Key
Chi Square GoF
or
1 prop z test

Activity 24-13: Halloween Treats

In an effort to curb the obesity problem among America's youth, researchers investigated whether trick-or-treaters might be equally likely to choose a toy as opposed to candy when presented with a choice between the two (Schwartz, Chen, and Brownell, 2003). Seven households in five suburban Connecticut neighborhoods offered two bowls to trick-or-treaters aged 3 to 14. One bowl contained lollipops or fruit candy, and the other contained small toys such as plastic bugs that glow in the dark. Of the 283 children who were simultaneously offered the two bowls, 148 chose candy and 135 chose toys.

→ what other test could you use? Try it

a. Test the "equally likely" hypothesis with a chi-square test. Report all aspects of the test, including a check of technical conditions. Summarize the conclusion you would draw, in this context, at the $\alpha = .20$ significance level.

b. Use these sample data to produce an 80% confidence interval for the population proportion of trick-or-treaters who would choose the toy in such a situation. Also interpret this interval.

c. Does this interval include the value .5? Explain how this is consistent with your test decision in part a.

d. To what population would you feel comfortable generalizing the results of this study? Explain.

a)

State: H_0: Children are equally likely to choose candy or a toy
H_a: Children are not likely to choose candy or a toy equally

Plan: χ^2 GoF
Conditions: • Randomly selected 7 housholds in 5 Connecticut neighborhoods
• All expected counts > 5 (see table)
• 10% condition 283 < 10% (All children in suburban Connecticut)

Do:

category	stated %	observed	Expected	$(O-E)^2/E$
Candy	50	148	141.5	0.29859
Toy	50	135	141.5	0.29859
		283		

$\chi^2 = 0.59717$
df = 1 P-value = .44 (calc)
P-value > 0.25 (book)

Conclude: ① Fail to Reject H_0, P-value > α level of 0.20
② There is no evidence that children from this area would not be equally likely to choose candy or a toy.
③ Assuming H_0 is true, there is a 44% chance of getting differences in treat choice at least this extreme by chance alone.

1 Sample z test for Proportions $H_0: P_c = 0.5$ $H_a: P_c \neq 0.5$ $\hat{P}_c = \frac{148}{283} = .523$

$z = \frac{\hat{P}_c - P_0}{\sqrt{\frac{P_0(1-P_0)}{n}}} = \frac{.523 - .5}{\sqrt{\frac{(.5)(.5)}{283}}} = \frac{0.023}{0.0297} = 0.7744 \xrightarrow{\text{Table A}} .7794$

Pvalue = 1 − .7794 = .2206 multiply by 2
Pvalue = 0.4412

b.) CI of 80%

$\hat{p}_{candy} \pm z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$ $\quad .523 \pm 1.282 \sqrt{\frac{(.523)(.477)}{283}}$

(0.48492, 0.56102) We are 80% confident the true proportion of children in suburban Connecticut who choo candy is between 0.485 and 0.561.

c.) Yes, this interval does include 0.5. This supports our conclusion from part (a) because we failed to reject that there was 'no difference' in choosing a candy + a toy. which means about 50% of children chose a toy + about 50% chose a candy.

d.) All children in suburban Connecticut.