



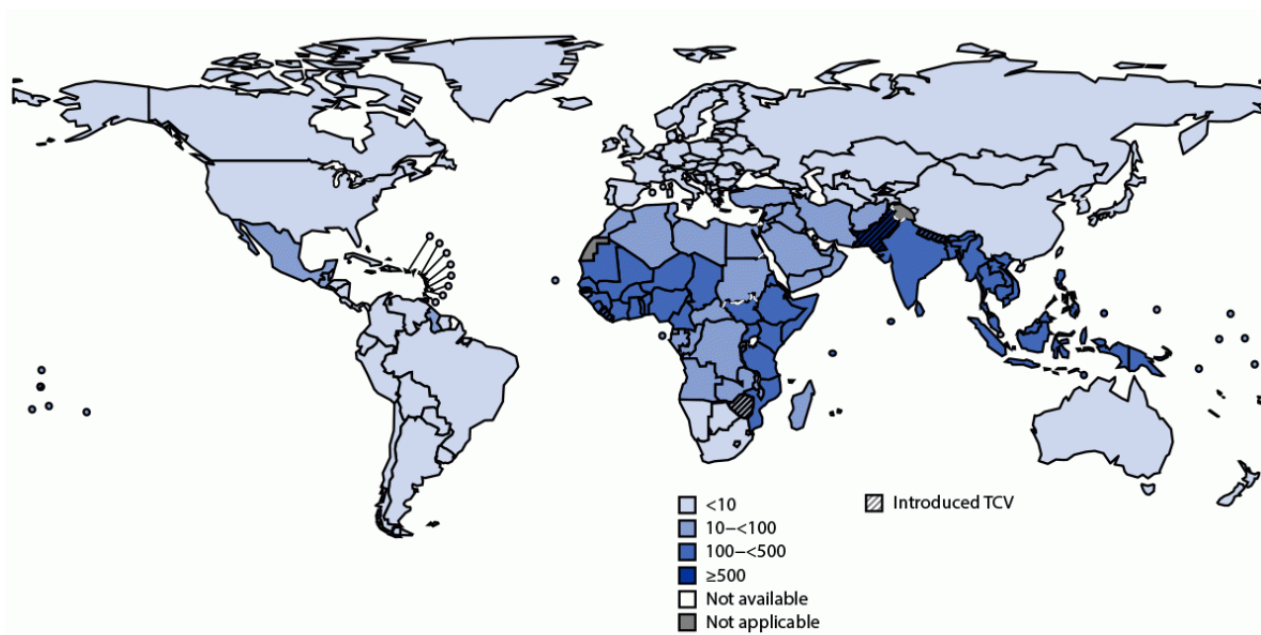
Fighting Typhoid: The Importance of Evidence for Effective Prevention and Control

13th International Conference on
Typhoid & Other Invasive Salmonellosis
December 5, 2023

 **SABIN**
VACCINE INSTITUTE

Typhoid remains a **significant public health challenge** in Asia and Africa

Estimated typhoid fever incidence by country, 2022



9 million fall sick from typhoid fever annually, killing **110,000** people.

Emergence of antibiotic - resistant *S. typhi*

Typhoid control is threatened by dynamic forces

Climate change

Over 20 million people being forced to leave their homes due to extreme weather events each year

