Costing the National Strategic Plan on Prevention and Control of Cervical Cancer: Nigeria, 2017–2021

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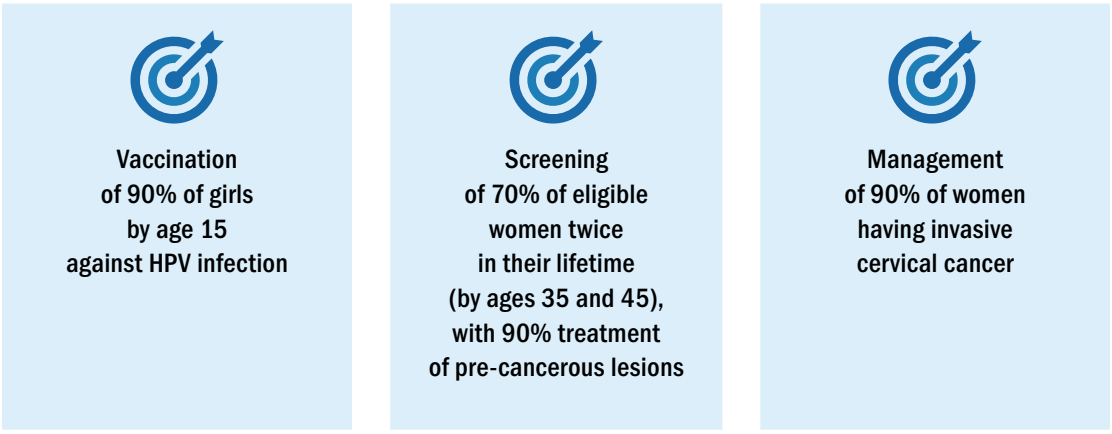
CONSIDERATIONS FOR PLANNING ELIMINATION OF CERVICAL CANCER AS A PUBLIC HEALTH PROBLEM

The expansion of Nigeria's cervical cancer programme under the 2017–2021 National Strategic Plan is to be highly commended. This current costing exercise, which began in 2018, assists in the implementation of the Plan and supports the development of new plans for the cervical cancer elimination effort.

The results reported below illuminate the additional resources and expenditures required under the 2017–2021 Plan and helps inform government planners and programme managers as to its feasibility and affordability. The information may then be extended to help highlight areas of priority attention in planning the considerable acceleration of service provision that will be needed under a cervical cancer elimination strategy. Nigeria's coverage targets for a future Plan might take the 2030 targets of the Global Strategy towards Eliminating Cervical Cancer as a Public Health Problem 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 human papillomavirus (HPV) vaccine is currently fully subsidized by Gavi in Nigeria and so its cost (assumed at US$ 4.50 per dose) is included in the economic costs but not the financial costs in this report. However, vaccine cost is the largest contributor to the vaccination delivery costs. As Nigeria "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, the vaccination investment will continue to constitute a small fraction of the overall cervical cancer programme costs, and primary prevention of cervical cancer through vaccination will remain highly cost effective for long run health outcomes and health system utilization.

2. The vaccination cost per fully immunized girl (FIG) is lower through fixed health facilities than through school or outreach campaigns, and this report reflects an increasing shift towards delivery at fixed facilities and thus decreasing average costs per FIG. To extend the coverage rate of 78%, achieved in year 5, to the 90% of the elimination strategy target, the average cost per FIG may increase as most of the population easiest to reach in the high-volume catchment areas may already have been vaccinated, and outreach and catch-up school campaigns are necessarily implemented, including to low-volume areas.

3. We encourage the Federal Ministry of Health (FMoH) to review the financial and logistical feasibility of the rapid scaling-up of screening and pre-cancer treatment to reach the 80% coverage target set in the 2017–2021 plan, which would meet and even exceed the 2030 global elimination target for screening. While welcoming the ambitious targets, we caution that the current costing model does not take into account additional investment required to build capacity or retrain healthcare workers on new techniques such as HPV DNA testing or the use of thermal ablation to treat pre-cancerous lesions. Costs are therefore understated for this level of scale-up.

4. Similarly, we applaud the government plans to expand cancer treatment services nationally by committing to build an additional 68 cancer treatment centres. However, we caution that the costing model does not take into account the substantial cost associated with constructing these new centres. Therefore, the cost of tertiary prevention is also understated.

