AMERICAN BANKRUPTCY INSTITUTE

2017 Winter Leadership Conference

How Experts Lie with Statistics

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Tactical Financial Consulting, LLC; Alpharetta, Ga.

Nicole R. Horton
EY; Los Angeles

K. Scott Van Meter
Berkeley Research Group; Houston

CONCURRENT SESSION

2017

WELCOME TO…

How Experts Lie With Statistics

Nicole Horton
Ernst & Young
Los Angeles

Franklind Lea
Tactical Financial Consulting
Atlanta

Scott Van Meter
Berkeley Research Group
Houston

We live in a world that is built on promises constructed by liars.

Unknown

Lying is done with words and also with silence.

Adrienne Rich

History is a set of lies agreed upon.

Napoleon Bonaparte

I love listening to lies when I know the truth.

The best revenge on a liar is to convince him that you believe what he said.

I'm not upset that you lied to me, I'm upset that from now on I can't believe you.

Friedrich Nietzsche

Being true to yourself is better than being a liar just to impress everyone.

Lying Is an elementary means of self-defense.

Susan Sontag

If you tell the truth, you don't have to remember anything.

Mark Twain

If the words don't add up, its usually because the truth wasn't in the equation.

Gordon Bethune

A single lie discovered is enough to create contagious doubt over every other truth expressed.

Unknown

Sometimes the truth will hurt and a lie will set you free; just as a lie will hurt and the truth will set you free.

Drinking? Why, no, Officer.

The check is in the mail.

It’s not the money, it’s the principle of the thing.

Half the lies they tell about me aren't true.

Yogi Berra

If you don't want to slip up tomorrow, speak the truth today.

Bruce Lee

Once a liar always a liar.

Unknown

I lie to myself all the time. But I never believe me.

S. E. Hinton

The great masses of the people will more easily fall victim to a big lie than to a small one.

Adolf Hitler

When a man is penalized for honesty he learns to lie.

Criss Jami

The longer the explanation the bigger the lie.

Ziad K. Abdelnour

The most dangerous lies are the ones you tell yourself.

Richard Bach

Never tell a lie – except for practice.

Mark Twain

Any fool can tell the truth, but it requires a man of some sense to know how to lie well.

Samuel Butler

Don’t steal, don’t lie and don’t cheat. The government hates competition.

Hussein Nishah

A lie has speed, but truth has endurance.

Edgar J. Mohn

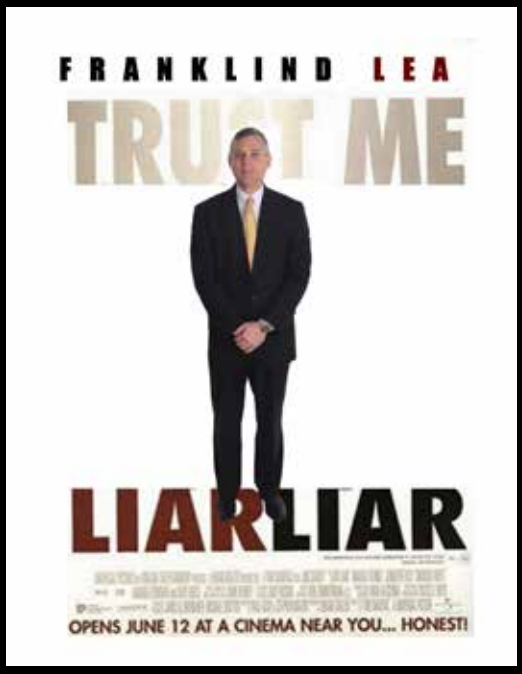
I've always tried to tell the American People the truth. My mouth just doesn't always cooperate.

Unnamed Political Candidate

My parents called me a liar…I looked them in the eyes and said "Santa, Easter Bunny, Tooth Fairy" and walked away like a boss.

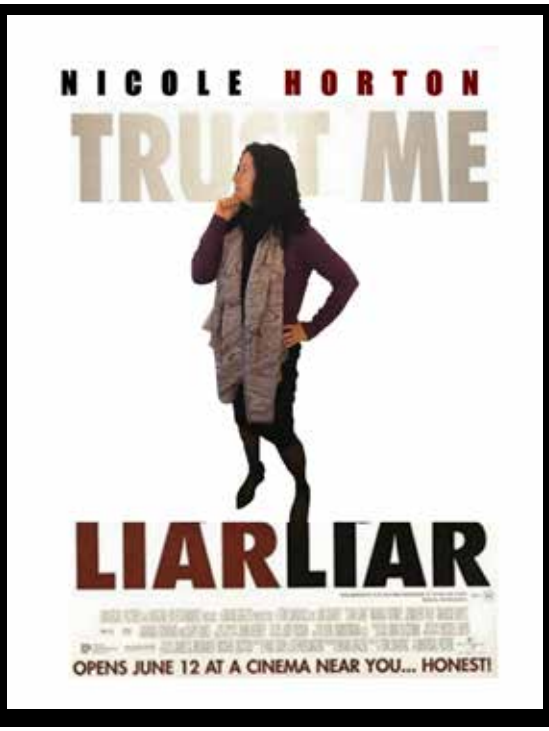
Unknown

Lies, Damn Lies and Statistics



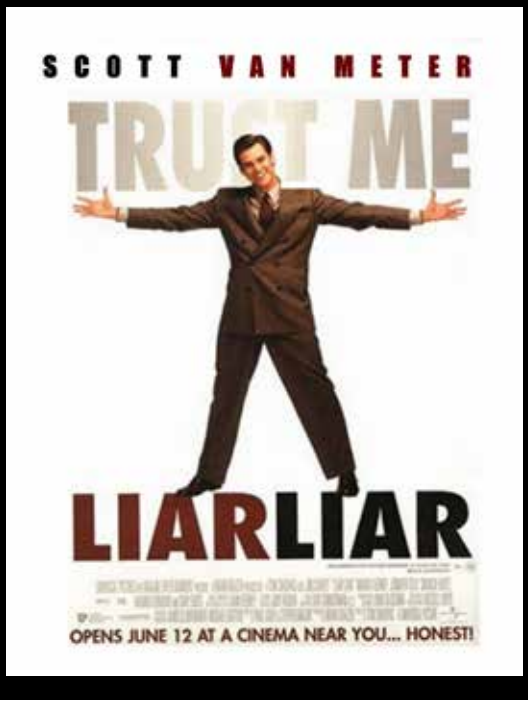
Franklind Lea

- President, Tactical Financial Consulting
- Financial and Real Estate Expert
- 25+ Years of Experience
- B.S. Management
- M.B.A., Emphasis in Finance
- Master of Real Estate
- Three facts about me:
  - I play(ed) clarinet
  - I compete in equestrian events
  - I had a cat named Boots



Nicole Horton

- Executive Director in EY's Transaction Advisory Services practice
- More than 17 years of experience
- Heavily focused on the financial services sector
- Three facts about me:
  - I play(ed) bassoon
  - I compete in equestrian events
  - I have a cat named Chewbacca

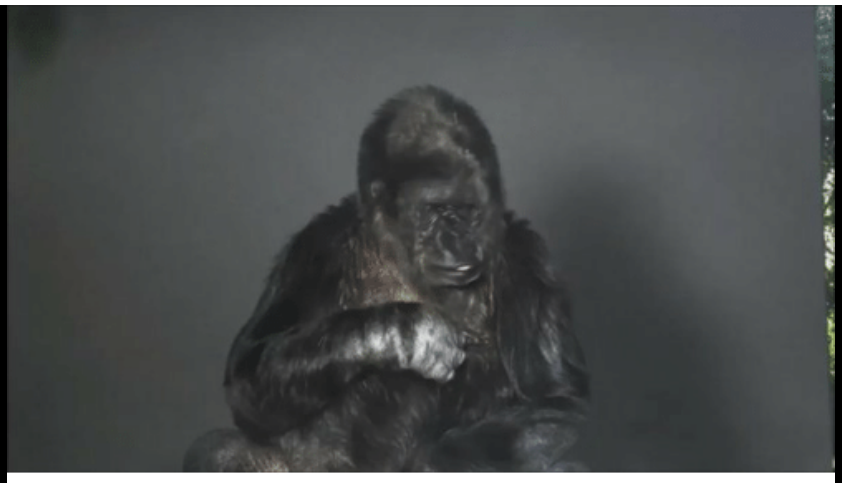


Scott Van Meter

- Managing Director, Berkeley Research Group
- Expertise in valuation and economic damage analysis
- 30+ Years of Experience
- JD, CPA, CIRA
- Three facts about me:
  - I play(ed) the Tuba
  - I compete in equestrian events
  - I have a cat named "Chu Chu"

Who Just Lied To You? / Can You Imagine A World Where You Couldn't Lie

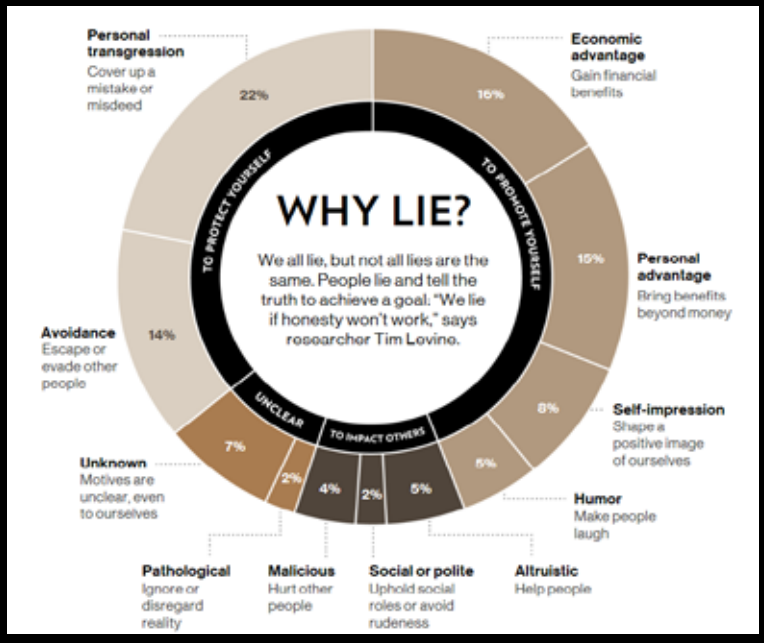
Meet Koko



This is Koko, a female gorilla that can communicate using sign language.

Who Gets the Blame?

Sociologists Tell Us Everyone Needs To Lie



What's The Most Common Lie Told?

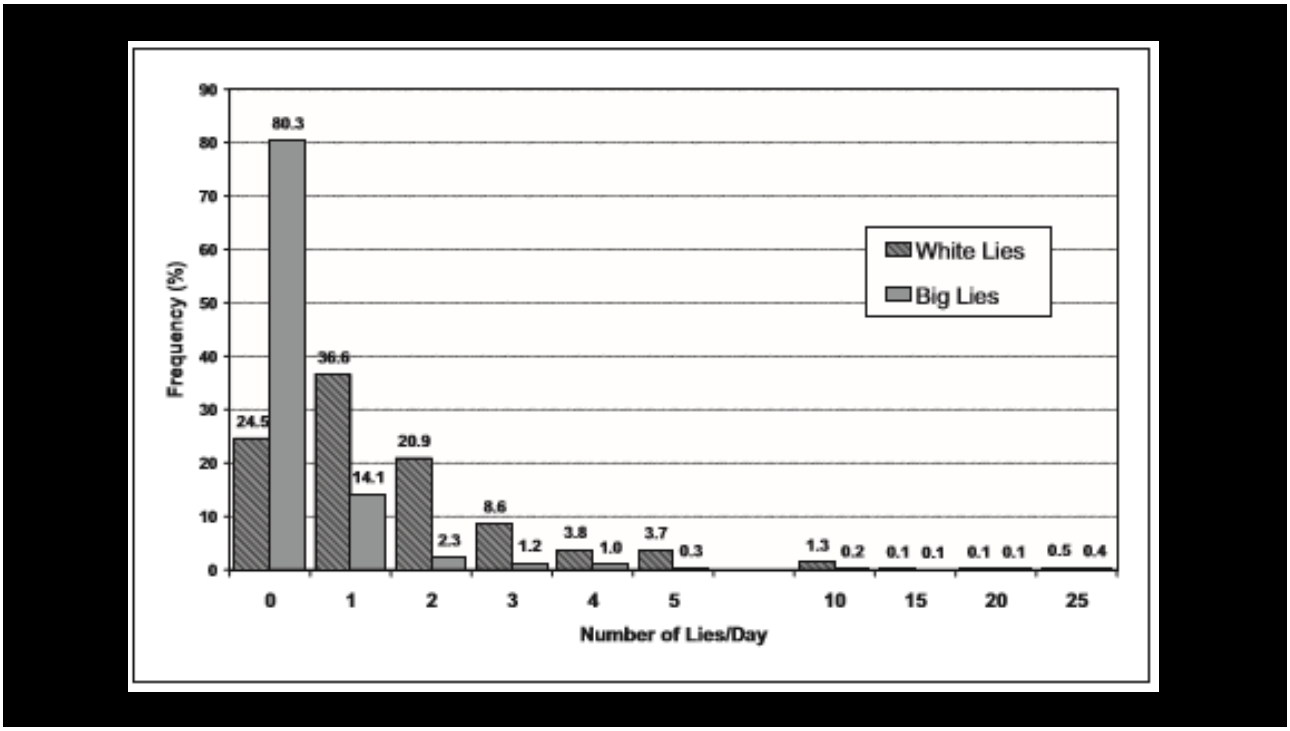
A. I'm from the Government and I'm here to help.

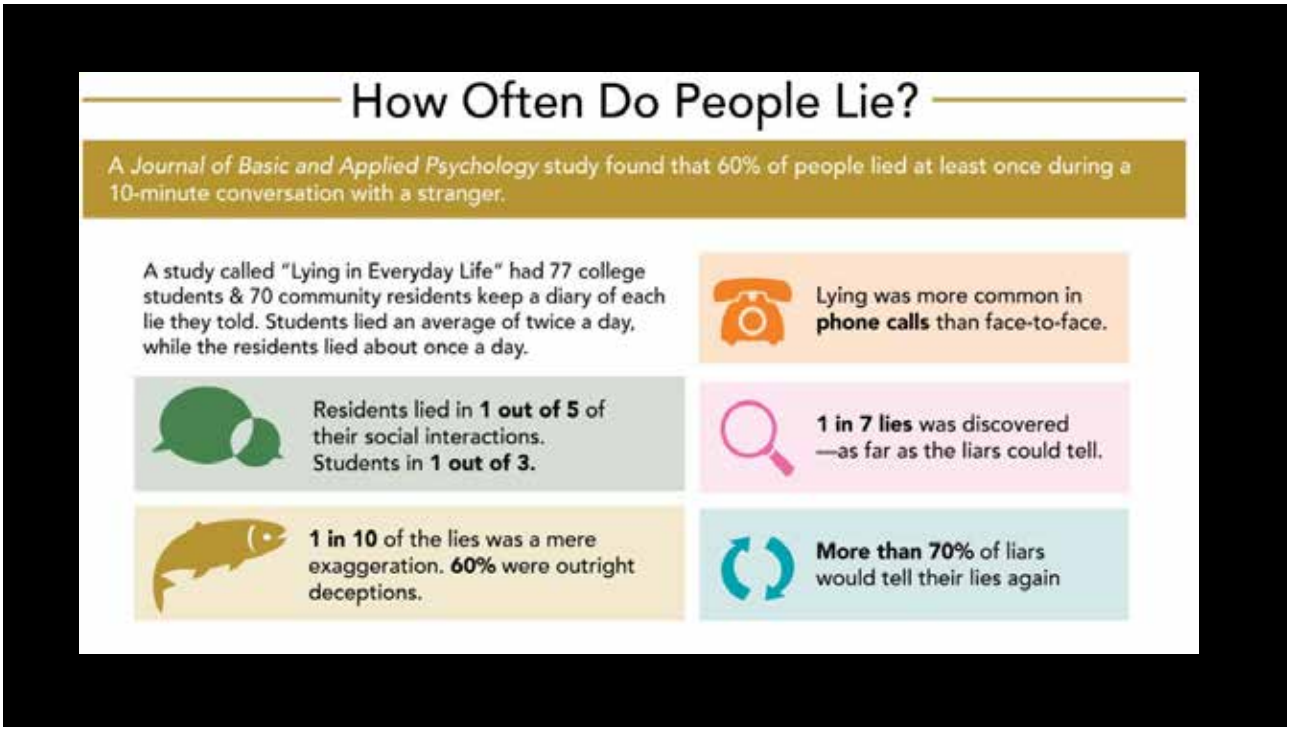
B. It's not you, it's me.

