# Costing the National Response to Cervical Cancer: United Republic of Tanzania, 2020–2024

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**Costing the National Response to Cervical Cancer: United Republic of Tanzania, 2020–2024**



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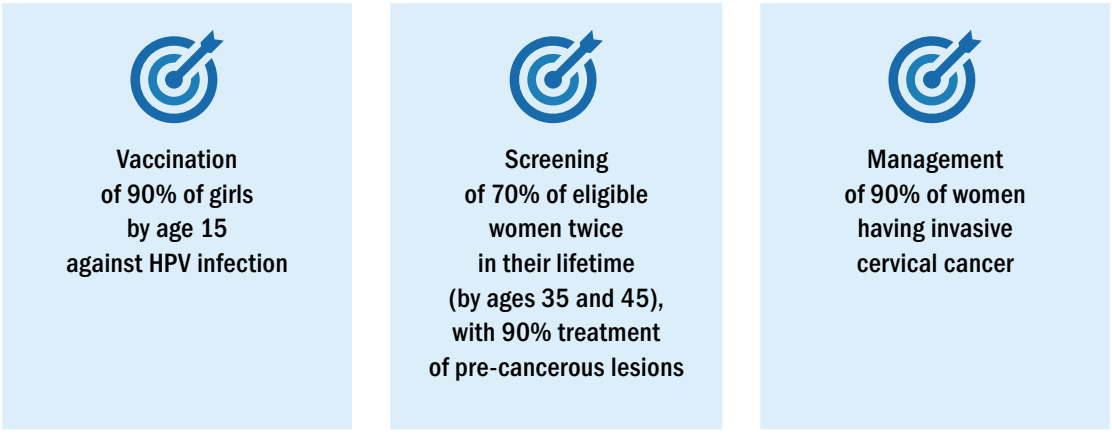
# CONSIDERATIONS FOR PLANNING ELIMINATION OF CERVICAL CANCER AS A PUBLIC HEALTH PROBLEM

This current costing exercise assists in the implementation of the National Response to Cervical Cancer 2020–2024 in Tanzania and supports the development of new plans for the cervical cancer elimination effort. The results reported below illustrate the additional resources and expenditures required for the Response and help inform government planners and programme managers as to its feasibility and affordability. The information may then be extended to help highlight areas of priority in planning the considerable acceleration of service provision that will be needed under a cervical cancer elimination strategy. While the current Response nearly reaches the ambitious vaccination target of the Global Strategy towards Eliminating Cervical Cancer as a Public Health Problem, Tanzania's coverage targets for a future plan might take all the elimination 2030 targets into consideration (Fig. 1).

**Fig. 1.** **Targets of the Global Strategy towards Eliminating Cervical Cancer as a Public Health Problem**




HPV: human papillomavirus.
*Source*: World Health Organization (2020) *(1).*

In the context of future planning for accelerated scale-up of services, several points based on the costing results (summarized below) may be noted.

1. The HPV vaccine is currently subsidized substantially by Gavi in Tanzania and so its full cost (assumed at US$ 4.50 per dose) is included in the economic costs while the financial cost only includes the subsidized cost (US $0.90 per dose) in this report. However, vaccine cost is the largest contributor to the vaccination delivery costs. As Tanzania "graduates" from Gavi support, the difference between the economic and financial costs will close. That is, the portion represented by actual outlays by the government will grow. Nevertheless, primary prevention of cervical cancer through vaccination will remain highly cost-effective for long run health outcomes and health system utilization.

3. We applaud the government plans to expand cancer treatment services nationally by committing to build additional cancer treatment centres to expand access. However, we caution that the costing model does not take into account the substantial cost associated with constructing these new centres. Therefore, the full cost of tertiary prevention is understated.

# BACKGROUND

In 2018 Tanzania had the fourth highest incidence rate of cervical cancer in the world with 59.1 new cases per 100,000 women (age-standardized to the world population) *(2)*. Cervical cancer mortality is also high, with 42.7 deaths per 100,000 (age-standardized to the world population) in 2018 *(2)*. Tanzania's high incidence of cervical cancer is linked to the burden of Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS) in the country, with HIV prevalence of female adults aged 15–49 at 6.0% in 2019 *(3)*.

