

Pearson Chi-Square Test

Verified Python analysis transcript

Test: Pearson Chi-Square Test

Design: Sex-by-four-level final-grade-band association.

Variables: sex, G3 grade band

Null hypothesis: Sex and final-grade band are independent.

Primary formula: $X^2 = \sum_{ij} (O_{ij} - E_{ij})^2 / E_{ij}$

Valid source rows: 649

Verified results:

statistic: 8.88574542919574

p_value: 0.030849172453314578

degrees_of_freedom: 3

cramers_v: 0.11701043260874072

minimum_expected_count: 18.853620955315872

cells_expected_below_5: 0

Interpretation:

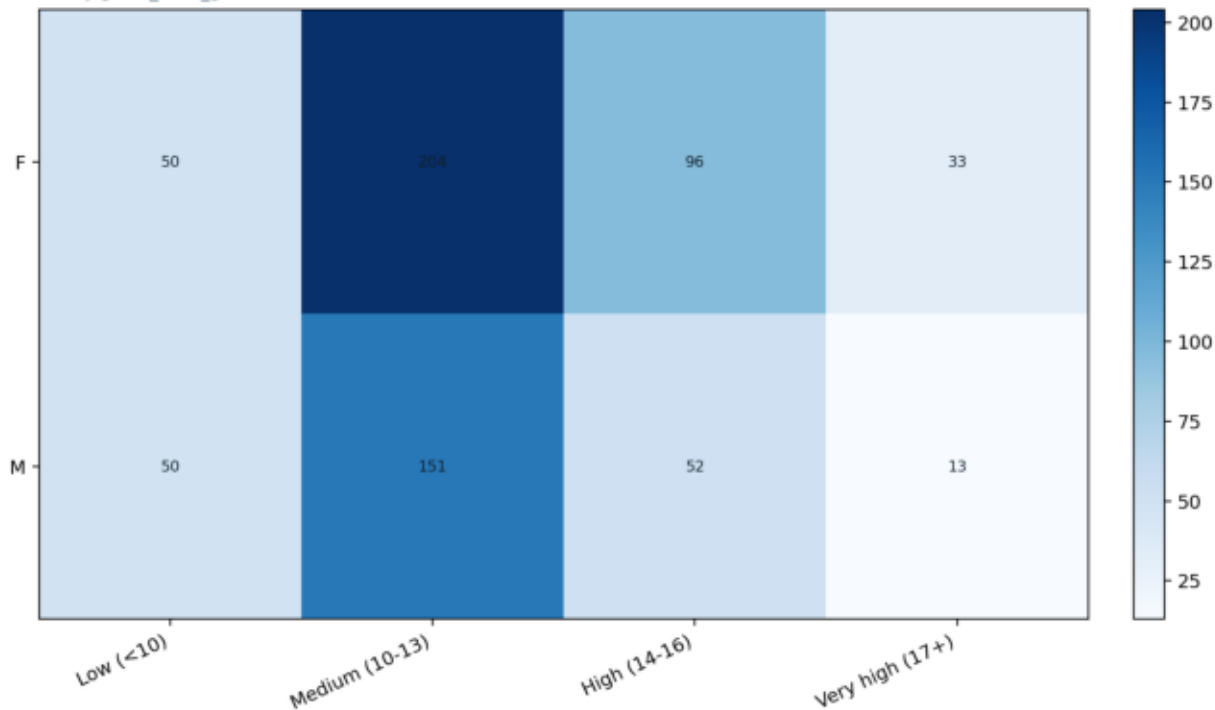
The primary statistic is 8.885745 with $p = 0.0308492$.

Cramer's V is 0.117010 and the minimum expected count is 18.854.

Interpret the residual and contribution tables before describing which cells account for the global result.

