Challenges & potential impact of large-scale implementation of Ebola vaccines

Anton Camacho, Conall Watson, Sebastian Funk, Stefan Flasche, Marc Baguelin, Rebecca Glover, Adam Kucharski & John Edmunds

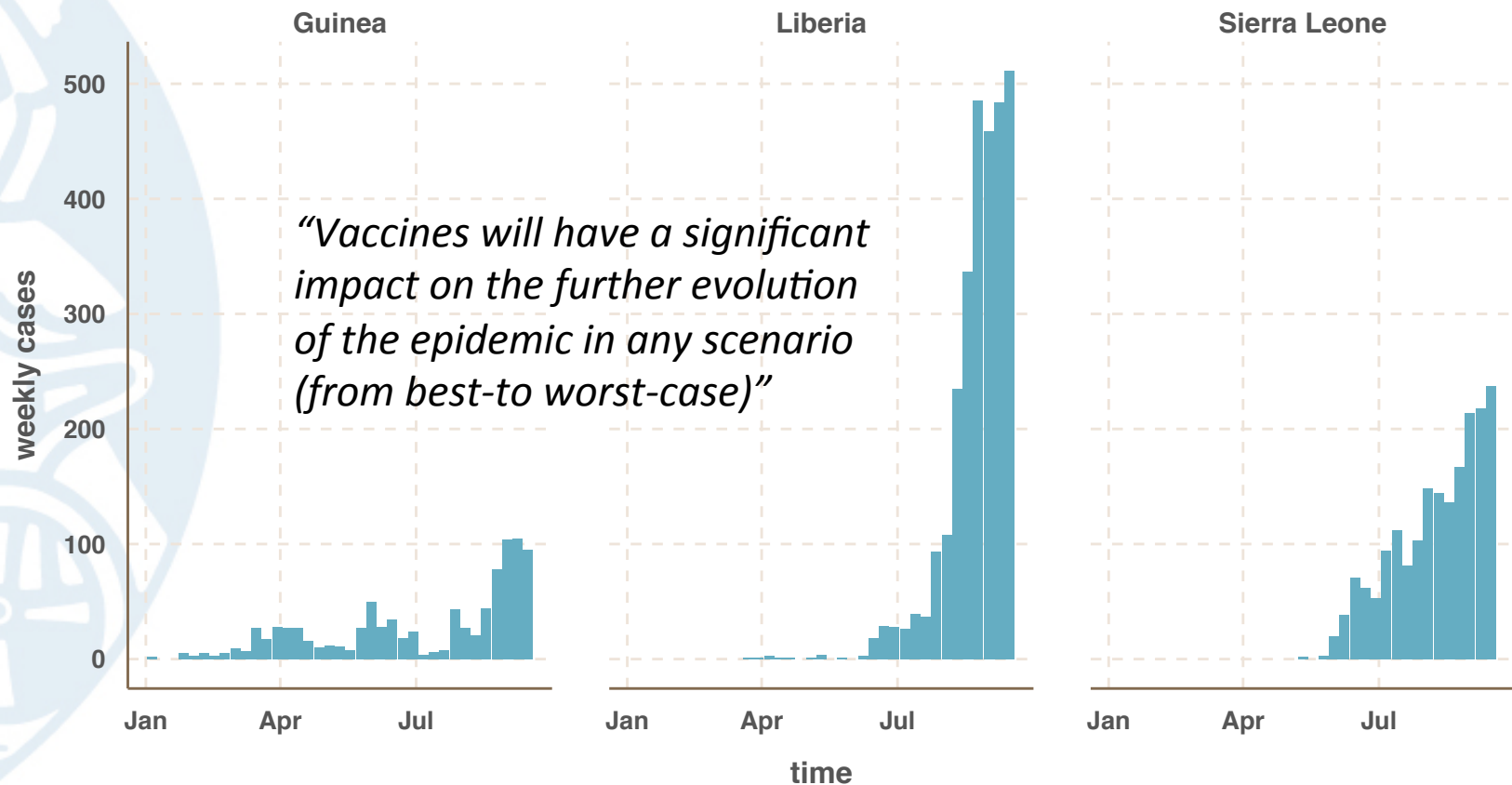London School of Hygiene & Tropical Medicine
anton.camacho@lshtm.ac.uk

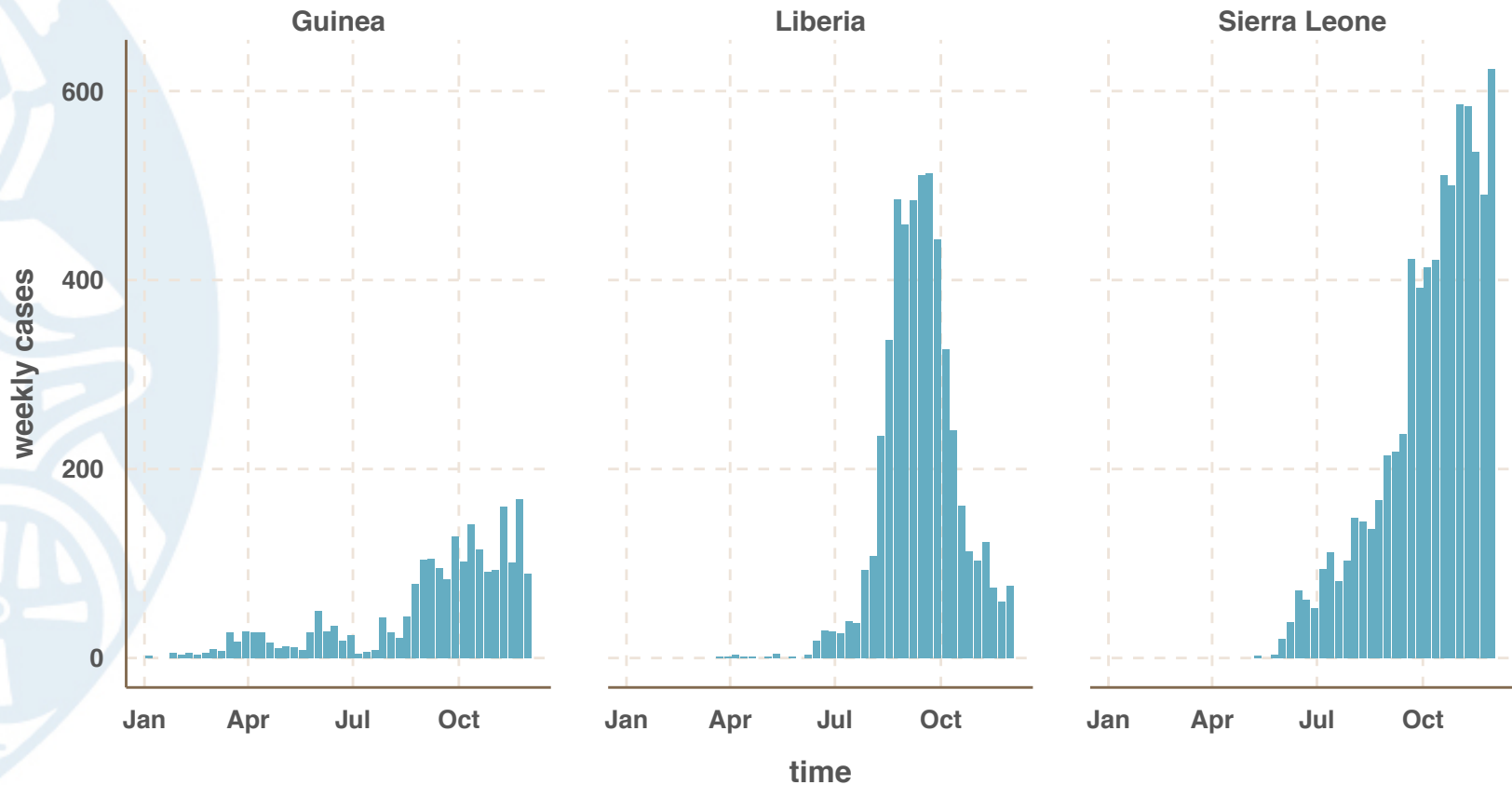*Ebola Vaccine: Where are we? How to move forward?*
12-13 January 2015

Looking back

23 October 2014: First high-level meeting on Ebola vaccines access and financing

"Vaccines will have a significant impact on the further evolution of the epidemic in any scenario (from best-to worst-case)"

