

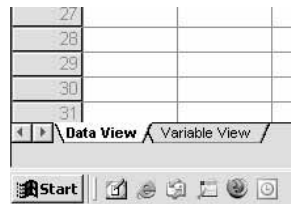
5.4.2. Chi-squared test for association when there is only one degree of freedom

EXAMPLE 5.5. Frequency of *Cepea nemoralis* and *Cepea hortensis* in a hedge and wood

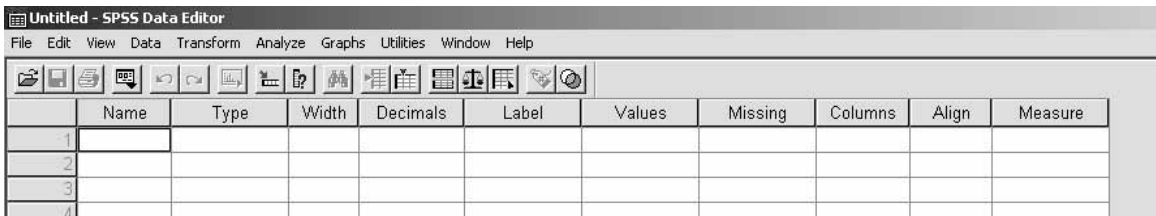
BOX 5.6. How to calculate a 2×2 chi-squared test for association

Step 1. Set up the variables

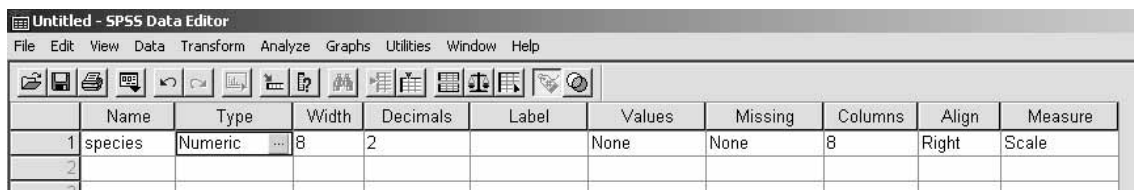
- (i) When SPSS starts, select the 'Type in Data' option.
- (ii) Then choose 'Variable View' from the tabs at the bottom left.



You will see a screen something like this:



Each row represents a variable for the analysis. Our variables are species and habitat. In the 'Name' cell in row 1, type 'species', and press 'return'. Most of the properties of the variable will be set by default.



Repeat the process on row 2 for 'habitat'.

	Name	Type	Width	Decimals	Label	Values	Missing	Columns	Align	Measure
1	species	Numeric	8	2		None	None	8	Right	Scale
2	habitat	Numeric	8	2		None	None	8	Right	Scale
3										

Both these variable have the default type ‘numeric’, which is not what we want: they are string variables. Click on the ‘type’ cell for one of them, and a small grey area will appear at the right-hand side of the cell (see above). Click in this area to obtain a dialogue box to change the type of the variable. Click in the radio button for ‘String’.

The screenshot shows the 'Variable Type' dialog box for the 'species' variable. The 'String' radio button is selected. The 'Characters' field is set to 8. The dialog box also includes buttons for 'OK', 'Cancel', and 'Help'.

Click on ‘OK’, and repeat for the other variable.

	Name	Type	Width	Deci
1	species	String	8	0
2	habitat	String	8	0
3				

We also need to enter the numbers, so we need a variable called ‘number’. Enter this in the ‘Name’ cell of row 3, and press ‘return’.

	Name	Type	Width	Decimals	Label	Values	Missing	Columns	Align	Measure
1	species	String	8	0		None	None	8	Left	Nominal
2	habitat	String	8	0		None	None	8	Left	Nominal
3	number	Numeric	8	2		None	None	8	Right	Scale
4										

We can't have fractions of a snail, so we need to set the ‘Decimals’ property to zero. Click in the ‘Decimals’ window, and use the ‘up’ and ‘down’ arrows that appear to change the decimals for 2 to 0.

