Spatial Analysis Results

2022-08-25

Models 1a-1c: 77 timepoints

- Model 1: Baseline intensity (assumed different) for each location plus two linear time components, beginning on respective intervention dates (school closure and state mandated stay-at-home-order)

  a: Contact intensity between each pair of state borders is assumed to be different (termed distance model)
  b: Contact intensity between each pair of state borders is assumed to be the same (CAR model)
  c: Contact intensity between each pair of state borders is assumed to be different; the number of travelers between two locations (flow) increases with the locations' populations while decreases with the distance between them (gravity model)

Models 2a-2c: 184 timepoints

- Model 2: Baseline intensity (assumed different) for each location plus two linear time components, beginning on respective intervention dates (school closure and state mandated stay-at-home-order) and temporal basis splines of 3 degrees of freedom

  a-c: Same as above

Models 3-4: 153 fitted timepoints, 297 missing/predicted timepoints (total: 450 timepoints)

- Model 3: Baseline intensity (assumed different) for each location, a temporal basis splines of 3 degrees of freedom, the proportion of population vaccinated (at least one vaccine shot) and proportion fully vaccinated (all doses prescribed by the initial vaccination protocol) as recorded on 01/06/2021
- Model 4: Baseline intensity (assumed different) for each location, a temporal trigonometric term, the proportion of population vaccinated (at least one vaccine shot) and proportion fully vaccinated (all doses prescribed by the initial vaccination protocol) as recorded on 01/06/2021

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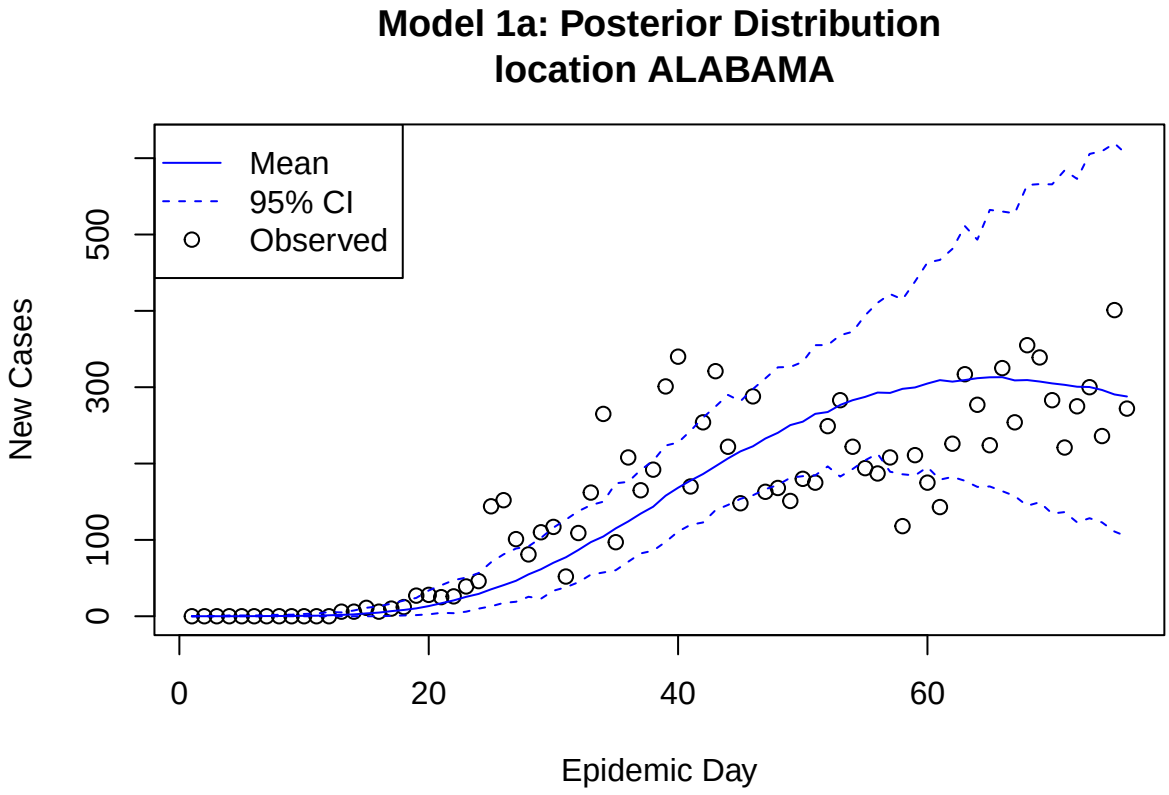
Model 1a: Posterior Distribution
location ALABAMA
Mean
95% CI
Observed
New Cases
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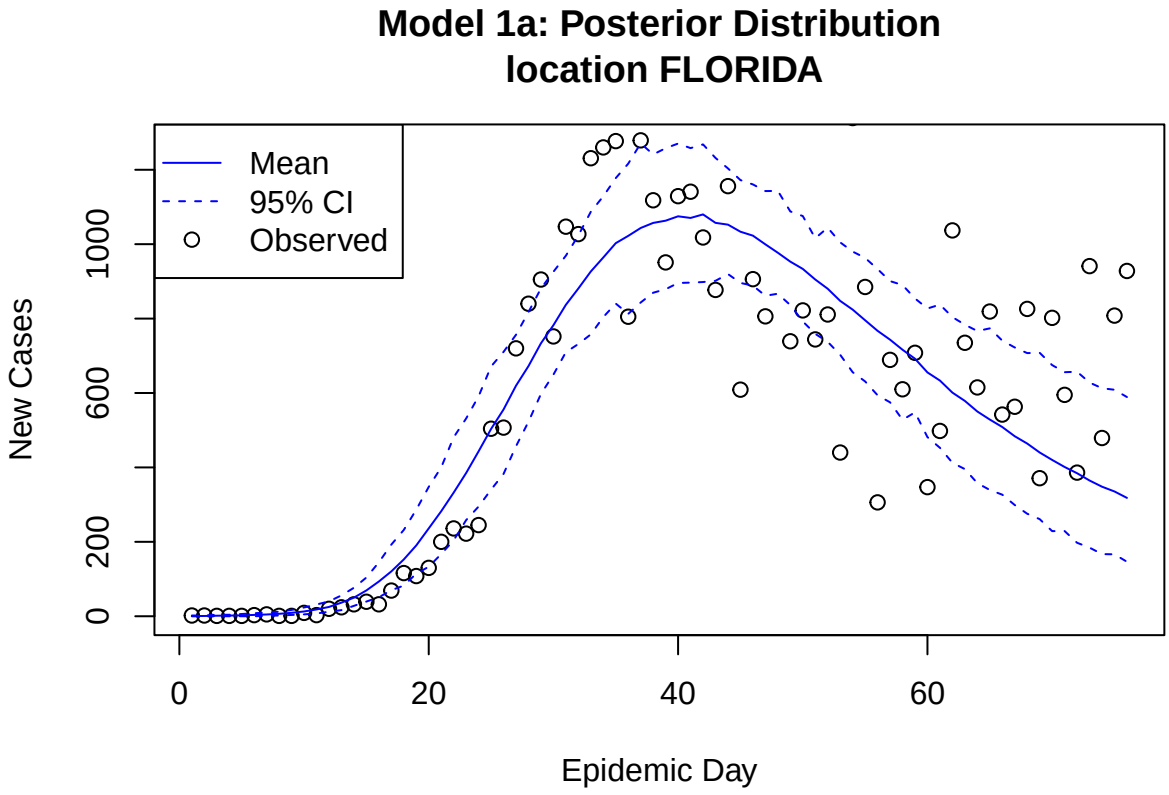
Epidemic Day


Model 1a: Posterior Distribution
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Mean
95% CI
Observed
New Cases
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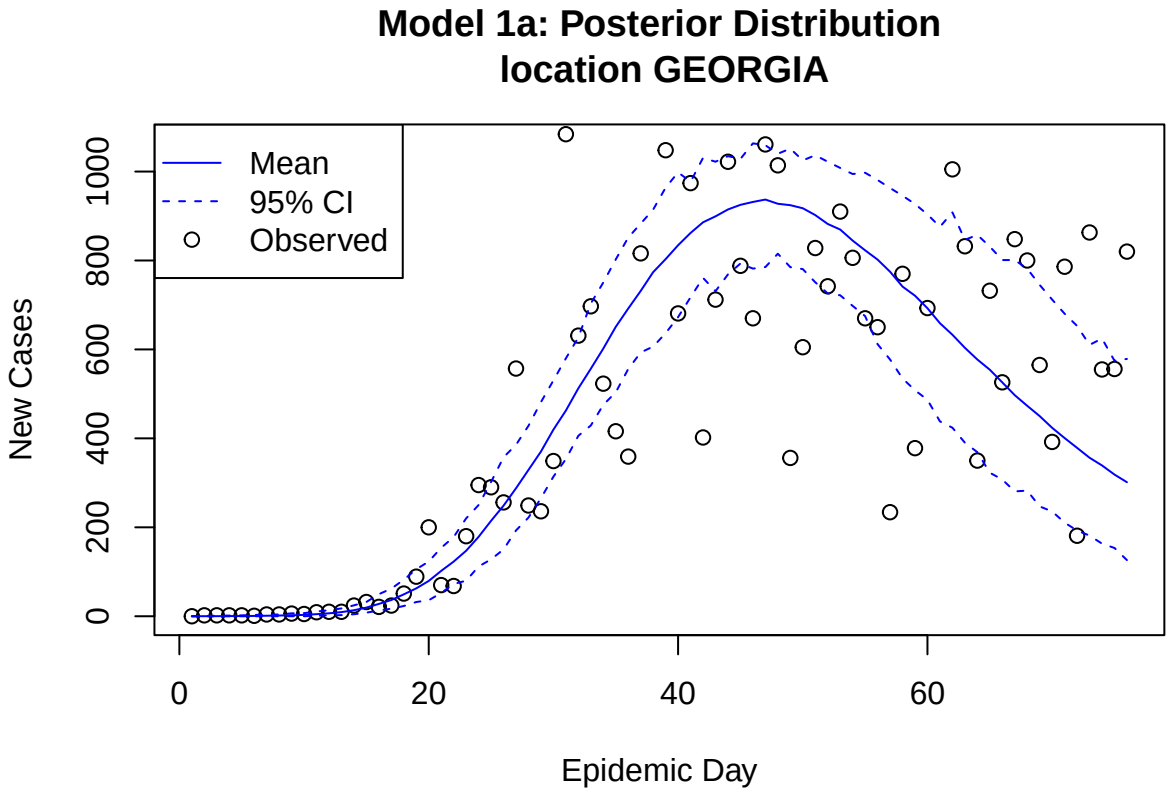
Epidemic Day


Model 1a: Posterior Distribution
location GEORGIA
Mean
95% CI
Observed
New Cases
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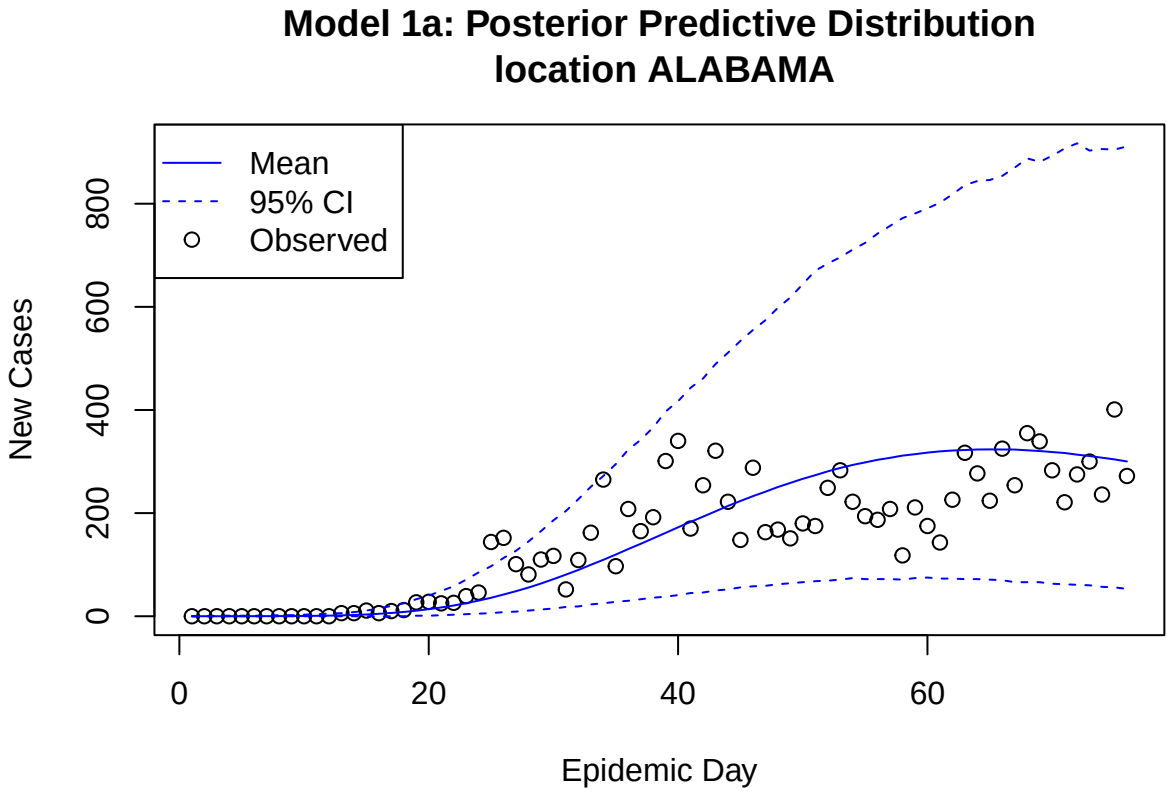
Epidemic Day


Model 1a: Posterior Predictive Distribution
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Mean
95% CI
Observed
New Cases
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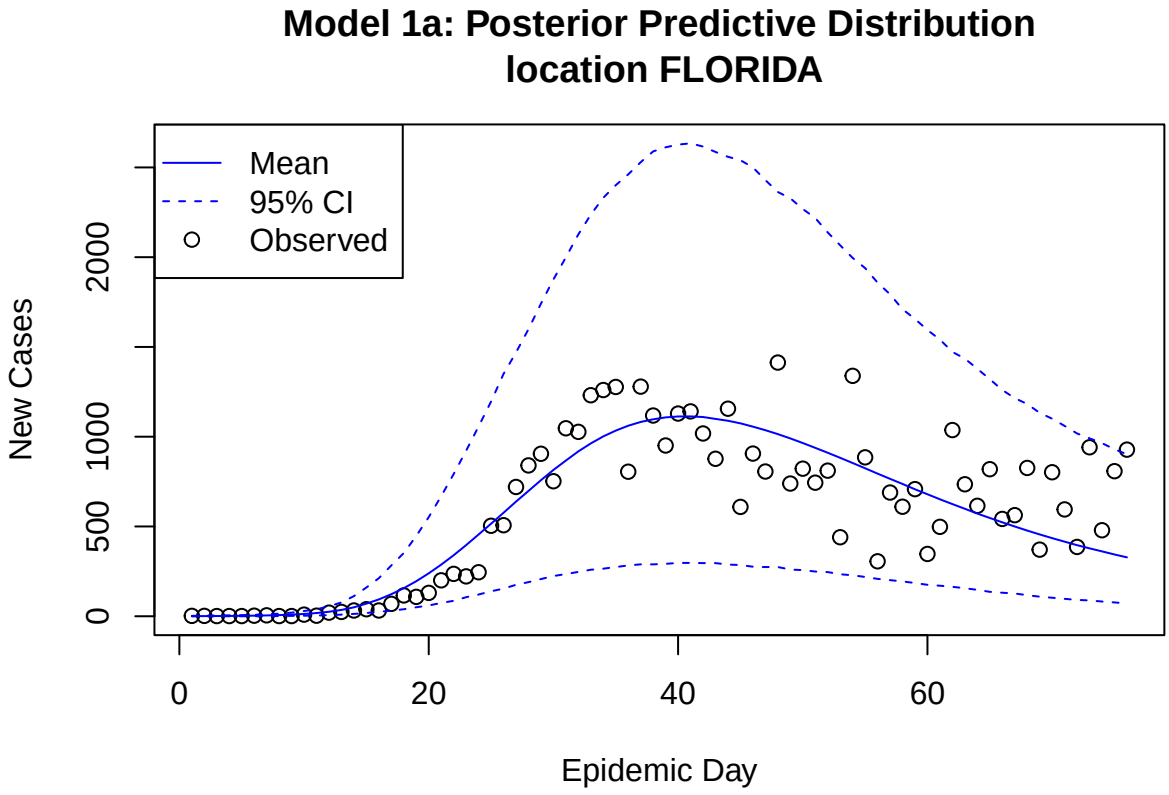
Epidemic Day


Model 1a: Posterior Predictive Distribution
location FLORIDA
Mean
95% CI
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New Cases
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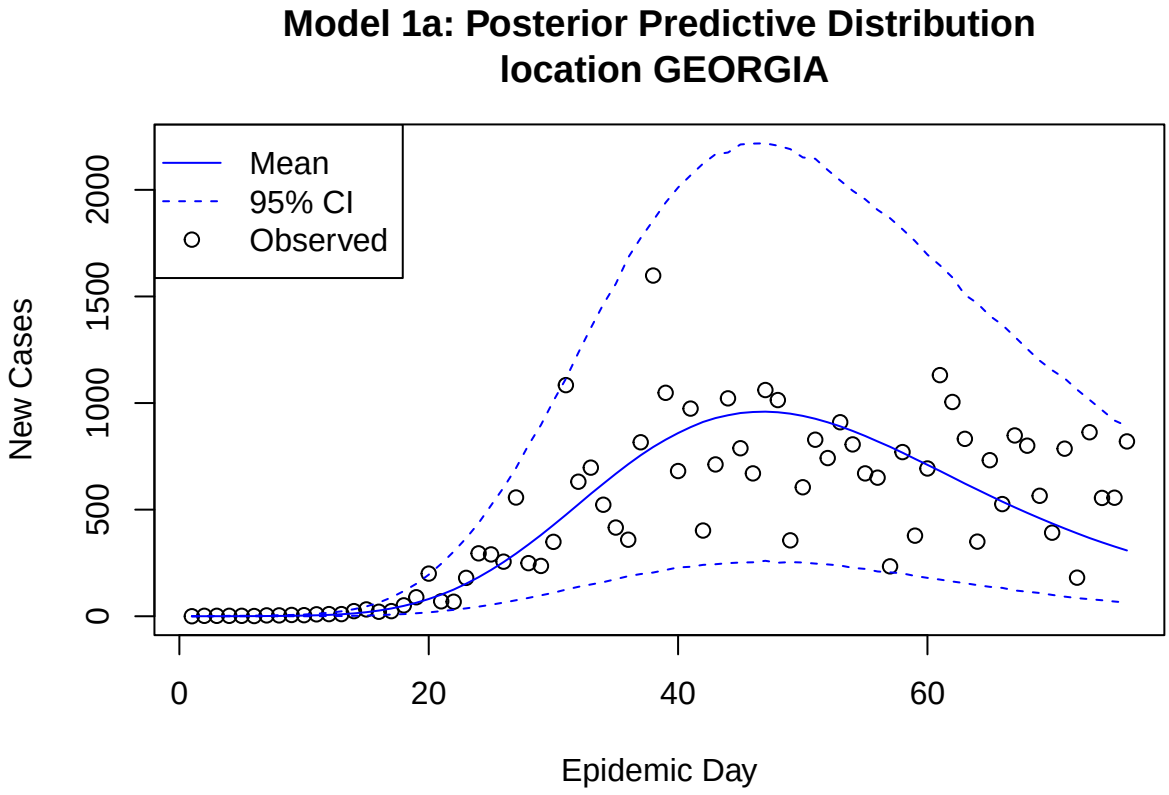
Epidemic Day


Model 1a: Posterior Predictive Distribution
location GEORGIA
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Observed
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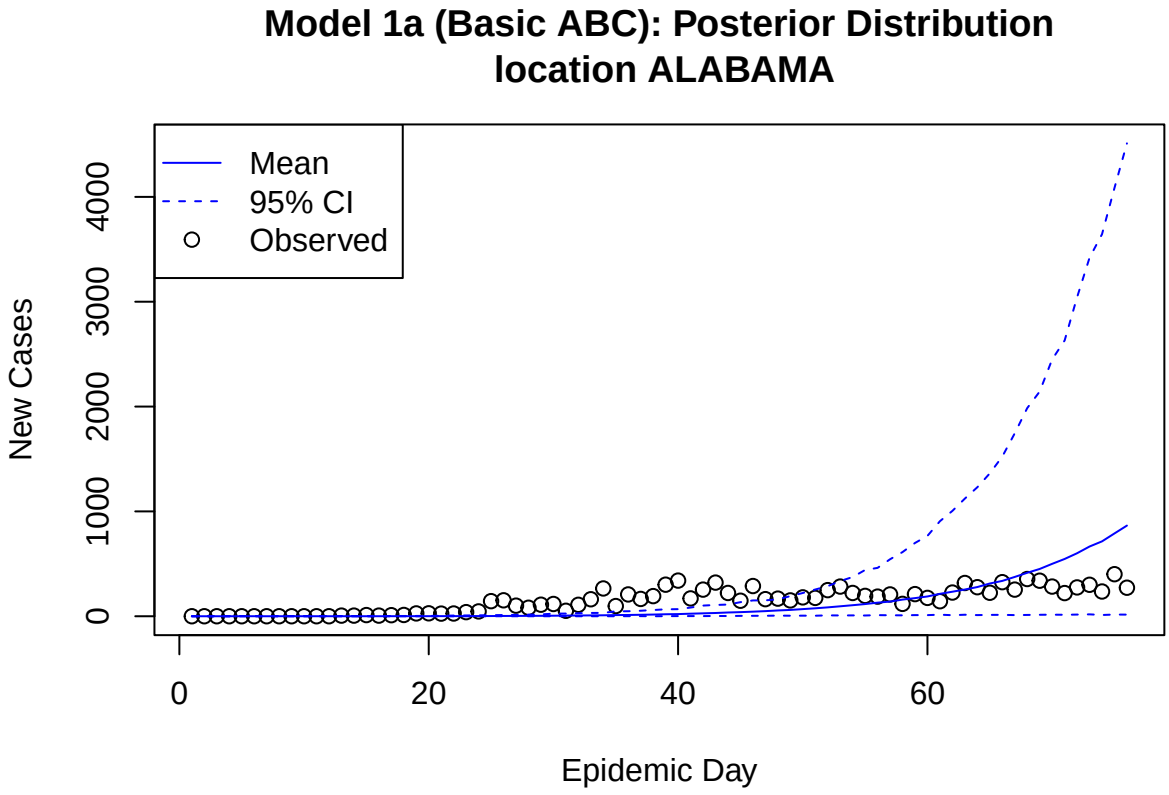
Epidemic Day


Model 1a (Basic ABC): Posterior Distribution
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Mean
95% CI
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New Cases
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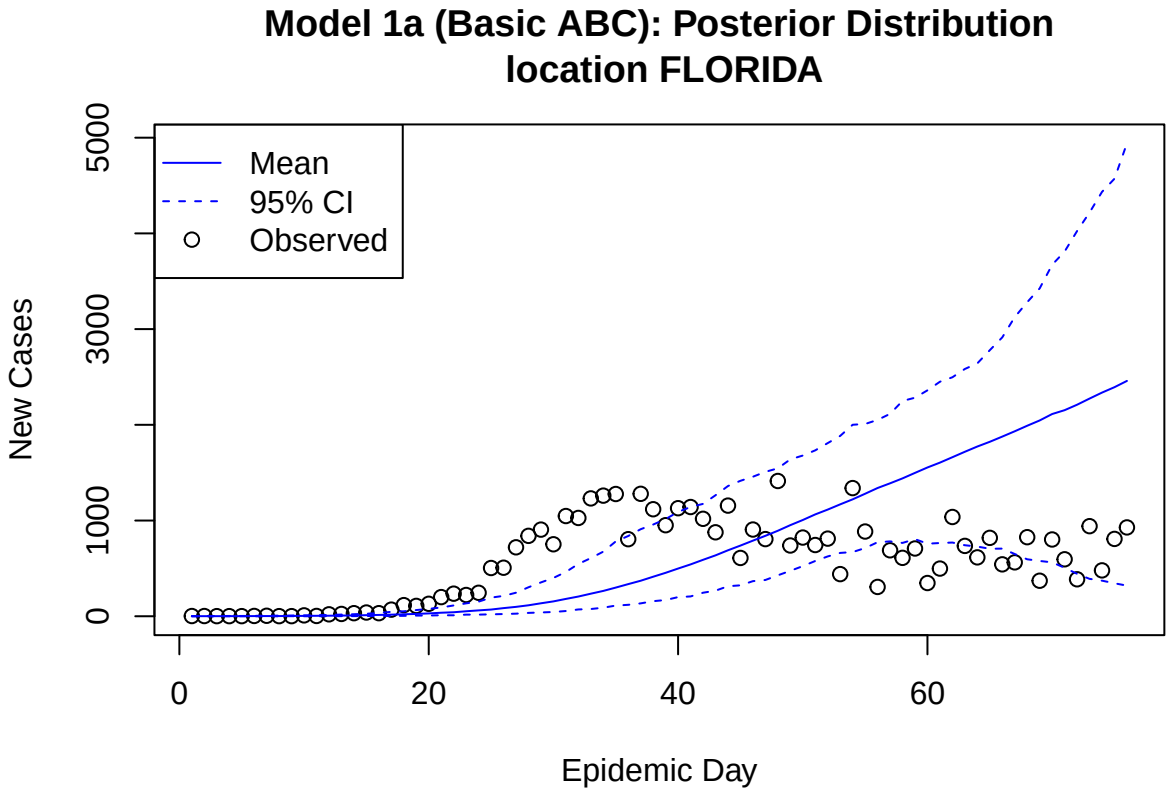
Epidemic Day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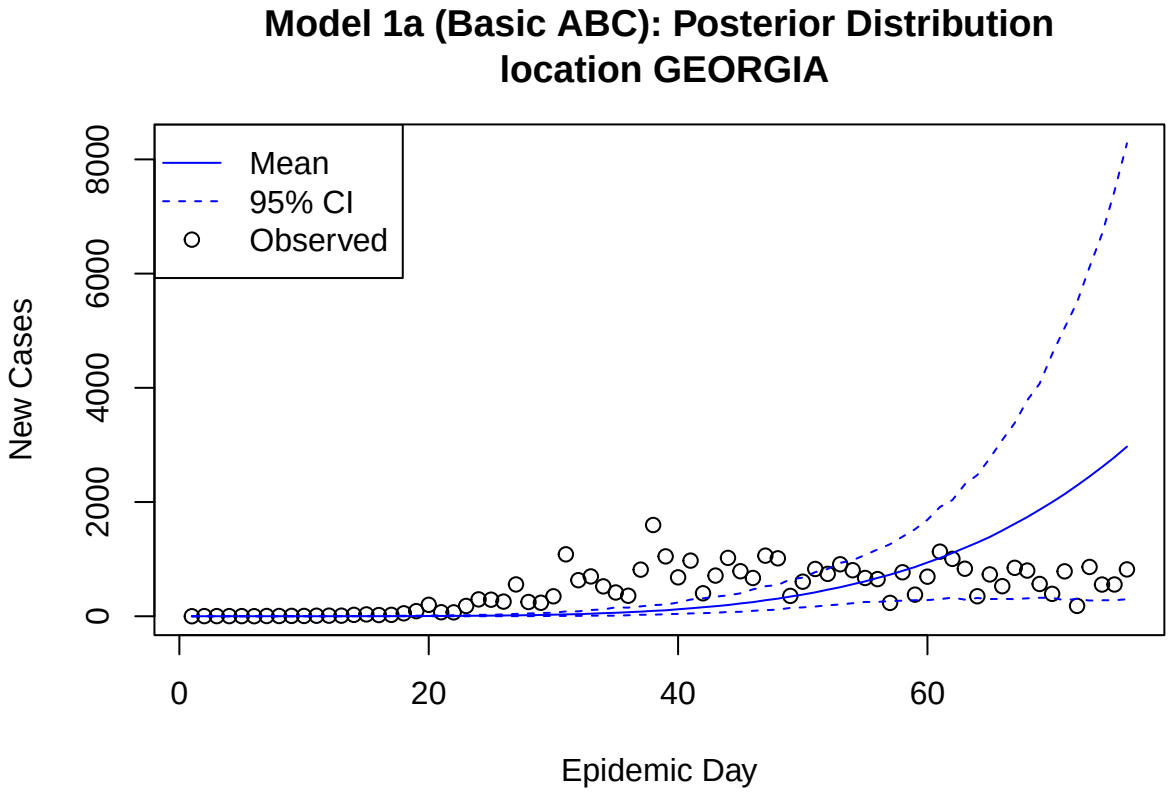
Epidemic Day


