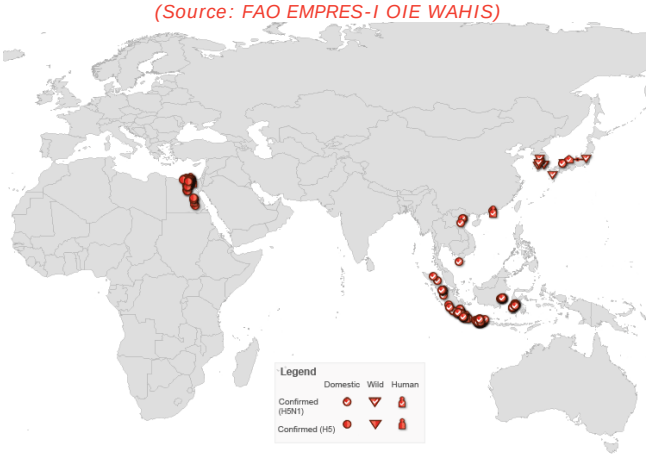
WORLDWIDE SITUATION

During November and December 2010, 209 H5N1 HPAI outbreaks in poultry were reported in Egypt, Indonesia, the Republic of Korea, Japan and Viet Nam. Seven outbreaks in wild birds were reported during the same period in Japan and the Republic of Korea. The number of reported outbreaks/cases by country and their location are illustrated in Table 1 and Figure 1.

Table 1
H5N1 HPAI outbreaks/cases in poultry and H5 and H5N1 infection in wild birds in November and December 2010
(Source: FAO EMPRES-, OIE WAHIS)

		No of outbreaks		
Month	Country	Domestic poultry	Wild birds	Total
November	Egypt	19	-	19
	Indonesia	46		50
	Rep of Korea	-	2	2
	Japan	1	-	1
	Viet Nam	3	-	3
Total		69	2	75
December	Egypt	39	-	39
	Indonesia	87		87
	Japan	-	3	3
	Rep of Korea	2	4	6
	Viet Nam	1	-	1
Total		129	7	136

FIGURE 1
H5N1 HPAI outbreaks/cases reported in poultry, H5 and H5N1 infection in wild birds and H5N1 infection in humans in November and December 2010
(Source: FAO EMPRES-I OIE WAHIS)



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 2 shows the number of confirmed cases of H5N1 infections in humans reported to the World Health Organization (WHO) by country from November 2003 to December 2010. During the two month reporting period there were eight confirmed cases of H5N1 in humans reported from Indonesia (1), China (1) and Egypt (6), three of whom died. These new human cases increased the number of confirmed human cases of H5N1 reported between November 2003 and December 2010 to 515 in 15 countries with a case fatality rate (CFR) of 59.2% (305 out of 515). Among the countries with more than ten reported cases, Indonesia had the highest CFR of 82.5% (141 out of 171).

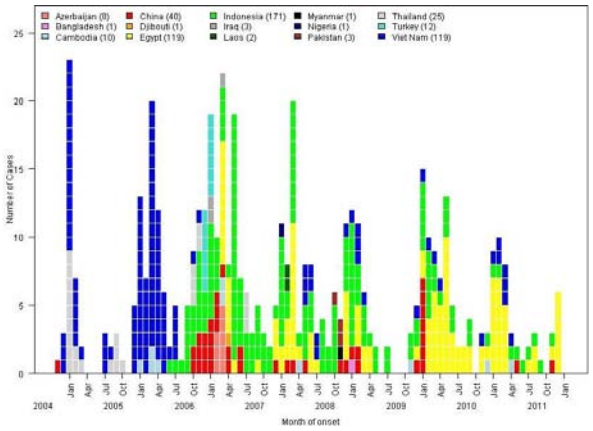
The age distribution of the reported human cases ranged from three months to 81 years of age (median: 19 years of age). The highest CFR (73.8%) was in persons 10 to 19 years of age and lowest (25.0%) in persons aged 70 and above. Fifty-percent of the cases were female (258/485). Gender was equally distributed, with females representing 53% of the cases. (Source: Western Pacific Regional Office of WHO, Avian Influenza Update).

TABLE 2
Cumulative number of confirmed human cases of avian influenza A/H5N1 reported to WHO between January 2008 and December 2010
(Source: World Health Organization - WHO)
Note: in red the figures that have changed since the last Global overview

Country	2008		2009		2010	
	cases	Deaths	cases	deaths	cases	deaths
Bangladesh	1	0	0	0	0	0
Cambodia	1	0	1	0	1	1
China	4	4	7	4	2	1
Egypt	8	4	39	4	29	13
Indonesia	24	20	21	19	9	7
Viet Nam	6	5	5	5	7	2
Total	44	33	73	32	48	23

Table 2 shows the cumulative number of confirmed human cases and deaths due to H5N1 reported to WHO between January 2008 and December 2010. There was an increase in case numbers from 2008 to 2009 and a decrease in 2010. This was associated with a consistent decrease in deaths attributable to the disease across the three year period. During 2010, (as of 31 December 2010) 48 human cases have been reported worldwide and 23 have died resulting in CFR of 47.9%.

