What research is needed to evaluate complementary vaccine strategies?

Ira Longini
University of Florida

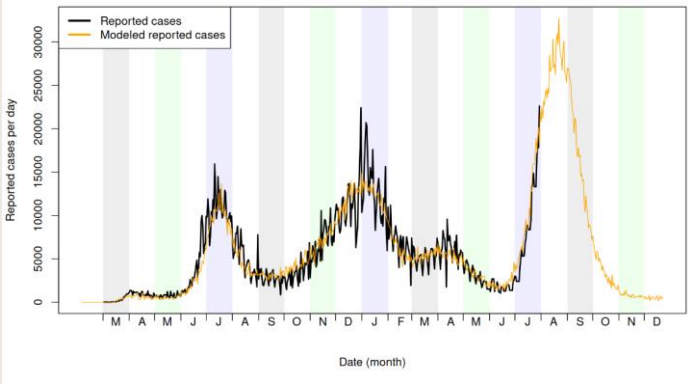
World Health Organization

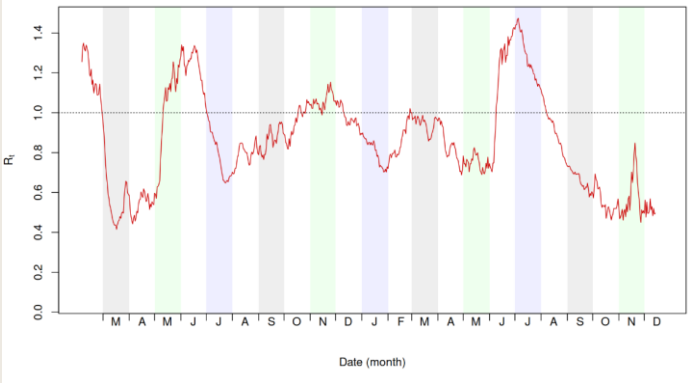
R&DBlueprint
Powering research
to prevent epidemics

Rationale for vaccination strategies

- It is critical to vaccinate in all the threatened countries on the planet to protect people at high risk and slow transmission to impede the rise of variants
- Vaccination strategies available
  - Mass vaccination with slow rollout
  - Ring vaccination integrated into surveillance and containment
  - Targeted vaccination
    - Expanded ring
    - Geographically targeted
  - Reactive vaccination could be first dose for some, and booster for others

Delta variant epidemic in Florida, US





R_t varies from 0.4 to 1.5, delta variant causes a max of 1.5

R&DBlueprint
Powering research to prevent epidemics

Potential impact of targeted vaccination strategies

- Although the R_0 for the some of variants is quite high, e.g., 5-10, the effective R is lower 1.2 – 1.5
  - Proportion of the population has natural immunity
  - Vaccinated people
  - Control measures put in place during outbreaks
  - This makes it possible to limit transmission with targeted vaccination strategies

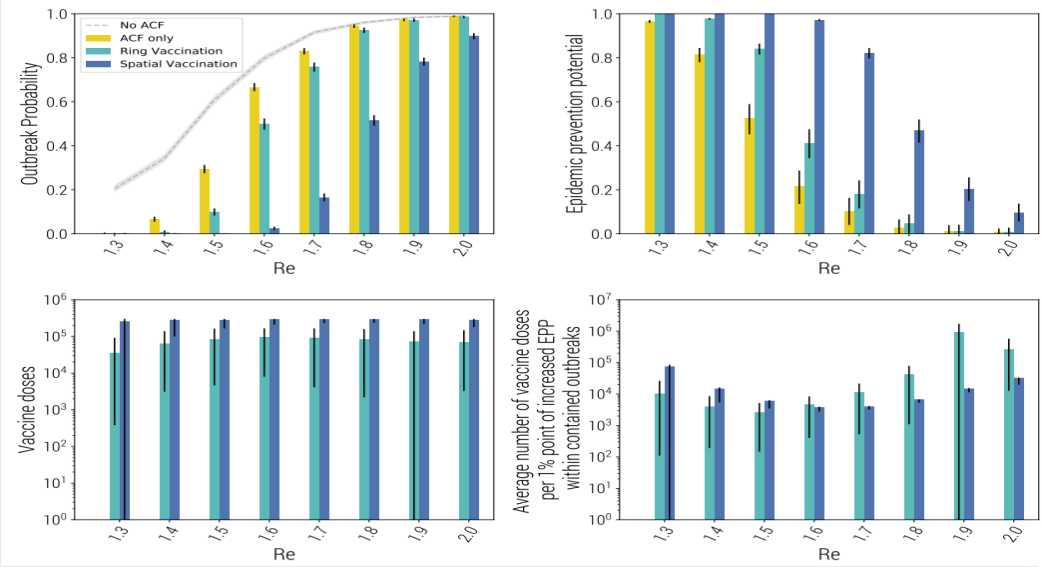
Targeted vaccination strategies

- Ring vaccination
  - Rapidly vaccinate the contacts and contacts of contacts of identified index cases
- Targeted vaccination
  - Expanded ring vaccination
    - Vaccinate same people as ring vaccination + everyone else who could have been in contact with the index case
  - Geographically targeted vaccination (spatial)
    - Concentrate vaccination in a limited geographic area where an outbreak is occurring or is predicted to occur

Simulated overall effectiveness for ring and geographically targeted vaccination*

ACF: Syndromic surveillance combined with test, tracing and isolation

3.2 to 7.2 times more vaccine needed when going from ring to spatial



Both ring vaccination and geographically targeted vaccination are highly effective for $R_e \leq 1.5$. Ring vaccination uses less vaccine

*Liu, et al. Approaches to contain outbreaks of new SARS-CoV-2 variants at the source (report)

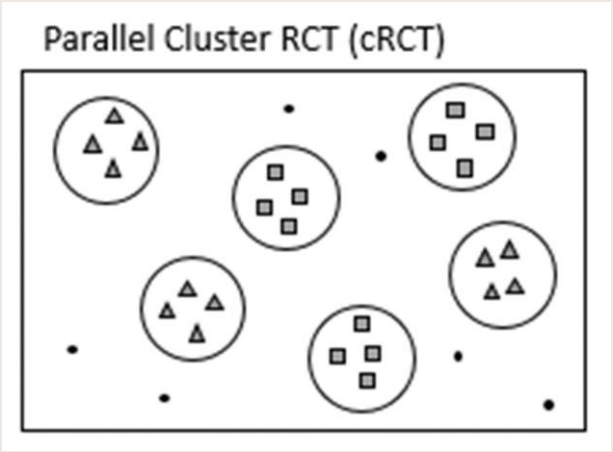
R&DBlueprint
Powering research to prevent epidemics

Evaluation of vaccination effectiveness: Cluster randomized designs

- With limited quantities of vaccine, randomize the timing of intervention clusters to immediate or delayed
  - Reasonable delay may be 3 weeks, or just until vaccine can be delivered
- Clusters can be rings, expanded rings or geographic

Randomization scheme

- Randomization across clusters over time



Estimate total and overall effectiveness, reduction of epidemic potential

What we can learn

- Prior example of ring vaccination evaluation for Ebola in the DRC: Ebola rVSV vaccine (Ervebo) is highly effective for containing outbreaks.
- How effective are the different vaccination strategies in preventing outbreaks, reducing morbidity, mortality, reducing transmission?
- How can we deliver limited quantities of Covid-19 vaccine to protect the vulnerable and stop transmission?

Thank you

R&DBlueprint
Powering research
to prevent epidemics