

UNIVERSITY OF TEXAS AT AUSTIN

Quiz # 12

Inference for proportions: Hypothesis testing.

Provide your **complete solution** to the following problems.

Problem 12.1. (3 points) Suppose that a dietician suspects that more than 30% of adults are allergic to Wensleydale. How is she going to formulate her null and alternative hypotheses?

Solution: Let p denote the population proportion of people who are allergic to Wensleydale.

$$H_0 : p = 0.30 \quad \text{vs.} \quad H_a : p > 0.30$$

Problem 12.2. (6 points) After a college football team once again lost a game to their archrival, the alumni association conducted a survey to see if alumni were in favor of firing the coach. A simple random sample of 100 alumni from the population of all living alumni was taken. Sixty-four of the alumni in the sample were in favor of firing the coach. Let p represent the proportion of all living alumni who favored firing the coach. Suppose the alumni association wished to see if the majority of alumni are in favor of firing the coach. To do this they test the hypotheses

$$H_0 : p = 0.50 \quad \text{versus} \quad H_a : p > 0.50.$$

What is the p -value for this hypothesis test?

Solution: The observed value of the z statistic under the null hypothesis is

$$\frac{0.64 - 0.5}{\sqrt{\frac{0.25}{100}}} = 2.8.$$

The p -value is

$$1 - \Phi(2.8) = 1 - 0.9974 = 0.0026.$$

Problem 12.3. (3 points) Your friend claims that he is better at shooting three-pointers in the sense that his proportion of successes is higher than yours. You disagree. Your plan is to set up a hypothesis test. Specify the hypotheses in this test.

Solution: Let p_1 be your proportion of successes. Let p_2 be your friend's proportion of successes. You are supposed to test

$$H_0 : p_1 = p_2 \quad \text{vs.} \quad H_a : p_1 > p_2.$$

Problem 12.4. (3 points) A pharmaceutical company is testing whether their new medication works for a higher proportion of people than the existing medication. Specify the parameters in this situation and the hypotheses in the necessary hypothesis test.

Solution: Let p_C be the population proportion for the people who are helped by the existing medication. Let p_T be the population proportion for the people who are helped by the new medication. Then, the hypotheses are to be formulated as

$$H_0 : p_C = p_T \quad \text{vs.} \quad H_a : p_C < p_T.$$