Serologic Data for Cholera Surveillance and Control: Where are we today?

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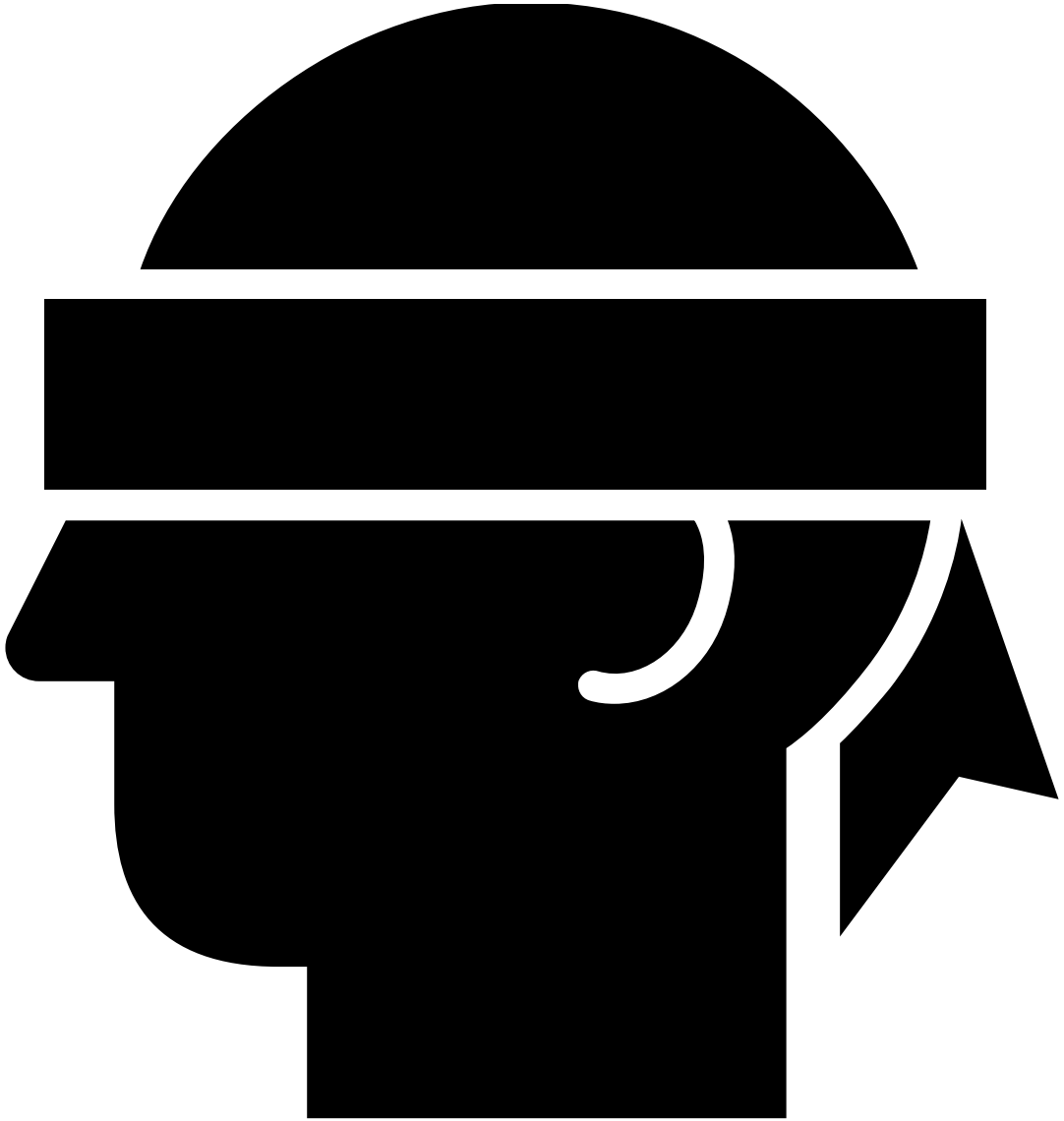
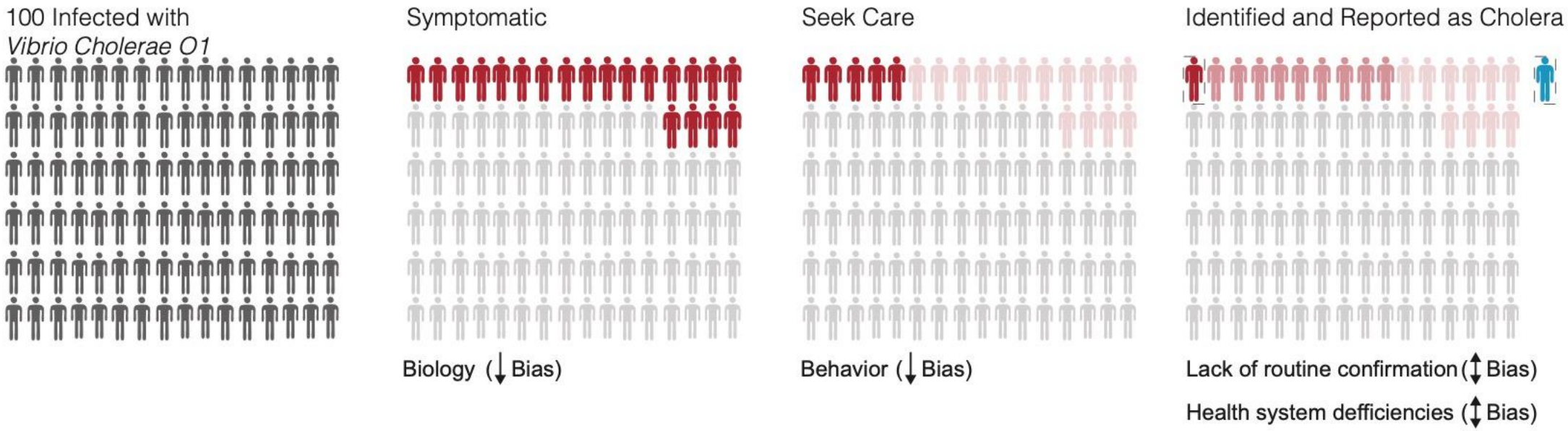
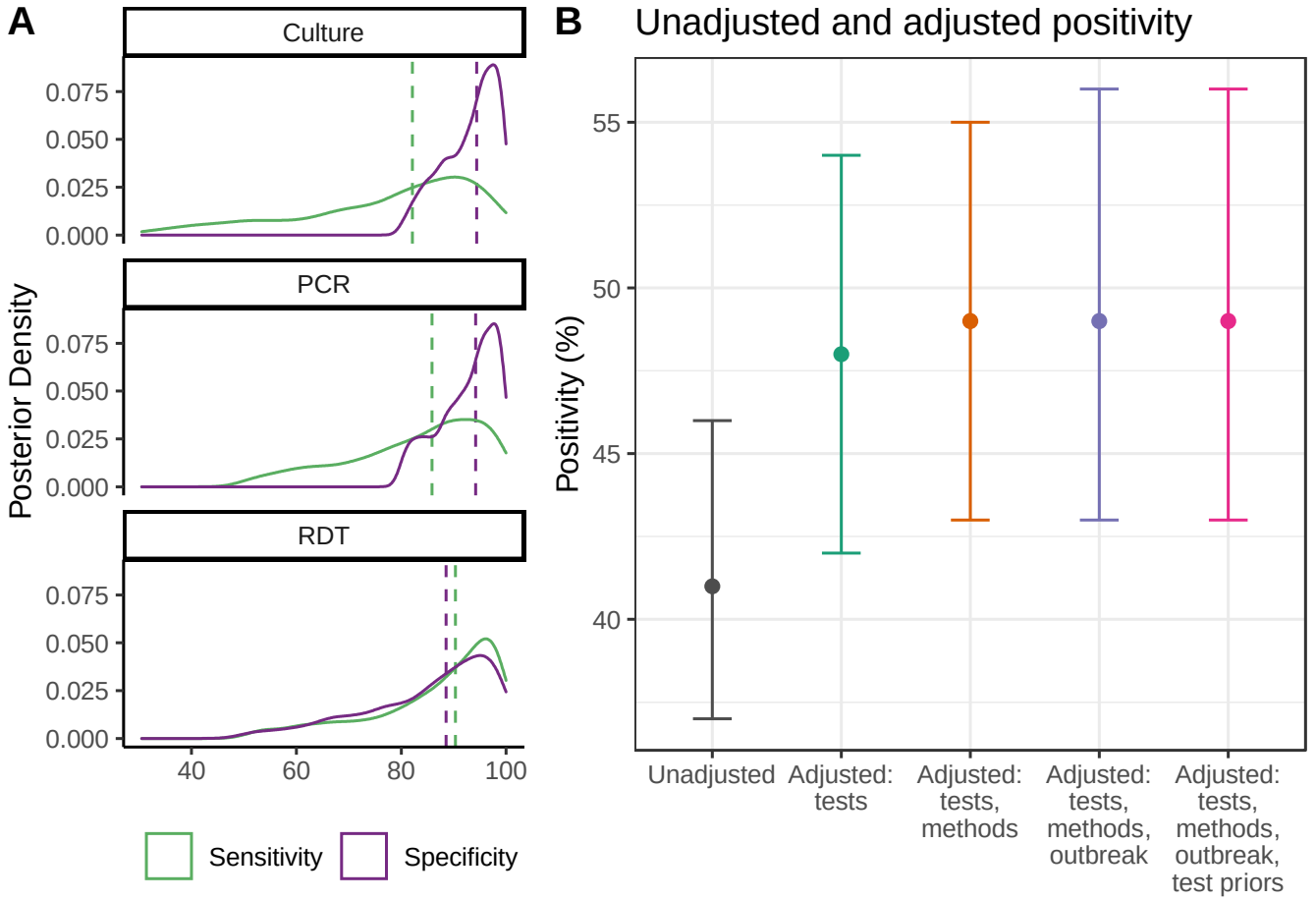
GTFCC Surveillance Working Group Meeting :: 4-May-2023



