

## SUMMARY

Researchers rarely work directly with each and every member of a population. Instead, they study a smaller number of cases known as a sample. In this chapter, we explored the key concepts and procedures related to generalizing from a sample to the entire group (i.e., population) that a researcher in criminal justice attempts to understand. If every population member is given an equal chance of being drawn into the sample, a random sampling method is being applied; otherwise, a nonrandom type is employed. It was suggested that sampling error—the inevitable difference between a sample and a population based on chance—can be expected to occur despite a well-designed and well-executed random sampling plan. As a result of sampling error, it is possible to characterize a sampling distribution of means, a theoretical distribution in the shape of a normal curve whose mean (the mean of means) equals the true population mean. With the aid of the standard error of the mean, it is possible to estimate the standard deviation of the sampling distribution of means. Armed with this information, we can construct confidence intervals for means (or proportions) within which we have confidence (95% or 99%) that the true population mean (or proportion) actually falls. In this way, it is possible to generalize from a sample to a population. In this chapter, we also introduced the  $t$  distribution for the many circumstances in which the population standard deviation is unknown and must be estimated from sample data. The  $t$  distribution will play a major role in hypothesis tests presented in the following chapter.

## QUESTIONS AND PROBLEMS

- Alpha represents the area
  - in the center of the distribution.
  - in the tails of the distribution.
  - higher than the mean of the distribution.
  - lower than the mean of the distribution.
- Confidence intervals are used to
  - provide an exact score for our estimate of the mean.
  - provide a lower and upper limit on our estimate of the population mean.
  - find the sampling confidence.
  - None of the above
- Researchers in criminal justice most often use the \_\_\_\_\_ level of confidence.
  - 68%
  - 90%
  - 95%
  - 99%
- The margin of error in a 99% confidence interval is \_\_\_\_\_ the margin of error in a 95% confidence interval.
  - larger than
  - the same as
  - smaller than
  - random and unrelated to
- The confidence interval for proportions is used when the level of measurement is
  - nominal.
  - ordinal.
  - interval/ratio.
  - All of the above
- The confidence interval for means is used when the level of measurement is
  - nominal.
  - ordinal.
  - interval/ratio.
  - All of the above

7. The inevitable difference between the mean of a random sample and the mean of a population is known as
  - a. confidence interval.
  - b. probability.
  - c. random sample.
  - d. sampling error.
8. Ten defendants have been sentenced to prison for 3, 4, 7, 7, 11, 12, 12, 19, 22, and 23 years each. Estimate the standard error of the mean.
9. With the sample mean in Problem 8, find (a) the 95% confidence interval and (b) the 99% confidence interval.
10. Over the past several decades, communication platforms have changed from telephones (land lines), to cell phones, to text messaging, to Internet based Web-pages. A researcher estimates the percentage of high school students who have a Web-page on myspace.com by surveying a random sample of 50 students. Thirty-four students said yes, they have a myspace page and 16 said no, they do not have one. Find (a) the 95% confidence interval and (b) the 99% confidence interval for the proportion of high school students who do have a myspace web-page.
11. Domestic violence in the United States is a serious problem. Once arrested, offenders are very likely to re-offend. Domestic violence counseling programs define success when an offender completes a counseling program and goes six or more months (180 days) without re-offending. Use Fox's ABCalc or a conventional calculator to determine the 95% confidence interval on days to re-offend for men who repeat domestic violence:  
17 17 14 31 33 35 45 65 20 58
12. The Bureau of Justice Statistics reports that, in 2005, some 29.5 households per 1,000 were victims of a home burglary. These data are obtained from an annual survey of about 77,000 households. Use ABCalc or a conventional calculator to estimate a 99% confidence interval for the proportion of burglaries as a confidence interval from summary data.
13. A researcher tested a random sample of arrestees for cocaine use at the time of their arrest. Thirty-three percent of the 40 subjects came back with positive results for cocaine use. Use ABCalc or a conventional calculator to estimate a 95% level of confidence for cocaine use among arrestees.
14. A corrections researcher is examining prison health care costs and wants to determine how long inmates survive once diagnosed with a particular form of cancer. Using data collected on a group of 20 patients with the disease, she observes an average survival time (time until death) of 38 months with a standard deviation of 9 months. Use ABCalc or a conventional calculator to estimate a 99% level of confidence for the population mean survival time.
15. Most articles in criminal justice with quantitative information report a mean and standard deviation for key variables within the results section of an article. Find a research article that reports a mean and standard deviation and calculate a 95% confidence interval for the mean.
16. A national newspaper says that three out of four parents are in favor of home drug testing of their children. The report says that it is from a survey of 2,011 people which is accurate within 2.5 percentage points 19 times in 20.
  - a. What kind of confidence interval is it (means or proportions)?
  - b. What is the level of confidence?
  - c. How much is the margin of error?
  - d. Rewrite the information from above as an equation.