**Table 1. Overview of cervical cancer disease burden**

| | |
|---|---|
| Cervical Cancer Age-standardized Incidence Rate in 2018[a] | 59.1 per 100,000 women |
| Cervical Cancer Age-standardized Mortality Rate in 2018[a] | 42.7 per 100,000 women |
| HPV types 16 and/or 18 prevalence[b] among women with: | |
| Normal cytology | 3.3% |
| Low-grade cervical lesions | 30% |
| High-grade cervical lesions | 46.9% |
| Cervical cancer | 68% |
| HIV Prevalence (females aged 15–49)[c] | 6.0% |

HPV: human papillomavirus; HIV: human immunodeficiency virus.
*Sources*: [a]International Agency on Research for Cancer (2019) *(2)*. [b]Bruni L, Albero G, Serrano B, Mena M, Gómez D, Muñoz J, Bosch FX, de Sanjosé S (2019) *(4)*. [c]UNAIDS (2020) *(3)*.

Resulting from a collaboration between the Ministry of Health, Community Development, Gender, Elderly and Children of Tanzania and the World Health Organization (WHO), here we provide a summary report of the 5-year (2020–2024) national cervical cancer prevention and control cost estimates. The report is presented from the public provider perspective in terms of financial costs (actual expenditures) and economic costs (financial costs plus value of in-kind resources used for the programme). All costs were calculated using the WHO Cervical Cancer Prevention and Control Costing (C4P) tool *(5)* and are reported in 2018 United States (US) dollars. Technical notes on costing methodology can be found in the Annex.

# INTERVENTIONS

## PRIMARY PREVENTION – HPV Vaccination

Tanzania first introduced the HPV vaccine on a pilot basis in 2014 and to the national routine immunization programme on a national scale in April 2018. The country has demonstrated success in delivering other vaccines through the routine immunization programme, with DTP-3 coverage at 98% in 2018 *(6)*.

Tanzania plans to achieve an overall HPV vaccination coverage rate of 85%, fully immunizing a total of 2.7 million girls aged 14 years over five years. 80% of the target population are enrolled in school and will be vaccinated both through fixed health facilities and schools. The remaining 20% of 14-year-old girls are out-of-school and will be vaccinated through health facilities. Tanzania will achieve this coverage at a financial cost of US $6.38 per fully immunized girl (FIG).

**Table 2. Costing summary of HPV vaccination**

| | 2020 | 2021 | 2022 | 2023 | 2024 | 2020–2024 |
|---|---|---|---|---|---|---|
| Target vaccination coverage | 70% | 72% | 75% | 80% | 85% | N/A |
| Number of FIGs per year | 469,634 | 497,998 | 534,646 | 588,497 | 644,036 | 2,734,810 |
| Financial cost per FIG (US$) with vaccine costs* | 6.38 | 6.38 | 6.38 | 6.38 | 6.38 | 6.38 |
| Economic cost per FIG (US$) with vaccine costs* | 16.84 | 16.84 | 16.84 | 16.84 | 16.84 | 16.84 |

HPV: human papillomavirus; FIG: fully immunized girl.
* Average cost per FIG over 5 years, calculated as (total cost from years 1–5)/(number of FIGs from years 1–5); note that because introduction and capital costs are annualized, the average cost per FIG remains constant over the five years.
*Note:* costs reported in 2018 United States dollars (US$).

## SECONDARY PREVENTION – Screening and Pre-cancer Treatment

11% of women aged 30–50 years were reported being screened with visual inspection with acetic acid (VIA) by December 2018 *(7, 8)*. VIA is the current principle screening modality, although screening services are available in only 136 of 169 districts. Treatment by cryotherapy is offered to eligible

VIA-positive women, and those ineligible for cryotherapy are referred for loop electrosurgical excision procedure (LEEP) or invasive cancer management for suspected cancer cases.

Between 2020 and 2024, Tanzania will increase the number of screening services provided to attain a national coverage rate of 35%. Capacity for screening will be ramped up at the facility level such that 6,447 facilities will be able to provide screening services, up from 624 *(7)*. The eligible population will constitute 15- to 49-year-old HIV-positive women and 30- to 49-year-old HIV-negative women. All eligible HIV-negative women will be screened every five years while HIV-positive women will be screened every three years *(8)*. Women who are treated for pre-cancer will be rescreened in one year *(8)*. The principle screening modality will be VIA with 90–100% of women being screened using this method at a financial cost of US$ 2.89 per service. HPV DNA testing will also be introduced starting in 2020 and be utilized in 1–10% of all screenings at a financial cost of US$ 9.10 per service. The total financial cost of screening is expected to be US$ 28.8 million over the 2020–2024 period, inclusive of annualized equipment costs but exclusive of programme support activities costs.

