Introduction

Cervical cancer is the second leading cause of death in the Region of the Americas. In some countries, it is the leading cause of death in women. Florida International University (FIU), through its Global Health Department, has been supporting the Pan American Health Organization (PAHO) in its efforts to reach the goal of eliminating cervical cancer by 2030. The pledge PAHO has made to be the first region to achieve it depends on the individual work of the member states in the region.

The work around the strategy is being focused on three areas: prevention through vaccination, early detection, and early treatment. These three areas of work must be linked to achieve the desired goals. All actions must be viewed and connected through a systems approach. If a country implements testing for human Papillomavirus (HPV) detection, but has not strengthened its laboratory capacity, or if treatment tools and training are not in place, the results will not be positive.

All services have to be linked to the strategy. Detection is linked to laboratory capacity; positive test results must be delivered to the patient through the primary health physician on time, and the system must have the treatment capabilities to offer a resolution.

HPV vaccination is the primary preventive strategy to be implemented. More countries are including boys as vaccination target groups along with girls. The vaccine effectiveness has been proven, and countries must speed up the intervention.

In this report, we present the analyses of three countries on the strategies and efforts they are implementing to control and eliminate cervical cancer. The cases presented here, from Brazil, Colombia, and Mexico, are relevant to the region and could serve as examples of the efforts these countries are undertaking.

We thank the experts who worked with us towards the integration of the reports: Fernando Maia, Lina Trujillo, and Cuitlahuac Ruiz Matus. We hope the information can guide researchers, medical personnel, public health authorities, and mainly decision-makers, towards designing better and stronger plans to eliminate cervical cancer in the Americas.

Sincerely,

Carlos Espinal, MD, MPH
Director, Global Health Consortium
Global Health Department
Robert Stempel College of Public Health and Social Work

Francisco Becerra-Posada, MD, MPH, DrPH
Visiting Professor, Global Health
Global Health Department
Robert Stempel College of Public Health and Social Work

Table of content

Brazil

Toward the Elimination of Cervical Cancer in Brazil: Strategic Advances, Challenges, and Recommendations

Key Findings

- Cervical cancer remains a leading public health issue in Brazil, with approximately 17,000 new cases and over 7,000 deaths annually.
- Significant disparities exist as incidence and mortality are highest in the North and Northeast regions, with disproportionate impact on vulnerable populations (Black, Brown, Indigenous, low-income, and rural women).
- HPV vaccination coverage has improved but remains uneven, especially among boys and in certain states.
- Cytology-based screening has low population effectiveness due to opportunistic screening, fragmented pathways, and limited laboratory quality.
- Brazil is transitioning to HPV DNA testing, including self-collection, but this requires substantial investment in infrastructure, training, and organized screening.
- Delays in treatment initiation persist as in 2023, only 51% of women began treatment within 60 days of diagnosis, with worse indicators in the North.
- Health information systems are fragmented and lack a unique identifier, hindering longitudinal follow-up and monitoring.
- Partnerships with civil society, academia, and international organizations are expanding and provide a strong basis for coordinated action.

Recommendations

- Strengthen governance with national and state committees, clear targets, and alignment across SUS levels.
- Scale up HPV vaccination through school-based strategies, combating misinformation, and ensuring equity in access.
- Implement HPV DNA testing within organized screening programs, prioritizing vulnerable populations and preparing for increased colposcopy demand.
- Expand and regionalize diagnostic and treatment services, including colposcopy, thermoablation, radiotherapy, and oncology care.

- Ensure sustainable financing for HPV tests, treatment supplies, and infrastructure modernization.
- Establish an integrated digital information system with a unique identifier to enable monitoring, follow-up, and accountability.
- Develop a national communication and engagement strategy to combat misinformation and mobilize communities, health professionals, and adolescents.
- Consolidate cervical cancer elimination as a State policy, beyond electoral cycles, to guarantee sustainability and impact.

Strategic Summary

1. Introduction

Cervical cancer continues to be a leading cause of morbidity and mortality among women in Brazil, even though it is a preventable and detectable disease. Since 2020, the World Health Organization (WHO) has recommended its elimination as a public health problem through a comprehensive global strategy structured around three pillars: HPV vaccination, high-performance screening, and timely treatment of precancerous lesions and invasive cancer. Brazil has aligned itself with this agenda, adopting updated guidelines, expanding vaccination coverage, and initiating the incorporation of HPV DNA testing as the primary screening method.

Nonetheless, persistent challenges hinder the full implementation of this strategy. Vaccination coverage remains below international targets, screening is predominantly opportunistic and fragmented, and delays in access to treatment compromise outcomes. Moreover, information systems are poorly integrated, and care pathways often fail to provide continuity. These structural weaknesses are aggravated by social and regional inequities, which make cervical cancer an emblematic case of how health outcomes are shaped by social determinants.

2. Epidemiological Overview

Cervical cancer is currently the third most common cancer among Brazilian women, with an estimated 17,000 new cases each year and over 7,000 deaths annually. Incidence and mortality rates are unevenly distributed across the country, with higher burdens in the North and Northeast. In Amazonas, for example, the crude incidence rate exceeds 27 cases per 100,000 women, nearly three times the rate observed in São Paulo. These regional disparities underscore the profound influence of socioeconomic and structural determinants of health on cancer outcomes.

Mortality trends are equally concerning. The crude mortality rate has increased over the last two decades, reaching 6.6 per 100,000 women in 2023. While the age-standardized mortality rate has remained relatively stable nationwide, it continues to exceed 9 per 100,000 in the North. Within these numbers, racial and social inequities are also important, as Black and Indigenous women face higher risks of advanced disease at diagnosis and higher mortality rates. These trends confirm that cervical cancer is both a biomedical challenge and a marker of inequality in Brazil.

3. Primary Prevention: HPV Vaccination

HPV vaccination represents the cornerstone of primary prevention. Since 2014, Brazil has offered free HPV vaccination for girls, later expanding to boys, and in 2024 adopted a simplified single-dose schedule. Coverage has improved in recent years, reaching above 80% in girls and 67% in boys, but the figures remain below WHO's 90% target. Moreover, national averages mask sharp regional variations, with some states achieving coverage near 100% and others struggling to reach half of the eligible population.

Barriers to universal vaccination include misinformation, operational difficulties in sustaining school-based campaigns, and hesitancy among parents and adolescents. Negative episodes, such as alleged adverse events amplified by the media, have had long-lasting effects on public perception in certain states. Strategies to overcome these challenges must prioritize the expansion of school-based vaccination campaigns, microplanning to identify and reach unvaccinated adolescents, and a national communication strategy that mobilizes families, educators, and health professionals against misinformation.

4. Secondary Prevention: Screening and Early Diagnosis

For over 30 years, Brazil has relied on cytology-based screening (Pap smears). While widely available, this approach has shown low effectiveness at the population level due to opportunistic implementation, poor coverage in vulnerable groups, and weaknesses in laboratory quality. Screening rates vary drastically by state, from 18% to just over 50%, reflecting unequal access and low adherence to recommended intervals.

In response, Brazil is transitioning to HPV DNA testing as the primary screening method. Guidelines recommend starting at age 25 and repeating every five years for women with negative results. Self-collection of samples is encouraged, particularly to expand access among women in remote areas and those with historically low participation. However, the transition will require investment in laboratory modernization, training of primary care teams, and significant expansion of colposcopy capacity to handle the higher number of referrals generated by a more sensitive test.

5. Treatment of Precancerous Lesions and Cancer

Treatment delays remain one of the most critical bottlenecks in Brazil's response. The law guarantees that cancer treatment should begin within 60 days of diagnosis, but in 2023, only half of women nationwide, and just one-third in the North, had access within this timeframe. These delays are linked to issues in referral processes, insufficient oncology infrastructure in certain regions, and fragmentation across levels of care.

Early-stage diagnosis rates are also declining, with only 48% of cases identified at stages I or II, down from 58% two decades ago. This reduction has profound implications for survival and quality of life. While investments have increased oncology capacity through the expansion of radiotherapy equipment, the accreditation of new centers, and the growth in surgery and chemotherapy, gaps remain in equitable access. Strengthening specialized services for the diagnosis and treatment of precancerous lesions, expanding thermoablation capacity in primary care, and ensuring regionalized oncology care networks are essential steps.

Information Systems, Monitoring and Evaluation

Robust monitoring is essential for any elimination strategy, but Brazil's health information systems remain fragmented and poorly integrated. While systems such as SI-PNI, SISCAN, SIM, and e-SUS APS each provide valuable data, the absence of a universal unique identifier prevents longitudinal follow-up of women across prevention, diagnosis, and treatment. Data gaps, incomplete adoption, and poor interoperability compromise planning and accountability.

Recent efforts offer opportunities for improvement. The National Health Data Network (RNDS) is being developed to allow interoperability between systems, and Meu SUS Digital has successfully provided citizens with access to vaccination data in near real time. However, to achieve cervical cancer elimination, these initiatives must be accelerated and scaled, ensuring that screening,

diagnostic, and treatment data are integrated. Public dashboards, equity indicators, and transparent reporting mechanisms are indispensable to guarantee accountability.

Partnerships

Cervical cancer elimination cannot be achieved by government action alone. Brazil has seen the emergence of strong partnerships across civil society, academia, and the private sector. The National Alliance for the Elimination of Cervical Cancer has mobilized stakeholders around communication, advocacy, and accountability. Groups like Mulheres do Brasil and Instituto Vencer o Câncer have led communication efforts, while FSP-USP and FOSP have generated research and epidemiological evidence. Hospitals like Hospital de Amor provide population-based screening models that reach underserved populations.

Pilot initiatives also demonstrate promising models for scaling. The MARCO Project evaluates new technologies such as rapid HPV testing and thermoablation. The Útero é Vida Program in Pernambuco tests organized screening through molecular methods and training of local teams. The PREVENTIVO Program in Indaiatuba is a long-term demonstration of organized HPV DNA testing in an entire municipality. These initiatives offer evidence and experience that can guide the expansion of effective models nationwide.

Recommendations

Brazil must strengthen governance by creating a national committee with representation from federal, state, and municipal health sectors, alongside civil society and international partners, and by institutionalizing elimination goals in state and municipal health plans with allocated budgets. State-level committees should establish priorities and monitor progress in high-burden territories. Continuous engagement with civil society and academia is essential to sustain legitimacy and technical support.

Implementation must include the scale-up of school-based vaccination, organized HPV DNA screening with self-collection, expansion of colposcopy and outpatient treatment capacity, and modernization of oncology networks. Investments should prioritize laboratory quality, telecolposcopy, and thermoablation, while financing mechanisms must ensure sustainability. An integrated information system with a unique identifier is critical for monitoring, while a national communication strategy must combat misinformation and engage diverse audiences. Above all, cervical cancer elimination must be institutionalized as a **State policy**, ensuring continuity beyond electoral cycles.

Conclusions

The elimination of cervical cancer in Brazil is an ambitious but achievable goal. The country has adopted global best practices, expanded the prevention and treatment capacity, and mobilized multi-sectoral partnerships. Yet, success will depend on overcoming persistent inequities, integrating fragmented systems, and guaranteeing sustainable investment. By committing to elimination as a long-term State policy, Brazil has the opportunity not only to reduce cancer burden but also to reverse decades of inequality in women's health.

1. Introduction

Cervical cancer remains one of the leading public health challenges in Brazil, despite being a preventable and detectable neoplasm. The elimination of this disease as a public health problem has been recommended since 2020 by the World Health Organization (WHO) through its Global Strategy for the Elimination of Cervical Cancer[1]. This strategy is structured on three pillars: vaccination against human papillomavirus (HPV), high-performance screening, and appropriate treatment of precancerous lesions and cancer.

In Brazil, significant progress has been made in recent years, notably the expansion of HPV vaccination coverage and the decision to adopt HPV DNA testing as the primary method for cervical cancer screening. Additionally, there has been increasing collaboration between the Ministry of Health, the Pan American Health Organization (PAHO), academic institutions, civil society, and state, municipal, and district health departments, fostering a national agenda aligned with global commitments.

Nevertheless, significant challenges remain, including vaccination coverage below global targets, particularly in certain areas, and predominantly opportunistic screening, resulting in low coverage in vulnerable regions. Furthermore, healthcare pathways for diagnosis and treatment are fragmented, and information systems remain poorly integrated.

Given this context, this report aims to provide an overview of advances in cervical cancer prevention and control in Brazil, identifying progress, challenges, and opportunities to strengthen the national response. The report will focus on general epidemiological indicators and actions and services provided through the Unified Health System (SUS), Brazil's universal health care system. Data from the supplementary health sector, which covers approximately 25% of the population across various health plan modalities, are not included, as this sector does not utilize SUS information systems for its activities.

2. Epidemiological Overview

2.1. Incidence and Mortality

Cervical cancer is the third most common cancer among women in Brazil, following breast and colorectal cancers. According to estimates from the National Cancer Institute (INCA), approximately 17,000 new cases of cervical cancer are expected annually for the 2023–2025 period, with a crude incidence rate of 15.38 cases per 100,000 women[2]. The disease shows an uneven distribution across the country, with higher incidence rates in the North and Northeast regions. In the state of Amazonas, the crude incidence rate reaches 27.63 cases per 100,000 women. Table 1 presents incidence estimates by state and region.

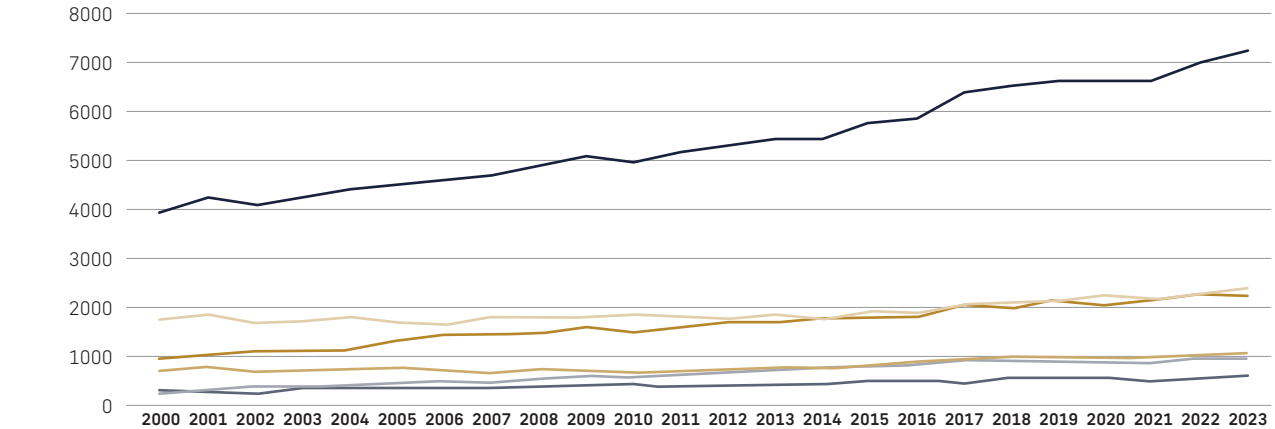
Table 1 - Estimates of annual new cervical cancer cases and crude and age-standardized incidence rates per 100,000 women. Brazil, Regions, and States, 2023–2025

Region / State	Cases	Crude Rate	Age-Standardized Rate
Acre	70	15.23	15.41
Amapá	100	21.86	26.73
Amazonas	610	27.63	31.71
Pará	830	18.65	19.48
Rondônia	150	16.33	16.39
Roraima	40	10.91	13.25
Tocantins	180	22	16.77
North	1,980	20.48	16.77
Alagoas	370	20.91	18.54
Bahia	1,160	14.93	11.84
Ceará	1,030	21.49	13.97
Maranhão	800	21.71	21.13
Paraíba	290	13.42	10.5
Pernambuco	770	15.18	12.14
Piauí	360	21.19	15.23
Rio Grande do Norte	280	15.33	12.06
Sergipe	220	17.71	13.85
Northeast	5,280	17.59	13.85
Distrito Federal	240	14.47	11.05
Goiás	660	17.74	9.12
Mato Grosso	220	12.33	11.14
Mato Grosso do Sul	320	21.71	17.73
Midwest	1,440	16.66	11.09
Espírito Santo	260	12.43	9.4
Minas Gerais	1,670	15.17	7.73
Rio de Janeiro	1,540	16.71	11.76
São Paulo	2,550	10.52	7.58
Southeast	6,020	12.93	8.57
Paraná	790	13.19	9.77
Rio Grande do Sul	620	10.42	7.11
Santa Catarina	880	23.18	17.2
South	2,290	14.55	9.77
Brazil	17,010	15.38	13.25

Source: INCA[2]

Mortality remains high, particularly in the North and Northeast regions. Data from the Mortality Information System (SIM) indicate that cervical cancer has accounted for over 6,000 deaths annually in recent years, reaching more than 7,200 deaths in 2023, as shown in Figure 1[3,4].

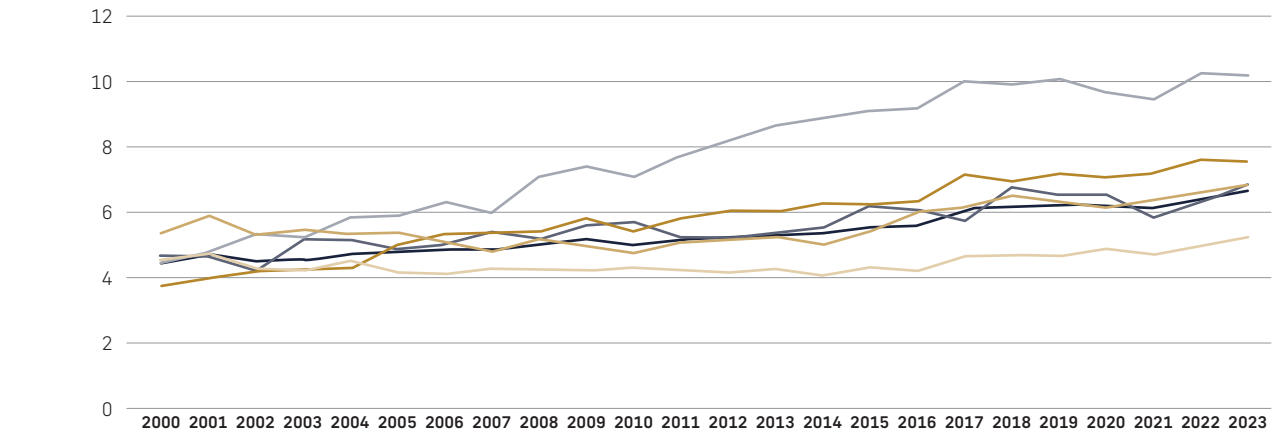
Figure 1 - Cervical Cancer Deaths. Brazil and Regions, 2000 to 2023. Source: SIM[3,4]



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Brazil	3955	4218	4091	4202	4393	4506	4602	4691	4873	5063	4986	5160	5261	5430	5448	5727	5847	6385	6526	6596	6627	6606	6983	7209
Midwest	283	289	267	335	333	329	338	374	367	400	414	385	391	409	423	480	477	458	549	535	542	491	534	588
North	292	321	370	396	420	434	471	458	552	583	573	632	673	724	756	782	800	879	880	906	877	865	940	944
Northeast	939	999	1065	1087	1131	1318	1434	1431	1467	1592	1484	1611	1678	1692	1762	1768	1802	2050	1999	2087	2058	2117	2229	2218
South	695	774	709	730	724	733	695	667	722	703	678	721	748	762	733	802	897	932	991	968	952	989	1028	1079
Sountheast	1746	1832	1680	1681	1785	1692	1664	1761	1765	1785	1837	1811	1774	1843	1774	1895	1871	2066	2107	2100	2198	2144	2252	2380

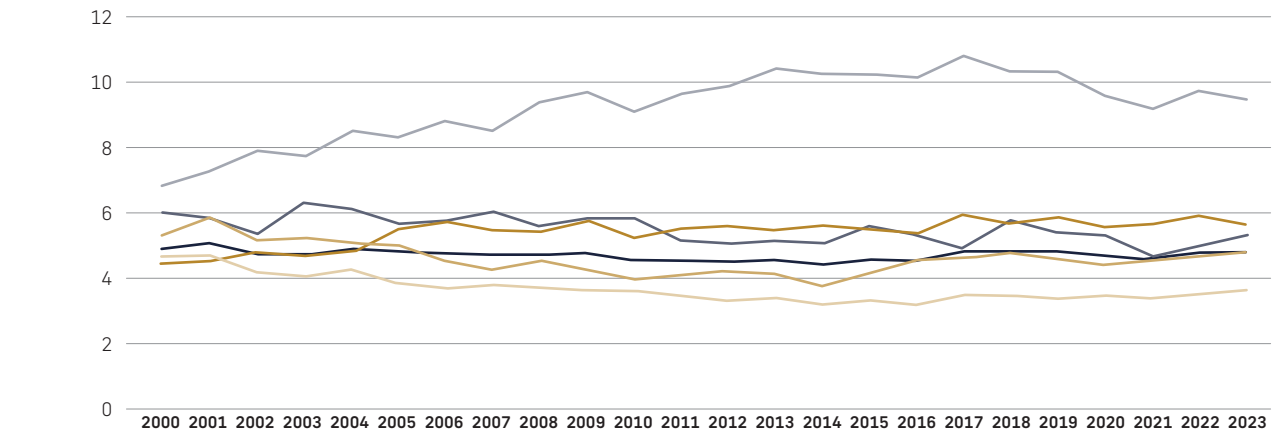
The crude mortality rate in Brazil has shown an upward trend over the historical series, rising from 4.45 per 100,000 women in 2000 to 6.65 per 100,000 women in 2023, as illustrated in Figure 2. In contrast, the age-standardized mortality rate has remained between 4 and 5 deaths per 100,000 women throughout the period but continues to exceed 9 per 100,000 in the North region, as shown in Figure 3.

Figure 2 - Crude cervical cancer mortality rates. Brazil and Regions, 2000 to 2023. Source: SIM[3,4]



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Brazil	4,45	4,68	4,48	4,54	4,72	4,76	4,83	4,85	4.99	5,13	5.01	5,15	5,21	5,33	5,31	5,53	5,61	6,08	6,18	6,2	6,19	6,14	6,47	6,65
Midwest	4,65	4,65	4,21	5,18	5,13	4,9	5,01	5,38	5,2	5,58	5,7	5,23	5,24	5,41	5,52	6,17	6,05	5,74	6,79	6,54	6,54	5,86	6,31	6,87
North	4,42	4,8	5,36	5,24	5,86	5,92	6,31	6,01	7,11	7,38	7,14	7,77	8,17	8,68	8,94	9,14	9,24	10,05	9,96	10,15	9,73	9,52	10,27	10,24
Northeast	3,75	3,95	4,16	4,21	4,32	5	5,36	5,33	5,42	5,83	5,4	5,82	6,03	6,04	6,26	6,24	6,33	7,17	6,95	7,22	7,09	7,26	7,63	7,57
South	5,37	5,92	5,36	5,47	5,35	5,38	5,05	4,81	5,16	4,98	4,77	5,04	5,18	5,24	4,99	5,41	6	6,18	6,52	6,31	6,15	6,35	6,56	6,38
Sountheast	4,55	4,72	4,27	4,23	4,5	4,17	4,11	4,25	4,22	4,23	4,32	4,23	4,12	4,25	4,06	4,31	4,23	4,64	4,71	4,67	4,86	4,73	4,95	5,22

Figure 3 - Age-standardized cervical cancer mortality rates using the world standard population. Brazil and Regions, 2000 to 2023. Source: SIM[3,4]



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Brazil	4,86	5,01	4,72	4,7	4,83	4,77	4,72	4,65	4,66	4,69	4,51	4,53	4,5	4,51	4,41	4,51	4,49	4,79	4,76	4,74	4,64	4,56	4,76	4,79
Midwest	5,97	5,82	5,35	6,28	6,09	5,64	5,74	6,01	5,56	5,72	5,82	5,11	5,04	5,1	5,03	5,56	5,28	4,89	5,69	5,4	5,28	4,65	4,98	5,3
North	6,81	7,27	7,89	7,74	8,5	8,3	8,8	8,5	9,4	9,71	9,11	9,68	9,91	10,41	10,26	10,22	10,14	10,83	10,35	10,35	9,57	9,18	9,74	9,47
Northeast	4,4	4,52	4,76	4,67	4,81	5,42	5,66	5,44	5,41	5,72	5,21	5,5	5,56	5,42	5,54	5,43	5,36	5,93	5,62	5,81	5,59	5,63	5,85	5,64
South	5,33	5,84	5,15	5,17	5,01	4,95	4,51	4,25	4,45	4,17	3,95	4,08	4,15	4,09	3,76	4,14	4,5	4,58	4,71	4,55	4,38	4,48	4,61	4,75
Sountheast	4,61	4,65	4,13	4	4,22	3,81	3,66	3,74	3,64	3,56	3,56	3,45	3,28	3,34	3,14	3,27	3,16	3,42	3,42	3,35	3,43	3,32	3,45	3,56

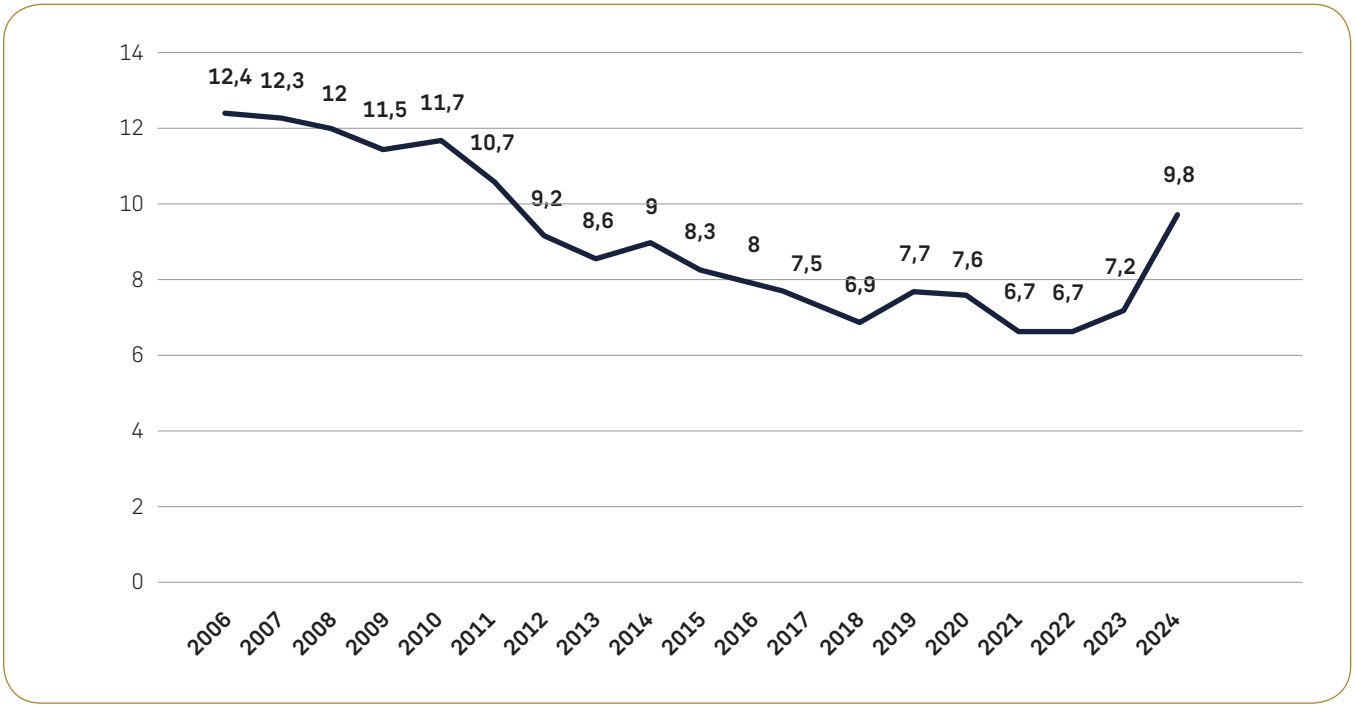
2.2. Risk Factors

The primary causal factor for cervical cancer is persistent infection with oncogenic types of human papillomavirus (HPV), which is present in over 99% of cases[5]due to sample inadequacy or integration events affecting the HPV L1 gene, which is the target of the polymerase chain reaction (PCR. HPV infection is common worldwide, with an estimated prevalence of 32.1%, and is higher in less developed countries, where it reaches 42.2%[6]. Other factors associated with cervical cancer include early onset of sexual activity, multiple sexual partners, immunosuppression (including HIV), and smoking[7].

In Brazil, there are no large-scale surveys on the prevalence of HPV infection in the general population. In a study conducted among unvaccinated young women aged 16 to 25 years, HPV infection prevalence was found to be 54.6%, with 38.6% corresponding to high-risk oncogenic subtypes[8]. Regarding HIV infection, between 2007 and June 2024, 541,759 cases of HIV were reported in the country, of which 158,626 (29.3%) were among women[9].

Tobacco control has been the focus of extensive public policies in Brazil, including bans on smoking in enclosed spaces, restrictions on advertising, health warnings on packaging, increased taxation, and prohibiting sales to minors. In addition, the country provides free smoking cessation treatment through the SUS, bans electronic smoking devices, and conducts educational campaigns. Although smoking prevalence has declined in recent decades, it has stabilized in recent years and showed an increase in the latest survey conducted in capital cities, reaching 9.8% among women, according to preliminary data[10,11]. The trend in female smoking prevalence is depicted in Figure 4.

Figure 4 - Percentage of female adult smokers (≥18 years) in the state capitals and the Federal District of Brazil, by year. Source: Vigitel, 2006–2024[10,11].



2.3. Vulnerable Populations

The persistence of cervical cancer as a significant public health issue in Brazil is deeply linked to social determinants of health. Numerous studies have investigated how factors such as race/ethnicity, educational attainment, income, geographic location, and access to health services affect the coverage and effectiveness of prevention, diagnosis, and treatment interventions. In the Brazilian context, a growing body of research has contributed to understanding the social and structural inequities that sustain the high burden of cervical cancer among vulnerable populations.

A study analyzing data from the 2008 National Household Sample Survey (PNAD) to examine social inequalities in access to Pap smear testing in Brazil found that, despite generally broad coverage, Black and Brown women, those with low educational attainment, without private health insurance, and residents of the North and Northeast regions were less likely to have undergone screening in the previous three years[12]

In a cross-sectional study that analyzed the prevalence of advanced-stage cervical cancer diagnosis in Brazil from 2006 to 2015 and its association with individual and contextual factors, the authors found that 48.4% of cases were diagnosed at an advanced stage[13]. Higher risk was observed among older women, those identified as Black, Brown, or Indigenous, women with lower educational attainment, and those without a partner.

An ecological study analyzing 9,095 cases of cervical cancer in women aged 30 years or older, diagnosed between 2010 and 2017 in 645 municipalities in the state of São Paulo, utilized the Social Responsibility Index (SRI), which classifies municipalities based on wealth, education, and longevity. The study found that higher SRI levels were associated with greater likelihood of stage I diagnosis, with odds ratios for differences between SRI levels ranging from 1.33 to 1.43[14] Brazil, the Index of Social Responsibility (ISR.

Another ecological study, which analyzed age-adjusted cervical cancer mortality rates in Brazil by race from 2002 to 2021 among women aged 20 years or older, found that Black women have higher mortality rates, and the reduction in mortality has been slower in this group, highlighting increasing racial disparities over time[15]from 2002 to 20121, of age-adjusted coefficients of cervical cancer mortality, in Brazil, in women aged 20 years or more, by race. The information sources were Brazil's mortality information system (Sistema de Informação sobre Mortalidade - SIM. The gap, which was 0.08 additional deaths per 100,000 Black women in 2002, reached one additional death per 100,000 in 2021.

An additional ecological study examining cervical and breast cancer mortality in Brazil between 2011 and 2015, in relation to socioeconomic indicators and health service availability, found that cervical cancer mortality was significantly associated with both the Gini index and the Human Development Index (HDI)[16].

