Talks, travel, grants

Brachiopods

Mammals

Talks

- Evolution 2014: basic comparison between NA and European mammal survival
- GSA 2014: current fully Bayesian model of brachiopod survival
  - lots of positive feedback, ideas

Travel and grants

- AMNH: tooth measures for all notoungulate specimens identified to species level
- DDIG: applied; travel to Argentina; collaboration with Rick Madden

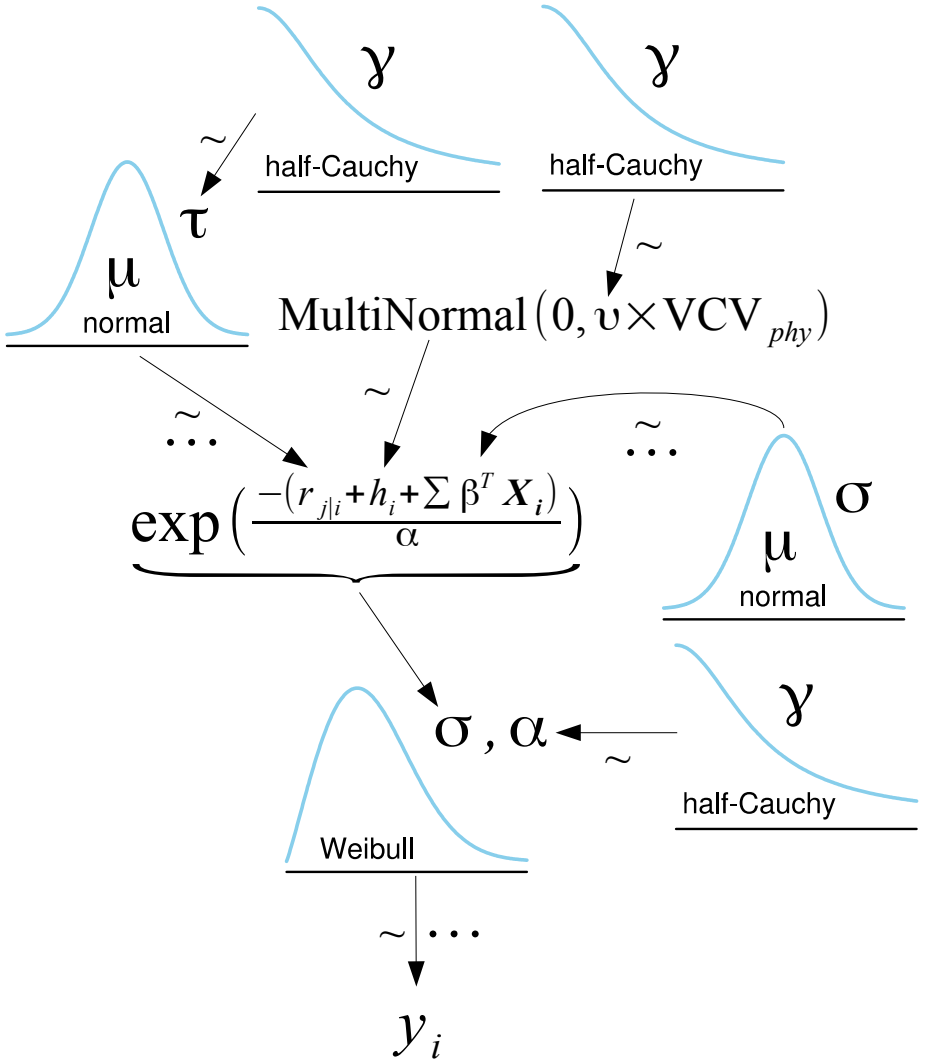
Survival model development

North American survival

- species duration as measure of survival
- traits
  - organismal: diet, locomotor categories
  - species: body size, bioprovince occupancy
- origination cohort
- phylogeny primarily based on taxonomy

