

12.2 Tests About a Population Proportion

Steps for one-proportion z-test (p)

① State the hypothesis

$$H_0: p = p_0 \quad H_a: p \neq p_0; \quad p > p_0; \quad p < p_0$$

② Name the procedure in context

One-proportion z-test for p , where p is the true proportion of all (context)

③ State and check the conditions SIN

S - SRS

I - independence $N \geq 10n$

N - sampling distribution is $\sim N$

$$np_0 \geq 10 \quad n(1-p_0) \geq 10$$

④ Computation

$$z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}}$$

⑤ Conclusion in context

"Because the p-value = _____ is ($>$ \otimes $<$)

$\alpha =$ _____, I (~~reject~~ \otimes fail to reject) the H_0 .

There (is \otimes is not) convincing evidence that _____ (context) _____."

* Review: CI for \hat{p} in Ch 10

$$\hat{p} \pm z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

Example According to the National Campaign to Prevent Teen and Unplanned Pregnancy, 20% of teens aged 13 to 19 say that they have electronically sent or posted sexually suggestive images of themselves. The counselor at a large high school the actual figure might be different at her school. To find out, she administers an anonymous survey to a random sample of 250 of the school's 2800 students. All 250 respond and 63 admit to sending or posting sexual images. Does the data provide convincing statistical evidence that the proportion of students at this school different from the national %?

① $H_0: p = .2$ $H_a: p \neq .2$

② One proportion z-test for p where p is the true proportion of all students at this school who send or post naked pictures

③ It is stated in the question that this is a simple random sample. $n \geq 10np = 10(250) = 2500$. Since there are more than 2500 students at 2800, we can assume independence. $np = 250(.2) = 50 \geq 10$ and $n(1-p) = 250(.8) = 200 \geq 10$. Since both are true the sampling distribution is $\sim N$.

④
$$z = \frac{\frac{63}{250} - .2}{\sqrt{\frac{.2(1-.2)}{250}}} = 2.055$$

area to the left of $z = .98005$
 $1 - .98005 = .02$
 p-value = $2(.02)$
 $= .04$

12.2 cont'd

⑤ Because the p -value = $.040 < \alpha = .05$, we reject H_0 . There is convincing evidence that the proportion of students at this school who send or post sexual images is different than the national percentage.