**Table 3. Costing summary of screening and pre-cancer treatment**

| | 2020 | 2021 | 2022 | 2023 | 2024 | 2020–2024 |
|---|---|---|---|---|---|---|
| Target initial screening coverage | 15% | 20% | 25% | 30% | 35% | N/A |
| Number of screening services provided | 510,313 | 1,093,757 | 1,676,601 | 2,306,164 | 2,940,963 | 8,527,798 |
| Financial cost per screening service provided (US$)* | 2.95 | 3.16 | 3.19 | 3.52 | 3.51 | 3.37 |
| Economic cost per screening service provided (US$)* | 4.53 | 4.71 | 4.75 | 5.04 | 5.03 | 4.91 |
| Number of pre-cancer treatment performed | 13,195 | 27,659 | 42,398 | 56,684 | 72,288 | 212,224 |
| Financial cost per pre-cancer treatment performed (US$)* | 8.77 | 8.63 | 8.55 | 8.67 | 8.58 | 8.62 |
| Economic cost per pre-cancer treatment performed (US$)* | 11.54 | 11.35 | 11.24 | 11.41 | 11.28 | 11.33 |

* Cost per screening service or treatment above is represented as the weighted average cost of the service based on expected distribution of screening or treatment methods.
*Note:* costs reported in 2018 United States dollars (US$).

Pre-cancer treatment includes cryotherapy and LEEP. The majority (92%) of pre-cancer treatments are projected to be cryotherapy with the remaining 8% requiring LEEP. The financial cost per service is US$ 3.57 per cryotherapy treatment and US$ 69.24 per LEEP treatment. The total financial cost of pre-cancer treatment is expected to be US$ 1.8 million over the 2020–2024 period, exclusive of programme support activities costs.

## TERTIARY PREVENTION – Cancer Diagnosis, Treatment and Palliative Care

Tertiary prevention for invasive cancer is currently provided at a few centers in the country: two for radiotherapy and 33 for chemotherapy. Surgical treatment for cervical cancer is not currently available. The country plans to increase the number of sites providing cancer diagnosis from 33 to 91, chemotherapy from 33 to 62, and radiotherapy from two to eight sites by 2023. The cost of building and equipping the additional 68 planned comprehensive centres is not included in these figures. A total of 74,383 services for invasive cancer will be provided over the five years.

**Table 4. Costing summary of cancer diagnosis, treatment and palliative care**

| | Pathology | Chemotherapy | Radiotherapy | Palliative care |
|---|---|---|---|---|
| 5-year target coverage | 100% | 100% | 100% | 100% |
| Number of services provided in 5 years | 122,437 | 19,574 | 23,489 | 31,319 |
| Financial Cost per service (US$) | 88.81 | 292.56 | 856.95 | 20.30 |
| Economic Cost per service (US$) | 94.76 | 574.52 | 974.58 | 21.09 |

*Note:* costs reported in 2018 United States dollars (US$).

## PROGRAMME SUPPORT ACTIVITIES COSTS – Secondary and Tertiary Prevention

Additional programme support activities costs for supporting activities like microplanning, training, social mobilization, and supervision require a financial expenditure of US$ 9.3 million, encompassing screening and treatment of both pre-cancer and cancer.