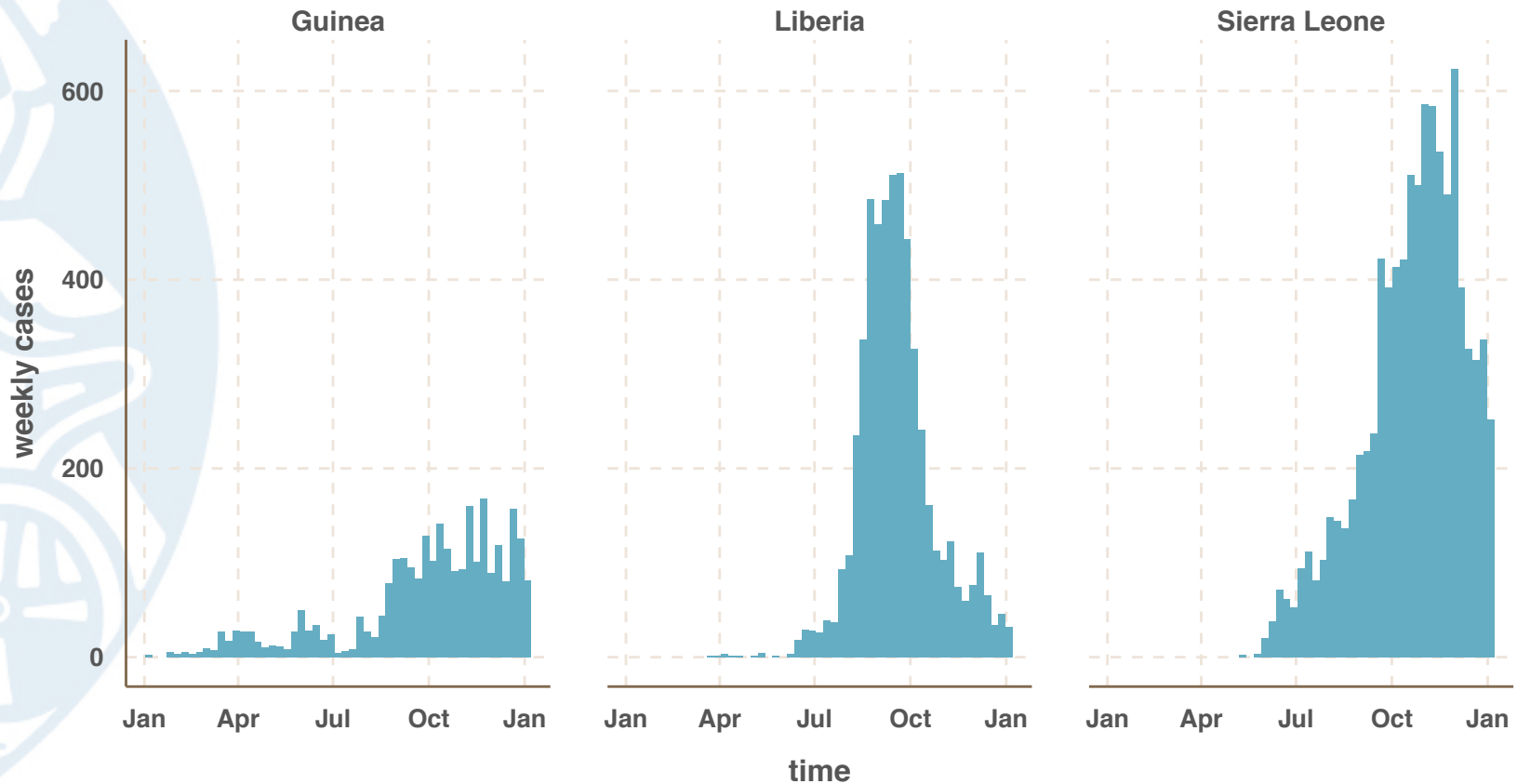Confirmed & probable EVD cases (source: WHO)

Looking back

9 December 2014: GAVI Board meeting

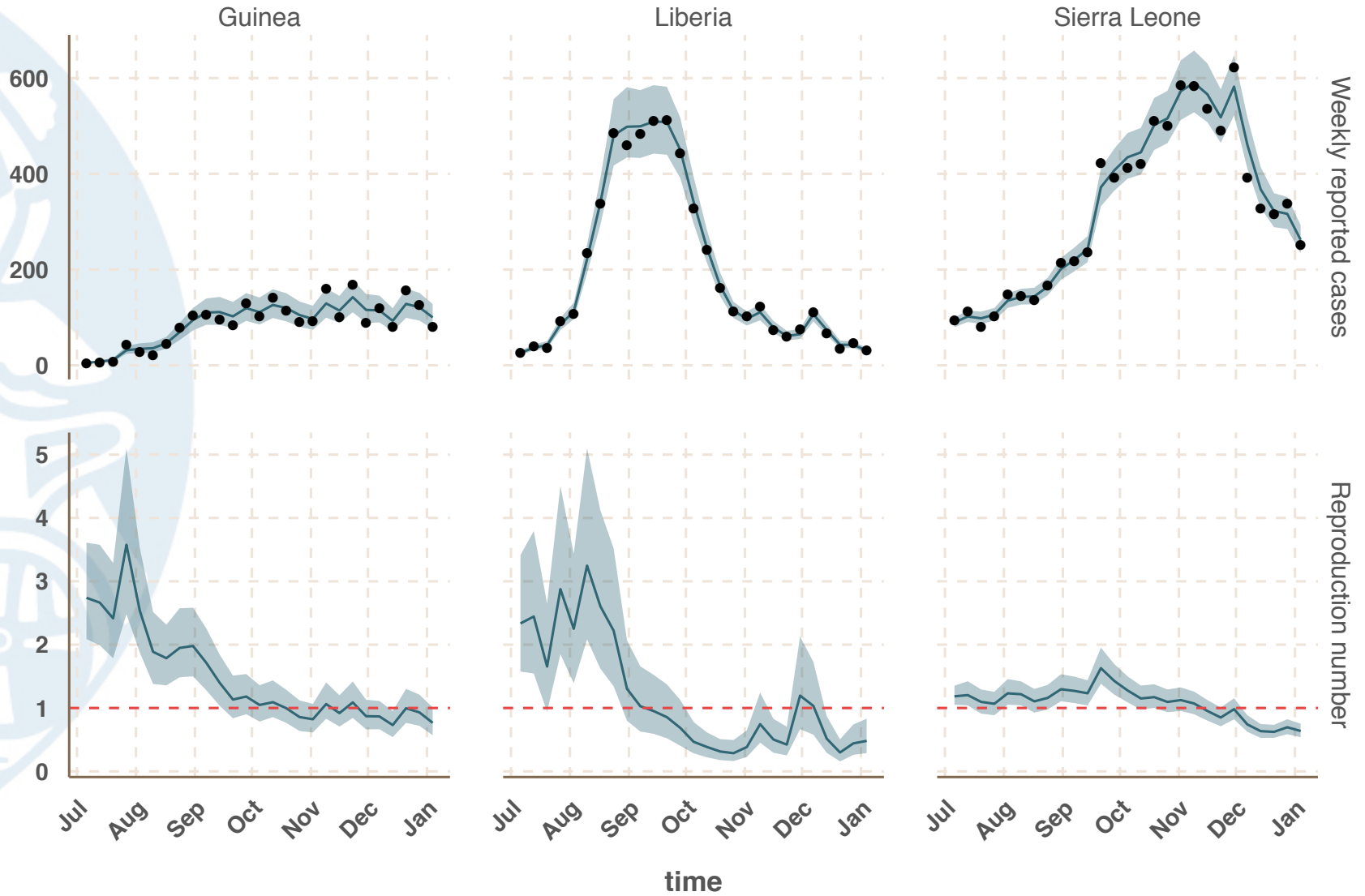Confirmed & probable EVD cases (source: WHO)

