

Panel 1

Proportion

Why: Stat. test that applies to non-numeric vars. (cat)

How: Consider this as an experiment where you repeat one process again+again. That process has 2 outcomes (1=Success, 0=Failure)

Test:

$$H_0: \text{prop. of success} = \pi \quad (1/2)$$

$$H_a: \text{prop. of success} \neq \pi \quad (1/2)$$

$$z_0 \text{ or } t_0 = \frac{\bar{x} - \pi}{\sqrt{\frac{\pi(1-\pi)}{n}}}$$

$$p = 2P(z > z_0) \quad \text{std. error for proportions}$$

Panel 2

We conduct a survey to ask people if they are for or against Hydraulic fracturing in a particular county. The survey asked 265 people, 116 came out for the practice, 149 against. Conduct a statistical test to check if the people are evenly divided on this issue. Based on your results, decide that if you were to advise a congress person to represent her district accurately, would you advise her to vote for or against the practice, or should she abstain?

$$S = \text{For} \Rightarrow 116/265 = 0.437$$

$$H_0: \pi = 1/2$$

$$H_a: \pi \neq 1/2$$

$$\text{std. error for a proportion}$$

$$\pi = \sqrt{\frac{\pi(1-\pi)}{n}}$$

$$z_0 = \frac{0.437 - 1/2}{\sqrt{\frac{1/2(1-1/2)}{265}}}$$

$$= \frac{-0.063}{0.0307} = -2.05$$

$$p = 2P(z \geq 2.05) = 2 \cdot 0.02 = 0.04 \Rightarrow \text{Reject } H_0$$

Panel 3

Flip coin 200 times. Get 94 H, 106 T

$H_0: \pi = 1/2$ (circled in red)

$H_a: \pi \neq 1/2$

$z = \frac{0.47 - 0.5}{\sqrt{\frac{1/2(1-1/2)}{200}}} = \frac{0.03}{0.035} = 0.9$

$p = 2P(z > 0.9) \approx 0.05$

inconclusive! Don't know
(prop. fair)

$H_0: \pi = 1/2$

$H_a: \pi \neq 1/2$

$z = \frac{0.47 - 0.5}{\sqrt{\frac{1/2(1-1/2)}{200}}} = \frac{-0.03}{0.035} = -0.86$

$p = \text{same!}$
 $2P(z < -0.86)$

(Note: "same" is written in green and has an arrow pointing to the p-value calculation.)