ct_trends.ipynb

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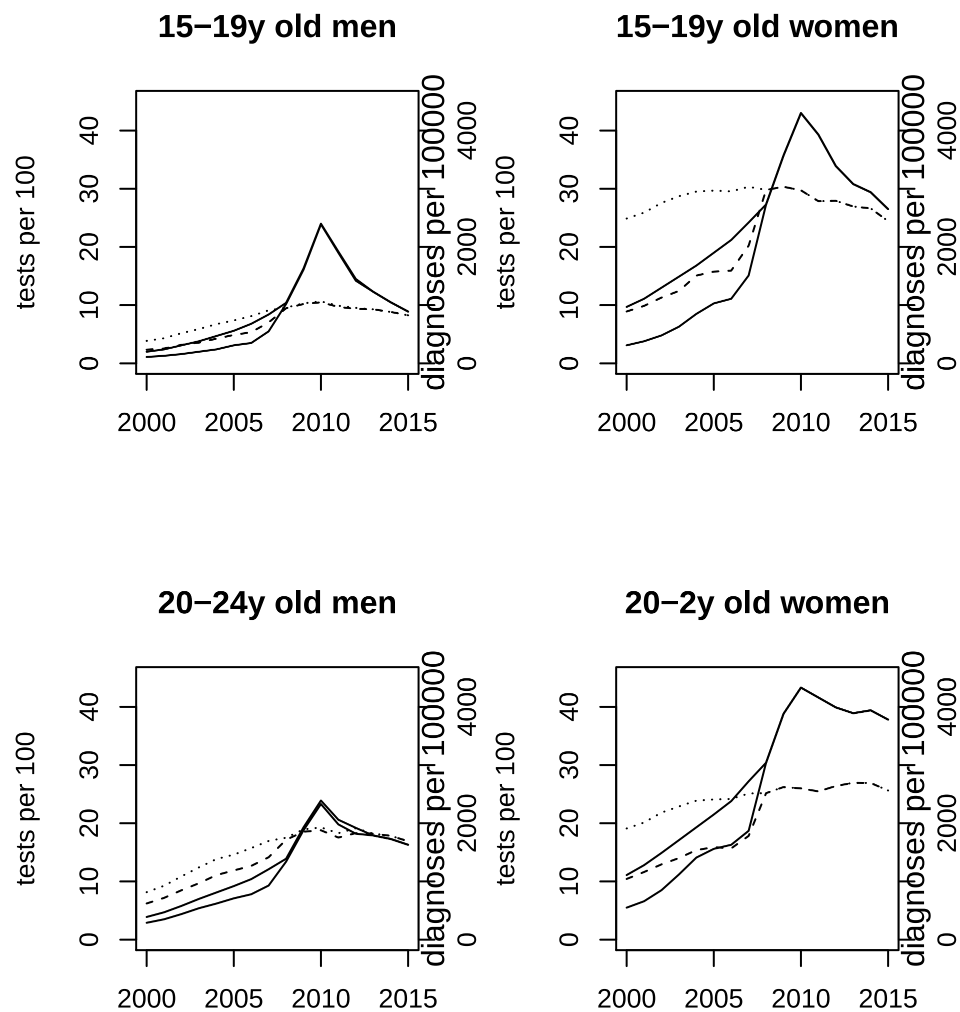
https://github.com/joanna-lewis/ct_trends/blob/master/ct_trends.ipynb

Chlamydia in England, 2000-2015 This notebook uses data on chlamydia testing and diagnosesto investigate trends in chlamydia prevalence in England over the period 2000-2015. Data on numbers of chlamydia tests and diagnoses by age group and sex came from from Chandra et al. Eurosurveillance 22:30453 (2017) for the years 2000-2012, and from http://www.chlamydiascreening.nhs.uk/ps/data.asp for subsequesnt years. Mid-year population estimates were from the Office for National Statistics.

