Hypothesis testing

Single Sample Test of a Population Mean

- The null hypothesis, denoted H_0, is a statement of the basic proposition being tested.

- The alternative or research hypothesis, denoted H_a, is an alternative (to the null hypothesis) statement that will be accepted only if there is convincing sample evidence that it is true

- One-Sided, "Greater Than" Alternative: $H_0 : \mu \leq \mu_0$ vs. $H_a : \mu > \mu_0$

- One-Sided, "Less Than" Alternative: $H_0 : \mu \geq \mu_0$ vs. $H_a : \mu < \mu_0$

- Two-Sided, "Not Equal To" Alternative: $H_0 : \mu = \mu_0$ vs. $H_a : \mu \neq \mu_0$

- μ_0 is a given constant value (with the appropriate units) that is a comparative value

- As a result of testing H_0 vs. H_a, will have to decide either of the following decisions for the null hypothesis H_0:

  - Do not reject H_0

  - Reject H_0

- In order to "test" H_0 vs. H_a, use the "test statistic"

$$z = \frac{\bar{x} - \mu_0}{\sigma/\sqrt{n}}$$

  where μ_0 is the given value or the hypothesized mean (often the claimed to be true) and $\bar{x}$ is the mean of a sample

- Type I Error: Rejecting H_0 when it is true (Innocent guy found guilty)

- Type II Error: Failing to reject H_0 when it is false (Guilty guy found innocent)

Comparing Two Population Means by Using Independent Samples

- Here, what matters is the difference $\mu_1 - \mu_2$ between two means. The two-sided, not-equal alternative is $H_0 : \mu_1 - \mu_2 = 0$ vs. $H_0 : \mu_1 - \mu_2 \neq 0$.

- This is what we do with the Atkins diet case.

- Approach is similar to the single sample case, but the test statistic differs somewhat.