## SPSS EXERCISES

17. Using SPSS to analyze the Monitoring the Future Study, calculate 90%, 95%, and 99% confidence intervals for the population mean for American High School students' perception of the risk of five or more drinks once or twice each weekend (V1779).  
Hint: Analyze—compare means, one-sample *t*-test, and set options to desired percentage.
18. Use SPSS to recode lifetime use of marijuana or hashish (V115) by high school seniors as a yes

25. Generate a bar graph  
 26. Generate a line graph

### Chapter 3

1. a  
 2. a  
 3. c  
 4. b  
 5. b  
 6. a  
 7. c  
 8. (a) Multiple modes: prerelease, minimum, and medium; (b) minimum; (c) Because not interval/ratio level  
 9. Offense, mode, drugs; Sex, mode, male; Assigned drug testing, median, falls between daily and weekly; Months, mean, 2.6  
 10. (a) 0.5; (b) 1.6  
 11. (a) 3; (b) 4; (c) 12.0; (d) median  
 12. Mo = 0, Mdn = 1,  $\bar{X}$  = 2.05  
 13. Mo = 3, Mdn = 4;  $\bar{X}$  = 4.0  
 14. (a) Mo = 3, Mdn = 5.5,  $\bar{X}$  = 5.5; (b) Mo = 8, Mdn = 5,  $\bar{X}$  = 5.2; (c) Knowledge  
 15. Mo = 0, Mdn = 0,  $\bar{X}$  = 0.42  
 16. Mo = 1 (None), Mdn 1 (None); No because ordinal.  
 17. Ordinal; Mo = 1 (None), Mdn = 7 (\$51-75)  
 18. Ordinal; Mo = 1 (None), Mdn = 1 (None)

### Chapter 4

1. d  
 2. b  
 3. c  
 4. c  
 5. (a) Precinct A, 6.6 versus 5.8; (b) Precinct B, 0.74 versus 2.6  
 6. (a) 3; (b) 1.00, (c) 1.00  
 7. Below = 63, Above = 85  
 8. (a) 4; (b) 1.47; (c) 1.21  
 9. (a) 12; (b) 12.86; (c) 3.59  
 10. (a) 3; (b) 1.55; (c) 1.25

11. (a) 23, 7; (b) 43.20, 5.60; (c) 6.57, 2.37; Judge Allison  
 12. R = 6, s = 1.508  
 13. R = 6, s = 1.625  
 14. R = 4, s = 0.827  
 15. Ordinal, Mo = 1 (None), Mdn = 1 (None), R = 6  
 16. Interval/Ratio, Mo = 7, Mdn = 6,  $\bar{X}$  = 5.24, R = 6, s = 1.645  
 17. Choose a variable

### Chapter 5

1. b  
 2. c  
 3. b  
 4. b  
 5. (a) 0.2; (b) 0.6; (c) 0.8; (d) 0.9  
 6. (a) 34.13; (b) 34.13; (c) 47.72; (d) 95.44  
 7. (a) 1.273, promoted; (b) -0.909, not promoted  
 8. (a) 4.01; (b) 0.0401  
 9. (a) 0.1303; (b) 0.0674  
 10. (a) 34.13%; (b) 34.13%; (c) 68.26%; (d) 0.3413; (e) 0.1949  
 11. (a) 6.68%; (b) 0.0228; (c) 0.003%  
 12. (a) 21.19%; (b) 0.5517  
 13. (a)  $\bar{X}$  = 3.2; s = 3.8; (b) 0.211; (c) 41.66%; (d) -0.579; (e) 28.13%  
 14. (a) 38.54%; (b) 15.08%; (c) 0.1508  
 15. (a) 20.99; (b) 0.1951  
 16. (a) Quite close; (b) 0.3892; (c) Actual 39.4%, very close

