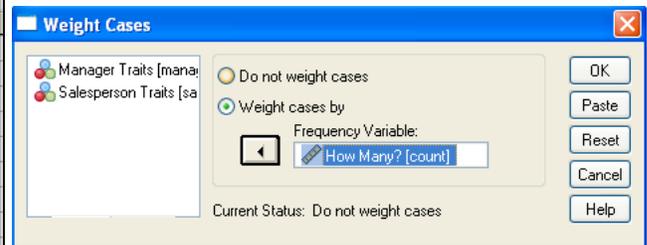
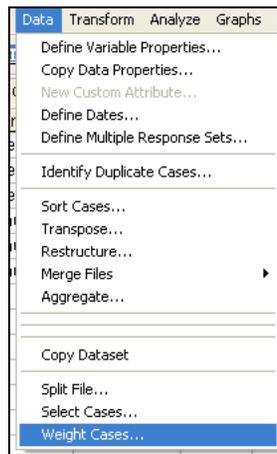


Chi-Square Independence/Homogeneity Tests in SPSS STAT 314

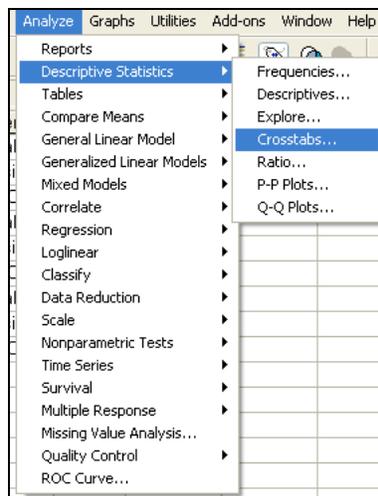
In a retail study, the traits of salespersons that were considered most important by sales managers were listed. These sales managers were also asked what traits they considered most important in a sales manager. The results are given in the analysis below. Are the two independent? Explain. Test at the 5% significance level.

1. Enter the row values (Manager: 1=Reliability, 2=Enthusiasm, 3=Other) into one variable, the column values (Salesperson: 1=Reliability, 2=Enthusiasm, 3=Other) into another variable, and the observed counts into a third variable (*see left figure, below*). Then weight the category variables (Manager, Salesperson) by the observed counts variable (*see two right figures, below*).

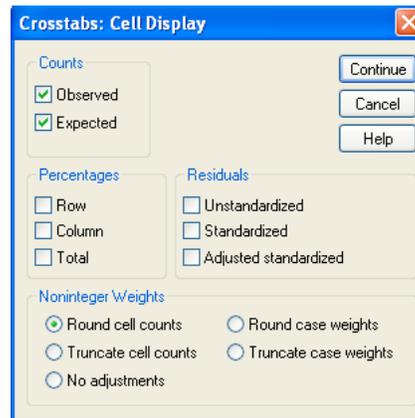
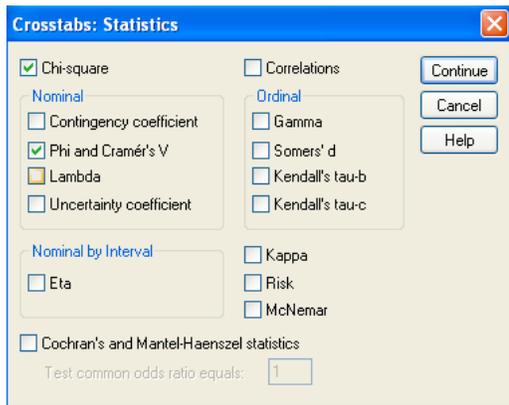
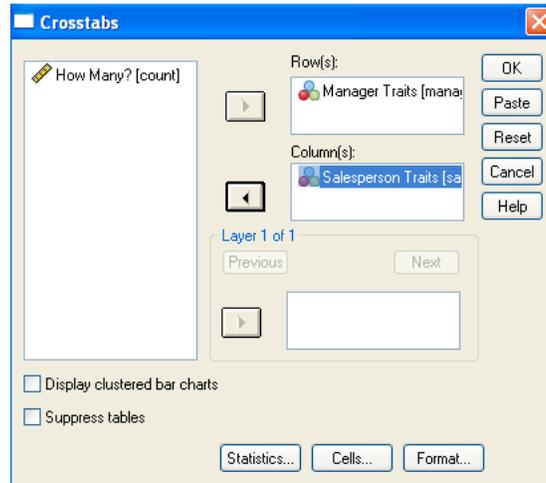
	manager	salesperson	count
1	Reliability	Reliability	12
2	Reliability	Enthusiasm	18
3	Reliability	Other	20
4	Enthusiasm	Reliability	23
5	Enthusiasm	Enthusiasm	7
6	Enthusiasm	Other	11
7	Other	Reliability	9
8	Other	Enthusiasm	5
9	Other	Other	15



