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Resource Paper 1

Animal and Pandemic Influenza – Overview of the Current Situation and International Support Efforts

UNSIC/World Bank

Acknowledgments

The preparation of this document has benefited from the experience of people in many countries as they have responded to threats posed by avian and human influenzas during the last five years. Their commitment and concerted action, and the lessons that are being learned, have helped the world to establish - and implement - effective responses.

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Produced by:

United Nations System Influenza Coordination (UNSIC)
United Nations Plaza
DC2-2609
New York, NY 10017 USA

Tel. +1 (212) 906 6083
Fax. +1 (212) 906 6473
www.influenza.undg.org

World Bank
1818 H Street NW
Washington, DC 20433
USA

Tel. +1 (202) 473 1000
Fax. +1 (202) 477 6391
www.worldbank.org/flu

UNSIC Team:
Julia Landford
Teresa Due
Kathryn Britton
Chadia Wannous
Michelle Barrett
Julie Hall

World Bank Team:
Olga Jonas
Jimmy Smith

Responsible Officer
David Nabarro (UN System Influenza Coordination)

Structure and Objectives of this Paper

This resource paper reviews the current situation regarding H5N1 Highly Pathogenic Avian Influenza, Pandemic Influenza A (H1N1) 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 support and political commitment to do more).

Section 1.1 contains an overview of the animal and pandemic influenza situation for highly pathogenic avian influenza in animals and humans, as well as other highly pathogenic influenzas. It also reviews impacts of pandemic (H1N1) 2009 on health care systems, schools and the education sector, specific population groups, animal health and agriculture systems, and the finance sector. Section 1.2 contains an overview of 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.

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1.0 Executive Summary

This paper provides an overview of the current situation and 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. Details of the current epidemiological situation in animals and humans of H5N1 HPAI, Pandemic Influenza A (H1N1) 2009 and a number of other influenza viruses of concern in animals and humans is provided and an assessment of the health and societal impact since the last IMCAPI in 2008 of these viruses. It includes an overview of the capacity building activities undertaken during the reporting period to strengthen global capacity to detect and manage animal and human influenza viruses of concern. It provides details of external financial assistance for programs in developing countries and for global capacity building.

H5N1 HPAI remains of concern because of its impacts on both animal and human health. Since the last IMCAPI in 2008, 14 countries have reported outbreaks of H5N1 HPAI in domestic poultry. These outbreaks have resulted in substantial economic impacts in the affected areas and 121 human cases have been reported. Although there has been a significant decline in the number of infected countries since 2006, the virus remains entrenched in at least five. This continued circulation of the virus poses a threat to animal and human health: the number of human cases confirmed in 2009 (77 cases/32 deaths) was more than double the number reported in 2008 (44 confirmed cases/33 deaths). All human cases of H5N1 AI have occurred in countries with ongoing movement of the virus among birds.

Other influenza viruses of animals with subtypes H2, H5, H6, H7 and H9 viruses have sporadically infected humans and are considered to have pandemic potential.

In April 2009, a novel influenza A virus was first detected in Mexico and the United States. Pandemic Influenza A (H1N1) 2009 rapidly spread to over 120 countries within 6 weeks, and as of April 2010, 213 countries and territories around the world have reported laboratory confirmed cases which include over 17,700 deaths.

The overall impact of Pandemic (H1N1) 2009 will not be known till the pandemic is over. However, during its first 9 months the pandemic has led to national authorities [from at least 10 countries] reporting moderate or significant strain on their health care systems and disproportionate impacts within specific population groups. Impacts have also been noted in the agriculture, tourism and trade sectors. Pandemic (H1N1) 2009 is a newly emerging virus of animal origin that appeared emerged without warning, and – for an initial period of several months - without clear indications as to its severity or duration.

Functioning surveillance systems, as well as ongoing analysis into the behaviour of influenza viruses remains critical to the definition of national and global risks and the development of strategies for reducing threats associated with pandemics.

The complexity of issues raised by the global spread of influenza viruses underlines the need for an interdisciplinary and systematic approach to any emerging infectious disease.

International and regional cooperation, and commitment to a global response, has continued since IMCAPI 2008. Authorities from many of the world's nations have made significant contributions to human health and pandemic preparedness and responses to Pandemic (H1N1) 2009. These successful efforts have contributed to a reduced sense of urgency - and funding - for avian influenza and animal health investments.

There have been significant achievements during the past 15 months (the reporting period): these include better surveillance and control of disease outbreaks at source, timely reporting of significant animal health events to the OIE World Animal Health Information System (WAHIS), strengthened networking across FAO/OIE laboratories and improved implementation of the WHO International Health Regulations (2005), while building community resilience and national communication capacities. Communications about the need for (a) well-functioning animal health sectors, (b) multi-partner action on biosecurity across the entire production and marketing chain, are being enhanced. As a result of Pandemic (H1N1) 2009 there has been an upsurge in (a) awareness of pandemic preparedness, and (activities to address the potential humanitarian impact caused by pandemics. Significant contributions to capacity building for avian and pandemic influenza have been made by developing country governments, with support from international agencies and the United Nations system, regional organisations and local level groups. Improved public-private partnerships and participation of schools and civil society groups contributed to enhanced capacity.

However, veterinary services under-perform in many countries, the global level of biosecurity in the poultry production chain remains low, veterinary and public health legislation is outdated and inadequate in many countries, and there is minimal funding for laboratory diagnostics. Although progress with non-health sector pandemic preparedness has been scaled up, the OIE Program for Strengthening Veterinary Services (PVS) and Gap Analysis Pathway provides an agreed mechanism for improving veterinary services across a range of areas including legislation and governance.

The threat of a severe influenza pandemic persists. Substantial work remains to be done to strengthen animal and human health sector service capacity, to improve understanding of (and response to) the drivers for disease, and to ensure a greater focus on non-health sector preparedness. The international community and governments, research communities and civil society would benefit from analysis of efforts and learning from the experiences of the past few years, particularly in response to H5N1 HPAI, Pandemic (H1N1) 2009 and other ongoing and emerging health threats.

1.1 Overview of the animal and pandemic influenza situation

1.1.1 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[2] in the Republic of Korea. From 2003, H5N1 HPAI spread widely across three continents from East and South East Asia, to southern Russia, the Middle East, Europe, Africa and South Asia in 2005-06[3]. By 2006, 56 countries had reported infections in birds, 38 of which were reported in domestic poultry[4].

During 2007 and 2008 the number of reported outbreaks and number of newly infected countries declined. Overall thirty-one countries reported outbreaks in 2007, reducing significantly to twenty-three countries in 2008 (See figure 1-1 and figure 1-2).

