

## CHI SQUARE For Goodness of Fit

In 2010 Census of the city, the weight of the individuals in a small city were found to be the following

<50kg	50-75	>75
20%	30%	50%

In 2020, weight of  $n=500$  individuals were sampled. Below are the results

<50	50-75	>75
140	160	200

Using  $\alpha=0.05$ , would you conclude the population differences of weights has changed in the last 10 years?

Ans)

2010  
Expected

<50kg	50-75	>75
20%	30%	50%

2020  
 $n=500$   
Observed

<50	50-75	>75
140	160	200

Expected

<50	50-75	>75
$0.2 \times 500$ $= 100$	$0.3 \times 500$ $= 150$	$0.5 \times 500$ $= 250$

① Null hypothesis :  $H_0$  : The data meets the expectation

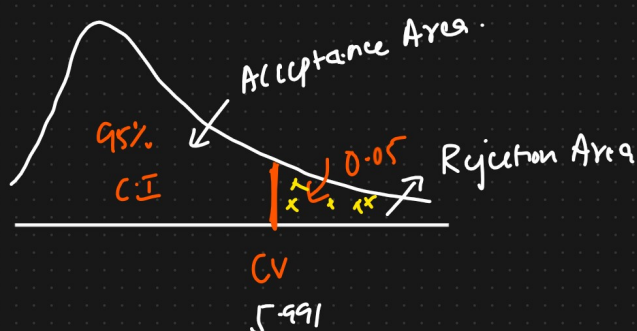
Alternate Hyp :  $H_1$  : The data does not meet the expectation

②  $\alpha = 0.05$  C.I = 95%

③ Degree of freedom

$$df = k - 1 = 3 - 1 = 2$$

④ Decision Boundary



If  $\chi^2$  is greater than 5.99, Reject  $H_0$   
else

We fail to reject the Null Hypothesis

⑤ Calculate Chi Square Test Statistics

2020  
 $n = 500$   
Observed

<50	50-75	>75
140	160	200

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

Expected

<50	50-75	>75
$0.28 \times 500$ = 140	$0.32 \times 500$ = 160	$0.4 \times 500$ = 200

$$= \frac{(140-140)^2}{140} + \frac{(160-160)^2}{160} + \frac{(200-200)^2}{200}$$

$$= \frac{1600}{100} + \frac{100}{150} + \frac{2500}{250}$$

$$= 16 + 0.66 + 10$$

$$= 26.66$$

$$\chi^2 = 26.66$$

If  $\chi^2$  is greater than 5.99, Reject  $H_0$   
else

We fail to reject the Null Hypothesis

$$26.66 > 5.99, \text{ Reject } H_0$$

Answer

The weights of 2020 population are different than those expected in the 2010 population