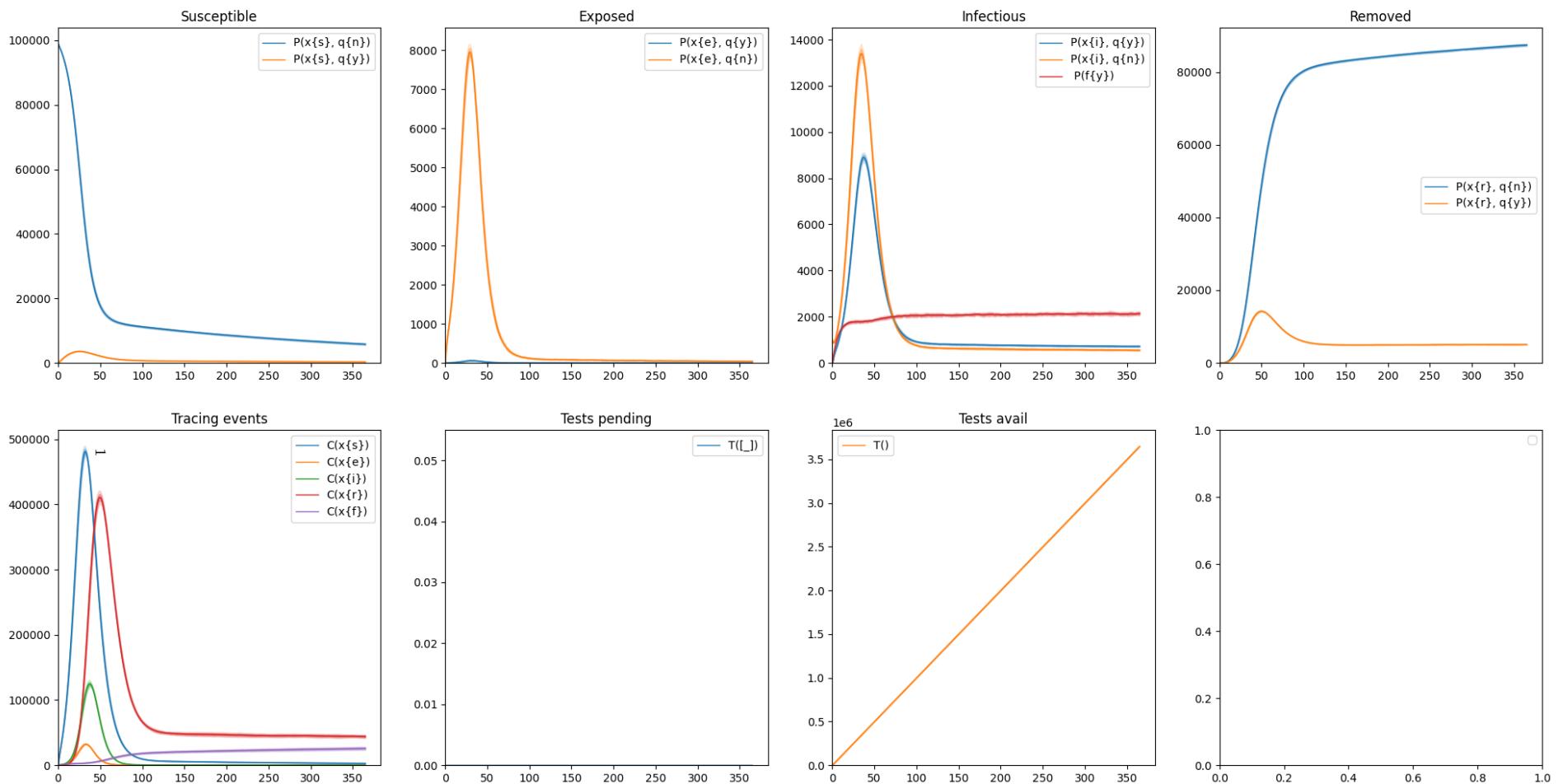
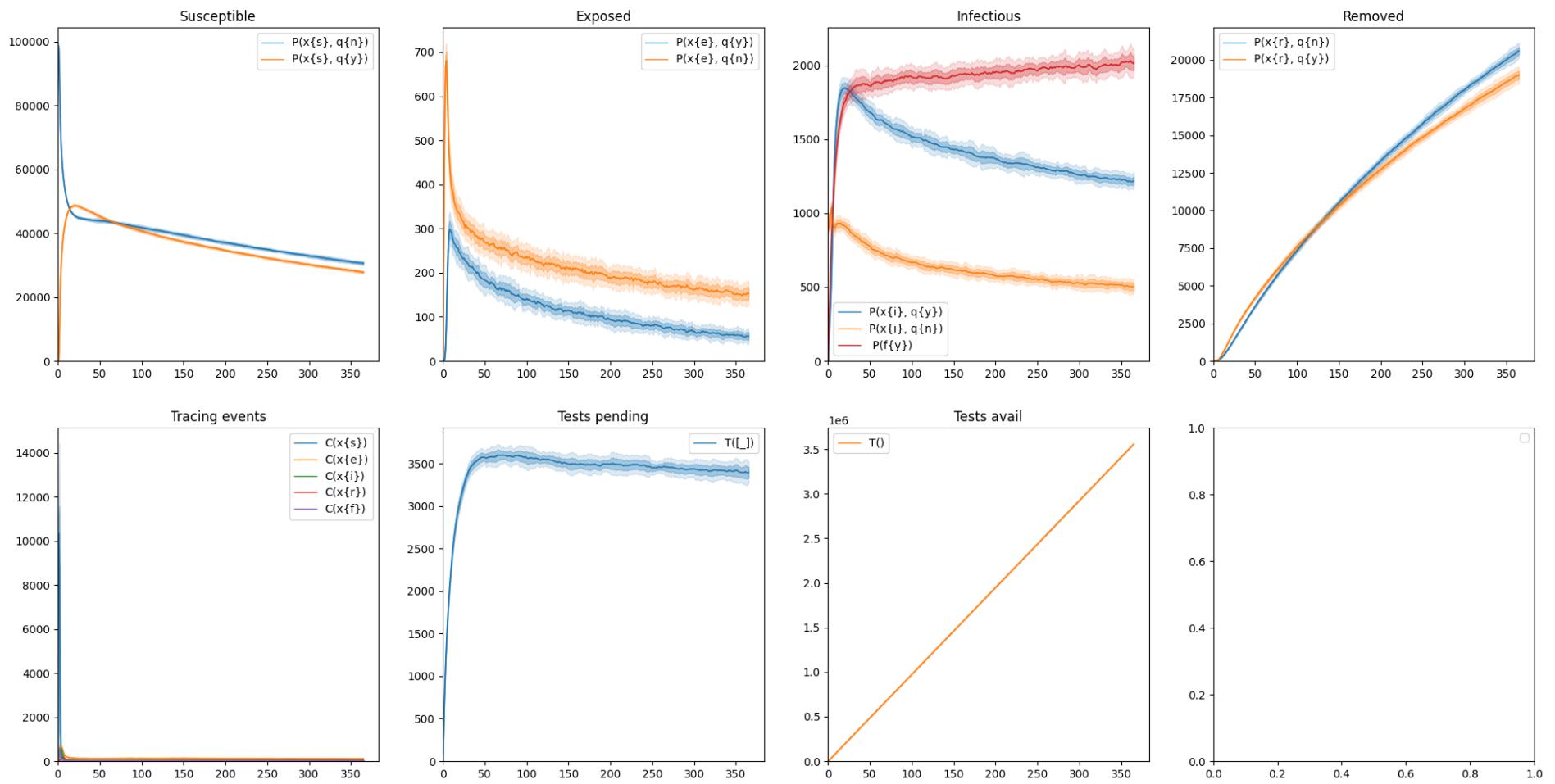


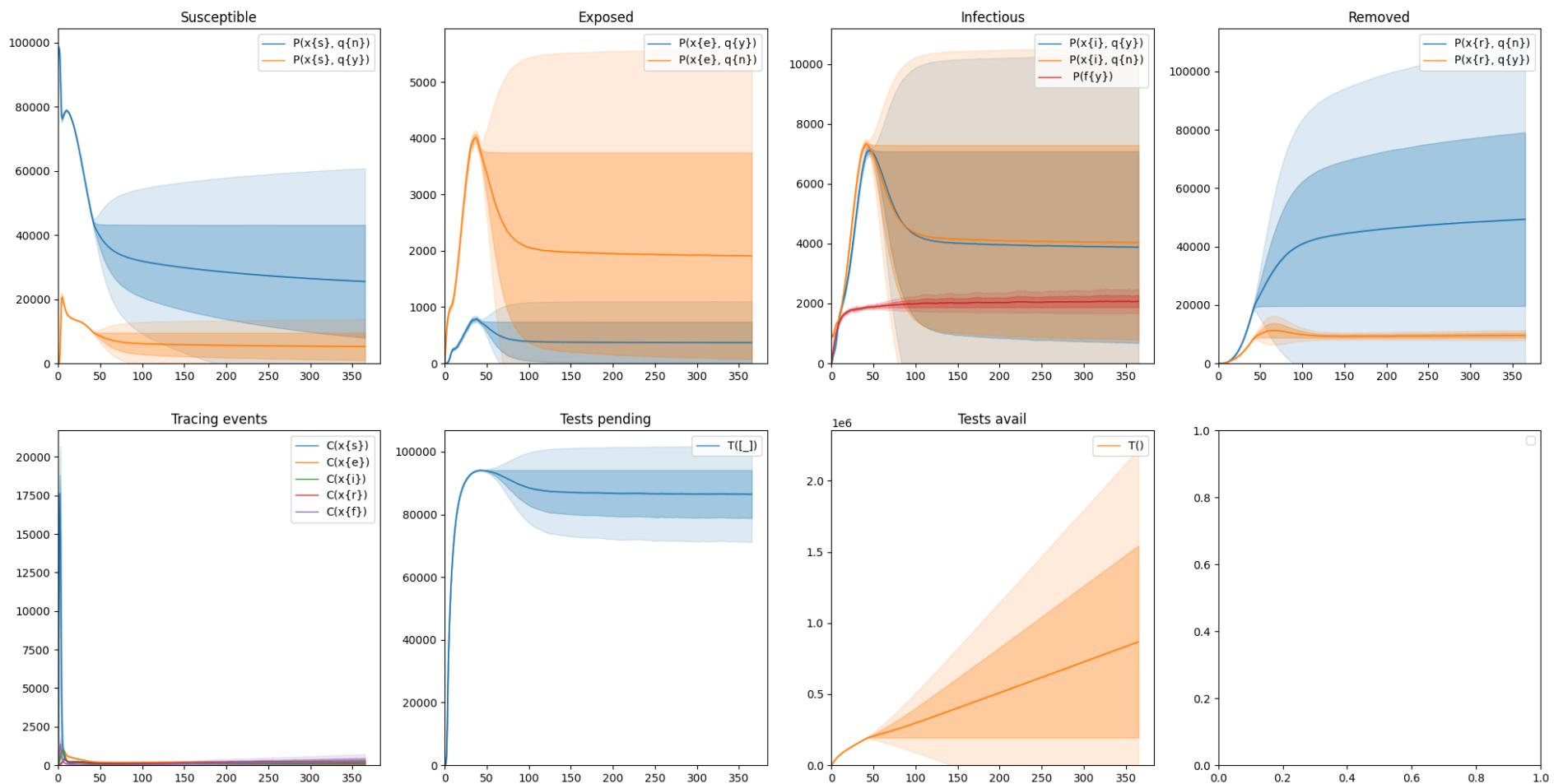
case: 0 INIT\_I: 1000.0 k\_result: 0.5 m: 10000.0 thetaD: 0.0 thetal: 0.0 thetaT: 0.0



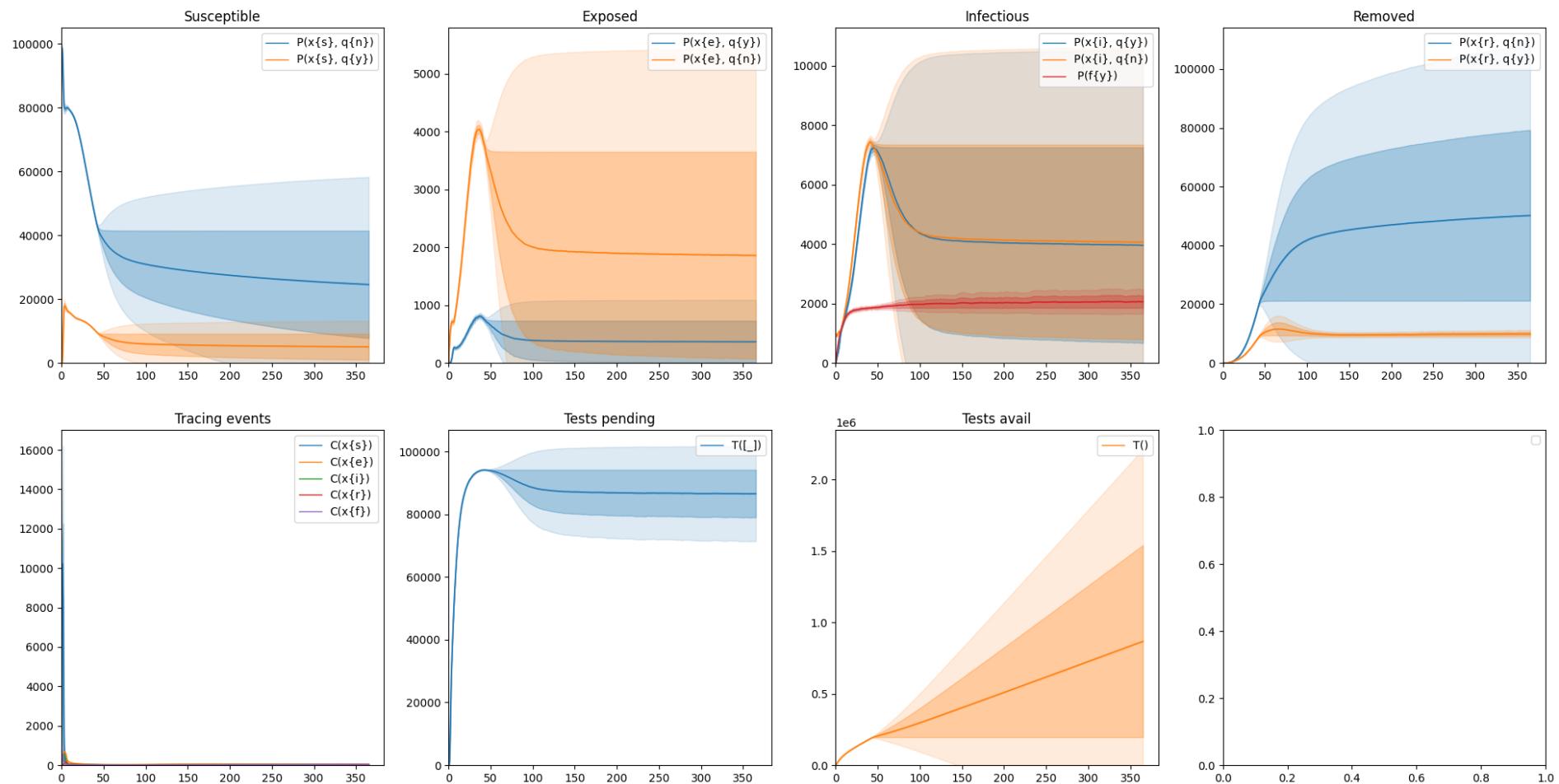
case: 1 INIT\_I: 1000.0 k\_result: 0.5 m: 10000.0 thetaD: 0.0 thetal: 0.0 thetaT: 1.0



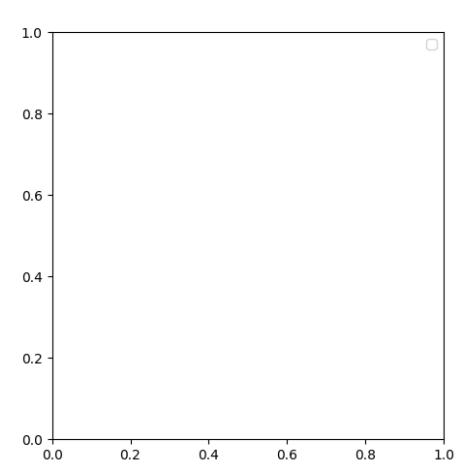
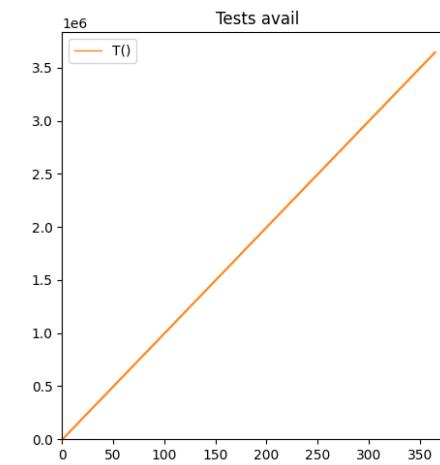
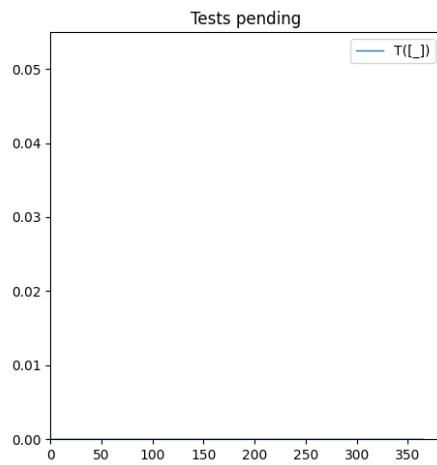
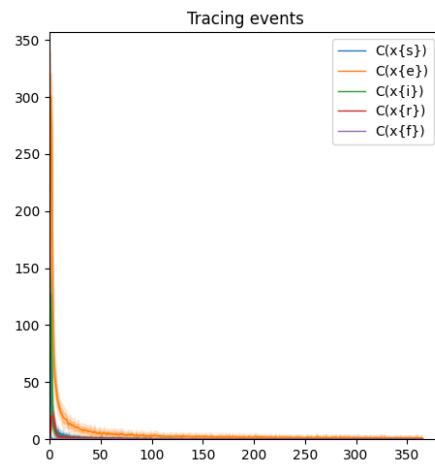
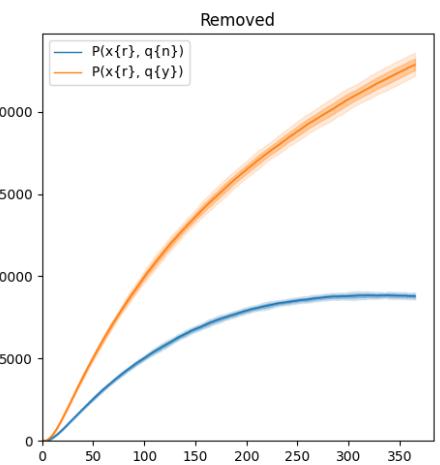
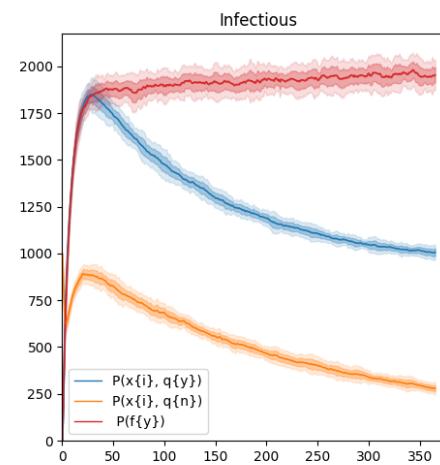
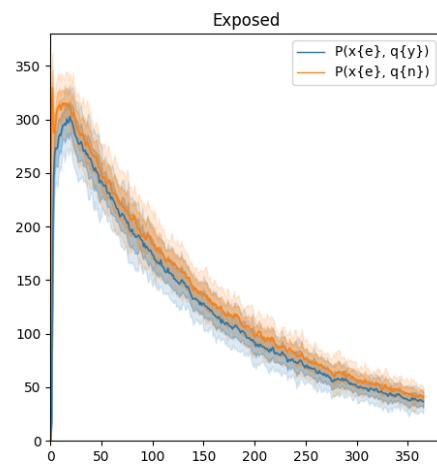
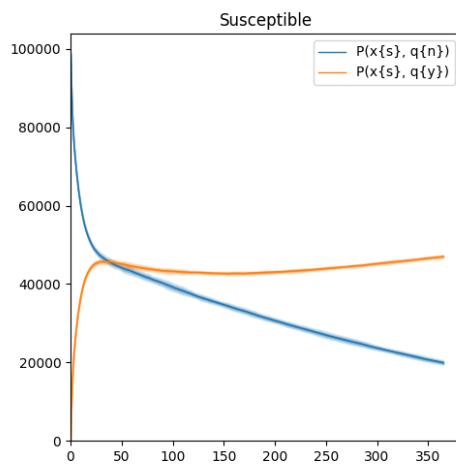
case: 2 INIT\_I: 1000.0 k\_result: 0.5 m: 10000.0 thetaD: 0.0 thetal: 0.14285714285700002 thetaT: 0.0



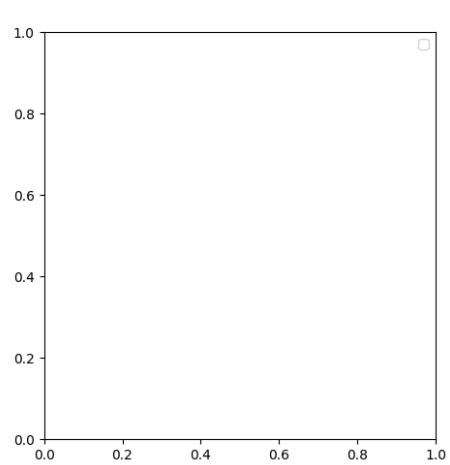
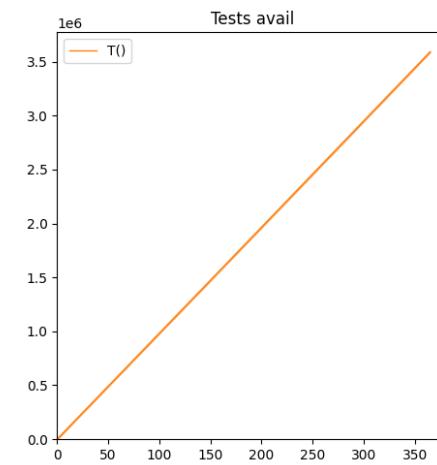
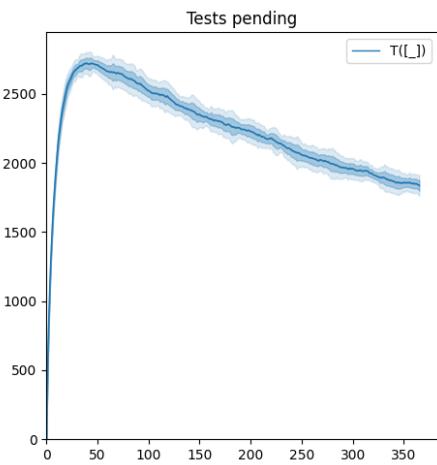
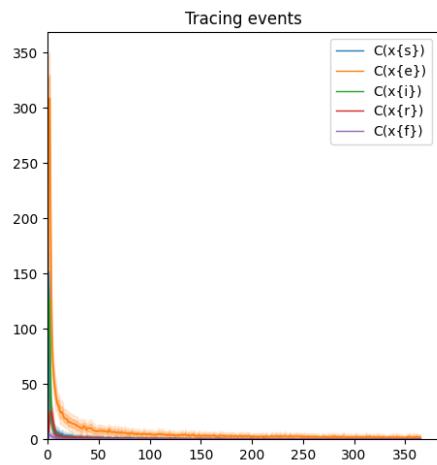
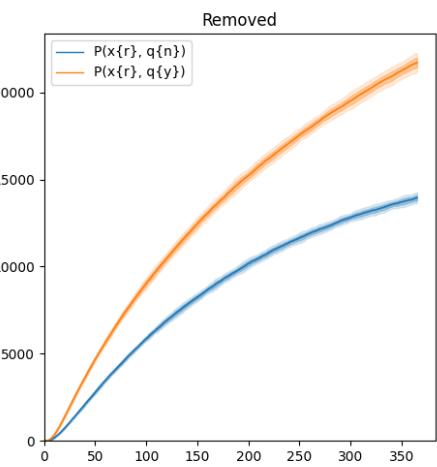
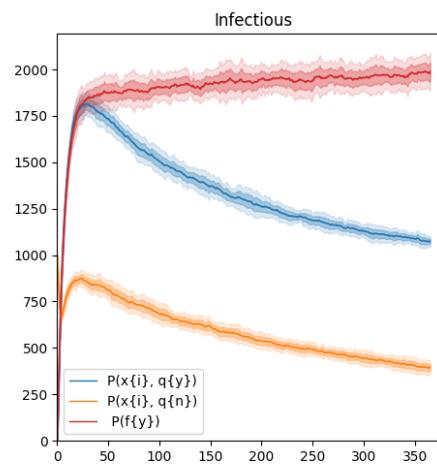
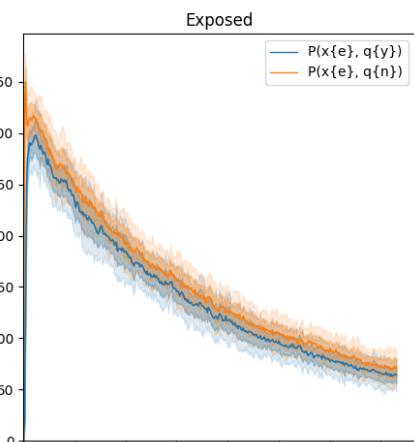
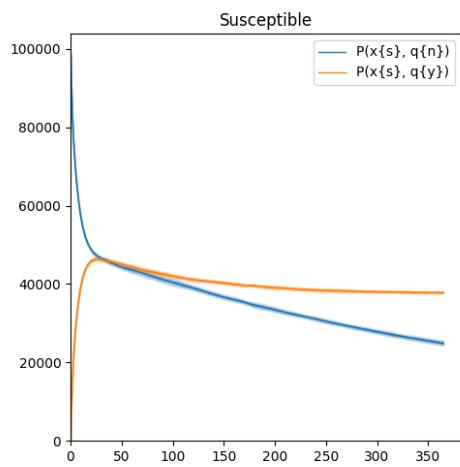
case: 3 INIT\_I: 1000.0 k\_result: 0.5 m: 10000.0 thetaD: 0.0 thetal: 0.14285714285700002 thetaT: 1.0



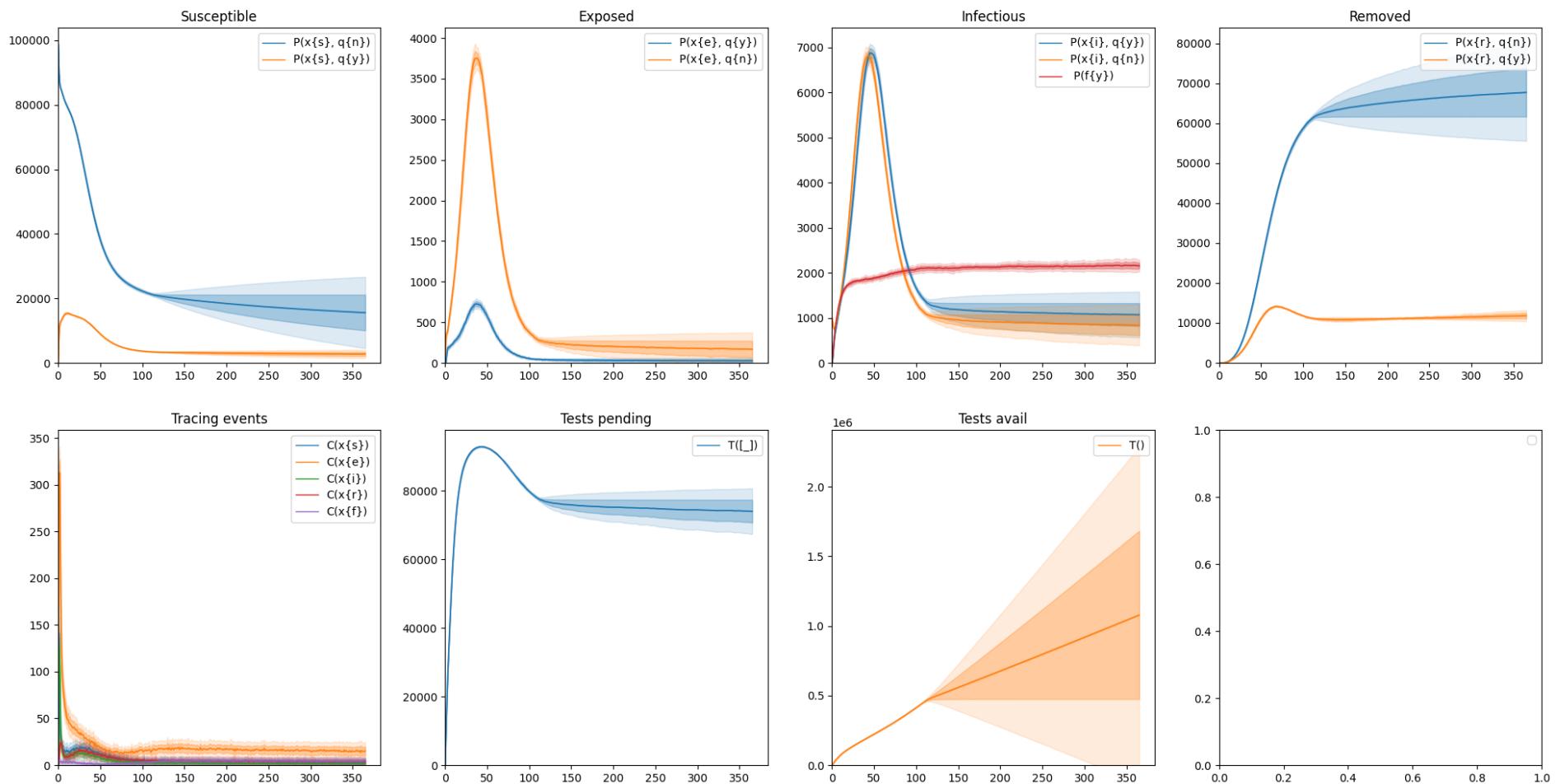
case: 4 INIT\_I: 1000.0 k\_result: 0.5 m: 10000.0 thetaD: 1.0 thetal: 0.0 thetaT: 0.0



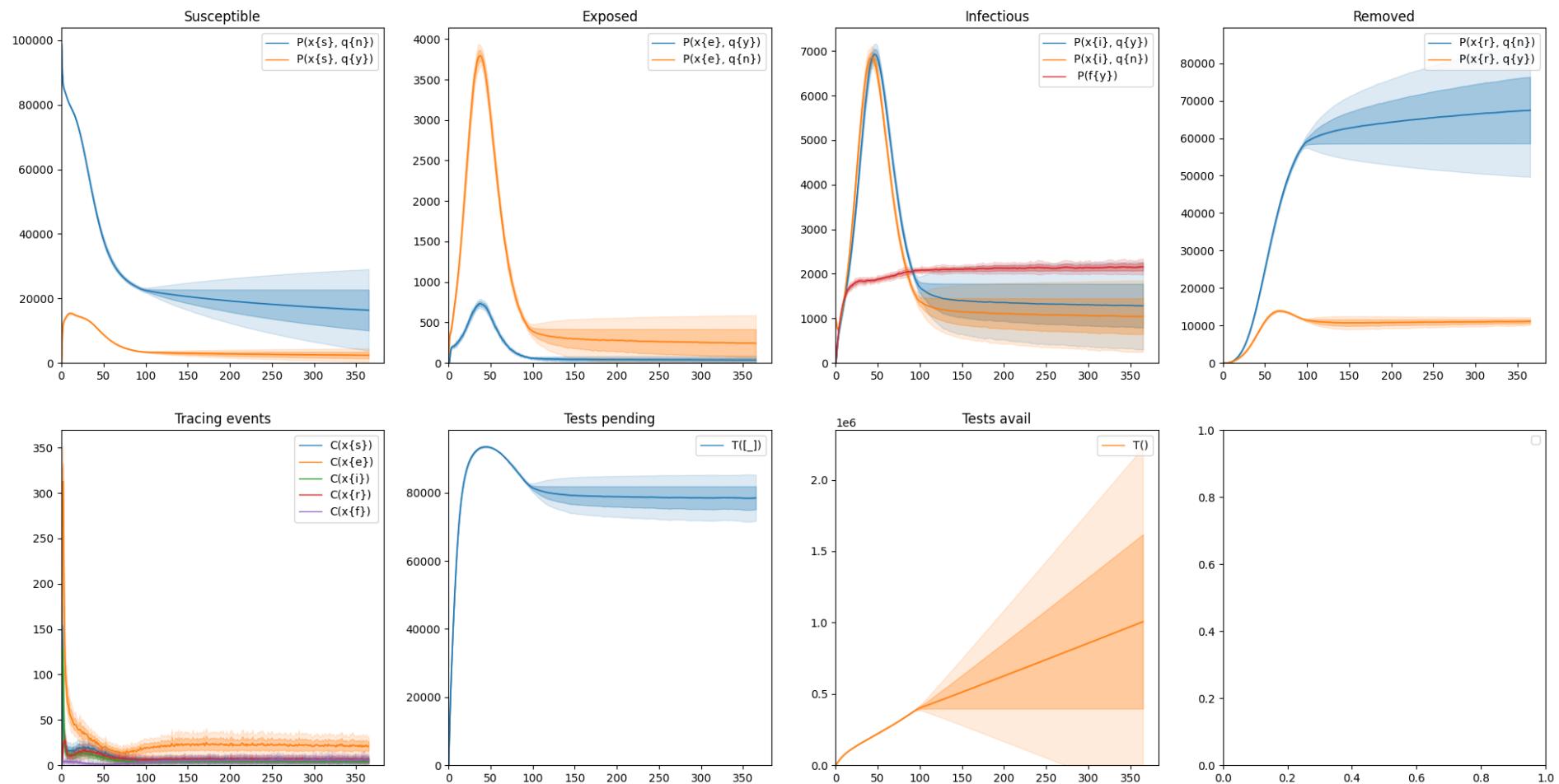
case: 5 INIT\_I: 1000.0 k\_result: 0.5 m: 10000.0 thetaD: 1.0 thetal: 0.0 thetaT: 1.0



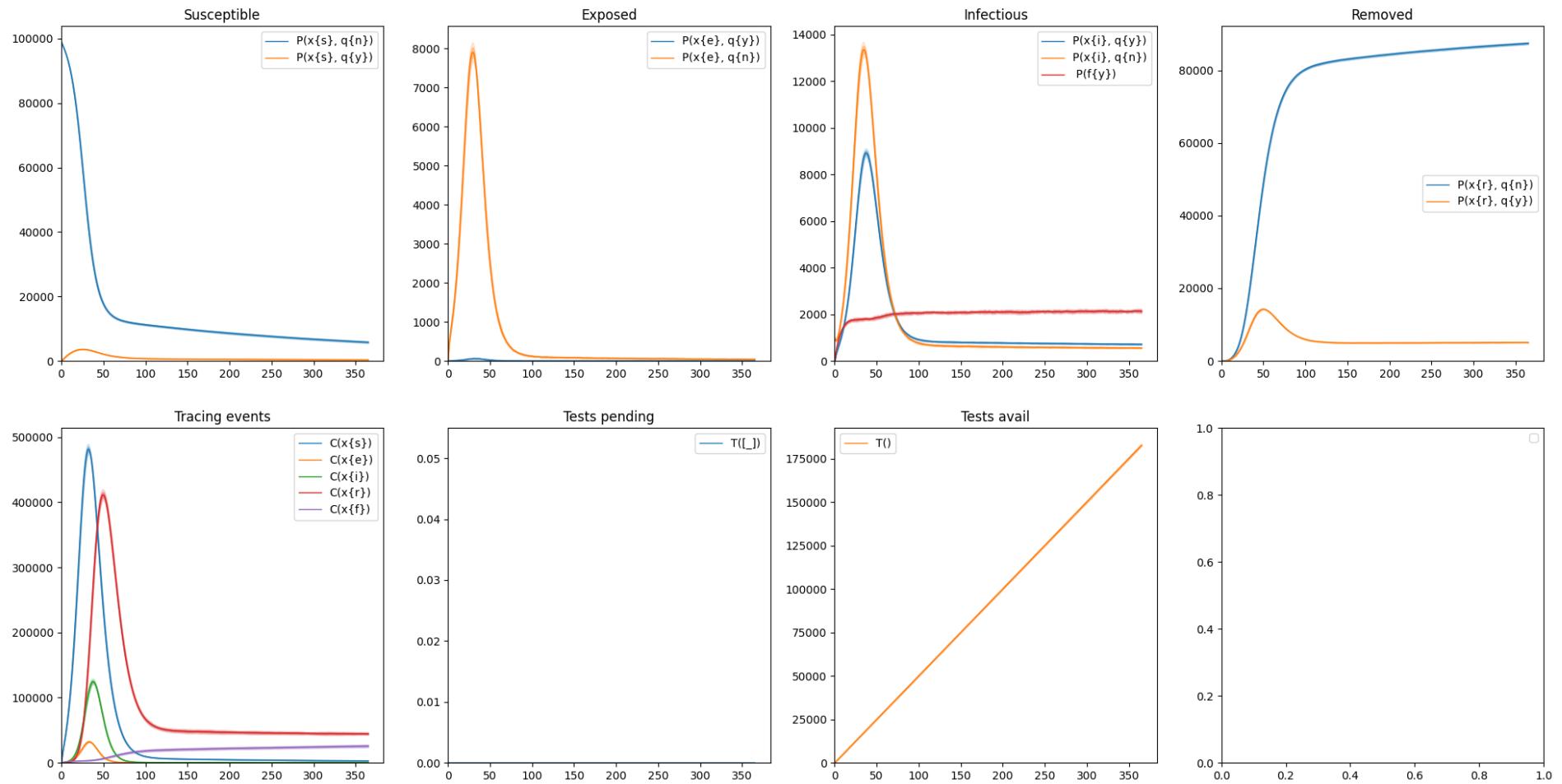
case: 6 INIT\_I: 1000.0 k\_result: 0.5 m: 10000.0 thetaD: 1.0 thetal: 0.14285714285700002 thetaT: 0.0



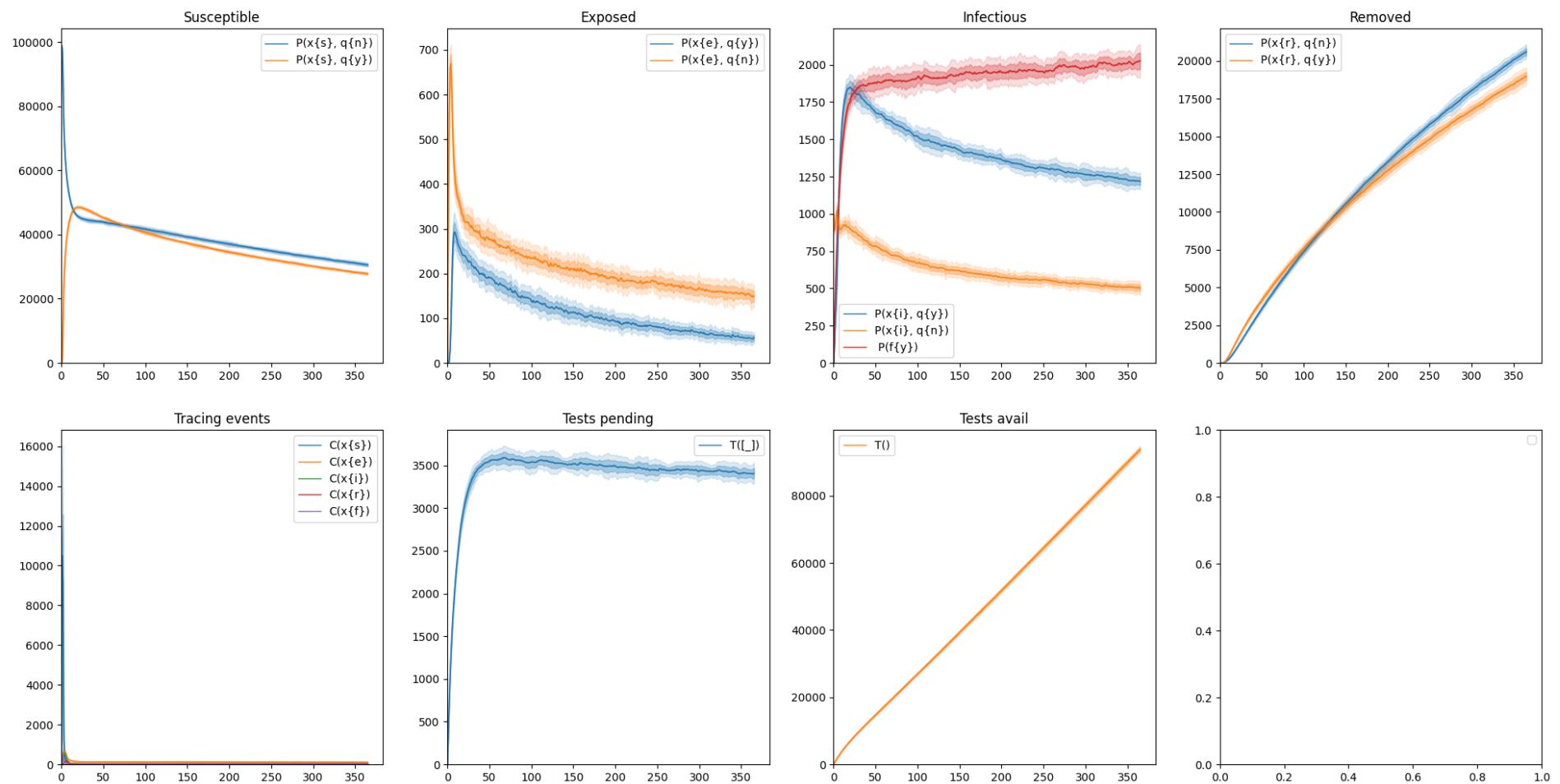
case: 7 INIT\_I: 1000.0 k\_result: 0.5 m: 10000.0 thetaD: 1.0 thetal: 0.14285714285700002 thetaT: 1.0



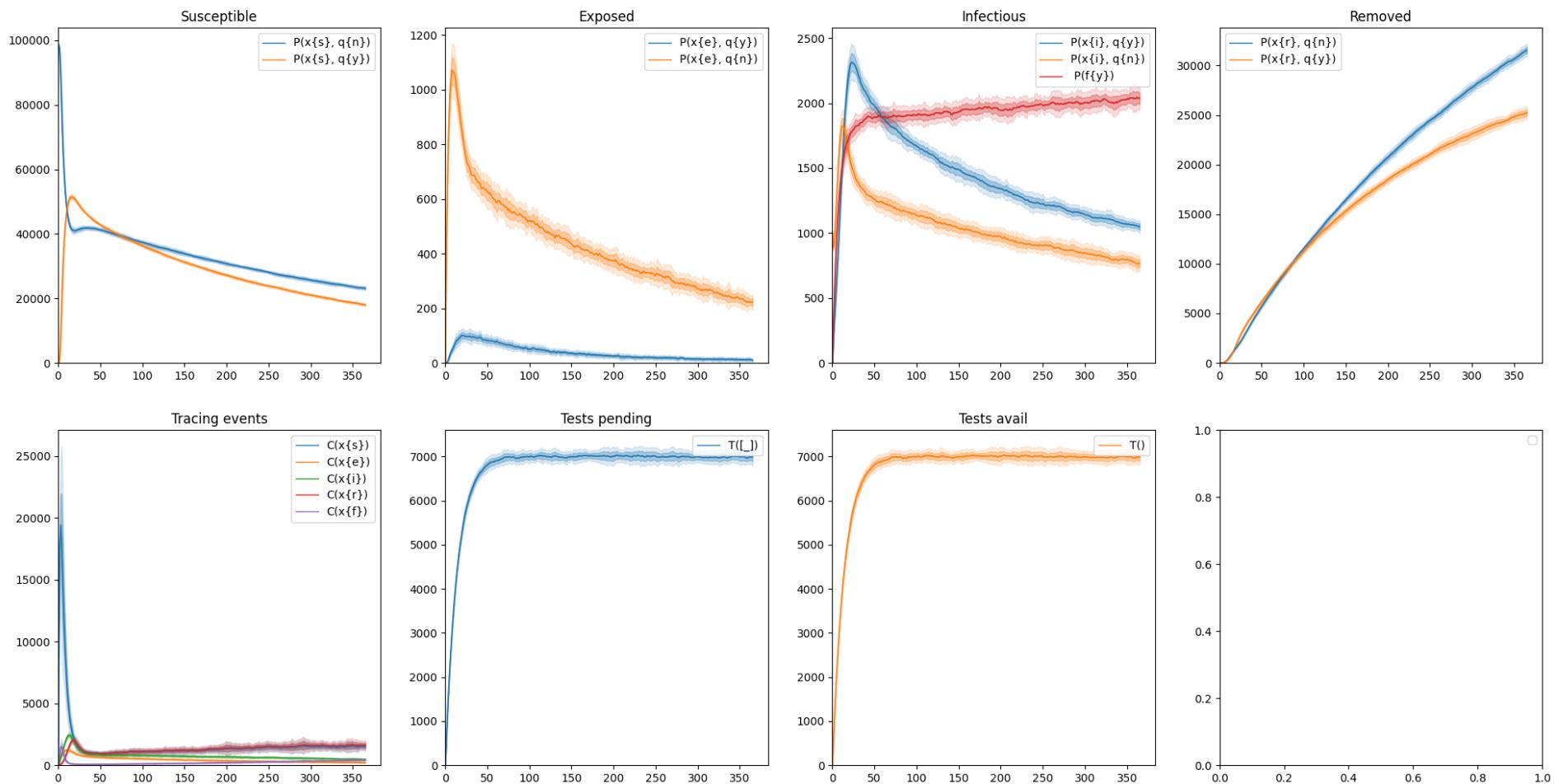
case: 8 INIT\_I: 1000.0 k\_result: 0.5 m: 500.0 thetaD: 0.0 thetal: 0.0 thetaT: 0.0



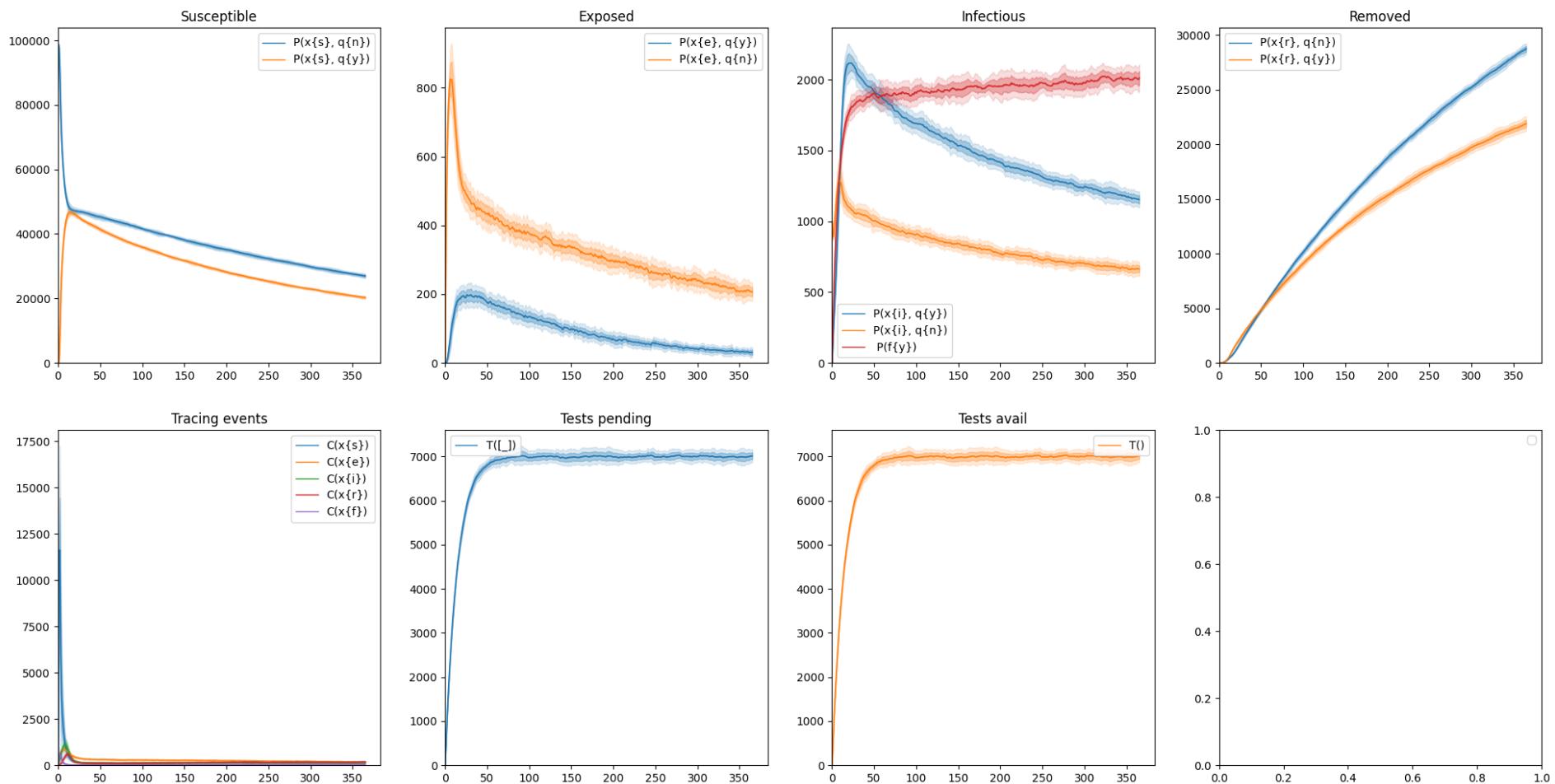
case: 9 INIT\_I: 1000.0 k\_result: 0.5 m: 500.0 thetaD: 0.0 thetal: 0.0 thetaT: 1.0



