Carl A. B. Pearson
Postdoctoral Researcher
Emerging Pathogens Institute, University of Florida
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Topic: Seasonal Vector Populations
comparison of continuous, spatially homogenous models

Why?

understanding of infection trends can inform interventions, health system preparations, *etc.*

Common Mosquito Model

TODO sine

...*vs.* Common Mosquito Abundance

TODO overlay mosquito pops with sine, match peaks

So: low hanging fruit

preview: no sophisticated analysis to pick said fruit
but these basic analyses provide fertile ground for much more quantitative detail

1. useful to write models in terms of measurable parameters,
2. measurable parameters are not scale-free,
3. mathematics is more useful when scale free, therefore
4. dimensional analysis is awesome

where $M(t)$ is mosquito population w.r.t time

$$\dot{M}(t) = E(t) - \lambda M(t)$$

defined on $t \in (-T/2, T/2)$

common usage is $M(t) \propto$ simple trigonometric

What salient observed features does that miss?

aside: why replace given $M(t)$ with given $\dot{M}(t)$?

Salient features:

- short time with appreciable population
- even shorter time for population rise and fall
- low correlation with early and peak populations

Need a spike-like $E(t)$ to replicate these. Candidates?

Spike-like could be more formally δ-function like.

So: use δ-function approximations.

TODO list approximate delta functions.

What should we use for the shape parameters?

clue: want oranges-to-oranges comparisons between the options

I chose to make mosquito total births equivalent

TODO M_p equation

and then to apply a subjective "constraint" on Δt

TODO delta t stuff

TODO list approximate delta functions with params in place

Now everything is on the same scale, but rewind: don't have any of the convenience of having the same scale.

So: dimensional analysis. What parameters should be eliminated?