



HPAI outbreaks reported in this publication refer to officially confirmed cases only. The information is compiled from the following sources: World Organisation for Animal Health (OIE), national governments and their ministries, and the European Commission (EC) – these sources are responsible for any errors or omissions.

Challenges and limitations of the avian influenza vaccination strategy in Egypt

The first confirmed cases of highly pathogenic avian influenza (H5N1 HPAI) in Egypt were reported to international authorities in early February 2006. By the end of the year, a total of 1,641 outbreaks took place in Egyptian territories, most of them in commercial poultry farms. In view of this emergency situation, and in consideration of the potential implications to human health and food security, the Government of Egypt decided to use mass vaccination against H5N1 HPAI based on the positive experiences initially had in the People’s Republic of China and later in Viet Nam. During the large-scale implementation of this control measure from 2006 to 2009, reduced attention was given to other essential activities and disease mitigation procedures such as outbreak investigations, biosecurity and surveillance. As time passed by it was clear that the impacts of vaccination alone in reducing outbreaks were very limited.



The Food and Agriculture Organization of the United Nations (FAO) and the General Organization of Veterinary Services (GOVS) were both interested in determining the factors that more significantly contributed to the lack of positive impact that the vaccination programme had on hampering disease transmission dynamics. A collaborative assessment study indicates that the shortcoming of the Egyptian vaccination strategy may be due in part to structural and institutional weaknesses such as (1) lack of detailed vaccination programs and protocols, (2) limited government controls and collaborations with the private sector, (3) inadequate training of field technicians performing immunization duties, (4) absence of a monitoring system to track coverage and antibodies, and (5) lack of sufficient support in terms of communication and funding. Now, as Egypt deals with an endemic disease situation, it is evident that vaccination against avian influenza should be considered as one of the many tools within a broad portfolio of control measures.

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AIDEnews is an FAO ECTAD publication

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A valuable lesson learned from the disease situation in Egypt is that the rigorous implementation of disease mitigation programmes should encompass –when and where possible– the following actions: farm registration, national livestock inventories, movement controls, culling, sampling and surveillance, enhanced in-farm biosecurity, routine cleaning and disinfections of markets, outbreak investigations and follow-ups, and vaccinations. These actions should be balanced and reassessed against an evolving disease environment, without over-attention or under-emphasis on a single disease control measure, and with more than appropriate institutional support –be it national, regional or international.

The study, and publication of findings, was carried out by Marisa Peyre, a researcher for the French Agricultural Centre for International Development (CIRAD) in conjunction with collaborators from international technical bodies. Financial support for the project was generously provided by the United States Agency for International Development (USAID) and implemented by the Emergency Centre for Transboundary Animal Diseases (ECTAD) of the FAO and GOVS within the framework of a project titled 'Strengthening Avian Influenza Detection and Response' (SAIDR).

Wild bird telemetry project helps FAO to better understand disease ecology of emerging diseases and the role of migratory birds in transmission dynamics

The concept behind wild bird radio telemetry is straightforward: attaching a radio transmitter to a wild bird and track the emitted signals to determine its movements. This monitoring technique determines bird movements over areas ranging in size from the restricted breeding sites of resident bird species to the pathways of international migratory species. Telemetry has important applications in the investigation of infectious diseases carried by migratory species, including the virus ecology of H5N1 avian influenza virus and other diseases. Telemetry projects tracking the local movements and migration routes of wild birds identified as potential virus hosts are already underway in many parts of the world, being particularly important for understanding ecology of emerging diseases in Asia.

For example, in Hong Kong SAR China, a twelve-month satellite tracking project discovered that coastal regions of the Yellow Sea [in Eastern China] are critical staging areas for over 90 per cent of Hong Kong's ducks within the East Asia-Australasian Flyway. These ducks require a wide range of inland and coastal wetland habitats scattered across many countries (China, Democratic People's Republic of Korea and the Republic of Korea) to complete their epic migration journeys, which may therefore carry animal health implications if these animals are asymptomatic hosts of emerging infectious diseases. In recent years, transboundary animal diseases have been highlighted as priority by leading animal and human health agencies, especially after the sudden appearance of severe acute respiratory syndrome (SARS), Nipah virus and H5N1 influenza virus in the region.

The wild bird telemetry project was launched in December 2008 when five institutions decided to jointly collaborate in search for answers to burning questions. The Food and Agriculture Organisation of the United Nations (FAO) partnered with the World Wildlife Fund (WWF), the Department of Microbiology of the University of Hong Kong, Asia Ecological Consultants and the US Geological Survey (USGS) to undertake a variety of activities dealing with ecology and conservation dimensions as well as wildlife disease issues. Their teams successfully fitted satellite receivers on 24 wild ducks (Eurasian Wigeon and Northern Pintail) at the Mai Po Nature Reserve. After release, the project team tracked the duck signals and locations weekly via institutional tracking websites or using Google Earth applications. The information gathered through subsequent phases of this collaborative project will be used to support an array of research themes in the various initiatives launched and supported by the institutions so far involved.

MOST RECENT H5N1 AI OUTBREAKS 2006-2010

Note: This list has been compiled on the basis of information up to 31 January 2010.

