comparing two independent means hypothesis testing

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question

do the data provide convincing evidence of a difference between the average post-meal snack consumption between those who eat with and without distractions?

biscuit intake in grams

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

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

question

$$H_0 : \mu_A = \mu_B = \mu$$
$$H_1 : \mu_A \neq \mu_B$$

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model and priors

- model under H_0

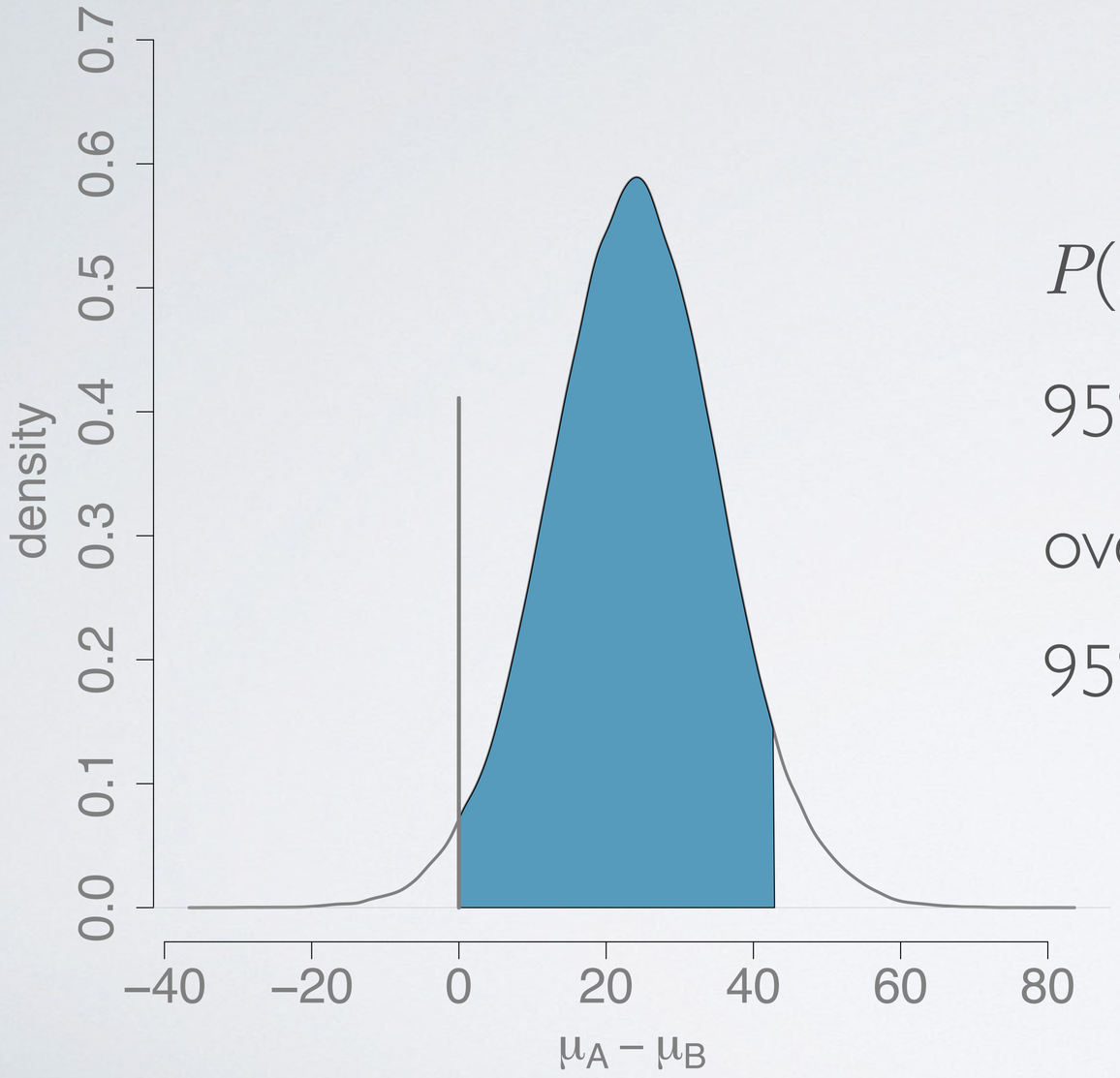
$$Y_{A,i} \overset{\text{iid}}{\sim} \mathsf{N}(\mu, \sigma^2_{A0})$$
$$Y_{B,i} \overset{\text{iid}}{\sim} \mathsf{N}(\mu, \sigma^2_{B0})$$

- model under H_1

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

- intrinsic prior for parameters
- prior probability of H_0 is 0.5
- use Markov Chain Monte Carlo (MCMC) to sample from posteriors

MCMC estimates



$P(H_0 \mid \text{data}) = 0.41$

95% CI $\mu_A - \mu_B$ is (-0.5, 45.8) (given H_1)

overall posterior mean 16.9g

95% CI $\mu_A - \mu_B$ is (-0.1, 43.2) (overall)

summary

- compared two independent means using Bayesian null hypothesis testing
- weak evidence in favor of hypothesis that distractions increase snack intake
- credible intervals under uncertainty
- MCMC and JAGS