**Problem​ ​Statement​ ​1:**

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:**

From the above data,

Here are the hypothesis statements

H0 : Null Hypothesis : The level of education is dependent on Gender (at 5% level of significance)

Ha : Alternate Hypothesis : The level of education is not dependent on the gender (at 5% level of significance)

Formula for chi square test,

ᶍ2 = ∑(Observed frequency – Expected frequency)2 /Expected frequency

In the above data, Observed frequencies are given

To calculate the expected frequency,

Expected Frequency, for Female High school = (Highschool total \* count of all Female qualification) / Sample Size.

Similarly, for Male high school = (Highschool total \* Count of all male qualification) / Sample Size.

See the below table with the expected frequencies

High School Bachelors Masters Ph.d. Total

Female 50.886 49.869 50.377 49.868 201

Male 49.114 48.132 48.623 48.132 194

Total 100 98 99 98 395

We’ll calculate the ᶍ2 from the above two tables

ᶍ2 = (60-50.886)2 / 50.886+ (54 – 49.869)2 / 49.869 + (46 – 50.377)2 / 50.377+ (41 – 49.868)2 / 49.868 + (40 – 49.114)2 / 49.114 + (44 – 48.132)2 / 48.132 + (53 – 48.623)2 / 48.623 + (57 – 48.132)2 / 48.132

ᶍ2 = 1.632 + 0.3422 + 0.380 + 1.577 + 1.691 + 0.355 + 0.394 + 1.634

ᶍ2 = 8.0052

From Chi square table, the chi square value with 5% level of significance and 3 degrees of freedom is, 7.8147

ᶍ2ά = 7.8147

ᶍ2 = 8.0052

Hence, ᶍ2 > ᶍ2ά, we reject the null hypothesis.

Hence, approving the alternate hypothesis, The level of education is not dependent on the gender (at 5% level of significance)