Lizard Perch Heights on Experimental Islands

Nick Herrmann
OEB201 Final Project
11/29/17

Control

Brown lizard removal

Predictor of Interest: Treatment through time

Response: Green Lizard Perch Height

$$y \sim N(\hat{y}, \sigma_y^2)\ [0,\infty)$$

$$y \sim N(\hat{y}, \sigma_y^2)\ [0,\infty)$$

$$\hat{y}_i = \alpha_{j[i]} + \beta_{\text{treatment}} + \beta_{\text{sex}} + \beta_{\text{year}} + \beta_{\text{treatment x year}} + \beta_{\text{treatment x sex x year}}$$

$$y \sim N(\hat{y}, \sigma_y^2)\ [0,\infty)$$

$$\hat{y}_i = \alpha_{j[i]} + \beta_{treatment} + \beta_{sex} + \beta_{year} + \beta_{treatment\ x\ year} + \beta_{treatment\ x\ sex\ x\ year}$$

Positive if males perch higher than females

Negative if lizards on removal islands perch lower following competitor removal

Negative if males on removal islands have a larger drop than females following competitor removal

$$y \sim N(\hat{y}, \sigma_y^2)\ [0,\infty)$$

$$\hat{y}_i = \alpha_{j[i]} + \beta_{treatment} + \beta_{sex} + \beta_{year} + \beta_{treatment\ x\ year} + \beta_{treatment\ x\ sex\ x\ year}$$

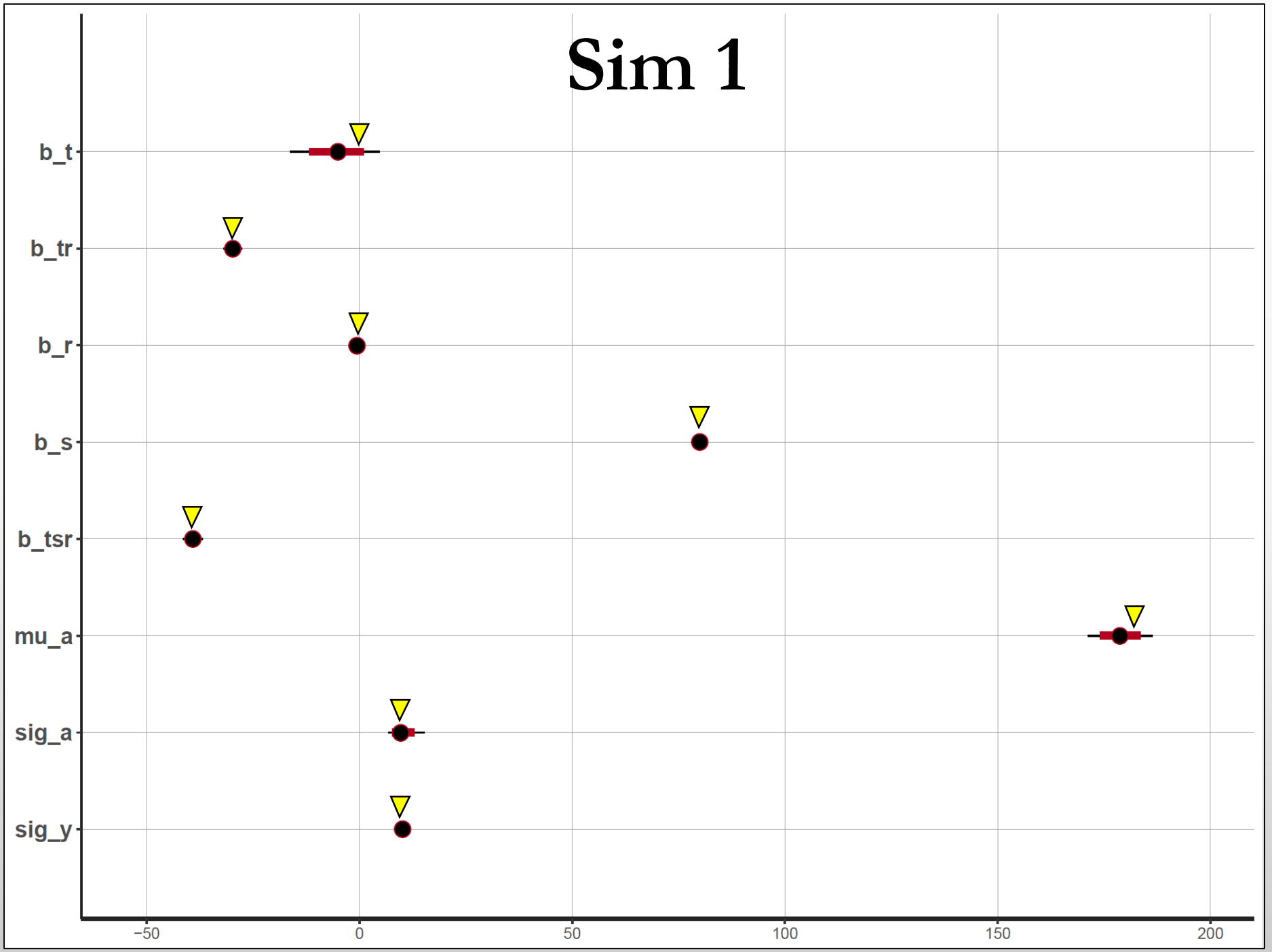
$$\alpha_j \sim N(\mu_\alpha, \sigma_\alpha^2)$$

