Phi Coefficient for Two Binary Variables

Contingency table:

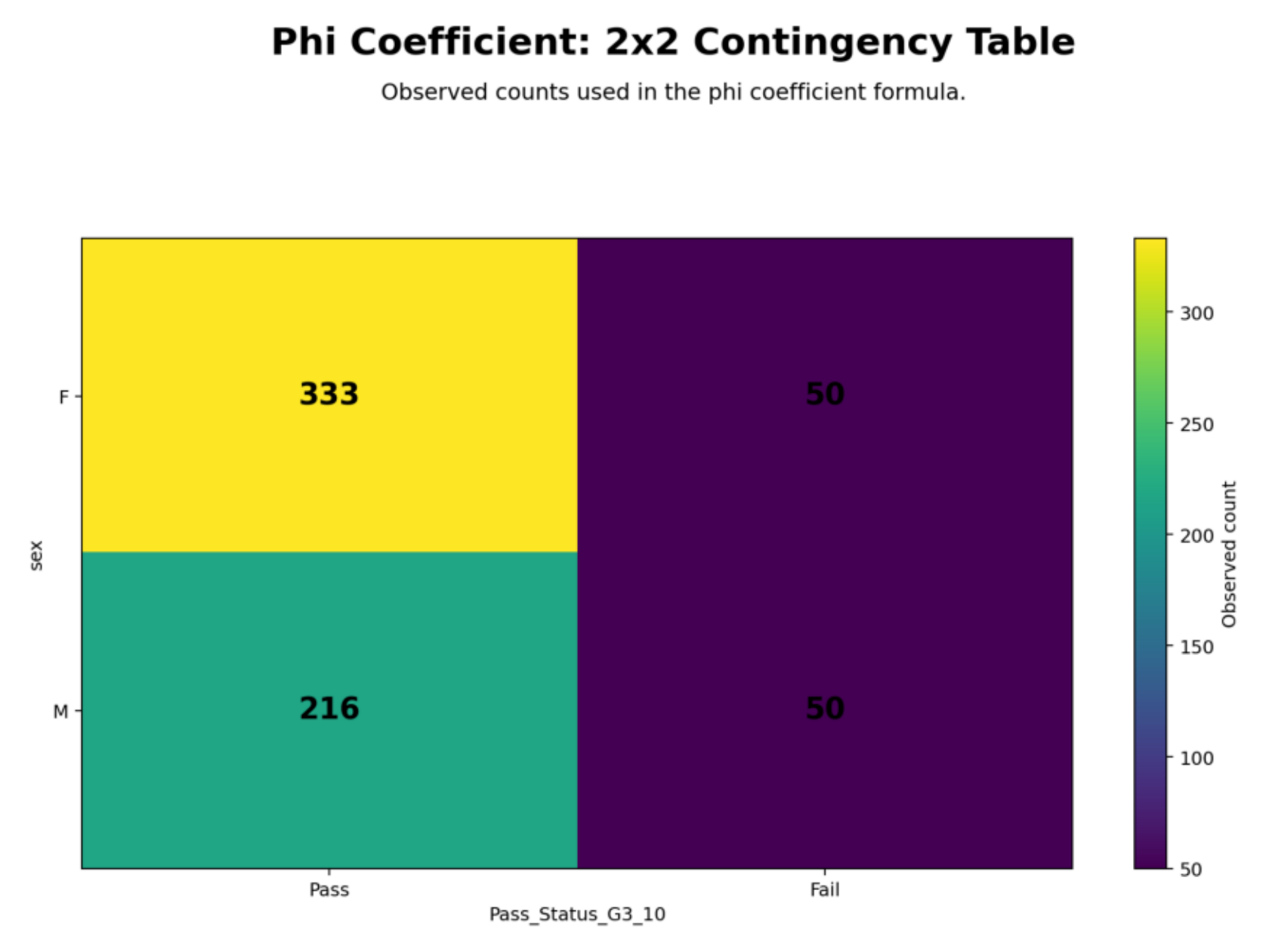
sex	Pass_Status_G3_10 Pass	Fail
F	333	50
M	216	50

