Economic Evaluation of HIV vaccine in Thailand

Is it worth thinking about HIV vaccine and at what cost? : an economic evaluation of HIV vaccine in Thailand

Pattara Leelahavarong[1], Yot Teerawattananon[1], Pitsaphun Werayingyong[1], Chutima Akaleephan[2], Nakorn Premsri[3], Chawetsan Namwat[3], and Viroj Tangcharoensathien[2]

1: Health Intervention and Technology Assessment Program (HITAP)
2: International Health Policy Program (IHPP)
3: Department of Disease Control, Ministry of Public Health

Economic Evaluation of HIV vaccine in Thailand

Outline

- Background
- Objectives
- Methods
- Results
- Discussion and conclusions

Economic Evaluation of HIV vaccine in Thailand

Background

- HIV/AIDS is a major cause of Disability-Adjusted Life Years (DALYs) lost in Thai population.

  Ref: The Thai Working Group on Burden of Disease and Injuries (2002)

- The projection of Thai HIV epidemic in 2010
  - 500,000 people currently living with HIV
  - 11,000 people with new infections

  Ref: The Analysis and Advocacy Project (A^2) in Thailand, The Thai Working Group on HIV/AIDS Projection (2008)

Economic Evaluation of HIV vaccine in Thailand

Background

- HIV vaccine is recognized as a potential intervention for mitigating HIV/AIDS burden.
- Prime-Boost combination of HIV vaccines randomized clinical trial (RV144) was established in Thai setting.
- Prior to the announcement of the RV144 results, this economic evaluation study was conducted for informing policy decisions.

Economic Evaluation of HIV vaccine in Thailand

Objectives

- To determine the maximum cost of HIV vaccine at which the vaccine is still cost-effective under the Thai healthcare setting.
- To identify the possible relative importance of several vaccine characteristics and subsequent impact of risk behavior changes among vaccine recipients on its value for money.

Economic Evaluation of HIV vaccine in Thailand

Methods

- Study design
  - Model-based cost-utility analysis
- Study population
  - General population aged 18 to 30 years
  - Female sex workers (FSWs)
  - Injecting drug users (IDUs)
  - Men who have sex with men (MSM)
  - Male military conscripts

Economic Evaluation of HIV vaccine in Thailand

Methods

- Perspective
  - Government perspective
- Time horizon
  - 99-year period to cover maximum expected lifetime
  - The future costs and outcomes were discounted at the rate of 3% per annum.

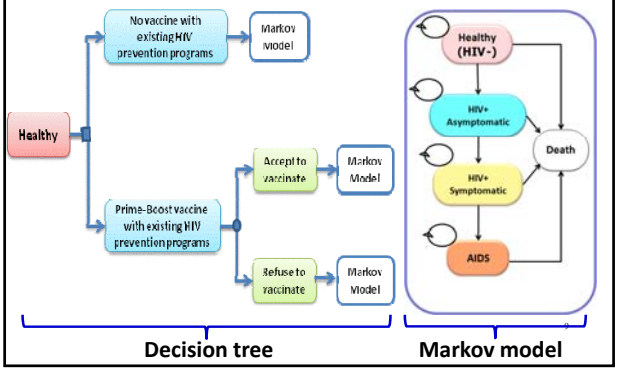
Economic Evaluation of HIV vaccine in Thailand

Methods

- Compared interventions
  - Prime-Boost combination of HIV vaccines (ALVAC-HIV® and AIDSVAX B/E ®) and existing prevention programs*
  - Only existing prevention programs

*existing prevention programs e.g. public and commercial sector condom provision, condom social marketing, harm reduction programs for IDUs, prevention of mother-to-child transmission

Economic model



Methods

- Epidemiological data used in model
  - Baseline HIV incidence
    - Ref: The Thai Working Group on HIV/AIDS Projections 2000-2020 (2001), Bureau of Epidemiology, Department of Disease Control, MoPH (2008), Suntharusamai et al. (2009), Wimonsate et al. (2008)
  - HIV/AIDS progression
    - Ref: Sirivichayakul et al.1992, Ono et al. 2006
  - Mortality rate
    - Survival analysis was conducted from individual data of 880 HIV/AIDS patients from two cohort studies in Thailand.
    - Ref: Maleewong et al.(2008), Leelukkanaveera et al. (2009)

Economic Evaluation of HPV vaccine in Thailand

10

Model assumptions

- Vaccine efficacy:
  - 50% for base-case and range of 30-70% for uncertainty
- Duration of protection:
  - 10 -year period for base-case and shorter time period and lifelong for uncertainty
- Vaccine cost:
  - 3,500 THB (US$1=34 THB in 2009) for base-case, while the study varies the vaccine cost to examine the maximum cost level at which the vaccine still offers a good value for money.
- Vaccine acceptance rate:
  - 80% acceptance rate for base-case and 30%-100% for uncertainty

Economic Evaluation of HPV vaccine in Thailand

11

Model assumptions (cont.)

