Economic Impact of Cancer Related to Human Papilloma Virus in Ecuador

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INTRODUCTION

Human papillomavirus (HPV) is a common sexually transmitted infection with numerous oncogenic strains associated with cervical cancer, anal cancer, head and neck cancer, penile cancer, vaginal cancer, and vulvar cancer (1). In fact, 4.5% of all diagnosed cancers are attributed to HPV (2). In addition, cervical cancer is the fourth most common cancer in women which was responsible of 662,301 new cases and 348,874 deaths in 2022 (3). Most HPV infections are transient and self-limited in healthy individuals, but the lack of attention from clinicians, the general population and policy makers to newly acquired infections increases the development of malignant neoplasms (2). Consequently, the World Health Organization launched a global strategy to eliminate cervical cancer as a public health issue by 2030 (4). The program includes targets for vaccination, screening and effective treatment. Indeed, a 70% coverage of screening with a high-performance test must be provided to women between 35 and 45 years old (4). In Latin-America, cervical cancer had an age-standardized incidence rate of 15.1 per 100,000 females, while in Ecuador it was 17.7 per 100,000 females in 2022 (3) (Figure 1). In fact, the impact of cervical cancer persists specially in Latin-American countries where socioeconomic disparities hinder the ongoing efforts in prevention, treatment, and vaccination (2). Ecuador has strategies for the prevention of cervical cancer through the HPV vaccination of girls (9 years old) and screening of females by pap smear test (5). However, a low coverage rate of both have been observed and currently cervical cancer is positioned as the second most common cancer in Ecuadorian women with 1,792 new cases annually (3,5).

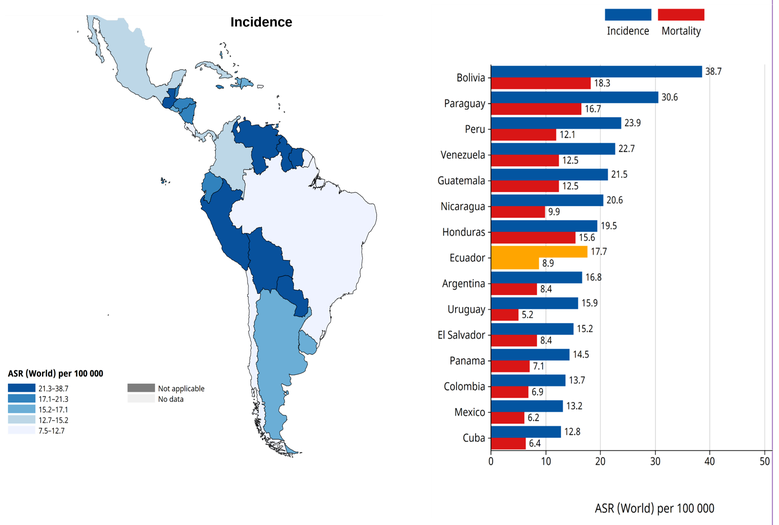


Figure 1. Age-standardized rate per 100,000 females of cervical cancer in Latin-America and the Caribbean, in 2022

Source: Cancer TODAY IARC (6) – http://gco.who.int/today. **Data version**: Globocan 2022

OBJECTIVE

The study aimed to assess the economic impact of cancer related to HPV diagnosis and treatment in Ecuador, and the cost of cervical cancer screening by pap smear test in 70% of the female population between 35 to 45 years old.

METHODS

The costs of cervical, vaginal, vulvar, penile, anal, and head-neck cancers related to HPV in Ecuador were calculated according to 2020 GLOBOCAN prevalence (6) (Table 1). Also, the costs per episode of care (costs of diagnosis and treatment until case resolution) were estimated from previous evidence (7-10).

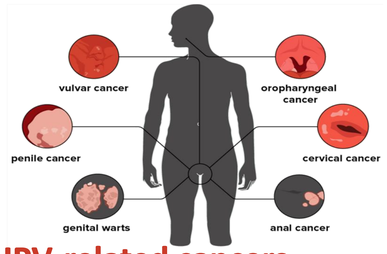
The economic estimates were converted to US dollars and inflated to 2023 according to the changes in the Consumer Price Index in Ecuador (12). In addition, the cost of cervical cancer screening coverage was obtained from the Ecuadorian National Fare System. Finally, a sensitivity analysis was performed assuming a 10% variation for the final costs.

Table 1. Estimated prevalence and proportion of HPV-related cancers in Ecuador, in 2020

	Female		Male	
	Prevalence (1-year)	Proportion (per 100,000)	Prevalence (1-year)	Proportion (per 100,000)
Cervical cancer	1,110	12.6	NA	NA
Vaginal cancer	25	0.28	NA	NA
Vulvar cancer	48	0.54	NA	NA
Anal cancer	58	0.66	25	0.28
Head and neck cancer	95	1.1	72	0.82
Penile cancer	NA	NA	85	0.96
Total	**1,336**	**15.18**	**182**	**2.06**

Abbreviations: NA – not applicable. **Adapted from:** GLOBOCAN, 2020 (6)

