Crosstab on Minitab (Categorical Data Analysis III)

Test of Homogeneity and Fisher's exact test

Problem: The treatment of children with Kawasaki syndrome (Continued)

By clicking on the **Stat** and **Tables** and **Cross Tabulation and Chi-Square**, the Cross Tabulation and Chi-Square window will be opened.

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	-	<u>R</u> egression	
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	Coronary Abnorm	Control Charts	▶
1	Abnormalities	Quality Tools	▶
2	Abnormalities	Reliability/Survival I	▶
3	Abnormalities	Multivariate	▶
4	Abnormalities	Time Series	
5	Abnormalities	Tables	Tally Tally Variables
6	Abnormalities	_	<u>I</u> ally Individual Variables
7	Abnormalities	Nonparametrics	Cross Tabulation and Chi-Square
8	Abnormalities	EDA	Chi-Square <u>G</u> oodness-of-Fit Test (One Variable)
9	Abnormalities	Power and Sample Size	Σ^2 Chi-Square Test (Two-Way Table in Worksheet)
10	Abnormalities	Aspirin	Descriptive Statistics
1		1 1	
	select	Categorical variables: For rows: Treat	tment GG' nary Abnormality CA' (optional) Chi-Square Options
	Help		OK Cancel

Assign CA as column and GG as row and make sure "Row percents" and "Column percents" are checked off under "Display", then open "Chi-Square" and "Other Stats"

Cross Tabulation - Chi-Square	Cross Tabulation - Other Statistics
Display Chi-Square analysis Expected cell counts Raw residuals Standardized residuals Adjusted residuals Each cell's contribution to the Chi-Square statistic	Tests ✓ Fisher's exact test for 2x2 tables Mantel-Haenszel-Cochran test for multiple 2x2 tables Other Measures of Association Cramer's V-square statistic Kappa for inter-rater reliability Goodman-Kruskal lambda and tau Measures of concordance for ordinal categories Correlation coefficients for ordinal categories
	Help OK Cancel

Make sure "Chi-Square analysis" and "Expected cell counts" are check off in the "Chi-Square" window and "Fisher's exact test for 2x2 tables" is checked off in the "Other Statistics" window. Click "Ok" to continue and "Ok" to run the tests. We can get the following output.

Tabulated statistics: Treatment GG, Coronary Abnormality CA

	Abnormalities	No Abnormalities	A11
Aspirin	21	63	84
-	25.00	75.00	100.00
	80.77	44.68	50.30
	13.08	70.92	84.00
Gamma Globulin	5	78	83
	6.02	93.98	100.00
	19.23	55.32	49.70
	12.92	70.08	83.00
A11	26	141	167
	15.57	84.43	100.00
	100.00	100.00	100.00
	26.00	141.00	167.00
Cell Contents:	Count		
	% of Row		
	% of Column		
	Expected cou	nt	

Rows: Treatment GG Columns: Coronary Abnormality CA

Pearson Chi-Square = 11.436, DF = 1, P-Value = 0.001

Fisher's exact test: P-Value = 0.0010477

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<u>The Chi-square test of Homogeneity</u> can be done by using Pearson Chi-square.

Step 1. $H_0: p_0 = p_1, H_a: p_0 \neq p_1 \text{ (or } H_0: RR = 1, H_a: RR \neq 1)$

Step 2. $\chi^2 = 11.436$

Step 3. The test statistics, 11.436 is larger than the critical $\chi^2_{1,0.05}$ =3.84. Thus reject H₀. Step 4: Reject H₀ since p-value = .001 is less than α =0.05.

Note: To the test be valid each cell has at least 5 expected frequency. Combining the two groups, we see that 26 of the 167 patients developed coronary abnormalities. The estimated risk of coronary abnormalities is 26/167 = .1157. Assuming that the null hypothesis is true, the risk is the same in both treatment groups, and we would expect that 11.57% of the patients develop coronary abnormalities. Among 83 patients in the Gamma globulin, we expect that $(.1157) \times (83) = 9.6031$ patient would develop coronary abnormalities.

Note also that this is same as Chi-square independent test for 2×2 table.

<u>Fisher's exact test</u> is useful when one or more of the four expected cell frequencies in 2×2 table is less than 5. In this example, 6% of the patients treated with Gamma globulin developed coronary abnormalities whereas 25% of patients treated with Aspirin developed abnormalities. The estimated RR is .24. The null hypothesis is H₀: RR=1 and H_a: RR \neq 1. We use the two-sided Fisher's Exact test to test the hypothesis. Assuming α =0.05, we reject H₀ since p-value is .001 is less than 0.05. (There is significant evidence that treatment with Gamma globulin developed less coronary abnormalities.)