Model 1a (Basic ABC): Posterior Distribution
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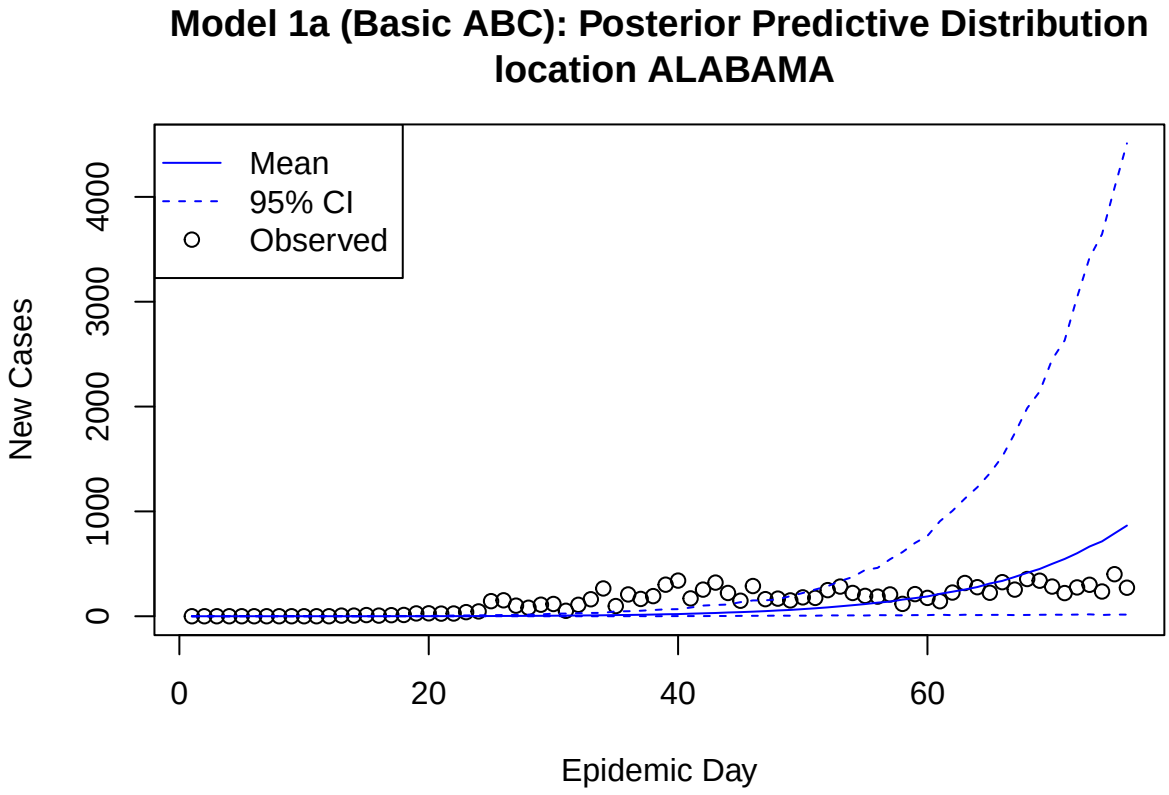
Epidemic Day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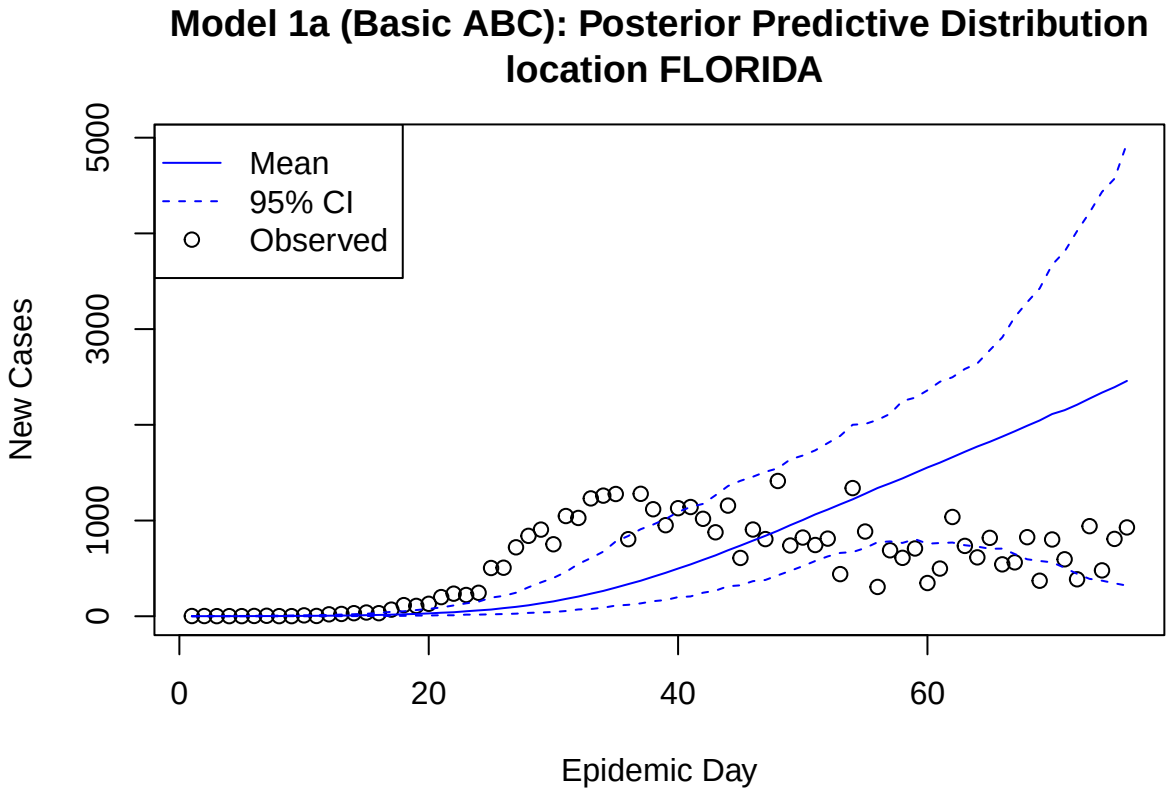
Epidemic Day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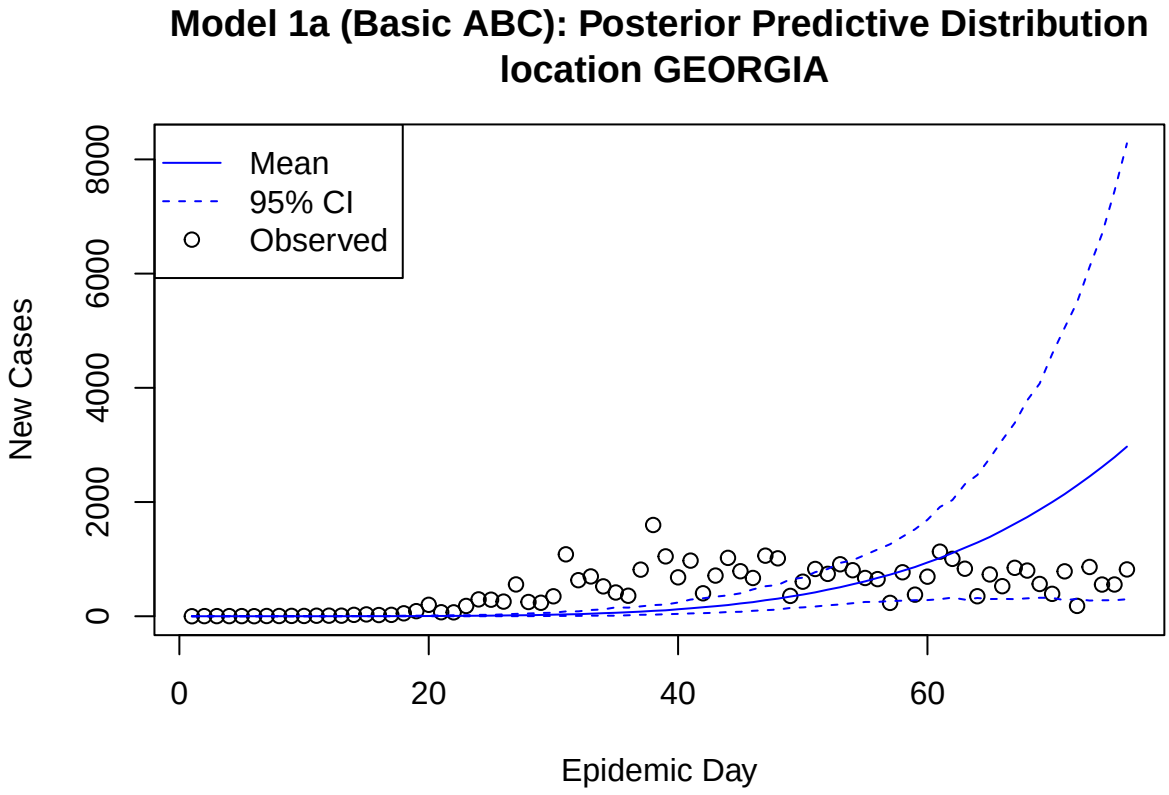
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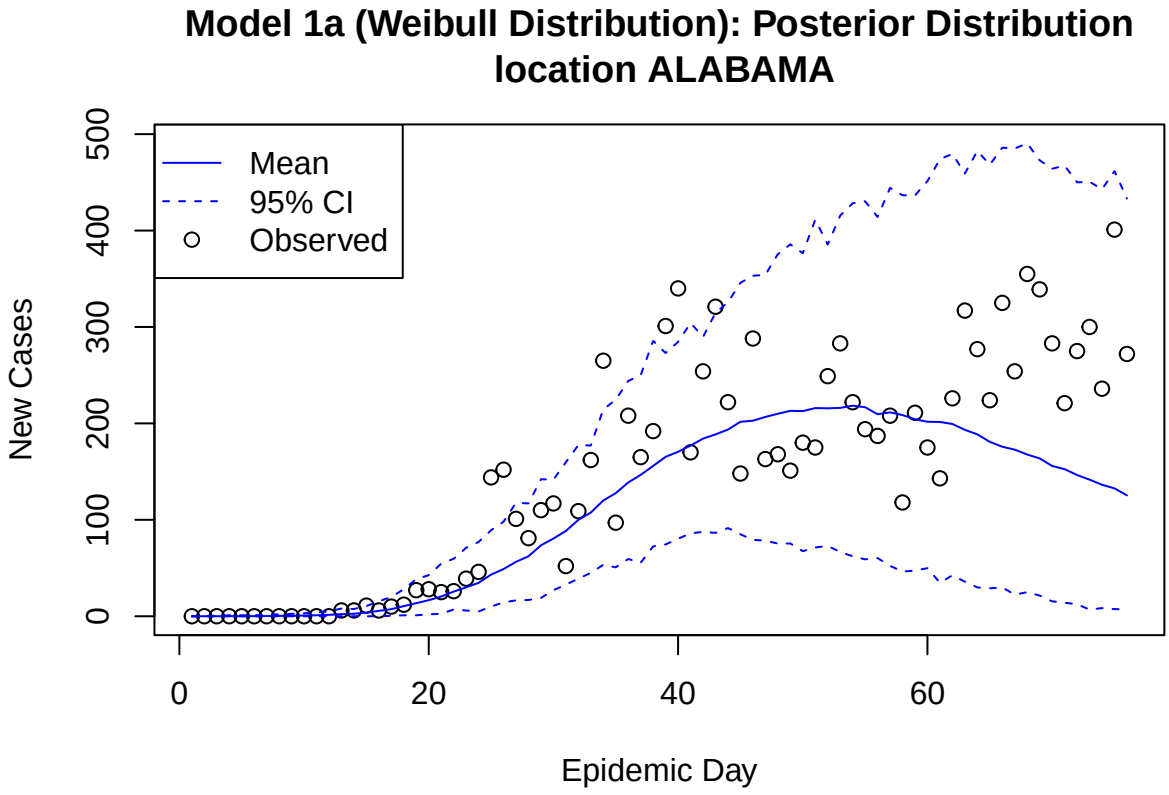
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Observed
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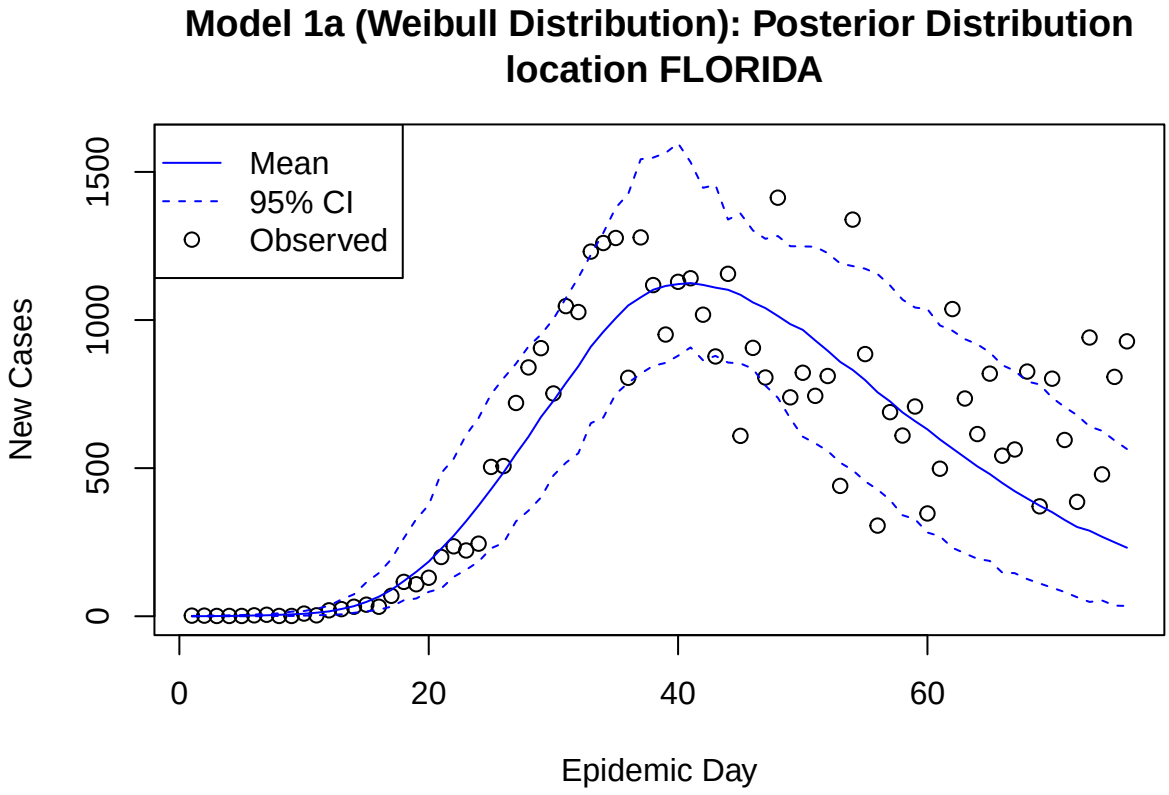
Epidemic Day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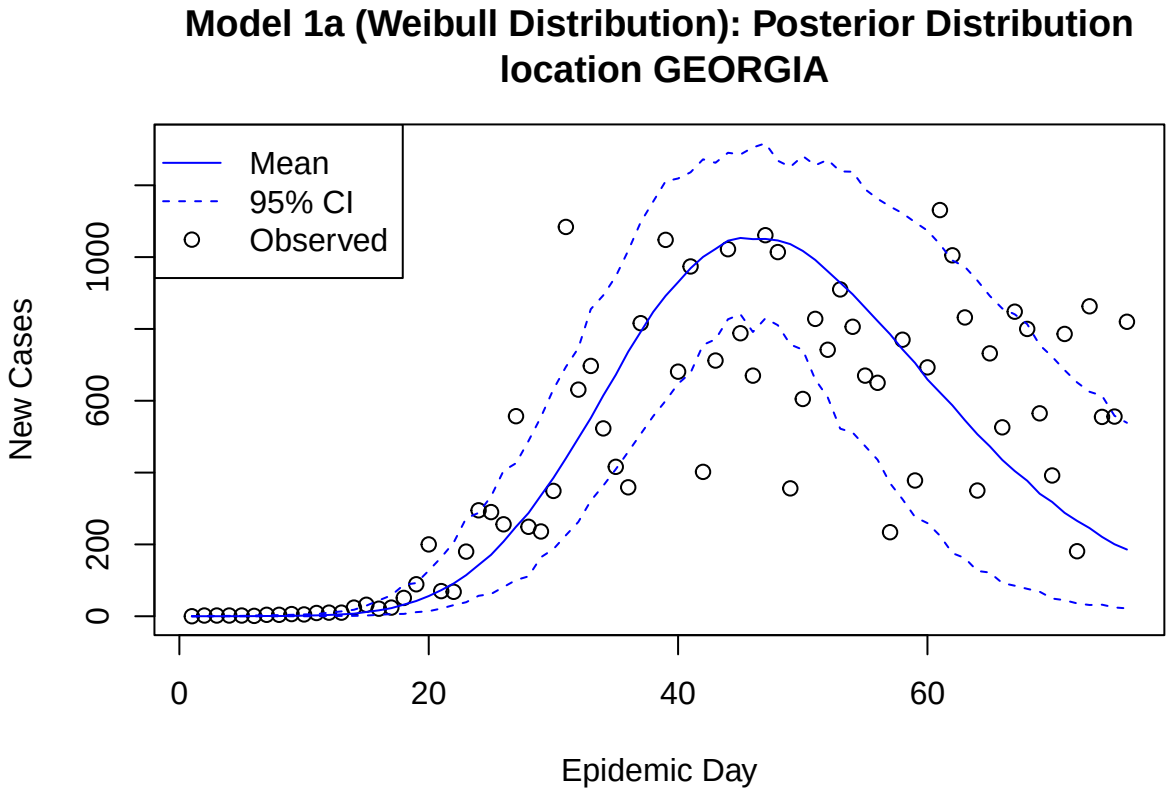
Epidemic Day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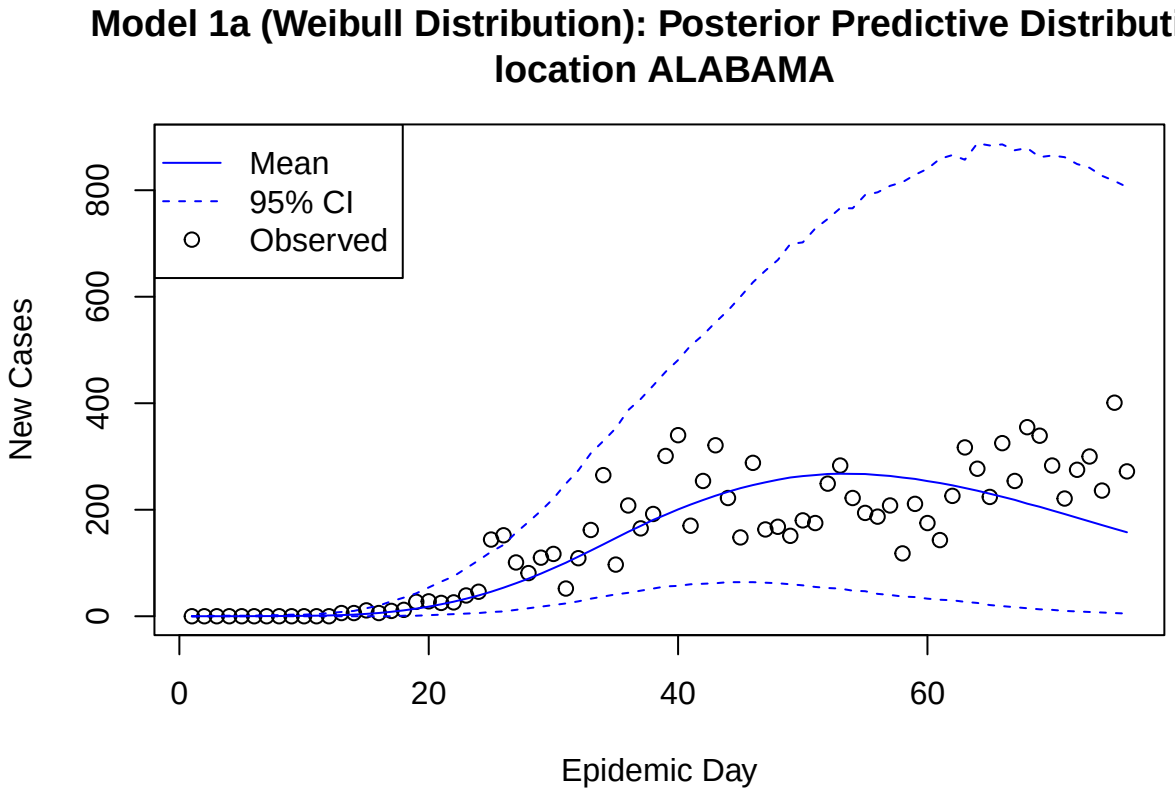
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Mean
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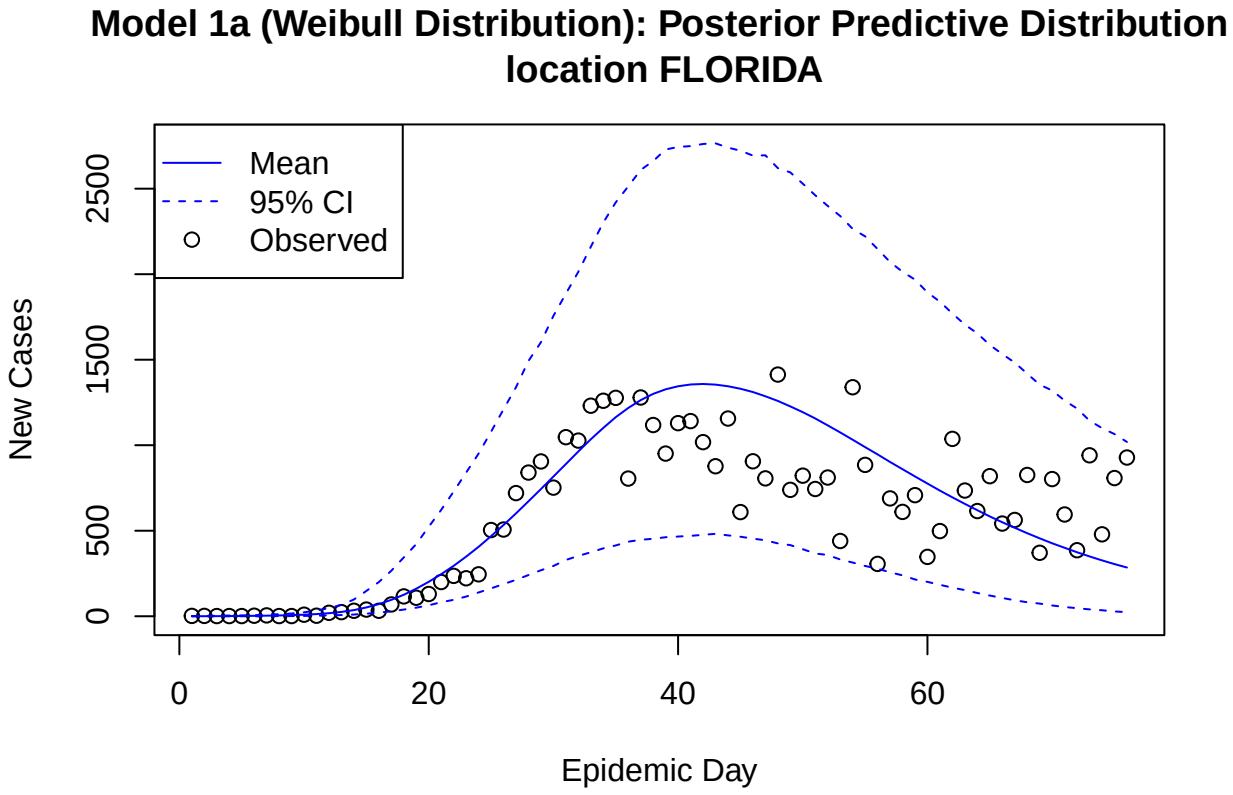
Epidemic Day


Model 1a (Weibull Distribution): Posterior Predictive Distribution
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Mean
95% CI
Observed
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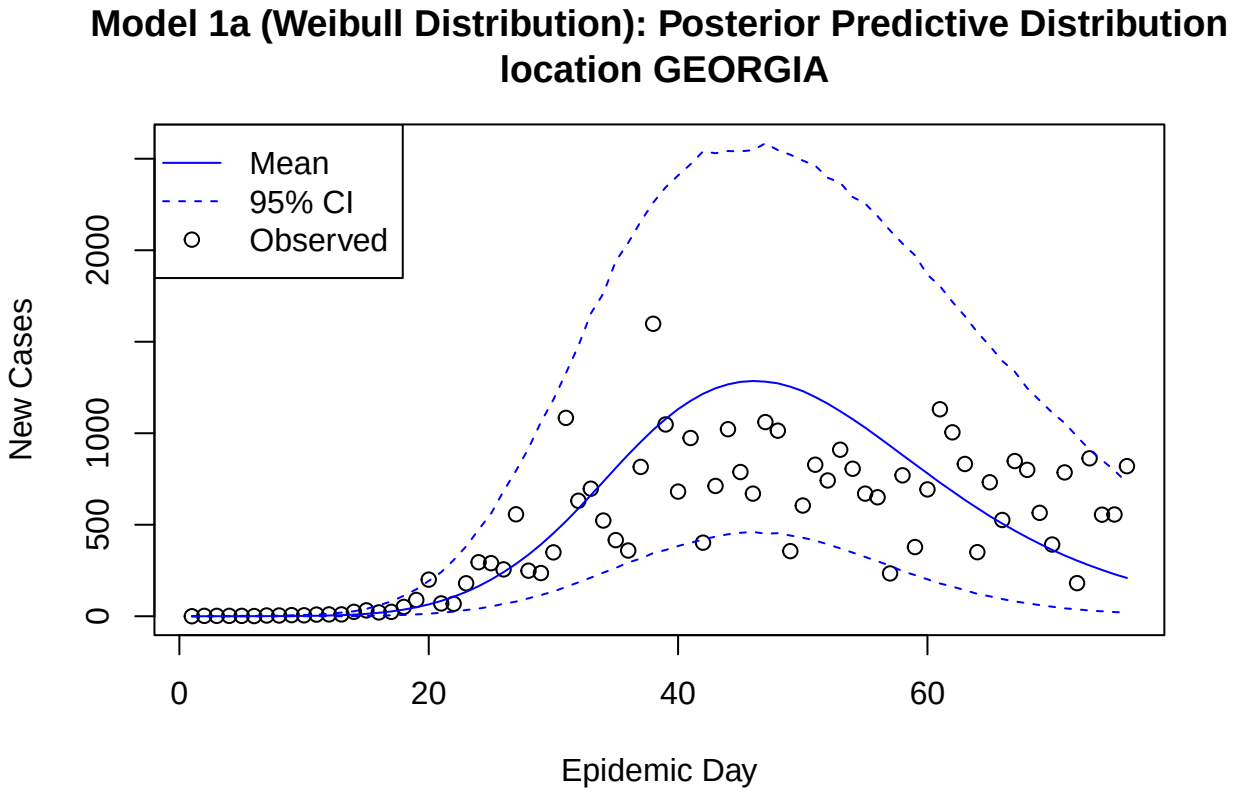
Epidemic Day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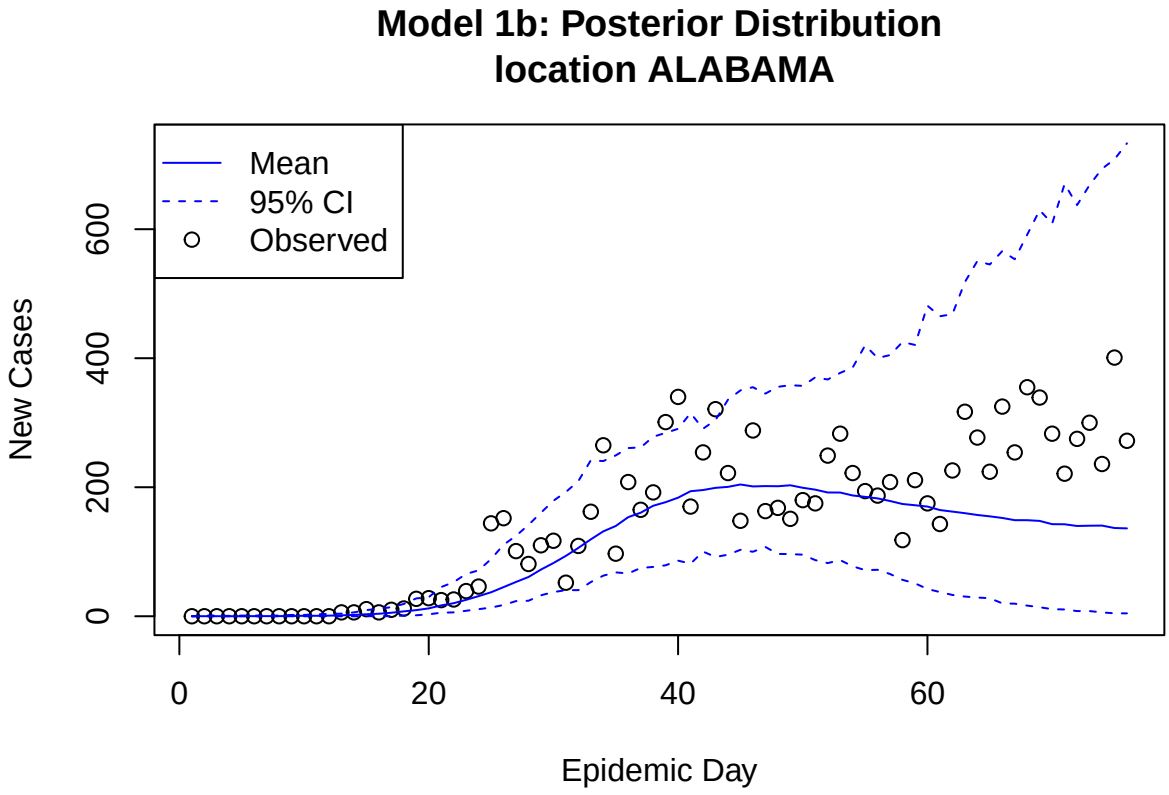
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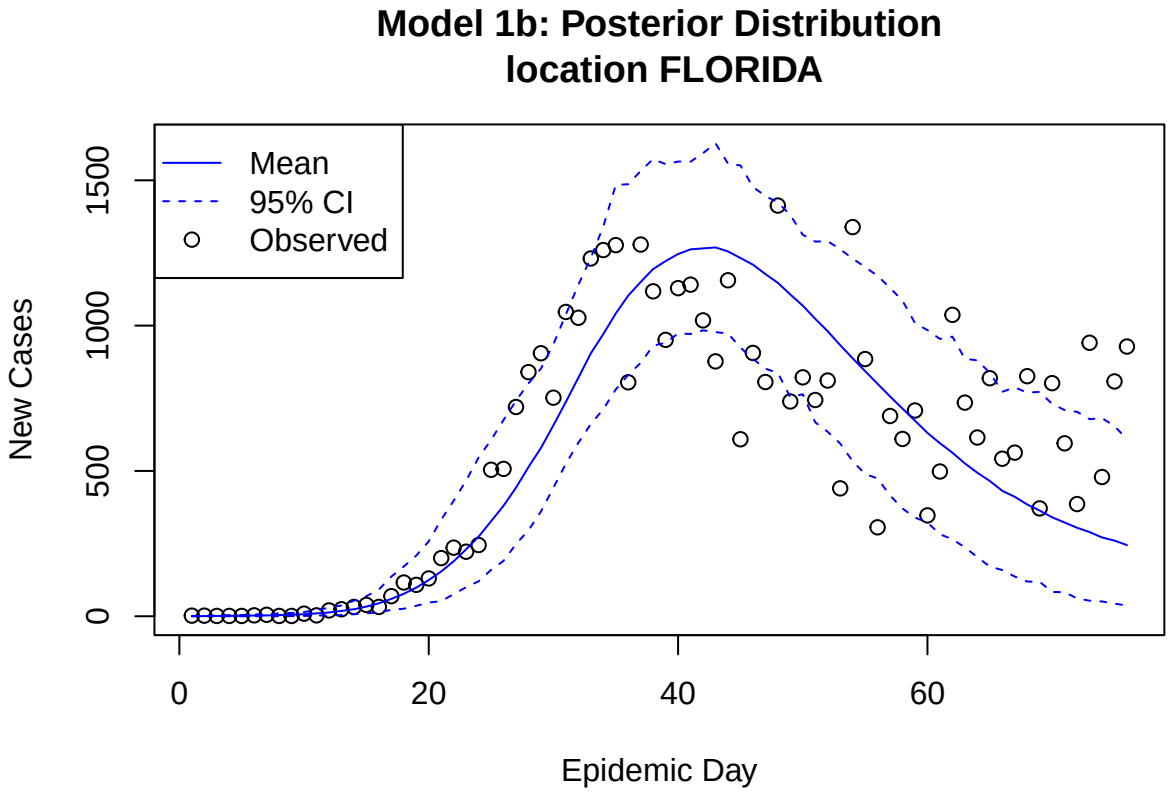
Epidemic Day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Mean
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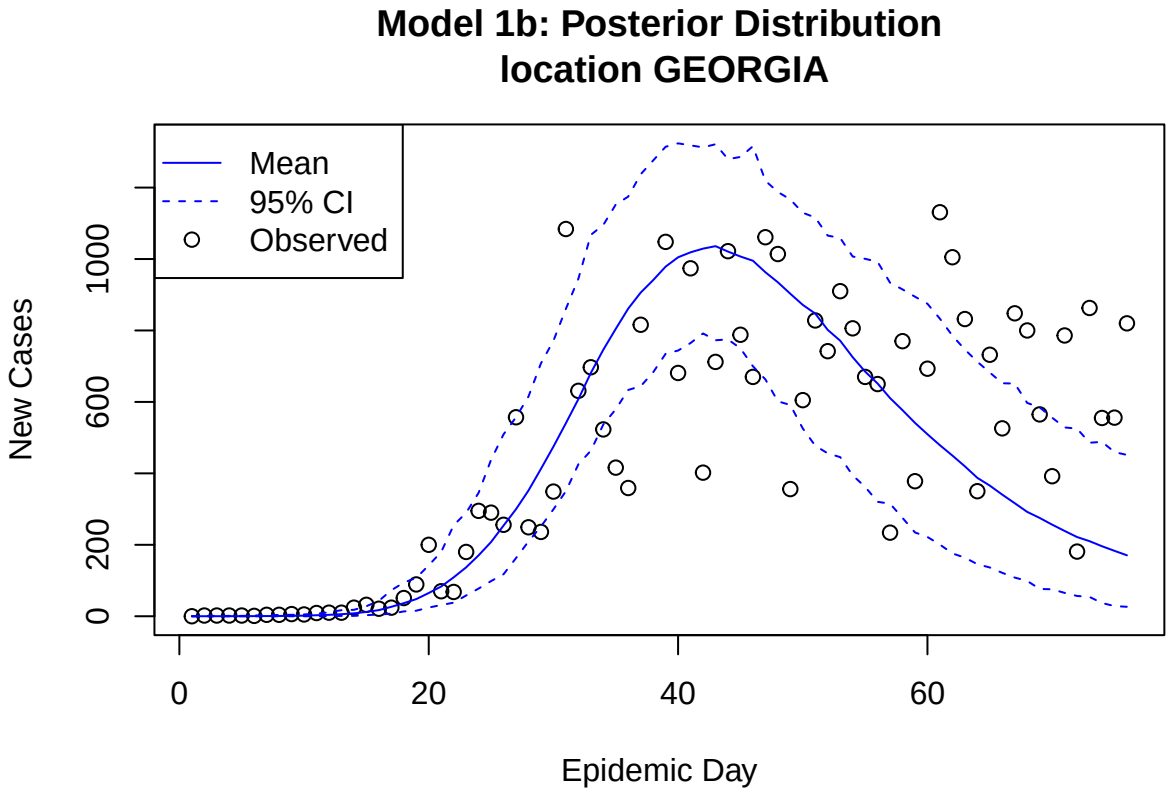
Epidemic Day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Mean
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Observed
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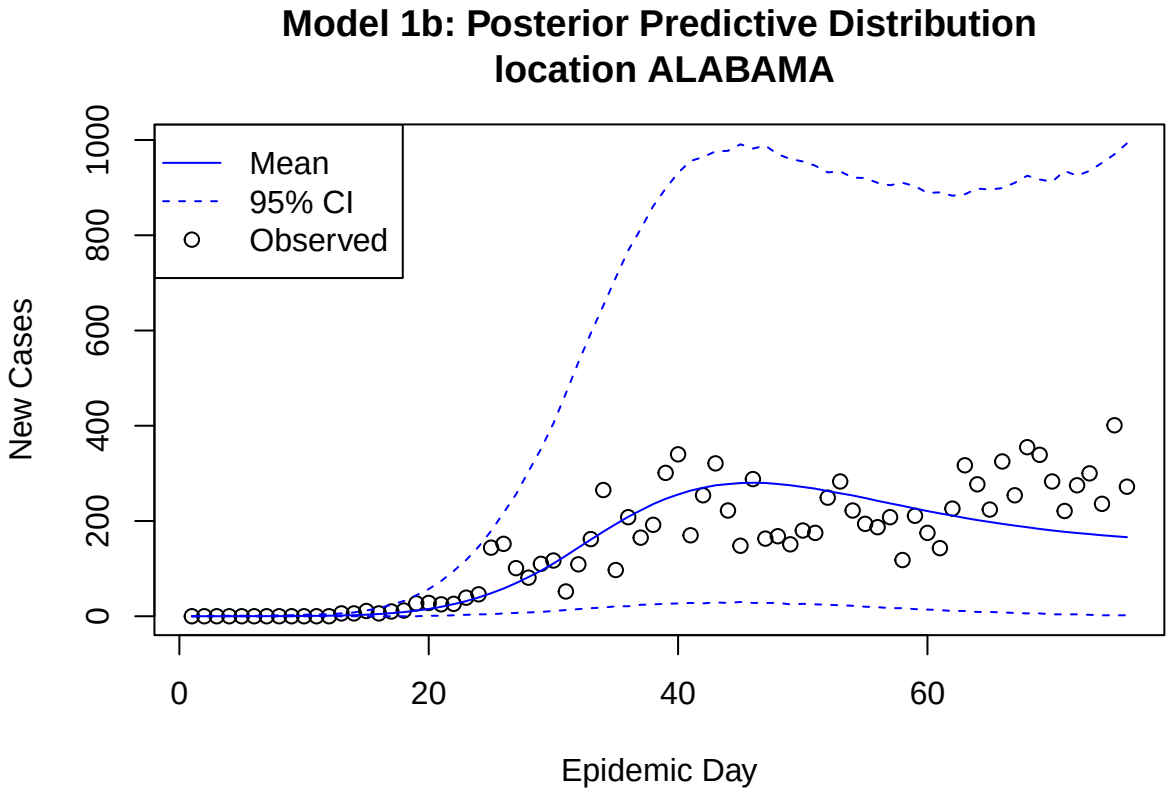
Epidemic Day


Model 1b: Posterior Predictive Distribution
location ALABAMA
Mean
95% CI
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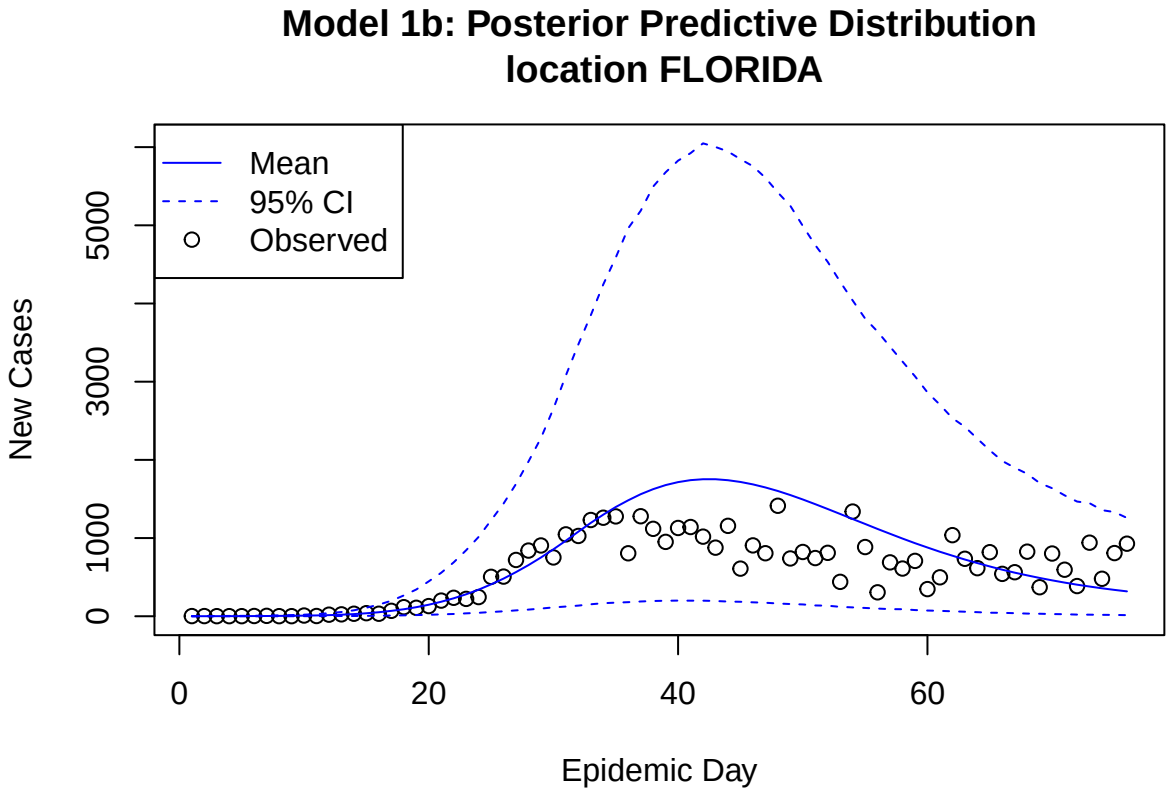
Epidemic Day


Model 1b: Posterior Predictive Distribution
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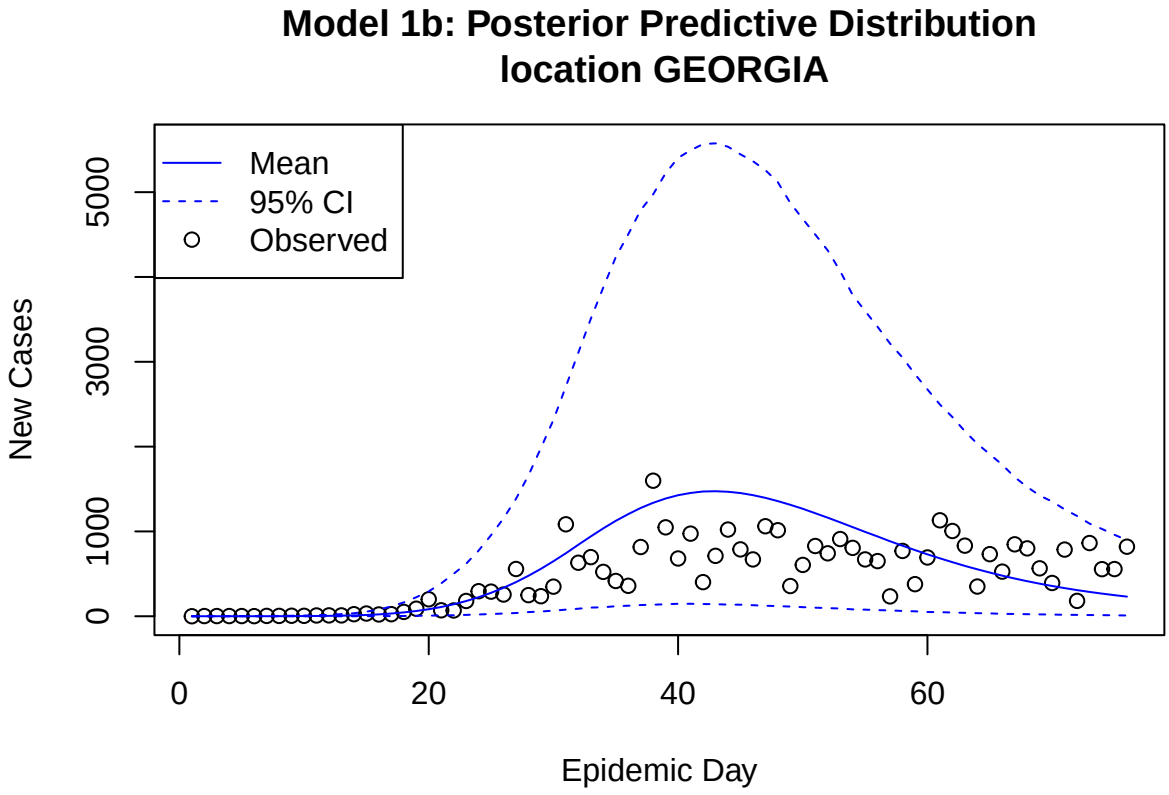
Epidemic Day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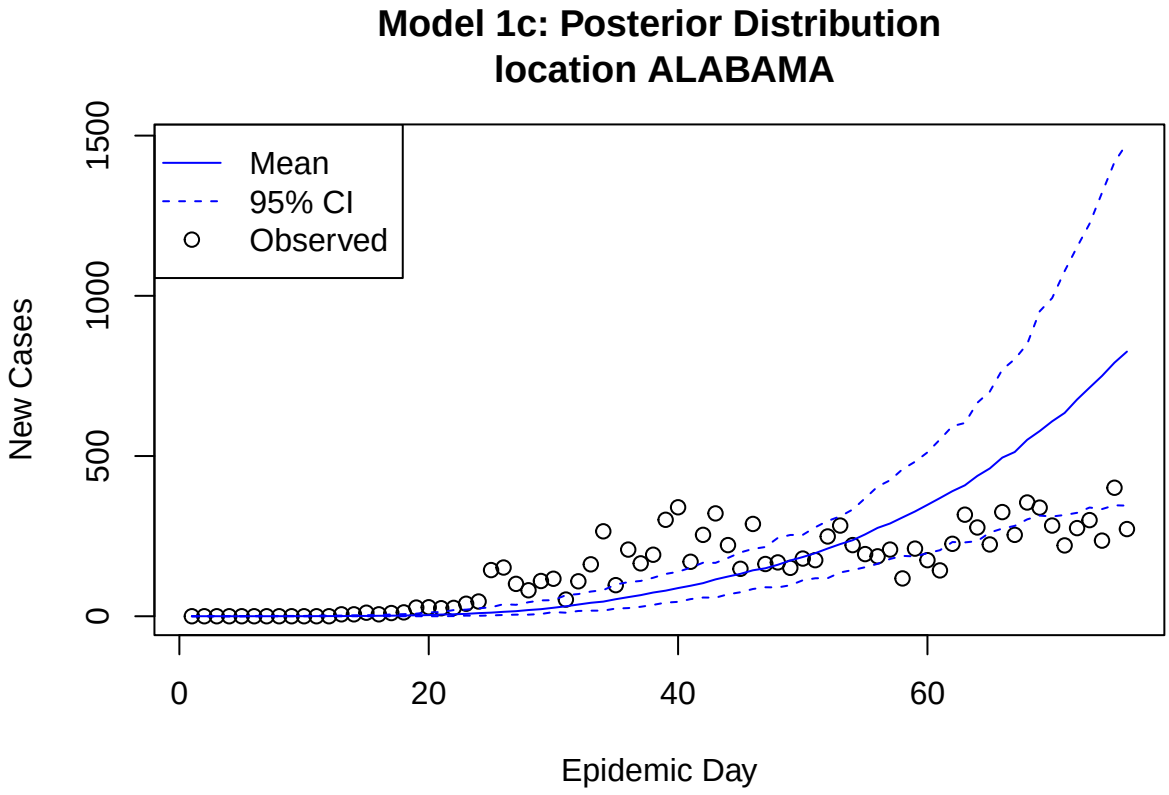
Epidemic Day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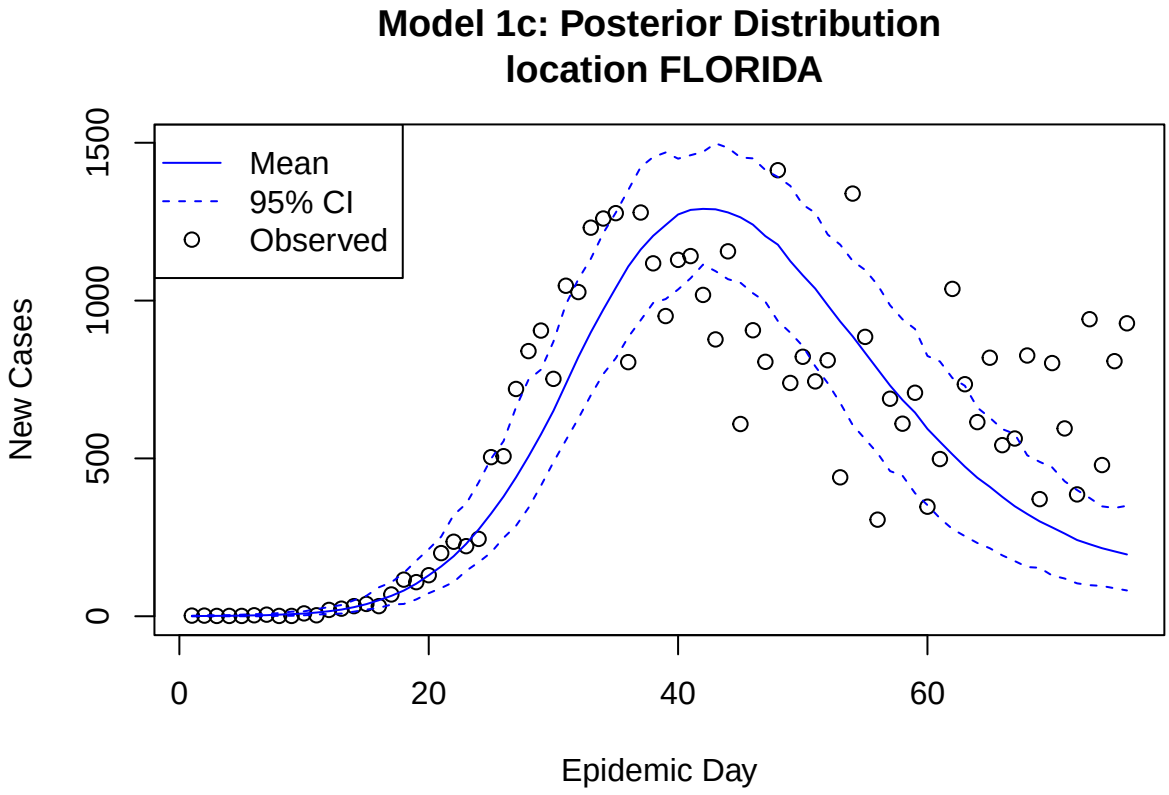
Epidemic Day