5. In line with the target framework expressed by the elimination strategy, the FMoH may consider expressing the expansion of cancer treatment services in terms of coverage so that progress may be more easily evaluated.

BACKGROUND

Cervical cancer is the second most common cancer both among women and in the general population in Nigeria. Of the 14,000 women who develop the disease annually, over half of them will die. In response to this public health problem, the FMoH developed the National Strategic Plan on Prevention and Control of Cervical Cancer 2017–2021. Additionally, the National Cancer Control Plan 2018–2022, which has a strong focus on cervical cancer targeting to screen at least 50% of eligible women, was launched in 2018 *(2)*. To operationalize these plans, the Government for the first time allocated funding to screen 200,000 women nationally. Furthermore, the FMoH is equipping seven teaching hospitals to be able to manage cancer cases, including cervical cancer, comprehensively *(3)*.

Table 1. Overview of cervical cancer disease burden

Cervical Cancer Age-standardized Incidence Rate in 2018[a]	27.2 per 100,000 women
Cervical Cancer Age-standardized Mortality Rate in 2018[a]	20.0 per 100,000 women
HPV Prevalence in adult women*	10.2–43.5%
HIV Prevalence (females aged 15–49)[b]	1.8%

HPV: human papillomavirus; HIV: human immunodeficiency virus.
* HPV prevalence rates have been reported from several small studies with varying populations; the full list of studies can be found in the HPV Information Centre report on Nigeria *(6)*.
Sources: [a]International Agency on Research for Cancer (2018) *(4)*. [b]UNAIDS (2020) *(5)*.

Resulting from a collaboration between the Nigeria FMoH and the World Health Organization (WHO), here we provide a summary report of the cost of Nigeria's 5-year National Strategic Plan on Prevention and Control of Cervical Cancer (2017–2021). The report is presented from the public provider perspective in terms of financial costs (actual expenditures) and economic costs (financial costs plus monetary value of resources used for the programme). All costs were calculated using the WHO Cervical Cancer Prevention and Control Costing (C4P) tool *(7)* and are reported in 2018 US dollars. Technical notes on costing methodology can be found in the Annex.

INTERVENTIONS

PRIMARY PREVENTION – HPV Vaccination

Vaccination for HPV has not been included in the routine immunization programme in Nigeria. Nigeria has a special Gavi support plan for the next 10 years that may support HPV vaccine introduction. With DTP-3 official coverage at 58% in 2018 *(8)*, opportunities exist to leverage the existing immunization system and strong cultural acceptance of vaccination to expand HPV vaccination coverage.

To substantially improve the coverage rate, Nigeria plans to leverage high-volume catchment areas to provide two doses of quadrivalent HPV vaccine to girls aged 9 to 13 years in the first year and routinely vaccinate 9-year-old girls from the second year. Half of the vaccinations will be conducted through school programmes while outreach campaigns and health facility vaccinations will make up the remaining 50% in the first 3 years. Health facilities will take on increasing prominence in service provision from 20% to 50% in the first 5 years, while the proportion of vaccinations delivered through outreach campaigns will decrease from 30% to 10%. It is anticipated that in the fifth year, an annual coverage of 78% will be achieved equating to a total of 4.5 million FIGs over the 5-year period. Over the same period a financial cost of US$ 18.1 million will be required to introduce and roll out HPV vaccines (including programme support activities costs). The financial cost to fully immunize a girl over this 5-year period will be US$ 3.98.

Table 2. Costing summary of HPV vaccination

	2017	2018	2019	2020	2021	2017–2021
Target vaccination coverage	2%	10%	29%	49%	78%	N/A
Number of FIGs per year	223,305	230,451	736,308	1,266,450	2,091,163	4,547,678
Financial cost per FIG (US$)	44.54	2.03	2.10	1.84	1.82	3.98*
Economic cost per FIG (US$)	57.80	11.89	13.47	12.59	12.51	14.88*

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

SECONDARY PREVENTION – Screening and Pre-cancer Treatment

Screening rates in Nigeria are very low, with less than 10% of women in the general population ever having been screened *(5).* In a bid to improve awareness and create demand for early diagnosis, the FMoH has engaged in extensive social mobilization and awareness campaigns throughout the country in many languages and across different communities.

