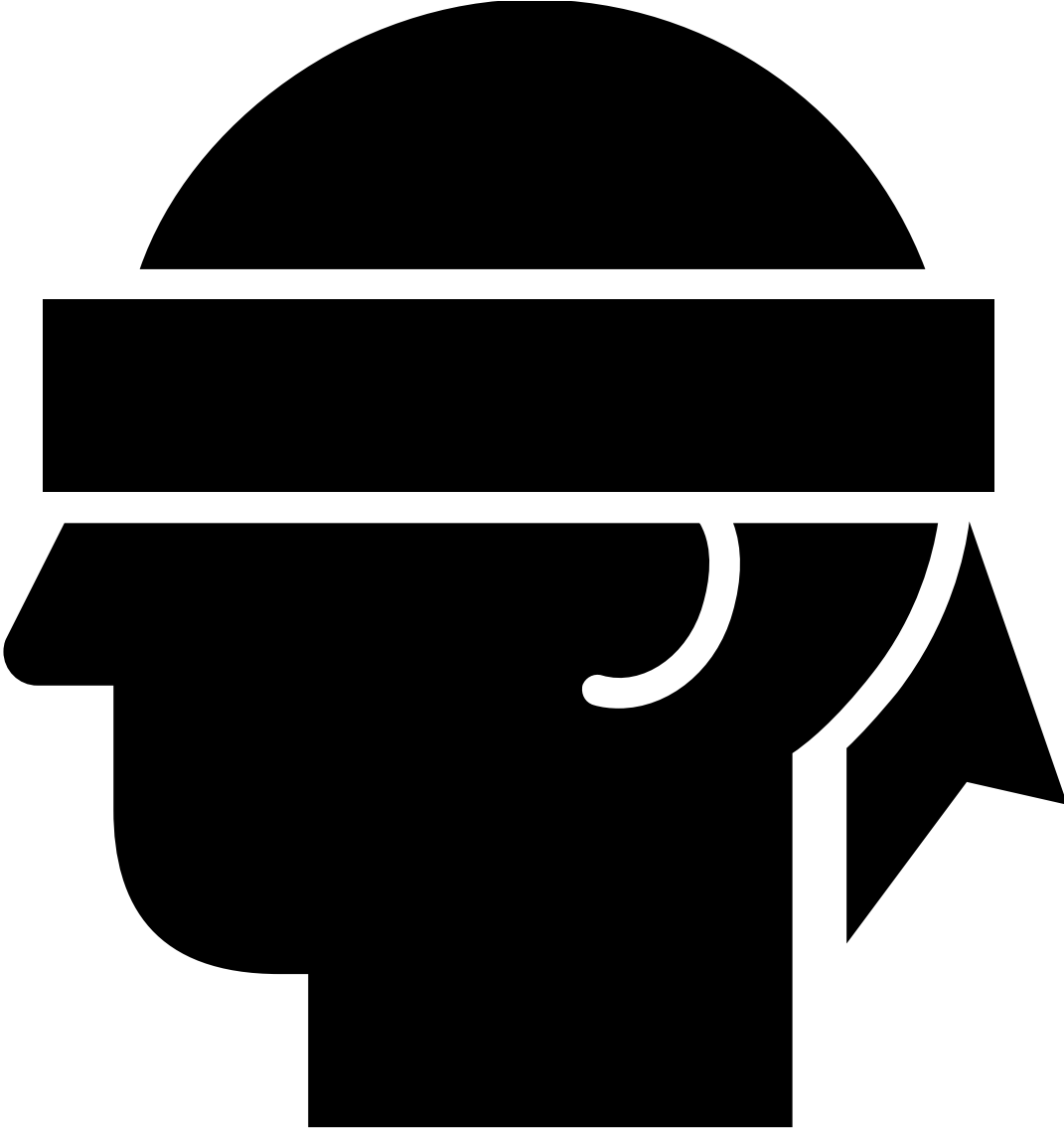


Serologic Data for Cholera Surveillance and Control: Where are we today?

Andrew Azman

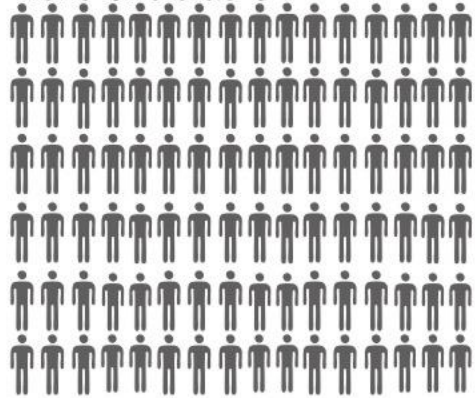
Department of Epidemiology, Johns Hopkins Bloomberg School of Public Health

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

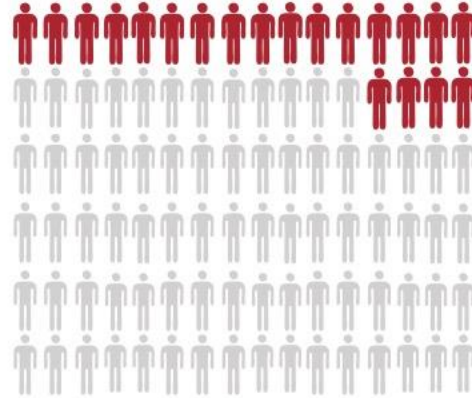


Challenges in counting cholera cases

100 Infected with
Vibrio Cholerae O1

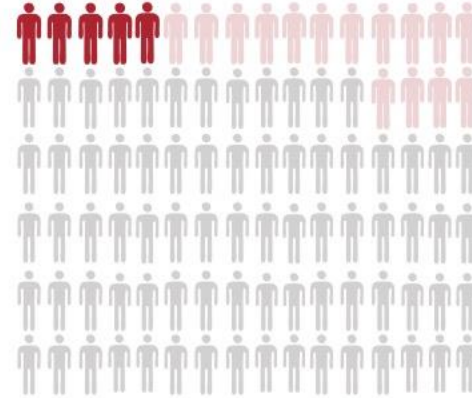


Symptomatic



Biology (↓ Bias)

Seek Care



Behavior (↓ Bias)

