Adjectives

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Adjectives model (and threshold variable models in general)

Inferred threshold (scalar adjectives) model

Literal Listener's probability distribution over the values X are is prior, conditioned on the utterance being true and renormalized.

$$P_{L0}(x|u,\theta) \propto \delta_{u \text{ is true}} \cdot P(x)$$

Speaker's utility is the negative cost and the log probability of the actual state of the world under the Literal Listener's posterior. This means that the more surprised the Literal Listener would be to hear the true state of the world after already hearing the utterance, the less good the utterance would be.

$$\mathbb{U}_S(u|x,\theta) = log(P_{L0}(x|u,\theta)) - cost(u)$$

The speaker then chooses an utterance by soft-maximizing their utility funciton.

$$P_S(u|x,\theta) \propto e^{\lambda \mathbb{U}_S(u|x,\theta)}$$

The pragmatic listener infers both the threshold θ and the value x conditioning on the speaker choosing the given utterance.

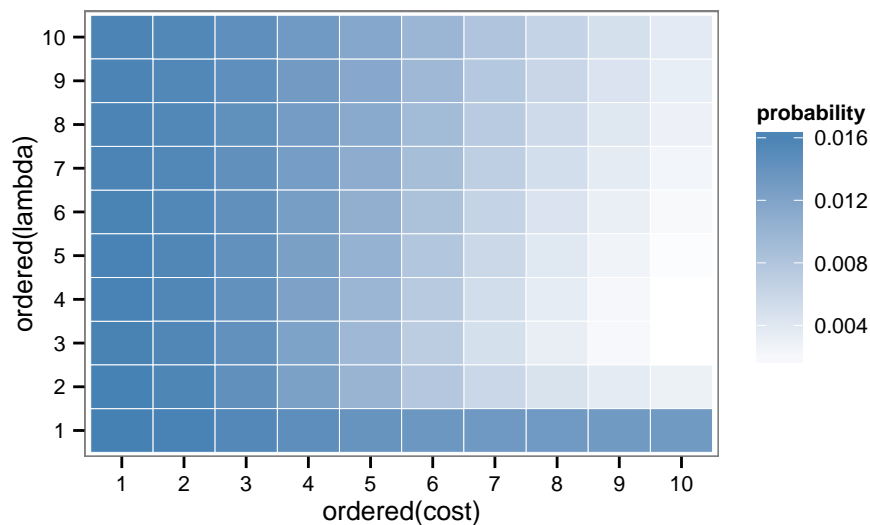$$P_{L1}(x,\theta|u) \propto P_S(u|x,\theta)P(x)P(\theta)$$