Conflicts

108 million people already displaced by violence and armed conflicts

Urbanization

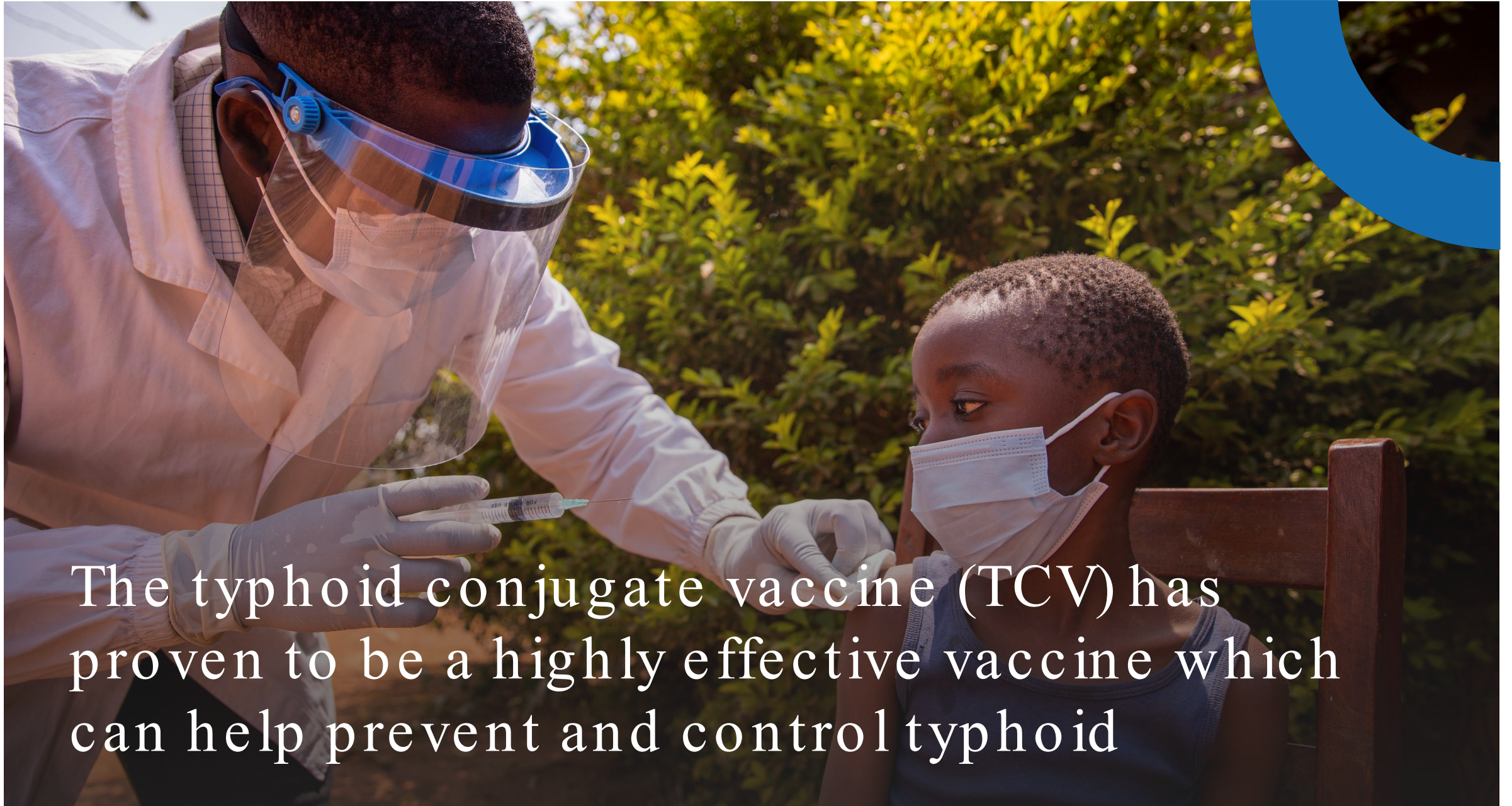
By 2050, 7 out of 10 people in the world will be living in cities

Water shortages

2 billion people do not have safe drinking water

Drug resistance

4.95 million deaths per year associated with antimicrobial resistance

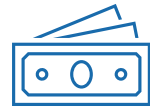


The typhoid conjugate vaccine (TCV) has proven to be a highly effective vaccine which can help prevent and control typhoid

TCV introduction will contend with multiple priorities in high incidence countries