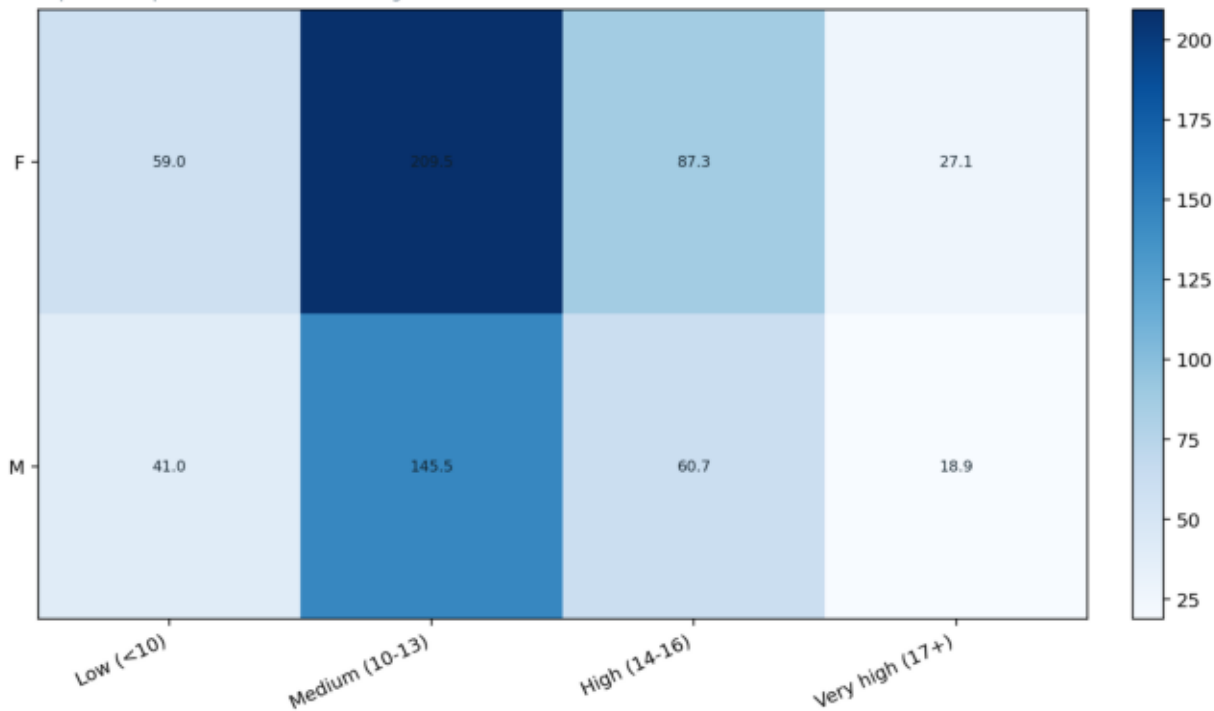
Observed categorical counts

sex by grade_band_g3



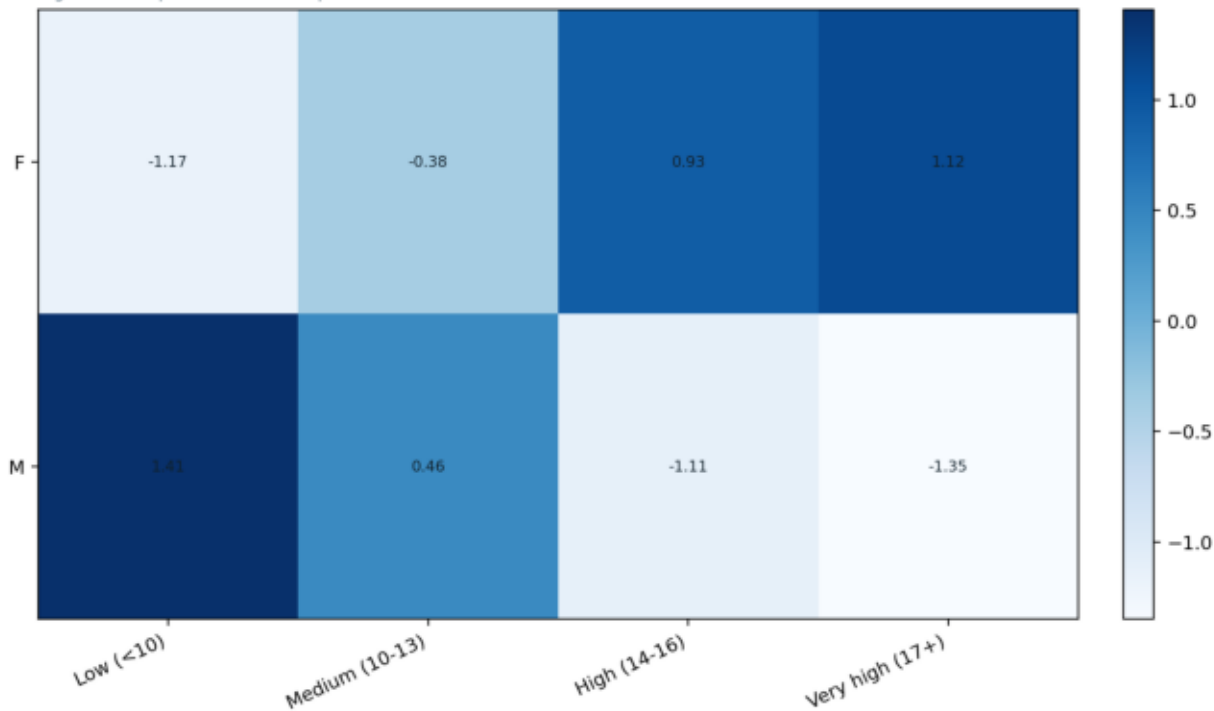
Expected counts under the null

Expected frequencies from the fitted margins



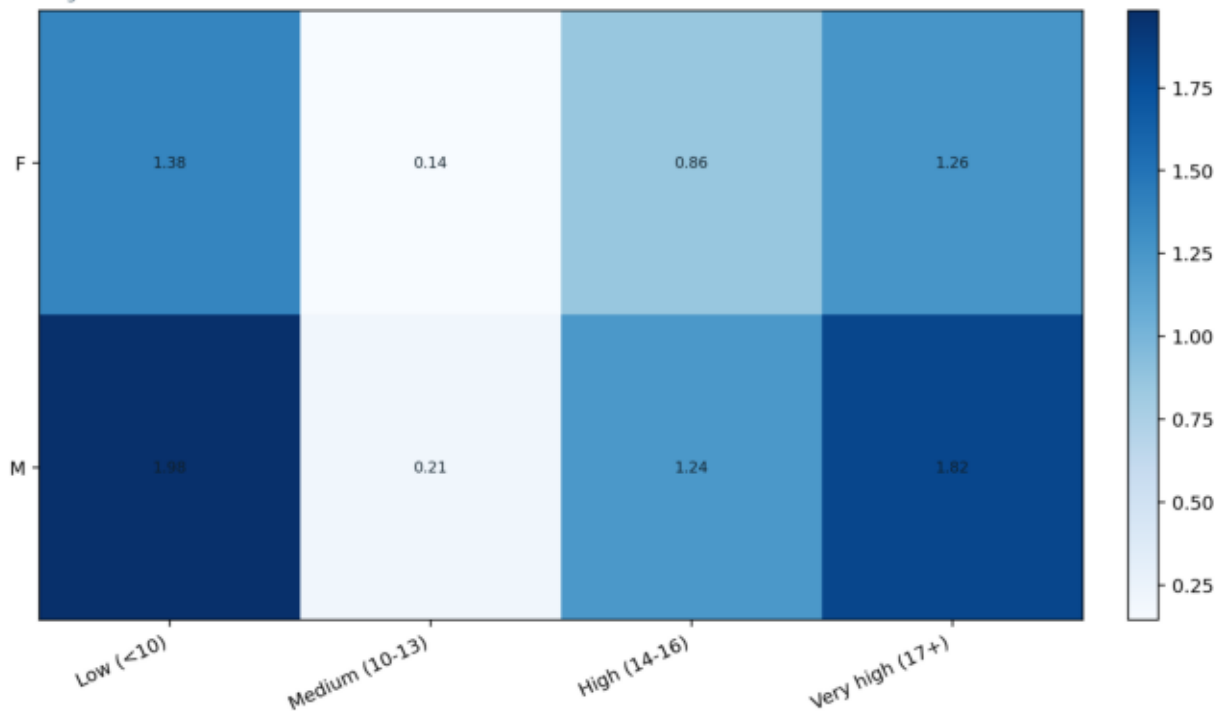
Pearson residual pattern

Signed cell departures from independence



