Module 3:
What do you mean?

MANG 434

Spring 2020

Agenda for Module 3

- 3/2/2020 – 3/4/2020
  - Summarizing data (frequency distributions); fitting data (central tendency and shape); interpretation and communication; issues in datasets

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  - Exam 1 review session (BE 347 | 5-7pm)

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- 3/6/2020
  - No class – Meet with Jamie day (need to meet with me this week!)
  - Exam 1 posted on eCampus

Agenda for Module 3

- 3/9/2020
    - Excel skills (IF AND statements)

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- 3/11/2020
    - Excel skills (IF OR statements)

Agenda for Module 3

- 3/9/2020
  - Excel skills (IF AND statements)
- 3/11/2020
  - Excel skills (IF OR statements)
- 3/13/2020
  - Exam day (Exam 1 is due by 11:59PM ET on this day – no exceptions!)
  - Evidence that group project data collection is (near) completion is also due

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Agenda for Module 3

- Let’s get started! ☺

Summarizing Data

- Frequency distribution

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  - A table or graph that shows each possible score along with the number of times that score was observed in the data.

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Table 2. Frequency Distribution

			Job	Pay
Rating	Stress	WLB	satisfaction	satisfaction
10	0	0	0	3
9	0	0	0	0
8	0	2	1	0
7	3	0	3	2
6	2	0	0	2
5	2	1	0	0
4	0	1	2	0
3	0	0	1	0
2	0	3	0	0
1	0	0	0	0
0	0	0	0	0
Count	7	7	7	7

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CAN BE VISUALIZED IN A BARPLOT

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CAN BE VISUALIZED IN A BARPLOT

CAN BE USED TO SUMMARIZE ALL TYPES OF DATA (SEE MODULE 2)

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$$\text{Relative frequency} = \frac{frequency\ of\ response}{total\ number\ of\ responses}$$

$$= \quad \frac{3}{7} \quad = \quad 43\%$$

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- Cumulative frequency and cumulative percentage
    - An assessment of the total frequency (percentage) of all categories up to and including the category of interest

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$$\text{Cumulative frequency}_n = \text{frequency}_n + \textit{cumulative frequency}_{n-1}$$

Table 3. Frequency Distributions for Stress

		Relative	Cumulative	Cumulative
Rating	Frequency	frequency	frequency	percentage
10	0	0 (0%)	7	1.0 (100%)
9	0	0 (0%)	7	1.0 (100%)
8	0	0 (0%)	7	1.0 (100%)
7	3	.43 (43%)	7	1.0 (100%)
6	2	29 (29%)	4	.58 (58%)
5	2	.29 (29%)	2	.29 (29%)
4	0	0 (0%)	0	0 (0%)
3	0	0 (0%)	0	0 (0%)
2	0	0 (0%)	0	0 (0%)
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Cumulative percentage$_n$ = percentage$_n$ + cumulative percentage$_{n-1}$

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Step 1: Calculate column mean (average)

Average job satisfaction rating = $\frac{7+7+7+8+3+4+4}{7}$ = 5.71

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Summarizing Data

4 out 7 ="high" scores

4/7 = .57 (57%)

3 out 7 ="low" scores

3/7 = .43 (43%)

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  - Represents a simple statistical model of the center of the distribution of scores.
  - A hypothetical estimate of the "typical" score

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Calculate column median (mid-point of distribution)

Median job satisfaction rating = 7

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  - Can be bi-modal or even multi-modal