2010

January Bangladesh, Egypt, India, Israel, Viet Nam

2009

December Cambodia, China (Hong Kong), Indonesia

October Russian Federation

August **Mongolia**

May China

March Germany

February Lao PDR, Nepal

2008

November Thailand

September Togo

July Nigeria

June Pakistan

May Japan, Korea (Republic of), United Kingdom

March Turkey

February **Switzerland**, Ukraine

January Saudi Arabia

2007

December Benin, Iran, Myanmar, Poland

November Romania

October Afghanistan

August France

July Czech Republic

June Ghana, Malaysia

April Kuwait

January Côte d'Ivoire, Hungary

2006

August Sudan

July **Spain**

June Niger

May **Bulgaria**, Burkina Faso, Denmark

April Djibouti, Sweden, West Bank & Gaza Strip

March Albania, Austria, Azerbaijan, Cameroon, **Croatia**, **Greece**, Jordan, Kazakhstan, Serbia, **Slovenia**

February **Bosnia-Herzegovina**, **Georgia**, Iraq, **Italy**, **Slovakia**

Green: areas which never had reported outbreaks in poultry

Sources: World Organisation for Animal Health (OIE), European Commission (EC), FAO and national governments

AT A GLANCE

The latest HPAI outbreaks for the period 1 December 2009 – 31 January 2010

Note AIDNews publishes reports of **confirmed HPAI cases** using the following sources: OIE, European Commission, FAO and national governments.

AFRICA

EGYPT

Samples taken from poultry in 13 of the 29 Governorates (Behera, Beni Suef, Dakahlia, Fayoum, Gharbia, Kafr El Sheikh, Menoufiya, Minya Port Said, Qalyoubia, 6th of October, Sharkiya and Suez) were found positive for H5 HPAI. The Government Veterinary Service has strengthened the passive surveillance in veterinary clinics – Clinic Veterinarians are now trained in HPAI case definition and use of a rapid field test, contributing to the early detection of cases in villages.

MIDDLE EAST

ISRAEL

An outbreak of H5N1 HPAI in Haifa Province was reported to OIE on 26 January 2010. The outbreak started on 24 January in a poultry farm in Hadera; 100 breeder pullets (16-week-old) out of 700 cases died. Clinical signs were observed in only one of the three poultry houses of the farm under high biosecurity that holds total 43,000 pullets.

ASIA

BANGLADESH

Outbreaks of H5 HPAI in Rajshahi Division were reported on the Government website in January 2010. The first outbreak was on 24 January in a commercial layer farm in Khetlal Upazilla, Joypurhat District, 250 birds died (case fatality rate 100 %) and the rest were destroyed; the second outbreak was on 26 January in commercial poultry farm in Sirajganj Sadar, Sirajganj District.

CAMBODIA

An outbreak of H5N1 HPAI in Kampong cham Province was reported to OIE on 28 December 2009. The outbreak started on 16 December in La ork Village, Kraek Commune, Ponhea kraek District among backyard poultry; 143 birds died (case fatality rate 100%) and 875 birds were destroyed. The government veterinary service identified a 1-km radius control zone and a 10-km radius surveillance zones.

CHINA (HONG KONG)

The veterinary service website reported that an Oriental Magpie Robin (*Copsychus saularis*) found dead in the Pat Sin Leng Country Park near Hok Tau management centre on 29 December 2009, tested positive for H5N1 HPAI.

INDIA

Outbreaks of H5N1 HPAI in 12 villages in Burwan and Khargram Blocks in Murshidabad District, West Bengal State were reported on the government website. The outbreaks occurred in backyard poultry and as of 28 January 2010, 1,849 birds died (case fatality rate 100%) and 129,692 birds were destroyed.

INDONESIA

In December 2009, PDSR officers visited 1,928 villages of which 135 (7.0 %) were classified as infected. Of these, 105 villages (77.7%) had not reported any HPAI cases in the previous six months. On the day of 31 December, and in comparison with the situation on the day of 30 November, no change was observed in the percentage of villages classified as 'infected' (HPAI compatible event supported by a positive rapid antigen

test result). The level of surveillance (i.e. the proportion of villages visited by PDSR teams in a particular province in a specific month, relative to the total number of villages covered under PDSR in that province) varied across provinces, with DI Yogyakarta (14.6%) and Bali (9.2%) having the highest levels. The level of infected villages detected (i.e. the proportion of villages found to be infected relative to total number of villages visited by PDSR teams in a specific month) varied across provinces. The percentage of new villages that were classified as infected for the first time during December 2009 showed some variability with Kalimantan Tengah (33.0%) having the highest. Two Provinces in Kalimantan reported infected villages for the first time.

VIET NAM

Outbreaks of H5N1 HPAI in Ca Mau, Cao Bang, Dien Bien, Ha Tinh and Thai Nguyen Provinces were reported on the Government website. The last outbreak occurred in a backyard ducks in Tan Phu, Thoi Binh District, Ca Mau Province on 26 January, 40 out of 250 ducks died. Approximately 1000 chickens, 2000 ducks and 24 muscovy ducks were destroyed since the reoccurrence of outbreak in Ca Mau. As of 31 January 2010, Ca Mau, Dien Bien, Ha Tinh and Soc Trang Provinces are under 21 days control measures.

This overview is produced by the FAO-GLEWS team, which collects and analyses epidemiological data and information on animal disease outbreaks as a contribution to improving global early warning under the framework of the Global Early Warning for Transboundary Animal Diseases (TADs) including Major Zoonoses.

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WORLDWIDE SITUATION

Fifty-six outbreaks of H5N1 HPAI in poultry were reported officially worldwide in November 2009. Outbreaks in poultry were reported from Egypt, Indonesia and Viet Nam. The number of reported outbreaks/cases by country and their location are illustrated in Figures 1 and 2, respectively.

