

WORLDWIDE SITUATION

Two hundred and fifty-four H5N1 HPAI outbreaks in poultry occurred officially worldwide during January 2010, in Bangladesh, Cambodia, Egypt, India, Indonesia, Israel, Nepal and Viet Nam. No wild bird cases were reported during January 2010. The number of reported outbreaks/cases by country and their location are illustrated in Figures 1 and 2, respectively. The evolution of the number of outbreaks/cases by species group (wild or domestic) is represented in Figure 3.

FIGURE 1
H5N1 HPAI outbreaks/cases in poultry and wild birds in January 2010
(Source: FAO EMPRES-i)

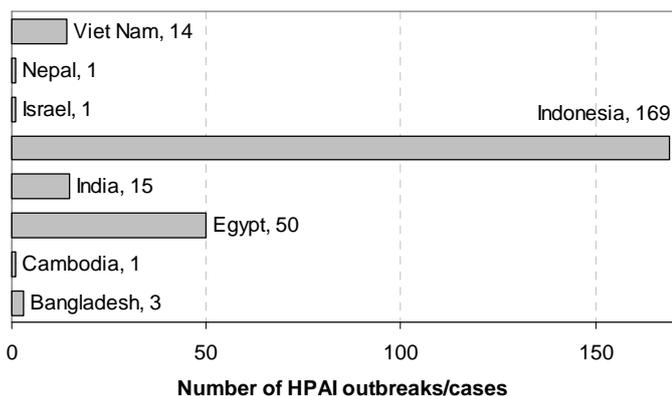
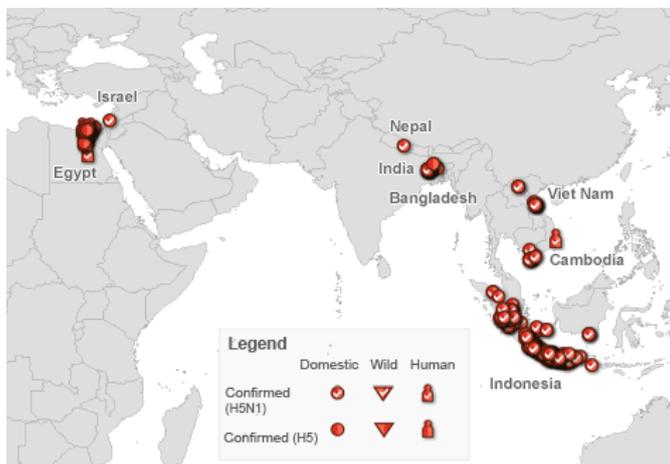


FIGURE 2
H5N1 HPAI outbreaks/cases reported in poultry, wild birds and humans in January 2010
(Source: FAO EMPRES-i)



NOTE: H5 cases are represented for outbreaks where N-subtype characterization is not being performed for secondary cases or if laboratory results are still pending. Countries with H5 and H5N1 occurrences only in wild birds are not considered infected countries according to OIE. The original data have been collected and aggregated at the most detailed administrative level and for the units available for each country.

FIGURE 3
Weekly number of H5N1 HPAI outbreaks/cases in poultry/wild birds between August 2009 and January 2010
(Source: FAO EMPRES-i)

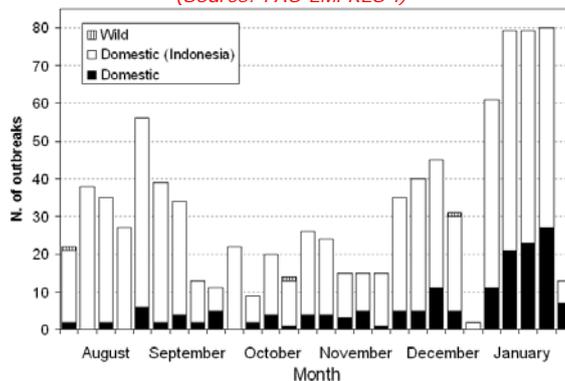
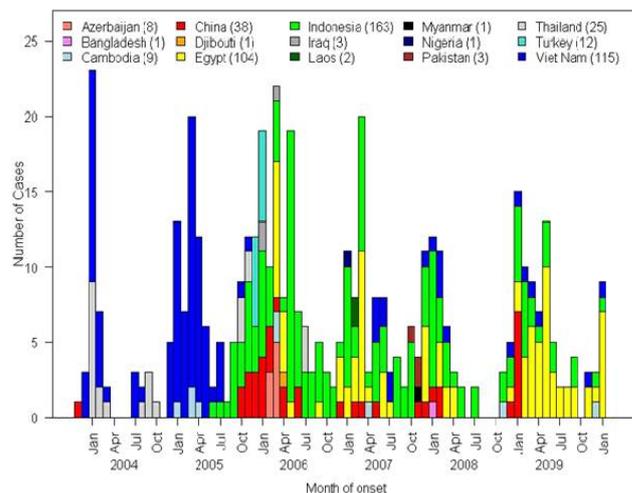


Figure 4 shows the confirmed cases of H5N1 infections in humans reported to the World Health Organization (WHO) by country over time. Between November 2003 and 31 January 2010, 476 human cases of H5N1 infection were reported to WHO from 15 countries, of which 286 died, a case fatality rate (CFR) of 60%. Among the countries with more than ten reported cases, Indonesia had the highest CFR of 83% (135 out of 163). Age distribution of the reported human cases in all countries ranged from three months to 81 years of age (median 19 years of age), with 91% (412 out of 455) of patients being 39 years of age or younger. The highest CFR was among persons between ten and 29 years of age and the lowest was among persons aged above 50 years. Gender was equally distributed (232 female cases out of 447, or 52%). Indonesia did not report on the age and gender of the 2009 cases.

In 2008, 44 cases (33 fatal - 75%) were confirmed, with Indonesia reporting the highest number of cases (24 cases, 20 fatal), followed by Egypt (eight, four fatal), Viet Nam (six, five fatal), China (four, all fatal), Cambodia (one) and Bangladesh (one). In 2009, 73 cases (32 fatal - 44%) were reported: 39 from Egypt (four fatal), 21 from Indonesia (19 fatal), seven from China (four fatal), five from Viet Nam (all fatal) and one from Cambodia. (Source: Western Pacific Regional Office of WHO, 19 February 2010, Avian Influenza Update Number 222). As of 31 January 2010, eight human cases have occurred: seven in Egypt (three fatal) and one fatal case in Indonesia.