Phi analysis result:

predictor_variable	outcome_variable	predictor_positive_level	predictor_negative_level	outcome_positive_level	outcome_negative_level	a_positive_positive	b_positive_negative	c_negative_positive	d_negative_negative	n	phi_coefficient	chi_square_df1	p_value	cramers_v_for_2x2	odds_ratio	risk_positive_for_predictor_level_1	risk_positive_for_predictor_level_2	risk_difference	risk_ratio	effect_size_label	decision_alpha_0_05	method_notes
sex	Pass_Status_G3_10	F	M	Pass	Fail	333.0	50.0	216.0	50.0	649.0	0.078222	3.971035	0.046289	0.078222	1.541667	0.869452	0.81203	0.057422	1.070714	Negligible	Reject H0: variables are associated	Phi = (ad - bc) / sqrt((a+b)(c+d)(a+c)(b+d)); for 2x2 tables, chi-square = n * phi^2

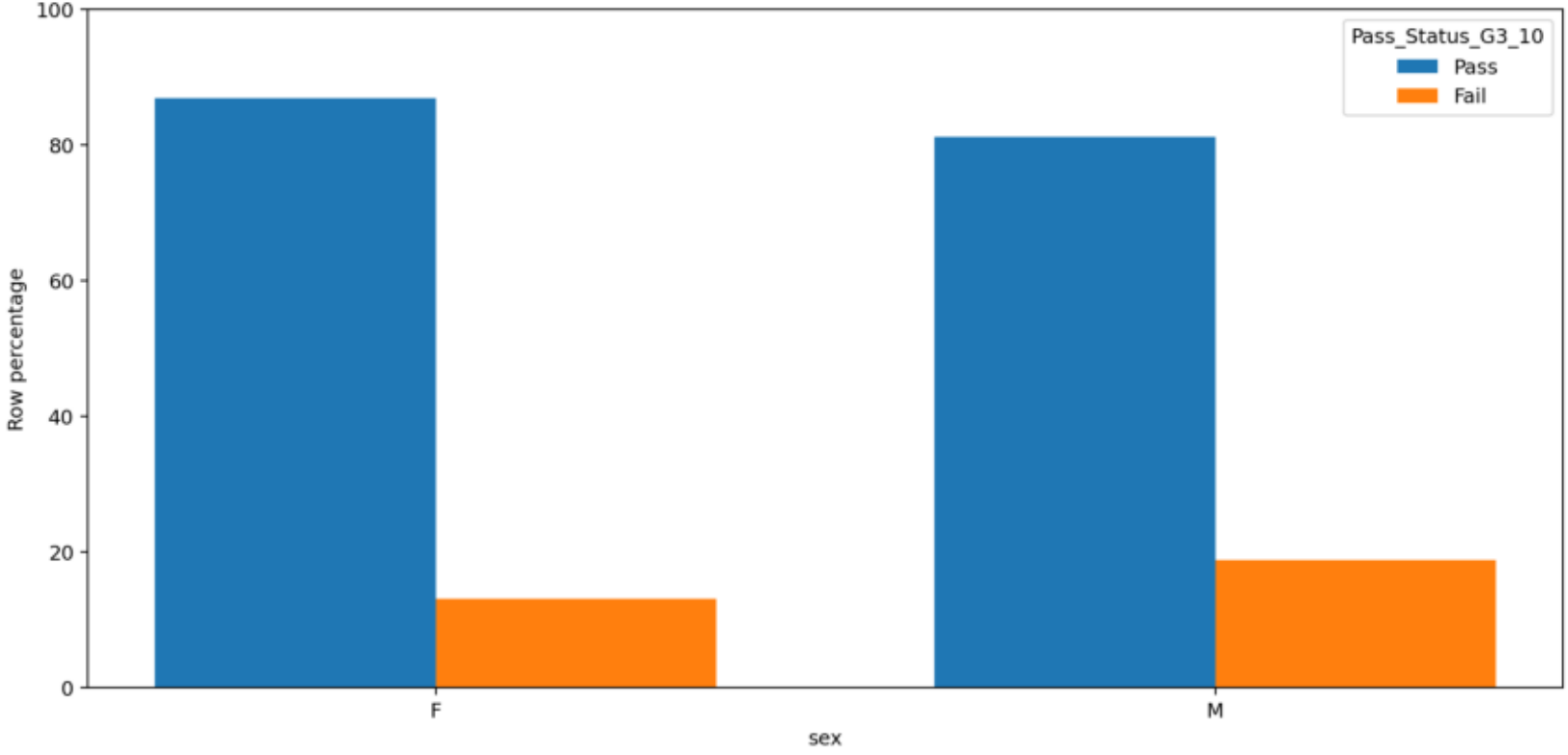
Expected counts and residuals:

predictor_level	outcome_level	observed_count	expected_count	residual	standardized_residual	chi_square_contribution
F	Pass	333.0	323.986133	9.013867	0.500781	0.250782
F	Fail	50.0	59.013867	-9.013867	-1.173368	1.376792
M	Pass	216.0	225.013867	-9.013867	-0.600906	0.361088
M	Fail	50.0	40.986133	9.013867	1.407968	1.982373


Phi Coefficient: 2x2 Contingency Table
Observed counts used in the phi coefficient formula.
333
50
216
50
F
M
sex
Pass
Fail
Pass_Status_G3_10
Observed count
300
250
200
150
100
50

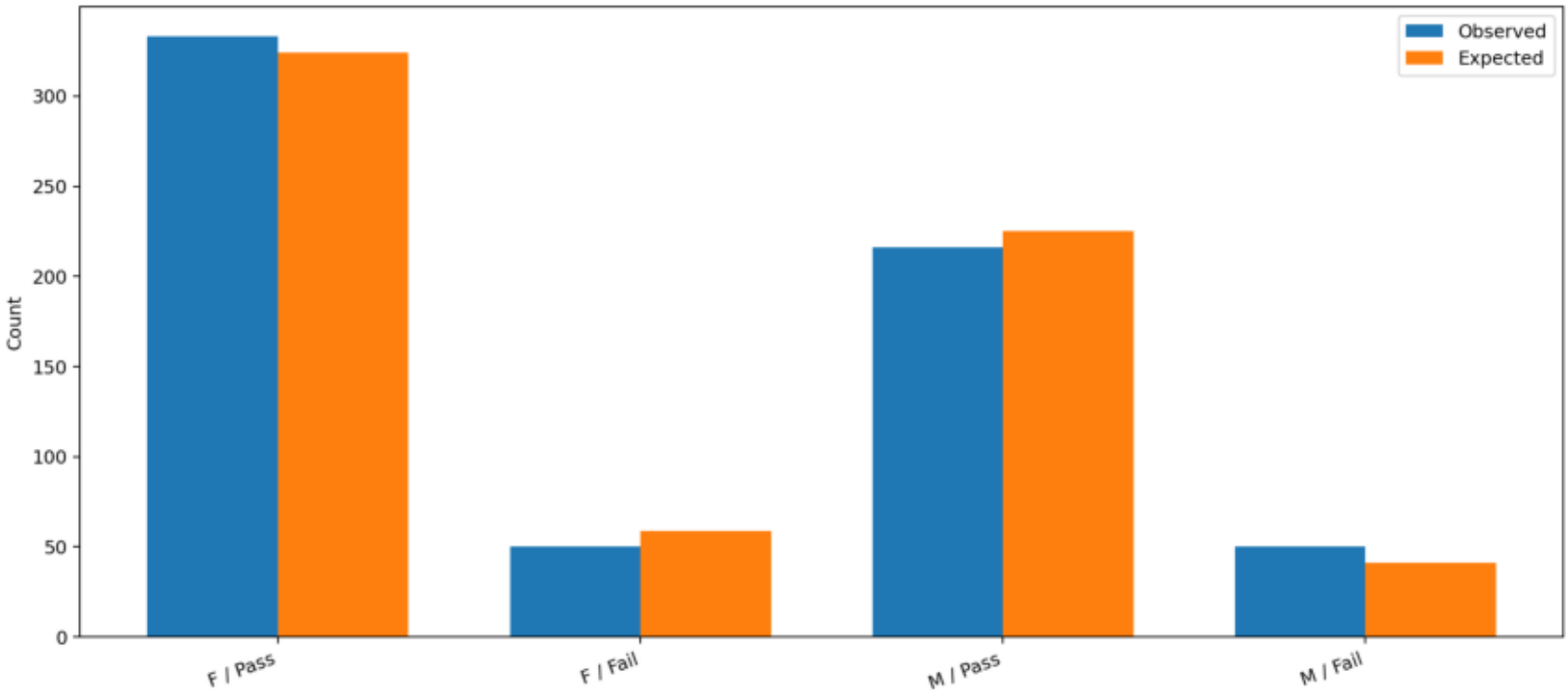
Phi Coefficient: Row Percent Comparison

The row percentages show practical direction of the binary association.



