

# Diversity and Antimicrobial Resistance of *Salmonella* Paratyphi A: A Global Typhoid Genomics Consortium initiative

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*Kigali, Rwanda*

# Global Typhoid Genomics Consortium

2021-present

>200 members  
>50 countries

## Our Mission:

We aim to engage the global typhoid research community in order to aggregate *Salmonella* Typhi & Paratyphi A genomic data to monitor the emergence and spread of drug resistance and inform targeted public health action.

## Consortium goals:

1. Encourage prompt sharing of typhoid genome data for public health benefit
2. Facilitate the extraction and reporting of key data of public health relevance
3. Promote and facilitate the dissemination and use of information derived from typhoid genomic data to monitor antimicrobial resistance and post-vaccination impact

## Consortium coordinators:



Kathryn Holt  
LSHTM



Zoe Dyson  
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Megan Carey  
LSHTM



Stephen Baker  
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## Global diversity and antimicrobial resistance of typhoid fever pathogens: Insights from a meta-analysis of 13,000 *Salmonella* Typhi genomes

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Group author details:  
Global Typhoid Genomics  
Consortium Group Authorship  
[See page 32](#)

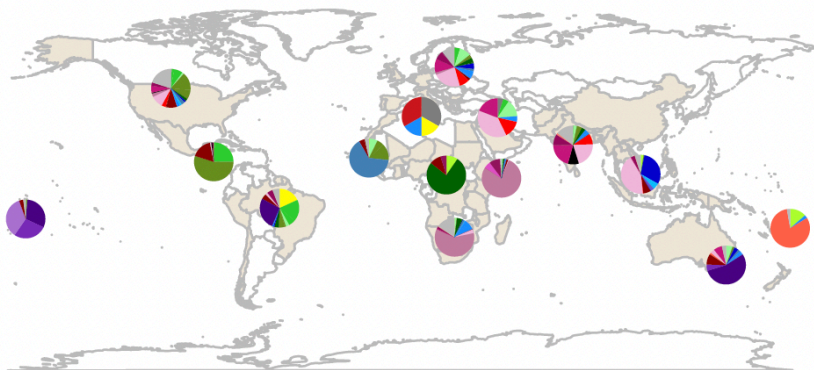
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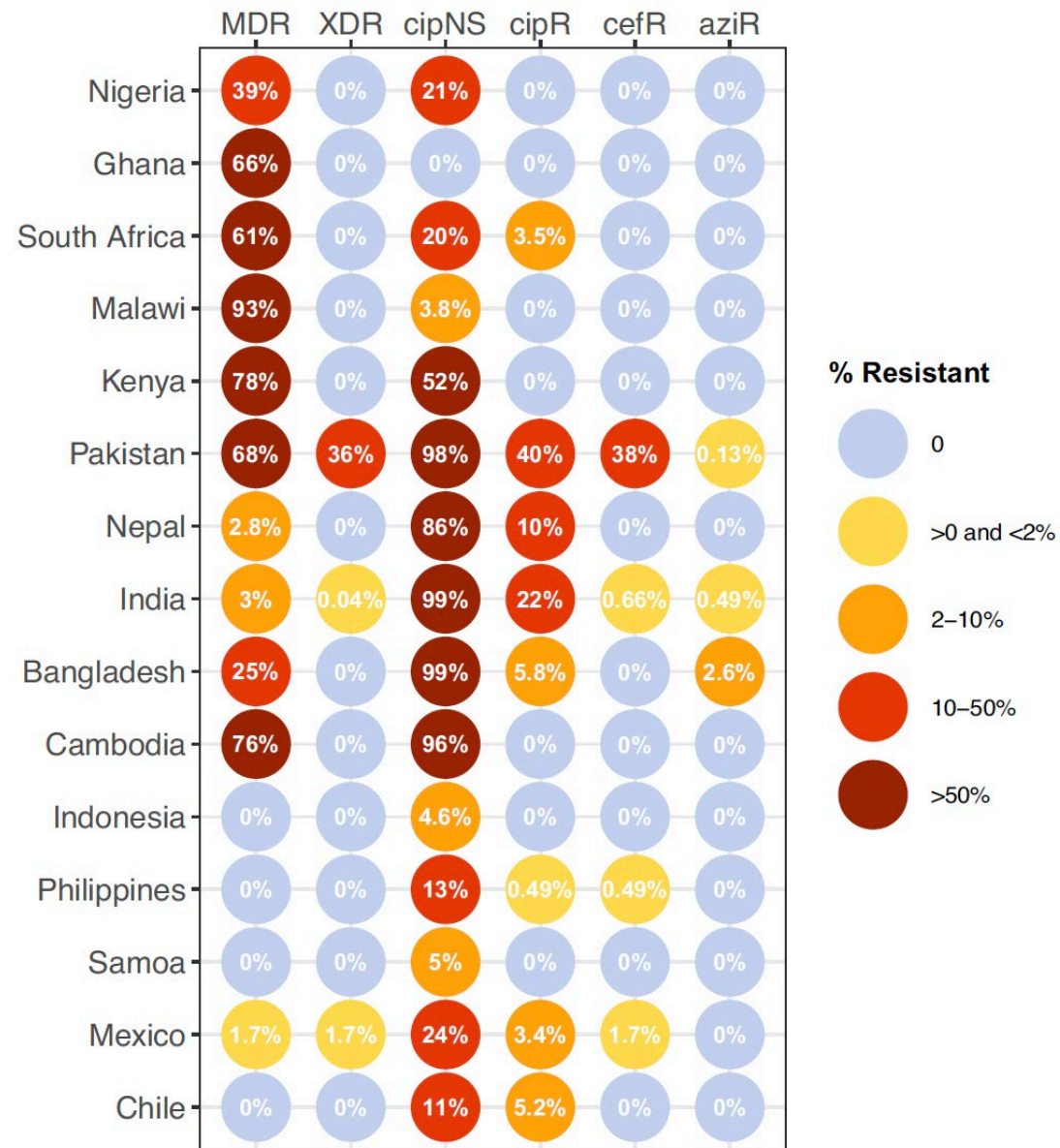
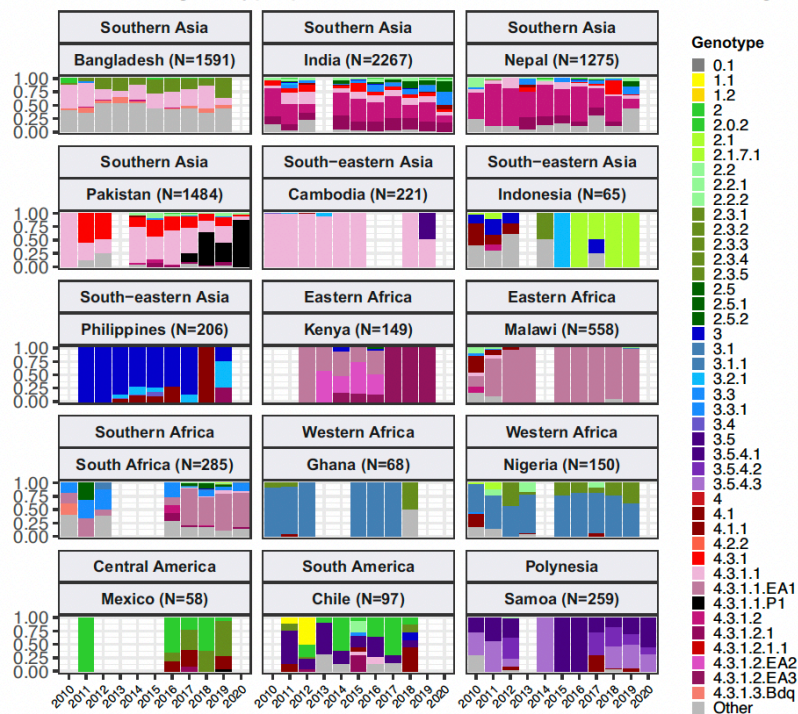
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# Genetic diversity of Typhi from 13k genomes