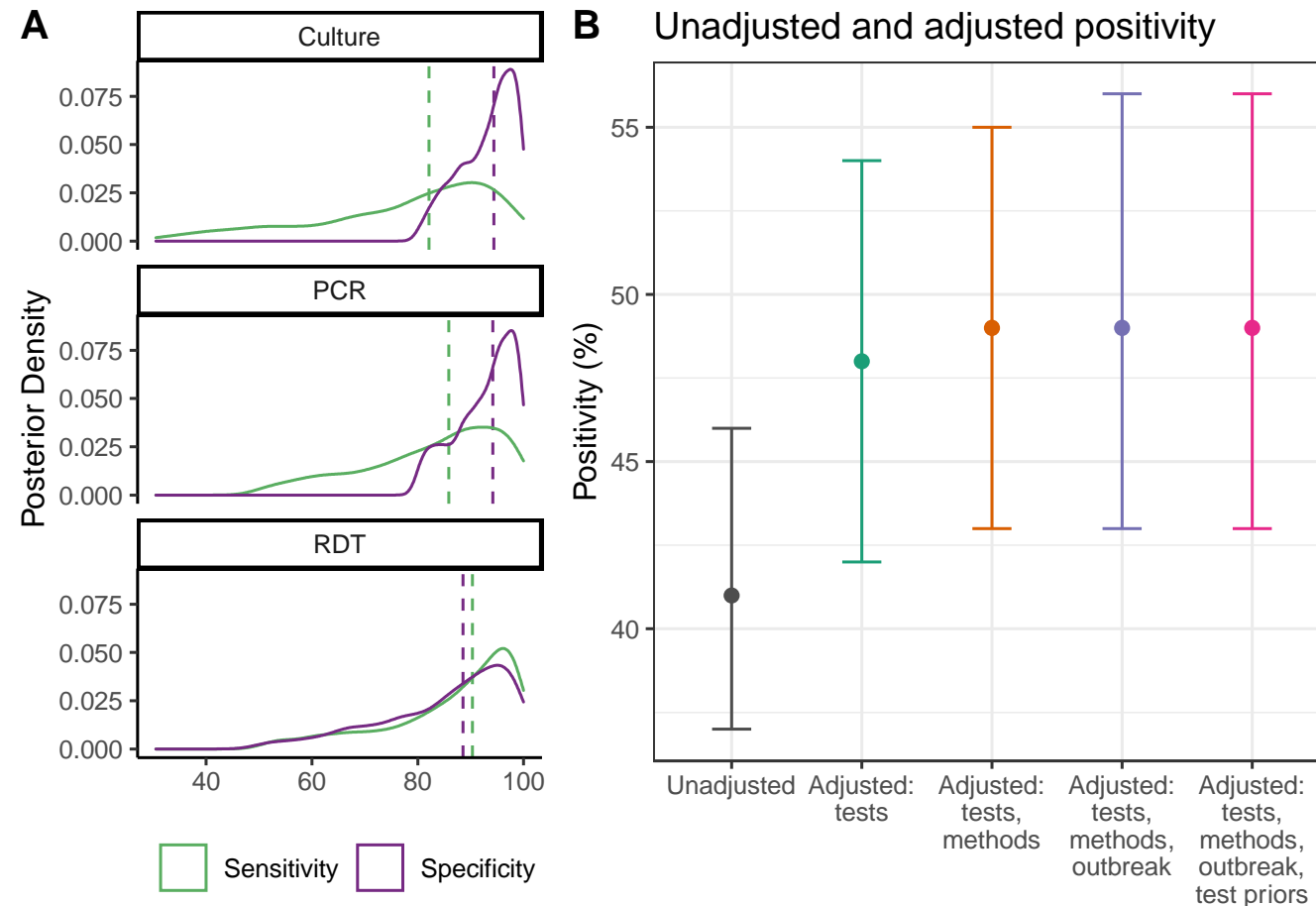
Identified and Reported as Cholera



Lack of routine confirmation (↕ Bias)

Health system defficiencies (↕ Bias)

Low specificity of suspected case definition and imperfect diagnostic tools





Seroepidemiology for cholera

The Journal of
Infectious Diseases

Issues

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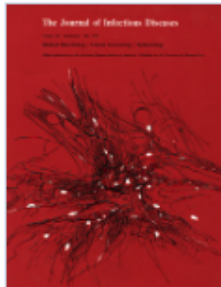
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The Journal of Infectious Diseases



Volume 121, Issue
Supplement
May 1970

JOURNAL ARTICLE

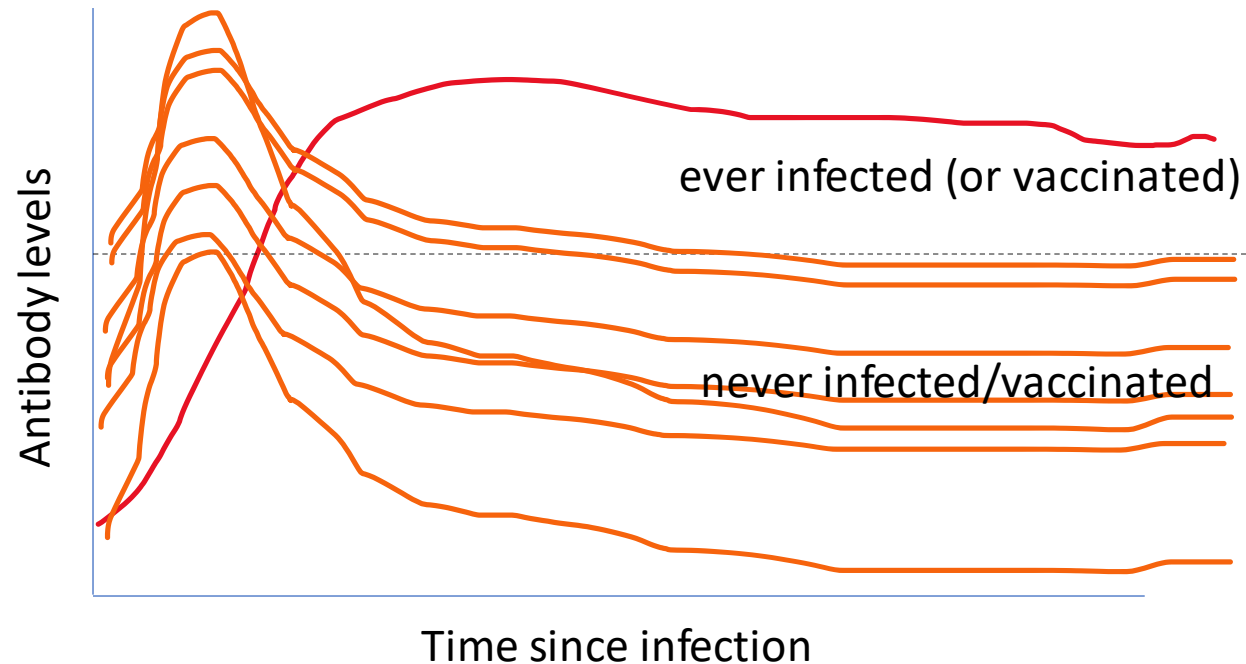
Seroepidemiologic Studies during a Simultaneous Epidemic of Infection with El Tor Ogawa and Classical Inaba *Vibrio cholerae* [Get access >](#)