These findings underscore the profound influence of social, economic, and structural determinants on cervical cancer outcomes in Brazil. Persistent inequities in access to prevention, early diagnosis, and treatment contribute to the higher burden of disease among vulnerable populations, particularly among women of lower socioeconomic status, racial minorities, and those residing in underserved regions.

3. Primary Prevention: HPV Vaccination

Vaccination against human papillomavirus (HPV) is the principal primary prevention strategy for cervical cancer. Studies have demonstrated that vaccination, especially when administered before exposure to the virus (i.e., prior to sexual activity), is highly effective in preventing persistent infection with oncogenic HPV subtypes, as well as precancerous lesions and invasive cancer[17,18]. Several countries that have achieved high vaccination coverage already report significant reductions in the incidence of cervical cancer and other HPV-related diseases[19,20].

In Brazil, the quadrivalent vaccine was introduced into the National Immunization Program (PNI) in 2014 for girls aged 11 to 13 years. Vaccination of boys was included in 2017. The current guideline, in effect since April 2024, recommends a single dose of the vaccine for both boys and girls aged 9 to 14 years[21].

3.1. Vaccination Coverage

Since its introduction, HPV vaccination coverage in Brazil has fluctuated considerably. In its launch year, 2014, the country achieved high first-dose coverage among girls, a result of vaccination campaigns conducted in schools with the support of municipal and state education departments. However, various challenges, primarily related to misinformation, contributed to declining coverage in subsequent years.

In the most recent year, considering the single-dose schedule, official estimates from the Ministry of Health indicate that coverage among the target age group reached 82.77% for girls and 67.21% for boys[22], as shown in Figure 5. It is important to note, however, that there is substantial heterogeneity in vaccination coverage across the country, with coverage among 14-year-old girls ranging from 44% in Acre to 103% in Roraima, as shown in Table 2.

Figure 5 - HPV vaccine coverage 9 -14 years, 2014 – 2025. Source: PNI [22]

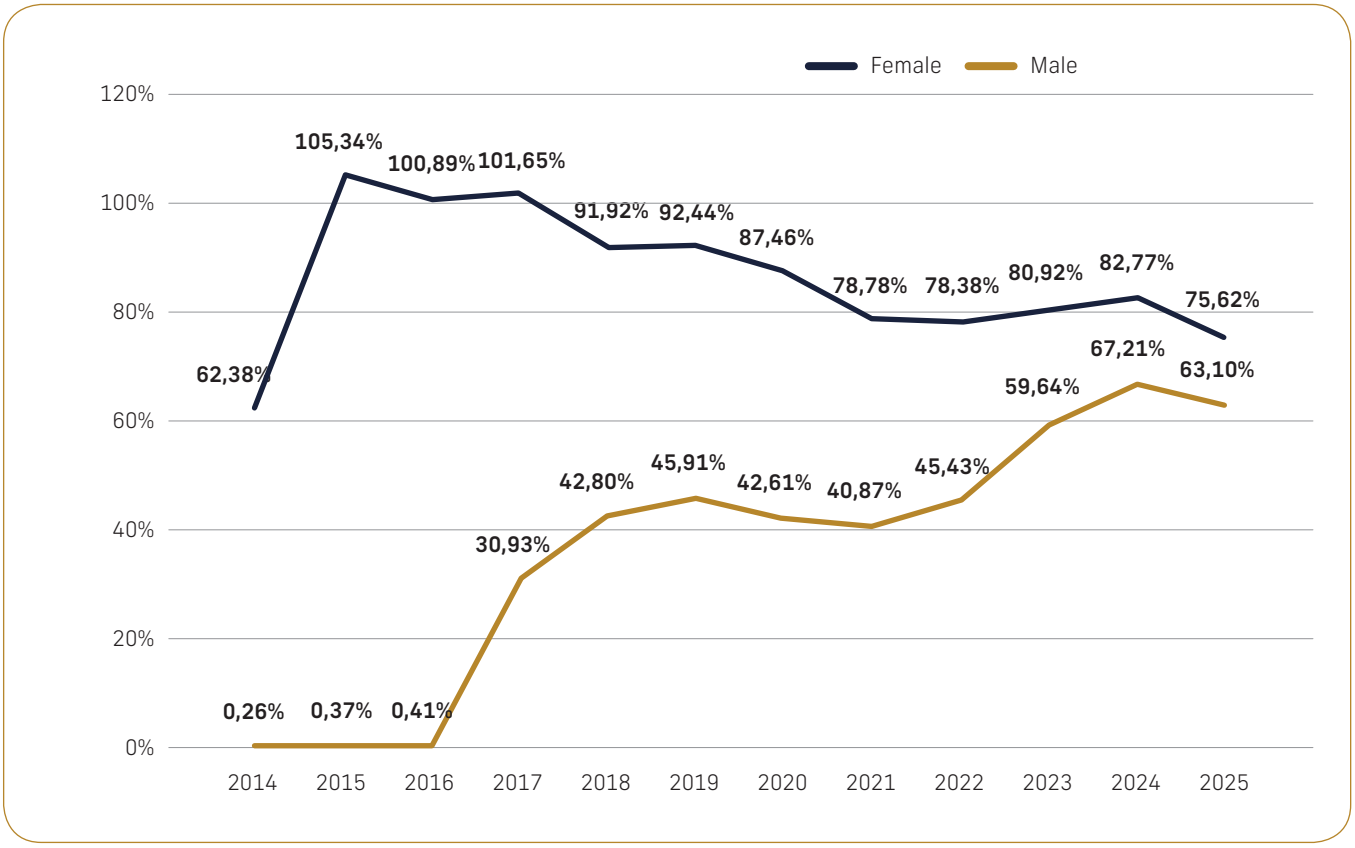


Table 2 - HPV vaccine coverage by age, in %, 2024

Region / State	9 Years		10 Years		11 Years		12 Years		13 Years		14 Years	
	F	M	F	M	F	M	F	M	F	M	F	M
Acre	43	34	53	40	52	43	52	42	47	37	44	32
Amapá	83	73	96	91	94	86	88	72	99	81	100	75
Amazonas	68	49	84	63	79	65	81	60	76	58	79	56
Pará	64	51	77	62	76	61	74	56	77	59	72	53
Rondônia	73	56	88	73	90	74	89	68	102	75	87	71
Roraima	68	56	96	78	105	83	108	78	108	90	103	83
Tocantins	77	65	90	77	88	76	92	72	107	78	91	78
North	70	57	84	70	83	69	81	63	86	67	81	62
Alagoas	60	47	83	69	79	65	82	64	92	67	80	63
Bahia	54	40	73	57	74	57	79	59	86	64	73	58
Ceará	70	56	84	73	80	69	84	64	93	68	79	67
Maranhão	60	47	77	65	75	62	75	60	79	63	71	53
Paraíba	64	53	82	73	74	66	79	60	89	65	84	66

Region / State	9 Years		10 Years		11 Years		12 Years		13 Years		14 Years	
Pernambuco	61	47	77	64	75	63	77	60	86	61	79	57
Piauí	74	58	83	73	82	67	84	66	94	73	79	66
Rio Grande do Norte	63	45	74	58	78	60	82	60	93	65	77	64
Sergipe	66	54	83	74	84	68	87	71	93	79	79	64
Northeast	62	48	78	65	77	63	80	61	88	66	77	61
Distrito Federal	74	53	91	79	90	74	90	67	109	74	90	76
Goiás	68	55	80	70	83	70	84	68	91	74	80	70
Mato Grosso	81	69	90	79	89	78	90	75	109	81	95	78
Mato Grosso do Sul	75	60	89	76	87	73	87	74	103	76	83	73
Midwest	73	59	86	75	86	73	87	70	100	76	85	73
Espírito Santo	88	80	103	98	103	94	97	86	105	98	96	83
Minas Gerais	74	60	88	80	85	75	87	69	106	79	88	72
Rio de Janeiro	58	40	71	53	69	57	71	53	78	58	67	54
São Paulo	66	52	84	72	86	72	86	67	101	78	89	72
Southeast	67	53	83	72	83	71	84	66	98	75	85	69
Paraná	81	75	96	95	95	90	97	82	118	92	99	93
Rio Grande do Sul	68	54	82	70	88	74	87	72	106	82	90	75
Santa Catarina	79	68	92	85	96	84	96	79	114	90	99	86
South	76	66	90	84	93	83	93	77	113	88	96	85
Brazil	68	54	83	72	83	70	84	66	96	73	83	68

Source: PNI [22]

3.2. Barriers to Increasing Coverage

Despite the availability of the HPV vaccine through the SUS across the entire country, Brazil faces multiple barriers to expanding vaccination coverage. One of the main challenges is misinformation, which disproportionately affects HPV vaccination. Myths regarding a supposed link between the vaccine and sexual activity, as well as moral concerns, have emerged as obstacles in several studies worldwide[23].

A key factor explaining low coverage, particularly in the state of Acre, is the alleged association between the vaccine and epileptic seizures, a narrative widely amplified by the media at the time. The adolescents involved underwent extensive investigation, which confirmed there was no biological causality and that these episodes were related to Immunization stress-related responses (ISRR)[24]. Nevertheless, the negative impact on public perception persists there.

A population-based cross-sectional study, which interviewed individuals in all regions of Brazil, found that the prevalence of vaccine hesitancy was 5.97%, being more common among men

and residents of the South region. The main reasons for refusal were lack of knowledge about the vaccine, difficulty accessing vaccination, and the absence of a recommendation from health professionals[25].

Another important aspect concerns vaccination among people living with HIV/AIDS. Although there are no official coverage data for this population, a study showed that less than 10% of interviewed women had previously received the HPV vaccine, even though it is available for this group up to 45 years of age[26].

3.3. Strategies to Increase Vaccination Coverage

School-based vaccination has proven to be the most effective approach for achieving high coverage among adolescents in several countries and is the strategy recommended by the WHO[27]. Brazil itself achieved its highest coverage rates in 2014 and 2015, when the school-based strategy was widely implemented.

In 2023, the Ministry of Health renewed efforts to promote vaccination in schools, leading to a major national school-based vaccination campaign in 2024 that included the HPV vaccine[28]. These school-based initiatives involve mapping schools and the target population in each area, with prior coordination between municipal health and education departments, and defining the vaccination calendar and logistics. Another important element is engaging school administrators, teachers, and families through educational materials and informational meetings.

In addition to national actions by the Ministry of Health, some states and municipalities conduct their own school-based vaccination campaigns as part of microplanning strategies[29]. Furthermore, certain civil society organizations also implement activities that contribute to increasing vaccination coverage[30,31].

4. Secondary Prevention: Screening and Early Diagnosis

Population-based screening is one of the most effective tools for the early detection of precancerous cervical lesions, enabling timely treatment and preventing progression to invasive cancer[32]. In Brazil, screening has been offered for decades through cytological examination (Pap smear), with a recommended three-year interval for women aged 25 to 64 after two consecutive annual negative tests[33]. However, this strategy has proven ineffective in significantly reducing cervical cancer incidence and mortality[34].

4.1. Challenges in Cytology-Based Screening

Although cytology-based screening has been part of the SUS for over 30 years, it has shown low population effectiveness in Brazil. Official data from INCA indicate that screening coverage in 2023 ranged from 18% in Amapá to 52.8% in Espírito Santo[35].

Moreover, the current model is essentially opportunistic. There is no systematic invitation of the target population, nor monitoring of participation or screening history. Several studies found out that Black, Indigenous, and low-income women, as well as those living in rural areas, are disproportionately excluded from regular screening[36,37].

While cytology is widely used for cervical cancer screening, it has important limitations that undermine its effectiveness. It is a complex process involving multiple steps, from sample collection, fixation, and transportation, to processing, analysis, and result communication[38]. In Brazil, many

laboratories still operate without adequate technical standards, with low production, insufficient quality control, and failures in standardization and timely reporting of results[39].

4.2. Introduction of HPV DNA Testing

In response to this scenario, the Ministry of Health decided to incorporate HPV DNA testing as the primary method for cervical cancer screening[40]. Guidelines for cervical cancer screening are currently being updated and are expected to be published soon. The official recommendation will be to initiate screening at age 25 and repeat every five years in cases with negative results, up to age 64[41]. One of the main innovations associated with HPV testing is the possibility of self-collection of cervical samples by women themselves, eliminating the need for a gynecological exam or the presence of a health professional. The guidelines recommend this approach especially for vulnerable populations[41].

In a recent publication, the Ministry of Health established recommendations for the implementation of HPV DNA testing[42]. This document emphasizes that the expected impact will only be achieved if the test is implemented within an organized screening context, which includes identification and active follow-up of the target population to ensure cost-effectiveness and economic viability.

The implementation of organized screening is based on actions carried out by Primary Health Care, which becomes responsible for inviting the target population. To increase effectiveness, the program suggests initially prioritizing women at higher risk, such as those in age groups with higher cancer risk and those overdue for screening or who have never been screened.

The document alerts managers to the need for careful planning of the care network, as the transition to HPV DNA testing will affect the demand for other services. Because it is a more sensitive test, an initial increase in the need for colposcopies is expected, which may be up to four times higher than in a cytology-based program. Based on data from a national research project[43], it is estimated that about 6.16% of screened women will require referral for colposcopy, making it necessary for the health system to prepare for this demand.

Implementation of the new model will also require updating guidelines for the treatment of precancerous lesions, which are underway. Additional measures have been identified, such as training primary health care professionals in the new guidelines and training cytologists for liquid-based cytology, both of which are also in progress.

A notable development in the Brazilian experience is the creation of a national HPV DNA test by the IBMP laboratory. This test, approved by ANVISA in 2023[44], represents a major advancement that will enable screening at lower costs. Clinical validation for the use of this test in screening strategies is underway and is expected to be completed in the coming months.

5. Treatment of Precancerous Lesions and Cancer

Timely and appropriate treatment of precancerous lesions and cancer constitutes the third pillar of the WHO Global Strategy for the Elimination of Cervical Cancer. In Brazil, despite the existence of a structured public healthcare network, barriers to access and prolonged intervals between diagnosis and initiation of treatment remain critical challenges.

After a positive screening test result, the next step is colposcopy. If lesions are identified, biopsy and/or treatment with excision of the transformation zone (EZT) is generally recommended. If the biopsy confirms CIN2+ (Cervical Intraepithelial Neoplasia grade 2 or higher), EZT is indicated.

For type 1 or type 2 EZT, the procedure can be performed on an outpatient basis. For type 3 EZT, hospitalization is required.

If biopsy confirms invasive carcinoma, evaluation by an oncology team is recommended to perform staging and determine the appropriate treatment, which may involve chemotherapy, external radiotherapy, brachytherapy, and surgery.

5.1. Specialized Care Network for the Diagnosis and Treatment of Precancerous Lesions

The ambulatory specialized care network within the SUS is highly heterogeneous, ranging from outpatient services focused on specific specialties or procedures to large polyclinics offering multiple specialties and access to imaging such as MRI and CT scans. The organization and distribution of these services have historically been determined by local and regional health authorities, with limited direct involvement from the federal level.

In 2014, the Ministry of Health established regulations for the accreditation of Reference Services for the Diagnosis and Treatment of Precancerous Cervical Lesions (SRC)[45], intended to provide early diagnosis, confirmatory diagnostics, and specialized treatment for cervical precancerous lesions. However, after more than ten years, this policy has had a limited practical impact, with only 53 services accredited during this period[46]. There is substantial regional heterogeneity in their distribution, as shown in Table 3.

Table 3 - Reference Services for Diagnosis and Treatment of Cervical Cancer Precursor Lesions (SRC) by State, 2025

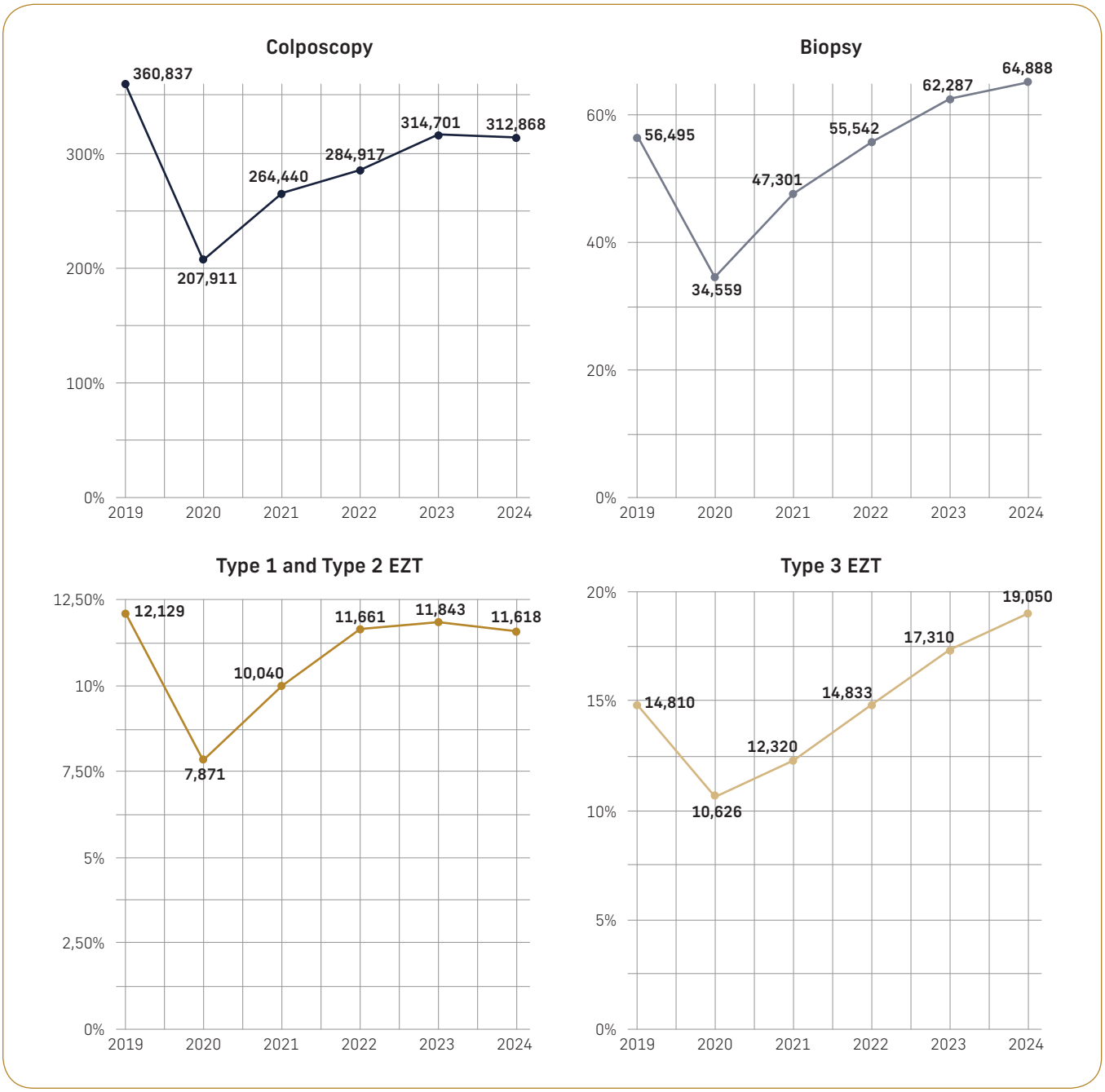
State	SRC
AM	10
BA	2
CE	8
DF	4
ES	1
GO	1
MA	5
MS	2
MT	1
PA	3
PB	1
RS	2
SC	1
SP	10
TO	2
Total	53

Source: National Registry of Health Facilities[46]

Type 3 EZT must be performed in a hospital setting but does not require specific accreditation, so hospitals performing this procedure may be cancer centers or general hospitals. Most procedures related to the diagnosis and treatment of precancerous lesions are carried out in services that are not specifically accredited for this purpose and have varying levels of complexity and capacity to resolve cases. According to INCA data, of the 1,099 facilities performing colposcopy in 2023, only 17.1% also performed biopsy and EZT[35].

Overall, the volume of these procedures is much lower than the estimated need based on epidemiological indicators. There was a marked decline in these procedures during the COVID-19 pandemic. Among them, colposcopies and type 1 and type 2 EZT have not yet returned to pre-pandemic levels, as shown in Figure 6. Detailed data by state are provided in the appendices.

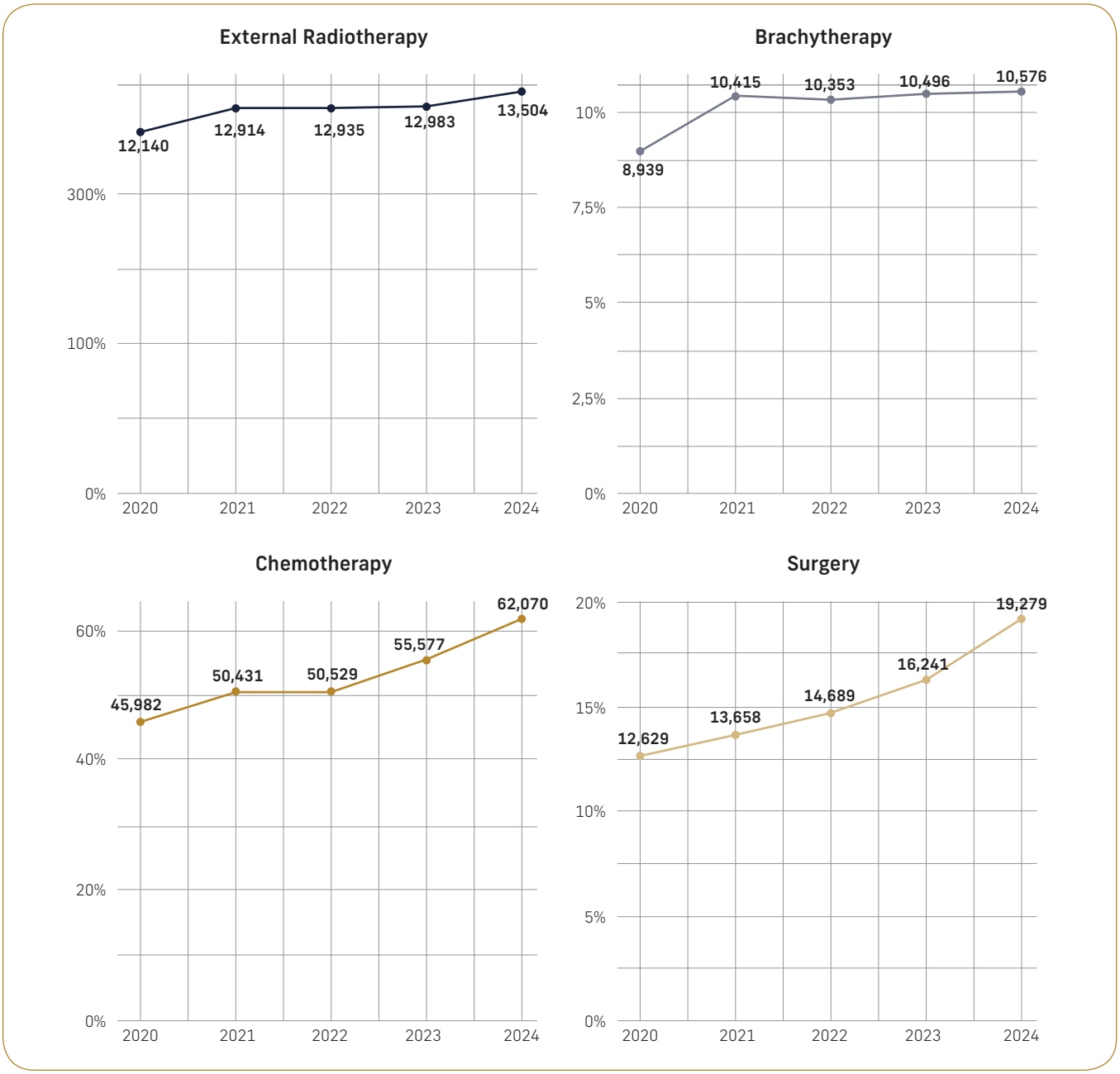
Figure 6 - Cervical cancer diagnosis and treatment procedures performed 2019-2024, by type. Source: Hospital Information System of SUS [47] and Outpatient Information System of SUS[48]



5.2. Structure of the Hospital-Based Specialized Care Network

High-complexity oncology care requires accreditation from the Ministry of Health, which involves demonstrating adequate physical infrastructure, equipment, and staff to provide comprehensive cancer care[49]. Accreditation as a High-Complexity Care Unit (Unacon) requires the hospital to have at a minimum the necessary structure for general oncology care, including surgical services (general surgery, digestive system surgery, coloproctology, gynecology, mastology, and urology), clinical oncology, palliative care, and a chemotherapy center. Accreditation as a High-Complexity Oncology Care Center (Cacon) requires the hospital to have the full infrastructure for comprehensive oncology care across multiple specialties, including surgical services (general surgery, digestive system surgery, coloproctology, gynecology, mastology, urology, head and neck surgery, skin and plastic surgery, thoracic surgery, and bone and soft tissue surgery), clinical oncology, hematology, radiotherapy (including brachytherapy), palliative care, and a chemotherapy center.

Figure 7 - Gynecologic cancer treatment procedures 2020–2024. Source: Hospital Information System of SUS [47] and Outpatient Information System of SUS[48]



Although accredited services exist throughout the country, their geographic distribution is uneven, resulting in significant shortages in certain health regions. The regional distribution of hospitals providing cancer treatment is presented in the Appendices.

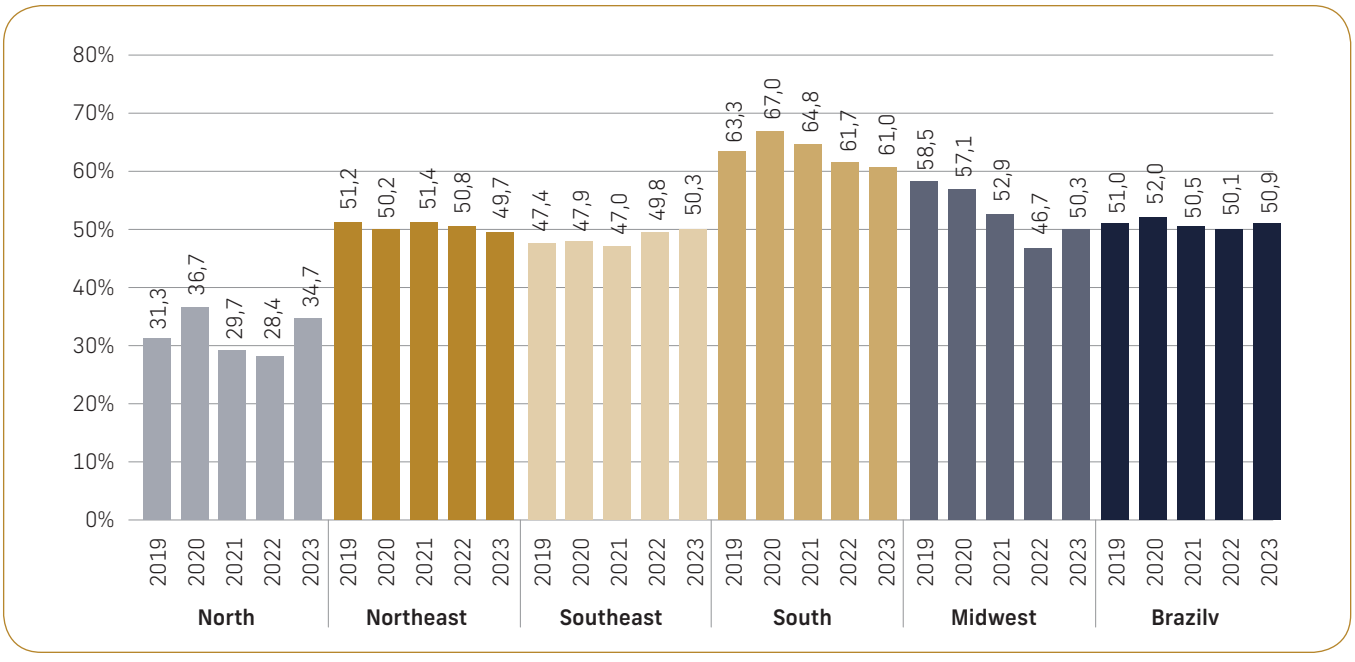
The treatment of gynecologic cancer involves oncologic surgery, radiotherapy, and chemotherapy, often used in combination. The delivery of these procedures is also uneven, reflecting differences in the installed capacity of states and the stage distribution of cases in each locality. It is important to note that, in recent years, there has been an increase in the number of treatment procedures, and this production was not significantly affected by the COVID-19 pandemic, as shown in Figure 7. From 2020 to 2024, the number of external radiotherapy procedures increased by 11%, brachytherapy by 18%, chemotherapy by 34%, and surgery by 52%. This growth is likely related to the expansion of the facilities, including the accreditation of new centers and the implementation and replacement of radiotherapy equipment.

In radiotherapy, the federal government has made significant efforts to increase the number of devices and replace obsolete equipment. The Radiotherapy Expansion Plan (PER-SUS), a federal program launched in 2012, has delivered 75 out of the 92 planned solutions to date, with the remaining units in the final stages of implementation[50]. In addition to this initiative, in 2023, the Ministry of Health approved 35 agreements for the replacement of radiotherapy equipment across the country[51]. Most recently, PER-SUS 2 was launched this year to replace 56 obsolete radiotherapy devices[52].

5.3. Time from Diagnosis to Treatment

One of the main challenges faced by women diagnosed with cancer is the waiting time before treatment begins. Delays in treatment initiation are associated with worse clinical outcomes, increased risk of disease progression, and reduced survival. Unfortunately, this time often exceeds the period established by the Law No. 12,732/2012, known as the "60-Day Law," that guarantees that cancer patients have the right to begin treatment in the SUS within 60 days of diagnosis[53]. However, data from the Oncology Panel shows that a significant proportion of women do not meet this timeframe. In 2023, only 34.7% of women in the North region started treatment within 60 days, while the national proportion was 50.9%[54]. Annual percentages can be seen in Figure 8.

Figure 8 - Cervical cancer cases treated within 60 days — Brazil and Regions, 2019–2023. Source: INCA[35]

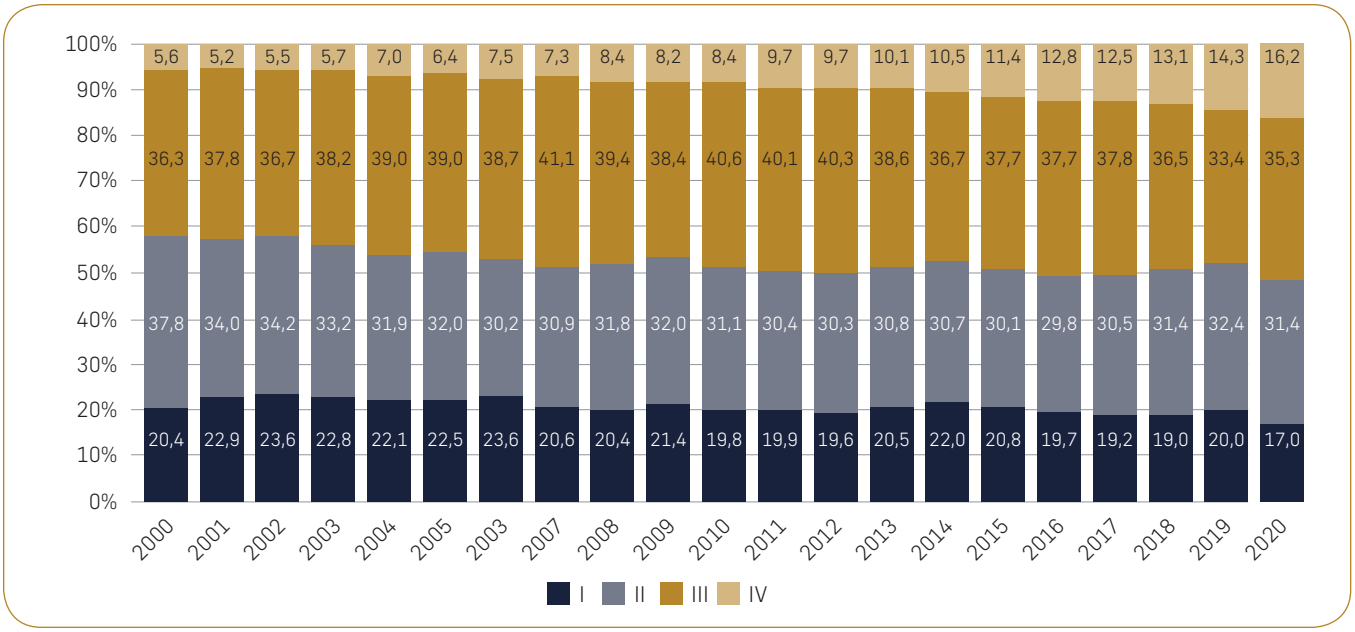


The reasons for these delays are varied and include difficulties in scheduling at referral centers, lack of efficient referral and regulatory mechanisms, poor integration between levels of care, and insufficient installed capacity.

