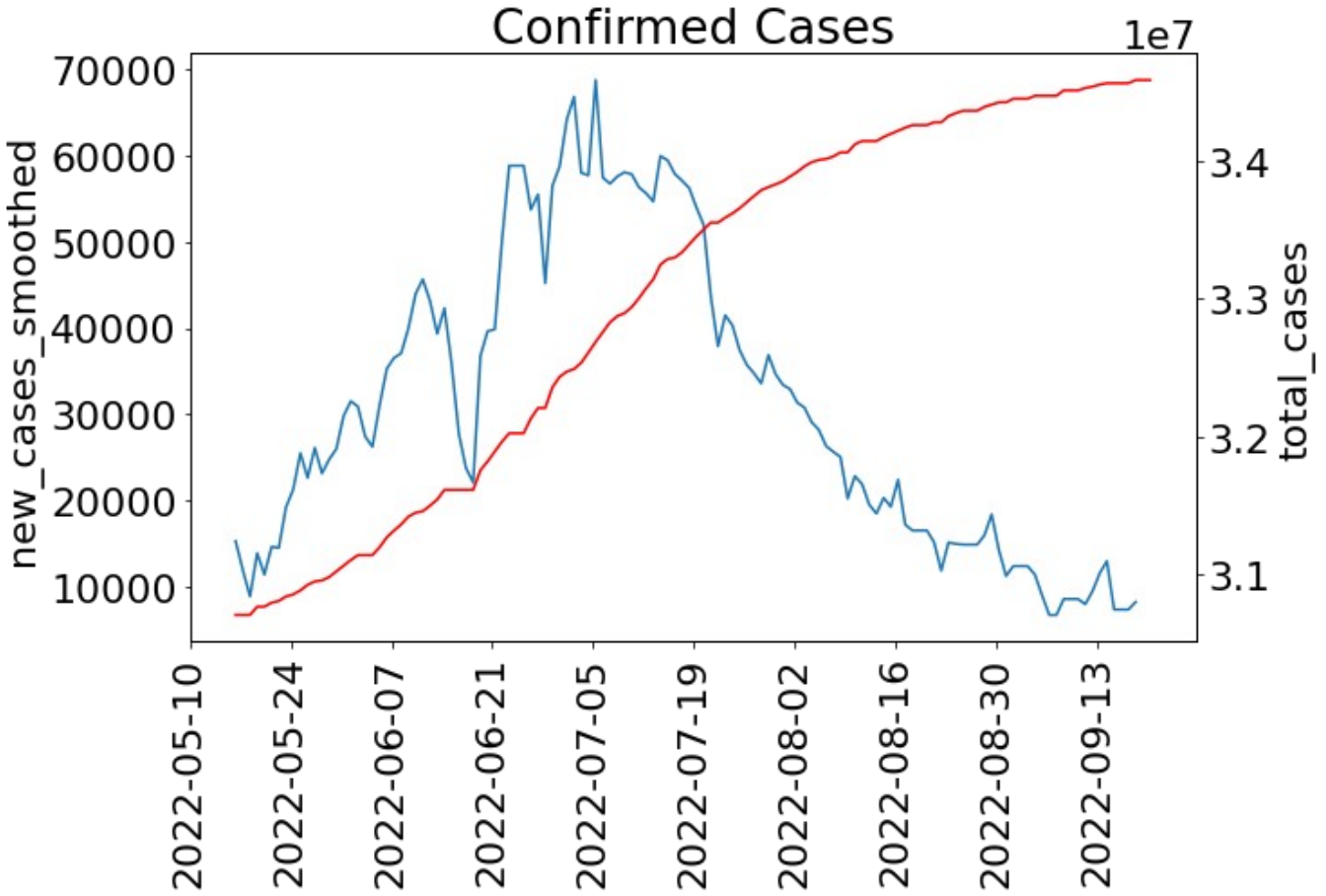
