

1. The success of precious metal mines depends on the purity (or grade) of ore removed and the market price for the metal. Suppose the purity of gold ore must be at least 0.5 ounce of gold per ton of ore in order to keep a particular mine open. Samples of gold ore are used to estimate the purity of the ore for the entire mine. Discuss the impact of type I and type II errors on the following hypotheses:

H_0 : purity = 0.5 ounce per ton

H_a : purity < 0.5 ounce per ton

Type I - We think the purity is less than 0.5 ounce per ton, but it's not.
They will incorrectly close the mine.

Type II - We don't think the purity is less than 0.5 ounce per ton, but it actually is less.
They will incorrectly keep the mine open.

2. According to the Census Bureau, the average amount of money spent per U.S. household per week on food is \$98. A local newspaper takes a random sample of 1000 households in Minnesota and the mean weekly food budget of the sample is calculated. They want to know if the mean weekly food budget for all households in Minnesota is higher than the national average. Describe the population parameter for this situation using appropriate notation (μ or p), create the hypotheses for this test, and discuss the impact of type I and type II errors.

Parameter - μ = mean weekly food budget for all households in Minnesota

H_0 : $\mu = \$98$

H_a : $\mu > \$98$

Type I - We think Minnesotans spend more than the national average, but we actually don't spend more.

Type II - We don't think Minnesotans spend more than the national average, but we actually do spend more.

3. A drug manufacturer claims that fewer than 10% of patients who take its new drug for treating Alzheimer's disease will experience nausea. To test this claim, a test at the 0.025 significance level is carried out with a random sample of 100 patients with hypotheses:

$$H_0: p = 0.10$$

$$H_a: p < 0.10$$

Give the probability of making a type I error and discuss the impact of type I and type II errors.

$$\text{Probability of Type I error} = .025$$

Type I - We think less than 10% of patients will experience nausea, but it's actually at least 10% who will experience nausea.

Type II - We don't think less than 10% of patients will experience nausea, but it's actually less than 10%.