Challenges in counting cholera cases



Low specificity of suspected case defintion and imperfect diagnostic tools



Wiens et al, *in revisions*

Seroepidemiology for cholera

The Journal of Infectious Diseases

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Volume 121, Issue Supplement
May 1970

JOURNAL ARTICLE

Seroepidemiologic Studies during a Simultaneous Epidemic of Infection with El Tor Ogawa and Classical Inaba *Vibrio cholerae*

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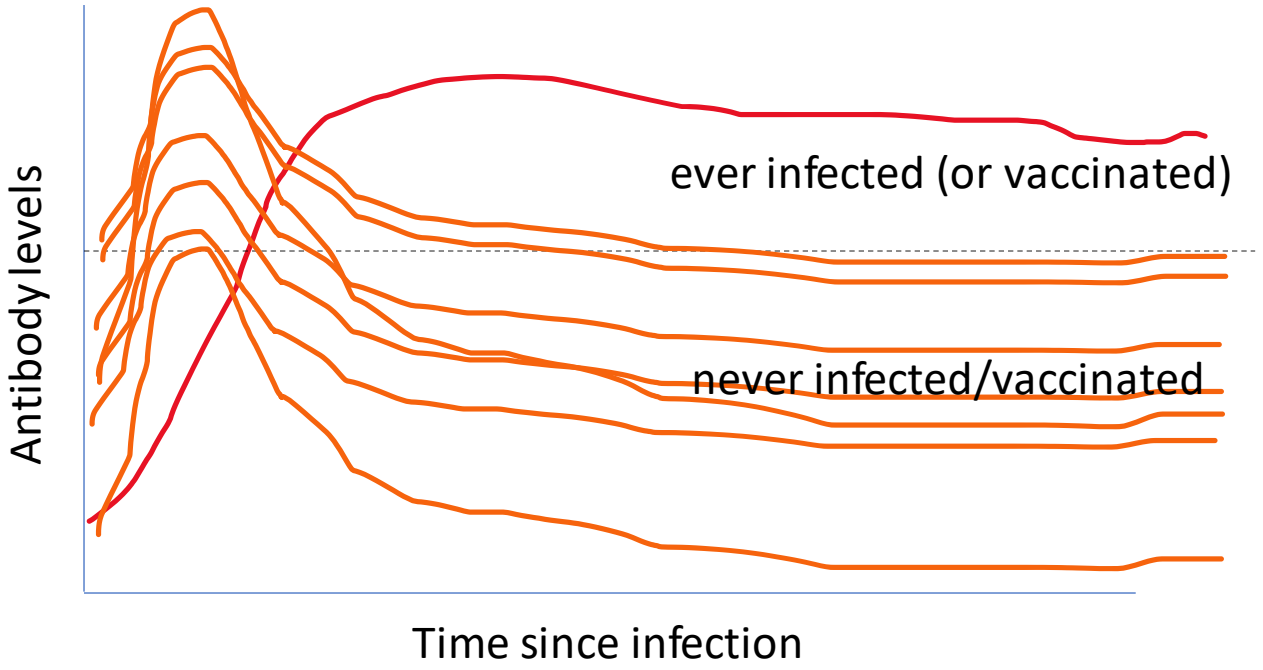
Kenneth J. Bart, Zahidul Huq, Moslemuddin Khan, Wiley H. Mosley, Md. Nuruzzaman, A. K. M. Golam Kibriya