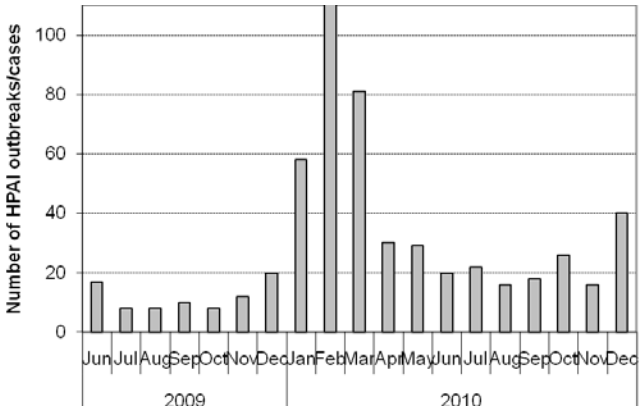
FIGURE 2
Cases of H5N1 AI infections reported in humans by country and month of onset from November 2003 to December 2010
(Source: World Health Organization - WHO)



SITUATION BY CONTINENT/REGION

Africa

FIGURE 3
H5N1 HPAI outbreaks in poultry in Egypt between June 2009 and December 2010
(Source: FAO EMPRES-i)



Egypt reported 58 H5 HPAI outbreaks in poultry (chickens, ducks, geese and turkeys) from 14 governorates, primarily in the household sector (54 of 58 outbreaks) during November and December 2010. Affected governorates, in order of the number of reported outbreaks, include Dakahlia (11), Gharbia (9), Minufiyah (8), Qalubia (8), Kafr-Elshiekh (4), Minya (3), Luxor (3), Sixth October (3), Alexandria (2), Beni Suef (2), Qena (2), Aswan (1), Fayoum (1), and, Sharkia (1). Four (7%) of the outbreaks occurred in vaccinated flocks and 22 (38%) in non-vaccinated flocks, while the vaccination status of the birds in the remaining 32 outbreaks (55%) was unknown. During the reporting months, the Community Animal Health Outreach (CAHO) teams visited 247 villages in 15 governorates and detected 14 (24%) of the 58 reported outbreaks. CAHO teams operate in high-risk governorates and collect samples only from suspected HPAI cases.

Out of 5,396 samples tested, as part of regular pre-movement testing during the reporting period, only one tested positive for A/H5N1. Poultry farms in Egypt are required to test birds prior to movement as part of an HPAI certification programme (HPAI infection negative status). Compliance with certification for poultry transportation is generally sub-optimal and only registered commercial poultry farms (<20% of all farms) seek such services.

As part of the ongoing active surveillance programme, 15 commercial poultry farms located in four different governorates were tested and one was confirmed positive for H5 HPAI infection. Active surveillance in household poultry was also carried out in 489 villages where 35 samples collected from fifteen governorates were found positive for H5 HPAI.

Two of the six suspected HPAI notifications received from commercial poultry farms were confirmed positive for H5 HPAI. In addition, 18 of the 176 suspected outbreak notifications received from the household poultry sector in 14 governorates were confirmed positive for H5 HPAI. A total of 26 samples were collected at road check points and all tested negative for H5 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, until July 2009, the government provided vaccination to household/village poultry free of charge; then vaccination was suspended after an assessment indicated that the programme had limited or no impact on H5N1 HPAI incidence.

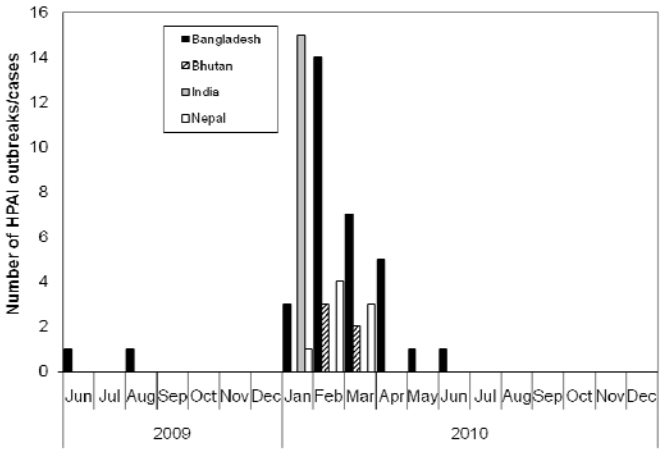
In December 2010, there were six human avian influenza (AI) type A H5N1 cases with three fatalities. There were no human A/H5N1 cases reported in the prior month (November 2010). Since the beginning of the A/H5N1 epidemic in 2006, a total of 118 human laboratory-confirmed infections were reported in Egypt. Of these, 39 (33%) have been fatal. While most cases in 2009 were in children under four years of age, in 2010, 78% of human infections have been reported in patients above that age. The CFR in 2010 is higher than in 2009 (43% vs 10%), but similar to the CFR reported in 2008 (50%). The increase in reported H5N1 HPAI outbreaks in poultry (460 outbreaks reported from January to December 2010, compared with 177 in the same period in 2009) is most likely the result of improved surveillance through the effectiveness of the CAHO program.