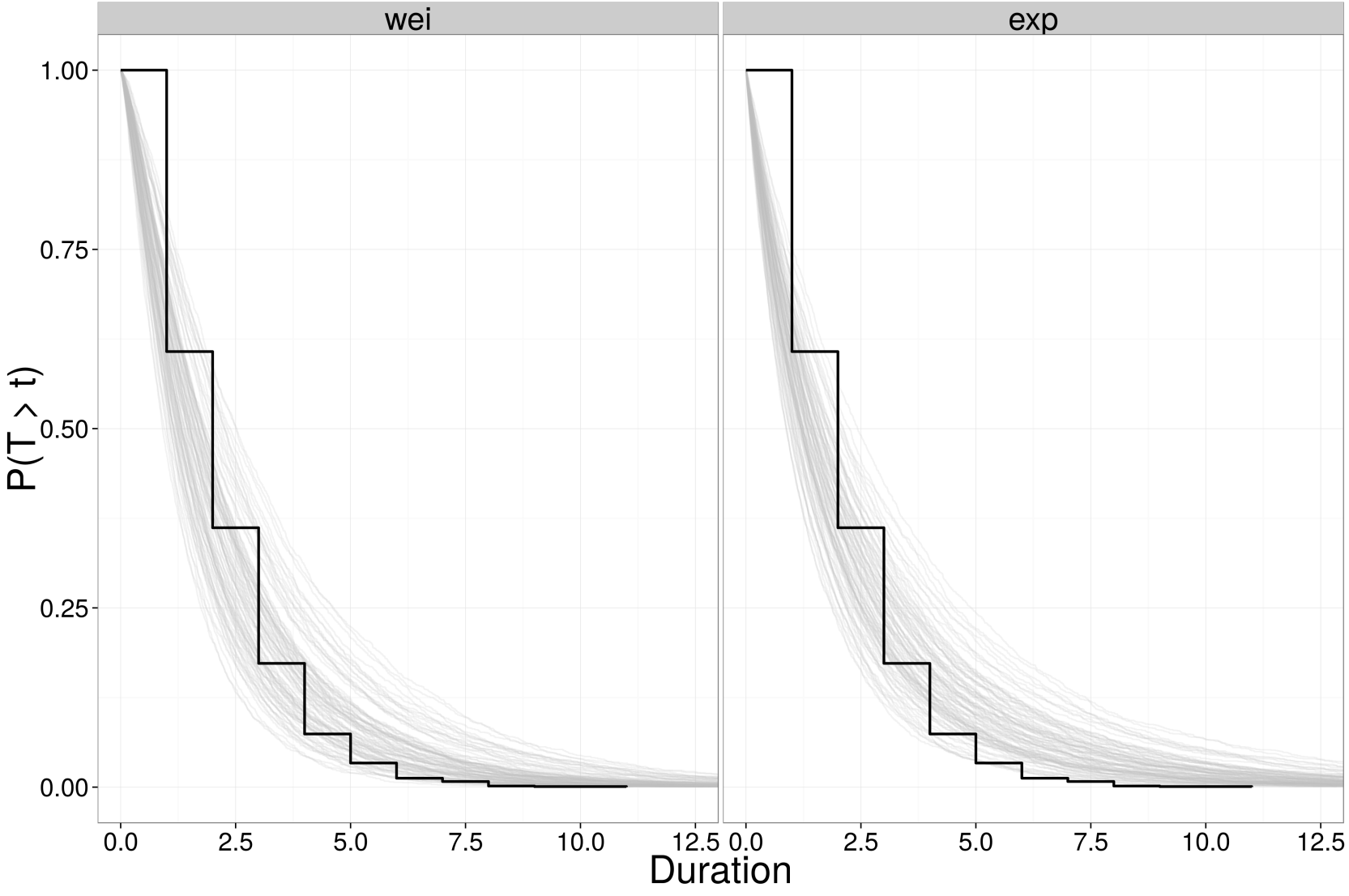
- duration defined as number of 2My bins from FAD to LAD, inclusive
- fully Bayesian hierarchical model
- censoring approach
  - if still extant, right censored
  - if not extant and duration of only 1 bin, left censored
- continuous traits rescaled following Gelman 2009 *Stats. Med.* by $2 * \text{sd}$.