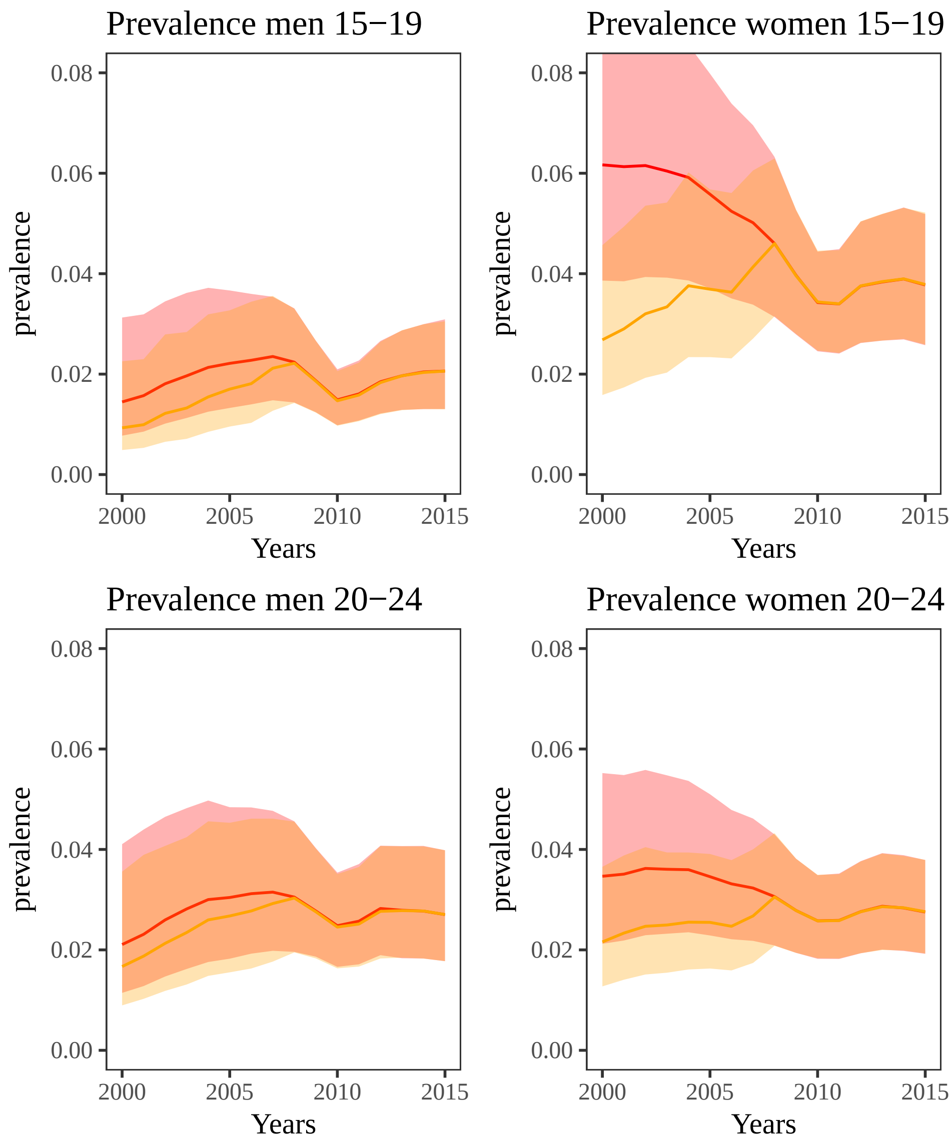


The first plot shows chlamydia tests and diagnoses in young people in England. Dotted lines represent annual tests per 100 individuals; solid lines represent annual diagnoses per 1000 individuals. Data are shown by age and sex: in men (panels A and B) and women (C and D), and in 15-19-year-olds (A and C) and 20-24-year-olds (B and D). Dashed lines represent the start and end of the NCSP roll-out across England.

Chlamydia prevalence

We now estimate chlamydia prevalence and year-on-year changes thereof, using the method described in Lewis and White Epidemiology 28:492-502 (2017) and at https://github.com/joanna-lewis/ct_surveillance.

We sample from distributions for the probability of being sexually active, the size of the sexually active population and the testing and diagnosis rates per person per year.



