

# But, It's A Number So It Has To Be True...Right?: Introduction to Statistical Literacy, Part I

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July 14 - 15, 2016

Free registration - Free SCECHs - Register at <http://dataliteracy.si.umich.edu/conference>  
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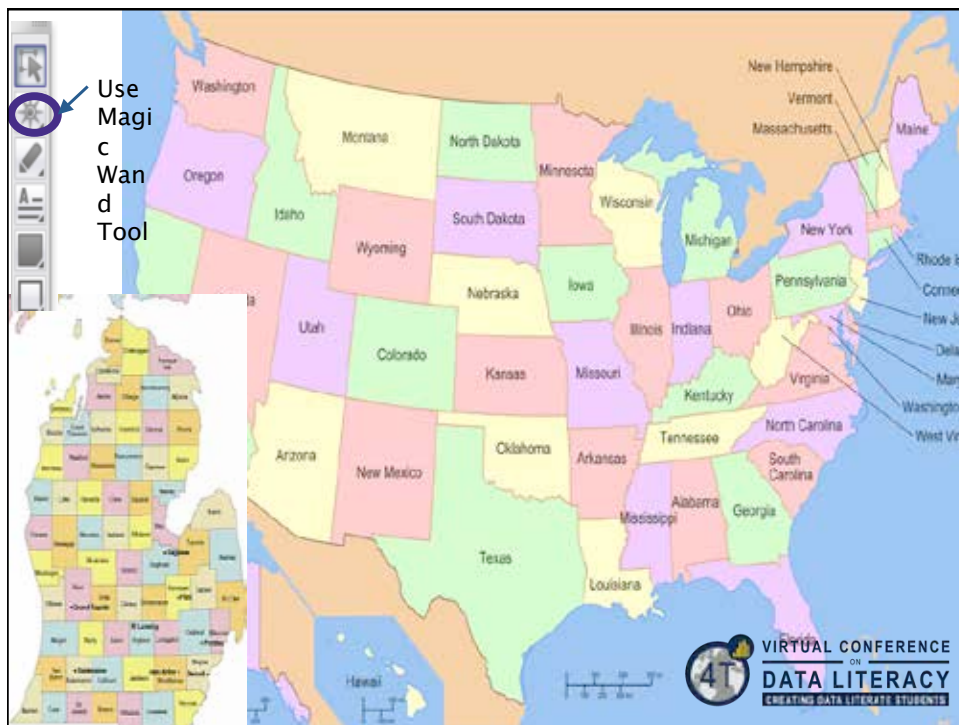
**[http://  
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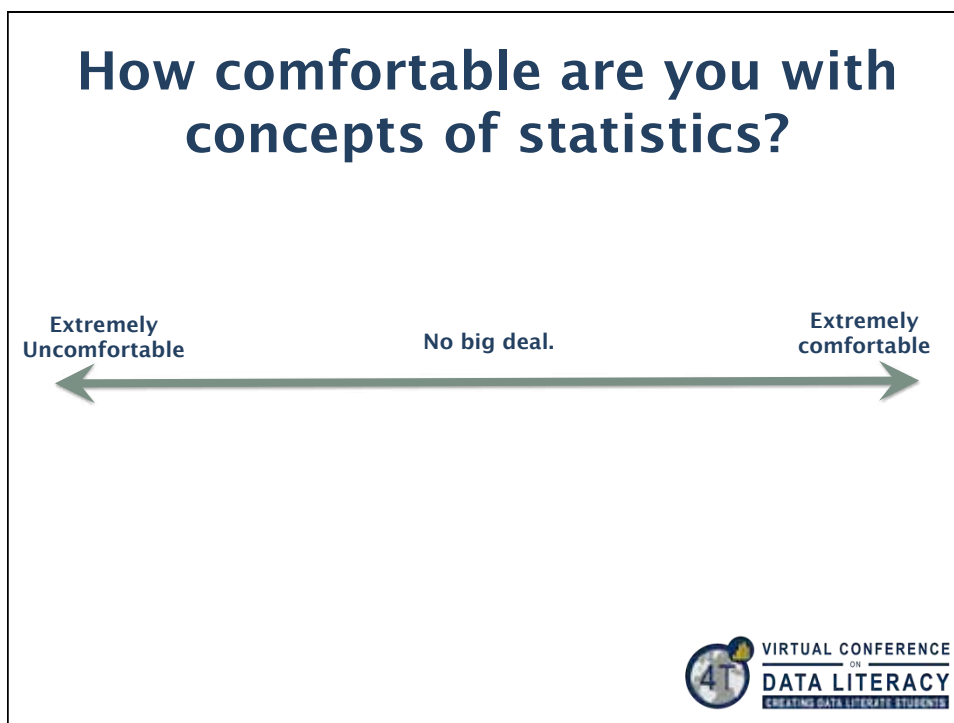
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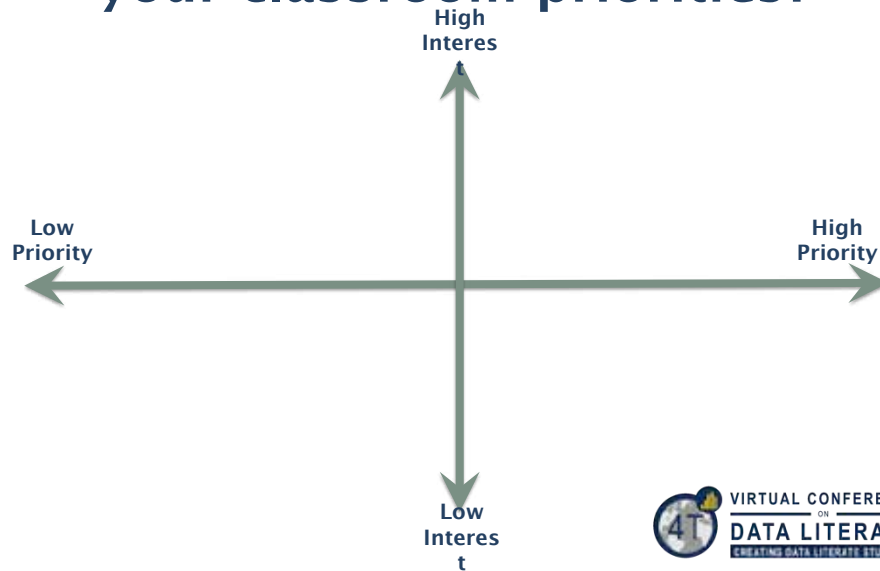
The image shows the homepage of the 'VIRTUAL CONFERENCE ON DIGITAL WRITING' website. The header features the 4T logo (a globe with '4T' and a person icon) and the text 'VIRTUAL CONFERENCE ON DIGITAL WRITING' with the tagline 'TEACHERS TEACHING TEACHERS ABOUT TECHNOLOGY'. The dates 'October 2, 9, 16 & 23, 2016' and social media icons are also present. A navigation menu includes 'HOME', 'ATTENDEES', 'SCHEDULE', 'PRESENTERS', 'PARTNERS & SPONSORS', 'ABOUT', '4T CONFERENCES', and 'ARCHIVE'. A search bar is located in the top right. The main content area features a large yellow 'M' logo for the 'SCHOOL OF EDUCATION UNIVERSITY OF MICHIGAN'. To the right, a call to action says 'Join the Conversation! October 2, 9, 16 & 23, 2016' and includes the text 'Connect and collaborate with other K-16 educators about the teaching of writing in virtual spaces. FREE REGISTRATION & SCECHs #4TDW' and a 'CLICK TO REGISTER' button. The footer contains the 'VIRTUAL CONFERENCE ON DATA LITERACY' logo with the tagline 'CREATING DATA LITERATE STUDENTS'.