Anthea's experiments

Anthea ran experiments eliciting priors and posteriors (after hearing "many") and found the following results.
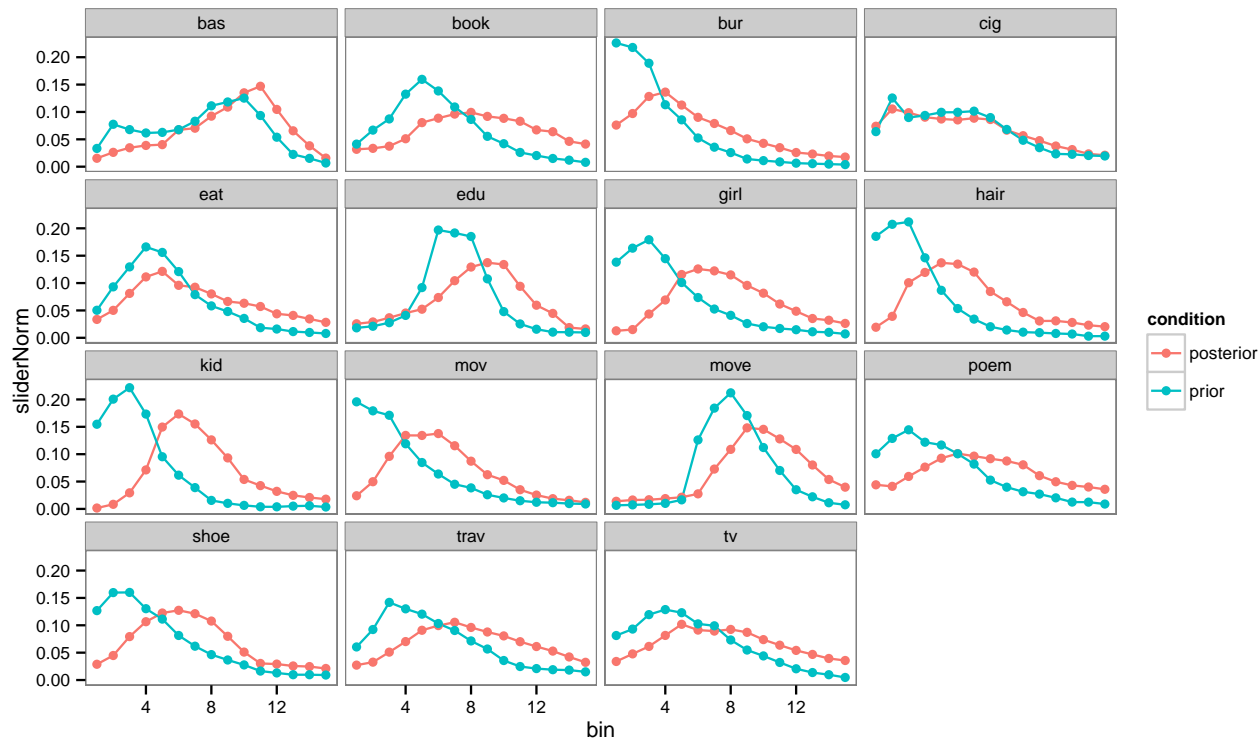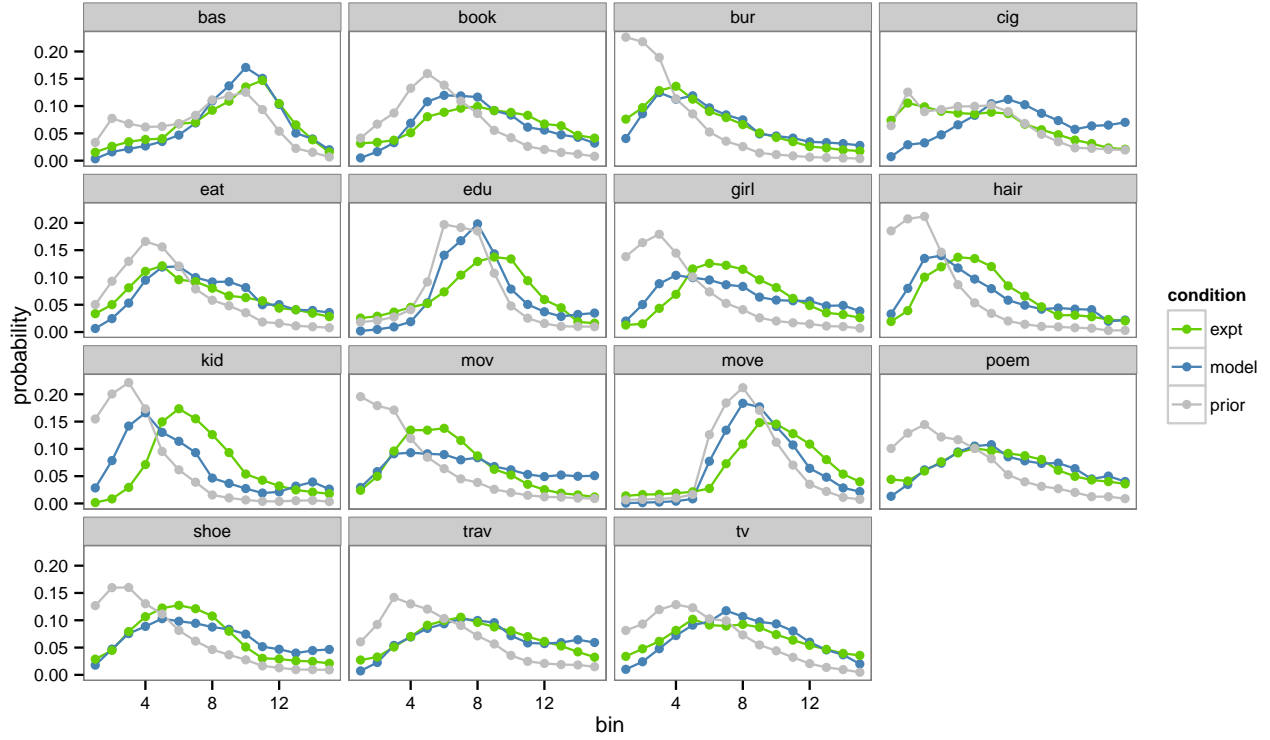

