

Data inequity and typhoid conjugate vaccines

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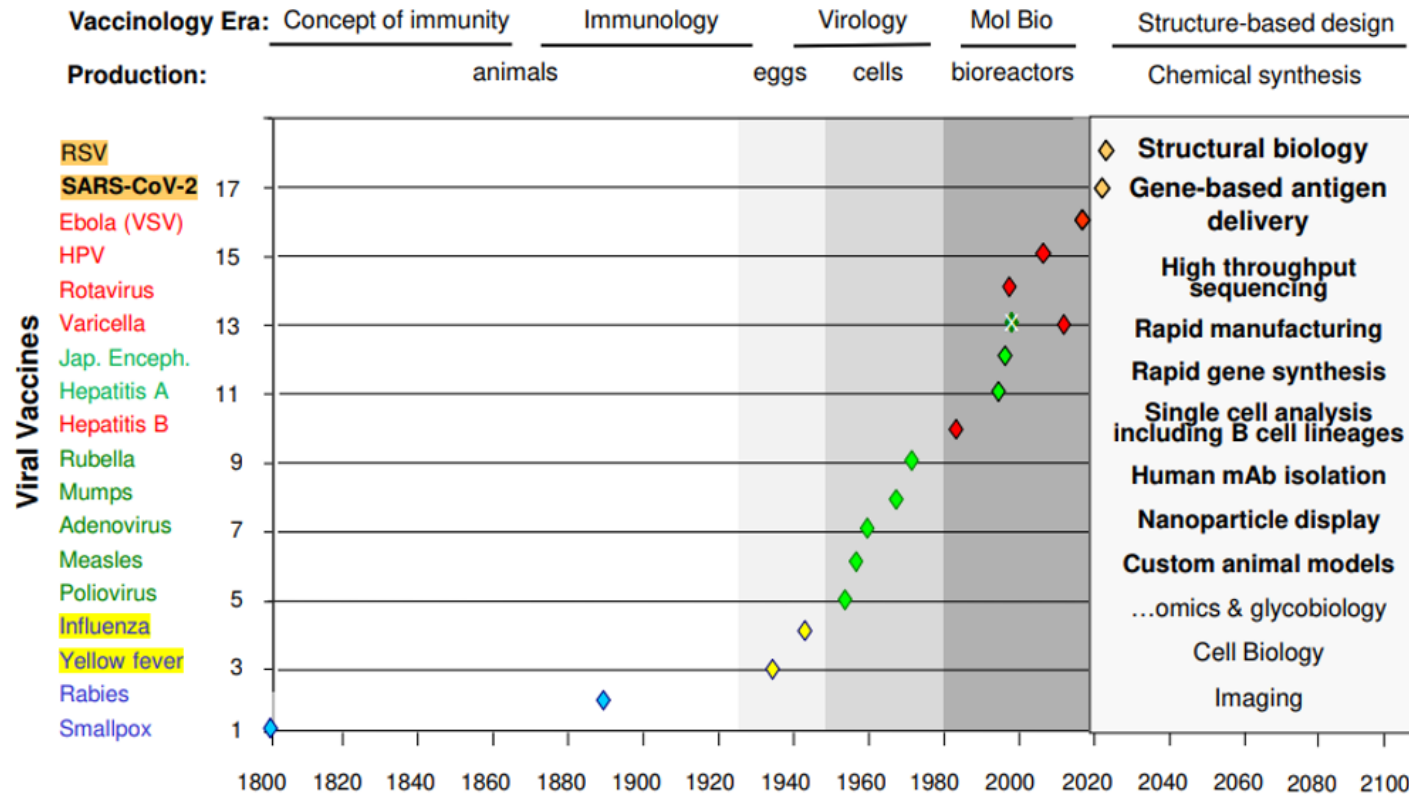
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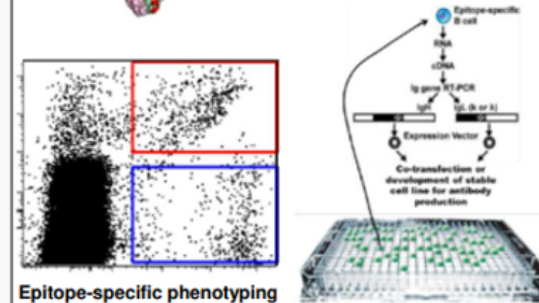
Vaccine science has never moved so fast...technology advances make new vaccines possible

