COST-EFFECTIVENESS ANALYSIS OF DIFFERENT CERVICAL CANCER PREVENTION APPROACHES IN THE UNITED STATES

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Objective

- To compare the cost-effectiveness of HPV vaccination combined with conventional cytology screening versus HPV vaccination alone on cervical cancer prevention in the U.S.

Background

- Cervical cancer is the third most common gynecologic cancer in the United States.
- Two proven approaches to cervical cancer prevention: conventional cytology screening and human papillomavirus (HPV) vaccination.
- Prevention guidelines recommend screening every one to three years after onset of sexual activity.
- Many states have passed legislation to require mandatory HPV vaccination for school children.

Methods

- Study population: Women in the U.S.
- Time horizon: Lifetime
- Estimation starting time: Age of 21
- Decision tree (Figure 1) was used to estimate the costs (in 2004 US$) and outcomes for women receiving HPV vaccination or mandatory HPV vaccination combined with conventional cytology screening
- Input values(Table 1): Costs and epidemiological data derived from published literature and health institution websites
- Outcomes(Table 2): Life expectancy and quality-adjusted life years (QALYs) gained derived from published literatures

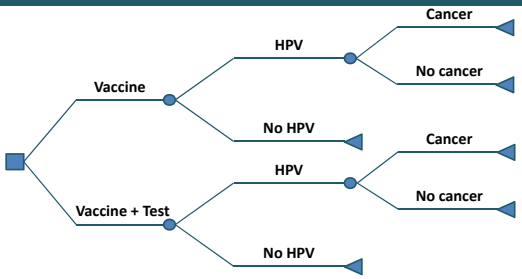


Figure 1. Decision tree model for vaccination and screening versus vaccination only in cervical cancer prevention

Table 1. Transition probabilities and outcomes Input values and ranges

Variable	Estimate	Range	
Event Probabilities			
Probability of getting high-risk HPVs infection after vaccination	0.804%[1]	-	-
Transition probability from high risk HPVs infection to cervical cancer	1.36%[2, 3, 4]	-	-
Reduction in lifetime risk for cervical cancer[5]			
Annual test	76%	68%	82%
Biennial test	69%	60%	77%
Triennial test	62%	51%	71%
Life expectancy (years)			
Without cervical cancer	79.9[6]	-	-
With cervical cancer	61.27[7]	-	-
Utilities			
Cervical cancer[8]	0.64	0.48	0.76
No cervical cancer	1	-	-

Table 2. Costs input values and ranges[9]

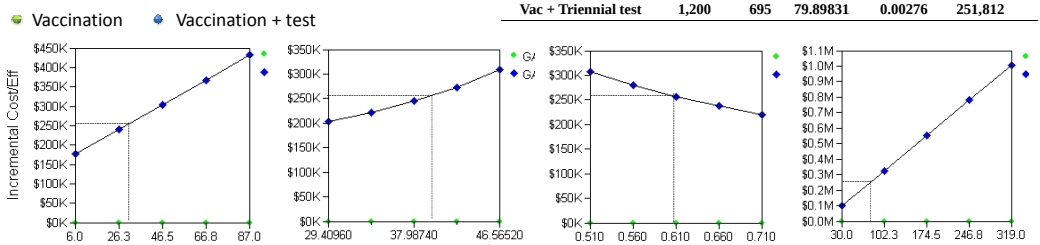
Variable	Estimate	Range	
Vaccination			
Vaccine and wastage	134	100	300
Supplies and administration	9	4.5	27
Patient time and Transport	24	12	72
The Pap test			
Test	30	6	87
Office visit	25	12	115
Patient time and transport	24	12	217
Diagnostic follow-up			
Office visit	57	29	115
Colposcopy	341	62	651
Biopsy	50	18	71
Patient time and transport	48	23	84
Treatment of CIN2, 3			
Office visit	105	105	105
Procedures and follow-up	3116	198	12925
Cancer treatment			
Local invasive cancer	24477	16740	29225
Regional invasive cancer	26197	18768	35623
Distant invasive cancer	41959	22041	55964
Cancer treatment on average	30877	16740	55964

Results

- The incremental cost-effectiveness ratio (ICER) for HPV vaccination combined with the triennial screening compared to vaccination alone was $251,812 per QALY gained (Table 3).
- When increasing the frequency of screening to biennial and annual, the ICER of HPV vaccination combined with screening compared to vaccination alone changed to $335,505 and $593,195 per QALY gained respectively (Table 3).

Table 3. Cost-effectiveness analyses of vaccination and screening versus vaccination only for cervical cancer prevention

Strategy	Cost	IC	QALY	IE	ICER
Undiscounted					
Vaccine	505	-	79.89555	-	-
Vac + Annual test	5,270	4,765	79.89893	0.00338	1,409,763
Vac + Biennial test	2,900	2,395	79.89862	0.00307	780,130
Vac + Triennial test	2,110	1,605	79.89831	0.00276	581,522
Discounted					
Vaccine	505	-	79.89555	-	-
Vac + Annual test	2,510	2,005	79.89893	0.00338	593,195
Vac + Biennial test	1,535	1,030	79.89862	0.00307	335,505
Vac + Triennial test	1,200	695	79.89831	0.00276	251,812



a. ICER increases with screening costs increase

b. ICER increases with QALYs of having cancer increase

c. ICER decreases with lifetime cancer risk reduction by triennial tests increases

d. ICER increases with screening test total costs increase

Figure 2. Sensitivity analyses indicate the result was not sensitive to test costs, QALYs of having cancer, lifetime cancer risk reduction by triennial test, and total test costs

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Conclusions

- Vaccination combined with conventional cytology screening is not cost effective compared to vaccination only.
- Routine cytology screening should not be recommended for women who have been successfully vaccinated.

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