FIGURE 1
H5N1 HPAI outbreaks/cases reported in poultry
and wild birds in November 2009
(Source: FAO EMPRES-i)

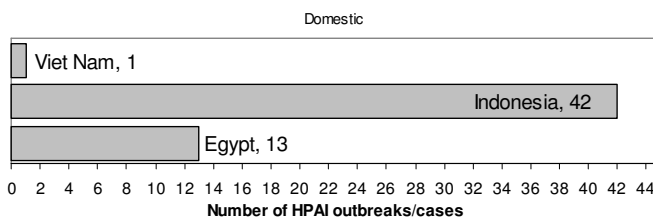
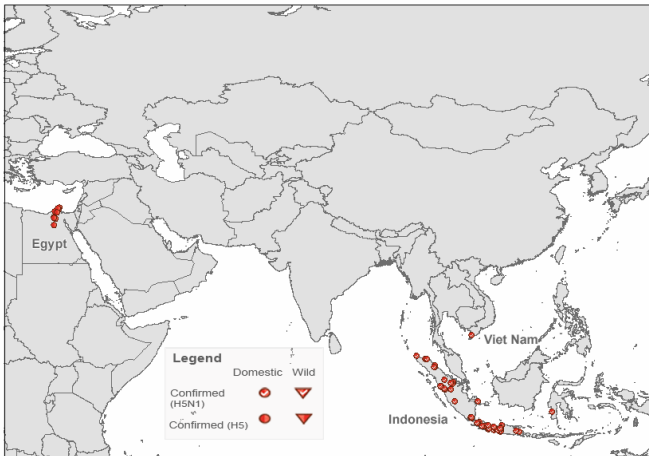


FIGURE 2
H5N1 HPAI outbreaks/cases reported in poultry
and wild birds in November 2009
(Source: FAO EMPRES-i)



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 status. The original data have been collected and aggregated at the most detailed administrative level and for the units available for each country.

The evolution of the number of outbreaks/cases over the last six months by species group (wild or domestic) and by geographical area is represented in Figures 3 and 4, respectively.

The evolution of the number of confirmed cases of H5N1 avian influenza (AI) infections in

humans reported to the World Health Organization (WHO) by country since November 2003 is illustrated in Figure 5.

Between November 2003 and 30 November 2009, human cases of AI were reported to WHO from 15 countries around the world and the number reached 445. In 2008, a total of 44 cases were confirmed by WHO. Indonesia had the highest number of reported cases (24 cases or 54.5%), followed by Egypt (8 cases or 18.2%). In 2009, a total of 50 cases (13 fatal [26%]) have been confirmed by WHO so far.

Thirty-eight cases were reported from Egypt, seven from China and five from Viet Nam. Of the 445 reported cases, 263 died; case fatality rate (CFR) of 59.1%. Among the countries with more than ten reported cases, Indonesia had the highest CFR of 81.6% (115 out of 141).

Age distribution of the reported human cases in all countries ranges from three months to 81 years of age (median 18.0 years of age), with 91.0% (405 out of 445) of patients being 39 years of age or younger.

The highest CFR was among persons between ten and 19 years of age and the lowest was among persons aged above 50. Gender was equally distributed (229 female cases or 51.5%). (Source: Western Pacific Regional Office of WHO, 8 Dec. 2009, Avian Influenza Update Number 213).

SITUATION BY CONTINENT/REGION

Africa

Confirmed outbreaks of H5N1 HPAI in Africa (Egypt) over the last six months are presented in Figure 6.

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

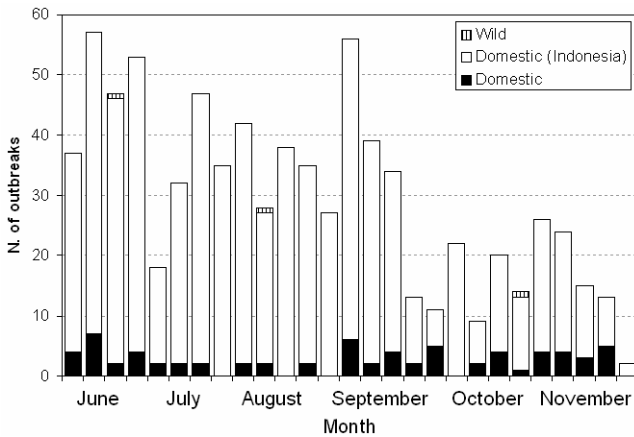


FIGURE 4
Weekly number of H5N1 HPAI outbreaks/cases reported by region between June 2009 and November 2009
(Source: FAO EMPRES-i)

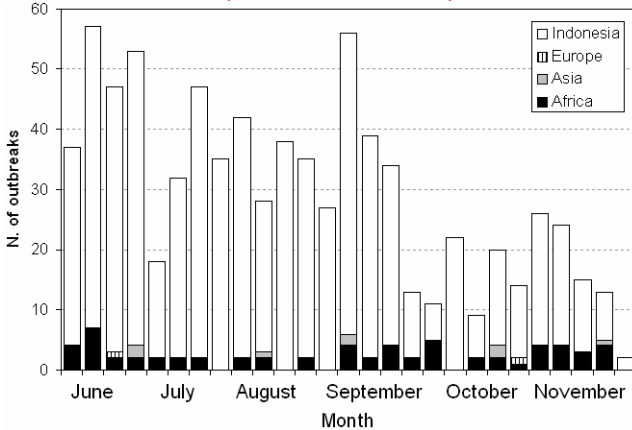


FIGURE 5
Confirmed cases of H5N1 AI infections reported in humans by country and month of onset since November 2003
(Source: World Health Organization - WHO)

