

Does a single-dose HPV vaccine regimen deliver program cost savings? Real-world evidence from Ethiopia

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Background

- As external funding for public health programs declines, the recently recommended single-dose regimen for human papillomavirus (HPV) vaccine creates opportunities for lowering procurement and delivery costs. Additional program advantages may include simplified logistics and increased coverage, but real-world evidence is lacking.
- Previous research has focused largely on estimating the delivery costs of two- or three-dose regimens during HPV vaccine introduction or in routinized programs targeting single-age cohorts.
- Our study aimed to determine the costs and describe the HPV vaccination program context of delivering a single-dose regimen to a multi-age cohort (MAC) of 9- to 14-year-old adolescent girls and to evaluate how these metrics compare with those for a two-dose regimen.

Methods

- This retrospective microcosting and operations research study collected primary data following the HPV vaccine MAC campaign conducted in late 2024 in Ethiopia.
- Data were collected from 82 health facilities, from affiliated subnational program offices in four regions, and at the national level.
- We estimated the financial, opportunity, and economic costs of the campaign and described the program context. Activities and costs evaluated are described in Table 1.
- We then compared cost estimates for the MAC campaign with those generated using similar research methods when the country used a two-dose regimen to vaccinate a single-age cohort between 2019 and 2021.
- All costs are reported in 2024 USD.

Table 1. HPV vaccination program activities and cost categories evaluated.

HPV vaccination program activities	
✓ Vaccine procurement	✓ Vaccine collection or distribution and storage
✓ Estimating demand	✓ Service delivery
✓ Program planning and management	✓ Supervision
✓ Social mobilization and advocacy	✓ Record keeping
✓ Training	✓ Waste management
	✓ Crisis management

Cost categories evaluated for each program activity as relevant

Economic costs	
Financial costs <i>Direct financial outlays or expenditures for HPV vaccination program</i>	Opportunity costs <i>Opportunity costs for use of existing resources by HPV vaccination program</i>
<ul style="list-style-type: none"> Per diems. Meeting costs. Vehicle rental and public transport. Fuel for vehicles and other equipment, energy for cold chain equipment, and vehicle maintenance. Radio messages or printing and distribution of information for social mobilization. Shipping, customs, and storage for vaccine on arrival. 	<ul style="list-style-type: none"> Health worker time. Non-health worker time such as Ministry of Education staff and community stakeholders. Allocation of cost for use of existing vehicles and equipment (incinerators, refrigerators, and vaccine carriers) used during the campaign.

Table 2. Average costs, doses delivered, and proportion of cost types per facility/office by health system level.

	Average economic costs per facility/office (2024 USD)	Average number of doses delivered per facility/office	Proportion of average economic costs by cost type per facility/office	Key
National (N=1)	\$556,713	7,085,236	13% (Fuel), 82% (Vaccine customs, taxes, and storage)	Per diems, Venue, Fuel, Other financial costs, Vehicle rental or public transport, Vaccine customs, taxes, and storage, Capital costs, Non-health worker time, Health worker time
Regional health bureau (n=4)	\$28,372	515,411	22% (Per diems), 34% (Venue), 6% (Fuel), 20% (Other financial costs)	
Subcity and zone (n=12)	\$5,977	27,321	31% (Per diems), 13% (Venue), 16% (Other financial costs), 23% (Vehicle rental or public transport), 9% (Fuel)	
Woreda* (n=16)	\$1,326	3,644	21% (Per diems), 29% (Venue), 24% (Other financial costs), 7% (Vehicle rental or public transport), 7% (Fuel)	
Health facility* (n=82)	\$870	910	11% (Per diems), 7% (Venue), 36% (Other financial costs), 36% (Non-health worker time)	

*Sample-weighted averages.

Findings

- Staff from 90% of health facilities conducted school-based sessions as part of their HPV vaccine delivery strategy.
- Outreaches were also an important strategy, as staff from 73% of health facilities delivered at community-based locations.
- A weighted average of 910 doses were delivered per health facility.

