WEB MATERIAL

The Impact of Screening and Partner Notification on Chlamydia in the United States, 2000 to 2015: Evaluation of Epidemiological Trends Using a Pair-Formation Transmission Model

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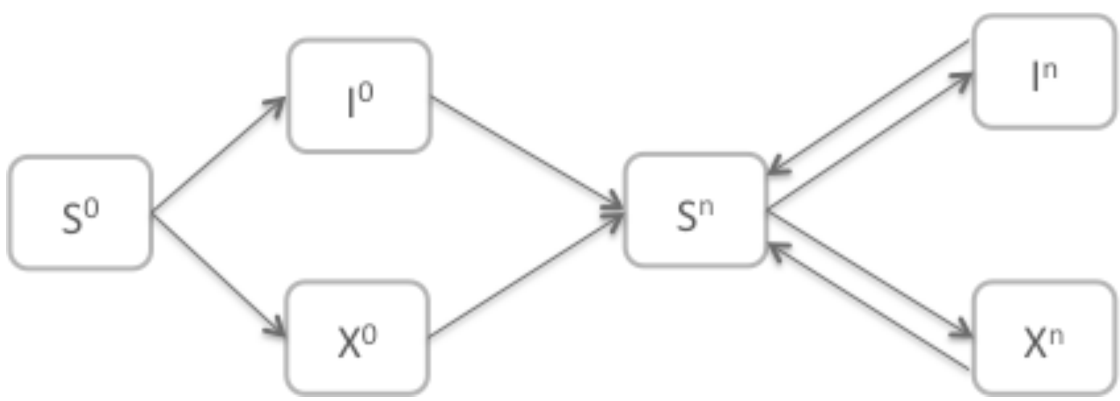
Web Appendix 1. Pair Model Structure

1.1 Natural History

The natural history (in Web Figure 1) is represented using the susceptible-infected-susceptible framework, and is presented where infected are divided into asymptomatic (I) and symptomatic (X), and we further separate chlamydia naive (never experiences an infection, S^o) and those who have their first chlamydia infection (I^0, X^0) from those who have recovered from chlamydia (ever infected, now susceptible, S^n), and those who have subsequent infections (I^n, X^n). We assume that the susceptibility of ever infected, S^n, is the same as those who are never infected S^o. People can recover from infection either through testing and treatment, or through natural recovery. We assume that symptom status does not affect sexual activity (no reduction in frequency of acts during symptom presence of treatment seeking).

Web Figure 1. Flowchart of the natural history of chlamydia

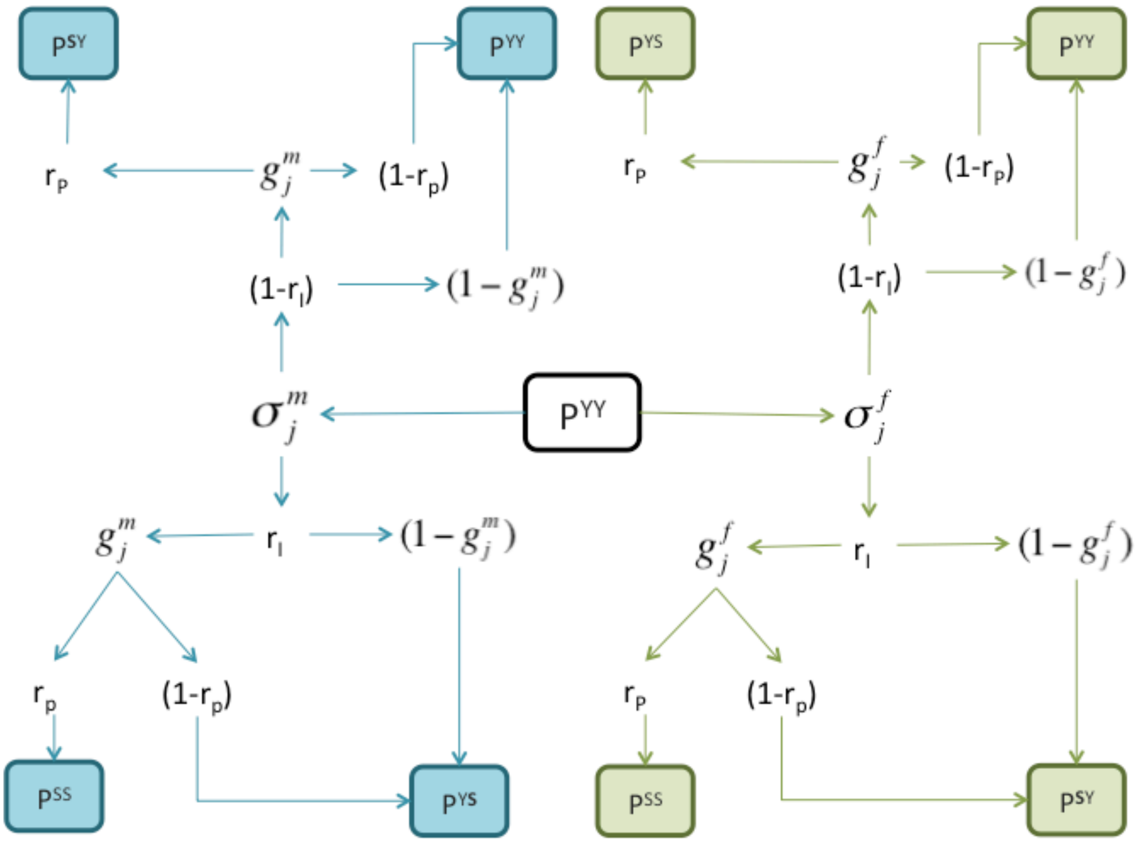


1.2 Interventions

The model has incorporated the following interventions: rate of testing (σ), proportion of index cases who are successfully treated (r_I), proportion of their partners who are notified (g), and proportion of notified partners who are then successfully (tested and) treated (r_P). Parameter for index case testing is stratified by sex (superscript m for male, f for female), symptom status (superscript a for asymptomatic and s for symptomatic) and age (subscript j), and parameter for partner notification is stratified by sex of the index case and age (if there is good evidence that partner notification depends on the symptom status of the index case, this can be also added to the model). Treatment success is separately defined for index case and their partner (which includes both the probability of being tested, and complying with treatment).

When referring to any infected, we use here superscript Y (for I^0, I^n, X^0, X^n) and any susceptible S (for S^0, S^n). The possible outcomes of treating a dually infected heterosexual couple (P^{YY}) are presented in Web Figure 2. The framework follows that presented in Heijne (2013, supplement material)(1), and how the respective rates for women and men are calculated is presented in Web Table 1. These are further stratified by symptom status of the index case in the differential equations.

Web Figure 2. Outline of the possible outcomes resulting from testing an infected index case with an infected partner.



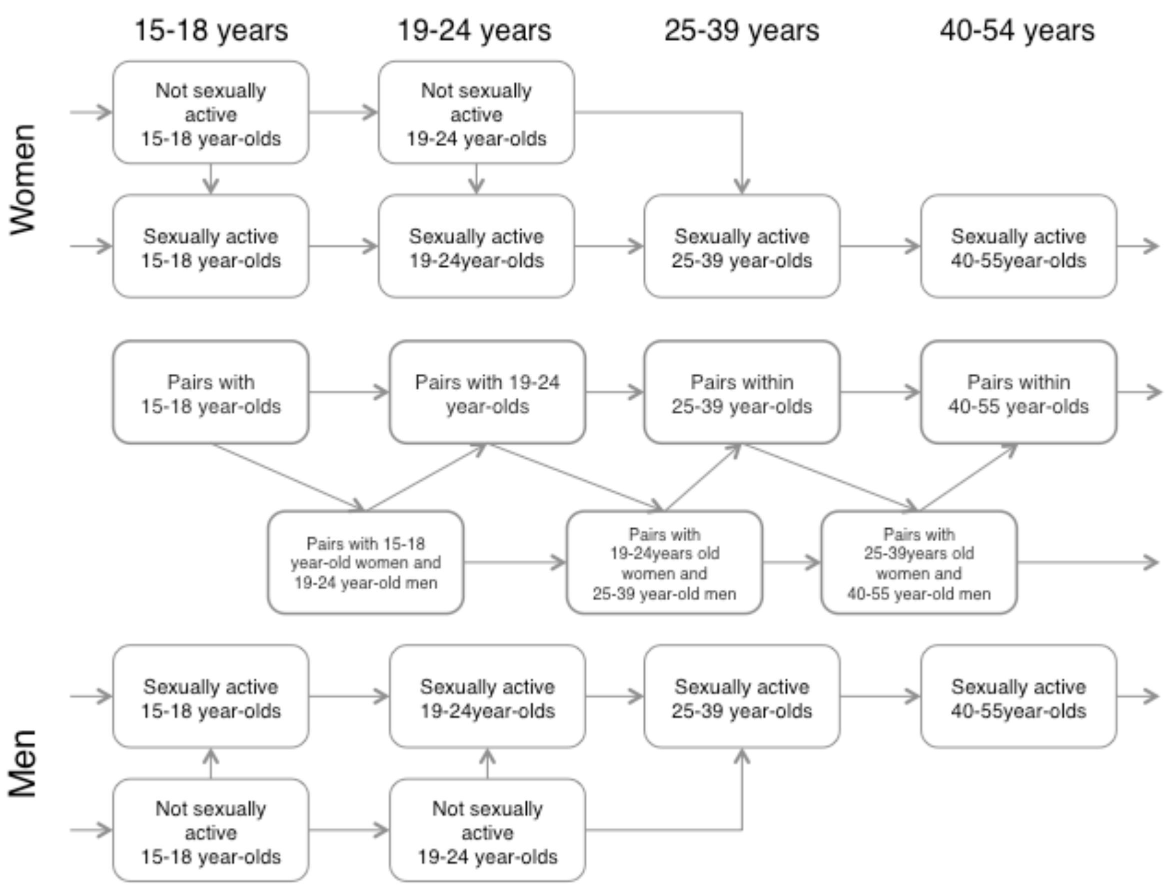
Web Table 1. Interventions in the model

Outcome	Rate for Women	Rate for Men
$P_{YY} \rightarrow P_{SS}$	$\sigma_j^f r_I g_j^f r_P$	$\sigma_j^m r_I g_{ij}^m r_P$
$P_{YY} \rightarrow P_{SY}$	$\sigma_j^f r_I (g_{ij}^f (1-r_P) + (1-g_{ij}^f))$	$\sigma_j^m (1-r_I) g_{ij}^m r_P$
$P_{YY} \rightarrow P_{YS}$	$\sigma_j^f (1-r_I) g_{ij}^f r_P$	$\sigma_j^m r_I (g_{ij}^m (1-r_P) + (1-g_{ij}^m))$
$P_{YY} \rightarrow P_{YY}$	$\sigma_j^f (1-r_I)(g_{ij}^f (1-r_P) + (1-g_{ij}^f))$	$\sigma_j^m (1-r_I)(g_{ij}^m (1-r_P) + (1-g_{ij}^m))$

1.3 Age Structure

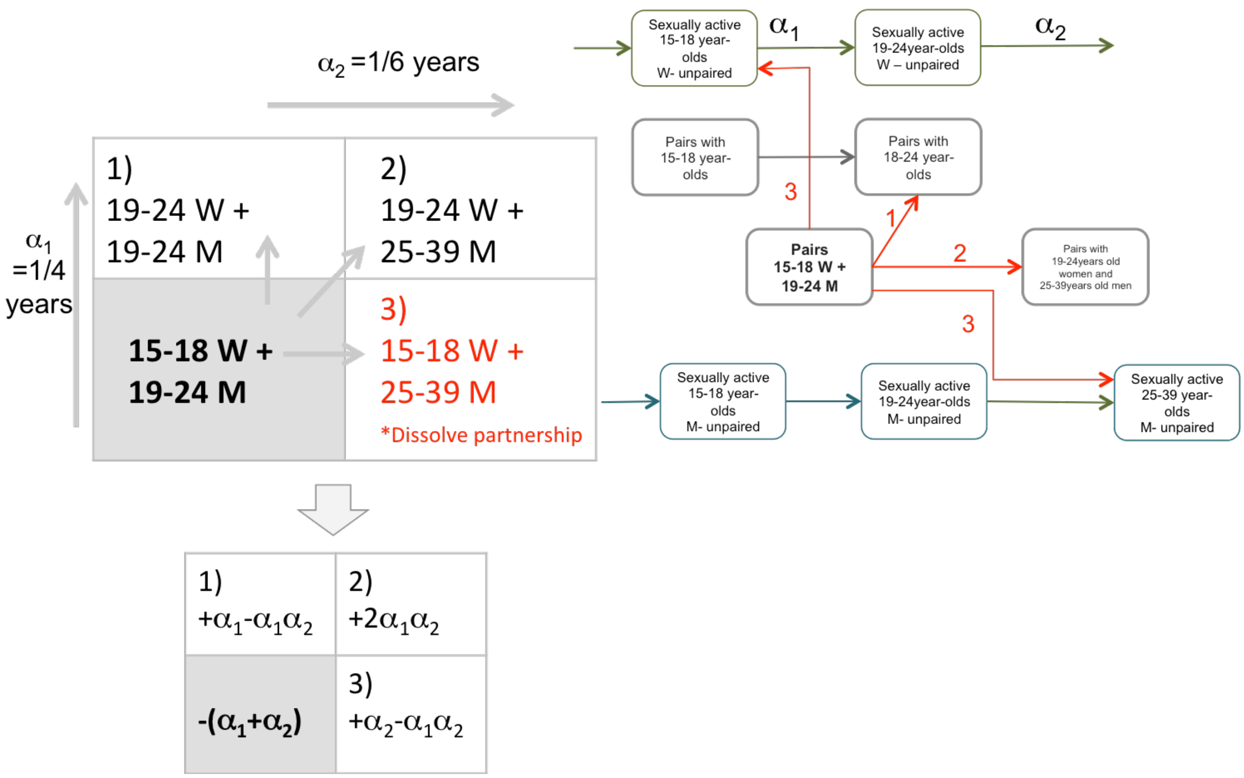
The model population is divided into age categories: 15-17, 18-24, 25-39, and 40- years old women and men. The population upper age band is capped at 55 (or similar, we should agree on a sensible age limit to which behavioral and prevalence data still exist). The age structure is illustrated in Web Figure 3. People enter the population in the youngest age group as a sexually active or inactive at the 15-18 year-old women or men who have never experienced an infection. Only sexually active people can form heterosexual pairs. We further assume once people initiate sexual activity in the model, they remain in the sexually active pool until they age out of the model population.

Web Figure 3. Flow chart of the age structure and aging process in the model. Aging is represented with arrows, and the population >25 years old is assumed to be sexually active respective to their age category parameters.



There are limited number of pair compartments (not all possible age-pairs are represented in the model), and the individuals in a pair may not age to the next age category at the same time. To preserve the true aging rate in the model, there are aging-events in a pair that lead to partnership dissolution (if there is no corresponding compartment the pair can age into) as described in Web Figure 4 and Web Table 2 describes how this is applied to the various pairs in the model, and Web Table 3 summarizes the dissolutions events (due to aging)

Web Figure 4. Illustration of aging events in a pair for pairs with 15-18 years old women and 19-24 years old men



Web Table 2. Aging processes in the different pair combinations. Pair compartments j>4 note for mixed-age pairs

Pair Compartments by Age Group	**Aging out of the Pair Compartment** Noted in the Difference Equations as 0_{ji}	**Aging in to the Pair Compartment** Noted in the Difference Equations as A_{ji},
F: 15-17 (j=1) + M: 15-17 (j=1)	$-(\alpha_1^f + \alpha_1^m)\, P_{1i}$	NA
F: 18-24 (j=2) + M: 18-24 (j=2)	$-(\alpha_2^f + \alpha_2^m) P_{2i}$	$+2\alpha_1^f \alpha_1^m P_{1i} + (\alpha_1^f - \alpha_1^f \alpha_2^m) P_{5i}$
F: 25-39 (j=3) +M: 25-39 (j=3)	$-(\alpha_3^f + \alpha_3^m) P_{3i}$	$+2\alpha_2^f \alpha_2^m P_{2i} + (\alpha_2^f - \alpha_2^f \alpha_3^m) P_{6i}$
F: 40-55 (j=4) + M: 40-55 (j=4)	$-(\alpha_4^f + \alpha_4^m) P_{4i}{}^*$	$+2\alpha_3^f \alpha_3^m P_{3i} + (\alpha_3^f - \alpha_3^f \alpha_4^m)\, P_{7i}$
F: 15-17 (j=1) + M: 18-24 (j=2) --> j=5	$-(\alpha_1^f + \alpha_2^m) P_{5i}$	$+(\alpha_1^m - \alpha_1^f \alpha_1^m)\, P_{1i}$
F: 18-24 (j=2) +M: 25-39 (j=3) --> j=6	$-(\alpha_2^f + \alpha_3^m)\, P_{6i}$	$+2\alpha_1^f \alpha_2^m\, P_{5i} + (\alpha_2^m - \alpha_2^f \alpha_2^m) P_{2i}$
F: 25-39 (j=3)+ M: 40-55 (j=4) --> j=7	$-(\alpha_3^f + \alpha_4^m) P_{7i}$	$+2\alpha_2^f \alpha_3^m P_{6i} + (\alpha_3^m - \alpha_3^f \alpha_3^m) P_{3i}$

*) Special case when both individuals in a pair will age out: $2\alpha_4^f \alpha_4^m P_{4i}$; they will age out of the model as a pair, whilst the pair will dissolve in other cases.

Web Table 3. Aging processes in the unpaired compartments

	Aging out from the Current Unpaired Compartment. Noted as Below in the Difference Equations.	**Aging in from the Previous Unpaired Compartment.** Noted as Below in the Difference Equations.	**Dissolution of Partnership into Unpaired Groups Due to Aging Events.** Noted in the Difference Equations as Δ_{ji}^{f} , Δ_{ji}^{m} for Women and Men, Respectively.
F: 15-17 (j=1)	$-\alpha_1^f F_1$	NA	$+ (\alpha_2^m - \alpha_1^f \alpha_2^m)\ P_{5i}$
M: 15-17 (j=1)	$-\alpha_1^m M_1$	NA	$+(\alpha_1^f - \alpha_1^f \alpha_1^m) P_{1i}$
F: 18-24 (j=2)	$-\alpha_2^f F_2$	$+\alpha_1^f F_1$	$+(\alpha_1^f - \alpha_1^f \alpha_1^m) P_{1i}$ $+(\alpha_3^m - \alpha_2^f \alpha_3^m) P_{6i}$
M: 18-24 (j=2)	$-\alpha_2^m M_2$	$+\alpha_1^m M_1$	$+(\alpha_2^f - \alpha_2^f \alpha_2^m)\ P_{2i}$
F: 25-39 (j=3)	$-\alpha_3^f F_3$	$+\alpha_2^f F_2$	$+(\alpha_2^f - \alpha_2^f \alpha_2^m) P_{2i}$ $+(\alpha_4^m - \alpha_3^f \alpha_4^m)\ P_{7i}$
M: 25-39 (j=3)	$-\alpha_3^m M_3$	$+\alpha_2^m M_2$	$+(\alpha_3^f - \alpha_3^f \alpha_3^m) P_{3i}$ $+(\alpha_2^m - \alpha_1^f \alpha_2^m) P_{5i}$
F: 40-55 (j=4)	$-\alpha_4^f F_4$	$+\alpha_3^f F_3$	$+(\alpha_3^f - \alpha_3^f \alpha_3^m) P_{3i}$ $+2\alpha_3^f \alpha_4^m\ P_{7i}$ $+(\alpha_4^f - \alpha_4^f \alpha_4^m) P_{4i}$ $+(\alpha_4^m - \alpha_4^f \alpha_4^m) P_{4i}$
M: 40-55 (j=4)	$-\alpha_4^m M_4$	$+\alpha_3^m M_3$	$+\left(\alpha_3^m - \alpha_2^f \alpha_3^m\right) P_{6i}$ $+2\alpha_3^f \alpha_4^m\ P_{7i}$ $+(\alpha_4^m - \alpha_3^f \alpha_4^m) P_{7i}$ $+(\alpha_4^m - \alpha_4^f \alpha_4^m) P_{4i}$ $+(\alpha_4^f - \alpha_4^f \alpha_4^m) P_{4i}$

Aging rate for women and men (α_j^f and α_j^m) is the same for a given age group (j), but for clarity these are differentiated with the superscripts. Assumptions: given there is an age-dependent partnerships dissolution rate (and that we do not have data on dissolution of long-term partnerships), this determines the partnership dissolution. We are modeling pair formation in more detail as described below.

1.4 Partnerships, Overview

As outlined in Web Figure 3, people can exist in three different relationship types (which impact their sexual activity): never had sex (not sexually active) in the two youngest age groups (15-18, 19-24), unpaired (single people) who can form casual partners (modeled as frequency dependent partnerships) and which represent short-term relationships, and long-term partnerships, which are governed by set of rules defined below.

There is a change in sexual activity defined by age (younger having higher activity than older), and partnership status (long-term vs casual), but we assumed people stay in their respective activity class (high or low activity). There is a population-average decrease in sexual activity in older ages, but cessation of sexual activity is not explicitly modeled.

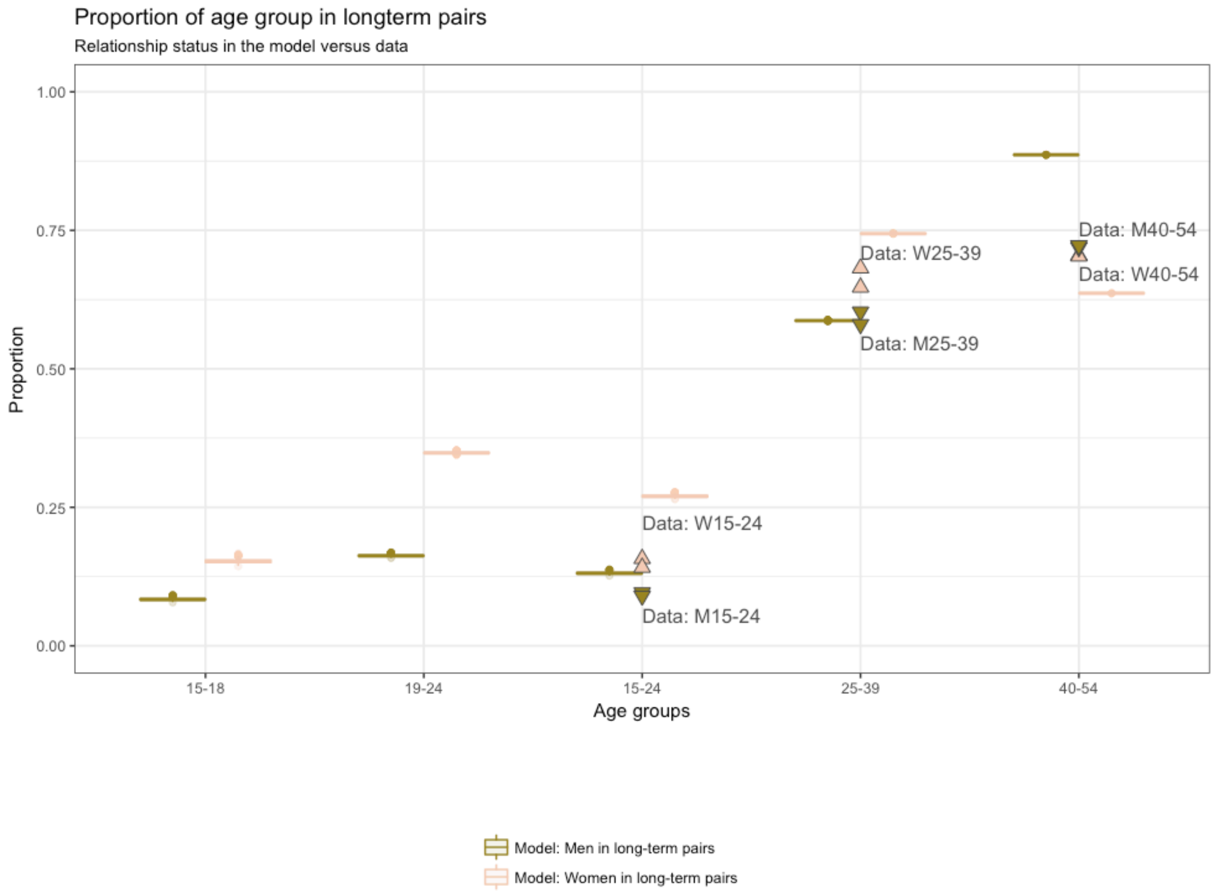
1.5 Pair Formation

Long-term partnerships are represented with pair compartments. Pairs are formed within one's own risk group (i). There are 7 possible pair combinations by age group, *j*, as presented in Web Table 4. Partnerships are preferably formed within their own age group with some partnerships formed with younger women and older men resulting in asymmetry for pairing. Pair formation parameters were set to represent data from the United States (parameters in Web Appendix 4, Web Table 5, illustration in Web Figure 5).