5.4. Staging

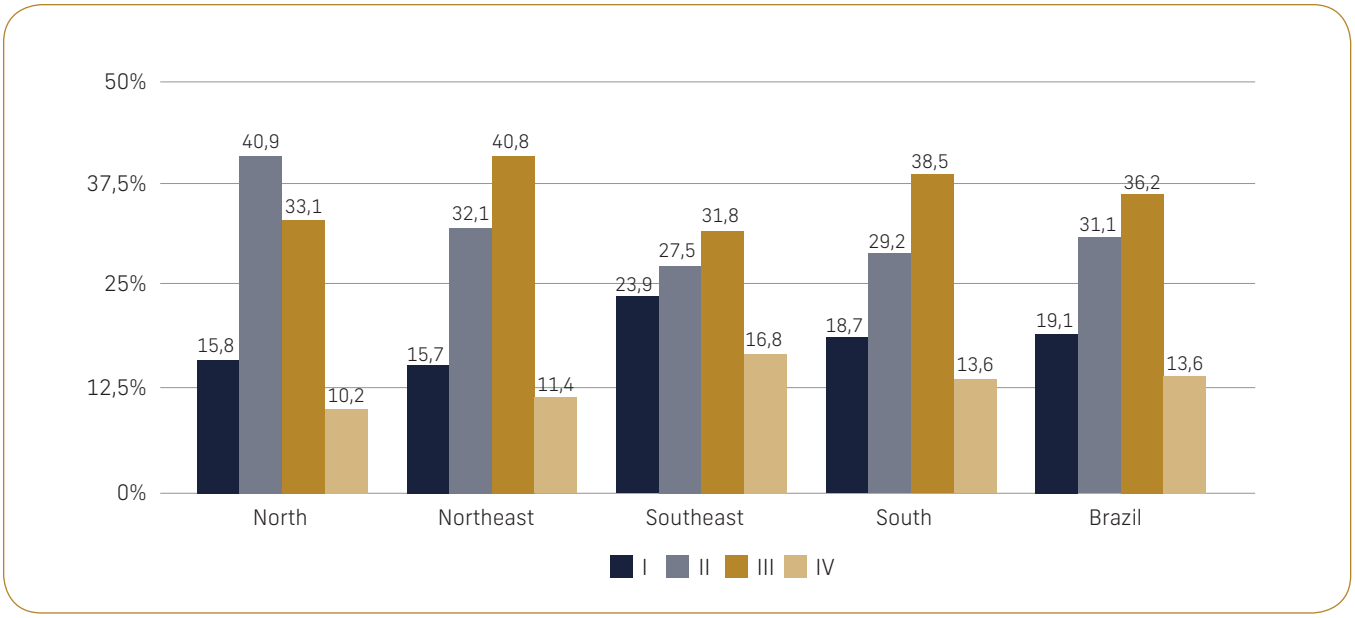
Regarding staging at the start of treatment, the situation in Brazil is quite critical, with only 48.5% of cases diagnosed at early stages in 2020 (I and II)[35]. This is particularly concerning given the downward trend over time: in 2000, early-stage diagnoses accounted for 58.2% of cases, as shown in Figure 9.

Figure 9 - Cervical cancer case percentage by stage and year. Source: INCA[35]



Regional distribution is also heterogeneous. While the proportion of cases diagnosed at early stages is 50.2% nationwide, this figure ranges from 56.6% in the North region to 47.8% in the Northeast, as shown in Figure 10.

Figure 10 - Percentage of cervical cancer cases by stage, Brazil and Regions, 2016–2020. Source: INCA[35]



6. Information Systems, Monitoring and Evaluation

Monitoring and evaluation are fundamental components for the success of any public health policy, especially in cancer screening and control programs. In the context of cervical cancer elimination, the World Health Organization (WHO) recommends the development of robust monitoring systems capable of identifying baseline indicators and tracking their progress as proposed actions are implemented[55].

In Brazil, although the SUS has established information systems, these systems operate in a fragmented and unintegrated manner, which makes it difficult to generate comprehensive analyses and assess the effectiveness of interventions. Additionally, the country lacks a consistent unique identifier for SUS users, which prevents longitudinal follow-up of women over time and across different levels of care.

6.1. Description of Information Systems

The main information systems related to cervical cancer are described below.

SI-PNI (National Immunization Program Information System): SI-PNI is responsible for recording vaccination activities in Brazil, including both aggregated data and, more recently, nominal records. This evolution enables greater detail and traceability of vaccination coverage, including HPV vaccination. However, despite advances with nominal data, the system is not yet integrated with other relevant databases, such as school records, which limits the ability to identify unvaccinated adolescents and plan active outreach efforts.

SISCAN (Cancer Information System): SISCAN was created to monitor the cancer care continuum through the recording of screening and diagnostic exams, such as cytology, colposcopy, histopathology, and mammography. The system represents an advance in the standardization of data related to early cancer detection, allowing the linkage of screening and confirmatory exams. However, it has not been implemented in all states, and there are limitations related to its structure, incomplete data entry, underutilization, and inconsistencies in data quality. Moreover, SISCAN is not integrated with other SUS information systems, which makes it difficult to track patients longitudinally and assess clinical outcomes.

SIM (Mortality Information System): SIM is one of the country's most established systems, responsible for collecting, processing, and disseminating mortality data in Brazil. Fueled by death certificates, the system has strong national coverage and is essential for analyzing mortality patterns for cervical cancer.

SIA/SIH-SUS (Outpatient and Hospital Information Systems of SUS): The SIA and SIH-SUS are the main databases for health service delivery in the outpatient and hospital settings of SUS. They record information on consultations, exams, surgical procedures, hospitalizations, and treatments, and are fundamental for the financing and planning of services. However, these systems were designed for administrative and financial purposes rather than for individualized clinical monitoring. Data are organized by procedure rather than by patient trajectory, which hinders longitudinal follow-up and integrated evaluation of care pathways, especially for chronic and complex diseases such as cancer.

e-SUS APS (Primary Health Care Information System): e-SUS APS is the main digital health strategy for Primary Health Care in Brazil, integrating data on population registration, clinical care, and collective health actions carried out by Family Health Strategy teams. The system allows for nominal

registration of users and the activities performed by teams, making it a strategic tool for monitoring longitudinal care, including cervical cancer prevention. However, the use of e-SUS APS still varies across municipalities in both coverage and data quality. Furthermore, integration with other systems, such as SISCAN, remains limited, hindering the development of a continuous and fully digitalized care pathway.

6.2. Absence of a National Unique Identifier

One of the main obstacles to system integration and the development of a digital care pathway is the lack of a reliable and universal unique identifier for each SUS user. Currently, different systems use various identifiers, such as the National Health Card (CNS), Individual Taxpayer Registry (CPF), local medical record number, or combinations of name and date of birth.

The inconsistency of these identifiers, combined with the lack of interoperability between databases, prevents automatic linkage of records and the longitudinal follow-up of women. Effective implementation of a validated unique identifier, used at all levels of care, is essential for the success of a national cervical cancer elimination program.

6.3. Impact of Fragmentation on the Quality of the National Response

The fragmentation of health information systems and the absence of a unique identifier directly affect the effectiveness of the national cervical cancer prevention and control program. Local and federal managers face challenges in accurately identifying which actions are being implemented and in establishing effective strategies to address service gaps.

This fragmentation also contributes to loss to follow-up among women with abnormal test results, many of whom are not reached in time or do not complete the diagnostic and therapeutic process. Additionally, assessments of vaccination coverage, screening, and treatment are generally based on aggregated data, making it impossible to verify continuity of care and leading to imprecise estimates.

The lack of an integrated nominal database also hampers the ability to stratify the population according to vulnerability or risk, limiting the prioritization of more effective interventions. As a result, planning becomes inefficient, with decisions regarding service expansion, resource allocation, and educational campaigns often disconnected from local realities and needs.

6.4. Ongoing Initiatives

In recent years, Brazil has made progress on several fronts to address the challenges of fragmented health information systems and lack of database integration. A major milestone in this process was the creation of the Secretariat for Digital Health Information within the Ministry of Health, which established a strategic agenda for the digital transformation of the Unified Health System (SUS). Among the main initiatives is the National Health Data Network (RNDS), a foundational platform designed to enable interoperability between different health systems and services, facilitating the secure exchange of clinical, administrative, and epidemiological information.

In the specific context of cancer prevention and control, ongoing efforts aim to incorporate SISCAN data into the RNDS. This integration would represent a significant qualitative advance in cancer care management, allowing for longitudinal follow-up of users, linkage between different steps of the care process, and population stratification based on clinical and sociodemographic criteria. Another relevant initiative is the consolidation of Meu SUS Digital (formerly ConecteSUS), which has emerged

as a promising tool for empowering citizens and providing access to their health information. One successful example is the integration of vaccination data, which users can now access directly on the platform in near real time, potentially strengthening public engagement in vaccination efforts.

In addition to national initiatives, regional and local experiences have also contributed significantly to innovation in health information management and care pathway improvement. A notable example is JORDANA, a digital platform developed as part of the "Útero é Vida" program by the Pernambuco State Health Department. Despite certain limitations, the system has supported project activities, integrating databases and enabling follow-up of screened women. Other regional projects are also developing their own systems, such as the ConeCta-SP project, in which a similar system is being developed by the São Paulo Oncocenter Foundation. There are federal initiatives to incorporate these features into the SUS information system ecosystem through partnerships with research institutions, but there is not yet a set timeline for achieving this objective.

7. Partnerships

The elimination of cervical cancer as a public health problem is an ambitious goal that cannot be achieved solely through the actions of health managers and professionals. In recent years, Brazil has witnessed the emergence and strengthening of institutions committed to this cause, which have made important contributions toward cervical cancer elimination.

Key strategic partners include:

National Alliance for the Elimination of Cervical Cancer: A multisectoral initiative created to mobilize and connect public and private stakeholders, generate evidence, propose policies, and monitor progress. Its focus is on communication, partner engagement, and advocacy.

Women of Brazil Group: With a national presence and strong community engagement, this group mobilizes female leaders, disseminates high-quality information, and advocates for public policies. It has ongoing projects across various sectors, with cervical cancer prevention as a health priority, and leads initiatives in several cities and regions. It is also one of the leading institutions of the National Alliance for the Elimination of Cervical Cancer.

Instituto Vencer o Câncer: Focused on the production and dissemination of evidence-based information, awareness campaigns, and support for research and advocacy projects. It is the other institution leading the National Alliance for the Elimination of Cervical Cancer.

EVA Group (The Brazilian Group for Gynecologic Tumors): A multidisciplinary, non-profit organization dedicated to gynecologic oncology in Brazil. Its mission includes promoting education, research, outreach, and support for patients with gynecologic cancers. The group brings together professionals and institutions to develop initiatives in prevention, diagnosis, treatment, and comprehensive patient support.

School of Public Health, University of São Paulo (FSP-USP): FSP-USP conducts population-based research, screening studies, and public policy evaluation on cervical cancer. It is noted for collaborative projects with international organizations such as IARC.

Oncocenter Foundation of São Paulo (FOSP): FOSP manages and analyzes large oncological databases, such as the Hospital Cancer Registry (RHC), and conducts epidemiological studies on cervical cancer in São Paulo. It also supports training, health surveillance, and evaluation of diagnostic and treatment services.

National Cancer Institute (INCA): As the national reference for cancer prevention and control, INCA coordinates the development of guidelines for screening, treatment, and follow-up of cervical cancer. It is active in training health professionals, epidemiological surveillance, HPV vaccination campaigns, and technical support for the implementation of the WHO elimination strategy.

Hospital de Amor: The Hospital de Amor conducts screening using mobile units, HPV testing, and innovative technologies. It develops protocols for self-sampling and adopts a population-based approach in areas with low coverage.

MARCO Project (Cervical Cancer Risk Management): The MARCO Project is an ongoing initiative by FIOCRUZ in Brasília and Manaus that evaluates new technologies for cervical cancer screening and triage, including rapid HPV testing with risk stratification, automated visual evaluation (AVE), and thermoablation treatment. The goal is to generate evidence on more effective and operational tools for organized screening strategies in Brazil.

Útero é Vida Program: This program is being implemented in Pernambuco with support from PAHO/WHO, IARC, Ministry of Health and several national institutions. It aims to promote organized screening through molecular PCR testing, local team training, and expanded access to diagnosis and treatment. The strategy includes health education and an active presence in municipalities across Pernambuco.

PREVENTIVO Program: The PREVENTIVO (Prevention of HPV Viruses in Entire Indaiatuba) Program was developed by UNICAMP researchers in Indaiatuba, São Paulo. It focuses on the implementation of organized screening based on HPV DNA testing, evaluating adherence, effectiveness, and feasibility in almost the entire female population of the city, generating evidence to support screening in Brazil.

8. Recommendations

The elimination of cervical cancer as a public health problem in Brazil depends on more than well-designed technical guidelines or robust scientific evidence. The success of the national strategy is intrinsically linked to the effective large-scale implementation of interventions, the strengthening of governance across all three levels of SUS management, and the enhancement of the operational and institutional capacity of services, teams, and territories.

8.1. Strengthening Governance

The complexity of the response required for cervical cancer elimination demands effective intergovernmental coordination among the federal, state, and municipal levels. The following actions are recommended:

- Establish a national committee with representation from various Ministry of Health sectors (primary care, immunization, oncology, women's health, digital health, health surveillance), participation from state and municipal health secretariats through CONASS and CONASEMS, civil society and support from PAHO/WHO.
- Create state-level governance bodies, with target-setting, definition of priority territories, and joint monitoring.
- Maintain ongoing engagement with civil society, the private sector, and academia to ensure legitimacy, technical support, and political sustainability.
- Include cervical cancer elimination in state and municipal health plans, with allocated budgets and agreed-upon indicators.

8.2. Implementation of Actions

The transition to HPV testing as the primary screening method, the expansion of vaccination coverage, and the improvement of the care pathway require coordinated actions, progressive scaling, and technical support. The following recommendations are proposed:

- Development of state-level implementation plans, with support from the Ministry of Health and strategic partners, considering local capacities and challenges.
- Identification of high-priority areas, based on epidemiological indicators, installed capacity, current coverage, and social vulnerability.
- Mapping and improvement of installed capacity (laboratories, colposcopy, oncology), with strategies for territorial expansion and/or mobile services.
- Structured and ongoing training opportunities for primary care teams, colposcopy units, and treatment centers.

8.3. Invest in Institutional and Technical Capacity

The success of elimination efforts requires institutional capacity at all levels of the system, including infrastructure and qualified personnel. Priority actions should include:

- Modernization of public laboratories to ensure high-quality HPV testing.
- Expansion and regionalization of colposcopy and outpatient treatment services for lesions, with the development of referral centers and use of telecolposcopy.
- Integration of thermoablation as a strategy for vulnerable populations.
- Maintenance of ongoing radiotherapy equipment replacement and modernization, with expansion plans targeting regions with the greatest shortages.

8.4. Ensure Sustainable Financing for Interventions

The elimination of cervical cancer requires consistent public investment, with a focus on sustainability and equity. The following recommendations are made:

- Specific funding for key interventions, such as of HPV tests, self-collection kits, colposcopy equipment, and treatment supplies.
- Revision of the SUS reimbursement and federal funding mechanisms to ensure the viability of services.
- Mobilization of external resources and public-private partnerships, with transparency, a focus on equity, and alignment with SUS principles.

8.5. Establish a National Communication and Engagement Strategy

The success of this policy depends on informed participation by the population and active engagement of health professionals. To achieve this, it is essential to:

- Develop a national integrated communication strategy, with targeted campaigns for different audiences (parents, adolescents, professionals, managers), using multiple channels and accessible language.
- Utilize schools, community centers, and religious spaces as legitimate platforms for information dissemination and mobilization.
- Highlight successful local experiences, giving visibility to municipalities that have made progress in vaccination, screening, and follow-up.

- Collaborate with influencers and social media networks to combat misinformation and promote women's leadership in health.

8.6. Information and Monitoring System

Finally, it is urgent and essential to establish an information system that enables continuous monitoring, public transparency, and accountability mechanisms. The following actions are recommended:

- Define a timeline for incorporating the necessary functionalities into health information systems, in alignment with the progress of implementation activities.
- Publish regular national and state-level dashboards and bulletins, including targets, indicators, and alerts.
- Create a shared management dashboard with states and municipalities, featuring data on vaccination, testing, follow-up, treatment, and mortality.
- Establish annual targets agreed upon by federal, state, and municipal entities, with technical monitoring and support for the most vulnerable areas.
- Include equity and impact indicators to enable tracking of progress by age group, race/ethnicity, geographic area, and social condition.

9. Conclusions

The elimination of cervical cancer in Brazil is an ambitious yet fully attainable goal. The country has up-to-date technical guidelines, expanding installed capacity, and a growing network of partnerships and mobilized projects.

It is essential to build this strategy in a coordinated, sustained, and result-oriented manner. This path requires political leadership, federative coordination, and an implementation model that places women at the center of the response. Engaging diverse stakeholders and strengthening partnerships are critical to ensuring effective action.

More than just a government policy, the elimination of cervical cancer must become a state policy to reverse decades of inequality and offer a future free from a preventable and treatable disease.

References

1. WHO. World Health Organization. Global Strategy to Accelerate the Elimination of Cervical Cancer as a Public Health Problem. (WHO, Geneva, 2020).
2. INCA. Instituto Nacional de Câncer. Estimativa 2023 : Incidência de Câncer No Brasil. (2022).
3. INCA - Instituto Nacional do Câncer - Ministério da Saúde. Atlas On-line de Mortalidade. https://mortalidade.inca.gov.br/MortalidadeWeb/.
4. BRASIL. Ministério da Saúde. Secretaria de Vigilância em Saúde e Ambiente. Sistema de Informações sobre Mortalidade - SIM. http://tabnet.datasus.gov.br/cgi/deftohtm.exe?sim/cnv/obt10uf.def (2024).
5. Walboomers, J. M. M. et al. Human papillomavirus is a necessary cause of invasive cervical cancer worldwide. The Journal of pathology **189**, (1999).
6. Vinodhini, K., Shanmughapriya, S., Das, B. C. & Natarajaseenivasan, K. Prevalence and risk factors of HPV infection among women from various provinces of the world. Arch Gynecol Obstet **285**, 771–777 (2012).
7. IARC. Human Papillomaviruses. vol. 90 (IARC, Lyon, 2007).
8. Wendland, E. M. et al. Prevalence of HPV infection among sexually active adolescents and young adults in Brazil: The POP-Brazil Study. Sci Rep **10**, (2020).
9. BRASIL. Epidemiological Report – HIV & AIDS 2024. (2024).
10. BRASIL. VIGITEL BRASIL 2006-2023. VIGILÂNCIA DE FATORES DE RISCO E PROTEÇÃO PARA DOENÇAS CRÔNICAS POR INQUÉRITO TELEFÔNICO. TABAGISMO E CONSUMO ABUSIVO DE ÁLCOOL. (Ministério da Saúde. Secretaria de Vigilância em Saúde e Ambiente. Departamento de Análise Epidemiológica e Vigilância de Doenças Não Transmissíveis., Brasília, 2023).
11. BRASIL. Dados mostram crescimento de 25% no número de fumantes no Brasil. Agência Brasil https://agenciabrasil.ebc.com.br/radioagencia-nacional/saude/audio/2025-05/dados-mostram-crescimento-de-25-no-numero-de-fumantes-no-brasil (2025).
12. Theme Filha, M. M., Leal, M. D. C., Oliveira, E. F. V. D., Esteves-Pereira, A. P. & Gama, S. G. N. D. Regional and social inequalities in the performance of Pap test and screening mammography and their correlation with lifestyle: Brazilian national health survey, 2013. Int J Equity Health **15**, (2016).
13. Oliveira, N. P. D. D. et al. Desigualdades sociais no diagnóstico do câncer do colo do útero no Brasil: um estudo de base hospitalar. Ciênc. saúde coletiva **29**, (2024).
14. Galindo, J. F. et al. Social determinants influencing cervical cancer diagnosis: an ecological study. Int J Equity Health **22**, (2023).
15. Luiz, O. D. C. et al. Racial iniquity in mortality from cervical cancer in Brazil: a time trend study from 2002 to 2021. Ciênc. saúde coletiva **29**, (2024).
16. Oliveira, N. P. D. D., Santos Siqueira, C. A. D., Lima, K. Y. N. D., De Camargo Cancela, M. & Souza, D. L. B. D. Association of cervical and breast cancer mortality with socioeconomic indicators and availability of health services. Cancer Epidemiology **64**, 101660 (2020).
17. Drolet, M. et al. Population-level impact and herd effects following the introduction of human papillomavirus vaccination programmes: updated systematic review and meta-analysis. The Lancet **394**, 497–509 (2019).
18. Garland, S. M. et al. Impact and Effectiveness of the Quadrivalent Human Papillomavirus Vaccine: A Systematic Review of 10 Years of Real-world Experience. Clin Infect Dis. **63**, 519–527 (2016).
19. Lei, J. et al. HPV Vaccination and the Risk of Invasive Cervical Cancer. N Engl J Med **383**, 1340–1348 (2020).
20. Falcaro, M. et al. The effects of the national HPV vaccination programme in England, UK, on cervical cancer and grade 3 cervical intraepithelial neoplasia incidence: a register-based observational study. The Lancet **398**, 2084–2092 (2021).
21. BRASIL. Ministério da Saúde. Secretaria de Vigilância em Saúde e Ambiente. Nota Técnica nº 41/2024-CGICI/DPNI/SVSA/MS. Atualização das recomendações da vacinação contra HPV no Brasil. (2024).
22. BRASIL. Coortes Vacinais - Papilomavírus Humano (HPV). Ministério da Saúde https://infoms.saude.gov.br/extensions/SEIDIGI_DEMAS_VACINACAO_HPV/SEIDIGI_DEMAS_VACINACAO_HPV.html (2025).

23. Salleh, N. S., Abdullah, K. L. & Chow, H. Y. Cultural barriers and facilitators of the parents for human papillomavirus (HPV) vaccination uptake by their daughters: A systematic review. Jornal de Pediatria **101**, 133–149 (2025).
24. Marchetti, R. L. et al. Immunization stress-related responses presenting as psychogenic non-epileptic seizures following HPV vaccination in Rio Branco, Brazil. Vaccine **38**, 6714–6720 (2020).
25. Soares, L. M. C. et al. Factors associated with HPV vaccine hesitancy: A nationally representative cross-sectional study. Vaccine **59**, 127278 (2025).
26. Silveira, M. et al. Detection of HPV DNA in vaginal samples self-collected by women living with HIV treated through the Brazilian public health system: Prevalence and analysis of risk factors. Revista da Sociedade Brasileira de Medicina Tropical **56**, (2023).
27. World Health Organization. Guide to Introducing HPV Vaccine into National Immunization Programmes. (World Health Organization, Geneva, 2016).
28. BRASIL. Vacinação nas escolas. Ministério da Saúde https://www.gov.br/saude/pt-br/campanhas-da-saude/2023/vacinacao/vacinacao-nas-escolas (2024).
29. Araújo, A. C. D. M. et al. Microplanejamento na vacinação de alta qualidade: potencialidades e barreiras experienciadas por multiplicadores. Saúde debate **49**, (2025).
30. IVOC. Campanha do Instituto Vencer o Câncer com a Ogilvy Brasil fala sobre pais superprotetores para incentivar a vacinação contra o HPV. Instituto Vencer o Câncer https://vencerocancer.org.br/campanha-do-instituto-vencer-o-cancer-com-a-ogilvy-brasil-fala-sobre-pais-superprotetores-para-incentivar-a-vacinacao-contra-o-hpv/ (2022).
31. Instituto Lado a Lado pela Vida. Vacina contra o câncer: saiba mais sobre o câncer por HPV. Instituto Lado a Lado pela Vida https://ladoaladopelavida.org.br/noticia/1701723542276x358104991597592600 (2023).
32. World Health Organization & Special Programme of Research, Development, and Research Training in Human Reproduction (World Health Organization). WHO Guideline for Screening and Treatment of Cervical Pre-Cancer Lesions for Cervical Cancer Prevention. (World Health Organization, Geneva, 2021).
33. Instituto Nacional de Câncer José Alencar Gomes da Silva. Diretrizes brasileiras para rastreamento do câncer do colo do útero. (Inca, 2016).
34. Corrêa, F. M., Migowski, A., De Almeida, L. M. & Soares, M. A. Cervical cancer screening, treatment and prophylaxis in Brazil: Current and future perspectives for cervical cancer elimination. Front. Med. **9**, (2022).
35. INCA. Controle Do Câncer Do Colo Do Útero No Brasil: Dados e Números 2025. (Instituto Nacional do Câncer, Rio de Janeiro, 2025).
36. Girianelli, V. R., Gamarra, C. J. & Azevedo E Silva, G. Disparities in cervical and breast cancer mortality in Brazil. Rev. Saúde Pública **48**, 459–467 (2014).
37. Amorim, V. M. S. L., Barros, M. B. D. A., César, C. L. G., Carandina, L. & Goldbaum, M. Fatores associados à não realização do exame de Papanicolaou: um estudo de base populacional no Município de Campinas, São Paulo, Brasil. Cad. Saúde Pública **22**, 2329–2338 (2006).
38. Ribeiro, A. M., Lima, E. A. & Balacol, C. D. Interferences in the pre-analytical and analytical phase as part of the cytological examination. Brazilian Journal of Clinical Analyses **54**, 212–219 (2022).
39. Amaral, R., Diniz, E., Carneiro, C. & Tobias, A. Quality Indicators of Cervical Cytopathology Tests in the Public Service in Minas Gerais, Brazil. Rev Bras Ginecol Obstet **38**, 065–070 (2016).
40. BRASIL. Ministério Da Saúde. Comissão Nacional de Incorporação de Tecnologias No Sistema Único de Saúde - Conitec. Relatório de Recomendação Nº 878 - Testagem Molecular Para Detecção de HPV e Rastreamento Do Câncer Do Colo Do Útero. (Ministério da Saúde, Brasília, 2024).
41. BRASIL. Relatório preliminar - Diretrizes Brasileiras para o Rastreamento do Câncer do Colo do Útero: Parte I - Rastreamento organizado utilizando testes moleculares para detecção de DNA-HPV oncogênico. (2024).
42. BRASIL. Manual de apoio à implementação do teste DNA-HPV para gestores do Sistema Único de Saúde. (2025).
43. Teixeira, J. C. et al. Transition from opportunistic cytological to organized screening program with DNA-HPV testing detected prevalent cervical cancers 10 years in advance. Sci Rep **14**, (2024).
44. BRASIL. Registro Anvisa 80780040020 - Kit IBMP Biomol HPV Alto Risco. (2023).

45. BRASIL. Ministério da Saúde. Gabinete do Ministro. Portaria nº 189, de 31 de janeiro de 2014, que institui o Serviço de Referência para Diagnóstico e Tratamento de Lesões Precursoras do Câncer do Colo de Útero (SRC), o Serviço de Referência para Diagnóstico de Câncer de Mama (SDM) e os respectivos incentivos financeiros de custeio e de investimento para a sua implantação. (2014).
46. BRASIL. Cadastro Nacional de Estabelecimentos de Saúde - CNES. DATASUS. Ministério da Saúde https://cnes.datasus.gov.br/pages/consultas.jsp (2025).
47. BRASIL. Produção Hospitalar (SIH/SUS). DATASUS. Ministério da Saúde https://datasus.saude.gov.br/acesso-a-informacao/producao-hospitalar-sih-sus/ (2025).
48. BRASIL. Produção Ambulatorial (SIA/SUS). DATASUS. Ministério da Saúde https://datasus.saude.gov.br/acesso-a-informacao/producao-ambulatorial-sia-sus/ (2025).
49. BRASIL. Ministério da Saúde. Secretaria de Atenção Especializada à Saúde. Portaria SAES/MS nº 688, de 28 de agosto de 2023, que altera a Portaria de Consolidação SAES/MS nº 1, de 22 de fevereiro de 2022, para dispor sobre a habilitação de estabelecimentos de saúde na alta complexidade em oncologia. (2023).
50. BRASIL. Ministério da Saúde. Plano de Expansão da Radioterapia no SUS. https://www.gov.br/saude/pt-br/acesso-a-informacao/acoes-e-programas/per-sus/plano-de-expansao-da-radioterapia-no-sus (2025).
51. BRASIL. Novo PAC: Saúde: Atenção Especializada. https://www.gov.br/casacivil/pt-br/novopac/saude/atencao-especializada (2024).
52. BRASIL. Ministério da Saúde. Gabinete do Ministro. Portaria nº 7.007, de 29 de maio de 2025, que altera a Portaria de Consolidação GM/MS nº 5 de 28 de setembro de 2017, para instituir o Plano de Expansão da Radioterapia no Sistema Único de Saúde II – PERSUS II, conforme Programa de Aceleração do Crescimento – Novo PAC. (2025).
53. BRASIL. Lei 12.732, de 22 de novembro de 2012, que dispõe sobre o primeiro tratamento de paciente com neoplasia maligna comprovada e estabelece prazo para seu início. (2012).
54. BRASIL. Ministério da Saúde. Painel Oncologia. http://tabnet.datasus.gov.br/cgi/dhdat.exe?PAINEL_ONCO/PAINEL_ONCOLOGIABR.def (2024).
55. WHO. World Health Organization. Framework for Monitoring the Implementation of the WHO Global Strategy to Accelerate the Elimination of Cervical Cancer as a Public Health Problem. (2023).

