

Bayesian Logistic Regression

1 Bayesian Logistic Regression

In this analysis, we used Bayesian logistic regression to model the probability of infection in mosquitoes as a function of species at each time point (dpi). For each dpi, a separate model was fit to estimate the difference in infection risk between *Aedes albopictus* and the baseline species, *Aedes aegypti*, using the log-odds scale. The key parameter of interest, β_1 , represents the difference in log odds of infection between the two species. We have used the same modeling framework for Infection, Dissemination, and Transmission. These separate models allow us to examine how species differences evolve over time for each stage.

Infection Rate

The coefficient β_1 represents the difference in log-odds of infection between *Aedes albopictus* and the baseline species, *Aedes aegypti*. The logistic regression model is written as:

$$\log \left(\frac{\Pr(\text{Infection} = 1)}{1 - \Pr(\text{Infection} = 1)} \right) = \beta_0 + \beta_1 \cdot 1_{\{\text{Species}=\text{albopictus}\}}$$

- $\beta_1 > 0$: *Aedes albopictus* has higher log-odds of infection than *Aedes aegypti*, meaning it is more likely to be infected.
- $\beta_1 = 0$: There is no difference in infection odds between the two species.
- $\beta_1 < 0$: *Aedes albopictus* has lower log-odds of infection than *Aedes aegypti*, meaning it is less likely to be infected.