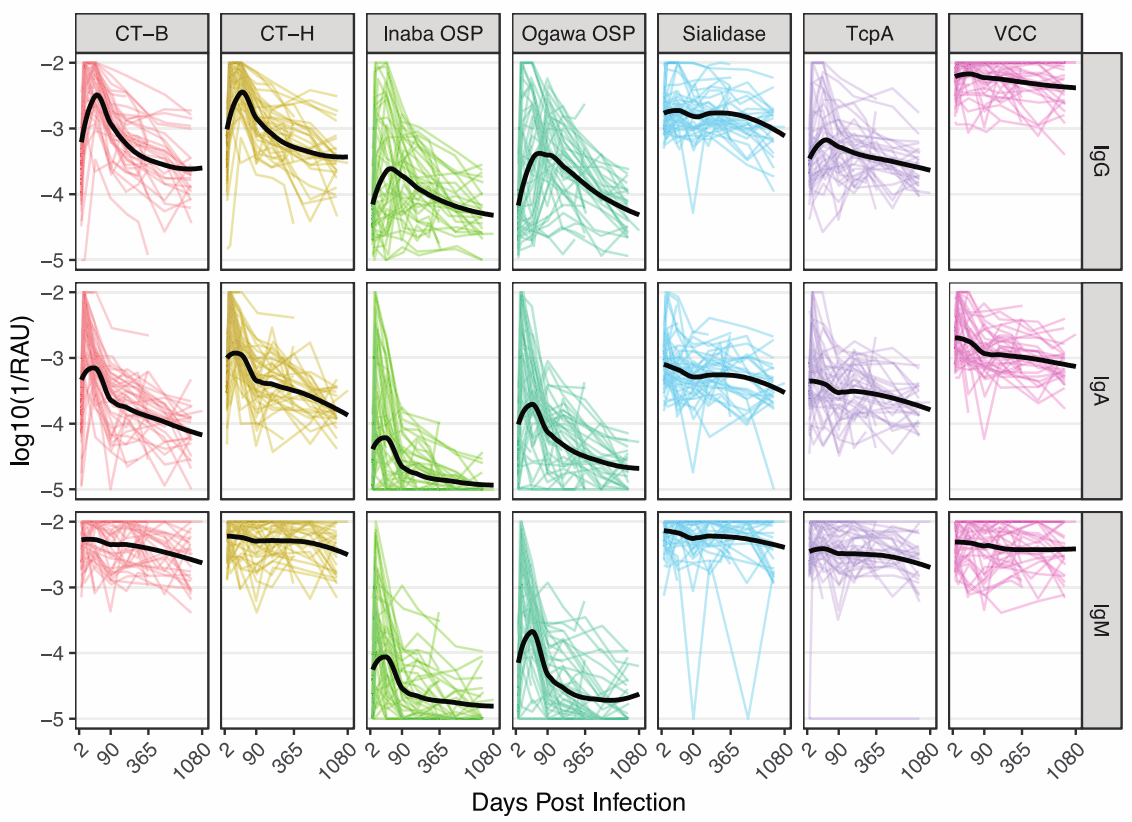
The Journal of Infectious Diseases, Volume 121, Issue Supplement, May 1970, Pages S17–S24, https://doi.org/10.1093/infdis/121.Supplement.S17
Published: 01 May 1970

What makes cholera serology different from many vaccine preventable diseases?

