

# Typhoid vaccine policy and practice: update from the Coalition against Typhoid (CaT)

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1 March 2013

# 8<sup>th</sup> International Conference

## Typhoid Fever and Other Invasive Salmonellosis

1-2 March 2013 • Dhaka, Bangladesh  
[typhoidconference.org](http://typhoidconference.org)



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COALITION  
AGAINST  
**TYPHOID**





# Typhoid Fever has impacted populations since antiquity



430–424 BC: plague of Athens killed one third of the population, including their leader Pericles. The balance of power shifted from Athens to Sparta, ending the Golden Age of Pericles and Athenian dominance in the ancient world.

International Journal of Infectious Diseases (2006) 10, 206-14.

Image: [http://www.pbs.org/empires/thegreeks/keyevents/430\\_c.html](http://www.pbs.org/empires/thegreeks/keyevents/430_c.html)

Alexander the Great (356-323 BC) dies from typhoid fever in Babylon.



Oldach DW, Richard RE, Borza EN, Benitez RM. N Engl J Med. 1998 Jun 11;338(24):1764-9.  
Alexander fighting the Persian king Darius III. From Alexander Mosaic, Pompeii. Naples National Archaeological Museum. Naples, Italy.

# Typhoid Fever has impacted populations since antiquity

Zhang Zhong-Jing (150 – 219 A.D.)

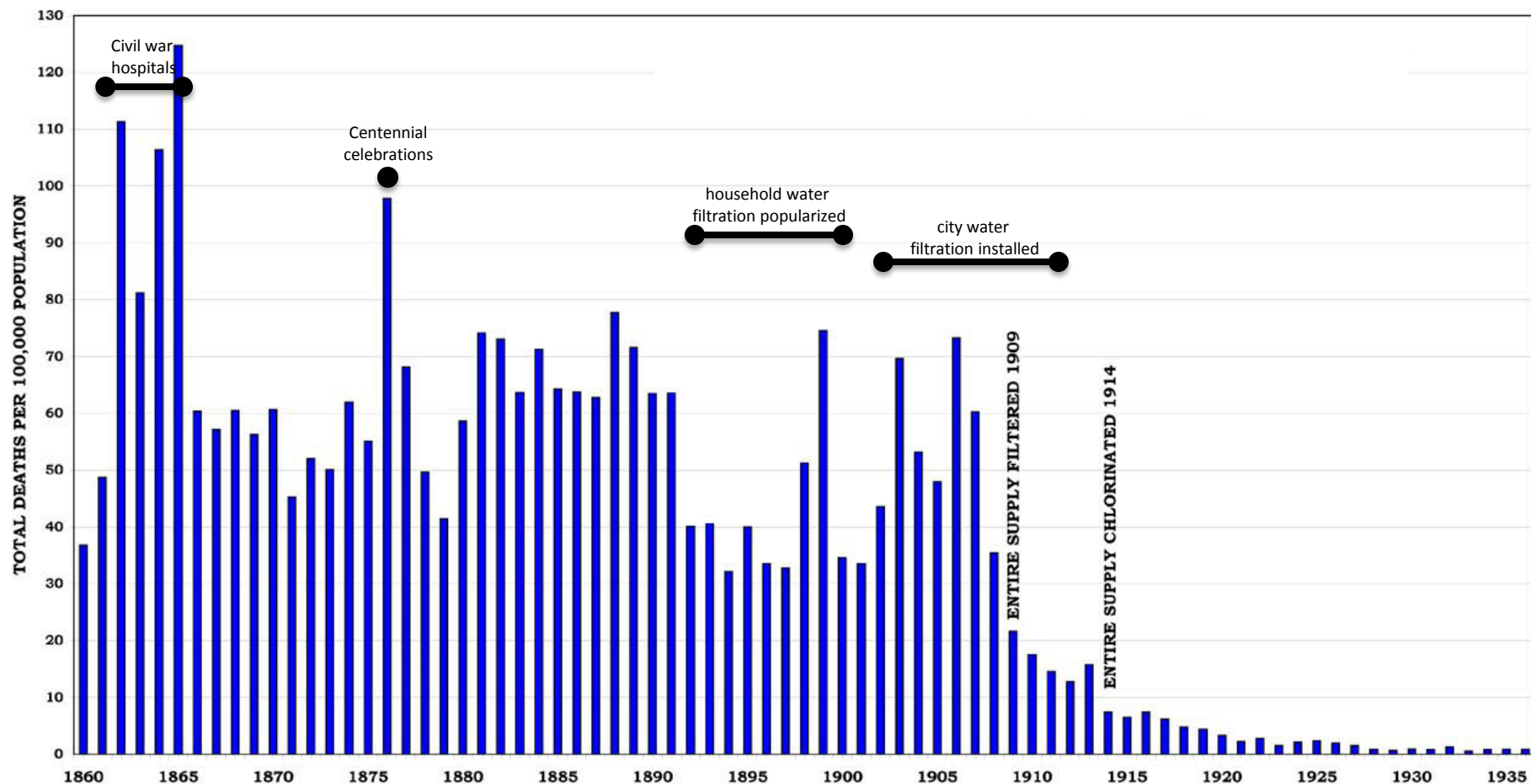
- compiled the "*Shanghan Zabing Lun*", or "Treatise on Febrile and Miscellaneous Diseases"
- addresses typhoid fever
- the work was later divided in two parts:
  - 1) "Shang han lun" or "Treatise on Febrile Diseases Caused by Cold" (description of epidemic disease causing fever);
  - 2) "Jin kui yao lue" or "Synopsis of prescriptions of the golden chamber" (compendium of clinical experience).
- in the preface the author notes that of the approximately 200 inhabitants in his village, more than two-thirds died within the course of 10 years and 70% of these deaths were due to typhoid.



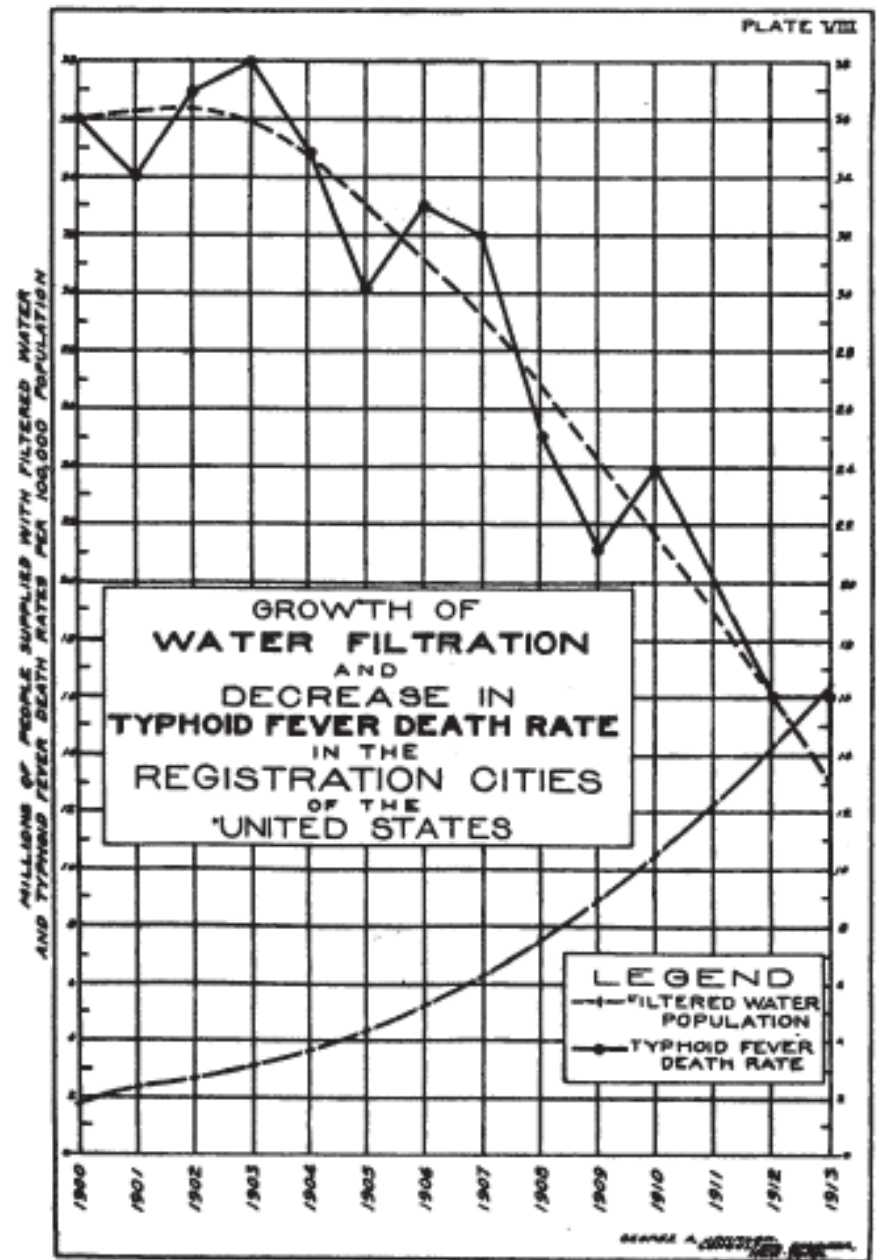
G. Maciocia. ZHANG ZHONG JING.1980. Journal of Chinese Medicine. 4. Spring/summer.  
<http://homepage.mac.com/sweiz/files/article/4-2.pdf>

# **THE URBAN PENALTY: TYPHOID FEVER**

## Death Rate from Typhoid Fever in Philadelphia 1860-1936



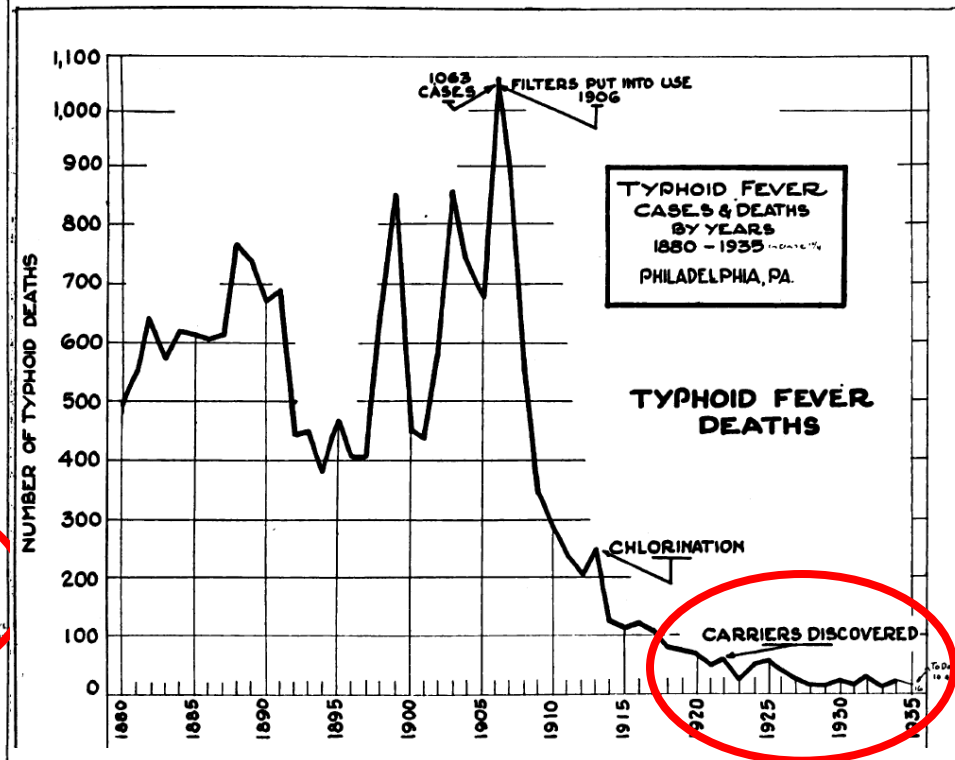
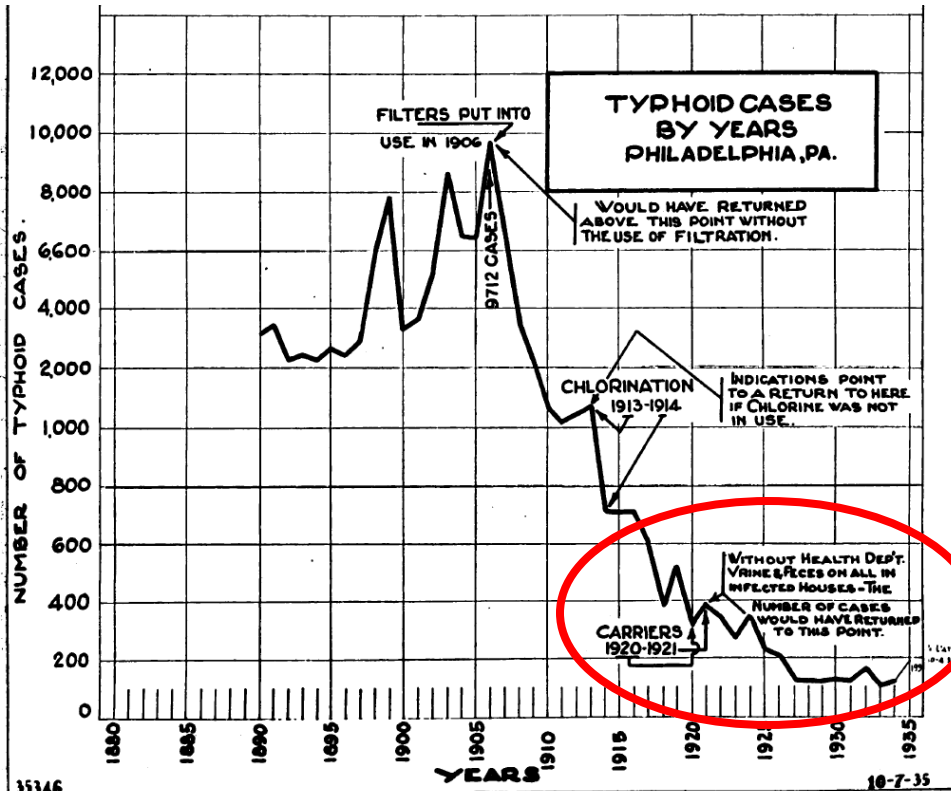
The widespread adoption of improved water (filtration +/- chlorination) by American cities in the early 20<sup>th</sup> century is followed by dramatic decreases in typhoid mortality



