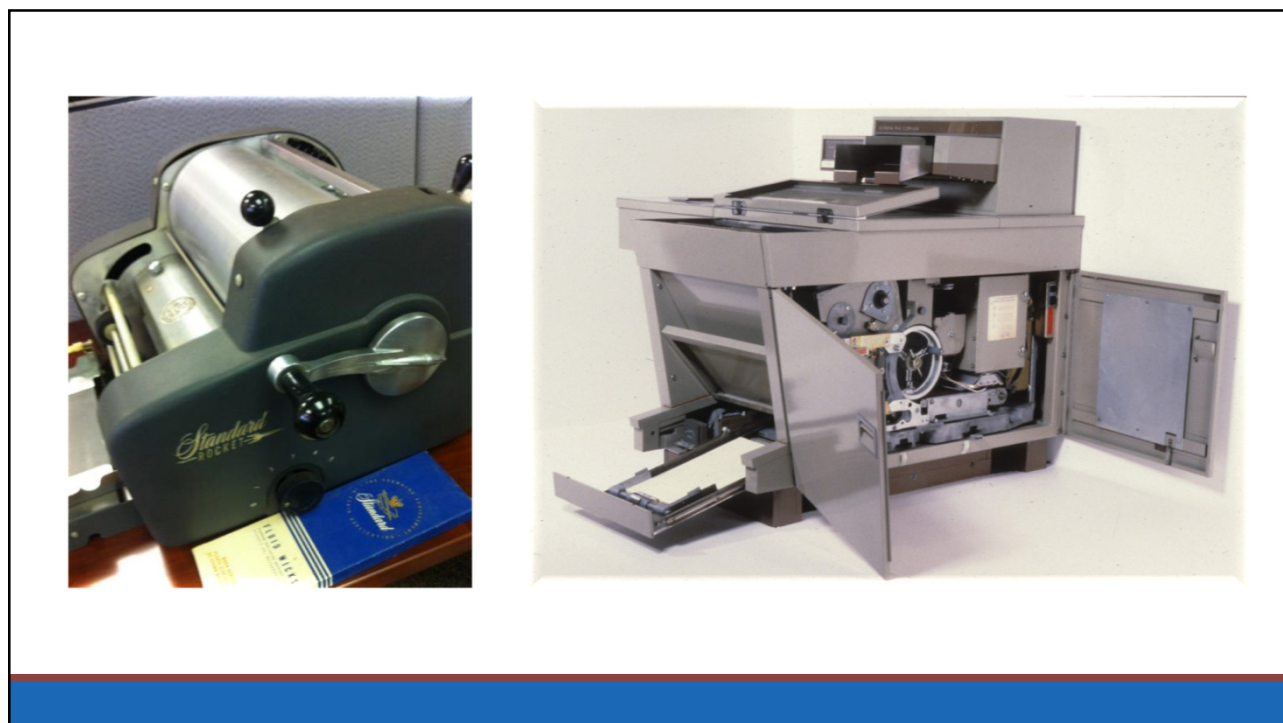


Statistics

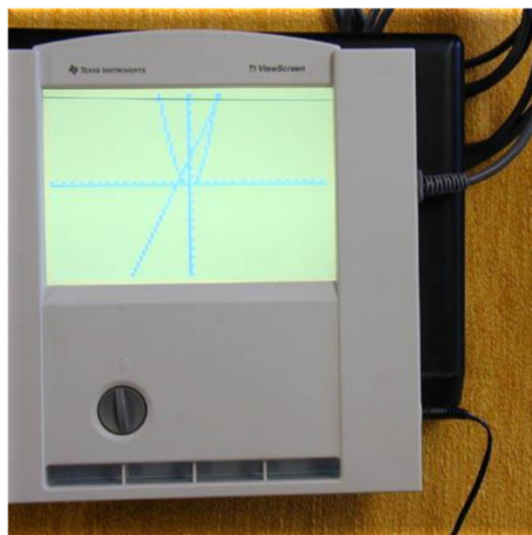
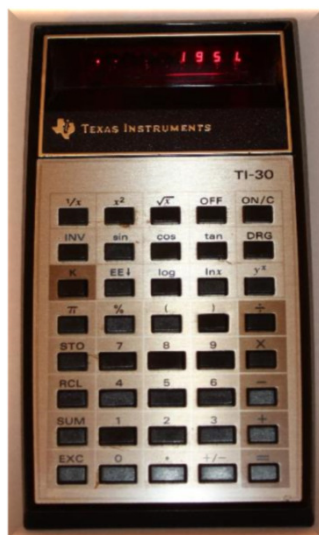
INSIGHTS FOR TEACHING

BARRY J. MONK









If you choose an answer to this question at random, what is the chance you will be correct?

