



PES University, Bangalore

(Established under Karnataka Act No. 16 of 2013)

UE19CS203 – STATISTICS FOR DATA SCIENCE

Unit-4 - Hypothesis and Inference

QUESTION BANK – SOLVED

Large Sample tests for a Population proportion :

Exercises for section 6.3: [Text Book Exercise 6.3– Pg. No. [416 – 417]]

1. The article “HIV-positive Smokers Considering Quitting: Differences by Race/Ethnicity” (E. Lloyd- Richardson, C. Stanton, et al., *Am J Health Behav*, 2008:3–15) surveyed 444 HIV-positive smokers. Of these, 281 were male and 163 were female. Consider this to be a simple random sample. Can you conclude that more than 60% of HIV-positive smokers are male?

[Text Book Exercise – Section 6.3 – Q. No.2 – Pg. No. 416]

Solution:

$$x = 281, n = 444, \hat{p} = \frac{281}{444} = 0.6329$$

The null and alternate hypotheses are

$$H_0: p \leq 0.60$$

$$H_1: p > 0.60$$

Z- score:

$$z = \frac{\hat{p} - p_0}{\sqrt{p_0(1 - p_0)/n}}$$
$$z = \frac{0.6329 - 0.6}{\sqrt{0.6(1 - 0.6)/444}} = 1.42$$

Since the alternate hypothesis is of the form $p > p_0$, the P-value is the area to the right of $z = 1.42$ so $P = 0.0748$. The claim is rejected.

There is not sufficient evidence to support the claim that more than 60% of HIV -positive smokers are male.

2. A grinding machine will be qualified for a particular task if it can be shown to produce less than 8% defective parts. In a random sample of 300 parts, 12 were defective. On the basis of these data, can the machine be qualified?
[Text Book Exercise – Section 6.3 – Q. No.8 – Pg. No. 417]

Solution:

$$x = 12, n = 300, \hat{p} = \frac{12}{300} = 0.04$$

The null and alternate hypotheses are

$$H_0: p \geq 0.08$$

$$H_1: p < 0.08$$

Z- score:

$$z = \frac{\hat{p} - p_0}{\sqrt{p_0(1 - p_0)/n}}$$
$$z = \frac{0.04 - 0.08}{\sqrt{0.08(1 - 0.08)/300}} = -2.25$$

Since the alternate hypothesis is of the form $p < p_0$, the P-value is the area to the left of $z = -2.25$ so $P = 0.0054$.

The claim is rejected.