One-Dose HPV Vaccine Durability in a Moderate HIV Prevalence setting: Mathematical modeling analyses

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REPUBLIC OF KENYA

MINISTRY OF HEALTH

BACKGROUND

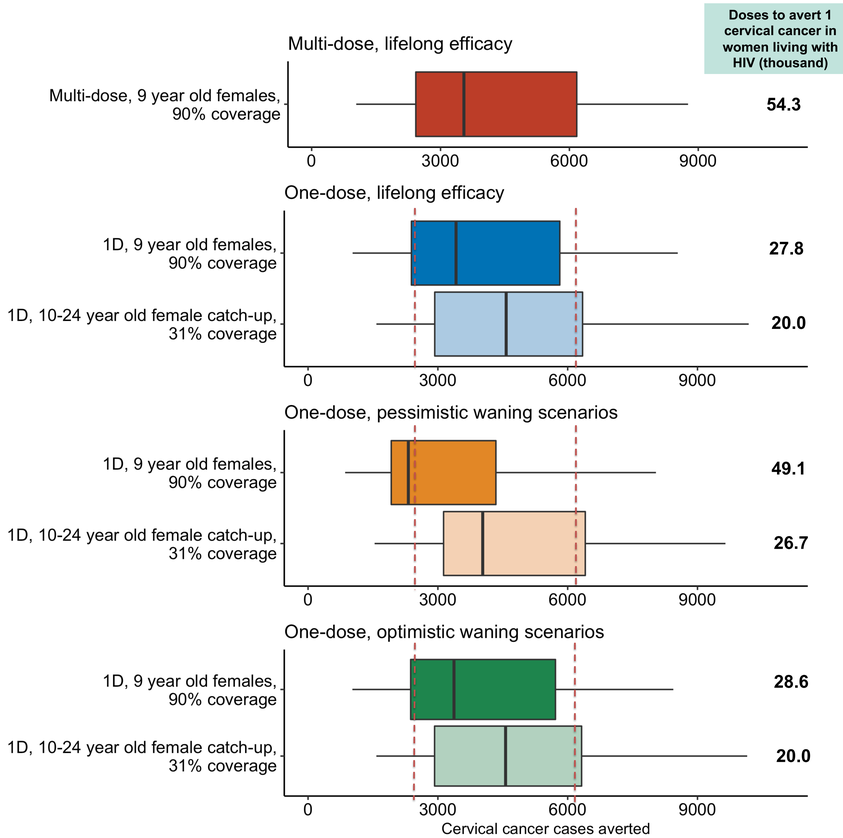
- Kenya launched the HPV vaccination program in 2019, but uptake has been low, with 31% of 10-year-old girls receiving two-doses and 61% receiving one-dose.
- There has been increasing evidence on the efficacy of a single dose HPV vaccine from different settings.
- The duration of efficacy of one-dose is uncertain among women living with HIV (WLHIV) where immune dysregulation may limit vaccine durability.
- **We sought to evaluate the potential impact of a single-dose HPV vaccination on long-term cervical cancer outcomes for women living with HIV in Kenya.**

METHODS

- Using a validated compartment transmission model of HPV and HIV in Kenya, we evaluated scenarios of multi-dose and one-dose strategies using a quadrivalent vaccine for 9-year-old girls over a 100-year time horizon.
- One-dose scenarios include a) lifelong durability, b) pessimistic durability (15 years efficacy, 10 years waning), and c) optimistic durability (30 years efficacy, 20 years waning).
- We explored the impact of investing the 5-year cost-savings of one-dose strategies into catch-up vaccination for 10-24-year-old females.
- Multi-dose vaccine efficacy = 100% (95% CI 88.4, 100)[1]; one-dose efficacy for WLHIV assumed to be aligned with women without HIV = 97.5% (95% CI, 90.0-99.4%)[2] and ≤ multi-dose efficacy.
- The potential effect of reaching the 95-95-95 ART targets was also estimated

RESULTS

Figure 1. Cervical cancer cases averted over a 100-year time horizon compared to no vaccination, with different assumptions for one-dose HPV vaccine durability.



- The dotted red lines represent the upper and lower quartile results for multi-dose HPV vaccination of 9-year-old girls with 90% coverage.
- The values to the right are the median number of doses (in thousands) to avert one cervical cancer case for women living with HIV.

In a moderate HIV prevalence setting, single-dose HPV vaccination with modest catch-up vaccination could offset the theoretical effect of waning vaccine efficacy with single-dose vaccination. Single-dose vaccination + modest catch-up requires 20 thousand HPV vaccine doses to avert one cervical cancer case for WLHIV compared to 54 thousand doses with multi-dose strategies.

Table 1. Cervical cancer outcomes for women living with HIV in Kenya under different HPV vaccination and ART coverage scenarios over a 100-year time horizon. EP is efficacy period and WP is waning period.

Scenario	Efficacy duration	Percent reduction in age-adjusted cervical cancer incidence, WLHIV (IQR)	Cervical cancer cases averted, WLHIV (IQR)	Percent reduction in cervical cancer mortality, WLHIV (IQR)	Number of HPV vaccines, population, millions (IQR)
No HPV vaccination					
ART coverage remains at current levels		Reference	Reference	Reference	0 (0-0)
ART coverage scale-up to 95-95-95 targets		1.67% (1.18-2.04)	-1,075.4 (-14,154-246.6)	-14.49% (-16.14- -12.98)	0 (0-0)
Single age vaccination, 9-year-old females, 90% coverage					
3-dose	Lifelong	85.06% (84.67-85.78)	4,190.3 (1,074.9-15,117.5)	75.99% (74.73-76.62)	227.5 (222.5, 229.6)
1-dose	Lifelong	84.47% (83.73-85.1)	4,100.4 (1,061.5-14,544.3)	75.12% (73.93-75.82)	113.8 (111.2, 114.8)
1-dose	30EP/20WP	84.37% (83.6-84.91)	4,016.3 (1,055.3-14,383.6)	74.8% (73.35-75.45)	113.8 (111.2, 114.8)
1-dose	15EP/10WP	67.14% (62.24-71.63)	2,337.4 (858.8-10,288.5)	54.3% (49.35-59.08)	113.8 (111.2, 114.8)
One-dose, using cost savings to invest in catch-up age 10-24 (31% coverage)					
Catch-up	Lifelong	84.92% (84.32-85.45)	5,836.7 (1,649.7-1,9031.3)	75.94% (74.77-76.58)	116.4 (113.8, 117.5)
Catch-up	30EP/20WP	84.88% (84.17-85.42)	5,817.3 (1,648.3-18,965.1)	75.63% (74.35-76.34)	116.4 (113.8, 117.5)
Catch-up	15EP/10WP	67.79% (62.81-72.38)	4,390.1 (1,554-15,744.4)	55.33% (50.29-60.23)	116.4 (113.8, 117.5)

CONCLUSIONS

- While waning vaccine efficacy for single-dose could increase cervical cancer cases compared to multi-dose strategies, general population vaccination could mitigate some of this change. Evidence on single-dose HPV vaccine efficacy and duration specifically for women living with HIV are needed.
- The simplified logistics of delivering a single dose could accelerate cervical cancer elimination efforts in Kenya.

REFERENCES

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