FIGURE 4
Confirmed cases of H5N1 AI infections reported in humans by country and month of onset since November 2003
(Source: World Health Organization - WHO)

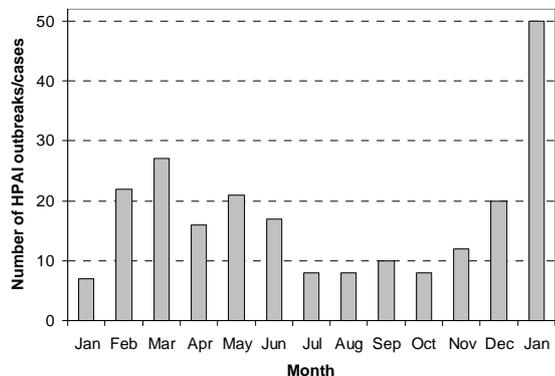


SITUATION BY CONTINENT/REGION

Africa

Confirmed outbreaks of H5N1 HPAI in Africa (Egypt) over the last six months are presented in Figure 5.

FIGURE 5
H5N1 HPAI outbreaks in poultry in Africa (Egypt) between January 2009 and January 2010
(Source: FAO EMPRES-i)



Egypt reported the first H5N1 HPAI outbreak in February 2006. Despite a vigorous initial response to the disease, including the culling of over 40 million birds, Egypt is considered as an endemic country where outbreaks are regularly reported from different governorates. In January 2010, 50 H5 HPAI outbreaks were observed in poultry (chickens, ducks and geese) from Beni-Suef (6), Dakahlia (15), Gharbia (6), Sixth of October (2), Kafr-el-sheikh (3), Menia (2), Menoufia (7), Qalubia (5), Port Said (2) and Sharkia (2) governorates. Of these, 48 outbreaks (96 %) were reported from the household poultry sector. Thirty-six of the 50 outbreaks occurred in non-vaccinated birds and five in vaccinated birds, while the vaccination status of the remaining outbreaks remains unknown. During January 2010, Community Animal Health Outreach (CAHO) teams visited 72 villages in eight governorates and detected 24 (48%) of the above-reported confirmed outbreaks. CAHO teams operate in high-risk governorates and collect samples only from suspected cases.

During winter, the National Laboratory for Quality Control on Poultry Production (NLQP) and the General Organization for Veterinary Services (GOVS) with support from FAO, conducted surveillance activities targeting both poultry and migratory wild birds around selected important bird areas (IBAs). In January 2010, 2 000 duplicate samples were collected from domestic ducks around Lake Manzala in Dakahlia, Damietta and Port Said governorates, where three (6%) of the 50 outbreaks occurred.

Poultry farms are required to test their birds and receive certification (HPAI infection negative status) prior to any planned transportation. During January 2010, 2 281 samples were collected for this purpose and confirmed to be negative for HPAI. In Egypt, compliance with certification for poultry transportation is generally sub-optimal, as only registered farms (<20 % of the farms) seek such services.

During January 2010, 116 farms in five governorates were subjected to active surveillance and no HPAI infections were detected. On the other hand, two of the nine HPAI notifications (passive surveillance) received from commercial poultry farms were found positive for H5 HPAI.

By way of active surveillance, 13 out of 54 household poultry units sampled in nine governorates were confirmed as H5 HPAI. Conversely, 35 of the 90 suspected outbreak notifications (passive surveillance) from 12 governorates were confirmed to be due to H5 HPAI. Besides this, 27 samples collected at road check points were all found to be negative for HPAI.

The current government policy is to allow commercial poultry farms to vaccinate their flocks with registered vaccines of their choice. Although there are no official vaccination data, it is assumed that vaccines are widely used in the commercial poultry sector. All AI vaccines used in Egypt (at least 21) are inactivated (mostly H5N2) and imported. The government was providing vaccination to household/village poultry free of charge. However, as of July 2009, vaccination in household poultry settings was provisionally suspended until further notice. This decision was made after three years of a mass AI vaccination programme, with an apparently limited or no impact on H5N1 HPAI incidence. Despite the continuous vaccination of poultry against HPAI, poultry outbreaks and human cases are reported regularly. A recent assessment study conducted by FAO and GOVS, in the framework of the Strengthening Avian Influenza Detection and Response (SAIDR), revealed that vaccination coverage was under 20% and flock immunity under 10% in the household sector. The study also highlighted substantial weaknesses in the current immunization programme, mainly due to the difficulties of blanket vaccinations in the semi-commercial and household poultry sectors, lack of sufficient funding and communication support, absence of an efficient monitoring system, and inadequate training of field technicians. More information is available in Peyre *et al.* (2009) at <http://www.libpubmedia.co.uk/MedJ-Issues/Issue-5/Peyre.pdf>.

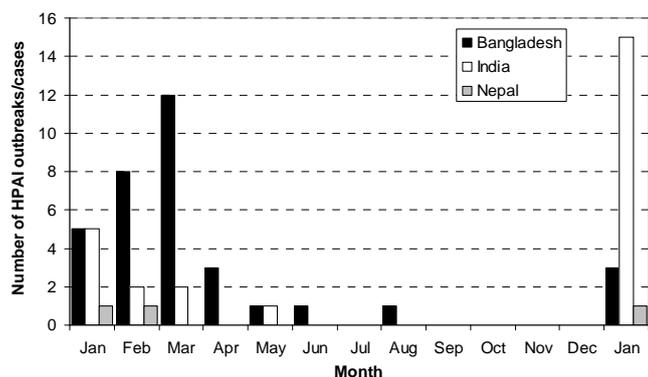
Live bird markets (LBMs) are key links between commercial and household poultry sectors. Egypt has recently implemented bans on selling live birds in open markets (Law 70/2009, MOALR MD 941/09), but the ban has had little effect and LBMs continue to operate. Some governorates are enforcing decrees related to the banning of unregistered poultry farms and control of bird movements. Enforcement varies from one governorate to another, but is generally weak.