Looking back

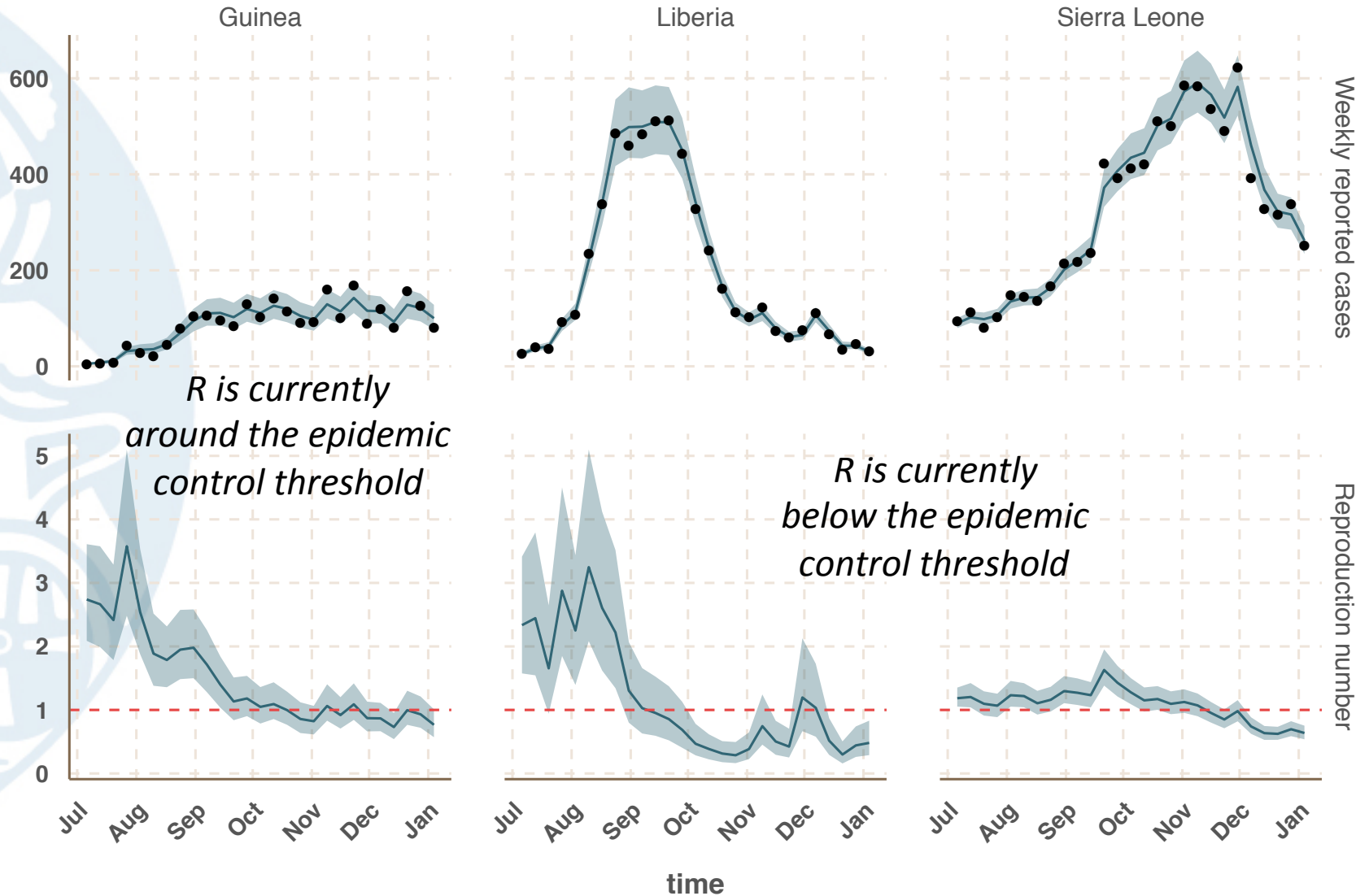**8 January 2015:** Second high-level meeting on Ebola vaccines access and financing

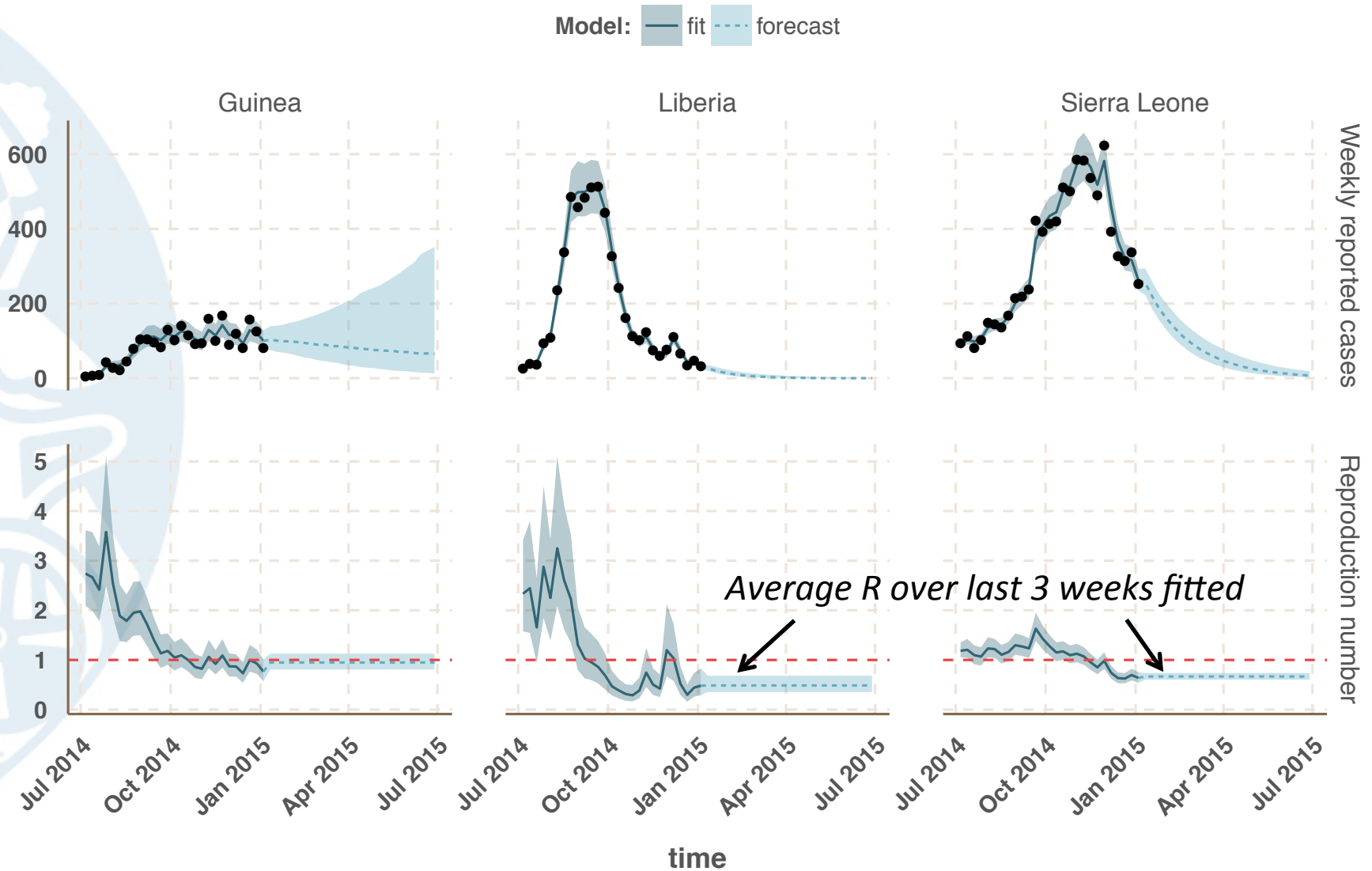Confirmed & probable EVD cases (source: WHO & MoH Sitreps)

Where are we?

Where are we?