Positive if males perch higher than females

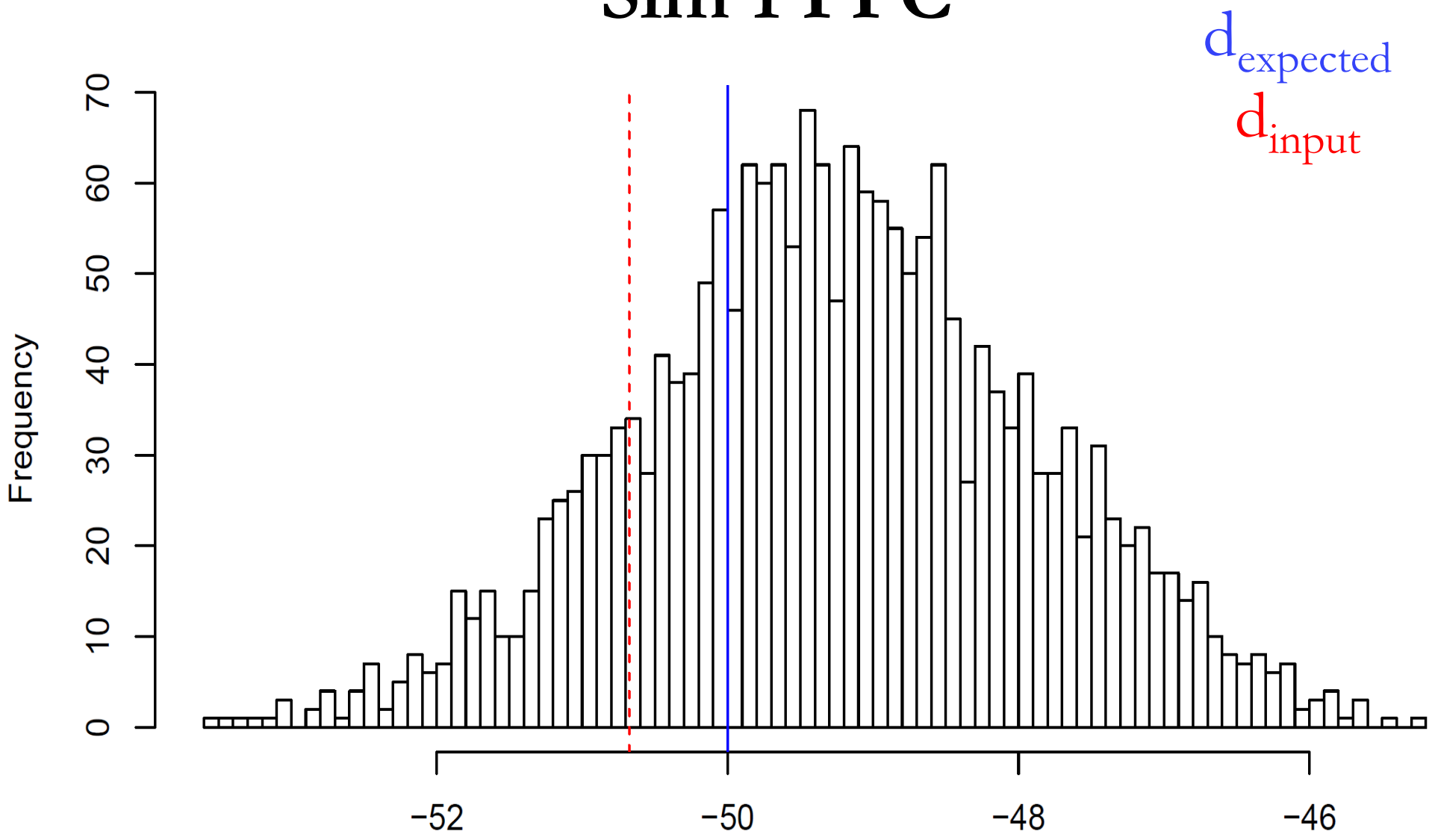
Negative if lizards on removal islands perch lower following competitor removal

Negative if males on removal islands have a larger drop than females following competitor removal