Figure 1. Financial and economic HPV vaccine delivery costs per dose for a single-dose regimen administered to a multi-age cohort of adolescent girls in Ethiopia.

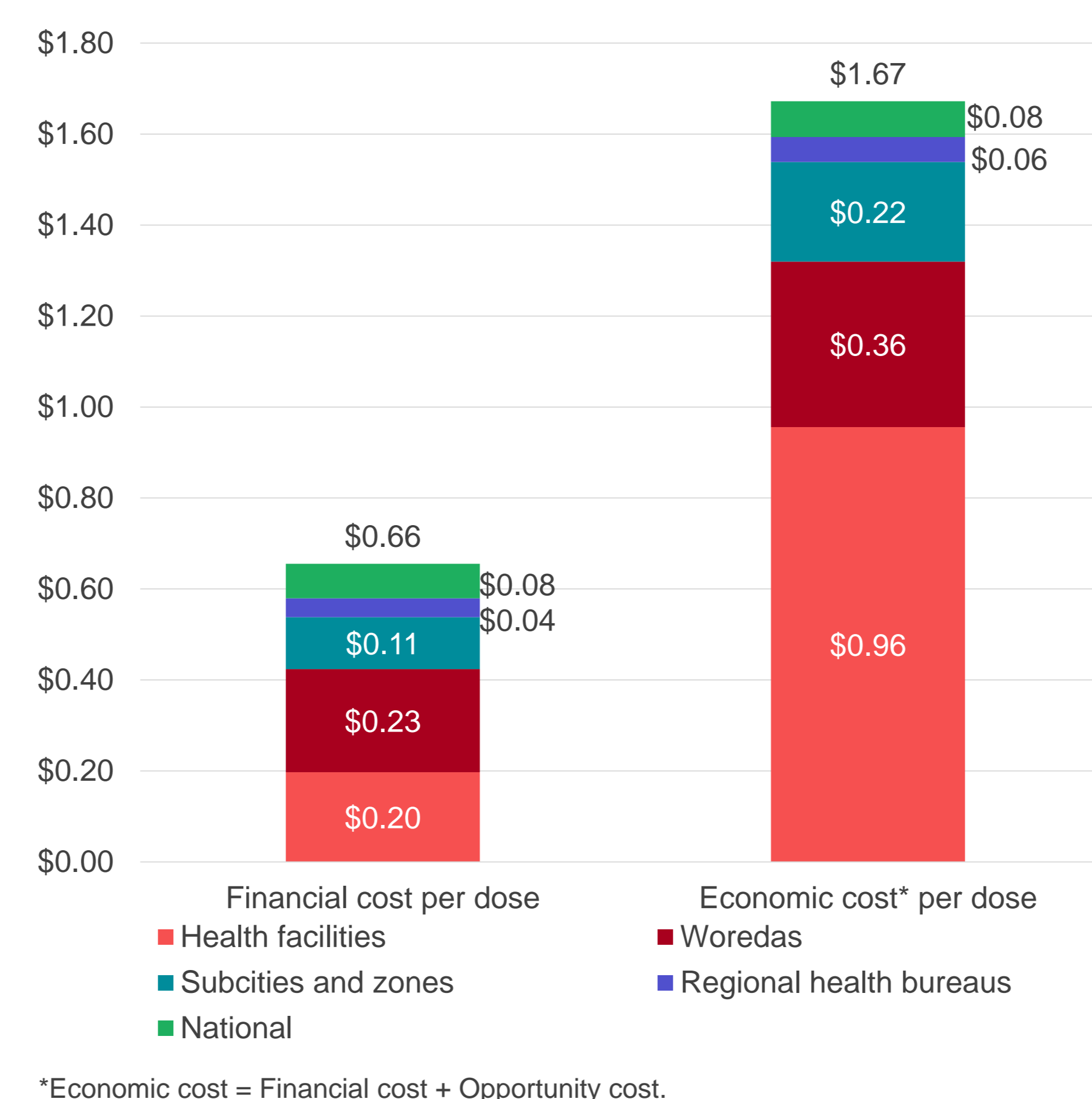
