

Cochran's Q Test

Verified Python analysis transcript

Test: Cochran's Q Test

Design: Four related binary support/activity responses measured on the same students.

Variables: schoolsup, famsup, paid, activities

Null hypothesis: All four related binary response probabilities are equal.

Primary formula: $Q = (k-1)[k \sum_j C_j^2 - T^2] / [kT - \sum_i R_i^2]$

Valid source rows: 649

Verified results:

cochrans_q: 639.2472160356348

p_value: 3.1237986523292055e-138

degrees_of_freedom: 3

subjects: 649

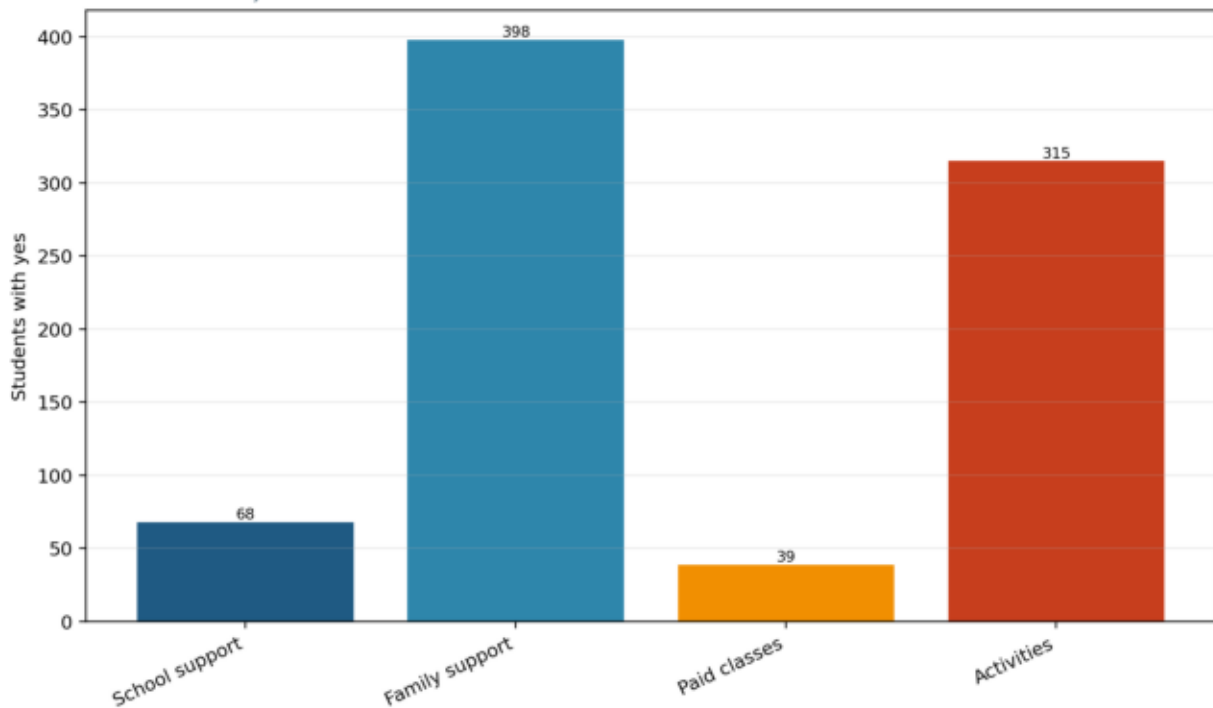
Interpretation:

Cochran's Q = 639.247216, df = 3, p = 3.1238e-138.

The four support/activity probabilities are not treated as independent because every row belongs to the same student.