The first report of an outbreak of H5N1 HPAI in Egypt was 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. Circulating viruses belong to Clade 2.2.1 and cluster in two major genetic groups indicating that there have been no new introductions of H5N1 viruses after 2006. The work on gene sequencing depicts that currently there are two major groups of A/H5N1 viruses: i) The classical group: which is closely related to the originally introduced viruses and is circulating mainly in household poultry flocks; and ii) the variant group that has emerged in late 2007 and that is circulating mainly in commercial poultry farms. In 2010, the latter group(variant group) has been further divided into two minor subgroups (1 and 2).

All the human cases in 2010 are caused by viruses genetically similar to those isolated in 2009. Data are not available on the antigenic properties of the recent poultry viruses in Egypt, but the human isolates characterized are antigenically similar to sub group I described above. These viruses did not react well to post-infection ferret antiserum raised against the vaccine reference viruses used in the country.

South Asia

FIGURE 4
H5N1 HPAI outbreaks/cases reported in poultry, H5 and H5N1 infection in wild birds in South Asia, by country, between June 2009 and December 2010
(Source: FAO EMPRES-i)



In November and December 2010, **Bangladesh** experienced no outbreaks of H5N1 HPAI. Phylogenetic analyses of viral samples from 2010 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 indicate that the virus is being maintained and 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 biosecurity in various production sectors. Poultry vaccination against H5N1 HPAI is prohibited by the government.

As of 31 December 2010, a total of 358 outbreaks had been recorded in 49 out of 64 districts, including 31 outbreaks in 2010, 32 in 2009, 226 in 2008 and 69 in 2007. Out of these outbreaks, 304 were on commercial poultry farms, and only 54 in backyard poultry. Over 1.869 million birds have been culled since 2007. 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 (CAHW) employed by the active surveillance programme send SMS coded text messages to the Department of Livestock Services, regardless of the presence or absence of disease and deaths in poultry. SMS messages of suspected HPAI events are automatically forwarded to the livestock officer in the area who will respond by initiating an investigation. In November and December, 22,849 and 23,996 SMS messages were received, respectively, including 215 suspected HPAI events in backyard poultry and 467 suspected events on commercial poultry farms. The veterinary investigations that followed excluded 636 of these suspect cases and on 46 occasions, diagnostic specimens were collected. Of all specimens collected and reported through the SMS gateway system, none tested positive for H5N1 HPAI.

Eight of 23 migratory waterfowl trapped in Bangladesh in February 2010, as part of an FAO-facilitated satellite tracking project, are still delivering data that will allow further clarification of the role of migratory birds in the spread of H5N1 HPAI. The current location of the birds can be found at http://www.werc.usgs.gov/Project.aspx?ProjectID=159. An article on this project was published in Science (http://www.sciencemag.org/content/vol328/issue5978/r-samples.dtl). Four of these birds were observed to have returned to Bangladesh in November 2010.

In **Bhutan**, no new outbreaks have been reported since February and March 2010. These outbreaks were caused by viruses belonging to Clade 2.2, similar to those detected in India and Bangladesh.

In **India**, the last outbreaks of H5N1 HPAI occurred in backyard flocks in January 2010 in West Bengal. The 2010 virus isolates of Clade 2.2. were similar to those found during 2008 and 2009. India declared itself free from H5N1 HPAI in July 2010.

Surveillance activities conducted at the High Security Animal Disease Laboratory (HSADL), Bhopal, are periodically reported at http://www.dahd.nic.in/, including the number of samples received and tested per state. In addition, the Ministry of Environment and Forests of the Government of India and the Department of Wildlife and Forests of Uttar Pradesh are funding the sampling of wild water birds.

Twelve of sixteen migratory waterfowl trapped in the states of Assam and West Bengal as part of an FAO-facilitated satellite tracking project in January 2010 are still delivering data (http://www.werc.usgs.gov/Project.aspx?ProjectID=60). Diagnostic specimens were collected and laboratory results are still pending.

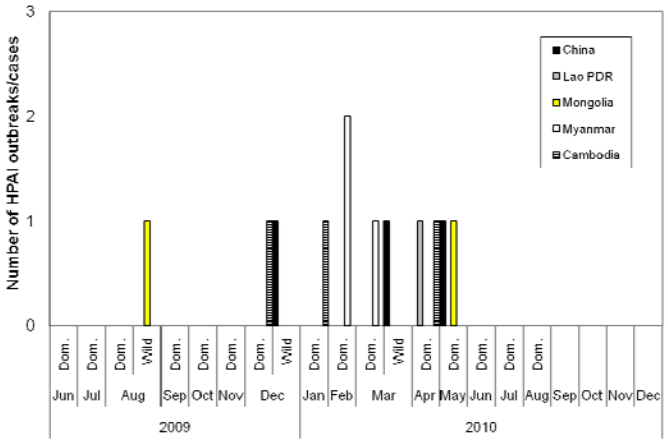
In **Nepal**, no new H5N1 HPAI outbreaks have been reported since March 2010. Phylogentic analyses of virus isolates from these last outbreaks identified H5N1 Clade 2.2 (samples taken from the Kaski District outbreaks) and H5N1 Clade 2.3.2 (from all outbreaks). Clade 2.2 had been previously isolated in 2009 in Nepal's eastern region, but this was the first detection of Clade 2.3.2 in the South Asia region. Clade 2.3.2 viruses were most related to viruses isolated in wild birds in 2009 from the Russian Federation and Mongolia. More distant Clade 2.3.2 viruses were also isolated in wild birds in Hong Kong SAR (China) and in poultry in Viet Nam.