# COSTING SUMMARY

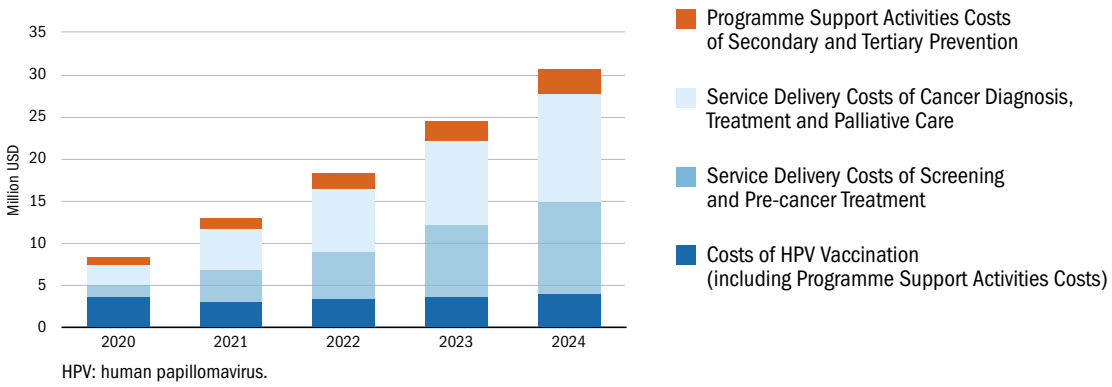
We estimate the total cost of national cervical cancer prevention and control activities in Tanzania for the years 2020–2024 to be at a financial cost of US$ 94.6 million. Of the total, 18% will be for vaccination (including programme support activities cost), 32% for service delivery of screening and pre- cancer treatment, and 40% for service delivery of cancer diagnosis, treatment and palliative care while the remaining 10% will be for programme support activities costs of secondary and tertiary prevention.

**Table 5. Summary of total financial costs of the national response by programme areas and by years**

| Programme Areas | 2020 | 2021 | 2022 | 2023 | 2024 | Total |
|---|---|---|---|---|---|---|
| Costs of HPV Vaccination (including Programme Support Activities Costs) (million US$) | 3.5 | 3.1 | 3.3 | 3.6 | 3.9 | **17.4** |
| Service Delivery Costs of Screening and Pre-cancer Treatment (million US$) | 1.6 | 3.7 | 5.7 | 8.6 | 11.0 | **30.6** |
| Service Delivery Costs of Cancer Diagnosis, Treatment and Palliative Care (million US$) | 2.4 | 4.9 | 7.5 | 9.9 | 12.8 | **37.4** |
| Programme Support Activities Costs of Secondary and Tertiary Prevention (million US$) | 0.9 | 1.2 | 1.9 | 2.4 | 2.8 | **9.2** |
| **Total** | **8.4** | **12.9** | **18.4** | **24.5** | **30.4** | **94.6** |

HPV: human papillomavirus.
*Note:* costs reported in 2018 United States dollars (US$).

**Fig. 2. National response by programme areas over five years (financial cost)**



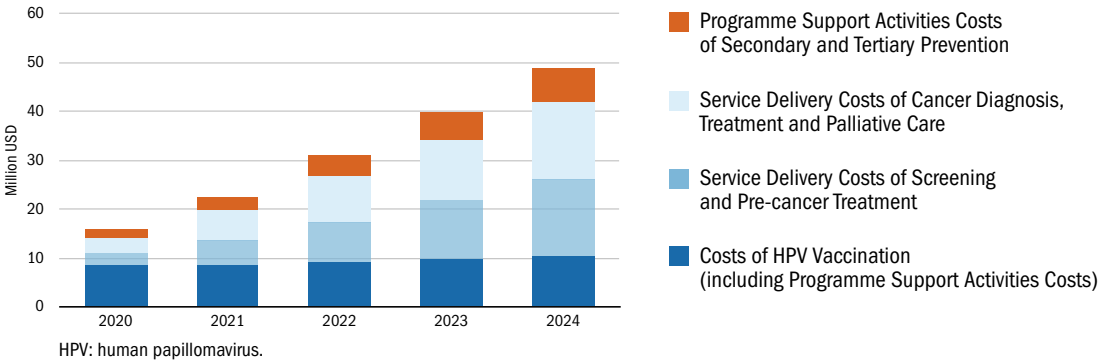

HPV: human papillomavirus.

**Table 6.** Summary of total economic costs of the national response by programme areas and by years

| Programme Areas | 2020 | 2021 | 2022 | 2023 | 2024 | Total |
|---|---|---|---|---|---|---|
| Costs of HPV Vaccination (including Programme Support Activities Costs) (million US$) | 8.5 | 8.4 | 9.0 | 9.7 | 10.5 | **46.1** |
| Service Delivery Costs of Screening and Pre-cancer Treatment (million US$) | 2.5 | 5.4 | 8.4 | 12.2 | 15.6 | **44.3** |
| Service Delivery Costs of Cancer Diagnosis, Treatment and Palliative Care (million US$) | 3.0 | 6.1 | 9.3 | 12.2 | 15.8 | **46.4** |
| Programme Support Activities Costs of Secondary and Tertiary Prevention (million US$) | 2.0 | 2.7 | 4.4 | 5.8 | 6.8 | **21.7** |
| **Total** | **16.0** | **22.7** | **31.1** | **40.0** | **48.7** | **158.5** |

HPV: human papillomavirus.
*Note:* costs reported in 2018 United States dollars (US$).

