Cost-utility analysis of HPV vaccination for cervical cancer prevention in Morocco

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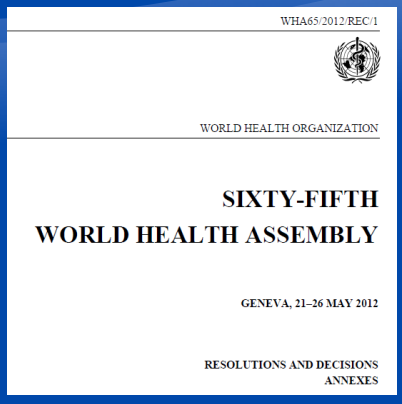

65th World Health Assembly (2012)

Decided to adopt a global target of a **25% reduction** in premature mortality from non-communicable diseases (NCDs) **by 2025**

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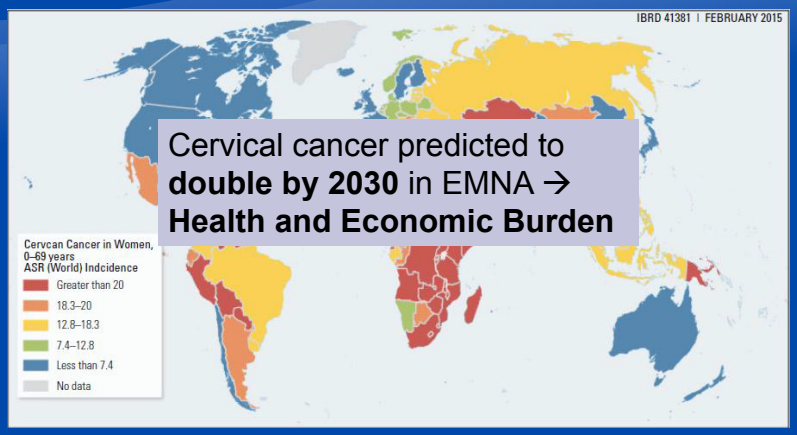
Incidence rate in EMR is low compared to a world average of 15.2 per 100,000 women



Cervical cancer predicted to **double by 2030** in EMNA → **Health and Economic Burden**

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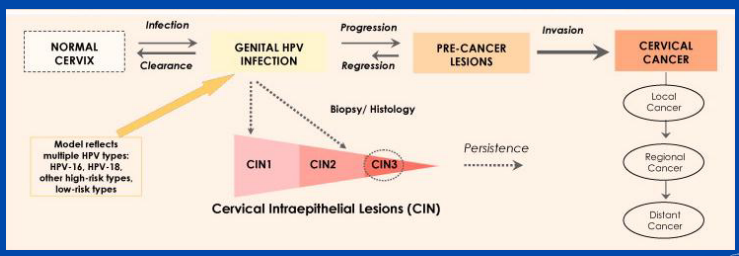
HPV INFECTION & CERVICAL CANCER

- Over 100 HPV types
- High risk strains (oncogenic): HPV types 16 & 18
- low risk strains (non-oncogenic): HPV types 6 & 11

- **WHO recommends** vaccination of preadolescent females in countries where cervical cancer is a public health problem

Model schematic of cervical cancer natural history:



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14 EMNA countries have licensed one of two vaccines against cervical cancer

	Bivalent	Quadrivalent
Manufacturer	GlaxoSmithKline	Merk
HPV types included	16 , 18	6, 11, 16 and 18
Dosing schedule	3-dose series : 0, 1 and 6 months	3-dose series : 0,2 and 6 months
Duration of protection	5 – 6 years	5- 6 years

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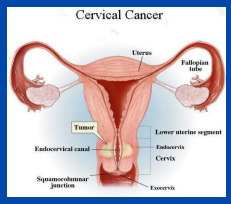
BURDEN OF CERVICAL CANCER IN MOROCCO

- 2nd most common after breast cancer.
- Typically common in women above 30 years old.
- CC is responsible for 1978 new diagnosed cases and 1152 death case annually.
- Incidence rate among women aged 50 to 55 is 60 per 100,000 women per year (**highest** in the region) .



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HPV INFECTION CONTROL IN MOROCCO

- Morocco has licensed Gardasil in 2008.
- Announcing the National Plan of Cancer Prevention and Control (2010-2019) under the initiative and guidance of HRH Princess Lalla Salma

Measure 14 : Set up a program for immunization against HPV

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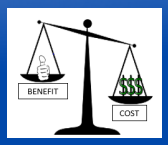
STUDY RATIONALE

- Not incorporated into a publically funded vaccination program.
- 3 dose course = 4,500 Moroccan Dirhams
- Absence of EE studies



Aim

- Is quadrivalent vaccine a cost-effective intervention ?

