Finding a Point Estimate and *E* from a Confidence Interval

When using technology to create a confidence interval, the result is often expressed in a format such as (18.128, 20.060). The sample mean $\bar{x}$ is the value midway between those limits, and the margin of error E is one-half the difference between those limits (because the upper limit is $\bar{x} + E$ and the lower limit is $\bar{x} - E$, the distance separating them is $2E$).

$$\text{Point estimate of } \mu\text{: } \bar{x} = \frac{(\text{upper confidence limit}) + (\text{lower confidence limit})}{2}$$

$$\text{Margin of error: } E = \frac{(\text{upper confidence limit}) - (\text{lower confidence limit})}{2}$$

Example 4 Chocolate Chips

The accompanying TI-83/84 Plus calculator screen displays results from counts of chocolate chips in a sample of 32 Chips Ahoy chewy cookies. The display shows the confidence interval limits for a 95% confidence level. Use the displayed confidence interval to find the values of the best point estimate $\bar{x}$ and the margin of error E.

Solution

The following results show that for the population of Chips Ahoy chewy cookies, the mean number of chocolate chips per cookie is estimated to be 19.1 (rounded) and the margin of error is 1.0 (rounded).

TI-83/84 PLUS

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TInterval
 (18.128,20.06)
 x̄=19.094
 Sx=2.68
 n=32
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$$\bar{x} = \frac{(\text{upper confidence limit}) + (\text{lower confidence limit})}{2}$$

$$= \frac{20.06 + 18.128}{2} = 19.094 \text{ chocolate chips}$$

$$E = \frac{(\text{upper confidence limit}) - (\text{lower confidence limit})}{2}$$

$$= \frac{20.06 - 18.128}{2} = 0.966 \text{ chocolate chips}$$

Using Confidence Intervals to Describe, Explore, or Compare Data

In some cases, we might use a confidence interval to achieve an ultimate goal of estimating the value of a population parameter. In other cases, confidence intervals might be among the different tools used to describe, explore, or compare data sets.

Example 5 Second-Hand Smoke

Figure 7-6 shows graphs of confidence interval estimates of the mean cotinine level in each of three samples: (1) people who smoke; (2) people who don't smoke but are exposed to tobacco smoke at home or work; (3) people who don't smoke and are not exposed to smoke. (The sample data are listed in Data Set 9 in Appendix B.) Because cotinine is produced by the body when nicotine is absorbed, cotinine is a good indication of nicotine intake. Figure 7-6 helps us see the effects of second-hand