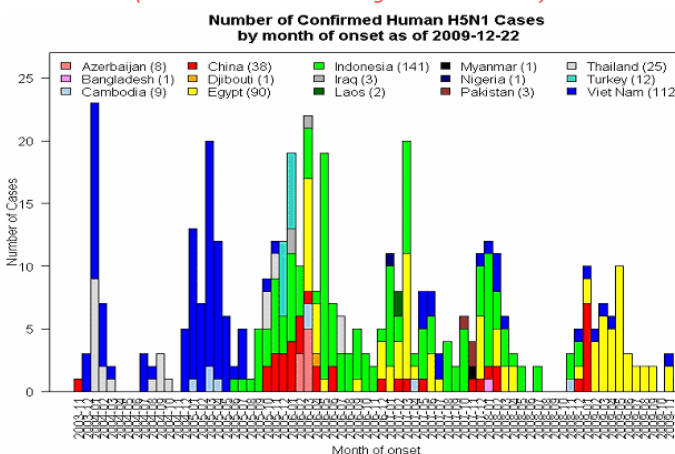
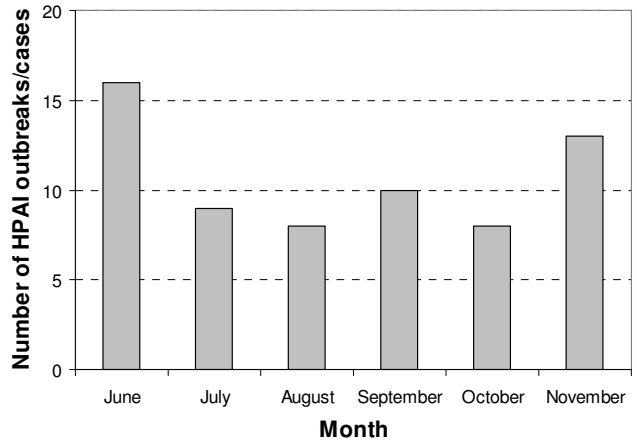


FIGURE 6

Number of reported H5N1 HPAI outbreaks in poultry in Africa (Egypt) between June and November 2009
(Source: FAO EMPRES-i)



Egypt, which reported its first H5N1 HPAI outbreak in February 2006, is considered endemic with regular reporting of outbreaks in almost all of the 29 governorates. In November 2009, Egyptian veterinary authorities reported thirteen H5 HPAI outbreaks in poultry (chickens, ducks, turkeys and geese) from Dakahlia (4), Fayoum (4), Menufia (2), Menia (1), Qalubia (1) and Bani-swaif (1) governorates. Twelve outbreaks (92%) were reported in household poultry and one outbreak (8%) was reported on a poultry breeder farm. Eleven of the twelve outbreaks in households occurred in non vaccinated birds. The infected farm poultry was also not vaccinated. During November 2009, 22 Participatory Disease Surveillance (PDS) teams visited 78 villages in ten governorates (Sharkia, Gharbia, Dakahlia, Menufia, Fayoum, Behera, Kafr-Elshiekh, Menia, Bani-Seuif and Qalubia) and detected nine confirmed outbreaks in Dakahlia, Menufia, Mina, Bani-swaif and Fayoum governorates out of ten suspected outbreaks that matched the HPAI clinical case definition.

An assessment study conducted in the framework of the SAIDR (Strengthening Avian Influenza Detection and Response) project revealed that vaccination coverage in the

household sector is very low (<20%) and that the flock immunity level is also less than 10%.

Surveillance activities are being undertaken targeting both poultry and migratory wild birds around selected important bird areas (IBAs) during winter. Poultry farms are required to test their birds and receive certification (HPAI infection negative status) prior to any planned transportation. During November 2009, 1,986 samples were collected for this purpose without any positive cases detected. Compliance with certification for poultry transportation is sub-optimal as only registered farms seek such services. In terms of surveillance on commercial farms during November 2009, active surveillance did not detect any HPAI infections on farms (89 farms tested from ten governorates), and passive surveillance detected one outbreak (only one sample was taken in the country). In terms of surveillance in the backyard/household sector, three HPAI outbreaks were detected in households through active surveillance (out of 191 samples from fourteen governorates). Eighteen samples were also collected at road check points without any testing positive for HPAI.

The current government policy is to allow commercial companies to vaccinate their flocks with registered vaccines of their choice. The government was providing vaccination of household/village birds free of charge. However, since July 2009, vaccination in backyard/household settings has been provisionally suspended until a new vaccination strategy is adopted. This decision was made after three years of a mass AI vaccination programme, with an apparently limited impact on disease incidence. Although there are no official vaccination data, especially from commercial farms, it is assumed that vaccines are widely used in the commercial poultry sectors. All AI vaccines used in Egypt are imported and there are at least 21, all inactivated and mostly the H5N1 Re-1 Chinese vaccine for household poultry and the H5N2 vaccine for commercial farms.

In November 2009, two human avian influenza A/H5N1 cases were reported in Egypt: a 21-year old male from Alexandria Governorate and

a 3 year old male from Minia Governorate. The total number of AI A/H5N1 human infections is 89, of which 27 (30%) have been fatal.

In **Nigeria**, there has been no reported case of H5N1 HPAI since July 2008. A surveillance study expected to start before the end of the year 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 FAO, and the support of the Nigerian Ministries of Agriculture and Environment.

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 HPAI (Burkina Faso, Ghana, Cote d'Ivoire, Benin and Niger).

South Asia

In **Bangladesh**, although no H5N1 HPAI outbreak was reported during November 2009 for the third consecutive month, the country is still believed to be endemic with active circulation of the virus. Poultry vaccination against H5N1 AI is prohibited by the government. As of 30 November 2009, a total of 326 outbreaks were recorded in 47 out of 64 districts on both commercial farms and in backyard holdings and nearly 1.7 million birds had been culled. FAO is coordinating and supporting active surveillance that is currently conducted in 150 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, 450 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.