The image shows a screenshot of a virtual meeting interface, likely a Blackboard Collaborate session. The interface includes a toolbar on the left with various icons. Red annotations are overlaid on the image: a diagonal arrow pointing to the toolbar with the text 'raise hand polling', a horizontal arrow pointing to a specific icon with the text 'magic wand', and another horizontal arrow pointing to a chat window at the bottom with the text 'chat'. The bottom right corner features the 'VIRTUAL CONFERENCE ON DATA LITERACY' logo with the tagline 'CREATING DATA LITERATE STUDENTS'.





## Where does data literacy fall in your classroom priorities?



## Session Goals

- What is “data”?
- Define quantitative (statistical) literacy
- Statistics and statistical literacy
- Key statistics concepts:
  - Variables
  - Percentages, rates, etc.
  - Averages
  - Sampling
  - Margin of Error/Confidence
  - Correlation
  - Significance



## What is Data?

- Can be quantitative (numbers) or qualitative (text) – here, referring to quantitative
- Summary charts, graphs, numbers presented in everyday or scientific media
- The survey responses and other forms of information underlying the summary results
  - Census information, social survey data, administrative records



## Quantitative (Statistical) Literacy

- All about context – basic math in the “wild”
  - Reading charts and graphs
  - Calculating averages, percentages
- Working within a scientific model
- Thinking critically about quantitative information in every day life
  - Making and evaluating arguments based on data
  - Identifying the kind of data needed to answer a given question (and, conversely, when the wrong data are used)
- Ability to present results orally or...

## Importance of Statistical Literacy

- Availability of information requires ability to make sense of information coming from multiple sources
- Understanding information is prerequisite for fully participating in a democratic society
- Use of evidence is critical in making decisions and evaluating arguments: e.g., risks related to disease or treatment, political behaviors, financial matters, costs/benefits of buying a hybrid



## Statistics vs Statistical Literacy

- As traditionally taught, **statistics** more about math – formulas and calculations
- Important for those intending to pursue research, typically stand-alone class
- Interpretation and understanding central in **statistical literacy** – mindset
- Critical for *everyone*, can be incorporated into *any* class
- Knowing basic concepts from stats helpful in stat literacy





# Key Statistical Concepts



## Key Concepts: Variables

- What we know comes from what is measured (variables)
- Often numbers presented without context – e.g., road deaths, success rates for an experimental drug
- Think about:
  - Who measured?
  - How did they measure?
  - What exactly was measured?
  - Why is it being reported as it is?



## Another Example:

Suppose you are working with high school juniors and seniors as they are choosing colleges. One factor you use is the percent of students getting jobs upon graduation. Here, employment rate would be the variable.

Why would it matter:

- 1) Who measured?
- 2) How it was measured?
- 3) Exactly what was measured?



## Key Concepts: Percentages, Rates

- Both percentages and rates provide context for raw numbers, standardization
- Percentages show part of a whole so groups of different vastly sizes can be easily compared
- Percentiles rank individuals against others in the comparison group – e.g., standardized tests, height/weight charts, income groups



