

Vaccine is a cost-effective solution for countries burdened by typhoid

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Credit: Yale University

Introducing a typhoid conjugate vaccine (TCV) into routine child vaccine schedules and conducting a catch-up campaign to vaccinate all children up to age 15 is a cost-effective solution for many low- to middle-income countries severely burdened by typhoid, a new study led by researchers at the Yale School of Public Health finds.

The study is the first comprehensive analysis of the cost-effectiveness of different typhoid vaccination strategies for 54 countries hit hardest by

typhoid—primarily located in Asia and sub-Saharan Africa—and where funding from Gavi, an international organization dedicated to [vaccine](#) introduction, is available.

The study —published Thursday in *Lancet Infectious Diseases*—analyzed disease transmission rates, hospitalizations, [mortality rates](#), vaccine-related costs and the financial resources of each country. Extensive computer modeling and analysis were applied to evaluate four strategies: no vaccination, routine immunization at nine months, or routine immunization at nine months with catch-up campaigns to either age 5 or age 15. An optimum strategy for a country was considered one that maximized the average net monetary benefit.

"We have provided all of the information for [decision-makers](#) to evaluate whether the typhoid conjugate vaccine is a good value," said Virginia Pitzer, associate professor of epidemiology at the Yale School of Public Health and the study's senior author. "Now each country will have the information needed to decide for itself whether or not to apply for Gavi funding to introduce the vaccine."

Typhoid is a serious and sometimes fatal disease caused by the bacteria *Salmonella Typhi*. It impacts over 10 million people a year and is spread through contaminated food and water, usually due to inadequate sanitation and water infrastructures in low- and [middle-income countries](#). While global incidence of typhoid has declined in recent years, prolonged multi-year outbreaks continue to pose a public health threat. Climate change, urbanization and increasing [drug resistance](#) have contributed to the significant health and economic burden that typhoid places on families and communities.

The typhoid conjugate vaccine, Typbar-TCV, was recently approved by the World Health Organization and is currently recommended as part of an integrated approach to controlling the disease along with

improvements in water, sanitation and hygiene. The conjugate vaccine overcomes many of the limitations of earlier typhoid vaccines: it offers longer-lasting protection, requires fewer doses and is suitable for children as young as 6 months of age, allowing it to be included in routine childhood immunization programs.

"Expanding access to, and coverage of, TCVs can protect children and adolescents from illness, reduce the need for antibiotics, slow emergence of drug-resistant strains, and save lives," said Dr. Kathleen Neuzil, director of the Center for Vaccine Development and Global Health at the University of Maryland School of Medicine and director of the Typhoid Vaccine Acceleration Consortium (TyVAC).

TyVAC, one of the funders of the study, is a partnership between 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, an international nonprofit, that aims to accelerate the introduction of TCVs into low-resource settings.

Individual country reports on the cost-effectiveness and potential benefits of TCV can be found at the Together We Can Take On Typhoid website.

The study was led by Pitzer and Professor A. David Paltiel, co-directors of the Yale School of Public Health's Modeling Concentration, in close collaboration with a team in the Center for Health Economics and Modelling Infectious Diseases (CHERMID) at the University of Antwerp in Belgium. Other collaborators included experts from the University of Oxford and the University of Maryland School of Medicine.

Uncertainty surrounding the probability of hospitalization, [typhoid](#) incidence and mortality rates had the greatest influence on a country's

optimal vaccination strategy, the researchers said. But such unknowns should not deter decision-makers.

"For some countries, substantial uncertainty exists around the optimal vaccination strategy," said the study's lead author Joke Bilcke, a postdoctoral researcher and lecturer at CHERMID, part of the Vaccine & Infectious Disease Institute at the University of Antwerp, Belgium. "Nevertheless, this should not preclude the introduction of TCV. Decisions need to be made in the context of uncertainty, and the strategy of choice in terms of cost-effectiveness should be the one with the highest expected net benefit."

More information: Joke Bilcke et al. Cost-effectiveness of routine and campaign use of typhoid Vi-conjugate vaccine in Gavi-eligible countries: a modelling study, *The Lancet Infectious Diseases* (2019). DOI: [10.1016/S1473-3099\(18\)30804-1](https://doi.org/10.1016/S1473-3099(18)30804-1)

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