

1 Chapter 1: Introduction

Why conduct experiments? Experiments versus observational studies. Trying to infer causation.

Treatments, units, and assignment method specify the experimental design. Terms and concepts. Experimental versus measurement (observational) units. Primary responses versus other responses.

2 Chapter 2: Randomization and Design

In a true experiment we randomize treatments to experimental units. Note the distinction between randomized assignment and haphazard assignment! We primarily think of randomization in an experiment as a way to protect against confounding, but randomization is useful in other stages of research studies. Design for known problems, randomize everything else.

2.1 Performing a randomization, the randomization approach to inference

The text discusses the distinction between physical and numerical randomization. Numerical randomization uses pseudo-random numbers. The remaining part of the chapter (section 2.4) presents an approach to inference that is based only on the randomization of treatments to experimental units, and does not make the standard normal-theory assumptions. It is very useful to understand this approach to inference, but in this course we will rely on (and check the validity of) the normal-theory approach to inference for our data analyses.

3 References

Casella, G. 2008. *Statistical Design*, Springer.

Kuehl, R.O. 2000. *Statistical Principles of Research Design and Analysis* (second edition), Duxbury Press.

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Oehlert, G.W. 2000. *A First Course in Design and Analysis of Experiments*, W.H. Freeman. (now out of print, but available for free under Creative Commons license at Prof. Oehlert's website at the University of Minnesota)