13-1 Review and Preview

Many of the statistical methods from the preceding chapters require normally distributed populations and are based on sampling from a population with specific parameters, such as the mean μ, standard deviation σ, or population proportion p. This chapter introduces methods of *nonparametric* statistics, which do not have the stricter requirements of corresponding parametric methods.

DEFINITIONS **Parametric tests** have requirements about the distribution of the populations involved; **nonparametric (or distribution-free) tests** do not require that samples come from populations with normal distributions or any other particular distributions.

Terminology Flaw The term *distribution-free test* correctly indicates that a test does not require a particular distribution. The term *nonparametric tests* is a bit misleading because it suggests that the tests are not based on a parameter, but there are some nonparametric tests that are based on a parameter such as the median. Due to the widespread use of the term *nonparametric test,* we use that terminology, but we define it to be a test that does not require a particular distribution. (The author likes the term *nondistribution test,* but he didn't make it to the front of the line when definitions were being made.)

The following are major advantages and disadvantages of nonparametric tests.

Advantages of Nonparametric Tests

1. Because nonparametric tests have less rigid requirements than parametric tests, they can be applied to a wider variety of situations.
2. Nonparametric tests can be applied to more data types than parametric tests. For example, nonparametric tests can be used with data consisting of ranks, and they can be used with categorical data, such as genders of survey respondents.

Disadvantages of Nonparametric Tests

1. Nonparametric tests tend to waste information because exact numerical data are often reduced to a qualitative form. For example, with the nonparametric sign test (Section 13-2), weight losses by dieters are recorded simply as negative signs, and the actual magnitudes of the weight losses are ignored.
2. Nonparametric tests are not as *efficient* as parametric tests, so a nonparametric test generally needs stronger evidence (such as a larger sample or greater differences) in order to reject a null hypothesis.

Efficiency When the requirements of population distributions are satisfied, nonparametric tests are generally less efficient than their corresponding parametric tests, but the reduced efficiency can be compensated for by an increased sample size. For example, in Section 13-6 we present the concept of *rank correlation,* which has an efficiency rating of 0.91 when compared to linear correlation in Chapter 10. This means that with all other things being equal, nonparametric rank correlation requires 100 sample observations to achieve the same results as 91 sample observations analyzed through parametric linear correlation, assuming the stricter requirements for using the parametric test are met. Table 13-2 lists nonparametric tests along with the