

## CHAPTER OVERVIEW

### 5: Foundations for inference

Chapter by Matthew Crump

*Data and data sets are not objective; they are creations of human design. We give numbers their voice, draw inferences from them, and define their meaning through our interpretations.*

—Katie Crawford

So far we have been talking about describing data and looking possible relationships between things we measure. We began by talking about the problem of having too many numbers. So, we discussed how we could summarize big piles of numbers with descriptive statistics, and by looking at the data with graphs. We also looked at the idea of relationships between things. If one thing causes another thing, then if we measure how one thing goes up and down, we should find that other thing goes up and down, or does something at least systematically following the first thing. At the end of the chapter on correlation, we showed how correlations, which imply a relationship between two things, are very difficult to interpret. Why? because an observed correlation can be caused by a hidden third variable, or simply be a spurious findings “caused” by random chance. In the last chapter, we talked about sampling from distributions, and we saw how samples can be different because of random error introduced by the sampling process.

Now we begin our journey into **inferential statistics**. The tools we use to make inferences about where our data came from, and more importantly make inferences about what causes what. In this chapter we provide some foundational ideas. We will stay mostly at a conceptual level, and use lots of simulations like we did in the last chapters. In the remaining chapters we formalize the intuitions built here to explain how some common inferential statistics work.

[5.1: Brief review of Experiments](#)

[5.2: The data came from a distribution](#)

[5.3: Is there a difference?](#)

[5.4: Chance makes some differences more likely than others](#)

[5.5: The Crump Test](#)

[5.6: The randomization test \(permutation test\)](#)

[5.7: Videos](#)

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