Now we plot the difference in prevalence

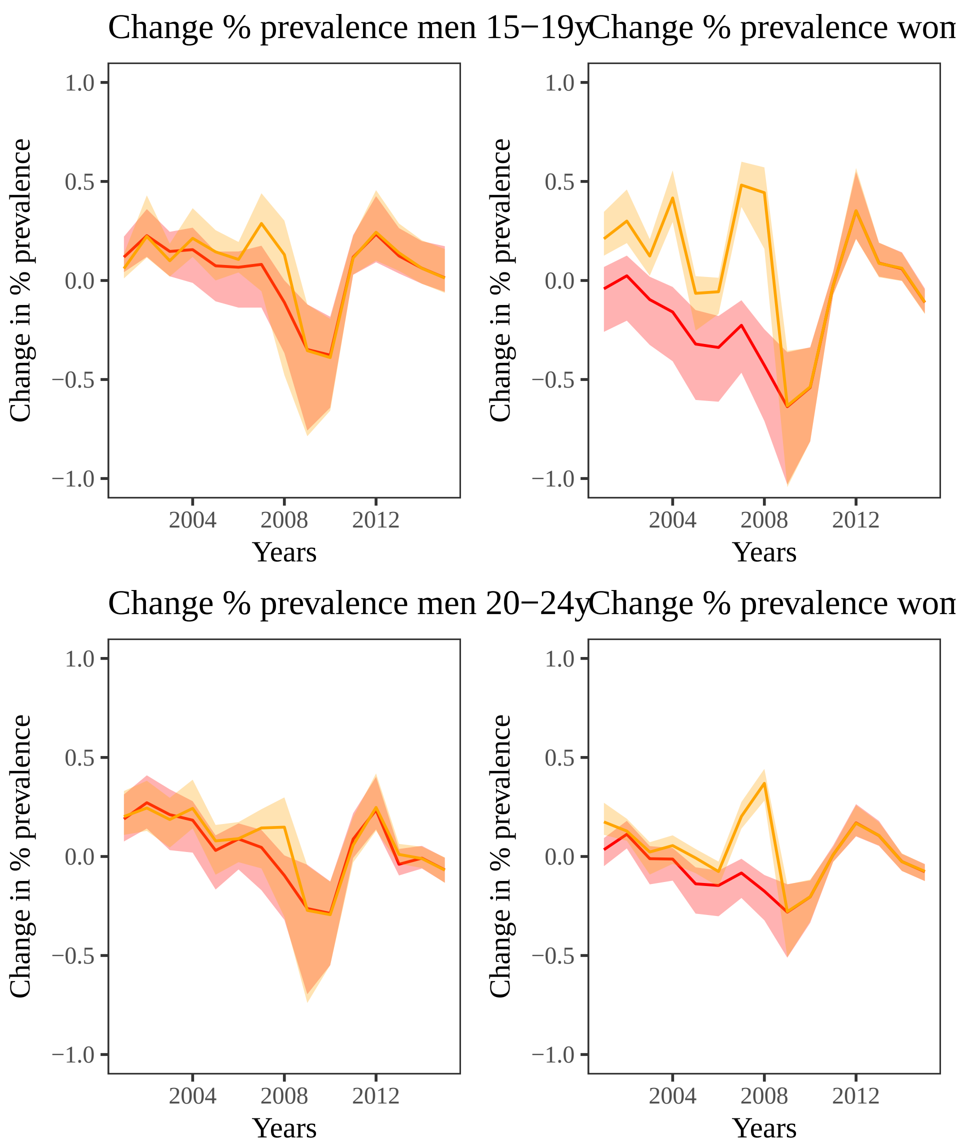


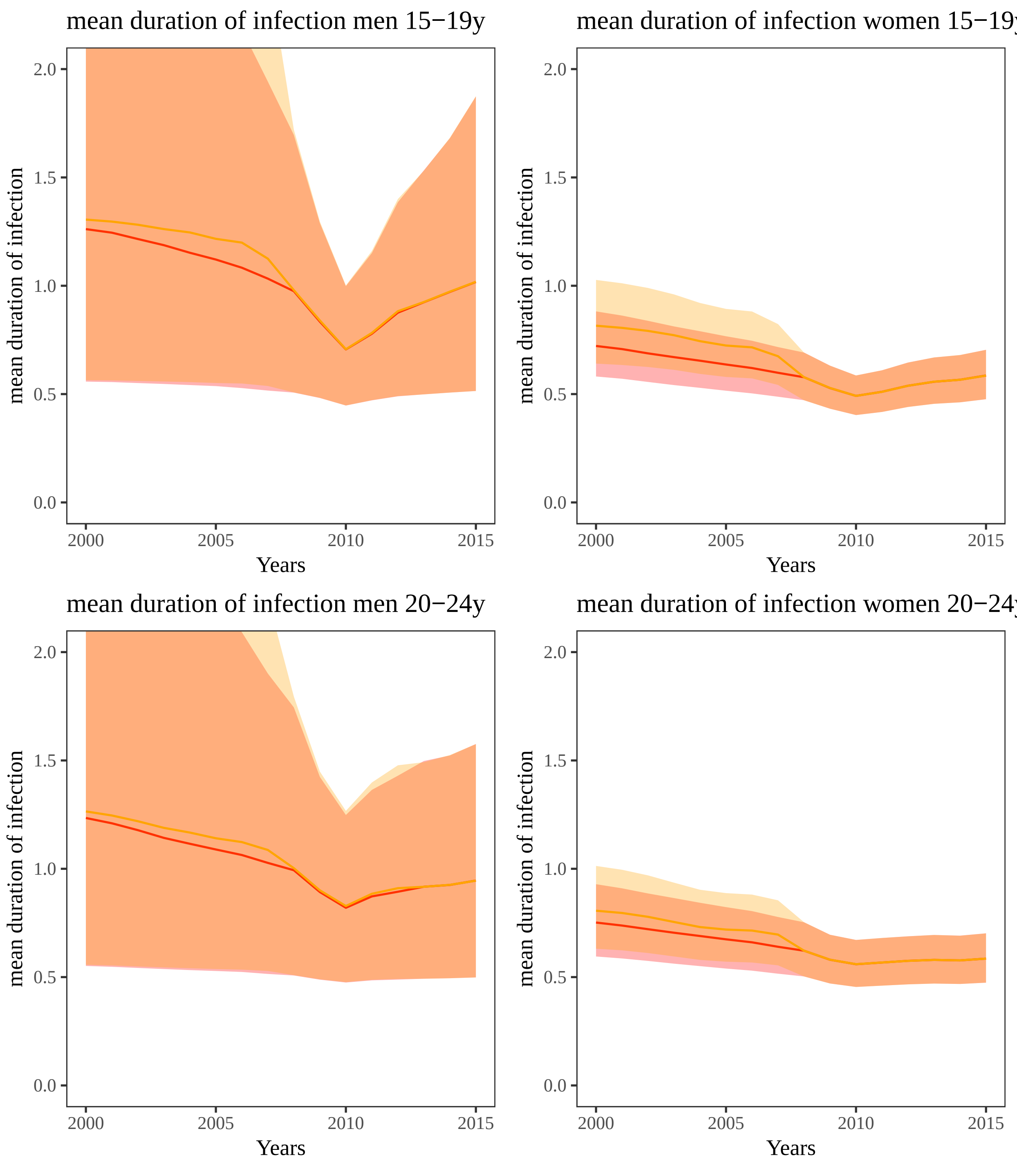
Fig. 2

The box plots show estimated annual changes in chlamydia prevalence. Within each pair, the light-, and dark-coloured boxes correspond to the minimum and maximum estimated numbers of tests and diagnoses shown in Figure 1, respectively; for the later years the minimum and maximum estimates were identical so the boxes show the same results. A horizontal line indicates the median estimate; boxes show the 50% credible interval, and vertical lines the 95% credible interval. Data are shown by age and sex: in men (panels A and B) and women (C and D), and in 15-19-year-olds (A and C) and 20-24-year-olds (B and D). Dashed lines represent the start and end of the NCSP roll-out across England.

Average duration of infection

Now plot the average duration of infections, calculated using the relationship: duration = prevalence/incidence.