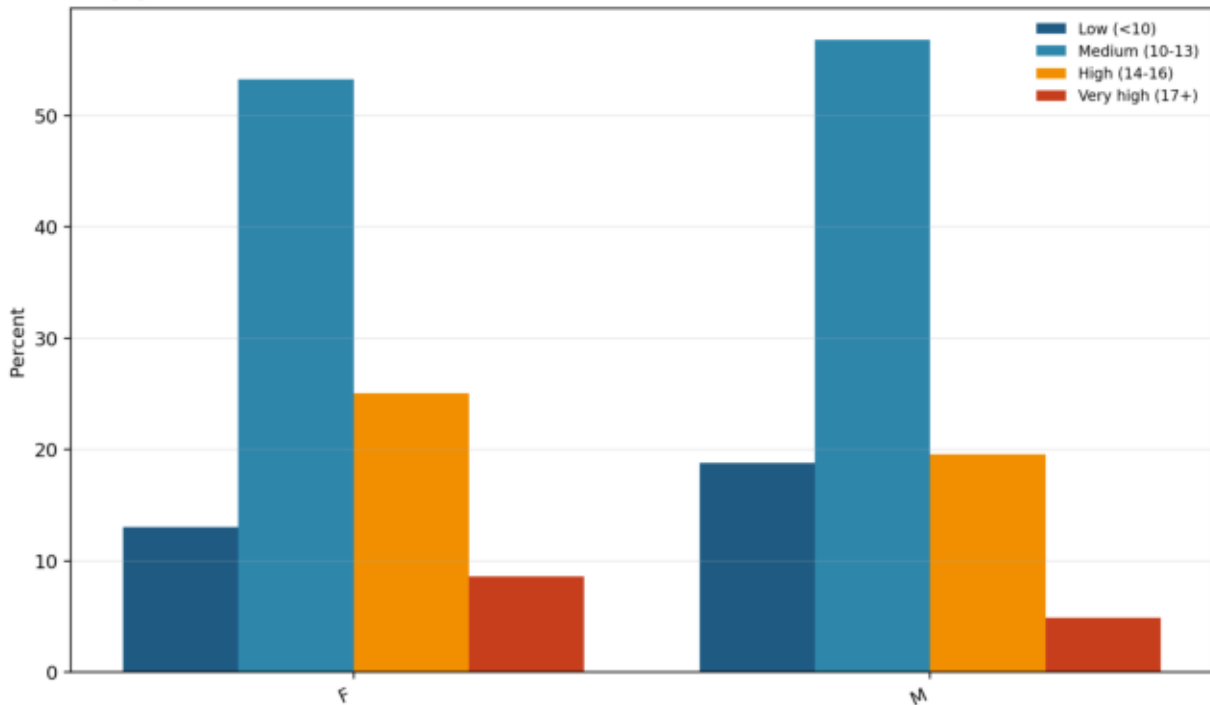
Cell contributions to the statistic

Larger values contribute more evidence



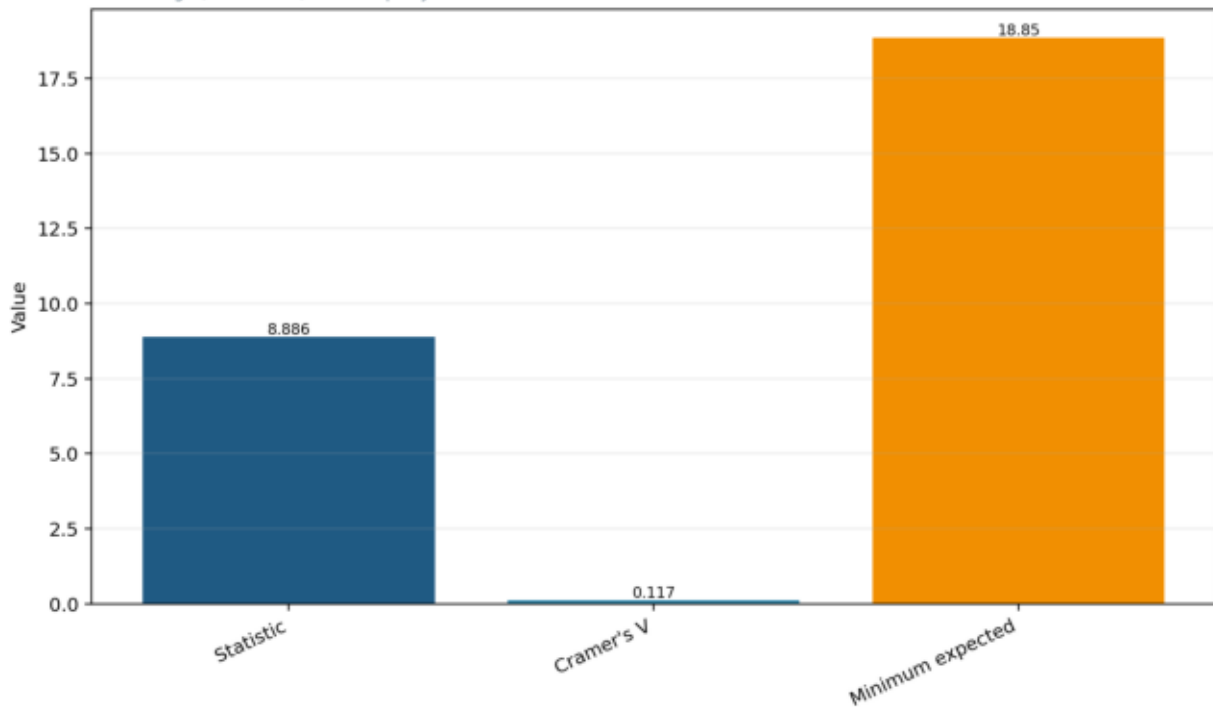
Row percentage comparison

Category distribution within each row



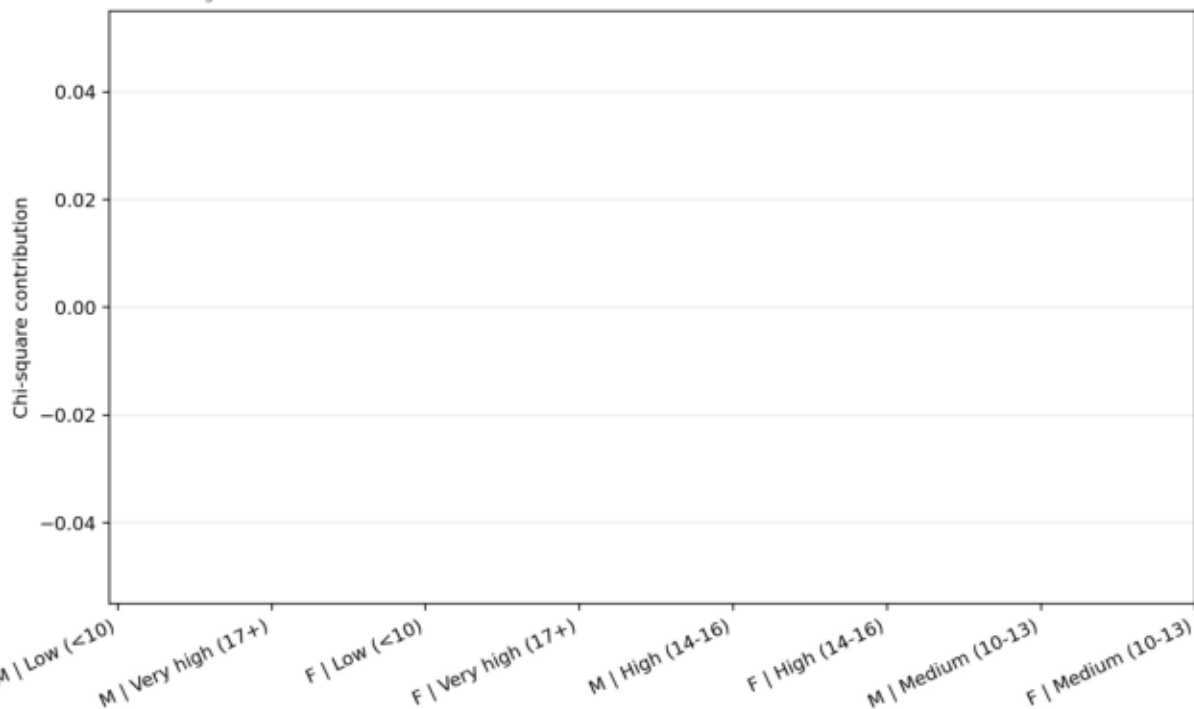
Model diagnostics

test strength, effect size, and adequacy



Largest Pearson cell contributions

Cells driving the overall association



Observed Counts

Low (<10)	Medium (10-13)	High (14-16)	Very high (17+)
50	204	96	33
50	151	52	13

Expected Counts

Low (<10)	Medium (10-13)	High (14-16)	Very high (17+)
59.0139	209.499	87.3405	27.1464
40.9861	145.501	60.6595	18.8536

Pearson Residuals

Low (<10)	Medium (10-13)	High (14-16)	Very high (17+)
-1.17337	-0.379936	0.926582	1.12349
1.40797	0.4559	-1.11184	-1.34812

Cell Contributions

Low (<10)	Medium (10-13)	High (14-16)	Very high (17+)
1.37679	0.144351	0.858554	1.26223
1.98237	0.207844	1.23619	1.81742