

WORLDWIDE SITUATION

In February 2010, 356 H5N1 HPAI poultry outbreaks were observed officially in Bangladesh, Bhutan, Egypt, Indonesia, Myanmar, Nepal and Viet Nam. Bhutan experienced its first H5N1 HPAI outbreak ever. No wild bird cases were reported during February 2010. The number of reported outbreaks/cases by country and their location are illustrated in Figures 1 and 2, respectively. Figure 3 shows the number of outbreaks/cases by wild/domestic status.

FIGURE 1
H5N1 HPAI outbreaks in poultry in February 2010
(Source: FAO EMPRES-i)

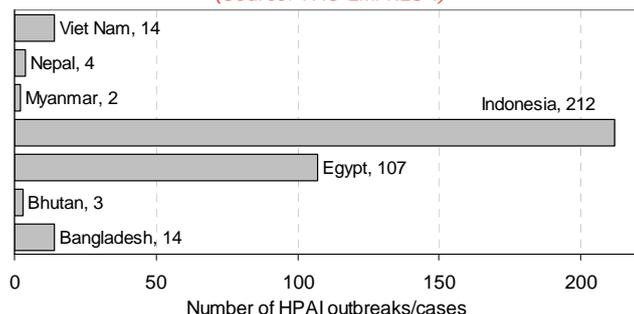
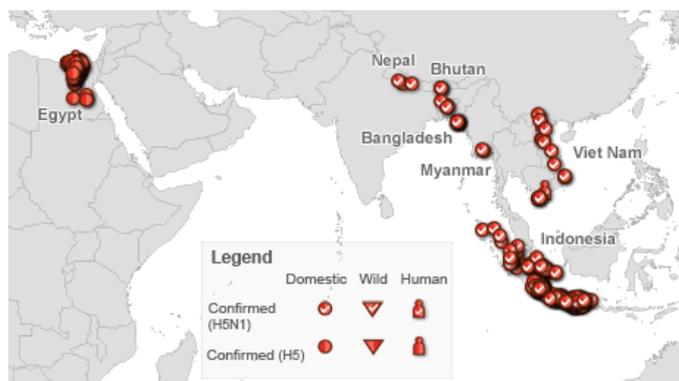


FIGURE 2
H5N1 HPAI outbreaks/cases reported in poultry, wild birds and humans in February 2010
(Source: FAO EMPRES-i)



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 September 2009 and February 2010
(Source: FAO EMPRES-i)

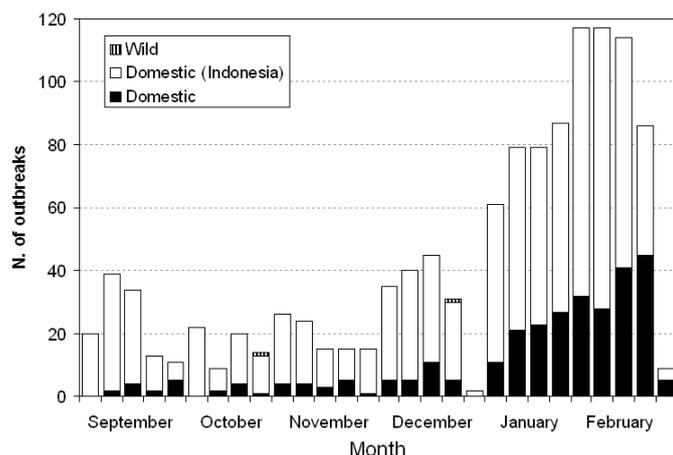
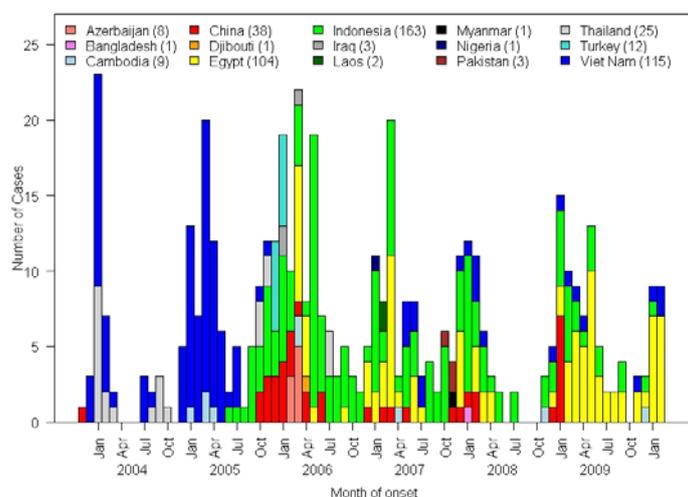