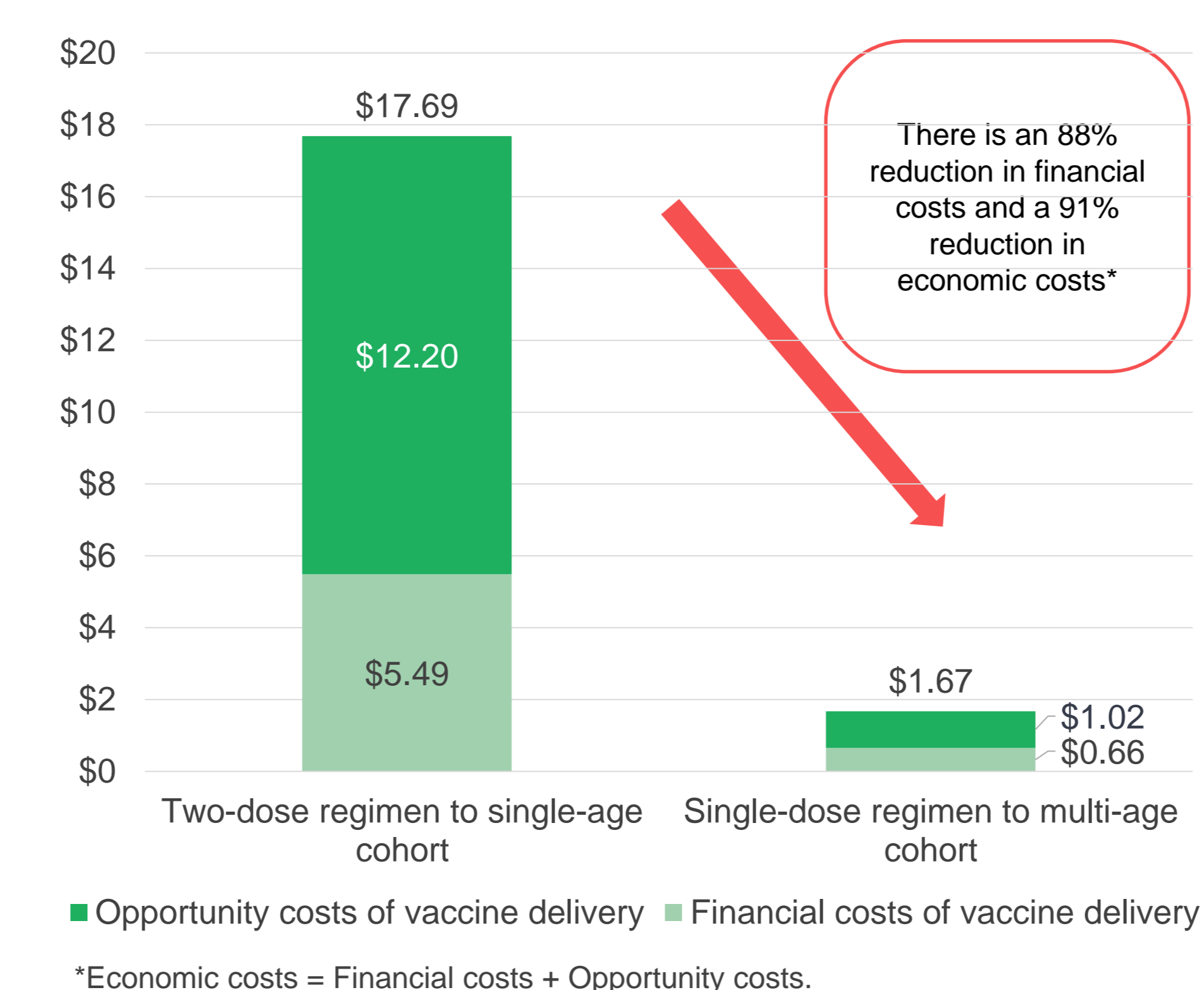


Figure 2. Economic delivery cost per adolescent to administer a full two-dose regimen to a single-age cohort compared with a full single-dose regimen to a multi-age cohort.