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>

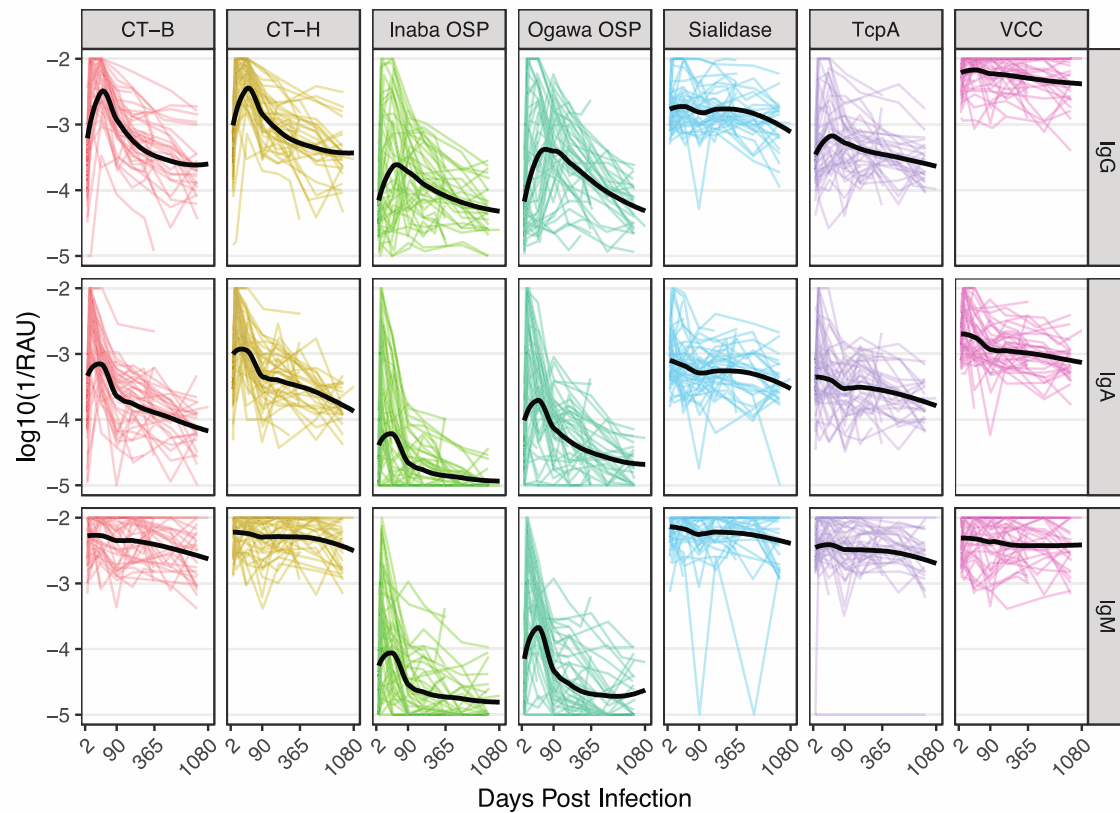
Published: 01 May 1970

What makes **cholera** serology different from many **vaccine preventable** diseases?