Figure 4 shows the confirmed cases of H5N1 infections in humans reported to the World Health Organization (WHO) by country over time. Between November 2003 and 28 February 2010, 486 human cases of H5N1 infection were reported to WHO from 15 countries, of which 288 died, a case fatality rate (CFR) of 59%. 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, n=457). Cases between 0 and 9 years of age were most common (29.3%). The highest CFR (75.5%) was in persons aged 10-29 and the lowest (25.0%) in persons aged 70 and above. Gender was equally distributed, with 51.4% of the cases being females (235/457). Indonesia did not report age and gender of the 2009 cases.

In 2008, 44 cases (33 fatal - 75%) were confirmed, with Indonesia reporting the highest number (24 cases, 20 fatal), followed by Egypt (eight cases, four fatal), Viet Nam (six cases, five fatal), China (four cases, all fatal), Cambodia (one case) and Bangladesh (one case). 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). As of 28 February 2010, 17 human cases had occurred: 14 in Egypt (three fatal), two in Viet Nam (one fatal), and one in Indonesia, which was fatal.

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

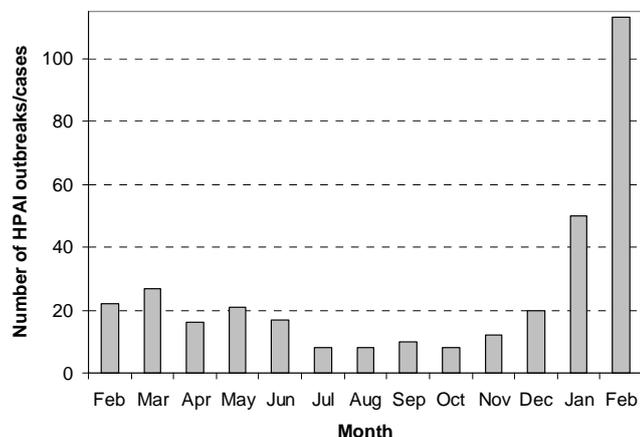


SITUATION BY CONTINENT/REGION

Africa

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

FIGURE 5
H5N1 HPAI poultry outbreaks in Egypt between February 2009 and February 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 February 2010, 113 H5 HPAI outbreaks were observed in poultry (chickens, ducks and turkeys) from Alexandria (6), Aswan (1), Bahaira (4), Beni-Suef (6), Dakahlia (12), Damietta (2), Fayoum (7), Gharbia (13), Giza (1), Helwan (4), Ismailia (1), Kafr-el-sheikh (6), Luxor (1), Menia (9), Menoufia (21), Qalubia (13), Sharkia (2), Sixth of October (2), Suez (1) and Wadi E Gedid (1) governorates. Of these, 93 outbreaks (82 %) were reported from the household poultry sector. Eighty-six of the 113 outbreaks occurred in non-vaccinated birds and 18 in vaccinated birds, while the vaccination status of the remaining outbreaks remains unknown. During February 2010, Community Animal Health Outreach (CAHO) teams visited 88 villages in ten governorates and detected 28 (25%) of the above-reported confirmed outbreaks. CAHO teams operate in high-risk governorates and collect samples only from suspected cases.

