

SPSS Instructions for the Chi-Squared (χ^2) Test

To carry out a chi-squared test, you need to be able to do the following:

- Draw a clustered bar chart
- Create a two way contingency table
- Carry out the chi-squared test

The data file for this example is *upgrade1.sav*. You need to download and save this file for use in the example.

Open SPSS and the data file

On the Brookes PC network, select Start > All programs > Statistics > SPSS, choosing version 15.0.

If necessary, when SPSS has loaded, click Cancel to avoid a tutorial session.

To open the data file, *upgrade1.sav*, select File > Open and then navigate to the folder where you have downloaded and saved the file for this example, and open the file.

The file contains two columns of data, with data for 204 students.

The first column, *gender*, records whether each student was male or female.

The second column, *awarecal*, records whether they agreed with the statement 'I am aware of the calorie content of foods that I eat.'

Plot the data using a clustered bar chart

Select Graphs > Legacy dialogs > Bar > Clustered > Summaries for groups of cases > Define

Select *awarecal* for the category axis and *gender* for the box labelled 'Define clusters by'

Under Bars represent, select % of cases

Click on OK.

Cross-tabulate the two variables adding %s and Chi-squared test:

Select Analyse > Descriptive statistics > Crosstabs

Select *gender* in the list on the left and click on the ▶ symbol for Columns

Select *awarecal* and click on the ▶ symbol for Rows

Click on the button labelled Cells, then under Percentages, select Column

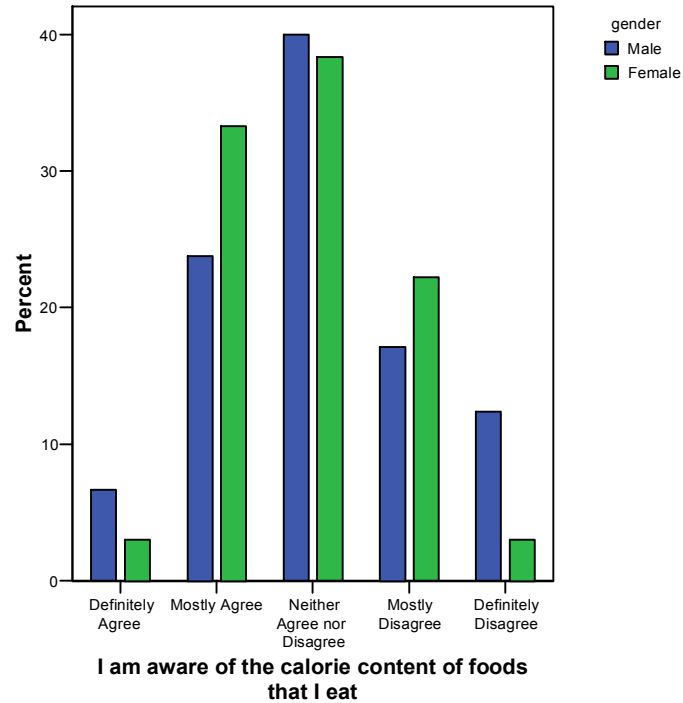
Click on Continue

Click on the button labelled Statistics, then select Chi-square

Click on Continue > OK

SPSS generates three tables.

Check that your output looks like this:



Crosstabs

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
I am aware of the calorie content of foods that I eat * gender	204	99.0%	2	1.0%	206	100.0%

I am aware of the calorie content of foods that I eat * gender Crosstabulation

			gender		Total
			Male	Female	
I am aware of the calorie content of foods that I eat	Definitely Agree	Count	7	3	10
		% within gender	6.7%	3.0%	4.9%
	Mostly Agree	Count	25	33	58
		% within gender	23.8%	33.3%	28.4%
	Neither Agree nor Disagree	Count	42	38	80
		% within gender	40.0%	38.4%	39.2%
	Mostly Disagree	Count	18	22	40
		% within gender	17.1%	22.2%	19.6%
	Definitely Disagree	Count	13	3	16
		% within gender	12.4%	3.0%	7.8%
Total	Count	105	99	204	
	% within gender	100.0%	100.0%	100.0%	

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.385 ^a	4	.052
Likelihood Ratio	9.915	4	.042
Linear-by-Linear Association	1.291	1	.256
N of Valid Cases	204		

a. 1 cells (10.0%) have expected count less than 5. The minimum expected count is 4.85.

The bar chart shows the percentages of men and women who agreed with the statement about awareness of calories.

The first table shows how much data is available with non –missing values.

The second table is the two-way contingency table, showing the column percentages.

The third table shows the test statistic, degrees of freedom and P value, labelled ‘Asymp.Sig.’. Note that the first row of results in this table is the one you need for a chi-squared test.

Can you use the output to answer the following questions?

- 1 What does the bar chart tell you about the students in this sample?
- 2 How is the bar chart related to the cross-tabulation?
- 3 What is the null hypothesis for the chi-squared test?
- 4 What is the conclusion of the chi-squared test?

- 5 Why is the chi-squared test appropriate here?
- 6 What does the footnote beneath the third table of output mean? Do you need to do anything about it?

Answers

- 1 The bar chart shows that women were more likely than men to 'mostly agree' that they were aware of calorie content of foods but also more likely to 'mostly disagree'. It looks as though women were a little more moderate in their opinion than men: male students in the sample were more likely than women to express a strong opinion, whether in agreement or disagreement with the sample.
- 2 The bar chart shows the same percentages as those shown in the table.
- 3 Null hypothesis: there is no association between a student's gender and their awareness of the calorie content of foods

OR

- There are no differences between men and women students in the proportions expressing each level of agreement with the statement describing their awareness of the calorie content of foods.
- 4 The sample does not provide statistically significant evidence of an association between a student's gender and their awareness of calorie content of foods ($\chi^2 = 9.385$, $df = 4$, $P > 0.05$).
 - 5 The chi-squared test is appropriate as we are comparing the responses given by two independent samples of students (men and women) to a question that classifies them as belonging to different categories.
 - 6 The footnote warns us that one cell in the table had an expected value of less than 5. In this case, less than 20% of cells are affected and so there is no need to take remedial action.