South East and East Asia

FIGURE 5

H5N1 HPAI outbreaks/cases in poultry, H5 and H5N1 infection in wild birds in East and South East Asia, by country (excluding Indonesia and Viet Nam), between June 2009 and December 2010

(Source: FAO EMPRES-i)



In **Cambodia,** no additional poultry or human cases have been reported since April 2010. All available human and animal isolates since 2004, including all those from 2010, are Clade 1 (genotype Z) and are most closely related to Clade 1 viruses previously circulating in Cambodia. This is also the same clade that circulates predominantly in southern Viet-Nam.

Cambodia routinely reports results obtained from surveillance activities through two hotlines (supported by FAO until February 2010) at the National Veterinary Research Institute (NaVRI). There is also ongoing duck market surveillance at eight live bird markets (LBMs) in five provinces and sentinel duck flock surveillance in six provinces. Both duck surveillance efforts are conducted by NaVRI (and supported by FAO). As none of the samples previously collected from 12 markets over two years have tested positive for H5N1 HPAI, the number of markets was reduced to eight and 12 sentinel duck flocks have been introduced into the surveillance programme.

In **China**, no outbreaks were reported in domestic poultry during November and December 2010. One case of H5N1 in a decomposed poultry carcass was reported in December in Hong Kong SAR. The last reported outbreak for 2010 was observed in May in wild birds in Tibet.

China first identified HPAI viruses of the H5N1 subtype in 1996 in geese in Guangdong Province and these viruses have continued to circulate and evolve over time. Almost 200 H5N1 HPAI outbreaks have been reported in poultry and wild birds in 29 provinces since 2004 and over 35 million poultry have been culled to control the spread of the disease.

Between 2004 and 2009 there has been a marked decrease in the number of reported outbreaks in domestic poultry. Despite this decrease in outbreak numbers, official ongoing surveillance activities conducted at national and provincial levels provide evidence that H5N1 viruses are still circulating in many provinces in domestic poultry, as well as in wild

birds. Results from the national surveillance system released in December 2010 by the Ministry of Agriculture for activities conducted during January 2010, April 2010 and July 2010 show that 14 provinces (Anhui, Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Yunnan and Zhejiang) had H5N1 positive samples. Out of 182,362 virological samples collected and tested during those three months, 86 (4.7 per 10,000) were positive. The majority of positive samples came from ducks (52.3%) and chickens (40.4%), and to a lesser extent, geese (2.2%), pigeons (1.16%), and wild birds (1.16%). Sixty-five percent of samples were collected from chickens, 18% from ducks, 6% from geese, 3% from wild birds and the remaining 8% from pigs and other species. In a number of provinces, the proportion of positive samples was higher than expected, particularly for ducks (some over 4%). Sampling results by month confirmed circulation of H5N1 HPAI viruses in domestic poultry at live bird markets during January 2010 and April 2010 and one positive wild bird sample in July 2010. In January, 38 out of 21,892 poultry samples taken from chickens, ducks and geese in 13 provinces were positive for H5N1 HPAI viruses in 29 LBMs. In April 2010, 46 out of 21,892 samples from similar species were positive for H5N1 HPAI viruses in 31 LBMs. In July 2010, H5N1 HPAI virus was isolated from one wild bird (*Chinesis)* out of 686 wild bird samples taken at Dongting lake of Hunan Province. This is added evidence of the presence of the virus in wild birds and the constant risk of virus introduction into domestic poultry. A recent study by Kou *et al.* (2010) describes the H5N1 virus prevalence in apparently healthy wild birds surveyed between April 2004 and August 2007. Of 14,472 wild birds sampled, covering 56 species of 10 orders in 14 provinces of China tested with RT-PCR using H5 primers, 17 viral strains out of 149 positive samples were isolated. Of the six bird orders affected, Anseriformes had the highest prevalence (2.70%), while Passeriformes had the lowest (0.36%). Among the 24 positive species, mallards (*Anas platyrhynchos*) had the highest prevalence (4.37%). Of the provinces included in the sampling, Qinghai Province had the highest prevalence (3.88%), particularly in pintails (*Anas acuta*), mallards (*Anas platyrhynchos*) and tufted ducks (*Aythya fuligula*).

An intensive surveillance programme is ongoing in Hong Kong SAR which includes sampling of dead wild birds, wholesale and retail market birds found dead, as well as faecal swabs and pre-sale antibody checks from healthy birds. Results from this programme are not available.