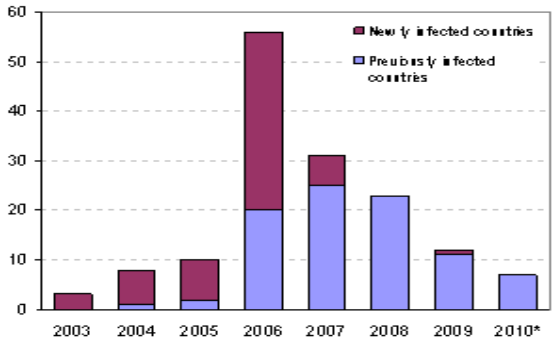


FIGURE 1-1: NUMBER OF H5N1 HPAI NEWLY INFECTED COUNTRIES SINCE 2003 (SOURCE: FAO EMPRES-I) 2010, ONLY

In total, sixty-two countries have experienced disease events of H5N1 HPAI since the beginning of the panzootic in 2003.

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. H5N1 HPAI does, however, remain entrenched in poultry in parts of Asia (Bangladesh, Indonesia, Viet Nam, China) and Africa (Egypt) with a persisting risk that human infections will occur.

Update on H5N1 HPAI in domestic poultry since 2008

Twelve countries in Asia, Europe and Africa experienced disease events during 2009. Nepal was the only newly infected country in 2009 (figure 1-1). During January 2010, Israel and Myanmar have reported outbreaks, although they had not experienced any H5N1 HPAI in over a year. Cambodia also reported outbreaks of H5N1 HPAI in ducks in January 2010. The number of countries reporting outbreaks in 2009 is lower compared to 2008, 2007 and 2006 (figure 1-1).

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[5].

H5N1 HPAI has recently re-surfaced in several countries, where the disease was believed to have been eliminated. 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 programs. In the case of Bangladesh and India that had reported no outbreaks in the second half of 2009, a new wave of cases has been observed since the beginning of 2010.

Figure 1-2 shows data of 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.

In summary, since 2008 there has been a continued decline in the number of poultry outbreaks reported worldwide, and a decrease in the total number of countries affected[i].

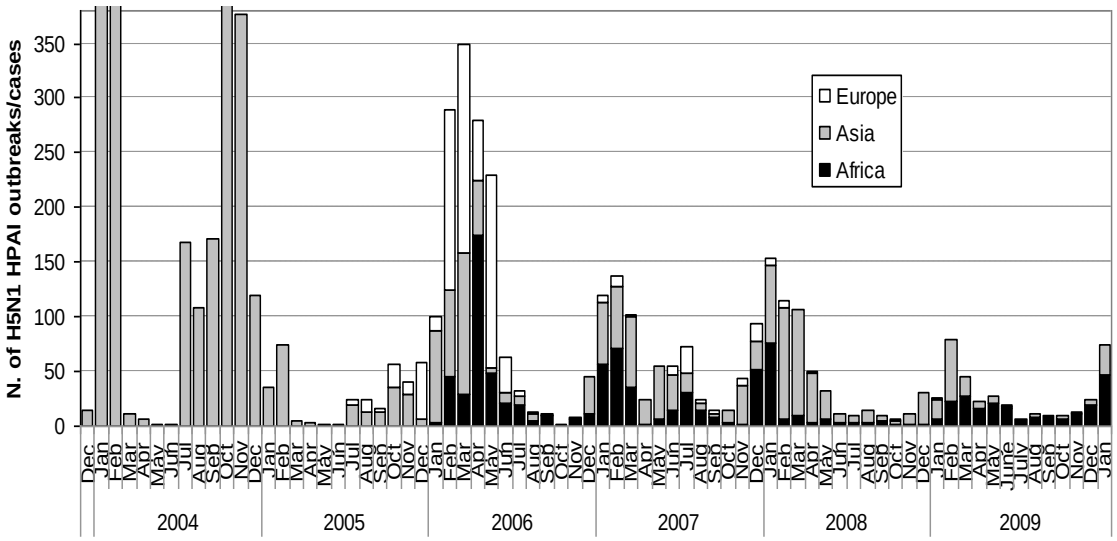


FIGURE 1-2: NUMBER OF H5N1 HPAI EVENTS BY CONTINENT SINCE 2003

(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: Those months with more than 380 outbreaks (Jan 2004: 1,311, Feb 2004: 1,175 and Oct 2004: 741), have been truncated so that rest of the graph is not distorted.

Although disease awareness has increased, cases of H5N1 HPAI are still likely to be under-reported in some regions. The total number of outbreaks reported is highly

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

influenced by a number of variables, such as case definition used, awareness level, intensity/ effectiveness of surveillance programmes in countries, and willingness to report.

Confirmed outbreaks of H5N1 HPAI have been reported in wild bird populations in China, Mongolia, Russia and Germany since July 2008 (See figure 1-3: H5N1 HPAI events in domestic poultry and wild birds).

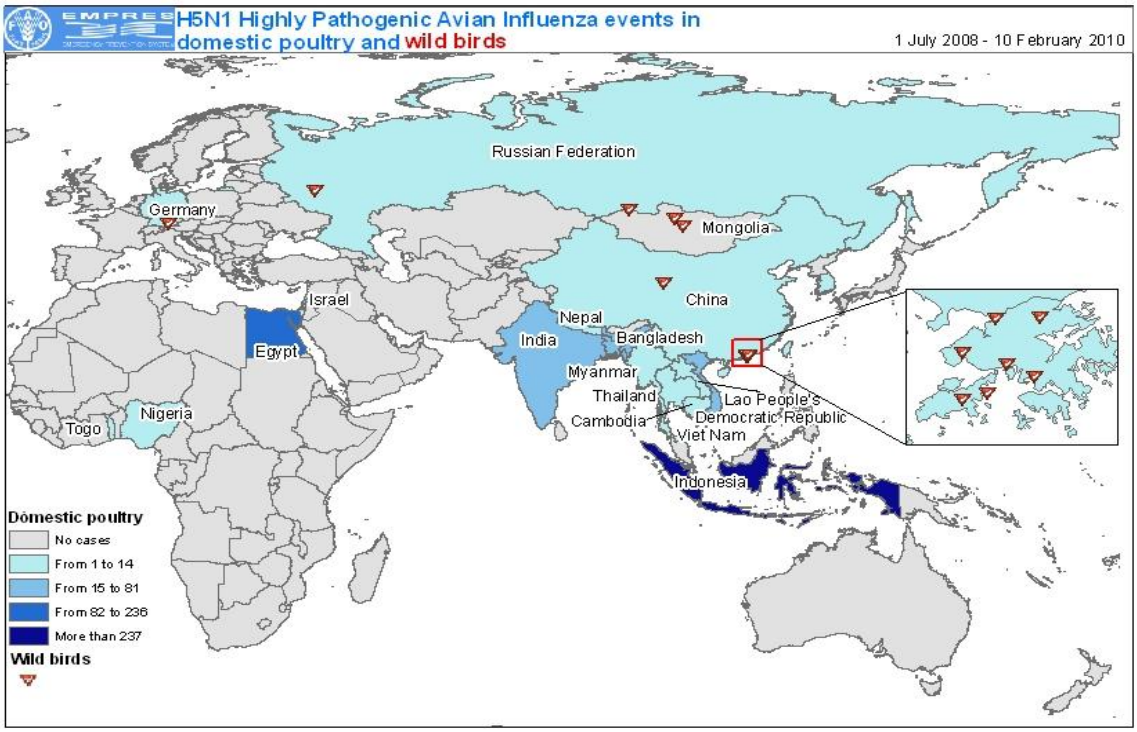


Figure 1-3: H5N1 HPAI outbreaks in domestic poultry and cases in wild birds

(SOURCE: FAO EMPRES-I)

1.1.2 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 influenza cases in 15 countries.

