

# The role of free-grazing ducks in the circulation of influenza A viruses in Vietnam



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SVEPM – Elsinore, 2016



To describe the free-grazing duck production system and characterise the contact pattern between the duck flocks

### **Location of free-grazing sites**

| 12.5 | 25 | 50 Kilometers | Vinh |
|------|----|---------------|------|

To assess the level of circulation of influenza A viruses among these flocks

## **Contacts at free-grazing sites**







56% of farmers reported contacts with waterfowl and 70% reported direct contacts with other duck flocks

Potential risk factors for the transmission of AI viruses related to free-grazing practices:

- Direct contacts with flocks of various origins
- Direct contacts with waterfowl (potential reservoirs for AI viruses)
- Persistence of AI virus in the ground when paddies are used by several flocks.



Map: Representation of the routes followed by farmer No. 4 (in orange) and 33 (in green).

32%

16%

19%



Where are the rice fields located? (N=219)



### **Transport between sites**



#### By boat

### **Logistic regression on the influenza A status**

Bayesian logistic regression analysis was used to model the influenza A status (detected/not detected) of the duck flocks and identify potential risk factors. The factors increasing the risk of detection of AI are presented in the table below.





Proportion of journeys in which the vehicle transported more than 1 flock:

- According to the farmers: 10% [5-14%]
- According to the transporters: 31% [21-42%]

Potential risk factors for the transmission of AI viruses relating to transport:

- Transport of several flocks on same vehicle (especially during long journeys)
- Cleaning and disinfection of transport vehicles are rarely implemented

Available techniques to handle datasets with quasi-complete separation (see example below):

- Combining categories within variables
- Use exact logistic regression
- Use Firth's penalised maximum likelihood estimation
- Use Bayesian analysis

|                 | Hatchery | Other |  |
|-----------------|----------|-------|--|
| Al detected     | 11       | 9     |  |
| Al not detected | 9        | 0     |  |

**Table:** Example of quasi-complete separation between the outcome (AI status) and one predictor (Origin)

#### Limitations:

- Small sample size !
- Convenience sample (selection of study
- communes and farmers)

| Variable           | Categories                | Number of flocks | IA detected | OR   | 95% CI      |
|--------------------|---------------------------|------------------|-------------|------|-------------|
| Origin of the      | Not from hatchery         | 9                | 0           | Ref  |             |
| ducklings          | From hatchery             | 20               | 9           | 18.8 | 1.3 - 478.3 |
| Number of flocks   | Several flocks            | 15               | 2           | Ref  |             |
| farmer             | One flock only            | 14               | 7           | 15.2 | 1.7 - 182.6 |
| Residency of the   | Resident                  | 13               | 1           |      | Ref         |
| farmer             | Visitor                   | 16               | 8           | 16.2 | 1.1 – 387.3 |
| Consistancy of the | Same every season         | 15               | 2           |      | Ref         |
| journey            | Different every<br>season | 14               | 7           | 10.4 | 1.1 – 135.9 |
| Contact with wild  | Never or rarely           | 20               | 5           | Ref  |             |
| ducks              | Often                     | 9                | 4           | 4.4  | 0.4 - 50.1  |

**Table:** Results of the Bayesian logistic regression

### **Next steps:**

- To model the spatio-temporal dynamics of the free-grazing duck density in South Vietnam
- To model of the risk of maintenance of avian influenza viruses by longdistance free-grazing duck flocks
- To assess the effectiveness of potential mitigation measures (such as restricting the number of flocks transported per vehicle or implementing compulsory disinfection of vehicles)

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Gilbert, M. et al. (2006). Free-grazing ducks and highly pathogenic avian influenza, Thailand



