

1. The *power* we have calculated of ≈ 0.637 is the probability of correctly rejecting the null hypothesis H_0 and it being statistically significant. As we have learned from Tutorial 4 larger *power* values require a larger sample size so a larger sample size can be used to increase the value of power.
2. The Fisher's Exact Test Statistic was calculated to be 0.0650 which resulted in a *p – value* of 0.1409 which is not statistically significant.

```

Data helmets;
    INPUT helmet case sex num @@;
    DATALINES;
0 0 0 2 0 0 1 35
0 1 0 5 0 1 1 53
1 0 0 5 1 0 1 16
1 1 0 6 1 1 1 7
;
RUN;

PROC FORMAT;
    VALUE Cformat 1="Case" 0="Control";
    VALUE Eformat 1="Yes Helmet" 0="No Helmet";
    VALUE Sformat 1="Male" 0="Female";
RUN;

PROC FREQ DATA=helmets ORDER=FORMATTED;
    FORMAT helmet Eformat. case Cformat.;
    TABLES helmet*case / NOPERCENT NOCOL NOROW CHISQ ODDSATIO;
    WEIGHT num;
RUN;

PROC POWER;
    TWOSAMPLEFREQ TEST=pchi
    POWER = .
    ALPHA = 0.05
    ODDSATIO = 2.5322
    REFPROPORTION = 0.362068966 /* 21/58 from helmet+control / nonhelmet+case */
    GROUPWEIGHTS = (95 34) /* (control case) */
    NTOTAL=129;
RUN;

PROC POWER;
    TWOSAMPLEFREQ TEST=pchi
    POWER = 0.80
    ALPHA = 0.05
    ODDSATIO = 2.5322
    REFPROPORTION = 0.362068966
    GROUPWEIGHTS = (6 7) /* (control case) */
    NTOTAL=.;
RUN;

DATA smallstudy;
    INPUT exposure case num;
    /*6 exposures in total where 5 of those exposures are cases */
    /*thus there is 1 exposure that is not a case */
    /* since there are 5 exposure + case there must be 5 non-exposed + case */
    /* non-exposed + non-cases = 20 - 5 - 1 - 5 = 9 */
    DATALINES;
0 0 9
0 1 5
1 0 1
1 1 5
;
RUN;

PROC FORMAT;
    VALUE Eformat 1="Exposed" 0="Unexposed";
    VALUE Cformat 1="Case" 0="Control";
RUN;

PROC FREQ DATA=smallstudy ORDER=FORMATTED;
    FORMAT exposure Eformat. case Cformat.;
    TABLES exposure*case / NOPERCENT NOCOL NOROW CHISQ;
    WEIGHT num;
RUN;

```

The FREQ Procedure

Frequency	Table of helmet by case			
	helmet	case		
		Case	Control	Total
	No Helmet	58	37	95
	Yes Helmet	13	21	34
	Total	71	58	129

Statistics for Table of helmet by case

Statistic	DF	Value	Prob
Chi-Square	1	5.2679	0.0217
Likelihood Ratio Chi-Square	1	5.2685	0.0217
Continuity Adj. Chi-Square	1	4.3862	0.0362
Mantel-Haenszel Chi-Square	1	5.2270	0.0222
Phi Coefficient		0.2021	
Contingency Coefficient		0.1981	
Cramer's V		0.2021	

Fisher's Exact Test	
Cell (1,1) Frequency (F)	58
Left-sided Pr <= F	0.9937
Right-sided Pr >= F	0.0182
Table Probability (P)	0.0119
Two-sided Pr <= P	0.0274

Odds Ratio and Relative Risks			
Statistic	Value	95% Confidence Limits	
Odds Ratio	2.5322	1.1318	5.6654
Relative Risk (Column 1)	1.5968	1.0116	2.5203
Relative Risk (Column 2)	0.6306	0.4377	0.9085

Sample Size = 129

The POWER Procedure

Pearson Chi-square Test for Proportion Difference

Fixed Scenario Elements	
Distribution	Asymptotic normal
Method	Normal approximation
Alpha	0.05
Reference (Group 1) Proportion	0.362069
Odds Ratio	2.5322
Group 1 Weight	95
Group 2 Weight	34
Total Sample Size	129
Number of Sides	2
Null Odds Ratio	1

Computed Power
Power
0.637

The POWER Procedure

Pearson Chi-square Test for Proportion Difference

Fixed Scenario Elements	
Distribution	Asymptotic normal
Method	Normal approximation
Alpha	0.05
Reference (Group 1) Proportion	0.362069
Odds Ratio	2.5322

Fixed Scenario Elements	
Group 1 Weight	6
Group 2 Weight	7
Nominal Power	0.8
Number of Sides	2
Null Odds Ratio	1

Computed N Total	
Actual Power	N Total
0.816	156

The FREQ Procedure

Frequency	Table of exposure by case		
	case		
	exposure	Case	Control
	Exposed	5	1
	Unexposed	5	9
	Total	10	10

Statistics for Table of exposure by case

Statistic	DF	Value	Prob
Chi-Square	1	3.8095	0.0510
Likelihood Ratio Chi-Square	1	4.0700	0.0437
Continuity Adj. Chi-Square	1	2.1429	0.1432
Mantel-Haenszel Chi-Square	1	3.6190	0.0571
Phi Coefficient		0.4364	
Contingency Coefficient		0.4000	
Cramer's V		0.4364	
WARNING: 50% of the cells have expected counts less than 5. Chi-Square may not be a valid test.			

Fisher's Exact Test	
Cell (1,1) Frequency (F)	5
Left-sided Pr <= F	0.9946
Right-sided Pr >= F	0.0704
Table Probability (P)	0.0650
Two-sided Pr <= P	0.1409

Sample Size = 20