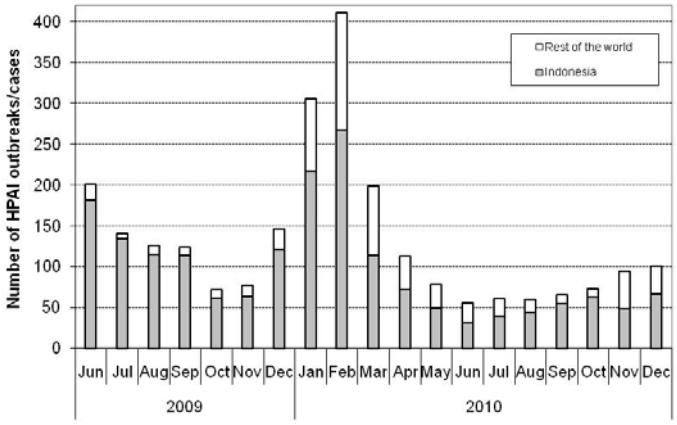
Mass vaccination against H5N1 HPAI has been implemented since November 2005. Vaccination combined with other measures has resulted in improved disease control. Between January 2010 and July 2010, out of 2,093,323 post-vaccination samples, 1,902,142 (90.87%) were sero-positive. AI vaccines are provided 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” vaccine 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.

One human infection of H5N1 influenza A was reported in Hong Kong SAR, China during the reporting period. The last reported human infection for 2010 occurred in June. Since the beginning of the epidemic, China has reported 40 human cases, of which 26 (65%) were fatal.

All the clades of Asian-lineage H5N1 HPAI virus found globally have been detected in China. Of particular interest is the recent expansion of Clade 2.3.2, which was originally detected from a dead Chinese pond heron in Hong Kong SAR in 2004 and has now expanded its geographic range to include Mongolia, the Russian Federation, Nepal, Romania and Bulgaria. In Hong Kong SAR, viruses from Clade 2.3.4 were also detected in wild birds and poultry in 2009. The study by Kou et al. (2001) also provides some information on virus clades in wild birds sampled in China between April 2004 and August 2007. Additional information can be found at http://www.plosone.org/article/info:doi%2F10.1371%2Fjournal.pone.0006926.

Indonesia continues to report a high proportion of H5N1 HPAI outbreaks in poultry worldwide (Figure 6), 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 village poultry. The programme is supported by FAO with USAID, AusAID and World Bank-implemented Avian and Human Influenza Facility Policy and Human Resources Development Fund (AHIF-PHRD) financial support and is operating in 349 of 496 (70%) districts through 31 Local Disease Control Centres (LDCCs) in 27 (82%) of 33 provinces in Java, Sumatra, Bali, Sulawesi and Kalimantan, including all known endemic areas. Larger and less densely-populated provinces report HPAI outbreaks less often than more densely populated provinces.

FIGURE 6
H5N1 HPAI outbreaks in poultry in Indonesia (compared to the rest of the world) between June 2009 and December 2010
(Source: GoI/ECTAD Indonesia and EMPRES-i)



During November 2010, PDSR officers visited 1,608 villages, of which 46 (2.8%) were infected. Of these, 42 were new infections. In December 2010, PDSR officers visited 1,662 villages, of which 87 (5.2%) were infected. Of these, 83 were new infections. During the previous 12 months, 19,961 (27.9% of 71,547) villages were visited in the 384 PDSR surveillance districts. Since May 2008, the PDSR officers have visited approximately 54.4% of villages under coverage. Approximately 7.0 % of villages visited during the previous 12 months were classified as newly infected. Cases over the past 12 months were concentrated in Sumatera and Java.

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 by the central government in the

* 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.

backyard poultry sector were implemented until 2008, when they stopped as a result of concern over the efficacy of registered vaccines. 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.

Japan has reported one outbreak in poultry during November and three cases in wild birds during December 2010. This follows the recent isolation of H5N1 HPAI virus belonging to subclade 2.3.2. in wild bird faecal material in October 2010. The virus responsible for the outbreaks during this reporting period was similar to that found in October 2010.

Lao People's Democratic Republic has reported no outbreaks since April and May 2010 in Vientiane, the capital, when the country experienced its first HPAI outbreaks since February 2009. Samples sent to the Australian Animal Health Laboratory (AAHL) in Geelong were identified as Clade 2.3.4, clustering together with viruses seen in Lao PDR previously.

The 2010 active surveillance programme is carried out in the nine highest-risk provinces in Lao PDR, based on the location of historical HPAI outbreaks. The surveillance is focused on ducks in live bird markets, high duck concentrated villages and farms. A total of 30 markets, 35 villages and 28 farms have been visited. Three samplings of active surveillance (March, June and September 2010) have been completed. A total of 3,695, 3,227 and 3,148 swab samples and 1,899, 2,064 and 1,943 serum samples were collected from the first, second and third rounds respectively. From all the three samplings, 565 (5.61%) swab samples were tested positive to avian influenza type A/H5N1RT-PCR, but all were negative to AIV H5. While 302 (5.11%) of sera tested positive to AIV type A by ELISA, but all were negative to the HI test. Laboratory results from the he fourthsampling conducted in December 2010 is pending.