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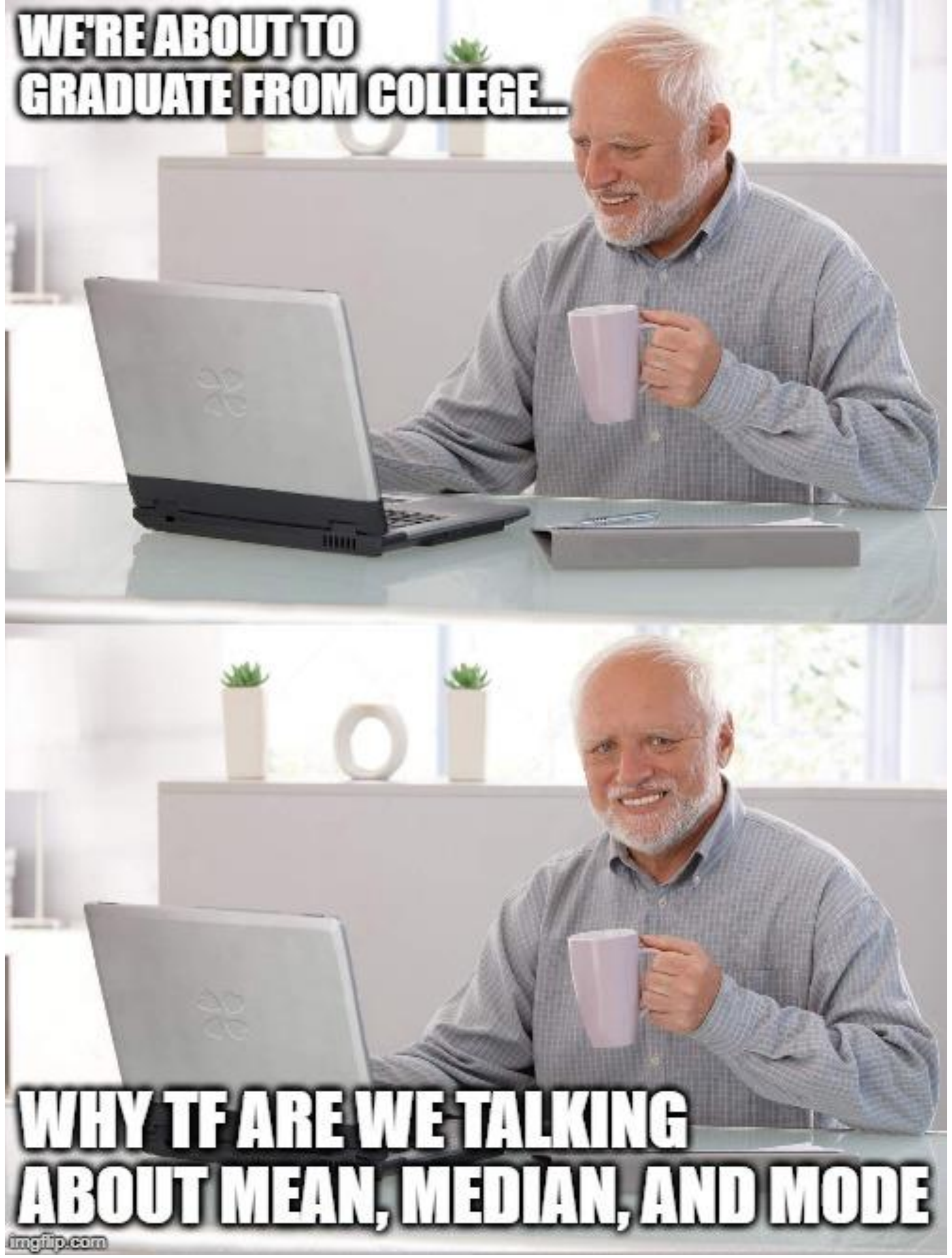
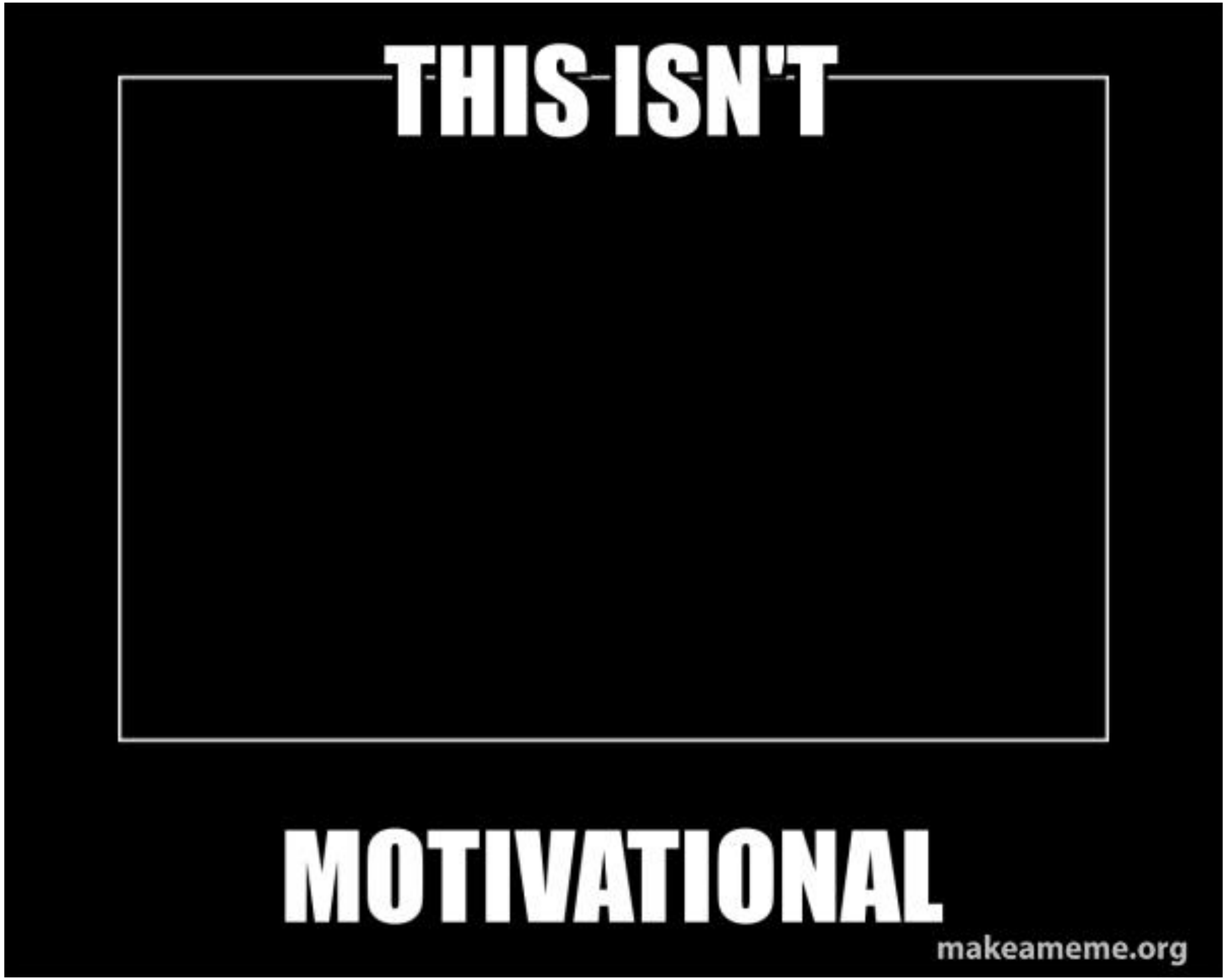
Calculate column mode

