
Introduction to Network Analysis and Network Data Visualization for Veterinary Epidemiology using Open Access Tools

Pre-Symposium Workshop, ISVEE 15
11th November 2018

Background and history of the workshop

The study of network analysis has an important role in veterinary epidemiology. Network visualization and related statistics can help us understand which nodes (people, farms, villages) act as potential super-spreaders or super-receivers, allowing for specific resource allocation focused on high risk nodes. Targeted policies towards specific nodes can help with early identification of cases, disease contention, reduction on animal emergency culling and consequently a decrease on economic losses as well as an improve on food safety. Moreover, network data can be used to improve traditional disease spread models, where the unrealistic homogeneous contact assumption must be accepted.

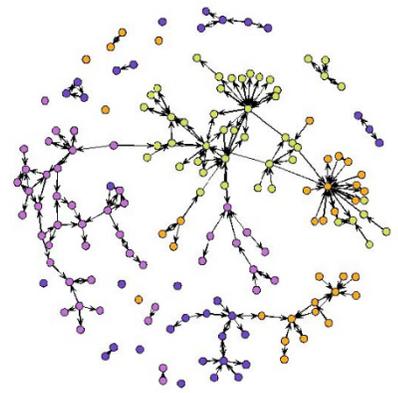
This **hands-on practice workshop** is an adaptation of a group of lectures/labs given annually at the graduate level, at the University of California Davis, USA and at the IREC institute, Universidad Castilla la Mancha, Spain. Main language will be English. Organizers are fluent in English, Spanish, French and Korean.

Learning outcomes

After completion of this workshop, attendees will be able to:

- ✓ Understand key concepts of Social Network Analysis (SNA).
- ✓ Get used to the basic terminology of graph theory.
- ✓ Recognize how network analysis is used in the area of veterinary epidemiology.
- ✓ Use R studio at the beginners/intermediate level.
- ✓ Import, build and adapt data to construct networks on R studio.

- ✓ Calculate and understand SNA statistics.
- ✓ Visualize and plot networks geospatially.
- ✓ Be exposed to advanced methods of network analysis: advanced visualization, community algorithm and regression.
- ✓ Appropriately and critically interpret results of Network analysis.



Background and skills workshop attendees should have

- Basic understanding of epidemiology and biological perspectives in infectious disease transmission.
- No prior knowledge on network analysis or R software is necessary.
- A laptop with R and R Studio installed - free and open source (Directions on how to install the software will be given prior to the workshop).

Contents and schedule

Sections will be based on a combination of lectures, problem-based learning scenarios and group discussions. A short 10-minute break will follow each section during which participants can catch up on material or discuss comments or ideas with nearby fellows. Questions are encouraged throughout all sections.

9:00 am - 9:50 am (50 min). Introduction of Social Network Analysis (SNA)

Why is important in veterinary epidemiology context and how it is applied in veterinary epidemiology. We will cover basic terminology and key concepts in SNA.

10:00 am - 10:50 am (50 min) Introduction RStudio

Introduction to RStudio and hands-on practice on basic functions on RStudio.

11:00 am - 11:50 am (50 min) Hands-on practice with R

Basic practice for network analysis on RStudio: how to import data, use packages, how to search for help. Upload and read the network dataset, build network from data.

12:00 pm - 1:00 pm (1 hr.) Lunch Break

1:00 pm - 1:50 pm (50 min.) Network data representation

Undirected graphs, nodes and edges. Changing options for data representation (sizes, colors, shapes, and data subsetting).

2:00 pm - 2:50 pm (50 min) General network properties and centrality measurement

We will explain what general network properties and centrality are and use RStudio to calculate both values.

3:00 pm - 3:50 pm (50 min) Mapping our network

Plot network on map. Explain “what the code is doing” with brief explanation of Map on RStudio.

4:00 pm - 4:50 pm (50 min) Exploration of the future use of network analysis

Introduce advanced visualization, community algorithm and application in regression.

Introduction of Shiny and dynamic networks.

Final small group discussions to share personal views on how to use SNA in the future and applications. Group perceptions.

Dates and Registration

Pre-Symposium Workshop. Fees: Student: 200 USD, Non-student: 250 USD

Please, use the conference website for registration:

<http://isvee.net/scientific-information/pre-post-symposium-workshop/>

Moderators and Contact

All instructors are members of the Center for Animal Disease Modeling and Surveillance (CADMS) based at the University of California Davis, USA. Please, feel free to reach any of us if you have any questions.

