

Hawthorne and Experimenter Effects

The well-known placebo effect occurs when an untreated subject incorrectly believes that he or

she is receiving a real treatment and reports an improvement in symptoms. The Hawthorne effect occurs when treated subjects somehow

respond differently, simply because they are part of an experiment. (This phenomenon was called the “Hawthorne effect” because it was first observed in a study of factory workers at Western Electric’s Hawthorne plant.) An experimenter effect (sometimes called a Rosenthal effect) occurs when the researcher or experimenter unintentionally influences subjects through such factors as facial expression, tone of voice, or attitude.



DEFINITIONS

In **systematic sampling**, we select some starting point and then select every k th (such as every 50th) element in the population.

With **convenience sampling**, we simply use results that are very easy to get.

In **stratified sampling**, we subdivide the population into at least two different subgroups (or strata) so that subjects within the same subgroup share the same characteristics (such as age bracket). Then we draw a sample from each subgroup (or stratum).

In **cluster sampling**, we first divide the population area into sections (or clusters). Then we randomly select some of those clusters and choose *all* the members from those selected clusters.

It is easy to confuse stratified sampling and cluster sampling, because they both use subgroups. But cluster sampling uses *all* members from a *sample* of clusters, whereas stratified sampling uses a *sample* of members from *all* strata. An example of cluster sampling is a preelection poll, in which pollsters randomly select 30 election precincts from a large number of precincts and then survey all voters in each of those precincts. This is faster and much less expensive than selecting one voter from each of the many precincts in the population area. Pollsters can adjust or weight the results of stratified or cluster sampling to correct for any disproportionate representation of groups.

For a fixed sample size, if you randomly select subjects from different strata, you are likely to get more consistent (and less variable) results than by simply selecting a random sample from the general population. For that reason, pollsters often use stratified sampling to reduce the variation in the results. Many of the methods discussed later in this book require that sample data be derived from a *simple random sample*, and neither stratified sampling nor cluster sampling satisfies that requirement.

Multistage Sampling Professional pollsters and government researchers often collect data by using some combination of the basic sampling methods. In a **multistage sample design**, pollsters select a sample in different stages, and each stage might use different methods of sampling. For example, one multistage sample design might involve the random selection of clusters, but instead of surveying all members of the chosen clusters, you might randomly select 50 men and 50 women in each selected cluster; thus you begin with cluster sampling and end with stratified sampling. See Example 2 for an actual multistage sample design that is complex, but effective.

Example 2 Multistage Sample Design

The U.S. government’s unemployment statistics are based on surveyed households. It is impractical to personally visit each member of a simple random sample, because individual households are spread all over the country. Instead, the U.S. Census Bureau and the Bureau of Labor Statistics collaborate to conduct a survey called the Current Population Survey. This survey obtains data describing such factors as unemployment rates, college enrollments, and weekly earnings amounts. One recent survey incorporates a multistage sample design, roughly following these steps:

1. The entire United States is partitioned into 2025 different regions called *primary sampling units* (PSUs). The primary sampling units are metropolitan areas, large counties, or combinations of smaller counties. These primary sampling units are geographically connected. The 2025 primary sampling units are then grouped into 824 different strata.