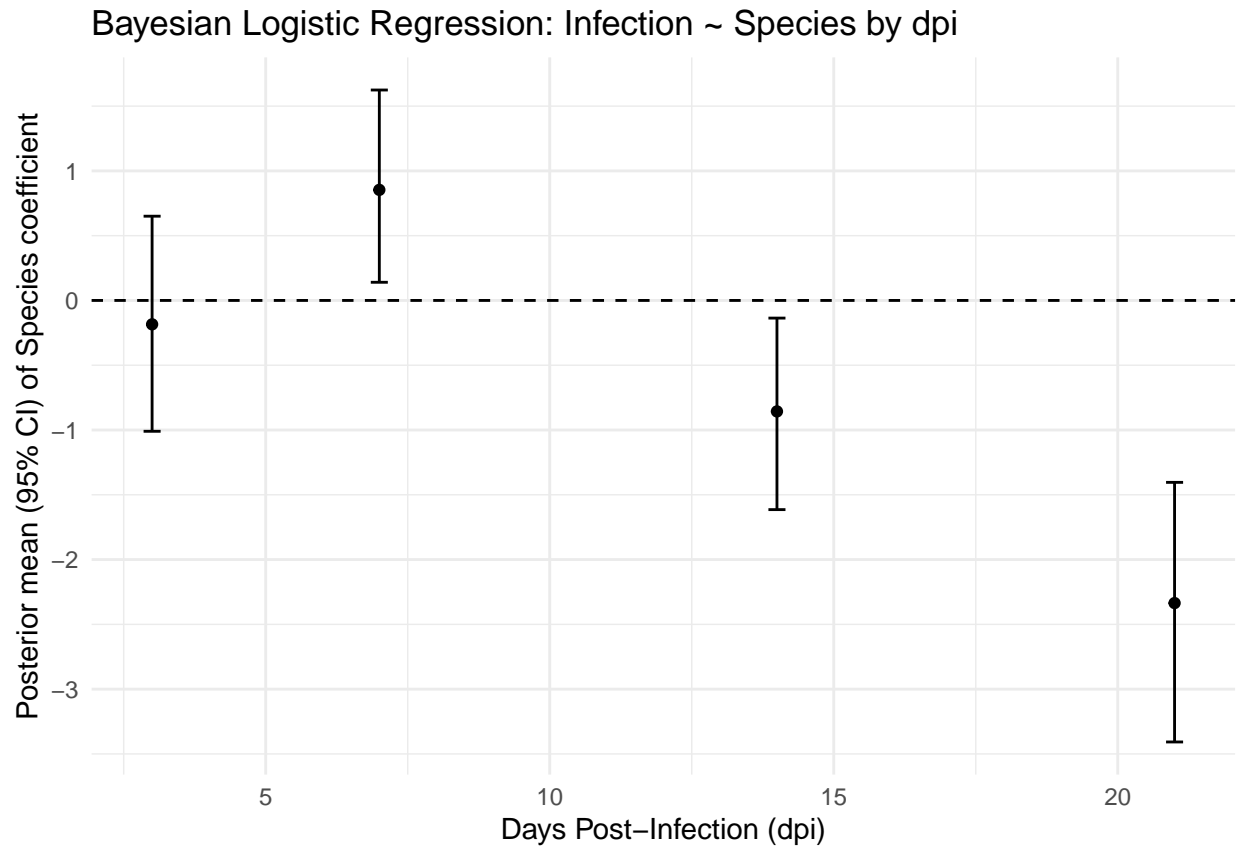
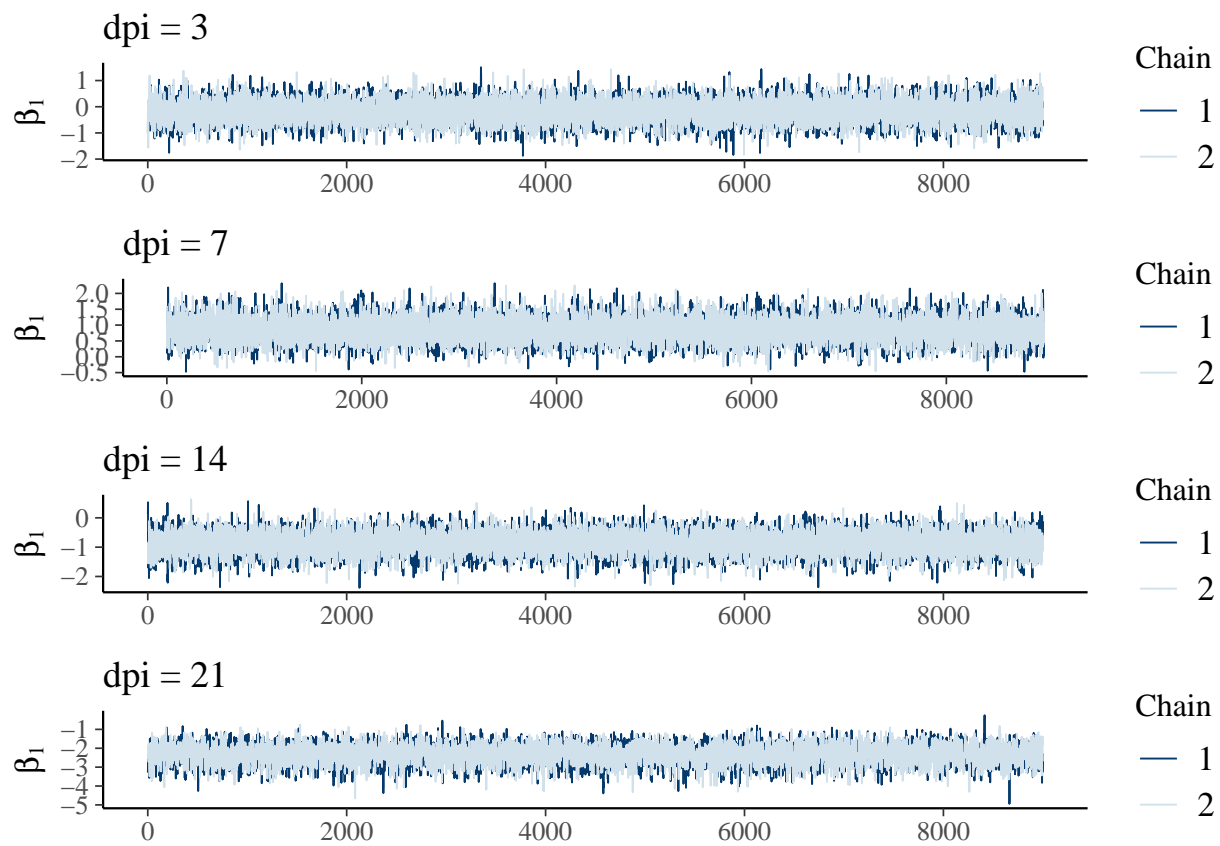