Appendices

Table 4 - Colposcopy performed by state, 2019-2024

Region/State	2019	2020	2021	2022	2023	2024
TOTAL	360.838	207.911	264.440	284.917	314.701	312.868
North	11.887	9.186	12.308	14.255	18.187	17.268
.. Rondônia	970	1.229	1.533	1.302	1.531	2.078
.. Acre	874	444	788	1.479	1.818	2.012
.. Amazonas	2.253	1.925	2.389	2.945	3.306	2.251
.. Roraima	814	72	643	739	419	51
.. Pará	5.540	3.850	5.179	5.651	9.403	9.275
.. Amapá	673	953	1.020	1.482	1.314	542
.. Tocantins	763	713	756	657	396	1.059
Northeast	131.689	60.625	85.088	97.969	116.573	115.327
.. Maranhão	8.598	4.964	7.476	9.317	9.896	10.738
.. Piauí	4.459	1.156	2.663	3.090	3.049	2.541
.. Ceará	14.674	8.427	6.937	9.365	10.299	9.403
..Rio Grande do Norte	3.594	1.434	1.688	1.963	1.976	1.704
.. Paraíba	8.298	2.261	4.842	6.083	8.913	10.542
.. Pernambuco	39.675	14.937	23.686	24.255	26.190	25.563
.. Alagoas	12.529	6.516	7.977	10.003	13.474	12.072
.. Sergipe	2.981	3.420	3.731	4.995	6.605	6.844
.. Bahia	36.881	17.510	26.088	28.898	36.171	35.920
Southeast	164.634	101.415	121.224	123.724	126.979	128.794
..Minas Gerais	26.809	17.363	20.387	22.252	24.710	29.101
..Espírito Santo	2.842	1.514	1.213	1.505	3.398	3.402
..Rio de Janeiro	7.221	4.621	6.080	7.398	13.125	16.740
.. São Paulo	127.762	77.917	93.544	92.569	85.746	79.551
South	37.806	26.017	31.175	33.639	35.153	32.962
.. Paraná	17.840	12.088	15.309	16.370	17.144	16.900
..Santa Catarina	6.414	3.262	3.418	4.401	5.639	5.912
..Rio Grande do Sul	13.552	10.667	12.448	12.868	12.370	10.150
Midwest	14.822	10.668	14.645	15.330	17.809	18.517
..Mato Grosso do Sul	3.806	2.863	4.602	4.426	4.670	4.520
..Mato Grosso	4.153	2.096	3.134	3.318	4.162	3.656
.. Goiás	2.468	1.223	1.714	2.136	2.651	2.836
..Distrito Federal	4.395	4.486	5.195	5.450	6.326	7.505

Source: Outpatient Information System of SUS[48]

Table 5 - EZT type 1 performed by state, 2019-2024

Region/State	2019	2020	2021	2022	2023	2024
TOTAL	11.153	7.052	9.066	10.175	9.816	9.442
North	1.167	827	1.349	1.366	1.333	1.217
.. Rondônia	68	60	35	10	11	47
.. Acre	303	187	234	194	276	275
.. Amazonas	33	14	40	3	23	29
.. Roraima	4	-	41	26	-	-
.. Pará	680	355	686	807	792	737
.. Amapá	21	96	252	305	212	57
.. Tocantins	58	115	61	21	19	72
Northeast	2.155	1.431	1.823	2.053	2.247	2.259
.. Maranhão	800	401	744	622	305	217
.. Piauí	112	24	27	30	14	30
.. Ceará	409	219	335	649	638	811
.. Rio Grande do Norte	81	52	66	100	97	77
.. Paraíba	159	148	245	188	408	381
.. Pernambuco	80	29	58	41	199	137
.. Alagoas	-	-	-	-	-	-
.. Sergipe	107	314	42	44	93	66
.. Bahia	407	244	306	379	493	540
Southeast	3.935	2.466	2.614	2.963	2.959	3.210
.. Minas Gerais	1.550	948	898	1.060	1.283	1.493
.. Espírito Santo	182	88	34	32	23	35
.. Rio de Janeiro	142	66	137	114	267	379
.. São Paulo	2.061	1.364	1.545	1.757	1.386	1.303
South	3.398	2.084	2.764	3.143	2.652	2.101
.. Paraná	2.937	1.739	2.369	2.605	2.082	1.778
.. Santa Catarina	92	27	36	71	22	23
.. Rio Grande do Sul	369	318	359	467	548	300
Midwest	498	244	516	650	625	655
.. Mato Grosso do Sul	59	84	273	338	316	316
.. Mato Grosso	34	11	70	84	67	104
.. Goiás	329	112	79	126	132	112
.. Distrito Federal	76	37	94	102	110	123

Source: Outpatient Information System of SUS[48]

Table 6 - EZT type 2 performed by state, 2019-2024

Region/State	2019	2020	2021	2022	2023	2024
TOTAL	976	819	983	1.486	2.027	2.176
North	192	172	200	456	489	407
.. Rondônia	7	7	6	3	6	6
.. Acre	-	-	-	164	73	67
.. Amazonas	168	123	133	185	236	193
.. Pará	2	1	23	79	119	101
.. Amapá	-	9	29	20	53	34
.. Tocantins	15	32	9	5	2	6
Northeast	167	78	203	92	204	277
.. Maranhão	128	5	8	2	2	-
.. Piauí	-	-	-	10	50	44
.. Ceará	-	-	1	2	4	14
.. Rio Grande do Norte	-	1	1	1	-	1
.. Paraíba	3	-	-	-	2	6
.. Pernambuco	19	25	53	63	137	151
.. Sergipe	17	47	140	14	9	61
Southeast	387	402	452	753	964	974
.. Minas Gerais	65	39	28	61	151	202
.. Espírito Santo	43	79	65	126	163	162
.. Rio de Janeiro	18	5	43	39	117	71
.. São Paulo	261	279	316	527	533	539
South	227	167	119	179	340	482
.. Paraná	41	10	22	41	40	97
.. Santa Catarina	-	-	3	5	103	119
.. Rio Grande do Sul	186	157	94	133	197	266
Midwest	3	-	9	6	30	36
.. Mato Grosso do Sul	2	-	-	-	5	8
.. Mato Grosso	-	-	8	4	19	20
.. Goiás	-	-	1	2	1	8
.. Distrito Federal	1	-	-	-	5	-

Source: Outpatient Information System of SUS[48]

Table 7 - EZT type 3 performed by state, 2019-2024

Region/State	2019	2020	2021	2022	2023	2024
TOTAL	14.810	10.626	12.320	14.833	17.310	19.050
North	1.040	633	768	909	926	1.144
.. Rondônia	201	242	291	262	310	259
.. Acre	3	3	2	2	9	1
.. Amazonas	534	201	296	378	314	461
.. Roraima	31	18	20	74	45	39
.. Pará	218	134	129	143	166	320
.. Amapá	-	2	1	1	1	15
.. Tocantins	53	33	29	49	81	49
Northeast	2.794	1.747	2.359	2.789	3.105	3.467
.. Maranhão	251	174	132	175	149	119
.. Piauí	44	27	40	45	73	73
.. Ceará	207	151	155	274	496	517
.. Rio Grande do Norte	124	62	142	122	137	112
.. Paraíba	78	33	61	104	101	80
.. Pernambuco	720	418	668	715	732	880
.. Alagoas	202	103	200	230	253	268
.. Sergipe	4	-	2	5	4	6
.. Bahia	1.164	779	959	1.119	1.160	1.412
Southeast	6.211	4.324	4.915	5.916	7.185	8.334
.. Minas Gerais	1.550	1.163	1.347	1.647	1.842	1.862
.. Espírito Santo	361	262	265	247	373	735
.. Rio de Janeiro	1.236	882	995	1.131	1.512	1.687
.. São Paulo	3.064	2.017	2.308	2.891	3.458	4.050
South	3.848	3.205	3.507	4.220	4.879	5.086
.. Paraná	1.568	1.304	1.323	1.491	1.407	1.663
.. Santa Catarina	844	533	714	1.041	1.468	1.609
.. Rio Grande do Sul	1.436	1.368	1.470	1.688	2.004	1.814
Midwest	917	717	771	999	1.215	1.019
.. Mato Grosso do Sul	108	65	62	106	154	163
.. Mato Grosso	267	212	205	329	395	326
.. Goiás	343	266	257	306	343	266
.. Distrito Federal	199	174	247	258	323	264

Source: Hospital Information System of SUS [47]

Table 8 - Cancer hospitals by state, 2025

State	Cancer Hospitals
AC	1
AL	4
AM	1
AP	1
BA	18
CE	9
DF	4
ES	8
GO	6
MA	4
MG	35
MS	7
MT	5
PA	5
PB	5
PE	11
PI	3
PR	24
RJ	28
RN	7
RO	3
RR	1
RS	32
SC	17
SE	3
SP	81
TO	2
Total	325

Source: National Registry of Health Facilities[46]

Table 9 - External Raditotherapy performed by state, 2020-2024

Region/State	2020	2021	2022	2023	2024
TOTAL	12.140	12.914	12.935	12.983	13.504
North	1.228	1.222	1.214	1.245	1.192
.. Rondônia	234	234	206	191	175
.. Acre	-	31	81	98	75
.. Amazonas	373	396	377	402	473
.. Pará	530	423	443	425	332
.. Tocantins	91	138	107	129	137
Northeast	3.413	3.757	3.676	3.570	3.842
.. Maranhão	468	542	389	397	608
.. Piauí	296	347	290	316	277
.. Ceará	749	716	782	636	625
.. Rio Grande do Norte	222	265	285	320	286
.. Paraíba	244	279	282	301	302
.. Pernambuco	468	577	575	662	724
.. Alagoas	228	238	245	175	252
.. Sergipe	66	116	126	140	172
.. Bahia	672	677	702	623	596
Southeast	4.583	4.813	4.661	4.823	5.158
.. Minas Gerais	1.255	1.314	1.308	1.491	1.516
.. Espírito Santo	305	262	257	308	284
.. Rio de Janeiro	871	959	866	882	980
.. São Paulo	2.152	2.278	2.230	2.142	2.378
South	2.088	2.212	2.533	2.410	2.461
.. Paraná	849	793	982	950	989
.. Santa Catarina	450	487	572	565	523
.. Rio Grande do Sul	789	932	979	895	949
Midwest	828	910	851	935	851
.. Mato Grosso do Sul	146	120	104	152	125
.. Mato Grosso	73	110	105	132	139
.. Goiás	472	539	497	507	463
.. Distrito Federal	137	141	145	144	124

Source: Outpatient Information System of SUS[48]

Table 10 - Brachitherapy performed by state, 2020-2024

Region/State	2020	2021	2022	2023	2024
TOTAL	8.938	10.415	10.353	10.496	10.576
North	837	954	1.002	961	753
.. Rondônia	160	185	200	178	157
.. Acre	-	-	-	-	48
.. Amazonas	297	354	275	322	273
.. Pará	352	346	463	393	210
.. Tocantins	28	69	64	68	65
Northeast	2.682	3.216	3.225	3.047	3.159
.. Maranhão	287	346	389	287	455
.. Piauí	267	332	274	268	278
.. Ceará	581	629	624	552	502
.. Rio Grande do Norte	188	211	227	240	259
.. Paraíba	100	226	281	260	279
.. Pernambuco	450	614	550	600	520
.. Alagoas	180	212	192	162	171
.. Sergipe	33	45	90	84	103
.. Bahia	596	601	598	594	592
Southeast	3.323	3.805	3.724	4.042	4.233
.. Minas Gerais	862	914	920	1.014	1.001
.. Espírito Santo	248	249	210	256	230
.. Rio de Janeiro	463	698	677	725	701
.. São Paulo	1.750	1.944	1.917	2.047	2.301
South	1.502	1.733	1.802	1.761	1.696
.. Paraná	725	717	787	767	777
.. Santa Catarina	335	407	426	403	416
.. Rio Grande do Sul	442	609	589	591	503
Midwest	594	707	600	685	735
.. Mato Grosso do Sul	116	106	74	113	115
.. Mato Grosso	129	136	169	155	101
.. Goiás	268	329	351	320	360
.. Distrito Federal	81	136	6	97	159

Source: Outpatient Information System of SUS[48]

Table 11 - Chemotherapy performed by state, 2019-2024

Region/State	2019	2020	2021	2022	2023	2024
TOTAL	43.700	45.982	50.431	50.529	55.577	62.070
North	3.931	3.923	3.940	3.887	4.812	5.013
.. Rondônia	811	803	842	668	680	643
.. Acre	120	106	164	284	365	327
.. Amazonas	981	1.007	908	968	1.183	1.117
.. Roraima	11	27	45	25	36	44
.. Pará	1.608	1.521	1.472	1.467	1.905	2.107
.. Amapá	83	57	91	91	163	239
.. Tocantins	317	402	418	384	480	536
Northeast	11.543	12.498	14.417	14.113	14.982	17.399
.. Maranhão	1.489	1.640	1.985	1.869	1.876	1.958
.. Piauí	1.125	930	1.085	1.001	1.076	1.160
.. Ceará	1.577	1.825	2.158	2.198	2.132	2.268
.. Rio Grande do Norte	907	940	1.133	1.283	1.444	1.380
.. Paraíba	867	963	1.084	1.106	1.068	1.454
.. Pernambuco	2.389	2.565	2.853	2.652	3.270	3.955
.. Alagoas	817	860	991	1.052	1.067	1.234
.. Sergipe	398	723	1.043	895	997	739
.. Bahia	1.974	2.052	2.085	2.057	2.052	3.251
Southeast	17.146	17.804	19.060	18.883	21.259	23.871
.. Minas Gerais	4.380	4.500	4.887	4.940	5.405	6.049
.. Espírito Santo	1.282	1.262	1.239	1.411	1.644	1.991
.. Rio de Janeiro	3.230	3.654	3.913	3.651	3.614	3.907
.. São Paulo	8.254	8.388	9.021	8.881	10.596	11.924
South	7.878	8.255	9.165	9.693	10.310	10.951
.. Paraná	3.139	3.458	3.559	3.885	4.097	4.582
.. Santa Catarina	1.720	1.766	2.085	2.196	2.387	2.519
.. Rio Grande do Sul	3.019	3.031	3.521	3.612	3.826	3.850
Midwest	3.202	3.502	3.849	3.953	4.214	4.836
.. Mato Grosso do Sul	464	529	470	488	622	643
.. Mato Grosso	487	532	701	747	799	988
.. Goiás	1.479	1.591	1.811	1.757	1.714	2.048
.. Distrito Federal	772	850	867	961	1.079	1.157

Source: Outpatient Information System of SUS[48]

Table 12 - Oncological Surgery performed by state, 2019-2024

Region/State	2019	2020	2021	2022	2023	2024
TOTAL	13.347	12.629	13.658	14.689	16.241	19.279
North	655	612	666	764	741	831
.. Rondônia	87	96	109	114	120	98
.. Acre	23	16	21	24	52	86
.. Amazonas	243	236	231	254	231	228
.. Roraima	11	21	3	40	15	28
.. Pará	203	166	212	256	211	301
.. Amapá	4	14	23	5	2	5
.. Tocantins	84	63	67	71	110	85
Northeast	3.398	3.055	3.577	4.084	4.300	5.375
.. Maranhão	542	440	672	751	744	855
.. Piauí	209	132	252	184	237	257
.. Ceará	625	519	449	583	615	748
.. Rio Grande do Norte	303	272	282	423	452	680
.. Paraíba	218	177	268	347	352	370
.. Pernambuco	598	674	694	725	776	919
.. Alagoas	182	181	194	207	200	206
.. Sergipe	111	112	124	165	185	192
.. Bahia	610	548	642	699	739	1.148
Southeast	5.371	5.081	5.590	5.756	6.459	7.279
.. Minas Gerais	1.172	1.200	1.324	1.408	1.594	1.834
.. Espírito Santo	527	503	509	546	530	623
.. Rio de Janeiro	845	771	987	940	896	1.071
.. São Paulo	2.827	2.607	2.770	2.862	3.439	3.751
South	3.081	3.031	2.970	3.289	3.906	4.492
.. Paraná	1.476	1.365	1.330	1.544	1.746	1.875
.. Santa Catarina	750	798	761	806	1.067	1.206
.. Rio Grande do Sul	855	868	879	939	1.093	1.411
Midwest	842	850	855	796	835	1.302
.. Mato Grosso do Sul	147	133	165	160	162	182
.. Mato Grosso	159	137	117	155	193	333
.. Goiás	328	302	337	287	281	566
.. Distrito Federal	208	278	236	194	199	221

Source: Hospital Information System of SUS [47]

Colombia

Cervical Cancer Elimination Strategy in Colombia

Dra. Lina Trujillo

Key points:

- Cervical cancer is **preventable and treatable**, but in the world and in Colombia, it continues to be a public health problem.
- The WHO strategy establishes three goals to meet by 2030: 90% vaccination, 70% screening, and 90% treatment.
- Colombia reported an age-adjusted incidence rate of 13.9 per 100,000 women in 2022.
- Vaccination coverage fell drastically in 2014 but has partially improved since 2023 with a new gender-neutral one-dose strategy, which includes the vaccination of children.
- Cytology remains the primary screening method; however, coverage with HPV-DNA testing is only 14.6%.
- New clinical practice guideline (2025) promotes screening with NAAT tests and adapted regional algorithms.
- Specialized cancer treatment services are concentrated in the Andean, Caribbean, and Pacific regions; however, in regions of the Amazon and Orinoquía, inequalities in access to care are observed.
- Structural barriers: fragmentation of information systems, absence of integration, duplication of reports, lack of standards.
- ImPACT 2022 Evaluation recommends improving interoperability, unifying pathology reports, and strengthening funding for population registries.
- Challenges: governance, geographic access, test quality, service coverage, vocational training, communication with communities.
- Short-, medium-, and long-term strategies include: self-collection, expansion, screening, equipment, monitoring, and sustained education.
- Success depends on coordinated work between the government, civil society, health systems, and international cooperation.

Executive summary

Cervical cancer continues to represent an important public health problem, in Colombia it is one of the main causes of morbidity and mortality in women; despite being a preventable and treatable disease through effective vaccination, screening and treatment strategies. The global strategy proposed by the WHO seeks to eliminate it as a public health problem through the implementation of three pillars: vaccination of 90% of girls before the age of 15, screening of 70% of women at 35 and 45 years of age with high-throughput tests (HPV-DNA) and treatment of 90% of women diagnosed with precancerous lesions or invasive cancer. All this established within the compendium of the goals established to achieve the elimination of this disease as a public health problem by 2030.

In Colombia, the age-adjusted incidence rate for 2022 was 13.9 per 100,000 women and a mortality of 6.9 per 100,000 women due to this disease, figures that remain above the threshold established by the WHO (4 cases per 100,000 women). Although vaccination was implemented since 2012 with initial success, coverage fell drastically in 2014 due to a psychogenic event and loss of confidence within the population. The program has been working on the recovery of this confidence and on the strengthening of actions to recover; especially since 2023, with the modification and adoption of a vaccination scheme in the population subject to a single dose and a gender-neutral approach between 9 and 17 years of age. In 2024, coverage was 53% in girls and 42% in boys, figures well below the optimal figures in the population.

Regarding screening, national recommendations and guidelines since 2014, the country includes the national guideline that promotes the use of the HPV-DNA test as a primary method, with cytology being the most used main method, Coverage with HPV-DNA tests remains low (14.6%), and faces challenges related to infrastructure, training of human talent and logistical barriers. The new clinical practice guideline (2025) proposes the use of NAAT tests as the primary method and adapts screening algorithms regional contexts and at-risk populations, including women with HIV.

The system of treatment of precancerous and invasive lesions includes cancer centers, surgery, chemotherapy and radiotherapy, however, for various reasons within the country there are marked territorial inequities, most of them due to geographical inequities; although the country has cancer centers with specialized services, the geographical distribution favors central regions, leaving areas such as the Orinoquía and Amazonia unattended. Likewise, there are limitations in access to radiotherapy and brachytherapy in several regions where this type of service is non-existent.

Prevention programs are cost-effective, but they present barriers: long times between diagnosis and treatment, low coverage in early staging, and logistical difficulties in accessing services, factors that lead to future complications and fatal outcomes.

Indicator monitoring faces significant challenges due to the fragmentation of information systems. Despite having platforms such as SISPRO, SIVIGILA, CAC and population-based cancer registries, the lack of integration and duplication of reports make unified analysis difficult. The ImPACT 2022 report identified these gaps and proposed recommendations for their solution.

Barriers to the implementation of the elimination strategy include governance issues, geographic and economic access, lack of knowledge, misinformation, low quality of inputs and services, as well as the lack of standards and articulation between actors. In response, short-, medium- and long-term, multi-tiered interventions are proposed, including the expansion of screening, self-sampling, strengthening of information and training systems, investment in technology and human talent, and the inclusion of NGOs in the implementation of the strategy.

Colombia has made progress in regulatory and technical aspects; However, comprehensive and coordinated implementation remains a challenge. An effective articulation between governance, financing, installed capacity and monitoring is required, as well as the sustained commitment of the State, civil society and the international community, not only to work on strengthening high vaccination coverage, implementation of HPV screening, ensuring access to treatment and quality monitoring, and integrating information systems, intersectoral cooperation and sustained political commitment are required as action essential for the achievement of the fulfillment of the goals set for the elimination of this event by 2030, the maintenance and improvement of actions in the future.

Content

Cervical cancer is a preventable and curable disease if detected early and treated properly. However, an estimated 662,044 women were diagnosed with cervical cancer worldwide in 2022 and around 348,709 women died from the disease [1]

The Global Strategy to Accelerate the Elimination of Cervical Cancer as a Public Health Problem was developed by WHO in collaboration with member states to accelerate the elimination of cervical cancer, with clear goals and targets for the period 2023-2030 [2]. The strategy proposes a population-based approach that will enable countries to achieve global targets for key interventions that will lead to the elimination of cervical cancer as a public health problem.

The WHO defined the threshold for the elimination of cervical cancer as a public health problem, as an age-standardized incidence rate of less than 4 cases per 100,000 women per year. To achieve elimination within a century, the following goals must be met by 2030 and sustained over time:

90%	70%	90%
of girls fully vaccinated with the HPV vaccine at 15 years of age.	Of women have a high-throughput test (HPV DNA test) at age 35 and 45.	Of women identified with cervical disease receive treatment and care. (That 90% of women with precancerous lesions and 90% of women with invasive cancer receive adequate treatment).

WHO recommends a comprehensive approach to cervical cancer elimination, with simultaneous implementation of these three pillars for maximum impact. Countries can expect a decrease in cervical cancer mortality as access to treatment for invasive disease improves, along with a decrease in incidence as a result of the implementation of population-based screening and treatment programs for precancerous lesions. HPV vaccination will offer protection against cervical cancer for future generations.

Cervical cancer continues to be a public health problem in Colombia [3]. According to GLOBOCAN 2022 estimates, 4,570 new cases of the disease occurred in 2022, corresponding to an age-adjusted incidence rate (EAR) of 13.9 per 100000 women, and a proportional incidence of 7.4% of new cases of cancer in women, ranking third in incidence; in addition, a mortality of 2,435 cases is reported, which corresponds to an APR of 6.9 per 100,000 women and 8.4% of cancer deaths, ranking fifth in cancer mortality in women [4].

To achieve the elimination of cervical cancer as a public health problem worldwide and to reach the threshold of elimination, it is necessary to achieve an age-adjusted incidence rate of less than 4 new cases per 100,000 women per year, for which Colombia must maintain high HPV vaccination

coverage rates above 90%. increasing screening rates with high-sensitivity tests to 70%, and improving access to and utilization of treatment services to 90% (90% of women with precancerous lesions and 90% of women with invasive cancer receiving adequate treatment).

1. Evaluating the implementation of screening and diagnostic methods, treatment protocols, and vaccination campaigns.

VACCINATION

The bivalent and quadrivalent vaccines arrived in Colombia in 2008 on the private market and in 2012, after cost-effectiveness studies [5], they entered the expanded immunization program [6]. Thus, in the second half of 2012, vaccination began in girls aged 9 years and over from the 4th grade of schooling with a three-dose schedule at 0, 2 and 6 months, with results of coverage of 1 and 2 doses above 90% and third dose of 87%, being a program nested in schools [7].

In 2013, after the analysis of the evidence in modification of the schedule and number of doses [8], the population to vaccinate girls between 9 and 17 years of age in the 0, 6 and 6 months schedule was expanded, including the population of girls who did not attend school, achieving 89% coverage of the first dose and 67% of the second dose.

In 2014, a massive psychogenic event occurred in a small town in northern Colombia related to the application of the HPV vaccine, with a large media deployment generating distrust in the vaccination program and producing a drop in vaccination coverage throughout the country, especially in HPV vaccination [9].

By 2016, the school-based nested program stopped and, therefore, coverage fell to its lowest levels, generating a first-dose coverage of only 18%, which was the lowest in the program [10].

In 2017, the Constitutional Court of Colombia, through ruling T-365 of 2017, made informed consent mandatory for all those who are subject to vaccination against HPV.

Between 2017 and 2022, the program carried out different activities supported by international non-governmental organizations (NGOs), it did not achieve much variation in national coverage, but it did achieve tangible effects at the regional level.

In 2018, it was decided, given the available evidence, to leave 0 and 6 months in the schedule in two doses; That meant not looking for girls who were vaccinated in 2013 and would have to receive their third dose [11].

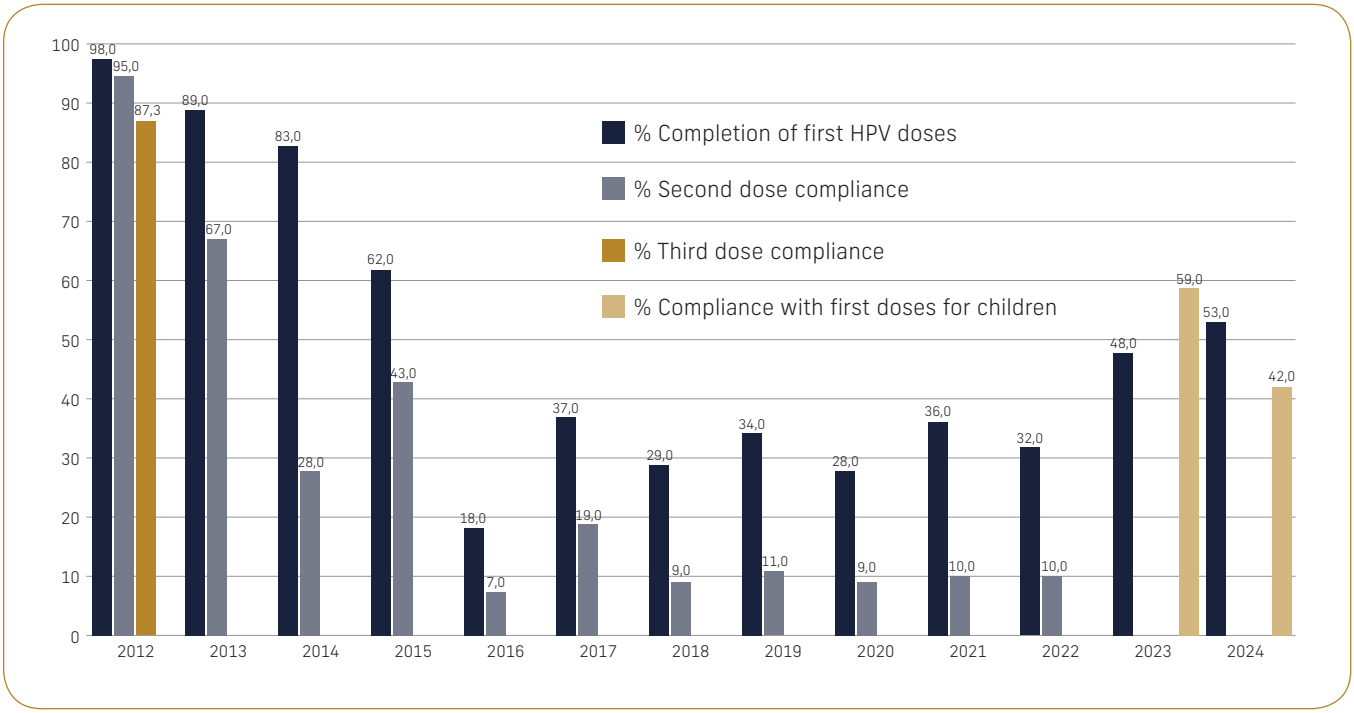
In April 2022, WHO updated its recommendations for the HPV vaccine. The new recommendations state that a single dose of the vaccine can provide efficacy and durability of protection comparable to a two-dose regimen. Multiple randomized trials and observational studies confirm that a single dose (using bivalent, quadrivalent, or nonavalent vaccines) shows immunogenicity, efficacy, effectiveness, and duration of protection comparable to two-dose schedules among immunocompetent females aged 18 years or younger at the time of first dose administration [12].

In 2023, after discussions of the available scientific evidence and as part of the national shock plan for malignant diseases, it was decided to include 9-year-old children and modify the schedule to a single gender-neutral dose, meeting the goal at 59% for 9-year-olds.

In 2024, it is decided to unify the age groups and the program is offered to children from 9 to 17

years of age with a single dose. Coverage for that year was 53% in girls and 42% in boys, showing an upturn compared to previous years [13].

Figure 1. HPV vaccination coverage Colombia 2012 to 2024.



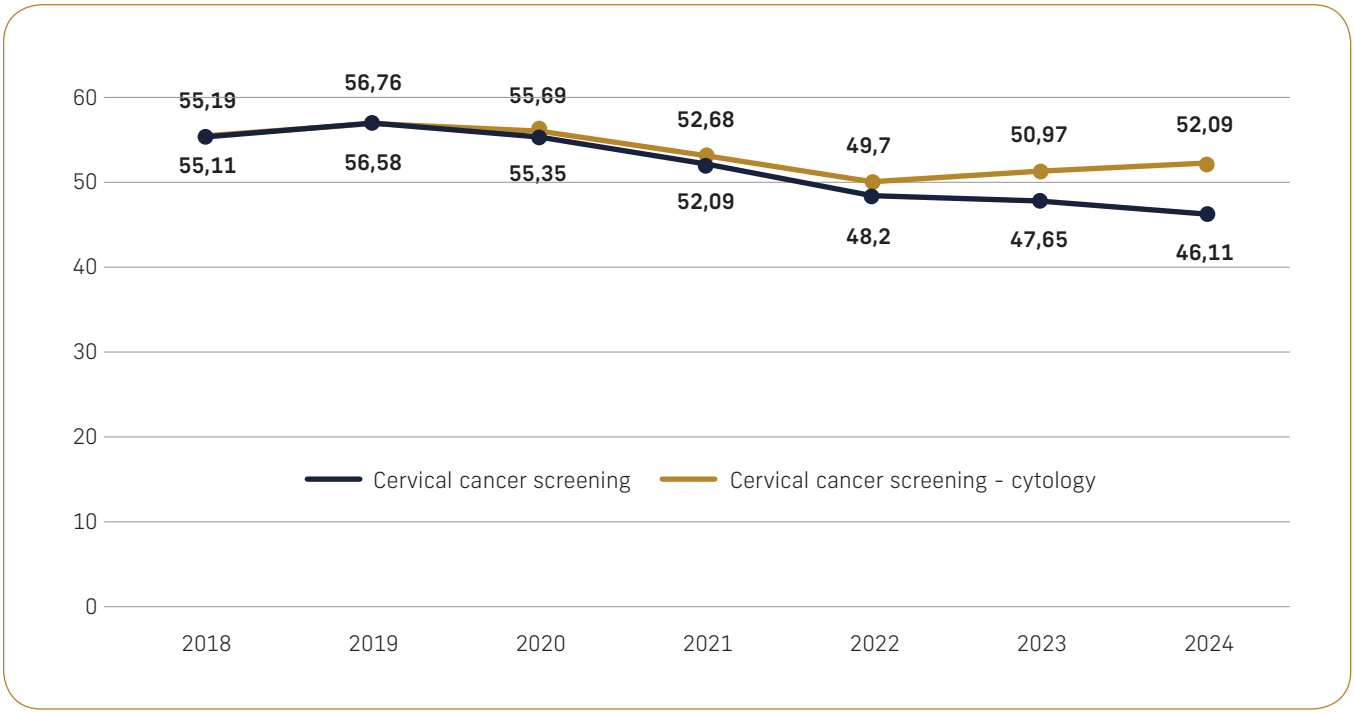
Source: Ministerio de Salud y Protección Social. Sistemas de Información PAI-MSPS. [redacted]

SCREENING

Secondary prevention or screening aims to decrease morbidity and mortality, by preventing invasive cervical cancer by detecting and treating precancerous lesions of the cervix before they progress to cancer [14]. These premalignant lesions or cervical intraepithelial neoplasia (CIN) are characterized by cellular changes in the transformation zone of the cervix that are classified as low-grade squamous intraepithelial lesions or CIN1 lesions, and high-grade intraepithelial lesions, or CIN 2/3 lesions [15].