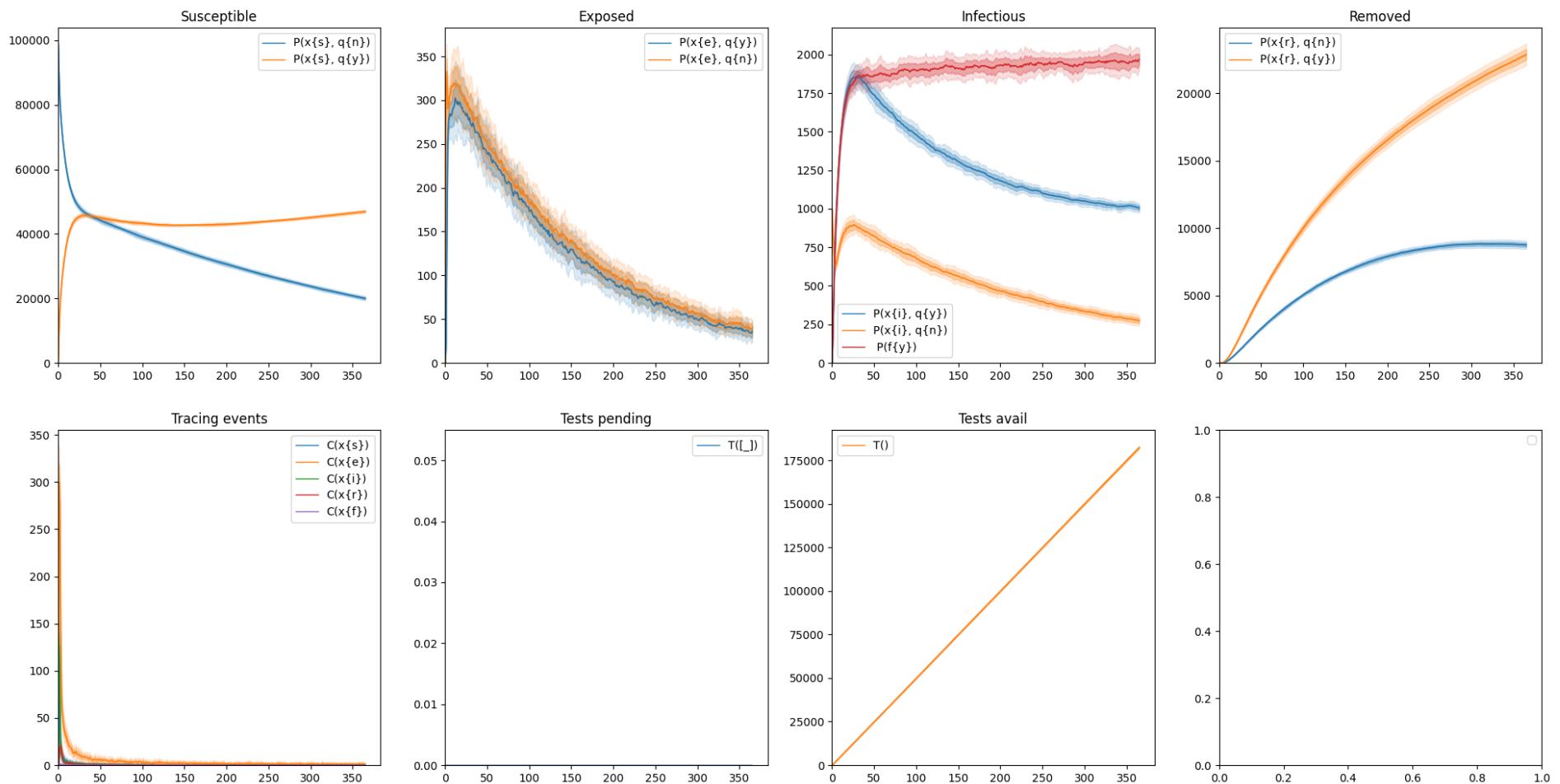
case: 10 INIT\_I: 1000.0 k\_result: 0.5 m: 500.0 thetaD: 0.0 thetal: 0.14285714285700002 thetaT: 0.0



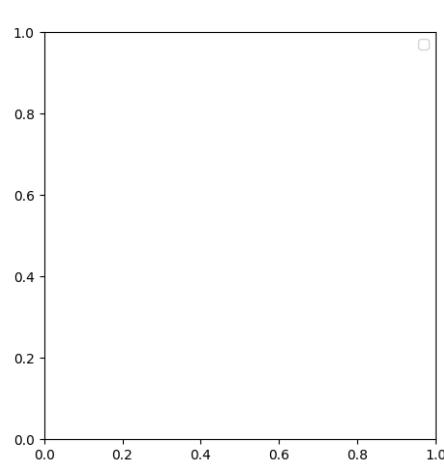
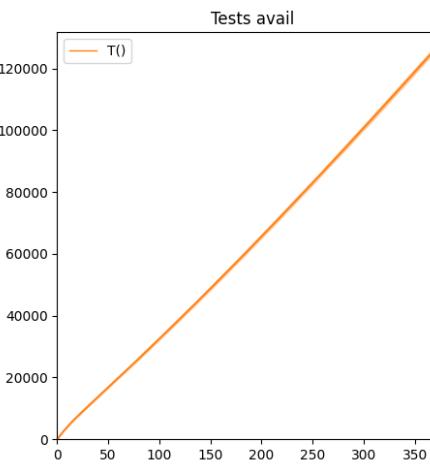
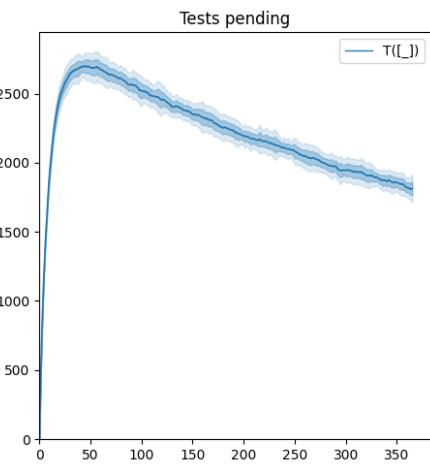
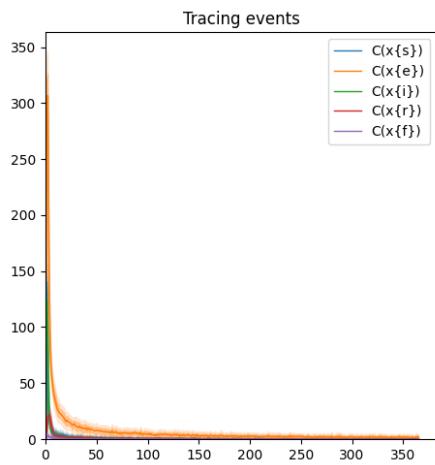
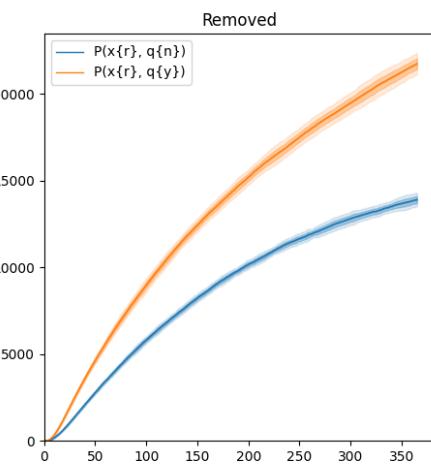
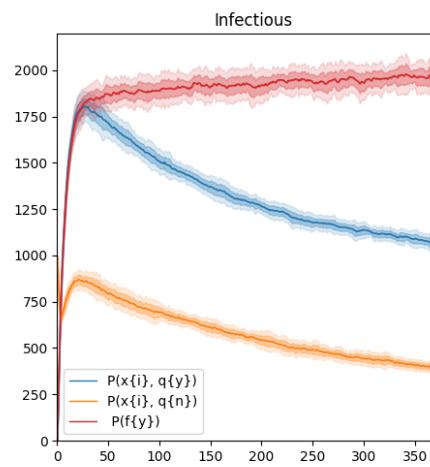
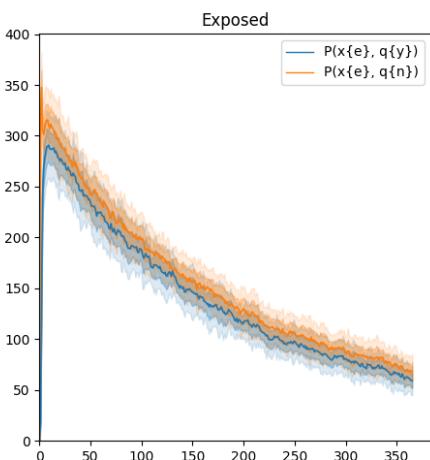
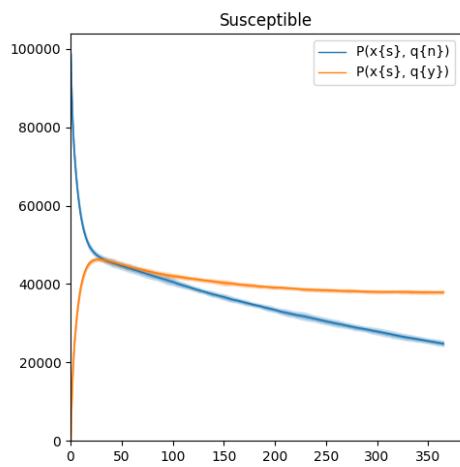
case: 11 INIT\_I: 1000.0 k\_result: 0.5 m: 500.0 thetaD: 0.0 thetal: 0.1428571428570002 thetaT: 1.0



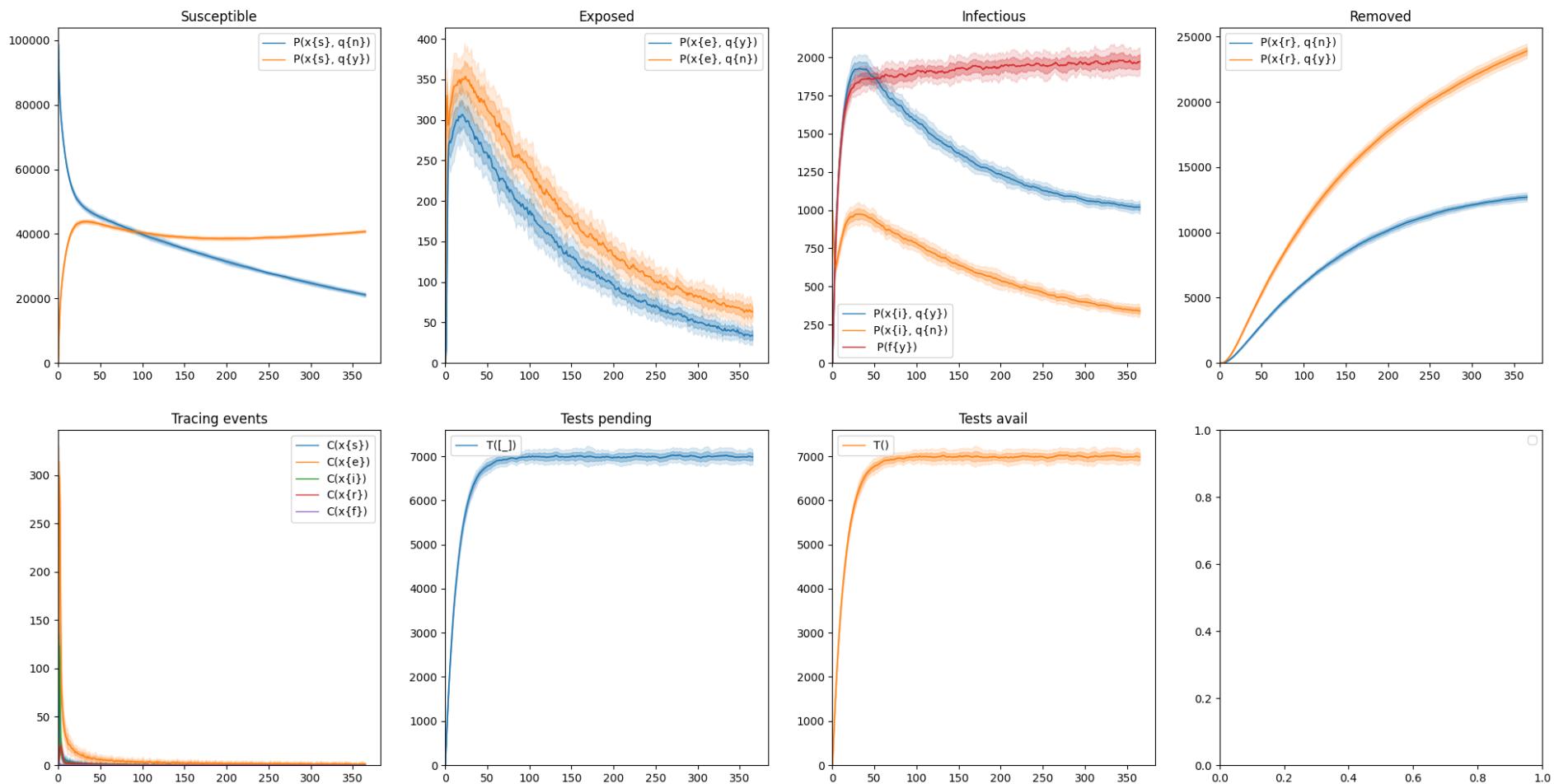
case: 12 INIT\_I: 1000.0 k\_result: 0.5 m: 500.0 thetaD: 1.0 thetaI: 0.0 thetaT: 0.0



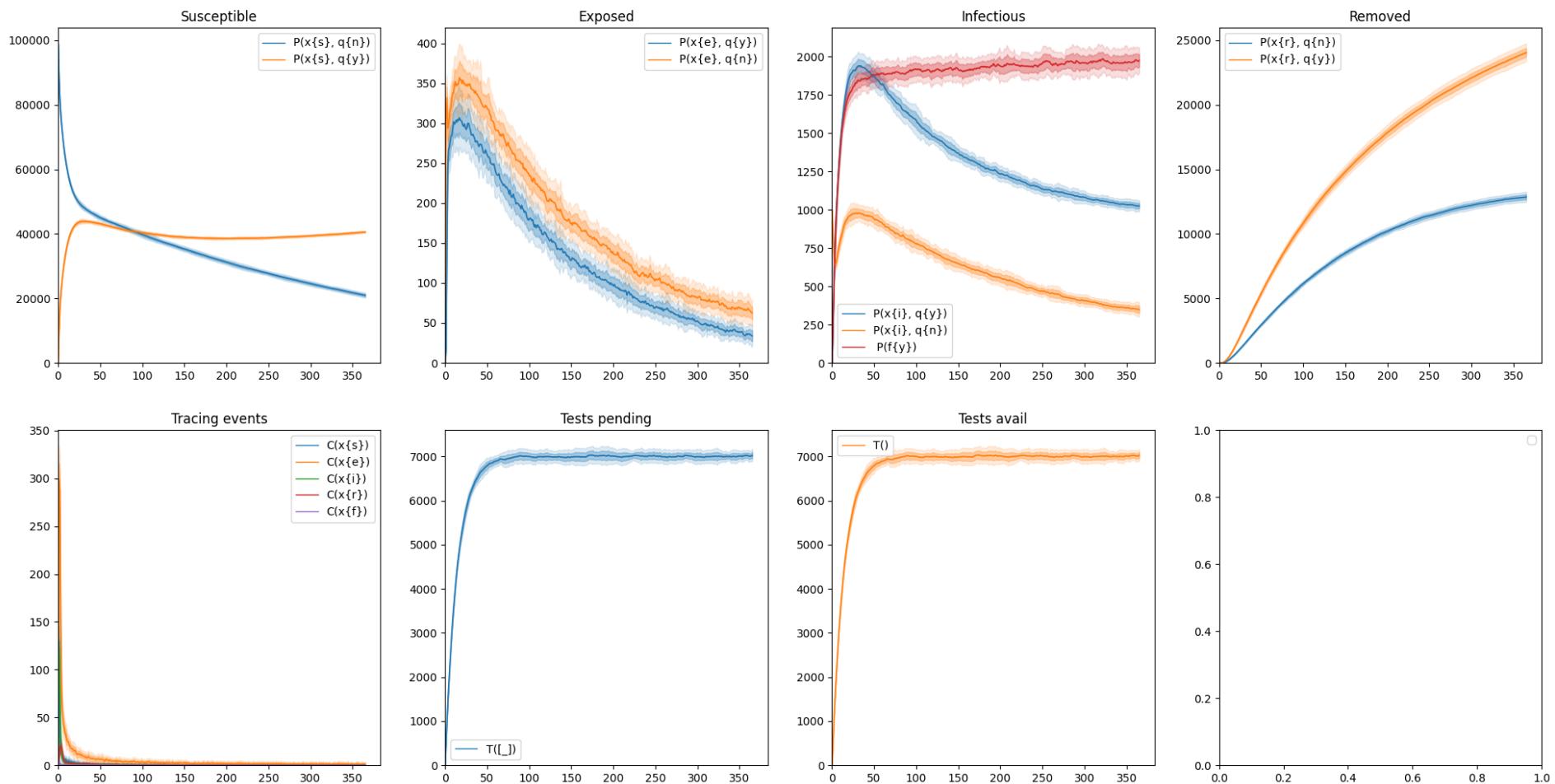
case: 13 INIT\_I: 1000.0 k\_result: 0.5 m: 500.0 thetaD: 1.0 thetaI: 0.0 thetaT: 1.0



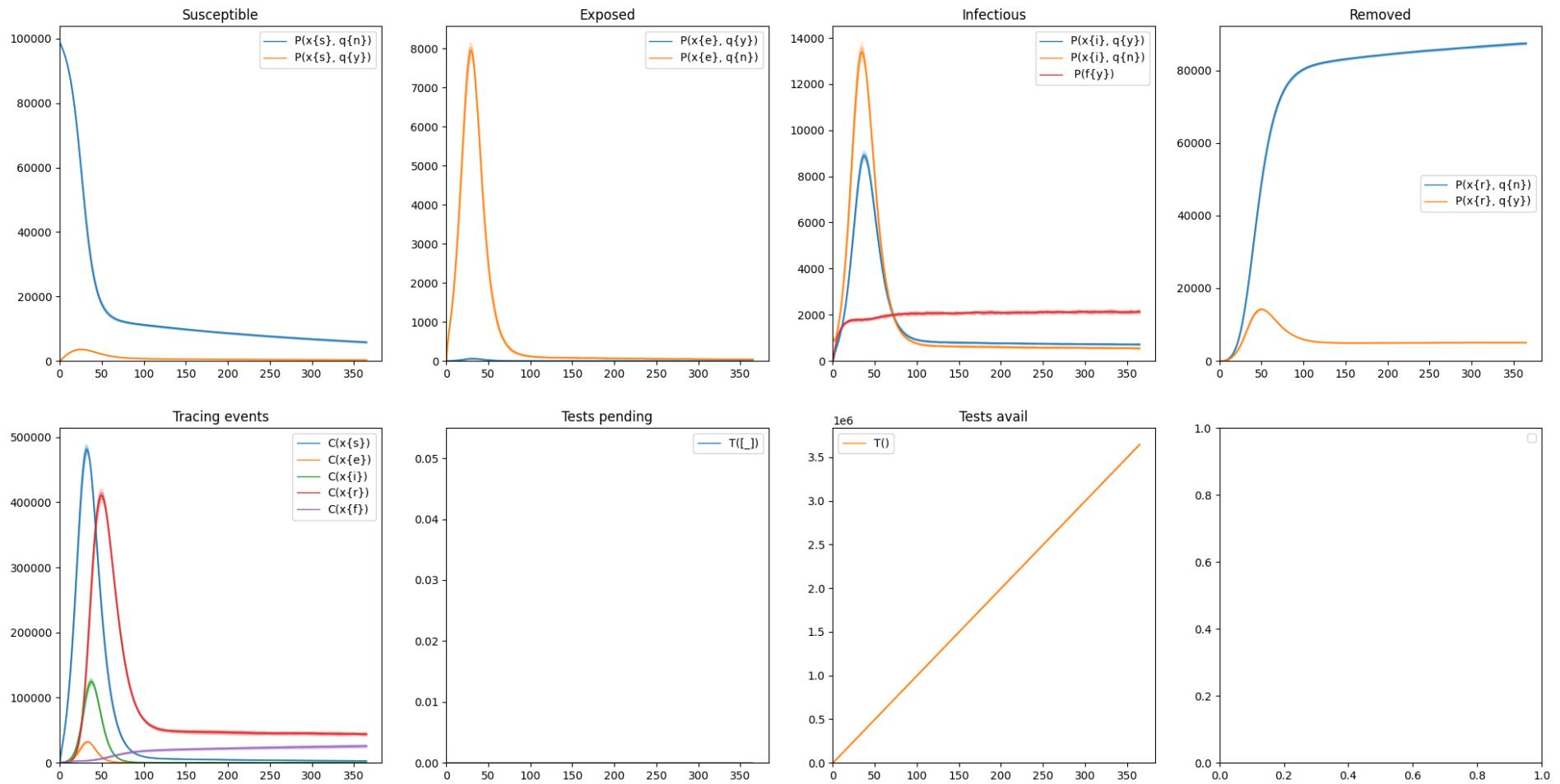
case: 14 INIT\_I: 1000.0 k\_result: 0.5 m: 500.0 thetaD: 1.0 thetal: 0.14285714285700002 thetaT: 0.0



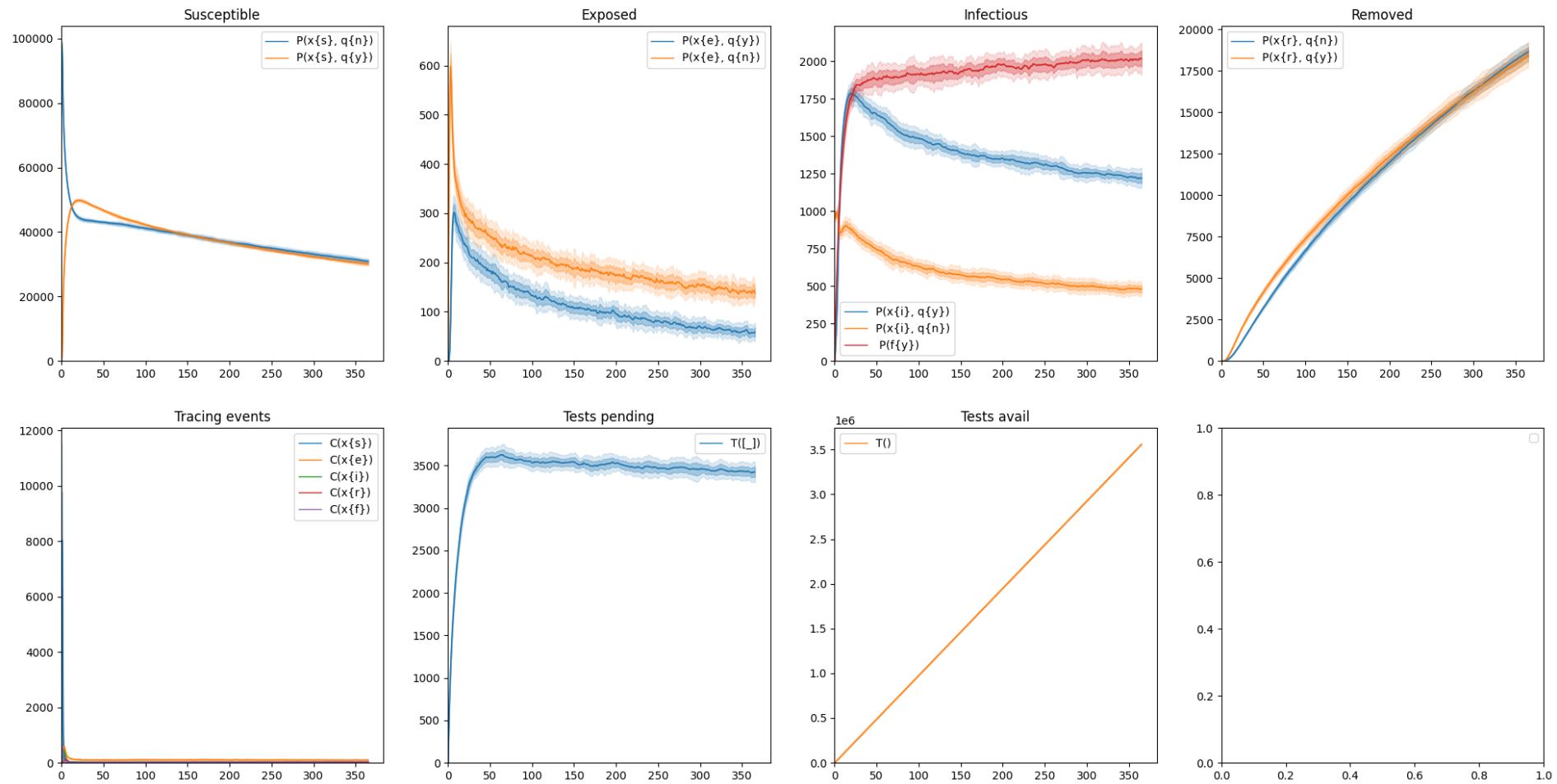
case: 15 INIT\_I: 1000.0 k\_result: 0.5 m: 500.0 thetaD: 1.0 thetal: 0.14285714285700002 thetaT: 1.0



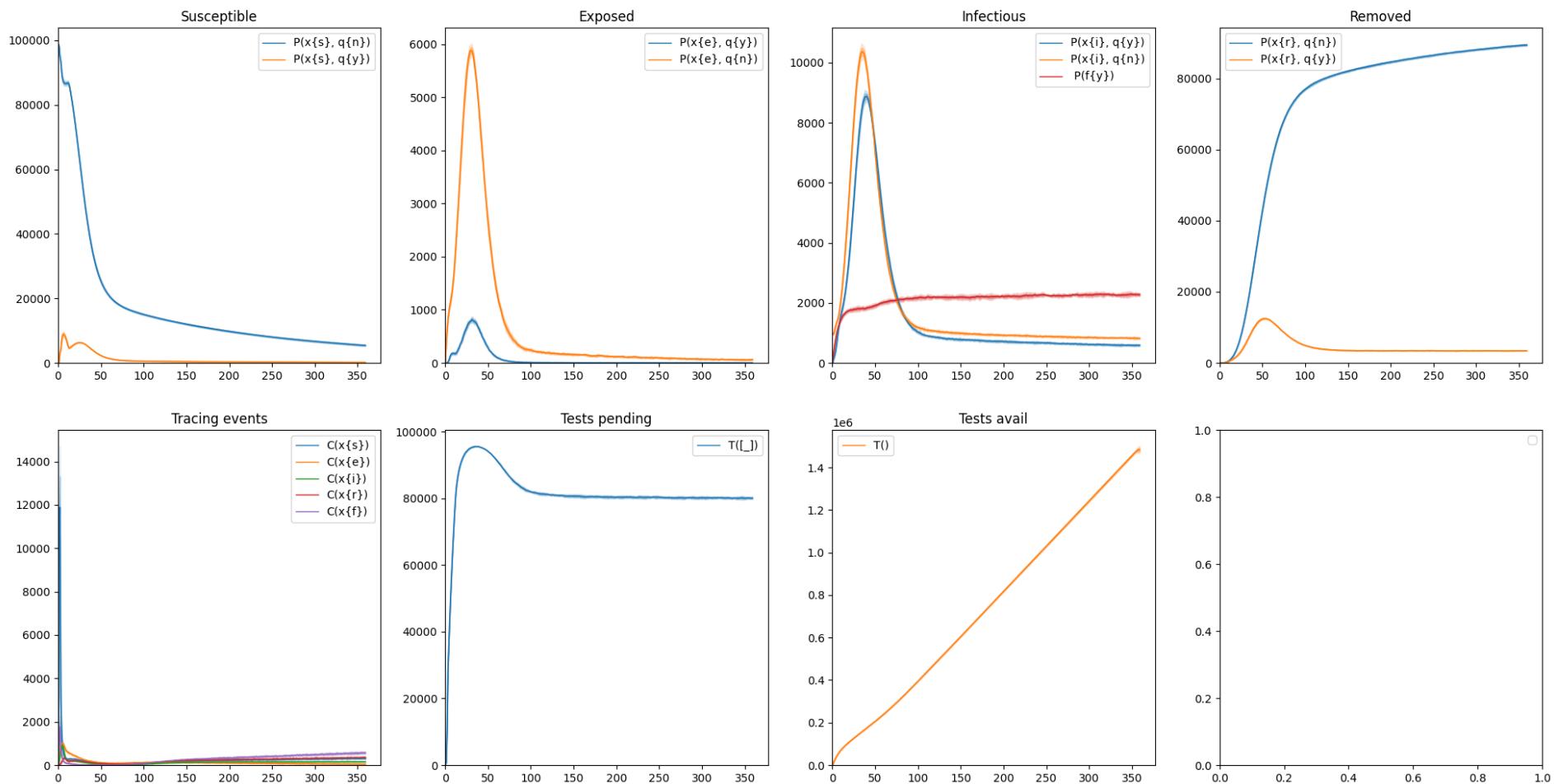
case: 16 INIT\_I: 1000.0 k\_result: 12.0 m: 10000.0 thetaD: 0.0 thetal: 0.0 thetaT: 0.0



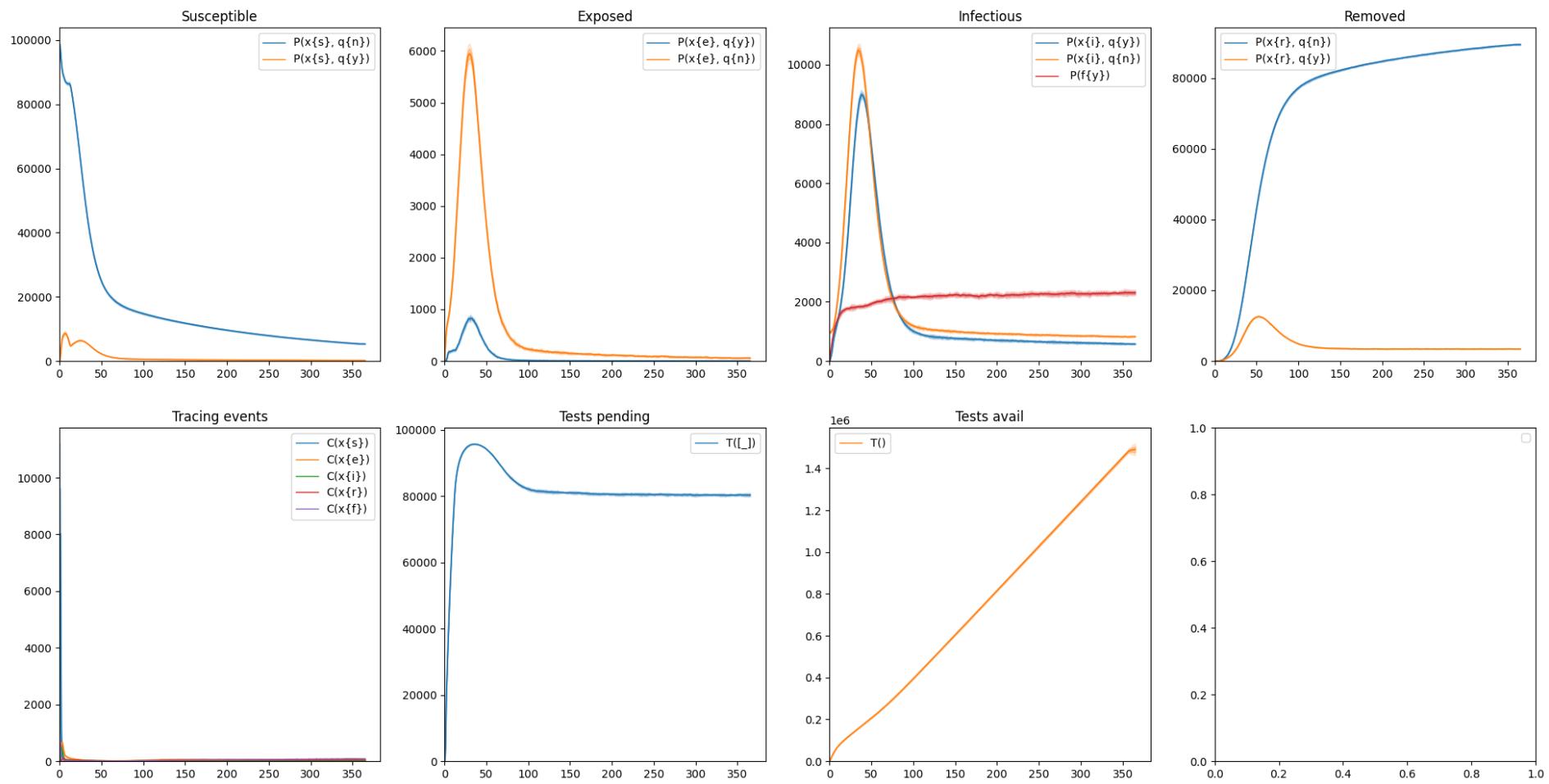
case: 17 INIT\_I: 1000.0 k\_result: 12.0 m: 10000.0 thetaD: 0.0 thetal: 0.0 thetaT: 1.0



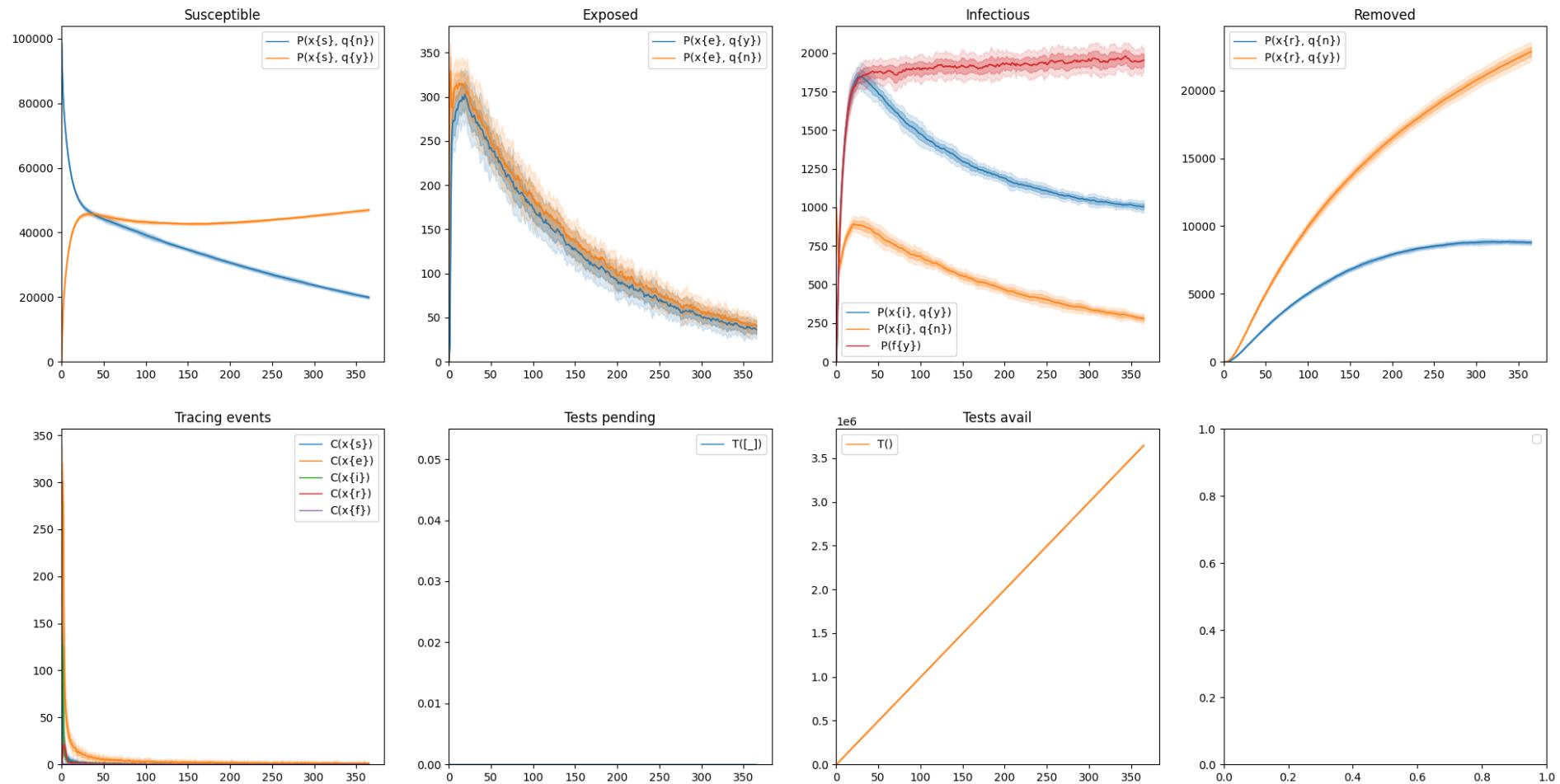
case: 18 INIT\_I: 1000.0 k\_result: 12.0 m: 10000.0 thetaD: 0.0 thetal: 0.14285714285700002 thetaT: 0.0



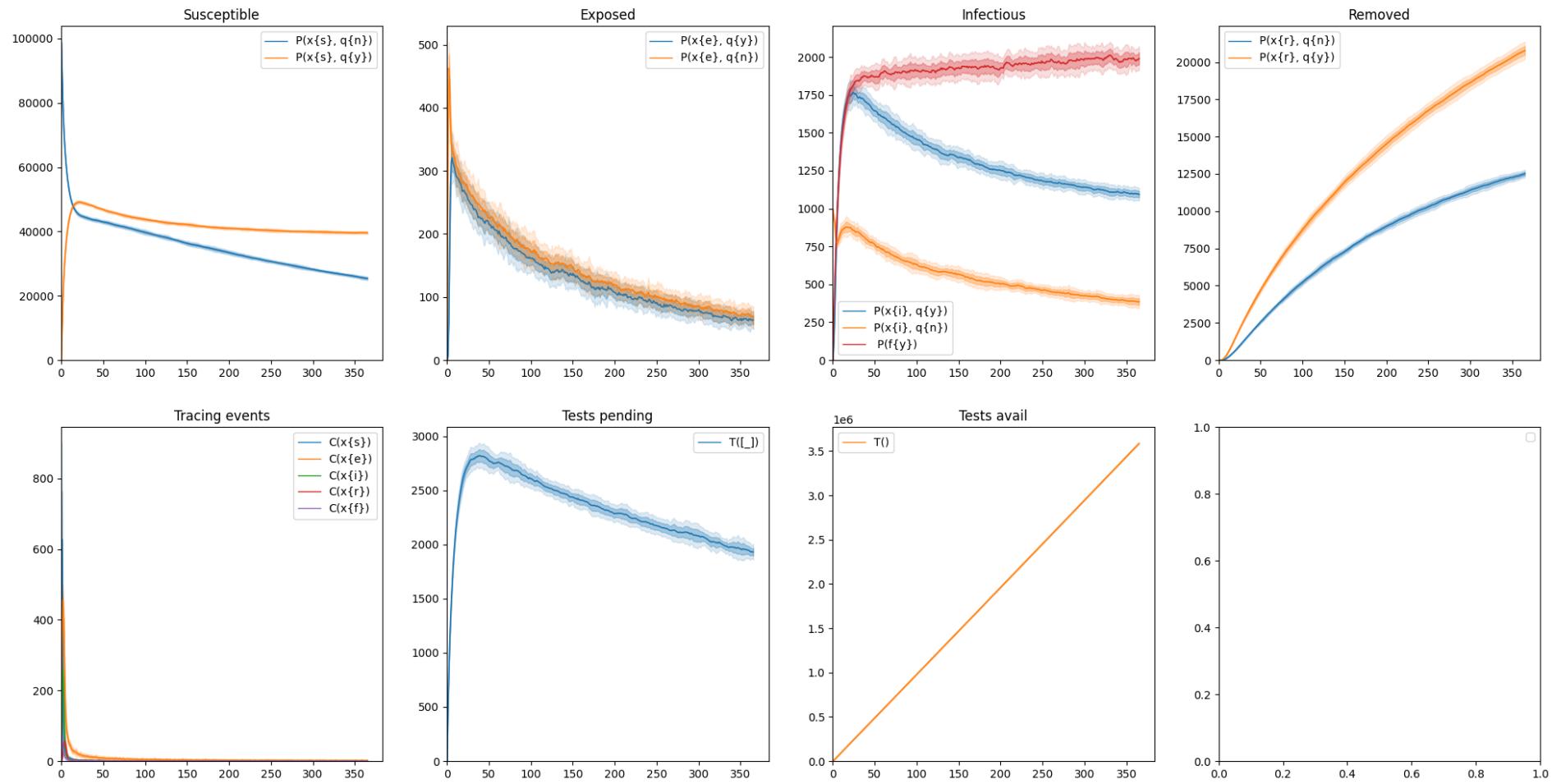
case: 19 INIT\_I: 1000.0 k\_result: 12.0 m: 10000.0 thetaD: 0.0 thetal: 0.14285714285700002 thetaT: 1.0



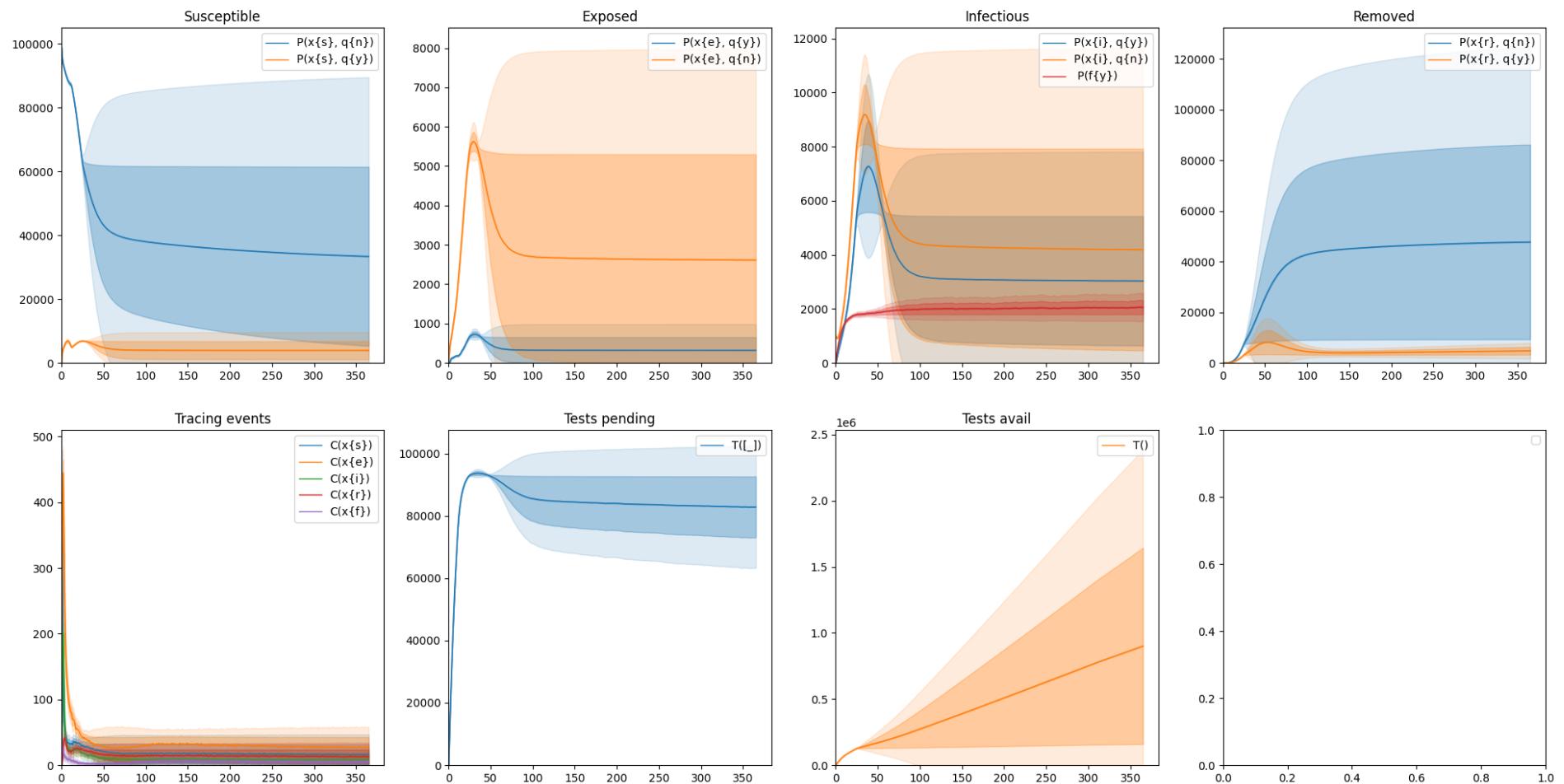
case: 20 INIT\_I: 1000.0 k\_result: 12.0 m: 10000.0 thetaD: 1.0 thetal: 0.0 thetaT: 0.0



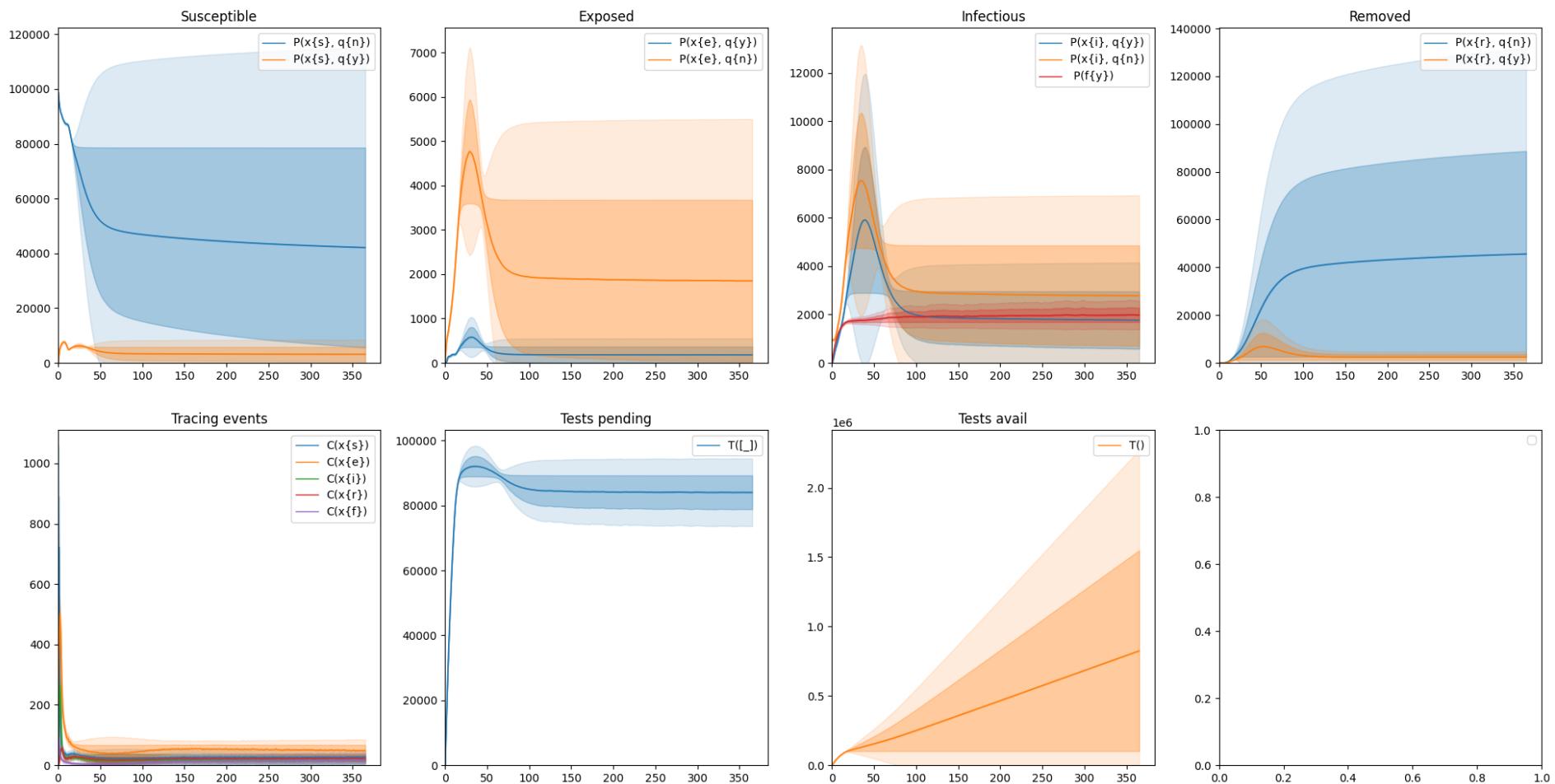
case: 21 INIT\_I: 1000.0 k\_result: 12.0 m: 10000.0 thetaD: 1.0 thetal: 0.0 thetaT: 1.0