a) Genotype prevalence by world region, 2010–2020

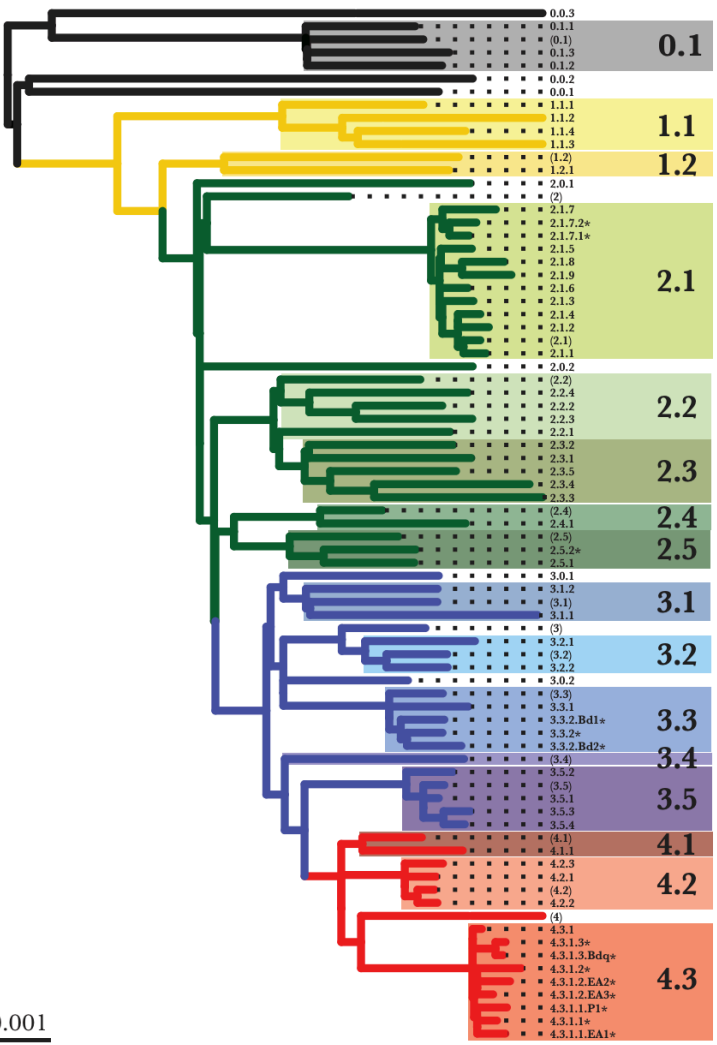


b) Annual genotype prevalence, for countries with at least 50 genomes

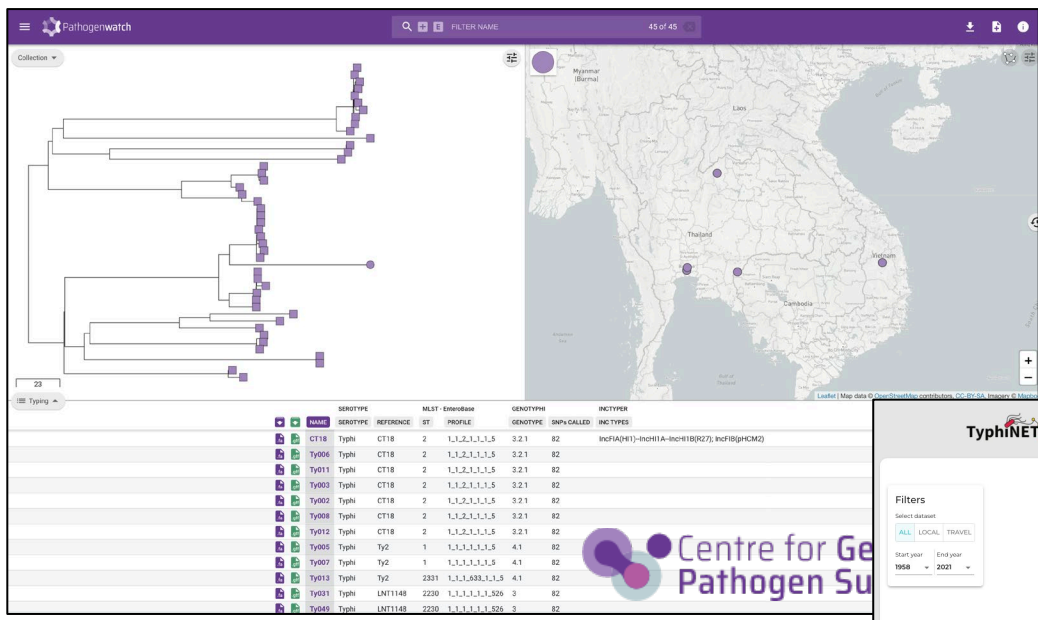


# Global Typhoid Genomics Consortium Resources

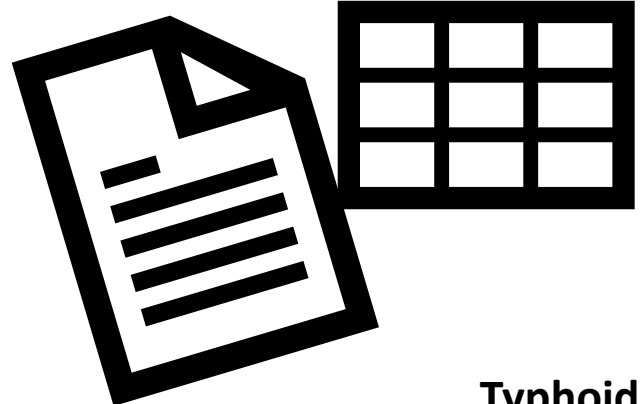
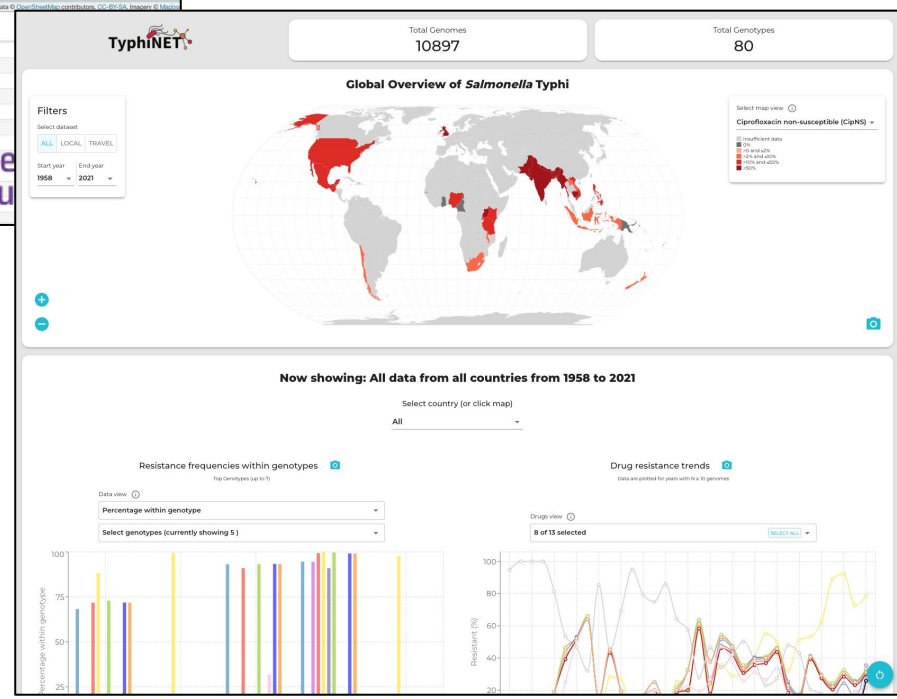
## GenoTyphi genotyping software



## Typhi Pathogenwatch: <http://pathogen.watch>



## TyphiNET surveillance dashboard <http://typhi.net>



## Typhoid Genomics Metadata Template: <https://bit.ly/typhiMeta>

0.001

[github.com/typhoidgenomics/genotyphi](https://github.com/typhoidgenomics/genotyphi)

# Global Typhoid Genomics Consortium Working Groups

1. Typhi transmission dynamics & phylodynamics
2. GenoTyphi Mykrobe software development
3. GenoTyphi genotyping scheme
4. Paratyphi A genetic epidemiology & software tools

# Paratyphi A special interest group

## Motivation

To curate a global collection of Paratyphi A whole genome sequences to better understand the global distribution of Paratyphi A pathogen variants, their transmission dynamics, and antimicrobial resistance for public health benefit.

## Goals and aims

1. Extend the current GTGC standardised metadata template for use with Paratyphi A data and long-read nanopore data
2. To better understand the global genetic epidemiology of Paratyphi A, including spatio-temporal distribution of AMR pathogen variants, their emergence, and transmission dynamics
3. Increase the accessibility of the Paratype genotyping framework via Mykrobe and Pathogenwatch

## Collaboration

- Contacted corresponding authors who have published at least a single Paratyphi A genome
- Responses from >90 consortium members in >40 countries

## Working groups

1. Statistical analysis of AMR and pathogen genotypes
2. Phylodynamic analysis of pathogen transmission dynamics
3. Accessible software tools to facilitate the analysis of Paratyphi A genome data