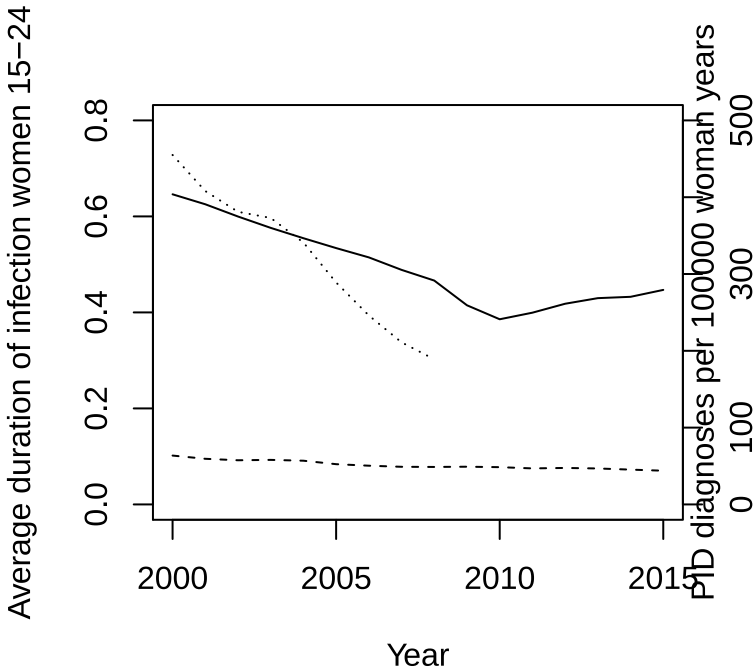
Fig. 3



Coloured lines show the median estimated average duration of infection. Coloured ranges represent the 95% credible interval. The two lines and shaded regions represent estimates from the minimum and maximum numbers of tests and diagnoses. Data are shown by age and sex: in men (panels A and B) and women (C and D), and in 15-19-year- olds (A and C) and 20-24-year-olds (B and D). Dashed lines represent the start and end of the NCSP roll-out across England.

Pelvic inflammatory disease and duration of infection in women

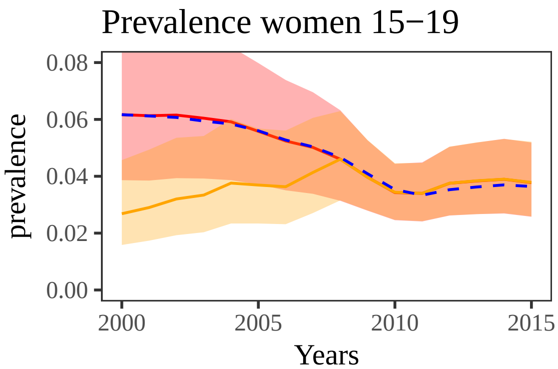
Finally, we use data from the Organisation for Economic Co-operation and Development (http://stats.oecd.org/Index.aspx?DataSetCode=HEALTH_PROC; accessed 1 August 2017) to examine the relationship between estimated prevalence in 15-24-year-old women and hospital discharge rates for inflammatory disease in female pelvic organs.