- Change in risk behaviors
  - Assumed the increase risk behavior among vaccine recipients of 0%(unchanged) -30% (significantly changed)
    - Decreased condom use among general population, FSWs, MSMs and male military conscripts
    - Increased needle sharing among IDUs
  - The impact of risk behaviors changed due to post-vaccination was estimated using the "Asian Epidemic Model (AEM)*", and the impact was presented in percentage of increasing of HIV incidence.
    - * AEM was analyzed by Wiwat Peerapatanapokin

Economic Evaluation of HPV vaccine in Thailand

12

Economic Evaluation of HIV vaccine in Thailand

Methods

- Costs measurement (THB 2009)
  - Existing HIV prevention programs
    Ref: National AIDS Spending Assessment (NASA) (2007)
  - HIV vaccination program
    - Community engagement ➡ *Prime-Boost vaccine RCT*
    - Pre and post counseling *(assumed)*
    - Vaccine and its delivery costs *(assumed)*
  - HIV/AIDS treatment costs
    Ref: Revenga et al. The economics of effective AIDS treatment: evaluating policy options in Thailand (2006)

13

Economic Evaluation of HIV vaccine in Thailand

Methods

- Health outcome
  - Quality adjusted life years (QALYs)

QALYs = Utility weight * Life Years

  - Utility weight = patient's quality of life (QoL)
    - 0=death and 1= full health

Collection the QoL questionnaire in 16 community hospitals in Thailand using EQ-5D instrument

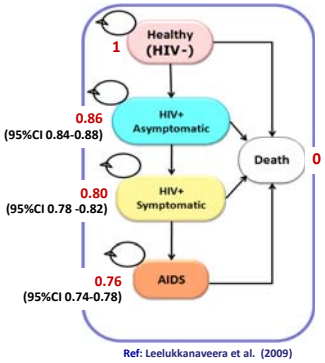
Ref: Leelukkanaveera (2009)

14

Economic Evaluation of HIV vaccine in Thailand

Methods

- Utility weight of HIV/AIDS patients



Ref: Leelukkanaveera et al. (2009)

15

Economic Evaluation of HIV vaccine in Thailand

Methods

- Incremental cost-effectiveness ratio (ICER)

$$ICER = \frac{(C_V - C_N)}{(E_V - E_N)}$$

  - C_V = Vaccination program cost
  - C_N = No vaccination program cost
  - E_V = Vaccination program effectiveness
  - E_N = No vaccination program effectiveness

- Recommendation of the Thai Subcommittee for Development of the NLED
  - The ceiling threshold of 100,000 THB/QALY at which an intervention becomes cost-effective.

16

Economic Evaluation of HPV vaccine in Thailand

Methods

- Uncertainty analysis
  - One-way sensitivity analysis
    - To examine the relative important factors
  - Threshold analysis (at 100,000 THB/QALY)
    - To quantify the maximum costs
  - Probabilistic sensitivity analysis
    - To assess uncertainty surrounding all model parameters

17

Economic Evaluation of HPV vaccine in Thailand

Results: Cost-utility analysis

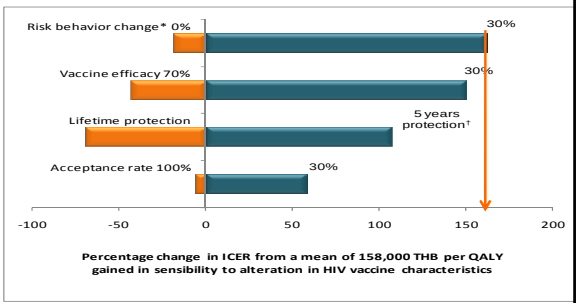
Population	HIV vaccination		Existing prevention		ICER
	Cost (THB*)	QALYs	Cost (THB*)	QALYs	THB per QALY
General population *aged 18 years*	12,900	25.73	5,500	25.68	158,000
FSW *aged 29 years*	47,300	23.46	46,800	23.25	2,840
IDU *aged 26 years*	53,900	13.03	62,400	12.61	Dominate**
MSM *aged 26 years*	243,000	16.51	245,000	16.27	Dominate**
Male conscript *aged 21 years*	11,400	23.80	4,570	23.78	326,000

*US$1=34 THB in 2009
**Negative ICER due to higher effectiveness and lower cost of HIV vaccination program compared with existing prevention program

18

Economic Evaluation of HPV vaccine in Thailand

Results: One-way sensitivity analysis



*Risk behaviors changed i.e. decreasing of condom use and increasing of needle sharing
† The revaccination was needed to get the protective effect over 30-year period

19

Economic Evaluation of HPV vaccine in Thailand

Results: Threshold analysis

- From one-way sensitivity results, only 3 significant parameters
  - Risk behaviors changed
  - Vaccine efficacy
  - Duration of protection

were used to identify the maximum costs of HIV vaccine at which the vaccine is still cost-effective under the Thai healthcare setting.

