Getting ready for the next epidemic: example of the Likati Ebola outbreak, DRC 2017

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26th February 2018

Imperial College London
MRC Centre for Outbreak Analysis and Modelling

Lessons learnt from the Ebola response

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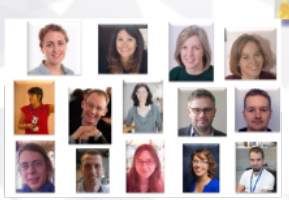

Imperial College Ebola team

Lessons learnt from the Ebola response

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Lessons learnt from the Ebola response

Most statistical/modelling tools for situation awareness missing.

Challenges of a timely response

Affected countries

data collection

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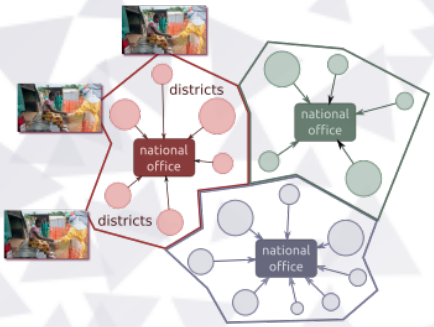
Affected countries

time (block = day)

data collection

Challenges of a timely response



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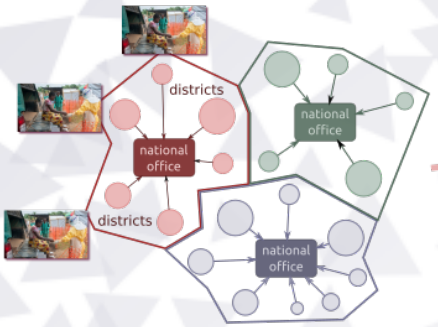

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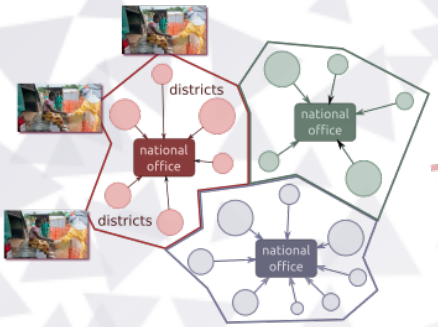
Challenges of a timely response



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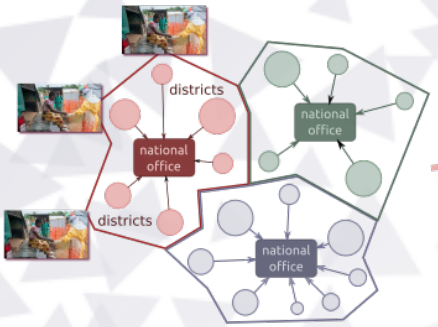

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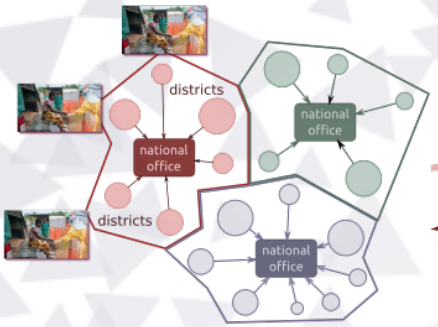

