

Spatial Analysis Results

2022-08-25

Associated RData file (spatial_results.RData) can be downloaded at: <https://mega.nz/folder/yBpA0IpA#jUZw1qrXeGQioN3bImE-Wg>

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

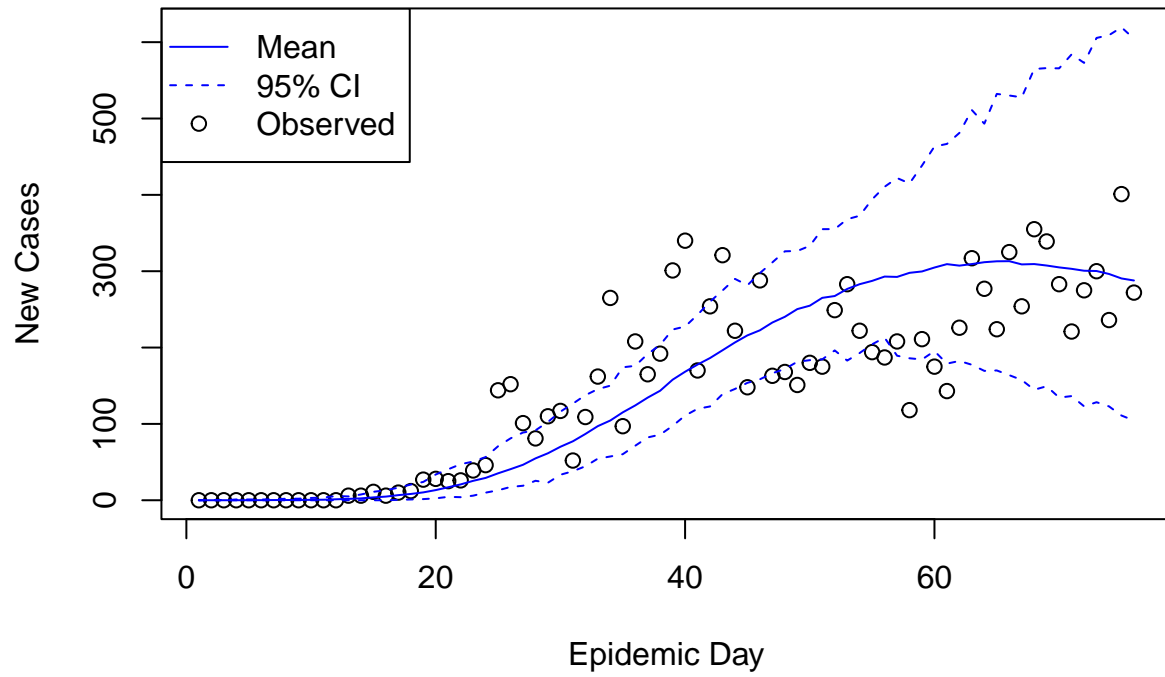
- Model 2: Baseline intensity (assumed different) for each location plus two linear time components, beginning on respective intervention dates (school closure and state mandated stay-at-home-order) and temporal basis splines of 3 degrees of freedom

a-c: Same as above

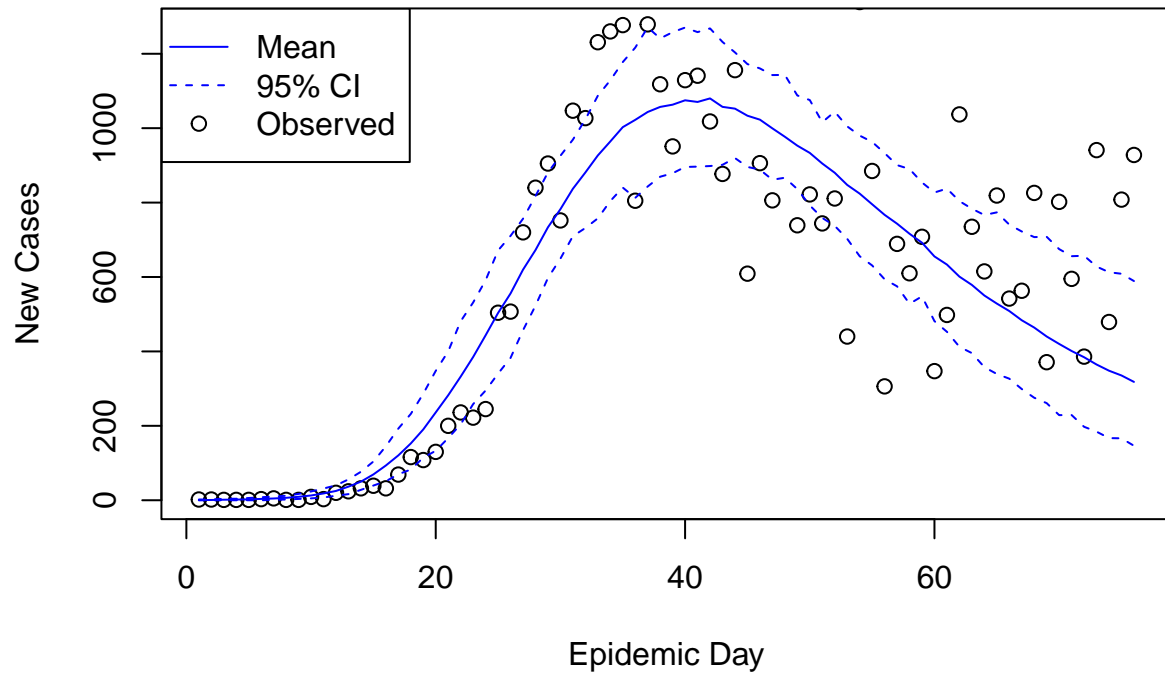
Model 3: 153 fitted timepoints, 297 missing/predicted timepoints (total: 450 timepoints)

- Model 3: 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

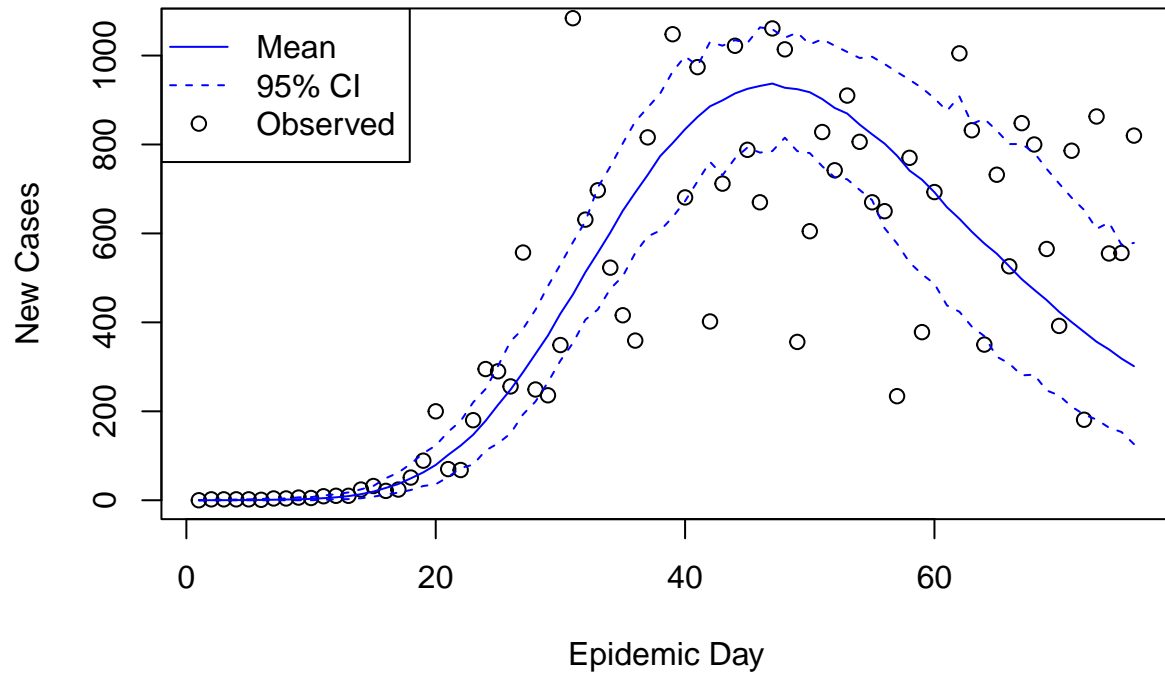
Model 1a: Posterior Distribution location ALABAMA



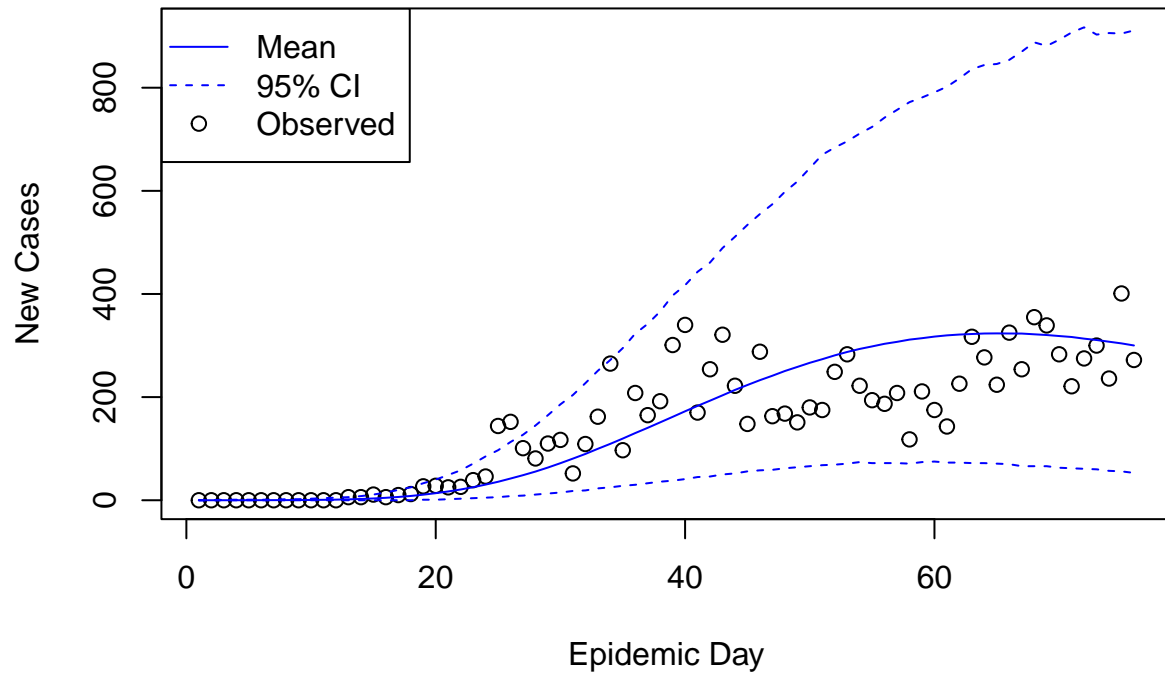
Model 1a: Posterior Distribution location FLORIDA



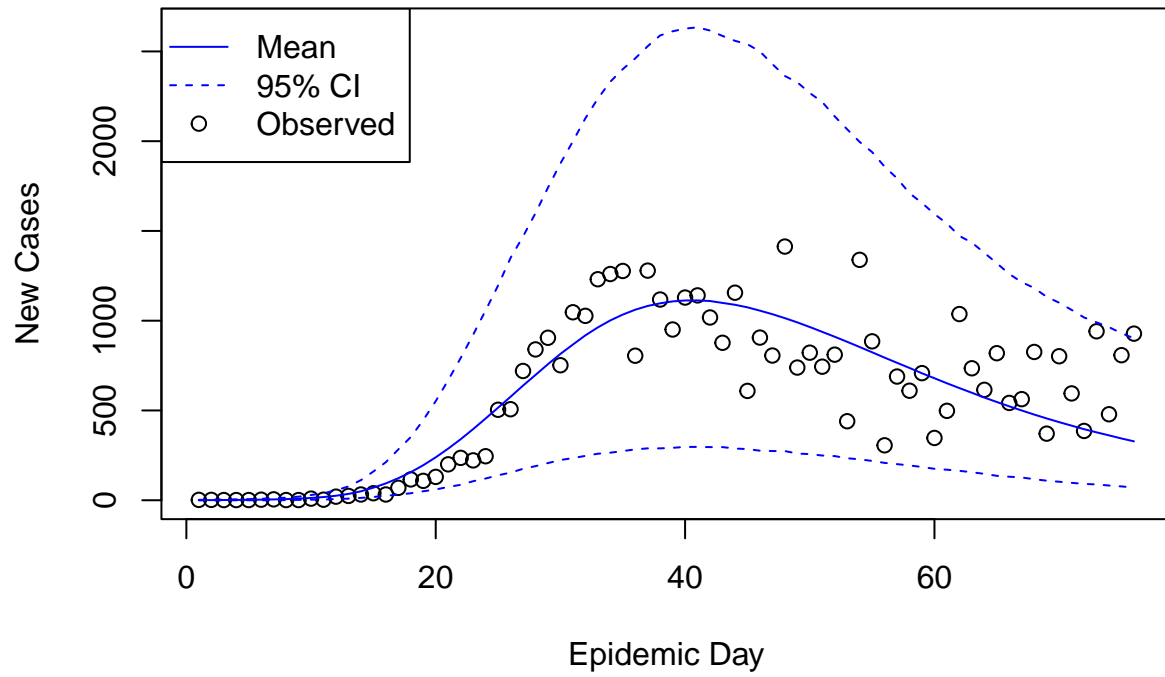
Model 1a: Posterior Distribution location GEORGIA



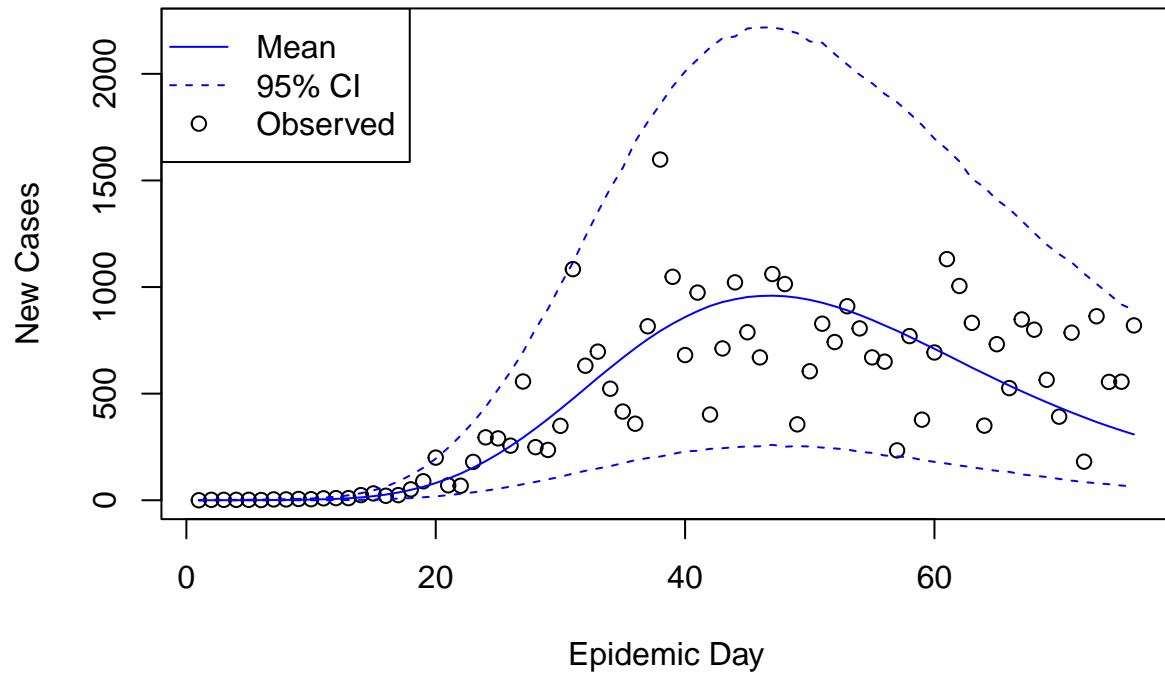
Model 1a: Posterior Predictive Distribution location ALABAMA



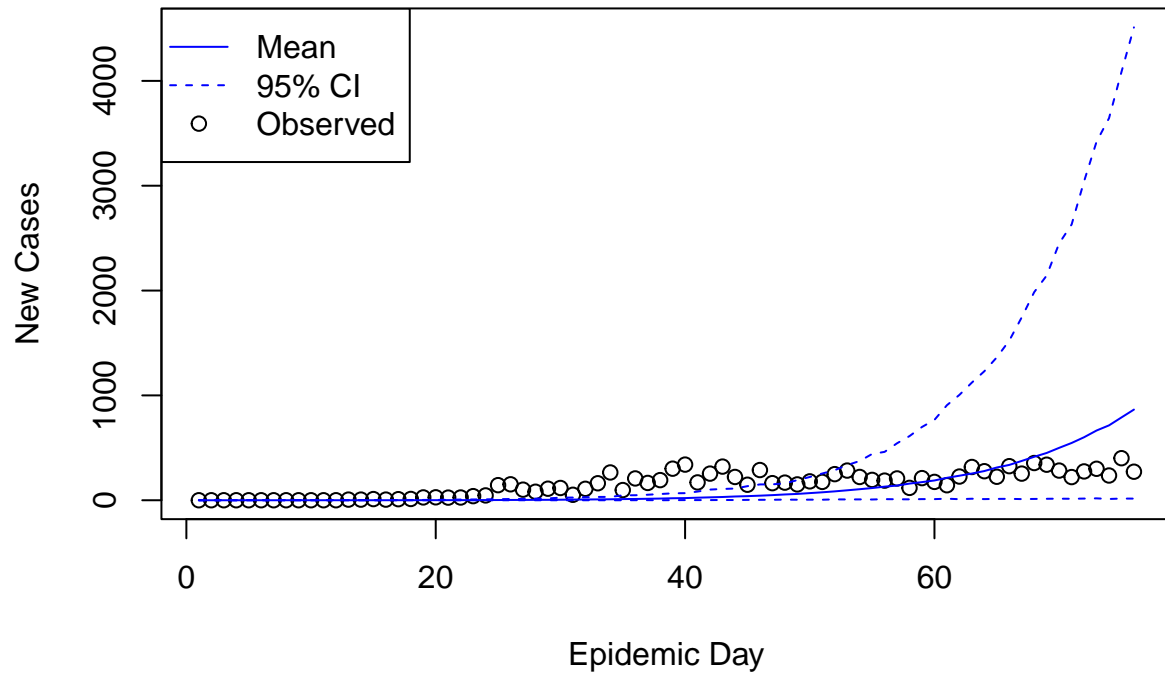
Model 1a: Posterior Predictive Distribution location FLORIDA



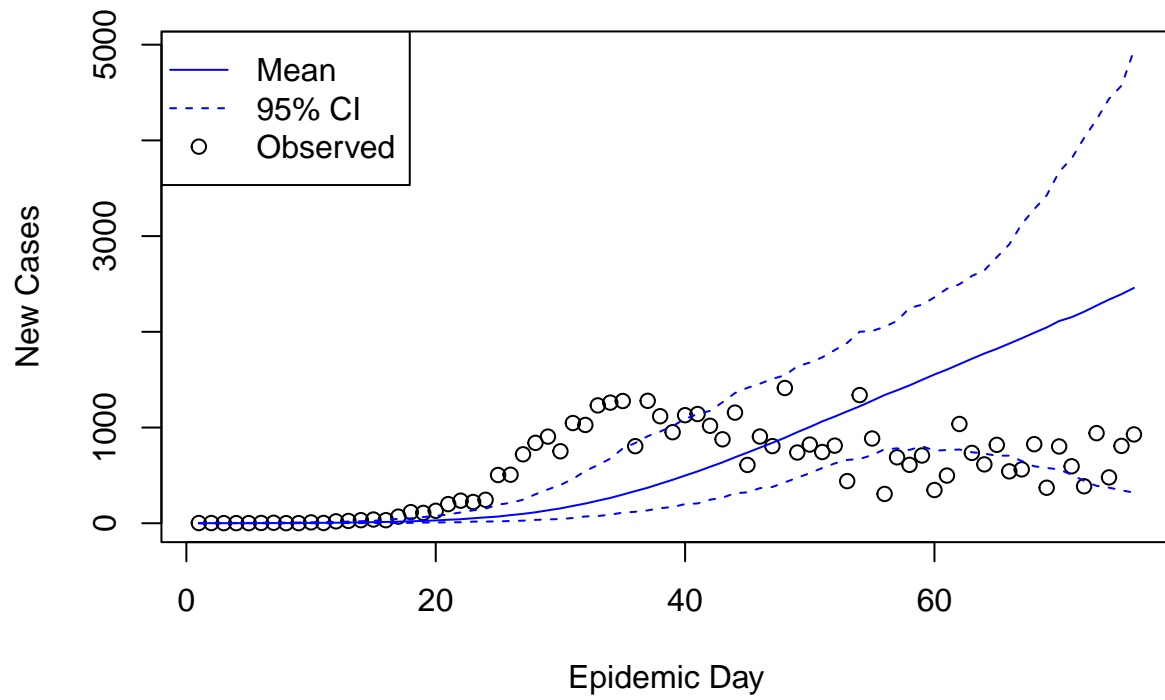
Model 1a: Posterior Predictive Distribution location GEORGIA



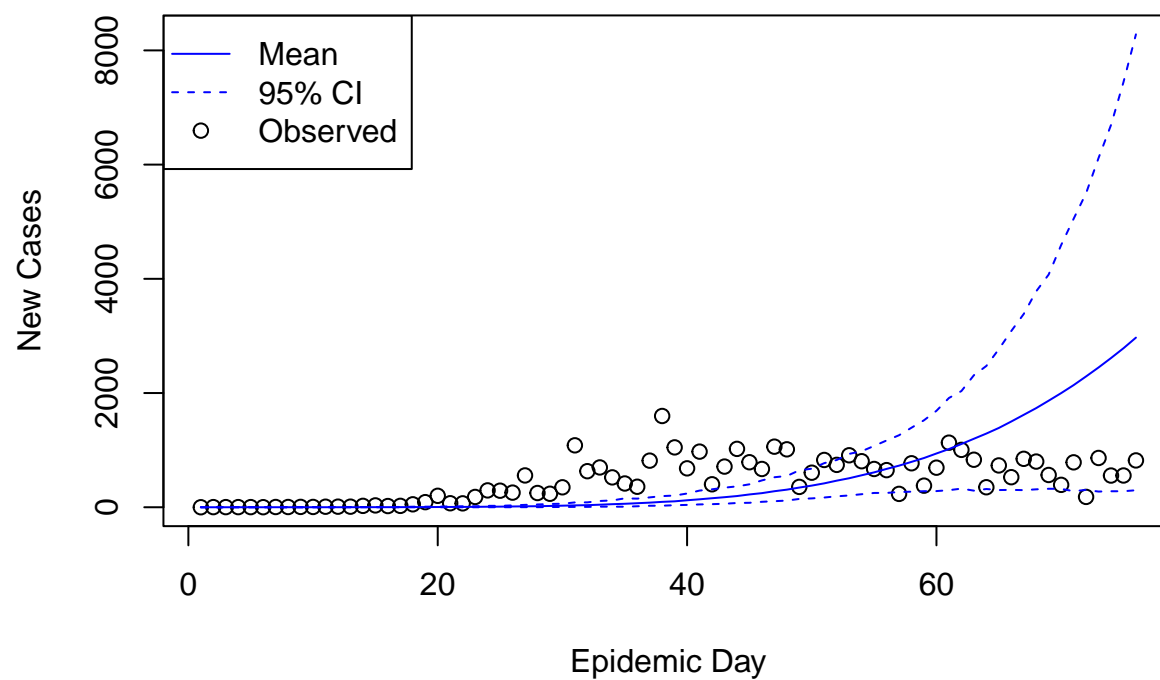
Model 1a (Basic ABC): Posterior Distribution location ALABAMA



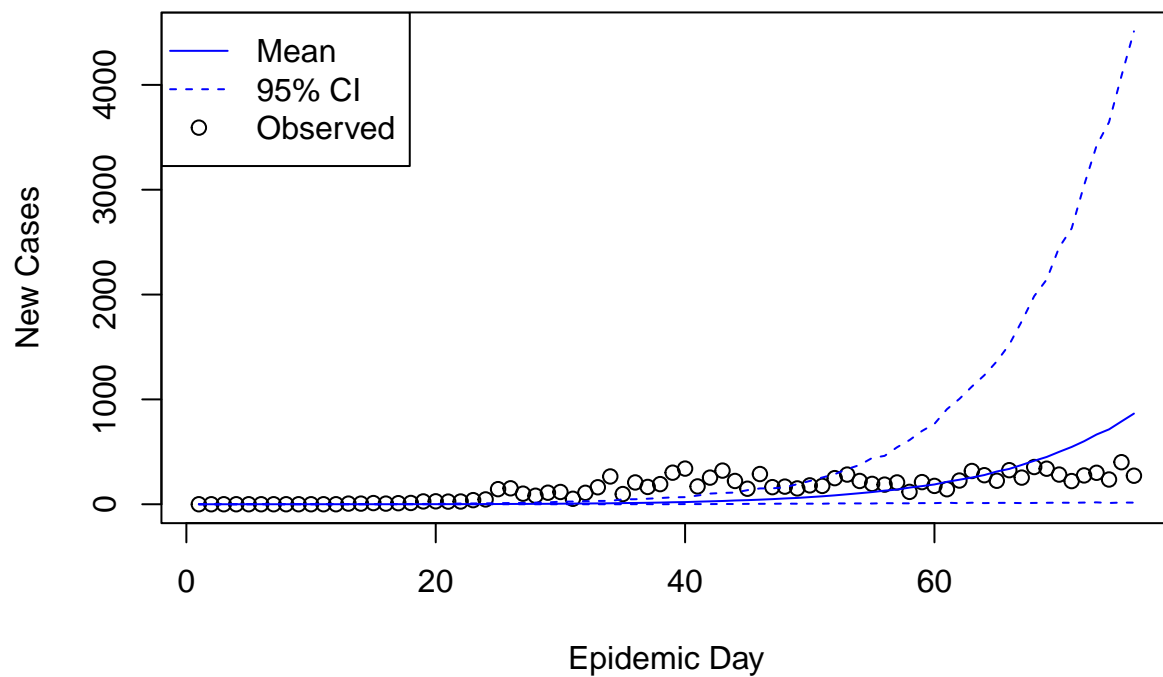
Model 1a (Basic ABC): Posterior Distribution location FLORIDA



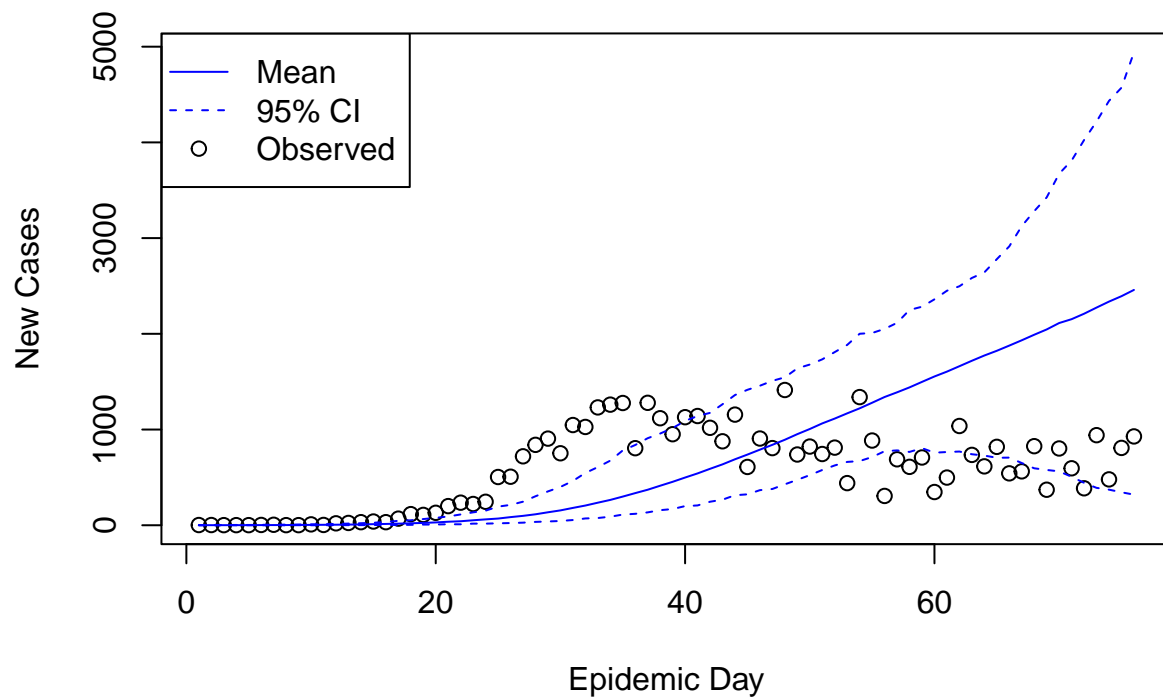
Model 1a (Basic ABC): Posterior Distribution location GEORGIA



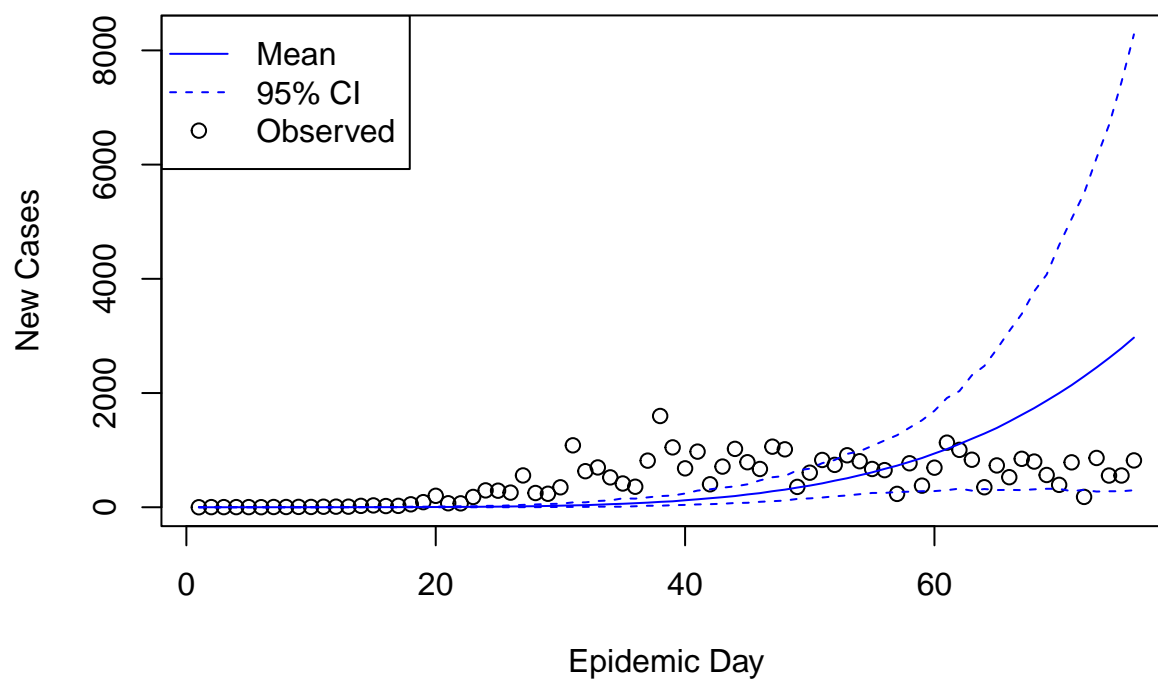
Model 1a (Basic ABC): Posterior Predictive Distribution location ALABAMA



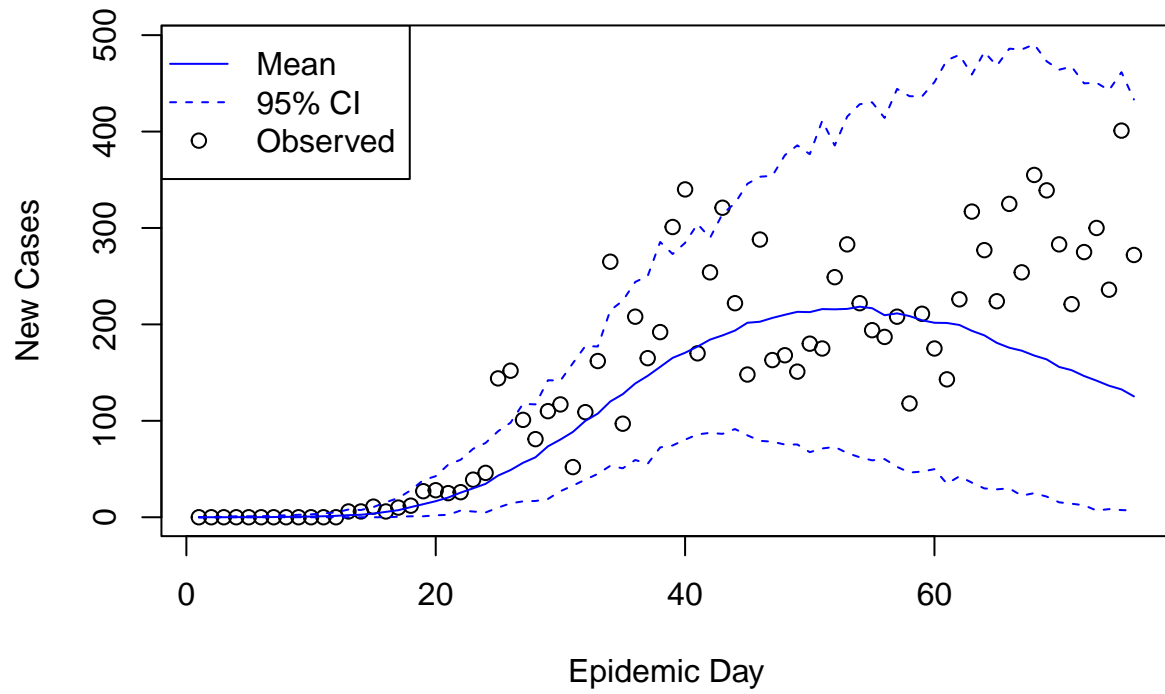
Model 1a (Basic ABC): Posterior Predictive Distribution location FLORIDA