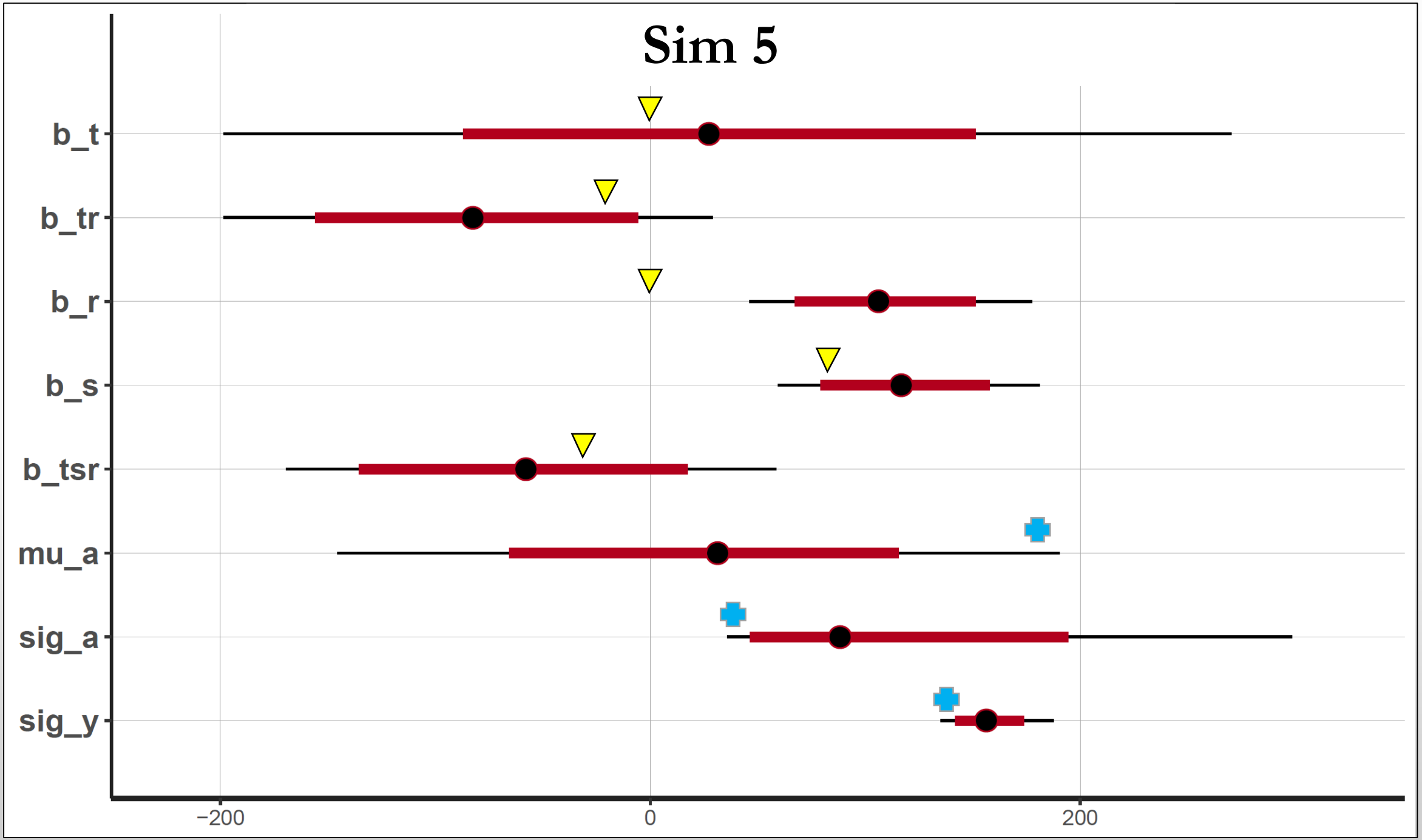
	Sim 1	Sim 2	Sim 3	Sim 4	Sim 5	Sim 6
Data Type	fake	fake	fake	fake	real and fake	real and fake
Balanced sampling?	Y	Y	Y	Y	N	N
Observations per island	50	26*	26	26	26‡	26‡
Number of islands (j)	16	6*	6	6	6	6
Total number of observations (i)	1600	312*	312	312	294*	294
$\beta_{treatment}$	0	0	-120*	0*	0	0
$\beta_{treatment\ x\ year}$	-30	-30	-30	-30	-30	-30
β_{year}	0	0	0	0	0	0
β_{sex}	80	80	80	80	80	80
$\beta_{treatment\ x\ sex\ x\ year}$	-40	-40	-40	-40	-40	-40
μ_{α}	180	180	180	180	181.6*†	181.6†
σ_{α}	10	25*	25	40*	41.2*†	41.2†
σ_{y}	10	25*	25	100*	123.4*†	40*


