chapter problem

8

Forensic Statistics: Did the county clerk cheat on election ballots?

Some people wrongly believe that the legal profession is among those that do not require any knowledge of statistical methods. In fact, statistics often plays a central role in resolving legal disputes. Consider the case of Nicholas Caputo, the county clerk in Essex County, New Jersey. The clerk was responsible for arranging names for ballot lines used in elections. He was supposed to use a method of random selection for determining the order of the names. This was important, because a candidate can have an advantage if listed first on the ballot. Caputo made his selections using a procedure that was not observed by witnesses. Among 41 different ballots, Democrats won the first line 40 times. Republicans filed a lawsuit and made the claim that instead of using a method of random selection, Caputo was using a method that favored Democrats. Although the results appear to be lopsided and nonrandom, Caputo denied that he was rigging the results to favor Democratic candidates.

A central and key question is this: How likely is it that anyone would get results as extreme as 40 Democrats in 41 selections, assuming that each election involves the random selection of a Democrat or a Republican? This is the same likelihood as getting results as extreme as 40 heads when tossing a coin 41 times.

We must take into account this subtle but important interpretation: Instead of finding the probability of getting *exactly* 40 Democrats in 41 random selections, we need the probability of getting 40 Democrats *or any result that is more extreme*—so we need to find the probability of getting *at least* 40 Democrats in 41 random selections. (See "Identifying *Unusual* Results with Probabilities" in Section 5-2.)

This situation can be addressed by using the method of *hypothesis testing* that is presented in this chapter. We have the Republican claim that $p > 0.5$, which is the symbolic form of the verbal claim that the clerk used a selection process that favored Democrats so that Democrats have more than a 0.5 probability of being selected. We have the clerk's defense that $p = 0.5$, so that his probability of selecting a Democrat is 0.5. This chapter will present the standard methods for testing such claims.

8-1 Review and Preview

8-2 Basics of Hypothesis Testing

8-3 Testing a Claim About a Proportion

8-4 Testing a Claim About a Mean

8-5 Testing a Claim About a Standard Deviation or Variance