A) 25 %
 B) 50 %
 C) 60 %
 D) 25 %

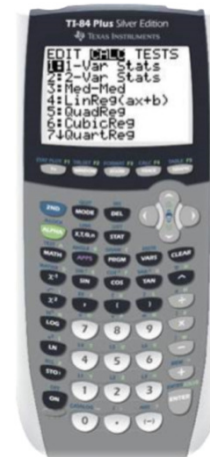
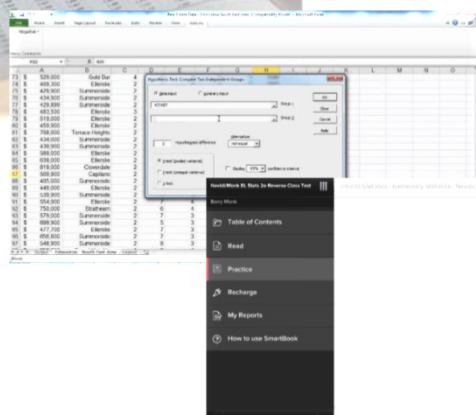
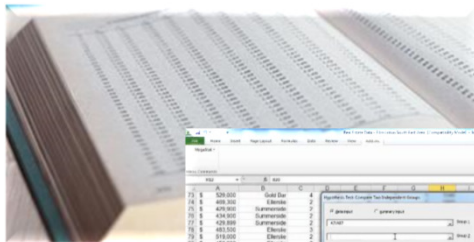
II. FINITE DIMEN.
 Find $u_h(x)$ such that

$$\int_0^L \frac{d^2 u_h}{dx^2} \frac{dv}{dx} dx = \int_0^L q v dx$$

for all $v(x)$

Letting $u_h(x) = \sum_{i=1}^N \phi_i(x) u_i$

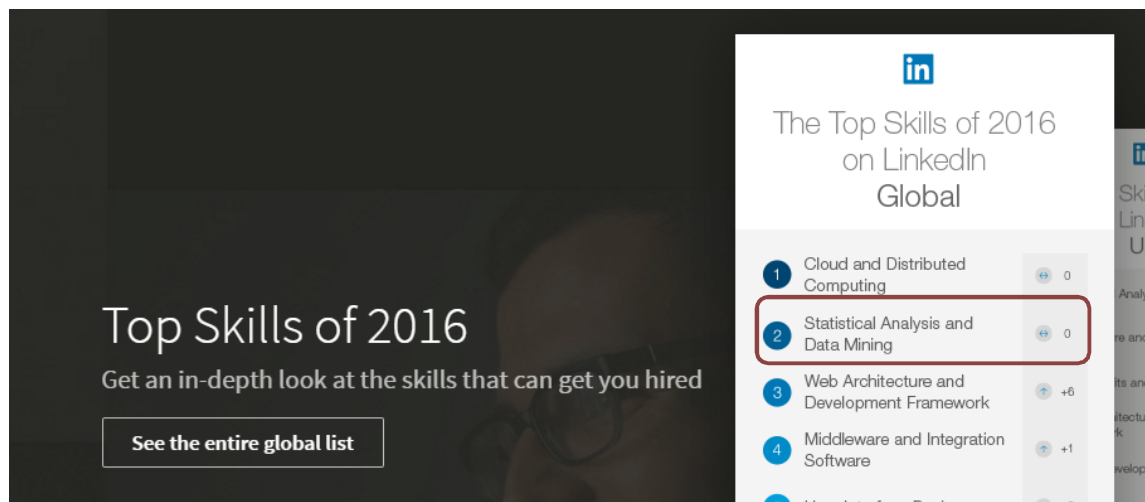
and choosing



Why Statistics?

The 25 Hottest Skills of 2014 on LinkedIn

- ① Statistical Analysis and Data Mining
- ② Middleware and Integration Software
- ③ Storage Systems and Management
- ④ Network and Information Security
- ⑤ SEO/SEM Marketing
- ⑥ Business Intelligence
- ⑦ Mobile Development
- ⑧ Web Architecture and Development Framework
- ⑨ Algorithm Design
- ⑩ Perl/Python/Ruby



The Age of Data



More data has been created in the past two years than in the entire previous history of the human race.

SINTEF Independent Research Group

By the year 2020, 1.7 megabytes of new information will be created every second for every human being on the planet.

DeLL EMC

A 10% increase in data accessibility translates into an additional \$65.7 million in net income for a typical Fortune 1000 company.

Baseline

51% of companies say the lack of available talent is one of the biggest impediments to making better decisions with big data.