C. Trust me, I'm a Lawyer.

D. The check is in the mail.

E. I'm Fine.


Frequency (%)
90
80
70
60
50
40
30
20
10
0
80.3
36.6
24.5
20.9
14.1
8.6
2.3
1.2
3.8
1.0
3.7
0.3
1.3
0.2
0.1
0.1
0.1
0.1
0.5
0.4
0
1
2
3
4
5
10
15
20
25
Number of Lies/Day
White Lies
Big Lies

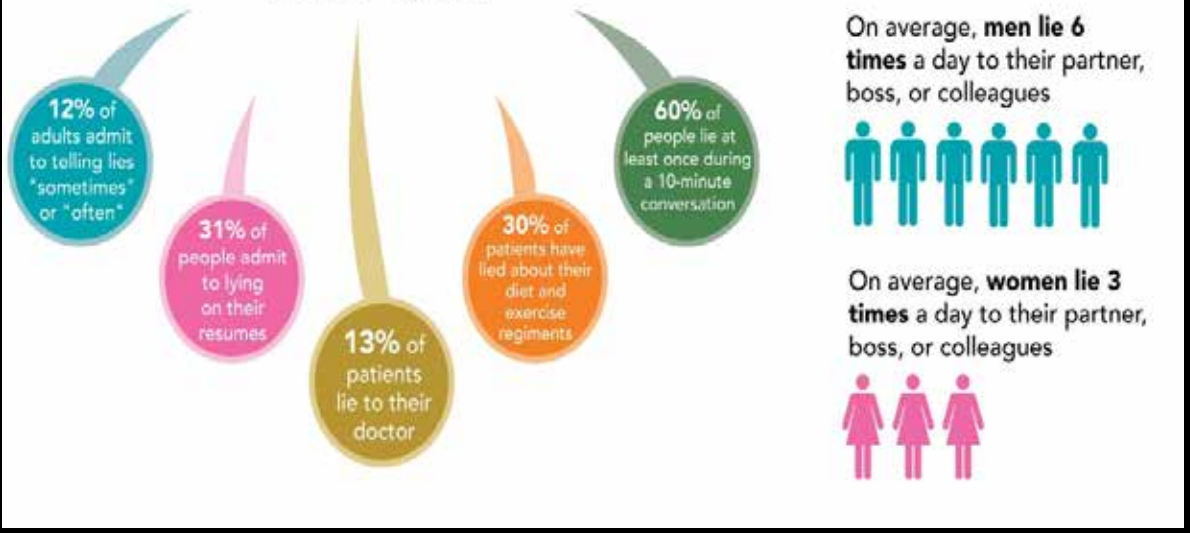

How Often Do People Lie?
A Journal of Basic and Applied Psychology study found that 60% of people lied at least once during a 10-minute conversation with a stranger.
A study called "Lying in Everyday Life" had 77 college students & 70 community residents keep a diary of each lie they told. Students lied an average of twice a day, while the residents lied about once a day.
Lying was more common in phone calls than face-to-face.
Residents lied in 1 out of 5 of their social interactions. Students in 1 out of 3.
1 in 7 lies was discovered —as far as the liars could tell.
1 in 10 of the lies was a mere exaggeration. 60% were outright deceptions.
More than 70% of liars would tell their lies again

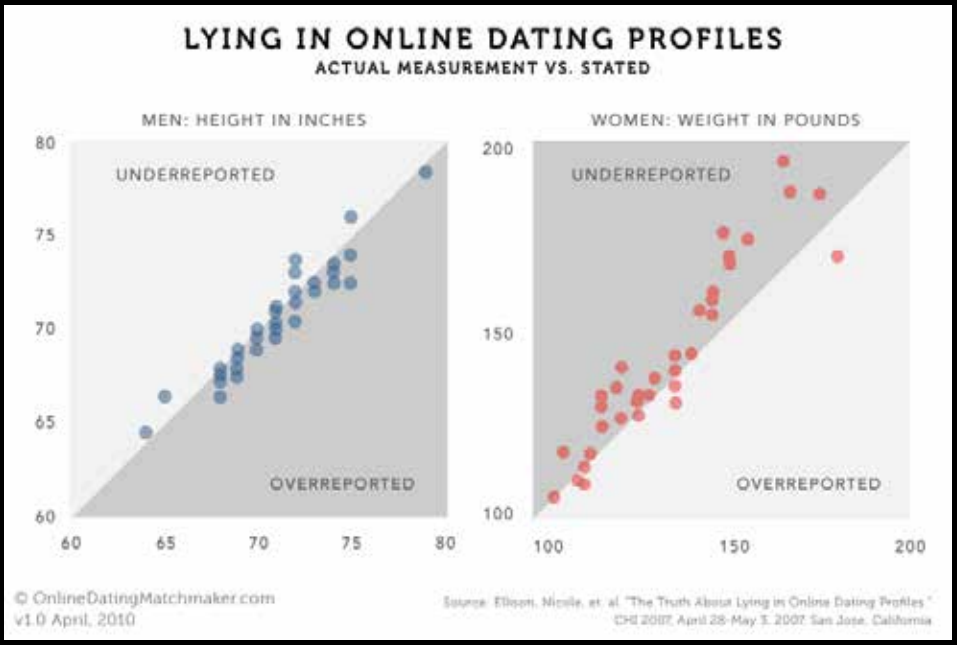
How Many Lies Do You Tell During Your Lifetime?

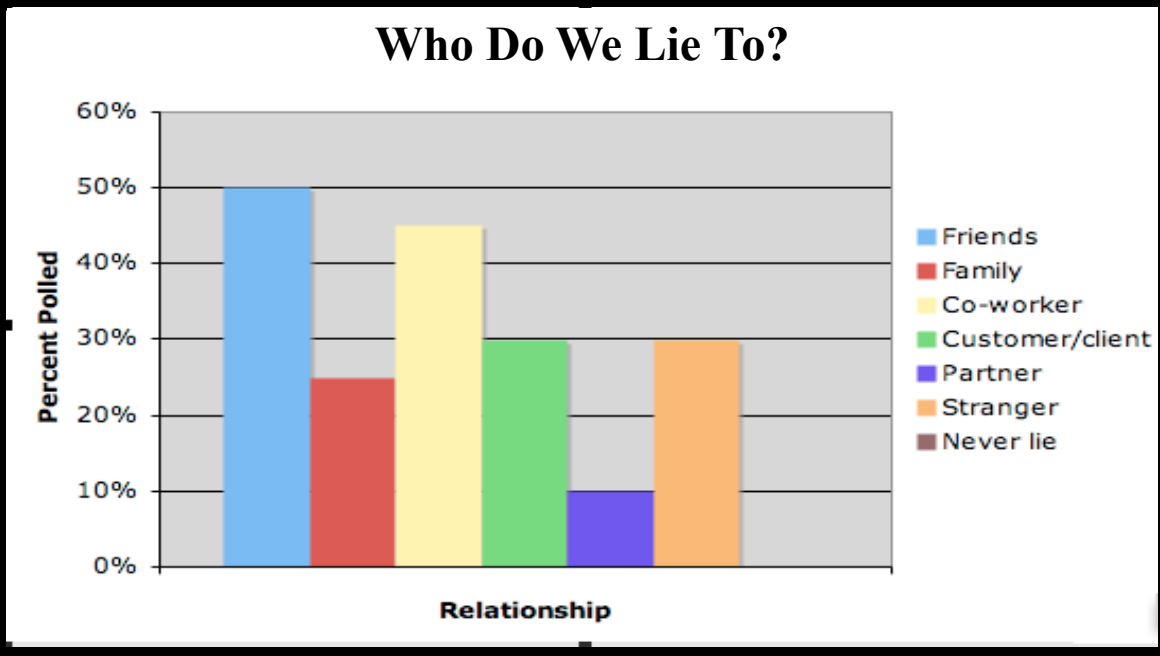
The average person tells 4 lies a day or 1460 a year; a total of 87,600 by the age of 60.

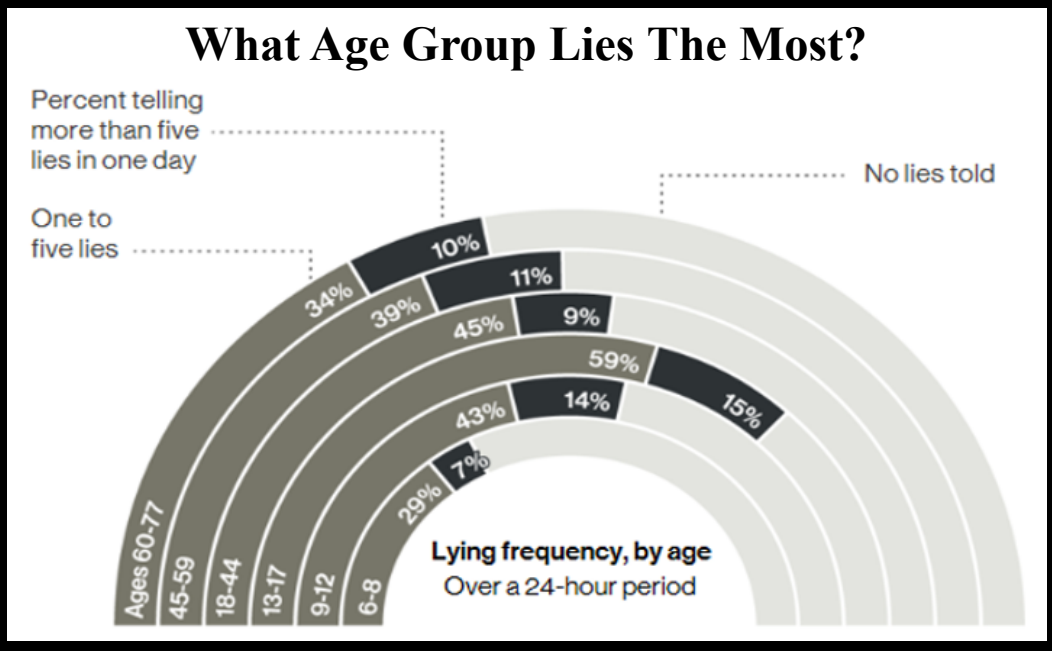
The twelve people now standing will tell over 1,000,000 lies during their lifetimes!

Who Lies More, Men or Women?




LYING IN ONLINE DATING PROFILES
ACTUAL MEASUREMENT VS. STATED
MEN: HEIGHT IN INCHES
WOMEN: WEIGHT IN POUNDS
UNDERREPORTED
OVERREPORTED
UNDERREPORTED
OVERREPORTED
80
75
70
65
60
60
65
70
75
80
200
150
100
100
150
200
© OnlineDatingMatchmaker.com
v1.0 April, 2010
Source: Ellison, Nicole, et. al. "The Truth About Lying in Online Dating Profiles"
CHI 2007, April 28-May 3, 2007, San Jose, California


Who Do We Lie To?
60%
50%
40%
30%
20%
10%
0%
Percent Polled
Relationship
Friends
Family
Co-worker
Customer/client
Partner
Stranger
Never lie



"Lies" In The Courtroom

The Seven Deadly Sins of Statistical Analysis

The Seven Deadly Sins of Statistical Analysis
(Basis in Academic Literature)

Steven Ross, Ph.D.

1. Non-Representative Sample
2. Mistaking Statistical Association for the Cause
3. Poisoned Control
4. Data Enhancement
5. Absoluteness
6. Partiality
7. A Bad Measuring Stick

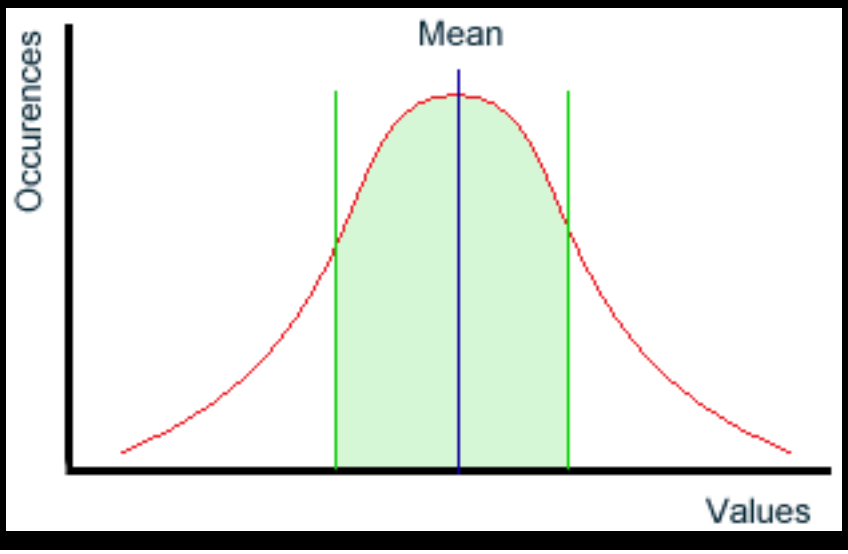
Louis and Chapman

1. Assuming Small Differences are Meaningful
2. Equating Statistical Significance with Real World Significance
3. Neglecting to Look at Extremes
4. Trusting Coincidence
5. Getting Causation Backwards
6. Forgetting to Consider Outside Causes
7. Deceptive Graphs

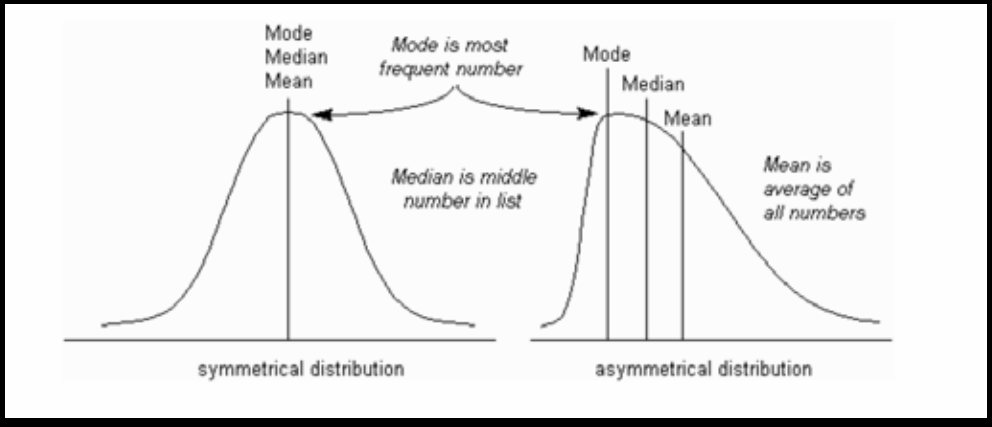
Three Types of Averages

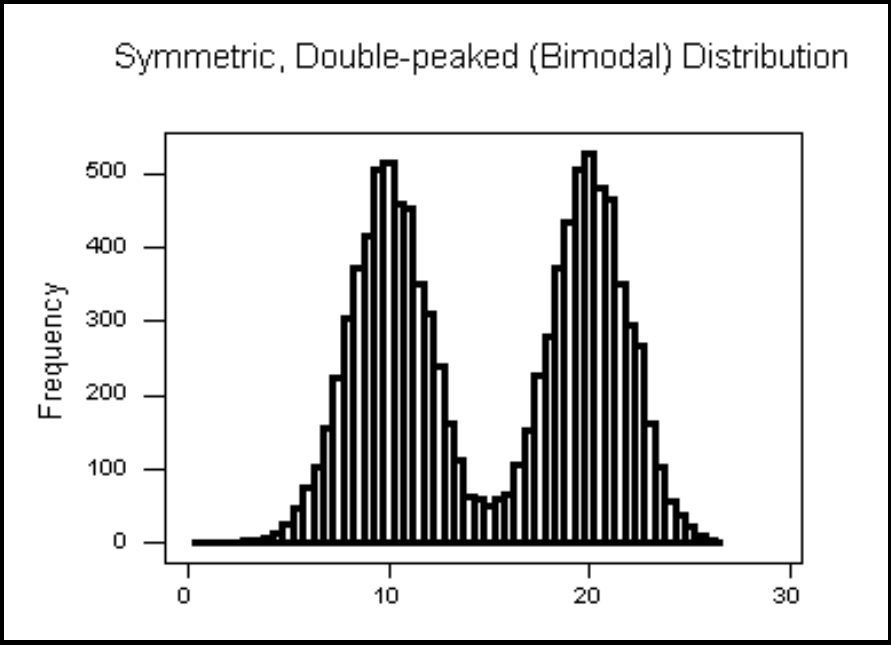
	Data Set #1	Data Set #2	Data Set #3	Data Set #4
	1	0	1	0
	3	2	1	0
	3	3	1	0
	3	5	2	0
	5	5	10	15
Total	15	15	15	15
Mean	15/5=3	15/5=3	15/5=3	15/5=3
Mode	3	5	1	0
Median	3	3	1	0

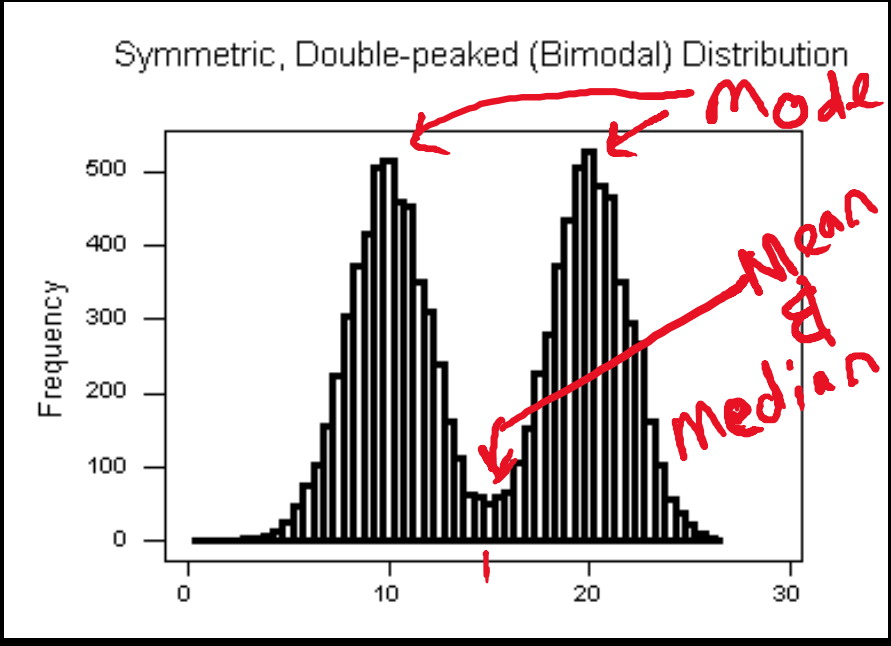
Anytime one uses the mean without consideration of the "outliers" they have made a mistake!

