

MAT102 Introduction to Statistics

- Class Ground Rules
- Calculator Req'd TI-83 or TI-83 Plus or TI-84
- Text: An Introduction to Statistics, 9th Ed
by DeSanto, Totoro and Moscatelli

Answers to odd numbered
problems p 757

Appendices:

A: Databases p 792

B: Formulas p 797

C: Summary of Tests p 803

D: Stat Tables p 805

Index: p 811

MAT102 Introduction to Statistics

- * There are three kinds of lies: lies, damned lies and statistics.
- Twain attributed this to Benjamin Disraeli
- * It has long recognized by public men of all kinds ... that statistics come under the head of lying, and that no lie is so false or inconclusive as that which is based on statistics.
- Hillair Belloc
- * Figures don't lie, but liars figure.
- Samuel Clemens (alias Mark Twain)
- * If your experiment needs statistics, you ought to have done a better experiment
- Ernest Rutherford

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Some samples have a built-in "bias"
(bias: an unreasoned distortion of judgment)

**Average Yale Graduate: Class of 1980
makes \$250,000/year**

- Average may be influenced by outliers
- Sample is from addresses that are KNOWN.
- Honesty Issue

Sources of Bias

Literary Digest Magazine phone survey

Asking people at a railroad station.

Unequal Representation. Does every name
or thing have proportional representation?

Use Stratified sampling.

Try to get people from various groups.

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**USERS REPORT 23% FEWER
CAVITIES WITH OUR
TOOTHPASTE**

**"UNIVERSITY STUDIES
PROVE THAT..."**

**OUR STUFF KILLED GOLD
GERMS IN 11 SECONDS**

**CLINICAL STUDY
DEMONSTRATED AVERAGE
WEIGHT LOSS OF FIFTEEN
POUNDS OVER AN EIGHT-
WEEK PERIOD.**

Graphs Can Reveal Patterns

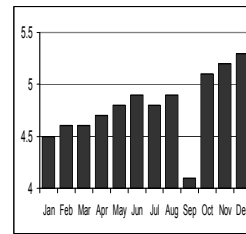
Deaths from Cholera
London Sept 1854



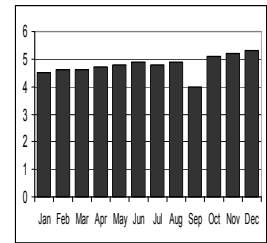
Dot map of Dr John Snow plotting Deaths from Cholera in Sept 1854

Graphs Can Be Misleading

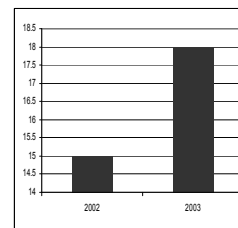
UNEMPLOYMENT RATE



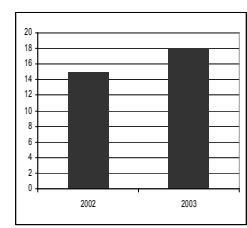
UNEMPLOYMENT RATE



MAGAZINE CIRCULATION (Thousands)

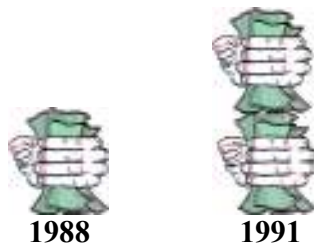


MAGAZINE CIRCULATION (Thousands)

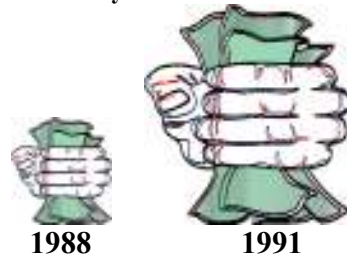


Misleading Graphs

Baseball Players' Salaries Double



Baseball Players' Salaries Double



Some Problems with Surveys

Non-random sample

- (Dewey-Truman election)
- (Survey the first 50 students who enter a building on a certain day.)