Poultry farms are required to test their birds and receive certification (HPAI infection negative status) prior to any planned transportation. During February 2010, 2 099 samples were collected for this purpose, three of them confirmed positive for HPAI, from three governorates. In Egypt, compliance with certification for poultry transportation is generally sub-optimal, as only registered farms (<20 % of the farms) seek such services.

During February 2010, 61 farms in eight governorates were subjected to active surveillance and six of them were confirmed positive for HPAI infections. On the other hand, 10 of 14 HPAI notifications (passive surveillance) received from commercial poultry farms were found to be positive for H5 HPAI.

By way of active surveillance, 55 out of 288 household poultry units sampled in 13 governorates were confirmed as H5 HPAI. Conversely, 38 of the 84 suspected outbreak notifications (passive surveillance) from 12 governorates were confirmed to be due to H5 HPAI. Besides this, 77 samples collected at road check points were found to be positive 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 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. For three years, the government provided vaccination to household/village poultry free of charge until July 2009, when vaccination was suspended until further notice, because of a limited or no impact on H5N1 HPAI incidence. A recent assessment study conducted by FAO and the General Organisation for Veterinary Services (GOVS), in the framework of the Strengthening Avian Influenza Detection and Response (SAIDR) project, 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 can be found 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 February 2010, seven human avian influenza A H5N1 cases were reported, in a 53-year old male (fatal) and a 1-year old male from Qalyubiya Governorate, a 10-year old male from Dakalia Governorate, a 30-year old female and a 13-year old male from Kafr El-Sheik Governorate, and a 32-year old male and a 29-year old pregnant female (fatal) from Menoufia Governorate.

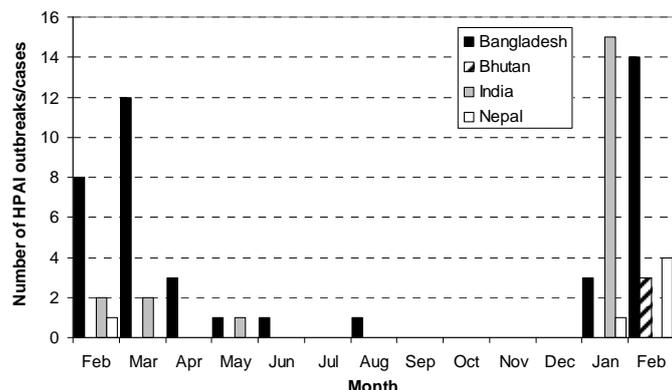
Of the 104 laboratory-confirmed human cases of influenza A H5N1 reported in Egypt since the beginning of the epidemic, 31 have been fatal (30%). Compared with 2009, when most cases were in children under four years of age, 11 out of the 14 human infections so far in 2010 have been in patients over that age. The observed CFR is also higher so far in 2010 (29% compared with 10% in 2009, when it dramatically decreased from 50% in 2008). The relative increase in H5N1 HPAI outbreaks in poultry (163 in 2010 compared with 29 in the same month in 2009) is thought to be a result of the improved surveillance and reporting rate, mainly because of the effectiveness of CAHO.

In May 2008, serum and nasal swabs were collected from 240 pigs (11 herds) in Cairo slums, where pigs feed on organic remains, including dead birds, and thus have a higher chance of becoming infected. Although all nasal samples were negative to influenza A/H5 by real-time PCR, seroprevalence for avian influenza was 1.67% and 4.6% (when the non-local H5N2 and local H5N1 viral antigens were used, respectively). Of the 11 positive pigs, eight were from one herd and three from three other herds. More details are available in El-Sayed et al. (2010) at <http://www.cdc.gov/EID/content/16/4/726.htm>.

