Modeling information sharing in animal health surveillance with social network analysis

INTRODUCTION: The performances of public surveillance systems depend on their capacity to capture health information transmitted fromprivate to public actors in contact. The health information network structure is driven by particular social or economic factors. The identification and analysis of such networks can help the implementation of policies aiming at associating private actors in the public surveillance of animal diseases.

The aim of this study was to apply the network paradigm to identify groups of actors significantly involved in information exchanges on Highly Pathogenic Avian Influenza (HPAI) suspicions, and their links with public stakeholders. An additional objective was to assess the efficacy of two different data collection approaches and their resulting network models: questionnaire-based surveys were used to analyze inter-individual exchanges, while participatory approaches and tools were used to analyze interactions between categories of actors mentioned as targets of information releases.

2 rural study areas were selected: one commune of northern Vietnam (Hải Dương province), 3 communes of southern Vietnam (Đồng Nai province).

1. Network of individuals based on questionnaires

A specific study was performed in the area of Hải Dương (northern Vietnam): 49 individuals belonging to 10 different pre-determined categories of actors were interviewed using standardized questionnaires. The questions concerned their information exchanges with other individuals on outbreaks of high mortality in poultry and the estimated yearly frequency of these information exchanges.

The resulting network included 265 individuals and comprised only one strong component of 175 individuals who were susceptible to receive information about at least some outbreaks. A small proportion of poultry traders were found to be included in the strong component, despite having regular contacts with poultry farmers to buy their animals. On the contrary, other categories such as poultry farmers, veterinary authorities, feed or quick suppliers and medicine sellers were well included. Farmers usually fear traders could use the information on diseases to reduce the poultry sale price.

**FIG. 1. Scatter plot and barplot representation of measured alpha centrality of individuals included in the individual information network of Hải Dương province.**

**FIG. 2. Scatter plot and barplot representation of betweenness centralities of individuals in the network of Hải Dương province.**

**FIG. 3. Networks built from the results of the participatory study in two locations. Nodes at the bottom represent the different types of farms potentially affected by high mortality outbreaks.**

**FIG. 4. Scatter plot and barplot representation of relative proportions of information received by each category of actors from direct reports of affected backward farms (t=1) and from following indirect exchanges (t=2) according to the results of participatory investigation.**

CONCLUSION: Currently in Vietnam private information networks have a crucial role in the management of epizootic poultry diseases. They are mainly relayed by local feed and medicine sellers and the agribusiness industry and have little connection with veterinary authorities.

However, analysis of inter-individual information exchanges show that veterinary agents are well included in the local private network because of their private activity, such as farming or medicine selling.

The need of early warning systems informing actors of poultry production of sanitary threats while preserving them from risks of price lowering constitutes an opportunity for public decision makers to significantly improve the acceptability of surveillance.