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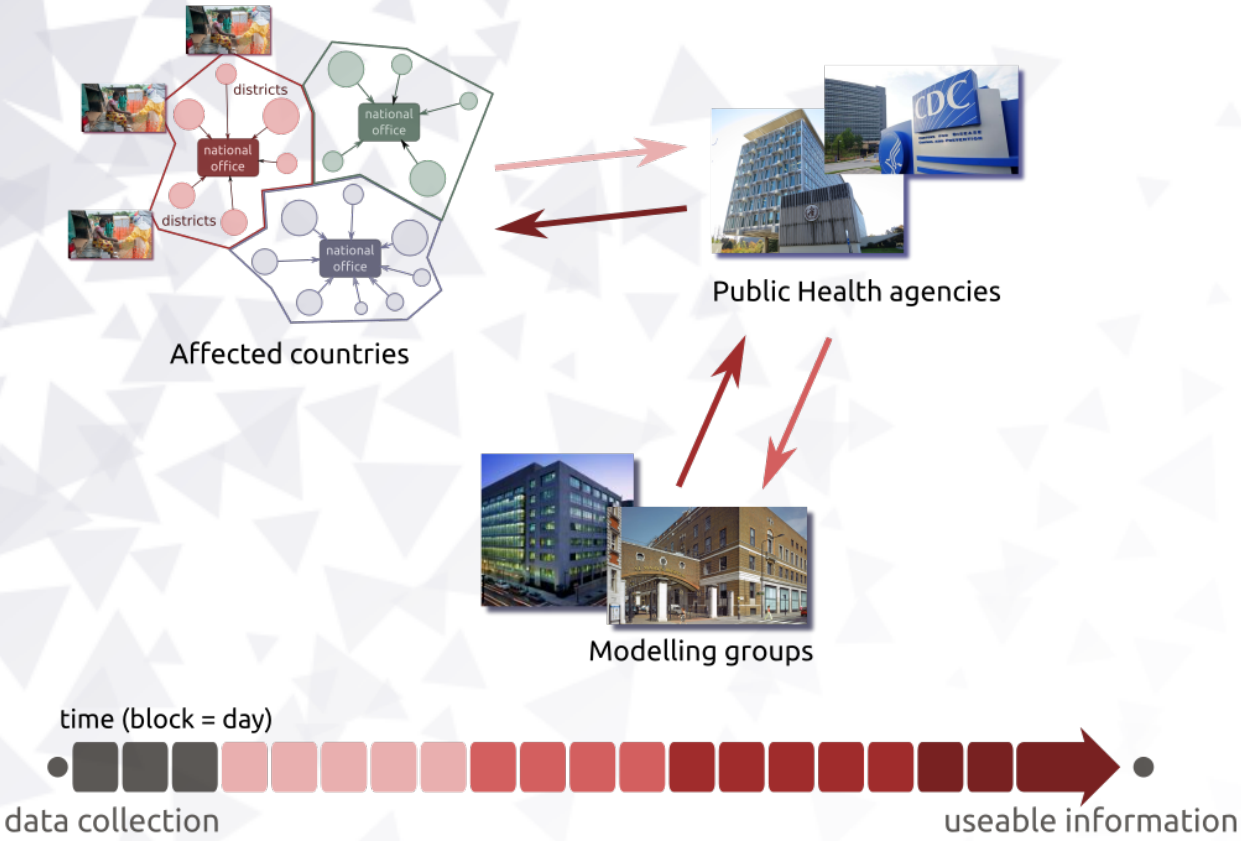
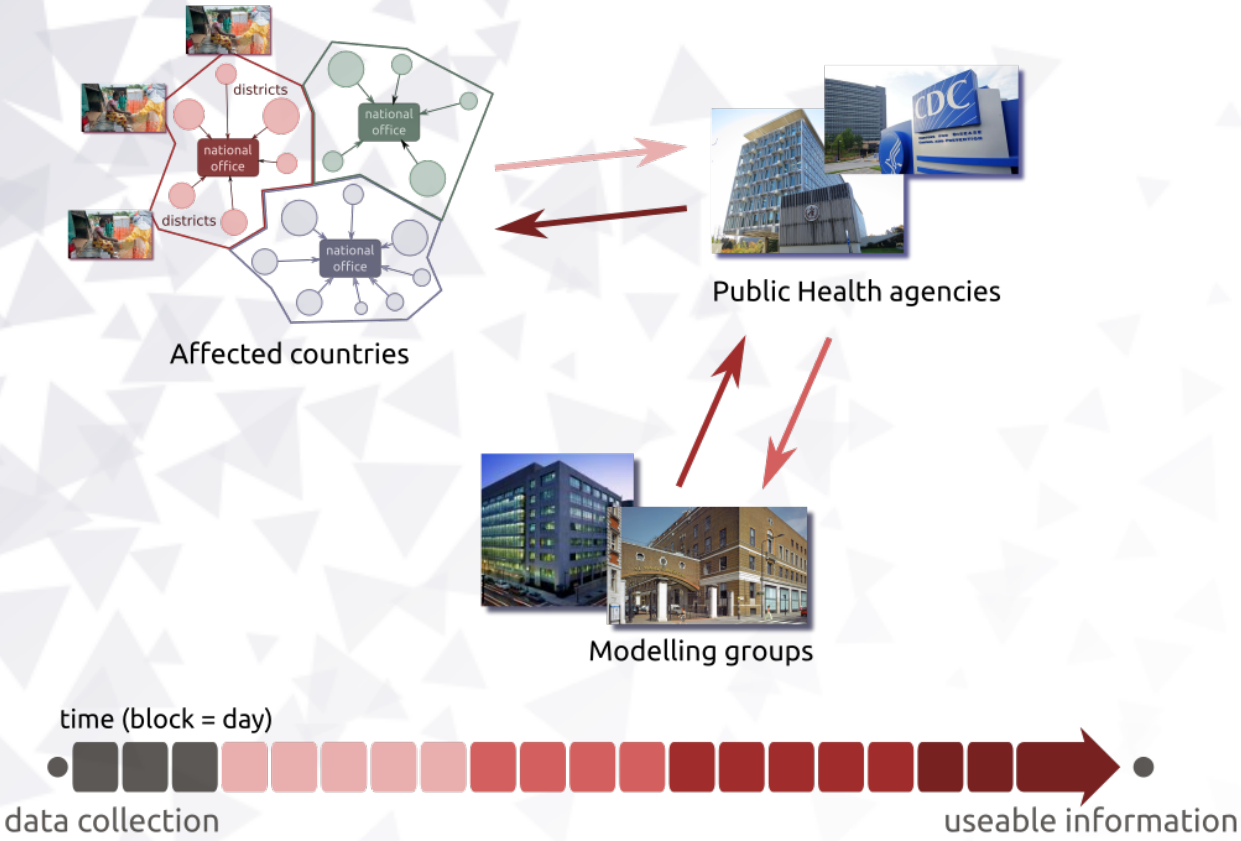