Major Conceptual and Technological Advances



Structural analysis of antigenic sites on viral surface glycoproteins

Isolation of human monoclonal antibodies from single B cells



Epitope-specific phenotyping

Sequencing for viral diversity and escape mutations



Sequencing B cells to define clonal lineages; TCR & BCR-specific transcriptome

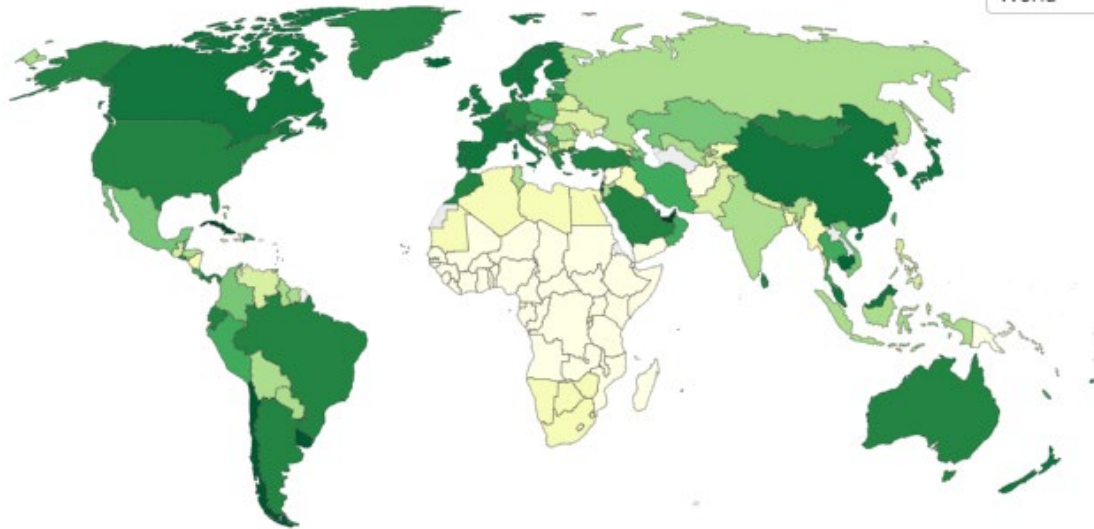
Courtesy of Dr. Barney Graham

Inequity persists...COVID-19 global vaccine distribution, October 2021

COVID-19 vaccine doses administered per 100 people, Oct 30, 2021
All doses, including boosters, are counted individually. As the same person may receive more than one dose, the number of doses per 100 people can be higher than 100.

Our World
in Data

World



Source: Official data collated by Our World in Data - Last updated 31 October 2021, 10:00 (London time)
OurWorldInData.org/coronavirus • CC BY

- 7 billion doses had been administered globally
- 49.4% of the world population had received at least one dose of a COVID-19 vaccine
- Only 3.6% of people in low-income countries have received at least one dose

[Which countries are on track to reach global COVID-19 vaccination targets? - Our World in Data](#)

Vaccines don't save lives...vaccination does

- Core principle of vaccinology is the public health goal of reducing infectious diseases
- Relies to a variable degree on population immunity
- Relies on systems to deliver vaccines
- Safety is paramount – vaccines are given to healthy people.