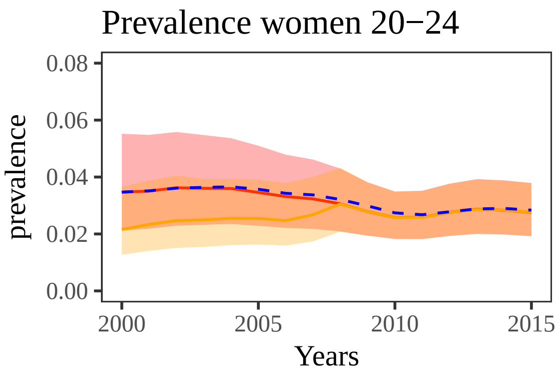


Panel A shows estimated average duration of infections (solid lines) in 15-24-year-old women in England, and UK hospital discharge rates for inflammatory disease of the female pelvic organs (dashed line), 2000-2015, Panel B shows the correlation between hospital discharges and average duration of infection in 15-24-year-old women. Triangles pointing to the right indicate minimum estimates of duration; triangles pointing left indicate maximum duration. Horizontal lines join markers corresponding to the same year and age group. All estimates for duration of infection are represented by the median sample.

Steady state assumption?

Chlamydia in England, 2000-2015: dynamic analysis Our analysis of chlamydia prevalence estimates between 2000 and 2015 assumes a system is in a steady state. This workbook investigates this assumption in more detail. The red line is the prevalence figure calculated using stead states. The blue line is the prevalence figure making no such assumptions.