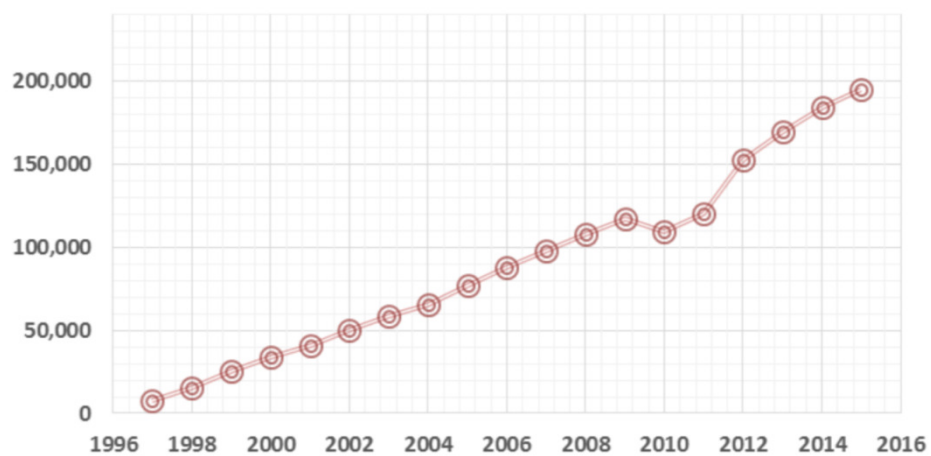
Forbes

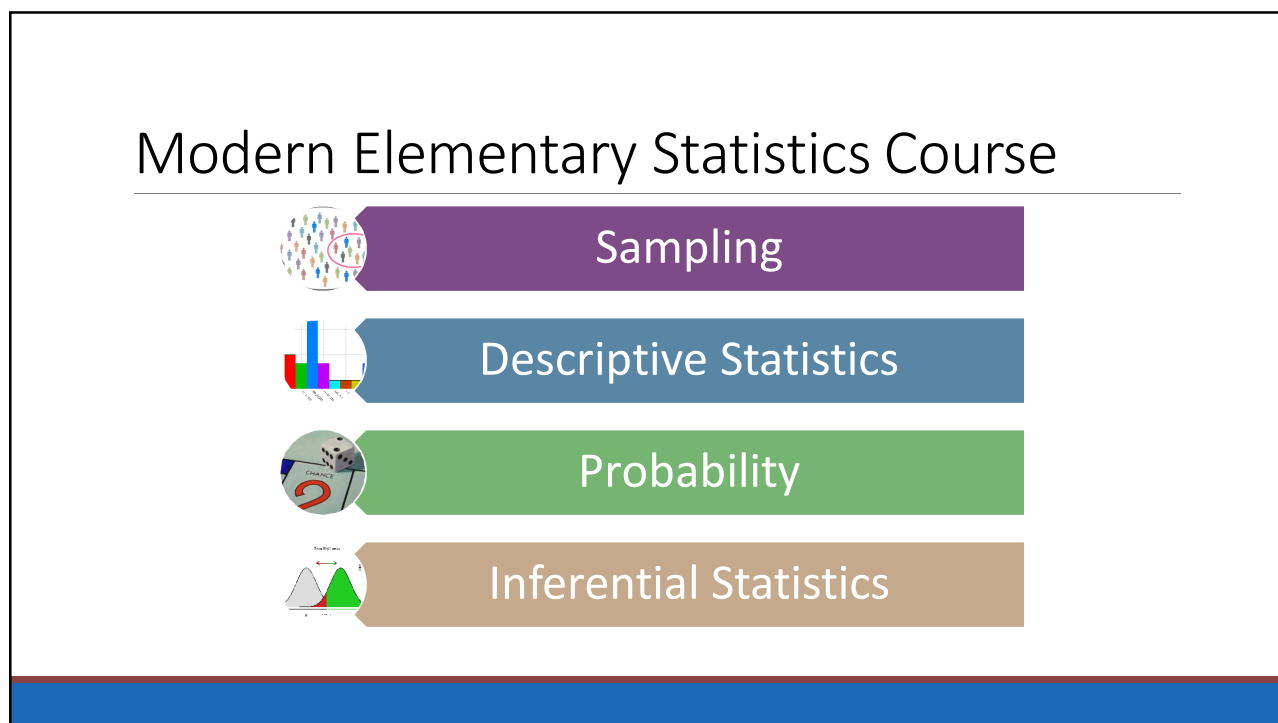
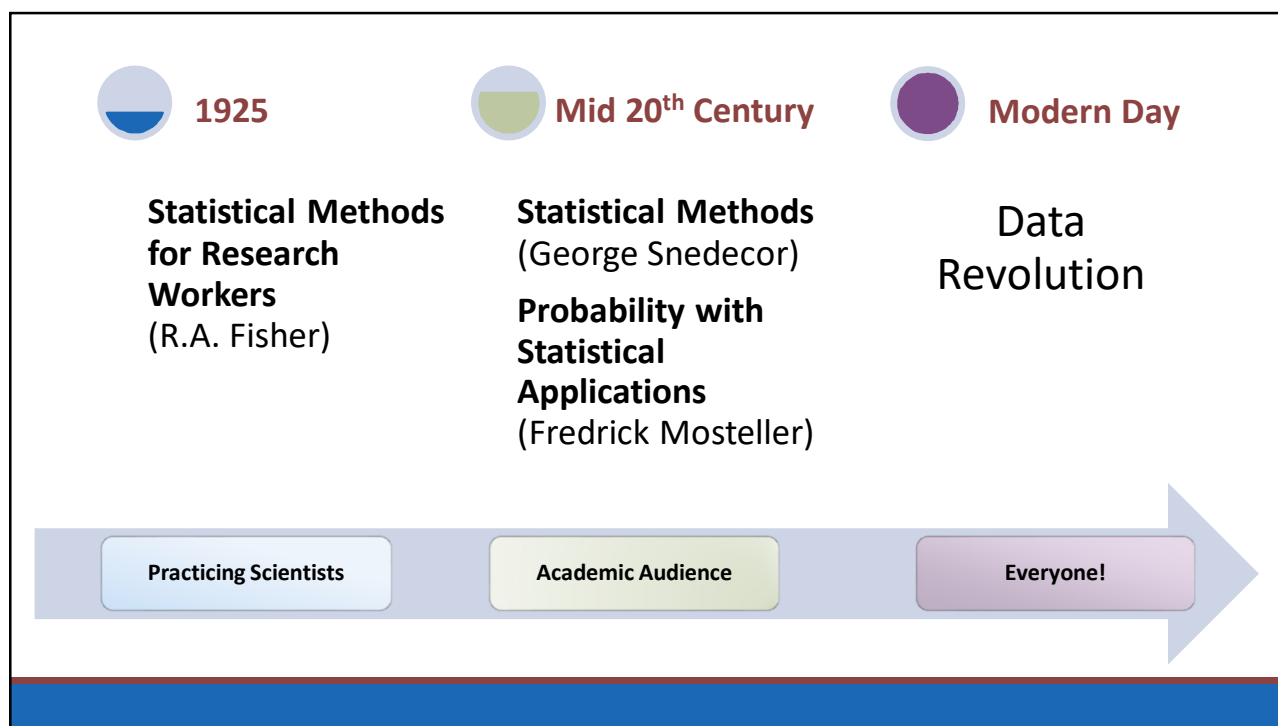
The sexy job in the next 10 years will be statisticians. We really do have essentially free and ubiquitous data. So the scarce factor is the ability to understand that data and extract value from it.

