Chapter 9

Alternative Hypothesis H_a The claim about the population that we are trying to find evidence *for*.

Hawthorne effect The fact that almost any change in the work environment together with knowledge that a study is under way will produce a short-term productivity increase.

Null hypothesis H_0 The claim tested by a statistical test. The test is designed to assess the strength of the evidence *against* the null hypothesis. Often the null hypothesis is a statement of "no difference."

One-sample *t* test Choose an SRS of size n from a large population with unknown mean μ. To test the hypothesis H_0: $\mu = \mu_0$, compute the one-sample t statistic

$$t = \frac{\overline{x} - \mu_0}{s_x / \sqrt{n}}$$

Find the P-value by calculating the probability of getting a t statistic this large or larger in the direction specified by the alternative hypothesis H_a in a t distribution with df = $n - 1$. Use this test only when (1) the population distribution is Normal or the sample is large ($n \geq 30$), and (2) the population is at least 10 times as large as the sample.

One-sample *z* test for a proportion Choose an SRS of size n from a large population that contains an unknown proportion p of successes. To test the hypothesis H_0: $p = p_0$, compute the z statistic

$$z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}}$$

Find the P-value by calculating the probability of getting a z statistic this large or larger in the direction specified by the alternative hypothesis H_a. Use this test only when the expected numbers of successes and failures np_0 and $n(1-p_0)$ are both at least 10 and the population is at least 10 times as large as the sample.

One-sided alternative hypothesis The alternative hypothesis is one-sided if it states that a parameter is *larger than* the null hypothesis value or if it states that the parameter is *smaller than* the null value.

***P*-value** The probability, computed assuming H_0 is true, that the statistic would take a value as extreme as or more extreme than the one actually observed. The smaller the P-value, the stronger the evidence against H_0 provided by the data.

Paired data Study designs that involve making two observations on the same individual, or one observation on each of two similar individuals, result in paired data.

Paired *t* procedures When paired data result from measuring the same quantitative variable twice, we can make comparisons by analyzing the differences in each pair. If the conditions for inference are met, we can use one-sample t procedures to perform inference about the mean difference μ_d. These methods are sometimes called paired t procedures.

Power The power of a test against a specific alternative is the probability that the test will reject H_0 at a chosen significance level α when the specified alternative value of the parameter is true.

Significance test Assesses the evidence provided by data about some claim concerning a population.

Statistically significant When our P-value is less than the chosen significance level α, the result is statistically significant.

Test statistic Measures how far a sample statistic diverges from what we would expect if the null hypothesis H_0 were true, in standardized units. That is, test statistic = $\dfrac{\text{statistic} - \text{parameter}}{\text{standard deviation of statistic}}$

Two-sided alternative hypothesis The alternative hypothesis is two-sided if it states that the parameter is *different* from the null value (it could be either smaller or larger).

Type I error Occurs if H_0 is rejected when H_0 is true.

Type II error Occurs if H_0 is not rejected when H_0 is false.