

The Role of Statistics in Science and Everyday Life: A First Year Seminar

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Overview

- Intent of Course
- Course Readings and Other Assignments
- Final Thoughts

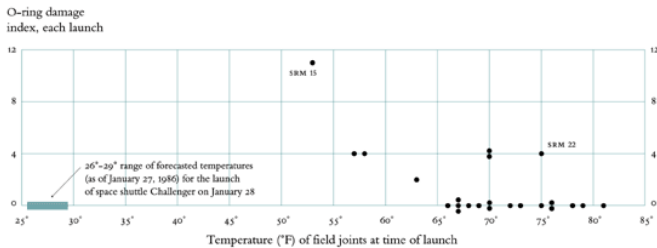
Intent of Course

- Not a Statistics course
- Spring semester: First Year Seminar
 - Topics vary, focus on research and communication skills
 - Not many options for quantitatively minded students
- “Changing the World with Data”
 - How statistics is used and misused
 - 18 students

“What Everyone Should Know About Statistics”

EDWARD R. TUFTTE

VISUAL AND STATISTICAL THINKING:
DISPLAYS OF EVIDENCE FOR MAKING DECISIONS

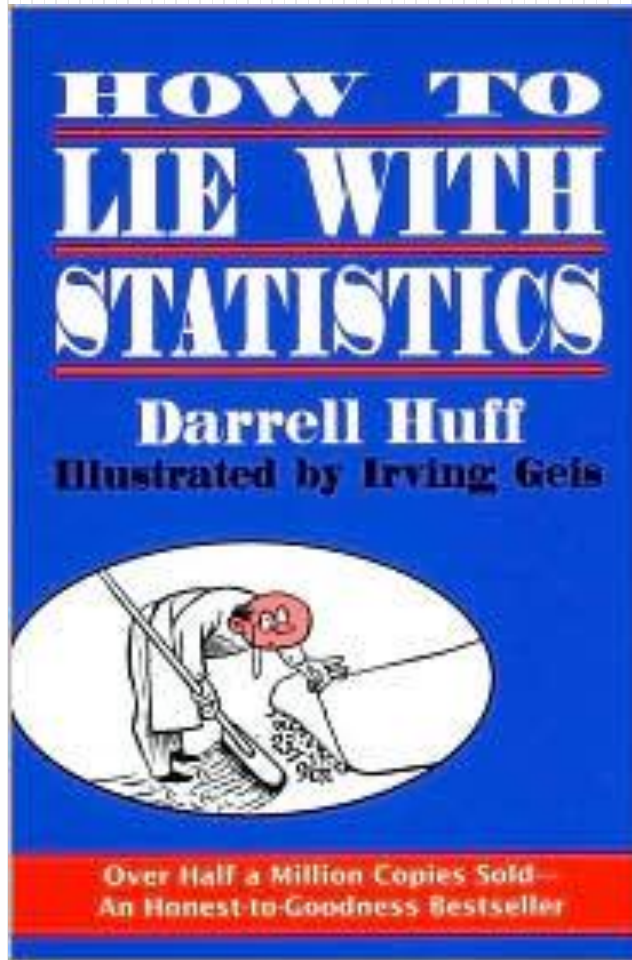


JOHN SNOW AND THE CHOLERA EPIDEMIC

THE DECISION TO LAUNCH THE SPACE SHUTTLE CHALLENGER

- John Snow and the Cholera Epidemic
 - Effective display
 - Examples of misleading displays of this data
- The Decision to Launch the Space Shuttle *Challenger*
 - Ineffective display
 - Hard to follow, but *that's the point!*

“What Everyone Should Know About Statistics”

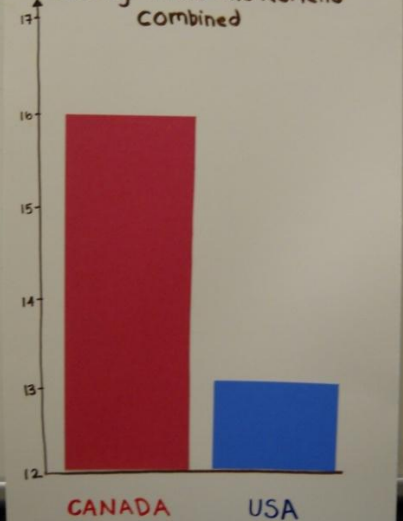


- Biased Samples
- “Average”
- Margin of error
- Statistical significance
- Misleading graphics
- Association vs Causation
- How to think critically about quantitative information

“What Everyone Should Know About Statistics”

- Assignment: Given your dataset, make an accurate but misleading display of the data.