*Hal Varian
Chief Economist, Google*



AP Statistics Examinees





Statistics for Everyone

Taught across many disciplines and departments

Students have different backgrounds and interests

Vastly different levels of preparedness

Prerequisites vary from institution to institution

Prerequisites

Number Sense

Squares & Square Roots

Symbols \leftrightarrow Words

Basics of Exponents and Scientific Notation

Rounding/Estimation

Plotting Points

Order of Operations

Slope/Equation of a Line

Expressions with Variables

Interpreting Data in a Table

Fractions \leftrightarrow Decimals \leftrightarrow Percentages

Working with Intervals

What Do I Want My Students to Learn?



New study shows that drinking tequila fights viruses and aids in weight loss.

26% of deaths are preventable

Women earn 80 cents to every dollar that a man makes for equal work

Condoms are effective 98% of the time

Only 1 in 10 Americans own a passport

A Harvard study has proven that instant noodles can cause irreversible damage to your body.

Is There Evidence for That
?

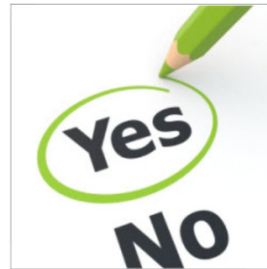


The consumption of poppy seeds used on bagels and muffins can produce positive results on drug screening tests.



The consumption of poppy seeds used on bagels and muffins can produce positive results on drug screening tests.

Statistical studies have shown that eating poppy seeds can produce false positives in drug screening.

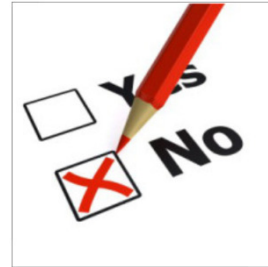


Avoiding sunshine leads to a higher mortality rate for women.



Avoiding sunshine leads to a higher mortality rate for women.

A 2014 [article](#) in the *Journal for Internal Medicine* found a link, but...



Studies show that flossing is effective in removing plaque.



Studies show that flossing is effective in removing plaque.