George A. Johnson. The typhoid toll. *Journal of the American Water Works Association*. 3(2):308. June 1916.



After water filtration +/- chlorination,  
Public health measures contributed to the control of typhoid fever:  
Pasteurization of milk, epidemiologic investigation of cases and outbreaks with  
hospitalization of cases, immunization of contacts,  
and occupational restrictions for carriers (pre-antibiotic era)





# Typhoid Mary – a chronic carrier



- Mary Mallon worked as a cook for wealthy New York families
- Families for whom Mallon had worked as a cook had fallen ill with typhoid fever.
- Was the first identified healthy carrier of typhoid: she carried the typhoid bacteria and spread them to others, but did not fall ill herself.
- In 1907, detained by the New York City Department of Health for three years
- In 1915, while working under an assumed name, was associated with 25 typhoid cases, one of whom died.
- Detained at North Brother Island and remained there for the next 23 years until her death in 1938.
- At the time of her death in 1938, she was officially and directly linked to 10 outbreaks totaling 51 cases of typhoid fever, and three deaths from the disease.

# Erasing the Urban Penalty



During the early 20<sup>th</sup> century, the provision of clean water (filtration +/- chlorination) to major American cities led to:

- the near-elimination of typhoid fever (>90% reduction)
  - 26% almost immediately
  - Add'l 65% over 5 years
- a 74% decrease in infant mortality
- a 62% decrease in child mortality

# **POPULATIONS W/O ACCESS TO SAFE WATER AND BASIC SANITATION:**

**DEVELOPMENT, IMPLEMENTATION AND IMPACT OF  
THE FIRST TYPHOID VACCINES**



# S. Typhi is observed and cultured for the first time in the early 1880's

## The Widal agglutination test was described in 1896

first used in municipal hospitals later that year (Johnston 1896) including the New York city Health Department (Guerard 1897)



[http://www.appl-lachaise.net/appl/article.php3?id\\_article=2038](http://www.appl-lachaise.net/appl/article.php3?id_article=2038)

Philadelphia Water Department  
Historical Collection  
Downloaded from  
[www.phillyh2o.org/filtration.htm](http://www.phillyh2o.org/filtration.htm)

### CHAPTER XX.

Typhoid fever—Study of the organism concerned in its production—  
Its morphological, cultural, and pathogenic properties—*Bacillus coli*—*Bacillus paratyphosus*—Its resemblance to *Bacillus typhosus*.

#### BACILLUS TYPHOSUS.

THE organism discovered in the tissues of typhoid cadavers microscopically by Eberth (1880–81), and subsequently isolated in pure culture and described by Gaffky (1884), is now generally recognized as the etio-

FIG. 70.



*Bacillus typhosus*, from culture twenty-four hours old, on agar-agar.

FIG. 71.



*Bacillus typhosus*, showing flagella stained by Löffler's method.

logical factor in the production of typhoid fever. It may be described as follows :

It is a bacillus about three times as long as broad, with rounded ends. It may appear at one time as very short ovals, at another time as long threads, and both

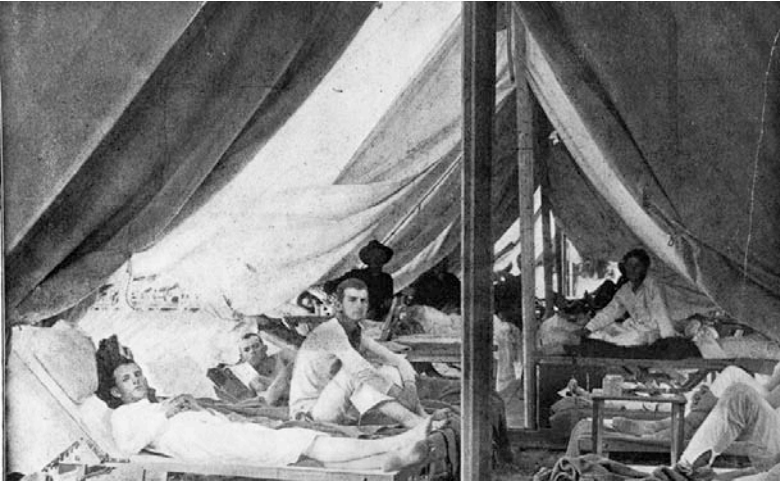
**General conclusions.**—From an analysis of the results which have so far been obtained in the application of the Widal test, it would seem, in the first place, that the serum reaction is by no means specific, in the strict acceptation of the term. In the second place, it is evident that this test has certain limitations in its practical utility, and that unless properly applied with a due appreciation of these limitations, it is liable to lead to false conclusions. The chief

When the subject of the serum diagnosis of typhoid fever was first brought before the public, it was hoped that at last the long-sought infallible diagnostic test for typhoid fever had been discovered, which was at once rapid, simple and suitable for clinical use at the bedside. With the non-fulfillment of these hopes, some physicians have come to look upon Widal's test as practically useless for diagnostic purposes. But,

AR Guerard. JAMA. 29. 1897.



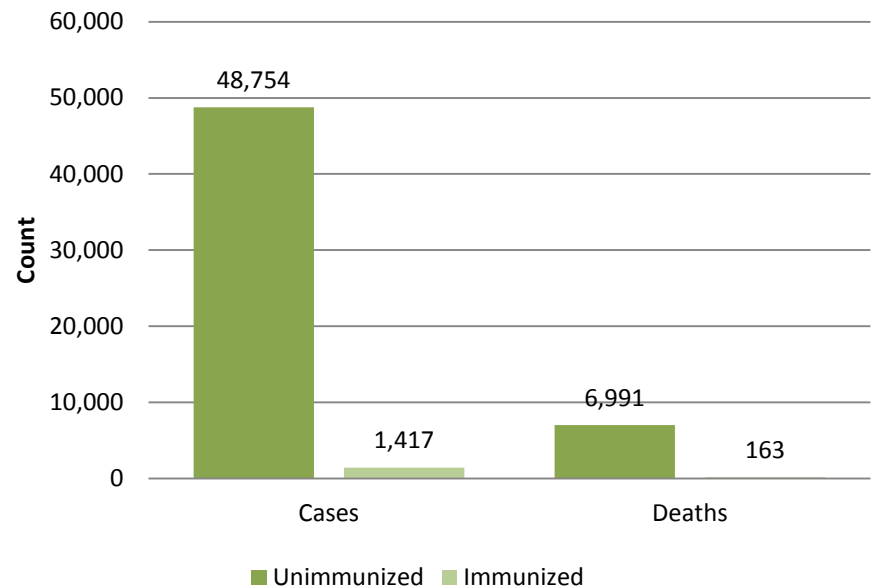
# Hx of Typhoid Vaccines: UK



**1897** English bacteriologist Almroth Wright introduces a killed (heat-inactivated, phenol-preserved, whole-cell) typhoid vaccine in Britain.

**1898-9** Trials in the Indian army produced excellent results and typhoid vaccination was adopted for the use of British troops serving in the Second Boer War (1899).

Early Typhoid Vaccine Use in the Anglo-Boer War, 1899



Cantlie N. History of the Army Medical Department, Vol. II. Edinburgh and London: Churchill Livingstone, 1974:230, 373.

NB: whole-cell inactivated vaccine, one dose regimen, soldiers.

# Hx of Typhoid Vaccines: USA

Typhoid vaccination for US soldiers during WWI. Image from the History of Medicine (NLM). The History of Vaccines. <http://www.historyofvaccines.org/>

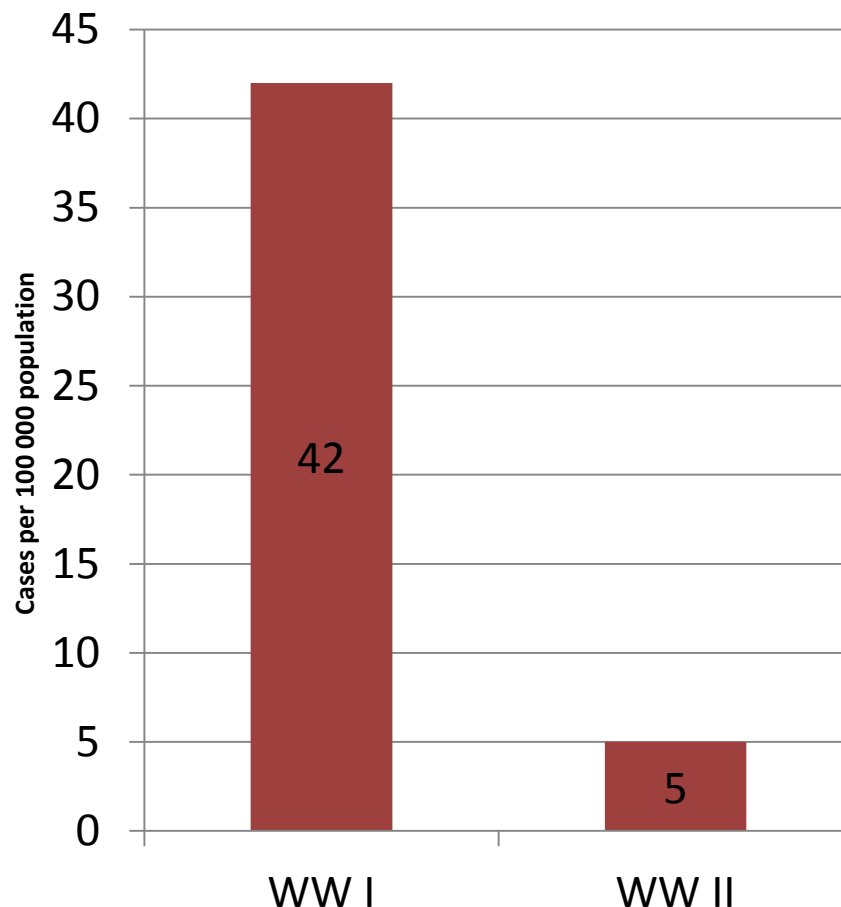


## Typhoid vaccination in the US armed forces

- **1909** starts in US Army
- **1911** required for entire US Army and Navy

## The impact of typhoid vaccination in the US armed forces

- World War I, 1917–1918
  - 2 000 typhoid cases, 227 deaths (11.4% CFR)
  - 42 typhoid cases per 100 000 soldiers
- World War II, 1941–1945
  - 5 typhoid cases per 100 000 soldiers



# Hx of Typhoid Vaccines: USA



Doctor administering a typhoid vaccination at a school in San Augustine County, Texas.  
Photograph by John Vachon, April 1943.