- As Table 2 shows, at the health facility level, opportunity costs for health worker and non-health worker time were the two largest cost categories. At the national level, the largest cost category was vaccine customs, taxes, and storage.
- Figure 1 shows the financial and economic costs per dose to deliver the full regimen to a MAC of adolescent girls. The health facility and woreda levels contribute the greatest share of the financial costs per dose (where per diems represent a greater proportion of these financial costs, as shown in Table 2). The health facility level contributes the greatest share of opportunity costs per dose, which are opportunity costs of human resource time.
- Figure 2 compares the present study findings with the cost to deliver the full two-dose regimen to a single-age cohort of adolescent girls. There is an 88% reduction in financial costs and a 91% reduction in economic costs.

Conclusions

- Multiple delivery locations were used for the HPV vaccination MAC campaign, though school-based delivery remained the predominant location for providing HPV vaccines, with 90% of health facilities vaccinating at schools.
- At the health facility level, opportunity costs represented 79% of economic costs while at all administrative levels, financial costs were a greater share of economic costs.
- The cost to deliver HPV vaccine under a single-dose regimen administered to a MAC of adolescents was estimated at \$0.66 for financial costs and \$1.67 for economic costs per dose or per girl receiving the full HPV vaccination regimen, excluding the price of the vaccine and immunization supplies.
- The switch to a single-dose HPV vaccination regimen delivered to a MAC of adolescents in Ethiopia resulted in a significant reduction in financial and economic costs (88% and 91% reduction, respectively) per fully vaccinated girl compared with the two-dose regimen administered to a single-age cohort.
- Switching to a single-dose HPV vaccination regimen and vaccinating MACs may be a way for HPV vaccination programs to reduce costs and enhance sustainability.

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Un schéma monodose du vaccin HPV permet-il de réaliser des économies de programme ? Preuves du monde réel en Éthiopie

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Résumé détaillé :

La réduction des financements externes pour les programmes de santé publique rend cruciale l'évaluation des nouvelles recommandations de vaccination monodose contre le HPV, qui pourraient réduire les coûts d'achat et de distribution. Cette étude de micro-coûtage rétrospective a analysé la campagne de vaccination menée fin 2024 en Éthiopie auprès d'un cohortes multi-âges (filles de 9 à 14 ans). Des données ont été collectées dans 82 établissements de santé, auprès des bureaux régionaux et au niveau national. Les coûts financiers, d'opportunité et économiques ont été estimés et comparés à ceux d'un schéma à deux doses mis en œuvre entre 2019 et 2021 pour une cohorte d'âge unique. Les coûts ont été exprimés en dollars américains 2024.

Les résultats montrent que 90 % des établissements ont organisé des séances de vaccination en milieu scolaire et que 73 % ont également mené des actions de proximité dans la communauté. En moyenne, 910 doses ont été administrées par établissement. Les plus grandes composantes de coût au niveau des établissements étaient le temps du personnel de santé et du personnel non sanitaire, tandis que les coûts liés aux droits de douane, aux taxes et au stockage dominaient au niveau national. Le coût financier moyen pour administrer le schéma monodose à une fille était de 0,66 \$ et le coût économique (incluant les coûts d'opportunité) de 1,67 \$, hors prix du vaccin et des consommables. Comparativement au schéma à deux doses pour une cohorte d'âge unique, le schéma monodose a entraîné une réduction de 88 % des coûts financiers et de 91 % des coûts économiques par fille vaccinée. Les auteurs concluent que l'adoption d'un schéma monodose pour une cohorte multi-âges constitue une option prometteuse pour réduire les coûts des programmes de vaccination contre le HPV et améliorer leur viabilité, tout en maintenant une forte couverture grâce à la combinaison de la vaccination en milieu scolaire et d'activités communautaires.

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