2. Select Analyze → Descriptive Statistics → Crosstabs... (*see figure, below*).



- Select “Manager” as the row variable and “Salesperson” as the column variable (see top figure, below). Click the “Statistics...” button and be sure that “Chi-square” is selected (also “Phi and Cramer’s V” in performing a test of independence...not for tests of homogeneity) (see bottom-left figure, below). Click the “Cells...” button and be sure that the “Observed” and “Expected” are selected (see bottom-right figure, below). Click “Continue” to close the “Statistics...” window, and then click “OK” to perform the analysis.



- Your output should look like this.

Case Processing Summary							
		Cases					
		Valid		Missing		Total	
		N	Percent	N	Percent	N	Percent
Manager Traits * Salesperson Traits		120	100.0%	0	.0%	120	100.0%

Manager Traits * Salesperson Traits Crosstabulation						
			Salesperson Traits			Total
			Reliability	Enthusiasm	Other	
Manager Traits	Reliability	Count	12	18	20	50
		Expected Count	18.3333	12.5000	19.1667	50.0000
	Enthusiasm	Count	23	7	11	41
		Expected Count	15.0333	10.2500	15.7167	41.0000
	Other	Count	9	5	15	29
		Expected Count	10.6333	7.2500	11.1167	29.0000
Total		Count	44	30	46	120
		Expected Count	44.0000	30.0000	46.0000	120.0000

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.6176 ^a	4	.0086
Likelihood Ratio	13.3000	4	.010
Linear-by-Linear Association	.048	1	.827
N of Valid Cases	120		

^a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.25.

Symmetric Measures			
	Value	Approx. Sig.	
Nominal by Nominal	Phi	.337	.009
	Cramer's V	.2382	.0086
N of Valid Cases		120	

^a. Not assuming the null hypothesis.
^b. Using the asymptotic standard error assuming the null hypothesis.

5. You should use the output information in the following manner to answer the question.

Step 1: Hypotheses

H_0 : Salesperson traits and Sales Manager traits are unrelated (Independent).

H_a : Salesperson traits and Sales Manager traits are related (Dependent).

Step 2: Significance Level

$\alpha = 0.05$

Step 3: Critical Value and Rejection Region

Reject the null hypothesis if $p\text{-value} \leq 0.05$.

Step 4.1: Calculate Expected Frequencies

Manager Traits * Salesperson Traits Crosstabulation

		Salesperson Traits			Total	
		Reliability	Enthusiasm	Other		
Manager Traits	Reliability	Count	12	18	20	50
		Expected Count	18.3333	12.5000	19.1667	50.0000
	Enthusiasm	Count	23	7	11	41
		Expected Count	15.0333	10.2500	15.7167	41.0000
	Other	Count	9	5	15	29
		Expected Count	10.6333	7.2500	11.1167	29.0000
Total	Count	44	30	46	120	
	Expected Count	44.0000	30.0000	46.0000	120.0000	

Step 4.2: Check Assumptions

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.6176 ^a	4	.0086
Likelihood Ratio	13.300	4	.010
Linear-by-Linear Association	.048	1	.827
N of Valid Cases	120		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.25.

All expected frequencies are ≥ 5 (smallest value is 7.2500) [from footnote, above].

Step 4.3: Test Statistic

$\chi^2 = 13.6176$, $p\text{-value} = 0.0086$ [from table, above]

Step 5: Conclusion

Since $p\text{-value} = 0.0086 \leq 0.05$, we reject the null hypothesis.

Step 6: State conclusion in words

At the $\alpha = 0.05$ level of significance, there exists enough evidence to conclude that salesperson traits and sales manager traits are related (Dependent).

b. Since the two variables are deemed to be dependent, use Cramer's V to determine the strength of the relationship between the traits the sales managers think are important for salespersons and for sales managers?

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.337	.009
	Cramer's V	.2382	.0086
N of Valid Cases		120	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Cramer's V: (V : 0 = independence & 1 = complete dependence)

Since the coefficient value ($V = 0.2382$) is not close to 1, the relationship is not very strong.