

## Dose Response: Chi Square for Trend

The test for trend is often used for dose-response studies and can also be used to test for trends with age, passage of time, or any ordered variable. The data can be stratified on other variables like age and sex to eliminate confounding from these variables.

The Extended Mantel-Haenszel chi square that is calculated reflects the departure of a linear trend from horizontal (i.e., no trend). If the associated p value is less than .05, there is 95% probability that a trend exists in the underlying population.

For each level of "exposure," an odds ratio is calculated to compare it with the baseline level. For level 1, for example, the odds ratio represents a two-by-two table with level 0 being unexposed and level 1 being the "exposed" group. Similar odds ratios are calculated to compare level 2 with level 0, level 3 with level 0, etc. If the tables are stratified, Mantel-Haenszel summary odds ratios for stratified two-by-two tables are calculated rather than simple odds ratios. If a trend exists, the odds ratios will increase (or decrease) with increasing exposure.

In doing a stratified test for trend, both Mantel-Haenszel summary odds ratios and crude odds ratios are calculated for each level of exposure. If the two are the same or nearly the same, then confounding by the stratifying variable was minimal or absent, and the unstratified results can be used. The TwobyTwo module can be used to find confidence limits for the odds ratios if desired.

Levels of exposure for analysis of trend by this method must be grouped according to an ordered numerical sequence. The simplest groups are arbitrary ones of 0, 1, 2, 3, etc.. These are the "observations" or "scores." Other scores might be the mid-points of groups, such as 0 for 0 glasses of water, 2 for 1-3 glasses, 4 for 3-5, etc.. These are the groups over which the presence of trend will be measured. Strata are determined by the confounding variables; common strata would be age or age-sex groups.

The following table may be used as an example.

### Frequency of Cigarette Smoking Among Women with Myocardial Infarction (MI) and Controls (C), Stratified by Age

Age	25-29	
Smoke	MI	Control
0	1	131
1	1	104
2	4	51

Age	30-34	
Smoke	MI	Control

0	0	188
1	6	152
2	15	83
Age	35-39	
Smoke	MI	Control
0	3	161
1	12	130
2	22	65
Age	40-44	
Smoke	MI	Control
0	11	169
1	21	134
2	39	68
Age	45-49	
Smoke	MI	Control
0	23	157
1	42	97
2	34	52

From Schlesselman, JJ. Case-Control Studies. Oxford Univ. Press, NY, 1982, p. 205.

To try this example enter Stratum 1 on the first screen, then click on the Add Stratum button, and enter Stratum 2. After entering all five strata in this way, click Calculate to see the results.