Controlling Avian Flu and Protecting People's Livelihoods in Africa and Indonesia

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Overview of Qualitative Risk Assessments for the Introduction and Spread of HPAI H5N1 Virus

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Key Findings

- Risk assessments conducted in Africa and Indonesia, by identifying practices associated with higher risk of introduction or spread of HPAI, can inform recommendations for mitigation strategies.

- In countries included in the study, the risk of HPAI introduction or spread between production sectors was assessed as negligible to medium, as a reflection of the estimated prevalence of HPAI, and not because of the presence of rigorous control measures.

From 2006 to the present, 11 countries in Africa reported outbreaks of highly pathogenic avian influenza (HPAI) H5N1: Egypt, Sudan, Djibouti, Niger, Nigeria, Burkina Faso, Côte d'Ivoire, Ghana, Togo, Benin, and Cameroon. Other than Egypt, where the disease is endemic, the last cases of HPAI H5N1 in Africa reported to the World Organization for Animal Health (OIE) occurred in Nigeria (June and July 2008) and Togo (September 2008). In Indonesia, the disease has become endemic since its introduction in 2004.

Qualitative risk assessment is the most common type of assessment to guide routine decisionmaking, especially in data-scarce environments. It allows for the development of risk mitigation strategies and for the identification of data gaps, and provides useful recommendations for future research.

A joint research team from the Royal Veterinary College (RVC) in London and International Livestock Research institute (ILRI) in Nairobi led five qualitative risk assessments in Ghana, Ethiopia, Kenya, Nigeria and Indonesia between October 2008 and June 2009. The work was carried out by national collaborators: Paa Kobina Turkson (Ghana), Bewket Siraw and Hassen Chaka (Ethiopia), Dennis Onkundi (Kenya), Garba Maina Ahmed (Nigeria), and Syafrison Idris and Maria F. Palupi (Indonesia). In each of the five countries, a stakeholders workshop was held in October or November 2008. These workshops had three main objectives: to present the risk assessment objectives to the stakeholders; to define the risk questions of interest for each country; and to outline the risk pathways. Drawing on the workshop outcomes,

the risk assessments (RAs) were then conducted from January to April 2009. Given the scarcity of data in these environments, input data for the models were collected by expert opinion elicitation, with key informants responding to questionnaires. The RA reports are currently being finalized.

Probability categories were attributed on a scale from negligible to very high (Table 1). In addition to the risk estimate, uncertainty was assessed and classified in three categories (Table 2).

Table 1. Interpretation of probability categories used in the risk assessment

Probability category	Interpretation
Negligible	Event is so rare that it does not merit consideration
Very low	Event is very rare but cannot be excluded
Low	Event is rare but does occur
Medium	Event occurs regularly
High	Event occurs very often
Very high	Even occurs almost with certainty

Adapted from: The EFSA journal. 2006. Migratory birds and their possible role in the spread of highly pathogenic avian influenza, p. 155.

Table 2. Interpretation of uncertainty categories used in the risk assessment

Uncertainty category	Interpretation
Low	Solid and complete data available; strong evidence provided in multiple references; authors report similar conclusions
Medium	Some but no complete data available; evidence provided in small number of references; authors' conclusions vary from one another
High	Scarce or no data available; evidence is from unpublished reports or based on observations or personal communication; authors report conclusions that vary considerably between them

Adapted from: The EFSA journal. 2006. Migratory birds and their possible role in the spread of highly pathogenic avian influenza, p. 155.

For the identified risk pathways, risk estimates were combined using the combination matrix presented in Table 3. When applicable, Table 4 was used to combine overall risk estimates of release and exposure assessments.

