



Cost-effectiveness Evaluation of Human Papilloma Virus test in comparison with cytology in Costa Rica from the public health system perspective.

Nicolás Armijo BSc, Felipe Vera MSc, Alejandro Calderón MD, Tomás Abbot MSc, Paula Zamorano MSc, Carlos Balmaceda MSc, Manuel A. Espinoza S., MD MSc PhD

Correspondence to: manuel.espinoza@uc.cl

1. What is the impact of Human Papilloma Virus in Costa Rica?

- According to WHO, Costa Rica presents a gross incidence rate of cervical cancer of 14.4 per 100,000 inhabitants in 2020 and 160 deaths due to this cause in 2019. It is recognized that there are 14 types of HPV that have high risk for cancer (HR - HPV), and only two of them - serotypes 16 and 18 - are responsible for approximately 70% of cases and 50% of pre-invasive lesions.
- In Latin America, analysis of a sub-cohort of the ESTAMPA study indicates that HPV-16 was the most frequently genotype in all histological grades.
- Costa Rica has a cervical cancer screening programme based on conventional cytology (CC) every two years, whereas several guidelines state that the preferred screening method should be the molecular test.

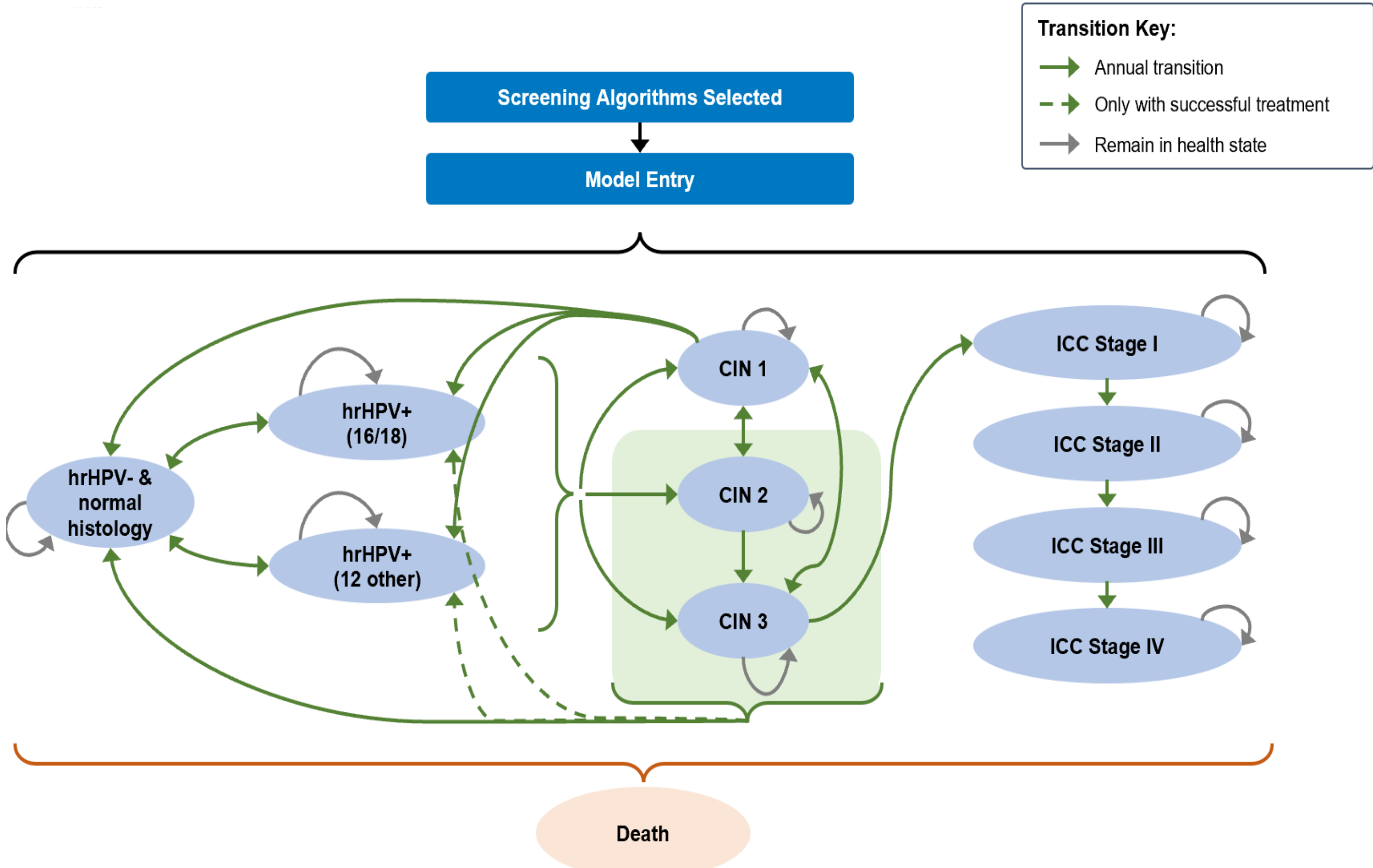
OBJECTIVE

To estimate the cost-effectiveness of a population-based screening strategy using the molecular test with genotyping 16/18 (mHPV) compared to CC to prevent cervical cancer in Costa Rica.

2. Methods

- Modeling:** We adapted a Microsimulation health-state transition model that characterizes the natural history of the HPV infection to the Costa Rican setting (Figure 1).