Table 1: Posterior estimates for the Species effect (*Aedes albopictus* vs. *Aedes aegypti*) across dpi.

dpi	Mean	2.5%	97.5%
3	-0.18	-1.01	0.65
7	0.85	0.14	1.62
14	-0.86	-1.61	-0.14
21	-2.34	-3.41	-1.40

Trace Plots



Dissemination Rate

Bayesian Logistic Regression: Dissemination ~ Species by dpi

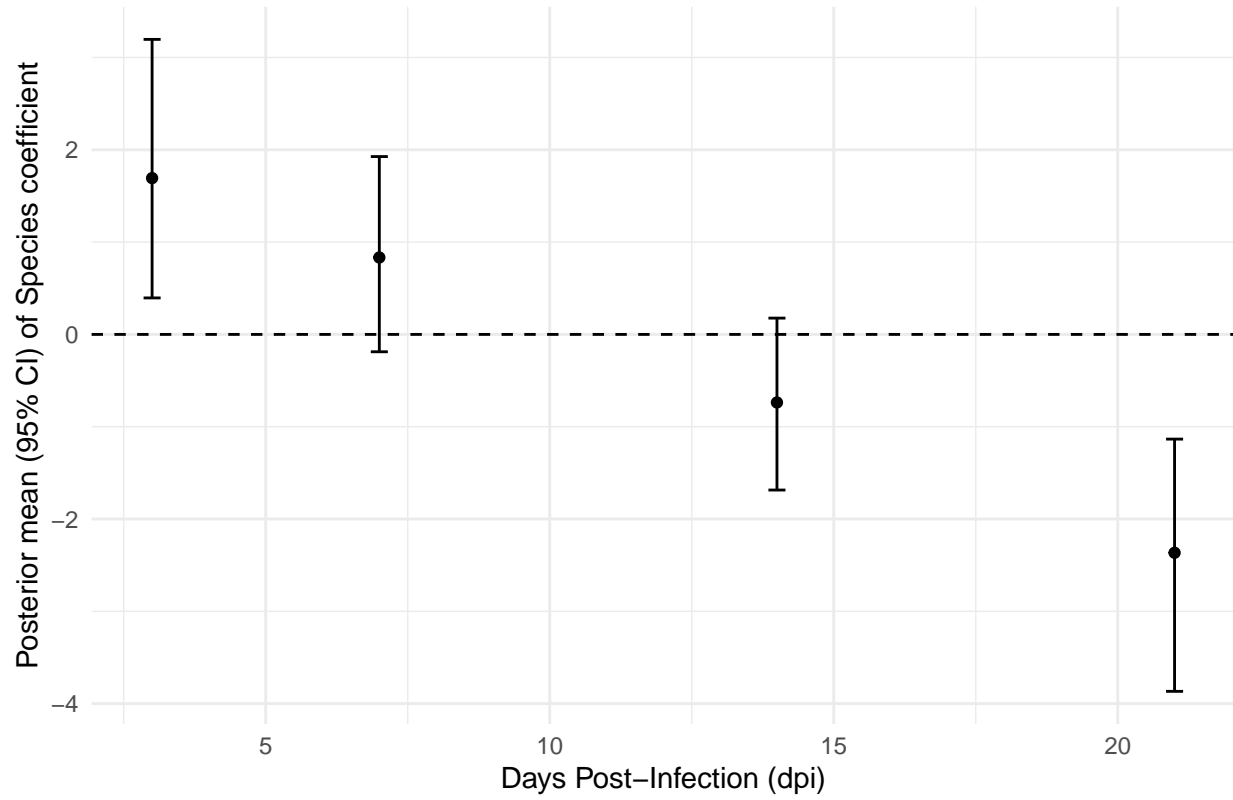


Table 2: Posterior estimates for Species effect on Dissemination across dpi.