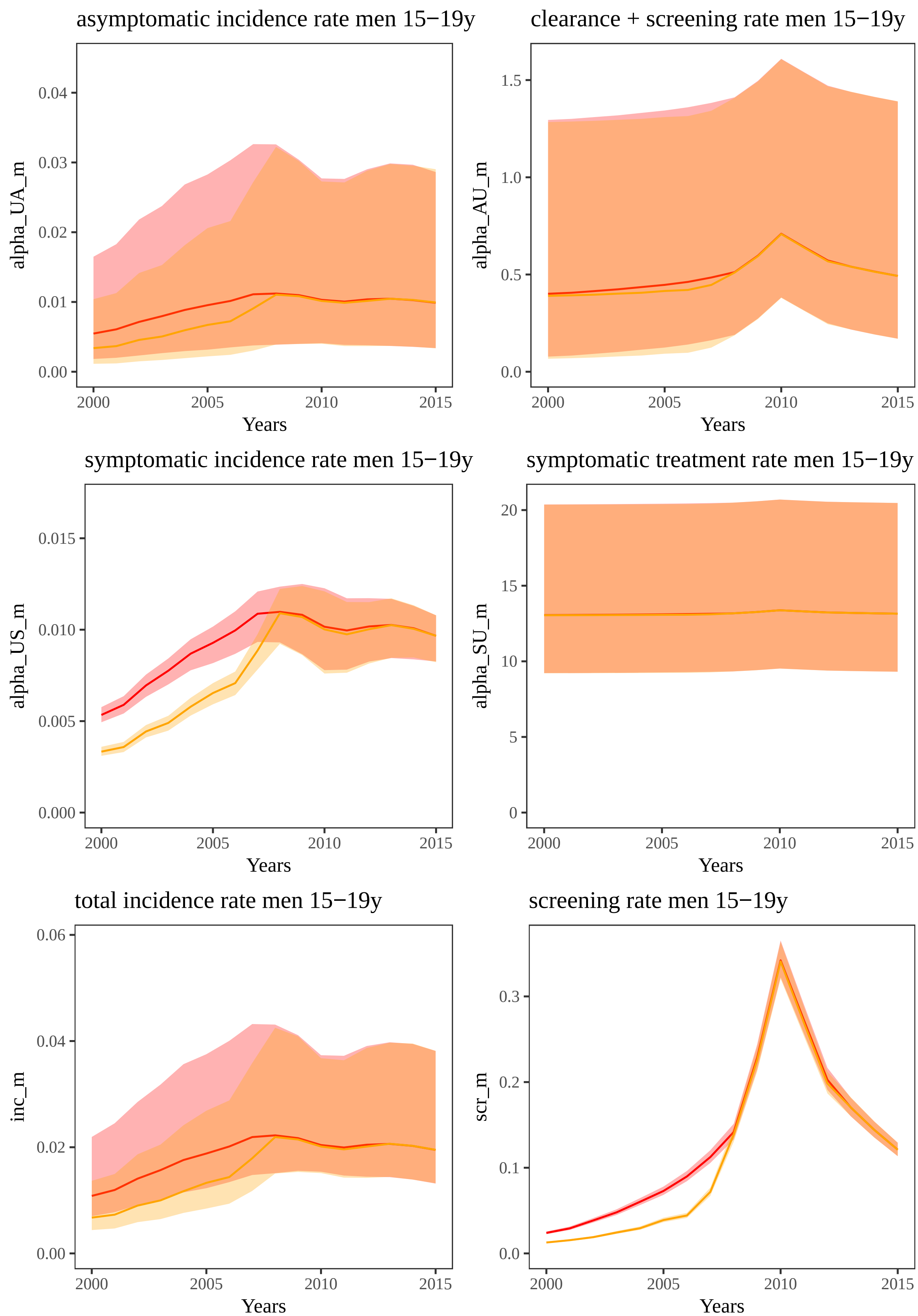




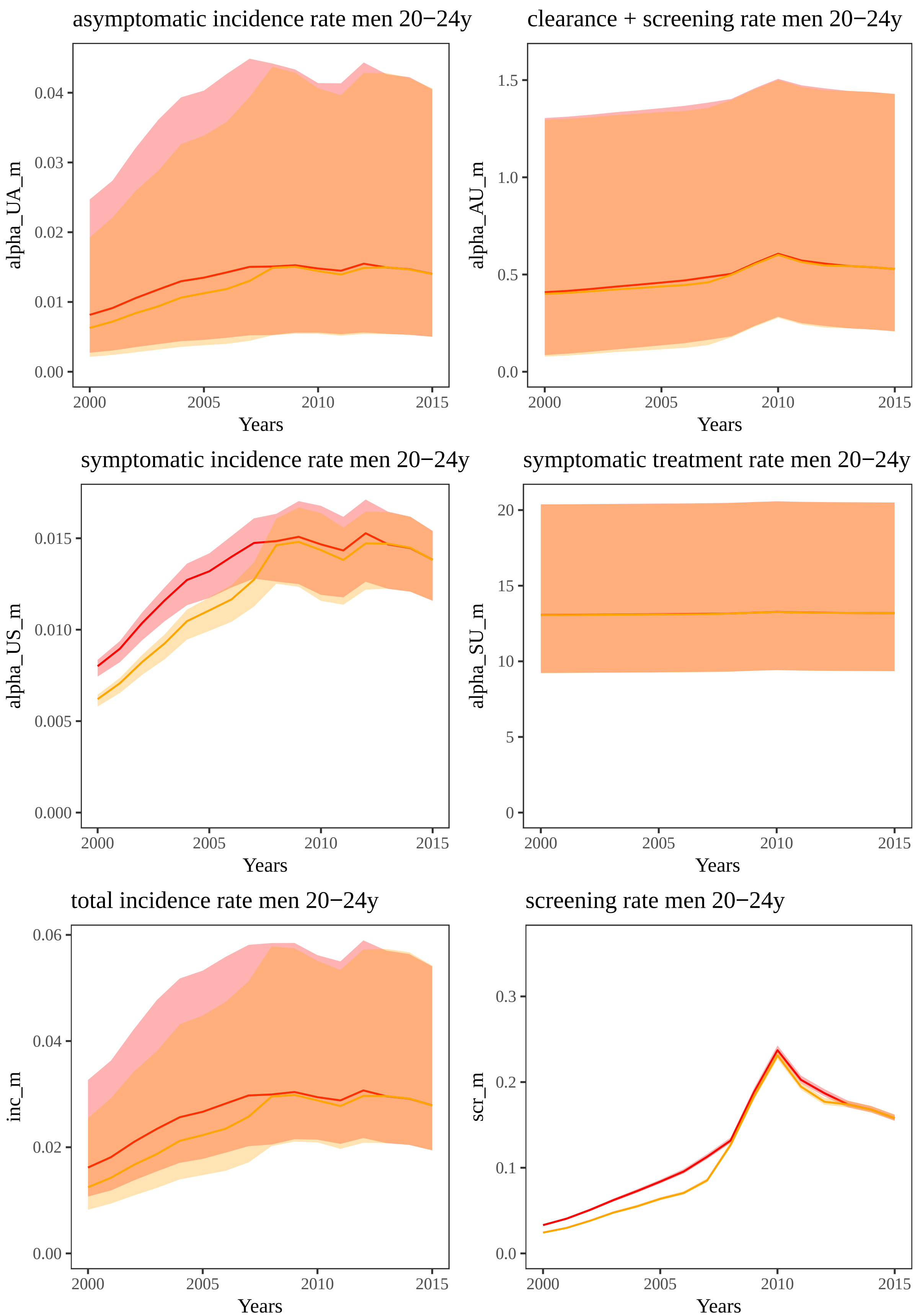
By comparing the computed prevalence using the equations in steady state only (red graph) to the ones that considere within one year dynamics occurring (blue graphs) it is clear that the steady state assumptions doesn't seem to affect the results much. This means: the dynamic changes in the transition rates (which are computed for each year separately) determine the model trajectories most (and hence the computed prevalence for each year).