Model 1c: Posterior Distribution
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Mean
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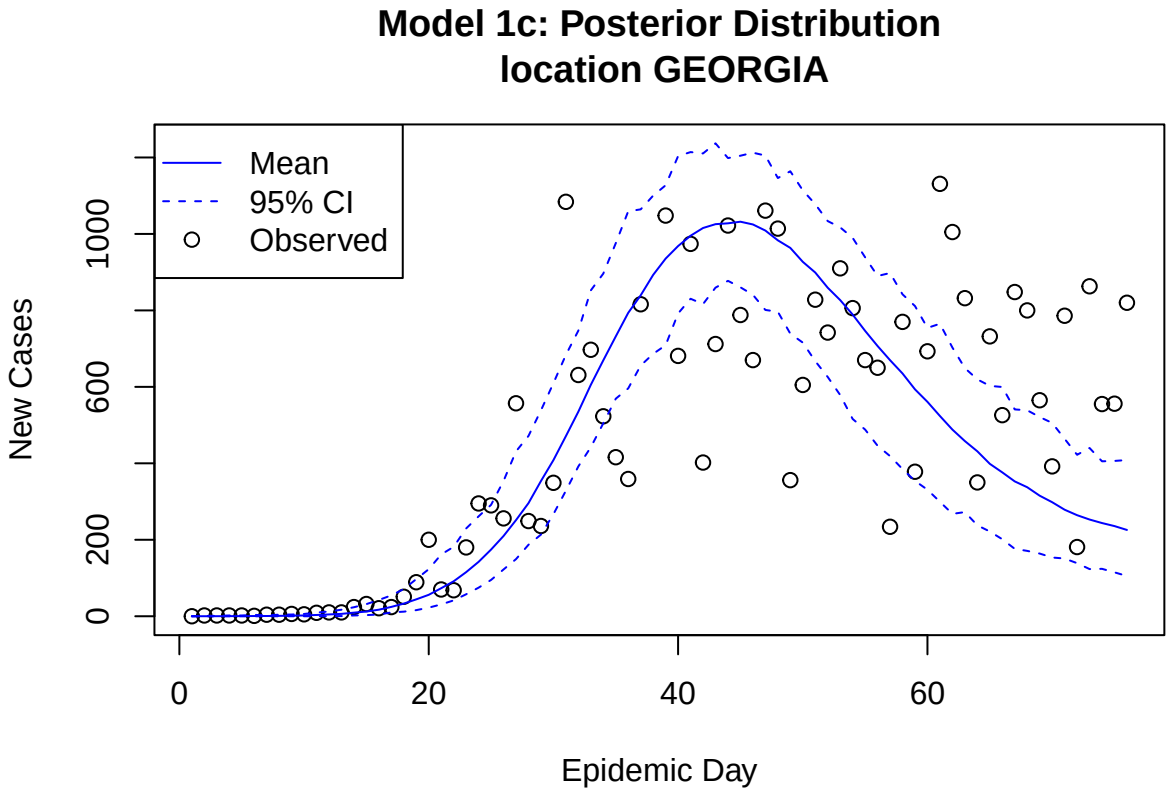
Epidemic Day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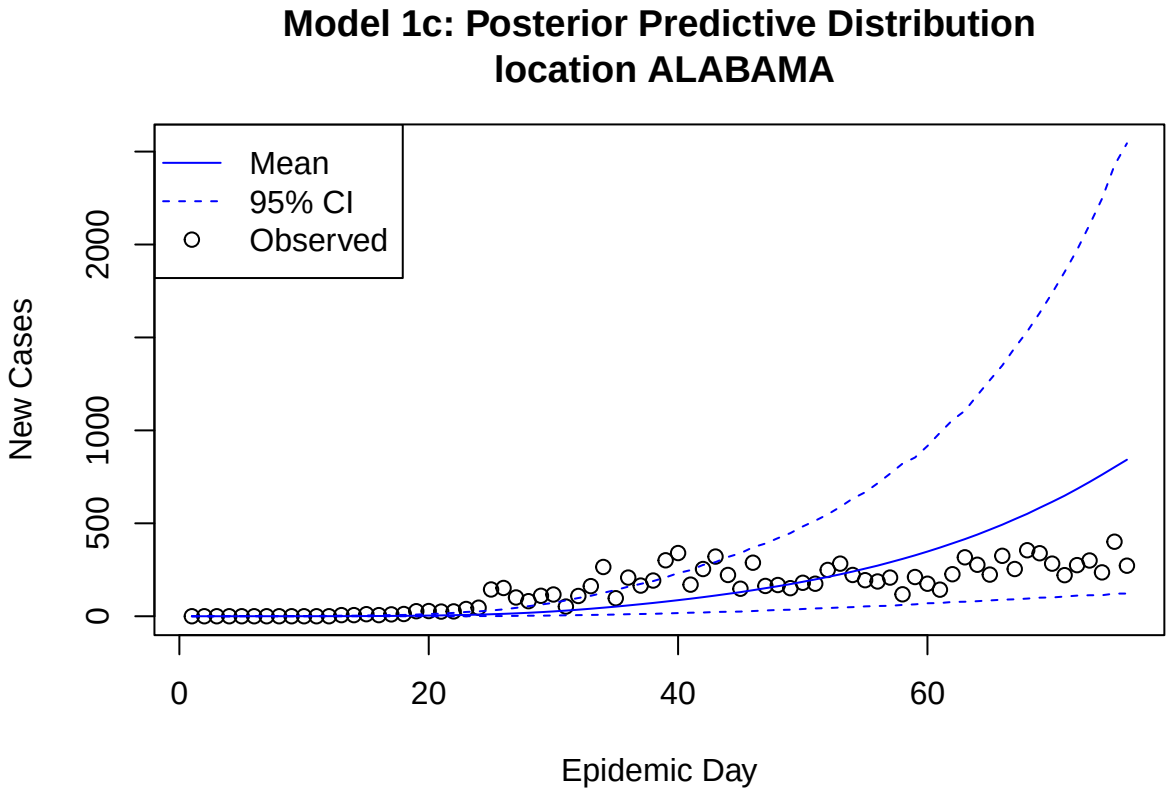
Model 1c: Posterior Predictive Distribution
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Mean
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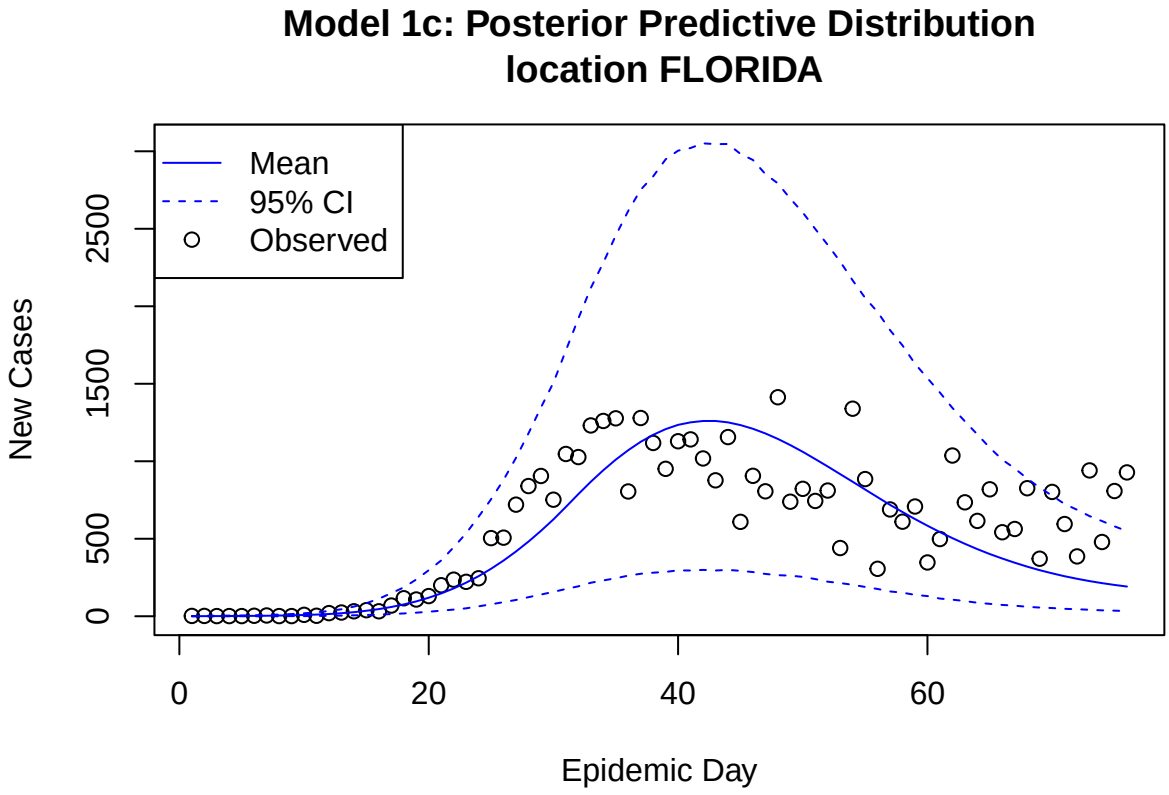
Epidemic Day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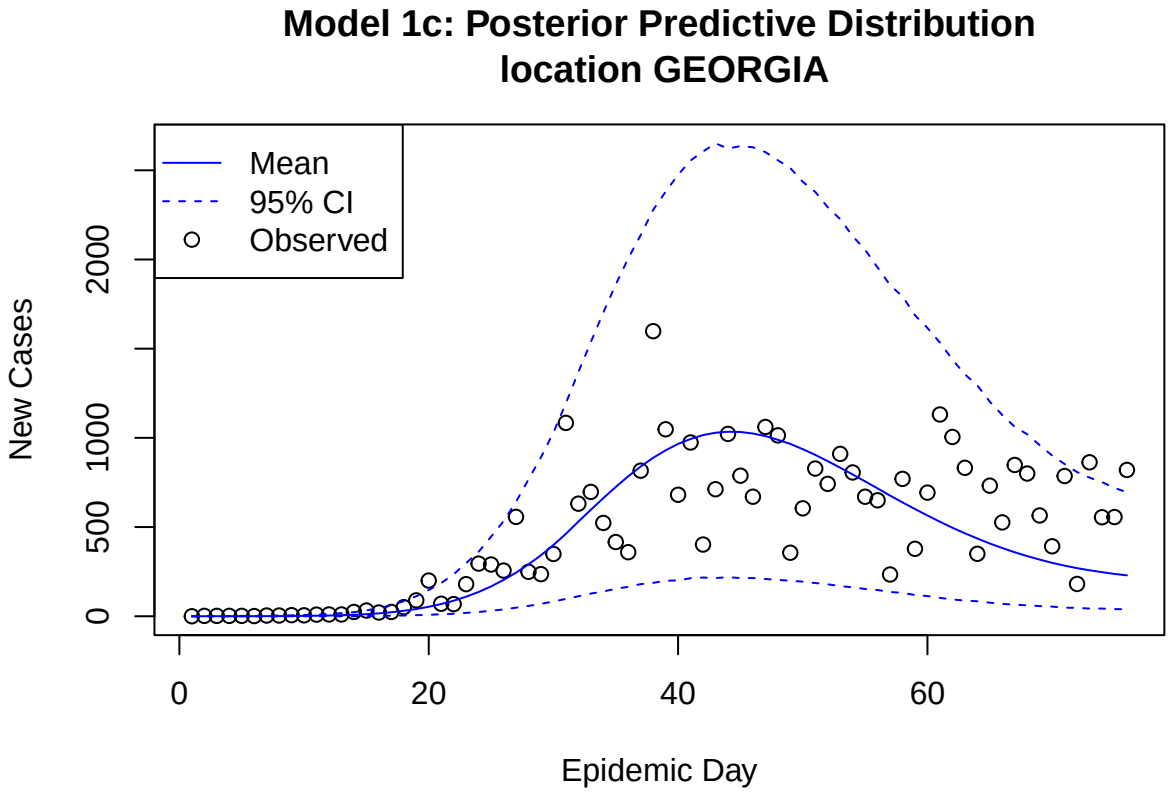
Epidemic Day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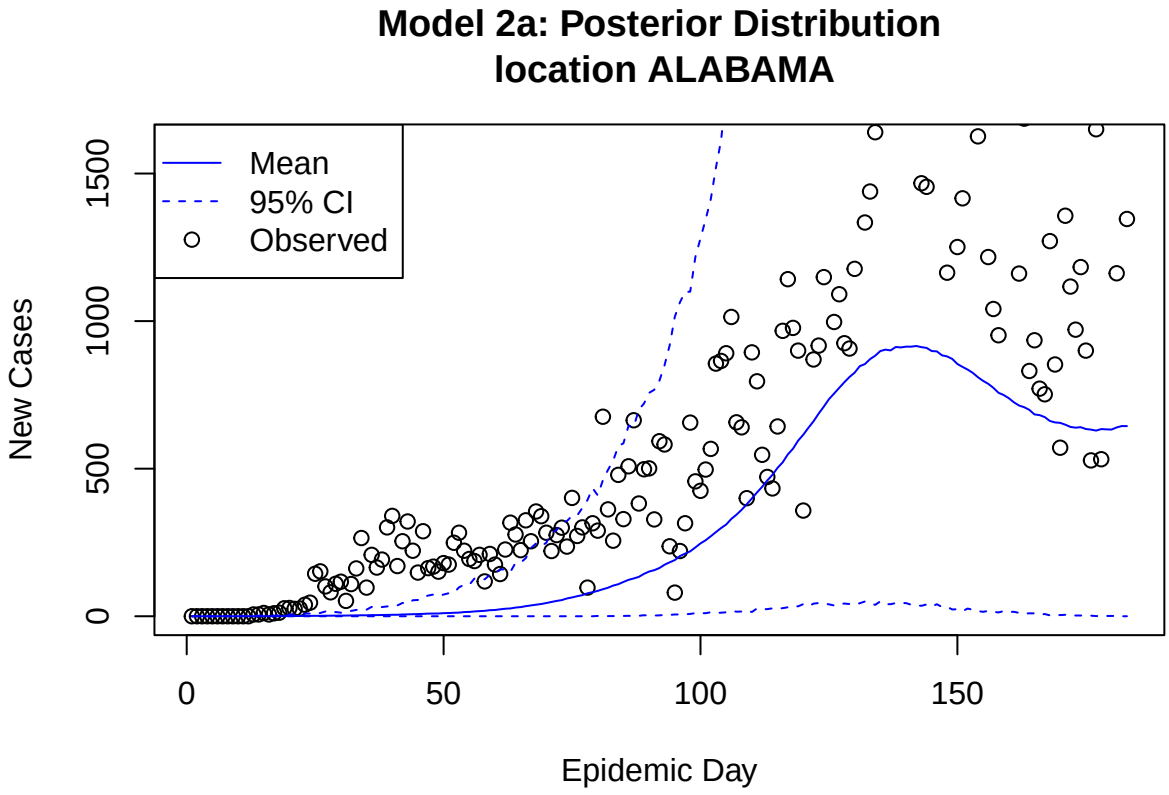
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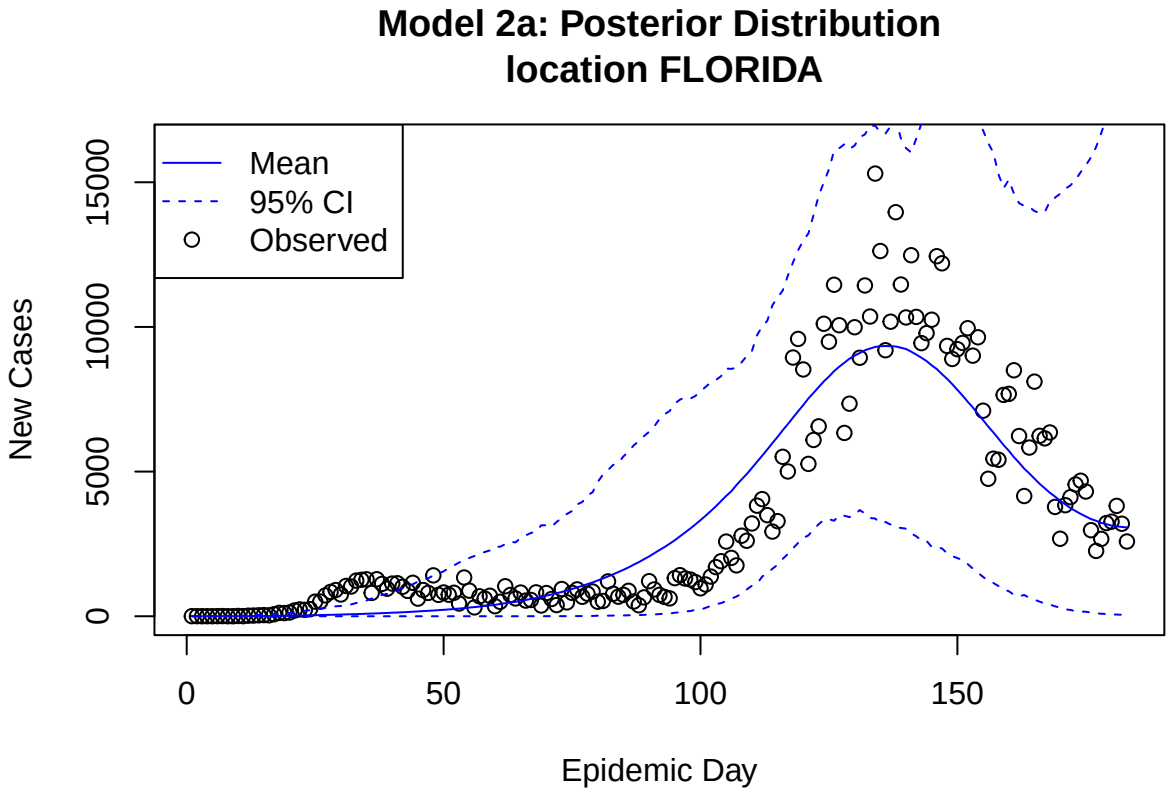
Epidemic Day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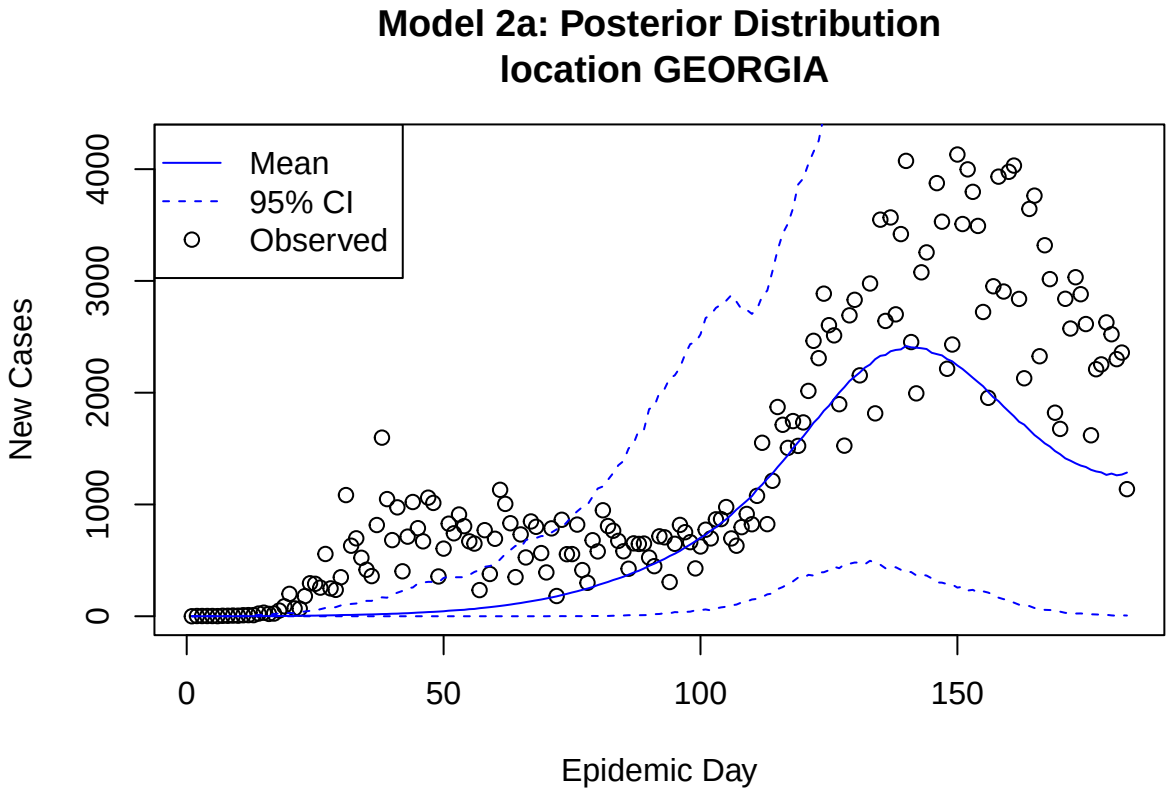
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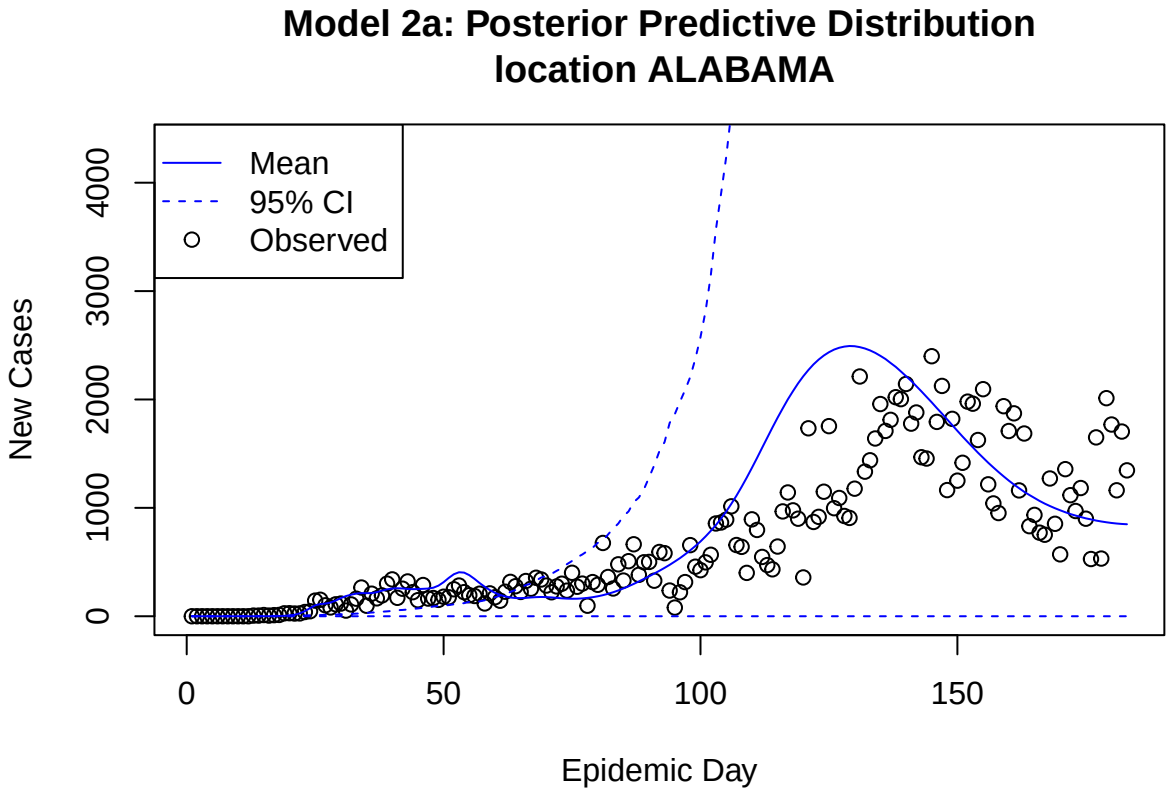
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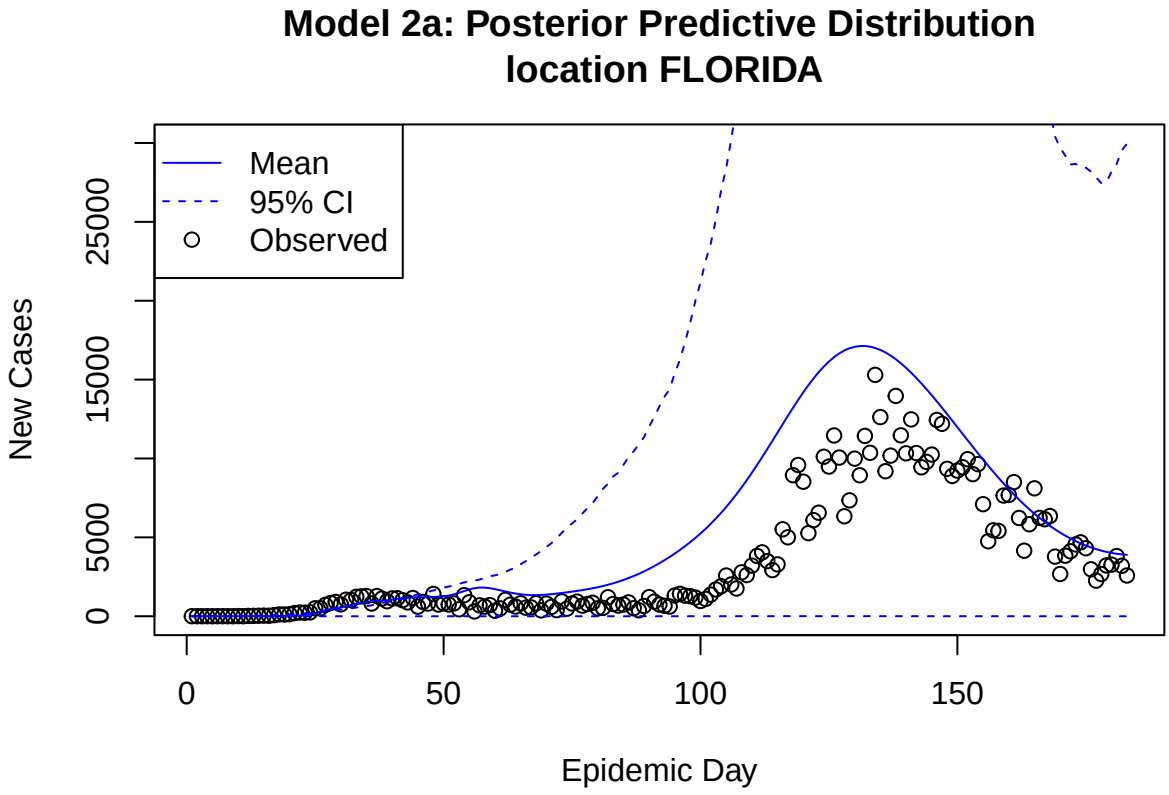
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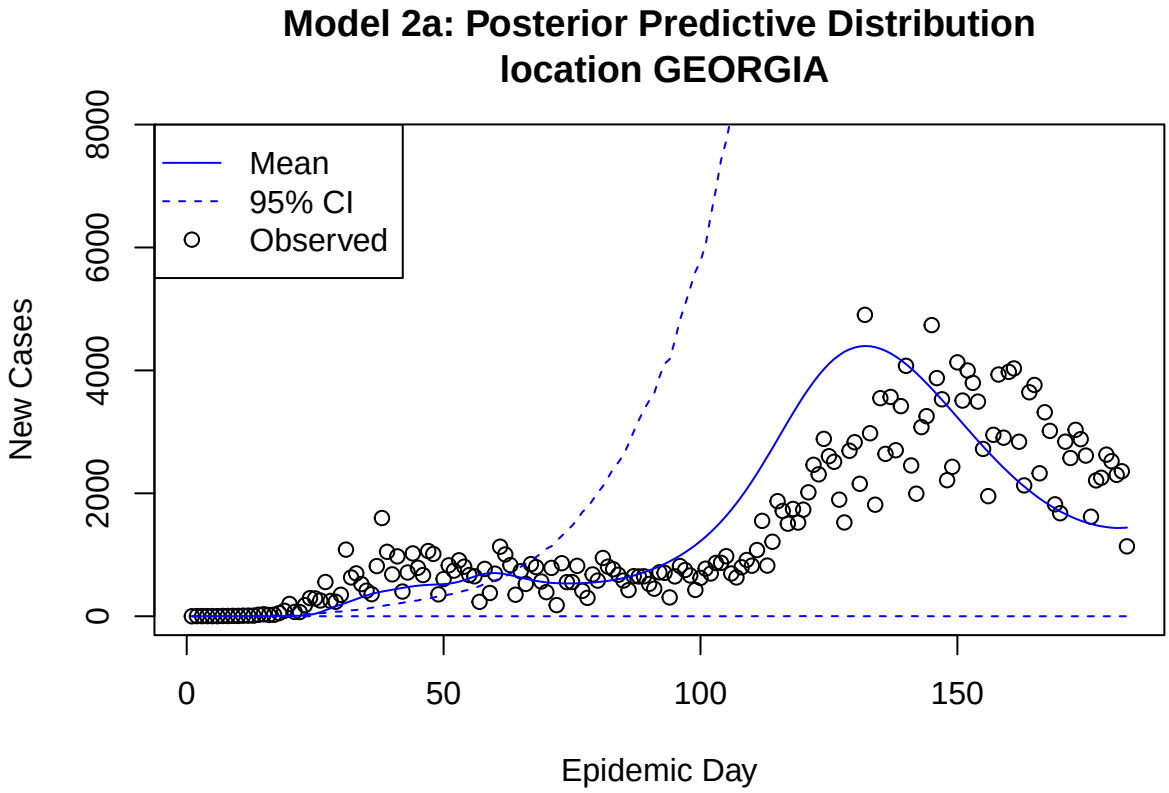
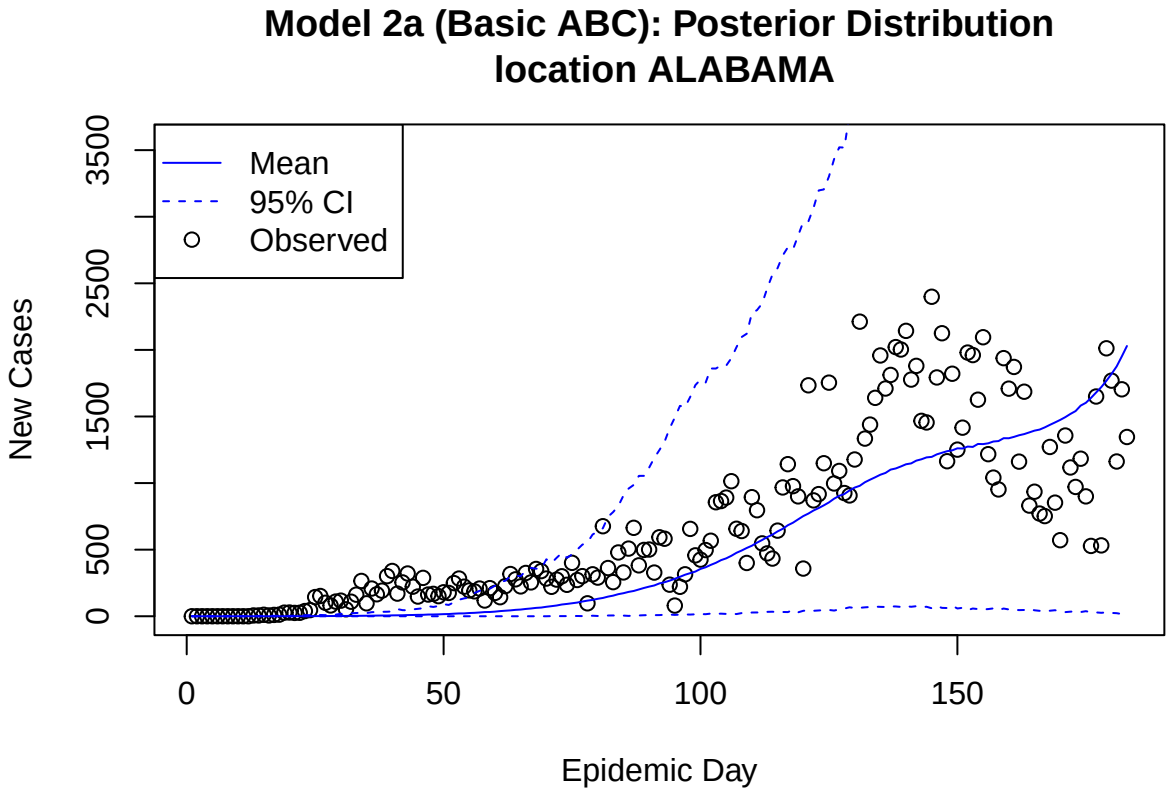
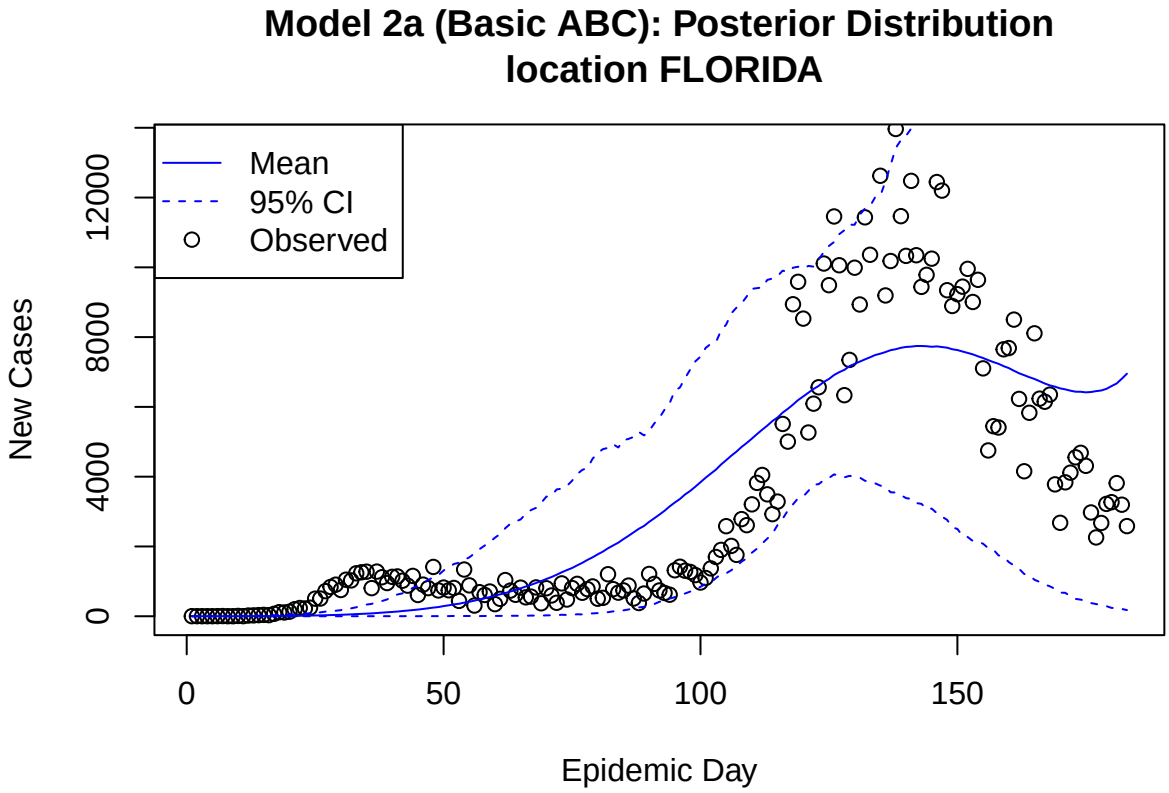
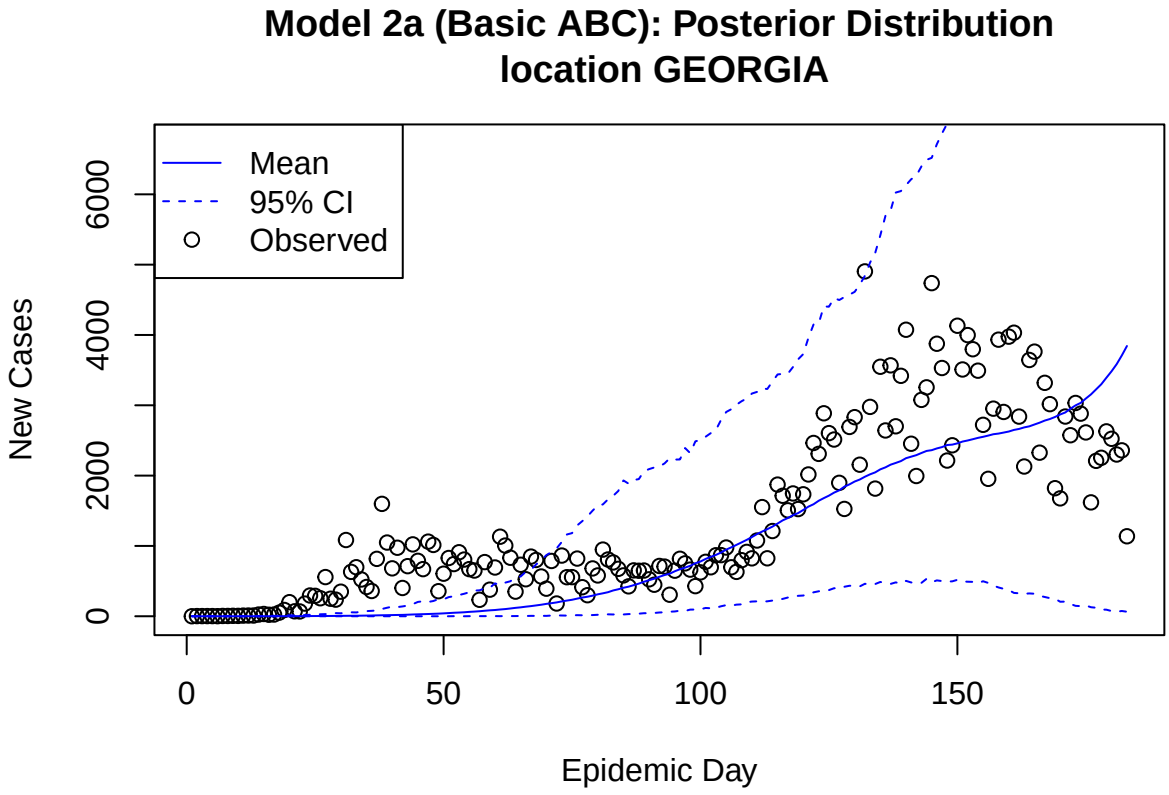
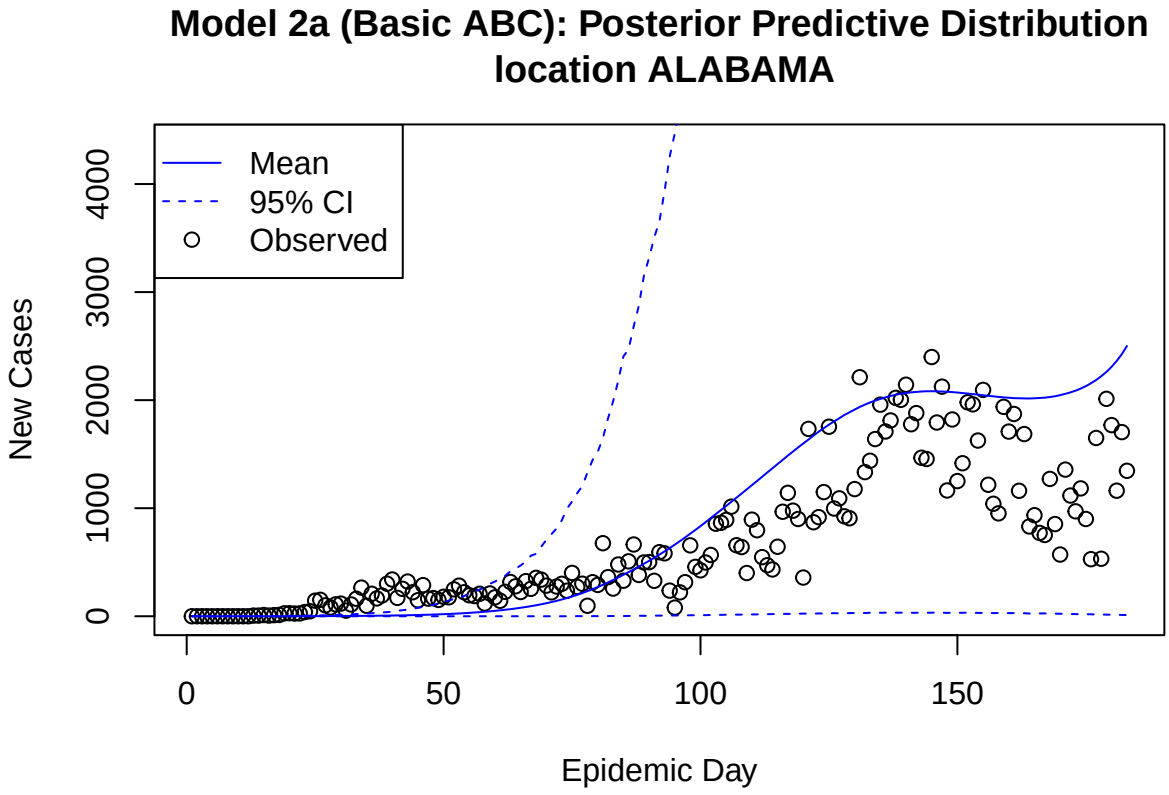
150
Epidemic Day