Objective

- To perform a cost-utility analysis of HPV vaccination against no vaccination in the context of Morocco.

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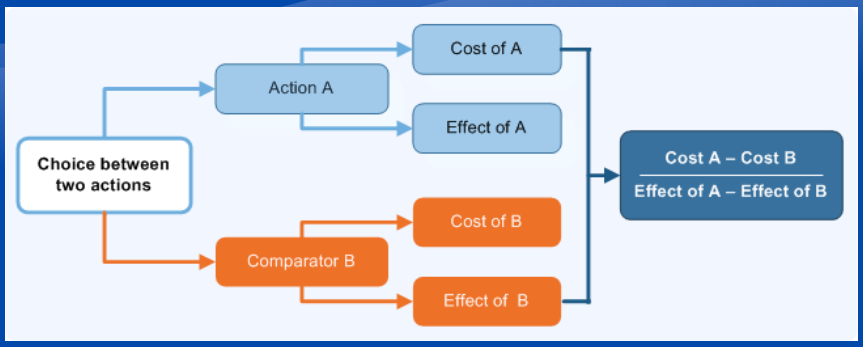
Vaccination strategy vs. NO vaccination strategy

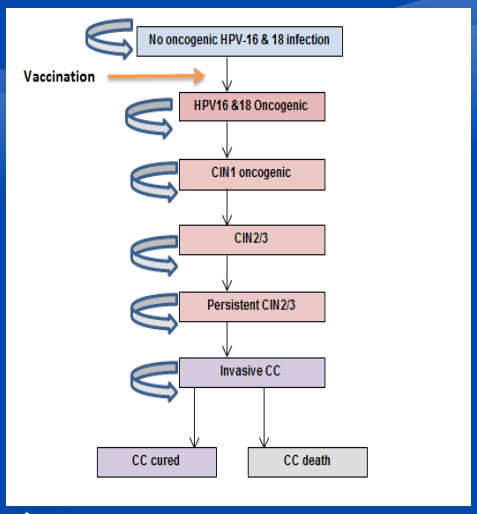


Action A = Vaccination strategy
Comparator B = No vaccination strategy 'do-nothing'

STUDY DESIGN

- **Perspective:** Healthcare system (Payer)
- **Analysis type:** Health outcome expressed in QALYs
- **Comparator** : No vaccination strategy
- **Model design:** A life time Markov model
- **Time horizon:** 73 years old
- **Population analysed:** 10,000 hypothetical cohort of girls at the age of 12

MODEL ASSUMPTION



- HPV type specific model.
- Markov cycle = 1 year
- At fixed cycles , girls either move to another health state or remain where they are.
- Girls at the age of 12 receive full vaccination course - immunised after one year.
- Vaccine duration is a lifelong
- Vaccine coverage 100%

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MODEL INPUTS

- **Epidemiological parameters** Prevalence of HPV 16 and 18 in cervical cancer (Morocco specific).
- **Vaccine efficacy** % reduction in HPV 16 & 18 persistent infections
- **HRQoL parameters** : Utilities
- **Economic parameter** : Direct medical costs
- **Decision maker parameters**: Discounting rate (3% WHO guideline)
- **Transitional probabilities**

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BASE CASE COST-EFFECTIVENESS RESULTS

	Vaccination	No vaccination	Incremental outcomes (Vaccination – No vaccination)	ICER
Total costs				
Undiscounted	$ 472,325,564	$ 908,876,710	$ -436,551,146.15	
Discounted	$ 161,341,111	$ 252,040,532	$ -90,699,420.23	**-3145** Vaccination dominates (lower costs and higher QALYs)
Total QALYs				
Undiscounted	533361	454835	+78527	
Discounted	263713	234874	+28839	

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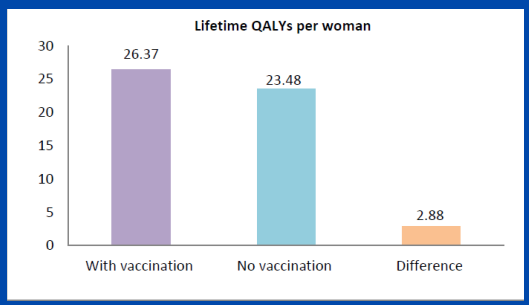
Average QALYs gained per woman?

