Instructor’s Introduction to Statistics

The information we gather with experiments and with surveys is collectively called data.

Statistics is the art and science of designing studies and analyzing the data that those studies produce. Its ultimate goal is translating data into knowledge and understanding of the world around us. In short, statistics is the art and science of learning from data.

Why study statistics?

According to Mark Twain (1835-1910, Samuel Clemens), who incorrectly attributed the quote to British Prime Minister Benjamin Disraeli (1804-1881): “There are three kinds of lies: lies, damned lies, and statistics.”


1. 1990 August 2: Iraq, under the Presidency of Saddam Hussein, invaded Kuwait.

2. 1990 August 6: Economic sanctions were imposed on Iraq.

3. 1991 January 17: The United States invaded Iraq, officially beginning the Gulf War.


5. 1995: United Nations Food and Agriculture Organization AND Iraq’s Ministry of Agriculture and Nutrition Research Institute (FAO-NRI) interviewed
1. war, two uprisings, and mass migration

2. fear

3. extrapolation

4. Iraqi regime

Example: Autism vs. Vaccines. In 1998 Dr. Andrew Wakefield published in Lancet his belief that the MMR (measles, mumps, and rubella) vaccine causes
autism. Jenny McCarthy (a celebrity) for years publicly claimed that the MMR vaccine caused autism in her son.

Example: The Freshman Fifteen. TRUE or FALSE: The average weight gain of college students during their freshman year is 15 pounds.

Where else are statistics used in the real world?

Example: In World War II, Japan attacked Midway (North Pacific Ocean) on June 4, 1942.

Example: Satellite imagery.

Example: Drug development, approval, and safety.

Example: Assessing disease risk. Based on history, environment or behavior, how great is the risk for an individual for cancer, heart attack or stroke?

Example: Health policy - track the nation’s health care system.

Example: Economic productivity - monitor trade deficit, gross national product, consumer price index, and unemployment rate; software / web development; test marketing.

Example: Environmental monitoring - pollution regulation vs. environmental health, climate change, monitor natural resources.

Example: Energy policy - track energy production and consumption, energy efficiency, projecting future energy supply and demand, model effects of policy interventions.
Example: Sports and gambling? MOSTLY JUST ENTERTAINMENT.

Statistics consists of

- **Design:** Planning how to obtain data to answer the questions of interest.

- **Description:** Summarizing the data that are obtained via graphs and numbers (such as averages and percentages).

- **Inference:** Making decisions and predictions about a population based on the data. Hence, the population is unknown, but a sample is known.

Example of inferential statistics:

In this course we study both *statistics* and *probability.*

Regarding probability, the population is assumed known, and statements are made regarding the likelihood of obtaining certain data values.

Example of probability:

Random sampling implies that data are selected for the sample at random from the population.
Homework: Know all of these above examples.