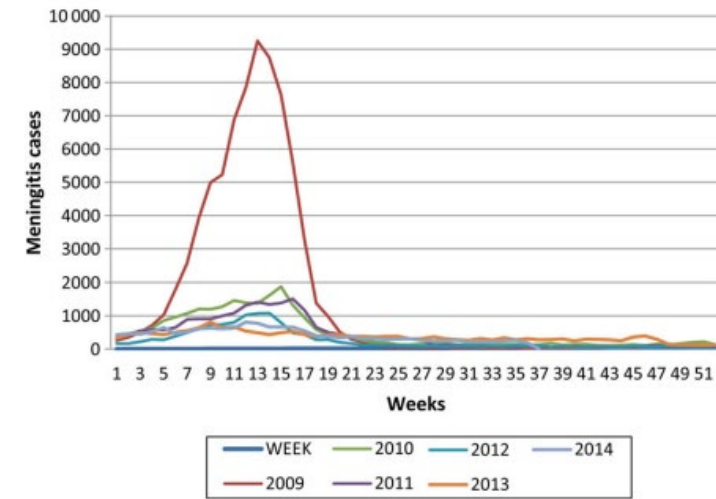


Figure 1. Incidence of meningitis in the African meningitis belt, 2009–2014. Source: www.meningvax.org.

Public Health Impact After the Introduction of PsA-TT: The First 4 Years

Fabien V. K. Diomandé,^{1,a} Mamoudou H. Djingarey,² Doumagoum M. Daugla,³ Ryan T. Novak,¹ Paul A. Kristiansen,⁴ Jean-Marc Collard,⁵ Kadidja Gamougam,⁶ Denis Kandolo,² Nehemie Mbakuliyemo,^{2,b} Leonard Mayer,¹ James Stuart,⁷ Thomas Clark,¹ Carol Tevi-Benissan,⁸ William A. Perea,⁹ Marie-Pierre Preziosi,^{10,11} F. Marc LaForce,^{12,c} Dominique Caugant,⁵ Nancy Messonnier,¹ Oladapo Walker,² and Brian Greenwood⁷










Vaccine programs must be equitable, affordable and feasible

- Vaccine delivery systems designed to reach every individual regardless of:
 - Socioeconomic status
 - Geography
 - Age
 - Sex
- Curative care limited by requirement for fixed structures
- Financing mechanisms in place



World Health Organization (WHO)-prequalified typhoid conjugate vaccines: Safe, well-tolerated, efficacious AND fit for purpose for vaccination

Programmatic characteristics

	Typbar TCV®	TYPHIBEV®
 MANUFACTURER	Bharat Biotech, India	Biological E, India
 VACCINE TYPE	Vi polysaccharide from <i>Salmonella</i> Typhi conjugated to tetanus toxoid carrier protein	Vi polysaccharide from <i>Citrobacter freundii</i> conjugated to CRM197 carrier protein*
 FORMULATION	Liquid: ready to use	
 ADMINISTRATION	Intramuscular injection	
 AGES	≥6 months to ≤65 years	≥6 months to ≤45 years
 NUMBER OF DOSES REQUIRED	1	
 WHO-PREQUALIFIED PRESENTATION(S) AVAILABLE WITH GAVI SUPPORT	5-dose vial	
 COLD CHAIN VOLUME	5-dose vial: 2.9 cm ³ /dose	5-dose vial: 2.9 cm ³ /dose
 SHELF LIFE	36 months at storage temperature: 2-8°C	24 months at storage temperature: 2-8°C



Gavi supports TCV introduction



Photo: Bill & Melinda Gates Foundation/Sam Reinders



Single dose routine

- Co-financed
- Vaccine introduction grant
- Routine immunization at 9 months or 15 months old



