

# Economic evaluation of HIV vaccination: current practice and broadened perspectives

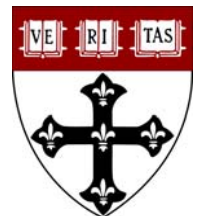
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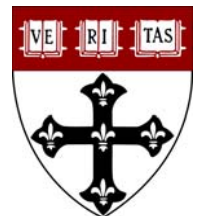
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# Background

- In other work we have argued that economic evaluation of vaccinations commonly ignores important vaccination effects in establishing the social value of vaccination
  - *Haemophilus influenzae* type B vaccine (Bärnighausen et al. *Vaccine* 2011)
  - Pneumococcal conjugate vaccine and Rotavirus vaccine (Bärnighausen et al. *SAMJ* 2011)
  - Human papilloma virus vaccine (Bärnighausen *CMID* forthcoming)
  - Dengue vaccine
  - WHO efforts

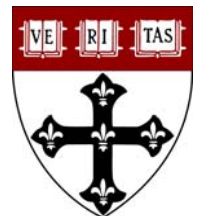


# Benefits (or effects) framework

		Category
Broad	Narrow	1 Health gains
		2 Health care savings
		3 Care-related productivity effects
		4 Outcome-related productivity effects
		5 Behavior-related productivity effects
		6 Externalities

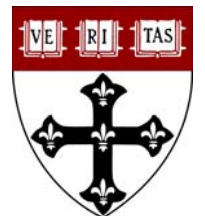


Based on Bärnighausen, Bloom, Canning, Friedman, Levine, O'Brien, Privor-Dumm, Walker *Vaccine* 2011



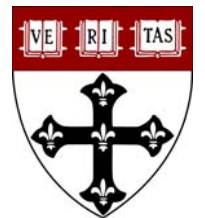
# HIV vaccination: outcome-related productivity effects

- Effects of HIV (and ART) on employment and labor productivity
  - Population-based studies (Bor, et al. 2012)
  - Clinical studies (Thirumurthy et al. 2008, 2011; Rosen et al 2010)
  - Firm-based studies (Habyarimana et al 2011; Larson et al. 2008, 2009)



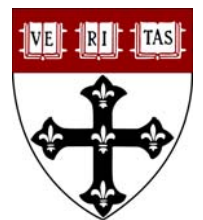
# HIV vaccination: behavior-related productivity effects

- Behavior-related productivity benefits
  - Human capital investment (education and health)
  - Savings
  - Demographic dividend (Bloom and Canning *Science* 2000)
- Behavior-related productivity losses
  - Risk compensation