- embed methodologists in outbreak response teams

Challenges of a timely response



- embed methodologists in outbreak response teams
- efficient tools can shorten delays

Who do we need to develop these tools?

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Public Health

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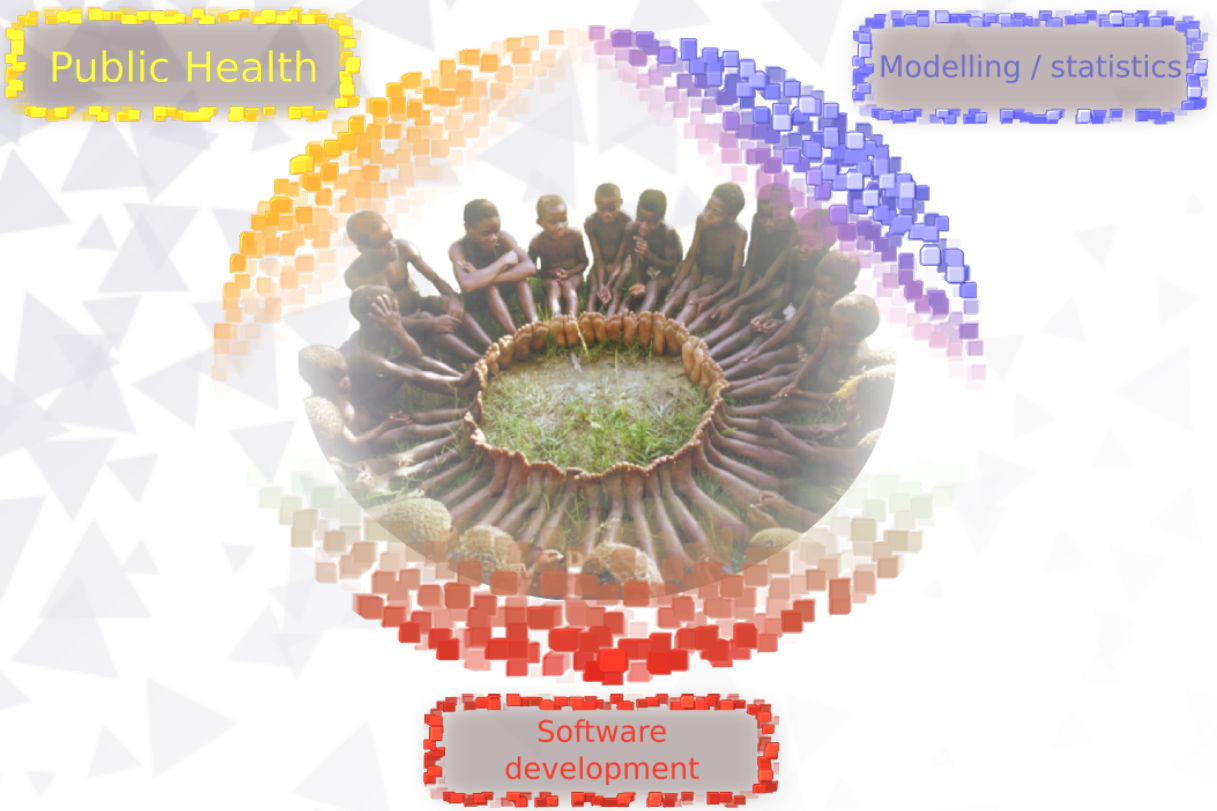