Photo: PATH/Asim Hafeez

One time single dose catch-up campaign

- Financed by Gavi
- Operational cost support
- Up to 15 years of age

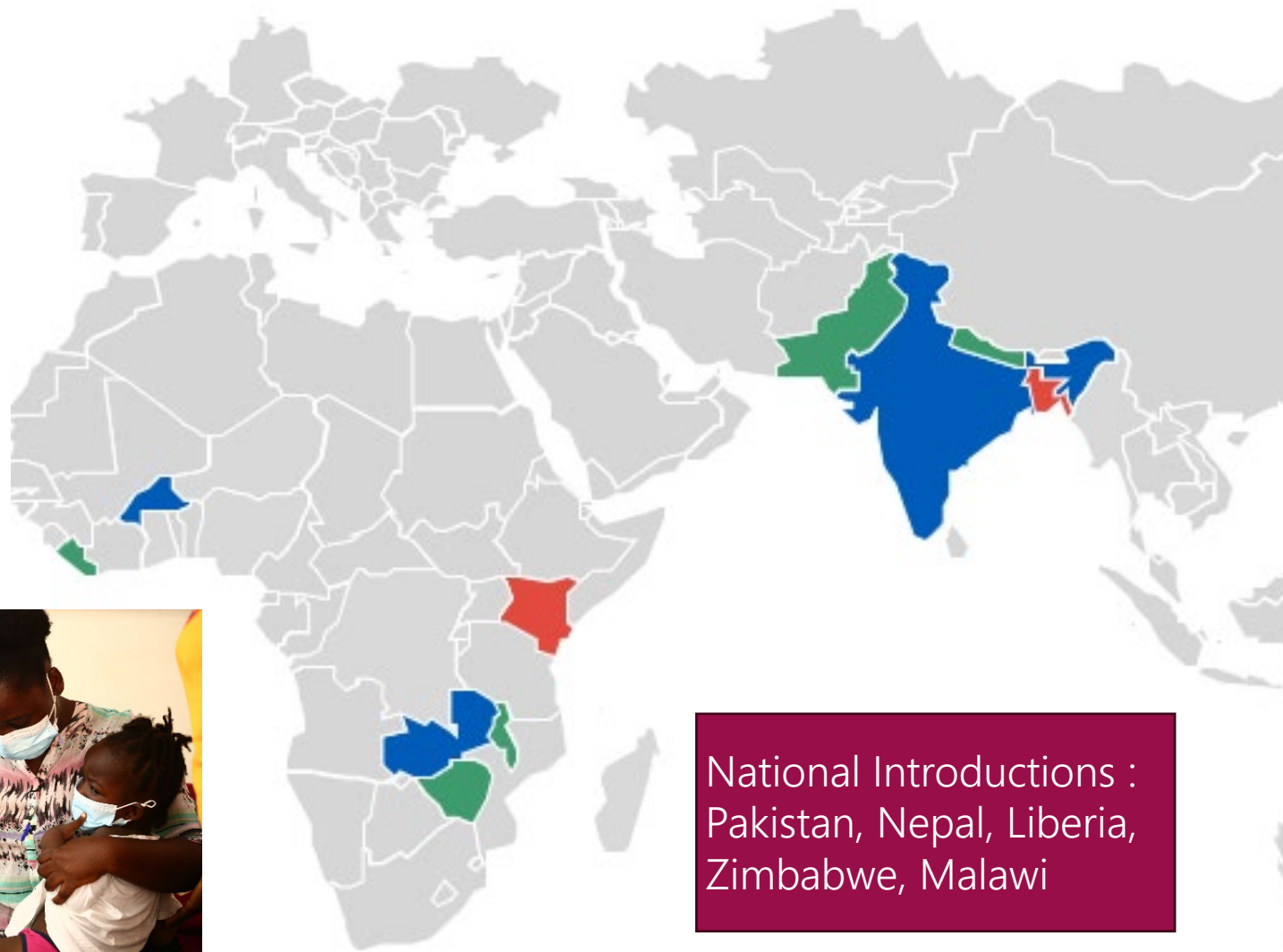
Getting TCV to kids who need it: Almost 60 million vaccinated and counting....



Credit: Kudzai Tinago



Credit: Nurudeen Sanni



National Introductions :
Pakistan, Nepal, Liberia,
Zimbabwe, Malawi



Credit: PHC Global



Malawi Integrated National Campaign, May 2023: TCV, MR, OPV, Vitamin A

Together We Can

Take on Typhoid

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Amidst challenges, Malawi delivers for the children

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Celebrating Nepal's typhoid conjugate vaccine introduction



Rocking his sho



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Reaching 9 million children with vaccines in Malawi