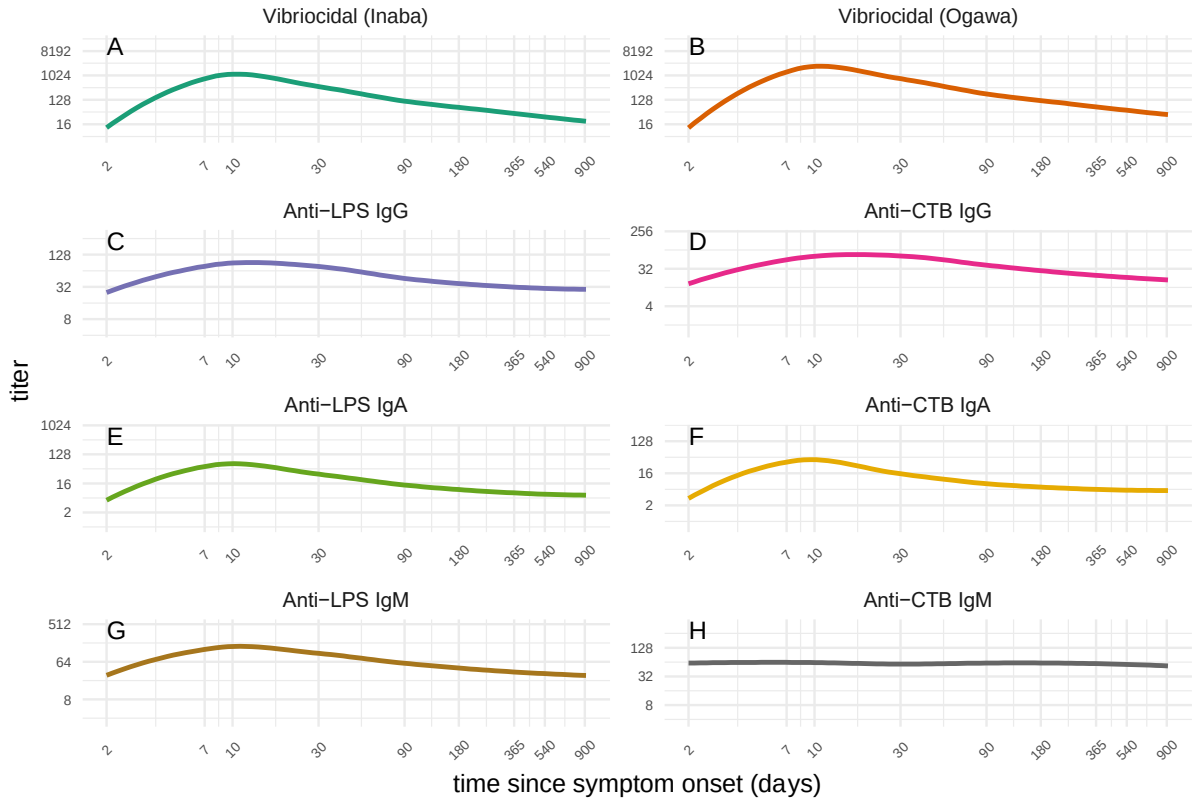


- Faster decay
- More variable baseline levels
- High variability in post-infection antibody trajectories
- One single antibody with a single threshold probably isn't good enough