From a hack to a pack

Hackout 3, summer 2016, Berkeley

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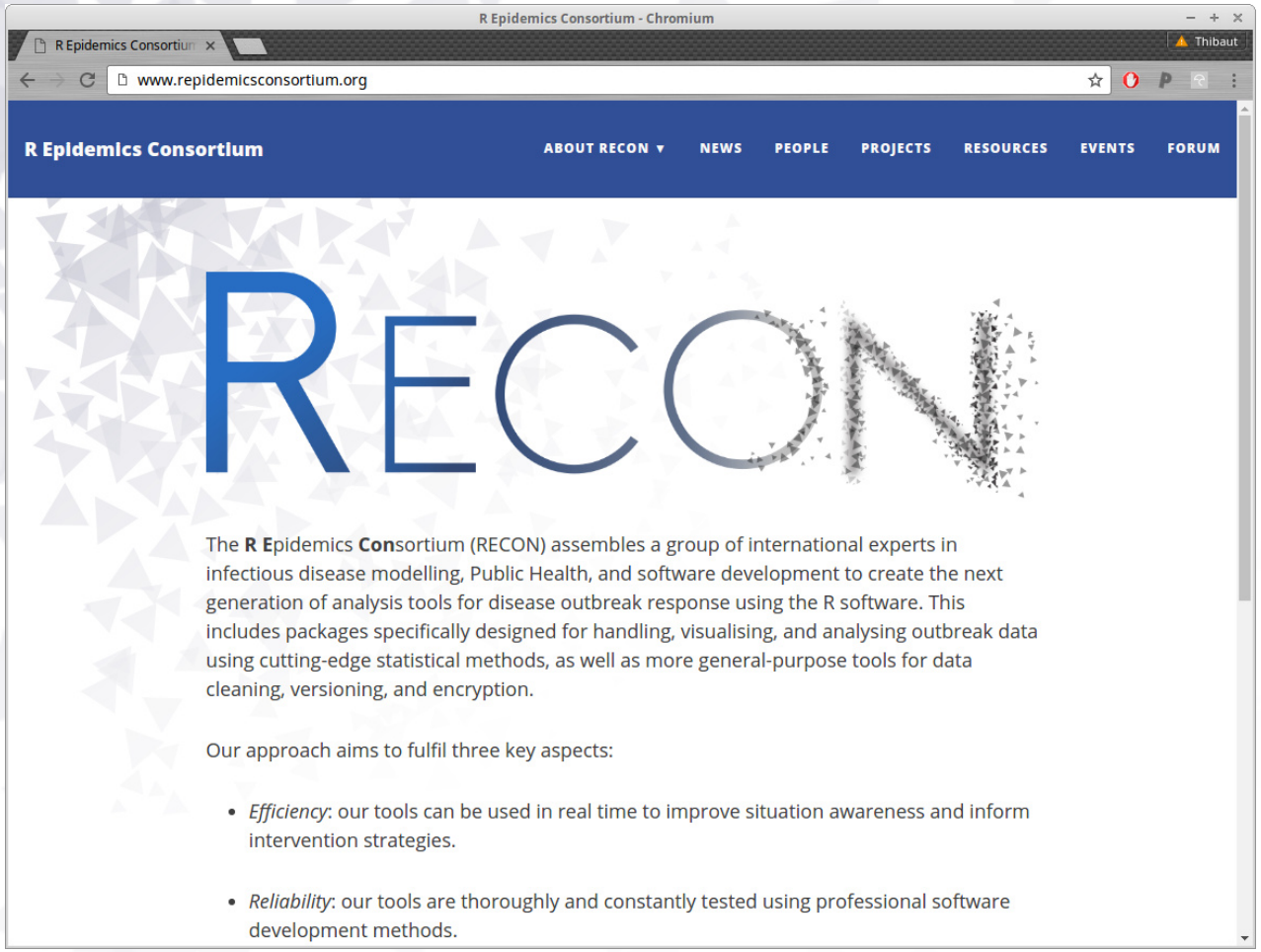
RECON