**Fig. 3.** National response by programme areas over five years (economic cost)




HPV: human papillomavirus.

**Table 7.** Overall summary of Tanzania's National Response to Cervical Cancer, 2020–2024 (five-year totals and averages)

| | |
|---|---|
| **TOTAL COST OVER FIVE YEARS** | |
| **Total financial cost of National Response to Cervical Cancer over five years** | **US$ 94,690,882** |
| **Total economic cost of National Response to Cervical Cancer over five years** | **US$ 158,437,275** |
| **HPV VACCINATION** | |
| Delivery strategy and interventions | Health facility and school-based vaccinations for girls age 14 years |
| Target coverage | 85% |
| Number of FIGs | 2,734,810 |
| Cost per FIG (financial) | US$ 6.38 |
| Cost per FIG (economic) | US$ 16.84 |
| Total cost (financial) | US$ 17,440,247 (including programme support activities costs) |
| Total cost (economic) | US$ 46,061,084 (including programme support activities costs) |
| **SCREENING** | |
| Delivery strategy and interventions | • VIA as primary screening modality. HPV DNA testing as alternative primary screening for up to 10% of screens<br>• VIA for triaging and for determining treatment modality after HPV DNA testing |
| Target coverage | 35% |
| Number of services provided | 665,434 – HPV DNA<br>7,862,364 – VIA (initial and triage screens) |
| Cost per service (financial) | US$ 9.10 – HPV DNA<br>US$ 2.89 – VIA |
| Cost per service (economic) | US$ 9.90 – HPV DNA<br>US$ 4.48 – VIA |
| Total service delivery cost (financial) | US$ 28,777,553 |
| Total service delivery cost (economic) | US$ 41,848,049 |

| PRE-CANCER TREATMENT | |
|---|---|
| Delivery strategy and interventions | • Cryotherapy for women with small lesions<br>• LEEP for women who are ineligible for cryotherapy |
| Target coverage | 100% of all women presenting with lesions |
| Number of services provided | 195,899 – Cryotherapy<br>16,325 – LEEP |
| Cost per service (financial) | US$3.57 – Cryotherapy<br>US$69.24 – LEEP |
| Cost per service (economic) | US$5.23 – Cryotherapy<br>US$84.55 – LEEP |
| Total service delivery cost (financial) | US$ 1,829,200 |
| Total service delivery cost (economic) | US$ 2,404,537 |
| **CANCER DIAGNOSIS, TREATMENT AND PALLIATIVE CARE** | |
| Delivery strategy and interventions | Number of sites providing cancer diagnosis to increase from 33 to 91, chemotherapy from 33 to 62, and radiotherapy from two to eight sites by 2024 |
| Target coverage | 100% of all women in need of services |
| Number of services provided | 196,820 |
| Cost per service (financial) | US$ 88.81 – pathology<br>US$ 292.56 – chemotherapy<br>US$ 856.95 – radiotherapy<br>US$ 20.30 – palliative care |
| Cost per service (economic) | US$ 94.76 – pathology<br>US$ 574.52 – chemotherapy<br>US$ 974.58 – radiotherapy<br>US$ 21.09 – palliative care |
| Total service delivery cost (financial) | US$ 37,364,842 |
| Total service delivery cost (economic) | US$ 46,400,545 |
| **PROGRAMME SUPPORT ACTIVITIES COSTS** | |
| Total programme support activities costs for screening, pre-cancer treatment, and cancer diagnosis, treatment, and palliative care (financial) | US$ 9,279,040 |
| Total programme support activities costs for screening, pre-cancer treatment, and cancer diagnosis, treatment, and palliative care (economic) | US$ 21,723,060 |

FIG: fully immunized girl; HPV: human papillomavirus; DNA: deoxyribonucleic acid; VIA: visual inspection with acetic acid; LEEP: loop electrosurgical excision procedure.
*Note:* costs reported in 2018 United States dollars (US$).