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 HPAI viruses were associated with widespread poultry outbreaks in China, Thailand and Vietnam. 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[6].

In 2005 - 2006, Cambodia, China, Indonesia, Thailand and Vietnam, severe and fatal human infections with H5N1 were associated with the ongoing H5N1 epizootic among poultry. Overall, 98 human H5N1 cases with 43 deaths were reported from five countries. In 2006, Azerbaijan, Cambodia, China, Djibouti, Egypt, Indonesia, Iraq, Thailand, Turkey, experienced fatal human infections with H5N1 viruses occurred in association with the ongoing and expanding epizootic. 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, 115 human H5N1 cases with 79 deaths were reported in nine countries[7].

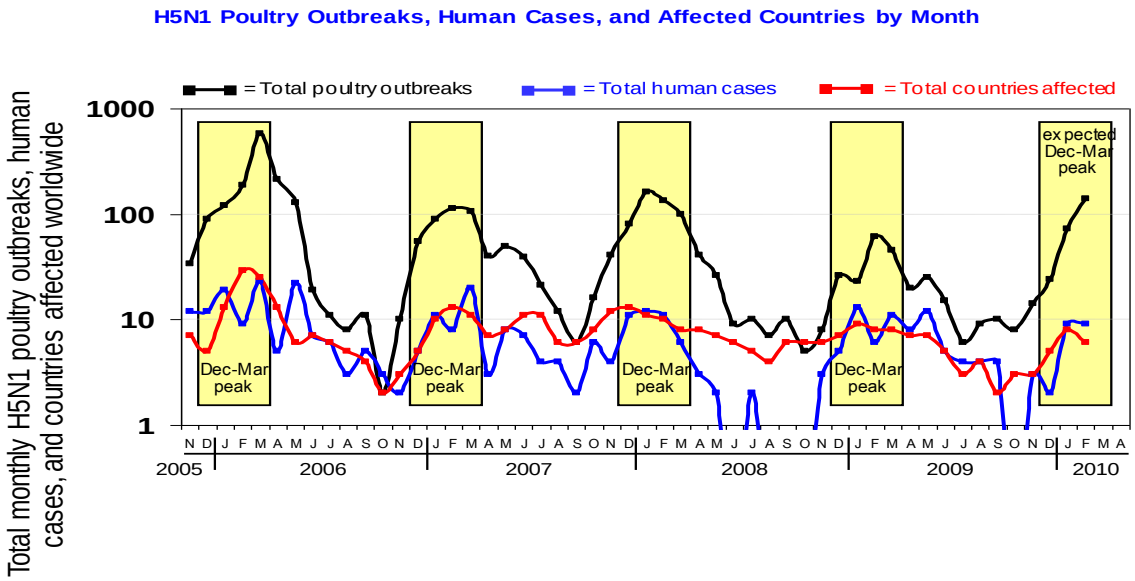
In 2007 - 2008 Cambodia, China, Egypt, Indonesia, Laos, Myanmar, Nigeria, Pakistan, and Vietnam experienced human fatalities due to H5N1 in association with poultry outbreaks. In addition, during 2007, Nigeria, Laos, Myanmar, and Pakistan confirmed their first human infections with H5N1. Overall nine countries reported a total of 86 human cases with 59 deaths[8]. Six countries - Indonesia, Egypt, Vietnam, China, Bangladesh and Cambodia - reported a 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 avian influenza A(H5N1) virus were reported to the World Health Organisation (WHO) from 5 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 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 increases in Egypt.

All human cases of avian (H5N1) 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)[9].

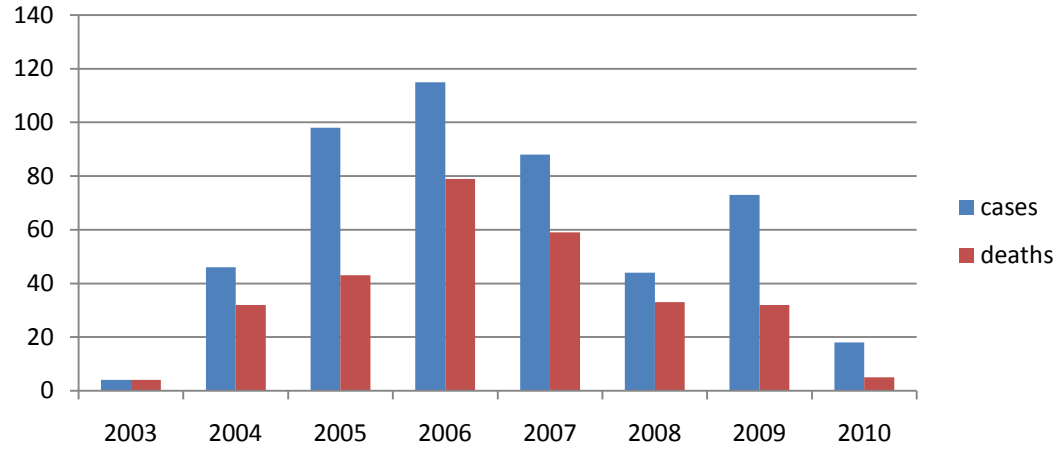
Figure 1-4:



Source: OIE, WHO, FAO reports through 3/5/10 (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.

