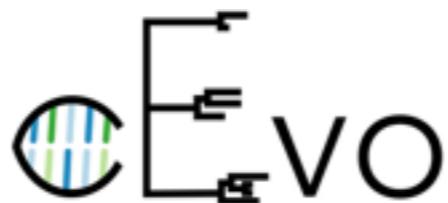


Population structure using the multitype birth-death model

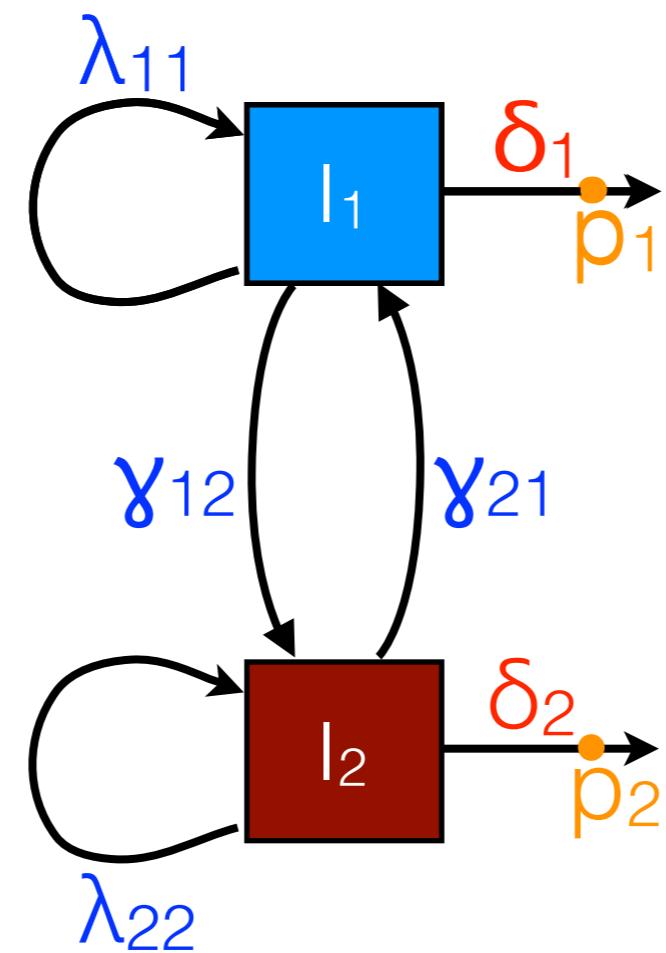
Jūlija Pečerska
TtB London, 2017



BDMM: dossier

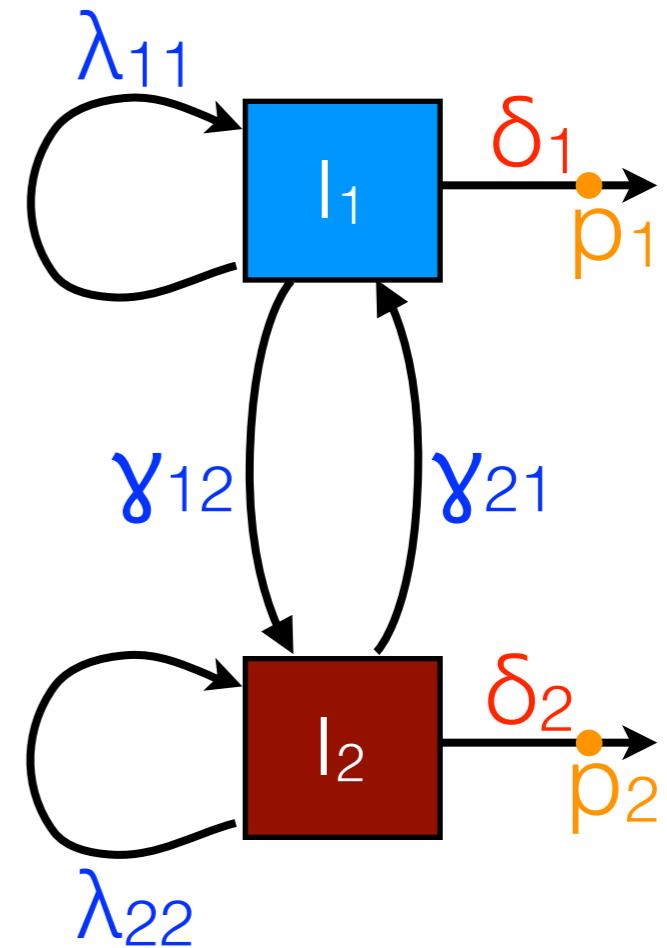
- Birth-Death-Migration Model;
- <https://github.com/denisekuehnert/bdmm>;
- **Kühnert, D., Stadler, T., Vaughan, T. G., & Drummond, A. J. (2016).**
Phylogenetics with Migration: A Computational Framework to Quantify Population Structure from Genomic Data.