Web Table 4. Age mixing between age groups. j signals the age group, and for j>4, the pairs have across age group pairing. Mixing across ages occurs only with a younger woman and an older man (e.g. F, j=1 + M, j=5)

	M 15-17 *(j=1)*	**M 18-24 *(j=2)***	**M 25-39 *(j=3)***	**M 40-55 *(j=4)***
F 13-17 *(j=1)*	j=1; preference + proportional	j=5; proportional only	-	-
F 18-24 *(j=2)*	-	j=2; preference + proportional	j=6; proportional only	-
F 25-39 *(j=3)*	-	-	j=3; preference + proportional	j=7; proportional only
F 40-55 *(j=4)*	-	-	-	j=4; preference + proportional

Web Figure 5. Model pair formation set so that it represents data (CPS 2015 and 2016) on long-term partnerships in the United States (defined as married or cohabiting partnerships)



Footnote for Web Figure 5: Due to age structure asymmetry in the model (with long-term partnerships possible between younger women and older men but not the reverse), the model is overestimating the proportion of women in long-term partnerships among those aged 15-24 and 25-39 and underestimating the proportion of women in long-term partnerships for the group aged 40-54.

Data: Current Population Survey (CPS) estimates of cohabiting and married partnerships in the United States (2,3); W: Women, M: Men

1.5.1 Mixing

Pair forming and preferences may differ across age groups, and we first take the geometric mean of the preferred age mixing ($\boldsymbol{e_j}$) given one's pair formation "tendency" ($\boldsymbol{\varrho_j}$). For the assortative mixing component, φ_j^e:

for j=1:4

$$\varphi_j^e = \sqrt{e_j^f * \varrho_j * e_j^m * \varrho_j}$$

And proportional mixing, φ_j^o

for j=1

$$\varphi_{j=1}^o = \sqrt{(1 - e_j^f) * \varrho_j * (e_j^m) * \varrho_j}$$

for j=2:3

$$\varphi_{j=2:3}^o = \sqrt{(1 - e_j^f) * \varrho_j * (1 - e_j^m) * \varrho_j}$$

for j=4

$$\varphi_{j=4}^o = \sqrt{e_j^f * \varrho_j * (1 - e_j^m) * \varrho_j}$$

for j=5:7

$$\varphi_{j=5:7}^o = \sqrt{(1 - e_{j-4}^f) * \varrho_{j-4} * (1 - e_{j-3}^m) * \varrho_{j-3}}$$

1.5.2 Actualized Pair Formation Rate *to Paired Compartments*

Actualized pair formation rate for each unpaired compartment is determined by the mixing and availability of unpaired people. Pairs are formed from the unpaired people following the principle of harmonic mean, as described by Kretzschmar (1994)(4):

$$\phi_{FM} = 2\rho \frac{FM}{\sum F + \sum M}$$

M notes unpaired men and F unpaired women who are sexually active. Z represents a summary of the different disease states, for a given sex, age and risk group. Pairs are selected preferentially from your own age group (φ_j^e) "pool" after which the remaining selection happens from unpaired people in the "proportional pool". The proportional pool includes the other unpaired age groups also selecting from the given type of sex and age group; see Web Table 6.

To calculate the pair formation rate for each disease stage in an age group, a generalized pair formation rate $\phi_{ji}^{QW}$is defined where and W and Q symbolize any disease state in the model.

for j=1:4

$$\phi_{ji}^{QW} = 2\varphi_j^e \frac{F_{ji}^Q M_{ji}^W}{\sum_z F_{ji}^z + \sum_z M_{ji}^z} + 2\varphi_j^o \frac{F_{ji}^Q M_{ji}^W}{U_{prop,j}}$$

for j=5:7

$$\phi_{ji}^{QW} = 2\varphi_j^o \frac{F_{j-4,i}^Q M_{j-3,i}^W}{U_{prop,j}}$$

Where, the pool of available unpaired people available for the proportionate mixing is calculated as follows (note that $U_{prop,j} = U_{prop,j+4}$):

$$U_{prop,j=1} = \sum_z F_{1i}^z + \sum_z M_{1i}^z + \sum_z M_{2i}^z$$

$$U_{prop,j=2} = \sum_z F_{3i}^z + \sum_z M_{3i}^z + \sum_z F_{2i}^z + \sum_z M_{4i}^z$$

$$U_{prop,j=3} = \sum_z F_{3i}^z + \sum_z M_{3i}^z + \sum_z F_{2i}^z + \sum_z M_{4i}^z$$

$$U_{prop,j=4} = \sum_z F_{4i}^z + \sum_z M_{4i}^z + \sum_z F_{3,i}^z$$

$$U_{prop,j=5} = \sum_z F_{1i}^z + \sum_z M_{1i}^z + \sum_z M_{2i}^z$$

$$U_{prop,j=6} = \sum_z F_{2i}^z + \sum_z M_{2i}^z + \sum_z F_{1i}^z + \sum_z M_{3i}^z$$

$$U_{prop,j=7} = \sum_z F_{3i}^z + \sum_z M_{3i}^z + \sum_z F_{2i}^z + \sum_z M_{4i}^z$$

1.5.3 Actualized Pair Formation Rate *from the Unpaired Compartments*

To calculate the actualized rate of pair formation rate from the unpaired compartments, ρ_{ji}^{f}, and ρ_{ji}^{m}, for women and men, respectively, we need to tally the rate of pair formation occurring at each time-step given the age-mixing and availability of unpaired partners of the preferred type.

For women:

for j=1

$$\rho_{j=1,i}^{f} = 2\varphi_1^e \frac{\sum_Z M_{1i}^Z}{\sum_z F_{1i}^z + \sum_z M_{1i}^z} + 2\varphi_1^o \frac{\sum_Z M_{1i}^Z}{U_{prop,j=1}} + 2\varphi_5^o \frac{\sum_Z M_{2i}^Z}{U_{prop,j=5}}$$

for j=2

$$\rho_{j=2,,i}^{f} = 2\varphi_2^e \frac{\sum_Z M_{2i}^Z}{\sum_z F_{2i}^z + \sum_z M_{2i}^z} + 2\varphi_2^o \frac{\sum_Z M_{2i}^Z}{U_{prop,j=2}} + 2\varphi_6^o \frac{\sum_Z M_{3i}^Z}{U_{prop,j=6}}$$

for j=3

$$\rho_{j=3,i}^{f} = 2\varphi_3^e \frac{\sum_Z M_{3i}^Z}{\sum_z F_{ji}^z + \sum_z M_{ji}^z} + 2\varphi_3^o \frac{\sum_Z M_{3i}^Z}{U_{prop,j=3}} + 2\varphi_7^o \frac{\sum_Z M_{4i}^Z}{U_{prop,j=7}}$$

for j=4

$$\rho_{j=4,i}^{f} = 2\varphi_4^e \frac{\sum_Z M_{4i}^Z}{\sum_z F_{4i}^z + \sum_z M_{4i}^z} + 2\varphi_4^o \frac{\sum_Z M_{4i}^Z}{U_{prop,j=4}}$$

For men:

for j=1

$$\rho_{j=1,i}^{m} = 2\varphi_1^e \frac{\sum_Z F_{1i}^Z}{\sum_z F_{1i}^z + \sum_z M_{1i}^z} + 2\varphi_1^o \frac{\sum_Z F_{1i}^Z}{U_{prop,j=1}}$$

for j=2

$$\rho^m_{j=2,i} = 2\varphi^e_2 \frac{\sum_Z F^Z_{2i}}{\sum_z F^z_{2i} + \sum_z M^z_{2i}} + 2\varphi^o_2 \frac{\sum_Z F^Z_{2i}}{U_{prop,j=2}} + 2\varphi^o_5 \frac{\sum_Z F^Z_{1i}}{U_{prop,j=5}}$$

for j=3

$$\rho^m_{j=3,i} = 2\varphi^e_3 \frac{\sum_Z F^Z_{3i}}{\sum_z F^z_{3i} + \sum_z M^z_{3i}} + 2\varphi^o_3 \frac{\sum_Z F^Z_{3i}}{U_{prop,j=3}} + 2\varphi^o_6 \frac{\sum_Z F^Z_{j2i}}{U_{prop,j=6}}$$

for j=4

$$\rho^m_{j=4,i} = 2\varphi^e_4 \frac{\sum_Z F^Z_{4i}}{\sum_z F^z_{4i} + \sum_z M^z_{4i}} + 2\varphi^o_4 \frac{\sum_Z F^Z_{4i}}{U_{prop,j=4}} + 2\varphi^o_7 \frac{\sum_Z F^Z_{3i}}{U_{prop,j=7}}$$

1.6 Pair Dissolution

Partnership duration is determined by the pair dissolution rate γ_{ji} . and aging events. For this analysis pair dissolution, described in the difference equations as γ_{ji} is set at zero, and the dissolution events are driven by the aging events described in tables. We do not know the true rate of partnership dissolution, and duration of long-term partnerships is a function of formation and dissolution. We set the partnership formation and age mixing to produce patterns observed in the United States.

Aging events are described in more detail in section 1.3.

1.7 Force of Infection

Chlamydia transmission can happen within a pair where one partner is infected. In pairs the transmission probability during a time step is dependent on number of acts in a time step (n^r_{ji}), transmission probability in an act (b), the proportion of acts where condom is used (u^r_{ji}), and the efficacy of condom use against transmission (e). For this analysis, condom use was set to zero, and the acts represent unprotected sex.

Transmission probability from female to male is defined as:

$$\beta^{rm}_{ji} = 1 - (1-b)^{n^r_{ji}\left(1-u^r_{ji}\right)}(1-b(1-e))^{n^r_{ji}u^r_{ji}})$$

And from male to female, accounting for a higher relative risk of transmission R_m

$$\beta^{rf}_{ji} = 1 - (1-R_m b)^{n^r_{ji}\left(1-u^r_{ji}\right)}(1-R_m b(1-e))^{n^r_{ji}\left(u^r_{ji}\right)})$$

For casual partnerships, β_{ji}^{cm} and β_{ji}^{cf} , this corresponds to transmission probability per partnership (with instantaneous partnership formation and dissolution, modeled as frequency dependent force of infection), whereby the casual contacts consist of n_{ji}^{c} acts per partnership, and u_{ji}^{c} defines the proportion of acts where condom is used (set to zero for this analysis; assuming modeled acts are unprotected sex). Although in the model casual partnerships are implemented as instantaneous they are approximating a short-term relationship and transmission risk from that.

The generalized force of infection equation, λ_{ji}^{t}, for casual partnerships by age (j), risk (i) and relationship status (t, for unpaired having casual partnerships and paired having concurrent casual partnership) is modeled as frequency dependent, and mixing is proportional to the partnerships offered by the opposite sex, noted with m'_{jit} depending on the partnerships offered by the opposite sex, noted as '. In the difference equations λ_{ji}^{F} and λ_{ji}^{f}, mark for unpaired and paired people casual partnerships, respectively, for women and the same, λ_{ji}^{M} and λ_{ji}^{m}, for men.

$$\lambda_{ji}^{t} = c_{ji}^{c}\beta_{ji}^{c}\sum_{jit}^{\substack{j=4\\i=2\\t=2}} m'_{jit}\frac{Y'_{jit}}{N'_{jit}}$$

c_{ji}^{c} notes for casual partners for unpaired single people, and force of infection for the concurrent casual partners among the paired people is modeled similarly, but with a different partner change rate for concurrency c_{ji}^{r}. The number of partnerships between men and women are balanced using the Garnett-Anderson method, with balance set to 0.5 (equal balance by both sexes).(5)

1.8 Time-Varying Parameters

1.8.1 Chlamydia Testing and Screening

We assumed that testing rate of chlamydia among patients with symptoms has not changed over time.

We wanted a flexible curve able to capture potential changes in screening, and have used a modified Bezier curve:

$$Y_j(t) = (1-t)^3 P_0 + 3(1-t)^2 t P_1 + 3(1-t)t^2 P_2 + t^3 P_3$$

Control points of the Bezier curve are defined as

$$P_0 = y_0$$

$$P_1 = (-5y_0 + 18y_1 - 9y_2 + 2y_3) / 6$$

$$P_2 = (-2y_0 - 9y_1 + 18y_2 - 5y_3) / 6$$

$$P_3 = y_3$$

For the increasing screening scenario the middle control points were constrained so that they were between the start and end control points as

$$y_1 = y_0 + (y_3 - y_0) \text{ Beta}(1,1)$$

$$y_2 = y_1 + (y_3 - y_1) \text{ Beta}(1,1)$$

For the less constrained scenario the control points were defined as independent priors, but restrained so that the subsequent control points were higher than the first, e.g.

$$y_1 = y_0 + y_1$$

We assume that men's screening rate is proportional to women $Y_j(t)$ of the same age group.

In addition, in the difference equations the testing rate incorporates the test sensitivity, so that any testing rate

$$\sigma(t) = \sigma(t) * sens(t)$$

1.8.2 Test Sensitivity and Case Reporting

Test sensitivity and reporting of diagnosed cases were modeled as logistic growth. K defines the upper limit and R_0 defines the starting condition and r the increase per time step.

$$R(t) = \frac{KR_0e^{rt}}{KR_0(e^{rt} - 1)}$$

1.8.3 Changes in Rate of Sexual Initiation among 15-18 Years Old Individuals

The change was modeled as a linear change in the proportion of the population entering the model as sexually experienced, and change in the rate sexual debut among the model 15-18 years old individuals. Where we define the start estimate as D_1 and a relative change to this as D_2.

$$D(t) = (D_1D_2 - D_1)\mathrm{t} + D_1$$

Web Appendix 2. Difference Equations

These are generalized equations displaying the components across age (j) and risk (i) groups.

For the two youngest age groups (15-18 and 19-24), a proportion of the age-class (1-p) is not sexually active ($S^{\sim}$), and this is represented as a separate compartment. B tallies the number of people removed from the model due to aging out of the model, and these returned to the model population in the youngest age group as susceptible individuals to retain a steady population size.

F describes single women compartments, M describes the single men compartments and P describes the heterosexual pairs where the superscripts note the infection status of the people in a pair with the first letter describing women and the second men in a given pair. For force of infection λ_1^F and λ_1^f differentiate the force of infection for unpaired single people (former) and for paired people having concurrent partners (latter).

Equations for the chlamydia susceptible unpaired population are described below.

for j=1 ;15-18 year-olds who are sexually not active (~):

$$\frac{d}{dt}F_{1i}^{\sim S^0} = (1 - p_i^f)(B^f) - (\alpha_1^f + \omega_1^f)F_{1i}^{\sim S^0}$$

$$\frac{d}{dt}M_{1i}^{\sim S^0} = (1 - p_i^m)(B^m) - (\alpha_1^m + \omega_1^m)M_{1i}^{\sim S^0}$$

for j=1 ;15-18 year-olds who are sexually active:

$$\frac{d}{dt}F_{1i}^{S^0} = p_i^f(B^f) + \omega_1^f F_{1i}^{\sim S^0} - (\alpha_1^f + \rho_{1i}^f + \lambda_{1i}^F)F_{1i}^{S^0} + \sum_{mi} \gamma_{1i} P_{1i}^{S^0 m} + \sum_{mi} \gamma_{5i} P_{5i}^{S^0 m} + \Delta_{1i}^f$$

$$\frac{d}{dt}M_{1i}^{S^0} = p_i^m(B^m) + \omega_1^m M_{1i}^{S\sim^0} - (\alpha_1^m + \rho_{1i}^m + \lambda_{1i}^M)M_{1i}^{S^0} + \sum_{fi} \gamma_{1i} P_{1i}^{fS^0} + \Delta_{1i}^m$$

for j=2; 19-24 year-olds:

$$\frac{d}{dt}F_{2i}^{\sim S^0} = \alpha_1^f F_{1i}^{\sim S^0} - (\alpha_2^f + \omega_2^f)F_{2i}^{\sim S^0}$$

$$\frac{d}{dt}F_{2i}^{S^0} = \alpha_1^f F_{1i}^{S^0} + \omega_2^f F_{2i}^{S^\sim} - (\alpha_2^f + \rho_{2i}^f + \lambda_{2i}^F)F_{2i}^{S^0} + \sum_{mi}\gamma_{2i}P_{2i}^{S^0 m} + \sum_{mi}\gamma_{6i}P_{6i}^{S^0 m} + \Delta_{2i}^f$$

$$\frac{d}{dt}M_{2i}^{\sim S^0} = \alpha_1^m M_{1i}^{\sim S^0} - (\alpha_2^m + \omega_2^m)M_{2i}^{\sim S^0}$$

$$\frac{d}{dt}M_{2i}^{S^0} = \alpha_1^m M_{1i}^{S^0} + \omega_2^f M_{2i}^{S^\sim} - (\alpha_2 + \rho_{2i}^m + \lambda_{2i}^M)M_{2i}^{S^0} + \sum_{fi}\gamma_{2i}P_{2i}^{fS^0} + \sum_{fi}\gamma_{5i}P_{5i}^{fS^0} + \Delta_{2i}^m$$

for j=3; 25-39 years old, where everyone is sexually active:

$$\frac{d}{dt}F_{3i}^{S^0} = \alpha_2^f (F_{2i}^{\sim S^0} + F_{2i}^{S^0}) - (\alpha_3^f + \rho_{3i}^f + \lambda_{3i}^F)F_{3i}^{S^0} + \sum_{mi}\gamma_{3i}P_{3i}^{S^0 m} + \sum_{mi}\gamma_{7i}P_{7i}^{S^0 m} + \Delta_{3i}^f$$

$$\frac{d}{dt}M_{3i}^{S^0} = \alpha_2^m (M_{2i}^{\sim S^0} + M_{2i}^{S^0}) - (\alpha_3^m + \rho_{3i}^m + \lambda_{3i}^M)M_{3i}^{S^0} + \sum_{fi}\gamma_{3i}P_{3i}^{fS^0} + \sum_{fi}\gamma_{6i}P_{6i}^{fS^0} + \Delta_{3i}^m$$

for j=4; 40-54 years old:

$$\frac{d}{dt}F_{4i}^{S^0} = \alpha_3^f F_3^{S^0} - (\alpha_4^f + \rho_4^f + \lambda_{4i}^F)F_{4i}^{S^0} + \sum_{mi}\gamma_{4i}P_{3i}^{S^0 m} + \Delta_{4i}^f$$

$$\frac{d}{dt}M_{4i}^{S^0} = \alpha_3^m (M_{3i}^{S^\sim} + M_{3i}^{S^0}) - (\alpha_4^m + \rho_{4i}^m + \lambda_{4i}^M)M_{4i}^{S^0} + \sum_{fi}\gamma_{4i}P_{3i}^{fS^0} + \sum_{fi}\gamma_{7i}P_{7i}^{fS^0} + \Delta_{4i}^m$$

In the non-naive unpaired compartments, to make the equations generalizable across the age categories, the following rules are added:

- For women, $o_j^f = 1$ when j<4 and $o_j^f = 0$ when j=4 (women in the oldest age group form partnerships with only men of the same age group). For men $o_j^m = 1$ when j>1 and $o_j^m = 0$ when j=1 (youngest age group forms partnership with only women of the same age group).
- $\kappa'_j = 1$ when j>1 and $\kappa_j = o$ when j=1 (rate of aging from the previous compartment)

for j=1:4

Women who are not in a pair:

$$\frac{d}{dt}F_{ji}^{I^0} = \kappa'_j \alpha_{j-1}^f F_{j-1}^{I^0} - (\alpha_j^f + \mu_j^f + \rho_{ji}^f + r_I\sigma_j^{fa} + \upsilon^f)F_{ji}^{I^0} + (1-f^f)\lambda_{ji}^F F_{ji}^{S^0} + \sum_{mi}\gamma_{ji}P_{ji}^{I^0 m} + o_j^f \sum_{mi}\gamma_{j+4,i}P_{j+4,i}^{I^0 m} + \Delta_{ji}^f$$

$$\frac{d}{dt}F_{ji}^{X^0} = \kappa'_j \alpha_{j-1}^f F_{j-1}^{X^0} - (\alpha_j^f + \rho_{ji}^f + r_I\sigma_j^{fs} + \upsilon^f)F_{ji}^{X^0} + f^f\lambda_{ji}^F F_{ji}^{S^0} + \sum_{mi}\gamma_{ji}P_{ji}^{X^0 m} + o_j^f \sum_{mi}\gamma_{j+4,i}P_{j+4,i}^{X^0 m} + \Delta_{ji}^f$$

$$\frac{d}{dt}F_{ji}^{S^n} = \kappa'_j \alpha_{j-1}^f F_{j-1}^{S^n} - (\alpha_j^f + \mu_j^f + \rho_{ji}^f + \lambda_{ji}^F)F_{ji}^{S^n} + (r_I\sigma_j^{fa} + \upsilon^f)(F_{ji}^{I^0} + F_{ji}^{I^n}) + (r_I\sigma_j^{fs} + \upsilon^f)(F_{ji}^{X^0} + F_{ji}^{X^n}) + \sum_{mi}\gamma_{ji}P_{ji}^{S^n m} + o_j^f \sum_{mi}\gamma_{j+4,i}P_{j+4,i}^{S^n m} + \Delta_{ji}^f$$

$$\frac{d}{dt}F_{ji}^{I^n} = \kappa'_j \alpha_{j-1}^f F_{j-1}^{I^n} - (\alpha_j^f + \mu_j^f + \rho_{ji}^f)F_j^{I^n} - (r_I\sigma_j^{fa} + \upsilon^f)F_{ji}^{I^n} + (1-f^f)\lambda_{ji}^F F_{ji}^{S^n} + \sum_{mi}\gamma_{ji}P_{ji}^{I^n m} + o_j^f \sum_{mi}\gamma_{j+4,i}P_{j+4,i}^{I^n m} + \Delta_{ji}^f$$

$$\frac{d}{dt}F_{ji}^{X^n} = \kappa'_j \alpha_{j-1}^f F_{j-1}^{X^n} - (\alpha_j^f + \mu_j^f + \rho_{ji}^f + r_I\sigma_j^{fs} + \upsilon^f)F_{ji}^{X^n} + f^f\lambda_{ji}^F F_{ji}^{S^n} + \sum_{mi}\gamma_{ji}P_{ji}^{X^n m} + o_j^f \sum_{mi}\gamma_{j+4,i}P_{j+4,i}^{X^n m} + \Delta_{ji}^f$$