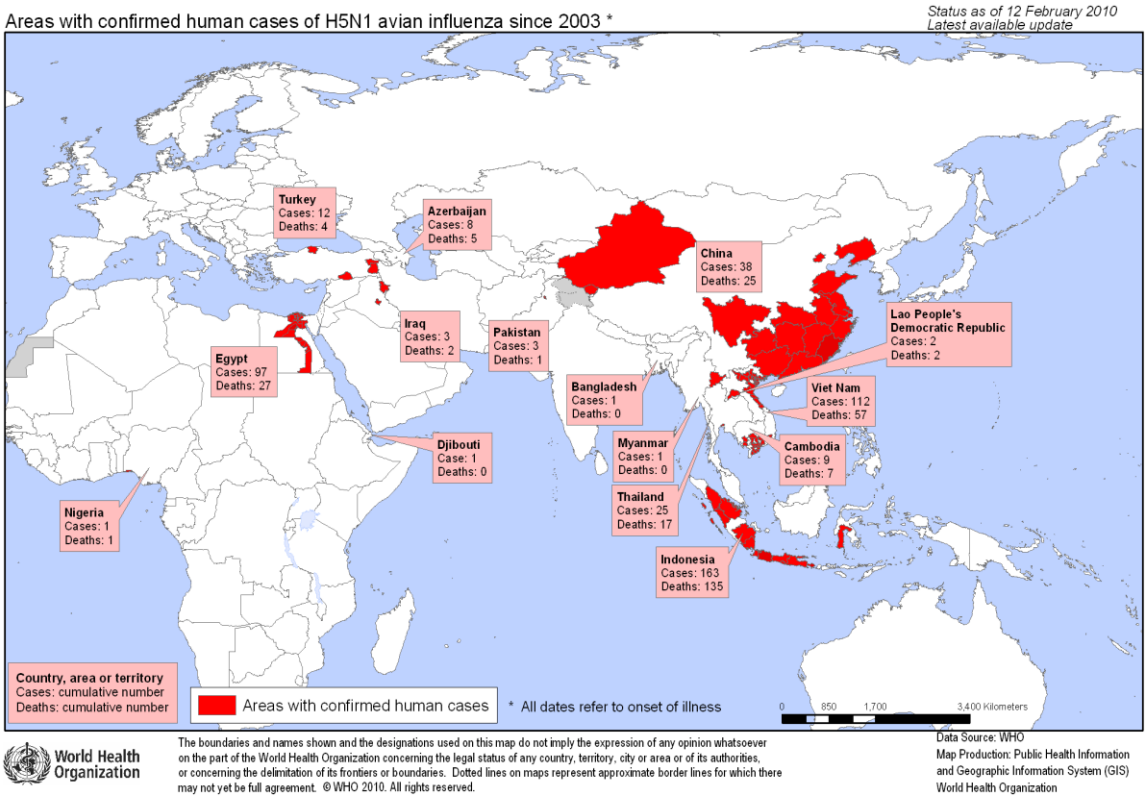
Until the end of 2009, 468 confirmed human cases and 282 deaths had been reported to WHO (See figure 1-5: Number of confirmed cases; figure 1-6: Areas with confirmed human cases of H5N1 AI since 2003). Between January and March 2010 three countries (Egypt, Vietnam and Indonesia) have reported a further 18 human cases and 2 deaths. As in previous years[10], increased case counts have been reported during the winter and spring in the northern hemisphere (See figure 1-7).

Figure 1-5: Number of confirmed H5N1 Avian Influenza human cases since 2003.



Source: WHO[11]

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

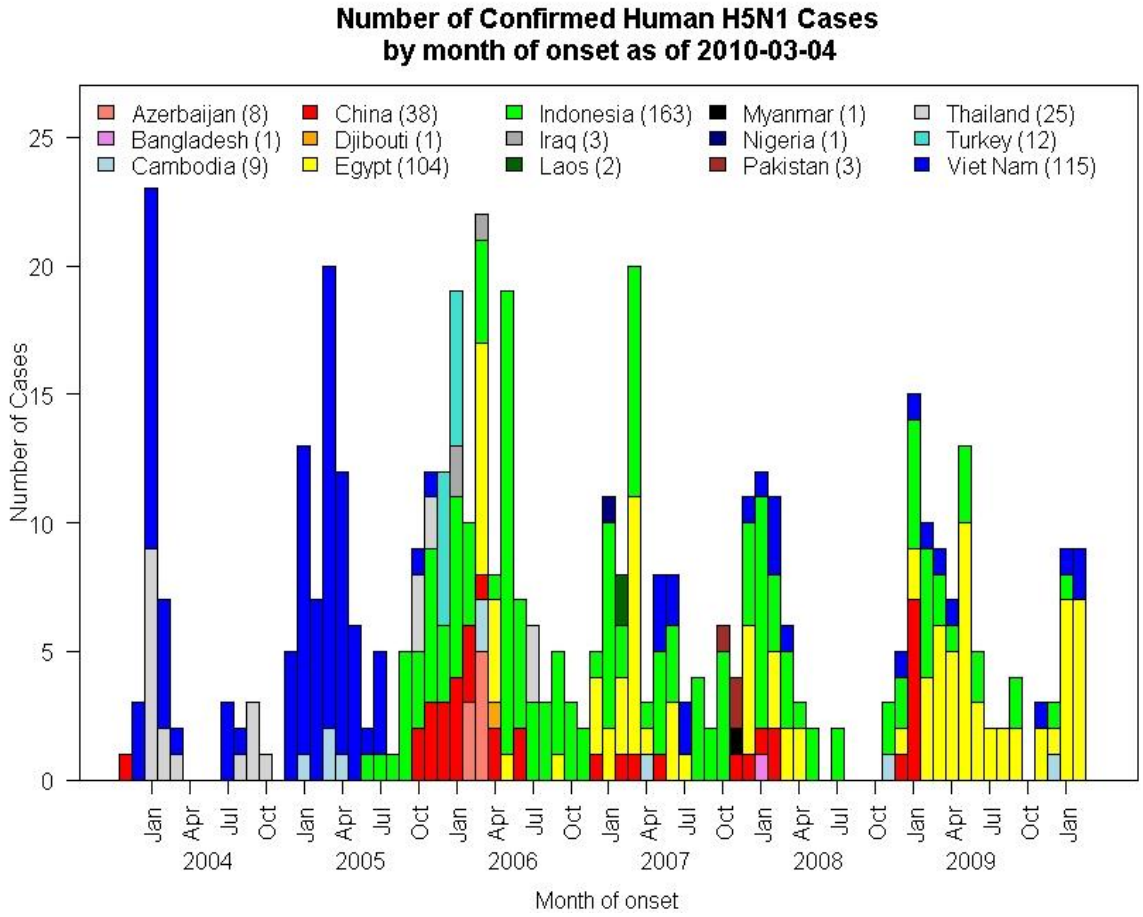


Source: WHO

While the numbers of males and females infected with H5N1 AI has 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 in age from 6 months to 57 years, with a median age of 5 years. A disproportionate number of young cases were reported from Egypt in 2009 (when 79 percent of all infected individuals were younger than 10 years old). The overall case fatality ratio (CFR) for 2009 was 44 percent, lower than the preceding 2 years, but similar to what was observed in 2005. Case Fatality Ratios (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[12].

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 2 family members and with no sustained human-to-human transmission were documented in 2009.

Figure 1-7: Number of confirmed cases of human infection with H5N1 Avian Influenza



Source: WHO

1.1.3 Overview of Pandemic Influenza A (H1N1) 2009

In April 2009 a novel Influenza A (H1N1) virus emerged in Mexico and the United States. On 25 April 2009, the Director General of the World Health Organisation 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 6 weeks.

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 United States

(peaking in late June), and United Kingdom (peaking in mid July). Continental Western Europe also experienced large community outbreaks during this period but not to the same degree as in the U.K. 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 influenza H1N1 appeared and became the predominant strain, resulting in a second period of influenza last winter which peaked during early August.

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 United States, Mexico, and Japan, began to experience an 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 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 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, but as of January 2010 active transmission persists. Levels of illness have yet to return to seasonal baselines. 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 persists as of 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, have reported the arrival of the pandemic virus and peak transmission rates at various times. The surveillance data needed for pandemic monitoring are not available in most countries.