In January 2010, seven human avian influenza A H5N1 cases were reported: in a 37-year old male from Helwan Governorate (fatal), a 40-year old female from Qalyubiya Governorate, a 29-year old female from Menoufia Governorate (fatal), a 20-year old female from Beni Suef Governorate (fatal), an 18-month old male from Dakahlia Governorate, a 3-year old male from Assuit Governorate, and a 45-year old male from Sharkia Governorate. Investigation revealed that most had had close contact with sick or dead poultry. Of the 97 laboratory-confirmed cases of influenza A H5N1 reported in Egypt since the beginning of the epidemic, 30 have been fatal (31%). Compared to 2009, when most cases were in children under four years of age, five out of the seven human infections so far in 2010 have been in adults. The observed CFR is also higher so far in 2010 (43% compared to 10% in 2009, although it had decreased from 50% in 2008). The relative increase in H5N1 HPAI outbreaks in poultry (50 in January 2010 compared to seven in the same month in 2009) is a result of the improved surveillance and reporting rate, mainly because of the effectiveness of CAHO.

South Asia

FIGURE 6

H5N1 HPAI outbreaks/cases in poultry and wild birds in South Asia, by country, between January 2009 and January 2010
(Source: FAO EMPRES-i)



In **Bangladesh**, after four months without any reported H5N1 HPAI event, three outbreaks occurred in Jaipurhat (2) and Sirajgonj. The first outbreak was noticed on 4 January at a commercial farm at Khetlal Fakirpara, a sub-district in Joypurhat District in the north-west of the country, bordering West Bengal of India. The second outbreak, on 23 January 2010, was also at a commercial farm in the same sub-district, less than half a kilometre away from the first outbreak. The third outbreak took place on 25 January 2010 at a commercial farm in Ranigram, Sirajgonj District. The authorities immediately took action and destroyed the infected birds at the epicentre in all three outbreaks. Viral samples, including three samples isolated in 2010, were shipped for sequencing to the OIE/FAO Reference Laboratory for Avian Influenza and Newcastle Disease in Padova, Italy.

As of 31 January 2010, a total of 329 outbreaks had been recorded in 47 out of 64 districts on both commercial farms and in backyard holdings and nearly 1.7 million birds had been culled. Poultry vaccination against H5N1 HPAI is prohibited by the government. FAO is coordinating and supporting active surveillance that has been expanded to 260 upazillas (sub-districts) across the country, including the innovative use of the Short Message Service (SMS) gateway (method of sending and receiving SMS messages between mobile phones and a computer) as a reporting tool. Daily, in each Upazilla three community animal health workers employed by the active surveillance programme send SMS coded text messages to the Department of Livestock Services, reporting disease and death in poultry. SMS messages of suspected AI events are automatically forwarded to the livestock officer in the area, who starts an investigation. In January, 21,707 SMS messages were received, including 24 suspected HPAI events in backyard poultry and 36 suspected AI events on commercial poultry farms. The veterinary investigations that followed discounted 48 of these suspect cases and on 12 occasions diagnostic specimens were collected. Of all specimens collected and reported through the SMS gateway system, only one tested positive for HPAI H5N1.

FAO has partnered with Wildlife Trust Bangladesh (WTB) and the United States Geological Survey (USGS) to undertake a wild bird telemetry project in Bangladesh. This project is also collaborating with the Bombay Natural History Society in India, which is placing identification rings on the legs of 30 avian species for additional tracking studies. Satellite-based telemetry consists of placing a backpack with a radio transmitter to a wild bird and tracking the emitted signals to map its daily movements. In Bangladesh, migratory birds stop over every year on their journeys along the 'Central Asian Flyway' and the 'East Asian-Australian Flyway'. Scientific evidence suggests that wild birds can be asymptomatic carriers of numerous avian influenza viruses. The project selected specific avian species that travel the

longest distance routes, for example from the Arctic to Bangladesh via Mongolia and the Himalayas. This year, it is planned that additional birds will be fitted with transmitters before the migration season starts. At present, it has been estimated that some 477 species of local and migratory birds reside in Bangladesh; of them 301 are thought to be resident species and 176 migratory species. The tagged birds are tested for avian influenza exposure or infections through blood and faecal samples before they are returned to their natural habitats. The data gathered will be used to assess the flight patterns, including altitude, routes and duration of flights, as well as the time spent at each location along their flyways. During their lengthy sojourns, birds will be continuously monitored to determine survival rates and retrospective correlation of stopover sites with reported disease outbreaks. This way, objective and verifiable evidence will be available to further elucidate the role of migratory birds in the spread of H5N1 HPAI, and if they pose a transmission and infection risk to domestic bird populations along their migratory paths.

In **India**, after no notification of outbreaks since 27 May 2009 (in West Bengal), H5N1 HPAI outbreaks were reported in Khargram and Burwan blocks of Murshidabad District in West Bengal, all in backyard poultry. The virus isolated from these current outbreaks has been sequenced and is similar to the virus isolates of 2008 and 2009 (Clade 2.2). To prevent the further spread, the state government immediately deployed Rapid Response teams (RRTs) to the affected areas for action, which included epidemiological investigation; stamping out of all domestic poultry in a 3-km radius zone around the outbreak followed by compensation to the poultry owners; launching of an intensive surveillance campaign in a 10-km radius zone in addition to closure of poultry markets; prohibition on the sale and transportation of poultry products in the infected zone; disinfection of premises after culling, and sealing of premises when appropriate. During the outbreak response, about 149 500 birds were culled and about 18 000 eggs were destroyed.

According to the last surveillance report, between 28 December 2009 and 7 February 2010, 17 419 active surveillance samples were received at the High Security Animal Disease Laboratory (HSADL), Bhopal. Testing was completed on 14 083 samples (some from the previous month), all but 20 (all from West Bengal) with negative results, and another 12 180 were under test or pending. The periodical reports (available at <http://www.dahd.nic.in/>) include the number of samples received and tested per state.