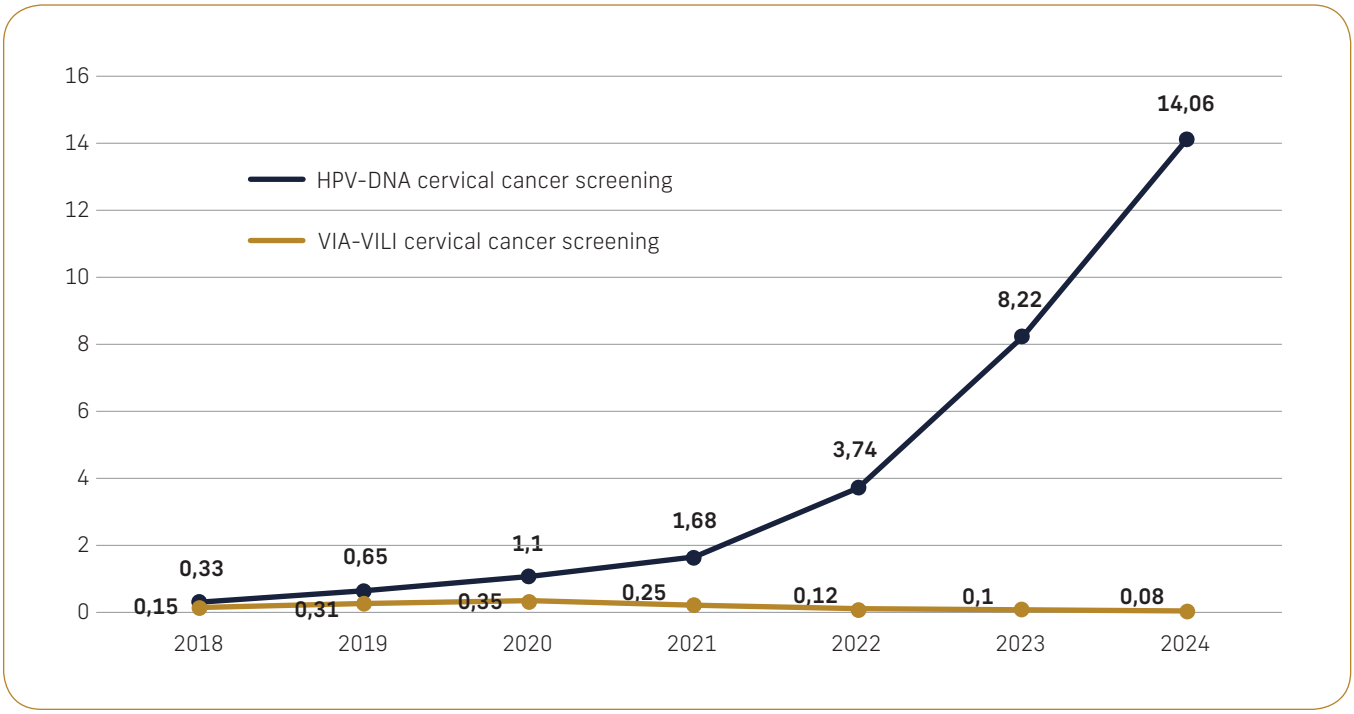
The most commonly used screening methods to identify people who have or are at risk for cervical cancer are high-risk HPV-based testing, visual inspection with acetic acid (VIA), and cytology. The WHO recommends using HPV DNA screening as a primary screening test rather than VIA or cytology, provided resources are available, followed by timely treatment [16]. The recommendations are based on studies showing that reductions in cancer incidence and related mortality are greater with HPV testing compared to VIA. These studies estimate that nearly three times the number of women would die from cervical cancer after screening with VIA followed by treatment of precancerous lesions, compared to using HPV DNA testing (88 patients in 1 million versus 30 patients in 1 million, respectively). International recommendations propose that countries transition to HPV screening as the primary screening method for cervical cancer [2].

Figura 2. Cervical cancer screening and cytology. Colombia. 2018 – 2024



Fuente: Ministerio de salud y protección Social MSPS, 2024.

Figura 3. Cervical cancer screening based on detection method. Colombia. 2018 – 2024



Fuente: Ministerio de salud y protección Social MSPS, 2024.

According to the graph, in the last two years the country has increased its screening coverage with HPV tests, but it is still far from the goals set. Screening continues to be mostly with cytology, which imposes a great challenge as a country in the incorporation of HPV tests.

Regardless of the method and approach, cervical cancer screening requires a parallel increase in the treatment capacity of detected precancerous lesions, as screening for the disease without providing access to treatment is unethical. The treatment methods available for precancerous cervical disease include ablation (cryotherapy, thermal ablation), large loop excision of the transformation zone (LLETZ) or loop electrosurgical excision procedure (LEEP), small loop electrosurgical biopsy, and scalpel conization (CKC).

Treatment of precancerous lesions with cryotherapy has not been implemented or sustained in many countries. New low-cost, portable, multipurpose treatment devices are now available that effectively treat precancerous lesions using thermal ablation, a treatment option that uses heat instead of freezing to destroy precancerous cells. Thermal ablation offers several advantages over cryotherapy: independence from medical gas and a shorter procedure time of about one minute, compared to 15 minutes of cryotherapy.

In the country, cervical cancer screening has traditionally been carried out with cytology, despite the fact that since 2014 the recommended HPV tests were already in the guidelines. In resolution 3280 of 2018, it became mandatory for health insurers to perform the HPV test as a primary screening strategy. The knowledge of the population cannot be denied as the latest ENDS 2025 Demographic and Health Survey showed that 66% of men and 81.6% of women have heard of the Human Papillomavirus (HPV), which is positive ground for the implementation of the Colombian screening guide, according to the data reported by resolution 202 of 2022, In the early detection of cervical cancer, screening with HPV-DNA achieved coverage of 14.6%.

In Colombia, the practice guideline for the detection and management of precancerous lesions of the cervix, in force since 2014, was updated by the new Evidence-Informed Clinical Practice Guideline for the Screening, Detection and Treatment of Preneoplastic Lesions of the Cervix 2025, which is an adaptation of the WHO guideline, complying with all aspects of evidence analysis and methodological aspects for its implementation in the context Colombian in two populations, women from the general population and women living with HIV diagnosis. In this new guideline, HPV nucleic acid amplification testing (NAAT) is the primary screening strategy. Different algorithms are proposed for different contexts of test availability and at-risk populations [17].

This clinical practice guideline (CPG) was developed by adapting three source CPGs: the WHO Guideline for the Detection and Treatment of Precancerous Cervical Lesions for the Prevention of Cervical Cancer, Second Edition (2021), the WHO Guidelines for the Use of Thermal Ablation for Precancerous Lesions of the Cervix (2019), and the WHO Guideline for the Detection and Treatment of Lesions cervical precancerous tests for cervical cancer prevention on the use of mRNA testing for HPV (2021). The adaptation was carried out following the methodology proposed by the Pan American Health Organization (PAHO).

The general population will be screened with cytology between 25 and 29 years of age and then from 30 to 65 years of age, screening with NAAT tests every 5 years if it is negative and screening will end when at 65 years of age they have two consecutive negative tests. Triage testing if HPV tests are positive will vary depending on the setting of screening, triage, diagnosing and treating or screening, triage, and treating or screening and treating.

Women living with HIV deserve special attention as they have a 4 to 6 times higher risk of developing cervical cancer and are more likely to develop it at a younger age. In addition, women infected with HPV are twice as likely to contract HIV as those who are not infected with HPV. Despite improved access to HIV care and treatment, cervical cancer prevention screening coverage for women living with HIV has been low. The objective of this clinical practice guideline in Colombia is to develop a strategy that addresses cervical cancer control in high-risk groups, as well as in the general population.

The population living with HIV will be screened from the age of 25 with an HPV NAAT test every 3 years and the algorithms will allow screening to be completed at 65 years of age with two previous negative NAAT tests.

On the other hand, in 2025, the country launched the guidelines for the self-collection technique as part of the strategy to increase HPV-DNA coverage and guarantee its immediate treatment and seeks to be complementary to the CPG's algorithm of screening and treating.

In relation to treatment in Colombia, the clinical practice guideline standardizes the diagnostic and treatment approach for preinvasive lesions. In relation to infiltrating cancer, the country has cancer centers where different therapeutic approaches are present: surgery, chemotherapy, teletherapy, brachytherapy, immunotherapy, target therapies, rehabilitation and palliative care. In addition, it has two second specialty programs for the training of gynecologic oncologists, also a radiotherapeutic oncology program and two clinical oncology programs, all aimed at training human talent in oncology to meet the needs of the country.

Medical oncology and oncohematology are specialties of university academic training under the concept of second specialty and are an essential requirement to be able to practice the specialty and prescribe oncological pharmacological treatments. Most medical services support their treatment decisions with national or international guidelines or recommendations. In turn, therapeutic decisions have as a routine process the participation in tumor committees or interdisciplinary meetings, for the interdisciplinary therapeutic approach. With regard to access to essential drugs according to defined pathology, there is no difficulty in prescribing them and carrying out the indicated treatment, under detailed justification according to current practices.

In general, institutions specialized in the care of cancer patients have a **gynecological-oncological surgery service**, with a number of operating rooms and adequate equipment, for the declared demand. Regarding the technological equipment of the operating rooms, in general they met the essential requirements for adequate oncological surgery, usually with multidisciplinary surgical teams; although this differs in the Orinoquia and Amazonia regions, where the technological resources of the operating room are more limited [18].

The radiotherapy technology platform in Colombia is adequately up-to-date and the number of radiotherapy providers is generally appropriate. However, most of the radiotherapy centers are located in the Andean, Caribbean and Pacific regions, while the Orinoquía and Amazonas regions are severely underserved (1 active radiotherapy center in the Orinoquía and none in the Amazon). In turn, 75% of them belong to the private medicine system. Regarding Brachytherapy, approximately 30% of the centers did not have treatment equipment [19].

2. Evaluating the potential effectiveness of cervical cancer prevention and control programmes.

Prevention of cervical cancer through HPV vaccination, screening, and treatment of precancerous lesions is cost-effective. However, timely management of invasive cervical cancer must be strengthened simultaneously to achieve a long-term impact on mortality rates [20]. In Colombia there is a nominal registry of women with cervical cancer because it is registered within the High Cost Account System.

In 2016, the High Cost Account developed a consensus of experts with which priority indicators were defined for the measurement of risk management by insurance companies, among which are those related to the timeliness of care in terms of the time elapsed, which allows evidence of possible shortcomings and deficiencies in the care of people with this pathology [21].

The results from 2018 to 2023 of the opportunity indicators are presented in the following table (Table 1):

Table 1. Risk Management Indicators in Cervical Cancer Colombia 2018-2023*.

Opportunity indicators	Compliance range			Periods					
	High	Half	Low	2018	2019	2020	2021	2022	2023
Opportunity for general care (suspected to first treatment)	<= 60 days	> 60 to 75 days	> 75 days	138,51	120,49	128,16	113,67	111,78	99,25
Opportunity for cancer care (diagnosis to first treatment)	<= 30 days	> 30 to 45 days	> 45 days	77,33	77,45	79,13	71,85	70,79	62,68
Opportunity by attending physician (pathology report to attending physician)	<= 30 days	> 30 to 45 days	> 45 days	35,02	36,59	42,55	41,24	38,35	15,68
Opportunity to start treatment (attending physician to first treatment)	<= 15 days	> 15 to 30 days	> 30 days	49,35	46,31	41,95	35,12	33,42	28,07

Source: Cuenta de Alto Costo CAC, Republica de Colombia. Ministerio de Salud y protección Social – Ministerio de Hacienda y Crédito Público. [redacted]

** The period refers to the cut-off year; The period in total runs from January 2 of each year to January 1 of the following year. The 2023 data are taken from Higia of the CAC.*

According to the result of the opportunity indicators, there are long times between the suspicion of access to the first treatment, exceeding 99 days for the year 2023, this shows the barriers faced by women, due to the multiple consultations they must obtain to achieve diagnostic confirmation; this is related to the opportunity times between diagnosis and the first treatment in which the times were 62 days, not complying with the standard defined by the High Cost Account that corresponds to 30 days.

Shorter times are evidenced for the pathology report indicator with a result of 15 days, which may infer that the longest times are found in the confirmation of the diagnosis and not in the initiation of treatment.

In relation to the information on the calculation and distribution of resources for cervical cancer for the year 2023, there was evidence of non-compliance with the early staging goal at the time of diagnosis of 99% of the total health care providers (EPS); (Target 80%).

Table 2. Description of the early staging goal at the time of diagnosis of Cervical Cancer, according to the Health Promoting Entity – EPS. Colombia, 2023.

EPS	Early staging at the time of diagnosis
EPS FAMILIAR DE COLOMBIA	16,67%
CAJA DE COMPENSACIÓN FAMILIAR DEL ORIENTE COLOMBIANO-COMFA	16,67%
CAJACOPI EPS	38,16%
COMFACHOCO- CCF DEL CHOCO	0,00%
EMPRESAS PÚBLICAS DE MEDELLÍN DEPARTAMENTO MÉDICO ANTIOQUIA MEDELLIN	
FONDO DE PASIVO SOCIAL DE FERROCARRILES NACIONALES DE COLOMBIA	33,33%
ALIANSALUD	77,78%
SALUD TOTAL S.A ENTIDAD PROMOTORA DE SALUD	64,71%
ENTIDAD PROMOTORA DE SALUD SANITAS S.A.	76,54%
COMPENSAR E.P.S.	81,16%
EPS SURA	48,97%
COMFENALCO VALLE E.P.S.	36,36%
E.P.S. FAMISANAR LTDA.	52,63%
ENTIDAD PROMOTORA DESALUD SERVICIO OCCIDENTAL DE SALUD S.A.	56,72%
CAJA DE PREVISION SOCIAL Y SEGURIDAD DEL CASANARE -CAPRESOCA	22,22%
NUEVA EPS S.A.	36,57%
COOSALUD CONTRIBUTIVO	0,00%
SALUD MIA EPS	57,14%
SALUD BOLIVAR EPS	
ASOCIACIÓN -MUTUAL SER- EMPRESA SOLIDARIA DE SALUD ESS	60,00%
ASOCIACIÓN DE CABILDOS INDÍGENAS DEL CESAR -DUSAKAWI	37,50%
ASOCIACIÓN INDÍGENA DEL CAUCA-A.I.C.	25,00%
ANAS WAYUU EPS INDIGENA	11,76%
ENTIDAD PROMOTORA DE SALUD MALLAMAS EPSI	25,00%
PIJAOS SALUD EPSI	
CAPITAL SALUD	32,50%
SAVIA SALUD EPS	33,33%
NUEVA EPS SUBSIDIADO (RES 02664)	32,52%
COOPERATIVA DE SALUD Y DESARROLLO INTEGRAL ZONA SUR ORIENTAL	33,68%
ASOCIACION MUTUAL LA ESPERANZA ASMET SALUD	56,44%
ASOCIACIÓN MUTUAL EMPRESA SOLIDARIA DE SALUD EMSSANAR ESS	57,14%
ASOCIACIÓN -MUTUAL SER- EMPRESA SOLIDARIA DE SALUD ESS (Subsidiada)	44,24%

Source: Unidad de pago por capitación (UPC). Ministerio de Salud y protección Social, Colombia. [redacted]

In relation to the opportunity times for cancer care, there is evidence of times greater than 30 days for diagnosis and 45 days for the start of treatment.

Table 3. Description of the opportunity times for diagnosis and opportunity to start treatment for Cervical Cancer, according to the Health Promoting Entity – EPS. Colombia

EPS	Opportunity of diagnosis	Treatment opportunity
EPS FAMILIAR DE COLOMBIA	28,33	71,60
CAJA DE COMPENSACIÓN FAMILIAR DEL ORIENTE COLOMBIANO-COMFA	27,67	88,00
CAJACOPI EPS	52,50	73,35
COMFACHOCO- CCF DEL CHOCO	8,00	105,80
EMPRESAS PÚBLICAS DE MEDELLÍN DEPARTAMENTO MÉDICO ANTIOQUIA MEDELLIN		
FONDO DE PASIVO SOCIAL DE FERROCARRILES NACIONALES DE COLOMBIA	23,50	55,40
ALIANSALUD	58,89	111,75
SALUD TOTAL S.A ENTIDAD PROMOTORA DE SALUD	47,89	54,97
ENTIDAD PROMOTORA DE SALUD SANITAS S.A.	40,97	59,00
COMPENSAR E.P.S.	68,61	95,39
EPS SURA	40,05	65,80
COMFENALCO VALLE E.P.S.	43,89	75,82
E.P.S. FAMISANAR LTDA.	43,06	72,27
ENTIDAD PROMOTORA DESALUD SERVICIO OCCIDENTAL DE SALUD S.A.	38,59	69,87
CAJA DE PREVISION SOCIAL Y SEGURIDAD DEL CASANARE -CAPRESOCA	32,33	84,00
NUEVA EPS S.A.	40,90	73,88
COOSALUD CONTRIBUTIVO	30,00	59,00
SALUD MIA EPS	126,67	62,67
SALUD BOLIVAR EPS		
ASOCIACIÓN -MUTUAL SER- EMPRESA SOLIDARIA DE SALUD ESS	44,29	49,57
ASOCIACIÓN DE CABILDOS INDÍGENAS DEL CESAR -DUSAKAWI	28,60	26,00
ASOCIACIÓN INDÍGENA DEL CAUCA-A.I.C.	18,00	47,00
ANAS WAYUU EPS INDIGENA	37,19	56,25
ENTIDAD PROMOTORA DE SALUD MALLAMAS EPSI	28,00	70,08
PIJAOS SALUD EPSI		
CAPITAL SALUD	26,46	55,90
SAVIA SALUD EPS	66,67	65,10
NUEVA EPS SUBSIDIADO (RES 02664)	42,42	82,13
COOPERATIVA DE SALUD Y DESARROLLO INTEGRAL ZONA SUR ORIENTAL	50,29	86,23
ASOCIACION MUTUAL LA ESPERANZA ASMET SALUD	42,52	80,27
ASOCIACIÓN MUTUAL EMPRESA SOLIDARIA DE SALUD EMSSANAR ESS	52,49	78,62
ASOCIACIÓN -MUTUAL SER- EMPRESA SOLIDARIA DE SALUD ESS (Subsidiada)	44,38	62,47

Source: Unidad de pago por capitación (UPC). Ministerio de Salud y protección Social, Colombia. [redacted]

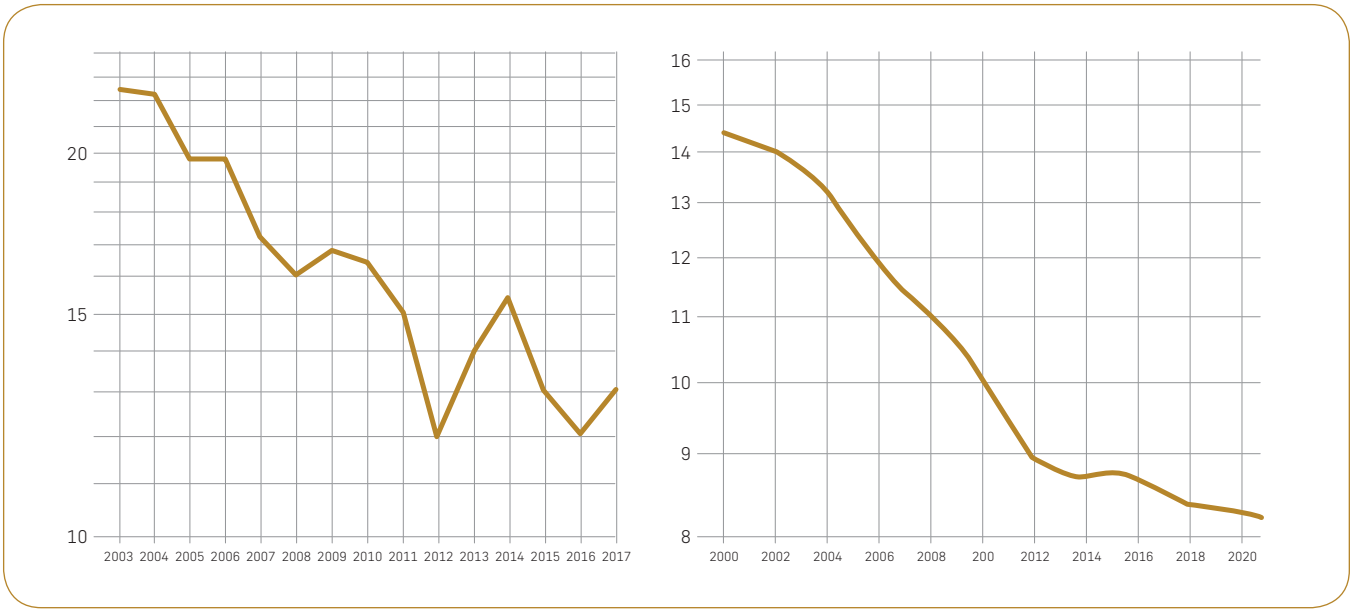
In addition, Colombia has 7 population-based cancer registries, considering the Cali registry, which is the one that has been around the longest, and which, together, allow monitoring the actions carried out through incidence [22] and mortality [23].

1. *RCBP of Cali*, which estimates that the 5-year survival rate for cervical cancer in that city is 53% [24]
2. *RCBP of Antioquia*, with a cervical cancer incidence of 9.2 new cases per 100,000 women over 18 years of age by 2020, and cervical cancer mortality is 6 deaths per 100,000 women by 2021.
3. *RCBP of Barranquilla*, with an incidence of 26.9 new cases of cervical cancer per 100,000 women per year (2013-2017) and mortality was 7.5 deaths per 100,000 per year (2013-2017).
4. *RCBP of Bucaramanga*, where the incidence was 11.7 new cases per 100,000 women per year (2013-2017) and 5.65 deaths from cervical cancer per 100,000 women per year (2019).
5. *RCBP of Manizales*, the incidence was 11.2 new cases of cervical cancer per 100,000 women per year (2021-2017) and mortality was 4.6 cervical cancer deaths per 100,000 women per year (2013-2017).
6. *RCBP of Neiva*, the age-adjusted incidence of cervical cancer was 18.9 new cases per 100,000 women per year (2013-2017).
7. *Pasto RCBP*, where the age-adjusted incidence of cervical cancer was 18.9 new cases per 100,000 women per year (2013-2017) and age-adjusted mortality was 9.6 deaths per 100,000 women per year (2013-2017).

The incidence in Colombia has decreased significantly, although the decline between 2012 and 2017 was not sustained, when there were clinical practice guidelines on screening and a ten-year cancer plan with clear objectives and goals for the prevention of cervical cancer.

Figure 4. Age-standardized cervical cancer incidence rate per 100,000 women, Colombia, 2003 – 2017.

Figure 5. Age-related standardized mortality rate (worldwide) per 100,000 women aged 15-85 years, Colombia, 2000 - 2020.



Source: International Agency for Research on Center. Global Cancer Observatory. World Health Organization.

In mortality, the trend is encouraging, although when investigating what the causes of the decline could be, it seems that the decrease in the birth rate has already fulfilled its effect on the decrease, which leaves room for vaccination, screening and treatment actions to consolidate the decline. The best way to measure the impact of screening programs is to assess trends in mortality curves.

Cervical cancer diagnosed in early stages is more likely to be cured than advanced stage cancer. With quality treatments, even women with locally advanced cervical cancer can have better

outcomes and quality of life if treated in a timely manner. Treatment of early-stage cervical cancer is also less complex, less expensive, and more effective, with higher long-term survival rates and a better quality of life. In countries where women have access to timely diagnosis and quality treatment, the 5-year survival rate for early-stage cancer can exceed 90%. The Cali population registry estimates that the 5-year survival rate for cervical cancer in that city is 53% [24]

3. Identifying barriers and challenges faced in implementing cervical cancer elimination strategies.

BARRIERS

The approach to this disease that has a causal agent and a premalignant stage seems easy to address, however, there are different obstacles that could be grouped into:

- **Governance barrier:** the elimination strategy must have a visible head, both technical and operational, that allows the integration of the three strategies for the elimination of cervical cancer. As long as they are not articulated, the results will be more difficult to obtain.
- **Geographical barriers:** Colombia has remote regions where health services are usually scarce and sporadic, travel to cities is expensive, and several visits are usually required, which makes them regions with high mortality from cervical cancer.
- **Economic barriers:** There is a lot of misinformation about the cost of HPV testing for screening, which becomes a barrier to the availability of health services. Health insurance groups continue to promote cytology as a primary screening tool, to avoid starting screening with HPV testing.
- **Currently:** en la actualidad no se cuenta con una relación de establecimientos de salud (ES) donde se realizan pruebas de detección del cáncer de cuello uterino en atención primaria; no se cuenta con el listado de ES para el manejo de mujeres con resultados anormales de tamizaje. Además, no se cuenta con el listado de ES con diagnóstico de cáncer, se realiza en laboratorios de histopatología con patólogos capacitados.
- **Education barriers:** Although more than 80% of women, according to the National Demographic and Health Survey, ENDS2025, know about the human papillomavirus, there are still myths about vaccination and screening, which makes it difficult to obtain greater assistance in vaccination programs and health services for screening. There are also barriers to education in both medical and nursing health personnel in terms of screening and treatment, which makes it difficult to implement.
- **Quality barrier:** The supply of HPV-DNA tests in the country represents a challenge, given that in recent years tests without clinical validation have entered the country, affecting the quality of early detection of cervical cancer.
- **Availability barrier:** Difficulties in the implementation of screening with visual inspection technique due to difficulties in the operation to perform cryotherapy in remote areas and not having a thermal ablation technique in the country due to lack of sanitary registrations in the country

CHALLENGES

- **Geographical:** One of the great challenges in the implementation of the guide for the management of preneoplastic lesions of the cervix is the territorial division to choose screening strategies, the scenario of screening and treating imposes a great challenge in remote regions with high mortality, offering the strategy with a single visit to resolve if the screening test is positive.
- **Economic:** Cost-effectiveness studies have shown that HPV testing is cost-effective in the population over 30 years of age, allowing screening at 5-year intervals and concentrating triage, diagnosis, and treatment activities on positive women. There is a lack of socialization and education for decision-makers in order to implement HPV testing programs.

- **Information:** integrate information from health services in relation to population, availability of screening tests, availability of colposcopists, availability of pathologists and cytologists, all trained in cervical pathology, joining monitoring information through population-based cancer registries and nominal data on the promotion and maintenance route and high-cost account, in real time that allows decision-making.
- **Education:** Broad and sustained education is required for all those involved in the elimination program, including target populations, parents, as well as health decision-makers.
- **Quality:** a monitoring system is required to ensure from the acquisition of tests that meet quality criteria for a program, as well as permanent monitoring of the screening program.

4. Evaluating the monitoring and evaluation systems in place to track progress and results.

The Integrated Social Protection Information System (SISPRO) is managed by the Office of Information and Communication Technologies (OTIC) in close coordination with the Directorate of Epidemiology and Demography (DED) of the Ministry of Health and Social Protection (MSPS). SISPRO constitutes a data warehouse containing the data of 5 information subsystems, namely:

1. The Health Provision Information System (RIPS),
2. Vital Statistics (VSS),
3. The National Public Health Surveillance System (SIVIGILA),
4. The Single Registry of Affiliates (RUAF)
5. The High Cost Account (CAC).

PAI WEB

The information from the population-based cancer registries is not integrated into SISPRO. Deaths are processed by the SISPRO "VEE cube".

In addition to these subsystems are resolution 202 of 2022 that generates coverage for the early detection of cervical cancer

In 2022, the ImPACT group made up of IARC, PAHO and the International Atomic Energy Agency visited the group.The imPACT Review is the tool that the three agencies developed to assess a country's cancer control capacities and needs using an integrated approach across cancer control within the country's health system.

The request for an ImPACT evaluation in Colombia, received by the International Atomic Energy Agency (IAEA) on September 7, 2021, is part of the efforts of the Government of Colombia to evaluate and strengthen the country's cancer management and control system (prevention, detection, diagnosis, treatment and palliative care, radiological safety), from this visit comes a technical document called Cancer Needs and Control Capacity Assessment Report [25].

Recommendations of the imPACT Report

- There are numerous information systems for cancer surveillance in Colombia, operated by different institutions; however, there is some duplication between the information systems for cancer surveillance, and there is very important variability specifically in the information on incidence (new cases) of cancer in the country reported by different actors, which generates confusion when planning and evaluating cancer control actions.
- A national data warehouse (SISPRO) has been established that includes several of the existing systems, providing a single useful basis for the various actors. However, the exchange of

information between systems and particularly of the data warehouse and vital statistics with population-based cancer registries should be strengthened.

- SIVIGILA follows the infectious disease surveillance model; however, not only does it lack the standard methodologies to obtain cancer incidence (but it also shows a huge underreporting when compared to the number of cases of these cancers in places where there are population-based cancer registries. It seems to provide useful information for the follow-up of women with abnormalities in screening programs. Their information constitutes another source of information for population registries (when there is an exchange of information).
- Most population-based cancer registries in Colombia are in universities, which has proven to be an appropriate model of co-financing, in addition to allowing their sustainability and improving the dissemination and use of information. The registries receive financial support from the INC (national budget) for their operation, in addition to technical assistance and periodic training. However, financial support is insufficient for some of them, limiting the dissemination of information and the collection of some key variables such as clinical stage.
- Mortality information (with identifiers) is not officially available to population-based cancer registries and access to it depends on relationships. This information is critical to improve the completeness and quality of incidence information, as well as to perform survival analyses.
- For the institutions in their role as sources of information there is an overload of similar information requirements: they must deliver cancer information to the High Cost Account, for some pathologies to SIVIGILA and also to the population registry, which they consider a reprocess. Therefore, work must be done on the integration of data so that complementary information can be obtained without overloading the institution.
- Pathology reports are a critical input for cancer surveillance; in Colombia, pathology reporting is not unified and minimum standards have not been adopted in terms of structure, formats, and minimum variables. In addition, the current health system favors reading in large centers, which limits access to this information for population-based cancer registries.

5. Recommendations to improve the effectiveness and sustainability of cervical cancer elimination efforts in Latin America.

The elimination strategy turns out to be a public health strategy that will benefit the female population from its three pillars and sustained over time will reduce the incidence rate to 4 per 100,000 women. It is a strategy that proposes for the region of the Americas the visibility of the current state of each country in terms of availability of vaccines, screening methods and treatment, once that information is corrected and implemented in order to comply with the management indicators that PAHO proposes in the strategy document and with the commitment of the actors to implement to reach 2030 with the goals and sustain it in time so that by 2060 - 2120 the goal is met.

The disparity with countries such as Canada and the United States compared to Haiti and Bolivia poses great challenges for the fulfillment of the three pillars of the strategy. The difference in access to vaccination, screening and treatment that low-income countries have when compared to high-income countries with low incidence and mortality is evident.

It is recommended that the strategy be educated and disseminated as a public health program, PAHO help in its compliance, the incorporation of compliance indicators and their monitoring.

Strengthen the organization, governance, coordination, and sustainability of the cervical cancer program, understanding that there must be a leader and develop a resource mobilization strategy to fund cervical cancer elimination efforts.

Strengthen primary prevention through awareness, information, education, and vaccination against HPV. Continue HPV vaccination to maintain 90% coverage > recommended doses in the target age group.

Strengthen detection by implementing clinical practice guidelines that standardize the screening process and allow evaluation of its performance and compliance.

Strengthen the treatment of pre-invasive and invasive lesions, review the installed capacity in technology and human resources that allow women to be adequately treated.

Encourage countries to have population-based cancer registries to adequately monitor incidence and mortality data in order to make elimination program decisions over time. At the same time, research should be carried out to resolve the questions of each country in relation to the programme.

In conclusion, these are the impact recommendations:

Establish the sources of information that will be officially used for each of the cancer surveillance indicators (incidence, mortality, survival, quality of care) and define those responsible for generating them.

At the departmental level, it is recommended to disseminate and use as an official standard, the incidence estimates and mortality analyses by type of cancer produced by the National Cancer Institute periodically.

Challenges and ways to address the issues

- Increasing HPV vaccination coverage
- Overcoming HPV vaccine accessibility and acceptability limitations
- Extension of opening hours in vaccination centres, taking into account the school calendar.
- Update the WHO HPV vaccination strategy recommendation
- Technology Transfer and Mass Implementation of HPV Testing
- Guarantee the supplies for screening with HPV test in self-sampling
- Short term (18 months)
- Strengthening the HPV vaccination program
- Conduct a baseline of laboratories that process HPV tests, in the country
- Implement at least 50% screening for women aged 30-65 years, with HPV testing
- Intensify screening with visual inspection techniques to hard-to-reach departments
- Perform evaluation for the introduction of the self-test strategy for HPV testing
- Conduct ongoing evaluation of the screening program based on visual inspection techniques in the selected departments
- Promotion of self-care and the exercise of responsible sexuality
- Medium term (36 months)
- Change to screening with HPV tests, currently only 12% of the population is screened with HPV
- Incorporate the screening interval recommended by the WHO at 5 years when you have a negative HPV test
- Evaluate use of HPV test with self-sampling
- Ensure follow-up, diagnosis and treatment of positive women
- Progressively increase the opportunity to perform colposcopy until it is less than 3 weeks
- To identify the primary and secondary prevention recommendations against cancer of the health plan, in order to facilitate the transmission of the message and dissemination.
- Assistance through the healthcare system (patient navigation)

Long term (60 months)

1. Evaluation of the implementation process
2. Need for trained human resources
3. Need for equipment, colposcopes, radiofrequency treatment equipment and ablative treatments
4. Incorporate the role of NGOs.
5. Progressively increase the opportunity to start treatment of cervical cancer cases until it is less than 30 days

In conclusion, Colombia has made great progress in the regulations for the fulfillment of the three pillars of the strategy for the elimination of cervical cancer, the challenge continues to be the implementation from governance to compliance with the management and quality indicators of the program as a single strategy and not as three separate strategies that is how it is currently envisioned. It will depend not only on the political will of the Colombian state but also on the incorporation of the different actors, civil society, non-governmental organizations and all the actors that together will allow the strategy to be implemented and meet the goals by 2030 and sustain them over time as a public health program.