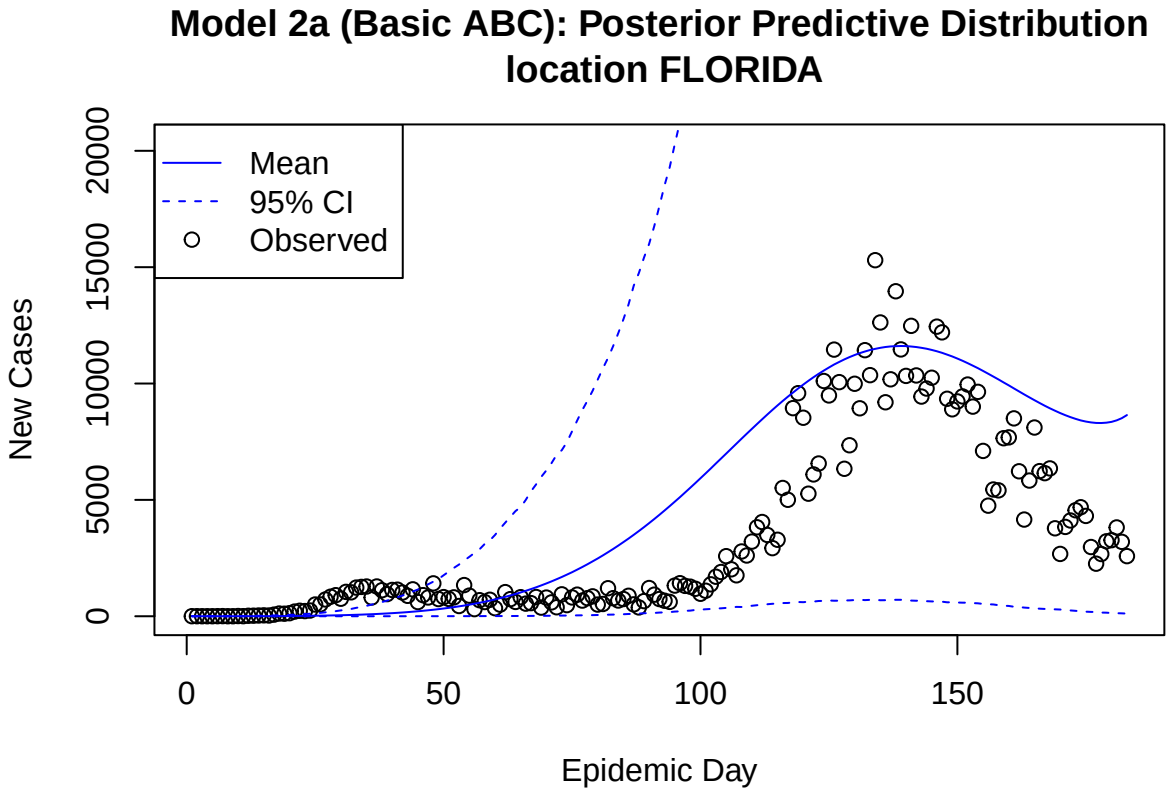

Model 2a: Posterior Predictive Distribution
location GEORGIA
Mean
95% CI
Observed
New Cases
0
2000
4000
6000
8000
0
50
100
150
Epidemic Day

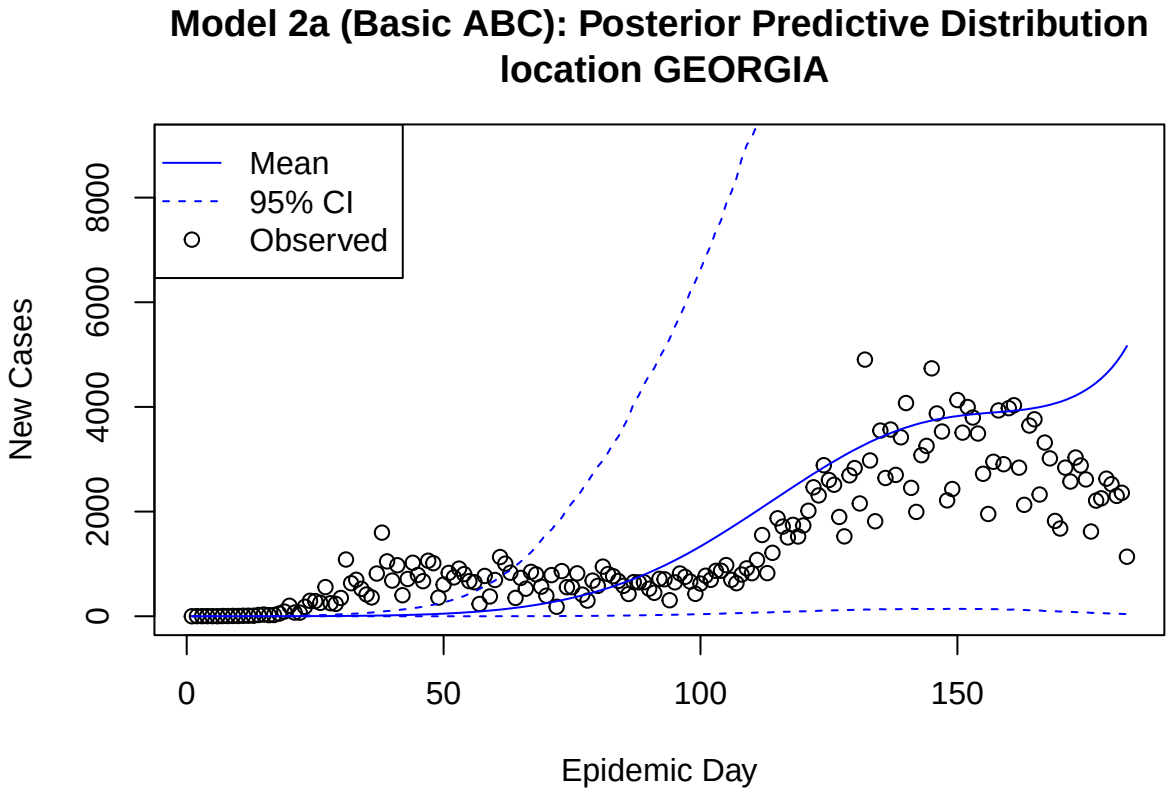

Model 2a (Basic ABC): Posterior Distribution
location ALABAMA
Mean
95% CI
Observed
New Cases
0
500
1500
2500
3500
0
50
100
150
Epidemic Day

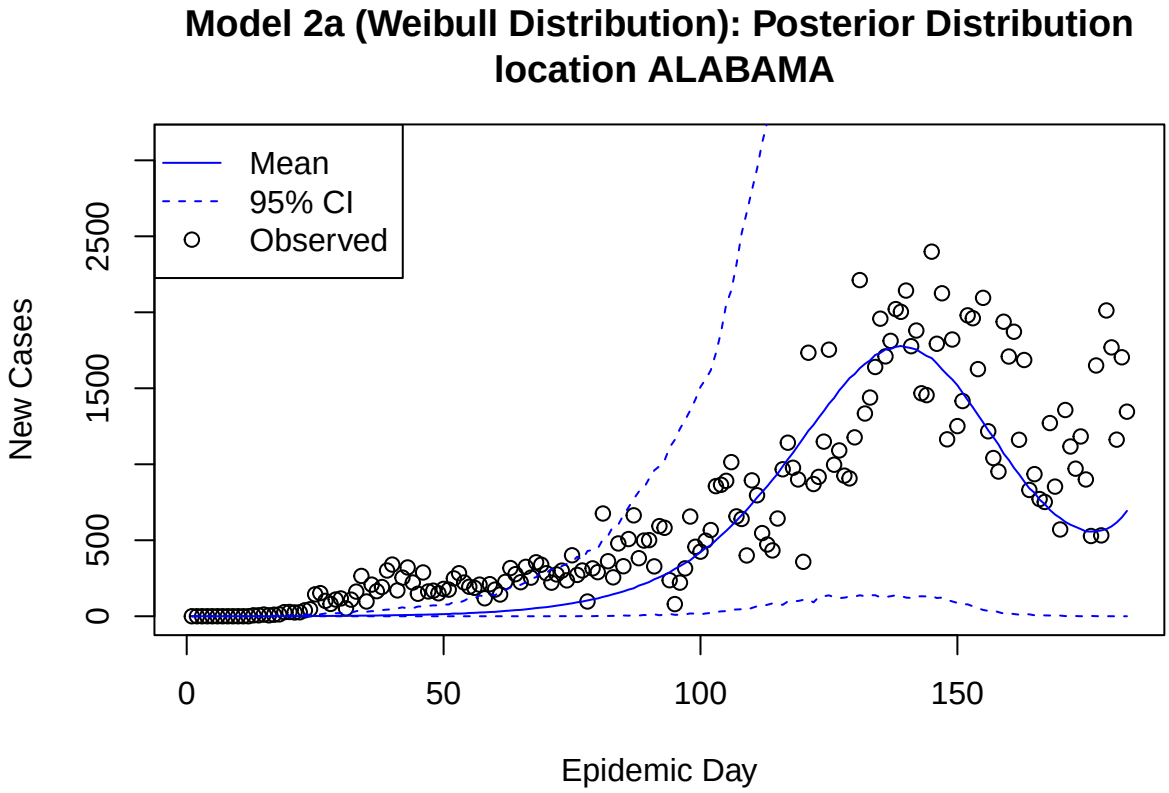

Model 2a (Basic ABC): Posterior Distribution
location FLORIDA
Mean
95% CI
Observed
New Cases
0
4000
8000
12000
0
50
100
150
Epidemic Day

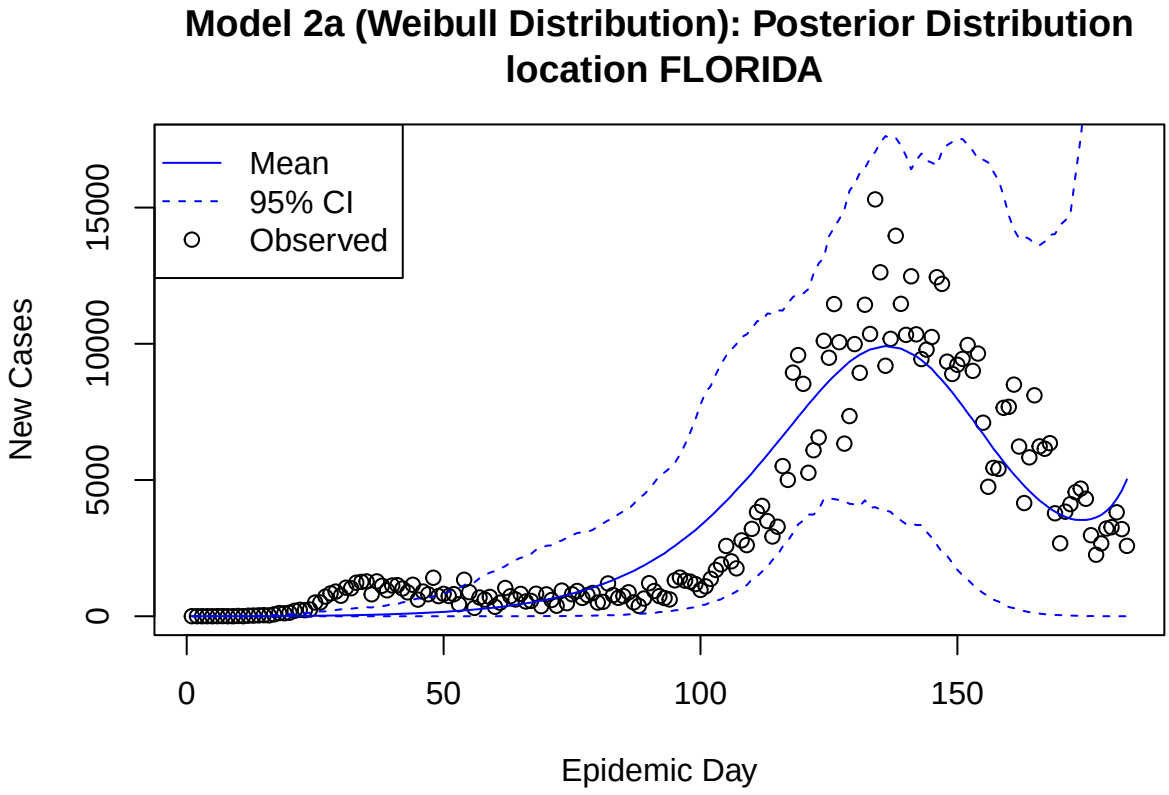

Model 2a (Basic ABC): Posterior Distribution
location GEORGIA
Mean
95% CI
Observed
New Cases
0
2000
4000
6000
0
50
100
150
Epidemic Day

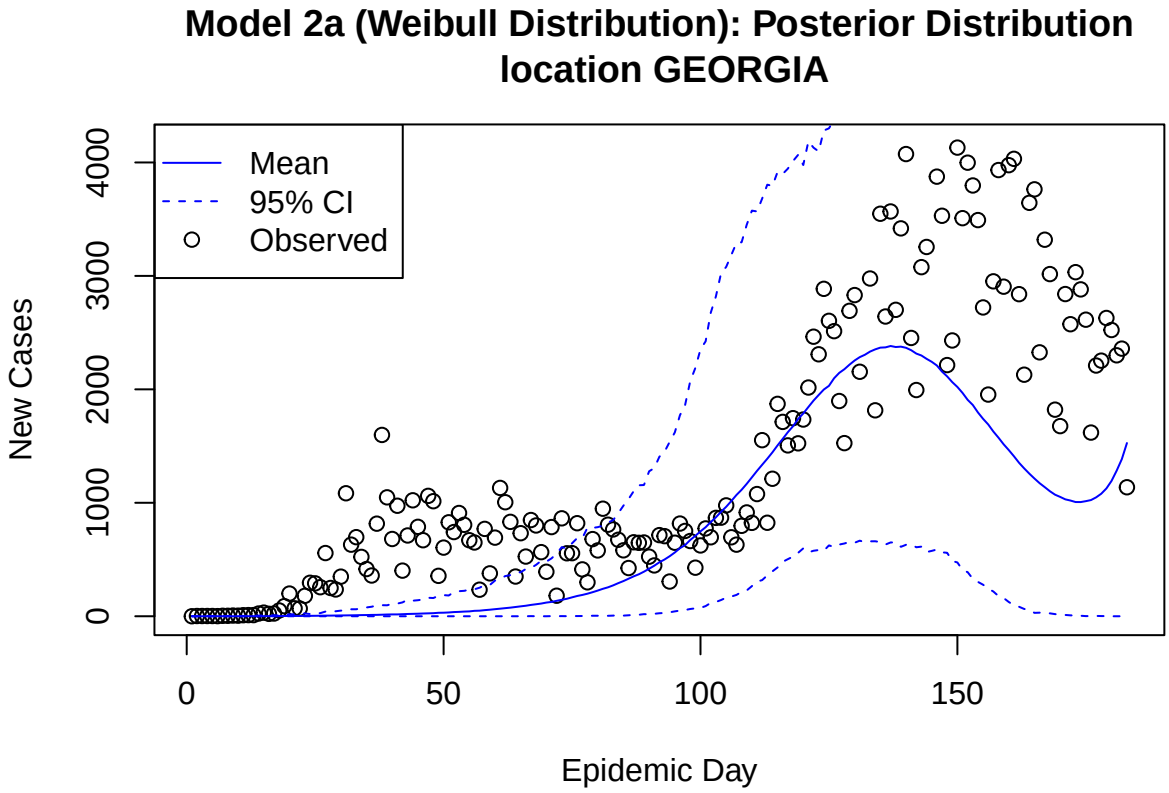

Model 2a (Basic ABC): Posterior Predictive Distribution
location ALABAMA
Mean
95% CI
Observed
New Cases
0
1000
2000
3000
4000
0
50
100
150
Epidemic Day

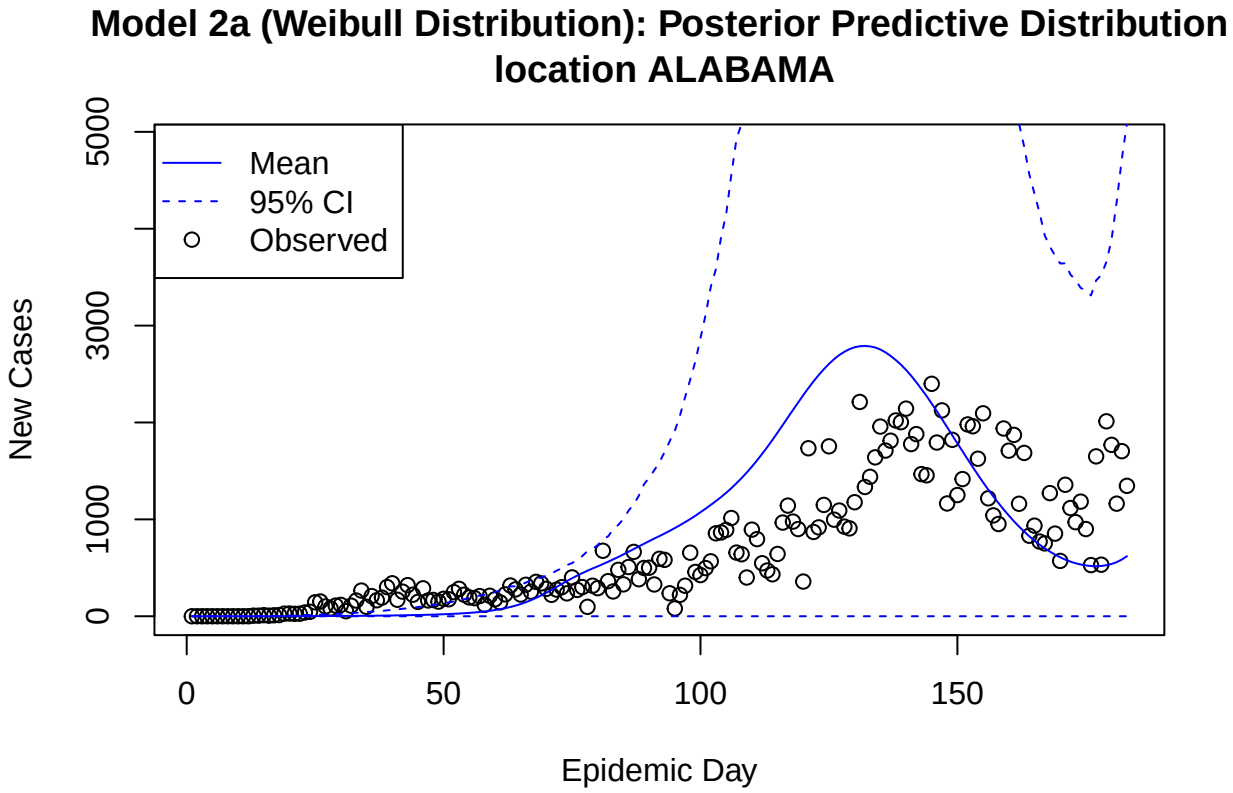

Model 2a (Basic ABC): Posterior Predictive Distribution
location FLORIDA
Mean
95% CI
Observed
New Cases
0
5000
10000
15000
20000
0
50
100
150
Epidemic Day

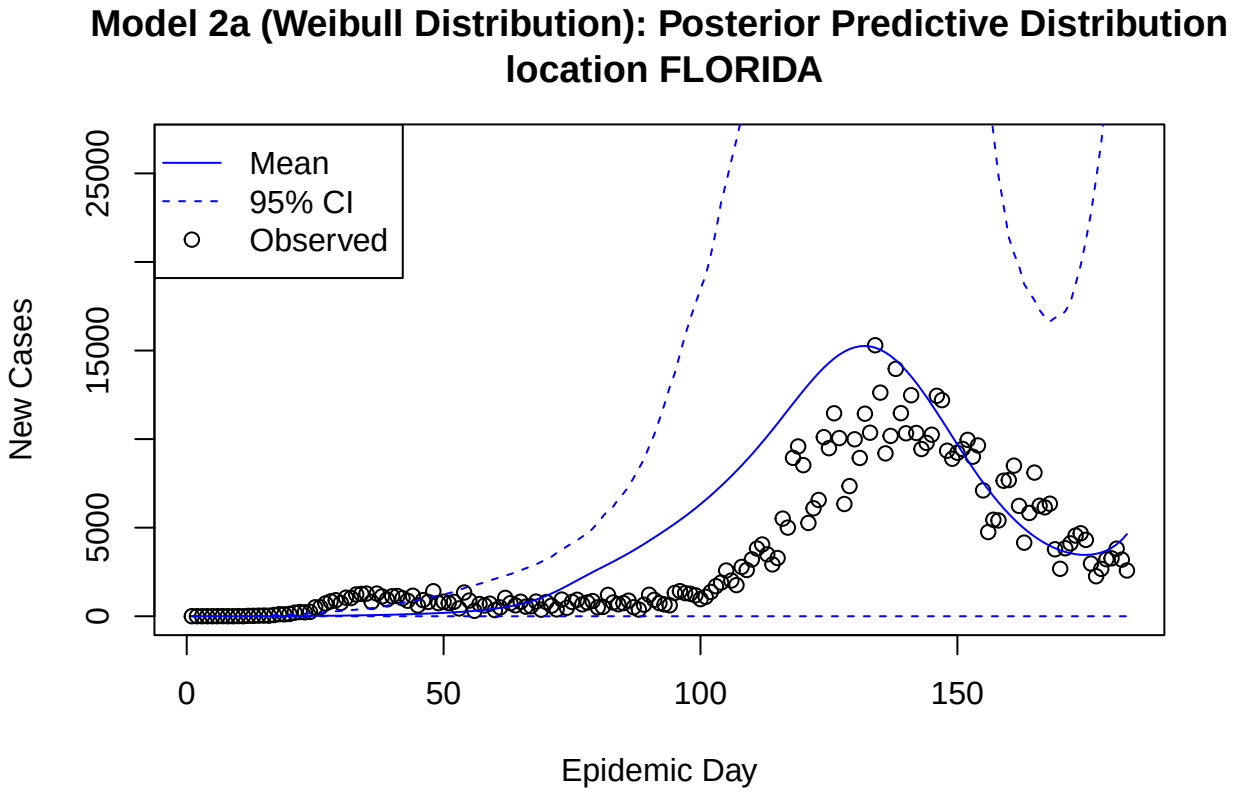

Model 2a (Basic ABC): Posterior Predictive Distribution
location GEORGIA
Mean
95% CI
Observed
New Cases
0
2000
4000
6000
8000
0
50
100
150
Epidemic Day

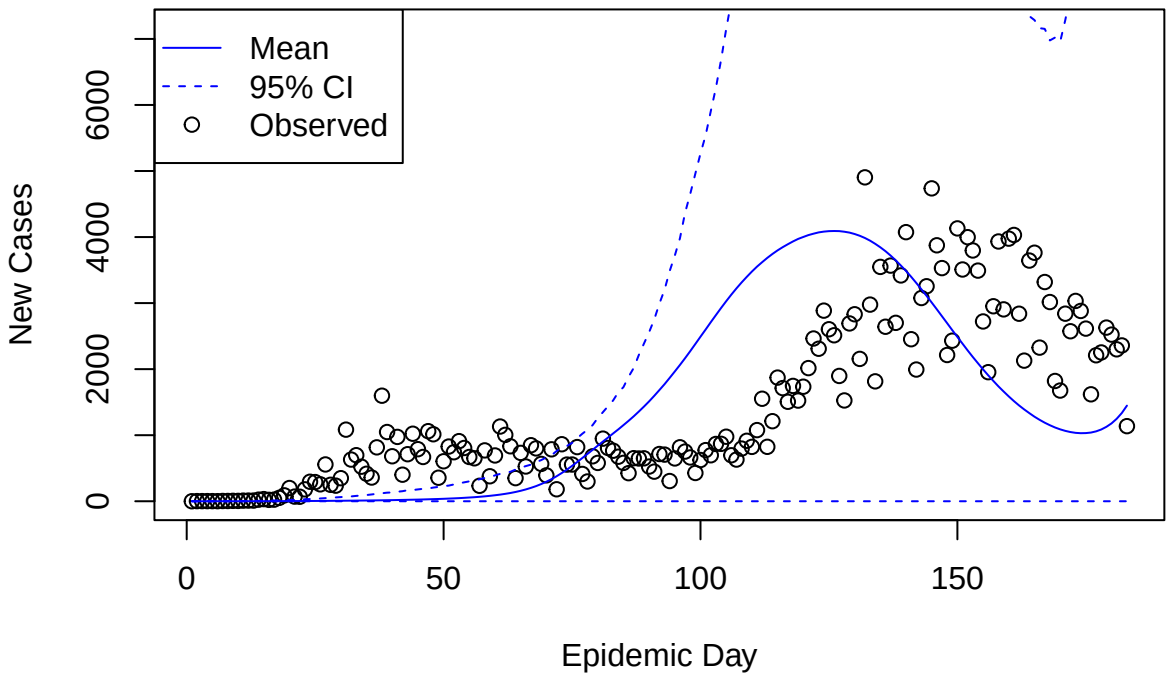

Model 2a (Weibull Distribution): Posterior Distribution
location ALABAMA
Mean
95% CI
Observed
New Cases
0
500
1500
2500
0
50
100
150
Epidemic Day

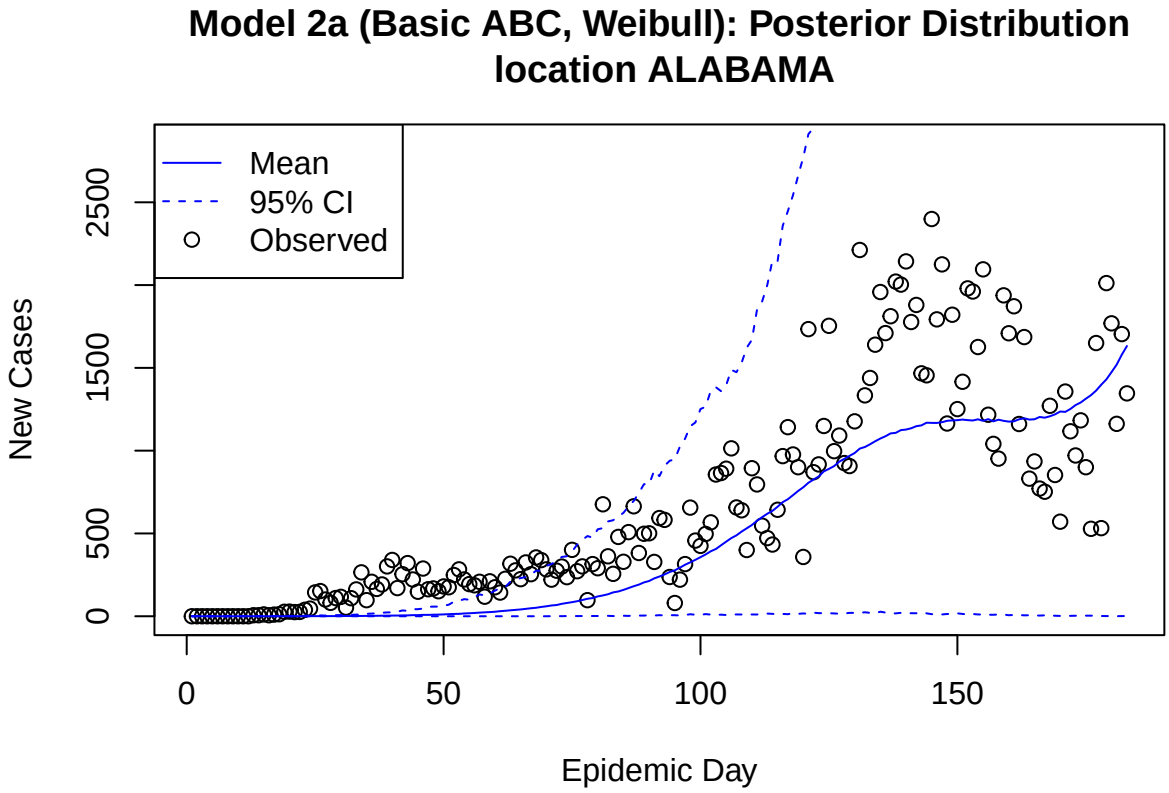

Model 2a (Weibull Distribution): Posterior Distribution
location FLORIDA
Mean
95% CI
Observed
New Cases
0
5000
10000
15000
0
50
100
150
Epidemic Day

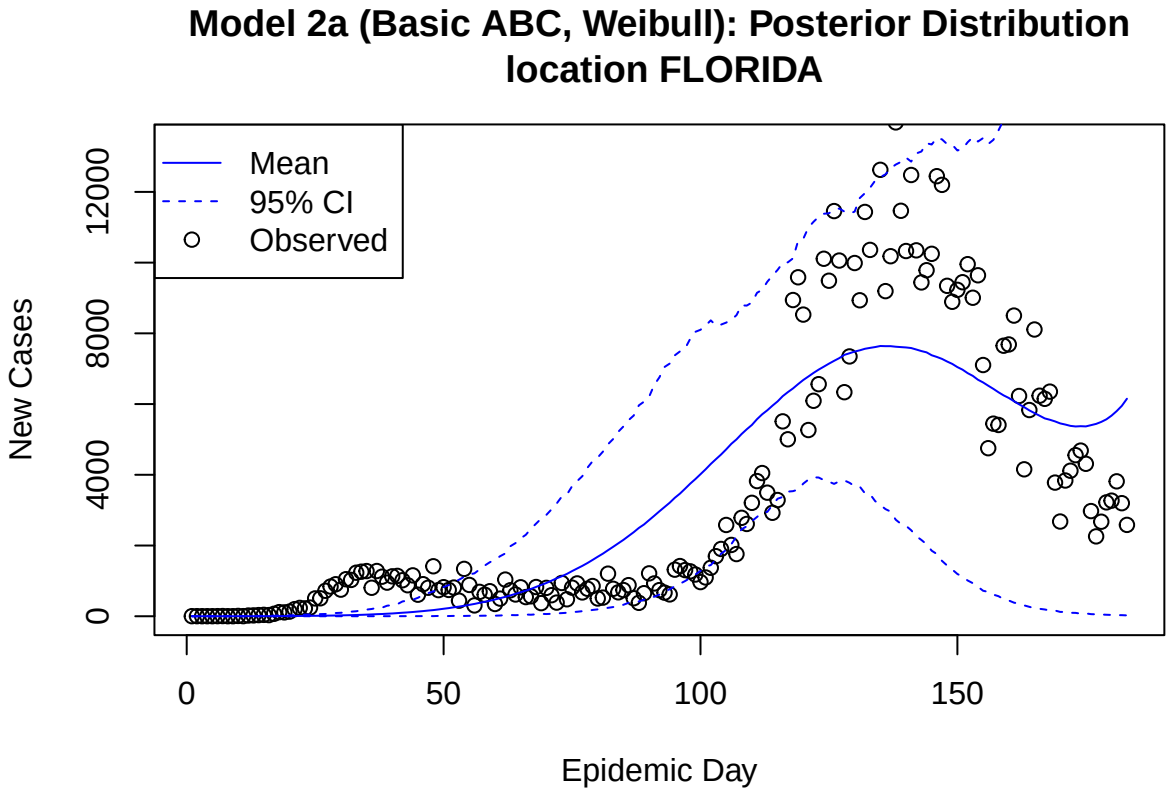

Model 2a (Weibull Distribution): Posterior Distribution
location GEORGIA
Mean
95% CI
Observed
New Cases
0
1000
2000
3000
4000
0
50
100
150
Epidemic Day