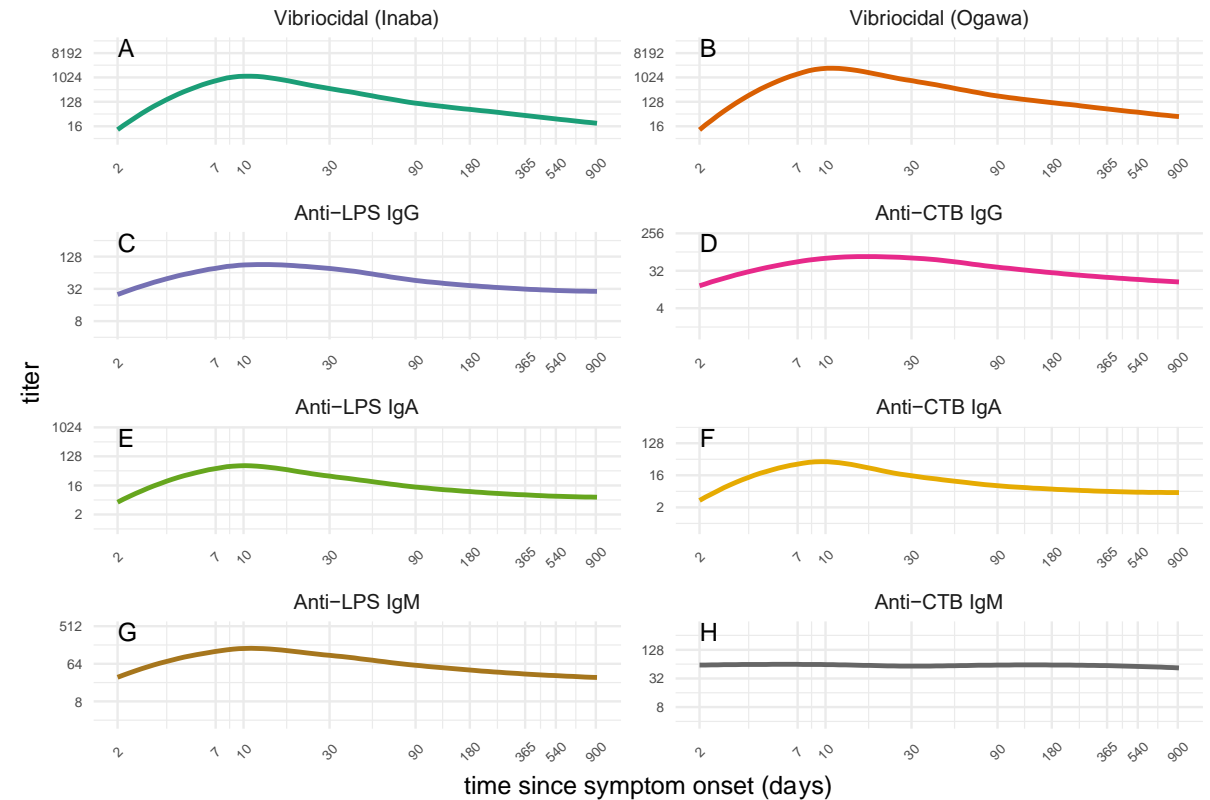


- Faster decay
- More variable baseline levels
- High variability in post-infection antibody trajectories
- One single antibody with a single threshold probably isn't good enough

Post-infection antibody dynamics

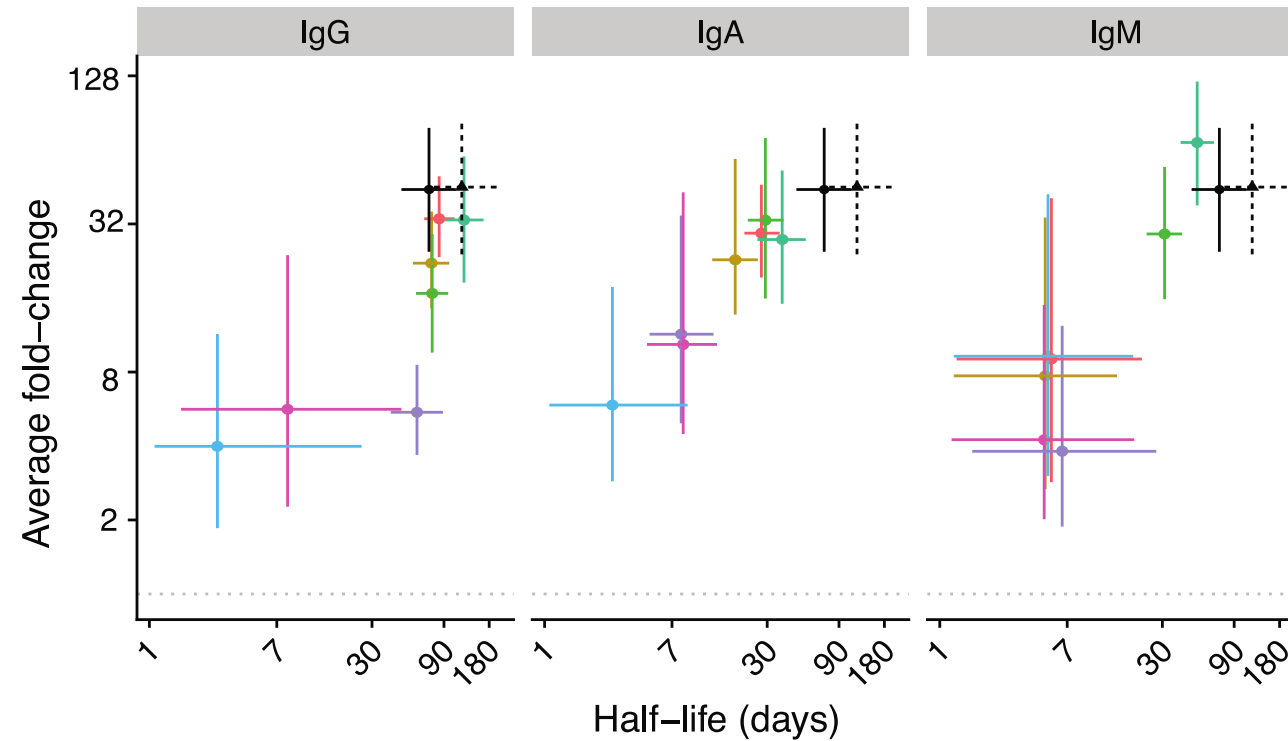


Jones et al, 2022, PMID 36286520



Azman et al, 2019, PMID 30787170

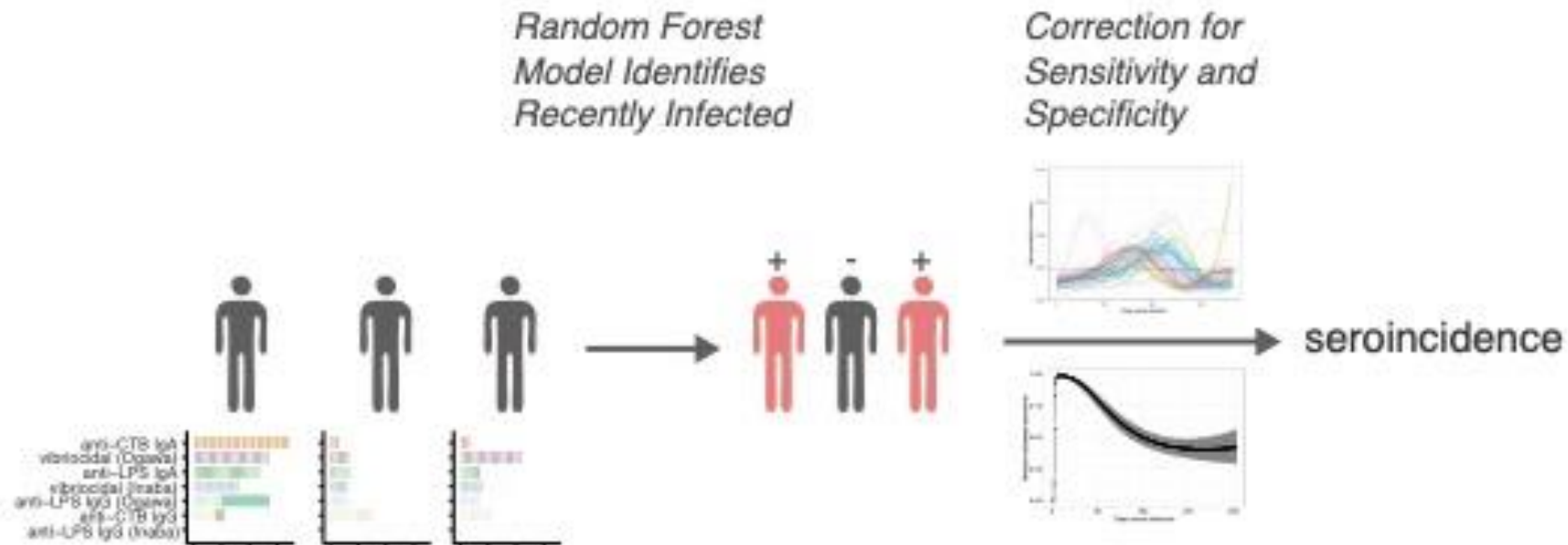
Differences in boost and decay of different antibodies helpful in estimating recent infections