South Asia

FIGURE 6

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



In **Bangladesh**, 14 outbreaks in chicken layer farms occurred in Bogra (1), Cox's Bazar (10), Dhaka (2) and Gazipur (1). The high number of outbreaks in Cox's Bazar occurred because of the clustering of farms in a narrow area. Viral samples, including three samples isolated in January 2010, were shipped for sequencing to the OIE/FAO Reference Laboratory for Avian Influenza and Newcastle Disease in Padova, Italy. The phylogenetic analysis showed that all isolates belonged to Clade 2.2. In particular, these isolates grouped in sublineage III and clustered with sequences of viruses from Bangladesh isolated from 2007 to 2009. These results suggest that the virus is being maintained in reservoirs unnoticed within the country. The emphasis of the current policy of the government is placed on early detection and containment by culling as well as the improvement of bio-security in various production sectors.

As of 28 February 2010, a total of 343 outbreaks had been recorded in 47 out of 64 districts on both commercial farms and in backyard holdings and over 1.8 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 February, 19 355 SMS messages were received, including 15 suspected HPAI events in backyard poultry and 31 suspected AI events on commercial poultry farms. The veterinary investigations that followed discounted 39 of these suspect cases and on 15 occasions (including other veterinary poultry farm investigations) diagnostic specimens were collected. Of all specimens collected and reported through the SMS gateway system, only one tested positive for H5N1 HPAI.

FAO has partnered with Wildlife Trust Bangladesh (WTB), Wetlands International, Wildlife Trust, United States Geological Survey (USGS) and International Centre for Diarrhoeal Disease Control, Bangladesh (ICDDR,B) 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 on 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. 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, time spent at each location along their flyways, 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.

Bhutan reported its first ever H5N1 HPAI outbreak, when the disease was observed on 18 February 2010 in free-range chickens in Phuntsholing District, Chhukha Province, near the southern border with India. A second outbreak was observed on 20 February 2010 in free-range poultry in Samphelling District, Chhukha Province, close to the first outbreak. On 25 February 2010, a third outbreak was detected in backyard poultry in Phuntsholing District, also in Chhukha Province. Illegal movement of animals and contact with wild species are suspected sources of the outbreak. Clade 2.2 was confirmed.

In **India**, after no notification of outbreaks since 27 May 2009, H5N1 HPAI outbreaks were reported during January 2010 in the Khargram and Burwan blocks of Murshidabad District in West Bengal, all in backyard poultry. However, no outbreaks were observed during February 2010. The 2010 virus isolates are similar to those of 2008 and 2009 (Clade 2.2).

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. During December 2009, 23 migratory waterfowl trapped in the states of Assam and West Bengal as part of an FAO-facilitated satellite tag marking project, were successfully: 1) marked with satellite transmitters; and 2) had feathers collected for genetic and isotopic analyses. Swab samples (oral and cloacal) and blood samples were collected for AI testing from 93 wild waterbirds and 47 domestic waterfowl. Additional sampling took place in January 2010 (http://www.fao.org/avianflu/en/wildlife/sat_telemetry_india.htm). In addition, as a follow-up to the above study, six more migratory birds were marked with satellite transmitters during late January and February 2010.

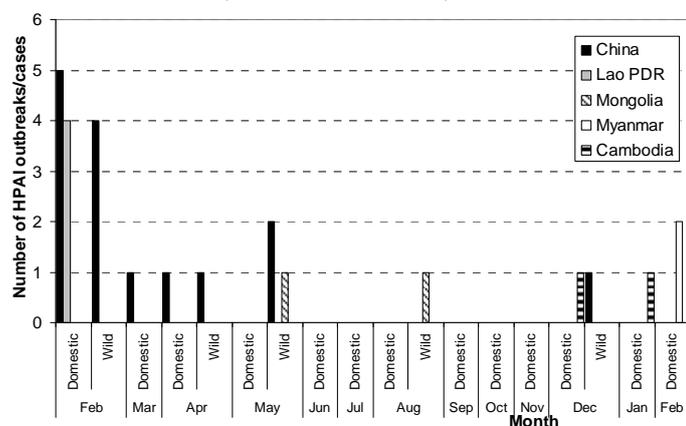
In **Nepal**, four outbreaks were observed during February 2010 in backyard birds in Rupandehi, Banke, Chitwan and Dang districts, all of which are located along the Indo-Nepali border. The full picture of the clades of the virus involved is not available, but it is known that in addition to the 2.2 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 possibility that this resulted from wild bird introduction should be considered. 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.

