Dessert Preferences
January 25, 2022

Mr. Merrick Loves Dessert, he claims that 90% of people would eat some sort of dessert with most meals. He conducts a simple random sample of people from his community and collects data that can be found at:
https://merrickmath.github.io/2021Statistics/Activities/Preference.csv
Using statistical inference, what conclusions can you make about Mr. Merrick's claim?

Solution: Here we will use a one sample Z-test for the population proportion. First we will make sure that the conditions for inference are met:

Random Sampling: It is clearly stated that the data is collected randomly.
Independence: The sample of $n = 287$ is clearly less than 10% of the population of all people.
Normality: Here $np_0 = 287(.9)$ and $n(1 - p_0) = 287(.1)$ are both greater than 10 so we may assume $\hat{p}$ is normally distributed with mean $\mu_{\hat{p}} = p$ and $\sigma_{\hat{p}} = \sqrt{\frac{p_0(1-p_0)}{n}}$.

Our hypothesis for this problem are:
$$H_0 : p = 0.9$$
$$H_a : p \leq 0.9$$

From the data we have $\hat{p} = 0.4$ for the sample proportion of people who prefer dessert. Next we will calculate our standardized test statistic and p-value.

$$
\begin{aligned}
z_{\text{calc}} &= \frac{\hat{p} - \mu_{\hat{p}}}{\sigma_{\hat{p}}} \\
&= \frac{0.4 - 0.9}{0.01770844} = -28.23512
\end{aligned}
$$

$$
\begin{aligned}
P(\overline{x} \leq 0.9) &= P(Z < -28.23512) \\
&\approx 0
\end{aligned}
$$

Assuming that Mr. Merrick's claim that 0.9 people prefer dessert is true there is an approximately 0% chance (very small) of observing data with a sample proportion less than or equal to our sample. Specifically $0 \leq \alpha = 0.05$ so we reject the null hypothesis in favour of the null.