Worksheet 11

In this worksheet, we will try to determine the ratio of adults in Michigan who smoke.

1. Using voter registration lists, a random sample of 1000 Michigan adults is chosen. The 1000 adults are contacted by telephone, but only 951 respond. Of the 951 respondents, 197 adults said that they smoke at least one cigarette per day. Compute the statistic \( \hat{p} \) of the ratio of smokers among the sample.

2. Let’s suppose that the parameter \( p \) of the actual ratio of smokers in Michigan is equal to 0.22.

   A new sample of 1000 adults is chosen, and the survey is repeated. In fact, the survey is repeated many times with different samples. Each time, a slightly different answer for \( \hat{p} \) occurs, but they are all approximately equal to 0.22.

   Describe the distribution of your values of \( \hat{p} \). What is the shape of the distribution? What are the mean and standard deviation? [Hint: Assume that each sample has 1000 participants, even though non-response reduces this number each time the survey is conducted.]
3. Find an interval in which \( \hat{p} \) lands 95% of the time. [Hint: 68–95–99.7 rule for normal distributions.]

4. (If you have time) How trustworthy are the results from this particular survey? Discuss biases caused by the method of sampling and by non-response (see problem 1). Do you trust the participants’ answers? Overall, is the true value of \( p \) likely to be higher or lower than the computed values of \( \hat{p} \)?