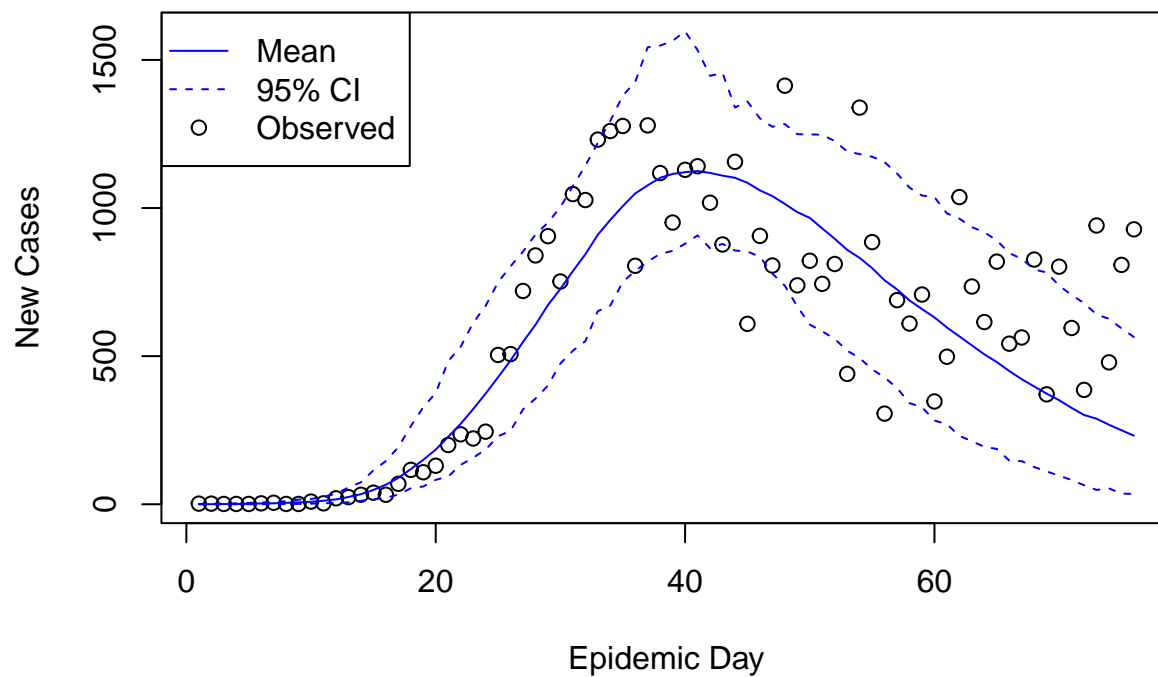
Model 1a (Basic ABC): Posterior Predictive Distribution location GEORGIA



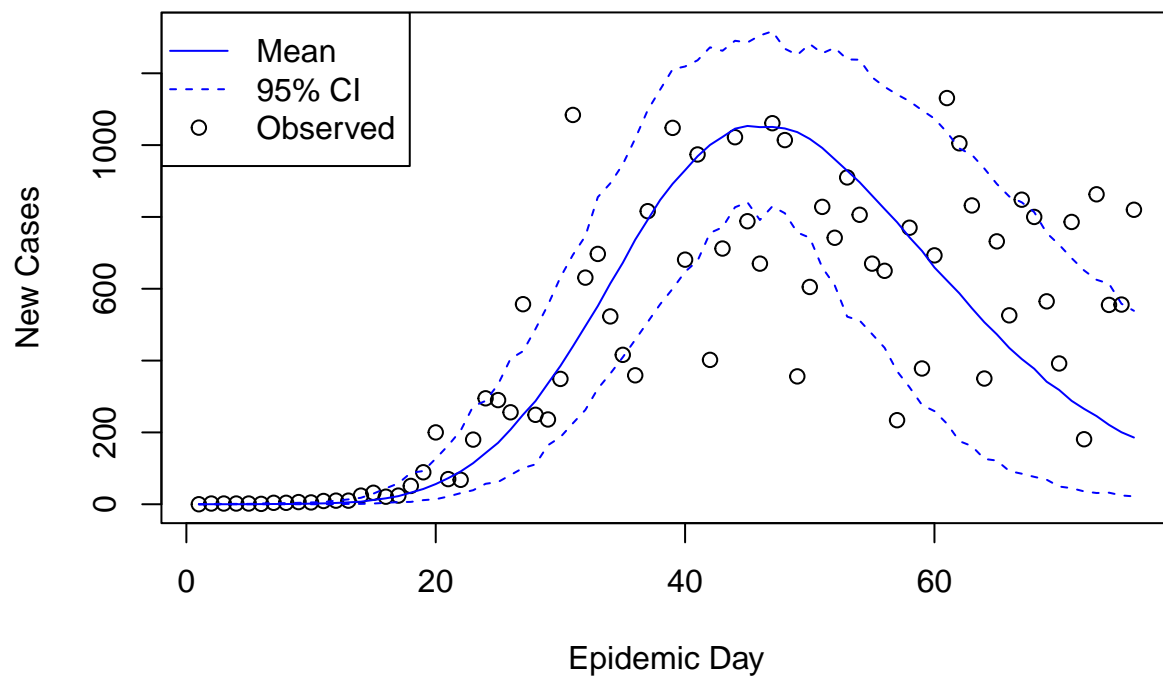
Model 1a (Weibull Distribution): Posterior Distribution location ALABAMA



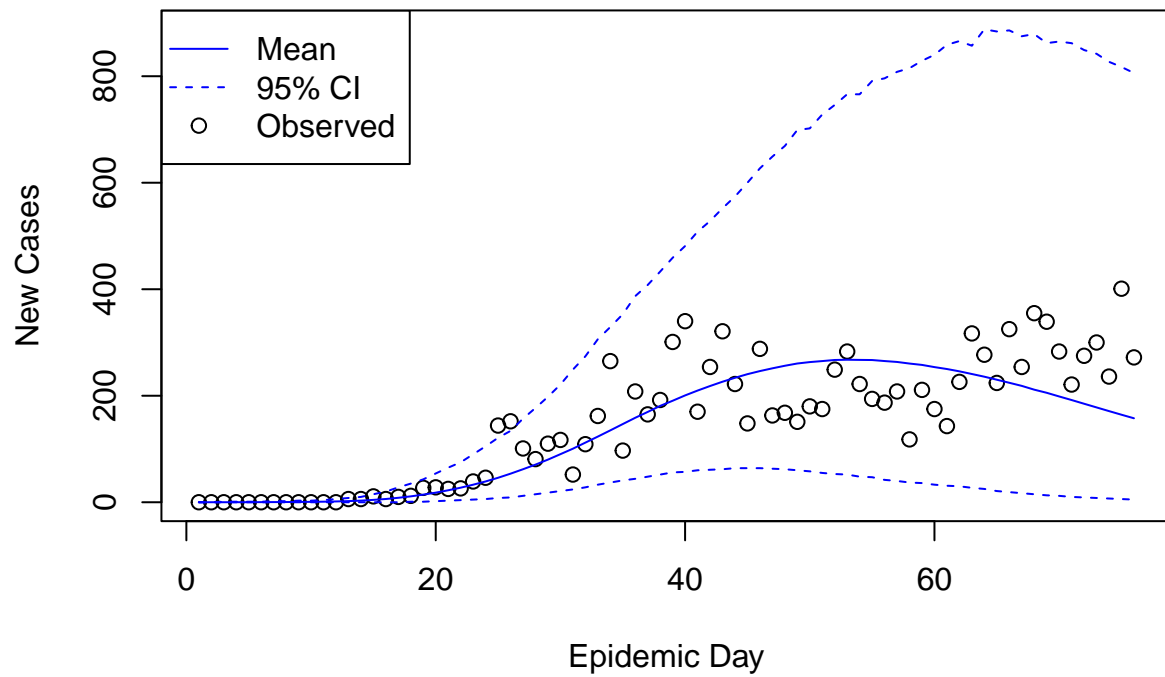
Model 1a (Weibull Distribution): Posterior Distribution location FLORIDA



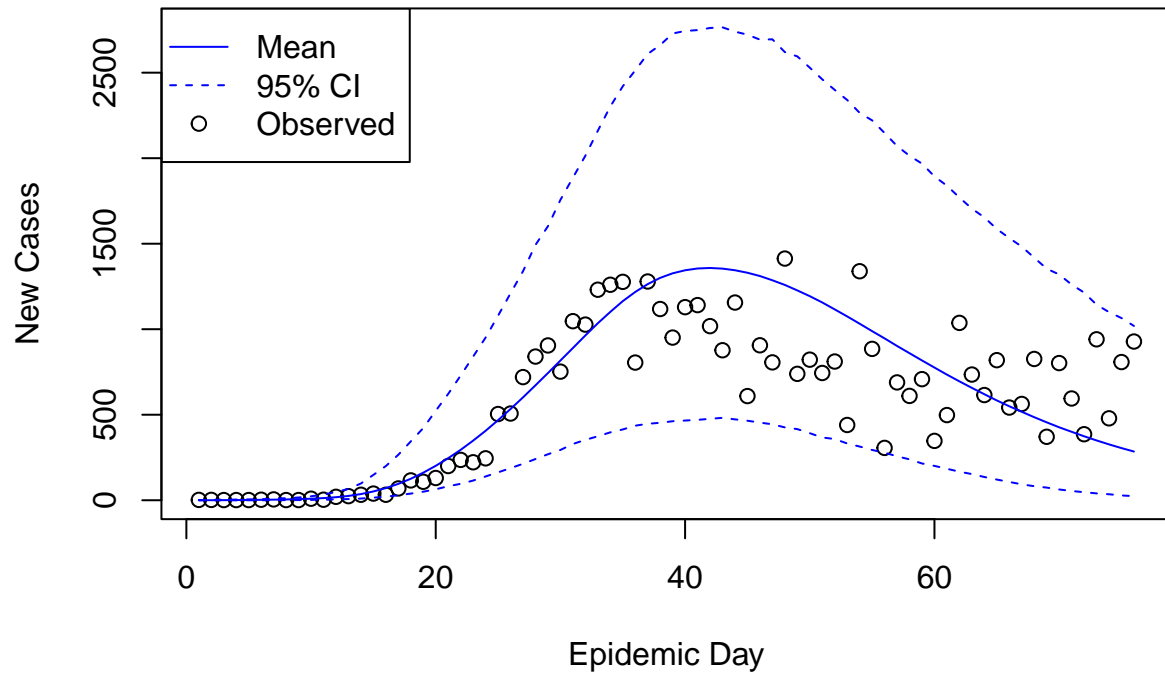
Model 1a (Weibull Distribution): Posterior Distribution location GEORGIA



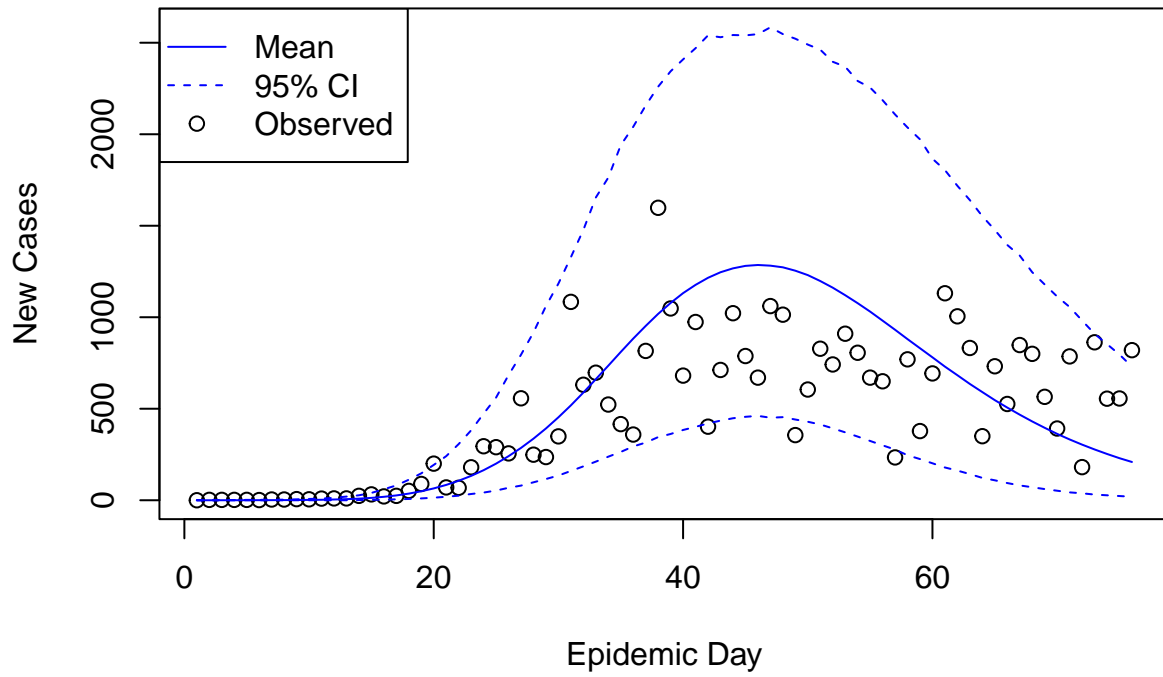
Model 1a (Weibull Distribution): Posterior Predictive Distribution location ALABAMA



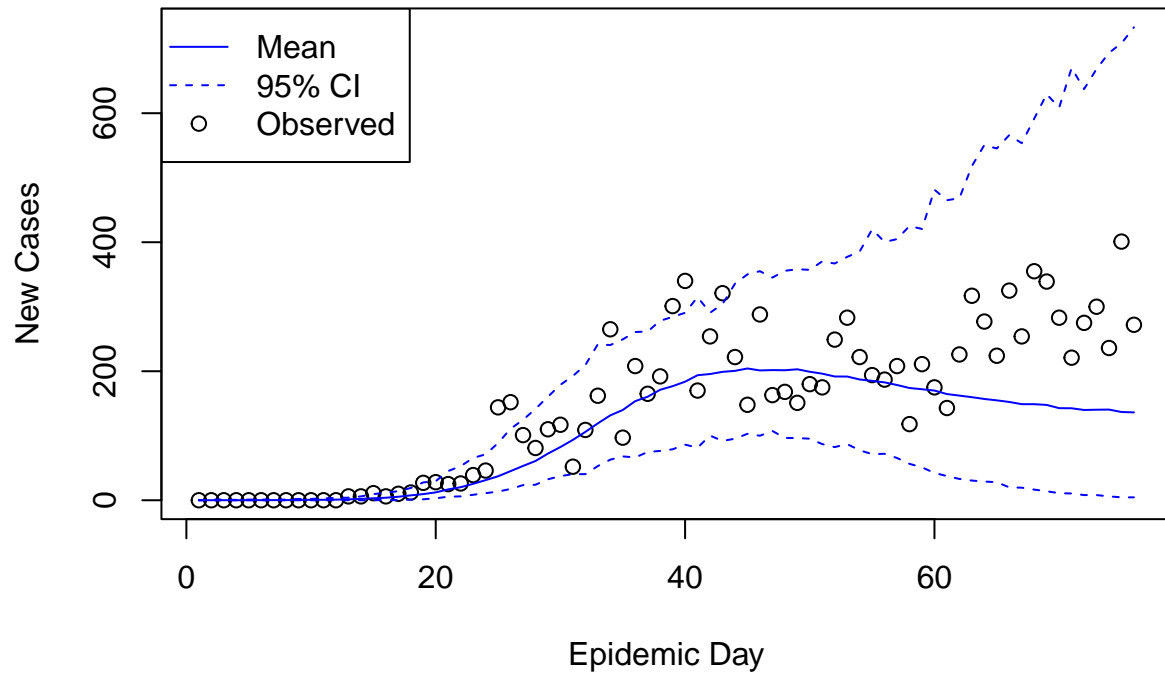
Model 1a (Weibull Distribution): Posterior Predictive Distribution location FLORIDA



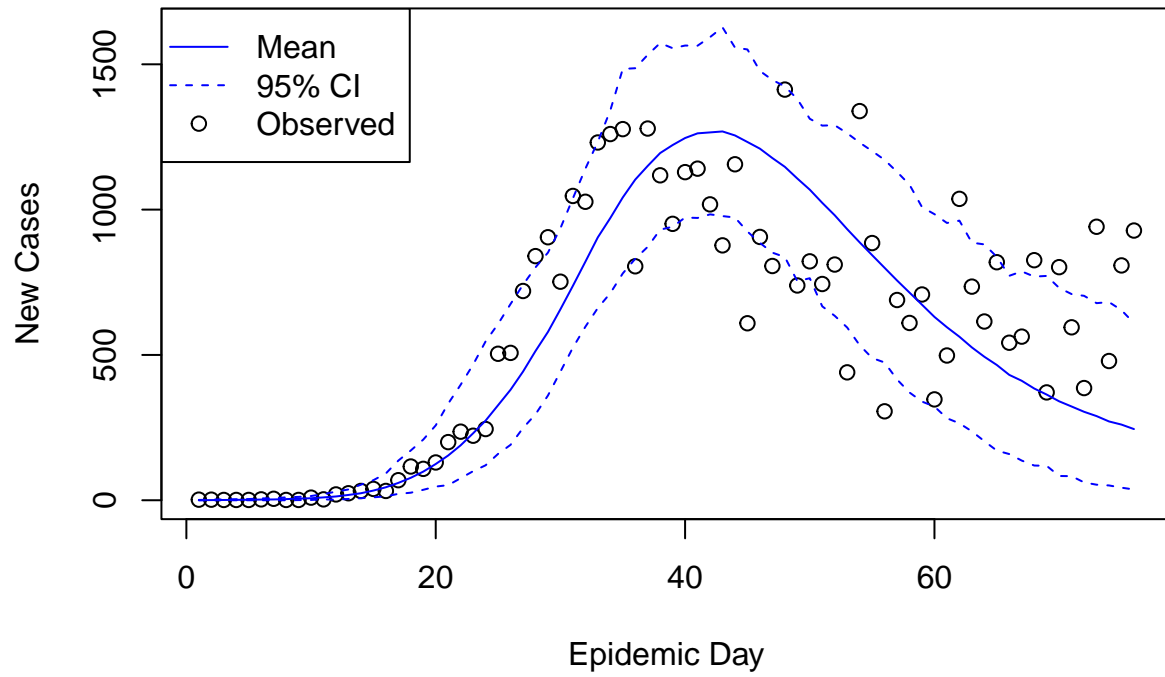
Model 1a (Weibull Distribution): Posterior Predictive Distribution location GEORGIA



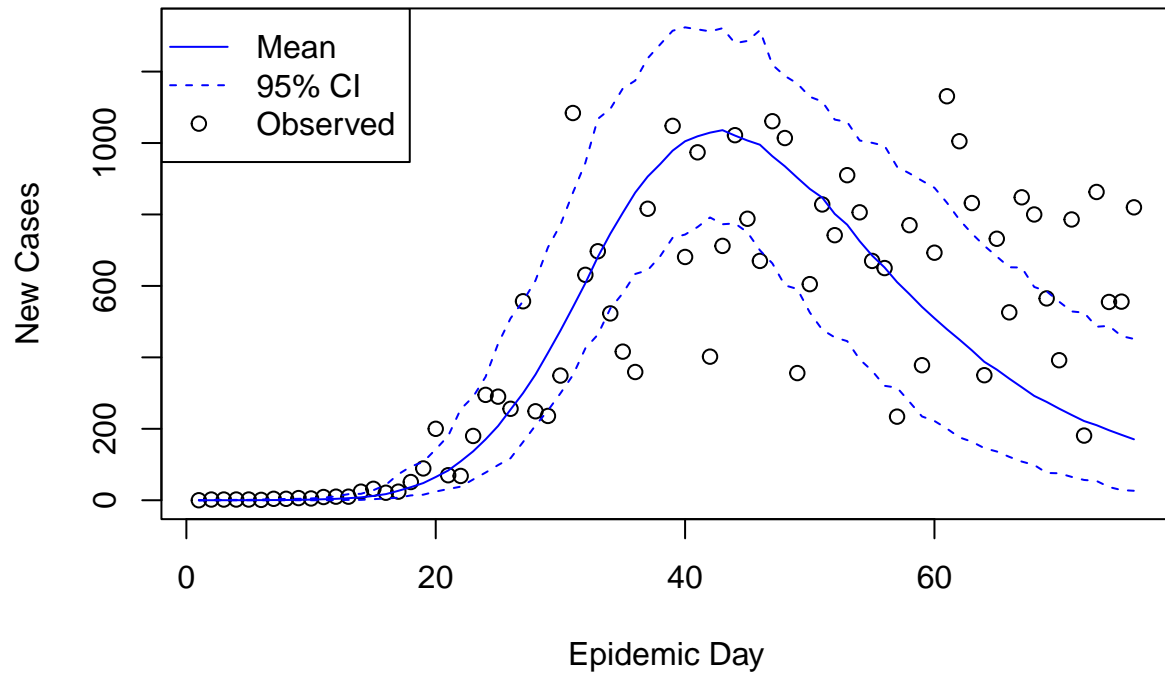
Model 1b: Posterior Distribution location ALABAMA



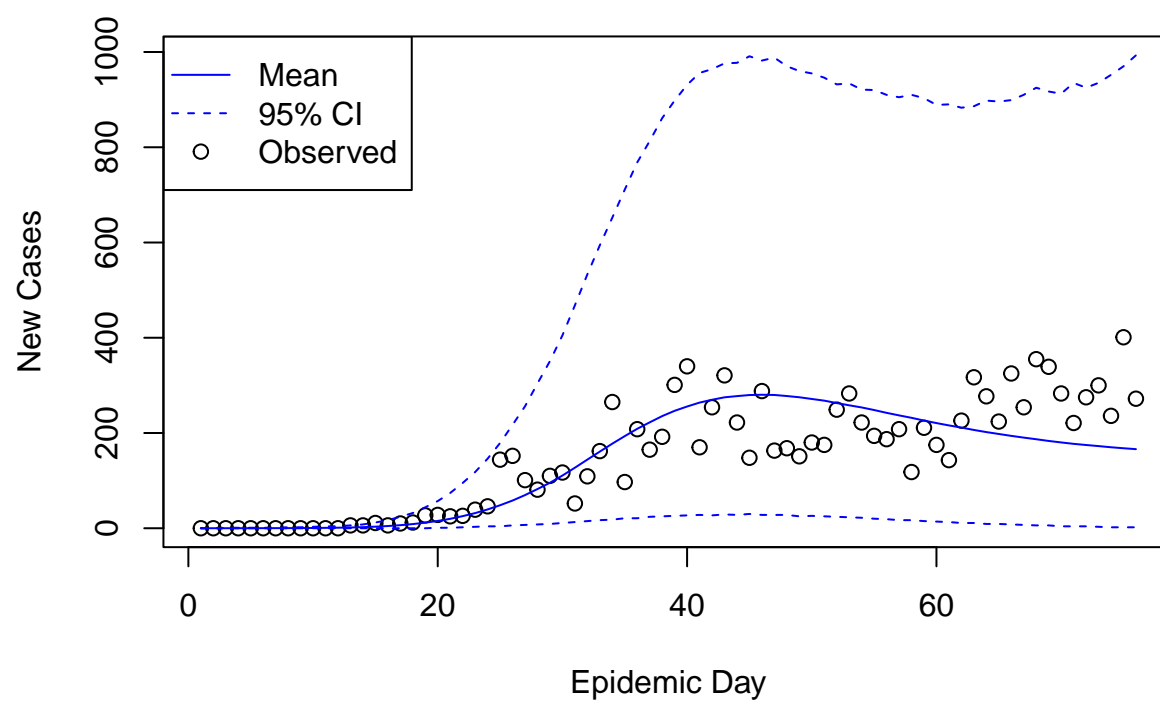
Model 1b: Posterior Distribution location FLORIDA



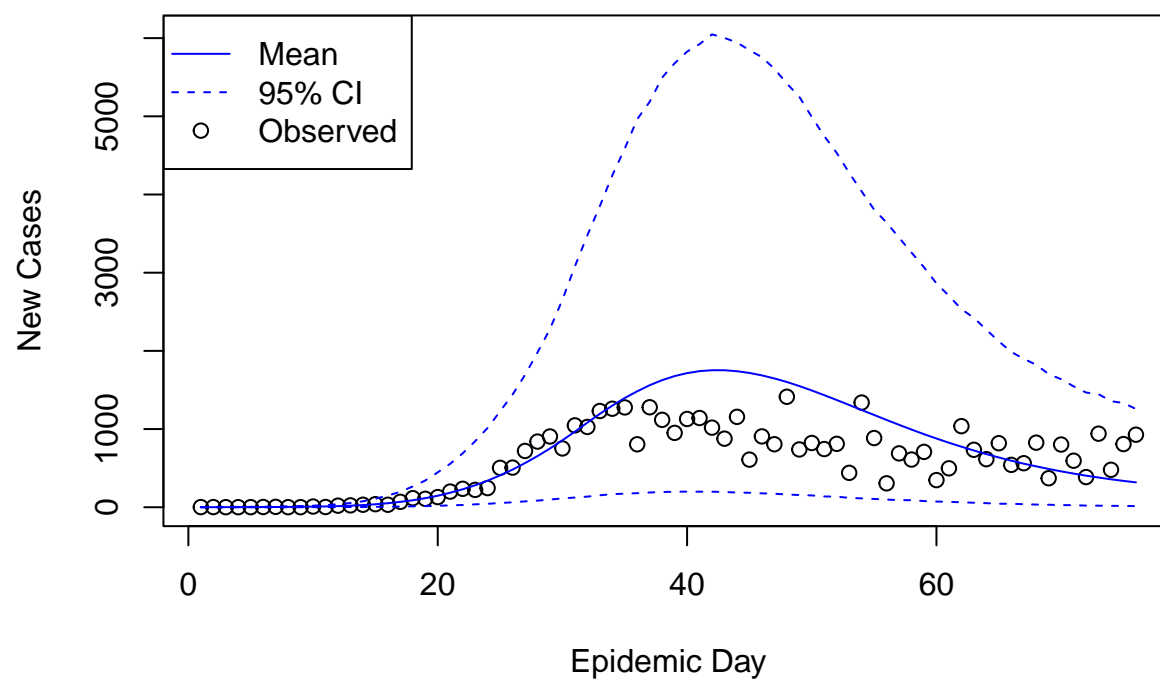
Model 1b: Posterior Distribution location GEORGIA



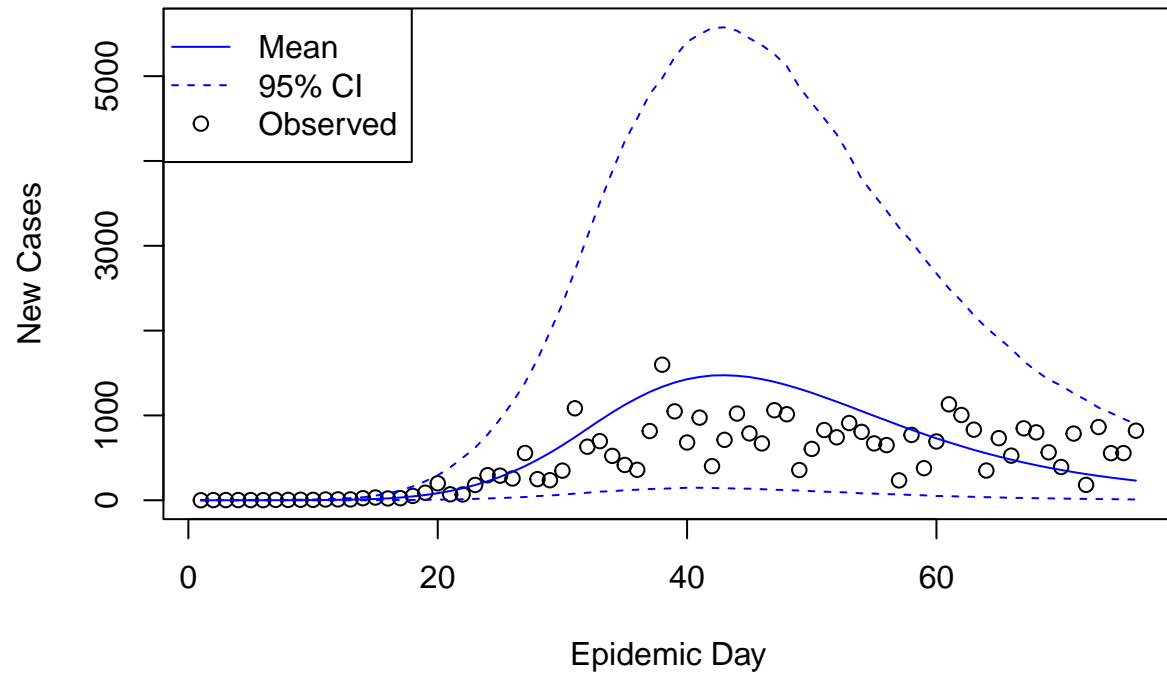
Model 1b: Posterior Predictive Distribution location ALABAMA



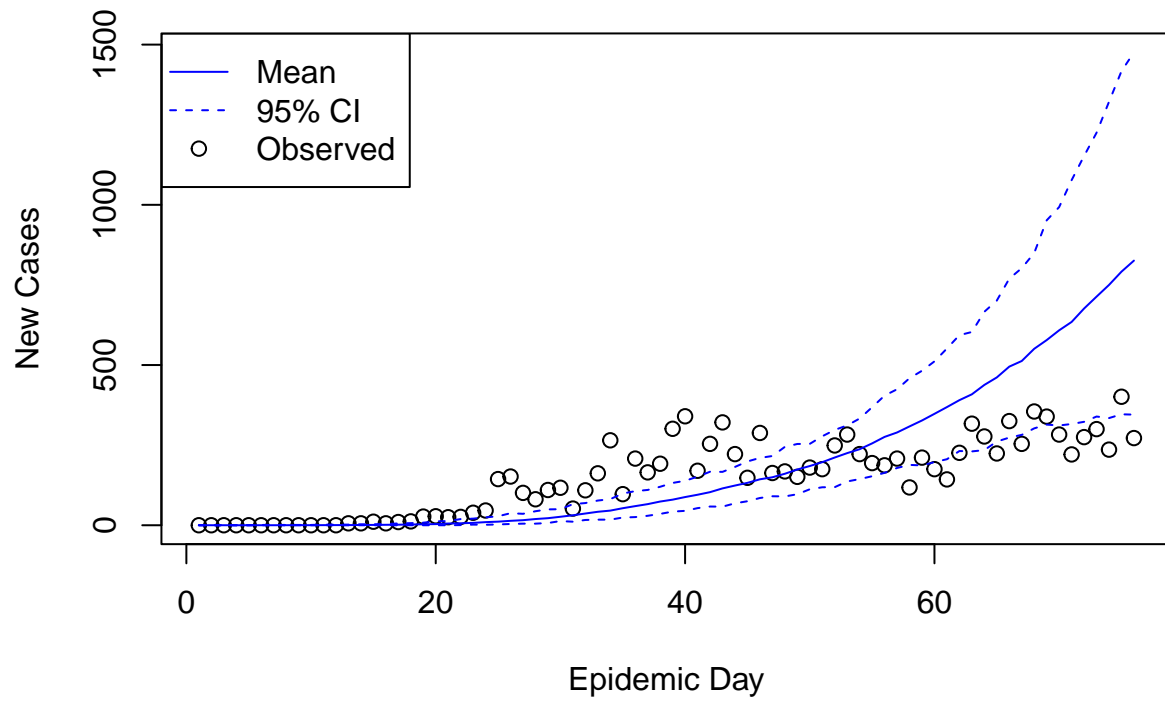
Model 1b: Posterior Predictive Distribution location FLORIDA



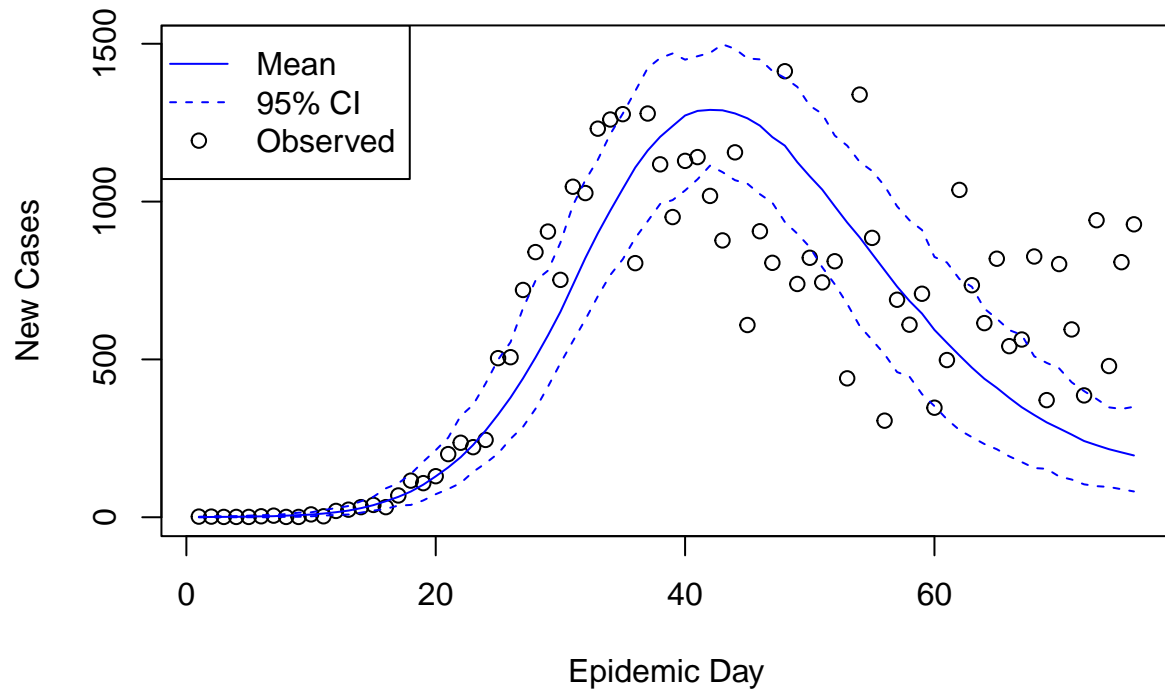
Model 1b: Posterior Predictive Distribution location GEORGIA



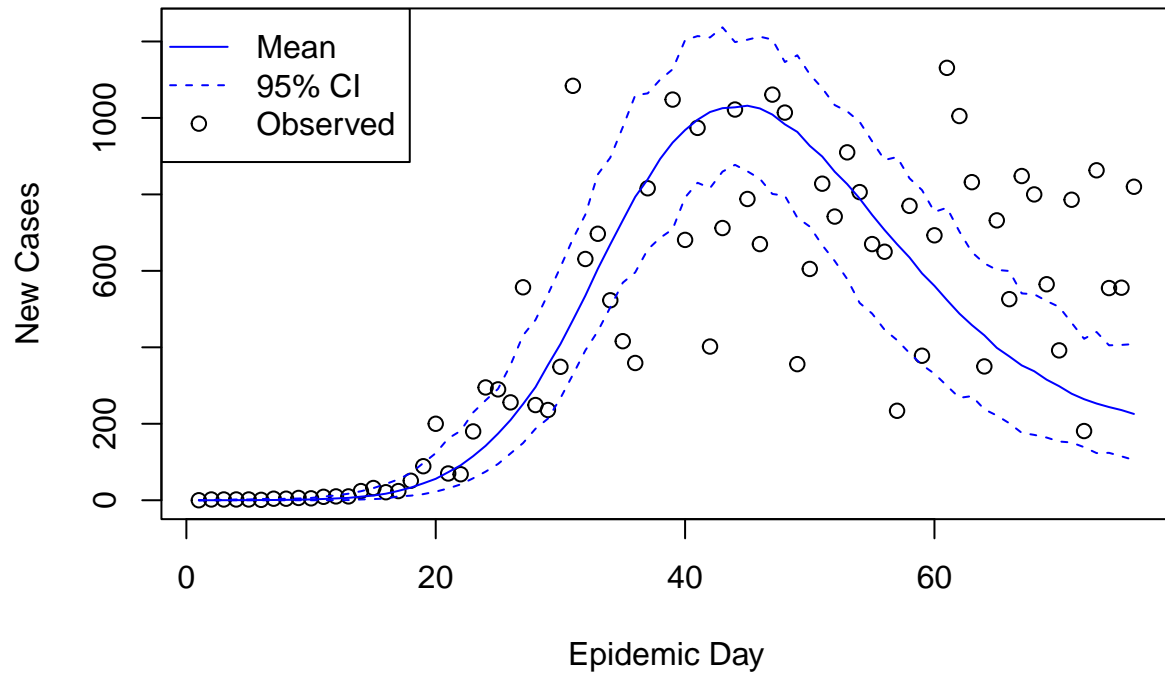
Model 1c: Posterior Distribution location ALABAMA