In the cervical cancer strategic plan, the government plans to screen every HIV-negative woman aged 30 to 49 years at an interval of five years and every HIV-positive woman aged 20 to 49 years at an interval of three years. Women treated for pre-cancer or cancer will be re-screened, if eligible, after one year regardless of their HIV status. The FMoH will achieve 80% screening coverage by year 5 primarily through HPV DNA testing (97%) at a financial cost of US$ 36 per service. Visual inspection with acetic acid (VIA), at a financial cost of US$ 13 per service, will complement HPV DNA testing to determine the presence and/or extent of lesions, and colposcopy will be available for managing more complex cases. Given the logistical complexities of cryotherapy, the country proposes to adopt thermal ablation as the principal treatment modality for same-day treatment of women with small lesions at a financial cost of US$ 3.50 per service. Cases that are more complex will be managed with loop electrosurgical excision procedure (LEEP) at a financial cost of US$ 107 per service. Over the first five years, a financial cost of US$ 919 million will be needed to provide 24.8 million screening services and 2.2 million pre-cancer treatments. These costs are exclusive of programme support activities costs.

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

	2017	2018	2019	2020	2021	2017–2021
Target initial screening coverage	20%	40%	60%	70%	80%	N/A
Number of screening services provided	3.95m	7.00m	7.03m	4.34m	2.54m	24.87m
Financial cost per screening service provided (US$)*	35.21	34.96	34.96	35.16	35.52	35.09
Economic cost per screening service provided (US$)*	80.06	79.79	79.78	80.00	80.40	79.93
Number of pre-cancer treatment performed	359,626	624,074	626,289	421,729	231,738	2.26m
Financial cost per pre-cancer treatment performed (US$)*	23.17	16.62	16.56	24.59	30.37	20.54
Economic cost per pre-cancer treatment performed (US$)*	53.30	46.55	46.50	54.14	60.94	50.50

* 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$).

TERTIARY PREVENTION – Cancer Diagnosis, Treatment and Palliative Care

In Nigeria, there are currently 9 comprehensive cancer centres providing a full complement of pathology, radiotherapy, surgery and chemotherapy services, and the country plans to scale these up to a total of 77 by 2021. Women suspected to have invasive cancer will be referred to higher levels of care or to more specialized care within the same facility. A total financial cost of US$ 59 million will be required for tertiary prevention: US$ 7 million to provide 634,260 diagnostic services, US$ 53 million to provide 268,603 treatment services for invasive cancer, and US$ 970 to provide 6,587 palliative care. The cost of building and equipping the additional 68 planned comprehensive centres and the programme support activities are not included in these figures.

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

	Pathology	Surgery	Chemo-therapy	Radio-therapy	Palliative care
5-year target coverage	100%	100%	100%	100%	100%
Number of services provided in 5 years	634,260	30,821	154,209	83,573	6,587
Financial Cost per service (US$)	10.51	63.17	146.89	335.44	0.15
Economic Cost per service (US$)	44.73	64.13	281.50	758.88	212.06

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

PROGRAMME SUPPORT ACTIVITIES COSTS – Secondary and Tertiary Prevention

Additional costs for programme support activities like microplanning, training, social mobilization, communication, supervision, monitoring and evaluation encompassing screening and treatment of both pre-cancer and cancer will require a financial cost of US$ 21 million.