Men who are not in a pair:

$$\frac{d}{dt}M_{ji}^{I^0} = \kappa'_j \alpha_{j-1}^m M_{j-1}^{I^0} - (\alpha_j^m + \mu_j^m + \rho_{ji}^m + r_I\sigma_j^{ma} + \upsilon^m)M_{ji}^{I^0} + (1-f^m)\lambda_{ji}^M M_j^{S^0} + \sum_{fi}\gamma_{ji}P_{ji}^{fI^0} + o_j^f \sum_{fi}\gamma_{j+3,i}P_{j+3,i}^{fI^0} + \Delta_{ji}^m$$

$$\frac{d}{dt}M_{ji}^{X^0} = \kappa'_j \alpha_{j-1}^m M_{j-1}^{X^0} - (\alpha_j^m + \mu_j^m + \rho_{ji}^m + r_I\sigma_j^{ms} + \upsilon^m)M_{ji}^{X^0} + \upsilon^m\lambda_{ji}^M M_{ij}^{S^0} + \sum_{fi}\gamma_{ji}P_{ji}^{fX^0} + o_j^f \sum_{fi}\gamma_{j+3,i}P_{j+3,i}^{fX^0} + \Delta_{ji}^m$$

$$\frac{d}{dt}M_{ji}^{S^n} = \kappa_{\prime j} \alpha_{j-1}^m M_{j-1}^{S^n} - (\alpha_j^m + \mu_j^m + \rho_{ji}^m + \lambda_j^M)M_j^{S^n} + (r_I\sigma_j^{ma} + \upsilon^m)(M_{ji}^{I^0} + M_{ji}^{I^n}) + (r_I\sigma_j^{ms} + \upsilon^m)(M_{ji}^{X^0} + M_{ji}^{X^n}) + \sum_{fi}\gamma_{ji}P_{ji}^{fS^n} + o_j^m \sum_{fi}\gamma_{j+3,i}P_{j+3,i}^{fS^n} + \Delta_{ji}^m$$

$$\frac{d}{dt}M_{ji}^{I^n} = \kappa_j{}'\alpha_{j-1}^m M_{j-1}^{I^n} - (\alpha_j^m + \mu_j^m + \rho_{ji}^m + r_I\sigma_j^{ma} + \upsilon^m)M_{ji}^{I^n} + (1-f^m)\lambda_{ji}^M M_{ji}^{S^n} + \sum_{fi}\gamma_{ji}P_{ji}^{fI^n} + o_j^f\sum_{fi}\gamma_{j+3,i}P_{j+3,i}^{fI^n} + \Delta_{ji}^m$$

$$\frac{d}{dt}M_{ji}^{X^n} = \kappa'_j\alpha_{j-1}^m M_{j-1}^{X^n} - (\alpha_j^m + \mu_j^m + \rho_{ji}^m + r_I\sigma_j^{ms} + \upsilon^m)M_{ji}^{X^n} + f^m\lambda_{ji}^M M_{ji}^{S^n} + \sum_{fi}\gamma_{ji}P_{ji}^{fX^n} + o_j^f\sum_{fi}\gamma_{j+3,i}P_{j+3,i}^{fX^n} + \Delta_{ji}^m$$

There are 36 pair combinations (6 possible states in the natural history model) further stratified by age mixing (j=1:7) and risk (i=1:2).

$$\frac{d}{dt}P_{ji}^{S^0S^0} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + (1-(\lambda_{ji}^f + \lambda_{ji}^m))\phi_{ji}^{S^0S^0} - (\gamma_{ji} + \lambda_{ji}^f + \lambda_{ji}^m)P_{ji}^{S^0S^0}$$

$$\frac{d}{dt}P_{ji}^{S^0I^0} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + (1-(\beta_{ji}^f + \lambda_{ji}^f))\phi_{ji}^{S^0I^0} + (1-f^m)\lambda_j^m(\phi_{ji}^{S^0S^0} + P_{ji}^{S^0S^0}) - (\gamma_{ji} + \beta_{ji}^f + r_I\sigma_j^{ma} + \upsilon^m + \lambda_{ji}^f)P_{ji}^{S^0I^0}$$

$$\frac{d}{dt}P_{ji}^{S^0X^0} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + (1-(\beta_{ji}^f + \lambda_j^f))\phi_{ji}^{S^0X^0} + f^m\lambda_{ji}^m(\phi_{ji}^{S^0S^0} + P_{ji}^{S^0S^0}) - (\gamma_{ji} + \beta_{ji}^f + r_I\sigma_j^{ms} + \upsilon^m + \lambda_{ji}^f)P_{ji}^{S^0X^0}$$

$$\frac{d}{dt}P_{ji}^{S^0S^n} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + (1-(\lambda_{ji}^f + \lambda_{ji}^m))\phi_{ji}^{S^0S^n} + (r_I\sigma_j^{ms} + \upsilon^m)(P_{ji}^{S^0X^0} + P_{ji}^{S^0X^n}) + (r_I\sigma_j^{ma} + \upsilon^m)(P_{ji}^{S^0I^0} + P_{ji}^{S^0I^n}) - (\gamma_{ji} + \lambda_{ji}^f + \lambda_{ji}^m)P_{ji}^{S^0S^n}$$

$$\frac{d}{dt}P_{ji}^{S^0I^n} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + (1-(\beta_{ji}^f + \lambda_{ji}^f))\phi_{ji}^{S^0I^n} + (1-f^m)\lambda_{ji}^m(\phi_{ji}^{S^0S^n} + P_{ji}^{S^0S^n}) - \left(\gamma_{ji} + \beta_{ji}^f + r_I\sigma_j^{ma} + \upsilon^m + \lambda_{ji}^f\right)P_{ji}^{S^0I^n}$$

$$\frac{d}{dt}P_{ji}^{S^0X^n} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + (1-(\beta_{ji}^f + \lambda_{ji}^f))\phi_{ji}^{S^0X^n} + f^m\lambda_{ji}^m(\phi_{ji}^{S^0S^n} + P_{ji}^{S^0S^n}) - \left(\gamma_{ji} + \beta_{ji}^f + r_I\sigma_j^{ms} + \upsilon^m + \lambda_{ji}^f\right)P_{ji}^{S^0X^n}$$

$$\frac{d}{dt}P_{ji}^{S^nS^0} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + (1-(\lambda_{ji}^f + \lambda_{ji}^m))\phi_{ji}^{S^nS^0} + (r\sigma_j^{fs} + \upsilon^f)(P_{ji}^{X^0S^0} + P_{ji}^{X^nS^0}) + (r\sigma_j^{fa} + \upsilon^f)(P_{ji}^{I^0S^0} + P_{ji}^{I^nS^0}) - (\gamma_{ji} + \lambda_{ji}^f + \lambda_{ji}^m)P_{ji}^{S^nS^0}$$

$$\frac{d}{dt}P_{ji}^{S^nI^0} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + (1-(\beta_{ji}^f + \lambda_{ji}^f))\phi_{ji}^{S^nI^0} + (1-f^m)\lambda_{ji}^m(\phi_{ji}^{S^nS^0} + P_{ji}^{S^nS^0}) + (\sigma_j^{fa}r_I(g_{ij}^f(1-r_P) + (1-g_{ij}^f)) + \sigma_j^{ma}(1-r_I)g_{ij}^m r_p + \upsilon^f)(P_{ji}^{I^0I^0} + P_{ji}^{I^nI^0}) + (\sigma_j^{fs}r_I(g_{ij}^f(1-r_P) + (1-g_{ij}^f)) + \sigma_j^{ma}(1-r_I)g_{ij}^m r_p + \upsilon^f)(P_{ji}^{X^0I^0} + P_{ji}^{X^nI^0}) - (\gamma_{ji} + \beta_{ji}^f + r_I\sigma_j^{ma} + \upsilon^m + \lambda_{ji}^f)P_{ji}^{S^nI^0}$$

$$\frac{d}{dt}P_{ji}^{S^nX^0} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + (1-(\beta_{ji}^f + \lambda_{ji}^f))\phi_{ji}^{S^nX^0} + f^m\lambda_{ji}^m(\phi_{ji}^{S^nS^0} + P_{ji}^{S^nS^0}) + (\sigma_j^{fa}r_I(g_{ij}^f(1-r_P) + (1-g_{ij}^f)) + \sigma_j^{ms}(1 - r_I)g_{ij}^m r_p + \upsilon^f)(P_{ji}^{I^0X^0} + P_{ji}^{I^nX^0}) + (\sigma_j^{fs}r_I(g_{ij}^f(1-r_P) + (1-g_{ij}^f)) + \sigma_j^{ms}(1-r_I)g_{ij}^m r_p + \upsilon^f)(P_{ji}^{X^0I^0} + P_{ji}^{X^nI^0}) - (\gamma_{ji} + \beta_{ji}^f + r_I\sigma_j^{ms} + \upsilon^m + \lambda_{ji}^f)P_{ji}^{S^0X^0}$$

$$\frac{d}{dt}P_{ji}^{S^nS^n} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + (1-(\lambda_{ji}^f + \lambda_{ji}^m))(\phi_{ji}^{S^nS^n} + (1-f^m)\lambda_{ji}^m(\phi_{ji}^{S^nS^0} + P_{ji}^{S^nS^0}) + (\sigma_j^{fa}r_I + \nu^f)(P_{ji}^{I^0S^n} + P_{ji}^{I^nS^0}) + (\sigma_j^{fs}r_I + \nu^f)(P_{ji}^{X^0S^n} + P_{ji}^{X^nS^0}) + (\sigma_j^{ma}r_I + \nu^m)(P_{ji}^{S^nI^0} + P_{ji}^{S^nI^n}) + (\sigma_j^{ms}r_I + \nu^m)(P_{ji}^{S^nX^0} + P_{ji}^{S^nX^n}) + \sigma_j^{fa}r_I g_{ij}^f r_P(P_{ji}^{I^0I^0} + P_{ji}^{I^0X^0} + P_{ji}^{I^0I^n} + P_{ji}^{I^0X^n} + P_{ji}^{I^nI^0} + P_{ji}^{I^nX^0} + P_{ji}^{I^nI^n} + P_{ji}^{I^nX^n}) + \sigma_j^{fs}r_I g_{ij}^f r_P(P_{ji}^{X^0I^0} + P_{ji}^{X^0X^0} + P_{ji}^{X^0I^n} + P_{ji}^{X^0X^n} + P_{ji}^{X^nI^0} + P_{ji}^{X^nX^0} + P_{ji}^{X^nI^n} + P_{ji}^{X^nX^n}) + \sigma_j^{ma}r_I g_{ij}^m r_P(P_{ji}^{I^0I^0} + P_{ji}^{I^nI^0} + P_{ji}^{X^0I^0} + P_{ji}^{X^nI^0} + P_{ji}^{I^0I^n} + P_{ji}^{I^nI^n} + P_{ji}^{X^0I^n} + P_{ji}^{X^nI^n}) + \sigma_j^{ms}r_I g_{ij}^m r_P(P_{ji}^{I^0X^0} + P_{ji}^{I^nX^0} + P_{ji}^{X^0X^0} + P_{ji}^{X^nX^0} + P_{ji}^{I^0X^n} + P_{ji}^{I^nX^n} + P_{ji}^{X^0X^n} + P_{ji}^{X^nX^n}) - (\gamma_{ji} + \lambda_{ji}^f + \lambda_{ji}^m)P_{ji}^{S^nS^n}$$

$$\frac{d}{dt}P_{ji}^{S^nI^n} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + (1-(\beta_{ji}^f + \lambda_{ji}^f))\phi_{ji}^{S^nI^n} + (1-f^m)\lambda_{ji}^m(\phi_{ji}^{S^nS^n} + P_{ji}^{S^nS^n}) + (\sigma_j^{fa}r_I(g_{ij}^f(1-r_P) + (1-g_{ij}^f)) + \sigma_j^{ma}(1-r_I)g_{ij}^m r_p + \upsilon^f)(P_{ji}^{I^0I^n} + P_{ji}^{I^nI^n}) + (\sigma_j^{fs}r_I(g_{ij}^f(1-r_P) + (1-g_{ij}^f)) + \sigma_j^{ma}(1-r_I)g_{ij}^m r_p + \upsilon^f)(P_{ji}^{X^0I^n} + P_{ji}^{X^nI^n}) - (\gamma_{ji} + \beta_{ji}^f + r_I\sigma_j^{ma} + \upsilon^m + \lambda_{ji}^f)P_{ji}^{S^0I^n}$$

$$\frac{d}{dt}P_{ji}^{S^nX^n} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + (1-(\beta_{ji}^f + \lambda_j^f))\phi_{ji}^{S^nX^n} + f^m\lambda_j^m(\phi_{ji}^{S^nS^n} + P_{ji}^{S^nS^n}) + (\sigma_j^{fa}r_I(g_{ij}^f(1-r_P) + (1-g_{ij}^f)) + \sigma_j^{ma}(1-r_I)g_{ij}^m r_p + \upsilon^f)(P_{ji}^{I^0X^n} + P_{ji}^{I^nX^n}) + (\sigma_j^{fs}r_I(g_{ij}^f(1-r_P) + (1-g_{ij}^f)) + \sigma_j^{ma}(1-r_I)g_{ij}^m r_p + \upsilon^f)(P_{ji}^{X^0X^n} + P_{ji}^{X^nX^n}) - (\gamma_{ji} + \beta_{ji}^f + r_I\sigma_j^{ms} + \upsilon^m + \lambda_j^f)P_{ji}^{S^0X^0}$$

$$\frac{d}{dt}P_{ji}^{I^0S^0} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + (1-(\beta_{ji}^m + \lambda_{ji}^m))\phi_{ji}^{I^0S^0} + (1-f^f)\lambda_j^f(\phi_{ji}^{S^0S^0} + P_{ji}^{S^0S^0}) - (\gamma_{ji} + \beta_{ji}^m + r_I\sigma_j^{fa} + \upsilon^f + \lambda_{ji}^m)P_{ji}^{I^0S^0}$$

$$\frac{d}{dt}P_{ji}^{I^0\mathrm{I}^0} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + \phi_{ji}^{I^0I^0} + (1-f^f)(\beta_{ji}^f + \lambda_{ji}^f)(\phi_{ji}^{S^0I^0} + P_{ji}^{S^0I^0}) + (1-f^m)(\beta_{ji}^m + \lambda_{ji}^m)(\phi_{ji}^{I^0S^0} + P_{ji}^{I^0S^0}) + (\sigma_j^{fa}(1 - r_I)(g_{ij}^f(1-r_P) + (1-g_{ij}^f) + \sigma_j^{ma}(1-r_I)(g_{ij}^m(1-r_P) + (1-g_{ij}^m)))P_{ji}^{I^0I^0} - (\gamma_{ji} + r_I\sigma_j^{fa} + r_I\sigma_j^{ma} + \upsilon^f + \upsilon^m)P_{ji}^{I^0I^0}$$

$$\frac{d}{dt}P_{ji}^{I^0X^0} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + \phi_{ji}^{I^0X^0} + (1-f^f)(\beta_{ji}^f + \lambda_{ji}^f)(\phi_{ji}^{S^0X^0} + P_{ji}^{S^0X^0}) + f^m(\beta_{ji}^m + \lambda_{ji}^m)(\phi_{ji}^{I^0S^0} + P_{ji}^{I^0S^0}) + (\sigma_j^{fa}(1 - r_I)(g_{ij}^f(1-r_P) + (1-g_{ij}^f) + \sigma_j^{ms}(1-r_I)(g_{ij}^m(1-r_P) + (1-g_{ij}^m)))P_{ji}^{I^0X^0} - (\gamma_{ji} + r_I\sigma_j^{fa} + r_I\sigma_j^{ms} + \upsilon^f + \upsilon^m)P_{ji}^{I^0X^0}$$

$$\frac{d}{dt}P_{ji}^{I^0S^n} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + (1 - (\beta_{ji}^m + \lambda_{ji}^m))\phi_{ji}^{I^0S^n} + (1 - f^f)\lambda_{ji}^f(\phi_{ji}^{S^0S^n} + P_{ji}^{S^0S^n}) + (\sigma_j^{fa}(1 - r_I)g_{ij}^f r_P + \sigma_j^{ma} r_I(g_{ij}^m(1 - r_P) + (1 - g_{ij}^m)) + \upsilon^m)(P_{ji}^{I^0I^0} + P_{ji}^{I^0I^n}) + (\sigma_j^{fs}(1 - r_I)g_{ij}^f r_P + \sigma_j^{ms} r_I(g_{ij}^m(1 - r_P) + (1 - g_{ij}^m)) + \upsilon^m)(P_{ji}^{I^0X^0} + P_{ji}^{I^0X^n}) - (\gamma_{ji} + \beta_{ji}^m + r_I\sigma_j^{fa} + \upsilon^f + \lambda_{ji}^m)P_{ji}^{I^0S^n}$$

$$\frac{d}{dt}P_{ji}^{I^0I^n} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + \phi_{ji}^{I^0I^n} + (1 - f^f)(\beta_{ji}^f + \lambda_{ji}^f)(\phi_{ji}^{S^0I^n} + P_{ji}^{S^0I^n}) + (1 - f^m)(\beta_{ji}^m + \lambda_{ji}^m)(\phi_{ji}^{I^0S^n} + P_{ji}^{I^0S^n}) + (\sigma_j^{fa}(1 - r_I)(g_{ij}^f(1 - r_P) + (1 - g_{ij}^f) + \sigma_j^{ma}(1 - r_I)(g_{ij}^m(1 - r_P) + (1 - g_{ij}^m)))P_{ji}^{I^0I^n} - (\gamma_{ji} + r_I\sigma_j^{fa} + r_I\sigma_j^{ma} + \upsilon^f + \upsilon^m)P_{ji}^{I^0I^n}$$

$$\frac{d}{dt}P_{ji}^{I^0X^n} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + \phi_{ji}^{I^0X^n} + (1 - f^f)(\beta_{ji}^f + \lambda_{ji}^f)(\phi_{ji}^{S^0X^n} + P_{ji}^{S^0X^n}) + f^m(\beta_{ji}^m + \lambda_{ji}^m)(\phi_{ji}^{I^0S^n} + P_{ji}^{I^0S^n}) + (\sigma_j^{fa}(1 - r_I)(g_{ij}^f(1 - r_P) + (1 - g_{ij}^f) + \sigma_j^{ms}(1 - r_I)(g_{ij}^m(1 - r_P) + (1 - g_{ij}^m)))P_{ji}^{I^0X^n} - (\gamma_{ji} + r_I\sigma_j^{fa} + r_I\sigma_j^{ms} + \upsilon^f + \upsilon^m)P_{ji}^{I^0X^n}$$

$$\frac{d}{dt}P_{ji}^{I^nS^0} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + (1 - (\beta_{ji}^m + \lambda_{ji}^m))\phi_{ji}^{S^nI^0} + (1 - f^f)\lambda_{ji}^f(\phi_{ji}^{S^nS^0} + P_{ji}^{S^nS^0}) - (\gamma_{ji} + \beta_{ji}^m + r_I\sigma_j^{fa} + \upsilon^m + \lambda_{ji}^m)P_{ji}^{I^nS^0}$$

$$\frac{d}{dt}P_{ji}^{I^nI^0} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + \phi_{ji}^{I^nI^0} + (1 - f^f)(\beta_{ji}^f + \lambda_{ji}^f)(\phi_{ji}^{S^nI^0} + P_{ji}^{S^nI^0}) + (1 - f^m)(\beta_{ji}^m + \lambda_{ji}^m)(\phi_{ji}^{I^nS^0} + P_{ji}^{I^nS^0}) + (\sigma_j^{fa}(1 - r_I)(g_{ij}^f(1 - r_P) + (1 - g_{ij}^f) + \sigma_j^{ma}(1 - r_I)(g_{ij}^m(1 - r_P) + (1 - g_{ij}^m)))P_{ji}^{I^nI^0} - (\gamma_{ji} + r_I\sigma_j^{fa} + r_I\sigma_j^{ma} + \upsilon^m + \lambda_{ji}^m)P_{ji}^{I^nI^0}$$

$$\frac{d}{dt}P_{ji}^{I^nX^0} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + \phi_{ji}^{I^nX^0} + (1 - f^f)(\beta_{ji}^f + \lambda_{ji}^f)(\phi_{ji}^{S^nX^0} + P_{ji}^{S^nX^0}) + f^m(\beta_{ji}^m + \lambda_{ji}^m)(\phi_{ji}^{I^nS^0} + P_{ji}^{I^nS^0}) + (\sigma_j^{fa}(1 - r_I)(g_{ij}^f(1 - r_P) + (1 - g_{ij}^f) + \sigma_j^{ms}(1 - r_I)(g_{ij}^m(1 - r_P) + (1 - g_{ij}^m)))P_{ji}^{I^nX^0} - (\gamma_{ji} + \beta_{ji} + r_I\sigma_j^{fa} + r_I\sigma_j^{ms} + \upsilon^f + \upsilon^m)P_{ji}^{I^nX^0}$$

$$\frac{d}{dt}P_{ji}^{I^nS^n} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + (1 - (\beta_{ji}^m + (\lambda_{ji}^m)))\phi_{ji}^{I^nS^n} + (1 - f^f)\lambda_{ji}^f(\phi_{ji}^{S^nS^n} + P_{ji}^{S^nS^n}) + (\sigma_j^{fa}(1 - r_I)g_{ij}^f r_P + \sigma_j^{ma} r_I(g_{ij}^m(1 - r_P) + (1 - g_{ij}^m)) + \upsilon^m)(P_{ji}^{I^nI^0} + P_{ji}^{I^nI^n}) + (\sigma_j^{fs}(1 - r_I)g_{ij}^f r_P + \sigma_j^{ms} r_I(g_{ij}^m(1 - r_P) + (1 - g_{ij}^m)) + \upsilon^m)(P_{ji}^{I^nX^0} + P_{ji}^{I^nX^n}) - (\gamma_{ji} + \beta_{ji}^m + r_I\sigma_j^{fa} + \upsilon^f + \lambda_{ji}^m)P_{ji}^{I^nS^n}$$

$$\frac{d}{dt}P_{ji}^{I^nI^n} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + \phi_{ji}^{I^nI^n} + (1-f^f)(\beta_{ji}^f + \lambda_{ji}^f)(\phi_{ji}^{S^nI^n} + P_{ji}^{S^nI^n}) + (1-f^m)(\beta_{ji}^m + \lambda_{ji}^m)(\phi_{ji}^{I^nS^n} + P_{ji}^{I^nS^n}) + (\sigma_j^{fa}(1 - r_I)(g_{ij}^f(1-r_P) + (1-g_{ij}^f) + \sigma_j^{ma}(1-r_I)(g_{ij}^m(1-r_P) + (1-g_{ij}^m)))P_{ji}^{I^nI^n} - (\gamma_{ji} + r_I\sigma_j^{fa} + r_I\sigma_j^{ma} + \upsilon^f + \upsilon^m)P_{ji}^{I^nI^n}$$

