

## When and How to Use Statistics

**Brief:** Use statistics as a tool to provide quantitative and objective support for an idea, but make them easily understandable to people who may not be familiar with them.

**Learning Objective:** Understand when and how to use statistics.

### Key Terms:

- **Arithmetic Mean:** The sum of the values divided by the number of values.
- **Average:** The term used to define the technical center location of a number of values; often used interchangeably with arithmetic mean.
- **Causation:** Proven evidence that one variable causes another variable to occur.
- **Correlation:** The term used to describe the relationships between variables that demonstrate similar attributes.
- **Probability:** A mathematical tool used to study randomness.
- **Sampling:** A research tool that selects a portion (or subset) of the larger population and study that portion (the sample) to gain information about that population.

## Use Understandable Statistics

Using statistics in public speaking can be a powerful tool because it can provide a quantitative and objective platform on which to support an idea. Before statistics can be used, however, they must be made easily understandable to people who may not be familiar with them. The key to the effective use of statistics is extracting meaning and patterns from raw data in a way that is logical and demonstrable.

To maintain your credibility, it's important to use reputable sources for the statistics you present in your speech such as government websites, academic institutions, and well respected research organizations and policy/research think tanks.

## Key Concepts

### *Probability*

Probability is a mathematical tool used to study randomness. It deals with the chance (the likelihood) of an event occurring. For example, if you toss a fair coin four times, the outcomes may not be two heads and two tails. However, if you toss the same coin 4,000 times, the outcomes will be close to half heads and half tails. The expected theoretical probability of heads in any one toss is  $1/2$  or 0.5. Even though the outcomes of a few repetitions are uncertain, there is a regular pattern of outcomes when there are many repetitions.

## ***Sampling***

Statistics is generally based on a sampling of a population, the collection of persons, things, or objects under study. The idea of sampling is to select a portion (or subset) of the larger population and study that portion (the sample) to gain information about the population as a whole.

For that information to have meaning, there needs to be a large enough sample size. For example, if a survey only includes four people, the results may not be representative of the general population.

## ***Mean vs. Average***

An arithmetic mean is the sum of the values divided by the number of values. For example, the arithmetic mean of the numbers 4, 6, and 8 is the total of the values, 18, divided by the number of values, 3. The mean is 6, which in this case is also the average, the term used to define the technical center location. While the arithmetic mean and average are not always the same (there are many “averages” in statistics), in practice these terms are used interchangeably.

## ***Correlation vs. Causation***

One common warning when using statistics is "correlation does not imply causation." This means that just because two variables demonstrate similar attributes does not necessarily suggest that one variable causes the other variable to occur.



For example, imagine you discover datasets indicating that during the same time period (summer) ice cream purchases have risen and drowning deaths have also risen. It would be incorrect to conclude that the increase in ice cream consumption leads to more drowning deaths, or vice versa. In this case, correlation clearly does not indicate causation.

Therefore, when using statistics in public speaking, a speaker should always be sure that they are presenting accurate information—especially when discussing two variables that may be related.

## ***From Concept to Action***

For your informative speech, select one of your main points and conduct research until you find a statistic related to that point. Next, assess the credibility of that statistic. Does it come from a reputable source? Is it based on a large enough sample? Does it assume unproven causation? If the statistic is credible, your next step is to determine if it will be useful in your speech. Will the

statistic help make your main point easier for your audience to understand? If yes, make sure you cite the statistic accurately and add it to your notes. If no, keep searching!

**OER IMAGE SOURCES:**

"Ice Cream Cone Melting Hot Ice Cream Scoop." Pixabay. <https://pixabay.com/en/ice-cream-cone-melting-hot-1274894>. Accessed 12 December 2018. [CC0]

**OER TEXT SOURCES:**

"Introductory Business Statistics: Definitions of Statistics, Probability, and Key Terms." OpenStax CNX. <https://cnx.org/contents/tWu56V64@35.2:IE5mTaXg@12/1-1-Definitions-of-Statistics-Probability-and-Key-Terms>. Accessed 12 December 2018. [CC BY-SA 4.0]

"Understanding Statistics." Lumen Learning. <https://lumen.instructure.com/courses/218897/pages/linkedtext54213>. Accessed 12 December 2018. [CC BY-SA 4.0]