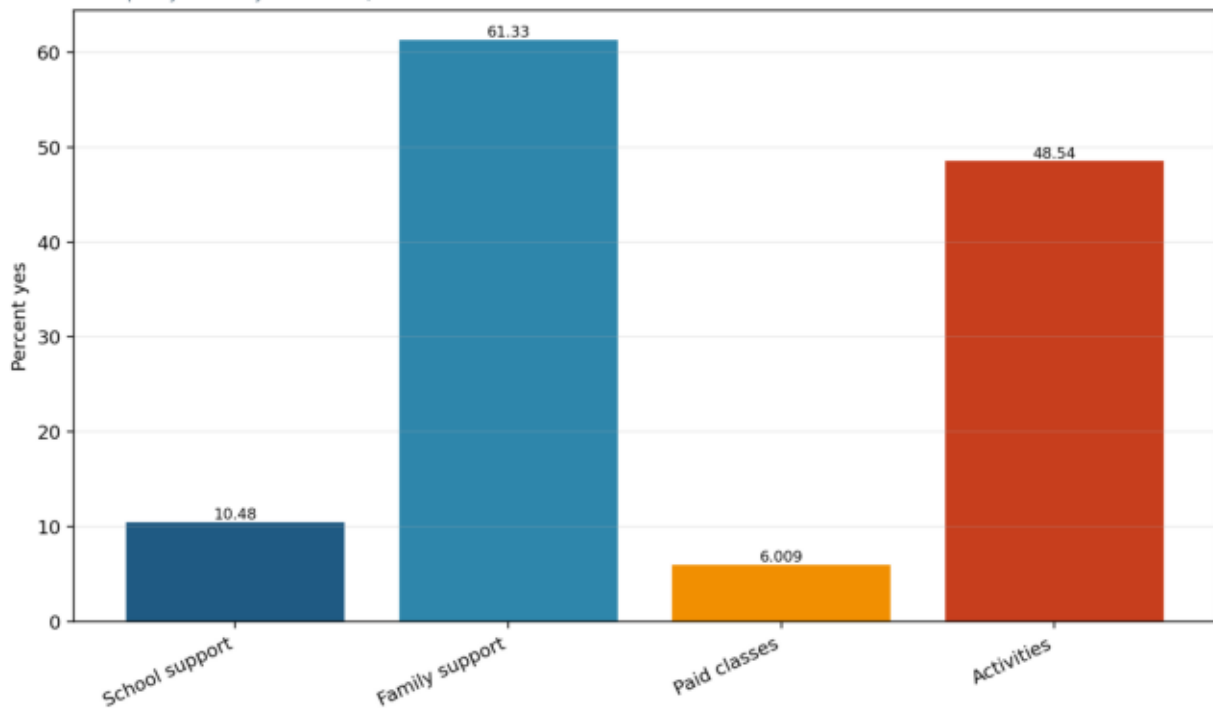
Positive responses by condition

Four matched binary measurements



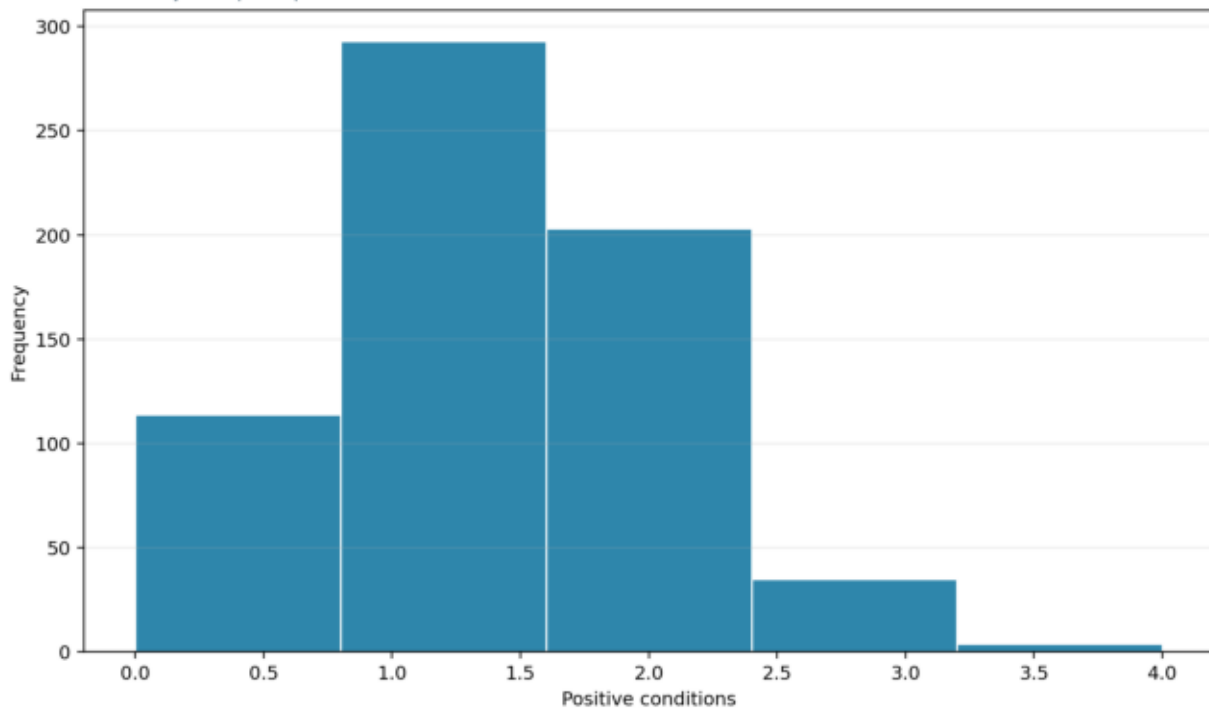
Matched response proportions

The equality tested by Cochran's Q