A three-year long Uttar Pradesh Forest and Wildlife Department project on "Migratory Movements of Waterbirds and Surveillance of Avian Diseases" has collected approximately 240 samples since January 2009, mostly from migratory bird species. Another 150 wild bird samples have been submitted from birds trapped at Chilika Lagoon, Orissa and Koothankulam Reserve, Tamil Nadu, as part of an FAO-facilitated satellite tag marking project (http://www.fao.org/avianflu/en/wildlife/sat_telemetry_india.htm). Samples were tested at HSADL and all were negative for the H5N1 virus. During December 2009, the project successfully marked 23 migratory waterfowl with satellite transmitters (seven Ruddy Shelducks, five Eurasian Wigeons, five Gadwalls, three Northern Pintails and three Garganeys). Feathers were also collected for genetic and isotopic analyses from the 23 marked birds. Swab samples (oral and cloacal) and blood samples were collected for avian influenza testing from 93 wild waterbirds and 47 domestic waterfowl. This study will be followed up by additional sampling in January 2010.

In **Nepal**, a new outbreak was reported in the Municipality of Pokhara, Kaski District, in which 138 backyard poultry (100 chickens and 38 ducks) died between 19 and 24 January 2010. An infected zone was demarcated and some 10 000 poultry culled in this area. The full picture of the clades of the virus involved is not available, but it is known that in addition

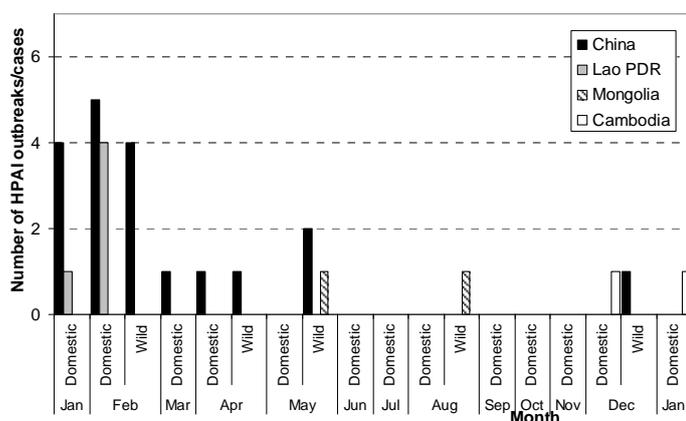
to the 2.2 Clade experienced one year ago in Nepal's eastern region, a further clade (2.3.2) not previously detected in Nepal has been recovered from the Pokhara outbreak. The Clade 2.3.2 viruses were most related to viruses isolated in wild birds in 2009 from the Russian Federation and Mongolia. The potential for wild bird introduction needs to be considered as a possibility. More distant Clade 2.3.2 viruses were also isolated in wild birds in Hong Kong SAR and in poultry in Viet Nam. The Clade 2.2 virus is closest to viruses from Bangladesh, but there is a great distance between this virus and the nearest reported relative in this tree. These are the first outbreaks in the country since early 2009, when two outbreaks were reported in Jhapa District, in what were the first two outbreaks ever reported in the country.

South East and East Asia

FIGURE 7

H5N1 HPAI outbreaks/cases in poultry and wild birds in East and South East Asia, by country (excluding Indonesia and Viet Nam), between January 2009 and January 2010

(Source: FAO EMPRES-i)



In **Cambodia**, from 3 January 2010, ducks started dying in Prolay Meas Village in Rominh Commune, Koh Andet District, Takeo Province, 10 km from the border of Vietnam. In total, 2 358 ducks died (44% mortality rate) out of a population of 5 400 ducks and 1 000 chickens. No chicken deaths were reported. The duck flocks were raised along the main road in rice fields/ponds with very low or non-existent biosecurity practices/measures. This is the first outbreak reported by a Village Animal Health Worker (VAHW) since January 2004. Culling, cleaning, and disinfection operations in a 1 km radius were conducted between 3 and 5 February 2010 and additional samples, all negative, were collected from ducks and chickens. Investigations are ongoing in a 10 km radius. The source of the outbreak remains unknown.

None of the virus sequences from the above outbreaks have been identified in public databases. So far, there are seven hemagglutinin (HA) sequences from Cambodia in the WHO unified nomenclature tree (http://www.who.int/csr/disease/avian_influenza/H5CompleteTree.pdf). Two are from human cases (2005 and 2007) and the rest from poultry (2004-2005). All are Clade 1. The viruses in southern Viet Nam have been predominantly Clade 1. Regarding the abnormally high mortality rate observed in ducks in Takeo Province (44%), a recent study found that viruses from Clades 1, 2.2, and 2.3.4 all caused mild symptoms and one virus from Clade 2.3.4 resulted in 100% mortality (Kim *et al.*, 2008 - <http://www.ncbi.nlm.nih.gov/pubmed/18786988>)

Cambodia routinely reports results obtained from surveillance activities through two hotlines supported by FAO at NaVRI. There is also ongoing duck market surveillance at 12 live bird markets in 11 provinces conducted by NaVRI (and supported by FAO) since 2007. None of the samples collected so far have tested positive for H5N1 HPAI.

In 1996, **China** first identified HPAI viruses of the H5N1 subtype in geese in Guangdong Province, and H5N1 HPAI viruses have continued to circulate and evolve since then. Almost 200 H5N1 HPAI outbreaks have been reported in poultry and wild birds in 29 provinces since 2004 and a total of over 35 million poultry have been culled to control the spread of the disease. While the year 2008 was marked by a slight increase in the number of cases in domestic poultry compared to 2007, only two outbreaks were reported in mainland China in 2009 (Xinjiang Autonomous Region in February and Tibet Autonomous Region in April 2009) and the last wild bird case dates from May 2009, showing a steady decrease in the number of outbreaks reported since the beginning of the epidemic in 2004.

However, official surveillance programmes demonstrated that H5N1 HPAI viruses continue to circulate in poultry in many provinces. The last national surveillance results released in November 2009 in the Official Veterinary Bulletin by the Ministry of Agriculture reported seven new viruses isolated from 23 962 samples in all provinces. The last positive report dates from October 2009, when the H5N1 HPAI virus was detected in chickens and ducks at three live bird markets in Hunan Province. There is an intensive on-going surveillance programme being conducted in Hong Kong SAR that covers dead wild birds, wholesale and retail market dead birds and faecal swabs and pre-sale antibody checks.

Mass vaccination against H5N1 HPAI has been implemented since November 2005 (more than 15 billion total production per year, with 5.5 billion permanent poultry population). Combined with other measures, it has succeeded in controlling the disease with an apparent reduction in the numbers of poultry outbreaks since 2004, although as mentioned above, the virus is still circulating in many provinces.

