



Objectives of presentation



1. To give you an overview of the published literature on cost-effectiveness of Hib vaccine
2. To explain differences in study results
3. To make conclusions about the cost-effectiveness of Hib vaccine

Overview



1. Systematic literature review
 - Methods and results
2. Studies published since Feb. 2009
3. Results of new global analysis using the TRIVAC model

Objectives of systematic review



- To determine the quantity of published papers, in particular for low- and middle-income countries
- To evaluate the methods used
- To determine the main limitations and knowledge gaps

Search strategy

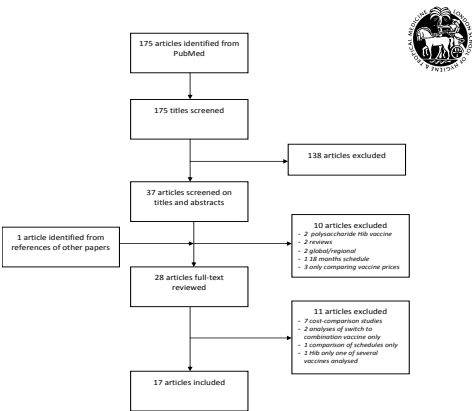


- Search terms:
 - “*Haemophilus influenzae* type b” and “vaccine” and “cost”.
- Databases:
 - PubMed
 - The National Health Service Economic Evaluation Database
 - The Health Economic Evaluation Database
- Search ended February 2009

Inclusion criteria



- Country-specific studies only
- Should assess both the incremental costs and *health* consequences of Hib vaccine compared to a situation without the vaccine
- Only conjugate vaccines



Countries with included papers and publication year



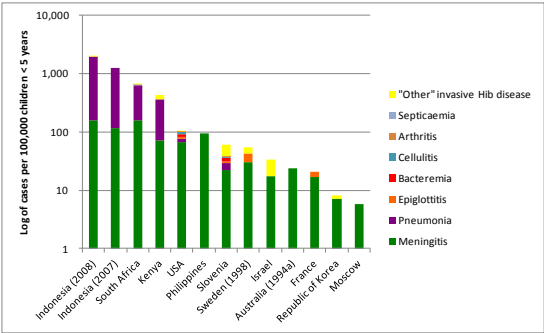
High-income		Middle-income		Low-income	
Israel	1993	South Africa	1995	PNG	2002
Australia (2)	1994	Russia	2006	Kenya	2007
Sweden (2)	1994+98	Philippines	2001		
France	1996	Colombia	2006		
Slovenia	2001	Indonesia (2)	2007+08		
USA	2002				
South Korea	2008				

Quality assessment of the 17 studies

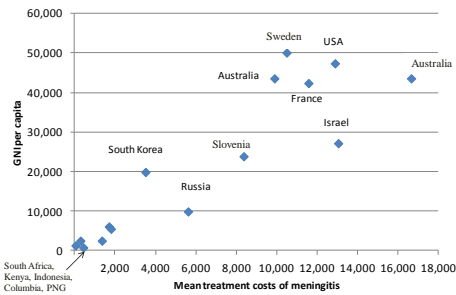


Quality indicator	YES	NO
Description of decision analytic model?	12	5
Hib disease incidence rates reliable and clearly reported ?	11	6
Hib pneumonia included in effectiveness measure?	8	9
Full disease impact included in outcome measure?	12	5
Treatment costs reported in transparent and reliable way?	4	13
Treatment costs of sequelae included?	11	6
Vaccine delivery costs included?	9	8
Productivity changes reported transparently?	4	4
Sensitivity analysis undertaken?	16	1

Hib disease incidence rates used in the studies



Correlation between GNI per capita and treatment costs of acute meningitis (2010 US\$)



Assumed lifetime treatment costs of meningitis sequelae



Country	2010 US\$
South Africa	448
Indonesia	6,580
Russia	56,229
South Korea	215,436
Israel	610,748
Australia	722,008
Australia	827,724
Slovenia	924,314
Sweden	1,821,627
Sweden	2,569,295

Included, but value not reported	Not included
France	Kenya
USA	Indonesia
Philippines	PNG
	Columbia

Hib vaccine price assumptions (2010 US\$ per dose)



High-income		Middle-income		Low-income	
France	26.82	South Africa	22.67	Kenya	3.70
Sweden	25.30	Russia	15.15	PNG	NS
Sweden	25.11	Philippines	6.60		
Republic of Korea	24.93	Columbia	4.87		
Australia	16.07	Indonesia	3.70		
Israel	15.72	Indonesia	3.79		
Slovenia	12.24				
Australia	8.93				
USA	6.96				

Methods used to value health effects



Monetary value on a life	QALYs gained	DALYs averted	Life years gained
Israel	Australia (2)	Indonesia (2)	PNG
Sweden (2)	France	Kenya	Columbia
South Africa		Russia	
Slovenia			
South Korea			
Philippines			

Results: Cost-benefit studies



	Benefit-cost ratio with productivity costs	Benefit-cost ratio w/o productivity costs
Israel	1.45	1.26
South Africa	1.43	Will be < 1
Slovenia	1.39	0.99
South Korea	0.77	NI
USA	5.40	3.40
	Annual cost savings with productivity costs	Annual cost savings w/o productivity costs
Sweden	US\$ 16,999,651	NI
Philippines	US\$ 24,629,930	US\$ 11,215,415
Sweden	US\$ 5,464,880	US\$ 1,821,627

Results: Costs per DALY averted and QALY/life year gained (2010 US\$)