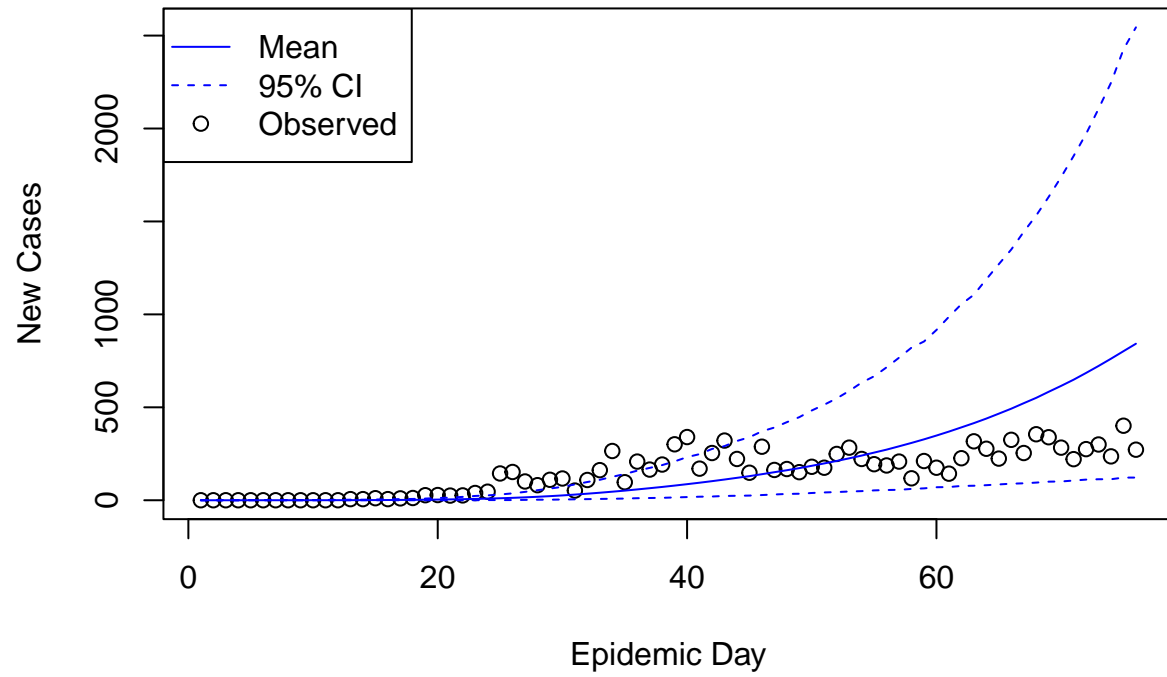
Model 1c: Posterior Distribution location FLORIDA



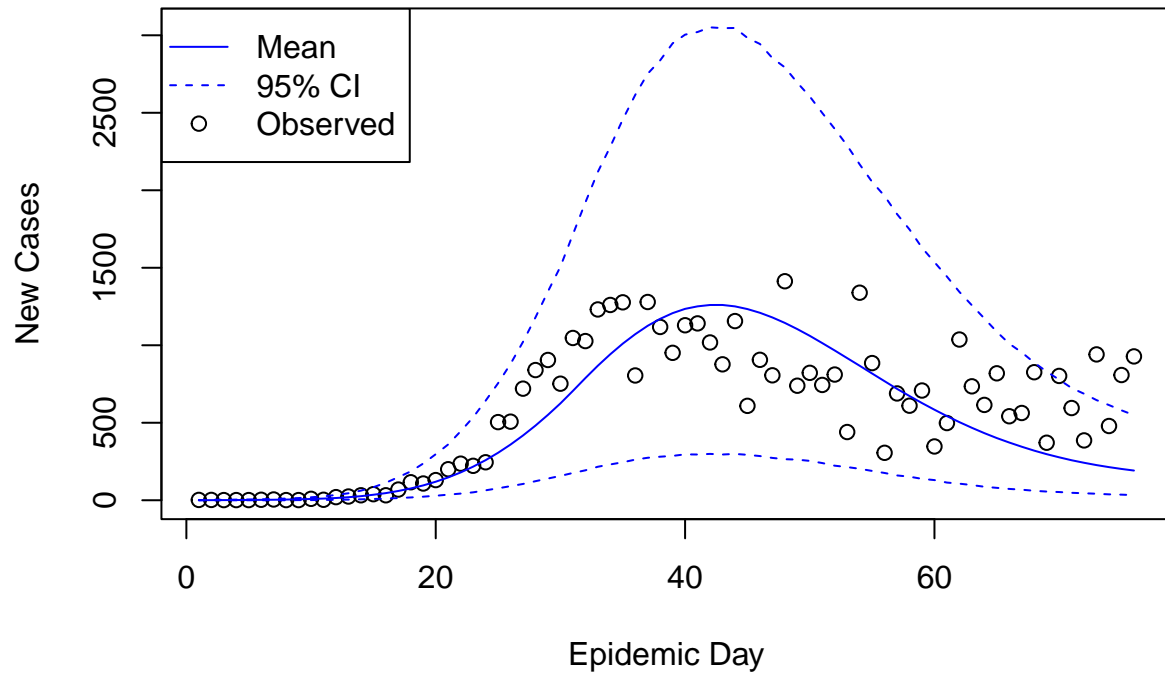
Model 1c: Posterior Distribution location GEORGIA



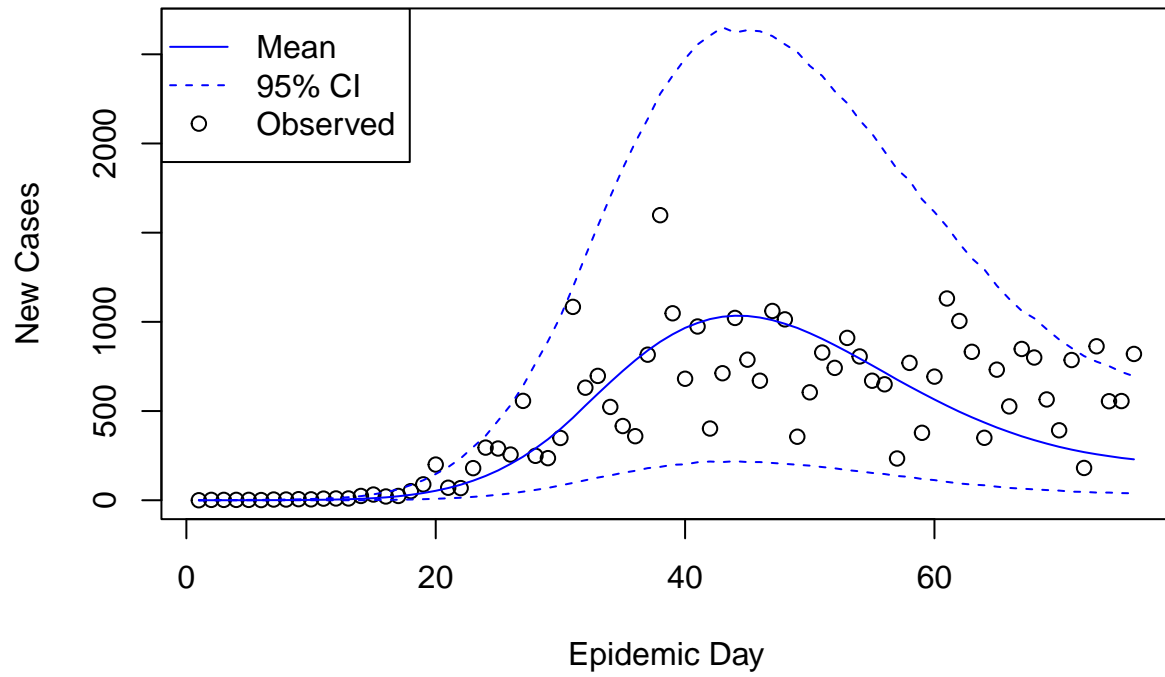
Model 1c: Posterior Predictive Distribution location ALABAMA



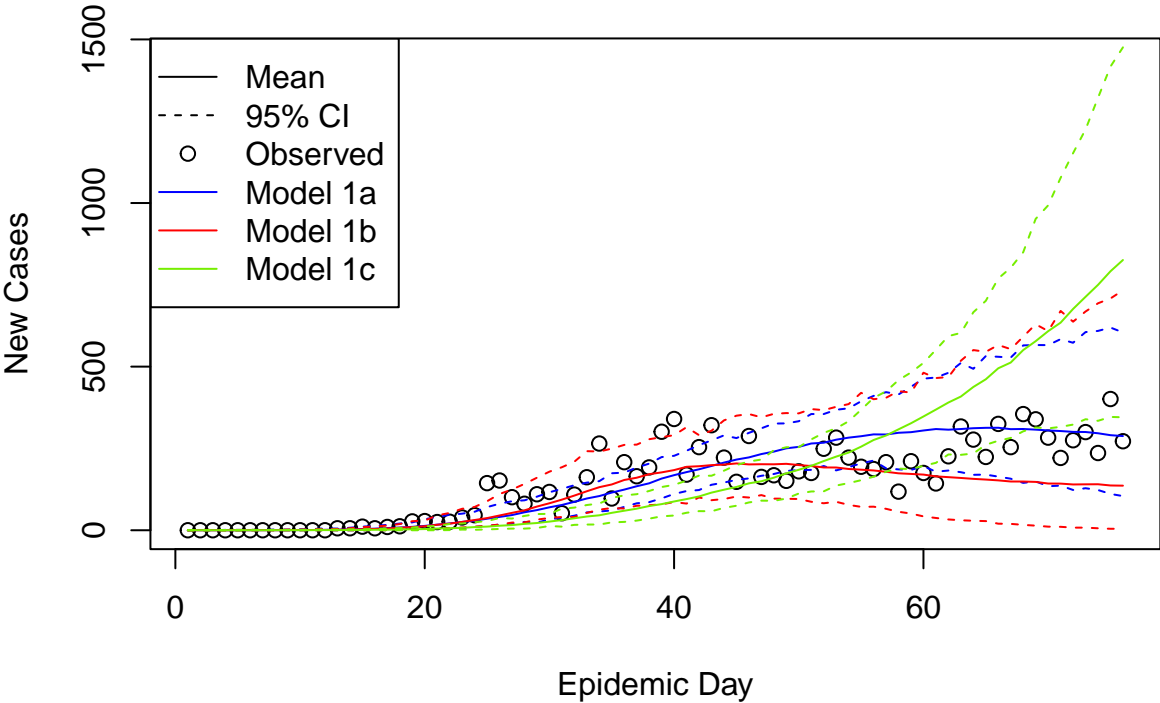
Model 1c: Posterior Predictive Distribution location FLORIDA



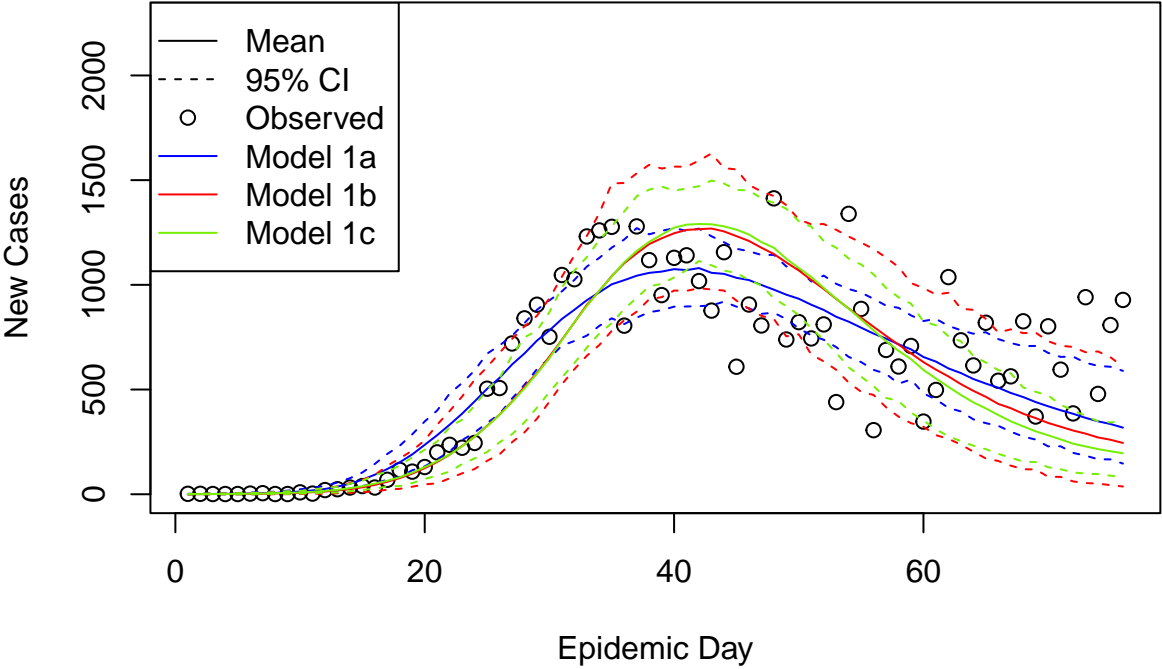
Model 1c: Posterior Predictive Distribution location GEORGIA



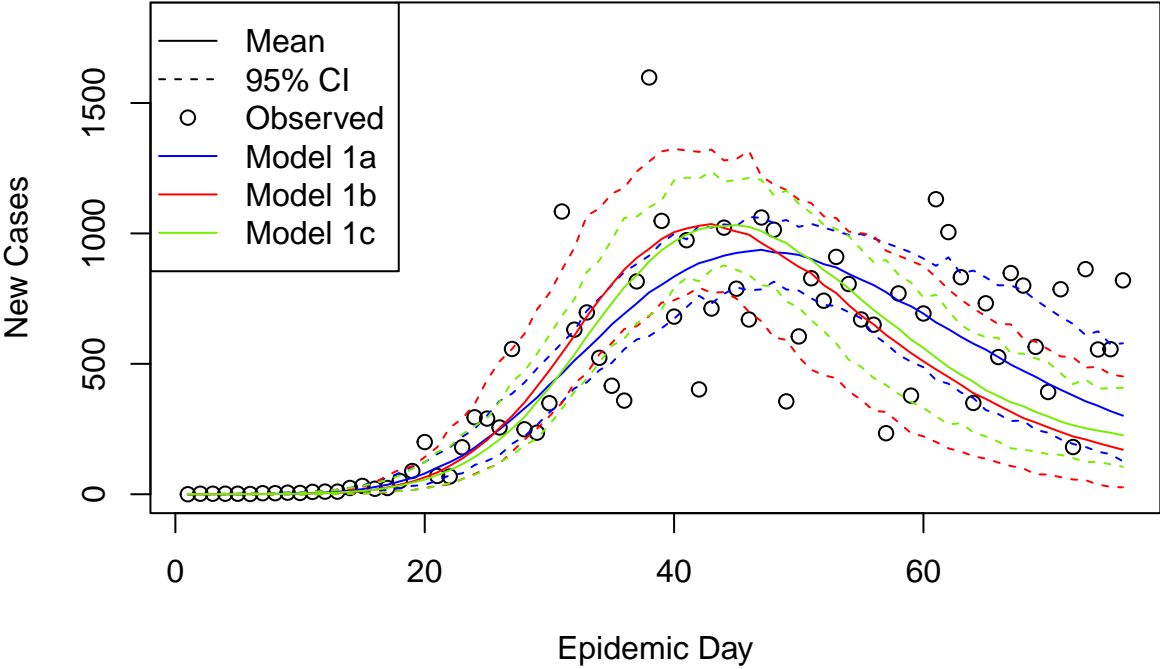
**Model 1a vs Model 1b vs Model 1c: Posterior Distribution
location ALABAMA**



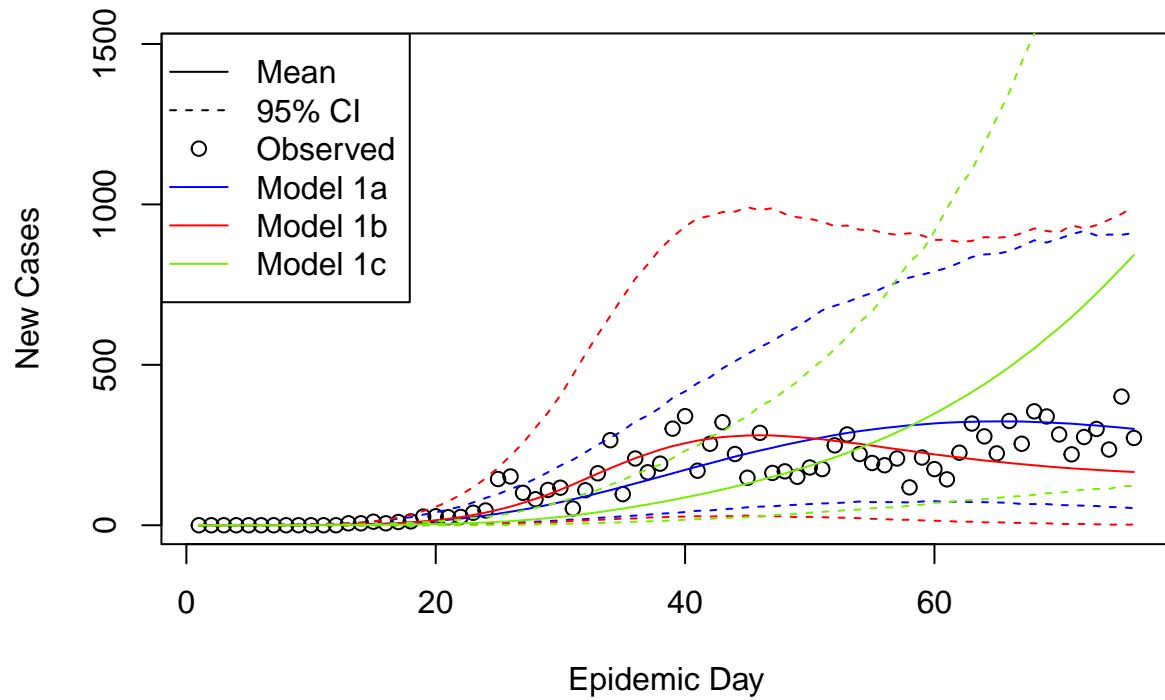
**Model 1a vs Model 1b vs Model 1c: Posterior Distribution
location FLORIDA**



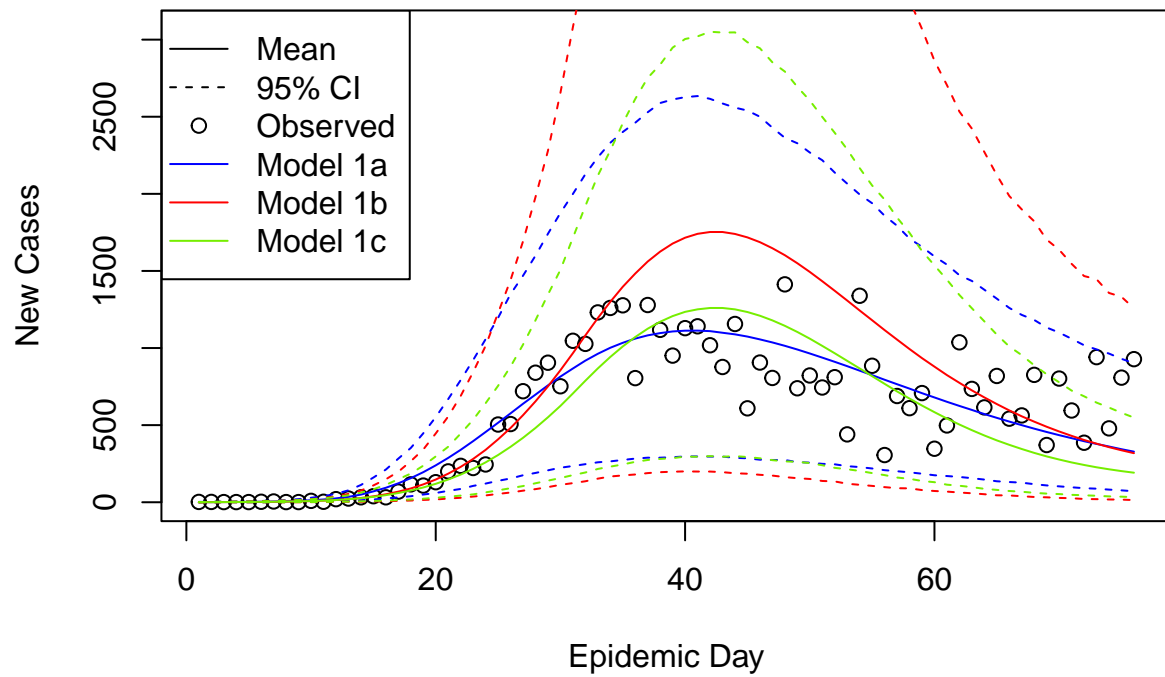
**Model 1a vs Model 1b vs Model 1c: Posterior Distribution
location GEORGIA**



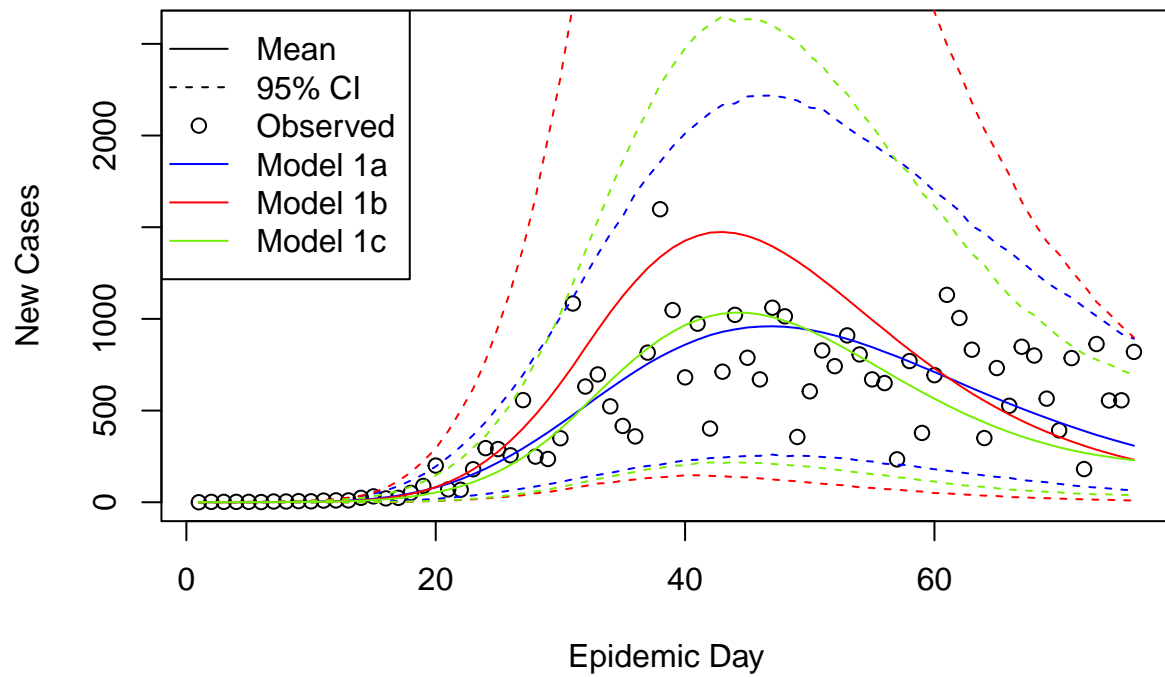
Model 1a vs Model 1b vs Model 1c: Posterior Predictive Distribution location ALABAMA



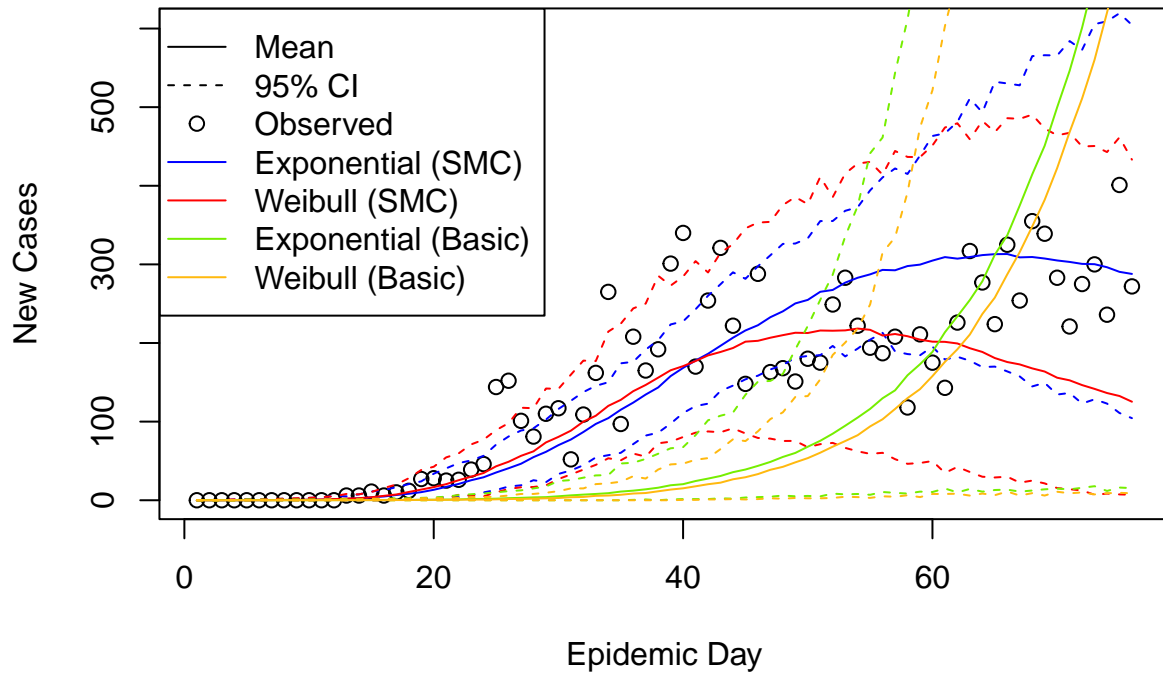
Model 1a vs Model 1b vs Model 1c: Posterior Predictive Distribution location FLORIDA



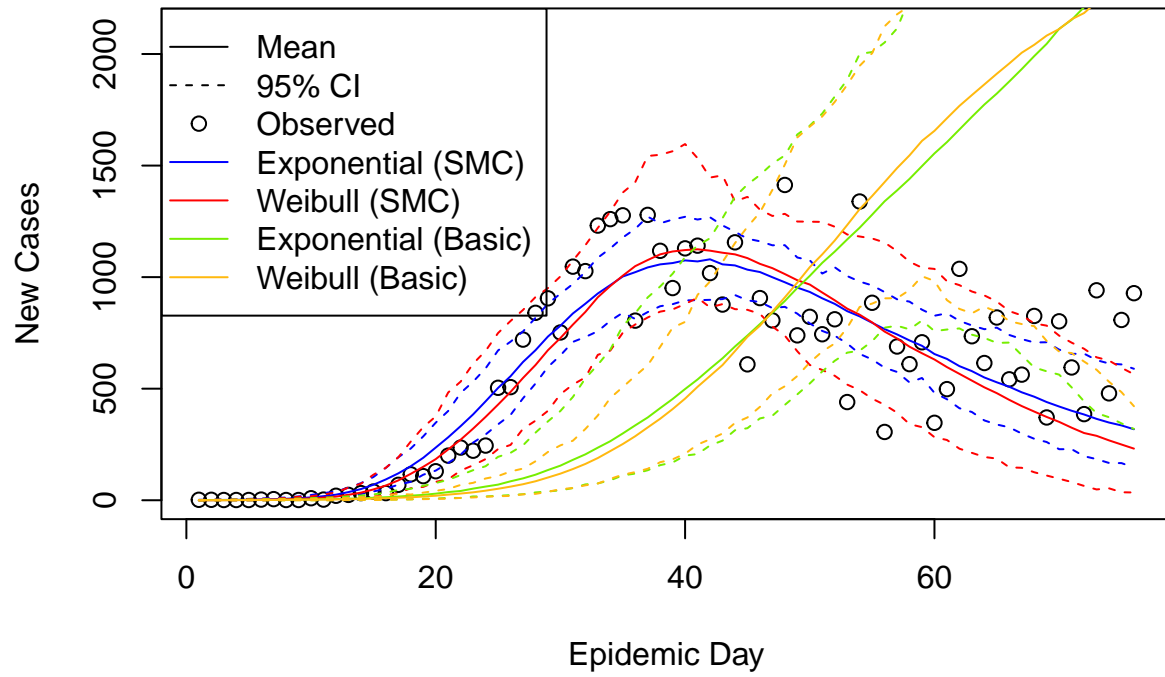
Model 1a vs Model 1b vs Model 1c: Posterior Predictive Distribution location GEORGIA



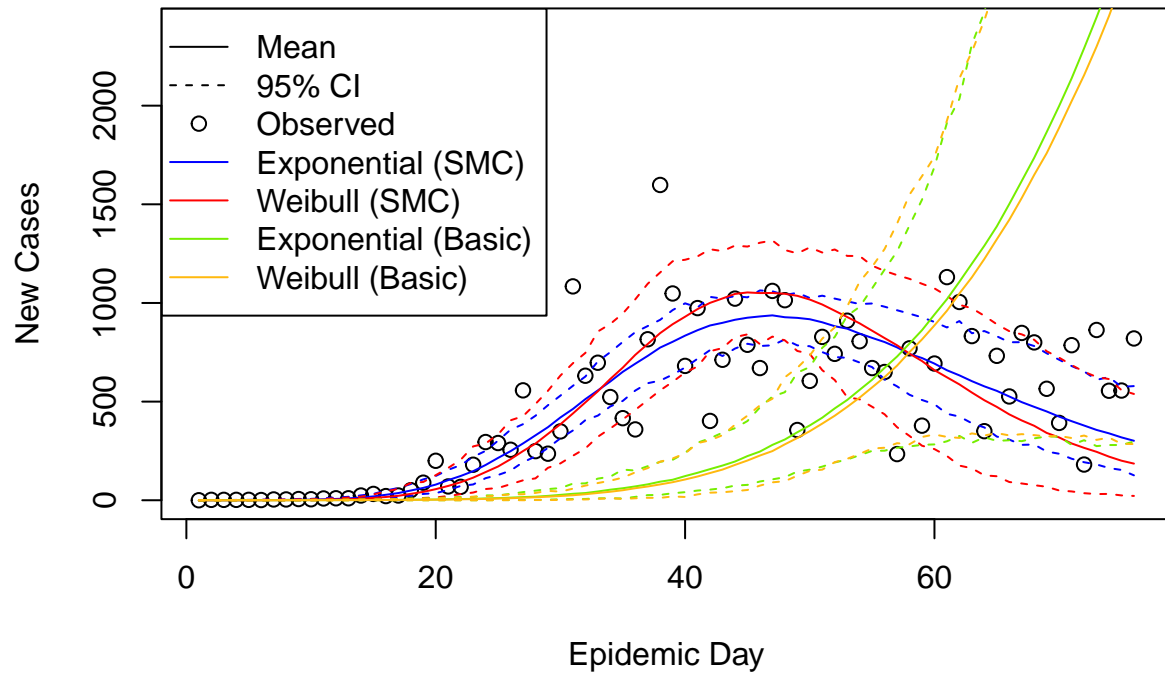
Model 1a: Posterior Distribution location ALABAMA



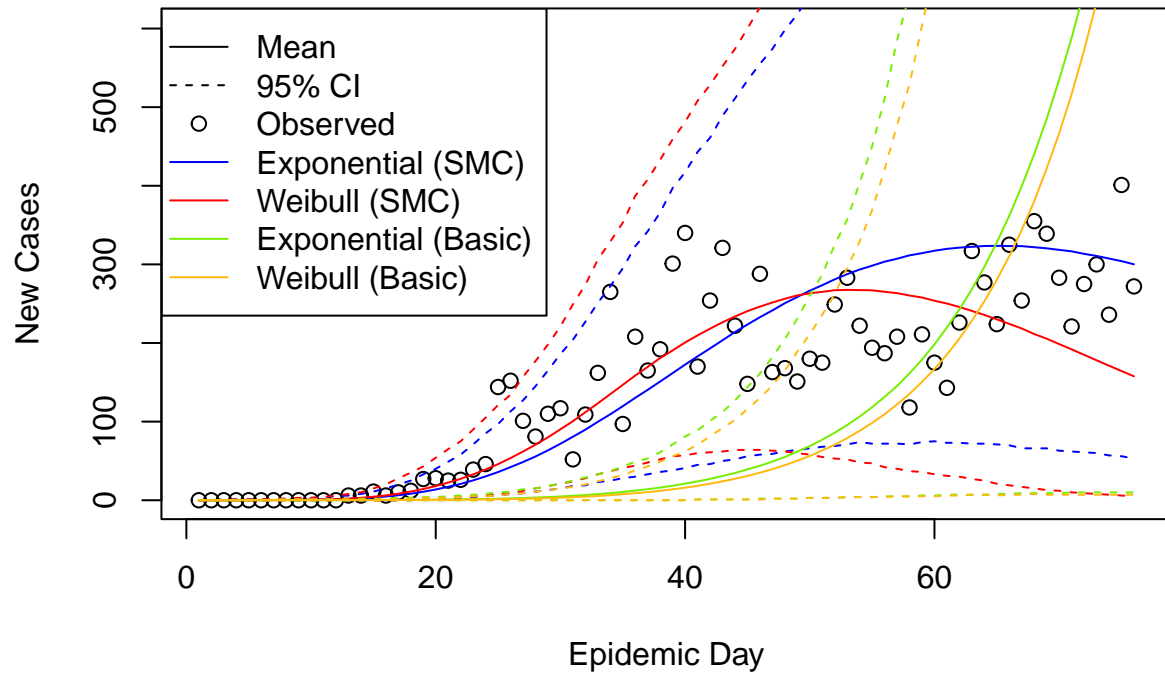
Model 1a: Posterior Distribution location FLORIDA