[The R Epidemics Consortium]

From a hack to a pack

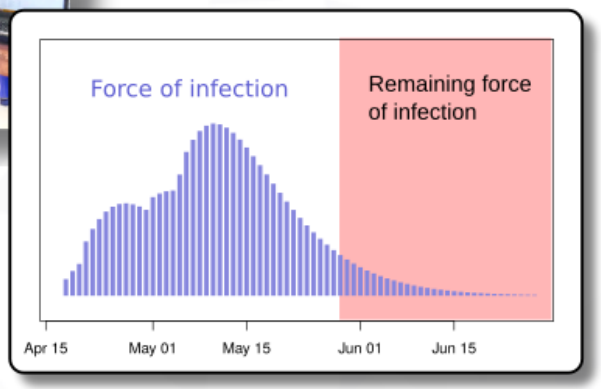
RECON: the R Epidemics Consortium

A taskforce to build a new generation of outbreak response tools in .



www.repidemicsconsortium.org

Ebola outbreak, Likati (DRC) 2017



- EVD outbreak May 2017
- contact data visualisation tools used in contact tracing
- simple model informed response (scaling)
- end: 2nd July 2017

Context / questions

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- remote, rural location (jungle), difficult travel conditions
- dangerous area (poor WASH, diseases, armed groups)
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- 4 confirmed cases, last onset 20 days ago
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- CFR reported to vary 0-100% across locations