- Comparators:** mHPV at three different intervals: five (mHPV-5), four (mHPV-4), and three (mHPV-3), years were compared with CC every three years.
- Costs** were expressed in USD as of September 2022 and outcomes in quality-adjusted life years (QALYs). Utilities were obtained from literature. A lifetime time horizon and a discount rate of 3.5% for costs and outcomes were considered. We adopted a perspective of the Costa Rican Social Security Fund.
- Sensitivity and specificity** of different screening strategy were obtained from the ATHENA study
- Cost** were obtained from tariff model available from health insurance of Costa Rican Social Security Fund.
- Deterministic and Probabilistic Sensitivity Analysis (PSA)** were performed. For PSA, 1,000 MonteCarlo simulation were carried out to the 100,000 microsimulation.

Figure 1. Microsimulation health-state transition model based on natural history of HPV progression



3. Results of CEA

Table 1. Incremental Analysis

Strategy	Total cost (USD)	Total QALYs	Δ Cost (USD)	Δ QALY	ICER	iHNB
Cytology	\$528,83	14,884	-	-	-	-
mHPV-3	\$479,93	14,891	-\$48,90	0,006775	-\$7.217	0,010685
Cytology	\$528,79	14,899	-	-	-	-
mHPV-4	\$411,73	14,902	-\$117,1	0,002847	-\$41.103	0,012206
Cytology	\$539,58	14,863	-	-	-	-
mHPV-5	\$364,90	14,861	-\$174,7	-0,00174	\$100.228	0,012193

mHPV-3: molecular test of Human Papilloma Virus screening every three years; mHPV-4: molecular test of Human Papilloma Virus screening every four years; mHPV-5: molecular test of Human Papilloma Virus screening every five years. ICER: Incremental Cost-effectiveness ratio. iHNB: Incremental health net benefit