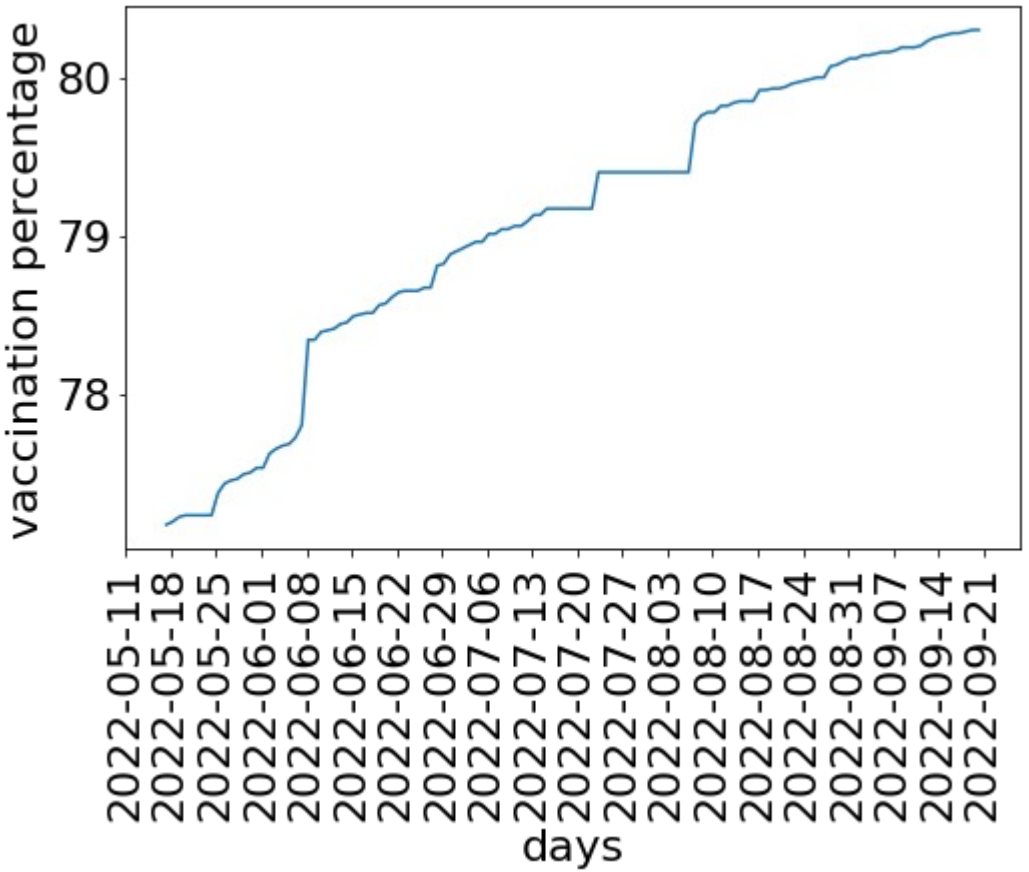
Covid 19 Model