## Typhoid vaccination in the general population

- **1914** Typhoid vaccine first licensed for the U.S. general population
- **July 16, 1952** Heat-phenol inactivated typhoid vaccine by Wyeth licensed in US.
- **Dec 15, 1989** A live, oral typhoid vaccine (Ty21a, *Vivotif Berna* by Swiss Serum Institute) licensed in US.
- **Nov 28, 1994** Typhoid Vi polysaccharide inactivated injectable polysaccharide vaccine (Typhim Vi by Aventis Pasteur) licensed in US.

<http://www.immunize.org/timeline/>

Grabenstein JD. et. al. Immunization to Protect the US Armed Forces: Heritage, Current Practice, and Prospects. Epidemiol Rev 2006;28:3–26.

# **THE URBAN PENALTY: TYPHOID FEVER**

**A CONTINUING PROBLEM**

**IN LOWER AND LOWER MIDDLE INCOME COUNTRIES**



# Populations at Risk for Typhoid Fever

Typhoid fever is  
prevalent in populations with

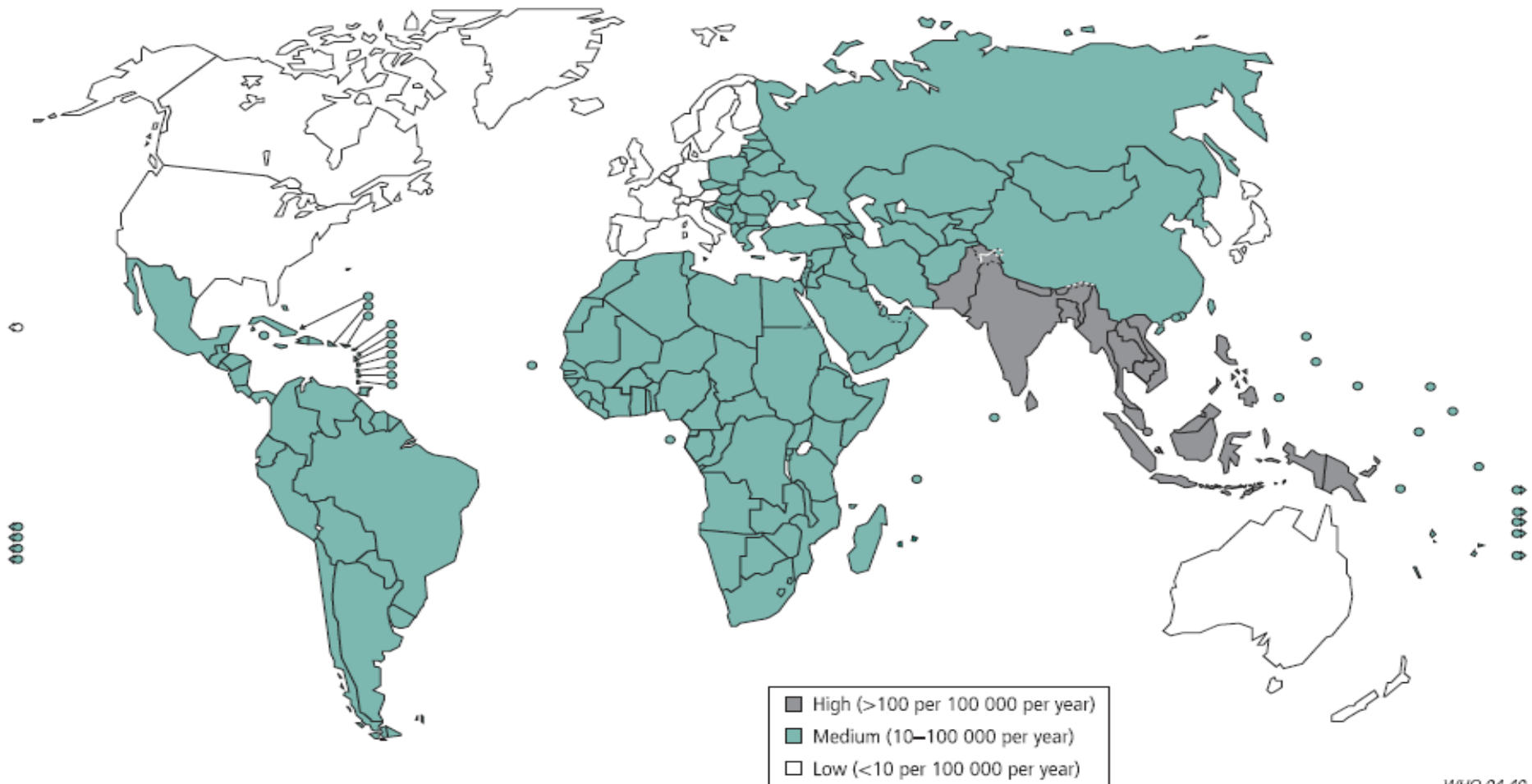
- *inadequate* access to safe water
- *inadequate* access to basic sanitation

*Levine MM. Vaccines. Typhoid fever vaccines. In: Plotkin SA, Mortimer EA, Orenstein W, editors. Vaccines 5<sup>th</sup> Edition. Philadelphia: WB Saunders Company; 2008.*

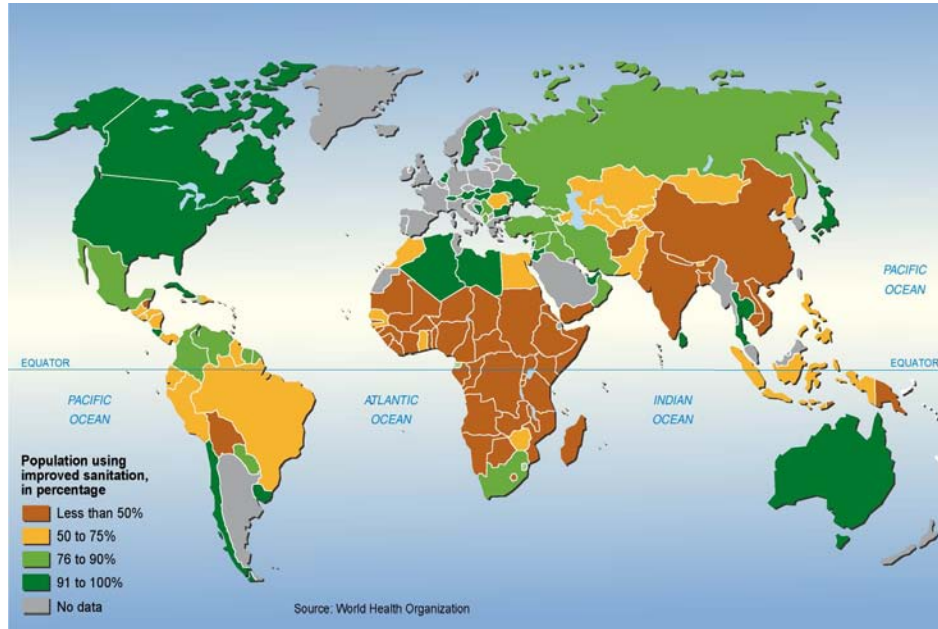
# Estimated Global Burden of Typhoid Fever

- WHO estimates 21 million cases and 216,000 – 600,000 deaths are caused by *S. Typhi*, every year.
  - Ivanoff et al. (1994) 17 million cases and 600,000 deaths
  - Crump et al. (2004) 21.6 million cases and 216,000 deaths

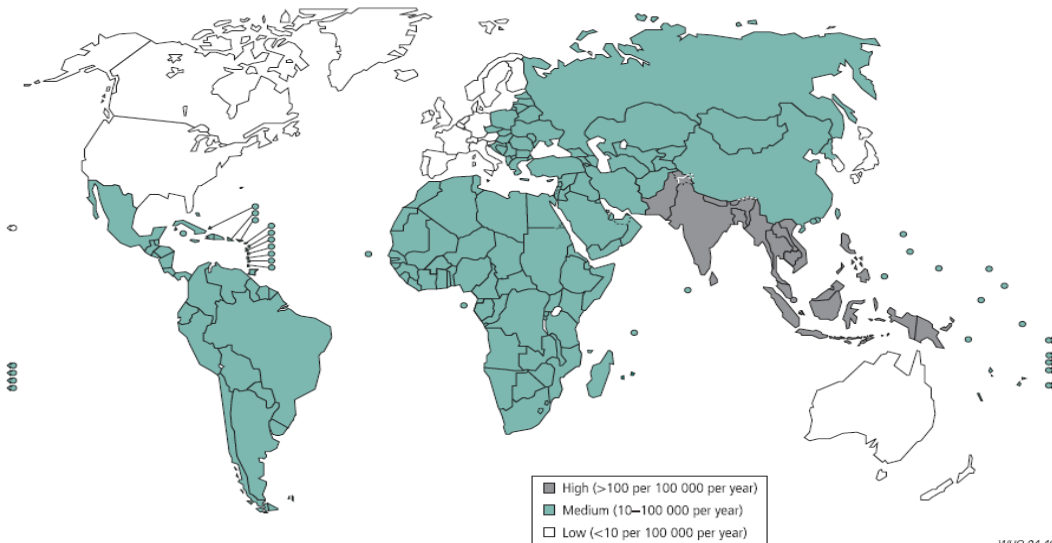
## Geographical distribution of typhoid fever



# Estimated Global Burden of Typhoid Fever



Geographical distribution of typhoid fever



Available burden estimates are limited by:

- Confounding with other febrile illness dx, e.g. malaria, dengue
- Poor diagnostics
- lack of systematic surveillance

# Typhoid is a global problem



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Global Health, Local Knowledge