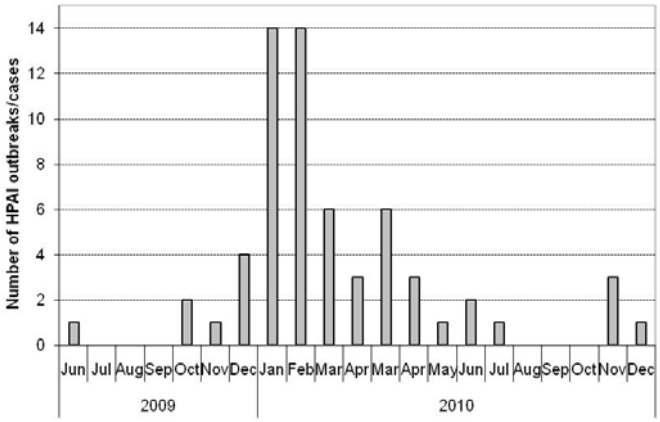
In **Mongolia**, no HPAI event has been reported since the wild bird outbreak reported in May 2010, affecting whooper swans (*Cygnus cygnus*) and greylag geese (*Anser anser*) in Ganga Lake, on the south-eastern border with China. Phylogenetic analyses placed them in the 2.3.2 Clade.

Myanmar is currently compiling a national database of commercial poultry farms with population and geo-location data to support disease control programmes. Myanmar is implementing an expanded surveillance programme in 78 townships (out of a total of 334). The programme is based on surveillance by community animal health workers (CAHW), suspect outbreak investigations by veterinary staff, and longitudinal studies of 100 poultry flocks. In the longitudinal studies, sera are collected monthly from ducks and backyard chickens in contact with ducks. To date, there have been no reports of diseases which have required investigation, but the longitudinal studies show that the virus continues to circulate among duck flocks.

The **Republic of Korea** reported two outbreaks in domestic poultry during December 2010 and six wild bird events during November and December 2010.

In **Thailand**, a country that has not experienced any outbreak since 2008, a recent study by Amosin *et al.* (available at http://www.virologyj.com/content/pdf/1743-422x-7-233.pdf) reported on the genetic characterization of the viruses isolated from the outbreaks reported in four provinces. Eight influenza A H5N1 viruses, recovered and characterised, displayed genetic drift characteristics (less than 3% genetic differences).

FIGURE 7
H5N1 HPAI outbreaks in poultry in Viet Nam, between June 2009 and October 2010
(Source: FAO EMPRES-i)



In **Viet Nam**, Four outbreaks were reported in poultry and none in humans for the reporting period. Two outbreaks were reported in Nam Dinh (North) and one outbreak in Nghe An (Center) provinces of Viet Nam in November 2010. In early December 2010, one outbreak was reported in Ca Mau province (South). H5N1 was first identified in poultry in 2003 and in humans in 2004. Altogether in 2010, the Department of Animal Health of the Ministry of Agriculture and Rural Development officially reported 46 poultry outbreaks in 20 provinces and the Ministry of Health declared seven human cases (with two fatalities).

However, there is evidence that there is virus circulation without severe clinical signs, particularly in ducks. Increased stress in poultry and increased movement of poultry due to higher demand in the winter months, including the Tet festival period, possibly help in the transmission of the disease in which these silent carriers possibly play a key role. Consistent outbreak investigations are not undertaken on infected farms and key information is often missing from the field. FAO is assisting the government to improve the outbreak investigation procedures through the development and updating of standard operating procedures (SOPs) and through Applied Veterinary Epidemiology Training (AVET).

Disease control measures include stamping out on infected farms, movement restrictions for 21 days, compensation and vaccination. Mass vaccination with an H5N1 inactivated vaccine started in 2005 and 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. The objective is to vaccinate 50% of the flocks in order to reduce the size of the susceptible population.

Post-vaccination monitoring is routinely carried out after each vaccination campaign. For the first round of 2010 (implemented in May to July 2010, a total of 12,854 samples were collected from randomly selected flocks in 18 targeted provinces for sero-monitoring. Results showed that vaccinated poultry have a protection rate† of 72.10 % at bird level. The protection rates of Muscovy ducks, Turkey, other ducks, chickens and geese were 80%, 80%, 78.90%, 68.05% and 50%, respectively..

Desvaux et al. (2010) reported at the "Options for the control of influenza VII" meeting on the "H5N1 avian influenza seroprevalence in North Viet Nam under a mass vaccination context". Around 1,000 birds were sampled for four campaigns (mid-December 2008, end-January 2009, end-March 2010 and early June 2010), from randomly selected poultry farms or villages (for backyard poultry) in the Red River Delta Northern provinces. The global seroprevalence

† HI ≥ 1/16

was 18.3%. Muscovy ducks are not usually vaccinated, so if excluded from the calculation, the percentage increases to 22.4%. Broilers, with a short cycle, presented a lower seroprevalence than breeder-layers (11.6% vs. 20.5%). These levels of protection are much lower than the coverage expected from mass vaccination and may be explained by the high turnover of the poutry population, the low duration of the immunity induced by an inactivated vaccine, and practical issues in the field implementation of the vaccination. Some non-vaccinated animals showed seroconversion, which was considered to be due to virus circulation during the study period.

Similarly, Henning, J., *et al*. (2010) conducted a longitudinal study from May 2007 to May 2008, monitoring, through bi-monthly testing, 80 flocks of ducks and in-contact chickens in the Mekong Delta of Viet Nam. Serum and swab samples from 5,409 birds were analyzed, showing a bird-level seroprevalence of 17.5% among unvaccinated ducks and 10.7% among unvaccinated, in-contact chickens. The paper can be downloaded at:
http://www.ncbi.nlm.nih.gov/pubmed/20594603.