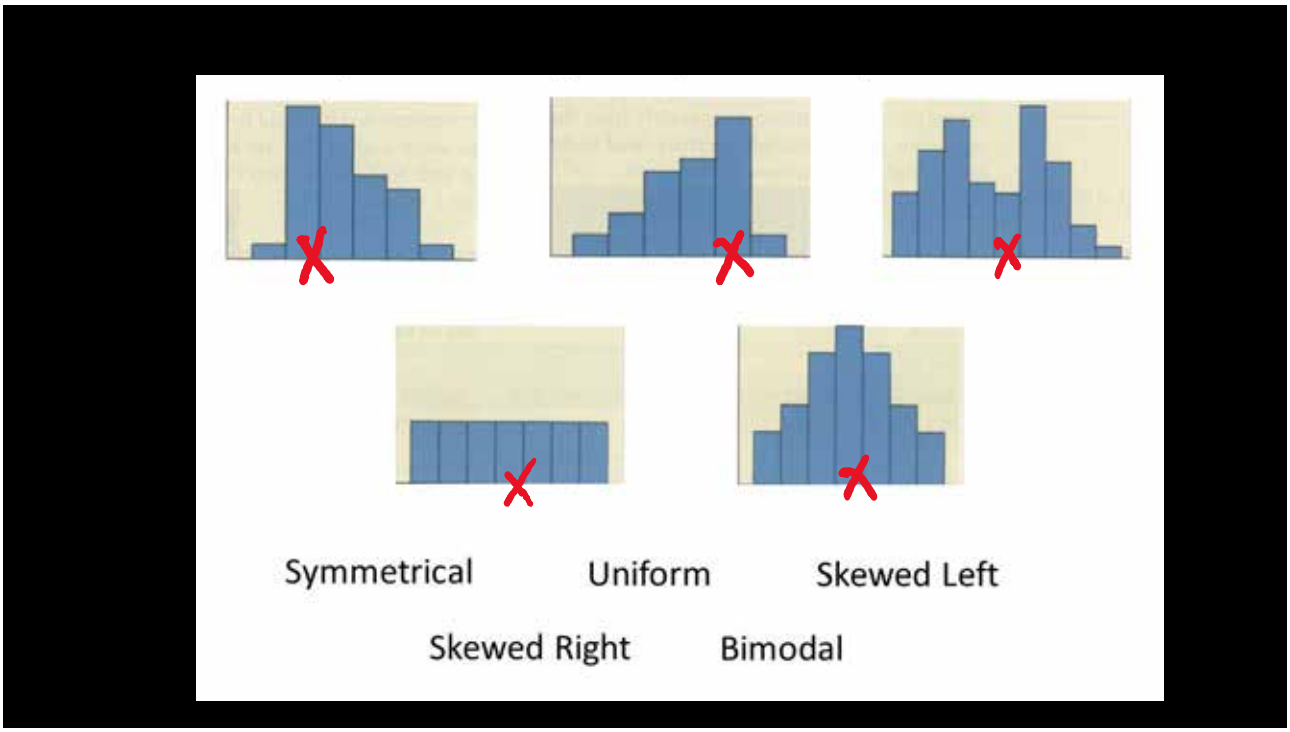


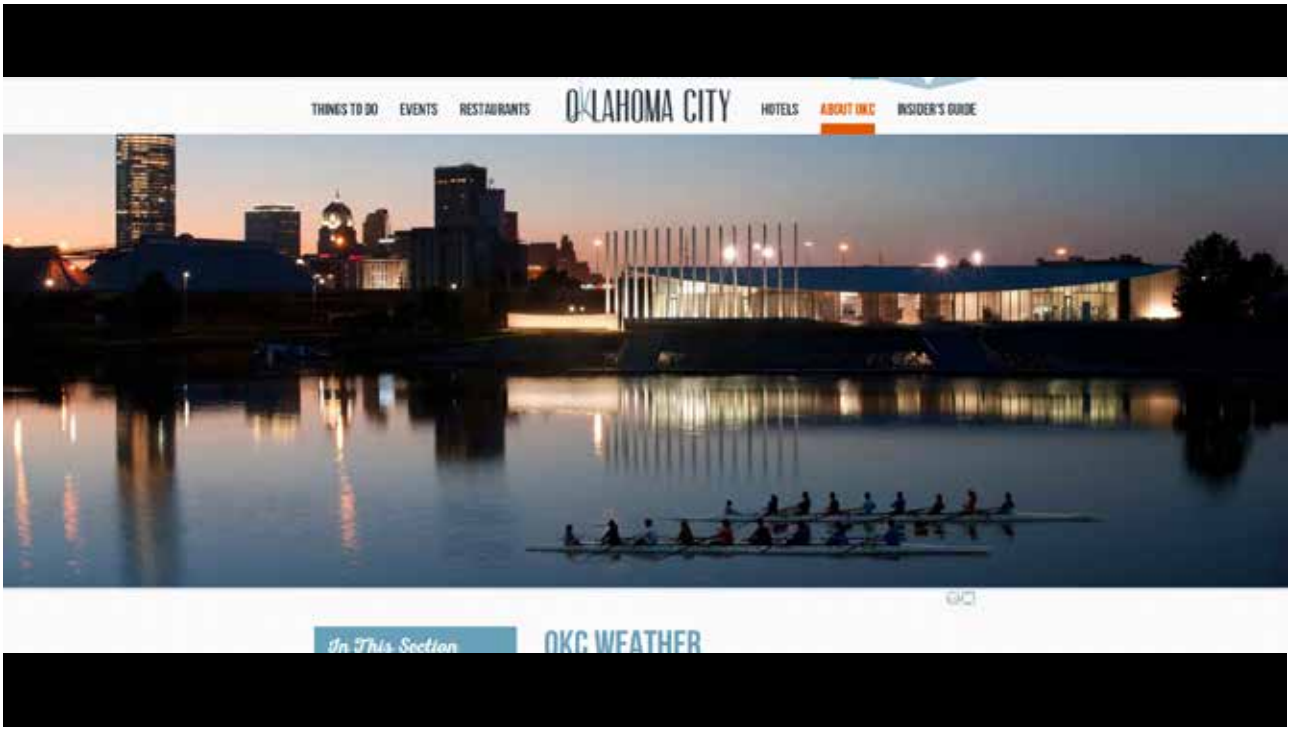
Unabashed use of the (Mean) Average

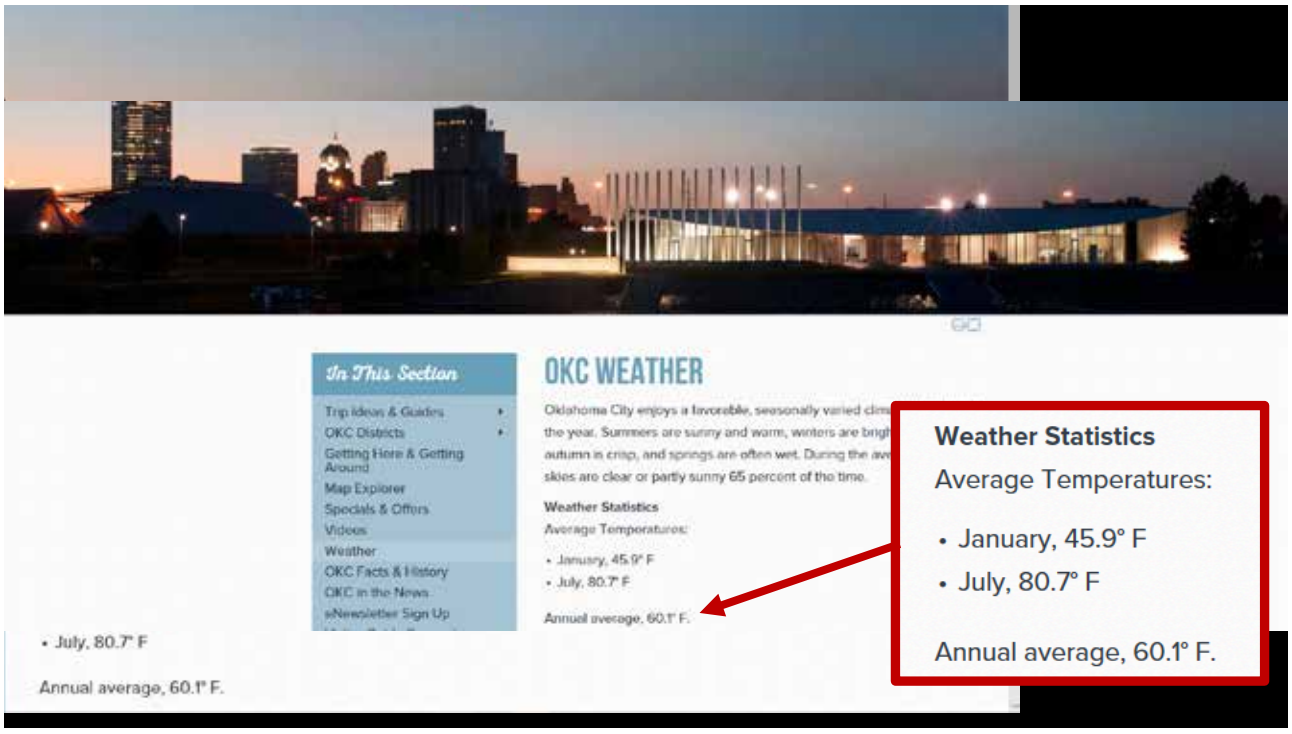



Symmetric, Double-peaked (Bimodal) Distribution
Frequency
0
100
200
300
400
500
0
10
20
30


Symmetric, Double-peaked (Bimodal) Distribution
Mode
Mean
&
Median
Frequency
0
100
200
300
400
500
0
10
20
30


Symmetrical
Uniform
Skewed Left
Skewed Right
Bimodal


THINGS TO DO
EVENTS
RESTAURANTS
OKLAHOMA CITY
HOTELS
ABOUT OKC
INSIDER'S GUIDE
In This Section
OKC WEATHER



Climate data for Oklahoma City (Will Rogers World Airport), 1981–2010 averages [hide]

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Record high °F (°C)	83 (28)	92 (33)	97 (36)	100 (38)	104 (40)	107 (42)	110 (43)	113 (45)	108 (42)	97 (36)	87 (31)	86 (30)	113 (45)
Average high °F (°C)	49.0 (9.4)	53.9 (12.2)	62.7 (17.1)	71.6 (22)	79.4 (26.3)	87.4 (30.8)	93.1 (33.9)	92.8 (33.8)	84.0 (28.9)	72.8 (22.7)	60.8 (16)	49.8 (9.9)	71.4 (21.9)
Daily mean °F (°C)	38.4 (3.6)	42.9 (6.1)	51.3 (10.7)	60.1 (15.6)	69.0 (20.6)	77.1 (25.1)	82.1 (27.8)	81.6 (27.6)	73.1 (22.8)	61.7 (16.5)	49.9 (9.9)	39.7 (4.3)	60.6 (15.9)
Average low °F (°C)	27.7 (−2.4)	31.9 (−0.1)	40.0 (4.4)	48.6 (9.2)	58.6 (14.8)	66.8 (19.3)	71.0 (21.7)	70.3 (21.3)	62.2 (16.8)	50.6 (10.3)	39.0 (3.9)	29.6 (−1.3)	49.7 (9.8)
Record low °F (°C)	−11 (−24)	−17 (−27)	1 (−17)	20 (−7)	32 (0)	46 (8)	53 (12)	49 (9)	35 (2)	16 (−9)	9 (−13)	−8 (−22)	−17 (−27)
Precipitation inches (mm)	1.39 (35.3)	1.61 (40.9)	3.06 (77.7)	3.06 (77.7)	4.64 (117.9)	4.95 (125.7)	2.97 (75.4)	3.31 (84.1)	4.07 (103.4)	3.73 (94.7)	2.01 (51.1)	1.89 (47.8)	36.67 (931.4)
Snowfall inches (cm)	2.8 (7.1)	2.0 (5.1)	9 (2.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	.4 (1)	2.3 (5.8)	8.5 (21.6)
Avg. precipitation days (≥ 0.01 in)	5.1	5.9	7.6	7.7	9.8	9.2	5.8	6.7	7.2	8.0	6.0	5.8	84.6
Avg. snowy days (≥ 0.1 in)	1.7	1.3	.6	0	0	0	0	0	0	0	.3	1.7	5.7
Mean monthly sunshine hours	201.5	192.1	244.9	270.0	294.5	327.0	356.5	328.6	264.0	244.9	186.0	179.8	3,089.8

Source: NOAA (snowfall averages 1981–2011, extremes 1890–present),[1][2] HKO (sun only, 1961–1990)[3]

Oklahoma City Climate Data 1981 -2010

Average Daily Mean Temperature

60.6 Degrees

113 Degrees - Record High

-17 Degrees – Record Low

130 Degrees Swing!

Sampling Errors

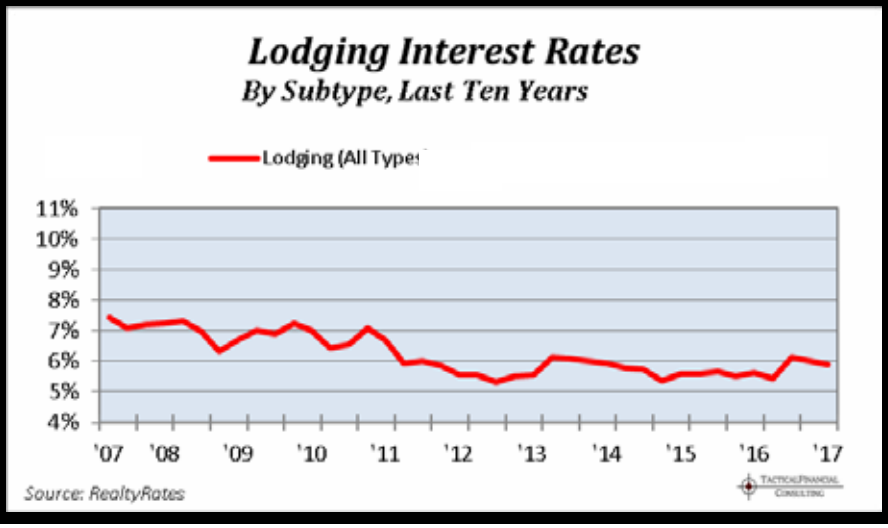
- What is sampling?
  - In instances where it is difficult or impossible to measure the characteristics of an entire population (e.g., every US citizen, all brown dogs), sampling is used to obtain information that is expected to represent the broader population.
  - In order for the sample to provide meaningful data, it is important that the sample be chosen in a way to avoid bias, i.e., using a random selection process.
- How do errors occur?
  - No matter how good the "random" sample is, it can never be fully representative of the entire population – the sample only estimates the characteristics of that population.
- Sampling errors are defined as the differences between the sample observations and the actual characteristics of the population
  - Since the total population's values cannot be determined, the "extent" of the sampling error is estimated using probabilities

Non-Representative Sample

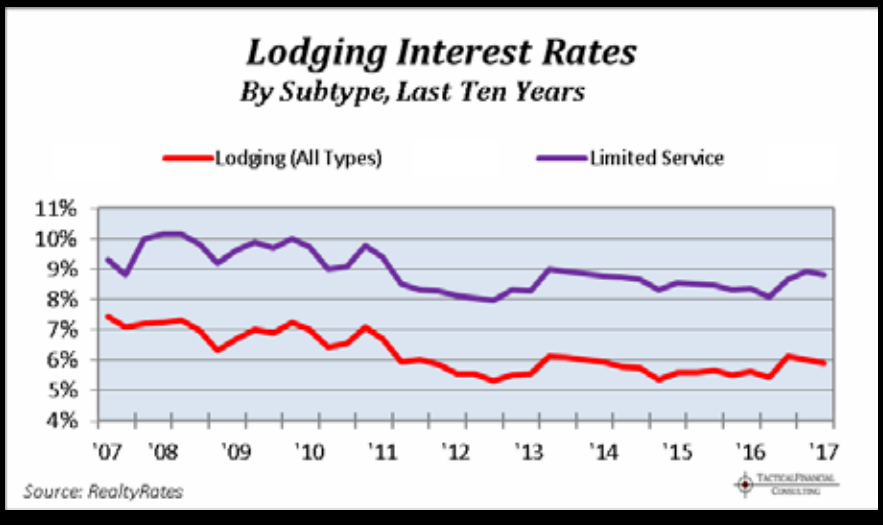
Data-driven decision-making is considered a smart move, but it can be costly or dangerous when something that appears to be true is not actually true.

Even with the best of intentions, some of the world's most famous companies are challenged by skewed results because the data is biased, or the humans collecting and analyzing data are biased, or both.

To Bias or Not To Bias - *Should sample represent all available data , the population or should it be purposely skewed toward a certain result?*

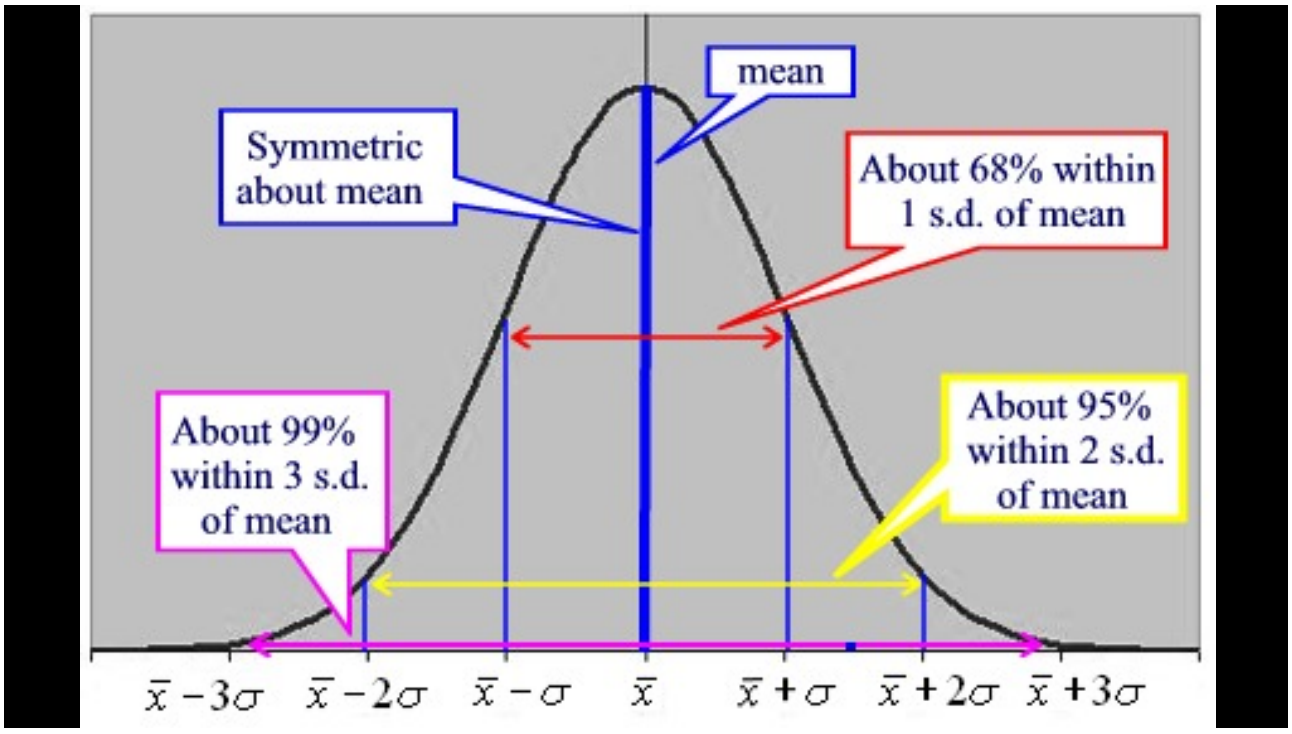


To Bias or Not To Bias - *Should sample represent all available data or should it be purposely skewed toward a certain result?*



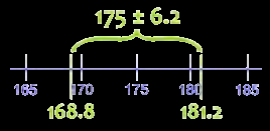
Confidence Intervals

- What is a confidence interval?
  - Confidence intervals consist of a range of values that act as good estimates of the unknown broader population characteristic. Since the data used came from a random sample, the confidence interval is also random.
  - Put more simply, the confidence interval is the range of values we are fairly sure our true value lies in.
- The desired level of confidence is set by the researcher (i.e., it is not determined by the data); typically a 95% confidence level is used