London School of Hygiene & Tropical Medicine

Guinea | Liberia | Sierra Leone

Weekly reported cases

R is currently around the epidemic control threshold

R is currently below the epidemic control threshold

Reproduction number

time

Model: —— fit ····· forecast

Average R over last 3 weeks fitted

Large-scale vaccination

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Comparing vaccine impacts
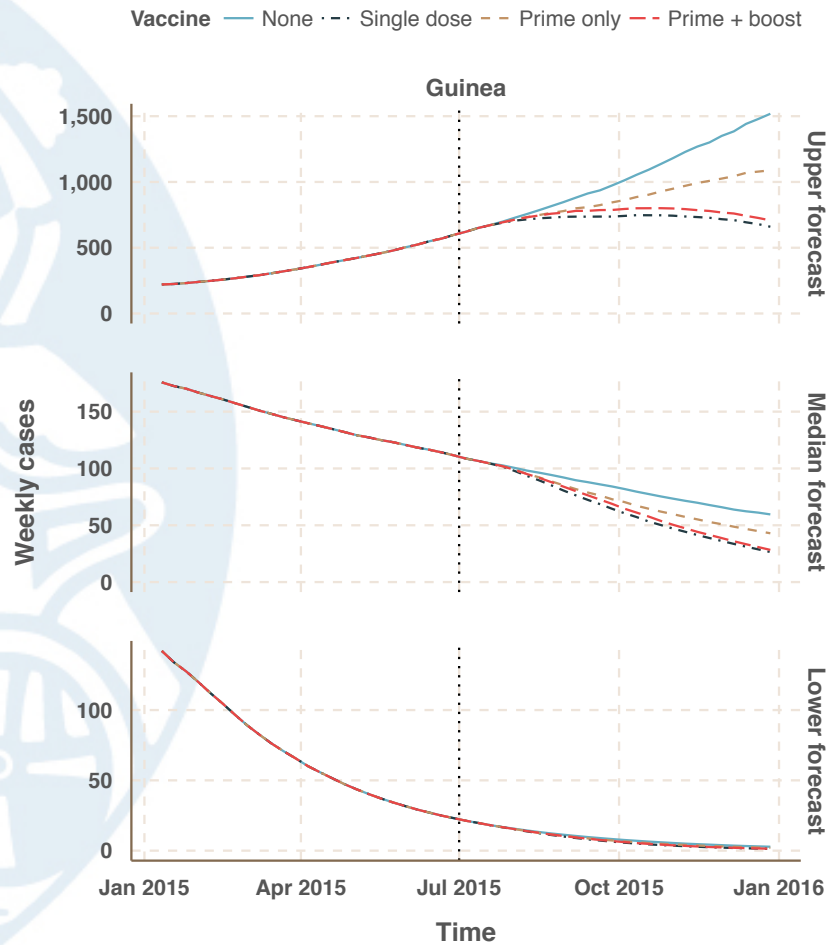
Weekly number of cases
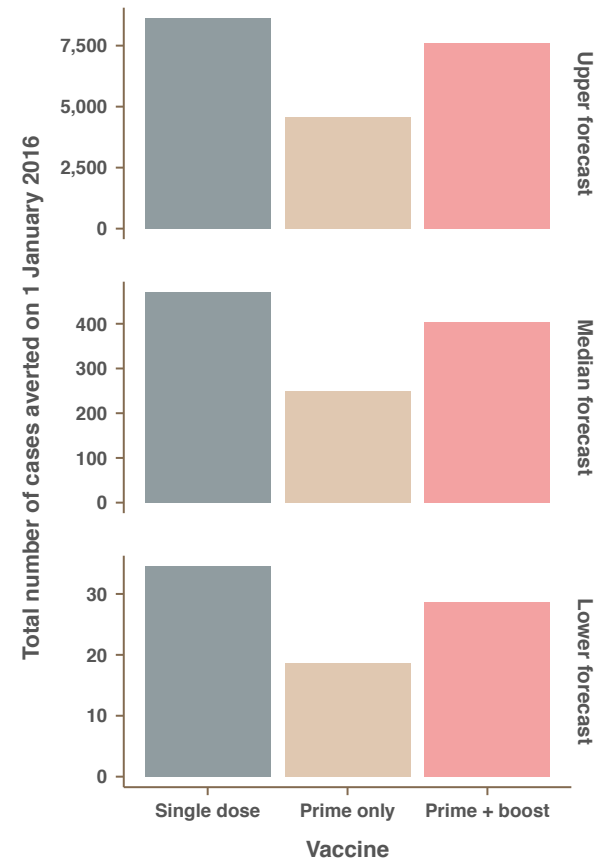
Total number of cases averted