Table 3. Combination matrix used to combine qualitative risk estimates

		Parameter 2 /Exposure risk category					
		Negligible	Very Low	Low	Medium	High	Very High
Parameter 1 / Release risk category	Very High	N	VL	L	M	H	**VH**
	High	N	VL	L	M	H	**H**
	Medium	N	VL	VL	L	M	**M**
	Low	N	N	VL	VL	L	**L**
	Very Low	N	N	VL	VL	VL	**VL**
	Negligible	**N**	**N**	**N**	**N**	**N**	**N**

Table 4. Combination matrix to combine release, exposure, and consequence

		Consequence/transmission risk category					
		Negligible	Very Low	Low	Medium	High	Very High
Combined release and exposure risk category	Very High	N	VL	L	M	H	**VH**
	High	N	VL	L	M	H	**VH**
	Medium	N	VL	L	M	H	**VH**
	Low	N	VL	VL	L	M	**H**
	Very Low	N	N	VL	VL	L	**M**
	Negligible	**N**	**N**	**N**	**N**	**N**	**N**

Risk Questions

The risk questions addressed for each country are listed below. The questions considered introduction of HPAI H5N1 in the country and/or disease spread between and within the different poultry sectors within the country.

Risk questions for Ethiopia
- What is the risk of introduction of HPAI H5N1 via legal and illegal trade of wild birds transiting in Ethiopia?
- What is the probability that domestic poultry in Ethiopia will become infected by HPAI H5N1 after the release of the virus by an infected traded wild bird transiting in Ethiopia?
- What is the risk of transmission of HPAI H5N1 between large commercial poultry farms and small-scale poultry farms?

Risk questions for Kenya
- What is the risk or probability of transmission of HPAI H5N1 between sector 4 farms?
- What is the risk or probability of transmission of HPAI H5N1 from sector 4 farms to sector 3 farms?
- What is the risk or probability of transmission of HPAI H5N1 from sector 3 farms to sector 4 farms via sale of live birds in markets?

Risk question for Ghana
- What is the risk of re-introduction of HPAI H5N1 from neighboring countries (Burkina Faso, Côte d'Ivoire, and Togo) via cross-border trade involving live birds, poultry products, and fomites?

Risk questions for Nigeria
- What is the risk of transmission of HPAI H5N1 from backyard commercial farms to household free range poultry?
- What is the risk of transmission of HPAI H5N1 from medium-scale commercial farms to household free range poultry?

Risk question for Indonesia

- In the district and municipality of Bogor, what is the risk of transmission of HPAI H5N1 infection between small-scale broiler farms?

Risk Pathways

Risk pathway diagrams were outlined for each risk question above. Two examples are presented below.

Example of a release pathway (Ghana)

The release pathway diagram for the risk of re-introduction of HPAI H5N1 from Côte d'Ivoire into Ghana via cross-border trade and movement of people and birds is presented in Figure 1. Large farms in Ghana were considered as the most important release pathway through the movements of live birds and day-old-chicks and through fomites (movement of traders, eggs, and egg trays). Small-scale farms were also identified as a potential release pathway for HPAI H5N1 through feeds or raw materials and movements of poultry farm workers.

Example of an exposure pathway (Ethiopia)

The exposure pathway diagram presented in Figure 2 shows the risk to the local Ethiopian poultry population after the release of the virus by an infected wild bird transiting in Ethiopia. The local poultry population could be exposed to HPAI H5N1 through five pathways: vermin, resident wild birds, day-old-chicks transiting via the airport, staff handling birds at the airport, and direct contact with the imported wild birds.