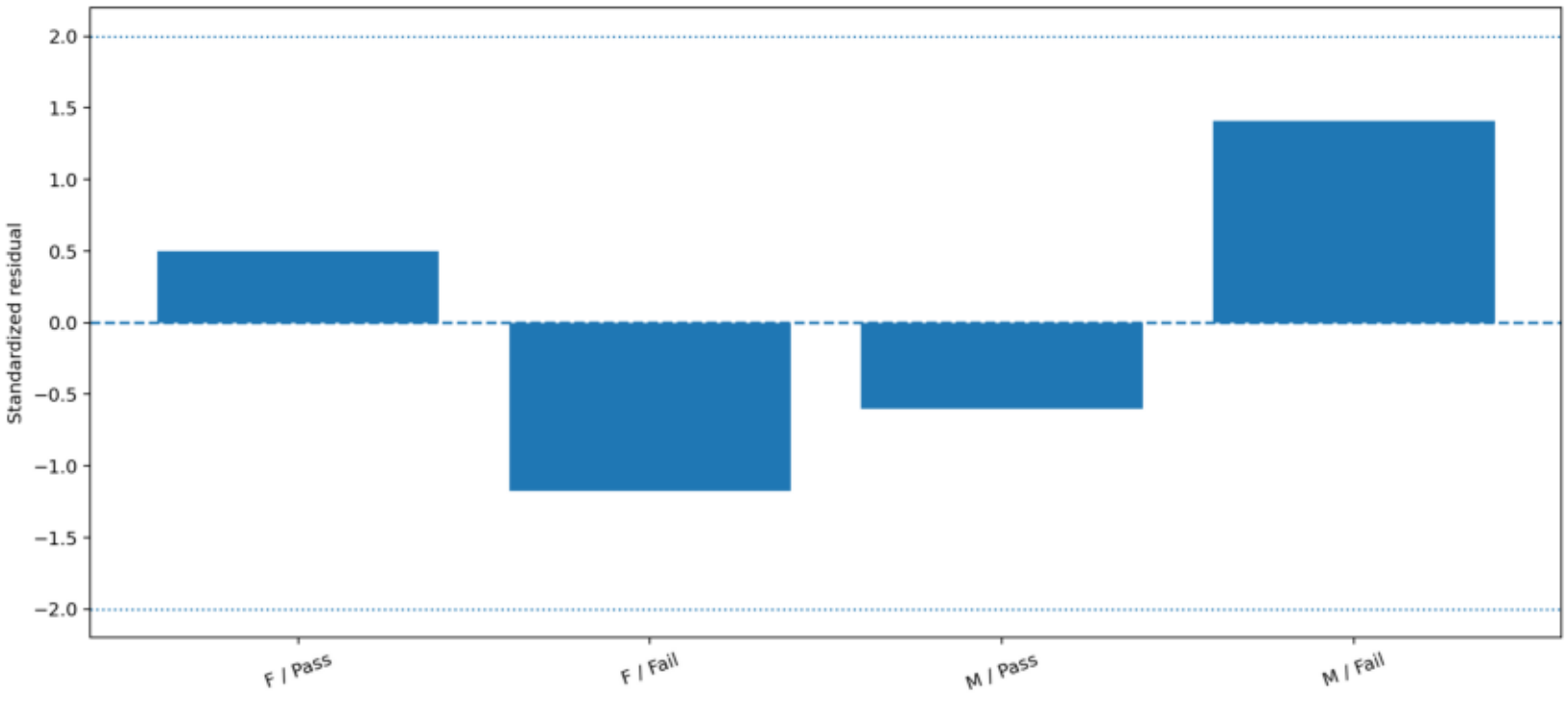
Phi Coefficient: Observed vs Expected Counts

Expected counts represent independence between the two binary variables.



Phi Coefficient: Standardized Residuals

Cells far from zero contribute more strongly to the chi-square association.



Phi Coefficient: Effect Size Summary

Phi keeps direction; Cramer's V is the absolute association strength for a 2x2 table.