BDMM: structure



BDMM: Features

- Multiple demes;
- Birth rates per interval;
- Sampling through time;
- Sampling at present;
- Removal probability - sampled ancestors.

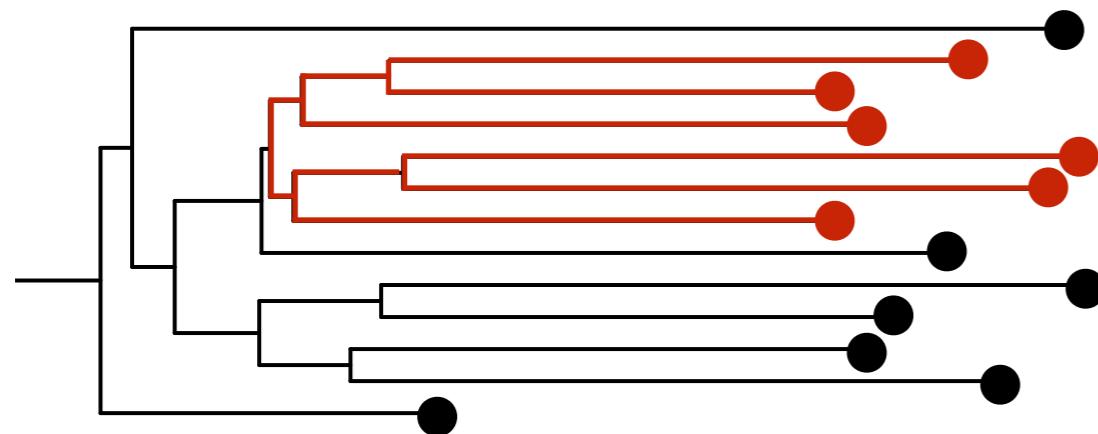


Possible demes

- Drug resistance status;
- Geographic location;
- Risk group:
 - HIV: HET, IDU, MSM;
 - TB: child, adult.

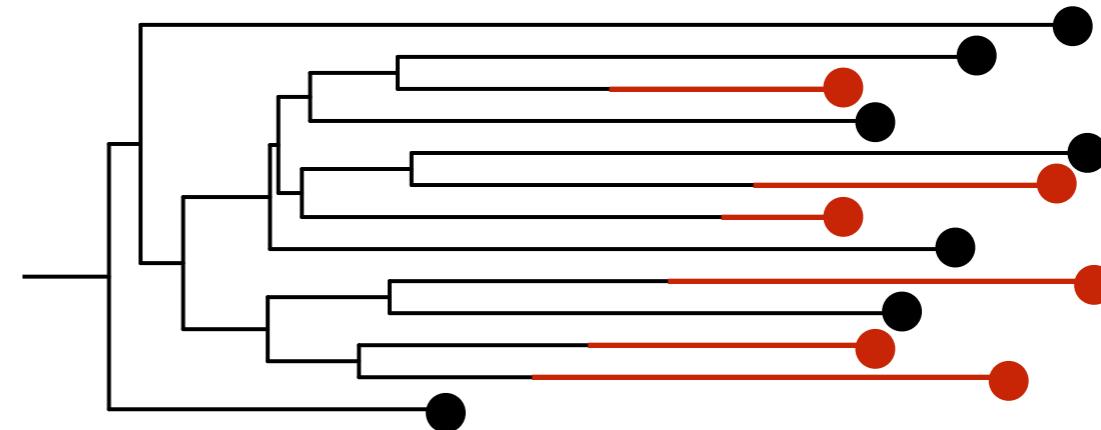
Types of drug resistance

Transmitted drug resistance:



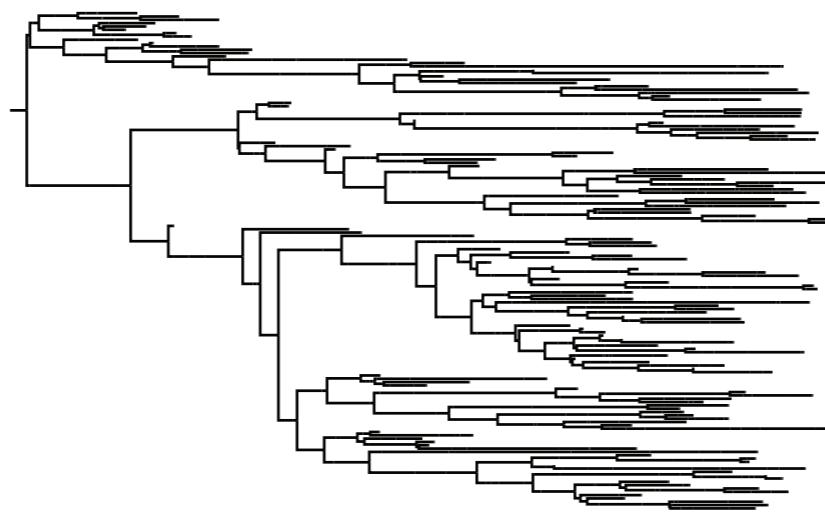
- drug resistant
- drug sensitive

Acquired drug resistance:



TB simulation study

Simulation



Analysis

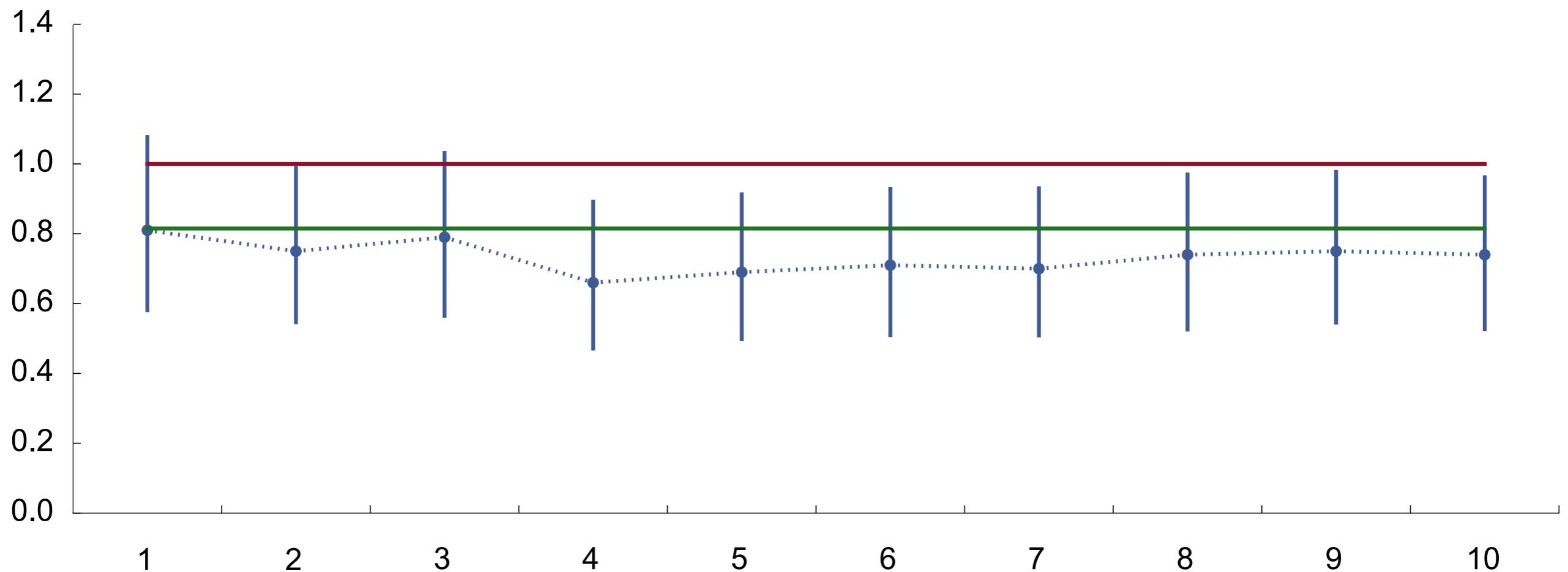
$$\frac{\lambda_{MDR}}{\lambda_{sensitive}}$$