References

1. GLOBOCAN 2022, Cancer Today. Ferlay J, Ervik M, Lam F, Laversanne M, Colombet M, Mery L, Piñeros M, Znaor A, Soerjomataram I, Bray F (2024). Global Cancer Observatory: Cancer Today (version 1.1). Lyon, France: International Agency for Research on Cancer. Available from: [redacted]. Accessed [06/06/2025].
2. World Health Organization, WHO framework for strengthening and scaling-up of services for the management of invasive cervical cancer. 2020; Dic8. [redacted].
3. Singh D, Vignat J, Lorenzoni V, et al. Global estimates of incidence and mortality of cervical cancer in 2020: a baseline analysis of the WHO Global Cervical Cancer Elimination Initiative. Lancet Glob Health. 2023 Feb;11(2):e197-e206. doi: 10.1016/S2214-109X(22)00501-0. Epub 2022 Dec 14.
4. Sung H, Ferlay J, Siegel RL, et al. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin. 2021 May;71(3):209-249. doi: 10.3322/caac.21660. Epub 2021 Feb 4.
5. de la Hoz-Restrepo F, Alvis-Guzman N, Narvaez J, Choconta-Piraquive LA. Evaluating the burden of disease caused by human papillomavirus in Bogota. Rev Salud Publica (Bogota). 2009 May-Jun;11(3):454-67. doi: 10.1590/s0124-00642009000300014.
6. Viveros-Carreño D, Fernandes A, Pareja R. Updates on cervical cancer prevention. Int J Gynecol Cancer. 2023 Mar 6;33(3):394-402. doi: 10.1136/ijgc-2022-003703.
7. Colombia. Ministerio de Salud y Protección Social. (2016). Manual técnico administrativo del PAI 2015 Tomo 1 al 10 Recuperado de: [redacted]
8. Donken R, Bogaards JA, van der Klis FR, et al. An exploration of individual- and population-level impact of the 2-dose HPV vaccination schedule in pre-adolescent girls. Hum Vaccin Immunother. 2016 May 12;12(6):1381–1393. doi: [redacted]
9. Henriquez-Mendoza, G. M. El "evento de El Carmen de Bolívar" en la vacunación contra VPH en Colombia. ¿Causa o desenlace? Revista de Salud Pública, 22(4), 447–452. DOI: [redacted]
10. N Muñoz et al. (2020). Vacunación contra el VPH en Colombia. De la pesadilla a un resplandeciente y prometedor amanecer. www.HPVWorld.com, 105ES
11. Romanowsk B, Schwarz T, Ferguson L, et al. Immunogenicity and safety of the HPV-16/18 AS04-adjuvanted vaccine administered as a 2-dose schedule compared with the licensed 3-dose schedule. Results from a randomized study. *Human Vaccines*, *7*(12), 1374–1386. [redacted]
12. X Ad Hoc Meeting of the PAHO Technical Advisory Group (TAG) on Vaccine-Preventable Diseases, 31 May 2023. Virtual . PAHO/CIM/23-0013. Pan American Health Organization, 2023. [redacted]
13. Ministerio de Salud y Protección Social. Lineamientos para la Gestión y Administración del Programa Ampliado de Inmunizaciones - PAI 2024. Colombia: s.n., 2024. [redacted]
14. Landy R, Sasieni PD, Mathews C, et al. Impact of screening on cervical cancer incidence: A population-based case-control study in the United States. Int J Cancer. 2020 Aug 1;147(3):887-896. doi: 10.1002/ijc.32826. Epub 2019 Dec 31.
15. Frappart L, Fontaniere B, Lucas E, Sankaranarayanan R. Histopathology and cytopathology of the uterine cervix – digital atlas. Editors (2004). Lyon: International Agency for Research on Cancer. IARC CancerBase No. 8. ISBN-13 (Database). 978-92-832-2424-2
16. WHO (2014). Comprehensive cervical cancer control: a guide to essential practice. 2nd ed. Geneva: World Health Organization. [redacted]
17. Instituto Nacional de Cancerología. Guía de práctica clínica informada en la evidencia para la tamización, detección y tratamiento de lesiones preneoplásicas del cuello uterino - versión para profesionales de la salud. Bogotá: INC; 2025. [redacted]

18. Murcia E, Aguilera J, Wiesner C, Pardo C. Oncology services supply in Colombia. Colomb Med (Cali). 2018 Mar 30;49(1):89-96. doi: 10.25100/cm.v49i1.3620.
19. Gamboa O, Cotes M, Valdivieso J, et al. Estimation of the Need for Radiation Therapy Services According to the Incidence of Cancer in Colombia to 2035. Adv Radiat Oncol. 2021 Aug 9;6(6):100771. doi: 10.1016/j.adro.2021.100771. eCollection 2021 Nov-Dec. PMID: 34632162; PMCID: PMC8488248.
20. Brisson M, Kim JJ, Canfell K, et al. Impact of HPV vaccination and cervical screening on cervical cancer elimination: a comparative modelling analysis in 78 low-income and lower-middle income countries. Comparative Study Lancet. 2020 Feb 22;395(10224):575-590. doi: 10.1016/S0140-6736(20)30068-4. Epub 2020 Jan 30. PMID: 32007141; PMCID: PMC7043009.
21. Fondo Colombiano de Enfermedades de Alto Costo. Cuenta de Alto Costo, CAC. Indicadores prioritarios para la medición, evaluación y monitoreo de la gestión de riesgo por parte de aseguradores y prestadores en pacientes con cáncer de mama y cuello uterino en Colombia. Bogotá 2026. [redacted]
22. Navarro E, Caballero H, Cortés A, et al. Sistema de información de cáncer en Colombia -SICC (Versión 1.0). Bogotá, Colombia: Instituto Nacional de Cancerología -INC 2024. https://www.infocancer.co/portal/#!/acercaDe/. Fecha de acceso: [14/06/2025].
23. Instituto Nacional de Cancerología -INC, Departamento Administrativo Nacional de Estadística -DANE. Datos mortalidad nacional. Sistema de información de cáncer en Colombia -SICC (Versión 1.0). [Internet]. Bogotá, Colombia: INC, DANE 2021. Disponible de: https://www.infocancer.co, fecha de acceso: [14/06/2025].
24. Bravo LE, García LS, Collazos P, et al.Trends in long-term cancer survival in Cali, Colombia: 1998-2017. Colomb Med (Cali). 2022 Mar 30;53(1):e2035082. doi: 10.25100/cm.v53i1.5082. eCollection 2022 Jan-Mar.
25. Impact Review report. Informe de evaluación de necesidades del control del cáncer. IARC, OPS, OIEA. Nov 2023 [redacted]

Mexico

Overview of Advances in the prevention and control of Cervical Cancer in Mexico

Abbreviations	
BT	Brachytherapy
CaCU	Cervical cancer
CeNSIA	National Center for Child and Adolescent Health
ICD	International Classification of Diseases
CIN	Cervical Intraepithelial Neoplasia
CNEGSR	National Center for Gender Equity and Reproductive Health
CT-RT	Chemo-RT
COVID-19	Coronavirus disease 2019
CT scan	Computed tomography scan
CUAIS	Catalog of Medical Units of the National Health System
DALYs	Disability-adjusted life-years
ENSANUT	National Health and Nutrition Survey
HB	Hepatitis B
HIV	Human Immunodeficiency Virus
HPV	Human Papillomavirus
hrHPV	High-risk strains of human papillomavirus
HSIL	High-grade squamous intraepithelial lesion
MICAELA	Program for the Care of Locally Advanced and Metastatic Cervical Uterine Cancer
MR	Measles Rubella
MSM	Men who have sex with men
IMSS	Mexican Social Security Institute
ISSSTE	Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado
PX	Petróleos Mexicanos
PET	Positron emission tomography
RT	Radiotherapy
SD	Secretaría de la Defensa Nacional
SICAM	Women's Cancer Information System
SM	Secretaría de Marina
SSA	Secretaría de Salud
Tdpa	Tetanus, diphtheria and acellular pertussis
UNICEF	United Nations Children's Fund
WHO	World Health Organization

Key findings

- **Persistent high disease burden:** Cervical cancer remains one of the leading causes of cancer-related deaths among women in Mexico, with a particularly high burden in marginalized states such as Chiapas and Guerrero.
- **Inequalities in access to specialized services:** Women in rural and Indigenous areas persist in facing geographic, economic, and cultural barriers to accessing diagnosis and treatment.
- **Insufficient and unequal HPV vaccination:** Although Mexico adopted a single-dose schedule in 2022, coverage remains far (43.7% among adolescents) from reaching the goal of 90%, showing comprehensive disparities at the subnational level, particularly between urban and rural regions.
- **Setbacks due to the pandemic:** The COVID-19 pandemic caused a 67.8% drop in Pap smears and an 80.5% drop in colposcopies, creating a backlog of at least two years for timely detection.
- **Limited screening and loss to follow-up:** Only 35% of women reported having undergone Pap smear, and less than 60% of women with positive test results completed clinical follow-up.
- **Increased use of HPV testing:** The increased use of HPV screening tests is well-received due to their higher robustness compared to cytology tests, but this implementation is not yet consistent throughout the country.
- **Fragmentation of the health system:** Lack of coordination between public institutions such as the Ministry of Health, IMSS, ISSSTE, and IMSS-Bienestar challenges the comprehensive and continuous approach to prevention, diagnosis, and treatment.
- **Lack of interoperability in information systems:** The absence of an interoperable national registry hinders case follow-up, program evaluation, and accountability.
- **Shortage of infrastructure and specialized personnel:** Many units lack the equipment and trained personnel to perform colposcopy, outpatient treatment, and clinical follow-up.
- **Initiatives such as the MICAELA program:** This multidisciplinary program has improved care for patients with advanced cervical cancer at the National Institute of Cancerology but has not been replicated across the 32 states.
- **National perspectives on Cervical Cancer Prevention and Control Program:** The National Program has been historically focused on targets (number of screening tests and treatments) rather than on actual coverage. This perspective challenges the concept of a continuum of care.
- **Lack of federal leadership and weak governance:** The absence of national coordination meetings endangers the continued communication between local, state, and federal levels.
- **Priority recommendations:** Expand screening with HPV testing, strengthen vaccination, ensure timely treatment, improve information systems, reduce inequalities, and reactivate national governance of the program.

Strategic summary

Cervical cancer continues to be one of the leading causes of morbidity and mortality from neoplasms in Mexican women, especially in the context of high social marginalization. Despite reductions in the disease burden since 1990, significant structural, institutional, and social challenges persist, limiting the effectiveness of prevention and control programs.

In response to this challenge, Mexico has implemented a series of strategies within the Cervical Cancer Prevention and Control Program, which aligns with the WHO Global Strategy to Eliminate Cervical Cancer as a Public Health Problem. However, limited screening coverage, deficiencies in HPV vaccination, loss of clinical follow-up, lack of interoperability between information systems, and weak inter-institutional governance continue to be challenges.

In terms of public health policy, it is worth noting that the Health Sector has faced substantial shortcomings in recent years, challenging specific funding for planning, operation, and monitoring

of public health programs. Alternative mechanisms may include the visibility of these difficulties through academic or civil society bodies.

Progress and challenges in vaccination, detection, and treatment

In terms of vaccination, Mexico has adopted a single-dose schedule for girls and adolescents since 2022, in line with international recommendations. Despite the cost-effective and logistical benefits of this strategy, coverage remains insufficient (43.7% in adolescents), with marked territorial disparities between urban and rural areas. During the pandemic, coverage dramatically decreased, affecting multiple cohorts.

Although Mexico has made efforts to introduce molecular HPV testing alongside cervical cytology, adequate screening coverage remains low overall. Only 35% of women reported having undergone Pap smears, and only 23% underwent them at the recommended intervals. Loss to follow-up after positive results (driven by underlying factors such as fear of diagnosis or geographical barriers) may significantly reduce the positive potential impact of these preventive strategies.

Concerning treatment, although the availability of resources in public institutions and the implementation of a Comprehensive Program for the Care of Locally Advanced and Metastatic Cervical Cancer with a multidisciplinary medical approach have been documented, gaps persist in timing, infrastructure, and therapeutic adherence. The average delay between diagnosis and treatment is 5–8 weeks in federal institutions, a situation that compromises patient prognosis.

Evaluation of the information and monitoring system

Mexico has made significant progress in implementing nationwide routine data systems, which consolidate information from local to national levels. Unfortunately, information systems generating data on cervical cancer, including probable cases, hospitalizations, diagnoses, treatments, and follow-up, remain working in silos. This lack of interoperability challenges data quality, case reporting outside the public sector, and accountability.

In 2022–2023, SICAM showed detection coverage of between 40% and 55%, with 70–75% of colposcopies performed on women with positive test results, but with complete clinical follow-up in less than 60% of cases. The lack of a consolidated population-based cancer registry still limits the accurate estimation of incidence, survival, and treatment quality.

Structural and social barriers

Various barriers affect program implementation.

1. Institutional fragmentation: Differences in protocols, financing, and platforms between public institutions such as the Ministry of Health, IMSS, ISSSTE, PEMEX, and IMSS-Bienestar hinder the continuity of care.
2. Geographic disparities: States with high levels of marginalization have coverage rates below 20%, whereas others have rates exceeding 60%.
3. Lack of leadership and national coordination: There are no regular meetings or uniform operating guidelines, which have reduced the program's effectiveness.
4. Impact of the pandemic: In 2020, there was a 67.8% drop in Pap smear tests and an 80.5% drop in first-time colposcopies.
5. Shortage of human resources and equipment: More than 60% of rural units lack basic diagnostic equipment.

6. Lack of differentiated strategies: Highly vulnerable groups, such as Indigenous women, adolescents outside the school system, and women with HIV, are not adequately covered.

Strategic recommendations

Based on the analysis and interviews with state public health leaders, the following recommendations are proposed.

1. Screening coverage should be expanded with highly sensitive tests.
2. Prioritizing HPV over cytology, with systematic follow-up and ongoing staff training.
3. Strengthen the HPV vaccination program with stable school schedules, catch-up campaigns for lagging cohorts, and strategies targeting key populations.
4. Timely access to diagnosis and treatment should be ensured by reducing waiting times and guaranteeing infrastructure and specialized personnel in all regions.
5. Integrate and modernize information systems by establishing interoperability and monitoring dashboards with a territorial focus.
6. Structural inequalities can be reduced through community partnerships, health education, and differentiated financing by region.
7. Promote program governance through effective federal leadership.
8. Consolidate local plans, monitoring, and accountability mechanisms.

Conclusion

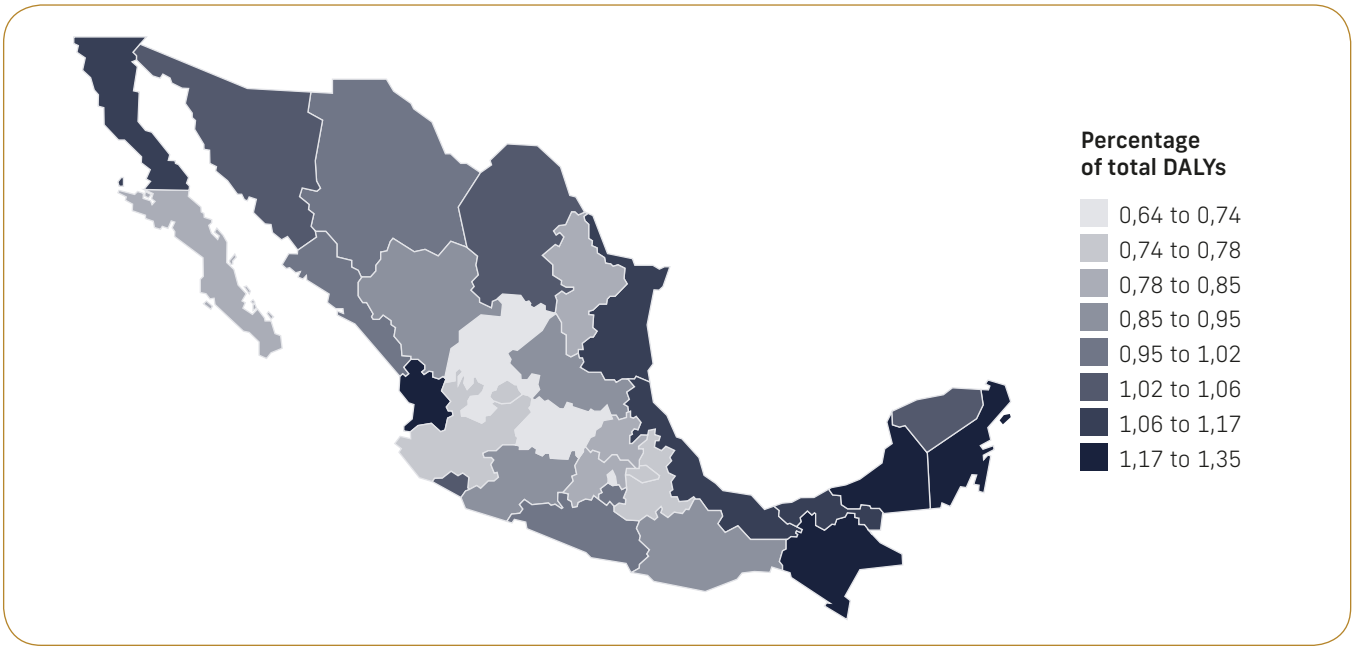
The elimination of cervical cancer in Mexico is technically possible; however, it requires urgent and profound institutional reconfiguration. Without clear political prioritization, multi-year budget allocation, and strengthened program governance, the current progress is at risk of being diluted. There is a need to transition from a "goal achievement" program to one based on **actual coverage, effective access, and a focus on gender equity and human rights.**

Introduction

Cervical cancer is a major public health concern in Mexico, accounting for a significant number of cases and deaths associated with cancer among women, particularly among those who are socially marginalized. The 2021 Burden of Disease study showed that cervical cancer accounted for 1.15% (0.99%, 1.31%) of all disability-adjusted life-years (DALYs) in women in Latin America and the Caribbean. In Mexico, this percentage was estimated to be 0.89% (0.72%, 1.07%), ranging from 0.64% (0.47%, 0.84%) in Mexico City to 1.35% (1.06%, 1.67%) in Chiapas (Figure 1).

The number of DALYs due to cervical cancer in Mexico has shown an apparent annual reduction since 1990 (1.46%, 1.33%, 1.61%). The exception was Guerrero, where DALYs for this type of cancer increased from 0.89% (0.75%, 1.02%) in 1990 to 0.95% (0.74%, 1.18%) in 2021, highlighting that this is a disease associated with social inequity. (Institute for Health Metrics and Evaluation, 2021)

Figure 1. Percentage of DALYs for cervical cancer in Mexico, All ages.



Institute for Health Metrics and Evaluation, 2021

In response to this challenge, the Government of Mexico has developed and implemented a set of strategies to prevent, detect, treat, and monitor the disease in a timely manner. These strategies are part of the Cervical Cancer Prevention and Control Program, which has evolved over the years. The program has faced various structural and circumstantial challenges, including a lack of sufficient funding, institutional transitions associated with governance issues, and the emergence of the COVID-19 pandemic, which severely impacted the performance of this and many other public health programs.

Conversely, it is widely acknowledged that the elimination of cervical cancer as a public health concern is an attainable objective from both technical and epidemiological perspectives. This possibility is predicated on the existence of highly effective tools, including vaccination against Human Papillomavirus (HPV), early detection through sensitive tests (e.g., the high-risk HPV test), and timely treatment of precancerous lesions. In this regard, the Global Strategy for Accelerating Cervical Cancer Elimination, promoted by the World Health Organization (World Health Organization, 2020), proposes a comprehensive approach with three specific goals for the year 2030: to achieve

90% coverage in the vaccination of girls, 70% coverage in screening with a high-precision test, and 90% coverage in the treatment of women diagnosed with cervical lesions or invasive cancer. If these objectives are accomplished in a sustained manner, it is estimated that the incidence of cervical cancer could be reduced to less than four cases per 100,000 women. This threshold is considered by the World Health Organization (WHO) as an indicator of elimination. (World Health Organization, 2020)

This report is part of the cervical cancer project in three Latin American countries, which aims to provide an overview of advances in the prevention and control of the disease in Mexico through five objectives:

- Evaluate the implementation of screening and diagnostic methods, treatment protocols, and vaccination campaigns.
- Assess the potential effectiveness of cervical cancer prevention and control programs.
- Identify the barriers and challenges encountered during the implementation of cervical cancer elimination strategies.
- Evaluate the monitoring and evaluation systems in place to track progress and outcomes.
- Provide recommendations for enhancing the effectiveness and sustainability of cervical cancer elimination efforts in Latin America.

1. Evaluate the implementation of screening and diagnostic methods, treatment protocols, and vaccination campaigns in Mexico

a. Immunization Program

In 2019, the National Immunization Program recommended the introduction of a one-dose HPV vaccination to the regular schedule. (Centro Nacional para la Salud de la Infancia y la Adolescencia, CeNSIA, 2022) This proposed schedule offered technical, logistical, and economic advantages to protect female adolescents against HPV in the context where international shortage enabled delays and subsequent lags in HPV vaccination. Nonetheless, in the absence of specific information in the 2022 SAGE review and recommendations, a three-dose vaccination scheme was recommended for cis and trans women with Human Immunodeficiency Virus (HIV). (Table 1)

Table 1. HPV vaccination schedule recommended in vaccination campaigns to mitigate the accumulated backlog. Mexico, 2022

Vaccine	Dose	Target population	Schedule	Timing
HPV vaccine	0.5mL intramuscular injection	Women 13-14 years	One dose	High school -1st or 2nd year
		Women cis and trans from 11 to 49 years with HIV	First dose	0 months
			Second dose	2 months
			Third dose	6 months

Vaccination coverage and prevalence in girls, boys, and adolescents were evaluated in Mexico by analyzing data from the National Health and Nutrition Survey 2022 (ENSANUT). These results indicated that only 43.7% of adolescent girls reported receiving at least one dose of the HPV vaccine. The estimated proportion of vaccinated women increased with age; thus, 14.8% (95% CI: 6.2%, 31.7%) of 10-year-old girls reported being vaccinated, while 69.1% (95% CI: 57.7%, 78.6%) of those aged 15 years and older received the vaccine (Mongua-Rodríguez, 2023).

A notable disparity was observed in the proportion of adolescents vaccinated against HPV and MR (Measles-Rubella vaccine), with a higher prevalence among urban vs rural residents (49.9% vs. 36.4% and 33.9% vs. 25.1%, respectively); highlighting that these immunogens did not reach the 90% coverage goal in the target population.

The immunization rate among adolescents for the immunogens under investigation was lower than that reported for individuals aged 13–17 years in the United States in 2020. Among this age group, the coverage rates for HPV, HB (Hepatitis B), Tdpa (Tetanus, diphtheria and acellular pertussis), and MR were 75.1%, 92.6%, 90.1%, and 92.4%, respectively. In the specific instance of the HPV vaccine, the data presented here exceed the estimated global coverage of 15%.

Romero-Feregrino et al. examined the procurement, coverage, and performance of the HPV vaccination program in Mexico from 2008 to 2023. The researchers obtained data from three public health institutions (IMSS, ISSSTE, and SSa). A comparative analysis was conducted between the annual procurement per institution and the aggregate national total. Notable interannual variability in the number of doses acquired was observed, reflecting fluctuations in institutional procurement behavior and programmatic priorities. A review of the aggregate data revealed that in certain years, all institutions exhibited a shortfall in both vaccine procurement and administration relative to the target population. Conversely, in other years, the number of doses administered exceeded the number of doses procured, suggesting potential discrepancies in reporting or the utilization of previously stockpiled vaccines.

For the Mexican Social Security Institute (IMSS) and the Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado (ISSSTE), coverage levels remained consistently low throughout most years of the period studied. In contrast, the Ministry of Health reported coverage exceeding 100% in several years, except for 2012, 2013, 2020, and 2021, when coverage fell below the expected levels. The estimated (administrative) target goal, which refers to the number of doses planned to be applied, instead of the real proportion of women protected against HPV within the population, may explain this reported percentage.

When considering all institutions collectively, adequate coverage (defined as meeting or exceeding the theoretical target population) was achieved in approximately half of the years analyzed. In certain years, coverage exceeded 100%, whereas in the remaining years, coverage fell below the target threshold. This variability in program performance is indicative of potential inconsistencies in the procurement and delivery processes.

Comprehensive analyses of institutional-level comparisons of coverage rates have revealed substantial disparities between institutions. The Ministry of Health achieved a notable milestone by attaining coverage levels (the proportion of administered doses out of the administrative target) that exceeded 100% within eight years. In contrast, IMSS and, particularly, ISSSTE, maintained coverage levels consistently below 70%, with ISSSTE exhibiting the poorest performance among the entities examined.

Therefore, a national reorganization of the HPV vaccination program is urgently needed. This requires strong political and operational commitment at all levels of government. Public health institutions must collaborate to review and update the nominal data of beneficiaries, accurately determining the true target population and ensuring the effective delivery of the vaccine.

b. Screening and diagnosis

In relation to the evaluation of screening and diagnostic methods, a case-control study conducted at the National Institute of Public Health found a protective effect of cervical cancer associated with the early detection program (Hernández-Avila, 1994). The risk of developing cervical cancer decreased proportionally to the number of cytologies performed and the frequency with which these examinations were conducted; thus, there was a 2.8-fold decrease in the risk of developing cervical cancer associated with a history of undergoing cytology testing periodically, every one or two years (Hernández-Avila, 1994).

It was found that in women with complete cytology schedules, 45% (95%CI: 34.3%, 40.3%) of cervical cancer cases were prevented, and at the population level, 27.7% were prevented. This fraction should be reflected in mortality rates and should have caused a decrease in mortality rates over time. However, because the above assumptions are often not met, the proportion of prevented cases likely represents the upper limit of the protective effect, and this number is likely to be lower.

The results clearly show a protective effect attributable to the early detection program; however, this effect is negligible when considered at the population level. This could be because the coverage (proportion of women with complete cytology schedules) found in the population is relatively low: only 35% of women reported a history of cytology, and this proportion decreased to 23% when those with annual or biannual exams were considered. This coverage problem is compounded by the fact that not all women receive their test results in a timely manner. Another reason why the program's effect is diminished is the high percentage of women who undergo cytological examination because of the presence of symptoms. Twenty-seven per cent of the cases came to the program due to the presence of gynecological symptoms; therefore, they were no longer part of a screening program but rather a symptom-driven diagnosis program.

In contrast, the National Institute of Public Health and the National Center for Gender Equity and Reproductive Health evaluated the performance of screening tests for cervical cancer caused by infection with high-risk strains of human papillomavirus (hrHPV). The study measured the relative sensitivity of the hrHPV test compared to cervical cytology as a primary screening method for detecting Cervical Intraepithelial Neoplasia (CIN) grade 2+ (CIN2+). The main results indicate that, at the population level, the hrHPV test detects 30–40% more cases of CIN2+ than cytology; however, there was a variation according to age group and geographical area, with lower relative sensitivity in women aged above 55 years old and in the southern part of the country.

It was also observed that a large number of CIN1 cytology diagnoses were referred for colposcopy unnecessarily, resulting in the saturation of these health care services. A large proportion of false negatives were detected; that is, women with CIN1 cytology diagnoses who theoretically should not be referred for colposcopy. However, 9.8% of the women referred had a histological diagnosis of CIN2+, including 126 cases of cervical cancer. A large proportion of loss to follow-up was found in the two screening cohorts, which represents a major challenge for cervical cancer prevention programs in the future. A plausible hypothesis related to loss to follow-up with cytological diagnosis of CIN 2+ may be because, in these women, greater anxiety and fear of confirming serious diagnoses is generated, which could cause their refusal to undergo a confirmatory evaluation, adding this fear to the list of sociocultural and methodological barriers that limit the programs.

A comparison of relative sensitivity allowed us to conclude that the hrHPV test detected 20% more cases of CIN2+ than cervical cytology. However, one of the great challenges for the Mexican Ministry of Health is to improve the cervical cancer prevention program. According to the recommendations suggested by the World Health Organization, an explanation of how the prevention program works could help mitigate participants' anxiety and decrease loss to follow-up.

c. Treatment protocols

In relation to the evaluation of treatment protocols in Mexico and according to a publication of the Ministry of Health called "Fact Sheet on Cervical Cancer" which was part of the dissemination of the Cervical Cancer Awareness Week in 2019, the treatment of breast and cervical cancer in Mexico is free of charge in public institutions (IMSS, ISSSTE, SEDENA, PEMEX, SEMAR, etc.). The fact sheet states that annually, approximately 5,000 cases are attended (3,597 in 2015) in Seguro Popular, of which only 48.4% are diagnosed in the early stages, where oncological treatment is more effective (National Centre for Gender Equity and Reproductive Health, 2019).

To describe the resources available for treating cervical cancer in Mexican public institutions, a survey was administered to members of the Mexican Society of Oncology and Radiation Oncology (Cetina-Pérez L). Specialists from different institutions treat different numbers of cervical cancer patients annually. The survey was sent to medical oncologists, gynecologic oncologists, surgical oncologists, and radiation oncologists, assigned to public institutions, such as Instituto Mexicano del Seguro Social (IMSS), Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado (ISSSTE), Secretaría de Salud (SSa), Secretaría de la Defensa Nacional (SD), Secretaría de Marina (SM), Petróleos Mexicanos (PX), and University Hospitals (UH). About 35.4% of respondents attended to up to 50 patients, 26.5% attended to up to 100 patients, 21.1% attended to up to 300 patients, and 17% cared for more than 300 patients. Regarding the time elapsed between diagnosis of the disease and the beginning of treatment, 50.1% of the respondents from public hospitals (IMSS, SSa, and ISSSTE) referred to starting treatment by 5-8 weeks after diagnosis. In contrast, 56% of specialists from State SSa, PX, SD, SM, and University Hospitals began therapy after 1-4 weeks.

Approximately 69.4% of respondents followed the National Comprehensive Cancer Network guidelines for treating patients with cervical cancer. Regarding the resources for the diagnosis of cervical cancer patients, following the International Federation of Gynecology and Obstetrics (FIGO, 2018), 96.2% of the respondents answered that they had computed tomography scan (CT scan), 2.2% had magnetic resonance imaging (MRI), and 1.5% had positron emission tomography (PET) or PET scan. Among the participants with radiotherapy (RT) equipment in their institutions, 76.8% indicated that they had a linear accelerator, 7.8% had a cobalt pump, 13.7% had both, and 0.7% had TomoTherapy. Respondents without RT (39.5 %) or brachytherapy (BT) (44.7 %) equipment referred their patients to other institutions for treatment. Concerning other services necessary for the care of cervical cancer patients, 94.7% had a pathology service; the remaining 5.3% sent samples of patients' tumours to other institutions. Psychology services were available for 71.1% of respondents, psychiatry services for 26.5%, algology services for 68.4%, nutrition services for 67.4%, and thanatology services for 26.9%.