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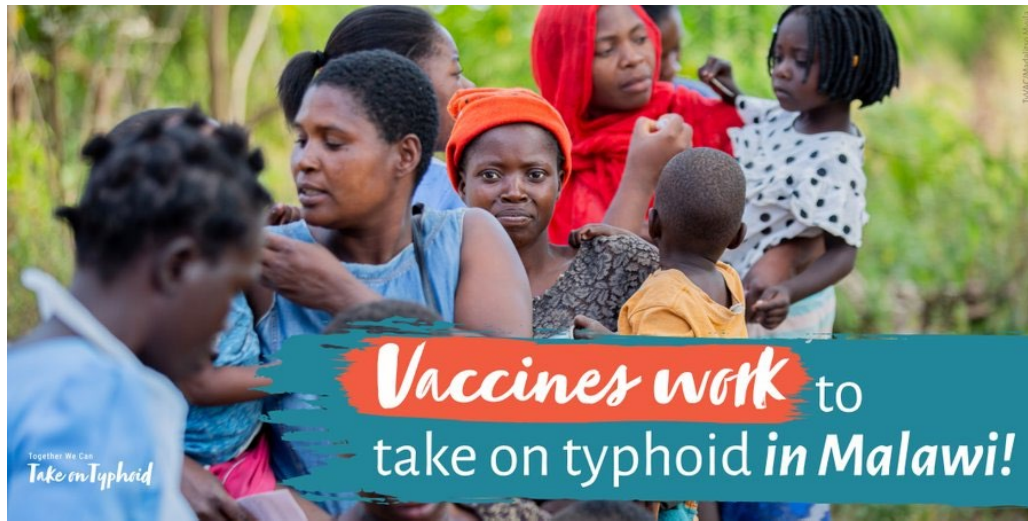
Take on Typhoid Retweeted
Gavi, the Vaccine Alliance @gavi · May 16
Congratulations Malawi for becoming the third African country to introduce typhoid conjugate vaccine into routine immunisation!

We're proud to work with @MalawiUNICEF, @WHOMalawi and @PreventTyphoid to support @health_malawi's work to #TakeOnTyphoid:

Coalition against Typhoid
May 19 ·

Malawi's typhoid conjugate vaccine introduction is poised to protect millions of children from typhoid. 🎉 Congratulations, Malawi!

<https://www.coalitionagainststypthoid.org/amidst.../>



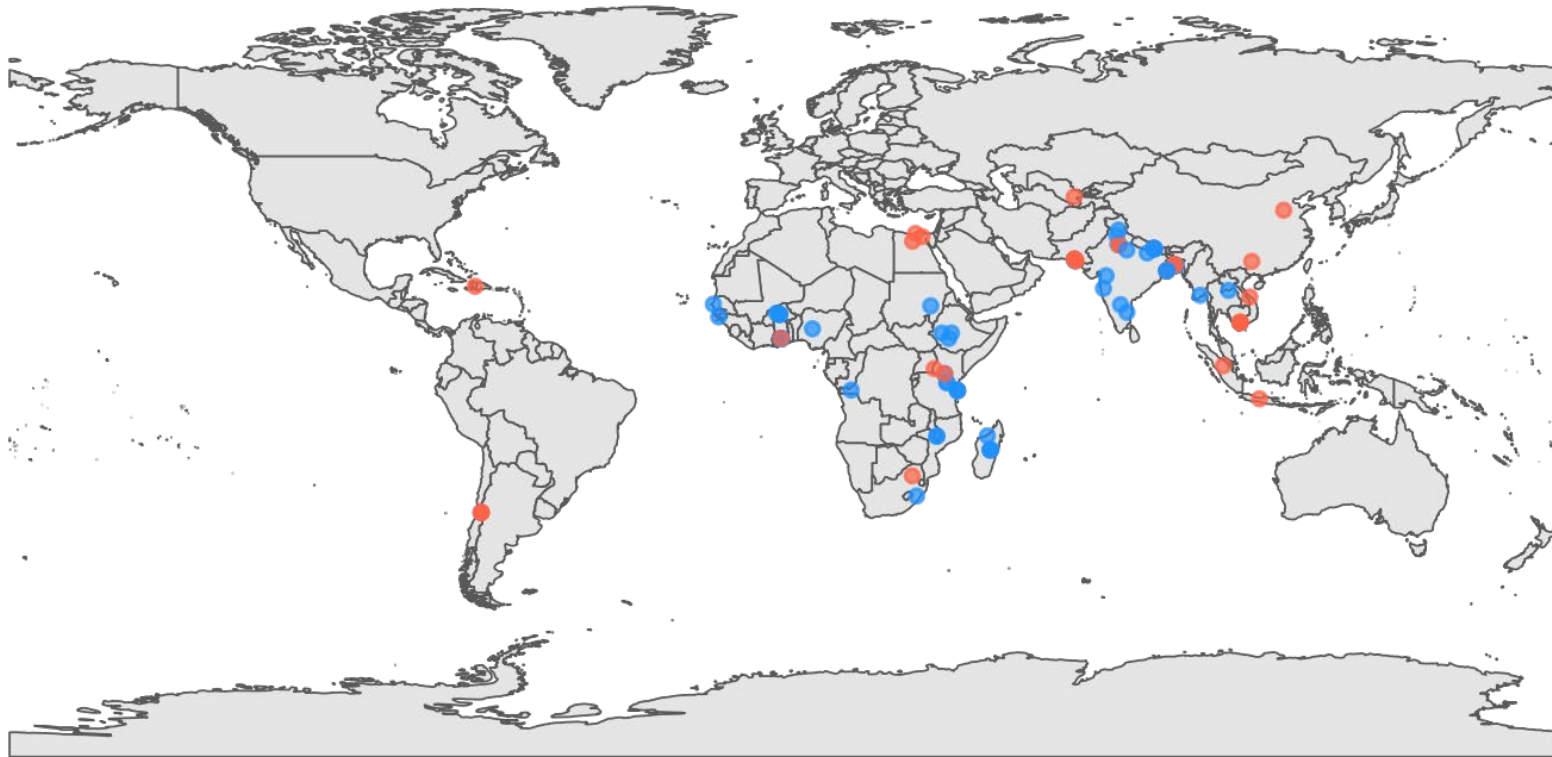
Vaccines work to take on typhoid in Malawi!