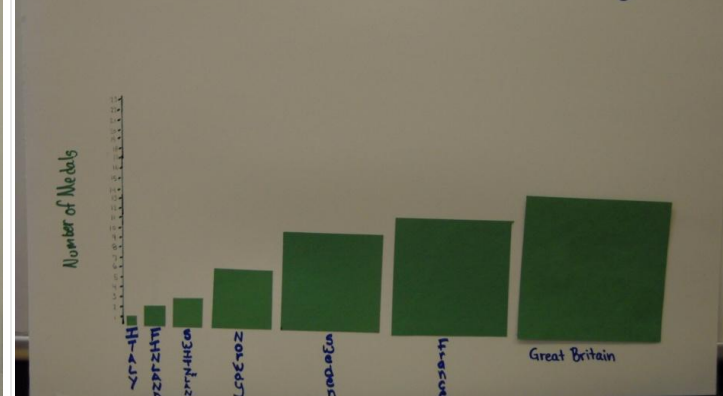
A Winter Olympic medals for the US & Canada in Ice Hockey men's and women's Combined



Curling Medals Won at the Winter Olympics



Number of Figure Skating Medals for Every Winter Olympics



“What Everyone Should Know About Statistics”

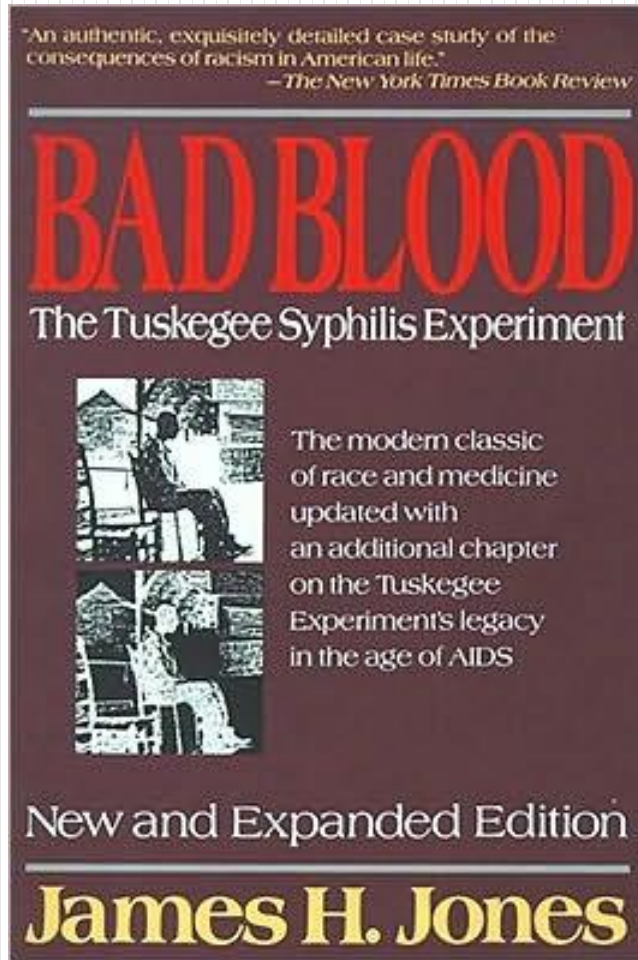
- Experimental Design = *Mythbusters*
 - Exploding Pants
 - Factorial Experiment
 - Season 4
 - *Big Bangs Collection* (Netflix “Watch Instantly”)
 - Exploding Steaks/Don’t Drive Angry
 - Matched Pairs Design
 - Season 6
 - *Collection 5* (Netflix “Watch Instantly”)



Statistics and Climate Science

- Readings from IPCC Report (FAQs from WG1)
 - What determines the earth's climate
 - Relationship between climate and weather
 - How do human activities contribute to climate change
 - How are temps changing
 - Can recent warming be explained by natural variability
- Readings from Skeptical Science
 - “Debunks” skeptic arguments
- Climate skeptic Bjorn Lomborg on TED Talks

A Dark Period in American Science



- 40 year study on the effect of untreated syphilis on African-American men
- Conducted by United States Public Health Service
- Subjects were uninformed
 - “I ain’t never understood the study”

Final Thoughts

- A few other things I'd do differently:
 - More "science is good"
 - Do a little statistics
 - Introduce scientific writing
- What might work in a Statistics course:
 - Tufte reading
 - TED Talks/Mythbusters
- Acknowledgements
 - Scott Alberts, Truman State University