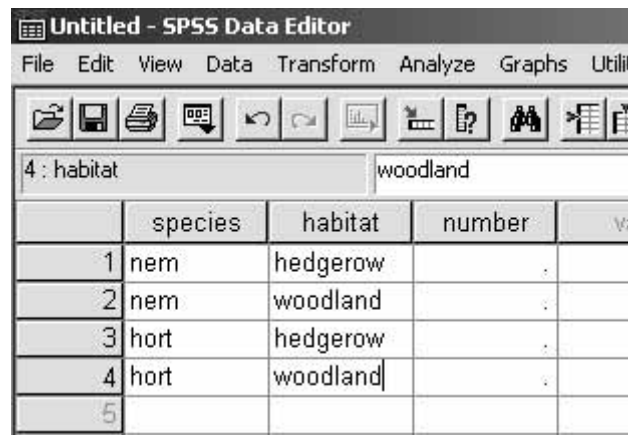
	Name	Type	Width	Decimals	Label
1	species	String	8	0	
2	habitat	String	8	0	
3	number	Numeric	8	0	
4					

Change to ‘Data View’ using the tabs at the bottom left-hand corner.

	species	habitat	number	vs
1				
2				
3				
4				

We now need to enter the data. The species names ‘nemoralis’ and ‘hor-tensis’ are too long (more than eight characters), so we have to use abbreviations.

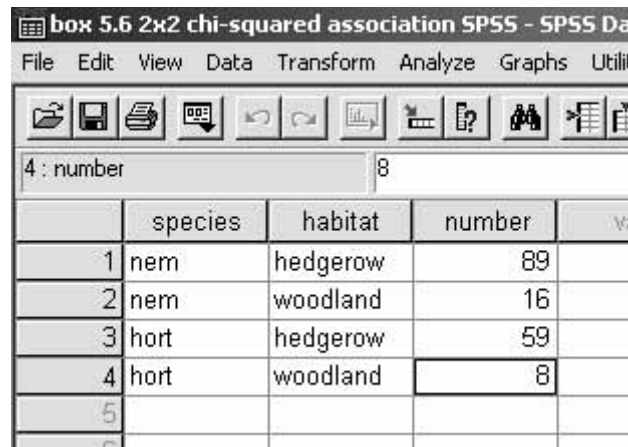
4 Chi-squared test for association when there is only one degree of freedom



The screenshot shows the SPSS Data Editor interface. The title bar reads 'Untitled - SPSS Data Editor'. The menu bar includes 'File', 'Edit', 'View', 'Data', 'Transform', 'Analyze', 'Graphs', and 'Utilities'. Below the menu bar is a toolbar with various icons. The main data entry area shows a dropdown menu for the variable '4 : habitat' with 'woodland' selected. Below this is a table with columns 'species', 'habitat', and 'number'. The data rows are as follows:

	species	habitat	number	va
1	nem	hedgerow	.	
2	nem	woodland	.	
3	hort	hedgerow	.	
4	hort	woodland	.	
5				

The numbers can now be entered.

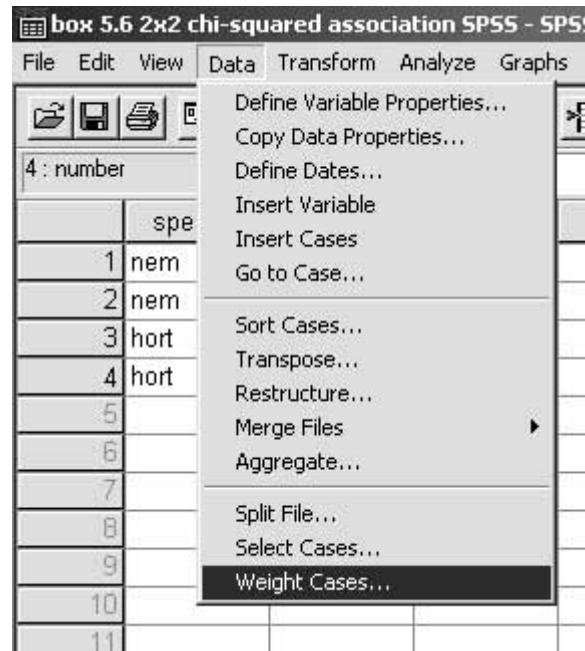


The screenshot shows the SPSS Data Editor interface. The title bar reads 'box 5.6 2x2 chi-squared association SPSS - SPSS Da'. The menu bar includes 'File', 'Edit', 'View', 'Data', 'Transform', 'Analyze', 'Graphs', and 'Utilities'. Below the menu bar is a toolbar with various icons. The main data entry area shows a dropdown menu for the variable '4 : number' with '8' entered. Below this is a table with columns 'species', 'habitat', and 'number'. The data rows are as follows:

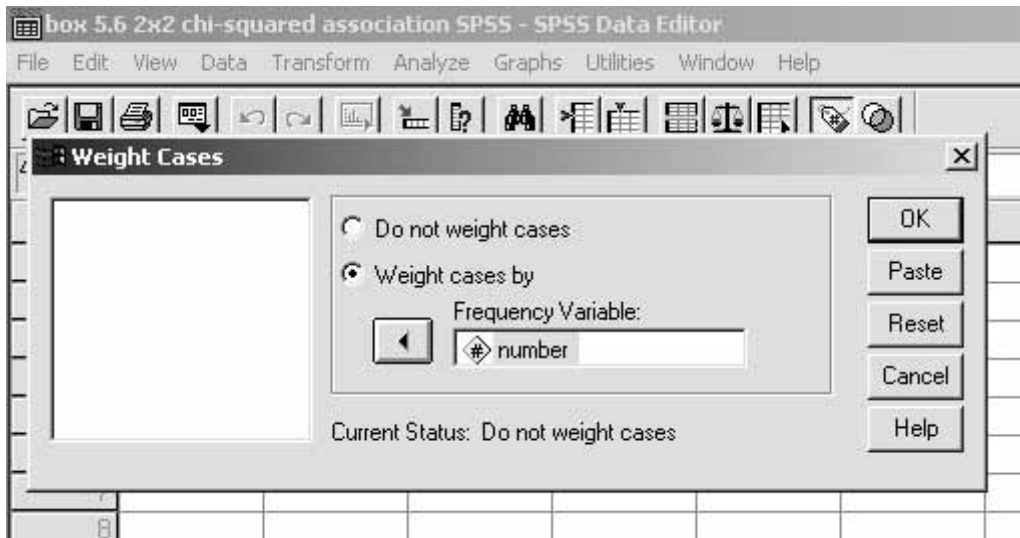
	species	habitat	number	va
1	nem	hedgerow	89	
2	nem	woodland	16	
3	hort	hedgerow	59	
4	hort	woodland	8	
5				

Step 2. Perform the test.

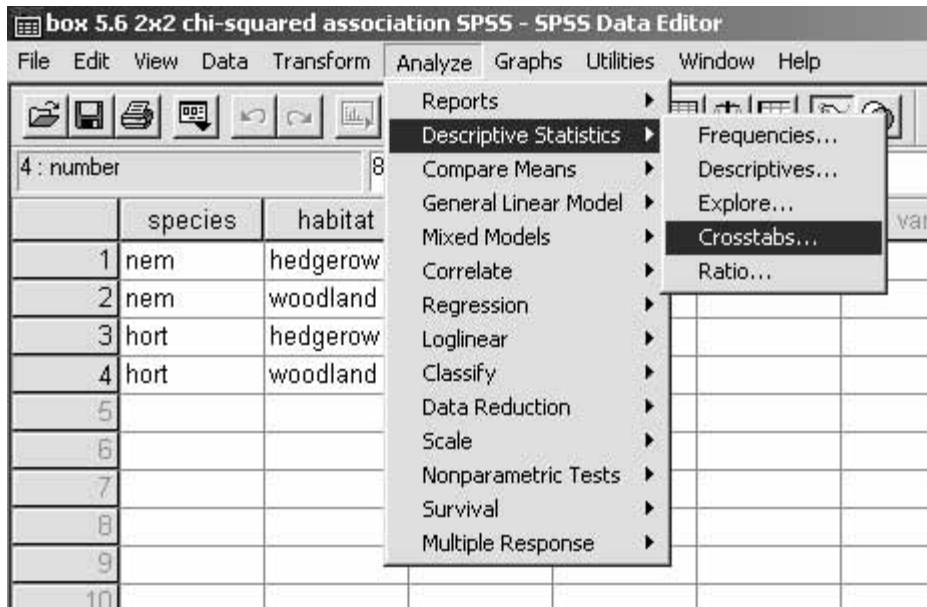
The first thing that needs to be done is to weight the cases. Go to 'Data', 'Weight Cases'.