Model diagram

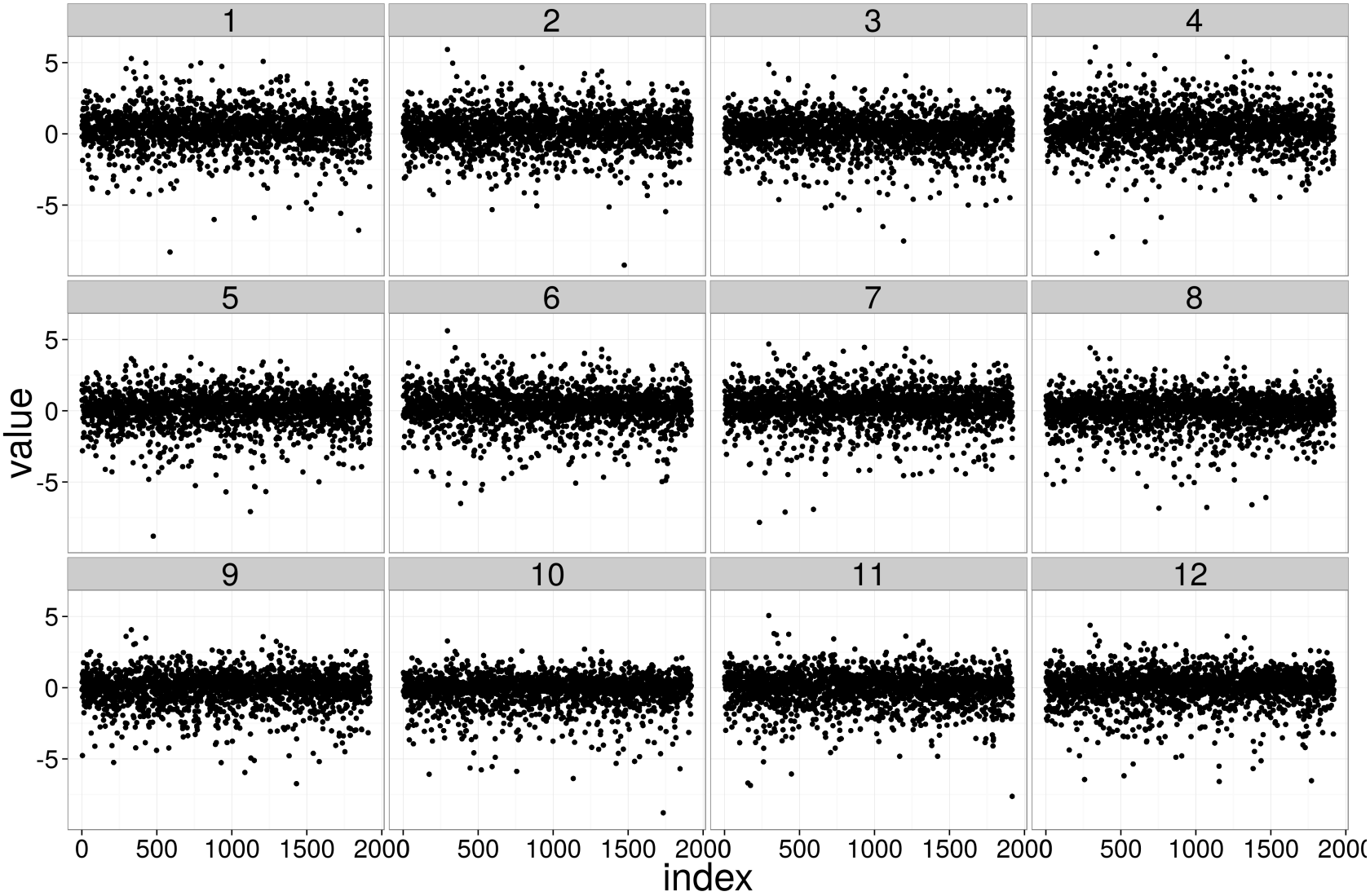


$$y_i \sim \text{Weibull}(\sigma, \alpha)$$
$$r_{j|i} \sim \text{Normal}(0, \tau)$$
$$\tau \sim \text{half-Cauchy}(2.5)$$
$$h_i \sim \text{MultiNormal}(0, \Sigma)$$
$$\Sigma = \upsilon \times \text{VCV}_{phy}$$
$$\upsilon \sim \text{half-Cauchy}(2.5)$$
$$\beta \sim \text{Normal}(0, 10)$$
$$\alpha \sim \text{half-Cauchy}(2.5)$$