$$\frac{d}{dt}P_{ji}^{I^nX^n} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + \phi_{ji}^{I^nX^n} + (1-f^f)(\beta_{ji}^f + \lambda_{ji}^f)(\phi_{ji}^{S^nX^n} + P_{ji}^{S^nX^n}) + f^m(\beta_{ji}^m + \lambda_{ji}^m)(\phi_{ji}^{I^nS^n} + P_{ji}^{I^nS^n}) + (\sigma_j^{fa}(1 - r_I)(g_{ij}^f(1-r_P) + (1-g_{ij}^f) + \sigma_j^{ms}(1-r_I)(g_{ij}^m(1-r_P) + (1-g_{ij}^m)))P_{ji}^{I^nX^n} - (\gamma_{ji} + r_I\sigma_j^{fa} + r_I\sigma_j^{ms} + \upsilon^f + \upsilon^m)P_{ji}^{I^nX^n}$$

$$\frac{d}{dt}P_{ji}^{X^0S^0} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + (1-(\beta_{ji}^m + \lambda_{ji}^m))\phi_{ji}^{X^0S^0} + f^f\lambda_{ji}^f(\phi_{ji}^{S^0S^0} + P_{ji}^{S^0S^0}) - (\gamma_{ji} + \beta_{ji}^m + r_I\sigma_j^{fs} + \upsilon^f + \lambda_{ji}^m)P_{ji}^{X^0S^0}$$

$$\frac{d}{dt}P_{ji}^{X^0I^0} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + \phi_{ji}^{X^0I^0} + f^f(\beta_{ji}^f + \lambda_{ji}^f)(\phi_{ji}^{S^0I^0} + P_{ji}^{S^0I^0}) + (1-f^m)(\beta_{ji}^m + \lambda_{ji}^m)(\phi_{ji}^{X^0S^0} + P_{ji}^{X^0S^0}) + (\sigma_j^{fs}(1 - r_I)(g_{ij}^f(1-r_P) + (1-g_{ij}^f) + \sigma_j^{ma}(1-r_I)(g_{ij}^m(1-r_P) + (1-g_{ij}^m)))P_{ji}^{X^0I^0} - (\gamma_{ji} + r_I\sigma_j^{fs} + r_I\sigma_j^{ma} + \upsilon^f + \upsilon^m)P_{ji}^{X^0I^0}$$

$$\frac{d}{dt}P_{ji}^{X^0X^0} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + \phi_{ji}^{X^0X^0} + f^f(\beta_{ji}^f + \lambda_{ji}^f)(\phi_{ji}^{S^0X^0} + P_{ji}^{S^0X^0}) + f^m(\beta_{ji}^m + \lambda_{ji}^m)(\phi_{ji}^{X^0S^0} + P_{ji}^{X^0S^0}) + (\sigma_j^{ms}(1 - r_I)(g_{ij}^f(1-r_P) + (1-g_{ij}^f) + \sigma_j^{ms}(1-r_I)(g_{ij}^m(1-r_P) + (1-g_{ij}^m)))P_{ji}^{X^0X^0} - (\gamma_{ji} + r_I\sigma_j^{fs} + r_I\sigma_j^{ms} + \upsilon^f + \upsilon^m)P_{ji}^{X^0X^0}$$

$$\frac{d}{dt}P_{ji}^{X^0S^n} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + (1-(\beta_{ji}^m + \lambda_{ji}^m))\phi_{ji}^{X^0S^n} + f^f\lambda_{ji}^f(\phi_{ji}^{S^0S^n} + P_{ji}^{S^0S^n}) + (\sigma_j^{fs}(1-r_I)g_{ij}^f r_P + \sigma_j^{ma} r_I(g_{ij}^m(1-r_P) + (1-g_{ij}^m)) + \upsilon^m)(P_{ji}^{X^0I^0} + P_{ji}^{X^0I^n}) + (\sigma_j^{fs}(1-r_I)g_{ij}^f r_P + \sigma_j^{ms} r_I(g_{ij}^m(1-r_P) + (1-g_{ij}^m)) + \upsilon^m)(P_{ji}^{X^0X^0} + P_{ji}^{X^0X^n}) - (\gamma_{ji} + \beta_{ji}^m + r_I\sigma_j^{fs} + \upsilon^f + \lambda_{ji}^m)P_{ji}^{X^0S^n}$$

$$\frac{d}{dt}P_{ji}^{X^0I^n} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + \phi_{ji}^{X^0I^n} + f^f(\beta_{ji}^f + \lambda_{ji}^f)(\phi_{ji}^{S^0I^n} + P_{ji}^{S^0I^n}) + (1-f^m)(\beta_{ji}^m + \lambda_{ji}^m)(\phi_{ji}^{X^0S^n} + P_{ji}^{X^0S^n}) + (\sigma_j^{fa}(1 - r_I)(g_{ij}^f(1-r_P) + (1-g_{ij}^f) + \sigma_j^{ma}(1-r_I)(g_{ij}^m(1-r_P) + (1-g_{ij}^m)))P_{ji}^{X^0I^n} - (\gamma_{ji} + r_I\sigma_j^{fs} + r_I\sigma_j^{ma} + \upsilon^f + \upsilon^m)P_{ji}^{X^0I^n}$$

$$\frac{d}{dt}P_{ji}^{X^0X^n} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + \phi_{ji}^{X^0X^n} + f^f(\beta_{ji}^f + \lambda_{ji}^f)(\phi_{ji}^{S^0X^n} + P_{ji}^{S^0X^n}) + f^m(\beta_{ji}^m + \lambda_{ji}^m)(\phi_{ji}^{X^0S^n} + P_{ji}^{X^0S^n}) + (\sigma_j^{fs}(1 - r_I)(g_{ij}^f(1 - r_P) + (1 - g_{ij}^f) + \sigma_j^{ms}(1 - r_I)(g_{ij}^m(1 - r_P) + (1 - g_{ij}^m)))P_{ji}^{X^0X^n} - (\gamma_{ji} + r_I\sigma_j^{fs} + r_I\sigma_j^{ms} + \upsilon^f + \upsilon^m)P_{ji}^{X^0X^n}$$

$$\frac{d}{dt}P_{ji}^{X^nS^0} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + (1 - (\beta_{ji}^m + \lambda_{ji}^m))\phi_{ji}^{X^nS^0} + f^f\lambda_{ji}^f(\phi_{ji}^{S^nS^0} + P_{ji}^{S^nS^0}) - (\gamma_{ji} + \beta_{ji}^m + r_I\sigma_j^{fs} + \upsilon^f + \lambda_j^m)P_{ji}^{X^nS^0}$$

$$\frac{d}{dt}P_{ji}^{X^nI^0} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + \phi_{ji}^{X^nI^0} + f^f(\beta_{ji}^f + \lambda_j^f)(\phi_{ji}^{S^nI^0} + P_{ji}^{S^nI^0}) + (1 - f^m)(\beta_{ji}^m + \lambda_j^m)(\phi_{ji}^{X^nS^0} + P_{ji}^{X^nS^0}) + (\sigma_j^{fs}(1 - r_I)(g_{ij}^f(1 - r_P) + (1 - g_{ij}^f) + \sigma_j^{ma}(1 - r_I)(g_{ij}^m(1 - r_P) + (1 - g_{ij}^m)))P_{ji}^{X^nI^0} - (\gamma_{ji} + r_I\sigma_j^{fs} + r_I\sigma_j^{ma} + \upsilon^f + \upsilon^m)P_{ji}^{X^nI^0}$$

$$\frac{d}{dt}P_{ji}^{X^nX^0} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + \phi_{ji}^{X^nX^0} + f^f(\beta_{ji}^f + \lambda_{ji}^f)(\phi_{ji}^{S^nX^0} + P_{ji}^{S^0X^0}) + f^m(\beta_{ji}^m + \lambda_{ji}^m)(\phi_{ji}^{X^nS^0} + P_{ji}^{X^nS^0}) + (\sigma_j^{fs}(1 - r_I)(g_{ij}^f(1 - r_P) + (1 - g_{ij}^f) + \sigma_j^{ms}(1 - r_I)(g_{ij}^m(1 - r_P) + (1 - g_{ij}^m)))P_{ji}^{X^nX^0} - (\gamma_{ji} + r_I\sigma_j^{fs} + r_I\sigma_j^{ms} + \upsilon^f + \upsilon^m)P_{ji}^{X^nX^0}$$

$$\frac{d}{dt}P_{ji}^{X^nS^n} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + (1 - (\beta_{ji}^m + \lambda_{ji}^m))\phi_{ji}^{X^nS^n} + f^f\lambda_{ji}^f(\phi_{ji}^{S^nS^n} + P_{ji}^{S^nS^n}) + (\sigma_j^{fs}(1 - r_I)g_{ij}^f r_P + \sigma_j^{ma}r_I(g_{ij}^m(1 - r_P) + (1 - g_{ij}^m)) + \upsilon^m)(P_{ji}^{X^nI^0} + P_{ji}^{X^nI^n}) + (\sigma_j^{fs}(1 - r_I)g_{ij}^f r_P + \sigma_j^{ms}r_I(g_{ij}^m(1 - r_P) + (1 - g_{ij}^m)) + \upsilon^m)(P_{ji}^{X^nX^0} + P_{ji}^{X^nX^n}) - (\gamma_{ji} + \beta_j^m + r_I\sigma_j^{fs} + \upsilon^f + \lambda_{ji}^m)P_{ji}^{X^nS^n}$$

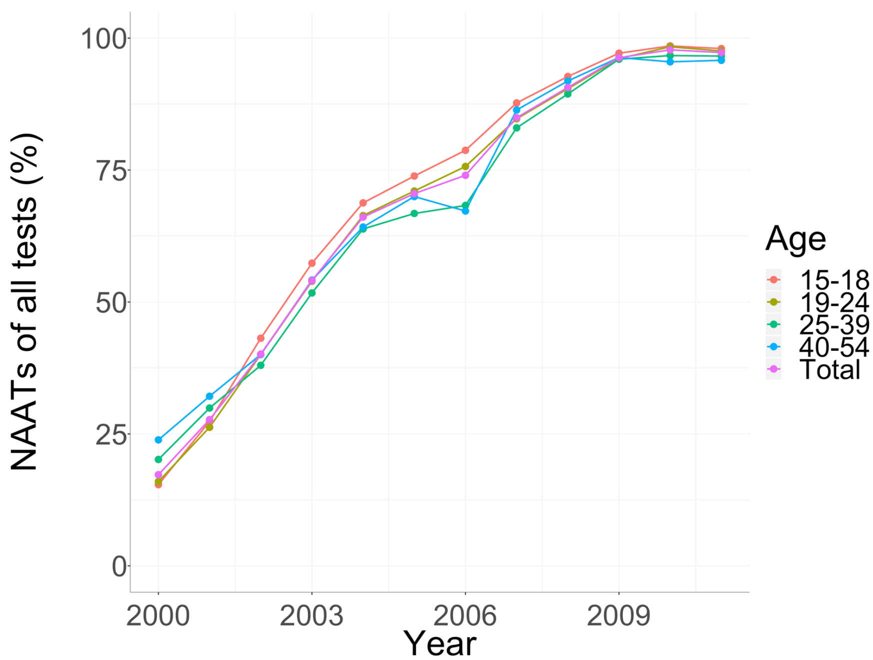
$$\frac{d}{dt}P_{ji}^{X^nI^n} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + \phi_{ji}^{X^0I^n} + f^f(\beta_{ji}^f + \lambda_{ji}^f)(\phi_{ji}^{S^0I^n} + P_{ji}^{S^0I^n}) + (1 - f^m)(\beta_{ji}^m + \lambda_{ji}^m)(\phi_{ji}^{X^0S^n} + P_{ji}^{X^0S^n}) + (\sigma_j^{fa}(1 - r_I)(g_{ij}^f(1 - r_P) + (1 - g_{ij}^f) + \sigma_j^{ma}(1 - r_I)(g_{ij}^m(1 - r_P) + (1 - g_{ij}^m)))P_{ji}^{I^0I^n} - (\gamma_{ji} + r_I\sigma_j^{fs} + r_I\sigma_j^{ma} + \upsilon^f + \upsilon^m)P_{ji}^{X^0I^n}$$

$$\frac{d}{dt}P_{ji}^{X^nX^n} = \mathrm{A}_{ji} - \mathrm{O}_{ji} + +f^f(\beta_{ji}^f + \lambda_{ji}^f)(\phi_{ji}^{S^0X^n} + P_{ji}^{S^0X^n}) + f^m(\beta_{ji}^m + \lambda_{ji}^m)(\phi_{ji}^{X^0S^n} + P_{ji}^{X^0S^n}) + (\sigma_j^{fs}(1 - r_I)(g_{ij}^f(1 - r_P) + (1 - g_{ij}^f) + \sigma_j^{ms}(1 - r_I)(g_{ij}^m(1 - r_P) + (1 - g_{ij}^m)))P_{ji}^{X^0X^n} - (\gamma_{ji} + r_I\sigma_j^{fs} + r_I\sigma_j^{ms} + \upsilon^f + \upsilon^m)P_{ji}^{X^0X^n}$$

Web Appendix 3. Trends in Chlamydia Tests and Screening Coverage

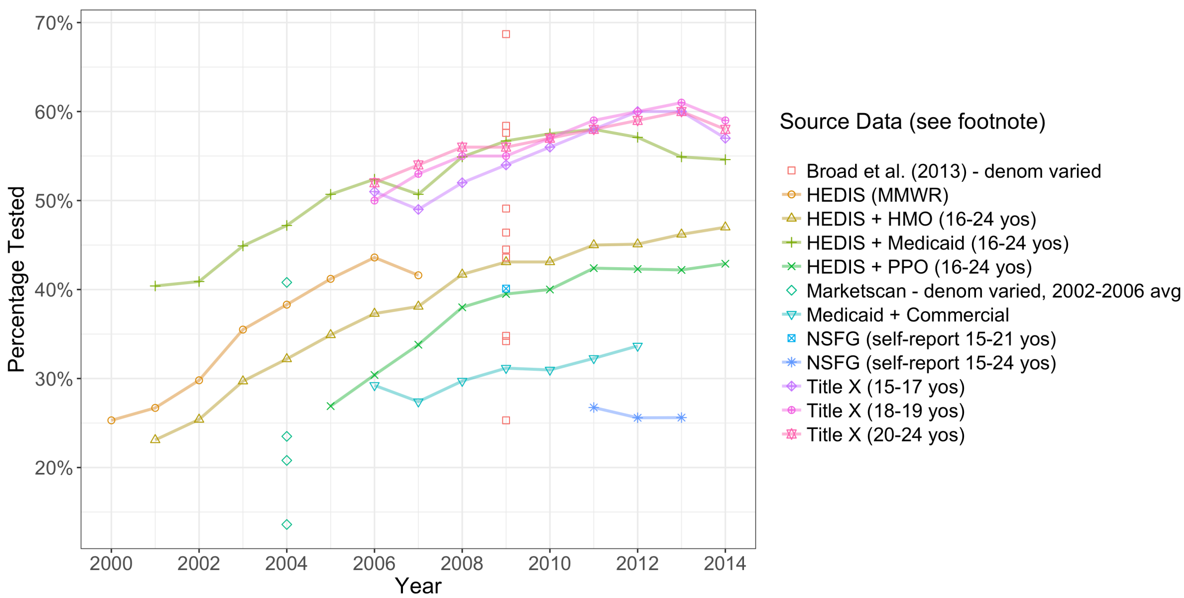
Setting parameters for test sensitivity were informed by data from the Infertility Prevention Project (Web Figure 6), and trends for screening coverage were informed by data from different sources presented in Web Figure 7.

Web Figure 6. Data on proportion of chlamydia tests performed using NAAT in clinics taking part in the Infertility Prevention Project 2000–2011. Average proportion of NAATs in 2000 was 19%.



NAAT: Nucleic acid amplification technique

Web Figure 7. Screening coverage among women 15–24 years of age from different sources [a]. The denominator and age group vary across the estimates.



a) Source data References (6–12)

Web Appendix 4. Model Calibration and Supplementary Results

As part of the model calibration we defined the prior distributions used in Web Table 5. Of the 54 parameters varied, the following are time-varying : screening, for 3 youngest age groups among women (4 parameters per age group); reporting, assumed the same for all women (3 parameters); chlamydia test sensitivity, assumed the same for everyone (2 parameters); initiation of sexual activity among 15-18 years old individuals, by sex (2 parameters per sex). There are 33 time-invariant parameters varied in the calibration governing aspects such as natural history and partner change rate. This includes the scalar parameters for men (screening and reporting). There are further 60 parameters that were fixed (this includes parameters such as time step).

Web Table 6 and Web Figures 13-16 describe the posterior distributions. Correlation matrices for the different calibration scenarios are presented in Web Figures 8-11 and the calibrated model outputs against the target data is shown in Web Figure 12. Additional results are shown in Web Figures 17-19.

We also calculated AIC (Akaike Information Criteria) for each calibration scenarios. Specifically, we calculated the AIC based on the maximum likelihood from each calibration scenario as

- More constrained priors on reporting and screening, AIC = 717
- Less constrained priors on reporting, more constrained priors on screening, AIC = 683
- More constrained priors on reporting, less constrained priors on screening , AIC = 728
- Less constrained priors on reporting and screening, AIC = 707

With a note that given the number of parameters varied was the same in each calibration scenario, the AIC differences are due to differences in the maximum likelihood.

Web Table 5. Description of parameters governing testing, natural recovery and transmission probability.

Parameter/ Variable	Symbol	Description	Distribution	Parameter	References
Population size	**N**	Population size, aged 15-54	Fixed	171,470,000	(13)
Time step	**dt**	Time step implemented in the model	Fixed	A week	
Testing symptomatic individuals (pw)					
Women	σ_j^{fs}	Testing of symptomatic women	1/(52*(0.079+ 0.072*Beta(4,4)))	0.17 (constrained range 0.13-0.24) pw	(14)
Men	σ_j^{fm}	Testing of symptomatic men	1/(52*(0.079+ 0.072*Beta(4,4)))	0.17 (constrained range 0.13-0.24) pw	(14)

Testing asymptomatic 15-18 years old women (pw)	$\sigma_{j=1}^{fa}$	Time-varying parameter, see section screening for further detail.			
For the more constrained scenario					See Web Figure 2
		Start (2000)	Beta(1,1200)/2	med: 0.015 (IQR 0.006-0.03) py	
		Mid-controlpoint, 1	Beta(1,1)	range 0-1	
		Mid-controlpoint, 2	Beta (1,1)	range 0-1	
		End (2015)	Beta(15,1000)/2	med: 0.38 (IQR 0.31-0.45)py	
For the less constrained scenario					
		Start(2000)	Beta(1,1200)/2	med: 0.015 (IQR 0.006-0.03) py	
		Mid-controlpoint, 1	Beta(1,1200)/2	med: 0.015 (IQR 0.006-0.03) py	
		Mid-controlpoint, 2	Beta(15,1000)/2	med: 0.38 (IQR 0.31-0.45)py	
		End (2015)	Beta(15,1000)/2	med: 0.38 (IQR 0.31-0.45)py	
Testing asymptomatic 19-24 women (pw)	$\sigma_{j=2}^{fa}$	Time-varying parameter, see section screening for further detail.			
For the more constrained scenario					
		Start (2000)	Beta(1,1200)/2	med: 0.015 (IQR 0.006-0.03) py	
		Mid-controlpoint, 1	Beta(1,1)	range 0-1	
		Mid-controlpoint, 2	Beta (1,1)	range 0-1	
		End (2015)	Beta(15,1000)/2	med: 0.38 (IQR 0.31-0.45)py	
For the less constrained scenario					
		Start(2000)	Beta(1,1200)/2	med: 0.015 (IQR 0.006-0.03) py	
		Mid-controlpoint, 1	Beta(1,1200)/2	med: 0.015 (IQR 0.006-0.03) py	
		Mid-controlpoint, 2	Beta(15,1000)/2	med: 0.38 (IQR 0.31-0.45)py	
		End (2015)	Beta(15,1000)/2	med: 0.38 (IQR 0.31-0.45)py	
Testing asymptomatic 25-39 women (pw)	$\sigma_{j=3}^{fa}$	Time-varying parameter, see section screening for further detail.			
For the more constrained scenario					
		Start (2000)	Beta(1,1400)/2	med: 0.013 (IQR 0.005-0.03) py	

		Mid-controlpoint, 1	Beta(1,1)	range 0-1	
		Mid-controlpoint, 2	Beta (1,1)	range 0-1	
		End (2015)	Beta(4,1200)/2	med: 0.08 (IQR 0.05-0.11) py	
For the less constrained scenario		Same as for the more constrained scenarios			
Testing asymptomatic 40-54 women (pw)	$\sigma_{j=4}^{fa}$	No screening assumed among women aged ≥40	Fixed	0	
Screening in men					
Men 15-18, 19-24		Scaler vs the same age group of women	Beta(3,30)	med: 0.08 (IQR 0.05-0.12)	
Men 25-39		Scaler vs W, aged 25-39	Beta(3,100)	med: 0.03 (IQR 0.02, 0.04)	
Men 40-54		No screening assumed for men aged ≥40	Fixed	0	
Partner notification		Proportion of partners of index case that get correctly notified and correctly tested (among those in a long-term pair)			
Women	g_j^f				
		PN, index case F 15-18	Beta(4,3)	med: 0.58 (IQR 0.44-0.70)	Expert opinion
		PN, index case F 19-24	Beta(4,3)	med: 0.58 (IQR 0.44-0.70)	
		PN, index case F 25-39	Beta(4,3)	med: 0.58 (IQR 0.44-0.70)	
		PN, index case F 40-54	Beta(4,3)	med: 0.58 (IQR 0.44-0.70)	
Men	g_j^m				
		PN, index case M 15-18	Beta(4,3)	med: 0.58 (IQR 0.44-0.70)	
		PN, index case M 19-24	Beta(4,3)	med: 0.58 (IQR 0.44-0.70)	
		PN, index case M 25-39	Beta(4,3)	med: 0.58 (IQR 0.44-0.70)	
		PN, index case M 40-54	Beta(4,3)	med: 0.58 (IQR 0.44-0.70)	
Test sensitivity					
	sens	Average sensitivity of chlamydia test in 2000, time varying, see section time-varying parameters	x*y+(1-x)z		
	x	Proportion of tests done using a NAAT	Fixed	0.17	See Web Figure 1
	y	Sensitivity of NAAT	Beta(45,1)	med: 0.98 (IQR 0.97-0.99)	(15,16)
	z	Sensitivity of non NAAT	Beta(17,2)	med: 0.90 (IQR 0.86-0.95)	
	$\mathbf{sens_{max}}$	Maximum sensitivity of a chlamydia test	Fixed	1	
Treatment success (efficacy of antibiotics)					
	$\mathbf{r_I}$	Index case	Beta(190,8)	med: 0.96 (IQR 0.95-0.97)	(17)
	$\mathbf{r_P}$	Partner of index case	Beta(190,9)	med: 0.96 (IQR 0.95-0.97)	
Reporting		Proportion of diagnosed cases reported per year. Time-varying parameter, see			Expert opinion