AI vaccines are provided free of charge by the government to both commercial poultry farms and backyard poultry breeders. China produces its own AI vaccines with ten manufacturers nationwide. Nowadays most birds receive the killed Re-5 regardless of species. The majority of poultry should receive at least two doses of vaccine (primary + booster), except for meat ducks and chickens with a very short production cycle.

This mass vaccination has been possible thanks to: (1) a robust and well designed AI vaccination strategy in place with comprehensive detailed plans at national and local levels; (2) strong, decentralized veterinary services; (3) large-scale involvement of all the stakeholders, including the private sector; and (4) intensive post-vaccination monitoring.

However, some issues remain, such as: (1) some discrepancies in the efficacy of the vaccines from laboratory validation and field application (e.g. lower efficacy in ducks and need for a booster dose in field conditions instead of a single dose protocol); (2) sub-optimal vaccination status and vaccine efficacy in waterfowls; (3) practical limitations regarding backyard vaccination in remote areas; (4) limitations of the surveillance system in terms of assessing the true vaccination coverage and addressing the issue of outbreak detection in vaccinated flocks and/or underreporting of an outbreak; and (5) long-term sustainability of such a mass vaccination strategy.

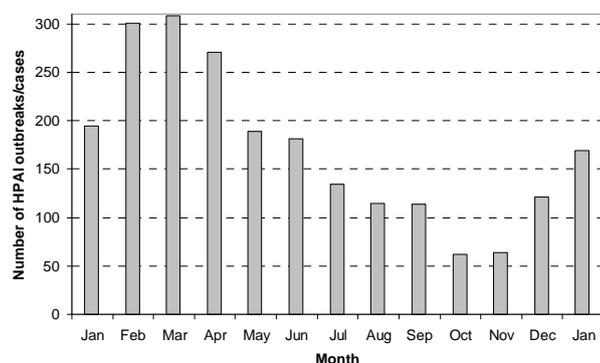
Virtually all of the identified clades of Asian-lineage H5N1 HPAI virus found so far globally have been detected in China. The main threats from wild birds include Clade 2.2 and Clade 2.3.2. Clade 2.2 viruses have circulated in wild birds predominantly in the north-west of the country since 2005, although such viruses were also found in South Korea and Japan in the winter of 2006-07. Clade 2.3.2 viruses have also been isolated from pikas (*Ochotona curzoniae*), a wild mammal, in Qinghai, China (as well as Clade 2.2 viruses). Clade 2.3.2 viruses have also been detected in South Korea (in poultry), Japan (in wild birds), the Russian Federation (in poultry exposed to viscera from wild birds in April 2008) and

in dead wild birds in Tyva Republic, bordering Mongolia (in 2009). An outbreak of Clade 2.3.2 was also observed in Mongolia, resulting in the death of many wild birds during the summer of 2009. Sequence information from isolates from Qinghai Lake in 2009 is still awaited. It is highly likely that a cycle of infection with Clade 2.3.2 viruses has become established in wild birds and could pose a threat to poultry in areas where wild birds and poultry are in close association. Viruses in other clades have also been detected in wild birds, including Clade 2.3.4 viruses from Hong Kong SAR.

No human cases were reported during January 2010. Since the beginning of the epidemic, China has reported 38 cases, of which 25 were fatal (65.8%). On average, fewer than ten human cases are reported each year (range 0 to 13 cases annually since 2003). The latest case confirmed by WHO was a year ago, when there was a concurrent sudden increase in the number of human cases from January through early February 2009 [in Hunan (3), Beijing (1), Shandong (1), Xinjiang (1), Guizhou (1) and Guangxi (1)], including in provinces where no poultry outbreak of viral infection had been recently or ever detected. Disease investigations carried out in the vicinity of these human cases remained inconclusive as for the origin of contamination in birds and raised questions about the existence of possible unnoticed outbreaks or asymptomatic viral excretion leading to human infection in backyard poultry farms or LBMs.

Indonesia continues to report a high number of H5N1 HPAI outbreaks in poultry (Figures 3 and 8), as it has for the past three years. H5N1 HPAI Clade 2.1 is confirmed to be endemic on the islands of Java, Sumatra and Sulawesi, and probably Bali, with sporadic outbreaks reported elsewhere. H5N1 HPAI prevalence by village varies widely. Only two of Indonesia's 33 provinces have never reported the occurrence of H5N1 HPAI. The high number of reports each month is partially explained by the implementation of the Participatory Disease Surveillance and Response (PDSR)* programme that targets village poultry production systems (mainly backyard) and reports evidence of virus circulation in the village. The programme is supported by FAO with USAID, AusAID and World Bank-implemented AHIF-PHRD financial support and is operating in 349 of 496 (70%) districts through 31 Local Disease Control Centres (LDCCs) in 27 (82%) of 33 provinces in Java, Sumatra, Bali, Sulawesi and Kalimantan, including all known endemic areas. Larger and less densely-populated provinces report HPAI outbreaks less often than more densely populated provinces.

FIGURE 8
H5N1 HPAI outbreaks in poultry in Indonesia, between January 2009 and January 2010
(Source: *Gol/ECTAD Indonesia*)



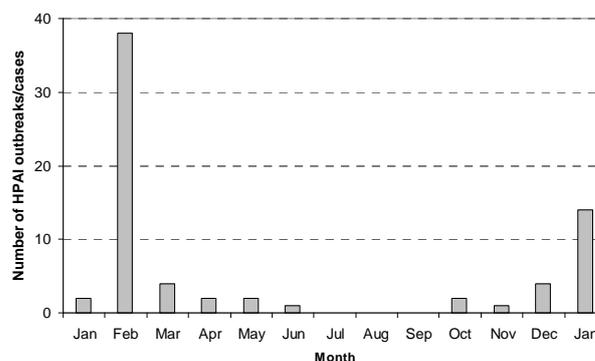
* In the event that more than one bird dies suddenly in a flock, with or without clinical signs, Participatory Disease Surveillance and Response (PDSR) teams carry out an influenza type A rapid test. A mortality event consistent with clinical HPAI and a positive rapid test in affected poultry is considered a confirmed detection of HPAI in areas where HPAI has previously been confirmed by laboratory testing.