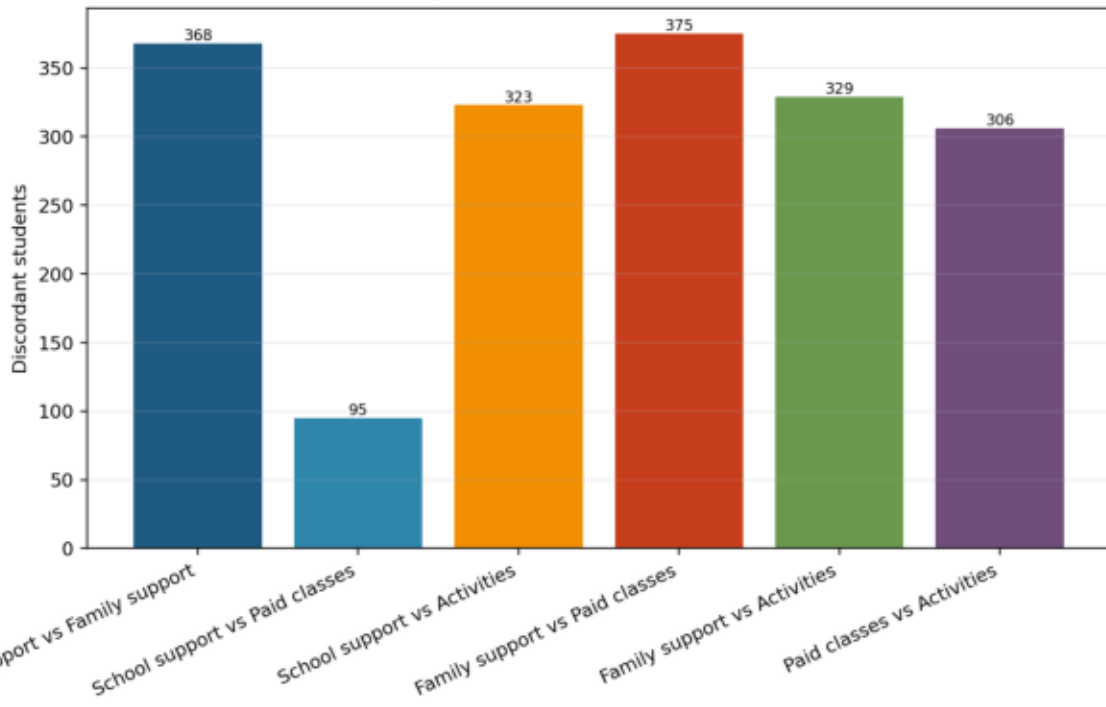
Number of positive responses per student

Within-subject response pattern



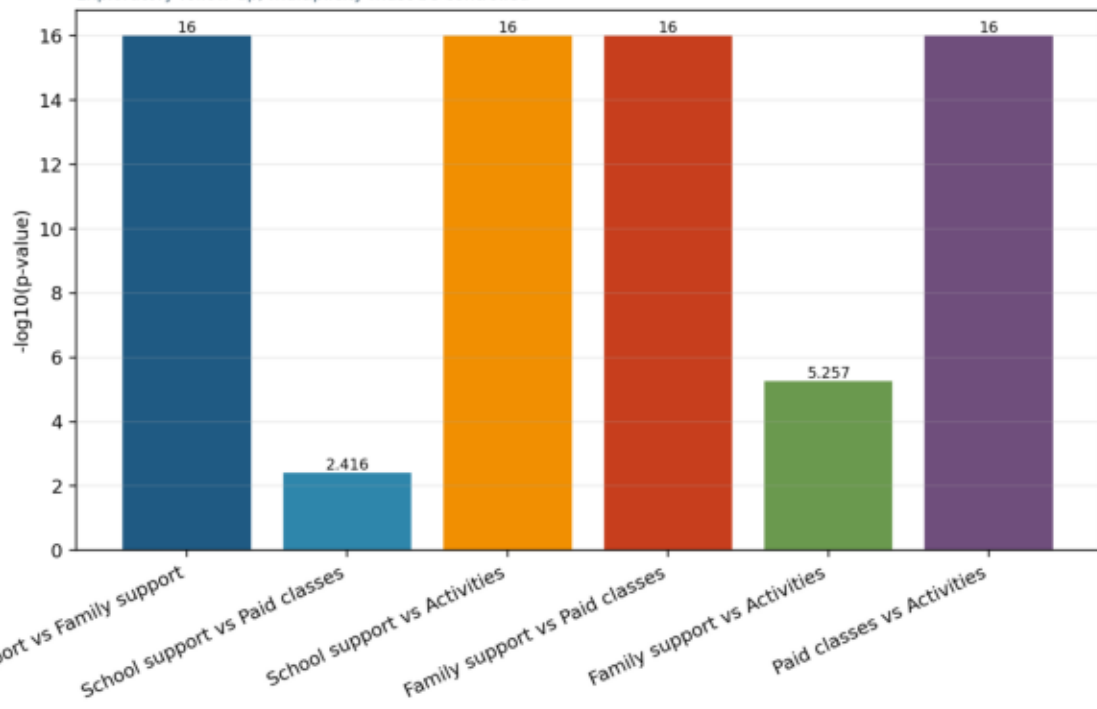
Discordant pairs for follow-up comparisons