Congratulations Malawi

Population-based studies of typhoid incidence

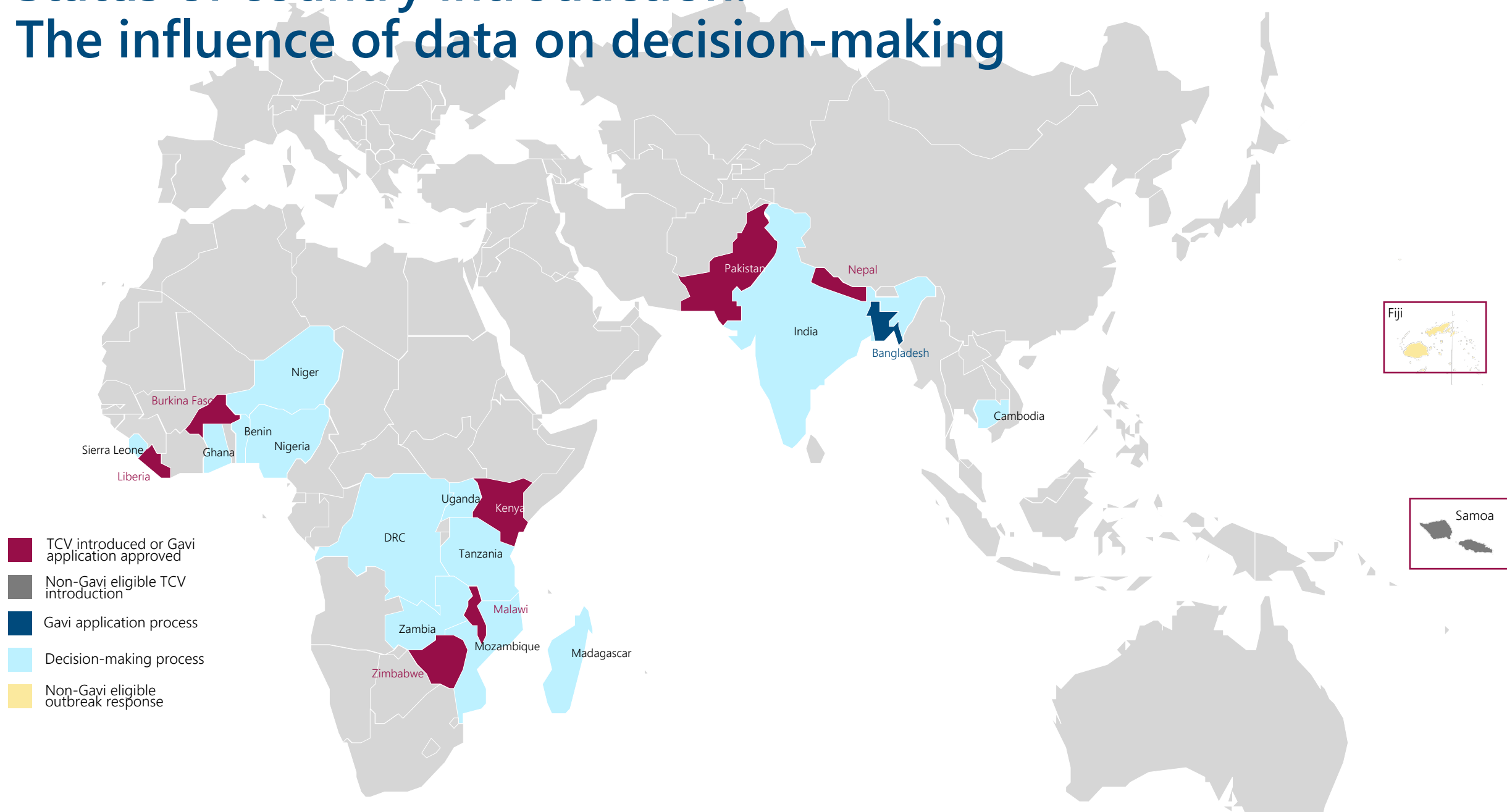
Incidence data in the updated burden model