- ICER < Threshold (100,000 THB per QALY)

20

Economic Evaluation of HPV vaccine in Thailand

Results: Threshold analysis

- The highest costs of HIV vaccine was for the scenario of the 70% vaccine efficacy with lifetime protection, no changed risk behaviors, and provided for:
  - MSMs (very high)
  - IDUs (very high)
  - FSWs (very high)
  - general population aged 18-year (12,000 THB)
  - male conscripts (8,900 THB)
  - general population aged 30-year (1,100 THB)

21

Economic Evaluation of HPV vaccine in Thailand

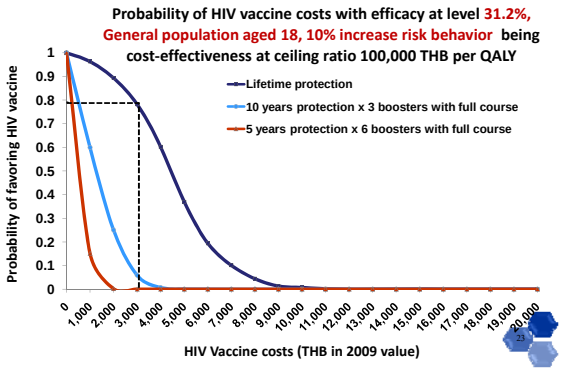
Results: Threshold analysis

- In contrast, the vaccine should not be provided at any cost (even free) given the following scenarios, for example:
  - 30% efficacy, regardless of duration of protection, ≥10% increased risk behaviors, and provided for FSWs & MSMs
  - 30% efficacy, regardless of duration of protection, ≥ 20% increased risk behaviors , and provided for IDUs & general population aged 18-year
  - 50% efficacy, 5 to 10-year protection, ≥ 20% increased risk behaviors, and provided for FSWs, MSMs, and male conscripts

22

Economic Evaluation of HPV vaccine in Thailand

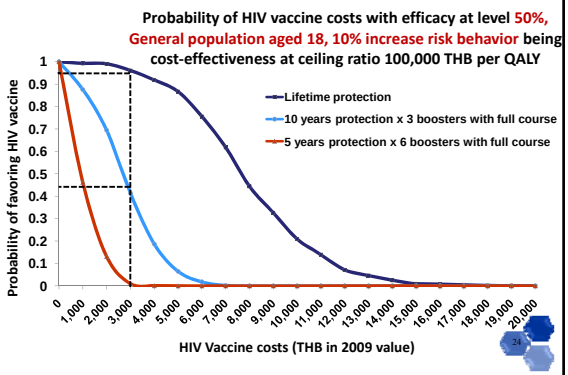
Result: Probabilistic sensitivity analysis



23

Economic Evaluation of HPV vaccine in Thailand

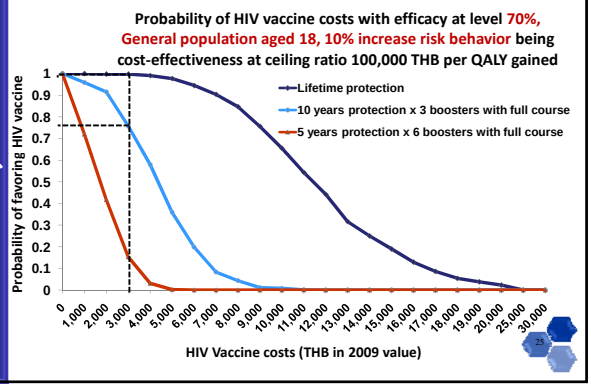
Result: Probabilistic sensitivity analysis



24

Economic Evaluation of HIV vaccine in Thailand

Result: Probabilistic sensitivity analysis



Economic Evaluation of HIV vaccine in Thailand

Discussion and conclusions

- This kind of study can be very useful and important for both researchers conducting future HIV vaccine researches, as well as policy decision makers who, in the future, will consider the vaccine adoption in Thailand.

Economic Evaluation of HIV vaccine in Thailand

Discussion and conclusions

- Recommendation for policy making
  - The providing of HIV vaccine would be more cost-effective for high-risk groups than general population, if the vaccine recipients do not change the risk behaviors.
- Recommendation for further research
  - Changing of risk behaviors after vaccination is one of major parameters influencing cost-effectiveness ratio in this study; therefore, we recommend that the future clinical study of HIV vaccine closely monitor risk behaviors of vaccinate volunteers.

Economic Evaluation of HIV vaccine in Thailand

Acknowledgement

The funding support from
the Health System Research Institute (HSRI)
Ministry of Public Health
Thailand


Thank you for your attention