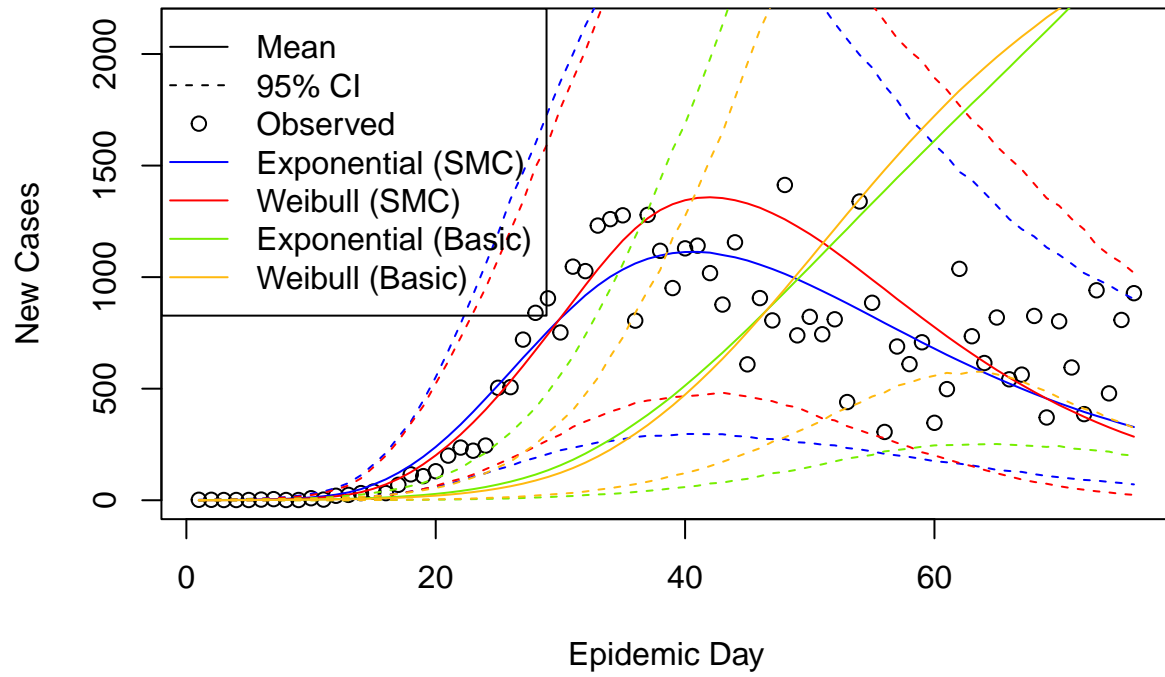
Model 1a: Posterior Distribution location GEORGIA



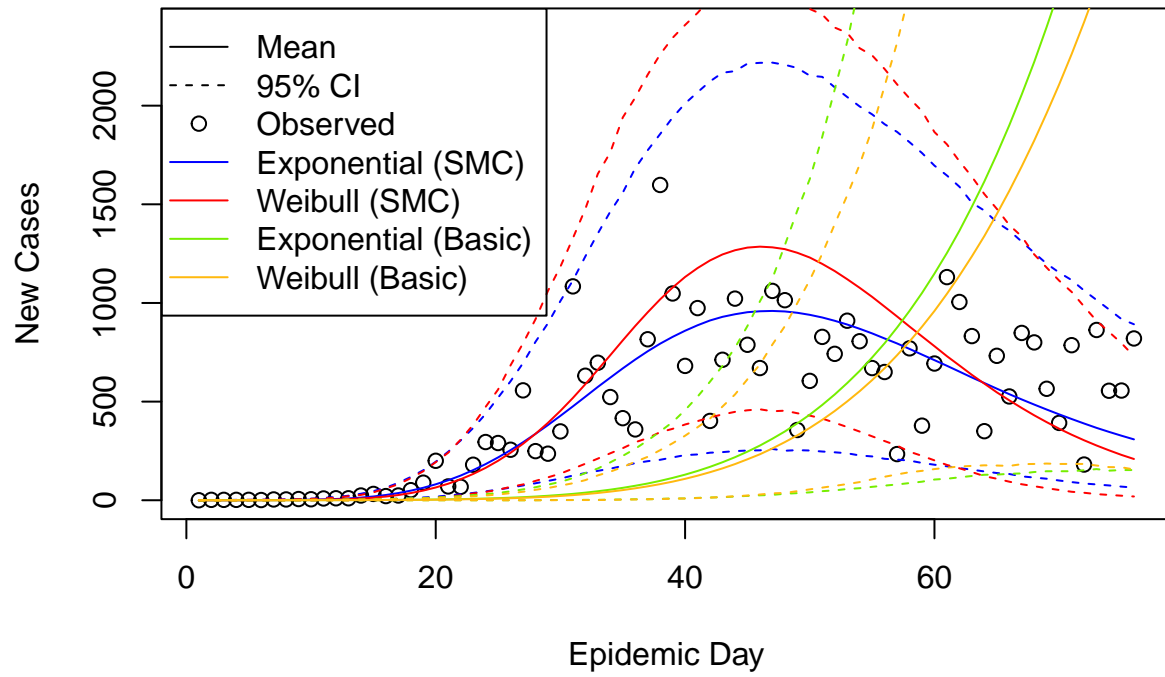
Model 1a: Posterior Predictive Distribution location ALABAMA



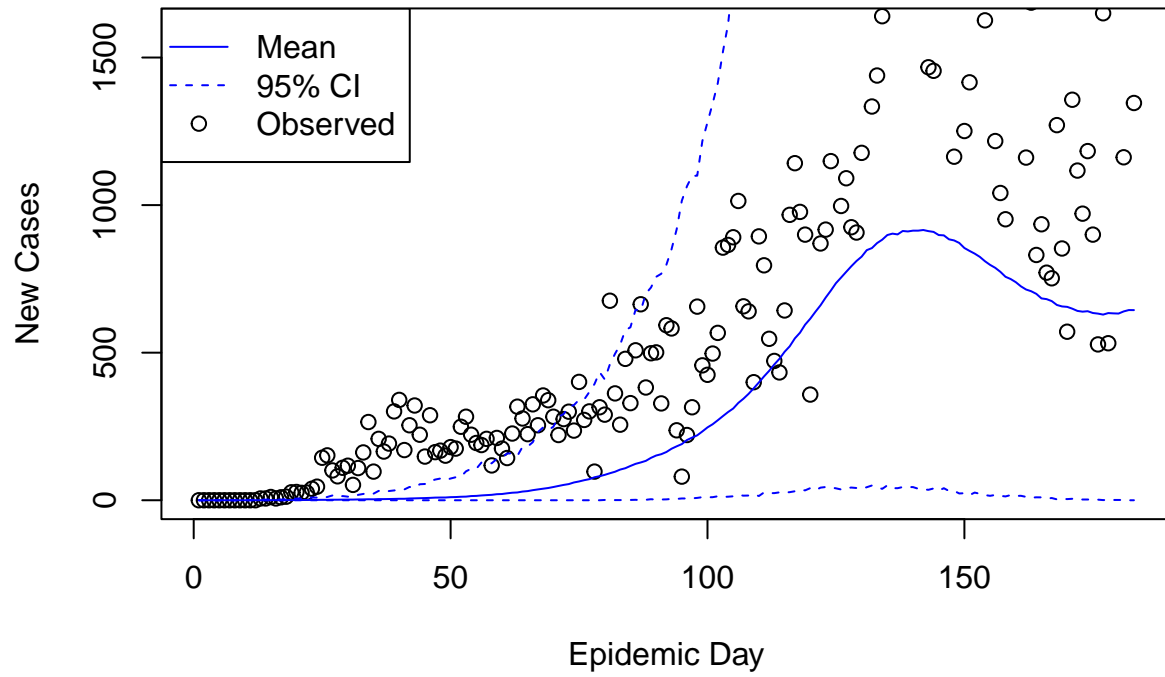
Model 1a: Posterior Predictive Distribution location FLORIDA



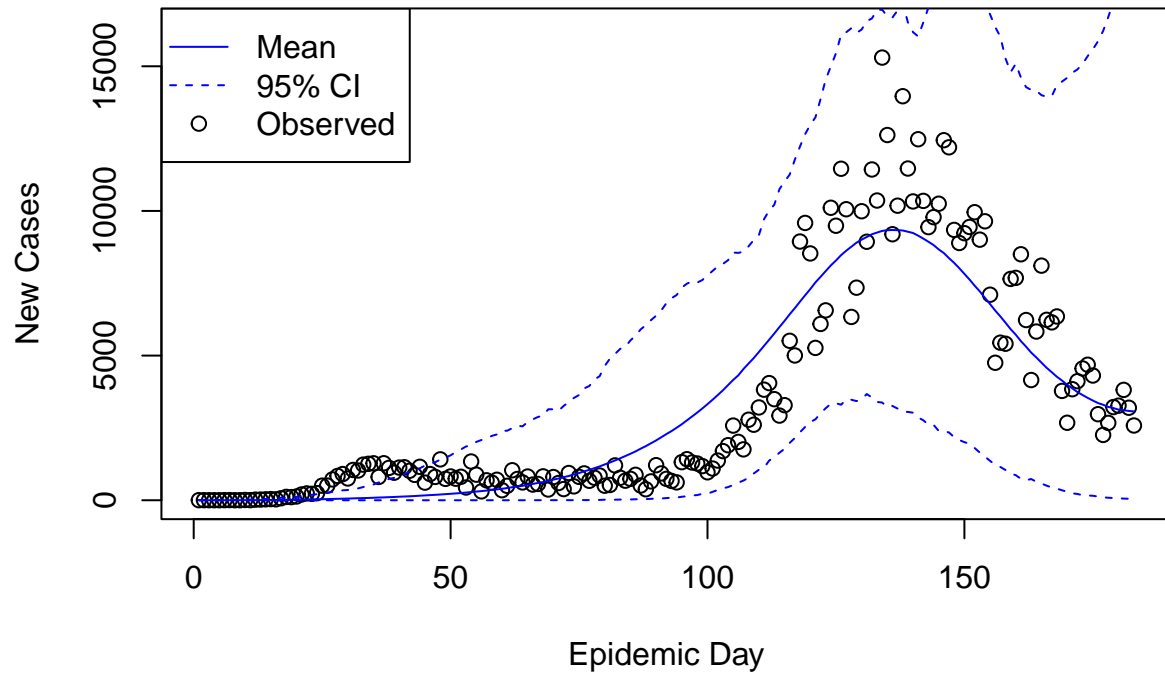
Model 1a: Posterior Predictive Distribution location GEORGIA



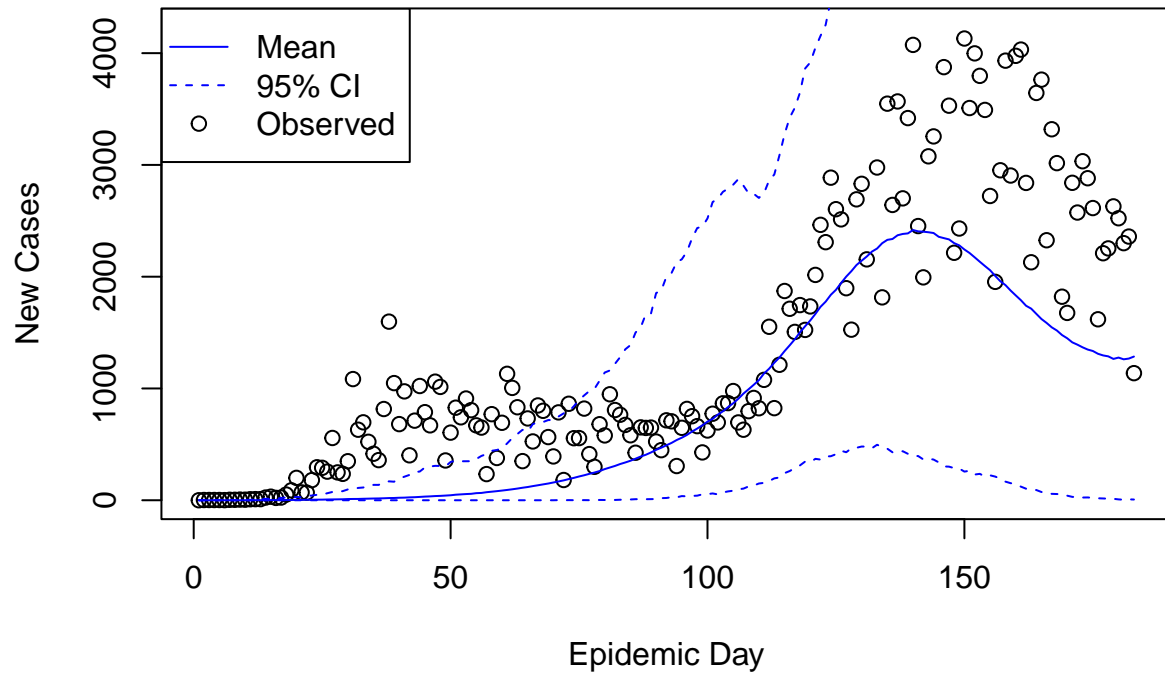
Model 2a: Posterior Distribution location ALABAMA



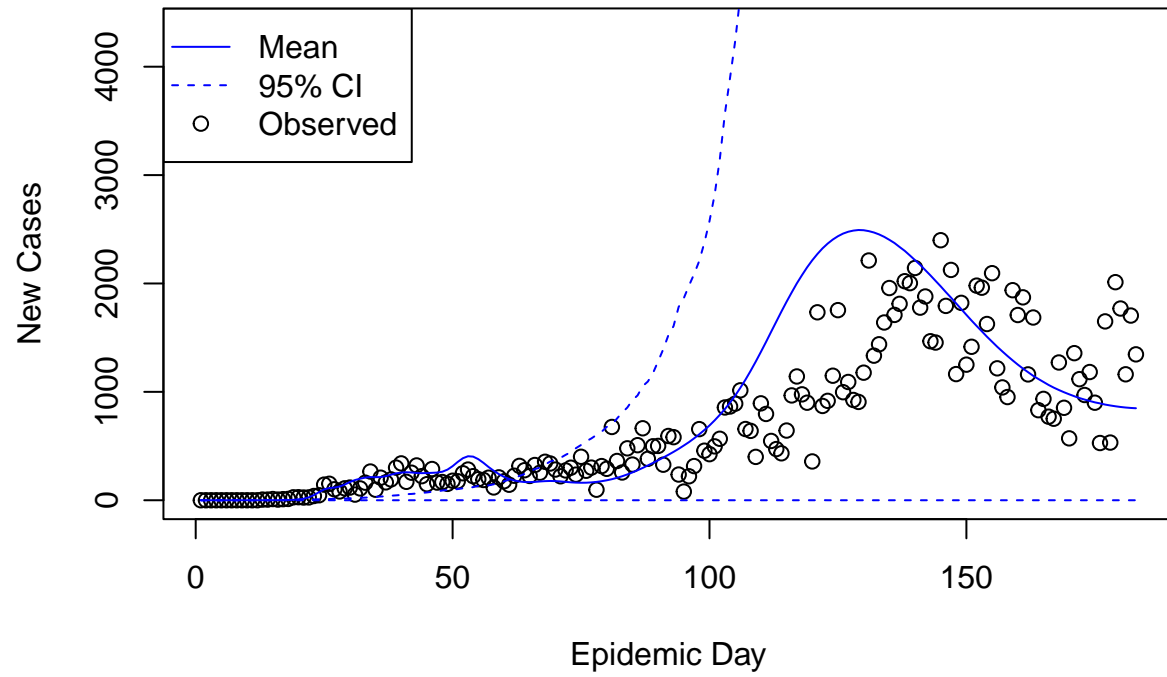
Model 2a: Posterior Distribution location FLORIDA



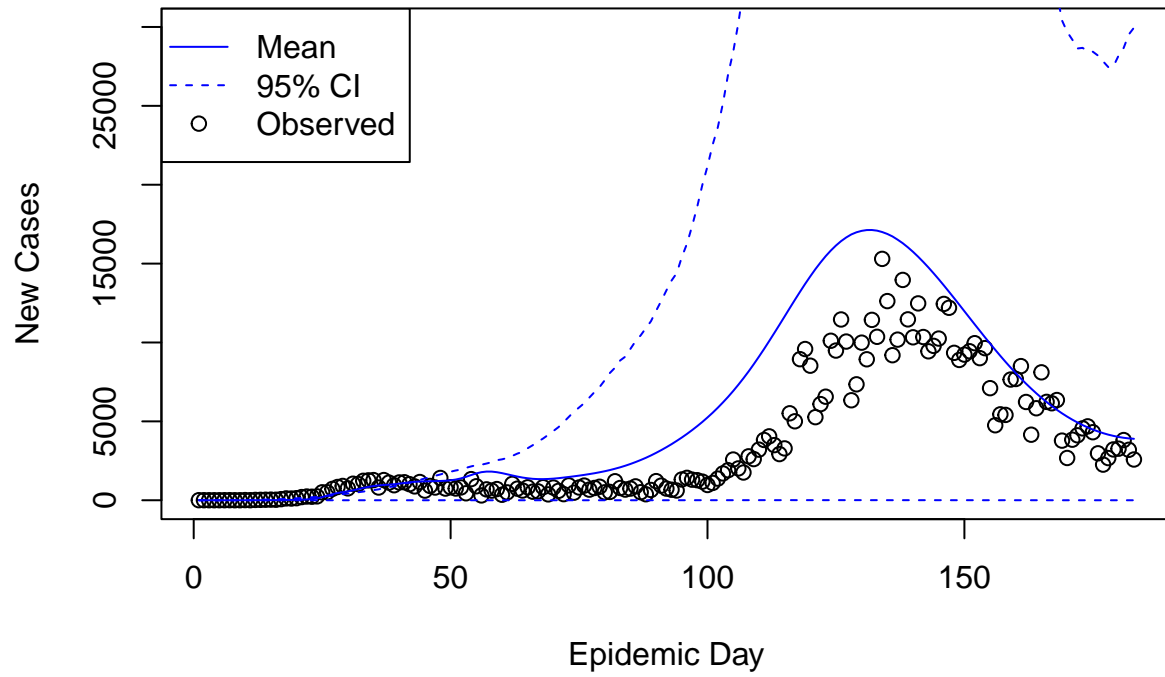
Model 2a: Posterior Distribution location GEORGIA



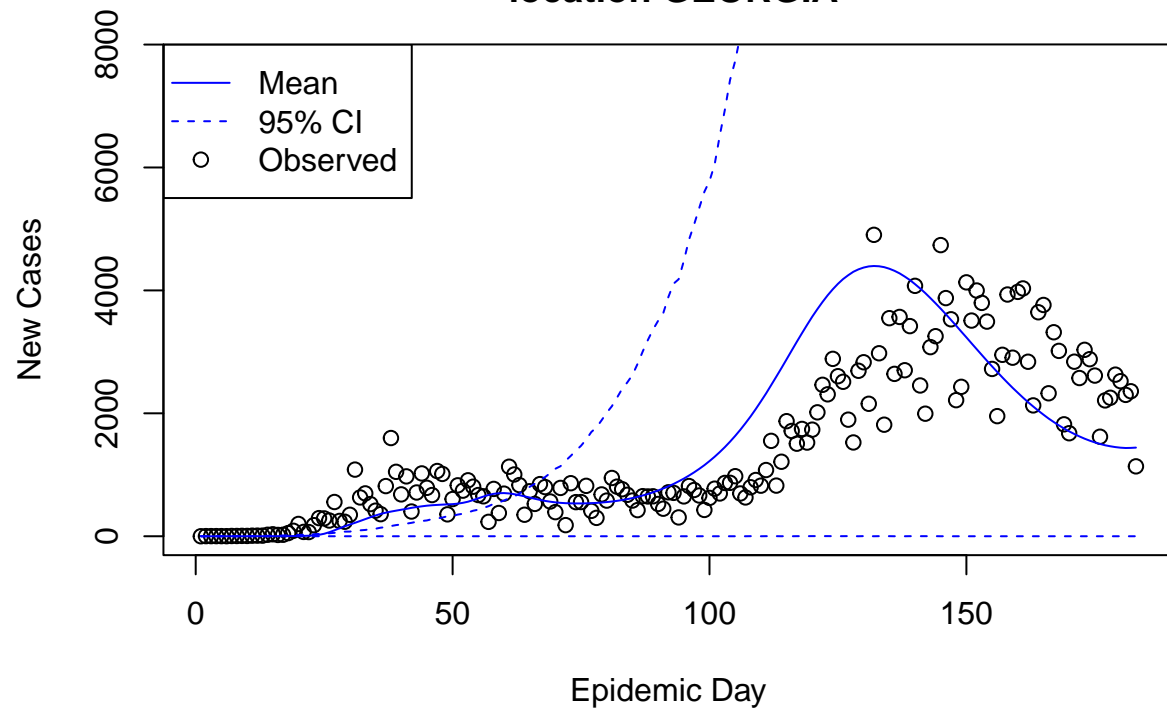
Model 2a: Posterior Predictive Distribution location ALABAMA



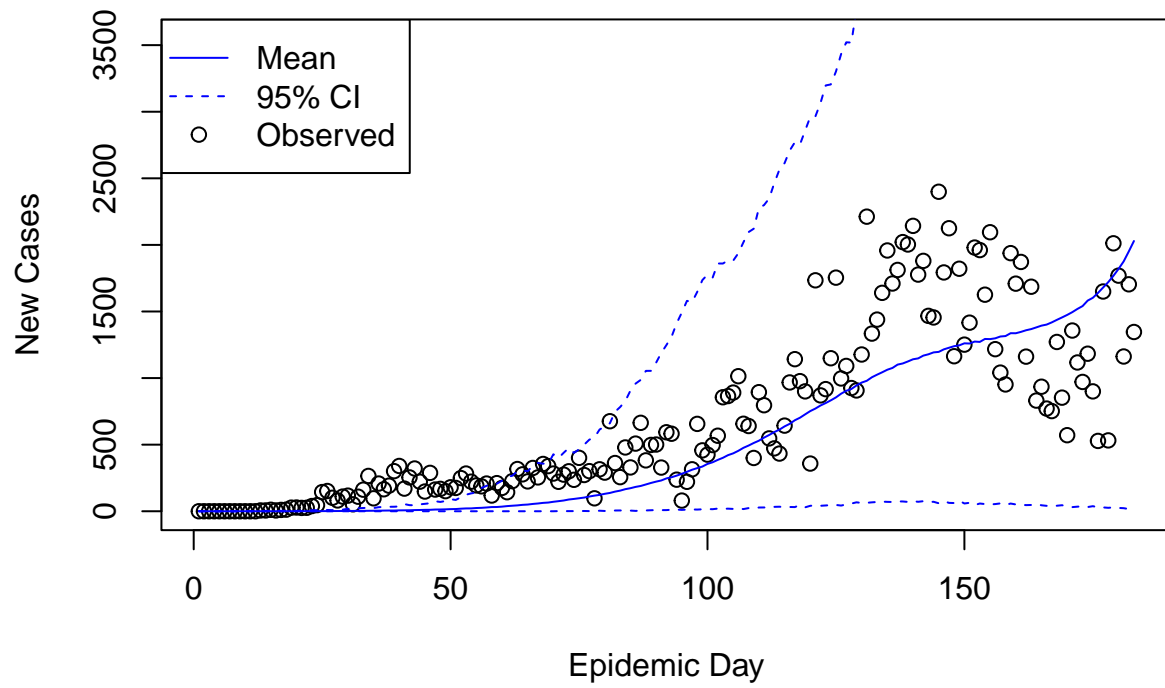
Model 2a: Posterior Predictive Distribution location FLORIDA



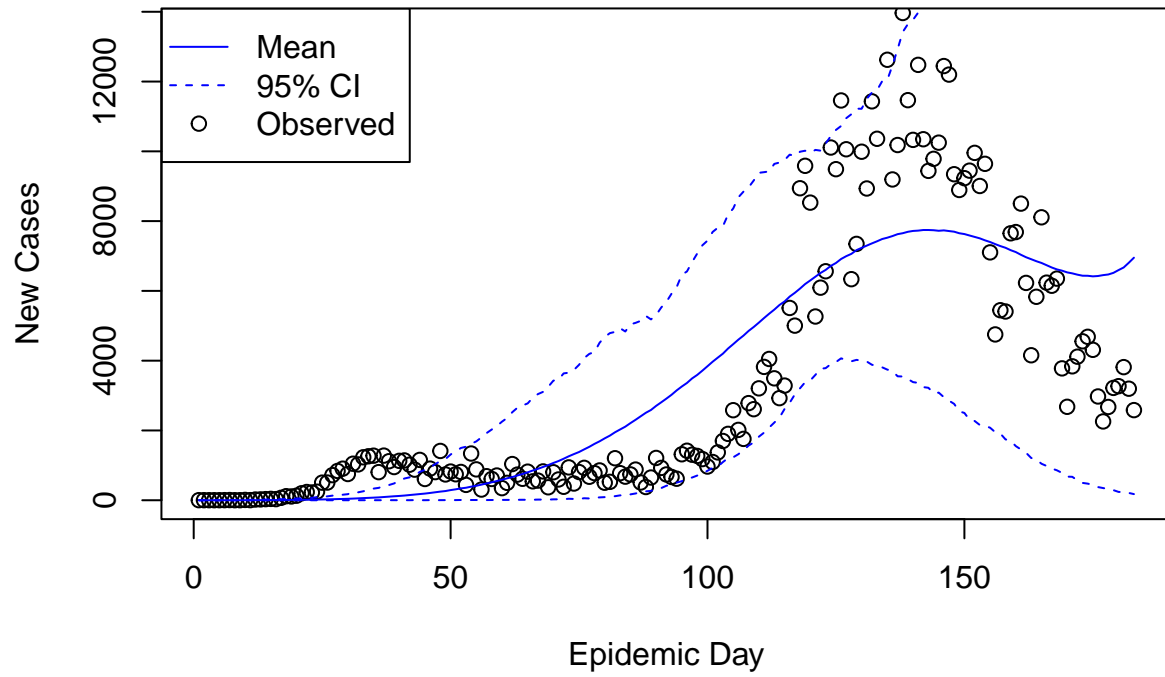
Model 2a: Posterior Predictive Distribution location GEORGIA



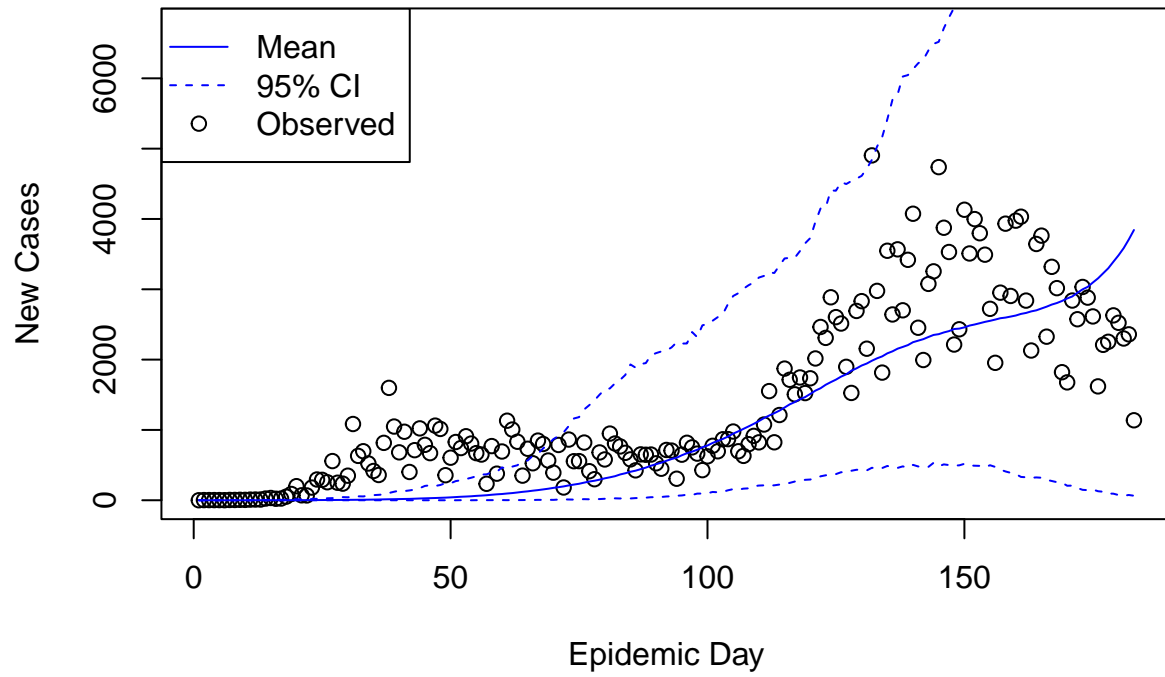
Model 2a (Basic ABC): Posterior Distribution location ALABAMA



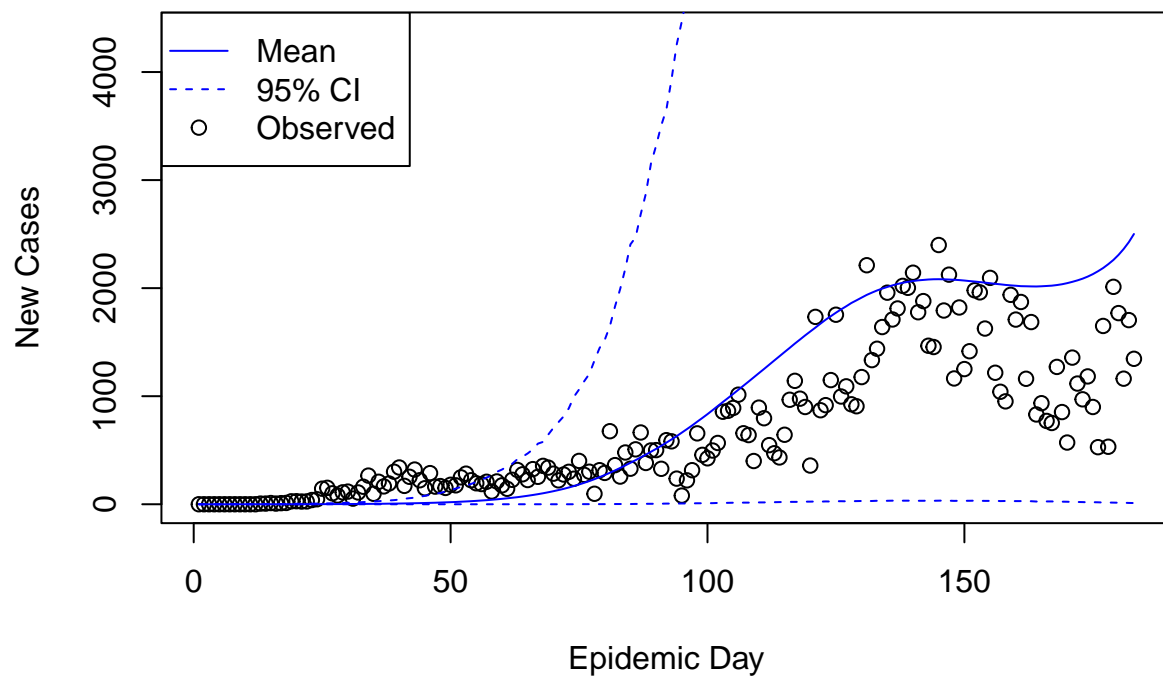
Model 2a (Basic ABC): Posterior Distribution location FLORIDA



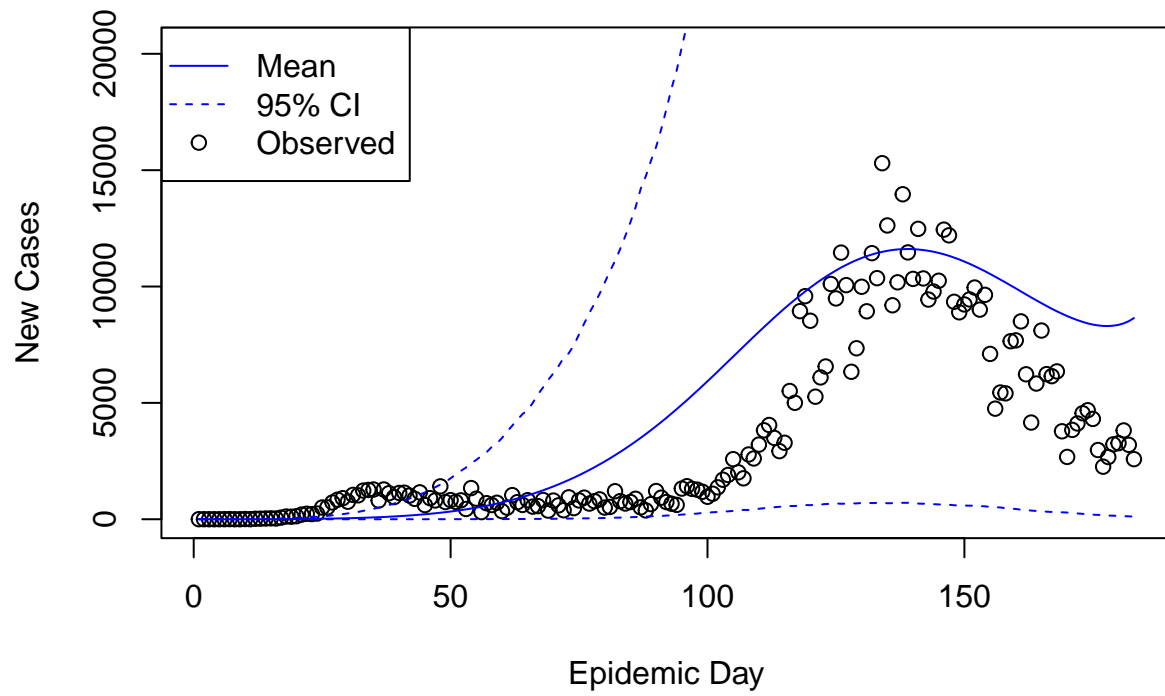
Model 2a (Basic ABC): Posterior Distribution location GEORGIA