- **Studies in previous model**
(published 1980-2013)
(32 studies, 22 locations)
- **Studies in new model**
(published 1980-2021)
(43 studies, 60 locations)

Courtesy of Dr. Virginia Pitzer

Status of country introduction: The influence of data on decision-making

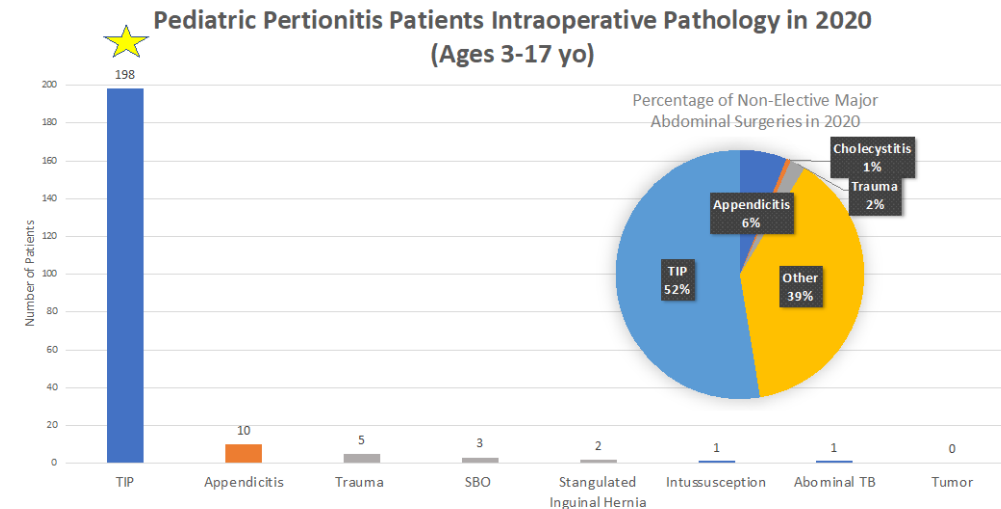


What about areas without population-based data?