COSTING SUMMARY

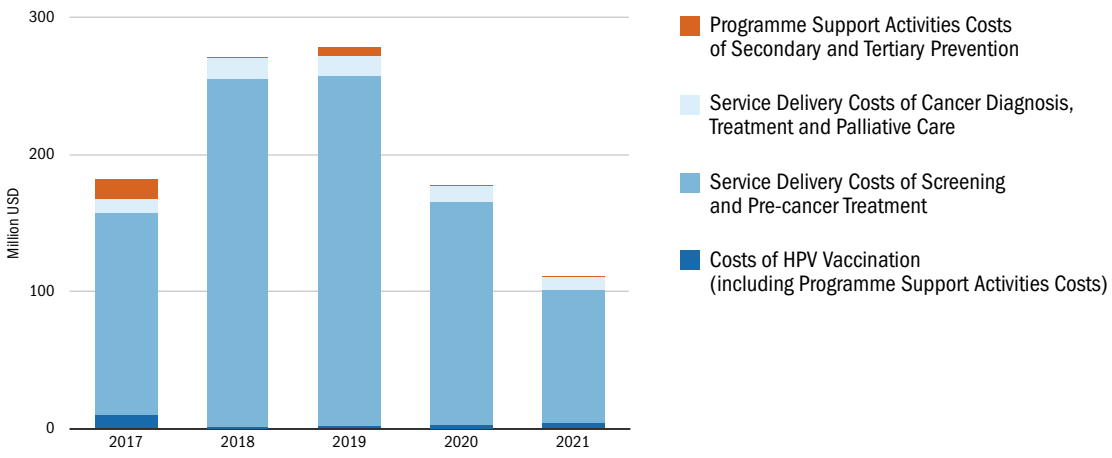
We estimate the National Strategic Plan on Prevention and Control of Cervical Cancer in Nigeria for the years 2017–2021 to be implemented at a financial cost of US$ 1.017 billion. Of the total estimated cost, 2% will be for vaccination (including programme support activities costs), 90% for service delivery of screening and pre-cancer treatment, and 6% for service delivery of cancer diagnosis, treatment and palliative care while the remaining 2% 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	2017	2018	2019	2020	2021	Total
Costs of HPV Vaccination (including Programme Support Activities Costs) (million US$)	9.9	0.5	1.5	2.3	3.8	**18.1**
Service Delivery Costs of Screening and Pre-cancer Treatment (million US$)	147.5	255.3	256.3	163.0	97.3	**919.4**
Service Delivery Costs of Cancer Diagnosis, Treatment and Palliative Care (million US$)	10.6	14.4	14.5	11.1	8.8	**59.3**
Programme Support Activities Costs of Secondary and Tertiary Prevention (million US$)	13.9	0.1	6.5	0.1	0.1	**20.7**
Total	**181.9**	**270.3**	**278.8**	**176.6**	**110.0**	**1017.5**

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

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



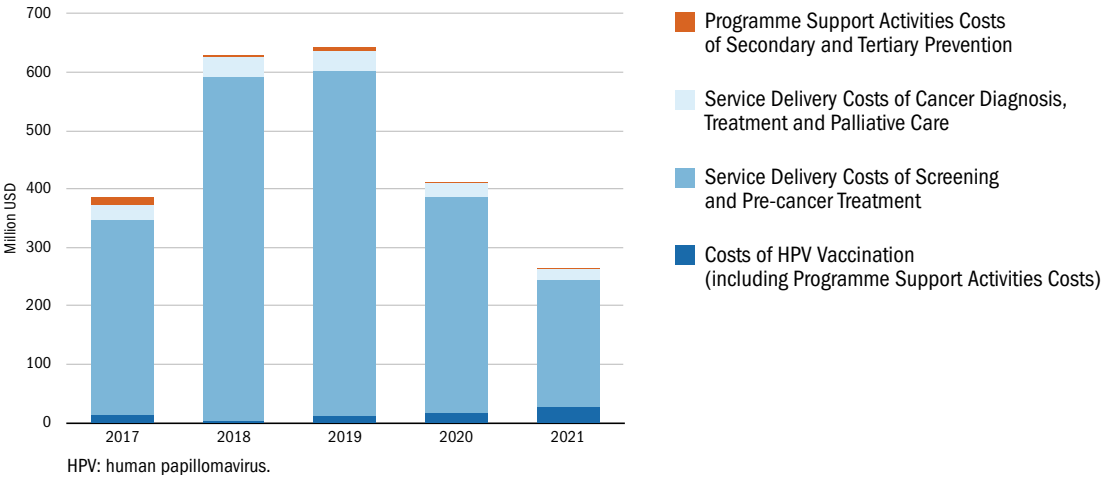
HPV: human papillomavirus.