Modal job satisfaction rating = 7


WE'RE ABOUT TO GRADUATE FROM COLLEGE...
WHY TF ARE WE TALKING ABOUT MEAN, MEDIAN, AND MODE
imgflip.com

Because mean, median, and mode are important
CHANGE MY MIND
imgflip.com



THIS ISN'T
MOTIVATIONAL
makeameme.org

ME WAITING ON THE POINT TO BE MADE
makeameme.org

The point is…

- Although we know about these measures of central tendency, we may not be using them to their full potential

- Many of the descriptive statistics that we aware of (e.g., mean) are meaningless if they are not reported in tandem with other important information

- What other important information should accompany the mean…

Variance

- Standard deviation
  - SD is an estimate of the average variability (spread) of a set of observations around the mean
  - Importantly, SD is expressed in the same units of measurement as the raw scores
  - It is the square root of the variance (sqrt[sum of squares/number of values])

Variance

- Range
  - The range of scores is the value of the smallest score subtracted from the highest score

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$$
\begin{aligned}
\text{Range} &= \mathit{Highest\ score} - \mathit{lowest\ score} \\
&= 8 - 3 \\
&= 5
\end{aligned}
$$

Shape

- Skewness

- Kurtosis

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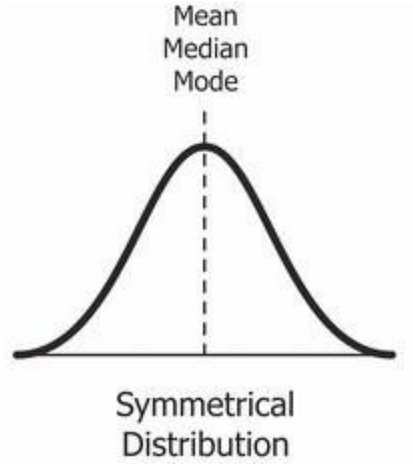
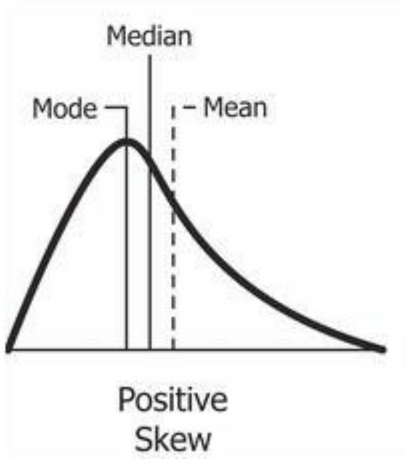