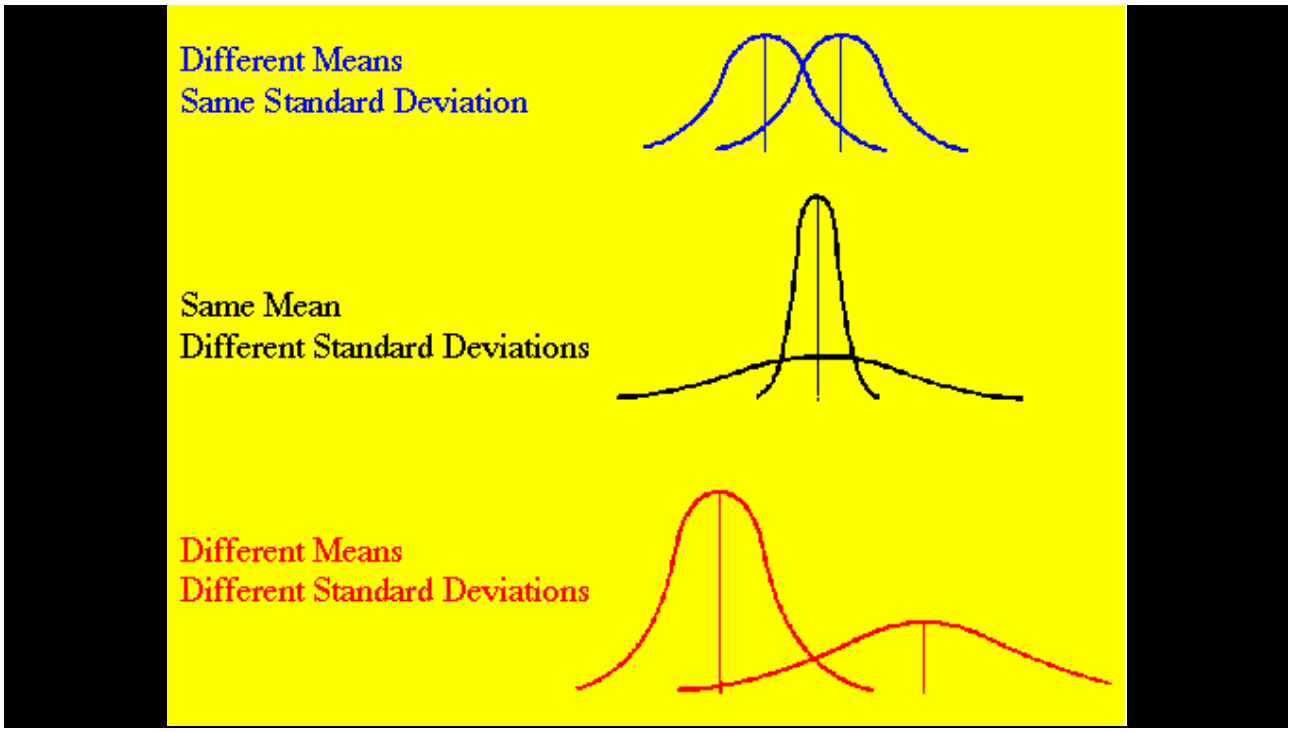


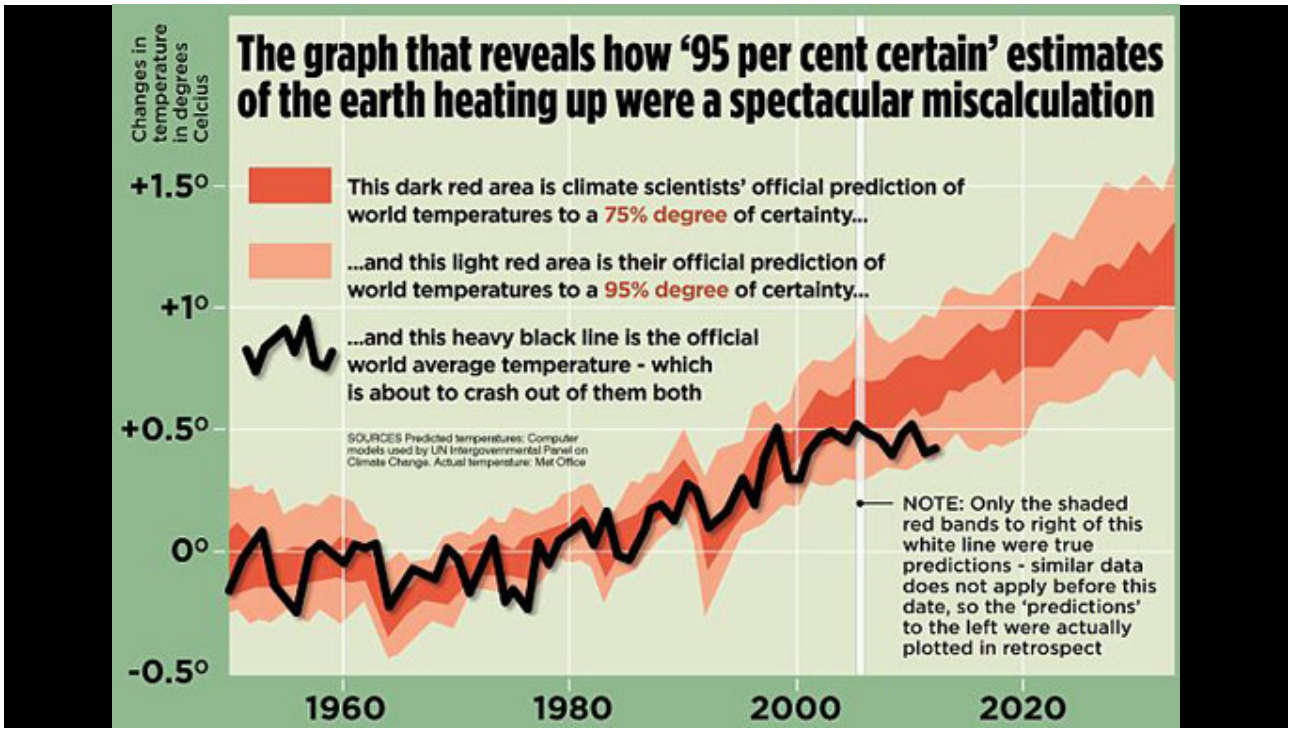
Confidence Intervals - Example

- The height of randomly selected sample of forty men was measured.
  - The mean height was 175 centimeters
  - The standard deviation for the sample was 20 centimeters
- Using a desired level of confidence of 95%, the confidence interval is represented by the following graph:



- Based on the calculations, the conclusion would be that the true mean for all men – assuming every man's height could be measured – would fall between 168.8 and 181.2 centimeters – but not necessarily!
- The 95% confidence level means that 95% of our samples would include the true mean, but 5% won't.


Different Means
Same Standard Deviation
Same Mean
Different Standard Deviations
Different Means
Different Standard Deviations


The graph that reveals how '95 per cent certain' estimates of the earth heating up were a spectacular miscalculation
Changes in temperature in degrees Celcius
+1.5°
+1°
+0.5°
0°
-0.5°
This dark red area is climate scientists' official prediction of world temperatures to a 75% degree of certainty...
...and this light red area is their official prediction of world temperatures to a 95% degree of certainty...
...and this heavy black line is the official world average temperature - which is about to crash out of them both
SOURCES Predicted temperatures: Computer models used by UN Intergovernmental Panel on Climate Change. Actual temperature: Met Office
NOTE: Only the shaded red bands to right of this white line were true predictions - similar data does not apply before this date, so the 'predictions' to the left were actually plotted in retrospect
1960
1980
2000
2020

False Positives and Negatives

- What is a false positive?
  - A false positive, or "Type 1" error, represents the rejection of a true null hypothesis; in other words, one infers the existence of something that isn't actually there.
- What is a false negative?
  - A false negative, or "Type 2" error, represents the acceptance of a false null hypothesis; in other words, one infers that something doesn't exist, when in fact it does.
- For reference, in statistics, a null hypothesis represents the statement or outcome that one is trying to prove is not true using the evidence/data gathered
  - A researcher will develop the null hypothesis with the intent of rejecting it

False Positives and Negatives - Examples

- Example 1:
  - *Hypothesis:* "The evidence produced before the court proves that this man is guilty."
  - *Null hypothesis (H_0):* "This man is innocent."
  - A type I error occurs when convicting an innocent person. A type II error occurs when letting a guilty person go free.
  - A positive correct outcome occurs when convicting a guilty person. A negative correct outcome occurs when letting an innocent person go free.
- Example 2:
  - *Hypothesis:* "A patient's symptoms improve after treatment A more rapidly than after a placebo treatment."
  - *Null hypothesis (H_0):* "A patient's symptoms after treatment A are indistinguishable from a placebo."
  - A Type I error would falsely indicate that treatment A is more effective than the placebo, whereas a Type II error would be a failure to demonstrate that treatment A is more effective than placebo even though it actually is more effective.

Source: Wikipedia

Regression Analysis

Regression analysis is a mathematical measure of the average relationship between two or more variables in terms of the original units of data.

Types of regression:

- Simple - Two variables at a time
- Multiple - Three or more variables at a time
- Linear and Non-Linear

Regression Analysis

Linear versus Non-Linear Regression

- Linear and nonlinear regression are actually named after the functional form of the models that each analysis accepts.
- A model is linear when each term is either a constant or the product of a parameter and a predictor variable. A linear equation is constructed by adding the results for each term. This constrains the equation to just one basic form:

  Response = constant + parameter * predictor + ... + parameter * predictor

  $$Y = b_o + b_1X_1 + b_2X_2 + ... + b_kX_k$$

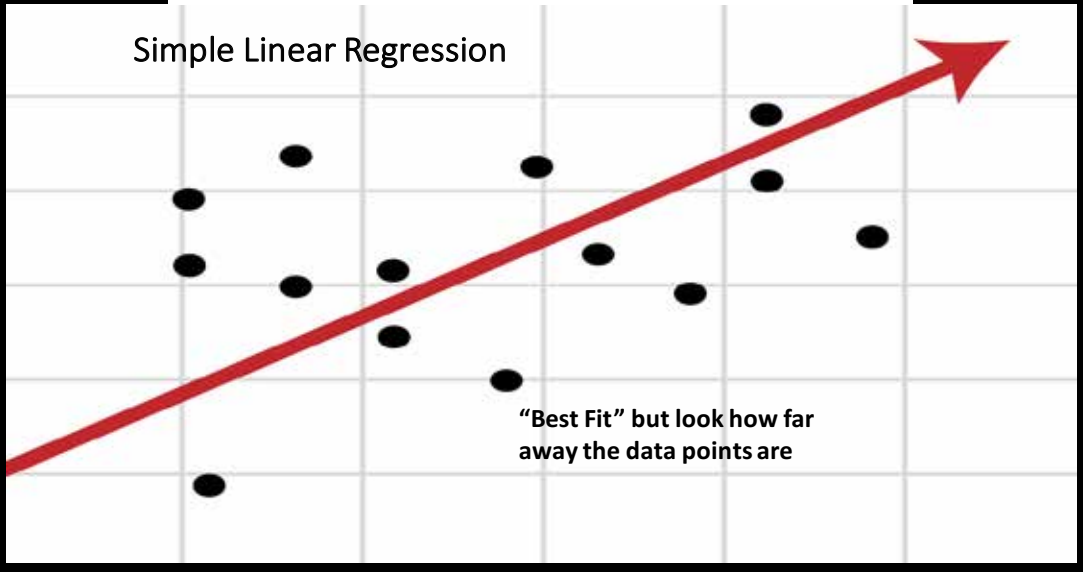
- A linear model can produce a curved line, by squaring one of the variables

  $$Y = b_o + b_1X_1 + b_2X_1^2$$

All other models not meeting the parameters for a linear equation are non-linear

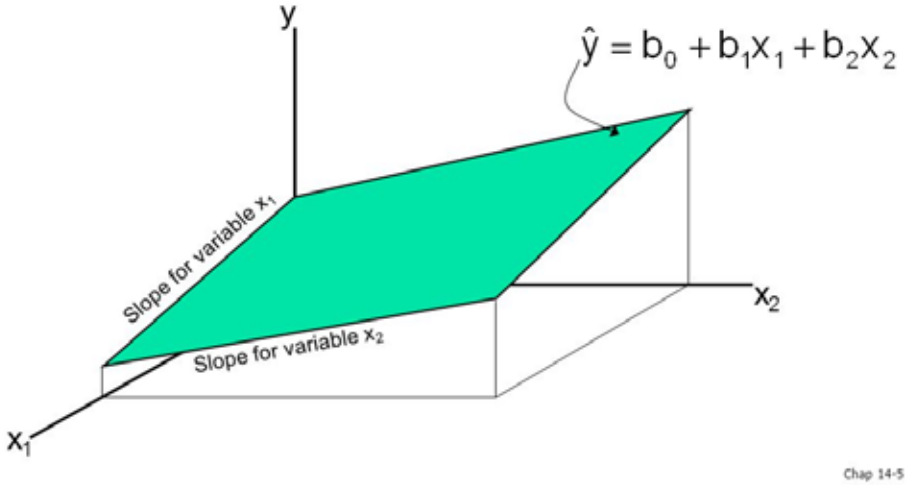
Formula - y = b + mx

Simple Linear Regression



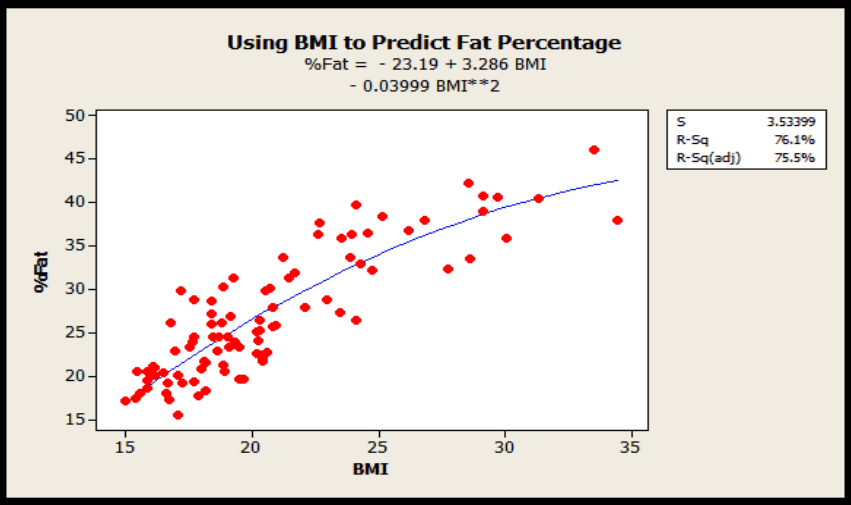
Multiple Regression Model

Two variable model

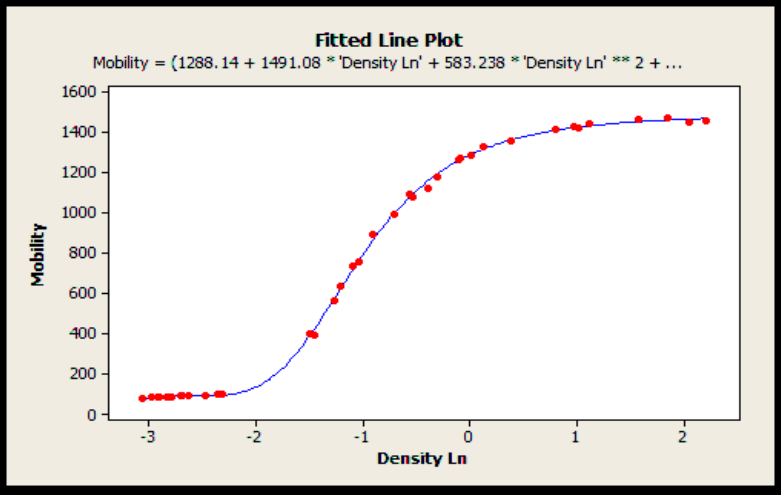


Chap 14-5

Linear Regression with Curvature



Non-Linear Regression



Common Mistakes in Regression

- Model Misspecification
- Unusual Observations and Outliers
- Interpreting the Coefficient of Determination – "R-Squared" (R^2)

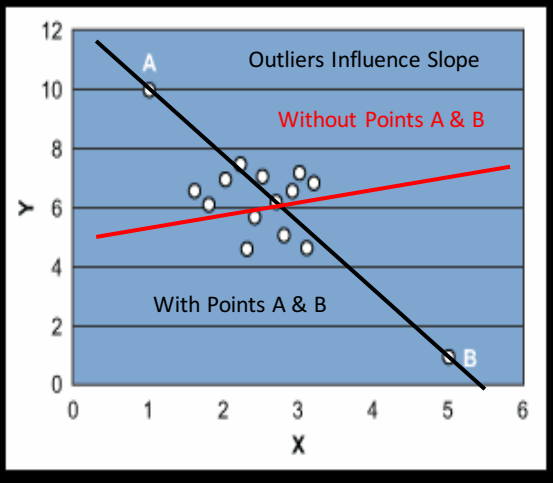
Model Misspecification

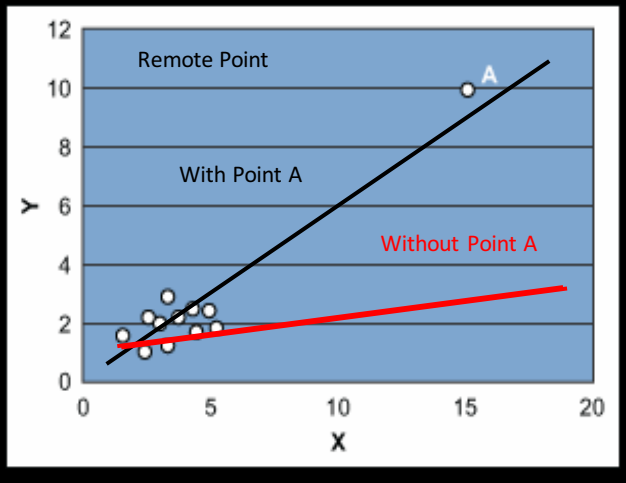
- Purpose of regression is to approximate a functional relationship between two or more variables
- Then use that model to predict the variable of interest
- Just because two variables are correlated does not mean they are functionally related. Correlation does not equal Causation!
- For example, a strong statistical relationship between sales of hot chocolate and facial tissues does not mean hot chocolate causes people to need facial tissue.