The federal government removed the recommendation for flossing from federal guidelines after the *Associated Press* requested the research showing the effectiveness of flossing. But . . .

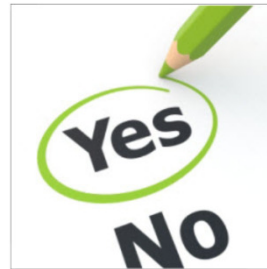


There is a link between the antibiotic Ciprofloxacin and tendon damage.



There is a link between the antibiotic Ciprofloxacin and tendon damage.

Though rare, a link between Ciprofloxacin and tendon damage has been demonstrated.



Ten percent of college graduates surveyed indicated Judge Judy was a Supreme Court justice.



Ten percent of college graduates surveyed indicated Judge Judy was a Supreme Court justice.

In a survey conducted by the American Council of Trustees and Alumni, 10% of respondents selected "Judith Sheindlin" as one of nine Supreme Court justices.



Think Statistically

Key parts of a statistical investigation

Variability

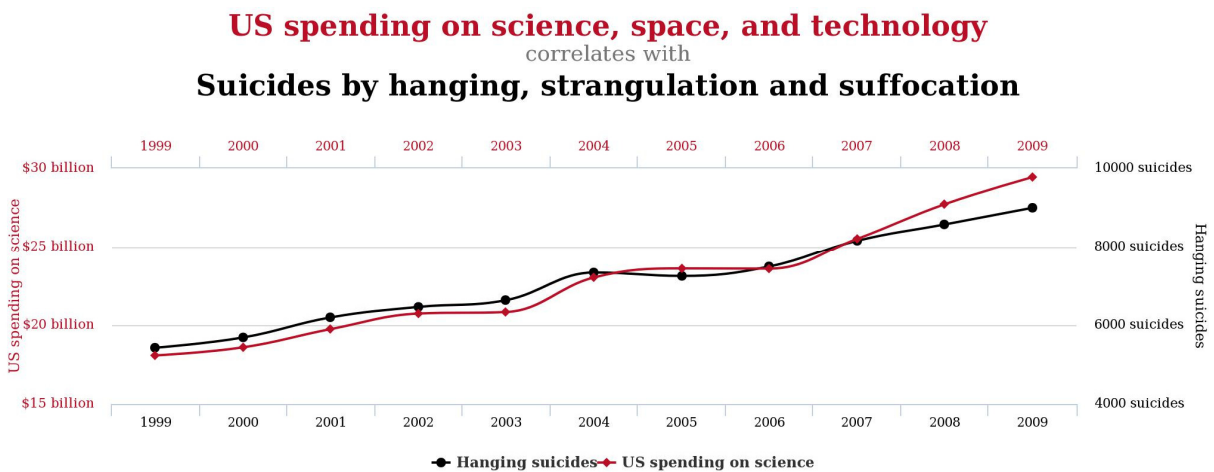
Think Statistically

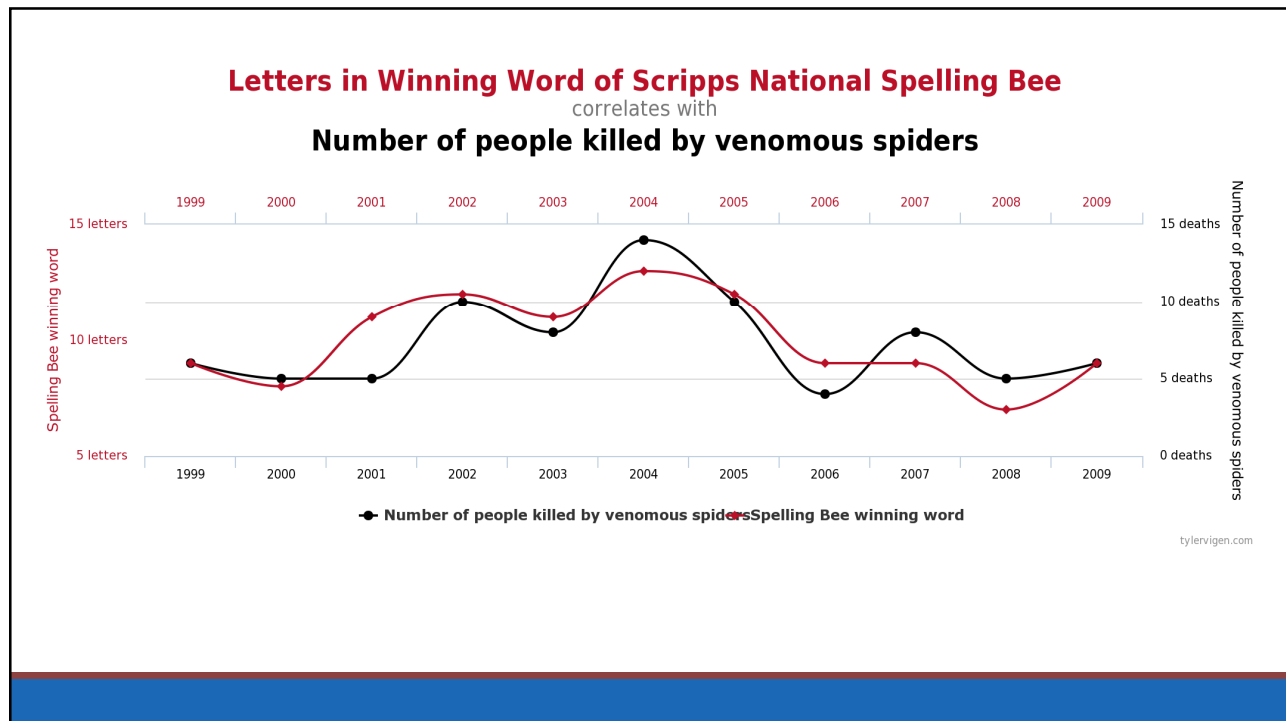
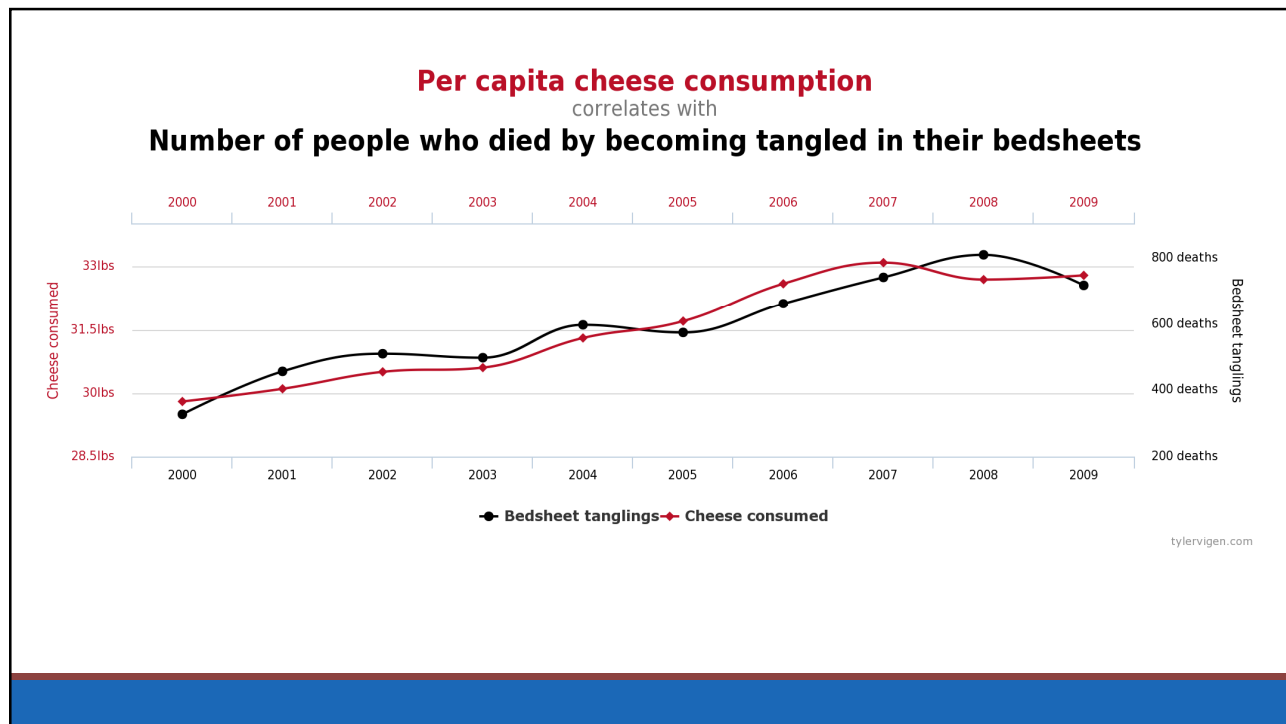
Key parts of a statistical investigation