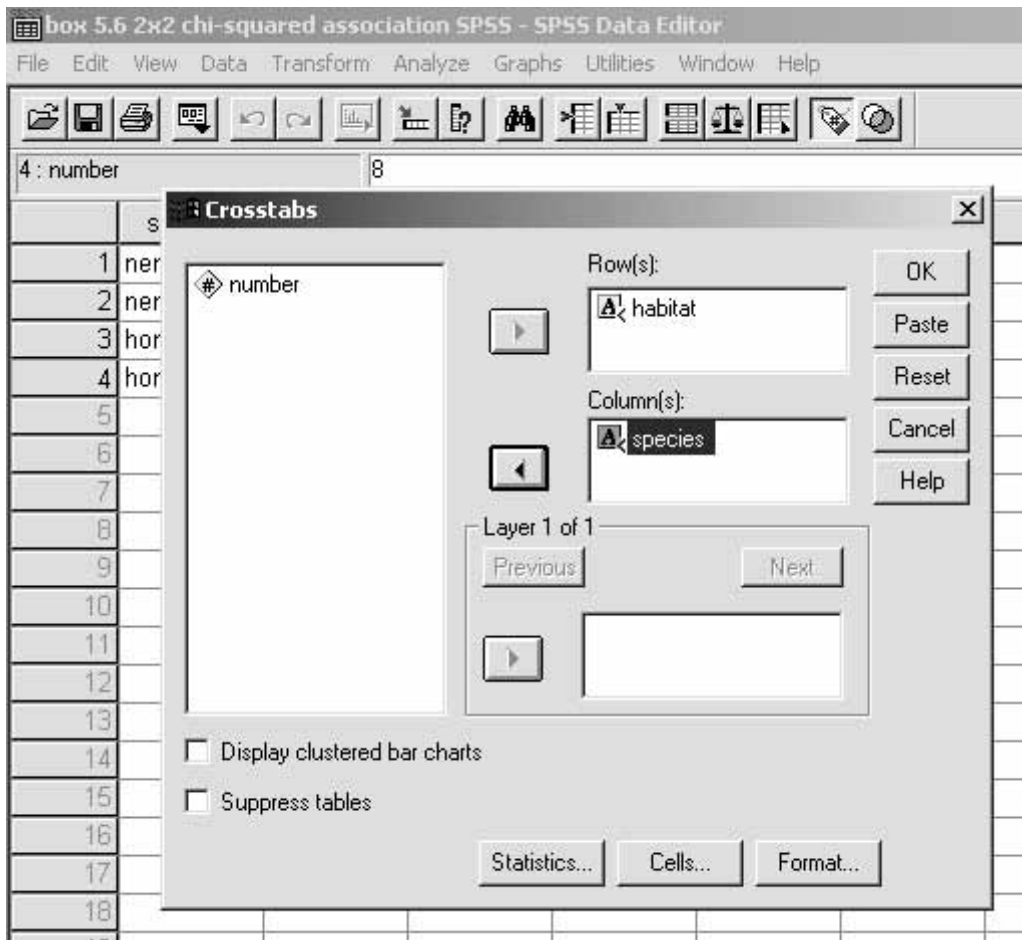
Click on the 'Weight cases by' radio button, ensure that 'number' is selected, and click on the arrow to transfer it across into the 'Frequency Variable' window.