BDMM

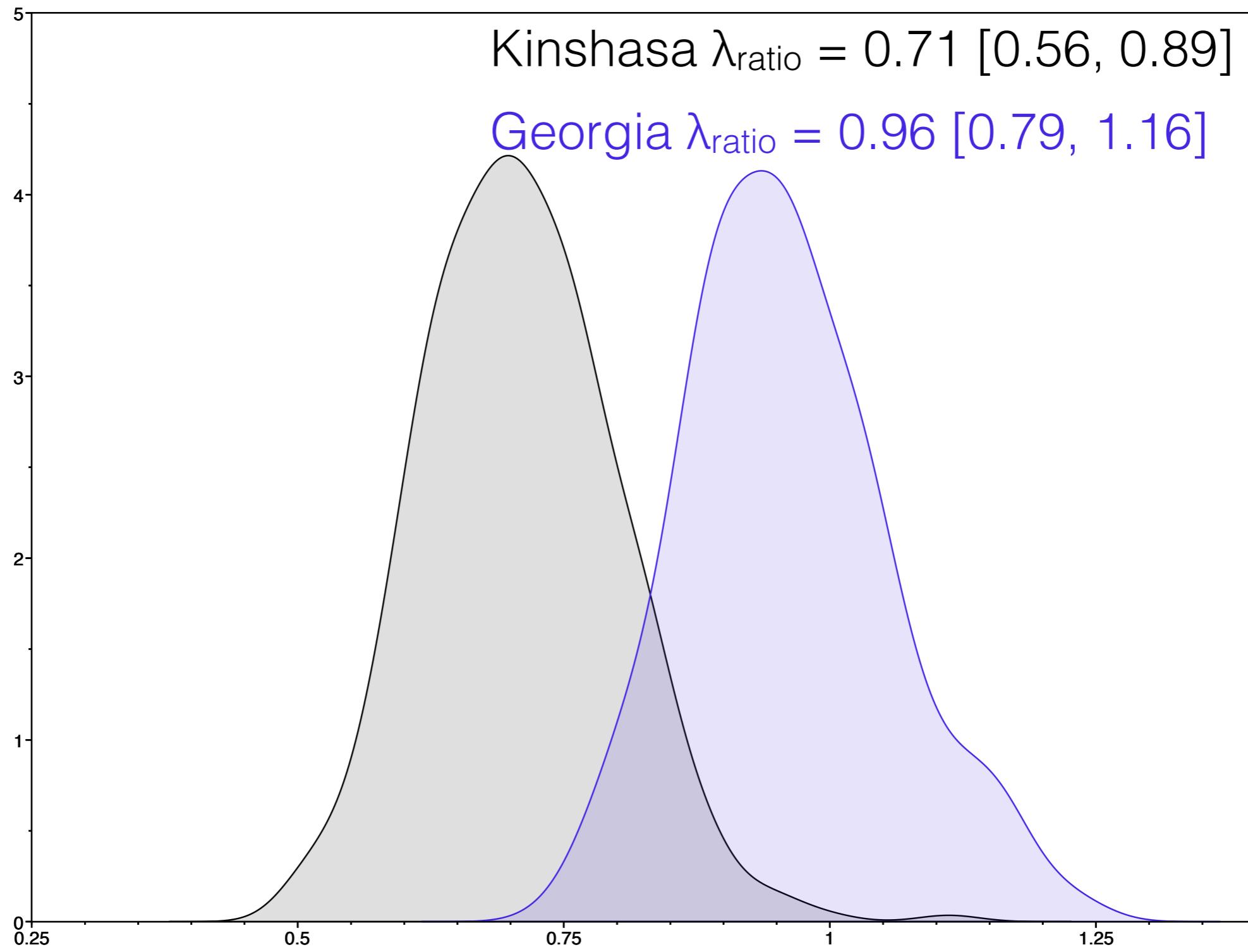
- No immunity;
- Long treatment;
- Long non-infectious period;
- Possible relapse.



TB simulation results



TB analysis results



Other applications

- HIV in Latvia;
Shows: IDU seem to be driving the epidemic;
- Ebola in Sierra Leone;
Shows: Ineffective control efforts before June 2014;
- Influenza;
Shows: Tropics source the epidemic;
- ...

Thanks for listening & have fun
w/ the tutorial!