Adjectives model simulations

We fit cost C and speaker rationality parameter λ to experiment posterior data. The best parameters were $C=1$ and $\lambda=1$.

We can graph results of the model with these parameters against the data from Anthea's experiments. The average KL divergence for these parameters accross all items is 0.1047.

The model marginal distributions for the value X and the threshold θ are shown below.
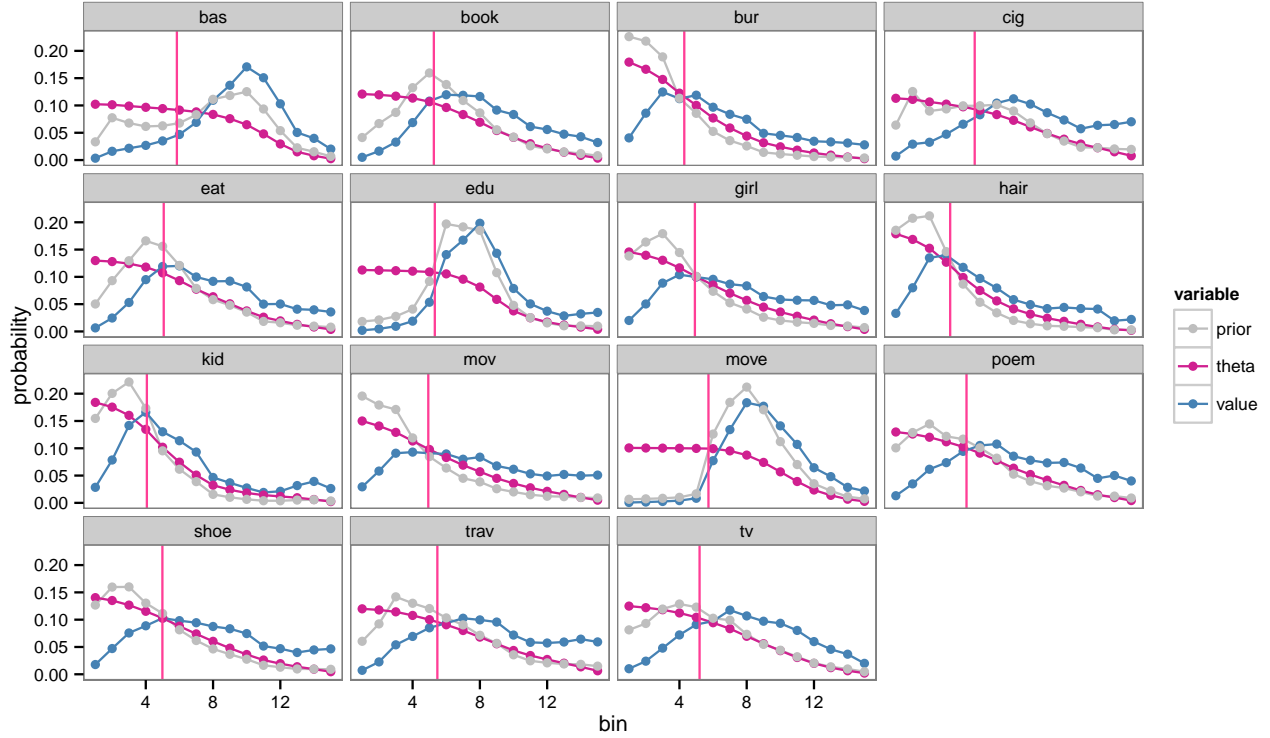