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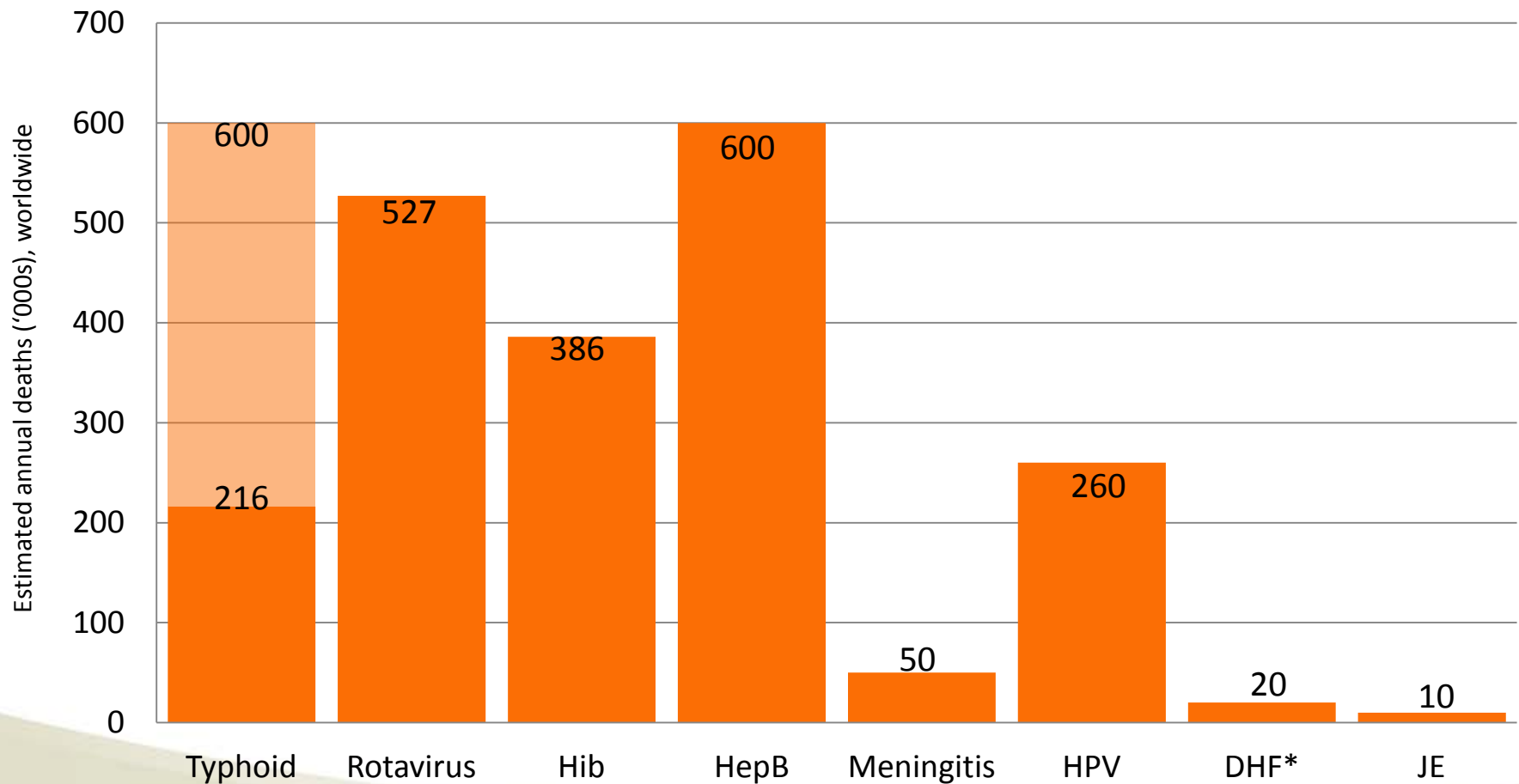
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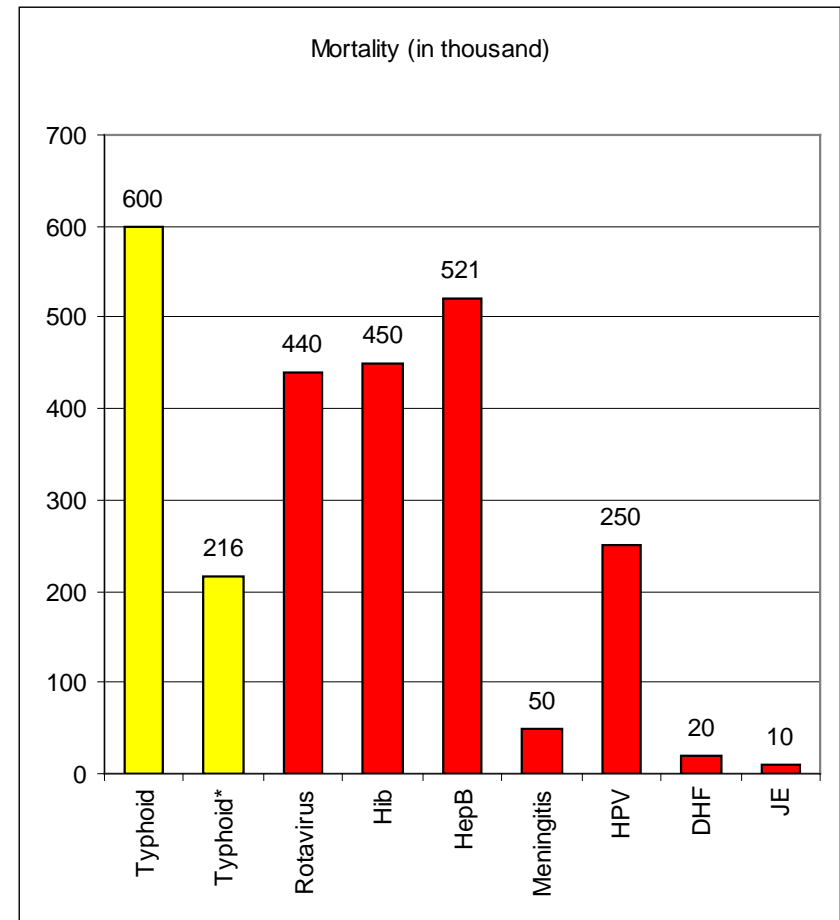
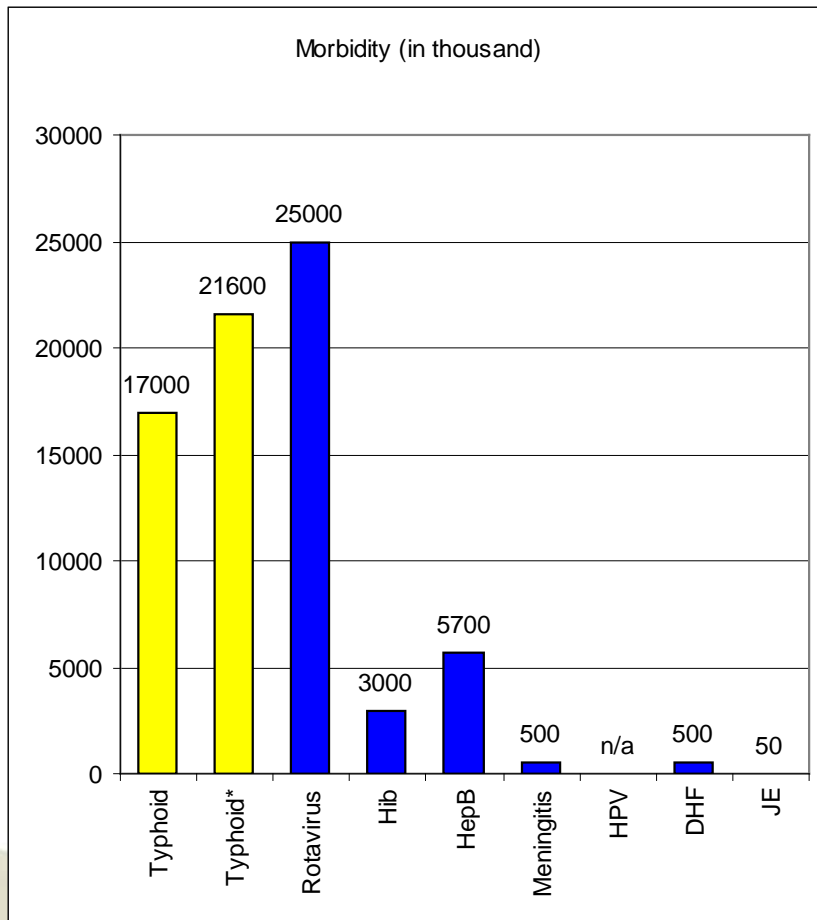


# Typhoid Fever Mortality

is Similar to Other Vaccine Preventable (VP) Diseases



# Typhoid Fever Morbidity and Mortality in Relation to Other VP Diseases



<http://www.who.int/immunization/topics/en/> (2007)

Crump et al. Global Burden of Typhoid Fever, *Bulletin of WHO* (Typhoid\*)

Parashar et al. Global Illness and Deaths Caused by Rotavirus Disease in Children, *EID* (Rotavirus)

# **POLICY & PRACTICE: SOUTH AND SOUTHEAST ASIA**

# WHO recommends typhoid vaccines

## WHO Position Paper (2008)

(<http://www.who.int/wer/2008/wer8306.pdf>)

Countries should consider the programmatic use of typhoid vaccines for:

- controlling endemic disease (targeting high risk groups / high burden populations)
- outbreak control

An update of the original WHO position paper issued in 2000  
(<http://www.who.int/docstore/wer/pdf/2000/wer7532.pdf>)

2008, 83, 49-60



Organisation mondiale de la Santé

Weekly epidemiological record  
Relevé épidémiologique hebdomadaire

8 FEBRUARY 2008, 83rd YEAR / 8 FÉVRIER 2008, 83<sup>e</sup> ANNÉE  
No. 6, 2008, 83, 49-60  
<http://www.who.int/wer>

### Contents

- 49 Typhoid vaccines:  
WHO position paper
- 60 WHO web sites on infectious  
diseases

### Sommaire

- 49 Vaccins antityphoidiques:  
note d'information de l'OMS
- 60 Sites Internet de l'OMS  
sur les maladies infectieuses

### Typhoid vaccines: WHO position paper

In accordance with its mandate to provide guidance to Member States on health policy matters, WHO issues a series of regularly updated position papers on vaccines and vaccine combinations against diseases that have an international public health impact. These papers, which are concerned primarily with the use of vaccines in large-scale immunization programmes, summarize essential background information on the respective diseases and vaccines, and conclude with the current WHO position concerning their use in the global context. The papers have been reviewed by a number of experts within and outside WHO and, since April 2006, they have been reviewed and endorsed by WHO's Strategic Advisory Group of Experts (SAGE) on immunization. The position papers are designed for use mainly by national public health officials and immunization programme managers. However, they may also be of interest to international funding agencies, the vaccine manufacturing industry, the medical community, scientific media and the public.

The current position paper on typhoid fever updates and replaces the corresponding paper previously published in the *Weekly Epidemiological Record*.<sup>1</sup> These updated recommendations were endorsed by SAGE in November 2007.<sup>2</sup>

### Summary and conclusions

Typhoid fever is a serious systemic infection caused by the enteric pathogen *Salmonella*

### Vaccins antityphoidiques: note d'information de l'OMS

Conformément à son mandat, qui est de fournir des conseils aux États Membres sur les questions relatives aux politiques de santé, l'OMS publie une série de notes d'information régulièrement actualisées sur les vaccins et les associations vaccinales contre les maladies qui ont un impact sur la santé publique au niveau international. Ces notes d'information, qui portent essentiellement sur l'utilisation des vaccins dans le cadre de programmes de vaccination à grande échelle, résument les considérations générales essentielles sur les maladies et vaccins respectifs et présentent en conclusion la position actuelle de l'OMS concernant leur utilisation dans le cadre mondial. Ces notes ont été soumises à un certain nombre de spécialistes, à l'OMS et à l'extérieur et, depuis avril 2006, sont examinées et approuvées par le Groupe stratégique consultatif d'experts de la vaccination de l'OMS. Elles sont principalement destinées aux responsables nationaux de la santé publique et aux administrateurs des programmes de vaccination. Mais ces notes peuvent également présenter un intérêt pour les organismes internationaux de financement, les fabricants de vaccins, la communauté médicale, les médias scientifiques et le grand public.

La présente note d'information sur la fièvre typhoïde actualise et remplace la note correspondante publiée précédemment dans le *Relevé épidémiologique hebdomadaire*.<sup>1</sup> Cette mise à jour des recommandations a été approuvée par le Groupe stratégique consultatif d'experts en novembre 2007.<sup>2</sup>

### Résumé et conclusions

La fièvre typhoïde est une affection généralisée grave causée par une entérobactérie pathogène,

DE LA SANTÉ  
GENÈVE  
Annuel subscription / Abonnement annuel  
Vol. 83 / N. 6, 2008  
2 2008  
ISSN 2049-8114  
Printed in Switzerland

<sup>1</sup> See No. 32, 2006, pp. 253-264.

<sup>2</sup> See No. 1, 2008, pp. 1-15.

<sup>1</sup> Voir N° 32, 2006, pp. 253-264.

<sup>2</sup> Voir N° 1, 2008, pp. 1-15.



# WHO Regions and Countries: SEAR

WHO South East Asia (SEA)  
Regional Office  
Immunization  
Technical Advisory Group (ITAG)

July 2008:

*Recognizing that typhoid fever may be a significant cause of morbidity and mortality in the region, the ITAG encourages countries to identify their disease burden and at-risk populations in order to consider vaccines introduction as part of a comprehensive disease control package.*

WHO South East Asia (SEA) Region  
Countries

May 2009:

*Countries in WHO's SEA region prioritize typhoid vaccines for 'immediate' introduction*

WHO SEARO. Report of the South-East Asia Regional Vaccine Prioritization Workshop. Bangkok, Thailand, 11-13 May 2009. SEA-Immun.- 56. Available at: [http://www.who.int/immunization/sage/Report\\_SEARO\\_Vaccine\\_Prioritization\\_wsh\\_op.pdf](http://www.who.int/immunization/sage/Report_SEARO_Vaccine_Prioritization_wsh_op.pdf) (Accessed 23 June, 2011)

# WHO Regions and Countries: SEAR

## WHO SEAR Immunization Technical Advisory Group (ITAG)

March 2011:

**The ITAG recommends establishing sub-groups to review and make recommendations on specific issues such as health resource management and vaccine introduction (rubella, hepatitis B and typhoid)** with each sub-group consisting of an ITAG member as a focal point, WHO staff as secretariat and invited experts from relevant areas.