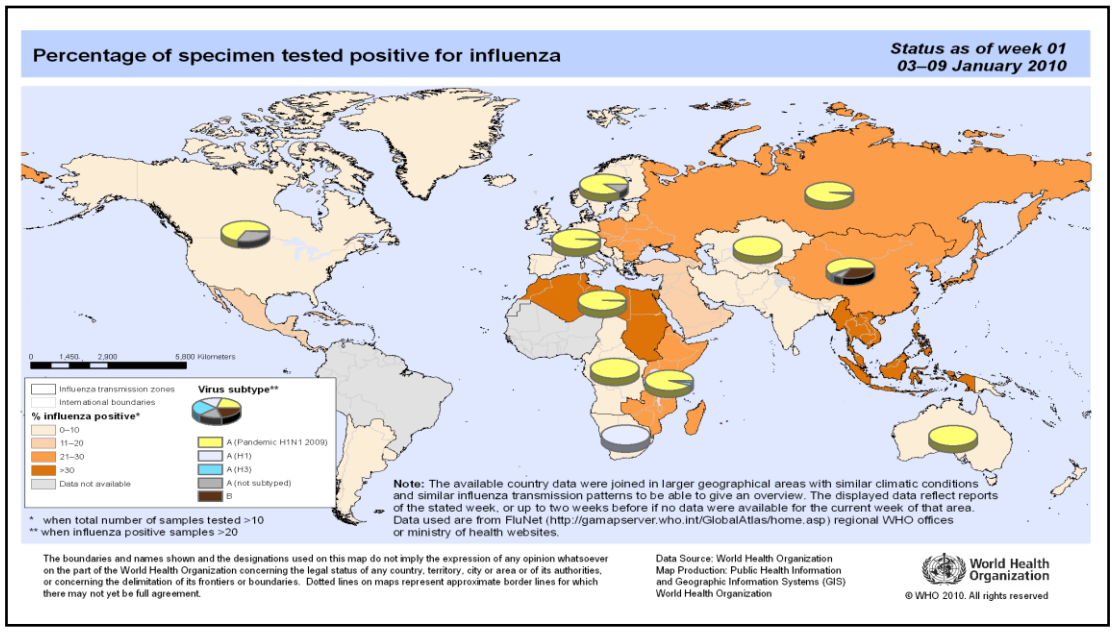
Current global distribution and intensity of circulation of influenza viruses as of January 2010

Pandemic (H1N1) 2009 has now been confirmed in almost all countries. As of 12 April 2010[13], at least 213 countries have reported laboratory confirmed cases, including at least 17,700 deaths reported from 125 countries[14].

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.

In January 2010, pandemic (H1N1) 2009 was the predominant circulating influenza virus worldwide. It accounted for more than 99% of influenza A virus detections (See figure 1-8).

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



Source: WHO

1.1.4 Pandemic (H1N1) 2009 situation in animals

Since April 2009, the pandemic (H1N1) 2009 virus has been confirmed in six different animal species (swine, turkey, cat, dog, ferret, and cheetah). To date the virus has caused only mild clinical signs in animals. Infection has been confirmed in commercial swine herds in 21 countries, including Canada, Argentina, Australia and Serbia (See figure 1-9: Confirmed animal cases with confirmed Pandemic (H1N1) 2009 Influenza Virus).

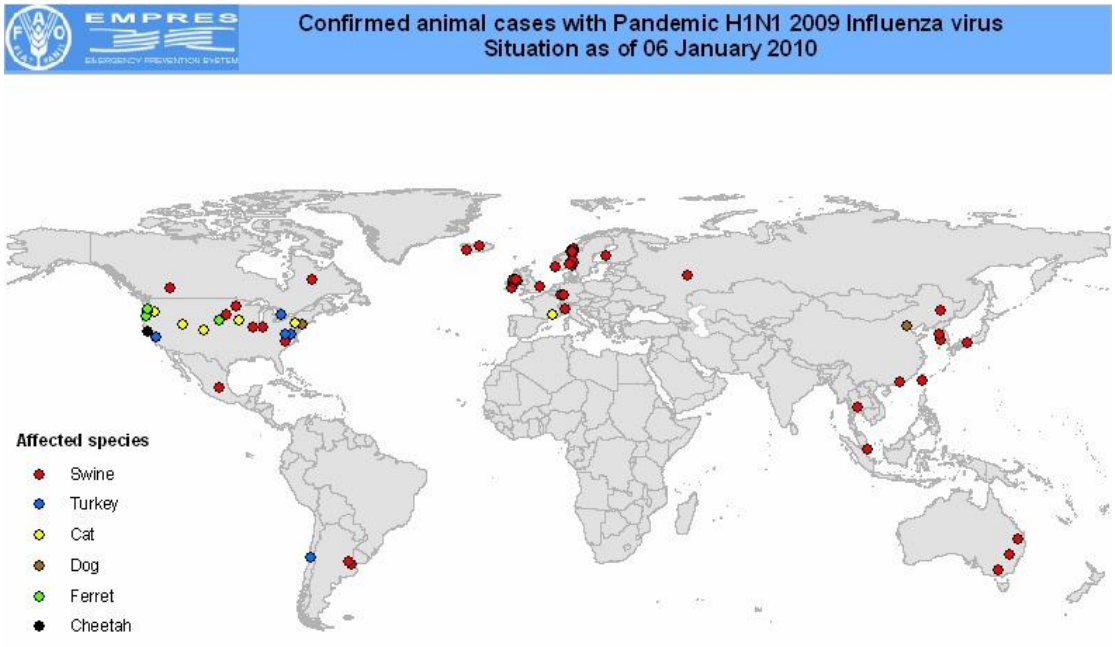
It appears to have been introduced to swine herds by infected humans. It is possible that the virus has also spread to other swine holdings through movement of incubating, sick or virus-shedding pigs. Given the mild symptoms, only those countries with active surveillance systems and laboratory testing have detected and reported the infection in commercial piggeries; surveillance programmes have not targeted backyard pigs.

A number of other species have been found positive to pandemic (H1N1) 2009; farm animals such as turkeys, with outbreaks reported in Chile, Canada and USA; ferrets and cats in the USA and France, dogs in China and the USA, and a cheetah in a zoo in California, USA. Deaths associated with pandemic (H1N1) infection have been reported in cats and other feline species.

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.

Figure 1-9: Confirmed animal cases with confirmed Pandemic (H1N1) 2009 Influenza Virus



Source: FAO EMPRES-1

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: 27 Immediate Notifications have been submitted to the OIE.

