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# Benefits and harms of cervical screening, triage and treatment strategies in women living with HIV

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*Supplementary Table 1 HPV-type specific multipliers for eventual risk of acquisition, progression and regression of HPV associated disease for HIV positive individuals[38]*. Table reproduced with minor alterations from Hall et al. 2020 PLOS ONE.[1]*

| **Parameter description** | **Assumed arameter value**[+] |
|---|---|
| Multiplier increasing HPV acquisition for HIV positive individuals | 2.75 |
| Clearance of an HPV infection (no CIN) | 0.6 |
| Progression from HPV infection to CIN1 | 3.73 |
| Progression from HPV infection to CIN2 | 1.3 |
| Regression from CIN1 to clearance or HPV infected | 0.7 for HIV 16/18<br>0.67 for all other HPV types. |
| Regression from CIN2/3 to clearance, HPV infection or CIN1 | 0.57 |
| Progression from CIN3 to invasive cervical cancer | 2.5 |

[+]*Note that these parameters are the same for all HPV types except where otherwise stated.*

*Supplementary Table 2 Summary of disease control interventions for HIV.*

| **Intervention** | **Disease** | **Description** |
|---|---|---|
| Anti-retroviral therapy (ART) | HIV (secondary benefit to HPV in HIV-positive women) | In virally suppressed patients, ART halts disease progression and reduces HIV-related mortality in patients without AIDS. HIV-positive women with HPV infection and/or cervical precancer experience a more aggressive HPV natural history, which can be mitigated through viral suppression. Partially treated individuals experience reduced HIV-mortality rates, with no benefit to cervical cancer risk. |
| Voluntary medical male circumcision (VMMC) | HIV and HPV | VMMC reduces the per-timestep risk of HIV and HPV acquisition in males. |
| Condom use | HIV and HPV | Condom use reduces the per-timestep risk of HIV and HPV acquisition in males and females. |
| Pre-exposure prophylaxis (PrEP) | HIV | PrEP is assumed to remove males and females from the population susceptible to HIV. Assumed coverage of PrEP in this analysis is 0%. |

*Supplementary Table 3 HPV-FRAME analysis domain descriptions.*

| Domain | Description |
|---|---|
| CRS | Core reporting standards |
| 1 | Vaccination in adolescents |
| 2 | Vaccination in adults |
| 3 | Vaccination in MSM |
| 4 | Models of HPV-associated cancers among individuals living with HIV (ILWH). |
| 5 | HPV prevention in LMIC |
| 6 | Cervical screening (including integrated vaccination and screening) |
| 7 | Alternative vaccine types or reduced-dose schedules |

** screening should be included for countries where significant screening exists*

*Supplementary Table 4 Reportable model input and output descriptions for this analysis.*

| Domain | Inputs | Reported by age? (Y/N) | Report by sex (F/M/Both)? | Comments |
|---|---|---|---|---|
| CRS | Target population for intervention | Y | F | Reported in methods sub-section titled 'Scenarios for evaluation'. |
| CRS | Sexual behaviour | Y | Both | Reported in previous publication (Hall et. al.PLoS ONE 2020).[1] |
| CRS | Cohort examined for evaluation/ time horizon | Y | F | Reported in methods sub-section titled 'Scenarios for evaluation'. |
| CRS | Quality of life assumptions | N/A | N/A | Not applicable. |
| CRS | Calibration | Y | Both | Reported in a previous publication (Hall et. al.PLoS ONE 2020).[1] |
| CRS | Validation (where possible) | Y | Both | Reported in a previous publication (Hall et. al.PLoS ONE 2020).[1] |
| CRS | Costs | N/A | N/A | Not applicable. |
| 2 | Vaccine coverage at older ages | N/A | N/A | Not applicable. |
| 1 | Vaccine uptake | N/A | N/A | Not applicable. |
| 1 | Vaccine efficacy | N/A | N/A | Not applicable. |
| 1 | Vaccine cross-protection | N/A | N/A | Not applicable. |
| 1 | Duration vaccine protection and waning | N/A | N/A | Not applicable. |
| 1 | Vaccine and delivery costs | N/A | N/A | Not applicable. |

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|---|---|---|---|---|
| 1 | Pre-vaccination disease burden (including population attributable fractions for HPV) | Y | F | Reported in a previous publication (Hall et. al.PLoS ONE 2020).[1] |
| 1 | Heterogeneity in sexual behaviour | Y | Both | Reported in a previous publication (Hall et. al.PLoS ONE 2020).[1] |
| 1 | Duration of natural immunity | N/A | Both | Reported in a previous publication (Hall et. al.PLoS ONE 2020).[1] |
| 2 | Natural history parameters, specifically for older individuals: structure; rate of infection clearance; loss of natural immunity; simulation of latency | N/A | N/A | Not applicable. |
| 3 | MSM-specific disease burden | N/A | N/A | Not applicable. |
| 3 | Interaction between HIV and HPV | N/A | N/A | Not applicable. |
| 3 | Prior exposure | N/A | N/A | Not applicable. |
| 4 | HPV prevalence, CIN prevalence and cervical cancer incidence by HIV status | Y | F | Reported in a previous publication (Hall et. al.PLoS ONE 2020).[1] |
| 4 | HPV disease multipliers on HPV acquisition, progression from HPV infection to cancer (or relevant precursors, if modelled) for HIV-infected women/men | N/A | F | Reported in a previous publication (Hall et. al.PLoS ONE 2020).[1] |
| 4 | HPV-associated cancer mortality by HIV status (and CD4 count if modelled) | Y | F | Reported in a previous publication (Hall et. al.PLoS ONE 2020).[1] |
| 4 | Relevant co-morbidities | N/A | N/A | Not applicable. |
| 4 | HPV-associated screening sensitivity/specificity by HIV status | N/A | F | Reported in the appendix to the companion article 'Benefits, harms and cost-effectiveness of cervical screening and treatment in 78 low-income and lower-middle income countries for women in the general population: modelling to support updated WHO cervical screening and |