Per year changes in the transition rates

Below we plotted the per year changes in the transition rates (computed by using the data on number of tests and diagnoses for each year separately). Particularly the incidence seems to go down. This is probably becuase the prevalence goes down in time.



asymptomatic incidence rate men 15−19y
alpha_UA_m
0.00
0.01
0.02
0.03
0.04
2000
2005
2010
2015
Years
clearance + screening rate men 15−19y
alpha_AU_m
0.0
0.5
1.0
1.5
2000
2005
2010
2015
Years
symptomatic incidence rate men 15−19y
alpha_US_m
0.000
0.005
0.010
0.015
2000
2005
2010
2015
Years
symptomatic treatment rate men 15−19y
alpha_SU_m
0
5
10
15
20
2000
2005
2010
2015
Years
total incidence rate men 15−19y
inc_m
0.00
0.02
0.04
0.06
2000
2005
2010
2015
Years
screening rate men 15−19y
scr_m
0.0
0.1
0.2
0.3
2000
2005
2010
2015
Years


asymptomatic incidence rate men 20−24y
alpha_UA_m
0.00
0.01
0.02
0.03
0.04
2000
2005
2010
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Years
clearance + screening rate men 20−24y
alpha_AU_m
0.0
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symptomatic incidence rate men 20−24y
alpha_US_m
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symptomatic treatment rate men 20−24y