A paper by Biswas *et al.* (2009) recently evaluated the risk factors for HPAI infection in backyard chickens in Bangladesh, through a matched case-control study. The following factors were found to be associated: offering slaughter remnants of purchased chickens to backyard chickens, having a nearby water body, and having contact with pigeons. Separating chickens and ducks at night was found to be protective. The study is at <http://www.cdc.gov/eid/content/15/12/1931.htm>.

In **India**, no outbreaks have been reported since the last outbreak of H5N1 HPAI was notified on 27 May 2009 in West Bengal. The control measures adopted were stamping out of the entire poultry population, including destruction of eggs, feed, litters and other infected items.

During November 2009, 3,076 active surveillance samples were received at the High Security Animal Disease Laboratory (HSADL), Bhopal. Testing was completed on 3,759 samples (some from the previous month), all with negative results, and another 3,472 were under test or pending. The periodical reports (available at <http://www.dahd.nic.in/birdflu.htm>) 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 about 240 samples since January 2009, mostly from migratory bird species. Another 150 wild bird samples have been submitted from samples collected at Chilika Lagoon, Orissa and Koothankulam Reserve, Tamil Nadu, from birds trapped as part of an FAO-facilitated satellite tag marking project (http://www.fao.org/avianflu/en/wildlife/sat_lemetry_india.htm). Samples were tested at

HSADL and all were negative for H5N1. The project will collect additional samples from migratory species this winter in Assam and West Bengal, in areas which have had historical HPAI H5N1 poultry outbreaks.

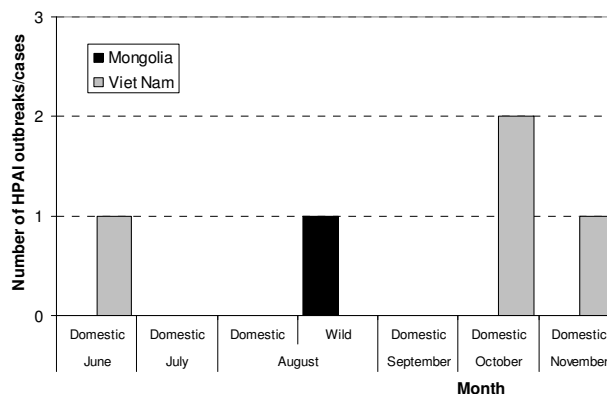
There has been a genetic study recently published by Chakrabarti *et al.* (2009) analysing the whole genome sequence of three isolates from West Bengal, one isolate from Tripura, and the hemagglutinin (HA) and neuraminidase (NA) genes of 17 other isolates. In the HA gene phylogenetic tree, all the 2008-09 Indian isolates belonged to EMA3 sublineage of clade 2.2. The 2007-09 isolates from Bangladesh were found to have the closest phylogenetic relationship, rather than the earlier 2006 and 2007 Indian isolates. This implies a third, cross border introduction of H5N1 HPAI into India. The study is available at: <http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0007846>.

South East and East Asia

Confirmed outbreaks/cases of H5N1 HPAI in South East Asia over the last six months are presented in Figures 8 and 9.

FIGURE 7

Number of H5N1 HPAI outbreaks/cases in poultry and wild birds in South East Asia, by country (excluding Indonesia), between June and July 2009
(Source: FAO EMPRES-i)



In **Cambodia**, no additional H5N1 HPAI events have been reported since the human case and poultry outbreak reported in Kandal Province in December 2008. Cambodia routinely reports results obtained from surveillance activities through two hotlines supported by FAO at the National Veterinary Research Institute (NaVRI). During November 2009, the hotlines received

seven calls. 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. No poultry outbreaks have been reported since April 2009 and the last wild bird case dates from May 2009. However, official surveillance programmes have demonstrated that H5N1 HPAI viruses continue to circulate in poultry in many provinces. The last figures released in the Official Veterinary Bulletin by the Ministry of Agriculture covering surveillance activities in September reported no new viruses isolated from routine surveillance. The last report with isolates dates from July 2009, when the H5N1 HPAI virus was detected in chickens, ducks and geese in Guangdong (including Shenzhen), Fujian (Xiamen) and Chongqing. 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. The last positive virus sample was detected in a dead feral pigeon in May 2009.

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 of the birds will

receive the killed Re-5 regardless of the species. Most of the poultry should receive at least two doses of vaccine (primary + booster) except for the 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 Clade 2.3.2 was also observed in Mongolia, resulting in the death of many wild birds during the summer of 2009. Sequence

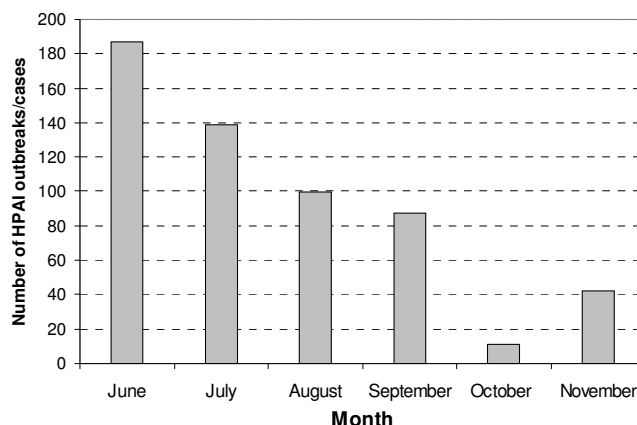
information from isolates from Qinghai Lake in 2009 is still awaited. It is highly likely that a cycle of infection with Clade 2.3.2 viruses has become established in wild birds and could pose a threat to poultry in areas where wild birds and poultry are in close association. Viruses in other clades have also been detected in wild birds, including Clade 2.3.4 viruses from Hong Kong SAR.