Sensitivity analysis
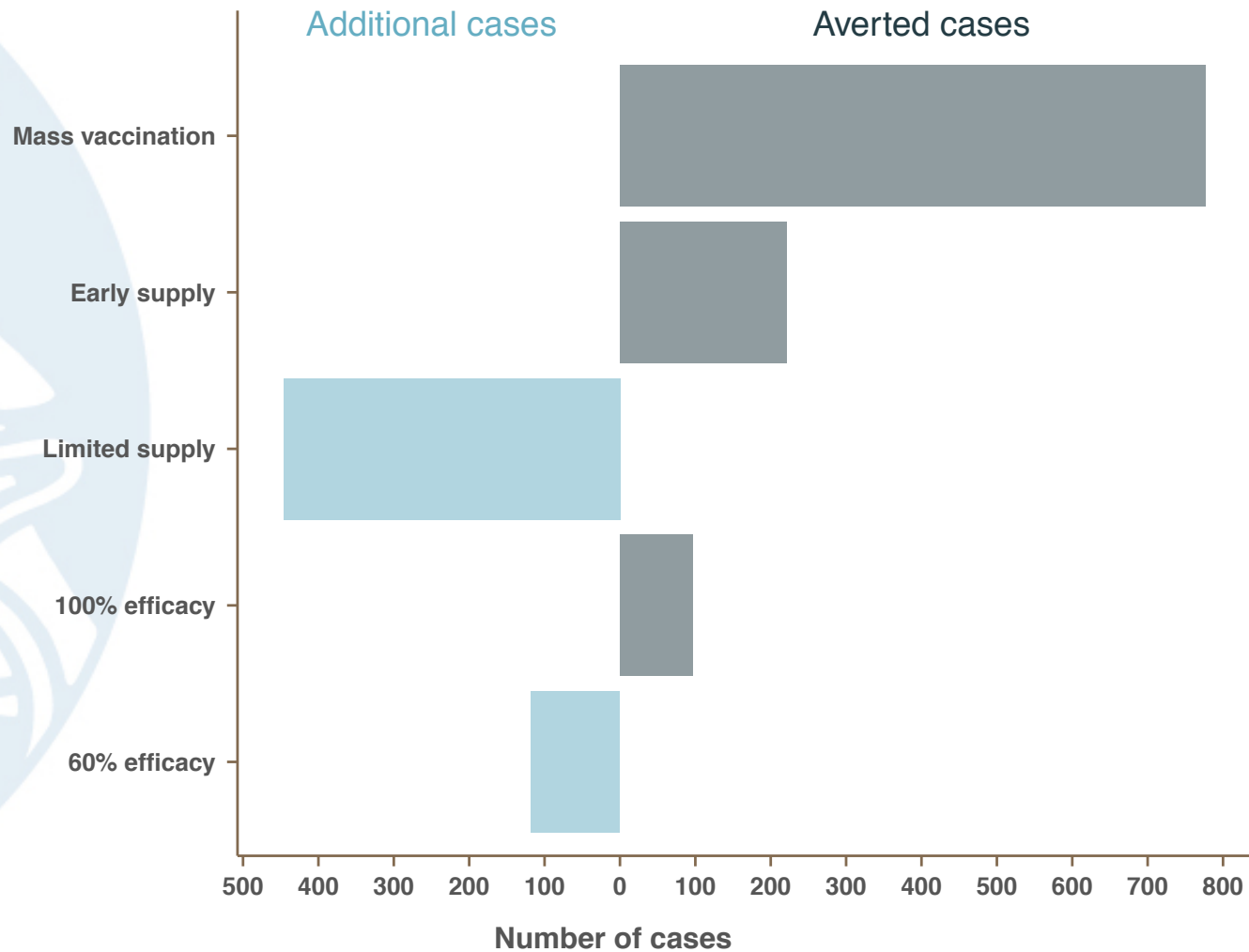
Based on median forecast, single dose vaccine
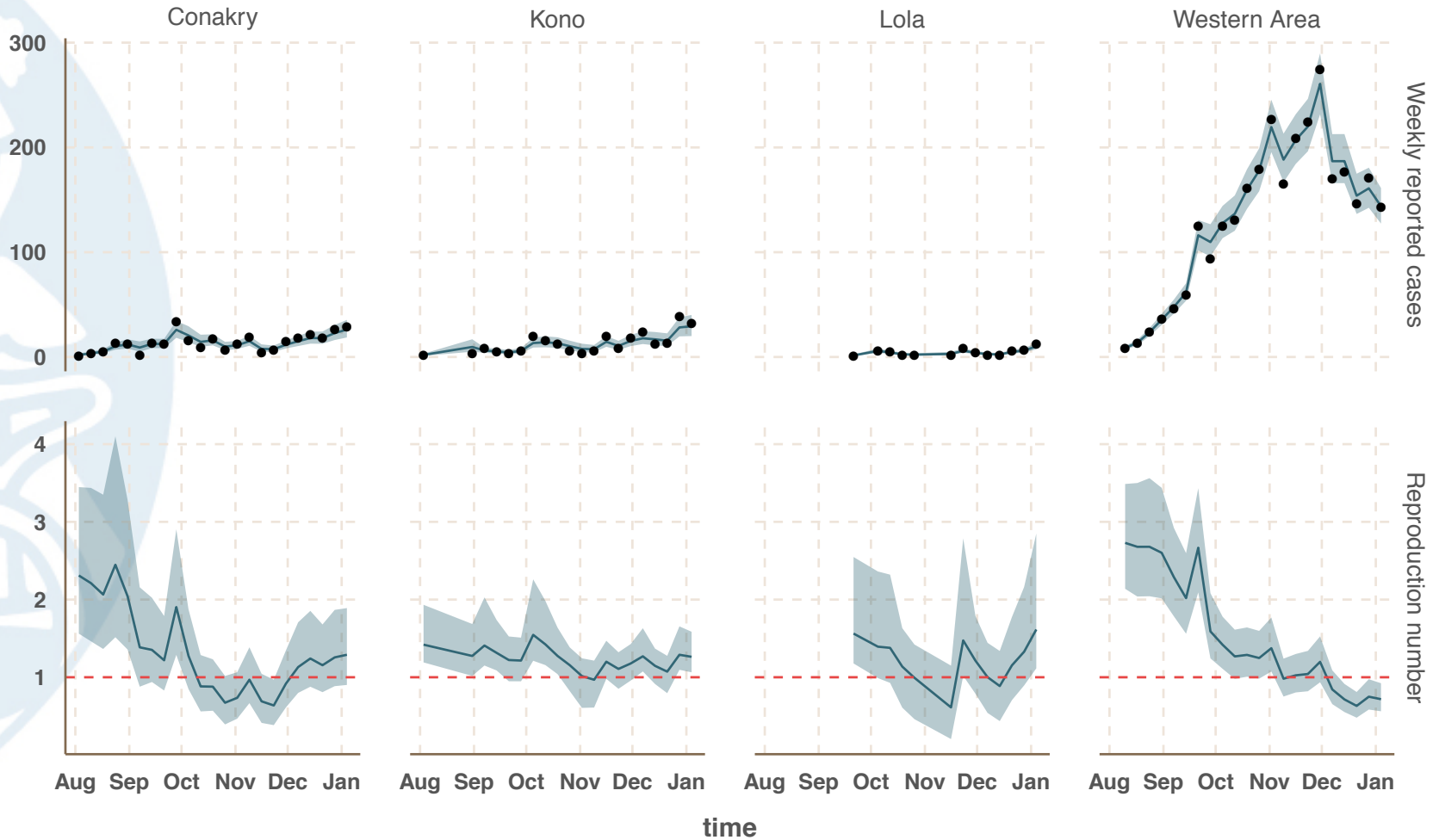
Health-care workers
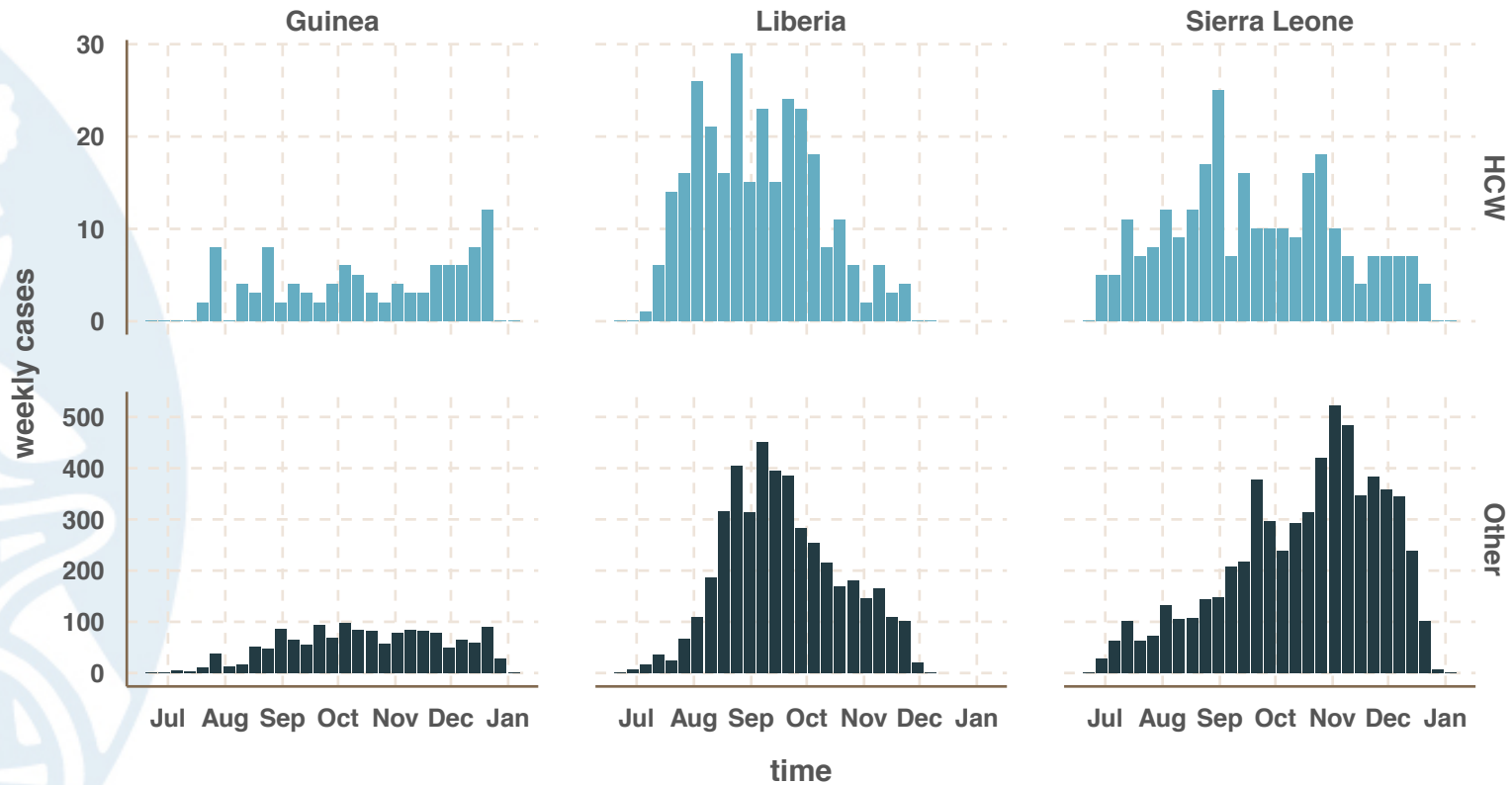
- Between 5 and 10% of all cases, clear benefit of vaccination
- Adverse events could disrupt health-services