Figure 1. Release pathway diagram for Ghana

What is the risk of re-introduction of HPAI H5N1 from neighbouring countries (Cote d'Ivoire) into Ghana via cross-border trade and movement of people and birds?
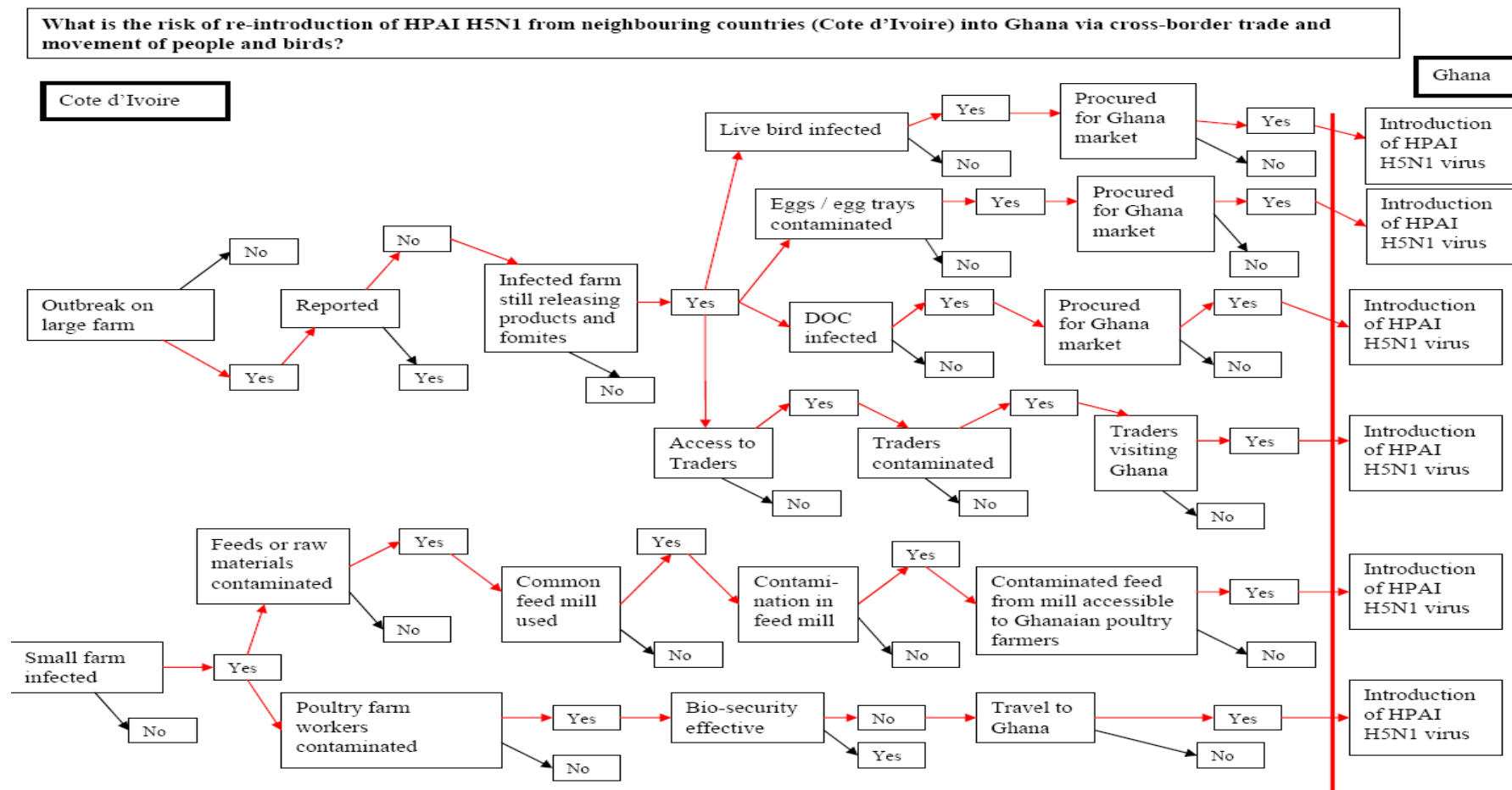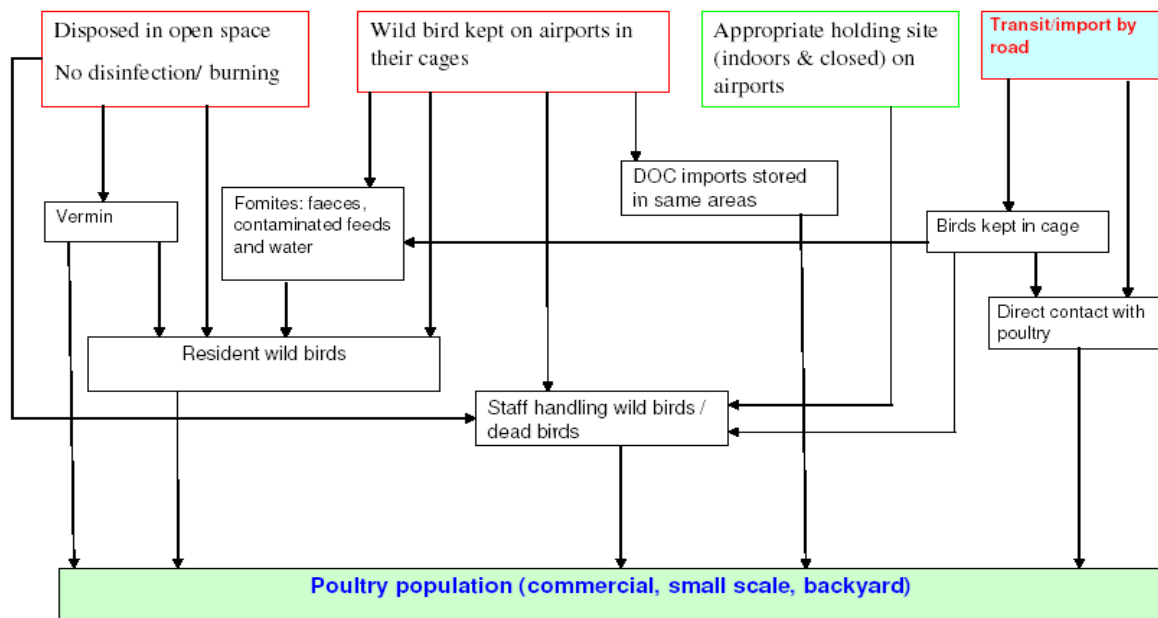
Figure 2. Diagram of exposure pathways of HPAI H5N1 to the poultry population after the release of the virus by an infected wild bird trade transiting in Ethiopia