Dr. Beatriz Martínez López (DVM, MPVM, PhD) obtained her DVM at the Veterinary School of the Complutense University of Madrid, Spain in 2004; the Master of Preventive Veterinary Medicine (MPVM) at the University of California, Davis in 2007 and her PhD in Veterinary Epidemiology at the Complutense University of Madrid in 2009. Dr. Martínez López research and teaching is focused on the development and application of epidemiological tools for supporting more cost-effective and risk-based surveillance and control strategies. She has been primarily working on epidemiological modeling, network analysis and risk assessment for the evaluation of the potential introduction and/or spread of diseases affecting domestic and/or wild animal populations She currently leads the Disease BioPortal® project, which is a secure web-based platform system intended for real time surveillance, risk assessment and modeling of animal diseases using laboratory data and other types of information . She has received more than 140 citations since 2009 for her publication “Social network analysis. Review of general concepts and use in preventive veterinary medicine” and published more than 15 publications using network analysis methods since then.

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Dr. Esther Kukielka (DVM, MSc, PhD candidate) is a veterinarian interested in wildlife, infectious diseases epidemiology and public health, especially in developing countries. Esther

holds a DVM and a MSc on Wild Animal Health and is close to the completion of a PhD in Epidemiology at UC Davis, California. Her research is directed to better understand several infectious diseases transmission in low and middle-income countries, using a One Health approach (i.e. health, socio-cultural, economic and environmental factors for disease emergence and maintenance). She has experience with qualitative and quantitative epidemiological methods such as semi-structured interviews, geo-statistical analysis, social network analysis and simulation modeling.

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Dr. Jerome Baron (DVM, MSc) holds his veterinary degree from the University of Liège, Belgium (2013) and a masters in veterinary epidemiology from the Royal Veterinary College, London UK (2015). He worked for a year and a half as a consultant in epidemiology in the private sector providing disease forecast models and epidemiologic knowledge to both scientific and non-scientific members of the client company. He is currently a second year PhD student in epidemiology at the University of California Davis with interests in zoonotic disease dynamics and modeling. There he has gained experience working with social network analysis, and survey data analysis. He also works as a part time analyst with the UC Davis Veterinary Center for Clinical trials having gained experience in study design, sampling and analysis and as a teaching assistant in basic epidemiology classes.

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Dr. Gema Vidal (DVM, MPVM, PhD candidate) is a livestock veterinarian from Spain. In 2002, she earned her DVM degree at Universidad Cardenal Herrera CEU, Spain. Before moving to the US, she worked for several years in private practice, as Lecturer of Infectious Diseases at her former University, and as research assistant at Universidad Politecnica de Valencia. Gema completed her clinical internship at University of Florida, and her residency training at University of California, Davis. During both training programs, she was able to participate in outreach activities and was actively involved in student mentoring. Since 2015, Dr. Vidal is a PhD student in epidemiology at the Center for Animal Disease Modeling and Surveillance (CADMS), University of California, Davis. She has held different teaching assistantship positions and she has been involved in project management, disease investigation, outreach and capacity building in Nicaragua, Pakistan, Ethiopia, Uganda, and Tanzania. Gema's experience include a variety of analytical methods such as survey design and analysis, mixed methods, state space models for time series data, and modeling of disease dynamics.

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Dr. Kyuyoung Lee (DVM, MPVM) is a Ph.D. student in Graduate group of Epidemiology at the University of California, Davis. He obtained his Doctor of Veterinary Medicine degree at the Chungnam national university in South Korea (2010) and master of preventive veterinary medicine degree at the University of California, Davis (2016). He worked as a public

veterinarian and a veterinary epidemiology researcher in the governmental veterinary authority in South Korea. He is interested in the application of advanced epidemiological methods to challenge governmental and global issues in animal health. His academic goal led him to engaging in the research for complex live pig shipments network and estimated the risk of Porcine reproductive and respiratory syndrome virus transmission among pig production sites using social network analysis supported by Boehringer Ingelheim PRRS Research Award 2015. He is interested in advanced epidemiological methods for infectious diseases and pursuing to expand the methods by incorporating phylogenetics of pathogens and economic analysis to measure the benefit of preventive measures for infectious diseases.

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