South East and East Asia

FIGURE 7

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

(Source: FAO EMPRES-i)



In **Cambodia**, after the January 2010 outbreak in ducks in Takeo Province, no further HPAI outbreaks were observed in February 2010. All available human and animal isolates since 2004 are so far Clade 1. The last two outbreaks were also of Clade 1. The viruses in southern Viet Nam have been predominantly Clade 1.

Cambodia routinely reports results obtained from surveillance activities through two hotlines supported by FAO at National Animal Veterinary Research Institute (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 with 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 ongoing surveillance activities conducted at national and provincial levels provided evidence that H5N1 viruses were still circulating in many provinces. Out of 424 606 samples collected between January to September 2009, 80 H5N1 viruses were isolated – 62% from ducks, 34% from chickens and 4% from geese. The positive samples were from Xinjiang autonomous region, Hunan, Hubei, Chongqing, Henan, Shandong, Guangdong, Guangxi autonomous region, Fujian, Sichuan and Guizhou. Sixty-five percent of all virological samples were collected from chickens, 20% from ducks, 6% from geese and 2% from wild birds, the rest being collected from pigs and other species. The last national surveillance results released by the Ministry of Agriculture in November 2009 in the Official Veterinary Bulletin reported seven new viruses isolated from 23 962 samples. These H5N1 HPAI viruses were detected in chickens and ducks at three live bird markets in Hunan Province. There is an intensive ongoing 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. Between January and September 2009, 2 845 088 post-vaccination samples were collected, of which 89.5 percent were seropositive.

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. Most birds receive the killed Re-5 regardless of species. Most poultry should receive at least two doses of vaccine (primary + booster), except for meat ducks and chickens, which have a very short production cycle.

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 China's north-west since 2005 (and also 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. Clade 2.3.2 viruses have also been detected in South Korea (in poultry), Japan (in wild birds), the Russian Federation (in poultry and wild birds in 2009), and Mongolia (summer 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 (as demonstrated in Nepal in 2010). Viruses in other clades have also been detected in wild birds, including Clade 2.3.4 viruses from Hong Kong SAR.

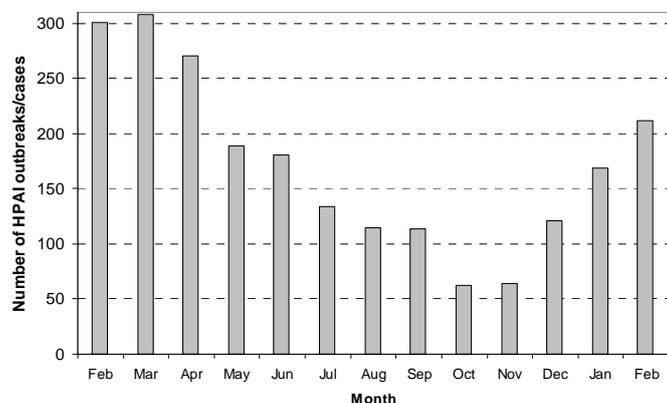
No human cases were reported during January 2010. Since the beginning of the epidemic, China has reported 38 cases, of which 25 were fatal (65.8%). On average, fewer than ten human cases are reported each year (range 0 to 13 cases annually since 2003). The latest case confirmed by WHO was a year ago, 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 to 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

* 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.

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 February 2009 and February 2010
(Source: *Gol/ECTAD Indonesia*)



During February 2010, PDSR officers visited 1 723 villages, of which 286 (16.6%) were infected (212 were newly found, while the remaining 74 carried over the infection status from the previous month). This infection rate is higher than the January 2010 infection rate of 12.0%. During the previous six months, PDSR officers visited 10 933 villages (16.3%) in the 349 districts under PDSR surveillance. Since May 2008, they have visited approximately 47.3% of villages under coverage. An average of 7.2% 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 Sumatra (Lampung and Kepulauan Belitung).

