

Math 161 Lecture 1

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Lecture 1

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Course Overview

What is Statistics?

- **Statistics**: a mathematical science pertaining to the collection, analysis, interpretation or explanation, and presentation of data (Wikipedia).
- **René Descartes (1596-1650)**: “It is a truth very certain that, when it is not in our power to determine what is true, we ought to follow what is most probable.”
- **Our text**: The science (some say ‘art’) of data.

The General Idea of Statistics

- **General Idea**: Gather data from part of some population, then use that data to draw conclusions about the entire population.
- **Examples**:
 - Take a opinion survey
 - Look at existing data and try to identify trends
 - Do a medical or drug experiment
- **Caution 1**: Take care when gathering data: sloppy data collection can yield poor results.
- **Caution 2**: Results reported by ‘studies’ or the media can be (sometimes intentionally) misleading. Don’t believe everything you hear or read.

Statistics in Action: Polling

- 77% of Americans believe there is solid evidence that the earth is warming.
- Based on a survey of 1708 randomly selected adults aged 18 and older
- The survey is accurate to within 3% nineteen times out of twenty.
- Source: The Pew Research Center for the People and the Press.

- Italian researchers examined the relationship between alcohol consumption and long-term survival in 1,536 men aged 45-65. The results show that about two (2) years of life are gained by moderate drinkers (1-4 drinks per day) in comparison with occasional and heavy drinkers.
- Drinking in moderation, exercising, and not smoking were all found to be associated with greater life expectancy.
- Source: Alcohol Problems and Solutions, citing the paper by Farchi, G., et al. *Alcohol and survival in the Italian rural cohorts of the Seven Countries Study*. International Journal of Epidemiology, 2000, 29, 667-671.

Course Overview

- Part I: Producing Data (Very little math)
- Part II: Organizing Data (Some graphing and math)
- Part III: Chance (or Probability: a bit more math)
- Part IV: Inference (the most math, but not too much)

A Few Comments . . .

- The Text: Statistics Concepts and Controversies
- Easy reading, so READ IT! Reading assigned weekly (one to two chapters per week).
- American book, so many examples focused on American political and social issues
- Some sensitive issues: sex, race, religion, body image, political views, smoking, drinking, . . . As (social) scientists, our goal is to assess data and draw conclusions

Chapter 1: Where Do Data Come From?

Some terminology

- **Individuals:** The objects described by a set of data
- **Population:** The entire group of individuals of interest
- **Sample:** The portion of the population from which we collect information and attempt to draw conclusions about the entire population

For example,

Some Examples

Population	Individuals	Sample
All full-time Malaspina students	people	1000 randomly selected students
All cars registered in BC	cars	cars arriving at the ferry terminal on Sept 1
All houses in the Nanaimo Regional District	houses	houses with phone numbers beginning with 758

Variables and Responses

- **Variable**: characteristic of an individual.
- **Response** of a variable: records the outcome of that variable in a study or experiment.
- For example,

Individual	Variable	Response
person	height	height (in cm)
car	colour	red, black or other
house	price	above or below \$300 000

How do we collect data?

- **Observational Studies**: observe individuals and record variables without attempts to influence response.
- **Sample Surveys**: observational study in which a representative sample is used to reach conclusions about the entire population.
- **Census**: sample survey which *attempts* to include the entire population
- **Experiment**: impose a treatment on individuals to observe their responses

Examples

- **Observational Study (Sample Survey)**: 77% of Americans believe there is solid evidence that the earth is warming (based on a survey of 1708 randomly selected adults aged 18 and older.)
- **Census**: Canadian census of population conducted every five years (1996, 2001, 2006). See <http://www12.statcan.ca/english/census/index.cfm>
- **Experiment**: 67 people with hip pain are randomly divided into two groups: the first group receives acupuncture while patients in second group have needles placed in random locations. Question posed to patients of each group: did hip pain reduce?