- | Marker | | Antigen | | | | | | | |
|--------|-------------------|---------|------|---|-----------|---|-----------|---|-----|
| ↓ | Vibriocidal Inaba | ● | CT-B | ● | Inaba OSP | ● | Sialidase | ● | VCC |
| ↑ | Vibriocidal Ogawa | ● | CT-H | ● | Ogawa OSP | ● | TcpA | ● | |

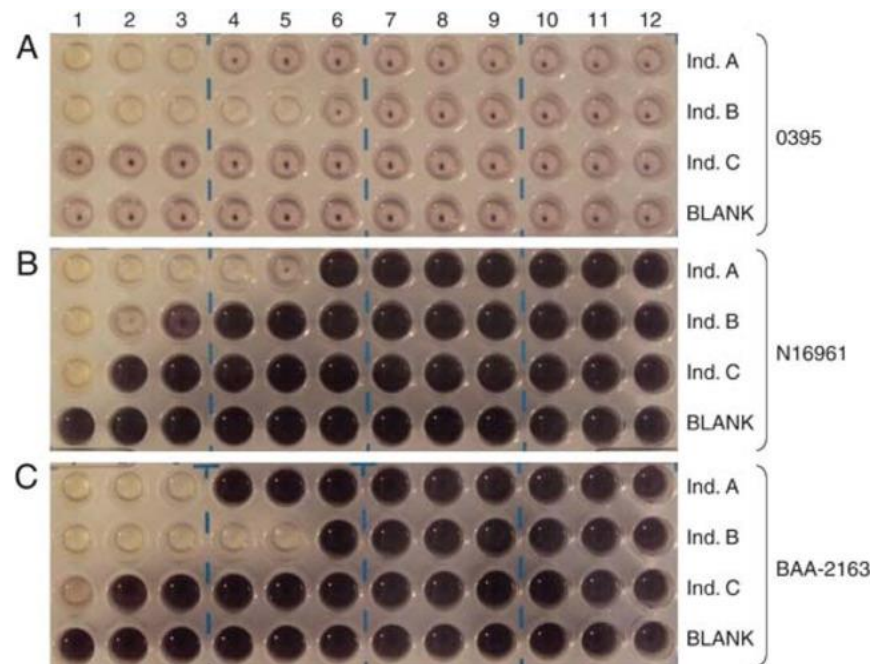
Seroincidence

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

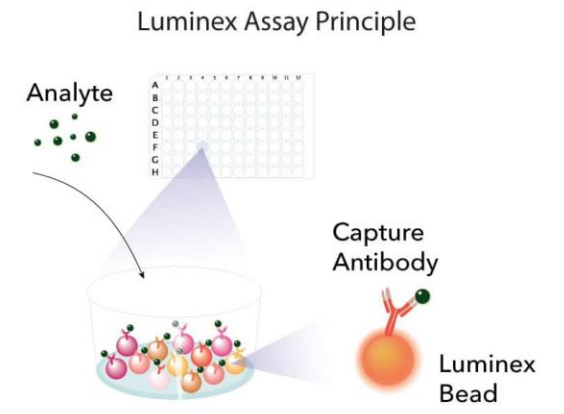
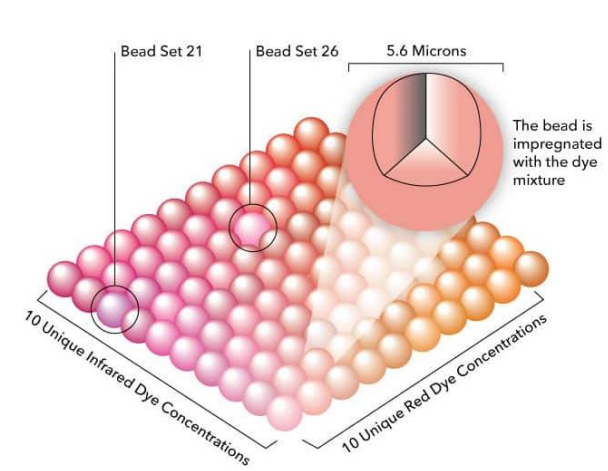


