

Case studies of vaccine herd protection: Hib vaccines

GVRP 2009 Satellite Workshop on
Herd Effects and Vaccine Effectiveness
Bamako, Mali

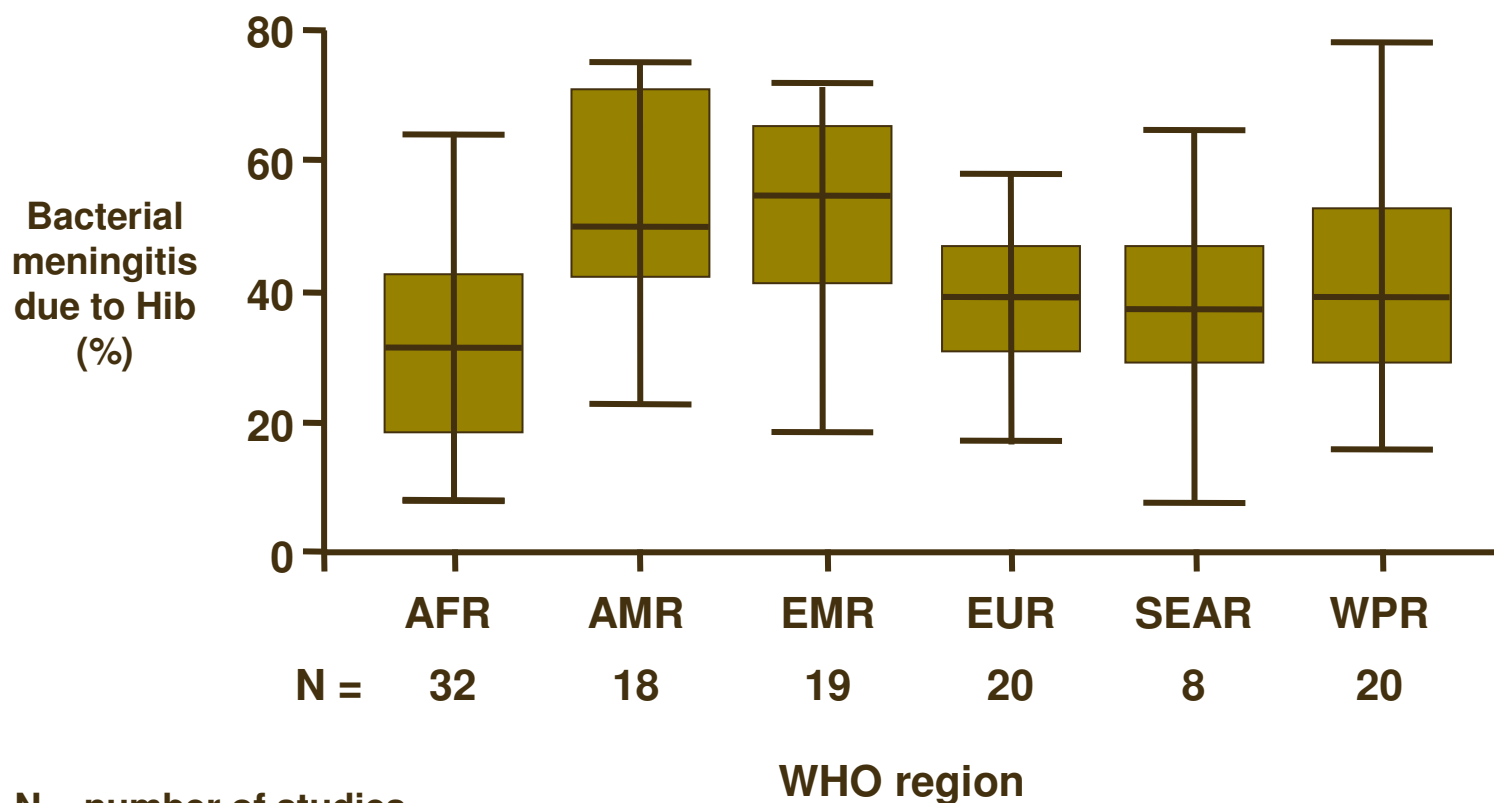
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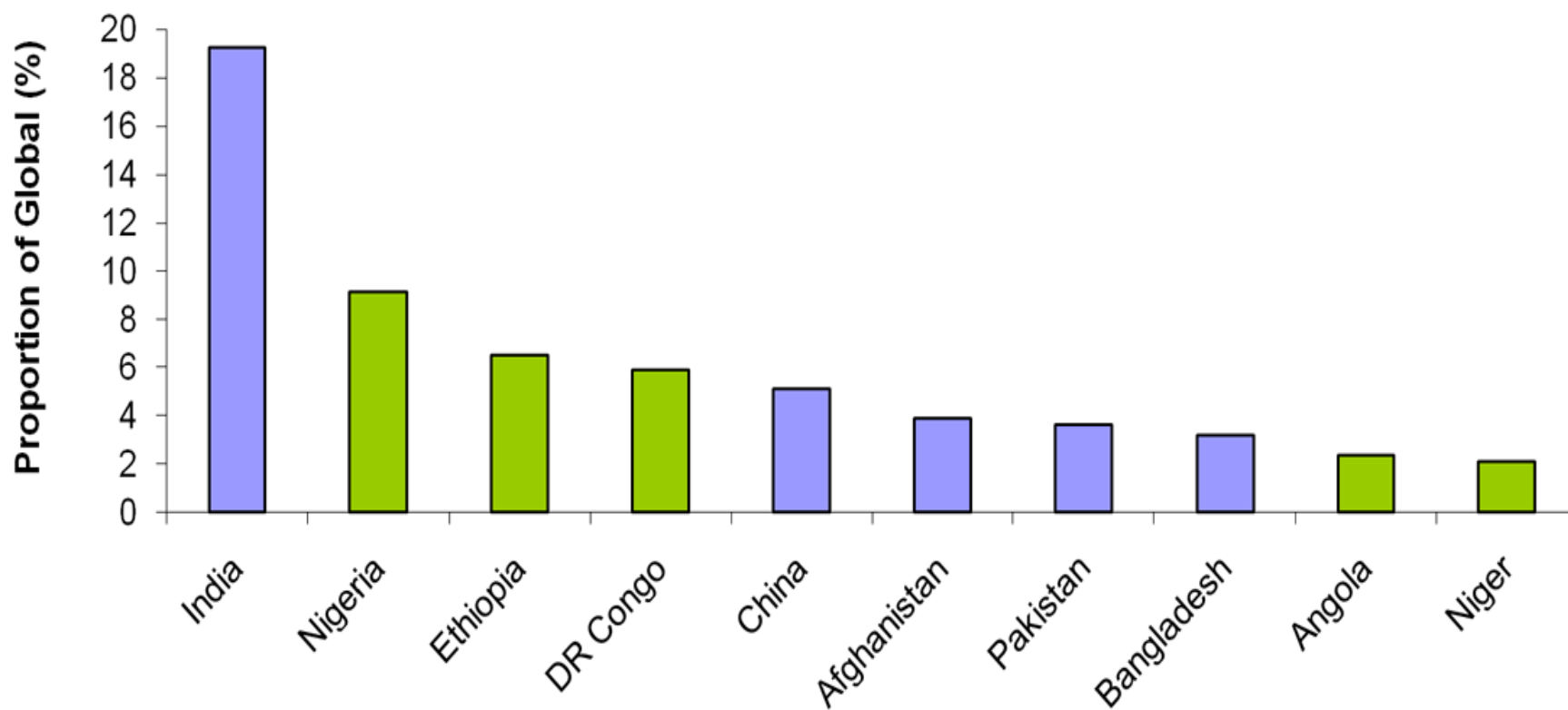
Hib was consistently the leading cause of childhood bacterial meningitis

Hib as a percentage of all bacterial meningitis with established etiology in children < 5 years of age (median, quartiles, range)