- Second South-East Asia Regional Technical Advisory Group on Immunization (SEAR ITAG) Meeting. A Brief Report, 2-3 March 2011, New Delhi, India ([http://www.who.int/immunization/sage/11-Second\\_SEAR\\_ITAG\\_Meeting\\_nov11.pdf](http://www.who.int/immunization/sage/11-Second_SEAR_ITAG_Meeting_nov11.pdf))

- WHO-SEARO-ITAG chair:  
Professor Lalitha Mendis
- WHO-SEARO-ITAG Typhoid, Paratyphoid and Cholera working group chair:  
Dr Jacob John
- WHO-SEARO-ITAG Members:  
Professor Lalitha Mendis, Dr. Jacob John, Dr. Supamit Chunsuttiwat, Dr. Nyoman Kandun, Dr. A. M. Zakir Hussain, Dr. Lalit Kant., Dr. M. H. Maskey, Dr. N. K. Arora, Dr. Triono Soendoro, Dr. Khin Pyone Kyi, Dr. Brent Burkholder

# Pediatric Associations recommend typhoid vaccines



the Indian Academy of  
Pediatrics Committee on  
Immunization (IAPCOI)  
recommends the use of  
ViPS typhoid vaccines in  
children 2-15y

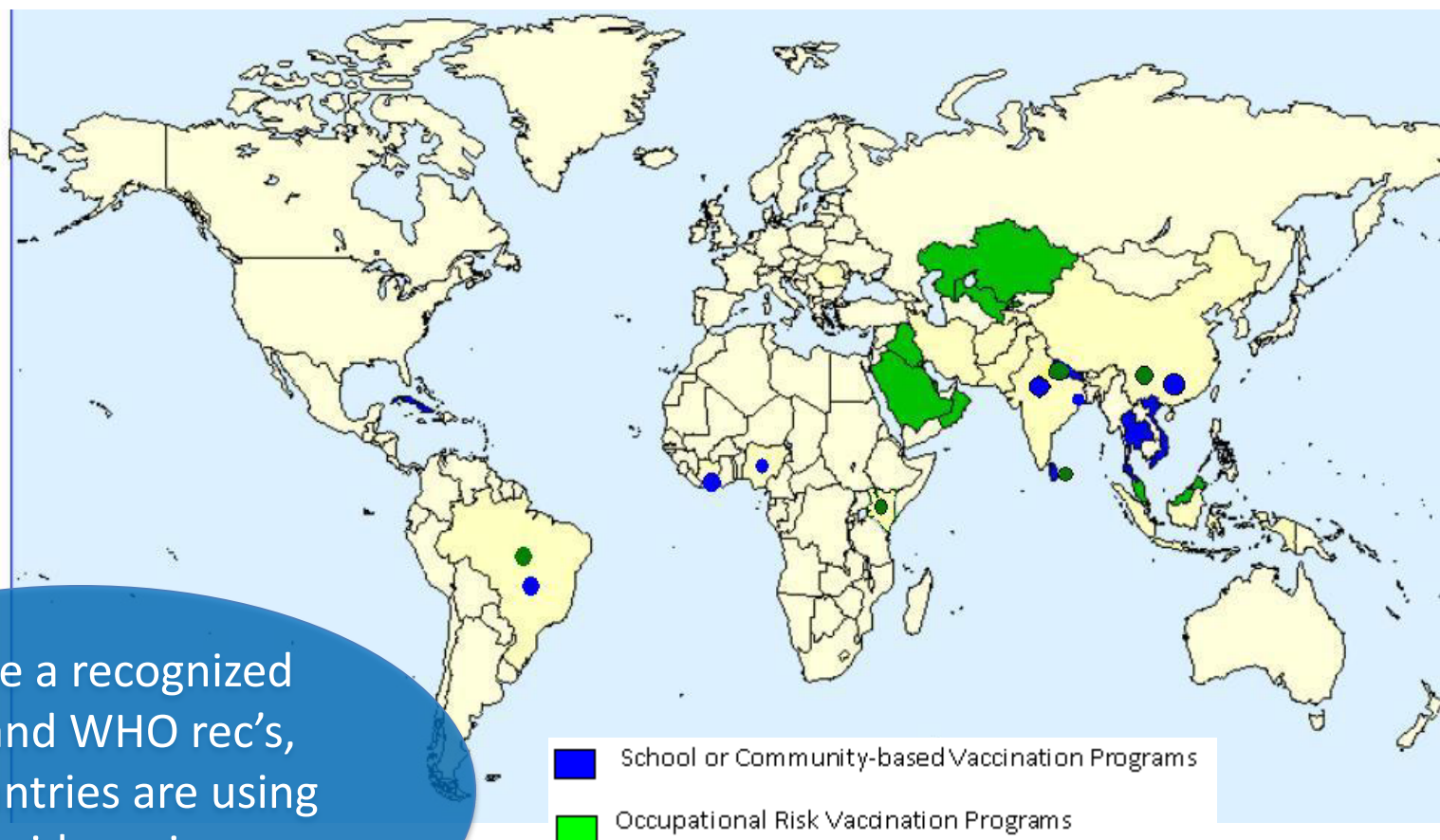


IDAI Ikatan Dokter Anak Indonesia  
*Indonesian Pediatric Society*

the Indonesian Pediatric  
Society  
recommends the use of  
typhoid vaccines

Indian Academy of Pediatrics Committee on Immunization. IAPCOI 2011  
Recommendations on use of individual vaccines. Typhoid Vaccines:  
Recommendations for use. Available at:  
for use. Available at: <http://www.iapcoi.com/hp/pdf/11-TYPHOID%20VACCINES.pdf>  
(Accessed May, 2012)

# Summary of typhoid vaccination programs: 1980-present





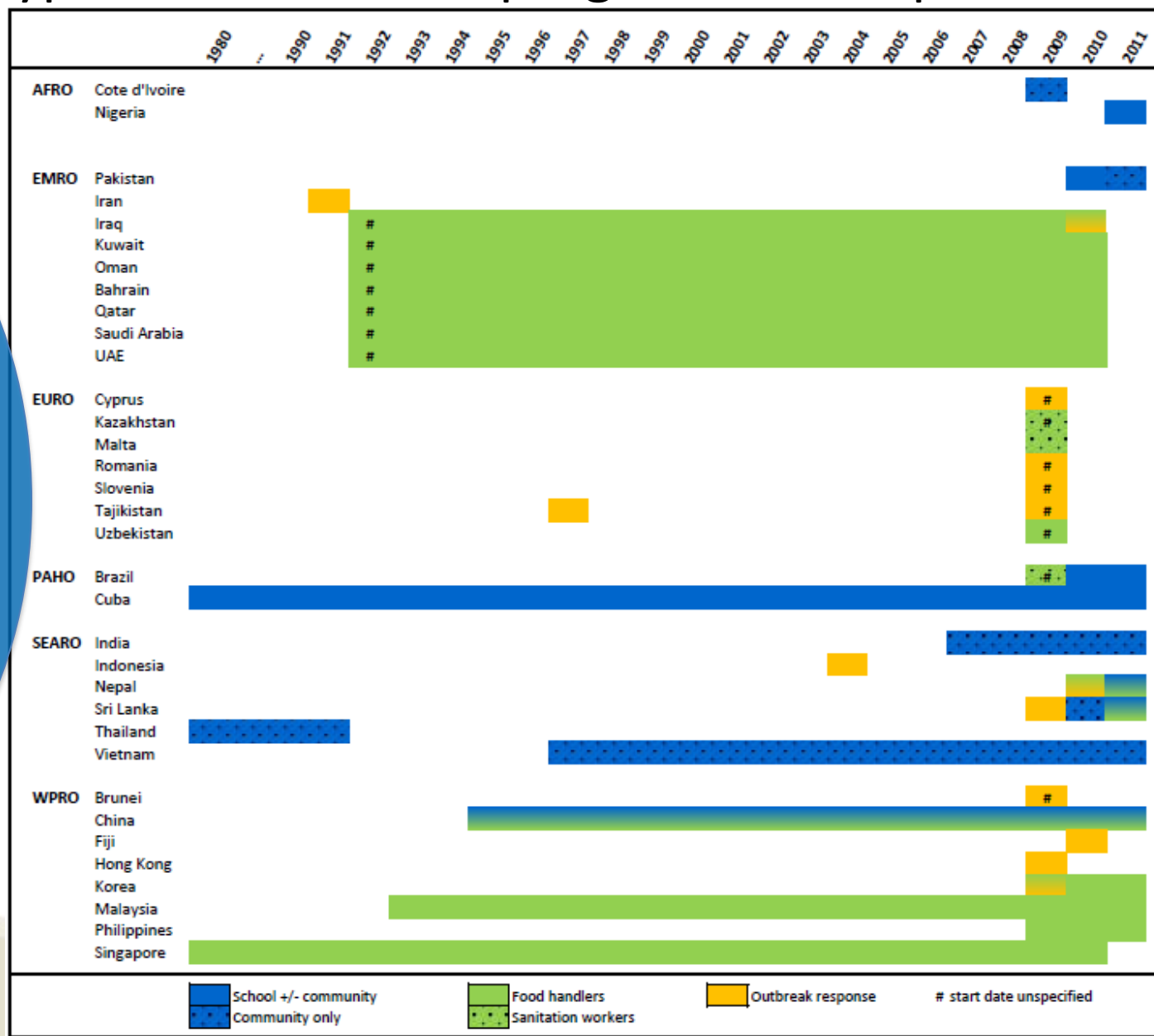
# Summary of typhoid vaccination programs: 1980-present

Existing typhoid vaccination programs

- Food handlers
- Gen'l Population

and

- in place many years
- started recently



# WHAT HAS BEEN THE IMPACT?

# Programmatic Effectiveness of existing Typhoid Vaccine

## **Old generation killed whole cell vaccine**

- School-based vaccination program in Thailand
  - More than 5 million children vaccinated (1977-84)
  - Sharp decline in typhoid fever incidence (note: no formal assessment)

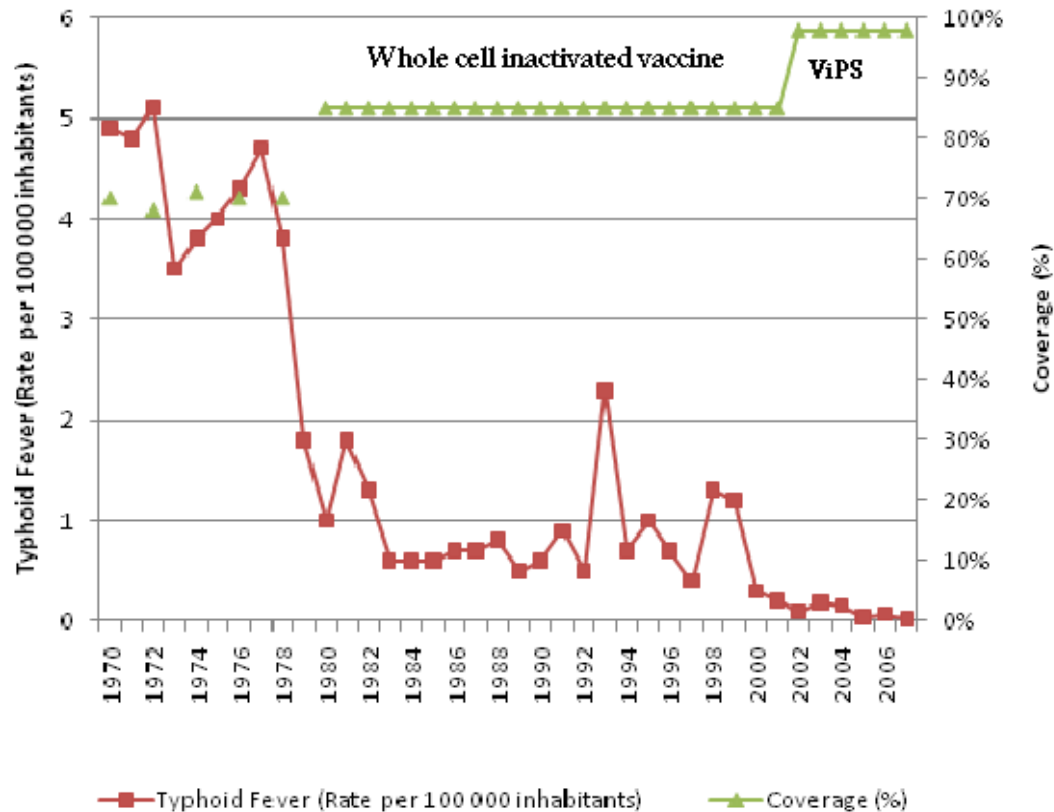
## **Live attenuated Ty21a vaccine**

- School-based vaccination in Santiago, Chile
  - Half a million school aged children through large school-based, randomized, controlled vaccine trials
  - Conferred protection and decline in typhoid cases noted