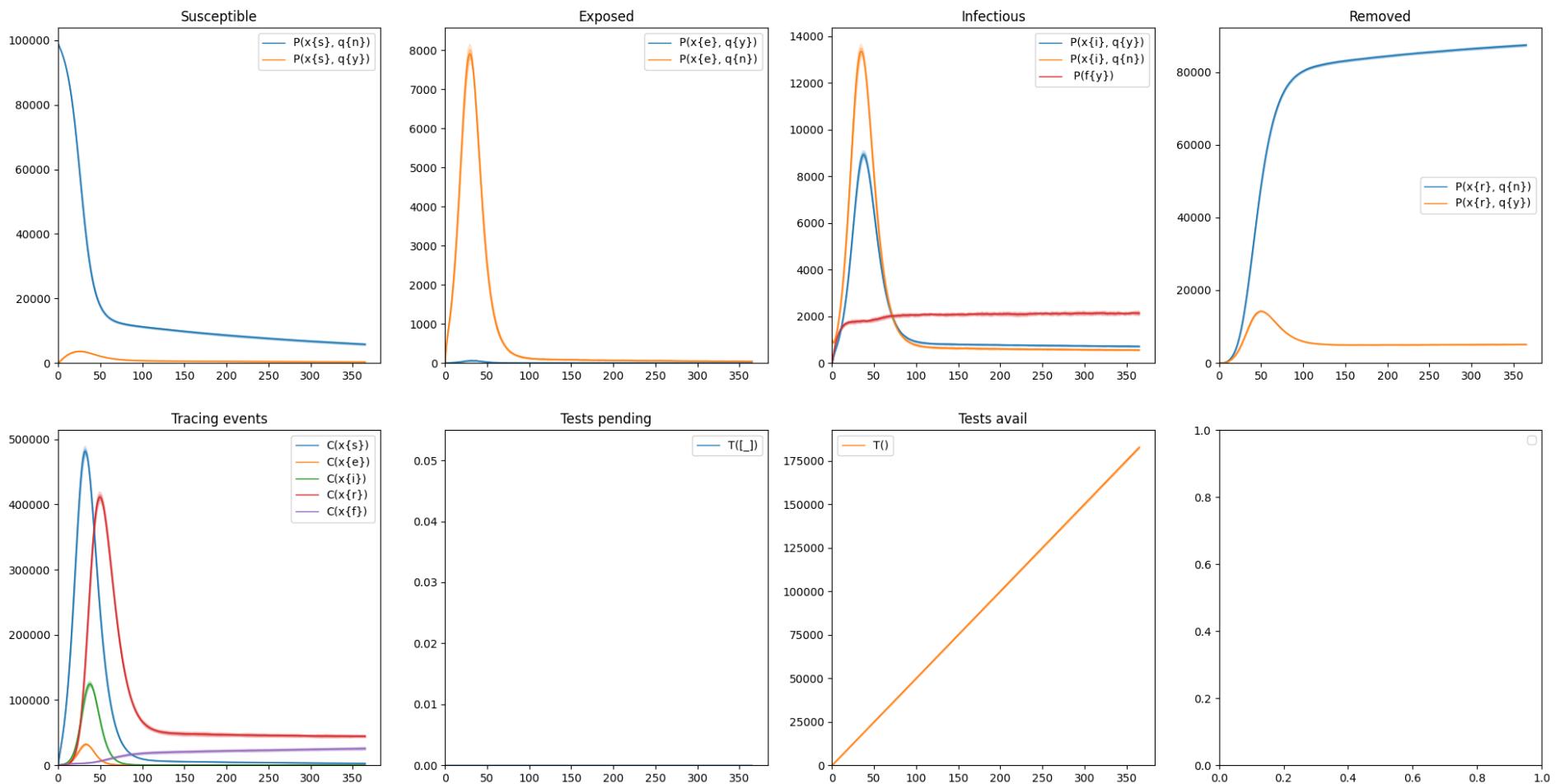
case: 22 INIT\_I: 1000.0 k\_result: 12.0 m: 10000.0 thetaD: 1.0 thetal: 0.14285714285700002 thetaT: 0.0



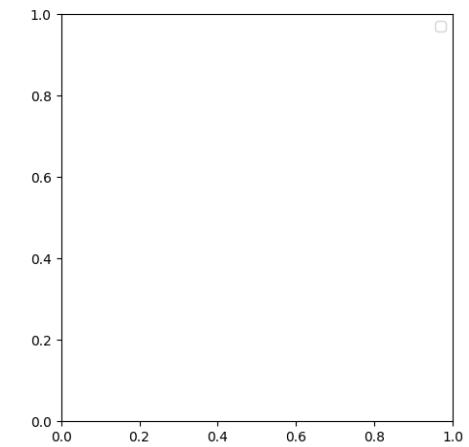
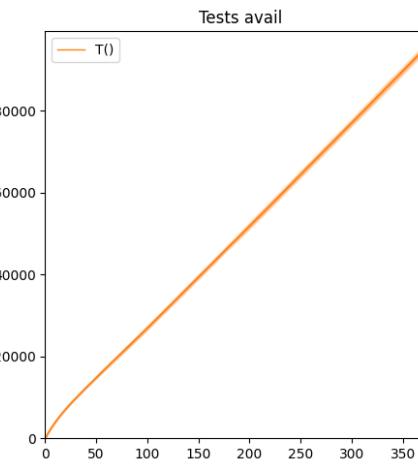
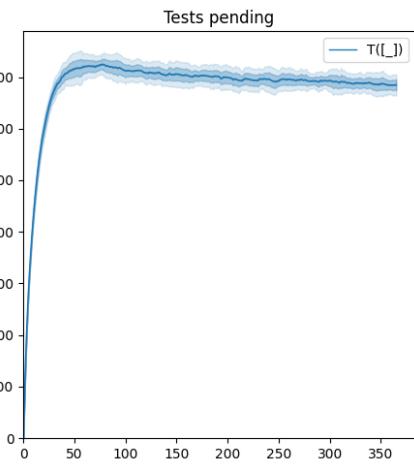
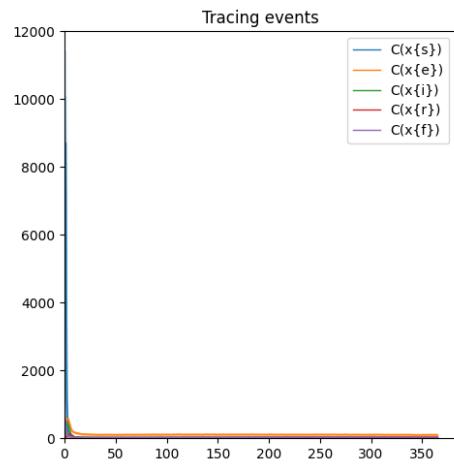
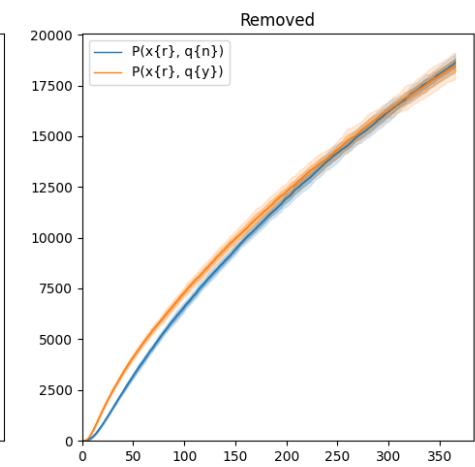
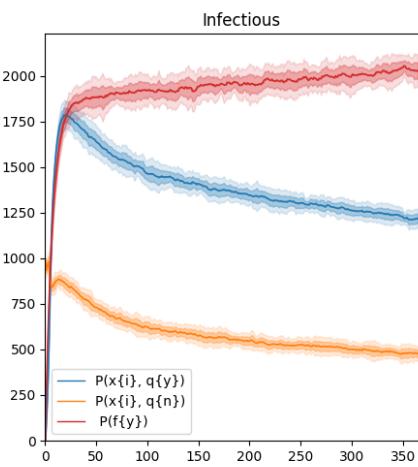
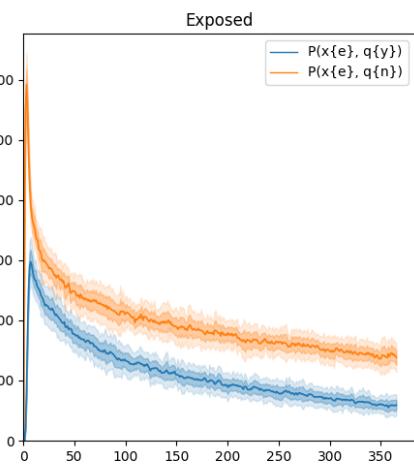
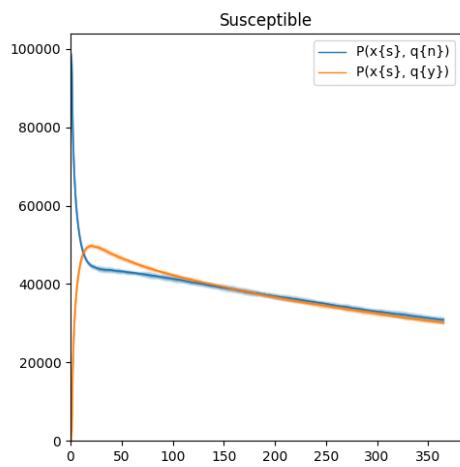
case: 23 INIT\_I: 1000.0 k\_result: 12.0 m: 10000.0 thetaD: 1.0 thetal: 0.14285714285700002 thetaT: 1.0



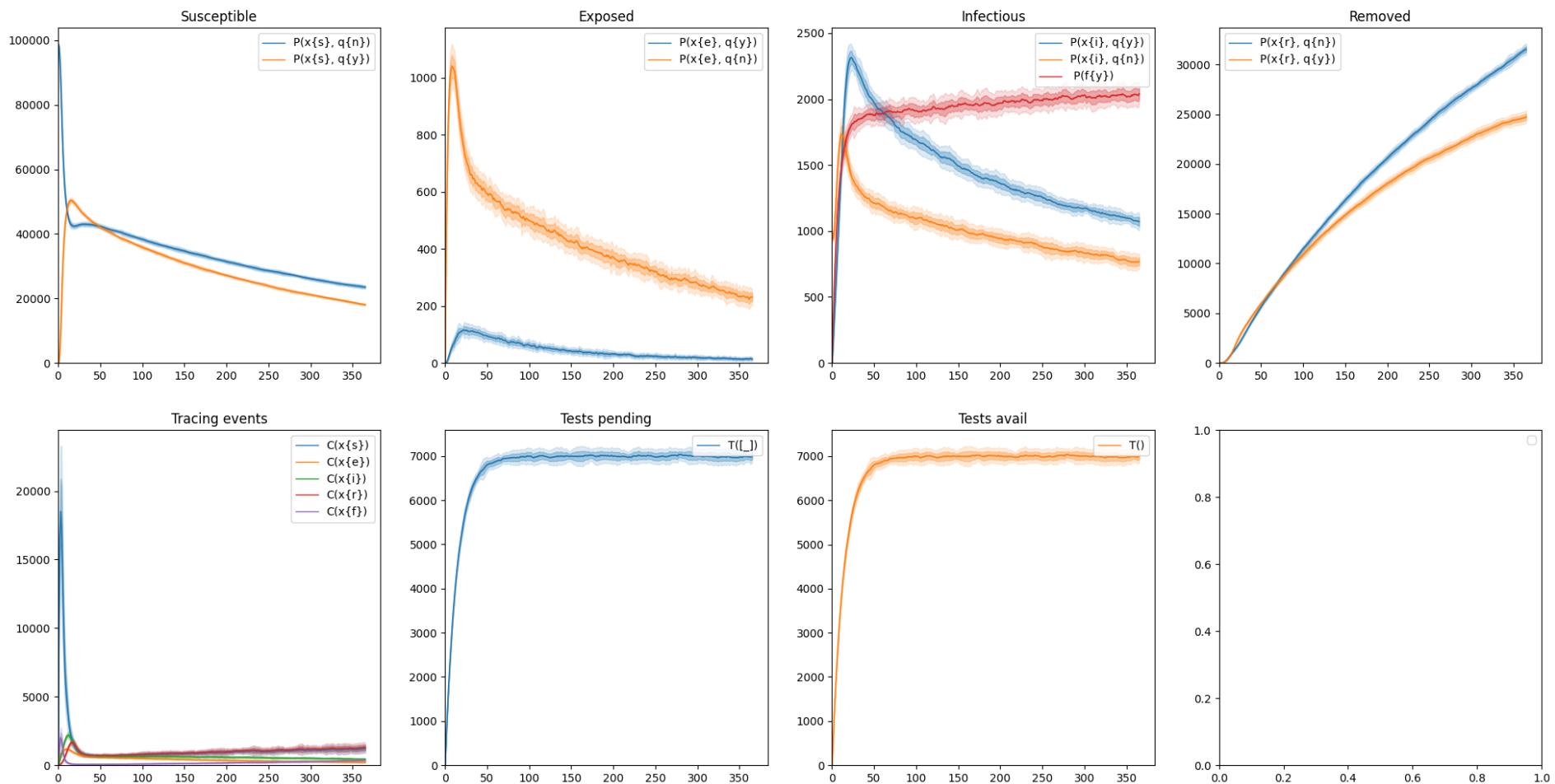
case: 24 INIT\_I: 1000.0 k\_result: 12.0 m: 500.0 thetaD: 0.0 thetal: 0.0 thetaT: 0.0



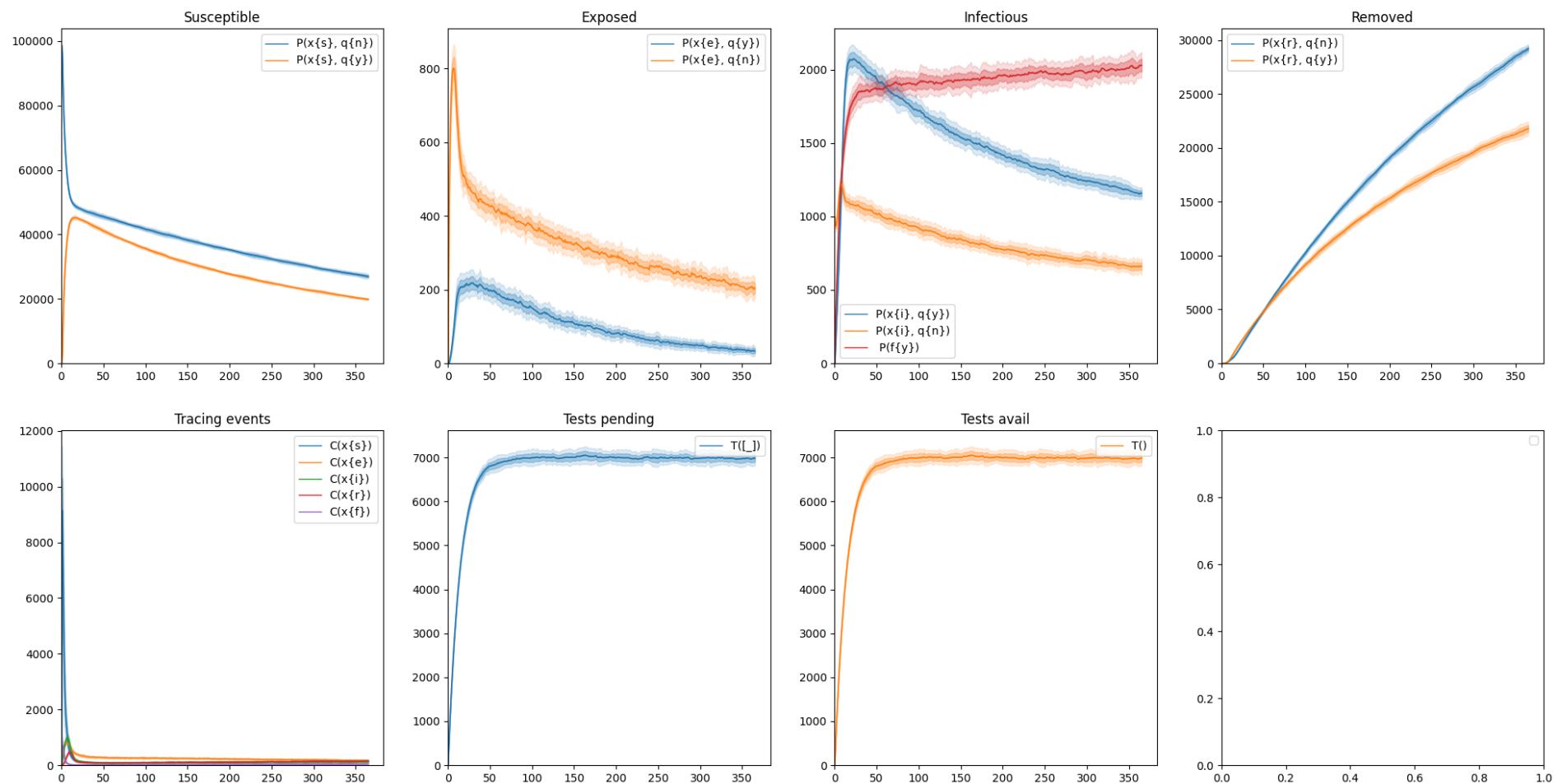
case: 25 INIT\_I: 1000.0 k\_result: 12.0 m: 500.0 thetaD: 0.0 thetal: 0.0 thetaT: 1.0



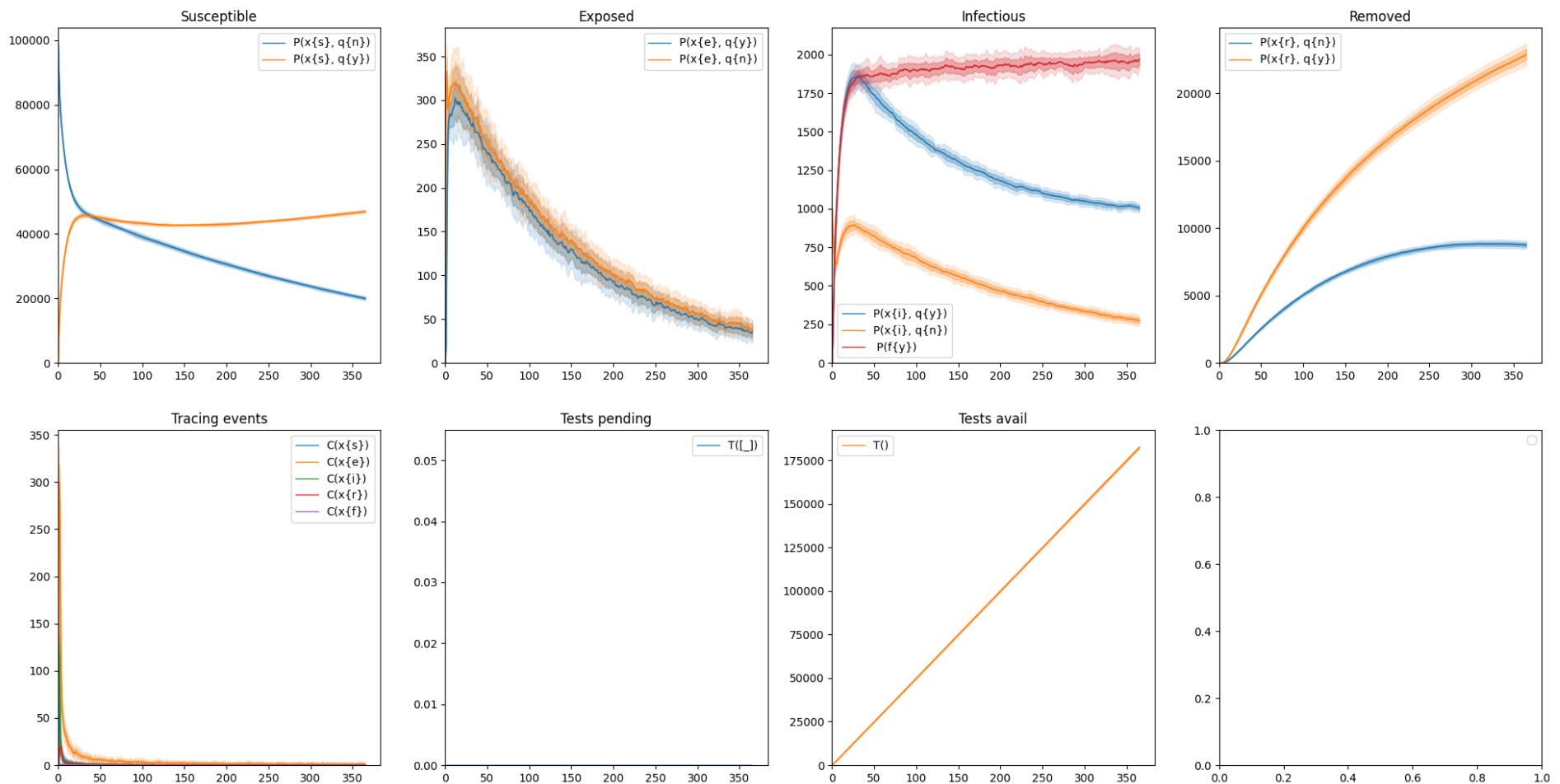
case: 26 INIT\_I: 1000.0 k\_result: 12.0 m: 500.0 thetaD: 0.0 thetal: 0.14285714285700002 thetaT: 0.0



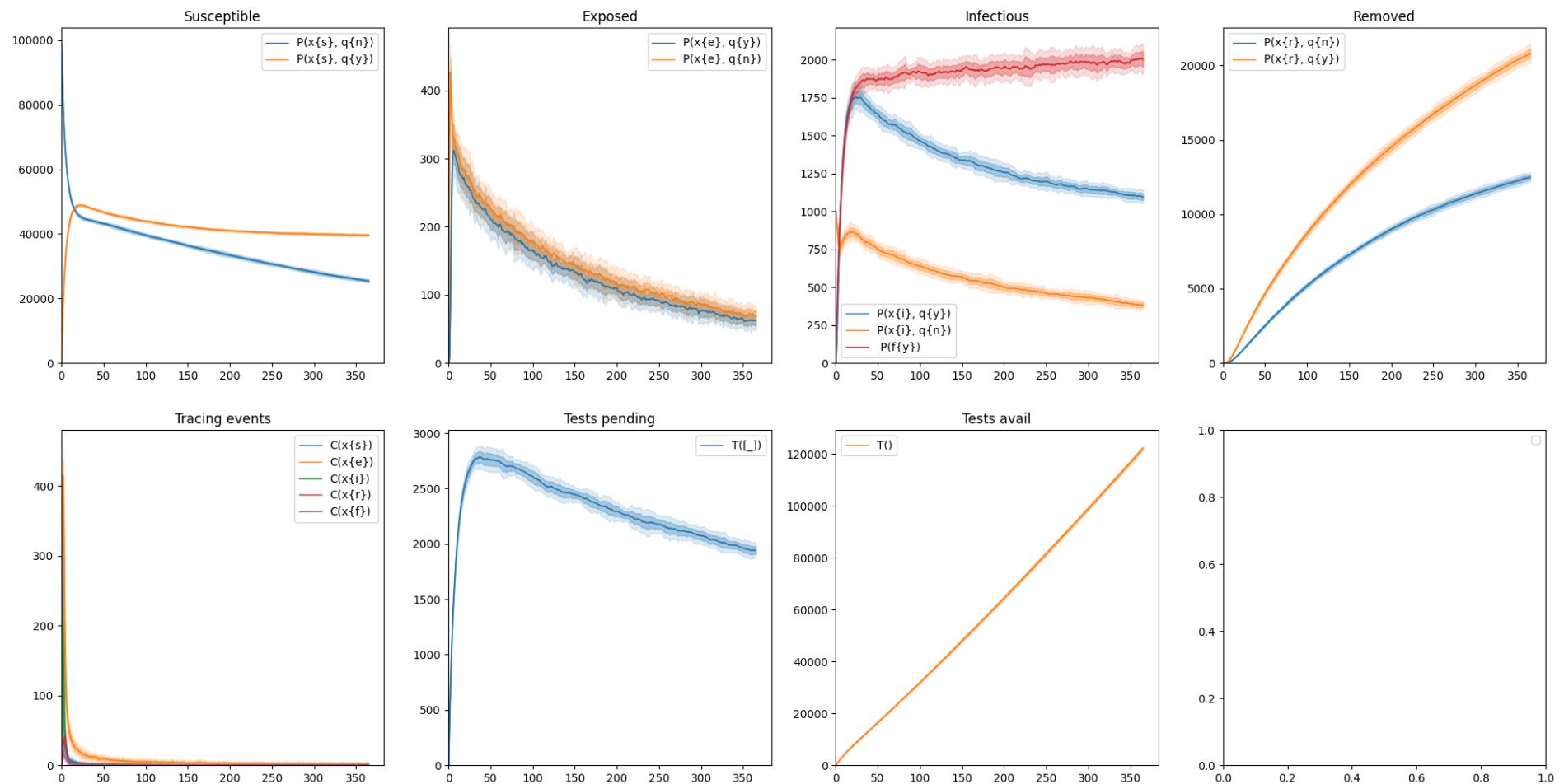
case: 27 INIT\_I: 1000.0 k\_result: 12.0 m: 500.0 thetaD: 0.0 thetal: 0.14285714285700002 thetaT: 1.0



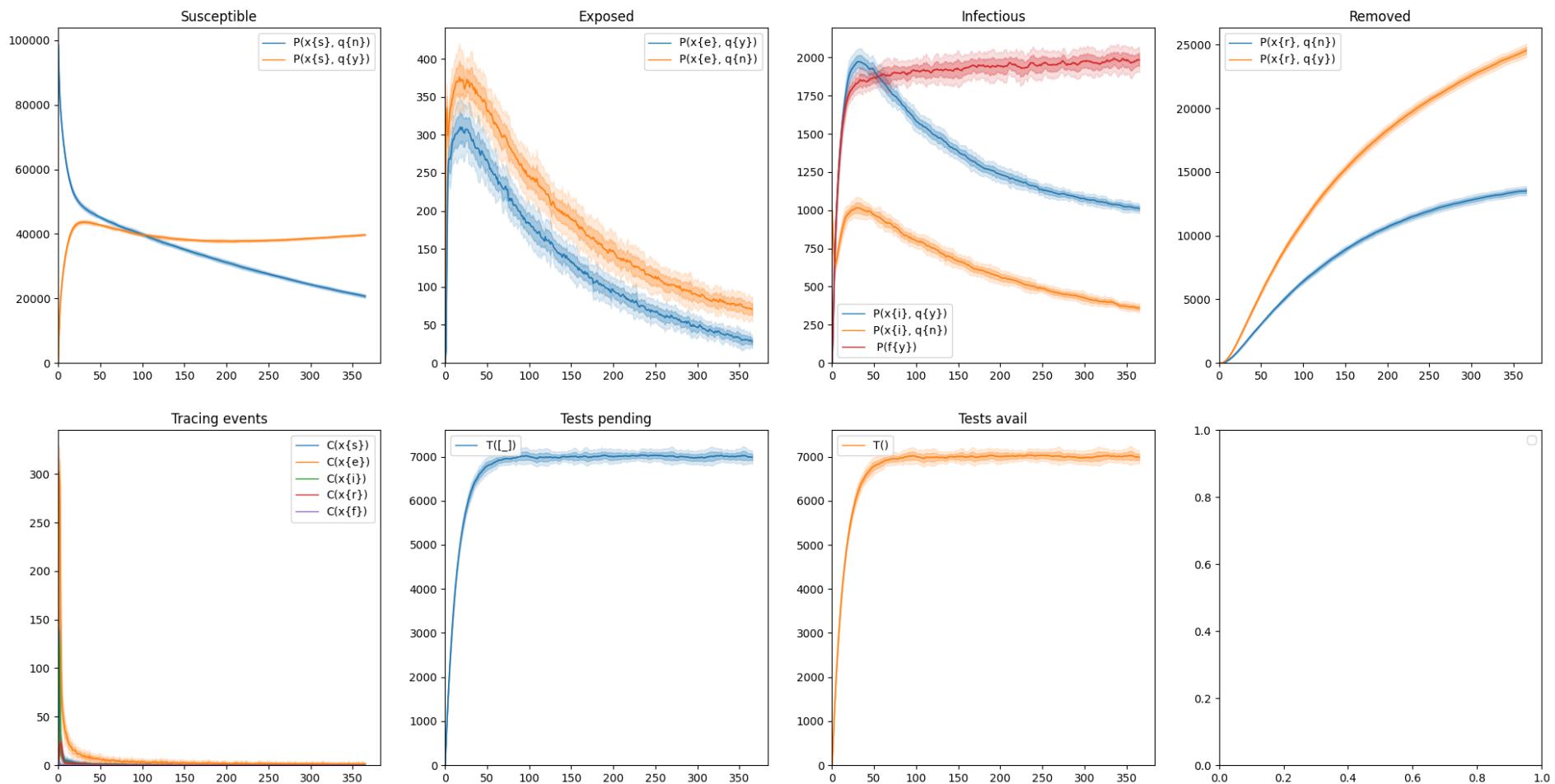
case: 28 INIT\_I: 1000.0 k\_result: 12.0 m: 500.0 thetaD: 1.0 thetal: 0.0 thetaT: 0.0



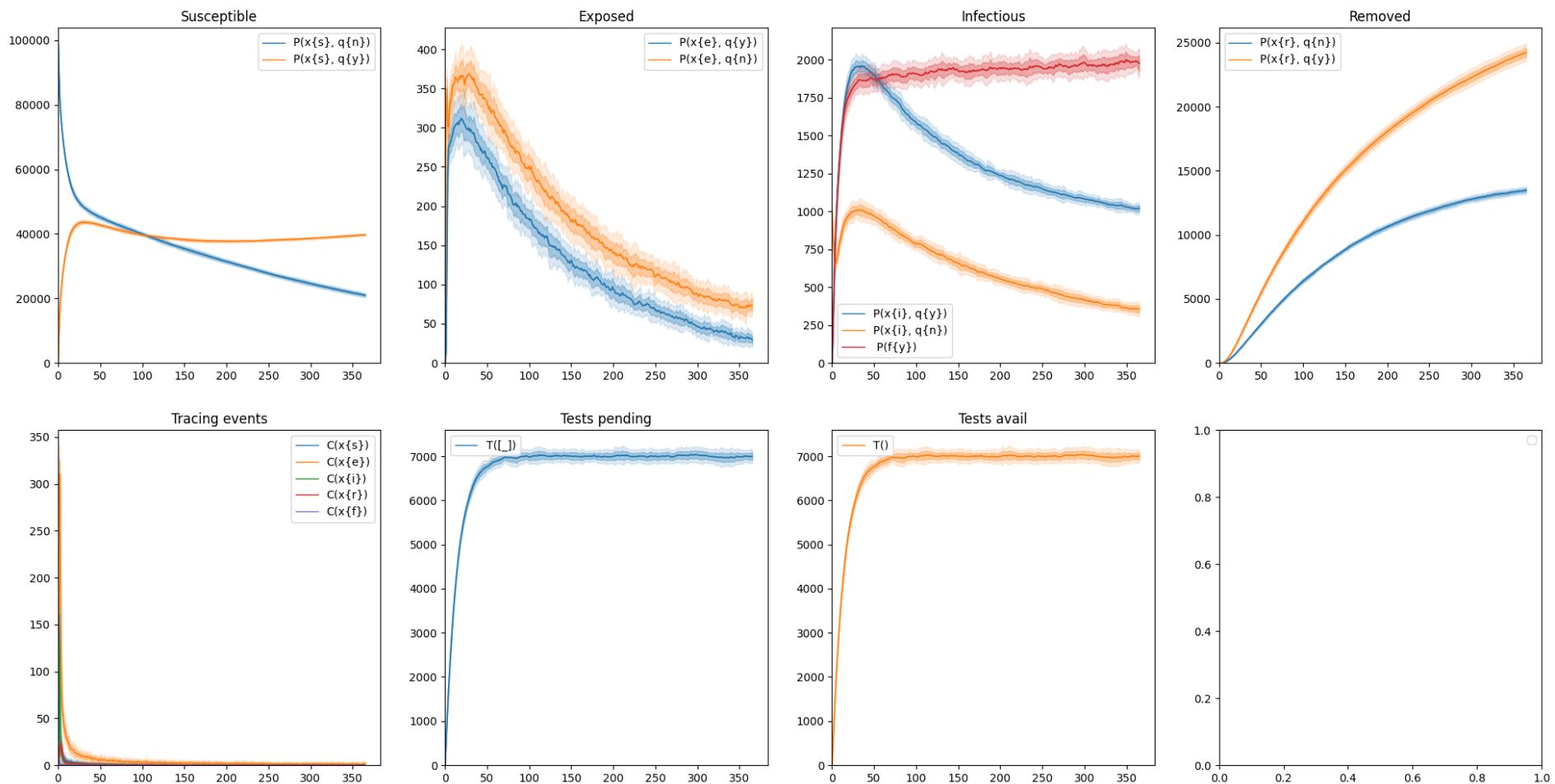
case: 29 INIT\_I: 1000.0 k\_result: 12.0 m: 500.0 thetaD: 1.0 thetal: 0.0 thetaT: 1.0



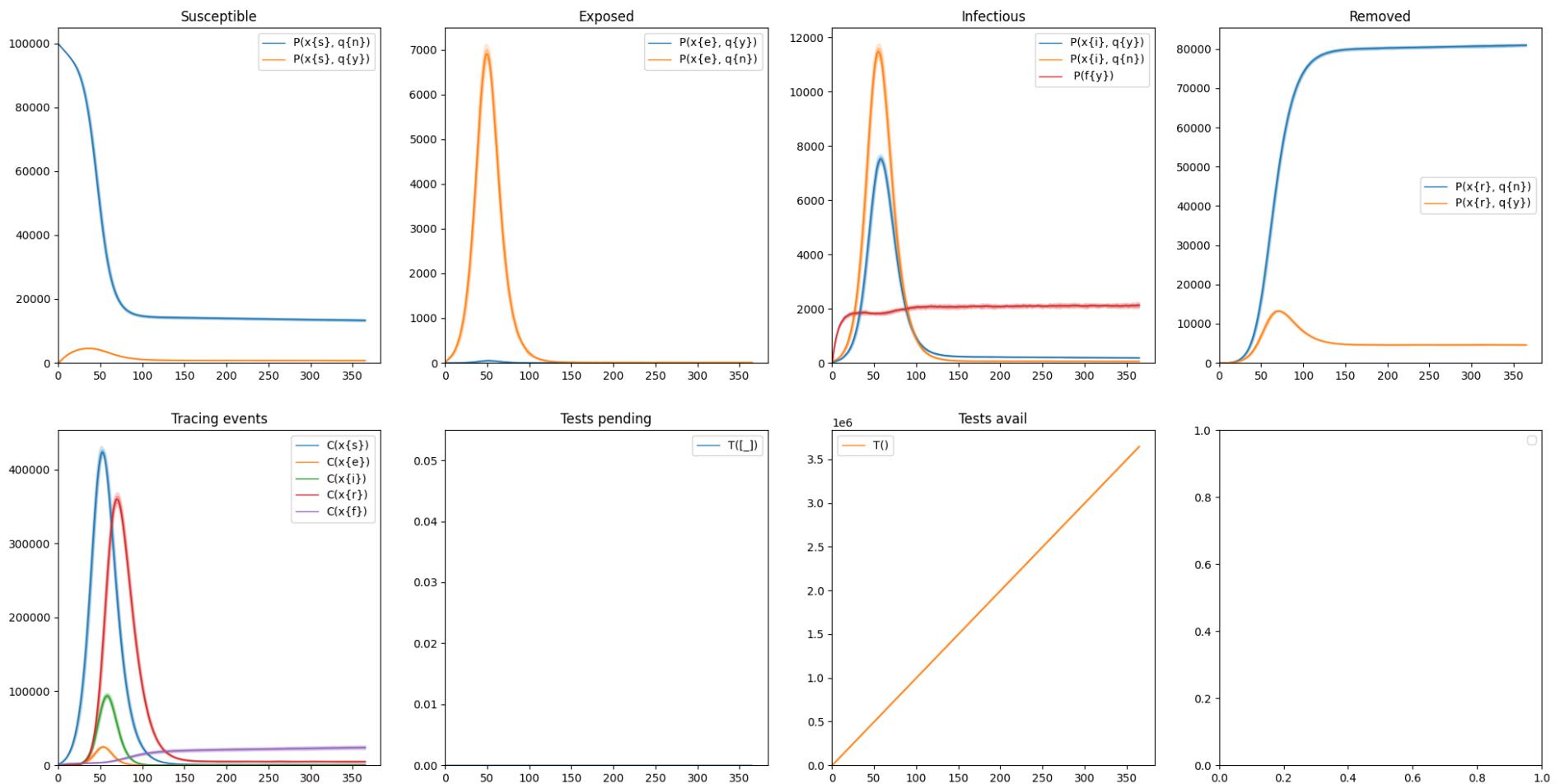
case: 30 INIT\_I: 1000.0 k\_result: 12.0 m: 500.0 thetaD: 1.0 thetal: 0.14285714285700002 thetaT: 0.0



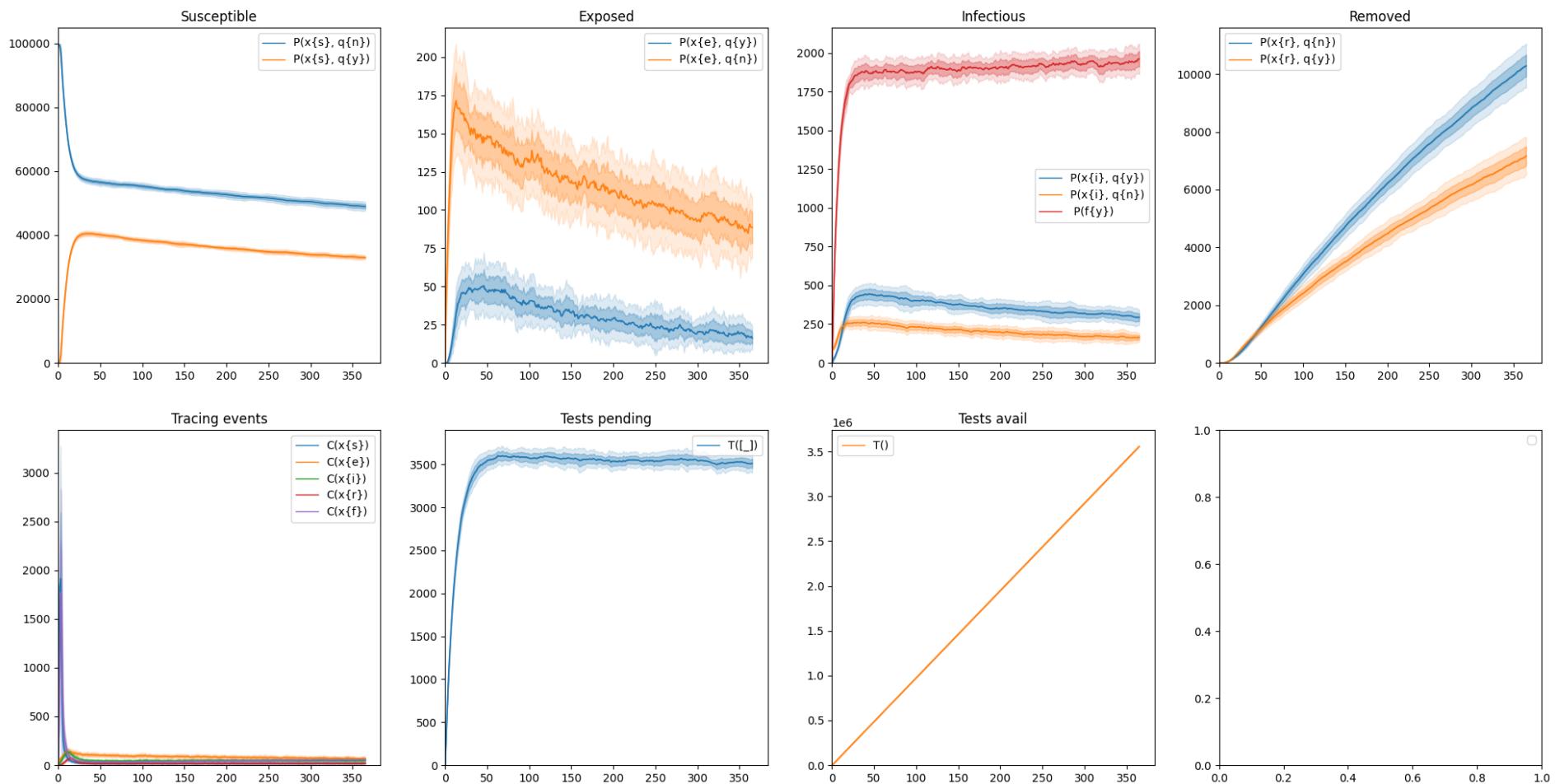
case: 31 INIT\_I: 1000.0 k\_result: 12.0 m: 500.0 thetaD: 1.0 thetal: 0.14285714285700002 thetaT: 1.0



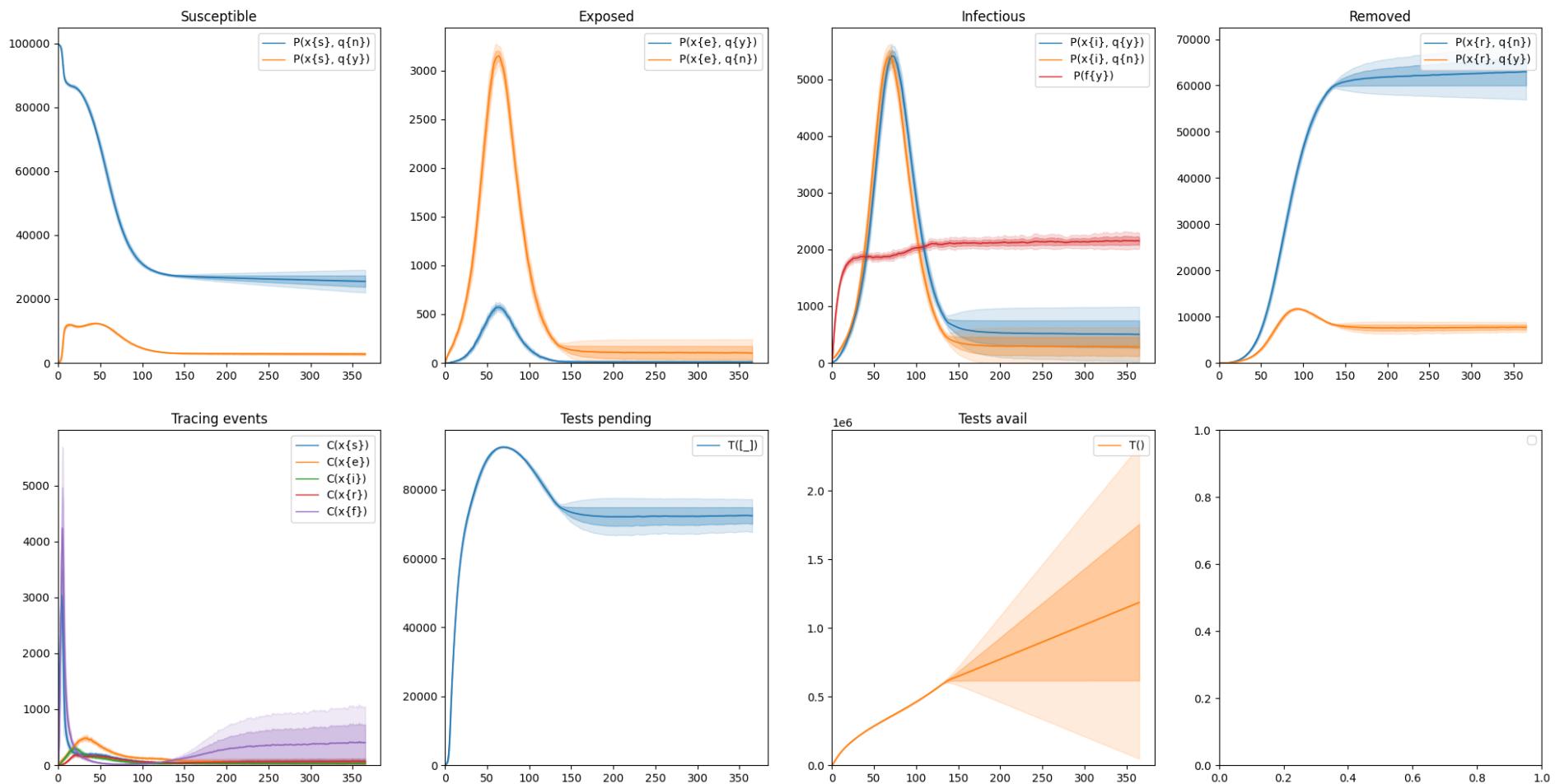
case: 32 INIT\_I: 100.0 k\_result: 0.5 m: 10000.0 thetaD: 0.0 thetal: 0.0 thetaT: 0.0



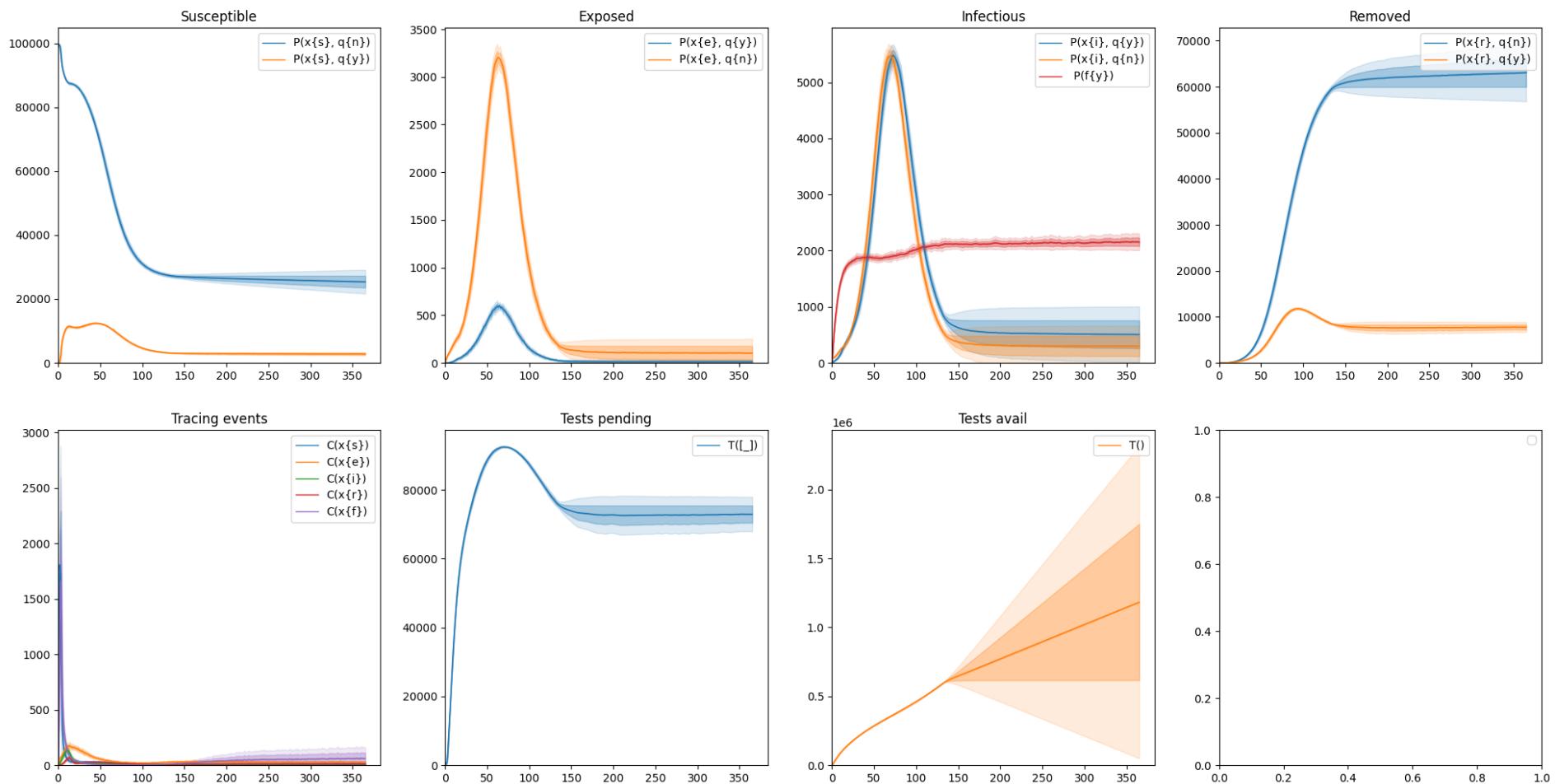
case: 33 INIT\_I: 100.0 k\_result: 0.5 m: 10000.0 thetaD: 0.0 thetal: 0.0 thetaT: 1.0