Women	**repW**	Proportion of diagnosed cases reported in 2000. Time-varying, see section on time-varying parameters			
Less constrained			Beta (7,3)	med: 0.71 (IQR 0.61-0.80)	
More constrained			Beta (7,3) /2+0.5	med: 0.86 (IQR 0.80-0.90), lower limit 0.50	
Maximum reporting			Fixed	1	
Men	**repM**	Relative to women	Beta (8, 2)	med: 0.82 (IQR 0.73-0.89)	
Natural recovery (pw)					
Women	$\boldsymbol{v^f}$		1/(52*(1.13+0.5* Beta(4,4.696)))	med: 0.74 (constrained range 0.61-0.88) py	(18) (14)
Men	$\boldsymbol{v^m}$		1/(52*(1.13+0.5* Beta(4,4.696)))	med: 0.74 (constrained range 0.61-0.88) py	
Transmission probability					
	$\boldsymbol{b}$	Per act probability	Beta(5.5, 50)	med: 0.094 (IQR 0.07 – 0.12)	(18)
	$\boldsymbol{R_m}$	Relative transmission probability increase from men to women	Fixed	RR=2	(18); Assumption
Proportion with symptoms					
Women	$\boldsymbol{f^f}$	Proportion symptomatic	0.159+0.152*Beta(5, 5.55)	med: 0.23 (constrained range 0.16,0.31)	(14)
Men	$\boldsymbol{f^m}$		0.159+0.152*Beta(5, 5.55)	med: 0.23 (constrained range 0.16,0.31)	(14)
Sexual debut					
Women	$\boldsymbol{p^f}$	Had sex before age 15	Beta(16, 30)	med: 0.35 (IQR 0.30-0.39)	Calibrated to (19)
	$\boldsymbol{\omega_1^f}$	Rate of sexual initiation, calculated from:			
		proportion sexually active by 18 (of those not yet active) used to derived a rate	Beta(8,11)	med: 0.42 (IQR 0.34-0.50)	
	$\boldsymbol{R^f}$	Relative change in sexual debut	Uniform(0.77-1.3)		
	$\boldsymbol{\omega_2^f}$	Rate of sexual initiation, calculated from the			
		proportion sexually active by 25 (of those not yet active) used to derived a rate	Beta (120, 10)	med: 0.93 (IQR 0.91-0.94)	(20)
Men	$\boldsymbol{p^m}$	Had sex before age 15	Beta (16, 30)	med: 0.35 (IQR 0.30-0.39)	Calibrated to (19)
	$\boldsymbol{\omega_1^m}$	Rate of sexual initiation, calculated from: proportion sexually active by 18 (of those not yet active) used to derived a rate	Beta (8,11)	med: 0.42 (IQR 0.34-0.50)	
	$\boldsymbol{R^m}$	Relative change in sexual debut	Uniform(0.77-1.3)		
	$\boldsymbol{\omega_2^m}$	Rate of sexual initiation, calculated from: proportion sexually active by 25 (of those not yet active) used to derived a rate	Beta (120, 10)	med: 0.93 (IQR 0.91-0.94)	(20)

Casual partners (py)	c_{ji}^{c}				
High-risk (HR)		Single, 15-18 HR	Beta(3,30)	med: 4.2 (IQR 2.6-6.2) py	(11); Assumption
		Single, 19-24 HR	Beta(3,30)	med: 4.2 (IQR 2.6-6.2) py	
		Single, 25-39 HR	Beta(3,60)	med: 2.1 (IQR 1.6-3.1) py	
		Single, 40-54 HR	Beta(3,400)	med: 0.4 (IQR 0.2-0.5) py	
Low-risk (LR)		Single, 15-18 LR	Beta(1,40)	med: 0.9 (IQR 0.4-1.8) py	
		Single, 19-24 LR	Beta(1,40)	med: 0.9 (IQR 0.4-1.8) py	
		Single, 25-39 LR	Beta(1,160)	med: 0.2 (IQR 0.1-0.5) py	
		Single, 40-54 LR	Beta(1,160)	med: 0.2 (IQR 0.1-0.5) py	
Among paired (concurrency)		Partner change rate for concurrency is compared to the respective single compartments			
High-risk (HR)		Paired, 15-54 HR	Beta(10,70)	RR= med: 0.12 (IQR 0.1-0.15)	
Low-risk (LR)		Paired, 15-54 LR	Beta(10,100)	RR= med: 0.09 (IQR 0.07-0.11)	
Proportion of population who is HR			Fixed	0.1	Assumption*
Number of acts per casual partnership	n_{j}^{c}		Fixed	15 per partnership	Assumption
Condom use in casual partnerships	u_{j}^{c}	Proportions of acts protected by condoms. Only unprotected acts modeled in this analysis.	Fixed	0	
Long-term partnerships		Long-term partnerships formed within one's own age group or women with one age group older.			
Age mixing - input preference		Age mixing and partner formation set to represent partnerships among cohabiting and married people in the United States			See Web Figure 18 (2,3,11)
Women	e_{j}^{f}				
		Aged 15-18	Fixed	0.8	
		Aged 19-24	Fixed	0.2	
		Aged 25-39	Fixed	0.98	
		Aged 40-54 (only formed with own age)	Fixed	1	
Men	e_{j}^{m}				
		Aged 15-18 (only formed with own age)	Fixed	1	
		Aged 19-24	Fixed	0.8	
		Aged 25-39	Fixed	0.5	
		Aged 40-54	Fixed	0.98	
Pair formation rate "tendency" (pw)	ϱ_{j}				
		Aged 15-18	Fixed	0.002	
		Aged 19-24	Fixed	0.0015	

		Aged 25-39	Fixed	0.004	
		Aged 40-54	Fixed	0.007	
Actualized pair formation rate from unpaired	$\boldsymbol{\rho_{ji}}$	Adjusted pair formation to assure it is balanced: See section pair formation			
Pair formation rate to paired	ϕ_{ji}	Adjusted pair formation to assure it is balanced: See section pair formation			
Pair dissolution	$\boldsymbol{\gamma_{ji}}$	Dissolution rate	Fixed	0	Pair dissolution governed by aging events, see below
Number of acts in a pair (pw)	$\boldsymbol{n_j^r}$		Fixed	2	Assumption
Condom use in pairs	$\boldsymbol{u_j^r}$	Proportions of acts protected by condoms. Only unprotected acts modeled in this analysis.	Fixed	0	

pw: per week; py: per year; IQR: interquartile range

*) We chose to fix the fraction of the population defined as high risk at a constant 10%, but to accommodate uncertainty in levels of risk behavior by varying the partner change rates by relationship stats and age, in each of the risk groups. Defining a set proportion of the population to belong to a risk group and varying partner change rates is a modeling convention. Varying both the partner change rate and proportion of high risk population overparameterize the same source of uncertainty.

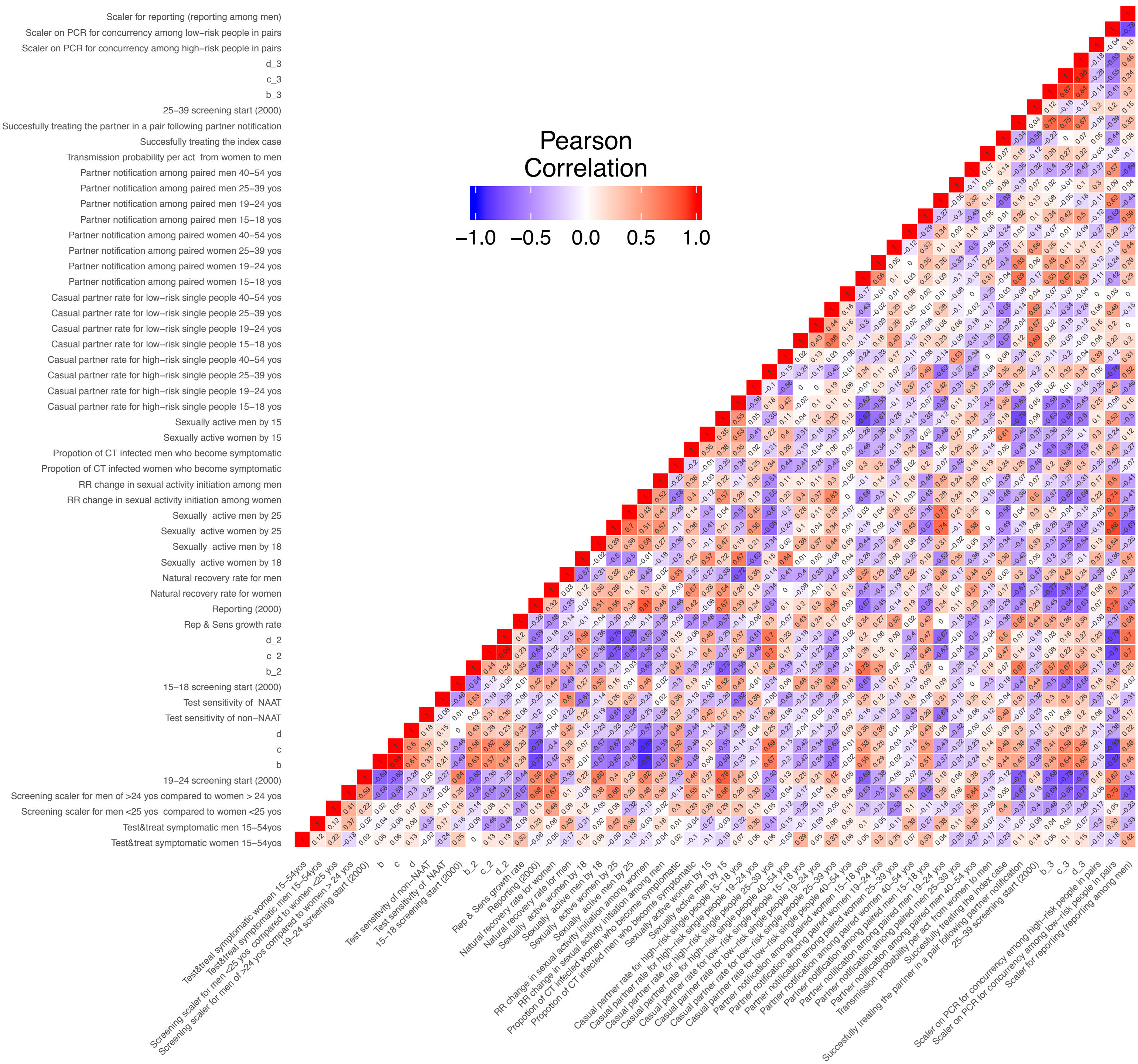
Web Table 6. Posterior estimates for the parameters in the four calibration scenarios. Presenting the median and 95% credibility interval in brackets. Rates are shown per week.

Parameter/ Variable	Symbol	Description	i) More Constrained Priors on Reporting and Screening	ii) Less Constrained Prior on Reporting, More Constrained Priors on Screening	iii) More Constrained Priors on Reporting, Less Constrained Priors on Screening	iv) Less Constrained Priors on Reporting and Screening
Testing symptomatic individuals (pw)						
Women	σ_j^{fs}	Testing of symptomatic women	0.182 (0.179-0.185)	0.181 (0.178-0.185)	0.189 (0.186-0.192)	0.188 (0.18-0.192)
Men	σ_j^{fm}	Testing of symptomatic men	0.171 (0.168-0.174)	0.17 (0.164-0.175)	0.173 (0.17-0.178)	0.173 (0.165-0.176)
Testing asymptomatic 15-18 years old women (pw)	$\sigma_{j=1}^{fa}$	Time-varying parameter, see section screening for further detail.				
		Start(2000)	0 (0-0)	0 (0-0.001)	0 (0-0)	0 (0-0)
		End (2015)	0.013 (0.013-0.014)	0.013 (0.011-0.014)	0.007 (0.006-0.007)	0.006 (0.006-0.007)
Testing asymptomatic 19-24 women (pw)	$\sigma_{j=2}^{fa}$	Time-varying parameter, see section screening for further detail.				
		Start (2000)	0.001 (0.001-0.001)	0 (0-0.002)	0.005 (0.005-0.005)	0.005 (0.005-0.005)
		End (2015)	0.013 (0.012-0.013)	0.013 (0.012-0.014)	0.014 (0.013-0.015)	0.014 (0.013-0.014)
Testing asymptomatic 25-39 women (pw)	$\sigma_{j=3}^{fa}$	Time-varying parameter, see section screening for further detail.				
		Start (2000)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)
		End (2015)	0.003 (0.002-0.003)	0.003 (0.003-0.003)	0.002 (0.002-0.002)	0.002 (0.002-0.002)
Screening in men						
Men 15-18, 19-24		Scaler vs the same age group of women	0.149 (0.141-0.159)	0.108 (0.09-0.127)	0.177 (0.162-0.185)	0.133 (0.111-0.145)
Men 25-39		Scaler vs W, aged 25-39	0.02 (0.015-0.026)	0.021 (0.017-0.024)	0.021 (0.019-0.023)	0.021 (0.017-0.024)
Partner notification		Proportion of partners of index case that get correctly notified and correctly tested (among those in a long-term pair)				
Women	g_j^f					
		PN, index case F 15-18	0.549 (0.485-0.572)	0.528 (0.283-0.588)	0.574 (0.55-0.628)	0.511 (0.478-0.554)
		PN, index case F 19-24	0.701 (0.665-0.722)	0.715 (0.688-0.804)	0.668 (0.645-0.698)	0.663 (0.612-0.691)
		PN, index case F 25-39	0.527 (0.503-0.569)	0.53 (0.47-0.575)	0.539 (0.522-0.57)	0.544 (0.51-0.599)
		PN, index case F 40-54	0.502 (0.468-0.529)	0.514 (0.481-0.54)	0.502 (0.481-0.549)	0.503 (0.471-0.536)
Men	g_j^m					
		PN, index case M 15-18	0.646 (0.601-0.673)	0.663 (0.604-0.685)	0.689 (0.662-0.741)	0.683 (0.625-0.731)
		PN, index case M 19-24	0.651 (0.583-0.685)	0.622 (0.548-0.649)	0.683 (0.659-0.704)	0.678 (0.623-0.724)
		PN, index case M 25-39	0.752 (0.717-0.787)	0.767 (0.712-0.802)	0.77 (0.738-0.792)	0.78 (0.736-0.817)
		PN, index case M 40-54	0.713 (0.665-0.75)	0.724 (0.632-0.762)	0.709 (0.663-0.751)	0.737 (0.696-0.771)

Test sensitivity						
	y	Sensitivity of NAAT	0.995 (0.99-1)	0.998 (0.993-1)	0.997 (0.993-1)	0.998 (0.993-1)
	z	Sensitivity of non NAAT	0.972 (0.947-0.986)	0.982 (0.961-0.994)	0.956 (0.925-0.983)	0.982 (0.961-0.994)
Treatment success						
	r_I	Index case	0.955 (0.951-0.959)	0.956 (0.953-0.96)	0.949 (0.947-0.951)	0.951 (0.947-0.958)
	r_P	Partner of index case	0.96 (0.956-0.964)	0.958 (0.954-0.962)	0.959 (0.955-0.962)	0.96 (0.955-0.963)
Reporting		Proportion of diagnosed cases reported per year.				
Women	**rep W**	Proportion of diagnosed cases reported in 2000	0.563 (0.549-0.603)	0.276 (0.254-0.313)	0.588 (0.576-0.607)	0.336 (0.302-0.394)
Men	**rep M**	Relative to women	0.708 (0.676-0.742)	0.771 (0.706-0.807)	0.721 (0.7-0.74)	0.757 (0.735-0.804)
Natural recovery (pw)						
Women	υ^f		0.015 (0.015-0.016)	0.015 (0.015-0.016)	0.016 (0.015-0.016)	0.015 (0.015-0.016)
Men	υ^m		0.016 (0.015-0.016)	0.016 (0.016-0.016)	0.016 (0.016-0.016)	0.016 (0.016-0.016)
Transmission probability						
	b	Per act probability	0.02 (0.019-0.022)	0.023 (0.02-0.028)	0.021 (0.019-0.023)	0.024 (0.022-0.026)
Proportion with symptoms						
Women	f^f	Proportion symptomatic	0.285 (0.28-0.287)	0.286 (0.279-0.289)	0.293 (0.287-0.295)	0.293 (0.289-0.299)
Men	f^m		0.261 (0.257-0.266)	0.266 (0.261-0.278)	0.254 (0.25-0.257)	0.268 (0.265-0.273)
Sexual debut						
Women	p^f	Had sex before age 15	0.312 (0.303-0.324)	0.322 (0.292-0.339)	0.311 (0.304-0.322)	0.313 (0.3-0.338)
	ω_1^f	Rate of sexual initiation, calculated from:				
		proportion sexually active by 18 (of those not yet active) used to derived a rate	0.352 (0.338-0.39)	0.351 (0.302-0.383)	0.337 (0.306-0.349)	0.344 (0.325-0.367)
	R^f	Relative change in sexual debut	0.985 (0.962-1.077)	0.937 (0.897-1.3)	1.079 (1.055-1.145)	1.048 (1.018-1.092)
	ω_2^f	Rate of sexual initiation, calculated from the				
		proportion sexually active by 25 (of those not yet active) used to derived a rate	0.92 (0.91-0.927)	0.92 (0.908-0.932)	0.92 (0.913-0.928)	0.922 (0.913-0.928)
Men	p^m	Had sex before age 15	0.284 (0.264-0.327)	0.29 (0.265-0.308)	0.282 (0.273-0.3)	0.295 (0.276-0.312)
	ω_1^m	Rate of sexual initiation, calculated from: proportion sexually active by 18 (of those not yet active) used to derived a rate	0.298 (0.285-0.314)	0.314 (0.277-0.327)	0.282 (0.245-0.316)	0.299 (0.271-0.336)
	R^m	Relative change in sexual debut	0.983 (0.956-1.012)	0.826 (0.805-1.101)	1.019 (0.994-1.034)	0.891 (0.851-0.952)
	ω_2^m	Rate of sexual initiation, calculated from: proportion sexually active by 25 used to derived a rate	0.928 (0.92-0.935)	0.933 (0.926-0.94)	0.928 (0.923-0.93)	0.935 (0.93-0.945)
Casual partners (pw)	c_{ji}^c					
High-risk (HR)		Single, 15-18 HR	0.045 (0.037-0.068)	0.047 (0.041-0.389)	0.034 (0.03-0.041)	0.029 (0.023-0.043)
		Single, 19-24 HR	0.246 (0.234-0.252)	0.223 (0.058-0.248)	0.239 (0.225-0.25)	0.222 (0.206-0.233)

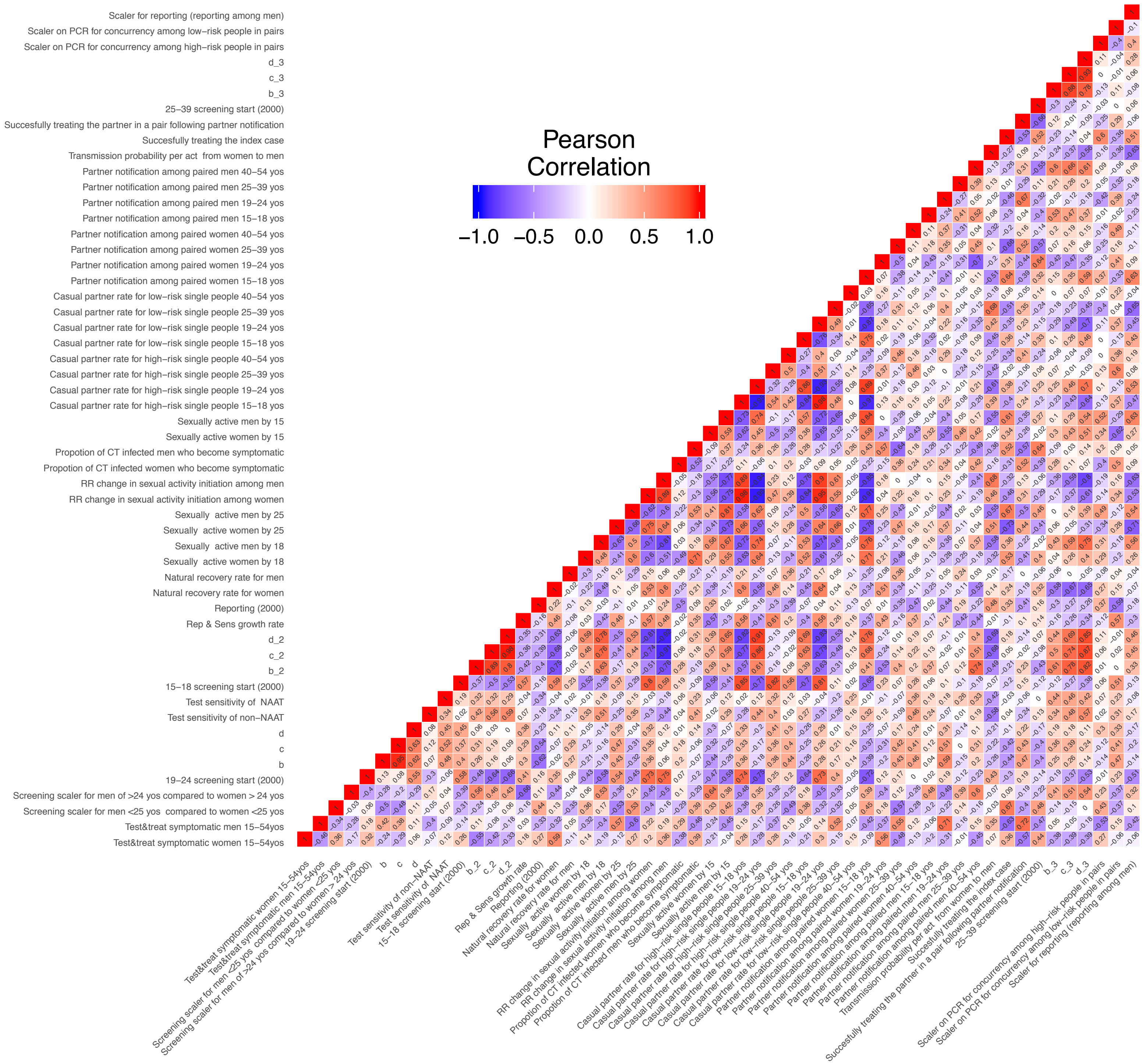
		Single, 25-39 HR	0.042 (0.031-0.048)	0.04 (0.028-0.071)	0.043 (0.04-0.047)	0.024 (0.019-0.028)
		Single, 40-54 HR	0.002 (0.002-0.003)	0.002 (0.002-0.004)	0.002 (0.001-0.003)	0.001 (0-0.003)
Low-risk (LR)		Single, 15-18 LR	0.009 (0.008-0.015)	0.011 (0-0.013)	0.012 (0.01-0.016)	0.012 (0.009-0.017)
		Single, 19-24 LR	0.001 (0-0.003)	0.001 (0-0.021)	0.001 (0-0.005)	0.002 (0-0.006)
		Single, 25-39 LR	0 (0-0.002)	0.001 (0-0.002)	0 (0-0.002)	0.002 (0.001-0.003)
		Single, 40-54 LR	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)
Among paired (concurrent)	c_{ji}^{r}	Relative rate compared to the single group				
High-risk (HR)		Paired, 15-54 HR	0.095 (0.09-0.1)	0.098 (0.082-0.114)	0.097 (0.09-0.1)	0.122 (0.115-0.129)
Low-risk (LR)		Paired, 15-54 LR	0.088 (0.071-0.111)	0.088 (0.082-0.1)	0.083 (0.07-0.089)	0.089 (0.083-0.1)

Web Figure 8. Pearson correlation matrix for the calibration scenario: *More constrained priors on reporting and screening*



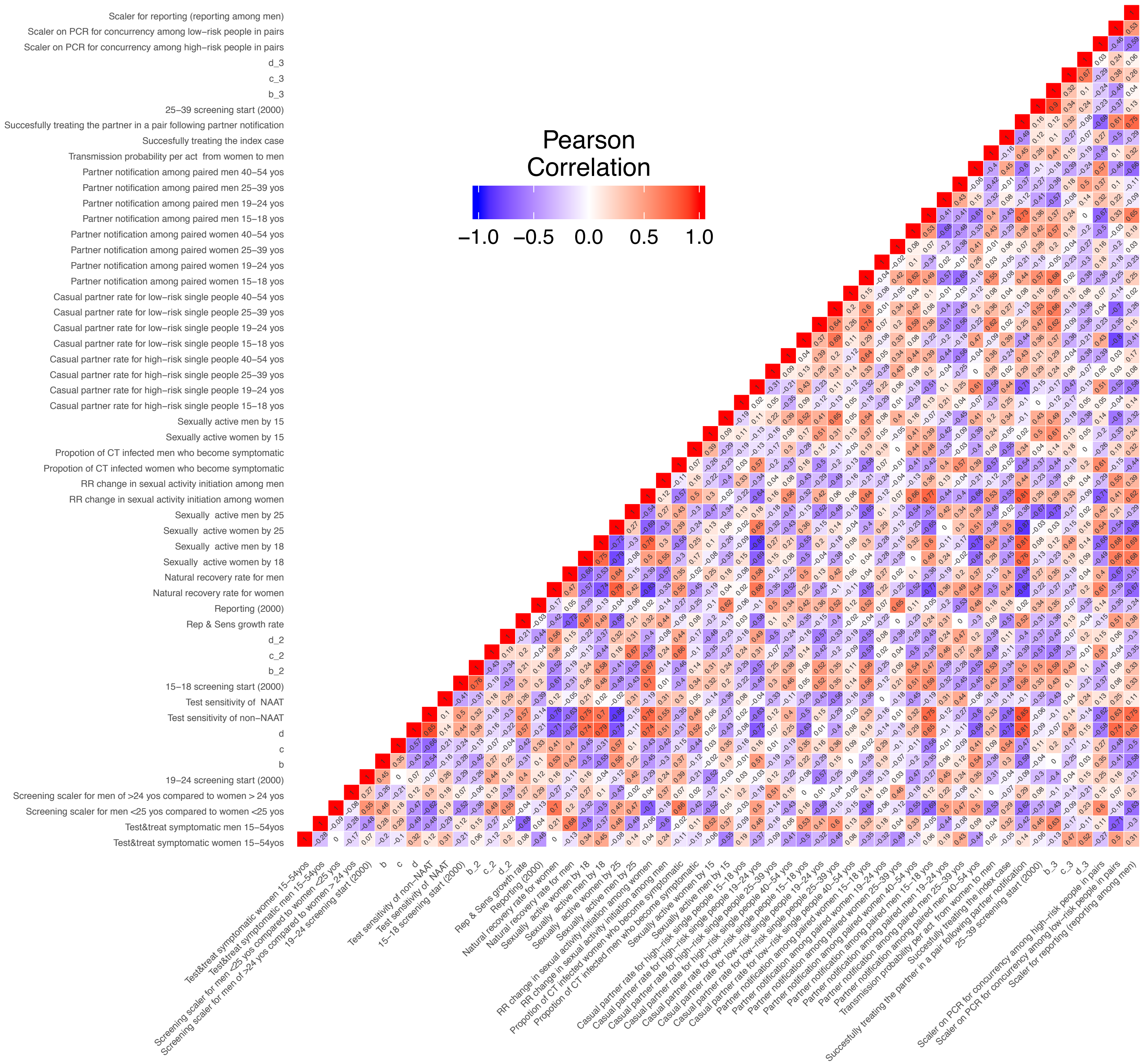
Footnote for Web Figure 8: Parameters b, c, d; b_2, c_2, d_2, and b_3, c_3, d_3 refer to the last three control points in the Bezier curve defining screening trends for the 19-24, 15-18 and 25-39 years old women, respectively.

