

Statistical Thinking for the 21st Century

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Chapter 1

Introduction

“Statistical thinking will one day be as necessary for efficient citizenship as the ability to read and write.” - H.G. Wells

1.1 What is statistical thinking?

Statistical thinking is a way of understanding a complex world by describing it in relatively simple terms that nonetheless capture essential aspects of its structure, and that also **provide us some idea of how uncertain we are about our knowledge.** The foundations of statistical thinking come primarily from mathematics and statistics, but also from computer science, psychology, and other fields of study.

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We can distinguish statistical thinking from other forms of thinking that are less likely to describe the world accurately. In particular, human intuition often tries to answer the same questions that we can answer using statistical thinking, but often gets the answer wrong. For example, in recent years most Americans have reported that they think that violent crime was worse compared to the previous year (Pew Research Center). However, a statistical analysis of the actual crime data shows that in fact violent crime has steadily *decreased* since the 1990's. Intuition fails us because we rely upon best guesses (which psychologists refer to as *heuristics*) that can often get it wrong. For example, humans often judge the prevalence of some event (like violent crime)

using an *availability heuristic* – that is, how easily can we think of an example of violent crime. For this reason, our judgments of increasing crime rates may be more reflective of increasing news coverage, in spite of an actual decrease in the rate of crime. Statistical thinking provides us with the tools to more accurately understand the world and overcome the fallibility of human intuition.

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