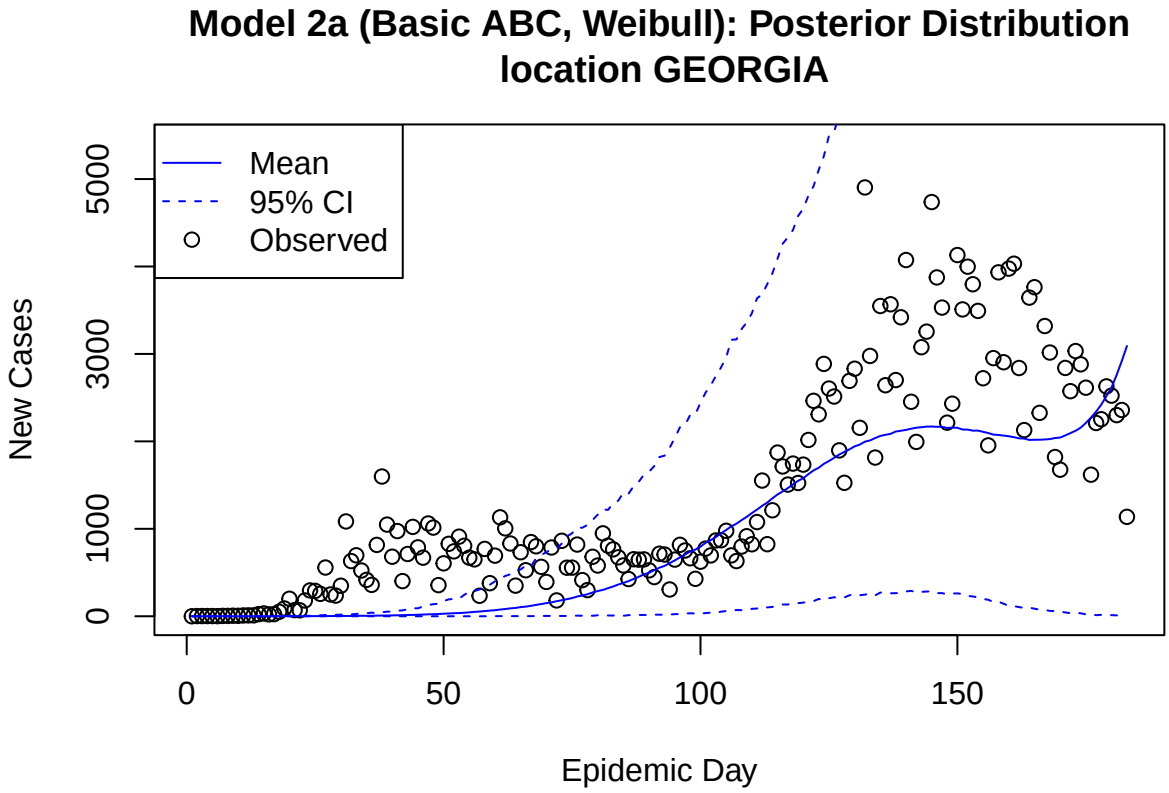

Model 2a (Weibull Distribution): Posterior Predictive Distribution
location ALABAMA
Mean
95% CI
Observed
New Cases
0
1000
3000
5000
0
50
100
150
Epidemic Day

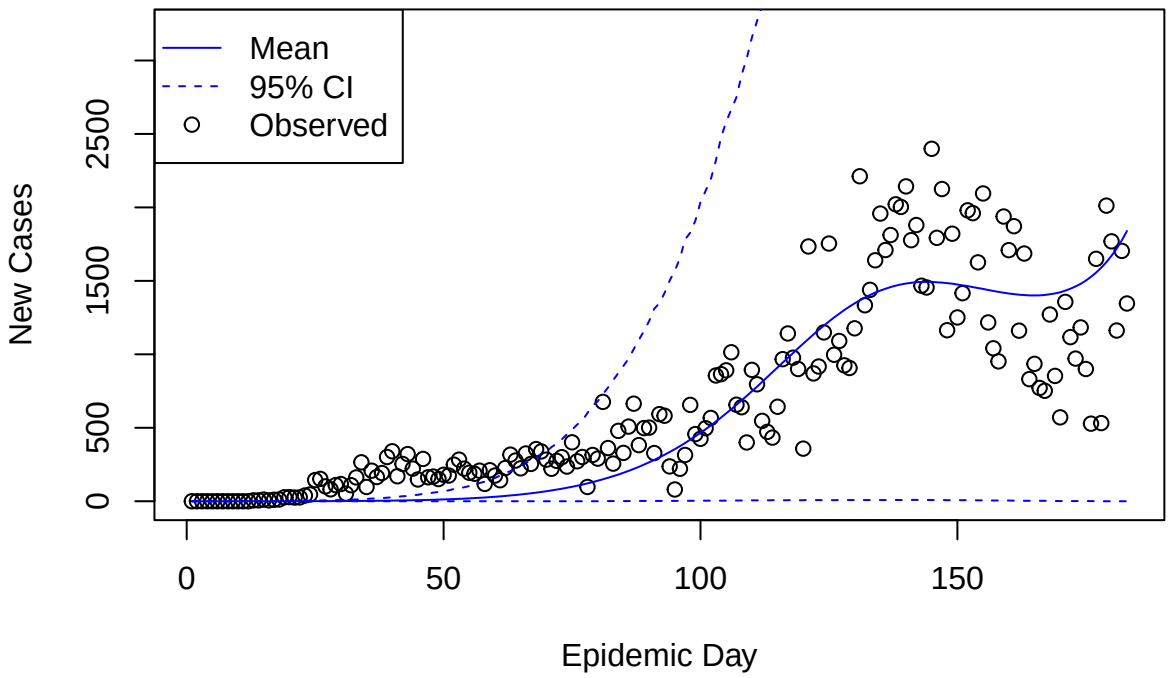

Model 2a (Weibull Distribution): Posterior Predictive Distribution
location FLORIDA
Mean
95% CI
Observed
New Cases
0
5000
15000
25000
0
50
100
150
Epidemic Day

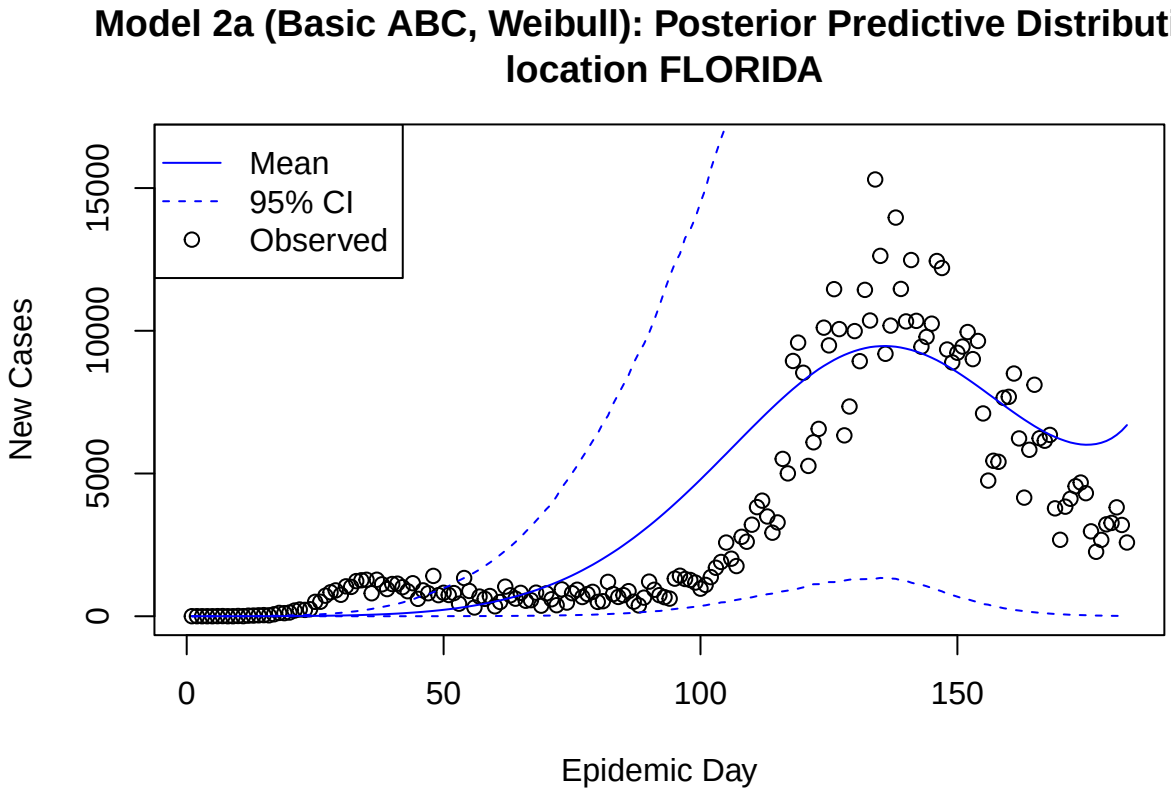

Model 2a (Weibull Distribution): Posterior Predictive Distribution
location GEORGIA
Mean
95% CI
Observed
New Cases
0
2000
4000
6000
0
50
100
150
Epidemic Day

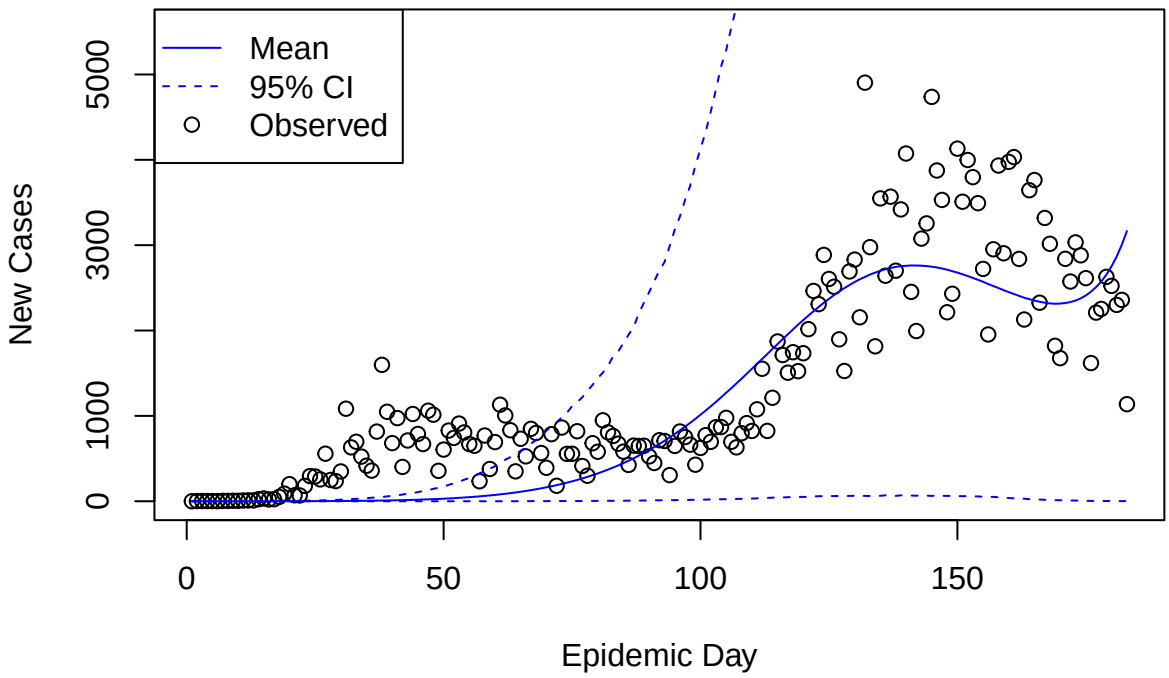

Model 2a (Basic ABC, Weibull): Posterior Distribution
location ALABAMA
Mean
95% CI
Observed
New Cases
0
500
1500
2500
0
50
100
150
Epidemic Day

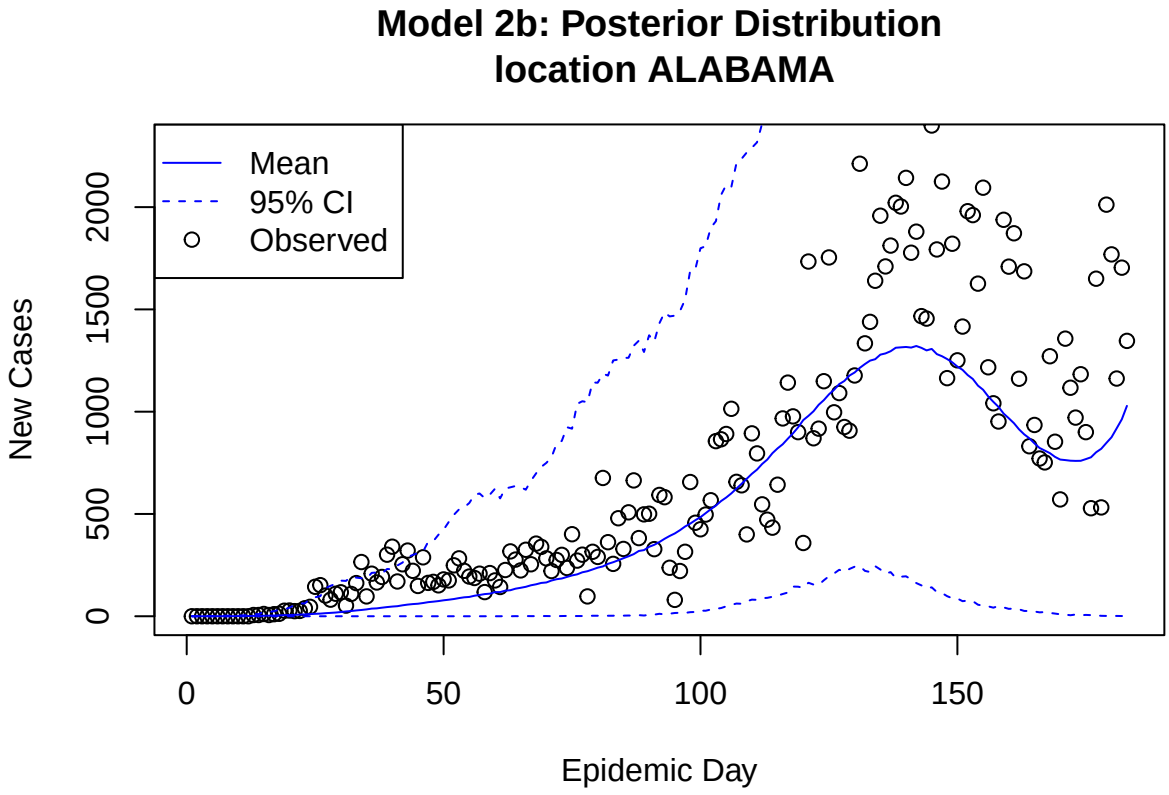

Model 2a (Basic ABC, Weibull): Posterior Distribution
location FLORIDA
Mean
95% CI
Observed
New Cases
0
4000
8000
12000
0
50
100
150
Epidemic Day

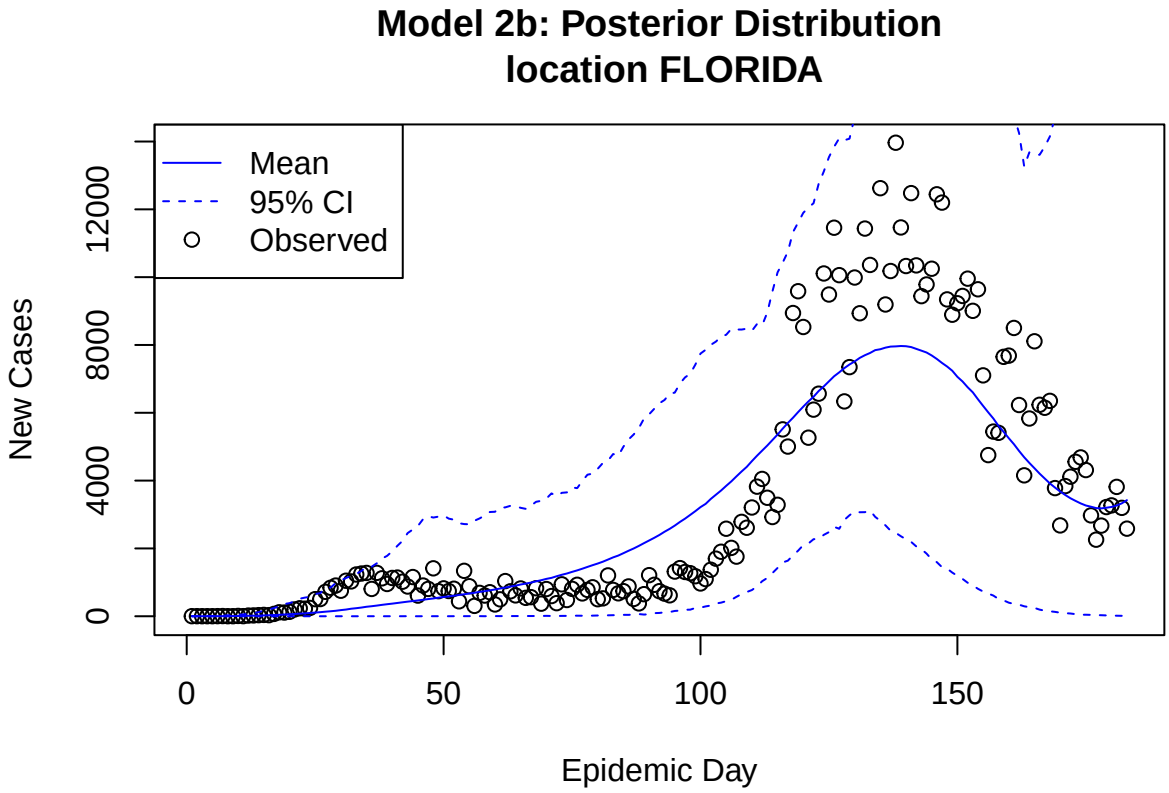

Model 2a (Basic ABC, Weibull): Posterior Distribution
location GEORGIA
Mean
95% CI
Observed
New Cases
0
1000
3000
5000
0
50
100
150
Epidemic Day

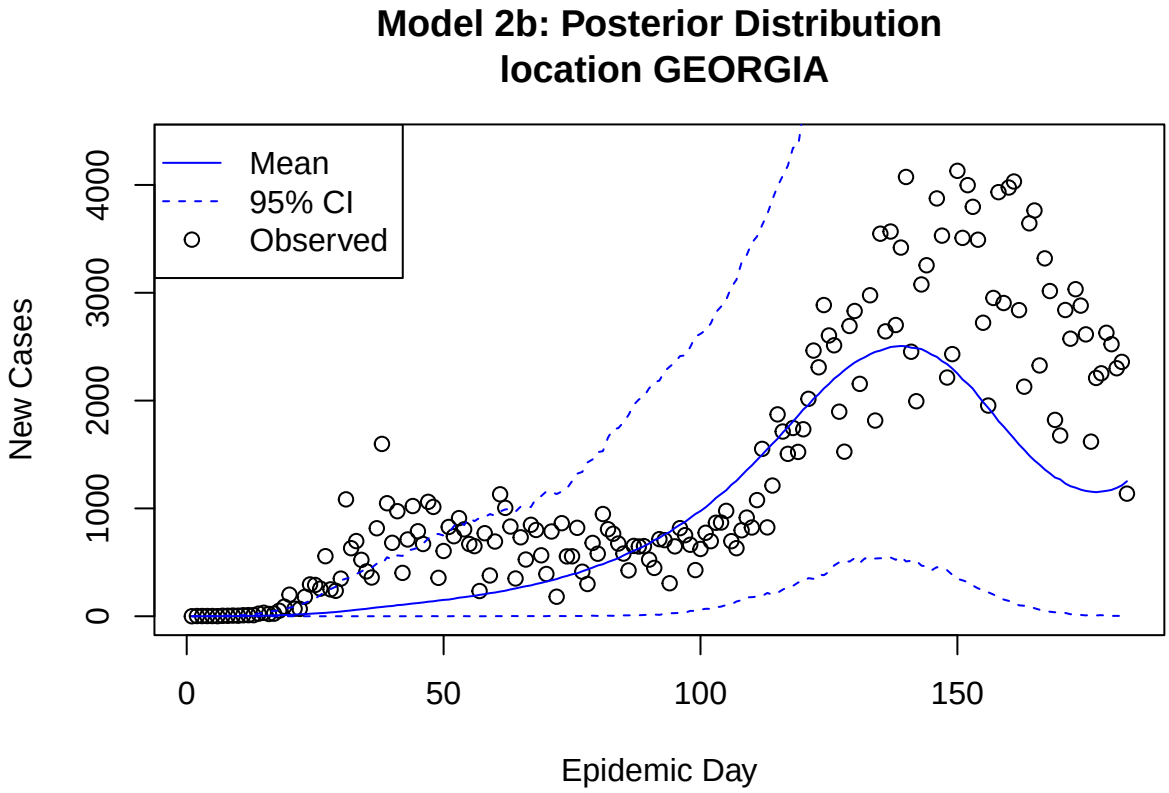

Model 2a (Basic ABC, Weibull): Posterior Predictive Distribution
location ALABAMA
Mean
95% CI
Observed
New Cases
0
500
1500
2500
0
50
100
150
Epidemic Day

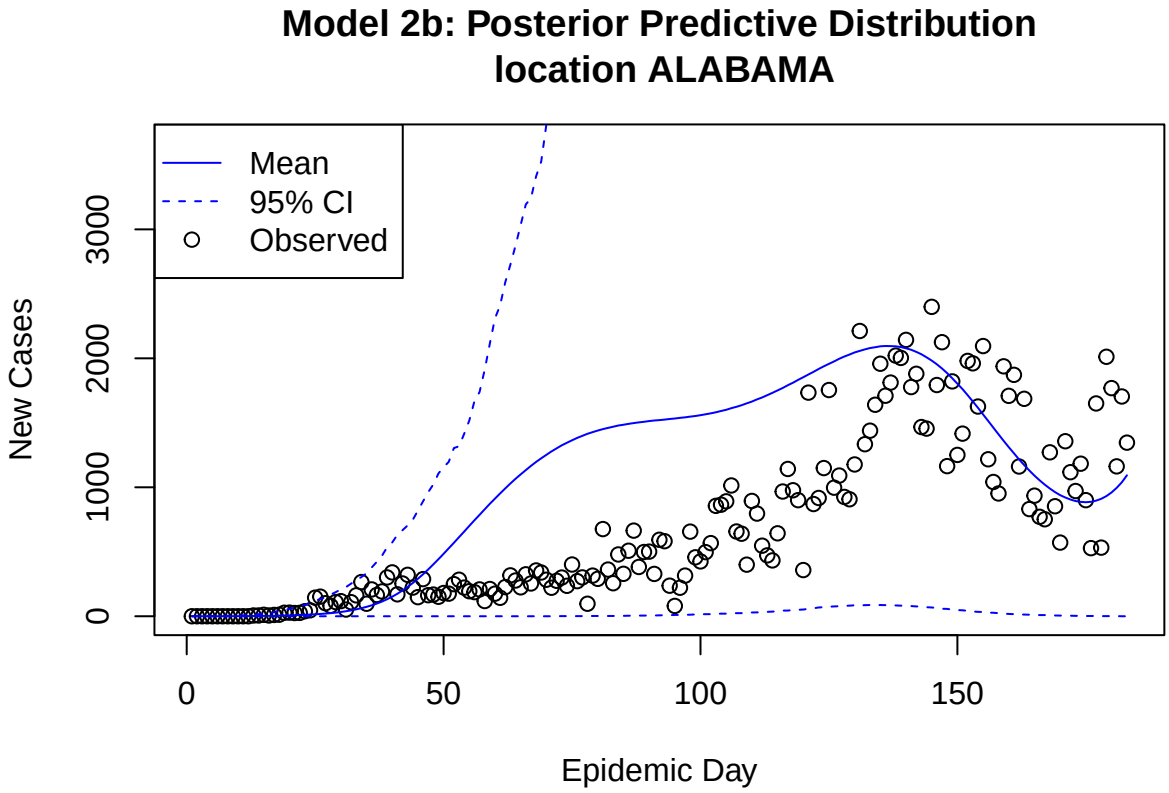

Model 2a (Basic ABC, Weibull): Posterior Predictive Distribution
location FLORIDA
Mean
95% CI
Observed
New Cases
0
5000
10000
15000
0
50
100
150
Epidemic Day

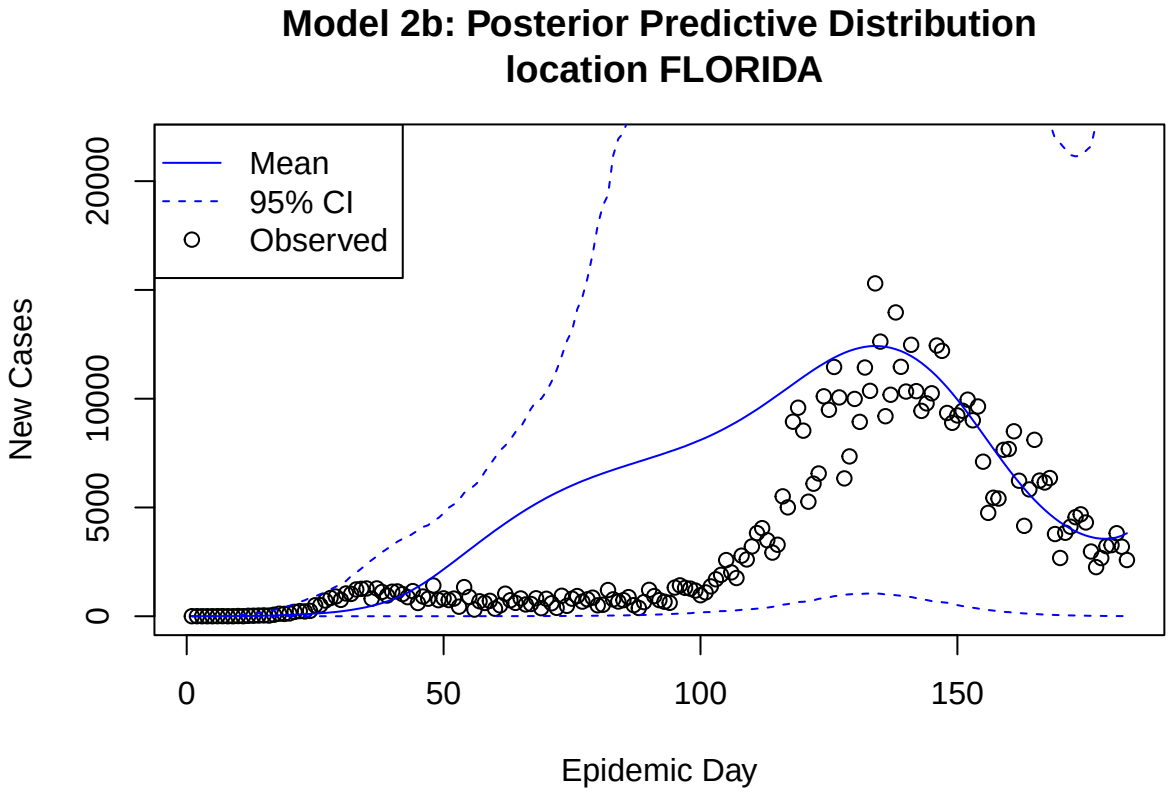

Model 2a (Basic ABC, Weibull): Posterior Predictive Distribution
location GEORGIA
Mean
95% CI
Observed
New Cases
0
1000
3000
5000
0
50
100
150
Epidemic Day

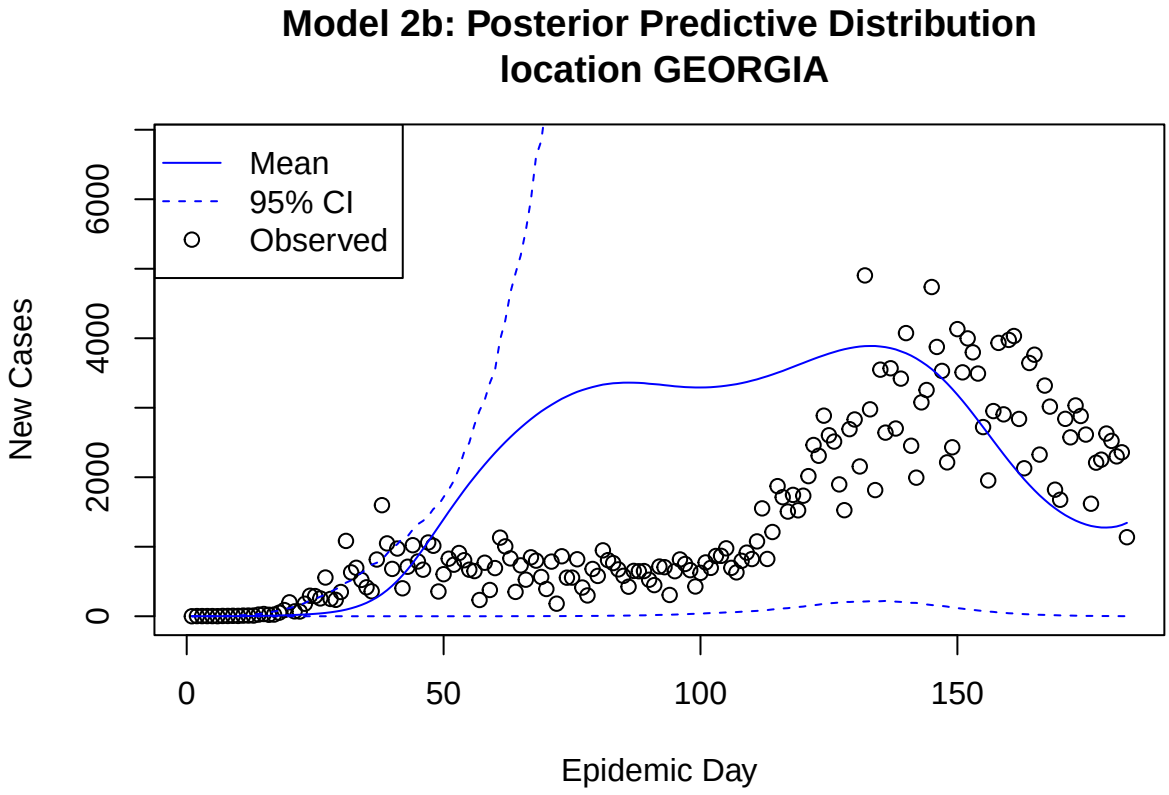

Model 2b: Posterior Distribution
location ALABAMA
Mean
95% CI
Observed
New Cases
0
500
1000
1500
2000
0
50
100
150
Epidemic Day

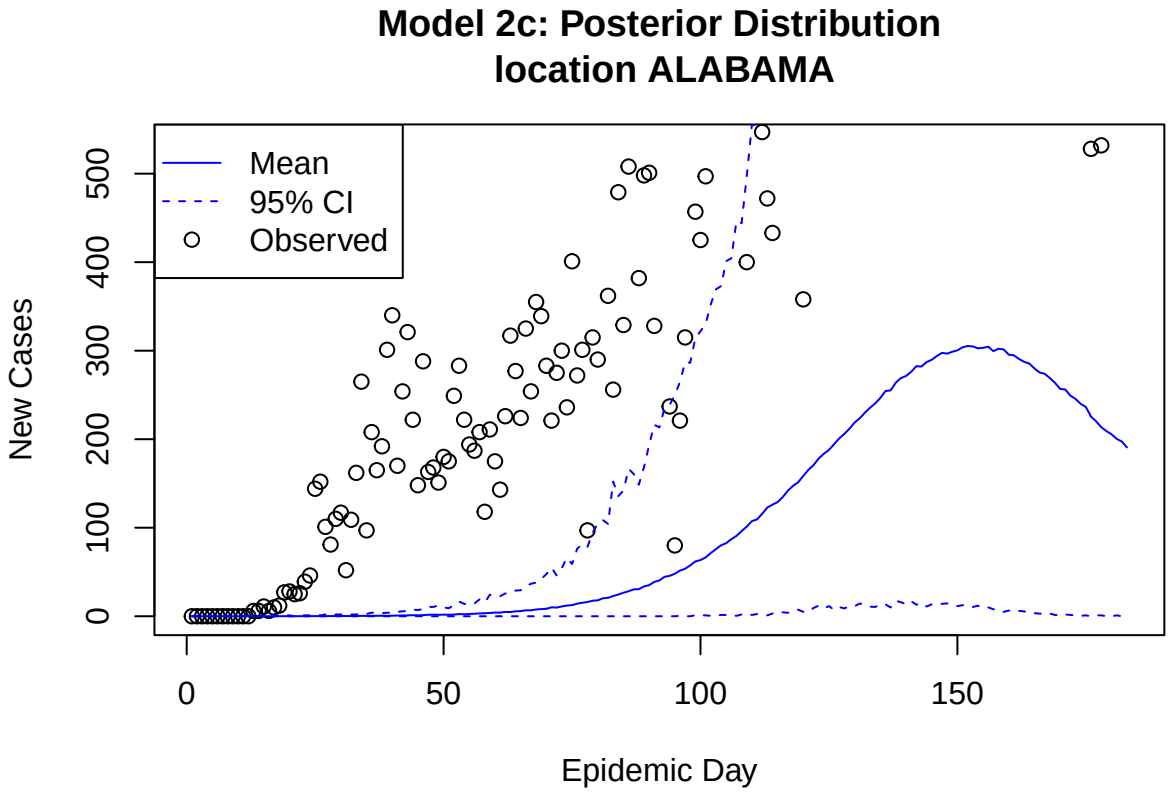

Model 2b: Posterior Distribution
location FLORIDA
Mean
95% CI
Observed
New Cases
0
4000
8000
12000
0
50
100
150
Epidemic Day

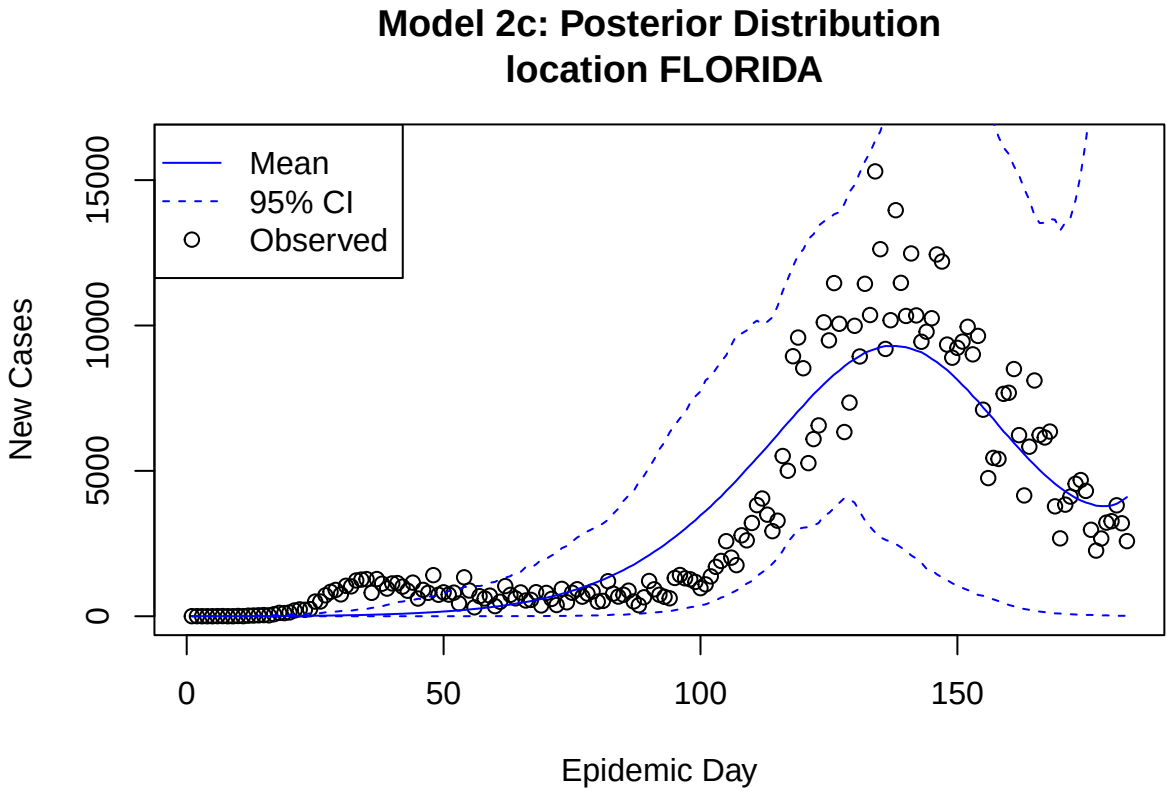

Model 2b: Posterior Distribution
location GEORGIA
Mean
95% CI
Observed
New Cases
0
1000
2000
3000
4000
0
50
100
150
Epidemic Day

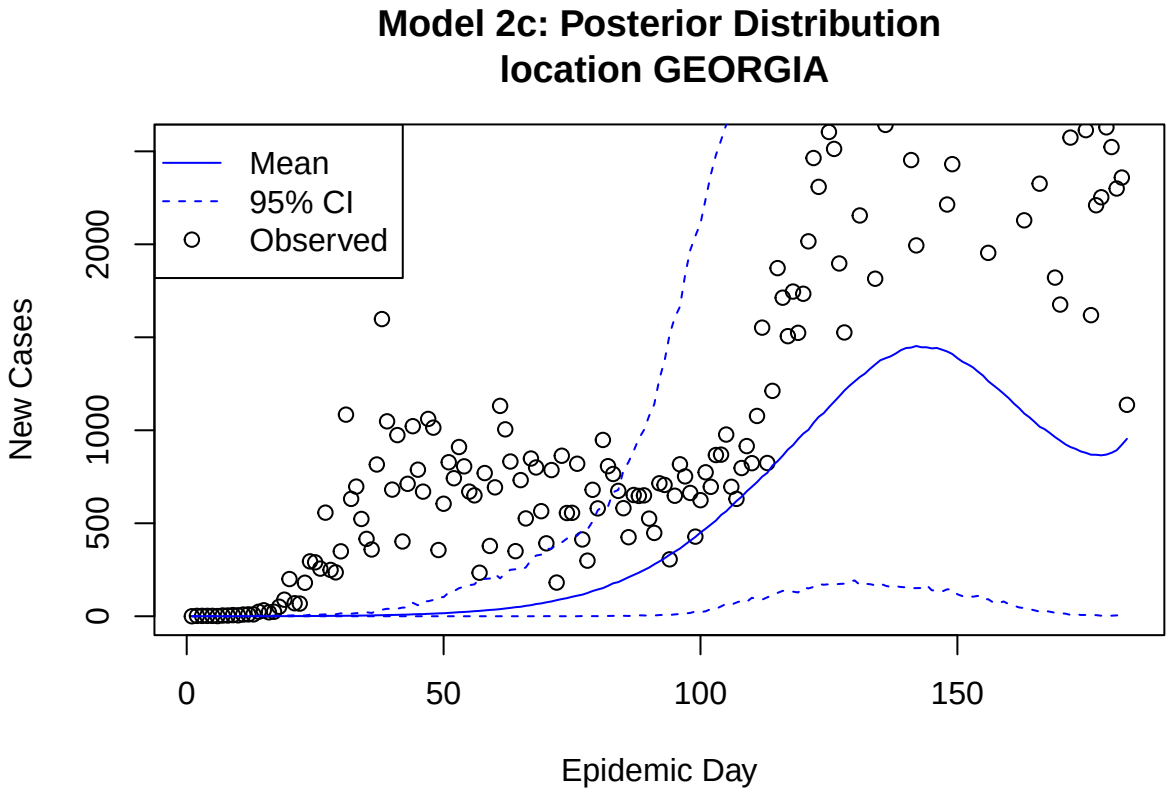

Model 2b: Posterior Predictive Distribution
location ALABAMA
Mean
95% CI
Observed
New Cases
0
1000
2000
3000
0
50
100
150
Epidemic Day