Pairwise information after the omnibus Q test



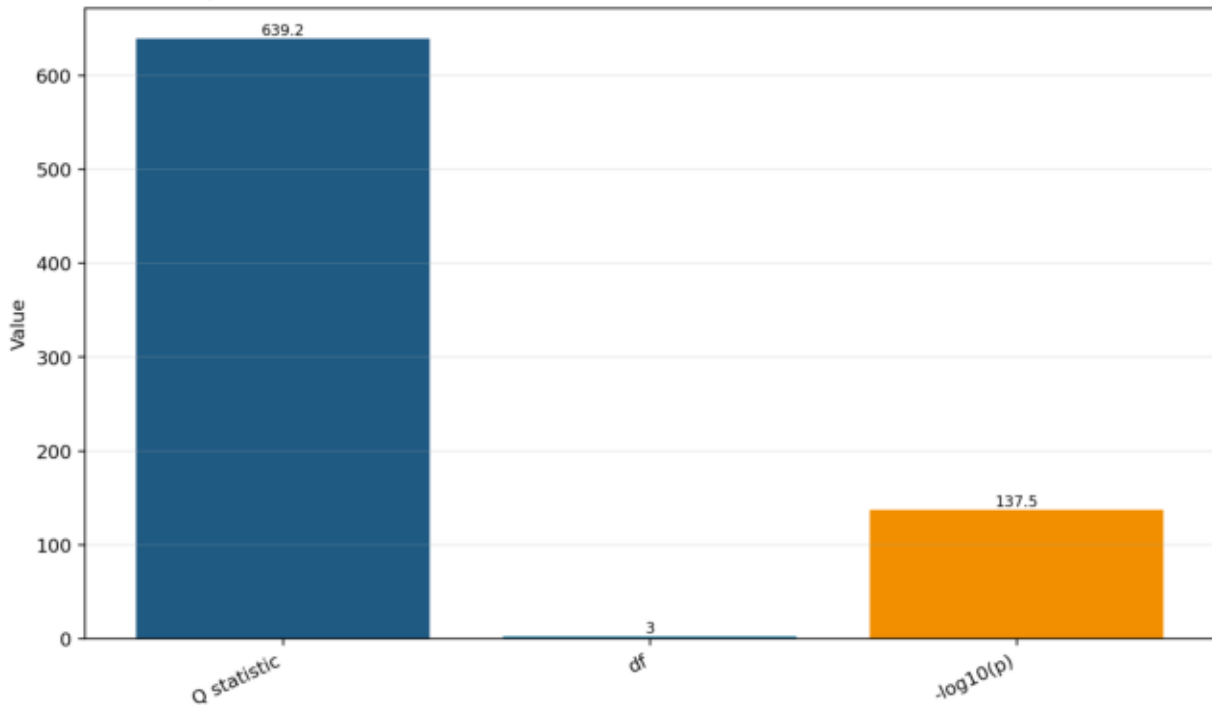
Pairwise exact McNemar evidence

Exploratory follow-up; multiplicity must be controlled



Cochran's Q result

Matched binary omnibus test



Response Matrix

School support	Family support	Paid classes	Activities
1	0	0	0
0	1	0	0
1	0	0	0
0	1	0	1
0	1	0	0
0	1	0	1
0	0	0	0
1	1	0	0
0	1	0	0
0	1	0	1
0	1	0	0
0	1	0	1
0	1	0	1
0	1	0	0
0	1	0	0
0	1	0	0
0	1	0	1
1	1	0	1
0	1	1	1
0	0	0	1
0	0	0	0
0	1	1	0
0	0	0	1
0	1	0	1
1	1	0	1
0	1	0	0
0	1	0	0
0	0	0	0

Condition Summary

successes	proportion
68	0.104777
398	0.613251
39	0.0600924
315	0.485362

Pairwise Mcnemar

i_yes_j_no	i_no_j_yes	exact_mcnemar_p
19	349	1.016e-79
62	33	0.00383287
38	285	5.98465e-48
367	8	2.38992e-97
206	123	5.53068e-06
15	291	1.68482e-67

Subject Response Totals

Row	Value
0	114
1	293
2	203
3	35
4	4