Jaspreet Mahindroo  
Imperial College

## Working group leads:



Yogesh Hooda  
CHRF

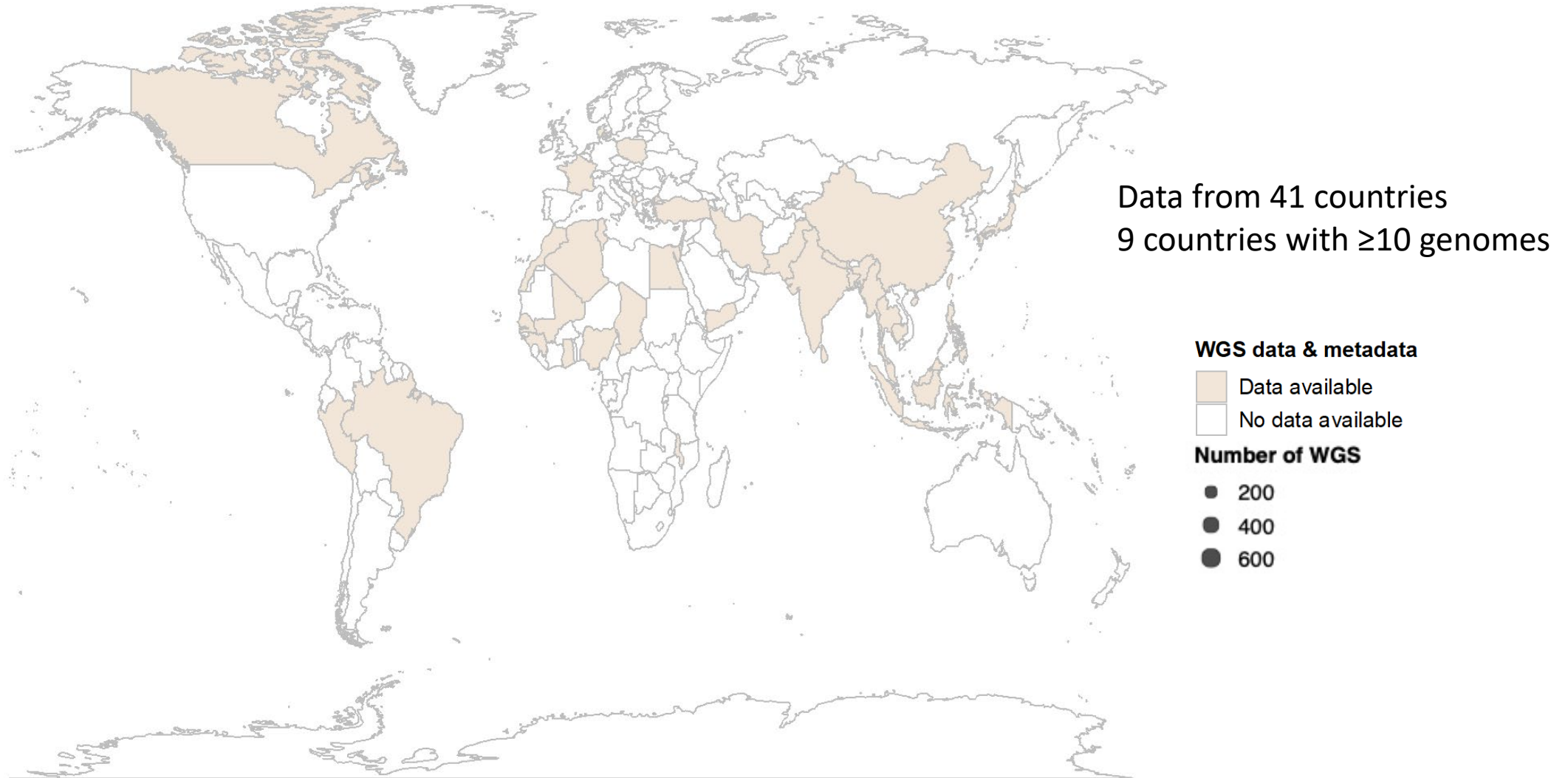
Zoe Dyson  