# ASSUMPTIONS AND LIMITATIONS

The analysis presented in this report represents a cost estimate of implementing the 2020–2024 National Response to Cervical Cancer in Tanzania as it was originally conceived, and thus does not take into account current programming activities and their observed costs. The report is not intended to show actual expenditures or capacity but to give broad indications of cost distributions between interventions, patterns of expenditures over a 5-year programme cycle, and to identify possible gaps in planning or programming. For the development of a future cervical cancer control strategy, particularly in regard to scaling-up services to achieve elimination targets, it is advised that a similarly detailed costing study be undertaken with updated inputs for accurate planning.

Local estimates provided from government sources of costs and other inputs were used as much as possible. Key costs were validated at a consultation with members of the Ministry of Health and relevant stakeholders in February and April of 2019. Because the model is from the public provider perspective, patients' costs, such as for travel, lost wages due to screening and treatment or out-of-pocket payments for provider fees or medications, were not included.

Other limitations of the analysis include the assumption that service coverage does not vary across the country, that demand for vaccination and screening and treatment will not decline, and that the projected target populations are correct.

The scope of this analysis is limited to public health system planning of cervical cancer prevention and treatment services and presents an indicative picture of the main resources required to scale-up current programme. However, it does not extend to ancillary services or equipment such as ambulances. Finally, the C4P tool was built as a modeling tool to assist countries with understanding potential costs associated with cervical cancer programming, but as with any model, there is a level of uncertainty inherent in the results, which should be considered as estimates and not exact values. Details on relevant technical aspects of the C4P tool can be found in the Annex of this report.

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# ANNEX

## Technical note on the WHO cervical cancer prevention and control costing methodology

The Cervical Cancer Prevention and Control Costing (C4P) Tool is intended specifically to assist low- and middle-income country programme managers in planning cervical cancer control strategies and approximating the 5-year cost projections of such a comprehensive national cervical cancer programme at country level. The methodology used is a "bottom-up" or "ingredient-based" approach, whereby each additional resource required for the intervention is identified and valued. To the extent possible, country-specific data on resources use and prices are collected and/or expert opinion is used, allowing users to model future strategies of their national cervical cancer programmes.

Costs are presented in two ways:

1. financial terms to assist in analysis of monetary and budgetary flows;
2. economic terms for analysis of sustainability and resource allocation.

Financial costs (sometimes referred to as "bookkeeping costs") are defined here as actual payments or expenditures made to acquire inputs and resources for developing and implementing the national (cervical cancer control) programme. Economic costs include additionally the value of resources that are already in place in the healthcare system and are diverted for the programme. Economic costs also include volunteer time, donations or subsidies provided for programme inputs; that is, expenditures made by parties other than the national government. Thus, economic costs provide a more complete and accurate picture of the resources used by the cervical cancer control programme.

In the C4P Tool a distinction is made between two broad categories of costs:

1. service delivery costs, for direct inputs needed to provide patient services, including staff, supplies, infrastructure and capital costs;
2. programme support activities costs, such as training, microplanning, social mobilization, and supervision, monitoring and evaluation.

Another distinction is annualization versus non-annualization of costs. Annualization is applied to resource items that have a useful "lifetime" of more than one year. This adjustment reflects that although the items may have been paid for in a single year, they are actually used over multiple years. In the service delivery category annualization is applied to both financial and economic costs of infrastructure and equipment without excess capacity and, in the programme support activities category,

to the financial and economic introduction (or set up) costs portion of the individual activities. Recurrent costs of these activities are not annualized; they are simply reported in the year in which they are incurred.

In the case of financial costs, the extent of annualization stops at dividing the financial item cost by its number of years of use or useful life to yield equal annual costs assuming straightline depreciation. However, economic costs require further treatment to reflect the opportunity cost of money, that is, tying it up for inputs for the cervical cancer programme instead of say, investing it. This leads to the concept that having money today is more valuable than having it in the future. To express this, economic costs are discounted, giving less value to costs in the future. To streamline the two aspects of annualization and discounting, the economic item cost is divided by an annualization factor incorporating the number of useful years and the discount rate to yield the annual cost. In this report the useful life of relevant inputs is extended over the five years of the programme and a discount rate of 3% is used, with a resulting annualization factor of 4.58.

All costs were calculated using the version of the C4P Tool that was current in 2019. It should be noted that the C4P is constantly updated to reflect new cervical cancer prevention and screening guidelines, updated input data, and model fixes.

The C4P tool including its manual can be downloaded here: https://www.who.int/immunization/diseases/hpv/cervical_cancer_costing_tool.


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