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Estimating Treatment Cost Savings of Gender-Neutral Nonavalent HPV Vaccination in Mexico

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Background

- In 2012, the Mexican National Immunization Program (NIP) introduced HPV vaccination targeting all 11-year-old girls, while vaccination for boys remained limited to the private market.[1-2]
- The HPV vaccination program faced a temporary interruption in 2021 due to supply problems. The program was resumed in November 2022 with a catch-up campaign that specifically targeted 13 and 14-year-old girls who had missed their vaccinations. Since 2023, the HPV vaccination program has continued to prioritize 11-year-old girls as the primary target group.[1-2]

Objectives

- To estimate the treatment cost savings associated with the implementation of gender-neutral vaccination (GNV) in 11-year-olds using the nonavalent HPV vaccine (9VHPV) compared to the quadrivalent (4vHPV) and bivalent vaccines (2vHPV) in Mexico.

Methods

- The bivalent vaccine in Mexico is only approved for girls and women; however, the present analysis was performed to demonstrate the clinical and economic (treatment) benefits among the vaccines approved in the country[3]
- A dynamic transmission model was used to simulate the natural history of HPV infection and estimate the costs related to HPV-associated diseases in México.[4-7] The economic model accounts for the transmission dynamics of those nine HPV-types
- The model assumed a two-dose schedule for 11-year-olds over a 100-year time horizon, lifetime immunity after vaccination, continuous cytology screening, and herd immunity in all scenarios. An annual discount rate of 5% for costs and benefits was applied. It was considered 1% VCR for males (private market) in base case and in scenarios with GNV for all vaccines, 60% of VCR for males
- The model considered the following diseases attributable to HPV genotypes 6, 11, 16, 18, 31, 33, 45, 52 and 58: cervical, vaginal, vulvar, anal, head and neck cancers, genital warts and cervical intraepithelial neoplasia (CIN) grade 1 and 2/3.[1,2,4,5]
- Mexico-specific data, including demographic, behavioral and epidemiological and screening parameters, were used from available literature; when local data were not accessible, data from other countries were used as a proxy[7-9]
- The direct costs with the treatment of HPV-related cancers and diseases were based on 2017 GRD-IMSS reported in Mexican pesos and updated to 2023 values[10-11]

Results

- Under the assumptions used in the model, after 100 years, implementing HPV vaccination with the 9vHPV vaccine in Mexico resulted in a significant reduction in cases and treatment costs compared to the other two vaccines, for both males and females (**Table 1** and **2**)
- An additional 657,403 and 2,702,133 cases of HPV-associated diseases were avoided compared to the 4vHPV and 2vHPV, respectively
- Around 12 and 54 billion pesos in cost savings were estimated due to the avoided direct treatment of HPV-associated diseases with 9vHPV compared to 4vHPV and 2vHPV
- The largest cumulative reductions in HPV-attributable diseases with the use of 9vHPV were seen in genital warts compared to 2vHPV and CIN 1-3 and cervical cancer compared to both 2vHPV and 4vHPV at year 100

Table 1. Avoided cases of HPV-attributable disease to 6/11/16/18/31/33/45/52/58 with 9vHPV vs. 4vHPV and 2vHPV over 100 years

HPV-attributable disease	9vHPV Cases	4vHPV Cases	2vHPV Cases	9vHPV vs 4vHPV Avoided Cases	9vHPV vs 2vHPV Avoided Cases
Cervical cancer	116,166	121,864	121,864	5,698	5,698
CIN 1	3,520,025	3,961,207	4,555,115	441,182	1,035,090
CIN 2/3	705,139	915,592	915,592	210,452	210,452
Anal Cancer (Female)	2,418	2,438	2,438	20	20
Anal Cancer (Male)	1,869	1,879	1,879	10	10
Vulvar Cancer	1,211	1,224	1,224	13	13
Vaginal Cancer	1,638	1,654	1,654	16	16
H&N (Female)	2,445	2,451	2,451	6	6
H&N (Male)	4,293	4,299	4,299	7	7
Genital Warts (Female)	3,373,980	3,373,980	4,342,968	0	968,988
Genital Warts (Male)	3,860,989	3,860,989	4,342,822	0	481,833
Total	11,590,173	12,247,576	14,292,305	657,403	2,702,133

9vHPV, nonavalent human papillomavirus vaccine; 4vHPV, quadrivalent human papillomavirus vaccine; 2vHPV, bivalent human papillomavirus vaccine; CIN, cervical intraepithelial neoplasia; H&N, Head and Neck.

