

**Homework 7 Solution:**

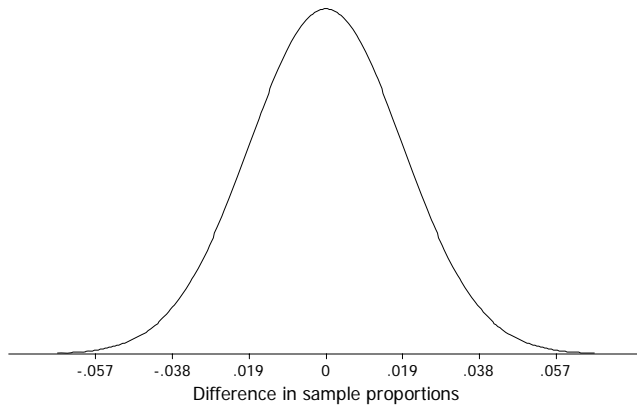
**Chapter 9: #3, 9, 13, 25, 36, 45, 51**

**Chapter 10: #2, 17, 22, 27, 42, 43**

- 9.3** a. A population is a collection of all individuals of interest while a sample is a subset of the population of interest. In Case Study 1.6 the population of interest was probably all adults, but based on the way the study was done the actual population to which results can be extended is men similar to male physicians. The sample in Case Study 1.6 consists of the 22,071 male physicians who participated in the study.  
 b. The proportion of placebo-takers who had heart attacks (.017) is an example of a statistic. It is an estimate of the population parameter of interest, which is the proportion of all men in the population who would have had heart attacks had they participated in the study and taken a placebo.
- 9.9** a.  $\hat{p}$  because this is a sample proportion.  
 b.  $p$  because this is a population proportion.  
 c.  $\hat{p}$  because this is a sample proportion.
- 9.13** *Hint:* This is an example of Situation 2 on page 337 of the text.  
 a. How much difference is there between the proportions with high blood pressure for women who use oral contraceptives versus women who do not?  
 b. Parameter =  $p_1 - p_2$ , where  $p_1$  = population proportion with high blood pressure for women who use oral contraceptives and  $p_2$  = population proportion with high blood pressure for women who do not use oral contraceptives.  
 c.  $\hat{p}_1 - \hat{p}_2 = .15 - .10 = .05$ .
- 9.25** a. The population proportion would not change. It is the proportion of all adults in the population that buys organic vegetables.  
 b. The sample proportion would change for each sample.  
 c. The standard deviation of  $\hat{p}$  would not change. It is based on the population proportion and on the sample size, which is 1000 for each of the samples.  
 d. The standard error would change because it is an estimate of the standard deviation of the sampling distribution, and it uses the sample data, which changes for each sample.  
 e. The sampling distribution of  $\hat{p}$  remains the same for all samples of the same size (1000 in this case) from the same population.
- 9.36** a. Mean =  $p = .2$   
 b. s.d. ( $\hat{p}$ ) =  $\sqrt{\frac{.2(1-.2)}{64}} = .05$ .  
 c. .15 and .25, calculated as  $.2 \pm .05$ .  
 d. .10 and .30, calculated as  $.2 \pm (2 \times .05)$ .
- 9.45** The mean is  $p_1 - p_2$  which is 0 if the two proportions are equal.
- 9.51** a. The proportion of the population of urban elementary school children who are obese.  
 b. The proportion of the 900 children sampled from urban elementary schools who are obese.  
 c. The sampling distribution is approximately normal with mean of 0 and standard deviation of  $\sqrt{\frac{.2(.8)}{900} + \frac{.2(.8)}{900}} = .019$

- d. The sampling distribution has mean 0 and standard deviation .019.

Figure for Exercise 9.51d



- 10.2 a. Confidence interval  
b. Sampling distribution

- 10.17 a.  $\hat{p} = .3$  (which is 30% expressed as a proportion)

b.  $s.e.(\hat{p}) = \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} = \sqrt{\frac{.3(1-.3)}{439}} = .022$

- c. The 95% confidence interval is  $\hat{p} \pm 2 s.e.(\hat{p})$ , which is  $.3 \pm 2 \times .022$  or .256 to .344. With 95% confidence, we can say that between .256 (25.6%) and .344 (34.4%) of American teenagers think their parents are less strict than their friends' parents.

- 10.22 a. The "formula" to use is *Sample estimate*  $\pm$  *Multiplier*  $\times$  *Standard error*. The sample estimate is

$\hat{p} = .56$  and the standard error is  $\sqrt{\frac{.56(1-.56)}{753}} = .018$ . The multiplier is 1.96, which we will round to 2.

The confidence interval is  $.56 \pm .036$ , or .524 to .596.

- b. Yes, it is reasonable to conclude that more than half of all Americans in 1998 thought that abortion is wrong because the confidence interval is completely above .5. Therefore, all plausible values for the true proportion are above .5, or half of the population.

- 10.27 A necessary condition for using the methods of this chapter is that the number in each category is at least 10 (although some authors say at least 5), and there is only one left-handed person in the sample.

*Note:* Theoretically, the sample size condition has to do with the expected numbers in the categories. Only slightly more than 10% of humans are left-handed, so any sample this small will almost certainly have fewer than 10 left-handed people. The expected number of left-handed people in a sample of  $n = 15$  is only about 1.5, many fewer than the 10 (or 5) required to use the procedures in this Chapter.

- 10.42 a. In 2000, .312 was opposed. In 1993, .226 was opposed.

b.  $\hat{p}_1 - \hat{p}_2 = .312 - .226 = .086$ .

- c. 0.058 to 0.114. With 95% confidence, we can say that the difference between the population proportions opposed to the death penalty in the years 2000 and 1993 was between 0.058 and 0.114 (with a higher proportion opposed in 2000 than in 1993).

d.  $\hat{p}_1 - \hat{p}_2 \pm z^* \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$ , which is  $.086 \pm 1.96 \sqrt{\frac{.312(1-.312)}{2565} + \frac{.226(1-.226)}{1488}}$

**10.43 a.**  $s.e.(\hat{p}_1 - \hat{p}_2) = \sqrt{\frac{.312(1-.312)}{2565} + \frac{.226(1-.226)}{1488}} = 0.0142$ .

**b.**  $0.086 \pm 1.645 (0.0142)$ , which is  $0.086 \pm 0.023$ , or 0.063 to 0.109.