- Risk of change in safe practice and behaviour
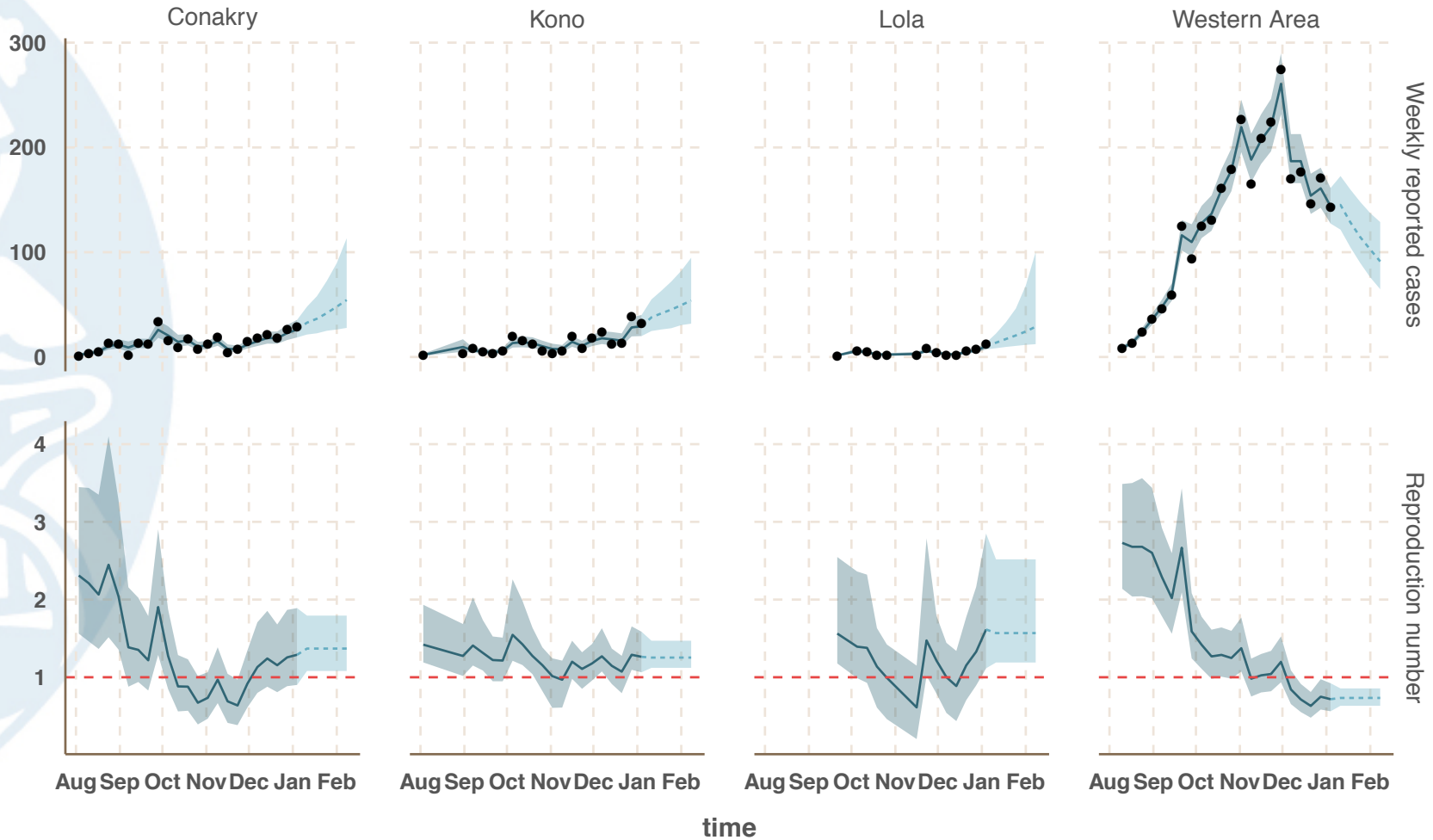
Heterogeneity within a country
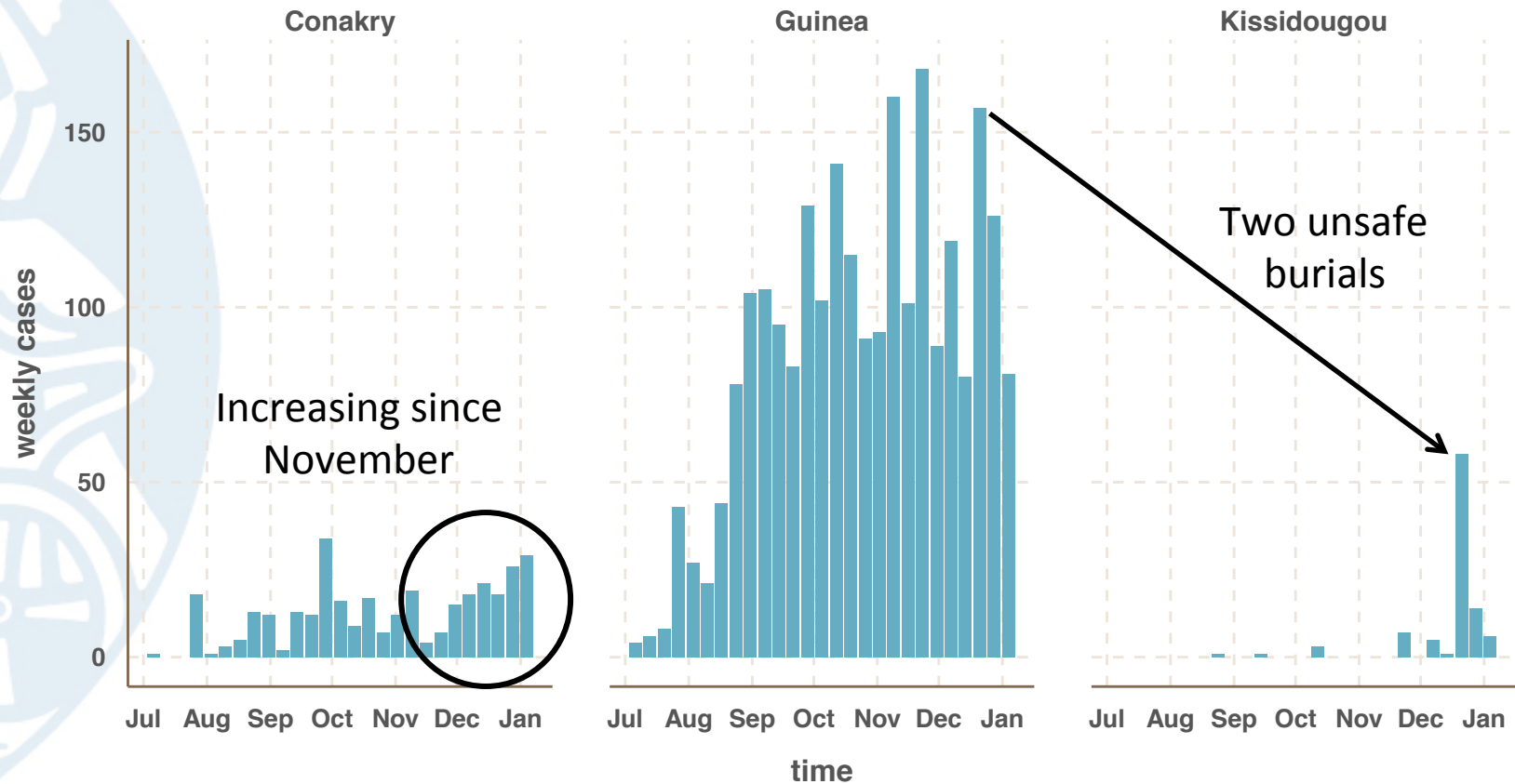
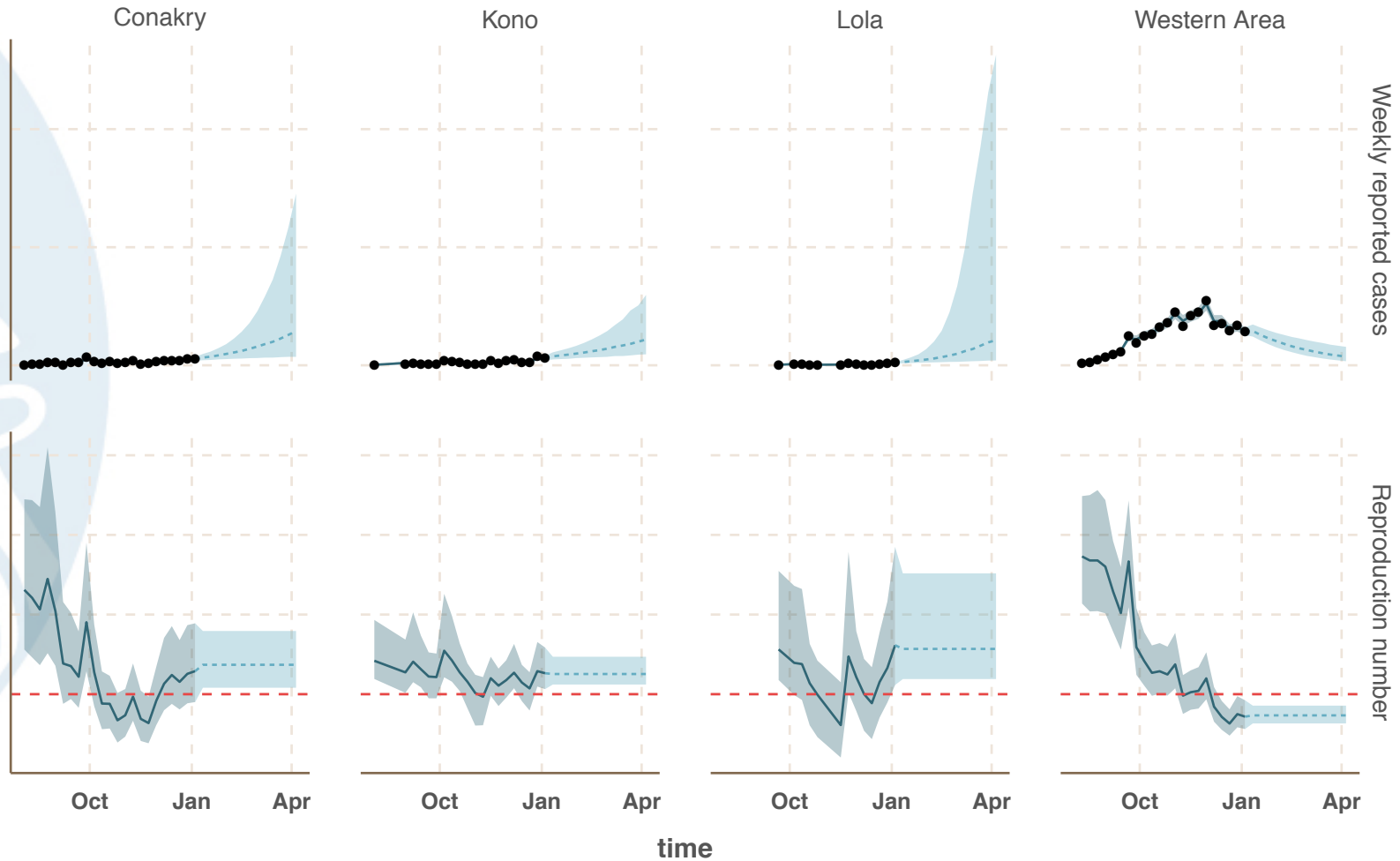Confirmed & probable EVD cases (source: WHO & MoH Sitreps)
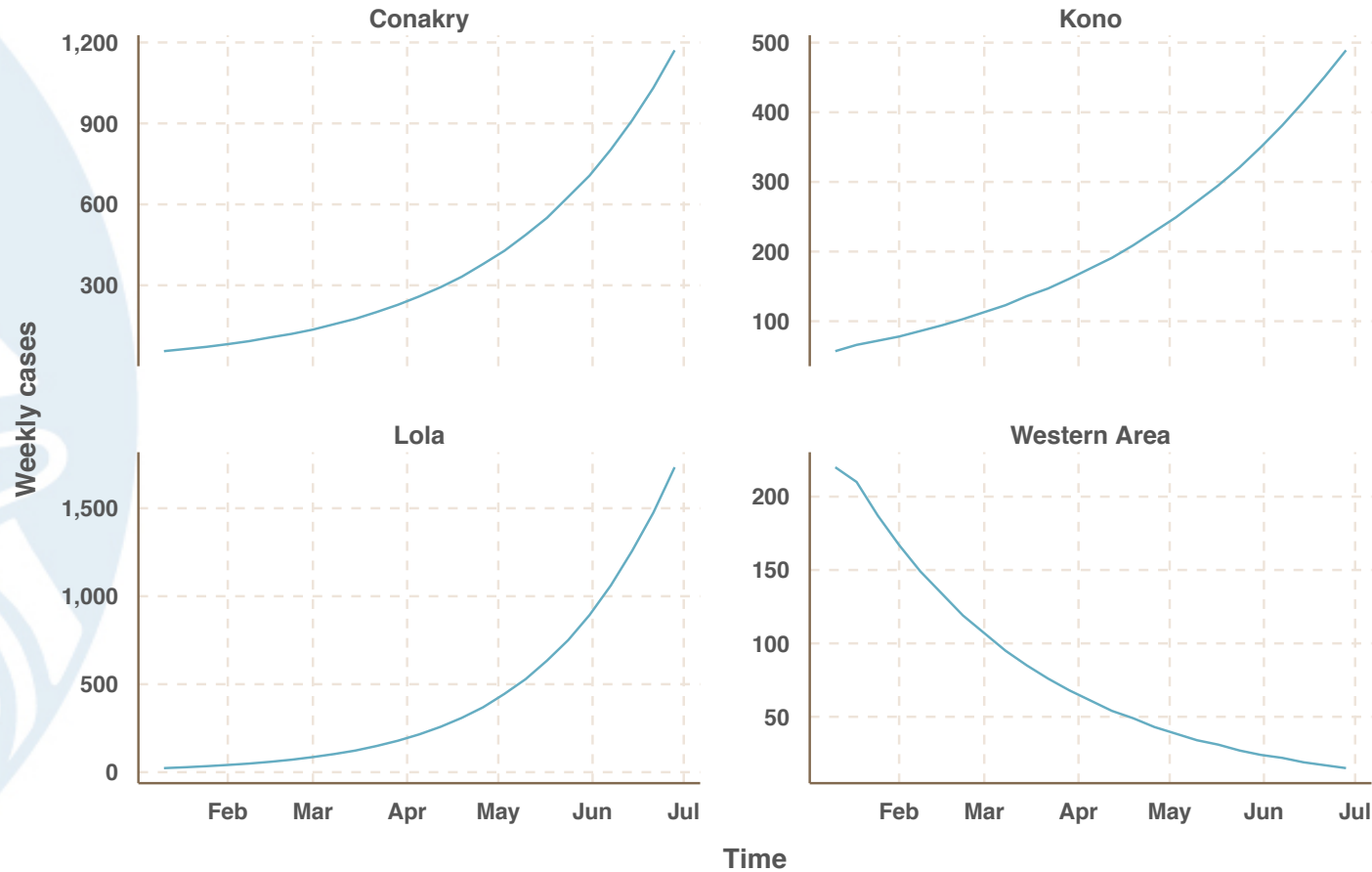
Regions with sustained transmission