N = number of studies

Top 10 countries with the most Hib deaths are in Africa and Asia



HIV (+) deaths included

Source: Hib/SP GDB June 15, 2009 Final Analysis

Vaccines against Hib disease

- **Hib polysaccharide vaccine**

- Licensed in US in 1985
- 90% effective at > 18 months
- 50% effective at < 18 months

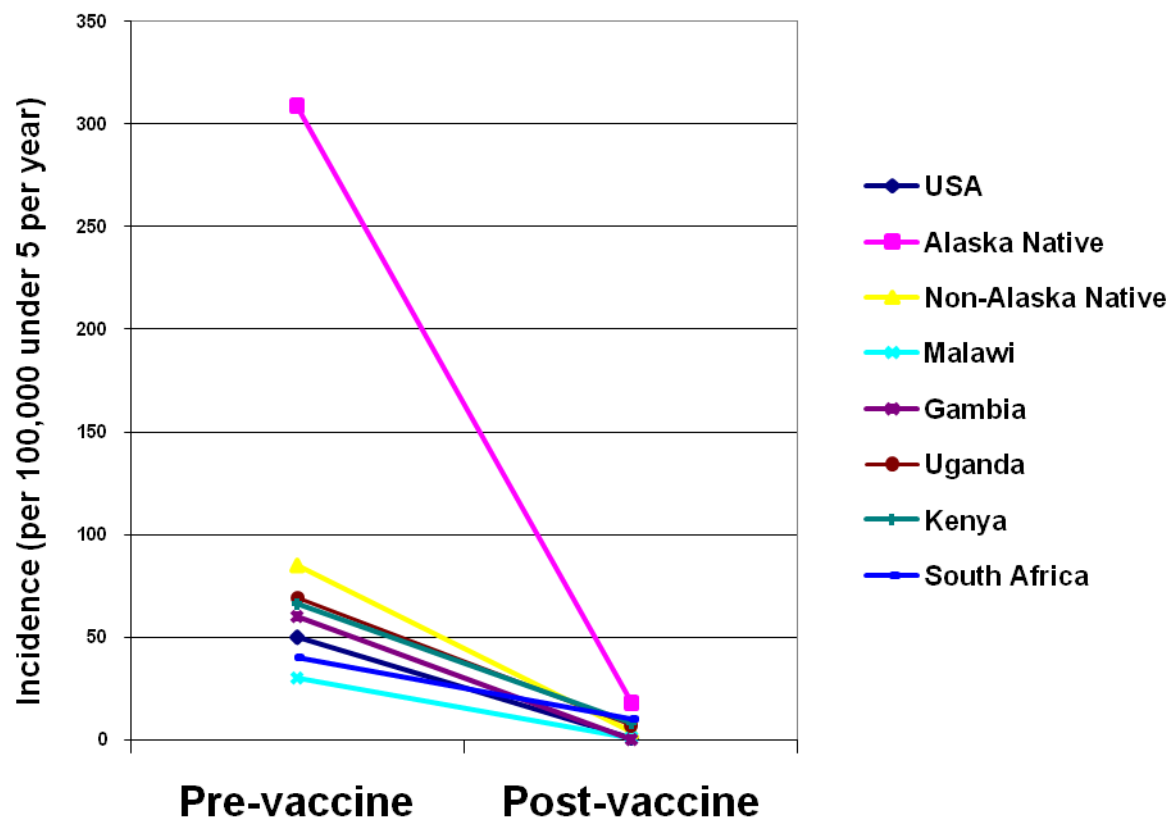


- **Polysaccharides alone are poorly immunogenic, particularly in infants**

- T cell independent responses
- No memory B cells
- No protection against carriage

Hib Vaccine Impact on Meningitis

- Vaccine impact high everywhere
- Some local influences (type of vaccine, HIV prevalence, vaccine coverage)
- Extremely high incidence populations tend to have higher residual disease



Indirect effect of Hib polysaccharide-protein conjugate vaccine

Is the dramatic impact of Hib-conjugate vaccines due to direct effect on Hib disease alone?