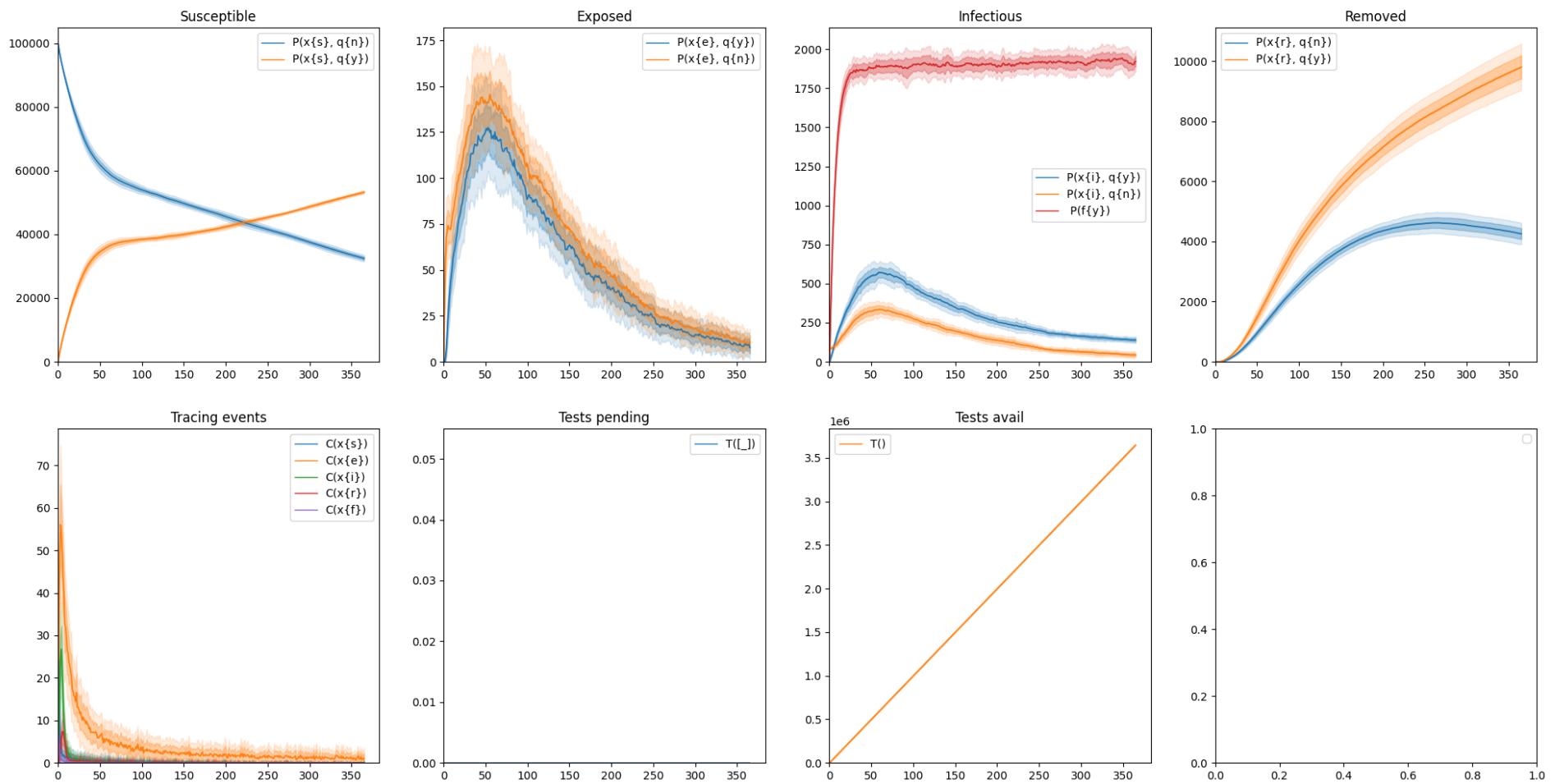
case: 34 INIT\_I: 100.0 k\_result: 0.5 m: 10000.0 thetaD: 0.0 thetal: 0.14285714285700002 thetaT: 0.0



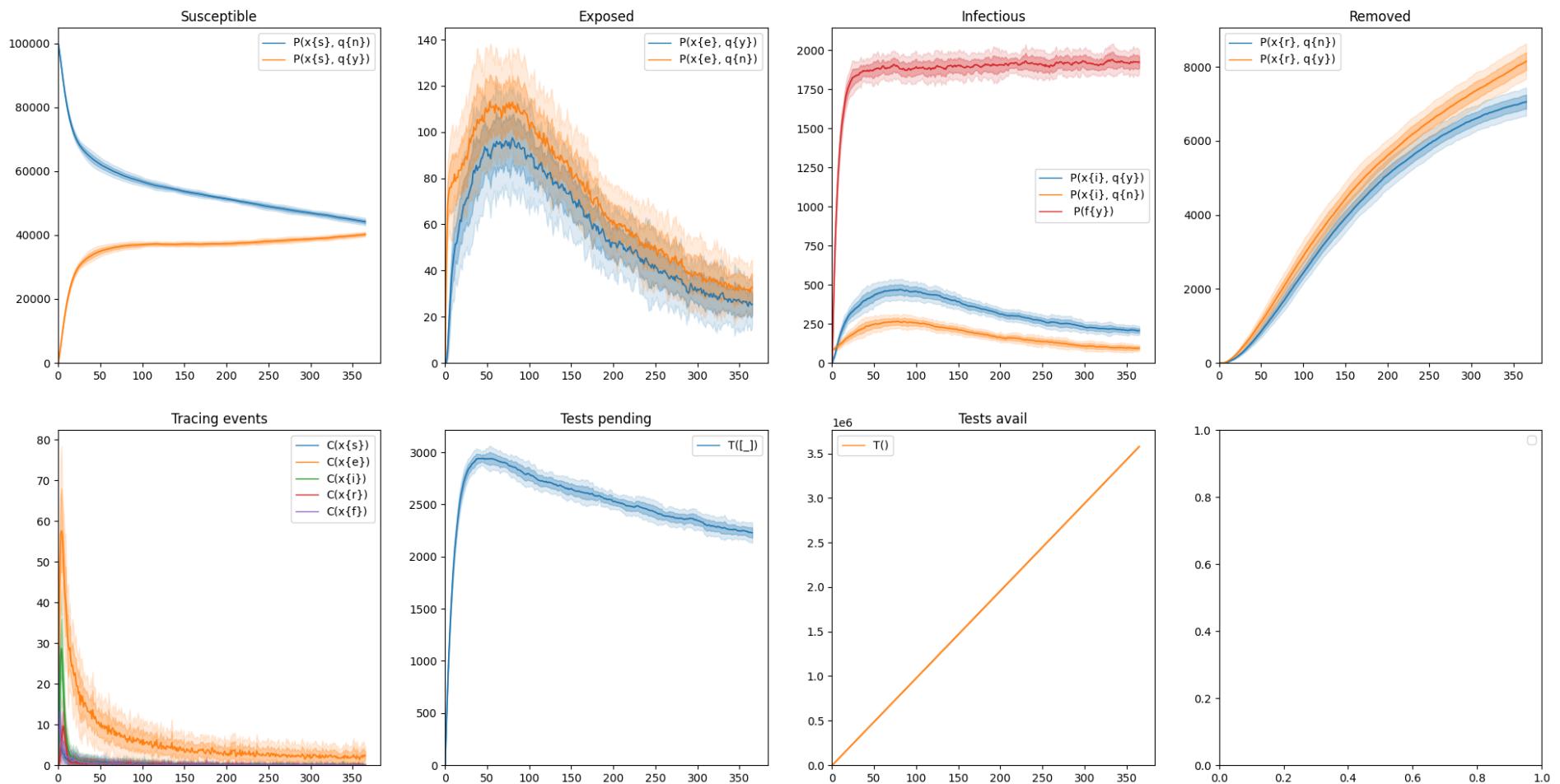
case: 35 INIT\_I: 100.0 k\_result: 0.5 m: 10000.0 thetaD: 0.0 thetal: 0.14285714285700002 thetaT: 1.0



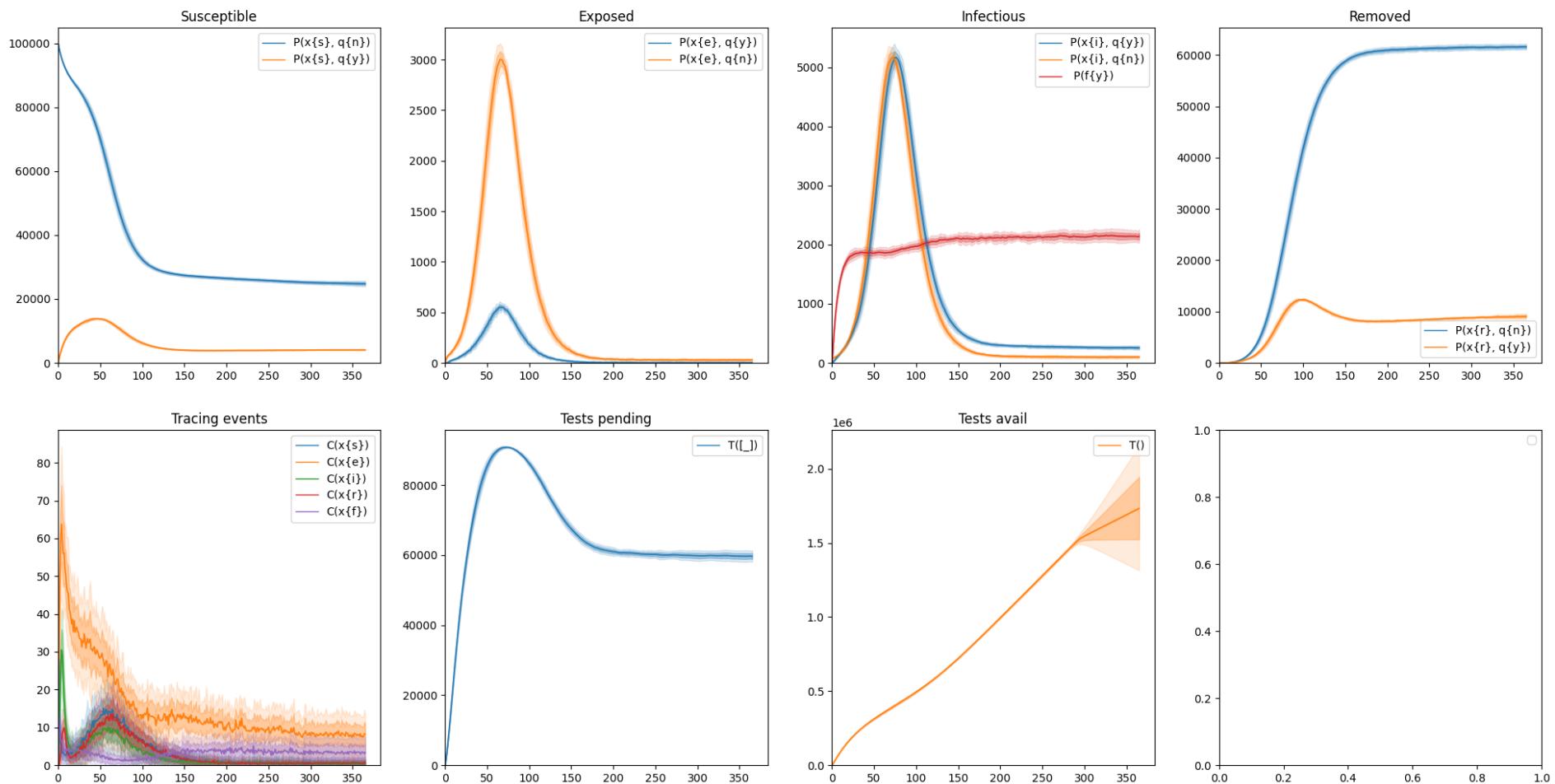
case: 36 INIT\_I: 100.0 k\_result: 0.5 m: 10000.0 thetaD: 1.0 thetal: 0.0 thetaT: 0.0



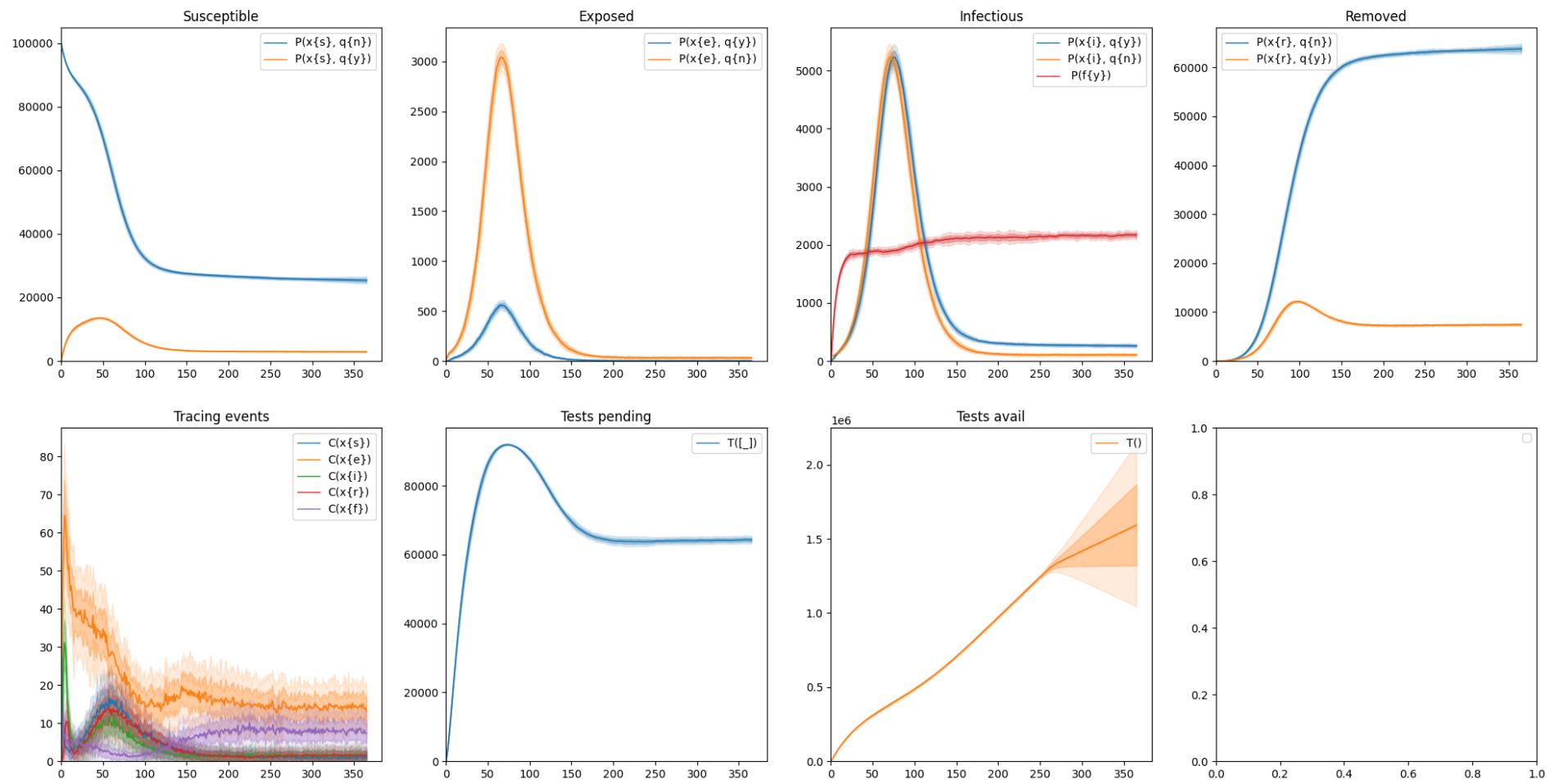
case: 37 INIT\_I: 100.0 k\_result: 0.5 m: 10000.0 thetaD: 1.0 thetal: 0.0 thetaT: 1.0



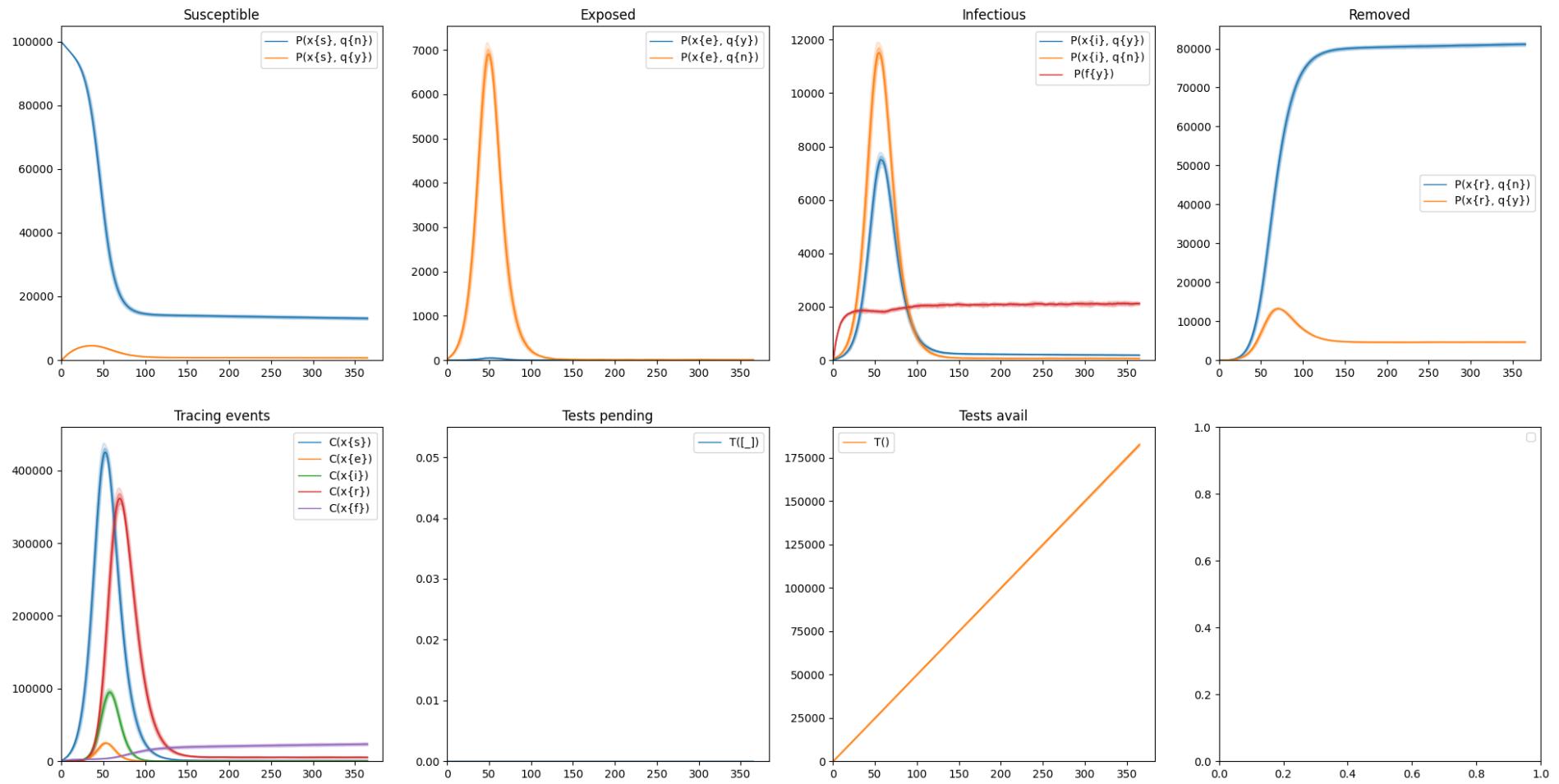
case: 38 INIT\_I: 100.0 k\_result: 0.5 m: 10000.0 thetaD: 1.0 thetal: 0.14285714285700002 thetaT: 0.0



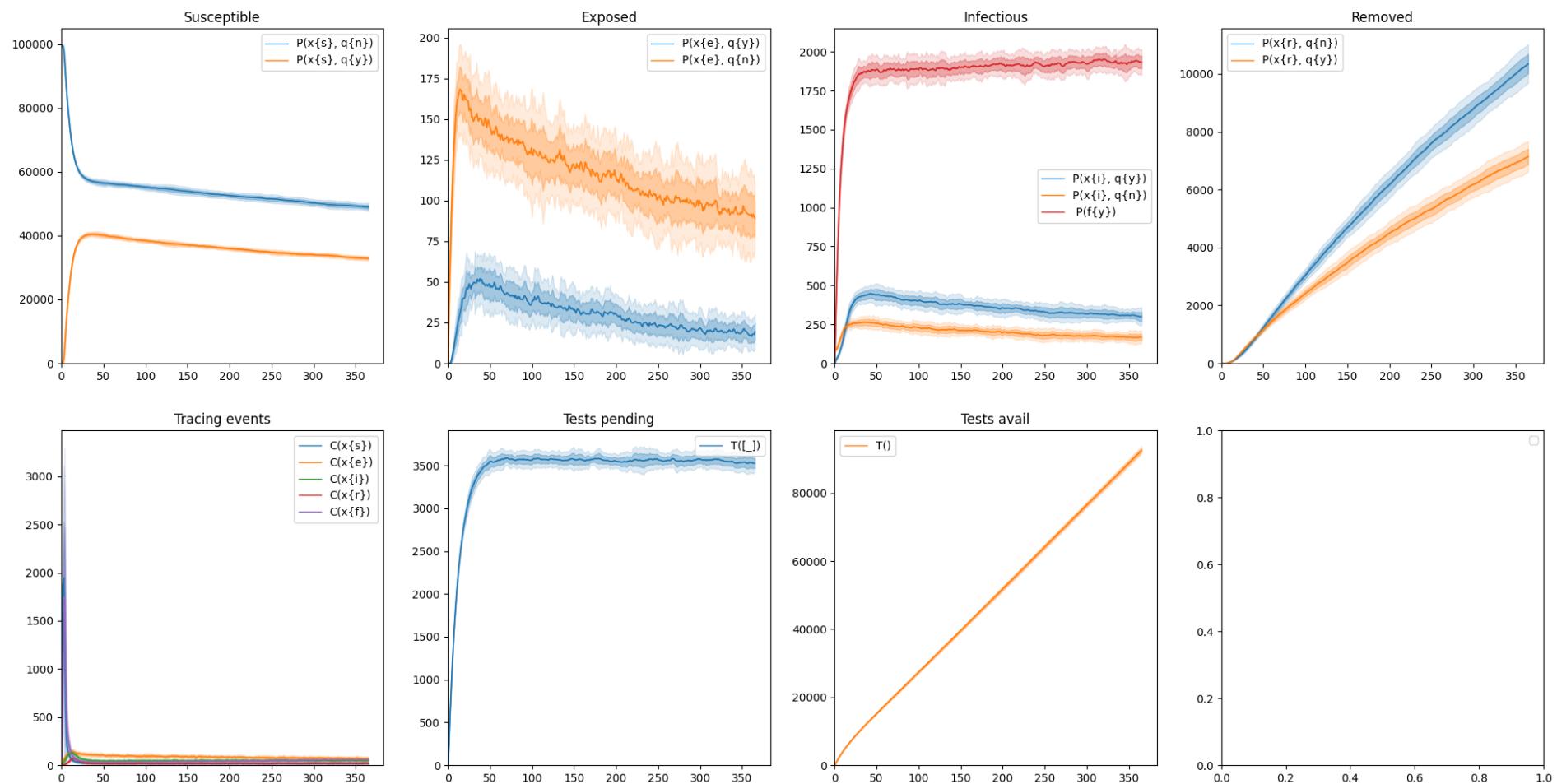
case: 39 INIT\_I: 100.0 k\_result: 0.5 m: 10000.0 thetaD: 1.0 thetal: 0.14285714285700002 thetaT: 1.0



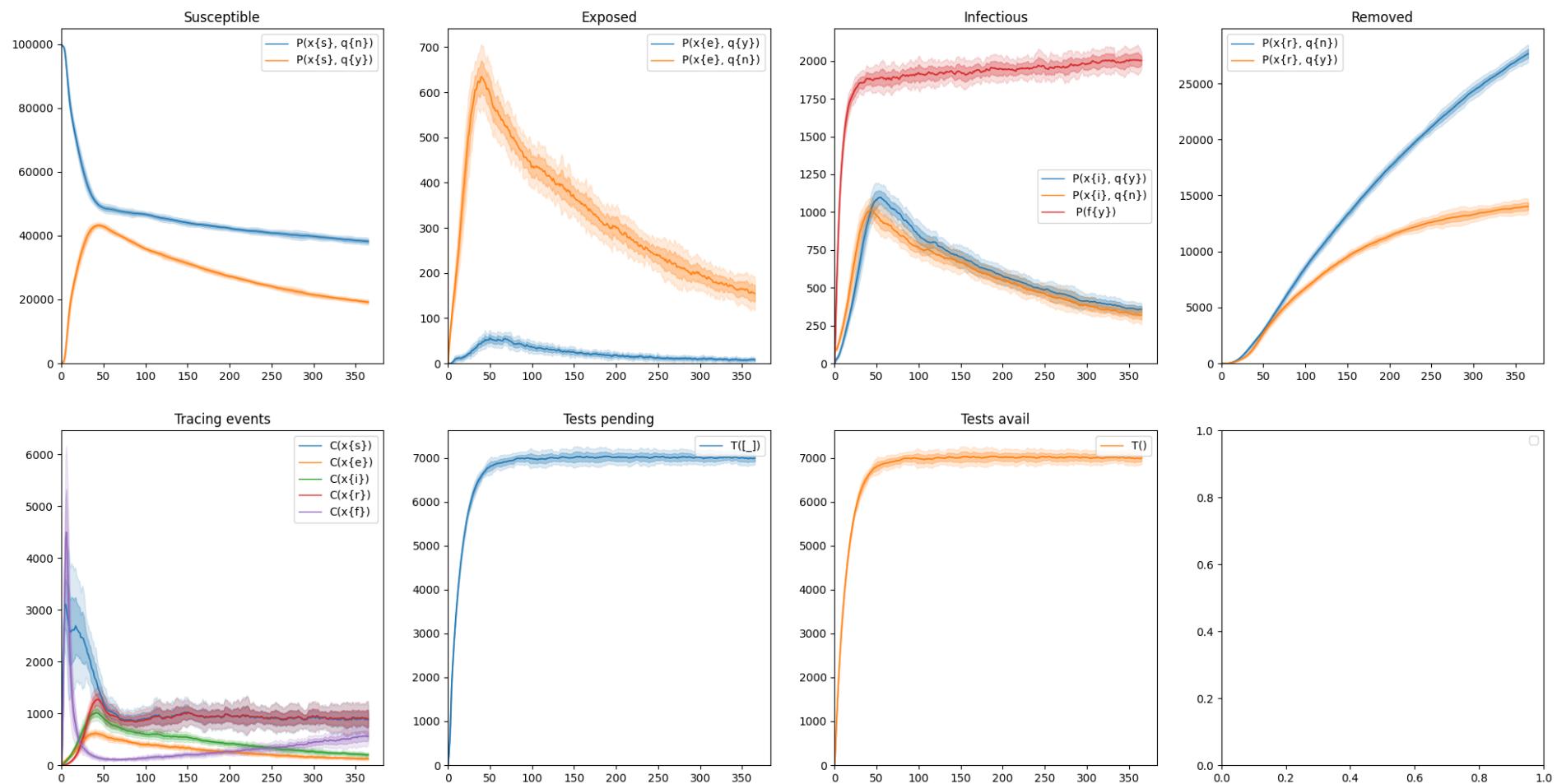
case: 40 INIT\_I: 100.0 k\_result: 0.5 m: 500.0 thetaD: 0.0 thetal: 0.0 thetaT: 0.0



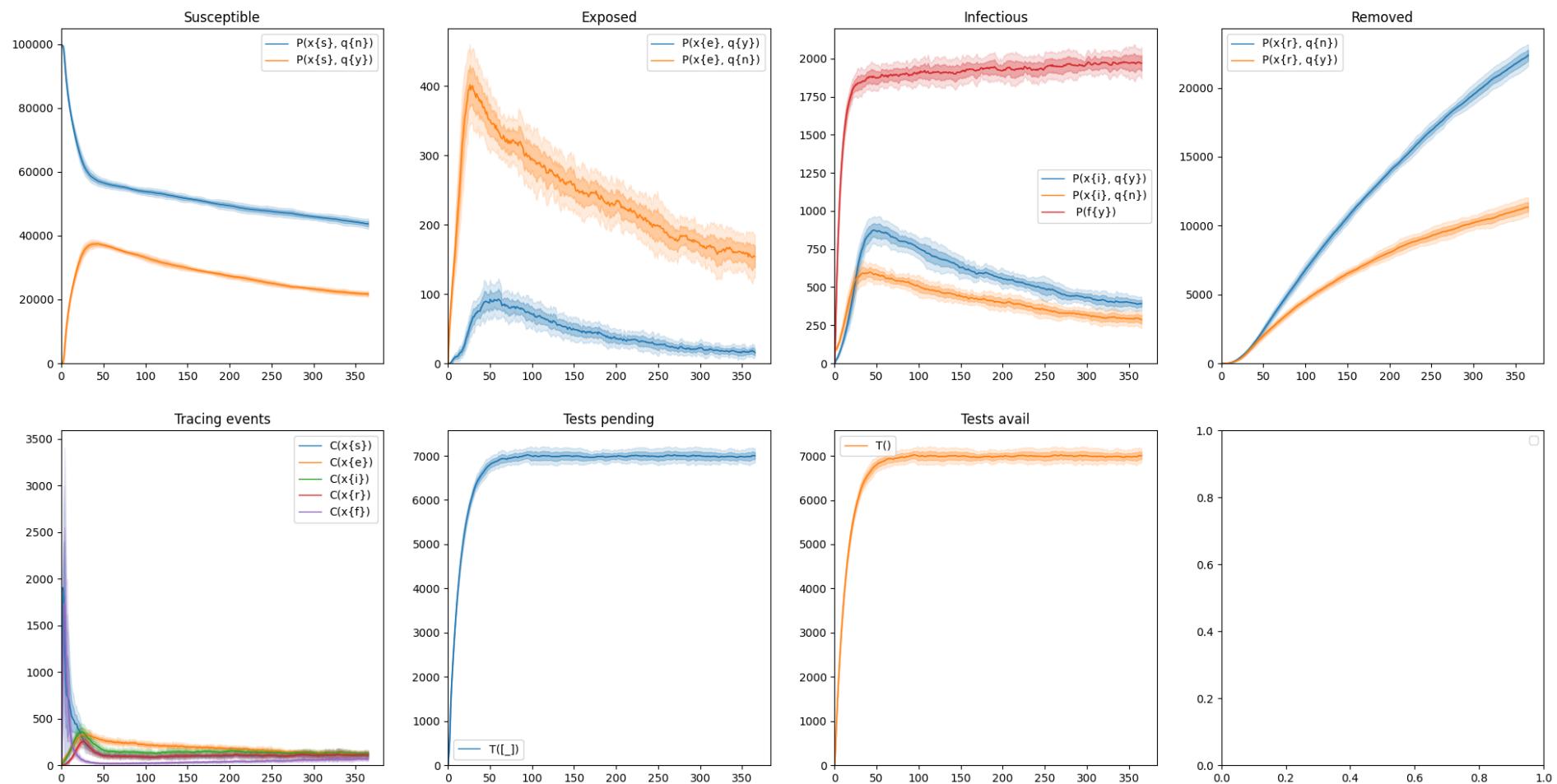
case: 41 INIT\_I: 100.0 k\_result: 0.5 m: 500.0 thetaD: 0.0 thetal: 0.0 thetaT: 1.0



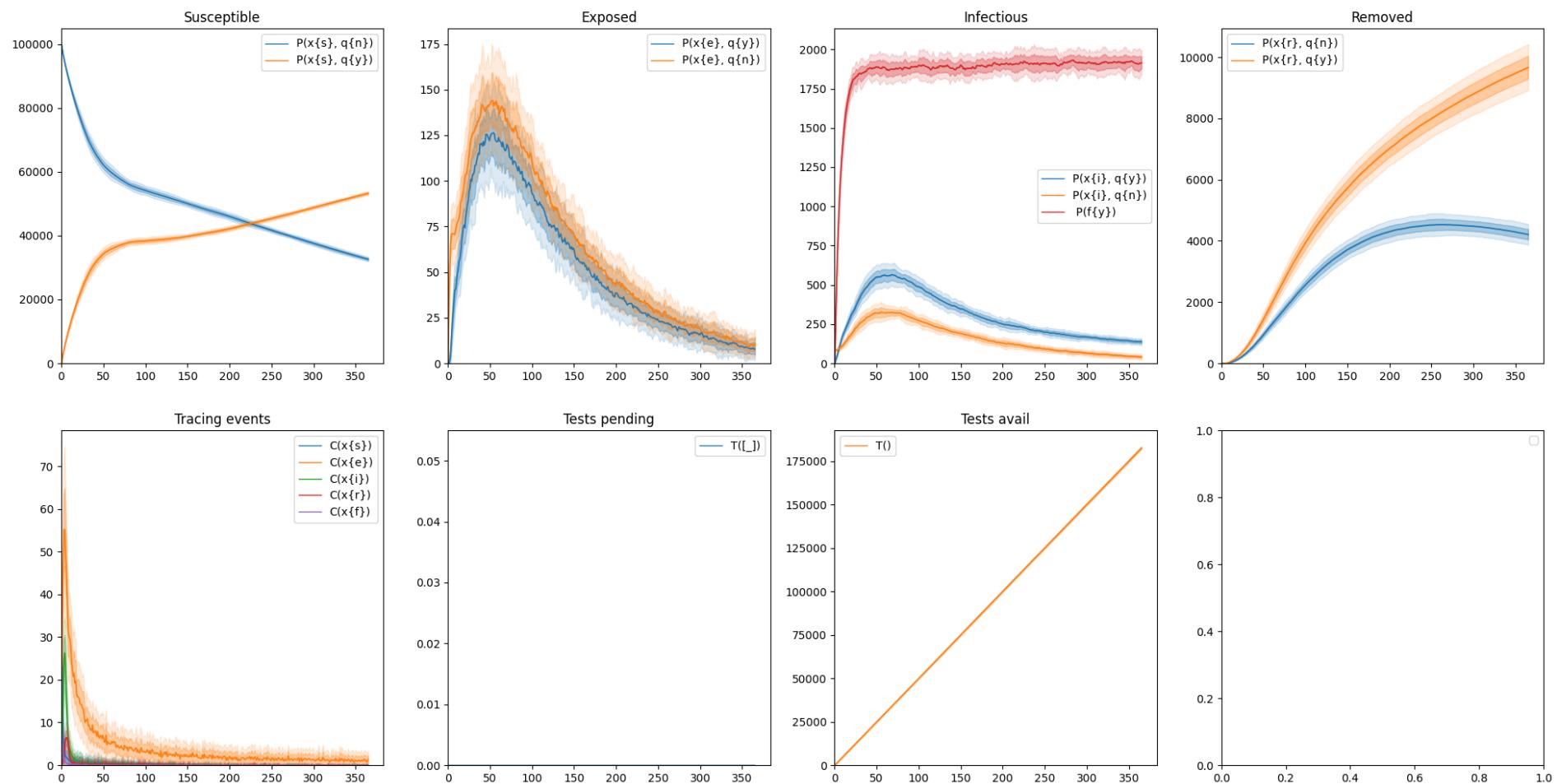
case: 42 INIT\_I: 100.0 k\_result: 0.5 m: 500.0 thetaD: 0.0 thetal: 0.1428571428570002 thetaT: 0.0



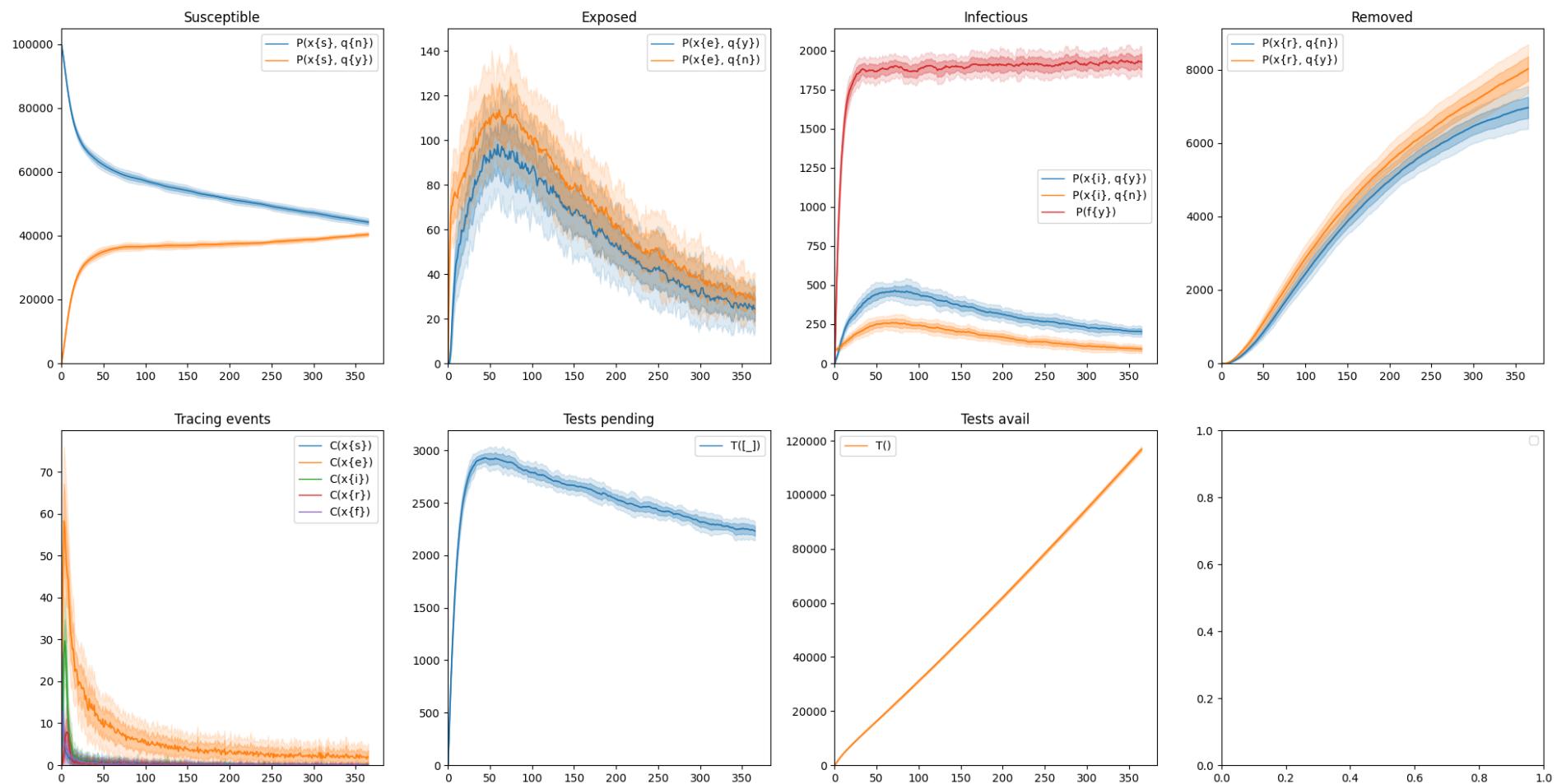
case: 43 INIT\_I: 100.0 k\_result: 0.5 m: 500.0 thetaD: 0.0 thetal: 0.1428571428570002 thetaT: 1.0



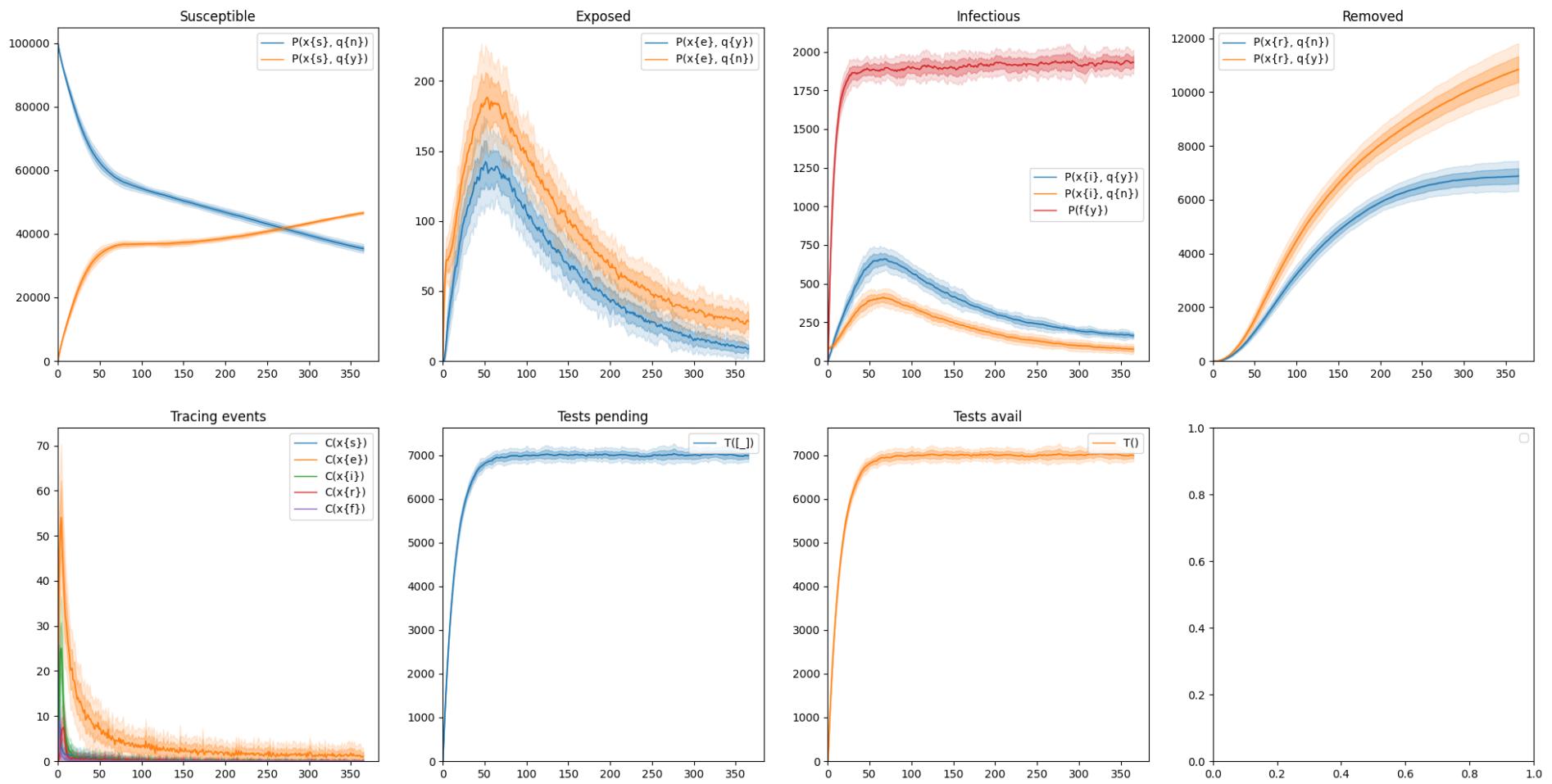
case: 44 INIT\_I: 100.0 k\_result: 0.5 m: 500.0 thetaD: 1.0 thetal: 0.0 thetaT: 0.0



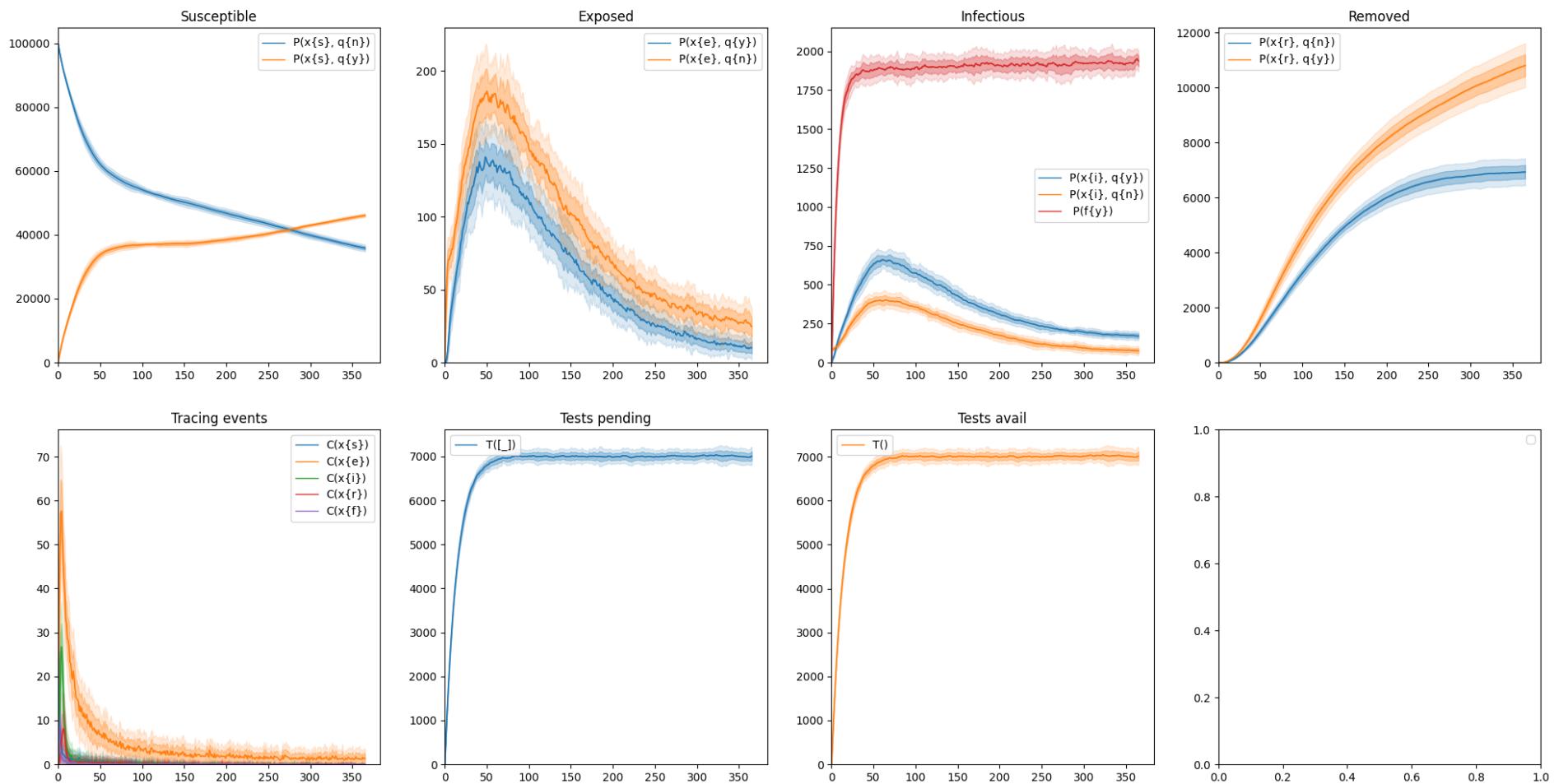
case: 45 INIT\_I: 100.0 k\_result: 0.5 m: 500.0 thetaD: 1.0 thetal: 0.0 thetaT: 1.0



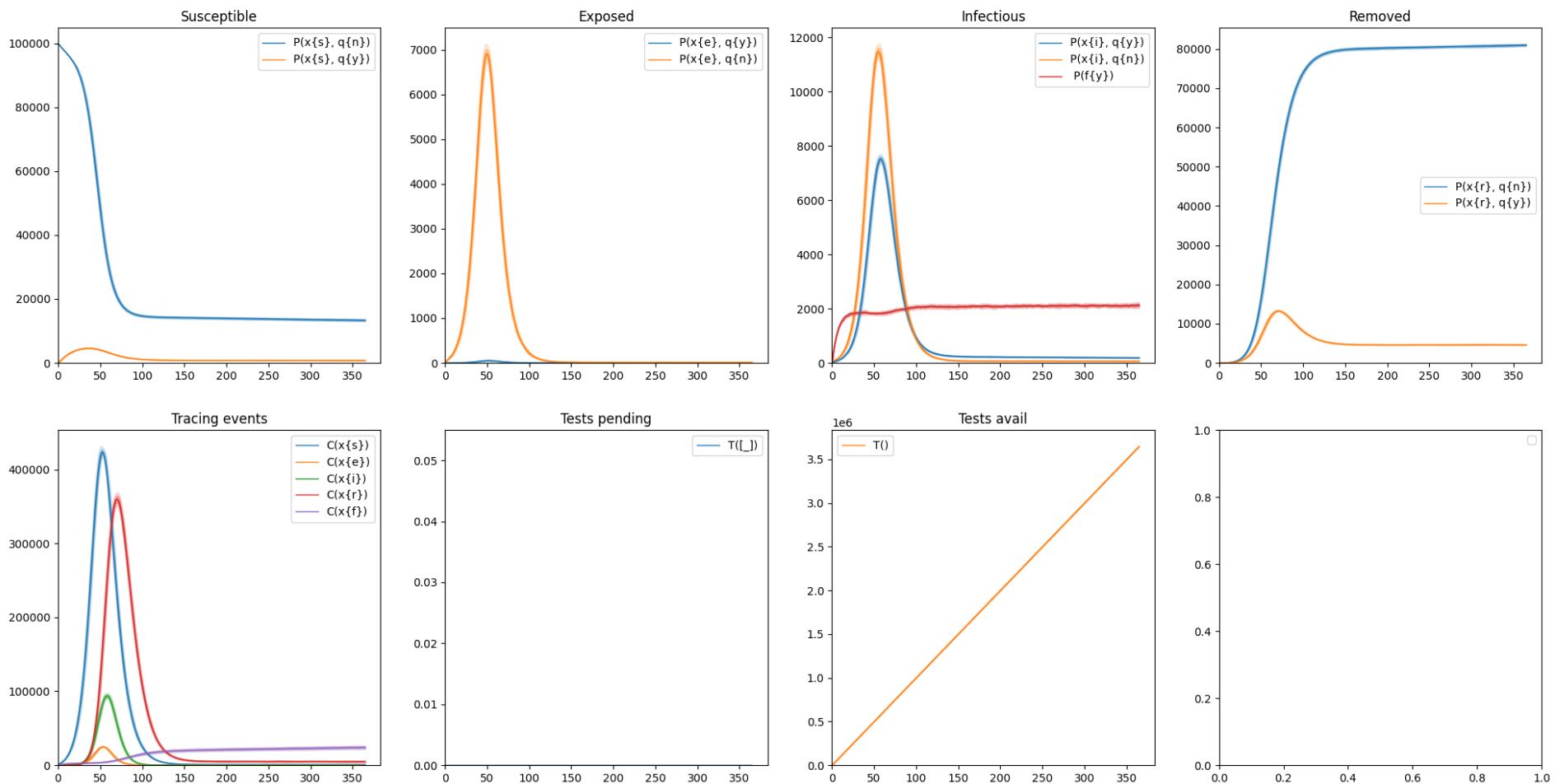
case: 46 INIT\_I: 100.0 k\_result: 0.5 m: 500.0 thetaD: 1.0 thetal: 0.1428571428570002 thetaT: 0.0