Country	Costs per DALY averted	Costs per QALY gained	Costs per life year saved
Kenya	96		
Indonesia	117		
Indonesia	90		
Russia	38,536		
Australia		1,816	
Australia		1,649	
France		8,418	
PNG			20
Columbia			2,056

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3. Results of new global analysis using the TRIVAC model

I know of three new studies



1. Griffiths UK, Clark A, Shimanovich V, Glinskaya I, Tursunova D, Kim L, Mosina L, Hajjeh R, Edmond K. Comparative economic evaluation of *Haemophilus influenzae* type b vaccination in Belarus and Uzbekistan. PLoS One. **2011**;6(6)
 - Costs per DALY averted: US\$ 267 in Uzbekistan and US\$ 9,323 in Belarus
2. Gupta M, Prinja S, Kumar R, Kaur M. Cost-effectiveness of *Haemophilus influenzae* type b vaccine introduction in the universal immunization schedule in Haryana State, India. Health Policy Plan. **2012** Mar 8
 - Costs per DALY averted: US\$ 277
3. Moradi-Lakeh M, Shakerian S, Esteghamati A. Immunization against *Haemophilus Influenzae* type b in Iran; Cost-utility and Cost-benefit Analyses, Int J Prev Med. **2012** May;3(5):332-40
 - Costs per DALY averted: US\$ 4,535

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Paper recently submitted



- Griffiths UK, Clark A, Hajjeh R, Cost-effectiveness of *Haemophilus influenzae* type b vaccine in low- and middle-income countries: Regional analysis and assessment of major determinants

Brief method outline



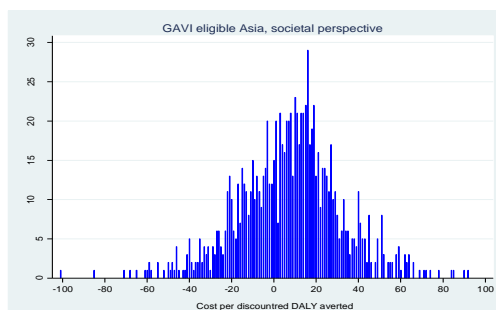
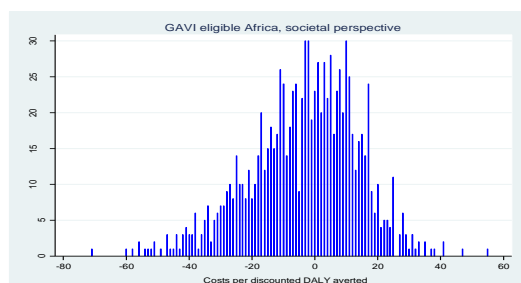
- Used the TRIVAC model
 - Hib part developed during Hib Initiative
- Ran analysis for one million birth cohort in four settings
 - GAVI eligible Africa, GAVI eligible Asia, lower middle-income countries and upper middle-income countries
- Parameter assumptions based on best available international evidence
 - Uncertainty ranges and statistical distribution attached to parameters and Monte Carlo simulations generated

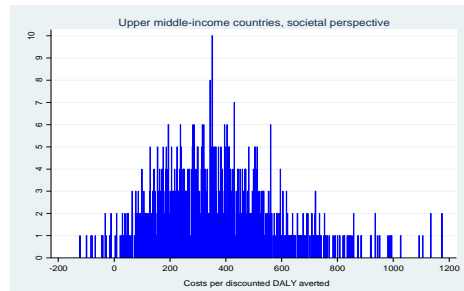
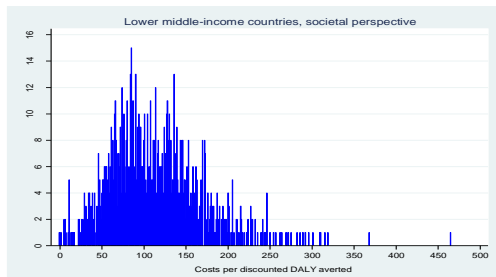
Most important new assumptions



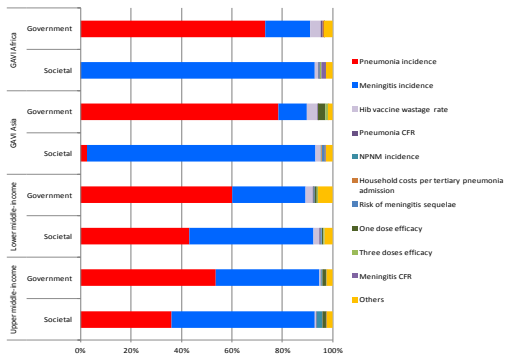
- Reduced GAVI pentavalent price
 - US\$ 1.75 per dose in 2012 (US\$ 3.60 in 2009)
- New study on lifetime sequelae costs in Senegal* extrapolated to all settings in the societal perspective analysis
 - Non-discounted costs: US\$ 53,165 per child (95% CI US\$ 68 - 148,067)
 - Treatment costs 1%, childcare costs 9% and productivity costs of caregivers 90%

*Griffiths UK, Dieye Y, Fleming J, Hajjeh R, Edmond K. Costs of Meningitis Sequelae in Children in Dakar, Senegal. *Pediatr Infect Dis J*. 2012 Jun 4.





Contribution to variance



Summary



- Cost-effectiveness studies are available for ten low- and middle-income countries
 - The are of variable quality
 - The conclusion of all the studies is that the vaccine is cost-effective
- New analysis provides cost-effectiveness ranges and shows that the vaccine is likely to be cost saving in Africa
 - Especially due to recent vaccine price reduction and inclusion of lifetime sequelae costs