The Gambian Hib vaccine efficacy trial

Outcome	VE (95% CI)
Hib disease	95 (67, 100)
Hib pneumonia	100 (55, 100)
Radiological pneumonia	21 (5, 35)
Hib carriage	60 (44,72)

Routine Hib immunization in The Gambia

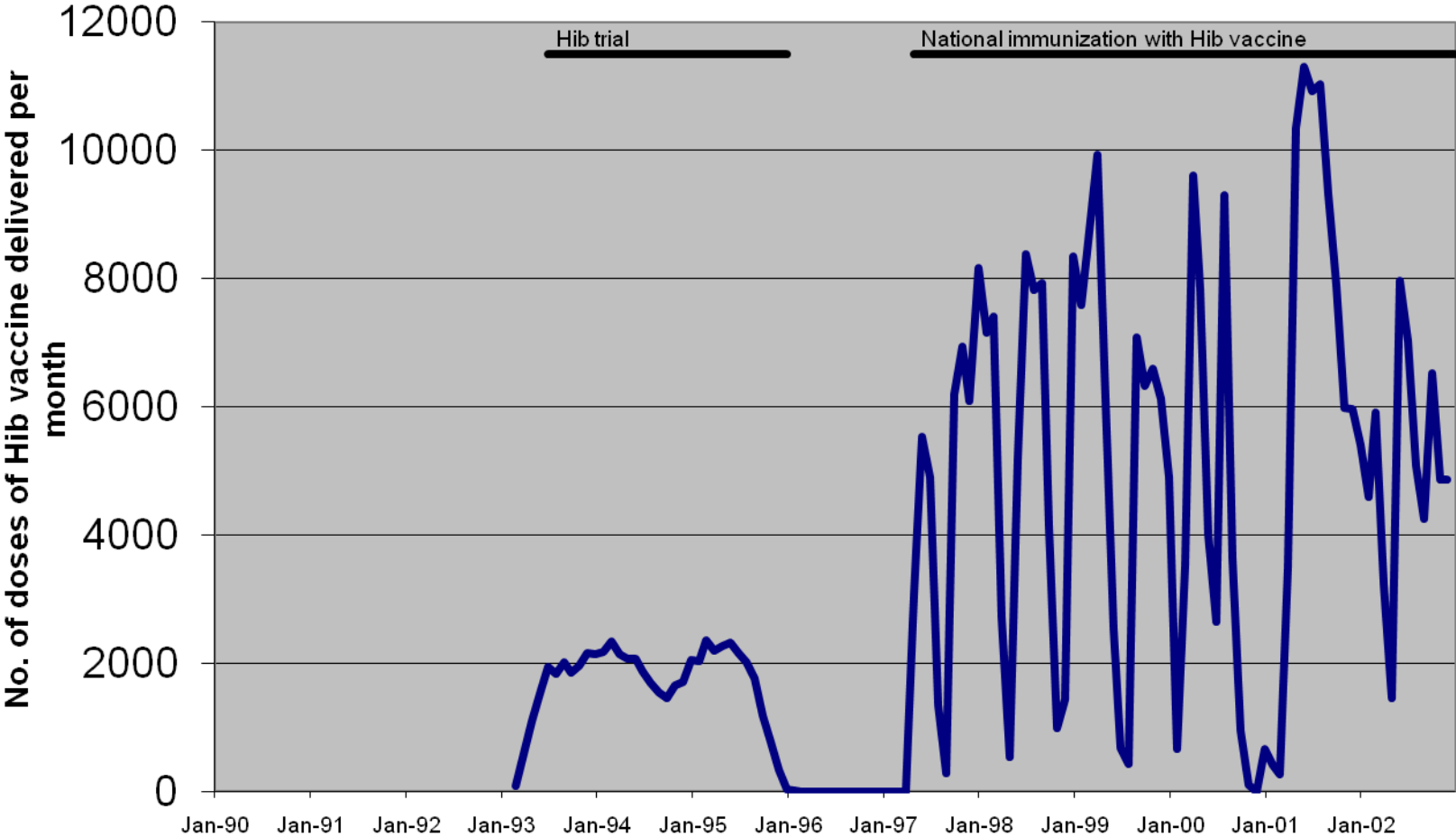
- Introduction of routine Hib immunization on 1 May 1997
- The Gambia Government/MRC Hib vaccine effectiveness study (1997-2002)
- Questions
 - Would Hib vaccine be as protective against Hib disease as it was during the trial?
 - Would there be herd effect as reflected by reduced Hib carriage among children aged 1 – 2 years?
 - Would unusual or late presentations of Hib disease occur?