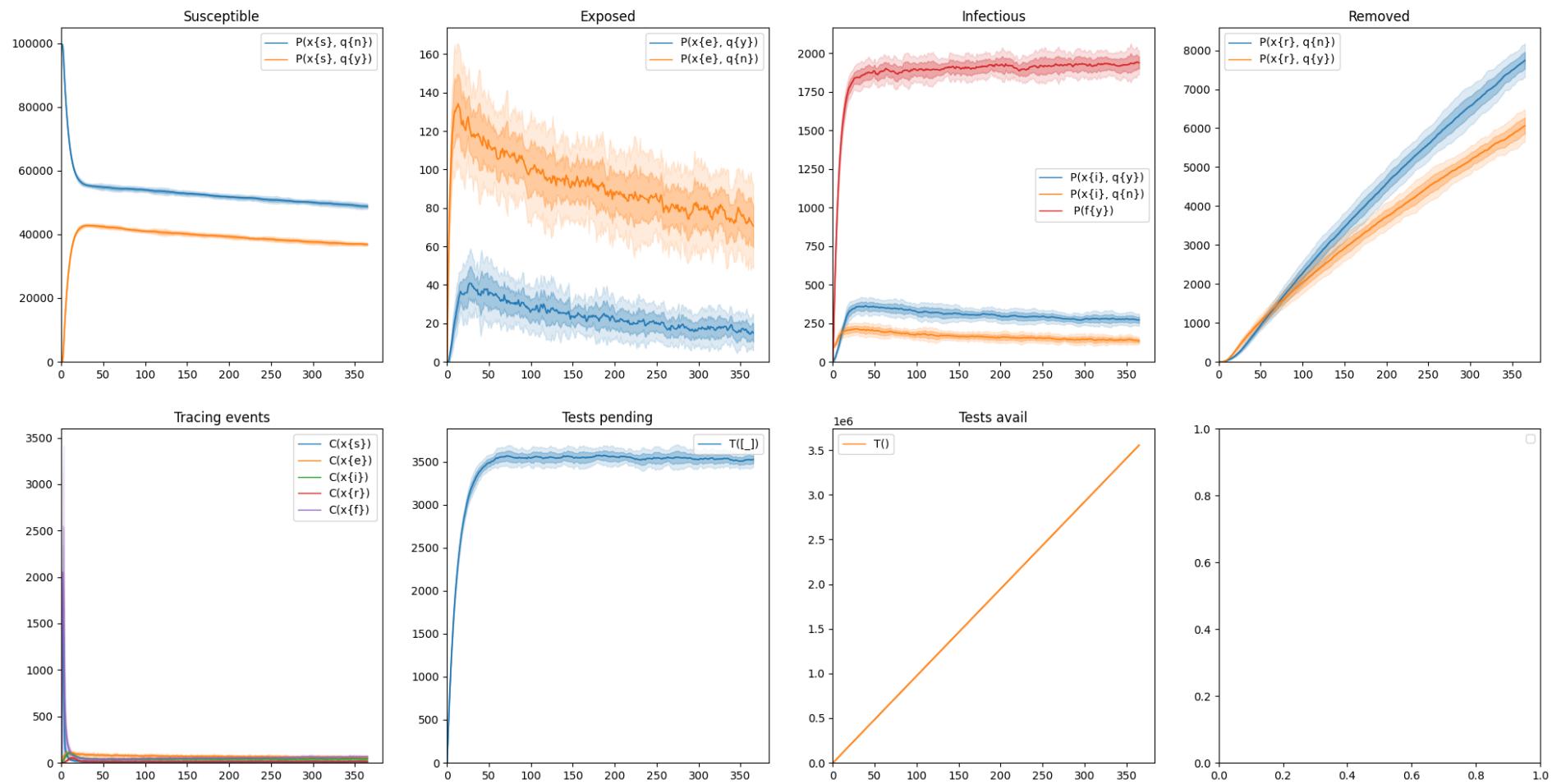
case: 47 INIT\_I: 100.0 k\_result: 0.5 m: 500.0 thetaD: 1.0 thetal: 0.1428571428570002 thetaT: 1.0



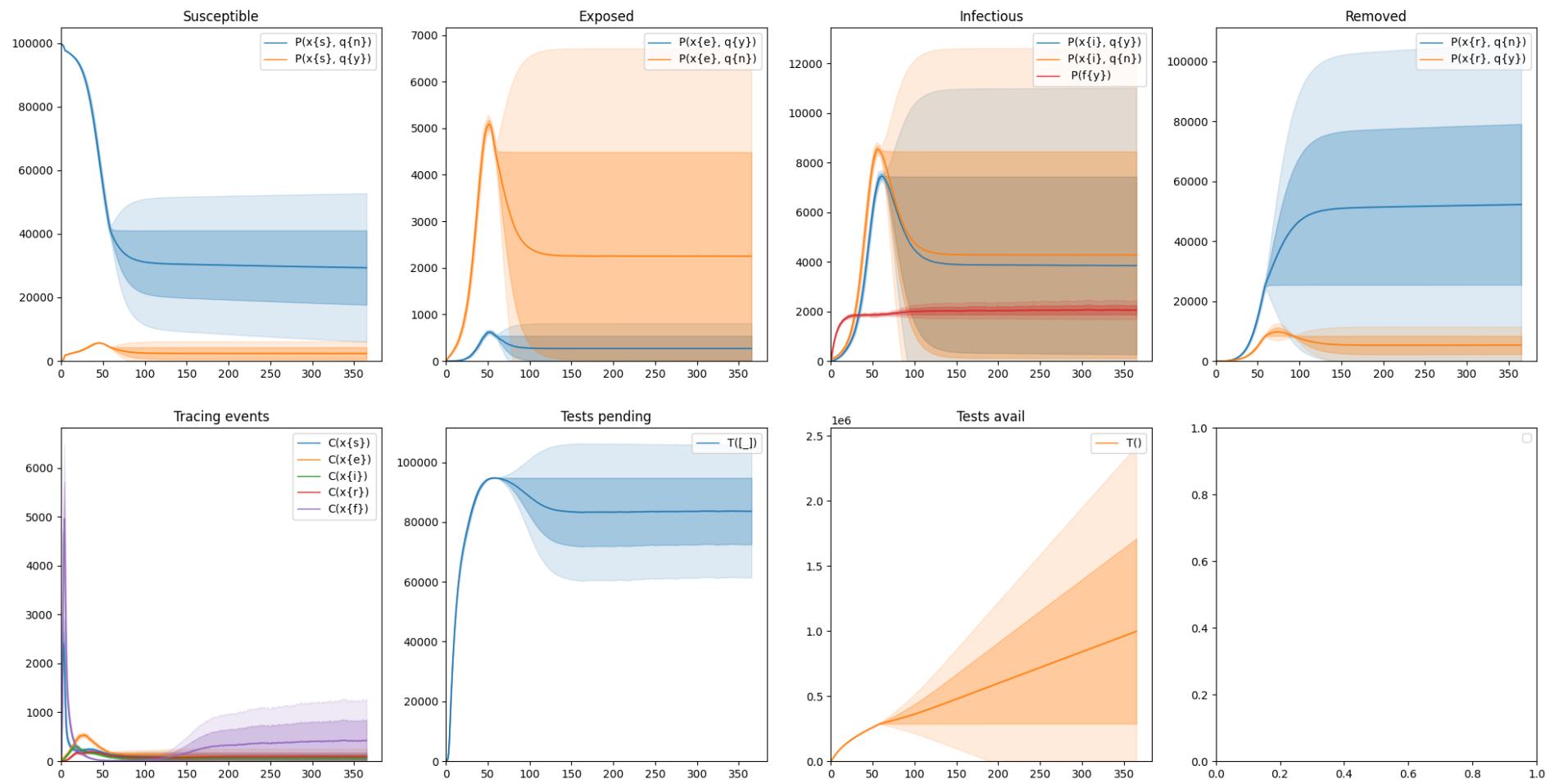
case: 48 INIT\_I: 100.0 k\_result: 12.0 m: 10000.0 thetaD: 0.0 thetal: 0.0 thetaT: 0.0



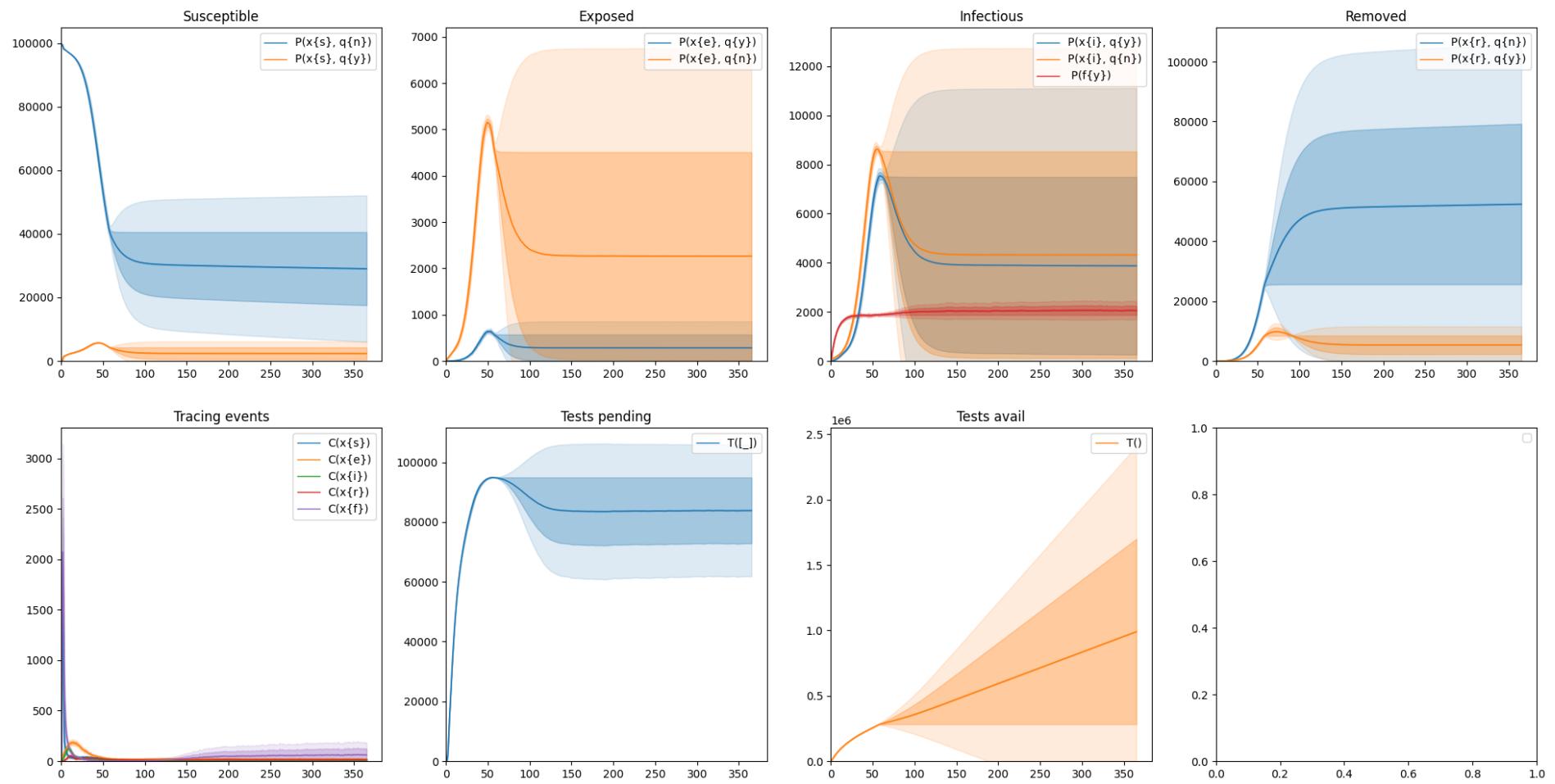
case: 49 INIT\_I: 100.0 k\_result: 12.0 m: 10000.0 thetaD: 0.0 thetal: 0.0 thetaT: 1.0



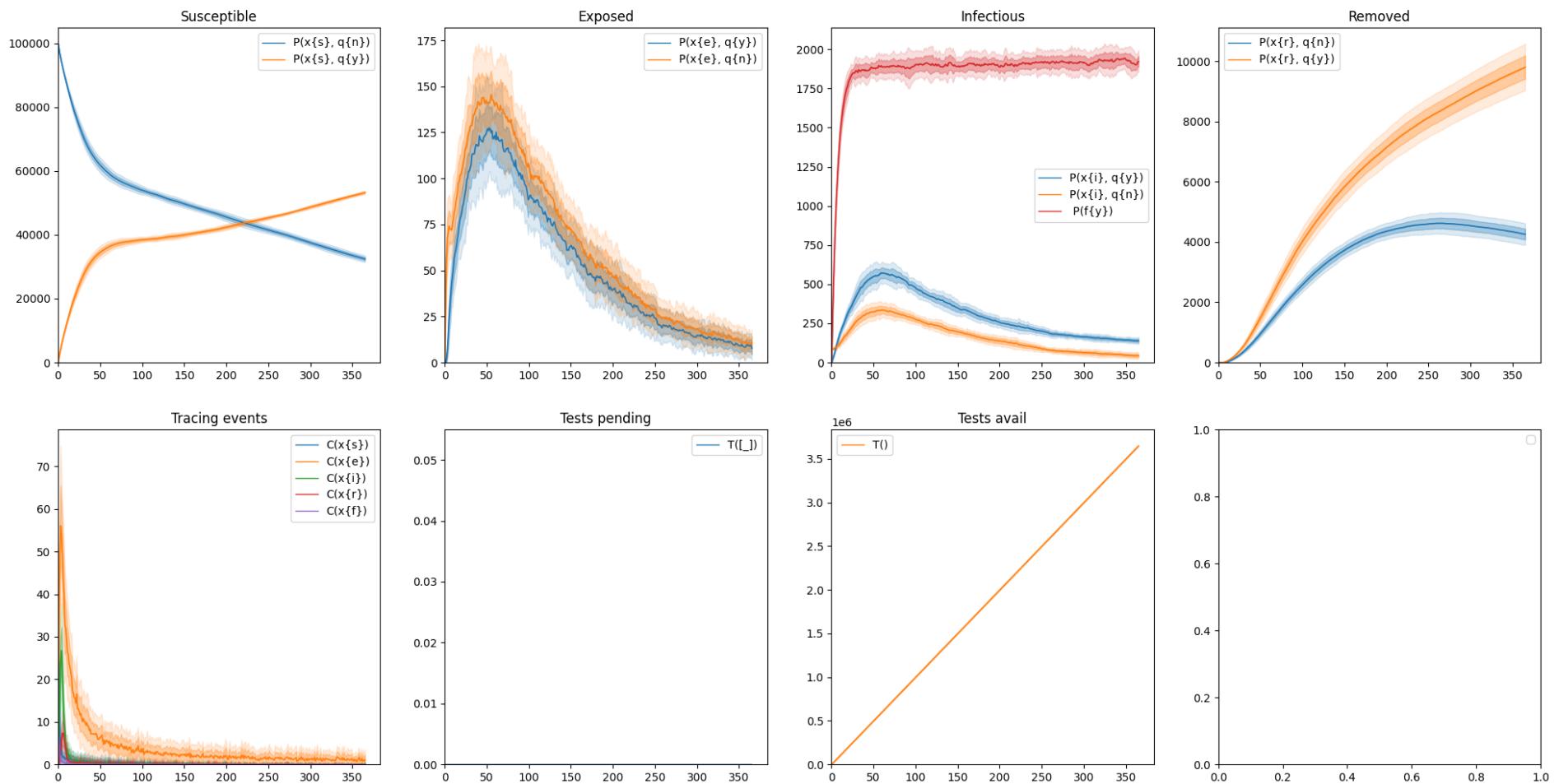
case: 50 INIT\_I: 100.0 k\_result: 12.0 m: 10000.0 thetaD: 0.0 thetal: 0.14285714285700002 thetaT: 0.0



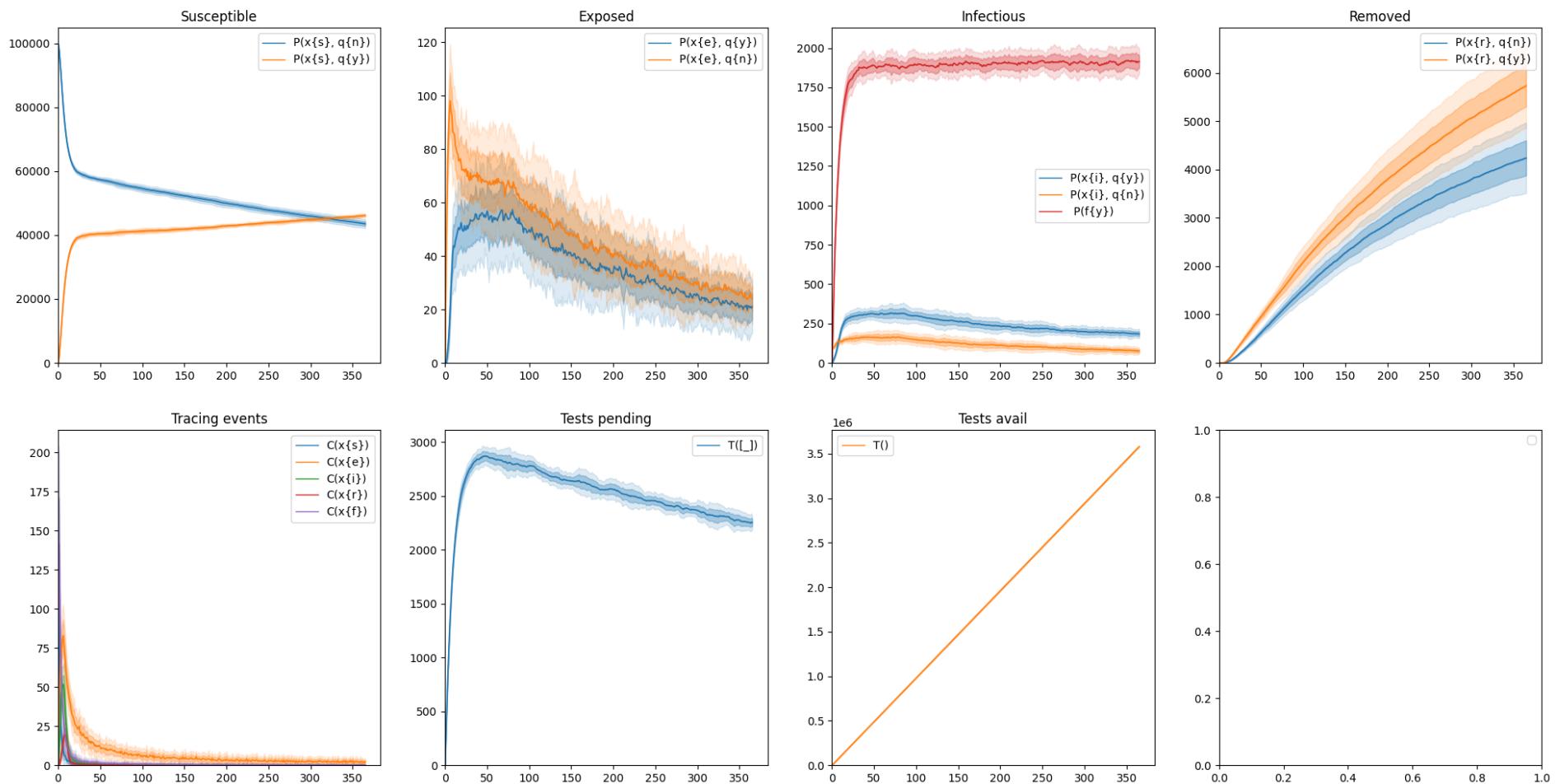
case: 51 INIT\_I: 100.0 k\_result: 12.0 m: 10000.0 thetaD: 0.0 thetal: 0.14285714285700002 thetaT: 1.0



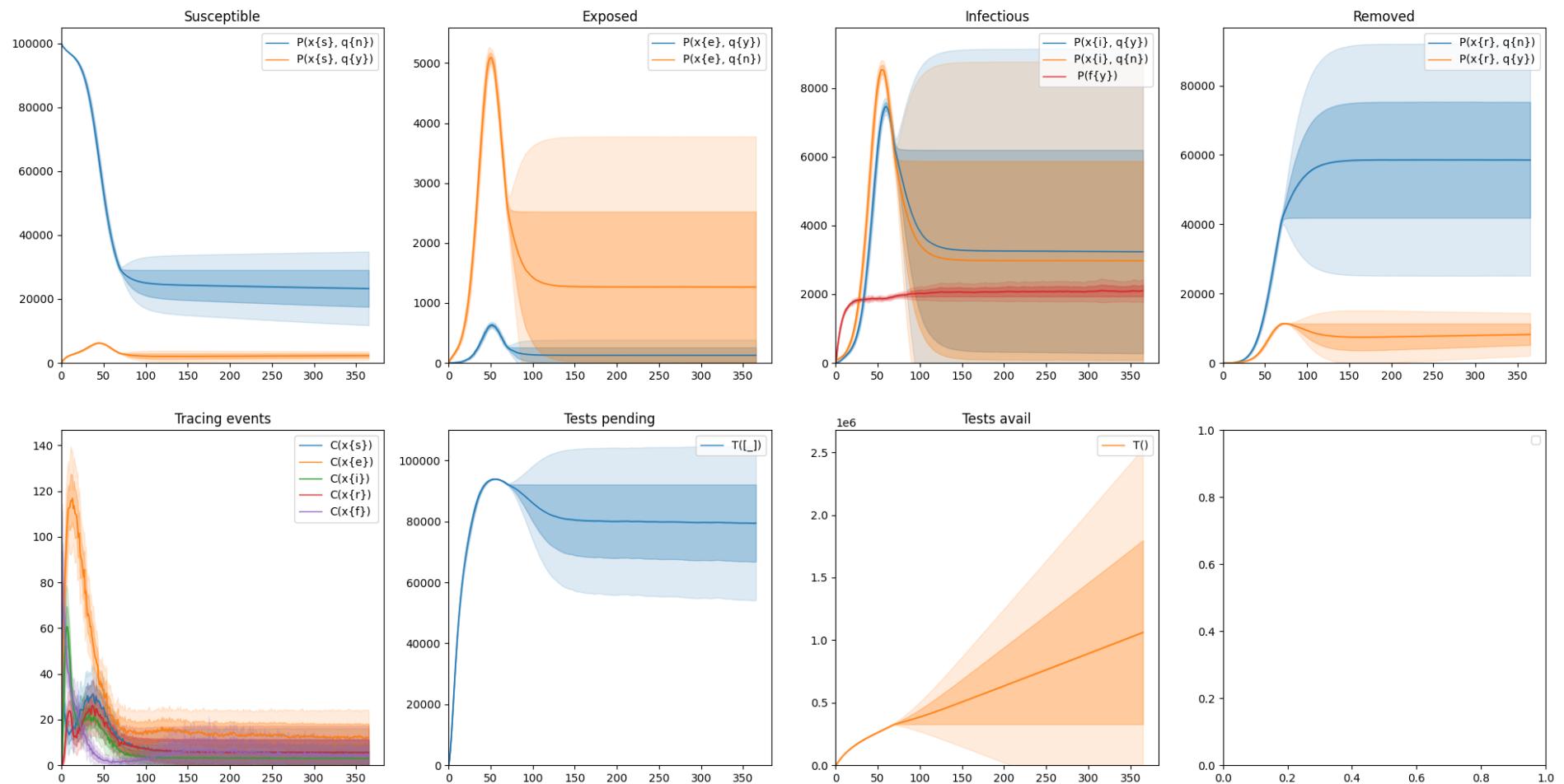
case: 52 INIT\_I: 100.0 k\_result: 12.0 m: 10000.0 thetaD: 1.0 thetal: 0.0 thetaT: 0.0



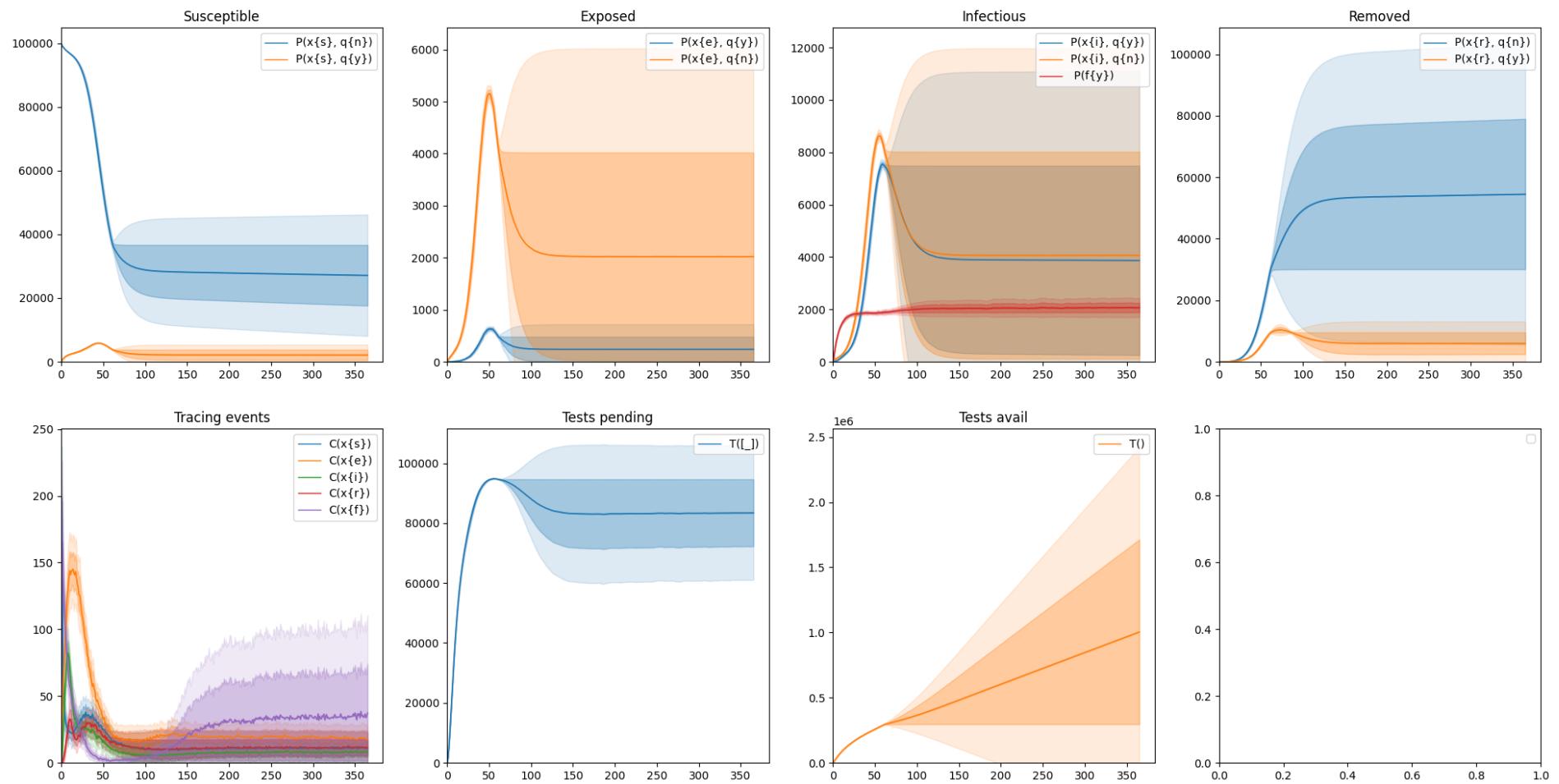
case: 53 INIT\_I: 100.0 k\_result: 12.0 m: 10000.0 thetaD: 1.0 thetal: 0.0 thetaT: 1.0



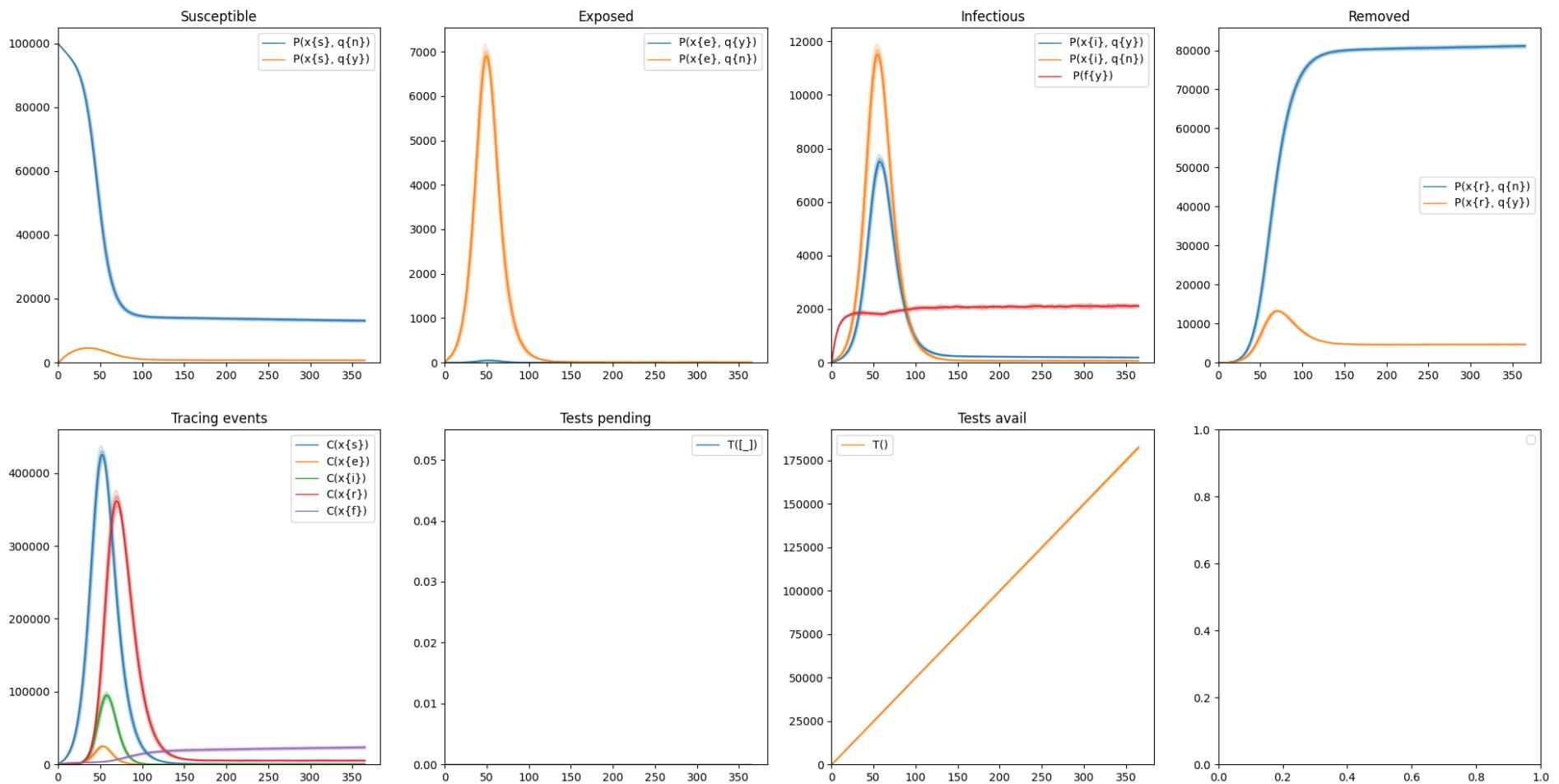
case: 54 INIT\_I: 100.0 k\_result: 12.0 m: 10000.0 thetaD: 1.0 thetal: 0.14285714285700002 thetaT: 0.0



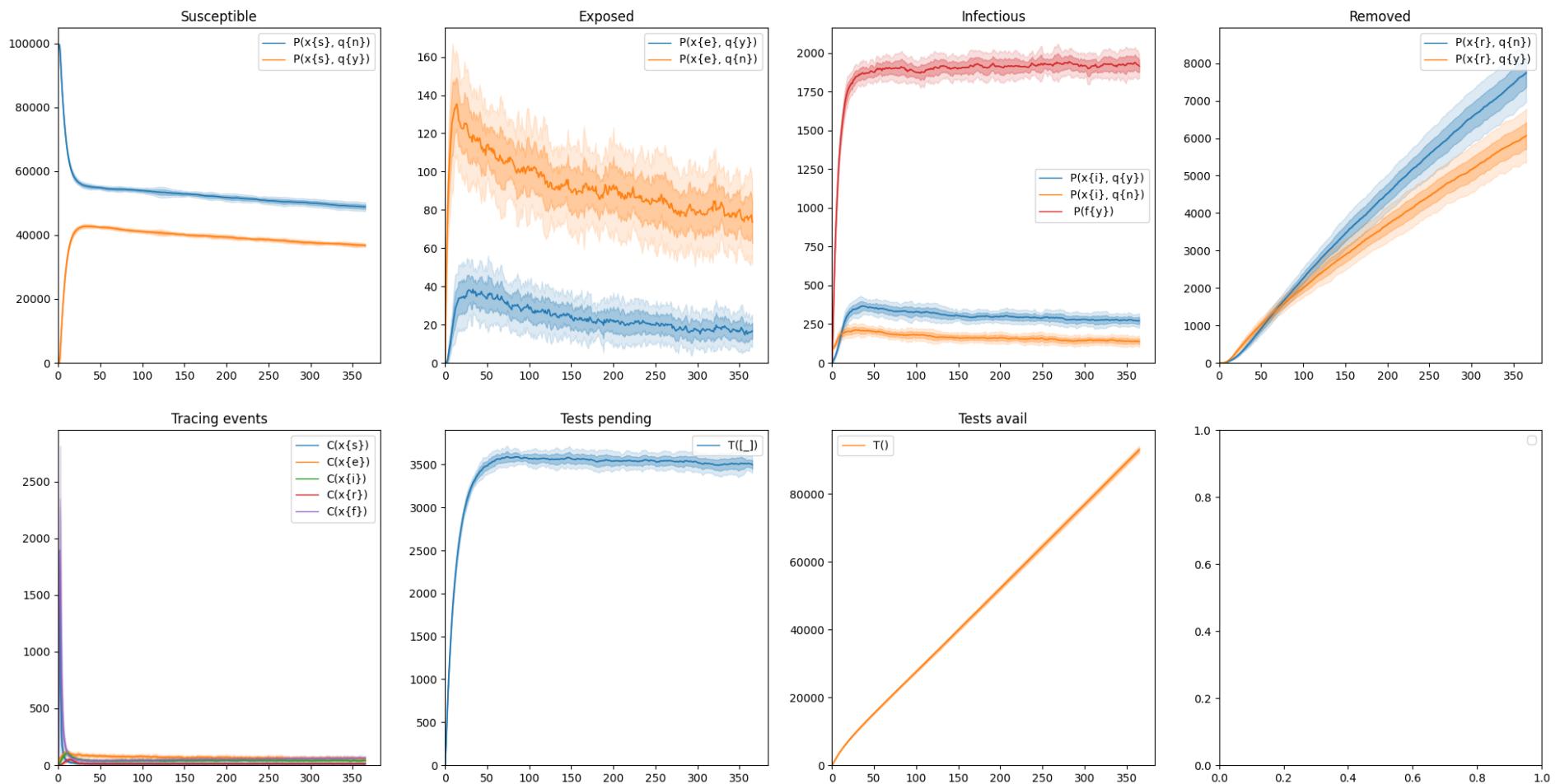
case: 55 INIT\_I: 100.0 k\_result: 12.0 m: 10000.0 thetaD: 1.0 thetal: 0.14285714285700002 thetaT: 1.0



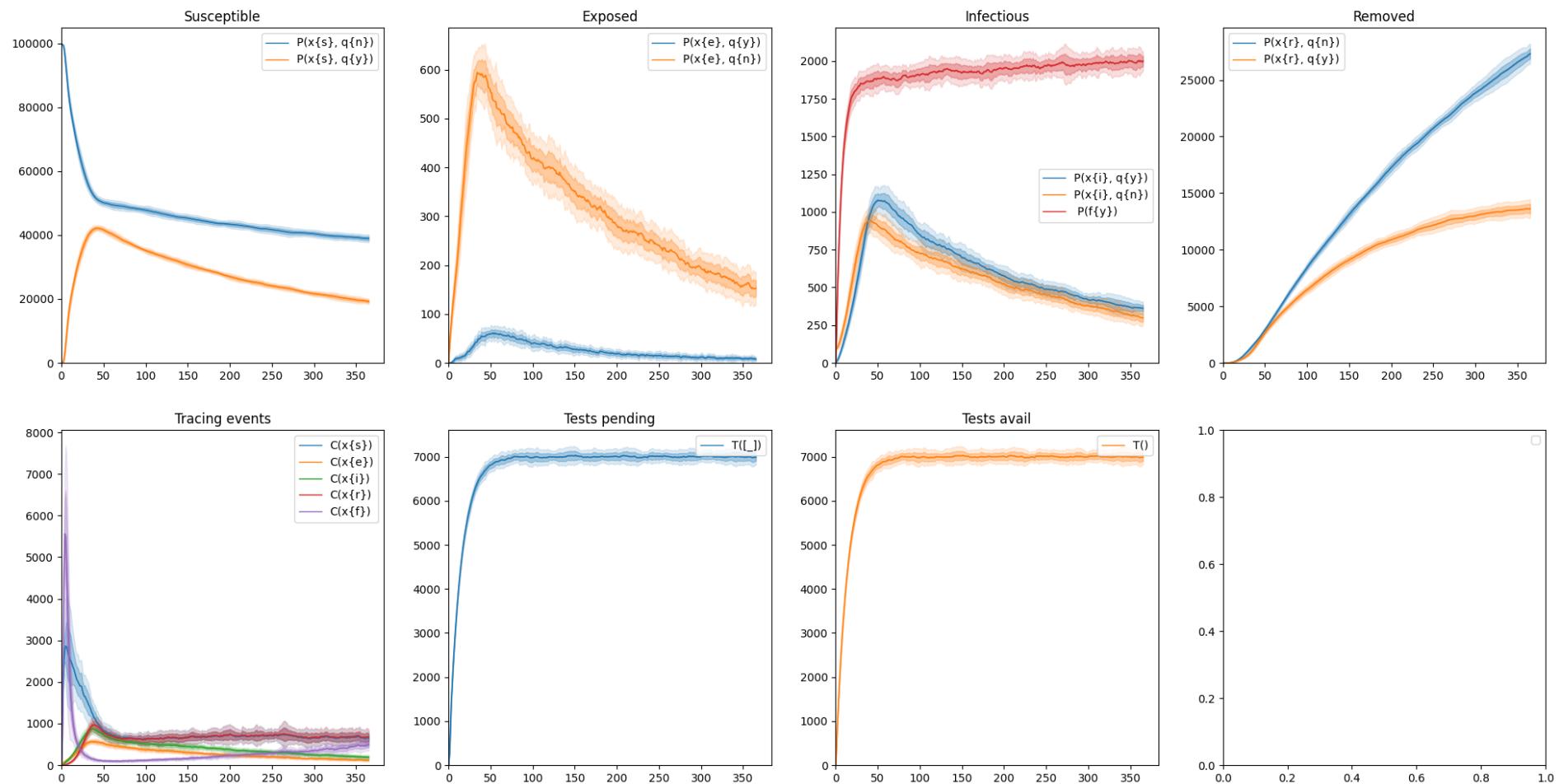
case: 56 INIT\_I: 100.0 k\_result: 12.0 m: 500.0 thetaD: 0.0 thetaI: 0.0 thetaT: 0.0



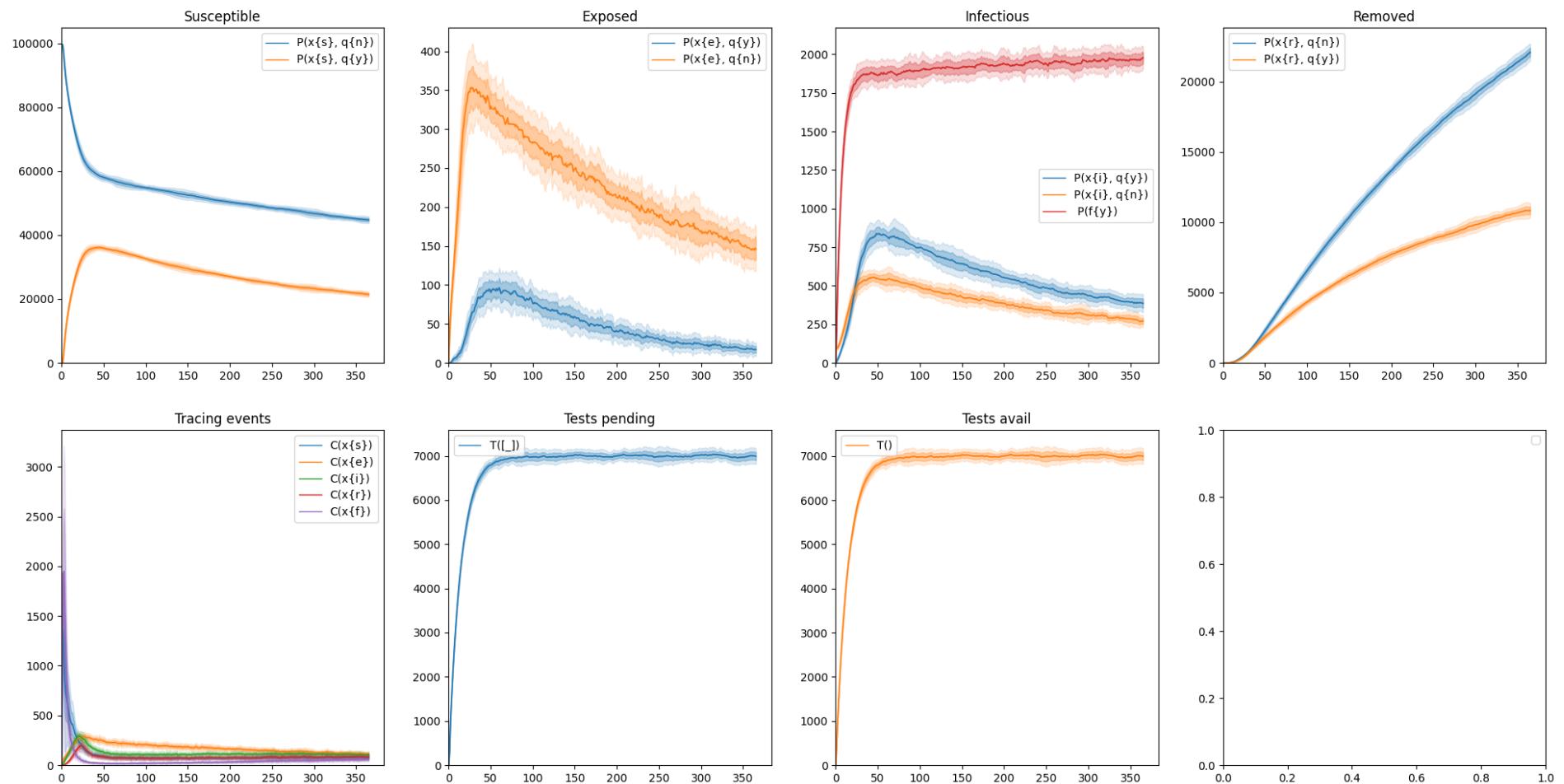
case: 57 INIT\_I: 100.0 k\_result: 12.0 m: 500.0 thetaD: 0.0 thetaI: 0.0 thetaT: 1.0



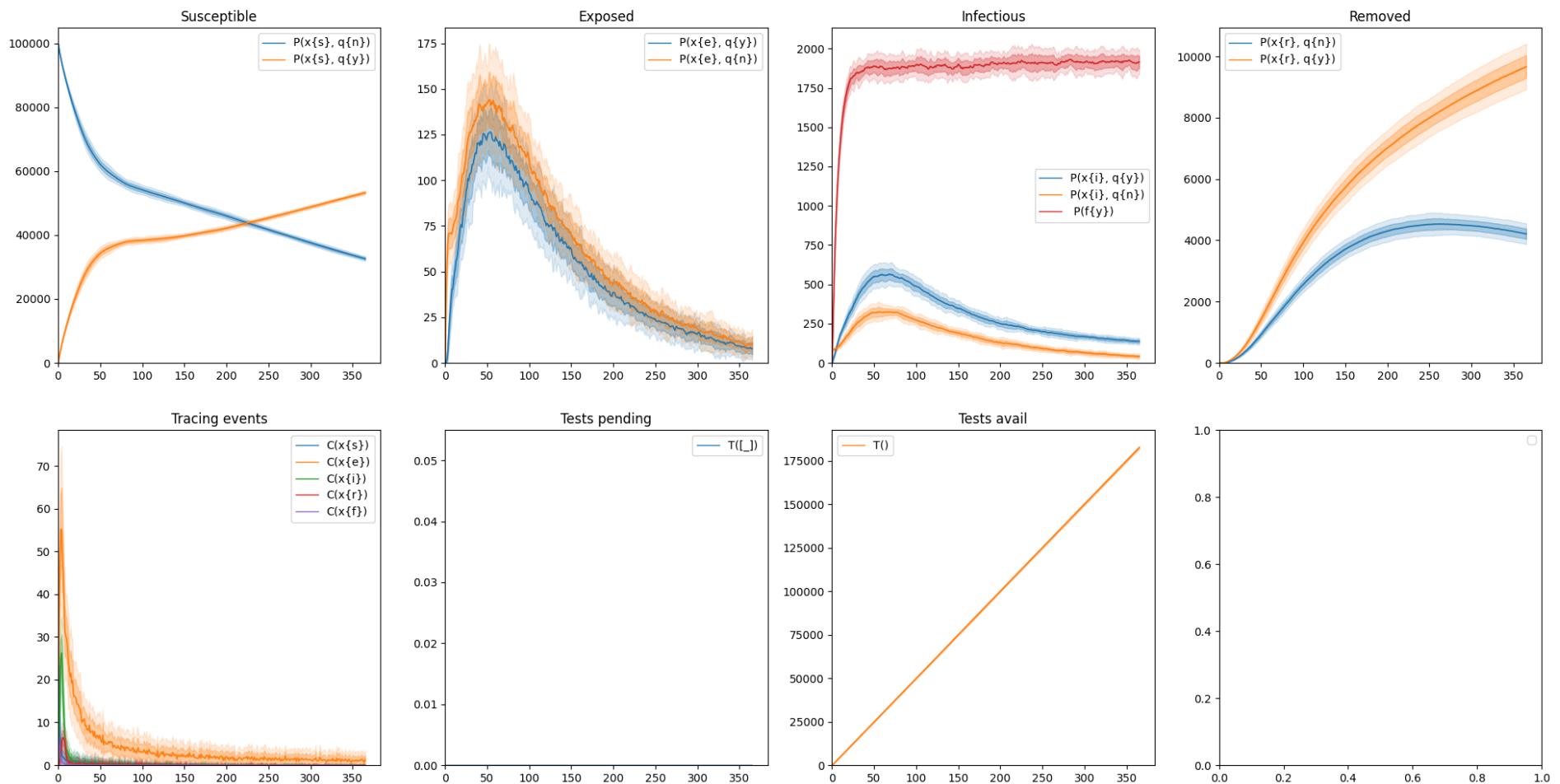
case: 58 INIT\_I: 100.0 k\_result: 12.0 m: 500.0 thetaD: 0.0 thetal: 0.14285714285700002 thetaT: 0.0