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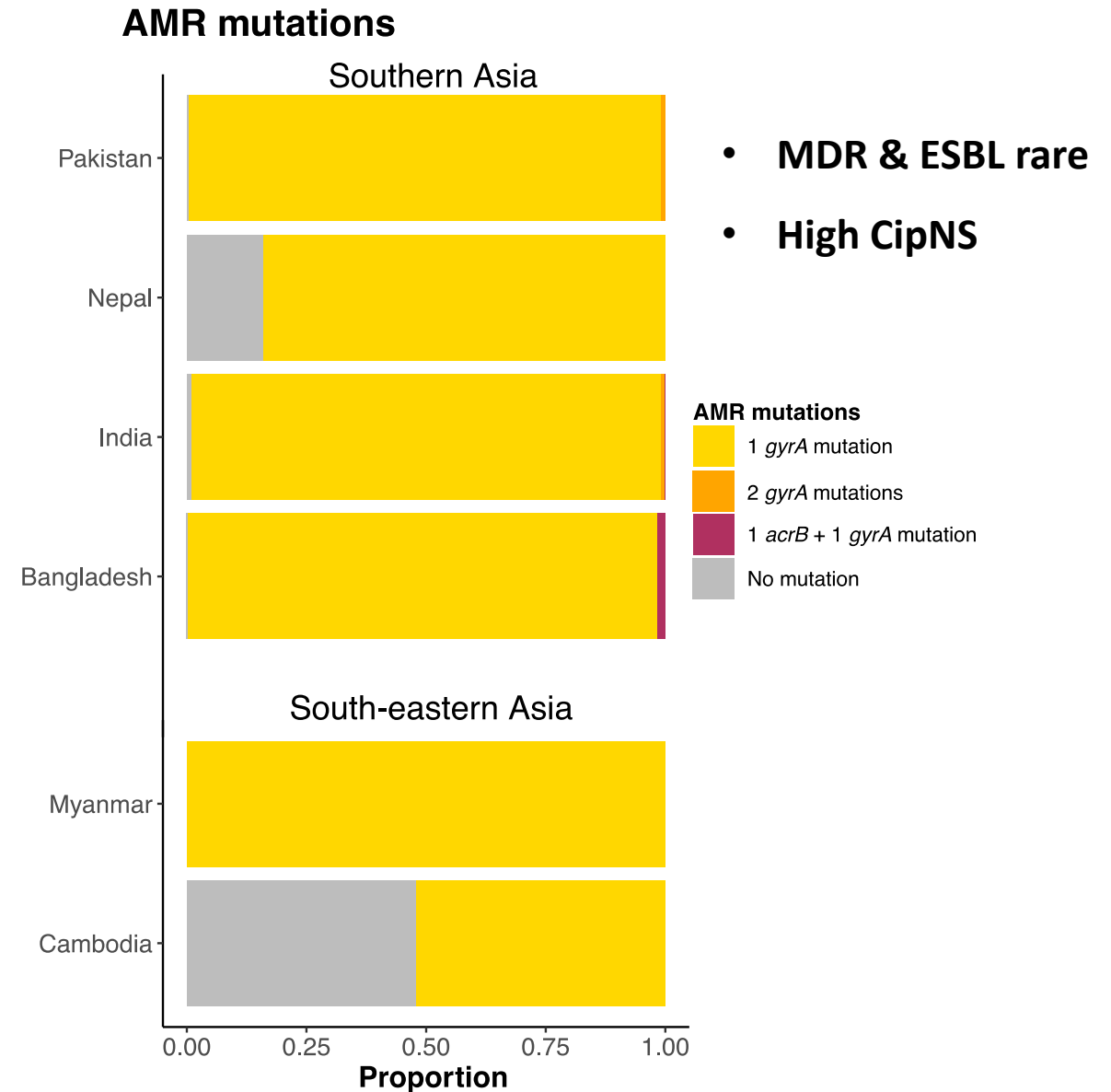
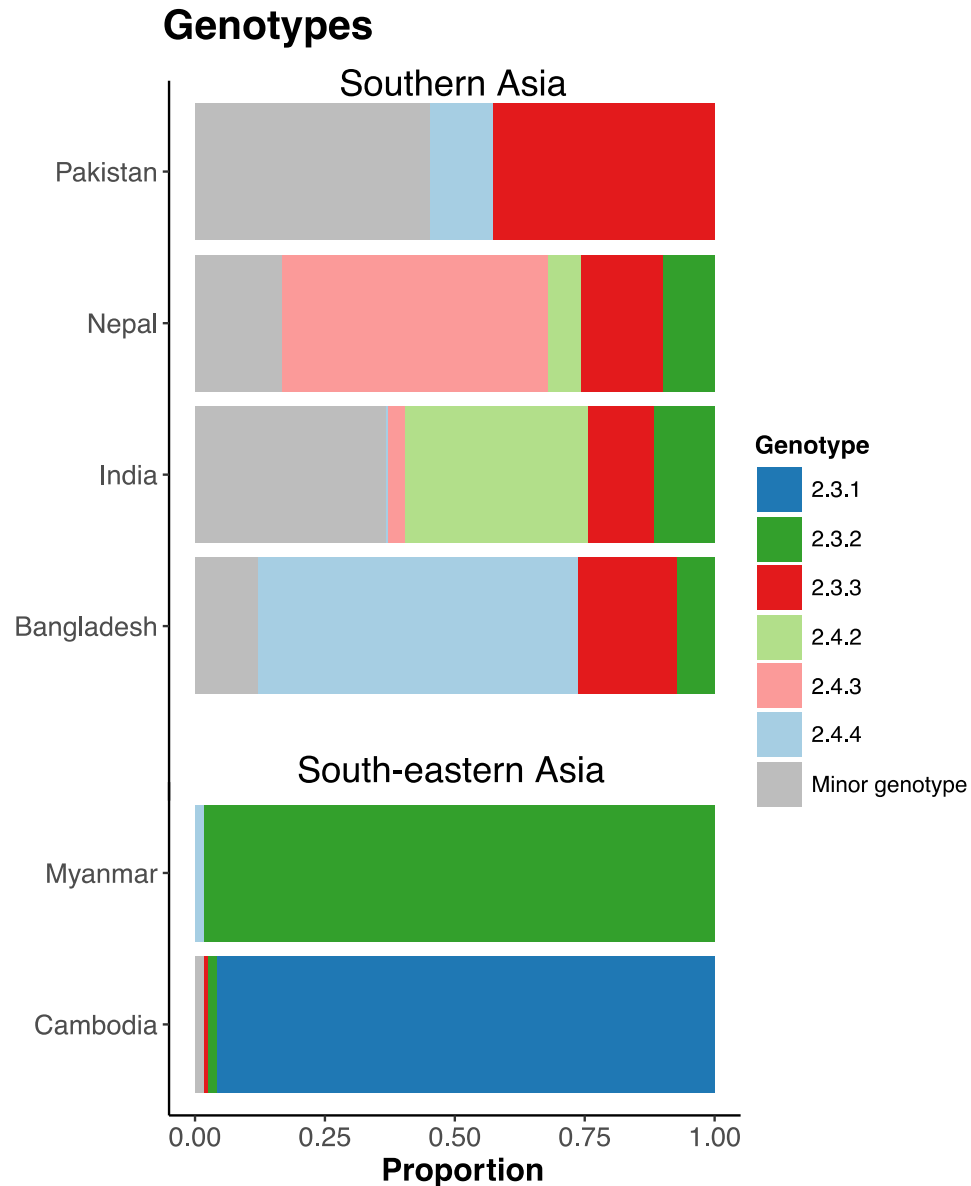
# Public genome meta-analysis: samples available

