Review of: "How does the host community structure affect the epidemiological dynamics of emerging infectious diseases?"

Matteo Convertino

Potential competing interests: The author(s) declared that no potential competing interests exist.

I like the paper in principle, since it deals with an importance aspect I am quite familiar with and population health. That said, I believe the paper is purely a theoretical paper and lacks of realism and a proper validation based on data. I like the idea but this limitation must be stated very clearly even in the introduction.
First of all host community complexity is just one of the many factors affecting the amplification or dilution of incidence of an epidemic in a target population, e.g. public health controls can overcome any ecologically-determined incidence potential. Therefore the quantification of this paper is about potential incidence rather than effective incidence.
Second the three simple host community structures considered with an increasing complexity are really not realistic; quite simple I would say unless we talk about diseases that are clearly related to non wild species. Ecological networks are much more complex and composed by many species. So the matter would be interesting to explore how realistic network community structure impact EID in population via data-based approaches.
Lastly the authors say "Globally, our results show two possible main outcomes." Why globally?
All these results seem quite simple and just related to model structure than real evidence "First, an intermediate host can have a diluting effect by preventing the di- rect transmission from hosts to the target population, thus reducing the prevalence of infection. Second, when two sources of infection are considered, the effects of the epidemic are generally amplified. By highlighting that the structure of the ecological hosts network can dramatically affect epidemics, our results may have implications for the control of emerging infectious diseases." so I highly suggest to mention that the study is theoretical and exploring a simplified model about reduced host complexity in potential incidence.

Further comments below.

SPECIFIC COMMENTS:
(1) The ecological-environmental processes you investigate are largely non-linear. Non-linear models such as Convergent Cross Mapping or OIF (see Li & Convertino 2021 for instance) can account for variable non-linear interactions even without considering time delays (that are however quite important for example for you population incidence). These models are also able to capture spatial (network) variability to understand spatial dependencies that are really important for the variable considered (but in this case you do not have space that is anyway another huge factor in determining EID spread). I am not sure how your study did consider these non-linearities and then if you can consider these aspects it

would be quite relevant to truly map ecosystem dynamics in term of incidence in your case (or otherwise stating this as a limitation of the study).

(2) To address the model Uncertainty-Sensitivity-Relevancy trilemma, global sensitivity and uncertainty analysis (GSUA) should be done to identify key determinants of model outputs / indicator variability (such as freshwater zooplankton). The authors lack to perform a classical sensitivity analysis too and so it is really not know what are the non-linear/synergistic drivers of model output/data (in relation to non-linear processes). GSUA considers non-linearity dependent on variable interactions (e.g. how different input factors are interlinked over space and time). See Pianosi et al. (2016) for an extensive discussion about this topic and how data should be used for GSUA using a simple variance-based approach. It is essentially looking into how much variability in contained in inputs for the variability of outputs (or event better into the co-predictability versus causality based on pdfs). There are other types of GSUA based on pdfs or entropy but in your case classical GSUA should be ok considering the non probabilistic nature of the model.

(3) How indicators/predicted variables change over space is critical to understand site- or time-specific and universal (ecosystem invariant) shifts. Thus, indicator distributions can be analyzed as a function of the environmental variables (or predictors) considering joint probability distribution functions (pdfs), or average value and variance and looking into indicator variability as a function of predictor gradients. Stability of incidence over predictor gradients is important to see because that can define potential stable states over which the predicted variable is not changing.

RECOMMENDATION:
The paper is really interesting but must present better limitations or further analyses that are missing (like GSUA). A fully probabilistic characterization would be interesting and important, but the most important thing would be a true validation on real data and consideration of space vs. the 1D model approach. Overall I would suggest to accept the paper after Moderate or Major Revision considering the issues above.

REFERENCES:

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Packages for GSUA

- https://www.safetoolbox.info/info-and-documentation/