Forecast up to 8 February 2015

Forecast up to 8 April 2015

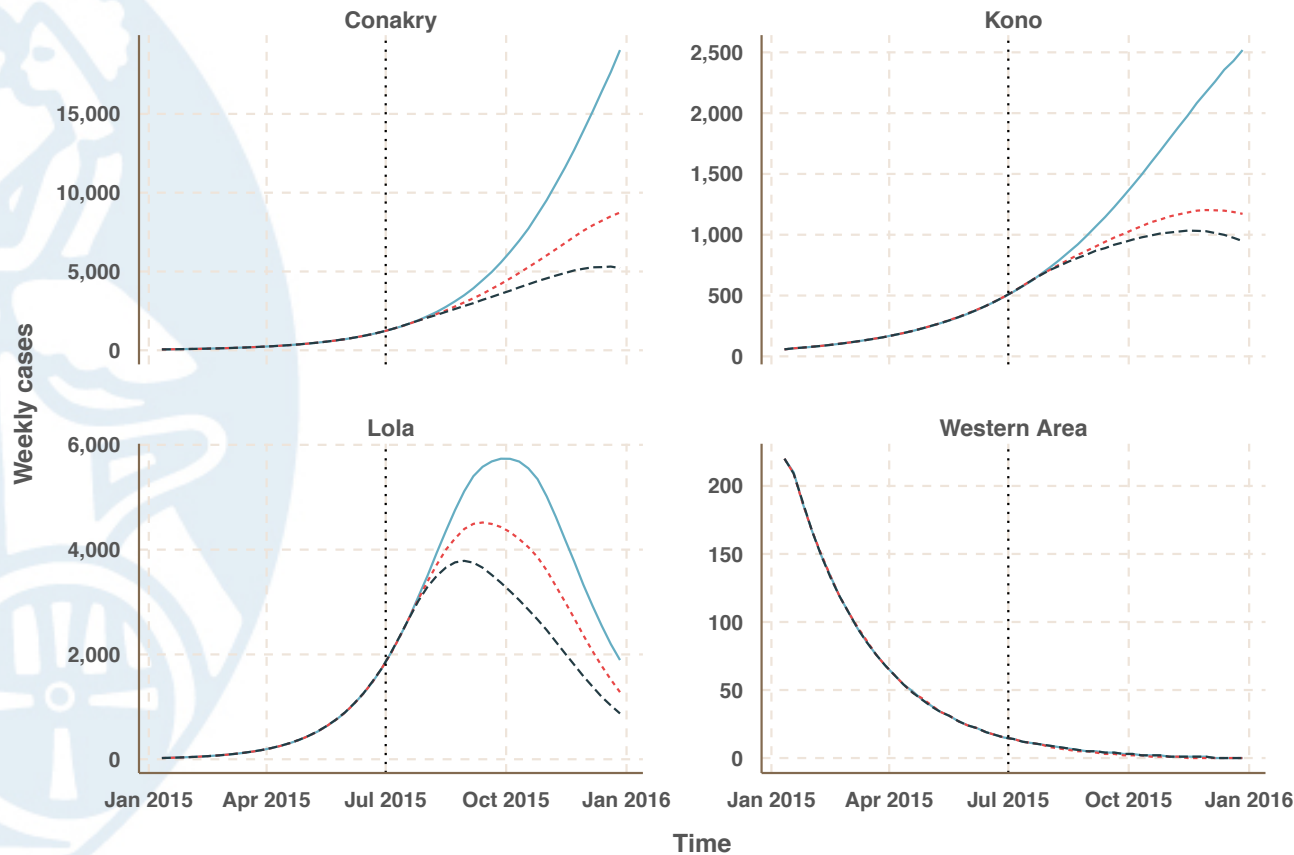# Median forecast, July 2015

Best strategy for vaccine allocation?
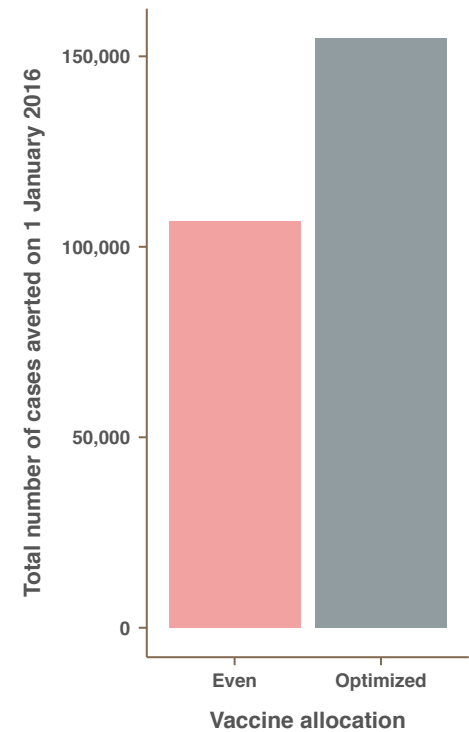
Optimized allocation

proportion of the population living in the county

$$\times$$

$$\frac{\#\ \text{cases over the past 3 weeks}}{\#\ \text{cases since the beginning}}$$