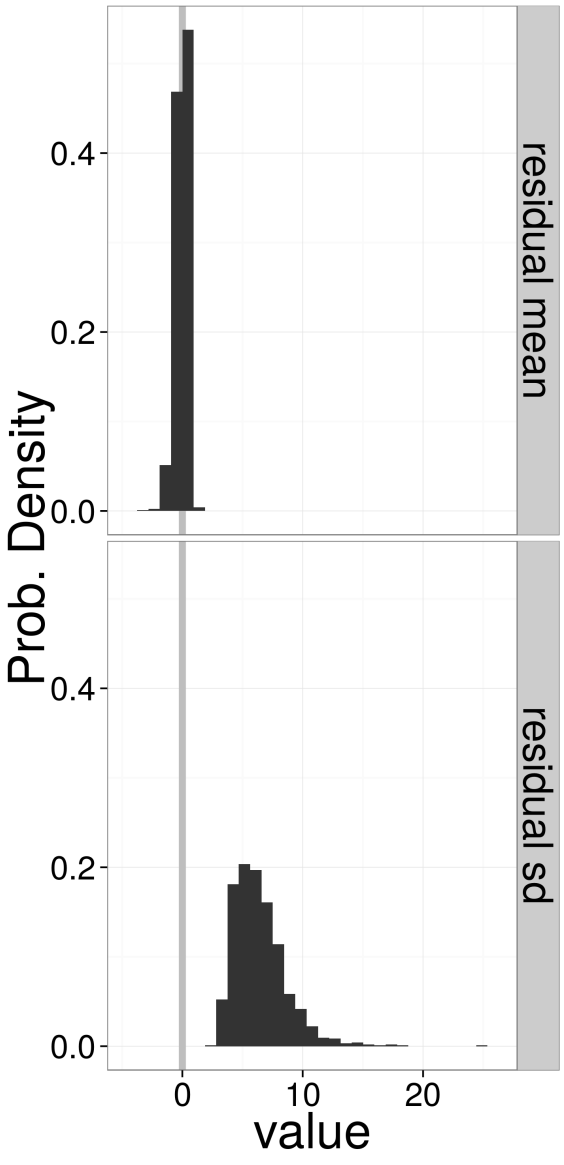
Posterior predictive checks: S(t)

