

Combining Data Across Spatial Scales to Inform Policy

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GTFCC Joint Meeting of Surveillance Working Groups, April 16, 2018





- Provide fine scale maps of cholera incidence
 - identify hotspots
- Combine datasets across spatial scales
- “Share strength” between places with more precise information with coarse *or missing* data.
- *Correct for under reporting*
- *Map other aspects of cholera epidemiology (e.g., CFR)*
- **Make tools to translate all of the above to *timely and policy relevant* conclusions**



Our goal...

Not “Forgoing...shoe leather epidemiology in favour of big data...”



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...but **using statistics to combine the results of shoe leather epidemiology and local information to get more out of our collective knowledge.**

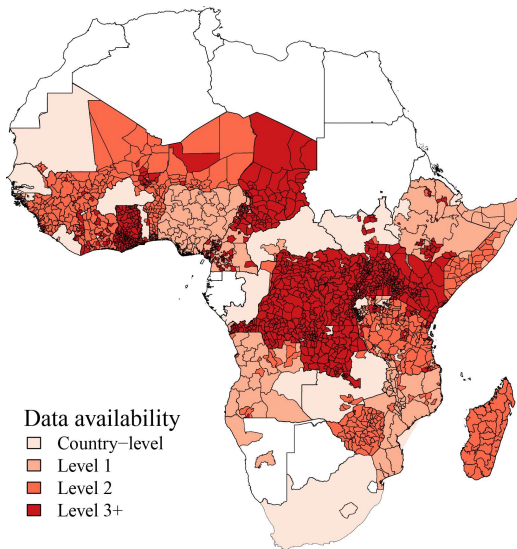
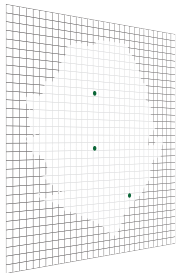


Fig. S2. Map of data on reported cholera cases from 2010-2016 included in generating the maps of cholera incidence. Color represents the lowest administrative level available for a given area.

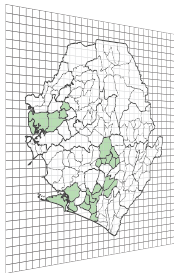


Points



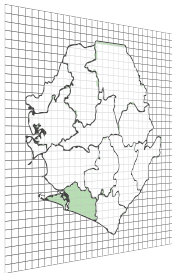
3 observations

Sub-district



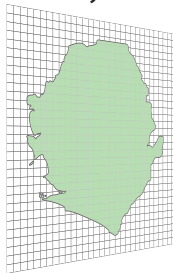
24 observations

District



2 observations

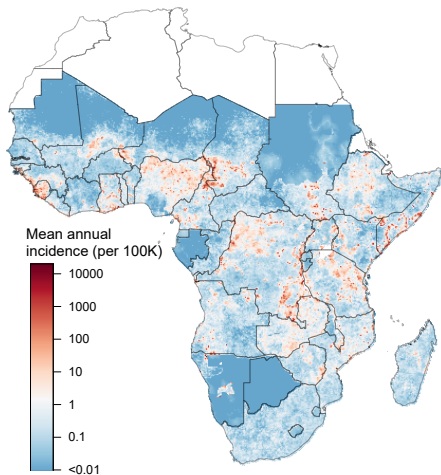
Country



1 observation

$$N_A \sim \text{Poisson} \left(\sum_{i \in A} \text{rate}_i \cdot \text{population}_i \right)$$