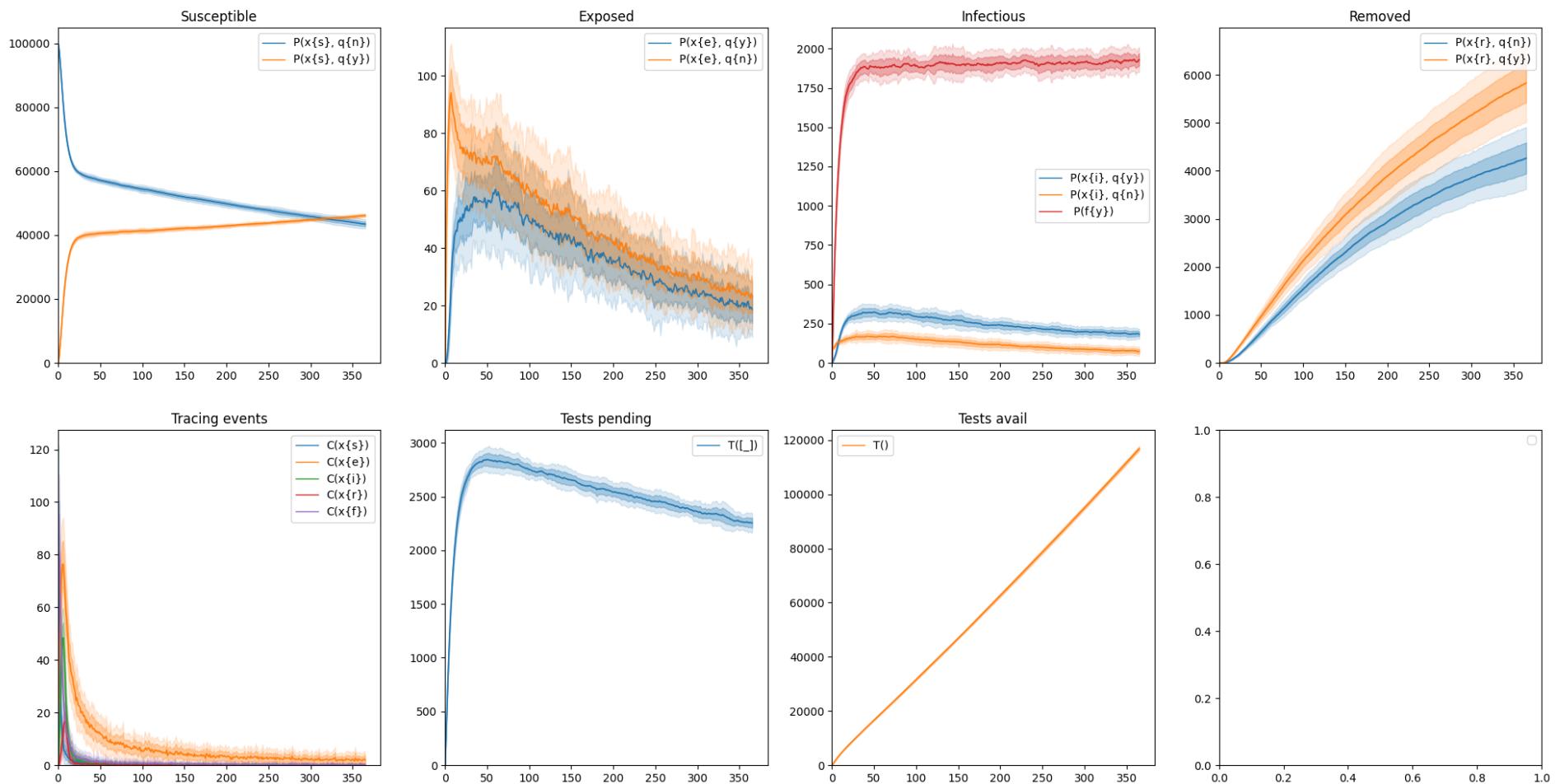
case: 59 INIT\_I: 100.0 k\_result: 12.0 m: 500.0 thetaD: 0.0 thetal: 0.14285714285700002 thetaT: 1.0



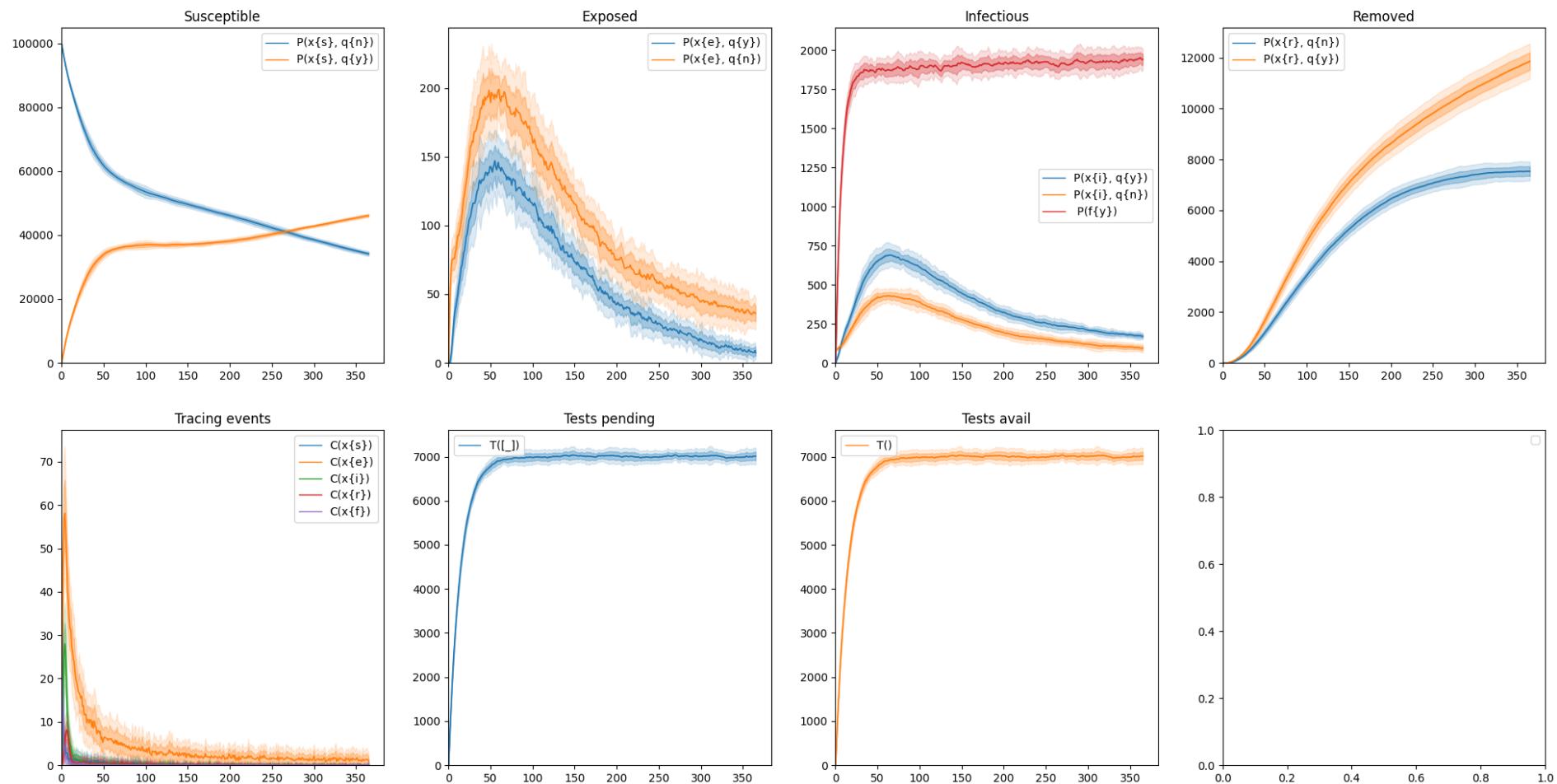
case: 60 INIT\_I: 100.0 k\_result: 12.0 m: 500.0 thetaD: 1.0 thetaI: 0.0 thetaT: 0.0



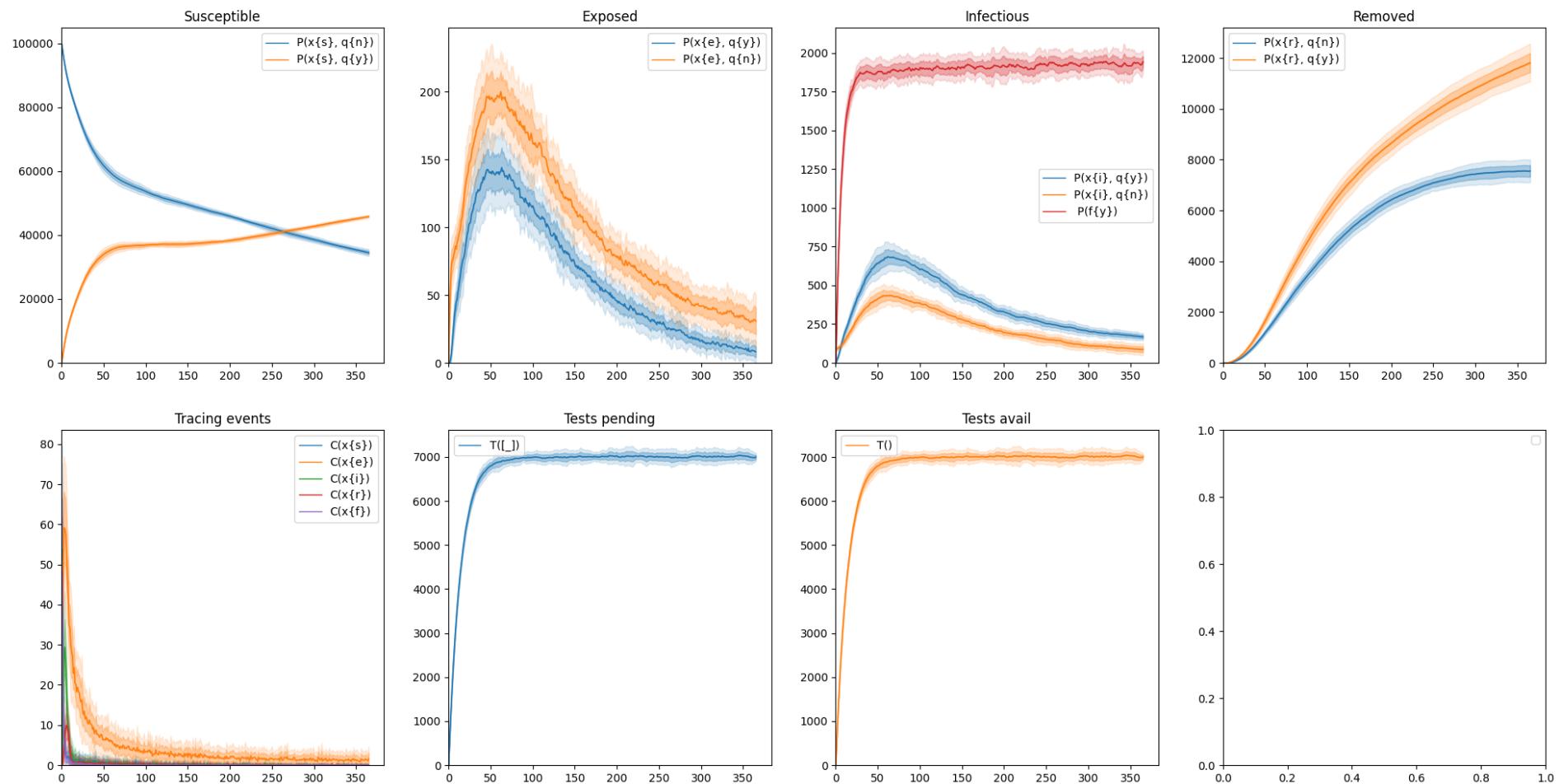
case: 61 INIT\_I: 100.0 k\_result: 12.0 m: 500.0 thetaD: 1.0 thetaI: 0.0 thetaT: 1.0



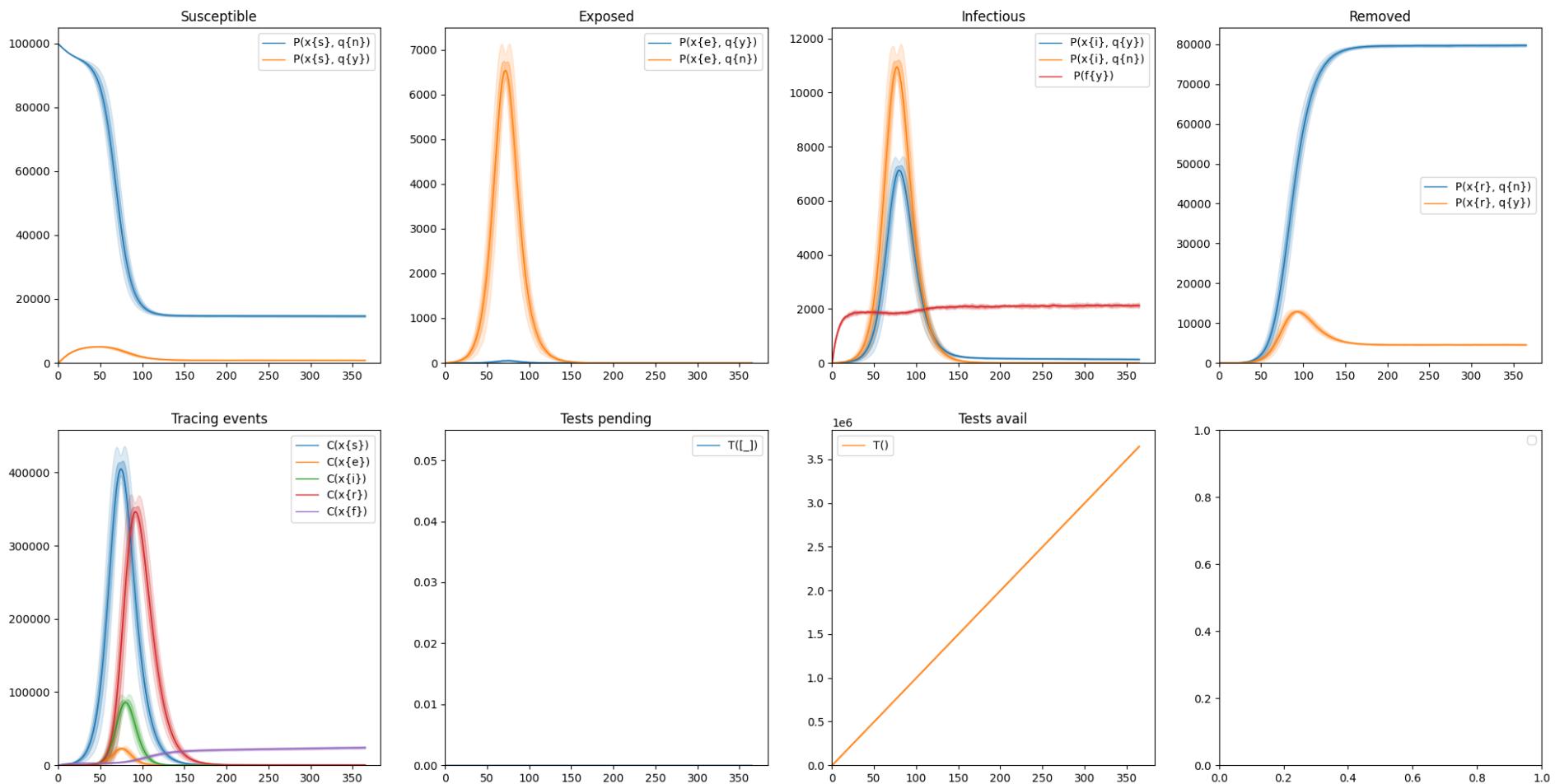
case: 62 INIT\_I: 100.0 k\_result: 12.0 m: 500.0 thetaD: 1.0 thetal: 0.14285714285700002 thetaT: 0.0



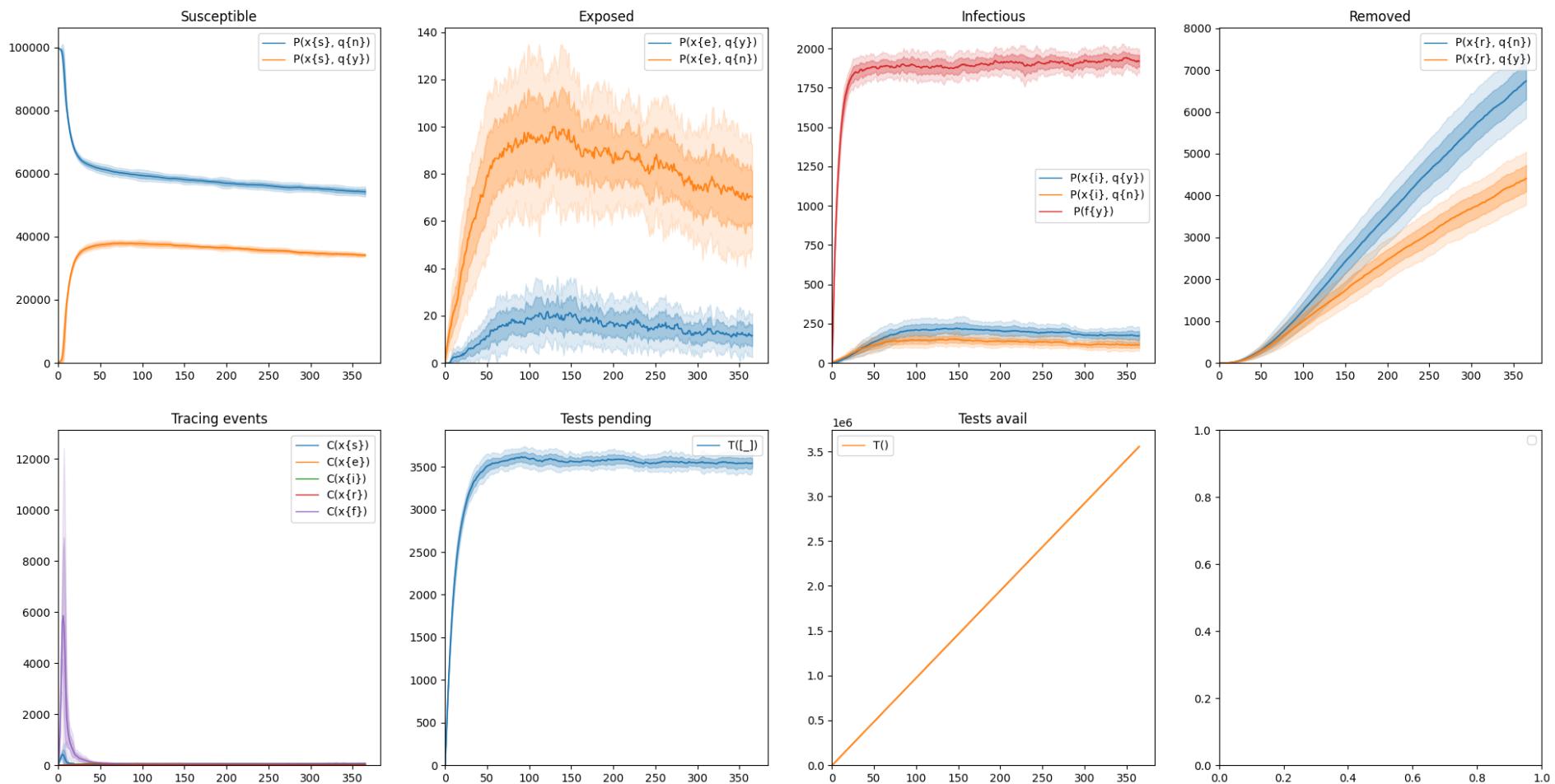
case: 63 INIT\_I: 100.0 k\_result: 12.0 m: 500.0 thetaD: 1.0 thetal: 0.14285714285700002 thetaT: 1.0



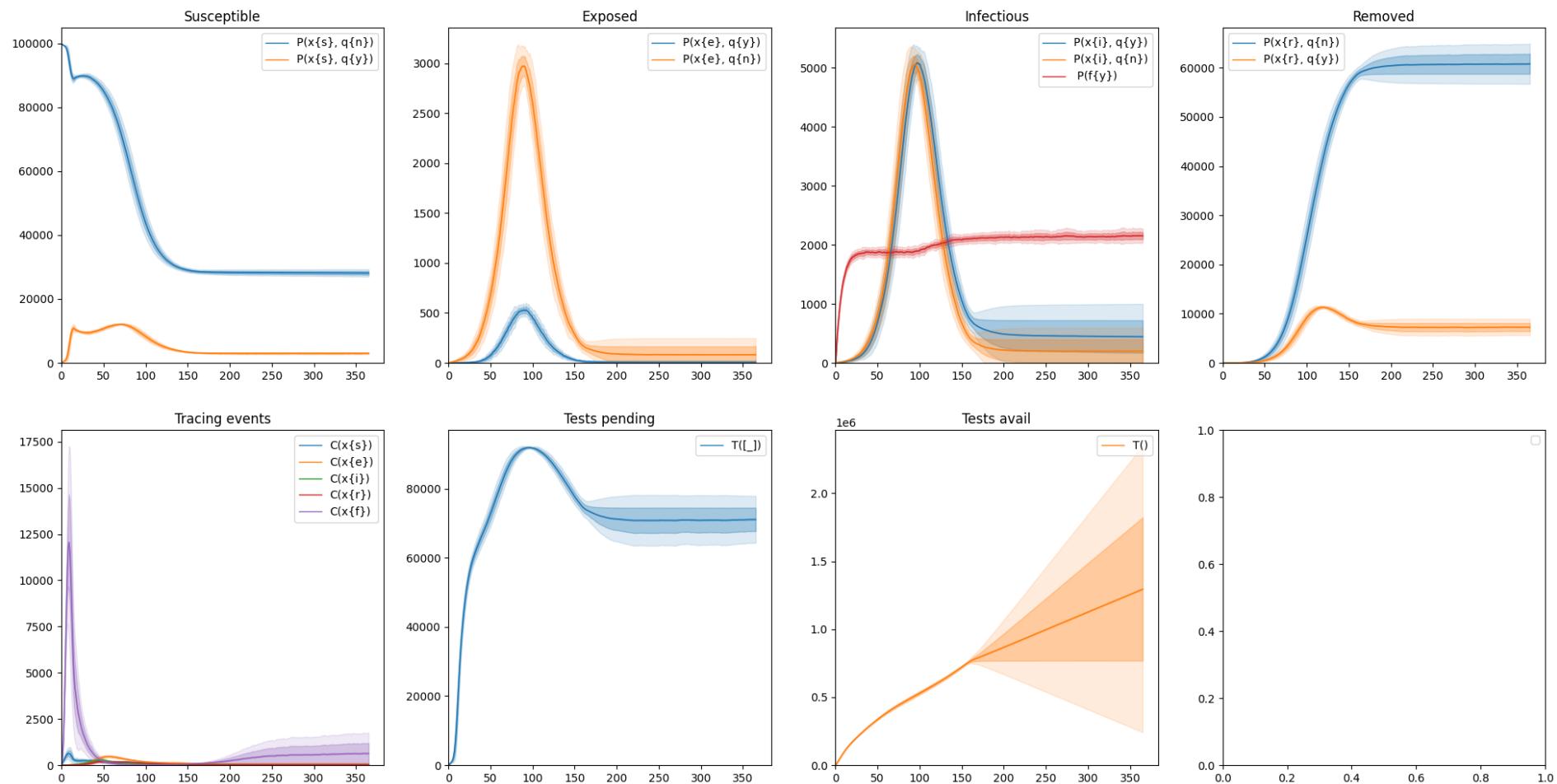
case: 64 INIT\_I: 10.0 k\_result: 0.5 m: 10000.0 thetaD: 0.0 thetaI: 0.0 thetaT: 0.0



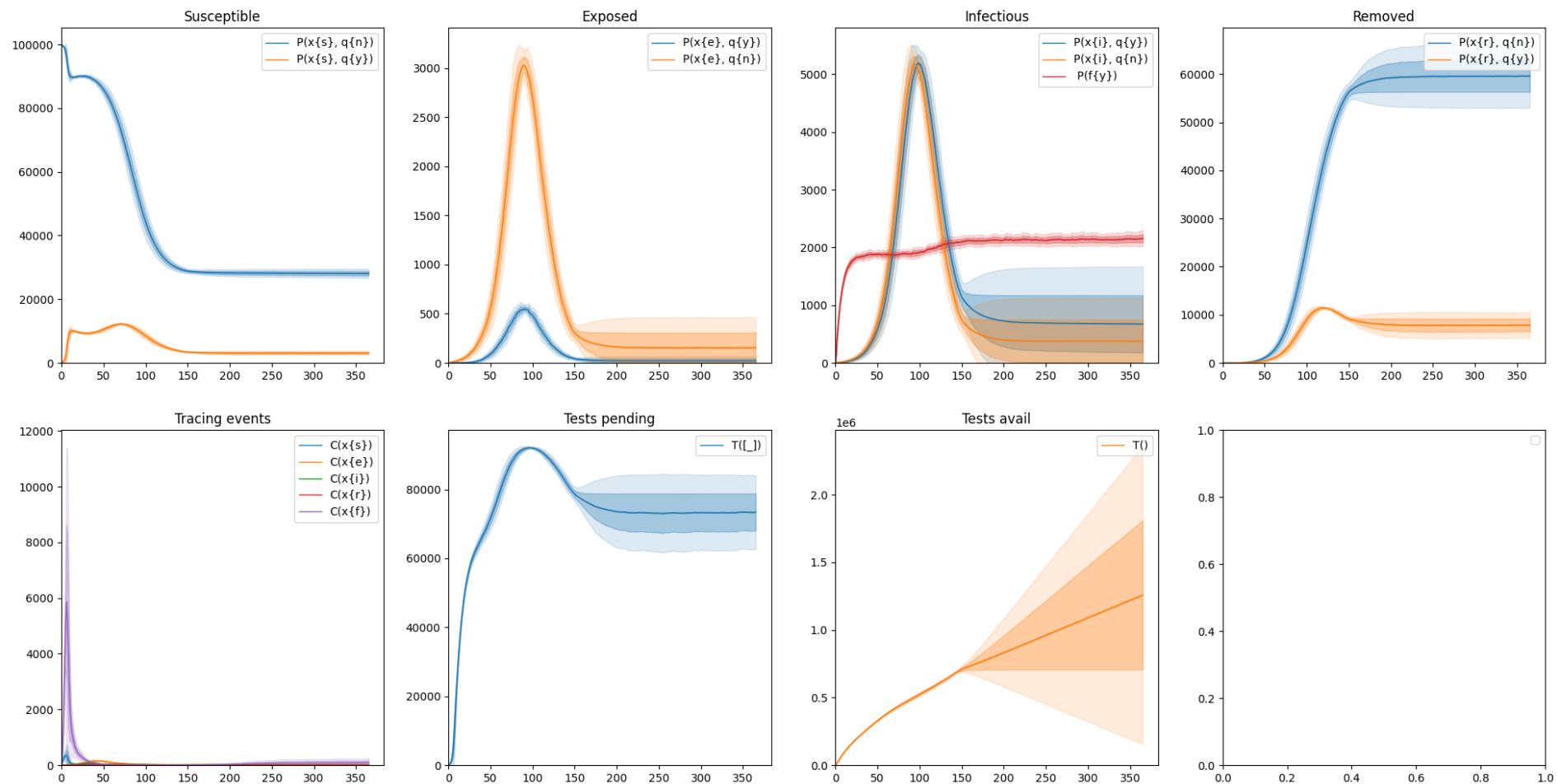
case: 65 INIT\_I: 10.0 k\_result: 0.5 m: 10000.0 thetaD: 0.0 thetaI: 0.0 thetaT: 1.0



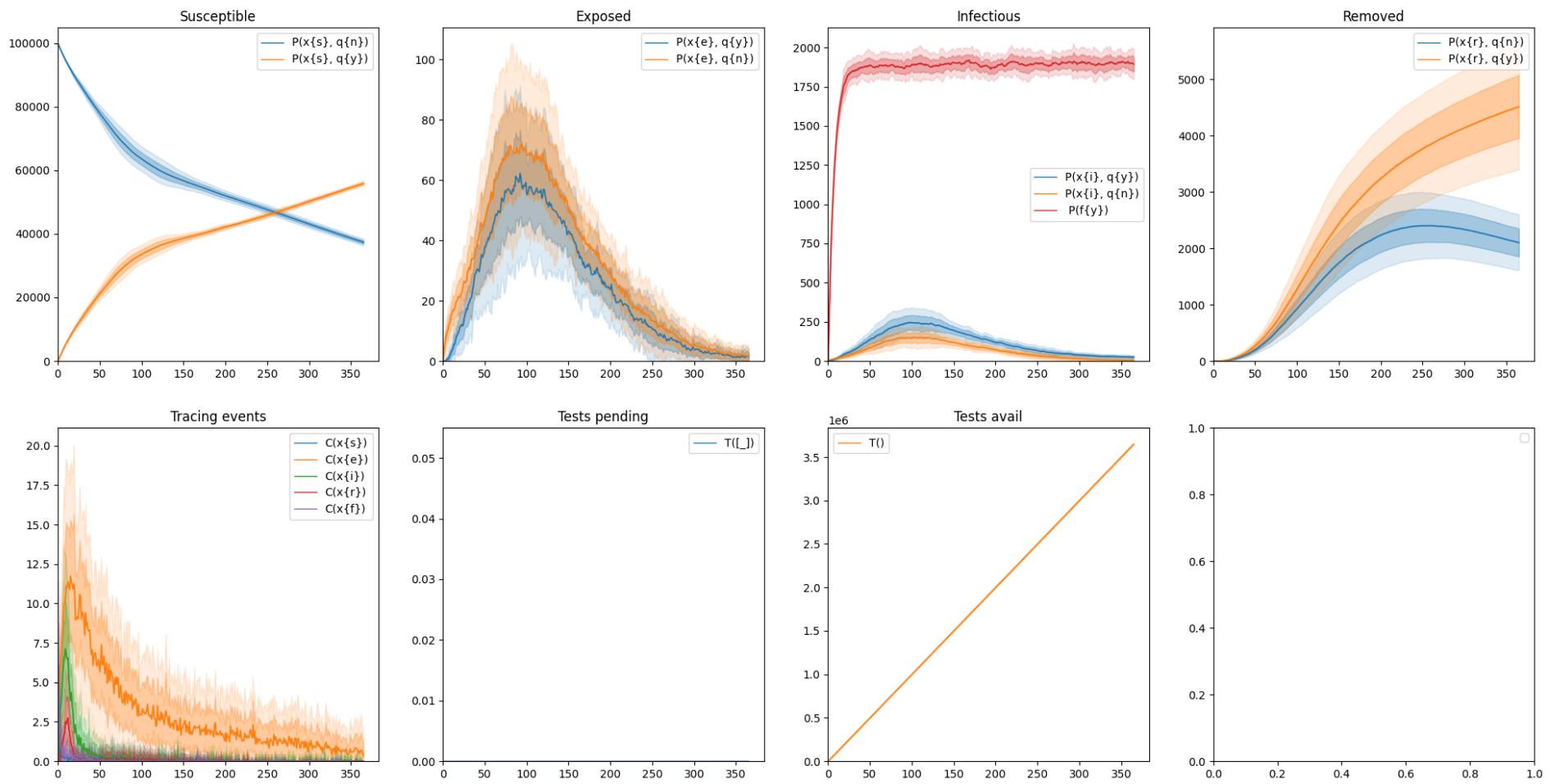
case: 66 INIT\_I: 10.0 k\_result: 0.5 m: 10000.0 thetaD: 0.0 thetal: 0.1428571428570002 thetaT: 0.0



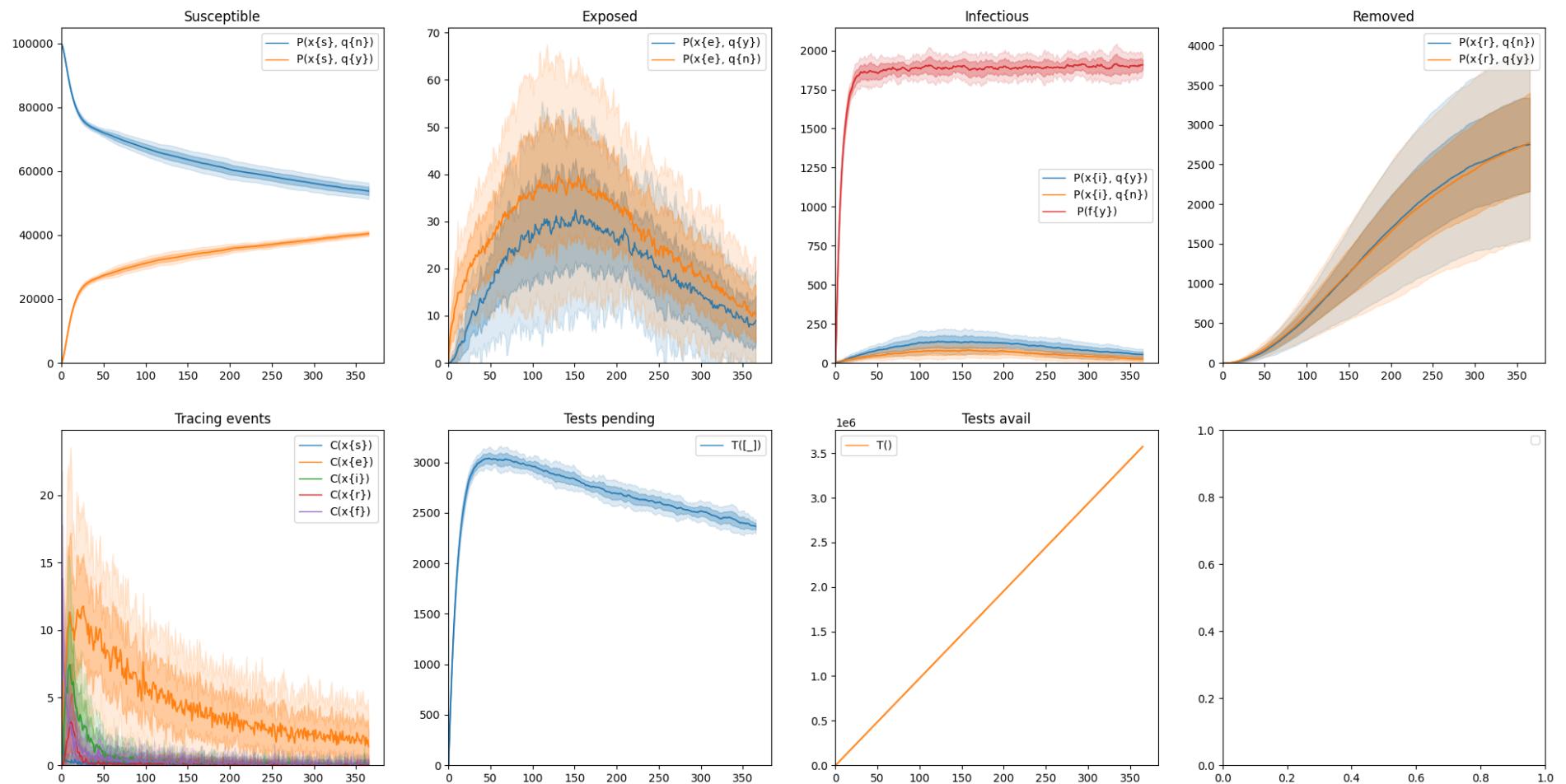
case: 67 INIT\_I: 10.0 k\_result: 0.5 m: 10000.0 thetaD: 0.0 thetal: 0.1428571428570002 thetaT: 1.0



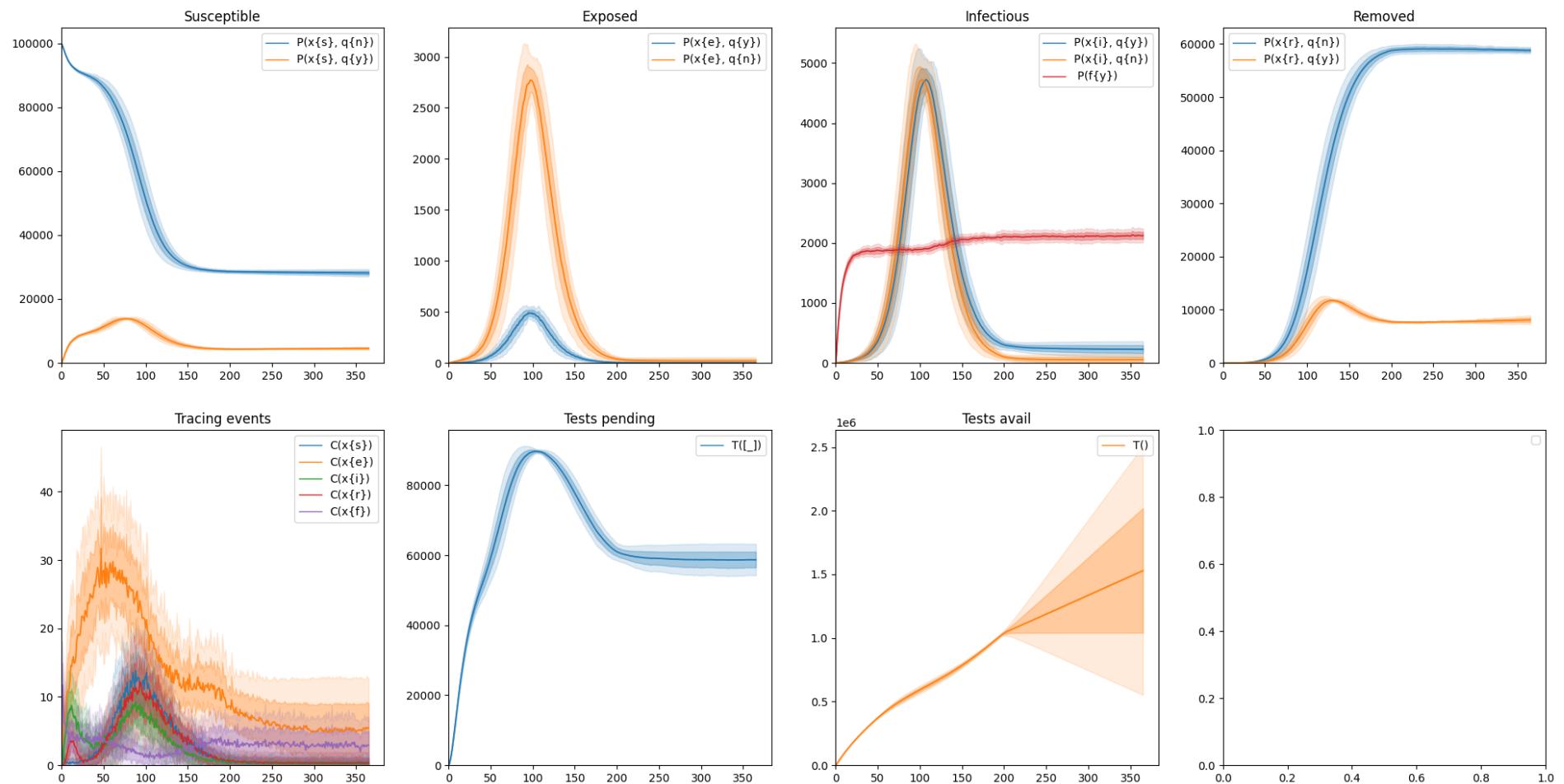
case: 68 INIT\_I: 10.0 k\_result: 0.5 m: 10000.0 thetaD: 1.0 thetaI: 0.0 thetaT: 0.0



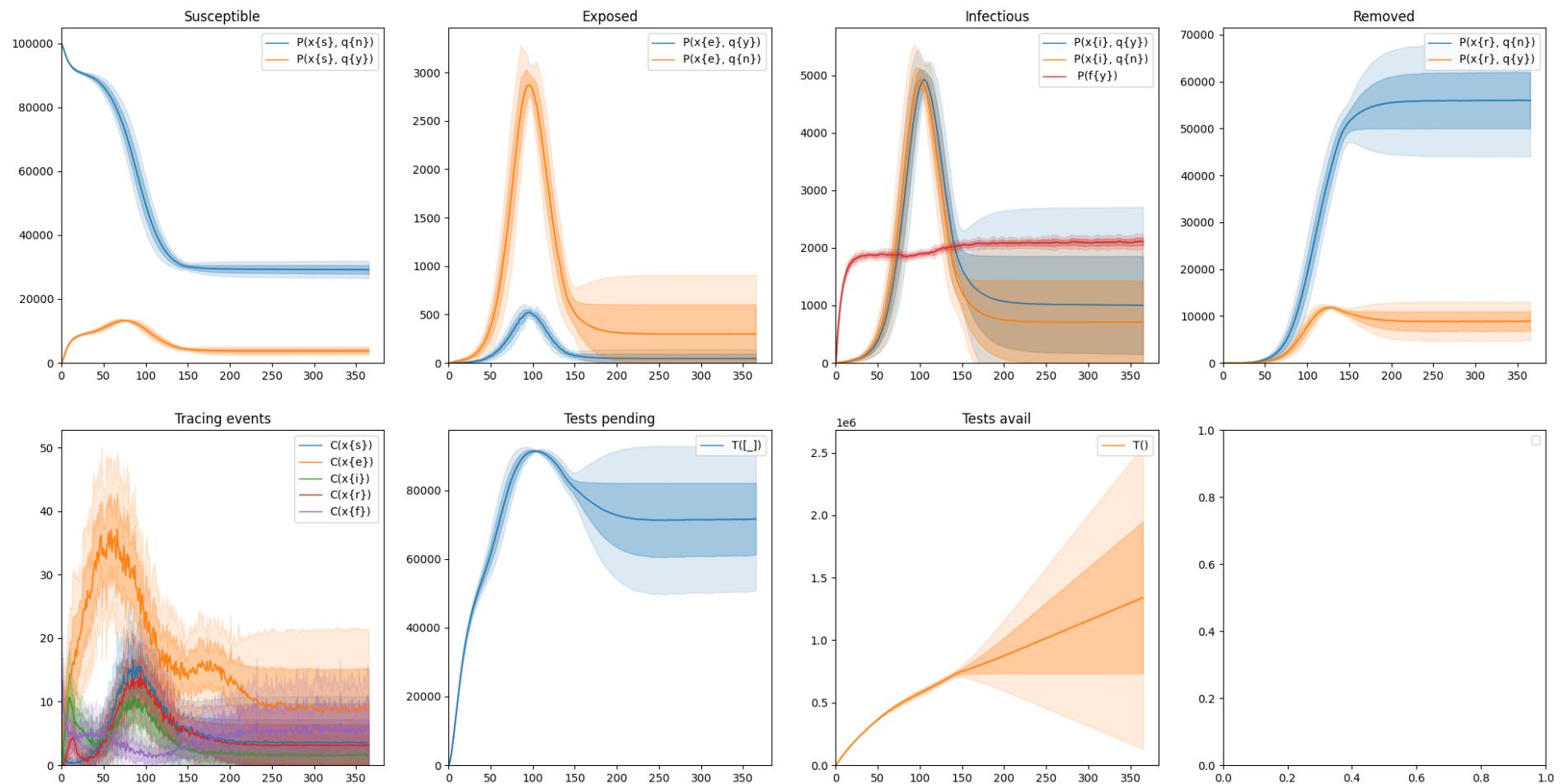
case: 69 INIT\_I: 10.0 k\_result: 0.5 m: 10000.0 thetaD: 1.0 thetaI: 0.0 thetaT: 1.0



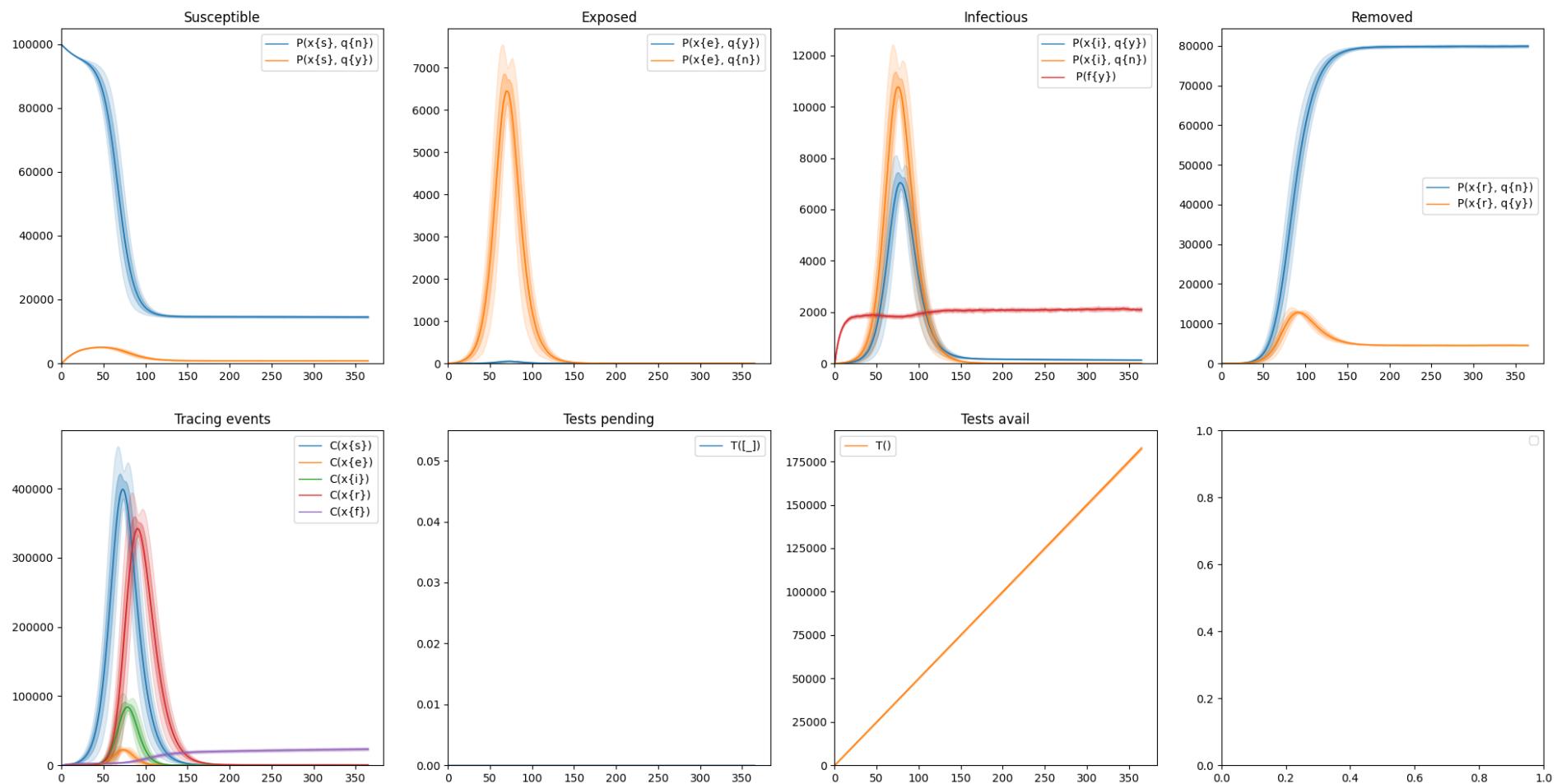
case: 70 INIT\_I: 10.0 k\_result: 0.5 m: 10000.0 thetaD: 1.0 thetal: 0.1428571428570002 thetaT: 0.0



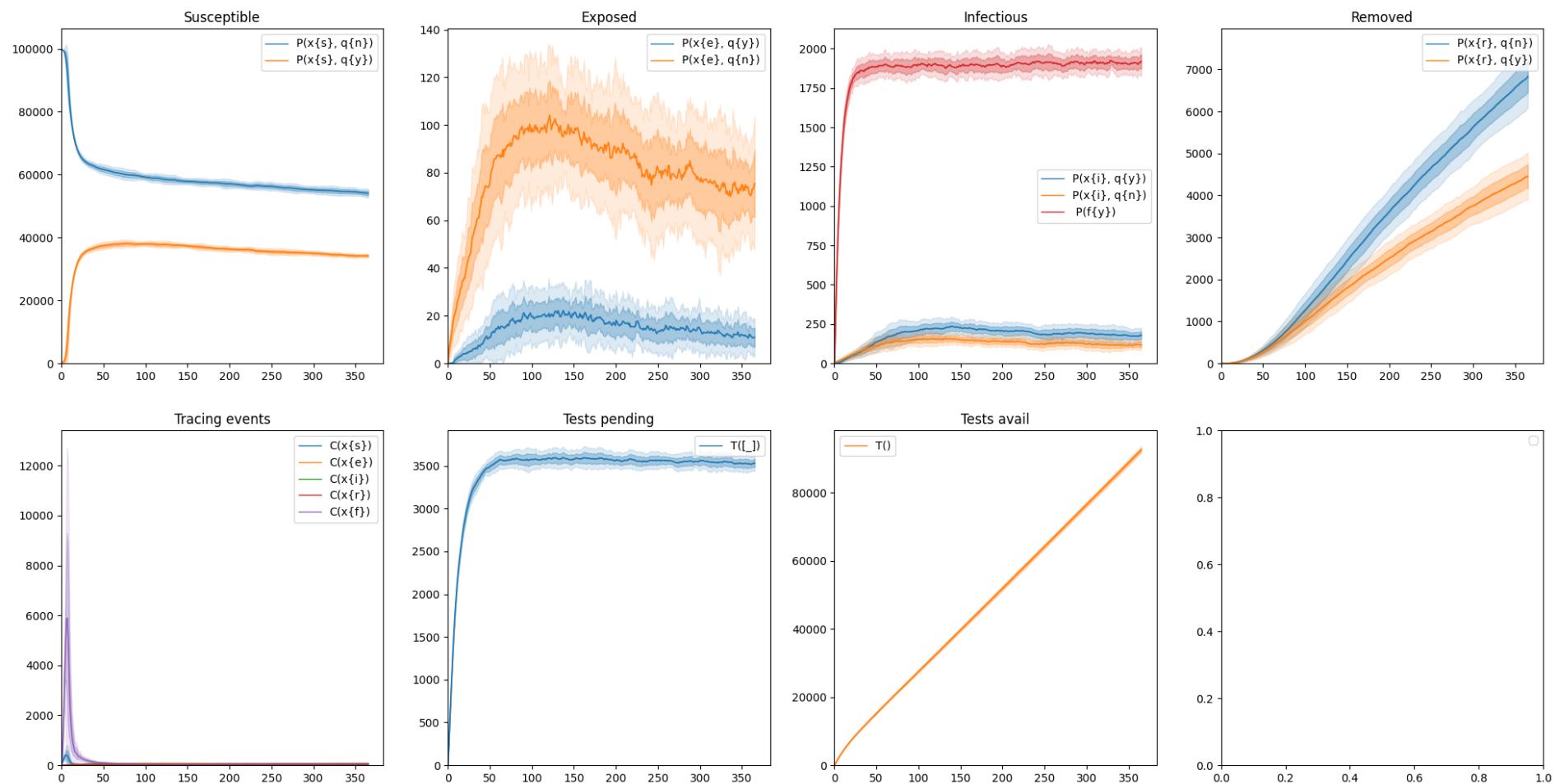
case: 71 INIT\_I: 10.0 k\_result: 0.5 m: 10000.0 thetaD: 1.0 thetal: 0.1428571428570002 thetaT: 1.0