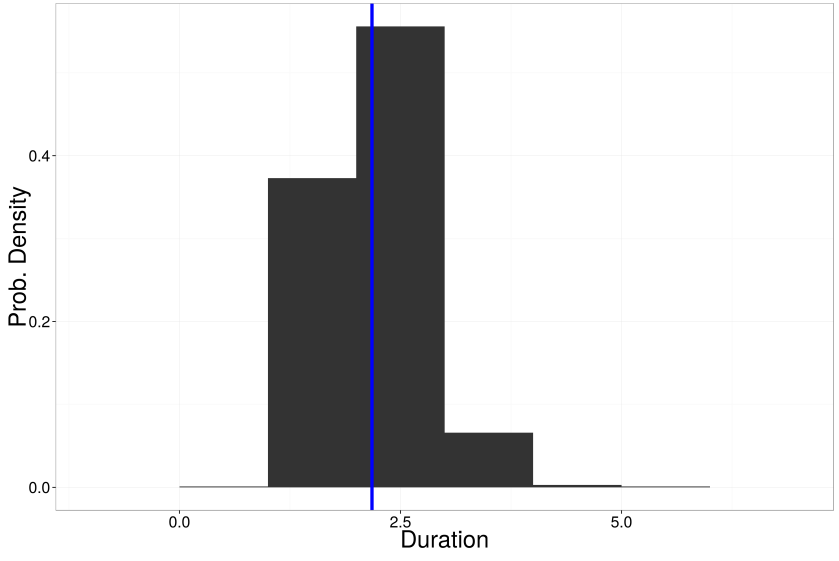


Posterior predictive checks: stnd. residuals

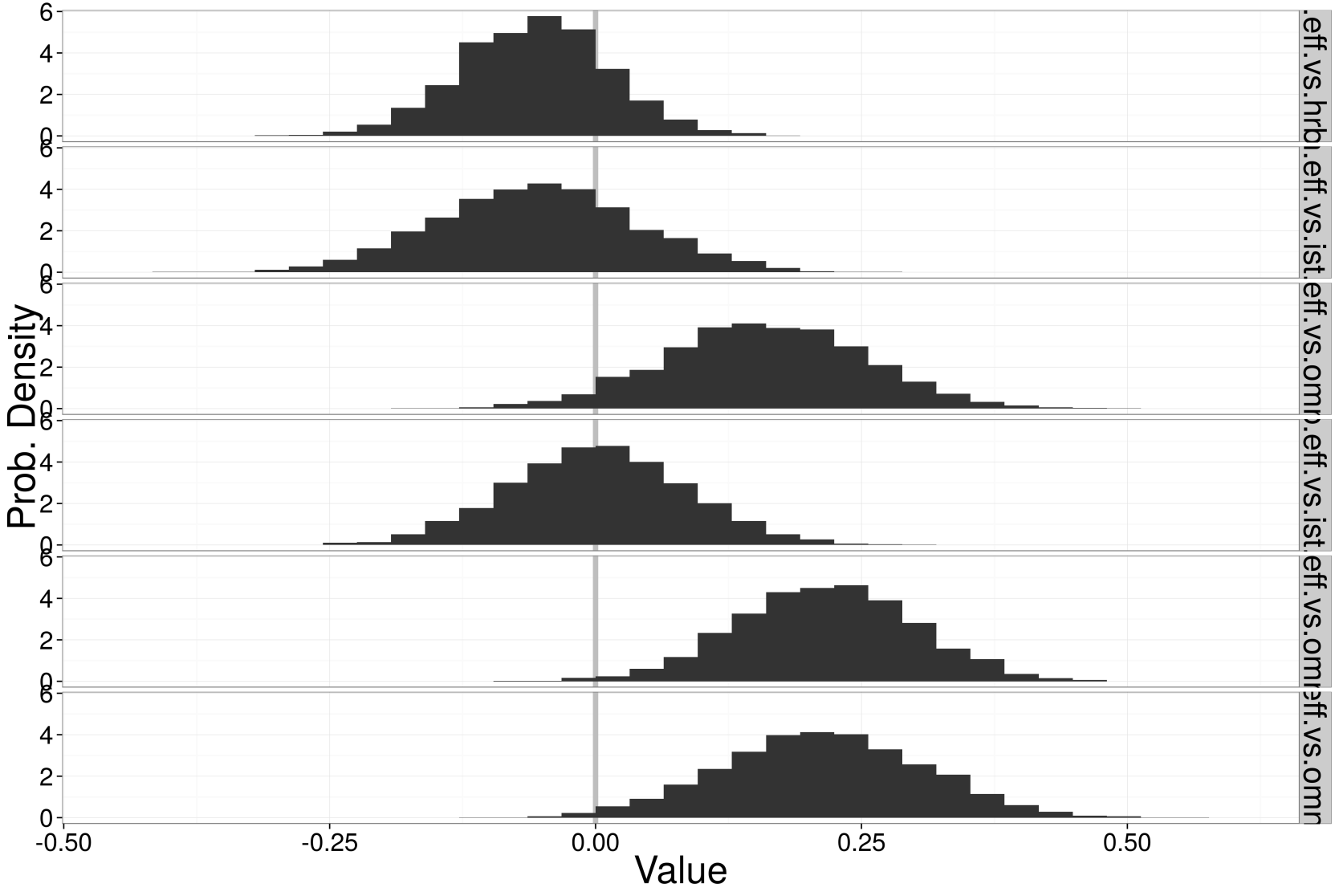


Posterior predictive