK	1996	H7N7	LPAI	1	Conjunctivitis
Hong Kong	1997	H5N1	HPAI	18	Respiratory
China and Hong Kong	1999	H9N2	LPAI	2	ILI
USA Virginia	2002	H7N2	LPAI	1	ILI
China and Hong Kong	2003	H5N1	HPAI	2	Respiratory
Netherlands	2003	H7N7	HPAI	89	Conjunctivitis, ILI, fever, cough, muscle aches, respiratory
Italy	2002-03	H7N3	LPAI	7	Conjunctivitis, respiratory
Hong Kong	2003	H9N2	LPAI	1	ILI
New York	2003	H7N2	LPAI	1	Respiratory
Canada	2004	H7N3	LPAI/HPAI	2	Conjunctivitis, respiratory
China, Thailand, Viet Nam	2003-04	H5N1	HPAI	50	Respiratory, pneumonia
Cambodia, China, Indonesia, Thailand, Viet Nam	2005	H5N1	HPAI	98	
Azerbaijan, Cambodia, China, Djibouti, Egypt, Indonesia, Iraq, Thailand, Turkey	2006	H5N1	HPAI	115	
UK	2006	H7N3	LPAI	1	Conjunctivitis
Cambodia, China, Egypt, Indonesia, Lao PDR, Myanmar, Nigeria, Pakistan, Viet Nam	2007	H5N1	HPAI	86	
UK	2007	H7N2	LPAI	4	Conjunctivitis, respiratory
Hong Kong	2007	H9N2	LPAI	1	Mild signs of disease

Annex 7: Notification of H5N1 outbreaks received by the OIE for 2009 and 2010 (updated on 7 July 2010)

Country	Date of confirmation[i]	Date of submission[ii]	Resolved date[iii]	Number of outbreaks	Serotype	Wild/ Domestic
Bangladesh	22/03/2007	30/03/2007	Continuing	354	H5N1	Domestic
Bhutan	22/02/2010	23/02/2010	25/03/2010	5	H5N1	Domestic
Bulgaria	01/04/2010	01/04/2010	03/06/2010	1	H5N1	Wild
Cambodia	18/12/2009	28/12/200	27/12/2009	1	H5N1	Domestic
	29/01/2010	05/02/2010	Continuing	2	H5N1	Domestic
China	10/02/2009	10/02/2009	03/05/2009	2	H5N1	Domestic
	17/05/2009	17/05/2009	26/06/2009	2	H5N1	Both
	03/06/2010	02/07/2010	25/05/2010	1	H5N1	Wild
Egypt	17/02/2006	18/02/2006	Endemic disease	1086	H5N1	Domestic
Germany	06/03/2009	11/03/2009	06/03/2009	1	H5N1	Wild
Hong Kong (China)	08/12/2008	12/12/2008	05/01/2009	1	H5N1	Domestic
	31/01/2009	13/02/2009	16/04/2009	12	H5N1	Both
	31/12/2009	05/01/2010	29/12/2009	1	H5N1	Wild
	29/03/2010	08/04/2010	26/03/2010	1	H5N1	Wild
India	27/11/2008	28/11/2008	22/10/2009	28	H5N1	Domestic
	14/01/2010	15/01/2010	02/06/2010	5	H5N1	Domestic
Indonesia	19/07/2006	25/09/2006	Endemic disease	6	H5N1	Domestic
Israel	26/01/2010	26/01/2010	02/02/2010	1	H5N1	Domestic
	06/05/2010	07/05/2010	13/05/2010	1	H5N1	Domestic
Japan	25/04/2008	29/04/2008	01/04/2009	5	H5N1	Wild
Lao PDR	09/02/2009	26/02/2009	04/04/2009	1	H5N1	Domestic
	06/05/2010	14/05/2010	27/05/2010	1	H5N1	Domestic
Mongolia	25/05/2009	28/05/2009	29/07/2009	1	H5N1	Wild
	06/08/2009	10/08/2009	12/10/2009	1	H5N1	Wild
	08/05/2010	10/05/2010	14/06/2010	1	H5	Wild
Myanmar	03/02/2010	05/02/2010	26/03/2010	3	H5N1	Domestic

[i] Date of confirmation relates to the first confirmation of the event through a diagnostic test.

[ii] Date of submission relates to the date when the immediate notification is submitted to OIE.

[iii] Resolved date is the date when the event was resolved, and corresponds to the closing date of the latest outbreak. If the disease is endemic it means the event could not be resolved.