alpha_SU_m
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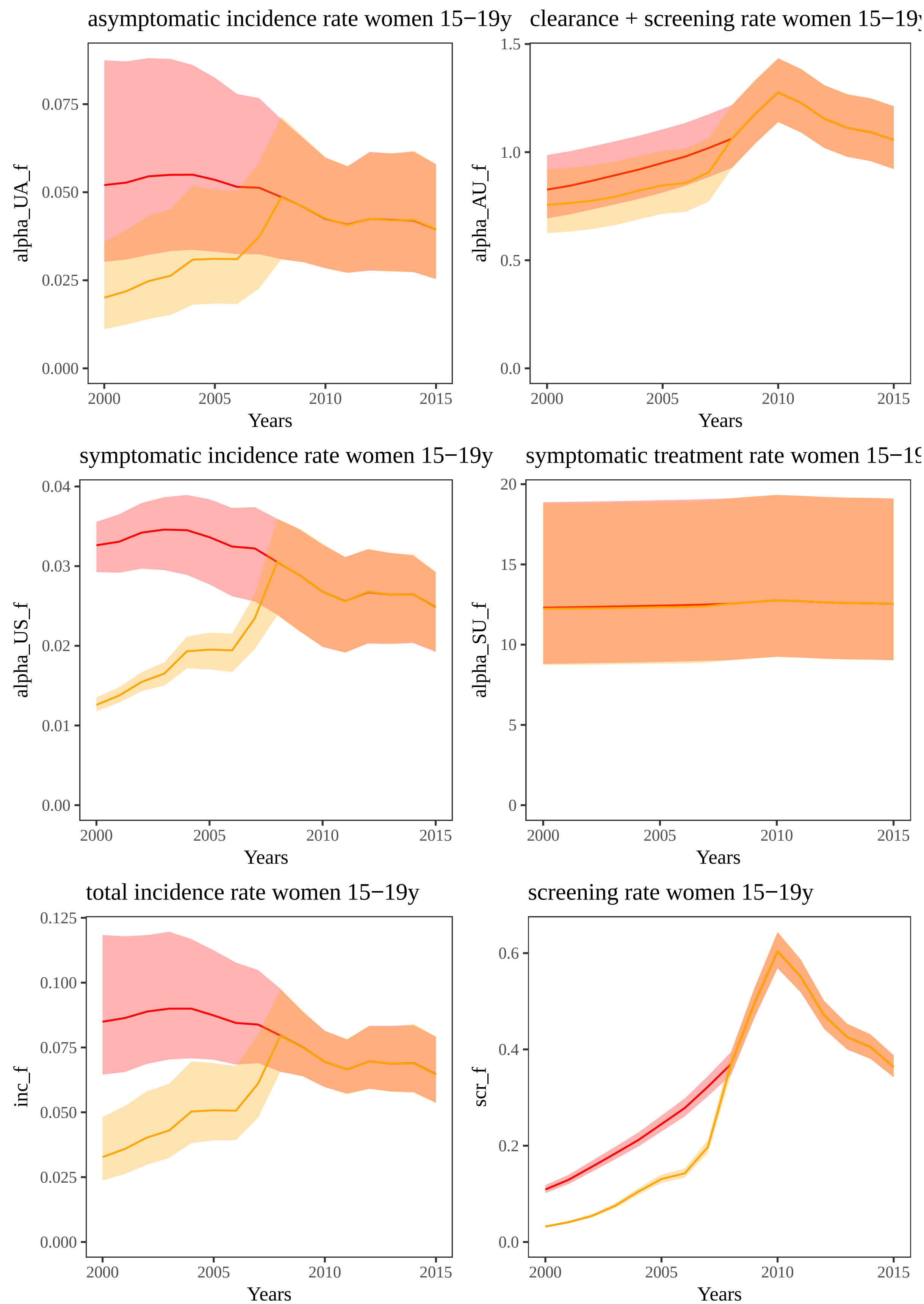
asymptomatic incidence rate women 15−19y
alpha_UA_f
0.000
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0.075
2000
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2015
Years
clearance + screening rate women 15−19y
alpha_AU_f
0.0
0.5
1.0
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2015
Years
symptomatic incidence rate women 15−19y
alpha_US_f
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Years
symptomatic treatment rate women 15−19
alpha_SU_f
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2015
Years
total incidence rate women 15−19y
inc_f
0.000
0.025
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screening rate women 15−19y
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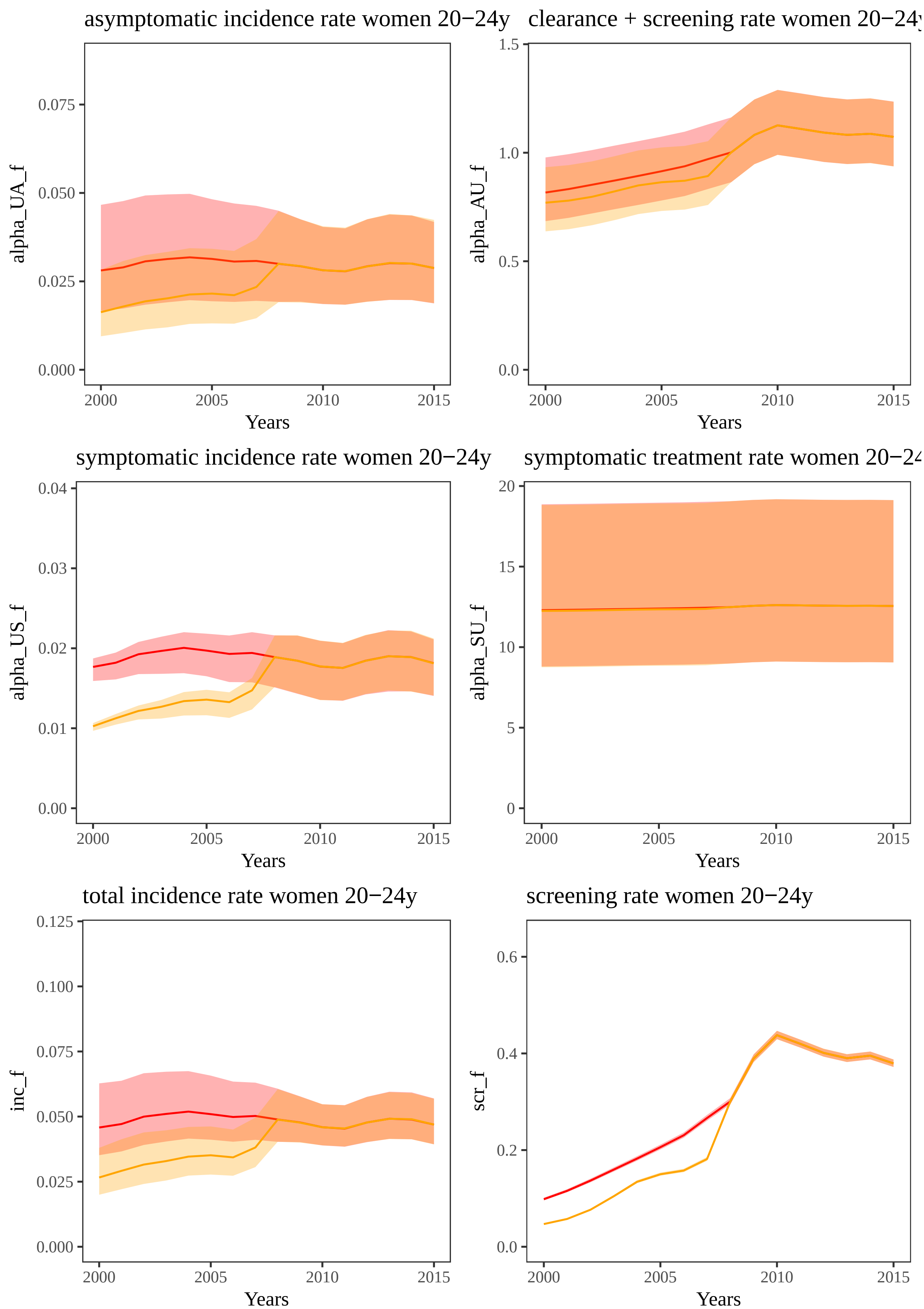
asymptomatic incidence rate women 20−24y
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Years
clearance + screening rate women 20−24y
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symptomatic incidence rate women 20−24y
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