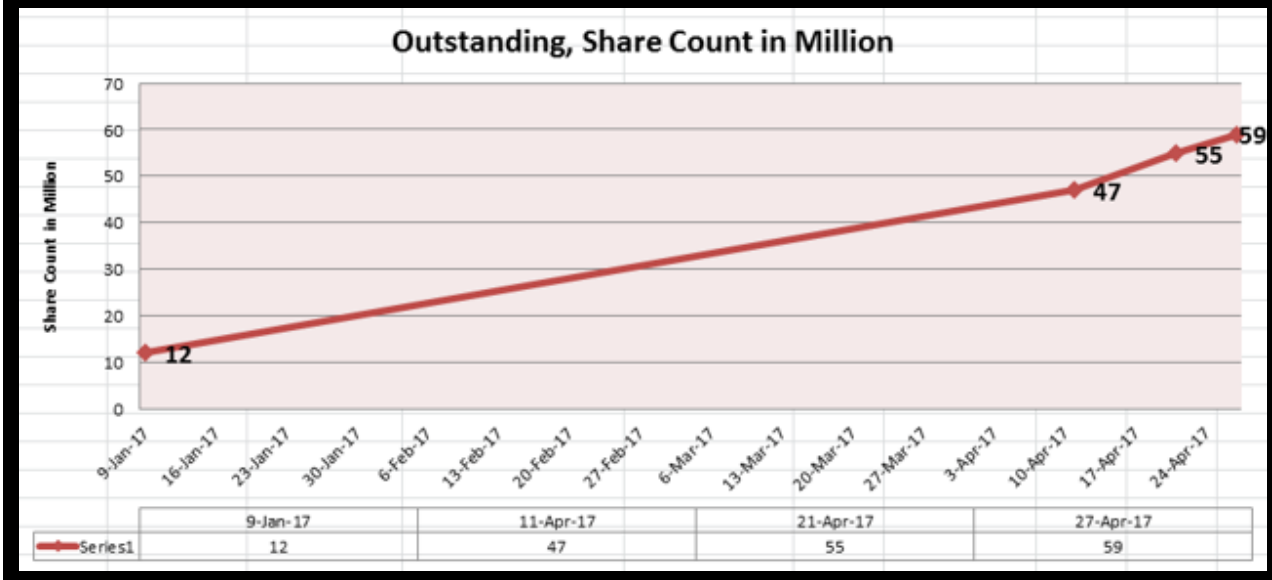
Unusual Observations and Outliers

- Generally, all data points have an equal weight in estimating the intercept of the regression
- However, the estimate of the slope is more strongly influenced by remote values

Unusual Observations and Outliers



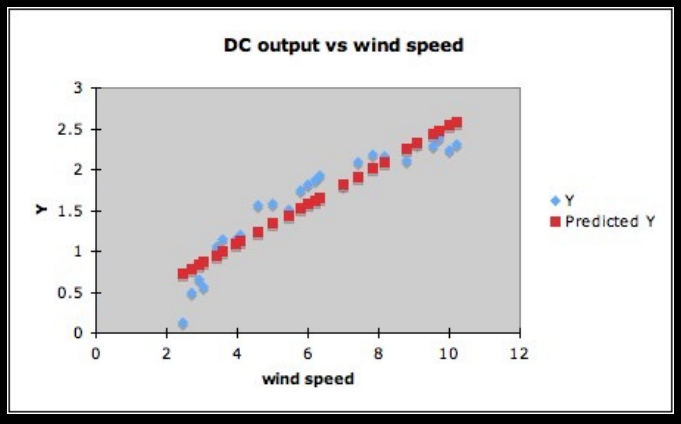




Interpreting Coefficient of Determination

- R^2 is often misinterpreted:
  - Measures influence of predictor variables on response variable
  - High R^2 proves correct model has been specified and theory is correct
  - Higher R^2 in one model means it is better than another model with lower R^2
  - R^2 is simply a measure of the spread of data around a regression line
  - It is not an estimator because there is no relevant population parameter
  - Can be useful in comparing models with same response variable but different predictor variables
  - Use of a test statistic (e.g., t-test, F-test) will show if estimated coefficients are statistically significant

Coefficient of Determination

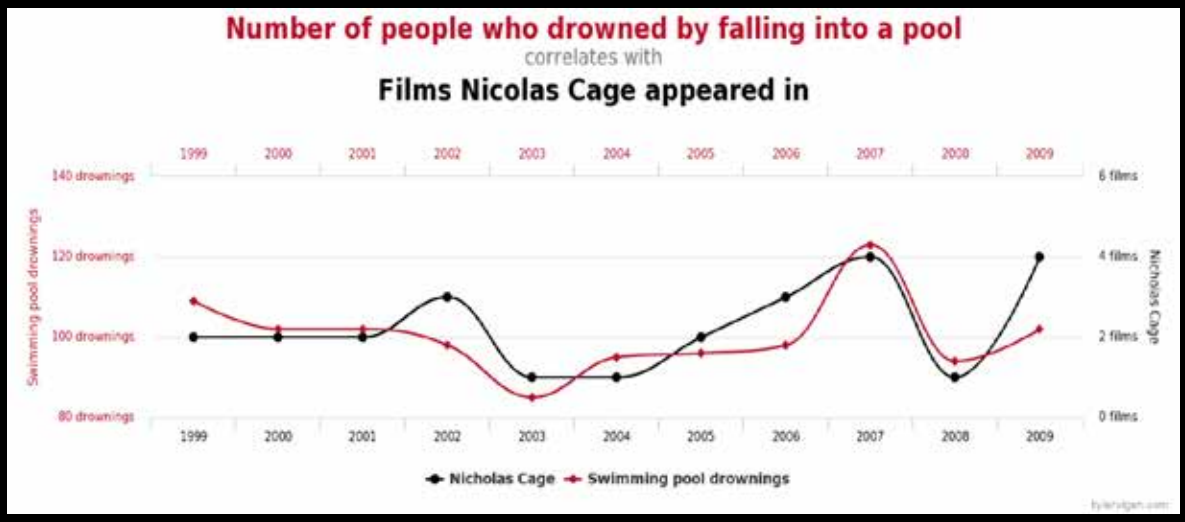


R^2 equals .87, pretty high

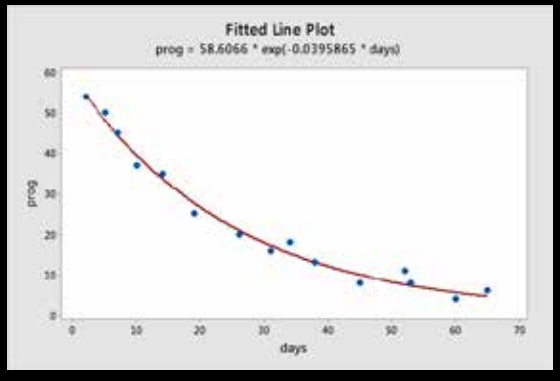
But, data clearly show a curved trend

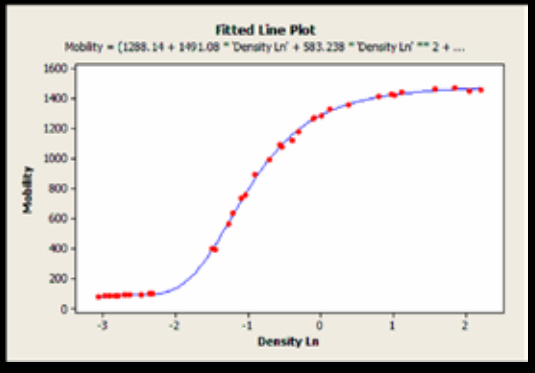
Mistakes in Thinking About Causation

- Correlation is often confused with Causation
  - Example - Shoe sizes and scores on a standardized reading exam (given to all students in an elementary school)
  - Data show that students with larger shoe sizes scored higher
  - While correlated, it is absurd to say higher reading scores cause larger shoe sizes (older students have bigger feet AND have read more than younger students, hence higher scores)



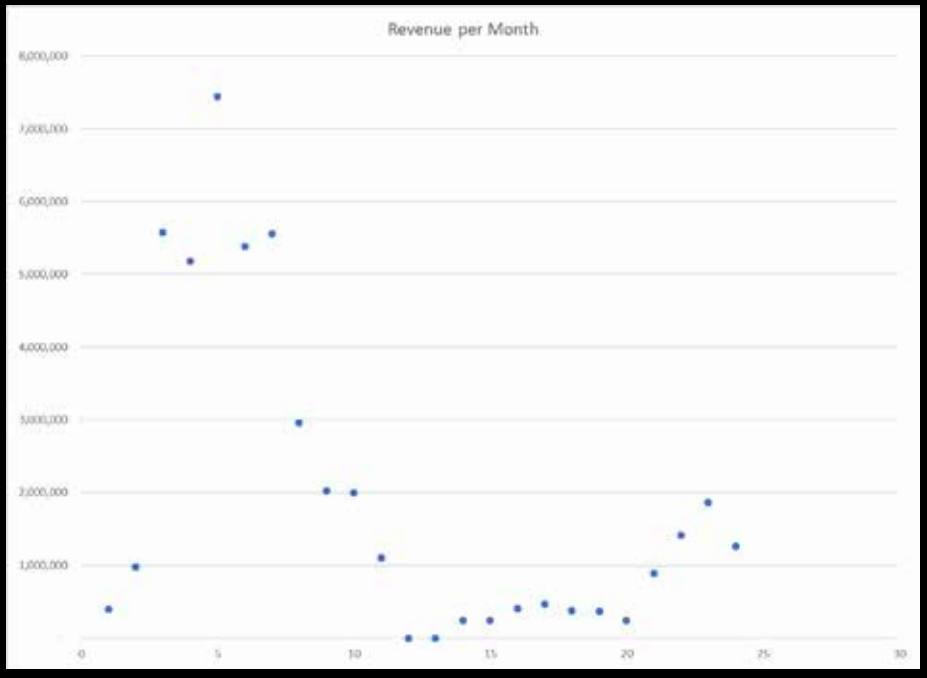
Linear versus Non-Linear Regression

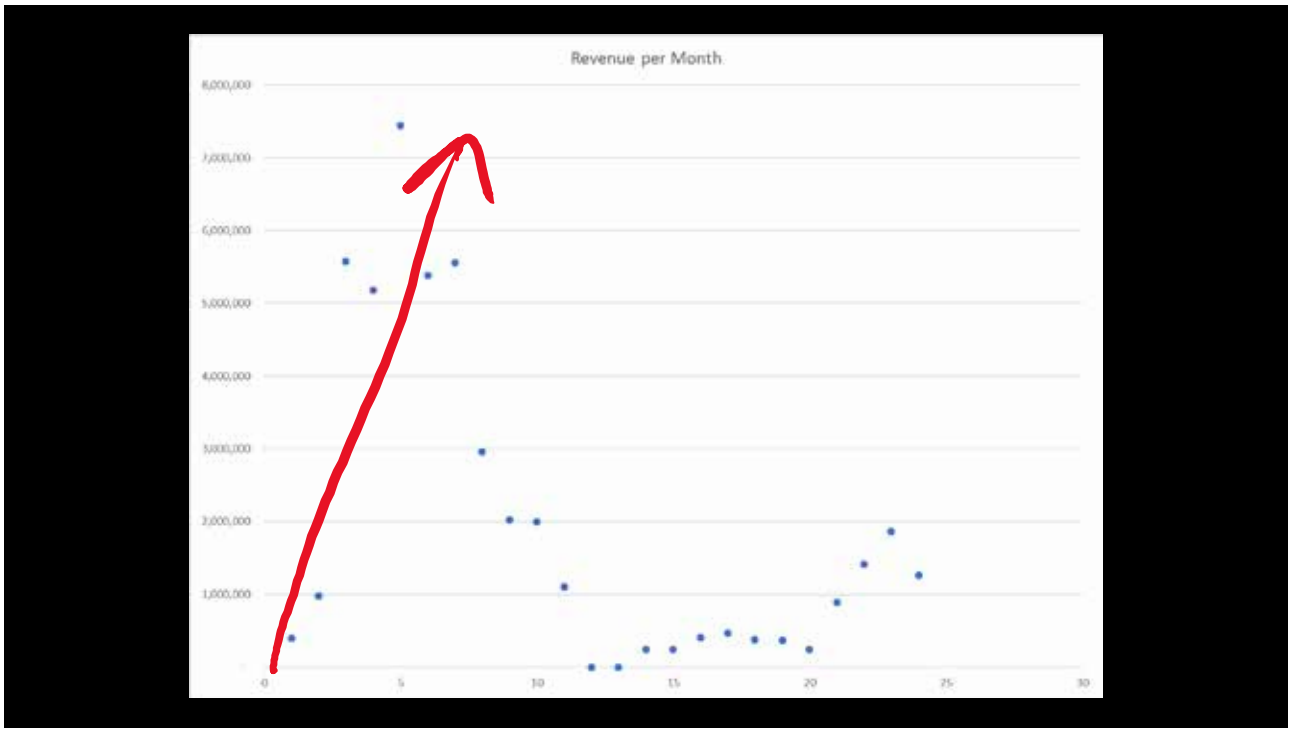


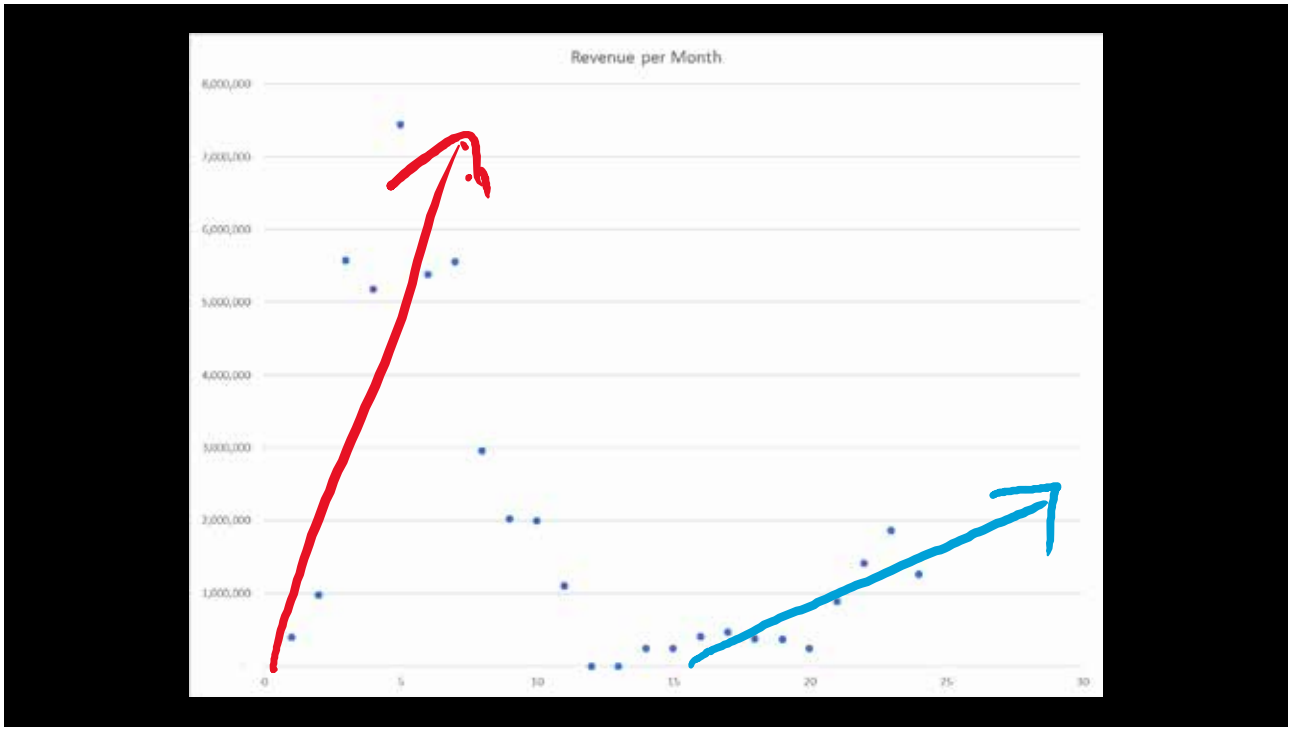


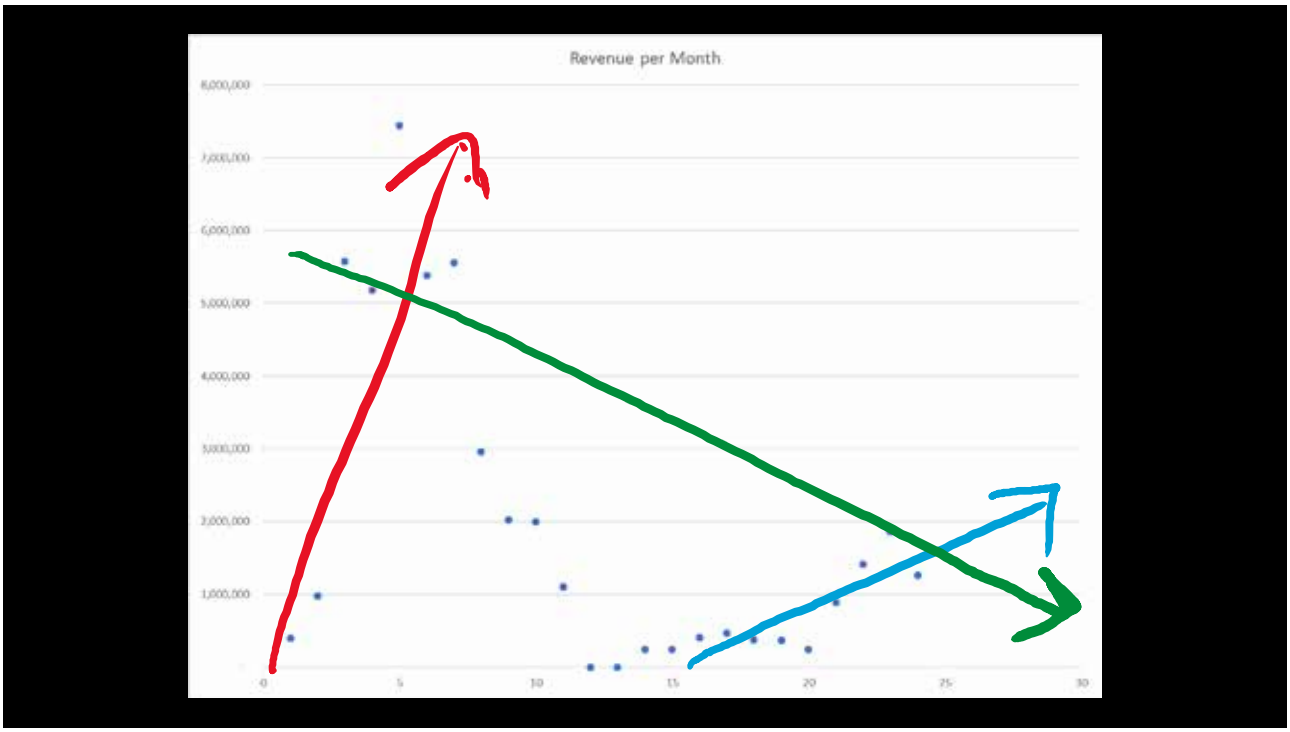
A Simple Case Study

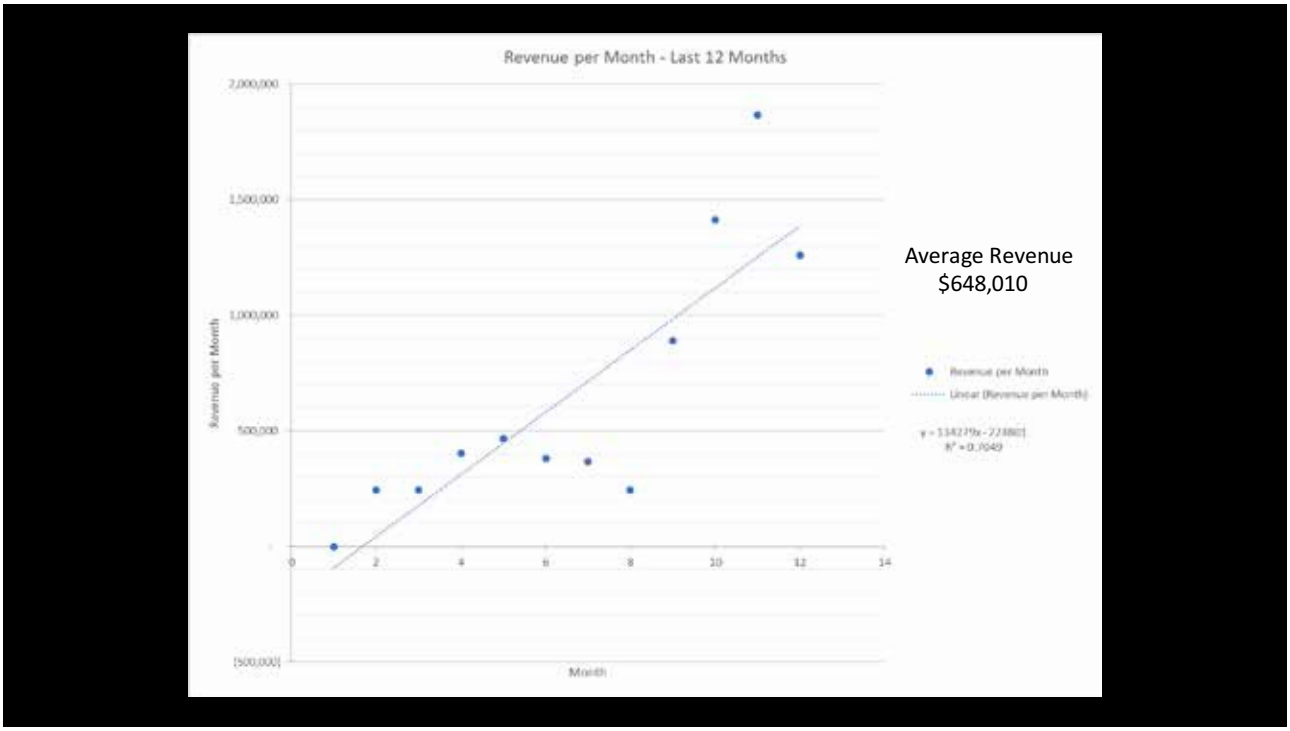
- A partnership was formed to develop a 200 unit condominium project in two phases
- Phase One of the project started out pretty well, but a recession hit toward the end of Year One, slowing sales dramatically and requiring significant discounts to sell the remaining units
- All units from Phase One were sold by the end of Year Two as the economy recovered
- Phase Two is about to kick off, but the parties could not agree on a valuation
- The key issue in the case is how to project revenue per month based on the experience in Phase One