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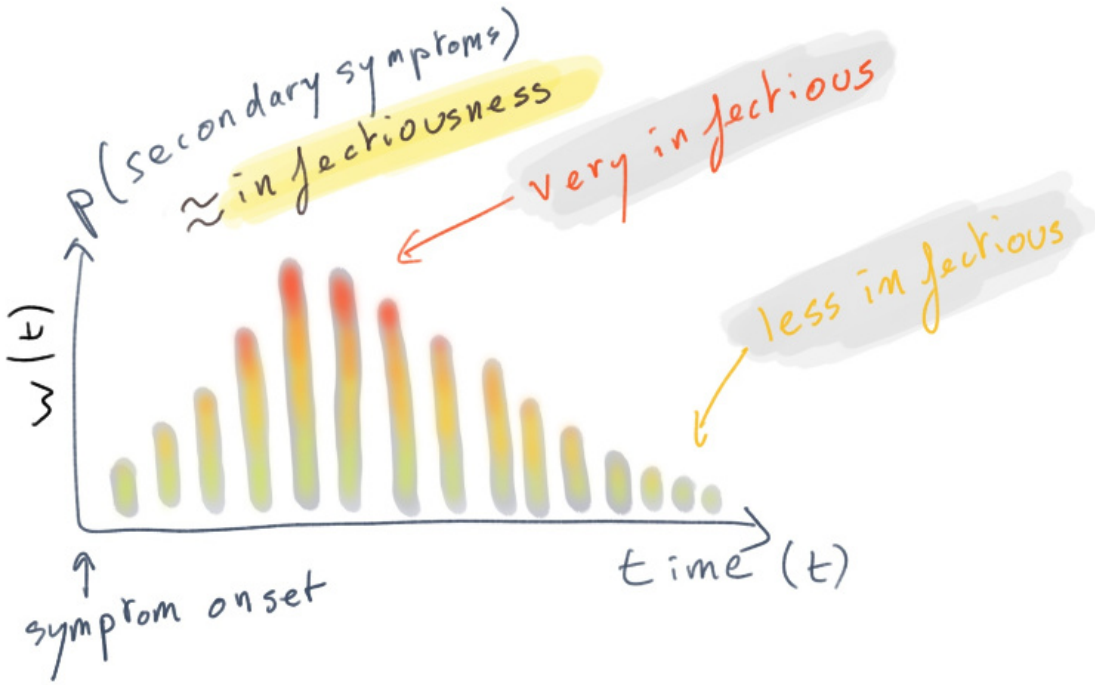
Key questions: Is it growing? Is it over?

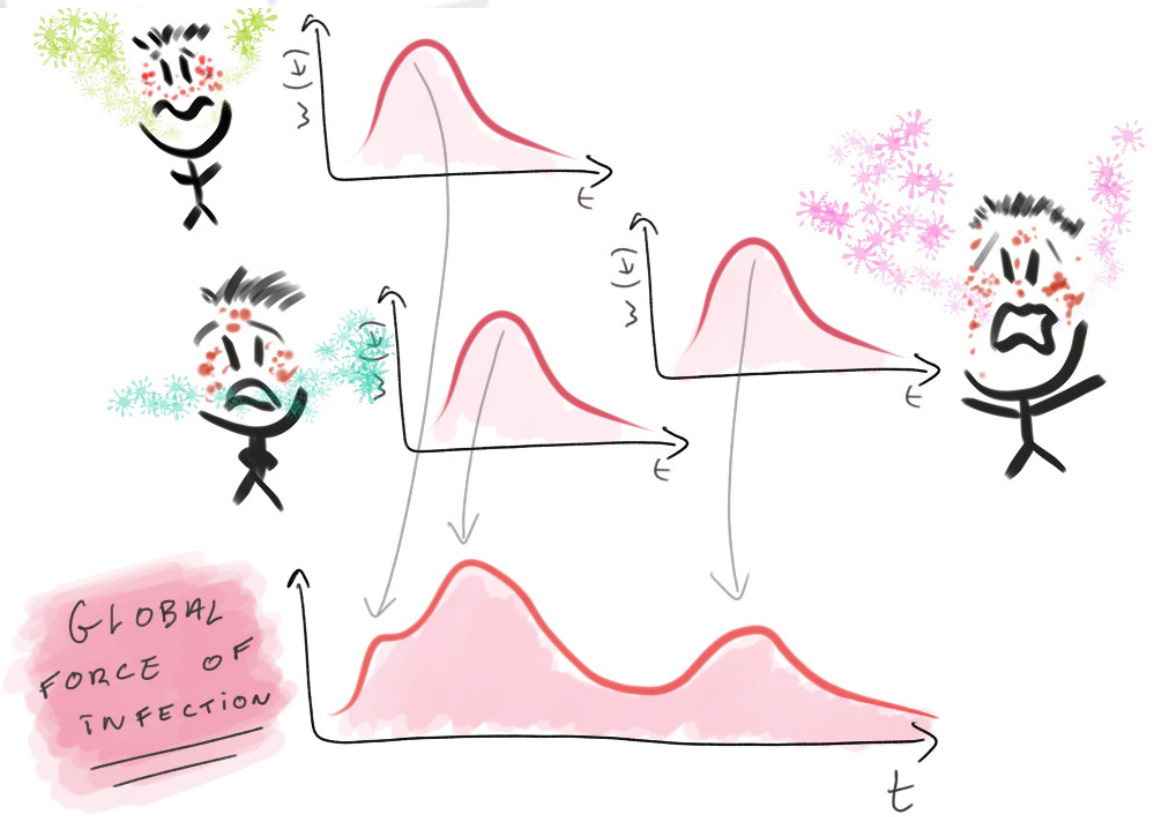
Individual infectiousness over time

Serial interval: delay between symptom onset in infector and infectees



Indicates when we expect new cases, if there are any.

