Food and Agriculture Organization of the United Nations

GLOBAL ANIMAL DISEASE INTELLIGENCE REPORT

CONTENTS

2

APRIL- JUNE 2015

Summary

Animal disease situation

The reporting period was characterized by the continued spread of FMD serotype O in **Northern Africa** (Algeria) and **East Asia** (Republic of Korea) and the spread of serotype SAT 2 to new areas in **Southern Africa.**

Mass die-off of the Saiga Antelope (Saiga tatarica) was observed in May 2015 in Kazakhstan. The country reported Haemorrhagic septicaemia (Pasteurella multocida) to the World Organisation for Animal Health (OIE). However, further investigations are needed to understand the drivers of this event that is sporadically affecting large populations of the Saiga antelope across Kazakhstan.

Outbreaks due to H5N1 HPAI continued in previously affected countries in Africa and Asia, and new incursions/spread into countries in Africa, the Near East and Eastern Europe - Central Asia (the Russian Federation, Kazakhstan, Turkey, Gaza Strip, Israel and the Islamic Republic of Iran) were reported.

A high diversity of non-H5N1 influenza virus subtypes associated with disease outbreaks in poultry and wild birds was reported in Asia and the Americas during the reporting period. In Egypt, human cases of AI H9N2 were detected in Egypt for the first time.

In West Africa, the Ebola virus continued with a slow spread in Guinea and Sierra Leone while Liberia was declared free from the disease on 9 May 2015, by the World Health Organization (WHO).

In the Near East, Oman, Qatar, United Arab Emirates and Saudi Arabia continued to identify human cases of MERS-CoV during the reporting period. In South East Asia, the first occurrence of cases imported into Thailand and the Republic of Korea was reported from April to June 2015. Following the introduction of MERS-CoV into the Republic of Korea, further transmission generated more cases and the government and public health services responded to the emergency situation with more than 185 human cases reported. NOTE - a case from the Republic of Korea to China was also reported, but no human to animal spillover is known to have occurred.

Drivers of disease emergence and spread

Slight changes in global meat prices were observed during this period, with decreased prices for pig and ovine meat, and increased prices for beef. Poultry prices did not change globally. These changes in meat prices may have caused livestock communities and dealers to move their animals to those areas where prices are more profitable. Disease pathogens may have spread as a result of these movements. The reduction in pork prices was due primarily to muted domestic demand for pig meat in some EU Member States, which caused quotations to fall. The increase in beef prices was due in part to a stronger import demand from the United States of America, Japan, the Republic of Korea and other countries.

Countries across the globe celebrated a number of religious festivities, including Easter, during this period, a factor which usually increases the demand for certain animal products, resulting in more live animal trade and movement.

Risk assessment

H5N1 HPAI in West Africa

The overall estimated risk probabilities and associated levels of uncertainty for risk of introduction of H5N1 HPAI for each of six uninfected countries in West Africa are presented in Table 1. For these non-infected countries, the risk of introduction was estimated as low for Benin and Togo and negligible for Cameroon, Senegal and Guinea (See Table 1). These countries identified Burkina Faso, Côte d'Ivoire, and Niger as the most likely source of virus incursion (See Table 2). Areas at risk for each country are shown in Table 1. Sectors most at risk in these countries included Sector 3 and LBM in Cameroon, Sectors 1 and 2 in Senegal, Togo and Benin.

The introduction of H5N1 HPAI would have important consequences for the commercial sector, as well as for food security in each country (results not shown).

The continued spread of FMD type O /O/ME-SA/Ind-2001 lineage in Algeria during this period is a threat to neighbouring countries like Morocco through multiple risk pathways, including formal/informal trade, people migration (transhumance), and local spread. Morocco, which shares its borders with Algeria and is currently free of the disease, is therefore at risk of introduction of FMD serotype O. A predicted ecological risk map (see Figure 7b), based on a niche model of FMD outbreaks reported since 2003 in North Africa, shows that areas at risk for FMD include northern Algeria, portions of Morocco in the west and northwest, northern areas of Libya and most of Tunisia.

Global animal disease forecasting

Table 4 summarizes the forecasts for July to September 2015, globally based on rapid and qualitative risk assessments, based on information generated by FAO and external sources of disease information.

The overall animal disease situation and infection pressure in the various regions during the upcoming three month period is considered medium for the following reasons:

- Decreased risk of H5N1 HPAI outbreaks is expected throughout South and Southeast Asia during the next three months, as, historically, the number of H5N1 HPAI outbreaks decreases between July and September;
- Increased risk in Latin America and the Caribbean for potentially highly pathogenic avian influenza viruses moving from the northern to the southern hemisphere by migratory routes;
- Increased risk of persistent and slow LSD spread within the areas in the Near East, to areas in the Caucasus, Central Asia and Southeast Europe;
- Increased risk of spread of FMD serotype O from Algeria/Egypt to the neighbouring countries of Libya, Morocco and Tunisia, all of which have a history of animal trade with Algeria/Egypt and have experienced civil and political unrest that has had an impact on veterinary regulatory services;
- Medium risk of RVF in Eastern Africa, given the high (greater than 90 percent) chance that El Niño will continue through the Northern Hemisphere in the autumn of 2015, and around an 85 percent chance that it will last through the 2015-2016 Northern Hemisphere winter. Above normal precipitation (rain) may occur in East Africa during the latter half of the year. Countries should remain vigilant as to the potential increase in arthropod-borne pathogen activity;
- Medium risk of MERS-CoV spread due to decreased reports of human cases of MERS-CoV in the Near East region, given the observed seasonality patterns where peaks are generally observed from March to April;
- Low risk of Ebola spread, although there are continued human cases of Ebola virus disease in affected countries in West Africa.

SECTION 1

Overview of the animal disease situation

Livestock disease occurrences

Foot-and-Mouth Disease (FMD)

During the reporting period (April to June 2015), FMD continued to represent a threat for livestock and spread was observed within several regions globally. The FMD serotype O spread was observed in Northern Africa **(Algeria)** and East Asia **(Republic of Korea)** and spread of serotype SAT 2 to new areas in **Southern Africa.** Figure 1a shows the total number of FMD outbreaks due to FMD types O or SAT 1, officially reported on a monthly basis in the **Republic of Korea,** and **Northern** and **Southern Africa** since 2010.

In **Northern Africa, Algeria** reported five new outbreaks in various livestock species (cattle, sheep and goats) from the north-eastern part of the country, increasing the total number of outbreaks reported since July 2014 to 432 from 31 (64.6 percent) provinces out of 48, concentrated mostly in the north (see Figure 1a and b). There were no new FMD outbreaks reported in neighbouring Tunisia, which last reported cases in October 2014.

In 2014, an emergency vaccination campaign targeting the approximately 1.6 million cattle in **Algeria** was implemented in response to the occurrence and spread of FMD. The vaccination strategy was modified in 2015 in response to new outbreaks in small ruminants; this involved the application of annual vaccination campaigns in cattle and vaccination in small ruminants located around areas where FMD outbreaks occurred in cattle, given the large population of small ruminants (~23 million). This strategy was again recently modified to include all small ruminants across **Algeria** with the exception of those located in three provinces (Adrar, Illizi, and Tindouf), where no outbreaks were reported (See Figure 1b).

In **Southern Africa,** several countries reported outbreaks of FMD (mostly serotype SAT 2). Affected countries include Angola (1), Botswana (2), Mozambique (1), Namibia (17) and Zimbabwe (42) (see Figure 1c). Abnormally dry conditions in areas across **Angola, Botswana, Namibia,** and **Zimbabwe** during the reporting period has caused increased movement and contact between livestock and wildlife in search for water in the affected areas. Farmers in northern Namibia moved their cattle into Angola for water and grazing while in Zimbabwe, cattle were moved to areas near national parks where contact via shared grazing and watering points with wild buffalo was facilitated.

The **Republic of Korea** reported 185 new outbreaks of serotype O from different cities/counties, primarily in pig farms (180 in swine and 5 in cattle). These outbreaks continued from the previous quarter (January to March 2015), increasing the current outbreak total to 176 in 6 out of 17 provinces (35 percent; see Figure 2). Previous outbreaks of 2010 and 2011 affected multiple species including cattle, pigs and goats, unlike the current situation where mostly pigs are affected.

In **Asia**, FMD spread is mainly driven by animal movement and trade. In the **Near East**, **North** and **sub-Saharan Africa** (East and Southern), FMD spread is facilitated by the nomadic movement of cattle and small ruminants and the sharing of common grazing and watering areas throughout their migration routes. The celebration of cultural and religious festivities can increase the risk of disease spread, as these are associated with greater movements of animal and animal products.