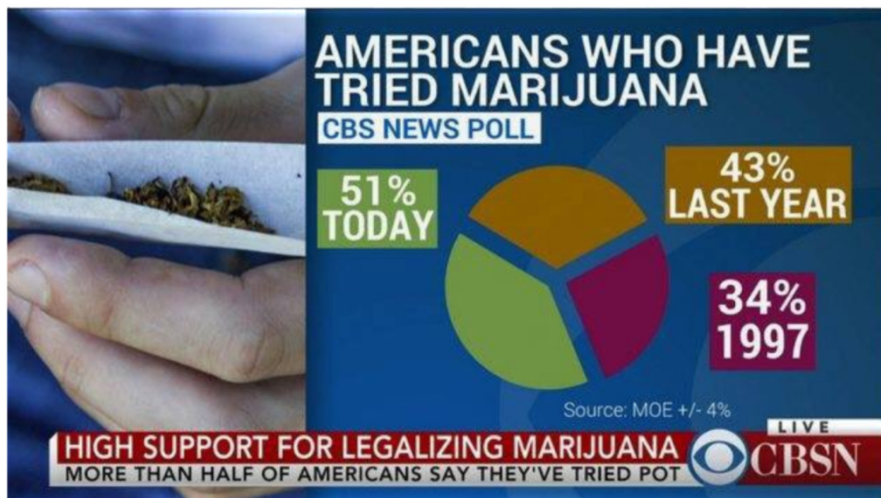
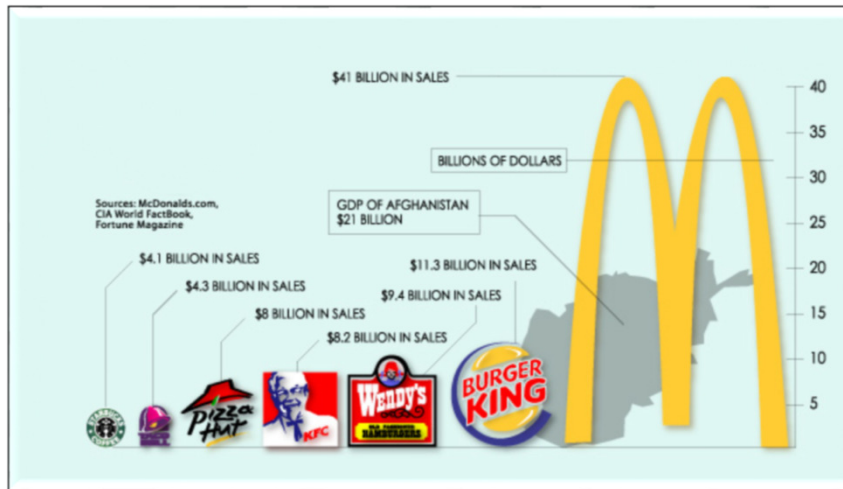
Variability

Randomness

Making generalizations







Which NFL Playoff matchup are you most looking forward to this weekend?

SEAHAWKS VS FALCONS



13%

TEXANS VS PATRIOTS



8%

STEELERS VS CHIEFS



19%

PACKERS VS COWBOYS

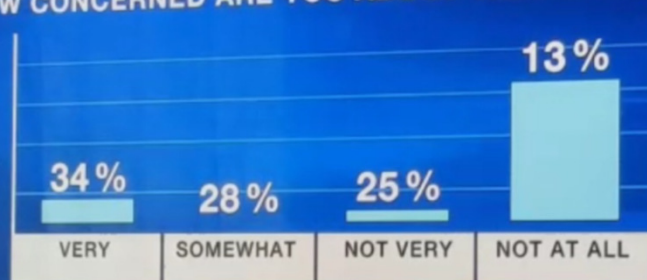


60%

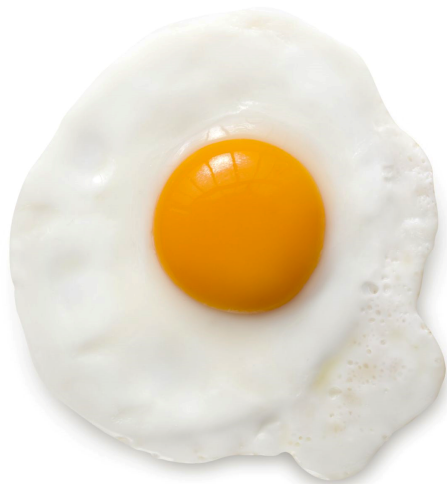
NBC2 VIEWER VOTE

NBC-2.COM

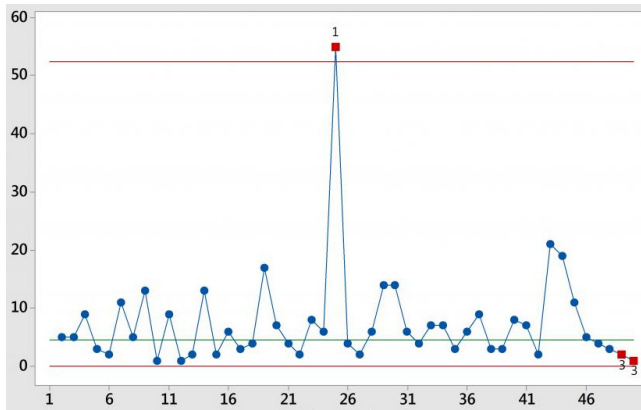
HOW CONCERNED ARE YOU ABOUT THE ZIKA VIRUS?



