6.5 Confidence Interval for a Population proportion (P):

A sample is drawn from the population of interest ,then compute the sample proportion $\hat{P}$ such as

$$\hat{p} = \frac{\text{no.of elementin thesamplewithsomecharachtaristic}}{\text{Totalno.of elementin thesample}} = \frac{a}{n}$$

This sample proportion is used as the point estimator of the population proportion . A confident interval is obtained by the following formula

$$\hat{P} \pm Z_{1-\frac{\alpha}{2}} \sqrt{\frac{\hat{P}(1-\hat{P})}{n}}$$

Example 6.5.1

The Pew internet life project reported in 2003 that 18% of internet users have used the internet to search for information regarding experimental treatments or medicine . The sample consist of 1220 adult internet users, and information was collected from telephone interview. We wish to construct 98% C.I for the proportion of internet users who have search for information about experimental treatments or medicine

Solution :

1-α =0.98 → α = 0.02 → α/2 =0.01 → 1- α/2 = 0.99

$Z_{1-\alpha/2} = Z_{0.99} = 2.33$, n=1220, $\hat{p} = \frac{18}{100} = 0.18$

The 98% C. I is

$$\hat{P} \pm Z_{1-\frac{\alpha}{2}} \sqrt{\frac{\hat{P}(1-\hat{P})}{n}} = 0.18 \pm 2.33 \sqrt{\frac{0.18\,(1-0.18)}{1220}}$$

0.18 ± 0.0256 = (0.1544 , 0.2056)

Exercises: 6.5.1 , 6.5.3 Page 187

6.6 Confidence Interval for the difference between two Population proportions :

Two samples is drawn from two independent population of interest ,then compute the sample proportion for each sample for the characteristic of interest. An unbiased point estimator for the difference between two population proportions $\hat{P}_1 - \hat{P}_2$

A 100(1-α)% confident interval for $P_1 - P_2$ is given by

$$(\hat{P}_1 - \hat{P}_2) \pm Z_{1-\frac{\alpha}{2}} \sqrt{\frac{\hat{P}_1(1-\hat{P}_1)}{n_1} + \frac{\hat{P}_2(1-\hat{P}_2)}{n_2}}$$

Example 6.6.1

Connor investigated gender differences in proactive and reactive aggression in a sample of 323 adults (68 female and 255 males). In the sample ,31 of the female and 53 of the males were using internet in the internet café. We wish to construct 99 % confident interval for the difference between the proportions of adults go to internet café in the two sampled population .

Solution :

1-α =0.99 → α = 0.01 → α/2 =0.005 → 1- α/2 = 0.995

$Z_{1-\alpha/2} = Z_{0.995} = 2.58$, $n_F=68$, $n_M=255$,

$$\hat{p}_F = \frac{a_F}{n_F} = \frac{31}{68} = 0.4559,\ \hat{p}_M = \frac{a_M}{n_M} = \frac{53}{255} = 0.2078$$

The 99% C. I is

$$(\hat{P}_F - \hat{P}_M) \pm Z_{1-\frac{\alpha}{2}} \sqrt{\frac{\hat{P}_F(1-\hat{P}_F)}{n_F} + \frac{\hat{P}_M(1-\hat{P}_M)}{n_M}}$$

$$(0.4559 - 0.2078) \pm 2.58 \sqrt{\frac{0.4559(1-0.4559)}{68} + \frac{0.2078(1-0.2078)}{255}}$$

0.2481 ± 2.58(0.0655) = (0.07914 , 0.4171)

- Exercises:
- Questions :
- 6.2.1, 6.2.2,6.2.5 ,6.3.2,6.3.5, 6.4.2
- 6.5.3 ,6.5.4,6.6.1