2022-9-22

Confirmed Cased

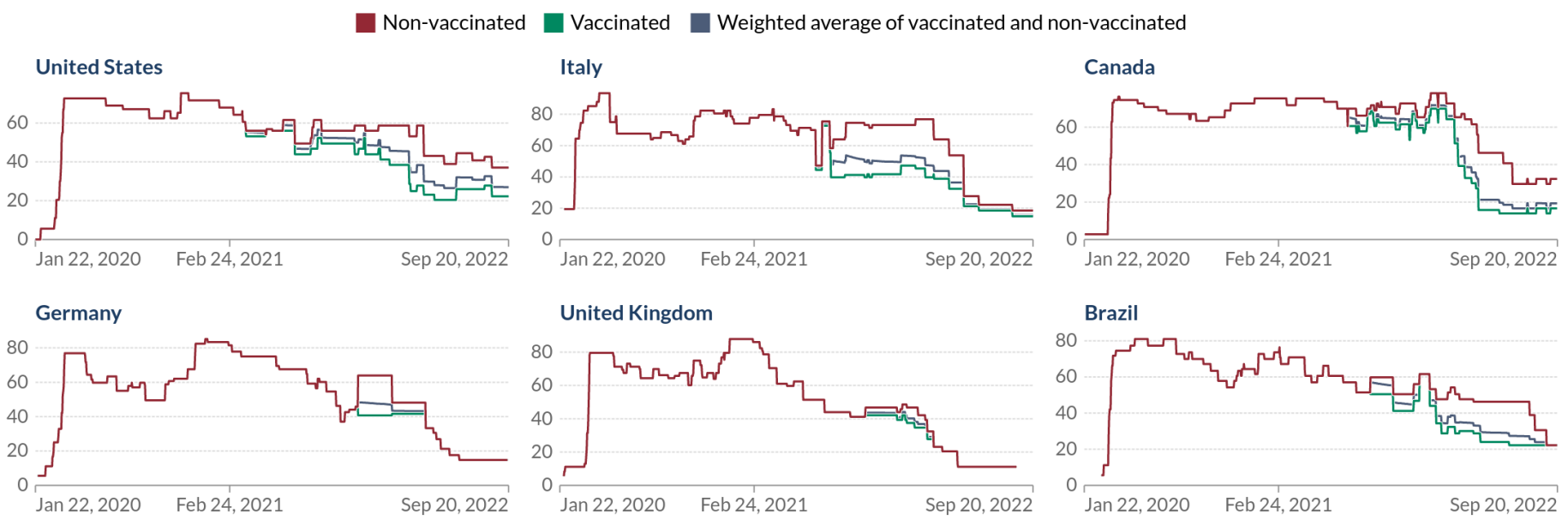


Vaccination



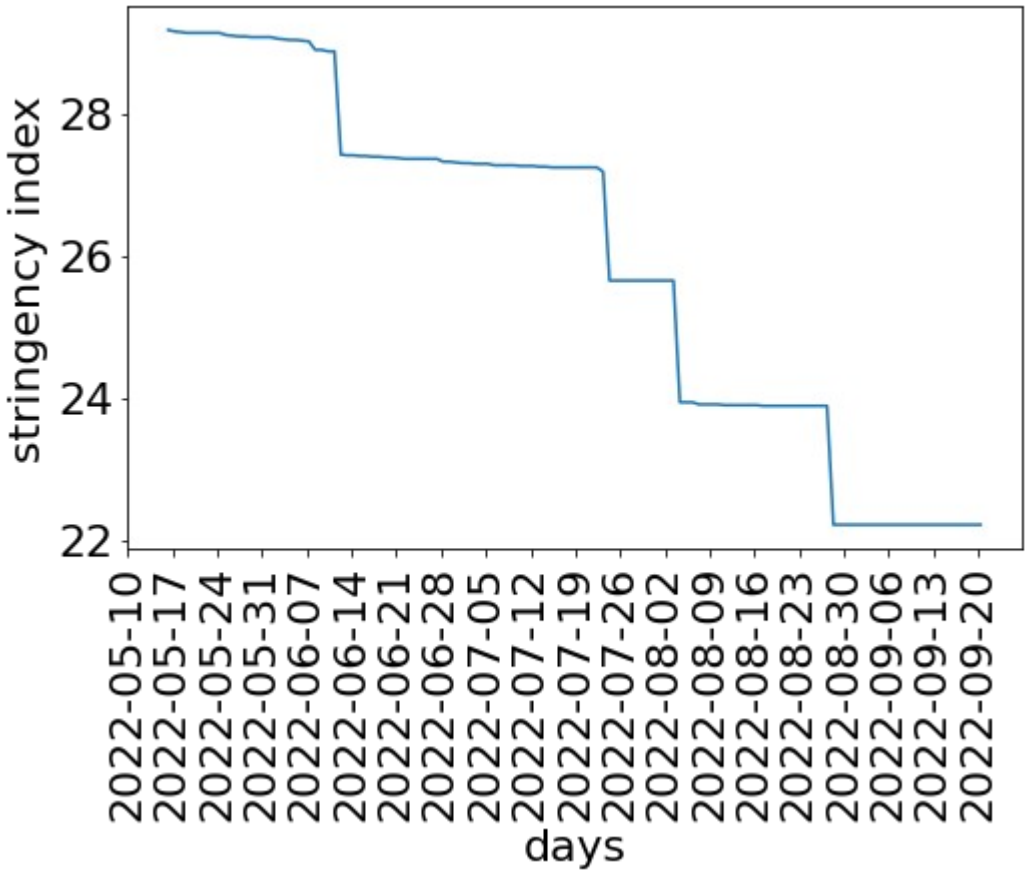
Stringency Index

- The stringency index is a composite measure based on nine response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest).