Post-infection antibody dynamics

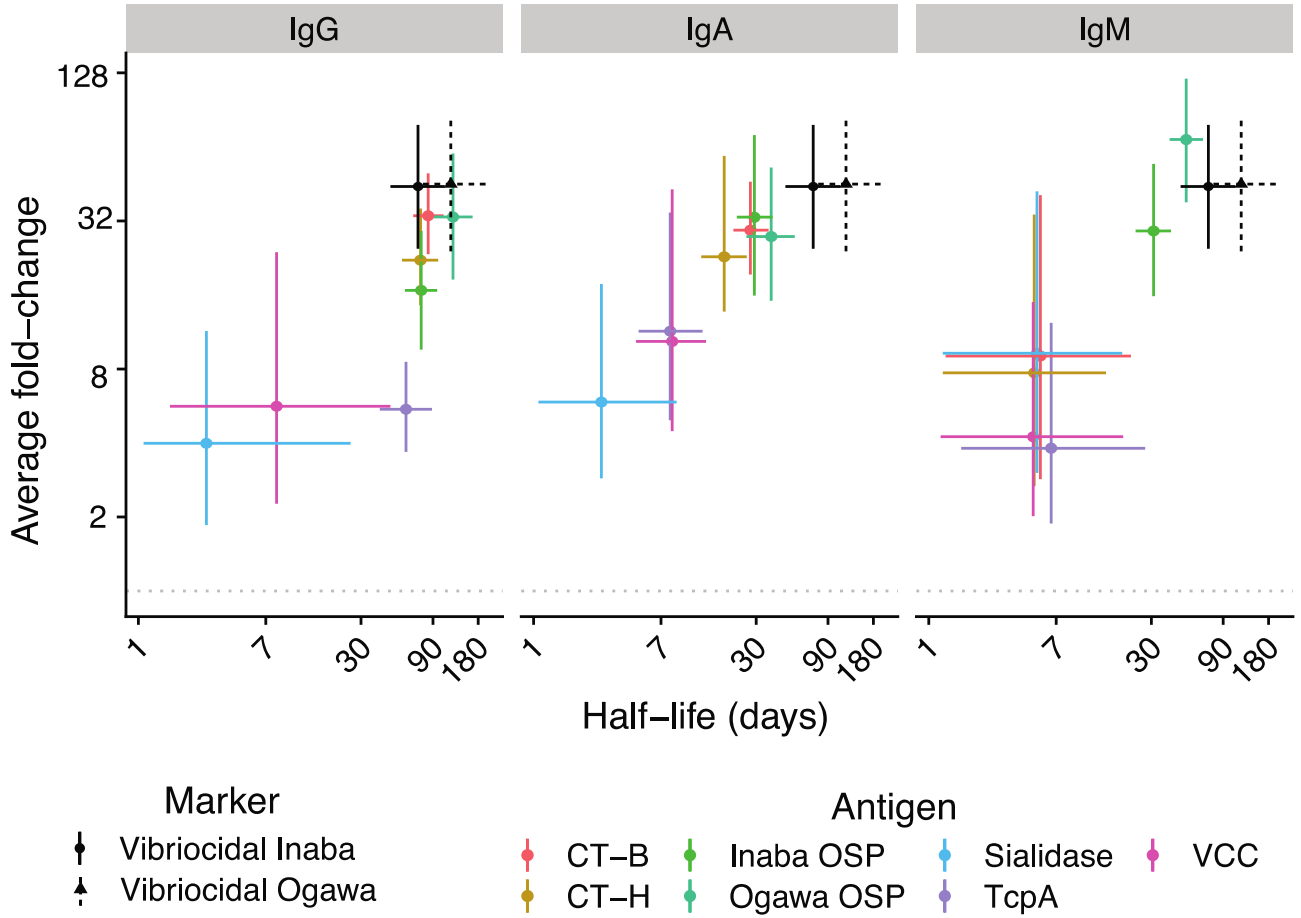


Jones et al, 2022, PMID 36286520



Azman et al, 2019, PMID 30787170

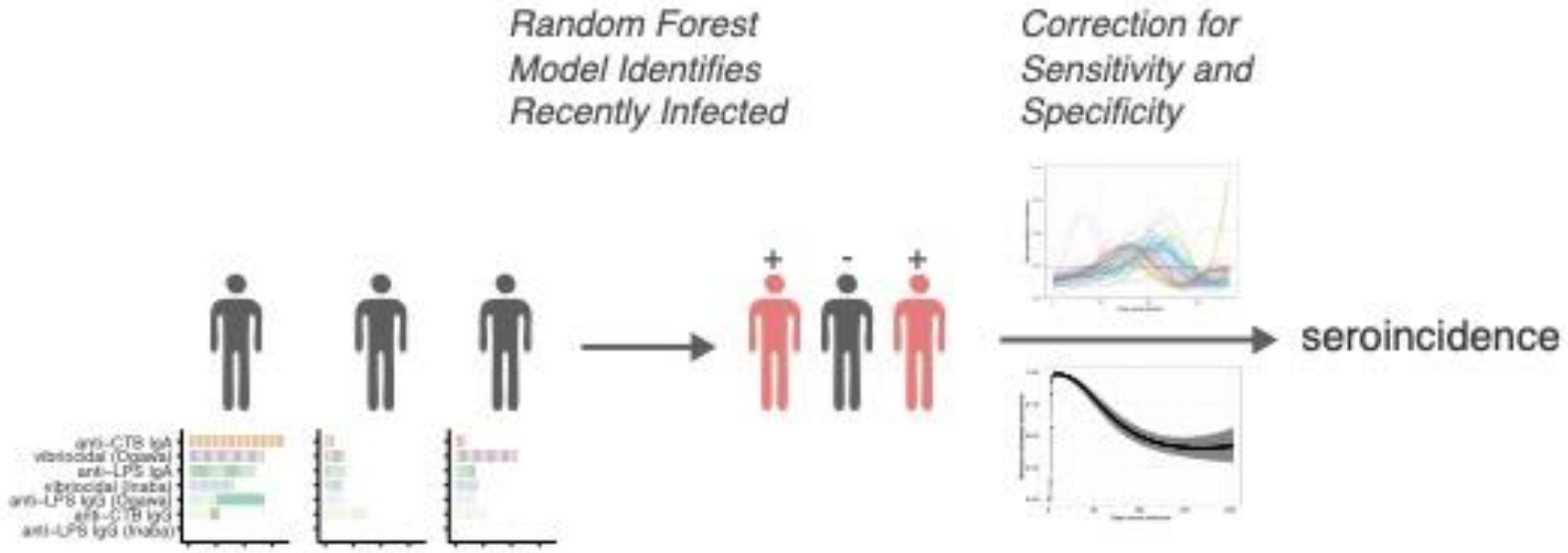
Differences in boost and decay of different antibodies helpful in estimating recent infections



Jones et al, 2022, PMID 36286520

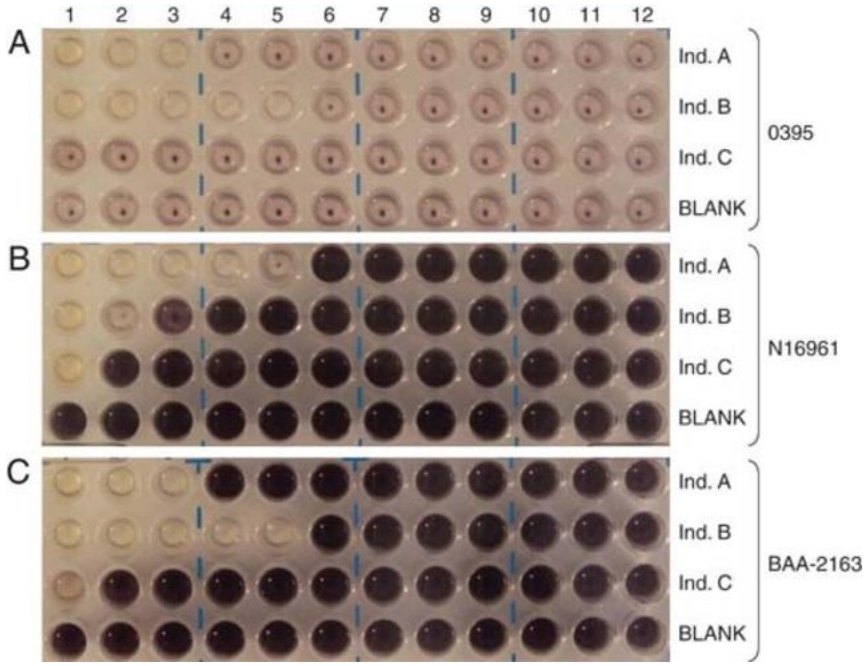
Seroincidence

- *Seroincidence*: incidence of immunologically meaningful exposures to *V. cholerae* O1
- What proportion of indivudals were infected/exposed in the last *X* (eg., 1,3,6) months?