High mortality in the Saiga

In **Kazakhstan**, a mass die-off of 152 336 Saiga antelopes *(Saiga tatarica)* was observed within a two-week period in May 2015. Samples taken from affected animals tested positive for *Pasteurella multocida* and ruled out other pathogens. Investigations are ongoing regarding the possible underlying/additional factors that caused such a high mortality, uncommon in HS. The Saiga is a critically endangered migratory antelope found primarily in Kazakhstan and to a lesser extent in Mongolia, Russia, Uzbekistan and sometimes Turkmenistan. The most recent census conducted in 2014 of the Saiga estimated the global population at 250 000. A previous mass mortality event which occurred in Kazakhstan in May 2010 resulted in the death of approximately 12 000 Saiga. The cause or factors involved in the die-off in 2010, as well as the current one, are unknown. The national authorities have reported to the OIE that the observed events might be due to *Haemorrhagic septicaemia.*

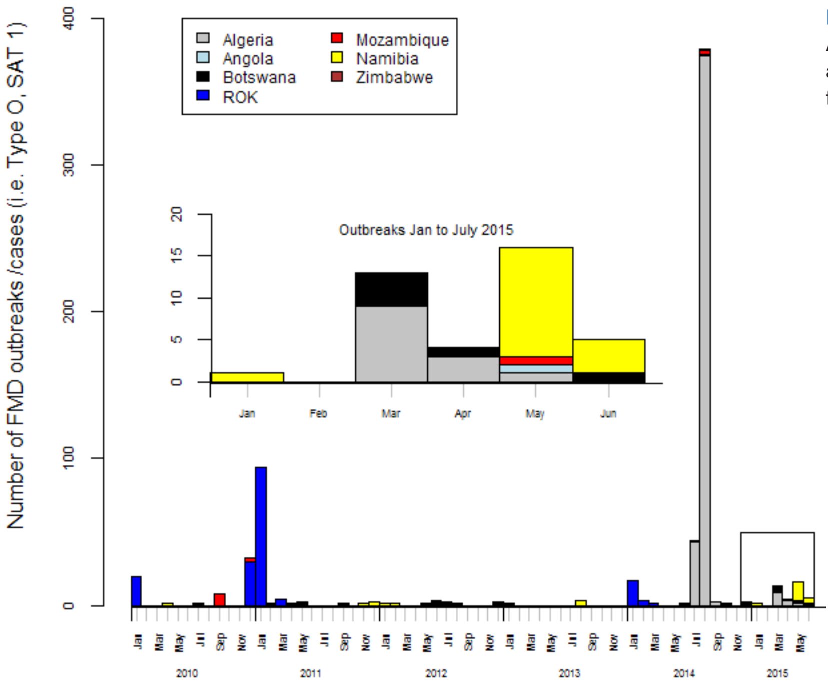


Figure 1a. Bar chart of FMD outbreak in Algeria, South Africa and the Republic of Korea (ROK) between 2010 and 2015. Insert shows the outbreaks reported per month for 2015.

Figure 1b. Map of point locations of FMD outbreaks reported Algeria from 1 January to 30 June 2015.

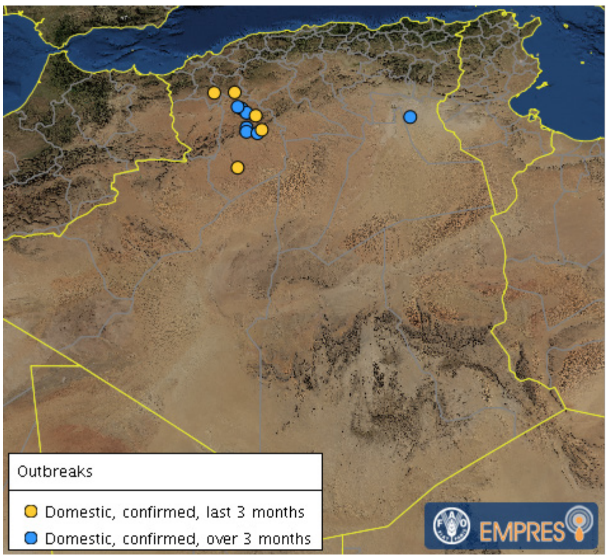
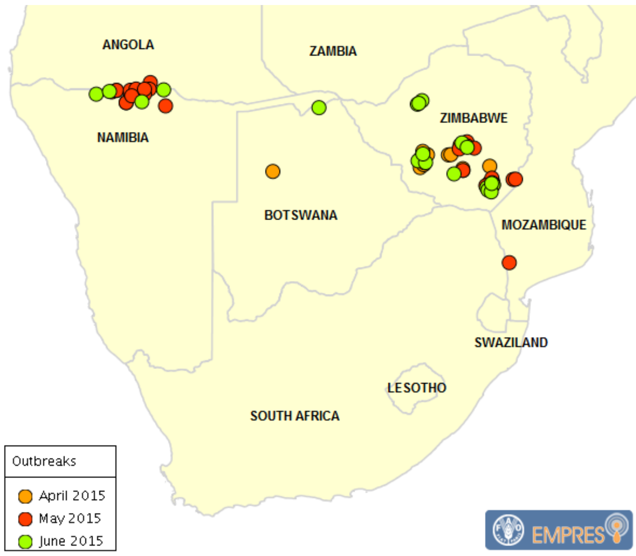


Figure 1c. Map of FMD outbreaks in Southern Africa from 1 April to 30 June 2015 (by onset date)



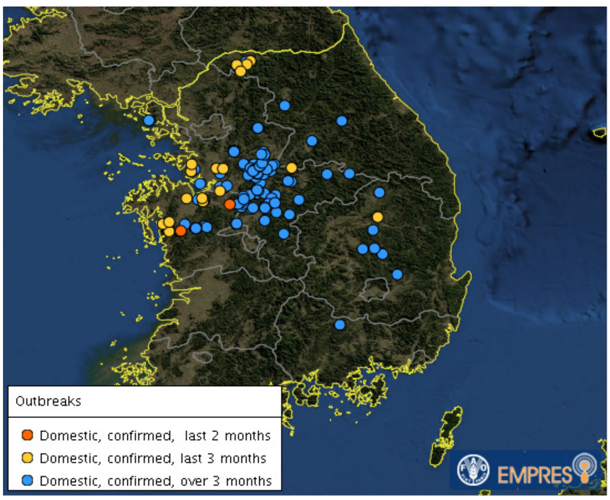


Figure 2. Map of FMD outbreaks in the Republic of Korea (ROK) from July 2014 to June 2015 (by onset date).

Zoonotic disease events

Avian Influenza (AI) – H5N1 HPAI

Overall, the period was characterized by continued outbreaks of AI in previously affected countries in Africa and Asia, and new incursions/spread into countries in **Africa**, the **Near East** and **Eastern Europe** - **Central Asia** (Russian Federation, Kazakhstan, Turkey, Gaza Strip, Israel and the Islamic Republic of Iran), of East Asia origin. See Figures 3a, b and c.

In **West Africa,** outbreaks were detected for the first time in **Côte d'Ivoire, Ghana** and **Niger** while new outbreaks were confirmed in **Nigeria** and **Burkina Faso** (new incursion: February 2015). The occurrence of H5N1 HPAI in April 2015 in **Côte d'Ivoire, Ghana** and **Niger** is the first incursion since 2006 for Niger, and since 2007 the first also for the other two countries. One outbreak was detected in backyard poultry in the Vallée du Bandama Region of **Côte d'Ivoire,** and the disease is expected to spread further. **Ghana,** on the other hand, reported 10 outbreaks in three regions: Ashanti, Greater Accra and Volta. **Burkina Faso** reported 16 additional outbreaks, increasing the total number of outbreaks to 26 in 9 out of 13 regions (69.2 percent). **Nigeria,** the first country to confirm a new incursion of H5N1 HPAI in poultry in **West Africa,** in early January 2015, continued to report outbreaks during the reporting period. A total of 31 outbreaks were reported in 7 previously affected states of Kaduna, Kano, Katsina, Lagos, Nassarawa, Ogun, Oyo, Plateau and Rivers. Thus far, outbreaks have occurred in 18 out of 33 provinces across Nigeria affecting primarily medium-sized farms (5 000 – 1 000 birds). More than 1 400 000 birds have been depopulated (death + culling) in 448 farms (including 10 live bird markets) and one zoological garden. The situation of H5N1 HPAI in West Africa is highly uncertain as the number of reported outbreaks has decreased notably, but zero reporting is not undertaken. However, the decrease in outbreaks may be explained by an expected decrease of AI activity based on historical patterns from previous H5N1 HPAI epidemics in West Africa, due either to the fact that this is a period with low AI activity, or because of lack of surveillance efforts to find infection in risk areas or specific production systems or market chains. However, if the infection persists in commercial or backyard poultry, a growing number of cases and therefore a recrudescence of H5N1 HPAI outbreaks can be expected up to and including December of this year.

