4-1 Review and Preview

The preceding chapters have presented some critically important concepts in the study and application of statistics. We have discussed the importance of sound sampling methods. We have discussed common measures of characteristics of data, including the mean and standard deviation. The main objective of this chapter is to develop a sound understanding of probability values, because those values constitute the underlying foundation on which methods of inferential statistics are built. Statisticians use the following *rare event rule for inferential statistics.*

Rare Event Rule for Inferential Statistics

If, under a given assumption, the probability of a particular observed event is extremely small, we conclude that the assumption is probably not correct.

Example 1 Rare Event Rule for Inferential Statistics

The Genetics & IVF Institute has developed a method of gender selection so that couples could increase the likelihood of having a baby girl. Instead of using some of their real results, let's use a more obvious example. Suppose that 100 couples use the procedure for trying to have a baby girl, and results consist of 98 girls and only 2 boys. We have two possible explanations for these results:

1. *Chance:* The gender-selection technique is not effective and the result of 98 girls and 2 boys occurred by random chance.
2. *Not Chance:* The results did not occur by chance, so it appears that the gender-selection technique is effective.

When choosing between the above two possible explanations, the *probability* of getting 98 girls and 2 boys is the deciding factor. Without calculating that probability, it is safe to say that it is *extremely* small. The probability of 98 girls and 2 boys is so small that the first explanation of chance would be rejected as being reasonable. Instead, it would be generally recognized that the results provide strong support for the claim that the gender-selection technique is effective. This is exactly how statisticians think: They reject explanations based on very low probabilities.

If you follow the thought process in Example 1, you understand a fundamental way of statistical thinking. Example 1 did not provide an actual probability value, and the main objective of this chapter is to develop a sound understanding of probability values that will be used in later chapters of this book. A secondary objective is to develop the basic skills necessary to determine probability values in a variety of important circumstances.