Sim 1
b_t
b_tr
b_r
b_s
b_tsr
mu_a
sig_a
sig_y
−50
0
50
100
150
200

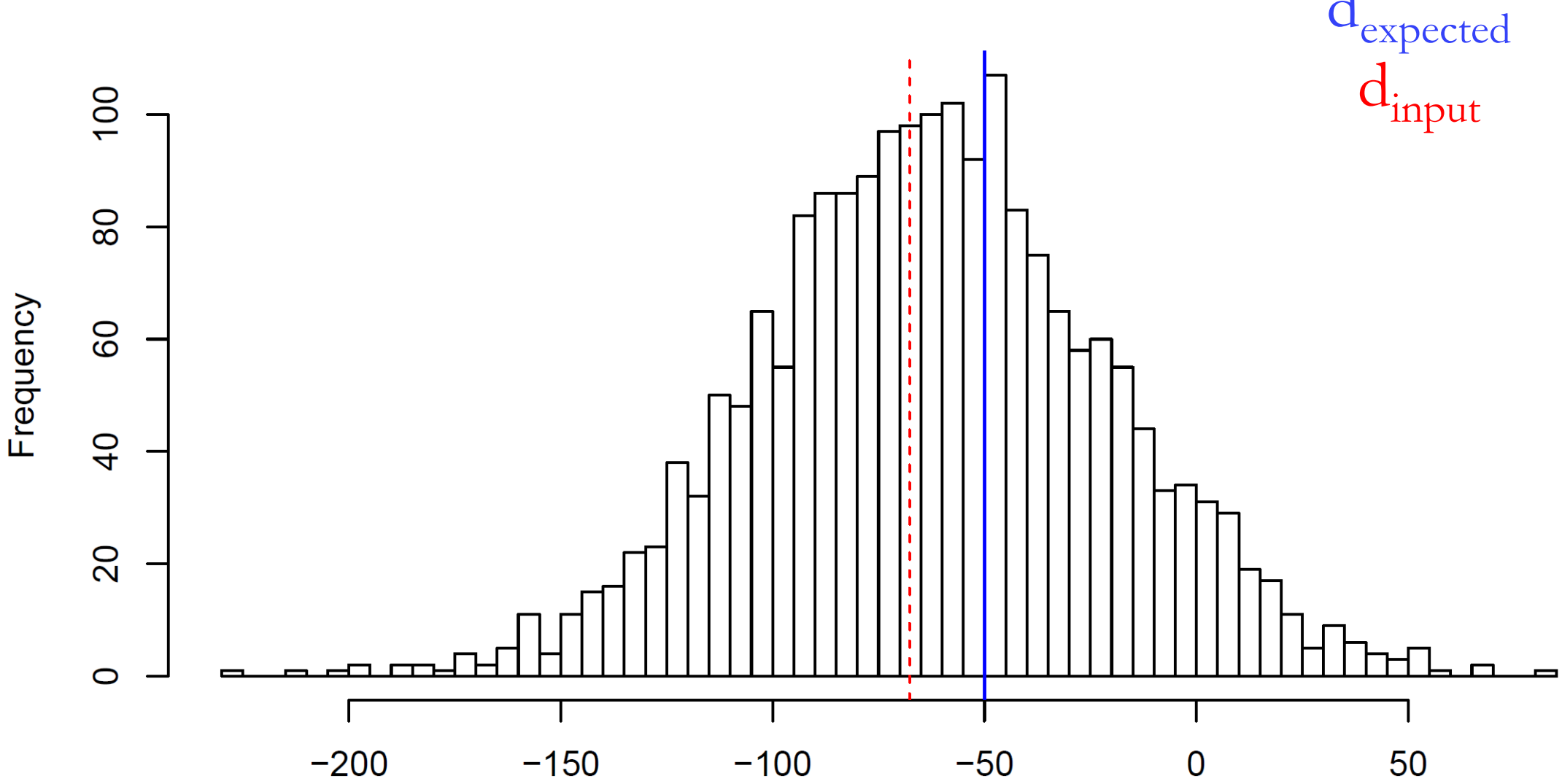
Sim 1 PPC



$$d = (\mu_{Year1Removal} - \mu_{Year0Removal}) - (\mu_{Year1Control} - \mu_{Year0Control})$$


Sim 5
b_t
b_tr
b_r
b_s
b_tsr
mu_a
sig_a
sig_y
−200
0
200

Sim 5 PPC



$$d = (\mu_{Year1Removal} - \mu_{Year0Removal}) - (\mu_{Year1Control} - \mu_{Year0Control})$$

What's next?

- Different variances for removal vs. control islands
- Weakly informative priors on hyperparameters
- Use my new skills on an experiment that won't get crushed by a hurricane


Thanks!