Is gender independent of education level? A random sample of 395 people were

surveyed and each person was asked to report the highest education level they

obtained. The data that resulted from the survey is summarized in the following table:

High School Bachelors Masters Ph.d. Total

Female 60 54 46 41 201

Male 40 44 53 57 194

Total 100 98 99 98 395

Question: Are gender and education level dependent at 5% level of significance? In

other words, given the data collected above, is there a relationship between the gender

of an individual and the level of education that they have obtained?

**Solution**

**Null Hypothesis**: The two categorical variables are independent.

**Alternative Hypothesis**: The two categorical variables are dependent.

**Obsereved**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | High School | Bachelors | Masters | PH.d | Total |
| Female | 60 | 54 | 46 | 41 | 201 |
| Male | 40 | 44 | 53 | 57 | 194 |
| Total | 100 | 98 | 99 | 98 | 395 |

E=row total×column total/sample sizep[Expected]

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | High School | Bachelors | Masters | PH.d | Total |
| Female | 50.886 | 49.868 | 50.377 | 49.868 | 201 |
| Male | 49.114 | 48.132 | 48.623 | 48.132 | 194 |
| Total | 100 | 98 | 99 | 98 | 395 |

Y=square(X-XE)=( (60−50.886)2/50.886+(54-49.868)2/49.868+(46-50.377)2/50.377+(41-49.868)2/49.868+(40-49.114)2/49.114+(44-48.132)2/49.114+(53-48.623)2/48.623+(57-48.132)2/48.132)=8.006

Degree of freedom(df)=3

Critical value for df 3(after lookup)= 7.815

Y=8.006>7.815 hence the null hypothesis is rejected and gender and education level dependent at 5% level of significance