Egypt as an endemic setting for H5N1 HPAI continued to report outbreaks. Three hundred and thirty eight (338) poultry outbreaks were reported during the period, which reflects an increase in the number of outbreaks/detections of H5N1 HPAI in poultry compared to the previous three-month period (n = 135), and to the same period in previous years (n = 3 in 2014). Outbreaks in **Egypt** are detected through a combination of both passive and active surveillance efforts and the GOVS-FAO Community Animal Health Outreach system, in place since 2006.

In addition to the increased number of poultry outbreaks, a decrease in H5N1 human cases was observed in Egypt from the previous reporting period (125 human cases reported between January – March 2015). During the period April to June 2015, a total of nine human cases were observed. Compared to a similar period during 2014, the number of human cases (n = 3 for April to June 2014) observed represents a slight increase in case numbers. As of 30 June 2015, 344 confirmed human cases have been reported in Egypt since 2006, of which 114 were fatal. The majority of human cases (300) have had contacts with domestic poultry. From 1 January to 30 June 2015, 135 human cases were confirmed (representing 39.0 percent of the total confirmed cases), with 27 deaths.

H5N1 HPAI was reported in poultry and wild birds in the **Near East** and **Eastern Europe** - **Central Asia region,** while outbreaks continued in countries in **Asia** where the disease is endemic.

Between April and June 2015, several dead wild birds were found near the Black Sea in **Kazakhstan** and the **Russian Federation,** while four outbreaks in domestic poultry were detected in **Turkey**.

New incursions/outbreaks of H5N1 HPAI occurred in the **Near East,** affecting Israel and the Gaza Strip. Outbreaks in Israel, Gaza and the West Bank began in January 2015 and since then, 10 outbreaks have been confirmed in **Israel,** 2 in the **Gaza Strip** and 4 in the West Bank.

A new incursion of H5N1 HPAI in poultry was confirmed in the **Islamic Republic of Iran** in the Mazandran area, near the Caspian Sea, during June 2015. This is the first H5N1 HPAI outbreak reported in this country since 2011.

In **Eastern** – **South Eastern Asia,** five countries reported H5N1 HPAI during the reporting period: Bhutan, China, India, Indonesia and Viet Nam. In **India,** new poultry outbreaks occurred in Andra Pradesh and Manipur States, a continuation of outbreaks that began in the southern part of the country in November 2014. **China** continued to report H5N1 HPAI in poultry in the Jiangsu and Guizhou provinces and in wild birds in Tibet and Inner Mongolia.

In the **United States of America,** one case of H5N1 HPAI was also reported in Washington State in a wild bird. This particular strain had not been identified in an animal or human host before. The virus found in the United States of America is not the same virus as the H5N1 virus found in Asia, Europe and Africa that has caused some human illness. This HPAI H5N1 strain is a new mixed-origin virus that combines the H5 genes from the Asian HPAI H5N1 virus with N genes from native North American avian influenza viruses found in wild birds. (http://www.usda.gov/documents/usda-avian-influenza-factsheet.pdf)

Figure 3a. Monthly number of HPAI outbreaks/cases stratified by continent since 2003. Insert shows the number of reports between July 2010 and July 2015.

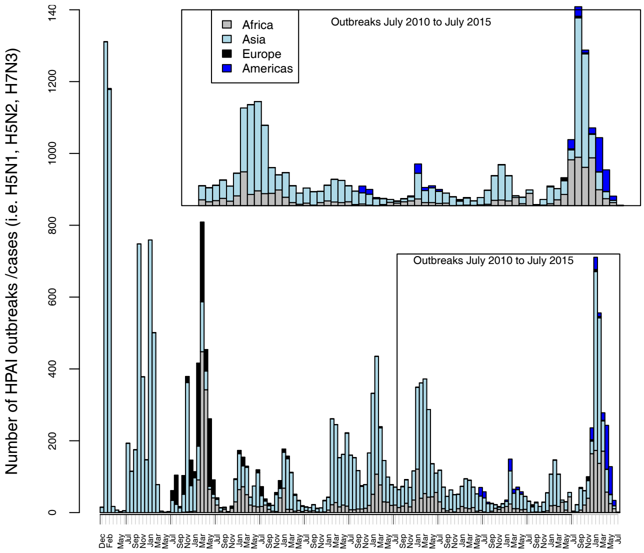


Figure 3b. Number of H5N1 HPAI outbreaks/cases stratified by species affected by quarter since 2003. Red line shows the number of countries affected.

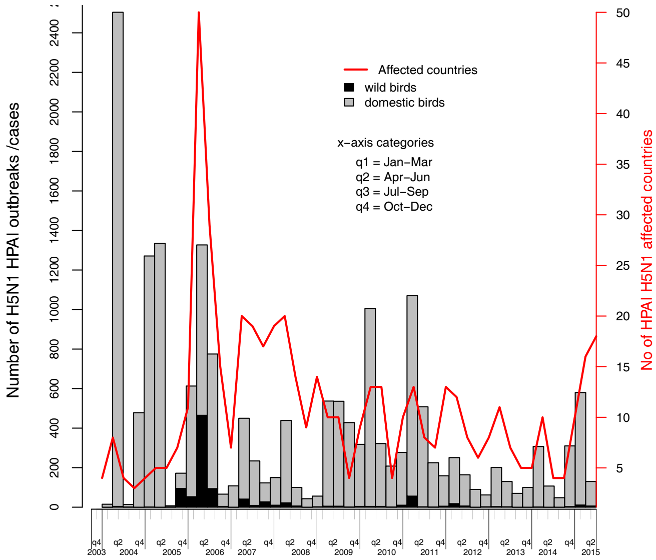


Figure 3c. Map of relevant AI events in animals and humans reported globally (April–June 2015)

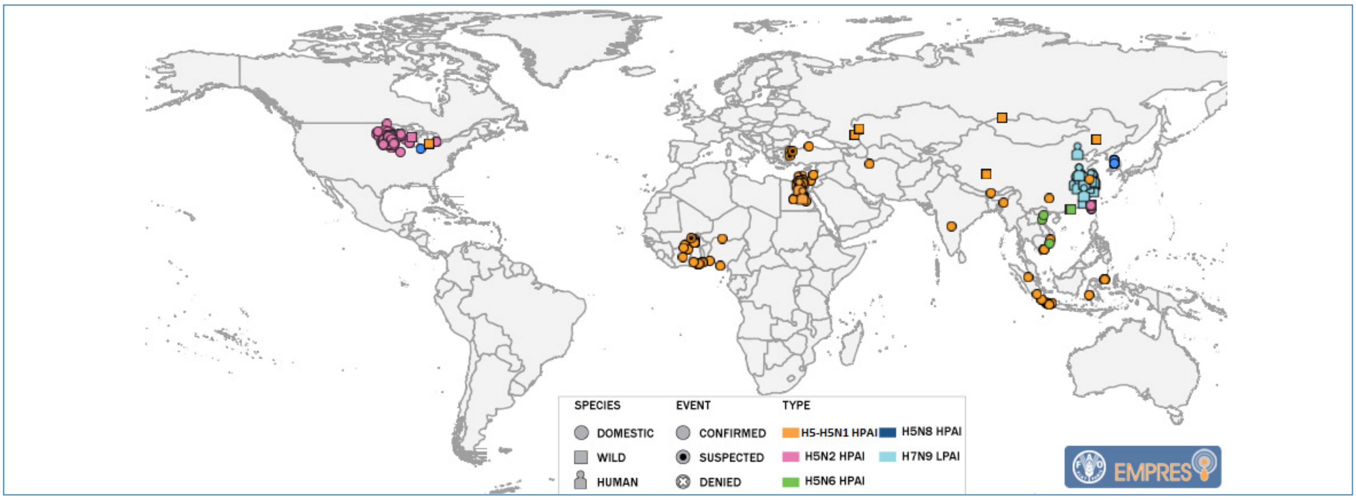
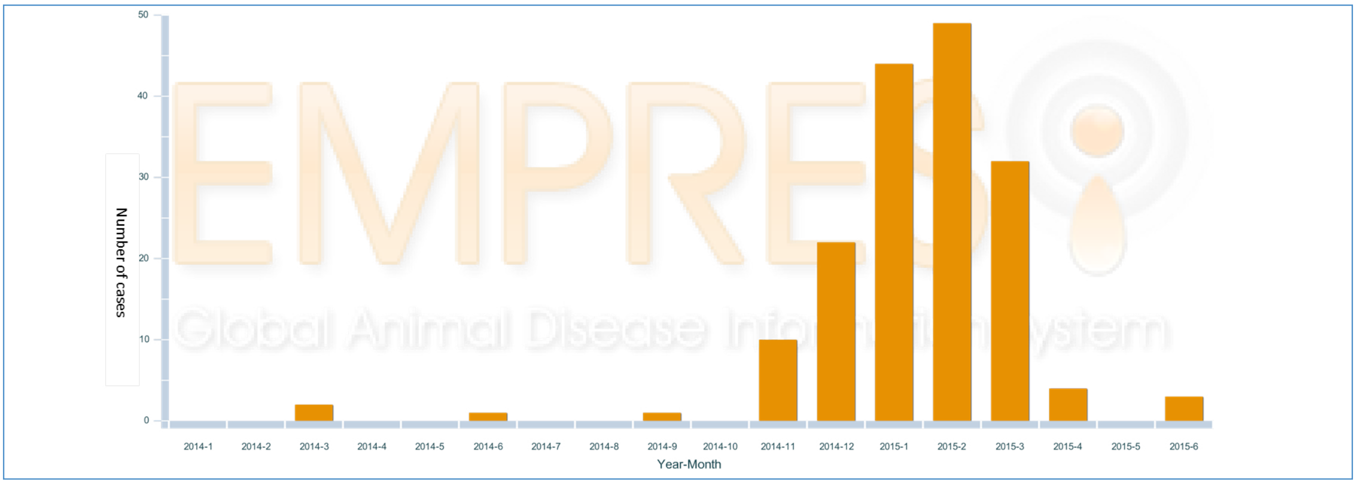