Symmetrical distributions have a skew of 0

Shape

- Skewness → a measure of the symmetry of a *frequency distribution*

- Kurtosis



Symmetrical distributions have a skew of 0

When the frequent scores are clustered at the lower end of the distribution and the tail points to the higher (more positive) scores, the value of skew is positive

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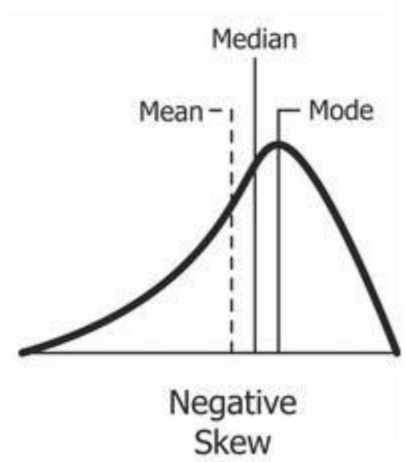

Symmetrical distributions have a skew of 0

When the frequent scores are clustered at the lower end of the distribution and the tail points to the higher (more positive) scores, the value of skew is positive

When the frequent scores are clustered at the higher end of the distribution and the tail points to the lower (more negative) scores, the value of skew is negative

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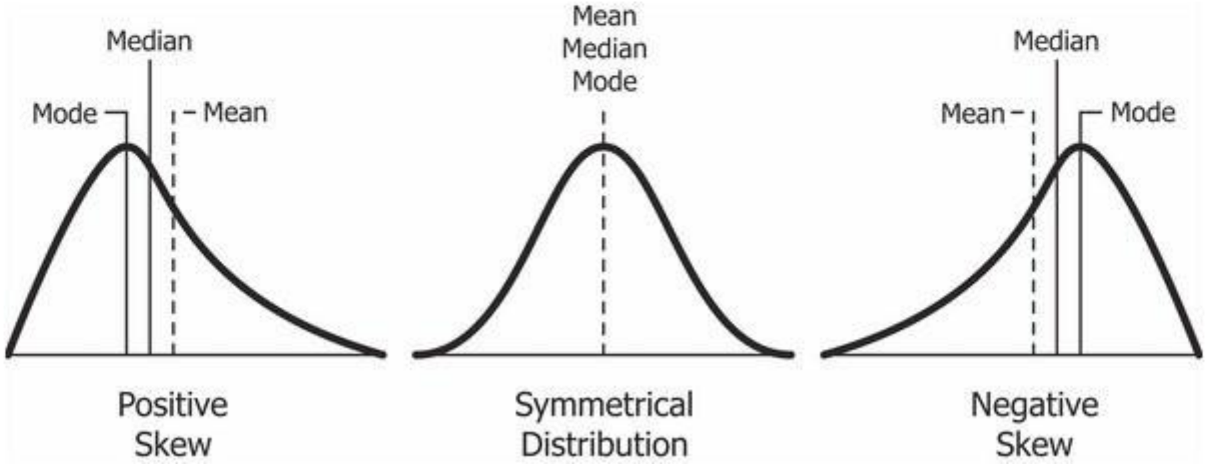

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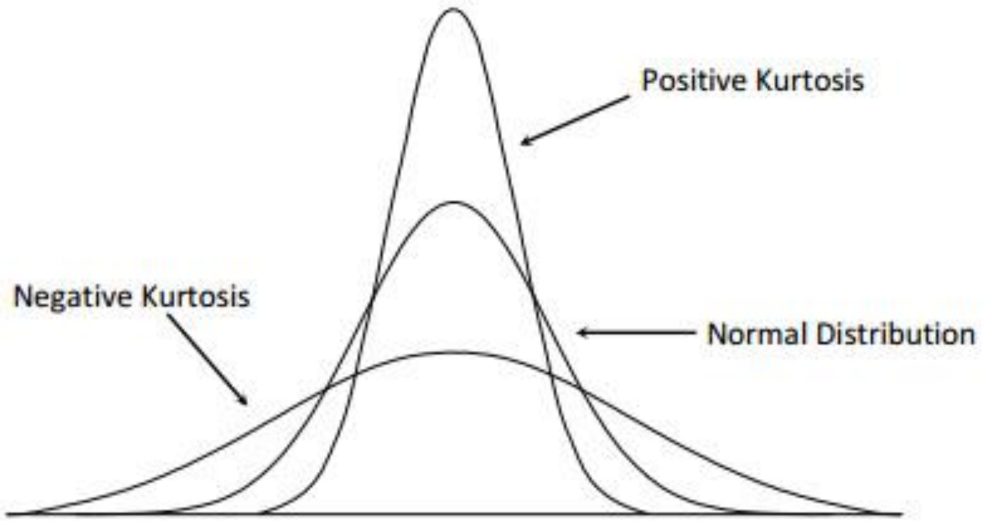
Shape