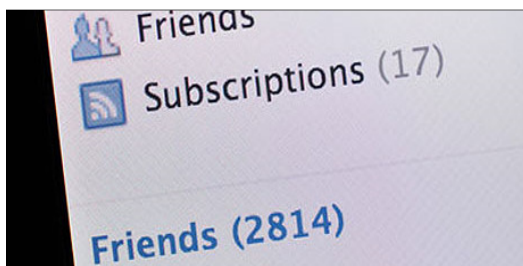
Focus on Concepts



Teach Thematically



Unusual Events



2814

7,494,401,107

**Is it an unusual event
that you have friends?**

Let Technology Do the Heavy Lifting



Demonstrate Statistical Output

Variable	N	Mean	StDev	SE Mean	95% CI
Hours	123	8.20000	9.84000	0.88724	(6.44361, 9.95639)

Use Formulas to Facilitate Conceptual Understanding

$$s^2 = \frac{\sum (x - \bar{x})^2}{n - 1}$$

Real Data

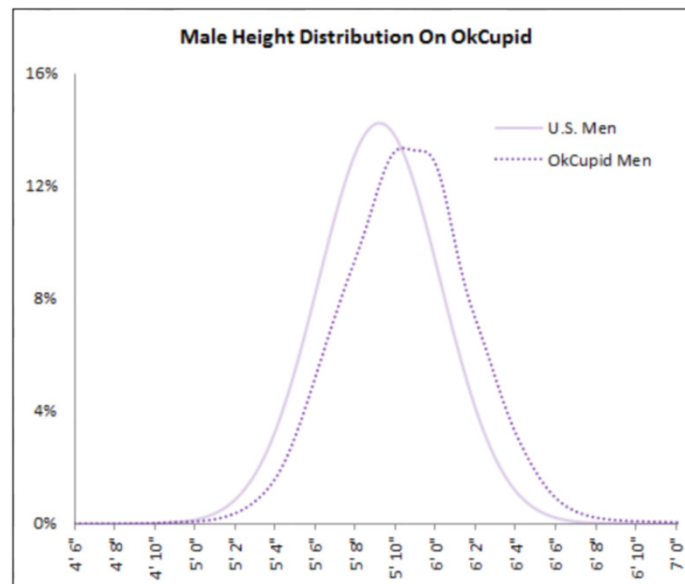


Not Algebra

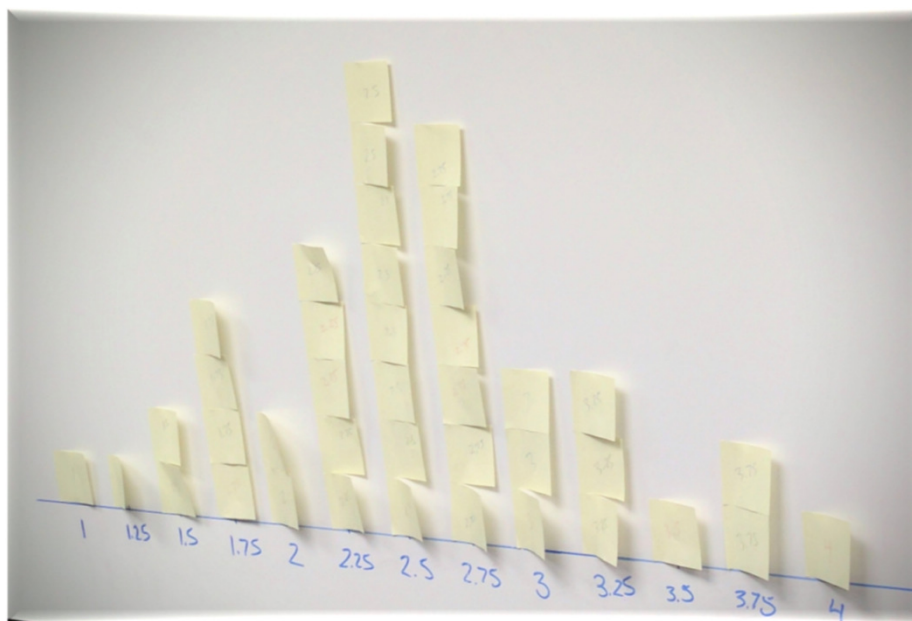
Let the data tell the story

Sometimes data is messy

Student-driven data is a great source



Active Learning





Personality Trait Activity

2016 GAISE College Report

Teach Statistical Thinking

Focus on conceptual understanding

Integrate real data with a context and purpose

Foster active learning

Use technology to explore concepts and analyze data

Use assessments to improve and evaluate student learning



Thank You

Barry Monk
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