# Cuba Vaccine Impact

## Vaccination Coverage and Rate of Typhoid Fever in Cuba, 1970 - 2007

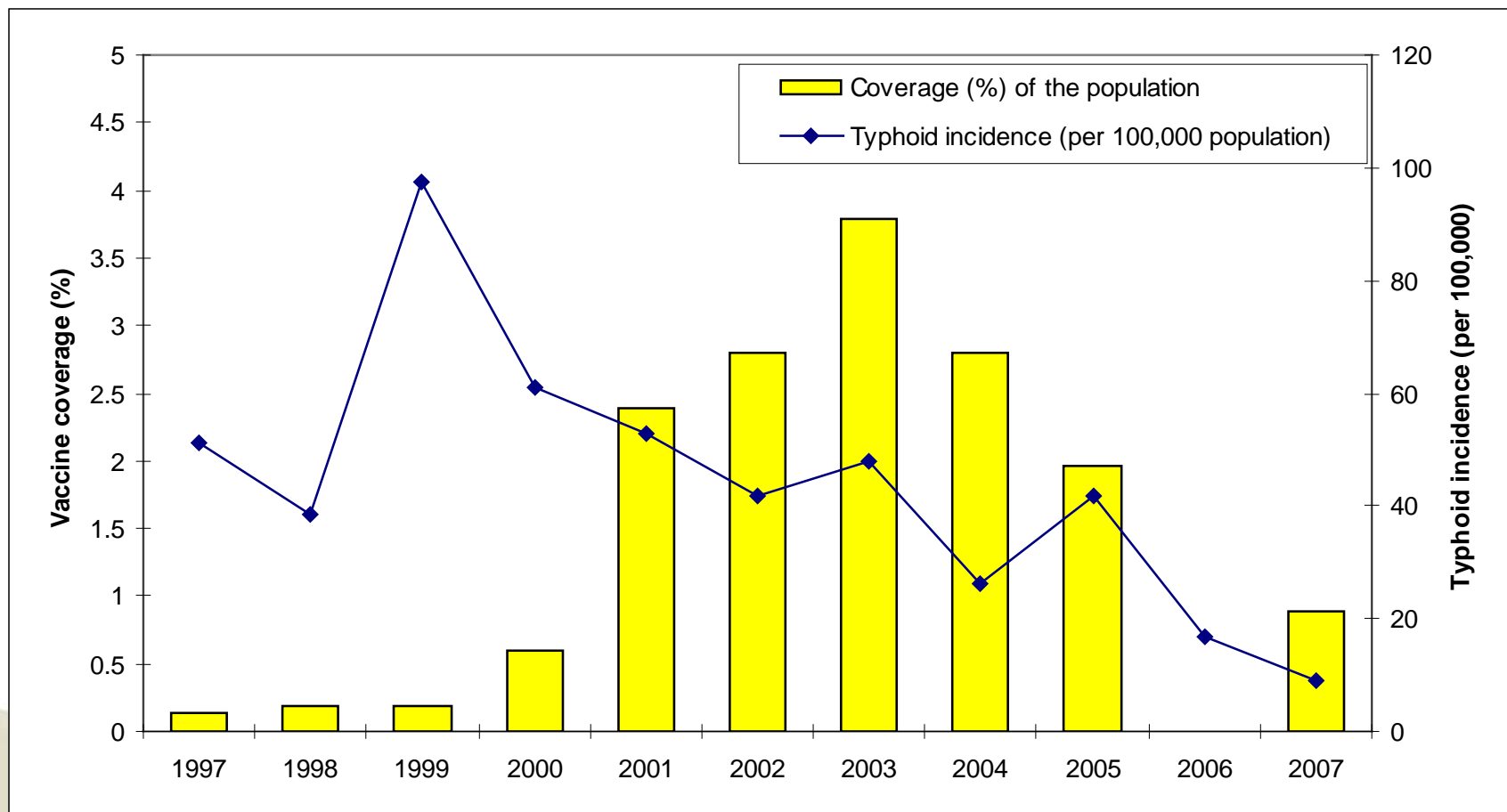
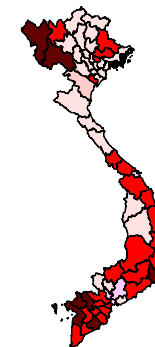
(in 2002, Cuba switched from whole-cell inactivated vaccine to Vi PS, one dose regimen, 10-16y school children.)



Galindo MA. Programa Nacional de Inmunización, Cuba. PowerPoint presentation at FINSA, November 2006, Havana. Available at: [http://medicreview.medicc.org/articles/mr\\_56.pdf](http://medicreview.medicc.org/articles/mr_56.pdf). (Accessed 17 August, 2011).

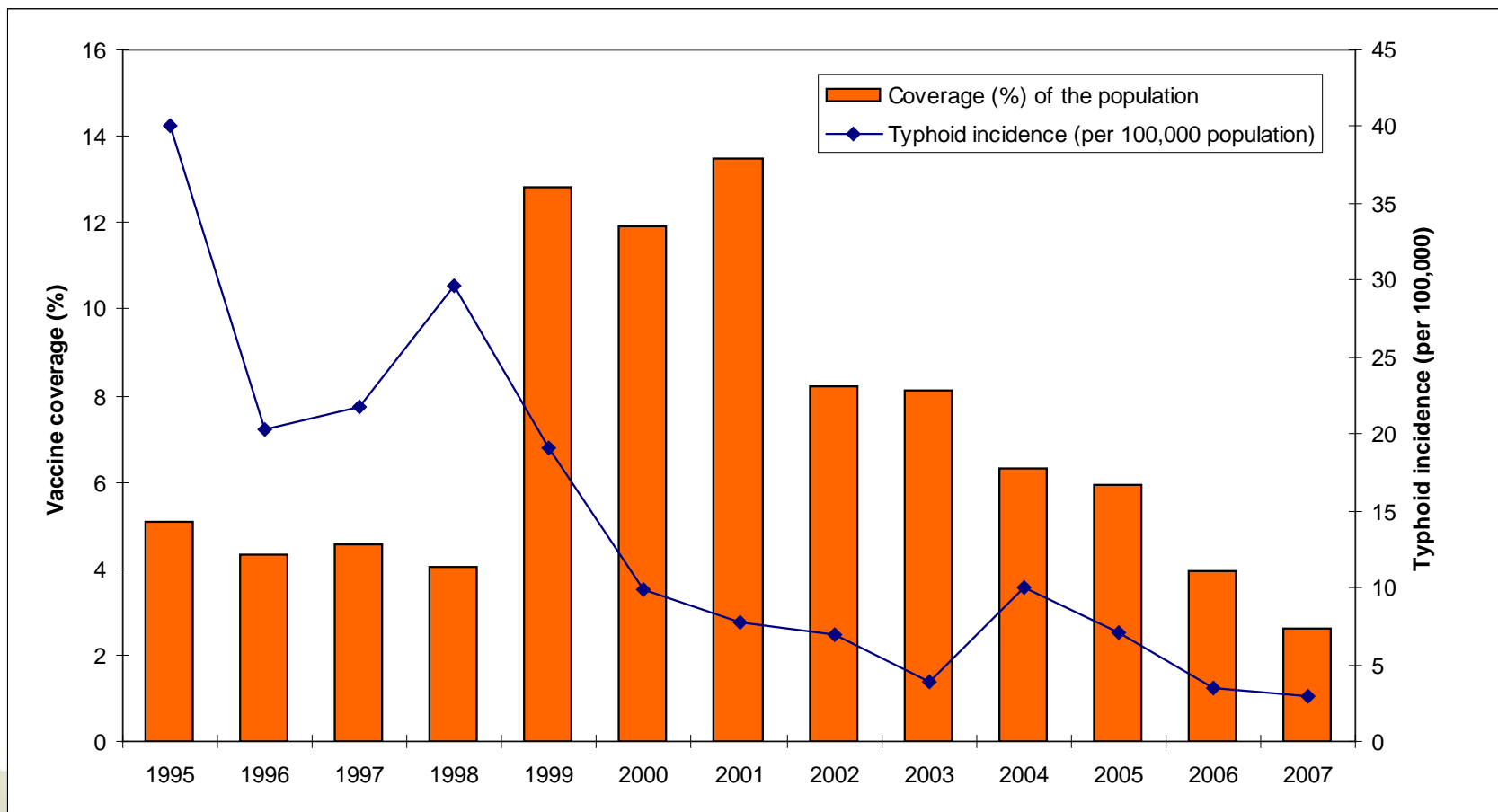
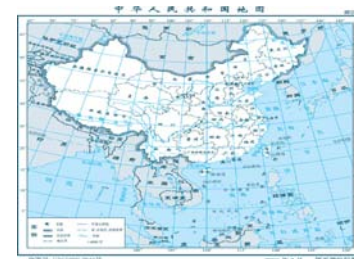


