

1. The association is not statistically significant as the  $\chi^2$  test yields  $p=0.002$  which is many times lower than the previous p-value of 0.33. From this we can see that as the sample size becomes larger while the magnitude of association stays the same it's easier to see whether or not an association is statistically significant.
2. As the power levels increase the sample size calculated gets larger where the difference in sample sizes get progressively bigger as we move from 0.75 to 0.8 to 0.85 to 0.9 to 0.95 as shown in the chart below.

Power Level	Calculated Sample Size	Difference from previous to current Power Level
0.75	72	
0.80	82	10
0.85	93	11
0.90	109	16
0.95	134	25

```
LIBNAME mydata '/home/u58684395/tutorial4';
PROC PRINT DATA=mydata.eyestudy (OBS=5);
RUN;

PROC FORMAT;
  VALUE Cformat 1="Carrot gene" 0="No carrot gene";
  VALUE Lformat 1="Corrective lenses" 0="No corrective lenses";
  VALUE Gformat 1="Female" 2="Male";
RUN;

DATA eyestudytimes10;
  INPUT gender lenses num;
  DATALINES;
1 0 220
1 1 300
2 0 250
2 1 230
;
RUN;

PROC FREQ DATA=eyestudytimes10 ORDER=FORMATTED;
  TITLE "Is Gender a Risk Factor For Requiring Corrective Lenses Times 10";
  FORMAT lenses Lformat. gender Gformat.;
  TABLES gender*lenses / NOPERCENT NOCOL NOROW CHISQ RELRISK;
  WEIGHT num;
RUN;

/* SAS assumes exposed and unexposed cohorts are of equal size*/
PROC POWER;
  TITLE "Sample Size For POWER=0.75";
  TWOSAMPLEFREQ TEST=pchi
  POWER = 0.75
  ALPHA = 0.05
  RELATIVERISK = 2
  NULLRELATIVERISK= 1
  REFPROPORTION = 0.20
  NPERGROUP =.;
RUN;

PROC POWER;
  TITLE "Sample Size For POWER=0.80";
  TWOSAMPLEFREQ TEST=pchi
  POWER = 0.80
  ALPHA = 0.05
  RELATIVERISK = 2
  NULLRELATIVERISK= 1
  REFPROPORTION = 0.20
  NPERGROUP =.;
RUN;

PROC POWER;
  TITLE "Sample Size For POWER=0.85";
  TWOSAMPLEFREQ TEST=pchi
  POWER = 0.85
  ALPHA = 0.05
  RELATIVERISK = 2
  NULLRELATIVERISK= 1
  REFPROPORTION = 0.20
  NPERGROUP =.;
RUN;

PROC POWER;
  TITLE "Sample Size For POWER=0.90";
  TWOSAMPLEFREQ TEST=pchi
  POWER = 0.90
```

```
ALPHA = 0.05
RELATIVERISK = 2
NULLRELATIVERISK= 1
REFPROPORTION = 0.20
NPERGROUP =.;
RUN;
PROC POWER;
TITLE "Sample Size For POWER=0.95";
TWO SAMPLE FREQ TEST= pchi
POWER = 0.95
ALPHA = 0.05
RELATIVERISK = 2
NULLRELATIVERISK= 1
REFPROPORTION = 0.20
NPERGROUP =.;
RUN;
```

Obs	id	carrot	gender	latitude	lenses
1	1	0	1	33	1
2	2	0	2	46	1
3	3	1	1	32	1
4	4	0	2	26	0
5	5	1	1	25	1

Is Gender a Risk Factor For Requiring Corrective Lenses Times 10

The FREQ Procedure

Frequency	Table of gender by lenses			
	gender	lenses		
		Corrective lenses	No corrective lenses	Total
	Female	300	220	520
	Male	230	250	480
	Total	530	470	1000

Statistics for Table of gender by lenses

Statistic	DF	Value	Prob
Chi-Square	1	9.5755	0.0020
Likelihood Ratio Chi-Square	1	9.5881	0.0020
Continuity Adj. Chi-Square	1	9.1871	0.0024
Mantel-Haenszel Chi-Square	1	9.5659	0.0020
Phi Coefficient		0.0979	
Contingency Coefficient		0.0974	
Cramer's V		0.0979	

Fisher's Exact Test	
Cell (1,1) Frequency (F)	300
Left-sided Pr <= F	0.9992
Right-sided Pr >= F	0.0012
Table Probability (P)	0.0004
Two-sided Pr <= P	0.0023

Odds Ratio and Relative Risks			
Statistic	Value	95% Confidence Limits	
Odds Ratio	1.4822	1.1547	1.9026
Relative Risk (Column 1)	1.2040	1.0691	1.3559
Relative Risk (Column 2)	0.8123	0.7118	0.9270

Sample Size = 1000

Sample Size For POWER=0.75

The POWER Procedure  
Pearson Chi-square Test for Proportion Difference

Fixed Scenario Elements	
Distribution	Asymptotic normal
Method	Normal approximation
Null Relative Risk	1
Alpha	0.05
Reference (Group 1) Proportion	0.2
Relative Risk	2
Nominal Power	0.75
Number of Sides	2

Computed N per Group	
Actual Power	N per Group
0.750	72

**Sample Size For POWER=0.80**

The POWER Procedure  
Pearson Chi-square Test for Proportion Difference

Fixed Scenario Elements	
Distribution	Asymptotic normal
Method	Normal approximation
Null Relative Risk	1
Alpha	0.05
Reference (Group 1) Proportion	0.2
Relative Risk	2
Nominal Power	0.8
Number of Sides	2

Computed N per Group	
Actual Power	N per Group
0.804	82

**Sample Size For POWER=0.85**

The POWER Procedure  
Pearson Chi-square Test for Proportion Difference

Fixed Scenario Elements	
Distribution	Asymptotic normal
Method	Normal approximation
Null Relative Risk	1
Alpha	0.05
Reference (Group 1) Proportion	0.2
Relative Risk	2
Nominal Power	0.85
Number of Sides	2

Computed N per Group	
Actual Power	N per Group
0.851	93

**Sample Size For POWER=0.90**

The POWER Procedure  
Pearson Chi-square Test for Proportion Difference

Fixed Scenario Elements	
Distribution	Asymptotic normal
Method	Normal approximation
Null Relative Risk	1
Alpha	0.05
Reference (Group 1) Proportion	0.2
Relative Risk	2
Nominal Power	0.9
Number of Sides	2

Computed N per Group	
Actual Power	N per Group
0.902	109

**Sample Size For POWER=0.95**

The POWER Procedure  
Pearson Chi-square Test for Proportion Difference

Fixed Scenario Elements	
Distribution	Asymptotic normal

Fixed Scenario Elements	
Method	Normal approximation
Null Relative Risk	1
Alpha	0.05
Reference (Group 1) Proportion	0.2
Relative Risk	2
Nominal Power	0.95
Number of Sides	2

Computed N per Group	
Actual Power	N per Group
0.951	134