Table 2. Avoided costs of HPV-attributable disease 6/11/16/18/31/33/45/52/58 with 9vHPV vs. 4vHPV and 2vHPV over 100 years (in million Mexican pesos)

HPV-attributable disease	9vHPV Costs	4vHPV Costs	2vHPV Costs	9vHPV vs 4vHPV Avoided Costs	9vHPV vs 2vHPV Avoided Costs
Cervical Cancer	17,154	17,995	17,995	841	841
CIN 1	63,403	71,350	82,048	7,947	18,644
CIN 2/3	12,701	16,492	16,492	3,791	3,791
Anal Cancer (Female)	227	229	229	1.9	1.9
Anal Cancer (Male)	175	176	176	0.9	0.9
Vulvar Cancer	114	115	115	1.2	1.2
Vaginal Cancer	155	156	156	1.5	1.5
H&N (Female)	421	422	422	1.0	1.0
H&N (Male)	739	740	740	1.1	1.1
Genital Warts (Female)	72,278	72,278	93,036	0.0	20,758
Genital Warts (Male)	82,711	82,711	93,033	0.0	10,322
Total	250,078	262,665	304,442	12,586	54,364

9vHPV, nonavalent human papillomavirus vaccine; 4vHPV, quadrivalent human papillomavirus vaccine; 2vHPV, bivalent human papillomavirus vaccine; CIN, cervical intraepithelial neoplasia; H&N, Head and Neck.

Limitations

- This model has several limitations that should be taken into account
- It assumes a high and sustained vaccination coverage rate over 100-year period
- The model is a representation of the natural history of the disease and may not consider all possible health states and complications associated with the disease in different populations
- The results may underestimate the potential cost savings associated with vaccination since the analysis did not considered indirect cost (productivity losses) of HPV-related diseases

Conclusion

- The results of the model highlights the potential long-term benefits of implementing more comprehensive HPV vaccination programs, extending coverage for males and targeting five additional oncogenic genotypes with the nonavalent vaccine.
- Implementing gender-neutral vaccination using nonavalent HPV vaccination in Mexico would lead to a substantial treatment cost savings by preventing new cases of HPV-associated cancers and diseases in both men and women.
- By preventing diseases and cancer cases against a broader range of genotypes the nonavalent vaccine offers the potential for substantial cost savings compared to other vaccines in Mexico

References

1. Secretario de Salud. Available from https://www.gob.mx/cms/uploads/attachment/file/769721/VPH_2022.PDF, 2022.
2. Secretario de Salud. Available from https://www.gob.mx/cms/uploads/attachment/file/852406/LINEAMIENTOS_VACUNA_VPH_2023.pdf, 2023.
3. Compendio Nacional de Insumos para la Salud, 2023.
4. Dasbach EJ, et al. *Epidemiol Rev*. 2006;28:88-100.
5. Elbasha EH, et al. *Emerg Infect Dis*. 2007;13(1):28-41.
6. Elbasha EH, et al. *Bull Math Biol*. 2008;70(8):2126-2176.
7. Ortiz AP, et al. *PLoS One*. 2017;12(11):e0184540 ;
8. Globocan 2020.Accessed Oct 16, 2023.
9. Domenech-Viñolas M, et al. Salud Publica Mex.2018;60(6):624-632. World Health Organization. Immunization Dashboard – Global. https://immunizationdata.who.int/index.html. Accessed Oct 16, 2023.
10. Grupos Relacionados con el Diagnóstico: Producto Hospitalario. GRD-IMSS: 2017.
11. Instituto Nacional de Estadística y Geografía (INEGI); Índice Nacional de Precios al Consumidor (INPC), 2023.

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