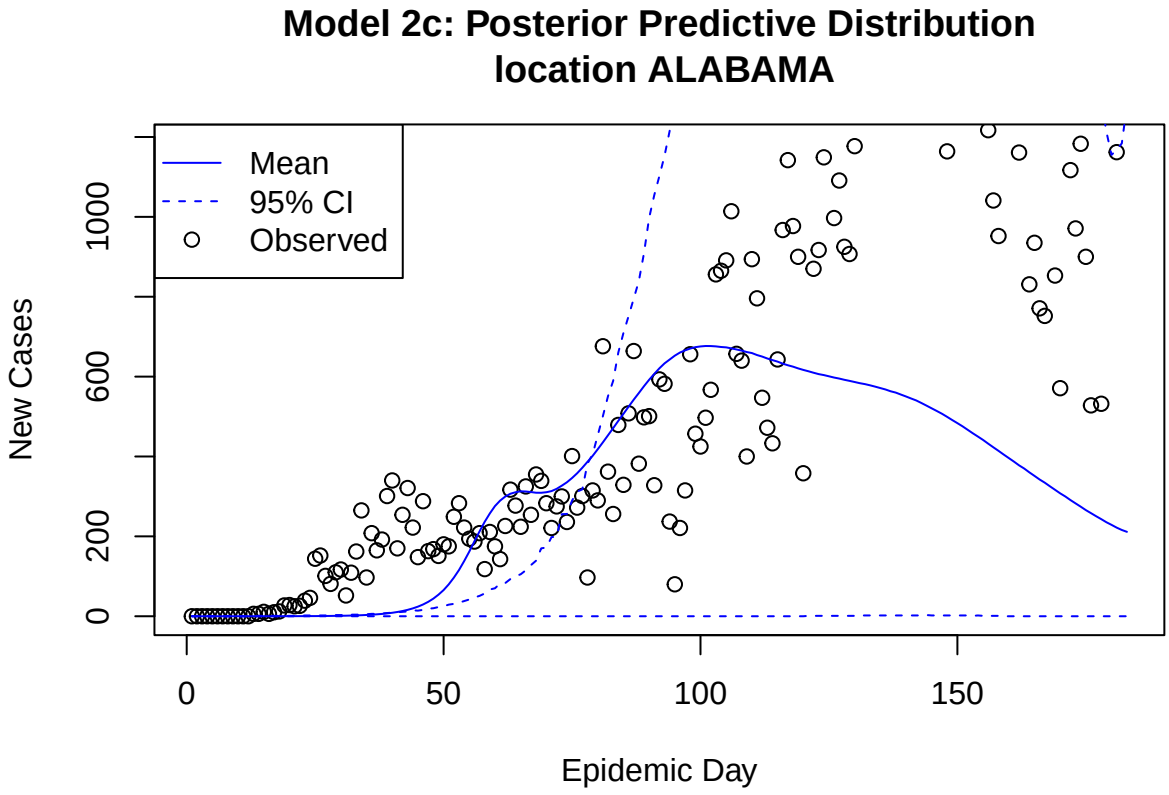

Model 2b: Posterior Predictive Distribution
location FLORIDA
Mean
95% CI
Observed
New Cases
0
5000
10000
20000
0
50
100
150
Epidemic Day

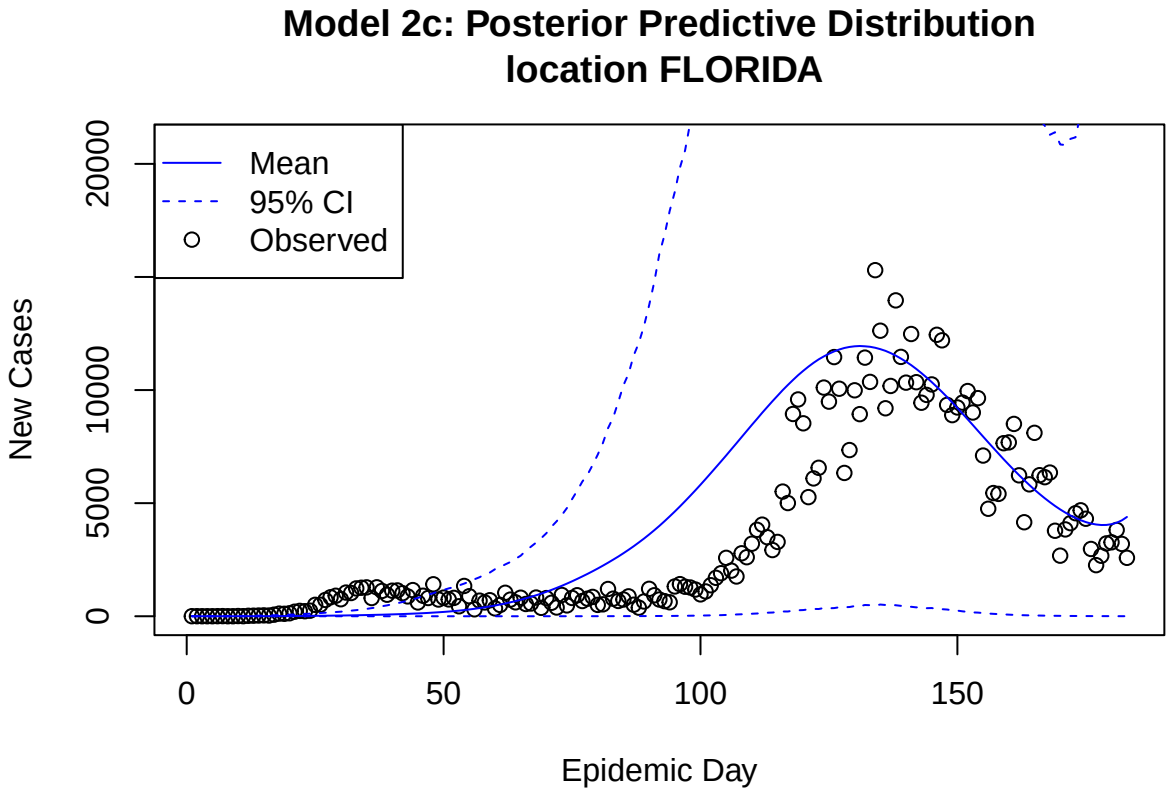

Model 2b: Posterior Predictive Distribution
location GEORGIA
Mean
95% CI
Observed
New Cases
0
2000
4000
6000
0
50
100
150
Epidemic Day

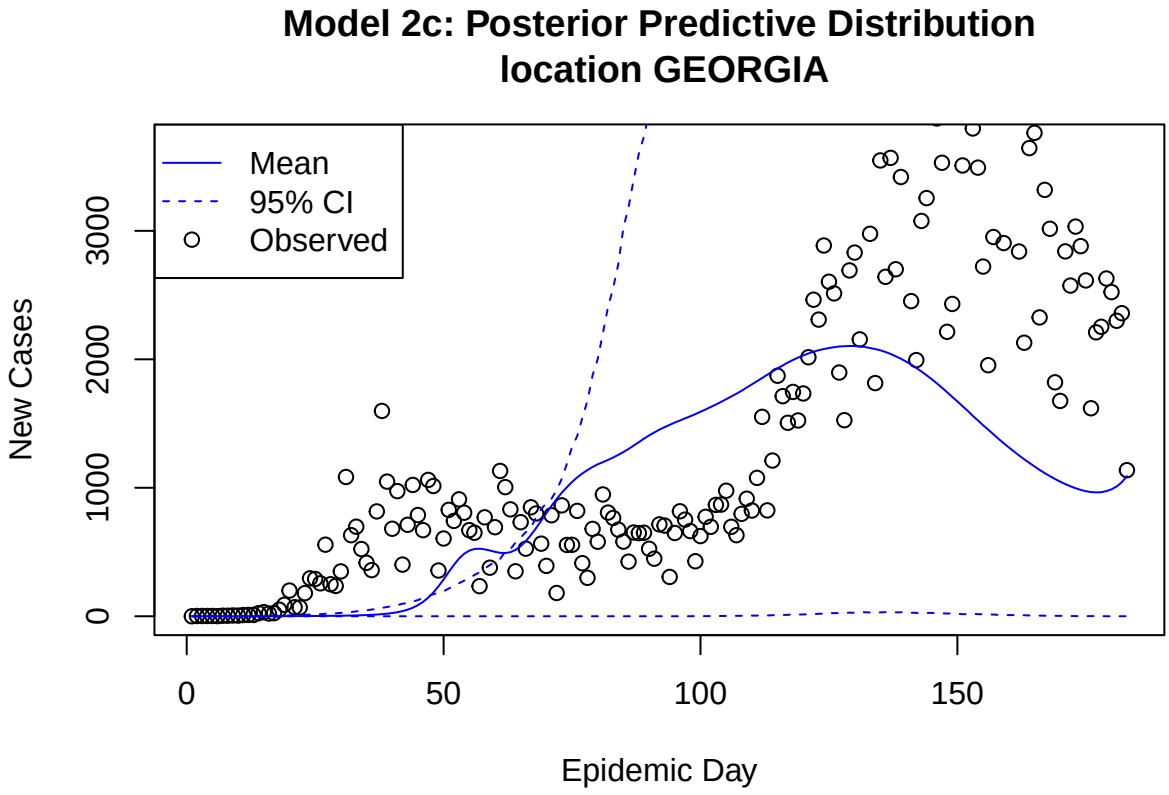

Model 2c: Posterior Distribution
location ALABAMA
Mean
95% CI
Observed
New Cases
0
100
200
300
400
500
0
50
100
150
Epidemic Day

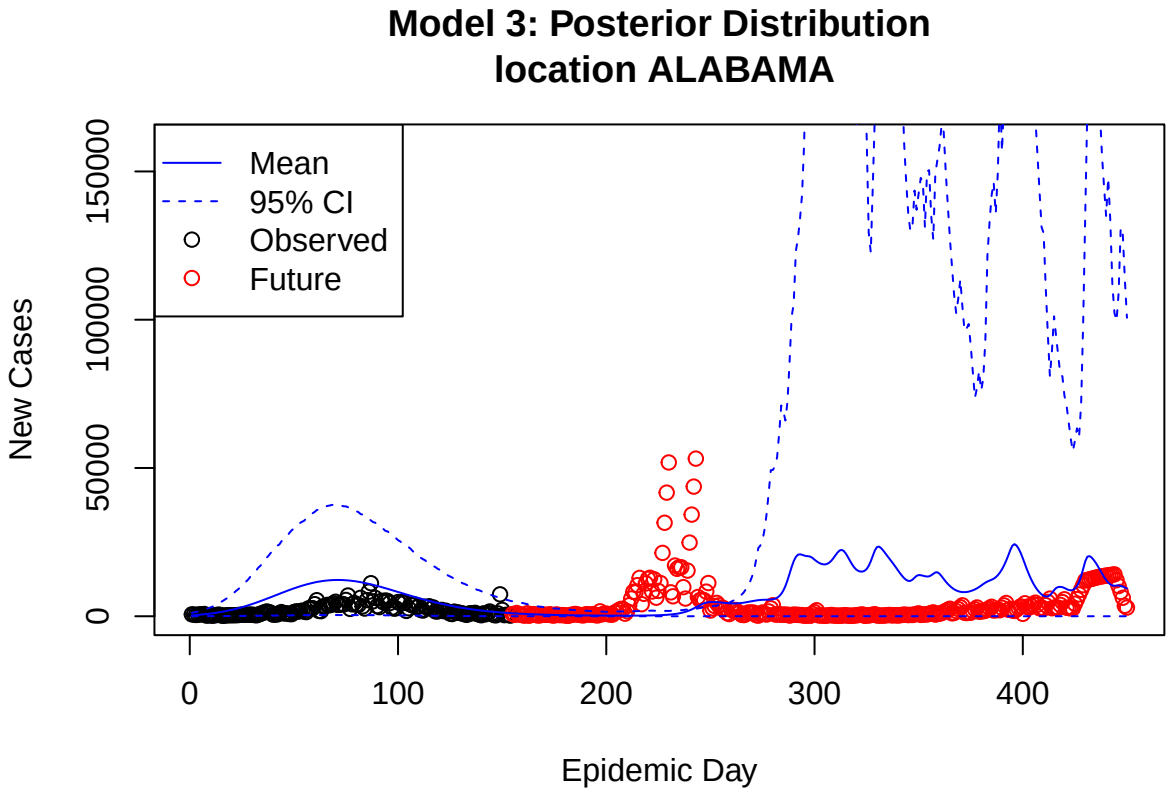

Model 2c: Posterior Distribution
location FLORIDA
Mean
95% CI
Observed
New Cases
0
5000
10000
15000
0
50
100
150
Epidemic Day

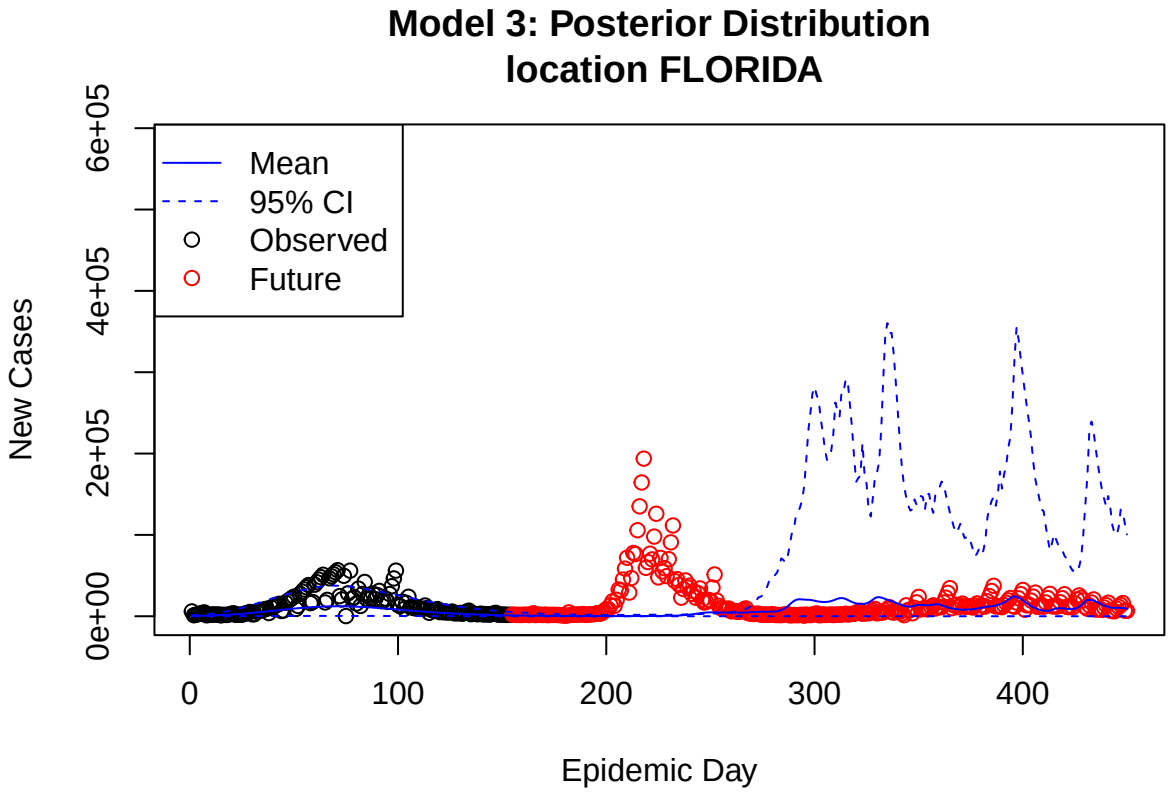

Model 2c: Posterior Distribution
location GEORGIA
Mean
95% CI
Observed
New Cases
0
500
1000
2000
0
50
100
150
Epidemic Day

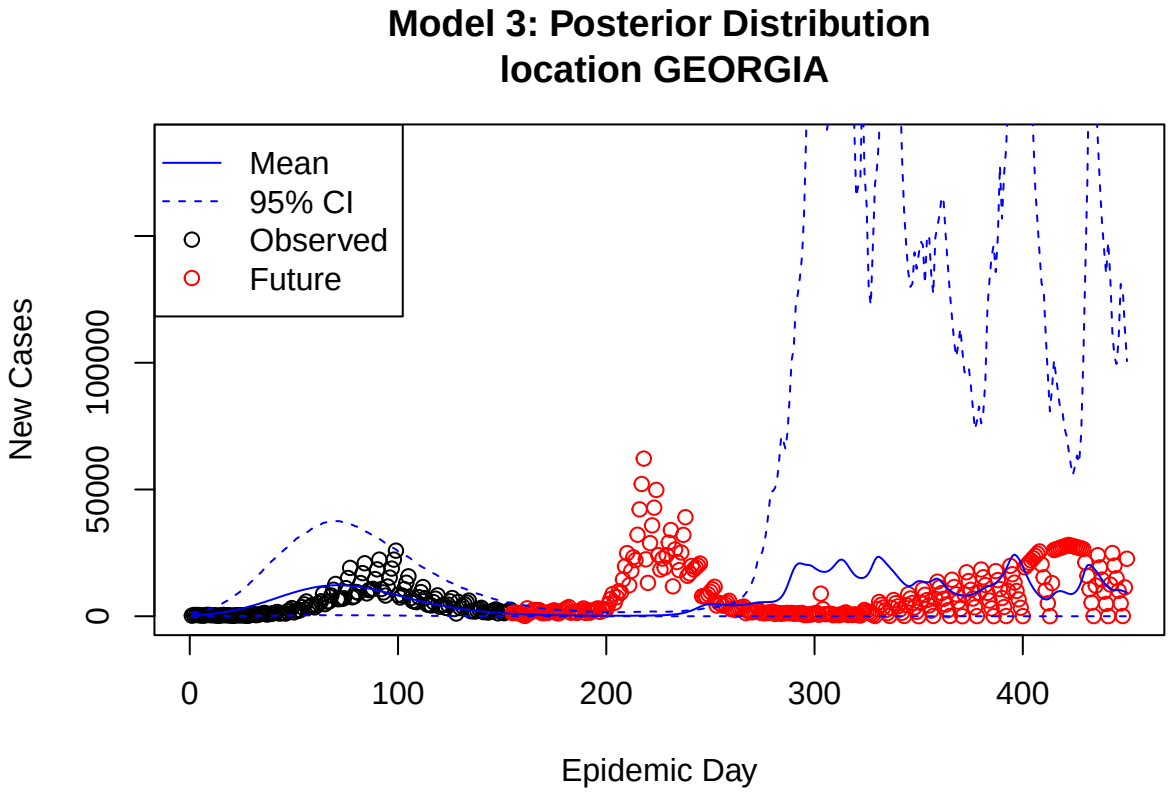

Model 2c: Posterior Predictive Distribution
location ALABAMA
Mean
95% CI
Observed
New Cases
0
200
600
1000
0
50
100
150
Epidemic Day

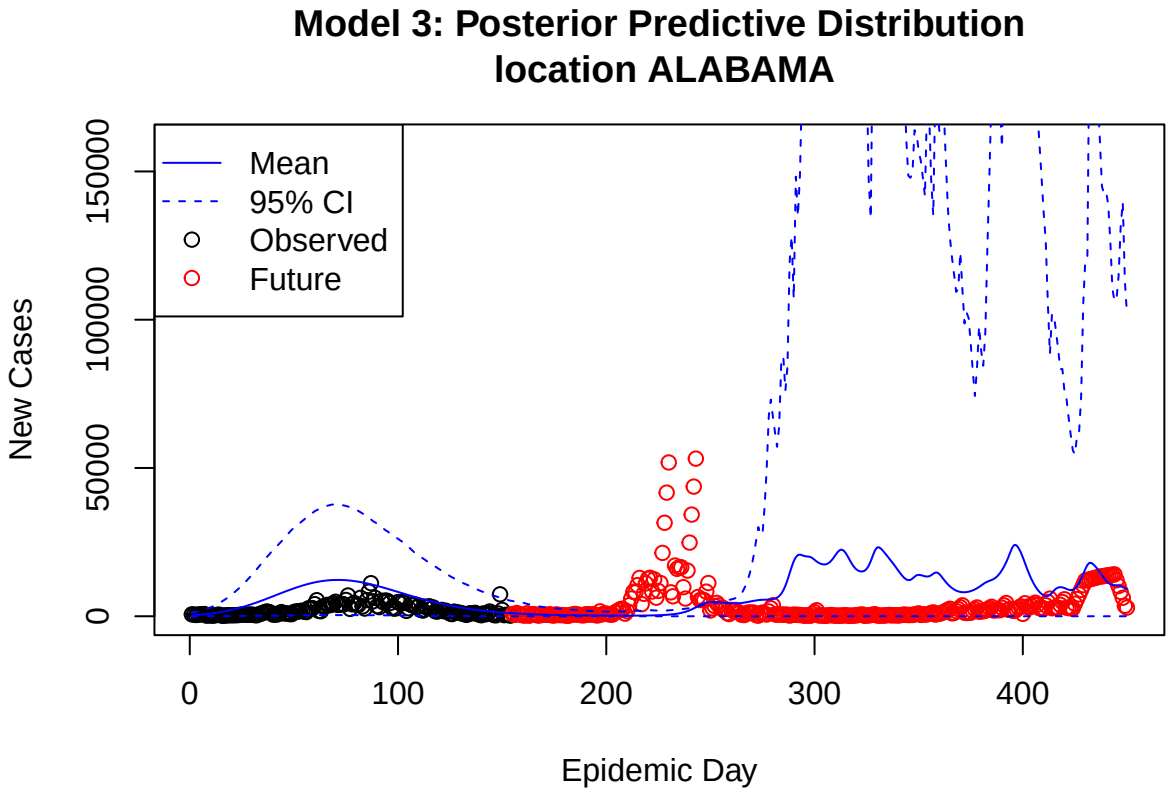

Model 2c: Posterior Predictive Distribution
location FLORIDA
Mean
95% CI
Observed
New Cases
0
5000
10000
20000
0
50
100
150
Epidemic Day

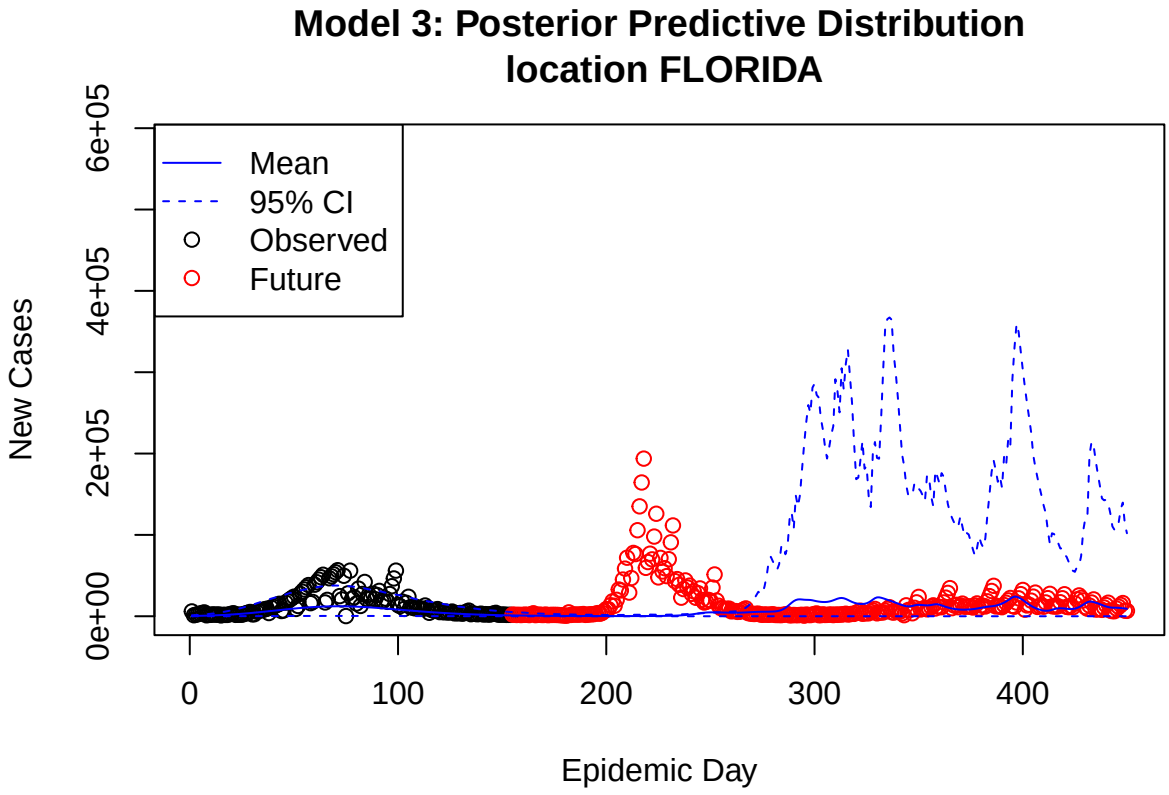

Model 2c: Posterior Predictive Distribution
location GEORGIA
Mean
95% CI
Observed
New Cases
0
1000
2000
3000
0
50
100
150
Epidemic Day

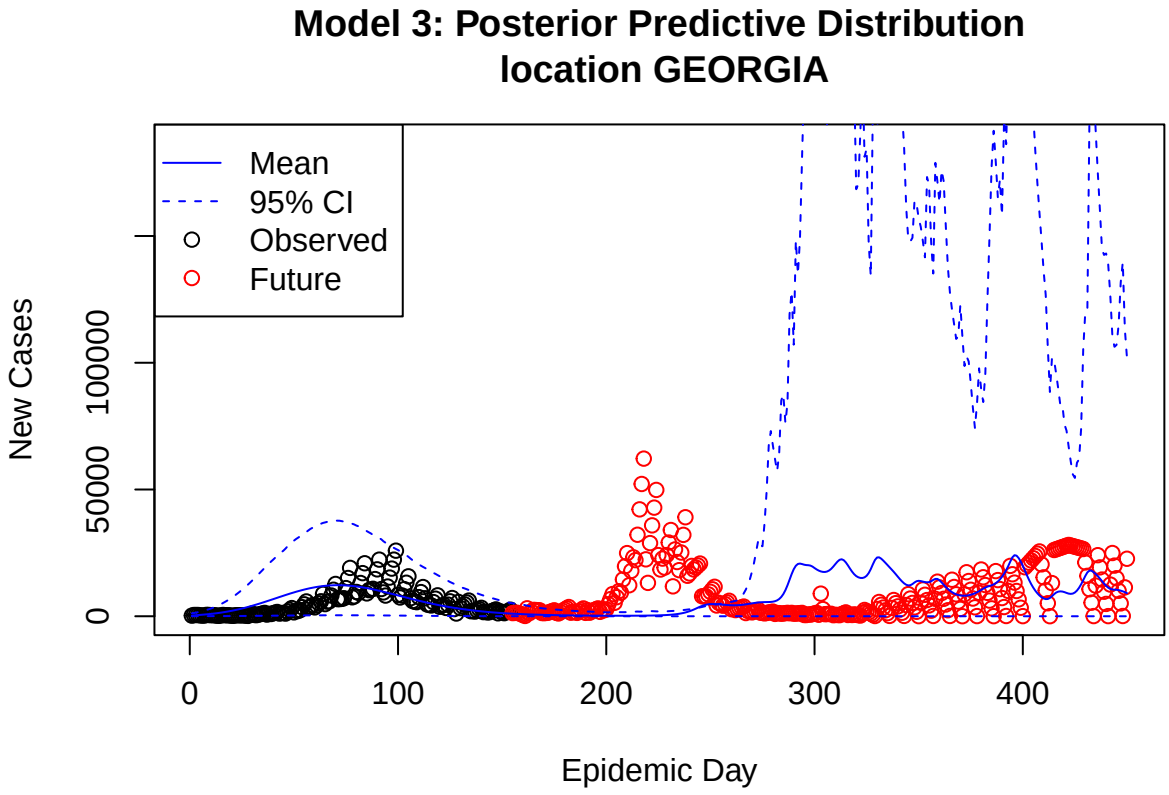

Model 3: Posterior Distribution
location ALABAMA
Mean
95% CI
Observed
Future
New Cases
0
50000
100000
150000
0
100
200
300
400
Epidemic Day

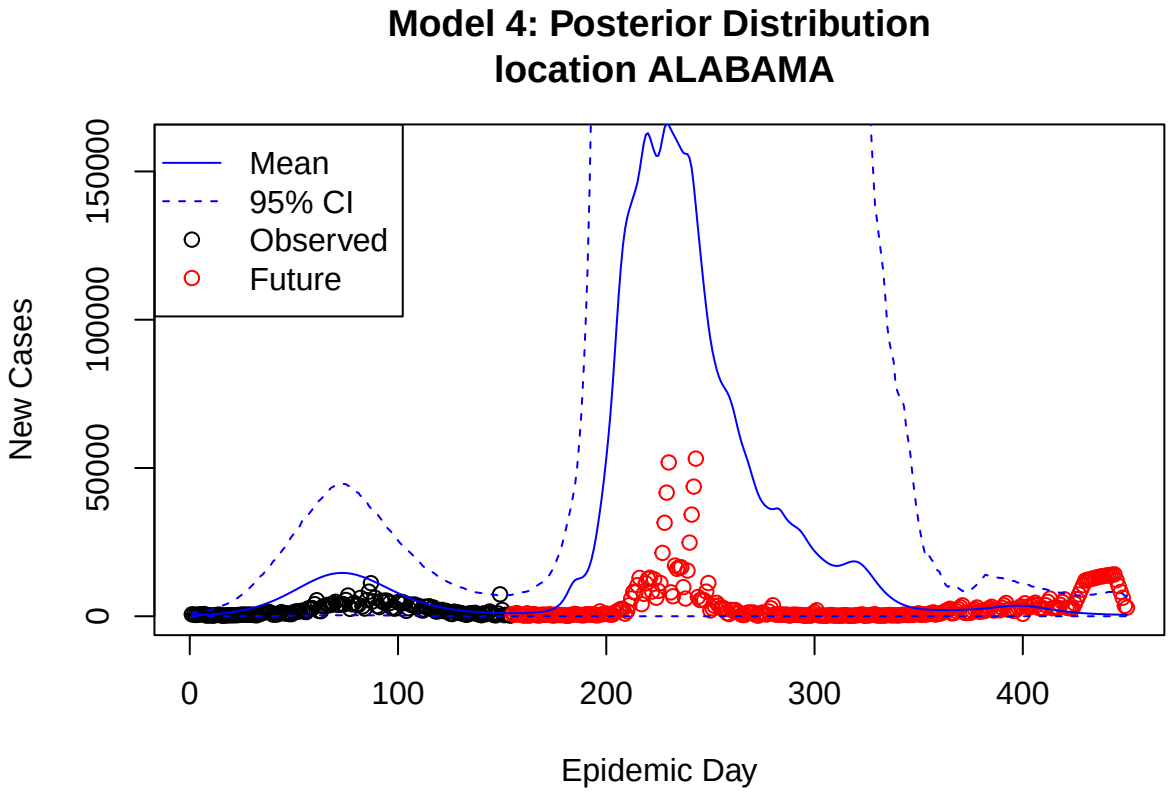

Model 3: Posterior Distribution
location FLORIDA
Mean
95% CI
Observed
Future
New Cases
0e+00
2e+05
4e+05
6e+05
0
100
200
300
400
Epidemic Day

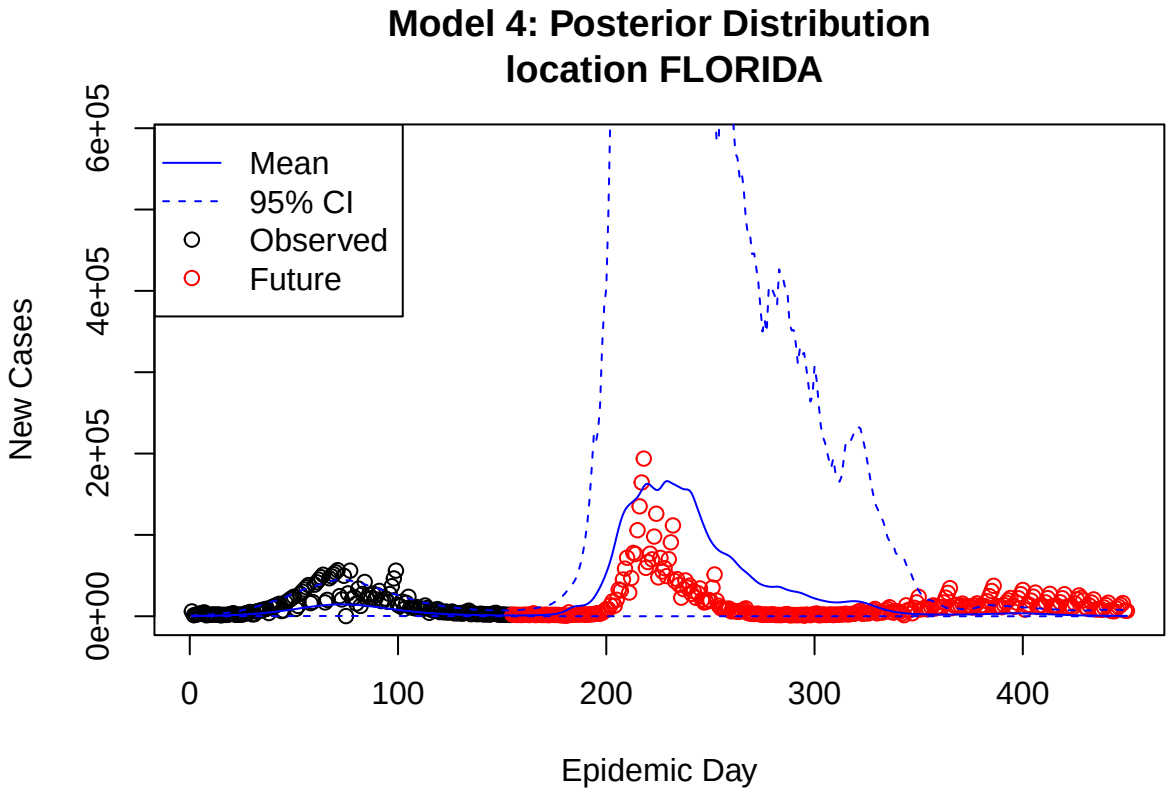

Model 3: Posterior Distribution
location GEORGIA
Mean
95% CI
Observed
Future
New Cases
0
50000
100000
0
100
200
300
400
Epidemic Day

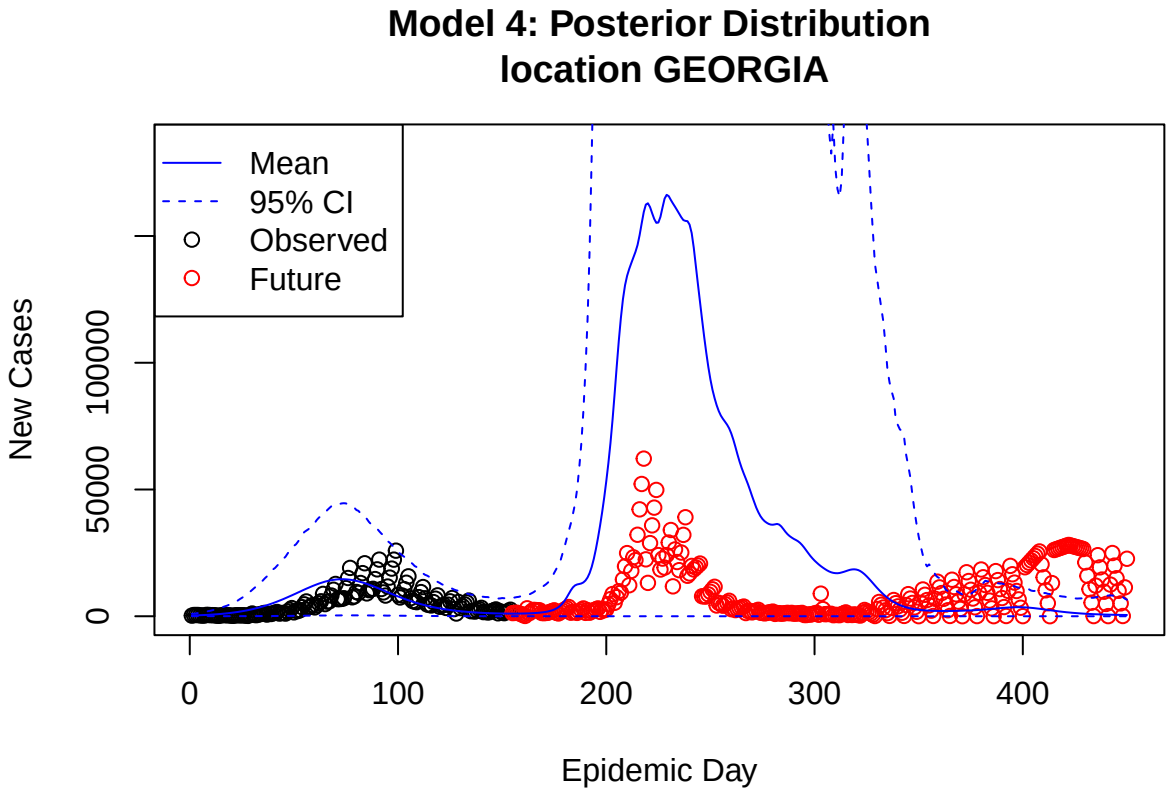

Model 3: Posterior Predictive Distribution
location ALABAMA
Mean
95% CI
Observed
Future
New Cases
0
50000
100000
150000
0
100
200
300
400
Epidemic Day