1.1.5 Pandemic Influenza A (H1N1) 2009: overview of impacts

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

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

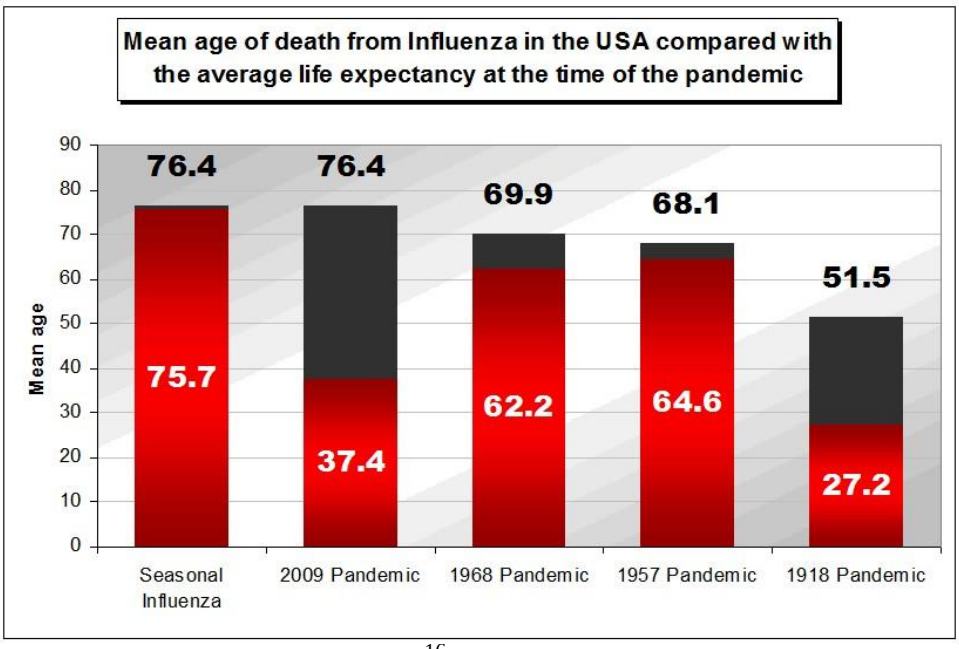
Fatal case reporting based on laboratory confirmed cases averages about 8 to 10 deaths per million infected people. This represents a significant undercounting. Asia and the Americas regions, and Europe/Eurasia regions have reported the most cases and deaths.

Anecdotes 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 (with seasonal influenza as many as 75% 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 50-64 (median 35-51) – in stark contrast to seasonal influenza where around 90% of deaths occur in the frail elderly, who often suffer from one or more chronic medical conditions. A recent study of the mortality burden of pandemic (H1N1) 2009 in the USA 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). [15]

Figure 1-10:



Source: PLoS Currents: Influenza[16]

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 are likely to be disproportionately impacted by pandemic (H1N1) 2009. Observed numbers of deaths per million from pandemic (H1N1) 2009 for a developed country is 10, on average, but for sub-Saharan Africa the HPA study suggested that a range of 100-200 deaths per million could occur as a result of pandemic (H1N1) 2009.

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 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[17] rates seen during recent previous influenza seasons in all age groups, except for persons >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.[18]

Over 45 countries have reported that the pandemic led to moderate strain on health services. Between July and December 2009, 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.[ii] The majority were least developed countries.

International support to reduce health system strain has been received by Argentina, Bolivia, Chile, Ecuador, Egypt, El Salvador, Guatemala, Haiti, Jamaica, Laos, Malaysia, Mexico, Nicaragua, Panama, Paraguay, Peru, Philippines, and Uruguay[iii]. 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 - in countries with limited resources for health

[ii] 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

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

care - high potential for the pandemic to put significant strains on health services leading to demand exceeding the care that is available.

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% 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 15 and 49 years, however, children under the age of 5 years have the highest risk of severe disease requiring hospitalization (See Figure 1). The rate of hospitalization in this group appears to be 2 to 3 times as high, and probably more, than the next highest age group. Of children under the age of 5 years, those under the age of 1 year are at even higher risk of severe disease. Many of these severe hospitalized cases occur in previously healthy infants. In contrast, the highest rate of death is in the group from 50 to 65 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% 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%.

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 pregnancy cases occur five times higher than cases 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]

If this trend continues, it is possible that the maternal mortality rate in sub-Saharan Africa might increase by 3-6% equating to an additional 30 to 60 deaths per 100,000. This could increase the 2007 MDG reported ratio of 900 maternal deaths to 930-960 per 100,000, resulting in a rate greater than the baseline rate reported in 1990 upon which progress towards the MDG target is measured (ref).

Indigenous peoples: There are few structured *sources of data* available to assess the impact of H1N1 on indigenous populations globally. Based on one recent study 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 1-2).

In Canada and the United States, indigenous populations represent less than 5% of the population, however, in Canada, indigenous groups accounted for 17.6% of hospitalized cases of H1N1 and in Arizona (United States) 17.5%. Variations also existed within these groups. Incidence of serve acute respiratory illness in Amerindians in Brazil, was 4.5 times higher than in the rest of the population. Australian aboriginal populations account for 2.5% of the total population, but accounted for 16.4% of all people hospitalized in Australia with pandemic (H1N1) 2009 during the first wave of the pandemic in Australia, and 11.5% 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]

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. As early treatment of high-risk individuals appears to result in better outcomes, this could increase 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.

Case Study 1-1: Reducing the Impact of H1N1 on Indigenous Communities

During the first wave of the pandemic in Canada, First Nations 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 6% 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.

Source: La Ruche and Tarantola et al.,[24], Zarychanski and Stuart, 2010[25], Johnson, 2010[26]

Impact on Animal Health and the Agriculture Sector

The major impact of H1N1 on animal health, agriculture and the environment occurred with the initial apportioning of blame to swine, 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-line.

Currently, "classical" 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 1-8: Confirmed animal cases with Pandemic Influenza A H1N1 2009 virus). It is not yet clear if pig infections with influenza H1N1 2009 will become routine, and whether this influenza strain will become established in the swine populations. The OIE continues to work with 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 an agreed understanding of the situation and messages to the public are agreed; and that contingency planning also takes account of human to animal transmission and potential impacts.

Impact on Transport & Tourism

Whilst WHO advised against travel restrictions, the UN World Tourism Organization (UNWTO) 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.

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 1-3). Immediately following WHO's 25 April 2009 declaration of a public health emergency of international concern, the Tourism Emergency Response Network (TERN) network were 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 ICAO, has been 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.

With an estimated two billion passengers travelling every year domestically and internationally by air, the civil aviation environment also poses particular challenges as is 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 International Civil Aviation Organization (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 Emergency guidelines, which incorporated public health emergencies into scenario planning. Further planning for systematic simulation exercises is needed to test plans and track progress.

Case Study 1-2: UNWTO 2009 International Review and Preparation Exercises: Madrid and the Bahamas

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 personally in their implementation.
Source: UNWTO [27] [28]

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, which helped them to ensure a measured response.

1.1.6 Other highly pathogenic influenzas of concern

Influenza A viruses emerge from the aquatic bird reservoir, adapt to humans, modify their severity and cause influenza. Of the 16 hemagglutinin subtypes, the H2, H5, H6, H7 and H9 viruses are those currently considered to have pandemic potential.[29] Poultry outbreaks caused by HPAI and LPAI viruses of the H7N1, H7N2, H7N3, H7N4, and H7N7 have taken place in recent years, amounting to more than 75 million birds.[30] Subtypes H7, H9, H1 and H3 have sporadically infected humans or have the potential to do so (See Annex 1: 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 the Netherlands, Italy, Canada, the United States and the United Kingdom. Clinical illness ranges from conjunctivitis to mild upper respiratory illness to pneumonia and death[31].

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[32].

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[33].

