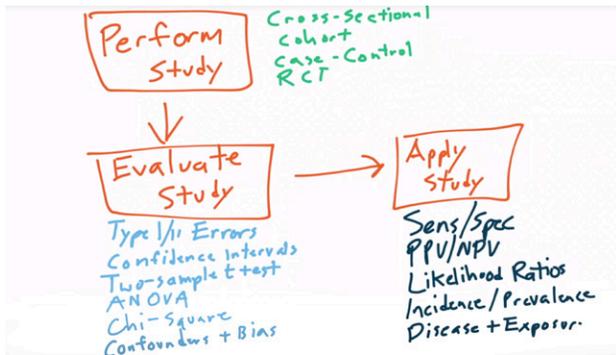


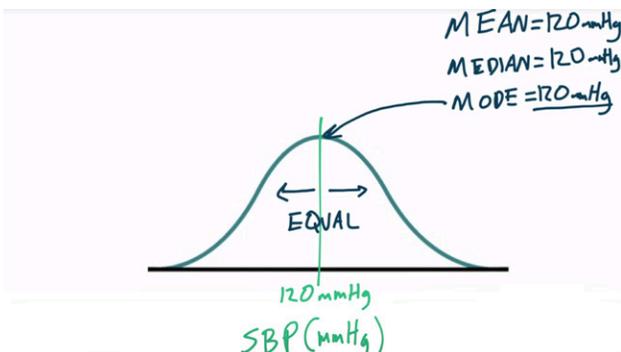
BIOSTATISTICS

Section I - Biostatistics Overview

- I. The whole purpose of biostatistics is to study disease and apply it to the patient.
 - A. Step 1: Design and perform a study.
 1. Discussed in Section II.
 - B. Step 2: Evaluate the study.
 1. Discussed in Sections II through V.
 - C. Step 3: Apply it to the patient.
 1. Discussed in Sections VI through IX.



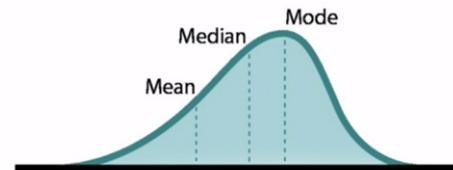
- II. Mean: The average.
- III. Median: The middle number.
- IV. Mode: The most common number.
 - A. Very resistant to outliers.
 - B. Always the peak of the graph.
- V. Normal Distribution
 - A. Mean = median = mode



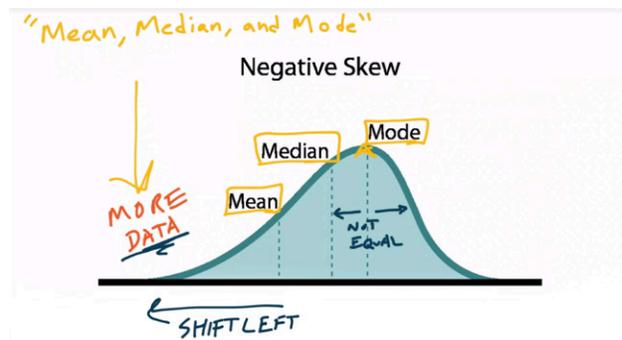
VI. Negative Skew

- A. An abnormal distribution of data in which more data falls heavily on the left side, or more negative side of the graph.

Negative Skew



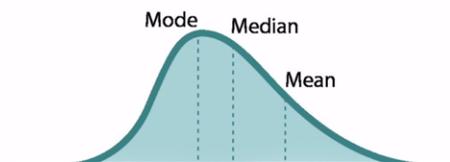
- B. Organizing mean, median and mode
 1. At the mode (peak), draw a line down the center of the graph. Notice more data falls on the left (negative) side.
 2. Remember, "Mean, median, and mode" in that order.
 - a) Negative skew = more data on left = "mean, median, and mode" from left to right.



VII. Positive Skews

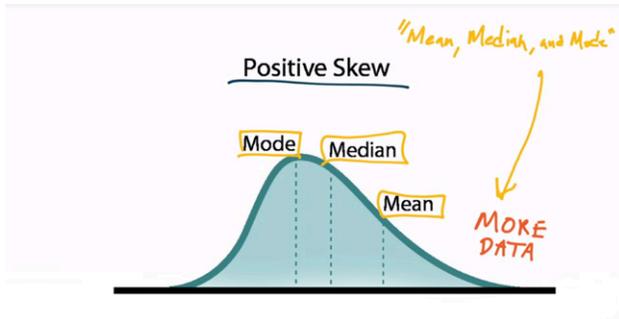
- A. An abnormal distribution of data in which more data falls heavily on the right side, or more positive side of the graph.

