

### Supplemental Material S7. Posterior predictive $p$ -values.

	Mean	Standard Deviation	Kurtosis
Model 1	0.50	0.32	0.92
Model 2	0.52	0.33	0.64
Model 3	0.54	0.22	0.67
Model 4	0.49	0.29	0.65
Model 5	0.49	0.36	0.90

The posterior predictive  $p$ -values revealed that the models accurately estimated the *mean* number of successes compared to the observed data. The posterior predictive  $p$ -values for *standard deviation* suggest that the models underestimated the standard deviation of the number of successes compared to the observed data. The posterior predictive  $p$ -values for *kurtosis* for Models 1 and 5 suggests that 90% of the distributions from the simulated outcomes had heavier tails when compared to the observed data. For Models 2, 3, and 4, roughly 60% of the simulated distributions had heavier tails than the observed data.