

Cost and operational context of HPV vaccine delivery to a multi-age cohort of adolescent girls in Ethiopia

In Ethiopia, cervical cancer ranks as the second most frequent cancer among women and is the second leading cause of cancer deaths. The age-standardized cervical cancer incidence rate for Ethiopia was estimated at 22.3 per 100,000 women, and there are approximately 8,168 new cervical cases each year.¹ Human papillomavirus (HPV) vaccines are recommended by the World Health Organization (WHO) for inclusion in all national immunization programs as part of a comprehensive cervical cancer prevention strategy. In 2022, WHO endorsed a single dose HPV vaccination regimen based on high-quality evidence of its efficacy and duration of protection compared to multiple doses. Ethiopia introduced the HPV vaccine in 2018 as a two-dose regimen and switched to a single-dose regimen in 2024, vaccinating a multi-age cohort of 9- to 14-year-old girls.

To understand the implications of this new vaccine regimen, the Federal Ministry of Health and PATH conducted a study to evaluate the delivery costs and describe the operational context of administering a single-dose HPV vaccine regimen to a multi-age cohort of adolescent girls.

HPV vaccination in Ethiopia and prior delivery cost estimates

Ethiopia introduced the HPV vaccine nationally in December 2018 as a two-dose regimen administered to 14-year-old girls. As part of the switch to a single-dose regimen, the country conducted a multi-age cohort (MAC) vaccination campaign in November 2024, vaccinating girls aged 9 to 14 years.

A prior costing study in Ethiopia² evaluated the two-dose HPV vaccine regimen, estimating the average financial cost per dose for vaccine delivery as US\$2.23 and the economic cost as US\$7.19 in 2019 US\$, excluding the cost of vaccines. This is equivalent to \$2.74 and \$8.84, respectively, per dose in 2024 US\$, or \$5.49 in financial costs and \$17.69 in economic cost per child receiving the full two-dose regimen.

Study methods

This cross-sectional retrospective study aimed to evaluate the costs and operational context of HPV vaccine delivery during the MAC campaign. The study comprised two components:

- The costing component aimed to identify, quantify, and value the resources used for HPV vaccination program activities using an ingredients-based micro-costing methodology. Both financial costs and economic costs borne by the health system were estimated.
- The operations research component aimed to quantify and describe the MAC campaign implementation, assessing what was done, how often, with what intensity, and by whom.

Overall, the study evaluated 11 HPV vaccine program activities: vaccine procurement, estimating demand, program planning and management, social mobilization and advocacy, training, vaccine distribution and storage, service delivery, supervision, record keeping, waste management, and crisis management. Data were collected at health facilities (health centers and health posts) through interviews with immunization program staff and extraction of dose data from campaign reports. Interviews were also conducted at the woreda,

Key study findings



- ◇ Multiple delivery settings were used to conduct HPV vaccination sessions during the MAC campaign, with staff from 90 percent of health facilities in the study sample conducting sessions at schools and 73 percent conducting sessions at outreach locations.
- ◇ The estimated delivery cost per dose for the HPV vaccine across all levels of the health system was **US\$0.66** for financial costs and **US\$1.67** for economic costs, excluding the cost of vaccines and supplies.
- ◇ There was very little integration of HPV vaccine program activities with other health interventions during the MAC campaign.
- ◇ At administrative levels, financial costs accounted for at least 52 percent of economic costs, while at the health facility level, they represented only 21 percent.
- ◇ The switch to a single-dose HPV vaccination regimen delivered to a MAC resulted in substantial cost reductions per fully vaccinated girl, compared to the two-dose regimen administered to a single-age cohort.

Financial costs include expenditures/monetary outlays for the HPV vaccination program activities conducted. Opportunity costs account for the use of existing resources. Economic costs are the sum of financial and opportunity costs.

subcity/zone/town administration, region, and national levels. Health facilities included in the study were randomly selected from four purposively selected regions (Addis, Afar, Amhara, and Somali). The study included 82 health facilities, as well as 16 woreda, 12 subcity/zone/town administration, 4 regional health bureau, and the national health program offices.

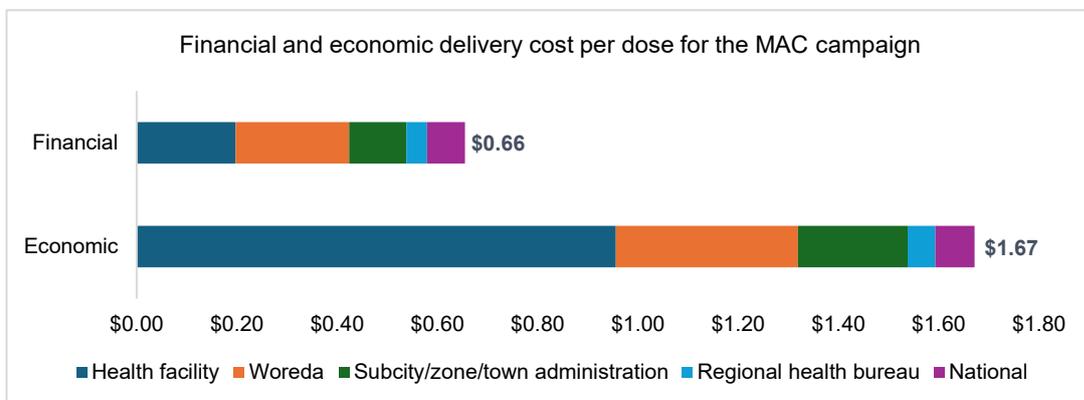
Operational research data were tabulated to describe program activities for HPV vaccinations conducted at each level of the health system. Data extracted from vaccination campaign reports at health facilities were analyzed to tabulate the location of vaccination services and doses administered. Doses delivered by administrative levels were obtained from secondary data at the national level based on aggregated campaign reports. The costing analysis estimated the costs by health system level. All costs are reported in 2024 US\$ and represent the HPV vaccination program cost for the MAC campaign, referred to as HPV vaccine delivery costs. All cost estimates exclude the cost of vaccines and supplies.