Positive Skew



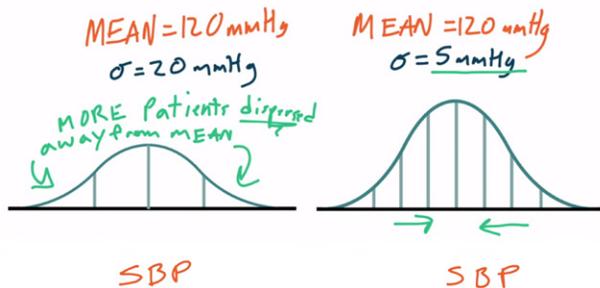
B. Organizing mean, median and mode

- At the mode (peak), draw a line down the center of the graph. Notice more data falls on the right (positive) side.
- Remember, "Mean, median, and mode" in that order.
 - Positive skew = more data on right = "mean, median, and mode" from right to left.

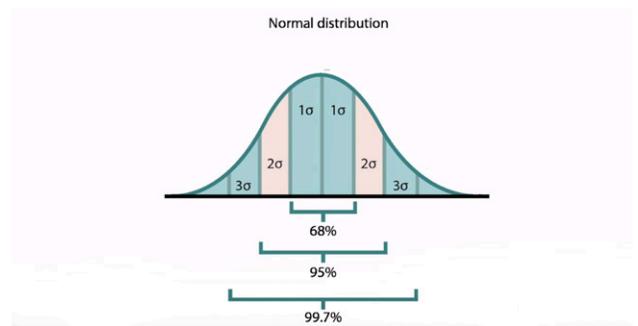


VIII. Standard Deviations (SD)

- Represented by σ (sigma)
- Measures the variability compared to the mean within a study set.
 - Higher SD indicates higher variability and higher dispersion (more results are distant from the mean).



- 1 SD = 68%
 - Note: 32% of observations fall outside 1 SD (16% below and 16% above).
- 2 SD (technically 1.96) = 95%
 - Note: 5% of observations fall outside 2 SD (2.5% below and 2.5% above).
- 3 SD (technically 2.58) = 99%
 - Note: 1% of observations fall outside 3 SD (0.5% below and 0.5% above).



IX. Standard Error of the Mean (SEM)

- Measures the variability between mean of sample and mean of general population.
- σ / \sqrt{n}
 - $\uparrow n \rightarrow \downarrow \text{SEM} \rightarrow \downarrow \text{variability}$ (results cluster closer to the mean)
 - $\downarrow n \rightarrow \uparrow \text{SEM} \rightarrow \uparrow \text{variability}$ (results more dispersed)

X. Z-score

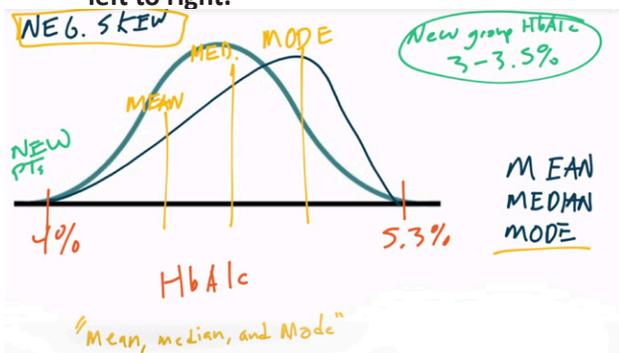
- How many SD from the mean.
- Example: 2 SD = Z score of 2.

REVIEW QUESTIONS



1. A study is performed in a family medicine clinic in which HbA1c is measured in otherwise healthy males between the ages of 20 and 30. The HbA1c results range from 4% to 5.3%. However, an unusual number of new patients have a HbA1c of 3% to 3.5%. How would the mean shift in relation to the median and mode?

- The new group is lower than that found on the original, normal distribution of patients → negative skew of data
- Negative skew indicates more data on left → repeat, “mean, median, and mode” from left to right.



2. A study of 200 elderly males between the ages of 80-89 evaluates their cognitive ability with the MMSE. The average score out of 30 possible points is 23. One standard deviation is 2 points. How many patients have scores of 19 or lower?

- First, recognize that 19 is 2 standard deviations (SD) from the mean → 2 SD encompasses 95% of the data → 2.5% fall below this range → 0.025×200 patients = 5 patients

