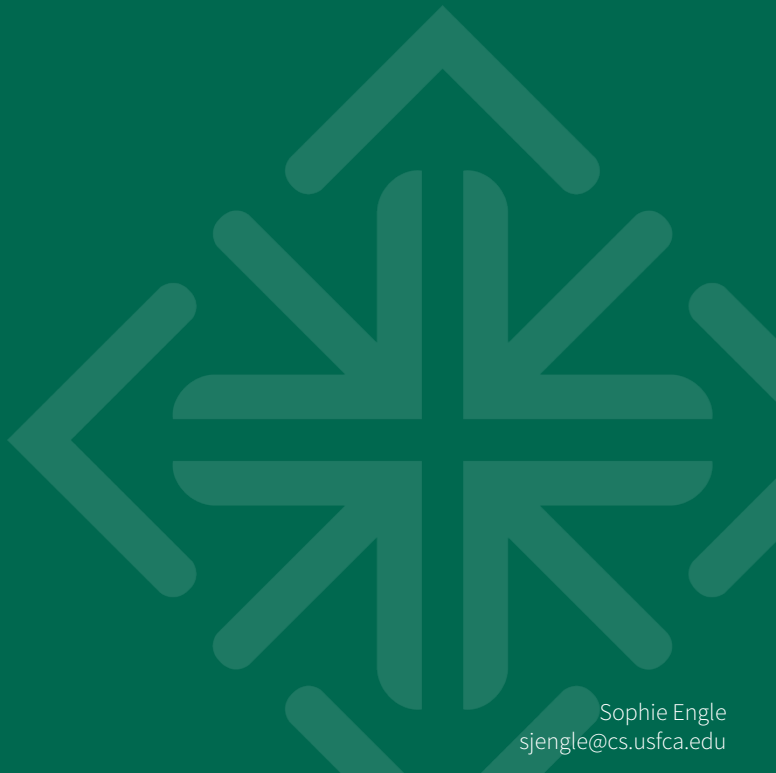
UNIVERSITY OF SAN FRANCISCO

CHANGE THE WORLD FROM HERE

# Motivation



Sophie Engle
sjengle@cs.usfca.edu

# WINTER IS COMING

## An Argument from Epidemiology, 1849



Sophie Engle
sjengle@cs.usfca.edu

# JOHN SNOW'S CHOLERA MAP

## An Argument from Epidemiology, 1849



Sophie Engle
sjengle@cs.usfca.edu
UNIVERSITY OF SAN FRANCISCO

# 1854 Cholera Outbreak

- Tens of thousands people in England are dying of cholera between 1831 and 1854
- Many assumed cholera was airborne (caused by “miasma in the atmosphere”)
- People did not have running water or modern toilets

http://www.ph.ucla.edu/epi/snow/snowcricketarticle.html and http://www.bbc.co.uk/history/historic_figures/snow_john.shtml


Sophie Engle
sjengle@cs.usfca.edu

# 1854 Cholera Outbreak

- Terrible cholera outbreak in 1854 in Soho, near where physician John Snow lived
- Tracked down data from hospitals and public records
- Created simple plot of where victims lived and location of water pumps

http://www.ph.ucla.edu/epi/snow/snowcricketarticle.html and http://www.bbc.co.uk/history/historic_figures/snow_john.shtml


Sophie Engle
sjengle@cs.usfca.edu


http://en.wikipedia.org/wiki/File:Snow-cholera-map-1.jpg



Sophie Engle
sjengle@cs.usfca.edu


http://www.theguardian.com/news/datablog/interactive/2013/mar/15/cholera-map-john-snow-recreated

# 1854 Cholera Outbreak

- Identified contaminated water pump
- Eventually able to trace many cases to “sherbert” a bubbly drink with a fizzy powder mixed in, served from water coming from the Broad Street area pump
- Pioneered the field of epidemiology

http://www.ph.ucla.edu/epi/snow/snowcricketarticle.html and http://www.bbc.co.uk/history/historic_figures/snow_john.shtml

# TED Talk

**How the Ghost Map Helped End a Killer Disease**
Steven Johnson 2006

http://www.ted.com/talks/steven_johnson_tours_the_ghost_map


Sophie Engle
sjengle@cs.usfca.edu

# ANSCOMBE'S QUARTET

## An Argument from Statistics, 1973



Sophie Engle
sjengle@cs.usfca.edu

> “A computer should make both calculations and graphs. Both sorts of output should be studied; each will contribute to understanding. ”
>
> **– Francis Anscombe, 1973**

