

1) Explanations and evidence: thinking critically about evidence and causality

Selection bias

“Randomize and intervene”

Endogeneity and confounding

Natural experiments

2) Exploring multivariate data: describing variation with pictures and simple models

Basic plots and summaries

Group means, grand mean

Regression and least squares

Coefficients, fitted values, residuals

“Taking the X-ness out of Y”

Nonlinear models: logs and polynomials

3) Predictable and unpredictable variation: partitioning sums of squares

Coverage intervals

Residual uncertainty

Naive prediction intervals

R^2 and its interpretation

4) Quantifying uncertainty: confidence in estimates and predictions

Sampling distribution

Standard errors

Confidence intervals

Frequentist coverage property

Bootstrapping

Residuals as aggregations of nudges

Normal linear regression model

Cross validation

5) Grouping variables

Aggregation paradoxes

Dummy variables

Interactions

6) Multiple regression

Statistical adjustment

Partial slopes and collinearity

7) Hypothesis testing

Setting up a Neyman-Pearson test

Permutation tests: shuffling the cards