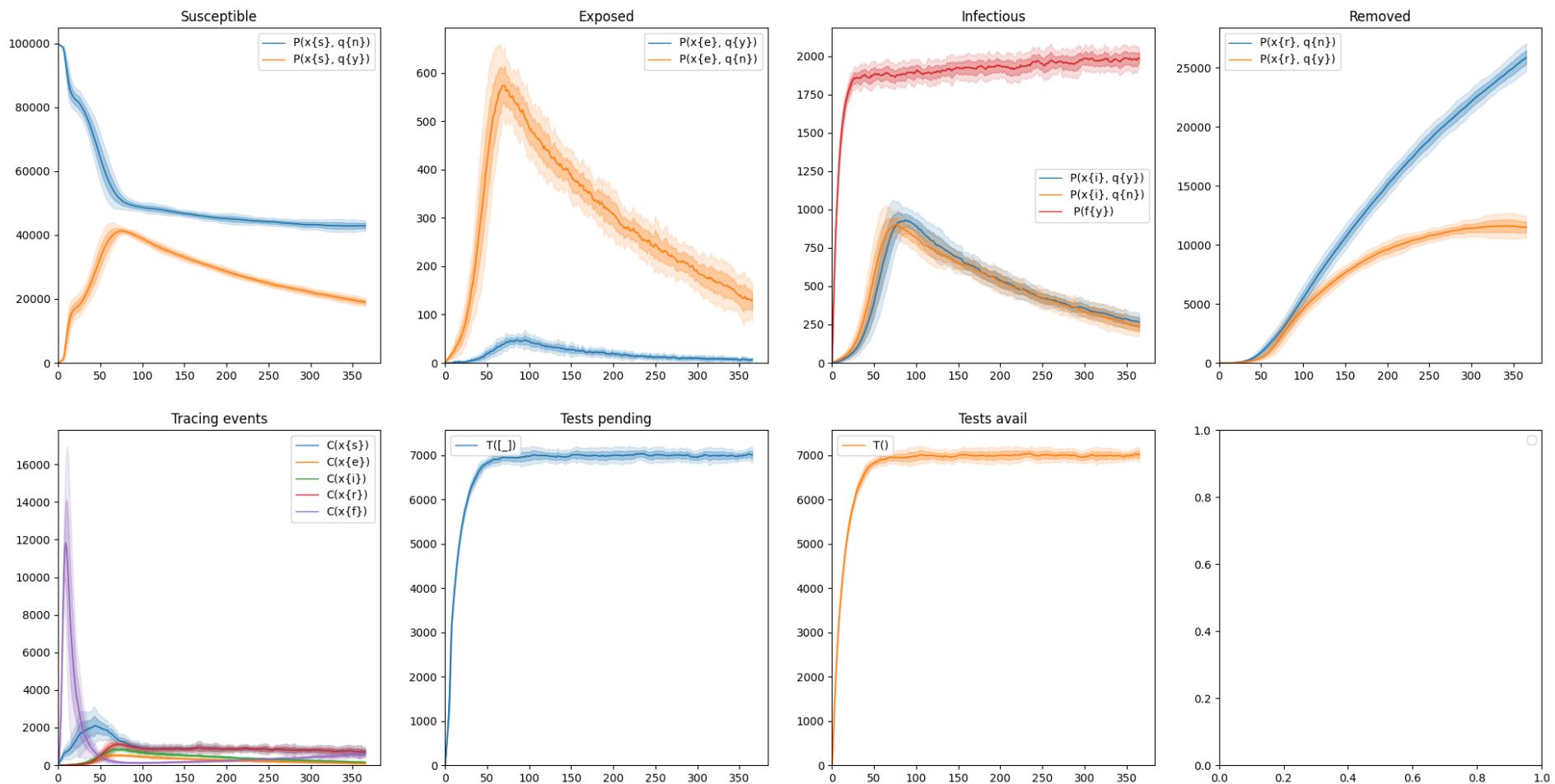
case: 72 INIT\_I: 10.0 k\_result: 0.5 m: 500.0 thetaD: 0.0 thetal: 0.0 thetaT: 0.0



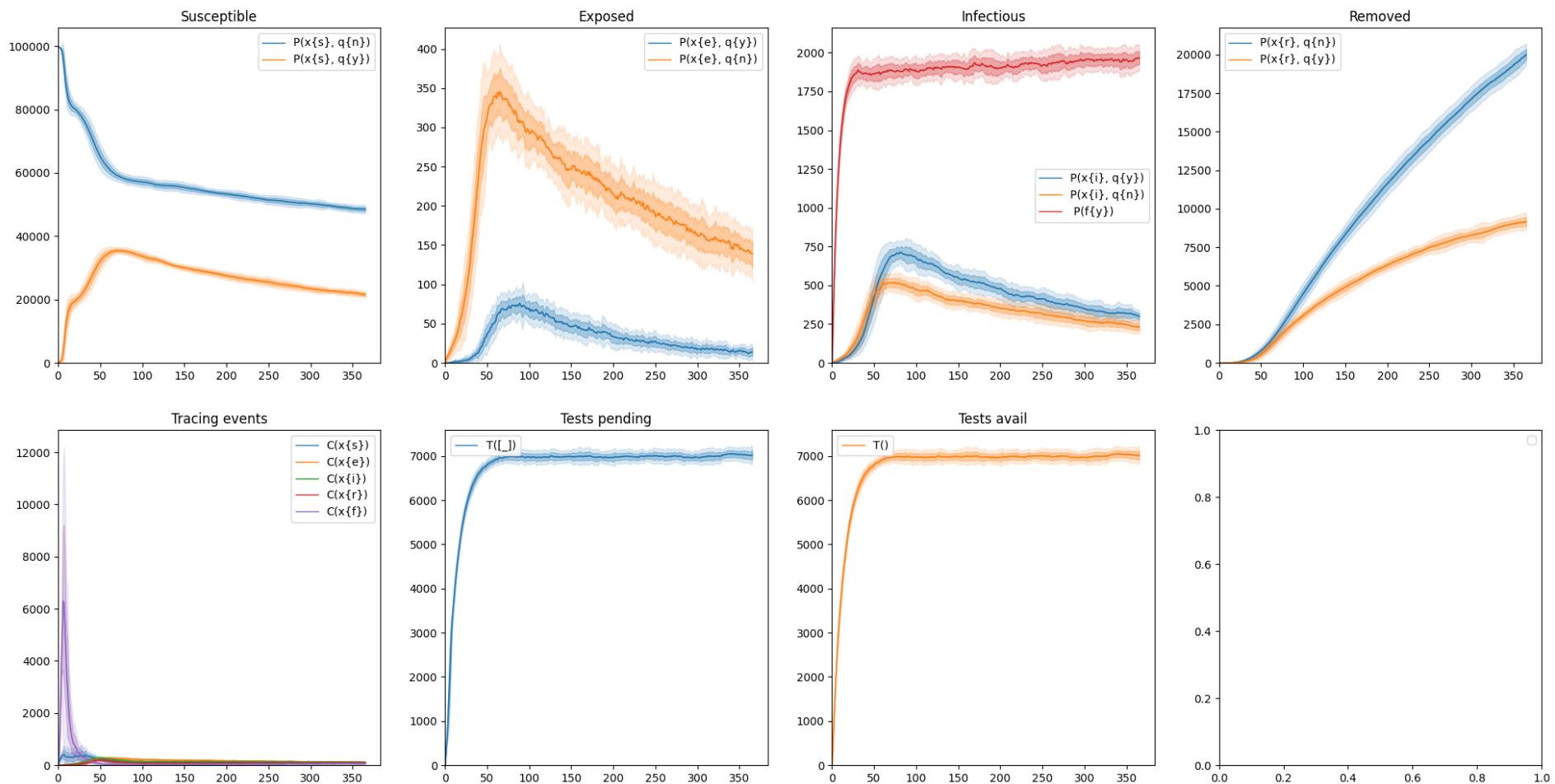
case: 73 INIT\_I: 10.0 k\_result: 0.5 m: 500.0 thetaD: 0.0 thetal: 0.0 thetaT: 1.0



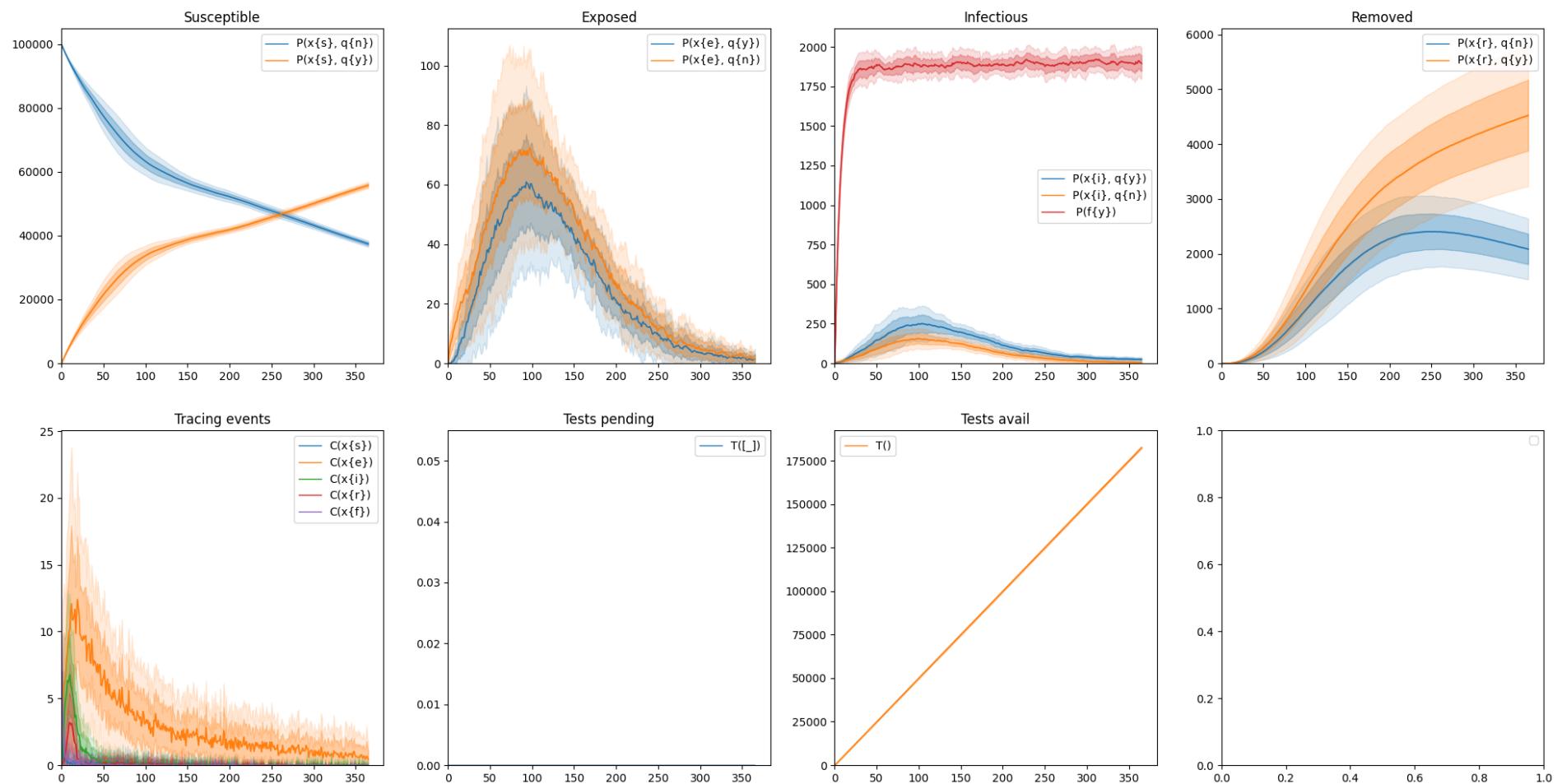
case: 74 INIT\_I: 10.0 k\_result: 0.5 m: 500.0 thetaD: 0.0 thetal: 0.14285714285700002 thetaT: 0.0



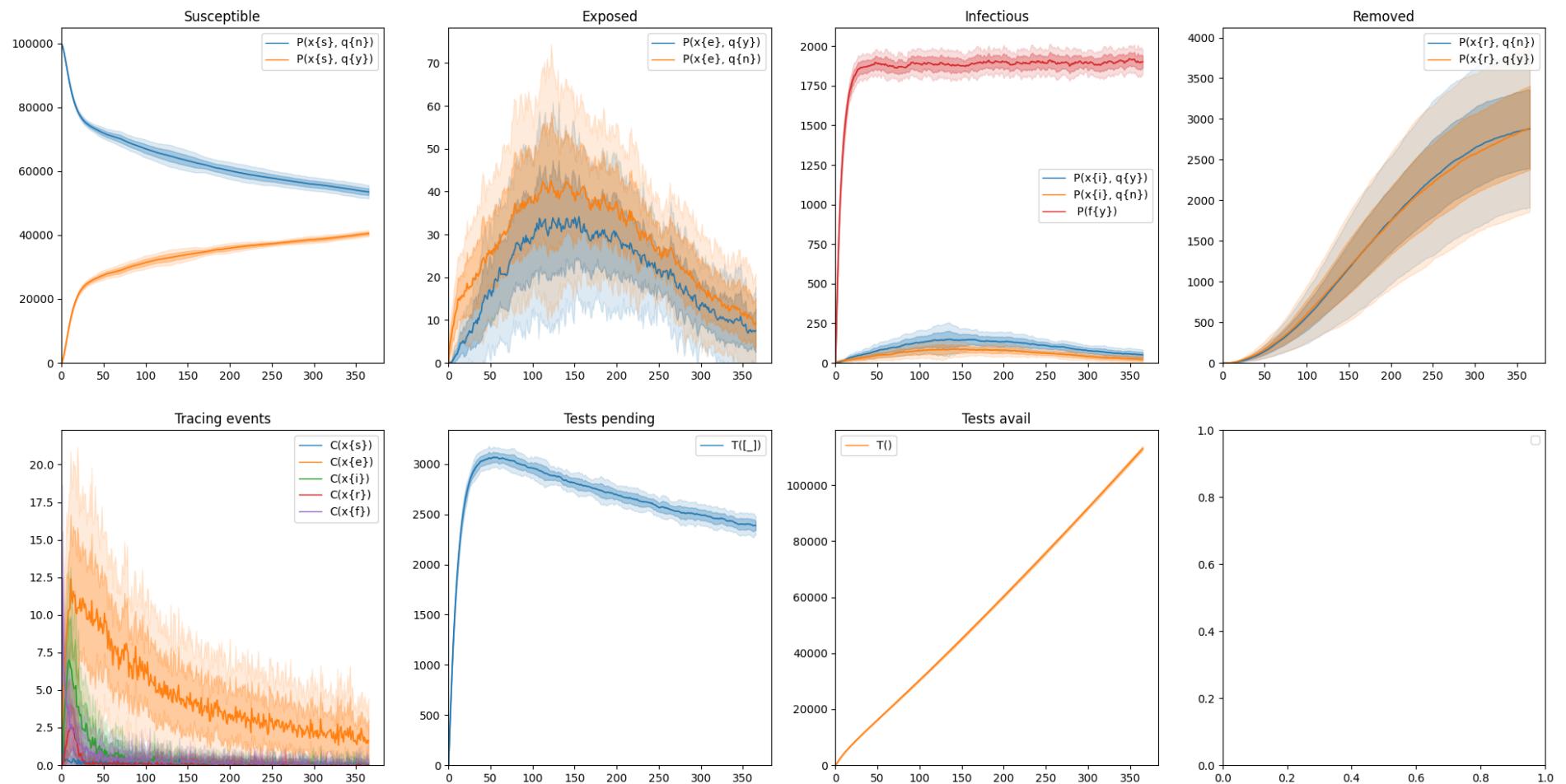
case: 75 INIT\_I: 10.0 k\_result: 0.5 m: 500.0 thetaD: 0.0 thetal: 0.14285714285700002 thetaT: 1.0



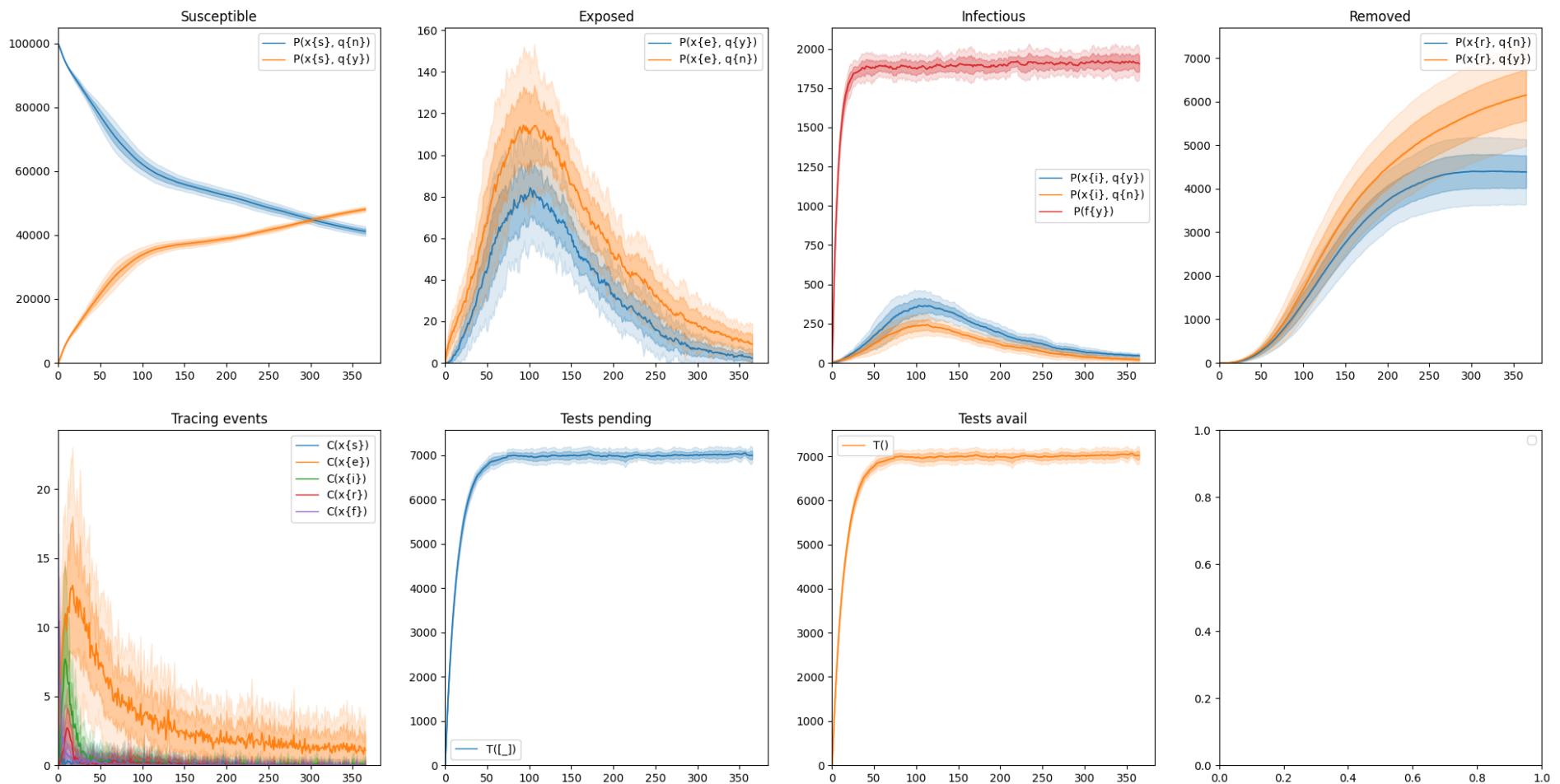
case: 76 INIT\_I: 10.0 k\_result: 0.5 m: 500.0 thetaD: 1.0 thetal: 0.0 thetaT: 0.0



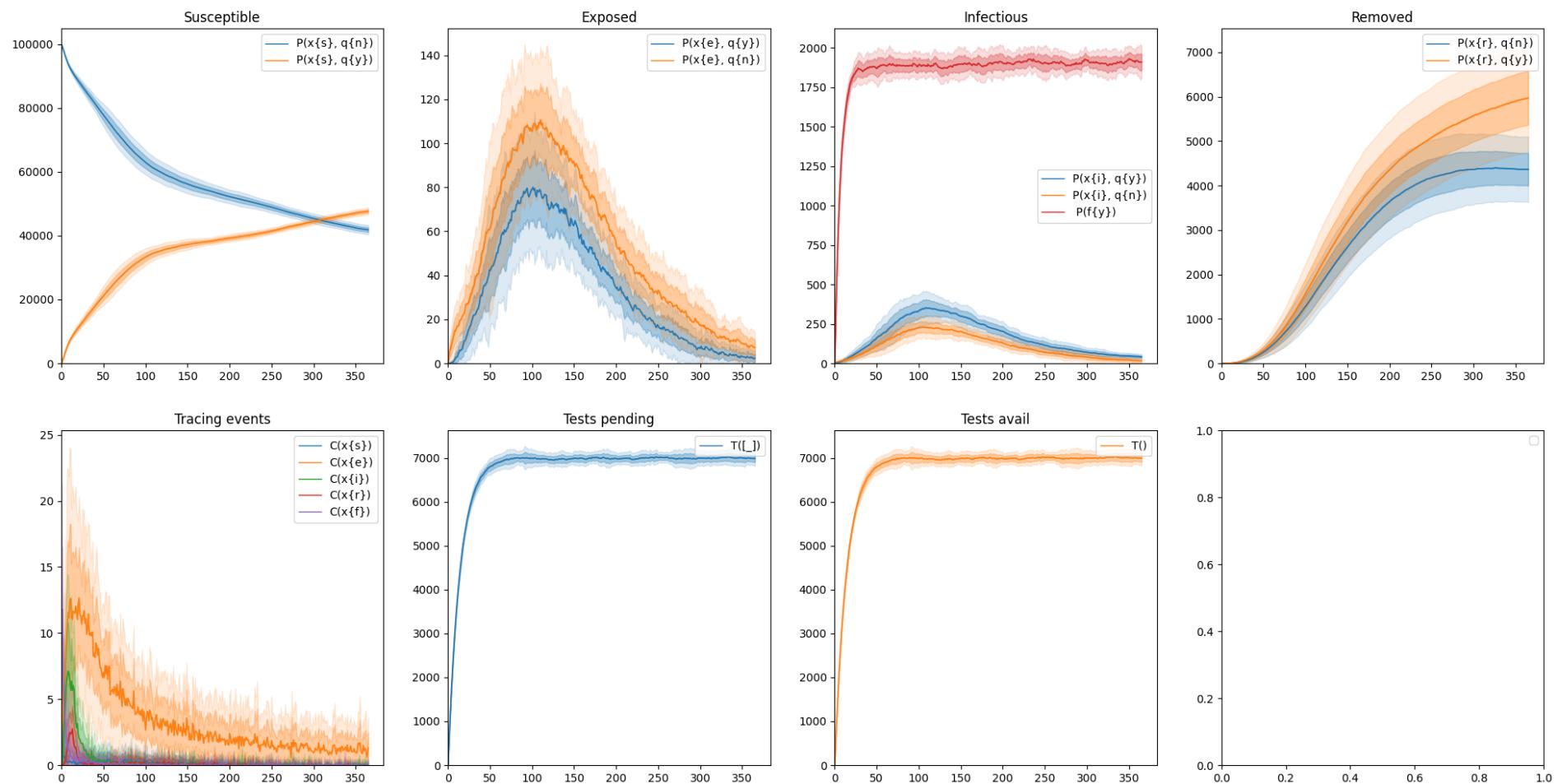
case: 77 INIT\_I: 10.0 k\_result: 0.5 m: 500.0 thetaD: 1.0 thetal: 0.0 thetaT: 1.0



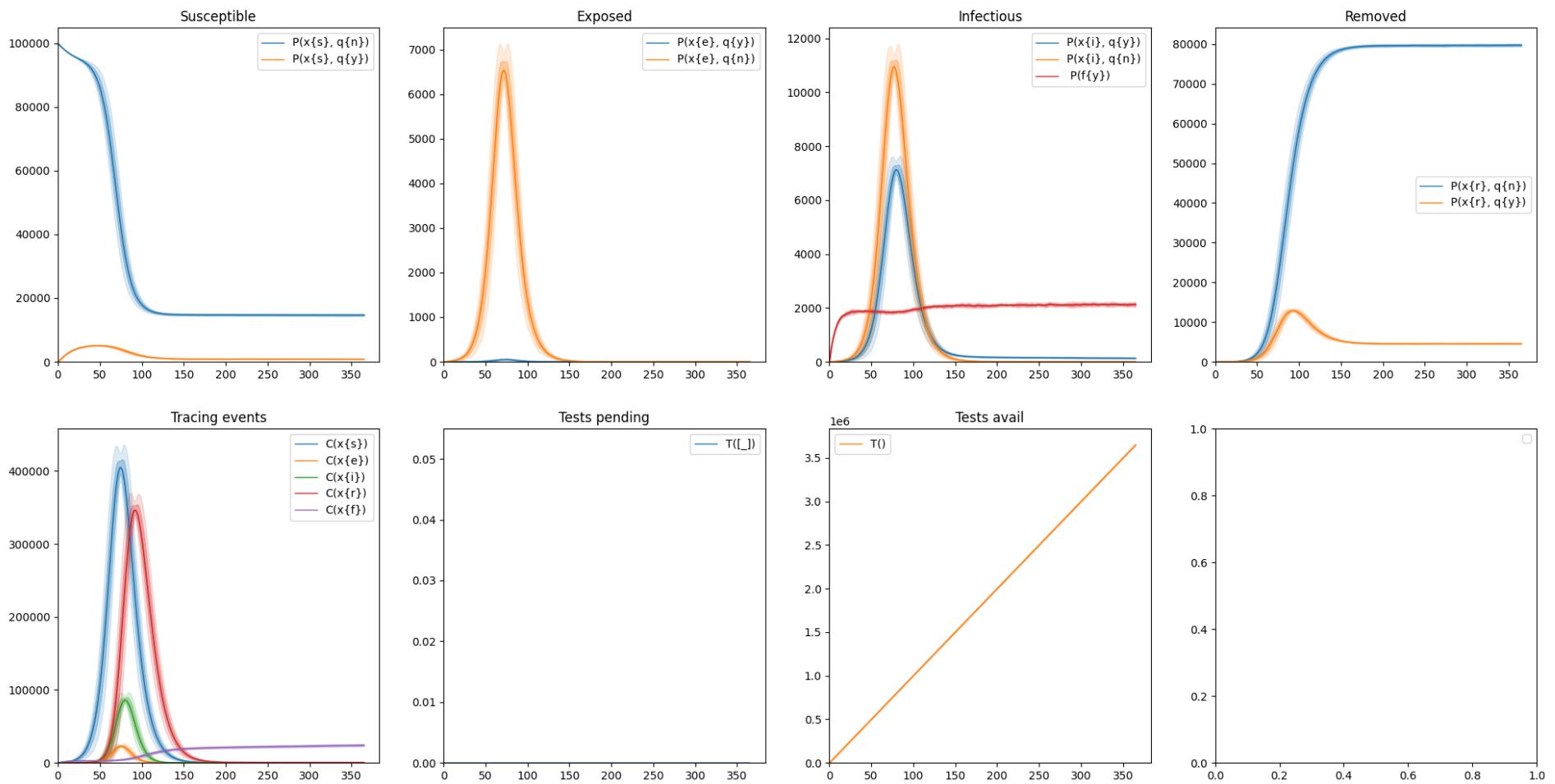
case: 78 INIT\_I: 10.0 k\_result: 0.5 m: 500.0 thetaD: 1.0 thetal: 0.14285714285700002 thetaT: 0.0



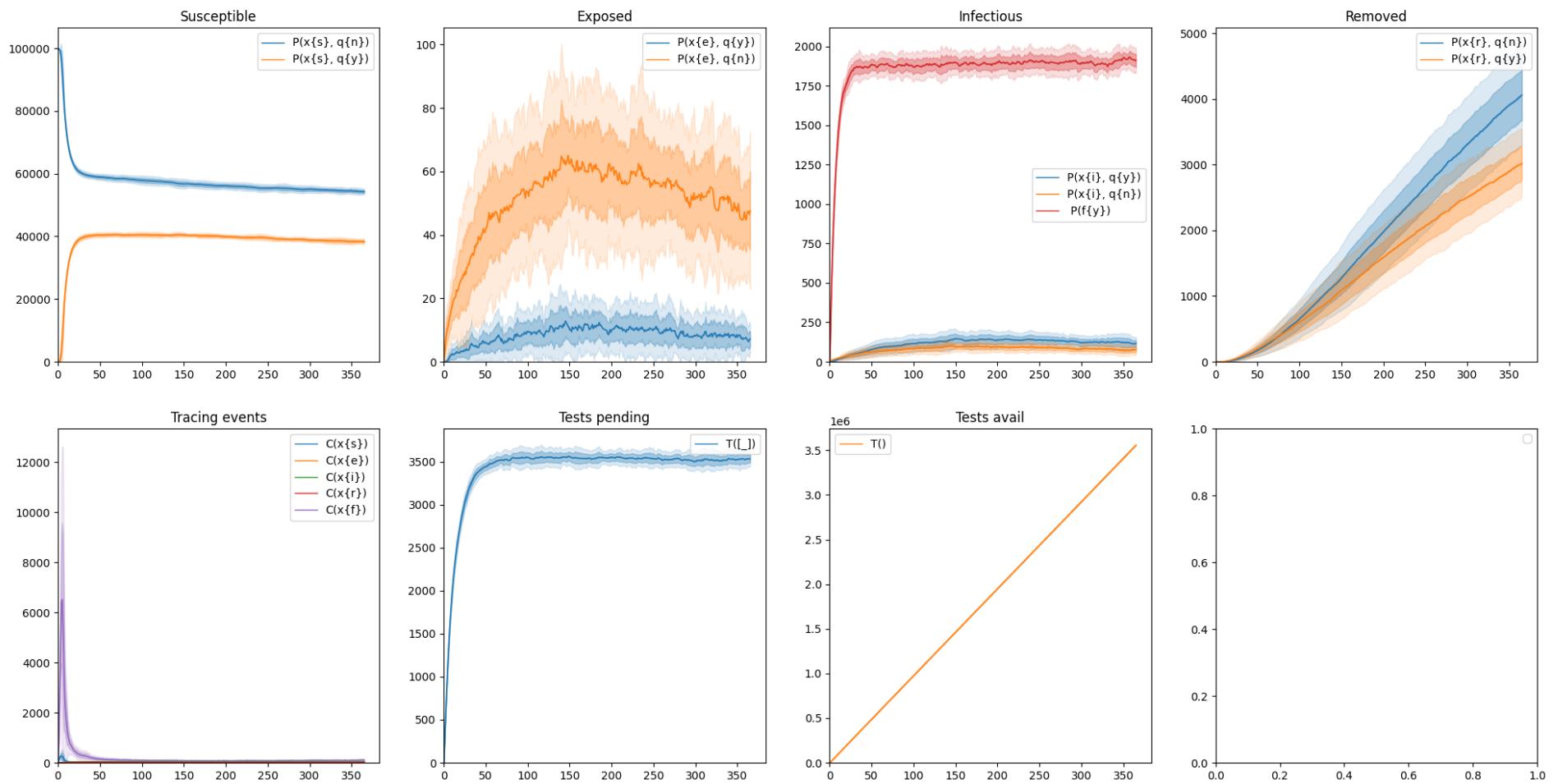
case: 79 INIT\_I: 10.0 k\_result: 0.5 m: 500.0 thetaD: 1.0 thetal: 0.14285714285700002 thetaT: 1.0



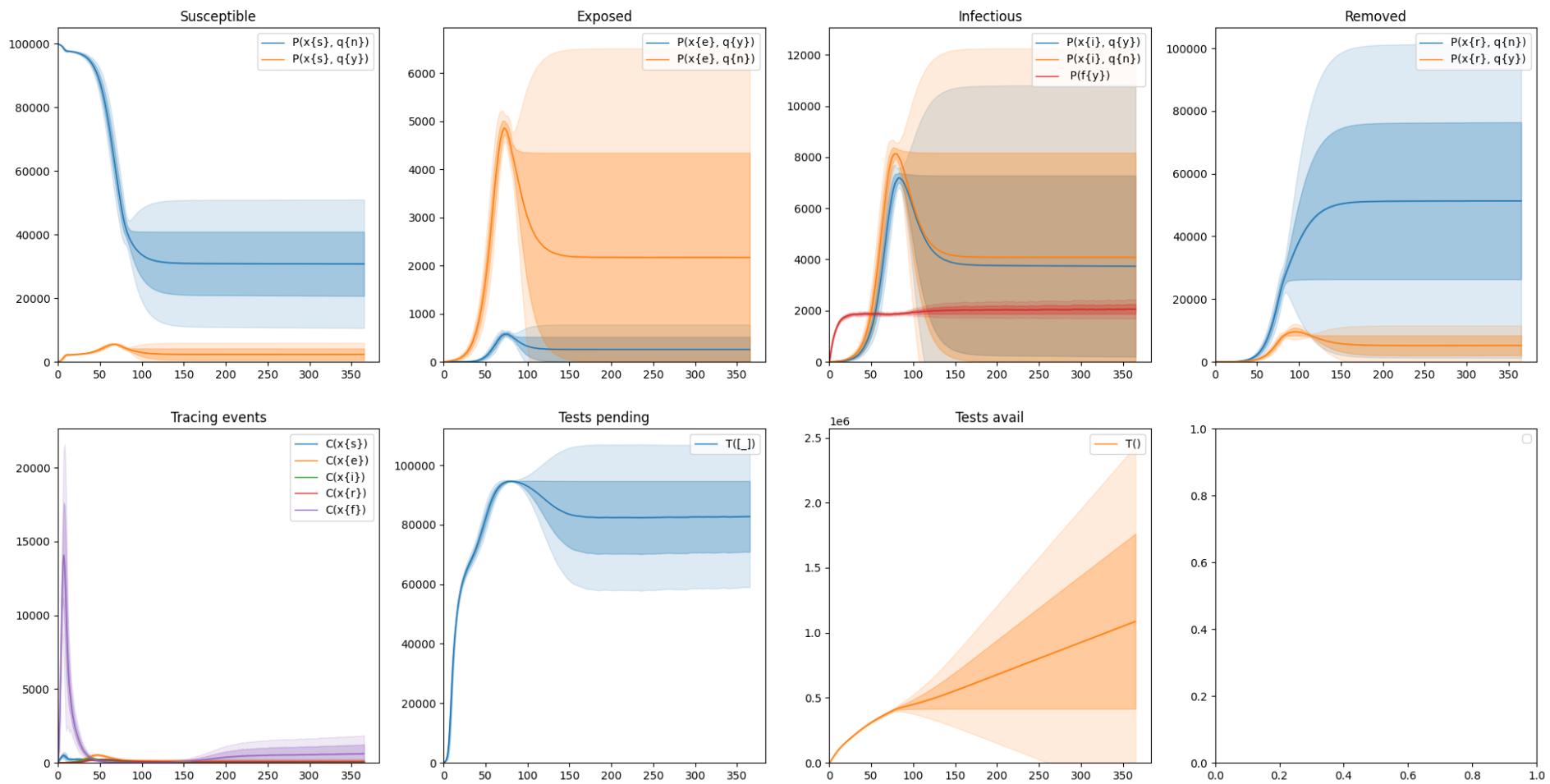
case: 80 INIT\_I: 10.0 k\_result: 12.0 m: 10000.0 thetaD: 0.0 thetal: 0.0 thetaT: 0.0



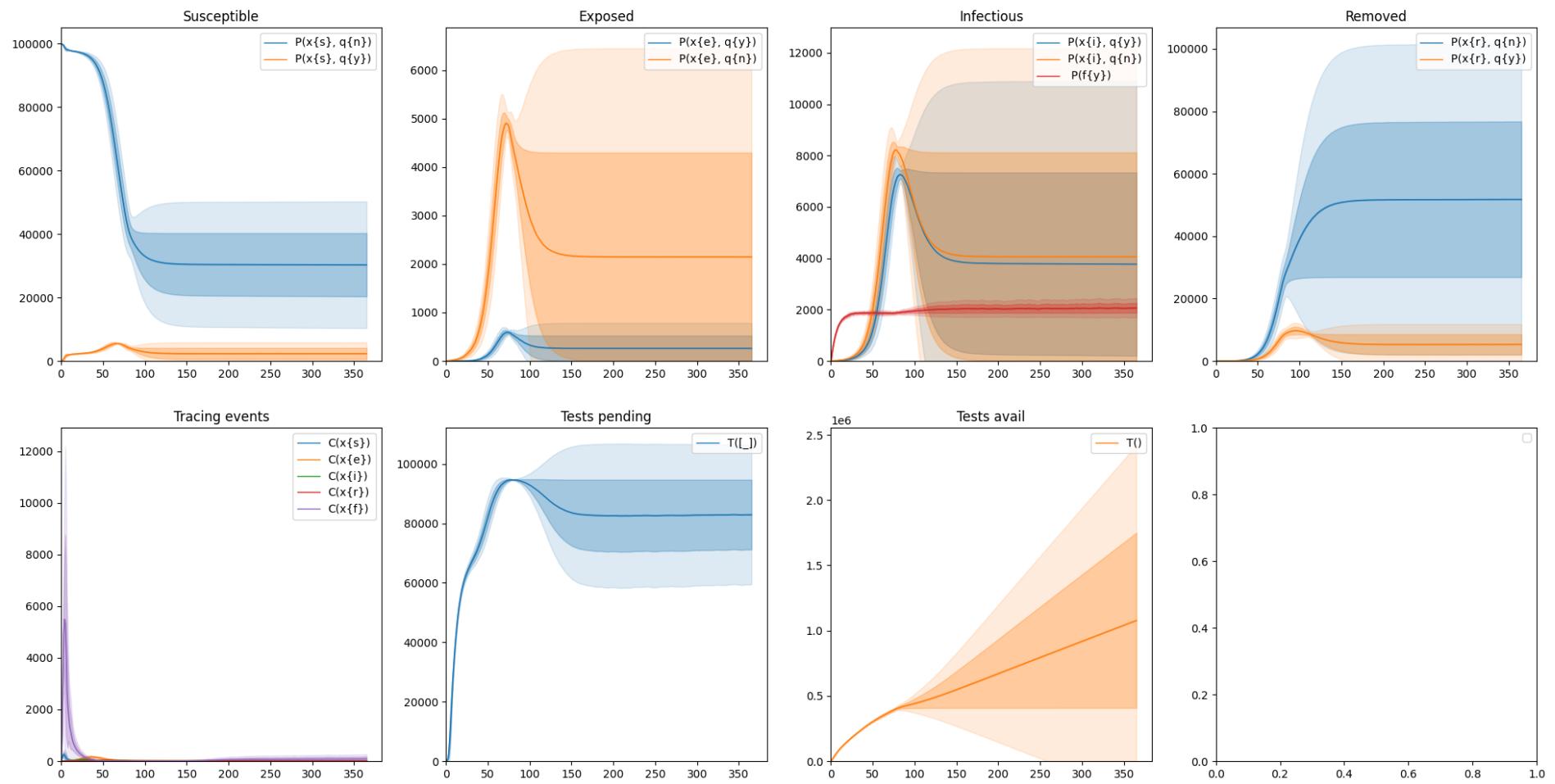
case: 81 INIT\_I: 10.0 k\_result: 12.0 m: 10000.0 thetaD: 0.0 thetal: 0.0 thetaT: 1.0



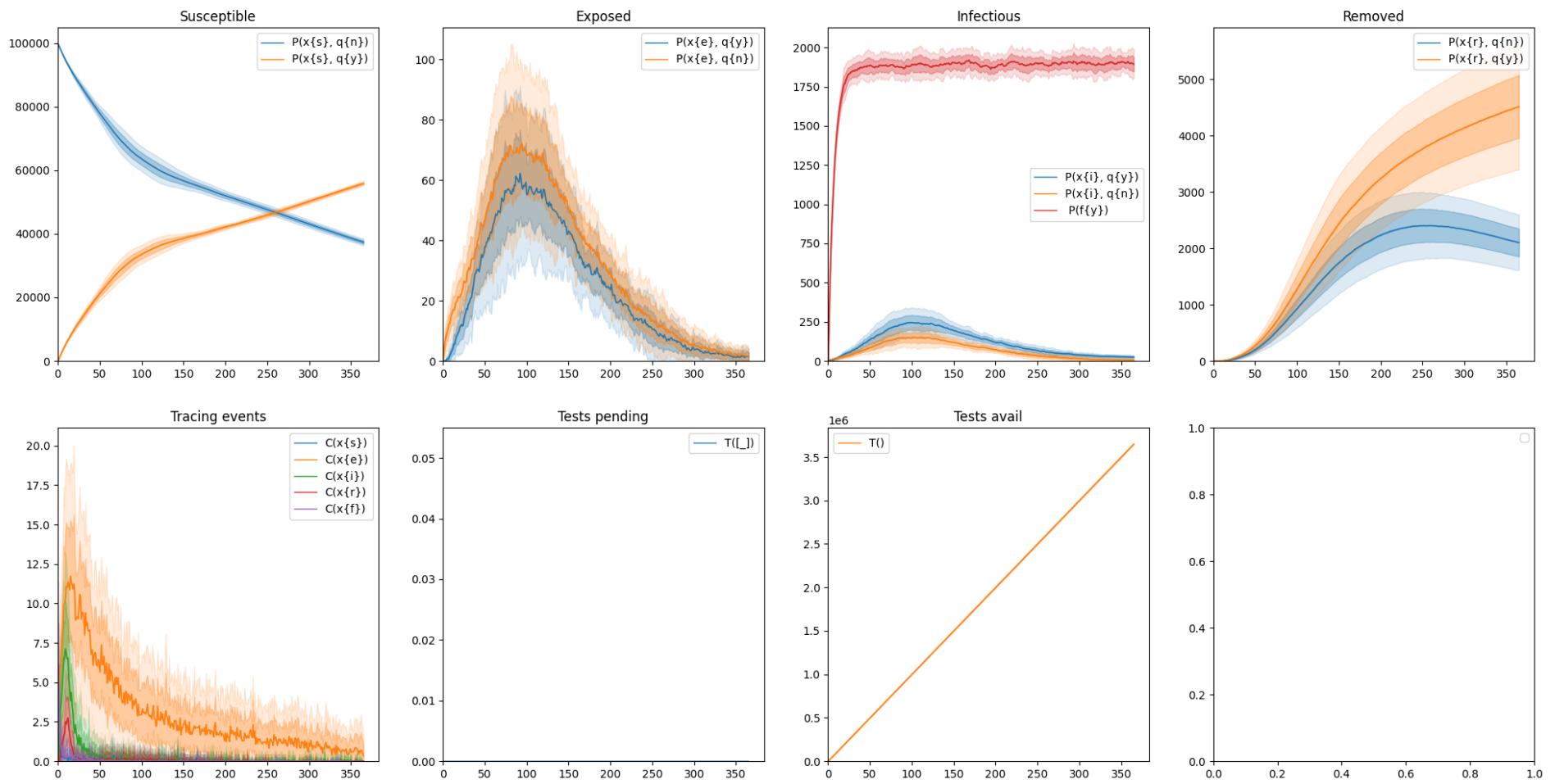
case: 82 INIT\_I: 10.0 k\_result: 12.0 m: 10000.0 thetaD: 0.0 thetal: 0.14285714285700002 thetaT: 0.0



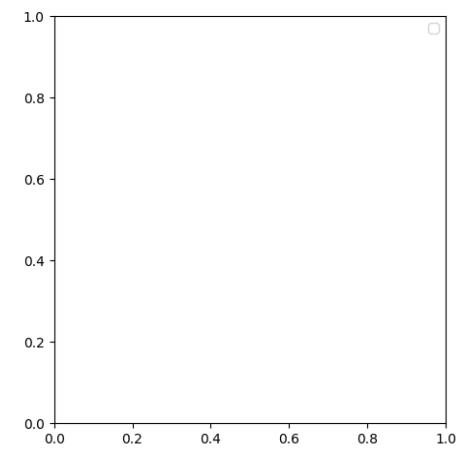
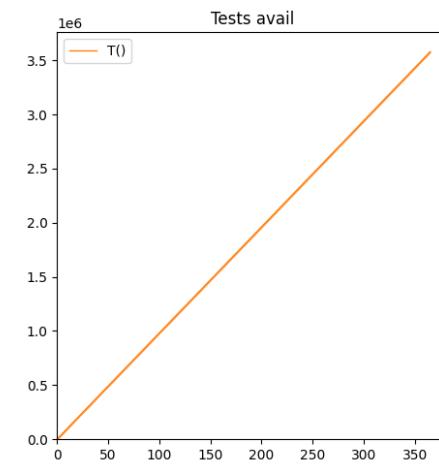
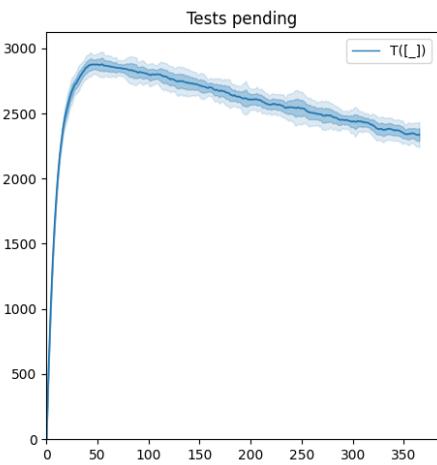
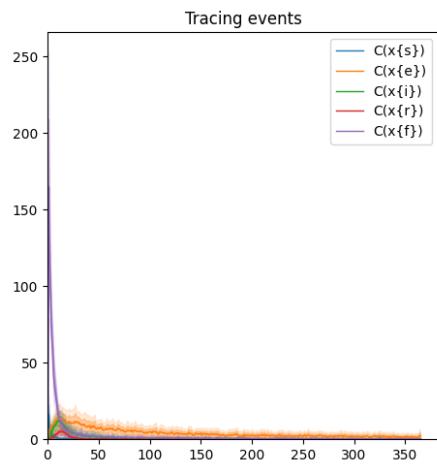
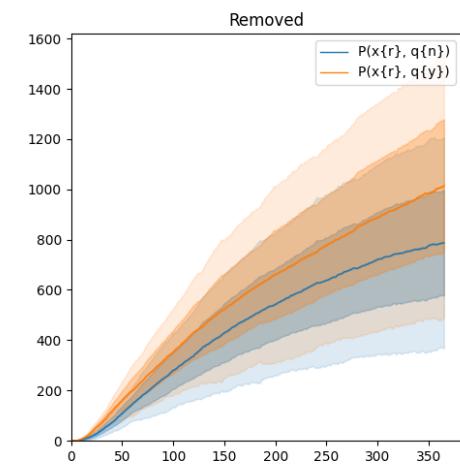
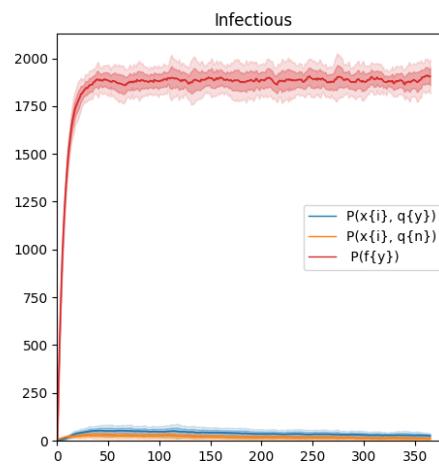
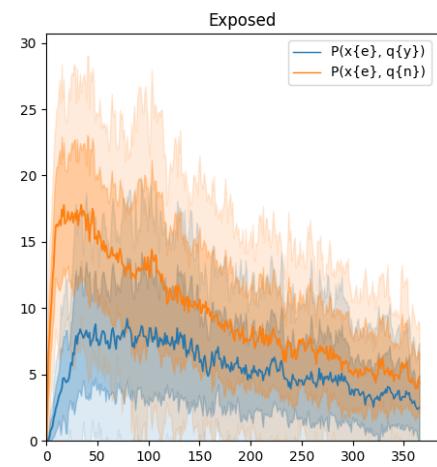
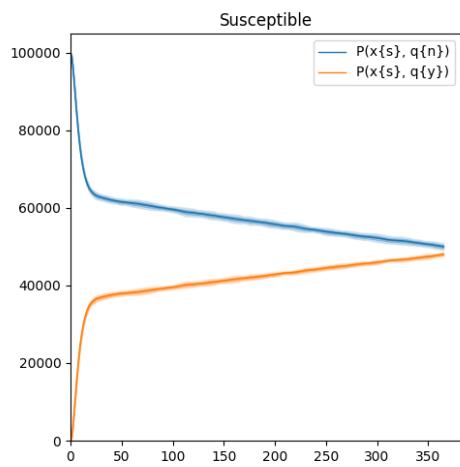
case: 83 INIT\_I: 10.0 k\_result: 12.0 m: 10000.0 thetaD: 0.0 thetal: 0.14285714285700002 thetaT: 1.0