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

	2017	2018	2019	2020	2021	Total
Costs of HPV Vaccination (including Programme Support Activities Costs) (million US$)	12.9	2.7	9.9	15.9	26.2	**67.7**
Service Delivery Costs of Screening and Pre-cancer Treatment (million US$)	335.5	587.9	590.3	370.2	218.3	**2102.3**
Service Delivery Costs of Cancer Diagnosis, Treatment and Palliative Care (million US$)	23.3	36.4	36.6	25.0	17.3	**138.6**
Programme Support Activities Costs of Secondary and Tertiary Prevention (million US$)	14.3	0.1	6.7	0.1	0.1	**21.4**
Total	**386.1**	**627.2**	**643.5**	**411.3**	**261.9**	**2330.0**

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 Nigeria's National Strategic Plan on Prevention and Control of Cervical Cancer, 2017–2021 (five-year totals and averages)

TOTAL COST OVER FIVE YEARS	
Total financial cost of National Strategic Plan over five years	**US$ 1,017,481,645**
Total economic cost of National Strategic Plan over five years	**US$ 2,329,995,713**
HPV VACCINATION	
Delivery strategy and interventions	• Administration of a 2-dose vaccine to be delivered to 9 to 13-year-old girls in the first year and 9-year-old girls from the second year • 50% of girls to be vaccinated at schools in the first year, others to be vaccinated at outreaches or health facilities
Target coverage	78%
Number of FIGs	4,547,678
Cost per FIG (financial)	US$ 3.98
Cost per FIG (economic)	US$ 14.88
Total cost (financial)	US$ 18,105,758 (including programme support activities costs)
Total cost (economic)	US$ 67,681,025 (including programme support activities costs)
SCREENING	
Delivery strategy and interventions	• HPV DNA as primary screening test • VIA used for triaging and determining treatment modality • 2,417 health facilities providing screening services
Target coverage	80%
Number of services provided	24,002,597 – HPV DNA 870,570 – VIA
Cost per service (financial)	US$ 35.90 – HPV DNA US$ 12.78 – VIA
Cost per service (economic)	US$ 81.67 – HPV DNA US$ 31.83 – VIA
Total service delivery cost (financial)	US$ 872,852,387 (excluding programme support activities costs)
Total service delivery cost (economic)	US$ 1,998,070,776 (excluding programme support activities costs)

PRE-CANCER TREATMENT	
Delivery strategy and interventions	• 2,417 health facilities providing thermal ablation • 900 health facilities providing LEEP
Target coverage	80%
Number of services provided	1,890,358 – Thermal ablation 373,098 – LEEP
Cost per service (financial)	US$ 3.49 – Thermal ablation US$ 106.90 – LEEP
Cost per service (economic)	US$ 34.54 – Thermal ablation US$ 131.33 – LEEP
Total service delivery cost (financial)	US$ 46,486,320 (excluding programme support activities costs)
Total service delivery cost (economic)	US$ 114,299,640 (excluding programme support activities costs)
CANCER DIAGNOSIS, TREATMENT AND PALLIATIVE CARE	
Delivery strategy and interventions	77 health facilities providing comprehensive cancer care by 2021
Target coverage	100% of all women in need
Number of services provided	909,450
Cost per service (financial)	US$ 10.51 – pathology US$ 63.17 – surgery US$ 146.89 – chemotherapy US$ 335.44 – radiotherapy US$ 0.15 – palliative care
Cost per service (economic)	US$ 44.73 – pathology US$ 64.13 – surgery US$ 281.50 – chemotherapy US$ 758.88 – radiotherapy US$ 212.06 – palliative care
Total service delivery cost (financial)	US$ 59,300,036 (excluding programme support activities costs)
Total service delivery cost (economic)	US$ 138,575,861 (excluding programme support activities costs)

PROGRAMME SUPPORT ACTIVITIES COSTS	
Total programme support activities costs for screening, pre-cancer treatment, and cancer diagnosis, treatment, and palliative care (financial)	US$ 20,737,143
Total programme support activities costs for screening, pre-cancer treatment, and cancer diagnosis, treatment, and palliative care (economic)	US$ 21,368,410

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 2017–2021 Plan in Nigeria as it was then 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. In developing a new cervical cancer control strategy, particularly in regards to scaling-up services to achieve elimination targets, it is advised that a more detailed, comprehensive micro-costing study be undertaken.

Local estimates of costs and other inputs provided from government sources were used as much as possible, but some estimates rely on older data or comparable estimates from other countries or global sources when more current local figures were not available. Key costs were validated at a consultation with members of the FMoH and relevant stakeholders in July 2018. Because the the model is from the health system 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.

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 programming. However, it does not extend to ancillary services or equipment such as ambulances. Finally, the C4P 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 2018. 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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