Indirect effect of Hib polysaccharide-protein conjugate vaccine

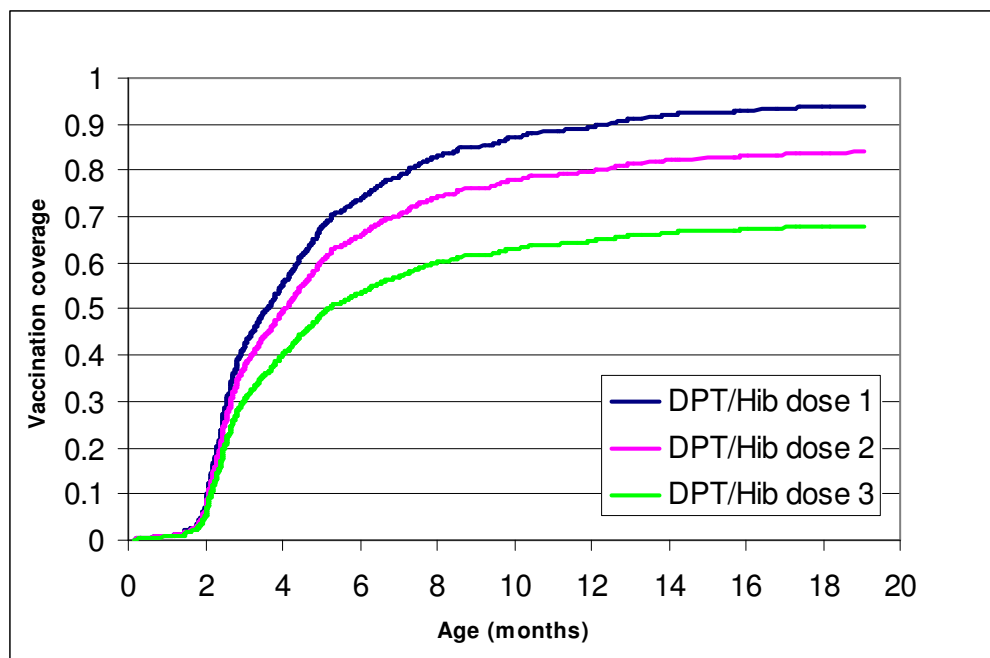
To estimate relative contribution of direct and indirect effects of vaccination:

- The age distribution of Hib meningitis before (1990-1993) and after (2000) vaccination was compared to ensure there was no shift in age distribution of disease.
- The probability of receiving a protective dose early enough to prevent Hib disease was calculated
- This probability was multiplied by the estimated vaccine efficacy to give the expected proportion of cases that would be prevented by direct effect alone

