comparing two independent means

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effect of distraction on snacking

randomized study to compare snacking

- eat lunch while playing solitaire
- eat lunch without distraction

biscuit intake in grams

	ybar	s	n
solitaire	52.10	45.10	22
no distraction	27.10	26.40	22

Sources: https://pixabay.com/en/playing-cards-deck-card-games-29472/
Study reference: Oldham-Cooper, Rose E., etal."Playing a computer game during lunch affects fullness, memory for lunch, and later snack intake."The American Journal of Clinical Nutrition 93.2 (2011): 308- 313

model and priors

model

$$Y_{A,i} \overset{\text{iid}}{\sim} \mathsf{N}(\mu_A, \sigma_A^2)$$
$$Y_{B,i} \overset{\text{iid}}{\sim} \mathsf{N}(\mu_B, \sigma_B^2)$$

independent
Jeffrey's prior

$$p(\mu_A, \sigma_A^2) \propto 1/\sigma_A^2$$
$$p(\mu_B, \sigma_B^2) \propto 1/\sigma_B^2$$

independent
posterior

$$\mu_A \mid \text{data} \sim \mathsf{t}_{n_A-1}\left(\bar{Y}_A, s_A^2/n_A\right)$$
$$\mu_B \mid \text{data} \sim \mathsf{t}_{n_B-1}\left(\bar{Y}_B, s_B^2/n_B\right)$$

posterior of difference in means

- estimate of the difference between snack consumption with and without distractions

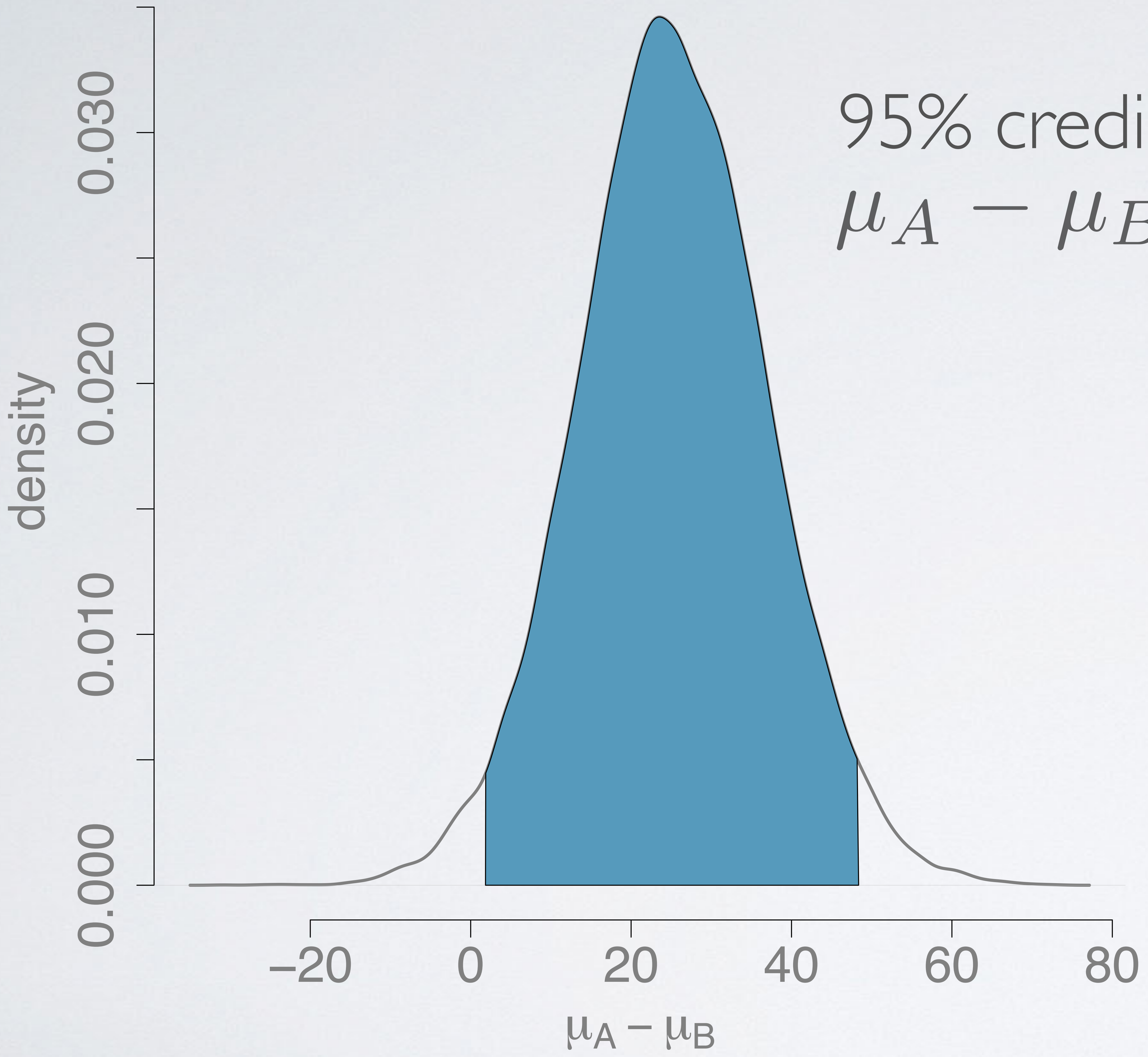
  52.1 - 27.1 = 25 g

- credible interval for difference in means
- no closed form distribution of $\mu_A - \mu_B$ given data

Monte Carlo sampling

1. simulate M realizations for μ_A from t distribution
2. simulate M realizations for μ_B from t distribution
3. calculate $\mu_A^{(m)} - \mu_B^{(m)}$ from sample m
4. summarize sample from posterior (histogram, means, quantiles, etc.)

distracted eaters example



95% credible interval for $\mu_A - \mu_B$ is (1.85, 48.37)

summary

- estimate of the difference between snack consumption with and without distractions
- independent Jeffrey's prior
- under assumptions that there is a difference $\mu_A \neq \mu_B$

next:

- evidence that $\mu_A \neq \mu_B$ via Bayes factors

Sources: https://www.flickr.com/photos/werwin15/3203171586/