A "simple" branching process model

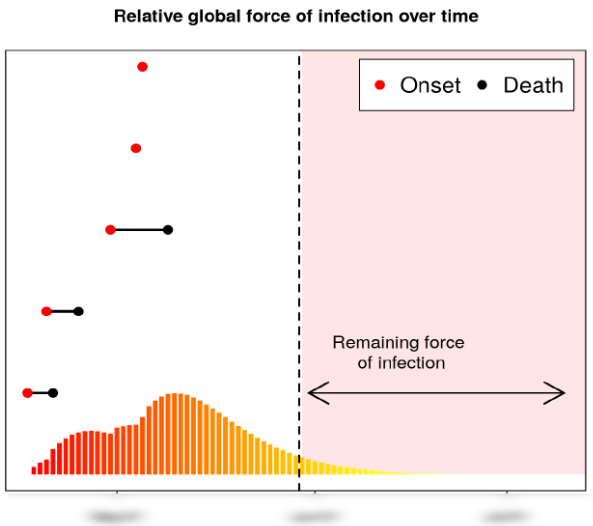


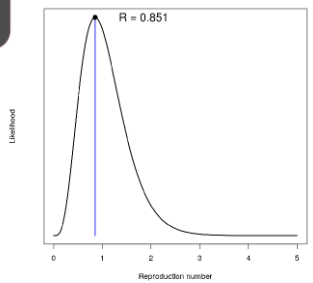
$$y_t \sim \mathcal{P}(\lambda_t) \quad ; \quad \lambda_t = R_0 \times \sum_i w(t - t_i)$$

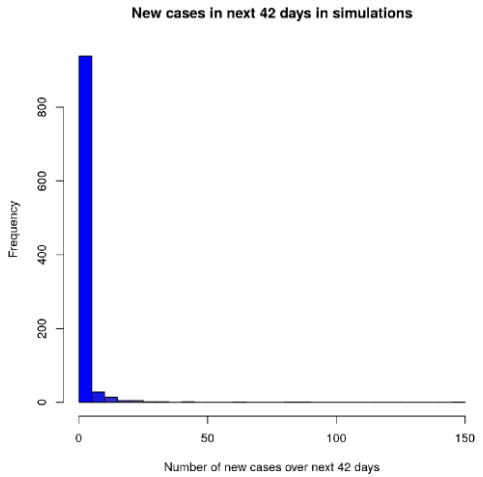
y_t: incidence at time t; $\mathcal{P}()$: Poisson distribution; λ_t: global force of infection; $w()$: serial interval distribution; t_i: date of symptom onset

Scaling the response in real-time

Estimating remaining force of infection, transmissibility (R), predicting new cases







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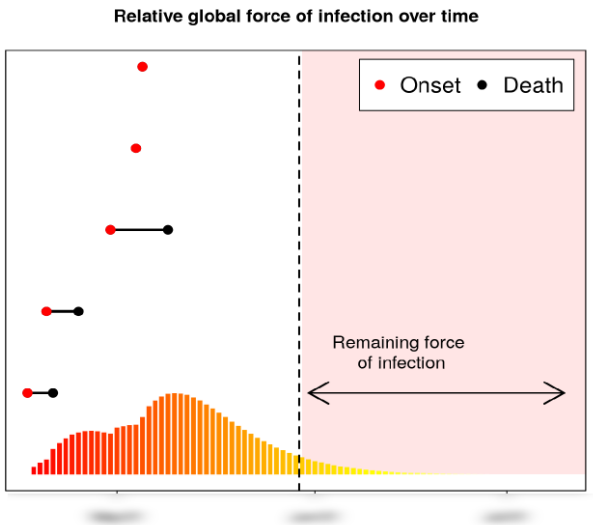