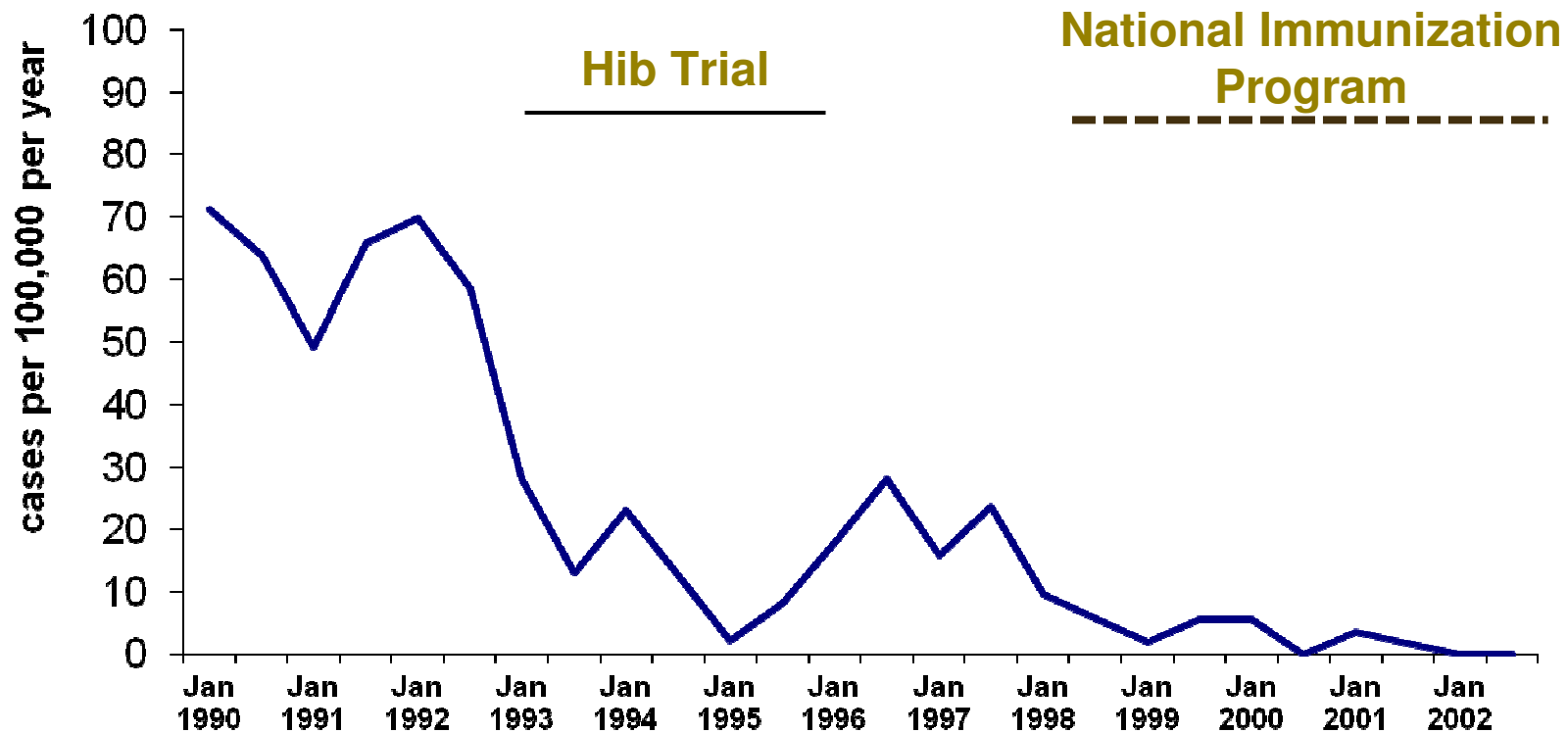
Hib implementation in The Gambia



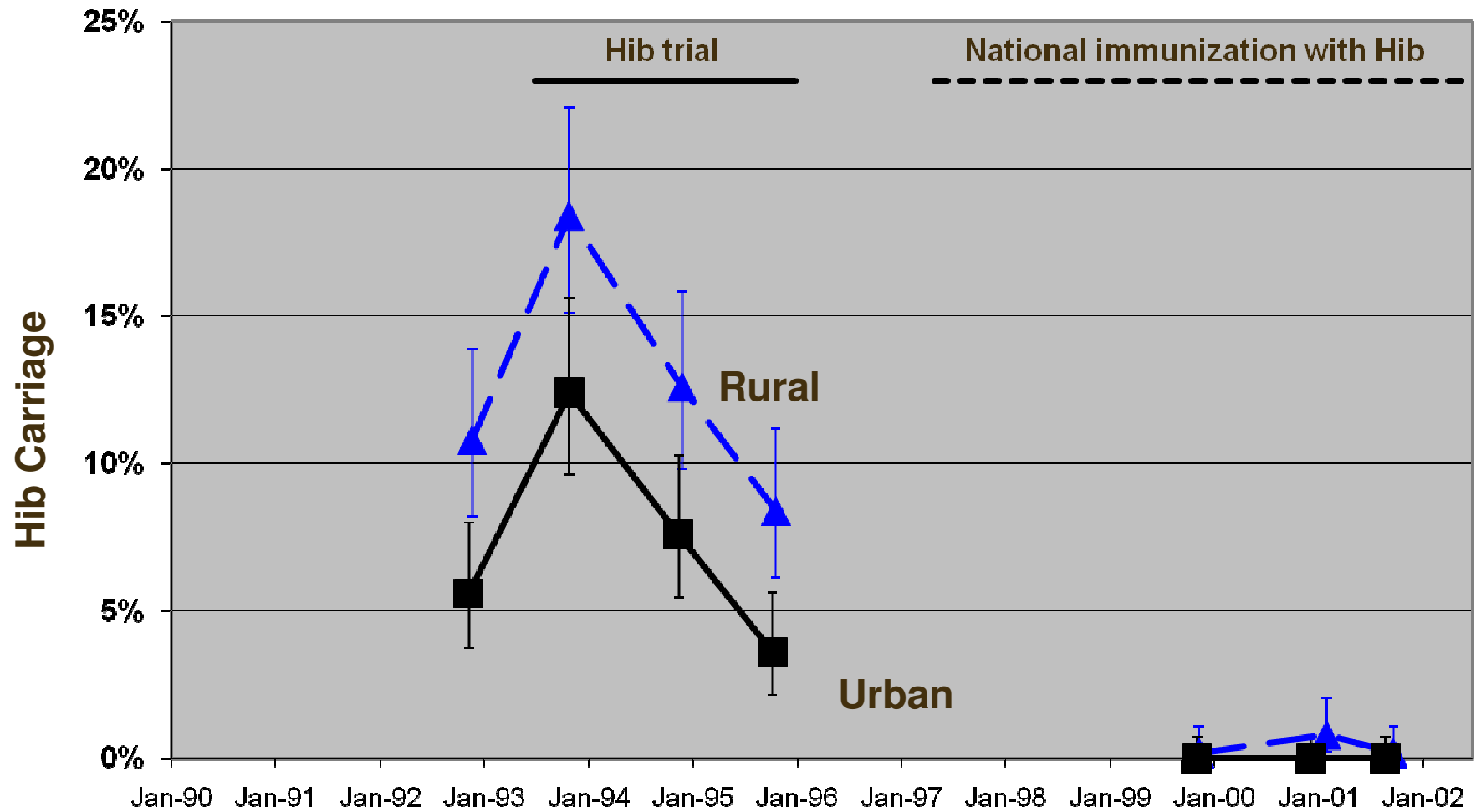
Coverage with 1, 2 or 3 doses of DPT/Hib vaccine in 2000



Incidence of Hib meningitis in children under 5 in The Gambia



Impact of routine Hib immunization on carriage



Vaccine efficacy against Hib meningitis

No. of doses	VE	95% CI	P values
1 dose	35%	-84 to 77	0.421
2 doses	93%	42 to 99	0.013
3 doses	96%	47 to 100	0.015

The estimate of probability for receiving 2 doses of Hib vaccine early enough to be protective was 0.44 and with VE of 93%, 41% would be expected to be the reduction in disease incidence due to direct effects alone.

An effectiveness trial of Hib vaccine in Bangladesh

- Pneumonia:
 - Prevented 34-44% of X-ray proven pneumonia
- Meningitis:
 - about 90% protection against culture-confirmed Hib meningitis
 - Prevented 71-83% of probable bacterial meningitis
- Consistent with studies from the Gambia and Chile

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Thank You

*This presentation is entirely my responsibility
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