0.1 Can you taste the "diet" in diet soda

Some people claim that they can tell the difference between a diet soda and a regular soda in the first sip. A researcher wanting to test this claim randomly sampled 80 such people. He then filled 80 plain white cups with soda, half diet and half regular through random assignment, and asked each person to take one sip from their cup and identify the soda as diet or regular. Fifty-three participants correctly identified the soda. Do these data provide strong evidence that these people are able to detect the difference between diet and regular soda (i.e. that they are doing better than expected by random guessing)?

0.2 State

We will conduct a 95% confidence z-test with $\alpha = 0.05$ in order to determine whether there is an observable difference between diet and regular soda. $H_0 : p = 0.5$, $H_a : p \neq 0.5$ where p is the true proportion of people who identify the diet soda correctly.

0.3 Plan

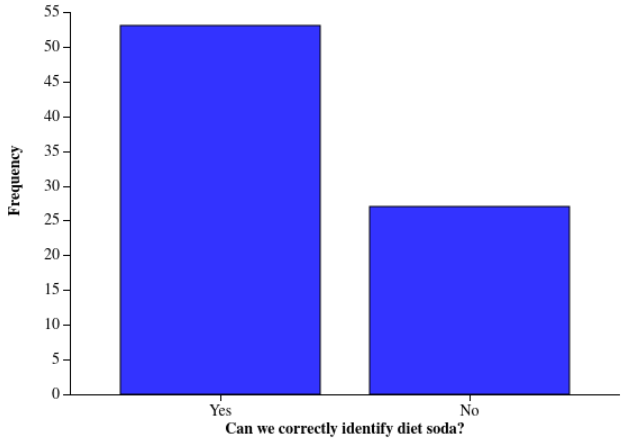
- 80 people is less than 10% of all people.
- The 80 people are randomly sampled.
- Let's define p as the proportion that correctly identify the soda.
- The people who correctly identified the soda are independent of the people who did not correctly identify the soda.
- Then, np_0 is the number of people who correctly identify the soda, and $np_0 = 53 > 10$.
- $n(1-p_0)$ is the number of people who incorrectly identify the soda, and $n(1 - p_0) = 27 > 10$.
- Therefore, the large counts condition is satisfied.
- The normal model is hence appropriate.

0.4 Do

Formula for 1-sample z-test:

$$z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}}, p_0 = 0.5, \hat{p} = 0.6625, n = 80$$

Our resulting z-score is 2.904, which corresponds to a p-value of 0.004.



0.5 Conclude

Since $p = 0.004 < 0.05$ we reject the null hypothesis and conclude that there is strong evidence that people are able to detect the difference between diet and regular soda.