**Climate driven variation in mosquito density predicts the spatiotemporal dynamics of dengue**

Dengue is a global problem, climate change is making it much worse, increasing amounts of global population are becoming susceptible to infection

**Serotype**: group of orgs, microorgs or cells distinguished by their shared specific antigens

**Disease vector**: Any agent which carriers and transmits an infectious pathogen into another living organism; either living (e.g. mosquito) or not (e.g. dust)

**Generalised additive models**: Models=a modified version of GLMs “in which the usual linear relationship between the **response** and **explanatory** variables is replaced by several **non-linear** smooth functions to model and capture the non-linearities in the data.” (datascienceplus.com)

**Root Mean Squared Error:** a popular way to calculate how close predicted values are to observed values (a smaller error means the predicted values match the observed values more i.e. the model is better) (www.statisticshowto.datasciencecentral.com)

General questions to ask on ANY paper:

* What questions is the paper trying to answer? What are the goals? Did they achieve these goals?
* Is the paper biologically relevant? Is it novel?
* What are the merits and flaws of the method?
* Are results clear and could they have answered their question from them?
* Have they made any unfounded statements?

**What question/s is the paper trying to answer?**

* What are we asking, bad papers get lost answering too many questions and so don’t solve the question they sought to answer in the first place
  + Is it possible to predict when dengue outbreaks will happen based on models and existing data?
  + This paper seems to have achieved that goal

**How relevant is the paper?**

* Understanding dengue dynamics and local weather patterns, why is this relevant?
  + Medical applications, holistic
  + Disease of humans is a big issue

**Are the methods novel?**

* Haven’t seen predictions for disease matching up so well to existing models
* Combination of GLM model and SIR model: integration seems to increase applicability

**What are the merits/flaws of the method?**

They used the precipitation days as a predictor but biologically does this make sense?

How are mosquitos linked to precipitation – water bodies are where they breed, precipitation days – how is this correlated?

Maybe precipitation days was chosen as it fit the model better?

1mo lag after precipitation showed significance => precipitation influences mosquito pop dynamics

Chose 1mo lag because it fit best, 2mo lag was not predictive – why? Because of life cycle of mosquito

Merit: paper is very relevant to climate change research, how will disease dynamics change as an effect of a warming planet

Merit: repeated across multiple cities over a long period

Flaw: different surveillance in southern cities compared to northern, northern have much more prevention, south wait until outbreak

Flaw: only using city information, dynamics of human pop, dynamics are not the same in rural areas, this model is great for cities but still untested on rural areas, can it be extrapolated?

Flaw: didn’t include asymptomatic infections, when you get a second infection it can be more dangerous, what could they do? Encourage higher surveillance of mosquitos and humans

Underestimating or overestimating amount of infections?

**How is the data visualisation?**

* Pretty perfect match in Time vs. Number of human infections
* Strength: observed vs predicted values match up pretty well in S4 on appendix

**How is the graph doing at answering the main question?**

* Presentation is very clear, obvious where the matches are using colour
* Clear that the outbreaks both predicted and observed match up very well

Where is the data on the other cities, 8 cities were used for the model training?

**Have they made any unfounded statements?**

* Researchers need to back up EVERY POINT they make, don’t get caught out on this in your thesis!

1-month lag – need more detail on why that is the best fit, what is the mosquito life cycle

Surprising that they are estimating mosquito density to use the SIR model, are all mosquitos infected – what are the prevalence rates of dengue in China? = per-mosquito vector efficiency = measure of prevalence?

Made an inference that local weather conditions impact on variation of mosquito abundance can be applied to other mosquito borne diseases, reiterated multiple times

They have studied dengue in China and then they are saying this is applicable to Zika, malaria, and chikungunya, is there any founding to this?

Only effective in places with a lot of precipitation, can you use this in other places, population density in Northern China also a lot lower

Mosquitoes they studied – do also spread Zika and the two models they used to underpin dengue model are fairly general as they work on mosquito abundance vs weather rather than dengue-specific parameters => inference that Zika is also applicable is OK but should go into more detail on WHY they believe that the mechanism can be used in other diseases

Reading scientific papers, general order some of us do things is:

* Start with the abstract
* Jump into graphs, does the question match what the graph is telling us?
* Read the last paragraph as a summary of what they found
* Then get back into the rest with a better understanding of the aims and results
* Introduction section is looking at the entire background of the field, maybe it’s best to see what the paper itself is talking about before you jump into the rest of the research!