Web Figure 9. Pearson correlation matrix for the calibration scenario**:** *Less constrained prior on reporting, more constrained priors on screening*



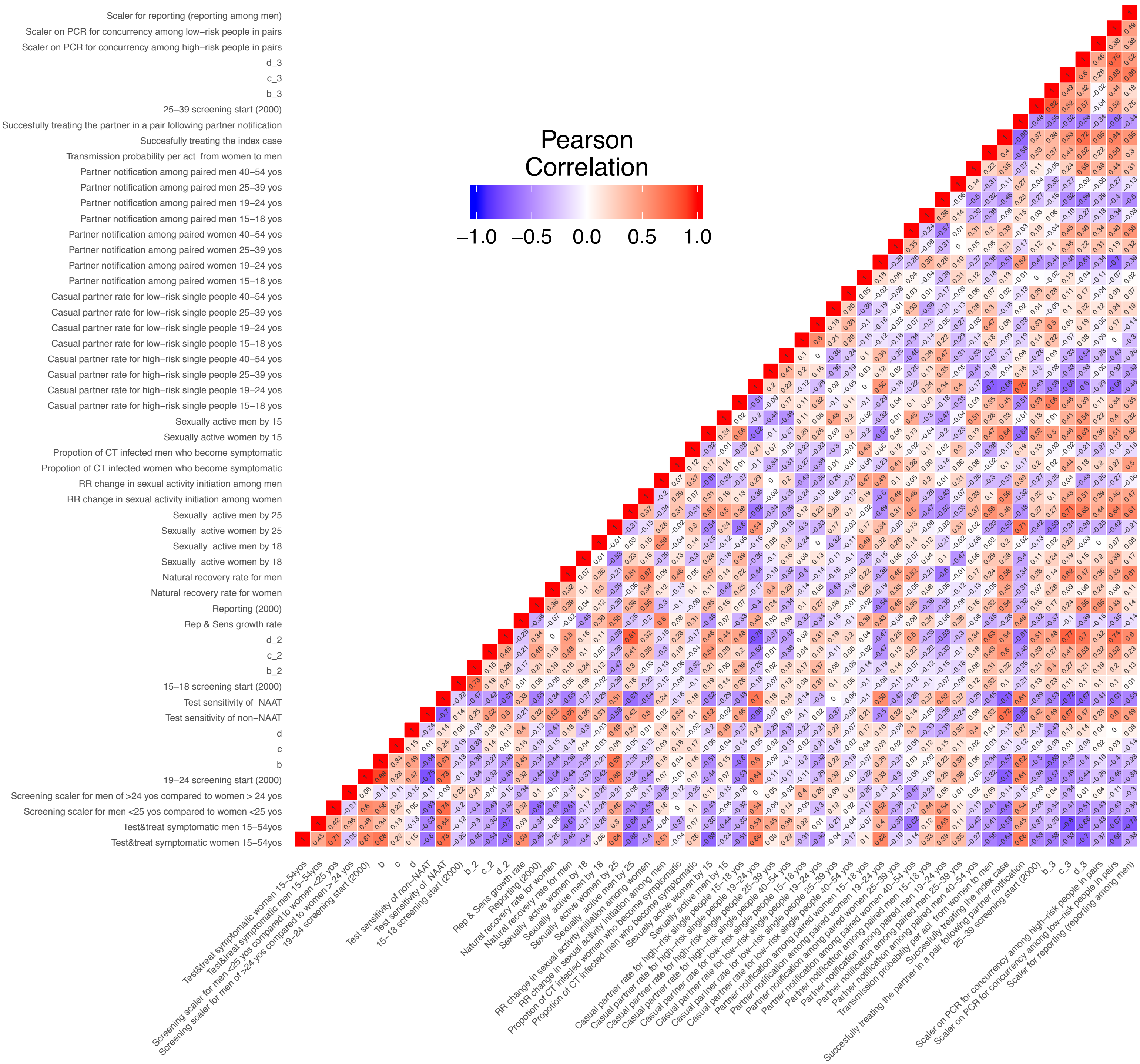
Footnote for Web Figure 9: Parameters b, c, d; b_2, c_2, d_2, and b_3, c_3, d_3 refer to the last three control points in the Bezier curve defining screening trends for the 19-24, 15-18 and 25-39 years old women, respectively.

Web Figure 10. Pearson correlation matrix for the calibration scenario: *More constrained priors on reporting, less constrained priors on screening*



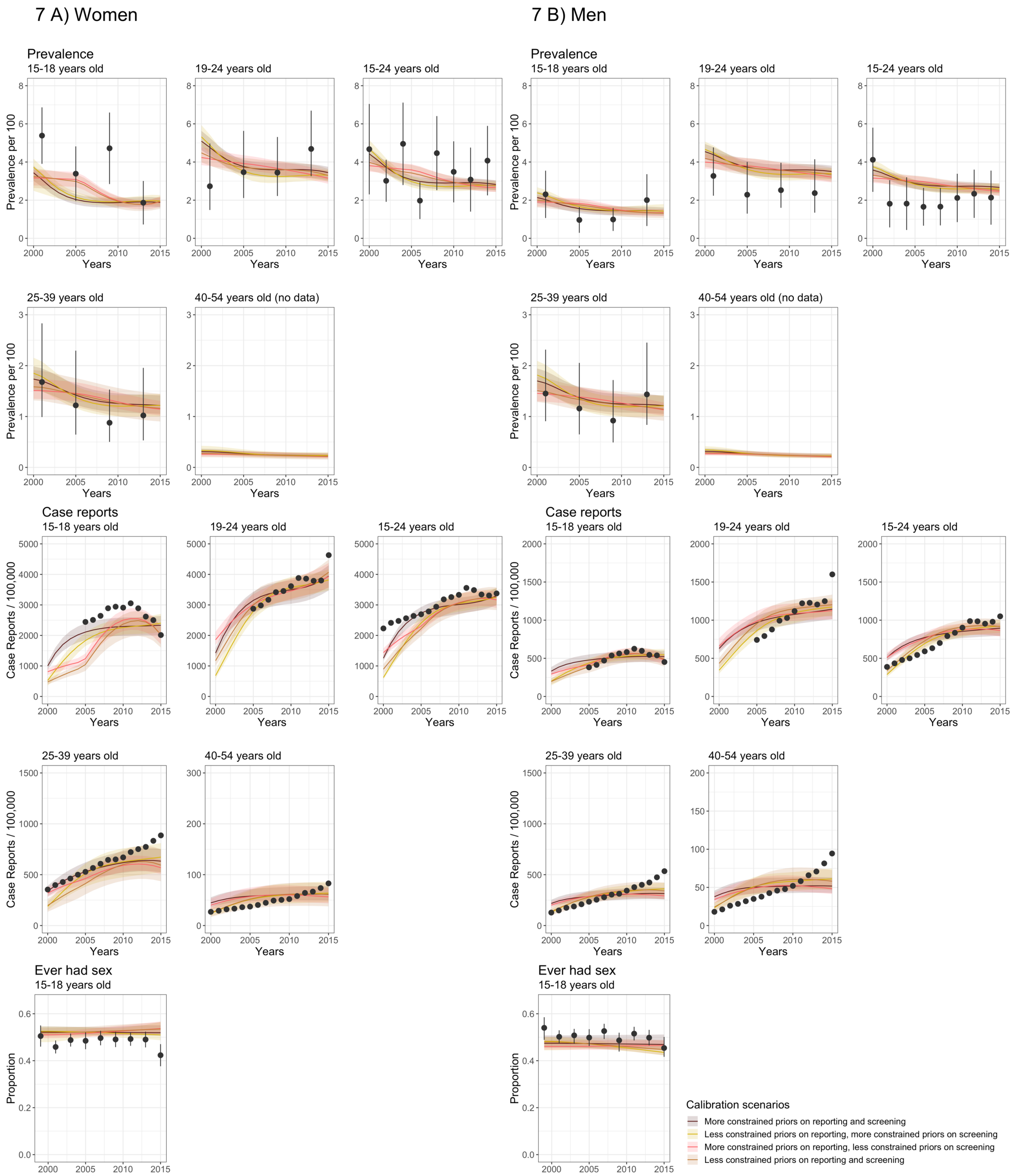
Footnote for Web Figure 10: Parameters b, c, d; b_2, c_2, d_2, and b_3, c_3, d_3 refer to the last three control points in the Bezier curve defining screening trends for the 19-24, 15-18 and 25-39 years old women, respectively.

Web Figure 11. Pearson correlation matrix for the calibration scenario***: Less constrained priors on reporting and screening***



Footnote for Web Figure 11: Parameters b, c, d; b_2, c_2, d_2, and b_3, c_3, d_3 refer to the last three control points in the Bezier curve defining screening trends for the 19-24, 15-18 and 25-39 years old women, respectively.

Web Figure 12. Calibration results for the four calibration scenarios varying prior assumptions for reporting and screening. For each scenario the mean and 95% credible interval of the calibrated model is shown along with the data (black circles) used in the calibration (and respective confidence interval, where applicable). Note the varying y-axis between the subgroups.



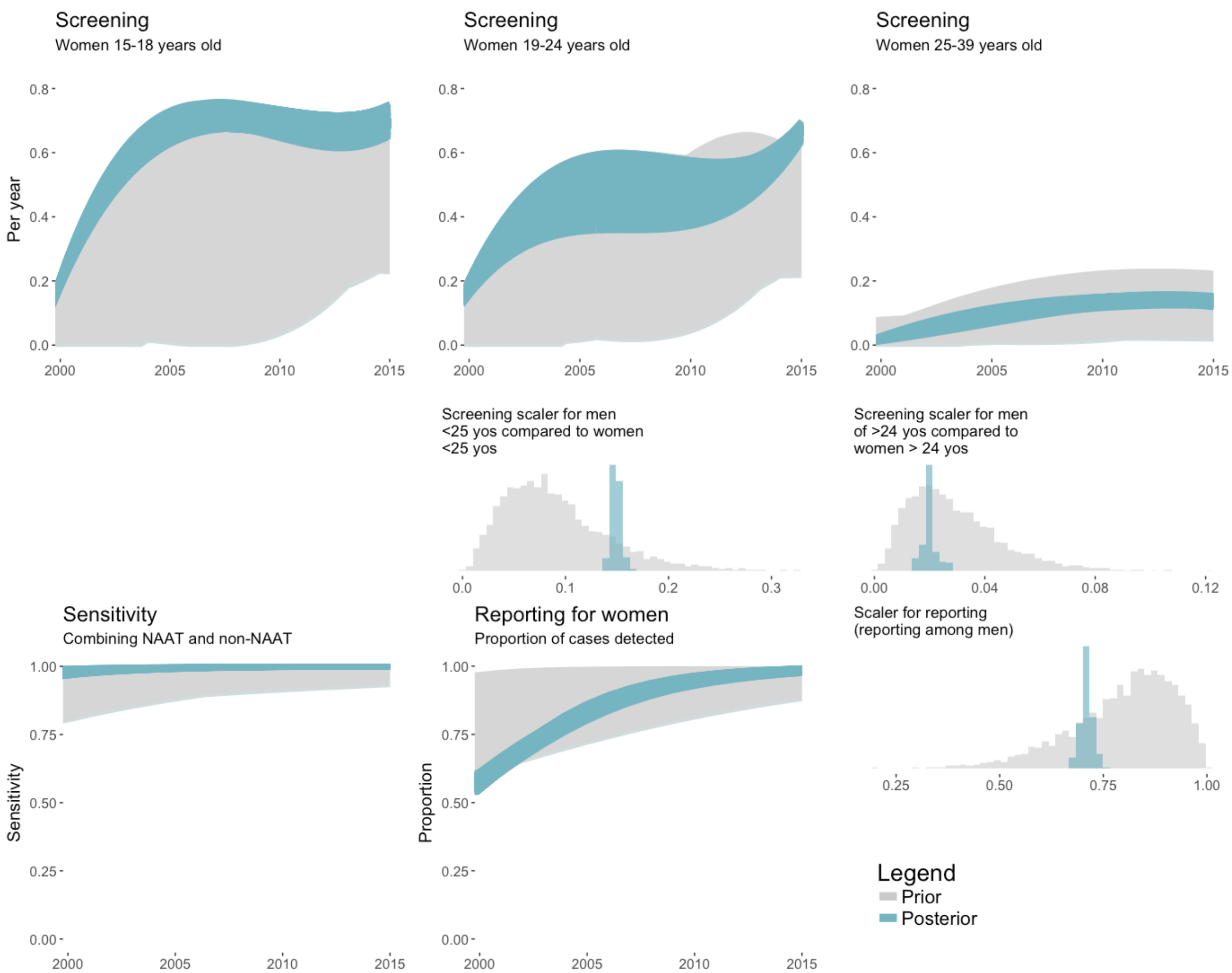
Footnote for Web Figure 12: 95% confidence intervals around the data estimates reflect variance in NHANES and YRBS data for prevalence and ever had sex, respectively. NHANES prevalence estimates for 15–17 years old women and men are restricted variables, these data were accessed through the Research Data Center. Case report data presents reported chlamydia cases per 100,000 persons. Confidence intervals are not presented for case report data.

Web Figure 13. Priors and posteriors for the calibration scenario: More constrained priors on reporting and screening.

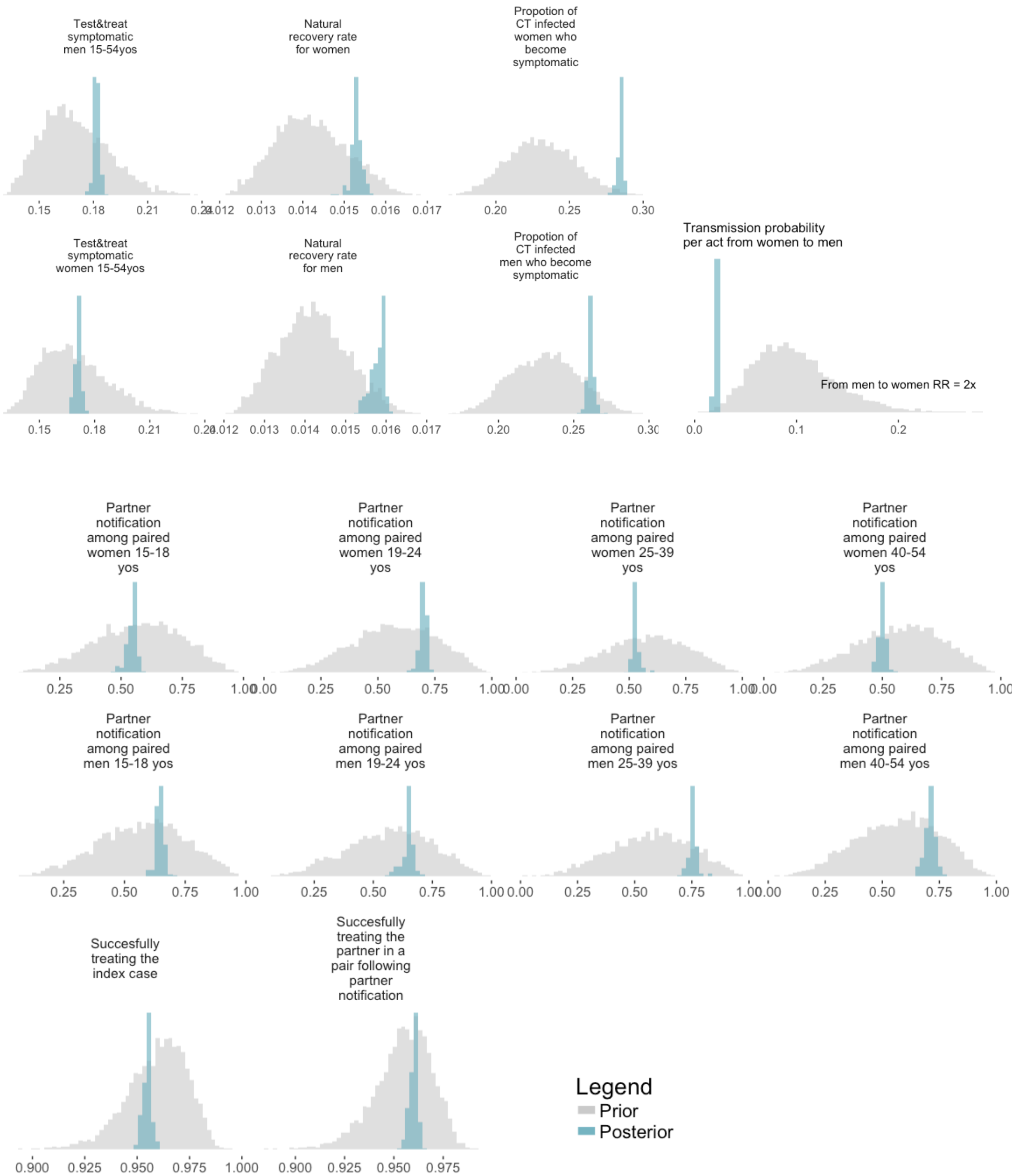
Prior assumptions

- Reporting restricted to >50% since 2000: Prior parameter for (Beta(7,3)/2+0.5) with a median reporting 86% (IQR 80-90%) in 2000. Reporting is modeled as a logistic function only allowing for increase in reporting over time.
- Time-varying screening parameter constrained so screening may have increased or remained stable between 2000-2015.