During January 2010, PDSR officers visited 1 882 villages, of which 226 (12.0%) were infected (169 were newly found, while the remaining 57 carried over the infection status from the previous month). This infection rate is higher than the December 2009 infection rate of 7.0%. During the previous six months, PDSR officers visited 11 119 villages (16.6%) in the 349 districts under PDSR surveillance. Since May 2008, they have visited approximately 45.2% of villages under coverage. An average of 7.3% of the villages visited during the previous six months were classified as infected at the time of visit. Cases over the last six months were concentrated in provinces on Java (especially DI Yogyakarta) and Sumatra (Lampung).

The Indonesian Government introduced vaccination in small flocks in mid-2004. Vaccines containing either an Indonesian H5N1 antigen (e.g. A/chicken/Legok/2003) or H5N2 viral antigen have been used in government programmes, and there are now approximately 20 different licensed vaccines. Vaccination programmes in the backyard poultry sector were implemented until, as a result of concern over the efficacy of registered vaccines, vaccination by the central government stopped in 2008. In the commercial sectors, vaccination is not coordinated by government, thus vaccination practices there are based on risk as perceived by the farmer. Today, preventive vaccination is practiced in all breeder facilities and on nearly all layer farms nationwide. Single dose vaccination of broilers with inactivated vaccine is practiced sporadically during the wet season on Java. Vaccination of ducks is not widely practiced and the epidemiologic role for ducks in Indonesia remains poorly understood.

The Ministry of Health of Indonesia announced a new case of human infection of H5N1 avian influenza in a 25-year old female from DKI Jakarta Province, who died on 25 January 2010. The case was possibly infected from direct contact with poultry. Of the 163 cases confirmed to date in Indonesia, 135 have been fatal (CFR=82.8%).

FIGURE 9
H5N1 HPAI outbreaks in poultry in Viet Nam, between January 2009 and January 2010
(Source: *FAO EMPRES-i*)



In **Viet Nam**, H5N1 was first identified in poultry in 2001 and in humans in 2004. During January 2010, 14 H5N1 HPAI outbreaks were detected in Ha Tinh, Soc Trang and Ca Mau Provinces, affecting chickens and ducks, mainly unvaccinated. The question still remains as to where the virus hides during inter-epidemic periods in the complex and variable poultry production systems comprising chickens, ducks and rice fields. Consistent outbreak investigations are not undertaken on infected farms and key information is usually missing from the field.

Disease control measures include stamping out of infected farms, movement restrictions for 21 days, compensation (up to 70% of market value; approximately USD 1.3/bird) and vaccination. Vaccination is implemented throughout the country in two annual campaigns (March/April and October/November), but in some areas, vaccination between the seasonal campaigns is also practiced.

Post-vaccination monitoring is routinely carried out after each vaccination campaign. For the first round of 2009, a total of 32 597 samples from 1 090 flocks were collected in 28 provinces for sero-monitoring and approximately 1 866 swab samples were taken to monitor HPAI virus circulation in slaughterhouses/slaughter points or at live bird markets of 16 provinces. Results of the post-vaccination monitoring programme for this first round of 2009 showed that approximately 58% of vaccinated birds were protected, while approximately 77% of vaccinated flocks were protected, i.e. flocks with more than 70% of birds showing protective titres $HI \geq 1/16$. Chicken samples showed a higher protection level of 62.29% compared with duck samples, which had a protection rate of 55.19%. However, it is likely that sampled flocks are not really selected at random from the entire poultry population, so this assessment of the vaccination programme is more a monitoring of the immune response on vaccinated flocks rather than a monitoring of the vaccine coverage.

Virus circulation surveillance (which is done at the same time as the post-vaccination monitoring) was carried out in 16 target provinces and cities. Out of 448 unvaccinated flocks (selected from slaughterhouses, slaughter points or even from households) tested, only one 500-bird duck flock in Soc Trang Province tested positive for H5N1 virus.

Surveillance for AI is a component of numerous projects:

- ACIAR (Australian Centre for International Agricultural Research) project started in June 2006 for three years and includes longitudinal studies to determine the prevalence of past and present infection in smallholder farms in the Mekong River Delta–South Viet Nam (ongoing).
- NZAID (New Zealand's International Aid & Development Agency) project will run for two years and includes longitudinal studies on nomadic ducks in the Mekong River Delta–South Viet Nam (ongoing).
- CIRAD (French Agricultural Research Centre for International Development) project started in 2007 and includes epidemiological studies in the Red River Delta–North Viet Nam (ongoing).
- VAHIP (Vietnam Avian and Human Influenza Control and Preparedness Project) project is being funded by the World Bank for three years and includes various surveillance activities, including market surveillance for virus circulation and outbreak investigations (ongoing).
- A new cycle of the USAID (United States Agency for International Development) project by FAO Viet Nam was launched in September 2009 in five new pilot provinces with a surveillance component focusing on enhancing the reporting system, strengthening the outbreak investigation and response, and developing an active surveillance model at commune level with local USAID partners.

Based on the monitoring of surveillance activities, three currently circulating virus clades have been isolated: (1) HA Clade 1 (predominant in southern Viet Nam and also isolated in Cambodia); (2) HA Clade 2.3.4 (predominant in northern Viet Nam and also circulating in China); and (3) HA Clade 7 (detected in poultry seized at the Chinese border and at markets near Hanoi). In 2009, ten viruses were sent to the U.S. Centers for Disease Control and Prevention (CDC) for sequencing and, to date, no new circulating clade has been detected.

A recent study by Carrel *et al.* (2010) showed that there have been at least six independent H5N1 introductions into Viet Nam and there were nine newly emerged reassortants from 2001 to 2007. H5N1 viruses in Viet Nam cluster distinctly around Hanoi and Ho Chi Minh City. More information is available at <http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0008631>.

A cross-sectional survey conducted in March 2008 in the Mekong River Delta looking at the demographic structure of

the itinerant grazing duck population found that larger flocks (>800 ducks) were 7.24 times more likely than smaller flocks to be moved outside their home district, thus potentially spreading the disease. This suggests that surveillance should focus on larger flocks (Minh *et al.*, 2009). The study is at <http://www.ncbi.nlm.nih.gov/pubmed/20015558?dopt=Abstract>.