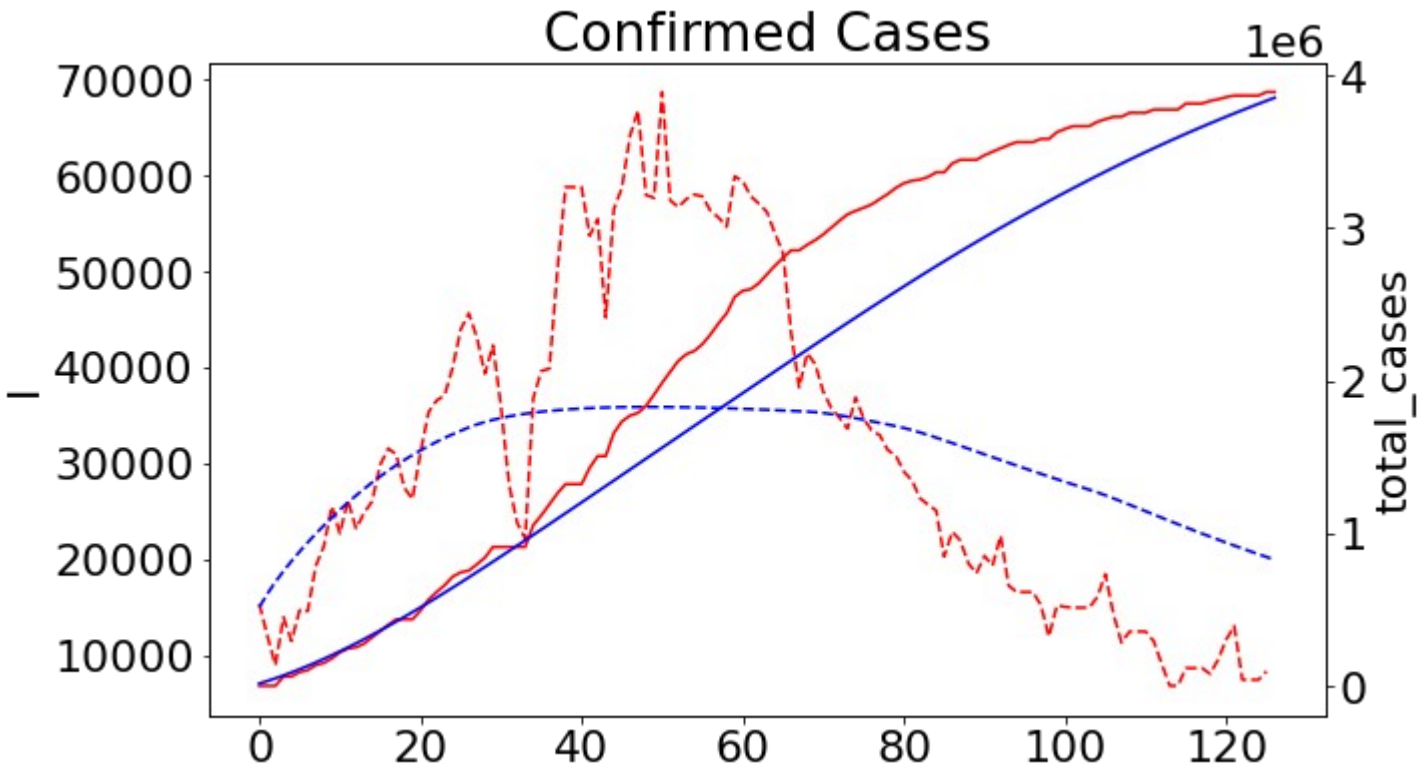


Source: Hale, T., Angrist, N., Goldszmidt, R. et al. A global panel database of pandemic policies (Oxford COVID-19 Government Response Tracker). Nat Hum Behav 5, 529–538 (2021). https://doi.org/10.1038/s41562-021-01079-8