Data entry errors

Biased wording

- (Should the U.S....
- forbid public speeches against...
- allow public speeches against...)

Poorly worded questions

- (How many hours do you study?)

Order of the questions

- (1. Should a criminal face additional charges if his victim becomes pregnant?)
- (2. Should abortions be legal under any, all or only certain circumstances?)

Things We Know.

- Sugar makes kids hyperactive.

False. In at least 12 double- blinded, randomized, controlled trials none could detect any behavior differences from sugar. In studies in which parents think their children have consumed sugar, parents rate their children's behavior as more hyperactive, even if no sugar was consumed.

From Skeptical Inquirer Vol 33 No. 1 pp 8-9

Things We Know.

- Sugar makes kids hyperactive.

False.

- Suicides increase over the holidays.

False. No scientific evidence show a holiday peak in suicides. Suicides are actually more common during warm and sunny times of the year.

From Skeptical Inquirer Vol 33 No. 1 pp 8-9

Things We Know.

- Sugar makes kids hyperactive.

False.

- Suicides increase over the holidays.

False.

- Poinsettias are toxic.

False. The largest study of poinsettia "toxicity" to date involved an analysis of 849,575 plant exposures reported to the American Association of Poison Control Centers. None of the 22,793 poinsettia cases revealed significant poisoning.

From Skeptical Inquirer Vol 33 No. 1 pp 8-9

Things We Know.

- Sugar makes kids hyperactive.

False.

- Suicides increase over the holidays.

False.

- Poinsettias are toxic.

False.

- You lose most of your body heat through your head.

False. Probably from an old military study in which scientists put subjects in arctic survival suits without hats and measured their heat loss in cold temperatures. They did lose the most heat through their heads but only because it was the only bare part of their bodies. Had they worn only they would not have lost more than 10 percent of their body heat through their heads.

From Skeptical Inquirer Vol 33 No. 1 pp 8-9

Things We Know.

- Sugar makes kids hyperactive.
False.
- Suicides increase over the holidays.
False.
- Poinsettias are toxic.
False.
- You lose most of your body heat through your head.
False.
- Eating at night makes you fat.
False. Eating more meals and taking in more calories makes you gain weight regardless of when the calories are consumed. The bottom line is that the time of day or night when one eats is irrelevant.

From Skeptical Inquirer Vol 33 No. 1 pp 8-9

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Things We Know.

- Sugar makes kids hyperactive.
False.
- Suicides increase over the holidays.
False.
- Poinsettias are toxic.
False.
- You lose most of your body heat through your head.
False.
- Eating at night makes you fat.
False.
- You can cure a hangover with...
False. There is no scientific evidence supporting any cure for alcohol hangovers. A hangover is caused by excessive alcohol consumption.

From Skeptical Inquirer Vol 33 No. 1 pp 8-9

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Chapter 1: Introduction

Statistics

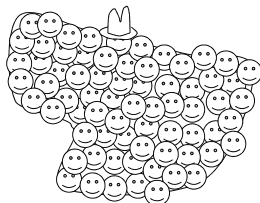
The collection, analysis and interpretation of data

Population

The total collection of individuals or objects under consideration

Parameter

A number that describes a characteristic of a population



Population
(parameters)

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Chapter 1: Introduction

Sample

The portion of the population selected for study

Statistic

A number that describes a characteristic of a sample

Descriptive Statistics

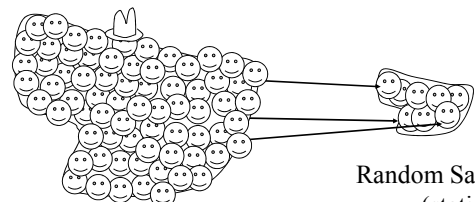
The use of numerical and/or visual techniques to summarize data

Inferential Statistic

Draws a conclusion about the population from the sample

Representative Sample

A sample that has the pertinent characteristics of the population in the same proportion as the population



Population
(parameters)

Random Sample
(statistics)

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