Laboratory Methods: A menu of options

Vibriocidal (functional) Assay

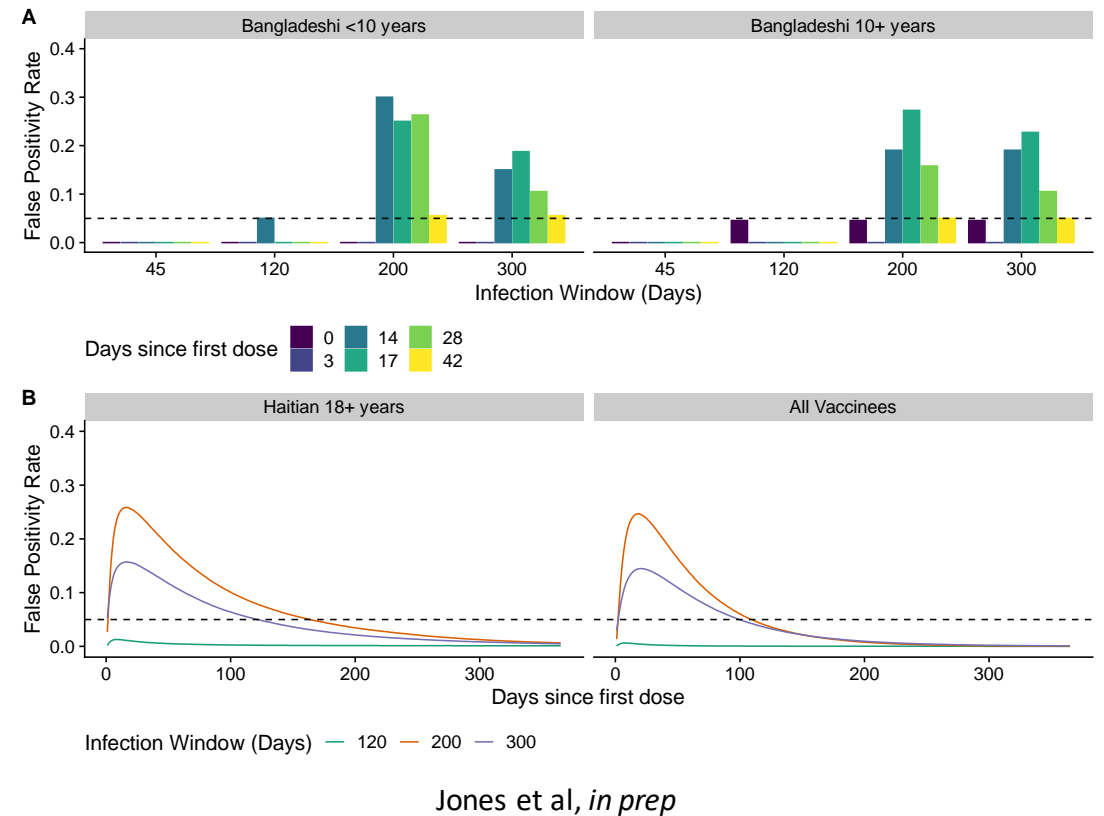


Luminex Assay (or ELISAs)

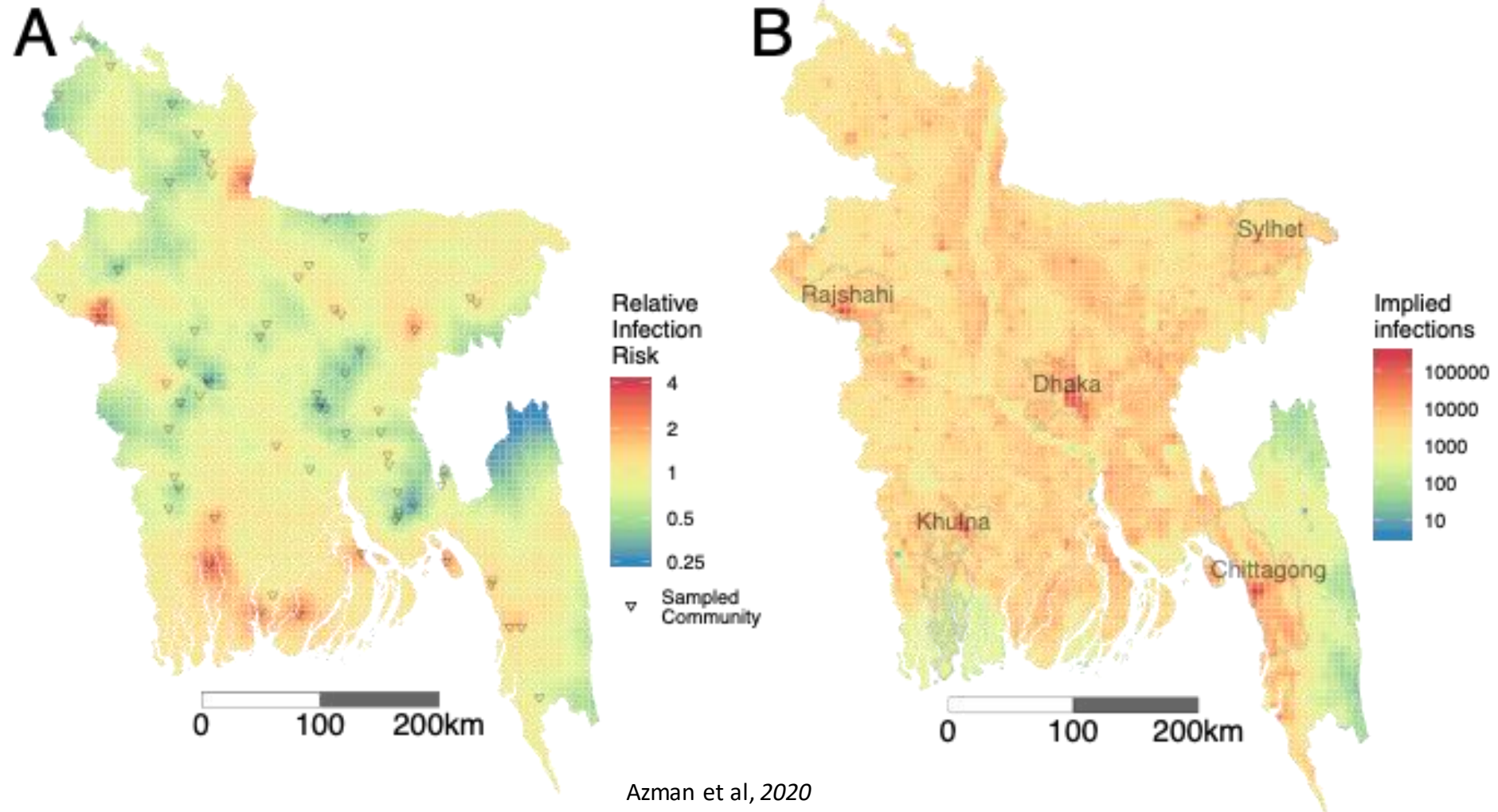


What happens in partially vaccinated populations?