HOME | NEWS | NATIONAL

**Majority of police force quits after Missouri town elects first black mayor**

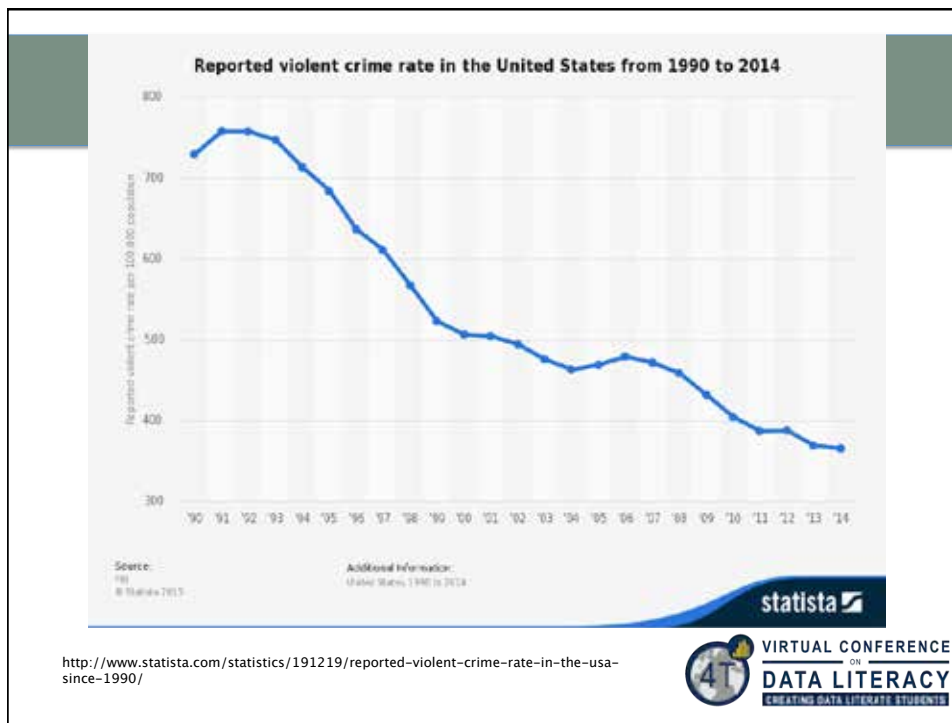
**80 percent of police force resigns after Missouri town elects first African-American mayor**



## Key Concepts: Rates

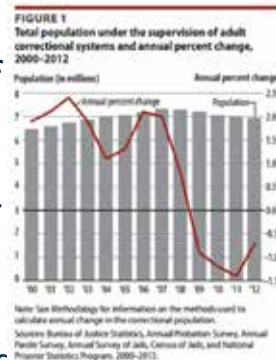
- Another way to standardize for comparison
- Number of people who experienced an event/ number of people who could have experienced it
- Typically multiplied by 1,000 or a factor thereof and reported as such
- Challenge is in knowing what to use in numerator and denominator (definition issue)
  - Divorce rate; crime rate; birth





## Key Concepts: Percent Change

- Related to percentages – tricky for students because of shifting baseline
- The size of the effect is related to both the amount of change and the size of the group to begin with
  - Used to make health risks sound more urgent
- Retail trick: “Sale! 50% off + additional 25% off”  $\neq$  75% off



## Key Concepts: Averages

- **Mode:**
  - Most frequently occurring value/characteristic
- **Median:**
  - Value that splits a distribution exactly in  $\frac{1}{2}$
  - Not affected by extreme values
- **Mean:**
  - Arithmetic average
  - Very sensitive to extreme values
- Presenting median and mean allow for detecting “outliers”
- Sometimes a measure of “spread” is also presented



## Average New Home Prices

- What does this table tell you about new home prices in the U.S.?

Year	Median	Mean
2007	\$247,900	\$313,600
2010	\$221,800	\$272,900
2015	\$296,400	\$360,600

Source: [www.census.gov/const/uspriceann.pdf](http://www.census.gov/const/uspriceann.pdf)



# Putting it into Practice



## Questioning Data

1. What was measured, by whom, and why? (Source)
2. How is the information reported? (Presentation)
3. Is there a potential for bias? (Source of argument)



## YOU Don't Need to be a Statistics Guru

- Ways to strengthen students' SL skills:
  - Start class with a data-based news article
  - Require empirical evidence to support claims in essays
  - Question banks and exercises allow students to work with surveys and data
  - In-class polls of students
  - Engage students by having them find maps, graphs, or other data that exemplify course content
  - Extra credit on exams



## Recap:

1. Statistical literacy (SL) is a mindset
2. Concepts like variables, percentages, and averages can be foundation for SL
3. Incorporating data doesn't have to be

## Questions?

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