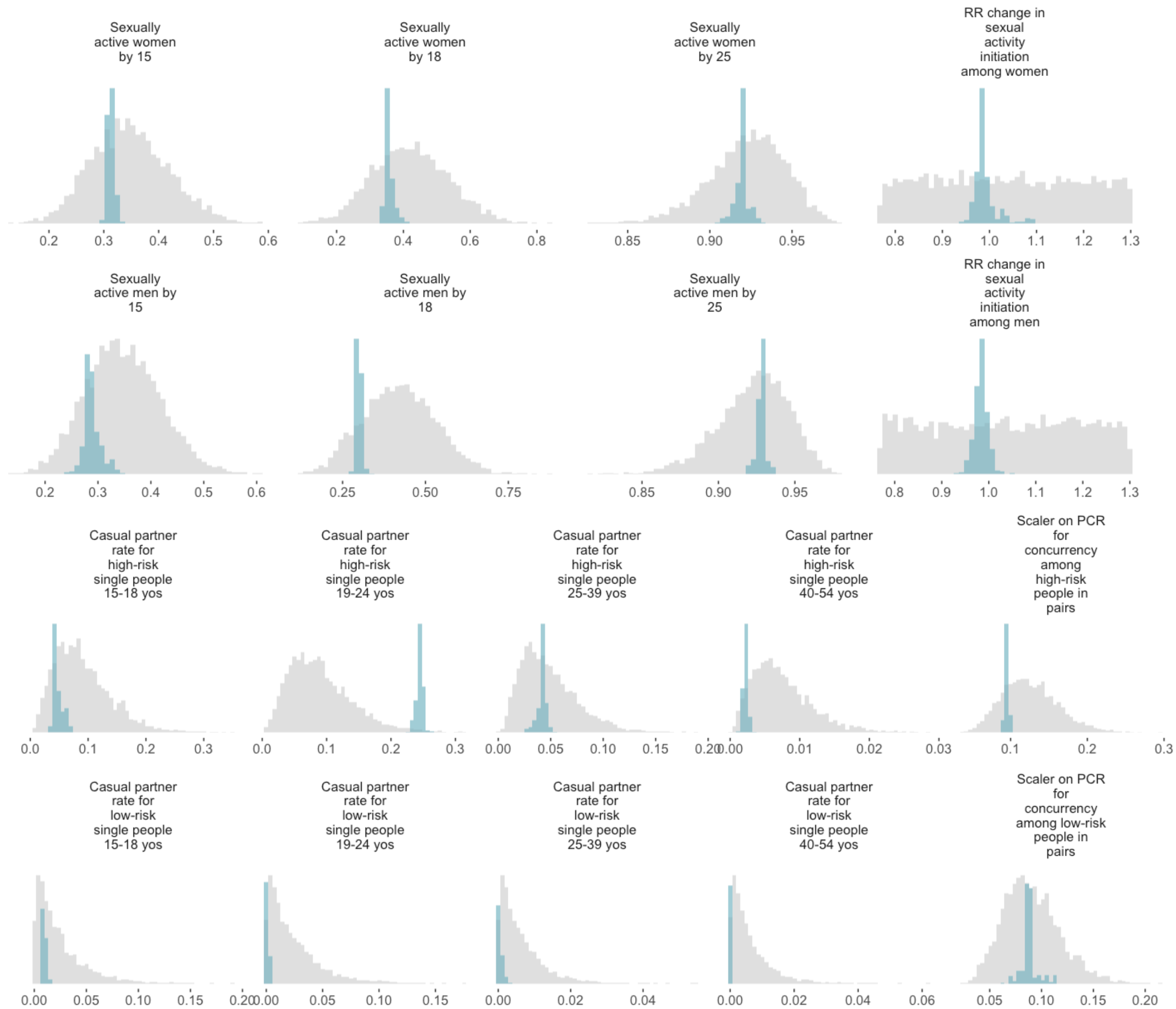
13 A) Time-varying screening, reporting and sensitivity



13 B) Treatment and recovery parameters



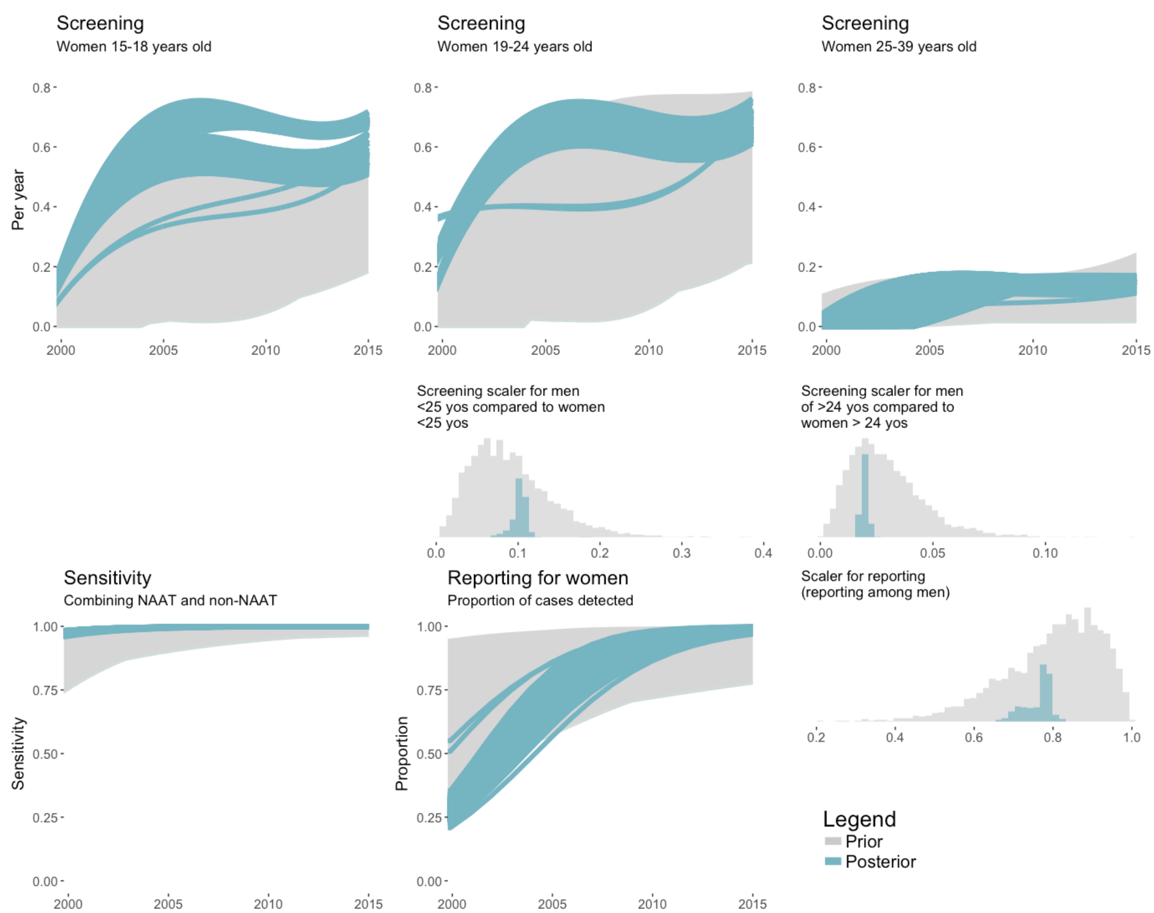
13 C) Behavioral parameters



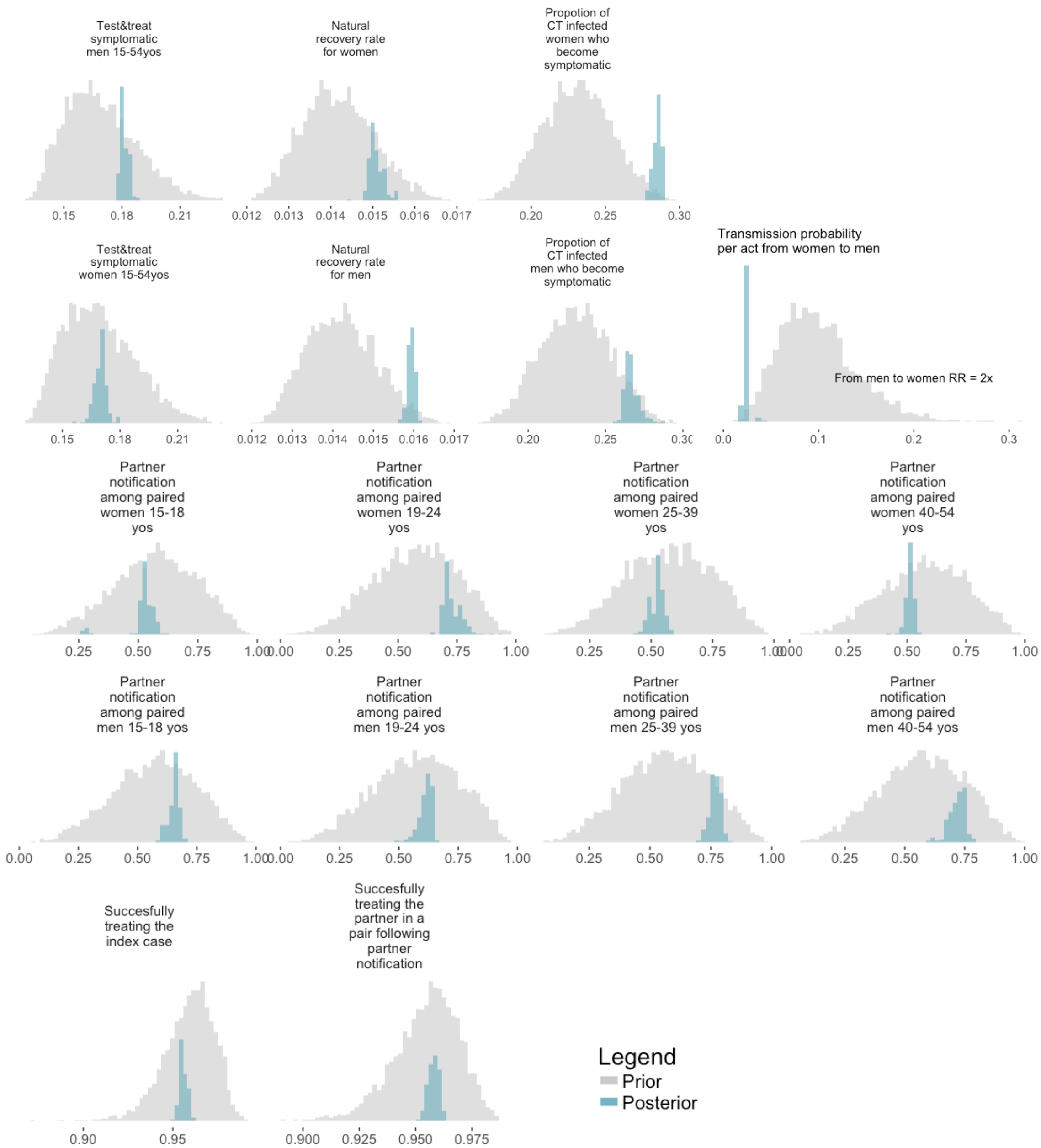
Web Figure 14. Priors and posteriors for the calibration scenario: Less constrained priors on reporting, more constrained priors on screening.

Prior assumptions
• Reporting in 2000 estimated as Beta(7,3) with a median of 71% (IQR 61-80%) in 2000. Reporting is modeled as a logistic function only allowing for increase in reporting over time.
• Time-varying screening parameter constrained so screening may have increased or remained stable between 2000-2015 for 15-24 years old.

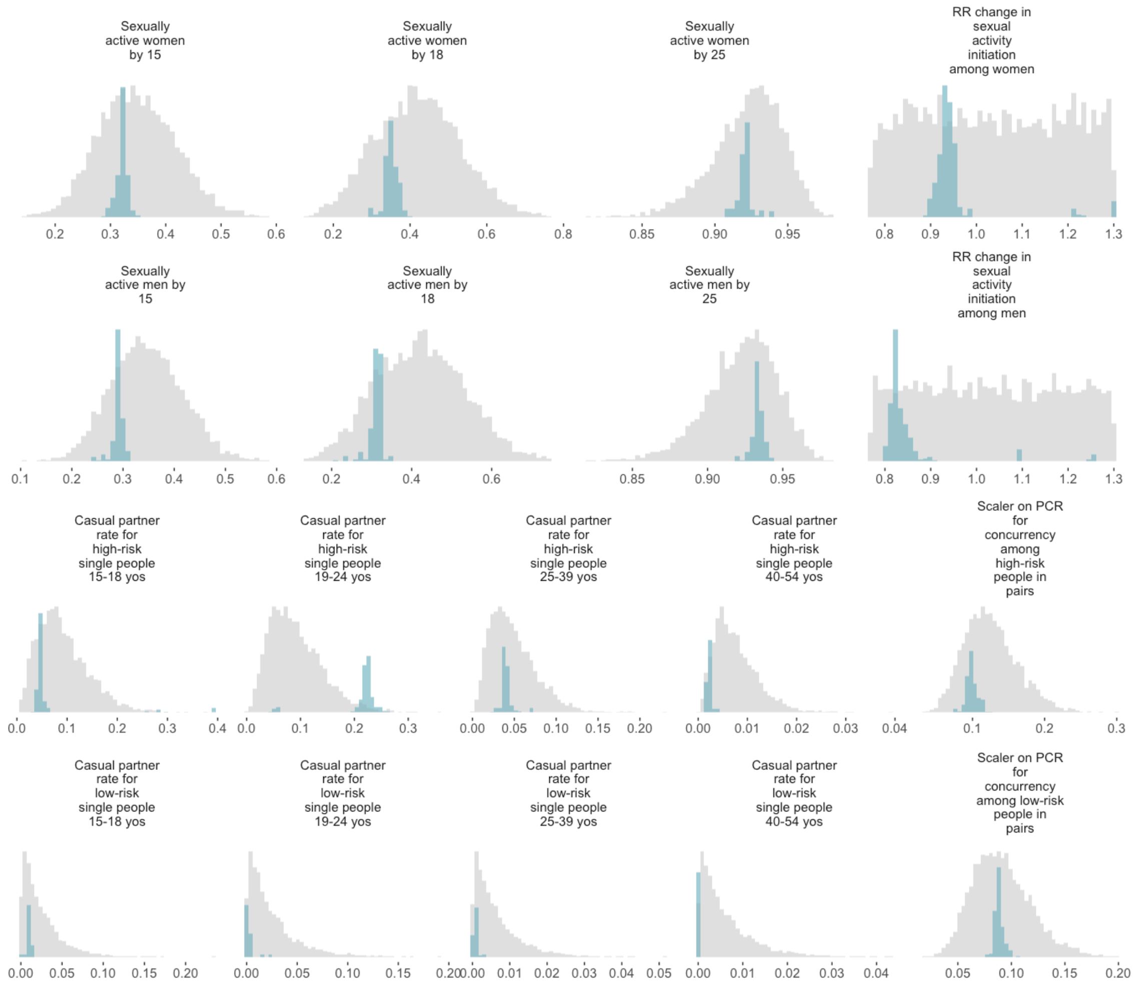
14 A) Time-varying screening, reporting and sensitivity



14 B) Treatment and recovery parameters



14 C) Behavioral parameters

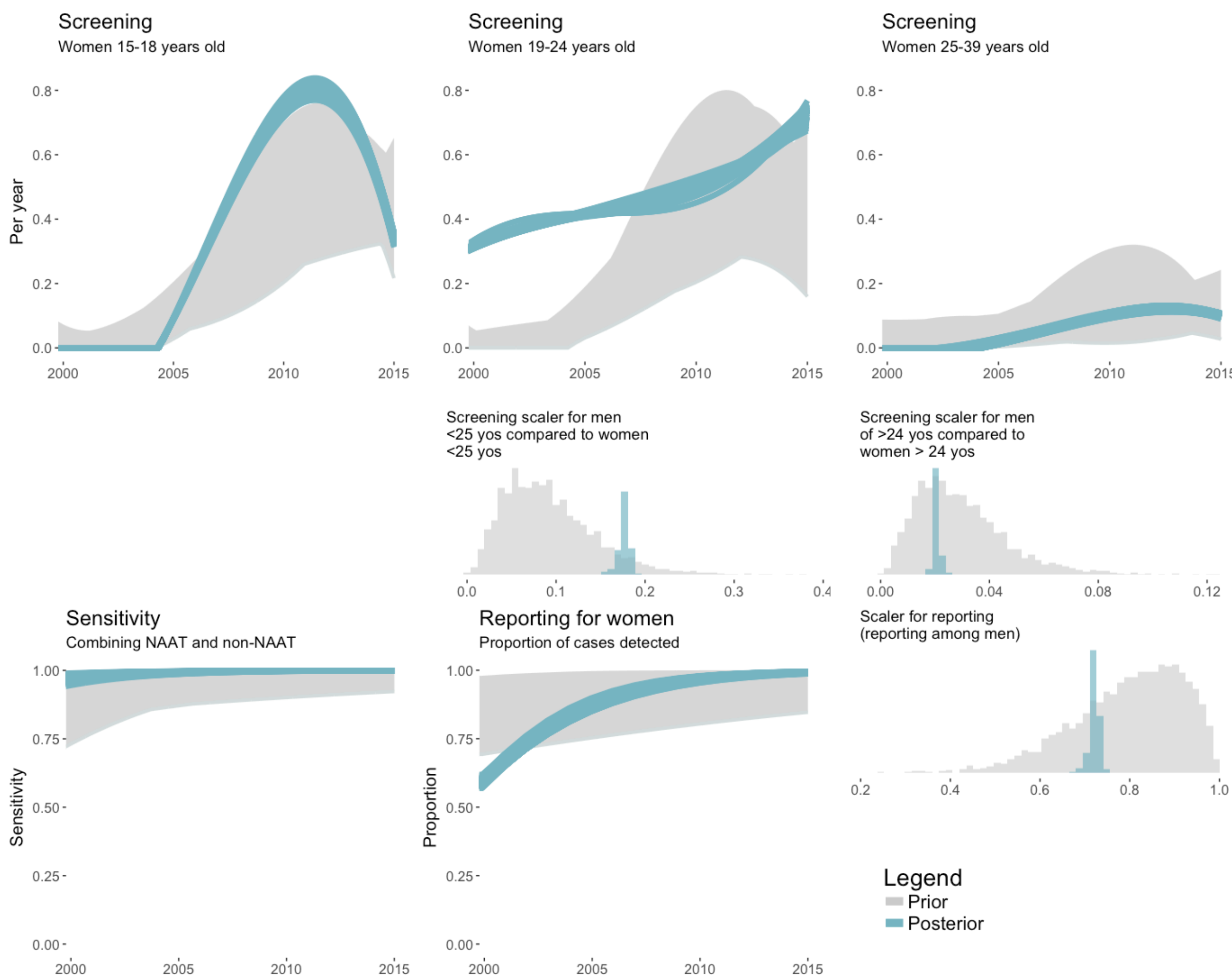


Web Figure 15. Priors and posteriors for the calibration scenario: More constrained prior on reporting, less constrained priors on screening.

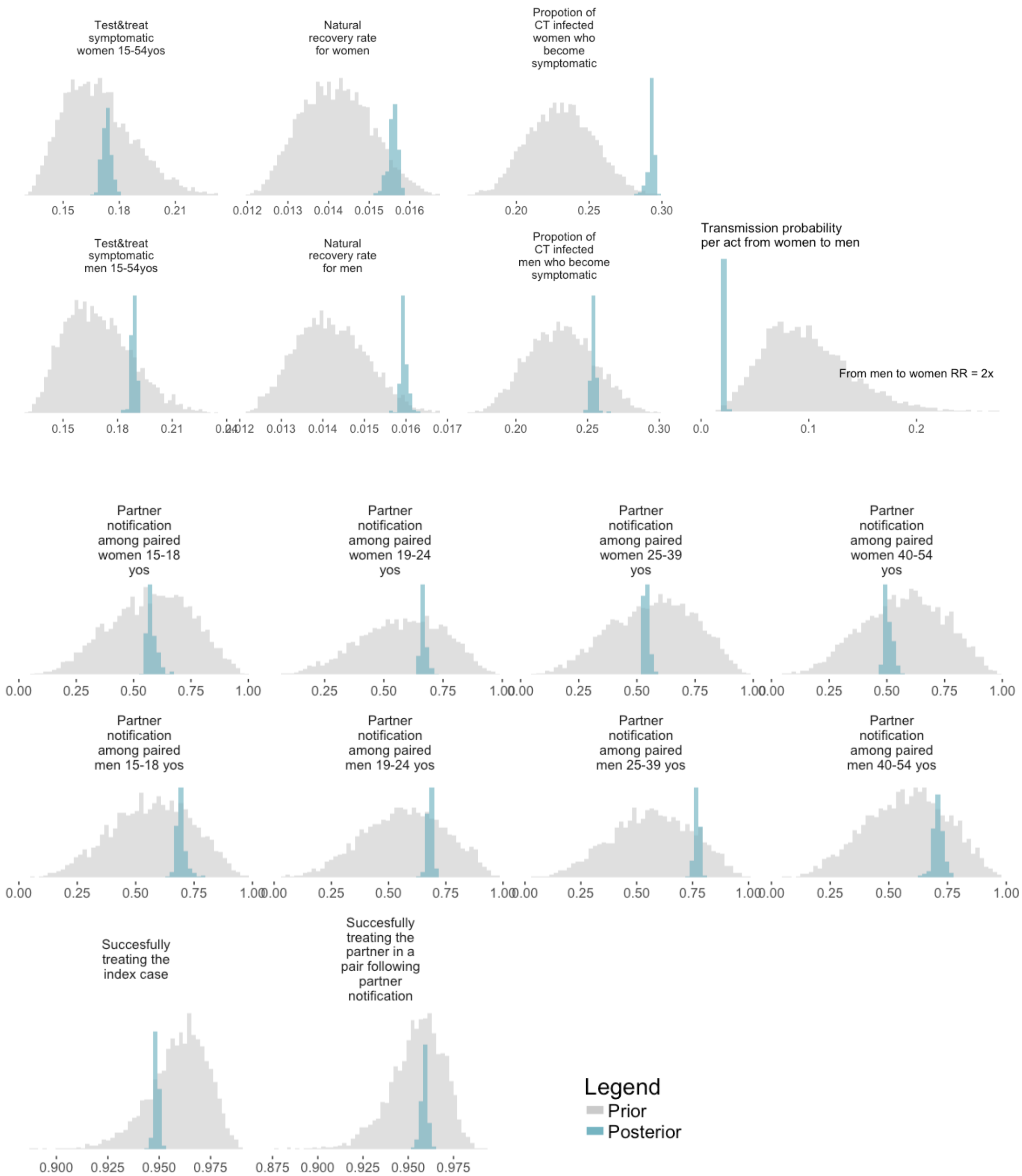
Prior assumptions

- Reporting restricted to >50% since 2000. Prior parameter for (Beta(7,3)/2+0.5).
- The starting (2000) and end (2015) priors for the screening for 15-24 years old remain unchanged but time-varying shape of the screening parameter is allowed to vary over time.