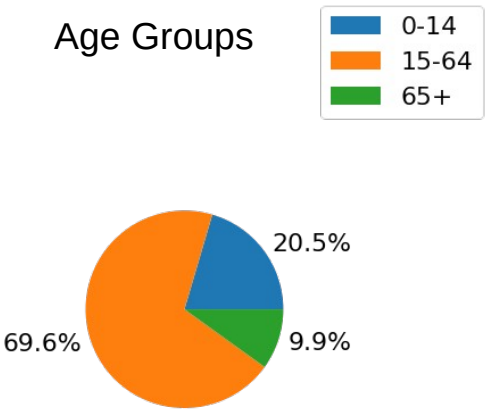
Stringency index



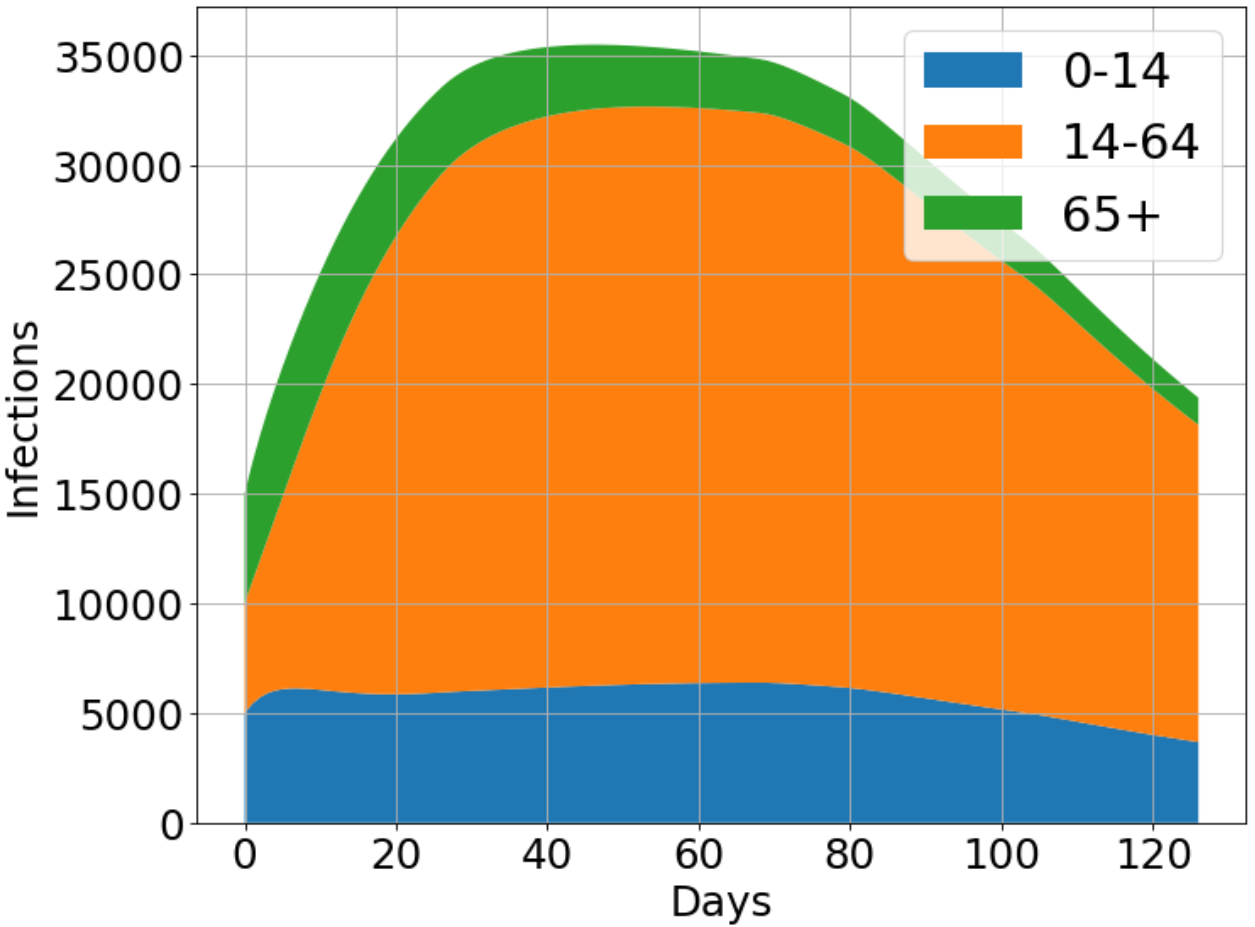
Simulation



beta : 0.0795,
sigma : 1/5,
gamma : 1/10,
theta' : 0.6(有效免疫率)



Simulation


35000
30000
25000
20000
15000
10000
5000
0
Infections
0
20
40
60
80
100
120
Days
0-14
14-64
65+

Inference

Inferred parameters:
Optimal value (local minimisation):
 Logp: 717.9336263012722
'beta': 0.07999984741709554,
'gammaE': 0.1997210783638968,
'gammaI': 0.10123728173062965,

```
priors = {
    'beta':{
        'mean': 0.0795,
        'std': 0.2,
        'bounds': [eps, 0.8],
        'prior_fun': 'truncnorm'
    },
    'gammaE':{
        'mean': 0.2,
        'std': 0.1,
        'bounds': [eps, 0.2],
        'prior_fun': 'lognorm'
    },
    'gammaI':{
        'mean': 0.1,
        'std': 0.2,
        'bounds': [eps, 0.6]
    }
}
```

```
Starting global minimisation ...
(16_w,32)-aCMA-ES (mu_w=9.2,w_1=19%) in dimension 3 (seed=161106858, Fri Sep 23 22:45:11 2022)
Iterat #Fevals   function value  axis ratio  sigma  min&max std  t[m:s]