No human cases were reported during November 2009. China has reported 38 cases, of which 25 have been fatal (65.8%). The latest case confirmed by WHO was on 2 February 2009. On average, fewer than ten human cases are reported each year (range 0 to 13 cases annually since 2003).

Indonesia continues to report a high number of H5N1 HPAI outbreaks in poultry (Figure 8), as it has for the past three years. HPAI 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)¹ 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.

¹ 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.

FIGURE 8
Number of reported outbreaks/cases of H5N1 HPAI in poultry in Indonesia, between June and November 2009
(Source: FAO EMPRES-i)



During November, PDSR officers visited 1,531 villages, of which 64 (4.2%) were infected (42 were newly found, while the remaining 22 carried over the infection status from the previous month). The infection rate was slightly higher than the October 2009 infection rate of 3.2%. During the previous six months, PDSR officers visited 10,892 villages (16.8%) in the 349 districts under PDSR surveillance. Since May 2008, they have visited about 44.8% 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. Bali continued to have infected villages. 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 (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 practiced.

Indonesia's Ministry of Health, updating information on H5N1 avian influenza for the first time since January 2009, reported that the country has had 20 human cases in 2009, 19 of them fatal.

Lao People's Democratic Republic. A study by Boltz *et al.* (2009) reported an introduction of H5N1 HPAI clade 2.3.2 in September 2008, a virus found in Korea, Japan and Russia in April 2008. Prior to 2008 all H5N1 isolates in Lao PDR were from clade 2.3.4. The paper also reported the circulation of isolates with decreased sensitivity/resistance to oseltamivir and amantadine. The isolation of two reassortants with PB1 and PB2 genes homologous to Eurasian viruses, leads to a new genotype: P. The study is available at <http://www.ncbi.nlm.nih.gov/pubmed/20016036?dopt=Abstract>.

In **Viet Nam**, an H5N1 HPAI outbreak was reported on a duck farm in Tan Loc Bac Commune, Thoi Binh District, Ca Mau Province, where 184 out of 350 ducklings died. From January 2009, the Department of Animal Health (DAH) officially reported 50 HPAI outbreaks in 15 (24%) of 63 provinces, mostly on duck farms (65%) and in the small-scale commercial sector (69% of outbreaks in flocks with 50 to 1,000 birds). Consistent outbreak investigations are still not undertaken on infected farms and key information is usually missing from the field, so that it is difficult to have a good understanding of the way the virus is spreading throughout widely distributed regions of the country.

Disease control measures include stamping out of infected farms, movement restrictions for 21 days, compensation (up to 70% of market value; around 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 about 1,866 swab samples were taken to monitor HPAI virus circulation in slaughter-houses/-points or at live bird markets of 16 provinces. Results of the post-vaccination monitoring programme for this first round of 2009 showed that around 58% of vaccinated birds were protected, while around 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 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 currently being implemented in Viet Nam, including:

- 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). So far in 2009, ten viruses isolated from outbreaks have been sent to the U.S. Centers for Disease Control and Prevention (CDC) for sequencing, and to date, no new circulating clade has been detected.

In November 2009, there was one fatal human case of infection with H5N1 AI in a man from Dien Bien Phu city, Dien Bien Province, who developed symptoms on 18 November and died on 28 November 2009. Of the 112 cases confirmed to date in Viet Nam, 57 have been fatal.

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) are 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>.

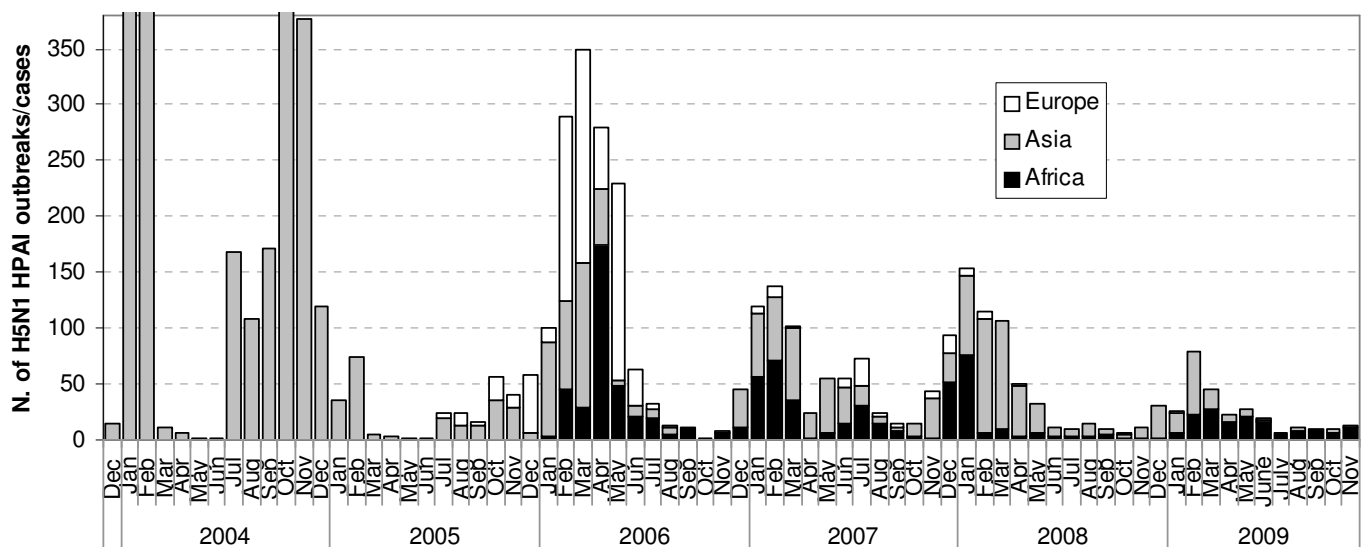
Europe

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

FIGURE 9
Number of reported H5N1 HPAI outbreaks/cases by continent, by month, since December 2003.