Figure 4. Map of relevant AI events in animals and humans reported globally (April–June 2015)



Other Avian Influenzas (AI)

A diversity of non-H5N1 influenza virus subtypes associated with disease outbreaks in poultry and wild birds was reported in **Asia** and the **Americas** during the reporting period (see Figure 3c).

In **Asia**, H5N2, H5N6 and H5N8 HPAI in poultry were reported in **China** (Hong Kong and Taiwan, Province of China), while H5N8 HPAI and H5N6 HPAI were reported in the **Republic of Korea** and **Viet Nam** respectively. H5N3 HPAI was not reported in the reporting period.

China continued to report human cases of infection with H7N9 LPAI. Between April and June 2015, 32 new cases of H7N9 infection in humans, with 8 deaths, were reported, increasing the total number of cases since the start of 2015 to 169 with 15 deaths.

The **United States of America** reported one outbreak of H5N8 HPAI in Indiana and 209 outbreaks/cases of H5N2 HPAI in wild and domestic birds in several states (Iowa, Michigan, Minnesota, Missouri, Nebraska, North Dakota, South Dakota and Wisconsin). Canada reported three H5N2 HPAI outbreaks in domestic birds in the Province of Ontario.

In **Mexico**, three new outbreaks/cases of H7N3 HPAI were reported, one in wild birds in the State of Chiapas and two in poultry in the Puebla and Oaxaca States). A previous occurrence of H7N3 HPAI was identified in February 2014.

In **Africa, Egypt,** human cases of AI H9N2 were detected for the first time in March and April by the routine national surveillance system in the Cairo Governorate. The cases had a history of contacts with backyard poultry. The H9N2 virus has been detected in the Egyptian poultry sector since 2011. No poultry cases were reported during this period.

Ebola

In **West Africa,** the Ebola virus continued to spread in **Guinea** and **Sierra Leone** while **Liberia** was declared free from the disease on 9 May 2015 by WHO, as a result of last confirmed cases on 21 March 2015. From 1 April to 30 June 2015, in the two affected countries, 321 confirmed cases and around 259 confirmed deaths were registered, showing a decrease in virus transmission.

The overall number of cases of Ebola (including confirmed, suspected and probable cases) and deaths at 30 June 2015 is: 27 576 and 11 244, respectively. In the three most affected countries, the reported number of cases is 27 540 with 11 229 deaths. The total number of confirmed and probable cases is similar in males and females. Compared with children aged 0 to 14 years and adults aged 45 and over, people aged 15 to 44 were approximately three times more likely to be affected.

MERS-CoV

In the **Near East, Oman, Qatar, United Arab Emirates** and **Saudi Arabia** continued to report human cases of MERS-CoV during the reporting period. **Oman** reported one new case; **Qatar,** two new cases; the **United Arab Emirates,** seven new cases and **Saudi Arabia**, 65 new cases. Since April 2012, the **United Arab Emirates** reported 77 cases and 11 deaths; **Oman** six cases and three deaths; **Qatar,** 14 cases and 5 deaths; and, **Saudi Arabia** 1 041 cases with 460 deaths.

In **Asia,** the first occurrence of imported cases into **Thailand** and the **Republic of Korea** was reported between April and June 2015. The case in **Thailand,** similar to the index case in the **Republic of Korea,** fell ill after returning from travel to the Near East. Apart from the imported case in Thailand, there were no additional reports of MERS-CoV. Unlike the sequence of events in Thailand, the first case, who returned to Seoul from the Near East, resulted in further transmission to relatives, hospital roommates and health workers within the Republic of Korea, and a single case reported in the People's Republic of **China,** of Korean origin. Within a matter of weeks, patients were reported in at least six different hospitals in Seoul. As of 30 June 2015, 181 cases with 33 deaths have been reported in the Republic of Korea.

Between April 2012 and June 2015, 1 366 human infections with MERS-CoV and 528 associated deaths were reported globally, mainly in the Near East. Dromedary camels are thought to be the source of the virus in humans, but studies have not conclusively substantiated this hypothesis.

SECTION 2

Drivers of animal disease incursion and spread

Well studied factors/drivers that influence the dynamics of animal and zoonotic diseases globally include changes in land use, and thus, agro-ecological dynamics; human behaviour and movements (including animals and food products), whether because of trade opportunities or cultural practices, or to escape civil unrest; intensification of contact between wildlife and livestock or human species because of urban expansion or environmental encroachment; unprecedented erratic fluctuations in climate; and the lack of access to goods and services in areas stricken by poverty and hunger, among others. This section describes briefly the observed changes in major drivers that could have influenced the pattern of disease observed during this reporting period (April to June 2015).

Given the complex nature of the interaction between drivers and disease occurrence, this section does not attempt to provide proof of association or causation, but attempts to highlight some key disease risk factors that may provide some insight into the incursion and spread of animal diseases in different ecosystems.

Agro-ecological drivers: The observed global and regional changes in **rainfall** and **temperature** during the reporting period are described http://www.fews.net/sites/default/files/documents/reports/Global%20Weather%20Hazard-150625.pdf. Rainfall and temperature are known to affect pathogen survival in the environment and disease vector behaviour. High temperatures and heavy seasonal rainfall as well as the presence of water (i.e. flooding, rivers, etc.) are generally associated with an increase in arthropods which may increase the likelihood of transmission and occurrence of vector-borne diseases such as LSD, Rift Valley fever and Trypanosomosis in areas where these diseases are endemic. But expansion can occur to new areas (non-endemic) because of climatic change. The persistence and stability of avian influenza viruses is increased as the result of low temperatures and high relative humidity in tropical settings. Additionally, wild bird migration patterns and their ability to spread diseases like H5N1 may be impacted by climatic changes and thus alterations in migratory pathways. Dryness and low precipitation trigger livestock/pastoral movement and cause the congregation of livestock at water points and grazing areas, where wildlife species also occur. In these areas, the increased contact between different livestock herds and between domestic/wildlife species further increases the risk of disease spillover and spread in livestock and wildlife, e.g. FMD.