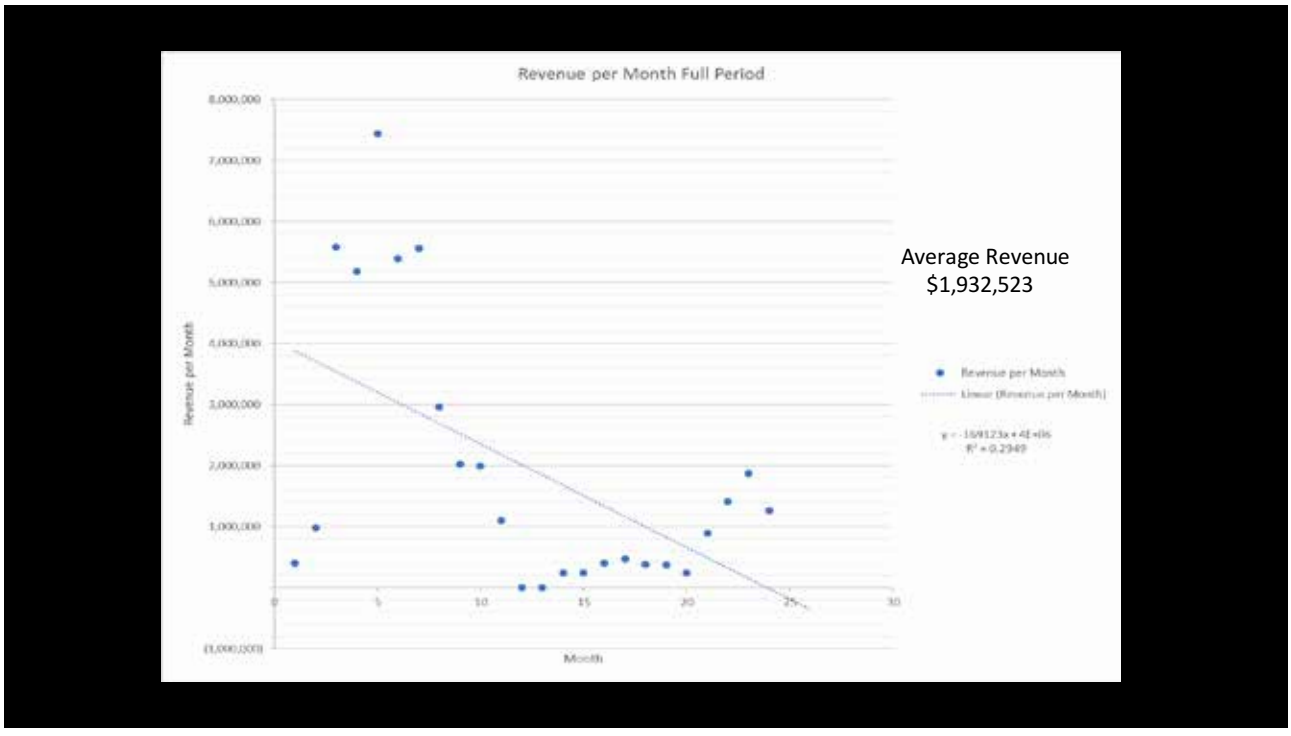


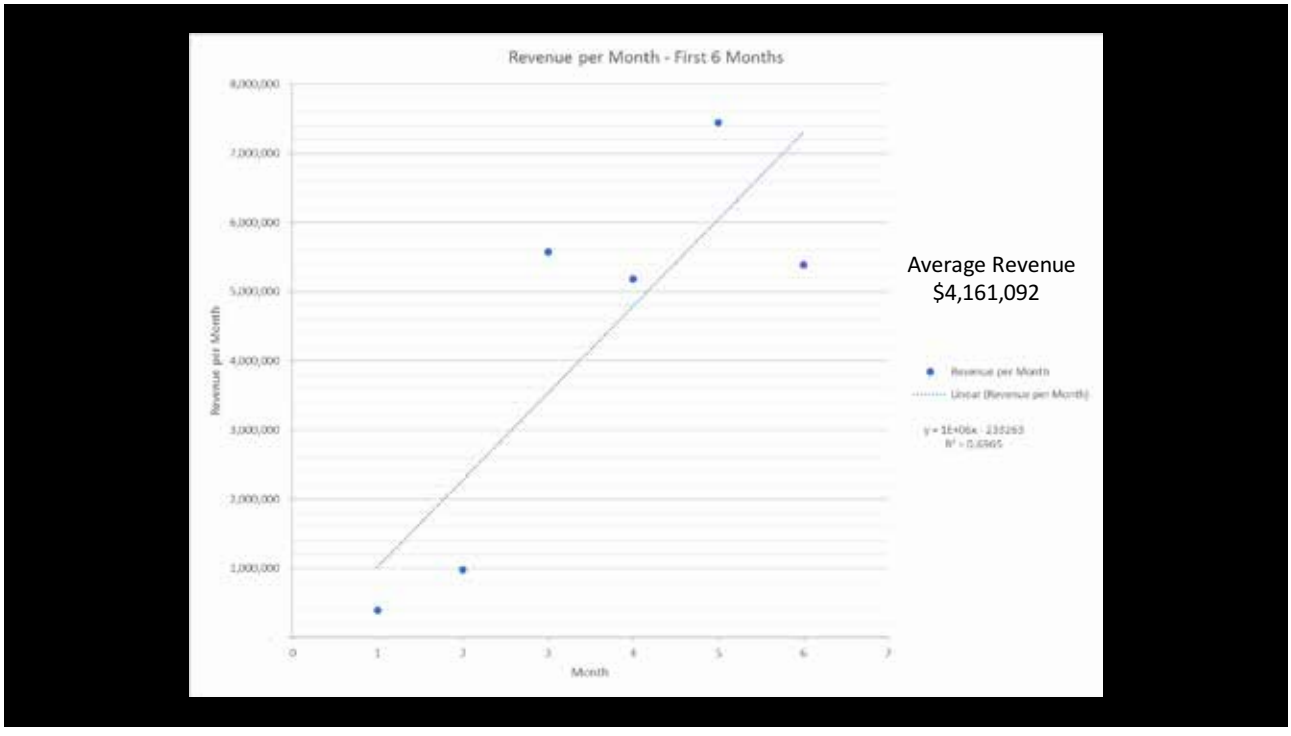

Revenue per Month
8,000,000
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
5
10
15
20
25
30


Revenue per Month
8,000,000
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
5
10
15
20
25
30


Revenue per Month
8,000,000
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
5
10
15
20
25
30


Revenue per Month - Last 12 Months
2,000,000
1,500,000
1,000,000
500,000
(500,000)
Revenue per Month
0
2
4
6
8
10
12
14
Month
Average Revenue
$648,010
Revenue per Month
Linear (Revenue per Month)

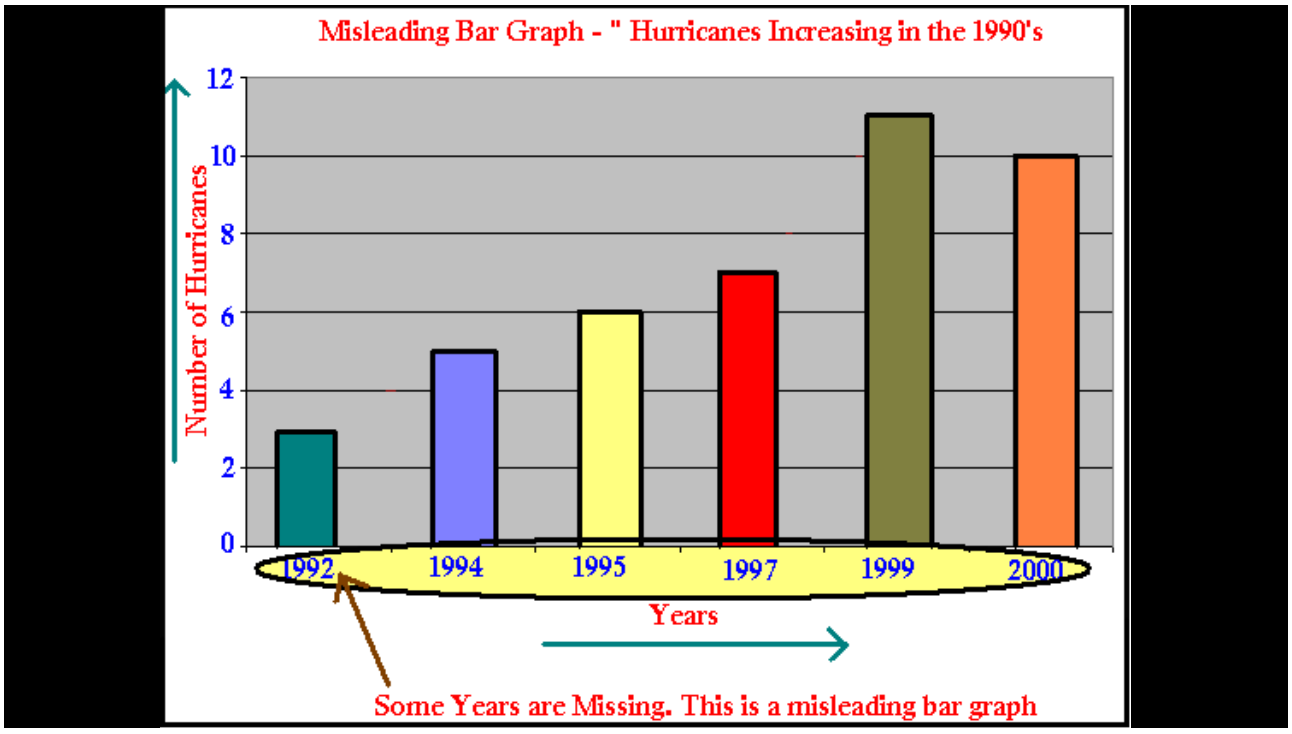

Revenue per Month Full Period
Revenue per Month
Month
Average Revenue
$1,932,523
Revenue per Month
Linear (Revenue per Month)

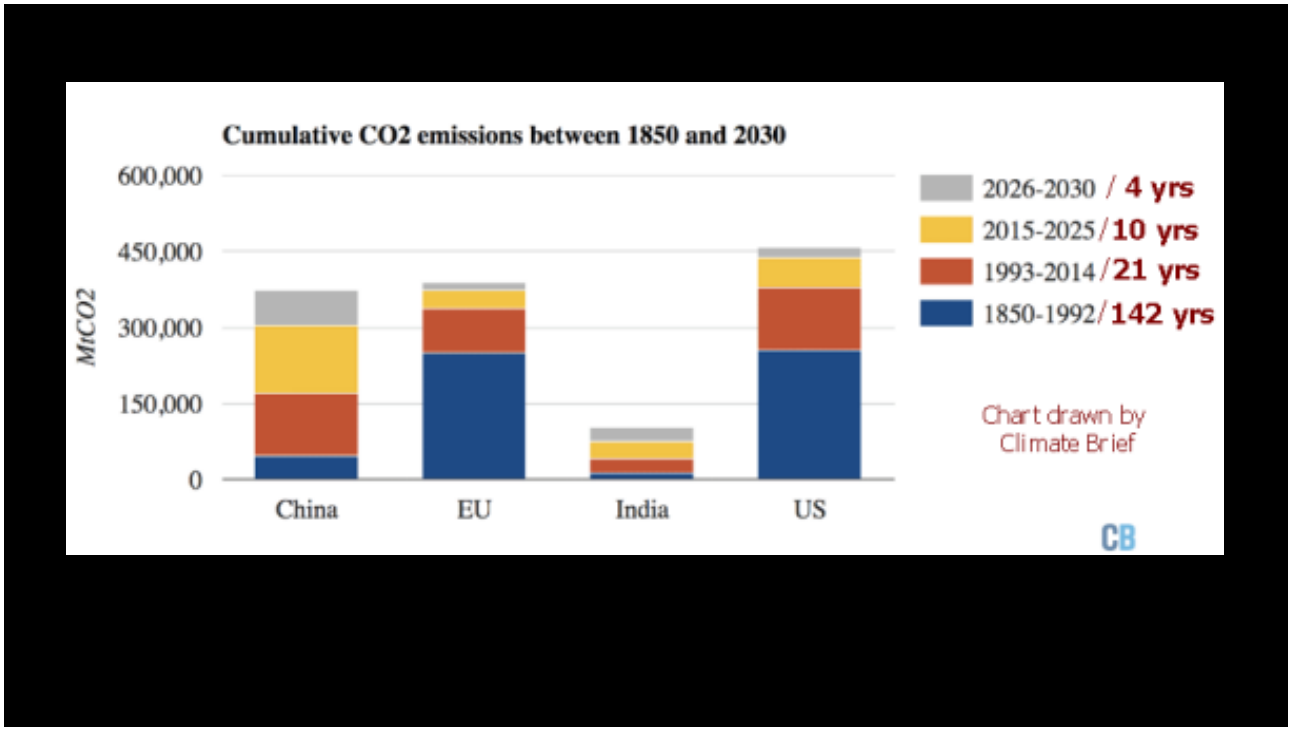

Revenue per Month - First 6 Months
Revenue per Month
Month
Average Revenue
$4,161,092
Revenue per Month
Linear (Revenue per Month)

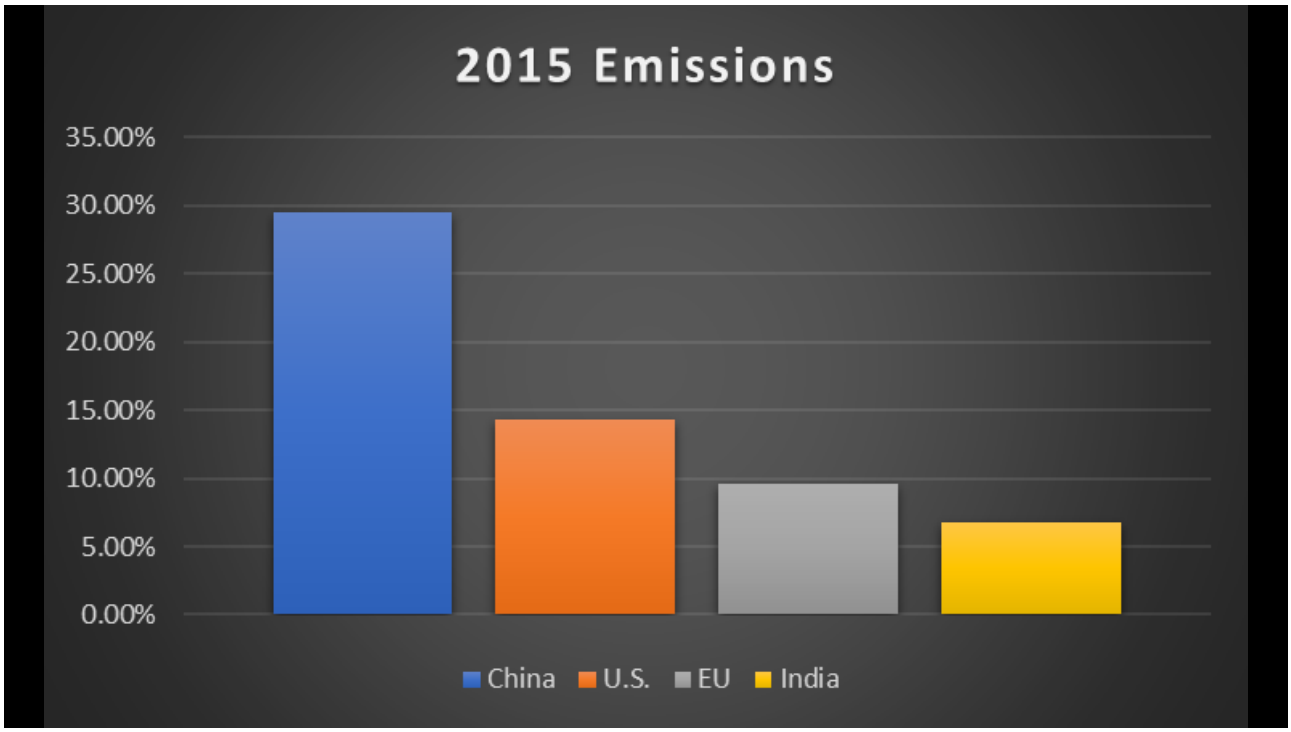
Sample Period	Revenue per Month	Units Sold per Month	Average Unit Price per Month
Full Period	$ 1,932,523	4.17	$ 362,656
First 6 Months	$ 4,161,092	7.83	$ 493,362
First 12 Months	$ 3,217,037	6.50	$ 420,147
First 18 Months	$ 2,241,211	4.67	$ 363,629
Last 12 Months	$ 648,010	1.83	$ 305,165
Last 6 Months	$ 1,006,458	2.67	$ 359,736

