

Unit 1: Introduction

Statistics 571: Statistical Methods
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5/25/2004

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What is Statistics?

- **Statistics**
 - Science of collecting and analyzing data for the purpose of drawing conclusions and making decisions
 - Provides data collection methods to reduce biases, and analysis methods to identify patterns and draw inference from noisy data
- **Statistical tasks**
 - Collecting data
 - Summarizing and exploring data
 - Drawing conclusions and making decisions based on data

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Statistical Concepts and Terms

- Observational studies such as surveys
- Experimental studies
- Descriptive statistics or exploratory data analysis
 - Summarizes data
- Inferential statistics or confirmatory data analysis
 - Fitting models to data
 - Drawing conclusions and making decisions
- A *population* is a collection of all units of interest
- A *sample* is a subset of a population that is actually observed
- A *variable* is a measurable property or attribute associated with each unit of a population

Statistical Concepts and Terms

- A *parameter* is a numerical characteristic of a population defined for each variable of interest
- A *statistic* is a numerical characteristic of a sample defined for each variable of interest
- Statistics are used to infer the values of parameters
- A *random sample* gives an equal chance to every groups of unit of the population to enter the sample
 - One form of unbiased sample
- In probability we assume that the population and its parameters are known and compute the probability of drawing a particular sample
- In statistics we assume that population parameters are unknown and use a sample to infer their value

Statistical Concepts and Terms

- Different samples give different estimates of population parameters (called *sampling variability*)
- Sampling variability leads to sampling error
- One goal of statistic is to quantify sampling error
- Probability is deductive
- Statistics is inductive

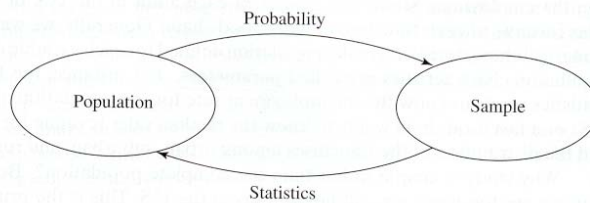


Figure 1.1 Relationship between Probability and Statistics*