Preliminary Results for the Pathway Examples

Ghana

The risk estimates for re-introduction of HPAI H5N1 into Ghana from Côte d'Ivoire, Burkina Faso, and via cross-border trade and movement of birds and people are presented in Table 5. The release pathway at highest risk was Côte d'Ivoire, with a risk ranging from "Negligible to Medium." The release pathway at lowest risk was Togo, with a risk ranging from "Negligible to Very Low." Overall, most pathways were estimated as "Negligible" or "Very Low" because the prevalence of the disease was estimated as "Negligible," and not because control measures have been implemented. For that reason, in each risk pathway, emphasis should be on implementing preventive measures at high-risk points of HPAI H5N1 re-introduction. Additionally, the high level of uncertainty associated with the risk estimates underscores the lack of knowledge on the epidemiology of HPAI H5N1 in Ghana and surrounding countries.

Table 5: Preliminary summary conclusions for the qualitative risk assessment in Ghana

Risk Pathway	Probability	Uncertainty
Risk of re-introduction of HPAI H5N1 virus from Côte d'Ivoire	Negligible to medium	High
Risk of re-introduction of HPAI H5N1 virus from Burkina Faso	Negligible to low	High
Risk of re-introduction of HPAI H5N1 virus from Togo	Negligible to very low	High

Ethiopia

The probability that domestic poultry in Ethiopia will become infected by HPAI H5N1 after the release of the virus by an infected wild bird on trade transit was estimated as "Low to Medium" with a "Medium" uncertainty. The uncertainty was estimated "Medium" partly because of lack of information on all species of resident wild birds living around the airport, their susceptibility, and virus shading behavior.

Preliminary analysis suggests that the most important risk factors in the exposure pathways are the lack of appropriate holding facilities for resident wild birds and contaminated staff attending the transit wild birds at the airport and owning poultry. The stratification of this risk scenario by the five identified exposure pathways will allow the development of tailored prevention measures.

Discussion

In most RAs, the majority of risk pathways were estimated as "Negligible" or "Very Low to Medium" because the prevalence of the virus was estimated "Negligible" or "Low" and not because control measures were implemented. However, practices associated with high risk of introduction and spread of HPAI H5N1 were identified, and recommendations for preventive or control measures drawn accordingly.

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