Precipitation: During the reporting period, below-average rainfall was observed over many areas of **West Africa,** due to the delayed onset of the rainy season followed by poorly distributed rainfall. In particular, abnormal dryness was observed in **Burkina Faso,** the northern parts of **Ghana, Togo,** and **Benin,** western and southern **Niger,** and northern **Nigeria.** In contrast, above-average rainfall was observed in **Liberia, Guinea, Sierra Leone, Côte d'Ivoire,** southeastern **Cameroon, Gabon,** western **Central African Republic, South Sudan,** southern **Sudan,** many parts of the **Democratic Republic of Congo, Uganda,** much of **Ethiopia, Kenya,** southern **Somalia,** many parts of **Tanzania, Zambia, Botswana, Zimbabwe,** and coastal **South Africa.** Heavy rains occurred in Narok **(Kenya)** and Dar Es Salaam **(Tanzania)** between mid-April and early May, causing extensive flooding. Precipitation was above and near-average over **Central Asia** and well below-average in **South-east Asia** (e.g. **Laos, Viet Nam, Cambodia, Philippines,** parts of **Malaysia** and **Indonesia** and northern and north-central **Australia**). The Andhra region of **India,** which experienced a major heat wave during late May, received rains in mid-June. Below-average rainfall was observed from late March throughout most of **Haiti** and the **Dominican Republic.** A delayed season and erratic, below-average rainfall from the beginning of May occurred across many parts of **Central** and southern **America,** including parts of **Brazil, Colombia, Uruguay, Venezuela** and **Peru.** As of 6 July 2015, El Niño conditions were higher than those of the previous three months, with an Oceanic Niño Index (ONI) value for April – June 2015 at 0.9°C. This implies suitable conditions in upcoming months for rainfall and precipitation and therefore high-risk conditions for the occurrence of Rift Valley fever or other vector-borne diseases **globally** during the reporting period.

Temperature: The period March-May 2015 was the warmest period on record across the world's land and ocean surfaces; at 0.85°C (1.53°F), above the twentieth century average of 13.7°C (56.7°F), surpassing the previous record of May 2010 by 0.04°C (0.07°F). Globally-averaged land and sea surface temperatures (hereafter LST and SST) surpassed previous records in 2010 by 1.33°C (2.39°F) and 0.66°C (1.19°F) respectively. Between January and May 2015, LST and SST were also record highs for the same period. May 2015 was the warmest May on record globally, with the combined average global land and ocean temperature at 0.87°C (1.57° F) above the twentieth century average. Most of western **North America, South America, Africa,** and **Eurasia** was much warmer than average. A few areas in **south central United States, north-central Mexico, north-eastern Canada, western Greenland,** and **Western Australia** were cooler or much cooler than average, although no cold records were observed in these areas. Much cooler than average SSTs and an area of unusual cold temperatures were observed in the **North Atlantic,** south of **Greenland.** More information can be found at http://www.ncdc.noaa.gov/sotc/global/201505.

Festivals: Several festivals were celebrated in various countries around the world during this period, normally associated with increased movements of animals and animal products and people. These include Easter, Lailat Al Miraj and Lailat Al Bara'ah, in countries with notable Christian and Muslim populations, respectively.

The Ramadan and Eid festivities, celebrated throughout the Muslim communities around the world will take place between late June and early July 2015 and will be characterized by large movements of people as well as foodstuffs, including animals or animal products. On 17 July 2015, Muslims mark the end of Ramadan by celebrating Eid Al-Fitr, the "Festival of Breaking the Fast". Festivities can last up to three days in some countries and will involve increased movement of animals, especially sheep and goats, to markets for feasting and celebrations. This may increase the possibility of disease transmission in small ruminants during the festivities, including PPR, FMD and brucellosis.

Large (multi-million) aggregations of pilgrims for the observation of religious rites are expected (especially in the sacred city of Makkah in Saudi Arabia). This could lead potentially to the introduction of a pathogen and its quick spread because of the close human-to-human contact (i.e. MERS-CoV, influenza, other emerging zoonotic or non-zoonotic diseases).

Animal trade: A number of countries began celebrations associated with Ramadan, New Year and Easter (see Festivals above), a period when an increase in live animal trade and movement was expected as a result of the increased demand for animal products. Increased livestock trade and animal movements during festive periods are normally associated with the increased possibility of disease spread.

Generally, reliable data is not available on informal trade/movement of animals and animal products between countries (frequently underestimated but often depicted as greater in terms of quantities and economic value than sanctioned or formal trade). It is assumed that incentives for informal trade may increase during periods of increased demand (i.e. festivities) and where there are price differences across borders.

The changes in the **global meat prices** showed an overall increase (meat price index [1] ranged from 170.8 to 173.6) but varied by commodity type; price indices for pork and ovine meat decreased, while those of beef increased and poultry remained unchanged. The reduction in pork prices was due primarily to muted domestic demand for pig meat in some EU Member States which caused quotations to fall. The increase in beef prices was due in part to stronger import demand from the United States of America, Japan, the Republic of Korea and other countries. See FAO FPI for more details.

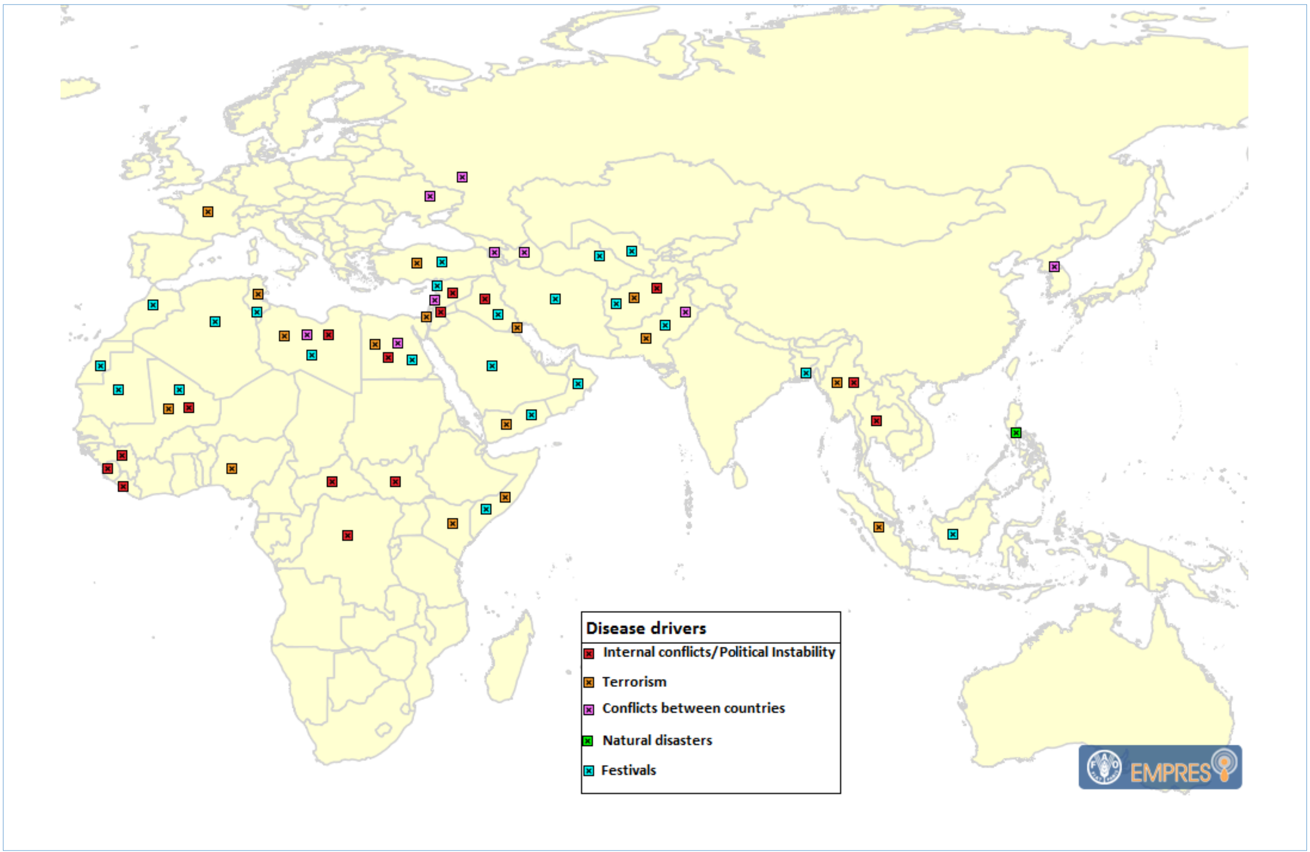
Price differentials across regions and borders increase incentives for unregulated animal and animal product-related movements and consequently, the potential for transboundary spread of pathogens or diseases. National changes in prices were observed in various regions; In the **Americas,** poultry prices decreased across various regions of **Bolivia** and **Paraguay;** in **Africa**, poultry prices increased in **Algeria,** in the **Near East** (Gaza Strip and West Bank where H5N1 HPAI outbreaks occurred), while in **Tunisia,** prices decreased. In South East Asia, **Thailand** had an increase in poultry prices. No information was available from H5N1 HPAI countries in **West Africa** at the time of writing.