## Distribution of public Paratyphi A WGS data



*n=2,561 genomes published prior to July 2023*

# Public genome meta-analysis: genotype & AMR prevalence



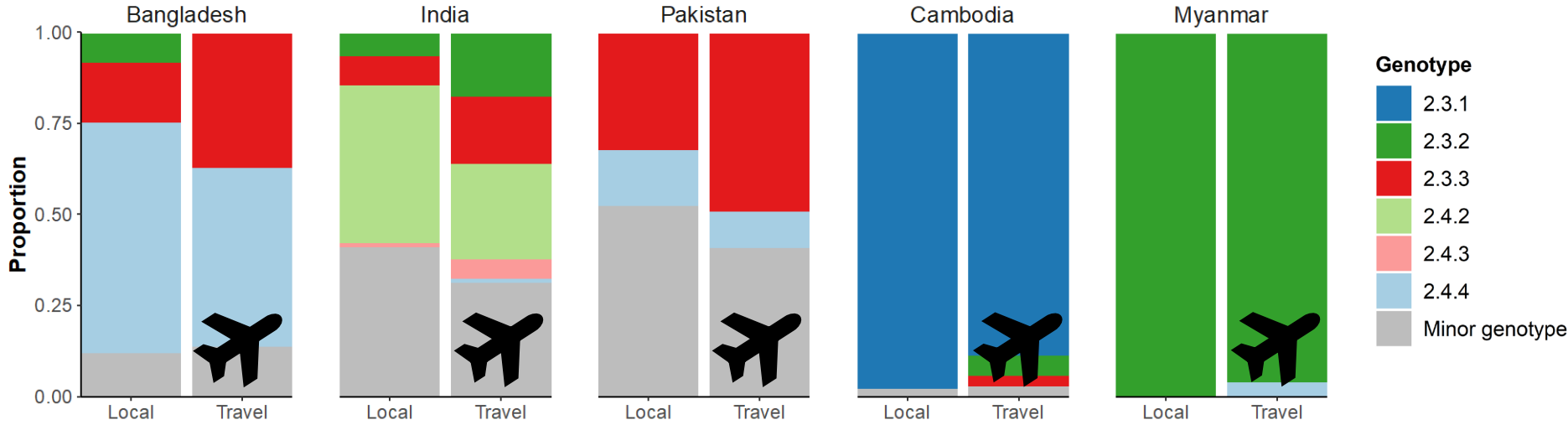
Minor genotypes present at <20%

**Endemic countries with  $n \geq 20$  non-targeted sequences post 2010**



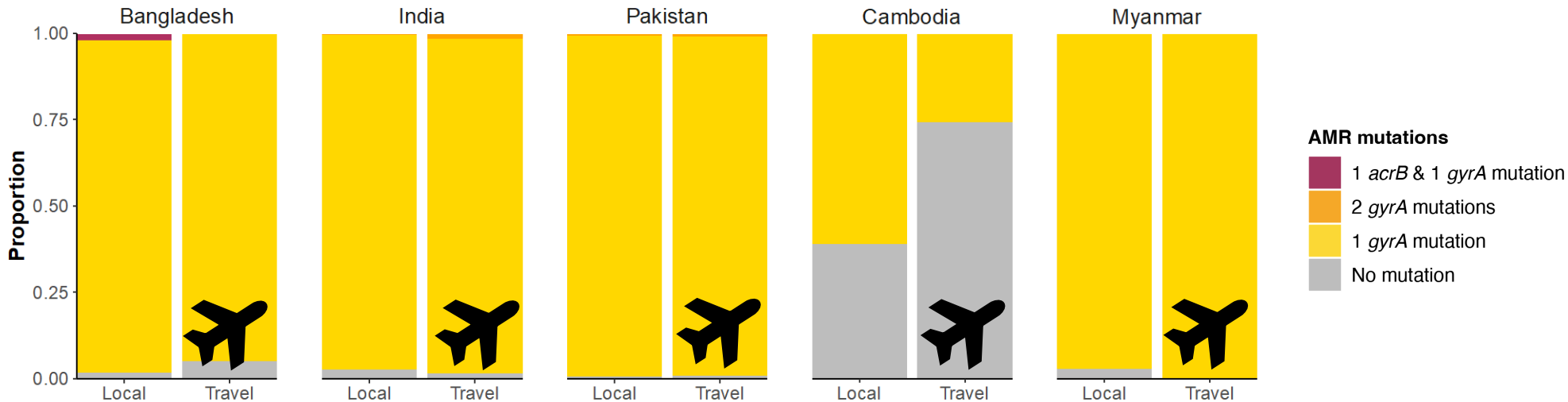
# Travel-associated cases predict endemic populations

