Introduction to Statistical Thinking

Felipe José Bravo Márquez

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- Statistical thinking is a systematic way of thinking about how we describe the **world** and use **data** make decisions and predictions.
- Taking into account the inherent **uncertainty** that exists in the real world. [Poldrack, 2019]
- The foundations of statistical thinking come primarily from mathematics and statistics, but also from computer science, psychology, and other fields of study. [Poldrack, 2019]
- **Statistics**, in particular, is the discipline that concerns the collection, organization, analysis, interpretation, and presentation of data [**?**].

Statistical Thinking and Intuition

- 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. [Poldrack, 2019]

What can statistics do for us?

There are three major things that we can do with statistics:

- **Describe**: The world is complex and we often need to describe it in a simplified way that we can understand.
- **Decide**: We often need to make decisions based on data, usually in the face of uncertainty.
- **Predict**: We often wish to make predictions about new situations based on our knowledge of previous situations.

Poldrack, R. A. (2019).
Statistical Thinking for the 21st Century.