Sixty-nine per cent of the specialists performed open surgery in their institutions, while 19.9% performed laparoscopic surgery combined with open surgery, 7.1% used laparoscopic surgery alone, and 3.2% performed a combination of open and robotic laparoscopic surgery. Forty-seven percent of the specialists indicated that 20% of patients treated with radical hysterectomy received adjuvant RT or chemo-RT (CT-RT) followed by BT. In contrast, 43.6% of respondents indicated that more than 40% of patients received only adjuvant treatment with RT or CT-RT. The supplies for surgical treatment were sufficient in 70.5% of the institutions. The main factor that affected the participants during surgical treatment was the lack of operating room equipment (58.3%).

Most participants (93.5%) from the different public institutions responded that the treatment for locally advanced disease was concomitant CT-RT; the rest used neoadjuvant CT followed by RT (4.5%), RT as a single therapy (1.8%), and neoadjuvant CT with surgery (0.2%). Twenty-four percent of the specialists referred more than 50% of their patients to other hospitals for CT-RT. This situation

was consistent across the four regions. Cisplatin was the most used radio sensitizer regardless of the institution or the region (98.1%). For bulky tumors (stages IB2 and IIA2), the most commonly used treatment was RT or CT-RT (65.4%), followed by complementary hysterectomy (29.2%), surgery (4.5%), and other treatment modalities (0.8%).

According to 89.6% of medical oncologists, first-line therapy for metastatic, persistent, or recurrent advanced disease consisted of cisplatin, carboplatin, or carboplatin combined with paclitaxel. The percentage of patients who received a second-line treatment, according to 55.6% of the oncologists, was < 40%, while that of patients who received three or more lines of treatment was < 20%. Most institutions had cisplatin, paclitaxel, carboplatin, and gemcitabine available. Seventy-three percent of respondents had vinorelbine, 26.4% had topotecan, and 41% had bevacizumab. Regarding treatment adherence, 95.8% of the respondents stated that more than 20% of the patients abandoned the treatment. Oncologists believed that the reasons included financial problems (27.7%), patients' personal decisions (27.7%), treatment toxicity (13.8%), and family decisions (3.2%).

In Mexico, access to cancer treatment, segmentation of the health system, and lack of information on resources for cervical cancer management make it difficult to obtain accurate data. This study allowed for a comprehensive understanding of the characteristics of the infrastructure of different public hospitals in the country, as well as the resources, specialized personnel, supplies, and equipment for diagnosing and treating women with cervical cancer. For treatment success and a better prognosis, including improved life expectancy, patients with this condition should initiate treatment immediately. Half of the respondents answered that the treatment delay in their institutions was 5-8 weeks, and up to 5% reported a delay of more than 13 weeks. Despite recent investments in the health system, resources and infrastructure for the care and treatment of patients with cervical cancer in Mexico remain limited. New public policies should be created and evaluated for the proper diagnosis, prognosis, and treatment of these diseases.

The provision of health services for the uninsured population in Mexico has undergone multiple transformations in recent decades, notably the creation of Seguro Popular in 2003 as part of the Social Protection in Health System (SPSS). This model succeeded in expanding access to essential and high-cost interventions, including cervical cancer diagnosis and treatment, benefiting more than 56 million people. However, starting in 2019, with the creation of the Health Institute for Well-being (INSABI), efforts were made to replace Seguro Popular under a new free care scheme. The lack of operating rules and poor management led to a drastic reduction in coverage, which led to the disappearance of INSABI in 2023.

In response, the decentralized public agency IMSS-BIENESTAR was established to provide comprehensive and free medical care to people without social security. Its implementation was strengthened by the National Agreement for the Federalization of the Health System for Well-being, signed by 23 states. However, the consolidation of this model faces significant challenges, mainly related to chronic underfunding, which has limited the implementation of the Health Care Model for Well-being (MAS-BIENESTAR). This situation perpetuates inequality in access to health services between those with social security and those without.

Since 2018, the Government of Mexico has implemented the Comprehensive Program for the Care of Locally Advanced and Metastatic Cervical Uterine Cancer (MICAELA for its Spanish acronym) through the National Cancer Institute. The MICAELA Program at the National Cancer Institute of Mexico employs a multidisciplinary approach with the objective of providing comprehensive, individualized, and protocolized care to patients, incorporating areas such as medical oncology, nutrition, psycho-oncology, and algology. These actions contribute to improving the therapeutic approach and the

quality of life of patients with cervical cancer. The program included the care of 46,821 patients as of May 2024, as described in Table 2.

Table 2. Number of medical consultations of the MICAELA program in Mexico, 2024

Varibale	2018	2019	2020	2021	2022	2023	2024*	TOTAL
Medical visits	3,861	6,385	8,211	7,630	8,246	8,621	3,867	46,821

These patients received treatment schemes that were developed in accordance with national and international guidelines. These schemes were individualized, taking into account the profile of each patient, including those with and without comorbidities such as renal impairment and/or advanced age. Additionally, women were included in the National Program, which provided free access to innovative and highly specialized drugs.

2. Assessing the potential effectiveness of cervical cancer prevention and control programs

The Cervical Cancer Prevention and Control Program is led by the National Center for Gender Equity and Reproductive Health (CNEGSR for its Spanish acronym) in the Ministry of Health. Based on an analysis of cervical tests conducted by this institution from 2008 to 2011, several issues were identified that hindered the program's adequate performance (National Centre for Gender Equity and Reproductive Health, 2011). This analysis was conducted based on some indicators, such as the prevalence of CIN2+ in cytology samples, the percentage of referrals to colposcopy, the proportion of false negatives in cytological diagnoses of CIN 1, the percentage of biopsies in the colposcopy study, and the percentage of women lost to follow-up in the care algorithm. The five main problems detected, along with a brief description, are presented below.

A low prevalence of CIN2+ was detected in cervical cytology diagnosis in Mexico. The percentage of diagnostic abnormalities identified for cervical intraepithelial neoplasia 1 (CIN 1) or higher was 4%. However, for CIN 2 and above, the frequency of lesion identification was 0.98%.

However, there is a high diagnostic referral to colposcopy in women with CIN1. This was identified due to an enormous referral of CIN1 diagnoses to the colposcopy service when the official Mexican standard established conservative management and surveillance with periodic cytology. Approximately 108,343 women were reported, representing 44.5% of women sent for colposcopy, with consequent saturation of this service.

As previously described in the performance evaluation carried out by the INSP and the CNEGSR, a high proportion of false negatives in cytological diagnoses of CIN1 was identified because 6,351 women with a cytological diagnosis of CIN1, who in theory should not be sent directly to a colposcopy service, had a histopathological diagnosis of CIN2 and higher, including 197 cases of invasive cervical cancer.

Similarly, there is a high proportion of biopsies obtained in colposcopy practice, as 56,200 biopsies were reported, corresponding to 43.3% of women with a diagnosis of CIN1. However, only 11.3% of biopsies in this particular diagnosis detected CIN2 and higher. That is, 1 in 10 biopsies in CIN1 by cytology have high-grade lesions and cervical cancer.

Another problem identified was the high proportion of women who were lost to follow-up. The most serious problem with the cervical cancer prevention and control program in Mexico is the lack of follow-up in women with a diagnosis of CIN2 or higher. There was no evidence of diagnostic evaluation in 49.9% of women with a diagnosis of CIN2, 51% of women with CIN3, and 45.5% of women with a cytologic diagnosis of invasive cervical cancer.

When comparing cervical cytology and HPV testing, the relative sensitivity for identifying invasive cervical cancer of HPV testing compared to cervical cytology testing was 1.47 (95% CI: 1.19,1.82).

During this evaluation period, the Cervical Cancer Prevention and Control Program in Mexico was implemented under the opportunistic coverage model, focusing on women attending health services. Therefore, the conditions for human resources and processes to work to achieve maximum success did not exist, which conditioned the absence of follow-up strategies in women who were positive for screening tests, due to the organizational incapacity of community linkage. There are also no systematized follow-up strategies for screening test-positive women, mainly due to the limited organizational capacity to establish links with the population.

In the same way that an evaluation of the screening program from 2008 to 2011 was conducted, an internal evaluation of the progress and achievements of the objectives of the Specific Action Program for the Prevention and Control of Women's Cancer from 2013 to 2018 was also conducted. The identified objectives of this program were threefold: to increase the co-responsibility of women and men in the prevention and early detection of breast and cervical cancer; to strengthen the detection, follow-up, and timely and quality treatment of breast and cervical cancer cases; and to contribute to the convergence of cancer information systems among the institutions of the National Health System.

The analysis of progress and achievements shows that the screening coverage in the group of 25 to 64 years of age, through detection with cytology and HPV tests in 2012, was 54.9% of women under the responsibility of the Ministry of Health, while in 2017, this coverage increased to 55.6%. For the first half of 2018, 40.3% of women aged 25 to 64 years underwent cytology tests in the group of 25 to 34 years old and molecular tests for the detection of Human Papillomavirus in women aged 35 to 64 years. (Table 3)

Table 3. Coverage of cervical screening tests among women aged 25 to 64 years old, Mexico 2012-2018

Aim: To strengthen the detection, monitoring and timely treatment of cervical cancer

Women (%) from 25 to 64 years with a screening test performed during the last three years

Goal	2012	2013	2014	2015	2016	2017	2018
Estimated	49,0	50.0	54.0	58.0	62.0	66.0	70
Performed	54.9	57.2	54.4	50.6	47.4	55.6	40.3

Source: Ministry of Health

Women aged 25 to 64 years screened for cervical cancer were followed up using colposcopy in those with intraepithelial lesions or cancer. In 2014, the screening coverage was 64.5%, and in 2017, it was 62%. As of the first quarter of 2018, the proportion of women in this age group with intraepithelial lesions or cancer based on colposcopic evaluation was 57.5%.

Table 4. Coverage of colposcopy, Mexico 2014-2018

Aim: To contribute to the convergence of cancer information systems among public institutions

Proportion of women aged 25 to 64 years with the result of intraepithelial lesions or cancer with colposcopy

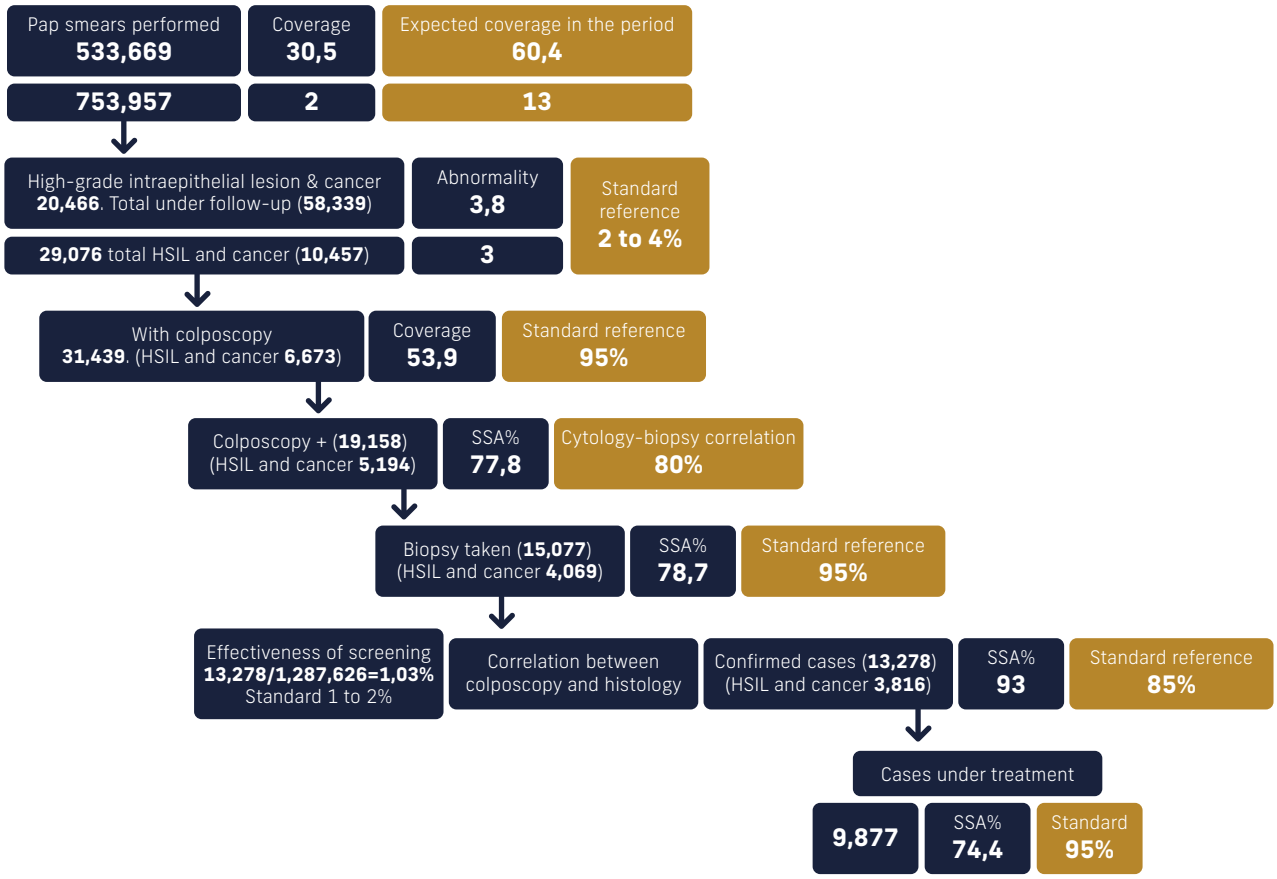
Goal	2014	2015	2016	2017	2018
Estimated	No available	75.0	80.0	85.0	90
Performed	64.5	54.8	65.2	62.0	49.3

Source: Ministry of Health

The effectiveness of the program was evaluated using various indicators, including coverage, concordance, and outcome or impact indicators. The algorithm of care comprises several steps that culminate in the completion of treatment for patients with cervical cancer.

Figure 2 presents the performance achieved through the algorithm of care using exfoliative cytology.

Figure 2. Evaluation of screening with Cytology 25-64 years, Ministry of Health, Mexico



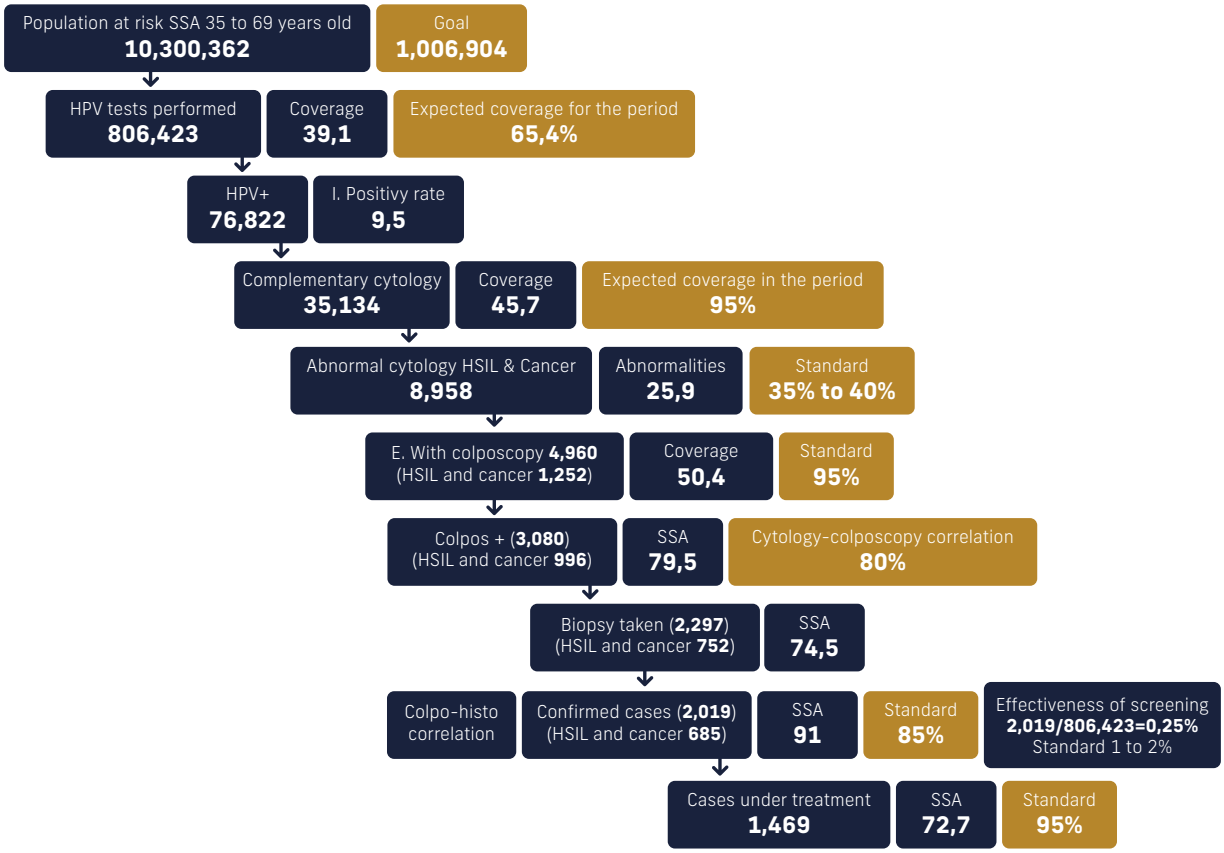
Source: National Center for Gender Equity and Reproductive Health (CNEGySR). Database. [online]: CaCu Information System (SICAM procacu. [Mexico]: Ministry of Health. <http://10.1.251.154/Principal.asp> [Accessed: 24-11- 14]. HSIL refers to High-grade Intraepithelial Lesion

In contrast, the evaluation of the program based on the HPV screening test had the performance shown in the following figure (Figure 3)

The above evaluations account for the lack of performance of the program; that is, the results captured clearly show the ineffectiveness of the program for women entering the care algorithm to achieve access to timely diagnosis and treatment. Given the above, we undertook the task of identifying similar evaluations for the government period from 2018 to 2024; however, no information was published or available to the population. Therefore, to identify the program's performance during this period, we directly consulted federal and local authorities who agreed to share part of their managerial evaluations.

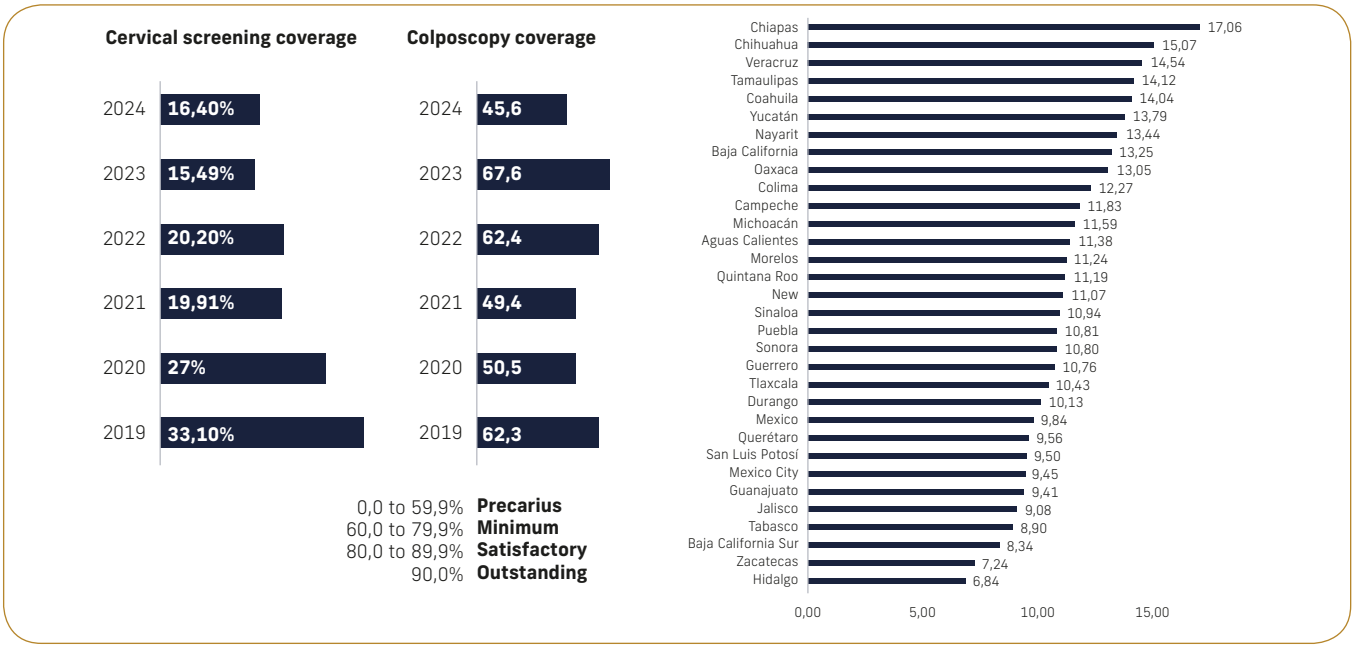
The evaluation of the performance of the cervical cancer screening program during this period indicated a worsening of the indicators. Screening coverage suffered a decrease of 16.7 percentage points from 2018 to 2024, that is, it decreased by 49.5%; worse still, the indicator of coverage with colposcopy to those women positive for precancerous lesions and cancer detected by cytology was found in all years at a level rated from minimal to precarious, as shown in Figure 4 that includes coverage by state.

Figure 3. Evaluation of primary screening with HPV among women aged 25-64, Ministry of Health, Mexico



Source: National Center for Gender Equity and Reproductive Health (CNEGySR). Database. [online]: CaCu Information System (SICAM procacu. [Mexico]: Ministry of Health. <http://10.1.251.154/Principal.asp> [Accessed: 24-11- 14]. HSIL refers to High-grade Intraepithelial Lesion

Figure 4. Performance indicators (coverage) for cervical cancer screening, Mexico 2019-2024.

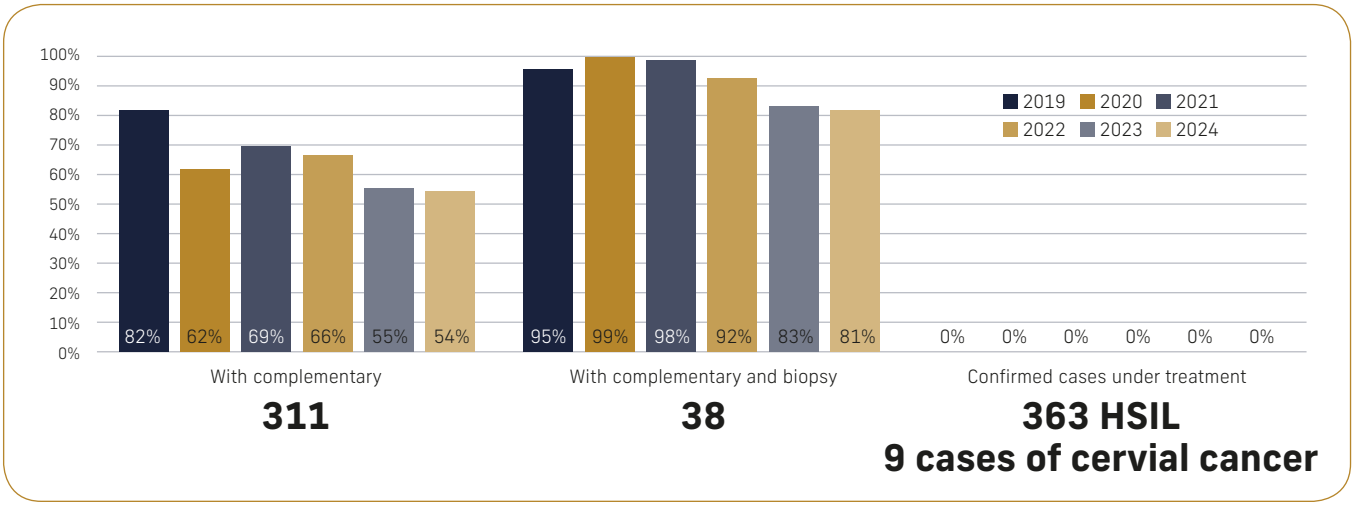


Prepared by CNEGSR using data from the Women's Cancer Information System (SICAM), 2024.

Patients with high-grade intraepithelial lesions who received a diagnostic evaluation by colposcopy as a complementary study were also found to have minimal to precarious levels in 2020; however,

those patients who underwent a biopsy as part of the colposcopic examination were found to have satisfactory to outstanding levels in that period. Notably, the loss of the system for registering cases of cervical cancer in the Ministry of Health did not allow us to identify how many patients with a diagnosis of high-grade squamous intraepithelial lesions or cancer received treatment; therefore, the percentage in all years was zero.

Figure 5. Indicators of follow-up and treatment, Mexico 2018-2024



Source: Prepared internally using data from the Women's Cancer Information System (SICAM), 2024 Third quarter cut-off

Based on these analyses, we identified the need to intervene in the generation of strategies to effectively increase detection coverage, improve the quality of cervical cytology screening and the reading capacity of cytotechnologists and cytologists, increase HPV detection coverage, and ensure that a person with a high-grade intraepithelial lesion, in situ cancer, or invasive cancer has access to treatment and follow-up until discharge.

3. Identify barriers and challenges faced in the implementation of cervical cancer elimination strategies

The implementation of cervical cancer elimination strategies in Mexico faces a series of structural, operational, cultural, technological, and institutional challenges that limit their effectiveness and sustainability. Although substantial advances have been made in recent years, such as the introduction of the HPV molecular test and the implementation of accessible vaccination, efforts remain fragmented, and the goals proposed by the World Health Organization (WHO) still seem distant in the Mexican context.

a. Limited coverage and institutional fragmentation

One of the most persistent and structural barriers to cervical cancer elimination in Mexico is the limited coverage of screening services, particularly in rural, Indigenous communities and regions of high social marginalization. Although screening is one of the most effective strategies for detecting precursor lesions of cervical cancer and preventing its progression, coverage levels in the country are far from the targets set by the World Health Organization (WHO), which proposes reaching at least 90% coverage in women between 35 and 45 years of age as part of its elimination strategy. The most recent data show that only 28.9 % of Mexican women reported having undergone cervical cytology in the last year, according to McClellan et al. (2023), who noted: “coverage remains low, with a 28.9 % one-year prevalence of Pap smear among women aged 20 and older in 2018–2019.” This figure represents a significant gap with respect to international standards and, more worryingly,

reveals profound territorial inequalities: in regions with high marginalization, this proportion can be as low as 12.9 %, suggesting systemic exclusion from prevention services in the most vulnerable areas of the country (National Council for the Evaluation of Social Development Policy, 2022).

The National Health and Nutrition Survey (ENSANUT) has consistently documented that women living in rural, indigenous, or less educated areas have less access to preventive health services, including HPV testing and cytology (National Institute of Public Health, 2022). This situation not only limits timely diagnosis but also perpetuates the unequal burden of cervical cancer, a disease that remains the second leading cause of death from gynecological cancer in Mexico, especially among low-income women.

This limited coverage cannot be understood without considering the institutional fragmentation of the Mexican healthcare system. Mexico operates under a segmented system composed of different subsystems: the Mexican Social Security Institute (IMSS), the Institute of Security and Social Services for State Workers (ISSSTE), the Ministry of Health (SSa), PEMEX the Mexican Oil Company, SEDENA for the military, SEMAR for the navy, and, more recently, IMSS-Bienestar. Each of these systems manages its own clinical protocols, resolution capacity, registry platforms, and financing schemes.

This fragmentation creates a highly disjointed environment where prevention, screening, and treatment policies are not implemented in a homogeneous or coordinated manner. According to the Pan American Health Organization, this lack of integration limits the efficiency of the system, hinders the clinical follow-up of patients, and favors the loss of cases in the different phases of the process (detection, diagnostic confirmation, treatment, and follow-up). Additionally, it prevents the construction of a consolidated national database that would allow the program's performance to be evaluated in a transparent manner and in real-time. (Pan American Health Organization (PAHO), 2022)

This problem is compounded by the fact that different subsystems lack interoperable systems for recording clinical data. For example, a woman who undergoes a screening test in a state clinic may not receive adequate follow-up if she is referred to a hospital in another subsystem because the information is not transferred in an automatic or standardized manner. This contributes to the abandonment of the diagnostic-therapeutic process, generating duplication of efforts, loss of resources, and frustration among patients.

Additionally, there is a lack of homogeneous standards at the national level regarding periodicity, type of tests, and target groups. In some institutions, the use of conventional cytology predominates, while others have begun to implement high-risk HPV testing, which is more sensitive and is recommended as the first-line test by the World Health Organization. (World Health Organization, 2020) This technical disparity, coupled with insufficient training of personnel in marginalized regions, compromises the quality and effectiveness of screening programs.

This situation was further compromised in the post-pandemic context. The collapse of preventive services during 2020 and 2021 led to an unprecedented decline in the number of tests performed. Although INEGI (2021) data do not discriminate by specific type of cancer, a 67.8% reduction in cytologies performed and an 80.5% drop in first-time colposcopies were reported between April and December 2020, reflecting the direct impact of the health emergency on cancer preventive services. (Instituto Nacional de Estadística y Geografía, 2021) This drop, although estimated from general data on oncology services, has been confirmed by various technical analyses by SSA and PAHO, which estimate that the impact on cervical cancer screening was particularly severe, generating a lag of at least two years in many regions.

b. Setback in HPV vaccination coverage

Vaccination against human papillomavirus (HPV) is one of the fundamental pillars of the global strategy for eliminating cervical cancer, as established by the World Health Organization. (World Health Organization, 2020). In Mexico, this component has faced significant setbacks in recent years, seriously compromising the effectiveness of preventive measures.

Until 2019, the National Vaccination Program achieved remarkable coverage; in some school cycles, levels of up to 95% were reported for the first dose of the tetravalent vaccine in girls in fifth grade of primary school or 11 years old, according to official reports from the National Center for Child and Adolescent Health (CeNSIA). (Centro Nacional para la Salud de la Infancia y la Adolescencia CeNSIA, 2019) This trend positioned Mexico as one of the most advanced countries in the region in terms of preventive HPV vaccination.

However, the COVID-19 pandemic profoundly destabilized school-based vaccination schedules, which are the main delivery mechanism for this biologic. According to Cruz-Valdez et al. (2023), national HPV vaccination coverage in Mexico dropped from 95% in 2019 to just 5% in both 2020 and 2021 and further declined to 1% in 2022. This represents a drastic and unprecedented drop in more than a decade. As a result, at least two entire cohorts of adolescent girls were left unprotected, creating a dangerous immunological gap that may lead to a future spike in persistent HPV infections and, eventually, precursor lesions or invasive cases of cervical cancer.

Notably, this problem is not restricted to the impact of the pandemic alone. Since before 2020, problems related to intermittent vaccine supply, uncoordinated planning, and lack of clear operational guidelines had already been reported, leading to partial interruptions in some states and municipalities. In addition, the institutional transition of the health system (from Seguro Popular to INSABI and later to IMSS-Bienestar) weakened the operational capacities of many jurisdictions to implement effective vaccination campaigns, especially in rural and marginalized areas.

Despite recovery efforts initiated between 2022 and 2023, the lack of continuity in federal guidelines and the absence of updated public data have made it difficult to monitor the effective re-establishment of the program. Currently, there is no open national platform that clearly shows the evolution of coverage by year, cohort, and federal entity. This opacity prevents technical evaluation of progress and limits accountability.

In addition, the absence of vaccination schedules targeting key populations, such as out-of-school adolescents, women with HIV, and men who have sex with men (MSM), leaves groups at high risk of persistent HPV infection and progression to cancer without coverage. Although scientific evidence has demonstrated the efficacy of vaccinating these groups (Markowitz et al., 2014), no operational mechanisms or specific budgets have been institutionalized in Mexico for their systematic inclusion.

In this context, various international organizations have expressed concern about the slowdown in HPV vaccination strategies. According to WHO/UNICEF data analyzed in a recent BMJ Medicine study, low- and middle-income countries experienced a drop in average first-dose HPV vaccination coverage from 65% during 2010–2019 to 50% in 2020–2021. In the Americas region, coverage fell from 68% to 51%, with the most dramatic decline observed in Mexico, where national coverage dropped from 94% to just 1%. This alarming fall stands in stark contrast to WHO's global target of achieving 90% coverage for the first dose by 2030.