Intervention	Total no. of women	Total QALYs	Average QALYs per woman
Quadrivalent	10,000	263713	26.37
No vaccine	10,000	234874	23.49



The difference **2.88** represents the average QALYs gained per woman

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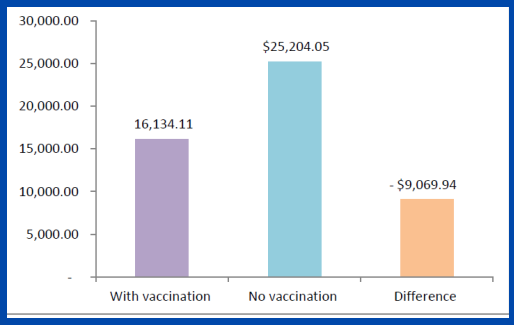
Average cost saved per woman?

Intervention	Total no. of women	Total cost	Average cost per woman
Quadrivalent	10,000	$ 161,341,111	$ 16,134.11
No vaccine	10,000	$ 252,040,532	$ 25,204.05



Positive-cost saving of $9,069USD per woman

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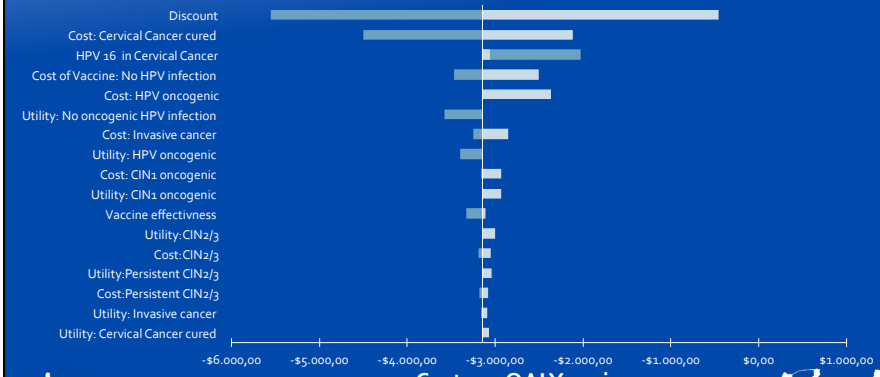
One-way sensitivity analysis

- Each parameter is varied once at a time.
- Top parameters with influential effect on ICER
- ICER robust, remained negative



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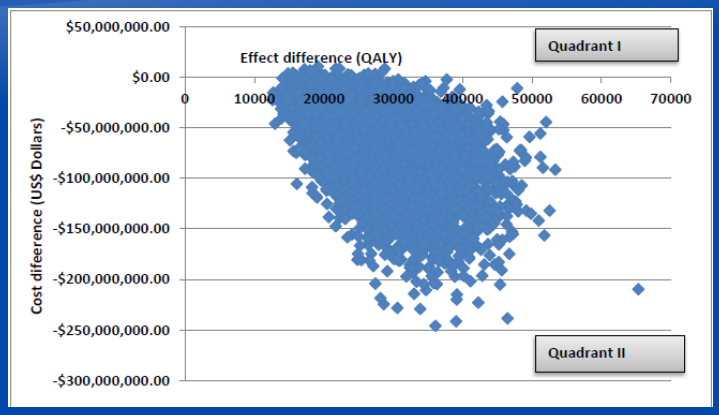
Probabilistic sensitivity analysis

A scatter plot of the bootstrapped incremental costs and effect pairs were presented on the incremental cost-effectiveness plane



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STUDY LIMITATIONS

- Analysis perspective – Societal perspective?
- Efficacy of Gardasil – Genital warts excluded?
- Transition probabilities – HPV type-specific & age- specific
- Utilities – HPV type-specific & age- specific? local utilities ?
- Heterogeneity – sexual behaviour not explored by the model
- Costs
- Model calibration & validation
- Vaccine coverage
- Booster
- Herd immunity

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FUTURE RESEARCH

- Address the previously identified limitations
- Use Micro-simulation modelling
  - To assess health benefits associated with herd immunity.
  - To incorporate sexual behaviour
- To assess cost- effectiveness of Gardasil against bivalent vaccination strategy (Cervarix)
- Assessing inclusion of genital warts in analytical modelling
- Boys?

CONCLUSION

- WHO strongly recommends for countries to evaluate the cost-effectiveness of introducing a new vaccine into their national immunization programme before implementing it.
- This work is an attempt to analyze the economic and health benefits of introducing Gardasil®
- Gardasil represents good value for money compared with a 'no vaccine' strategy.
- However, further studies are needed

Thank you

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