Bayesian model averaging

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model uncertainty

kid_score ~ hs + iq + work + age

- p predictors (4)
- 2^p possible models (16)

visualizing model uncertainty

R

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> image(cog_bas, rotate = F)
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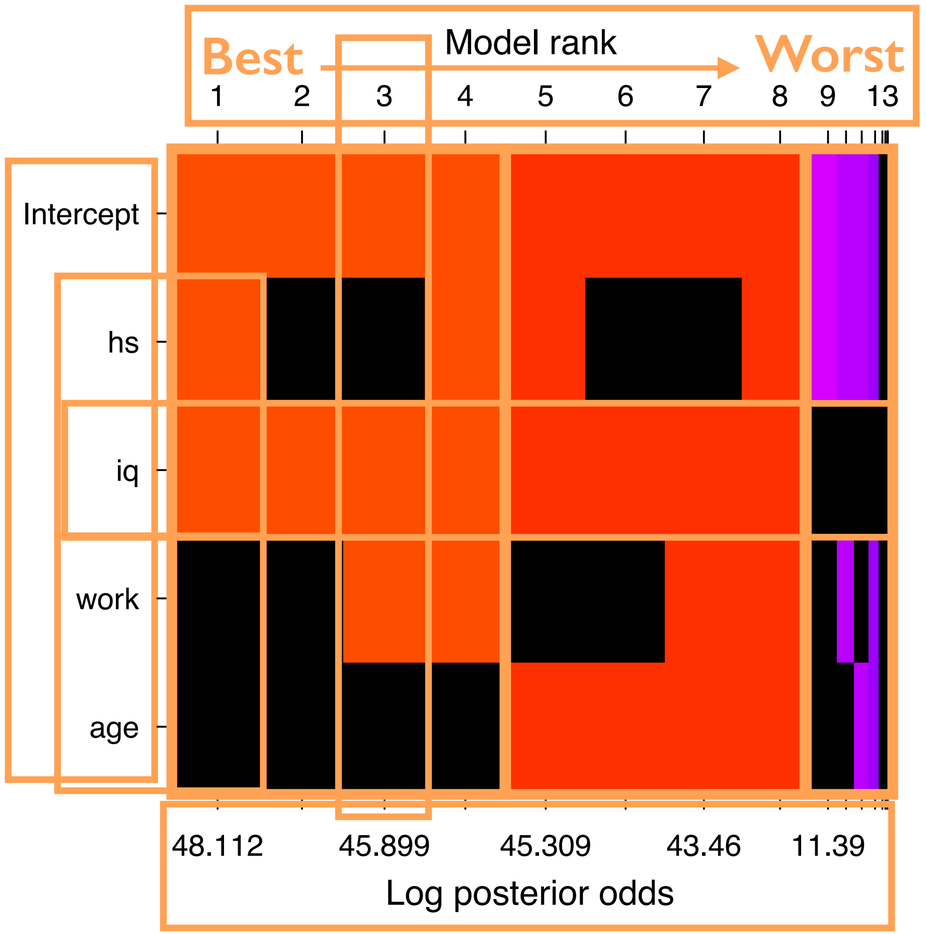

Bayesian model averaging

- let Δ be a quantity of interest

  Y^*, β_j, γ_j indicator variable j is included, $p(\beta_j \mid \mathrm{data})$

$$p(\Delta \mid \mathrm{data}) = \sum_m^{2^p} p(\Delta \mid \mathcal{M}_m, \mathrm{data}) p(\mathcal{M}_m \mid \mathrm{data})$$

$$\mathsf{E}[\Delta \mid \mathrm{data}] = \sum_m^{2^p} \mathsf{E}[\Delta \mid \mathcal{M}_m, \mathrm{data}] p(\mathcal{M}_m \mid \mathrm{data})$$

- weighted average of model specific quantities
- BMA predictions $\hat{Y}^* = \sum \hat{Y}^*_m p(\mathcal{M}_m \mid \mathrm{data})$

coefficient summaries

R

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> cog_coef

 Marginal Posterior Summaries of Coefficients:
           post mean  post SD   post p(B != 0)
Intercept  86.79724    0.87287    1.00000
hs          3.59494    3.35643    0.61064
iq          0.58101    0.06363    1.00000
work        0.36696    1.30939    0.11210
age         0.02089    0.11738    0.06898
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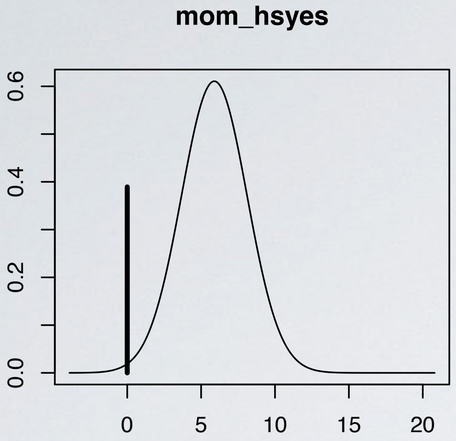
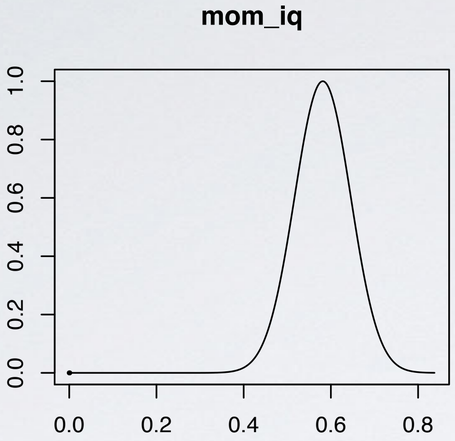
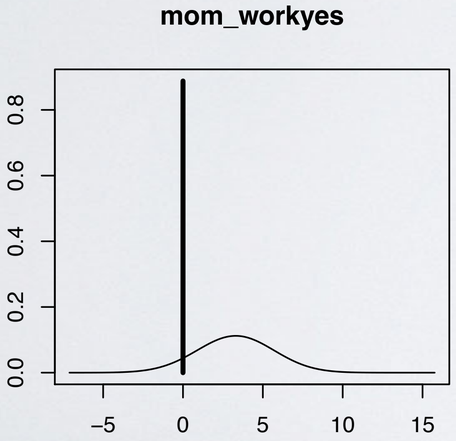
- $P(\beta_{age} = 0 \mid \text{data}) = 0.931$

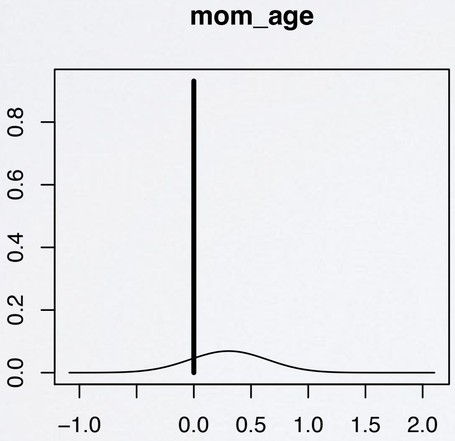
plausible values of coefficients





- spike represents probability coefficient is 0





- distribution of coefficient if it is not 0

summary

- BMA accounts for model uncertainty
- software
- use BIC and reference prior

next:

- prior sensitivity