

Chapter 7 Review

This chapter begins the presentation of methods for using sample data to make inferences about a population. Specifically, we use sample data to find *estimates* of population proportions, population means, and population variances (or standard deviations). This chapter included procedures for finding each of the following:

- point estimate of a population proportion, mean, standard deviation, or variance
- confidence interval estimate of a population proportion, mean, standard deviation, or variance
- sample size required to estimate a population proportion, mean, standard deviation, or variance

Because point estimates consist of single values, they have the serious disadvantage of not revealing how close to the population parameter that they are likely to be, so confidence intervals (or interval estimates) are commonly used as more informative and useful estimates. We also considered ways of determining the sample sizes necessary to estimate parameters to within given margins of error. This chapter also introduced the Student t and chi-square distributions. We must be careful to use the correct probability distribution for each set of circumstances. The following table summarizes some key elements of this chapter.

Parameter	Point Estimate	Confidence Interval
Proportion p	\hat{p}	$\hat{p} - E < p < \hat{p} + E$ where $E = z_{\alpha/2} \sqrt{\frac{\hat{p}\hat{q}}{n}}$
Mean μ	\bar{x}	$\bar{x} - E < \mu < \bar{x} + E$ where $E = t_{\alpha/2} \frac{s}{\sqrt{n}}$ or $E = z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$
Standard deviation σ	s (commonly used)	$\sqrt{\frac{(n-1)s^2}{\chi_R^2}} < \sigma < \sqrt{\frac{(n-1)s^2}{\chi_L^2}}$
Variance σ^2	s^2	$\frac{(n-1)s^2}{\chi_R^2} < \sigma^2 < \frac{(n-1)s^2}{\chi_L^2}$

For the confidence interval and sample size procedures in this chapter, it is very important to verify that the requirements are satisfied. If they are not, then we cannot use the methods of this chapter and we may need to use other methods, such as the bootstrap method described in the Technology Project at the end of this chapter, or nonparametric methods, such as those discussed in Chapter 13.

Chapter Quick Quiz

1. *USA Today* reported that 40% of people surveyed planned to use accumulated loose change for paying bills. The margin of error was given as ± 3.1 percentage points. Identify the confidence interval that corresponds to that information.
2. Here is a 95% confidence interval estimate of the proportion of female medical school students: $0.449 < p < 0.511$ (based on data from the *Journal of the American Medical Association*). What is the best point estimate of the proportion of females in the population of medical school students?
3. Write a brief statement that correctly interprets the confidence interval given in Exercise 2.