Virus circulation surveillance was carried out at the same time as post-vaccination monitoring in 16 target provinces and cities. A total of 1,511 tracheal swabs of poultry (742 samples from ducks, 743 samples from chickens and 26 samples from Muscovy ducks) were collected from farms randomly selected in eight high-risk provinces to monitor H5N1 virus circulation. Prevalences of Type A and H5N1 avian influenza viruses in ducks were 0.94% and 0.67% respectively while in chickens, respective prevalences were 0.54% and 0%. There was no evidence of AI virus persistence found with the samples taken from Muscovy ducks. The AI positive samples were from Khanh Hoa and Quang Ngai provinces (Center).
Molecular surveillance has indicated the presence of four circulating virus clades in Viet Nam since 2003. These are: (1) Clade 1 (predominant in southern Viet Nam and also isolated in Cambodia); (2) Clade 2.3.4 (predominant in northern Viet Nam since 2005 and also circulating in China); (3) Clade 7 (detected in poultry seized at the Chinese border and at markets near Hanoi); and (4) Clade 2.3.2 in 2007 and 2009. Limited sequence data from 2010 indicate that Clade 2.3.2 continues to circulate in Viet Nam. Interestingly, the Clade 2.3.2 HA genes were nearly identical to A/Hubei/1/2010, which was isolated from a recent human case in China. Clade 2.3.4 viruses grouped into one of two previously identified subgroups with limited genetic variation compared to Clade 2.3.4 vaccine strains. This clade, though largely prevalent in north and central Viet Nam, has also been detected in south Viet Nam in 2010. No new Clade 7 isolates have been detected since 2008.

No human cases have been reported since April 2010, but Viet Nam remains one of the countries with the highest number of human cases - 119 - of which 59 (50%) have been fatal.

Middle East

In **Israel**, no outbreaks have been reported since two emus at a mini-zoo of a Kibbutz in Hadarom tested positive for H5N1 HPAI in April 2010. Additionally, sequence data recently became available in Genbank for a virus recovered from an outbreak in heavy breeder pullets in Haifa in January 2010. The closest relatives appear to be Clade 2.2 viruses from Egypt.

Eastern Europe

The last wild bird event in Europe was reported in the **Russian Federation** in June 2010, when 367 wild birds were found dead in Ubsu-Nur Lake, in Tyva Republic. Genetic analysis at the All-Russian Research Institute for Animal Health (ARRIAH) in Vladimir, determined that the isolate belonged to Clade 2.3.2 of the Asian linage A/Guandong/1/96 and is 99% similar to the 2009-2010 H5N1 isolates from wild birds in Mongolia, Tyva and Qinghai.

Prior to this, H5N1 activity was reported at the Black Sea coast, with two outbreaks in backyard poultry in **Romania** and one positive case in a common buzzard in **Bulgaria**. Isolates from both countries grouped in 2010 Clade 2.3.2 and were 99.3% equal to each other and 99.3% similar to viruses isolated recently from poultry in Nepal. Prior to April 2010, the last H5N1 HPAI event in poultry had been detected in October 2008 on a mixed poultry farm in Germany.

CONCLUSIONS

During the reporting period, 198 domestic poultry outbreaks were reported in five countries (Egypt, Indonesia, Republic of Korea, Japan and Vietnam), eight confirmed reports of human cases in three countries (Indonesia, Egypt and China) and confirmed wild bird events were reported in Japan and the Republic of Korea.

Japan detected Clade 2.3.2 H5N1 HPAI viruses in domestic poultry during November and December 2010, despite the early warning provided by virus detection in wild birds in October 2010. This implies possible difficulties associated with the implementation of adequate biosecurity measures at the farm level (http://www.yomiuri.co.jp/dy/national/T110128005348.htm). The finding of another virus positive poultry carcass on the shores of one of a China (Hong Kong SAR) outer island (Clade 2.3.2) reaffirms the on-going presence of virus in the southern China region.

November and December 2010 showed the same trends as previous years in terms of the increases observed in the number of countries reporting outbreaks (Figure 8) and the number of outbreaks (Figure 9) reported globally. This period is generally associated with high virus activity and over the years the number of reports has consistently been higher during these two months than during any of the other months.

In November and December 2010**,** there were no new countries reporting outbreaks. During 2010, H5N1 HPAI has reoccurred in a number of countries where the disease had not been reported for a number of months, including Cambodia, Israel, Lao PDR, Myanmar, Nepal, Romania and the Republic of Korea. In some cases, molecular evidence suggests introduction of a new strain of virus (e.g. Clade 2.3.2 virus to Romania, Clade 2.2.1 virus to Israel). In other instances, e.g. in southeast Asia, it remains unknown whether the new cases resulted from reintroduction of virus or from detection of outbreaks caused by virus that was circulating at low level within the country without reports of disease or positive findings from surveillance studies.
Since 2003, 63 countries/territories have experienced outbreaks of H5N1 HPAI. The last newly infected country was Bhutan in February 2010 (Figure 8 – upper right corner). Effective control measures for outbreaks in poultry have been associated with a reduced incidence of human infections in several countries. However, H5N1 HPAI continues to be present in poultry in parts of Asia and Africa (Egypt) and thus the risk of human infection remains.