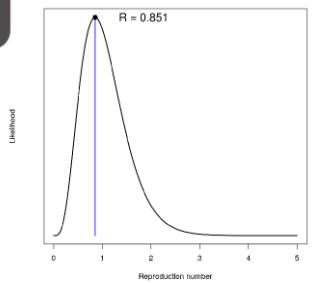

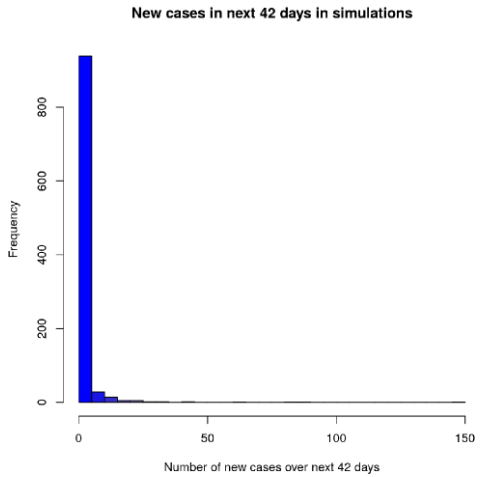

Despite uncertainty in R_0, new cases were unlikely.

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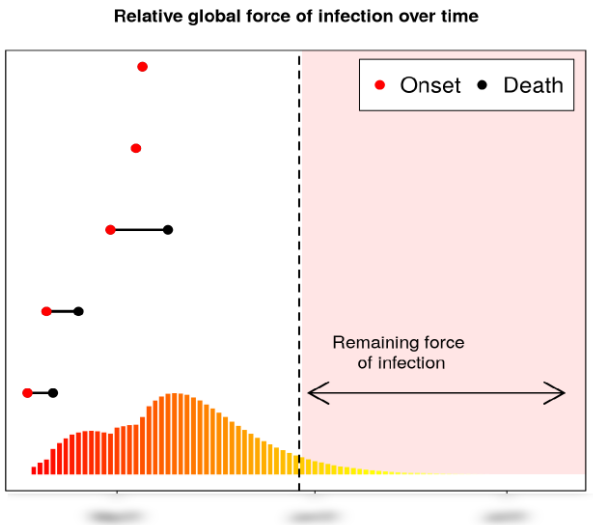

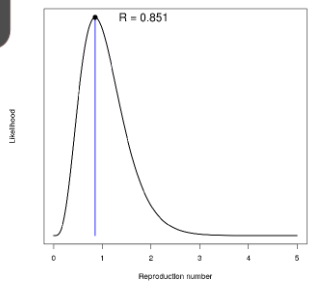

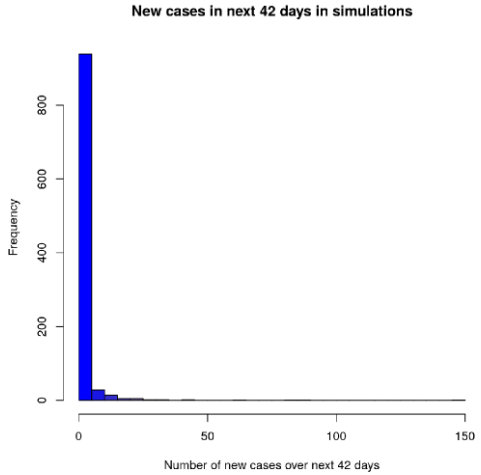

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Discouraged scaling up in resource-limited context.

Conclusion

- outbreak analytics can be useful to inform response in real-time
- analytic tools still in development
- increasingly relevant for analysts to be sent to the field
- different outbreaks will have different contexts
- importance of sharing knowledge within the community

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Links

- RECON: `http://www.repidemicsconsortium.org/`
- RECON learn: `https://reconlearn.netlify.com/`
- R Tips on Youtube: search "R tips" "RECONepi"