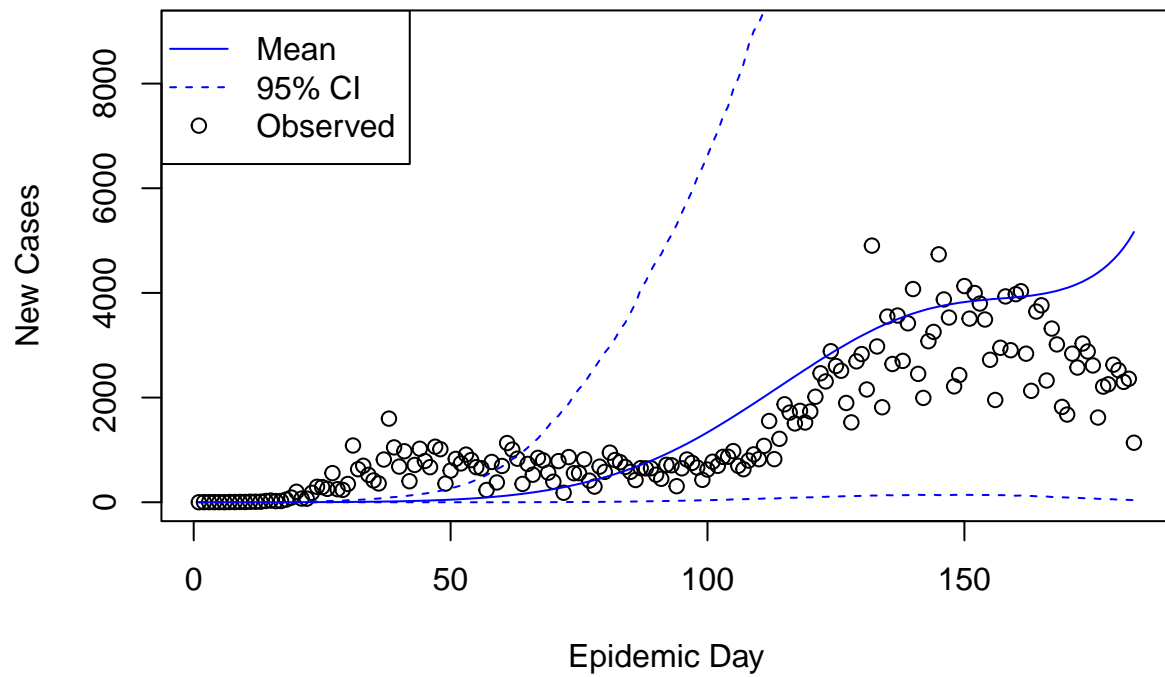
Model 2a (Basic ABC): Posterior Predictive Distribution location ALABAMA



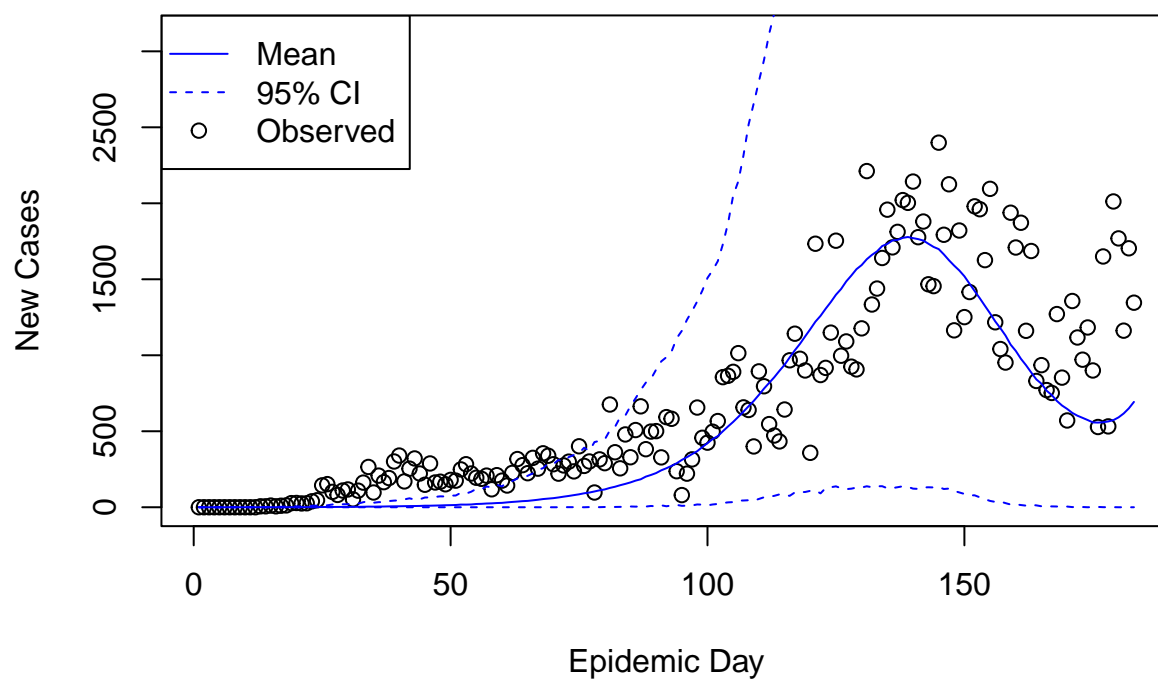
Model 2a (Basic ABC): Posterior Predictive Distribution location FLORIDA



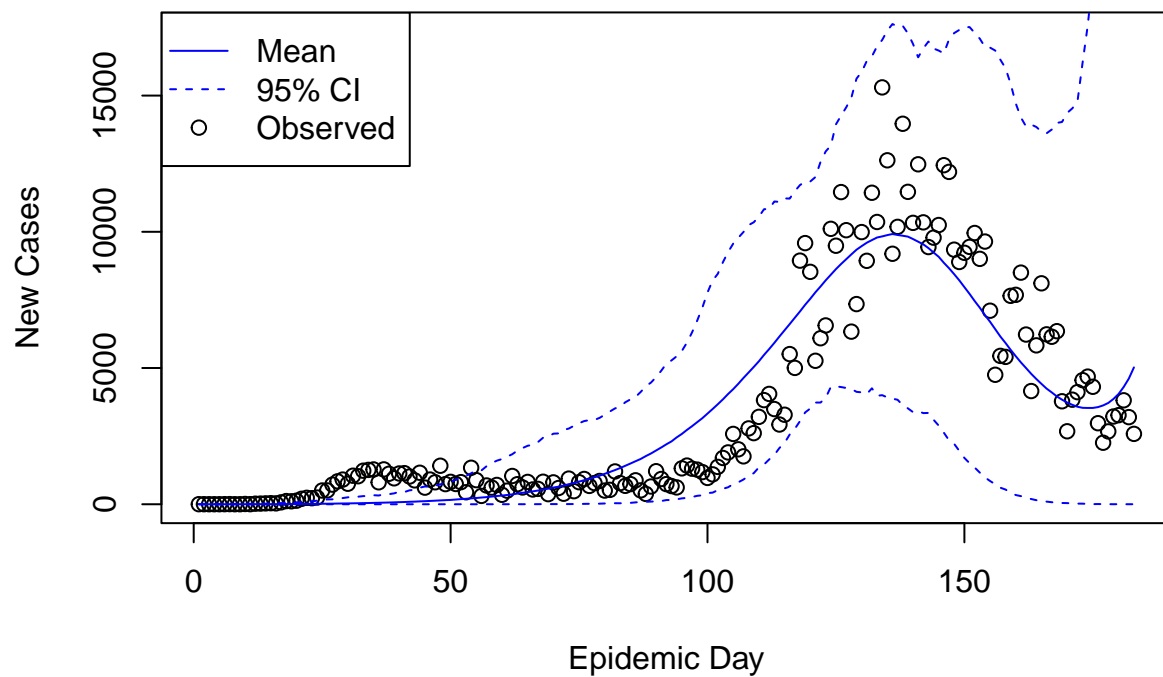
Model 2a (Basic ABC): Posterior Predictive Distribution location GEORGIA



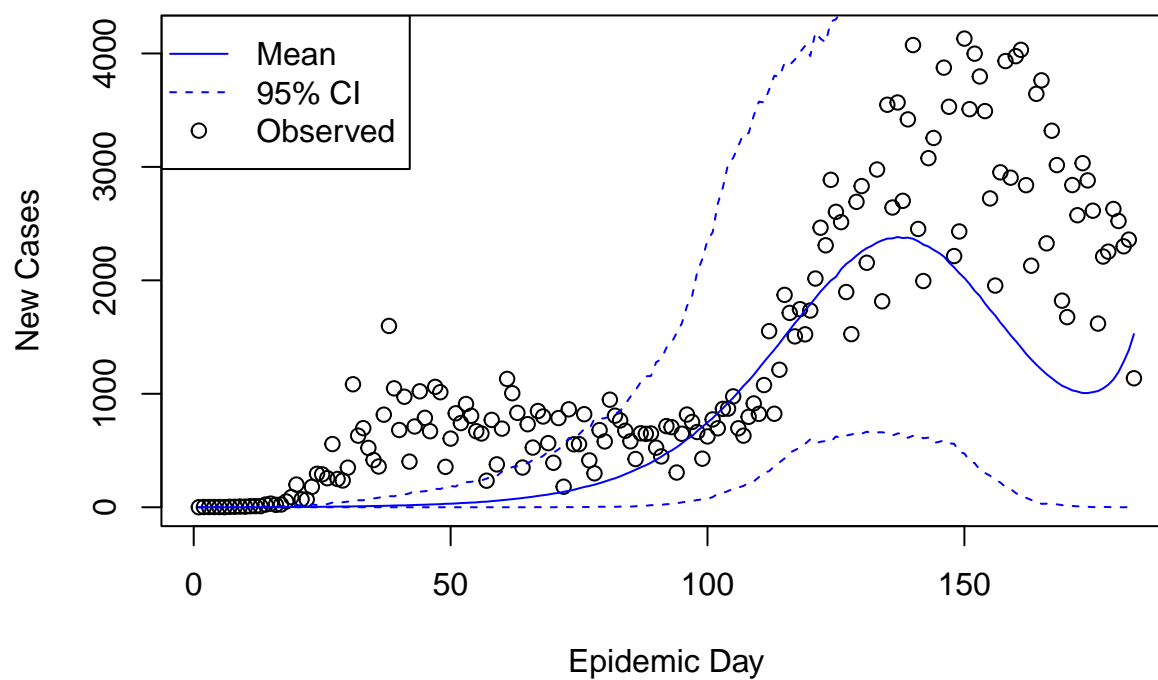
Model 2a (Weibull Distribution): Posterior Distribution location ALABAMA



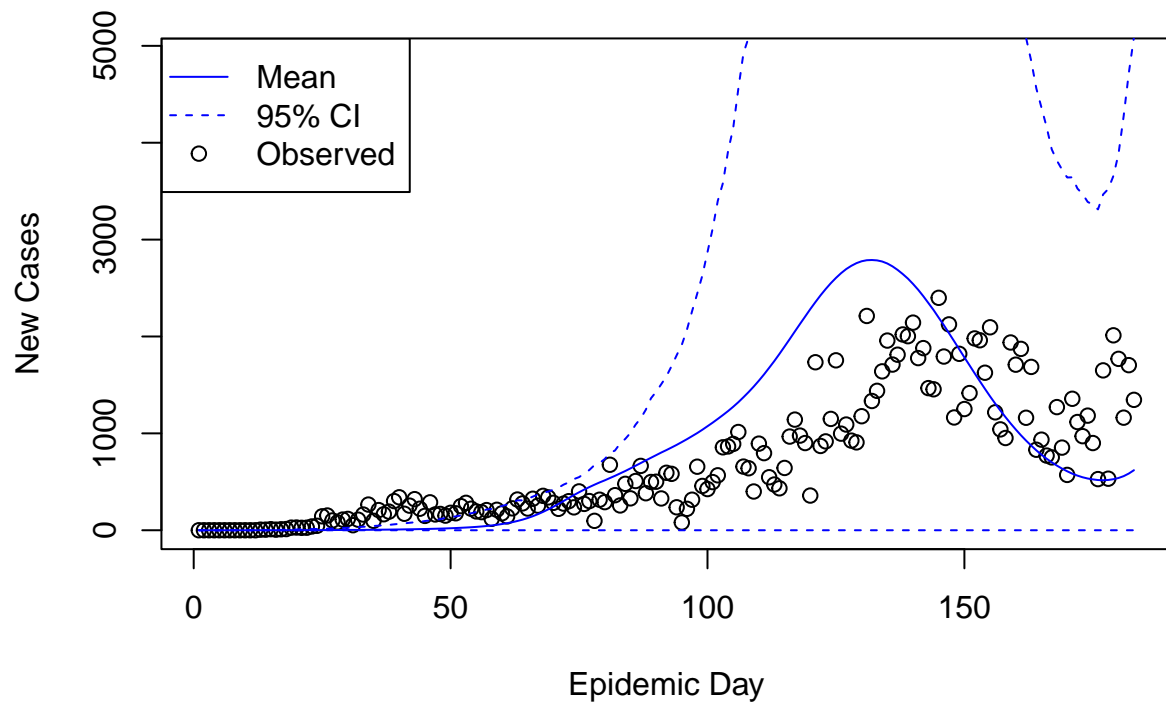
Model 2a (Weibull Distribution): Posterior Distribution location FLORIDA



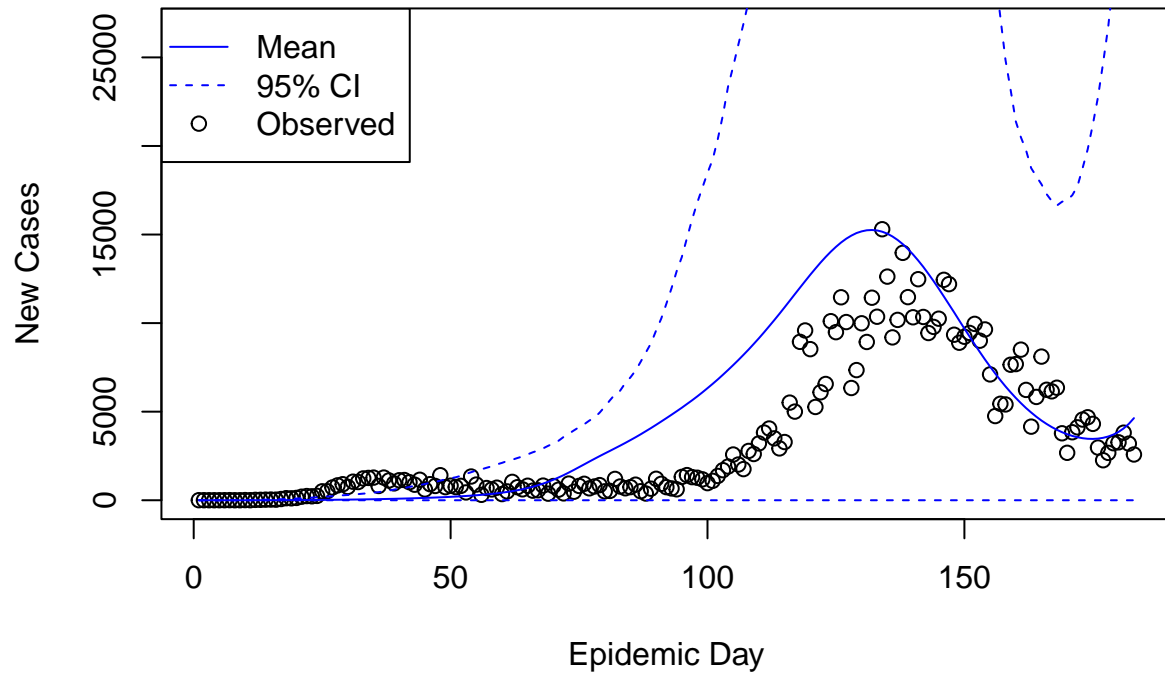
Model 2a (Weibull Distribution): Posterior Distribution location GEORGIA



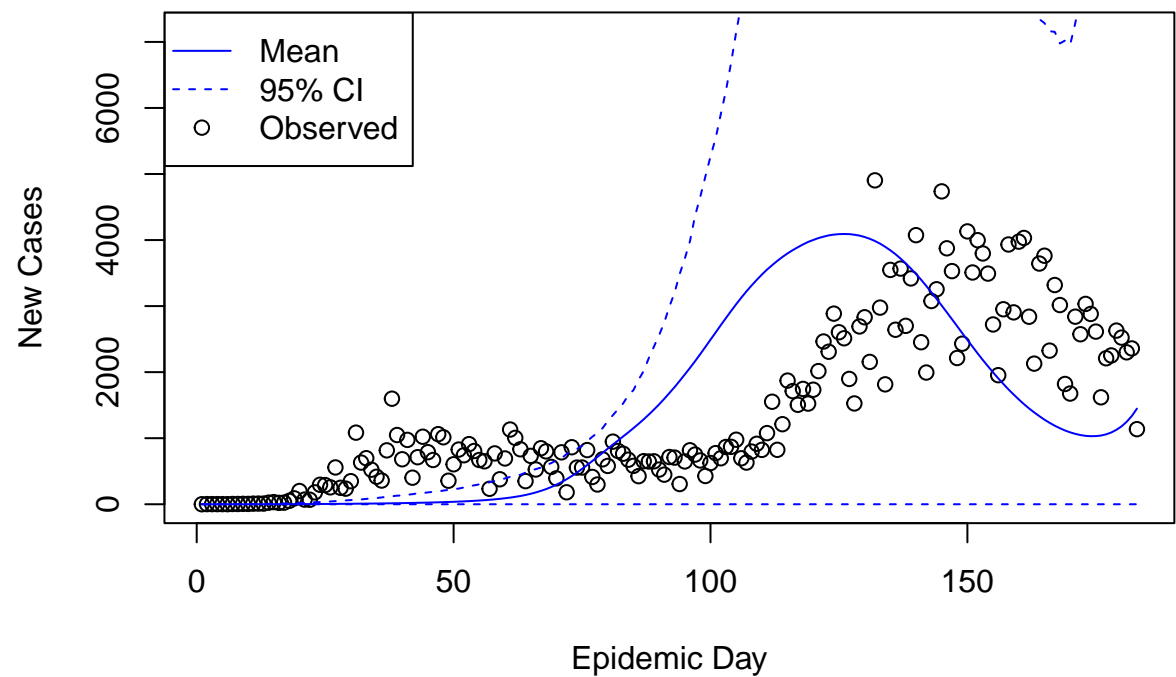
Model 2a (Weibull Distribution): Posterior Predictive Distribution location ALABAMA



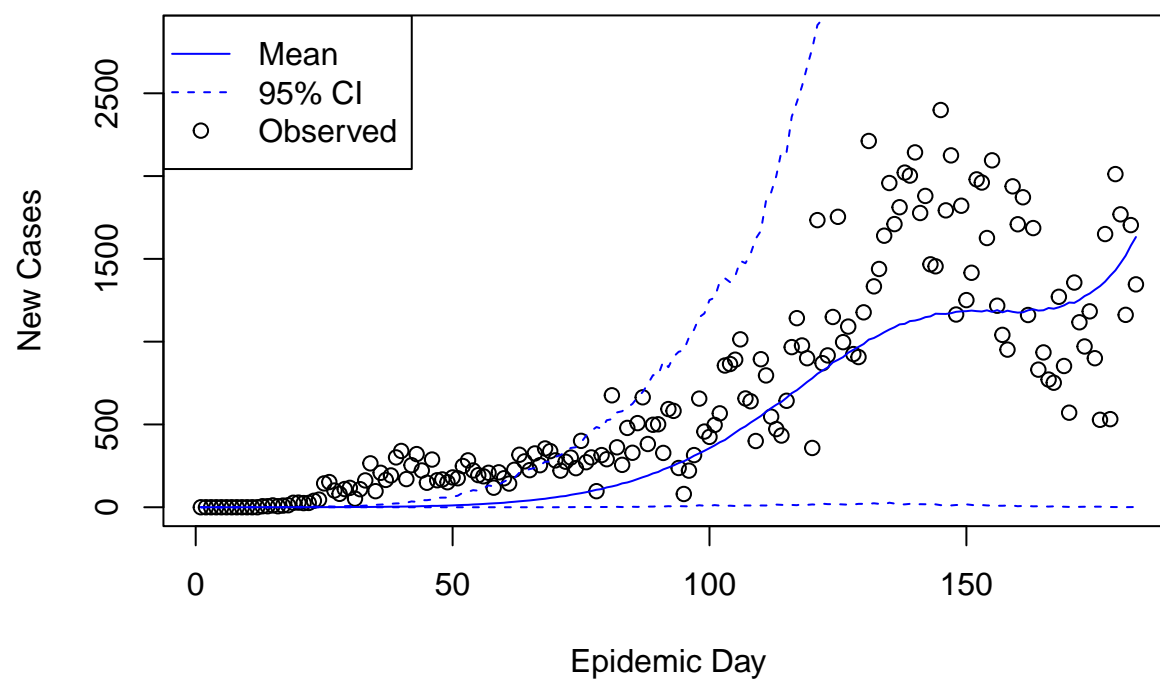
Model 2a (Weibull Distribution): Posterior Predictive Distribution location FLORIDA



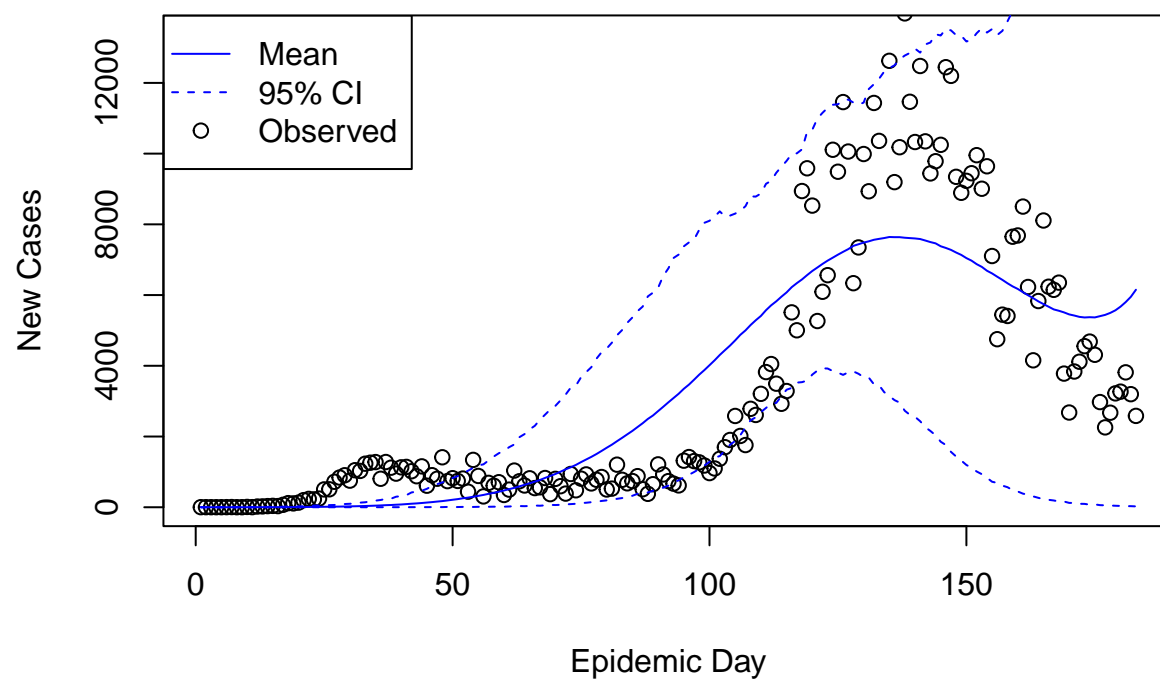
**Model 2a (Weibull Distribution): Posterior Predictive Distribution
location GEORGIA**



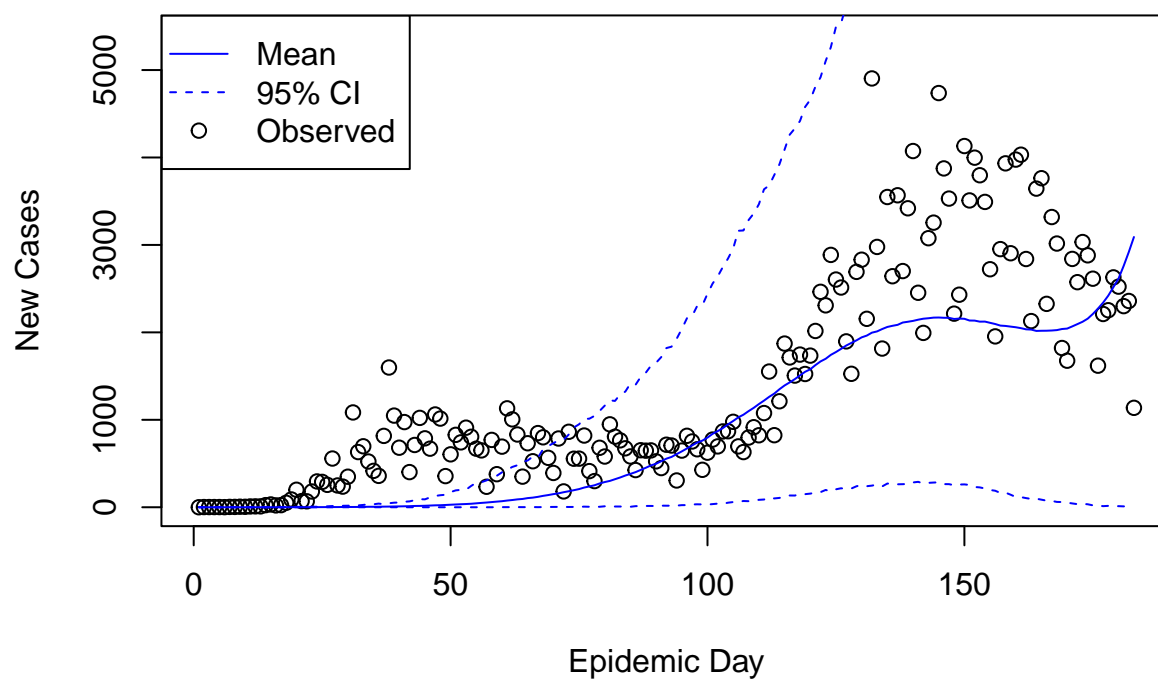
Model 2a (Basic ABC, Weibull): Posterior Distribution location ALABAMA



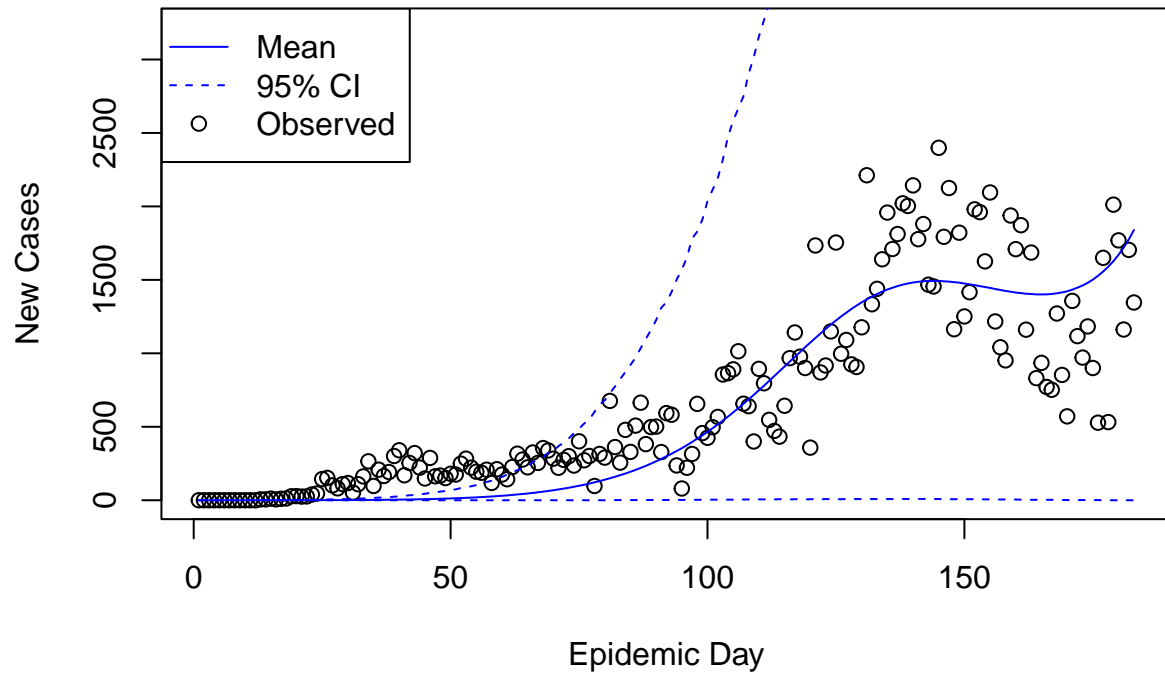
Model 2a (Basic ABC, Weibull): Posterior Distribution location FLORIDA



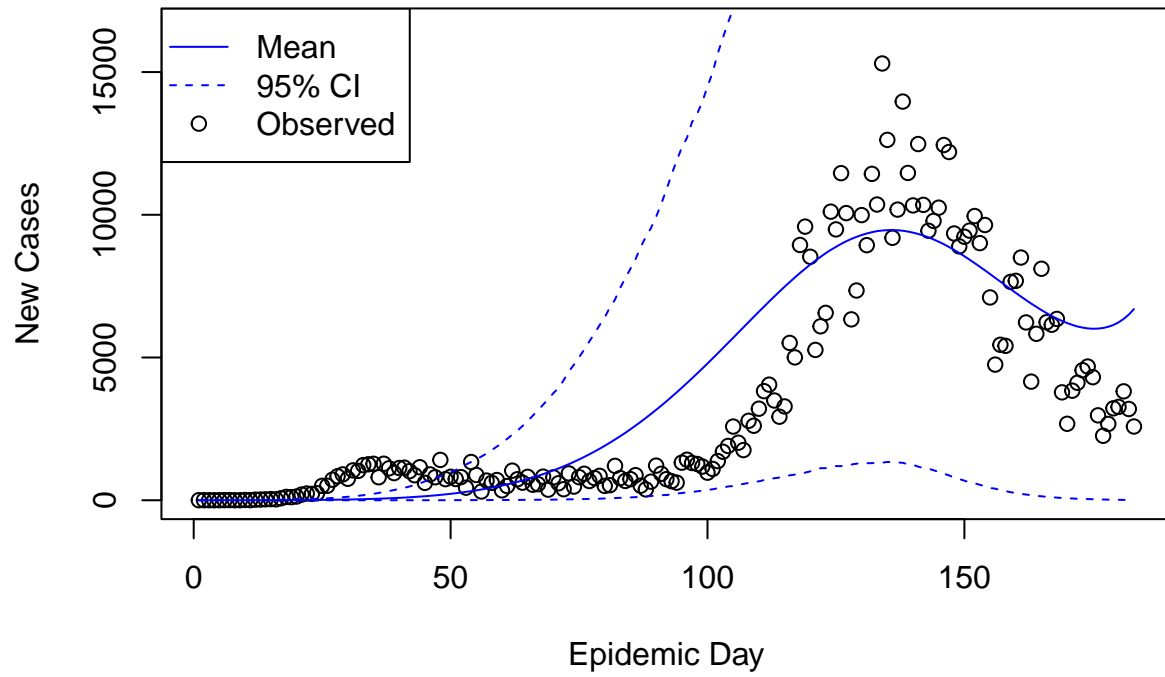
Model 2a (Basic ABC, Weibull): Posterior Distribution location GEORGIA



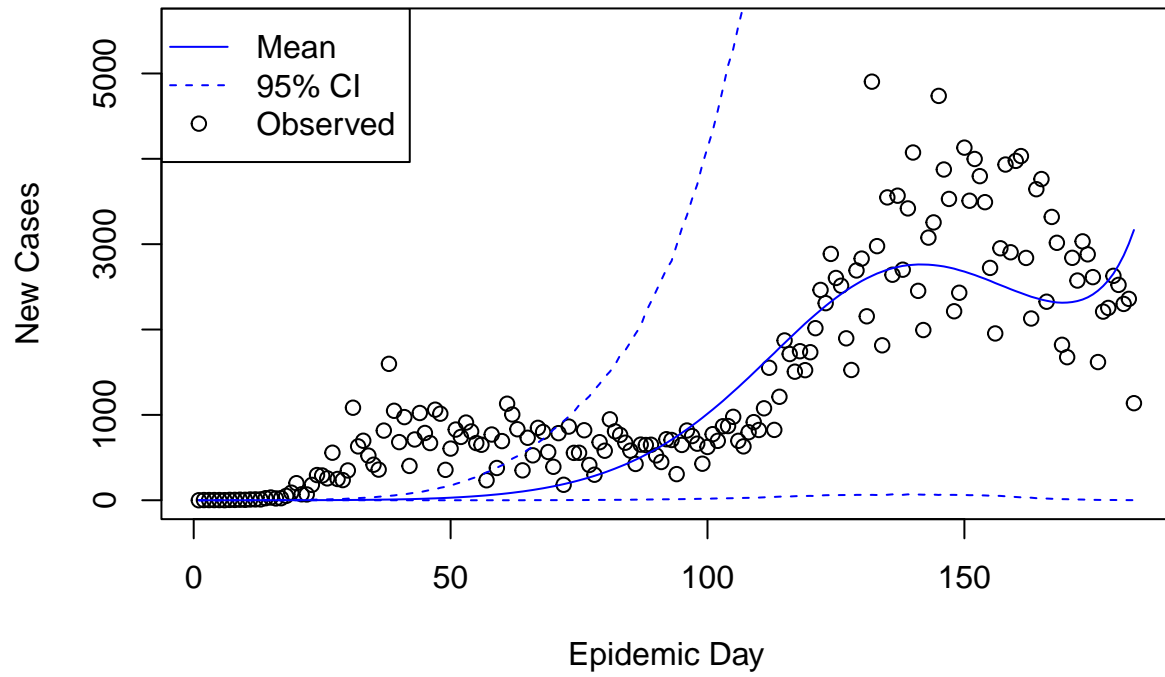
Model 2a (Basic ABC, Weibull): Posterior Predictive Distribution location ALABAMA



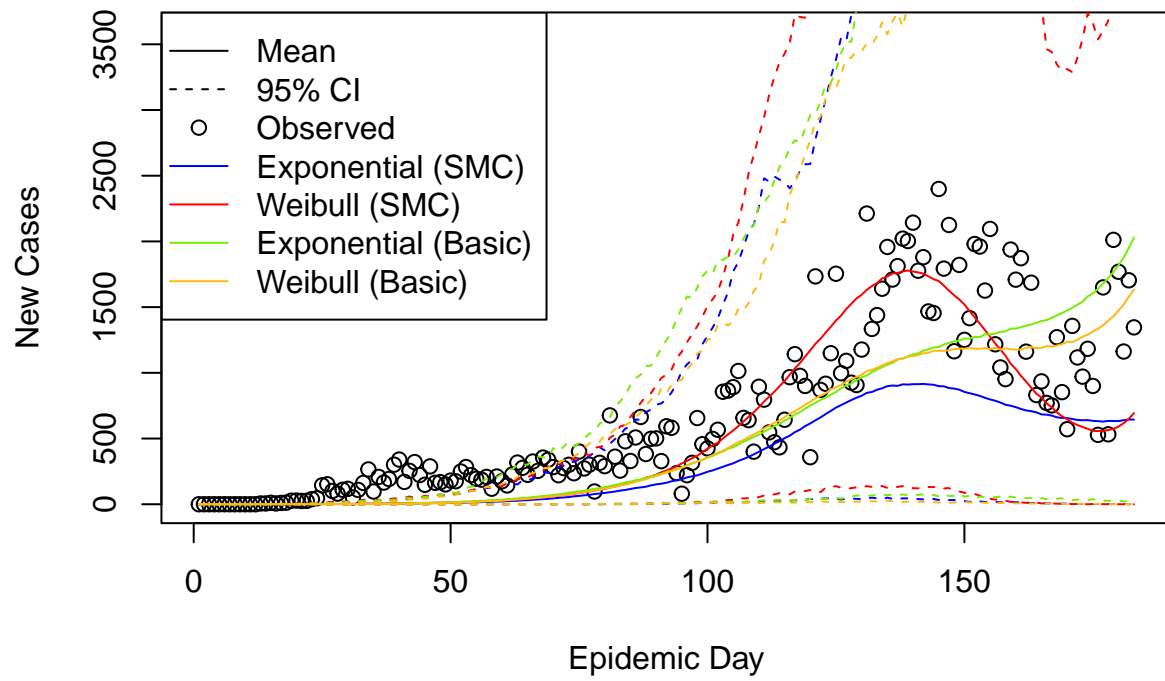
Model 2a (Basic ABC, Weibull): Posterior Predictive Distribution location FLORIDA