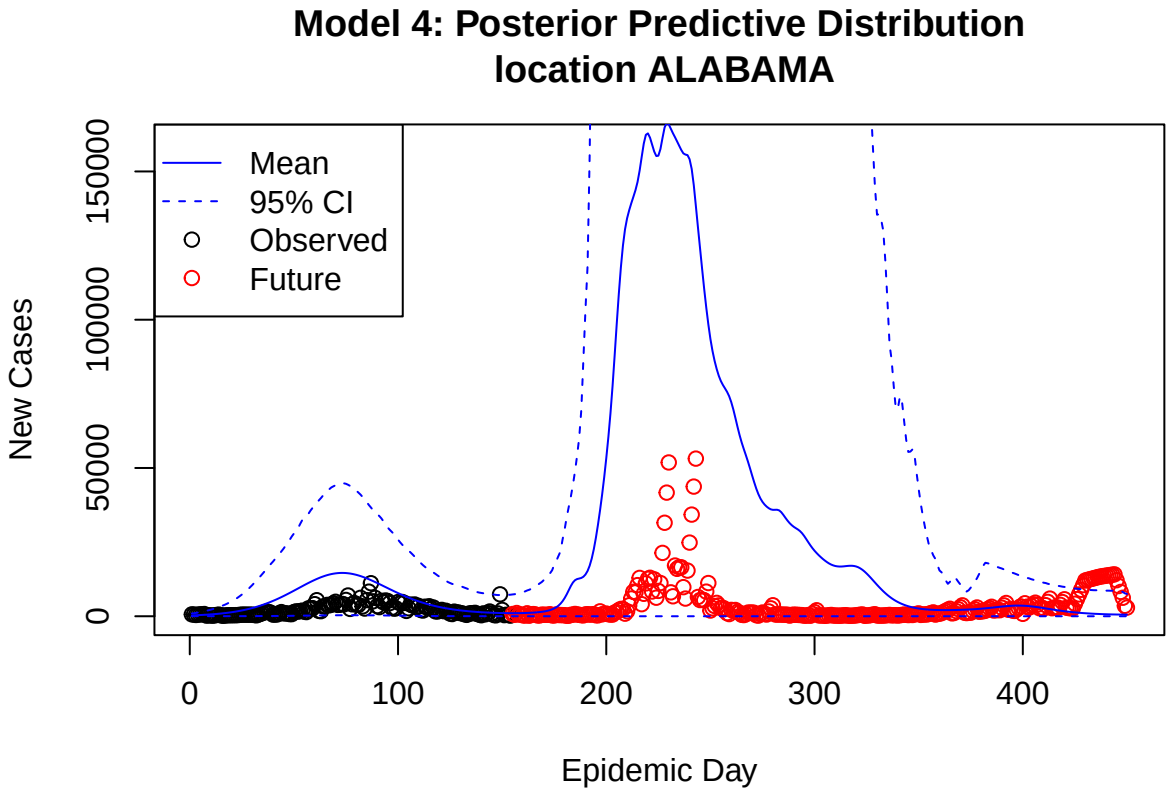

Model 3: Posterior Predictive Distribution
location FLORIDA
Mean
95% CI
Observed
Future
New Cases
0e+00
2e+05
4e+05
6e+05
0
100
200
300
400
Epidemic Day

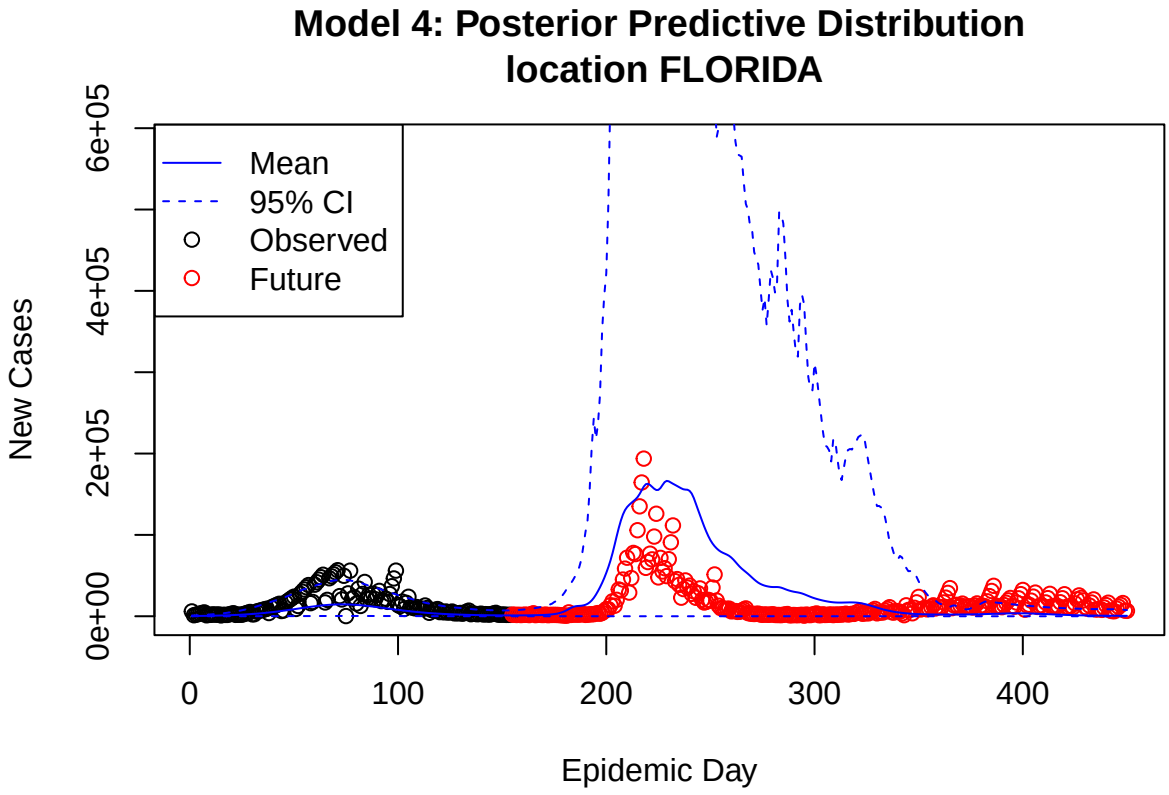

Model 3: Posterior Predictive Distribution
location GEORGIA
Mean
95% CI
Observed
Future
New Cases
0
50000
100000
0
100
200
300
400
Epidemic Day

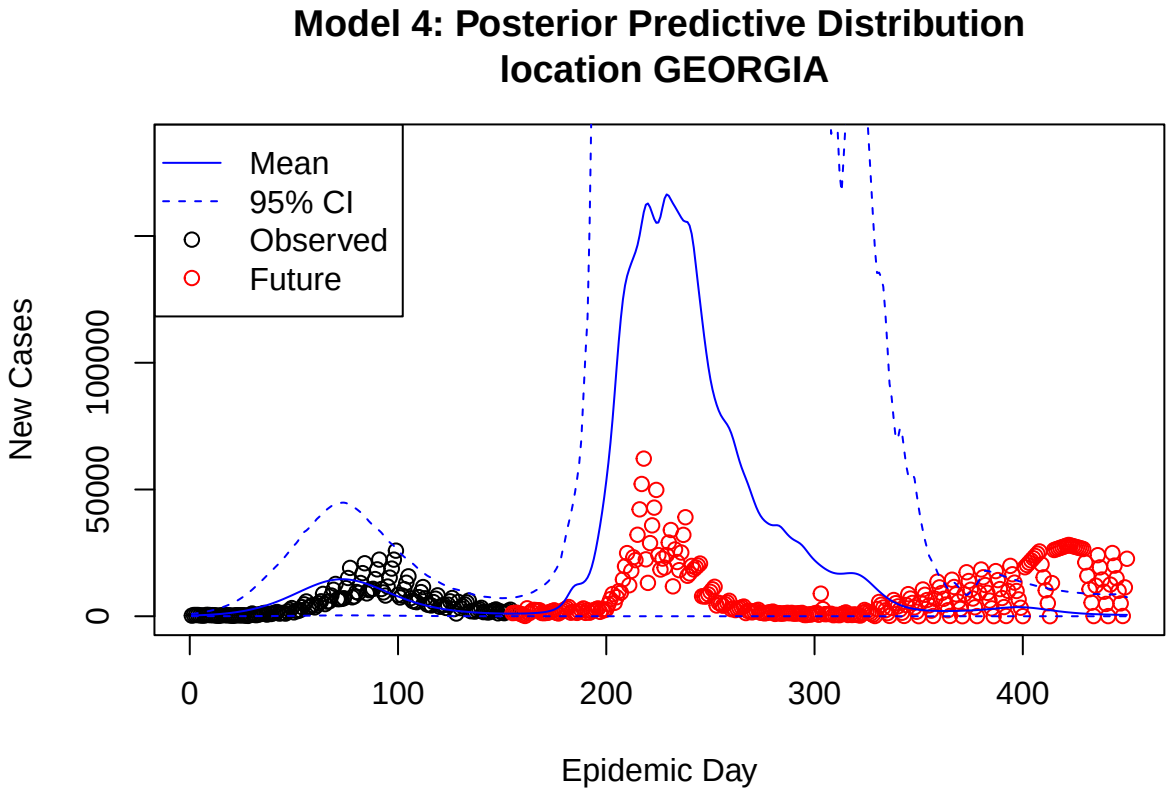

Model 4: Posterior Distribution
location ALABAMA
Mean
95% CI
Observed
Future
New Cases
0
50000
100000
150000
0
100
200
300
400
Epidemic Day

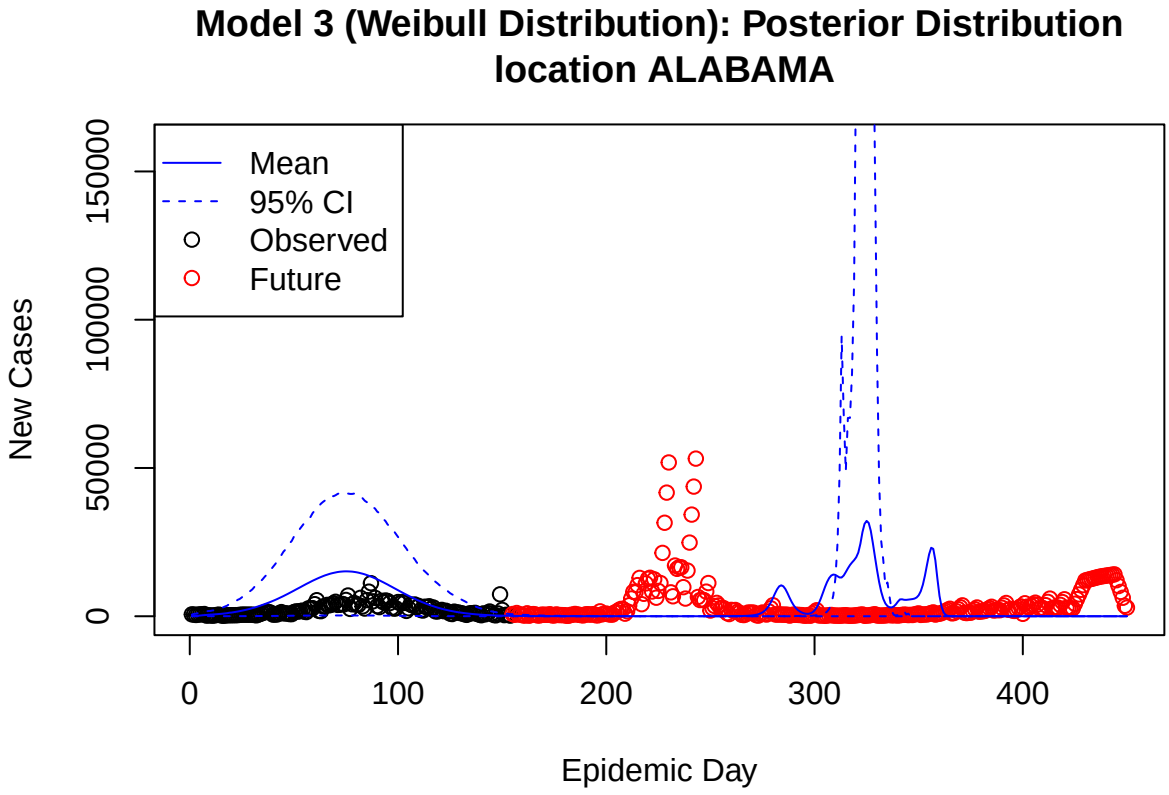

Model 4: Posterior Distribution
location FLORIDA
Mean
95% CI
Observed
Future
New Cases
0e+00
2e+05
4e+05
6e+05
0
100
200
300
400
Epidemic Day

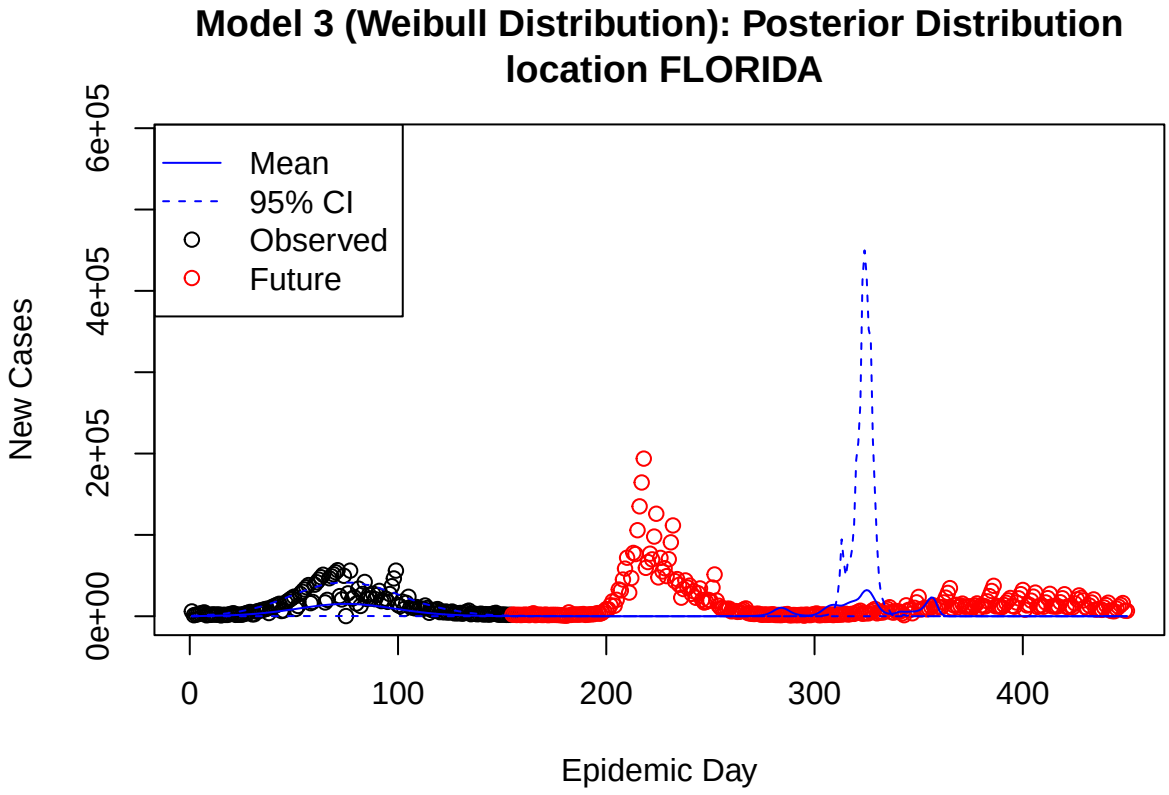

Model 4: Posterior Distribution
location GEORGIA
Mean
95% CI
Observed
Future
New Cases
0
50000
100000
0
100
200
300
400
Epidemic Day

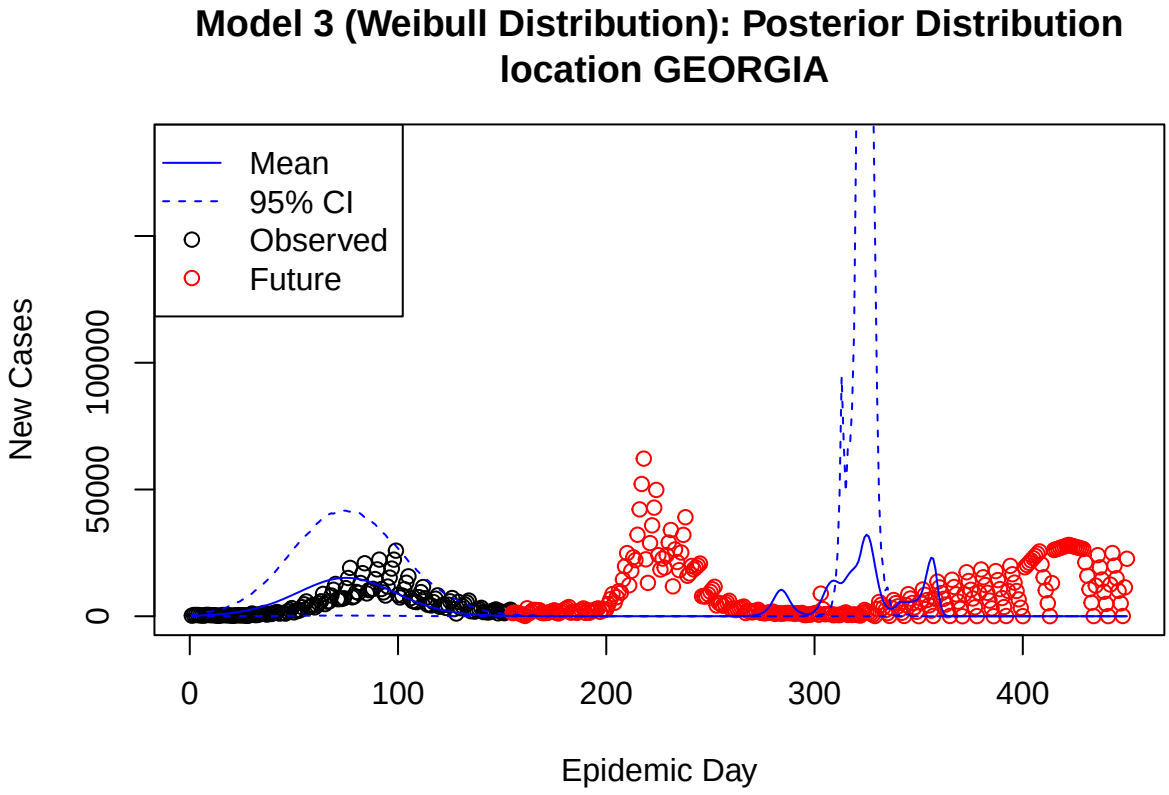

Model 4: Posterior Predictive Distribution
location ALABAMA
Mean
95% CI
Observed
Future
New Cases
0
50000
100000
150000
0
100
200
300
400
Epidemic Day

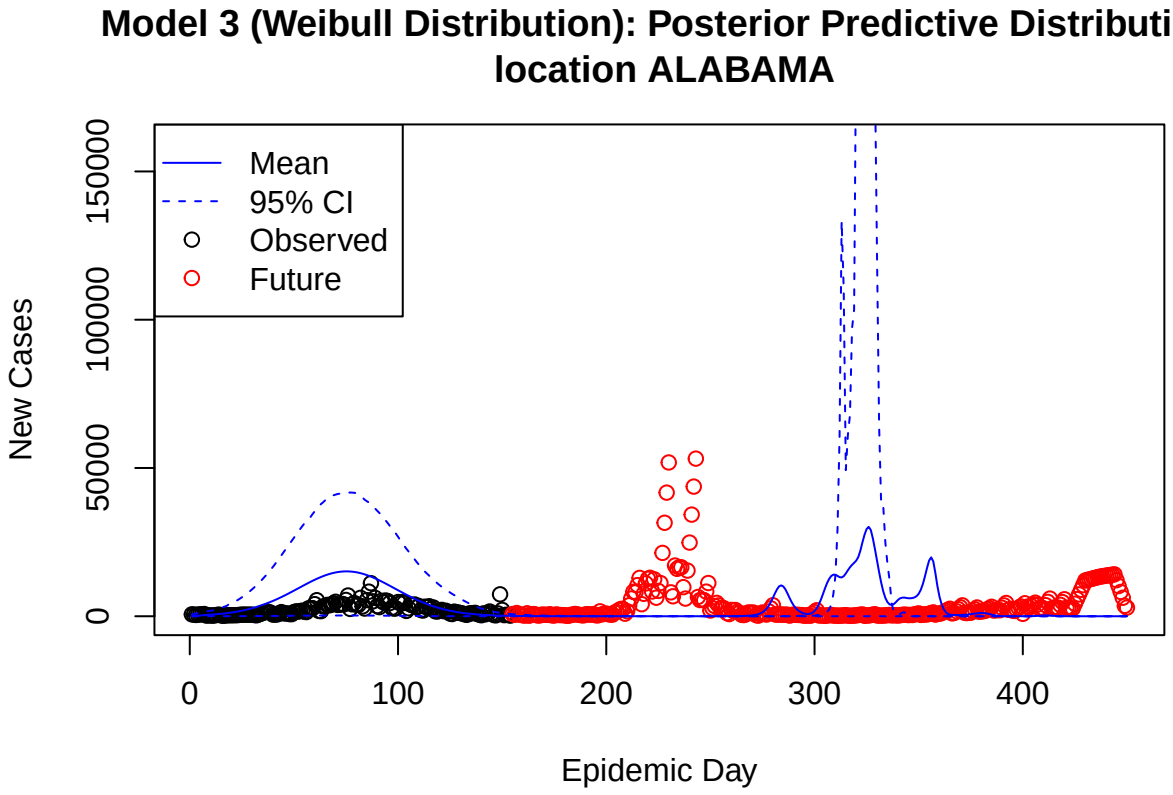

Model 4: Posterior Predictive Distribution
location FLORIDA
Mean
95% CI
Observed
Future
New Cases
0e+00
2e+05
4e+05
6e+05
0
100
200
300
400
Epidemic Day

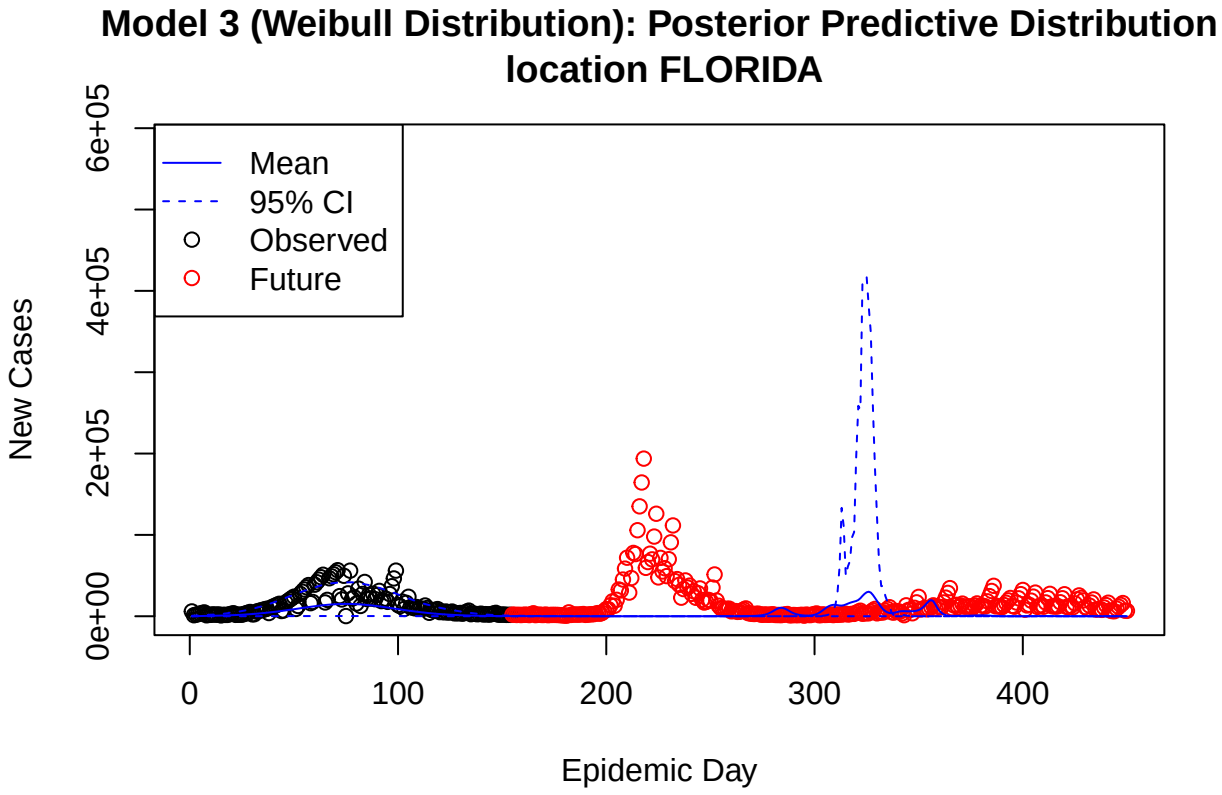

Model 4: Posterior Predictive Distribution
location GEORGIA
Mean
95% CI
Observed
Future
New Cases
0
50000
100000
0
100
200
300
400
Epidemic Day

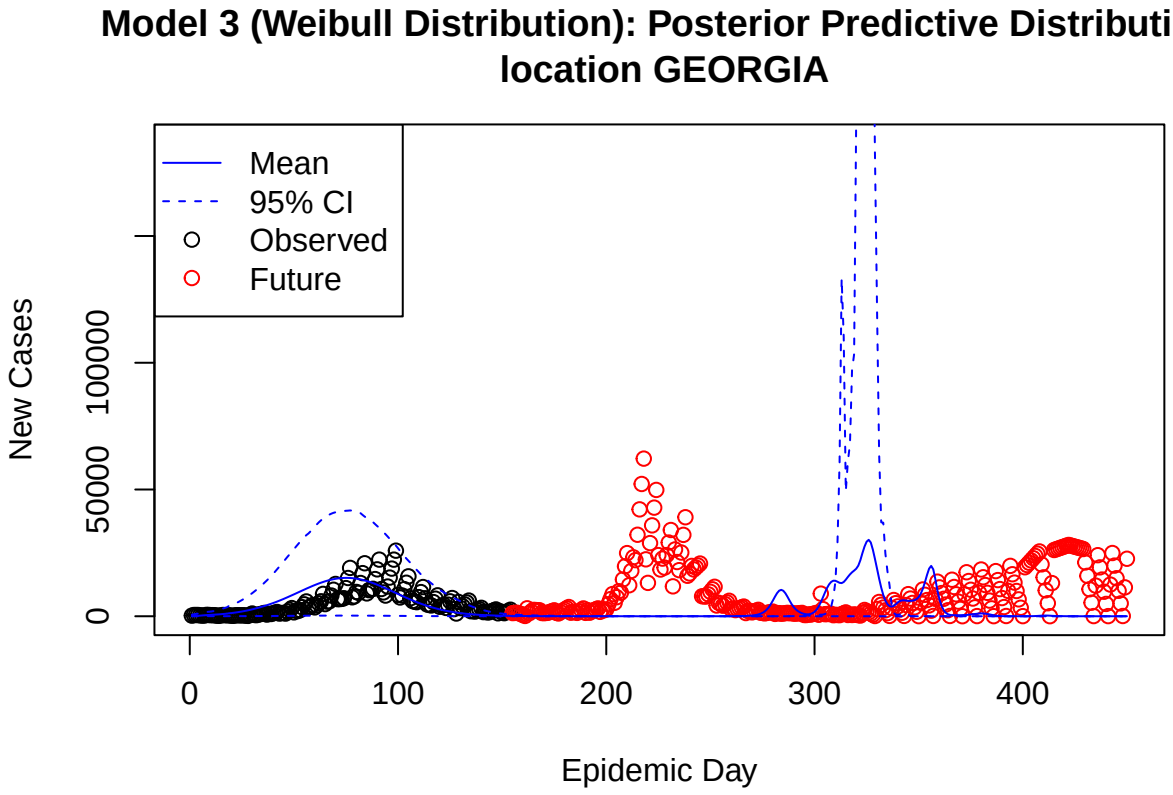

Model 3 (Weibull Distribution): Posterior Distribution
location ALABAMA
Mean
95% CI
Observed
Future
New Cases
0
50000
100000
150000
0
100
200
300
400
Epidemic Day

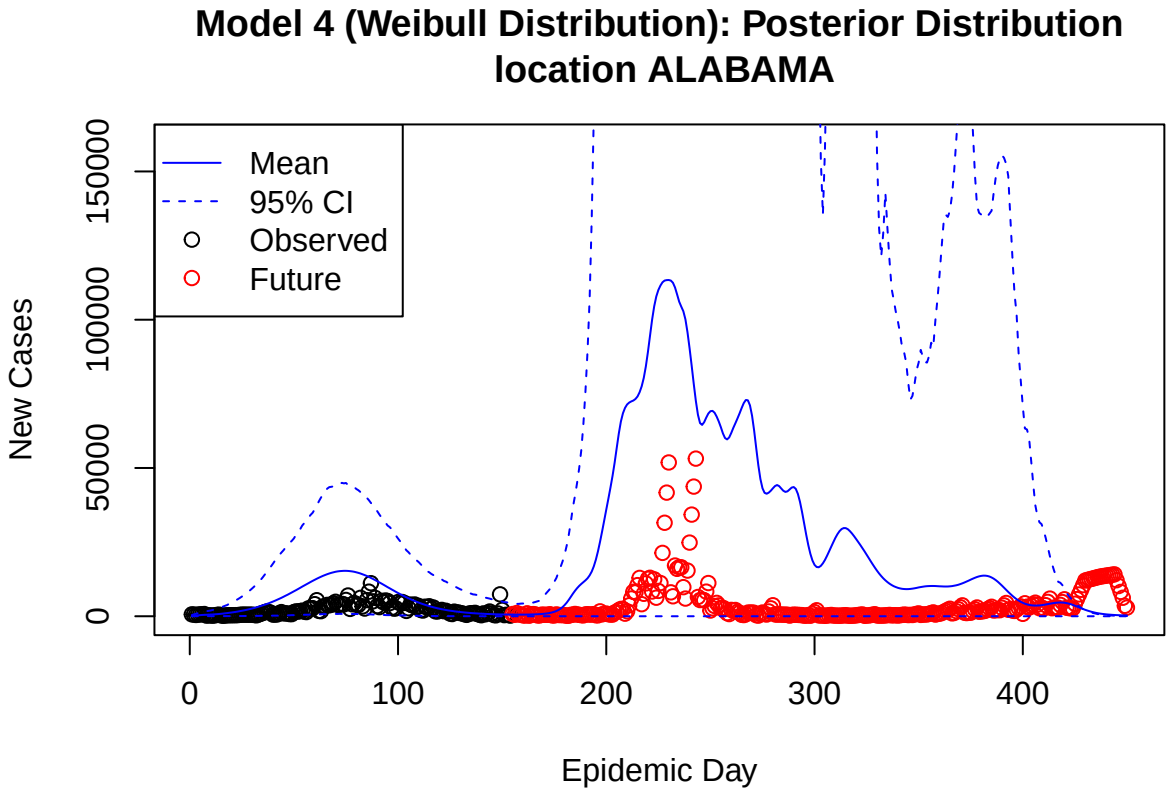

Model 3 (Weibull Distribution): Posterior Distribution
location FLORIDA
Mean
95% CI
Observed
Future
New Cases
0e+00
2e+05
4e+05
6e+05
0
100
200
300
400
Epidemic Day

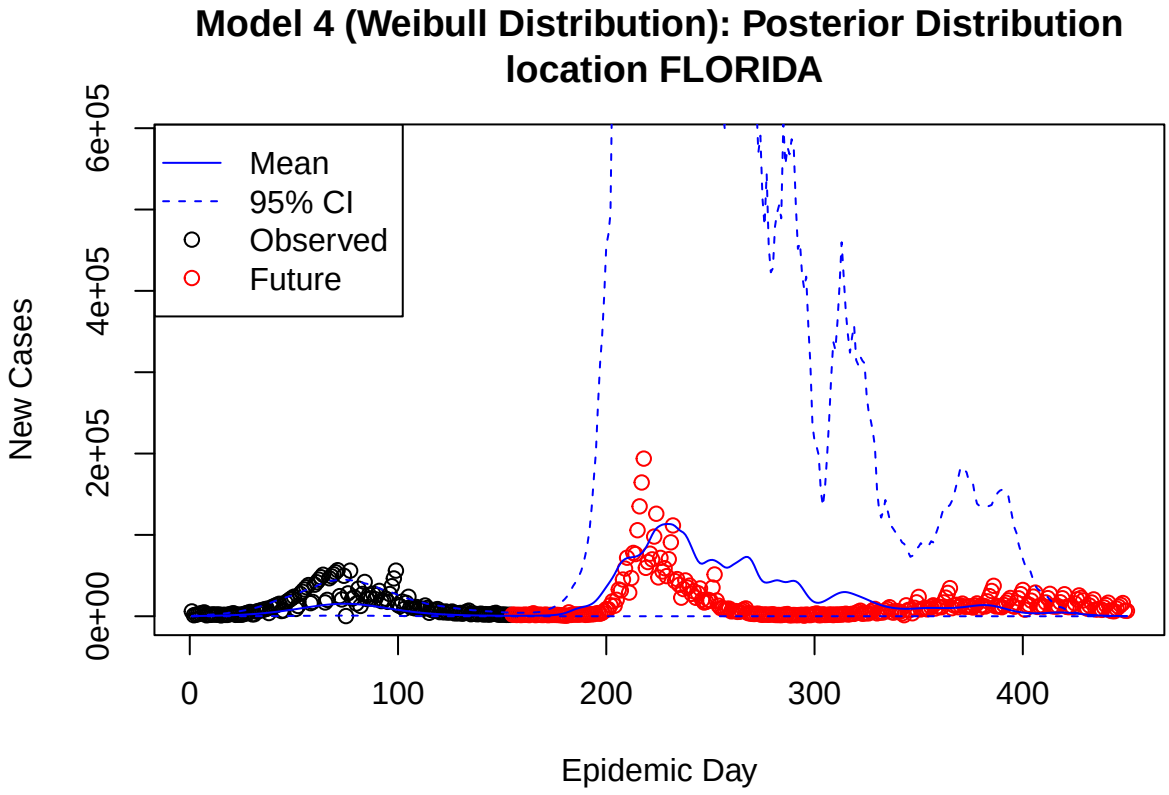

Model 3 (Weibull Distribution): Posterior Distribution
location GEORGIA
Mean
95% CI
Observed
Future
New Cases
0
50000
100000
0
100
200
300
400
Epidemic Day

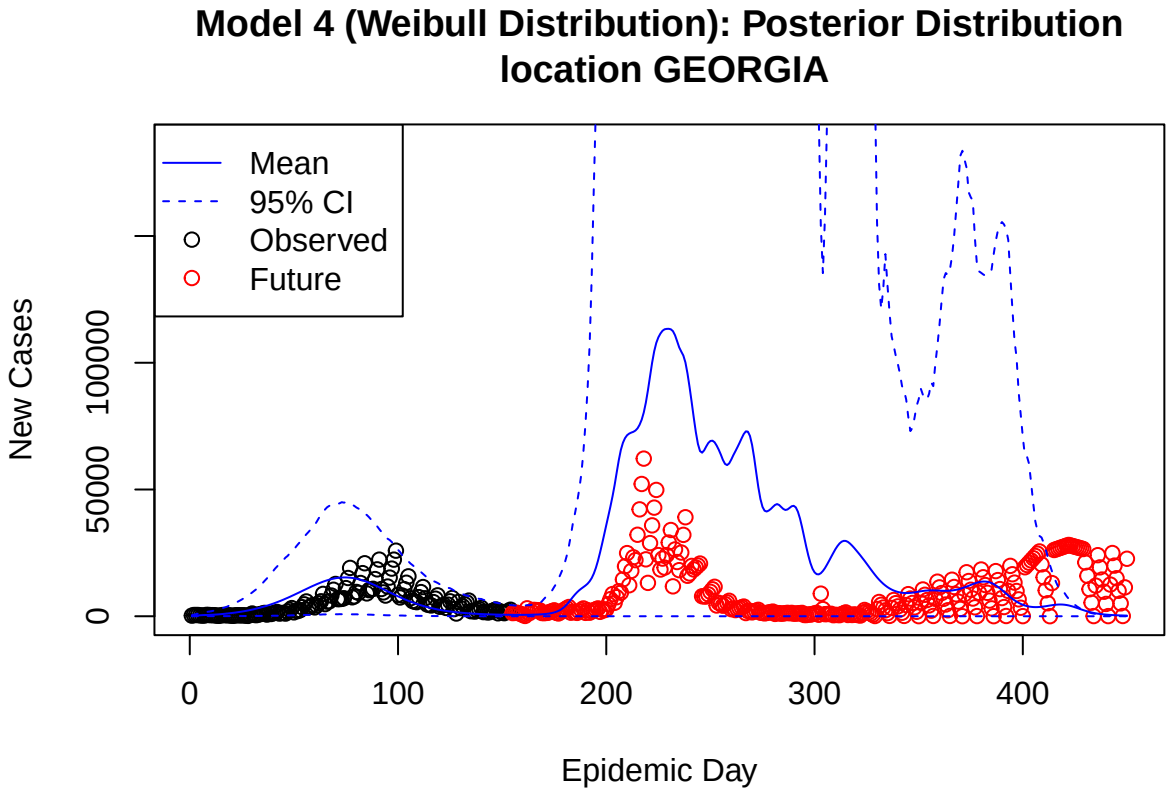

Model 3 (Weibull Distribution): Posterior Predictive Distribution
location ALABAMA
Mean
95% CI
Observed
Future
New Cases
0
50000
100000
150000
0
100
200
300
400
Epidemic Day