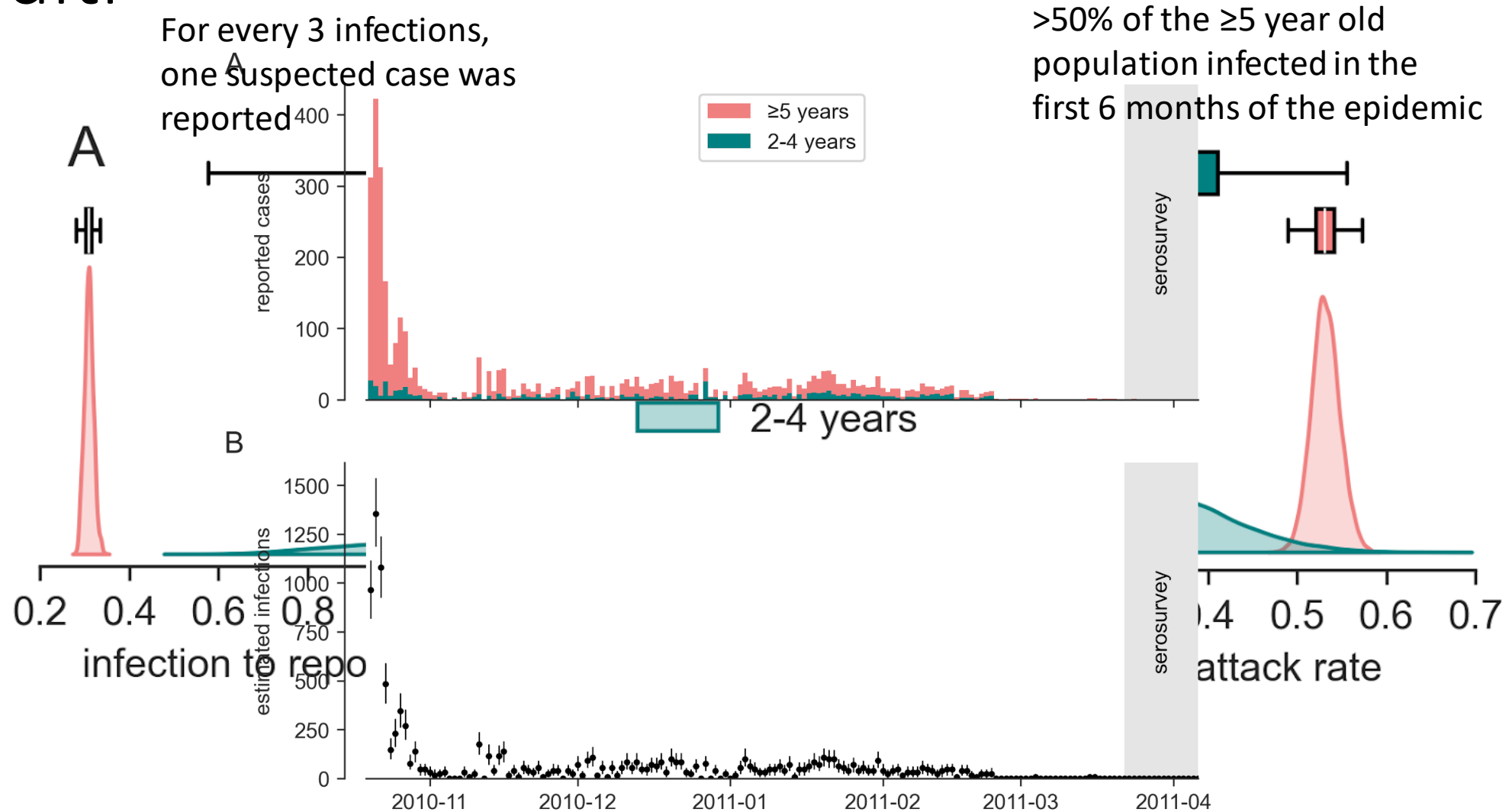
- Differential antibody response between vaccinated and infected in the first few months
- Recent infection models can be adjusted if vaccination status is known
- After waiting ~3 months post-vaccination, models no longer misclassify vaccinees as recently infected