# Vaccine Coverage and Typhoid Incidence in Northwestern Region of Vietnam



# Vaccine Coverage and Typhoid Incidence

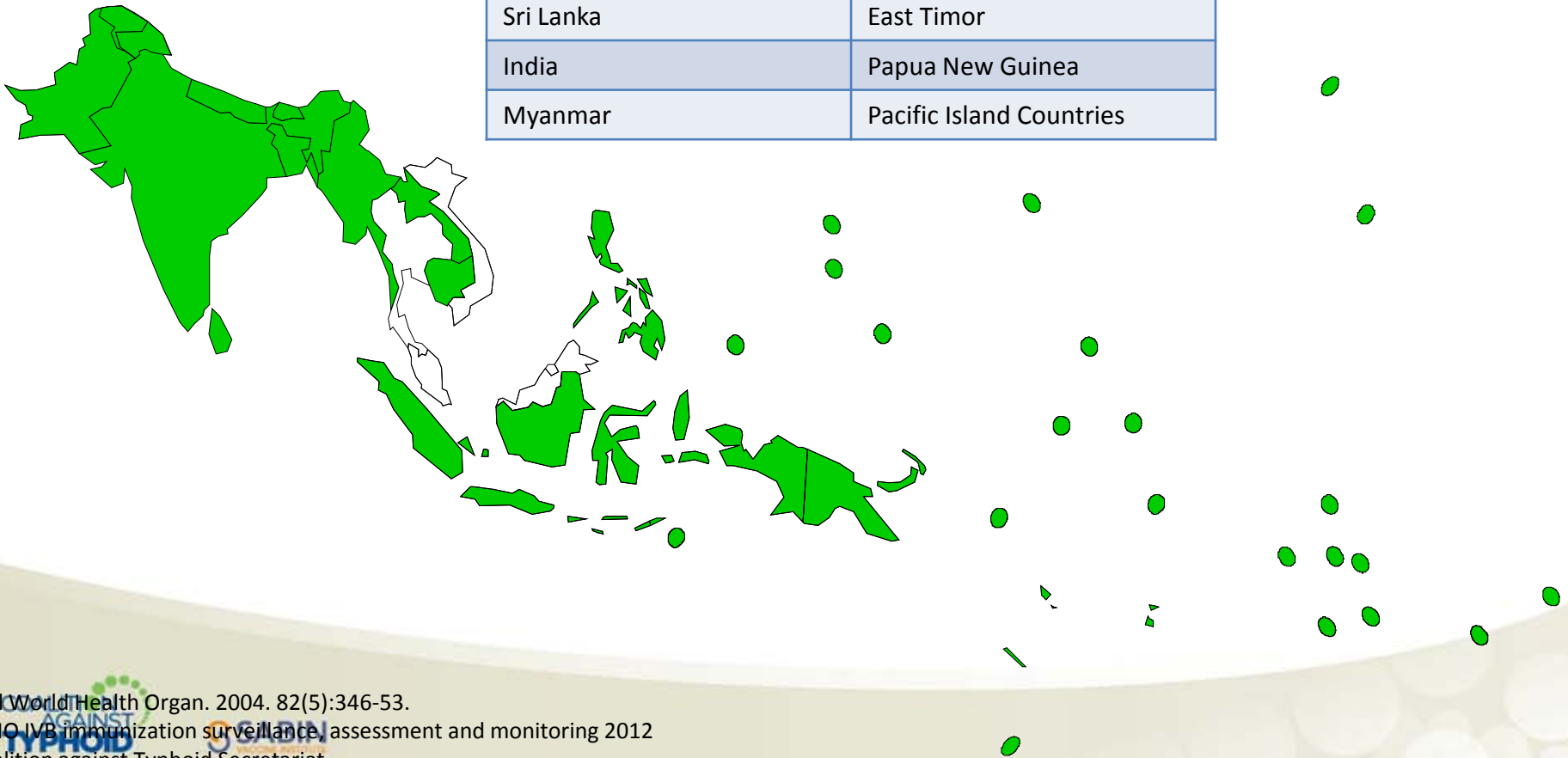
## Guilin, Guangxi Province, China



# **POLICY & PRACTICE: SOUTH AND SOUTHEAST ASIA**

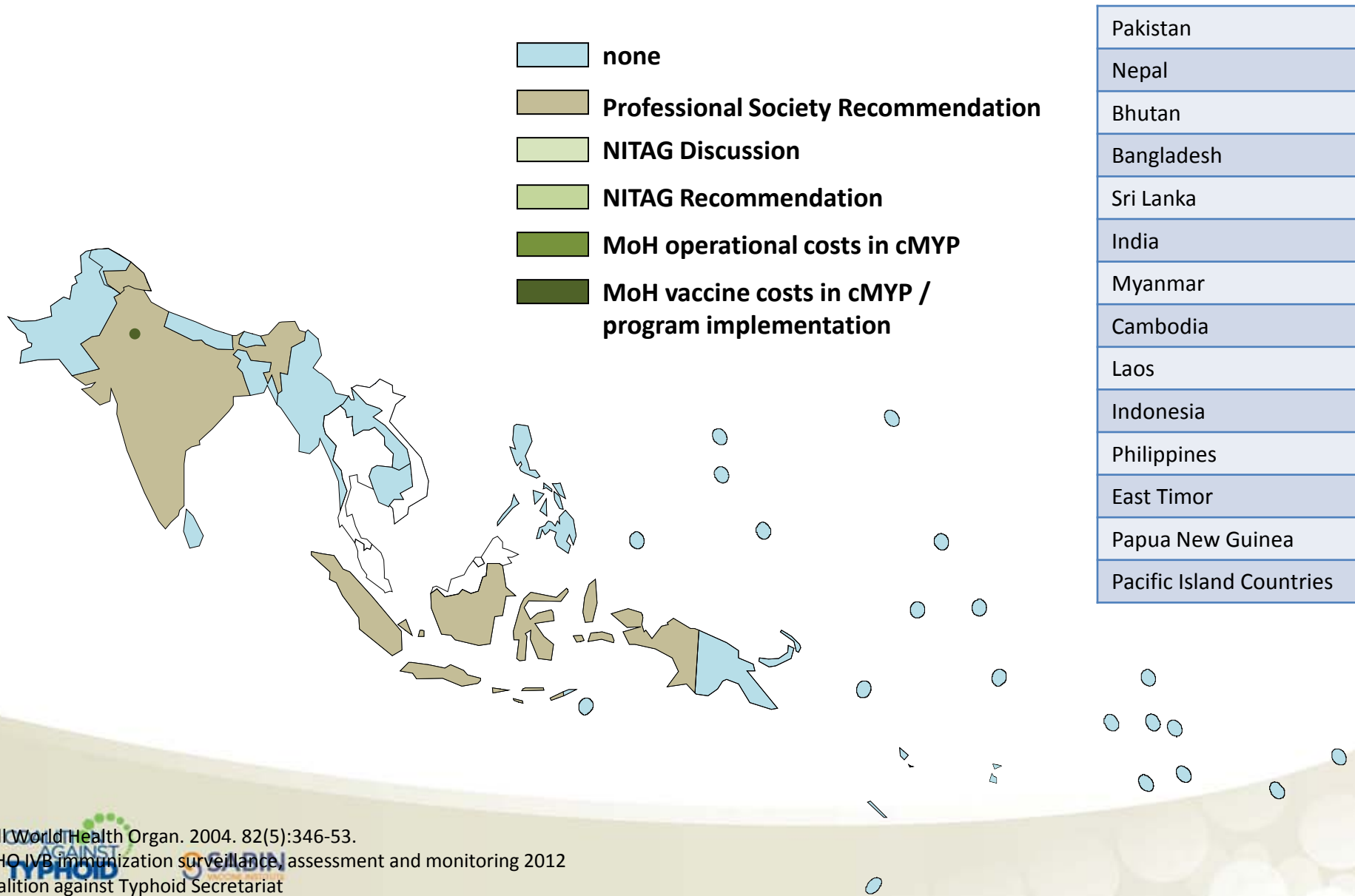
# High Typhoid Burden Countries, without existing typhoid immunization programs

Pakistan	Cambodia
Nepal	Laos
Bhutan	Indonesia
Bangladesh	Philippines
Sri Lanka	East Timor
India	Papua New Guinea
Myanmar	Pacific Island Countries

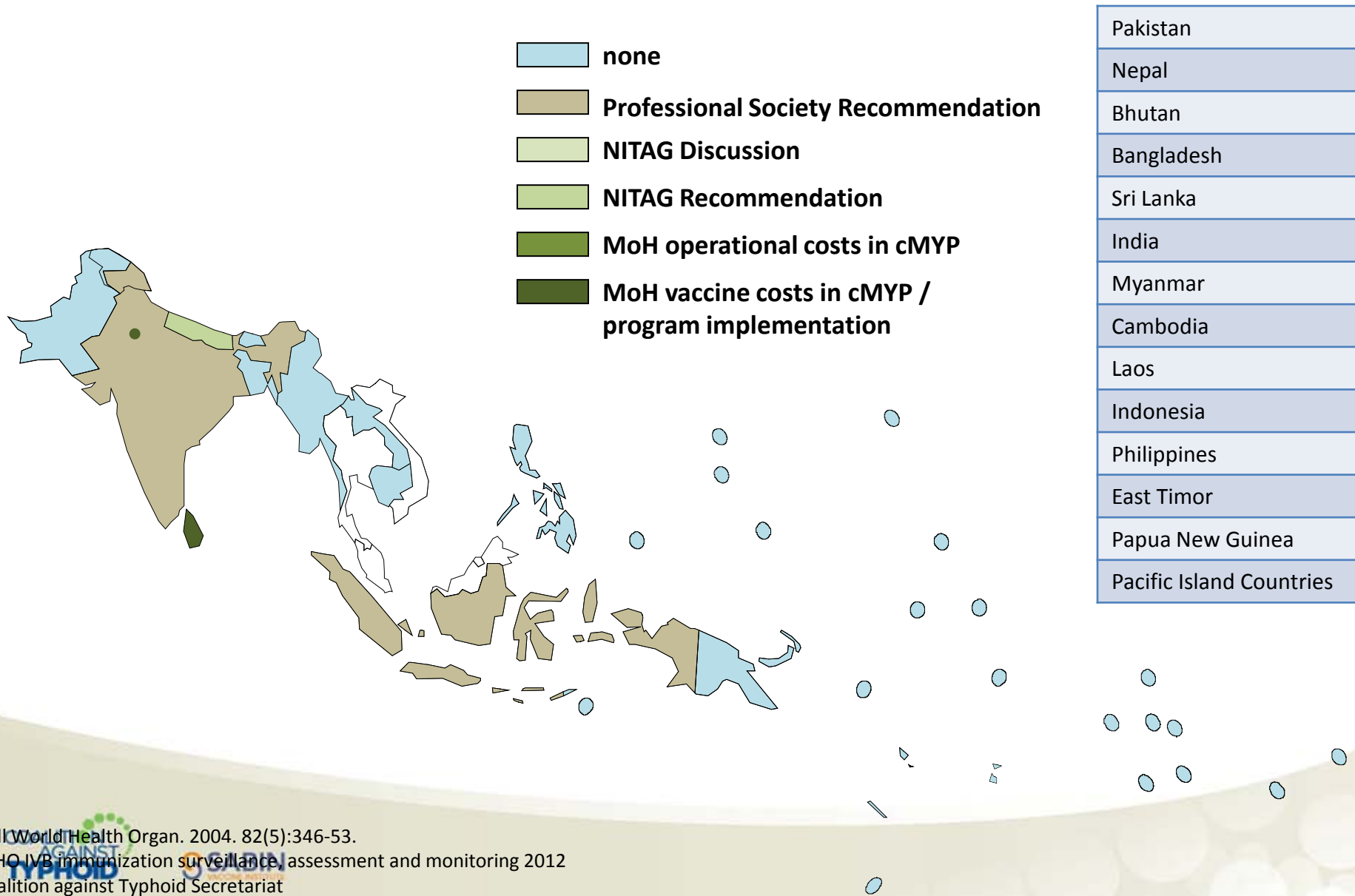




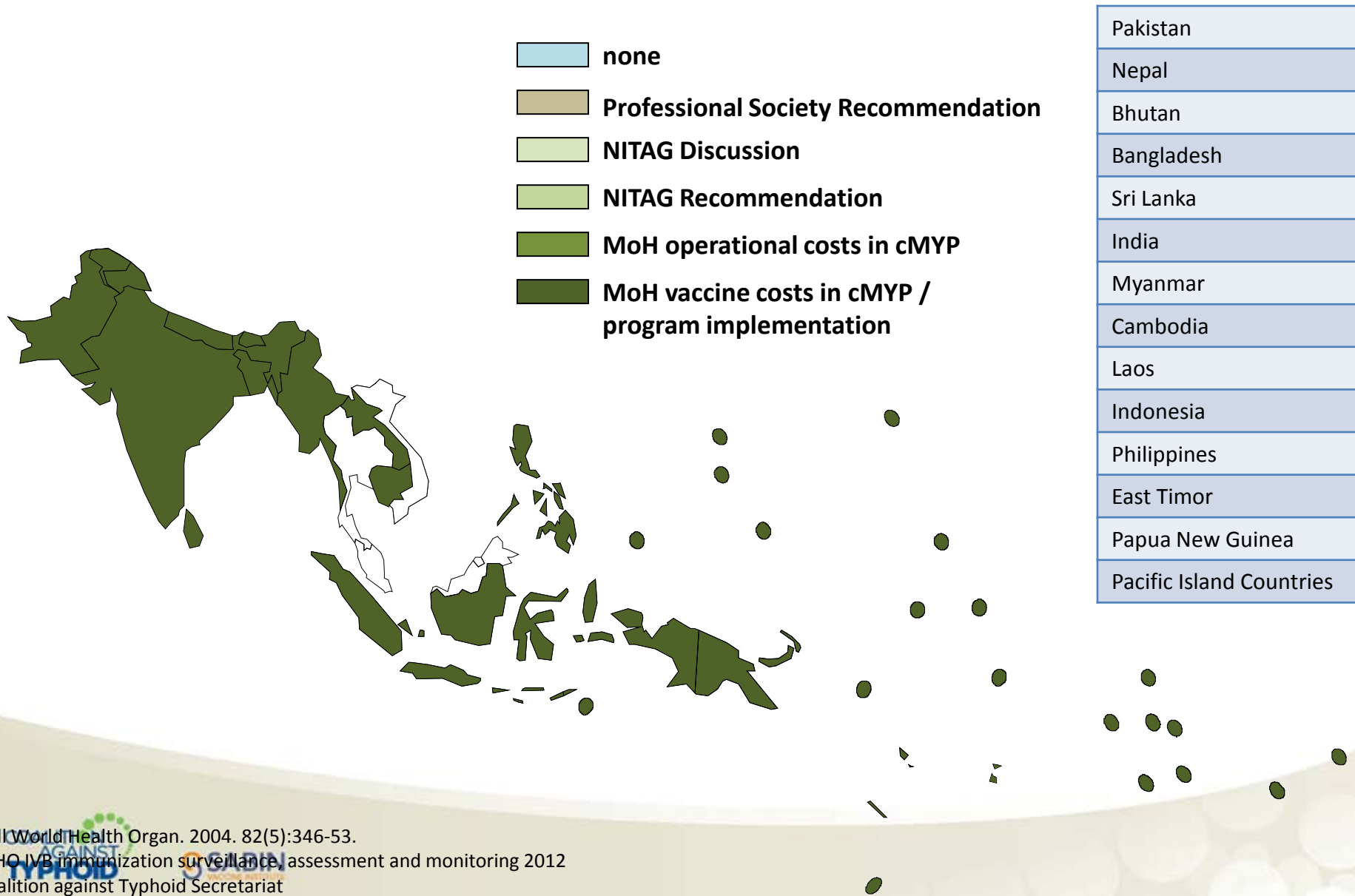
# 2009 - High Priority Countries: Progress with Recommendations, Policy and Practice