Findings on operational context and costs

The study³ found that for service delivery of the HPV vaccine, Ethiopia used a mixed delivery strategy that leveraged school and outreach locations. Staff from 90 percent of the health facilities in our study sample vaccinated in schools and staff from 73 percent of health facilities vaccinated at outreach locations. Each health facility in our sample delivered an average of 910 HPV vaccine doses. Nationally, over 7 million doses were administered.

Among the other activities evaluated, most health facilities and administrative offices conducted program planning, social mobilization, and training, but their intensity differed by health system level. The existing cold chain capacity was adequate for the MAC campaign, and there was very little integration of HPV vaccination program activities with other health interventions during the campaign.

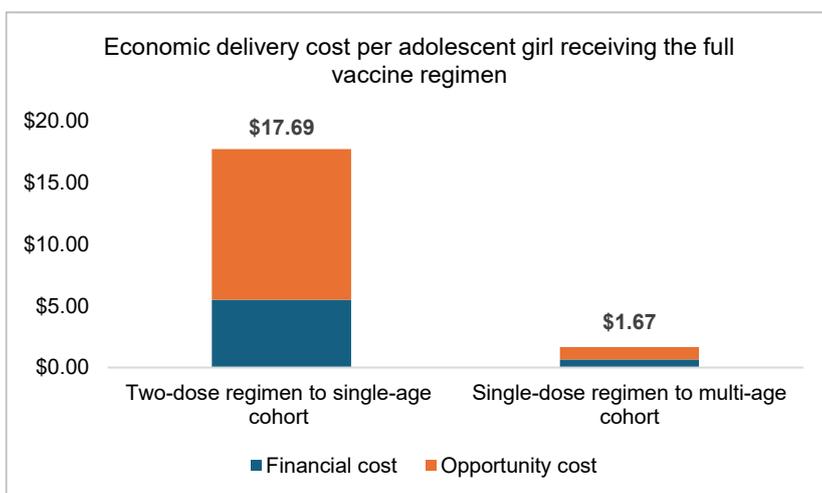
In the study sample, Ethiopia's estimated financial cost per dose for HPV vaccine delivery aggregated across all levels of the health system was **\$0.66**, and the economic cost per dose was **\$1.67**, excluding the cost of vaccines and supplies. For a single-dose regimen, the cost per dose is the same as the cost per adolescent girl receiving the full vaccine regimen.



At the health facility level, opportunity costs of using existing resources accounted for 79 percent of aggregated economic costs. These were mainly time costs for health workers and non-health workers (i.e., school staff and community stakeholders) involved in the campaign. At administrative levels, financial costs accounted for at least 52 percent of economic costs. The types of financial costs differed by level of the health system, with per diems most prevalent at subnational administrative levels.

Comparison of delivery costs: Administering a two-dose regimen to a single-age cohort versus a single-dose regimen to a multi-age cohort

The shift to a single-dose regimen delivered to a MAC resulted in substantial cost reductions. Compared to a two-dose regimen delivered to a single-age cohort, as estimated in the prior study, there was an 88 percent reduction in financial costs, a 92 percent reduction in opportunity costs, and a resulting **91 percent** reduction in economic costs. Switching to a single-dose HPV vaccination regimen and vaccinating multi-age cohorts may be a way for HPV vaccination programs to reduce delivery costs and enhance sustainability.



¹Global Cancer Observatory. Ethiopia page. <https://gco.iarc.fr/today/data/factsheets/populations/231-ethiopia-factsheets.pdf>. Accessed August 15, 2025.

²Mvundura M, Slavkovsky R, Debellut F, et al. Cost and operational context for national human papillomavirus (HPV) vaccine delivery in six low- and middle-income countries. *Vaccine*. 2023;41(49):7435–7443.

³ Mvundura M, Slavkovsky R, Dagne B, et al. Evaluating the delivery costs and operational context of a single-dose human papillomavirus (HPV) vaccine regimen administered to a multi-age cohort of adolescent girls in Ethiopia. *Vaccine*. 2026;75:128248. <https://doi.org/10.1016/j.vaccine.2026.128248>.