checks: residuals and mean

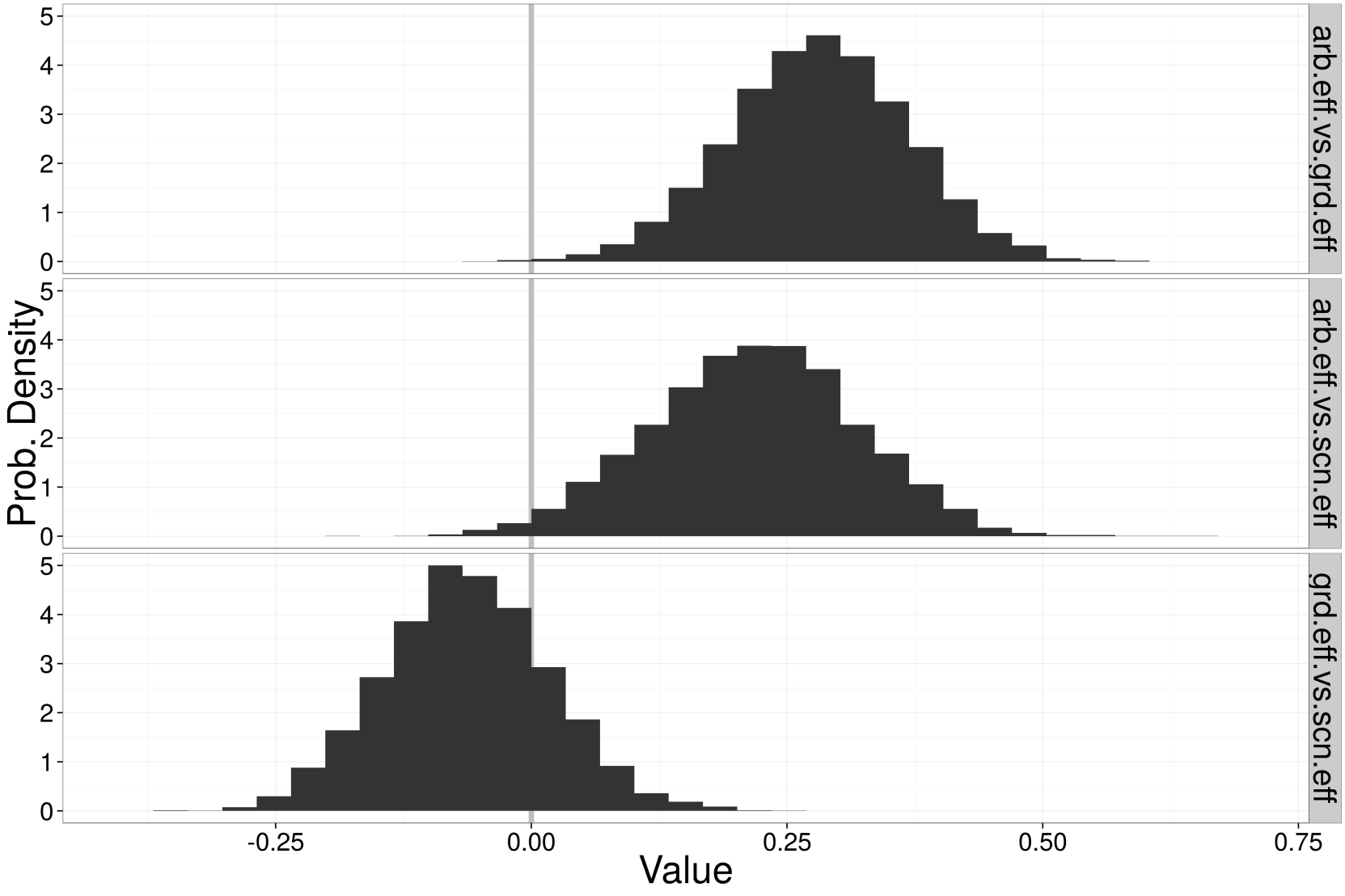




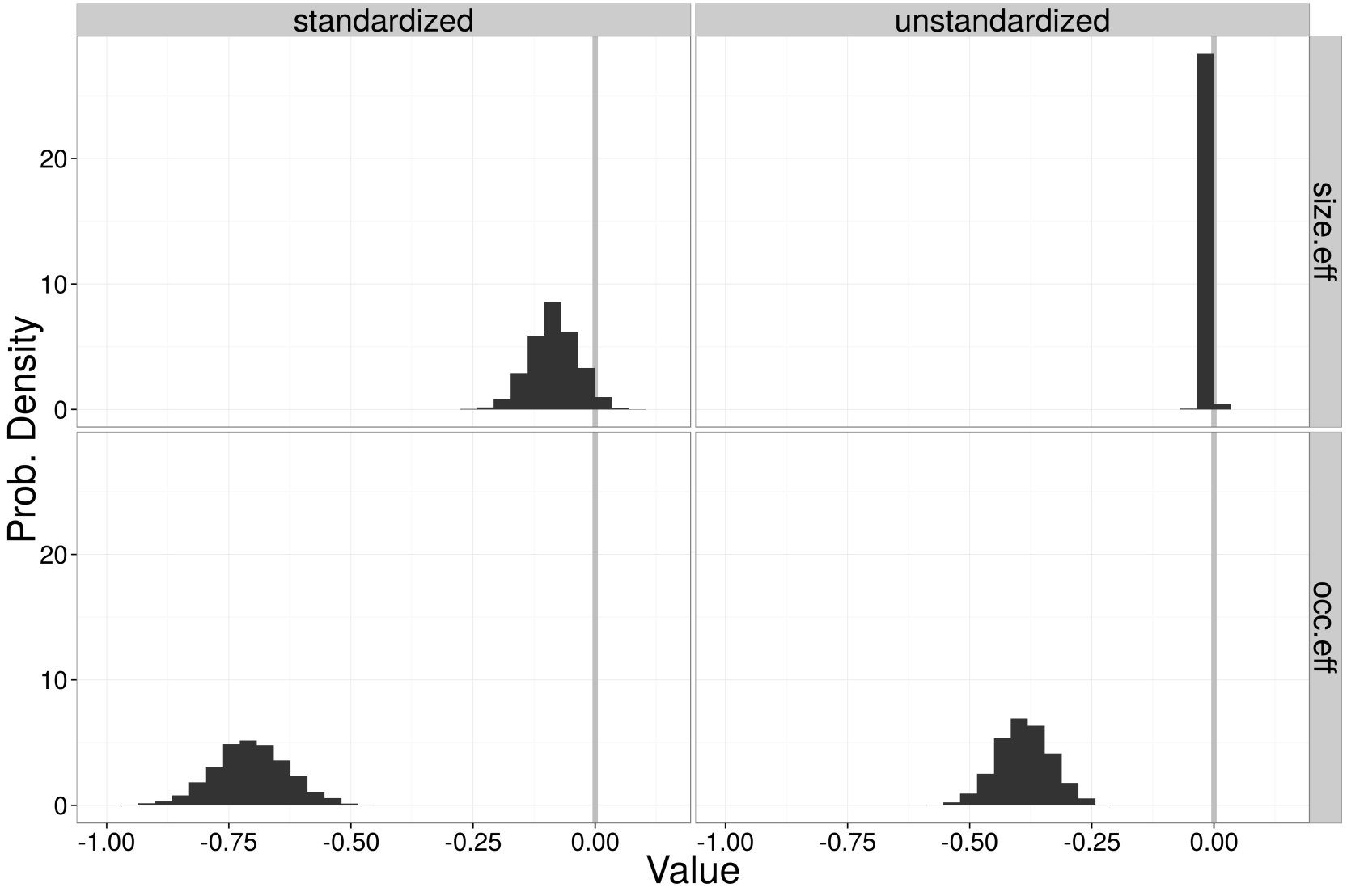
Pairwise differences of β, dietary category