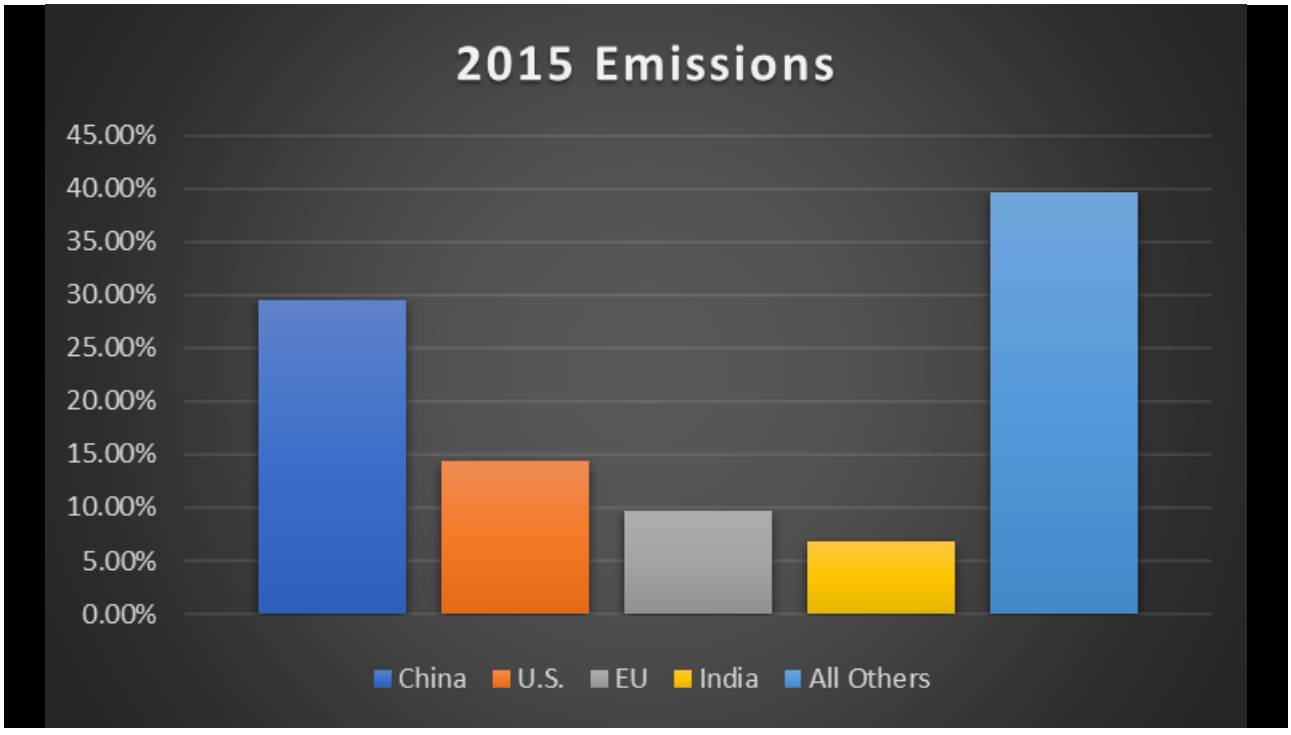
The Gee-Whiz Graph – Deceptive Graphs

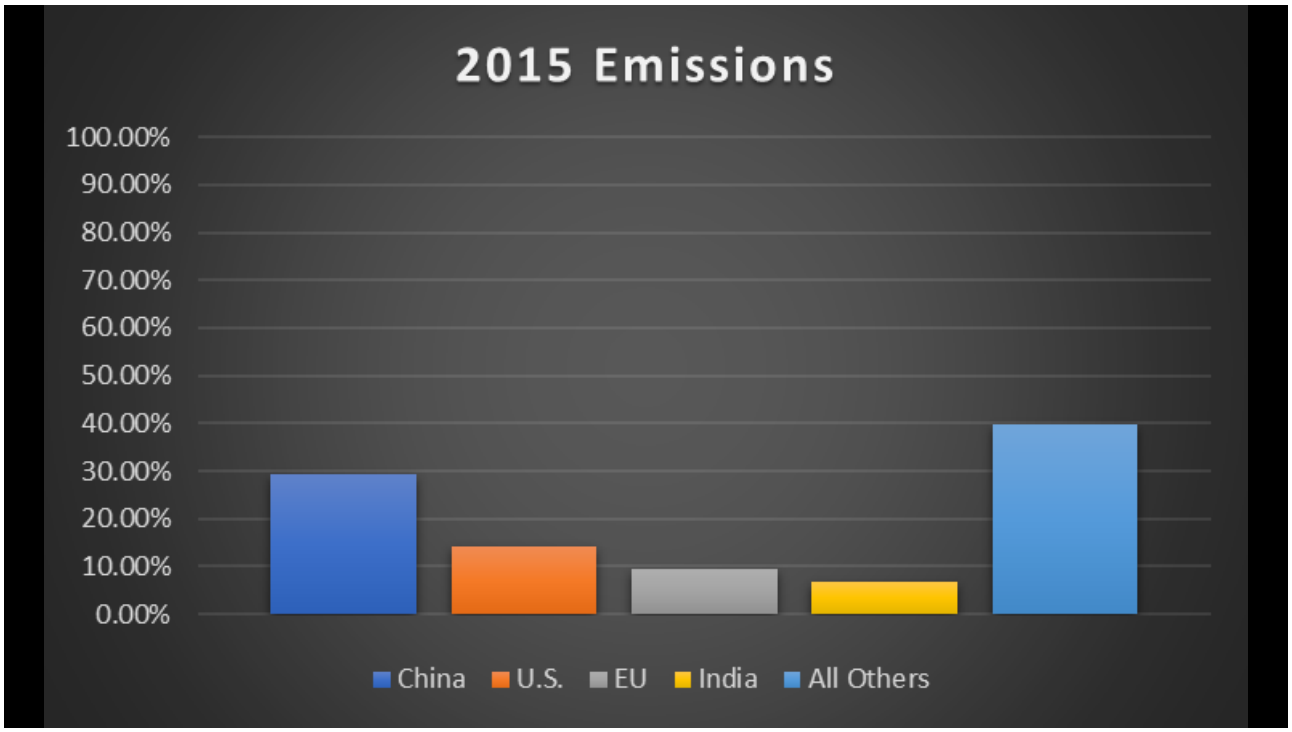
The Seven Deadly Sins of Statistical Analysis

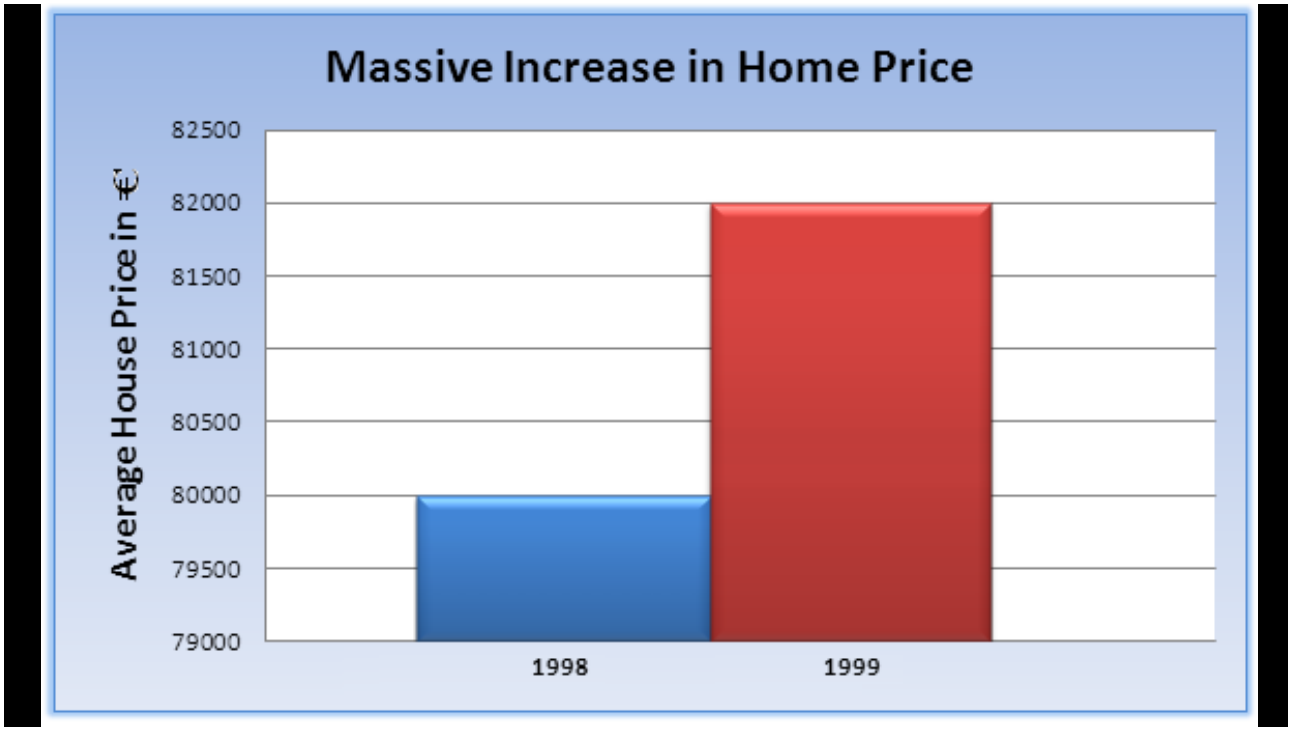

Misleading Bar Graph - " Hurricanes Increasing in the 1990's
Number of Hurricanes
12
10
8
6
4
2
0
1992
1994
1995
1997
1999
2000
Years
Some Years are Missing. This is a misleading bar graph

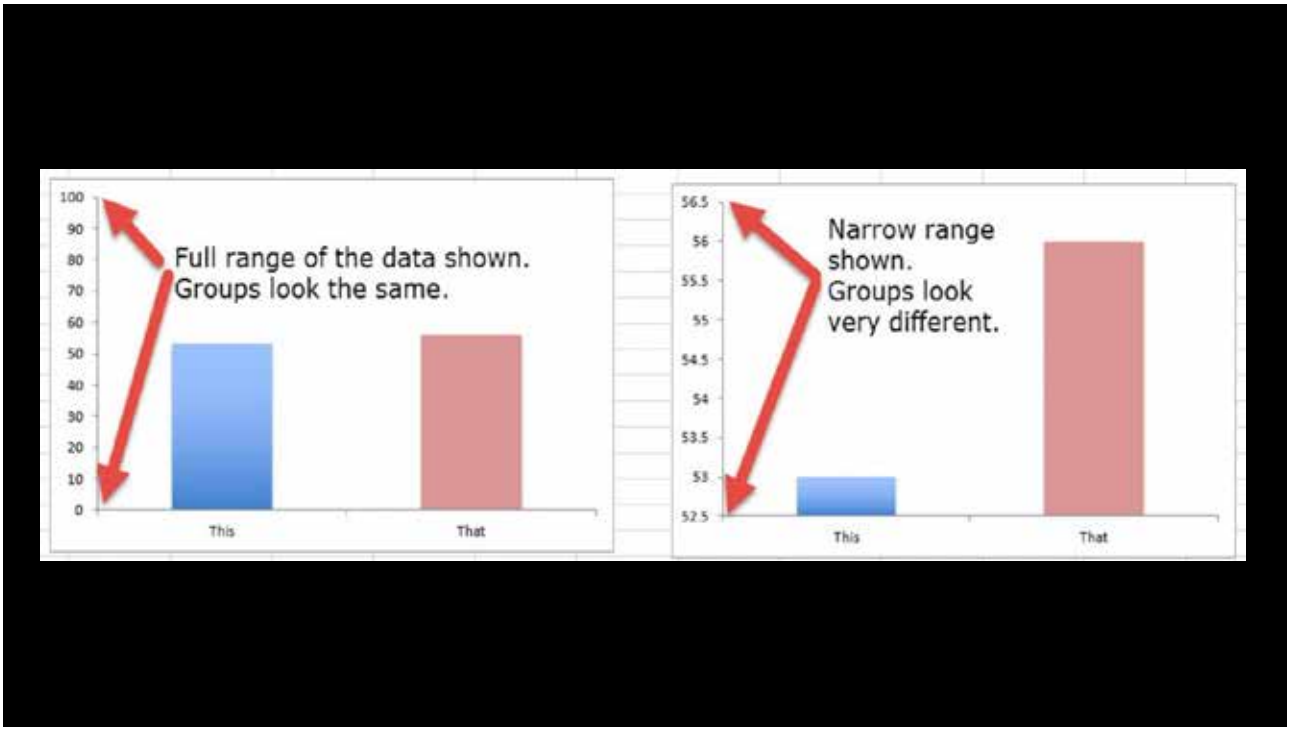

Cumulative CO2 emissions between 1850 and 2030
MtCO2
600,000
450,000
300,000
150,000
0
China
EU
India
US
2026-2030 / 4 yrs
2015-2025 / 10 yrs
1993-2014 / 21 yrs
1850-1992 / 142 yrs
Chart drawn by Climate Brief
CB

