

CHAPTER 19

ESTIMATING PROPORTIONS WITH CONFIDENCE

- 19.1**
- 0.17.
 - 0.019.
 - A 95% confidence interval is 0.132 to 0.208 or 13.2% to 20.8%.
 - We are 95% confident that the percentage of people who will experience headaches while taking Seldane-D is between 13.2% and 20.8%.
- 19.2**
- The sample proportion is about 0.22, so the standard deviation is 0.03. Hence a 95% confidence interval is 0.16 to 0.28 or 16% to 28%.
 - It is important to have a placebo group in order to decide whether it was the medication that actually caused the side effect.
- 19.3**
- It means that the proportion answering "Yes, should" in the sample is probably within 4% of the proportion of all adults nationwide who would answer "Yes, should." This can be verified by noting that the margin of error is approximately $1/\sqrt{645} = .0394$, or about .04, or 4%.
 - $31\% \pm 4\%$ or 27% to 35%
 - It probably represents a real difference. If the margin of error for each poll is 4%, then a confidence interval for the June poll is 15% to 23%, which does not overlap at all with the confidence interval given in part b for the September poll.
- 19.4**
- 0.0229.
 - Note that 2 standard deviations is about 4.5.
 - A 95% confidence interval is 0.705 to 0.795 or 70.5% to 79.5%. In other words we are 95% confident that the percentage of adult Americans who think Congress should maintain the ban is between 70.5% and 79.5%.
- 19.5**
- 68%.
 - 90%.
 - 95%.
 - 99%.
- 19.6**
- decrease.
 - remain the same.
 - decrease.
- 19.7** No. This was clearly not a random sample of the population.
- 19.8** The sample proportion is 0.2, so the standard deviation is 0.037. Therefore the 95% confidence interval is 0.2 ± 0.07 . This gives the desired interval of 13% to 27%.

- 19.10** Note that the sample size is fixed so we need look only at the numerator of the standard deviation formula and find its maximum value. Taking the proportion to be 0.10, 0.30, and 0.40, yields numerators: 0.30, 0.458, 0.49. And taking 0.60, 0.80, and 0.90 gives the values of the numerator as: 0.49, 0.40, and 0.30. The numerator would be 0.50 if the proportion 0.50 were used, so these values confirm that the standard deviation is largest at 0.50.
- 19.11**
- a.** The sample proportion is 0.6, and standard deviation is about 0.02. So a 95% confidence interval is approximately 0.56 to 0.64 or 56% to 64%.
 - b.** Yes. We can be 95% sure that the true percentage of people who prefer the quarter system is 56% to 64%, which is a majority.
 - c.** The sample proportion is 0.6, and the standard deviation is about 0.07. So the confidence interval is 0.46 to 0.74 or 46% to 74%. Because this confidence interval goes below 50%, it does not provide convincing evidence that the majority prefer to remain on the quarter system.
 - d.** The larger sample size in part a yielded a smaller standard deviation and thus a smaller confidence interval. In general the larger the sample size the smaller the 95% confidence interval we can get, so the sample size alone can determine whether we accept that the majority of a population indeed has a certain trait.