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Evaluating the Health and Economic Impact of Gender-Neutral Vaccination of 9-Valent Human Papillomavirus Vaccine in the Philippines Using a Dynamic Transmission Model

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Background

- In the Philippines, human papillomavirus (HPV) vaccination using quadrivalent HPV (4vHPV) vaccine since 2013 has had varying regional coverage for girls aged 9-14 years old until the present. The country's commitment to the World Health Organization (WHO) Cervical Cancer Elimination Initiative since 2020 has prompted acceleration of optimal strategies to achieve elimination targets from baseline cervical cancer incidence of 15.5 per 100,000 women to <4 per 100,000 women within this lifetime[1,2]
- Most updated local HPV epidemiology studies showed that prevalence of HPV type 52 is among the highest high-risk HPV genotypes among healthy women who have HPV infection in both urban and rural cohorts.[3] Among those who have been diagnosed with cervical cancer in a local tertiary government institution, HPV types 16, 18, and 52 were also the most present HPV genotypes[4]
- Local guidelines through 2023 Omnibus Health Guidelines for Adolescents on Recommended Vaccines states strong recommendations for the use of 4vHPV or 9-valent HPV (9vHPV) vaccine for ages 9-19 years.[5] Moreover, 9vHPV vaccine is also the preferred standard based on the Asia & Oceania Federation of Obstetrics & Gynaecology (AOFOG) recommendations for HPV vaccination in the Asia-Pacific region published in 2024[6]
- The Department of Health has officially nominated for Health Technology Assessment (HTA) the potential use of 9vHPV vaccine for inclusion in the formulary since October 2023, which was subsequently prioritized for review by the Department of Science and Technology - Health Technology Assessment (DOST-HTA) Council last May 2024[7]
- Findings from a previous local-cost-effectiveness analysis on 9vHPV vaccine over 4vHPV vaccine among females 9-14 years old was cost-effective under the 1xGDP per capita threshold[8]

Objective

This study aimed to assess the public health impact and cost-effectiveness of 9vHPV gender-neutral vaccination (GNV) of males and females 9-14 years of age compared with 4vHPV GNV.

Methods

- A previously validated dynamic transmission model was used to compare outcomes of using a 9vHPV GNV strategy with a 4vHPV GNV strategy for those aged 9-14 years with the following assumptions:
  - A 2-dose schedule and 90% coverage for both males and females
  - Utilizing local data, evaluated HPV-associated health outcomes including cervical intraepithelial neoplasia (CIN) stages 1/2/3; cervical, head and neck (H&N), vaginal, vulvar, penile, and anal cancers; and genital warts
  - Costs, quality-adjusted life-years (QALYs), and incremental cost-effectiveness ratios (ICERs) were calculated, considering lifelong vaccine protection and herd immunity
  - 3.66% discount rate on both costs and outcomes on payer perspective
- The cost-effectiveness was assessed at an implicit ceiling threshold of Philippines Pesos (PhP) 246,225 (~1× GDP per capita for 2025 using $4,350[9])

Results

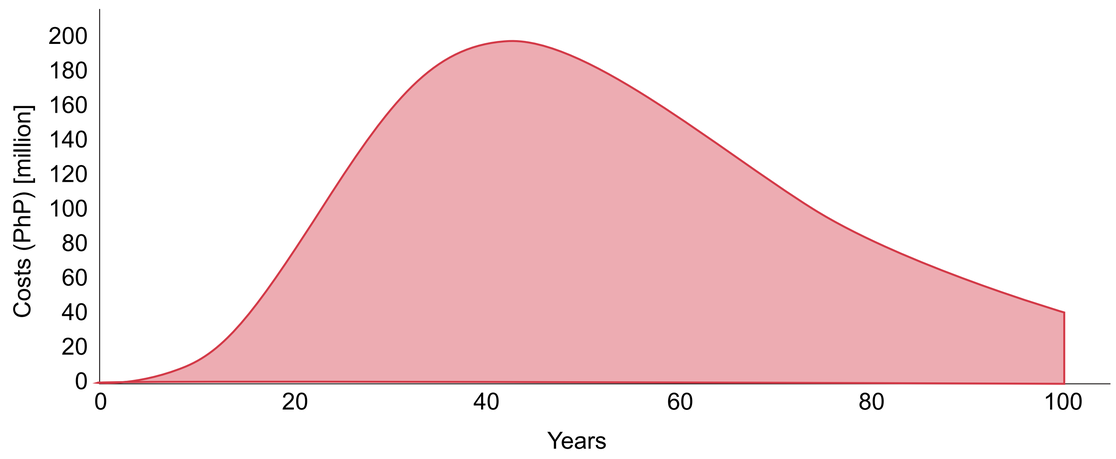
- Estimated cumulative changes in HPV-related disease incidence and mortality over a 100-year period are shown in **Table 1**
- 9vHPV GNV strategy would avert a significant number of cervical lesions and cancer cases (cervical cancer, 103,566; CIN 1/2/3, 1,440,588) as compared to the 4vHPV GNV strategy
- 9vHPV GNV strategy would also avert other HPV-related cancers (H&N, 1,036; vaginal, 190; vulvar, 266; penile, 335) and deaths (cervical cancer, 46,526; HPV-related cancers: H&N, 571; vaginal, 89; vulvar, 93; penile, 105) vs 4vHPV GNV strategy

Table 1. Cumulative changes in HPV-related disease incidence and mortality for 9vHPV GNV vs 4vHPV GNV over a 100-year period

9vHPV vs 4vHPV HPV-related disease	GNV Reduction of cases, n (%)	GNV Reduction of deaths, n (%)
Cervical cancer	**103,566 (22.7)**	**46,526 (19.4)**
CIN 1	1,094,552 (43.0)	
CIN 2/3	346,036 (27.3)	
Vaginal cancer	190 (6.1)	89 (5.3)
Vulvar cancer	266 (9.9)	93 (8.6)
H&N cancers, females	344 (4.3)	172 (3.8)
H&N cancers, males	692 (2.7)	399 (2/4)
Penile cancer	335 (26.3)	105 (23.5)

- Through 9vHPV GNV strategy, there were reduced disease management costs of PhP10,510,789,097 (5.4% of total healthcare costs) over 4vHPV GNV strategy
- The reduction in HPV-related disease costs with the 9vHPV GNV strategy was attributed to HPV 31/33/45/52/58 (100%) when compared to the 4vHPV GNV strategy (**Figure 1**)

Figure 1. Estimated healthcare costs avoided over 100 years by HPV type with a 9vHPV GNV strategy compared with a 4vHPV GNV strategy



- Compared to a 4vHPV GNV strategy, a 9vHPV GNV strategy was considered to be cost-saving due to higher QALYs gained with lower total net costs of vaccination and disease management costs
- Results from sensitivity analyses of varying vaccination coverage (78% or 33% for both females and males) showed a 9vHPV GNV strategy remained cost-saving over 4vHPV

Limitations

- The model does not assess changes to the cervical cancer screening methods that may develop over the course of 100 years
- Indirect costs associated with HPV-related diseases were not taken into consideration

Conclusion

Expansion to 9vHPV vaccination strategy in NIP and to include both males and females 9-14 years of age in the Philippines is projected to be cost-saving through additional public health benefits with reductions in both HPV-related disease incidence and costs.

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Disclosures

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