

Table S1. Model Input Ranges (note: in all subscripts, i=gender, j=age, k=sexual activity group)

Model Input Parameter (Symbol used in equations)	Range	Source	Value in top fitting scenario																												
Demography																															
Fertility rates per year (b^j)	Fixed (non-varying)	Analysis of Masaka (Uganda) cohort data	Age 15-19: 0.180 35-39: 0.211 20-29: 0.333 40-44: 0.079 30-34: 0.275 45-49: 0.028																												
Non HIV-related mortality rates per year (μ_1^j)	Fixed (non-varying):	Cohort data analysis, fitted to Brass life table model[1]	Life expectancy Females: 69 yrs Males: 66 yrs																												
Biology																															
HIV-related mortality rate (μ_s), where s=one of the HIV (not yet AID) HIV states	0.04-0.10/year	Cohort analysis	0.065/year																												
AIDS-related mortality rate (μ_s), where s = AIDS state	0.7-1.3/year (~ 0.04-0.11/month)	[2]	1.29/year																												
HIV infection probability per partnership (ϕ_s^i)	HIV Stage 2: M to F: 0.01-0.08 F to M: (male prob) * (0.05-0.90)	[3-5]	M->F: 6.7% F->M: 5.5%																												
Infection probabilities for HIV stage 1, 3, 4 are multiples of Stage 2, to ensure infectiousness from highest to lowest in stages 1, 4, 3, 2, respectively. (Stage 4 = AIDS)	M to F by stage: Stage 1: 0.05-0.72 Stage 3: 0.0125-0.54 Stage 4: 0.0188-0.71		M->F: S1: 29% S3: 19% S4: 28% F->M: S1: 21% S3: 14% S4: 21%																												
Mean duration in each HIV stage = 1/(rate of movement between HIV state s and s') ($\gamma_{s,s'}$)	Fixed (non-varying)	[2, 6]	Stage 1: 5 months, stage 2: 7 years, stage 3: 1.5 years, stage 4: 10 months																												
Year of first HIV infection	1970-1980	Earlier than 1982 [7]	1976																												
Sexual Behavior																															
Earliest potential age at sexual debut	11-15	Cohort data analysis	14																												
Rate of becoming sexually active ($\vartheta^{i,j}$)	Beginning with earliest potential age at sexual debut, the rate of becoming sexually active first increases with age, and then decreases. Our data show that those not sexually active by a certain age have a very low rate of becoming sexually active.	Cohort data analysis	<table border="1"> <thead> <tr> <th>Age</th> <th>Sex</th> <th>Rate/year</th> </tr> </thead> <tbody> <tr> <td rowspan="2">14-15</td> <td>M</td> <td>0.032</td> </tr> <tr> <td>F</td> <td>0.023</td> </tr> <tr> <td rowspan="2">16-19</td> <td>M</td> <td>0.128</td> </tr> <tr> <td>F</td> <td>0.138</td> </tr> <tr> <td rowspan="2">20-24</td> <td>M</td> <td>0.214</td> </tr> <tr> <td>F</td> <td>0.253</td> </tr> <tr> <td rowspan="2">25-28</td> <td>M</td> <td>0.160</td> </tr> <tr> <td>F</td> <td>0.184</td> </tr> <tr> <td rowspan="2">29+</td> <td>M</td> <td>0.096</td> </tr> <tr> <td>F</td> <td>0.161</td> </tr> </tbody> </table>	Age	Sex	Rate/year	14-15	M	0.032	F	0.023	16-19	M	0.128	F	0.138	20-24	M	0.214	F	0.253	25-28	M	0.160	F	0.184	29+	M	0.096	F	0.161
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Desired partner turnover rate by gender, age, sexual activity group, not in AIDS state ($\Delta^{i,j,k}$)	Until age 30, the ranges for ($\Delta_{i,j,k}$): High activity: 20-90 Middle activity: 1-5	Cohort data analysis	$\Delta_{i,j,k}$ for Age < 30: <table border="1"> <thead> <tr> <th>Sex</th> <th>Group</th> <th>Rate/yr</th> </tr> </thead> </table>	Sex	Group	Rate/yr																									
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	Low activity: (middle activity rate) * (0.1 – 0.5) Age 30+: $\Delta_{i,j,k}$ reduces by 3%/year		M High 68.24 Mid 1.99 Low 0.25 F High 36.62 Mid 2.96 Low 1.15
Desired partner turnover rate by gender, age, sexual activity group, in AIDS state ($\Delta_{i,j,k}$)	($\Delta_{i,j,k}$) * (0.20 – 0.80)	Cohort data analysis (with limited data)	0.41
Proportion entering each activity group at sexual debut - based on partner turnover desire (b_k)	High: 0.1%-3.0% Middle: 30% - 85% Low: 100%-high-middle	Cohort data analysis	High: 2.7% Middle: 62.0% Low: 35.3%
Cross generational age mixing: Proportion entering each 'cross generational' activity group – based on desired age mixing: (b_k) * (proportion of women willing to have cross generational partners)	Range at sexual debut: 0-50% Rate of leaving cross-generational age mixing group: 0.00-0.10	Cohort data analysis	31% at sexual debut. Starting at age 25, the rate of leaving this compartment (among women) = 0.060/year.
Age mixing (non-x-generational) Applies to partnerships that are not with women willing to engage in cross-generational sex.	Maximum age difference between partners: 2-7 years. 80% of partnerships are desired with older males, while 20% with younger/same age males.	Cohort data analysis	± 3 years
Assortativity of mixing by sexual activity group (ϵ_k)	0 to 1 0 = assortative 1 = proportional to partnerships on offer	[8]	0.66
Balancing parameter (θ)	0 to 1 0 = men get what they are requesting and women increase/decrease partnerships to match male demand. 1 = women get what they request. Between 0-1 = a compromise.	[9]	0.98
Year of intentional behavior change	1 st year of change: 1988-1991 2 nd year of change: 1998-2000	Cohort data analysis, and [10]	1988.7 1998.0
Factor changing desired sexual partner turnover rates: New $\Delta_{i,j,k} = (\text{Old } \Delta_{i,j,k}) * \text{factor}$	1988-1991: 0.44 – 0.99 1998-2000: 1.01 – 2.01	Turnover rates change gradually over 2 years.	1988.7: 0.97 1998.0: 1.02

References

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