analyzing only a 15-person sample taken from this population of 50 human subjects may be drastically biased, for example where all of the subjects in the 15-person sample have the genetic mutation.

Researchers may be interested in measuring a parameter from a sample, where the goal is to predict the same parameter in the entire population, that is, where it is not practical or not possible to determine that parameter in the population. An example can be found in the manufacture of tablets or pills. Where the goal is to determine the weight of the tablets, and to determine whether the range of weights is within manufacturing specifications, the analyst can measure the weights of 100 tablets, taken from a population of 1 million tablets that was manufactured in a specific batch. In this situation, the 100 tablets constitutes a "sample," while the 1 million tablets manufactured in a specific batch constitutes the "population." Batchwise manufacture is distinguished in that each component has a specific lot number, and by the fact that the machinery was cleaned and calibrated specifically for the manufacture of that batch.

In this scenario, the various statistical parameters of the sample (mean, standard deviation) are known, and the statistical parameters of the population (mean, standard deviation) are also known. Instead of measuring a parameter of 1 million tablets, the researcher can refer to standards set forth by the pharmaceutical industry. These standards may relate to mean weight and standard deviation.

Researchers may also want to compare a parameter from a **first sample** with the same parameter of a **second sample**. This situation occurs in clinical trials where there are two study arms, that is, an experimental drug group and a control group. In the context of a clinical trial, the relevant parameters (mean value of death rate, standard deviation) are collected from the two **samples**. But the relevant **population** parameters (mean value of death rate, standard deviation) would usually be impossible to collect, because this **population** would consist of all of the people in the world having the disease of interest, and satisfying the particular inclusion criteria and exclusion criteria mandated by the trial design.

VI. WHAT CAN BE COMPARED

Tests in drug manufacturing, or comparisons made in clinical trials, often take one of the following three forms (36). First, the mean value from a sample can be compared with a hypothetical value. The hypothetical value can be a standard (manufacturing specification) set forth by the manufacturing industry. The hypothetical can be a value from a census, or from an epidemiological study, involving every person in a country. For this type of study, there is one sample group and one population group.

[36] Whitley E, Bell J. Statistics review 5: Comparison of means. *Crit Care*. 2002;6:424–428.