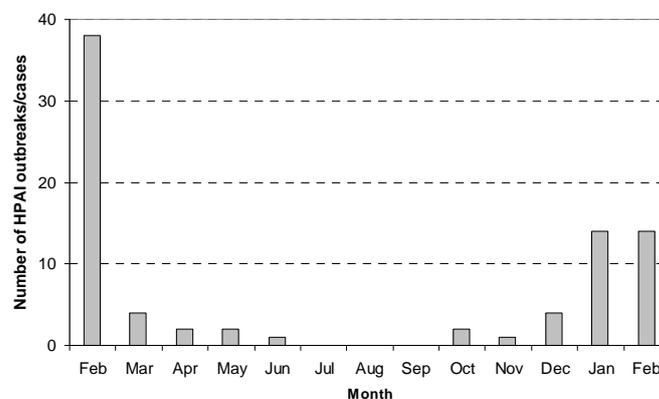
The Indonesian Government introduced vaccination in small flocks in mid-2004. Vaccines containing either an Indonesian H5N1 antigen (e.g. A/chicken/Legok/2003) or H5N2 viral antigen have been used in government programmes, and there are now approximately 20 different licensed vaccines. Vaccination programmes 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 of ducks in Indonesia remains poorly understood.

No cases of human infection of H5N1 avian influenza were reported in February 2010. Of the 163 cases confirmed to date in Indonesia, 135 have been fatal (CFR=82.8%).

Myanmar, reported its first outbreaks since December 2007. Two outbreaks were reported in February, both in the Yangon Municipal area. The first outbreak started on 27 January on a layer farm. A total of 115 poultry died and 2,354 were culled. The second was reported on 19 February with six poultry dying and 167 being culled. Myanmar recently completed a national duck survey, involving over 16,000 ducks on 541 farms. The results showed that 16% of ducks were seropositive for H5, and 40% of flocks were seropositive. This suggests that the HPAI virus is endemic in duck flocks. However, no virus has yet been isolated from any of these duck flocks. Further tests are being conducted on the viruses isolated from the outbreaks and on the serum from the duck

survey. To support ongoing disease control programs, Myanmar is conducting a national census of commercial poultry farms, including geo-location. Based on the resurgence of outbreaks, and the findings of the duck survey, an expanded surveillance program is being planned for 2010.

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



In **Viet Nam**, H5N1 was first identified in poultry in 2001 and in humans in 2004. In February 2010, during the Tet festival, 14 H5N1 HPAI outbreaks were detected in the following ten provinces: Ca Mau, Kon Tum, Quang Tri, Ha Tinh, Nghe An, Soc Trang, Nam Dinh, Khanh Hoa, Tuyen Quang and Ha Giang, affecting mainly unvaccinated chickens and ducks. 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 LBMs in 16 provinces. Results 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 $\text{HI} \geq 1/16$. 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 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>.

In February 2010, two human cases were reported, in a 38-year old female from Tien Giang Province (fatal), who had slaughtered and processed sick water fowl, and in a 17-year old female from Tuyen Quang Province, who had participated in the disposal of the dead poultry. Of the 115 cases confirmed to date in Viet Nam, 58 have been fatal (CFR = 50%).

Middle East

In **Israel**, after the isolated H5N1 HPAI outbreak on a commercial farm in Haifa Province, no further outbreaks were reported in February 2010. The previous H5N1 outbreak in Israel, in late December 2007, had involved a single, small backyard pet-bird holding, very close to the January 2010 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** and **Maldives**, have not experienced disease. Some Asian countries regularly report negative results obtained from their surveillance activities and suspected cases.

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 (202), backyard poultry (510), game and wild birds (-), and markets and slaughterhouses (120) were negative for H5N1. A farm tested positive for H9 in Waset Governorate.

