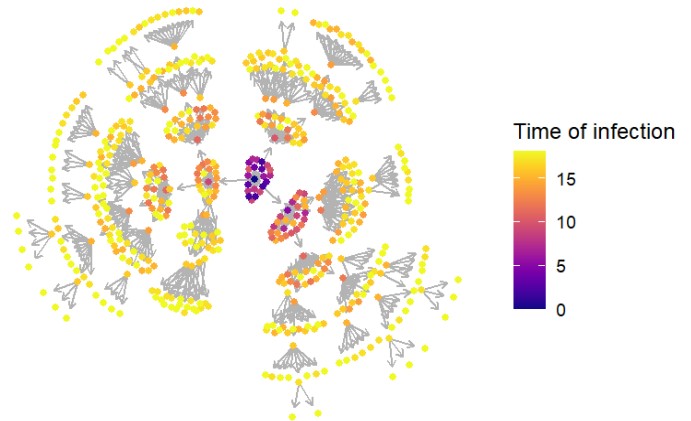# The role of superspreaders

Variation between individuals can have profound effects on populations, through evolution, but also through short-term ecological effects (e.g. Hart et al. 2016). A prime example where variation may have a profound effect is in epidemiology: for a pandemic to spread across the globe it only requires a small number of hosts to travel widely. Indeed, we suspect that the spread of epidemics strongly depends on so-called superspreaders (Wong et al. 2015). In this project, jointly supervised with Sebastian Lequime, we use an individual-based simulator, *nosoi* (Lequime et al. 2020) to simulate disease outbreaks.

In the first step, we will explore under what parameter settings outbreaks rely on a small number of superspreaders and how we can effectively quantify the impact of superspreaders. Once we have this characterization, in a second step, we use approximate Bayesian computation to fit the *nosoi* parameters on data from existing outbreaks of, for example, measles, RSV, NORO, or animal diseases. We then quantify to what extent superspreaders played a role in these outbreaks. The project will require running and analysing simulations, speeding up de *nosoi* code, and using approximate Bayesian computation. Affinity with simulation studies is thus a must. Hopefully, the project will increase our understanding of how individual variation contributes to the spread of diseases.

Hart, S. P., Schreiber, S. J., & Levine, J. M. (2016). How variation between individuals affects species coexistence. Ecology letters, 19(8), 825-838.

Lequime, S., Paul, B., Dellicour, S., Lemey, P., & Baele, G. (2020). nosoi: A stochastic agent-based transmission chain simulation framework in R. Methods in ecology and evolution, 11(8), 1002-1007. https://doi.org/10.1111/2041-210X.13422

Wong, G., Liu, W., Liu Y., Zhou, B., Bi, Y., & Gao, G. F. (2015). MERS, SARS, and Ebola: The Role of Super-Spreaders in Infectious Disease. Cell Host & Microbe 18(4): 398-401 http://dx.doi.org/10.1016/j.chom.2015.09.013

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Type of project:	☐ Bioinformatics	☐ Fieldwork	☐ Laboratory	☐ Theoretical	☒ Data analysis

MSc program:	☒ Biology	☒ Ecology and Evolution	☐ Behavioural and Cognitive Neurosciences
	☐ Biomedical Sciences	☐ Biomolecular Sciences	☐ Marine Biology

ECTS:	☒ 30	☒ 40	**Language:**	☐ Dutch	☒ English

Start date: **Location:**