

Social network analysis of poultry trade movements in Sikasso county, Mali: implications for surveillance of avian influenza

Molia, S.¹, Boly, I.¹, Duboz, R.¹ and Fournié, G.², ¹CIRAD, France, ²RVC, United Kingdom; sophie.molia@cirad.fr

Social network analysis (SNA) is a set of tools increasingly used in veterinary epidemiology. It enables to better understand the structure of animal movements and its impact on disease spread. It also helps predicting the most efficient outbreak surveillance and mitigation measures, which is especially useful for developing countries with limited resources and for emerging diseases such as avian influenza (AI). Here we apply SNA to quantify and decipher the web of poultry movements in the Sikasso county, the main supplier for 43% of all live bird markets in Mali. A cross-sectional survey was conducted in May-July 2010 in all markets (n=21) of Sikasso county and in 6 markets of adjacent counties. 180 poultry traders (PT) were interviewed with tested questionnaires and led to identifying 604 PT working in 186 locations. A directed weighted network was built with locations (villages, farms, markets) as nodes, sale of poultry as link, and number of poultry sold/mo as weight. The network was highly hierarchical with overdispersed distributions of centrality measures which led to identifying 4 hubs. The main targets for AI surveillance were the markets of Medine and Wayerma, (which accounted for 59% of all in-degrees). Targets for AI control were the markets of Medine, Wayerma, Farakala and Lobougoula whose removal from the network decreased the size of the giant weak component by 57%. 70% of poultry traded in the Sikasso county was sold to markets in Bamako and Ivory Coast, representing respectively 32 081 and 3600 poultry/mo. Building networks can be challenging in developing countries with no compulsory recording of animal movements as in the North. Our network was probably not complete but influential nodes can nevertheless be identified by degree centrality measures without requiring assessment of entire networks. Further work will analyse the network with PT as nodes and will assess the relationship between the geographical distance and the proportion of linked nodes and the number of poultry traded.