Bovine meat prices increased in **Indonesia,** and the **Russian Federation** and **Mongolia** and decreased in **Tunisia** and **Mauritania.** Ovine meat prices increased in **Algeria,** while camel meat decreased in **Mauritania.** Average pork prices increased in **China** and the **Russian Federation.**

Civil unrest: A number of events related to natural disasters and social unrest were observed which could have resulted in changes in animal health conditions in countries across the globe (see Figure 6). Terrorism and political instability were observed in several countries in North Africa (Egypt, Libya and Tunisia), Central and West Africa (the Central African Republic, Mali and Nigeria), West Central Asia (Afghanistan) and the Near East (Lebanon, the Syrian Arab Republic, and the West Bank). Such situations generally result in interruptions in basic veterinary services and activities leading to higher risk of diseases going unreported and in their uncontrolled spread. Related population movements also occur, some of these movements involving animals and animal products, changing geographic locations of demands for animals and animal products and, therefore, trade and notable price differentials. Countries with higher levels of activities (i.e. those reporting more than two events) include Syria, the West Bank, Afghanistan, Pakistan, Egypt, Libya, Mali, South Sudan, Yemen, Israel and Myanmar. In countries like Nigeria, where extremist groups are operating in particular areas, and in Libya, where a functional government is absent, reports of H5N1 HPAI have occurred.

[1] The FAO Food Price Index is a measure of the monthly change in international prices of a basket of food commodities. It consists of the average of five commodity group price indices, weighted with the average export shares of each of the groups for 2002-2004. (Source; http://www.fao.org/worldfoodsituation/foodpricesindex/en)

Figure 5. Map of selected disease drivers reported globally from July to September 2015



SECTION 3

Risk assessment activities

Updated risk assessment for H5N1 HPAI in West Africa

Given the current spread of H5N1 HPAI in West Africa to three additional countries **(Côte d'Ivoire, Ghana** and **Niger)** during the reporting period (April to June), efforts have been focused on examining the risk of continued spread within affected countries and spread to non-infected countries in the region. A survey was conducted to support a regional meeting held in the second quarter of 2015 in West Africa. Countries participating in the survey included infected countries **(Niger, Ghana, Côte d'Ivoire** and **Burkina Faso)** and non-infected countries **(Togo, Senegal, Mali, Guinea, Cameroon** and **Benin)**. Only the results for non-infected countries are presented here.

For non-infected countries, the risk of introduction was estimated as low for **Benin** and **Togo** and negligible for **Cameroon, Senegal** and **Guinea** (See Table 1). These countries identified Burkina Faso, Côte d'Ivoire, and Niger as the most likely source of virus incursion (See Table 2). Areas at risk for each country are shown in Table 1. Sectors most at risk in these countries included Sector[2] 3 and LBM in Cameroon, Sectors 1 and 2 in Senegal, Togo and Benin.

Table 1. Risk assessment for entry of H5N1 into uninfected countries in West Africa.

COUNTRY	PROBABILITY[3] OF INTRODUCTION (CONFIDENCE)	MOST LIKELY PATHWAYS5 (CONFIDENCE)	AREAS AT RISK[6]	SECTORS AT RISK (MEAN SCORE[7])
CAMERON	Negligible (M)	Eggs (L) - LT (L) - IT(L) T(M) - WB(N)	Far North region(1), North region(2), Adamaoua (3), Southwest (4), Northwest (5), Littoral (3), Nord-Ouest(5), and Sud(5)	Sector 1(4) - Sector 2(4) Sector 3(3) - Sector 4(4) LBM (3)
SENEGAL	Negligible (L)	Eggs (L) - LT (N) - IT(L) T(N) - WB(L)	Saint-Louis (1), Tambacounda (2), and Kolda(3)	Sector 1(2) - Sector 2(2) Sector 3(3)- Sector 4(4) LBM (5)
GUINEA	Negligible (M)	Eggs (N) - LT (L) - IT(N) T(N) - WB(L)	Guinée Forestière Region on the border with Côte d'Ivoire	Sector 1(4) - Sector 2(2) Sector 3(4) - Sector 4(3) LBM (4)
TOGO	Low (L)	Eggs (M) - LT (L) - IT(L) T(M) - WB(M)	Savanes, Maritime and Lomé communes	Sector 1(2) - Sector 2(2) Sector 3(5) - Sector 4(4) LBM (4)
BENIN	Low (M)	Eggs (M) - LT (M) -IT(M) T(N) - WB(L)	Departments of l'Ouémé-Plateau, Collines, Borgou-Alibori, l'Atacora and Zou	Sector 1(2) - Sector 2(3) Sector 3(5) - Sector 4(4) LBM (5)
MALI	info not available	info not available	Sikasso (1), Ségou (2) and Mopti (3)	Sector 1() - Sector 2() Sector 3(5) - Sector 4(5) LBM (5)

2 Sector 1: Industrial integrated system with high level biosecurity and birds/products marketed commercially (e.g. farms that are part of an integrated broiler production enterprise with clearly defined and implemented standard operating procedures for Biosecurity); Sector 2: Commercial poultry production system with moderate to high biosecurity and birds/products usually marketed commercially (e.g. farms with birds kept indoors continuously; strictly preventing contact with other poultry or wildlife); Sector 3: Commercial poultry production system with low to minimal biosecurity and birds/products entering live bird markets (e.g. a caged layer farm with birds in open sheds; a farm with poultry spending time outside the shed; a farm producing chickens and waterfowl); Sector 4: Village or backyard production with minimal biosecurity and birds/products consumed locally.(Source: http://www.fao.org/docs/eims/upload/214190/ProductionSystemsCharacteristics.pdf)

3 **Negligible (N)** – event is so rare that it does not merit consideration; **Low (L)** – event is rare but does occur; **Medium (M)** – event occurs regularly; **High (H)**– event occurs often

4 **Low** -There are solid and complete data available; strong evidence is provided in multiple references; authors report similar conclusions; **Moderate** -There are some but no complete data available; evidence is provided in a small number of references; authors report conclusions that vary from one to the other; **High** -There are scarce or no data available; evidence is not provided in references, but is found in unpublished reports or based on observations, or personal communication; authors report conclusions that vary considerably between each other.

5 LT= legal trade; IT= illegal trade; T= transhumance; WB= wild birds.

6 Identify areas and in order of importance (1 to 5).

7 Rank the following sectors in order of importance –on a scale of 1 to 5 (1 meaning most likely and 5 least likely): Industrial integrated (Sector 1), Commercial (Sector 2), Commercial (Sector 3), Backyard (Sector 4), Live bird markets (LBM). (Source: http://www.fao.org/docs/eims/upload/214190/ProductionSystemsCharacteristics.pdf)