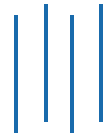
Multiplicity of global health agendas



Low and stretched health budgets



Overburdened health systems



Siloed health programs

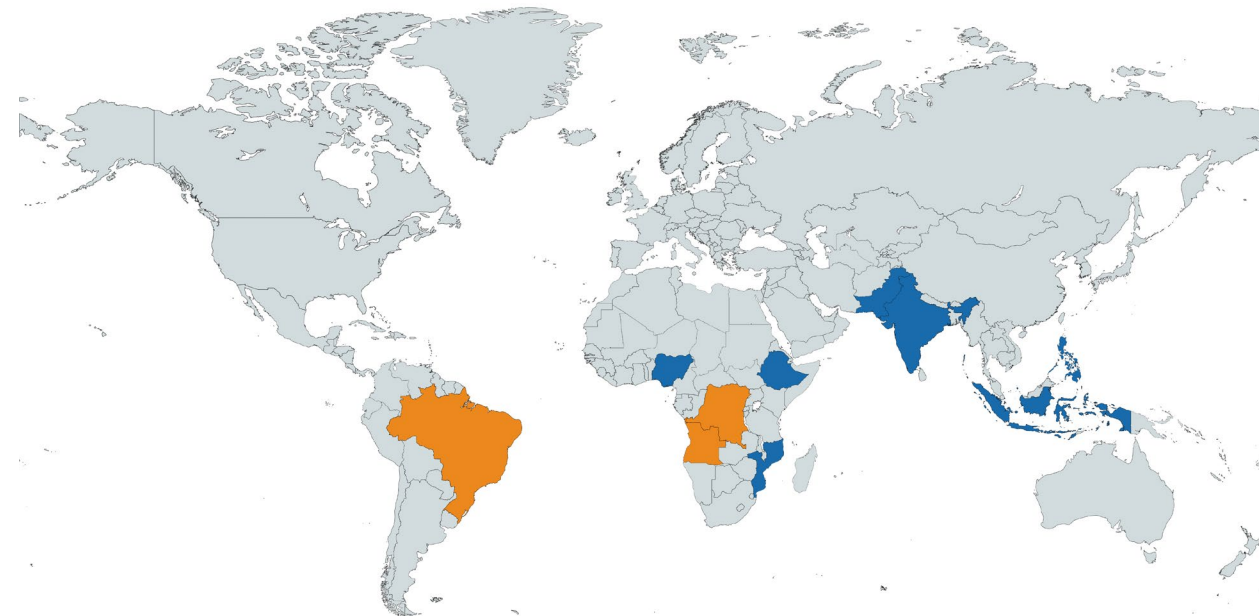


Competing new and underutilized vaccines

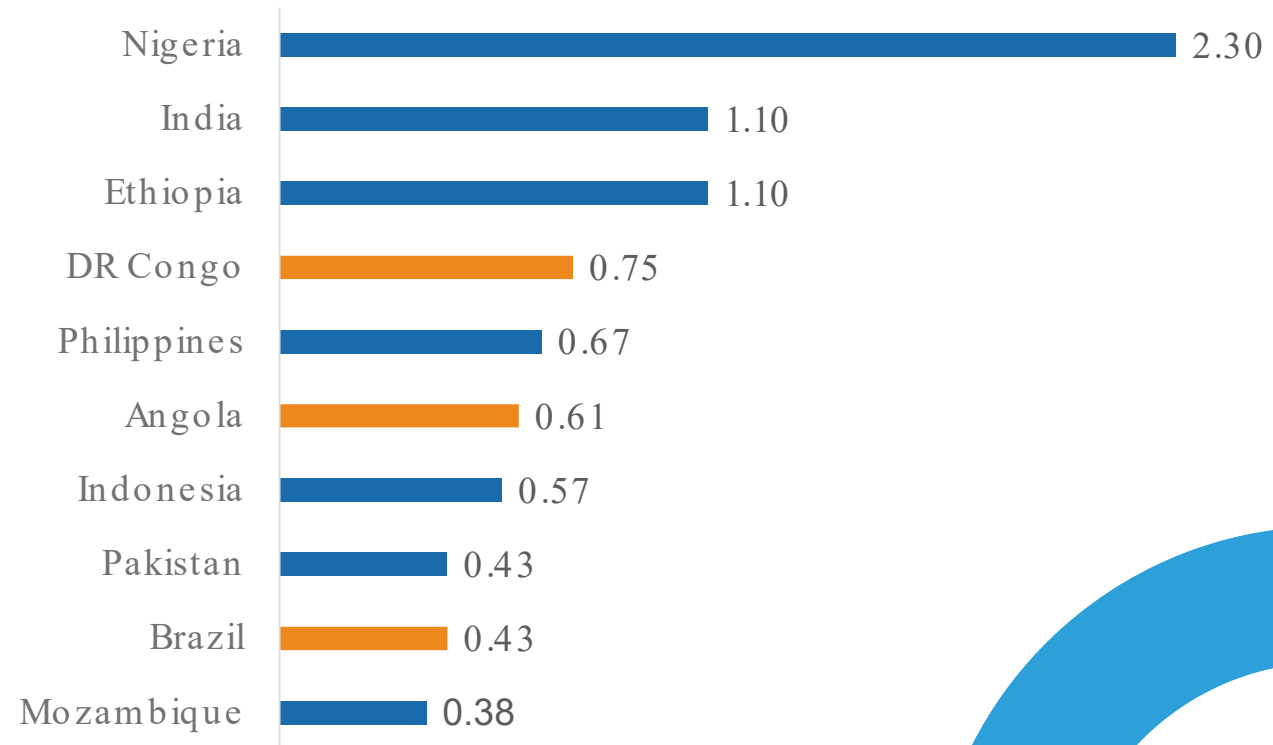
Typhoid vaccine coverage will be limited by the **pre-existing inequities** in routine immunization

10 countries account for 58% of zero-dose children

Number of zero-dose children in millions by country in 2022



Dark Blue: Countries with high typhoid incidence rates > 100 / 100 000
Orange: Countries with low typhoid incidence rates