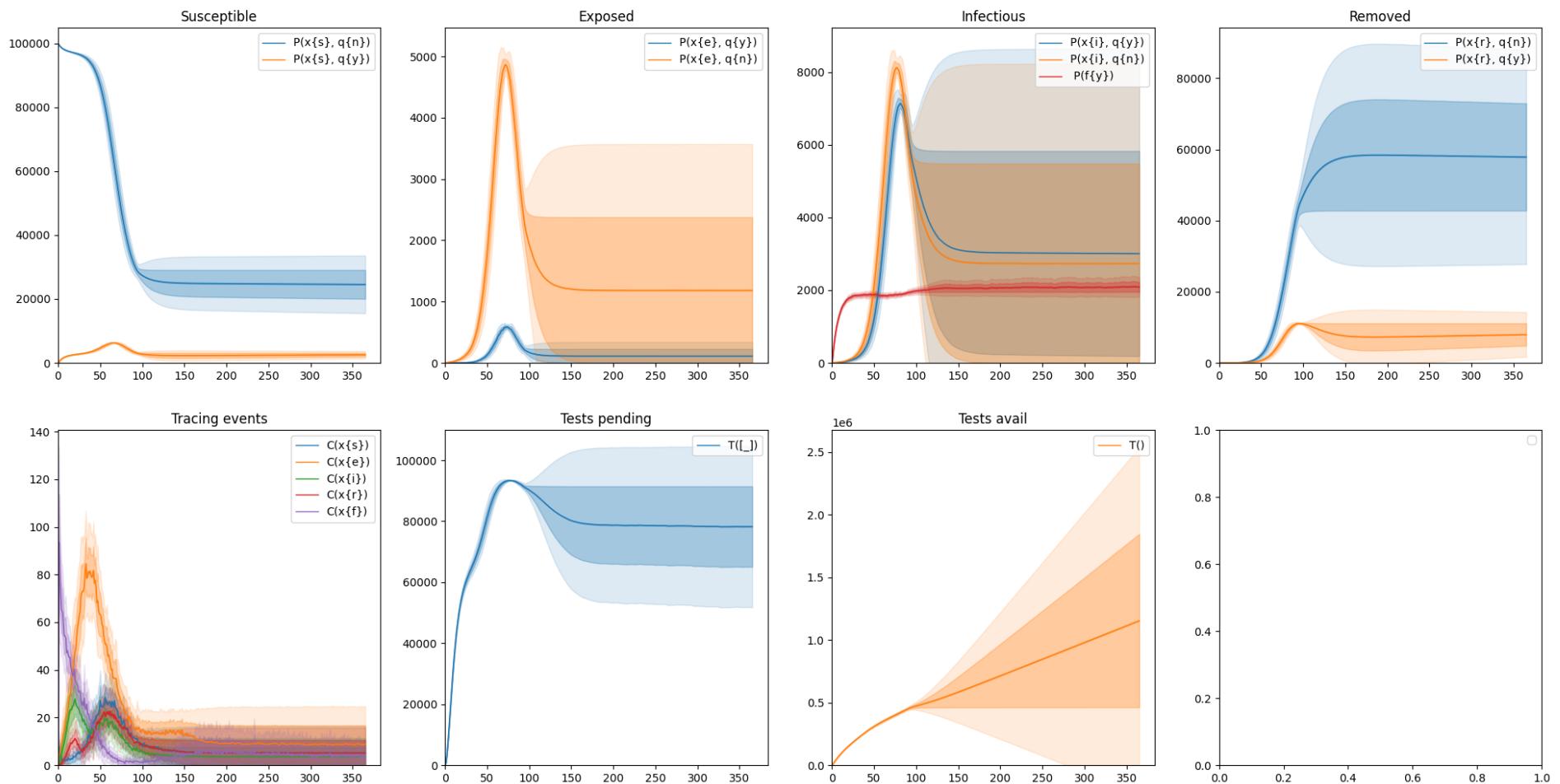
case: 84 INIT\_I: 10.0 k\_result: 12.0 m: 10000.0 thetaD: 1.0 thetal: 0.0 thetaT: 0.0



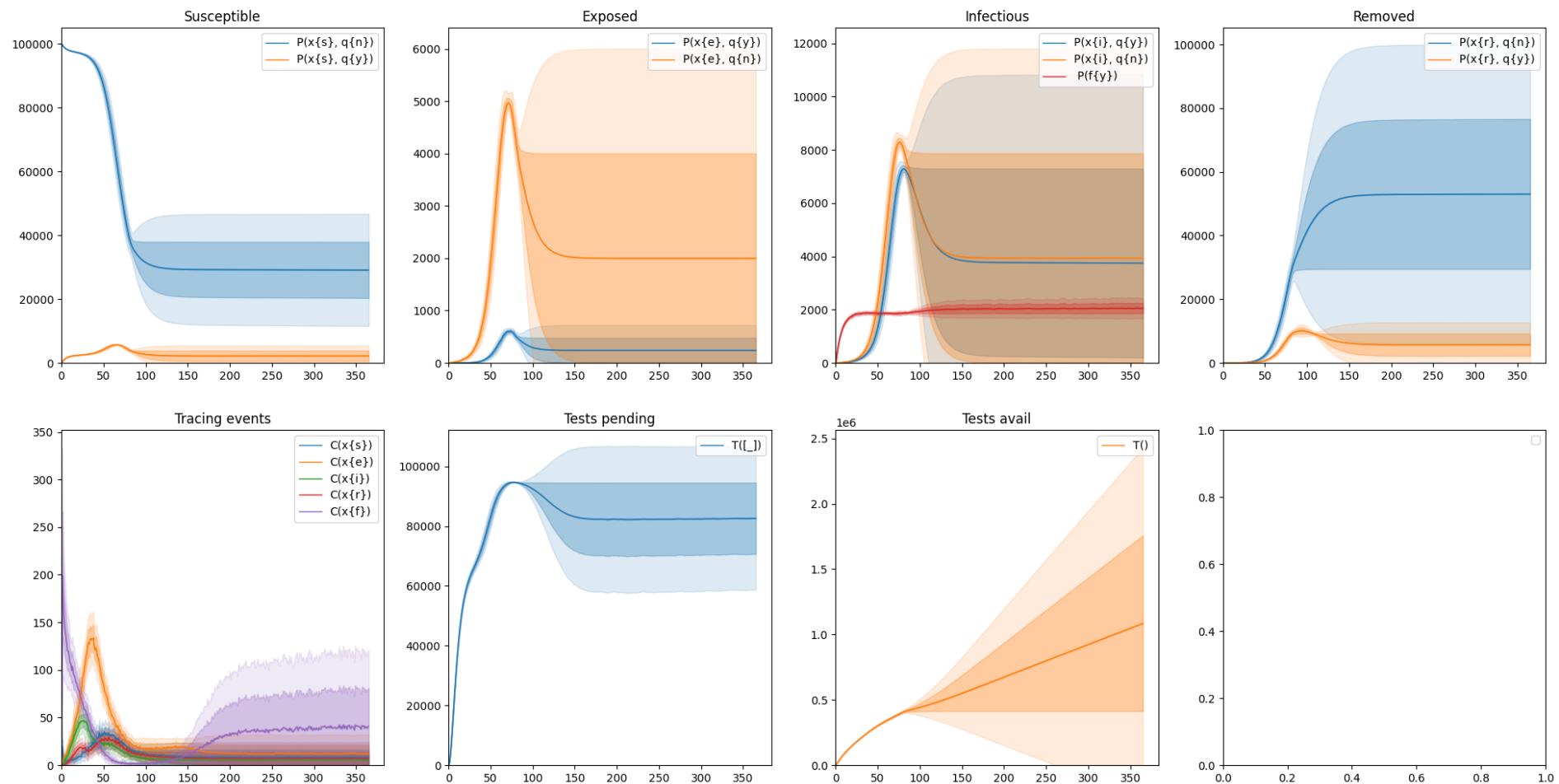
case: 85 INIT\_I: 10.0 k\_result: 12.0 m: 10000.0 thetaD: 1.0 thetal: 0.0 thetaT: 1.0



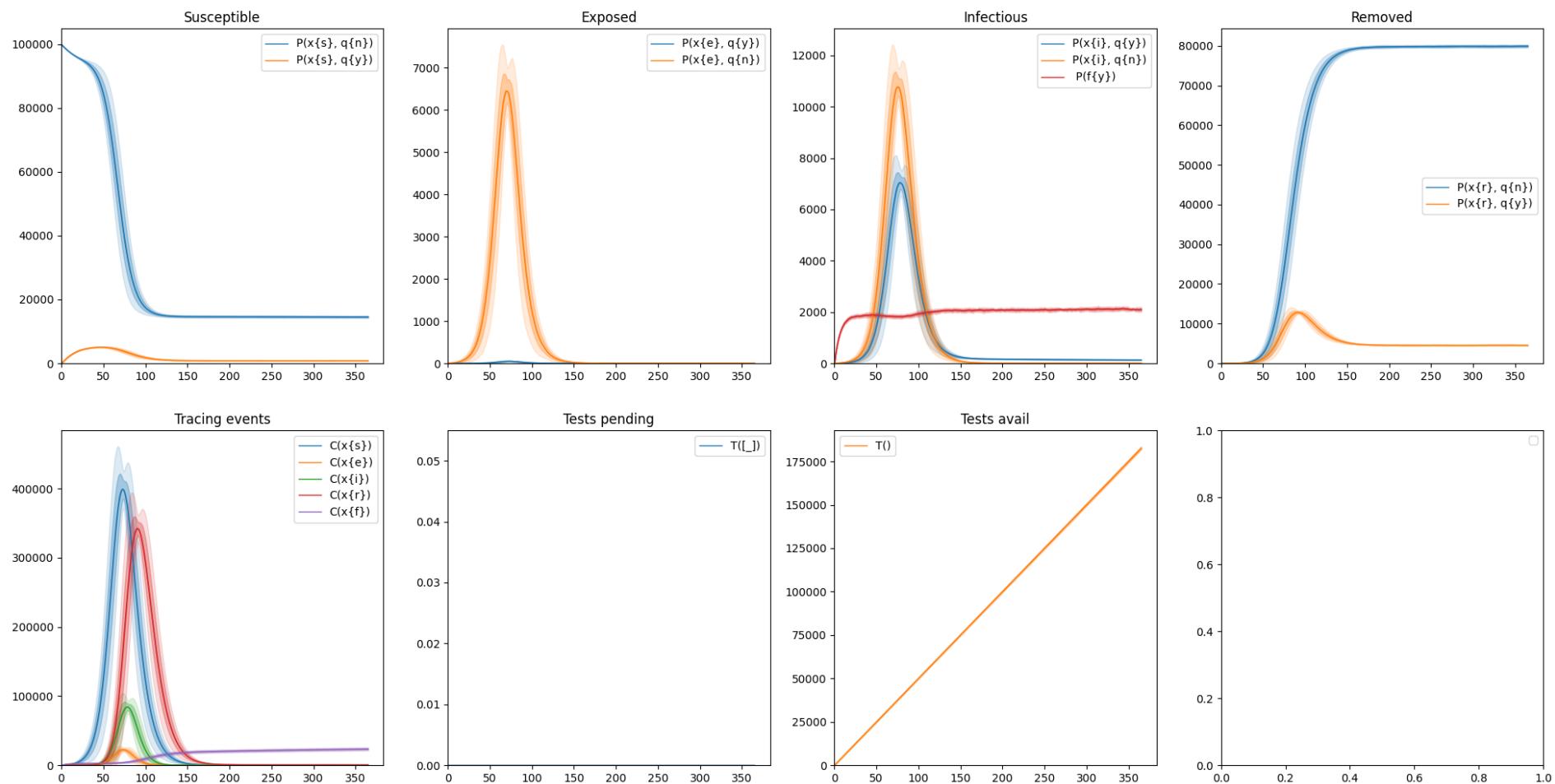
case: 86 INIT\_I: 10.0 k\_result: 12.0 m: 10000.0 thetaD: 1.0 thetal: 0.14285714285700002 thetaT: 0.0



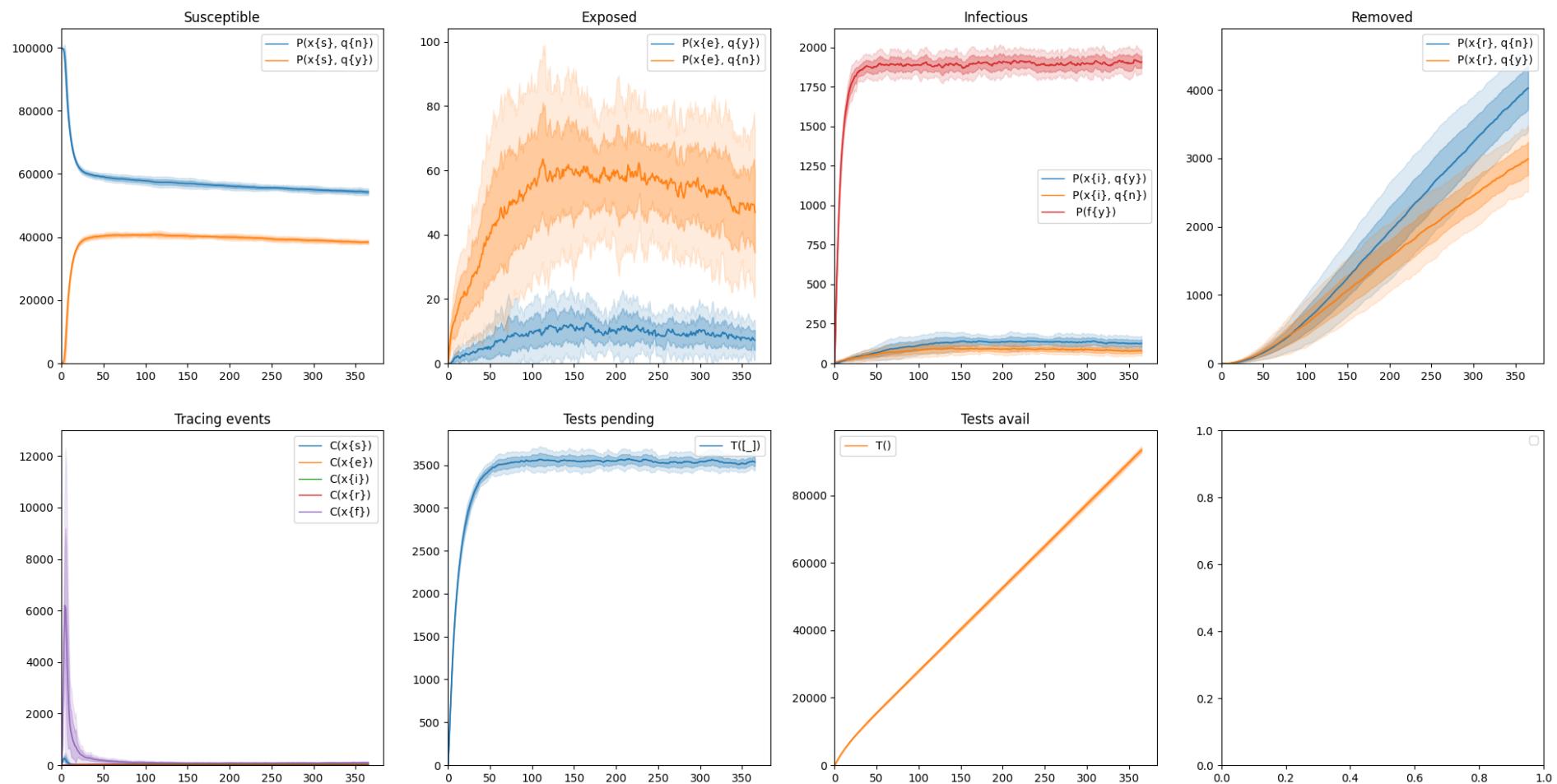
case: 87 INIT\_I: 10.0 k\_result: 12.0 m: 10000.0 thetaD: 1.0 thetal: 0.14285714285700002 thetaT: 1.0



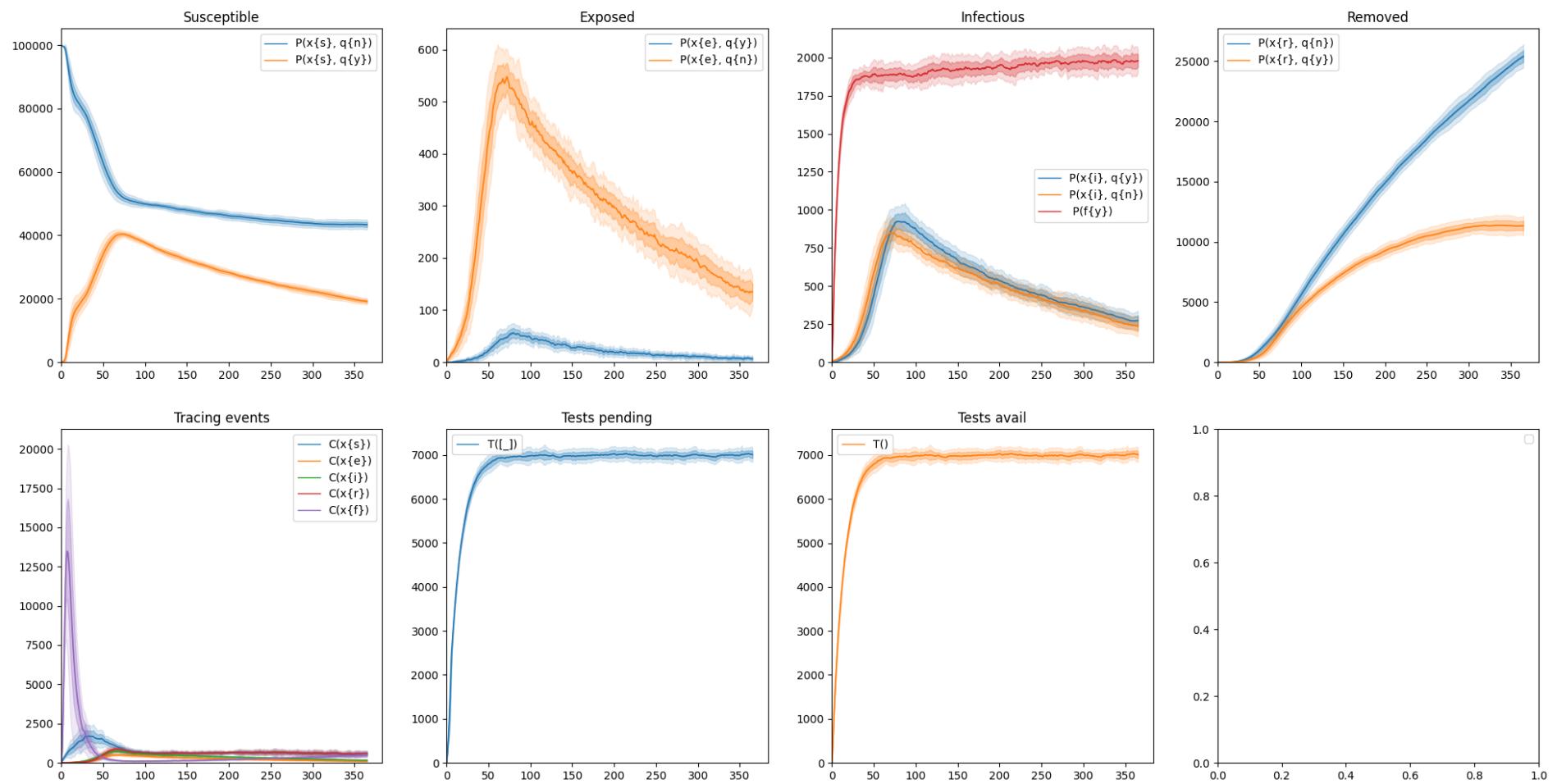
case: 88 INIT\_I: 10.0 k\_result: 12.0 m: 500.0 thetaD: 0.0 thetal: 0.0 thetaT: 0.0



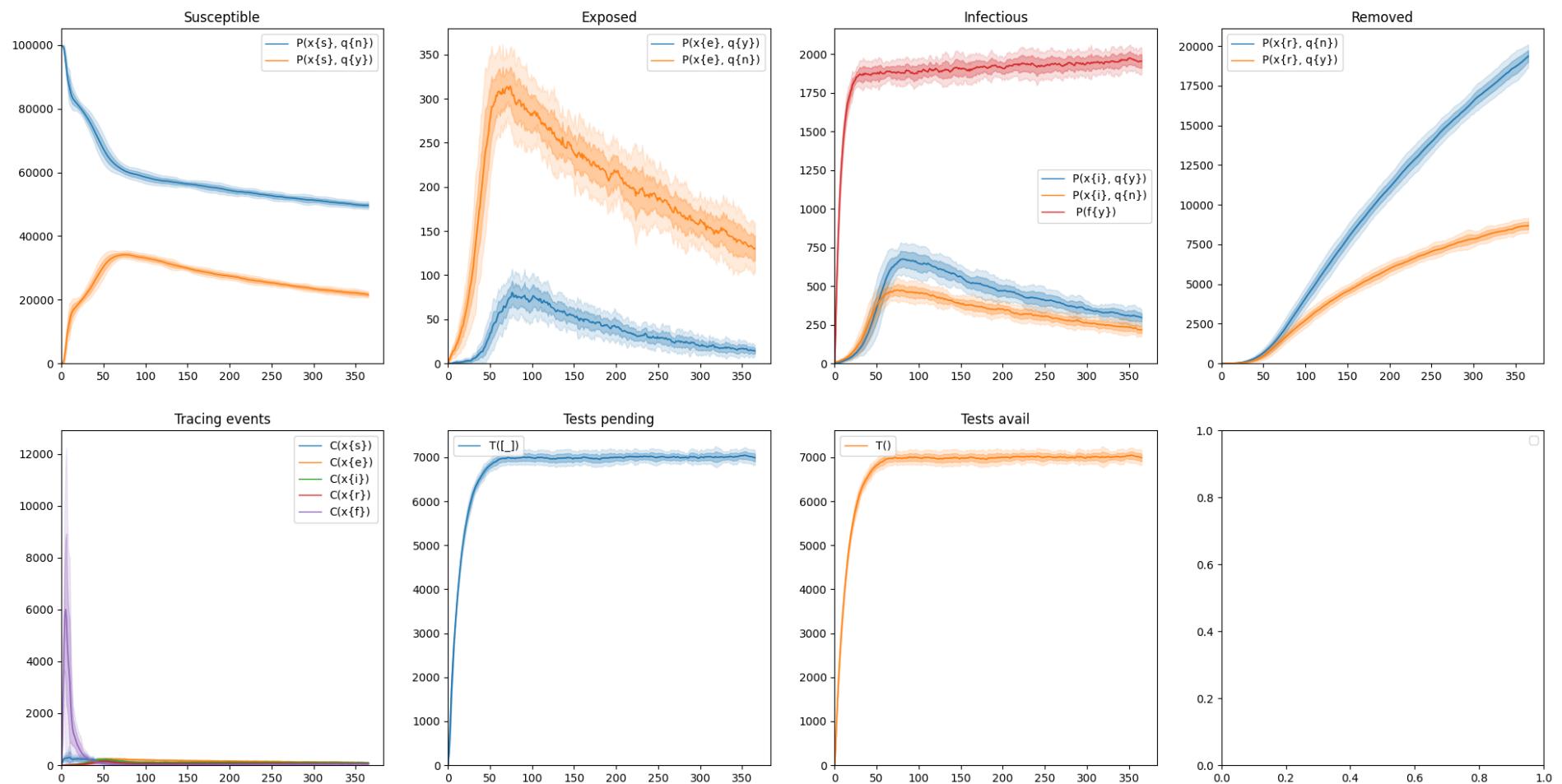
case: 89 INIT\_I: 10.0 k\_result: 12.0 m: 500.0 thetaD: 0.0 thetal: 0.0 thetaT: 1.0



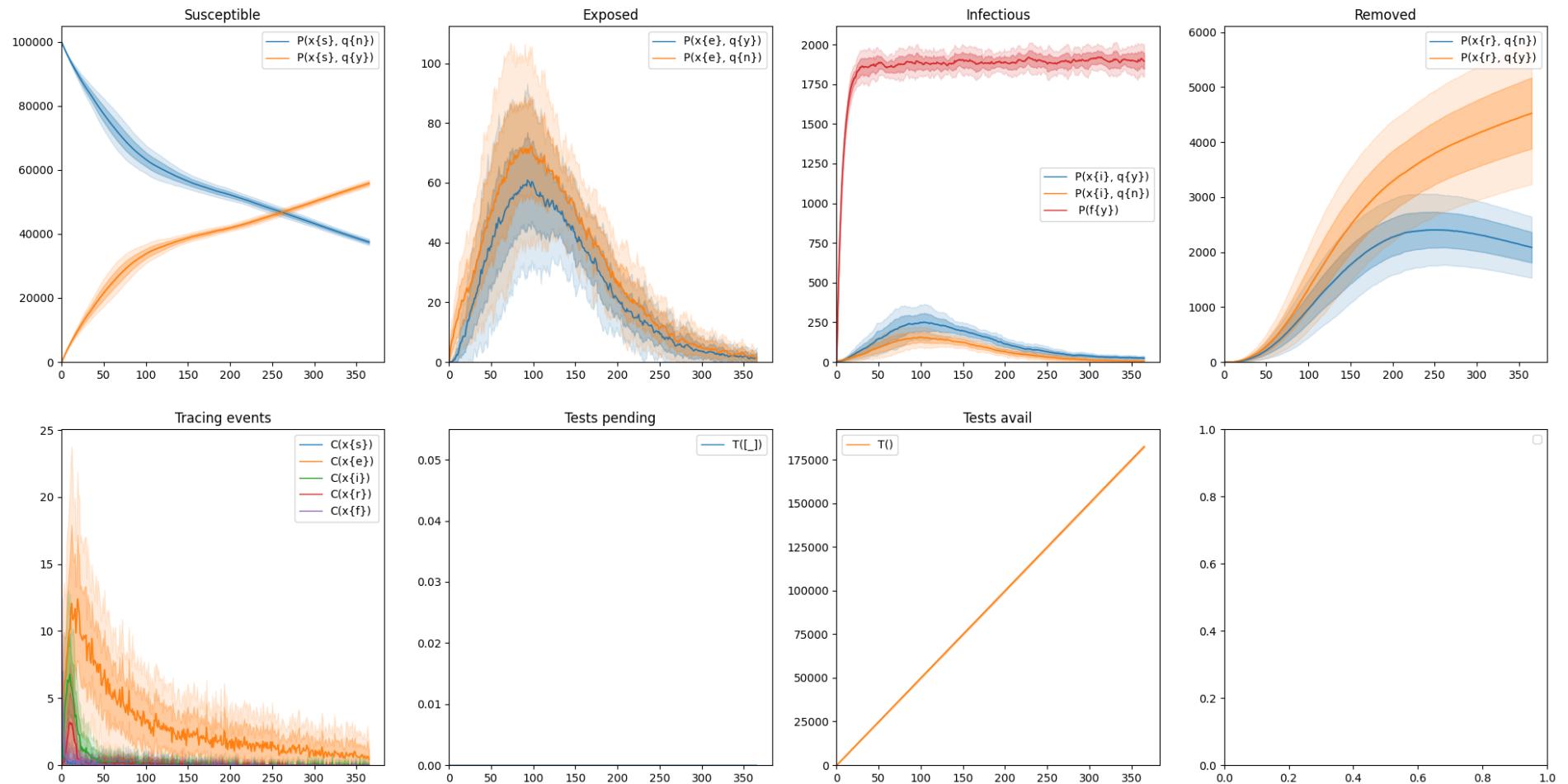
case: 90 INIT\_I: 10.0 k\_result: 12.0 m: 500.0 thetaD: 0.0 thetal: 0.1428571428570002 thetaT: 0.0



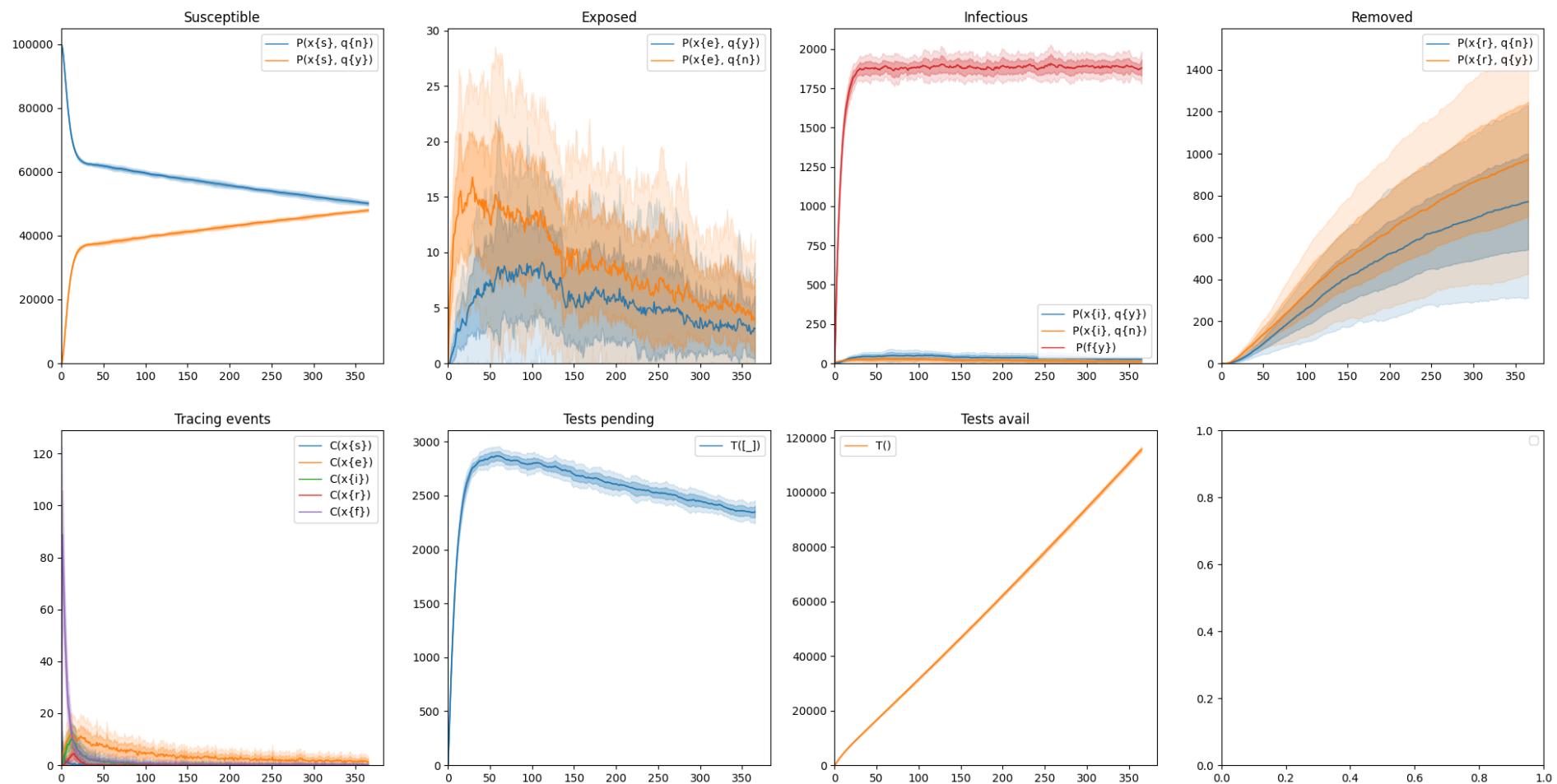
case: 91 INIT\_I: 10.0 k\_result: 12.0 m: 500.0 thetaD: 0.0 thetal: 0.1428571428570002 thetaT: 1.0



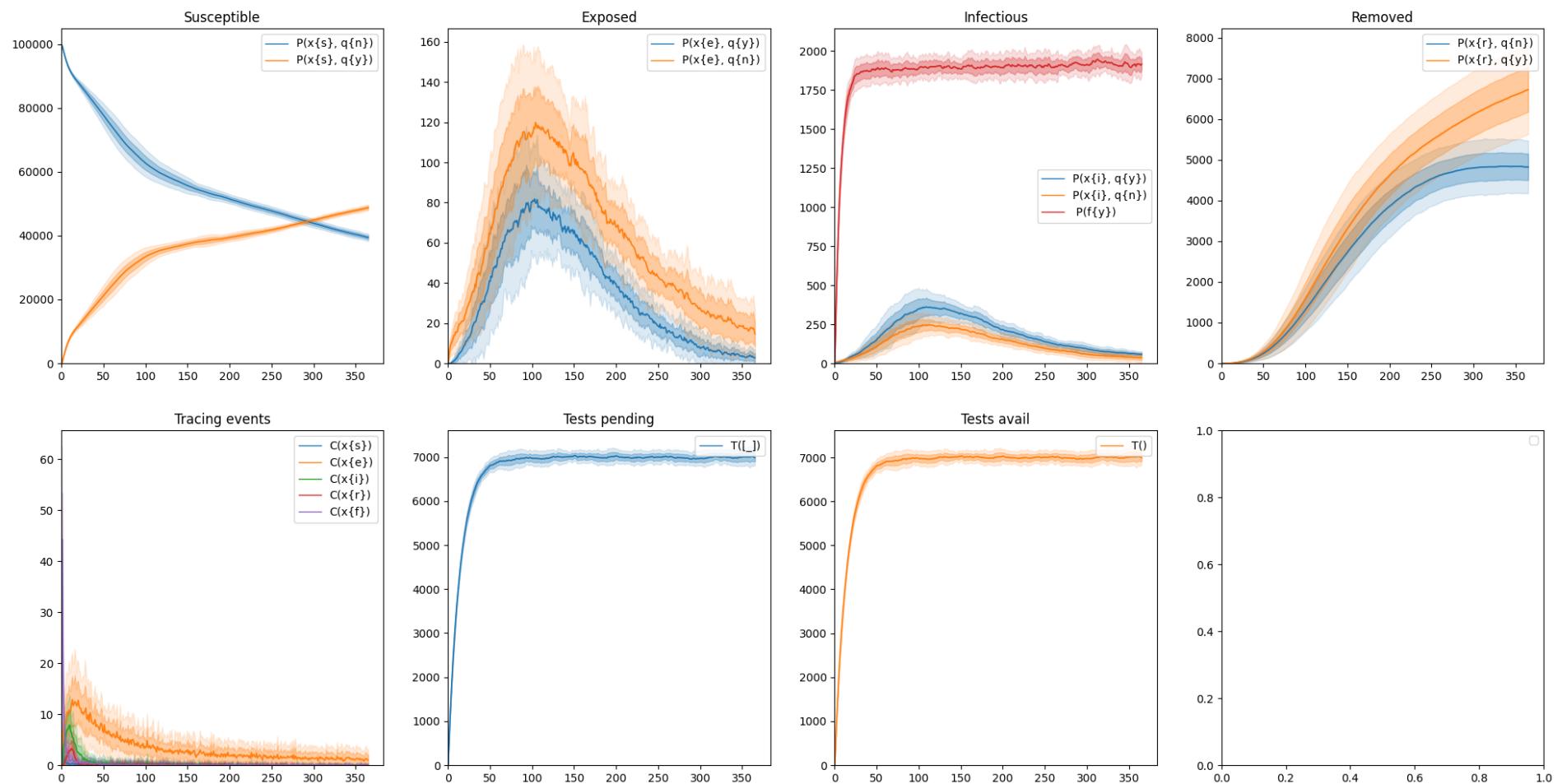
case: 92 INIT\_I: 10.0 k\_result: 12.0 m: 500.0 thetaD: 1.0 thetal: 0.0 thetaT: 0.0



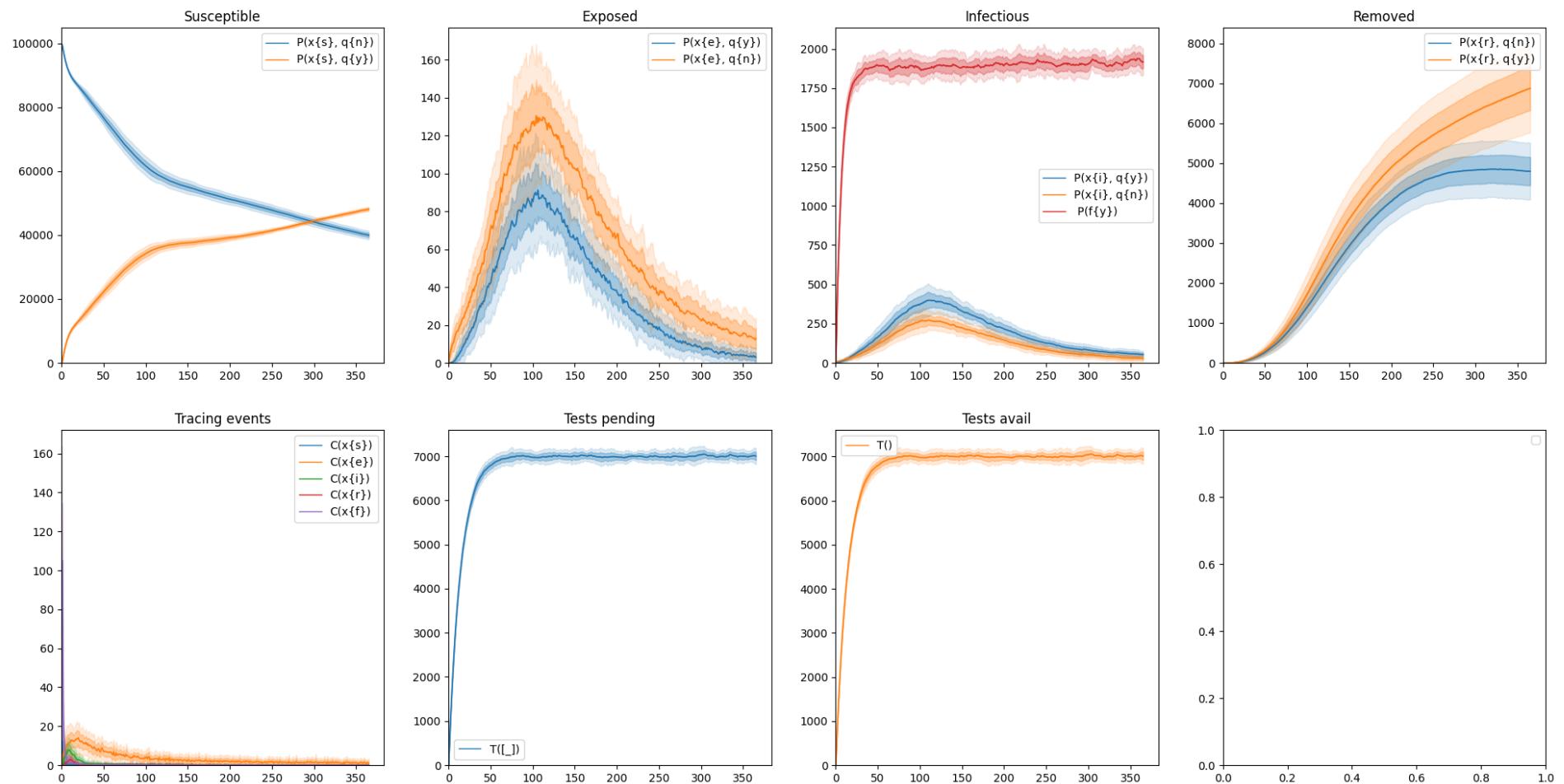
case: 93 INIT\_I: 10.0 k\_result: 12.0 m: 500.0 thetaD: 1.0 thetal: 0.0 thetaT: 1.0



case: 94 INIT\_I: 10.0 k\_result: 12.0 m: 500.0 thetaD: 1.0 thetal: 0.1428571428570002 thetaT: 0.0



case: 95 INIT\_I: 10.0 k\_result: 12.0 m: 500.0 thetaD: 1.0 thetal: 0.1428571428570002 thetaT: 1.0



```

1 /////
2 // Constants of the simulation
3 /////
4 %var: N      1000      // total population
5 %var: beta   0.034     // probability of infection from contact
6 %var: c      13        // contact rate
7 %var: k_pro  1.0/3     // progression from exposed to prodromic
8 %var: k_inf  1.0/2     // progression from prodromic to full disease
9 %var: p_asym 0.5       // probability of being asymptomatic
10 %var: k_rem  1.0/7    // removal by recovery or death
11 %var: k_iso   12       // rate of isolation -- within 2 hours
12 %var: k_exit  1.0/14   // rate of leaving isolation
13 %var: k_retest 1.0/14 // rate of allowing retesting
14 %var: k_result 1.0    // time to get test result
15 %var: k_flu   1.0/365  // rate of getting the flu, once per year
16 %var: d_flu   7        // duration of flu
17 %var: p_flu   d_flu*k_flu // prevalence of flu
18 %var: thetaT  1.0/3     // rate of kit testing in population
19 %var: thetaD  1.0/3     // rate of clinical diagnosis
20 %var: thetaI  1.0/7     // rate of testing of isolated population
21 %var: theta  thetaD + thetaI + thetaT - thetaD*thetaI - thetaD*thetaT - thetaI*thetaT + thetaD*thetaI*thetaT
22 %var: m      0.1*N     // rate of manufacturing tests
23 %var: r      1.0        // recall - true positives per positive
24 %var: s      1.0        // specificity - true negatives per negative
25 %var: eta    0.45       // trace 90% of contacts in two days
26
27
28 /////
29 // Agents, or participants in the simulation
30 /////
31
32 // individuals have several internal states:

```

```

33 // - x corresponds to the standard SEIR compartments
34 // - c covid symptomaticity: prodromic, asymptomatic, symptomatic
35 // - s symptomaticity from covid, cold, flu, etc
36 // - t indicates whether testing should give positive or negative
37 // - r test result, x for untested
38 // - q isolation status
39 // - f infected with the flu, or not
40 %agent: P(x{s e i r} c{p a s} s{y n} t{y n} r{x y n} q{y n} f{y n})
41 // tests are discrete entities and may be scarce, when being used,
42 // they are bound to an individual, and are used or not
43 %agent: T(u{y n})
44 // traces follow the same disease progression as individuals, and flu
45 %agent: C(x{s e i r f})

46
47 //// I. Rules relating to infectious disease infection and progression
48 //// 
49 // 1 - contact rules for unconfined individuals with the covid
50
51 'infection'    P(x{s}, q{n}), P(x{i}, q{n}), . ->
52           P(x{e}, q{n}), P(x{i}, q{n}), C(x{e}) @ beta*c/N
53
54 'lucky'        P(x{s}, q{n}), P(x{i}, q{n}), . ->
55           P(x{s}, q{n}), P(x{i}, q{n}), C(x{s}) @ (1-beta)*c/N
56
57 'exposed'      P(x{e}, q{n}), P(x{i}, q{n}), . ->
58           P(x{e}, q{n}), P(x{i}, q{n}), C(x{e}) @ c/N
59
60 'infected'     P(x{i}, q{n}), P(x{i}, q{n}), . ->
61           P(x{i}, q{n}), P(x{i}, q{n}), C(x{i}) @ c/N
62
63 'immune'       P(x{r}, q{n}), P(x{i}, q{n}), . ->
64

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65          P(x{r}, q{n}), P(x{i}, q{n}), C(x{r})  @ c/N
66
67 'flu'      P(q{n}), P(f{y}, q{n}), . ->
68          P(q{n}), P(f{y}, q{n}), C(x{f})        @ c/N
69
70 // 2 - progression of individuals to infectiousness. exposed individuals
71 //      become infectious, at first prodromic, and should test positively
72 'prog_pro'  P(x{e/i}, c{#/p} t{n/y})  @ k_pro
73
74 // 3 - progression to asymptomatic for a fraction of prodromic individuals
75 'prog_asym' P(x{i}, c{p/a}) @ k_inf*p_asym
76 // 4 - progression to symptomatic for the remainder
77 'prog_sym'  P(x{i}, c{p/s}, s{#/y}) @ k_inf*(1-p_asym)
78
79 // 5 - removal of asymptomatic individuals, no longer test positively
80 'rem_asym'  P(x{i/r}, c{a}, t{y/n}) @ k_rem
81 // 6 - removal of symptomatic individuals, no longer test positively
82 'rem_sym'   P(x{i/r}, c{s}, t{y/n}, s{y/n}) @ k_rem
83
84 // 7 - development and clearing of endemic flu symptoms
85 'flu_dev'    P(f{n}, s{n}) <-> P(f{y}, s{y}) @ k_flu, 1/d_flu
86
87 /////
88 // II. Rules relating to testing
89 /////
90
91 // manufacturing and disposal of tests
92 'manufacturing' . -> T(u[.]{n}) @ m
93 'disposal'     T(u[.]{y}) -> . @ m
94
95 // 1 - clinically diagnose those symptomatic
96 'clinical'    P(s{y}, r{x/y}) @ thetaD

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97
98 // 2 - test those in the population not isolated who are symptomatic
99 'symptomatic' P(s{y}, q{n}, r{x}, t[.]), T(u[.]{n}) -> P(s{y}, q{n}, r{x}, t[1]), T(u[1]{y}) @ thetaT
100
101 // 3 - test those who have been isolated and are untested
102 'isolated' P(q{y}, r{x}, t[.]), T(u[.]{n}) -> P(q{y}, r{x}, t[1]), T(u[1]{y}) @ thetaI
103
104 // 4 - test results, true negatives and positives
105 'test_tp' P(t[_]{y}, r{x/y}) @ r*k_result
106 'test_fn' P(t[_]{y}, r{x/n}) @ (1-r)*k_result
107 'test_tn' P(t[_]{n}, r{x/n}) @ s*k_result
108 'test_fp' P(t[_]{n}, r{x/y}) @ (1-s)*k_result
109
110 // 5 - allow for retesting after a time, release the test
111 'retest' P(t[1/.], r{#/x}), T(u[1/ .]) @ k_retest
112
113 //// III. Rules relating to isolation
114 //// 1 - self-isolate because of symptoms
115 //// 2 - isolate because of test
116
117 // 1 - self-isolate because of symptoms
118 'iso_sym' P(s{y}, q{n/y}) @ k_iso
119
120 // 2 - isolate because of test
121 'iso_test' P(r{y}, q{n/y}) @ k_iso
122
123 // 3 - rapidly exit from isolation on a negative test
124 'exit_test' P(r{n}, q{y/n}) @ k_iso
125
126 // 4 - exit from isolation if no symptoms
127 'exit_s' P(x{s}, q{y/n}) @ k_exit
128 'exit_e' P(x{e}, q{y/n}) @ k_exit

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129 'exit_ip'    P(x{i}, c{p}, r{n}, q{y/n}) @ k_exit // prodromic
130 'exit_ia'    P(x{i}, c{a}, r{n}, q{y/n}) @ k_exit // asymptomatic
131 'exit_ipx'   P(x{i}, c{p}, r{x}, q{y/n}) @ k_exit // prodromic
132 'exit_iax'   P(x{i}, c{a}, r{x}, q{y/n}) @ k_exit // asymptomatic
133 'exit_r'     P(x{r}, q{y/n})             @ k_exit
134
135 /////
136 // IV. Rules relating to tracing
137 /////
138
139 // 1. progression of traces parallel to individuals wthout
140 //      distinguishing severity
141 'c_progression' C(x{e/i}) @ k_pro
142 'c_removal'     C(x{i/r}) @ 1.0/(1.0/k_inf + 1.0/k_rem)
143 'c_degradation' C() -> . @ k_rem
144
145 // 2. trace those who have had contact with positive
146 //      tested individuals
147 'trace_s'      P(x{s}, q{#}), P(r{y}), C(x{s}) ->
148                  P(x{s}, q{y}), P(r{y}), .          @ eta*theta/N
149 'trace_e'      P(x{e}, q{#}), P(r{y}), C(x{e}) ->
150                  P(x{e}, q{y}), P(r{y}), .          @ eta*theta/N
151 'trace_i'      P(x{i}, q{#}), P(r{y}), C(x{i}) ->
152                  P(x{i}, q{y}), P(r{y}), .          @ eta*theta/N
153 'trace_r'      P(x{r}, q{#}), P(r{y}), C(x{r}) ->
154                  P(x{r}, q{y}), P(r{y}), .          @ eta*theta/N
155
156 // 3. trace those who have had contact with flu case
157 'trace_f'      P(q{#}), P(r{y}), C(x{f}) ->
158                  P(q{y}), P(r{y}), .            @ eta*theta/N
159
160 /////

```

```
161 ///// Observables, or things that we want to know from the simulation
162 /////
163 %obs: Sn    |P(x{s}, q{n})|
164 %obs: En    |P(x{e}, q{n})|
165 %obs: In    |P(x{i}, q{n})|
166 %obs: Rn    |P(x{r}, q{n})|
167 %obs: Sy    |P(x{s}, q{y})|
168 %obs: Ey    |P(x{e}, q{y})|
169 %obs: Iy    |P(x{i}, q{y})|
170 %obs: Ry    |P(x{r}, q{y})|
171 %obs: F     |P(f{y})|
172 %obs: Cs    |C(x{s})|
173 %obs: Ce    |C(x{e})|
174 %obs: Ci    |C(x{i})|
175 %obs: Cr    |C(x{r})|
176 %obs: Cf    |C(x{f})|
177 %obs: T     |T()|
178 %obs: Tbusy |T(u[_])|
179
180 // initially infectious
181 %var: INIT_I 0.005*N
182 // initially susceptible
183 %var: INIT_S N - INIT_I
184
185 %init: INIT_I P(x{i}, c{p}, s{n}, t{n}, r{x}, q{n}, f{n})
186 %init: INIT_S P(x{s}, c{p}, s{n}, t{n}, r{x}, q{n}, f{n})
```