RESULTS



Source: Yaja Mulcare, Medical News Today; 2022

In 2020, Ecuador had 1,518 cases of HPV-related cancer PV. Hence, the 2023 estimated costs per episode of care were 3,841,891.30 USD for cervical cancer (n=1110), 1,013,104.00 USD for vulvar cancer (n=48), and 476,033.33 USD for vaginal cancer (n=25). Penile cancer had a total cost of 1,848,268.33 USD (n=85), while anal cancer costs were 9,442,844.67 USD for females (n=58) and 4,097,441.67 USD for males (n=25). Foremost, head and neck cancer represented 4,902,823.33 USD for females (n=95) and 3,715,824.00 USD for males (n=72). Therefore, a total cost of 29,338,230.63 USD was estimated for the diagnosis and treatment of HPV-related cancers for both genders. Most importantly, females had a higher economic burden than males in HPV-related cancers with an excess of 10,015,162.63 USD (Table 2).

Table 2. Estimated costs per episode of HPV-related cancers in Ecuador 2023 (N=1,518)

	Estimated costs by gender (USD)		Total costs (USD)
	Female	Male	
Cervical cancer	3,841,891.30	NA	3,841,891.30
Vaginal cancer	476,033.33	NA	476,033.33
Vulvar cancer	1,013,104.00	NA	1,013,104.00
Anal cancer	9,442,844.67	4,097,441.67	13,540,286.34
Head and Neck cancer	4,902,823.33	3,715,824.00	8,618,647.33
Penile cancer	NA	1,848,268.33	1,848,268.33
Total	**19,676,696.63**	**9,661,534.00**	**29,338,230.63**

Abbreviations: NA – not applicable

The estimated costs for HPV screening reached a total of 4,476,809.92 USD considering the 70% of Ecuadorian women aged 35-45 years (855,987 females) and the unitary cost of pap smear test (5.23 USD) (Table 3).

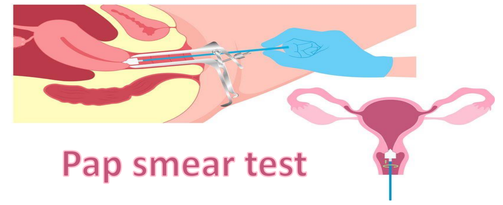


Table 3. Pap smear screening cost in 70% of the female population in Ecuador (age 35-45 years), in 2023

Total Population	Targeted Population (70%)	Unitary pap smear cost (USD)	Total cost (USD)
1,222,838	855,987	5.23	**4,476,809.92**

CONCLUSIONS

In conclusion, the costs of HPV-related cancers in the Ecuadorian population have a considerable economic impact compared to those expected by HPV-screening. Without doubt, public health authorities should invest more in prevention programs related to sexual education and HPV vaccination, especially targeting female populations.

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REFERENCES

1. Mirabello L, Clarke MA, Nelson CW, Dean M, Wentzensen N, Yeager M, et al. The Intersection of HPV Epidemiology, Genomics and Mechanistic Studies of HPV-Mediated Carcinogenesis. Viruses. 2018;10(2).
2. Alhamlan FS, Alfageeh MB, Al Mushait MA, Al-Badawi IA, Al-Ahdal MN. Human Papillomavirus-Associated Cancers. Adv Exp Med Biol. 2021;1313:1-14.
3. Ferlay J EM, Lam F, Laversanne M, Colombet M, Mery L, Piñeros M, Znaor A, Soerjomataram I, Bray F. Global Cancer Observatory: Cancer Today. Lyon, France: International Agency for Research on Cancer; 2024.
4. WHO. Global strategy to accelerate the elimination of cervical cancer as a public health problem; World Health Organization. 2020.
5. MSP. Estrategia Nacional para la Atención Integral del Cáncer en el Ecuador; Ministerio de Salud Pública; 2017
6. WHO. Globocan Cancer Today. World Health Organization; 2020.
7. Ding W, Ma Y, Ma C, Malone DC, Ma A, Tang W, Si L. The Lifetime Cost Estimation of Human Papillomavirus-related Diseases in China: A Modeling Study. J Transl Int Med. 2021;9(3):200-11.
8. Ong KJ, Checchi M, Burns L, Pavitt C, Postma MJ, Jit M. Systematic review and evidence synthesis of non-cervical human papillomavirus-related disease health system costs and quality of life estimates. Sex Transm Infect. 2019;95(1):28-35.
9. Deshmukh AA, Zhao H, Franzini L, Lairson DR, Chiao EY, Das P, et al. Total Lifetime and Cancer-related Costs for Elderly Patients Diagnosed With Anal Cancer in the United States. Am J Clin Oncol. 2018;41(2):121-7.
10. Murillo OGR. Estimación de la carga económica de las lesiones preneoplásicas y el cáncer de cuello uterino en Colombia. Implicaciones para la vacunación contra el VPH Rev Colomb Cancerol. 2016;Vol. 20. Núm. 2.:61-72.
11. Lang K, Menzin J, Earle CC, Jacobson J, Hsu MA. The economic cost of squamous cell cancer of the head and neck: findings from linked SEER-Medicare data. Arch Otolaryngol Head Neck Surg. 2004;130(11):1269-75.
12. INEC. Índice de Precios al Consumidor (IPC) Ecuador; Instituto Nacional de Estadística y Censos. 2023.

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