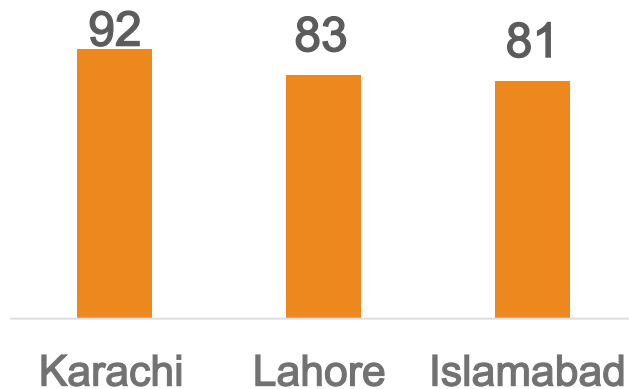


Source: WUENIC Estimates 2022. WHO Web site

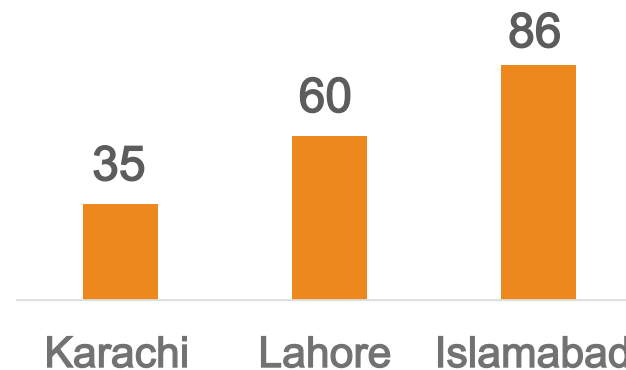
Zero-dose children represent households with multiple deprivations including lack of WASH

Disaggregated data from slums in three largest metropolitan cities in Pakistan

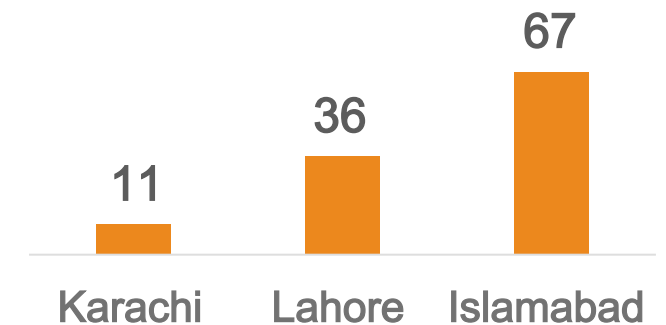
Illiterate mothers



Makeshift housing



No household toilet



Percentage of zero -dose children



Vaccination is an important intervention but investments in WASH, diagnostics, treatment and surveillance systems are urgently required

Ongoing evidence is needed to address emerging knowledge gaps

How do we optimize vaccine impact?

RCT in urban slums of Dhaka, Bangladesh, in 2018 showed an incidence rate of 96 per 100 000 in the vaccinated clusters ¹

What is the strategy to protect older age groups?

Study in Nepal showed that adjusted incidence of typhoid is higher in older age groups of 5 to 25 years compared to other high burden countries ²

How can we best fight antimicrobial resistance?

Pakistan recently reported a case of carbapenem - resistant typhoid in a young patient ³

How and when to use TCV in outbreak settings?

By 2030, the number of natural disaster events is projected to reach 560 per year, or 1.5 per day.⁴ Countries with high disease burden are also at high risk of climate change

Source: 1. Protection by vaccination of children against typhoid fever with a Vi-tetanus toxoid conjugate vaccine in urban Bangladesh: a cluster-randomised trial. Qadri, Firdausi et al. The Lancet, Volume 398, Issue 10301, 675 – 684; 2. Incidence of typhoid and paratyphoid fever in Bangladesh, Nepal, and Pakistan: results of the Surveillance for Enteric Fever in Asia Project. Garrett DO, Longley AT, Aiemjorn K, et al. Lancet Glob Health. 2022;10(7):e978-e988. doi:10.1016/S2214-109X(22)00119-X; 3. Nizamuddin S, Khan E, Chattaway M, et al. Case of Carbapenem-Resistant Salmonella Typhi Infection, Pakistan, 2022. Emerging Infectious Diseases. 2023;29(11):2395-2397. doi:10.3201/eid2911.230499; 4. United Nations Office for Disaster Risk Reduction (2022). Global Assessment Report on Disaster Risk Reduction 2022: Our World at Risk: Transforming Governance for a Resilient Future. Geneva.

Effective prevention and control will require investments beyond vaccine introduction



Improvement of WASH services including municipal sanitation services and chlorinated drinking water



Development and use of low-infrastructure diagnostic tests



Modification of prescribing practices to minimize spread of drug resistance



Expansion of surveillance systems to address various aspects, including vaccine impact, strain replacement, and clinical and economic implications of increasing drug resistance



Determination of durability of TCV protection and the need for booster doses



Thank You!

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