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.[34] H9 vaccines have been used in several countries including Pakistan, Iran, China, and countries in the Middle East.[35]

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% in the affected holdings, while the morbidity has averaged approximately 25% (ranging from less than 1% to 97%). While no human infections associated with this particular viral strain have been reported to date, investigations are continuing to evaluate the virus' potential for infecting humans[36]. It should be noted that H3N2 viruses have been responsible for human (for example, the 1968 Hong Kong influenza; See Paper 3, figure 3-1) and animal disease (prevalent in swine in Europe and North America) for decades[37].

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 our understanding of avian viruses. Application of this knowledge and improved surveillance will strengthen assessment of other HPAI and LPAI viruses with pandemic potential, improving our ability to respond to and reduce the severity of future pandemics, regardless of virus subtype[38]

1.2 Overview of progress in strengthening capacity to address animal and pandemic influenza since 2008

1.2.1 Political Commitment

Participants at IMCAPI 2008 (Sharm el Sheikh, Egypt), expressed determination to continue efforts for multi-sectoral, multi-level and multi-country pandemic preparedness, building upon the Avian and Pandemic Influenza efforts to address risks associated with emerging diseases of animal origin. Since 2008, much work has been done to address priorities through international, regional, national and local levels.

The past two years has seen ongoing engagement through international and regional organizations towards pandemic preparedness and response. Efforts to expand and strengthen international partnerships have continued, several elements of which have been captured by the UN Secretary General Ban Ki-Moon's call for "New multi-lateralism"[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, and 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 the 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. A lack of sustained attention has led to underinvestment in some areas of detection, prevention, preparedness and response capacity.

1.2.2 Collaboration – political, private sector, civil society and academic

The efforts by the international community and governments around the world to address pandemic influenza A (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 (an overview of this work is included at 1.2.3). This work has been coordinated by the UN System Coordinator, with a steering committee comprised of heads of UN agencies. International collaboration to progress One Health approaches (Winnipeg Technical Meeting, March 2009) with support from the Government of Canada has also been a notable step 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 World Bank 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 European Union (December 2009), and the ASEAN Plus Three EID Programme supported by the Australian Government since 2003. This has involved close engagement between governments and UN agencies including WHO, FAO, UNICEF and OIE 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 for cross-border surveillance.

Case Study 1-3: ASEAN'S Regional Mechanisms in the Midst of Pandemic (H1N1) 2009: an example of regional cooperation and pandemic response

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 multi-sectoral collaboration, information sharing and multi-country 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 multi-sectoral cooperation in the region. This work is linked to a regional Agreement on Disaster Management and Emergency Response (2009).

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. For example, a project was developed to stockpile antivirals and personal protective equipment, in the event of a pandemic.

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 multi-sectoral cross-border outbreak investigation, exercise management training programs and coordination across laboratory networks through the ASEAN Plus Three Partnership Laboratories.

Source: ASEAN Secretariat

Public-private partnerships have also been further developed in some regions. For example, a new program 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 Case Study 2-10, Paper 2). FAO has also been working with the private sector in some countries to strengthen compensation frameworks for livestock losses.

Civil society engagement has been achieved by 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 recent programs 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, do however, note 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.

1.2.3 Challenges over the past year (since IMCAPI 2008)

It is fortunate that pandemic (H1N1) 2009 did not seriously aggravate the economic downturn. Had the incidence of the disease been more severe, consequences to the economic recovery could have been greater[iv]. 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 2009A drop in international tourism reduced external revenue by as much as US$1.5 billion.

Global interconnectedness continues to be an important factor when addressing issues such as pandemics. According to the January 2010 UNWTO World Tourism Barometer, in 2009 there were an estimated 880 million international travel arrivals, meaning an average of more than 73 million international travels every month. This interconnectedness is also evident by the rapid global spread of the Pandemic (H1N1) 2009.

The response to the pandemic has also demonstrated **international collaboration** in the face of a global threat. Regional organizations such as ASEAN have devoted significant resources to enhancing pandemic preparedness in the South East Asia region.

Significant **scientific and technological development** continues to shift human capacity towards a greater understanding of genetic and pharmaceutical solutions.
Recent technological advances have led to the increased practice of molecular epidemiology, (the ability to use the genetic code of viruses with epidemiological tools to combat disease). This allows for a greater understanding of genetic differences

[iv] The World Bank has estimated that a severe flu pandemic could reduce world GDP by 4.8 percent, or about US$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).

between viruses, and can provide answers to questions regarding transmission dynamics between species.

1.2.4 Progress with capacity building for avian and pandemic influenza

The international community, governments and the private sector have continued efforts to strengthen capacity for responding to and preparing for avian 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. Concerted efforts are still required to focus on areas where viral transmission persists, and eliminate H5N1 in domestic poultry to prevent human cases.

Further work is also required to develop, test and update pandemic plans – particularly for non-health sectors. 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. Increased efforts are needed to strengthen prevention of emerging diseases at the animal-human interface; this was progressed at a technical level during 2009. Further research and development initiatives are also needed, with greater levels of multidisciplinary and cross-sectoral engagement required.

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 multi-year funding investment fulfilled by development partners as well as governments.

One major area that has not been progressed since IMCAPI 2008 is the development, standardization and utilization of indicators to enable more quantitative analysis of progress. This still requires substantial 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, and there is little evidence available to provide a reliable assessment of progress[42].

The seven key objectives of the UN Consolidated Action Plan for Animal and Human Influenza provide a framework for an update of current status and contributions to avian and pandemic influenza over the last reporting period.

Animal Health and Bio-security

FAO and OIE have worked with governments to strengthen capacity of veterinary services to respond to animal health concerns and the establishment of adequate bio-security standards in small, medium and large poultry production systems worldwide. The PVS and Gap Analysis Pathway provides a long term mechanism for improving in a sustainable manner animal health systems. 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.

There is **minimal funding available for laboratory diagnostics** in many countries; OIE has 7 Laboratory Twinning Projects for avian influenza underway for Avian Influenza and Newcastle Disease, and 2 further projects have been approved and are due to start in 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 World Bank, 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 WHO's International Health Regulations (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

Coordination efforts by UNDP, UNSIC, OCHA 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.

Communication: Public Information & Supporting Behaviour Change

Communication remains an area which requires significant support across animal, human and environmental health stakeholders. Outbreak communications for H5N1 and H1N1 in poultry and humans, and behaviour and social change communication improvements have lead to **increased knowledge and promotion of the adoption of protective practices**. This has been a focus for several UN 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, following intensive and wide-scale communication interventions in 2007-2008 which used both mass-media and face-to-face communication in Egypt, an Egyptian Demographic Health Survey indicated that 99 per cent of the population knows about avian influenza.[v] 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.

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.

Despite 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.

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 on logistics, to strengthen national capacities during a pandemic as well as continuation of humanitarian services support.

Business Continuity Planning (BCPs) is at the heart of the multi-sectoral whole-of-society approach to pandemic preparedness. (In addition to preparing essential sectors for critical functioning during potential severe disruptions of inter-dependent services:

[v] Fatma El-Zanaty and Ann Way, *Egypt Demographic and Health Survey 2008*, Ministry of Health with support of UNICEF and USAID, Cairo, 2009.

health, energy, transportation, food, water and sanitation, law and order, defence, financial services and telecommunications). The H1N1 Influenza Pandemic has created an upsurge in national governments' and the UN system's preparedness activities to address the potential humanitarian impact caused by the 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**[vi].