The 43% coverage reported by ENSANUT 2022 is based on self-reported data, frequently without verification from vaccination records, which may lead to overestimation of actual coverage. In contrast, the 1% figure is derived from official administrative records and reflects the effective decline in vaccination coverage during the pandemic.

c. Loss of clinical follow-up and weaknesses in care

One of the most persistent barriers to cervical cancer elimination in Mexico is the **loss of clinical follow-up** after a positive screening test result, such as a cytology or HPV test. This discontinuity in care severely limits the impact of preventive and therapeutic efforts implemented at the national level.

According to *the Clinical Practice Guidelines for the prevention, detection, diagnosis, treatment, and follow-up of cervical precursor lesions*, less than 50% of **women with abnormal results** reach the colposcopy or diagnostic confirmation stage, and an even lower proportion complete the indicated treatment. (Centro Nacional de Excelencia Tecnológica en Salud CENETEC, 2024) This data is consistent with previous evaluations by the Ministry of Health, which indicate high attrition between sample collection and clinical case closure, due to structural, social, and institutional deficiencies.

d. Structural and geographic causes

Unequal access to resolutive services is one of the leading causes of abandonment in the care pathway. According to the **Catalog of Medical Units of the National Health System (CLUES)** and the information contained in the guide CENETEC 2024, **less than 50% of the country's municipalities have units with the installed capacity to perform colposcopy** or treatments such as cryotherapy or loop electrosurgical excision (LEEP). (Centro Nacional de Excelencia Tecnológica en Salud CENETEC, 2024) This means that a woman with a positive result must, in many cases, travel long distances to access the next level of care, with the consequent economic and logistical costs.

These costs include **transportation, food, and loss of income** due to absence from work or the abandonment of home care activities. In rural and Indigenous areas, this displacement represents an even greater burden, especially when there are no family support networks or institutional programs that guarantee free transportation or medical accompaniment. Although state programs, such as health caravans or referral networks, have attempted to address this need, their coverage and sustainability have been limited. (Secretaría de Salud, 2023).

e. Psychosocial and cultural factors

Another central component of abandonment is the **fear of diagnosis**, social stigma associated with cancer or sexually transmitted diseases, and lack of knowledge of the clinical process. As noted in the *Diagnosis of the Situation of Cervical Cancer in Mexico* published by the General Directorate of Epidemiology, many women do not understand the importance of clinical follow-up, especially if they are asymptomatic. (Dirección General de Epidemiología, 2023) This lack of knowledge may be influenced by low levels of health literacy, lack of informative materials in indigenous languages, or approaches that are not sensitive to the cultural reality of the communities.

In addition, procedures such as colposcopy or biopsy can generate anxiety and embarrassment in contexts where gynecological issues are considered taboo or where women face barriers to medical consultations alone. Institutional care, which can sometimes be unempathetic or based on vertical models, reinforces the distance between patients and the healthcare system.

f. Deficit in human resources and equipment

At the institutional level, there is a significant deficit in **personnel trained in colposcopy, cervical pathology, and outpatient treatment**. The CENETEC 2024 guide acknowledges that many first-level units lack medical personnel trained in resolution procedures, resulting in a reliance on second- or third-level hospitals that are already overburdened. (Centro Nacional de Excelencia Tecnológica en Salud CENETEC, 2024) This saturation produces delays in the scheduling of colposcopies, treatments, or post-therapeutic revisions, increasing the risk of patients abandoning the process.

Likewise, obsolescence **or shortages of equipment** such as colposcopes, electric scalpels, or cryotherapy have been documented, especially in states with low health budgets. According to a CONEVAL analysis, more than 60% of rural health units in Mexico lack the necessary equipment to perform basic gynecological diagnostic procedures. (Consejo Nacional de Evaluación de la Política de Desarrollo Social, 2023).

g. Impact of the Pandemic on Preventive Services

The COVID-19 pandemic represented one of the most severe disruptions in the delivery of essential health services in Mexico's recent history, and its impact on cervical cancer (CaCU) prevention was particularly significant. Between April and December 2020, screening services plummeted: the number of positive Pap smears reported in the country decreased by 67.8%, and the number of first-time colposcopies fell by 80.5%, according to INEGI estimates (2021). (Instituto Nacional de Estadística y Geografía, 2021) These data reflect an almost total interruption of the screening process in the public health system during the most critical months of the health emergency.

This collapse was due to a combination of factors: the reorientation of human and material resources towards the response to the pandemic, the cancellation of non-urgent services, the population's fear of going to health centers, and the suspension of vaccination campaigns and community brigades. In particular, CaCU prevention services were classified as "non-priority" during the emergency, which implied a demobilization of personnel, temporary closure of mobile units, and suspension of community screenings, in many cases for more than a year.

The Ministry of Health reported that, in the first six months of the pandemic, cancer screening tests for women decreased by 73% compared to the same period in the previous year. (Secretaría de Salud, 2021) This decrease was not distributed homogeneously: entities with high marginalization and less installed capacity, such as those in the south and southeast of the country, were the most affected. This situation amplified pre-existing inequalities and deepened territorial gaps in access to preventive services.

In addition to the immediate impact, the pandemic revealed a structural weakness in the Mexican system: its limited resilience to maintain essential services during emergencies. Unlike other countries in the region that established protocols to preserve priority preventive services (as in the case of Uruguay or Chile), Mexico did not adopt coordinated measures to sustain the continuity of programs, such as the CaCU screening program. This lack of strategy resulted in accumulated lags that have not yet been fully redressed, as acknowledged by the National Center for Gender Equity and Reproductive Health (CNEGSR) in its Management Report 2018-2024. (National Center for Gender Equity and Reproductive Health 2024).

A report by the Pan American Health Organization warns that setbacks in screening and vaccination during the pandemic could delay the goals proposed by the WHO for the elimination of cervical cancer as a public health problem by 5 to 10 years. (Pan American Health Organization, 2021) This is

especially worrisome for contexts such as Mexico, where cervical cancer continues to be one of the leading causes of cancer deaths in middle-aged women.

h. Limitations in information management and digital technologies

One of the main obstacles to effective follow-up of cervical cancer in Mexico is the lack of a national interoperable information system that allows patients to be tracked from sample collection to the conclusion of treatment. Fragmentation among subsystems such as IMSS, ISSSTE, the Ministry of Health, PEMEX, and SEDENA has generated isolated records, duplications, and information gaps, making both epidemiological surveillance and public policy evaluation difficult. (Centro Nacional de Equidad de Género y Salud Reproductiva, 2024).

At the operational level, fewer than 40% of first-level units have a functional electronic clinical record, and only a fraction have sufficient digital connectivity to operate in real-time. (National Institute of Public Health, 2022) These limitations are particularly pronounced in rural areas, where access to technology is limited and many records are maintained manually, which complicates the clinical follow-up of women with positive screening results.

Although international evidence shows that digital interventions, such as SMS reminders or calls, can significantly improve participation in screening programs (RR 1.46-1.82), their implementation in Mexico is limited by technological inequality and the lack of national guidelines for their use. (Zhou et al., 2023) This is compounded by a still weak legal infrastructure for the protection of sensitive health data, which hinders the development of joint digital platforms between institutions.

This lack of technological integration also limits the system's accountability. Currently, it is not possible to know precisely how many women with positive tests complete their diagnosis or how much time elapses between each stage of care. This lack of data compromises the effectiveness of preventive programs and underscores the urgency of a national strategy to modernize the reproductive health information system.

i. Disarticulation between national goals and local realities

One of the most relevant challenges for the effective implementation of cervical cancer elimination strategies in Mexico is the lack of articulation between national goals and the actual capacities of the states and municipalities. Although the country has adopted the WHO 's"90-70-90" strategic framework -vaccinate 90% of girls, screen 70% of women, and guarantee treatment for 90% of positive cases–these goals have not been territorialized or adapted according to the epidemiological, budgetary, or logistical context of each state (Centro Nacional de Equidad de Género y Salud Reproductiva, 2024; World Health Organization, 2020).

This disconnect manifests as significant gaps between states in terms of vaccination coverage, screening, and follow-up. For example, data from CONEVAL and ENSANUT show that some entities report cytology or HPV testing coverage below 20%, while others report coverage above 60%, reflecting disparities in resources, personnel capacities, and available infrastructure (Consejo Nacional de Evaluación de la Política de Desarrollo Social, 2023 ; Instituto Nacional de Salud Publica, 2022). Despite these differences, the goals set by the federal government are applied uniformly without a detailed diagnosis to guide their implementation based on local evidence.

Additionally, there is currently no public and updated mechanism to monitor the progress of each state concerning the program's goals. This lack of differentiated follow-up has weakened the planning and evaluation processes at the subnational level.

Institutional disarticulation between the federal, state, and municipal levels has led to duplication, inefficiency in the use of resources, and low accountability. To advance towards the elimination objectives proposed by the WHO, it is essential to establish more flexible planning systems with territorialized indicators and differentiated financing mechanisms that respond to the real conditions of each region in the country.

In conclusion, the elimination of cervical cancer in Mexico faces a series of structural, operational, and social barriers that compromise the fulfillment of the objectives established by the WHO and adopted in the national strategy. From institutional fragmentation and low screening coverage to setbacks in HPV vaccination, loss of clinical follow-up, and technological limitations, each of these obstacles reveals flaws in the planning, execution, and monitoring of public prevention policies.

These challenges are not homogeneous across the country: the gaps in access, infrastructure, and technical capacities among states require more differentiated and contextualized approaches. The lack of articulation between national goals and local realities has hindered the effective implementation of strategies, weakening their expected impact on the most vulnerable communities. In addition, the absence of integrated information platforms limits the possibility of responding in real time to gaps, adapting interventions, and being accountable in a transparent manner.

Despite this complex landscape, there are valuable opportunities. Some innovative interventions, such as HPV self-sampling, the use of mobile technologies, and integrated care models, offer viable solutions if accompanied by political will, sustained investment, and institutional redesign that prioritizes equity. Recognizing and addressing these barriers in a structured manner is an essential step toward eliminating cervical cancer as a public health problem in Mexico.

4. Evaluate the monitoring and evaluation systems in place to track progress and outcomes

Mexico has made sustained efforts to generate information for public health decision-making. Periodic disease reporting began in 1944, one year after the establishment of the Ministry of Health, with the reporting of 14 communicable diseases, including brucellosis, diphtheria, diarrhea, pertussis, tuberculosis, and smallpox. Currently, the General Directorate of Epidemiology is responsible for analyzing and publishing the results in the monthly and bimonthly Epidemiological Bulletin. (Secretaría de Salud, 2021)

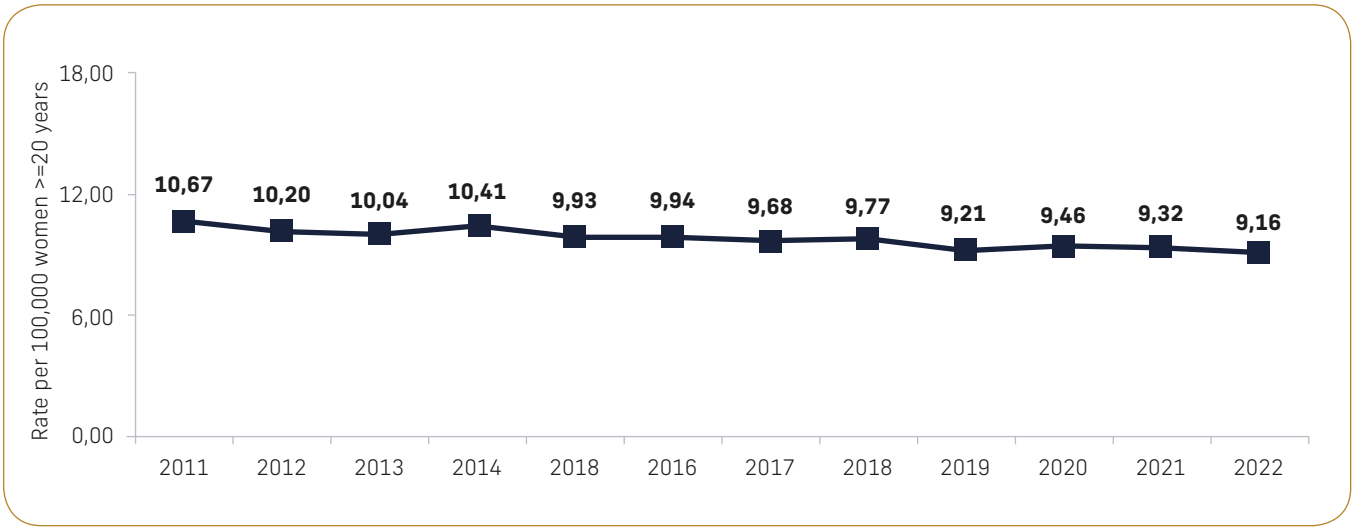
By 1985, with the introduction of computer technologies, the basis for notification of a new format was established with 88 diagnoses belonging to 10 groups of diseases, including chronic diseases such as diabetes mellitus, arterial hypertension, and cancer. In 1995, the Single Information System for Epidemiological Surveillance was implemented with the primary objective of systematizing information on morbidity and mortality of diseases subject to epidemiological surveillance from the Health Sector. This information system is aligned with the Official Mexican Standard NOM-017-SSA-2012 for epidemiological surveillance, as well as with diseases approved by the National Epidemiological Surveillance Committee.

Currently, epidemiological surveillance considers a single notification format to homogenize information in the health sector. Within the 32 states, health units report new cases of disease to health jurisdictions, which validate and send the information to the state level. State authorities concentrate and validate the information before sending it to the General Directorate of Epidemiology. Regarding dysplasias and neoplasias, the information system includes daily reports of probable cases of the following medical conditions: malignant cervical tumor (International Classification of Diseases, ICD- version10, C53), mild and moderate cervical dysplasia (ICD-10 Codes N87.0 and N87.1), severe cervical dysplasia, and cervical cancer *in situ* (ICD-10 Codes N87.2 and D06) (Ministry of Health, 2021).

In terms of hospitalizations, it is possible to identify hospital admissions for neoplasms through databases of admissions coded with ICD-10 codes. Hospital discharges are reported by public institutions of the Health Sector, and open databases are published online, with the disadvantage of not being able to discriminate between incident cases (new cases) and prevalent cases (cases previously diagnosed or under follow-up). It is estimated that approximately 6% of hospital discharges from public hospitals are due to cancer (Reynoso-Noverón et al., 2016).

In terms of mortality, deaths are compulsorily registered through the Epidemiological and Statistical System of Deaths. The source of information is the death certificates issued at the national level, which occurred both in health units and in the community. The following figure shows the cervical cancer mortality rate in Mexico. In the last decade, the mortality rate of cervical cancer in women aged ≥ 20 years in Mexico has decreased. In 2011, the mortality rate was 10 deaths per 100,000 women, which decreased to 9 in 2022. (Figure 6) (General Directorate of Health Information 2025).

Figure 6. Mortality rate (per 100,000) by cervical cancer in Mexico, 2011-2022



Although epidemiological surveillance and death statistics provide information on the behavior of probable cases and deaths due to cervical cancer at the national level, they present important limitations in understanding the individual characteristics, pathological anatomy, and follow-up of the clinical evolution of neoplasia cases. In 1982, the first attempt was made to implement a National Cancer Registry, which in 1993 changed to the Histopathological Registry of Neoplasms in Mexico through the coordination of the General Directorate of Epidemiology and the National Institute of Cancerology in the Ministry of Health together with the Mexican Association of Pathologists. The registry was intended to support the epidemiological surveillance of cancer through the periodic collection of variables from the physician, including data on patients and histopathological characteristics of malignant neoplasms (Macías-Martínez & Kuri-Morales, 1998). In 2016, the figure of the National Cancer Registry was formally constituted in the General Health Law with the participation of ten localities, covering 12.15% of the Mexican population (Brau-Figueroa, 2020). However, complete consolidation has not been achieved because of the fragmentation of the health system in Mexico (Mohar-Betancourt et al., 2017). Currently, in Mexico, there is still a need to integrate a population-based cancer registry that allows the planning and evaluation of cancer control programs with quality indicators that will enable both the estimation of incidence, prevalence, survival, and mortality from different types of neoplasms, as well as the monitoring of information quality indicators such as comparability, completeness, validity, and timeliness. (Leal et al., 2016)

To monitor the Cervical Cancer Prevention and Control program, the National Center for Gender Equity and Reproductive Health created the Women's Cancer Information System (SICAM), which is

designed to record program actions, such as the number of tests and laboratory results of cervical cytology, HPV tests, colposcopies, biopsies, treatment, and follow-up of the target population. (Ministry of Health) The information system has the opportunity to generate quarterly goal tracking indicators at the local, state and national levels. The following table shows the approximate national results for 2022-2023.

Indicator	Approximate result
Screening coverage in women 25-64 years old	40-55%
Positive HPV test with colposcopy performed	70-75%
Time between positive test and confirmatory diagnosis	20-45 days
Complete follow-up (detection → treatment)	< 60% in some entities
HPV vaccination coverage (full schedule)	Significant reduction in 2020-2021

SICAM allows for the systematic measurement of the coverage and quality of the national program, identification of clinical bottlenecks, and evaluation of progress towards cervical uterine cancer elimination goals in Mexico. The main limitations identified were i) variability in registry quality among states, ii) lack of interoperability with other national systems, iii) incomplete clinical follow-up, and iv) possible underreporting of results outside the public system.

5. Provide recommendations for enhancing the effectiveness and sustainability of cervical cancer elimination efforts in Latin America.

As previously mentioned, cervical cancer is one of the main causes of morbidity and mortality due to neoplasms in Mexican women, especially in the context of social, economic, and geographic vulnerability. Despite sustained institutional efforts over the last decades, including vaccination campaigns against human papillomavirus (HPV), timely detection programs, and treatment protocols, structural challenges persist that limit the scope, quality, and equity of interventions, especially in an unstable institutional environment that does not allow the consolidation and continuity of the strategies implemented and therefore prevents seeing results in the long and medium term as required in this issue.

We consider that one of the main problems faced by the cervical cancer program is the lack of "public visibility" it has had in recent years, like practically all women's health issues, which have not been a priority for the Mexican Government, resulting in institutional, operational, governance, budgetary, and evidently corporate and operational weaknesses.

Among the main challenges are the low effective coverage of screening with highly sensitive tests, fragmentation of clinical routes for diagnosis and treatment, territorial disparity in access to specialized services, interruption of vaccination schedules due to logistical and budgetary factors, and lack of integration and interoperability between information systems. Likewise, there is insufficient inter-institutional articulation and limited differentiated follow-up for Indigenous, rural, or extremely poor women, which reproduces gaps in access and health outcomes.

For the preparation of this document, we conducted semi-structured interviews with public health leaders at the state level who were recently in charge of the cervical cancer program in their respective states. The opinion of these individuals stands out in an important way, evidencing an almost total absence of federal leadership, which translates into a lack of operative scope of the program, concomitantly highlighting that historically, the program in Mexico has been a "program of goals" but not a "program of coverage," which significantly limits the expected impact based on the effort made.

They also highlighted the total absence of national coordination and training meetings that would allow for the exchange of ideas, resolution of problems, and outlining of operational routes that would allow for a homogeneous progress of the program.

In this context and based on the World Health Organization's Global Strategy to eliminate cervical cancer as a public health problem, it is essential to strengthen national policies through comprehensive, sustained, and evidence-based actions. The following recommendations seek to guide a more effective, equitable, and sustainable response, with a vision focused on women, human rights, and ensuring universal access to cervical cancer prevention and treatment in Mexico.

a. Expand screening coverage and quality

- Universalize access to high-sensitivity HPV-based screening tests through their mandatory incorporation in first-level health care units, prioritizing highly marginalized municipalities.
- Expanding coverage to at least 70% of the population is necessary to achieve a significant impact.
- Guarantee an adequate triennial periodicity and an automated follow-up system to summon women who have not been screened in a timely manner.
- Gradually replace conventional cytology with HPV testing, especially in women aged > 30 years, in accordance with WHO recommendations. (World Health Organization, 2020)
- Reinforcement of continuous training of personnel in proper sample collection, interpretation of results, sexual health counseling, and management of clinical data.

b. Strengthen HPV vaccination

- Resume and stabilize school campaigns, with coordination between the health and education sectors to reach girls between 9 and 14 years of age with a complete vaccination schedule.
- Design targeted strategies to vaccinate lagging cohorts (young people aged 15–18 years) who did not access the scheme during the pandemic.
- Promote awareness campaigns for parents and guardians to counteract misinformation and increase vaccine acceptance.
- Ensure national supply through multi-year consolidated purchase. (Ministry of Health, 2024; World Health Organization, 2020)

c. Ensure timely access to diagnosis and treatment

- Reduce waiting times between positive tests and confirmatory diagnoses (ideally less than 30 days) by strengthening mobile and fixed colposcopy units. (National Center for Gender Equity and Reproductive Health, 2022)
- Ensure territorial coverage of specific treatments through "tropicalized" strategies by region.
- Guarantee the complementation of the clinical diagnosis and treatment pathway for all screened women who require it.

d. Integrate and strengthen information systems

- Strengthen interoperability between SICAM (Women´s Cancer Information System), SIS (Hospital discharges), SINAVE (National Surveillance system) and state registries, avoiding duplication and loss of information. (General Directorate of Epidemiology, 2022)
- Implement visual dashboards and automated analyses with alerts for cases without timely clinical follow-up.
- Periodically audit the quality of the registries, assign responsible personnel per medical unit, and ensure their training.

- Incorporate gender, indigenous, and regional variables into information systems for intersectional analysis.

e. Address and reduce structural barriers to access

- Strengthen alliances with civil society organizations with experience in community health to strengthen assistance and women's adherence to this type of program. (National Center for Gender Equity and Reproductive Health, 2011)
- Encourage health education and promotion actions in the general population and among health personnel.
- Train and deploy community health workers (promotores/as) as liaisons between the health system and vulnerable populations.

f. Promote financial and inter-institutional sustainability

- Guarantee the allocation of a labeled and multiannual budget for cancer prevention and care programs.
- Promote the participation of the academic sector, NGOs, and international organizations in the program's external evaluation.
- Consolidate inter-institutional technical committees with the participation of IMSS, ISSSTE, IMSS-BIENESTAR, and the State Health Secretariat.

g. Promote effective governance and programmatic coordination to align efforts across institutions and levels of care

- Create a national council for the elimination of cervical cancer with multisectoral participation and a human rights approach.
- Establish clear 2030 targets aligned with the WHO Global Strategy (90-70-90) and public monitoring mechanisms. (World Health Organization, 2020)
- Develop state elimination plans with local adaptations and participatory micro-planning.
- Resume national follow-up, evaluation, and training meetings that have been interrupted due to budgetary issues and have historically been effective for coordination issues.

Conclusion

Elimination of cervical cancer requires sustained political commitment, coordination between levels of government, stable funding, and a woman-centered approach to health care. The actions proposed in this document constitute a strategic roadmap based on technical evidence published in the country, providing valuable suggestions that could be implemented in the medium and long term.

However, given the current public policy conditions, we consider that the cornerstone for a definitive and sustained impulse to increase the effectiveness and efficiency of this program is necessarily to raise the issue to the political priorities of the government in office, which will only be achieved through positive actions from organized civil society, health groups, and, evidently, the requests of women who are the focus of this important public health problem.

References

1. Brau-Figueroa H, P.-P. E. A., Mohar-Betancourt A, (2020). The National Cancer Registry in Mexico: A reality. *Gac Mex Oncol*, *19*, 107-111.
2. National Center for Gender Equity and Reproductive Health. (2011). *Evaluation of the Cervical Cancer Prevention and Control Program in Mexico, 2008-2011. Problemas y Recomendaciones.* Retrieved from [redacted]
3. National Center for Gender Equity and Reproductive Health. (2019). *Cervical Cancer Awareness Week*. Retrieved from [redacted]
4. National Center for Gender Equity and Reproductive Health. (2022). *Women's Cancer Information System (SICAM): National Indicators 2022.* [redacted]
5. National Center for Gender Equity and Reproductive Health. (2024). *Informe de Gestión Gubernamental 2018-2024*. Retrieved from [redacted]
6. National Center of Technological Excellence in Health CENETEC. (2024). *Clinical Practice Guideline: Prevention, detection, diagnosis, treatment and follow-up of cervical precursor lesions*.
7. National Center for Child and Adolescent Health CeNSIA (2019). *Annual immunization report 2018-2019*.
8. National Center for Child and Adolescent Health CeNSIA (2022). *Update of vaccination schedule against Human Papillomavirus (HPV) in girls/female adolescents and in the population of cis and trans women living with HIV*. Retrieved from [redacted]
9. Cetina-Pérez L, L.-M. J., Castro-Eguiluz D, Galicia-Carmona T, Alarcón-Barrios S, Arango-Bravo E, Rivera-Rivera S, Quintero-Beuló G, Gallardo-Rincón MD, Madrid-Marina V, . Resources and management for cervical cancer care are insufficient in public hospitals in Mexico. *Gaceta Medica Oncologia*, *22* . https://doi.org/https://doi.org/10.24875/j.gamo.23000144
10. Consejo Nacional de Evaluacion de la Politica de Desarrollo Social (2023). *Open data on coverage of preventive health services.* Retrieved from [redacted]
11. Consejo Nacional de Evaluación de la Política de Desarrollo Social, C. (2022). *Estadísticas por entidad federativa: acceso a servicios de salud.* Retrieved from [redacted]
12. Consejo Nacional de Evaluación de la Política de Desarrollo Social, C. (2023). *Informe de Infraestructura en Salud para la Atención del Primer Nivel*. Retrieved from [redacted]
13. Cruz-Valdez, A., Palacio-Mejía, L. S., Quezada-Sánchez, L., Sánchez-García, S., & Lazcano-Ponce, E. (2023). *Cervical cancer prevention program in Mexico disrupted due to COVID-19 pandemic: Challenges and opportunities. Frontiers in Oncology, 13*, 1132337. [redacted]
14. General Directorate of Epidemiology (2022). *Sistema Nacional de Vigilancia Epidemiológica (SINAVE): Datos de morbilidad y mortalidad por cáncer cérvico uterino 2022 (National Epidemiological Surveillance System (SINAVE): Morbidity and mortality data for cervical cancer 2022* [redacted]
15. General Directorate of Epidemiology. (2023). *Diagnóstico Situacional del Cáncer Cervicouterino en México.* Retrieved from [redacted]
16. General Directorate of Health Information. (2025). *Defunciones cifras oficiales.* [redacted]
17. Hernández-Avila, M. L.-P., E. C. Alonso de Ruiz, P. López-Carrillo, L. Rojas-Martínez, R. (1994). Evaluation of a program for the early detection of cancer of the uterine cervix in Mexico City. A populational-based epidemiologic study of cases and controls. *Gac Med Mex*, *130*(4), 201-209. (Evaluation of a program for the early detection of cancer of the uterine cervix in Mexico City. A population-based epidemiologic case-control study).
18. Institute for Health Metrics and Evaluation (2021). *Global burden of Disease Study* University of Washington [redacted]

19. National Institute of Statistics and Geography, I. (2021). *Impact of the COVID-19 pandemic on cancer screening services in Mexico*. Retrieved from [redacted]
20. National Institute of Statistics and Geography, I. (2021). *Health services statistics, April-December 2020*. Retrieved from [redacted]
21. National Institute of Public Health. (2022). *Encuesta Nacional de Salud y Nutrición 2022: Resultados nacionales y por entidad federativa.* Retrieved from Encuesta Nacional de Salud y Nutrición 2022: Resultados nacionales y por entidad federativa.
22. Leal, Y. A., Fernández-Garrote, L. M., Mohar-Betancourt, A., & Meneses-García, A. (2016). The importance of registries in cancer control. *Salud Publica Mex*, *58*(2), 309-316. https://doi.org/10.21149/spm.v58i2.7802
23. Macías-Martínez, C. G., & Kuri-Morales, P. (1998). [Results of the histopathologic registration of neoplasms in Mexico 1995]. *Gac Med Mex*, *134* (3), 337-342. (Results of the histopathologic registration of neoplasms in Mexico 1995.)
24. Markowitz, L. E. E., Dunne, E. F., Saraiya, M., Chesson, H. W., Curtis, C. R., Gee, J., Bocchini, J. A., Jr., & Unger, E. R. (2014). Human papillomavirus vaccination: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR Recomm Rep*, *63* (Rr-05), 1-30.
25. McClellan, S. P., UngerSaldaña, K., EspinosaTamez, P., SuazoZepeda, E., Potter, M. B., BarquetMuñoz, S. A., TorresIbarra, L., LamadridFigueroa, H., & Lajous, M. (2023). *The Cervical Cancer Treatment Gap in Mexico Under Seguro Popular, 2006–2016*. *Health Systems & Reform, 9*(1), Article 2272371. [redacted]
26. Mohar-Betancourt, A., Reynoso-Noverón, N., Armas-Texta, D., Gutiérrez-Delgado, C., & Torres-Domínguez, J. A. (2017). Cancer Trends in Mexico: Essential Data for the Creation and Follow-Up of Public Policies. *J Glob Oncol*, *3*(6), 740-748. https://doi.org/10.1200/jgo.2016.007476
27. Mongua-Rodríguez, N. D.-S., G. Ferreira-Guerrero, E. Ferreyra-Reyes, L. Martínez-Hernández, M. Canizales-Quintero, S. Téllez-Vázquez, N. A. García-García, L. (2023). Immunization coverage in children and adolescents in Mexico. *Salud Publica Mex*, *65* , s23-s33. [redacted]org/10.21149/14790
28. Pan American Health Organization (PAHO). (2022). *Sistema de salud en México: diagnóstico de fragmentación y propuestas de integración.* [redacted]
29. Pan American Health Organization (2021). *COVID-19 and cervical cancer screening in the Americas: Quantifying the impact and planning recovery*.
30. Reynoso-Noverón, N., Meneses-García, A., Erazo-Valle, A., Escudero-de Los Ríos, P., Kuri-Morales, P. A., & Mohar-Betancourt, A. (2016). Challenges in the development and implementation of the National Comprehensive Cancer Control Program in Mexico. *Salud Publica Mex*, *58*(2), 325-333. https://doi.org/10.21149/spm.v58i2.7804
31. Secretaría de Salud. *SICAM: Sistema de Información de Cáncer en la Mujer.* [redacted]
32. Secretaría de Salud. (2021). *Sistema de Vigilancia Epidemiológica Convencional*.
33. Secretaría de Salud. (2021). *Informe Anual de Labores 2020-2021*.
34. Secretaría de Salud. (2023). *Second Report of Activities: Programa de Acción Específico Prevención y Control del Cáncer Cervicouterino.* Retrieved from [redacted]
35. Secretaría de Salud. (2024). *Specific Action Program: Prevention and Control of Cancer in Women 2019-2024.* Retrieved from [redacted]
36. Tin, K. N., Ngamjarus, C., Rattanakanokchai, S., Sothornwit, J., Aue-Aungkul, A., Paing, A. K., Pattanittum, P., Jampathong, N., & Lumbiganon, P. (2023). Interventions to increase the uptake of cervical cancer screening in low- and middle-income countries: a systematic review and meta-analysis. *BMC Womens Health*, *23*(1), 120. https://doi.org/10.1186/s12905-023-02265-8
37. Trent, M., Pérez-Soto, R., de Oliveira Nogueira, L., Li, X., Bruni, L., Bielska-Lasota, M., ... & Baussano, I. (2024). *Covid-19 pandemic and equity of global human papillomavirus vaccination: Descriptive study of WHO/UNICEF coverage estimates*. BMJ Medicine, 3(1), e000726. https://doi.org/10.1136/bmjmed-2023-000726

38. World Health Organization (2020). *Global strategy to accelerate the elimination of cervical cancer as a public health problem.* [redacted]
39. Zhou, Y., Tin, S. T., Jamal, A., Vaca López, P., & Del Mar MartínezAlonso, M. (2023). *Effectiveness of digital interventions to increase cervical cancer screening participation: A systematic review and meta-analysis*. *Journal of Medical Internet Research, 25*, e58066. https://doi.org/10.2196/58066

FIU | Robert Stempel College of Public Health & Social Work
Florida International University
Department of Global Health