Chapter 4: Understanding the Normal Distribution

I. A normal distribution is symmetrical, unimodal, asymptotic

    a. The mean, median, and mode all occur in the same place: in the middle of the normal distribution

    b. Asymptotic means that the tails of the distribution never intersect with the X axis
        i. Important because it means that it is possible for even very extreme values to occur by chance, at least in theory.

    c. The normal distribution is a *theoretical* distribution (i.e., it may not occur, exactly, with data in the real world) that is useful for calculating probabilities.

II. Why the Normal Distribution is Important

    a. Because of the characteristics of the normal distribution (i.e., the shape, the fact that it is symmetrical and asymptotic, it can be used to calculate the probabilities of obtaining certain statistics *by chance*.
        i. Probabilities of z scores.

    b. This is useful for certain descriptive purposes (e.g., calculating percentile scores).

    c. Calculating probabilities of an event occurring by chance is the bases of *inferential* statistics.
        i. This means using sample data to make inferences (i.e., reach conclusions) about population parameters.

III. Assumptions of Normal Distribution

    a. When using the normal distribution to calculate probabilities, it is assumed that the distribution is truly normal and that individuals or samples are selected at random.

    b. When the assumptions of the normal distribution are violated, the probabilities that are based on the normal distribution are not valid.

IV. Sampling Method and Normal Distribution

    a. Probabilities generated from the normal distribution depend on:
        i. Shape of distribution
        ii. Sample is not systematically different from the population (i.e., biased).
            1. Random and representative sampling tend to reflect the population on key characteristics
            2. Convenience sampling often produces samples that are different from the population on important variables.
                a. This can make assumptions about the normal distribution invalid.

    b. When the sample does not represent the population well, probabilities based on the normal distribution are not valid.

     c.   Describing a Distribution of Scores
         i.   Kurtosis- Shape of distribution in terms of height or flatness
             1.   Platykurtic: lower peak and wider tales
             2.   Leptokurtic: higher peak and narrower tails
        ii.   Skewed- Bunching of scores at one end with tail on the other end
             1.   Positively Skewed: The tail extends out toward the right side of the distribution, pulling the mean above the median.
             2.   Negatively Skewed: The tail extends out toward the left side of the distribution, pulling the mean below the median.

V. Summary

     a.   The normal distribution is a theoretical distribution with certain key properties
         i.   Symmetrical, unimodal, asymptotic

     b.   It is very useful in statistics for calculating probabilities of obtaining certain statistics *by chance*.

     c.   Calculating probabilities of statistical results occurring by chance is the basis of inferential statistics.