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|---|---|---|---|---|
| | | | | treatment guidelines to prevent cervical cancer' by Simms & Keane. |
| 5 | HIV prevalence rates, if endemic in country | Y | Both | Reported in a previous publication (Hall et. al.PLoS ONE 2020).[1] |
| 5 | Description of any opportunistic or pilot/demonstration screening projects ongoing | Y | F | Reported in the discussion. |
| 6 | Routine screening behaviour (routine and follow-<br>up and test-of-cure) | Y | F | Reported in methods sub-section titled 'Scenarios for evaluation' and 'Screening attendance and treatment delivery'. |
| 6 | Screening test(s) and colposcopy accuracies | N/A | F | Reported in the appendix to the companion article 'Benefits, harms and cost-effectiveness of cervical screening and treatment in 78 low-income and lower-middle income countries for women in the general population: modelling to support updated WHO cervical screening and treatment guidelines to prevent cervical cancer' by Simms & Keane. |
| 6 | Abnormal test management (primary and triage) | N/A | F | Reported in the appendix to the companion article 'Benefits, harms and cost-effectiveness of cervical screening and treatment in 78 low-income and lower-middle income countries for women in the general population: modelling to support updated WHO cervical screening and treatment guidelines to prevent cervical cancer' by Simms & Keane. |
| 6 | Diagnostic follow-up of abnormal tests | N/A | F | Reported in the appendix to the companion article 'Benefits, harms and cost-effectiveness of cervical screening and treatment in 78 low-income and lower- |

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|---|---|---|---|---|
| | | | | middle income countries for women in the general population: modelling to support updated WHO cervical screening and treatment guidelines to prevent cervical cancer' by Simms & Keane. |
| 6 | Management by disease grade (confirmed disease) | N/A | F | Reported in the appendix to the companion article 'Benefits, harms and cost-effectiveness of cervical screening and treatment in 78 low-income and lower-middle income countries for women in the general population: modelling to support updated WHO cervical screening and treatment guidelines to prevent cervical cancer' by Simms & Keane. |
| 6 | Sources of information for screening structure and parameterisation | N/A | F | Reported in the appendix to the companion article 'Benefits, harms and cost-effectiveness of cervical screening and treatment in 78 low-income and lower-middle income countries for women in the general population: modelling to support updated WHO cervical screening and treatment guidelines to prevent cervical cancer' by Simms & Keane. |
| 6 | Herd effect | N/A | F | Model is transmission dynamic, so inclusion of herd effects is intrinsic to the model structure. |
| 6 | Association between vaccination and screening uptake | N/A | N/A | Not applicable. |
| 6 | Fixed – variable costs | N/A | N/A | Not applicable. |
| 7 | Timing between doses (for 2-dose) | N/A | N/A | Not applicable. |
| | | | | |
| | **Outputs** | **Reported by age? (Y/N)** | **Report by sex (F/M/Both)?** | **Comments** |

| | | | | |
|---|---|---|---|---|
| CRS | Cancer incidence, mortality, life years, QALYs/DALYs (as appropriate) | Reported but not by age | F | Reported in the results sub-sections ‘Benefits’ and ‘Harm’. |
| CRS | HPV prevalence, pre-intervention | N/A | N/A | Outcome not reported. |
| CRS | CIN2/3 detected | Reported but not by age | F | Reported in the results sub-section titled ‘Harm’. |
| CRS | Sensitivity analysis on key inputs | Reported but not by age | F | Reported in results subsection 'Sensitivity analysis findings'. |
| CRS | Incremental cost-effectiveness ratios and costs saved | N/A | N/A | Outcome not reported. |
| 1 | Absolute reductions in HPV infections, and/or warts, post-vaccination | N/A | N/A | Outcome not reported. |
| 1 | Absolute reductions in CIN2+ post-vaccination | N/A | N/A | Outcome not reported. |
| 1 | Absolute reductions in invasive cancer (cervical and other HPV cancers, as relevant) post-vaccination | N/A | N/A | Outcome not reported. |
| 4 | Reduction in cervical cancer incidence over time by HIV status (and CD4 count and ART status if modelled) | Y | F | All outcomes reported are in HIV positive women. |
| 7 | Threshold cost per vaccine dose | N/A | N/A | Not applicable. |