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Headlights Analysis Report

Research Objective: In some states the law requires drivers to turn on their headlights when driving in the rain. A highway patrol officer disagrees with this statement and believes that less than (.30) of all drivers follow this rule. As a test, she randomly samples 275 cars driving in the rain and counts the number whose headlights are turned on. She finds this number of cars with headlights on to be 19. Does the officer have enough evidence at 5% level of significance to support her belief that fewer than .30 of all cars follow the rules?

Problem Definition –

Compute whether the officer's evidence is enough to support her claims.

Hypothesis –

H_0: $\mu \geq .30$

H_1: $\mu < .30$

Decision Rule –

If Z test statistic less than -1.645 reject the null.

Test –

Test and CI for One Proportion

Method

p: event proportion

Normal approximation method is used for this analysis.

Descriptive Statistics

N	Event	Sample p	95% Upper Bound for p
275	19	0.069091	0.094246

Test

Null hypothesis	H_0: p = 0.3
Alternative hypothesis	H_1: p < 0.3

Z-Value	P-Value
-8.36	0.000

Conclusion –

1) The Z test statistic of -8.36 is less than the critical value of -1.645. Reject the null hypothesis, there is a 5% chance that Type 1 error has been committed.
2) The hypothesized value of Mu = .30 does not fall within the confidence interval upper bound of 0.09.
3) P-value 0.00 is < α .05 = Reject Null.

Interpretation –

The officer does have enough evidence to support her claim that fewer than .30 of all cars follow the rules.

Assumptions –

$np \geq 10$: $(275)(.069) = 18.975 \geq 10$ $n(1-p) \geq 10$: $275(1-.069) = 256.025 \geq 10$