

# Drivers of avian influenza virus movement within a city:

## Preliminary insights from Dhaka, Bangladesh

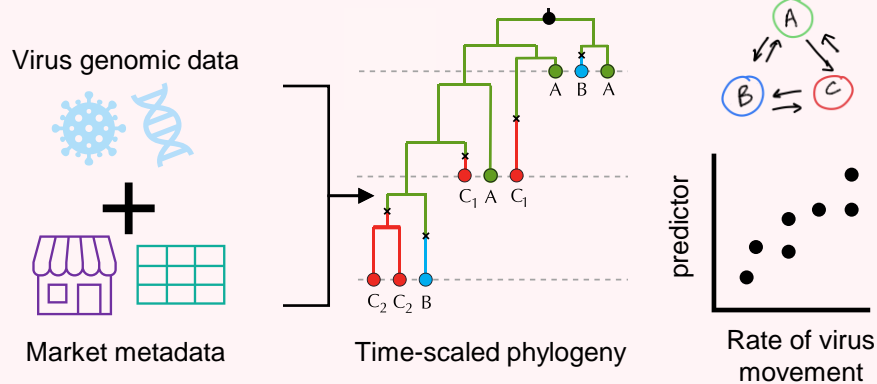
Jayna Raghwani, Marie-Cécile Dupas, Francesco Pinotti, Saira Butt, Anne Conan, Ashley Banyard, Ian Brown, Tom Lewis, Joe James, Josh Lynton-Jenkins, Alex Byrne, Nicola Lewis, Mahmudul Hasan, Pangkaj Kumar Dhar, Md. Helal Uddin, Rashed Mahmud, Mohammed Abdus Samad, Md. Ahasanul Hoque, Paritosh Kumar Biswas, Damer Blake, Fiona Tomley, Guillaume Fournié

### INTRODUCTION

In this study, we have analysed ~126 H9N2 virus genome sequences sampled from Dhaka between August 2021 and January 2022, together with metadata about the poultry trading network, to better understand predictors of virus spread within a city.

### METHODS

Generalised linear model-based phylodynamic approach was undertaken to identify key predictors of virus spread



### KEY HYPOTHESES

Virus movement among markets is likely to be influenced by:

-  Network connectivity
-  Trader movement
-  Niche overlap

*Other predictors evaluated: geographic distance, chicken trade, virus prevalence*

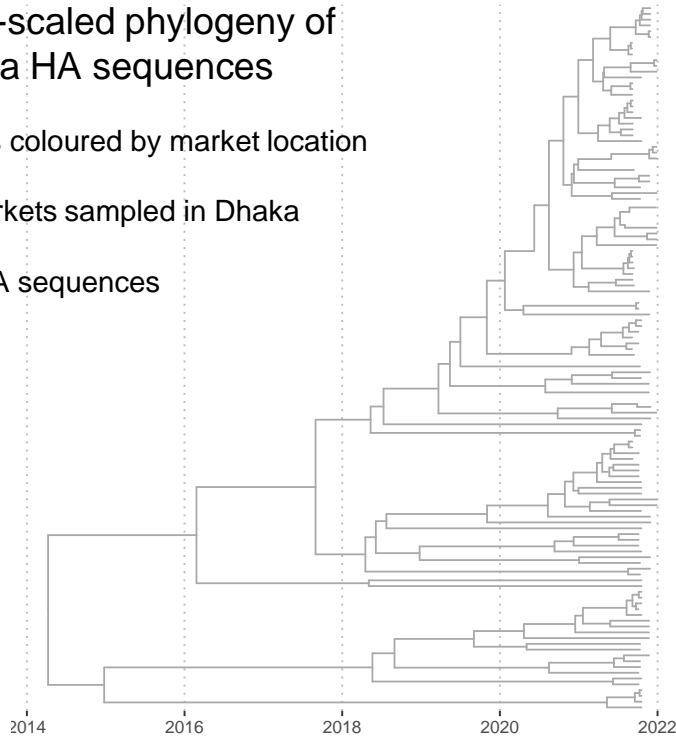
# PRELIMINARY RESULTS

## Time-scaled phylogeny of Dhaka HA sequences

Circles coloured by market location

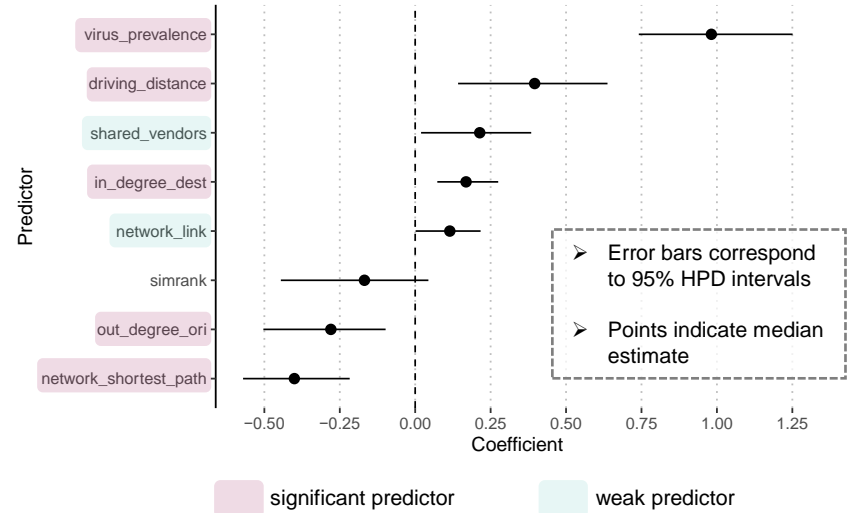
20 markets sampled in Dhaka

126 HA sequences



- Evidence of clustering by market = recent within market spread
- Intermingling of different colours = between market spread and/or spread from common source

## Predictors of virus movement between Dhaka markets

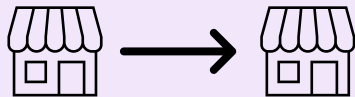


- Virus prevalence, driving distance, in-degree of destination markets are *positively associated* with virus spread between markets
- Out-degree of origin market and network shortest path (based on number of middlemen) are *negatively associated* with virus spread between markets

## DISCUSSION

Virus spread is greater from markets:

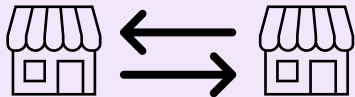
- With higher virus prevalence



Virus spread is greater to markets:

- That are supplied by a higher number of markets

Virus spread is greater between markets:



- Separated by greater geographic distance
- Shorter network distance (middlemen)

**Also, we find weak evidence for virus movement:**

- **Between markets that share a higher number of vendors**
- **Between markets that are more frequently linked in the poultry trade network**

## CONCLUSION

- Network connectivity, trader movement, geographic distance, and virus prevalence appear to be important predictors of H9N2 virus movement between Dhaka markets
- **Implications for reducing virus spread:** Target markets with (1) higher virus prevalence and that (2) supply other markets, (3) limit trade to geographically proximate markets

## FUTURE DIRECTIONS

- Evaluate robustness of these results, including highly correlated predictors (e.g. niche overlap and network shortest path)
- Are similar predictors also implicated in virus spread between Chattogram markets?
- What factors influence virus movement between cities?