03 One Page Summary

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Overview

You can use this one-page summary throughout the activity as a reference! You won't need it until `02 CEJST Activity`, though.

- This summarizes two points from the 03-one-pager-main.qmd document
- It does not mention two statistical paradigms, so as not to draw too much attention to Frequentist vs Bayes… yet!

General Inference

Inference is all about *cautiously* answering questions about a larger dataset while only having access to a smaller dataset. For instance, we may be interested in national trends, but may only have access to data from a handful of U.S. states.
To perform inference we must:

1. Translate our question into a mathematical form,
2. fit the model using a dataset, then
3. interpret the results in terms of our original question and testable hypothesis.

In order to accomplish (1), we must make a number of *assumptions*. Different statistical approaches use different assumptions….

The Frequentist and Bayesian approaches make very different assumptions about the nature of probability and models. One important distinction is that Frequentists make a *hard, binary decision* when performing a hypothesis test, while Bayesians only ever *quantify a degree of belief* in a hypothesis.

Frequentist	Bayesian
Deduction from Pr(data | H0), by setting α in advance	Induction from Pr(θ | data), starting with Pr(θ)

Frequentist	Bayesian
Accept H1 if Pr(data | H0) $< \alpha$	$1-\alpha$% of most likely parameter values fall within a $1-\alpha$ HPD
Accept H0 if Pr(data | H0) $\quad \alpha$	

Model Summaries

Statistical models are complex objects, so we use *model summaries* to help make sense of them. These include:

- Summaries such as (point) estimates
- Intervals, such as confidence intervals

Frequentist and Bayesian models are constructed from different assumptions, so their model summaries are quite different. Frequentist summaries are often presented as point estimates and confidence intervals. While Bayesians also present posterior estimates and intervals, they more typically study the entire posterior distribution.

Frequentist	Bayesian
Point estimates and standard errors	Descriptions of the posterior distribution such as means and quantiles
95% confidence intervals indicating that 19/20 times the interval covers the true parameter value	Highest posterior density intervals indicating region of highest posterior probability
	$1-\alpha$% of most likely parameter values fall within a $1-\alpha$ HPD

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