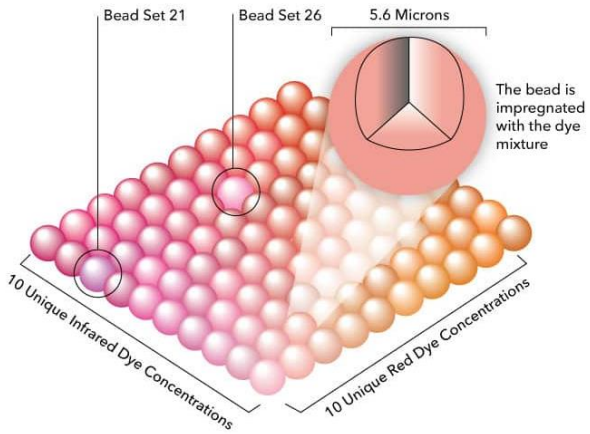


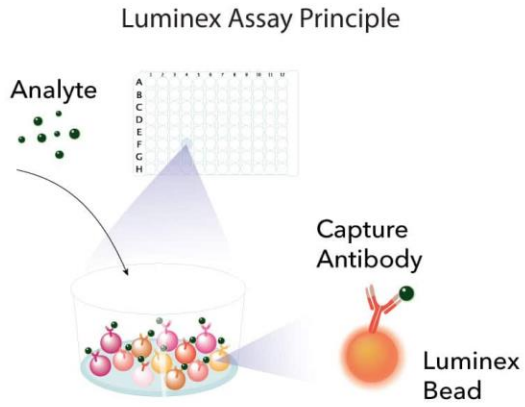
Laboratory Methods: A menu of options

Vibriocidal (functional) Assay



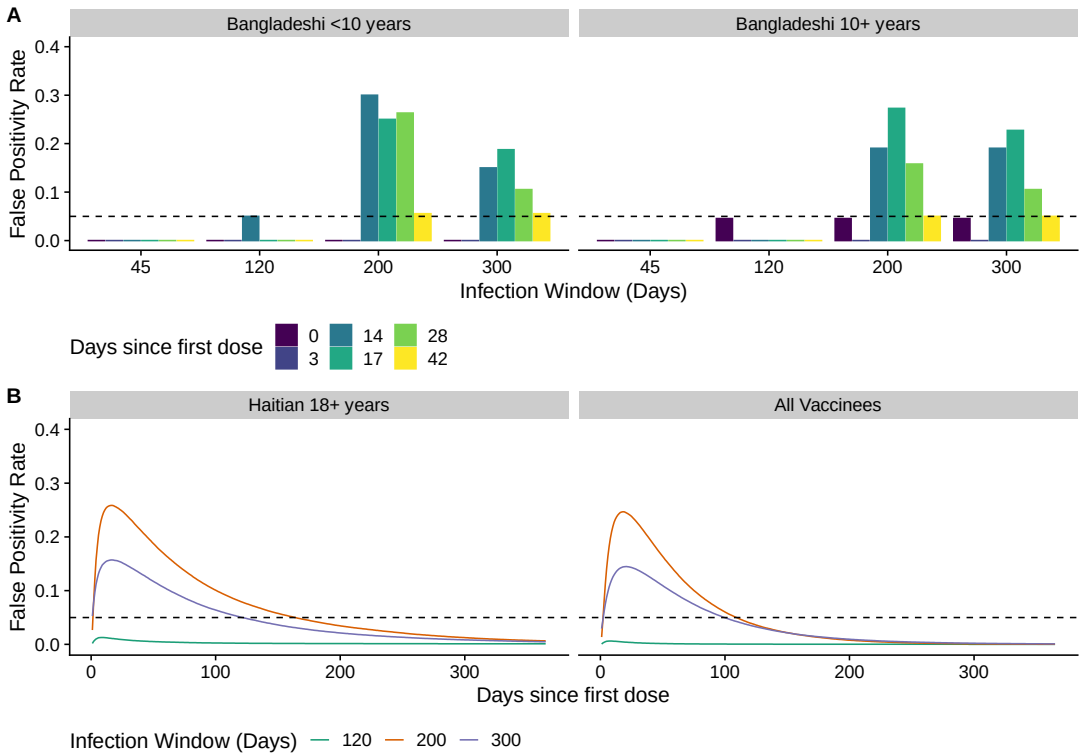
Luminex Assay (or ELISAs)





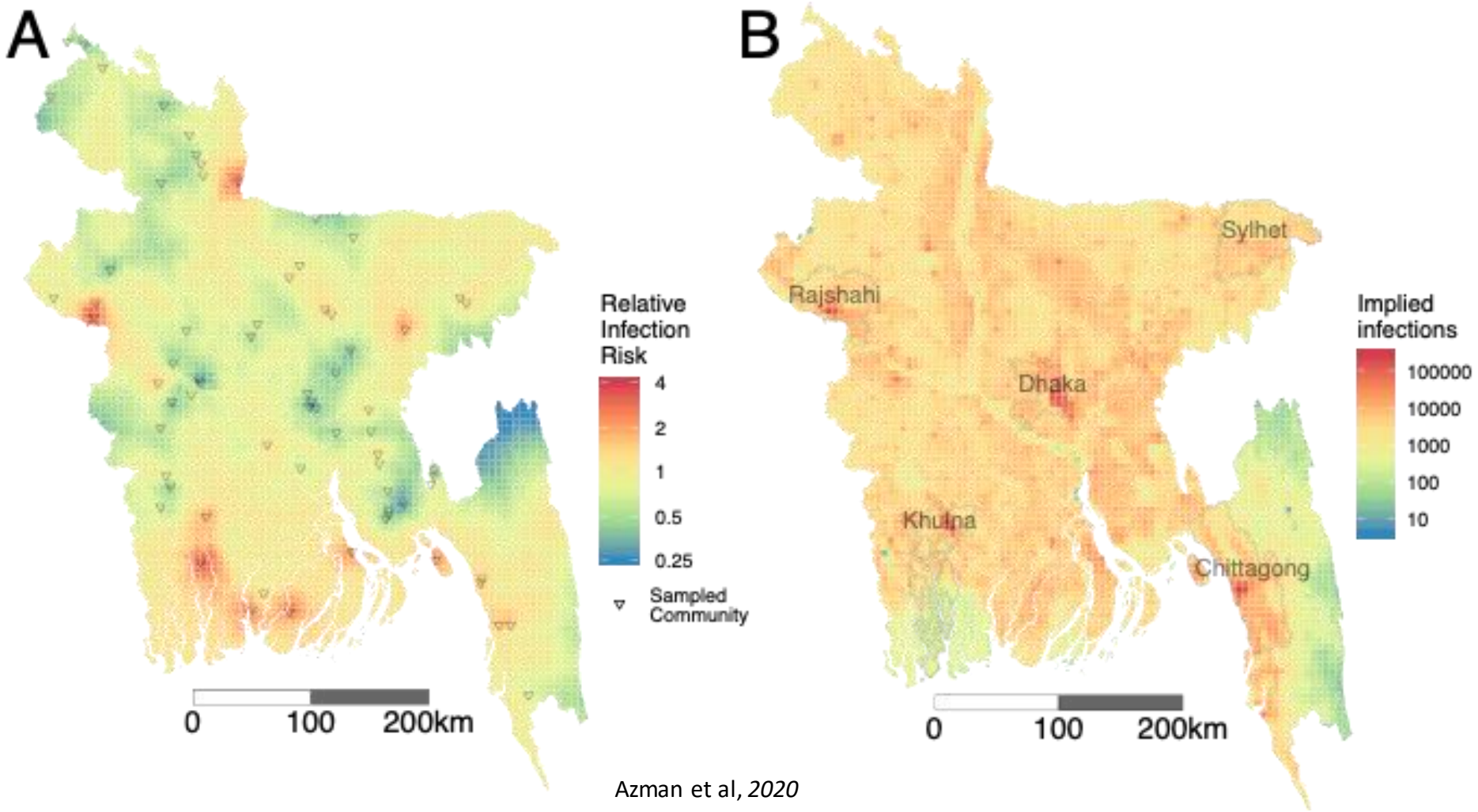
What happens in partially vaccinated populations?