Country	Date of confirmation[i]	Date of submission[ii]	Resolved date[iii]	Number of outbreaks	Serotype	Wild/ Domestic
Nepal	16/01/2009	16/01/2009	25/02/2009	2	H5N1	Domestic
	31/01/2010	05/02/2010	Continuing	7	H5N1	Domestic
Romania	15/03/2010	16/03/2010	27/04/2010	2	H5N1	Domestic
Russia	12/06/2009	24/06/2009	24/06/2009	1	H5N1	Wild
	28/10/2009	05/11/2009	13/01/2010	1	H5N1	Wild
	11/06/2010	25/06/2010	Continuing	1	H5N1	Wild
Togo	16/09/2008	18/09/2008	16/01/2009	1	H5N1	Domestic
Viet Nam	19/12/2006	19/12/2006	Continuing	265	H5N1	Domestic

[i] Date of confirmation relates to the first confirmation of the event through a diagnostic test.

[ii] Date of submission relates to the date when the immediate notification is submitted to OIE.

[iii] Resolved date is the date when the event was resolved, and corresponds to the closing date of the latest outbreak. If the disease is endemic it means the event could not be resolved.

Annex 8: Timeline of international meetings: avian and pandemic influenza contributions to One Health

Date	International meeting	Outcomes for One Health
October 2005	Ottawa, Canada – First International Meeting of Health Ministers	Declaration: 'mulitsectoral approach, beginning with the animal and human health sectors, must underlie global efforts towards coordinated pandemic planning'
November 2005	Geneva, WHO Meeting on Avian Influenza and Human Pandemic Influenza (Health Ministers and others)	Proposal for countries to develop integrated action plans
January 2006	Beijing, China – International Pledging Conference on Avian and Human Pandemic Influenza	International Pledging Conference on Avian and Human Pandemic Influenza – International community pledged US$ 1.9 billion in financial support and discussed prospective coordination mechanisms.
December 2006	Bamako, Mali – Fourth Ministerial Meeting and Pledging Conference on Avian and Pandemic Influenza	Compensation guidelines agreed, and an additional US$475 million financial support committed.
December 2007	New Delhi, India – Fifth International Ministerial Conference on Avian and Pandemic Influenza	Road Map for the control of HPAI, calling for formulation of a strategic framework.
October 2008	Sharm el-Sheikh, Egypt – Sixth International Ministerial Conference on Avian and Pandemic Influenza	Consultation document 'Contributing to One World One Health' tabled.
March 2009	Winnipeg, Canada – Expert Consultation on One World One Health	'One World One Health' Key Recommendations developed.
April 2010	Hanoi, Viet Nam – Seventh International Ministerial Conference on Animal and Pandemic Influenza	'Hanoi Declaration' calling for sustained momentum for the continuing H5N1 HPAI threat and action at the interface between human, animal and environmental health systems.
May 2010	Georgia, USA – Expert consultation on Operationalising 'One Health'	'One Health' critical enabler initiatives developed including establishment of a global network, training and an information repository.

Annex 9: The Manhattan Principles on 'One World, One Health'

Recent outbreaks of West Nile Virus, Ebola Hemorrhagic Fever, SARS, Monkeypox, Mad Cow Disease and Avian Influenza remind us that human and animal health are intimately connected. A broader understanding of health and disease demands a unity of approach achievable only through a consilience of human, domestic animal and wildlife health – **One Health**.

Phenomena such as species loss, habitat degradation, pollution, invasive alien species, and global climate change are fundamentally altering life on our planet from terrestrial wilderness and ocean depths to the most densely populated cities. The rise of emerging and resurging infectious diseases threatens not only humans (and their food supplies and economies), but also the fauna and flora comprising the critically needed biodiversity that supports the living infrastructure of our world. The earnestness and effectiveness of humankind's environmental stewardship and our future health have never been more clearly linked. To win the disease battles of the 21st Century while ensuring the biological integrity of the Earth for future generations requires interdisciplinary and cross-sectoral approaches to disease prevention, surveillance, monitoring, control and mitigation as well as to environmental conservation more broadly.

We urge the world's leaders, civil society, the global health community and institutions of science to:

1. Recognize the essential link between human, domestic animal and wildlife health and the threat disease poses to people, their food supplies and economies, and the biodiversity essential to maintaining the healthy environments and functioning ecosystems we all require.
2. Recognize that decisions regarding land and water use have real implications for health. Alterations in the resilience of ecosystems and shifts in patterns of disease emergence and spread manifest themselves when we fail to recognize this relationship.
3. Include wildlife health science as an essential component of global disease prevention, surveillance, monitoring, control and mitigation.
4. Recognize that human health programmes can greatly contribute to conservation efforts.
5. Devise adaptive, holistic and forward-looking approaches to the prevention, surveillance, monitoring, control and mitigation of emerging and resurging diseases that take the complex interconnections among species into full account.
6. Seek opportunities to fully integrate biodiversity conservation perspectives and human needs (including those related to domestic animal health) when developing solutions to infectious disease threats.
7. Reduce the demand for and better regulate the international live wildlife and bushmeat trade not only to protect wildlife populations but to lessen the risks of disease movement, cross-species transmission, and the development of novel pathogen-host relationships. The costs of this worldwide trade in terms of impacts on public health, agriculture and conservation are enormous, and the global community must address this trade as the real threat it is to global socioeconomic security.
8. Restrict the mass culling of free-ranging wildlife species for disease control to situations where there is a multidisciplinary, international scientific consensus that a wildlife population poses an urgent, significant threat to human health, food security, or wildlife health more broadly.
9. Increase investment in the global human and animal health infrastructure commensurate with the serious nature of emerging and resurging disease threats to people, domestic animals and wildlife. Enhanced capacity for global human and animal health surveillance and for clear, timely information-sharing (that takes language barriers into account) can only help improve coordination of responses among governmental and nongovernmental agencies, public and animal health institutions, vaccine / pharmaceutical manufacturers, and other stakeholders.
10. Form collaborative relationships among governments, local people, and the private and public (i.e. non-profit) sectors to meet the challenges of global health and biodiversity conservation.

11. Provide adequate resources and support for global wildlife health surveillance networks that exchange disease information with the public health and agricultural animal health communities as part of early warning systems for the emergence and resurgence of disease threats.

12. Invest in educating and raising awareness among the world's people and in influencing the policy process to increase recognition that we must better understand the relationships between health and ecosystem integrity to succeed in improving prospects for a healthier planet.

It is clear that no one discipline or sector of society has enough knowledge and resources to prevent the emergence or resurgence of diseases in today's globalized world. No one nation can reverse the patterns of habitat loss and extinction that can and do undermine the health of people and animals. Only by breaking down the barriers among agencies, individuals, specialties and sectors can we unleash the innovation and expertise needed to meet the many serious challenges to the health of people, domestic animals, and wildlife and to the integrity of ecosystems. Solving today's threats and tomorrow's problems cannot be accomplished with yesterday's approaches. We are in an era of 'One World, One Health' and we must devise adaptive, forward-looking and multidisciplinary solutions to the challenges that undoubtedly lie ahead.

Annex 10: Examples of global disease information systems[153]

The Global Public Health Intelligence Network (GPHIN) focuses primarily on four human diseases: influenza, polio, SARS, and smallpox. The GPHIN was developed under the auspices of the WHO and is open to governments on a user fee basis. In addition to its four focal diseases, the network also monitors for certain diseases in which an outbreak would constitute 'a public health emergency of international concern' (PHEIC).

The Global Outbreak Alert and Response Network is in place to follow up on any such outbreak identified by the GPHIN. It provides support to national governments on disease identification and characterization, outbreak preparedness and aid to affected populations. It is also under the auspices of the WHO.

The Program for Monitoring Emerging Diseases (ProMED) is a disease reporting system of the International Society for Infectious Diseases. It is based on formal and informal sources of information. Data on human, animal and plant diseases are collected by volunteers and screened by expert moderators. Most sources of information come from the US. Reporting by developing countries, particularly in sub-Saharan Africa, remains weak.

The Global Early Warning System for Major Animal Diseases – Including Zoonoses (GLEWS) was set up to combine the alert mechanisms of the three organizations FAO, OIE and WHO to assist with the prediction, prevention and control of animal disease threats, including those capable of transmission to humans. It focuses on several zoonotic and non-zoonotic diseases including HPAI and Rift Valley fever.

The World Animal Health Information System and Database (WAHIS and WAHID) are used to notify, store and summarize information on diseases reported to OIE. OIE requires its 176 members to provide timely notification of, and epidemiological information on, disease in accordance with the international standards. These include notifying OIE within 24 hours on new events of listed diseases and emerging diseases, some with zoonotic potential.

Med-Vet-Net is a European network that maintains a database for the prevention and control of zoonoses and food-borne diseases.

The Global Emerging Infections Surveillance and Response System (GEIS) of the US Department of Defence focuses on infectious disease with a potential health risk for US military personnel.

The Emerging Infectious Diseases Network (EIN), developed by the University of Iowa under the auspices of the US Centers for Disease Control and Prevention (USCDC), is based on a network of paediatric, internist, and public health officials.

OIE – Program for Strengthening Veterinary Services (PVS) includes surveillance, reporting, early detection and response to disease as well as the management of animal health systems in partnership with farmers, government agencies, industry, educational institutions and other stakeholders.

The International Health Regulations (IHR) is an international legal instrument that is binding on 194 countries across the globe, including all the Member States of WHO. Their aim is to help the international community prevent and respond to acute public health risks that have the potential to cross borders and threaten people worldwide.

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