H5N1 HPAI continues to be a global threat for poultry and also humans therefore vigilance needs to be maintained by governments in endemic countries and countries at risk. The evolution of virus Clade 2.3.2 during 2010 is a significant epidemiological event since, for the first time, this Clade spread to Europe (Romania and Bulgaria) probably by the migratory movement of wild birds.

FIGURE 8
Number of countries by continent and by month and year that reported H5N1 HPAI outbreaks since December 2003
(Source: FAO EMPRES-i)

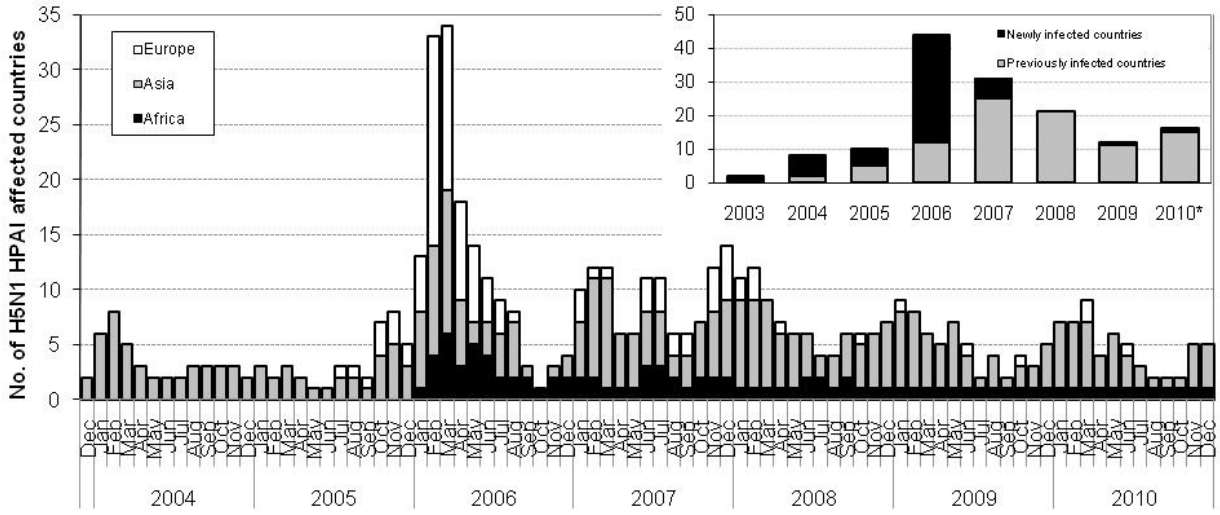
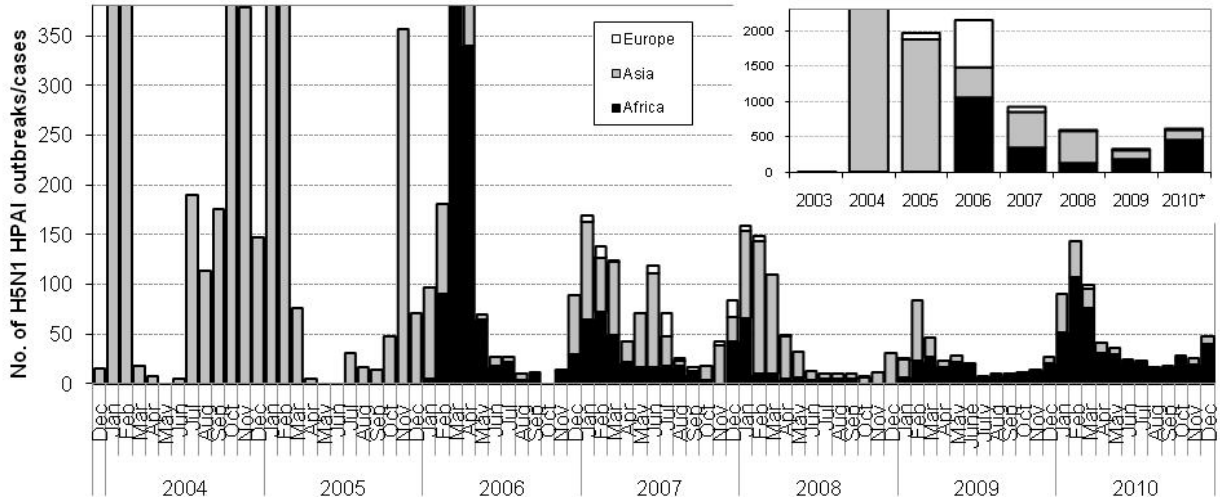


FIGURE 9
H5N1 HPAI outbreaks/cases by continent, by month, since December 2003
(Source: FAO EMPRES-i; Note 1: Indonesia data are not included, because the epidemiological unit definition for the PDSR data was modified from household level to village level in May 2008 and is not comparable); Note 2: Months 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: 4 189) have been truncated so that rest of the graph is not distorted)



DISCLAIMER

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.