

Let  $p$  be the true probability that someone prefers Stax to Pringles. Since this is a superiority claim, the burden of proof is on Lay's to prove that Stax is truly preferred. That is, we are testing the hypotheses

$$H_0 : p \leq .5$$

versus

$$H_a : p > .5.$$

Note that this is a one-tailed test from the point of view of what alternative is actually of interest to the Federal Trade Commission, but in practice the test would actually be done as a two-tailed test, making it more difficult for Lay's to meet the burden of proof. The test statistic is

$$z = \frac{\bar{p} - p_0}{\sqrt{p_0(1 - p_0)/n}}.$$

The question now is how to define  $\bar{p}$ . If we based it on the people who had a preference,  $\bar{p} = 63/98 = .643$ , and the test statistic is

$$z = \frac{.643 - .5}{\sqrt{(.5)(.5)/98}} = 2.83,$$

which has a one-sided tail probability of .0023, and two-sided tail probability of .0046. That is, there is strong evidence that Stax is preferred to Pringles. I would argue, however, that this is the wrong calculation; the people who have no preference should count as failures, in that they do not prefer Stax, making  $\bar{p} = 63/111 = .568$  and the test statistic equal to

$$z = \frac{.568 - .5}{\sqrt{(.5)(.5)/111}} = 1.43,$$

which has a one-sided tail probability of .076, and two-sided tail probability of .152. That is, there is not sufficient evidence that Stax is preferred to Pringles, and the ads should be pulled.