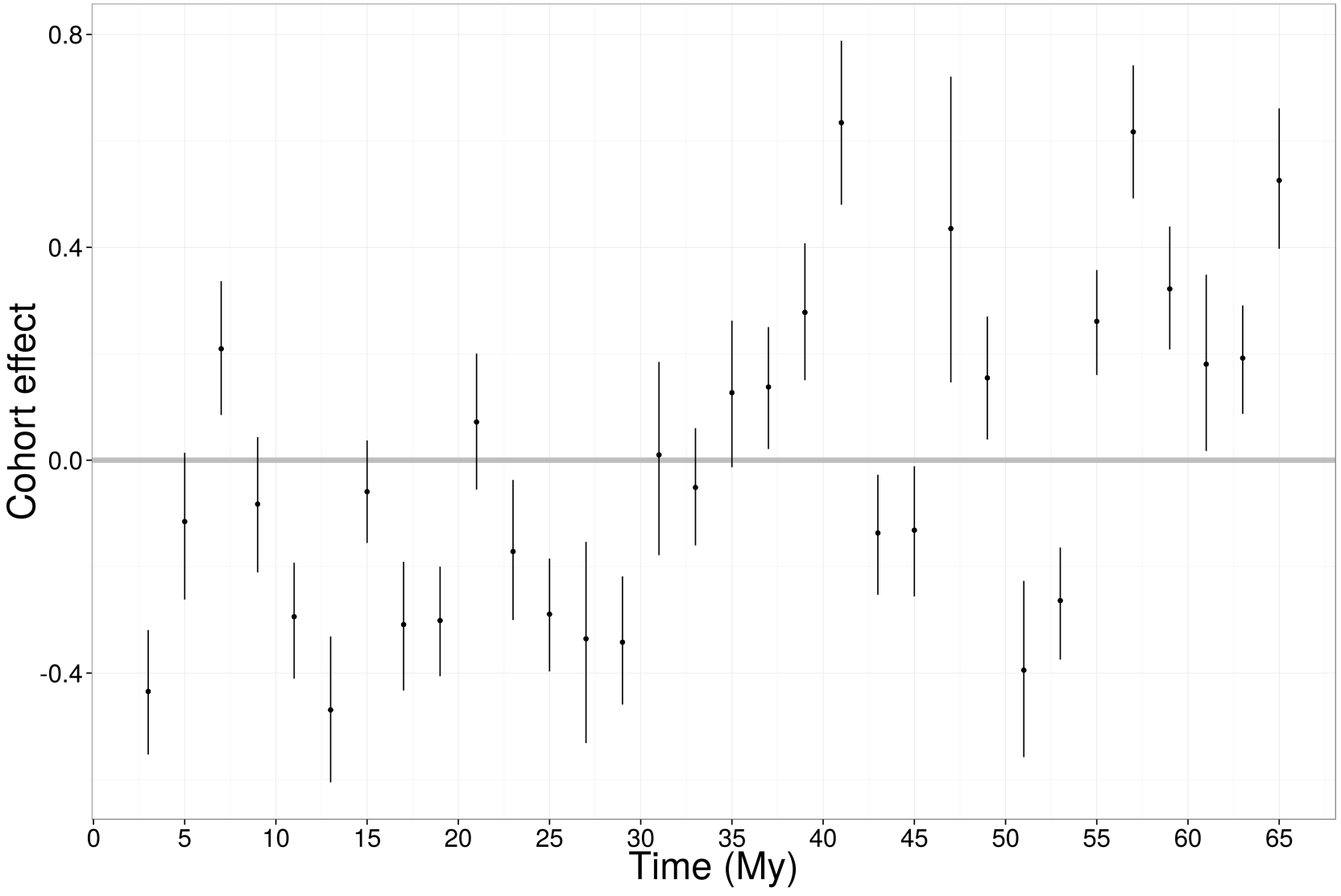
Pairwise differences of β, locomotor category