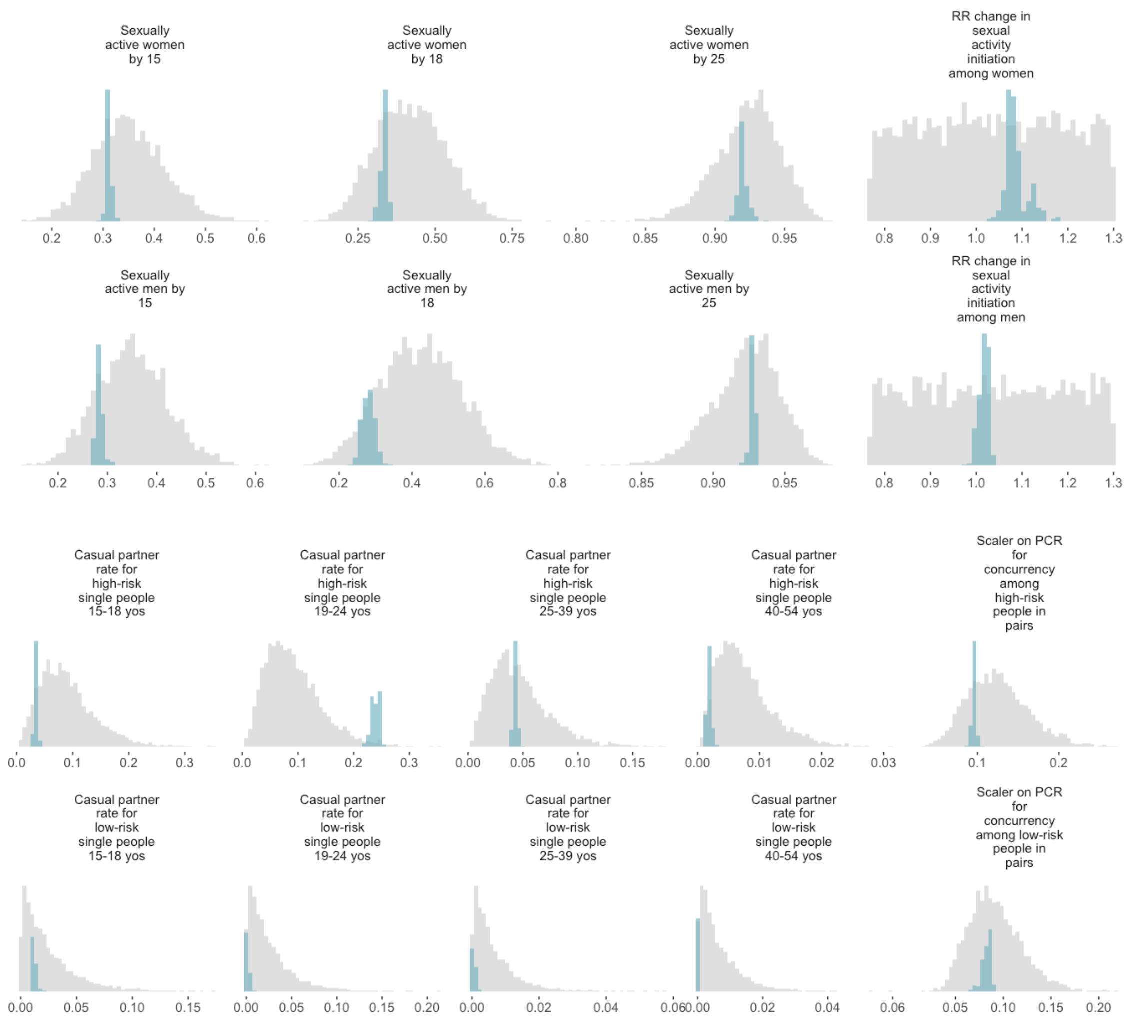
15 A) Time-varying screening, reporting and sensitivity



15 B) Treatment and recovery parameters



15 C) Behavioral parameters

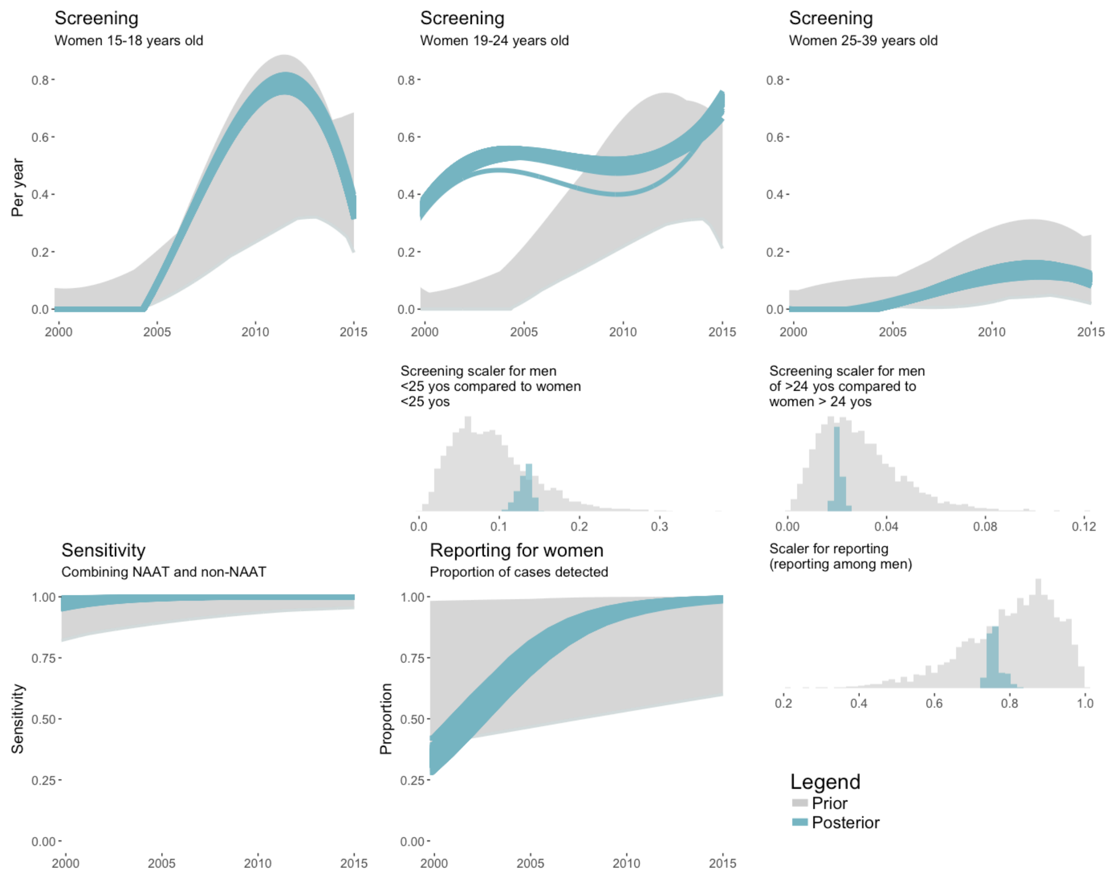


Web Figure 16. Priors and posteriors for the calibration scenario: Less constrained priors on reporting and screening

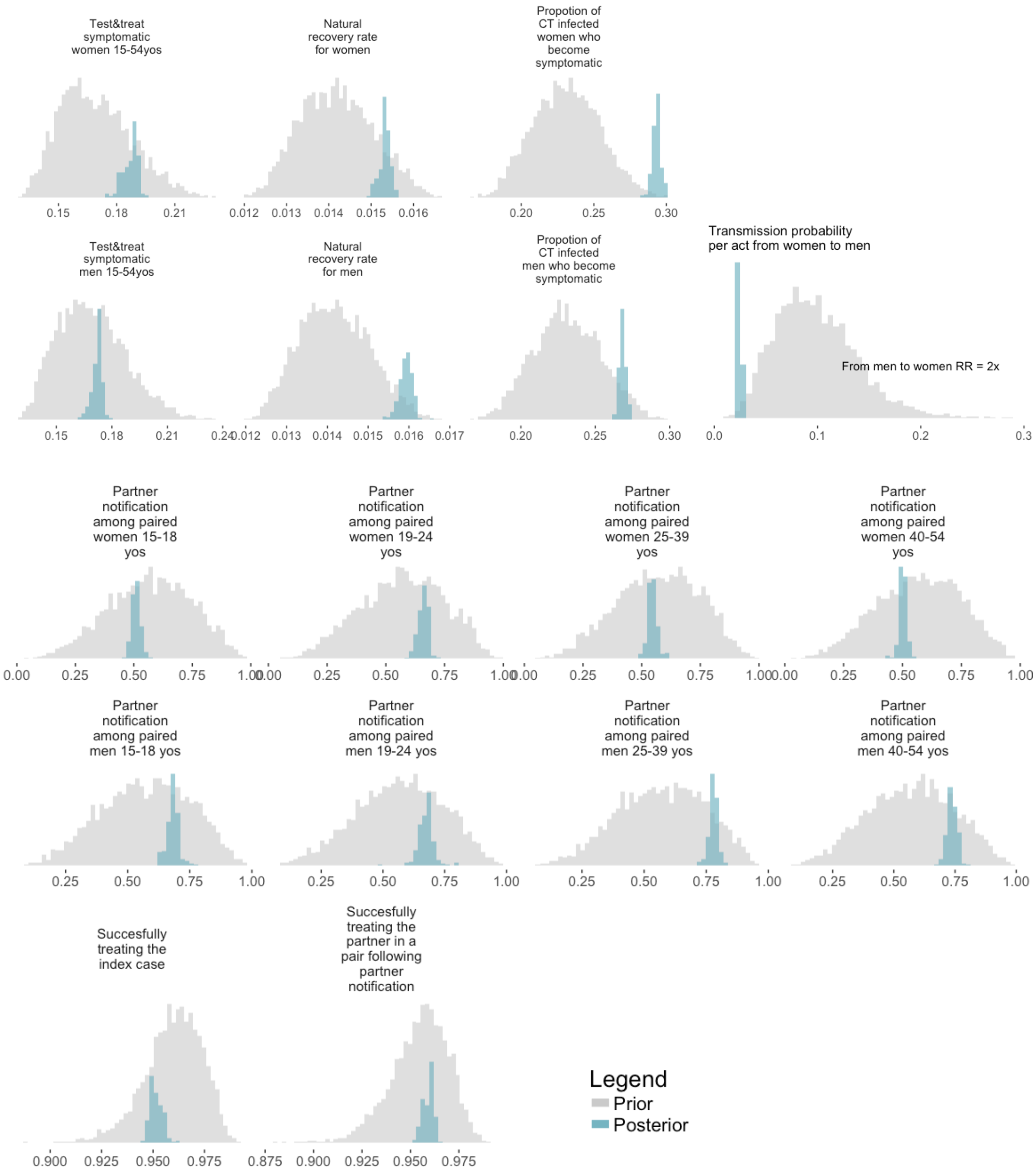
Prior assumptions

- Reporting in 2000 estimated as Beta(7,3) with a median of 71% (IQR 61-80%) in 2000. Reporting is modeled as a logistic function only allowing for increase in reporting over time.
- The starting (2000) and end (2015) priors for the screening for 15-24 years old remain unchanged but time-varying shape of the screening parameter is allowed to vary over time

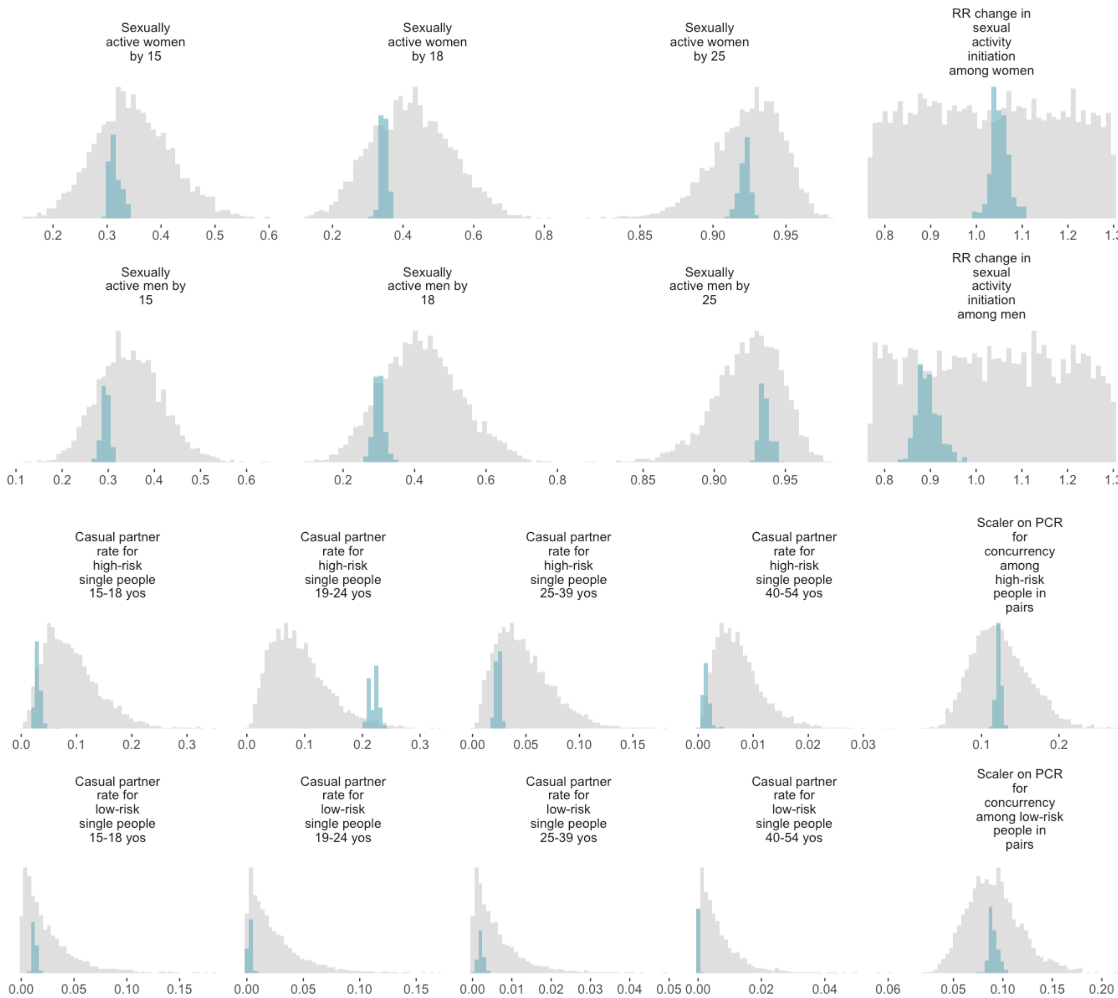
16 A) Time-varying screening, reporting and sensitivity



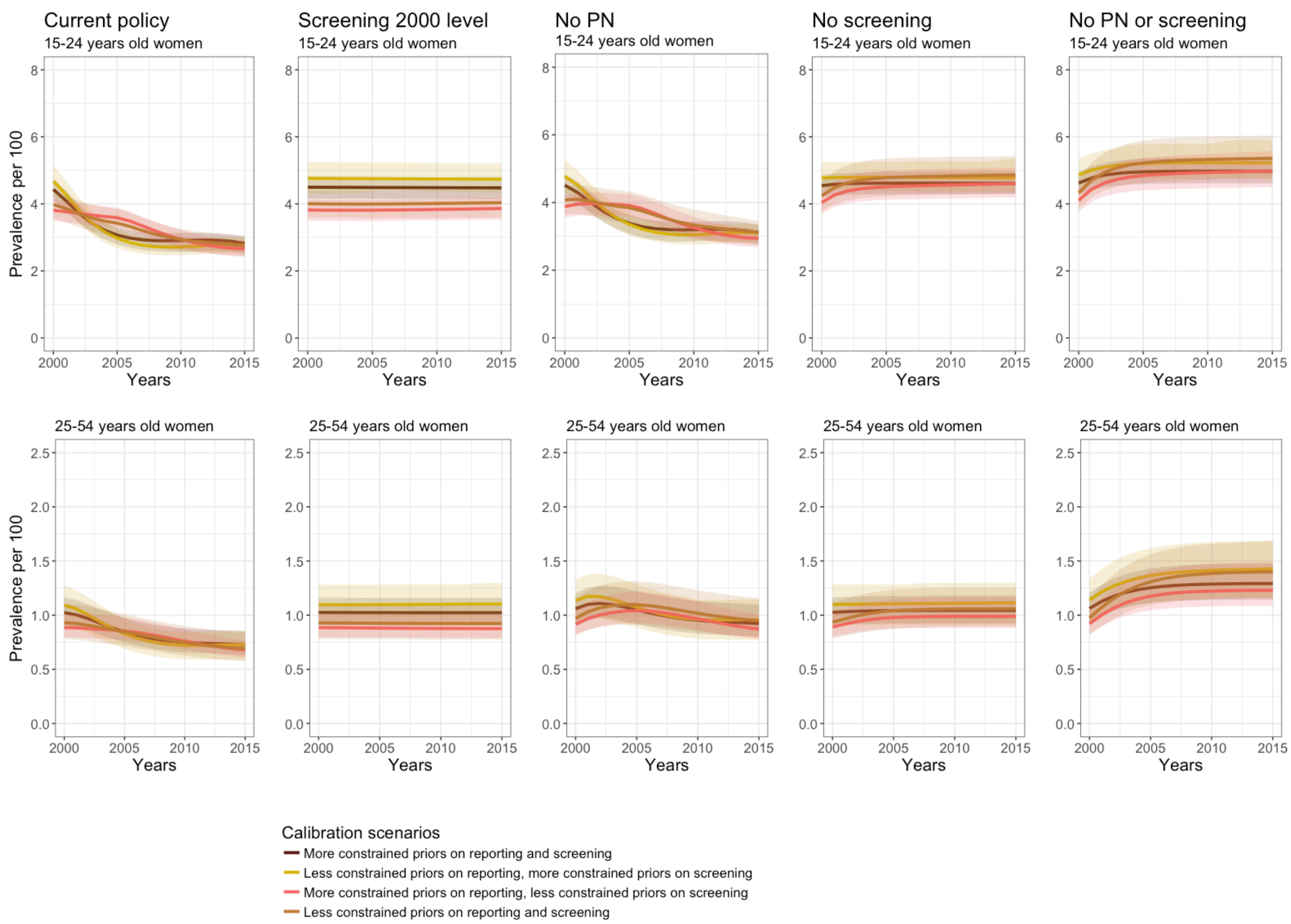
16 B) Treatment and recovery parameters



16 C) Behavioral parameters



Web Figure 17. Mid-year model prevalence estimates per 100 among women for 2000-2015 in the calibrated model (current policy) contrasted to the counterfactual scenarios.



Footnote for Web Figure 17.

Current policy: model estimated prevention efforts for 2000-2015

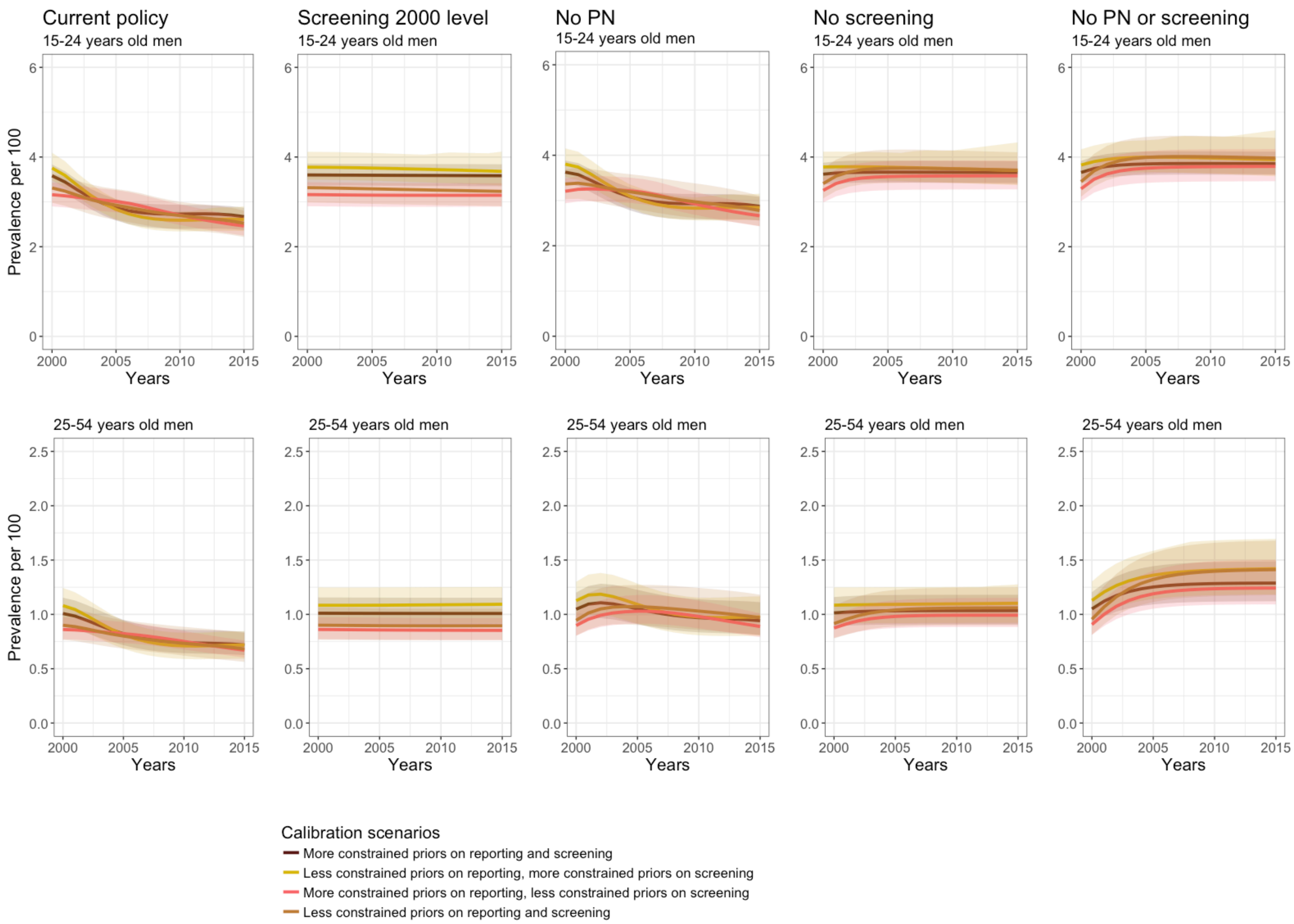
Services at 2000 level: Screening kept at the model estimated coverage in 2000

No PN (partner notification): Partner notification set to 0 for 2000-2015

No screening: Screening set to 0 for 2000-2015

No PN or screening: Both PN and screening set to 0 for 2000-2015

Web Figure 18. Mid-year model prevalence estimates per 100 among men for 2000-2015 in the calibrated model (current policy) contrasted to the counterfactual scenarios.



Footnote for Web Figure 18.

Current policy: model estimated prevention efforts for 2000-2015

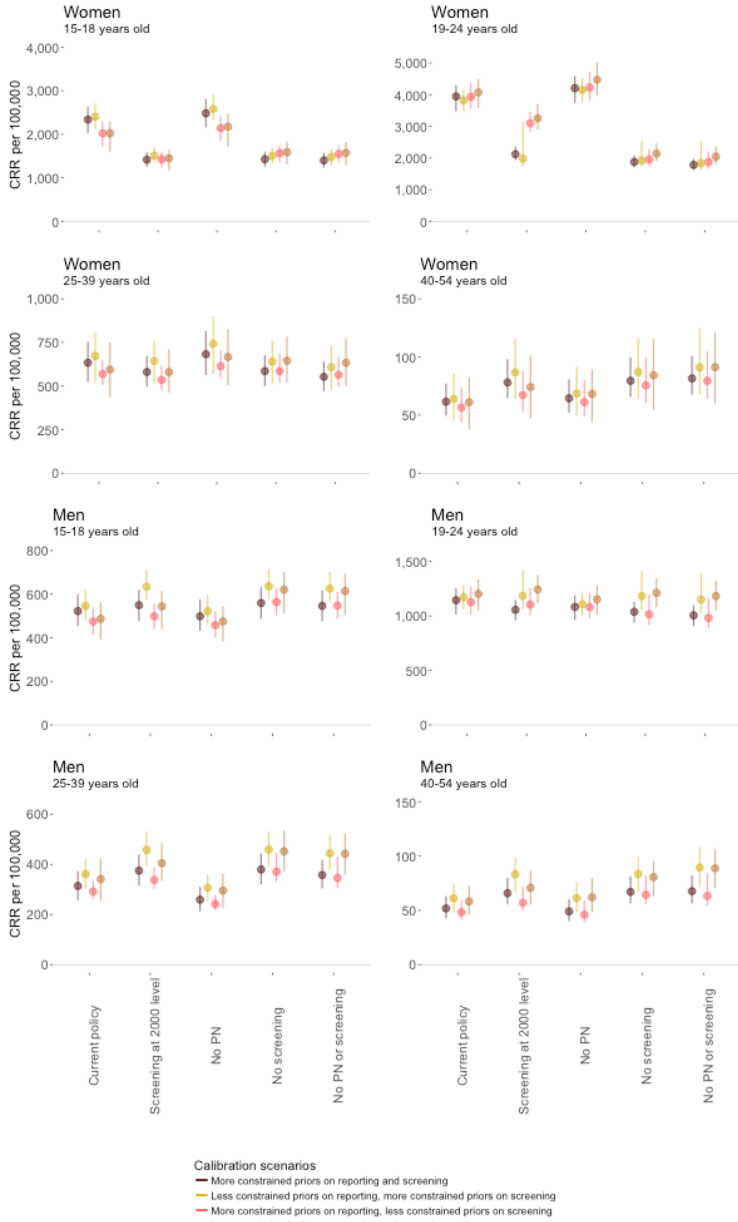
Services at 2000 level: Screening kept at the model estimated coverage in 2000

No PN (partner notification): Partner notification set to 0 for 2000-2015

No screening: Screening set to 0 for 2000-2015

No PN or screening: Both PN and screening set to 0 for 2000-2015

Web Figure 19. Model estimated chlamydia case report rate (CRR) in 2015 in the calibrated model for (estimating the impact under current policy), and across counterfactual scenarios using the mean and 95% credible intervals. Note the varying y-axis between the subgroups.



Footnote for Web Figure 19.

Current policy: model estimated prevention efforts for 2000-2015

Services at 2000 level: Screening kept at the model estimated coverage in 2000

No PN (partner notification): Partner notification set to 0 for 2000-2015

No screening: Screening set to 0 for 2000-2015

No PN or screening: Both PN and screening set to 0 for 2000-2015

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