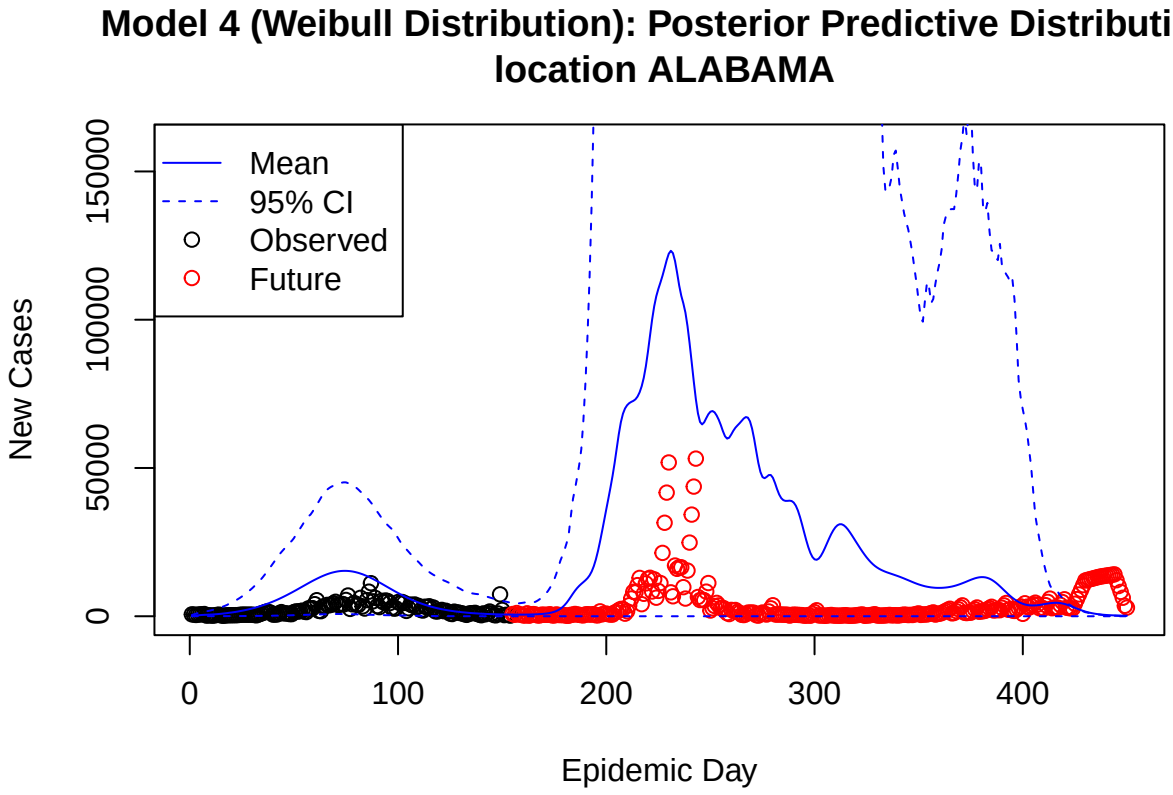

Model 3 (Weibull Distribution): Posterior Predictive Distribution
location FLORIDA
Mean
95% CI
Observed
Future
New Cases
0e+00
2e+05
4e+05
6e+05
0
100
200
300
400
Epidemic Day

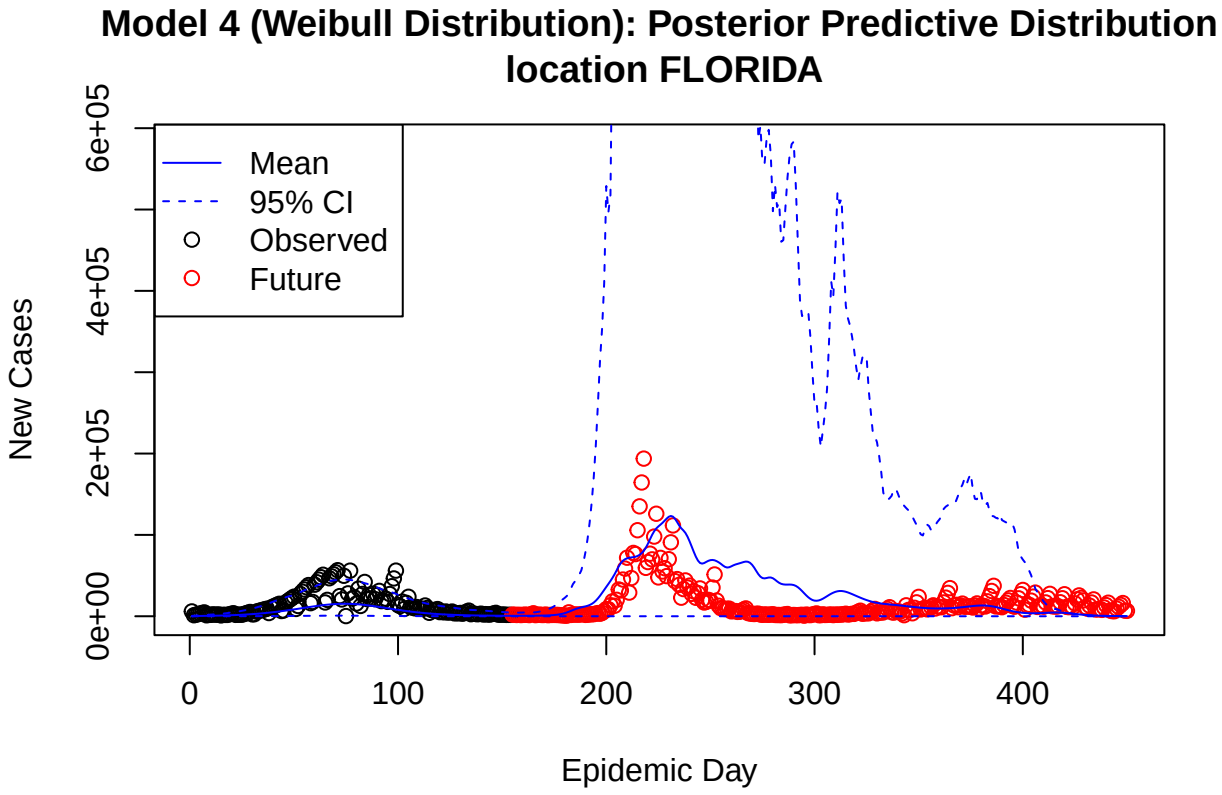

Model 3 (Weibull Distribution): Posterior Predictive Distribution
location GEORGIA
Mean
95% CI
Observed
Future
New Cases
0
50000
100000
0
100
200
300
400
Epidemic Day

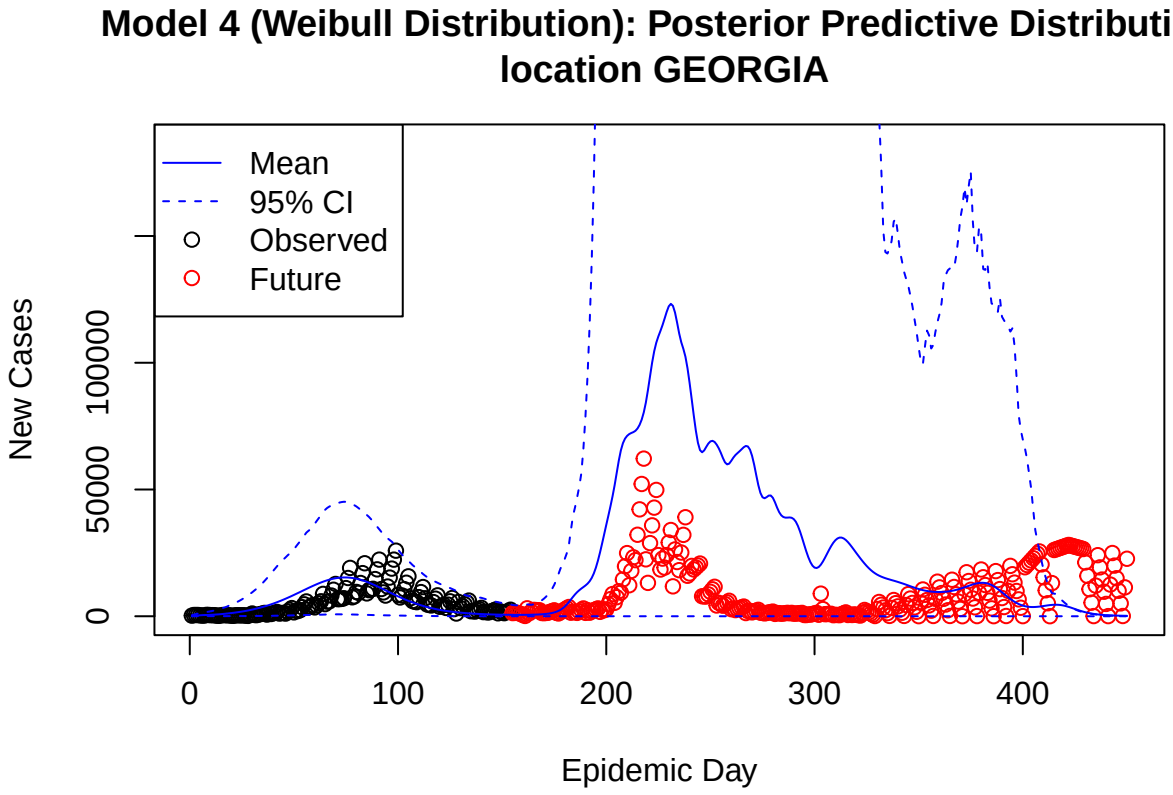

Model 4 (Weibull Distribution): Posterior Distribution
location ALABAMA
Mean
95% CI
Observed
Future
New Cases
0
50000
100000
150000
0
100
200
300
400
Epidemic Day

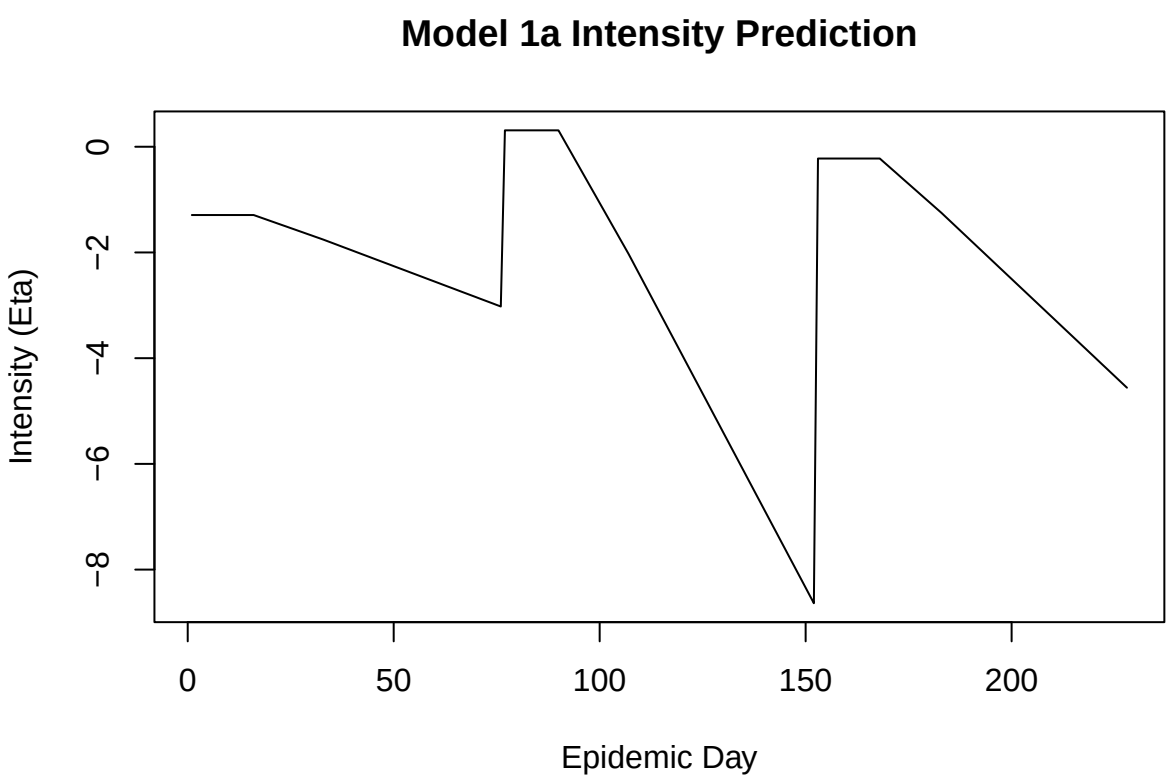

Model 4 (Weibull Distribution): Posterior Distribution
location FLORIDA
Mean
95% CI
Observed
Future
New Cases
0e+00
2e+05
4e+05
6e+05
0
100
200
300
400
Epidemic Day

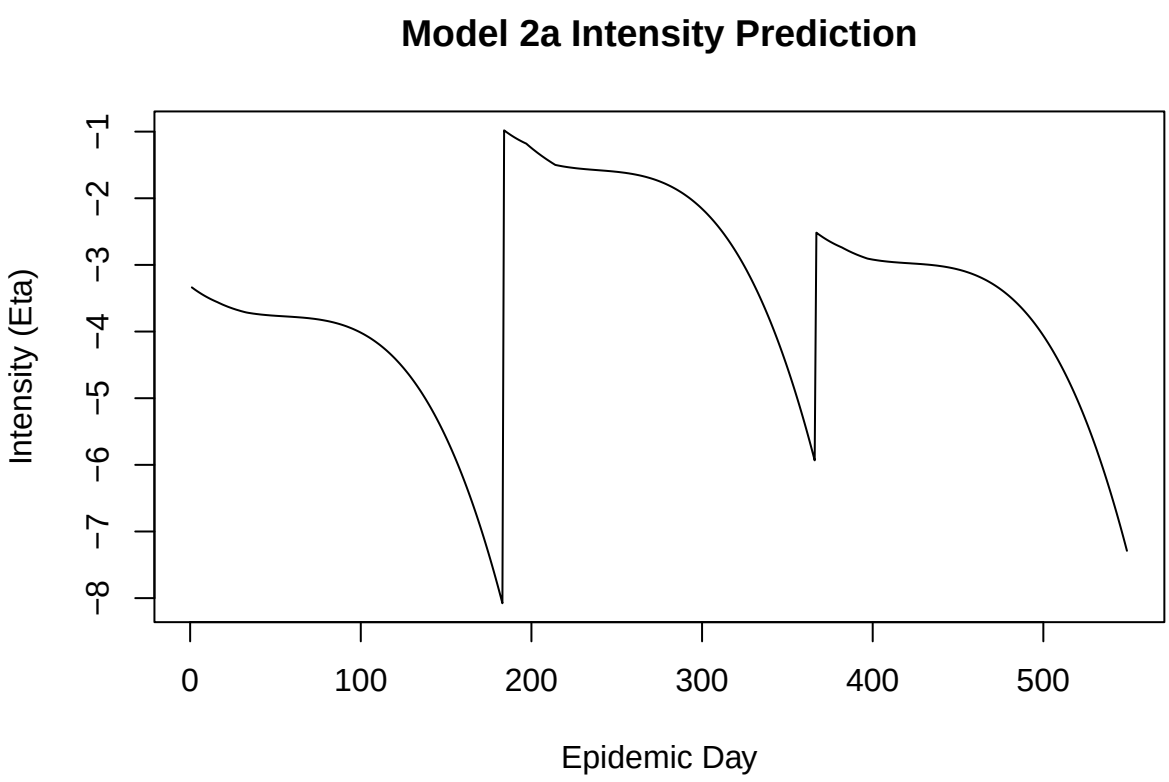

Model 4 (Weibull Distribution): Posterior Distribution
location GEORGIA
Mean
95% CI
Observed
Future
New Cases
0
50000
100000
0
100
200
300
400
Epidemic Day

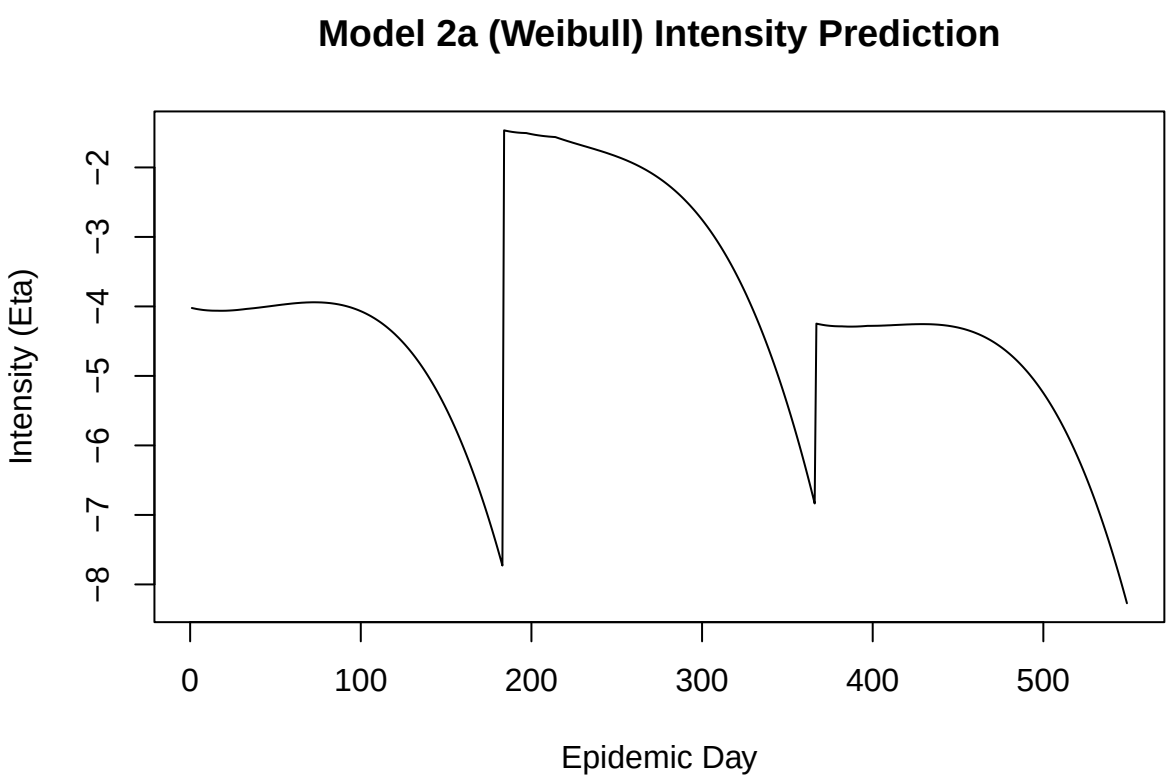

Model 4 (Weibull Distribution): Posterior Predictive Distribution
location ALABAMA
Mean
95% CI
Observed
Future
New Cases
0
50000
100000
150000
0
100
200
300
400
Epidemic Day

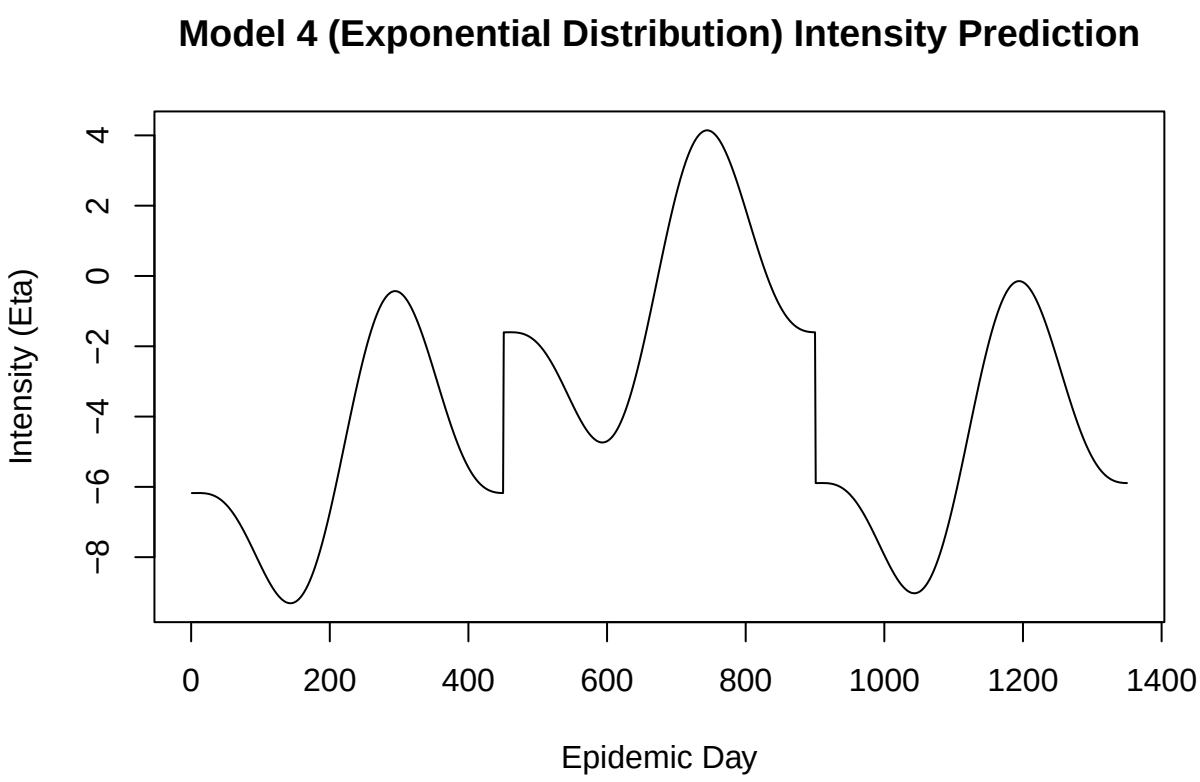

Model 4 (Weibull Distribution): Posterior Predictive Distribution
location FLORIDA
Mean
95% CI
Observed
Future
New Cases
0e+00
2e+05
4e+05
6e+05
0
100
200
300
400
Epidemic Day

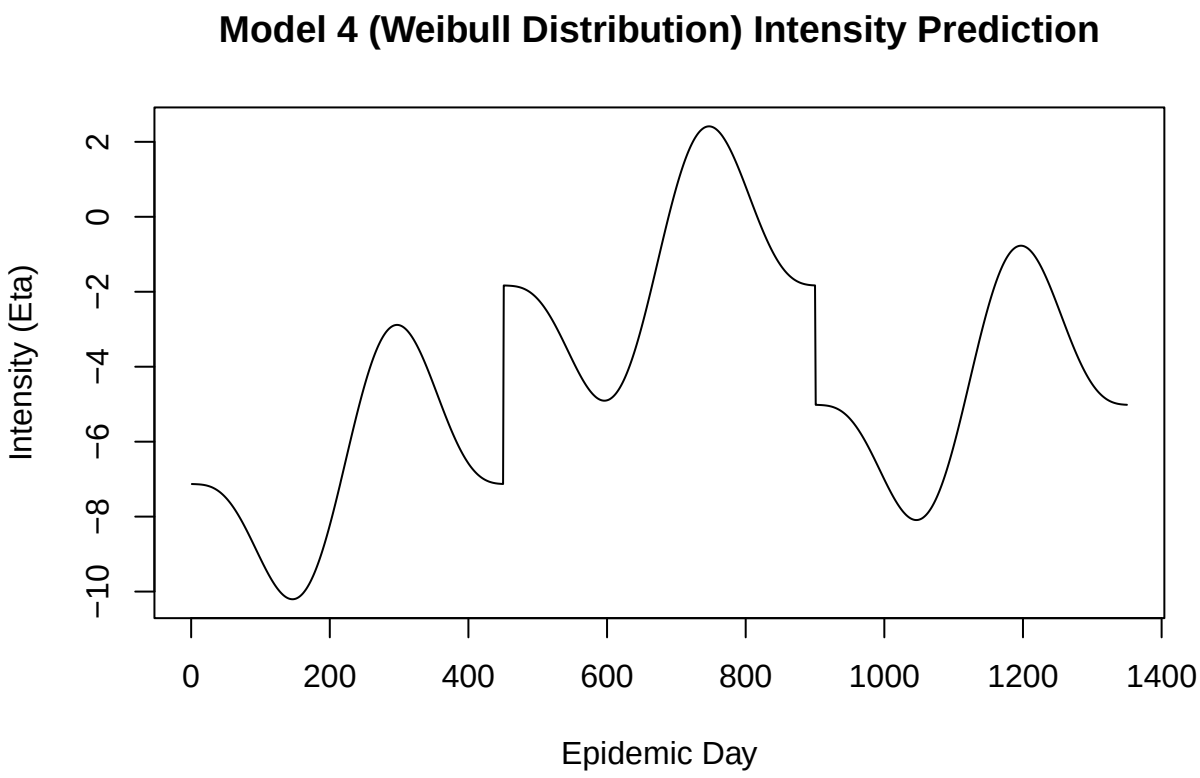

Model 4 (Weibull Distribution): Posterior Predictive Distribution
location GEORGIA
Mean
95% CI
Observed
Future
New Cases
0
50000
100000
0
100
200
300
400
Epidemic Day


Model 1a Intensity Prediction
Intensity (Eta)
0
−2
−4
−6
−8
0
50
100
150
200
Epidemic Day


Model 2a Intensity Prediction
Intensity (Eta)
−1
−2
−3
−4
−5
−6
−7
−8
0
100
200
300
400
500
Epidemic Day


Model 2a (Weibull) Intensity Prediction
Intensity (Eta)
−2
−3
−4
−5
−6
−7
−8
0
100
200
300
400
500
Epidemic Day


Model 4 (Exponential Distribution) Intensity Prediction
Intensity (Eta)
4
2
0
−2
−4
−6
−8
0
200
400
600
800
1000
1200
1400
Epidemic Day



Model 1a

```
## Summary: SEIR Model
##
## Locations: 3
## Time Points: 76
## Data Model Parameters: 0
## Exposure Process Parameters: 5
## Reinfection Model Parameters: 0
## Spatial Parameters: 3
## Transition Parameters: 2
##
##
## Parameter Estimates:
##                   Mean    SD       95% LB       95% UB
## Beta_SE_1       -1.292 0.300       -1.971       -0.743
## Beta_SE_2        0.310 0.169       -0.001        0.667
## Beta_SE_3       -0.223 0.165       -0.539        0.135
## Beta_SE_4      -13.740 2.247      -17.908       -9.854
## Beta_SE_5       -0.951 4.690       -9.492        8.177
## rho_1            0.158 0.098        0.022        0.388
## rho_2            0.164 0.090        0.019        0.321
## rho_3            0.340 0.067        0.209        0.463
## gamma_EI         0.199 0.048        0.125        0.289
```

```
## gamma_IR         0.062 0.032        0.010        0.120
## S0_1       4903185.000 0.000  4903185.000  4903185.000
## S0_2      21477733.000 0.000 21477733.000 21477733.000
## S0_3      10617423.000 0.000 10617423.000 10617423.000
## E0_1             0.000 0.000        0.000        0.000
## E0_2             2.000 0.000        2.000        2.000
## E0_3             0.000 0.000        0.000        0.000
## I0_1             0.000 0.000        0.000        0.000
## I0_2             2.000 0.000        2.000        2.000
## I0_3             0.000 0.000        0.000        0.000
## R0_1             0.000 0.000        0.000        0.000
## R0_2             0.000 0.000        0.000        0.000
## R0_3             0.000 0.000        0.000        0.000
```

Model 2a

```
## Summary: SEIR Model
##
## Locations: 3
## Time Points: 183
## Data Model Parameters: 0
## Exposure Process Parameters: 8
## Reinfection Model Parameters: 0
## Spatial Parameters: 1
## Transition Parameters: 2
##
##
## Parameter Estimates:
##                   Mean    SD       95% LB       95% UB
## Beta_SE_1       -5.313 4.276      -14.944        0.849
## Beta_SE_2       -0.119 0.918       -1.950        1.364
## Beta_SE_3       -3.385 2.716       -8.989        1.654
## Beta_SE_4       -0.674 4.692       -8.543        8.983
## Beta_SE_5       -2.159 5.635      -13.585        6.947
## Beta_SE_6       -4.187 3.319      -11.032        2.379
## Beta_SE_7        2.482 4.783       -5.428       11.867
## Beta_SE_8       -5.316 4.567      -14.254        2.648
## rho_1            0.386 0.160        0.098        0.725
## gamma_EI         0.163 0.040        0.092        0.237
## gamma_IR         0.056 0.039        0.005        0.152
## S0_1       4903185.000 0.000  4903185.000  4903185.000
## S0_2      21477733.000 0.000 21477733.000 21477733.000
## S0_3      10617423.000 0.000 10617423.000 10617423.000
## E0_1             0.000 0.000        0.000        0.000
## E0_2             2.000 0.000        2.000        2.000
## E0_3             0.000 0.000        0.000        0.000
## I0_1             0.000 0.000        0.000        0.000
## I0_2             2.000 0.000        2.000        2.000
## I0_3             0.000 0.000        0.000        0.000
## R0_1             0.000 0.000        0.000        0.000
## R0_2             0.000 0.000        0.000        0.000
## R0_3             0.000 0.000        0.000        0.000
```

Model 2a (Weibull Distribution)

```
## Summary: SEIR Model
##
## Locations: 3
## Time Points: 183
## Data Model Parameters: 0
## Exposure Process Parameters: 8
## Reinfection Model Parameters: 0
## Spatial Parameters: 3
## Transition Parameters: 4
##
##
## Parameter Estimates:
##                          Mean    SD       95% LB       95% UB
## Beta_SE_1              -4.022 2.746      -10.427        0.587
## Beta_SE_2              -1.466 1.463       -4.396        1.220
## Beta_SE_3              -4.247 2.844      -10.404        1.077
## Beta_SE_4              -0.526 3.184       -7.067        4.965
## Beta_SE_5              -0.714 3.122       -5.919        4.863
## Beta_SE_6              -0.350 3.739       -8.562        5.366
## Beta_SE_7               1.894 3.883       -6.094        9.465
## Beta_SE_8              -3.394 3.608      -10.085        3.446
## rho_1                   0.334 0.163        0.023        0.614
## rho_2                   0.150 0.103        0.005        0.365
## rho_3                   0.263 0.142        0.033        0.547
## latent_shape            2.139 0.252        1.627        2.595
## latent_scale            6.829 0.751        5.396        8.167
## infectious_shape        4.959 1.826        1.298        8.169
## infectious_scale       16.933 4.818        9.094       25.779
## S0_1              4903185.000 0.000  4903185.000  4903185.000
## S0_2             21477733.000 0.000 21477733.000 21477733.000
## S0_3             10617423.000 0.000 10617423.000 10617423.000
## E0_1                    0.000 0.000        0.000        0.000
## E0_2                    2.000 0.000        2.000        2.000
## E0_3                    0.000 0.000        0.000        0.000
## I0_1                    0.000 0.000        0.000        0.000
## I0_2                    2.000 0.000        2.000        2.000
## I0_3                    0.000 0.000        0.000        0.000
## R0_1                    0.000 0.000        0.000        0.000
## R0_2                    0.000 0.000        0.000        0.000
## R0_3                    0.000 0.000        0.000        0.000
```

Model 4 (Exponential)

```
## Summary: SEIR Model
##
## Locations: 3
## Time Points: 450
## Data Model Parameters: 0
## Exposure Process Parameters: 8
## Reinfection Model Parameters: 0
```

```
## Spatial Parameters: 3
## Transition Parameters: 2
##
##
## Parameter Estimates:
##                   Mean    SD       95% LB       95% UB
## Beta_SE_1       -4.207 3.603      -11.699        1.945
## Beta_SE_2        0.758 2.809       -5.076        5.404
## Beta_SE_3       -3.810 3.900      -12.162        3.151
## Beta_SE_4       -1.848 5.594      -11.806        9.716
## Beta_SE_5       -1.472 7.962      -15.557       12.792
## Beta_SE_6       -3.400 1.387       -6.064       -0.504
## Beta_SE_7       -0.872 1.276       -3.247        1.752
## Beta_SE_8        3.378 1.430        0.958        5.839
## rho_1            0.215 0.142        0.016        0.511
## rho_2            0.145 0.098        0.005        0.360
## rho_3            0.297 0.146        0.092        0.604
## gamma_EI         0.151 0.041        0.080        0.225
## gamma_IR         0.065 0.031        0.008        0.116
## S0_1       4870968.000 0.000  4870968.000  4870968.000
## S0_2      21348159.000 0.000 21348159.000 21348159.000
## S0_3      10543493.000 0.000 10543493.000 10543493.000
## E0_1           500.000 0.000      500.000      500.000
## E0_2          5000.000 0.000     5000.000     5000.000
## E0_3           200.000 0.000      200.000      200.000
## I0_1           640.000 0.000      640.000      640.000
## I0_2          5937.000 0.000     5937.000     5937.000
## I0_3           241.000 0.000      241.000      241.000
## R0_1         20048.000 0.000    20048.000    20048.000
## R0_2         79782.000 0.000    79782.000    79782.000
## R0_3         38080.000 0.000    38080.000    38080.000
```

Model 4 (Weibull)

```
## Summary: SEIR Model
##
## Locations: 3
## Time Points: 450
## Data Model Parameters: 0
## Exposure Process Parameters: 8
## Reinfection Model Parameters: 0
## Spatial Parameters: 3
## Transition Parameters: 4
##
##
## Parameter Estimates:
##                           Mean    SD       95% LB       95% UB
## Beta_SE_1               -4.896 3.832      -11.993        1.497
## Beta_SE_2                1.049 2.709       -5.030        5.546
## Beta_SE_3               -2.596 3.560      -11.222        2.383
## Beta_SE_4               -2.059 5.204      -12.425        6.616
## Beta_SE_5               -3.763 6.784      -16.596        8.209
## Beta_SE_6               -2.832 1.514       -5.746        0.418
```

```
## Beta_SE_7              -0.391 1.514       -3.196        2.670
## Beta_SE_8               2.770 1.672       -0.579        5.980
## rho_1                   0.306 0.160        0.048        0.629
## rho_2                   0.190 0.121        0.015        0.433
## rho_3                   0.231 0.148        0.017        0.511
## latent_shape            2.043 0.478        1.153        2.839
## latent_scale            6.819 1.149        4.622        9.081
## infectious_shape        4.891 2.319        0.710        9.211
## infectious_scale       22.714 8.218        6.585       36.181
## S0_1              4870968.000 0.000  4870968.000  4870968.000
## S0_2             21348159.000 0.000 21348159.000 21348159.000
## S0_3             10543493.000 0.000 10543493.000 10543493.000
## E0_1                 500.000 0.000      500.000      500.000
## E0_2                5000.000 0.000     5000.000     5000.000
## E0_3                 200.000 0.000      200.000      200.000
## I0_1                 640.000 0.000      640.000      640.000
## I0_2                5937.000 0.000     5937.000     5937.000
## I0_3                 241.000 0.000      241.000      241.000
## R0_1               20048.000 0.000    20048.000    20048.000
## R0_2               79782.000 0.000    79782.000    79782.000
## R0_3               38080.000 0.000    38080.000    38080.000
```

Bayes Factor (Model 1a vs Model 1b vs Model 1c)

```
##            Distance       CAR   Gravity
## Distance 1.00000000 16.462687 9.3474576
## CAR      0.06074343  1.000000 0.5677966
## Gravity  0.10698096  1.761194 1.0000000
```

Bayes Factor (Model 2a vs Model 2b vs Model 2c)

```
##           Distance       CAR  Gravity
## Distance 1.0000000 1.3561116 1.383407
## CAR      0.7374024 1.0000000 1.020128
## Gravity  0.7228531 0.9802695 1.000000
```

Bayes Factor (Exponential vs Weibull under Model 1a)

```
##           [,1]     [,2]
## [1,] 1.0000000 3.022843
## [2,] 0.3308144 1.000000
```

Bayes Factor (Exponential vs Weibull under Model 2a)

```
##          [,1]     [,2]
## [1,] 1.000000 0.622276
## [2,] 1.607004 1.000000
```

Coverage, width and bias for model 1a with exponential distribution, SMC-ABC (latent and infectious period estimates)

```
## $coverage
## [1] 1
##
## $width
## [1] 0.136887
##
## $bias
## [1] -16.94345
```

```
## $coverage
## [1] 1
##
## $width
## [1] 0.1037973
##
## $bias
## [1] 1.051762
```

Coverage, width and bias for model 2a with exponential distribution, SMC-ABC (latent and infectious period estimates)

```
## $coverage
## [1] 1
##
## $width
## [1] 0.08563094
##
## $bias
## [1] 4.058638
```

```
## $coverage
## [1] 1
##
## $width
## [1] 0.08526893
##
## $bias
## [1] 3.261002
```

Coverage, width and bias for model 2a with Weibull distribution, SMC-ABC (latent and infectious period estimates (shape and scale))

```
## $coverage
## [1] 1
```

```
##
## $width
## [1] 0.9968238
##
## $bias
## [1] 2.732983

## $coverage
## [1] 1
##
## $width
## [1] 2.849094
##
## $bias
## [1] 0.3229856

## $coverage
## [1] 1
##
## $width
## [1] 7.156211
##
## $bias
## [1] 30.53288

## $coverage
## [1] 1
##
## $width
## [1] 16.76137
##
## $bias
## [1] -5.720726
```

Coverage, width and bias for model 4 with exponential distribution, SMC-ABC (latent and infectious period estimates)

```
## $coverage
## [1] 1
##
## $width
## [1] 0.1339373
##
## $bias
## [1] 9.422127

## $coverage
## [1] 1
##
## $width
## [1] 0.1050449
```

```
##
## $bias
## [1] -2.732824
```

Coverage, width and bias for model 4 with Weibull distribution, SMC-ABC (latent and infectious period estimates (shape and scale))

```
## $coverage
## [1] 1
##
## $width
## [1] 1.755215
##
## $bias
## [1] -1.880829
```

```
## $coverage
## [1] 1
##
## $width
## [1] 4.488851
##
## $bias
## [1] 0.1787558
```

```
## $coverage
## [1] 1
##
## $width
## [1] 8.812926
##
## $bias
## [1] 28.75374
```

```
## $coverage
## [1] 1
##
## $width
## [1] 32.62747
##
## $bias
## [1] 26.46842
```

Runtimes

```
##          user.self sys.self  elapsed
## model 1   9013.290   75.045 1427.865
## model 2    360.886   13.259   57.756
```

```
## model 3  21764.164  189.012 3310.206
## model 4   4839.358   63.619  830.120
## model 5   9035.048   91.580 1469.613
## model 6   3444.724   22.469  468.603
## model 7    761.381   26.397  115.032
## model 8   3020.588   39.741  427.094
## model 9  14090.237  104.257 2056.698
## model 10  4069.530   31.586  544.678
## model 11  3289.843   26.394  441.865
## model 12  5720.690   35.189  793.683
## model 13  6594.632   47.456  919.279
## model 14 25686.391  169.012 3726.878
## model 15 18691.818   83.698 2506.355
```