Between August and December 2009, the HPAI Surveillance Guidelines for Backyard and Free Range Poultry Farming Systems, developed by FAO with 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	-

From 2006 to July 2008, when the last event was reported, there were 300 H5N1 HPAI outbreaks in **Nigeria**. There has been no reported outbreaks since July 2008. A surveillance study expected to have started 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.

Expanded active surveillance in selected LBMs in all the states of Nigeria conducted by the National Animal Disease

Information and Surveillance/Avian and Human Influenza Pandemic Preparedness Control Project (AICP/NADIS) and the National Veterinary Research Institute (NVRI) are underway. As of December 2009, 18 419 samples have been collected and 10,587 samples have been analyzed. So far, no avian influenza virus has been detected, However, 128 Newcastle disease viruses were isolated.

In addition, there is a surveillance plan in operation at cross-border markets and sector 3 commercial farms for H5N1 (as well as at pig farms for H1N1) under the Support Programme to Integrated National Action Plans for Avian and Human Influenza (SPINAP-AHI) project. The field activities will start in April 2010 in all registered poultry and pig farms (recently compiled under the SPINAP project).

A phylogenetic analysis by Fusaro *et al.* (2010) of 106 whole-genome sequences from viruses isolated between 2006 and 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>.

CONCLUSIONS

Since 2003, 63 countries/territories have experienced outbreaks of H5N1 HPAI. The last newly infected country was Bhutan in February 2010 (Figure 10 – upper right corner). 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 number of countries reporting outbreaks was less in 2009, when compared with 2008, 2007 and 2006 (Figure 10 – upper right corner). The difference in terms of total number of outbreaks reported (Figure 11 – upper right corner) shows a similar, but more pronounced trend, although it is more subjective, because it is highly influenced by 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 surveillance, sensitive and cost-effective disease surveillance, proper outbreak investigations in the field, and the absence or weakness of compensation schemes.

Data from previous years have shown a peak in the number of outbreaks/cases during the January-March period in terms of countries affected (Figure 10), number of reported outbreaks (Figure 11) and also human cases (Figure 4). February 2010 constitutes the peak so far this season, both in number of outbreaks and in number of countries affected (Figures 10 and 11). Overall, there is a decreasing trend in the height of the peak as years go by. However, in terms of number of outbreaks (Figure 11), and against the decreasing trend observed since 2004, the peak height has reached dimensions similar to the peaks of 2006-2007 and 2007-2008. This is explained by the higher contribution of Africa (Egypt) to the total number of outbreaks (Figure 11), because of the implementation of more intensive surveillance programme (CAHO), together with the fact that vaccination of backyard poultry was stopped in July 2009. It may also be related to a reduction in the efficacy of control programmes.

During 2010, H5N1 HPAI has re-surfaced in several countries where the disease was believed to have been eliminated (without vaccination): Cambodia, Israel, Myanmar and Nepal. 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 case 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.

