

CHAPTER OVERVIEW

Chapter 6: Modelling Variations

Learning Objectives

After reading this chapter, you should be able to:

- describe the basic equation for statistical models ($\text{data} = \text{model} + \text{error}$)
- distinguish between a population and a sample, and between population parameters and sample statistics
- describe the concepts of sampling error and sampling distribution
- describe how the Central Limit Theorem determines the nature of the sampling distribution of the mean.

In this chapter, we will delve into big ideas in statistics—**Modelling, Uncertainty and Sampling from Population**. As mentioned in Chapter 1, one of the fundamental activities in statistics is creating models that can summarise data using a small set of numbers, thus providing a compact description of the data.

Another foundational idea in statistics is that we can make **inferences** about an entire population based on a relatively small sample of individuals from that population. In this chapter, we will introduce the concept of statistical sampling and discuss why it works. As Charles Wheelan, the author of *Naked Statistics* aptly describes the process of inference as using *data from the “known world” to make informed inferences about the “unknown world.”* There will always be uncertainties in our data and this could be due to the fact that we usually sample from a population. Therefore, to understand how we can use statistics to make these inferences, we will also talk about sampling, the central limit theory and null hypothesis testing.

[6.1: A Simple Model](#)

[6.2: Statistical Modelling Using a Single Number](#)

[6.3: Sampling and Sampling Error](#)

[6.4: The Central Limit Theorem](#)

[6.5: Null Hypothesis Testing](#)

[6.6: Quantifying Effects](#)

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