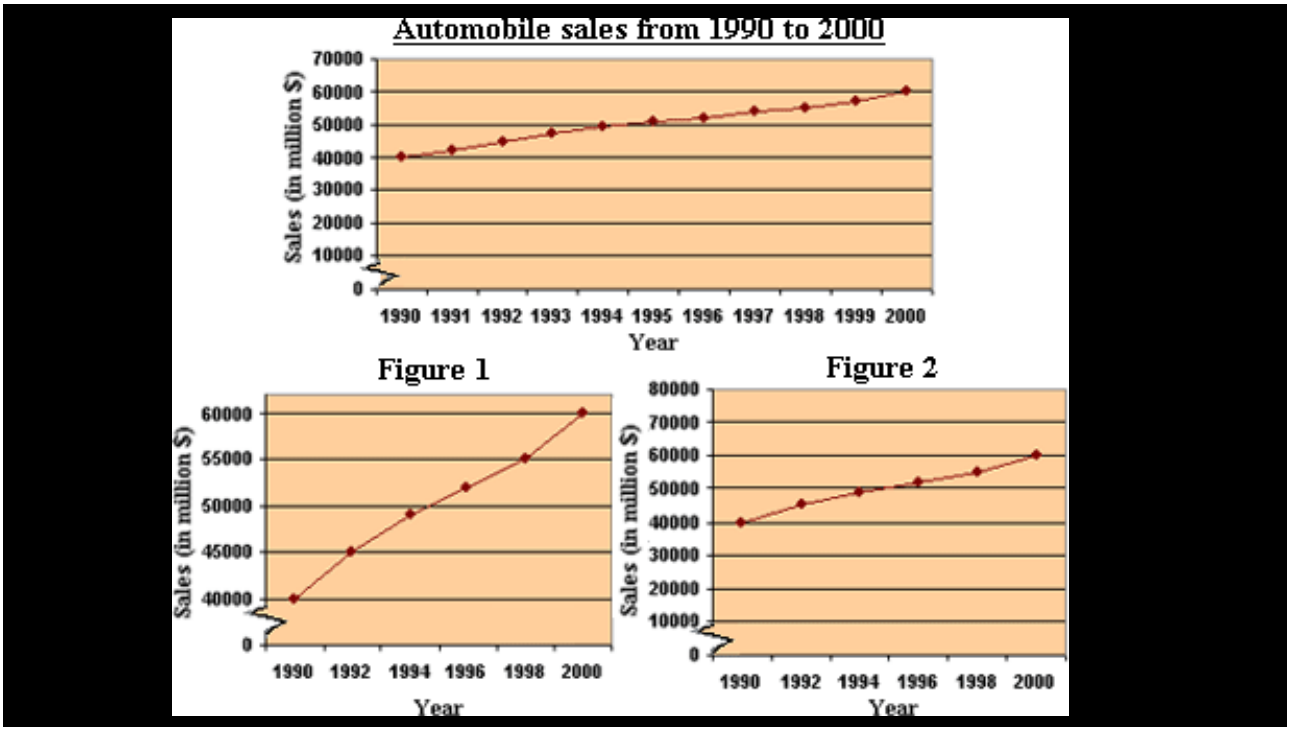

2015 Emissions
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
China
U.S.
EU
India

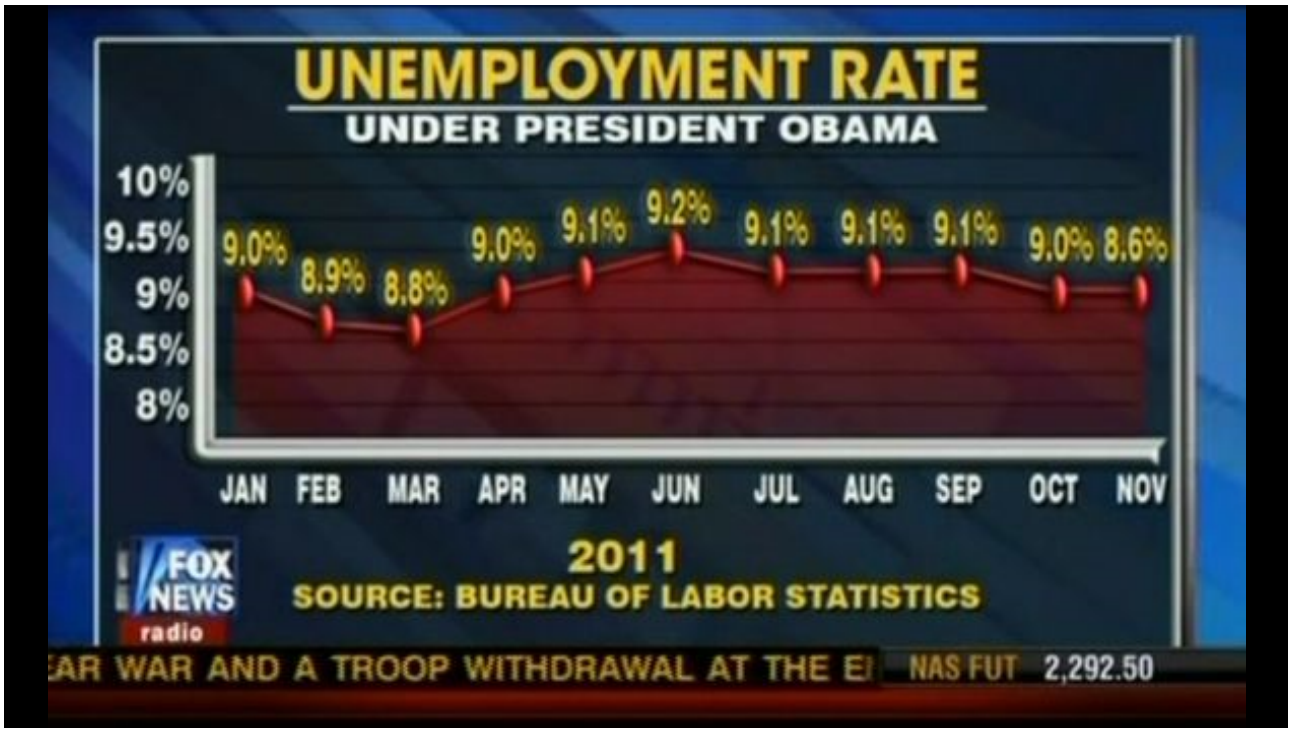

2015 Emissions
45.00%
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
China
U.S.
EU
India
All Others

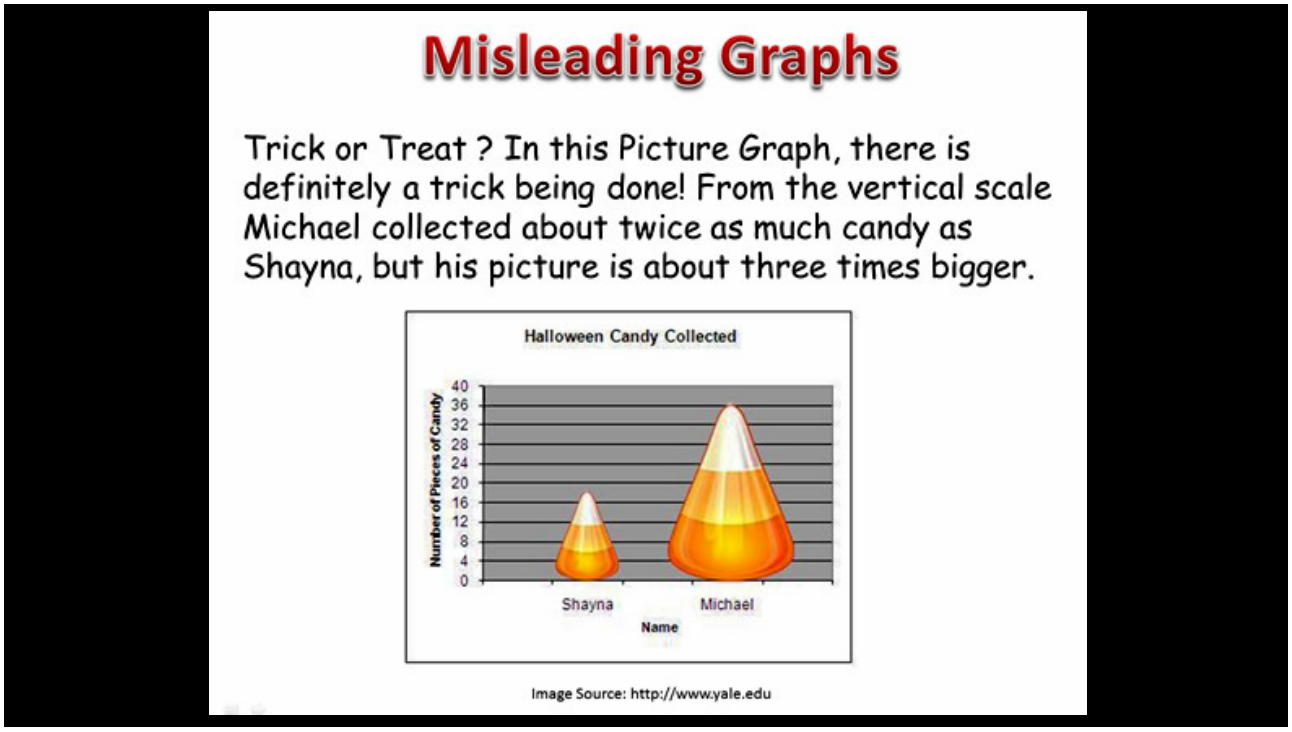

2015 Emissions
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
China
U.S.
EU
India
All Others


Massive Increase in Home Price
Average House Price in €'
82500
82000
81500
81000
80500
80000
79500
79000
1998
1999


Full range of the data shown.
Groups look the same.
100
90
80
70
60
50
40
30
20
10
0
This
That
Narrow range
shown.
Groups look
very different.
56.5
56
55.5
55
54.5
54
53.5
53
52.5
This
That


Automobile sales from 1990 to 2000
Sales (in million $)
70000
60000
50000
40000
30000
20000
10000
0
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000
Year
Figure 1
Sales (in million $)
60000
55000
50000
45000
40000
0
1990 1992 1994 1996 1998 2000
Year
Figure 2
Sales (in million $)
80000
70000
60000
50000
40000
30000
20000
10000
0
1990 1992 1994 1996 1998 2000
Year

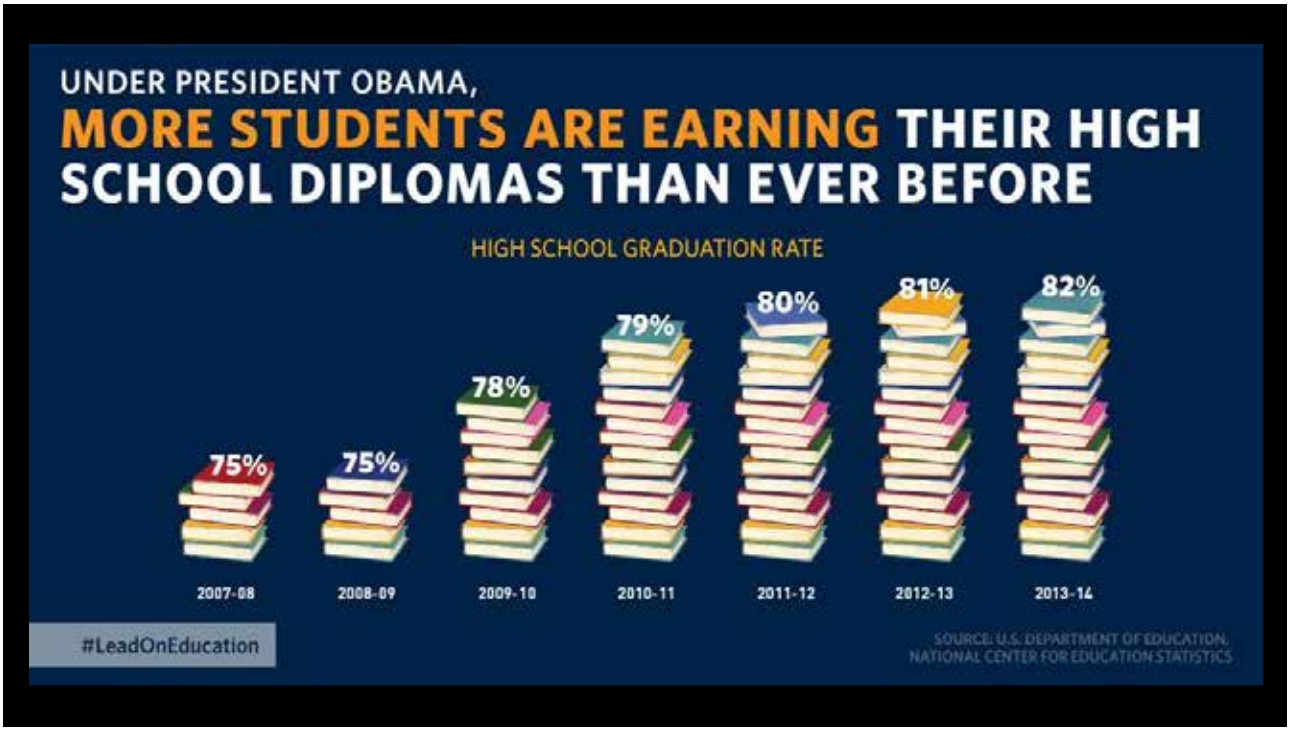

UNEMPLOYMENT RATE
UNDER PRESIDENT OBAMA
10%
9.5%
9%
8.5%
8%
9.0%
8.9%
8.8%
9.0%
9.1%
9.2%
9.1%
9.1%
9.1%
9.0%
8.6%
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV
2011
SOURCE: BUREAU OF LABOR STATISTICS
FOX NEWS radio
AR WAR AND A TROOP WITHDRAWAL AT THE E
NAS FUT 2,292.50

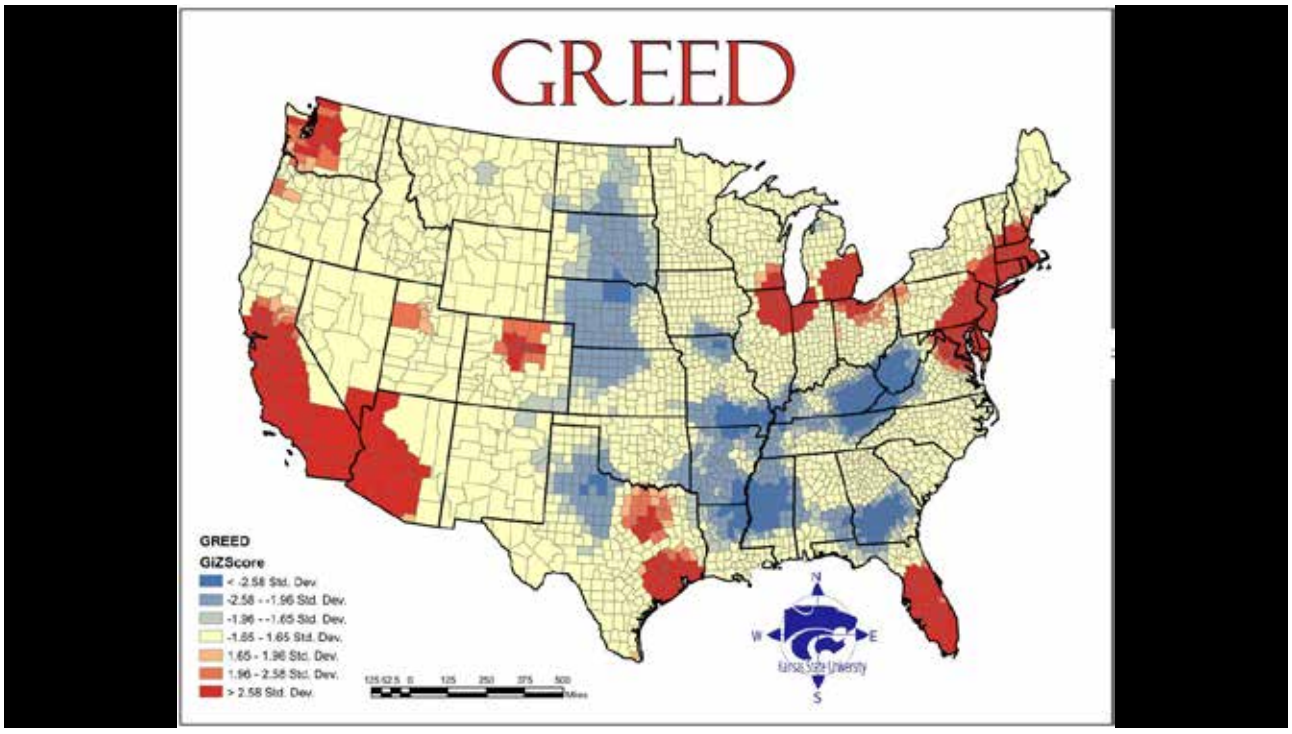

Misleading Graphs
Trick or Treat ? In this Picture Graph, there is definitely a trick being done! From the vertical scale Michael collected about twice as much candy as Shayna, but his picture is about three times bigger.
Halloween Candy Collected
Number of Pieces of Candy
40
36
32
28
24
20
16
12
8
4
0
Shayna
Michael
Name
Image Source: http://www.yale.edu

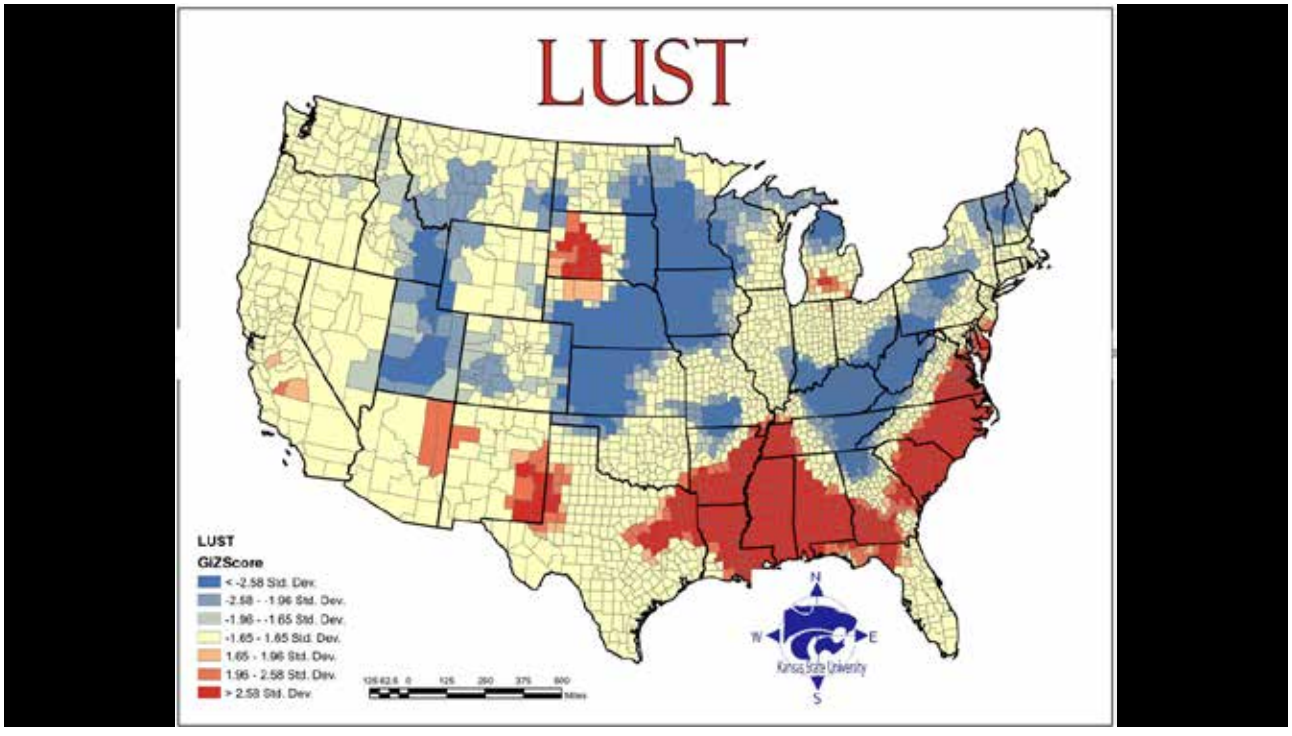
Misleading Graphs

This pie chart is totally incorrect. The sizes of the pieces of pie have not been drawn the right sizes.

Image Source: http://www.visionjar.com




GREED
GREED
GiZScore
< -2.58 Std. Dev.
-2.58 - -1.96 Std. Dev.
-1.96 - -1.65 Std. Dev.
-1.65 - 1.65 Std. Dev.
1.65 - 1.96 Std. Dev.
1.96 - 2.58 Std. Dev.
> 2.58 Std. Dev.
N
W
E
S
Kansas State University


LUST
LUST
GiZScore
< -2.58 Std. Dev.
-2.58 - -1.96 Std. Dev.
-1.96 - -1.65 Std. Dev.
-1.65 - 1.65 Std. Dev.
1.65 - 1.96 Std. Dev.
1.96 - 2.58 Std. Dev.
> 2.58 Std. Dev.
N
W
E
S
Kansas State University

Thank You For Attending!

Nicole Horton
Ernst & Young
Los Angeles

Franklind Lea
Tactical Financial Consulting
Atlanta

Scott Van Meter
Berkeley Research Group
Houston

- Problems
- Starts in 1859
- Projects into future (an unknown)
- Ignores Trade Exports to Other Countries using goods made from CO2 emissions
- Emphasizes U.S. however in 2015 the actual releases were:
- China = 29.51%
- U.S. = 14.34%
- EU = 9.62%
- India = 6.81%

One nation, seven sins
Geographers measure propensity for evil in states, counties
By Abigail Goldman
Thursday, March 26, 2009 | 2 a.m.
Seven Deadly Sins in Nevada

Launch slideshow »
Seven Deadly Sins Nationwide

Launch slideshow »
Seven Deadly Sins Nationwide with "Hot Spots"

Launch slideshow »
Seven Deadly Sins Comparison

Launch slideshow »
Beyond the Sun
Kansas State University's Department of Geography
The question of evil and where it lurks has been largely ignored by the scientific community, which is why a recently released study titled "The Spatial Distribution of the Seven Deadly Sins Within Nevada" is groundbreaking: Never before has a state's fall from grace been so precisely graphed and plotted.

Geographers from Kansas State University have used certain statistical measurements to quantify Nevada's sins and come up with a county-by-county map purporting to show various degrees of lust, gluttony, greed, sloth, wrath, envy and pride in the Silver State. By culling statistics from nationwide databanks of things like sexually transmitted disease infection rates (lust) or killings per capita (wrath), the researchers came up with a sin index. This is a precision party trick — rigorous mapping of ridiculous data.
Their findings were presented Tuesday at the Association of American Geographers' annual meeting at the Riviera, where Kansas State geography research associate Thomas Vought fielded questions while standing next to a poster of his research. Seven maps of Nevada, in seven different colors, for seven different sins.
The darker a county, the more evil it is.
Greed was calculated by comparing average incomes with the total number of inhabitants living beneath the poverty line. On this map, done in yellow, Clark County is bile (see map on Page 2).
Envy was calculated using the total number of thefts — robbery, burglary, larceny and stolen cars. Rendered in green, of course, Clark County is emerald.
Wrath was calculated by comparing the total number of violent crimes — murder, assault and rape — reported to the FBI per capita. Vought and his colleagues used the color red to illustrate wrath, so Clark County looks like a fresh welt. Washoe is slightly statistically duller. Everywhere else is a friendly pork pink.
Lust was calculated by compiling the number of sexually transmitted diseases — HIV, AIDS, syphilis, chlamydia and gonorrhea — reported per capita. Here again, Clark and Washoe counties are worst. Carson City County is a close third.
Gluttony was calculated by counting the number of fast food restaurants per capita, and this is one category

where Clark County is bested. First in deep fry goes to Carson City.
Sloth was calculated by comparing expenditures on arts, entertainment and recreation with the rate of employment. Here again Clark County is beat, scoring only average on the scale of sloth.
And pride, lastly, is most important. The root of all sins, in this study, is the aggregate of all data. Vought and his Kansas colleagues combined all data from the six other sins and averaged it into an overview of all evil. So pride, mapped in purple, shows the states two darkest bruises: counties Clark and Carson City.
Yet, in the grand scheme of things, maybe we're not that bad. While Vought and his colleagues spent four weeks on the detailed Nevada study, they also ran the numbers on some 3,000 counties across the country, a nationwide survey of sin.
Turns out Nevada is unremarkable when compared with other states. Sure, we have a little discoloration around Washoe and Clark counties when it comes to wrath, and Southern Nevada as a whole stands out in the nationwide map of greed, but other than that, we're almost colorless, boring even, when compared with Texas, which ranked high for gluttony, or wrath, which was concentrated in Florida and surrounding states.
Moreover, the Kansas geographers also compared the level of sin in 10 top casino markets, and while the Las Vegas Strip ranked first for greed, it could muster no better than third place for pride, the aggregate of all sins. It was the southern gambling cities — Lula, Miss.; Biloxi, Miss.; and Shreveport, La., that came out on top of the bottom. Why, exactly, remains to be seen. The Kansas geographers started this project, it seems pretty clear, for the erudite amusement; something to stand out at a 6,000-person convention consumed with the world's heavy questions. But if Tuesday's convention crowd was evidence, the sin study was interesting to other scholars as well. So Vought and colleagues plan to continue their national study of evil.
"It's too much fun," Vought said, smiling in a way that suggested, if not pride, then a good deal of pleasure.