Two main challenges that many countries face when addressing pandemic preparedness are: 1) the perception that pandemics only impact on human and animal health, and 2) a continuing lack of clarity of the necessity for holistic society-wide multi-sector 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 who are already coping with more immediately pressing challenges, such as food insecurity, access to water, and other major issues.

The World Food Programme (WFP) made significant progress in enhancing pandemic readiness. Nine WFP Pandemic Preparedness Plans were developed for priority operations, and a number of tools, specialised logistics assessments, operational continuity planning and geospatial tools were developed to prepare for continued operations under pandemic conditions. During this period, many national governments also made progress with further developing their multi-sector pandemic preparedness plans.

Most **African** countries report inclusive coordination mechanisms incorporating key actors. However, lack of finance and resources has limited implementation of pandemic plans in Africa. 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 Disaster Management and Mitigation Unit (DMMU), Office of the Vice President, Zambia, WFP conducted a simulation exercise in Zambia, in November 2009, to test previously developed pandemic preparedness and response guidance. The four day exercise sought to validate and enhance practical guidance for logistics operations in Zambia during a severe pandemic, to review national coordination mechanisms and to

[vi] 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 multi-sectoral preparedness, while further 19 percent have a degree of medium preparedness. An estimated total of 68 percent of national plans have very little multi-sectoral preparedness developed or none at all.

identify opportunities for strengthening the broader emergency response capacity of the Government of the Republic of Zambia.

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 different stages of the inclusion of multiple sectors in terms of the planning and implementing the plans 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 multi-sector coordination mechanisms. However, most countries have not yet addressed business continuity planning for essential services. In addition, implementation of the pandemic plan has not yet reached sub-national or local levels or remote communities.

Europe and Central Asian countries report various levels of multi-sector preparedness across the region, with high level of preparedness in the richer European Union (EU) countries, moderate preparedness in the new EU and Accession States, through to low levels of preparedness in the resource-poor, typically GAVI-eligible countries.

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

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.

Case Study 1-4: Pandemic preparedness exercise, Uganda 2009

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 H1N1 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.
Source: WFP

1.3 Conclusions

1.1 Overview of animal and human pandemic influenza

H5N1 Highly Pathogenic Avian Influenza (HPAI):

- 62 countries have experienced disease events of H5N1 HPAI in domestic poultry and wild birds since 2003. However since 2008 only 14 countries have reported disease outbreaks and no new countries 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 476 human H5N1 HPAI confirmed cases, and 284 deaths reported in 15 countries.
- With almost double the number of confirmed human H5N1 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 public health concern.
- 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 Influenza A (H1N1) 2009

- On 25 April 2009, a novel influenza A (H1N1) virus emerged from Mexico and the United States. As of 28 February 2010, at least 213 countries have reported laboratory confirmed cases of Pandemic Influenza A (H1N1) 2009, including at least 16,455 deaths in 125 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. Six different animal species have so far been infected by the virus.
- Assessment of the full impacts of Pandemic Influenza A H1N1 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) influenza including younger age groups (15 – 49 years), 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 virus. However, to date swine have played a negligible role in the transmission of the virus to humans.
- Transport and tourism sectors experienced negative impacts, with flow on effects for economies in affected countries during 2009. The pandemic had limited impacts on the financial sector, though precautionary measures were taken to reduce potential impacts.

- Recent experience with Pandemic Influenza A (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 highly pathogenic influenzas of concern

- Viruses emerge from the aquatic bird reservoir, adapt to humans, modify their severity and cause influenza. 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.

1.2 Overview of progress in strengthening capacity to address animal and pandemic influenza since 2008

Challenges over the past year (since IMCAPI 2008)

- The financial downturn has placed pressure on resources and has in some countries constrained capacity building activities – particularly for preventative and preparedness type activities
- The global food crisis and ever rising human populations has placed pressures on food production. The immediacy and the scale of the urgent food needs in many countries has had meant that investments in longer term capacity for biosecurity and strengthening of healthy poultry production has had to take a lower order of priority over urgent food production needs – particularly so in household and back yard settings.
- Pandemic (H1N1) 2009 has provided opportunities to scale up readiness and to test systems. However, as the predominate focus of the response to pandemic H1N1 has been within the health sector, investment in preparedness in other non health sectors has been less – and in some cases resources have had to be diverted from non health sector activities to support health services and urgent pharmaceutical needs.
- The complexity and interlinked nature of global issues reflects the growing need for an interdisciplinary and systematic view of the major economic, political, societal, environmental, epidemiological and technological changes ahead. Factors predisposing to risk for Influenza A and other emerging and re-emerging diseases continue to increase. They include urbanization, population growth, increasing demand for animal protein, intensive livestock production, trade, people movement, global warming and/or variability, and environmental degradation.

Political Commitment and Collaboration

- The past two years has seen ongoing engagement and collaboration through international and regional organizations towards pandemic preparedness and response. Efforts to expand and strengthen international partnerships have continued.
- 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 been progressing in some regions.

- Commitments to one health approach expressed at the IMCAPI in 2008, were further developed during a meeting 'Expert Consultation on One World One Health' in Winnipeg, March 2009.
- 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 was only 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 avian and pandemic influenza

- 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.
- Early warning systems have improved and improved implementation of the International Health Regulations 2005 has resulted in improved capacity for detection, assessment, notification and response to public health threats.
- The response to H1N1 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 is better prepared to respond to the current pandemic, and can continue to learn from Pandemic Influenza (H1N1) 2009 for future preparedness.
- 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.
- Communication remains an area for significant improvement, particularly for the prevention of animal-to-animal transmission of disease agents. FAO is advocating 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.
- Increased attention is required for the development, standardization and utilization of indicators, to enable more quantitative analysis of progress.

1.4 Appendices

Annex 1: Confirmed Avian Influenza A Virus Infections of Humans

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, Vietnam	2003 – 04	H5N1	HPAI	50	Respiratory, pneumonia
Cambodia, China, Indonesia, Thailand, Vietnam	2005	H5N1	HPAI	98	
Azerbaijan, Cambodia, China, Dijbouti, Egypt, Indonesia, Iraq, Thailand, Turkey	2006	H5N1	HPAI	115	
UK	2006	H7N3	LPAI	1	Conjunctivitis
Cambodia, China, Egypt, Indonesia, Laos, Myanmar, Nigeria, Pakistan, Vietnam	2007	H5N1	HPAI	86	
UK	2007	H7N2	LPAI	4	Conjunctivitis, respiratory
Hong Kong	2007	H9N2	LPAI	1	Mild signs of disease

Sources: Belser, JA, Bridges, CB, Katz, JM, Tumpey, TM. 2009. Past, Present, and Possible Future Human Infection with Influenza Virus A Subtype H7. *Emerging Infectious Diseases 15:6;* CDC. 2008. Avian Influenza A Virus Infections of Humans. http://www.cdc.gov/flu/avian/gen-info/avian-flu-humans.htm

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