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Example 35.7 Cochran-Mantel-Haenszel Statistics

The data set *Migraine* contains hypothetical data for a clinical trial of migraine treatment. Subjects of both genders receive either a new drug therapy or a placebo. Their response to treatment is coded as 'Better' or 'Same'. The data are recorded as cell counts, and the number of subjects for each treatment and response combination is recorded in the variable *Count*.

```
data Migraine;
   input Gender $ Treatment $ Response $ Count @@;
   datalines;
female Active  Better 16   female Active  Same 11
female Placebo Better  5   female Placebo Same 20
male   Active  Better 12   male   Active  Same 16
male   Placebo Better  7   male   Placebo Same 19
;
```

The following PROC FREQ statements create a multiway table stratified by *Gender*, where *Treatment* forms the rows and *Response* forms the columns. The CMH option produces the Cochran-Mantel-Haenszel statistics. For this stratified 2×2 table, estimates of the common relative risk and the Breslow-Day test for homogeneity of the odds ratios are also displayed. The NOPRINT option suppresses the display of the contingency tables. These statements produce Output 35.7.1 through Output 35.7.3.

```
proc freq data=Migraine;
   tables Gender*Treatment*Response / cmh;
   weight Count;
   title 'Clinical Trial for Treatment of Migraine Headaches';
run;
```

Output 35.7.1 Cochran-Mantel-Haenszel Statistics

Clinical Trial for Treatment of Migraine Headaches

The FREQ Procedure

Summary Statistics for Treatment by Response
Controlling for Gender

Cochran-Mantel-Haenszel Statistics (Based on Table Scores)				
Statistic	**Alternative Hypothesis**	**DF**	**Value**	**Prob**
1	**Nonzero Correlation**	1	8.3052	0.0040
2	**Row Mean Scores Differ**	1	8.3052	0.0040
3	**General Association**	1	8.3052	0.0040

For a stratified 2×2 table, the three CMH statistics displayed in Output 35.7.1 test the same hypothesis. The significant p-value (0.004) indicates that the association between treatment and response remains strong after adjusting for gender.

The CMH option also produces a table of relative risks, as shown in Output 35.7.2. Because this is a prospective study, the relative risk estimate assesses the effectiveness of the new drug; the "Cohort (Col1 Risk)" values are the appropriate estimates for the first column (the risk of improvement). The probability of migraine improvement with the new drug is just over two times the probability of improvement with the placebo.

The large p-value for the Breslow-Day test (0.2218) in Output 35.7.3 indicates no significant gender difference in the odds ratios.

Output 35.7.2 CMH Option: Relative Risks

Estimates of the Common Relative Risk (Row1/Row2)				
Type of Study	**Method**	**Value**	**95% Confidence Limits**	
Case-Control	Mantel-Haenszel	3.3132	1.4456	7.5934
(Odds Ratio)	Logit	3.2941	1.4182	7.6515
Cohort	Mantel-Haenszel	2.1636	1.2336	3.7948
(Col1 Risk)	Logit	2.1059	1.1951	3.7108
Cohort	Mantel-Haenszel	0.6420	0.4705	0.8761
(Col2 Risk)	Logit	0.6613	0.4852	0.9013

Output 35.7.3 CMH Option: Breslow-Day Test

Breslow-Day Test for Homogeneity of the Odds Ratios	
Chi-Square	1.4929
DF	1
Pr > ChiSq	0.2218

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