



Learning Objectives

- Understand that central tendency is about "middleness"
- Be able to define, discuss, and compute mean, median, and mode
- Understand the properties and advantages and disadvantages of each measure
- Appreciate the "slippery" nature of statistics
- Make friends with BIG SIGMA!



Wanted: Contemplation

THREE POLITICIANS RUNNING FOR OFFICE

Candidate Trump says "Prosperity" - Average Income: \$45,000+

Candidate Cruz says "Trouble" - Median Income: \$35,000

Candidate Clinton says "Big Trouble" - Modal Income: \$25,000



Which measure of central tendency should we trust? Why?



KHAN Academy



Google

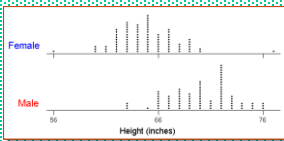
Measures of Central Tendency

- One of two major summary measures
 - “Middleness” (central tendency)
 - “Scatter” (spread or variability)
- Summary statistics used to describe a distribution



The Mode, Mo

- Most frequent score
- **What is the mode in our distribution?**
- Why is the mode is least stable measure of central tendency?
- What does it mean when we have a multi-modal distribution?





“There are three kinds of lies: lies, damned lies, and statistics.”

– Benjamin Disraeli

The Median, Md

- 50th percentile - middle score in a sequentially ordered array
- When odd number of scores
 - Md = middle score
- When even number of scores
 - Md = average two middle scores
- What is the median for our data?



IT'S STATISTICALLY IMPOSSIBLE!



The Mean as Balancing Point

- Equal deviation above AND below the mean
 - What is always the answer to the following equation?

$$\sum (X - M) =$$

X	M	X - M



$$\sum (X - M) =$$



The Mean or Average

- Mean = X-bar or M or \bar{X}
- Unbiased estimate of population average

$$\bar{X} = \frac{\sum X}{N}$$





Wanted: Contemplation

What does it mean to be an average American guy?

- Height?
- Weight?
- Waist?
- Pounds of bananas eaten per year?
- Potato chips? Beef? Ice cream?
- Average hours of sleep per night?



Some of Our Best Stories Are Told With Averages

- The “average” American male is 31 years old, 5’ 9 ½” tall, weighs 172 lbs, wears a size 40 suit, wears a 9 ½ shoe, and has a 34 inch waist.
- Each year he eats 12.3 lbs of pasta, 26 lbs of bananas, 4 lbs of potato chips, 18 lbs of ice cream, and 79 lbs of beef.
- He ends the day with 7.7 hours of sleep.
- The next day begins with a 21-minute commute to a job at which he will work for 6.1 hours.




When to Use

- **Mode:** quick snapshot; unimodal; normal curve; nominal data
- **Median:** missing data; skewed distribution
 Ex: 5, 5, 5, 5, 35
 Mean = $55/5 = 11$ **Md = 5**
- **Mean:** normal distribution; when inferring from sample to pop.

The secret of statistics?

- The data, when tortured long enough...will eventually confess.



OMITTED SLIDES



Worst social statistics ever?

- “Every year since 1950, the number of American children gunned down has doubled.”
 - Is this really true or could it just be the worst social statistic ever published?