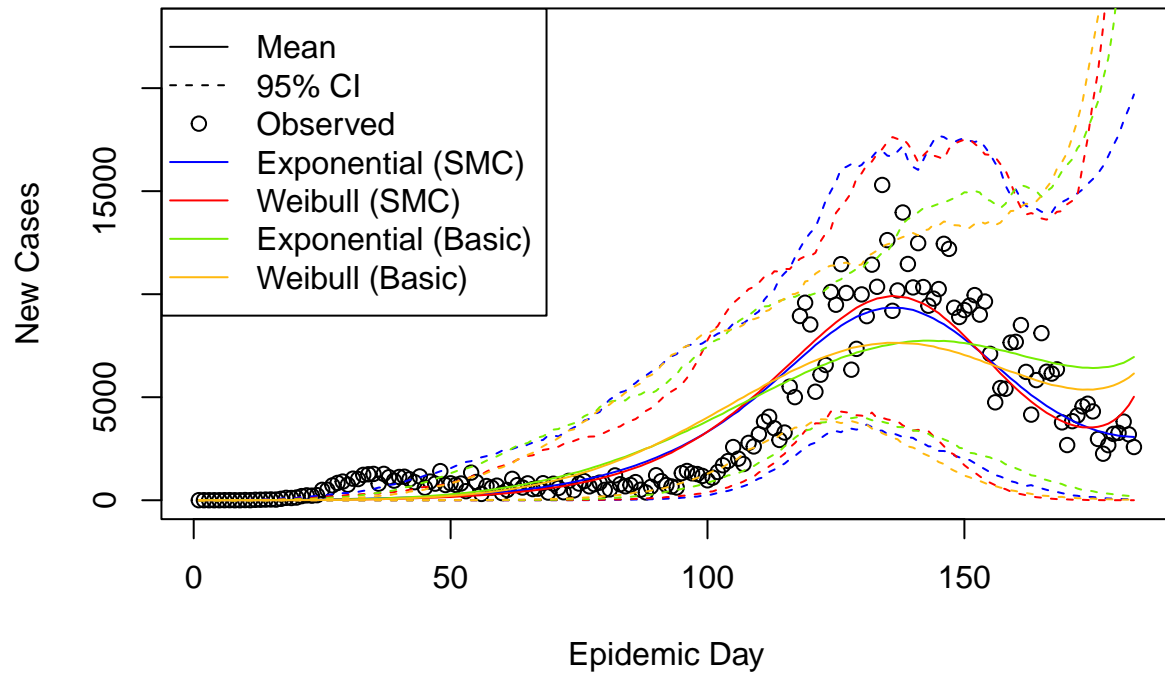
Model 2a (Basic ABC, Weibull): Posterior Predictive Distribution location GEORGIA



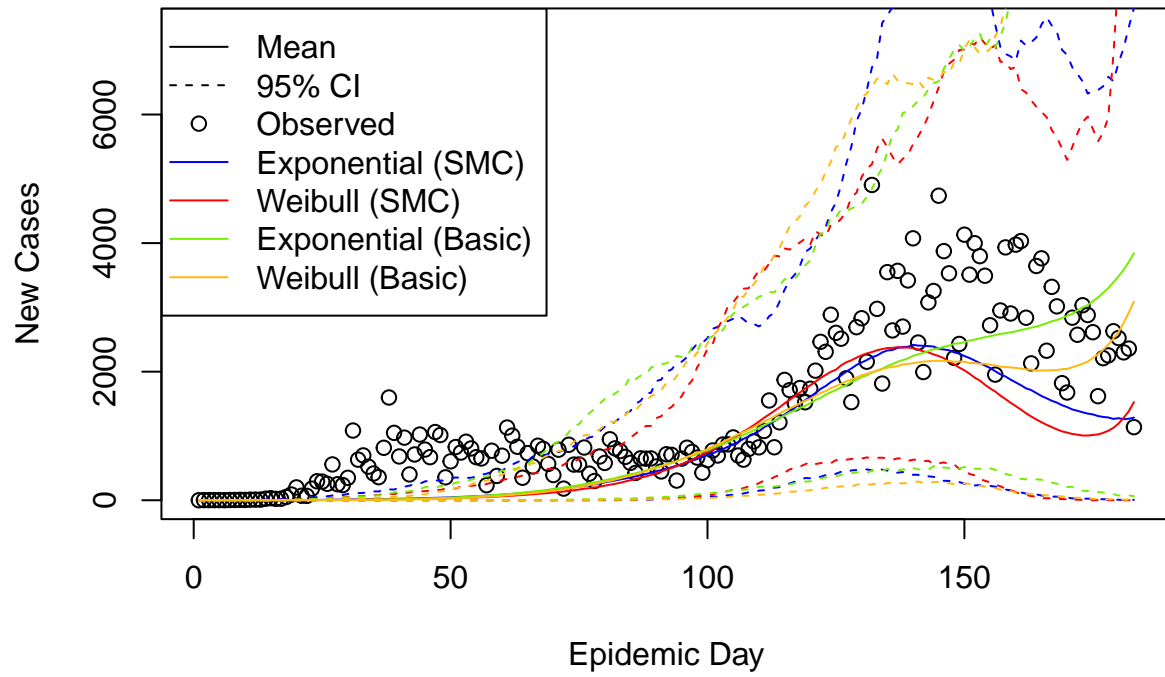
Model 2a: Posterior Distribution location ALABAMA



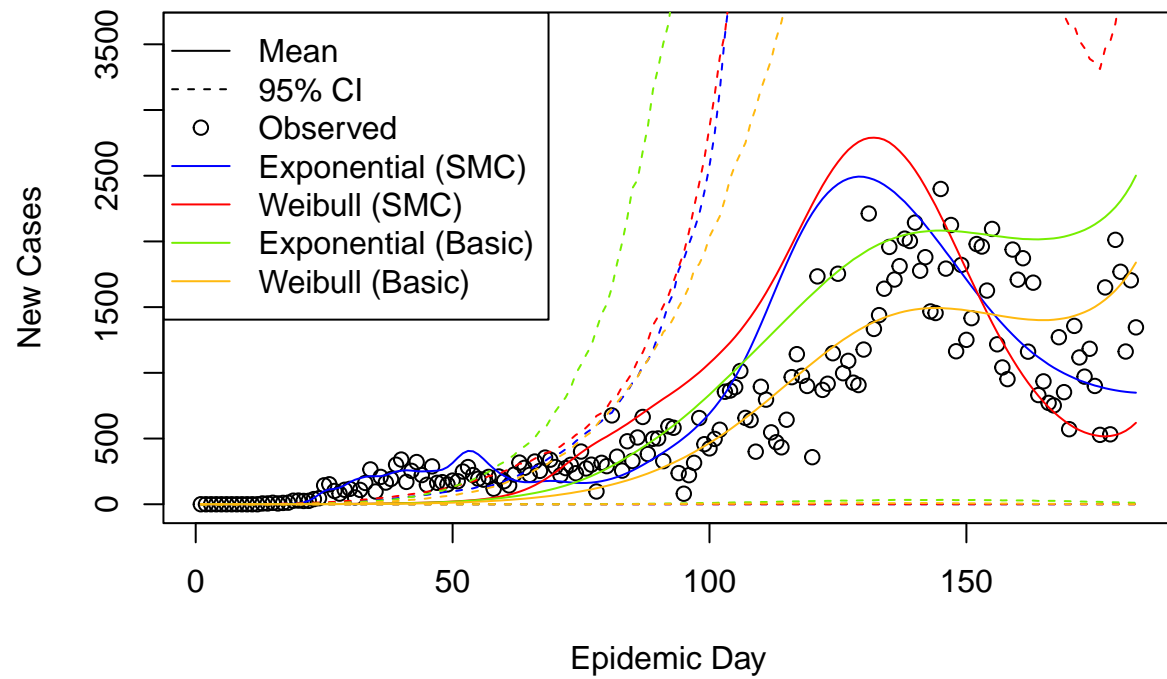
Model 2a: Posterior Distribution location FLORIDA



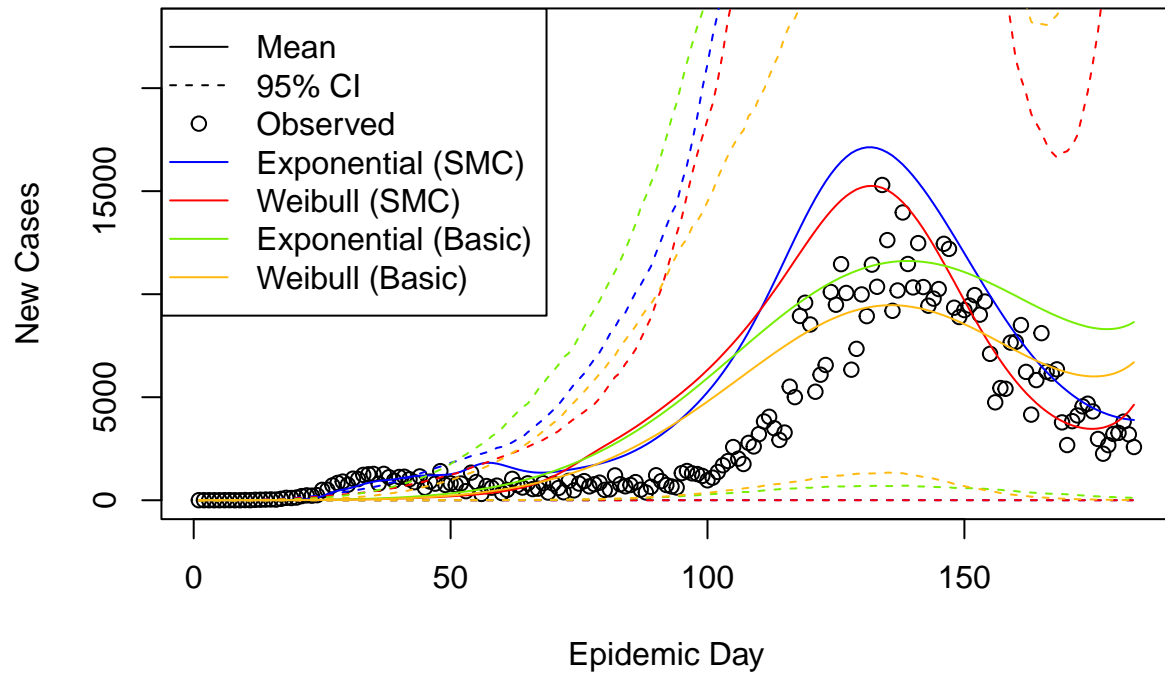
Model 2a: Posterior Distribution location GEORGIA



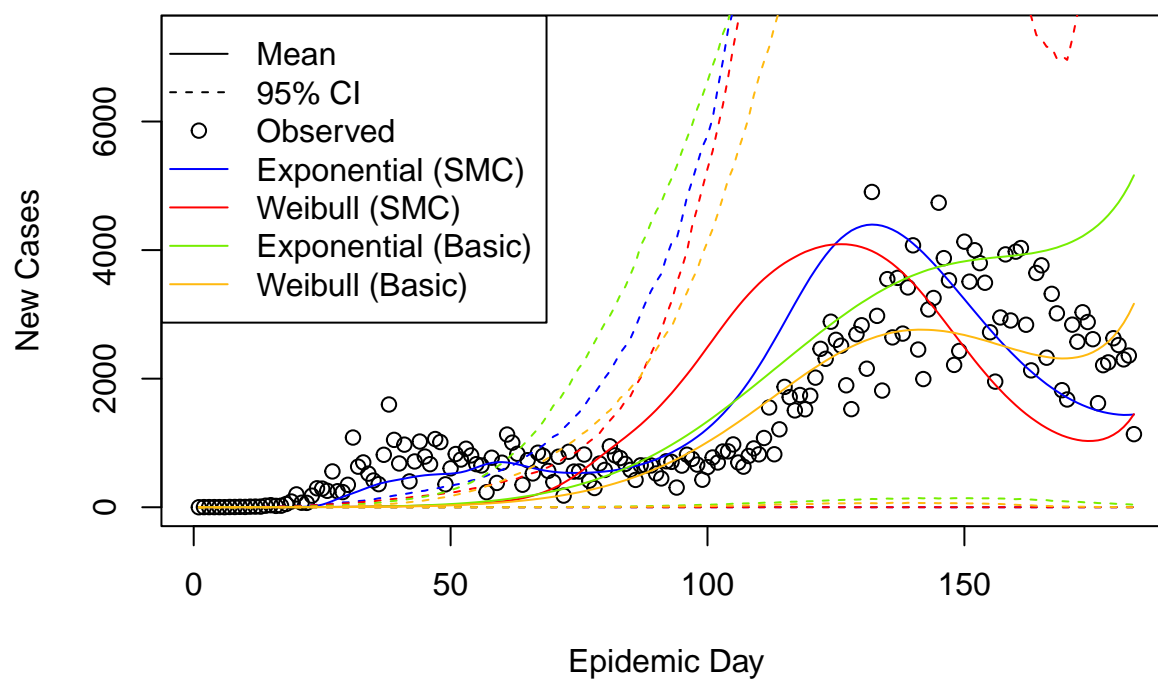
Model 2a: Posterior Predictive Distribution location ALABAMA



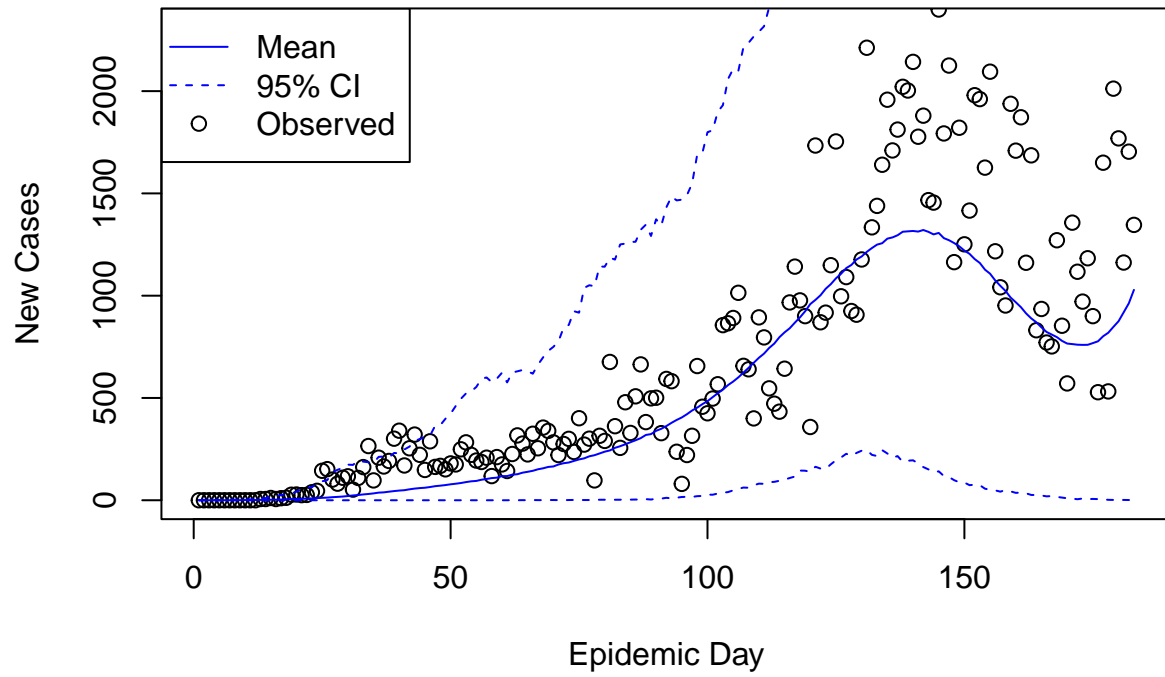
Model 2a: Posterior Predictive Distribution location FLORIDA



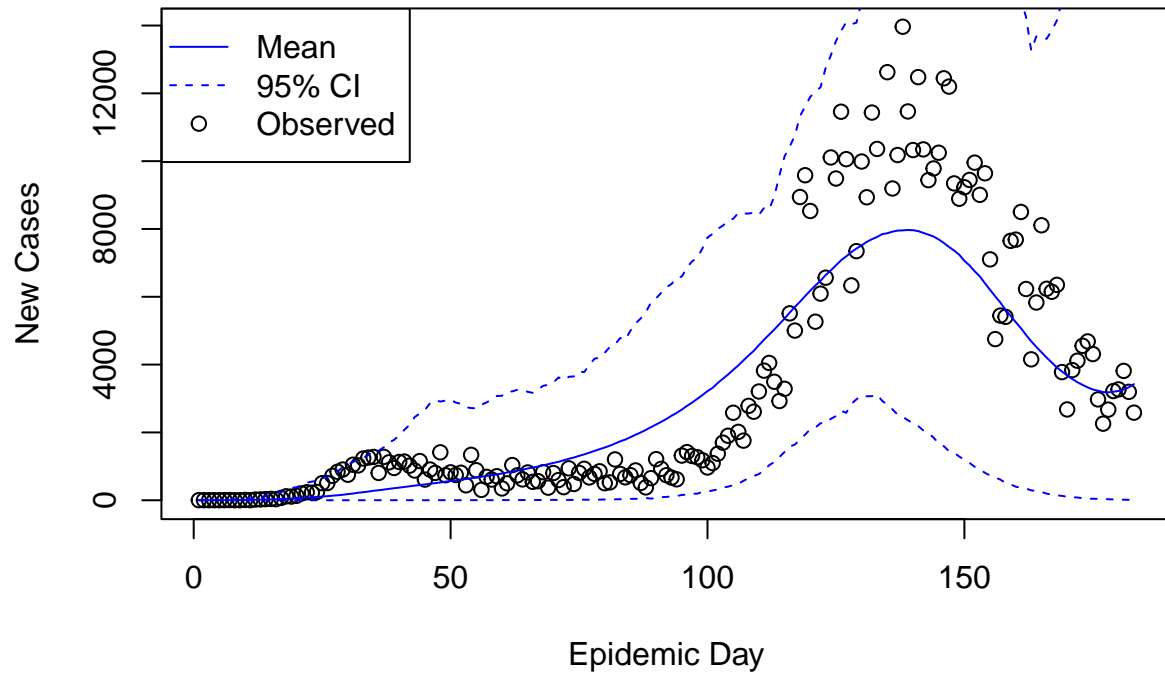
Model 2a: Posterior Predictive Distribution location GEORGIA



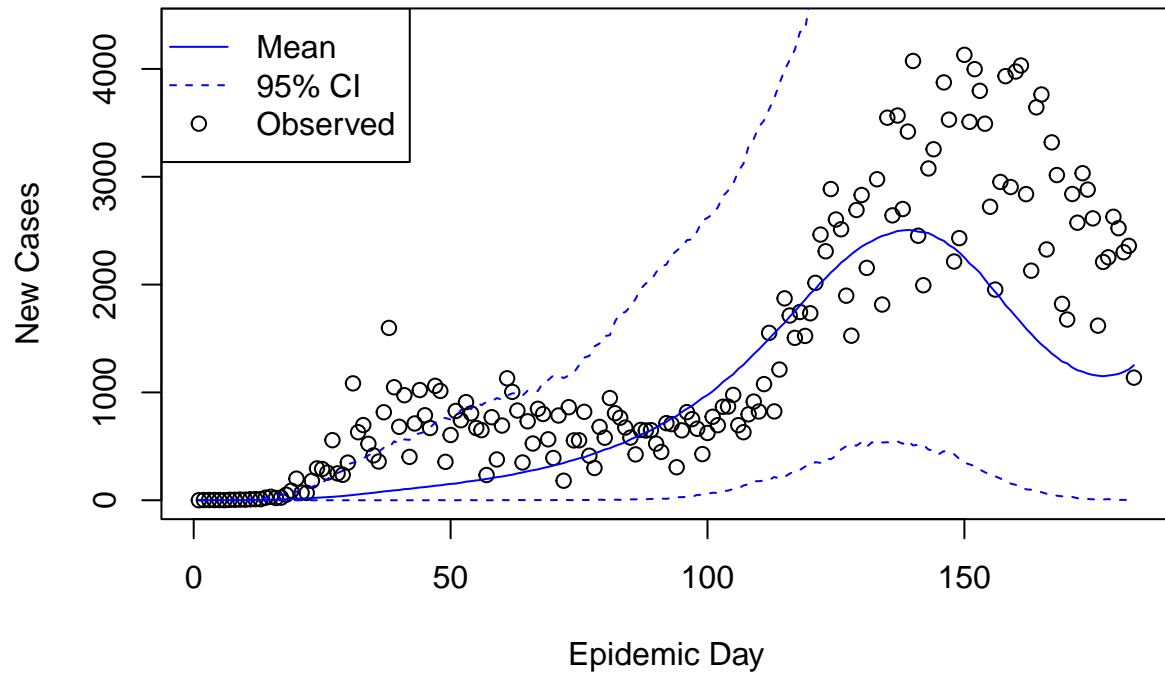
Model 2b: Posterior Distribution location ALABAMA



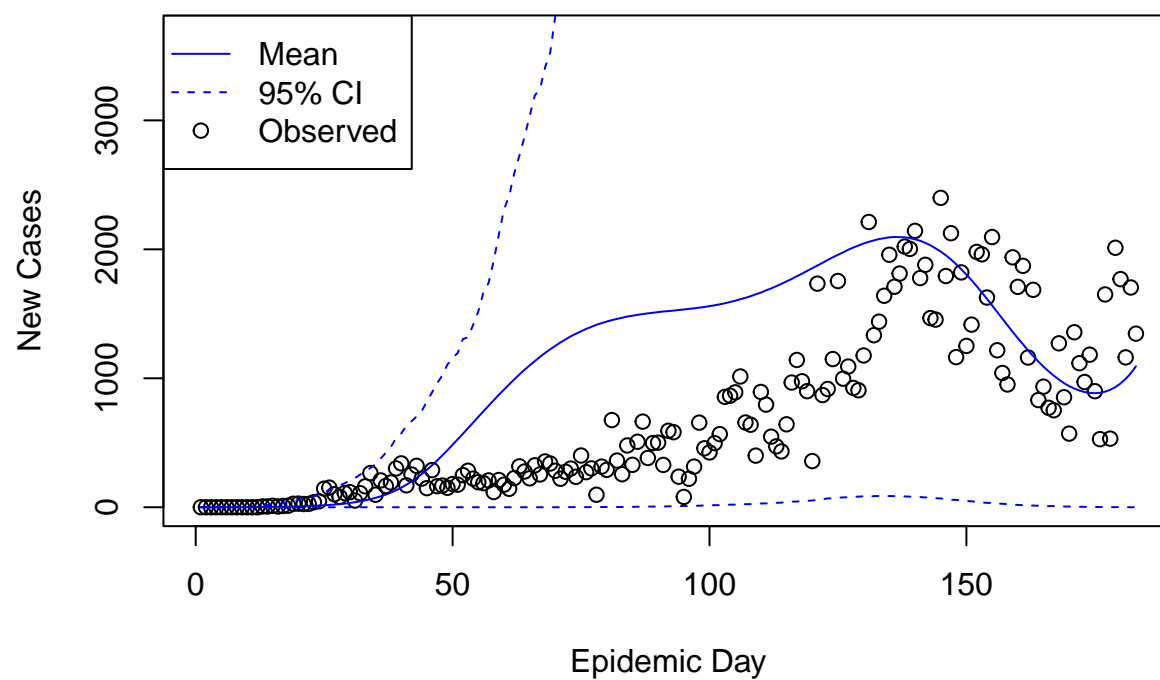
Model 2b: Posterior Distribution location FLORIDA



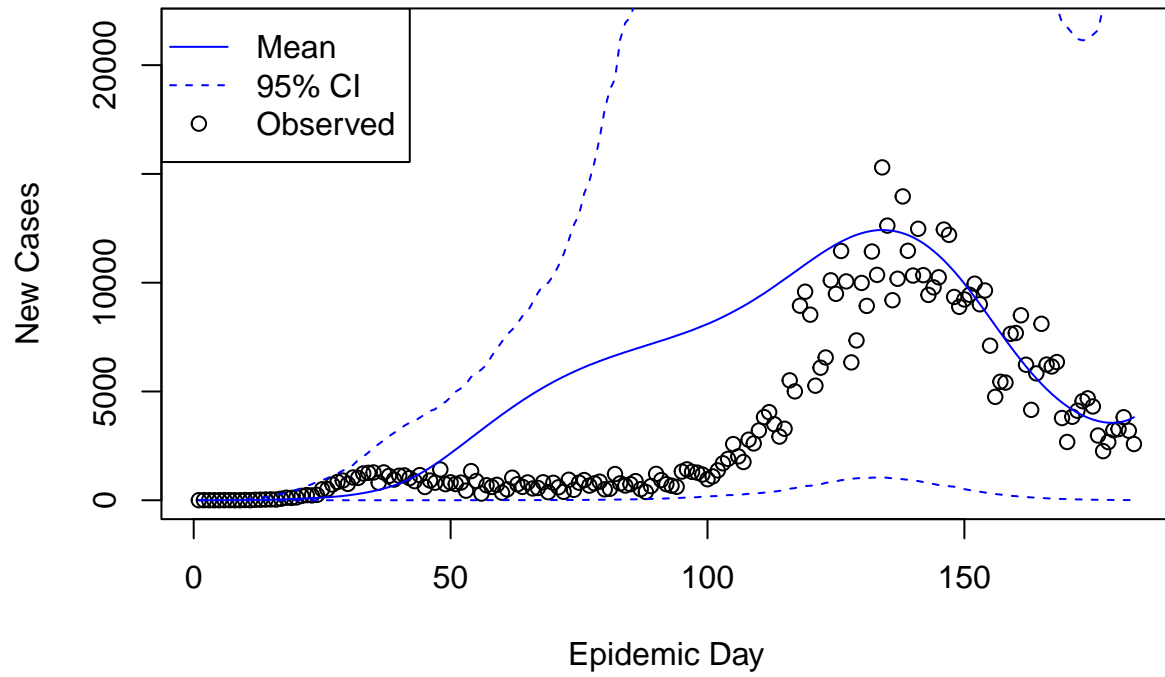
Model 2b: Posterior Distribution location GEORGIA



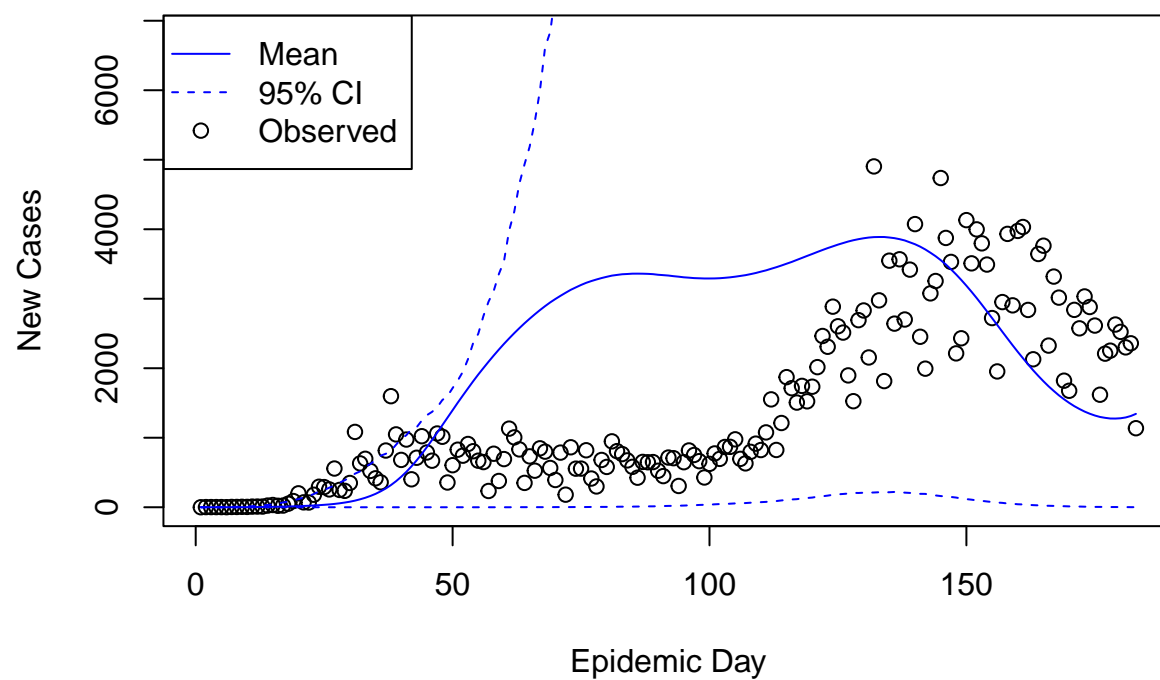
Model 2b: Posterior Predictive Distribution location ALABAMA



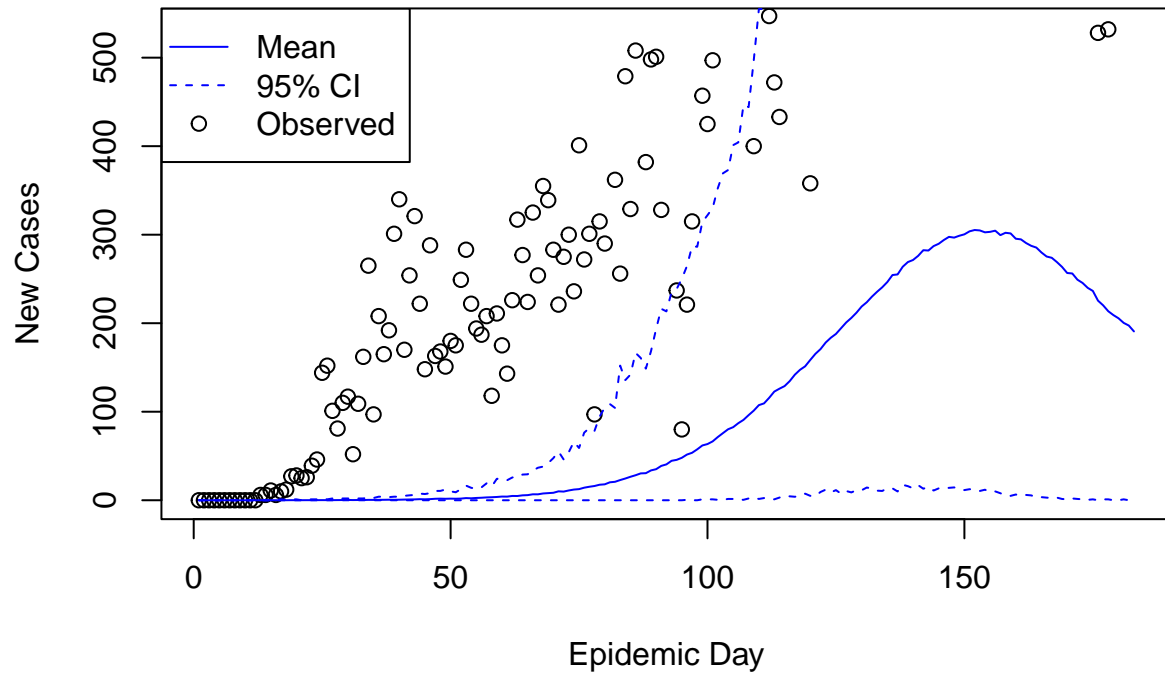
Model 2b: Posterior Predictive Distribution location FLORIDA



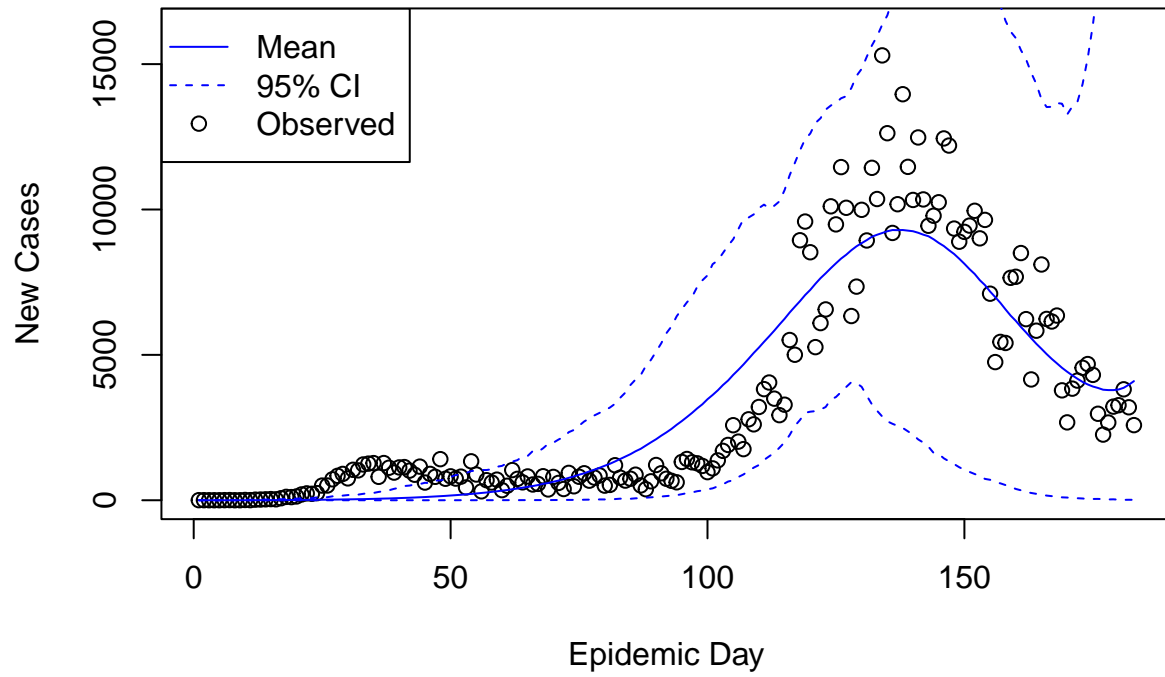
Model 2b: Posterior Predictive Distribution location GEORGIA