FIGURE 10

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

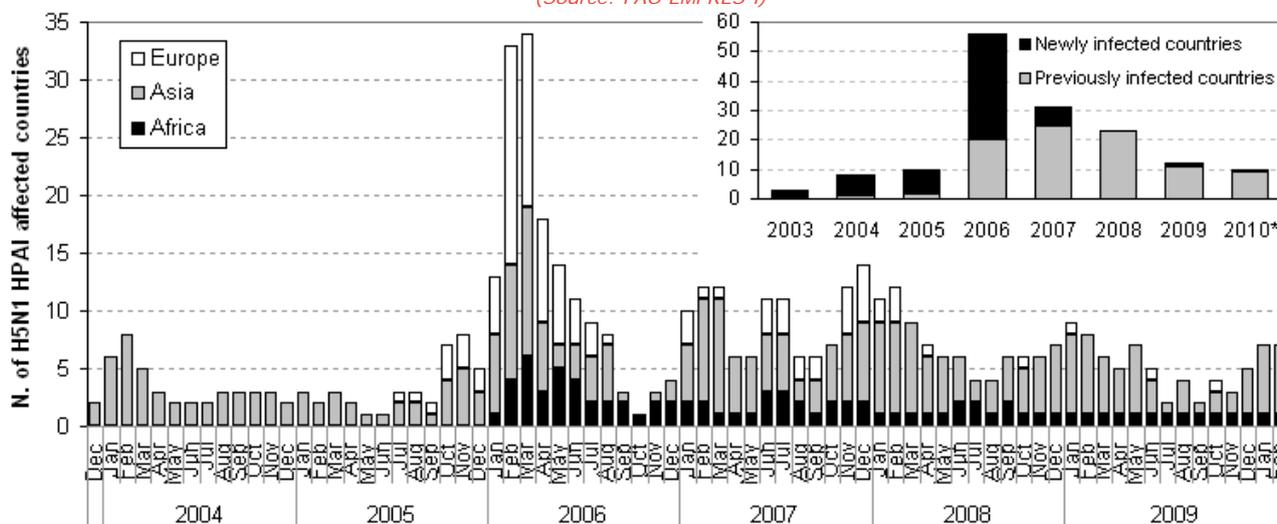
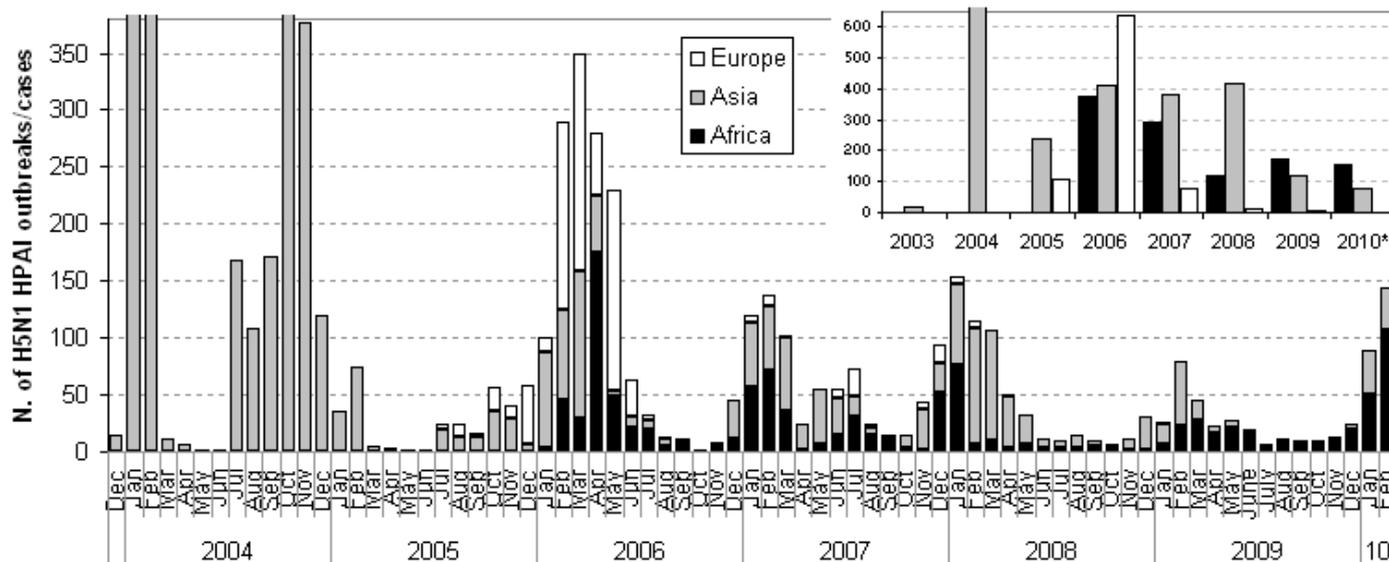


FIGURE 11

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)



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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.