**Supplementary file 1. List of model parameters.**

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| --- | --- | --- | --- |
| **Notation** | **Description** | **Values / ranges** | **Reference** |
| *Demography* | | | |
|  | Gender- and age-specific mortality | See **Appendix 1-Table 4** | Based UN life tables of India in 2015-2020.1 |
|  | Population sex-specific birth rate | Set such that the total population stays constant given and 50%-50% distribution of female and male new-borns | NA |
| *Sexual contact behaviour* | | | |
|  | Probability of being assigned to risk group 1 in women and men | 1.3%, 3.3% for West Bengal 1.7%, 2.8% for Tamil Nadu | Proportion of virgins in the age group 30-49 estimated by DHS in West Bengal and Tamil Nadu.2 |
|  | Probability of being assigned to risk group 3, 4, and 5 in men | 3.6%, 4.7%, 1.4% for West Bengal 7.9%, 4.6%, 2.2% for Tamil Nadu | Based on Table 1 of Gaffey et al.3 The rows for low- and high-HIV states were used for West Bengal and Tamil Nadu, respectively. Risk groups 3, 4 and 5 were based on the proportion of sexually active married men having non-regular partners, sexually active unmarried men having non-regular partners but not using female sex workers, and sexually active unmarried men using female sex worker, respectively. |
|  | Probability of being assigned to risk group 5 in women, representing female sex workers | 0.5% for West Bengal and Tamil Nadu | Estimated prevalence of female sex workers for India in Table 2 of Vandepitte et al.4 |
|  | Probability of being assigned to risk groups 3 and 4 in women | 2.5%, 2.5% for West Bengal  2.65%, 2.65% for Tamil Nadu | Urban percentage of women with at least one non-regular partners last year after subtracting the proportion of female sex workers in Table 6.2 of the NACO report.5 |
|  | Probability of being assigned to risk group 2 in women and men | 86.0%, 93.2% for West Bengal 82.5%, 92.5% for Tamil Nadu | Remaining proportion after fixing the proportions of other risk groups. |
| , | Population proportion with stable partnerships in women and men aged in the age group 10-14 | 0% | Set as zero given the low proportion of married individuals in this age groups as estimated by DHS.2 |
|  | Population proportion with stable partnerships in women in age groups 15-19, 20-24, 25-29, 30-49, 50-59, and 60-99 | 38.5%, 77.6%, 91.1%, 87.8%, 83%, 83% for West Bengal  12.8%, 58.5%, 84.7%, 86.2%, 64%, 64% for Tamil Nadu | Proportion of women married in DHS in West Bengal and Tamil Nadu.2 |
|  | Age-group-specific population proportion with stable partnerships in men in age groups 15-19, 20-24, 25-29, 30-49, 50-59, and 60-99 | 2.4%, 34.8%, 65.8%, 91.6%, 92.3, 92.3% for West Bengal  0.3%, 15.2%, 50.1%, 93.1%, 96.9, 96.9% for Tamil Nadu | Proportion of women married in DHS in West Bengal and Tamil Nadu.2 |
|  | Population proportion with stable partnerships in risk groups 1, 4, and 5 | 0%, by definition. | NA |
|  | Population proportion with stable partnerships in risk groups 2 and 3 | Set to match the age-group-specific population proportion with stable partnerships:  75% for West Bengal  72% for Tamil Nadu | NA |
|  | Overall population proportion with stable partnerships | Set to match the age-group-specific population proportion with stable partnerships:  68% for West Bengal  65% for Tamil Nadu | NA |
|  | Mean age difference in stable partnerships (men minus women) | 7.29 years for West Bengal  6.58 years for Tamil Nadu | Estimated from DHS for West Bengal and Tamil Nadu.2 |
|  | Mean spread of absolute age difference in stable partnerships | 3.31 years for West Bengal  3.28 years for Tamil Nadu | Estimated from DHS for West Bengal and Tamil Nadu.2 |
|  | Mean duration of stable partnerships | 20 years, by assumption. | NA |
|  | Mean degree of one-off partnerships in risk groups 1 and 2 | 0%, by definition. | NA |
|  | Mean degree of one-off partnerships in risk groups 3, 4, and 5 in men | 1.65, 1.65, 25.57 for West Bengal  3.41, 3.41, 70.58 for Tamil Nadu | Derived on in Table 6.4 of the NACO report.5 |
|  | Mean degree of one-off partnerships in risk groups 3 and 4 in women | 2, by assumption. | NA |
|  | Sex- and age-group-specific mean degree of one-off partnerships | Set to match the degree of one-off partnerships in men:  89.1 partners per year in West Bengal  373.4 partners per year in Tamil Nadu | NA |
|  | Overall mean degree of one-off partnerships | Set to match the risk-group-specific degree with one-off partnerships:  0.50 partners per year for West Bengal  1.98 partners per year for Tamil Nadu | NA |
|  | Mean duration of one-off partnerships | 1 unit of time step, by definition | NA |
|  | Mean number of sex acts per time step within stable partnerships according to a Poisson distribution |  |  |
|  | Fixed number of sex acts per time step within one-off partnerships | 1 act, by definition | NA |
|  | One-off partnership underreporting rate | Derived from model calibration with the following range for candidate values: (8, 20) | NA |
| *HPV natural history* | | | |
|  | Transmission probability of type per sex act | Derived from model calibration with the following range for candidate values: (0.2, 0.95). | NA |
|  | Clearance rate from CIN0 | 0.824 per year for HPV 16,  0.955 per year for HPV 18,  1.18 per year for the cross-protective types and remaining HR HPV types | 6,7 |
|  | Progression rate from CIN0 to CIN1 | 0.676 per year for HPV 16,  0.545 per year for HPV 18,  0.324 per year for the cross-protective types and remaining HR HPV types | 6,7 |
| ,, | Clearance rate from CIN1 | 0.133 per year for HPV 16,  0.386 per year for HPV 18,  0.481 per year for the cross-protective types and remaining HR HPV types | 6,7 |
| ,, | Clearance rate from regressive CIN2/3 | 2.10 per year for HPV 16,  2.10 per year for HPV 18,  2.10 per year for the cross-protective types and remaining HR HPV types | 6,7 |
| ,,, | Progression rate from CIN1 to regressive CIN2/3 | 0.048 per year for HPV 16,  0.00681 per year for HPV 18,  0.0447 per year for the cross-protective types and remaining HR HPV types | 6,7 |
| ,,, | Progression rate from CIN1 to non-regressive CIN2/3 | 0.0454 per year for HPV 16,  0.0450 per year for HPV 18,  0.0110 per year for the cross-protective types and remaining HR HPV types |  |
| , ,, | Rate of waning natural immunity | 0.0407 per year for HPV 16,  0.0287 per year for HPV 18,  0.0320 per year for the cross-protective types and remaining HR HPV types | 6,7 |

# References

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