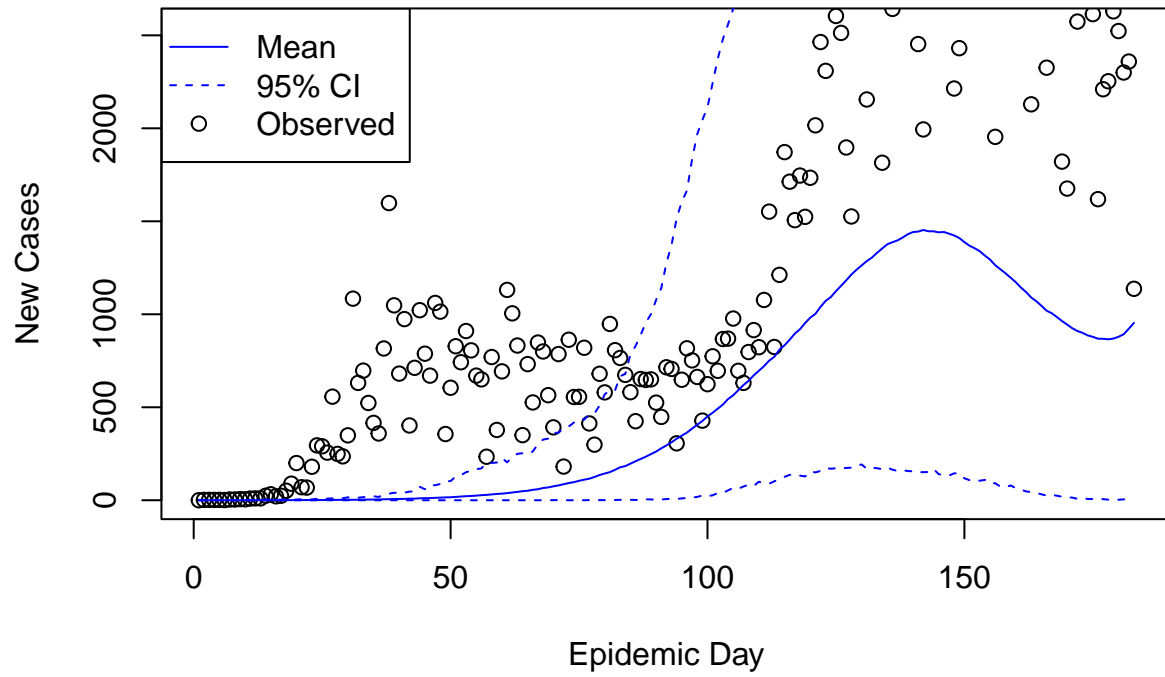
Model 2c: Posterior Distribution location ALABAMA



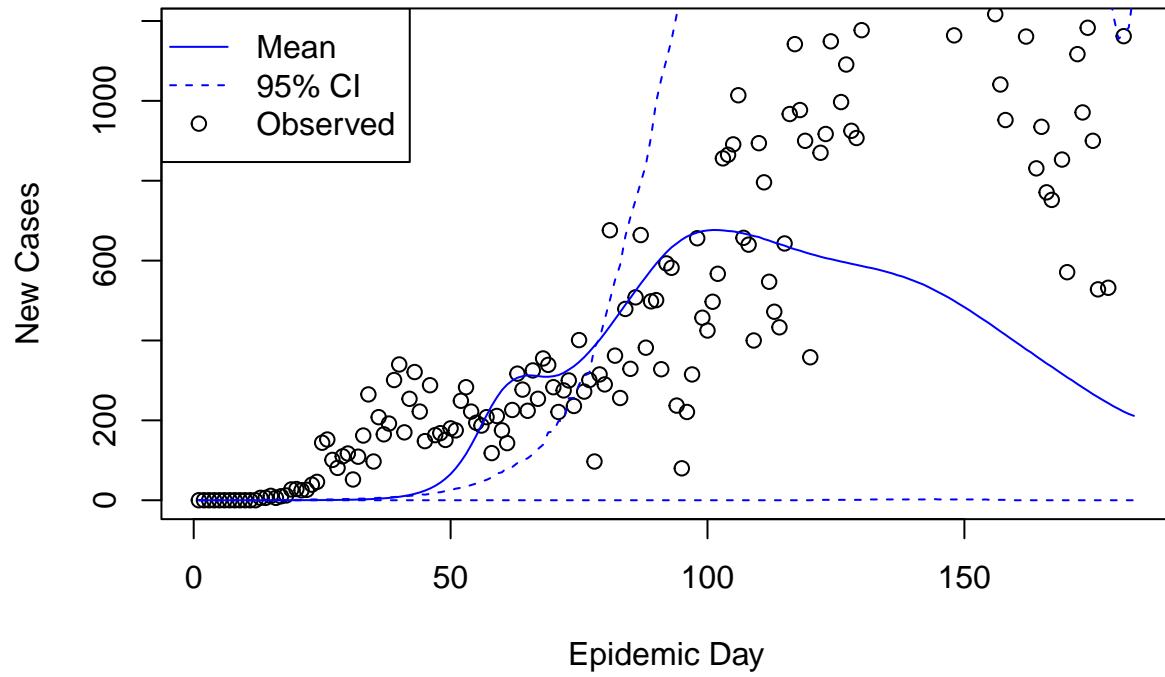
Model 2c: Posterior Distribution location FLORIDA



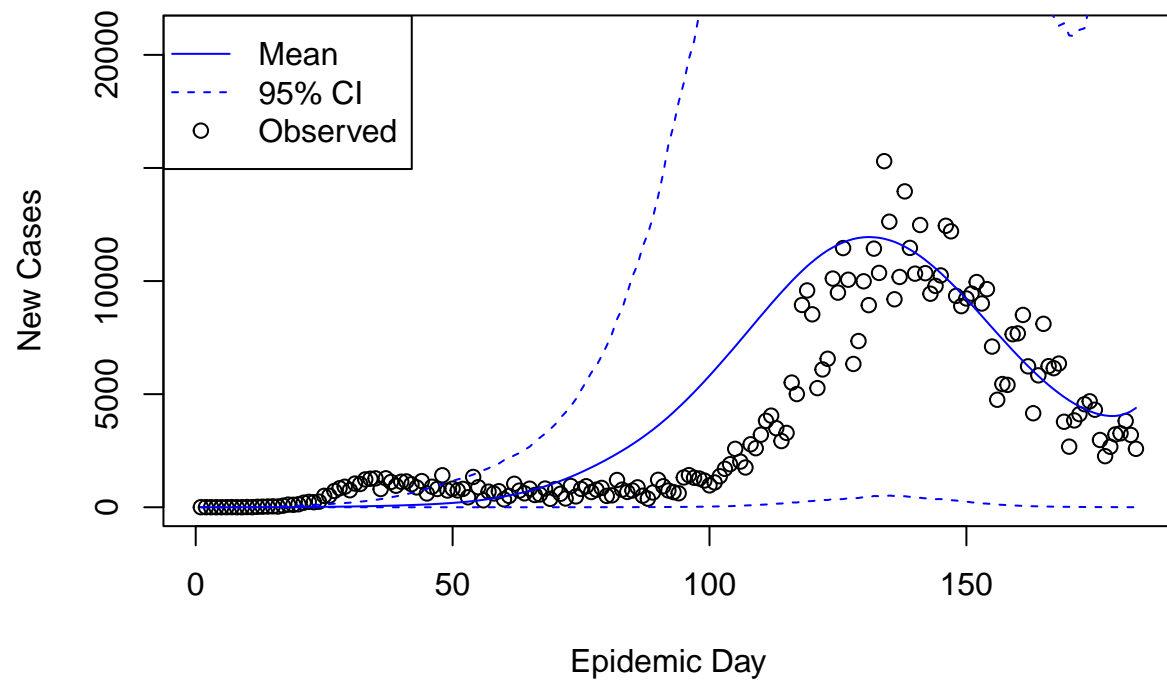
Model 2c: Posterior Distribution location GEORGIA



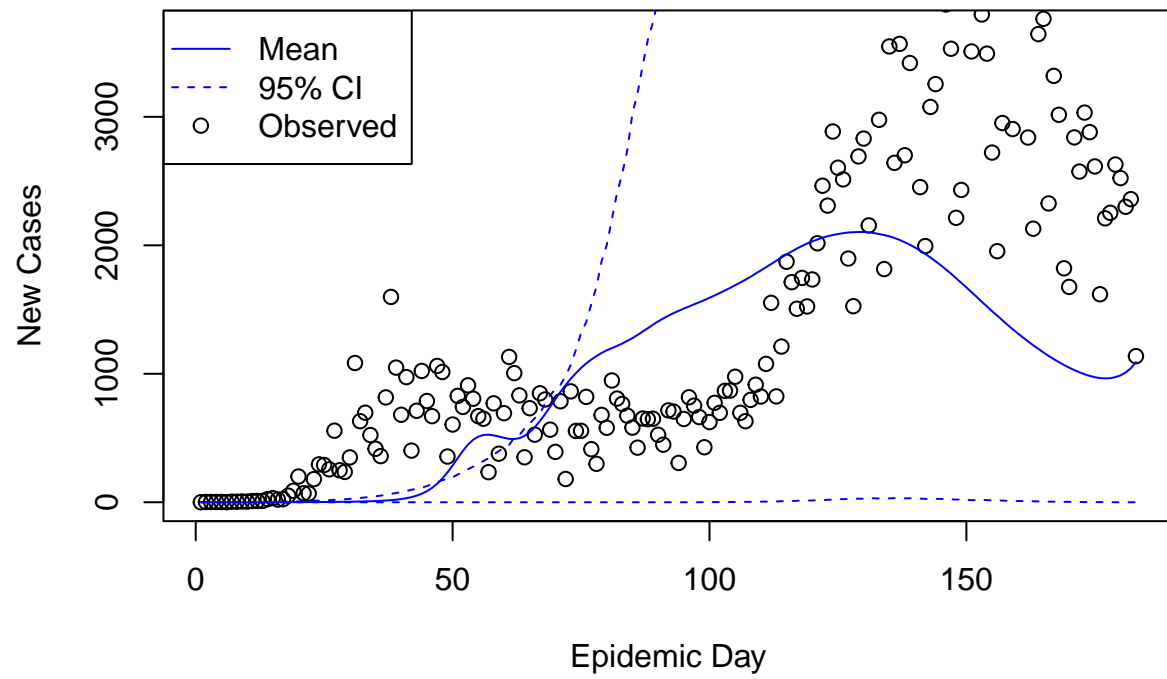
Model 2c: Posterior Predictive Distribution location ALABAMA



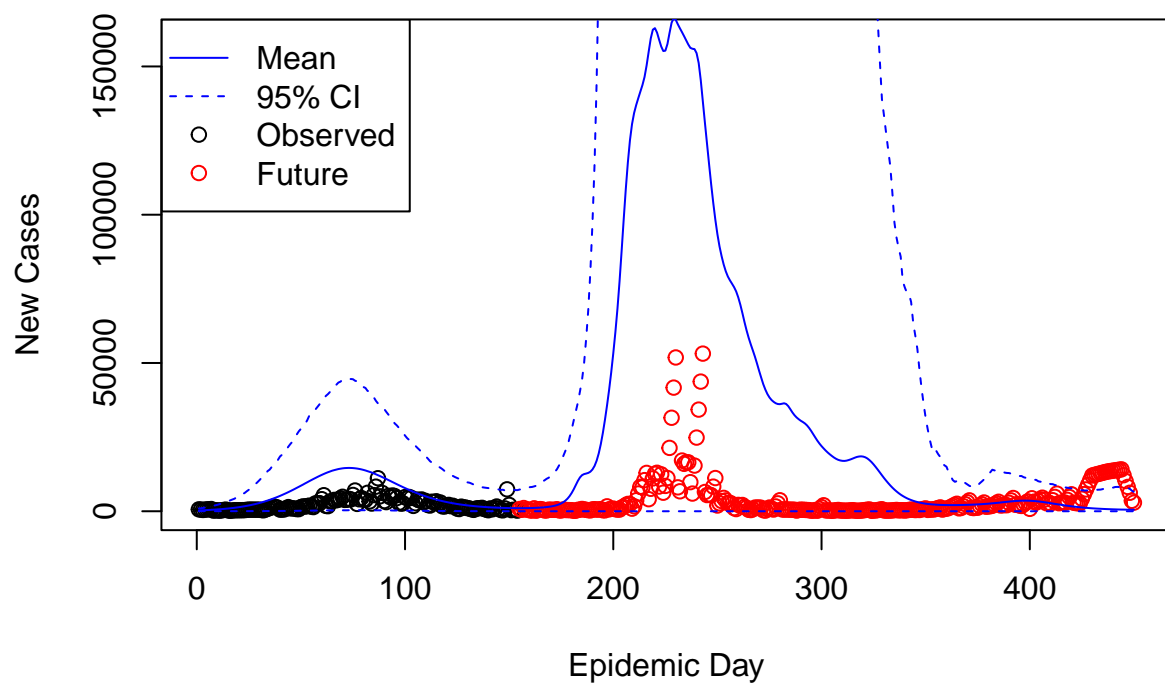
Model 2c: Posterior Predictive Distribution location FLORIDA



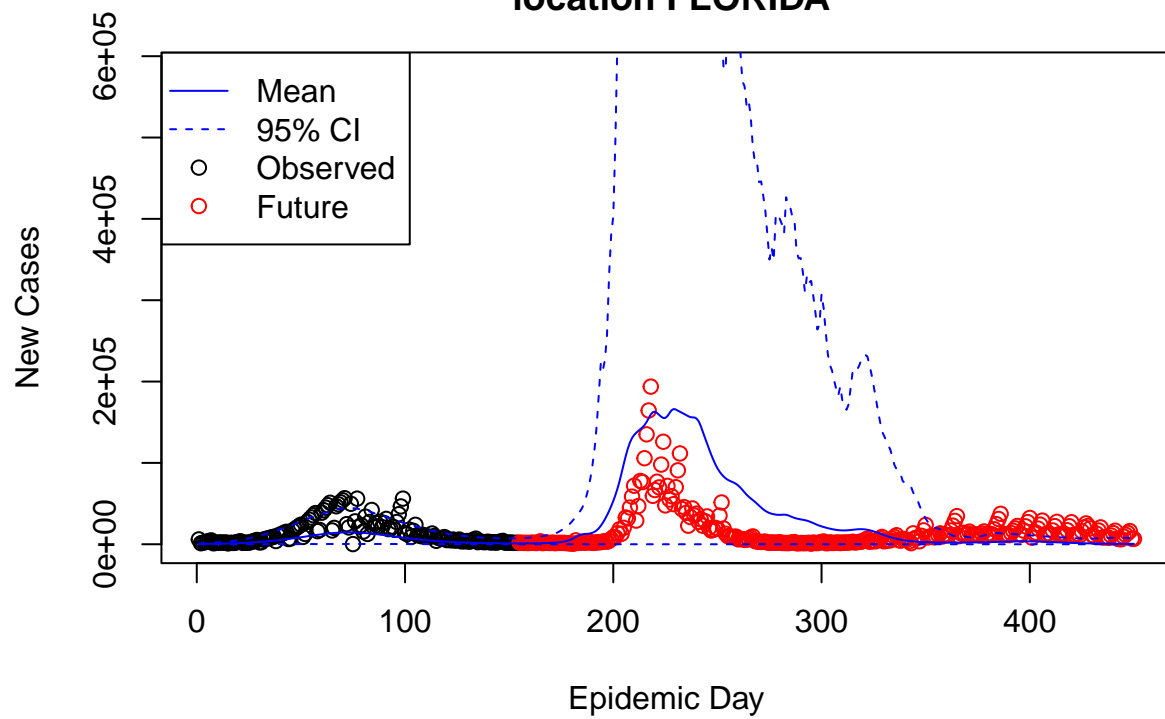
Model 2c: Posterior Predictive Distribution location GEORGIA



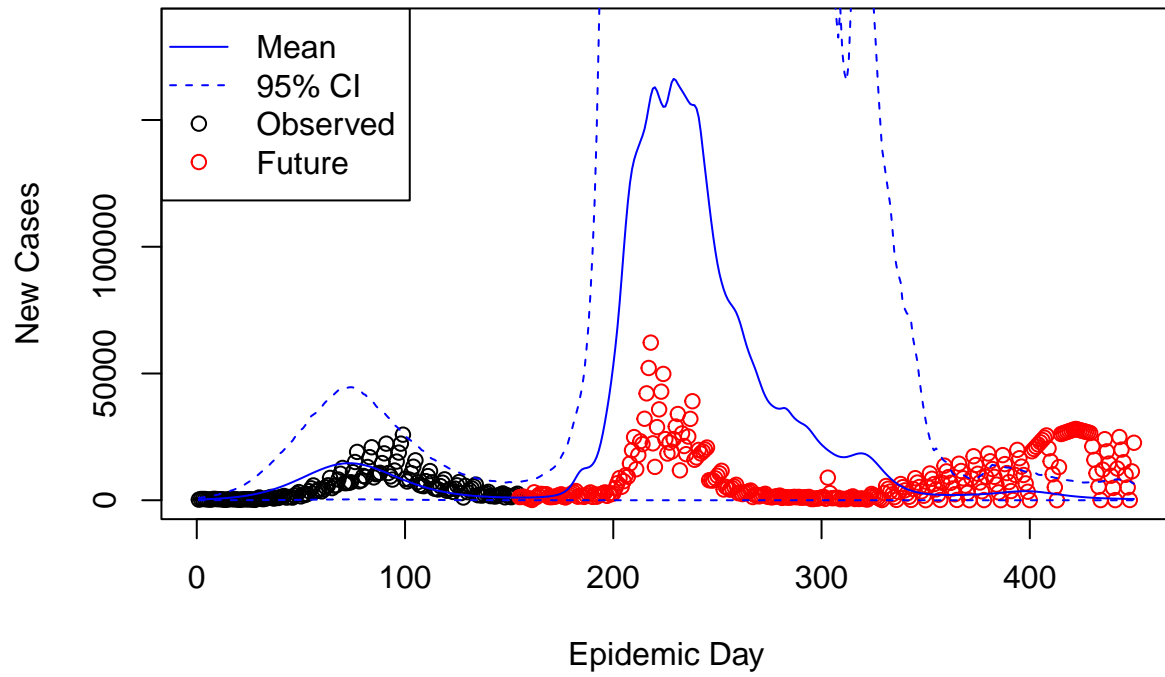
Model 3: Posterior Distribution location ALABAMA



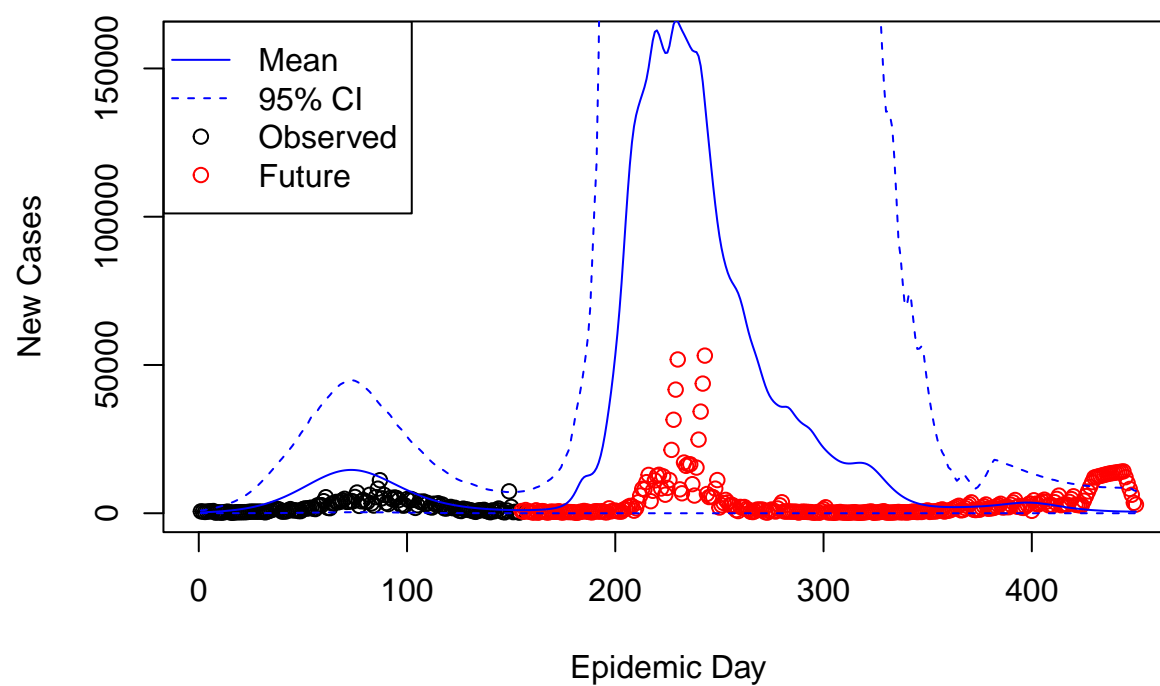
Model 3: Posterior Distribution location FLORIDA



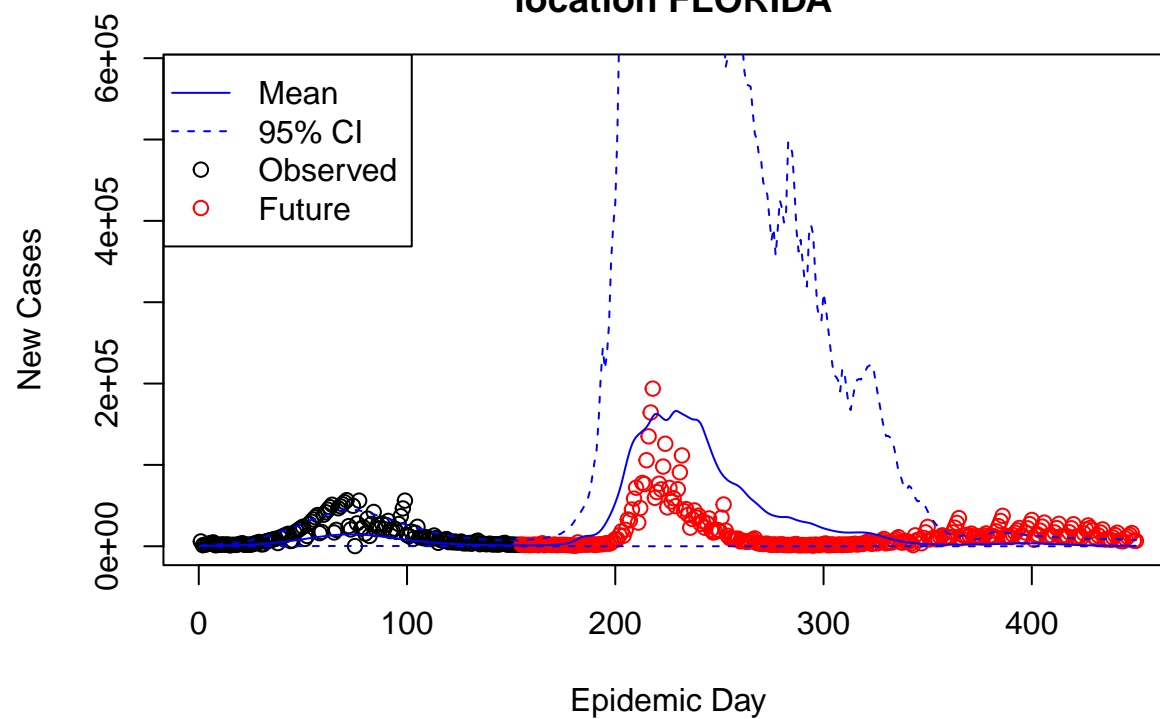
Model 3: Posterior Distribution location GEORGIA



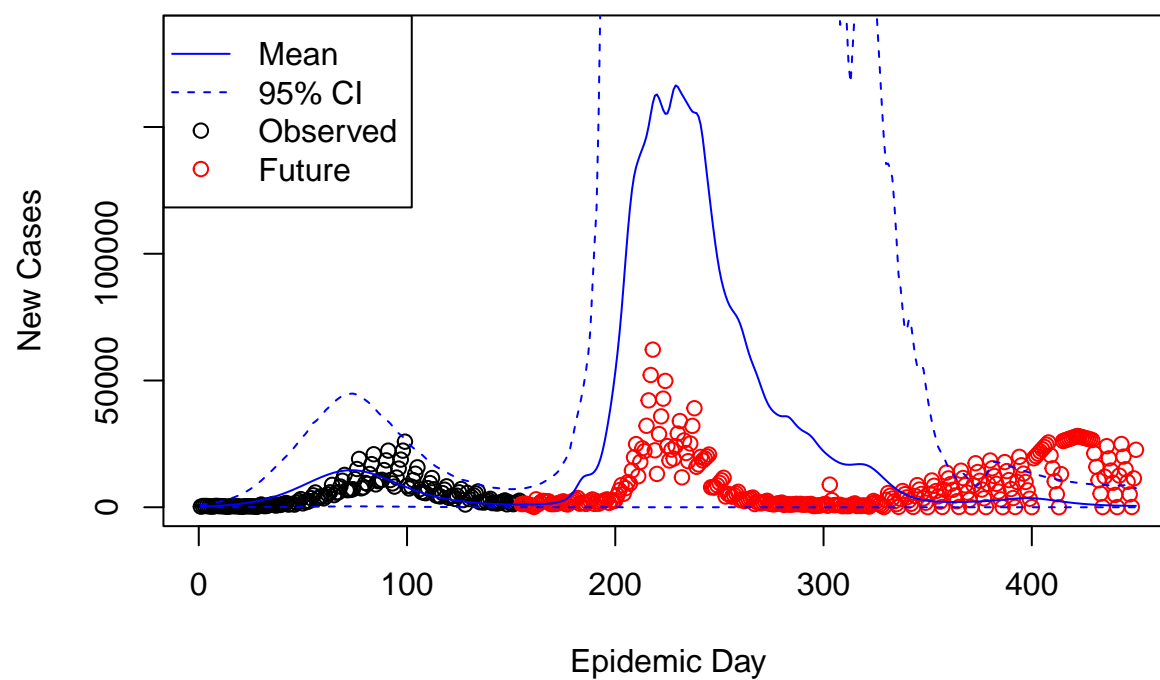
Model 3: Posterior Predictive Distribution location ALABAMA



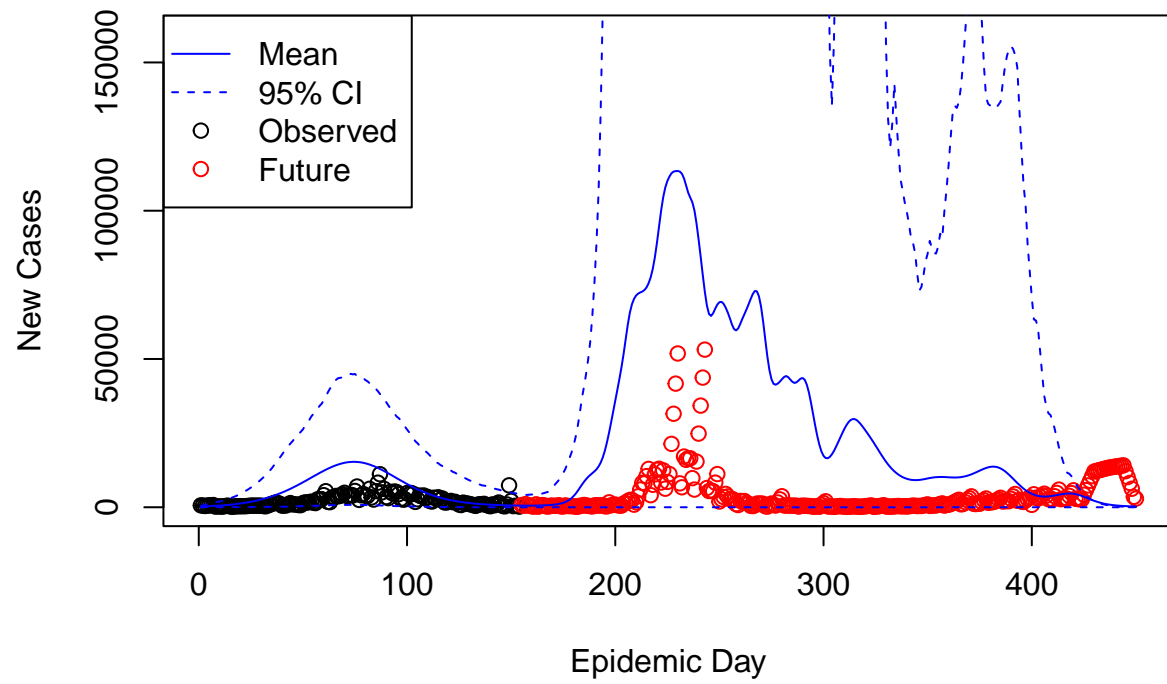
Model 3: Posterior Predictive Distribution location FLORIDA



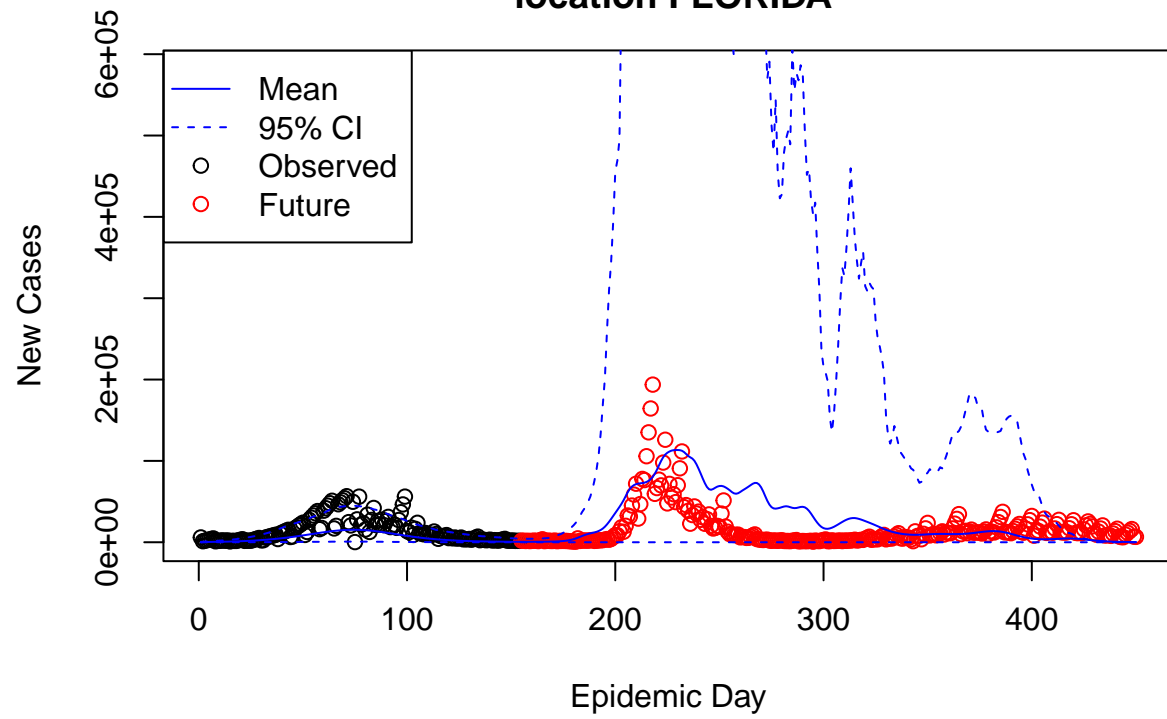
Model 3: Posterior Predictive Distribution location GEORGIA



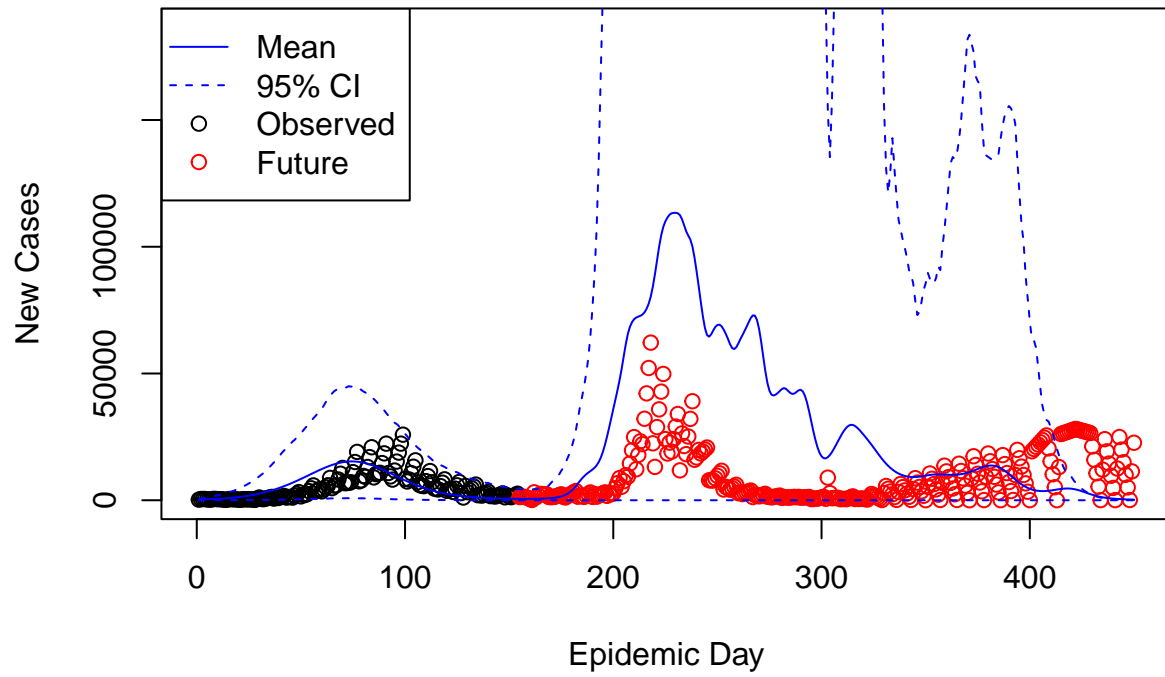
Model 3 (Weibull Distribution): Posterior Distribution location ALABAMA



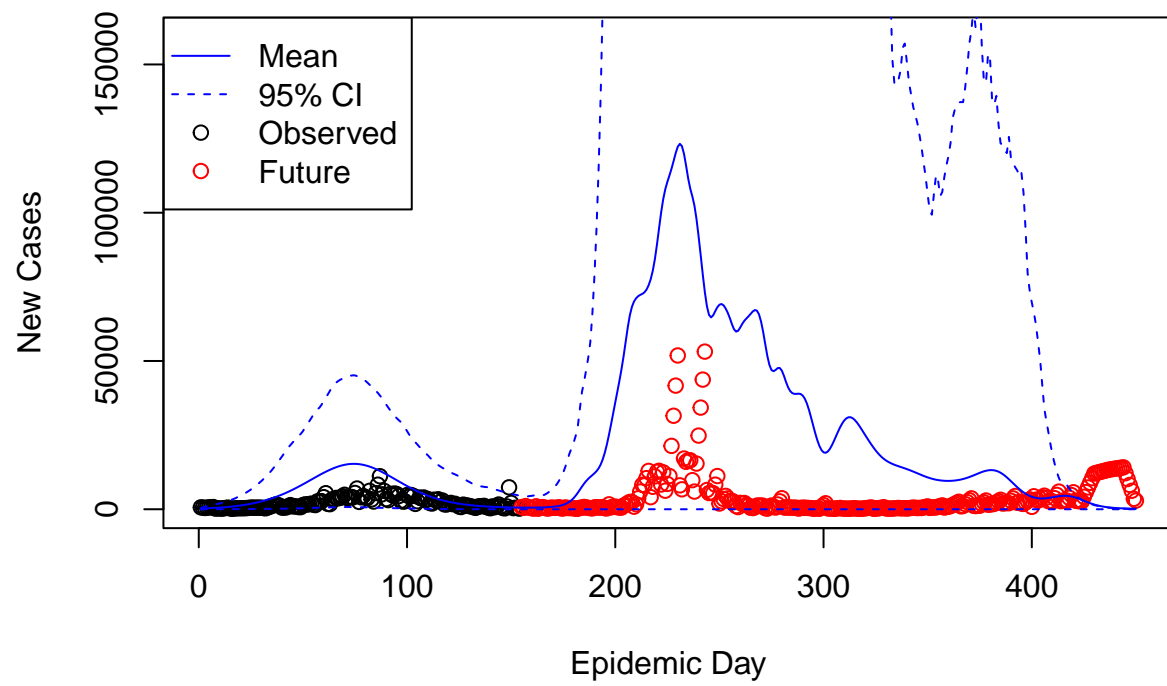
Model 3 (Weibull Distribution): Posterior Distribution location FLORIDA