## Genotypes



**Pearson correlation 0.95**  
**p=2.2x10<sup>-16</sup>**

## AMR mutations



**Pearson correlation 0.93**  
**p=7.1x10<sup>-12</sup>**

**Post 2010; minor genotypes present at <20%**

# Future plans

- **Inaugural special interest group meeting in January 2024**
- **Formal working group analyses**
  - Integrate ~800 more genomes into the GTGC collection
  - Statistical analysis of genotype and AMR prevalence
  - Phylodynamic analysis of transmission dynamics
  - Develop accessible software solutions for Paratyphi A data analysis
- **Inform Paratyphi A control and intervention strategies**
  - Empirical therapy
  - Baseline data ahead of potential future vaccination programmes

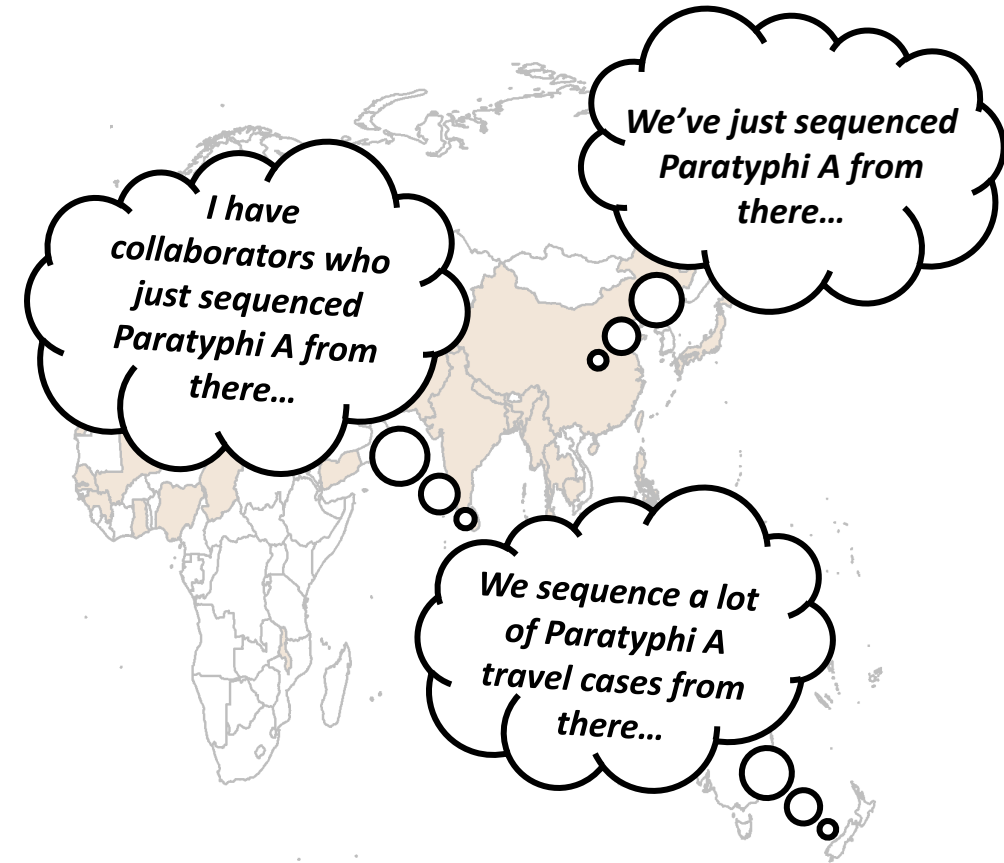
# How to get involved

## Seeking:

- Paratyphi A genomes and metadata
- Contributors to working group analyses

## How to contribute:

- Membership questionnaire: <https://bit.ly/ParatyphiREG>
- Come speak to us or email [typhininfo@gmail.com](mailto:typhininfo@gmail.com)



# Acknowledgements & further information

## Acknowledgements

**Global Typhoid Genomics Consortium**

<http://typhoidgenomics.org>

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Dr Jaspreet Mahindroo

**Oxford Big Data Institute, UK**

Prof David Aanensen

**LSHTM, UK**

Prof Kathryn Holt

Dr Megan Carey

## Typhoid Genomics Consortium

**Consortium membership**

<http://bit.ly/typhiREG>

<http://bit.ly/typhiMOU>

**Paratyphi A working group membership**

<https://bit.ly/ParatyphiREG>

## Funding

LSHTM ISSF3 Pump Priming Grant





# Travel-associated paratyphoid cases