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 September 2009 for all governorates except Kurdistan Province, in the north of the country. All samples taken were negative for H5N1 [poultry farms (306), backyard poultry (1,678), game and wild birds (1), and markets and slaughterhouses (138)].

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, as suggested by the two human cases reported in Egypt in September 2009.

Data from previous years have shown a peak in the number of outbreaks/cases during the January-March period in both poultry outbreaks (Figure 9) and human cases (Figure 5), although there is a decreasing trend in the height of the peak as years go by. According to the general trend, we can expect an increase in the total number of outbreaks and countries affected in the coming months. A secondary peak was shown in 2007 and 2008 during the June-August period, which has not been observed this year. Several countries considered to be endemic, such as Bangladesh or China, have not reported any H5N1 HPAI activity for a few months now. In order to confirm that the zero outbreak reports are valid in those countries, major efforts may be needed to strengthen surveillance systems. In any case, we will need to wait longer to see if

this trend of no reports and no detection of virus activity continues, before we can consider these countries to be no longer endemic.

In the case of Egypt, the situation in terms of human infections has worsened since last year, although the situation seems similar in terms of poultry outbreaks (156 in 2009 compared to 114 in 2008). So far in 2009, there have been 38 human cases, mainly in children under four years of age, which is a five-fold increase when compared to the eight human cases reported during the same period in 2008. However, the case fatality rate has decreased from 50% in 2008 to 10.5% in 2009, thanks to the efforts of the Ministry of Agriculture.

When comparing the number of affected countries, November 2009 showed lower activity than November 2006, 2007 and 2008 (3 vs. 5, 6 and 12 - Figure 10). However, in terms of number of outbreaks, the activity was similar to November 2006 and November 2008 (13 vs. 8 & 11 - Figure 11), but much lower than November 2007 (46 outbreaks reported). 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 many countries and regions because of limitations in the capacity of veterinary services to implement sensitive and effective disease surveillance and outbreak investigations for H5N1 HPAI, and because of the weakness of compensation schemes.

FIGURE 10
Number of countries by continent that reported H5N1 HPAI in November 2006, 2007, 2008 and 2009
(Source: FAO EMPRES-i)

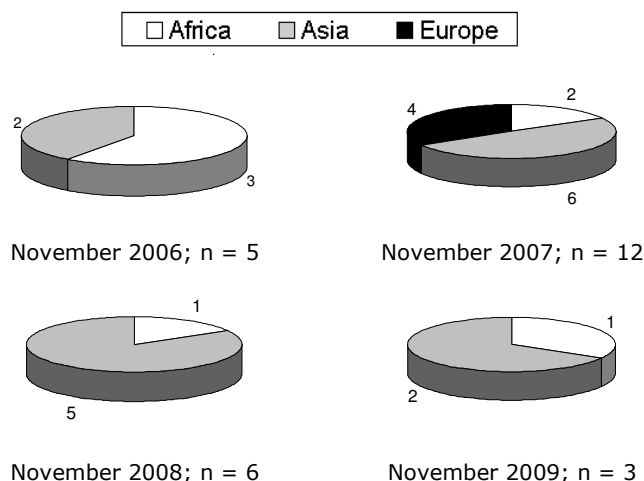
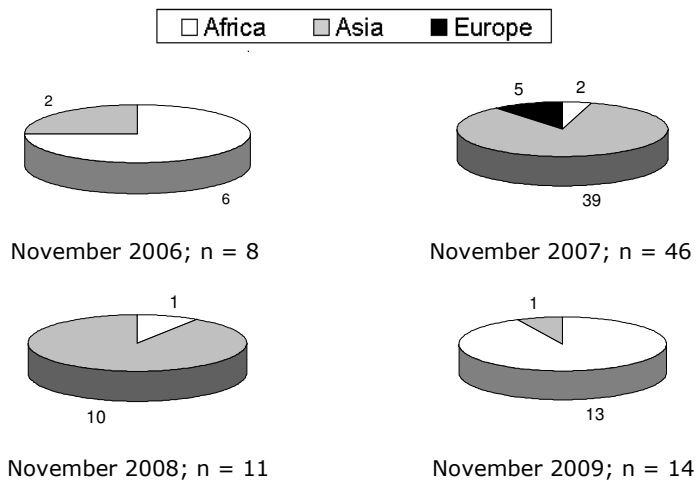


FIGURE 11

Number and distribution of H5N1 HPAI outbreaks/cases by continent in November 2006, 2007, 2008 and 2009

(Source: FAO EMPRES-i; 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)



An animated map showing the evolution of outbreaks over the last six months including November 2009 is available at:

www.fao.org/ag/againfo/programmes/en/empres/maps.html.

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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.

SUMMARY OF CONFIRMED HPAI OUTBREAKS (as of 31 January 2010)

Sources: OIE, European Commission (EC), FAO and national governments – WHO for human cases/deaths

Note: H5N1 unless otherwise indicated. Highlighted countries indicate those in which there has been only one officially confirmed H5N1 outbreak or occurrence. Dates of the last outbreak within this year are in bold.