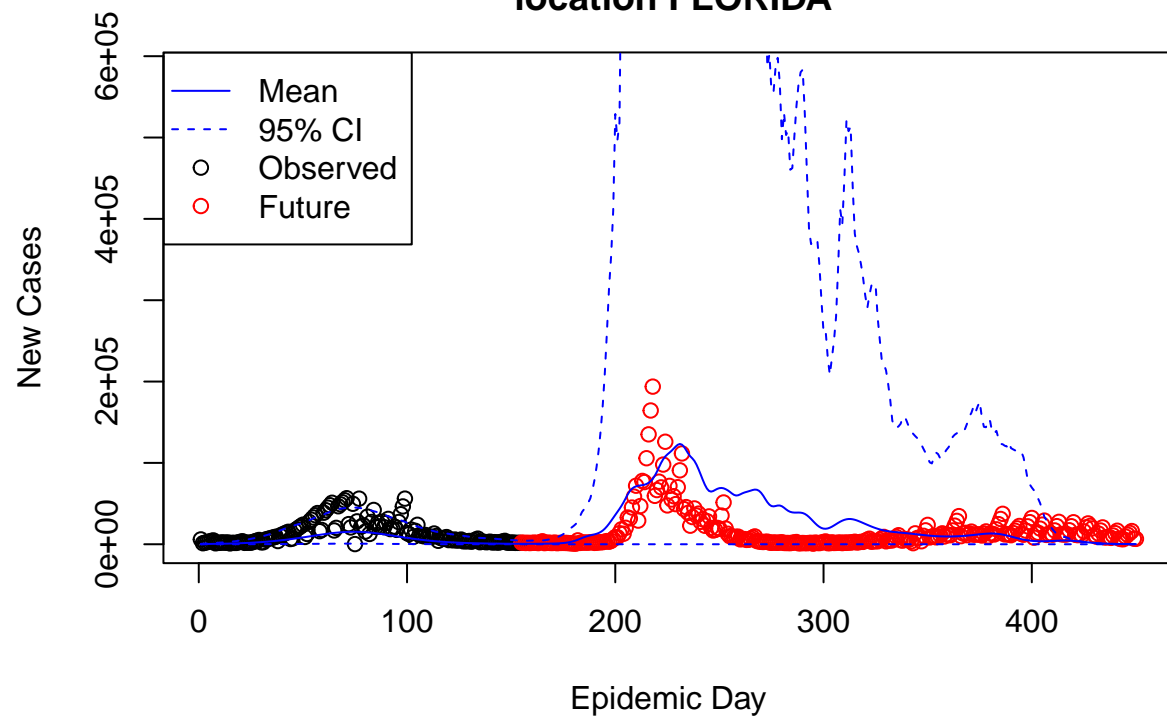
Model 3 (Weibull Distribution): Posterior Distribution location GEORGIA



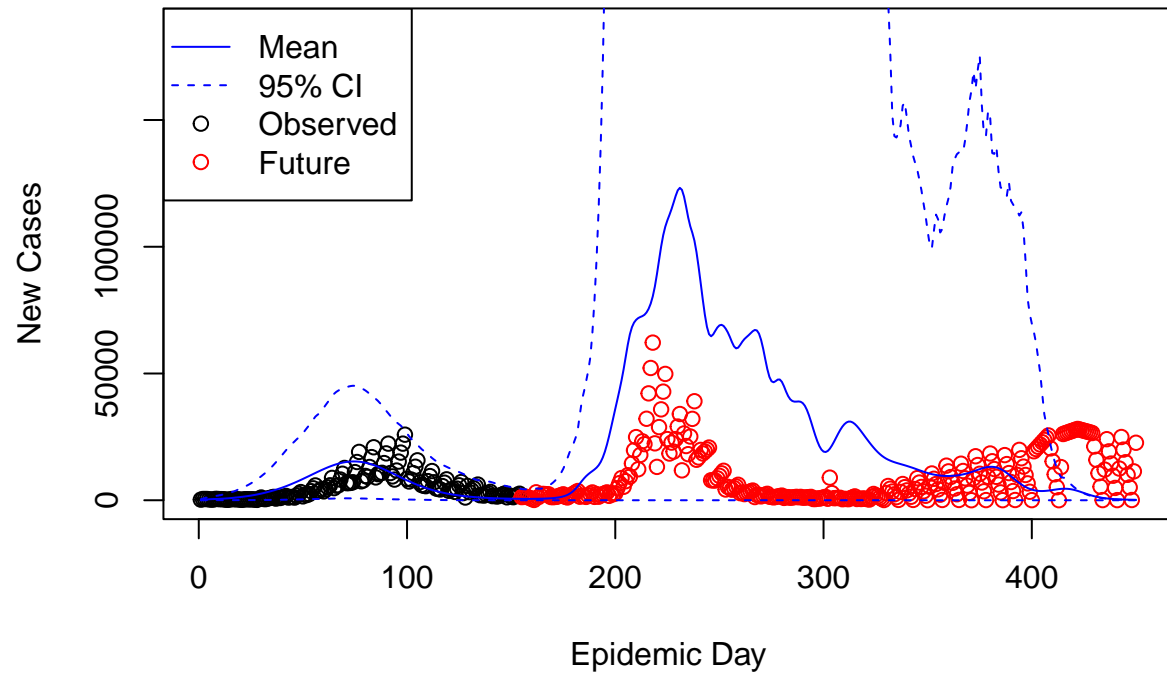
Model 3 (Weibull Distribution): Posterior Predictive Distribution location ALABAMA



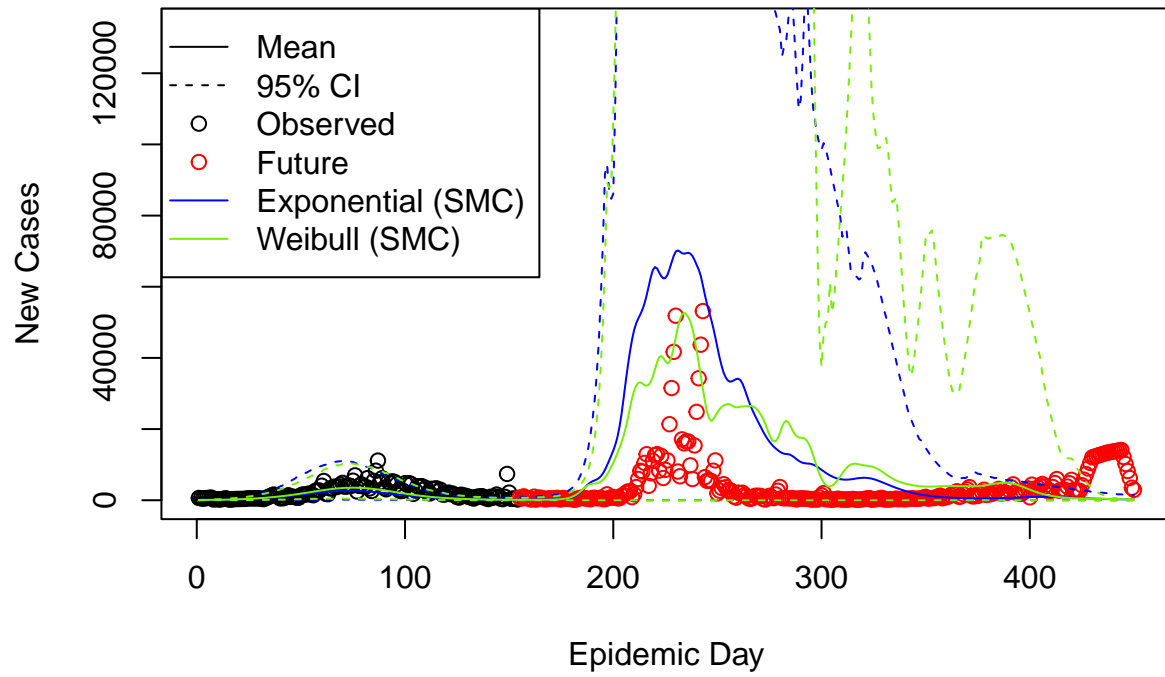
Model 3 (Weibull Distribution): Posterior Predictive Distribution location FLORIDA



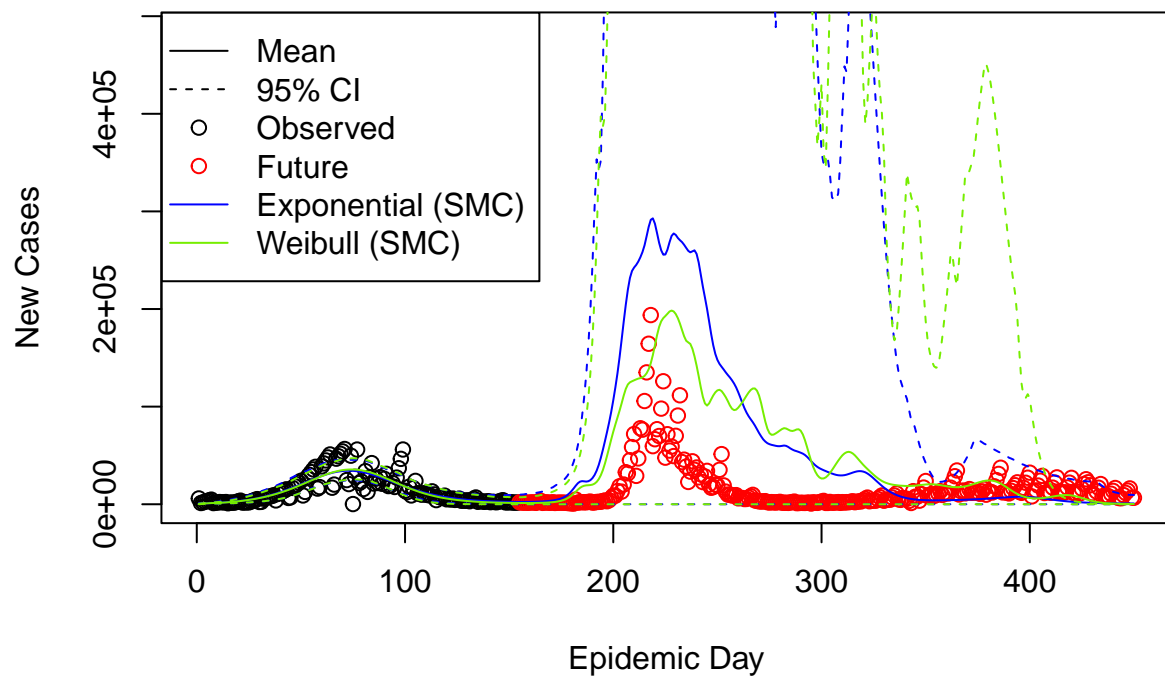
Model 3 (Weibull Distribution): Posterior Predictive Distribution location GEORGIA



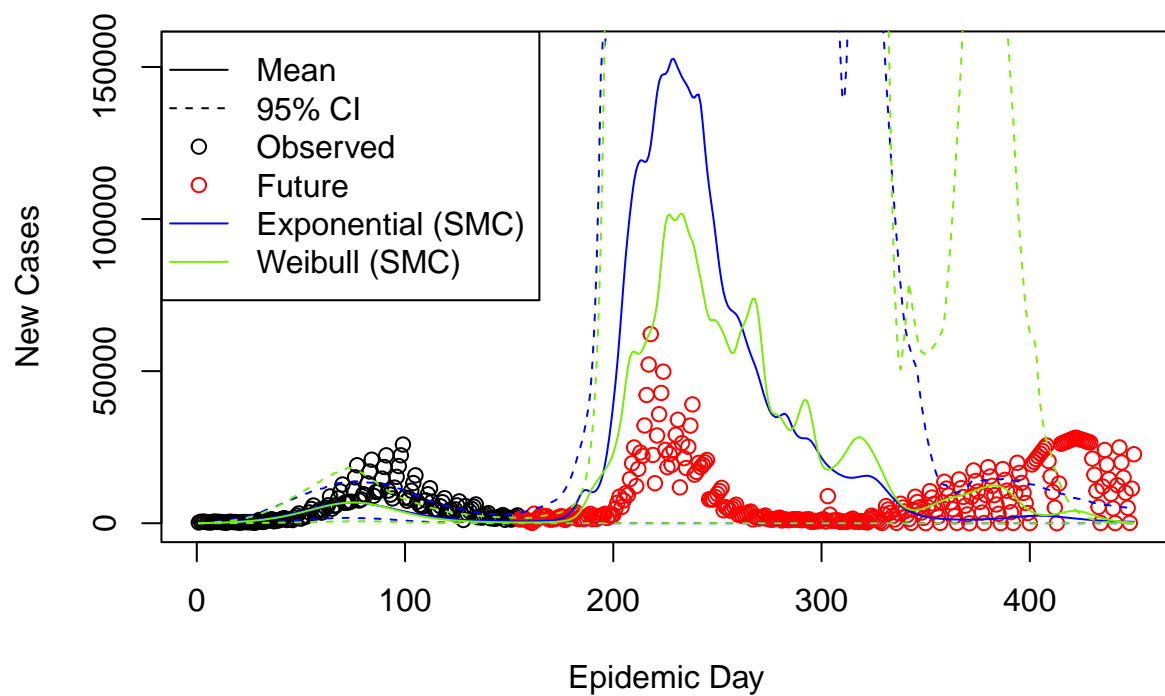
Model 3: Posterior Distribution location ALABAMA



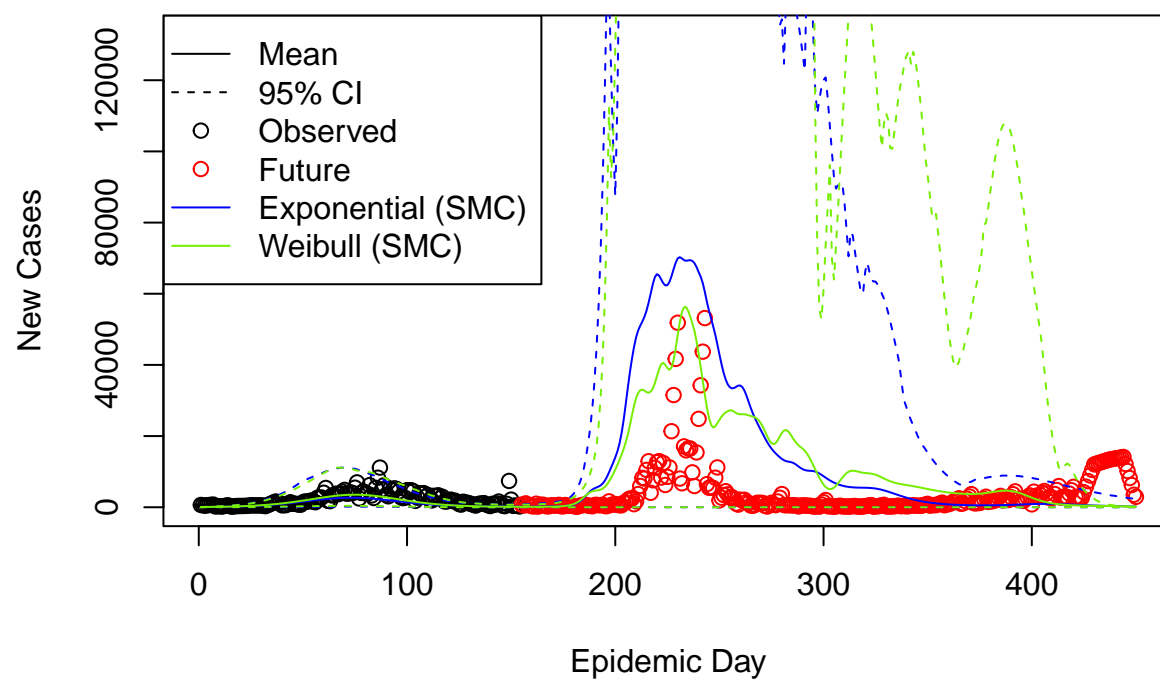
Model 3: Posterior Distribution location FLORIDA



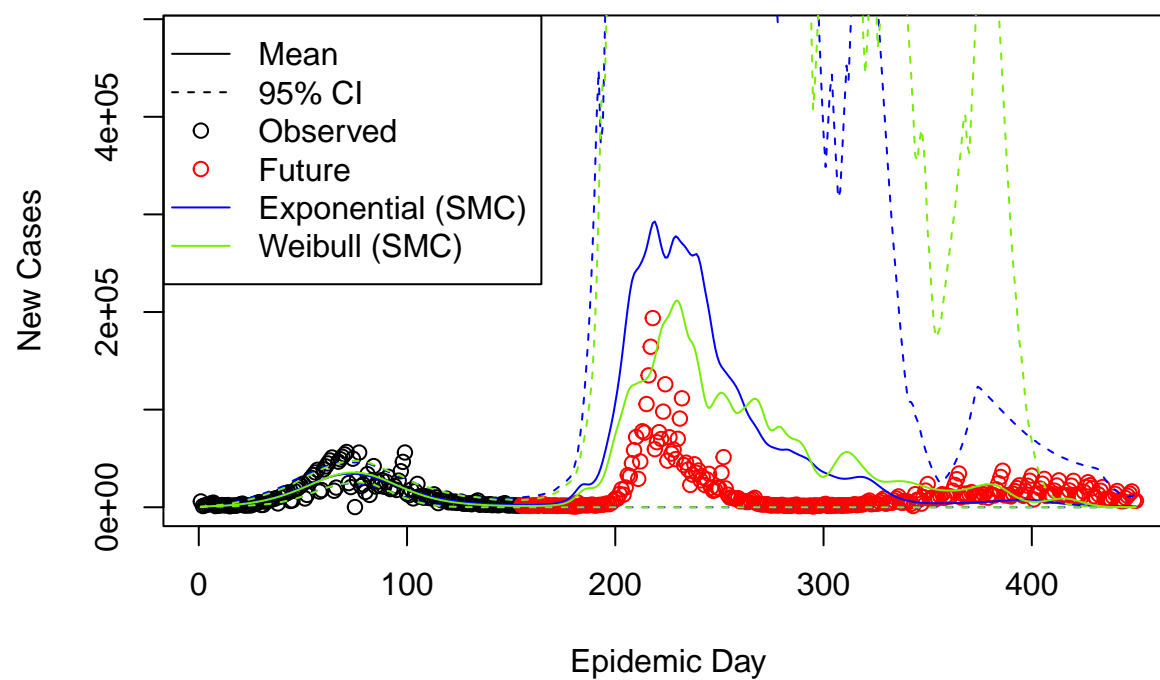
Model 3: Posterior Distribution location GEORGIA



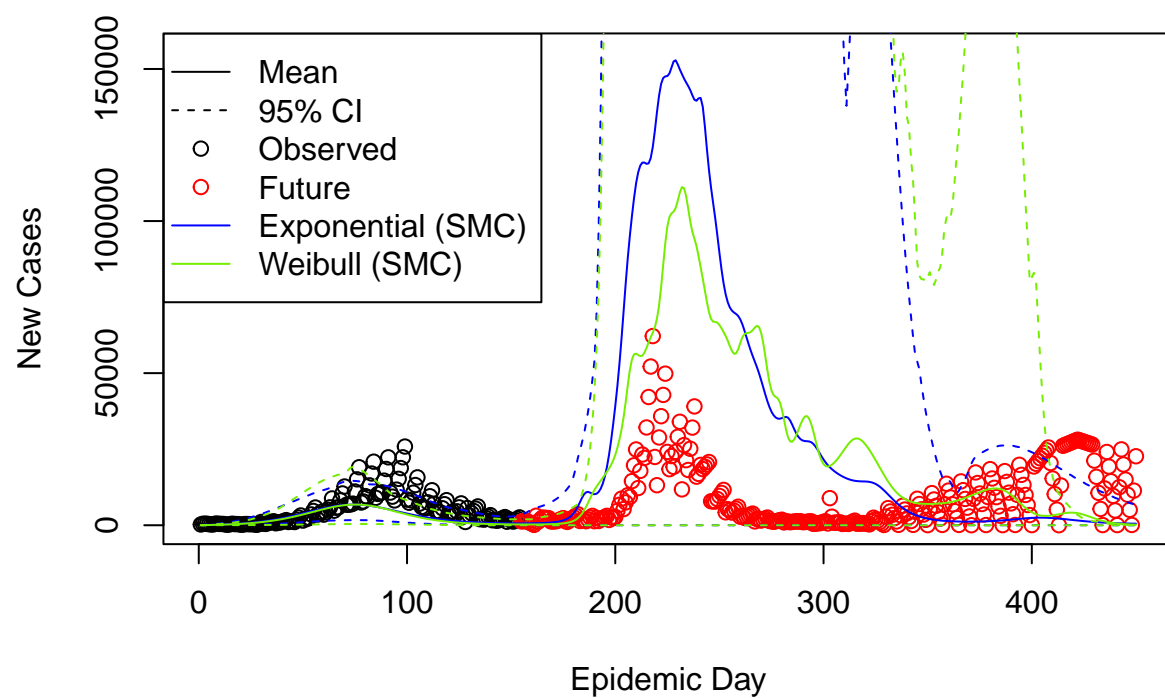
Model 3: Posterior Predictive Distribution location ALABAMA



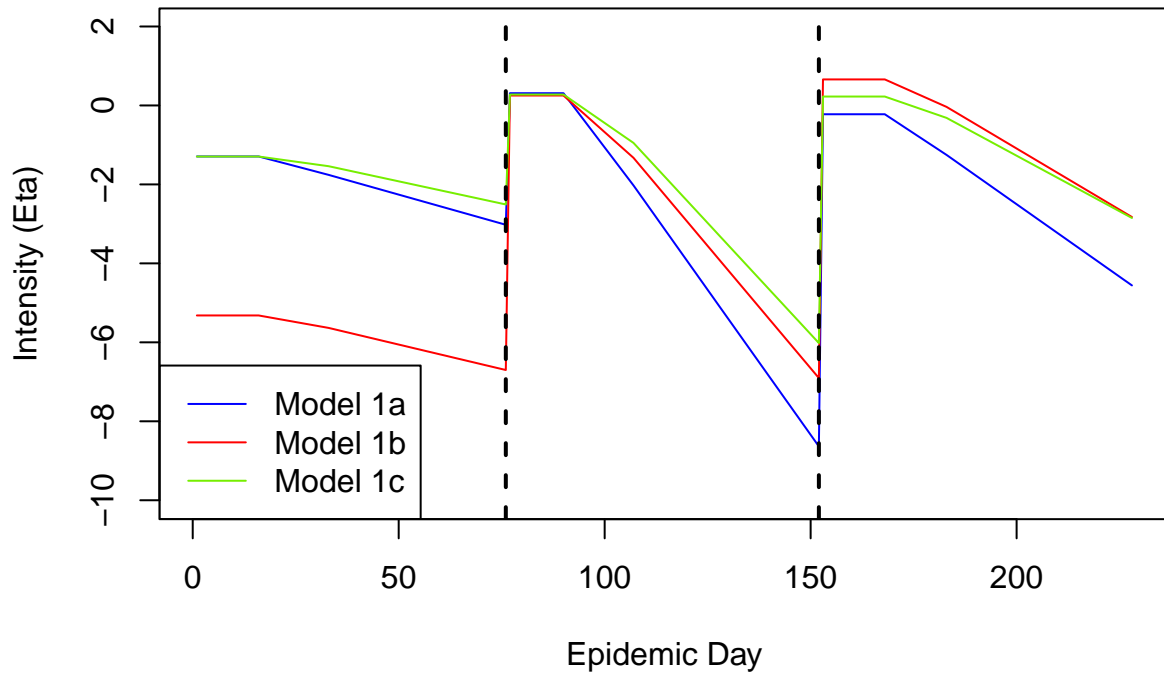
Model 3: Posterior Predictive Distribution location FLORIDA



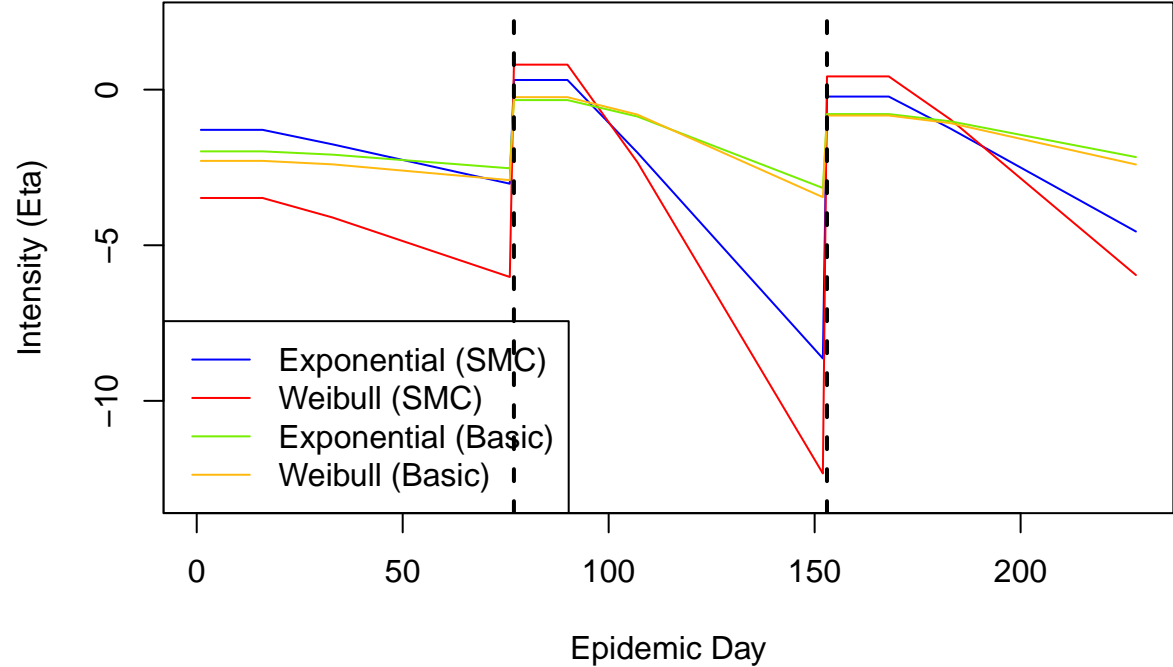
Model 3: Posterior Predictive Distribution location GEORGIA



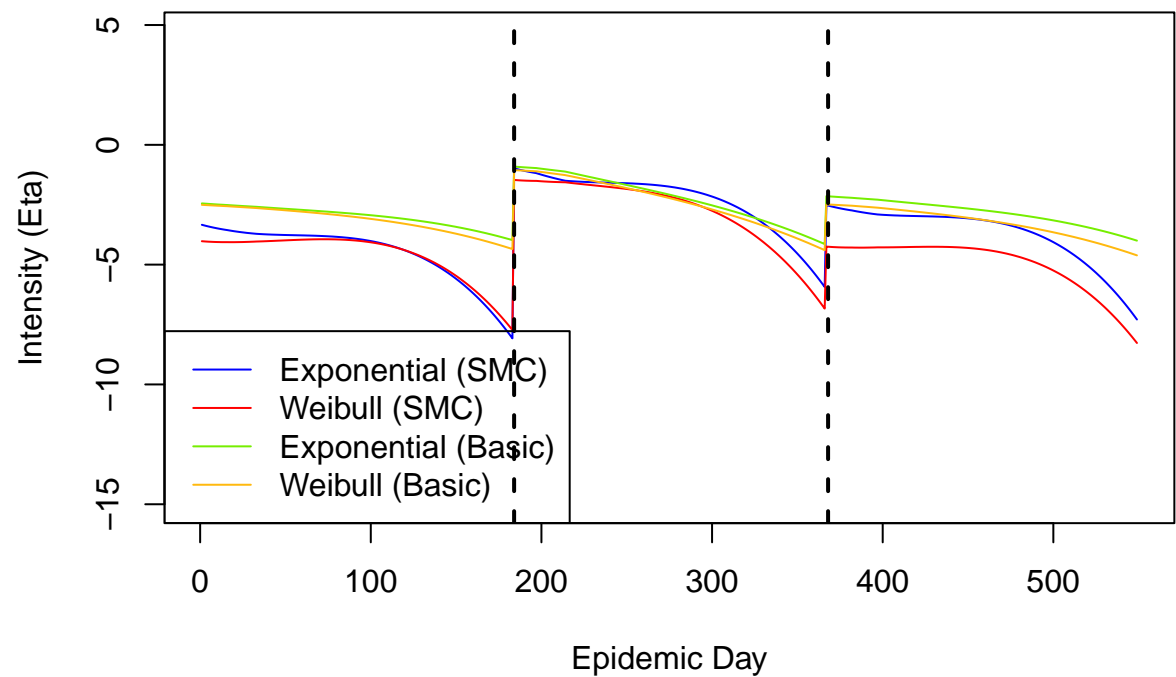
Intensity Prediction



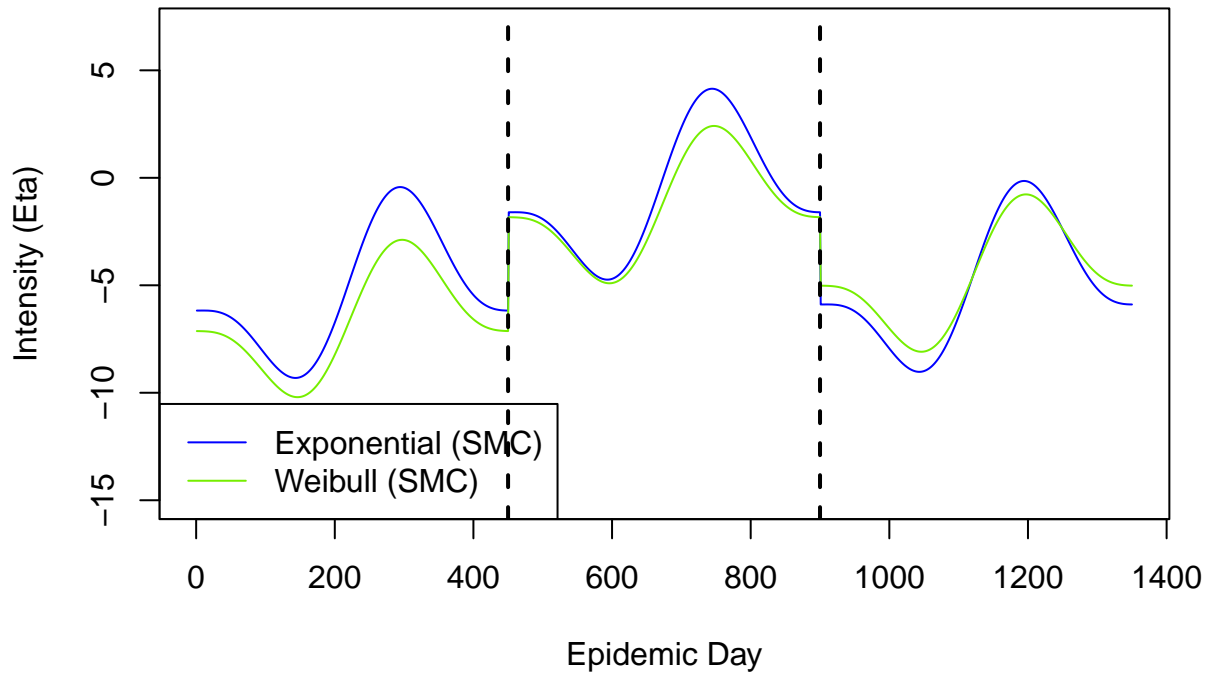
Model 1a Intensity Prediction



Model 2a Intensity Prediction



Model 3 Intensity Prediction



Model 1a (Exp)

```
## 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 1a (Weibull)

```
## 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: 4
##
##
## Parameter Estimates:
```

	Mean	SD	95% LB	95% UB
## Beta_SE_1	-3.481	4.207	-15.734	-0.310
## Beta_SE_2	0.803	0.294	0.227	1.287
## Beta_SE_3	0.425	0.309	-0.156	1.044
## Beta_SE_4	-18.468	4.446	-26.544	-11.421
## Beta_SE_5	-3.745	7.124	-17.059	10.040
## rho_1	0.335	0.148	0.060	0.583
## rho_2	0.169	0.095	0.019	0.367
## rho_3	0.322	0.093	0.143	0.486
## latent_shape	2.352	1.096	0.770	4.529
## latent_scale	7.207	1.543	4.436	10.517
## infectious_shape	7.765	5.567	0.385	18.866
## infectious_scale	30.409	16.519	6.356	70.280
## 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 3 (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 3 (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

## EO_3	200.000	0.000	200.000	200.000
## IO_1	640.000	0.000	640.000	640.000
## IO_2	5937.000	0.000	5937.000	5937.000
## IO_3	241.000	0.000	241.000	241.000
## RO_1	20048.000	0.000	20048.000	20048.000
## RO_2	79782.000	0.000	79782.000	79782.000
## RO_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	1.00000000	1.3561116	1.383407
## CAR	0.7374024	1.0000000	1.020128
## Gravity	0.7228531	0.9802695	1.0000000

Bayes Factor (Exponential vs Weibull under Model 1a)

##	[,1]	[,2]
## [1,]	1.0000000	3.114914
## [2,]	0.3210361	1.0000000

Bayes Factor (Exponential vs Weibull under Model 2a)

##	[,1]	[,2]
## [1,]	1.0000000	0.622276
## [2,]	1.607004	1.0000000

Runtimes

##	user.self	sys.self	elapsed
## model 1	6994.147	43.667	1082.683
## model 2	36929.154	240.209	5291.655
## model 3	71.148	2.863	11.010
## model 4	2942.665	40.600	433.531
## model 5	7866.135	58.250	1174.808
## model 6	6749.316	49.003	1025.711
## model 7	4673.844	34.702	677.711
## model 8	16707.045	112.214	2386.547
## model 9	151.647	5.541	23.787

## model 10	596.475	7.299	82.880
## model 11	4978.494	44.727	716.654
## model 12	4930.403	47.835	727.960
## model 13	6245.682	50.009	920.793
## model 14	7454.595	62.841	1129.426
## model 15	22008.893	145.167	3128.588
## model 16	17925.756	121.514	2498.662