# 2012 - High Priority Countries: Progress with Recommendations, Policy and Practice



# Goal - High Priority Countries: Progress with Recommendations, Policy and Practice



# **TYPHOID VACCINES: CURRENT AND FUTURE**

# Current Typhoid Vaccine Characteristics

	Ty21a vaccine	Vi polysaccharide vaccine	Vi conjugate vaccine (future)
<b>Type</b>	Live attenuated	Subunit	Subunit
<b>Route of administration</b>	Oral	IM/SC	IM/SC
<b>Doses / regimen</b>	4 (USA)	1	1-3
<b>Revaccination</b>	5-7 years	3 years	never – 4y
<b>Efficacy</b>	35-67%	55-72%	90+%
<b>Duration of efficacy</b>	62% at 7 years	55% at 3 years	90+% at 4y –life
<b>Herd protection</b>	Yes	Yes	Likely
<b>Cross-protection against paratyphoid</b>	Yes	No	No
<b>Age</b>	≥ 5 years (ex-USA; USA)	≥ 2 years (WHO; USA)	≥ 6 weeks / 9 months (TBD)



# Current Typhoid Vaccines

## WHO Pre-Qualification Status

### Applied for WHO PQ

- Crucell-Vivotif (Ty21a)

### WHO Pre-Qualified

- Sanofi Pasteur–Typhim Vi  
(June 2011)

The Coalition Against Typhoid Applauds World Health Organization Prequalification of a Typhoid Vaccine

**COALITION AGAINST TYPHOID**

**WHO Prequalification is a "Crucial Step" to Getting a Vaccine to Those Who Need it Most**

Washington, D.C. - June 21, 2011 — The WHO has granted prequalification status to sanofi-pasteur's typhoid Vi polysaccharide vaccine, Typhim Vi®. This is the first typhoid vaccine to be WHO prequalified.



WHO prequalification allows of Typhim Vi® by UNICEF and the PAHO Revolving Fund, gov organizations.

WHO prequalification for GAVI Alliance New and Support (NVS).

"The introduction of typhoid vaccines in app of high burden count Dr. Zulfiqar Bhutta, and Child Health Khan University "and should together with safe water, basic health care and WHO esti million people typhoid fever to at least 200, burden is highest pre-school-aged poverty. The widest

prevalence of antibiotic resistant typhoid increases the urgency for vaccine introduction.

Dr. Shyam Raj Upreti, Director of the Child Health Division of the Department of Health Services, Ministry



Sabin Vaccine Institute 2000 Pennsylvania Ave NW, Suite 7100 Washington, DC 20006 t +1 (202) 842-6025 www.sabin.org

# Future Typhoid Vaccines

## Vi Conjugate (ViCV) and Live Attenuated Vaccines

ViCV		Live Attenuated	
Vi-rEPA	NIH (USA) Lanzhou Institute (China)	M01ZH09	Prokarium (July 2012)
Vi-CRM197	NVGH (Italy) ?	Ty800	Avant Immuno- therapeutics
Vi-TT	Bharat Biotech (India)	CVD909	Center for Vaccine Development , UMD & NIAID
Vi-DT *	IVI/Shantha Biotechnics (India)		
Vi-DT *	IVI/SK Chemicals (S Korea)		
Vi-DT *	IVI/Biofarma (Indonesia)		
Vi-DT	DAVAC (Vietnam)		
Vi-DT	Finlay Institute (Cuba)		

# Development of WHO ECBS Guidelines for Prequalification of Typhoid Vi Conjugate Vaccines

- 5-7 September 2012
  - KFDA/WHO Joint Meeting of Working Group on Quality, Safety and Efficacy of Typhoid Vi Capsular Polysaccharide Conjugate Vaccine, Jeju, Republic of Korea
- 1-31 March 2013
  - first public consultation of the draft document through WHO website
- 29-30 April 2013
  - Follow-up meeting of Working Group on Quality, Safety and Efficacy of Typhoid Vi Capsular Polysaccharide Conjugate Vaccine, Geneva, WHO
- 28 June 2013
  - Submission of final draft for ECBS review
- August – September 2013
  - Second public consultation of the draft document through WHO website publication
- 21-25 October 2013
  - ECBS meeting and discussion, Geneva

# Review and Discussion of Typhoid Models

- Disease Burden
- Transmission models
  - Interventions effectiveness
  - Cost-effectiveness

# GAVI Supports Typhoid Vi Conjugate Vaccines

- In 2008, the GAVI Board approved the *Vaccine Investment Strategy – GAVI’s strategic approach*
  - 4 vaccines: Human Papillomavirus (cervical cancer), Japanese Encephalitis, Rubella, and **Typhoid conjugate**
  - Reflects a type and degree of commitment to countries, suppliers, and Alliance partners. (2010)
- In 2010 and 2011, the GAVI Programme and Policy Committee (PPC) recommended and the GAVI Alliance Board re stated their commitment to typhoid conjugate vaccines
  - Board-recommended Vaccine Investment Strategy (VIS) vaccines: Human Papillomavirus (cervical cancer), Japanese Encephalitis, Rubella, and **Typhoid conjugate**

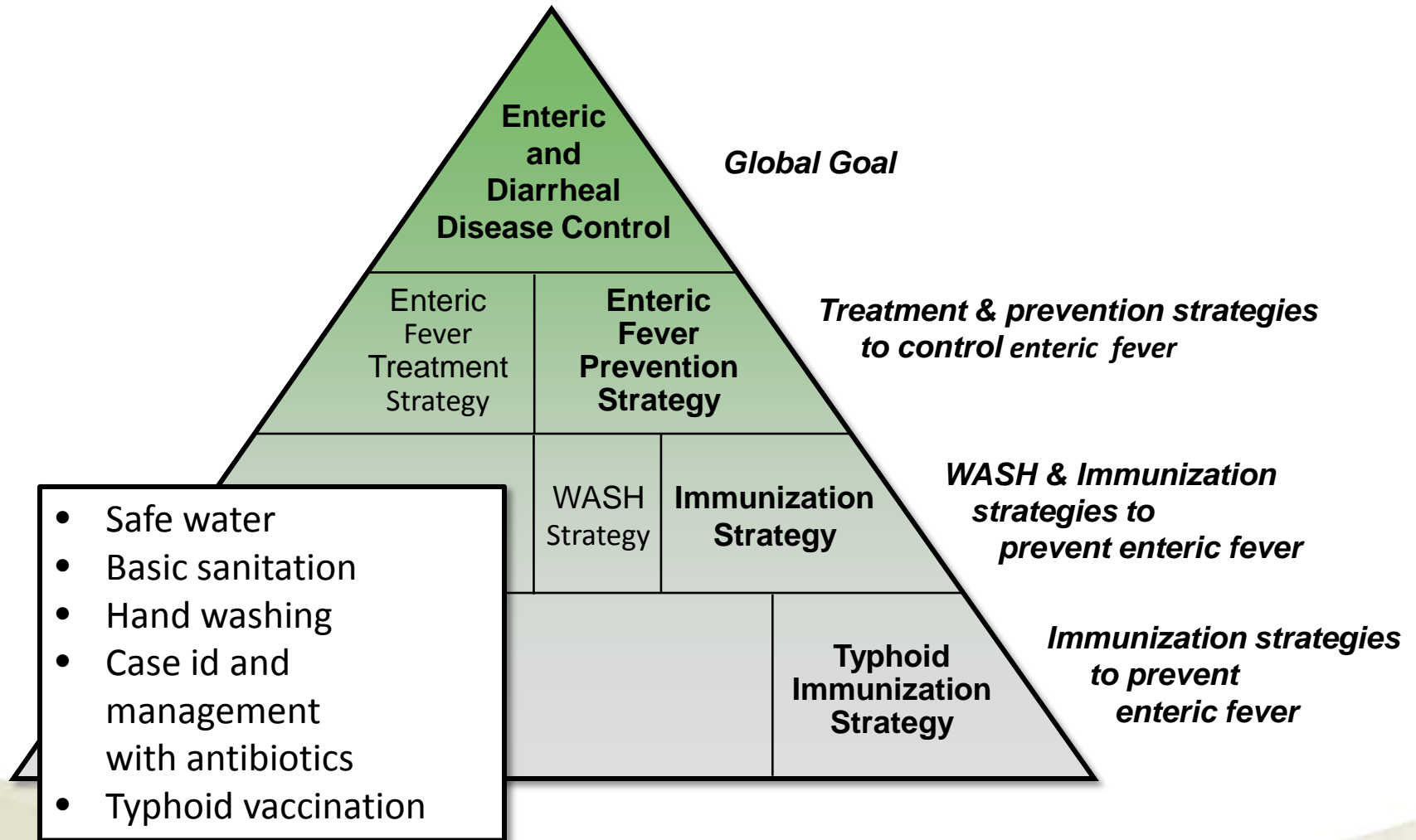


# **THE COALITION AGAINST TYPHOID (CaT)**



# CaT's aim is to expedite and sustain rational, evidence-based decisions regarding the use of typhoid vaccines.

Our aim is defined within the context of Enteric and Diarrheal Disease Control and specifically Enteric Fever Control



CaT's success is based on the collective action of its membership. It is not a highly funded organization in the style of previous new vaccine initiatives.



## 15th International Congress on Infectious Diseases

BANGKOK, THAILAND • JUNE 13-16, 2012



Organized by the International Society  
for Infectious Diseases



In collaboration with the Infectious Disease Association of Thailand

**Second Announcement**



The American Society of  
Tropical Medicine and Hygiene  
Advancing global health since 1903

### **ASTMH 61st Annual Meeting (2012)**

November 11-15, 2012

Atlanta, Georgia USA

<http://www.astmh.org/Home.htm>

### **CaT symposium**

Organizer: Chris Nelson, Coalition against Typhoid  
(CaT)/Sabin Vaccine Institute, Washington DC USA

Co-chair: Zulfi Bhutta, Founding Chair, Women and Child  
Health Division, the Aga Khan University, Karachi, Pakistan

### **Advances in typhoid fever epidemiology and control**

- Non-malaria febrile illness, J Crump
- Enteric fevers: diseases in need of better diagnostics, G Vernet
- Progress with typhoid conjugate vaccines, S Szu
- Typhoid fever transmission models, I Longini



# 8<sup>th</sup> International Conference

## Typhoid Fever and Other Invasive Salmonellosis

1-2 March 2013 • Dhaka, Bangladesh  
[typhoidconference.org](http://typhoidconference.org)



**SABIN**  
VACCINE INSTITUTE

COALITION  
AGAINST  
**TYPHOID**



ANNOUNCING THE SEVENTH INTERNATIONAL CONFERENCE ON:

# VACCINES FOR ENTERIC DISEASES

6-8 November 2013, The Royal Orchid Sheraton Hotel & Towers, Bangkok, Thailand

## ASTMH 62nd Annual Meeting

November 13-17, 2013

Marriott Wardman Park Hotel

Washington, DC USA

<http://www.astmh.org/Home.htm>



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Advancing global health since 1903



WSPID 2013

## 8TH WORLD CONGRESS OF THE WORLD SOCIETY FOR PEDIATRIC INFECTIOUS DISEASES (WSPID)

CAPE TOWN, SOUTH AFRICA, NOVEMBER 19-22, 2013







**MANY OF THOSE MOST AT RISK ARE THE LAST TO GET VACCINES...**

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## CaT NEWS & EVENTS

Hyper-endemic Typhoid in Africa Takes Spotlight in Cannes

Important new evidence revealing hyper-endemic typhoid in Africa will be presented by global health experts and scientists...



●●● VIEW ALL

## RESOURCES

Community Acquired Bacteremia in Young Children from Central Nigeria- A Pilot Study

A team led by researchers from Michigan State University found similar typhoid infection rates...



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Typhoid Epidemic Sweeps Philippines: Regional health officials declare typhoid incidence up 40%...

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