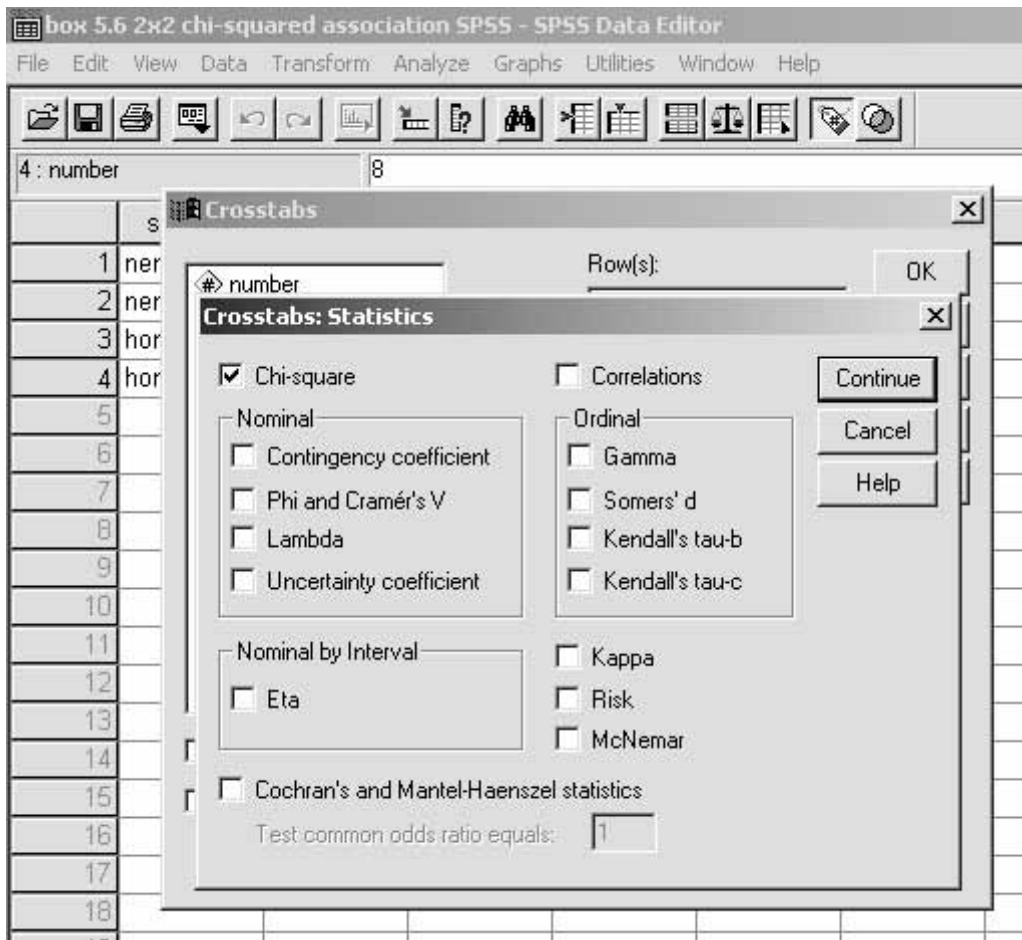
Click on 'OK'. Now go to 'Analyze', 'Descriptive Statistics', 'Crosstabs'.



Transfer 'habitat' into the 'row' window by highlighting it and clicking on the row to transfer it across, and similarly transfer 'species' into the 'Column' window.



Click on 'Statistics'. Make sure that 'Chi-square' is selected.



Click on 'Continue', and then on 'OK'. The output will appear in a separate window.

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
HABITAT * SPECIES	172	100.0%	0	.0%	172	100.0%

HABITAT * SPECIES Crosstabulation

Count

		SPECIES		Total
		hort	nem	
HABITAT	hedgerow	59	89	148
	woodland	8	16	24
Total		67	105	172

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.370 ^b	1	.543		
Continuity Correction ^a	.147	1	.702		
Likelihood Ratio	.377	1	.539		
Fisher's Exact Test				.654	.355
N of Valid Cases	172				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.35.

Step 3. Decide what the results mean.

The value of chi-squared without Yates' correction is 0.370, but with Yates' correction (labelled 'Continuity Correction' above) it is 0.147. This is less than the critical value of chi-squared (3.84), and so we conclude that there is no significant association between snail species and habitat.