dpi	Mean	2.5%	97.5%
3	1.69	0.40	3.20
7	0.83	-0.19	1.93
14	-0.74	-1.69	0.18
21	-2.37	-3.87	-1.13

Transmission Rate

Bayesian Logistic Regression: Transmission ~ Species by dpi

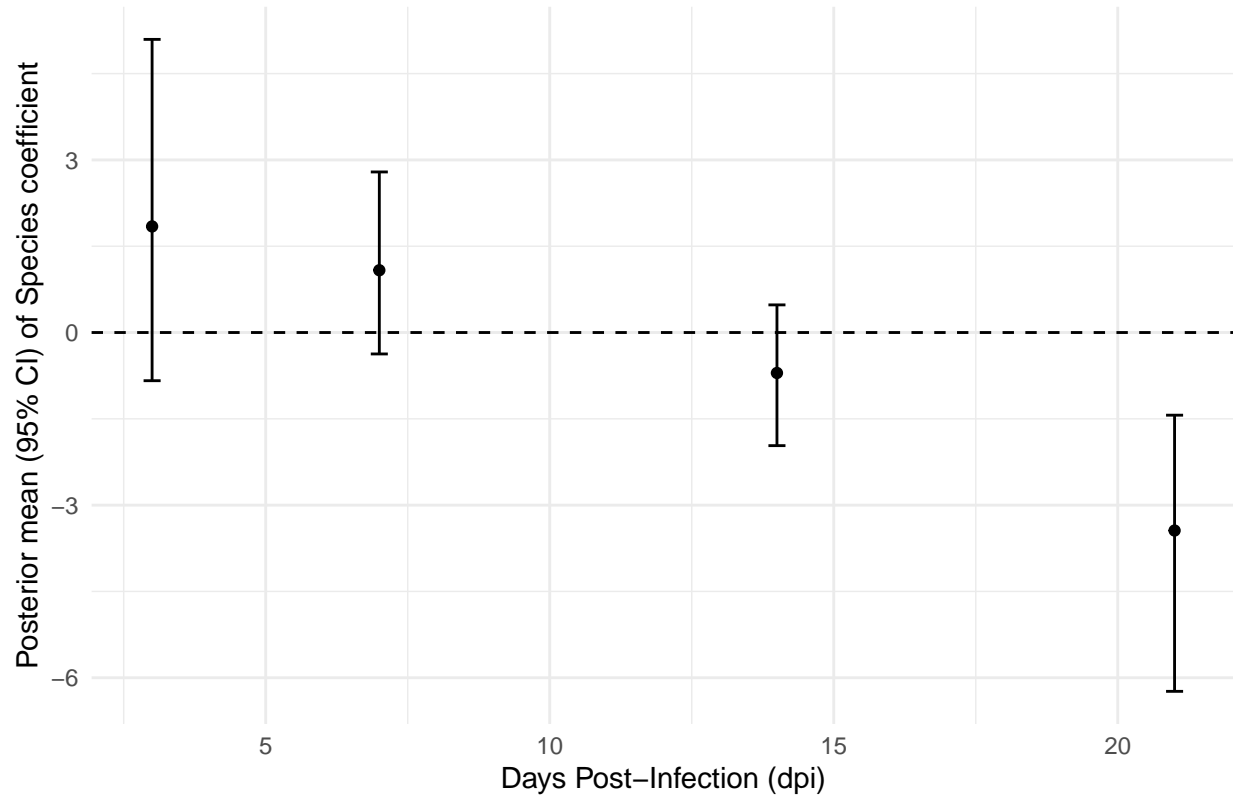


Table 3: Posterior estimates for Species effect on Transmission across dpi.

dpi	Mean	2.5%	97.5%
3	1.84	-0.84	5.09
7	1.08	-0.37	2.79
14	-0.70	-1.97	0.48
21	-3.44	-6.24	-1.44