### Chapter 6

1. b  
 2. b  
 3. c  
 4. a  
 5. a  
 6. c  
 7. d  
 8. 2.275

9. 6.853 to 17.147; 4.605 to 19.395
10. (a) 0.551 to 0.809; (b) 0.510 to 0.850
11. 20.79 to 46.21
12. 0.028 to 0.031
13. 0.19 to 0.47
14. 32.11 to 43.89
15. Find an article
16. (a) Proportions; (b) 95%; (c) .025; (d) 95%  
CI =  $.75 \pm .025$
17. 90%, 3.06 to 3.14; 95%, 3.05 to 3.15; 99%,  
3.03 to 3.17
18. 39% to 44%

## Chapter 7

1. c
2. a
3. b
4. a
5. d
6.  $t = -2.3$ ,  $df = 8$ , reject the null hypothesis  
at .05
7. (a)  $t = 2.6$ ,  $df = 16$ , reject the null hypothesis  
at .05; (b)  $z = 2.4$ , reject the null hypothesis  
at .05
8. (a)  $t = -2.9$ ,  $df = 17$ , reject the null  
hypothesis at .05; (b)  $t = -2.9$ ,  $df = 17$ ,  
Retain the null hypothesis at .01
9.  $t = 2.4$ ,  $df = 8$ , reject the null hypothesis  
at .05
10. (a)  $t = -3.7$ ,  $df = 9$ , reject the null hypothesis  
at .05; (b) Legal limit in your state
11. (a)  $t = 1.9$ ,  $df = 13$ , retain the null hypothesis  
at .05; (b) No gender differences in plea  
bargaining
12.  $t = -3.0$ ,  $df = 4$ , reject the null hypothesis  
at .05
13.  $z = -2.86$ , reject the null hypothesis at .05
14.  $z = 4.42$ , reject the null hypothesis at .05
15.  $z = 4.81$ , reject the null hypothesis at .05
16.  $t = 3.9$ ,  $df = 1340$ , reject the null hypothesis  
at .05
17.  $t = 2.6$ ,  $df = 1386$ , reject the null hypothesis  
at .05

18.  $t = 2.4$ ,  $df = 1374$ , reject the null hypothesis  
at .05
19. (a)  $t = 4.0$ ,  $df = 9$ , reject the null hypothesis  
at .05; (b) Aggression is lower after  
participating
20.  $t = -2.4$ ,  $df = 8$ , reject the null hypothesis  
at .05
21.  $t = -2.1$ ,  $df = 8$ , retain the null hypothesis  
at .05
22. (a) Both rounded to  $-2.4$ ; (b) more calcula-  
tions; (c) learning computer program; (d) easy  
to use but rounding with small samples can  
make a big difference
23. (a)  $t = 2.0$ ,  $df = 18$ , reject the null hypothesis  
at .05; (b) Traditional training made more  
errors than virtual training, 7.0 versus 4.9

## Chapter 8

1. a
2. c
3. b
4. d
5. a
6.  $F = 10.36$ , reject null hypothesis at .05
7. HSD = 1.03, significant differences between  
Schools A and B and between Schools  
B and C
8.  $F = 13.93$ , reject null hypothesis at .05
9. HSD = 1.22, significant differences between  
Northeast and South; between Northeast and  
West; and between Midwest and South.
10.  $F = 4.94$ , reject null hypothesis at .05
11. HSD = 1.35, married and widowed differs  
from never married
12.  $F = 9.38$ , reject null hypothesis at .05
13. HSD = 2.80, significant differences between  
alcohol and control, and between drugs and  
control
14.  $F = 0.30$ , retain null hypothesis at .05; HSD is  
not appropriate when null retained
15.  $F = 5.45$ , reject null hypothesis at .05;  
Northeast differs from South and West
16. Choose two variables