The example of intestinal perforations in Niger



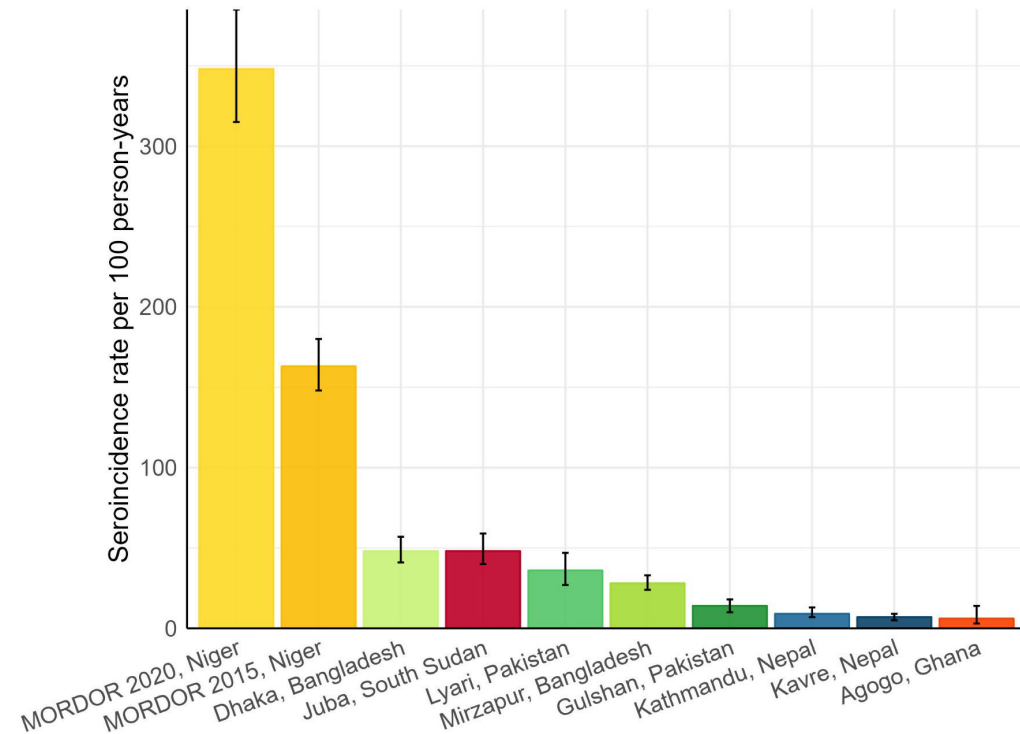
- Surgeons report excessive numbers of cases of TIP
 - Most marginalized children without access to care
 - Economically catastrophic for families
 - Complications, including ostomies are difficult to manage
 - Case fatality rates up to 30%
- Areas without blood culture capabilities
 - Children present late in course of disease, often having received antibiotics, lowering sensitivity of blood culture further



Courtesy of Drs. Yakoubou Sanoussi and Katherine Shafer

Coming together for solutions to data inequity: Seroepidemiology in Niger

- Samples collected from children < 5yo in Dosso, Niger as part of MORDOR study
- Burden of typhoid is 7x greater than other high burden settings in South Asia and Africa
- Between 2015 and 2020, typhoid sero-incidence doubled



Estimated using HlyE IgA + IgG

Courtesy of MORDOR investigators, SABIN/Jessica Seidman, Richelle Charles, Kirsten Aiemjoy

Data inequity solutions: From readily achievable to aspirational

- Vaccine introduction to demonstrate impact
- Clinical (e.g. TIP) surveillance
- Serosurveillance
- Environmental surveillance
- Sentinel blood culture surveillance
- Point-of-care diagnostics
- Population-based blood culture surveillance
- Integrated sustainable multi-disease surveillance and capacity building



Disease prevention is the goal



Young girl in Niger with ostomy following emergency operation for intestinal perforation



Young girl in Malawi following vaccination with TCV



THE AGA KHAN UNIVERSITY



The Typhoid Vaccine Acceleration Consortium (TyVAC) is led by the Center for Vaccine Development and Global Health at the University of Maryland School of Medicine, the Oxford Vaccine Group at the University of Oxford, and PATH. TyVAC is funded by the Bill & Melinda Gates Foundation.