- Differential antibody response between vaccinated and infected in the first few months
- Recent infection models can be adjusted if vaccination status is known
- After waiting ~3 months post-vaccination, models no longer misclassify vaccinees as recently infected



Jones et al, *in prep*

Serology to get a national overview

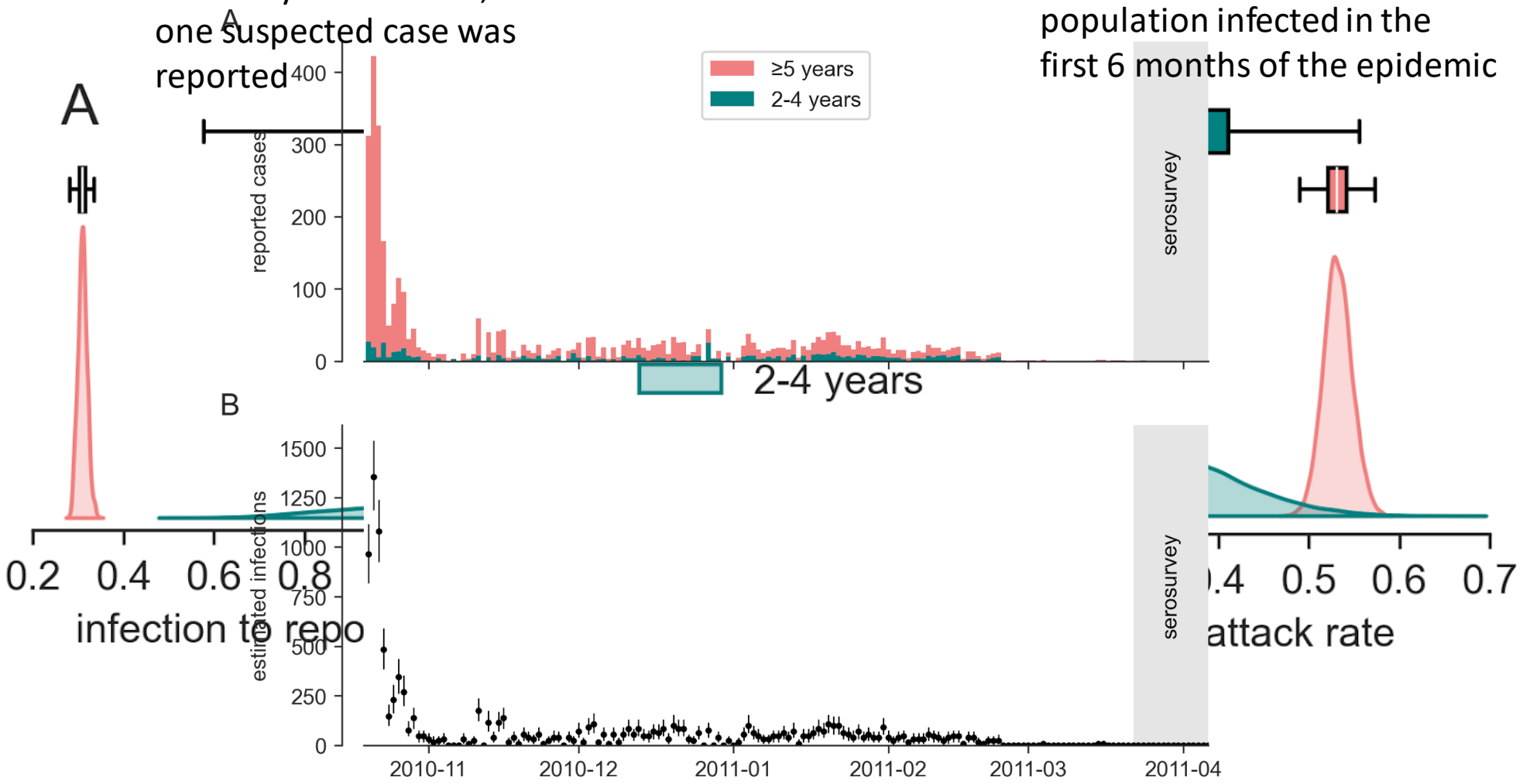


Azman et al, *2020*

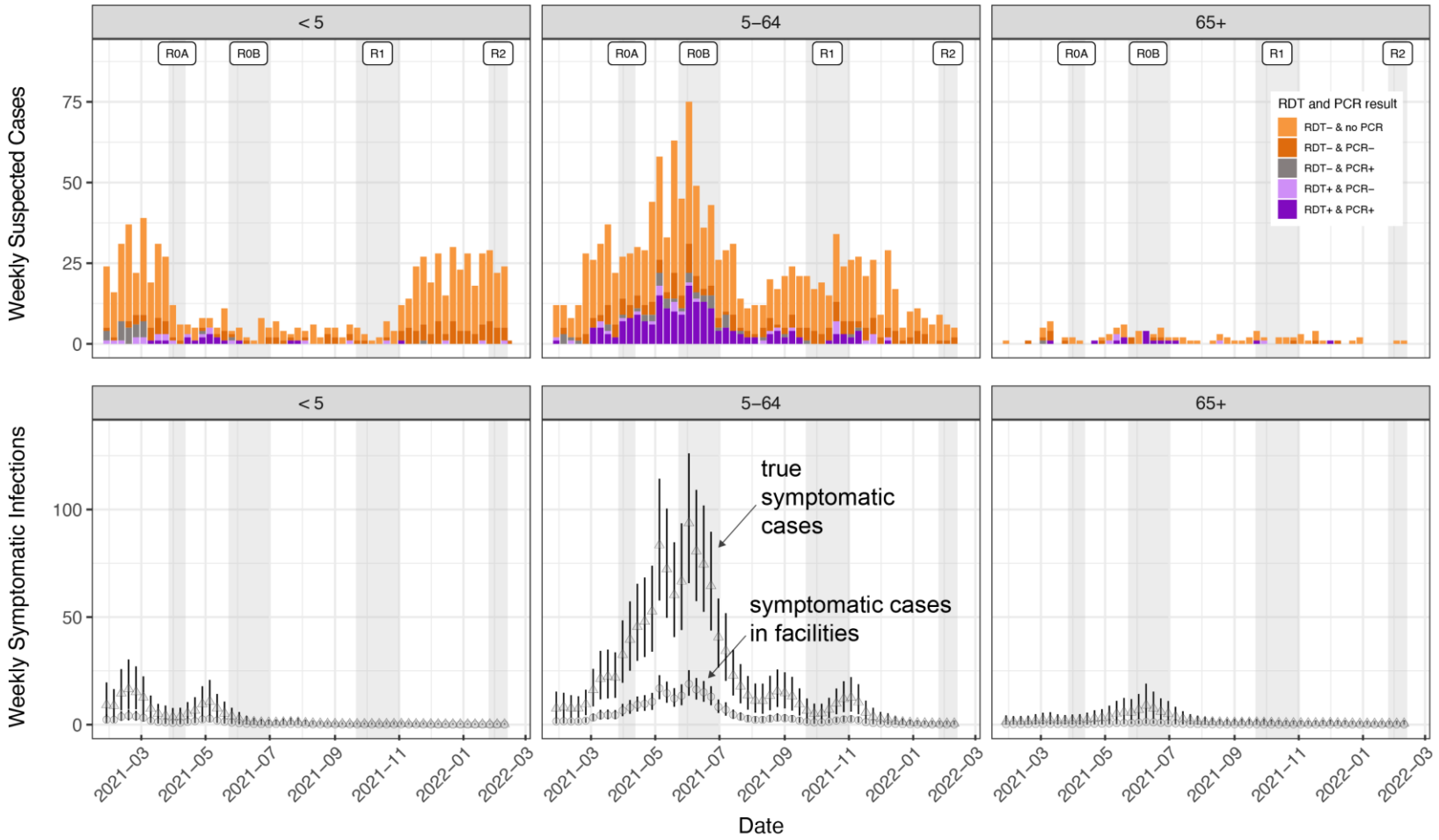
Understanding the infection to case ratio in Haiti