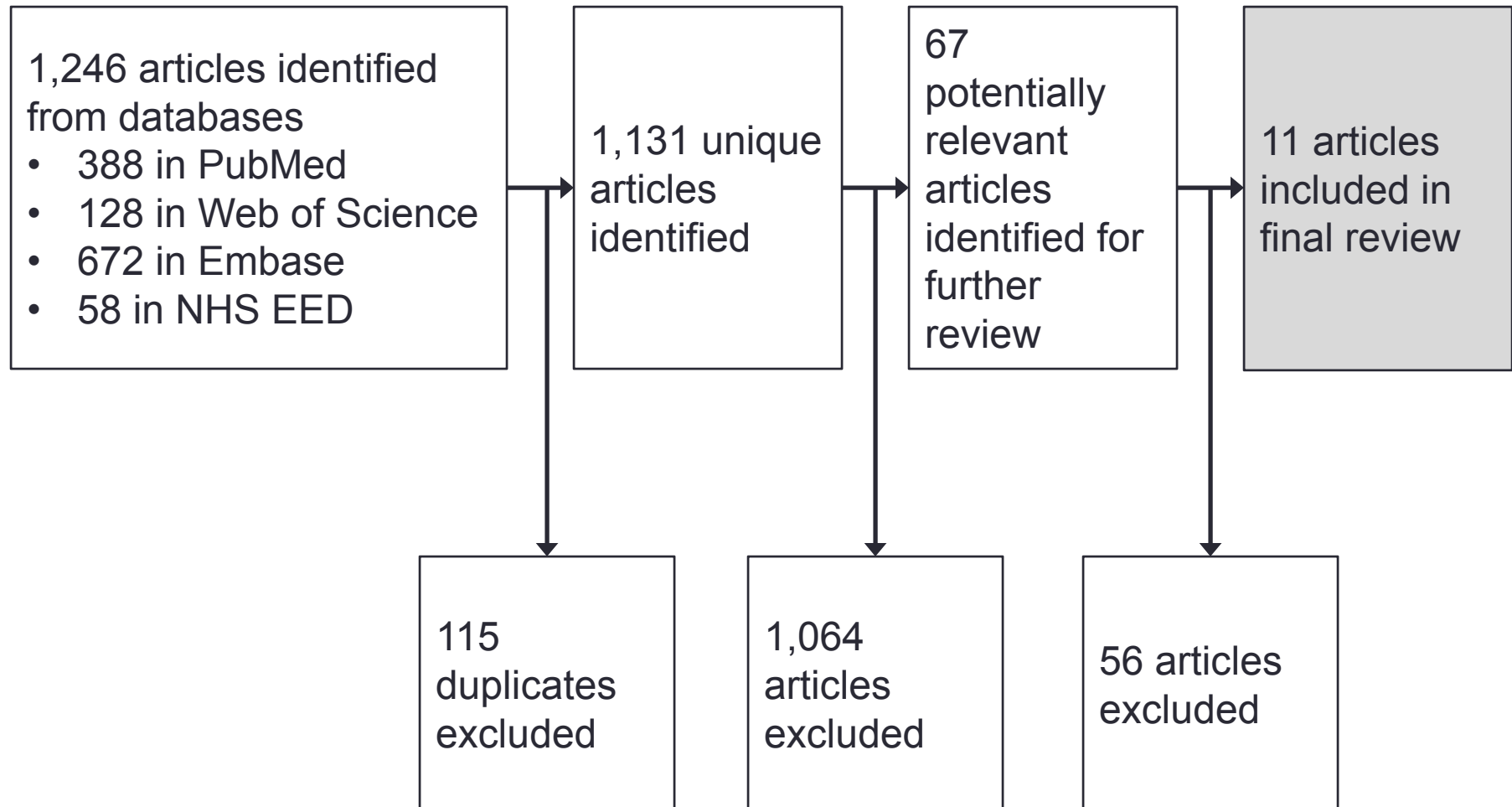


# HIV vaccination: externalities

- Community health spill-over effects
  - HIV transmission rates
- Community economic spill-over effects
  - Foreign direct investment (Asiedu et al. 2011)



# Flow chart of article extraction



# Economic evaluations of HIV vaccination

Authors	Date	Setting	Type
Cowley	1993	Abidjan, Ivory Coast	CBA
Edwards, Shachter and Owens	1998	San Francisco, USA	CEA
Bos and Postma	2001	Sub-saharan Africa	CEA
Bishai, Lin and Kiyonga	2002	World	CBA
Amirfar, Hollenberg and Abdool Karim	2006	South Africa	CEA
Ono, Kurotaki, Nakasone et al.	2006	Thailand	CEA
Long, Brandeau and Owens	2009	USA	CEA
Leelahavaro, Teerawattananon, Werayingyong et al.	2011	Thailand	CEA
Long and Owens	2011	USA	CEA
Nagelkerke, Hontelez and de Vlas	2011	Thailand	CEA
Hontelez, Nagelkerke, Bärnighausen et al.	2011	Rural KwaZulu-Natal	CEA



# Vaccination assumptions

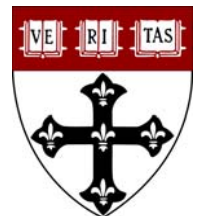
Study	Vaccine efficacy	Duration of protection	Vaccination coverage	Time horizon
Cowley 1993	60%-90%	Lifetime	54%	25 years
Edwards et al. 1998	75%	10 years	75%	20, 100 years
Bos and Postma 2001	60%	Lifetime	48%	55 years
Bishai et al. 2002	75%	10 years	NA	Lifelong
Amirfar et al. 2006	50%	5% loss per year	90%	10 years
Ono et al. 2006	30%	Lifetime	NA	Lifelong
Long et al. 2009	75%	Lifetime	100%	20 years
Leelahavaro et al. 2011	50%	10 years	80%	99 years
Long and Owens 2011	34%	Exponentially declining	60%	10 years
Nagelkerke et al. 2011	78%	6% loss per month	Ranges	10 years
Hontelez et al. 2011	31%	Rapidly waning	30%, 60%	20 years

# Effect categories and costs

Study	Effect categories	Costs
Cowley 1993	1, 2, 3, 4, 6	Vaccine (unspecified), administration (\$5.28)
Edwards et al. 1998	1, 5, 6	Vaccine and administration (\$ 1000)
Bos and Postma 2001	1, 6	Vaccine (\$5), administration (\$1.4)
Bishai et al. 2002	1, 2, 4, 6	Vaccine (\$10), administration (\$4.21 developed countries, \$0.50 developing countries)
Amirfar et al. 2006	1, 2, 6	Vaccine (\$20)
Ono et al. 2006	1, 2, 3, 6	Vaccine (\$1.54)
Long et al. 2009	1, 2, 5, 6	Vaccine (\$500)
Leelahavaro et al. 2011	1, 2, 5, 6	Vaccination series (\$100)
Long and Owens 2011	1, 2, 5, 6	Vaccination series (\$500)
Nagelkerke et al. 2011	1, 2, 5, 6	Vaccine and administration (\$80)
Hontelez et al. 2011	1, 2, 5, 6	Max. price of single vaccine to be cost-effective

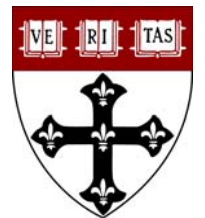
# Effect categories

- Most studies account for the ‘narrow’ effects on health and health care costs
- Most evaluations account for some ‘broader’ effects, but these are mainly limited to
  - Externalities (6): onward HIV transmission
  - Behavior-related productivity effects (5): risk compensation
- Only two studies each account for care-related productivity effects (Cowley et al. 1993; Ono et al. 2006) and outcome-related productivity effects (Cowley et al. 1993; Bishai et al. 2002)
- Non-health household and community externalities are not considered



# Discussion

- Current “industry standard” economic evaluation of HIV vaccination incorporates limited ‘broadened’ effects of vaccination (onward transmission and risk compensation)
- Large effects of HIV vaccination are usually ignored, e.g.,
  - Care-related productivity effects: chronic caregiving
  - Behavioral productivity effects: human capital investment
  - Externalities: community economic spillover effects
- Social value of HIV vaccination could be substantially underestimated
- Under-investment in HIV vaccination research and development?



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