4. Results of the Cost Effectiveness Analysis

Figure 2. Incremental Cost-effectiveness Plane

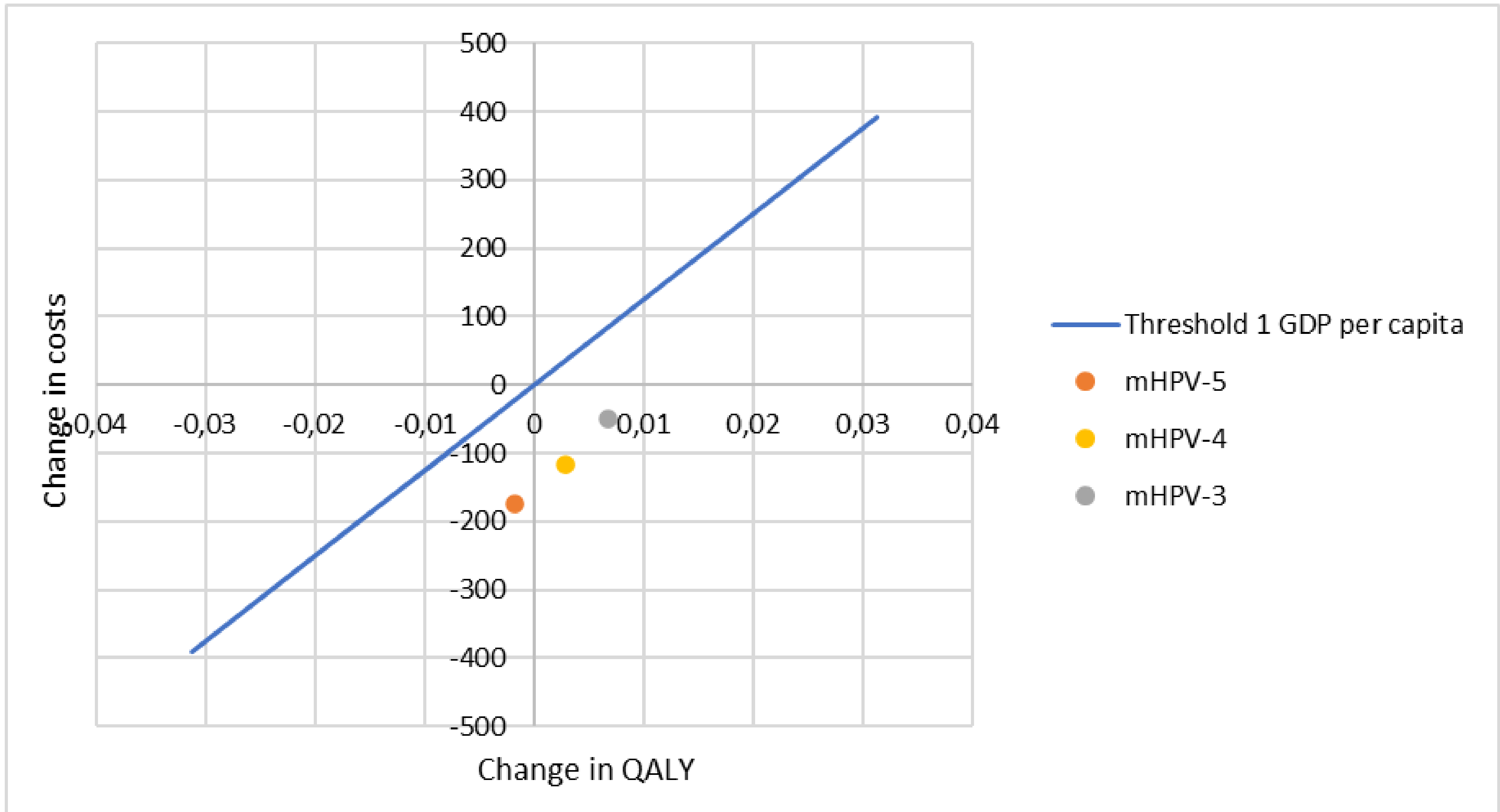
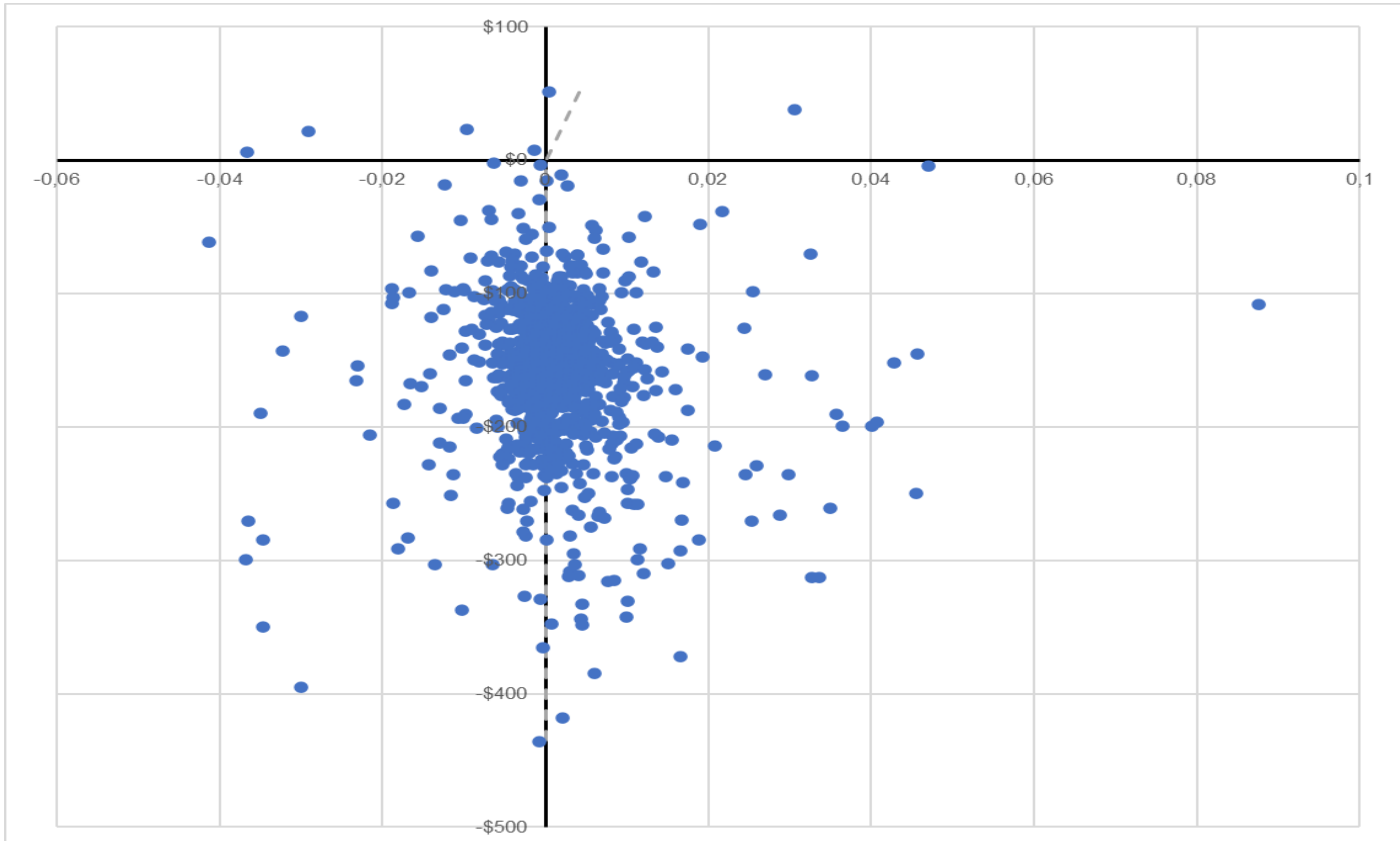


Figure 3. Probabilistic Sensitivity Analysis (PSA) mHPV-5 compared to Cytology



5. Key Messages

- mHPV-3 and mHPV-4 were both less costly and more effective than CC (ICERs -\$41,103 and -\$7,217 per additional QALY respectively). For mHPV-5, our results showed negative incremental costs and negative incremental QALY compared to CC (ICER \$100,228 per additional QALY).
- Among all alternatives, mHPV-4 was the most cost-effective because showed the maximum incremental health net benefits.
- The major source of uncertainty were parameters used to populate the epidemiological profile of the simulated patients.

6. Conclusions

The molecular test with genotyping 16/18 compared to conventional cytology was cost-effective strategies for Costa Rica regardless the time interval (3, 4 o 5 years). However, the screening with intervals every four years is the most cost-effective alternative for this country.

Funding: This study was funded by ROCHE Chile under strict independence clauses