For every 3 infections, one suspected case was reported

>50% of the ≥5 year old population infected in the first 6 months of the epidemic



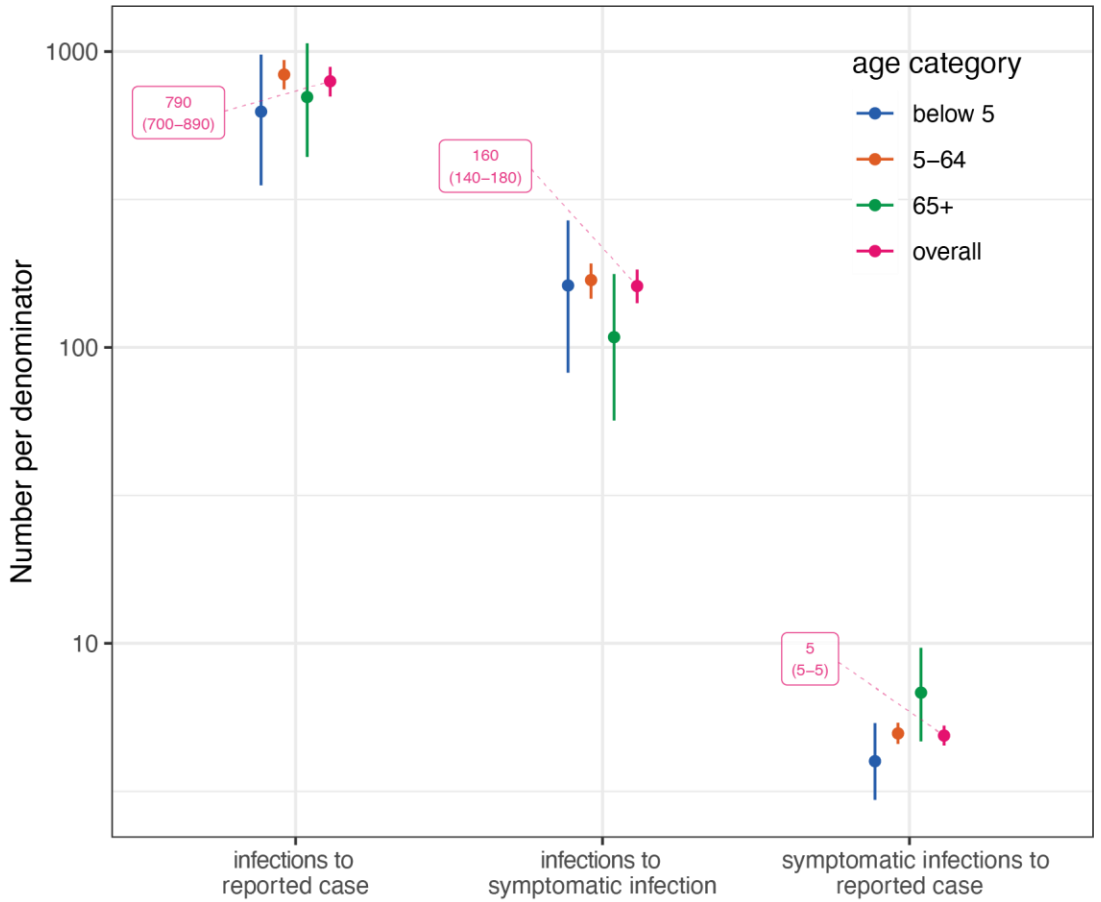
Insights from combined serologic and clincal surveillance in Bangladesh (*preliminary*)



Hegde, Khan et al, *in prep*

Insights from combined serologic and clincal surveillance in Bangladesh

- ~800 infections for every medically attended true cholera case
- ~160 infections per symptomatic infection
- ~5 symptomatic infections per medically attended true case



Hegde, Khan et al, *in prep*

Where are we now?

- Laboratory methods available in multiple labs including the use of Luminex beads
- Analysis methods allow for estimation of seroincidence rates in the past 6 months (less reliable up to 1 year)
- Serosurveys in partially vaccinated populations feasible (with some care)
- On-going work to characterize seroincidence in several locations including Nepal, DRC, Bangladesh, India, Cameroon

Looking forward

- Further standardize analysis tools
  - Luminex data processing
  - Availability of standard reagents (e.g., beads)
  - Seroincidence estimation
- What does seroincidence mean, especially in highly endemic settings?
  - Exposure vs infection?
- How do we translate this to immunity?
  - Does this vary by setting?
- Opportunity to collect large amounts of serologic data with new multi-pathogen serosurveillance platforms!

Can we capitalize on other efforts?