- Skewness

- Kurtosis → a measure of the degree



Normal kurtosis = 3

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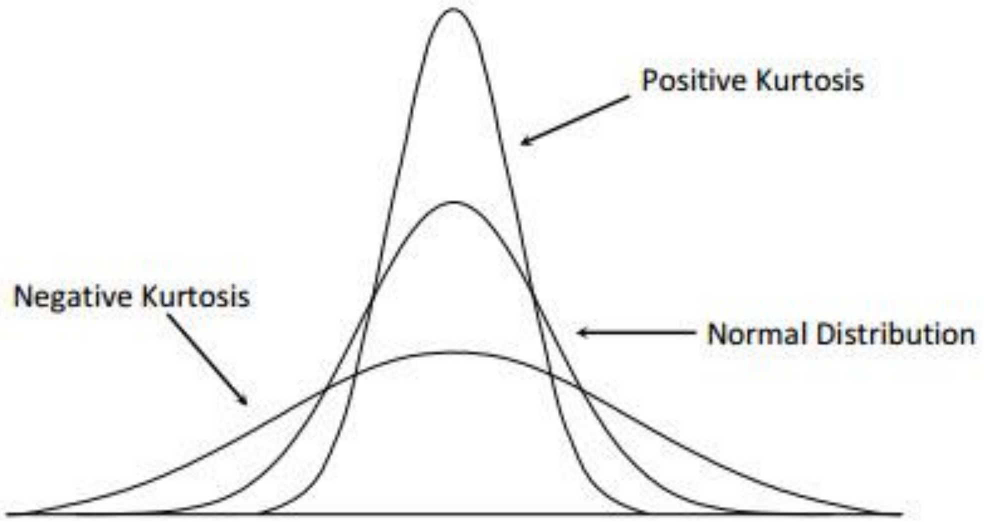

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Kurtosis < 3 → Platykurtic
(the distribution produces fewer and less extreme values [e.g., outliers] than does the normal distribution)

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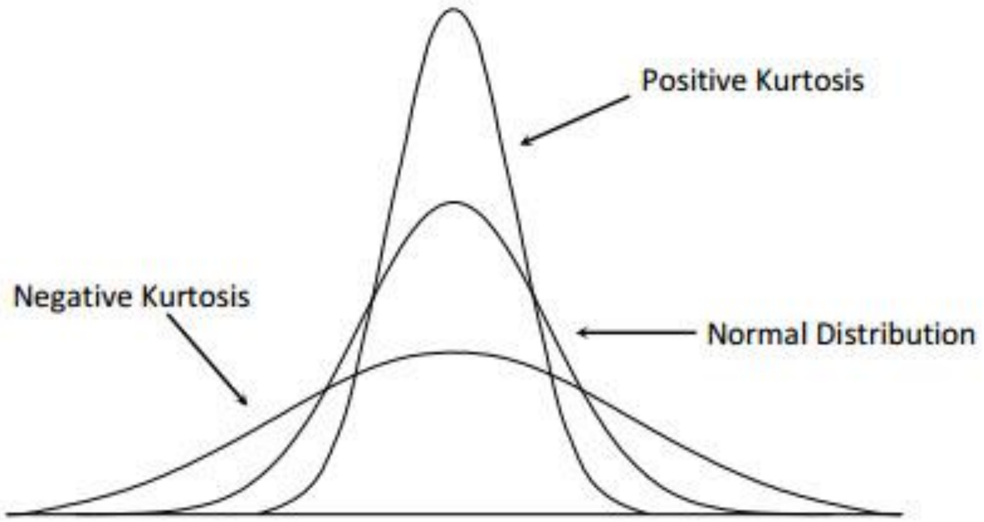

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Kurtosis > 3 → Leptokurtic
(this distribution produces more extreme values [e.g., outliers] than the normal distribution)

Threats to descriptive statistics

- Missing data

- Outliers

- Range restriction

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- Missing data
- Outliers
- Range restriction

1. Missing Completely at Random (MCAR)

2. Missing at Random (MAR)

3. Missing Not at Random (MNAR; this type of missingness cannot be ignored)

See https://www.theanalysisfactor.com/missing-data-mechanism/ for an explanation of each type of missing data.

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  - Etc.

- Descriptive statistics are the gateway to more sophisticated, in-depth analyses
  - Imagine that you observe low levels of job satisfaction among female employees. The next question that might need to be addressed is, “*Why* are females experiencing low levels of job satisfaction?”