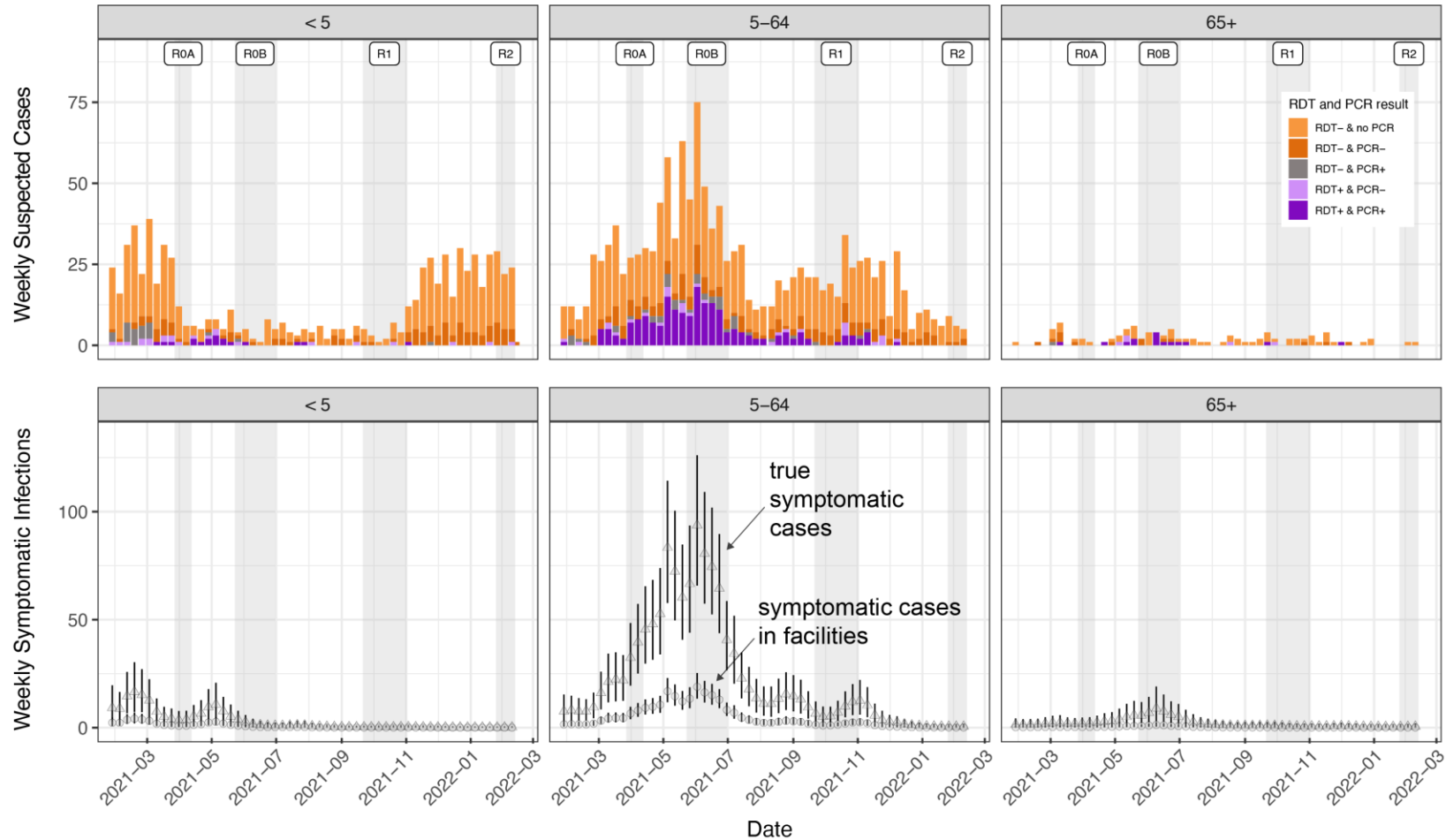
Serology to get a national overview



Understanding the infection to case ratio in Haiti

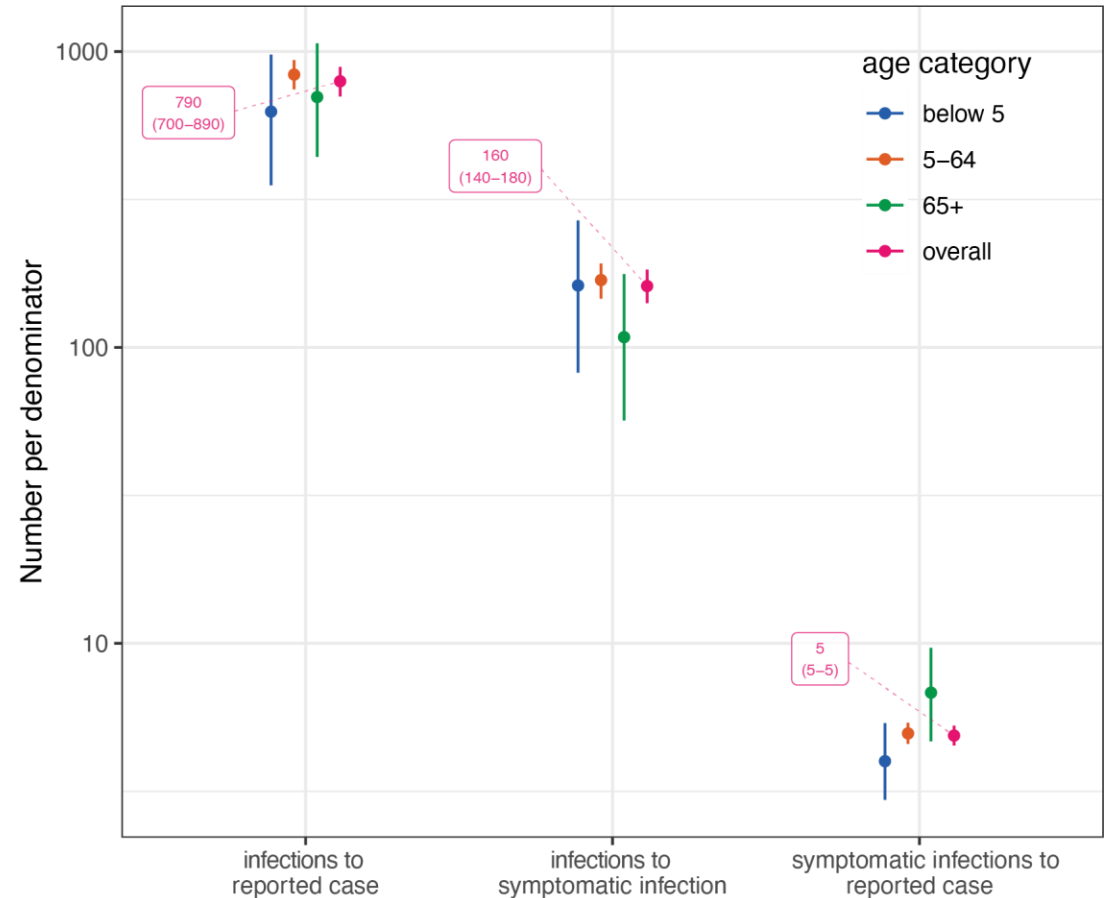


Insights from combined serologic and clinical surveillance in Bangladesh (*preliminary*)



Insights from combined serologic and clinical 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



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?

Toolkit for Integrated Serosurveillance of Communicable Diseases in the Americas



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RESULTS BY YEAR

1981 2023

Did you mean **sero surveillance** (3,734 results)?

Monitoring the SARS-CoV-2 Pandemic: Prevalence of Antibodies in a Large, Repetitive Cross-Sectional Study of Blood Donors in Germany-Results from the SeBluCo Study 2020-2022.

Cite

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Offergeld R, Preußel K, Zeiler T, Aurich K, Baumann-Baretti BI, Ciesek S, Corman VM, Dienst V, Drosten C, Görg S, Greinacher A, Grossegessle M, Haller S, Heuft HG, Hofmann N, Horn PA, Houareau C, Gülec I, Jiménez Klingberg CL, Juhl D, Lindemann M, Martin S, Neuhauser HK, Nitsche A, Ohms J, Paing S, Seeböck H, Schade J, Schäfer B, Scheiklauer H, Schlaud M, Schmidt M, Umhau