Other traits

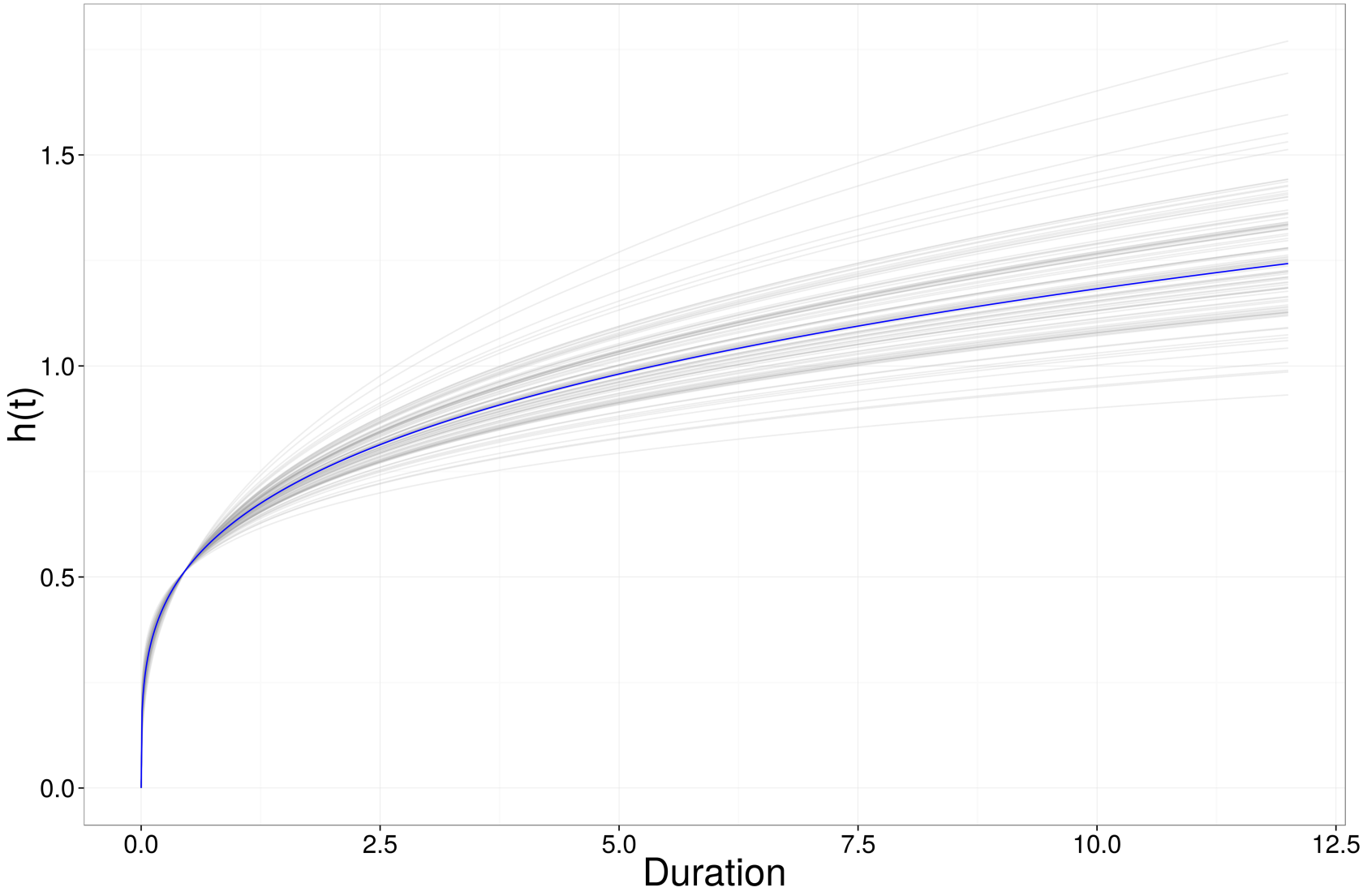


Cohort effect



Phylogenetic heritability *sensu* Lynch '91

Hazard curvature



Meaning and interpretation

- comparable probabilistic statements of trait, temporal, and historical effects
- increasing cohort survival risk over Cenozoic
- $h(t)$ not constant over t, increases
- model fits. no systematic biases in residuals. noisy.