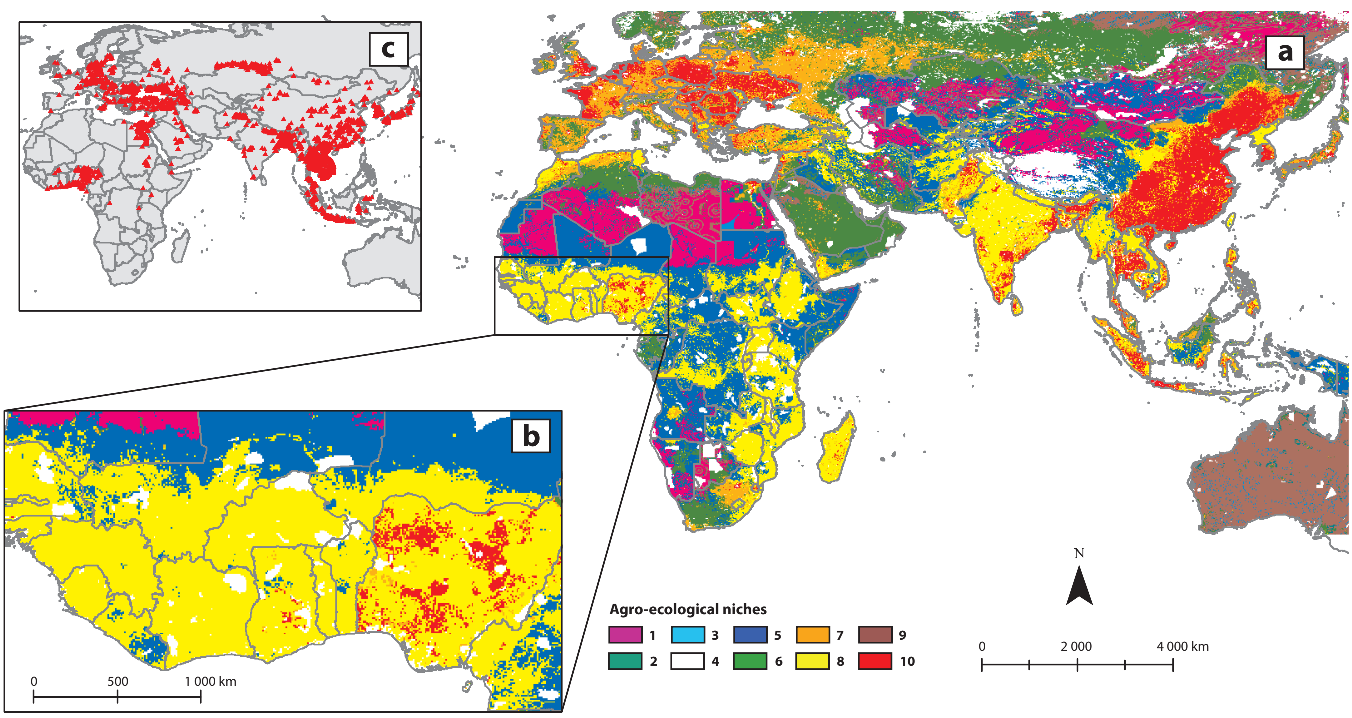
Table 2. Score assigned to potential source countries of H5N1 HPAI introduction into the six countries surveyed (Scores ranged from 1 to 7).

COUNTRY	SENGAL	CAMEROON	GUINEA	MALI	BENIN	TOGO
BURKINA FASO	4	3	3	7	7	7
CÔTE D'IVOIRE	4	5		7	2	4
EGYPT	3	4	6		5	2
GHANA	2	3	3		5	7
LIBYA	2	3	1		2	2
NIGER	3	5	3	6	7	3
NIGERIA	3	3	3		7	7

Based on the risk maps (Figure 8) generated from the global-level analyses, the uninfected areas in West Africa are mainly characterized by niche #8 (yellow), where high densities of backyard chickens and human population are present and are located within moderate distances from wetlands (< 30 km). Areas occupied by the yellow niche are also areas where the highest number of H5N1 outbreaks in Nigeria and other affected countries were observed during 2015.

In addition to the yellow niche, some areas of Nigeria fall within the red niche (#10) which are characterized by duck production and moderate distances from wetlands (<30 km). The agro-ecological patterns in Nigeria are similar to those observed in South and Southeast Asian countries, such as eastern India, northern Pakistan, Cambodia, Indonesia and Viet Nam, where H5N1 HPAI routinely occurs. Ghana, currently affected, is the only country in West Africa showing an agro-ecological pattern relatively similar to that observed in Nigeria, implying similar H5N1 HPAI risks. These results highlight similar H5N1 HPAI risks for Nigeria and countries in Southeast Asia, based on similarities in the agro-ecological patterns observed in these countries. Given the wide distribution of the yellow niche in western Africa, the risk of disease spread in the region is considered to be relatively high.

Figure 6. (a) A ten-cluster H5N1 HPAI niche map obtained using k-mean clustering. (b) The agro-ecological niches in western Africa. (c) H5N1 outbreaks between 2004 and 2015. The red and yellow niches included regions with the largest numbers of H5N1 outbreaks.



Risk assessment for FMD spread in Northern Africa and Southern Europe

The continued spread of FMD type O in Algeria from April to June 2015 means that neighbouring countries that have not yet reported the disease in Northern Africa and southern Europe are at risk of introduction through multiple risk pathways including formal/informal trade, people migration (transhumance) and local spread. Morocco, which shares its borders with Algeria and is currently considered free of the disease, is also at risk of introduction of FMD serotype O. See Figure 9a.

The most significant FMD related event in North Africa in 2014 was the incursion of FMD Serotype O into Tunisia and Algeria after 15 years of no reports. This was part of the transcontinental spread of the FMD O/ME-SA/Ind2001 lineage which began spreading in 2013 from the Indian sub-continent into the United Arab Emirates, Saudi Arabia, and later and more widely, into North African countries (Libya, Tunisia and Algeria – the latter two were previously FMD-free). Of particular concern for the North African region are the differences between vaccine and field strains and the risk posed to susceptible populations. The two additional outbreaks reported in March 2015 in the Sidi Bel Abbes and Saida Provinces (Algeria) provided evidence of an ulterior westward spread in small ruminants to new areas that were not previously affected during 2014. Genotyping of representative FMD viruses from ongoing outbreaks in Algeria is urgently required to confirm or dismiss the involvement of O/ME-SA/Ind-2001 lineage, or otherwise determine the causative strain. In view of the rapid spread of this lineage during 2013-2014, a resurgence of new cases (now 12 outbreaks in 2015) concentrated further to the west than in the outbreaks of 2014 (and closer to the border with Morocco), needs to be carefully monitored (WRL, 2015).

A predicted risk map (See Figure 9b) based on a niche model of FMD outbreaks reported since 2003 in North Africa and several risk factors (including livestock population, land cover, topography, human dynamics and climate), confirms high risk areas near the border with Morocco. A qualitative assessment of the main routes by which FMD would spread to countries at risk from currently affected countries in North Africa is shown in Table 3.

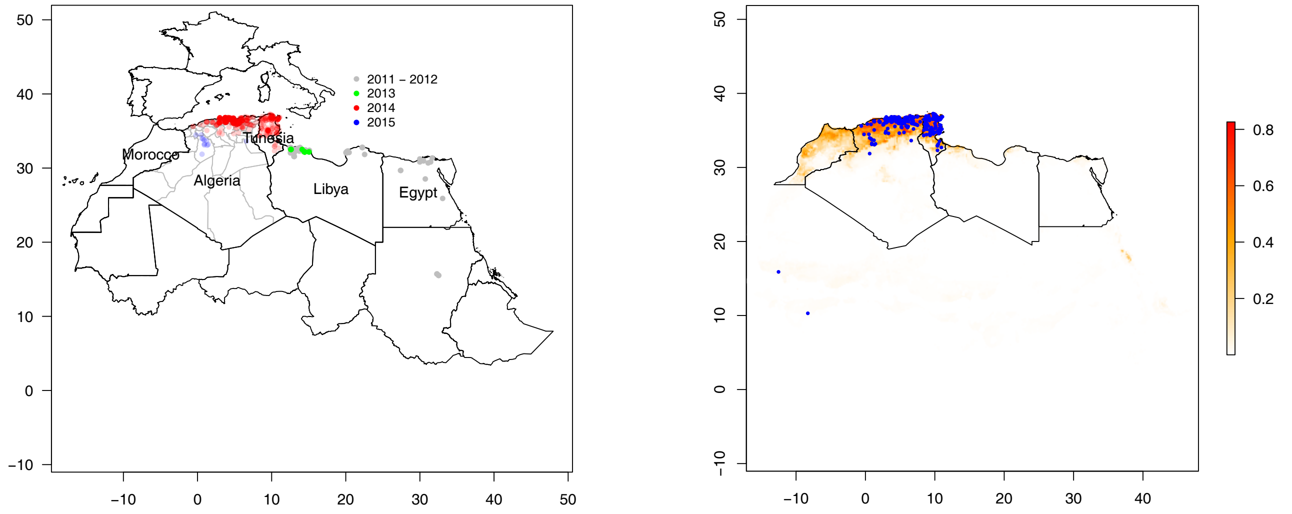
Table 3. Summary of assessment of risk pathways for the spread of FMD to countries at risk (conducted by FAO/AGAH GLEWS).