Vaccine allocation

Weekly number of cases

Total number of cases averted

Summary

- Difficult to do model forecasts over more than a few weeks
- Difficult to reduce spatial/time resolution below the county/week because of missing information/delays in reporting

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- Likely dynamics by July: mostly under control with localized clusters of cases
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Summary

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- Difficult to reduce spatial/time resolution below the county/week because of missing information/delays in reporting
- Likely dynamics by July: mostly under control with localized clusters of cases
- Real benefit of vaccination might be for eradication and future outbreaks
- But this requires good clinical trials
- Real time modelling and short-term forecasts can be useful for both designing and analysis of the clinical trials:
  - where to vaccinate to get most exposure
  - what the incidence might be in the control groups
- If we have safe and effective vaccines, then modelling can be used for designing vaccination programmes

Acknowledgments

LSHTM website

http://cmmid.lshtm.ac.uk/research/ebola/
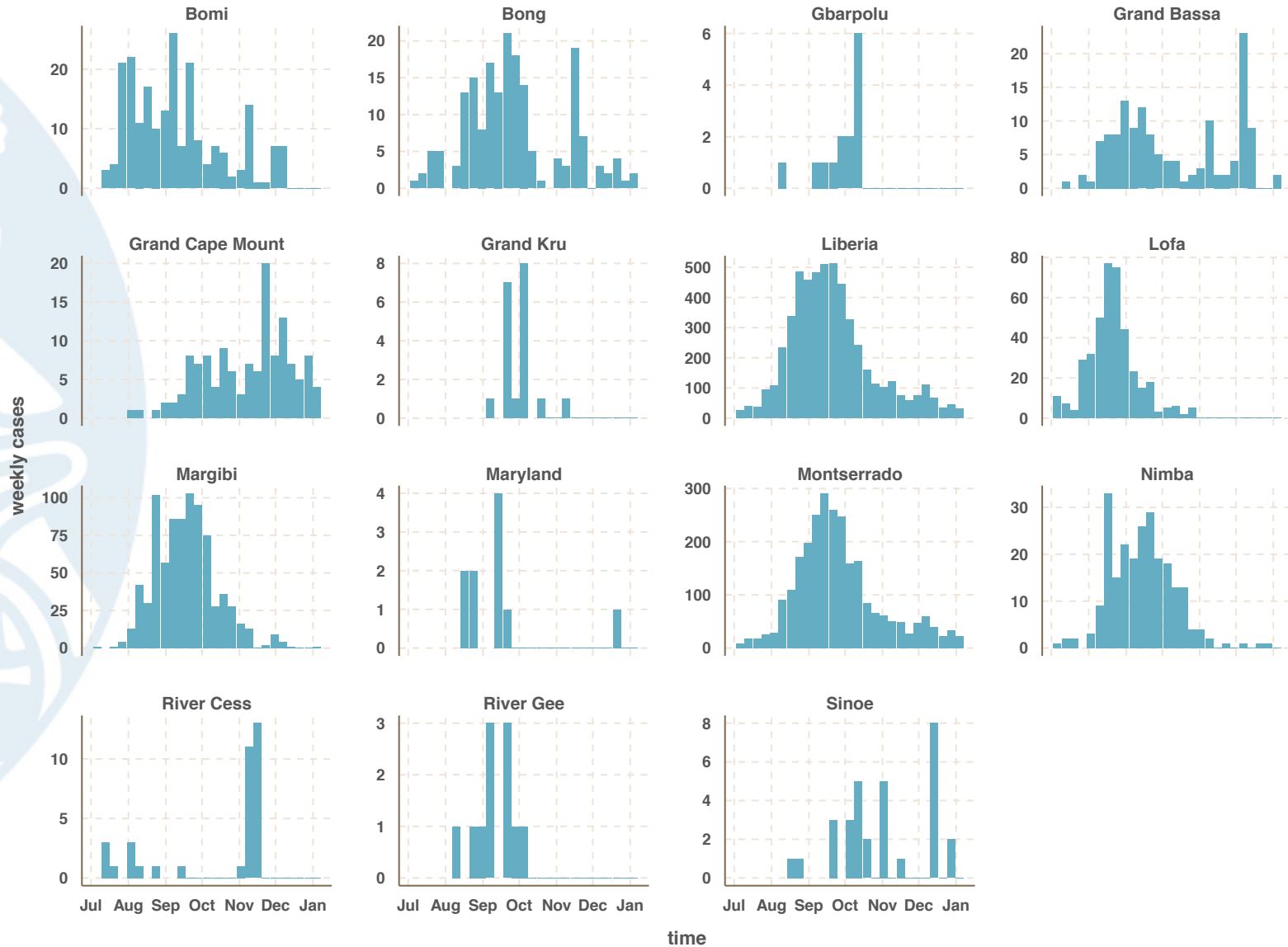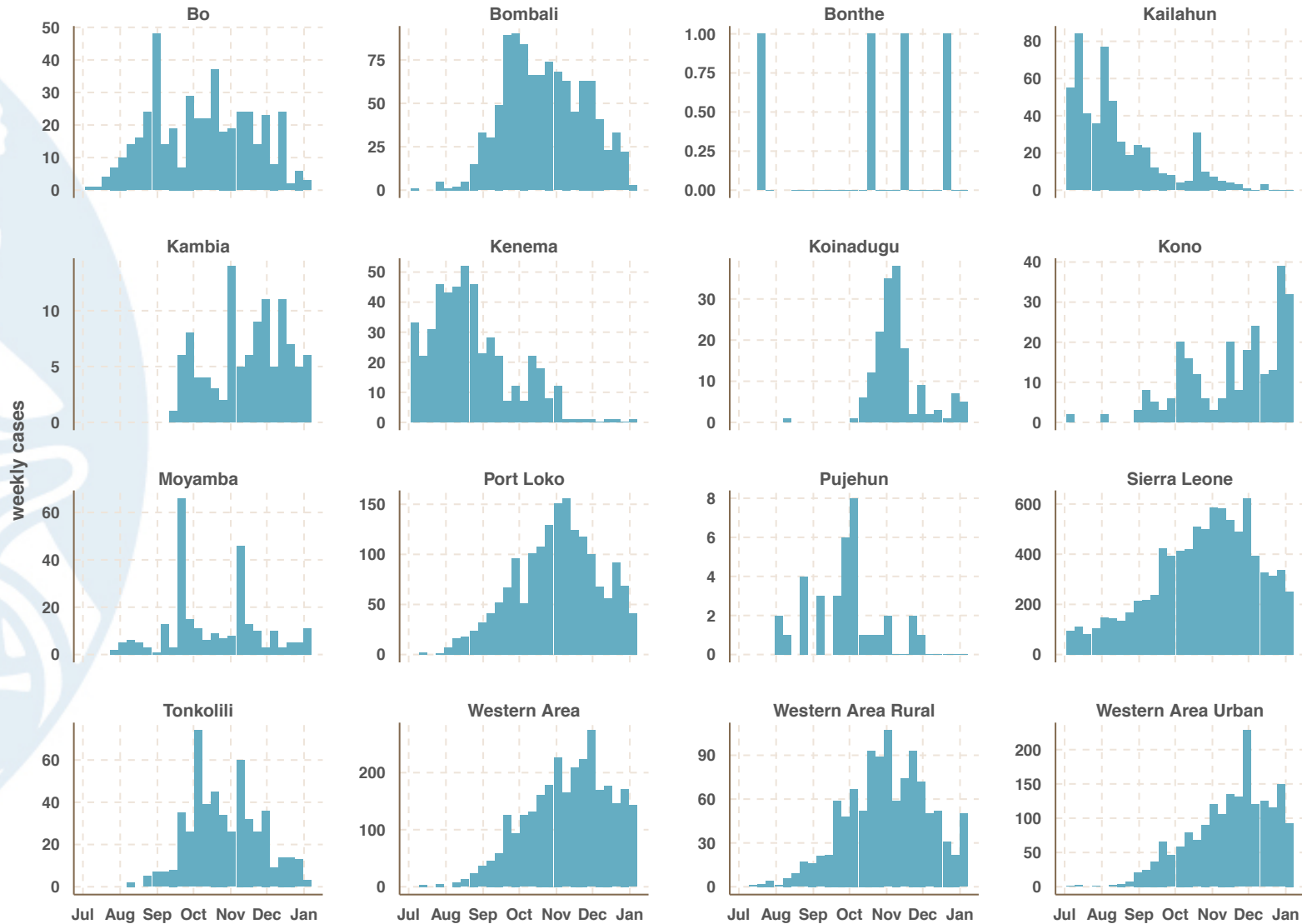

http://ntncmch.github.io/ebola/

Guinea – 4 January

Liberia – 4 January

Sierra Leone – 4 January