AFRICA	First outbreak	Latest outbreak	Animals affected to date	Human cases / deaths to date
Benin	7 November 2007	15 December 2007	Domestic poultry	-
Burkina Faso	1 March 2006	20 May 2006	Domestic poultry - wild birds	-
Cameroon	21 February 2006	28 March 2006	Domestic poultry – wild birds	-
Côte d'Ivoire	31 March 2006	31 January 2007	Domestic poultry – wild birds	-
Djibouti	6 April 2006	6 April 2006	Domestic poultry	1 / 0
Egypt	17 February 2006	18 January 2010	Domestic poultry – wild birds	94 / 27
Ghana	14 April 2007	13 June 2007	Domestic poultry	-
Niger	6 February 2006	1 June 2006	Domestic poultry	-
Nigeria	16 January 2006	22 July 2008	Domestic poultry – wild birds	1 / 1
Sudan	25 March 2006	4 August 2006	Domestic poultry	-
Togo	6 June 2007	8 September 2008	Domestic poultry	-

ASIA	First outbreak	Latest outbreak	Animals affected to date	Human cases / deaths to date
Afghanistan	2 March 2006	2 October 2007	Domestic poultry – wild birds	-
Bangladesh	5 February 2007	26 January 2010	Domestic poultry	1 / 0
Cambodia	12 January 2004	16 December 2009	Domestic poultry – wild birds	8 / 7
China	20 January 2004	27 May 2009	Domestic poultry – wild birds	38 / 25
China (Hong Kong SAR)	19 January 2004	29 December 2009	Wild birds	-
India	27 January 2006	30 January 2010	Domestic poultry	-
Indonesia	2 February 2004	December 2009	Domestic poultry – pigs (with no clinical signs)	141 / 115
Japan	28 December 2003	7 May 2009 (raccoons, seropositive)	Domestic poultry – wild birds – raccoons (with no clinical signs)	-
Kazakhstan	22 July 2005	10 March 2006	Domestic poultry – wild birds	-
Korea, Rep. of	10 December 2003	12 May 2008	Domestic poultry – wild birds	-
Lao PDR	15 January 2004	25 February 2009	Domestic poultry	2 / 2
Malaysia	7 August 2004	2 June 2007	Domestic poultry – wild birds	-
Mongolia	10 August 2005	1 August 2009	Wild birds	-
Myanmar	8 March 2006	23 December 2007	Domestic poultry	1 / 0
Nepal	8 January 2009	17 February 2009	Domestic poultry	-
Pakistan	23 February 2006	17 June 2008	Domestic poultry – wild birds	3 / 1
Thailand	23 January 2004	10 November 2008	Domestic poultry – wild birds – tiger	25 / 17
Viet Nam	9 January 2004	26 January 2010	Domestic poultry	111 / 56

NEAR EAST	First outbreak	Latest outbreak	Animals affected to date	Human cases / deaths to date
Iran	2 February 2006	10 December 2007	Domestic poultry - wild birds	-
Iraq	18 January 2006	1 February 2006	Domestic poultry – wild birds	3 / 2
Israel	16 March 2006	24 January 2010	Domestic poultry	-
Jordan	23 March 2006	23 March 2006	Domestic poultry	-
Kuwait	23 February 2007	20 April 2007	Domestic poultry – wild birds - zoo birds	-
Saudi Arabia	12 March 2007	29 January 2008	Domestic poultry	-
West Bank & Gaza Strip	21 March 2006	2 April 2006	Domestic poultry	-

EUROPE	First outbreak	Latest outbreak	Animals affected to date	Human cases / deaths to date
Albania	16 February 2006	9 March 2006	Domestic poultry	-
Austria	10 February 2006	22 March 2006	Wild birds – cats	-
Azerbaijan	2 February 2006	18 March 2006	Wild birds – domestic poultry – dogs	8 / 5
Bosnia-Herzegovina	16 February 2006	16 February 2006	Wild birds	-
Bulgaria	31 January 2006	30 May 2006	Wild birds	-
Croatia	21 October 2005	24 March 2006	Wild birds	-
Czech Republic	20 March 2006	11 July 2007	Wild birds – domestic poultry	-
Denmark	12 March 2006	22 May 2006	Wild birds – domestic poultry	-
France	17 February 2006	14 August 2007	Wild birds – domestic poultry	-
Georgia	23 February 2006	23 February 2006	Wild birds	-
Germany	8 February 2006	10 January 2009 mallard, wild	Wild birds – domestic poultry – cats – stone marten	-
Greece	30 January 2006	27 March 2006	Wild birds	-
Hungary	4 February 2006	23 January 2007	Wild birds – domestic poultry	-
Italy	1 February 2006	19 February 2006	Wild birds	-
Poland	2 March 2006	22 December 2007	Wild birds – domestic poultry	-
Romania	7 October 2005	6 December 2007 (cat)	Wild birds – domestic poultry – cat	-
Russian Federation	15 July 2005	26 October 2009 rock dove	Domestic poultry – wild birds	-
Serbia	28 February 2006	16 March 2006	Wild birds – domestic poultry	-
Slovakia	17 February 2006	18 February 2006	Wild birds	-
Slovenia	9 February 2006	25 March 2006	Wild birds	-
Spain	7 July 2006	9 October 2009 (H7)	poultry	-
Sweden	28 February 2006	26 April 2006	Wild birds – domestic poultry – game birds – mink	-
Switzerland	26 February 2006	22 February 2008	Wild birds	-
Turkey	1 October 2005	9 March 2008	Domestic poultry – wild birds	12 / 4
Ukraine	2 December 2005	11 February 2008	Wild birds – domestic poultry – zoo birds	-
United Kingdom	30 March 2006	22 May 2008 (H7N7)	Wild birds – domestic poultry	-

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