    1     32 2.331766121302369e+04 1.0e+00 8.86e-01  6e-02  2e-01 0:01.5
    2     64 2.641110738158215e+03 1.3e+00 7.54e-01  5e-02  1e-01 0:02.7
    3     96 1.708442949766261e+03 1.4e+00 6.71e-01  4e-02  9e-02 0:03.8
    6    192 2.097045196085140e+03 2.5e+00 6.58e-01  4e-02  6e-02 0:07.2
   10    320 1.214952232041536e+03 9.7e+00 3.95e-01  8e-03  3e-02 0:11.6
   15    480 8.513593492889757e+02 2.6e+01 1.99e-01  1e-03  1e-02 0:17.3
Global optimisation: Maximum number of iterations reached.
Optimal value (global minimisation):  743.8419424051965
Starting local minimisation...
Optimal value (local minimisation):  717.9336263012722
{'beta': 0.07999984741709554, 'gammaE': 0.1997210783638968, 'gammaI': 0.10123728173062965, 'beta*thetaS': array([0.0
477, 0.0477, 0.0477]), 'beta*thetaI': array([0.0477, 0.0477, 0.0477]), 'beta*thetaS*thetaI': array([0.02862, 0.0286
2, 0.02862]), 'one': array([1., 1., 1.]), 'vaccination_priority': array([1., 1., 1.]), 'vaccination_rate': array([7
7.17, 77.17, 77.17])}
28.05906653404236
```