COUNTRY	FMD STATUS	PATHWAY FOR SPREAD	DETAILS	ASSESSMENT
ALGERIA	FMD type O /O/ME-SA/Ind-2001 lineage	Infected Live animal movements	Based on livestock price differentials	High risk of spread within the country by informal animal movements
TUNISIA	FMD type O /O/ME-SA/Ind-2001 lineage	Infected Live animal movements	Unknown	High risk of spread from Libya
MOROCCO	FMD type O /O/ME-SA/Ind-2001 lineage	Informal movement from Algeria (FMD infected areas)	Unknown	High risk of incursion from borders with Algeria
LIBYA	FMD type O /O/ME-SA/Ind-2001 lineage	Civil unrest causing displacement of local populations with livestock	Unknown	High risk of further spread within the country and at the borders with Algeria and Tunisia
SOUTHERN EUROPE (BULGARIA, FRANCE, GREECE, ITALY AND SPAIN)	FMD type O /O/ME-SA/Ind-2001 lineage	Trade, Illegal migration	Increasing volume of informal trade and massive migration of people between sub-Saharan Africa and North Africa, and on to Southern Europe	Low to Medium. The risk of introducing FMD into Europe from Algeria/Tunisia is not negligible if FMD becomes endemic in currently affected countries in North Africa

Figure 7. (a) location of outbreaks of FMD serotype O in North Africa reported between 2011 and 2015, and (b) predicted ecological risk map for FMD obtained using maximum entropy modelling.

(a) FMD serotype O outbreaks (2011 - 2015)

(b) Predicted ecological risk of FMD with serotype O outbreaks reported between 2011 and 2015 (inclusive)



SECTION 4

Forecasting

Table 2 provides a summary of the expected disease situation globally for the next three months (from July to September 2015). Figures are based on observed trends in disease and disease drivers such as civil unrest, climatic conditions and the opinions of FAO-associated experts across the globe.

Table 4. Summary of forecasts for July to September 2015 (three month period)

DISEASE OR DISEASE DRIVERS	THREAT FORECAST	GEOGRAPHIC AREAS	LEVEL[8]	NOTES
Avian Influenza(AI)				
	Further spread of H5N1 HPAI	Near East (Israel, West Bank, Gaza strip)	Low to medium	Limited capacity to implement adequate control measures in the West Bank area; historically low reporting period for H5N1 HPAI.
	Spread of H5N1 from Egypt to neighbouring countries	North Africa (Libya)	Medium	Civil unrest, extremism and political instability in the region may exacerbate the possibility of disease spread due to inadequate control measures such as movement control, quarantine and vaccination.
	Further spread of subtypes: (H5N1, H7N9, H5N2, H5N3, H5N6, H5N8) in poultry	Southeast Asia	Low	Seasonally low period for AI activity.
	Risk of human exposure to AI viruses from poultry	Southeast Asia	Low	Seasonally low period for AI activity.
	Spread of H5N1 HPAI from currently affected countries in West Africa	West Africa	Very high	Continuation of civil unrest and possible increase of illegal movement of poultry. Rainfall drives intra-African migration of waterbirds. Hence, the onset of the rainy season and changes in rainfall patterns may contribute to the spread of the disease in this region.
	Spread of AI (H5N1, H5N2, H5N8) in poultry	North America	Low to medium	
Sheep and Goat pox				
	Further spread from Mongolia to neighbouring countries including Kazakhstan	Eastern Asia	Medium	Existence of cross-border trade of small ruminants with China particularly when price differentials are favourable.
FMD serotype O				
	Further spread of FMD (serotype O) within affected countries (Mongolia and Republic of Korea)	Eastern Asia	Medium	Possible spread to other areas due to uncontrolled animal movement.
	Spread of FMD from Algeria to neighbouring countries	Northern Africa: (Libya, Morocco and Tunisia)	Medium to high	Civil unrest, terrorism and political instability in the region may exacerbate the possibility of disease spread due to inadequate control measures such as movement control, quarantine and vaccination. In Northern Africa: Possible spread due to increased contact between livestock herds as they tend to congregate at water points/grazing areas during the dry season. In Southern Africa, e.g. Namibia and Zimbabwe: possible spread between livestock and wildlife during the dry season at water points and grazing areas where animals congregate.

[8] **Low** = An event is unlikely; **Medium** = An event is possible but not likely; **High** = An event is a strong possibility; **Very high** = An event is highly likely; **Extremely high** = An event is imminent.

(cont.)

(cont.)

DISEASE OR DISEASE DRIVERS	THREAT FORECAST	GEOGRAPHIC AREAS	LEVEL[8]	NOTES
Lumpy Skin Disease (LSD)				
	Continued regional spread and increased threat to livelihoods and food security	Near East, The Caucuses, Central Asia and Southeast Europe	Medium to high	Given the importance of insect vectors in the disease transmission dynamics, forecasted climatic conditions during the next three months in the region are favourable. It is likely that LSD may spread to other countries in the region and beyond, by expansion of the geographical distribution of vectors, informal live animal movement and as a consequence of civil unrest in some countries in the Near East.
Rift Valley Fever				
	Possible occurrence of outbreaks	East Africa: Kenya, Somalia, Uganda, the United Republic of Tanzania and South Sudan	Low to medium	There is a greater than 90 percent chance that El Niño will continue through autumn 2015 in the Northern Hemisphere, and around an 85 percent chance it will last through the 2015-16 winter. Above normal rains may occur in East Africa during the latter half of the year. Countries should remain vigilant.
MERS CoV				
	Continued occurrence of human cases in Saudi Arabia	Near East (Saudi Arabia)	Low to Medium	Evidence points to seasonal patterns in reporting/ occurrence with peaks during the period March–April, with cases expected to decrease after April.
	Possible spread to neighbouring countries	Near East, North Africa	High	Illegal movement of camels, considered to be an important spread pathway, is probable in the region; uncertainties related to transmission dynamics, particularly the role of camels.
	Possible spread to neighbouring countries	Republic of Korea- Eastern Asia	Medium to High	Human to human nosocomial infections still on-going.
Ebola				
	Spread of Ebola in humans from currently affected countries	West Africa	Medium to high	Very low and poor health conditions in the three most affected countries could lead to a further spread of disease, which is not yet under control.

[8] **Low** = An event is unlikely; **Medium** = An event is possible but not likely; **High** = An event is a strong possibility; **Very high** = An event is highly likely; **Extremely high** = An event is imminent.

Source: *EMPRES-i*; Quarterly *EMPRES-FCC*, April 2015 – June 2015.

SECTION 5

New publications and articles

Influenza

Zhang, Y., Feng, C., Ma, C., Yang, P., Tang, S., Lau, A., Sun, W. & Wang, Q. 2015. The impact of temperature and humidity measures on influenza A (H7N9) outbreaks–evidence from China. *International Journal of Infectious Diseases*, 20: 122–124 (available at http://www.sciencedirect.com/science/article/pii/S1201971214016981).

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Kim, H-R., Kwon, Y-K., Jang, I., Lee, Y-J., Kang, H-M., Lee, E-K., Song, B-M., Lee, H-S., Joo, Y-S., Lee, K-H., Lee, H-K., Baek, K-H. & Bae, Y-C. 2015. Pathologic changes in wild birds infected with highly pathogenic avian influenza A(H5N8) viruses, South Korea, 2014. *Emerg Infect Dis*, 21(5) (available at http://wwwnc.cdc.gov/eid/article/21/5/14-1967_article).

Ebola

FAO. 2015. Addressing Zaire Ebola virus (EBV) outbreaks. *Rapid qualitative exposure and release assessment.* 2015 (available at www.fao.org/3/a-i4364e.pdf).

MERS-CoV

Hemida, M.G., Al-Naeem, A., Perera, R.A.P.M., Chin, A.W.H., Poon, L.L.M. & Peiris, M. 2015. Lack of Middle East Respiratory Syndrome Coronavirus transmission from infected camels. *Emerg Infect Dis.* 21(4) (available at http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4378477/).

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http://www.cdc.gov/vhf/ebola/outbreaks/2014-west-africa/case-counts.html

EMPRES-i
http://empres-i.fao.org/eipws3g/

EUFMD Monthly reports
http://www.fao.org/ag/againfo/commissions/eufmd/commissions/eufmd-home/fmd-surveillance/situation-reports/en/

FAO EMPRES Watch
Emergence of lumpy skin disease in the Eastern Mediterranean Basin countries:
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FAO Food Chain Crisis Management Framework - Early Warning Bulletin
http://www.fao.org/foodchain/empres-prevention-and-early-warning/early-warning-bulletin/en/

FAO World Food Situation
http://www.fao.org/worldfoodsituation/foodpricesindex/en/

FEWS NET Global Weather hazards summary
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http://www.cfr.org/global/global-conflict-tracker/p32137#!/

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State of the Climate: Global Analysis for May 2015, published online June 2015:
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http://www.oie.int/wahis_2/public/wahid.php/Wahidhome/Home

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