CANADIAN
WILDLIFE HEALTH
COOPERATIVE

TRACKING CHANGING AVIAN INFLUENZA RISK OVER TIME

SUMMARY

Success in primary and primordial prevention of avian influenza (AI) relies on farmers implementing timely and effective biosecurity actions to prevent the virus moving from wild birds to poultry to people. A pilot AI health intelligence project identified information that influenced biosecurity measures, was accessible and could be integrated into a risk communication index. Environmental data related to viral survival and presence of waterfowl on the land were important influencers of risk perception. The results support recommendations to take a systems, rather than pathogen-based approach to AI surveillance and risk management.

PROBLEM STATEMENT

If the primary public health approaches to primordial and primary prevention target spill over of virus from poultry to people by preventing spillover from wild birds to poultry, farmers need to be motivated to disrupt exposure pathway(s). There is growing evidence that information on virus types, in the absence of nearby evidence of a viral spill-over from wildlife, is insufficient to routinely motivate biosecurity actions by farmers or farm employees. Research elsewhere on farmers' intentions and behaviours for implementating biosecurity measures found that the threat needed to be 'visible' to be perceived as a risk. Finding the virus, seems insufficient to provoke action. Accurate and timely depiction of changing spatial risk is challenged by logistic obstacles to obtaining a large enough, widely enough disbursed sample to reflect the geographic diversity and waterfowl populations across the country. Delays in confirming virus types result in viral detection coming well after migratory birds have left a specific geographic area. Many national wild bird surveillance systems, including Canada's, are limited in their ability to meet the very important objective of early warning of signals that will evoke actions to prevent transmission of AI from wild birds to poultry.

A FARMER-FIRST APPROACH

The purpose of an AI health intelligence should be to provide timely, contextual information to decision makers about changing transmission risks in their location over time. Surveillance outputs must meet the expectations of the users and the information needs to be compelling enough to stimulate a response or a change in behaviour. Health intelligence systems need to recognize that different decision makers may have different information needs. A pilot project was undertaken in Alberta and British Columbia to combine multi-criteria decision analysis with best available evidence from literature to nominate and trial a wild bird AI health intelligence platform to provide signals for biosecurity changes over an AI season. We identified candidate data elements through a multi-tiered approach; (i) a literature search of wild bird AI risk factors; (ii) consultation with poultry industry members and (ii) an assessment of whether data were relevant to risk management decision making, freely available and open data, amenable to automatic extraction, and were data's credibility and reliability. The figure 1 summarises the recommended structure of a wild bird AI health intelligence platform.

PILOT STUDY FINDINGS

No science-based methods exist to forecast changing AI risk over time, therefore, forecasting the threat to domestic poultry must remain based in part on data and in part on judgement.

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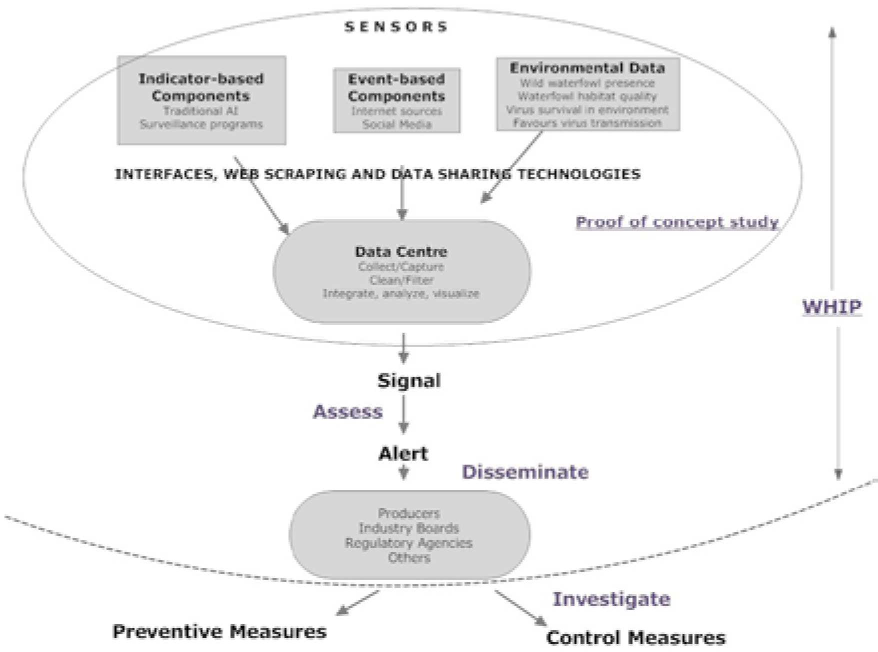
Indicator-based candidates:

The presence of AIV in a wild bird population, the location and timing of the detected virus relative to the waterfowl migratory flyways and migratory seasons, and the properties of isolated viruses are risk factors for transmission to poultry. The Canadian Wildlife Health Cooperative (CWHC), Community for Emerging and Zoonotic Diseases (CEZD), and the OIE's Avian Influenza Portal are potential sources of indicator-based information.

Figure 1. Schematic of the wild bird AI intelligence platform



Event-based candidates:

Environmental and host variables associated with changing wild bird AI risk over time and/or place include factors that; i) encourage wild waterfowl presence; ii) support virus survival in the environment; iii) and influence virus transmission from wild birds to domestic poultry such as waterfowl migration periods, landscape fragmentation, proportion of wetlands, surface water measurements, precipitation, temperature, presence of ice and snow, vegetation index, poultry density, types of poultry raised, on-farm biosecurity measures, and proximity of farms to water sources.

EXPLICIT ELICITATION

Using multi-criteria decision analysis, experts selected and weighed variables and developed rules to combine them into a risk index. Freely available data sources such eBird, Twitter, Environmental and Climate Change Canada and others were able to provide data on a regular and timely basis over the trial period of one AI season. Table 1 summarizes the results of this analysis.

CONCLUSION

The subjective nature of weighing and assessing diverse data plus the complexity of AI ecology suggests that forecasts that are precise in space and time are unlikely feasible, but a health intelligence approach can provide additional incentives for producers to reflect on the needs to improve biosecurity practices based on local and diverse information. While the platform was a technical success and subjectively valued by participants, it was clear that ongoing operations would require regular and sustained human intelligence inputs.

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Table 1: Environmental variables supported by a literature review and expert solicitation that could be used as a wild bird avian influence risk index to influence farmer biosecurity communications. Ranks and weights were developed in a multicriteria decision analysis exercise involving AI experts, farmers and risk decision makers from government.

Category	Element	Threat Score	Rank	Weight	Threat score X Wt
Detection of notifiable avian influenza virus	Global distribution Evidence of transmission Temporal distribution		1	0.4083	
Migratory routes	Waterfowl presence		2	0.2417	
Environmental conditions	Temperature		4	0.1028	
	Presence ice & snow		5	0.0611	
	Amount of surface water		3	0.1583	
	Vegetation density		6	0.0278