A treatment is administered to a sample of $N = 16$ individuals. The treatment population has unknown mean, but has a known standard deviation of $\sigma = 12$. The sample mean is found to be $\overline{X} = 55$.

1. Compute a 95% confidence interval for μ, the mean of the treatment population.

2. Define $\mathcal{H}_0 : \mu = 50$ and $\mathcal{H}_1 : \mu > 50$. What is the probability of observing a sample mean $\overline{X} = 55$ or larger if $\mathcal{H}_0$ is true?

3. Given the results of (a) and (b), can we reject $\mathcal{H}_0$ in favor of $\mathcal{H}_1$? Why or why not?

A treatment is administered to a sample of $N = 36$ individuals. The treatment population has unknown mean, but has a known standard deviation of $\sigma = 18$. The sample mean is found to be $\overline{X} = 52$.

- Compute a 95% confidence interval for μ, the mean of the treatment population.
- Define $\mathcal{H}_0 : \mu = 60$ and $\mathcal{H}_1 : \mu < 60$. What is the probability of observing a sample mean $\overline{X} = 52$ or smaller if $\mathcal{H}_0$ is true?
- Given the results of (a) and (b), can we reject $\mathcal{H}_0$ in favor of $\mathcal{H}_1$? Why or why not?

A researcher is interested in whether people can accurately identify others' emotions when they are extremely tired. It is known from previous research in this field that these accuracy ratings are normally distributed with mean 80% and standard deviation 4.5%. We tested 50 people who had no sleep the previous night and found a mean accuracy rating of 78%. What can we conclude from these data about people's ability to identify others' emotions when extremely tired?

There is some evidence that REM sleep may play a role in learning and memory processing. For example, Smith and Lapp (1991) found increased REM activity for college students during exam periods. Suppose that REM activity for a sample of $N = 16$ students during the final exam period produced an average score of $\overline{X} = 143$. It is known that regular REM activity for the college population is normally distributed with an average of 110 and a standard deviation of $\sigma = 50$.

- Compute a 95% confidence interval for μ, the population mean REM score for college students during exam periods.
- Perform a hypothesis test to decide whether REM scores during exam periods are significantly larger than regular REM scores.