In January 2010, a human case was observed in a 3-year old female from Khanh Hoa Province. The source of exposure is under investigation. Her family raises chickens but did not report any mass poultry illness or death. Of the 113 cases confirmed to date in Viet Nam, 57 have been fatal (CFR = 50%).

Middle East

Israel reported an H5N1 HPAI outbreak that started on 24 January 2010 on a commercial farm in En Shemer, Hadera District, Haifa Province. The farm has three poultry houses that contain 43 000 16-week old heavy breeder pullets under extremely high biosecurity, of which 700 cases were observed and 100 died (all in the same house). The suspected source of infection was reported as contact with wild bird droppings outside the affected poultry house. The previous H5N1 outbreak in Israel, in late December 2007, involved a single, small backyard pet-bird holding, very close to the current outbreak. Israel maintains intensive avian influenza surveillance.

Europe

The last H5N1 HPAI event in poultry was detected in October 2008 on a mixed poultry farm in **Germany** and the last H5N1-positive wild bird was a rock dove reported in October 2009 in the **Russian Federation**.

Non-infected countries/territories

There have been no HPAI outbreaks reported in **Australia**, **New Zealand**, the **Pacific Community**, **Papua New Guinea** (outbreaks have occurred in the Indonesian province of West Papua) or **the Philippines**. To date, no outbreaks have been reported in **Timor-Leste**, but here surveillance capacity is weak. In South Asia, **Sri Lanka**, **Maldives**, and **Bhutan** have not experienced disease. Some Asian countries regularly report negative results obtained from their surveillance activities and suspected cases. **Bhutan** produces a clinical surveillance report weekly (available at <http://www.moa.gov.bt/birdflu/main/reports.php?show=all>).

Iraq, where the last H5N1 HPAI outbreak was in February 2006, reported recent laboratory results of their surveillance activities for January 2010 for all governorates except Kurdistan Province, in the north of the country. All samples taken on poultry farms (267), backyard poultry (532), game and wild birds (31), and markets and slaughterhouses (23,257) were negative for H5N1.

Between August and December 2009, the HPAI Surveillance Guidelines for Backyard and Free Range Poultry Farming Systems developed by FAO under the financial support of USAID were applied in four selected countries from the Southern African Development Community (SADC), which has never reported HPAI: **Malawi**, **Mozambique**, **Zambia**, and **Zimbabwe**. Table 1 summarizes the results. All samples collected tested negative. There will be an extension of the surveillance activities for 2010 (March–September) using the same sampling framework.

TABLE 1

AI surveillance activities took place in four selected Southern African Development Community (SADC) countries between August and December 2009

| | Serum | Tracheal swabs | Cloacal swabs |
|-------------------|-------|----------------|---------------|
| Malawi | | | |
| Sector 3 | 880 | 421 | - |
| Sector 4 | 1934 | 1750 | 1805 |
| LBM | 981 | 550 | - |
| TOTAL | 3795 | 2721 | 1805 |
| Mozambique | | | |
| TOTAL | 2132 | 457 | - |
| Zambia | | | |
| TOTAL | 1738 | 2133 | - |
| Zimbabwe | | | |
| Sector 3 | 3086 | 9 | - |
| Sector 4 | 3729 | 15 | - |
| Border posts | 165 | - | - |
| TOTAL | 7980 | 24 | - |

In **Nigeria**, there has been no reported case of H5N1 HPAI since July 2008. A surveillance study expected to start before the end of 2009 will aim to establish the baseline for the duck population in a specified region, to understand the production systems, market chains and disease transmission risk factor among domestic and wild birds. This programme will be financially supported by the Avian Influenza Control programme assisted by the World Bank. In addition, wild bird capture and sampling organized by FAO was successfully completed at the Dagona Wild Bird Sanctuary, with the participation of the Wildfowl & Wetlands Trust (WWT) and the support of the Nigerian Ministries of Agriculture and Environment.

According to the Avian Influenza Control Program (AICP) unit, the department along with the National Disease Information Systems (NADIS) and the National Veterinary Research Institute are jointly conducting an active surveillance in selected Live Bird Markets (LBM) in all the states of Nigeria. So far all the samples submitted have been negative.

A phylogenetic analysis by Fusaro *et al.* (2010) of 106 whole-genome sequences from viruses isolated between 2006-2008 identified a major new sub-clade in Nigeria and two novel reassortment events. Two major source populations for the HPAI H5N1 virus in Nigeria were identified: one in the southwest (a major commercial poultry area) and one in the north (where contact between wild birds and backyard poultry is frequent). These findings suggest that migratory birds from Eastern Europe or Russia may serve an important role in the introduction of HPAI H5N1 viruses into Nigeria, although virus spread through the movement of poultry and poultry products cannot be excluded. The paper is available at <http://www.ncbi.nlm.nih.gov/pubmed/20071565>.

An active and targeted surveillance programme for AI in domestic ducks at markets, on farms and in villages, within a 5 km radius around the outbreaks, will be organized under FAO's supervision in five countries previously infected with H5N1 HPAI (Burkina Faso, Ghana, Cote d'Ivoire, Benin and Niger).

CONCLUSIONS

Since 2003, 62 countries/territories have experienced outbreaks of H5N1 HPAI. Effective control measures for outbreaks in poultry have been associated with reduced incidence of human infections in several countries. However, H5N1 HPAI remains entrenched in poultry in parts of Asia and Africa (Egypt) and thus the risk of human infection remains. The last newly infected country was Nepal in 2009 (Figure 10).

The number of countries reporting outbreaks was less in 2009, when compared to 2008, 2007 and 2006 (Figure 10). The difference in terms of total number of outbreaks reported (Figure 11) is more subjective, because it is highly influenced by a number of variables, such as the case definition used, the awareness level, the intensity/effectiveness of surveillance programmes in countries and the willingness to report. Although there has been an improvement in disease awareness, outbreaks/cases of H5N1 HPAI are still likely to be under-estimated and under-reported in some regions because of limitations in the capacity of veterinary services to implement, sensitive and cost-effective disease surveillance, proper outbreak investigations in the field, and the absence or weakness of compensation schemes.