A



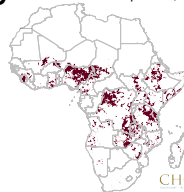
B Annual incidence >1 per 1,000

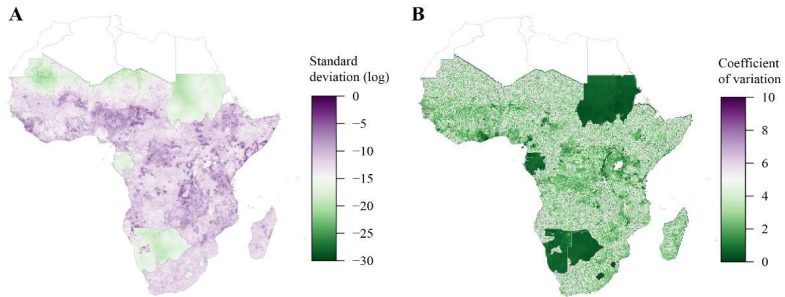


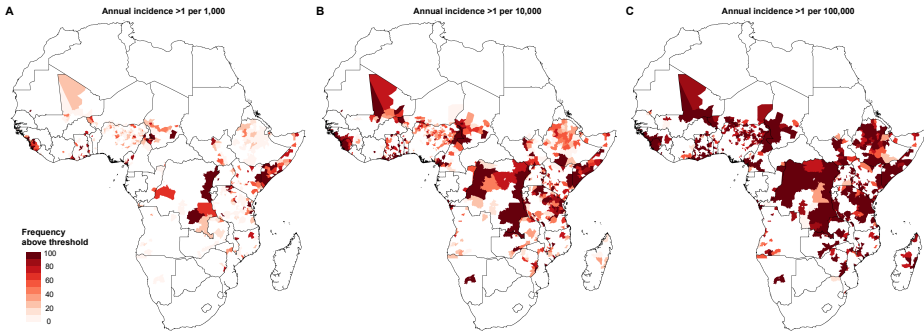
C Annual incidence >1 per 10,000



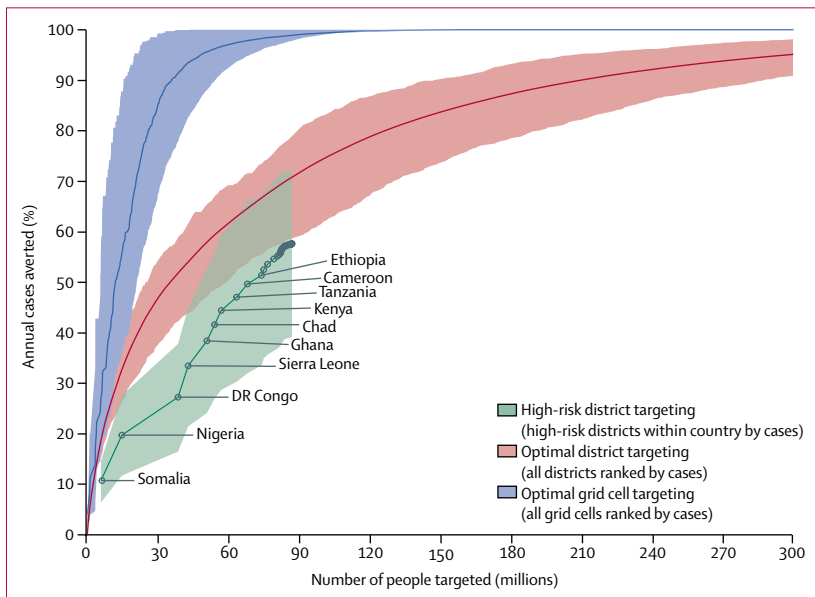
D Annual incidence >1 per 100,000

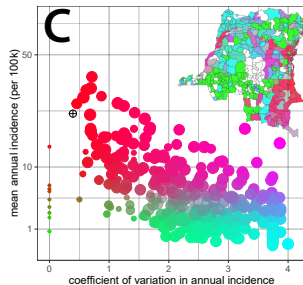
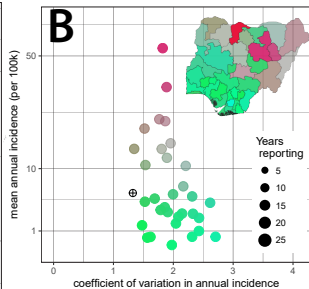
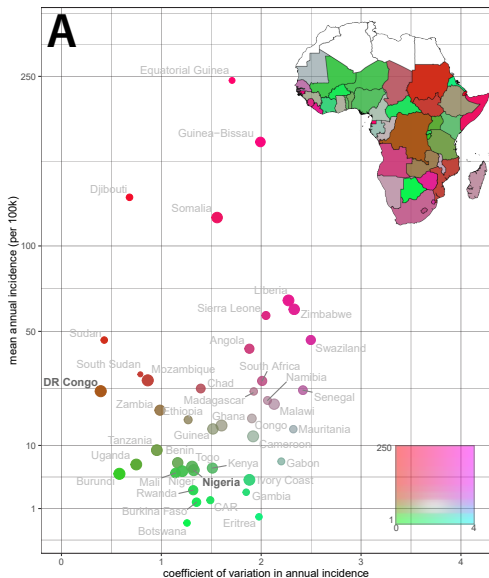






Why does it matter?







- Availability of data layers for use in GIS software
 - `iddynamics.jhsph.edu/cholera`
- Availability of data from a standardized interface
 - improved web interface for access and entering data in process
- Pipeline “real time” update of maps
 - regular updates
 - maps at a variety of spatial scales
 - *on demand maps*
- R package for access, manipulation and analysis of data



- Increased focus on tools and access

- Going global

- Going beyond reported incidence
 - CFR
 - over/under reporting
 - incorporate lab data (need negatives!)
 - endemic/epidemic spectrum
 - seasonality and timing

- 'Forecasting' and integrated analysis
 - OCV investment case
 - climatic change
 - "cholera sensitivity"
 - *more tomorrow...*

Collaborators and Data Contributors

- Médecins Sans Frontières/Epicentre
- Global Task Force for Cholera Control
- World Health Organization
- US Centers for Disease Control and Prevention
- Agence de Médecine Préventive
- UNICEF
- International Vaccine Institute
- ProMED
- MoH DRC
- WHO-EMRO (Abdinasar Abubakar)
- MoH Malawi
- MoH and WHO South Sudan
- ...many more MoHs and local WHO offices

Financial Support

- Bill and Melinda Gates Foundation