http://eagereyes.org/criticism/anscombes-quartet



Sophie Engle
sjengle@cs.usfca.edu

# Anscombe's Quartet

| Group 1 | | Group 2 | | Group 3 | | Group 4 | |
|---|---|---|---|---|---|---|---|
| x | y | x | y | x | y | x | y |
| 10.0 | 8.04 | 10.0 | 9.14 | 10.0 | 7.46 | 8.0 | 6.56 |
| 9.0 | 6.95 | 8.0 | 8.14 | 8.0 | 6.77 | 8.0 | 5.76 |
| 13.0 | 7.58 | 13.0 | 8.74 | 13.0 | 12.74 | 8.0 | 7.71 |
| 9.0 | 8.81 | 9.0 | 8.77 | 9.0 | 7.11 | 8.0 | 8.84 |
| 11.0 | 8.33 | 11.0 | 9.26 | 11.0 | 7.81 | 8.0 | 8.47 |
| 14.0 | 9.96 | 14.0 | 8.10 | 14.0 | 8.84 | 8.0 | 7.04 |
| 6.0 | 7.24 | 6.0 | 6.13 | 6.0 | 6.08 | 8.0 | 5.25 |
| 4.0 | 4.26 | 4.0 | 3.10 | 4.0 | 5.39 | 19.0 | 12.50 |
| 12.0 | 10.84 | 12.0 | 9.13 | 12.0 | 8.15 | 8.0 | 5.56 |
| 7.0 | 4.82 | 7.0 | 7.26 | 7.0 | 6.42 | 8.0 | 7.91 |
| 5.0 | 5.68 | 5.0 | 4.74 | 5.0 | 5.73 | 8.0 | 6.89 |

http://en.wikipedia.org/wiki/Anscombe's_quartet



Sophie Engle
sjengle@cs.usfca.edu

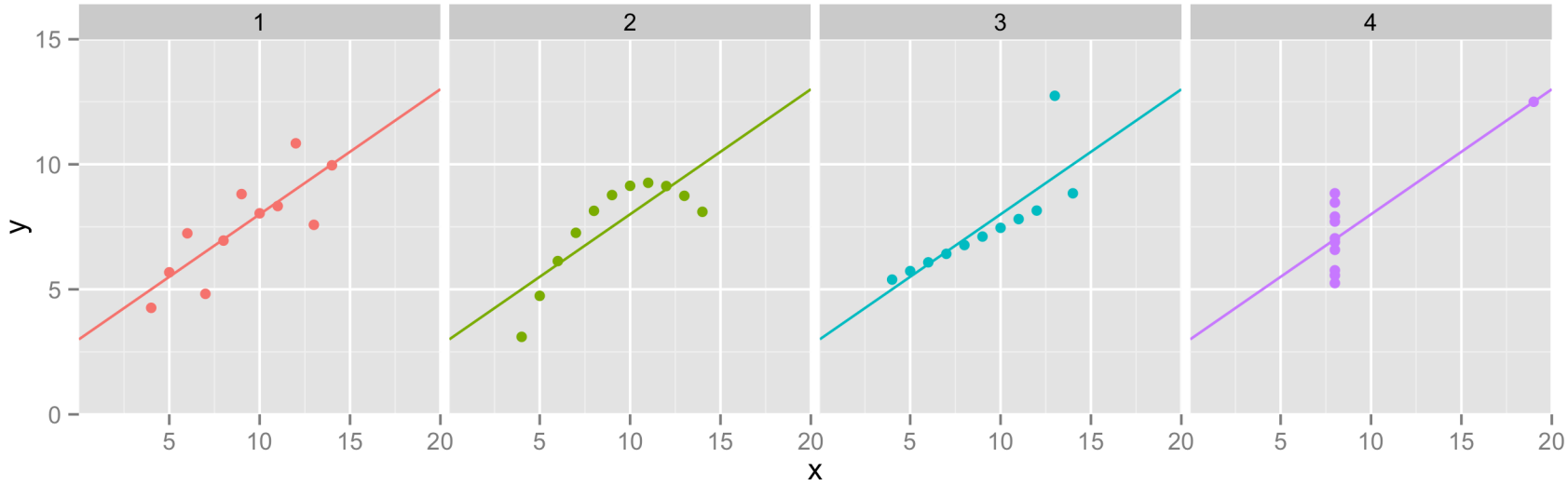
# Simple Statistics

| | Group 1 | Group 2 | Group 3 | Group 4 |
|---|---|---|---|---|
| **mean(x)** | 9.00 | 9.00 | 9.00 | 9.00 |
| **mean(y)** | 7.50 | 7.50 | 7.50 | 7.50 |
| **var(x)** | 11.00 | 11.00 | 11.00 | 11.00 |
| **var(y)** | 4.13 | 4.13 | 4.12 | 4.12 |
| **correlation** | 0.82 | 0.82 | 0.82 | 0.82 |
| **lm intercept** | 3.00 | 3.00 | 3.00 | 3.00 |
| **lm x effect** | 0.50 | 0.50 | 0.50 | 0.50 |

http://en.wikipedia.org/wiki/Anscombe's_quartet


Sophie Engle
sjengle@cs.usfca.edu

# Simple Visualization




http://blog.ouseful.info/2011/08/30/the-visual-difference-%E2%80%93-r-and-anscombe%E2%80%99s-quartet


Sophie Engle
sjengle@cs.usfca.edu
UNIVERSITY OF SAN FRANCISCO

# Anscombe's Quartet

- Simple, contrived, but effective example
- Need to analyze **and** visualize your data
- Simple visualizations are often enough to reveal structure

http://eagereyes.org/criticism/anscombes-quartet


Sophie Engle
sjengle@cs.usfca.edu

# QUESTIONS?



Sophie Engle
sjengle@cs.usfca.edu