FIGURE 10

Number of countries by continent and by month and year that reported H5N1 HPAI outbreaks since December 2003
(Source: FAO EMPRES-i)

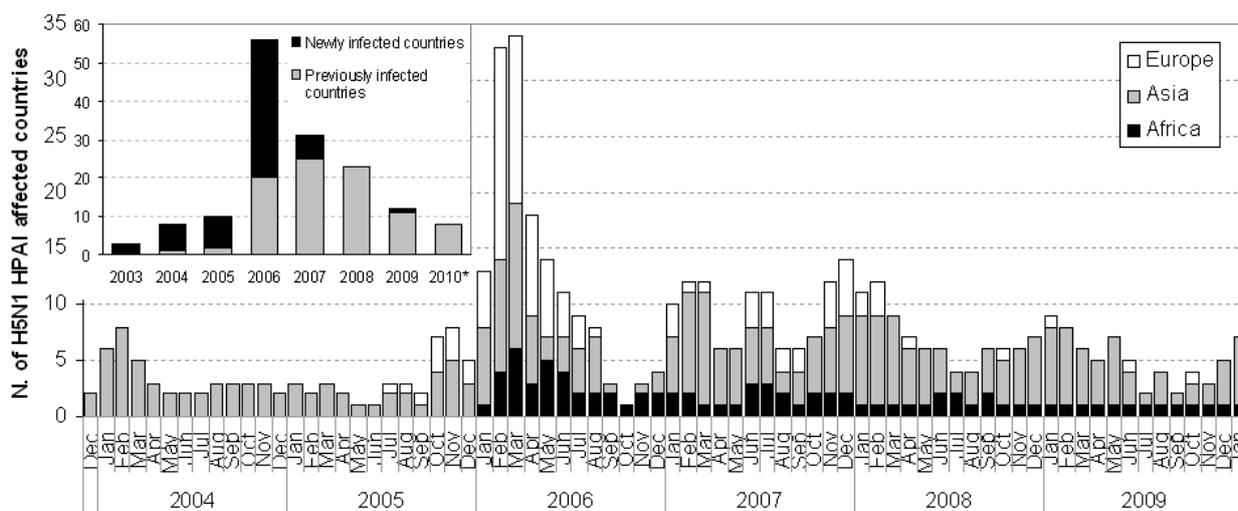
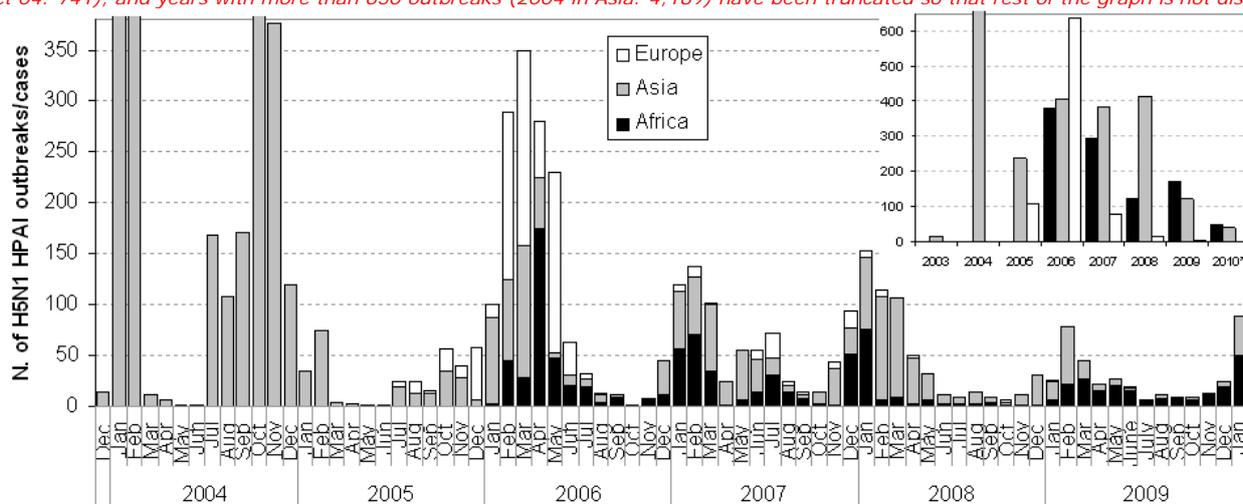


FIGURE 11

H5N1 HPAI outbreaks/cases 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 04: 1,311, Feb 04: 1,175 and Oct 04: 741), and years with more than 650 outbreaks (2004 in Asia: 4,189) have been truncated so that rest of the graph is not distorted)



Data from previous years have shown a peak in the number of outbreaks/cases during the January-March period in both poultry outbreaks (Figure 11) and human cases (Figure 4), although there is a decreasing trend in the height of the peak as years go by. A similar, although not so evident trend, is observed when looking at the number of countries reporting outbreaks (Figure 10). As expected, during January 2010 we have seen an increase in the total number of outbreaks and countries affected. January constitutes the peak so far (both in terms of number of outbreaks and number of affected countries) since the previous January-March period. Against the decreasing trend observed since 2004, it seems that the peak height in January 2010 is very similar in magnitude to that of 2009. Moreover, in terms of number of outbreaks, 2010 has already surpassed the peak of 2009, which was also reached one month later (February 2009). This may be partially explained by the implementation of more intensive surveillance programmes in countries such as CAHO in Egypt, together with the fact that vaccination of backyard poultry was stopped in July 2009). It may also be related with a reduction on the efficacy of control programmes in endemic countries (fatigue).

During January 2010, H5N1 HPAI has re-surfaced in several countries, where the disease was believed to have been eliminated (without vaccination): Cambodia, Nepal and Israel. It is still too early to evaluate whether these are re-introductions, where wild birds and hunting/poaching play a significant role, or whether the virus was circulating undetected by surveillance programmes. In the cases of Bangladesh and India, that had reported no outbreaks in the second half of the year, a new wave of cases has been observed since the beginning of 2010.

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This overview is produced by the EMPRES/GLEWS team in FAO, which collects and analyses epidemiological data and information on animal disease outbreaks under the framework of the Global Early Warning and Response System for Major Animal Diseases including Zoonoses. EMPRES welcomes information on disease events or surveillance reports on H5N1 HPAI (and other TADs) both rumours and official information. If you want to share any such information with us please send a message to glews@fao.org. Information will be treated confidentially if requested.