The thresholds vary depending on the distribution. The lowest is at about the 14th percentile of the prior (for *move*), and the highest is at about the 77th percentile of the prior (for *hair*).

```
##    theta_as_bin item theta_as_percentile
## 1        5.848  bas               0.3602
```

```
## 2          5.262 book          0.5237
## 3          4.288  bur          0.7707
## 4          5.690  cig          0.5410
## 5          5.067  eat          0.6030
## 6          5.320  edu          0.2626
## 7          4.918 girl          0.7184
## 8          4.232 hair          0.7708
## 9          4.064  kid          0.7561
## 10         4.932  mov          0.7439
## 11         5.726 move          0.1404
## 12         5.203 poem          0.6331
## 13         4.987 shoe          0.6868
## 14         5.471 trav          0.5937
## 15         5.197   tv          0.5658
```

We can plot our thetas against Anthea's theta ranges. (cocolab model = dots, Anthea's model = lines)
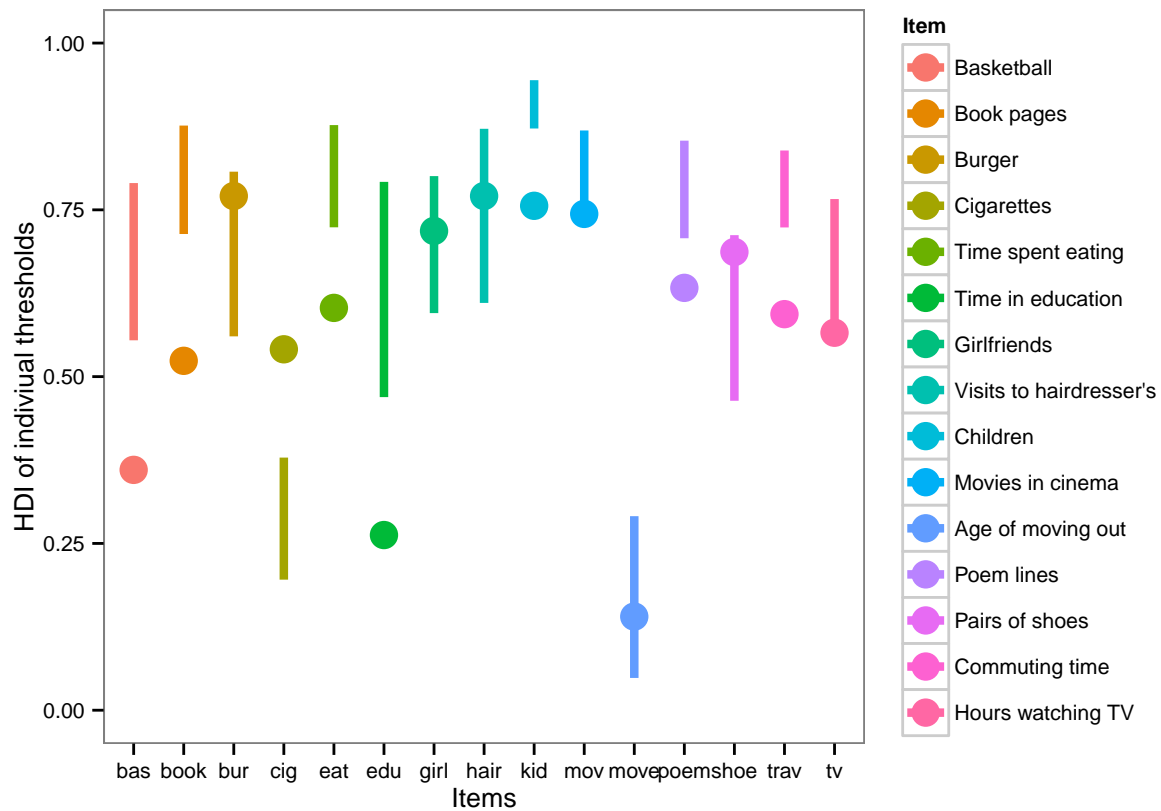
Other prior distributions to consider

Priors

Model simulations

Inferred thresholds

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