

HYPOTHESIS TESTING

Null Hypothesis: H_0 Trying to disprove

Alternative Hypothesis: H_a - What you believe is happening

Testing airbags. Researchers believe they do not open properly.

H_0 : Airbags open properly.

H_a : Airbags do not open properly.

Developers believe new paint dries more quickly.

H_0 : New paint dries at the same rate or slower.

H_a : New paint dries faster.

Hypothesis Test

- 1) Define parameters. (What numerical info is needed.)
- 2) Set up H_0 + H_a . (In terms of #'s using $<, >$)
- 3) Set the criteria for the test.

a) What kind of distribution? (normal)

b) Set level of confidence. for H_0

$$p < 0.05 \quad p < 0.01$$

(95% conf.) (99% conf.)

- 4) List sample evidence.

$$n, \bar{x}, \sigma \text{ or } s, \sigma_{\bar{x}}, z^* \text{ (test statistic)}$$

- 5) Find probability. ($p =$)



$$z^* = \frac{\bar{x} - \mu}{\sigma_{\bar{x}}}$$

- 6) If $p < \#$, then "Reject the H_0 ."
- If $p > \#$, then "Fail to Reject the H_0 ."

Millvale H.S. - National Test

95% confidence

National Test $\mu = 50$ $\sigma = 10$ 900 students $\bar{x} = 51.1$ $S = 10$

Did Millvale students really do better?

1) Parameter: student test scores

2) $H_0: \mu = 50 (\leq)$ $H_a: \mu > 50$ 3) Criteria: Normal, $p < 0.05$ 4) $n = 900$ $S = 10$ $\bar{x} = 51.1$

$$\sigma_{\bar{x}} = \frac{S}{\sqrt{n}} = \frac{10}{\sqrt{900}}$$

$$z^* = \frac{\bar{x} - \mu}{\sigma_{\bar{x}}} = \frac{51.1 - 50}{0.333} = 3.3$$

5)  $p = 0.0005$ 6) Reject the H_0 - MHS students performed better than the national average.

Kelley Employment Agency $\mu = 82$ $\sigma = 8$
 Brown Agency $n = 36$ $\bar{x} = 79$ $S = 8$

1) Param: test scores

2) $H_0: \mu \neq 82$ ← two-tailed test

$H_a: \mu = 82$

3) Criteria; Normal; $p < 0.05$

4) Sample evidence:

$$n = 36$$

$$\bar{x} = 79 \quad S = 8$$

$$\sigma_{\bar{x}} = \frac{8}{\sqrt{36}} = 1.333$$

$$Z^* = \frac{\bar{x} - \mu}{\sigma_{\bar{x}}} = \frac{79 - 82}{1.333} = -2.25$$



6) Reject H_0 ; Brown test is as accurate as Kelley test.